



PROJECT MEMORANDUM

KIETH AND ASSOCIATES, INC.

Pompano Isle Casino Water Service Capacity Study

Project No.: 202705
Date: February 2, 2024
Prepared By: Juniper Marini
Reviewed By: Angelica Gregory, PhD, PE
Subject: Water Service Capacity Study for Development by Keith and Associates in the City of Pompano Beach, Florida - Findings and General Recommendations

This document is released for the purpose of information exchange review and planning only under the authority of M. Angelica Gregory, February 2024, Florida PE No. 75583.

1.0 PURPOSE

The purpose of this document is to transmit to Keith and Associates, Inc. (Client) general findings and recommendations for the future connection of The Live! Pompano Isle Casino (Casino) to the City of Pompano Beach (City) potable water system, and their potential impact on the City's level of service and operation as related to pipe capacity and adequacy, and potable water service pressure. In order to issue recommendations, Carollo Engineers, Inc. (Carollo) used the City's potable water hydraulic model, developed in 2020 as part of the most recent Water Master Plan Update and the development layout and potable water demands provided by the Client as of November 2023.

2.0 BACKGROUND

Carollo initially performed and submitted a high-level water capacity study for the Casino development in April 2022. Since April 2022, the development layout and distribution of water demands has changed significantly. Carollo has been tasked to confirm that the updated piping layout as proposed by Client for the development, and their corresponding updated proposed water demand (provided to Carollo November 2023), will not have any major impacts on the City's potable water system in the future. The Client also wanted Carollo to evaluate potential downsizing of the previously proposed 12-inch segment of pipe connecting the south side of the development loop to the existing 8-inch pipes along North Cypress Bend Drive. The Client's new proposed diameter is 8-inch instead of 12-inch.

3.0 PROJECT LOCATION AND NETWORK CONNECTION CHANGE

The development area proposed by the Client is located in the City, south of Pompano Park Place, north of Cypress Bend drive, east of Powerline Road, and west of the Seaboard Coast Line railroad tracks as shown in Figure 1. The Casino development proposed site currently has potable water service through three public supply accounts/meters. However, the majority of the area proposed for development does not currently have access to potable water distribution lines. The water utility service in the surrounding existing parcels is mainly commercial and residential in nature. The industrial area directly west of the Seaboard Coast Line railroad tracks, spanning roughly 980 to 1200 feet, is no longer part of the Casino development (it was part of the development in the previous study dated April 2022), and now includes separate proposed connections to the City's water system and allocated water demands.

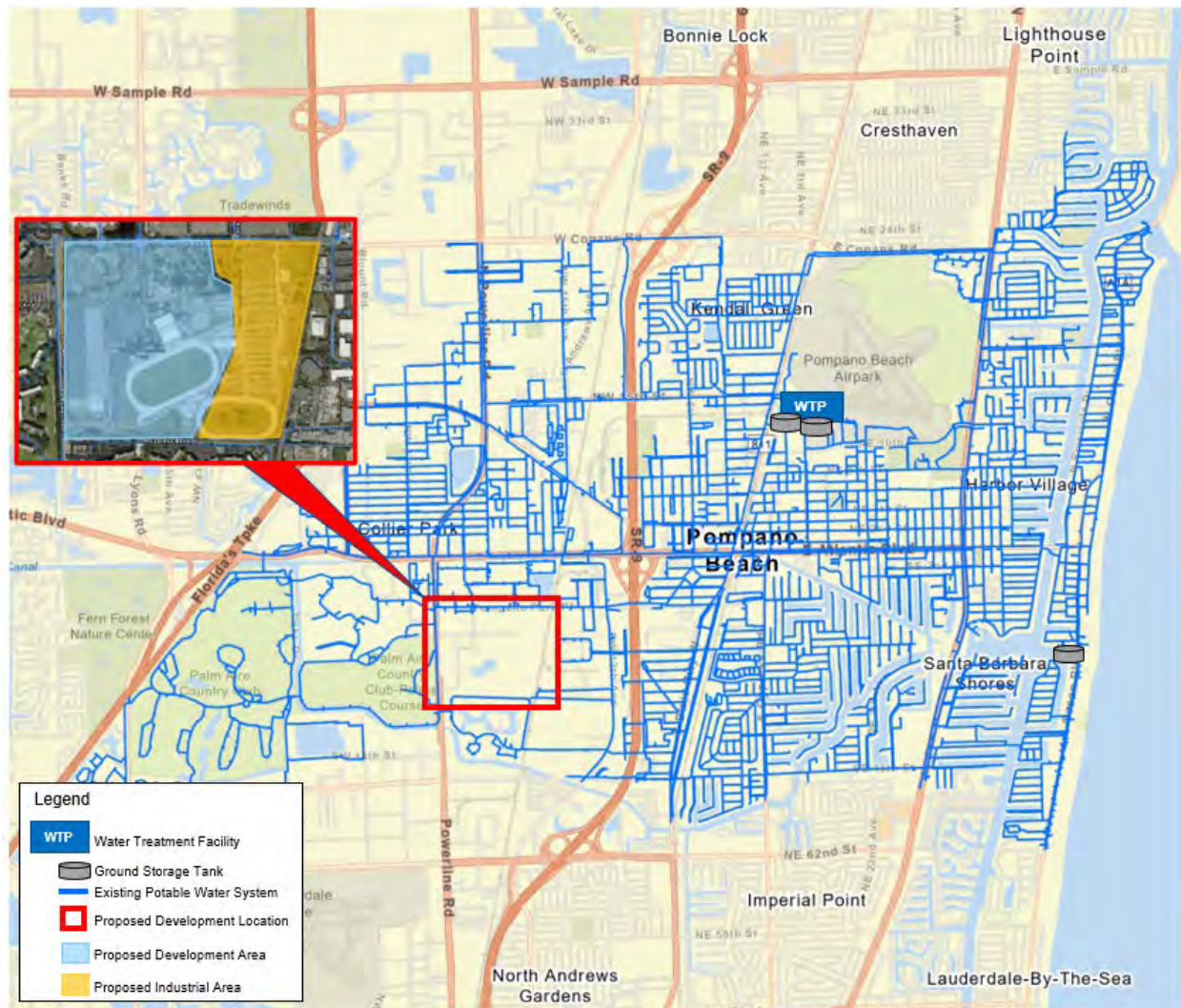


Figure 1 Location of Proposed Development by Client Relative to City's Potable Water Distribution System

4.0 HYDRAULIC MODEL UPDATE AND DEMAND ALLOCATION

The City's potable water hydraulic model was modified to include pipes that were configured using development plans, a preliminary pipe layout, and estimated water demands by land use type provided by the Client. Water demands and land use patterns were assigned to intersections between pipe segments, or junctions, based on proximity to planned buildings. The following model scenarios were modified to include the updated piping layout and the refined water demand allocation:

- 2025 Max Day Scenario.
- 2040 Max Day Scenario.
- 2040 Max Day Fire Flow Scenario.

Carollo updated the model to include the latest piping plans provided by the Client as of November 2023, which are included in this report are part of Attachment A.

Water demands were provided per building. Each building was noted by a number as part of the plans provided by the Client. Demands from each building were allocated to the nearest junction in the model, taking into account the proposed points of connection of service lines to distribution pipes (generally 8-inch in diameter). Some water demands were summed together and allocated to a junction in between two or more buildings. A maximum day peaking factor of 1.41 was applied to the water demands provided by the Client and included in each maximum day scenario. The maximum day peaking factor corresponds to the City's maximum day demand peaking factor as developed in the referenced Master Plan. For this water capacity study, it is assumed that all buildings will be built out by 2025 for a worst-case scenario evaluation.

Fire flow demands were also provided for each building. Fire flow demands were assigned to junctions nearby buildings and used for the fire flow scenario.

Attachment B shows the proposed water and fire flow demands for the Casino development as listed by the Client. The industrial area located to the east of the Casino development was reported by Client to have a water demand of 187,504 gallons per day (gpd) and to need a fire flow of 2,000 gallons per minute (gpm).

Figure 2 shows the updated model with the latest piping layout, junctions with water demands and junctions for fire flow evaluation, denoted as hydrants. The number of service lines departing from the main loop will not affect the results of this study if the total applied demands at the junctions shown are kept consistent.

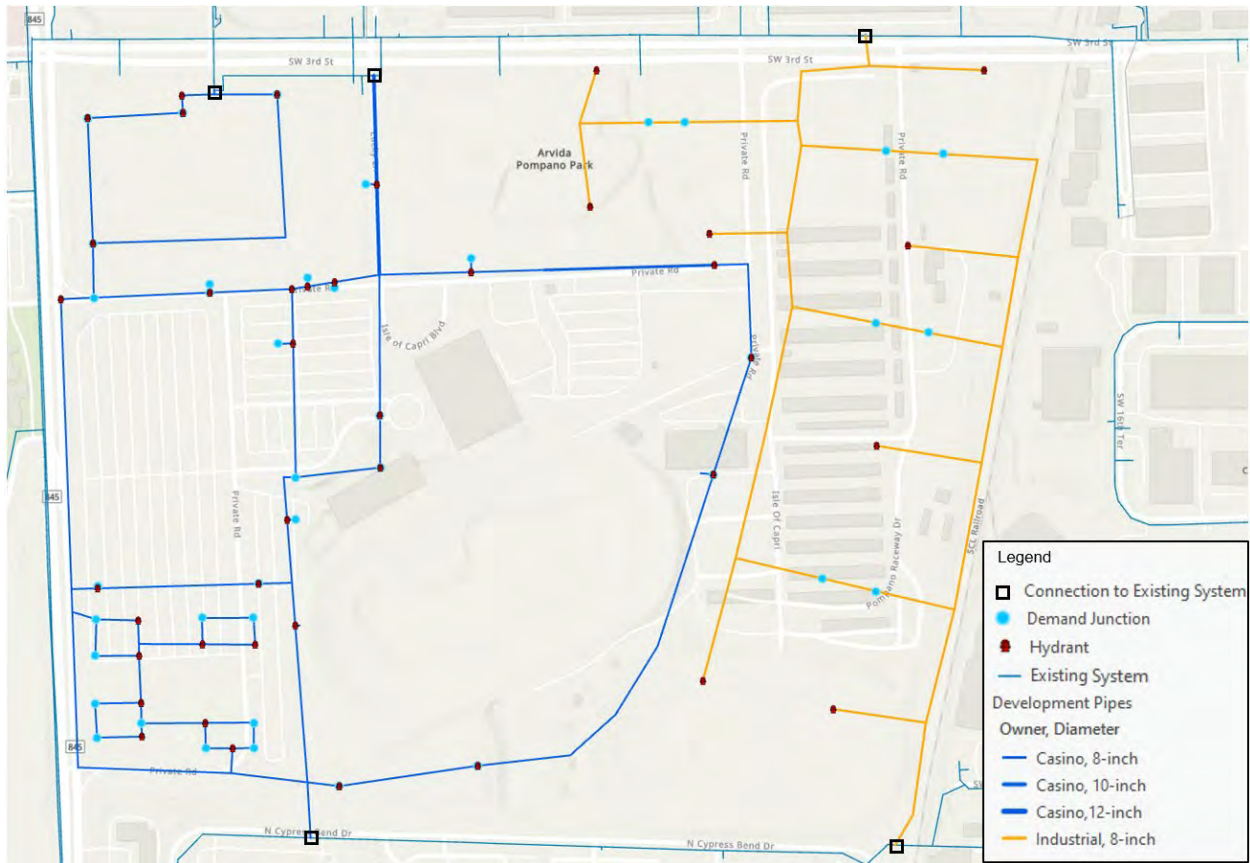


Figure 2 Proposed Piping Layout and Water Demand Allocation with Hydrants of Casino Development

4.1 Data, Assumptions, and Performance Criteria

This memorandum uses the data presented in Attachments A and B and infrastructure as found in the City's water hydraulic model previous to the Casino development. Proposed piping and layout 8-inches and larger were included as part of the scenario updates. The originally proposed 12-inch pipe connecting the south end of the development loop to the 12-inch line on Cypress Bend Drive has been decreased to an 8-inch pipe for these evaluations.

This memorandum summarizes the large-scale findings related to the hydraulic performance of incumbent infrastructure. Assessments provided are the result of desktop and engineering analyses, and not from condition assessments in the field. The computer model relies on available physical and operational data, understood to be the best available.

The pipe materials in this area, according to the development plans, are polyvinyl chloride (PVC) and ductile iron pipe (DIP) which are assumed to have a Hazen-Williams C-factor of 150 and 140, respectively. This study does not include flow measurement. The existing total flow through transmission mains was sourced from the hydraulic model, based on existing water demand allocation which uses population projections and a per capita factor.

Transmission and distribution mains must be able to meet peak demands, which are assumed to occur at the highest point in a day with maximum day demand conditions. The maximum day demands are based on the average day demands multiplied by a maximum day peaking factor of 1.41. The evaluations are based on performance criteria used in the City's latest Water Master Plan to identify system deficiencies. Table 1 summarizes the performance criteria used to evaluate the scenarios.

Table 1 Performance Criteria for Hydraulic Modeling Evaluations

Parameter	Average Day Demand Scenario	Maximum Day Demand Scenario ⁽¹⁾
Velocity	Less than or equal to 6 fps.	Less than or equal to 7 fps.
Headloss	<ul style="list-style-type: none"> Less than 3.5 feet per 1,000 feet for pipes 36 inches in diameter or larger. Less than 5.5 feet per 1,000 feet for pipes with a diameter greater than or equal to 24 inches and less than 36 inches. Less than 10 feet per 1,000 feet for pipes with a diameter less than 24 inches 	
Junction Pressure	Greater than 50 psi and less than 80 psi.	
Fire Flow Availability	Not applicable.	Greater than the NFF at critical sites, with uninterrupted domestic demand at a residual pressure of 20 psi.

Abbreviations: fps - feet per second; NFF - Need for Fire Flow; psi - pounds per square inch

Notes:

(1) Used for the evaluations in this memorandum.

The evaluated scenarios are modeled using extended period simulation (EPS) scenarios. EPS (as opposed to steady state (SS) simulations) are used to evaluate 24-hour system response, and to assess the duration and severity of identified deficiencies. Fire flow is evaluated using the fire flow demands for a specified period of time.

5.0 ANALYSES

The impact of the Casino development on the potable water distribution system is summarized in this section by comparing the 2020 City model hydraulic conditions (without the development) with the modified hydraulic conditions based on the latest plans and demands provided by the Client (with the development infrastructure and demands). For these evaluations, the development refers to the Casino development and the industrial area to the east of it.

5.1 2025 Max Day Scenarios

This section presents the existing distribution system performance results with and without the development under 2025 maximum day demand conditions. Parameters shown in Table 1 such as critical velocity in pipes, maximum headloss in pipes, and junction pressures were evaluated to identify non-compliant areas of the network. Results include:

Without the Development:

- The majority of pipes throughout the system experience velocities lower than 7 fps. However, some pipes have velocities ranging from 7.44 to 18.9 fps. Most of these pipes are located directly downstream of the high service pumps.
- Junction pressures throughout the system meet the criteria.

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- Only 0.26 percent of pipes in the network present a headloss in excess of the established criteria, and are short segments of 2-inch and 12-inch pipes, which are suspected to create hydraulic bottlenecks in the system.
- High service pump stations can pump required flows and maintain normal storage tank levels under maximum day demand (MDD) conditions.
- The water distribution system meets the selected performance criteria for maximum day demands.

With the Development Infrastructure and Demands:

- The majority of pipes throughout the system experience velocities lower than 7 fps. However, some pipes have velocities ranging from 7.53 to 19.3 fps. Most of these pipes are located directly downstream of the high service pumps. The development has no significant impact on overall system capacity.
- Junction pressures throughout the system meet the criteria. The development has no significant impact on system pressures.
- Only 0.20 percent of pipes in the network present a headloss in excess of the established criteria, and are short segments of 2-inch to 12-inch pipes, which are suspected to create hydraulic bottlenecks in the system. The development has no significant impact on system headloss.
- The installed high service pump stations can pump required flows and maintain normal storage tank levels under MDD conditions using modified pump operations to issue the additional increased demand.
- The water distribution system meets the selected performance criteria for maximum day demands.

It shall be noted that, due to the to issue the additional demand, pressures will slightly change within performance criteria. The proposed pipe connecting the Casino development loop to the existing pipe along North Cypress Bend Drive which was downsized from 12-inch to an 8-inch meets the capacity criteria.

Figures 3 through 5 compare the maximum velocity, maximum headloss, and minimum pressure results, respectively, for the 2025 Max Day Scenario with and without the development infrastructure.

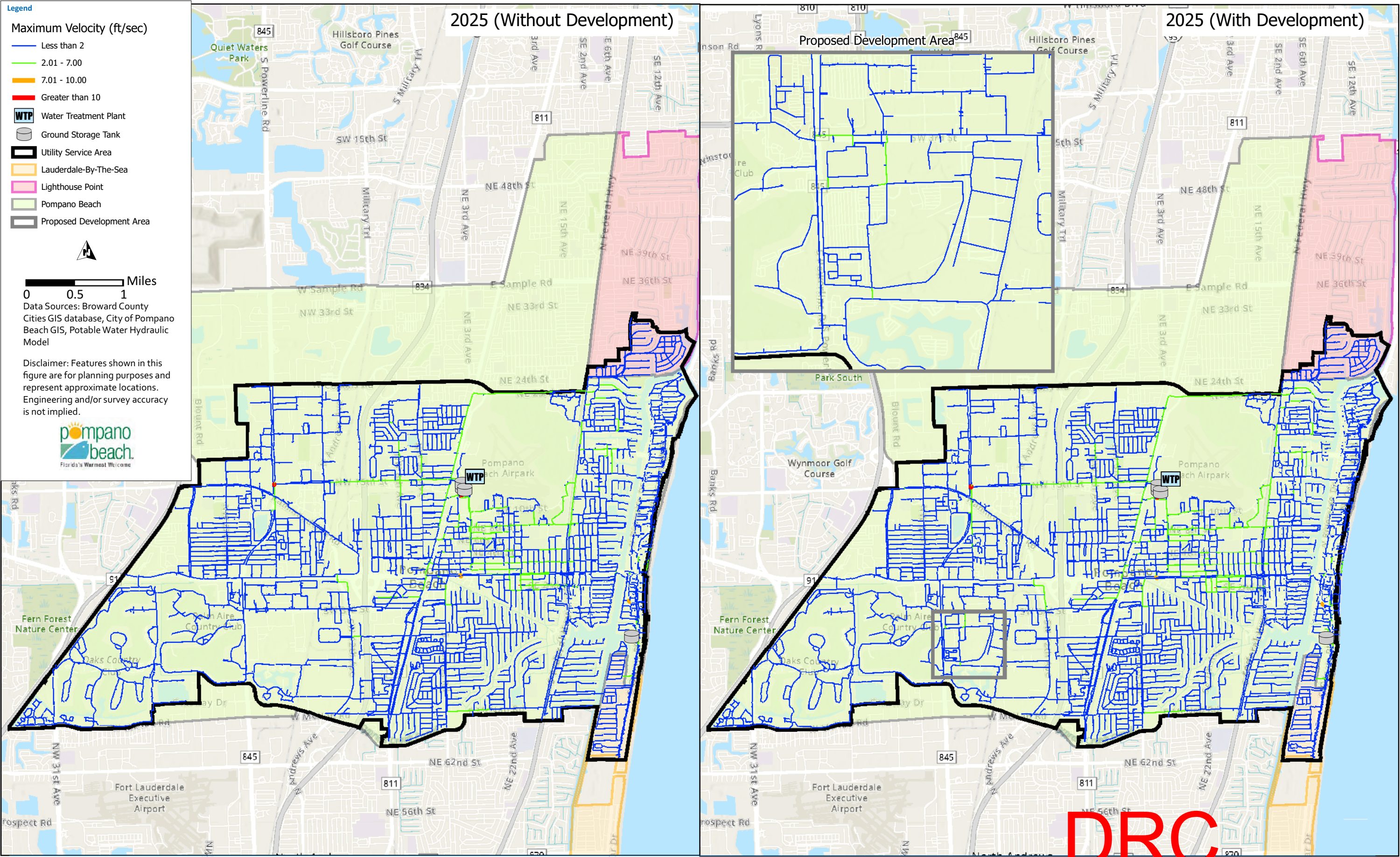


Figure 3 Maximum Velocity - 2025 Maximum Day Demand Condition

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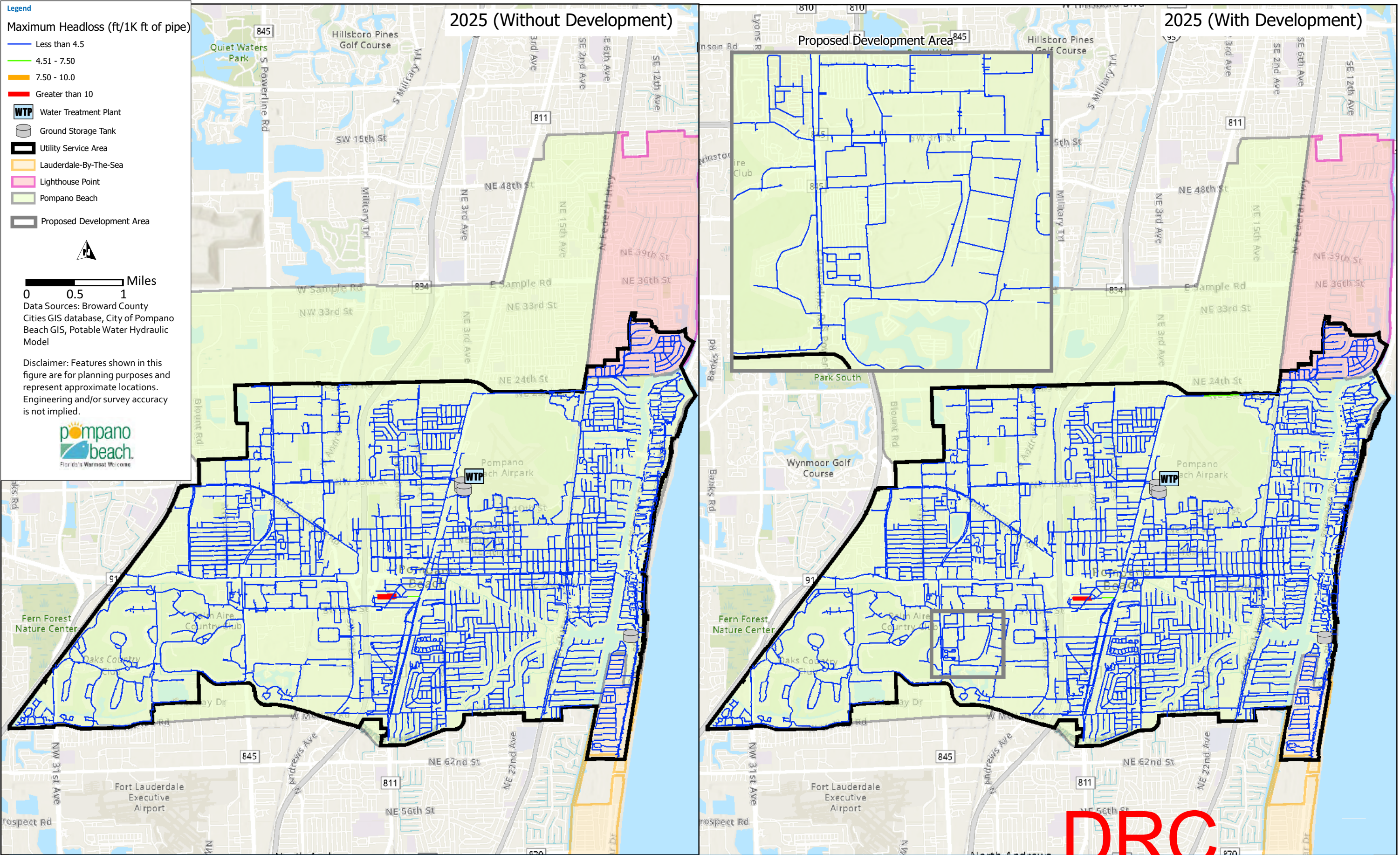
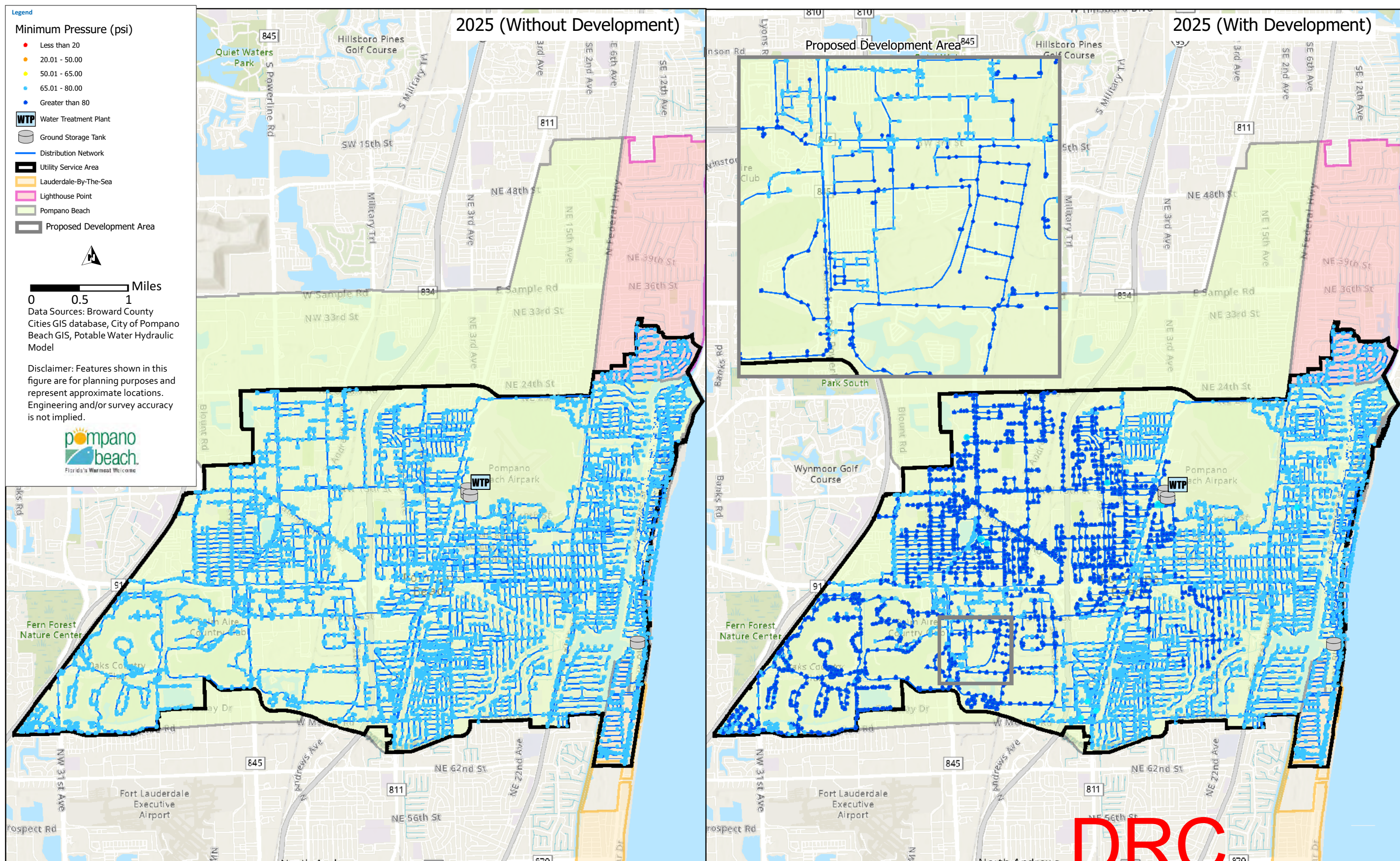


Figure 4 Maximum Headloss - 2025 Maximum Day Demand Condition

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Figure 5 Minimum Pressure - 2025 Maximum Day Demand Condition

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5.2 2040 Max Day Scenarios

This section presents the existing distribution system performance results with and without the development under 2040 maximum day demand conditions. The system was evaluated to illustrate typical operating parameters with and without the inclusion of the development at buildout. Parameters shown in Table 1 such as critical velocity in pipes, maximum headloss in pipes, and junction pressures were evaluated to identify non-compliant areas of the network. Results include:

Without the Development:

- The majority of pipes throughout the system experience velocities lower than 7 fps. However, some pipes present velocities ranging from 7.72 to 19.6 fps. Most of these pipes are located directly downstream of the high service pumps and near the Indian Mound remote pump station.
- Junction pressures throughout the system meet performance criteria.
- Only 0.24 percent of pipes in the network present a headloss in excess of the established criteria. Such pipes are short segments of 2-inch and 6-inch diameters, which are suspected to create hydraulic bottlenecks in the system. There are a few short segments of 8-inch and 12-inch piping connecting larger pipes that are showing high headloss and are also suspected of creating hydraulic bottlenecks.
- High service pump stations can pump required flows and maintain normal water storage tank levels.
- The water distribution system meets the selected performance criteria.

With the Development Infrastructure and Demands:

- The majority of pipes throughout the system experience velocities lower than 7 fps. However, some pipes present velocities ranging from 7.62 to 21.8 fps. Most of these pipes are located directly downstream of the high service pumps and near the Indian Mound remote pump station.
- Junction pressures throughout the system meet performance criteria.
- Only 0.24 percent of pipes in the network present a headloss in excess of the established criteria. Such pipes are short segments of 2-inch and 6-inch diameters, which are suspected to create hydraulic bottlenecks in the system. There are a few short segments of 8-inch and 12-inch piping connecting larger pipes that are showing high headloss and are also suspected of creating hydraulic bottlenecks.
- High service pumps can pump required flows and maintain normal water storage tank levels.
- The water distribution system meets the selected performance criteria. System pressure is higher throughout due to modified pumping operations.
- The downsized 12-inch to an 8-inch pipe connecting the Casino development loop to North Cypress Bend Drive meets criteria.

Figures 6 through 8 compare the maximum velocity, maximum headloss, and minimum pressure results, respectively, for the 2040 Max Day Scenario with and without the development infrastructure.

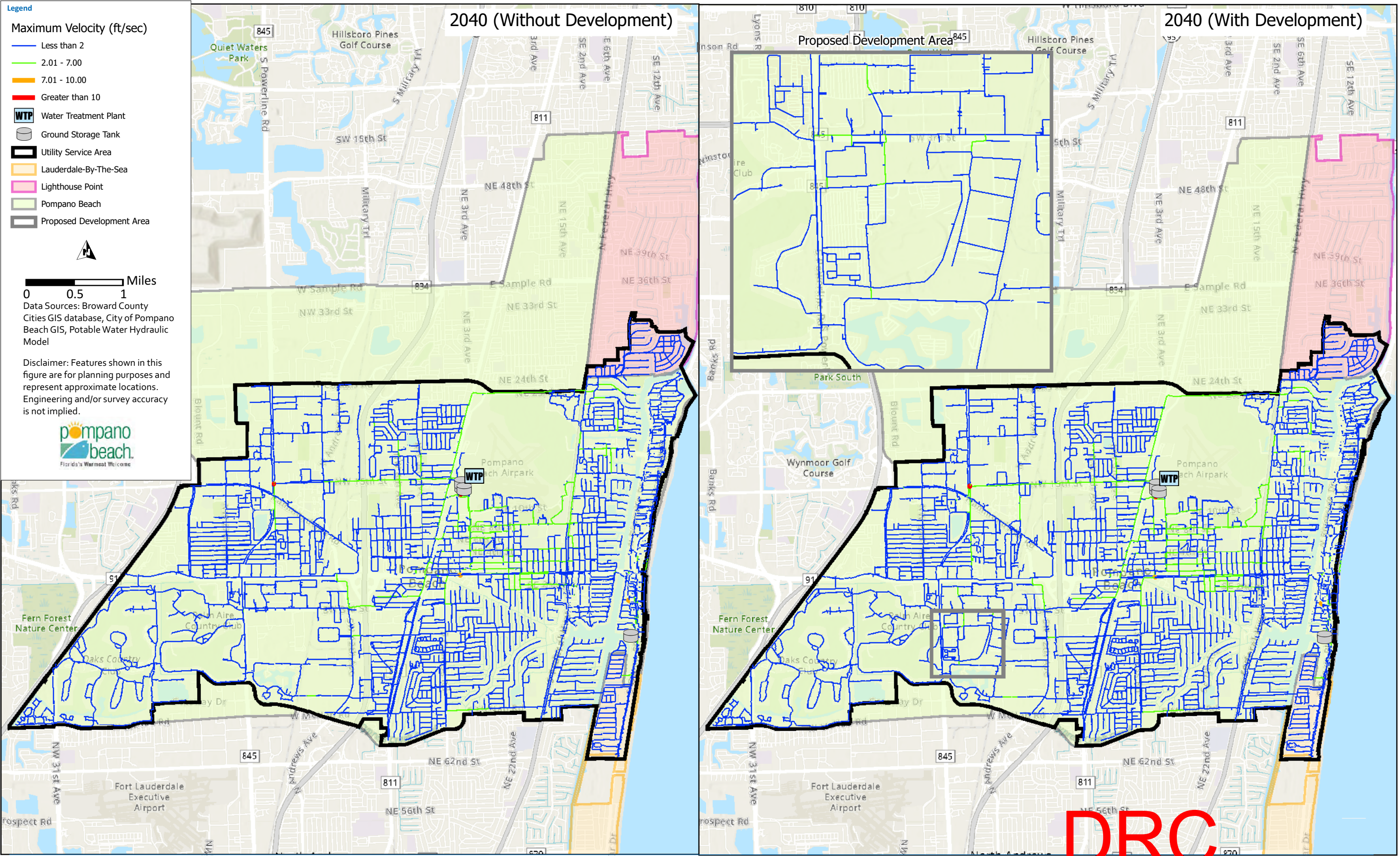


Figure 6 Maximum Velocity - 2040 Maximum Day Demand Condition

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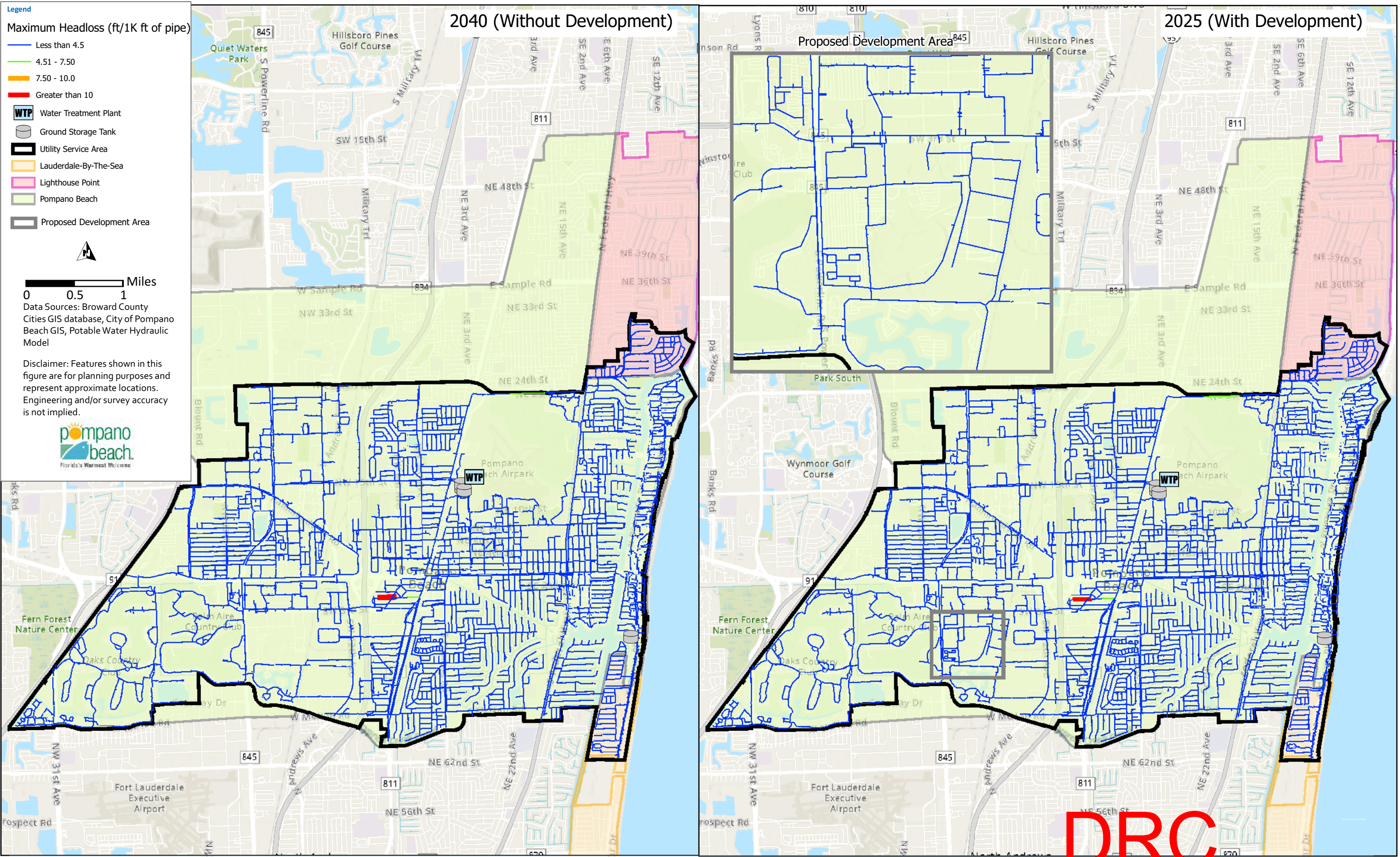
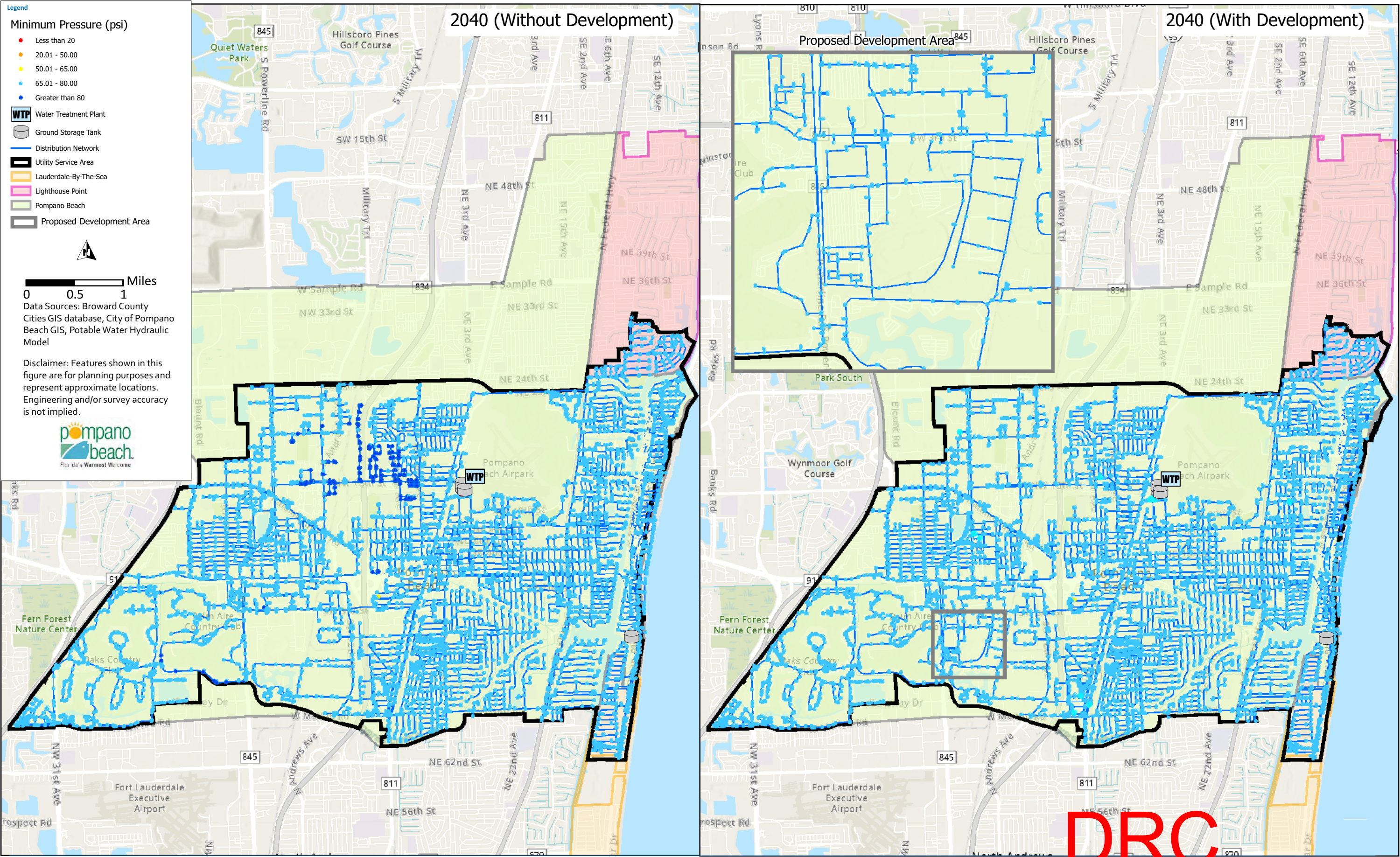


Figure 7 Maximum Headloss - 2040 Maximum Day Demand Condition

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5.3 Fire Flow Availability

Fire flow was simulated for the most critical Need for Fire Flow (NFF) expected within and around the Casino development to establish fire flow requirement compliance. Model scenario run was performed under 2040 maximum day conditions using the fire flow criteria set forth in Table 1.

5.3.1 Methodology and Assumptions

If a limiting factor for firefighting is identified for the most critical location, then the procedure would call for the investigation of other less critical demands and locations in the analysis. If no limiting factors for firefighting are identified for the most critical node, it is safe to assume that less critical fire nodes will attain their required firefighting flow need.

The fire flow scenario was assumed to occur at maximum day demand as per industry standard. Therefore, fire flows were added to the maximum day demand for the fire flow verification scenario. This same methodology was employed in the City of Pompano Beach Water Master Plan fire flow analyses.

The fire flow results assume 8-inch diameter service lines to the critical fire hydrants placed near each building within the development.

5.3.2 Fire Flow Simulation Results

Fire flow demands were provided by the Client as noted in Attachment B Table 2 shows the results of the fire flow run within the development. Results include hydrants that serve the industrial portion located to the east of the Casino and its associated buildings.

Table 2 2040 Max Day Fire Flow Scenario Results

Hydrant Model ID	NFF (gpm)	Hydrant Available Flow (gpm) ⁽¹⁾	Hydrant Pressure at Available Flow (psi)	Sufficient Fire Flow Requirements Met?
J31346	1,500	8,406	20	Yes
J31350	1,500	7,041	20	Yes
J31356	1,000	4,350	20	Yes
J31366	1,750	4,980	20	Yes
J31368	1,750	4,170	20	Yes
J31378	2,000	6,727	20	Yes
J31380	1,000	8,256	20	Yes
J31382	1,000	7,745	20	Yes
J31384	1,000	7,134	20	Yes
J31388	2,000	7,603	20	Yes
J31390	1,000	10,683	20	Yes
J31398 ⁽²⁾	2,000	4,174	20	Yes
J31402 ⁽²⁾	2,000	3,226	20	Yes
J31418 ⁽²⁾	2,000	4,447	20	Yes
J31426 ⁽²⁾	2,000	2,803	20	Yes

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Hydrant Model ID	NFF (gpm)	Hydrant Available Flow (gpm) ⁽¹⁾	Hydrant Pressure at Available Flow (psi)	Sufficient Fire Flow Requirements Met?
J31428 ⁽²⁾	2,000	2,695	20	Yes
J31432 ⁽²⁾	2,000	4,019	20	Yes
J31438 ⁽²⁾	2,000	3,567	20	Yes
J31440 ⁽²⁾	2,000	3,448	20	Yes
J31448	625	6,310	20	Yes
J31450	938	6,113	20	Yes
J31454	750	4,510	20	Yes
J31456	875	4,200	20	Yes
J31462	625	6,060	20	Yes
J31468	907	5,801	20	Yes
J31472	625	6,358	20	Yes
J31480	813	6,594	20	Yes
J31482	2,000	7,154	20	Yes
J31486	2,000	8,330	20	Yes
J31490	2,000	7,231	20	Yes
J31494	2,500	6,576	20	Yes
J31496	4,000	6,563	20	Yes
J31500	1,500	4,764	20	Yes
J31502	1,000	6,027	20	Yes
J31506	1,125	8,485	20	Yes
J31510	1,750	7,145	20	Yes
J31514	1,500	6,868	20	Yes
J31516	1,500	6,901	20	Yes
J31522	1,750	7,364	20	Yes
J31524	1,000	7,018	20	Yes

Notes:

- (1) Assumes 8-inch service lines connecting to each fire hydrant.
 (2) Hydrants located in the industrial area to the east of the Casino and associated buildings.

The available fire flow obtained from the fire flow scenario run exceeds the NFF for all the hydrants listed in the table, therefore the development meets the fire flow criteria listed in Table 1. This result is contingent to using 8-inch service lines to all fire hydrants.

6.0 CONCLUSION AND RECOMMENDATIONS

The addition of the Casino development, using the updated pipe information and water demands (which include the need for fire flow or NFF), adds minimal impact to the current system and neighboring communities.

- Impact to Transmission Pipes: Overall, the Casino development does not substantially impact the City's transmission system, other than extending previously identified capacity deficiencies in existing transmission lines close to the high service pumps slightly further away from the water treatment plant due to the need to supply an increased potable water demand.
- Impact to Distribution Pipes: A majority of distribution pipes throughout the system experience velocities less than 3 fps. This does not pose an issue as this is noted with and without the Casino development and system pressure meets performance criteria throughout.
- Impact to Neighboring Communities: There are no identified impacts at the level of the neighboring communities directly surrounding the development. This is subject to the developer maintaining the diameters shown in Figure 2, fire hydrant service lines 8-inch in diameter, and the demand distribution as presented in Attachment B.
- Firefighting Capability and Impact: The potable water distribution system will be capable to provide firefighting flow to the area, and the infrastructure proposed by the developer as shown in this memorandum will be capable to serve the most critical need for fire flow that has been identified by the developer. Firefighting capacity needs identified in different areas during the referenced Master Plan are still applicable.
- Impact to Operations: A need for adjustment to the number of high service pumps in operation during maximum day demand conditions is envisioned due to the additional water demand from the development. Future monitoring of pressures to adjust filling of the Indian Mound tank is also recommended. The system will be able to maintain and account for the additional demands in the long term.

ATTACHMENT A

CASINO DEVELOPMENT AREA PROPOSED
PIPING AND BUILDING LAYOUT AS OF
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ATTACHMENT B

DEVELOPER-PROPOSED WATER AND FIRE FLOW DEMANDS PER BUILDING

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Building #	Potable Water Demand (GPD)	Fire Flow Demand (GPM)
1	5,545	1,100
2	360	1,000
3	700	1,000
4	700	1,000
5	500	1,000
6	700	1,000
7	700	1,000
8	700	1,000
9	1,340	1,000
10	1,340	1,000
11	1,728	1,000
12	927	1,000
13	8,778	1,000
14	22,620	1,125
15	11,640	1,000
16	9,840	1,000
17	4,980	1,000
18	8,280	1,000
19	3,000	1,000
20	2,940	1,000
21	16,980	1,000
22	93,750	1,500
23	93,750	1,500
24	93,750	1,500
25	93,750	1,500
26	14,750	938
27	17,750	750
28	12,250	875
29	12,250	875
30	17,750	750
31	14,750	938
32	12,250	875
33	1,250	625
34	1,250	625
35	1,818	625
36	14,881	1,000
37	84,000	1,750
38	84,000	1,750
39	84,000	1,750
40	84,000	1,750
41	32,400	1,500
Casino	45,460	1,000
Parking Garage	1,140	1,500

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