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presentation



*City of Naples, Florida  
City Council Workshop*

# Computer Modeling of Available Fire Flows

*December 17, 2012*

# AGENDA

- **What Started The Discussion?**
- **Objectives & Aspirations**
- **Setting the Study Parameters**
- **Findings of the Investigation**
  - *Port Royal Area*
  - *Royal Harbor*
  - *Aqualane Shores*
  - *Area South of Central Avenue*
  - *Area North of Central Avenue (Northern Naples)*
- **Potential Cost Impacts**
- **The Path Forward**



## *What Started the Discussion?*



# ***Regulatory Requirements***

- Florida Fire Prevention Code
  - Adopted December 31, 2011
  - Includes minimum flow requirements
- Newly constructed one & two-family dwellings
  - Less than 5,000 SF: 1,000 gpm for 2 hours
  - More than 5,000 SF: per table 18.4.5.1.2



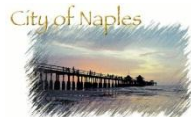
## What Started the Discussion?

**Table 18.4.5.1.2 Minimum Required Fire Flow and Flow Duration for Buildings**

See FFPC 1-18.4 for information regarding flow credits for fully sprinkled buildings.					Fire Flow gpm* (× 3.785 for L/min)	Flow Duration (hours)
Fire Area ft <sup>2</sup> (×0.0929 for m <sup>2</sup> )						
I(443),I(332), II(222)*	II(111), III(211)*	IV(2HH), V(111)*	II(000), III(200)*	V(000)*		
0-22.700	0-12.700	0-8.200	0-5.900	0-3.600	1.500	2
22.701-30.200	12.701-17.000	8.201-10.900	5.901-7.900	3.601-4.800	1.750	
30.201-38.700	17.001-21.800	10.901-12.900	7.901-9.800	4.801-6.200	2.000	
38.701-48.300	21.801-24.200	12.901-17.400	9.801-12.600	6.201-7.700	2.250	
48.301-59.000	24.201-33.200	17.401-21.300	12.601-15.400	7.701-9.400	2.500	
59.001-70.900	33.201-39.700	21.301-25.500	15.401-18.400	9.401-11.300	2.750	3
70.901-83.700	39.701-47.100	25.501-30.100	18.401-21.800	11.301-13.400	3.000	
83.701-97.700	47.101-54.900	30.101-35.200	21.801-25.900	13.401-15.600	3.250	
97.701-112.700	54.901-63.400	35.201-40.600	25.901-29.300	15.601-18.000	3.500	
112.701-128.700	63.401-72.400	40.601-46.400	29.301-33.500	18.001-20.600	3.750	
128.701-145.900	72.401-82.100	46.401-52.500	33.501-37.900	20.601-23.300	4.000	4
145.901-164.200	82.101-92.400	52.501-59.100	37.901-42.700	23.301-26.300	4.250	
164.201-183.400	92.401-103.100	59.101-66.000	42.701-47.700	26.301-29.300	4.500	
183.401-203.700	103.101-114.600	66.001-73.300	47.701-53.000	29.301-32.600	4.750	
203.701-225.200	114.601-126.700	73.301-81.100	53.001-58.600	32.601-36.000	5.000	
225.201-247.700	126.701-139.400	81.101-89.200	58.601-65.400	36.001-39.600	5.250	
247.701-271.200	139.401-152.600	89.201-97.700	65.401-70.600	39.601-43.400	5.500	
271.201-295.900	152.601-166.500	97.701-106.500	70.601-77.000	43.401-47.400	5.750	
Greater than 295'900	Greater than 166,500	106.501-115.800	77.001-83.700	47.401-51.500	6.000	
		115.801-125.500	83.701-90.600	51.501-55.700	6.250	
		125.501-135.500	90.601-97.900	55.701-60.200	6.500	
		135.501-145.800	97.901-106.800	60.201-64.800	6.750	
		145.801-156.700	106.801-113.200	64.801-69.600	7.000	
		156.701-167.900	113.201-121.300	69.601-74.600	7.250	
		167.901-179.400	121.301-129.600	74.601-79.800	7.500	
		179.401-191.400	129.601-138.300	79.801-85.100	7.750	
		Greater than 191.400	Greater than 138.300	Greater than 85.100	8000	

\*Types of construction are based on NFPA 220.

† Measured at 20 psi (139.9 kPa).



# **City Goals**

- Provide a minimum fire flow
  - 1,500 gallons per minute
  - 20 psi
- Where feasible, use reclaimed water to supplement fire flow



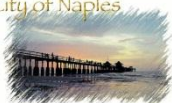
# **Our Task**

- Determine available fire flow in existing potable & reclaimed water systems
- Identify improvements to assist with meeting fire flow requirements

# ***Water System Demands***



- Potable Water System
  - Maximum Day Demand based on 3-month average
  - December, January, February
  - 20 Million Gallons /day (system-wide)
- Reclaimed Water System
  - Most water used during night-time hours
  - Maximum Day Demand (Late Fall / Early Spring)
  - 7 Million Gallons / day (system-wide)



# Building the Computer Model

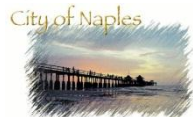
- Software: WaterCAD by Bentley Systems
- Imported pipe networks from City's GIS

Potable Water	
Size	Miles
2 inch	30.0
2.5 inch	0.1
4 inch	24.7
6 inch	128.9
8 inch	73.6
10 inch	12.0
12 inch	32.3
16 inch	13.8
18 inch	0.3
20 inch	5.9
24 inch	1.8
30 inch	0.7
<b>TOTAL</b>	<b>324.1</b>

Reclaimed Water	
Size	Miles
2 inch	0.4
4 inch	2.2
6 inch	8.8
8 inch	3.6
12 inch	8.1
16 inch	3.2
20 inch	0.5
24 inch	1.2
30 inch	1.8
36 inch	0.2
<b>TOTAL</b>	<b>29.9</b>



*The software contains an analysis tool to determine fire flow at each junction node*



Setting the Study Parameters

# Identifying High Demand Potable Water Users

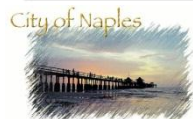
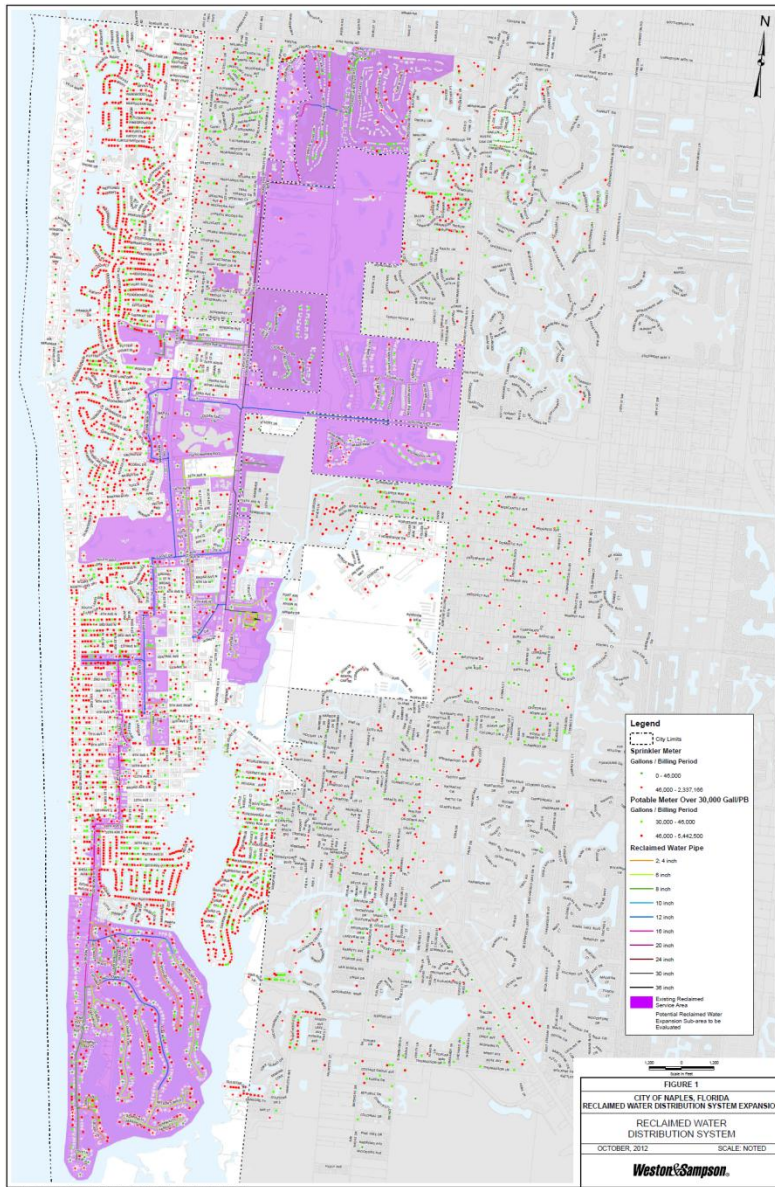
## Potable Meter

- ★ 0 – 46,000 Gallons / Billing Period
- ★ Over 46,000 Gallons / Billing Period

## Sprinkler Meter

- 0 – 46,000 Gallons / Billing Period
- Over 46,000 Gallons / Billing Period

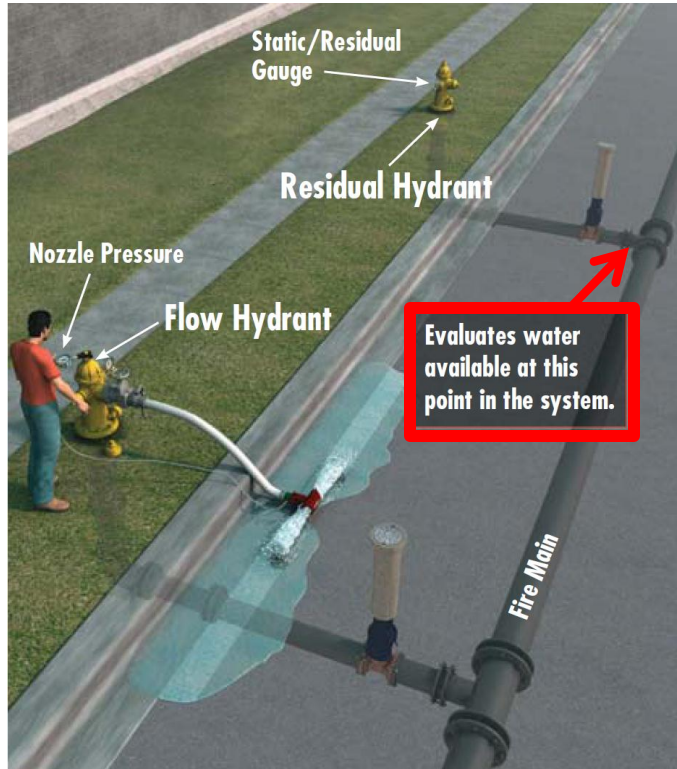
■ Reclaimed Water Service Area





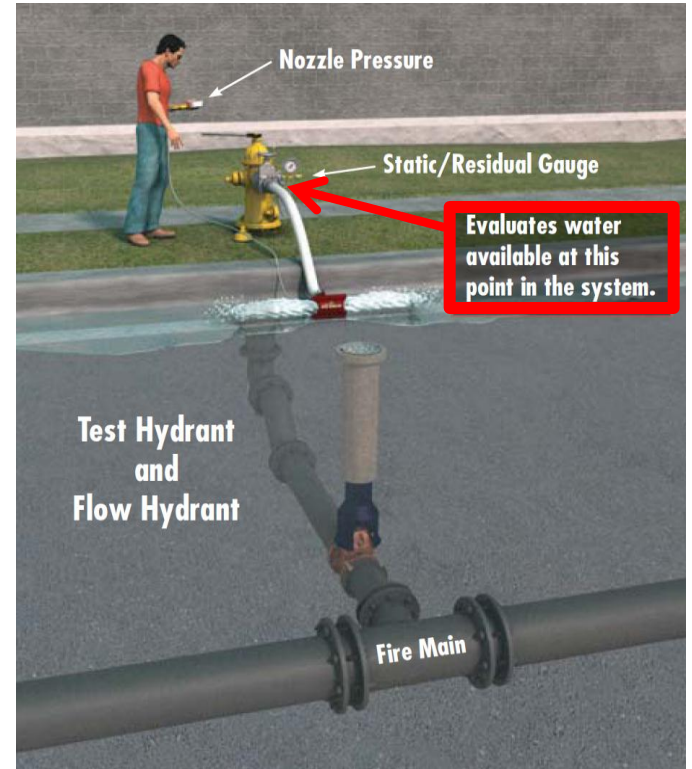
Setting the Study Parameters

# Main Capacity vs. Hydrant Capacity



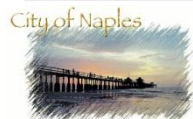
## Main Capacity

Evaluates the water supply of the fire main at the location of the residual hydrant.



## Hydrant Capacity

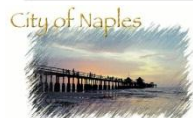
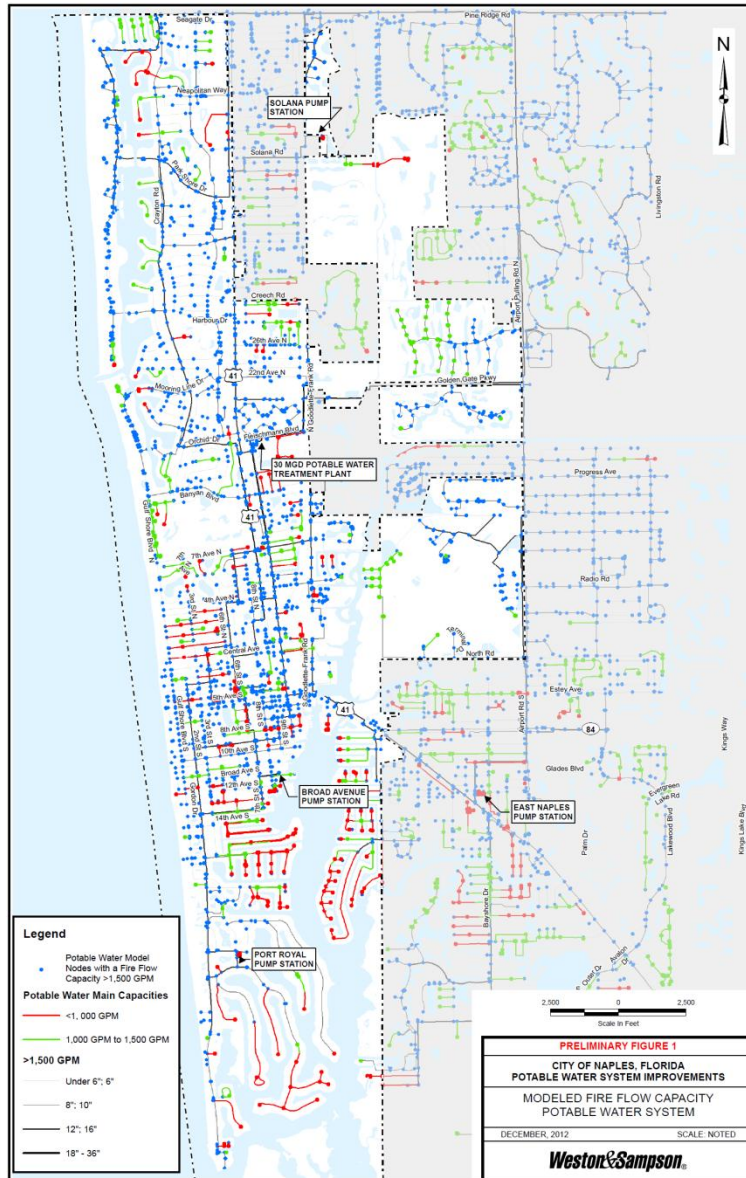
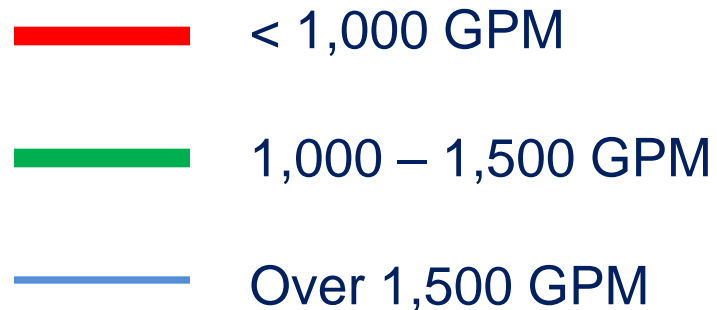
Evaluates the water supply available from the hydrant.



## Findings of the Investigation

# Potable Water System

## Main Capacities



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*Findings of the Investigation*

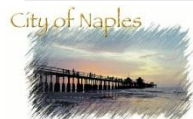
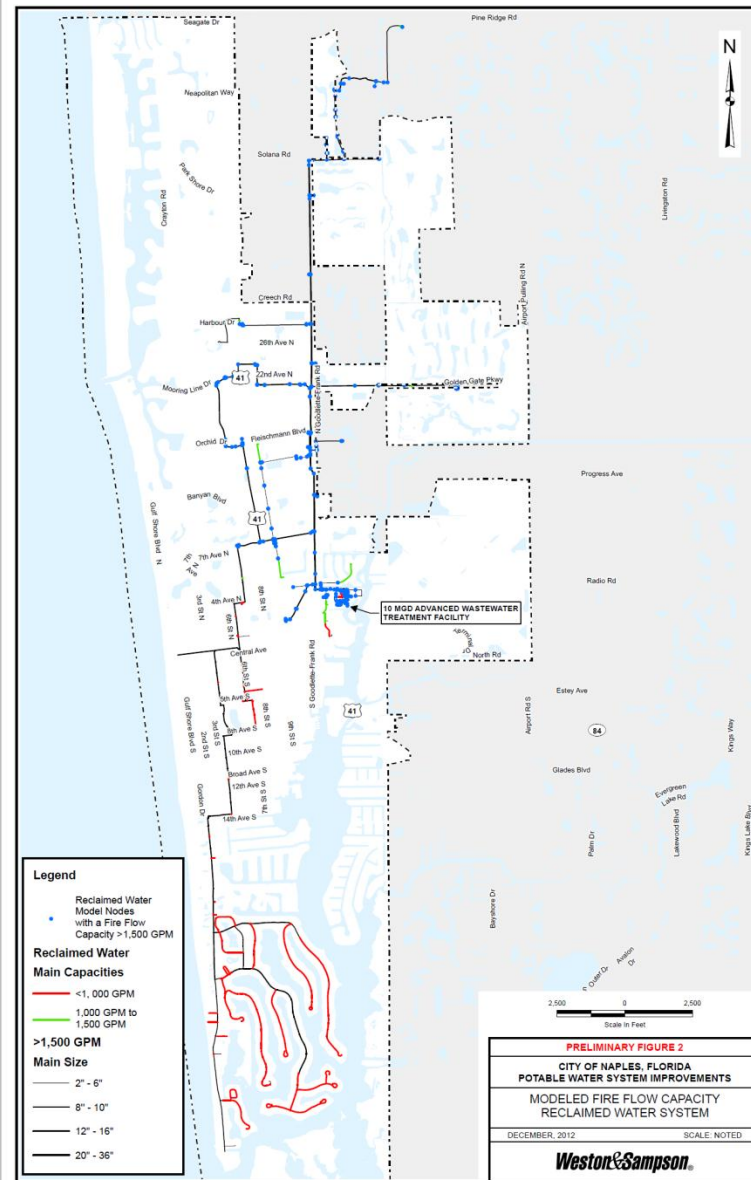
# Reclaimed Water System

## Main Capacities

 < 1,000 GPM

 1,000 – 1,500 GPM

 Over 1,500 GPM



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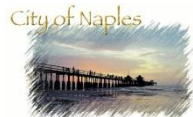
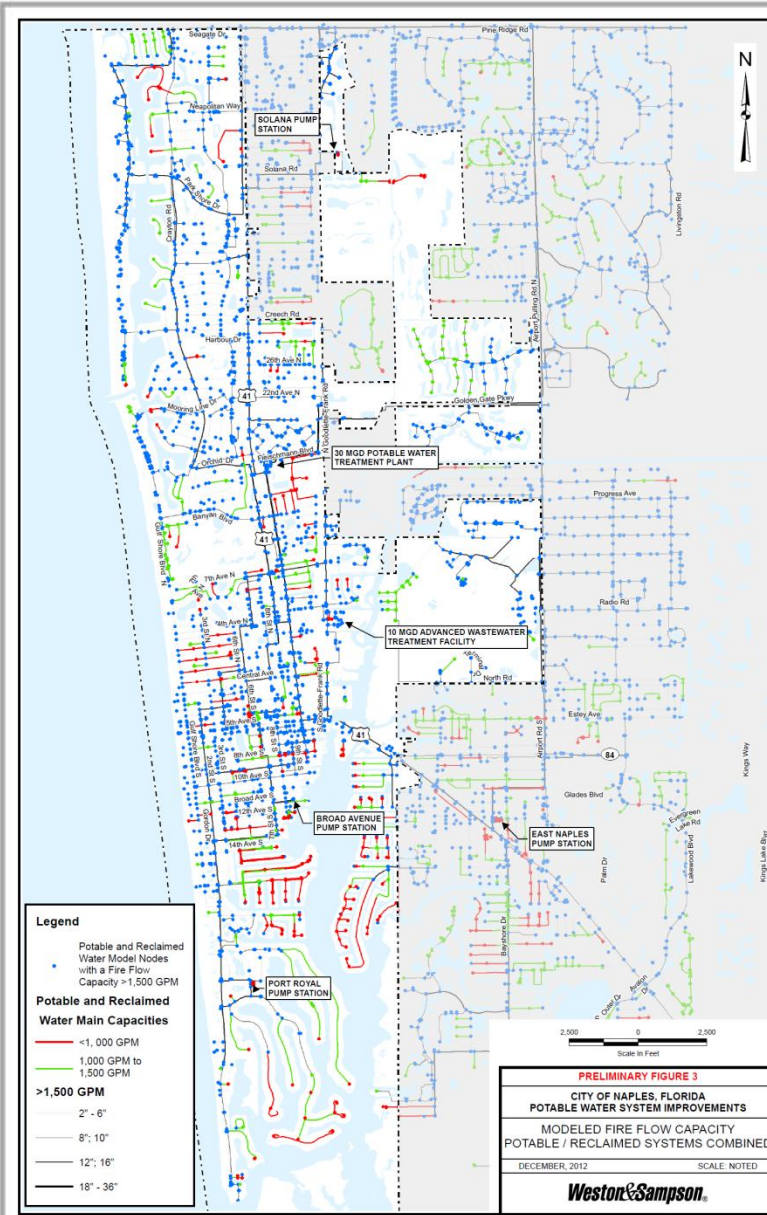
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*Findings of the Investigation*

# Potable PLUS Reclaimed Water System

## Main Capacities

-  < 1,000 GPM
-  1,000 – 1,500 GPM
-  Over 1,500 GPM

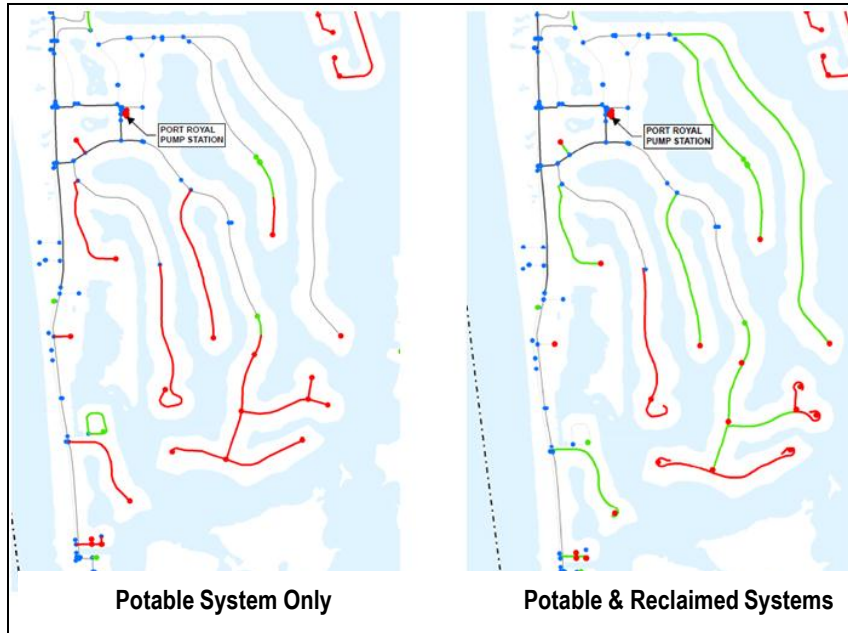


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## Findings of the Investigation

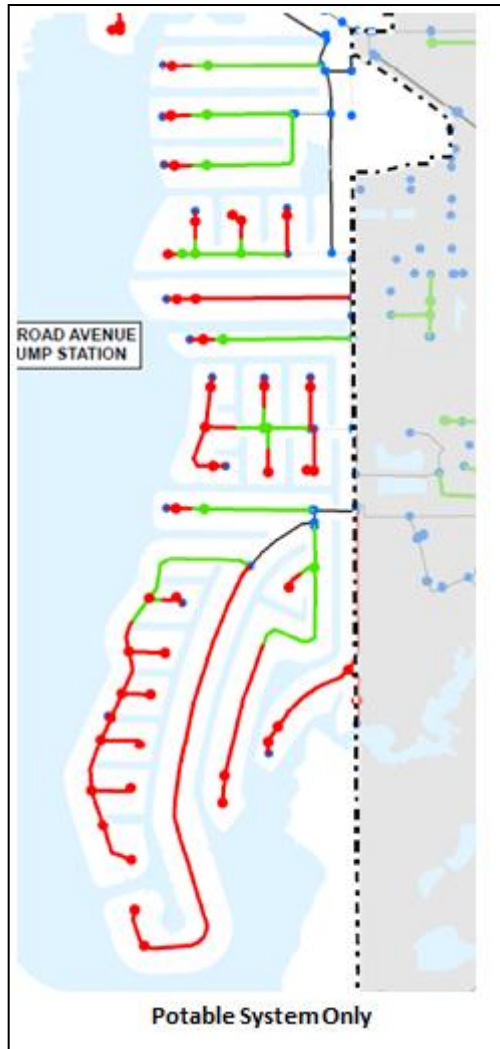
# Port Royal



- When irrigating: reclaimed system provides between 150 and 300 gpm additional fire flows.
- When not irrigating: reclaimed system provides between 600 and 900 gpm additional fire flows.
- Fire flows in potable system are improved approximately 100 gpm when both the Port Royal pumps are operating.

Combining the potable and reclaimed (with some operational changes), the majority of streets are meeting minimum requirement of 1500 gpm at 20 psi.

## Findings of the Investigation



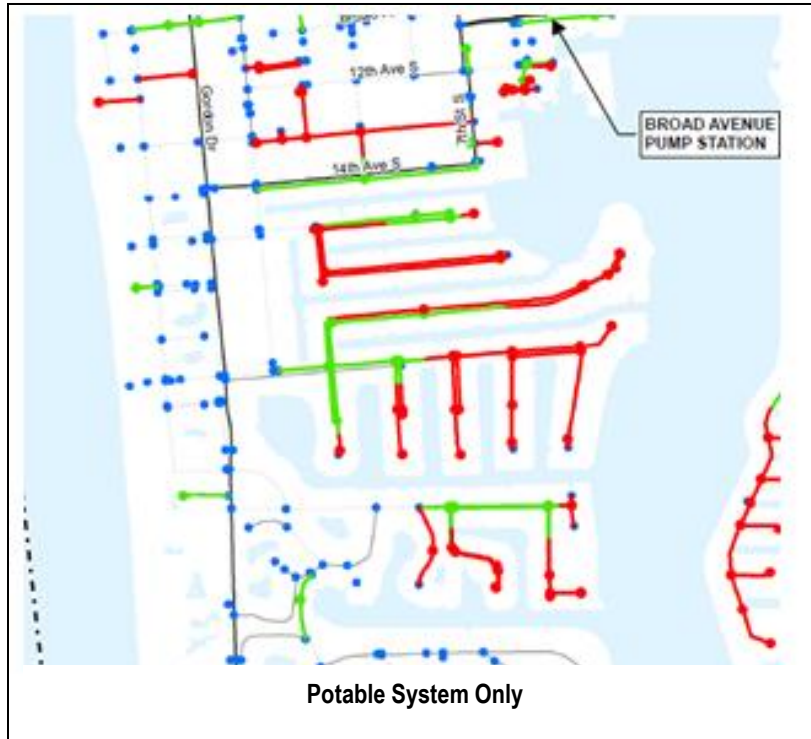
# Royal Harbor

- The reclaimed water system currently does not service the Royal Harbor area.
- Provides fire flows of less than 1,000 gpm.

For 1,500 gpm at 20 psi, the 6-inch mains would need to be replaced with 8-inch, or looping would be required at the dead end streets.



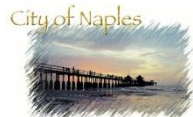
## Findings of the Investigation



# Aqualane Shores

- Potable water system provides fire flows of less than 1,000 gpm to the dead-end streets.
- Operational changes / improvements are limited (located between Broad Street Pump Station and Port Royal Pump Station)

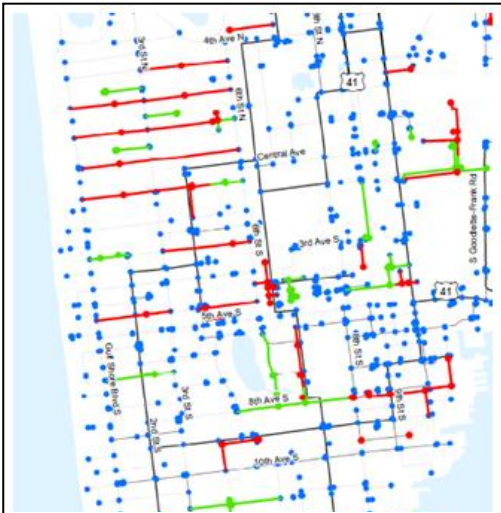
For 1,500 gpm at 20 psi, the 6-inch mains would need to be replaced with 8-inch, or looping would be required or an expansion of the reclaimed system



## Findings of the Investigation

# South of Central Avenue

- Currently experiencing significant growth.
- Oldest part of the potable distribution system (small diameter water main).
- Poorly gridded due to the pressure constraints caused by the Broad Street Pump Station.



Potable System Only



Potable & Reclaimed Systems

Transmission network is performing well, but that the smaller mains are causing fire flows to be less than 1,500 gpm.



## Findings of the Investigation

### North of Central Avenue

- The area currently uses the most potable water
- Problem areas are located on dead end roads bordering canals.
- To meet 1,500 gpm at 20 psi,
  - Replace 6-inch mains with 8-inch mains, or looping would be required.
  - extend reclaimed water system to these areas.



Potable System Only



Potable & Reclaimed Systems

The majority of this area is performing well due to the “gridded” system.

# Opinion of Probable Costs

- Basis of opinion
  - Costs presented are planning-level for budgeting purposes (prepared without benefit of detailed design plans and specifications.
  - Replacement of undersized potable water mains to 8-inch minimum
  - Assumes no contribution to fire flow from reclaimed water system.



<b>Summary By Neighborhood</b>	
<b>Port Royal</b>	<b>\$ 4,670,200</b>
<b>Aqualane Shores</b>	<b>4,326,100</b>
<b>South of Central Avenue</b>	<b>7,051,100</b>
<b>Royal Harbor</b>	<b>6,364,900</b>
<b>North Naples</b>	<b><u>18,003,000</u></b>
<b>Total</b>	<b>\$ 40,415,300</b>

# ***Policy Considerations for City Council***



***The Florida Fire Prevention Code requires a minimum of 1,000 gallons per minute (GPM) fire flow for duration of two hours for homes having a fire flow area of 5,000 square feet or less.***

- Cost impacts of providing 1,500 gpm vs. 1,000 gpm fire flows city-wide.
  - Replacing undersized potable mains
  - Eliminating dead-ends by “looping”
- Design and expansion of the reclaimed water system to include provisions for fire flow