Public Works Committee Chair Report for August 11th, 2022 Meeting

1. Summary of the aged-based water pipe infrastructure in town. Town Council asked staff to quantify and locate remaining Asbestos-Concrete (AC) and Cast Iron (CIP) pipes, as well as conduct an age assessment of the entire water main system. All pipes become Town property if PB decides not to renew the WPB franchise agreement.

- The Town has approximately 75 miles of underground water pipes. Only 2,2%, or approximately 1.7 miles of A-C piping remains in the system and all A-C piping is north of Southern Blvd. The use of A-C piping stopped in the late 70s. Most of the remaining A-C pipes are between 60 and 80+ years old. *The Town Council should consider whether these pipes should be made a priority for proactive replacement.* (**see pages 15-20**)

- The Town has approximately 51% or 38 miles of Cast Iron Pipe (CIP) in the system, and it is located throughout the town north to south. According to K-H, while there is no problem with CIP as a material, however, in our environment, with a high-water table and presence of salt water in the soil, CIP pipes are more vulnerable after 50-60 years. Consequently, it is recommended that the town budget for proactive replacement of these pipes after 50 years. The remaining 47% of our system consists of the less brittle ductal iron. *The City of West Palm Beach standard is Ductile Iron for all new pipes.* (***see pages 21-30***)

- Oldest Pipes: 23% of the Town's water pipes (17 miles) are between 73 and 80+ years old. According to Kimley-Horn, approximately 35% (26 miles) of the Town's water pipes will be more than 70 years old by the expiration of the franchise agreement in 2029. These older pipes under arterials and side streets are located north of Parc Monceau near Wideners Curve, in areas of the estate section, midtown and the north end. The pipes south of Widener's Curve are newer and all CIP, having been replaced after1960. This includes approximately 6 miles of A1A arterials (including Ibis Island pipes) from Parc Monceau to the South Palm Beach line.
(**see pages 7 & 8**)

- Historically, WPB's pipe replacement program has been reactive, addressing failure, or service issues such as a broken pipe, instead of a methodical, proactive replacement process based on age and cost efficiencies. The $16M replacement fund paid for by WPB upon renewal of the current franchise agreement was expended during the first decade of our current franchise agreement. The subsequent $1M in annual funding collected from Town residents with the water bills has proved to be inadequate to fund a proactive pipe replacement program. Consequently, during under-grounding in a specific area, the town has not always had adequate funding available to proactively replace very old pipes while it could realize cost and disruption efficiency of doing so while under-grounding. Even pipes identified as critical for replacement at the start of the current franchise agreement have been left in place in order for WPB to reactively address servicing issues, losing both proactive action and efficiency of costs that might be realized during under-grounding. Given that over a third (35%) of the piping infrastructure in Town is expected to be 70+ years old in 2029, the Public Works committee recommends that any consideration of renewal with WPB include a proactive replacement program that corrects deficiencies the Town experienced during the current agreement.

2. Council asked Staff to consider the costs of a Proactive Renewal and Replacement program of existing pipeline infrastructure

- According to Kimley-Horn, present-day costs to replace all pipelines is $239M, using a 75-year life cycle or $3.18M per year. The current 5% of the annual $20M water bill collected is only a third of what is needed annually. The $2.18M annual difference between what we need for a proactive age-based replacement program and the $1M WPB collects from our residents through their water bills, demonstrates that an additional $2.18M of annual funding needs to be provided in order to institute a proactive replacement program. *Note that these costs do not consider inflation.* Town Consultant, John Potts, suggested that adding $2.18M to get to the $3.18 needed may not be adequate initially to launch a proactive age-based replacement program. This is because WPB is behind the curve on instituting a proactive program that will address the vulnerability of the system now. We might consider how to enable a bigger initial capital budget for the first few years so that WPB can get ahead of the aging curve the city is currently facing. *Note that staff and our consultants were unable to find a line item in WPB's budget for Repair and Replacement of the City's water utility infrastructure.* ***(see pages 31-33)***

- Lastly, there was a discussion on the accounting review of how WPB spent money on its utility system serving Palm Beach. While the accounting was provided for Operations and Maintenance, the Town Manager asked for an audit of the rates, particularly how they were established and why they are considerably higher than in other nearby municipalities with newer systems. Staff has not yet identified a consultant to do that forensic analysis.

- The Committee recommends that Town Council request that staff develops a plan showing how to best address a proactive age-based program going forward and prioritizes the hiring of a forensic accountant to review the rate structure, as the audit may influence our selection of a water system.

3. Kimley-Horn also Provided an updated Timeline and Complexity Ongoing Study for Water System Alternatives still being reviewed.

- See attached updated charts. While discussed at the July Town Council meeting, K-H made some edits and wished to summarize the review of these 6 alternatives again. While there is not much new information, renewing the WPB franchise agreement as is, unsurprisingly, is by far the lowest price alternative still on the table. Somewhat surprisingly, staying with WPB and upgrading the entire treatment plant that would serve all of the City's current customers to a membrane-based technology is the most expensive alternative currently being studied, although it is on par with a desalinization plant at Phipps in terms of the lower range cost estimates and high-water security. The Town is approximately 1/3 of WPB's current water demand. The committee discussed the need to review with the full town council the status of these 6 alternatives to determine which ones still remain a real alternative or should be classified as no longer under consideration (no further study) and/or off the table entirely.

There was also a committee discussion regarding the value of actively educating our residents about the different options we are considering to provide a safe, state-of-the-art drinking water system for the future.

The committee recommends a workshop-like forum for residents be scheduled in the early fall season. Jason Debrincat also pointed out that his team is in the process of placing all of the information the Town Council sees and has seen on this subject on the Town's Website for our residents to review. The second chart shows what K-H calls very aggressive timelines for moving to membrane-based treatment by either WPB or Lake Worth Beach. (There is no time impact if we remain with WPB's system.) (**see pages 34 & 35**)

- Both the membrane-based upgrade to WPB and to Lake Worth Beach have similar 6-year timeframes for completion. However, the construction impact to the town is much greater to switch to LWB because of the year-round construction requirement in the same 6-year period to replace all of the existing north-south pipelines with a larger diameter pipe distribution system. Staying with WPB's new membrane or existing system both require an ongoing, proactive, program for gradual replacement of our aging pipeline system as discussed in item 2 above.

4. Membrane-based options: Nano filtration, Brackish water RO, Desalinization differences were reviewed by John Potts, Town Consultant

See attached chart labeled **Compounds Removed by Membrane Treatment Process** (**see page 36**)

- Town Consultant, John Potts, reviewed membrane technology filtration processes and their applications for different water sources. Three membrane types were reviewed: Nano membrane filtration for fresh water such as surface water like Lake Okeechobee, brackish water Reverse Osmosis for sources such as the brackish water from the Floridan Aquifer and Desalinization of seawater. All are reliable technologies that filter on a molecular level, removing the unregulated emerging contaminants (CECs), PFAS (forever chemicals), viruses, bacteria and bacterial toxins, organics, most hardness and heavy metals—all contaminants we don't want in our drinking water. How much salt in the source water determines the size of the hole/type of membrane required. The smaller the hole, the more energy is required to push the source water through the membrane and the more wastewater is generated. Therefore, a desalination process is more expensive and generates more waste than a brackish water RO process, which is more expensive and generates more wastewater than a Nano process. By example, desalination results in a loss of 65%-45% of the water to waste, brackish water RO, 30%-20% lost to waste, and Nano filtration 20%-7% lost to waste. Most of the wastewater from Nano filtration can be used for irrigation, as its salt levels are very low and tolerated by plants. There is additional permitting required for the use of more water from surface or aquifer sources as a result of wastewater resulting from using membrane technologies, but these permits have proven to be obtainable.

5. **TC asked staff for a high-level feasibility review of using Horizontal Wells from a possible desalination plant on West side of Intracoastal Waterway. (see page 37)**

- Kimley-Horn estimates that a suitable property would require 3-5 acres with 220 feet of frontage along the intracoastal waterway. The endpoint of each of the 11 wells radius would require 500' of separation in order to avoid interfering with each other. Therefore the 10 -11 wells would need to be approximately 2200-2700 feet long to achieve that configuration. (See diagram on page of backup). K-H noted it is also important to confirm that appropriate rock formation exists underwater where the endpoints of the wells would be located and Mr. Potts added that this condition is required to ensure the wells do not pull up dirty water. K-H and staff spoke with a hydrologist and could not find an example where a horizontal well configuration in Florida was built for extracting water. (during public comments, Mr. Pat Cooper mentioned that this sort of underwater drilling was done frequently by the oil industry.) However, no local experience of this in the Florida area makes costs difficult to estimate. K-H and Staff believe the town will need a FDEP permit as well as submerged lands permit and USACOE permit. K-H's estimate of cost is $3-$5 M per well (up to $55M.) For comparison, at the Par 3, the seawater wells were estimated at $400K per well, with confidence. To arrive at a total cost, the town would still need to add costs for real estate, changes to distribution, and the physical plant itself. The cost to pursue this option seems high with a lot of unknowns. The committee will ask the full council if they wish to pursue this item further.

6. **Placement of north-south water distribution pipeline in the intracoastal waterway.**

K-H discussed a simplistic concept of a water transmission pipe in the intracoastal waterway. The submerged Water Main would follow a route from the northernmost ICW pipe crossing at Orange Grove Road south 7 miles, ending at the southernmost Sloans Curve crossing, connecting to the town's system at each of the existing 5 ICW crossings.
The diameter of the pipeline would range from 24" to 30". The proposed installation method would be horizontal directional drilling. The maximum length of a directional drill would be about 5500 — 6500 feet (just over a mile.) The drilling would likely be managed from a temporary trestle system driven into the ICW floor and supported from above the waterway. The reason a trestle is preferred over a barge is the mile-long pull back from each bore would require the stability of an anchored trestle. K-H said each entry pit for the directional drill system would require a coffer dam, a dewatered square box to control the containment of drilling fluid.
The project would have 8 drilling mobilizations to complete the 7-mile-long pipe transmission system. K-H estimated it would take 18-24 months to complete the entire 8 mobilizations and drills. They discussed rates and costs with directional drilling contractors, and the size and number of barges, cranes and other equipment needed on the waterway to support the project. Total costs were estimated at $110M to $115M. K-H began discussions with DEP in early August. DEP hadn't seen a project like this, but they believed the horizontal drilling method was best as opposed to placement on the seafloor or open cut trenching.

It would be permitted as an individual permit, and it was suggested an easement for sovereign submerged lands would be straightforward. Since this was a high-level look at feasibility, other details and potential hurdles such as getting around the 3 bridges and locating where FPL has east-west power lines still need to be worked out.

The key benefit of an ICW transmission system, once installed, is that it utilizes the town's existing water distribution system and avoids installing all new pipes from the south to the north if, for example, we used Lake Worth Beach or Phipps desalination. However, there are risks associated with our transmission pipe being located in the ICW such as lack of redundancy and security. The committee recommends discussing this at greater length at the council meeting.

It's important for us to acknowledge that no matter what water system we select, no system will avoid the inevitable, proactive, and disruptive replacement of our older pipes. This type of transmission system's biggest benefit is avoiding performing those replacements all at once for a multiple period of years. (**see page 38**)

7. Open discussion: A discussion was had on a Civic Association Water Committee's suggestion to find a desalination site on the West Palm Beach intracoastal side near the FPL power plant. Staff said it would require a minimum of 3-5 acres using horizontal drilling and 10-11 acres for traditional lineal drilling to keep the 500' spacing between well sites.

8. Establishing our own Utility: Town consultant, John Potts, presented an organizational chart showing what a possible water utility formed by the town to run its own water system would look like. The utility is established by resolution. The utility director would be a new position under the Public Works Director and It is estimated the town might increase staff by 27 positions (approximately 30%) to manage operations, billing & collection, finance, etc..
(**see page 39**)

9. **Renew and Replace a Desalination Treatment Plant**.
A chart showing the Present Day Cost of a desalination Treatment Plant,such as that initially contemplated at Phipps Park was discussed. Initial Cost =$140M Assuming a life cycle of 50 years, the town would need to reserve $2.8M per year, plus inflation, to replace the plant in 50 years. (**see page 41**)

Respectfully submitted, Bobbie Lindsay,
Chair, September 6, 2022

Town of Palm Beach Water Supply Feasibility Study

Meeting
August 2022

Overview

- Age Based Watermain Assessment
  - Remaining Asbestos Concrete Pipe
  - Remaining Cast Iron Pipe
- Renewal and Replacement Programs
- Timeline and Complexity
- Membrane Treatment
- Horizontal Saltwater Wells Concept
- Transmission Pipe in the Intracoastal
- Conceptual Town Utility Department Structure

Age Based Watermain Assessment

Legend

WATERMAIN AGE

- 1940'S OR OLDER
- 1950'S
- 1960'S OR NEWER

Age Based Watermain Assessment

Legend

WATERMAIN AGE

- 1940'S OR OLDER
- 1950'S
- 1960'S OR NEWER

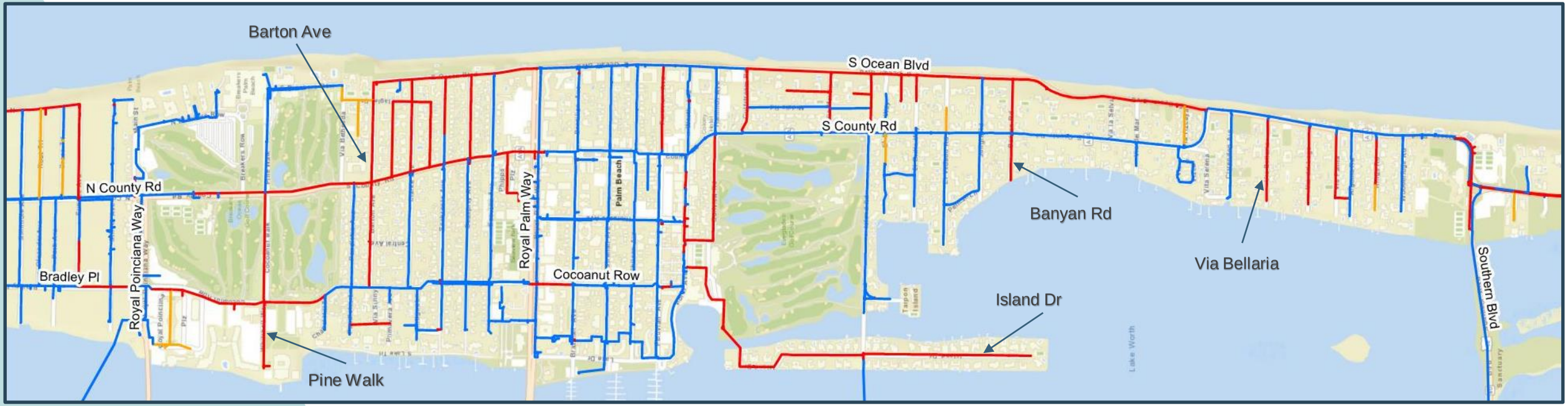
Age Based Watermain Assessment

Legend

WATERMAIN AGE

- 1940'S OR OLDER
- 1950'S
- 1960'S OR NEWER

Age Based Watermain Assessment



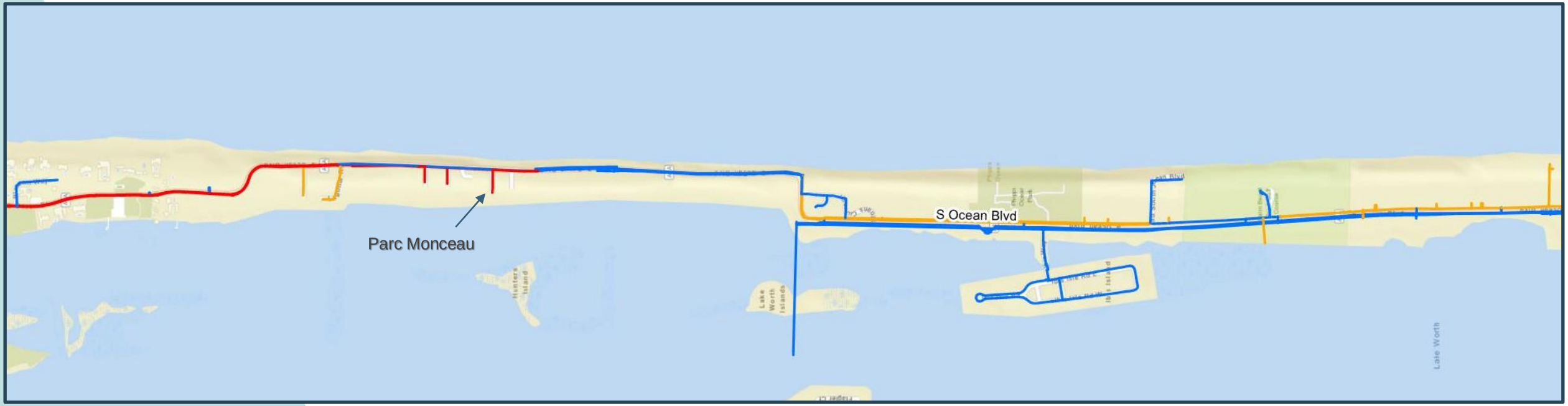
Age Based Watermain Assessment

Legend

WATERMAIN AGE

- 1940'S OR OLDER
- 1950'S
- 1960'S OR NEWER

Age Based Watermain Assessment



Legend

WATERMAIN AGE

- 1940'S OR OLDER
- 1950'S
- 1960'S OR NEWER

Age Based Watermain Assessment

Legend

WATERMAIN AGE

- 1940'S OR OLDER
- 1950'S
- 1960'S OR NEWER

Age Based Watermain Assessment

Age Based Watermain Assessment

Legend

WATERMAIN AGE

- 1940'S OR OLDER
- 1950'S
- 1960'S OR NEWER

Age Based Watermain Assessment

Age Group	Quantity (Linear Feet - LF)	% of total Pipe in the Town
1940's and Older	89,321	23%
1950's	48,522	12%
1960's to Present	258,426	65%
Total	396,269	

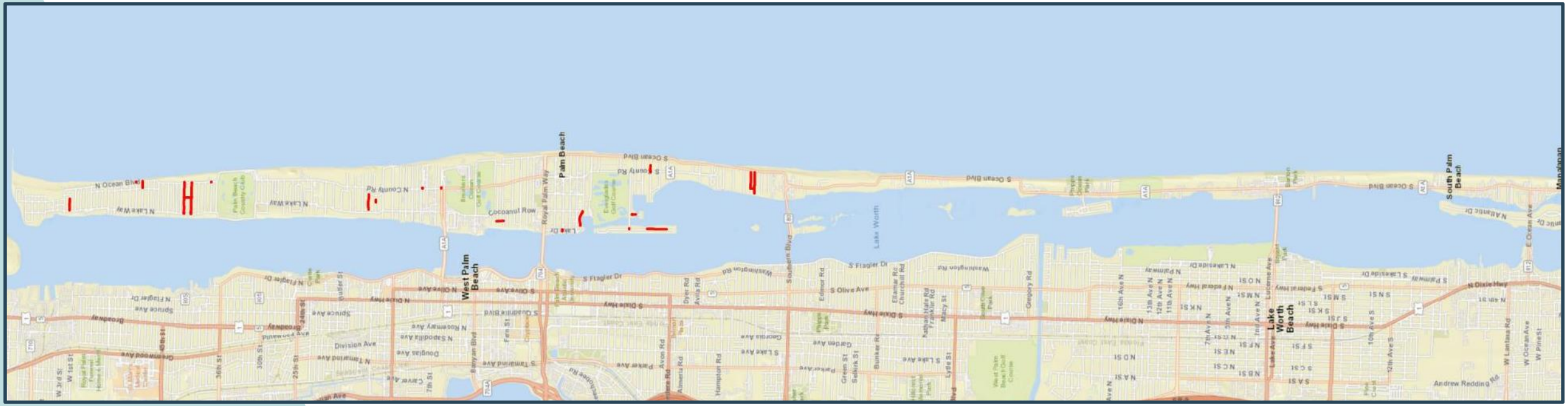
Age Based Watermain Assessment – Arterial Streets and Side Streets

		Arterial Streets			Side Streets		
Age Group	Quantity (LF)	Pipes on Arterial Streets (LF)	% of Age Group	% of Total Pipelines	Pipes on Side Streets (LF)	% of Age Group	% of Total Pipelines
1940's and Older	89,321	49,472	55%	12%	39,849	45%	10%
1950's	48,522	20,593	42%	5%	27,929	58%	7%
1960's to Present	258,426	129,707	50%	33%	128,719	50%	32%
Total	396,269	199,772		50%	196,497		50%

Age Based Watermain Assessment – Arterial Streets and Side Streets

Age Group	Arterial Street Pipes % of Total Pipeline	Side Street Pipes % of Total Pipeline
1940's and Older	12%	10%
1950's	5%	7%
1960's to Present	33%	32%

Remaining AC Pipe



Legend

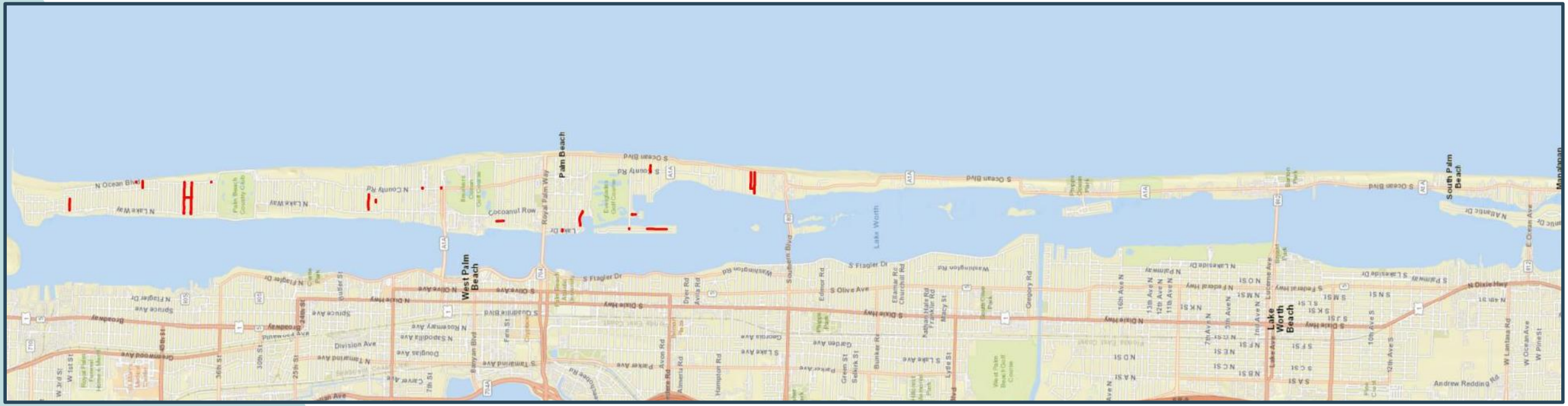
REMAINING AC PIPE

Remaining AC Pipe

Legend

REMAINING AC PIPE

Remaining AC Pipe



Legend

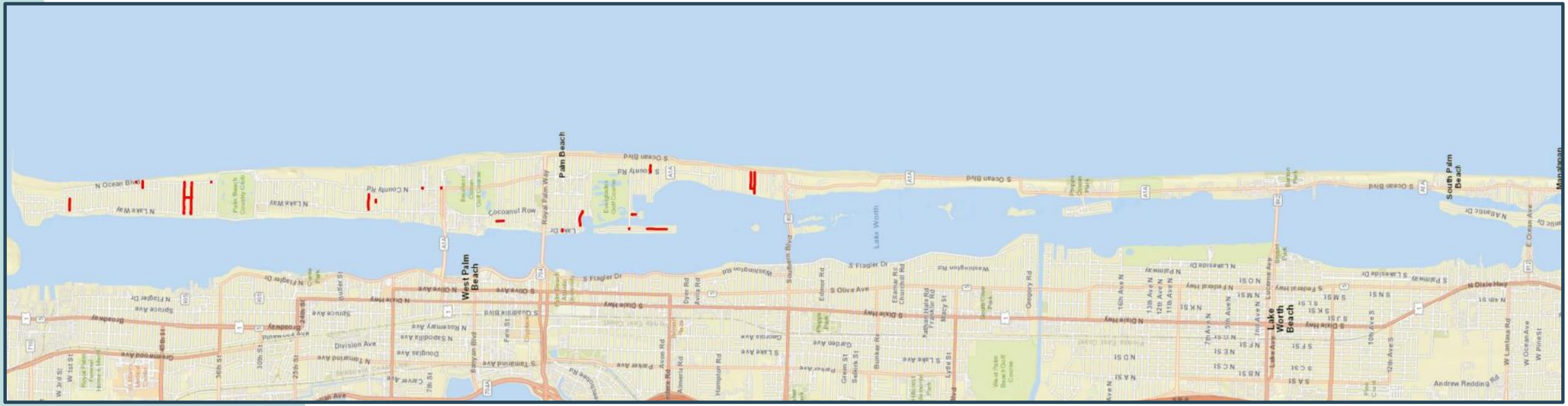
REMAINING AC PIPE

Remaining AC Pipe

Legend

REMAINING AC PIPE

Remaining AC Pipe



Legend

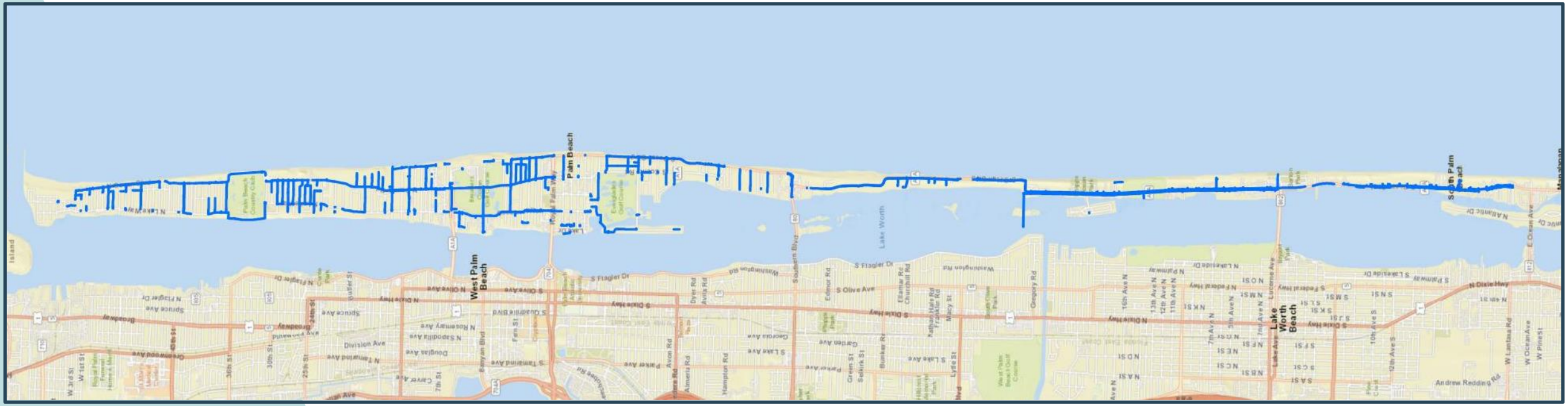
REMAINING AC PIPE

Remaining AC Pipe

- Total Pipe in the Town = 396,000 LF
- Total AC Pipe Remaining = 8,900 LF
- % of AC Pipe Remaining = 2.2%

Age Group	Quantity (LF)	AC Pipe Remaining	AC - % of Age Group	AC - % of Total Pipe
1940's and Older	89,321	5,978	7%	1.5%
1950's	48,522	599	1.2%	0.15%
1960's to Present	258,426	2,386	0.92%	0.60%
Total	396,269	8,963		

Remaining Cast Iron Pipe



Legend

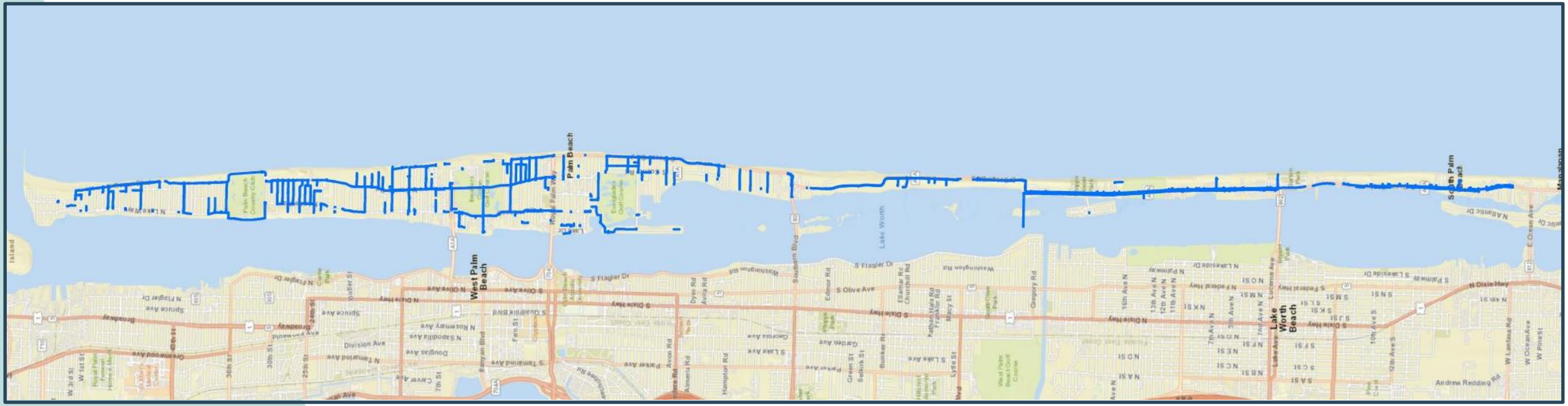
REMAINING CIP PIPE

Remaining Cast Iron Pipe

Legend

REMAINING CIP PIPE

Remaining Cast Iron Pipe



Legend

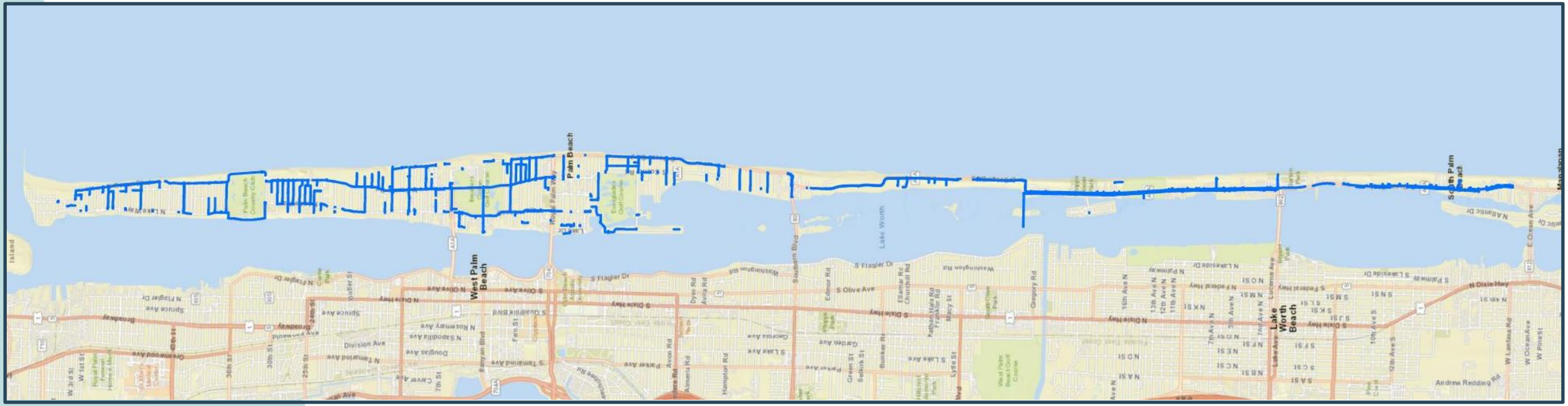
REMAINING CIP PIPE

Remaining Cast Iron Pipe

Legend

REMAINING CIP PIPE

Remaining Cast Iron Pipe



Legend

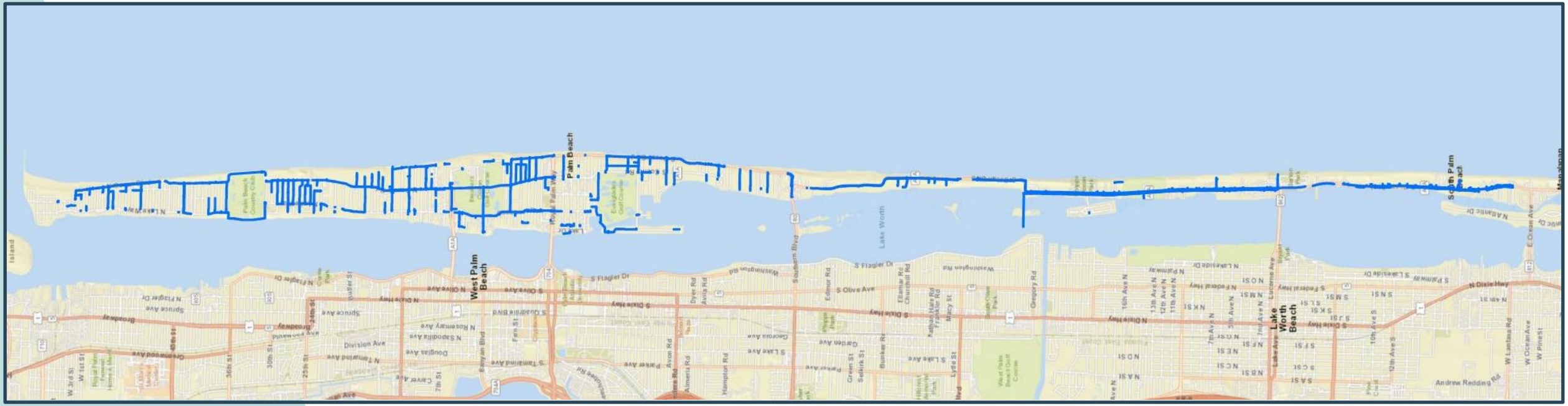
REMAINING CIP PIPE

Remaining Cast Iron Pipe

Legend

REMAINING CIP PIPE

Remaining Cast Iron Pipe

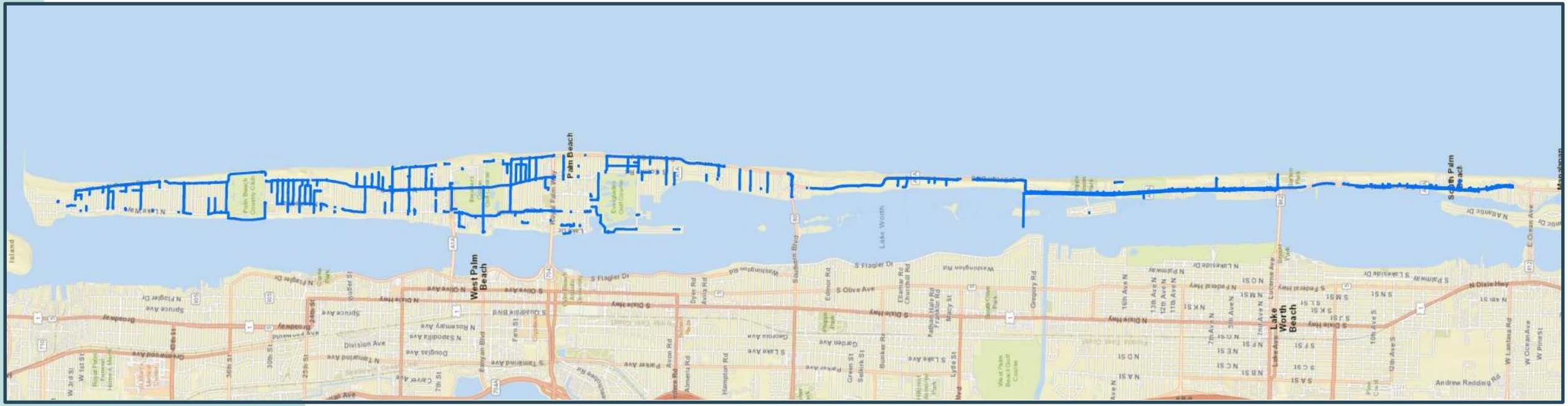


Legend

REMAINING CIP PIPE

Remaining Cast Iron Pipe

Remaining Cast Iron Pipe



Legend

REMAINING CIP PIPE

Remaining Cast Iron Pipe

- Total Pipe in the Town = 396,300 LF
- Total CIP Pipe Remaining = 201,740 LF
- % of CIP Pipe Remaining = 51%

Age Group	Quantity (LF)	CIP Pipe Remaining	CIP - % of Age Group	CIP - % of Total Pipe
1940's and Older	89,321	72,789	81%	18%
1950's	48,522	41,030	85%	10%
1960's to Present	258,426	87,921	34%	22%
Total	396,269	201,740		

Renewal and Replacement Programs

Renew and Replace - Pipes

- Total Pipelines in the Town = 396,300 LF
- Present Day Cost to replace all pipelines = $239M
- Life Cycle = 75 years
- $239M / 75 years = $3.18M

Renewal and Replacement - Pipes

- Total Cost of Pipelines = $239M
- Total Pipelines = 396,300 LF
- $239M / 396,300 LF = $603 / LF
- $3.18M R&R fund a year

Age Group	Linear Feet	Total Cost	Approx. Years
1940’s and Older	89,320	$53.9M	17
1950’s	48,520	$29.3M	9
1960’s to Present	258,430	$155.9M	49

Timeline and Complexity

Alternative Description	Cost	Town Developed Utility Required	Water Supply Security	Water Supply Permitting Complexity	Construction Complexity	Operational Complexity and System Reliability	Land Acquisition	Program Permitting Complexity	Stakeholder Coordination
Ongoing Study									
City of West Palm Beach – As Is	$47M - $70M	No	Moderate	None – Already Permitted	Low	Low / High	None	Low	Low
City of West Palm Beach – Membrane Upgrade	$547M - $821M ($182M - $273M)	No	High	Moderate	High	High / High	None	Low	Low
City of Lake Worth Beach	$263M -$395M	Retail – No	Moderate - High	Moderate	High	Low / Moderate	Low	High	High
No Further Study									
Town Owned Phipps Park - Desal	$352M - $529M	Yes	High	None	High	High / High	None	High	High
Town Owned Quadrille - Nano	$269M - $405M	Yes	High	None	High	High / High	None	High	High
Palm Beach County	$366M - $443M	Yes	Moderate - High	Low	High	High / Moderate	High	High	High

Timeline and Complexity

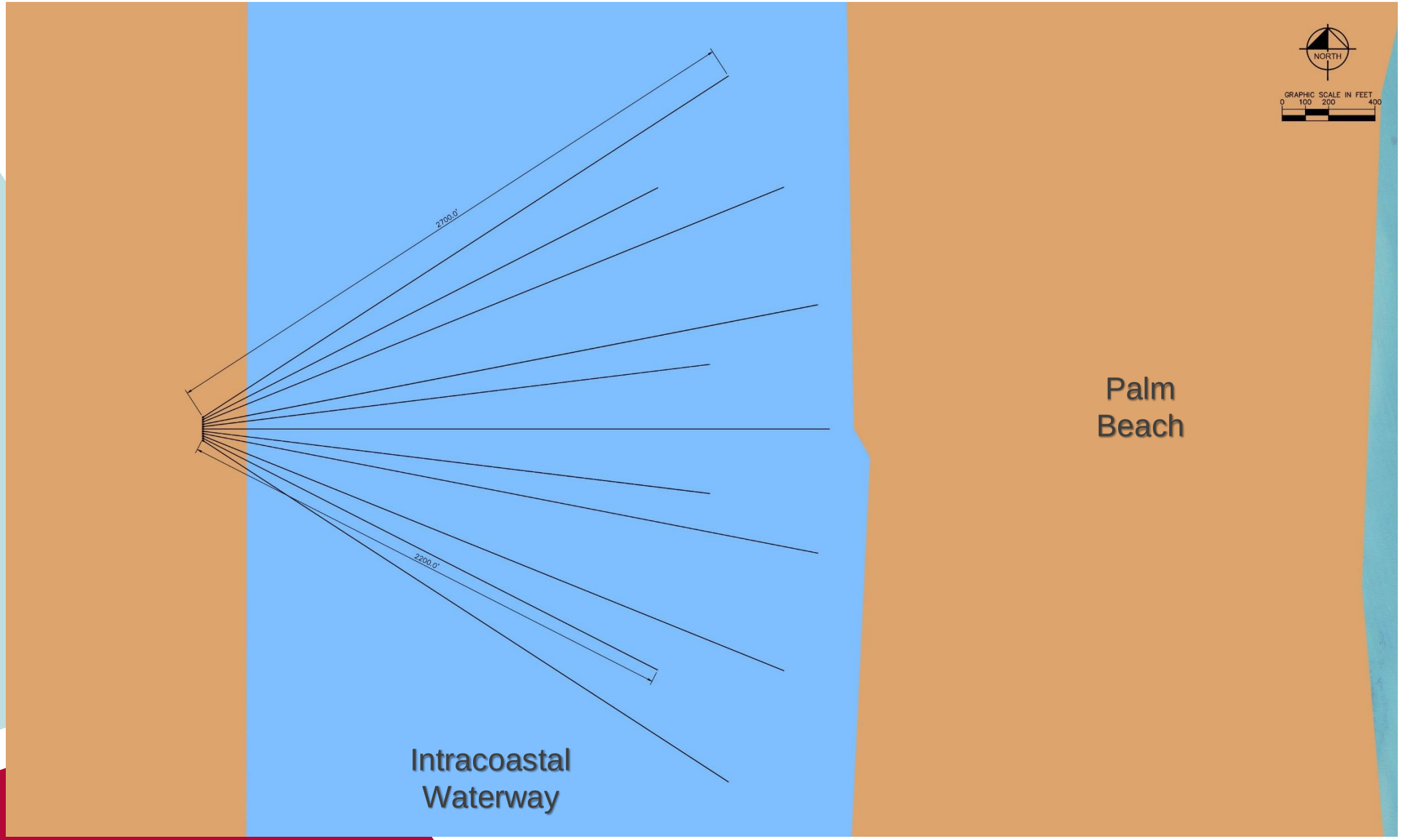
TOWN OF PALM BEACH ALTERNATIVE WATER SUPPLY STUDY
ESTIMATED COMPLETION DURATIONS OF SELECTED ALTERNATIVES

Alternate	Task/Activity	Duration (Months)	Duration (Quarters)	2023				2024				2025				2026				2027				2028				2029				2030				2031			
				1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
WPB WTP Treatment - As is	West Palm Beach- As is	0	0																																				
Upgrade WPB WTP Treatment	West Palm WTP Membrane Water Treatment Facility Construction	69	23																																				
LWB Supply	Town Water Distribution System Construction	69	23																																				

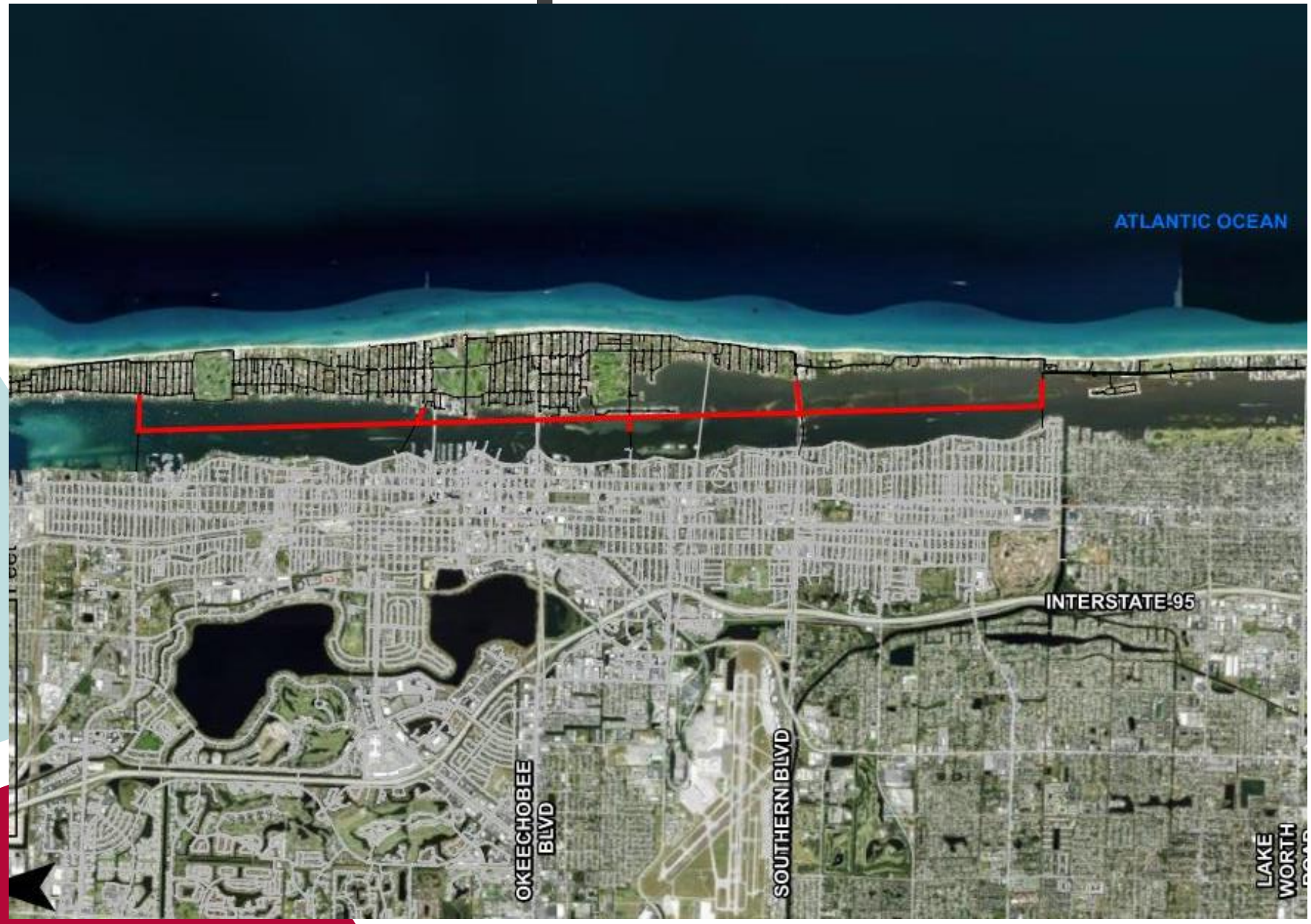
Compounds Removed by Membrane Treatment Process

Source Water	Seawater	Floridan Aquifer	Surface Water	Source Water
Process	Desalination - Reverse Osmosis (SWRO)	Brackish Water - Reverse Osmosis (BWRO)	Nanofiltration (NF)	Untreated
EXAMPLE COMPOUNDS PRESENT IN SOURCE WATER AND AMOUNT THAT PASS EACH MEMBRANE PROCESS (PARTICLE SIZE)	SWRO Membrane: Salt (<1% Pass)	BWRO Membrane: Salt (2% Pass); Hardness (None Pass); Iron (None Pass)	NF Membrane	Giardia (None Pass); Cysts (None Pass); Salt (80% Pass); Viruses (None Pass); Bacteria (None Pass); Hardness (25% Pass); Color (5% Pass); THM (5% Pass); Organics (None Pass); CEC (None Pass); PFA (None Pass); Iron (20% Pass)
OPERATING PRESSURE (PSI)	500 PSI TO 1000 PSI	120 PSI TO 300 PSI	60 PSI TO 120 PSI	
WATER LOST TO WASTE	65% TO 45%	30% TO 20%	20% TO 7%	

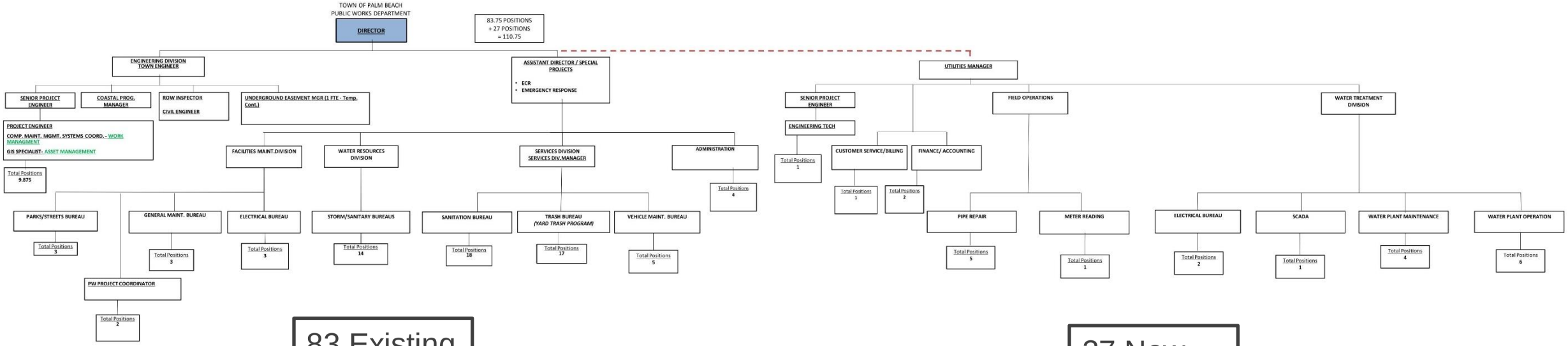
Horizontal Saltwater Wells Concept



Transmission Pipe in the Intracoastal



Utility Formation

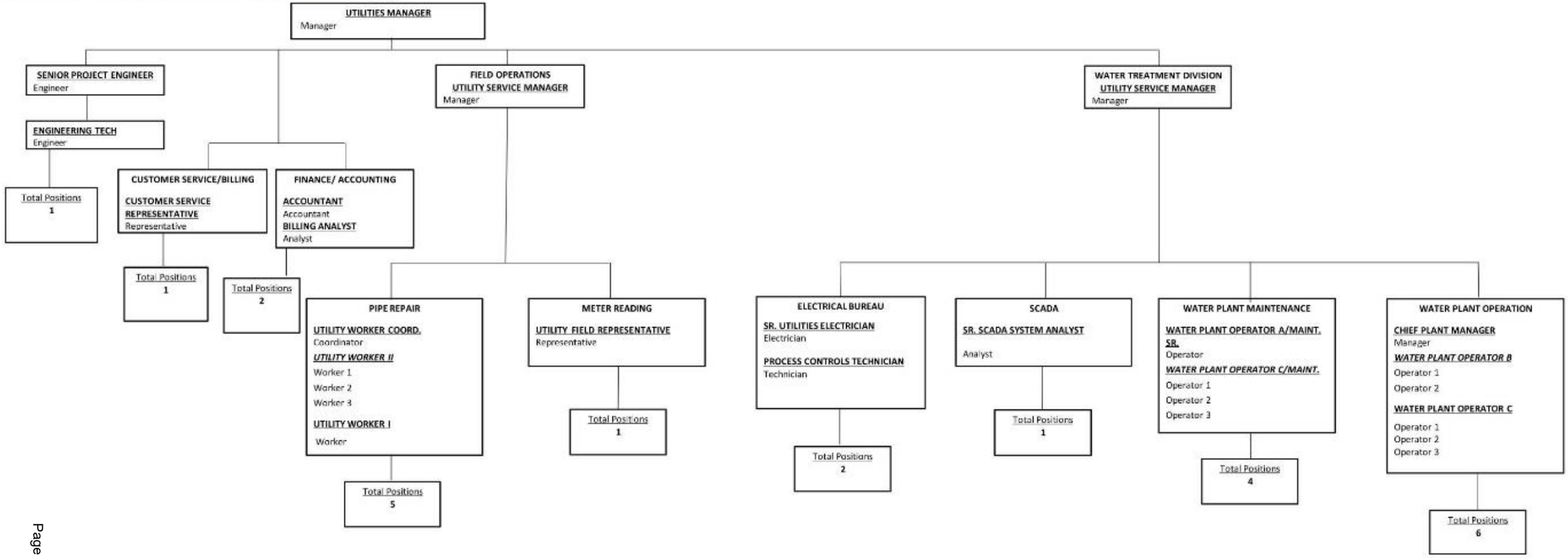


83 Existing Positions

27 New Positions

110 Total Positions

Utility Formation



27 New Positions

Renew and Replace – Treatment Plant

- Present Day Cost of Treatment Plant = $140M (Desalination Plant)
- Life Cycle = 50 years
- $140M / 50 years = $2.8M