5. IRRIGATION QUALITY WATER SYSTEM

The City's irrigation quality (IQ) water sources include reclaimed water and surface water from the City's freshwater canal system and the Southwest Aggregates Mine Reservoir.

5.1 IQ Water Supply

The City's irrigation quality (IQ) water sources include treated WRF effluent generated from the two City WRF facilities, freshwater from the canal system, reclaimed water from Florida Government Utility Authority (FGUA), a future reclaimed water supply from an interconnect with the City of Fort Myers, and seasonally available water from the Southwest Aggregates Mine Reservoir. Potable water is also used as a supplemental irrigation water source during critical dry periods.

The available IQ water supply varies over time based upon the terms of the contract agreements for reclaimed water from FGUA and City of Fort Myers; as improvements to IQ supply facilities are completed; and as reclaimed water production increases at the City WRFs due to expansion of the City's wastewater service area. In addition, the IQ water supply varies based upon varying dry and wet season conditions. A summary description of each water source is provided below and more detailed information regarding the water resource infrastructure is provided in Chapter 6.

Reclaimed Water

The primary source for the irrigation water system is effluent from the Everest and Southwest WRFs. In the last 5 years, the amount of reclaimed water produced at both Everest and Southwest WRFs has averaged at approximately 14 MGD during dry conditions and 15 MGD during the wet season.

Freshwater Canal Water

A main source of IQ water supply for the City is the network of freshwater canals. The irrigation water system consists of, as of January 2020, five City owned and operated canal pump stations, which draw water from the freshwater canals in the City and pump it directly into the reuse distribution system after screening and liquid chlorine injection. As water levels decline in the southern canals, a transfer pump station is utilized to pump water from canals north of Pine Island Road into the southern canal system. The City's five canal pump stations have the combined total pumping capacity to provide approximately 59,200 gpm (85.2 MGD). Withdrawal from the freshwater canals is permitted for 36.9 MGD on annual average basis and 50.2 MGD on a max month basis. The canal water availability to be pumped by the canal pump stations is estimated to be 12 MGD during the dry season based on historical trends.

Southwest Aggregates Mine Reservoir

The City has a water use permit from the Southwest Florida Water Management District (SWFWMD) that allows a peak month use of 16 MGD for up to 90 days per year in the dry season from the Southwest Aggregates Mine Reservoir to supplement the irrigation water supply. The Southwest Aggregates Mine is located in southern Charlotte County just east of US 41 and is a mined-out quarry, approximately 1 square mile in area, that forms a reservoir.

Reclaimed Water from FGUA and City of Fort Myers

The City has contracts with FGUA and the City of Fort Myers to take the excess reclaimed water from those public utilities for beneficial reuse within the City of Cape Coral. An interlocal agreement with the FGUA originally provided 0.25 MGD of additional irrigation water to the City in 2019. The agreement terms include that FGUA will send the following quantities to the City:

- A minimum of 1.5 MGD on an average daily basis. This is anticipated in the dry season when there is not a lot of excess reclaimed water at FGUA.
- A maximum of 3.5 MGD on an average daily basis. This is anticipated in the wet season when reclaimed water within FGUA's service area is in low demand.

The City will also purchase up to 12 MGD of reclaimed water from the City of Fort Myers starting in 2023 after completion of a river crossing transmission main. It is estimated that a minimum of 6 MGD will be available during the dry season and 12 MGD will be available in the wet season.

Supplemental Potable Water

Historically, potable water has been used as a supplemental source of irrigation water during drought conditions. In FY 2020, 43.7 MG of supplemental potable water was used for irrigation water. It is anticipated that as new IQ water sources are available, the City will no longer use potable water to augment IQ supplies and therefore it is not considered in **Table 5-1** below.

Table 5-1 below summarizes the available sources of irrigation water available to the City by 2025 during the wet and dry seasons. These quantities are illustrated in **Figures 5-1** and **5-2.**

Table 5-1: Summary of Irrigation Quality Water Sources

Source	Wet Season Supply (MGD)	Dry Season Supply (MGD)	Year Available
Reclaimed Water from WRFs	15	14	Available Now
Freshwater Canals	36.9[1]	12[2]	Available Now
Reclaimed Water from FGUA	3.5	1.5	Available Now
Reclaimed Water from the City of Fort Myers	12	6	2025
Southwest Aggregates Mine Reservoir	-	16[3]	2025[4]
Total	**67.4**	**49.5**	**-**

[1] Based on annual average permitted allocation in the SFWMD permit.
[2] 12 MGD selected conservatively based on historical dry season supply from the CPSs.
[3] Allowable withdrawal rate from the reservoir for 90 days as permitted.
[4] Estimated completion date of conveyance pipeline.

Figure 5-1: Wet Season Available IQ Water Supply

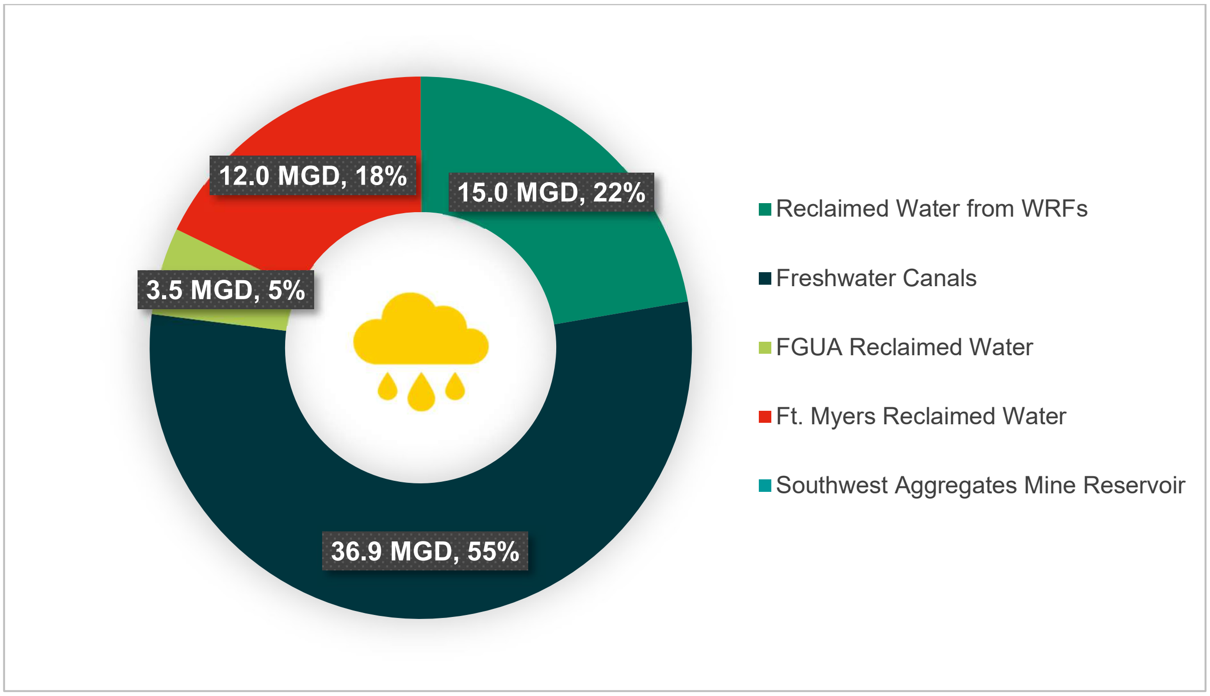
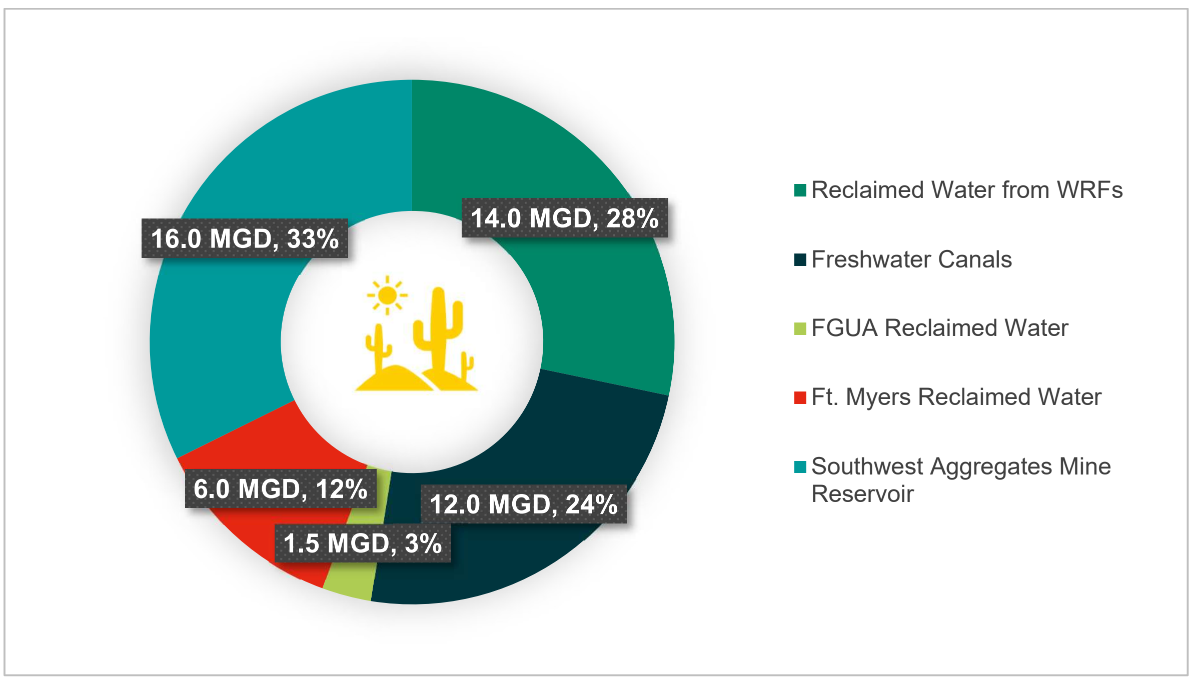


Figure 5-2: Dry Season Available IQ Water Supply



The City has many projects planned and underway to increase irrigation water supply to meet future irrigation demands and to eliminate the use of potable water for irrigation and these are described in Chapter 6 of this report. Improvements associated with the Southwest Aggregates Mine Reservoir are anticipated to be complete in 2025 and will minimize the losses from the available 16 MGD of irrigation water in the dry season. Reclaimed water from Fort Myers will also be available in 2025. Also, adoption of a new City Irrigation Ordinance will require more efficient sprinkler heads and the addition of a day to the irrigation schedule to reduce maximum day demands.

5.2 IQ Water Storage and Distribution System

The City has IQ water storage that consists of two 5-MG storage tanks at the Everest WRF and three 5-MG storage tanks at the Southwest WRF which store reclaimed water for IQ water supply. The IQ water is pumped into the IQ water distribution system via high service pumps located at the WRFs. The reuse pumps at the Southwest WRF consist of eight 250 HP pumps that have a capacity of 4,600 gpm, each. The reuse pumps located at the Everest WRF consist of six 300 HP pumps that have a capacity of 5,000 gpm, each. When the IQ storage tanks at the WRFs are full, excess treated effluent is pumped into the deep injection wells located at the Southwest and Everest WRFs or into the Caloosahatchee River at the Everest WRF. However, no effluent has been discharged to the river since 2007.

The IQ water distribution system includes, as of July 2022, 870 miles of distribution mains, 6456 gate valves, 455 butterfly valves. The system is also comprised of 74,576 service connections and 657 flushing assemblies. A portion of the IQ water distribution system includes 836 fire hydrants that provide fire protection to City residents. There are plans to expand the potable water system in these areas to provide fire protection and remove the irrigation fire hydrants.

5.3 IQ Water System Regulatory Compliance

Reuse is a significant part of water resources management, wastewater management, and ecosystem management in the state of Florida. The reduction of demand on essential drinking water sources, the elimination of undesirable surface water discharges, and the delay of expensive infrastructure investment in new water supplies are some of the many benefits of water reuse participation.

5.3.1 Current Regulations

The Florida Legislature has created "The encouragement and promotion of reclaimed water and water conservation" as formal state objectives in Section 403.064(1), Florida Statutes (FS) and Section 373.250, FS in conjunction with the EPA's Water Reuse Action Plan (WRAP) which was developed in 2020.

FDEP is entrusted with encouraging and promoting Florida's reuse program while protecting public health and environmental quality. Rules and regulations that govern reuse are stated in the following Florida Administrative code chapter:

- 62-610, FAC – Reuse of Reclaimed Water and Land Application: Establishes rules to govern reuse and land application in Florida. Rule 62-610.810, FAC distinguishes reuse of reclaimed water projects from effluent disposal.

5.3.2 New and Proposed Regulations

Existing reuse practices are continuing to develop. Potable reuse is becoming economically feasible. Due to the investment by communities, the Florida legislature, water management districts, FDEP, and EPA, the future of potable reuse is becoming more viable. Potable reuse involves treating reclaimed water to meet strict public health and environmental protection requirements and then utilizing that water to supplement drinking water supplies. Senate Bill 64 (SB 64), which was approved by the Governor of Florida in June of 2021, is among the legislations specifically addressing potable reuse. In SB 64, beneficial use or regulated authorized effluent discharges include discharges associated with indirect potable reuse projects. With regards to potable water, the bill not only incentivizes the potable reuse projects, but also specifies that potable reuse is an alternative water supply, making these projects eligible for alternative water supply funding.

A chapter under review by the FDEP is 62-620, FAC – Wastewater Facilities and Activities Permitting: This chapter sets forth the procedures to obtain a permit to construct, modify, or operate a wastewater treatment facility or activity which discharges into the waters of the State or which will reasonably be expected to be a source of water pollution. The permittee shall report to the Department any noncompliance which may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within five days of the time the permittee becomes aware of circumstances. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance including exact dates and time, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

FDEP also plans to include in this new update that any noncompliance event related to sanitary sewer overflow must be reported to FDEP. The FWEA Utility Council recommends that language be amended to include, "For noncompliance events related to sanitary sewer overflows or bypass events, which are not defined to include a spill or release of reclaimed water " indicating that reclaimed water spills or releases within limitation of the permit are not required to be reported to FDEP within 24 hours and are not subject to any fines or penalty.

5.3.3 Impacts to the City

The City continues to be at the forefront when it comes to implementing a reuse program which maximizes the beneficial reuse of WRF effluent and surface water to meet irrigation demands.

The City is not likely to pursue potable reuse alternatives in the near future considering their current integrated water management approach where desalinated brackish groundwater is used to meet potable water demands and the reclaimed water supplemented by the canal system is used to meet irrigation demands In addition, the City staff are very knowledgeable regarding permit compliance requirements for reclaimed water spills, and therefore the additional reporting requirements will not impact City operations.

5.4 IQ Water Historical and Projected Demands

5.4.1 Historical IQ Water System

The City has an established IQ water system that serves the area located south of Pine Island Road, with plans to extend to the north. As described above, the City uses alternative sources to fulfill its irrigation demands and the City has on-going efforts to expand the irrigation water supply. However, in the past during extremely dry conditions, the City has supplemented irrigation supply with water from the potable water system. Historical IQ water demand for the period of 2010-2019 is shown in **Table 5-2**.

Table 5-2: Historical IQ Water Demands

Fiscal Year	Annual Average Daily Demand (AADD)		Maximum Daily Demand (MDD)	
	System Flows (MGD)	Per Capita Demands (gpcd)[1]	System Flows (MGD)	Peaking Factor
2010	22.8	204	33.4	1.46
2011	24.7	220	34.3	1.39
2012	28.0	249	41.1	1.47
2013	26.4	234	40.9	1.55
2014	27.2	242	44.3	1.62
2015	25.7	228	38.5	1.50
2016	25.9	229	42.6	1.64
2017	27.0	239	42.8	1.59
2018	27.9	247	43.7	1.57
2019	30.7	262	47.8	1.56
Average	26.62	235	40.9	1.54

[1] Population used to calculate per capita demands are derived from historical number of reclaimed water accounts.

Per capita demand of irrigation water ranged from 204 gpcd in 2010 to 262 gpcd in 2019 with an average of 235 gpcd. Given the ongoing efforts to promote water conservation and the improvements to water sprinkler head efficiencies, 235 gpcd is used as the per capita rate for planning purposes herein. It is recommended that water conservation continues to be a core element in City planning to promote demand reduction. Measures for water conservation include efficient watering schedules and restrictions on permitted water use, as well as the consideration of Smart Irrigation Systems to reduce unnecessary watering. Further information supporting the use of 235 gpcd is provided in the Level of Service discussions provided in Section 5.5. As shown in **Table 5-2**, the MDD has generally increased from 33.4 MGD in 2010 to 47.8 MGD in 2019 with an average of 40.9 MGD. The MDD peaking factors (PFs) during that time ranged from 1.39 to 1.64 with an average of 1.54. The MDD PF of 1.5 is used for projecting the max day IQ demand.

IQ demands fluctuate based on seasonal dry and wet periods which can present a supply challenge particularly during the dry season. Ten years of historical daily IQ demands were analyzed to determine the seasonal variation in average day and max day demands between the wet and dry season. For this analysis dry season was defined as December through May and wet season as June through October. The summary of these demands separated by dry and wet season are shown in **Tables 5-3** and **5-4** and **Figures 5-3** and **5-4** respectively.

Table 5-3: Historical IQ Water Demands – Monthly Demands during Dry Season (MGD)

Fiscal Year	Dec		Jan		Feb		Mar		Apr		May	
	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day
2010	21.3	27.1	20.8	27.9	21.1	26.4	21.6	28.0	22.6	30.8	26.7	32.9
2011	20.3	26.2	-	-	-	-	-	-	-	-	-	-
2012	-	-	29.3	38.6	32.0	41.1	32.5	40.7	32.2	40.5	28.9	38.5
2013	28.8	38.8	28.0	37.0	29.3	36.7	28.6	35.8	26.6	35.7	29.4	38.1
2014	27.4	34.8	25.4	33.6	25.8	34.0	28.1	35.6	28.8	38.6	33.3	44.3
2015	27.3	33.5	29.4	36.7	29.2	38.5	31.0	38.4	28.4	37.9	25.7	33.5
2016	-	-	23.2	32.0	23.2	30.8	26.3	35.5	30.9	39.8	31.8	42.6
2017	36.5	42.4	33.3	42.6	32.6	40.7	33.2	42.8	31.6	41.7	23.9	33.4
2018	26.4	33.2	28.8	39.3	32.3	39.8	33.8	43.7	33.7	43.7	28.1	40.6
2019	30.4	39.8	30.3	39.0	29.5	38.4	31.7	40.7	31.6	41.5	33.5	44.5
10-YR AVERAGE	27.3	34.5	27.6	36.3	28.3	36.3	29.6	37.9	29.6	38.9	29.0	38.7

Dry Season	
Avg Day	Max Day
28.6	37.1

Note: Daily demand data was unavailable/incomplete for cells shown in red or with zero data

Table 5-4: Historical IQ Water Demands – Monthly Demands during Wet Season (MGD)

Fiscal Year	Jun		Jul		Aug		Sep		Oct		Nov	
	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day	Avg Day	Max Day
2010	26.8	33.4	23.2	31.2	21.5	30.4	22.4	28.8	23.1	30.4	23.0	29.4
2011	-	-	-	-	-	-	-	-	26.6	34.3	25.2	33.6
2012	28.5	38.5	21.4	32.3	23.5	36.7	24.0	31.5	-	-	-	-
2013	28.1	40.9	22.4	31.3	21.4	29.7	18.7	26.2	24.6	34.7	30.5	37.7
2014	29.9	39.9	25.4	35.5	25.6	34.3	24.4	36.6	23.5	34.3	29.5	36.5
2015	23.4	30.1	21.7	30.1	19.4	25.7	19.5	27.5	26.2	35.6	26.9	34.9
2016	26.5	34.0	26.4	35.5	22.7	29.5	22.2	28.3	-	-	-	-
2017	18.6	25.4	18.0	24.4	18.4	27.1	17.2	23.7	27.0	38.0	33.7	41.8
2018	29.4	40.1	28.2	36.6	26.6	36.0	23.8	31.4	20.1	26.2	23.6	30.4
2019	35.5	47.8	29.9	41.2	25.6	36.4	31.9	44.7	28.1	40.5	30.3	39.3
10-YR AVERAGE	27.4	36.7	24.1	33.1	22.7	31.7	22.7	31.0	24.9	34.2	27.8	35.4

Wet Season	
Avg Day	Max Day
24.9	33.7

Note: Daily demand data was unavailable/incomplete for cells shown in red or with zero data

Figure 5-3: 10-Year Average Historical IQ Water Demands - Average and Maximum Monthly Demands during Dry Season

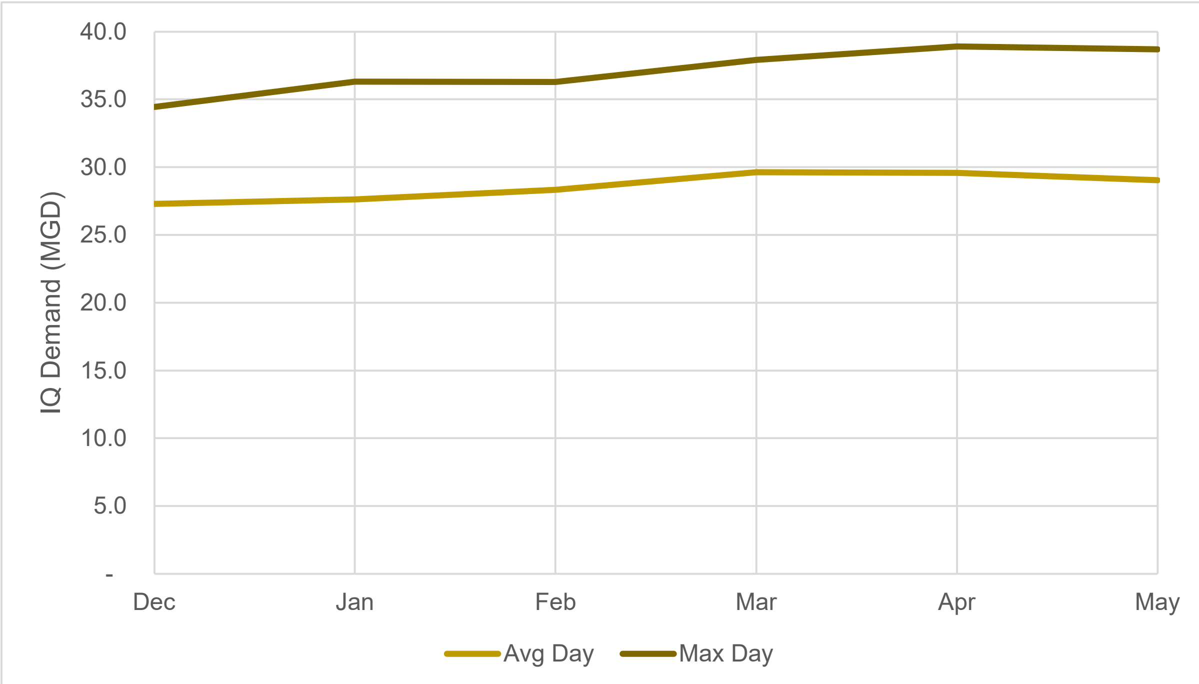


Figure 5-3 shows that, during the dry season for the period of FY 2011 to FY 2019, the highest monthly average day demand occurred in March and April at 29.6 MGD, while the highest monthly max day demand occurred in April 38.9 MGD.

Figure 5-4: 10-Year Average Historical IQ Water Demands - Average and Maximum Monthly Demands during Wet Season

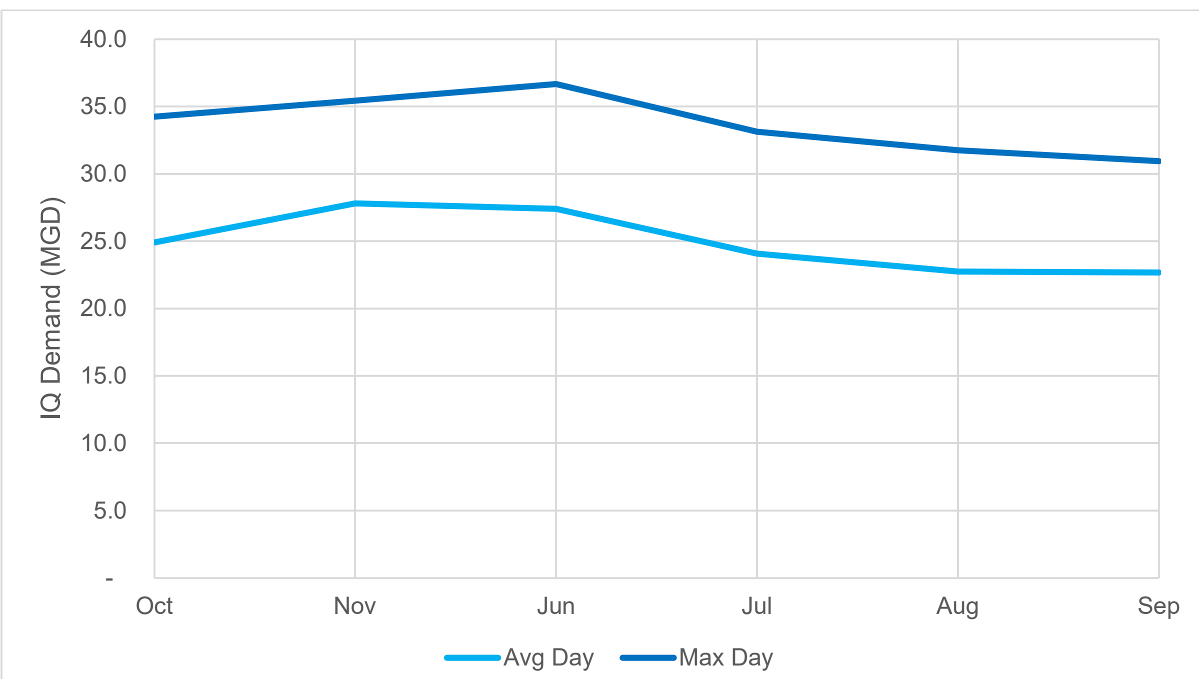


Figure 5-4 shows that, during the wet season for the period of FY 2011 to FY 2019, the highest monthly average day occurred in November at 27.8 MGD, while the highest monthly max day demand occurred in June at 36.7 MGD.

In order to account for the seasonal fluctuations in IQ demand when developing demand projections, the tabulated data was used to calculate a seasonal multiplier for wet and dry season max day and average day demands. The seasonal multiplier for the dry season (December through May) monthly average day demand was calculated by dividing the 10-year dry season monthly average day demand of 28.58 MGD as shown in **Table 5-3** by the 10-year annual average annual daily demand of 26.62 MGD as shown in **Table 5-2**. Similarly, the seasonal multiplier for the wet season (June through November) monthly average day demand was calculated by dividing the 10-year wet season monthly average daily demand of 24.94 MGD as shown in **Table 5-4** by the average annual daily demand of 26.62 MGD as shown in **Table 5-2.** The seasonal multipliers for the wet and dry season monthly maximum daily flow are calculated using the same method described above. A summary of the resulting seasonal demand multipliers that are used for developing IQ seasonal demand projections are shown in **Table 5-5**.

Table 5-5: Historical IQ Seasonal Demand Multipliers and Monthly Seasonal Demands

Season	Seasonal Avg Day	Seasonal Max Day	Seasonal Avg Day PF	Seasonal Max Day PF
Dry	28.58	37.1	1.07	1.39
Wet	24.94	33.7	0.94	1.27

Also analyzed were wastewater Minimum Month Flows (MinMF) for both the Everest and Southwest WRFs, which were evaluated on a seasonal basis to determine a min month PF which was used when projecting seasonal reclaimed water availability. The min month PF was calculated by dividing the lowest seasonal monthly average daily flow by the average of the seasonal monthly average daily flow for a given year. The lowest of the historical PFs was used to be conservative when projecting min month flows and reclaimed water availability. The results of the historical analysis of minimum month WRF flows and related PFs is presented in **Table 5-6**.

Table 5-6: Historical Wastewater Min Month Flows and PFs

Fiscal Year	Dry Season							Wet Season						
	Dec	Jan	Feb	Mar	Apr	May	Min Month PF	Jun	Jul	Aug	Sep	Oct	Nov	Min Month PF
	Avg Day							Avg Day						
2010	12.25	10.59	12.15	13.20	12.59	11.52	0.88	12.39	14.53	16.35	14.71	11.95	11.55	0.85
2011	10.82	11.34	11.46	11.71	11.64	11.36	0.95	11.80	15.00	15.33	14.72	11.37	11.38	0.86
2012	11.91	11.89	12.21	12.26	12.33	12.60	0.97	13.62	15.84	14.58	13.91	15.07	12.88	0.90
2013	11.46	11.42	12.06	12.29	11.47	11.57	0.98	12.77	15.04	15.10	16.07	12.78	11.54	0.83
2014	11.44	11.60	12.38	12.32	12.07	11.53	0.96	11.73	12.86	13.52	14.15	12.93	11.61	0.91
2015	12.36	11.79	11.99	12.03	11.67	11.52	0.97	12.47	14.61	14.79	15.20	12.75	12.46	0.91
2016	13.97	16.24	14.65	12.81	12.09	12.07	0.89	13.91	13.47	13.71	15.40	13.93	12.88	0.93
2017	11.84	12.24	12.12	12.07	12.13	11.79	0.98	14.29	14.03	16.61	16.14	14.07	12.53	0.86
2018	12.43	12.15	12.52	12.68	12.22	14.31	0.95	14.97	14.67	14.30	14.69	14.13	12.86	0.90
2019	12.62	12.96	13.68	13.31	13.26	13.23	0.96	13.73	15.33	17.07	13.28	12.88	12.36	0.88
10 Year AVG	12.11	12.22	12.52	12.47	12.15	12.15	0.99	13.17	14.54	15.14	14.83	13.19	12.21	0.88

As shown in **Table 5-6**, the lowest dry season min month wastewater flow PF is 0.88 and the lowest wet season min month PF is 0.83. These seasonal PFs are used for projecting seasonal minimum monthly flows and the estimated seasonal reclaimed water production.

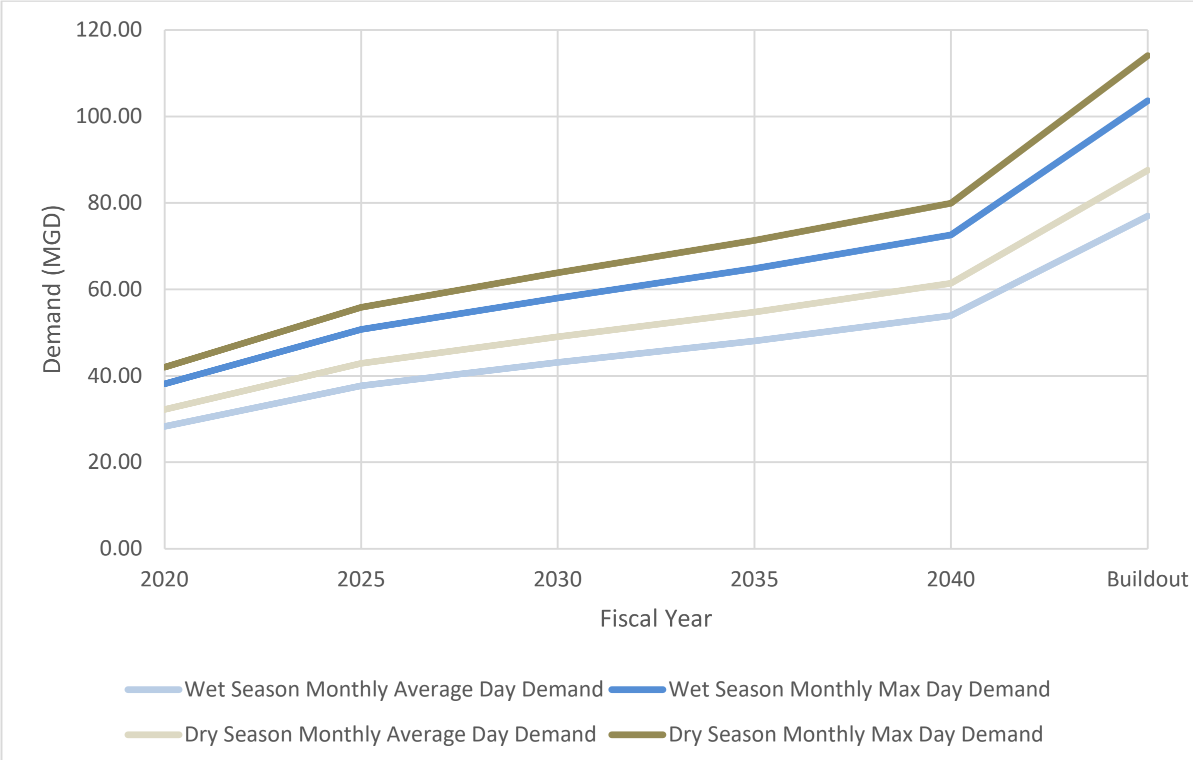
5.4.2 IQ Water Flow Projections

IQ water demand projections were prepared using the projected populations presented in Chapter 2 and the per capita water demand of 235 gpcd tabulated in Section 5.1, along with the monthly average day seasonal multipliers of 1.07 for dry season and 0.94 for wet season. The projected MDD were estimated using the AADD projections and the monthly max day seasonal multipliers of 1.39 for dry season and 1.27 for wet season. The resulting IQ water demand projections are shown below in **Table 5-7** and **Figure 5-5**.

Table 5-7: IQ Water Demand Projections

Fiscal Year	Projected IQ Served Population	Wet Season Monthly Average Day Demand (MGD)	Wet Season Monthly Max Day Demand (MGD)	Dry Season Monthly Average Day Demand (MGD)	Dry Season Monthly Max Day Demand (MGD)
2020	128,181	28.34	38.17	32.26	42.01
2025	170,433	37.68	50.75	42.89	55.86
2030	194,758	43.06	57.99	49.02	63.83
2035	217,502	48.09	64.76	54.74	71.29
2040	243,799	53.90	72.60	61.36	79.91
Buildout	348,073	76.96	103.64	87.60	114.08

Figure 5-5: IQ Water Demand Projections



5.5 Level of Service Standards/Performance Criteria

Based on acceptable application rates and frequency of use, the City has adopted irrigation water service performance criteria for per capita demand and PFs documented in City of Cape Coral Design Procedure Manual, the infrastructure element of the Cape Coral Comprehensive Plan, and the City of Cape Coral Year-Round Watering Schedule.

The City of Cape Coral Design Procedures Manual as well as the year-round watering schedule indicate that all residents in Cape Coral are allowed to water 1.5 inches/week during a 4-hour period for two days each week regardless of the source of the irrigation water. Using this application rate, a six-day watering schedule, and assuming irrigation is applied to 60% of a 10,000 sq ft lot per ERU results in 935 gpd/ERU. This results in 427 gpcd when using 2.19 persons per household which is much higher than the historical average of 235 gpcd. However, it should be noted that the 427 gpcd is dependent on several variables, including application rate, people per household, as well as lot size, whereas the historical average per capita demand reflects actual past demands. Further review of engineering reports documenting irrigation water usage was completed to verify historical per capita irrigation demands, any trends, and to confirm the appropriate per capita daily rate to be used for projecting irrigation demands in this master plan. Provided in **Table 5-8** is a summary of per capita demands documented in previous engineering reports:

Table 5-8: Historical Per Capita Irrigation Demand References

Referenced Engineering Report	Year	Per Capita Irrigation Demand – AADD (gpcd)	Notes
City of Cape Coral Water, Wastewater, and Irrigation Facilities Planning Report prepared by MWH dated 2004	2004	320	-
Irrigation and ASR Master Plan prepared by MWH dated 2011	2004	268	-
	2005	211	
	2006	200	
	2007	205	
	2008	193	
	2009	204	
North 1 and North 2 UEP Areas City of Cape Coral Water, Wastewater, Irrigation Facilities Planning Update prepared by CDM Smith dated 2016	2014	302*	662 gpd/ERU & 43,521 ERUs. Served population was estimated using 2.19 persons per ERU. Number of ERUs appears to be considering single family homes only driving per capita demand up.

Previous reports and the historical analysis completed herein have documented that irrigation demands are significantly lower than 935 gpd/ERU identified in the City's Design Manual. The historical analysis of irrigation demands shown in **Table 5-2** are in line with past studies and using an average per capita demand of 235 gpcd on an AADD basis (556 gpd/ERU) is therefore used for IQ demand projections in this master plan. As the City requested, MDD projections were calculated to determine peak conditions. The MDD PF of 1.5 is used for projection of the max day IQ demands as shown in **Tables 5-3** and **5-4.**

A list of LOS Standards/ Performance & Design Criteria was developed for the irrigation water service as summarized **in Table 5-9.** LOS, Performance and Design criteria are identified below and are utilized to establish levels of capacity for supply, treatment, and distribution systems to mitigate concerns regarding potential service interruption. The additional reliability goals are based upon Cape Coral Design Procedures Manual, FDEP and SFWMD permits as noted.

Table 5-9: Recommended IQ Water LOS and Performance/Design Criteria

Service Value	Performance Criteria Statement	2020 LOS/Performance Criteria	Unit of Measure	Driver	Reference Material
Capacity & Access	IQ water supply for irrigable areas	1.5 inch / week and/or 235 gpcd	inch / week or gpcd	Design	Cape Coral Design Procedures Manual
	Percent beneficial reuse of WRF Effluent as defined by SFWMD which equals providing an average annual reuse equal to the lowest consecutive three months of wastewater flows	100	%	Water Conservation	Consistent with Water Conservation Efforts and City of Cape Coral Water Supply Planning
Capacity & Access	Minimum pressure upstream of customer meter	30-35	psi	Design	Cape Coral Design Procedures Manual
Capacity & Access	Maximum pressure upstream of customer meter	90	psi	Design	Cape Coral Design Procedures Manual
Health & Safety	Water reclamation facility effluent water quality complies with regulatory and permitting requirements	100	% of time	Regulatory	FDEP Permit # FLA455458 and FL0030007

The recommended criteria outlined above are used as a basis to evaluate the IQ water system. The criteria are used to determine demand generated by a development and entire service area, the availability of facility capacity, and a basis to measure the overall performance of the IQ water service provided. System deficiencies over the planning horizon are identified and a prioritized list of these recommended improvements in conjunction with service expansion goals then form the basis for recommended Utility Improvement Projects.

5.6 IQ Water System Future Needs

5.6.1 IQ Water Supply Gap Analysis

An IQ water supply gap analysis is performed to determine whether the system will have excess supply or a deficit through the 2040 planning period and at buildout. The analysis is performed by subtracting the projected IQ water demands from the projected total IQ water supply availability during the wet and dry seasons. This analysis was performed for both AADD and MDD conditions using the served IQ population projections developed in Chapter 2, a per capita demand of 235 gpcd and the seasonal monthly average day and monthly max day multipliers to account for the dry and wet season variations in demand.

The IQ water supply gap analysis considers all of the City's available IQ sources:

- Reclaimed water from the City's WRFs. A minimum month flow with seasonal multipliers is used to represent the availability of reclaimed water.
- Freshwater from the City's canal system depending on seasonal adjustments.
- Reclaimed water from FGUA and the City of Fort Myers.
- Surface water from the Southwest Aggregates Mine reservoir.

In this gap analysis, potable water is only considered as an IQ water source in 2020. Historically the City has supplemented the IQ system with treated potable water during dry periods. The 2020 seasonal monthly average day and monthly max day demands shown in the gap analyses are representative of seasonal monthly average day/max day IQ supplemental potable water provided over the past 3 years, respectively. The City is taking steps to end this practice by bringing additional IQ water supply online. By 2025 it is expected that the City will no longer supplement with potable water.

The IQ water supply gap analysis accounts for seasonal variations by using seasonal multipliers where appropriate, terms in the contractual agreements, and reduced supply capacities based upon engineering judgement.

5.6.1.1 Seasonal Monthly Average Daily Demand Basis

Table 5-10 shows the results of the IQ water supply seasonal monthly average daily demand gap analysis for wet and dry seasons. For both the wet and dry season analyses, the results show that the projected IQ water demand does not exceed IQ water supply availability from 2020 through 2040. At buildout during the wet season, IQ water availability is projected to exceed demands with a surplus of 6.25 MGD. At buildout during the dry season, the IQ water supply gap is projected to be 19.42 MGD, requiring additional conservation efforts to reduce demand or additional storage and alternative IQ water sources. However, projections of demands and gap outside of the 2040 planning period should be reviewed in the future due to uncertainties.

5.6.1.2 Seasonal Monthly Max Day Demand Basis

Table 5-11 shows the results of the IQ water supply seasonal monthly max day demand gap analysis for wet and dry seasons. The seasonal max day gap analysis represents a worst-case analysis for IQ water supply availability. For the wet season analysis, the results show that the projected IQ water demand does not exceed supply availability from 2020 through 2040. However, a gap of 7.1 MGD is projected to occur at buildout during the wet season.

During the dry season, an IQ water supply gap is projected ranging from 1.38 MGD in 2025 to 17.12 MGD in 2040. That gap increases to 45.90 MGD at buildout. The City has many ongoing projects to increase IQ water supply and they also are proposing changes to the City's Irrigation Ordinance which when adopted will add one day to the irrigation schedule from 6 days/week to 7 and will require irrigation sprinkler heads with greater water efficiencies. These ongoing efforts to reduce IQ water monthly max day demand and increase monthly max day supply will help address the issue.

Table 5-10: IQ Water Supply Gap Analysis: Seasonal Monthly Average Daily Demand Basis

Served IQ Population Projection		Wet Season IQ Demands	Wet Season Supply Availability by Source (June thru Nov) (Flows in MGD)					Wet Season Surplus (Gap)	Dry Season IQ Demands	Dry Season Supply Availability by Source (Dec thru May) (Flows in MGD)							Dry Season Surplus (Gap)
Fiscal Year	Projected IQ Served Population [1]	Projected IQ Wet Season Average Day Demand[2]	Reclaimed Water[3]	Canal Water[4]	FGUA[4]	Ft Myers[4]	Total Water Availability	Seasonal Average Day Demand[6]	Projected IQ Dry Season Demand[2]	Reclaimed Water[3]	Canal Water[4]	FGUA[4]	Ft Myers[4]	SW Aggregates Reservoir[5]	Supplemental PW[6]	Total Water Availability	Seasonal Average Day Demand[7]
2020	128,181	28.34	14.17	36.88	3.5	0	54.55	26.21	32.26	15.03	12	1.5	0	16	3.09	47.62	15.36
2025	170,433	37.68	17.90	36.88	3.5	12	70.28	32.60	42.89	18.97	12	1.5	6	16	0	54.47	11.58
2030	194,758	43.06	20.68	36.88	3.5	12	73.06	30.00	49.02	21.93	12	1.5	6	16	0	57.43	8.41
2035	217,502	48.09	24.14	36.88	3.5	12	76.52	28.43	54.74	25.60	12	1.5	6	16	0	61.10	6.36
2040	243,799	53.9	25.73	36.88	3.5	12	78.11	24.21	61.36	27.28	12	1.5	6	16	0	62.78	1.42
Buildout	348,073	76.96	30.83	36.88	3.5	12	83.21	6.25	87.6	32.68	12	1.5	6	16	0	68.18	-19.42

1. Served IQ population for FY 2020 estimated based on Rate Sufficiency Study by Stantec. Population growth after FY 2020 through FY 2040 reflects 95% of system growth within both future UEP areas as per UEP prioritization timeline as well as infill within the existing system.
2. Projected IQ Wet and Dry Season Monthly Average Day Demands estimated based on Projected IQ Served Population, a 10-year historical IQ usage rate of 235 gpcd, and a 10-year historical avg day seasonal multiplier of 0.94 for wet season and 1.07 for dry season.
3. Reclaimed Water Capacity estimated from the projected combined system wastewater AADD multiplied by a 10-year historical min month seasonal multiplier of 0.83 for wet season and 0.88 for dry season.
4. Estimated Wet & Dry Season Available Irrigation Water supply based upon input from City staff and Engineering judgement, FGUA and City of Fort Myers availability as per contract, and SFWMD permit for the freshwater canals during the wet season.
5. 16 MGD for is the allowable withdrawal rate for 90 days as permitted for the SW Aggregates Reservoir.
6. Supplemental PW Capacity for 2020 estimated from historical usage between FY 2017 though FY 2019 and was assumed as zero in the future as new IQ sources will come online.
7. Seasonal Average Day Demand Surplus (GAP) for each season is found by subtracting the Total IQ Water Supply Availability from the Projected IQ Demand for each respective season.

Table 5-11: IQ Water Supply Gap Analysis: Seasonal Monthly Max Daily Demand Basis

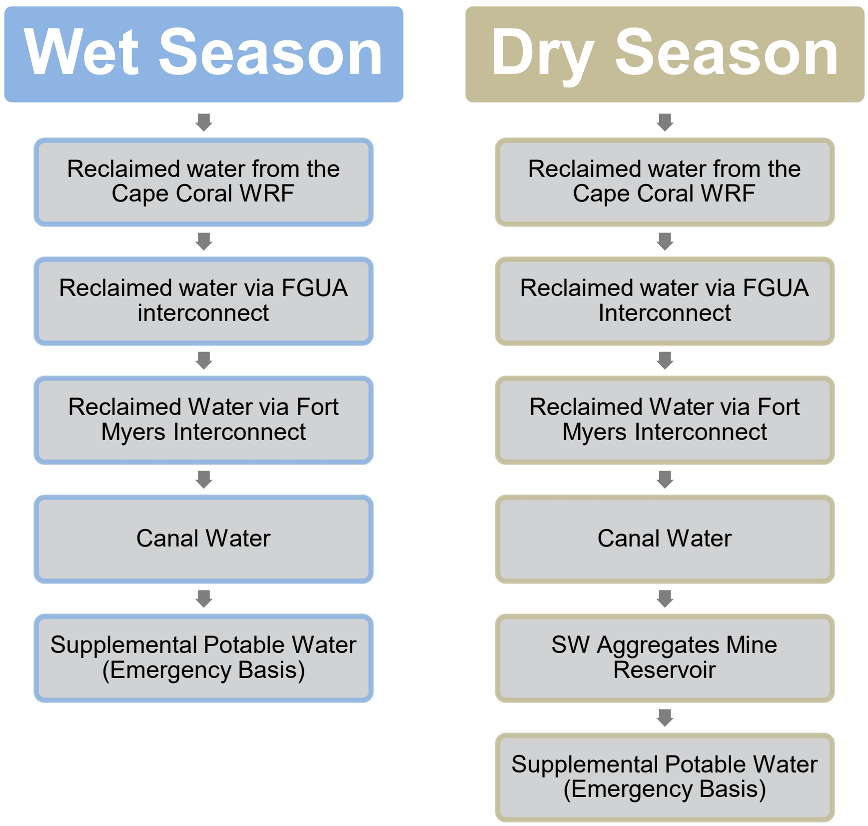
Served IQ Population Projection		Wet Season IQ Demands	Wet Season Supply Availability by Source (June thru Nov) (Flows in MGD)					Wet Season Surplus (Gap)	Dry Season IQ Demands	Dry Season Supply Availability by Source (Dec thru May) (Flows in MGD)							Dry Season Surplus (Gap)
Fiscal Year	Projected IQ Served Population	Projected IQ Wet Season Demand (Max Day)[2]	Reclaimed Water[3]	Canal Water[4]	FGUA[4]	Ft Myers[4]	Total Water Availability	Seasonal Max Day Demand[6]	Projected IQ Dry Season Demand (Max Day)[2]	Reclaimed Water[3]	Canal Water[4]	FGUA[4]	Ft Myers[4]	SW Aggregates Reservoir[5]	Supplemental PW[6]	Total Water Availability	Seasonal Max Day Demand[7]
2020	128,181	38.17	14.17	50.22	3.50	0.00	67.89	29.73	42.01	15.03	12.00	1.50	0.00	16.00	4.55	49.08	7.07
2025	170,433	50.75	17.90	50.22	3.50	12.00	83.62	32.87	55.86	18.97	12.00	1.50	6.00	16.00	0.00	54.47	-1.38
2030	194,758	57.99	20.68	50.22	3.50	12.00	86.40	28.41	63.83	21.93	12.00	1.50	6.00	16.00	0.00	57.43	-6.40
2035	217,502	64.76	24.14	50.22	3.50	12.00	89.86	25.10	71.29	25.60	12.00	1.50	6.00	16.00	0.00	61.10	-10.19
2040	243,799	72.60	25.73	50.22	3.50	12.00	91.45	18.86	79.91	27.28	12.00	1.50	6.00	16.00	0.00	62.78	-17.12
Buildout	348,073	103.64	30.83	50.22	3.50	12.00	96.55	-7.10	114.08	32.68	12.00	1.50	6.00	16.00	0.00	68.18	-45.90

1. Served IQ population for FY 2020 estimated based on Rate Sufficiency Study by Stantec. Population growth after FY 2020 through FY 2040 reflects 95% of system growth within both future UEP areas as per UEP prioritization timeline as well as infill within the existing system.
2. Projected IQ Wet and Dry Season Monthly Max Day Demands estimated based on Projected IQ Served Population, a 10-year historical IQ usage rate of 235 gpcd, and a 10-year historical max day seasonal multiplier of 1.27 for wet season and 1.39 for dry season.
3. Reclaimed Water Capacity estimated from the projected combined system wastewater AADD multiplied by a 10-year historical min month seasonal multiplier of 0.83 for wet season and 0.88 for dry season.
4. Estimated Wet & Dry Season Available Irrigation Water supply based upon input from City staff and Engineering judgement, FGUA and City of Fort Myers availability as per contract, and SFWMD permit for the freshwater canals during the wet season.
5. 16 MGD for is the allowable withdrawal rate for 90 days as permitted for the SW Aggregates Reservoir.
6. Supplemental PW Capacity for 2020 estimated from historical usage between FY 2017 though FY 2019 and was assumed as zero in the future as new IQ sources will come online.
7. Seasonal Max Day Demand Surplus (GAP) for each season is found by subtracting the Total IQ Water Supply Availability from the Projected IQ Demand for each respective season.

5.6.2 IQ Source Management Plan

The City has several IQ water sources which are discussed above. Considering the variety of sources and the seasonal variability of available supply, this section provides a recommendation for the management of these sources in the wet and dry seasons. **Figure 5-6** provides the recommended sequence of IQ water source utilization during the wet and dry seasons.

Figure 5-6: Recommended IQ Water Source Management Plan



As seen in **Figure 5-6**, priority should be given to 100% use of all reclaimed water sources first during both seasons even when water from the canals is available at larger quantities. This enables maximum utilization of reclaimed water from the City's treatment facilities, as well as Fort Myers' and FGUA's treatment facilities. During the dry season, use of the canal water is prioritized over the SW aggregates storage as long as the water levels are higher than the allowable level for withdrawal, considering the latter source is only permitted for 90 days. Supplemental potable water is only recommended to be used during emergency dry/drought conditions after exhausting all other IQ water sources.

5.6.3 Conveyance System

5.6.3.1 North 1 Analysis

The City intends to extend the IQ water system to serve the North 1 area. The starting point of the North 1 hydraulic model analysis was a model developed by MWH, which was updated to reflect current system conditions including pipelines, junctions, demand junctions, and facility operations. Three major scenarios were simulated for this evaluation: Year 2025, Year 2080 Buildout Conditions, and North 1 Construction Conditions. **Table 5-12** provides a summary of the three scenarios.

Table 5-12: Summary of Simulated Scenarios

Scenario	Purpose	Demand	Areas Included	List of Active Sources/Facilities
SCENARIO 1 *Year 2025*	Evaluate system ability to maintain pressures	2025 MDD	Existing Service Area North 2 and North1 Hudson Creek	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS
SCEANRIO 2 *Buildout*	Size water mains in North 1 area and identify capacity deficiencies	2080 MDD	Existing Service Area North 2 and North1 All future UEP Areas	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS, CPS 9, CPS 11 (Gator Circle), North WRF, Old Burnt Store Tank and PS
SCEANRIO 3 *North 1 Constructed Conditions*	Confirm the sizing selection for water mains	2080 MDD	Existing Service Area North 2 and North1 Hudson Creek	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS

The results from each of the simulations include:

- **Year 2025**: minimum pressures in the entire IQ water system are maintained above 45 psi.
- **2080 Buildout**:
  - The recommended piping network for this area primarily consists of 12-inch to 30-inch diameter transmission backbone with an 8-inch feeder system within neighborhoods, and 4 to 6-inch piping for most residential streets.
  - Necessary tie-in between the FGUA main on Del Prado Blvd and the main on NE 28th St identified to maintain minimum pressures.
- **North 1 Constructed Conditions:** Pipe sizes selected for North 1 IQ mains based on buildout conditions are adequate and minimum pressures are maintained above 30 psi.

5.6.3.2 Future Conveyance System Analysis

A hydraulic modeling analysis was conducted to evaluate the system at different intervals and recommend the irrigation system improvements needed to meet current and future needs for 2025, 2030, 2035, 2040, and buildout conditions. At the time the IQ water modeling was performed, the timeline for the North WRF coming online was assumed at buildout. As the Master Plan developed, the timing of the North WRF was moved ahead to 2035 as deemed necessary for wastewater conveyance. Additional hydraulic modeling of the IQ system was not completed because the North WRF would have little impact on system pressures and no impact on the necessary improvements identified for each scenario. The modeling was performed in extended period simulation over a 24-hour period. A summary of the six major scenarios simulated for this evaluation is presented in **Table 5-13**.

Table 5-13: Summary of Modeling Scenarios

Scenario	Demand	Areas Included	List of Active Sources/Facilities
SCENARIO 1 *Year 2020*	2020 MDD	Existing Service Area	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank
SCENARIO 2 *Year 2025*	2025 MDD	Existing Service Area North 2 and North1 North 3 Hudson Creek	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS
SCENARIO 3 *Year 2030*	2030 MDD	Existing Service Area North 2 and North1 North 3 Hudson Creek North 4 and North 5	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS, CPS 9
SCENARIO 4 *Year 2035*	2035 MDD	Existing Service Area North 2 and North1 North 3 Hudson Creek North 4 and North 5 North 6, North 7 and Coral Lakes Development	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS, CPS 9
SCENARIO 5 *Year 2040*	2040 MDD	Existing Service Area North 2 and North1 North 3 Hudson Creek North 4 and North 5 North 6, North 7 and Coral Lakes Development North 8 and North 9	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS, CPS 9, CPS 11 (Gator Circle)
SCENARIO 6 *Buildout*	2080 MDD	Existing Service Area All future UEP Areas	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank, CPS 10, Fort Myers, Pine Island Tank and PS, Del Prado Tank and PS, CPS 9, CPS 11 (Gator Circle), North WRF, Old Burnt Store Road Tank and PS

In addition to the six major modeling scenarios, four other modeling scenarios were simulated to evaluate the impacts of an additional watering day and implementation of Smart Irrigation Systems (SIS). All additional modeling scenarios were representative of the May 16, 2021 dry weather/low pressure condition of the City's irrigation distribution system. **Table 5-14** summarizes the additional modeling scenarios.

Table 5-14: Summary of Additional Modeling Scenarios

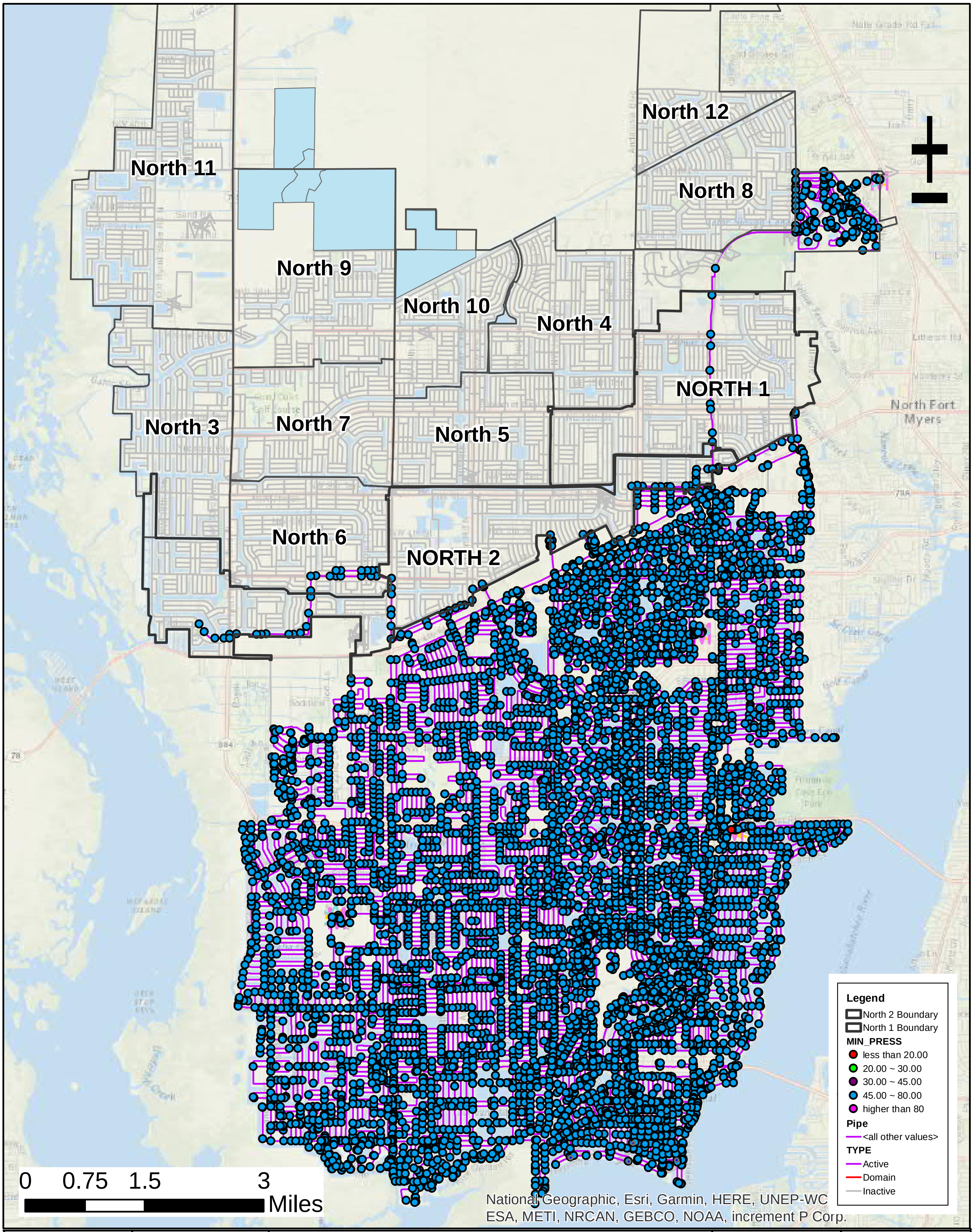
Scenario	Demand	Areas Included	List of Active Sources/Facilities
SCENARIO 7 *Existing Demand*	Pump operation and demand based on existing dry weather low pressure condition, based on May 16, 2021.	Existing Service Area North 2	CPS 2, CPS 3, CPS 4, CPS 5, CPS 8, Everest WRF, SW WRF, Entrada Tank
SCENARIO 8 *With an additional irrigation day*	Demand lowered by 16% due to addition of an irrigation day.		
SCENARIO 9 *With Smart Irrigation Systems 30% reduction in demand*	Demand lowered by 30% due to Smart Irrigation Systems.		
SCENARIO 10 *With Smart Irrigation Systems 15% reduction in demand*	Demand lowered by 15% due to Smart Irrigation Systems.		

5.6.3.3 Hydraulic Modeling Results and Findings

This subsection summarizes the results and findings from each of the modeling scenario simulations, including recommended improvements.

Baseline Conditions, Year 2020 (Scenario 1):

This scenario only evaluated the existing IQ water system ability to maintain pressures for the year 2020. **Figure 5-7** illustrates the minimum pressures in the system for this scenario. The results indicate that all minimum pressures were maintained above 45 psi.



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City of Cape Coral
Minimum Pressures for the 2020 MDD Scenario

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Figure 5-7

Year 2025 (Scenario 2):

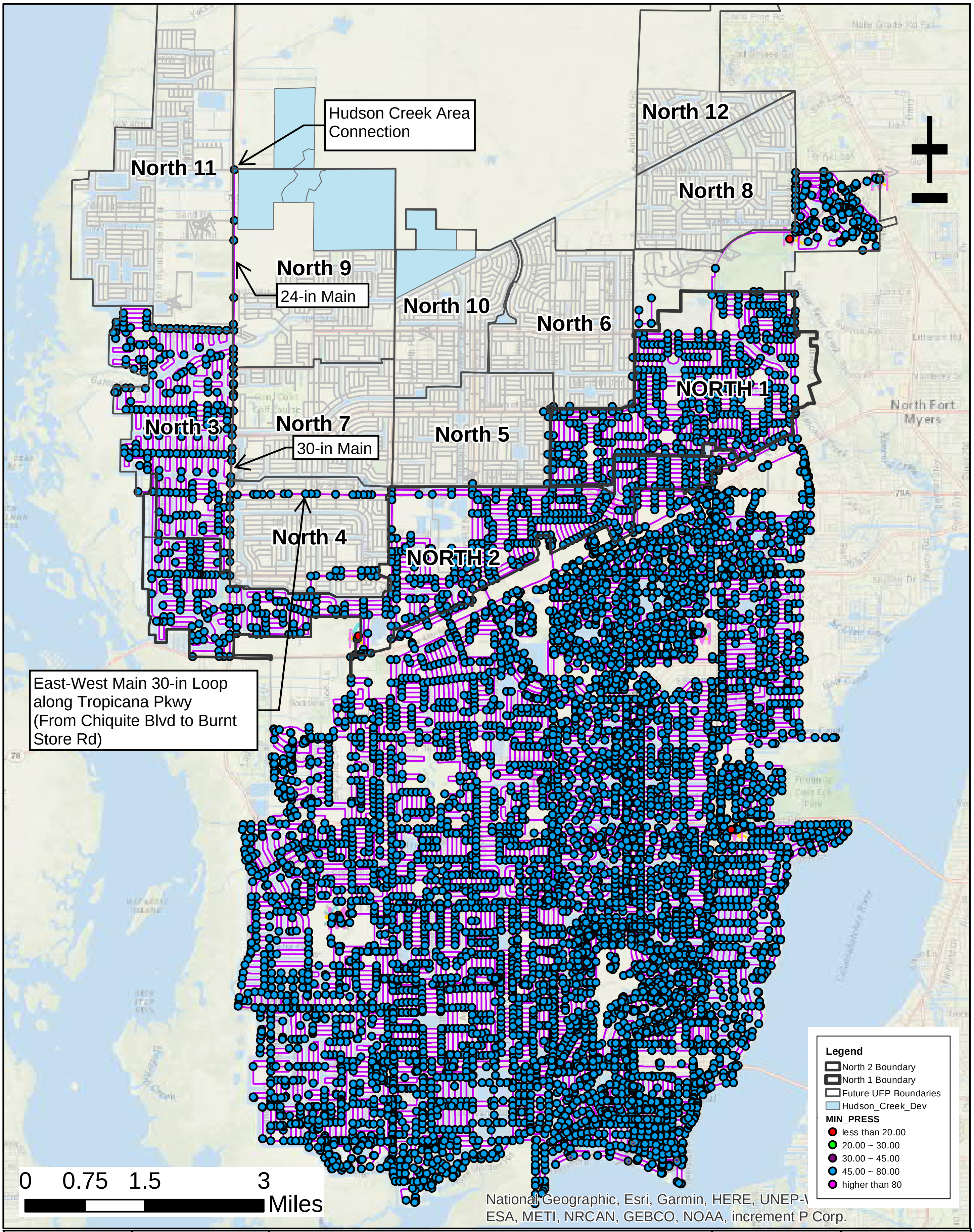
Figure 5-8 illustrates the minimum pressures in the system for this scenario. The results indicate that all minimum pressures in the system are projected to be maintained above 45 psi for year 2025 when North 1 and North 3 areas are expected to be constructed and Hudson Creek is online.

The recommended improvements under this scenario are listed below and the pipeline improvements are summarized in **Table 5-15**:

- Pine Island Tank and PS (located in the North 2 area)
- Del Prado Tank (two 5 MG storage tanks) and PS
- Fort Myers Connection
- North 1 Transmission and Distribution Mains
- North 3 Transmission and Distribution Mains
- Transmission mains to support service to Hudson Creek.

Table 5-15: Pipeline Improvements Summary for 2025 Scenario

Improvements	Diameter (in)	Length (LF)
North 1 Transmission and Distribution Mains	4	173,370
	6	129,820
	8	51,910
	10	3,430
	12	20,050
	16	17,580
	20	8,820
	24	4,970
	30	5,040
North 3 Transmission and Distribution Mains	4	234,510
	6	5,360
	8	4,400
	12	4,500
	16	16,760
	20	890
	24	5,360
	30	5,800
Transmission Mains to Support Service to Hudson Creek	24	11,000 (Burnt Store Rd)
	30	21,500 (Tropicana Parkway and Burnt Store Rd)



City of Cape Coral
Minimum Pressures for the 2025 MDD Scenario

AECOM

Figure 5-8

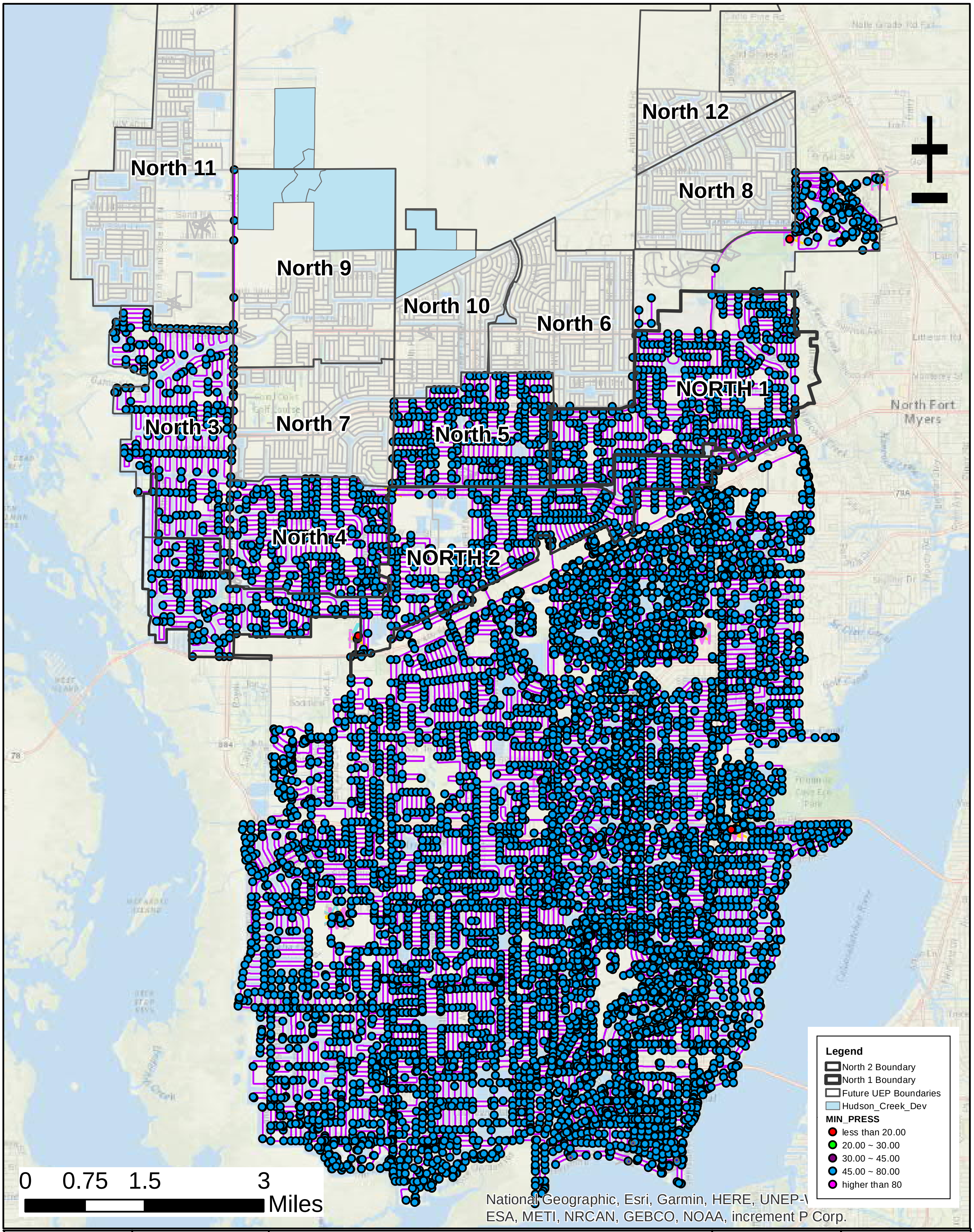
Year 2030 (Scenario 3):

This scenario was simulated to evaluate pressures for year 2030 when North 4 and North 5 are expected to be constructed and online. **Figure 5-9** illustrates the minimum pressures in the system for this scenario. Results indicate that all minimum pressures are projected to be maintained above 45 psi. The recommended improvements under this scenario are listed below and the pipeline improvements are summarized in **Table 5-16**:

- CPS 9
- North 4 Transmission and Distribution Mains
- North 5 Transmission and Distribution Mains

Table 5-16: Pipeline Improvements Summary for 2030 Scenario

Improvements	Diameter (in)	Length (LF)
North 4 Transmission and Distribution Mains	4	213,050
	6	26,100
	8	630
	10	1,380
	24	1,060
	30	16,360
North 5 Transmission and Distribution Mains	4	223,710
	6	8,380
	8	2,380
	12	13,730
	16	1,630
	20	450
	24	7,140



	City of Cape Coral Minimum Pressures for the 2030 MDD Scenario	AECOM	Figure 5-9

Year 2035 (Scenario 4):

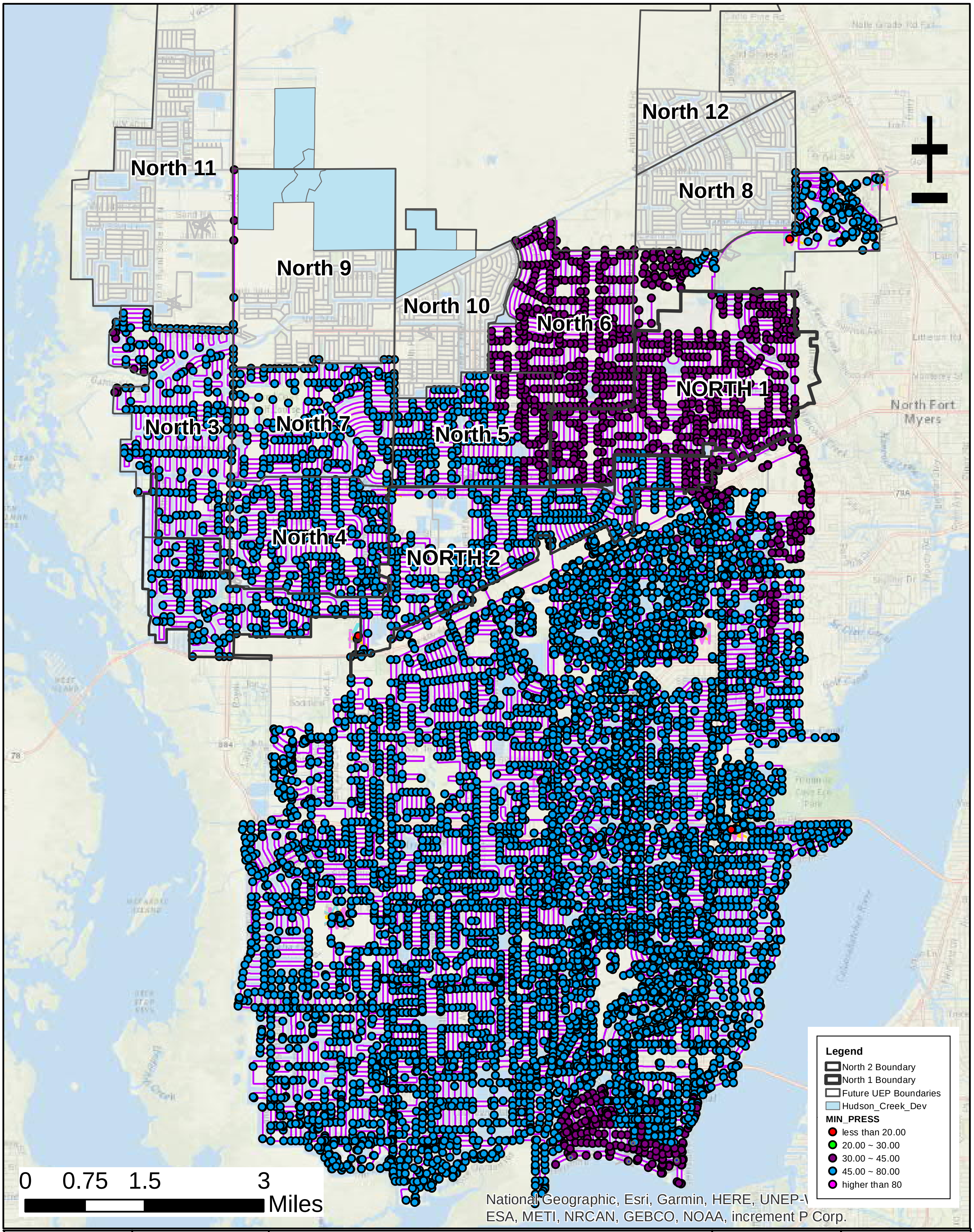
This scenario was simulated to evaluate pressures for year 2035 when North 6 and North 7 are expected to be constructed and online. **Figure 5-10** illustrates the minimum pressures in the system for this scenario. Results indicate that minimum pressures above 30 psi are projected to be maintained across the entire system, with minimum pressure of 45 psi are exhibited in most of the system. The recommended improvements under this scenario are listed below and are summarized in **Table 5-17**:

- North 6 Transmission and Distribution Mains
- North 7 Transmission and Distribution Mains
- Coral Lakes Transmission and Distribution Mains

Considering the wastewater modeling results concluded that the North WRF should come online in 2035, it is recommended that the 42-inch IQ main connecting the North WRF to North 6 is installed in 2035 ahead of North 10 coming online as a means of maintaining a method of effluent disposal from the WRF.

Table 5-17: Pipe Improvements Summary for Scenario 2035

Improvements	Diameter (in)	Length (LF)
North 6 Transmission and Distribution Mains	4	243,960
	6	28,130
	8	9,230
	12	21,540
	16	4,570
	30	9,770
North 7 Transmission and Distribution Mains	4	200,840
	6	8,500
	8	360
	10	5,340
	12	14,430
	16	800
	30	7,920
Coral Lakes Transmission and Distribution Mains	4	13,980
	6	6,040
	8	3,550
	12	1,150
North WRF IQ Water Main Connection to North 6	30	770
	36	340
	42	3,300



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City of Cape Coral
Minimum Pressures for the 2035 MDD Scenario

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Figure 5-10

Year 2040 (Scenario 5):

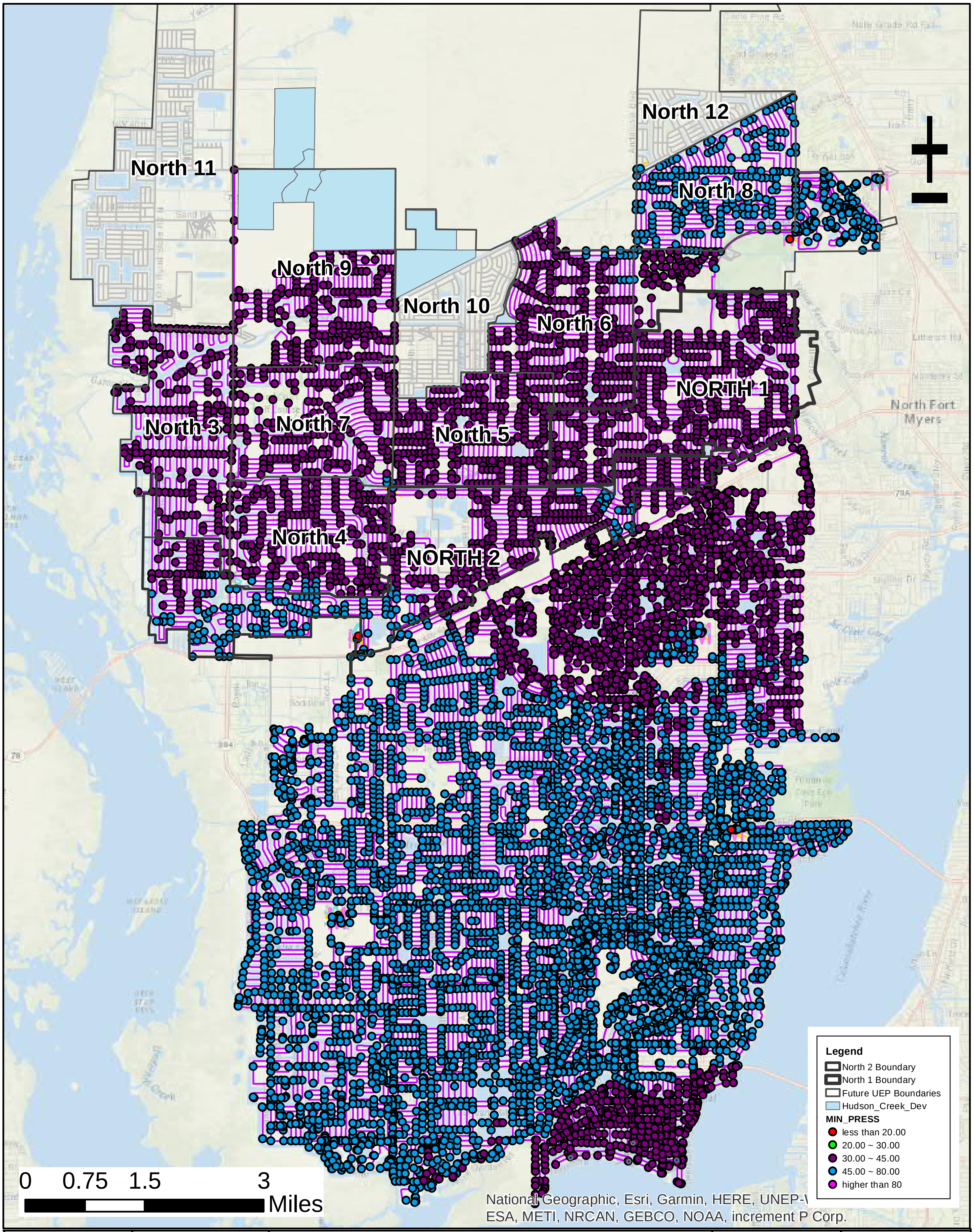
This scenario was simulated to evaluate pressures for year 2040 when North 8 and North 9 are expected to be constructed and online. **Figure 5-11** illustrates the minimum pressures in the system for this scenario. Results indicate that all portions of the system are projected to exhibit minimum pressures above 30 psi, and more than half is able to maintain minimum pressures above 45 psi. The recommended improvements under this scenario are listed below and the pipeline improvements are summarized in **Table 5-18**:

- CPS 11 (Gator Circle CPS)
- North 8 Transmission and Distribution Mains
- North 9 Transmission and Distribution Mains

Considering the wastewater modeling results concluded that the North WRF should come online in 2035, it is recommended that the segment of 42-inch IQ main connecting the North WRF to North 9 is installed in 2040 ahead of North 10 coming online as a means of maintaining a method of effluent disposal from the WRF.

Table 5-18: Pipe Improvements Summary for Scenario 2040

Improvements	Diameter (in)	Length (LF)
North 8 Transmission and Distribution Mains	4	201,250
	6	16,200
	8	6,810
	10	4,530
	12	14,090
	16	3,260
	24	4,690
	30	6,120
North 9 Transmission and Distribution Mains	4	160,690
	6	14,270
	8	4,100
	12	19,290
	16	3,790
	24	1,520
	30	7,370
North WRF IQ Water Main Connection to North 9	42	2,050



City of Cape Coral
Minimum Pressures for the 2040 MDD Scenario

Figure 5-11

Buildout Conditions, Year 2080 (Scenario 6):

This scenario was simulated to evaluate pressures for year 2080 when all future UEP areas are expected to be constructed and online. **Figure 5-12** illustrates the minimum pressures in the system for this scenario. Results indicate that most of the system is able to maintain minimum pressures above 30 psi. A small area at the southeast tip of the existing system is indicated to experience pressures slightly below 30 psi. Therefore, an alternative option was suggested to boost pressures in this area using irrigation wells, and its feasibility will be evaluated.

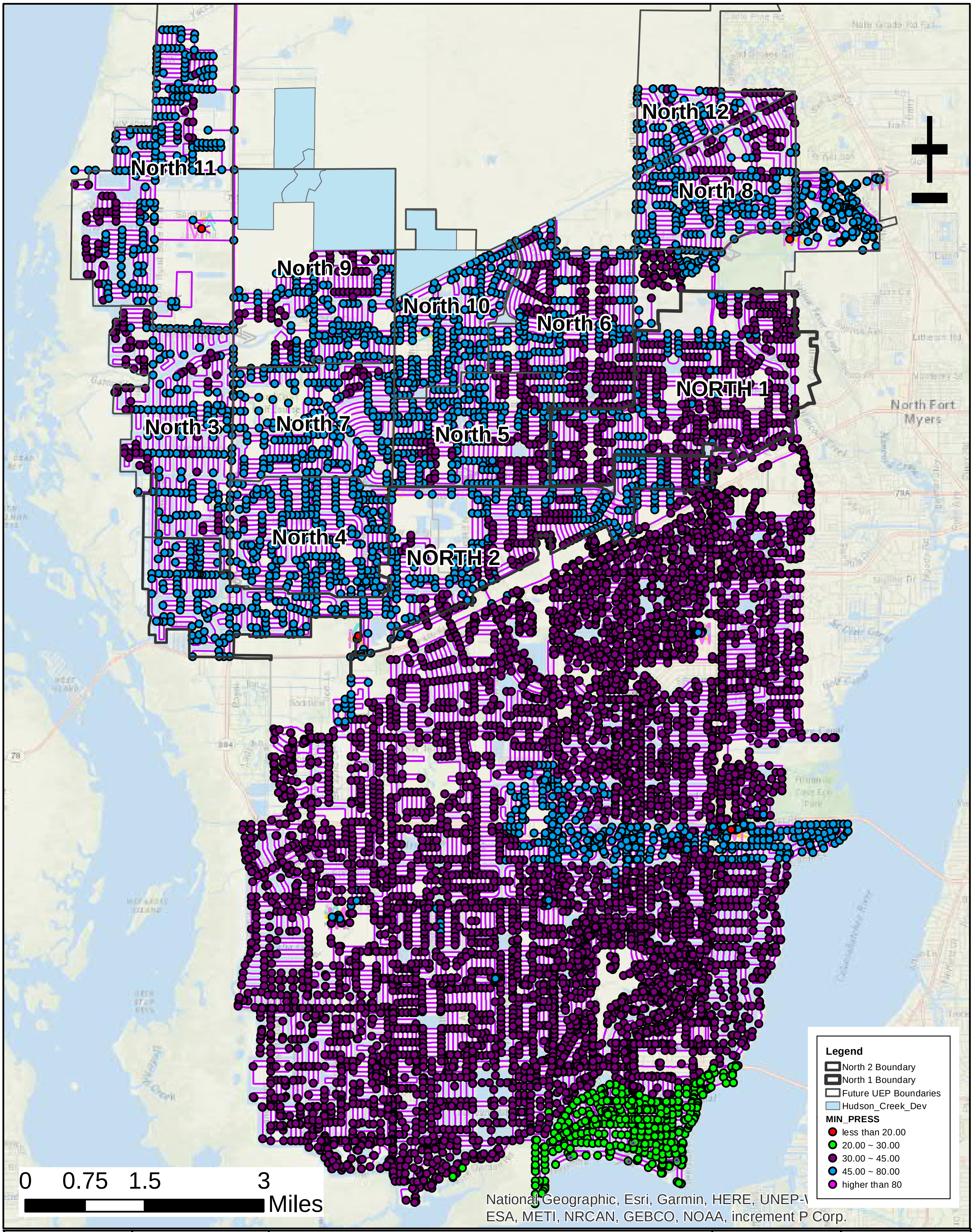
The recommended improvements under this scenario are listed below and the pipeline improvements are summarized in **Table 5-19**:

- North WRF
- Old Burnt Store Road Tank and PS (NW)
- All future UEP Transmission and Distribution Mains

Table 5-19: Pipe Improvements Summary for Scenario 2080

Improvements	Diameter (in)	Length (LF)
North 10 Transmission and Distribution Mains	4	151,060
	6	3,780
	8	1,790
	12	9,340
	24	2,990
	30*	770
	36*	340
	42*	5,350
North 11 Transmission and Distribution Mains	4	206,310
	6	30,200
	8	12,650
	10	16,090
	12	1,470
	24	5,250
	30	15,790
	36	7,940
	42	1,210
North 12 Transmission and Distribution Mains	4	78,490
	6	700
	8	10,840
	10	2,310
	12	5,160
	16	5,800
	24	2,340
	30	440

*Transmission mains to be installed as recommended in planning years 2035 and 2040.



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Minimum Pressures for the Buildout MDD Scenario

AECOM

Figure 5-12

Baseline May 16, 2021 (Scenario 7):

This scenario was chosen to represent a dry weather, low pressure condition. **Figure 5-13** illustrates the minimum pressures in the system for this scenario. Results of the model indicated that half of the system exhibited minimum pressures below 30 psi with some below 20 psi, which is consistent with the actual field recorded pressures for this day.

Additional Irrigation Day (Scenario 8):

Based on Scenario 7, this scenario adds an additional watering day to the City's 6-day watering schedule. While the weekly demands remain the same and are spread out over 7 days instead, a 16% reduction in daily demand is achieved. **Figure 5-14** illustrates the minimum pressures in the system for this scenario. The results for this scenario indicate that most system minimum pressures are above 30 psi, with some small areas exhibiting pressures between 20-30 psi. These results reflect significant improvement of pressure conditions with the addition of an irrigation day to the City's 6-day schedule.

Irrigation Schedule Change

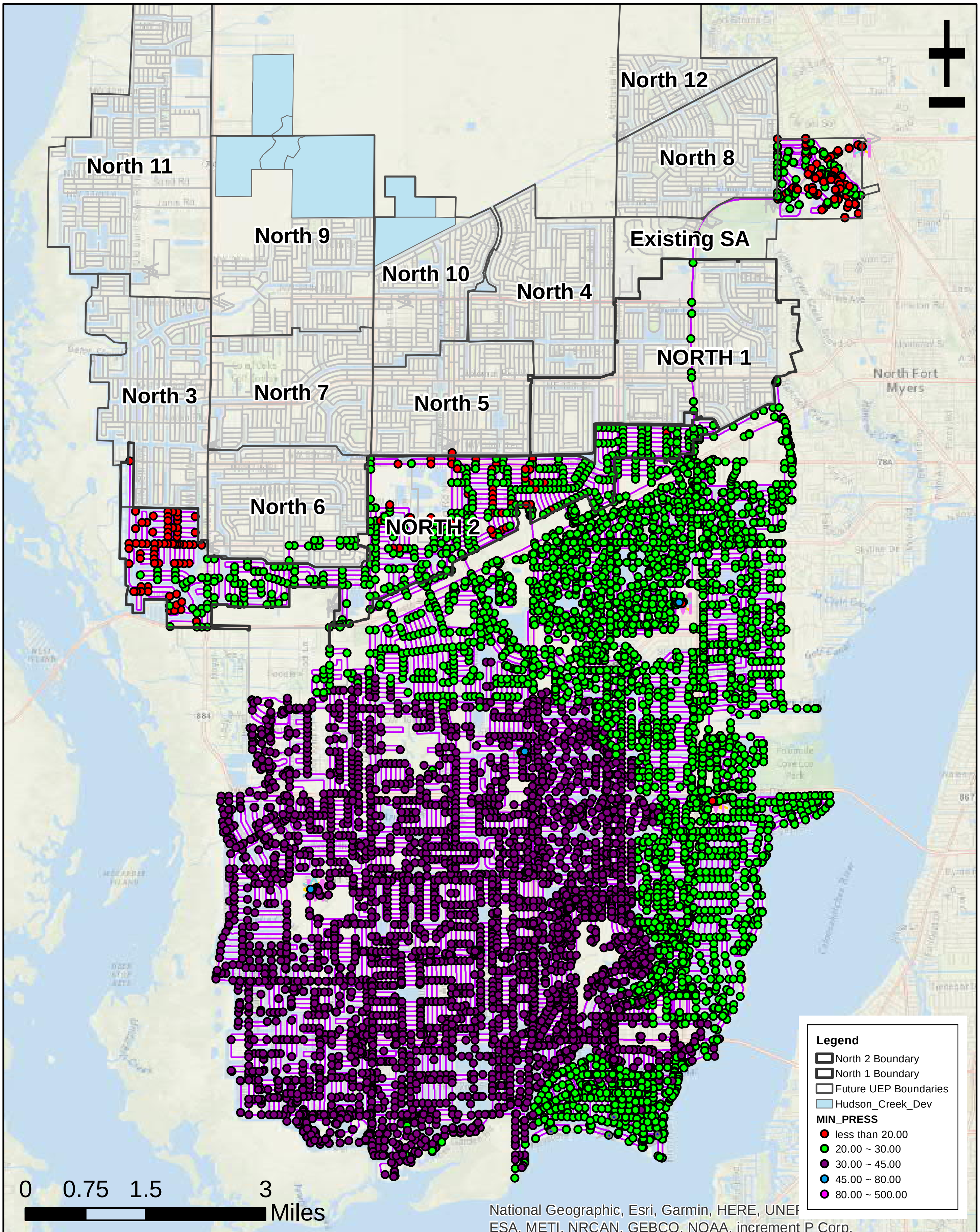
Based on these results, the City is proposing the adoption of an ordinance amending its existing watering schedule in Article VII, Chapter 19, Section 19-90. The City's previous water schedule was based on a 6-day watering week and used twelve watering time slots that allowed the simultaneous watering for two sets of house numbers. The newly adopted watering schedule adds 8pm to 12am as a new slot and removes Tuesday as a non-watering day, providing an additional eight slots. The twenty new watering time slots in a 7-day watering schedule feeds into the City's mission to efficiently manage water demands through reducing max day demand and consequently improving water pressure. The new watering schedule provides about a 40% reduction in the average number of customers irrigating simultaneously. This reduction does not change the weekly IQ demand.

30% Demand Reduction Due to SIS (Scenario 9):

This scenario is based on Scenario 7 but assumes a 30% reduction in demand due to implementation of SIS with a 100% participation of the IQ served population. **Figure 5-15** illustrates the minimum pressures in the system for this scenario, which indicate that minimum pressures throughout the system are maintained above 30 psi, with some exhibiting minimum pressures above 45 psi.

15% Demand Reduction Due to SIS (Scenario 10):

This scenario is more conservative than Scenario 9 as it assumes a 15% reduction in demand as opposed to 30% which requires 100% participation in SIS implementation. **Figure 5-16** illustrates the minimum pressures in the system for this scenario, which indicate that while most of the system has minimum pressures above 30 psi, some areas still have minimum pressures between 20-30 psi (west part of the North 2).

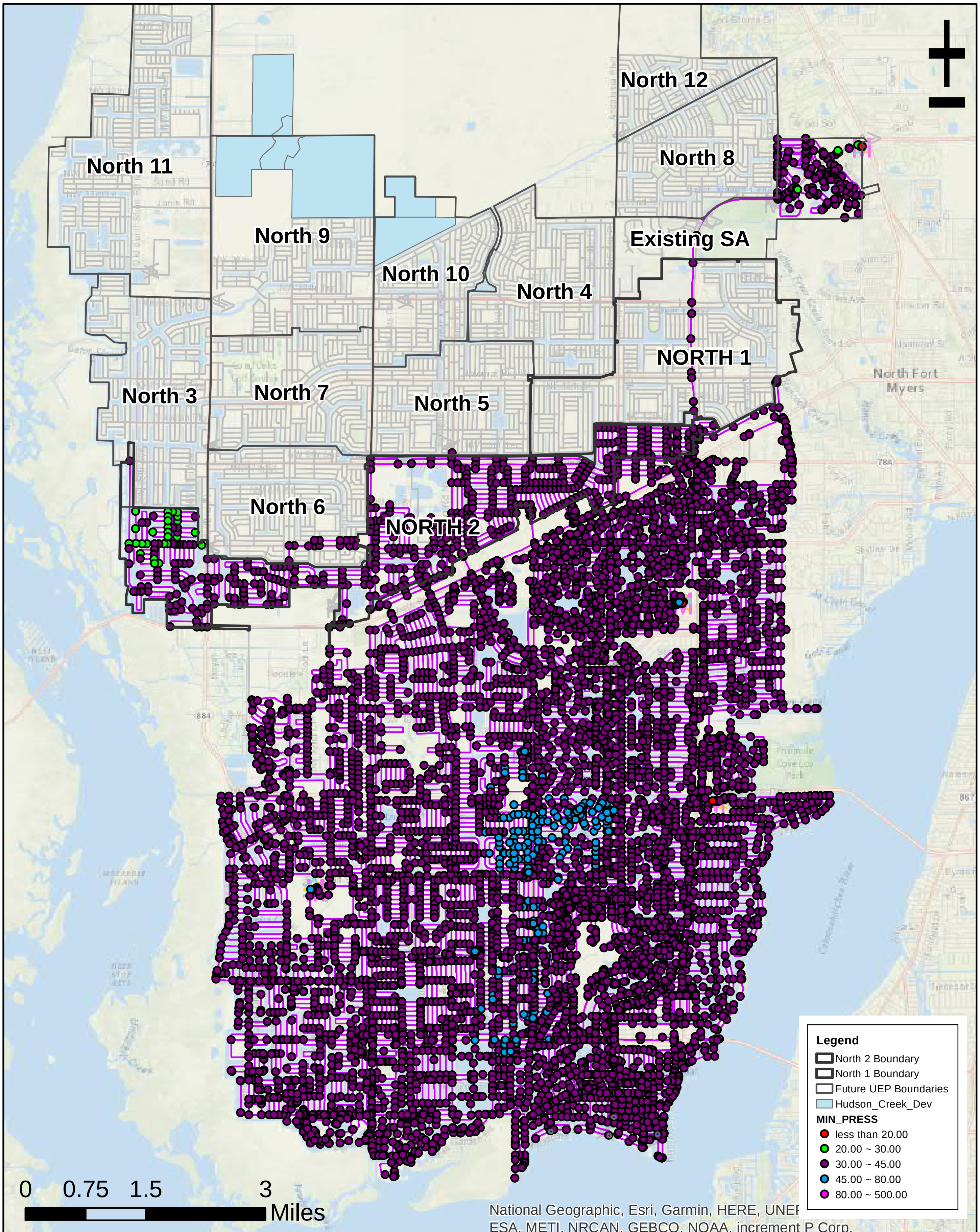


Cape Coral FLORIDA

City of Cape Coral
Minimum Pressures for Scenario 7

AECOM

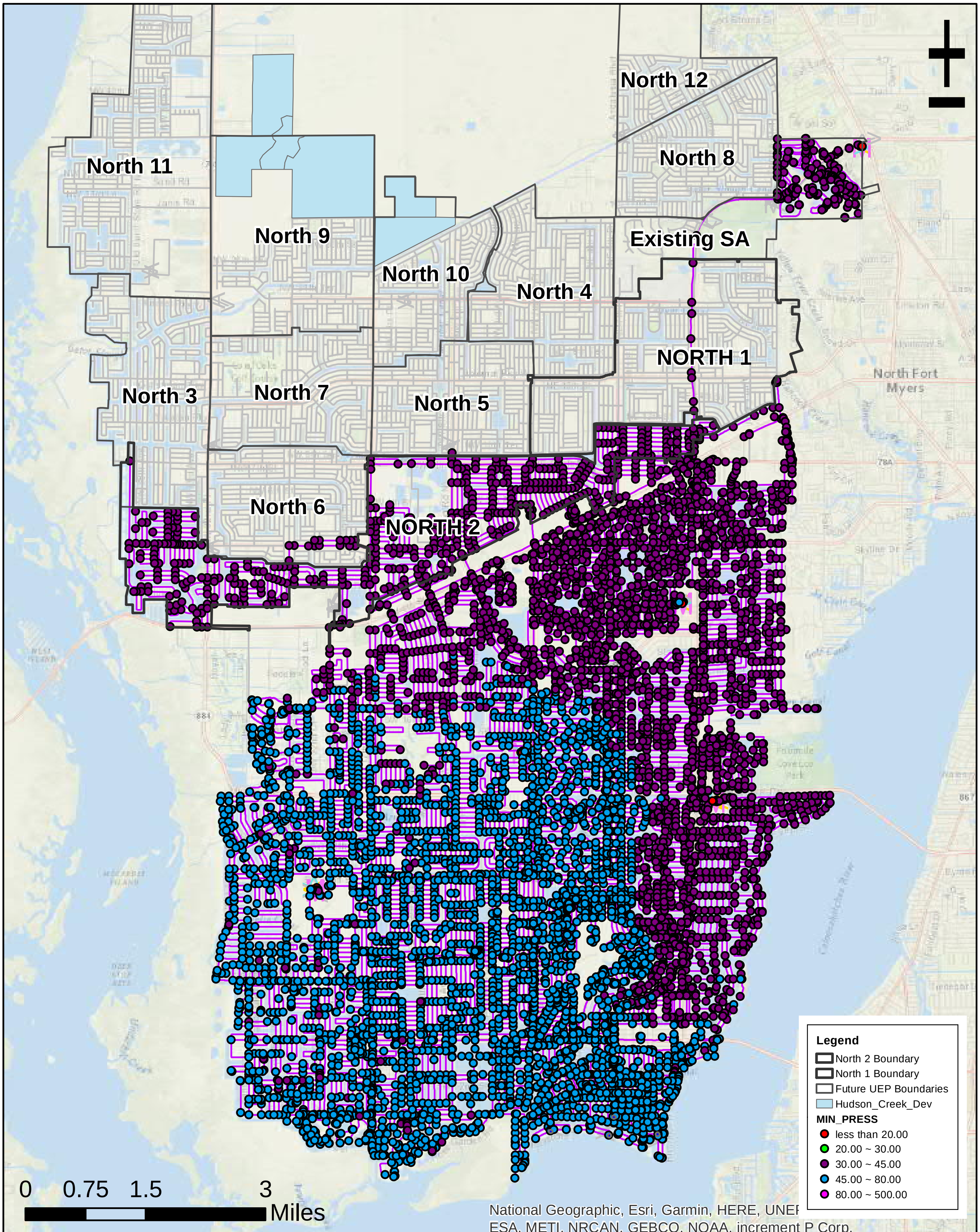
Figure 5-13



City of Cape Coral
Minimum Pressures for Scenario 8

AECOM

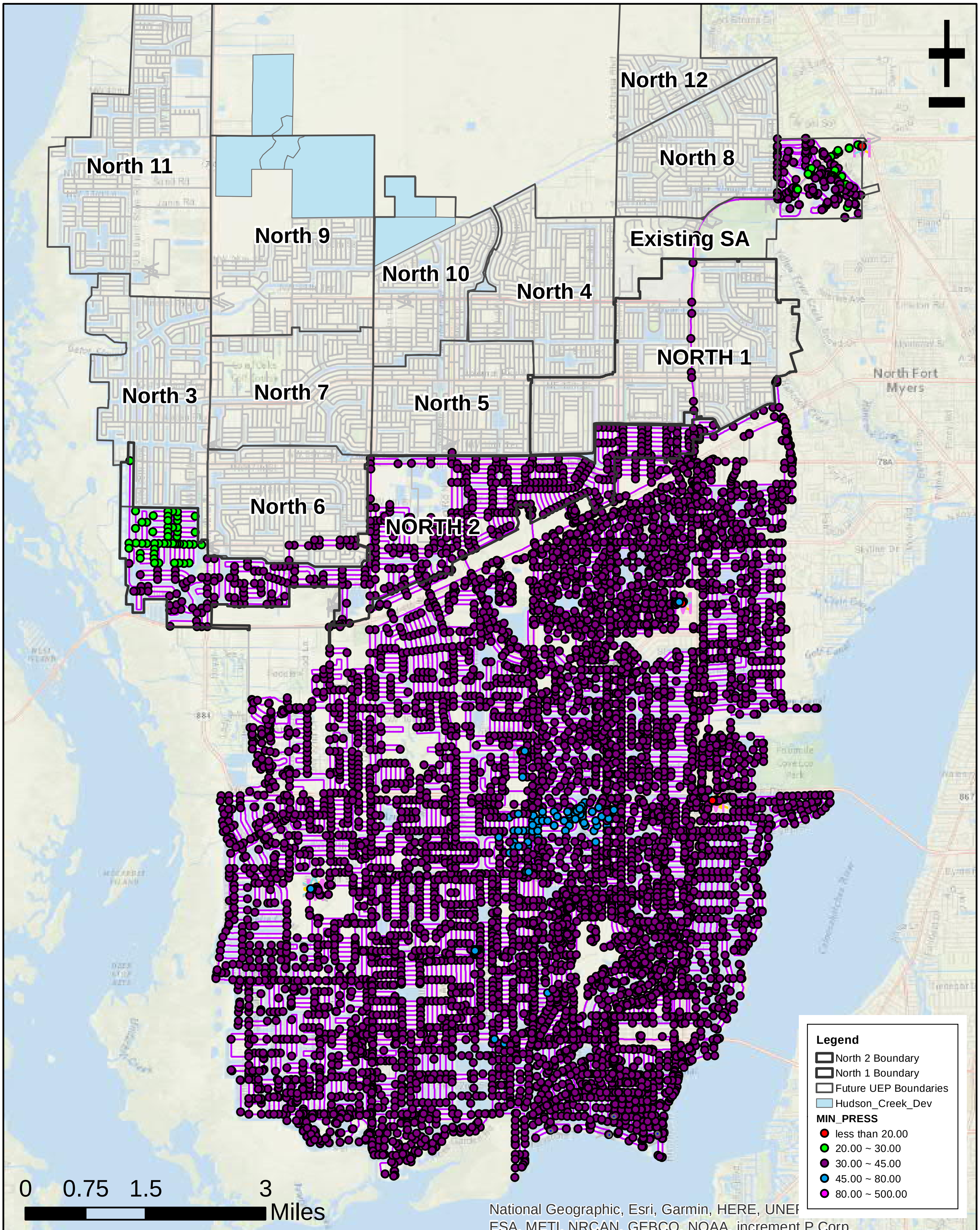
Figure 5-14



City of Cape Coral
Minimum Pressures for Scenario 9

AECOM

Figure 5-15



Cape Coral FLORIDA

City of Cape Coral
Minimum Pressures for Scenario 10

AECOM

Figure 5-16

5.6.3.4 Conclusions and Recommendations

This analysis identified adequate transmission and distribution improvements needed for expansion of utilities to North 1 through North 12 and new development projects including Hudson Creek and Pine Island Corridor in order to meet the performance criteria established in Section 5.5. The results of this analysis show that the IQ water system capacity will be sufficient to meet demands while maintain acceptable pressures. In the buildout scenario, pressures in a small area at the southeast tip of the existing system may not comply with the performance criteria for minimum pressures. To resolve pressure issues in this area, it is recommended to evaluate the feasibility of constructing irrigation wells to increase pressures. Furthermore, storage tank and pump station improvements as well as new canal pumping station improvements are recommended in conjunction with the linear improvements. Lastly, the implementation of SIS would reduce max day demands and consequently improve pressures.