Water Utility Master Plan Update 2022

June 2022

Town of Jupiter Utilities



Table of Contents

1. Executive Summary 1-1
1.1 Overview 1-1
1.2 Mission and Goals 1-1
1.3 History of Resilience and Sustainability 1-1
1.4 Challenges and Opportunities 1-2
1.4.1 Challenge 1 – NF Concentrate Disposal 1-2
1.4.2 Challenge 2 – RO Concentrate Disposal 1-5
1.4.3 Challenge 3 – Regulatory Compliance 1-5
1.5 Recommended Projects 1-6
1.6 Financial Strategies to Achieve Goals 1-6
2. Introduction 2-1
2.1 Background / Water System History 2-1
2.2 Level of Service 2-2
2.3 Environmental Stewardship 2-2
2.3.1 Conservation 2-2
2.3.1.1 Conservation Rate Structure 2-3
2.3.1.2 Water Shortage Restrictions 2-3
2.3.1.3 Landscape Irrigation Restrictions 2-3
2.3.1.4 Meter Replacement Program 2-3
2.3.1.5 Plumbing Code 2-3
2.3.1.6 Public Outreach 2-3
2.3.2 Reuse 2-4
2.4 Long-Term Financial Competitiveness and Stability 2-4
2.5 Climate Change / Coastal Resiliency 2-4
2.5.1 Introduction 2-4
2.5.2 Southeast Florida Regional Climate Change Compact – RCAP Overview 2-4
2.5.3 Summary of Recommended Water Actions 2-5
2.5.3.1 RCAP 2.0 2-5
2.5.3.2 Compact Climate Assessment Tool (C-CAT) 2-6
2.6 Risk and Resiliency Assessment 2-8

3. Current Position 3-1
3.1 Water Service Planning Area 3-1
3.2 Planning Period 3-2
3.3 Population and Water Demand 3-2
3.3.1 Service Area Extension to Jupiter Farms 3-4
3.4 Permitted Aquifer Withdrawals 3-4
3.5 Existing Raw Water Supply System 3-6
3.5.1 Surficial Aquifer Wellfield Water Supply System 3-6
3.5.1.1 Surficial Wellfield Overview 3-6
3.5.1.2 Surficial Wellfield Evaluation 3-10
3.5.1.3 Surficial Wellfield Rehabilitation 3-10
3.5.1.3.1 New Wells (less than ten years old) 3-10
3.5.1.3.2 Intermediate Age Wells (11 – 30 years old) 3-11
3.5.1.3.3 Older Wells (31 – 40 years old) 3-12
3.5.1.3.4 Wellheads 3-14
3.5.1.4 Historical Surficial Wellfield Pumpage 3-14
3.5.1.5 Historical Surficial Wellfield Water Quality Evaluation 3-16
3.5.2 Floridan Aquifer Wellfield Water Supply System 3-17
3.5.2.1 Floridan Wellfield Overview 3-17
3.5.2.2 Floridan Wellfield Evaluation 3-21
3.5.2.3 Floridan Wellfield Rehabilitation 3-21
3.5.2.4 Floridan Wellfield Pumpage and Water Quality Evaluation 3-26
3.5.2.5 Additional Floridan Wellfield Water Quality Evaluation 3-34
3.5.2.5.1 Bacteriological 3-35
3.6 Saltwater Intrusion Monitoring Program 3-35
3.7 Existing Water Treatment Facilities 3-38
3.7.1 Introduction 3-38
3.7.2 Treatment Facilities 3-41
3.7.3 Existing Water Storage, Transmission & Distribution Facilities 3-43
3.7.3.1 Transmission and Distribution System 3-43
3.7.3.2 Storage and Pumping Facilities 3-47
3.8 Recommended Improvements 3-48

3.8.1 Raw Water Supply System 3-49
3.8.1.1 Surficial Aquifer System 3-49
3.8.1.2 Floridan Aquifer System 3-50
3.8.2 Water Treatment Facilities 3-51
3.8.2.1 RO Phase 3 Improvements 3-51
3.8.2.2 Conversion from Chlorine Gas to Liquid Chlorine 3-52
3.8.2.3 Converting IX Facility to Calcite Contactor 3-53
3.8.2.4 Relocation of Ammonia Addition Point to Transfer Pump Header 3-53
3.8.3 Water Storage, Transmission & Distribution Facilities 3-54
3.8.3.1 Advanced Metering Infrastructure (AMI) Improvements 3-54
4. Regulatory Compliance Monitoring 4-1
4.1 Introduction 4-1
4.2 Lead and Copper Rule (LCR) Compliance 4-1
4.3 Total Coliform Rule Compliance 4-3
4.4 Disinfectants and Disinfection Byproducts Rules Compliance 4-6
4.5 Groundwater Rule (GWR) Compliance 4-8
4.5.1 Four-Log Virus Inactivation Requirement 4-10
4.6 Unregulated Contaminant Monitoring Rule (UCMR) 4-11
4.6.1 Contaminants of Emerging Concern (CECs) 4-12
5. Future Water System Challenges 5-1
5.1 Introduction 5-1
5.2 Sustainability of Current Water Supply Sources 5-1
5.2.1 Floridan Aquifer System 5-1
5.2.2 Surficial Aquifer System 5-1
5.2.3 Hydraulic Model Evaluations 5-2
5.2.3.1 Surficial Aquifer System Raw Water Main 5-2
5.2.3.2 Floridan Aquifer System Raw Water Main 5-3
5.3 Climate Change / Coastal Resiliency 5-4
5.4 Future Regulations 5-4
5.4.1 Introduction 5-4
5.4.2 Lead and Copper Rule Revisions 5-5

5.4.2.1 Trigger Level 5-5
5.4.2.2 Tap Sampling Site Selection 5-6
5.4.2.3 Sampling Procedures 5-8
5.4.2.4 Find-and-Fix Requirements 5-9
5.4.2.5 Optimal Corrosion Control Treatment 5-10
5.4.2.6 Initial Lead Service Line Inventory 5-11
5.4.2.7 LSL Inventory Updates 5-11
5.4.2.8 Annual LSL Owner Notifications 5-11
5.4.2.9 Lead Service Line Replacement Plan 5-12
5.4.2.10 School and Childcare Facility Testing 5-12
5.4.3 Future LCCR Compliance Requirements 5-13
5.4.3.1 Trigger Level 5-13
5.4.3.2 Corrosion Control Treatment 5-13
5.4.3.3 Service Line Material Inventory 5-14
5.4.3.4 Lead Service Line Replacement Plan 5-15
5.4.3.5 Public Education 5-15
5.4.3.6 Lead and Copper Tap Monitoring 5-15
5.4.3.7 School and Childcare Facility Testing 5-16
5.4.3.8 LCRR Budgetary Costs for Compliance 5-16
5.4.4 Potential Revisions of Microbial and Disinfection Byproducts Rules 5-17
5.4.5 Contaminants of Emerging Concern (CECs) 5-18
5.4.5.1 Nitrosamines 5-18
5.4.5.2 Perchlorate 5-18
5.4.5.3 Chlorate 5-19
5.4.5.4 1,4-Dioxane (p-Dioxane, Dioxane) 5-19
5.4.5.5 Per- and Polyfluoroalkyl Substances (PFAS) 5-20
5.4.5.6 Health Advisory Expected in Spring 2022 for GenX and PFBS 5-21
5.4.5.7 Future Considerations for CECs 5-21
5.4.6 Four-Log Virus Treatment Certification under the Groundwater Rule 5-22
5.5 Membrane Treatment Concentrate Management Options 5-23
5.5.1 Current Practices Overview 5-23
5.5.2 Nanofiltration Concentrate Management 5-24

5.5.2.1 Alternate Options for Reuse/Disposal 5-24
5.5.2.1.1 Renewal of Agreement with Loxahatchee River District (LRD) 5-25
5.5.2.1.2 Blending NF Concentrate with RO Feed Water 5-27
5.5.2.1.3 Deep Well Injection (DIW) 5-30
5.5.2.2 Considerations and Challenges 5-30
5.5.3 Reverse Osmosis Concentrate Management 5-33
5.5.3.1 Alternate Options for Disposal 5-33
5.5.3.1.1 Continued Discharge to C-18 Canal 5-33
5.5.3.1.2 Deep Well Injection (DIW) 5-34
5.5.3.2 Challenges 5-38
5.5.3.3 Opportunities 5-39
References 5-40
6. Renewal and Replacement of Water System Aging Infrastructure 6-1
6.1 Introduction 6-1
6.2 Recommended Water System Renewal and Replacement Improvements 6-1
7. Recommended Capital Improvement Program 7-1
8. Financial Forecasts and Recommendations 8-1
8.1 Introduction 8-1
8.2 Capital Expenditure Overview 8-1
8.3 Long-Term Cash Flow Projections and Financial Positions 8-9
8.3.1 Debt Service Coverage Ratio 8-19
8.3.2 Projected Net Revenue Margin 8-21
8.3.3 Liquidity (Cash) Position 8-22
8.3.4 Free Cash as Percent of Depreciation 8-25
8.3.5 Debt to Net Plant Investment 8-26
8.4 Rate Comparison 8-26
8.5 Observations and Recommendations 8-31

List of Tables

Table 1-1: Summary of Water Capital Project – Fiscal Years 2022 to 2046 ($000s) [1] 1-6
Table 2-1: Town of Jupiter Utility Expansion History 2-1
Table 2-2: Town of Jupiter Water System Level of Service Standards [1] 2-2
Table 2-3: Compact Climate Assessment Tool Priority Actions 2-7
Table 3-1: Town of Jupiter Water Service Area – Historical Annual Average 3-2
Table 3-2: Town of Jupiter Water Service Area – Water Demand Forecast 3-3
Table 3-3: Estimated Water Demand with Jupiter Farms Connection 3-4
Table 3-4: Existing Permitted Water Use (million gallons per day) 3-6
Table 3-5: Surficial Aquifer Wellfield Testing 3-10
Table 3-6: Surficial Aquifer Wellfield Historical Annual Average Raw Water Quality 3-17
Table 3-7: Town of Jupiter FA Historical Well Pumpage 3-29
Table 3-8: Floridan Aquifer Wellfield Historical Annual Average Raw Water Quality 3-35
Table 3-9: Design Capacities for Each Treatment Process 3-39
Table 3-10: Town of Jupiter Transmission / Distribution Pipeline 3-44
Table 3-11: Town of Jupiter Proposed FA Wellfield Operating Plan 3-51
Table 4-1: Town of Jupiter Summary of Historical CECs 4-15
Table 5-1: Response Actions for Trigger Level and Action Level Exceedances 5-6
Table 5-2: Comparison of Sample Site Tier Criteria 5-7
Table 5-3: Required Number of Sampling Sites Based on System Size 5-8
Table 5-4: Standard and Reduced Sampling Plans Based on Lead P90 5-8
Table 5-5: Potential LCRR Compliance Budgetary Costs 5-16
Table 5-6: Summary of Current Concentrate Management Methods 5-23
Table 5-7: Summary of NF Concentrate Management Options and Considerations 5-31
Table 5-8: Estimated Nutrient Reduction to C-18 Canal/Loxahatchee River 5-34
Table 5-9: Class I Deep Well Injection Design Considerations [(1)] 5-35
Table 5-10: DIW Pump Station Considerations [(1)] 5-38
Table 5-11: Comparison of Injection Well Costs vs RO Concentrate Treatment Costs 5-39
Table 7-1: Town of Jupiter 25-Year Capital Improvement Plan 7-1
Table 8-1: Summary of Water Capital Projects – Fiscal Years 2022 to 2046 ($000s) [(1)] 8-2
Table 8-2: Summary of Capital Improvement Plan – Fiscal Years 2022 to 2046 [(1)] 8-4
Table 8-3: Summary of Primary Water System Capital Projects (000s) [(1)] 8-9
Table 8-4: Summary of Recommended Rate Adjustment (%) 2023 – 2025 8-11
Table 8-5: Summary of Existing Principal Amount of Bonds Outstanding 8-14
Table 8-6: Capital Program - Funding Plan (000s) 8-16
Table 8-7: Comparison of Typical Monthly Resident Bills for Water Service [(1)] 8-28
Table 8-8: Summary of Recommended and Alternative Rate Adjustments (%) 2023-2024 8-33

List of Figures

Figure 1-1: Town of Jupiter's Existing Concentrate Management Strategies 1-3
Figure 1-2: Town of Jupiter's Proposed Concentrate Management Strategies 1-4
Figure 3-1: Town of Jupiter Water Service Area 3-1
Figure 3-2: Town of Jupiter's Dual Aquifer Supply Sources 3-5

Figure 3-3: Town of Jupiter Surficial Aquifer Well Locations 3-8
Figure 3-4: Town of Jupiter Surficial Aquifer Raw Water Mains 3-9
Figure 3-5: Town of Jupiter SA Well 45 3-12
Figure 3-6: Town of Jupiter SA Well 30 3-14
Figure 3-7: Surficial Wellfield Annual Raw Water Withdrawal 3-15
Figure 3-8: Surficial Wellfield Maximum Monthly Raw Water Withdrawal 3-16
Figure 3-9: Town of Jupiter Floridan Aquifer Well Locations 3-19
Figure 3-10: Town of Jupiter Floridan Aquifer Raw Water Mains 3-20
Figure 3-11: Town of Jupiter FA System Wells Specific Capacity Improvement 3-22
Figure 3-12: Town of Jupiter FA System Wells RO-2 and RO-3 Historical Chloride and Pumpage 3-24
Figure 3-13: Town of Jupiter FA System Wells RO-2 and RO-3 Specific Capacity Changes 3-25
Figure 3-14: Town of Jupiter FA System Wells RO-2 and RO-3 Specific Conductance Changes 3-26
Figure 3-15: Floridan Wellfield Annual Raw Water Withdrawal 3-27
Figure 3-16: Floridan Wellfield Maximum Monthly Raw Water Withdrawal 3-28
Figure 3-17: Town of Jupiter Individual FA Well Pumpage for 2005, 2011, 2015 and 2020 3-31
Figure 3-18: Town of Jupiter FA Wells Projected Raw Water Specific Conductance 3-32
Figure 3-19: Town of Jupiter FA Wells Projected Raw Water Chloride 3-33
Figure 3-20: 2019 Isochlor Interpretation – Palm Beach County Surficial Aquifer 3-37
Figure 3-21: Town of Jupiter Utilities Water System Process Flow Diagram 3-40
Figure 3-22: How Membrane Technology Works 3-41
Figure 3-23: Town of Jupiter Transmission and Distribution Piping Network 3-46
Figure 3-24: Town of Jupiter Water Storage & High Service Pumping Facilities 3-48
Figure 4-1: Town of Jupiter 90th Percentile Lead Levels 4-2
Figure 4-2: Town of Jupiter 90th Percentile Copper Levels 4-3
Figure 4-3: Town of Jupiter Compliance Monitoring Location 4-5
Figure 4-4: Historical Locational Running Annual Average (LRAA) for TTHM 4-7
Figure 4-5: Historical Locational Running Annual Average (LRAA) for HAA5 4-8
Figure 4-6: Town of Jupiter Reclaimed Water Irrigation System 4-13
Figure 4-7: Historical Trend of SA Wells in Vicinity of Reclaimed Water Irrigation 4-14
Figure 4-8: Town of Jupiter Average Combined Concentration of PFAS Compounds 4-16
Figure 5-1: Proposed Route of Replacement 30-inch Raw Water Main 5-3
Figure 5-2: Point of Entry Orthophosphate Levels (mg/L as PO_4) 5-14
Figure 8-1: Projected Operating Expenses 8-13
Figure 8-2: Operating Liquidity – Ending Cash Balances 8-15
Figure 8-3: Total System CIP Requirements by Funding Source 8-18
Figure 8-4: All-In Debt Coverage 8-20
Figure 8-5: Annual Debt Service Payments 8-21
Figure 8-6: Net Revenue (Operating) Margin 8-22
Figure 8-7: Operating Liquidity – Ending Cash Balances 8-23
Figure 8-8: Capital Liquidity – Ending Cash Balances 8-24
Figure 8-9: Free Cash Flow as % of Depreciation 8-25
Figure 8-10: Outstanding Debt as % Net Plant Investment 8-26
Figure 8-11: Rate Revenue Sufficiency Summary 8-31

List of Appendices (Provided Separately)

Appendix A: RCAP 2.0 Recommended Actions for Water Systems

Appendix B: Surficial Aquifer Annual Raw Water Withdrawal Per Well

Appendix C: Wellfield Water Quality

C-1 Surficial Aquifer Water Wellfield Water Quality

C-2 Floridan Aquifer Wellfield Water Quality

Appendix D: Final Draft Technical Memorandum RO Phase 3 Improvements

Appendix E: Final Draft Technical Memorandum Conceptual Analysis of Liquid Chlorine Conversion

Appendix F: Final Draft Technical Memorandum Conceptual Analysis of Converting IX Facility to Calcite Contactor

Appendix G: Technical Memorandum Town of Jupiter Compliance with Four-Log Compliance

Appendix H: SAS Raw Water Main Hydraulic Investigation and Improvements

Appendix I: FAS Raw Water Main Hydraulic Investigation and Improvements

Appendix J-1: Technical Memorandum Conceptual Analysis of Blending NF Concentrate with FAS Raw Water

Appendix J-2: Proposed Pilot Study Schedule (Preliminary Draft) for Blending Nanofiltration Concentrate with Reverse Osmosis Feed Water

Appendix K: Technical Memorandum Waste Stream Recovery and Disposal

Appendix L: Technical Memorandum Discussion of Membrane Concentrate Disposal Using Class I Deep Well Injection

Appendix M: Technical Memorandum Deep Well Injection Pump Station

Appendix N: Town of Jupiter Water System Master Asset List

Appendix O: Town of Jupiter Water System Cash Flow Analysis

List of Acronyms

Abbreviation	Definition
AACE	Association for the Advancement of Cost Engineering
AADF	Annual Average Daily Flow
AC	Asbestos Cement
AL	Action Level
AMI	Advanced Metering Infrastructure

Abbreviation	Definition
AWIA	America's Water Infrastructure Act of 2018
bls	Below Land Surface
BMPs	Best Management Practices
C-CAT	Compact Climate Assessment Tool
CCL	Contaminant Candidate List
CCT	Corrosion Control Treatment
CEC	Contaminant of Emerging Concern
CERP	Comprehensive Everglades Restoration Plan
CFR	Code of Federal Regulation
CIP	Capital Improvement Plan and/or Capital Investment Program
CT	Contact Time
CUP	Consumptive Use Permit
DBP	Disinfection Byproduct
DBPR	Disinfectants/Disinfection Byproducts Rules
DIP	Ductile Iron Pipe
DIW	Deep Injection Well
DO	Dissolved Oxygen
DOH	Department of Health
EDC	Endocrine Disrupting Chemical
EV	Electric Vehicle
FA	Floridan Aquifer
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
fps	Feet per Second
FRP	Fiberglass Reinforced Polyester
gpcd	Gallons per Capita per Day
gpm	Gallons Per Day
GWR	Groundwater Rule
HAA5	Haloacetic Acids
HAL	Health Advisory Level
HDPE	High Density Polyethylene
HFPO-DA	Hexafluoropropylene Oxide Dimer Acid
HRL	Health Reference Level
ICW	Intracoastal Waterway

Abbreviation	Definition
ID	Inside Diameter
IPS	Iron Pipe Size
IQ	Irrigation Quality
ISC	Institute for Sustainable Communities
IX	Ion Exchange
JCP	Jupiter Community Park
LCR	Lead and Copper Rule
LCRR	Lead and Copper Rule Revisions
LEC	Lower East Coast
LOS	Level of Service
LRAA	Locational Running Annual Average
LRD	Loxahatchee River District
LSI	Langelier Saturation Index
LSL	Lead Service Line
LSLR	Lead Service Line Replacement
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDBP	Microbial and Disinfection Byproducts
MGD	Million Gallons per Day
MGM	Million Gallons per Month
MGY	Million Gallons per Year
MIT	Mechanical Integrity Testing
NDMA	N-nitrosodimethylamine
NF	Nanofiltration
NNC	Numeric Nutrient Criteria
NOM	Natural Organic Matter
NPDWR	National Primary Drinking Water Regulation
OCCT	Optimal Corrosion Control Treatment
OD	Outside Diameter
PBC	Palm Beach County
PBCPZD	Palm Beach County Planning and Zoning Department
PFAS	Per- and Polyfluoralkyl Substances
PFBS	Perfluorobutane Sulfonic Acid
PFOA	Perfluorooctanoic Acid

Abbreviation	Definition
PFOS	Perfluorooctanesulfonic Acid
PPCPs	Pharmaceuticals and Personal Care Products
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
PWS	Public Water System
R&R	Renewal and Replacement
RCAP	Regional Climate Action Plan
RO	Reverse Osmosis
RRA	Risk and Resilience Assessment
RWMs	Raw Water Mains
SA	Surficial Aquifer
SCADA	Supervisory Control and Data Acquisition
SDI	Silt Density Index
SDWA	Safe Drinking Water Act
SFWMD	South Florida Water Management District
TCR	Total Coliform Rule
TDS	Total Dissolved Solids
TL	Trigger Level
TM	Technical Memorandum
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorus
TTHMs	Total Trihalomethanes
UCF CECE	University of Central Florida College of Engineering and Computer Science's Civil, Environmental and Construction Engineering Department
UCMR	Unregulated Contaminant Monitoring Rule
UDI	Under the Direct Influence of Surface Water
UFBEBR	University of Florida Bureau of Economic and Business Research
USC	United States Code
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
VFD	Variable Frequency Drive

Abbreviation	Definition
WET	Whole Effluent Toxicity
WF	Wellfield
WHO	World Health Organization
WQP	Water Quality Parameter
WTP	Water Treatment Plant
WUP	Water Use Permit

Acknowledgement

This document was prepared by multiple authors consisting of Town staff and its highly talented team of professional consultants. Content was provided in a manner to capitalize on each author's expertise. This long range planning strategy utilizing a complete team approach has and will continue to work well for the Town going forward.

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1. Executive Summary

1.1 Overview

Every five years the Town of Jupiter (Town) prepares an update to its Water Master Plan to keep it current relative to utility accomplishments, assessment of current and future conditions, review of regulatory requirements/impacts on utility needs, and financial forecasts and recommendations. This current 2022 Water Master Plan Update involved Town staff involved in utility operations, as well as multiple consultants. The purpose of this document is to summarize the Town's water related challenges, identify opportunities related to those challenges, and provide recommendations for capital project investments to address the challenges and achieve the Town's future goals.

1.2 Mission and Goals

The Town's Water Utility is committed to maintaining a sustainable water supply in concert with its unique environment. For over 30 years, the Town has provided award-winning drinking water service to its customers while providing benefits and protection to the local environment.

To ensure the Town continues to uphold these historical standards, the Town routinely master plans the Water Utility and further refines the mission and goals of the Utility. The mission of the Town is to provide high quality drinking water, protective of public health and safety.

The Town's goals that support this mission include the following:

- Provide sustainable, reliable water source for years to come
- Remain a technical leader in the industry
- Operate in a manner that protects and safeguards the environment
- Prioritize/schedule improvements to project affordable water rates

The Town achieves these goals by proactively planning and funding the Water Utility through a separate and dedicated enterprise source, paid for by Utility fees and grants.

1.3 History of Resilience and Sustainability

The Town is one of the largest utilities in the United States to treat both the Surficial (fresh) and Floridan (brackish) aquifers, through nanofiltration (NF) and reverse osmosis (RO), respectively. The Town's diversification of resources, as well as the Town's conservation efforts, minimizes the risk of saltwater intrusion into the Town's surficial water supply and the "wild and scenic" Loxahatchee River. The Town made this diversification decision in the early 1980s and has carefully monitored operations through the dry and wet seasons to maximize protection of both resources. The Town's commitment to the protection of the Surficial aquifer increases the sustainability of this water source for years to come.

The Town's RO facility is one of the few in the State of Florida to successfully operate with a permit for surface water discharge of the concentrated byproduct (concentrate). The Town successfully developed appropriate treatment of the concentrate and then procured the approval of the Florida Department of Environmental Protection (FDEP) and the Environmental Protection Agency (EPA) to discharge to the southwest fork of the Loxahatchee River. The Town has benefitted financially and environmentally from this method of concentrate disposal for the past three decades, further improving the resilience and sustainability of the water system.

Furthermore, during planning and design development of the NF facility the Town engaged with the Loxahatchee River District (LRD) to provide its NF concentrate to the LRD for blending with wastewater effluent, for irrigation purposes. Although this partnership increased the complexity of design of the NF plant, it served to minimize the overall cost of construction and operation (by eliminating the deep injection well from the original project).

The operation of the NF facility without an injection well, like the RO facility, has benefited the Town not only financially, but also reduced the additional carbon footprint associated with pumping down a deep injection well. While the Town remains under the current terms of the LRD agreement, the Town intends to continue to convey concentrate to LRD. However, recent ongoing negotiations with LRD for extending the agreement have resulted in the Town's decision to proactively plan construction of a deep injection well system for NF concentrate disposal, under this Master Plan Update. The deep injection well system would also allow for RO concentrate disposal.

1.4 Challenges and Opportunities

1.4.1 Challenge 1 – NF Concentrate Disposal

The Town is now tasked with balancing continued delivery of high-quality treated water while minimizing impacts of required revisions to existing concentrate disposal methods. The Town is using this challenge as an opportunity to explore other technically advanced solutions for concentrate management. In particular, the Town is now considering blending the NF concentrate with the Floridan Aquifer feed water into the RO facility. Successful implementation of this solution will require careful planning, study, and evaluation.

The Town intends on executing this blending option in parallel with the design of the deep injection well. The deep injection well would provide the necessary backup to the NF concentrate blending if ongoing negotiations with LRD fail. The strategy will ensure that the Town can operate the water treatment plant reliably and continuously. If the blending strategy is successful and sustainable, then the Town would only operate the injection well as a backup disposal system for NF concentrate, likely saving energy costs for pumping compared to treatment costs.

Figure 1-1 shows the revisions to the Town's current treatment and disposal process diagram that will be required if negotiations with LRD do not allow for continued conveyance of NF concentrate to blend with wastewater effluent for irrigation purposes. Included in **Figure 1-2** is both the deep injection well as well as the blending of the NF concentrate with the Floridan Aquifer feed water to the RO facility.

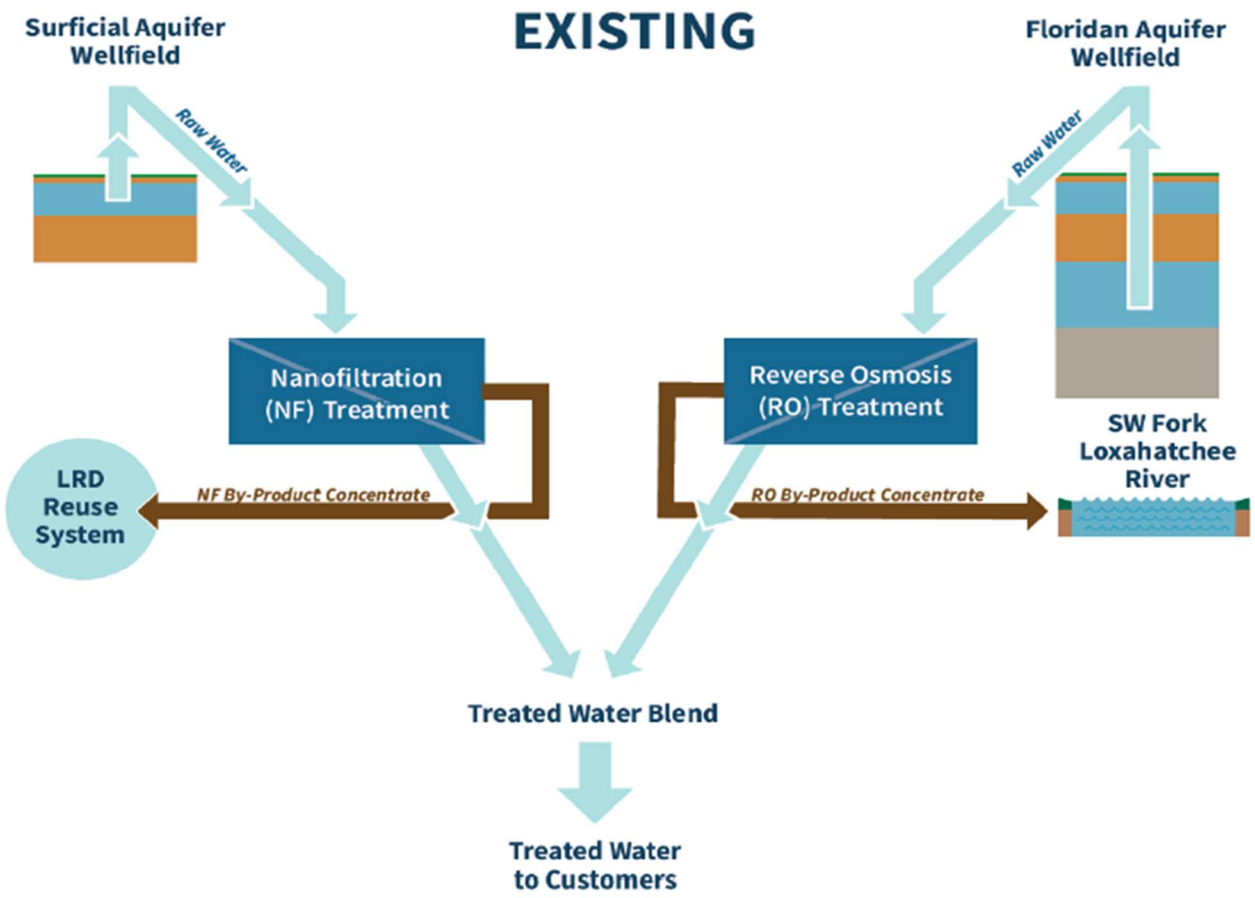

Figure 1-1: Town of Jupiter's Existing Concentrate Management Strategies

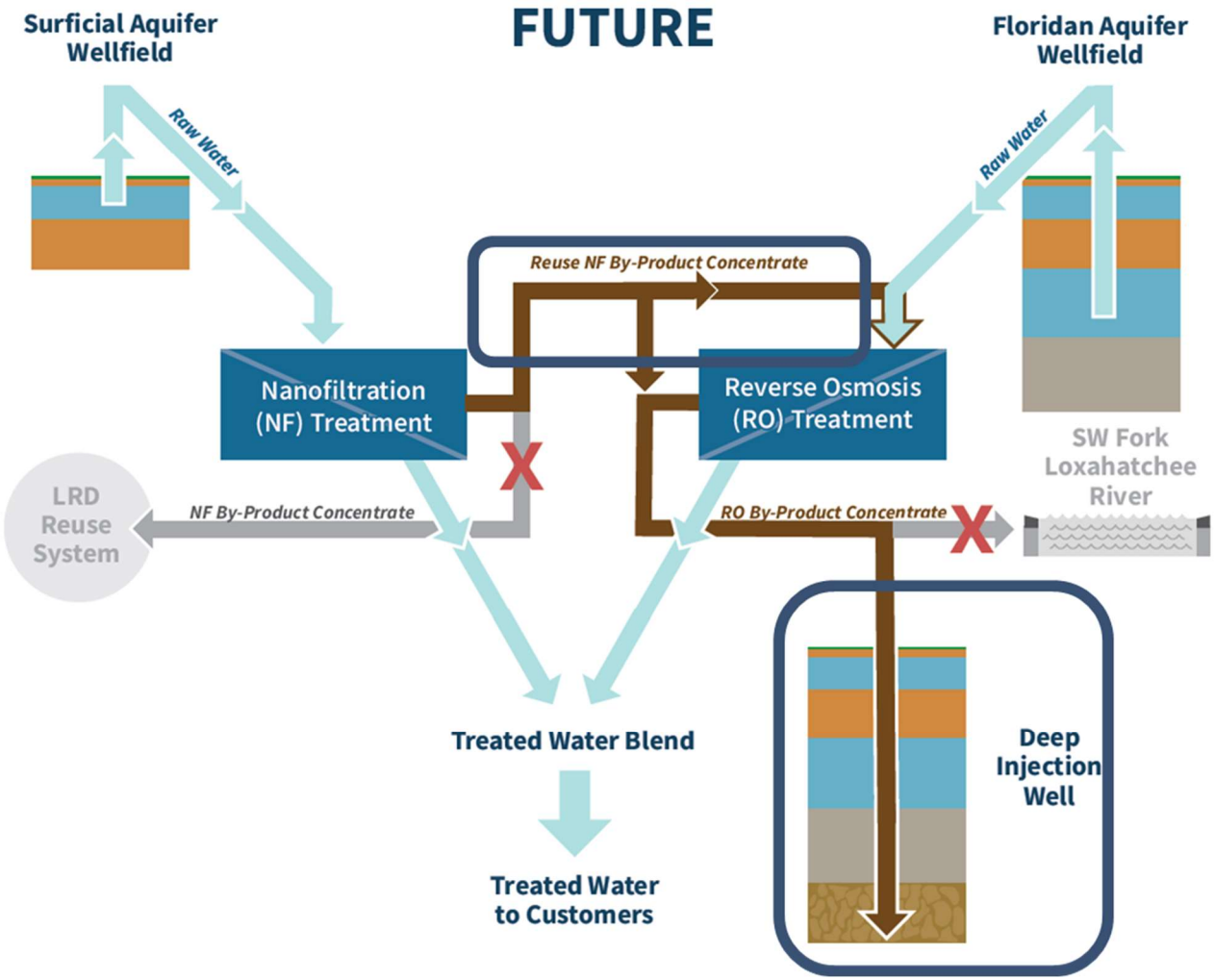

Figure 1-2: Town of Jupiter's Proposed Concentrate Management Strategies

An additional benefit of the blending of the NF concentrate with the Floridan Aquifer feed water, is the future opportunity to offset the known possible increase in total dissolved solids (TDS) and chlorides in the Floridan Aquifer likely to occur over time. With the blending of the lower TDS and lower chloride NF concentrate, the Town may not need to upgrade the RO facility to an RO facility of seawater desalination caliber (or may at least prolong the life of the current RO skids). Thus, the blending effort could save the Town, and the environment, from potential increased energy and chemical costs.

1.4.2 Challenge 2 – RO Concentrate Disposal

Further, once the deep injection well is constructed, the RO concentrate can also be disposed of down the injection well instead of through the outfall. The cessation of RO concentrate disposal through the outfall would assist the Town in further reducing nutrient loads to the Loxahatchee River, another challenge the Town is presently addressing. This nutrient reduction requirement is documented in the Loxahatchee River Pollutant Reduction Plan. (These requirements are further detailed in the concurrent 2022 Stormwater Master Plan Update.)

Additionally, the cessation of outfall discharge would allow operation of the RO concentrate treatment system (chemical scrubber system) to cease (as the concentrate does not need to be treated prior to injection well). The termination of the RO concentrate treatment system will save the Town approximately $1 million annually in chemical costs (related to the required chemical scrubbing of the concentrate prior to outfall discharge). This savings will offset the costs of the deep injection well operation and maintenance requirements, including the operation of injection well pumps and monitoring of the monitor well water quality (approximately $134K per year), a further benefit to the Town and to the environment.

1.4.3 Challenge 3 – Regulatory Compliance

The Town continuously reviews and modifies treatment to address upcoming regulatory requirements. The Town is actively assessing and addressing impacts of the following four rules:

- Lead and Copper Rule
- Total Coliform Rule
- Disinfectants and Disinfection By-Products Rule
- Groundwater Rule

Additionally, the Town has performed extensive testing related to contaminants of emerging concern (CECs), and more specifically, per-and poly-fluoroalkyl substances (PFAS) due to their persistence in the environment and growing evidence of health concerns. The testing results are documented in Section 4 of this master plan report and show that the Town is committed to sampling, testing, and relaying the results to the public.

The Town's membrane technology, both the nanofiltration and reverse osmosis treatment systems, have historically demonstrated high rejection, yielding non-detectable results in the finished water for all analyzed samples to-date. The Town will continue to sample as well as conduct pilot level research to determine and demonstrate treatment effectiveness.

1.5 Recommended Projects

As a result of these challenges, the Town has developed a summary of projects that will continue to sustain the Town and improve the resilience of the water treatment plant operations. The projects and their associated costs are detailed in Section 7. A fundable plan for implementation of the projects is depicted in Section 8.

The most significant projects, which are discussed throughout this Master Plan, and planned for in the financial strategies section, are:

- Addition of the deep injection well, monitor well, and associated pump station
- Inclusion of pilot testing for treating the nanofiltration concentration through the RO skids (in a blend with Floridan Aquifer feed water)
- Future Floridan Aquifer Wells and Surficial Wells
- Other typical renewal and replacement projects (supply, treatment and distribution)

1.6 Financial Strategies to Achieve Goals

The Town is rated "AA" and should continue policy which will promote the long-term maintenance of that rating with the credit agencies. The $343.1 million in capital expenditures identified in the Water Master Plan between Fiscal Years 2022 to 2046 is considered primarily to be for renewal and replacements of existing infrastructure. This is typical for a mature system in the south Florida area.

The summary of the capital plan expenditures is shown in Section 8 and in **Table 1-1**.

Table 1-1: Summary of Water Capital Project – Fiscal Years 2022 to 2046 ($000s) [1]

Summary of Capital Expenditures	2022 to 2025	2026 to 2030	2031 to 2035	2036 to 2040	2041 to 2046	Totals
Expansion-related Projects	$1,062.1	$180.2	$112.4	$17.8	$---	$1,372.5
Renewals, Replacements, and Rehabilitation Projects	98,097.8	65,673.5	52,855.8	75,084.3	48,344.5	340,055.9
General Operating (budgetary) Projects	---	---	---	---	400.0	400.0
Contributions and Grant Projects	1,306.1	---	---	---	---	1,306.1
Total Capital Expenditures	$100,466.0	$65,853.7	$52,968.2	$75,102.1	$48,744.5	$343,134.5

***Note:** [1] Amounts derived from Table 8-2*

The Town should continue to annually fund a deposit to the Renewal and Replacement (R&R) Fund at the amounts identified in the financial forecast:

- Maintain the annual baseline deposit of $5.2 million which was initially established in Fiscal Year 2012
- Continue to increase the deposit by the construction cost index as published annually in the Engineering News Record to account for changes in construction costs

The Fiscal Year 2022 baseline deposit (target transfer amount) to the R&R Fund was estimated to be $6,988,365 and the forecasted deposit for the respective fiscal year was estimated at $5,939,812. The Town should annually index the water rates to maintain Net Revenue Margins and provide funds for ongoing renewals and replacement capital projects. The indexing of rates is critical to the financial forecast and the ability to maintain a strong financial position of the Water System. The financial forecast assumes an annual 3% price index adjustment effective each October 1st beginning in Fiscal Year 2023.

The Town currently uses the Water and Sewerage Maintenance Index in the determination of the index to be applied to rates. The Town should continue applying this index for consistency but consider adopting a minimum (floor) index to provide an ability to maintain net revenue margins (funds available after payment of operating expenses and generally used to fund capital expenditures). Using this index and based on the forecast of operating expenses as presented in the financial forecast, the annual price index factor would be the higher of the 3% or the actual change in index for the calculation period.

Since rates were not adjusted in three years and the water system has incurred significant increases in costs due to inflation (on both operations and capital re-investment), it is recommended that the Town adopt a minimum of two years of fixed rate adjustments equal to 4.5% annually (in addition to the 3% increase). For the Fiscal Years 2023 (upcoming budget year) and 2024, this would result in an annual increase of approximately 7.5%. The financial plan recognizes the additional fixed rate adjustments to provide funds to recapture prior period inflationary impacts on utility costs and to continue to fund the target deposit balance for the R&R Fund to provide ongoing funds to finance the CIP as identified in the Master Plan. After Fiscal Year 2024, rates are assumed to be annually adjusted through the application of the price index (assumed at 3.0% for the determination of the financial forecast). The Town Council is considering the possibility of a reduced rate implementation plan for the first year of the Forecast Period. If a lower "up-front" rate adjustment when compared to the adjustments reflected in the financial forecast is implemented, additional rate increases will be required to meet the financial plan included in this report.

2. Introduction

2.1 Background / Water System History

The Town of Jupiter (Town) Water Utility has served Town of Jupiter water customers since 1963, expanding from a small investor-owned utility to the present regional utility it is today. Major milestones and capital expansions during the utility's history are summarized in **Table 2-1** below:

Table 2-1: Town of Jupiter Utility Expansion History

Approximate Date	Jupiter Water System Milestone	System Treatment Capacity (MGD)
1963	Water system founded as investor-owned facility	---
1968	Plant facilities relocated to current Central Boulevard location	---
1973	1.0 MGD Lime Softening Treatment System constructed	1.0
1976	4.0 MGD Lime Softening Treatment added	5.0
1978	Town purchased water system	5.0
1982	8.0 MGD Lime Softening Treatment added	13.0
1985	Original 1.0 MGD Lime Softening unit demolished	12.0
1985	Lime Softening Treatment capacity re-rated to 13.5 MGD	13.5
1990	6.0 MGD Reverse Osmosis (RO) Treatment facility constructed	19.5
1996	R.O. Treatment facility expanded to 12 MGD	25.5
1999	Ion Exchange (1.8 MGD) facility constructed	27.3
2006	R.O. Treatment facility expanded to 13.7 MGD	29.0
2010	14.5 MGD Nanofiltration (NF) Treatment Plant constructed	30.0
2011	13.5 MGD Lime Softening Treatment System demolished	30.0

The Town's current service area covers the entire Town of Jupiter limits, as well as areas within Juno Beach, and unincorporated Palm Beach and Martin Counties. This service area spans 58 square miles while the utility currently serves a population of approximately 88,797. Key metrics for the water utility's performance are discussed below. A map of the Town's service area is presented as Figure 3-1 in Section 3.

2.2 Level of Service

The Town has set level of service (LOS) standards for its potable water system, as summarized in **Table 2-2**.

Table 2-2: Town of Jupiter Water System Level of Service Standards [1]

Component	Level of Service Standard / Goal
Raw Water Supply	26.2 MGD – Surficial Aquifer 23.5 MGD – Floridan Aquifer 49.7 MGD – Total
Treatment Capacity	30 MGD
Minimum system pressure during peak hour demand with largest pump out of service during non-fire flow conditions	Maintain a minimum of 45 psi in the distribution system
Minimum system pressure during peak hour demand with largest pump out of service during fire flow conditions	Maintain a minimum of 20 psi in the distribution system
2019 Comprehensive Plan Volume 1, Infrastructure Element	Policy 1.4.4 of the Comprehensive Plan Volume 1, Infrastructure Element indicates that the level of service for finished water pumped shall be 153 gallons per capita per day for residential customers and 100 gallons per 1,000 square feet for non-residential customers
Finished Water Storage	A minimum of 5.1 MG [2] Current storage capacity: 29.5 MG.
Maximum Distribution System Water Loss	10 Percent of Finished Water Pumped

Notes:

[1] Water System LOS Standards were developed and presented in the Town's 10-Year Water Supply Facilities Work Plan – 2019 Update.

[2] Based on water demand documented over a 12-month period (FAC 62-555.320), as presented in the Town's 10-Year Water Supply Facilities Work Plan – 2019 Update.

2.3 Environmental Stewardship

2.3.1 Conservation

The Town has been promoting water conservation for more than 30 years through support of Town conservation programs, the reuse of potable water byproduct (concentrate), the recharge of the watershed, and through the implementation of conservation initiatives and ordinances within the Town's municipal code and Comprehensive Plan. The Town intends to continue to promote water conservation to its customers in the future. The following subsections summarize the Town's ongoing conservation initiatives.

2.3.1.1 Conservation Rate Structure

The Town has implemented a progressive conservation rate structure that provides for step-wise increases in rates as water usage increases. For example, water rates for residential customers increases from $1.31 per thousand gallons per month for consumption under 6,000 gallons, to $4.14 per thousand gallons per month when consumption increases to over 30,000 gallons per month. Further, the Town provides for additional curbs on water use during periods of water shortage through Section 20, Division 2 of the Town Municipal Code. Section 20-159 of the Town Municipal Code provides for the imposition of a surcharge of up to 100 percent on customer accounts whose water use exceeds the average of the preceding four months by an amount fixed by Council resolution.

2.3.1.2 Water Shortage Restrictions

Section 20-149 through 20-164 of the Municipal Code provides for the imposition of water restrictions under an array of circumstances, including drought, requests by the South Florida Water Management District (SFWMD), saltwater intrusion, and water availability. Restricted water uses are established and provisions for enforcement are addressed. The Town has been successful in upholding the various implemented restrictions and requirements.

2.3.1.3 Landscape Irrigation Restrictions

The Town has implemented progressive landscape irrigation restrictions under Section 20-156 and 20-344 of the Municipal Code that meet the requirements of the SFWMD. These restrictions can apply to all individuals who use Town of Jupiter water, as well as water from private wells, lakes, canals, or other sources. Violators are subject to fines and imprisonment. There have been no issues with successfully implementing irrigation restrictions and requirements.

2.3.1.4 Meter Replacement Program

The Town has implemented an ongoing meter replacement program that is funded annually, up to the year 2041, by its renewal and replacement budget. With newer and more accurate water meters, the Town can monitor water consumption more effectively. Additional information on the Town's meter replacement program is presented in Section 3.8.3 of this Master Plan.

2.3.1.5 Plumbing Code

An essential part of the Town's conservation program is the implementation of high efficiency plumbing requirements. Section 20-158 of the Municipal Code establishes the requirements for water saving devices such that flows are limited to 3.0 gpm for fixtures generally and 3.5 gallons per flush for toilets.

2.3.1.6 Public Outreach

The Town has always prided itself in being a very environmentally conscious community that embraces water conservation which is encouraged though the Town's public outreach efforts. On an annual basis, the utility works with local schools and Jupiter area students to promote resource protection and conservation

through a water conservation poster contest. The program has been a tremendous success in increasing awareness of natural resource issues and advocating for conservation efforts to the many local students who participate.

2.3.2 Reuse

The Town's Water Utility has been advancing the use of reclaimed water through beneficial reuse of its nanofiltration (NF) concentrate since 2006. The Town provides, on average, approximately 2 mgd of NF concentrate to Loxahatchee River District (LRD) for blending and distribution as part of LRD's irrigation quality water reuse system.

2.4 Long-Term Financial Competitiveness and Stability

The Town is committed to its long-standing financial policies related to rate maintenance (annual indexing) and replenishment of renewal and replacement reserves to ensure future rate stability. The Town continuously monitors trends and changes in Water System operations and capital needs to evaluate business and rate strategies in order to maintain the financial position of the Water System and the overall sufficiency of rates to meet the financial commitments of the utility. Section 8 – Financial Forecast and Recommendations presents a detailed evaluation of the financial position of the Town's Water Utility.

2.5 Climate Change / Coastal Resiliency

2.5.1 Introduction

South Florida is a unique region that is increasingly vulnerable to the impacts of climate change and sea level rise due to low land elevations, flat topography, a porous geology, and dense coastal development. In combination, climate change and sea level rise are expected to present challenges to water resource planning, management, and infrastructure for communities throughout Palm Beach County. The Town is committed to the integration of climate change considerations in their water supply and master planning, as part of their involvement in the Southeast Florida Regional Climate Change Compact (Compact) and commitment to enhancing the resilience of the Town's water system.

2.5.2 Southeast Florida Regional Climate Change Compact – RCAP Overview

The Compact is a partnership between Broward, Miami-Dade, Monroe, and Palm Beach counties to foster sustainability and climate resilience at a unified regional scale. The Institute for Sustainable Communities (ISC) serves as the secretariat for the Compact and provides implementation support for its activities. The Compact first developed the Regional Climate Action Plan (RCAP) in 2012 as a guiding tool for coordinated climate action in Southeast Florida, with recommendations, guidelines for implementation and shared best practices for local entities encompassing myriad genres. In particular, the Compact's guidance document, "Integrating Climate Change & Water Supply Planning in Southeast Florida," outlines methodologies for incorporating the RCAP's goals/recommendations into local water utility comprehensive

planning.[1] Designed with a five-year horizon in mind, the RCAP was updated with the launch of RCAP 2.0 in December 2017.

RCAP 2.0 was developed as an online tool with the input of local entities. It identified and prioritized resilience-building actions that each jurisdiction can implement and reported the actions that were implemented during the previous five years of RCAP initiation. The Compact aims to update the RCAP every five years; as such, RCAP 2.0 will be updated in 2022.

2.5.3 Summary of Recommended Water Actions

2.5.3.1 RCAP 2.0

Using the RCAP 2.0 online tool, stakeholders can build a customized implementation plan based on affiliation, jurisdiction and priorities. **Appendix A** lists the action plan recommendations for the Water Sector. It also summarizes those recommendations that are currently listed within RCAP 2.0 as completed/implemented by the Town of Jupiter Municipality.[2] Implementation status was based on surveys conducted in 2014 and 2016 where municipalities self-reported their activities related to RCAP recommendations. Historically, the Town of Jupiter Water Utility has implemented projects/programs that work toward the goals of each of the RCAP 2.0 recommendations for water systems, as indicated in **Appendix A**.

It is important to note that the Compact's RCAP is voluntary; its intent is a best practices tool for coordinated climate action across Southeast Florida. The Town's Water Utility remains dedicated to the goals of the Compact by advancing water management strategies, resilience and sustainability investments, infrastructure improvements, and conservation efforts to mitigate the impacts of climate change and sea level rise on the water system. The following Water Utility projects/programs are examples of the Water Utility's advancement toward the Compact's RCAP recommendations:

- Ongoing development of surface water storage and surficial aquifer recharge system through construction of control structures, flow-ways and salinity barriers to enhance long-term sustainability of the region's water resources and freshwater environment.
- Advocacy and leadership in restoration of the Loxahatchee River, a component of the Comprehensive Everglades Restoration Plan (CERP).
- State of the art NF and RO membrane water treatment technologies, enabling use of both the Floridan Aquifer (FA) and Surficial Aquifer (SA) raw water sources, providing water supply variability, and advancing sustainable water management.

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[1] "Integrating Climate Change & Water Supply Planning In Southeast Florida," *Southeast Florida Regional Climate Change Compact RCAP Implementation Guidance Series*, 2014, www.southeastfloridaclimatecompact.org//wp-content/uploads/2014/09/rcap-igd-water-supply-final-9-9.pdf.

[2] Southeast Florida Regional Climate Compact, RCAP 2.0 Online Tool, www.southeastfloridaclimatecompact.org. Accessed April 15, 2021.

- Ongoing wellfield water quality monitoring to continually adjust raw water production/pumping from each of the FA wells to enhance long term sustainability of the aquifer.
- Surficial aquifer saline monitoring program operated by the Town to monitor saltwater intrusion.
- Expanded use of reclaimed water through partnership with LRD to provide, on average, approximately 2 mgd of NF concentrate water to LRD for blending with reclaimed water and distribution in their reclaimed water system.
- Incorporation of the Unified Sea Level Rise Projection, published by the Compact, in utility planning and identification of methodologies to address sea level rise.
- Assessment of the Town's water system to proactively identify potential vulnerabilities to natural hazards, including climate change, and implement mitigation measures to enhance resilience of the system.
- Conservation strategies such as a conservation-based water rate structure, implementation of the SFWMD's Year-Round Water Conservation Rule, public outreach and advocacy of the Town's water conservation poster contest.
- Implementation of Best Management Practices (BMPs) and green infrastructure.
- Ongoing evaluation to determine the feasibility of implementing green infrastructure and net-zero greenhouse gas emission strategies in all future Utility projects.

Moving forward, the Compact does not currently plan on updating municipality implementation status related to the RCAP 2.0 recommendations or listing municipalities under RCAP categories on the Compact's website. Rather, the Compact recently developed and launched a more general tool called the Compact Climate Assessment Tool (C-CAT), independent of the RCAP, with the goal of annual self-assessment surveys in which local governments may report their progress.

2.5.3.2 Compact Climate Assessment Tool (C-CAT)

The Compact recently developed the Climate Assessment tool (C-CAT) in response to stakeholder interest in a shared tool to help identify, track, and report on the priority mitigation and adaptation strategies, and provide a means for communicating resilience progress across the region. The C-CAT focuses specifically on the top priority mitigation and adaptation actions, as summarized in **Table 2-3**. These 11 actions were identified by the Compact as foundational to climate resilience in Southeast Florida.[3]

[3] Southeast Florida Regional Climate Compact, Compact Climate Assessment Tool, www.southeastfloridaclimatecompact.org/climate-assessment-tool. Accessed October 5, 2021.

Table 2-3: Compact Climate Assessment Tool Priority Actions

Priority Action	Priority Action Description
Greenhouse Gas Emission Mitigation Priority Actions	
Mitigation Action #1	Establish internal (government operations) and community-wide targets/commitments for greenhouse gas emissions reductions and renewable energy goals, measure, and publicly report progress.
Mitigation Action #2	Improve building energy efficiency and conservation in new and existing buildings, across both residential, commercial, and government buildings.
Mitigation Action #3	Advance the use and adoption of solar energy within government operations and community-wide
Mitigation Action #4	Expand the use of electric vehicles (EVs) and the installation of EV infrastructure both within government operations and community-wide.
Mitigation Action #5	Reduce vehicle miles traveled. This may include major public transit investments, bike and pedestrian investments, alternative work schedules, and transit-oriented development.
Adaptation Priority Actions	
Adaptation Action #1	Conduct internal assessment of capacity to advance adaptation and resilience initiatives. This should include identifying potential staff and financial resources/capacity. In some cases, staff/resources may already support activities and projects that advance adaptation/resilience goals but are not identified as such. Should sufficient internal capacity not exist, seek support from your county, other municipalities, and other partners to develop a plan for how your local government will prioritize capacity for adaptation/resilience initiatives.
Adaptation Action #2	Conduct vulnerability analysis of hazards related to climate change including, but not limited to, sea level rise, flooding, saltwater intrusion, heat, extreme weather. The analysis should assess exposure and sensitivity of various assets including, but not limited to critical infrastructure, communities/populations, historic/cultural assets, transportation, natural resources, and economic assets. Assessment should seek to identify what factors contribute to elevated exposure and sensitivity, and what physical, social, institutional, human, and financial capacities exist to adapt, and where there are gaps.
Adaptation Action #3	Develop a community-wide adaptation/resilience plan, inclusive of specific actionable strategies and timeframes.
Adaptation Action #4	Planning: Incorporate risk reduction and equitable community resilience into planning. This may include comprehensive plans, housing initiatives, post-disaster redevelopment plans, stormwater management plans, transportation plans, and land development regulations, inclusive of low-impact development. Sea level rise projections should be included in all planning activities.
Adaptation Action #5	Policy: Advance policies that reduce risk and build equitable community resilience. This may include improving stormwater management practices, adopting urban heat policies, updating infrastructure standards, conducting remediation of contaminated sites, and updating building codes.
Adaptation Action #6	Capital Projects: Advance capital projects that reduce risk, adapt to changing climate conditions, and build equitable community resilience. This may include living shorelines, water infrastructure, resilience hubs, parks & open spaces, urban greening, tidal valves, pump stations, and road/bridge elevation.

Local governments will have the opportunity to report on their progress through an annual self-assessment survey. The first C-CAT survey was recently administered by the Compact in 2021, where local governments were invited to complete self-assessment on their progress toward the 11 prioritized mitigation and adaptation actions through 2020. For municipalities within Palm Beach County, the Compact coordinated survey efforts through the Palm Beach County (PBC) Office of Resilience, whereby the Office of Resilience distributed invitations to its municipal town managers and/or sustainability leads. Following the close of the survey (September 2021), the Compact will publish an annual snapshot of the region's climate change activities on its website. Additionally, all survey responses will be made publicly available on the Compact's website.

2.6 Risk and Resiliency Assessment

The Town performed a comprehensive Risk and Resilience Assessment (RRA) in 2020 with the purpose of assessing the risks to, and resilience of, their water system in support of compliance with America's Water Infrastructure Act (AWIA) of 2018.[4] The RRA evaluated the water system as a whole, including the following elements:

- The risk to the system from malevolent acts and natural hazards
- The resilience of the infrastructure, including SCADA/cyber resilience
- The monitoring practices of the system
- The financial infrastructure of the system
- The use, storage, or handling of various chemicals by the system
- The operation and maintenance of the system

As part of the confidential RRA, the Town characterized their water system assets, identified risks/threats to those assets, and evaluated countermeasures that could be implemented to minimize risks to their water system and thereby enhance resiliency.

To address the top risks, Hazen developed an implementation plan with the Town, which contains actionable steps to improve the Town's resilience to potential threats. The confidential plan outlined proposed projects, priority level and conceptual costs that will be rolled up into the Town's Capital Improvements Plan (CIP) to enhance the resilience of the water system. Additional information on the Town's CIP is presented in Section 7 – Recommended Capital Improvements Program.

[4] Town of Jupiter AWIA Compliance Risk and Resilience Assessment Summary Report – PRIVILEGED AND CONFIDENTIAL, Contract No. W2023, March 2021.

3. Current Position

3.1 Water Service Planning Area

The Town of Jupiter (Town) Water Utility service area encompasses a total area of 58 square miles with 30,583 water service connections (recorded in December 2021). Retail customers include residential, commercial, and industrial properties within the Town of Jupiter, Town of Juno Beach, and unincorporated areas of Palm Beach County and Martin County. The utility has no wholesale customers.

Figure 3-1 depicts the water service area, as well as key water utility facilities within the treatment and distribution system:

- Town of Jupiter Water Treatment Plant (WTP)
- Central Boulevard Ground Storage and High Service Pump Station
- Juno Repump Station – Remote storage and repump facility
- Riverbend Repump Station – Remote storage and repump facility

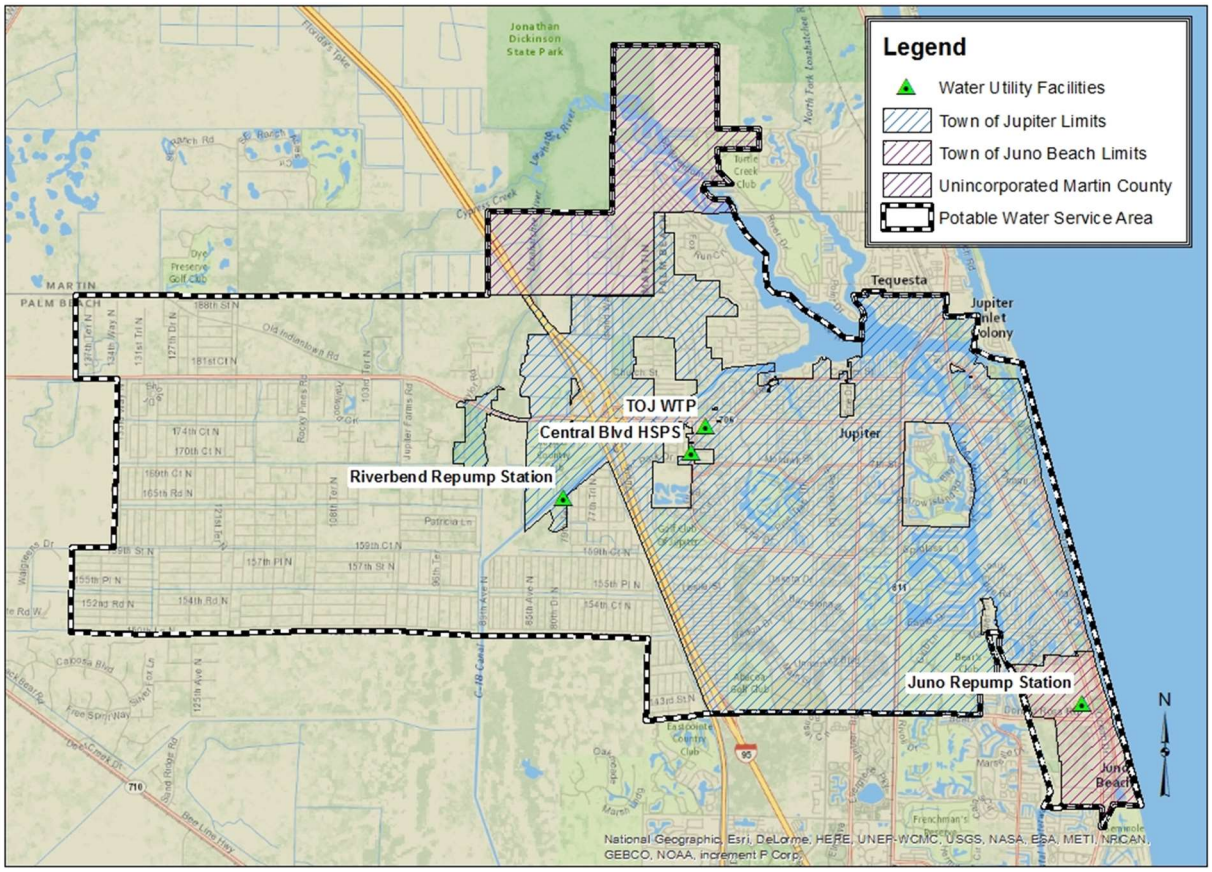

Figure 3-1: Town of Jupiter Water Service Area

3.2 Planning Period

The planning period for the Water Master Plan update herein will closely follow the planning period examined in the Town's recently developed 10-Year Water Supply Facilities Workplan - 2019 Update.[5] Within the Water Supply Facilities Workplan (2019 Update), population and utility data were used to estimate water demand forecasts for the planning period of 2020 through 2040.

3.3 Population and Water Demand

This Section presents the population and water demand projections developed within the Town's 10-Year Water Supply Facilities Workplan. The Town's historical per capita water demand was examined based on Annual Average Daily Flow (AADF) pumping data and population records from 2016 through 2018, as presented in **Table 3-1**. The data shown represents the overall water consumption rate within the Town's water service area, including residential, commercial, and industrial.

Table 3-1: Town of Jupiter Water Service Area – Historical Annual Average Daily Pumping Rate and Per Capita Water Demand

Year	Water Service Area Population [1]	Raw Water		Finished Water	
		Annual Average Daily Pumping Rate (MGD) [2]	Per Capita Demand (gpcd) [3]	Annual Average Daily Pumping Rate Residential / Total (MGD) [2]	Per Capita Demand Residential / Total (gpcd) [3]
2016	75,536	19.6	259.5	10.9 / 15.8	143.8 / 208.5
2017	76,646	20.0	260.8	11.5 / 16.5	150.1 / 215.0
2018	77,755	19.1	245.1	10.8 / 15.7	139.0 / 202.3
2016 to 2018 Average:		**19.9**	**255.1**	**11.1 / 16.0**	**144.3 / 208.6**

Notes:

[1] Water service area population data is from Palm Beach County Planning and Zoning Dept (PBCPZD).

[2] Data provided by Town of Jupiter Utilities Department. MGD = Million Gallons Per Day

[3] gpcd = Gallons per Capita per Day; Calculated value based on population and AADF.

Thus, the following per capita averages for raw water and finished water demand, along with population projections, were used to forecast the potable water demand for the year 2020 through 2040 planning period:

- Average Raw Water per Capita Demand (2016-2018): 255 gallons per person per day
- Average Finished Water per Capita Demand (2016 to 2018):

[5] Town of Jupiter 10-Year Water Supply Facilities Workplan 2019 Update, Prepared by Town of Jupiter Utilities Department in association with Hazen and Sawyer.

- Residential: 150 gallons per person per day
- Total: 209 gallons per person per day

Table 3-2 presents the potable water demand projections for the Town's water service area from year 2020 through year 2040. Additionally, the maximum day water demand is provided based upon the historical maximum day to annual average day ratio of 1.4 (based on water pumping data from 2009 to 2014). The data in the table below assumes that the Town's average gross per capita water demand from 2016 to 2018 remained stable through 2040.

Table 3-2: Town of Jupiter Water Service Area – Water Demand Forecast

Year	Population [1]	Raw Water Per Capita (gpcd) [2]	Finished Water Per Capita (gpcd) [2]	Water Demand (AADF)		Max Day Finished Water Demand (MGD)
				Raw Water Demand (MGD)	Finished Water Demand (MGD)	
2016	75,536	259	208	19.6	15.8	22.1
2017	76,646	261	215	20.0	16.5	23.1
2018	77,755	245	202	19.1	15.7	22.0
2020	79,974	255	209	20.4	16.7	23.4
2025	81,848	255	209	**20.9**	**17.1**	**23.9**
2030	83,953	255	209	**21.4**	**17.5**	**24.6**
2035	86,224	255	209	**22.0**	**18.0**	**25.2**
2040	89,090	255	209	**22.7**	**18.6**	**26.0**

Notes:

[1] Historical Populations from 2016 through 2018 are from Palm Beach County Planning and Zoning Department (PBCPZD). Population projections for years 2020 through 2035 were obtained directly from PBCPZD. Population forecast for year 2040 was estimated using the percentage of population growth projected for Palm Beach County from 2035 -2040 (University of Florida Bureau of Economic and Business Research (UFBEBR)), applied to the 2035 value.

[2] Years 2020 – 2040 raw and finished water per capita demands are projected, based on an average of the per capita demands estimated from years 2016 through 2018.

As illustrated in **Table 3-2**, review of the water demands projected to the year 2040 reveals the following considerations for the Town's planning purposes:

- Annual average day raw water demand does not exceed the Town's annual average day combined raw water allocation of 29.84 MGD through the year 2040.
- The Town's water treatment design capacity of 30.0 MGD is sufficient through the year 2040 to meet the maximum day demand, with all treatment units in service.

3.3.1 Service Area Extension to Jupiter Farms

Jupiter Farms is the area west of Florida's Turnpike/Interstate 95 corridor and represents the largest portion of the Town's service area to which potable water service has yet to be extended. As presented in the Town's 10-Year Water Supply Facilities Workplan 2019 Update, if Jupiter Farms elects to connect to the Town's water distribution system by the year 2030, the following water demands are estimated as summarized in **Table 3-3**.

Table 3-3: Estimated Water Demand with Jupiter Farms Connection

Year [2]	Water Demand (AADF) [1]		Max Day Finished Water Demand (MGD)
	Raw Water Demand (MGD)	Finished Water Demand (MGD)	
2030	23.5	19.3	27.0
2035	24.1	19.8	27.7
2040	24.8	20.4	28.6

Notes:

[1] Assumes demand for water in Jupiter Farms would not include an irrigation component, as households have existing private water systems. Per capita water demand is assumed to be reduced by approximately 25% for this extended area.

[2] Assumes Jupiter Farms reaches buildout at year 2030.

3.4 Permitted Aquifer Withdrawals

The Town utilizes two separate water supply sources to meet the needs of its water treatment facilities. **Figure 3-2** simply illustrates the Town's Dual Water Supply Sources. Fresh water from the Surficial Aquifer (SA) system is used to supply the Nanofiltration (NF) and Ion Exchange (IX) Treatment plants, while brackish water from the Floridan Aquifer (FA) system is used to supply the Reverse Osmosis (RO) Plant.

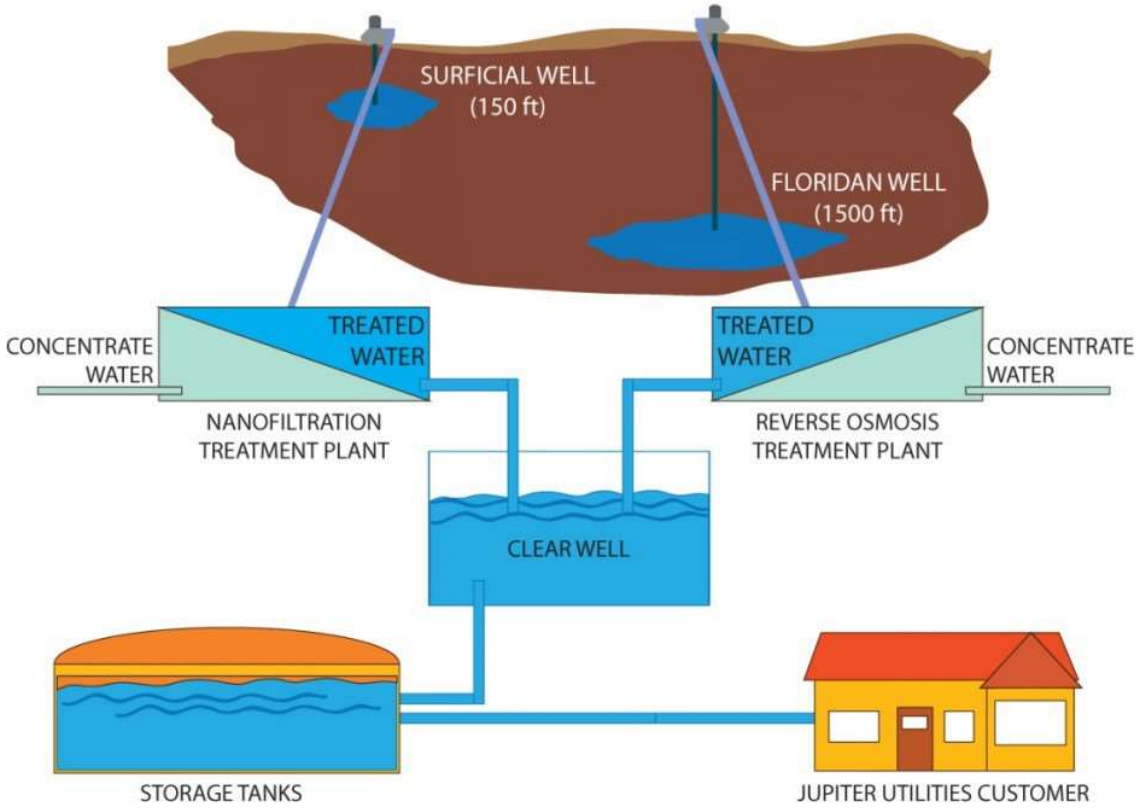

Figure 3-2: Town of Jupiter's Dual Aquifer Supply Sources

Both water sources are permitted by the South Florida Water Management District (SFWMD). While each source has a permitted maximum withdrawal rate (annual and max month), the total allowable withdrawal rate is less than the sum of the two sources to provide maximum operational flexibility. The Town's general approach to operating the utility is to depend more heavily on the brackish water source (and the RO Plant) during dry periods. This operating approach aids in reducing the impacts on the SA system and local wetlands, which may be strained during the dry season. During wet periods, the Town relies more heavily on the SA system and NF process due to its lower operating costs as compared to RO. The Town's Consumptive Use Permit (CUP No. 50-00010-W) issued August 23, 2010, was most recently revised via letter modification (Letter Mod) on March 26, 2019, and March 3, 2021. This permit expires on September 30, 2030. An August 2012 Letter Mod enhanced operational flexibility by authorizing a 25% increase in annual source limitation from the FA system while the March 2019 and March 2021 letter mod's added additional FA and SA well locations but did not increase the Town's allocation. Raw water allocations authorized by the CUP reflect population projections and raw water demand estimates based on information available prior to the August 2010 permit issuance as summarized in **Table 3-4**, where the "Total" column values correspond to CUP limits from the combined sources.

Table 3-4: Existing Permitted Water Use (million gallons per day)

Through September 23, 2030	Total [2]	Surficial Aquifer System	Floridan Aquifer System
Max Month (daily) [1]	29.84	19.90	17.90
Annual Average (daily) [1]	24.41	18.80	11.71

Notes:

[1] Based on 31 days/ month

[2] Corresponds to CUP limits from the combined sources

Accordingly, the total combined limits equate to 8,909 million gallons per year (MGY), equivalent to 24.41 MGD on average, and 925 million gallons per month (MGM) maximum, equivalent to 29.84 MGD. These total combined limits are less than the sum of specific source limitations from the SA system and FA system identified in **Table 3-4**. The higher combined specific aquifer source limitations provide for flexibility needed to adjust production from each resource to economize operations when rainfall conditions allow, and to protect the environment in times of drought by heightened use of the brackish FA system.

The existing permitted allocations have sufficient capacity to serve all demands through service area build out based on a historical average finished water demand of 16.0 MGD. The Town's 2019 10-Year Water Supply Plan reflects a 2040 average daily finished water demand of 18.6 MGD and a max daily finished water demand of 26.0 MGD. Additionally, the projected 2040 annual average day raw water demand of 22.7 MGD does not exceed the annual average day combined raw water CUP allocation of 29.84 MGD through the year 2040. The Town's current 30.0 MGD water treatment plant capacity is capable of meeting both the projected 2040 and CUP maximum day demand through the year 2040.

Current capacities of the Town's raw water withdrawal facilities from the SA system and FA system are approximately 26 MGD and 23 MGD, respectively. Maximizing redundancy through constructing wellfield capacity beyond permitted allocations is essential to ensure future sustainability of the aquifer resources. Wellfield withdrawals should be managed through well rotation to minimize the risk of individual well overuse and to minimize raw water quality degradation. Water supply wells have a useful life expectancy and care should be taken to maximize a wells usable life through routine well rehabilitation and smart well management.

3.5 Existing Raw Water Supply System

3.5.1 Surficial Aquifer Wellfield Water Supply System

3.5.1.1 Surficial Wellfield Overview

The Town's SA wellfield includes 51 production wells that have a combined raw water producing capacity of approximately 20,545 gallons per minute (gpm) or 29.6 MGD. The 51 SA production wells

include 44 in service production wells with a raw water capacity of 16,795 gpm or 24.2 MGD and seven production wells awaiting final completion. The wells are located throughout the largely residential western areas of the Town; located as far north as Rialto on Island Way and as far south as the Abacoa Golf Course on Heights Blvd. A map showing locations of all the Town's Surficial Aquifer wells within its service area (Wellfield II, III and IV) is provided as **Figure 3-3**.

As of 2021, ages of the Towns' wells vary from 0 to 40 years. Older wells are found within the corridor of Central Blvd, Toney Penna Drive and in The Heights of Jupiter. The oldest SA wells were installed in 1981. The newest wells (Wells 8A, 9A, 10A, and 11A) were drilled 2020-2021 and are located at the Town's Central Boulevard Ground Storage Tank and High Service Pumping Facility and at Jupiter Village Park on Toney Penna Drive (Well 12A). These five replacement wells were completed under the Production Well Replacement project as part of the Utility's Capital Investment Program (CIP) as recommended by the Town's 2017 Water Master Plan Update. These five new replacement wells and the two wells (SA Well 60 and SA Well 62 drilled in 2014) located north of Indiantown Road along the Island Way corridor are currently not in service and are awaiting final wellhead and raw water main construction.

Four new SA production wells (56, 57, 58, & 59) are proposed in the vicinity of the proposed Sante Circle development (WF4) and on Town property along Island Way. The Town's SA production wells typically produce between 125 and 800 gpm (0.2 - 1.2 MGD). Individual capacities of wells vary and are directly attributed to aquifer quality and productivity at individual well locations as is typical with the SA system. In general, newer wells produce at the higher end of the range with the older wells producing at the lower end of the range.

Raw water mains (RWMs) providing conveyance from each well to the water treatment plant are shown in **Figure 3-4** and consist of 6 to 24-inch diameter RWMs. Wells and corresponding RWMs are located within Jupiter's central communities with the larger transmission segments running along Central Blvd and through the Abacoa community south of the WTP. A mid-size transmission RWM runs west along Jupiter Gardens Blvd and north via a horizontal direction bore under the C-18 canal and Indiantown Road for a future connection to proposed Wellfield IV along Island Way. The RWM pipe segments are made primarily of ductile iron (DIP) and high-density polyethylene (HDPE). The oldest RWMs are located closest to the WTP and are approaching useful life as well as hydraulic capacity. Plans for construction of a redundant SA RWM are discussed in Section 5 to address both issues.

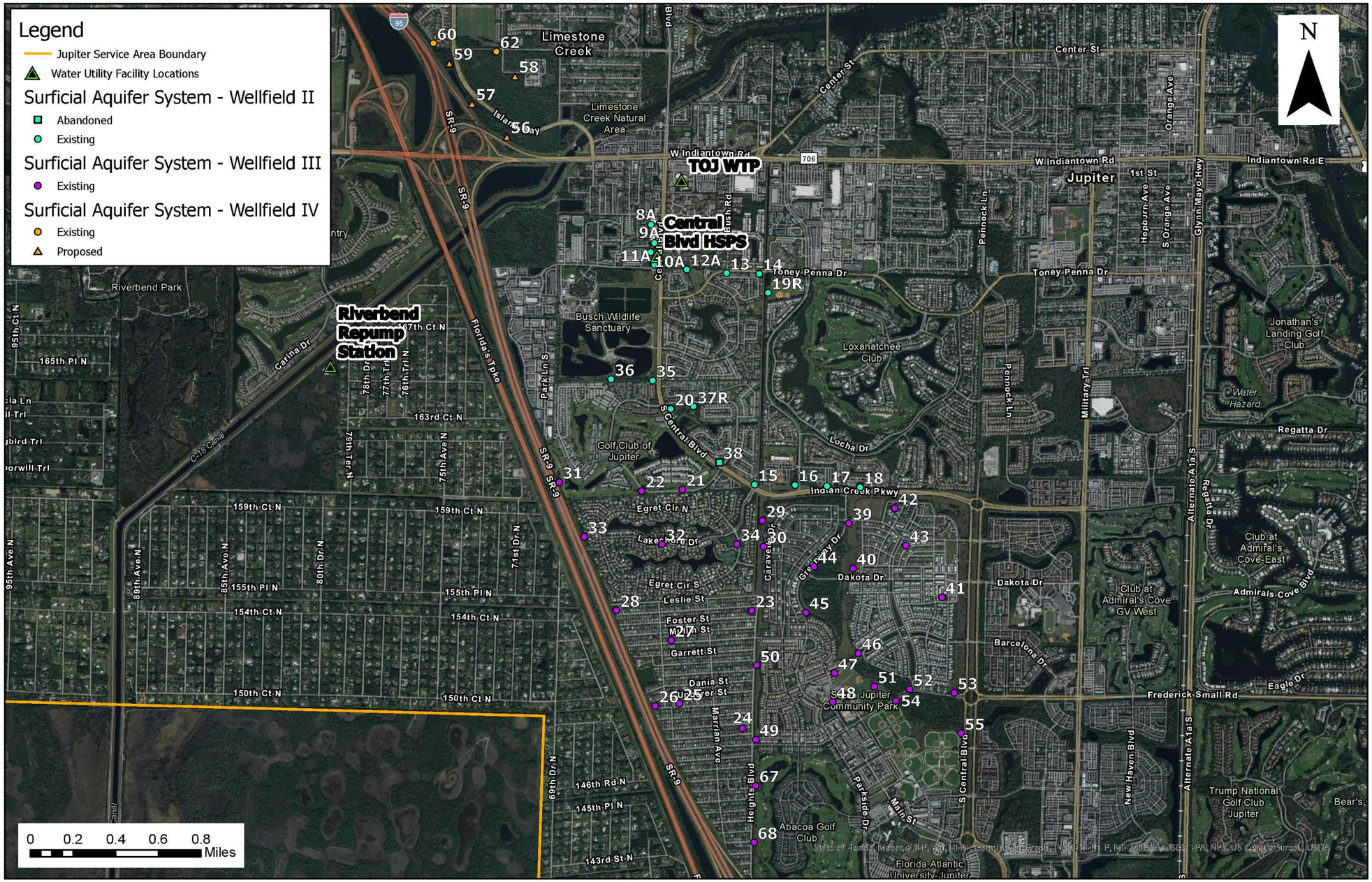

Figure 3-3: Town of Jupiter Surficial Aquifer Well Locations

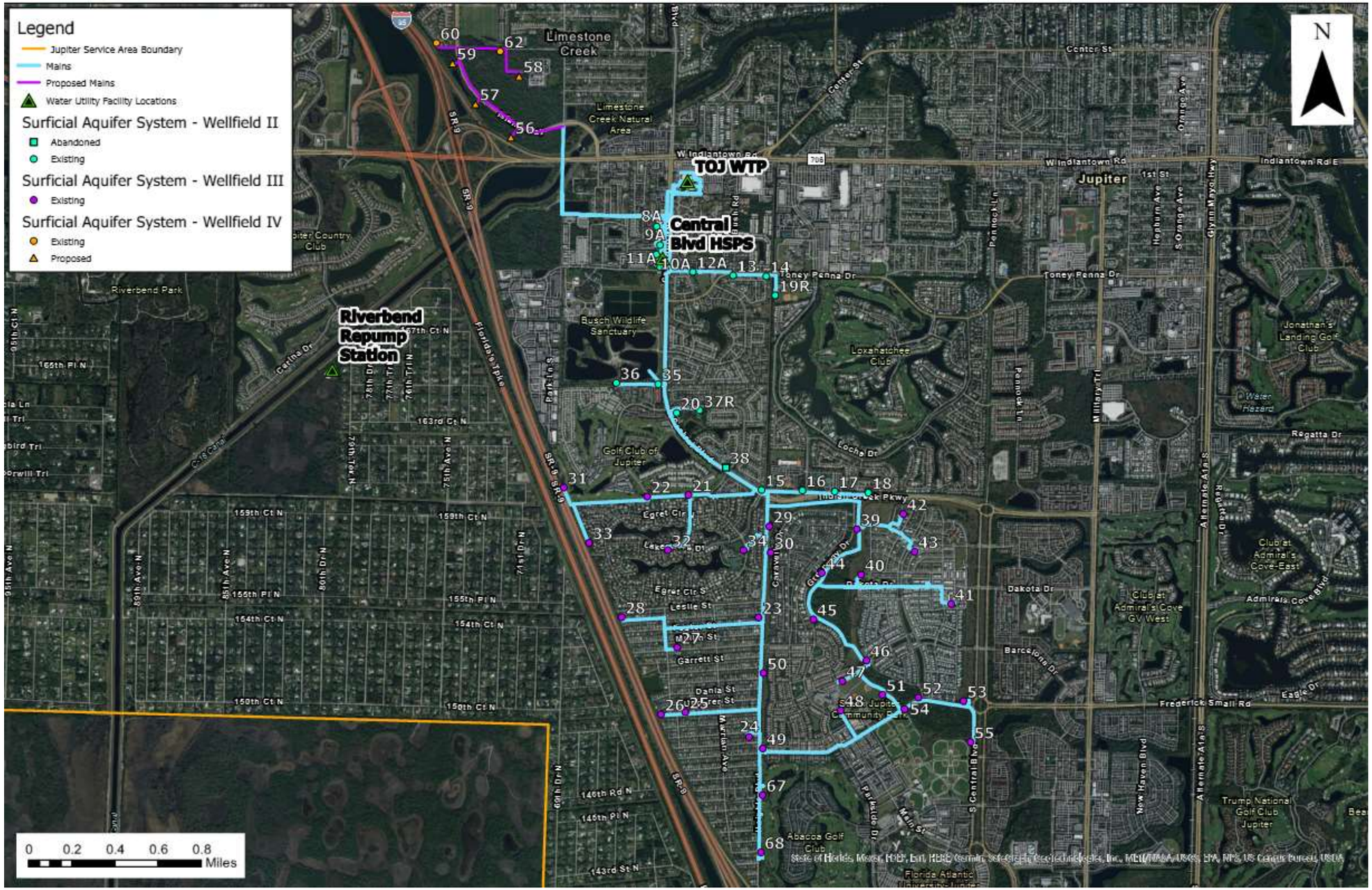

Figure 3-4: Town of Jupiter Surficial Aquifer Raw Water Mains

3.5.1.2 Surficial Wellfield Evaluation

In addition to routine and compliance-mandated monitoring performed by Town's operations and laboratory staff, each SA well undergoes comprehensive performance testing twice per year (during the wet and dry seasons) to evaluate production efficiency and produced water quality. The additional testing is a proactive monitoring strategy of the raw water supply treated by the NF plant as membrane systems' long term operational reliability is dependent on a source water free from foulants like silt and sand. The evaluation includes testing for parameters like silt density index (SDI) and sand content at individual production wells where results provide early indicators of wells' declining performance. For membrane treatment, the recommended SDI value and sand content of raw water produced from a well is less than 3.0 (with an ideal value less than 1.0) and less than 1.0 ppm (with ideal value of 0 ppm), respectively. Data from semiannual testing is used to evaluate the need for well rehabilitation and the type of rehabilitation that may be required to restore lost capacity and/or improve raw water quality. **Table 3-5** summarizes the results of SA Wellfield Testing performed in February 2021.

Table 3-5: Surficial Aquifer Wellfield Testing

Well Age (years)	Number of Wells	Percent of Total Wells (%)	Total GPM	Percent of Total WF Capacity	Avg. Individual Well Capacity (gpm)	Avg. Well Spec. Capacity (gpm/ft)	Avg. Sand Prod. (ppm)	Avg. Silt Density Index (SDI)
0 – 10	11	21.6	5725	27.9	520	59.3	0.11	2.0
11 – 20	2	3.9	1000	4.9	500	65.7	0.01	1.5
21 – 30	22	43.1	9145	44.5	416	26.9	0.02	1.6
31 – 40	16	31.4	4675	22.8	292	21.7	0.02	1.7
Total	**51**	**--**	**20,545 (29.6 mgd)**	**--**	**--**	**--**	**--**	**--**

Wellfield testing since 2010 (construction of the NF plant) has allowed proactive rehabilitation planning and improved overall SA wellfield health as evidenced by information presented in **Table 3-5**.

3.5.1.3 Surficial Wellfield Rehabilitation

3.5.1.3.1 New Wells (less than ten years old)

Of the 51 SA production wells within the Town's wellfields, the eleven newest wells (constructed or placed into service within the last seven years) represent 21.67% of the Town's SA wells and 27.9% of the total SA wellfield capacity.

- Eight wells constructed between 2014 and 2021 (8A, 9A, 10A, 11A, 12A, 37R, 60, 62) and three wells constructed between 2007 and 2011 but placed into service between 2015 and 2016 (42, 43, 19A).

- 0-7 years old age or service life
- Average specific capacity 59.3 gpm/ft
- Average well capacity 520 gpm
- 27.9% of total wellfield capacity 5725 gpm based on individual well setpoint

Currently seven of these wells (8A, 9A, 10A, 11A, 12A, 60, 62) are not in service or available for use awaiting final wellhead and/or raw watermain construction. Once in service, these seven wells will have an available raw water capacity of 3,700 gpm or 5.3 MGD. Even though sand and silt production from the newer wells is slightly higher than the older wells, the produced water is still acceptable for NF treatment. Wells that have been constructed within the last 10 years have all been constructed of 20-inch diameter PVC casing and open hole completion. The PVC casing is essentially inert and unlike steel, will not corrode. Completion intervals are within the competent rock formation of the aquifer in which cavities remain open and water production is consistent. Life expectancy of the PVC constructed wells is projected as 35 years.

3.5.1.3.2 Intermediate Age Wells (11 – 30 years old)

This group includes 24 SA wells that can be separated based on the date of construction. Wells in this group have been constructed with 20-inch diameter PVC final well casings and have production intervals completed as either open hole, open hole with liner, or screen with riser. Well construction phases included:

- Two wells installed between 2007 and 2010 (40, 41)
  - 10-14 years old
  - Average specific capacity 65.7 gpm/ft
  - 9.8% of total wells
  - Average well capacity 500 gpm
  - 4.9 % of total wellfield capacity 1,000 gpm based on individual well setpoint
- Eight wells installed in 2001 (39, 44, 45, 46, 47, 50, 67, 68)
  - 20 years old
  - Average specific capacity 36.9 gpm/ft
  - 15.7% of total wells
  - Average well capacity 502 gpm
  - 19.6 % of total wellfield capacity 4,020 gpm based on individual well setpoint
- Eight wells installed in 1997 (20, 48, 49, 51, 52, 53, 54, 55)
  - 24 years old
  - Average specific capacity 22.1 gpm/ft
  - 15.7% of total wells
  - Average well capacity 408 gpm

  - 15.9 % of total wellfield capacity 3,265 gpm based on individual well setpoint
- Six wells installed in 1993 (31, 32, 33, 34, 35, 36)
  - 28 years old
  - Average specific capacity 20.1 gpm/ft
  - 11.8% of total wells
  - Average well capacity 302 gpm
  - 8.8 % of total wellfield capacity 1,810 gpm based on individual well setpoint

The specific capacity of wells in this group ranges between 13 gpm/ft and 71 gpm/ft, with an average specific capacity of 30.1 gpm/ft. Wells in this group represent 49.1% of the total wellfield capacity or 10,095 gpm. Currently, these wells require minimal rehabilitation to provide reliable service, but as these wells continue to age, proactive rehabilitation is necessary to maintain useful life projections. **Figure 3-5** shows SA Well No. 45 which was installed in 2001.



Figure 3-5: Town of Jupiter SA Well 45

3.5.1.3.3 Older Wells (31 – 40 years old)

- The Town's older SA wells are typically lower producing and require more rehabilitation to maintain production rates and acceptable water quality. The Town's 16 production wells that are

older than 30 years are sized 14 and 12 inches in diameter and constructed of corrosion prone steel casings. Additionally, some are screened, and gravel packed to minimize sand production. Screened wells are typically prone to plugging and require mechanical and chemical rehabilitation to restore lost capacity. The smaller diameter of these wells also limits options for corrective measures. Well failure is typically due to failure of the casing and/or the cement seal around the casing resulting in sand and silt production. Such leaking casings may also contribute to undesirable chemical and biological characteristics of the produced water. Steel well casings deteriorate over time depending on the corrosiveness of the water, quality of the steel and oxygen introduced by the well pumping system. A steel cased well can have a life expectancy of 35 years; however, a number of the Town's steel cased SA wells in the 21 to 30 year age range have already been replaced due to casing and or casing cementing failures. Several wells in this group have been rehabilitated over the years but are now approaching the end of their useful life. Well replacements are planned within this group of wells over the next 5-10 years in the Town's capital program.

- Six wells installed between 1981 and 1982 (13, 14, 15, 16, 17, 18)
  - 40-41 years old
  - Average specific capacity 19.3 gpm/ft
  - 11.8% of total wells
  - Average well capacity 311 gpm
  - 9.1 % of total wellfield capacity 1,865 gpm based on individual well setpoint
- Ten wells installed between 1986 and 1989 (21, 22, 23, 24, 25, 26, 27, 28, 29, 30)
  - 33-36 years old
  - Average specific capacity 23.1 gpm/ft
  - 19.6% of total wells
  - Average well capacity 281gpm
  - 13.7 % of total wellfield capacity 2,810 gpm based on individual well setpoint

Figure 3-6 shows SA well No. 30 installed in 1989.



Figure 3-6: Town of Jupiter SA Well 30

3.5.1.3.4 Wellheads

The visible part of the well includes the surface casing, wellhead piping, electrical conduits, control panels, telemetry communications tower, and security fencing. Refer to **Figure 3-5** for the Town's standard wellhead design. Wellheads that have been constructed for the Town within the last 28 years, include durable stainless steel piping, stainless steel control panel enclosures and modern well pump control equipment. These materials come at a somewhat higher initial cost but contribute to greater reliability of the well. These materials are typical for wells that feed membrane (NF) treatment plants. As older wells are replaced, the wellheads and associated components should also be replaced with equipment consistent with the current Town of Jupiter standard wellhead design.

Additional recommended SA system improvements including, well replacement plan, well rehabilitation plan and new well construction plan are discussed in Section 3.8 – Recommended Improvements.

3.5.1.4 Historical Surficial Wellfield Pumpage

Historical raw water pumping data for the SA wellfield were evaluated for the five-year period between January 2016 and December 2020. **Appendix B** presents the annual raw water SA withdrawal for individual wells. The annual aquifer withdrawal from the SA wellfield for the period averaged 3,650 MG. Historical

annual pumpage is approximately 47% lower than the permitted annual allocation of 6,826 MG. Historical monthly pumpage averaged 304 MG and is approximately 50% lower than the permitted maximum month allocation of 617 MG. This data is illustrated in **Figure 3-7** and **Figure 3-8**.

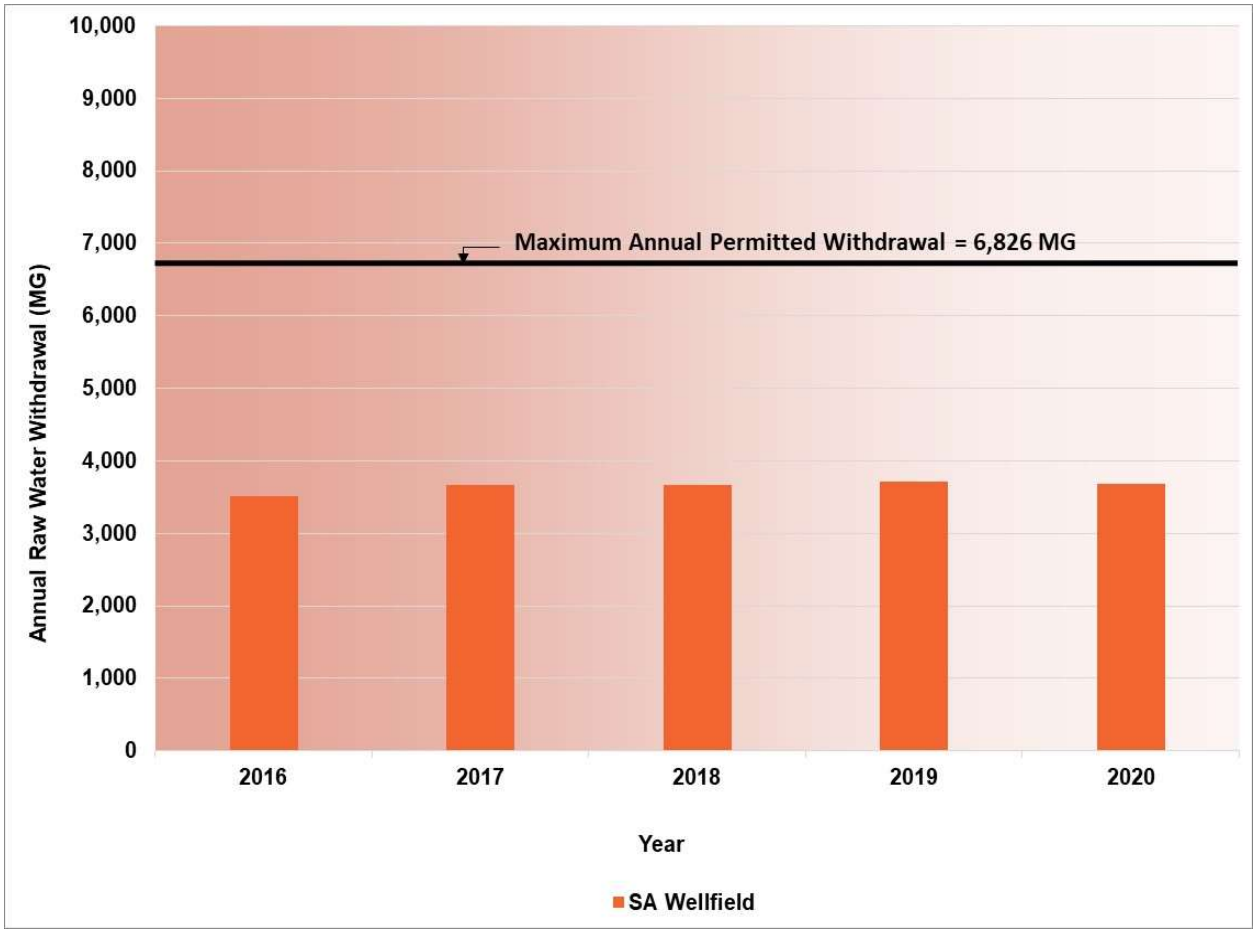

Figure 3-7: Surficial Wellfield Annual Raw Water Withdrawal

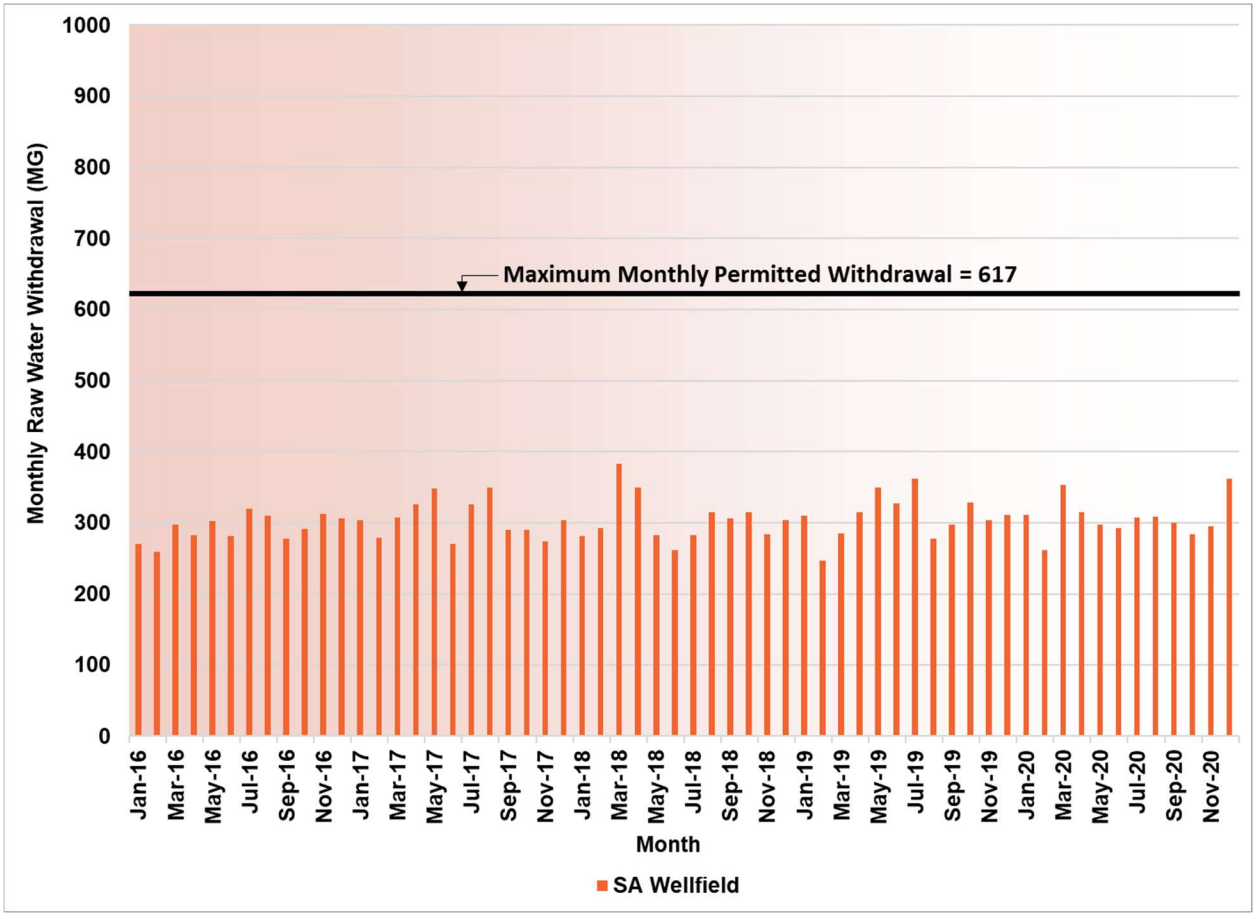

Figure 3-8: Surficial Wellfield Maximum Monthly Raw Water Withdrawal

3.5.1.5 Historical Surficial Wellfield Water Quality Evaluation

Historical raw water quality data obtained from the SA Wellfield monthly operating reports for the five-year period between January 2016 and December 2020 were evaluated. **Table 3-6** presents an overall summary of the historical annual averages for each parameter.

Table 3-6: Surficial Aquifer Wellfield Historical Annual Average Raw Water Quality

Parameter	Units	Value					
Year		2016	2017	2018	2019	2020	5-year Average
pH	Std. Units	7.2	7.3	7.4	7.2	7.1	7.3
Alkalinity, as $CaCO_3$	mg/L	290.0	300.9	289.6	294.3	286.8	292.3
Total Hardness, as $CaCO_3$	mg/L	329.7	326.2	345.0	332.2	329.1	332.4
Ca Hardness as $CaCO_3$	mg/L	308.7	308.3	324.8	322.7	315.8	316.1
Iron (Fe)	mg/L	0.5	0.3	0.2	0.2	0.2	0.3
Chloride (Cl-)	mg/L	71.8	65.8	71.2	68.4	69.9	69.5
Conductivity	µmhos/cm	794.8	803.7	807.2	821.8	816.4	808.8
Turbidity	NTU	1.6	0.7	0.8	0.8	1.0	1.0
Fluoride	mg/L	0.2	0.3	0.2	0.2	0.2	0.2
Color	Pt-Co	59.7	54.2	54.3	47.4	49.4	53.0

Notes:

[1] Data obtained from Town Monthly Operating Reports includes the combined historical average for all operating SA system wellfield wells.

The raw water quality parameter values measured for the SA wellfield are typical of Surficial aquifer groundwater. Graphs depicting water quality parameters for individual surficial wellfield wells are presented in **Appendix C-1**. Overall, the water quality trends observed for each parameter were generally similar for individual wells.

For the SA system raw water supply wells, the incidences of total coliform and/or *E.coli* positives were minimal throughout the five year study period between January 2016 and December 2020. Of the positive occurrences, follow-up repeat sampling performed by Town operations staff invalidated the positive results. To-date, there has been no biological contamination of the Town's SA Wellfield raw water supply system.

3.5.2 Floridan Aquifer Wellfield Water Supply System

3.5.2.1 Floridan Wellfield Overview

The Town's FA wellfield includes eleven in service production wells (RO-2, RO-3, RO-4, RO-6, RO-7, RO-8, RO-9, RO-10, RO-11, RO-12 and RO-13) and one out of service production well (RO-5) that have a combined raw water pumping capacity of approximately 11,100 gallons per minute (gpm) or 16.0 million MGD. Production from the FA wellfield currently does not meet the Town's needs for raw water supply. The Town's RO treatment plant has a rated capacity of 13.7 MGD which necessitates a firm supply of at least 18.3 MGD from the FA wellfield.

Individually these wells produce between 500 and 1,100 gpm. The wells are completed within the FA at depths between 1,017 feet and 1,825 feet (bls). The wells are located at the water plant site (RO-4); Central Blvd Ground Storage Tank and High Service Pumping Facility (RO-2 and RO-3); along the South Indian River Water Control District outfall canal (RO-7 and RO-10), and within the SFWMD C-18 Canal Right of Way (RO-5, RO-6, RO-8, RO-9, RO-11, RO-12 and RO-13). A map showing locations of the Town's FA existing production wells is provided as **Figure 3-9**.

As of 2021, ages of the FA wells range between 17 and 33 years. The wells are constructed with either fiberglass reinforced polyester (FRP) casing or poly vinyl chloride (PVC) casing. The nature of the brackish water produced by the FA wells dictates use of this type of casing because of the corrosive nature of the brackish water. From a physical/structural standpoint, these wells typically have useful life of 35-50 years.

There are 18 FA production wells (12 existing and 6 proposed) in the Town's SFWMD Consumptive Use Permit (CUP). The six proposed wells include RO-14, RO-15, RO-16, RO-17, RO-18, and RO-19. Locations of proposed FA wells are shown on **Figure 3-9**. Three of the proposed FA wells are scheduled to begin construction in 2022 and are located at Jupiter Community Park and Public Works / Emergency Operations Center (RO-15 and RO-16) and along the C-18 Canal Right of Way (RO-14). The other three potential FA wellsite locations include future developments of Sante Circle along the Island Way Corridor (RO-17 and RO-18), and Hawkeye south of Indiantown Road and east of I-95 (RO-19).

Similar to the SA Wellfield, the FA Wells also have a network of underground piping connecting them to the water treatment facility on Central Boulevard. Routing of the FA raw watermains is depicted within **Figure 3-10** and consists of 12 to 30-inch diameter RWMs. The majority of FA well capacity is located west of the treatment facility along the C-18 canal where the primary raw water transmission main runs west along Jupiter Gardens Drive and includes a 24-in HDPE aerial crossing and horizontal directional bore under I-95 and the turnpike connecting the western FA wells to the raw water system. The remaining FA RWMs are located within the treatment facility or within the Central Blvd Ground Storage and Pumping Facility. As discussed in Section 5, expansion of the FA wellfield is planned along Island Way where the RWM extension will be constructed via horizontal directional bore under the C-18 canal and Indiantown Rd.

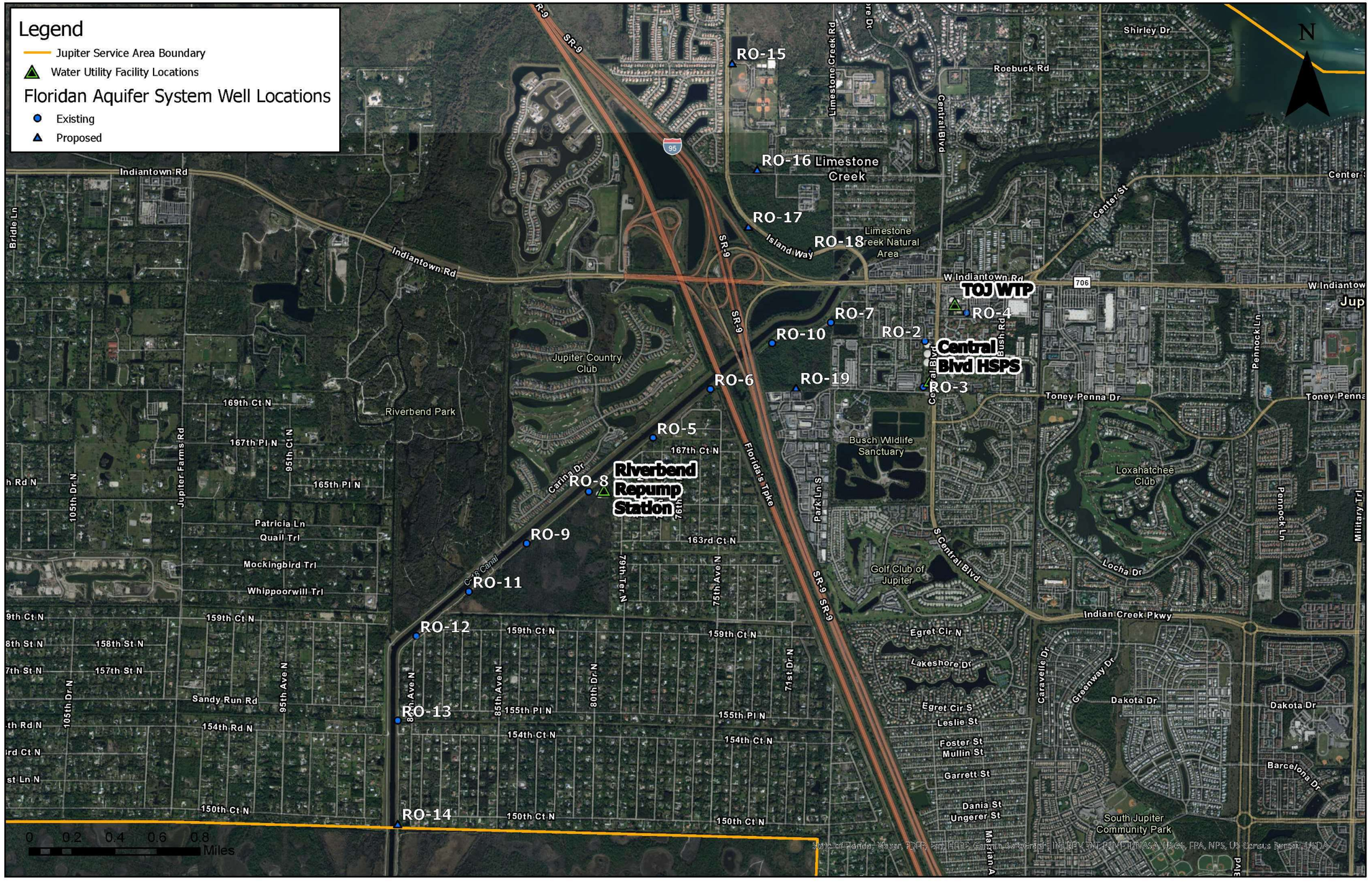

Figure 3-9: Town of Jupiter Floridan Aquifer Well Locations

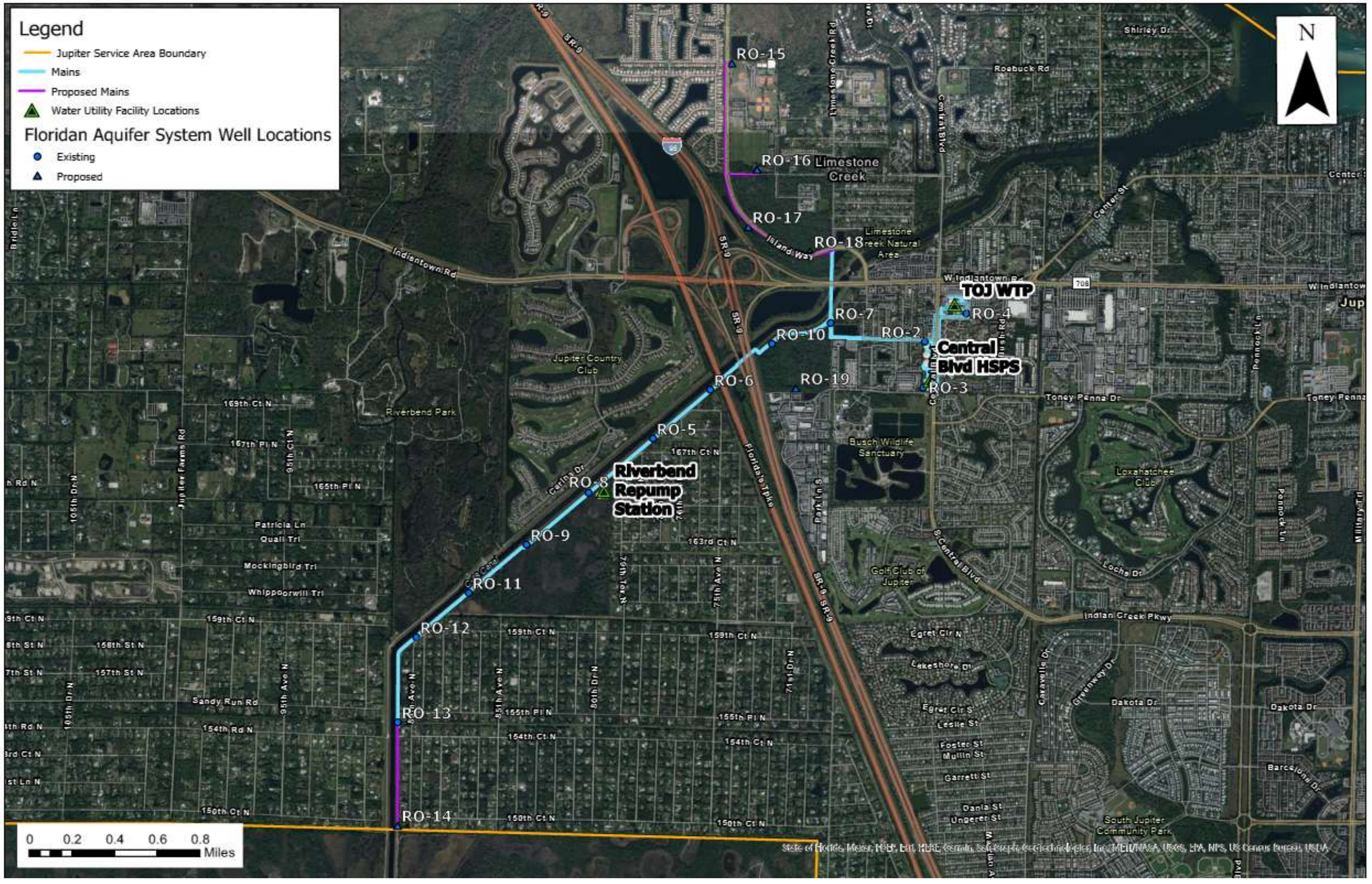

Figure 3-10: Town of Jupiter Floridan Aquifer Raw Water Mains

3.5.2.2 Floridan Wellfield Evaluation

In addition to routine and compliance-mandated monthly water quality tests performed by Town's operations and laboratory staff, each FA well undergoes comprehensive performance testing once per year to evaluate production efficiency and produced water quality. The testing is essential to proactively monitor the water supply for the RO water treatment plant. This robust evaluation is intended to identify problem wells that have lost specific capacity, produces less water than the original design point and/or produces water problematic for plant operation or could even potentially damage the membranes. Data from annual testing is used to evaluate when well rehabilitation is needed and the type of rehabilitation that may be required to restore lost capacity and/or improve produced water quality.

3.5.2.3 Floridan Wellfield Rehabilitation

Between 2014 and 2021 the Town has implemented a comprehensive FA rehabilitation program designed to improve the well performance and restore raw water capacity of the 11 in-service FA production wells. Rehabilitation typically involves low pH chemical treatment of the wells production interval followed by redevelopment. Individual wells' performance from the annual FA Wellfield evaluation are reviewed, and the wells exhibiting a 20% loss in specific capacity are selected for rehabilitation. Since 2014, all in-service FA wells have been rehabilitated with the exception of RO-5 and RO-6. Rehabilitation approaches are summarized below:

- Acidization of seven wells (RO-7, RO-8, RO-9, RO-10, RO-11, RO-12, RO-13)
- Back plugging and acidization of RO-2 and RO-3
- Redevelopment restoration of RO-4

Acidization efforts have led to specific capacity improvements between 189% (RO-7) and 27% (RO-9) when compared to the pre-acidization specific capacity. **Figure 3-11** shows specific capacity improvements from all seven acidized FA system wells.

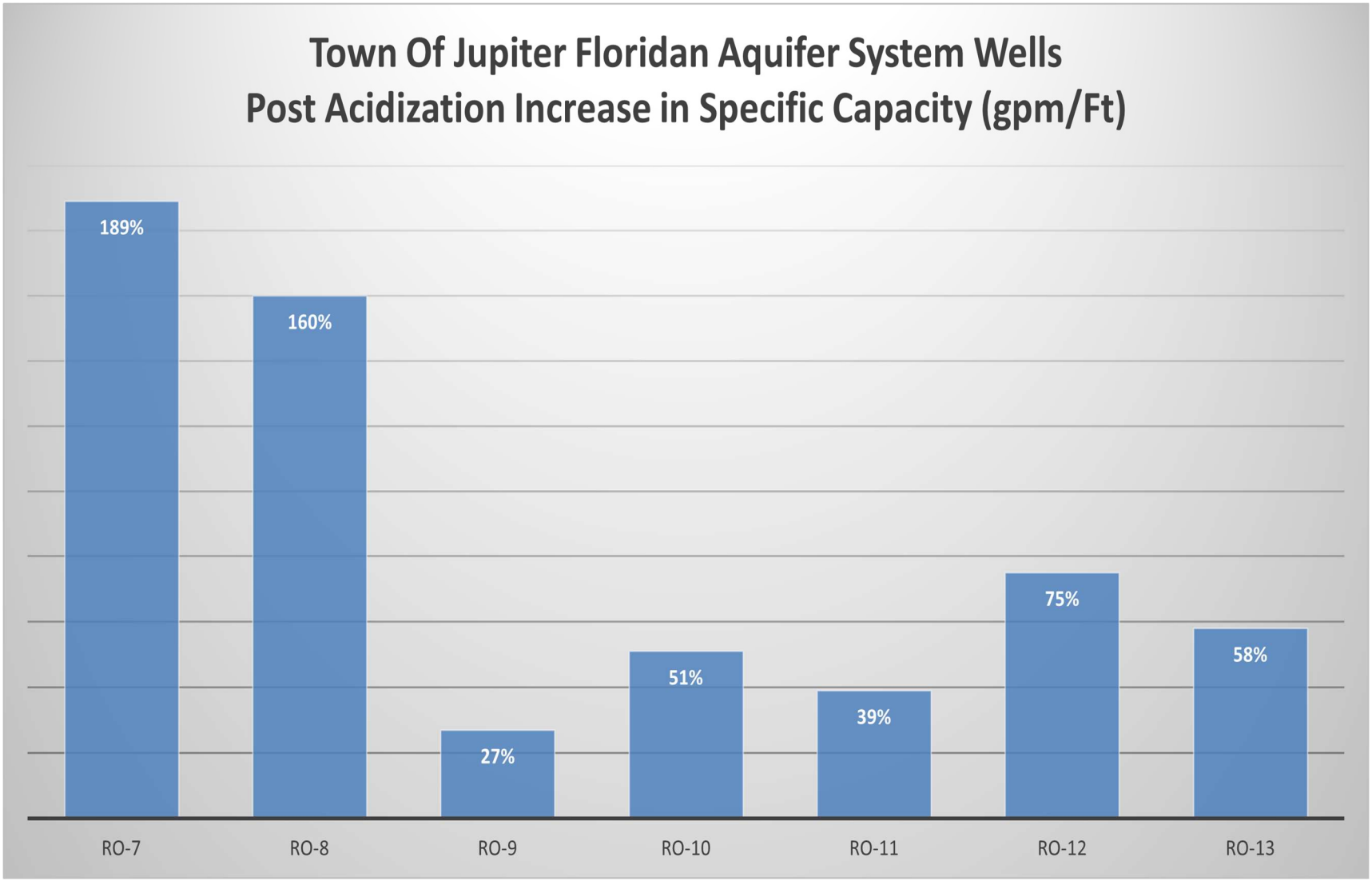

Figure 3-11: Town of Jupiter FA System Wells Specific Capacity Improvement

The resulting acidization efforts have improved the individual well specific capacities and raw water quality which helps to achieve the useful life of the wells.

Although initial improvements from acidization can be substantial, they often do not restore a well to its original post construction capacity and the improved performance can still degrade again within a few years following acidization. Acidization is a useful and efficient tool for restoring lost FA well capacity in the near term but cannot on its own compensate for lost FA well capacity. Constructing additional FA wells to increase the overall raw water capacity is critical to ensure that the Town can reliably meet current and future raw water demands.

Wells RO-2 and RO-3, located at the Central Blvd Ground Storage Tank and High Service Pumping Facility were originally constructed in 1990 and were deepened in 1996. They have historically been two of the Town's most productive FA production wells. In 2004, JLA generated a technical memorandum regarding the need for uniform and equitable pumpage of the FA wells following rapid increases in chloride and specific conductance from wells RO-2 and RO-3. At that time as much as 58% of the water supplying the plant was being produced from RO-2 and RO-3 with an average chloride concentration of approximately 3,000 mg/L. With the installation of wells RO-11, RO-12 and RO-13 in 2005, pumpage from RO-2 and RO-3 was reduced, which slowed the degradation in produced water quality. The slower rate of water quality degradation seen in RO-2 and RO-3 after 2005 is likely the result of reduced stress on the wells from a more even distribution of well pumpage and the increased number of wells available for use following the installation of RO-11, RO-12 and RO-13.

Despite the reduced pumpage, RO-2 and RO-3 water quality ultimately deteriorated to a point where they were virtually unusable from a raw water quality perspective by 2020. In 2021, and in an effort to restore the wells to service, the zones of high conductivity water in RO-2 and RO-3 were identified and blocked off with cement backplugs and the wells were acidized. In doing so, the capacity of each well was reduced. However, water quality produced by both wells was improved and the wells were restored to service. **Figure 3-12** illustrates the chloride and conductivity increases in RO-2 and RO-3 over time.

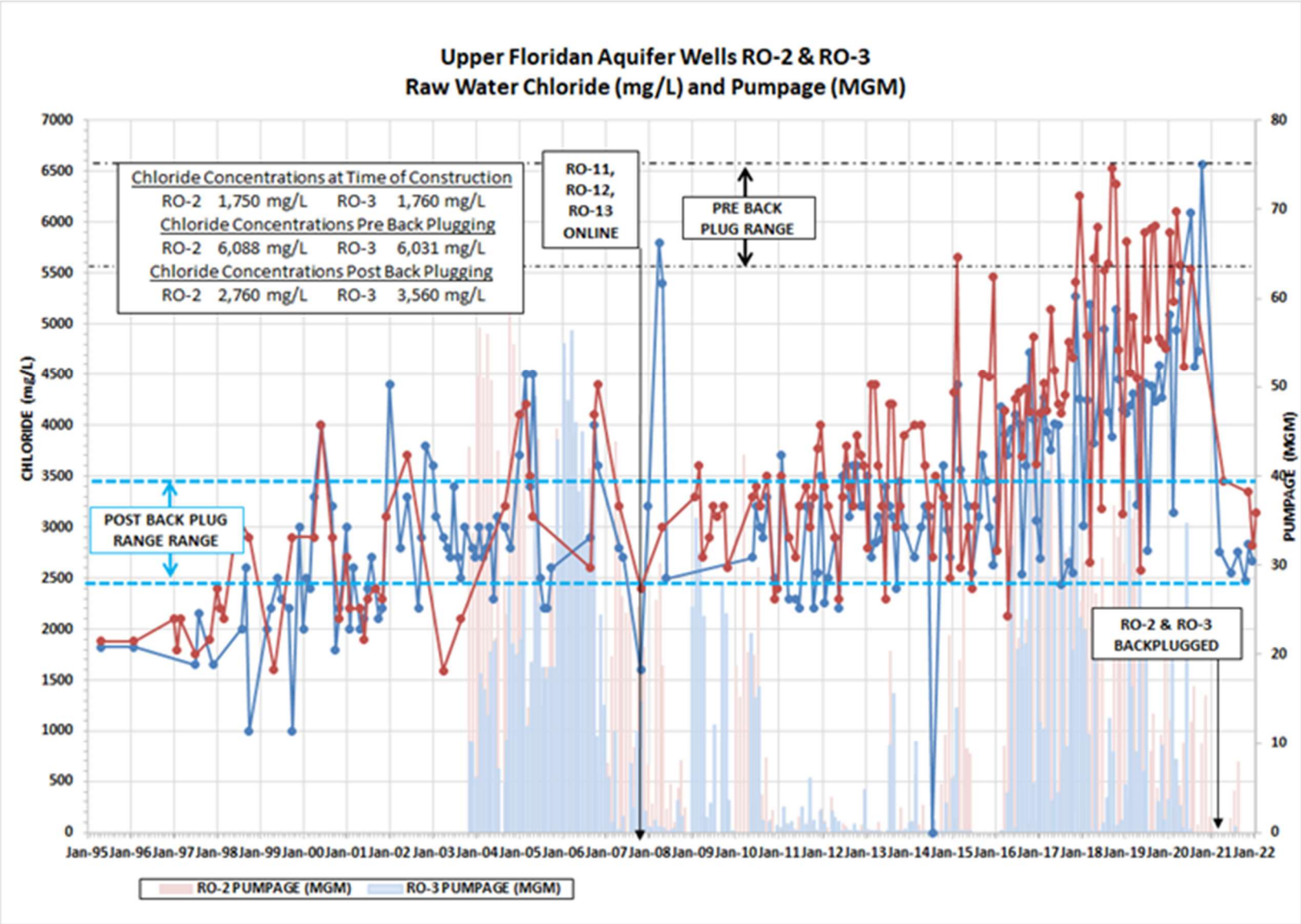

Figure 3-12: Town of Jupiter FA System Wells RO-2 and RO-3 Historical Chloride and Pumpage

Evaluation of RO-2 and RO-3 raw water quality showed that total dissolved solids (TDS) had increased by approximately 268% and 261%, respectively between 1995 and 2021. The design and implementation of an exploratory geophysical logging and water quality testing investigation showed that poorer water quality and the majority of water production originated from the bottom most section of the borehole in both wells. Based on this investigation it was recommended that both wells RO-2 and RO-3 be back plugged to isolate better water quality in the upper sections of the boreholes despite an expected loss of raw water production. Acidization of wells RO-2 and RO-3 was performed to improve the wells specific capacity after back plugging was completed.

Back plugging and acidization of wells RO-2 and RO-3 resulted in improved raw water quality and reduced specific capacity as was expected. Post rehabilitation well RO-2 had a 54% reduction in raw water conductivity and a 29% reduction in specific capacity. Well RO-3 had a 38% reduction in raw water conductivity and a 53% reduction in specific capacity. Results from the RO-2 and RO-3 back plugging and acidization rehabilitation are shown in **Figure 3-13** and **Figure 3-14**.

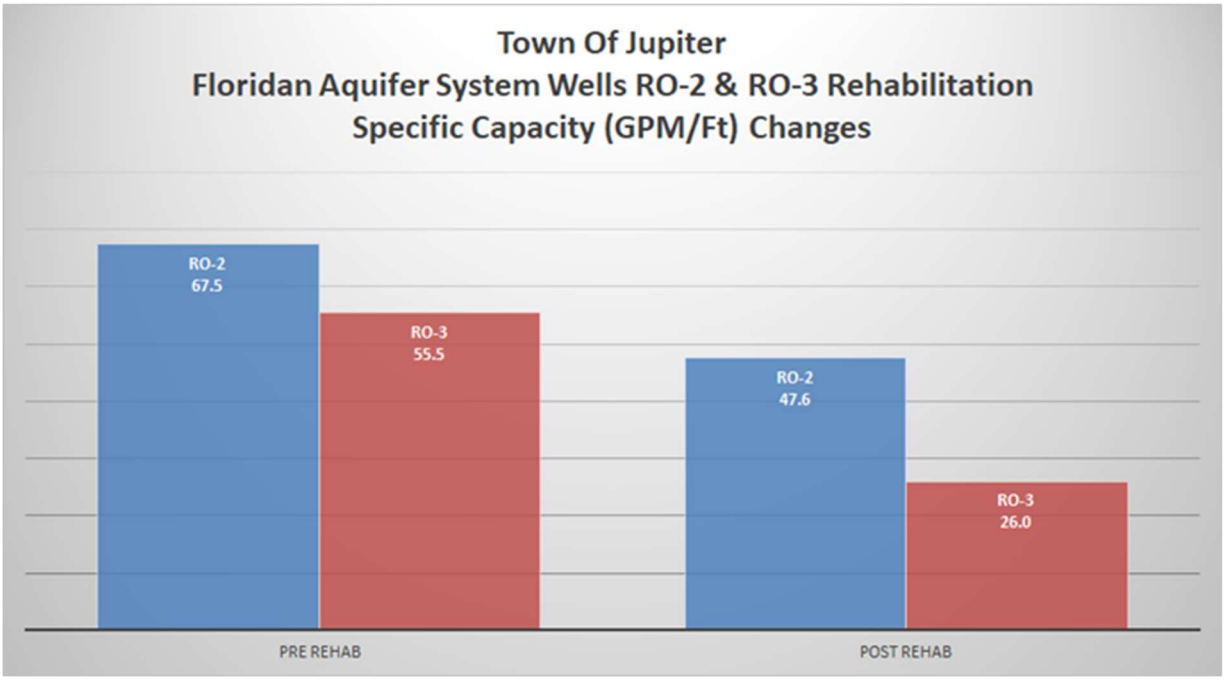

Figure 3-13: Town of Jupiter FA System Wells RO-2 and RO-3 Specific Capacity Changes

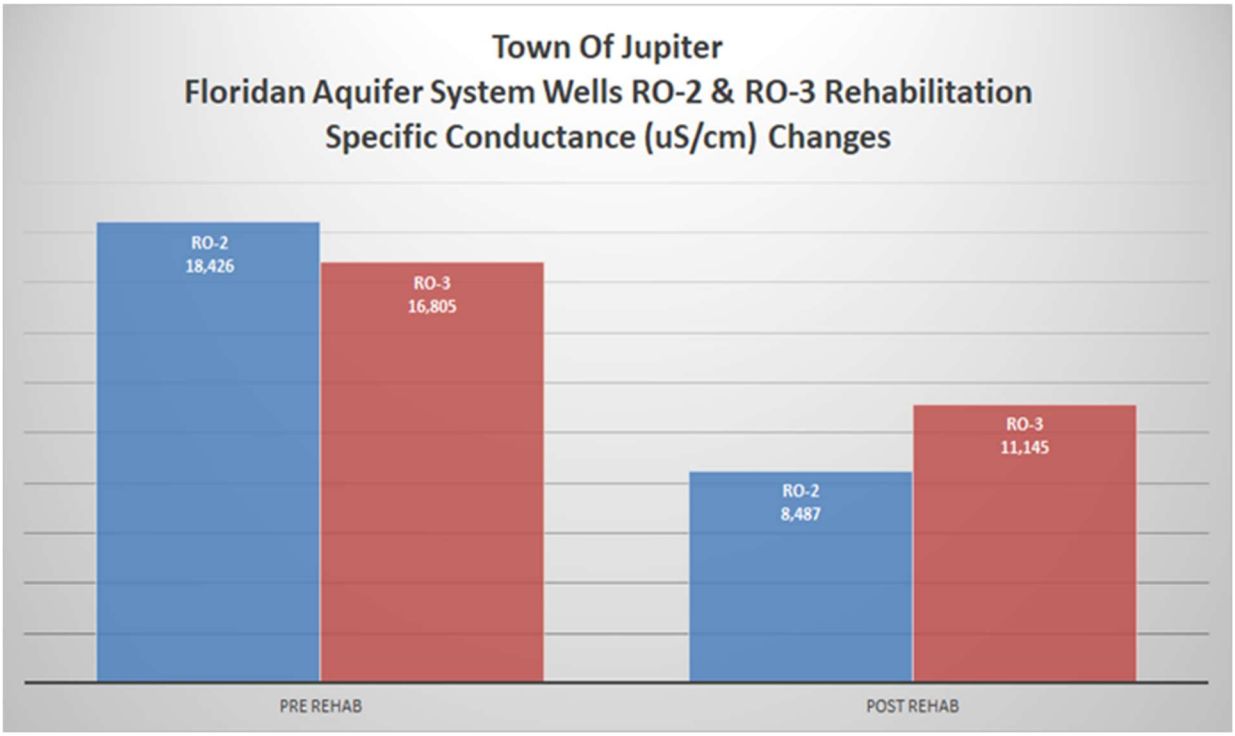

Figure 3-14: Town of Jupiter FA System Wells RO-2 and RO-3 Specific Conductance Changes

Back plugging and acidization of wells RO-2 and RO-3 resulted in both wells being placed back into service at a combined flow of 1.5 to 2.0 MGD that was lost due to water quality degradation.

Well RO-4, located at the WTP site, was originally constructed in 1990; however, the well was prone to sand and silt production and has remained unused. In 2016 the well was redeveloped and reevaluated for use by the low pressure RO plant as a water supply source. The evaluation included the following: mobilization, performance of a preliminary well video and geophysical logging, killing of the well, plumbness and alignment testing, wellhead modifications, installation of a temporary wellhead, well pump and discharge system, well development at approximately 2,000 gallons per minute (GPM), a three (3) step drawdown test, final well video, chlorination, and site restoration. Results of the rehabilitation indicate that well RO-4 is now suitable for use as an in-service upper FA production well at a recommended maximum pumping rate of 1,000 gpm. The recommendation also included using a soft startup procedure to minimize sand and silt production that mostly occurs on startup.

3.5.2.4 Floridan Wellfield Pumpage and Water Quality Evaluation

The Town measures pumpage and water quality obtained from each FA well on a monthly basis. Historical raw water pumping data for the FA wellfield were evaluated for the five-year period between January 2016 and December 2020. The annual Floridan aquifer withdrawal from the Floridan wellfield for the period averaged 3,461 MG. Historical annual pumpage is approximately 19% lower than the permitted annual allocation of 4,275 MG. Historical monthly pumpage averaged 288 MG and is

approximately 48% lower than the permitted maximum month allocation of 555 MG. This data is illustrated in **Figure 3-15** and **Figure 3-16**.

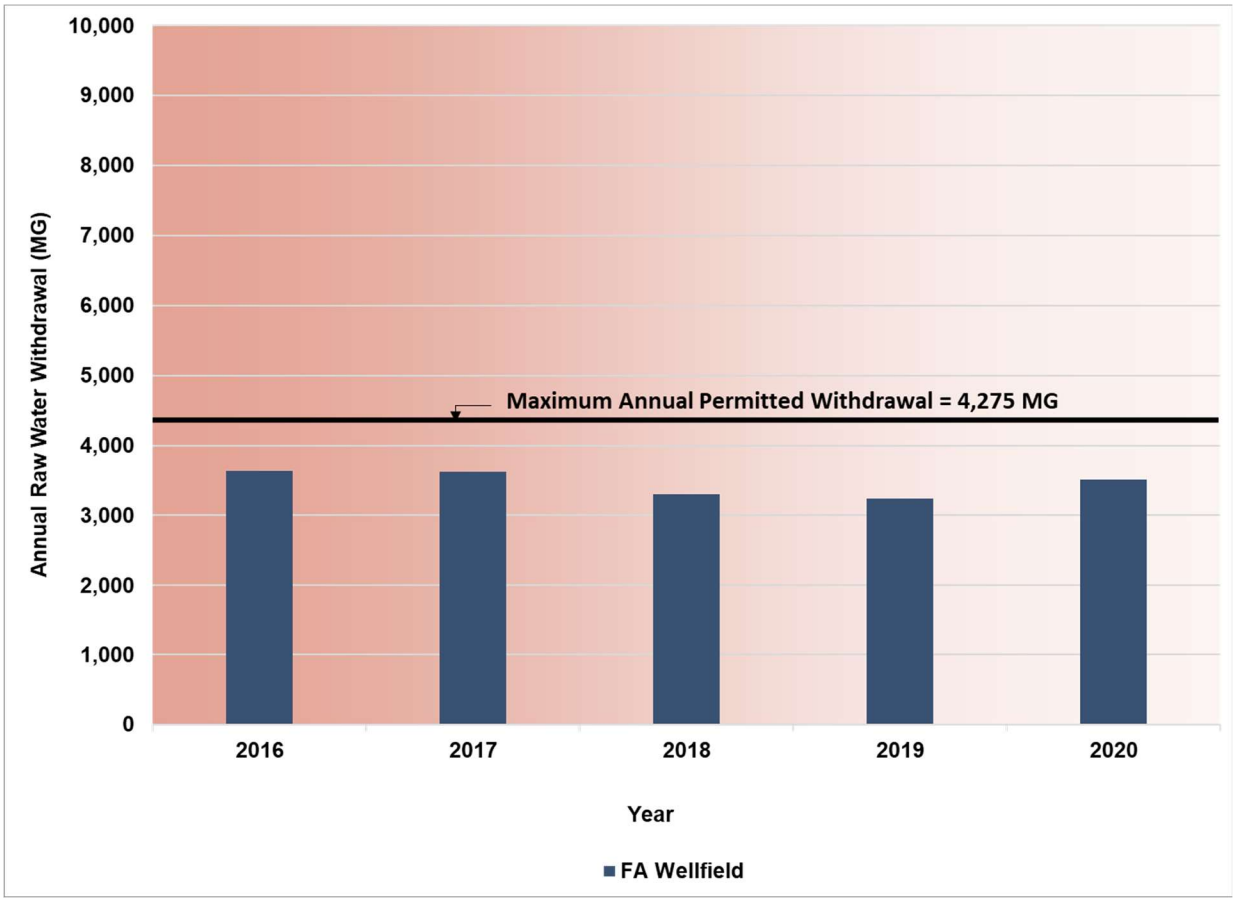

Figure 3-15: Floridan Wellfield Annual Raw Water Withdrawal

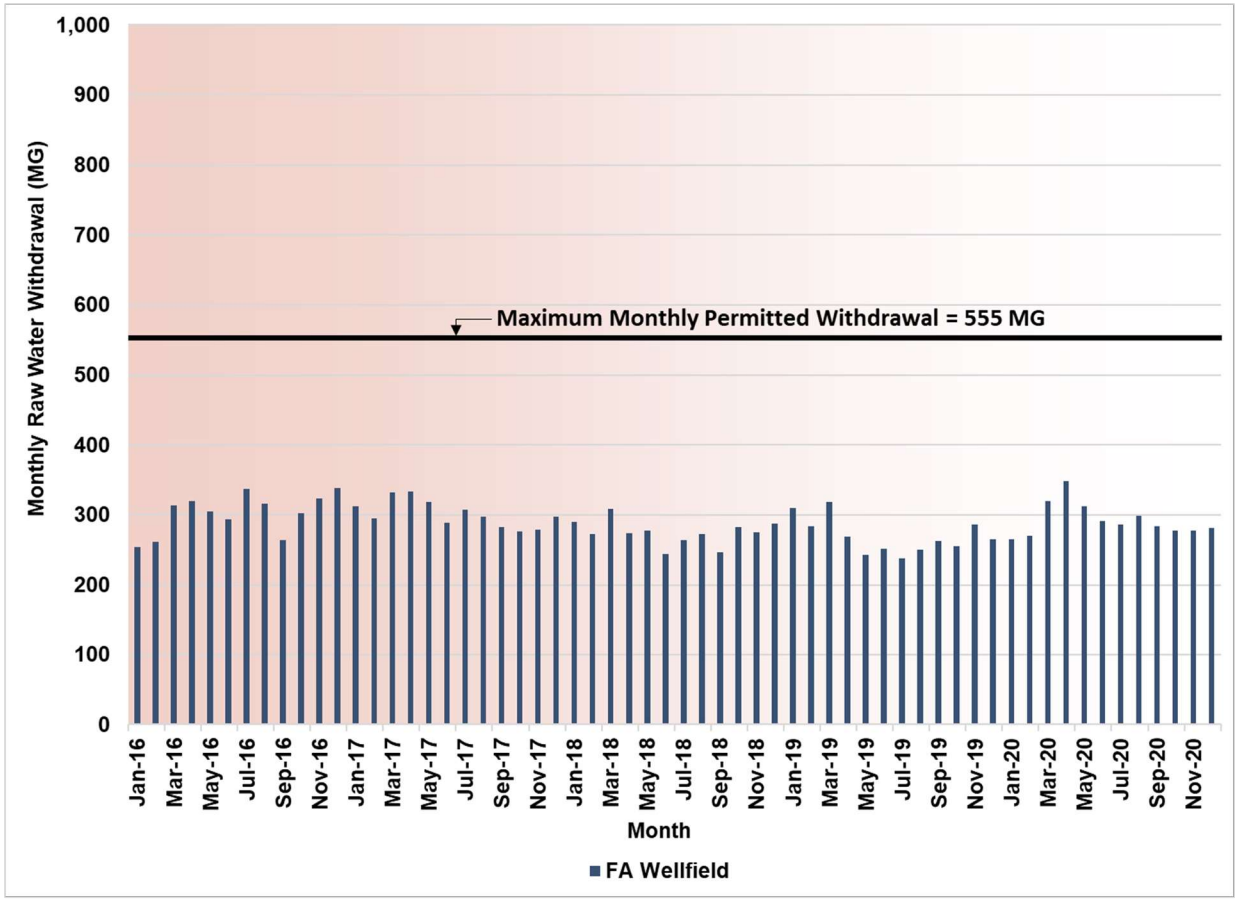

Figure 3-16: Floridan Wellfield Maximum Monthly Raw Water Withdrawal

Additionally, individual well and total wellfield pumpage data for the Period 2004 through 2020 are summarized in **Table 3-7**.

Table 3-7: Town of Jupiter FA Historical Well Pumpage

FA Well Pumpage (in millions of gallons)														
Year	RO-2	RO-3	RO-4	RO-5	RO-6	RO-7	RO-8	RO-9	RO-10	RO-11	RO-12	RO-13	Total	FA Wellfield Avg (MGD)
2020	86.7	46.5	243.0	0.0	58.7	538.5	383.4	438.1	508.7	588.9	367.0	254.9	3514.3	9.6
2019	201.1	133.6	0.0	0.0	34.9	612.8	346.2	436.8	529.9	495.5	348.3	96.8	3235.9	8.9
2018	304.3	105.3	0.0	0.0	32.8	582.4	207.1	421.3	501.8	672.4	146.9	323.5	3297.6	9.0
2017	291.8	282.5	0.0	0.0	29.2	451.8	295.0	592.8	351.4	719.3	265.0	345.0	3623.9	9.9
2016	250.4	220.8	0.0	34.2	18.3	633.8	326.5	545.7	541.9	625.6	28.5	407.0	3632.6	10.0
2015	85.4	21.2	0.0	0.0	139.6	98.4	521.5	551.3	480.2	537.4	599.0	29.7	3063.9	8.4
2014	50.3	17.8	0.0	0.0	58.1	52.4	579.5	521.2	327.0	586.5	545.6	233.0	2971.4	8.1
2013	31.1	31.2	0.0	5.9	6.2	367.1	257.5	560.0	560.6	690.0	378.3	601.6	3489.4	9.6
2012	12.5	10.6	0.0	14.9	59.4	283.0	577.8	62.6	628.9	706.5	581.1	681.9	3619.1	10.0
2011	10.2	18.3	0.0	12.0	0.0	164.1	307.3	740.0	464.3	721.3	614.8	354.2	3406.6	9.3
2010	166.1	57.3	0.0	85.9	0.0	362.4	282.3	500.3	388.5	509.3	356.1	376.1	3084.3	8.5
2009	12.2	189.0	0.0	70.5	0.0	512.8	379.6	232.6	309.4	187.6	230.7	391.2	2515.6	6.9
2008	131.7	12.4	0.0	0.0	0.0	312.3	327.5	118.3	363.4	216.3	215.4	426.7	2123.9	5.8
2007	268.7	95.8	0.0	0.1	8.7	`- -	288.9	172.9	410.0	400.6	188.5	412.9	2871.7	7.9
2006	468.6	480.3	0.0	56.6	30.6	379.1	363.7	521.4	480.0	146.3	0.0	210.6	3137.1	8.6
2005	369.6	269.3	0.0	166.7	216.8	411.3	367.8	405.9	405.9	0.0	0.0	0.0	2613.3	7.2
2004	528.3	167.1	0.0	123.2	108.2	515.5	566.2	475.1	387.6	0.0	0.0	0.0	2871.2	7.9

The pumpage data summarized in **Table 3-7** shows how FA well usage has changed over time as new wells have come online. Wells RO-11, RO-12 and RO-13 came online late 2006-2007 and pumpage was shifted to these new wells (**RED** values in **Table 3-7**). The available new wells and lower chloride/conductance water allowed the RO plant to operate at lower feed pressure because the new wells produce water with lower chloride (and total dissolved solids) concentrations and has lower specific conductance. In order that no individual well is over stressed, all wells should be utilized equally. Typically, as an FA well is pumped, the produced water typically increases very slightly in total dissolved solids (TDS) over time. TDS often increases more drastically when a well is pumped at a high rate for an extended amount of time.

Annual FA wellfield pumpage (shown on the right side of **Table 3-7** in **BLUE**) indicate that the wellfield in the last 16 years produced between 5.8 MGD to 10.0 MGD. For the period 2010 to 2015, the average pumpage was 9.0 MGD with the primary production coming from wells RO-8 through RO-13 (as seen in **PURPLE** **Table 3-7**). In 2016 the Town implemented recommendations to reduce and actively monitor FA well usage to distribute pumpage more evenly across all in-service wells (as seen in **GREEN** **Table 3-7**). For the period 2016 to 2020, the average pumpage was increased to 9.5 MGD with production coming from wells RO-2 through RO-4 and wells RO-7 through RO-13. **Figure 3-17** graphically presents each individual FA well pumpage data as a percentage of the total pumped, for the years 2005, 2011, 2015 and 2020.

Despite the increase in overall FA well pumpage seen since 2016, the rate of water quality degradation has slowed down. The slowed rate of water quality degradation can be attributed to the Town's efforts to reduce individual well pumpage rates, more evenly distribute pumpage among the in-service FA wells as much as possible, and aggressive well rehabilitation program. Historical and projected FA wells chloride and conductivity trends are illustrated on **Figure 3-18** and **Figure 3-19**.

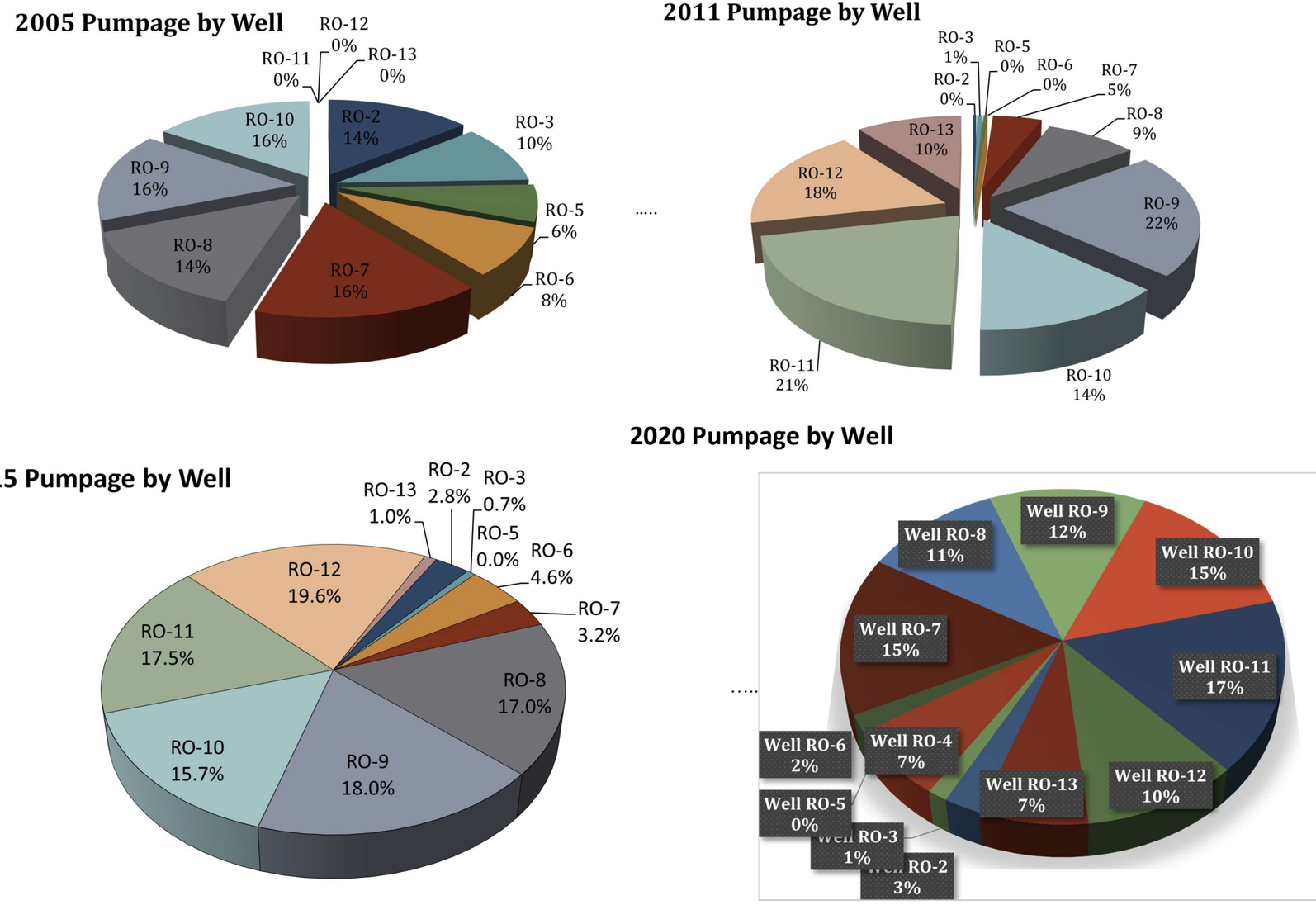

Figure 3-17: Town of Jupiter Individual FA Well Pumpage for 2005, 2011, 2015 and 2020

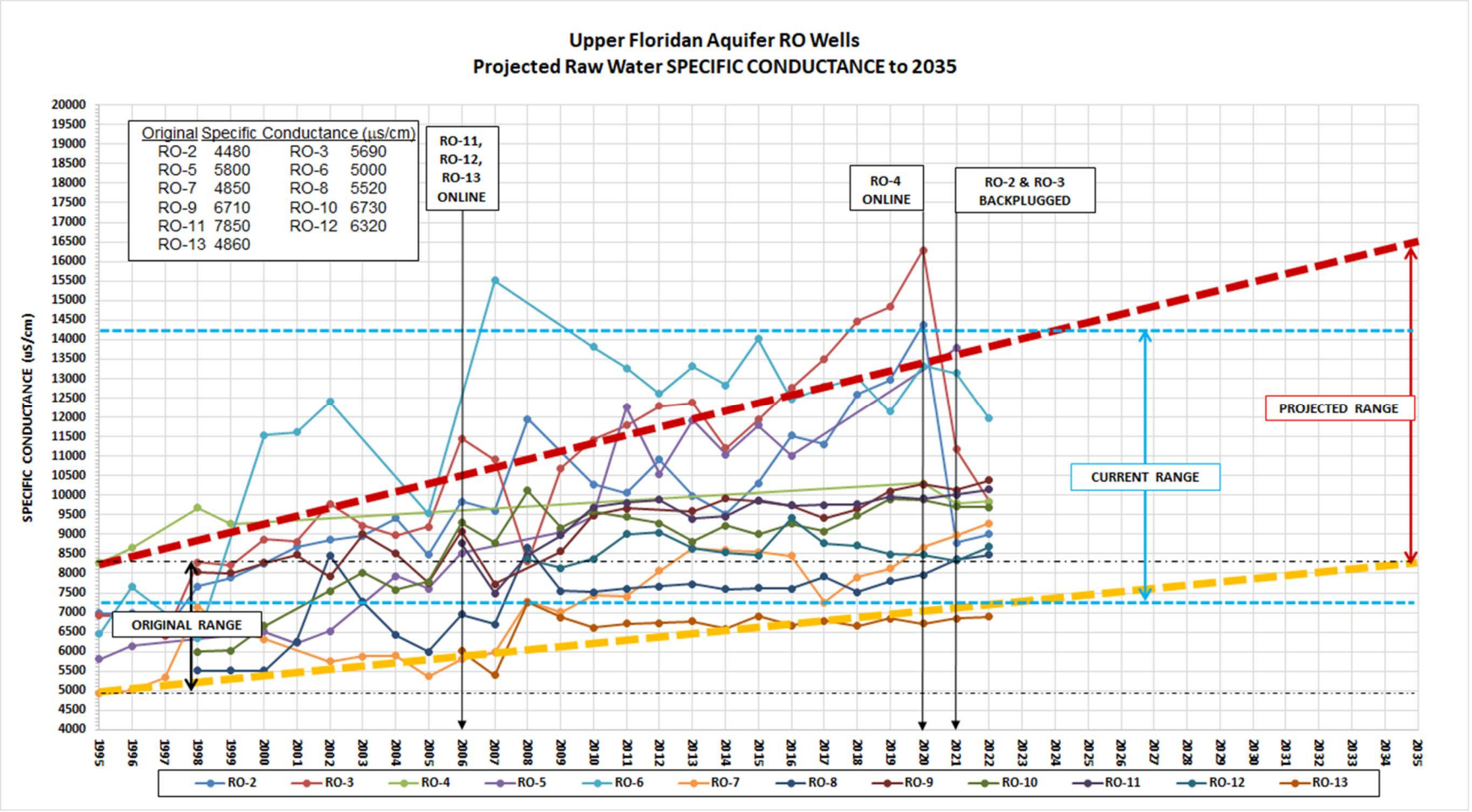

Figure 3-18: Town of Jupiter FA Wells Projected Raw Water Specific Conductance

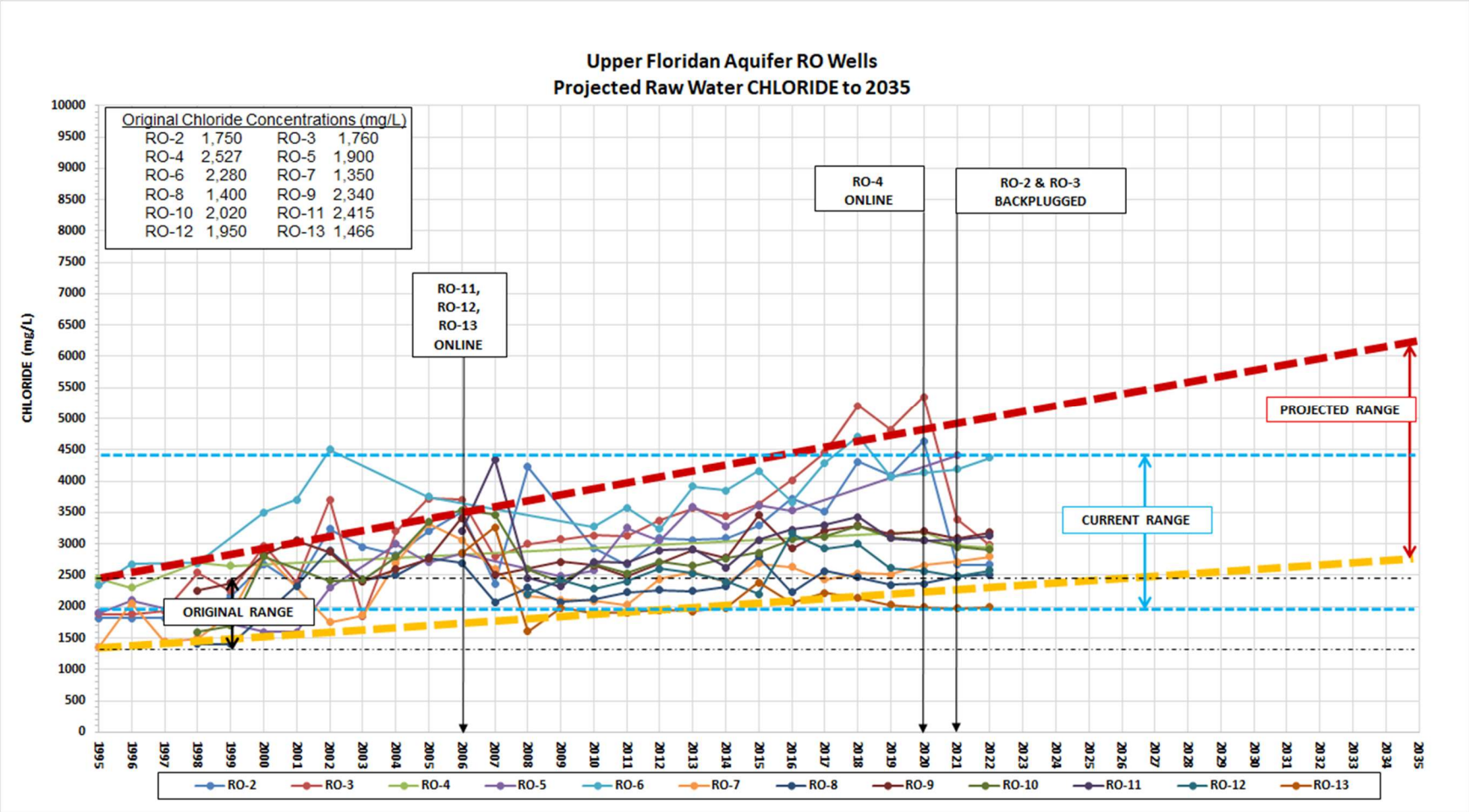

Figure 3-19: Town of Jupiter FA Wells Projected Raw Water Chloride

Based on **Figure 3-18** and **Figure 3-19** the following conclusions are provided:

- Increases in FA production well raw water chloride concentrations and specific conductivity (dissolved solids) is inevitable with continued use. The amount of use may influence the rate of increasing dissolved solids in the raw water.
- Higher stress on any one well from over pumping will increase the rate of water quality degradation in produced water.
- Prior to 2016, FA wells were not being used equally and there had been a greater emphasis on using newer wells with lower dissolved solids concentrations in raw water. Selective pumpage from wells with better water quality will ultimately result in an increased rate of water quality degradation over time.
- Since 2016, FA wells have been pumped more equally and at reduced pumping rates to decrease the rate of water quality degradation and distribute pumpage more evenly across more wells. These measures along with FA well rehabilitation have reduced the rate of water quality degradation.

Additional information on recommended FA system improvements, including well operation plan and new well construction plan is presented in Section 3.8 – Recommended Improvements.

3.5.2.5 Additional Floridan Wellfield Water Quality Evaluation

Additional historical raw water quality data obtained from the FA Wellfield monthly operating reports for the five-year period between January 2016 and December 2020 were evaluated. **Table 3-8** presents an overall summary of the historical annual averages for each parameter.

Table 3-8: Floridan Aquifer Wellfield Historical Annual Average Raw Water Quality

Parameter	Units	Value					
Year		2016	2017	2018	2019	2020	5-year Average
pH	Std. Units	7.4	7.6	7.8	7.5	7.4	7.5
Alkalinity, as $CaCO_3$	mg/L	150.5	163.4	-	152.7	146.9	153.4
Total Hardness, as $CaCO_3$	mg/L	1291.6	1275.5	1375.8	1345.4	1280.6	1313.8
Ca Hardness as $CaCO_3$	mg/L	603.5	620.0	458.9	460.7	430.7	514.7
Iron (Fe)	mg/L	0.1	0.0	0.0	0.1	0.1	0.1
Turbidity	NTU	0.2	0.3	0.8	1.2	1.8	0.8
Chloride	mg/L	3114.6	3203.6	3436.7	3183.7	3287.5	3245.2
Conductivity	µmhos/cm	9876.2	9656.6	9976.4	10708.3	10564.0	10156.3
Fluoride	mg/L	1.3	1.2	1.2	1.2	1.3	1.2
Color	Pt-Co	4.3	6.5	7.6	8.2	15.6	8.4
Silica	mg/L	14.8	16.7	12.4	10.8	15.0	13.9

The raw water quality parameter values measured for the FA system wellfield are typical of FA groundwater. Graphs depicting water quality parameters for individual surficial wellfield wells are presented in **Appendix C-2**. Overall, the water quality composition observed for the FA system appears to have remained relatively stable over time.

3.5.2.5.1 Bacteriological

For the FA Wellfield raw water supply wells, the incidences of total coliform and/or *E.coli* positives were minimal throughout the five year study period between January 2016 and December 2020. Of the three positive occurrences, follow-up repeat sampling performed by Town operations staff invalidated the positive results. There has been no biological contamination of the Town's FA Wellfield raw water supply system.

3.6 Saltwater Intrusion Monitoring Program

The Town of Jupiter's coastal location makes the Town's SA system wellfields vulnerable to potential impacts from the threat of saline intrusion. Recognition of such vulnerability is evident from the saltwater intrusion monitoring program that the Town has been operating for decades. The saltwater intrusion monitoring program is operated in accordance with the limiting conditions of the existing SFWMD Water Use Permit and requires the Town to locate and continuously monitor the saltwater interface in and around its wellfields. The program serves as an early warning monitoring system to assist wellfield managers in tracking the location and to manage withdrawals to limit the inland movement of the salt front. The Town currently has nine active surficial aquifer saltwater monitor wells. Monitor well locations are shown in **Figure 3-20**.

In conjunction with the U.S. Geological Survey (USGS), every five years SFWMD produces an estimate of the position of the saltwater interface by County for the Surficial Aquifer System. These estimates are important for evaluating the threat of saline intrusion to impact the Town's water supply wellfields located near the coast. The SFWMD defines the estimated location of the saltwater interface, as the 250 mg/L "isochlor". The isochlor line represents the inferred location where dissolved chloride (Cl^-) in the subsurface of the SA system equals 250 mg/L. **Figure 3-20** also depicts the 2019 estimate of the saltwater interface in relation to the Town's SA wellfields.

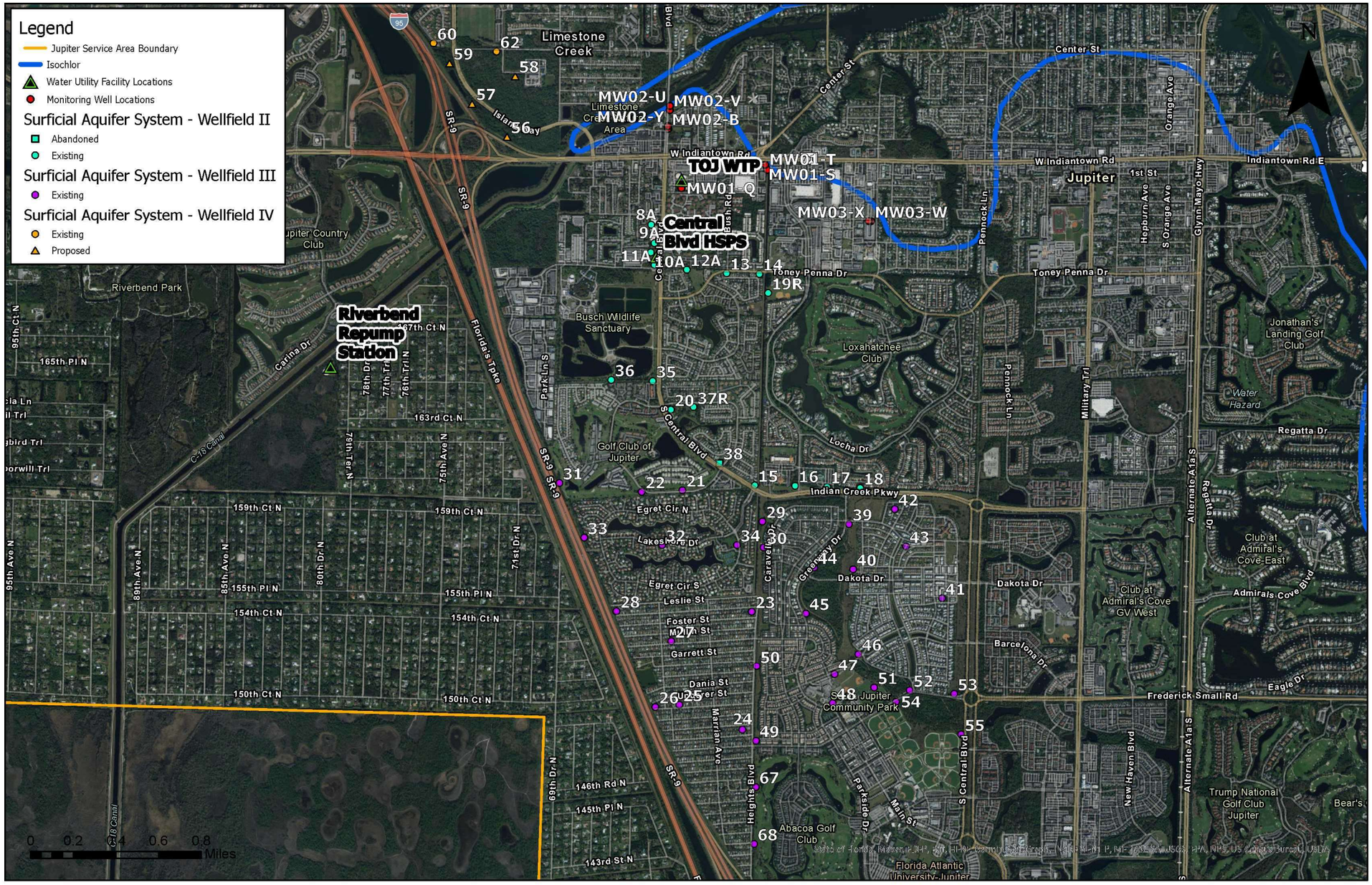

Figure 3-20: 2019 Isochlor Interpretation – Palm Beach County Surficial Aquifer

(*Source of Isochlor: Merged Isochlor, 2019 | Merged Isochlor, 2019 | South Florida Water Management District (Old Site) (arcgis.com)*)

The apparent inland locations of the interface within the central portion of the Town's service area reflects influence from the saline tidal portion of the Southwest Fork of the Loxahatchee River (Southwest Fork). It is important to note that Town's monitoring well data suggest that saline water presently occurs mainly at shallow depths adjacent to the Southwest Fork, and that saline intrusion does not yet occur within the production zone depths where SA system wells are completed as it may appear in **Figure 3-20**. SA system well chloride levels are summarized in **Table 3-6**.

Further, it is noted that SFWMD has determined that there has been no apparent inland migration of the saltwater interface in Palm Beach County[6] within the past 5 years. Interestingly, it should also be noted that seaward migration of the interface has actually been observed around some Cities in Palm Beach County. This is largely attributed to a shift in pumpage among certain SA system wells or the reduction in use of the SA system in favor of the deeper FA system wells.

Despite no recent inland migration near the Town's wellfields, based on the ongoing potential threat, it is recommended that the Town continuously strive to eliminate major withdrawals from the SA system which pose a risk to saltwater interface migration into the Town's wellfields that serve as a regional water supply source. To accomplish this, it is recommended that the Town target non-Town owned SA system withdrawal facilities with larger permitted withdrawal rates located in the SA system Adaptation Action Area to cooperatively seek the elimination of the SA system withdrawal facility and subsequent connection to the Town's regional water supply system or the Loxahatchee River District's (LRD) wastewater reuse system.

Transitioning of these privately held withdrawals to connections to the Town's regional water system or LRD's regional reuse system would then minimize risk of SAS saltwater contamination in the region including the Town's regional supply wellfields and in the area of the private wells. If implemented, both the Town and the private entity would then have far greater assurances of maintaining a continued future supply of usable high quality water.

3.7 Existing Water Treatment Facilities

3.7.1 Introduction

The Town of Jupiter's Water Treatment Plant (WTP) located at 17403 Central Blvd, Jupiter, FL 33458 consists of three separate treatment processes: reverse osmosis (RO), ion exchange (IX) and nanofiltration (NF). Each of the processes is permitted by the Florida Department of Environmental Protection (FDEP) and have rated treatment capacities as shown in **Table 3-9**. The Public Water System (PWS) identification number for the system is 4501491.

[6] *Source: SFWMD Saltwater Interface Monitoring and Mapping Program, Technical Publication WS-58, December 2020*

Table 3-9: Design Capacities for Each Treatment Process

Facility	Design Capacity (MGD)
Reverse Osmosis	13.7
Ion Exchange	1.8
Nanofiltration	14.5
Total	**30.0**

The location of the WTP is illustrated in **Figure 3-3**. A simplified process diagram of the WTP facilities is shown in **Figure 3-21**.

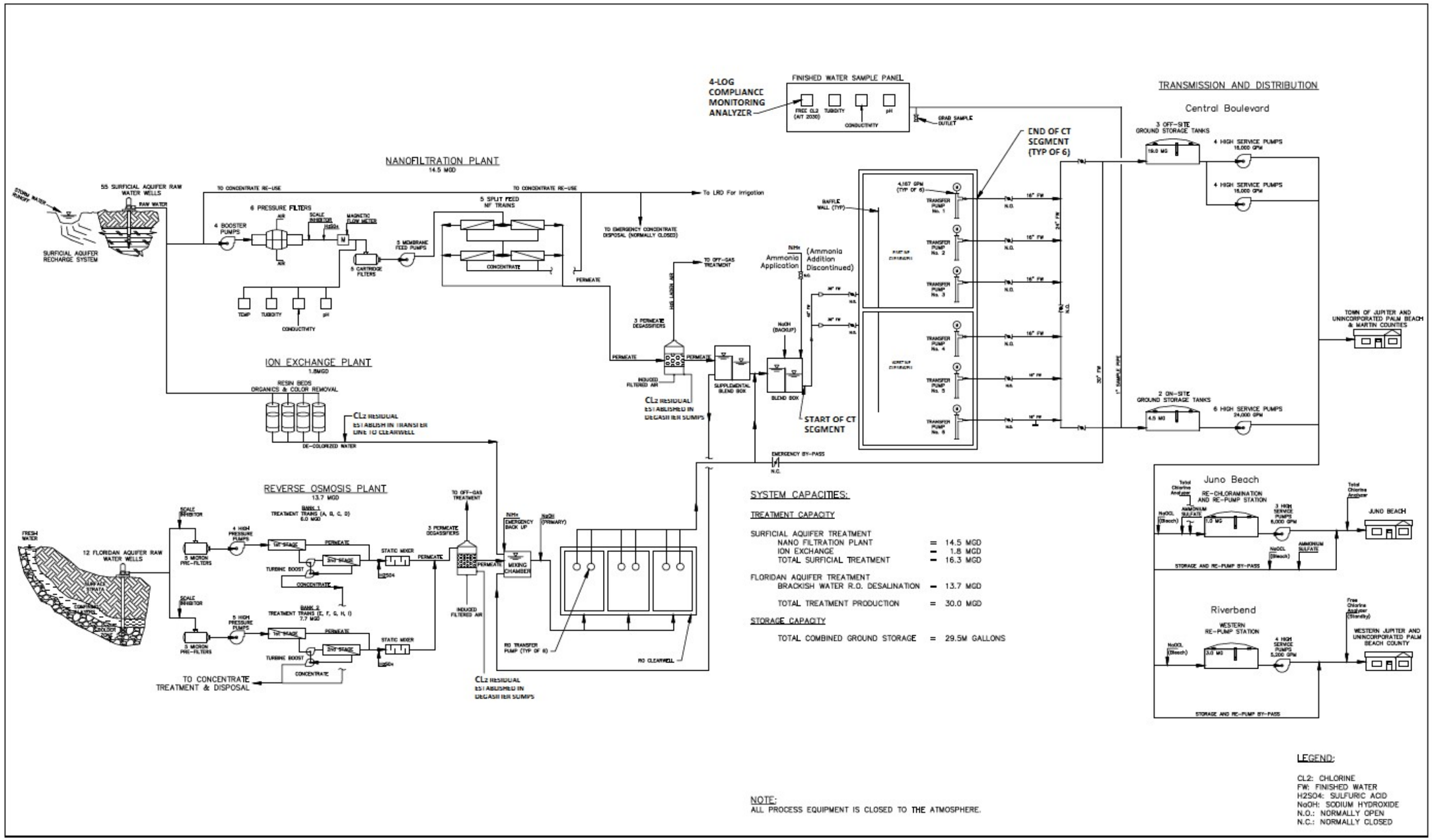

Figure 3-21: Town of Jupiter Utilities Water System Process Flow Diagram

3.7.2 Treatment Facilities

The Town of Jupiter (Town) uses two membrane treatment processes to treat its water: brackish Floridan aquifer (FA) water desalination through reverse osmosis (RO) and (NF) nanofiltration treatment of the fresh surficial aquifer (SA) water supply. The Town's treatment facility also includes an ancillary ion exchange (IX) process that treats the SA. This product is blended with the ultra-pure RO permeate and provides redundancy to the NF process. The product of these treatment processes is combined to create high quality finished water that is distributed to the Jupiter region. These membrane water treatment processes produce drinking water that surpasses all existing and foreseeable future quality standards. They also provide a way for the Town to produce ultra-pure water from the Floridan aquifer, a drought-resistant, alternative water supply, in a way that is not harmful to the environment.

Both the RO and NF processes operate by forcing pressurized, raw water through a semi-permeable membrane that separates contaminants from the water as illustrated in **Figure 3-22**. The chemical and physical properties of the membrane, combined with applied pressure, remove unwanted substances from the groundwater. Membrane treatment also provides a barrier against viruses, bacteria and many other harmful contaminants found in raw water.

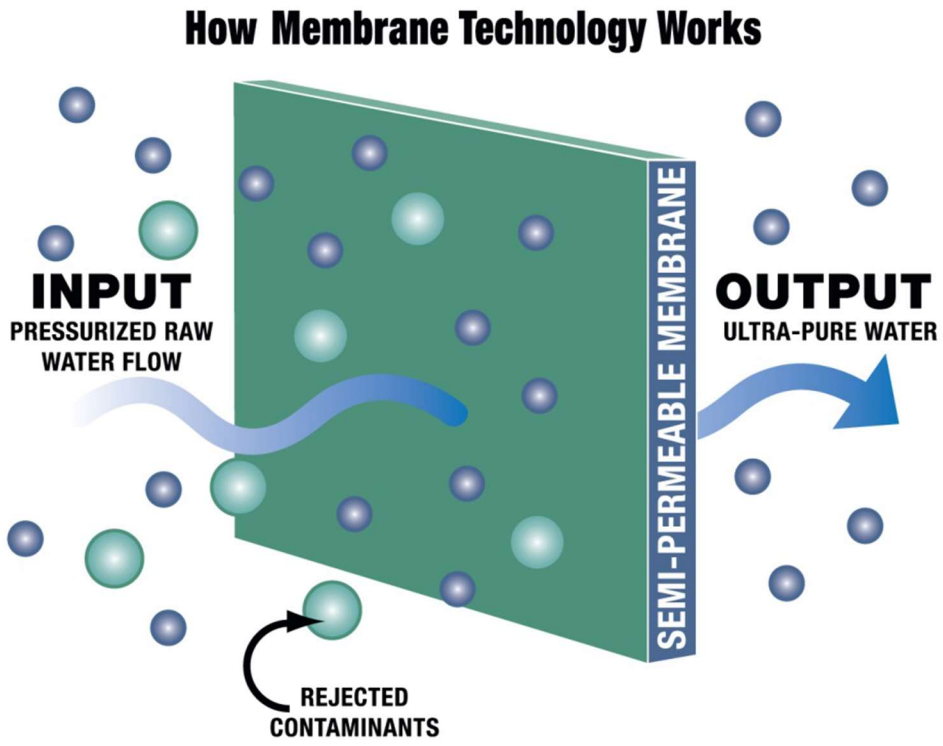

Figure 3-22: How Membrane Technology Works

The Town's customers demand high water quality while maintaining an awareness of the sensitive, environmental habitats in the region. As a coastal, South Florida community, Jupiter is in a region with limited fresh water supplies, and often experiences drought conditions during the dry season. Jupiter's nationally designated "wild and scenic" Loxahatchee River, which runs right through the middle of the community, is subject to environmental harm if local freshwater supplies are depleted or damaged. If use of the fresh, surficial aquifer in the Jupiter area is excessive, it can experience saltwater intrusion from the nearby Atlantic Ocean. To ensure a stable supply of drinking water for the area, Jupiter has become one of the first large communities in the United States to employ large-scale, state of the art membrane water treatment technologies. Using innovative new processes, Jupiter is able to supply the highest quality drinking water while achieving environmental sustainability of the local water resources.

The Town has allocations of water from both the surficial and Floridan aquifers based on their Consumptive Use Permit (CUP) issued by the South Florida Water Management District (SFWMD). While each source has a permitted maximum withdrawal rate, the total allowable withdrawal rate is less than the sum of the two sources to provide maximum operational flexibility. The Town's general approach to operating the utility is to depend more heavily on the brackish water source and the RO process during dry periods. This operating approach aids in reducing the impacts on the SA system and local wetlands, which may be strained during the dry season. During wet periods, the Town relies more heavily on the SA system and NF process due to its lower operating costs as compared to RO.

The permitted allocation from the SA water supply is 19.9 MGD (max month basis), which is sufficient to supply the NF and IX treatment processes. The NF plant produces 14.5 MGD of permeate at an overall recovery of 85% and has the ability to be expanded by an additional 2.9 MGD providing up to 17.4 MGD in the future. The 1.8 MGD IX plant treats the SA supply to produce water rich in mineral content and low color which when blended with the RO permeate improves the chemical and aesthetic characteristics of the total blended finish water. The RO process is capable of producing 13.7 MGD of treated water. The Utility has a permitted daily withdrawal allocation from the FA supply of 17.9 MGD (max month basis), which is sufficient for the plant to operate at its design capacity of 13.7 MGD at the 75% recovery rate of the process.

As illustrated in **Figure 3-21**, the Town's water treatment system also includes several ancillary processes including pre-treatment, post-treatment, disinfection and blending as well as concentrate management, which support and augment the membrane facilities. The RO and NF membrane processes require pre-treatment to condition the water upstream of the membranes; adequate pre-treatment prolongs the useful life of membranes, minimizes the frequency of cleaning and lowers operating costs for the facilities. Pre-treatment for the RO plant consists of 5-micron cartridge filtration followed by addition of a scale inhibitor. The NF plant requires additional pre-treatment due to the quality of source water and includes sand filtration and 5-micron cartridge filtration as well as addition of scale inhibitor and sulfuric acid. These additional treatment steps remove sand and prevent scaling of salts protecting the integrity of the membrane surface. The average, useful life of RO and NF membranes is 10 and 5 years, respectively; the Town's RO membranes are currently 15 years old and NF membranes approaching 12 years old demonstrating the value of a well-designed pre-treatment system.

The RO and NF processes also require post-treatment to degasify the permeate removing naturally occurring hydrogen sulfide and carbon dioxide while introducing oxygen into the treated water. These steps improve the aesthetics and palatability of the water. Following degasification, water is disinfected as required by federal and state drinking water regulations then blended together through a series of clearwells to provide disinfection contact time. Blending along with pH adjustment and addition of a corrosion inhibitor promote stabilization of the final product before being pumped to ground storage tanks and then to the Town's customers through the distribution system. Licensed water plant operators staff the facility 24-hours per day and 7-days per week and operate all facilities from a centralized plant control room at the water treatment plant site.

3.7.3 Existing Water Storage, Transmission & Distribution Facilities

3.7.3.1 Transmission and Distribution System

The Town's water distribution system consists of over 467 miles of 2 to 30-inch diameter water mains that convey potable water from the ground storage and pumping/repumping facilities to the Town's water customers. **Table 3-10** identifies the approximate length of pipeline by diameter. In general, the larger diameter transmission mains originate at the high service pumping stations located at the water treatment facility and the Central Blvd Ground Storage and Pumping Facility and decrease in size as they extend throughout the service area. The majority of the Town's customers are to the east, north and south of the WTP. The distribution system is connected in a loop configuration that provides reliable service to residents throughout the entire service area.

Table 3-10: Town of Jupiter Transmission / Distribution Pipeline

Pipe Diameter (Inches)	Pipe Length	
	(Feet)	(Miles)
2	91,409	17.31
3	7,594	1.44
4	98,455	18.65
6	643,208	121.82
8	1,042,630	197.47
10	43,620	27.20
12	265,594	50.30
14	1,288	0.24
16	105,576	19.98
18	22,402	4.24
20	2,318	0.44
24	44,650	8.46
30	697	0.13
Total	**2,469,441**	**467.69**

The distribution system includes pipe segments made of primarily four types of materials – ductile iron (DIP), C-900 polyvinyl chloride (PVC), high density polyethylene (HDPE) and asbestos cement (AC). In general, asbestos cement pipe was installed from approximately 1957 to 1970, C-900 PVC from approximately 1971 to present, ductile iron pipe from approximately 1958 to present, and HDPE, primarily used for service connections and subaqueous crossings, from approximately 1971 to present.

There are seven subaqueous crossings of the Intracoastal Waterway (ICW) C-18 Canal and Heights Canal, including:

- Indiantown Road/ICW - one 10-inch and one 16-inch diameter HDPE Pipe
- Frederick Small/Marcinski Roads/ICW - one 16-inch and one 18-inch diameter DIP)
- US1/ICW – one 10-inch Diameter HDPE Pipe
- C-18 Canal at Riverbend P.S – one 18-inch Diameter HDEP Pipe
- Heights Canal at St. Peters Church – one 24-inch DIP
- Heights Canal at Leslie St – one 16-inch DIP

There are four transmission mains crossing under I-95 and the turnpike, including:

- Island Way/Jupiter Country Club – 18-inch HDPE

- Jupiter Park Dr/Palm Beach Country Estates (PBCE) – 14-inch HDPE
- Egrets Landing/PBCE – 18-inch HDPE
- Heights/PBCE – 10-inch HDPE

The Town also operates multiple aerial crossings of various branches of the Loxahatchee River and the Canal waterbodies, including:

- Alternate A1A (Loxahatchee River) – one 20-inch diameter DIP and one 20-inch diameter steel pipe
- Island Way (NW Fork Loxahatchee River) – 12-inch diameter DIP
- Island Way (C-18 Canal) – 18-inch diameter DIP
- Center St (Sims Creek) – 12-inch DIP
- Center St (Jones Creek) – 12-inch DIP
- Loxahatchee River Road (SW Fork Loxahatchee River) – 12-inch diameter DIP
- Indiantown Rd (Jones Creek) – 12-inch DIP
- Toney Penna Dr (Heights Canal) – 24-inch DIP
- Central Boulevard (C-18 Canal) – 24-inch diameter DIP

There are also additional subaqueous and aerial or bridge crossings varying in size from 6 to 10-inch HDPE, DIP, and/or steel within the eastern communities of Jonathan's Landing and Admirals Cove due to the array of canals and lake systems that connect the communities to the ICW. Sub-aqueous and aerial crossings are placed on a regular inspection schedule to facilitate preventative maintenance and timely replacement should it be required. Aerial crossings' exterior pipe are re-coated, as required, to protect against the harsh, coastal environment and maintain useful life projections

The Town has emergency water interconnect agreements with the Village of Tequesta, adjacent to the north boundary of the Town of Jupiter service area, and Seacoast Utility Authority, adjacent to the southwest and southeast service area boundaries. Historically, adequate pressure has been maintained throughout most of the Town's distribution system. However, areas with the most noted pressure deficiencies still remain relative to the system's established minimum level of service pressure of 45 psi in the Bluff's Area (south to Juno Beach). Mitigation of pressure issues within the Town's distribution system are currently being accomplished through various ongoing and planned renewal and replacement related capital projects previously identified in the 2017 Water Master Plan update (Refer to Section 7 – Recommended Capital Improvements). **Figure 3-23** illustrates the Town's distribution and piping network.

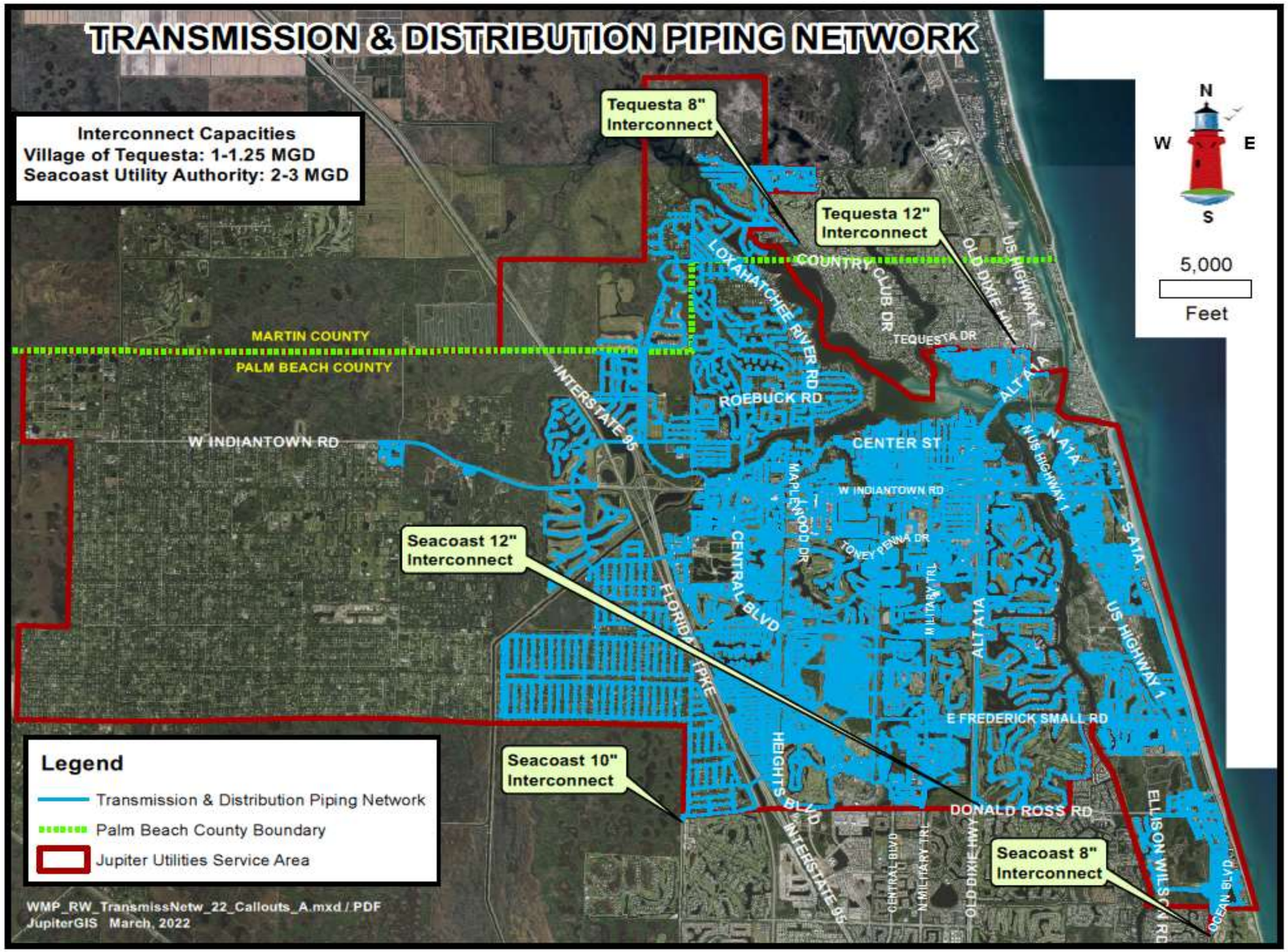

Figure 3-23: Town of Jupiter Transmission and Distribution Piping Network

3.7.3.2 Storage and Pumping Facilities

The Town's water storage system consists of seven ground storage tanks located at the Water Treatment Plant, Central Boulevard Repumping Station (located a block away from the WTP), Riverbend Repumping Station (located in the southwest region of the Town's water service area), and Juno Beach Repumping Station (located in the southeast region of the Town's water service area). The total system water storage capacity is 29.5 million gallons (MG).

There are two on-site ground storage tanks with a combined capacity of 4.5 million gallons (MG) located at the WTP site. The pumping facility at the WTP includes an array of six high service pumps with 200 hp motors and variable frequency drives (VFDs) for speed control.

The Central Boulevard Ground Storage and Pumping Facility includes three ground storage tanks with a combined capacity of 21.0 MG and two pumping stations each consisting of four 4,000 gpm high service pumps. The pumping capacity of each pumping station facility is 16,000 gpm; the combined total pumping capacity to the distribution system from both stations is 32,000 gpm.

The two remote storage and repump facilities sites are the Juno Beach Repump Station and the Riverbend Repump Station. The Juno Beach Repump Station includes a 1.0 MG ground storage tank and three 2,900 gpm high service pumps. This station serves the southeast region of the Town's water service area. The Riverbend Repump Station includes a 3.0 MG ground storage tank and four 4,400 gpm high service pumps. The station serves western Jupiter and the western section of unincorporated Palm Beach County located in the Town's water service area. The Riverbend Repump station is only placed into service when repumping to the western and southwestern regions of the service area is needed, otherwise, the station stays in a ready to service state.

In general, all high service pumps in the system are controlled automatically by control logic associated with programmable logic controllers located at each facility and can also be operated manually from the water treatment plant control room. Each pumping facility's control system is set to maintain a service pressure of 75 psi and operate independently from one another. The Riverbend Repump Facility is the exception and operates at a service pressure of 78 psi. **Figure 3-24** illustrates the capabilities of the Town's storage and high service pumping facilities.

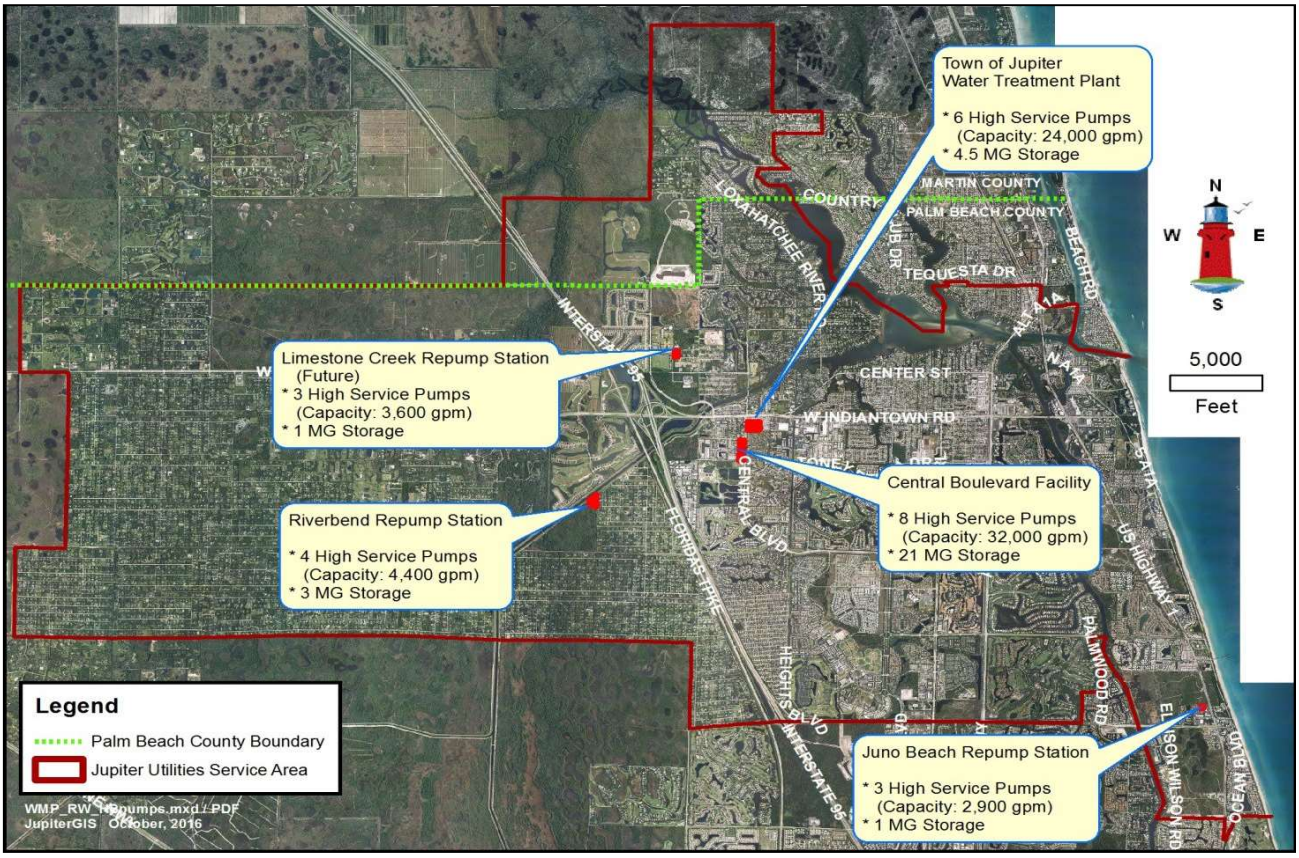

Figure 3-24: Town of Jupiter Water Storage & High Service Pumping Facilities

3.8 Recommended Improvements

The Town of Jupiter Water Utility provides heightened emphasis on long-range capital and financial planning in its operation. The following section contains a summary of projected capital requirements develop during this master planning efforts for the Town's wellfields, WTP and transmission system necessary for continued long-term efficient production and distribution of drinking water developed during this master planning effort. Potential future improvements related to the SA system and FA system raw water mains are discussed in Section 5 – Future Water System Challenges.

It is noted that the costs presented in this section are based upon year 2021 dollars and do not include escalation for inflation. For a complete list of the Town's ongoing and new capital improvement requirements refer to Section 7 – Recommended Capital Improvement Program.

3.8.1 Raw Water Supply System

3.8.1.1 Surficial Aquifer System

Well Replacement Plan

Replacement of wells 6, 7, 8, 9, 10, 11, and 12 with wells 8A, 9A, 10A, 11A and 12A will be completed in 2022. It is recommended that replacement of the remaining wells that are 39 to 44 years old (wells 13, 14, 15, 16, 17, and 18) be completed based on useful life and response to rehabilitation efforts at a budgeted well drilling cost of $452,000 per replacement well (2021 dollars). Selection of wells for replacement will be based on age, performance testing and response to well rehabilitation. The specific replacement approach will be site specific and may include over drilling the existing well, replacement at a nearby location, or installation of a non-ferrous liner. Construction of replacement wells 13A to 18A is anticipated to begin in 2024 and be completed by 2028. It is recommended that the ten wells (21, 22, 23, 24, 25, 26, 27, 28, 29, 30) that are 33 to 36 years old be replaced in groups based on useful life and responsiveness to well rehabilitation efforts beginning in 2027. The well construction cost of $452,000 per well is recommended for budgeting these replacement wells. Engineering and construction management services will be required to support this construction work. Planned well replacements will include additional costs associated with wellsite mechanical, electrical and instrumentation improvements where the scope of work varies from location to location. The SA wells are budgeted for replacement under the Town's ongoing Production Well Replacement Program (Refer to Section 7).

Well Rehabilitation

The Town should continue to fund the well rehabilitation program at the current level ($268,783) to support on-going rehabilitation of SA wells as part of its ongoing Water Asset Maintenance CIP efforts. Rehabilitation includes chemical treatment and re-development, maintenance of pumps, electrical and instrumentation systems, and additional wellsite repairs, which are necessary to achieve useful life projections. Engineering services will be required to support this work with project management provided by Town staff.

New Well Construction

In order to effectively secure SA system supplies needed to ensure the long-term viability of the Town's water treatment system, the remaining permitted wells (56, 57, 58, 59) located within Wellfield No. 4 (WF4) (North Limestone Creek wellfield) should be constructed along with needed ancillary facilities. Wells 60 and 62 were constructed in 2014 but are not in-service as they require wellsite construction and connection to the existing raw watermain system. Wells 58 and 59 are in design and scheduled to start construction in 2023. The projected construction cost of the additional WF4 SA wells is $452,000 per well not including the wellhead, raw watermains and ancillary features. Engineering and construction management services will be required to support this work.

Each proposed SA wellsite will require construction of wellsite mechanical, electrical and instrumentation components as well as extension of the SA RWM. Additionally, a new electrical building and generator to provide emergency power to these new facilities is required. Budgetary project costs for these improvements is estimated at $9,093,757.

3.8.1.2 Floridan Aquifer System

New Well Construction

Based on the evaluation in Section 3.5.24, the construction of five additional FA wells over the next 5 – 10 years is recommended to reduce individual well pumpage and more evenly distribute drawdown in the FA. However, it is noted that the actual timeframe for construction of the new FA wells construction may be adjusted dependent upon the potential reuse of NF concentrate as a feed water serving the RO treatment plant. The five proposed new FA production wells include RO-14, RO-15, RO-16, RO-17, and RO-18 and will make the total number of FA wells equal to 17 wells (12 existing and 5 proposed). Three new FA wells are in the design phase and slated for construction in 2022. Two of these wells are located in Jupiter Community Park (RO-15 and RO-16) and the third is located along the C-18 Canal Right of way (RO-14). Additional details for each proposed well are presented below:

- Proposed Well RO-14
  - Located within the C-18 Canal right of way.
  - Spaced approximately 2,500 feet south of existing RO-13.
- Proposed Well RO-15
  - Located in the SE corner of the JCP site.
  - Spaced approximately 2,500 feet south of RO-16; 4380 feet north of RO-10
- Proposed Well RO-16
  - Located in the NW corner of the JCP site.
  - Spaced approximately 2,500 feet north of RO-15; 2650 feet south Martin County

Other new FA future wellsite location options include Beacon Park (Beacon Park-1/RO-17 and Beacon Park-2/RO-18), and Hawkeye (RO-19).

Wells will be constructed within the FA at approximate depths between 1,020 feet and 1,660 feet with either PVC or FRP well casings. The estimated cost for well construction (not including final wellhead, pump, or raw watermains) is approximately $1.5 million per well. Engineering and construction management services will be required to support this construction work. Each proposed FA wellsite will require construction of wellsite mechanical, electrical and instrumentation components as well as extension of the FA raw watermain. Budgetary project costs for construction wells RO-14, RO-15 and RO-16 including well construction, wellhead, raw water piping is estimated at $12,865,938. Refer to Section 7 for budgeted project costs for well RO-18 and RO-19.

Well Operation Plan

Table 3-11 details a recommended FA system Operating Plan which includes the five new FA wells. This plan allows for the operation of wells RO-5 and RO-6, which have historically high chloride concentrations, to be pumped at a maximum of 0.5 MGD per well, and up to three FA system wells on standby.

Table 3-11: Town of Jupiter Proposed FA Wellfield Operating Plan

Well ID	Original Safe Yield (MGD	Current Yield (MGD	Proposed Safe Yield Goal (MGD	Comments
Existing Wells				
RO-2	1.7	1.1	1.1	Back plugged and Acidized 2021
RO-3	1.7	1.0	0.7	Back plugged and Acidized 2021
RO-4	1.6	1.4	1.5	Brought online Placed in service in 2020
RO-5	1.1	0.0	0.7	Limited by well water quality
RO-6	1.1	1.0	0.7	Limited by well water quality
RO-7	2.2	2.0	1.5	
RO-8	2.0	2.0	1.5	
RO-9	1.9	1.7	1.5	
RO-10	2.0	1.9	1.5	
RO-11	2.2	2.2	1.5	
RO-12	1.7	1.7	1.5	
RO-13	1.4	1.3	1.1	
New Wells				
RO-14	-	-	1.5	Anticipated in service in 2025
RO-15	-	-	1.5	Anticipated in service in 2025
RO-16	-	-	1.5	Anticipated in service in 2025
RO-17	-	-	1.5	Preliminary Location determined
RO-18	-	-	1.5	Preliminary Location determined
Total FA Raw Water Production	**20.5**	**17.3**	**22.5**	

3.8.2 Water Treatment Facilities

3.8.2.1 RO Phase 3 Improvements

The 2017 Master Plan Update recommended that improvements and additions be made to RO facilities in a three phased approach to address increasing salinity in the FA system raw water supply. Timing of the improvements were recommended to be constructed as required to operate the plant with higher raw water Total Dissolved Solids (TDS). Phase 1 of the program, which included replacement of membranes in RO Bank II (Trains E-H), has been completed. Phase 2 of the program, which includes replacement of energy recovery devices on all nine RO Trains and membrane replacements in Bank I (Trains A-D) and Train I, is underway.

The 2017 Master Plan Update Phase 3 recommended improvements are summarized as follows:

- Construct a booster pump station on the RO Water Treatment Plant (WTP) site which would boost raw water pressure upstream of the existing feedwater pumps. The pump station is recommended to boost the raw water pressure to 95 PSI, allowing all existing wells, feed pumps, raw water and treated raw water piping, fittings, and cartridge filters to remain in service. The booster pump station configuration would include in line piping to avoid introduction of air into the raw water and five 250 hp pumps with one pump as a redundant backup. It is anticipated that the raw water booster pump station would be installed south of the RO plant in the vicinity of the former sludge handling facility. If the future need for this booster pump station becomes a reality the RO feed pumps should be considered for a replacement study or modifications to determine if pressure needs can be achieved.
- The train feed water piping on all nine trains, including the Stage 1 feed manifolds and Stage 1 concentrate manifolds, will be replaced with piping that has a 450 PSI pressure rating.
- Stage 2 feed water and Stage 2 concentrate piping will be replaced with piping that has a pressure rating of 650 PSI.
- Bank II and Train I Stage 2 pressure vessels will be replaced with units that have a pressure rating of 600 PSI.
- Installation of second pass components on each of the existing RO trains. The second pass vessels will be housed in the unused Stage 1 locations. The second pass will use a new feed pump that discharges a metered flow of Stage 2 permeate through the second pass vessels. The expected flow rate of permeate through the second pass is approximately 150 GPM which requires approximately 4 membrane vessels.

The need, timing, and arrangement of the 2017 recommended modifications and improvements were reviewed and summarized in Kimley-Horn's Technical Memorandum (TM)– Conceptual Analysis of RO Phase 3, presented in **Appendix D**. Modified assumptions relative these proposed improvements are also summarized in the TM. It has been determined that the series of improvements recommended in the 2017 Plan update remain appropriate modifications needed to accommodate increasing high raw water TDS. The need to implement these improvements is entirely dependent on whether the raw water TDS increases and how quickly any increase occurs. Additionally, it is noted that the planned RO plant improvements intended to address increasing feed water TDS may be impacted by potential use of NF concentrate as a supplemental feed water supply. The current projection by JLA Geosciences indicates that the composite raw water TDS may reach 8,500 ppm by 2029. Phase 3 improvements are required when TDS exceeds 8,500 ppm. Budgetary project costs for implementing the new and modified facilities are estimated at $11,174,000.

3.8.2.2 Conversion from Chlorine Gas to Liquid Chlorine

Regulations for shipping, handling, and storing chlorine gas are becoming stricter, and it is appropriate to examine the current use of chlorine gas as the primary and secondary disinfectant at the water plant. The effects on plant facilities and water treatment processes that might occur if liquid chlorine is used instead of chlorine gas were examined as detailed in Kimley Horn's TM – Conceptual Analysis of Liquid Chlorine Conversion presented in **Appendix E**. It has been determined that conversion from gaseous chlorine to

liquid chlorine is a viable option for the Town. Converting from gaseous chlorine to liquid chlorine will involve several modifications to the existing facilities and treatment processes, including:

- Replacement of chemical storage tanks
- Replacement of chemical feed pumping system
- Modifications to control system
- Installation of chemical feed piping to application points
- Chlorine building modifications
- Chlorine scrubber demolition

Budgetary project costs for conversion of chlorine gas to liquid chlorine are estimated at $1,558,000.

3.8.2.3 Converting IX Facility to Calcite Contactor

A conceptual analysis of converting the existing IX Facility to a Calcite Contactor was performed. Refer to Kimley Horn's Technical Memorandum – Conceptual Analysis of Converting IX Facility to Calcite Contactor, presented in **Appendix F**. A calcite contactor provides an alternative treatment process approach to stabilize RO product water by the addition of hardness and alkalinity to the water. The pH of the RO product water is lowered and flowed through a bed of solid calcium material. The calcium material dissolves as the lower pH RO product water passes through it thereby increasing the hardness and alkalinity of the RO product water. This treatment practice is well known, and common applications use carbon dioxide to lower the pH and pass the water through a bed of calcite, or small particles of ground limestone. However, by converting the IX columns in this way, the overall treatment plant capacity will be reduced by 1.8 MGD.

Recent Disinfection Byproduct (DBP) testing in the distribution system indicated that system wide conversion to free chlorine may not be possible with current product water stabilization practices. It is recommended that improvements for converting the IX Facility to a Calcite Contactor remain a consideration that could be implemented if free chlorine becomes a viable option in the future. The need to implement these improvements is entirely dependent on future conditions in the distribution system that will allow implementation of converting to free chlorine as the secondary disinfectant. Implementing the change from IX treatment of SA system raw water to calcite treatment of RO product will require Implementation of NF Train 6 as well as SA system raw watermain improvements to replace the WTP rated capacity lost when IX is eliminated.

Budgetary project costs for future new and modified facilities required for conversion of IX facility to a Calcite Contactor are estimated at $14,260,000.

3.8.2.4 Relocation of Ammonia Addition Point to Transfer Pump Header

Under previous investigations for compliance with the Ground Water Rule, Hazen identified the need to relocate the ammonia addition point to the transfer pump discharge header at the NF clearwell. The current ammonia application point prohibits achieving the minimum contact time (CT) required for four-log certification with free chlorine. Relocation of the ammonia addition point allows the Town to achieve the

required CT with free chlorine prior to adding ammonia to form distribution system residual chloramines. This project will enable the Town to obtain four-log certification under the GWR (and exempt the Town from the triggered monitoring requirements under which the Town is currently operating). Additional information on GWR compliance is presented in Section 4.

The recommended ammonia injection location is shown on Figure 3 of the Assistance with four-Log Compliance Technical Memorandum dated April 3, 2020. This memo is provided as **Appendix G.** Subsequent to this memo, the Town further investigated and determined that bringing the transfer pump header above grade and locating the ammonia application point downstream of the transfer pumps would be more advantageous for the maintenance and operation of the system. The Town should continue planning capital budget for the revisions to the transfer pump header and ammonia application points. Budgetary project costs for improvements are estimated at $289,000.

3.8.3 Water Storage, Transmission & Distribution Facilities

Planning for water distribution system piping renewal and replacement needs is a critical element of the Town's Capital Improvements Program. As the Town has proactively replaced portions of the water distribution piping for the last several years, this Master Plan update continues the prioritization of the water pipe replacement projects based on age, line break frequency, level of service (pressure, flow, fire protection) and criticality of pipes. The age and condition of buried piping are key attributes to assessing water distribution system piping renewal and replacement needs. Planned distribution system renewal and replacement projects were previously identified and described in the 2017 Master Plan. The opinions of probable cost for renewal and replacement projects are presented in Section 7 - Recommended Capital Improvement Program of this Master Plan.

3.8.3.1 Advanced Metering Infrastructure (AMI) Improvements

Over the past 15 years the Town's water utility system has fully transferred from manually reading of meters to a system which allows for the reading of meters via a drive-by radio read system. While this radio-read system was a significant process improvement over in-person visits to each meter every month to obtain a single read, it too has its shortcomings. Technological improvements in utility meter reading have now progressed to systems providing far greater benefits. As such, it is recommended that the Town now undertake a program to systematically convert to the latest best management practice for the water meter reading industry known as Advanced Metering Infrastructure (AMI).

AMI provides improved system reliability & safety, enhanced operational efficiencies, conservation and leak/tamper detection. In comparison to the existing system employed by the Town, AMI will allow for a reassignment of labor due to efficiency gains so the utility can focus on other critical tasks. Additionally, the system upgrade would prove pivotal in minimizing system losses or non-revenue water losses which continue to rise as the Town's infrastructure ages. The system fully automates meter reading, billing and data collection processes making it a sustainable long-term solution for the Town's utility.

AMI is an integrated system of equipment, communications, and information management systems for utilities to remotely collect customer water usage data in real time. The Town's mechanical water meters installed at each service location, after which a meter interface unit receives a hardwired signal from the meter, converting this signal to a flow value, storing this flow value and then wirelessly (cellular)

transmitting the data to the information management system. Data can then be transmitted to the Customer Information Management System and into the Utility's Supervisory Control & Data Acquisition (SCADA) system.

Given the two-way communication established through the interface unit, the system can also be equipped to allow the utility to remotely control valves to shut off or turn on water service at a customer connection or detect meter tampering or potential system contamination sources via backflows remotely from the information management system. The real time notification of backflow from a customer connection and meter tampering is highly effective to protect the public health and safety as it could indicate accidental or intentional introduction of a contaminant into a water distribution system.

Beyond the obvious operational efficiencies and cost savings to the utility, the data gathered through the meters can also be relayed to the end user or customer to give them more insight into their water usage. This promotes transparency and such information access has become the norm while being a common customer expectation. With these data points, utilities can also improve messaging on water conservation and show how the customer compares to similar service installations in water usage. The customer portals provide data that is readily accessible by customers so they may view and manage their water usage as we all work to preserve our water resources.

To implement, it is recommended that the Town solicit proposals based on qualifications and price for the systematic conversion to an AMI system; evaluate proposals; select vendor through normal procurement and contracting; implement installation and business process transformation. The estimated annual cost for implementation of the AMI System over a ten year period is $1,502,218.

4. Regulatory Compliance Monitoring

4.1 Introduction

The Town of Jupiter (Town) remains governed by the federal Safe Drinking Water Act (SDWA[7]), as discussed in the previous updates to the Water Master Plan. The Florida Department of Environmental Protection (FDEP) has been granted authority by the United States Environmental Protection Agency (USEPA) to implement the SDWA. FDEP has promulgated rules in the Florida Administrative Code (FAC)[8] that meet and, in certain cases, exceed the requirements of USEPA regulations[9]. These regulations set legal limits for contaminants in drinking water and testing schedules and methods that water systems must follow. The Department of Health (DOH) in Palm Beach County (PBC) is the local regulatory authority for municipalities where the Town submits all regulatory and permitting documents as required by the SDWA and FAC. The Town's water system is currently in compliance with all Federal, State, and local regulations.

This section focuses on the Town's compliance with key existing water distribution system and water supply regulations including:

- Lead and Copper Rule
- Total Coliform Rule
- Disinfectants and Disinfection By-Products Rule
- Groundwater Rule

Additionally, this section evaluates the data for contaminants of emerging concern, including per and polyfluoroalkyl substances (PFAS), currently being monitored by the Town.

4.2 Lead and Copper Rule (LCR) Compliance

The Lead and Copper Rule (LCR) was published by USEPA in 1991, and the treatment technique for the rule requires water systems to monitor drinking water at customer taps in homes/buildings selected by the Town (and approved by FDEP). Lead and copper compliance monitoring requirements are established in FDEP Rule 62.550.800 FAC. Additional requirements for lead are established in FDEP Rule 62-550.513 FAC.

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[7] The SDWA is in Tile 42, United States Code (U.S.C.) §§300f-300j-26.

[8] The key Florida rules associated with the treatment and delivery of drinking water are in FAC 62-4, 62-550, 62-555, 62-602 and 62-609. Rules related to the water supply and underground injection control are in other sections of the FAC.

[9] USEPA regulations associated with the treatment and delivery of drinking water are in Volume 40, Code of Federal Regulation (CFR) Part 141 – National Primary Drinking Water Regulations and 40 CFR Part 143 – National Secondary Drinking Water Regulations.

The LCR established an Action Level (AL) of 15 µg/L for lead and 1.3 mg/L for copper; if these concentrations are exceeded in more than 10% of customer taps sampled, water systems must undertake additional actions to control corrosion. These actions include public notification, more frequent compliance and water quality sampling, lead service line replacement, and optimization of corrosion control treatment. The Town has remained in compliance with the LCR throughout the period for which data was reviewed (2013-2018) with 90th percentile lead and copper levels well below action levels. **Figure 4-1** and **Figure 4-2** present the 90th percentile lead and copper levels, respectively.

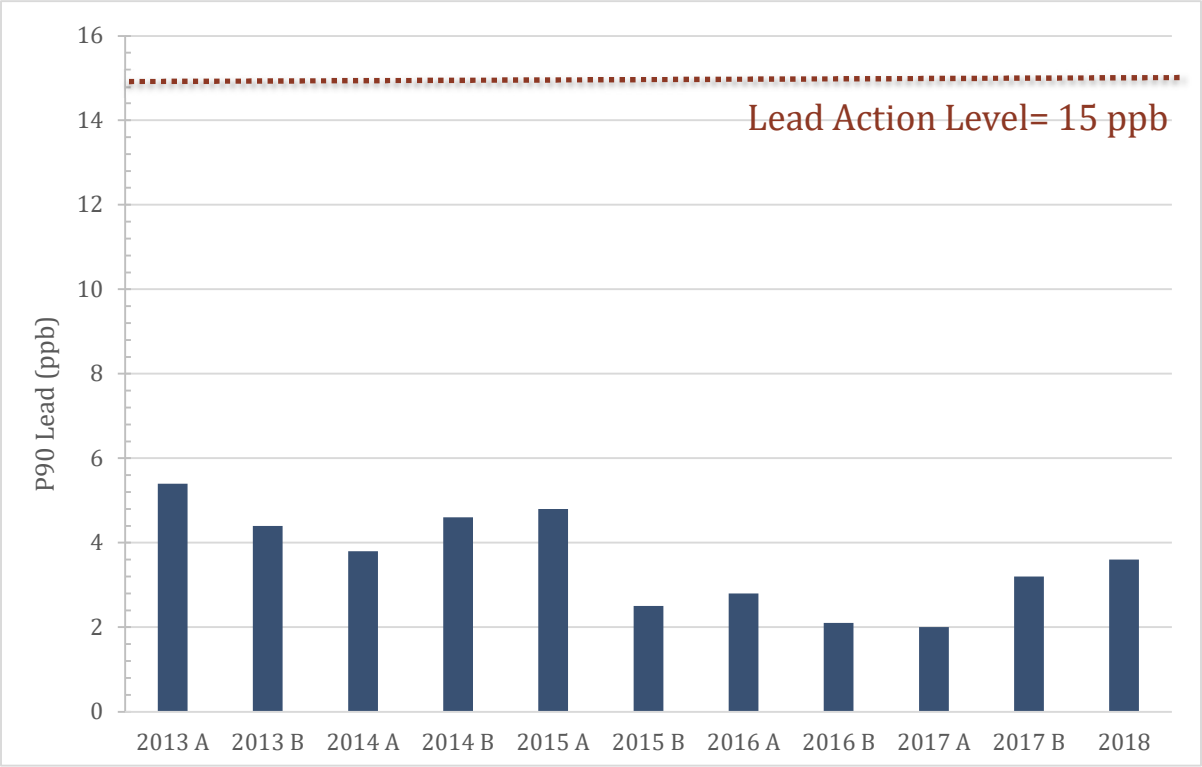

Figure 4-1: Town of Jupiter 90th Percentile Lead Levels

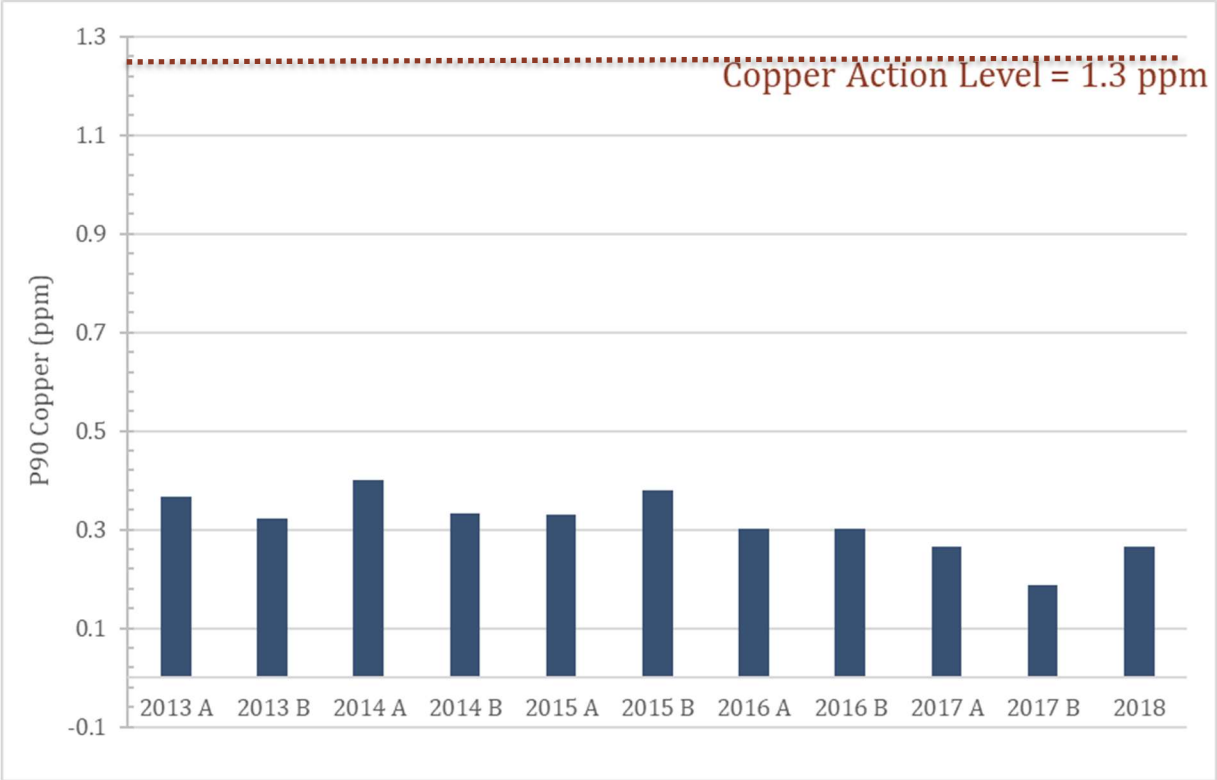

Figure 4-2: Town of Jupiter 90th Percentile Copper Levels

It is noted that the Town currently has a corrosion control plan approved by the DOH in Palm Beach. The Town's primary mechanism for corrosion control is utilization of a blended orthophosphate corrosion inhibitor along with pH adjustment and blending to achieve adequate re-mineralization of the finished water. In 2018, the Town was approved for reduced, triennial monitoring as a result of history of compliance and lead levels being consistently below 10ppb. A detailed discussion of the recently published Lead and Copper Rule Revisions (LCRR) is presented in Section 5.3.2. As discussed, it is anticipated that the Town will implement compliance recommendations, including but not limited to resuming routine monitoring, revise the existing sampling plan to incorporate schools and daycares, and developing a lead service line inventory.

4.3 Total Coliform Rule Compliance

The Total Coliform Rule (TCR), established under FDEP Rule 62-550.518 of the FAC to protect public health, imposed monitoring requirements for total coliform bacteria, including fecal coliforms and *Escherichia coli* (*E. coli*) in the distribution system. The revised TCR, which became effective on April 1, 2016, maintains the purpose of the TCR and further established a Maximum Contaminant Level (MCL) for *E. coli.* Under the revised TCR, water systems are encouraged to find and repair problems that could lead to fecal contamination and pathogens entering into the distribution system.

Town laboratory staff collect approximately 128 bacteriological samples monthly (routine and repeat), at representative sample locations throughout the distribution system. The Town has established a total of eight sample routes per month. Sample locations include private residences and commercial areas as well as Town and other governmental facilities. Residual combined chlorine and pH are also routinely monitored at these locations. Historical total coliform bacteria, residual combined chlorine and pH data for the period January 2016 through December 2020 were evaluated. **Figure 4-3** presents the Town of Jupiter Water Treatment Plant (WTP) distribution system TCR monitoring locations.

Based on review of the historical bacteriological data, the incidences of total coliform and/or *E.coli* positives were minimal throughout the study period. A total of 11 total coliform positive results were detected in a 5-year period or <1% of all samples; there were no *E.coli* positive results documented during the study period. During these occurrences, follow-up repeat sampling performed by Town laboratory staff invalidated the positive results. The Revised TCR requires, among other items, that no more than 5% of samples collected per month are positive for total coliform bacteria, and detection of E. coli in any samples would be a regulatory violation. The Town is in compliance with the Revised TCR.

The minimum and maximum residual combined chlorine levels measured at sampling locations during the five-year study period ranged from 0.45 mg/L and 4.7 mg/L, respectively. The highest running annual average of all residual disinfectant samples recorded for the year 2020 is 3.3. mg/L. The minimum and maximum pH levels measured at sampling locations during the five-year study period ranged from 7.6 and 8.5, respectively.

In addition to the combine chlorine concentrations monitored at the TCR locations, the Town performs daily grab sample monitoring of the total combined chlorine concentration in the finished water entering the distribution system. Residual chlorine monitoring requirements are established by the Florida Department of Environmental Protection (FDEP) rule 62-555.350(5) of the FAC. Total chlorine is also monitored using a total chlorine residual analyzer located at the end of the nanofiltration clearwell and represents finished water entering the ground storage tanks. Additionally, the Town also performs daily grab sample monitoring of the total combined chlorine concentration at a designated remote location in the distribution system. The Town's distribution system operations and maintenance staff analyze at least one grab sample collected daily from the "Little Club" designated Total Coliform Rule (TCR) location (most remote distribution system location). A review of historical data for the five year period January 2016 through December 2020 showed that the Town complies with residual disinfectant concentrations established under FDEP Rule 62-555.350(6).

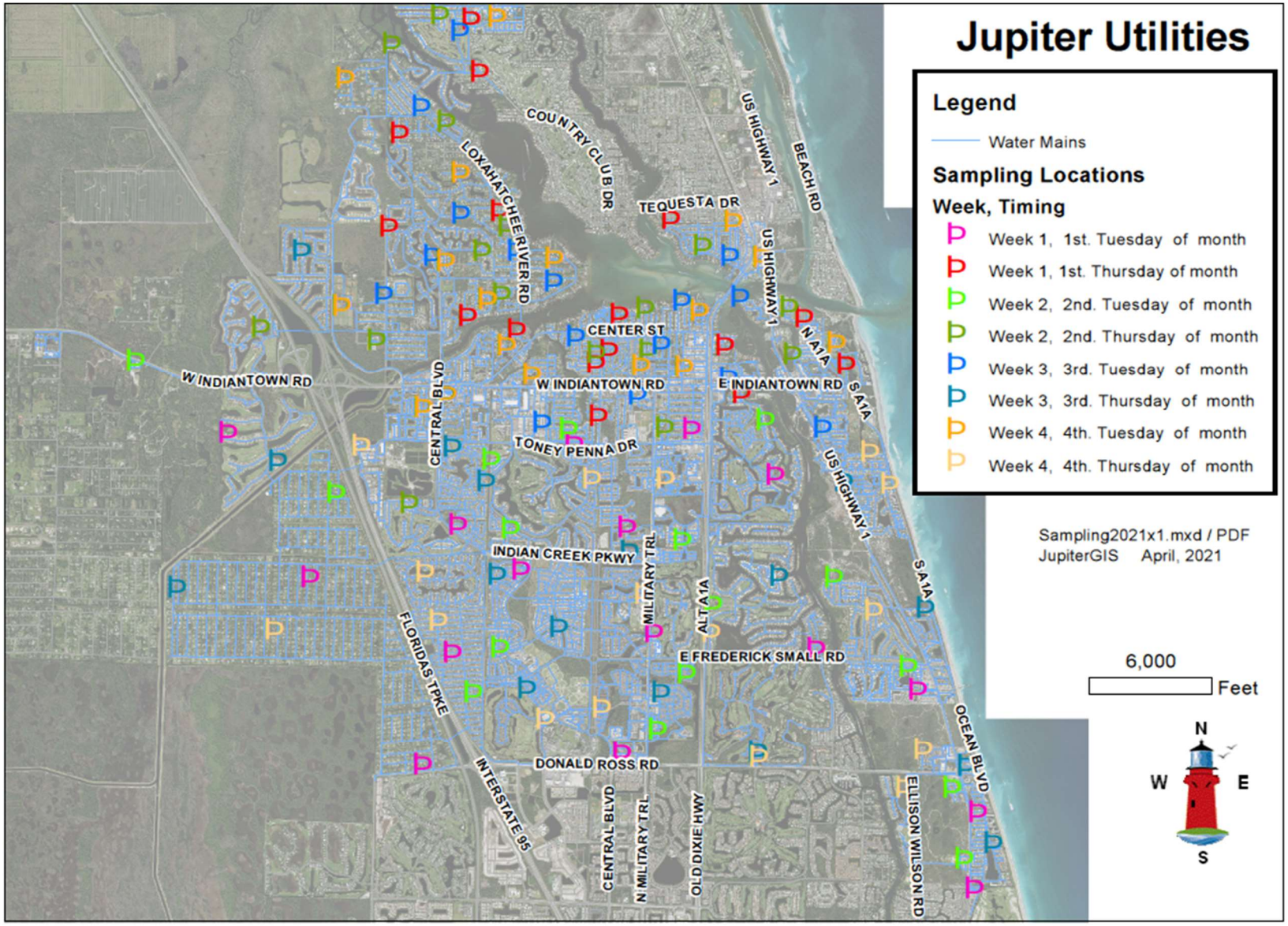

Figure 4-3: Town of Jupiter Compliance Monitoring Location

4.4 Disinfectants and Disinfection Byproducts Rules Compliance

The Town is required to comply with the Stage 1 and Stage 2 Disinfectants/Disinfection By-Products Rules (DBPR). The DBPR reduces drinking water exposure to disinfection byproducts (DBPs), which are known to form in treated drinking water after reacting with required disinfection. By-products such as total trihalomethanes (TTHMs) and haloacetic acids (HAA5) form from the reaction between residual chlorine disinfectant and natural organic matter (NOM) present in source waters, which is typically measured at total organic carbon (TOC). The Stage 2 DBPR Rule imposes more stringent limitations on the level of by-products in drinking water. Under the Stage 2 DBPR, compliance with the TTHM and HAA5 MCLs is determined through the use of Locational Running Annual Average (LRAA) values calculated at each monitoring location within the distribution system. The LRAA is defined as the average of analytical results for samples taken at a particular monitoring location during the current and previous three calendar quarters. Each LRAA must remain below the established MCLs of 80 ug/L and 60 ug/L for TTHMs and HAA5, respectively.

Both the nanofiltration (NF) and reverse osmosis (RO) treatment processes at the Town's WTP effectively remove NOM from the respective source waters producing treated water or permeate with a very low TOC. Utilization of treatment technologies that can effectively remove NOM whereby reducing or eliminating the reaction with chlorine disinfects is considered one of the best strategies to reduce formation of DBPs in finished drinking water. As such, DBPs formation exceeding the limits of Stage 2 DBPR is not likely to occur in the distribution system using either chloramines or free chlorine disinfection when operating the NF or RO treatment processes. The Town's treatment process also includes Ion Exchange (IX), which provides partial removal of negatively charged NOM using an anionic resin technology. The treated product has a measurable concentration of TOC, which reacts with chlorine disinfection to form higher DBPs. The IX treatment process has been maintained in a standby, ready reserve status by the Town since 2015; however, continued, periodic operation has proven valuable during periods of maintenance or repair that limit production from the RO and NF treatment processes. Since the IX process allows a greater passage of TOC, DBP formation exceeding the limits of Stage 2 DBPR could be a concern if the IX facility is operated during the use of free chlorine for distribution system maintenance. The long-term viability of the IX system and eventual replacement are discussed within the Master Plan due its treatment limitations.

The Town performs quarterly Stage 2 DBPR compliance monitoring for TTHMs and HAA5s at geographically representative sampling locations within the distribution system and in accordance with the Town's FDOH in PBC approved monitoring plan. Stage 2 DBPR compliance monitoring locations are referred to as:

- Olympus
- The Bluffs
- Little Club
- Juno Beach

An evaluation of historical TTHM and HAA5 data, from the five-year period between January 2016 and December 2020 was performed to determine compliance with the Stage 2 D/DBPR. The LRAA for TTHM and HAA5 at each monitoring location was determined. **Figure 4-4** and **Figure 4-5** present the historical LRAA for TTHM and HAA5 during the period January 2016 through December 2020. As shown, the LRAA for TTHMs and HAA5 concentrations in the distribution system are well below the MCL of 80 ug/L and 60 ug/L, respectively. The 2016 TTHM results included in **Figure 4-4** illustrate slightly higher concentrations, which reflect the continued, regular operation of the IX treatment process through the end of 2015, which resulted in higher TTHM formation. As the IX system was transitioned to a ready-reserve status, the TTHM concentrations decreased and have remained steady since that time.

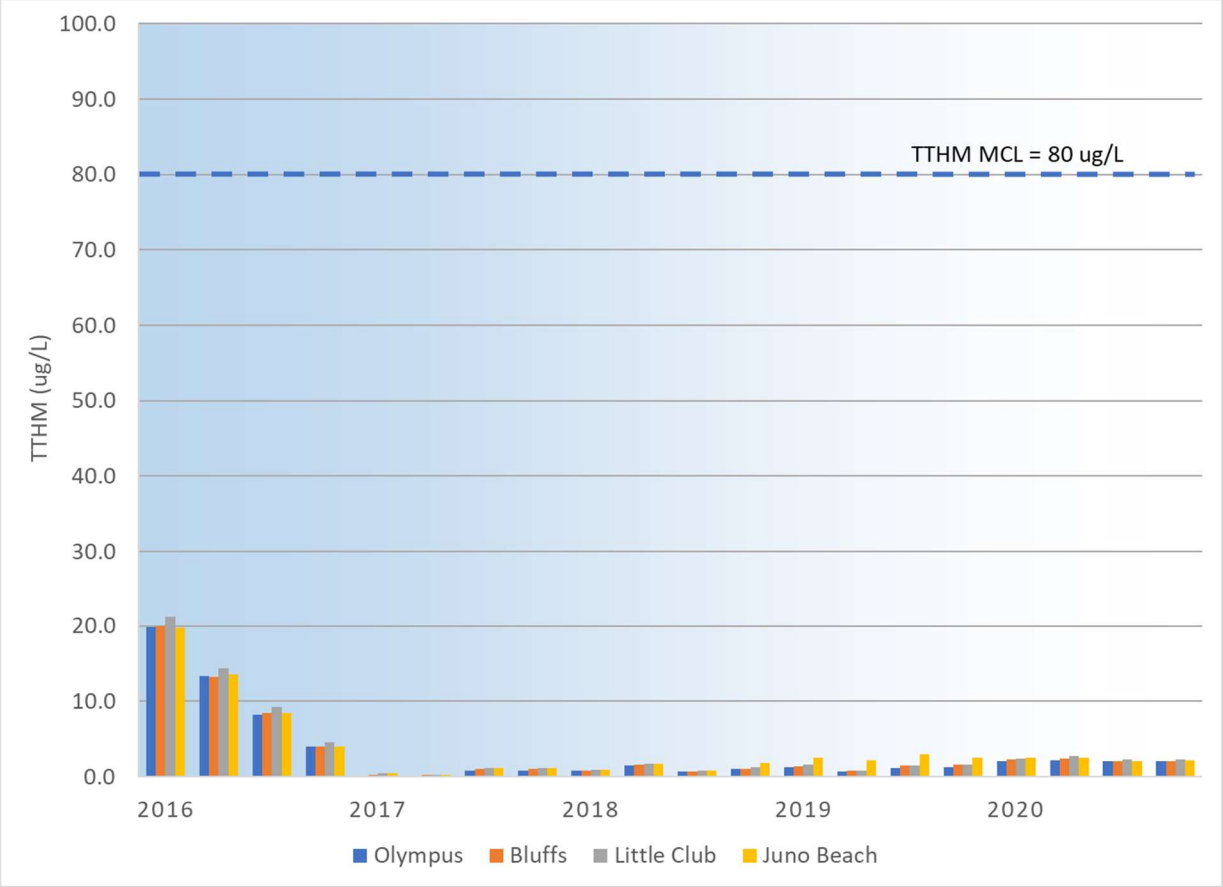

Figure 4-4: Historical Locational Running Annual Average (LRAA) for TTHM

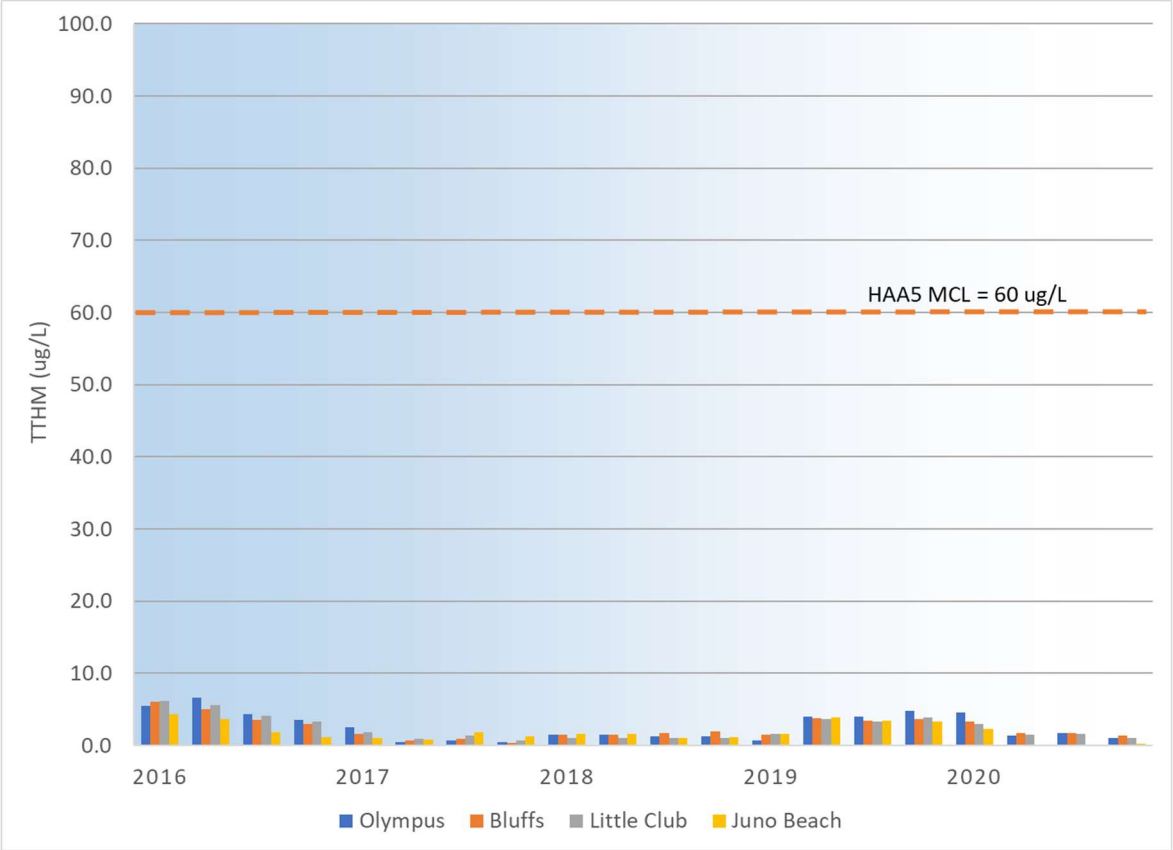

Figure 4-5: Historical Locational Running Annual Average (LRAA) for HAA5

4.5 Groundwater Rule (GWR) Compliance

The USEPA developed the Ground Water Rule (GWR) to extend microbial treatment and disinfection requirements for WTPs treating ground water sources. Similar to other federally mandated drinking water regulations, primacy or enforcement of the GWR is delegated to the FDEP. The GWR was published in 2006, and FDEP began enforcement in late 2009. The GWR establishes a risk-based approach to identify and target groundwater systems susceptible to microbial contamination and implement corrective actions to minimize the public's exposure to harmful bacteria. There are four major components to this rule:

1. Routine sanitary surveys of raw groundwater sources to "find" and "fix" sanitary deficiencies that may contribute to microbial contamination

2. Corrective actions for systems with significant sanitary deficiencies and/or fecal contamination of raw water

3. Triggered source water monitoring for systems that detect total coliform bacteria in treated water and have not received certification that the treatment process provides 99.99% removal and/or inactivation of bacteria and viruses (e.g., four-log certification)

4. Compliance monitoring for four-log certified systems that demonstrate reliable and continuous removal and/or inactivation of bacteria and viruses

Under the GWR, all WTPs must comply with components 1 and 2; however, WTPs achieving four-log virus treatment are exempt from the "triggered" source water monitoring requirements or component 3. Gaining exemption from the triggered monitoring requirements is an appropriate objective for WTPs, such as the Town, which have multiple supply wellfields with over 60 production wells. Presently, the Town is in full compliance with the terms of the GWR by following the "triggered" monitoring approach.

The Town has been proactive in pursuing four-log virus treatment certification under the GWR working collaboratively with the DOH in PBC, who is the local regulatory authority reviewing and providing four-log certification for WTPs. The Town has submitted three applications, to date, with a fourth application underway, but has encountered various challenges in obtaining final approval due to upgrades in treatment processes, modification of in-plant blending and flows of treated water as well as staff changeover at the DOH in PBC. In each instance, the Town must revise and/or re-submit its application for review. Four-log certification would allow the Town to follow a separate compliance track as described in component 4 above. There are advantages to this compliance track, which reduce resources necessary to complete triggered source water monitoring of over 60 production wells and enhanced consumer confidence that comes with four-log certification or demonstrated, reliable and continuous removal of potential microbial contaminants.

There are various mechanisms that a WTP can use to demonstrate four-log treatment, which include virus removal by physical processes such as filtration or membrane treatment and/or virus inactivation by disinfection. Each unit process or disinfection step is awarded log-removal credit, and the requirement for certification is that the sum of log credits for each process must equal at least four-log. The EPA left determination of the log removal credits for various processes under the GWR to State and Local regulatory authorities, and there is not uniform approach especially concerning removal credit for membrane treatment.

The FDEP requires direct membrane integrity testing and with associated monitoring of RO and NF processes to receive four-log treatment credit. While membrane processes provide a high level of treatment and consistent rejection of various contaminants, direct integrity testing of RO and NF membranes, as defined by regulatory authorities, is typically not feasible. Alternatively, the FDEP allows up to two-log credit for RO and NF treatment as long as the membrane characteristics provide at least 75% salt rejection or no more than 25% maximum salt passage. NF membranes typically do not provide this level of salt rejection as they are designed for treatment of water with high color, iron and total organic carbon and not salt rejection. The 25% maximum salt passage requirement is an arbitrary limit imposed by the FDEP Draft Guidelines for Four-Log Virus Treatment of Ground Water, and therefore eliminates NF membrane technologies from receiving removal credit for viruses and bacteria despite the high level of water treatment that the technology provides. The Town's NF WTP utilizes a membrane that does not meet the salt rejection requirements and therefore is not eligible to receive any log removal credit. The remaining treatment processes, RO and IX, are blended with the NF permeate, which also eliminates consideration for any log removal credit. Thus, four-log virus treatment must be achieved entirely by chemical disinfection and virus inactivation in the blended finished water at the Town's WTP.

4.5.1 Four-Log Virus Inactivation Requirement

The four-log virus inactivation requirement by chemical disinfection is established by a minimum "CT" value that must be met. CT is the product of disinfectant concentration, C, in mg/L and contact time, T, in minutes. The CT required is a function of the following variables:

- Type of disinfectant
- Water pH during disinfection contact time
- Minimum temperature

The type of disinfectant is the most critical factor. For instance, the CT required to achieve four-log inactivation by chloramines is about 250 times higher than that for free chlorine, the other two variables being equal, because chloramines are a weaker disinfectant than free chlorine. Thus, WTPs benefit from utilizing free chlorine as a primary disinfectant within the treatment facilities when it is necessary to achieve four-log certification by chemical disinfection alone.

A free chlorine or chloramines disinfectant residual may be used in distribution systems as a secondary disinfectant. The type of secondary disinfectant utilized by WTPs is site specific and dependent on raw water source, treatment technologies, and size of distribution systems. While free chlorine is considered a stronger disinfectant, it reacts with naturally occurring organic matter in water supplies to form DBPs as discussed in Section 4.4. Additionally, free chlorine can impart taste and odor into the finished water product, which may affect consumer confidence. For these reasons, municipalities may rely on chloramines for secondary, residual disinfection in distribution systems. While chloramines are a weaker oxidant than free chlorine, they form fewer DBPs and impart minimal taste and odor to the finished water. Chloramines can also be advantageous as they are a more stabilized disinfectant and persist longer in high water age areas.

The Town's WTP treatment processes consist of NF, RO and IX with free chlorine as a primary disinfectant within the treatment process. Chloramines are formed through addition of ammonia prior to water storage and distribution. The current ammonia application point prohibits achieving the minimum CT required for four-log certification with free chlorine. The Town may relocate the addition of ammonia such that the required CT is achieved with free chlorine prior to forming chloramines as the residual disinfectant. This would permit the Town to obtain four-log certification under the GWR.

As an alternative to chloramines, the Town also considered the use of free chlorine as the residual disinfectant. The Town recently completed DBP formation potential studies to evaluate the potential regulatory impacts of converting to free chlorine. Based on the DBPs results, the Town has determined that free chlorine would not be a viable option at this time, when the IX system is in operation.

Relocation of the ammonia addition point to achieve the required CT is the recommended solution for pursuing four-log virus certification for the Town's WTP. Additional details on the WTP modifications required to achieve four-log compliance with GWR were previously presented in Section 3.8.2.4.

4.6 Unregulated Contaminant Monitoring Rule (UCMR)

The USEPA requires that potable drinking water utilities monitor for compounds being considered for future regulation, also referred to as contaminants of emerging concern (CECs), under the Unregulated Contaminants Monitoring Rule (UCMR). The UCMR program was developed in coordination with the Contaminant Candidate List (CCL) after amendments to the 1996 SDWA and Section 2021 of America's Water Infrastructure Act of 2018 (AWIA). UCMR establishes a program to monitor for CECs included in the CCL every five (5) years. The CCL includes numerous chemical and microbiological contaminants for which sufficient national occurrence or health-based standards data are not yet available, but preliminary research has indicated potential exposure and harmful human health effects. Primacy or UCMR implementation is delegated to State and Local agencies, which include the FDEP and DOH in PBC. In order to collect critical data necessary to understand occurrence, public health significance and potentially establish health advisory levels (HALs), the Town has regularly participated in the UCMR since the initial program cycle in 2001.

The 5th UCMR was published in December 2021 and requires monitoring for 29 per- and polyfluoroalkyl substances (PFAS), and lithium between 2023 and 2025. PFAS are a group of man-made chemicals that includes PFOA[10], PFOS[11], GenX, and many other chemicals. PFAS were historically manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. PFOA (Perfluorooctanoic acid) and PFOS (perfluorooctanesulfonic acid) were the most extensively produced and studied of these chemicals. GenX, Chemours' trademark name for a short-chain PFAS compound (ammonium salt of hexafluoropropylene oxide dimer acid (HFPO-DA) fluoride), has more recently been included in research studies as a related PFAS compound with similar environmental occurrence. PFAS chemicals are very persistent in the environment and in the human body – meaning the chemicals do not break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects. Additional discussion on PFAS and other CECs are included in Section 5.

Understanding the importance of long-term sustainability, the Town has emphasized the importance of preparation for the ever-changing and increasingly stringent regulatory landscape. While UCMR requires for monitoring of CECs, this evaluation is typically limited to treated water supplies. Additional monitoring for and detection of CECs in raw or untreated water supplies allows utilities to better understand risk and vulnerability, plan for future, additional treatment needs, and/or improve wellfield protection ordinances to reduce contamination of raw water supplies. This becomes more significant as future regulations not only include new contaminants, but revisions to existing rules where known contaminants are regulated at even lower levels. As such, the Town has been monitoring its raw water supply for CECs in addition to treated, finished water under the UCMR to improve its understanding of the potential, long term treatment challenges.

[10] PFOA CAS No. 335-67-1

[11] PFOS CAS No. 1763-23-1

4.6.1 Contaminants of Emerging Concern (CECs)

The Town extended CEC monitoring to include raw water supplies during the planning and design phases for the NF water treatment plant in 2006-08. The source water for this treatment process is the surficial aquifer, a shallow, unconfined groundwater supply most susceptible to contamination. During this time, the body of knowledge relative to CECs was growing where chemicals were being discovered in water that previously had not been detected due in part to improvements in laboratory methods and the ubiquitous use of pharmaceuticals and products containing suspected endocrine disrupting properties. At that time, CECs of interest primarily included pharmaceuticals and personal care products (PPCPs) and endocrine disrupting chemicals (EDCs), which had been detected in untreated and treated waters as well as reclaimed or treated wastewater. More recently, CECs have shifted to industrial by-product chemicals like PFAS due to their persistence in the environment and growing evidence that they are harmful to health. Motivated by the knowledge gaps that exist in this field of research, the Town wanted to determine the source, presence and extent of CECs in their surficial aquifer (SA) water supply and assess the ability of the proposed NF process at removing CECs. Further, the Town understood that proactive information gathering would allow for transparent communication with the public helping to guide and positively influence the perception and reaction to CECs in the environment. As understanding improved, the Town could begin long term planning for treatment and environmental protection in order to reduce potential risk to the population.

During the initial screening evaluation, a total of 32 CECs were analyzed, with the majority of compounds being classified as PPCPs, in the untreated surficial aquifer and treated water from the NF pilot test unit. Understanding the potential relationship between reclaimed or irrigation quality (IQ) water and the SA water, the IQ water was also sampled during this initial research. As illustrated in **Figure 4-6,** more than half of the Town's wellfield is located in the vicinity of reclaimed water used to meet irrigation needs. Approximately 50% of the CECs (17 of the 32) were detected in the reclaimed water, and three CECs were detected in the surficial aquifer, but rejected by the NF membrane treatment process. Based on the limited data set, few compounds from the reclaimed water were transported into the aquifer and were likely transformed or degraded as they traveled through the environment. Further, the majority of compounds detected were pharmaceuticals or PPCPs for which an abundance of data is available for health effects, and the detected concentrations were several orders of magnitude below the minimum therapeutic dosages.

After this initial screening, the Town modified its list of CECs to shift focus towards contaminants included in the UCMRs such as industrial by-product chemicals like 1,4 Dioxane and PFAS compounds. National focus was moving towards these contaminants due to their ability to persist and accumulate in the environment along with the likelihood for adverse health effects even at very low concentrations. The Town's long-term chloride or salt concentrations in the SA production was observed to increase over time and was most apparent at wells primarily located in the vicinity of reclaimed water used for irrigation. **Figure 4-7** illustrates the trend of these wells, which are located inland and not at-risk for saltwater intrusion. Although the initial screening for PPCPs indicated minimal influence from reclaimed water, this observation suggested the potential for transport and accumulation of environmentally persistent CECs from reclaimed water to the surficial aquifer.

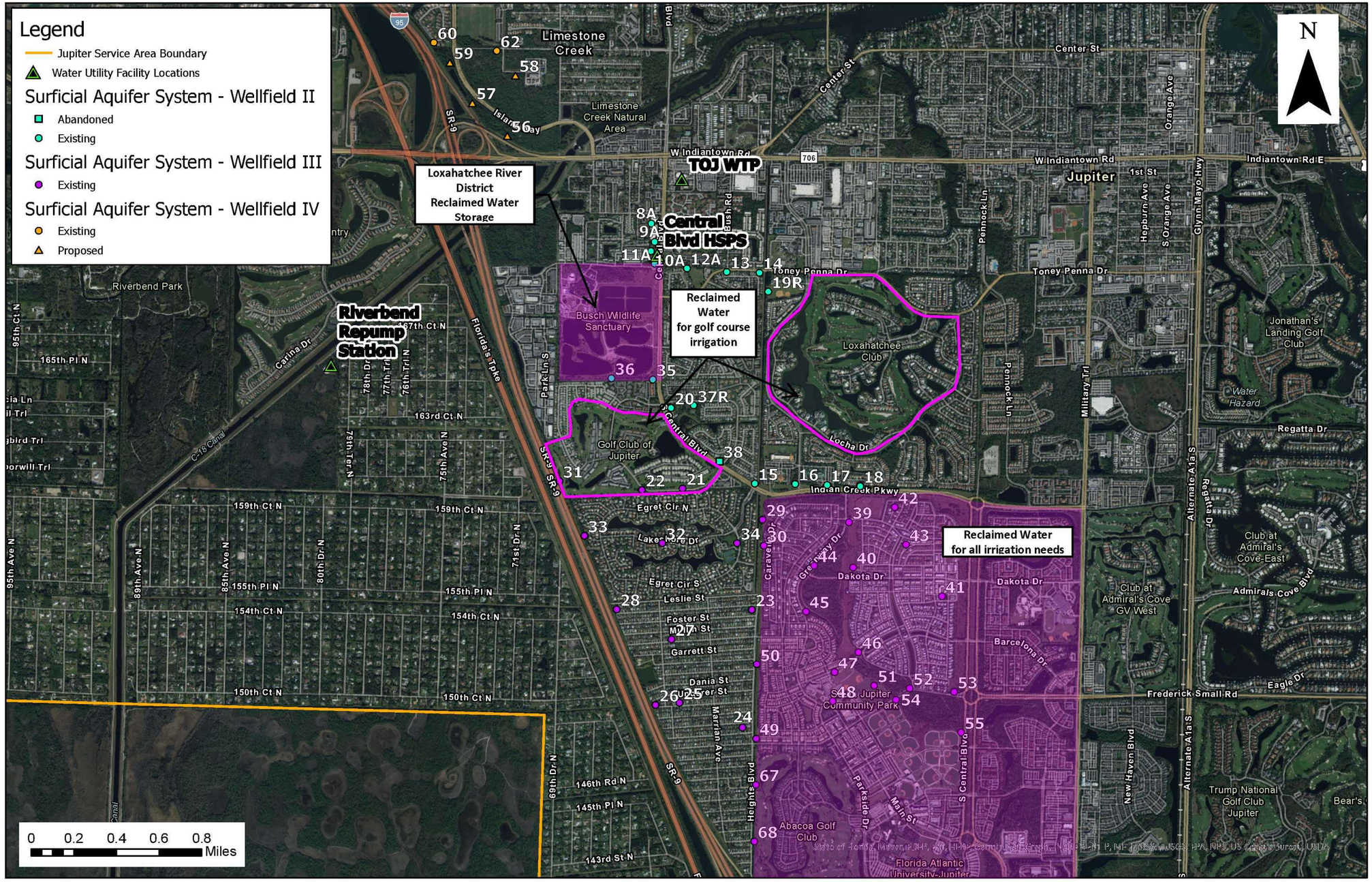

Figure 4-6: Town of Jupiter Reclaimed Water Irrigation System

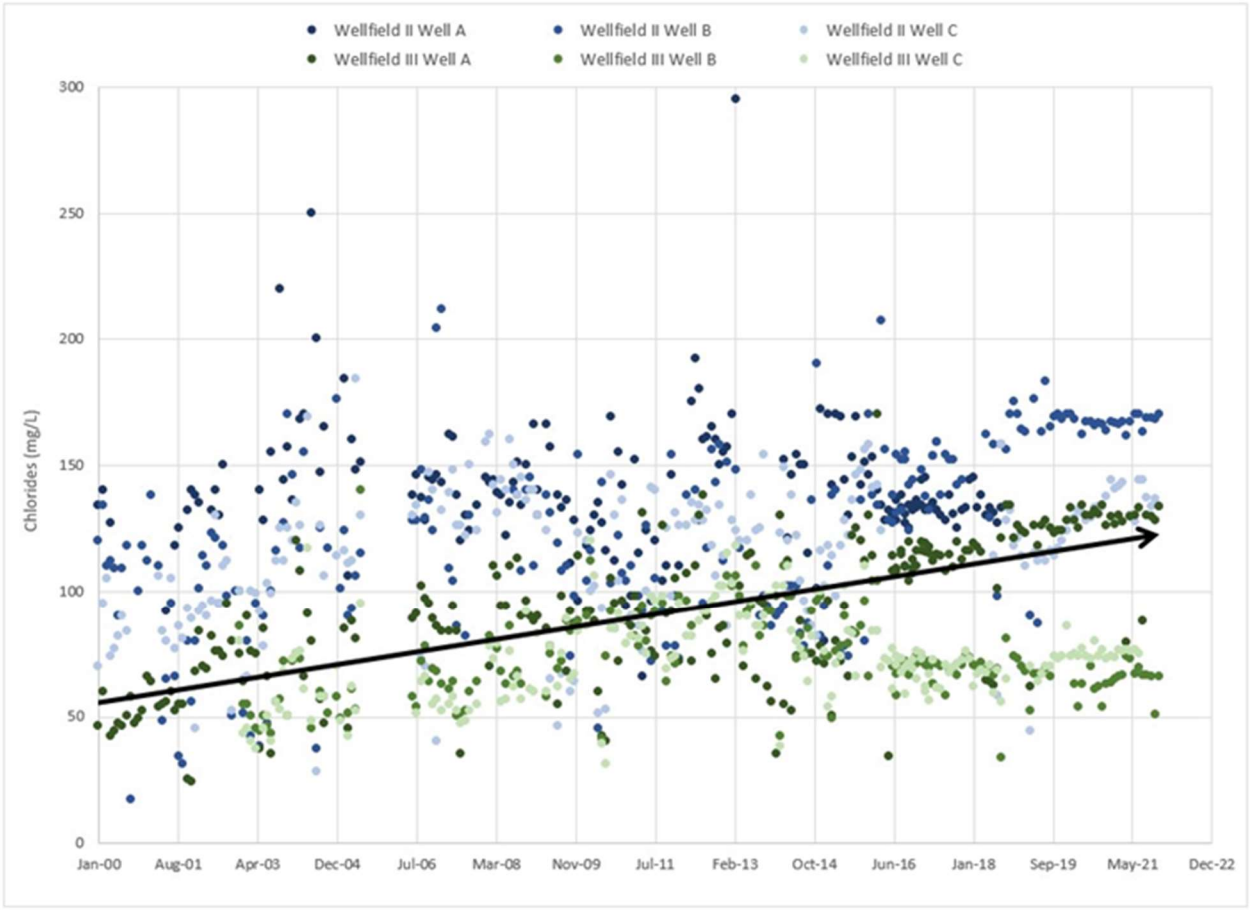

Figure 4-7: Historical Trend of SA Wells in Vicinity of Reclaimed Water Irrigation

Since 2014, the Town has evaluated reclaimed or irrigation quality water, the surficial aquifer raw water supply, NF permeate, IX treated water and final treated water for a variety of groups of CECs including pharmaceuticals, heavy metals, pesticides, and industrial by-products like 1,4 Dioxane and PFAS compounds. Samples have been collected during wet and dry seasons to coincide with the expected variability in irrigation water demand and typical aquifer water levels; evaluation included surficial aquifer wells located within and outside the vicinity of reclaimed water. CECs have been consistently well rejected by the NF process and undetected in the final treated water throughout all sample events. CECs were detected at varying levels in the reclaimed water, surficial aquifer wells and IX treated water where the highest levels and consistent detections included reclaimed water and surficial aquifer wells located in the vicinity of reclaimed water. It is important to note that the IX system is not expected to effectively reject CECs, and it is for this reason and others that discussion on its future replacement is included in Section 3.8.2.3. **Table 4-1** summarizes the data collected, to date, concerning CECs, where Wells B and C are within the vicinity of reclaimed water; Well A is outside the vicinity of reclaimed water.

Table 4-1: Town of Jupiter Summary of Historical CECs

Compound	IQ Water	Well C	Well B	Well A	Raw Composite	NF Permeate	IX Effluent	Finished Water
Atrazine	x	x	x	x	x	x		x
Bisphenol A	x	x	x	x	x	x		x
Caffeine	x	x	x	x	x	x	x	x
Carbamazepine	x	x	x	x	x	x	x	x
Deet	x	x	x	x	x	x	x	x
Diazepam	x	x	x	x	x	x	x	x
Estrone	x	x	x	x	x	x		x
Gemfibrozil	x	x	x	x	x	x		x
Iopromide	x	x	x	x	x	x		x
Isophorone	x	x	x	x	x	x		x
Meprobamate	x	x	x	x	x	x	x	x
Methadone	x	x	x	x	x	x	x	
Naproxen	x	x	x	x	x	x		x
Oxybenzone	x	x			x			
Pentoxifylline	x	x			x			
Salicylic Acid	x	x			x			
Sulfamethoxazole	x	x	x	x	x	x	x	x
Trimethoprim	x	x	x	x	x	x	x	x
Sucralose	x	x	x	x	x	x	x	x
Gadolinium	x	x	x	x	x	x	x	x
Hexavalent Chromium	x	x	x		x	x	x	x
Cobalt	x	x	x	x	x	x	x	x
1,4 Dioxane	x	x	x	x	x	x	x	x
PFOS	x	x	x	x	x	x	x	x
PFOA	x	x	x	x	x	x	x	x

Key	
X	Analyzed
	Not Detected
	Detected <50% of Events
	Detected >50% of Events
	Detected 100% of Events

Among other CECs, the consistent detection of PFAS compounds present a potential vulnerability as EPA has made a regulatory determination to establish a MCL for the PFAS compounds, PFOA and PFOS, which is expected to be less than the current HAL of 70 ng/L. The average combined concentrations of PFOA and PFOS are summarized in **Figure 4-8** for analyzed samples, which are less than the HAL for potable water samples. However, the combined total of all 29 PFAS compounds currently under EPA review exceeds the 70 ng/L HAL in the IQ water. While the Town's NF process has been shown to reject CECs at current levels, effective treatment is expected to diminish at increasing contaminant concentrations based on pilot study evaluations, which can be problematic should contaminants accumulate over time. The length of this research and database size is not sufficient to draw firm conclusions on long term impacts including accumulation of contaminants or potential for increasing trends of PFAS compounds. The Town is committed to providing safe drinking water to its customers and will continue to monitor levels of CECs in its water system as discussed in Section 5. Additionally, pilot level research will continue to better understand the relationship between increasing raw water CEC concentrations and effective rejection of contaminants by the NF process.

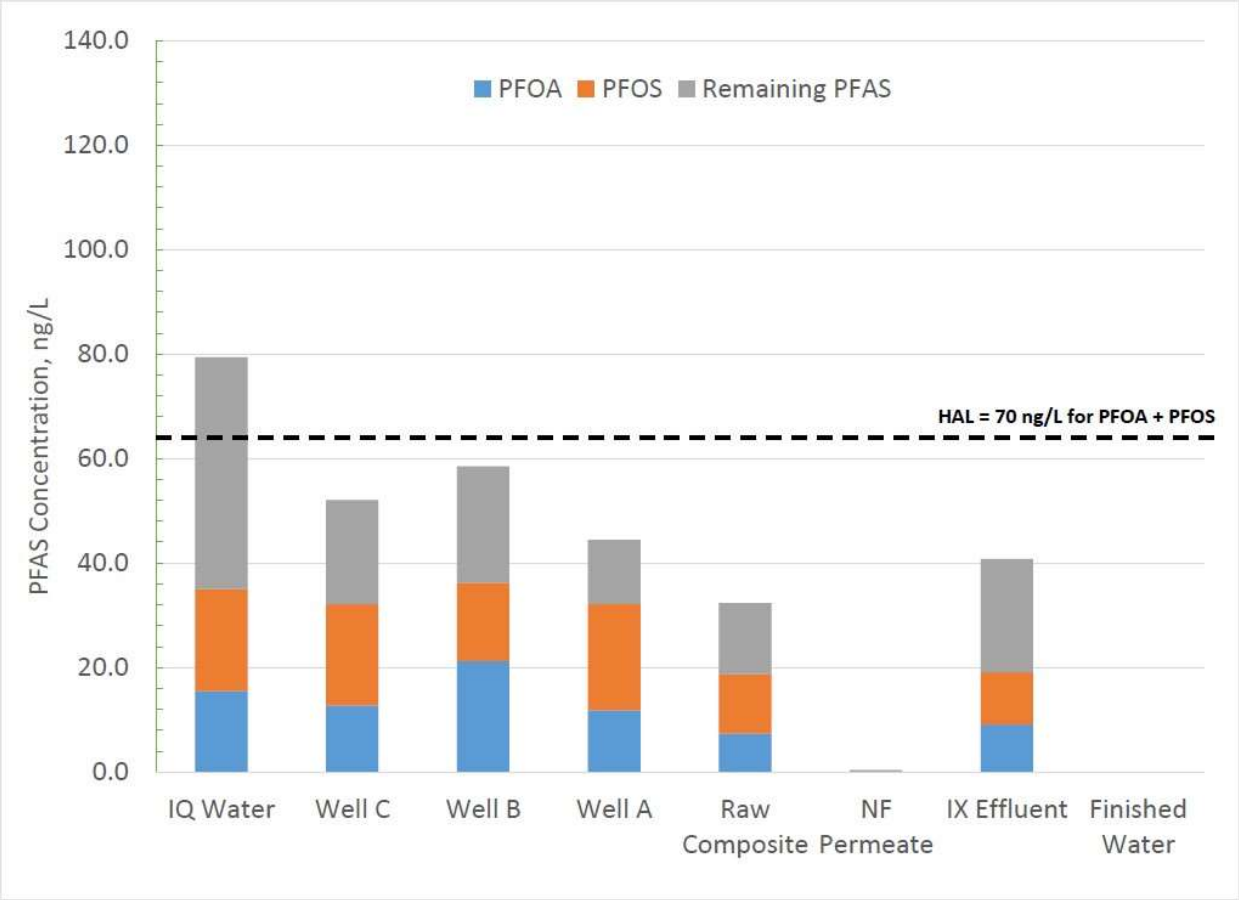

Figure 4-8: Town of Jupiter Average Combined Concentration of PFAS Compounds

5. Future Water System Challenges

5.1 Introduction

This section identifies the key future water system challenges facing the Town of Jupiter (Town) and provides recommendations for dealing with these challenges to ensure that the Utility will continue to maintain a sustainable, safe and reliable drinking water system. It is noted that the costs presented in this section are based upon year 2021 dollars and do not include escalation for inflation. For a complete list of the Town's ongoing and new capital improvement requirements refer to Section **7** – Recommended Capital Improvement Program.

5.2 Sustainability of Current Water Supply Sources

5.2.1 Floridan Aquifer System

The Reverse Osmosis (RO) plant is capable of producing 13.7 million gallons per day (MGD) of finished water. Considering a 75% recovery rate, 18.27 MG of raw water is required to meet WTP capacity. The current South Florida Water Management District (SFWMD) Consumptive Use Permit (CUP) permitted allocation allows for a maximum daily withdrawal from the Florida Aquifer (FA) of 18.44 MGD (max month basis).

Based on the 2021 Lower East Coast (LEC) Water Supply Plan Update, the anticipated Town of Jupiter (Town) Water System peak water usage needed at buildout is estimated to be 32.3 MGD on a maximum day; and 26.4 MGD on an average day. To achieve the desired water quality, a balance of water is produced by nanofiltration (NF) treatment supplied by Surficial Aquifer (SA) wells and RO treatment supplied by the FA wells. This includes an approximate blend ratio of 55% NF product water and 45% RO product water (conservative but simplified for this discussion). This is based on existing well capacities of approximately 2 MGD per well. These existing flow rates have contributed to degradation of raw water quality and need to be reduced. At this time, it is estimated that the Town's FA wells should be pumped at 1-1.5 MGD max flowrate based on individual well specific capacities. The change in recommended safe yield will reduce total FA raw water production from 20.5 MGD to 16.0 MGD and as such the excess capacity will be lost. As previously discussed in Section 3, additional FA wells are required to increase the Town's overall raw water capacity, provide a reduction in raw water TDS and is critical to meet current and future raw water demands.

5.2.2 Surficial Aquifer System

Each individual wells useful life projections, responsiveness to well rehabilitation and current performance will be used to make informed decisions regarding future well replacement projects. Site accessibility is another challenge for future well replacement projects since existing well sites are located in residential areas with relatively small well sites and restricted work areas. The diverse array of challenges for future SA well replacement projects will be overcome with site specific designs and a diverse set of technical approaches to tackle each problem. At locations where adjacent well

Job No. 44250-069

replacements are not feasible other methods of well design including in-place overdrilling; cost effective in-place well screen replacements; well casing liners for sealing off high sand production zones or damaged casings; large slot well screen replacements for underperforming screened wells will be explored. Through the consideration of a diverse array of well replacement options on a site specific basis, the Town will be able to effectively meet the challenges of future well replacement projects.

5.2.3 Hydraulic Model Evaluations

5.2.3.1 Surficial Aquifer System Raw Water Main

The Town's SA system wellfields include a 24-inch raw water transmission main that extends from the water plant south along Central Blvd to Indian Creek Blvd and then continues south along the North Palm Beach Heights Outfall Canal, and south down Greenway Drive into Abacoa. Velocities through the 24-inch SA system raw watermain located along Central Blvd. range from 8 – 9 feet per second (fps). These elevated velocities produce high pressures at the southernmost well sites which require higher horsepower well pump motors and higher operating costs in terms of electrical power consumption. Several potential improvements were reviewed to increase the efficiency of the well pumping system, including addition of a new raw watermain, paralleling of existing water main and addition of a booster pump station. For additional information on potential improvements, refer to **Appendix H** - Technical Memorandum, "SAS Raw Water Main Hydraulic Investigation and Improvements" prepared by Kimley-Horn.

The payback period for the new parallel raw watermain exceeds the service life of the new raw watermain. Due to the payback period, the installation of a parallel raw watermain is not recommended at this time.

The Town has assigned a service life of 45 years to underground watermains. The existing 24-inch raw watermain along Central Blvd. from Well 15 to Toney Penna Drive was installed in 1982 and will reach its useful service life in 2027. The existing 24-inch raw watermain along Central Blvd. from Toney Penna Drive to the Water Plant was installed in 1979 and will reach its useful service life in 2024. The findings of this investigation indicate that the replacement pipe should be a 30-inch diameter DIP or PVC C-905 raw watermain. Due to the many utilities that are constructed within the Central Blvd right-of-way it will be very difficult to find an alignment to construct a replacement raw watermain while maintaining service of the existing raw watermain to be replaced. For this reason, it was recommended that the alignment be along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive, west along Toney Penna Drive to Bush Road, Bush Road north to Atria Park of St Josephs, west in an existing utility easement in front of Atria Park of St Josephs and continue west behind Publix within existing utility easements and extend into the Water Plant (refer to **Figure**) for the replacement raw watermain. This alignment will allow the construction of the new raw watermain while maintaining service of the existing raw water main through the construction duration. The cost for this proposed improvement is estimated at $6,292,800.

Job No. 44250-069

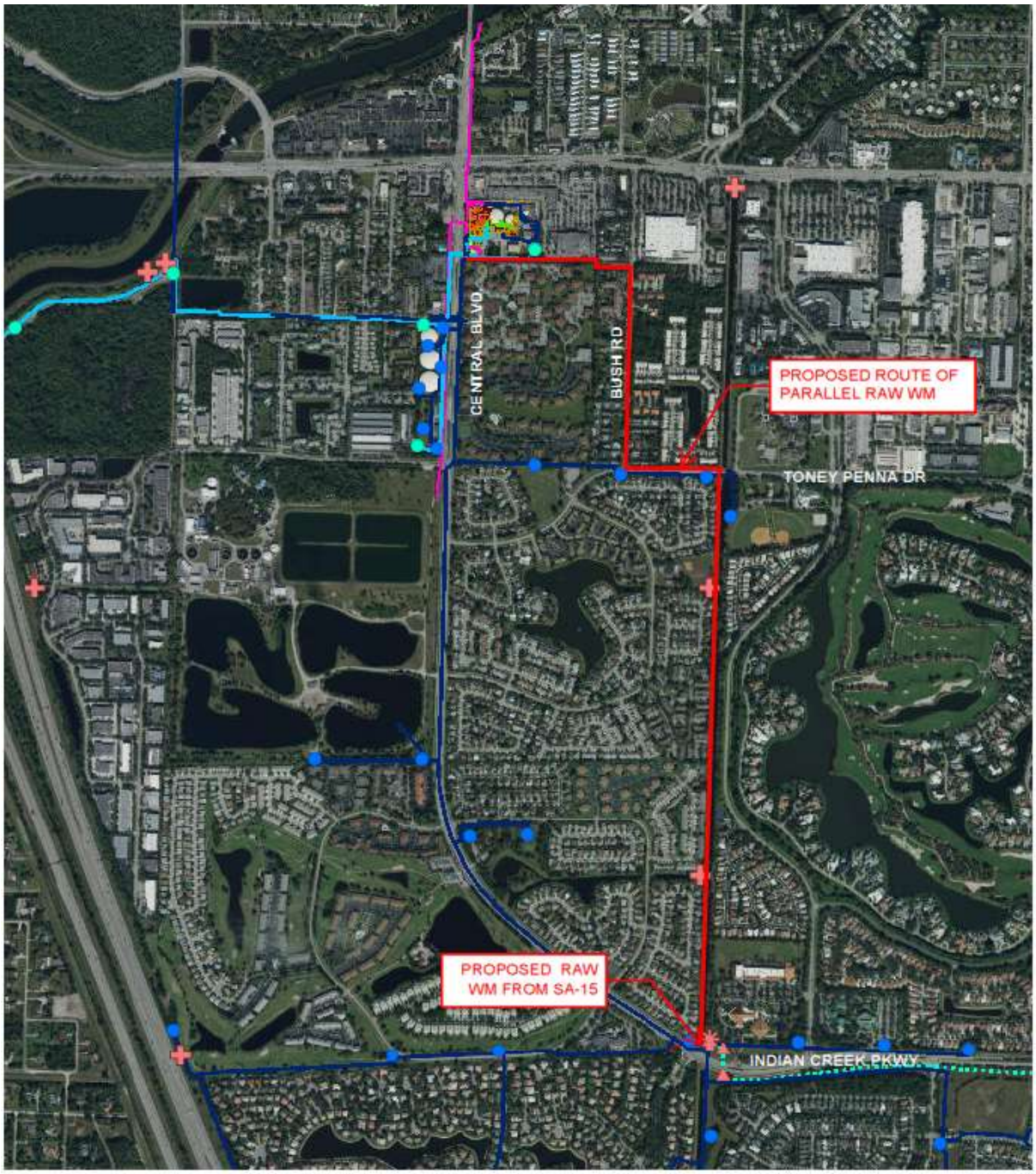

Figure 5-1: Proposed Route of Replacement 30-inch Raw Water Main

(*Source: Kimley-Horn Technical Memorandum SAS Raw Water Main Hydraulic Improvements)*

Job No. 44250-069

5.2.3.2 Floridan Aquifer System Raw Water Main

Raw water from the Town's FA system is delivered to the water plant through a 24-inch high density polyethylene (HDPE) iron pipe size (IPS) DR-11 pipe that extends from RO13, the westernmost well

site on the C-18 canal, to Jupiter Gardens Blvd. At the intersection of Jupiter Gardens Blvd. and Central Blvd., the raw watermain increases in diameter from 24-inch to 30-inch HDPE and heads north on Central Blvd to the water plant site. The 24-inch raw watermain along Jupiter Gardens Drive delivers flow to the plant from all of the Town's existing and future FA wells except for RO-2, RO-3, and RO-4. Velocities through this section of raw watermain range from 10–12 fps when the RO plant is operating at its maximum rated capacity. These elevated velocities yield high pressures at the well sites which require large well pump motors and high operating costs, in terms of electrical power consumption.

Two potential improvements were reviewed to reduce velocities in the raw water conveyance pipeline and thereby improve efficiencies of the FA system well pumps located west of Central Blvd. For additional information on potential improvements, refer to **Appendix I** - Technical Memorandum, "FAS Raw Water Main Hydraulic Investigation and Improvements" prepared by Kimley-Horn.

The payback period for the new parallel raw watermain is within one year of the service life of this new pipeline. Due to the payback period the installation of a parallel raw watermain is not recommended at this time. The existing 24-inch raw watermain along Jupiter Gardens Drive was installed in 1993 and will reach its projected useful service life in 2038. Due to the findings of this investigation, it is recommended that the 24-inch HDPE RO raw watermain on Jupiter Gardens Drive be replaced with a 36-inch diameter HDPE DR-11 IPS raw watermain when the existing main reaches its useful service life. The cost for this proposed improvement is estimated at $2,496,600.

5.3 Climate Change / Coastal Resiliency

Climate change and sea level rise are expected to present challenges to water resource planning, management, and infrastructure for communities throughout Palm Beach County. The Town is committed to the integration of climate change considerations in its water supply and master planning to enhancing the resilience of the Town's water system. The Town strives to ensure that existing practices, policies, and codes remain consistent with, or more stringent than, the statutory requirements and best practices related to climate change and sea level rise. Additionally, the Town continues to evaluate recommendations for resilience made by the Southeast Florida Regional Climate Change Compact (the Compact), and incorporate changes as needed. Information related to the Compact was previously discussed in Section 2 - Introduction. Additionally, the Town has prepared an updated Stormwater Master Plan that further addresses potential impacts of climate change and sea level rise and steps the Town is taking to mitigate these impacts.

5.4 Future Regulations

5.4.1 Introduction

The regulatory landscape concerning potable drinking water continues to evolve where pending and recently finalized regulatory actions have focused on revision of existing rules and regulation of new contaminants in water supplies. The Town benefits from the utilization of membrane technologies, which provide superior contaminant rejection. A discussion on the Town's regulatory compliance history was previously presented in Section 4 – Regulatory Compliance Monitoring. The following

Job No. 44250-069

subsections summarize the new requirements associated with the Revised Lead and Copper Rule as well as pending regulatory actions related to various contaminants.

5.4.2 Lead and Copper Rule Revisions

On January 15, 2021, USEPA published in the Federal Register (86 FR 4198) the "National Primary Drinking Water Regulation: Lead and Copper Rule Revisions" (LCRR). These revisions strengthen regulatory requirements related to corrosion control and improve public health protection. The LCRR currently has a compliance date of October 16, 2024[1], when the Town will need to comply with major elements of the Rule. The Rule revisions are considered significant. Updated revisions will require additional manpower and increased operating costs, at a minimum, with the potential for significant capital investment depending on the outcome of LSL inventory and compliance with new rule requirements. The LCRR focus on the following key areas:

- Trigger Level
- Tap Sampling Site Selection
- Sampling Procedures
- Find-and-Fix
- Optimal Corrosion Control Treatment (OCCT)
- Initial Lead Service Line (LSL) Inventory
- Annual LSL Inventory Updates
- Annual LSL Owner Notifications
- LSL Replacement Plan
- School and Childcare Facility Testing

5.4.2.1 Trigger Level

The LCRR introduced a new lead "Trigger Level" of 10-ppb, in addition to the Action Level of 15-ppb. **Table 5-1** provides a summary of the required response actions for Trigger Level (TL) and Action Level (AL) exceedances.

Job No. 44250-069

[1] A rule published June 16, 2021, at 86 FR 31939 delayed the effective date of the LCRR to December 16, 2021 and the compliance deadline to until October 16, 2024.

Table 5-1: Response Actions for Trigger Level and Action Level Exceedances

Status	90th Percentile Lead Level	Response Actions
Action Level Exceedance	>15 ppb	• Tap Sampling: Standard monitoring every 6 months • OCCT: Implement or re-optimize treatment • LSLR: Full replacement at 3% per year
Trigger Level Exceedance	≥ 10 and < 15-ppb	• Tap Sampling: Standard monitoring every year • OCCT: Conduct OCCT study or re-optimize treatment • LSLR: Full replacement at utility goal rate[m]
Below Trigger Level	<10 ppb	• Tap Sampling: Reduced monitoring every 3 years • OCCT: Maintain treatment and water quality parameters (WQPs) • LSLR: Voluntary

5.4.2.2 Tap Sampling Site Selection

The LCRR redefined tap sample site tier criteria to focus on sampling at sites with lead service lines (LSLs). **Table 5-2** compares the old criteria, based on the 1991 LCR, and the new criteria, based on the 2021 LCRR.

Job No. 44250-069

[m] A Utility's LSLR goal rate is a voluntary rate determined by the water system and the State.

Table 5-2: Comparison of Sample Site Tier Criteria

Tier	Sample Site Tier Criteria	
	1991 LCR (Old Rule)	2021 LCRR (New Rule)
Tier 1	Single-family structures with copper pipes with lead solder installed after 1982 (but before the effective date of the State's lead ban), or that are served by a lead service line	Single family structures served by LSLs
Tier 2	Buildings, including multiple-family residences: with copper pipes with lead solder installed after 1982 (but before the effective date of the State's lead ban), or that are served by a lead service line	Buildings and multi-family residences served by LSLs
Tier 3	Single family structures with copper pipes having lead solder installed before 1983	Single family home served by a galvanized service line preceded by a former lead service line or lead connector
Tier 4	N/A	Single family structures with copper pipes with lead solder installed before the effective date of the State's lead solder ban
Tier 5	N/A	Representative sample where the plumbing is like that used at other sites served

As part of sample site selection, high risk sites that contain LSLs should be designated as Tier 1 sites. Water systems must identify a pool of sampling sites sufficient to conduct standard monitoring, comprised of Tier 1 sites, unless sufficient Tier 1 sites are not available. The Town will need to identify new compliance sampling sites according to the revised sample site selection criteria.

The minimum number of monitoring sites is the same in the LCRR as in the LCR and is determined by the size of a water system and historical compliance with lead and copper regulations. The required number of monitoring sites is outlined in **Table 5-3**. In addition to selecting new sample sites, all utilities will be placed into standard monitoring when the LCRR compliance starts on October 16, 2024. The Town serves a population of approximately 79,974 and would therefore need to sample a minimum of 60 lead (Pb)/copper (Cu) compliance sites and a minimum of 10 water quality sites during the standard monitoring requirements of the LCRR.

Job No. 44250-069

Table 5-3: Required Number of Sampling Sites Based on System Size

Size Category	System Size	Number of Lead and Copper Sampling Sites	
		Standard	Reduced
Large	> 100K	100	50
	50,001 – 100K	60	30
Medium	10,001 – 50K	60	30
	3,301 – 10K	40	20
Small	500 – 3,000	20	10
	101 – 500	10	5
	< 100	5	5

Standard monitoring under the LCRR requires sampling every 6 months, but sampling frequency can decrease if a water system routinely meets the criteria outlined in **Table 5-4**.

Table 5-4: Standard and Reduced Sampling Plans Based on Lead P90

Lead Concentration	Sampling Frequency	Required Number of Sampling Sites
Standard Monitoring		
N/A	Every 6 months	Standard number of sites
Reduced Monitoring		
P90 > 15 ppb	Every 6 months	Standard number of sites
P90 between 10 and 15 ppb	Annual	Standard number of sites
P90 < 10 ppb	Triennial	Reduced number of sites

5.4.2.3 Sampling Procedures

The LCRR includes several key changes related to sample collection protocol. In homes with a LSL (Tier 1 and Tier 2), samples must be collected from the 1st and 5th liters from the tap. The 1st liter sample will be analyzed for copper, and the 5th liter sample will be analyzed for lead. In homes without a LSL, tap samples only need to be collected from the 1st liter and both lead and copper will be analyzed on this sample. Regardless of LSL material, tap samples should be collected:

- After water has sat stagnant for a minimum of six hours,
- In wide mouth bottles to accommodate a high flow rate,
- With the aerator in place (the LCRR prohibits removal of the aerator for sampling), and

Job No. 44250-069

- Without any flushing prior to sample collection and/or instructions or recommendations to remove/clean the aerator before sampling because either of these actions can influence observed lead levels.

The LCRR also requires water systems to notify persons served at the sampling site for any individual tap sample that exceeds 15 ppb, as soon as practicable but no later than three days after receiving the sampling results. This is in addition to the old LCR requirement to provide tap sample results within 30 days for sample results less than or equal to 15 ppb.

5.4.2.4 Find-and-Fix Requirements

The LCRR also introduces a new "Find-and-Fix" approach that addresses individual sites with high (> 15 ppb) lead results. This approach evaluates whether lead issues require adjustments to corrosion control techniques or are localized to a specific area or site. Therefore, at any individual sampling site with an observed lead concentration above 15 ppb (even when the 90th percentile lead level for the system is below 15 ppb), the water system is required to take the following steps:

- Step 1*:* Corrosion Control Treatment Assessment

  Within five days of the initial result, conduct follow-up Water Quality Parameter (WQP) sampling. The follow-up sampling is intended to replicate as close as possible the water quality conditions at the time when the initial tap sample exceeded 15 ppb. The WQP sampling location should not be from the site that exceeded 15 ppb but must be within the same pressure zone, on the same size main and within a half-mile from the initial tap sample site. If an existing WQP site or a total coliform sampling site meets these criteria, then the sample may be taken at that site. If the identified WQP site is not part of the existing WQP sampling list, the location should be added to the list of WQP compliance sampling sites. Results shall be submitted to the State of Florida.

- Step 2: Site Assessment

  Within 30 days of the initial result, conduct follow-up sampling at the tap sampling site that exceeded 15 ppb. This sample is intended for the water system to identify the source of lead concentration above 15 ppb such as the service line, brass faucet, lead solder, and/or gooseneck/pigtails, if possible. As such, the sampling protocol in Step 2 can be modified slightly to better identify the source and will not be included in the 90th percentile calculations. Investigative sampling procedures such as sequential sampling are allowed. Sequential sampling entails taking multiple water quality samples from a customer's tap, one after another, to discern how water quality changes throughout the premise plumbing and service line. Results shall be submitted to the State of Florida.

  If the Town is unable to collect follow-up sample at a site, the Town must provide documentation to the State, explaining why it was unable to collect a follow-up sample.

- Step 3: Formulate Plan to Improve Water Quality

  Water systems are required to evaluate the results of the monitoring data from Steps 1 and 2 to

Job No. 44250-069

determine if the cause of the lead tap sample above 15 ppb is due to a source of lead at the sampling location, to corrosive water quality parameters, or is unknown. Based on this result the water system may be required to make distribution system management changes such as flushing to reduce water age or adjust the corrosion control treatment as necessary to restore optimal water quality parameters in that portion of the system.

Town shall submit to the State of Florida, the Town's plan to reduce lead levels within six months after the end of the tap sampling period in which the site(s) exceeded the lead action level. The submittal must note the cause of the elevated lead level, if known from the site assessment

- Step 4: Obtain State Approval: The State will review the Town's plan to improve water quality. Within six months of completion of Step 3, the State shall approve the Town's plan or specify a different approach.
- Step 5: OCCT Process: Coordinate with the State to determine if any OCCT changes are needed.

5.4.2.5 Optimal Corrosion Control Treatment

The LCR Revisions clarify optimal corrosion control treatment (CCT) techniques and the corrosion control study methodology. Specifically, related to this master plan update:

- The LCR Revisions remove calcium hardness adjustment as an acceptable corrosion control treatment technique.
- The USEPA recognizes two possible corrosion control treatment strategies:
  - pH/Alkalinity Adjustment
  - Addition of a corrosion inhibitor (orthophosphate or silica-based)
- The LCR Revisions require systems to evaluate specific orthophosphate doses of 1 mg/L and 3 mg/L as PO_4 in corrosion control studies required under the rule.

The LCRR removed calcium hardness adjustment (i.e., modifying water quality to precipitate a carbonate scale on the interior wall of LSLs) as an acceptable optimal CCT technique. The Langelier Saturation Index (LSI) and other indices used to assess the potential for carbonate scale formation (i.e., a positive LSI) have no value as corrosivity indicators and should not be used to evaluate lead or copper corrosion control (USEPA, 2016a).

The LCRR specified that corrosion inhibitors must contain orthophosphate. Polyphosphate (such as sodium hexametaphosphate) is not considered a corrosion inhibitor under the LCRR. Research indicates that elevated levels of polyphosphate can increase lead and copper solubility.

For large systems with CCT that exceed the trigger level but are below the action level, States are allowed to approve a modification of the CCT (re-optimization) without a corrosion control study. However, large systems with LSLs that exceed the lead action level must prepare a harvested pipe loop

Job No. 44250-069

within a year of the exceedance and then perform a CCT Re-optimization Study. Coupon studies are only allowed as a screening tool or for systems with LSLs and lead below action level.

5.4.2.6 Initial Lead Service Line Inventory

The LCRR requires all public water systems to develop an inventory of all publicly-owned and privately-owned service line materials in their distribution system. For the public and private portion of each service line, the service line inventory must categorize the service line material as one of the following:

- LSL
- Non-LSL
- Galvanized requiring replacement
- Unknown material (for purposes of the LSL inventory and replacement, unknown service line materials are assumed to be potentially lead)

The service line inventory must be submitted within three years of the final Rule (December 16th, 2024, as modified by further extensions to the effective date) and will be updated over time as the status of unknown service line materials pipes gets verified or as LSLs are replaced. All systems with known or possible LSLs (i.e., unknown service line materials) must develop a Lead Service Line Replacement (LSLR) plan. If the initial inventory does not include any LSLs or Unknowns, an LSLR plan is not required.

For large systems, the service line inventory must be publicly accessible, posted to a publicly available website in an electronic format. While the LCRR allow the service line inventory to be developed as a list, table, or map, many existing water systems' service line inventories are often posted as an interactive online map, and recent research supports the use of a map format due to ease of use for customers and stakeholders.

5.4.2.7 LSL Inventory Updates

The LCRR require service line inventory updates and reports to the State either annually or triennially (based on the tap sampling frequency). Systems are required to update the service line inventory during normal operations as service lines are identified during routine distribution system repair and maintenance work. Systems may perform targeted field identification to confirm service line materials.

5.4.2.8 Annual LSL Owner Notifications

The LCRR required that the Town annually notify customers with LSLs or service lines of unknown material. Notification letters must explain that the public LSL will be replaced within 45 days if the customer replaces the private LSL. Hence, the Town shall establish policies (presumably through a resolution of the City Town Council commission) that require customers to notify the Town in writing of intent to replace a private LSL. Additionally, the Town shall create internal procedures (along with

Job No. 44250-069

external construction contracts) to ensure compliance with its duty to replace the public LSL within the required timeframe.

5.4.2.9 Lead Service Line Replacement Plan

Systems with LSLs or service lines of unknown material shall develop a Lead Service Line Replacement (LSLR) Plan that complies with specific requirements in the LCRR. An LSLR Plan establishes how a utility plans to perform LSLRs within the system for voluntary replacements or mandatory replacements in response to a TL or AL exceedance. Systems exceeding the TL or AL at the 90th percentile are required to replace full LSLs, including privately-owned portions, at a specified rate (i.e., 3% per year during an AL exceedance or at the utility's goal rate during a TL exceedance).

The LSLR Plan needs to have the following elements:

- A strategy for determining the composition of lead status unknown service lines in its inventory.
- Procedures to conduct full LSLR.
- A strategy for informing customers before a full or partial LSLR.
- For systems that serve more than 10,000 persons, a recommended LSLR goal rate in the event of a lead TL exceedance.
- A procedure for customers to flush service lines and premise plumbing of particulate lead.
- A LSLR prioritization strategy based on factors including but not limited to the targeting of known LSLs, LSLR for disadvantaged consumers and populations most sensitive to the effects of lead.
- A funding strategy for conducting LSLRs, which considers ways to accommodate customers that are unable to pay to replace the portion they own. This provision does not obligate the water system to pay for replacement of a customer-owned LSL, but water systems could investigate whether rate revenue can contribute to customer-owned LSLR or identify external LSLR funding, such as Federal or state grants or loans, that could be used to finance a customer's LSLR.

5.4.2.10 School and Childcare Facility Testing

The LCRR require lead and copper sampling in elementary schools and licensed childcare facilities starting December 16, 2024. The LCRR requires collection of samples at five taps in each school and two taps in each childcare facility constructed prior to January 1, 2014. The date of January 1, 2014 was selected because it was the date that brass fixtures containing more than 0.25% lead were banned[n]

Job No. 44250-069

n The Reduction of Lead in Drinking Water Act (which became effective on January 4, 2014), changed the definition of "lead-free" from a weighted lead content of 8-percent or less to a weighted average of less

(Reduction of Lead in Drinking Water Act, Pub. L. No. 111–380, 2011). At least 20% of elementary schools and childcare facilities must be sampled by the Town each year so that all facilities are tested during the first five years after the compliance date. Thereafter, water systems must collect samples from schools and childcare facilities upon request.

5.4.3 Future LCCR Compliance Requirements

The LCRR requirements were compared against historical water quality data and lead and copper compliance sampling results for the Town of Jupiter to determine possible future tasks needed to ensure continued compliance with the LCRR. With historically low lead and copper levels, the Town of Jupiter is currently under reduced, triennial monitoring. This means that the Town is only required to sample for lead and copper every three years at a reduced number of sites. The LCR Revisions will require all utilities to return to standard monitoring (increased number of sites) every six months. The results of this comparison are summarized below organized by major LCRR components.

5.4.3.1 Trigger Level

- The Town's historical P90 levels for lead have been below the TL for the available LCR compliance data analyzed (2013 through 2018). Based on these data, it appears unlikely that the Town will exceed the TL for lead; however, changes in lead and copper monitoring sites due to the new tier definitions and service line material inventory could potentially alter the P90 results.
- The Town should perform sequential sampling at future Tier 1, Tier 2, and Tier 3 sites to determine the anticipated impact of new LCRR compliance sampling requirements on lead levels.

5.4.3.2 Corrosion Control Treatment

While the Town has historically been in compliance with the LCR, as mentioned previously, new sampling requirements may increase 90th percentile lead levels.

- If the trigger level is exceeded, a pipe loop study would be required. The Town may want to consider developing a pipe loop apparatus and associated testing plan in advance of the first round of sampling so that they are well positioned to respond to a need to optimize CCT if ultimately required.
- The Town currently adds a blended phosphate inhibitor, AquaMag 9600, for corrosion control. This product contains 60% orthophosphate and 40% polyphosphate (**Figure 5-2**). While orthophosphate is an effective corrosion control method, polyphosphates are a sequestrant and

Job No. 44250-069

than or equal to 0.25 percent for surfaces in contact with potable water. It also established a formula to calculate the weighted average lead content. Any materials used for installation or repair must be lead-free, including pipes, pipe fittings, plumbing fittings, and plumbing fixtures. The law did not change the definition of "lead-free" for solder or flux (0.2 percent lead).

may solubilize lead. For this reason, the use of polyphosphates should be limited. Blended phosphates have been shown to be effective in reducing lead levels and sequestering iron and manganese; however, corrosion scales formed by polyphosphates are not as robust as the scales formed with orthophosphate (USEPA, 2016a). Also, the USEPA recommends an orthophosphate dose between 1 and 3 mg/L as PO_4. Between January 2017 and May 2021, the Town had an average orthophosphate dose of 0.91 mg/L as PO_4 at the point of entry (PO_4 dose ranged from 0.62 mg/L as PO_4 to 2.70 mg/L as PO_4). Distribution orthophosphate residuals ranged from 0.46 mg/L as PO_4 to 2.1 mg/L as PO_4 with an average residual of 0.67 mg/L as PO_4. Orthophosphate dosing within the Town's water distribution system is slightly below the minimum USEPA recommended orthophosphate dose of 1 mg/L. To further optimize corrosion control, the Town should consider switching to a corrosion inhibitor product that has a higher percentage of orthophosphate. This would increase the orthophosphate concentration without increasing chemical usage or significantly impacting total chemical costs.

- Additional testing (bench or pilot) of alternative inhibitor products is recommended prior to full scale implementation.

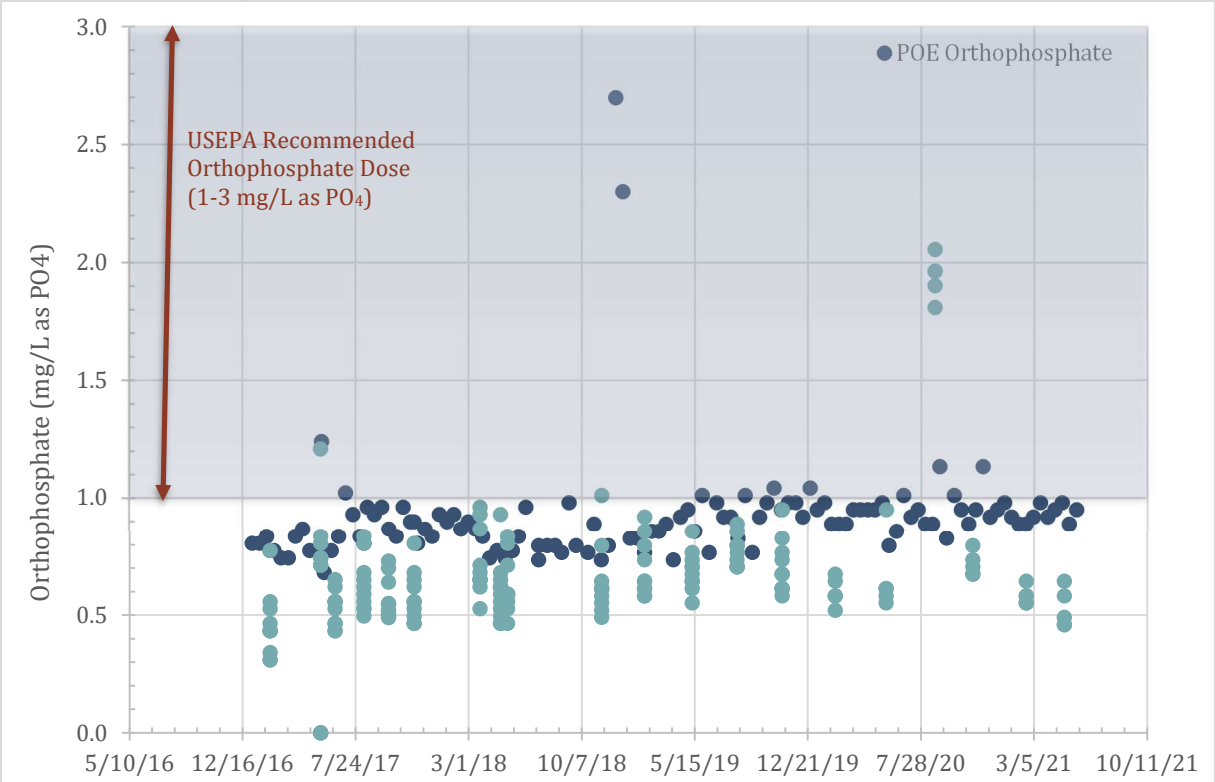

Figure 5-2: Point of Entry Orthophosphate Levels (mg/L as PO_4)

5.4.3.3 Service Line Material Inventory

- The identification of both private and public service line materials is a critical step in the development of the service line inventory. Since the service line inventory influences several of the other key components of the LCRR, it would be prudent for the Town to take steps to

Job No. 44250-069

develop the service line material inventory as soon as possible. The lead service line inventory shall be completed by October 16, 2024.

- In addition, the Town will need to develop customer education and notification materials for customers with lead service lines, galvanized lines requiring replacement, as well as those with unknown service line materials.

5.4.3.4 Lead Service Line Replacement Plan

- The Town is required to have an LSLR Plan by October 16t, 2024 and needs to consider those service lines designated as lead, galvanized requiring replacement, and lead status unknown in the planning.
- If the P90 lead concentration ever exceeds the TL or AL, the Town will be required to replace full LSLs, including privately-owned portions, as defined by the specific Trigger or Action Level requirement for LSLR.

5.4.3.5 Public Education

- The Town will be required to perform public notification, outreach, and education with both its customers with LSLs or unknown service lines as well as schools and childcare facilities (see below). The public education materials are required to include information on how to access the service line material inventory and how to access the results of all tap sampling in the LCRR.
- Customers should be able to contact the Town to get the lead public education materials translated in other languages.
- Other optional steps for public outreach and communication can be taken as well, all of which the Town will need to consider in the development of their outreach efforts in response to the LCRR.

5.4.3.6 Lead and Copper Tap Monitoring

- The Town will need to re-evaluate sample site selection to determine if the sites comply with the new tier requirements, which could possibly result in increased 90th percentile lead concentrations.
- In addition, the LCRR requires systems below the AL or the TL to pay attention to individual locations with elevated levels of lead by identifying the cause and mitigating the problem (Find-and-Fix). This is a new element that the Town will need to address as the need arises based on sampling results.
- The Town will also need to develop new sampling protocols for 5th liter sampling and analysis

Job No. 44250-069

5.4.3.7 School and Childcare Facility Testing

- The Town will be required to develop a list of schools (elementary and secondary) and licensed childcare facilities within its service area, prior to the compliance date of the LCRR.
- A schedule will also need to be developed for the mandatory 5-year period of sampling for the elementary and childcare facilities and the Town will need to update that list annually.

The Town will also need to perform outreach efforts to all schools and childcare facilities at least annually and provide them with health information and information on how to request sampling.

5.4.3.8 LCRR Budgetary Costs for Compliance

Table 5-5: Potential LCRR Compliance Budgetary Costs

LCRR Compliance Category	Task	Budgetary Cost
Trigger Level	*Proactive Sequential Sampling	$25,000
Corrosion Control Treatment (CCT)	**Design and Construction of CCT Pilot Study	$90,000
	**Bench Testing of Alternative CCT	$80,000
	**Pilot Testing of Alternative CCT (includes design and construction)	$250,000
Lead Service Line Inventory	Development of Online Geospatial Service Line Inventory	$150,000 ($15,000 annual maintenance and updating)
Lead Service Line Replacement Plan	Development of Lead Service Line Replacement Plan	$100,000
Public Education	Development of Public Notification, Outreach, and Education Materials	$50,000 - $75,000 ($35,000 annual maintenance and updating)
Lead and Copper Tap Monitoring	Selection of New Lead and Copper Monitoring Sites and Protocol.	$30,000 ($10,000 annual maintenance and updating)
School and Childcare Facility Sampling	Develop List of Schools and Childcare Facilities for Sampling and Develop New Sampling Protocols	$50,000 ($5,000 annual maintenance and updating)
Lead Service Line Replacement	**Cost per Service Line Replacement	$10,000 per replacement ($1,600 annual maintenance and updating)

Notes:

** Proactive task to optimize LCRR compliance.*

*** Only required if trigger level is exceeded and could also be a proactive task for LCRR compliance.*

*Costs presented in **Table 5-5** are order of magnitude conceptual costs and may vary depending on the final scope of the project, whether projects are performed internally, etc. All costs were developed based upon recently completed projects or cost estimates for similar projects at utilities of similar size.*

Job No. 44250-069

5.4.4 Potential Revisions of Microbial and Disinfection Byproducts Rules

The USEPA is currently seeking public input and information to inform potential regulatory revisions of eight existing National Primary Drinking Water Regulations as follows (USEPA, 2021e):

- Chlorite
- *Cryptosporidium*
- Haloacetic acids
- Heterotrophic bacteria
- *Giardia lamblia*
- *Legionella*
- Total Trihalomethanes
- Viruses

The above are currently regulated under the Microbial and Disinfection Byproducts (MDBP) rules[o]. The USEPA has hosted meeting to solicit input on potential MDBP rule changes. The USEPA held the following meetings in 2021:

- May 20, 2021: Disinfectant residual levels and opportunistic pathogens (including Legionella)
- June 24, 2021: Regulated and unregulated disinfection byproducts (DBPs) and consecutive water systems
- July 15, 2021: Drinking water distribution systems and finished water storage
- August 10, 2021: Source water considerations and precursor removal and treatment
- September 29, 2021: Water safety plans and sanitary surveys

The USEPA created a website that provides additional information on this topic at the following link: https://www.epa.gov/dwsixyearreview/potential-revisions-microbial-and-disinfection-byproducts-rules

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o The MDBP rules include the following: 1) Stage 1 Disinfectants and Disinfection Byproducts Rule, 2) Stage 2 Disinfectants and Disinfection Byproducts Rule, 3) Surface Water Treatment Rule, 4) Interim Enhanced Surface Water Treatment Rule, and 5) Long Term 1 Enhanced Surface Water Treatment Rule. The Town uses groundwater; groundwater is regulated under the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules. If the Town's wells were to be classified by the State of Florida as being "under the direct influence of surface water" (UDI), they would be subject to the surface water treatment rules. The risk of the Town's wells being classified as UDI is low.

Job No. 44250-069

Additionally, the USEPA created a public docket at Docket ID: EPA-HQ-OW-2020-0486 for the storage of documents and sharing of information. The docket can be accessed via the following link: www.regulations.gov and entering the docket ID into the search bar.

It is believed that MDBP rule revisions are likely a minimum of five years in the future. Currently, there is insufficient rule revision definition to assess an impact to the Town. It is recommended that the Town monitor potential MDBP rule revisions on a periodic basis to re-assess potential impacts to the Town.

5.4.5 Contaminants of Emerging Concern (CECs)

USEPA is in the process of reviewing and potentially revising several existing regulations. In addition, USEPA monitors Contaminants of Emerging Concern (CECs) for future regulation or addition to the Unregulated Contaminant Monitoring Rule (UCMR). These include numerous chemical and microbiological contaminants for which sufficient national occurrence or health-based standards data are not yet available, but preliminary research has indicated potential exposure and harmful human health effects. The potential future regulations and unregulated contaminants of relevance to the Town are briefly discussed below.

5.4.5.1 Nitrosamines

Nitrosamines are a class of compounds that are likely carcinogenic. Nitrosamines are found in certain medications, including those used to treat elevated blood pressure, heartburn, acid reflux, and diabetes. A certain nitrosamine is used in the manufacture of rocket fuel. USEPA research indicated a clear linkage between N-nitrosodimethylamine (NDMA)[p] formation in drinking water and the use of chloramines in distribution system disinfection (USEPA, 2016c).

Nitrosamines are not currently regulated by the USEPA. The USEPA continues to research nitrosamines for potential regulation. The timeframe for when the USEPA will promulgate drinking water regulations that limit nitrosamines remains unclear. USEPA's regulatory limit may be as low as 10-ng/L with an MCL goal (MCLG) of zero since nitrosamines are considered likely carcinogenic compounds. California has established a 10 nanogram per liter (ng/L) notification level and Massachusetts has established a regulatory limit of 10-ng/L for drinking water.

It should be noted, that as part of the UCMR 2, the Town monitors for NDMA in the water system. Based on historical sampling results, nitrosamines have been non-detectable. The Town will continue to monitor for the presence of nitrosamines as per the UCMR 2.

5.4.5.2 Perchlorate

Perchlorate occurs naturally in certain ore deposits and forms naturally in the atmosphere. Perchlorate is manufactured and used in rocket propellant, explosives, fireworks, and road flares. Perchlorate

[p] NDMA Chemical Abstract Service (CAS) Number: 62-75-9.

Job No. 44250-069

interferes with the ability of the thyroid to produce hormones needed for normal growth and development (USFDA, 2017).

In 2011 the EPA decided to regulate perchlorate under the SDWA (USEPA, 2011). After many years of research, on July 21, 2020, the USEPA elected to withdraw its 2011 regulatory determination and made a final determination to not issue a national regulation for perchlorate (USEPA, 2020). The USEPA determined that perchlorate did not meet the criteria for regulation as a drinking water contaminant under the SDWA.

5.4.5.3 Chlorate

The Town intends to utilize an interim sodium hypochlorite solution for disinfection. Sodium hypochlorite solution also contains chlorate, which is known to increase in concentration during storage as a function of time, temperature, and a suite of chemical factors (Stanford, Pisarenko, Snyder, & Gordon, 2011). While there is no indication that chlorate is a potential carcinogen to humans, negative health impacts such as thyroid issues and reduced hemoglobin production have been observed in laboratory animals subjected to prolonged exposure to chlorate (USEPA, 2016b).

Chlorate in drinking water is not currently regulated in the United States. In 2014 the USEPA issued a health reference level (HRL) for chlorate of 210-µg/L (USEPA, 2014). HRLs are risk-derived concentration used in public health analyses. HRLs are not final determinations about the level of a contaminant in drinking water that is necessary to protect any particular population and they are derived prior to development of a complete exposure assessment. For comparison, the World Health Organization (WHO) issued a provisional guideline value for chlorate of 700-µg/L (WHO, 2017).

If the USEPA elects to establish a MCL for chlorate, it is believed that the MCL will not seriously impact the viability of using delivered bulk hypochlorite for disinfection. Hence, it is recommended that the Town monitor the rule making process relative to chlorate. It is also recommended that the Town annually measure chlorate concentration in its distribution system at a few locations with high water age for future reference.

5.4.5.4 1,4-Dioxane (p-Dioxane, Dioxane)

1,4 Dioxane (p-Dioxane, Dioxane) is a likely carcinogen that's found in groundwater systems throughout the United States. Dioxane is a man-made synthetic industrial chemical that is widely used as a stabilizer in certain chlorinated solvents and cleaners. It is used in the manufacture of some dyes, adhesives, and lubricants. It has also been found as an impurity in some consumer products, such as antifreeze, shampoos, laundry detergents and cosmetics. Dioxane is highly mobile and does not readily biodegrade in the environment.

1,4-Dioxane is included on the fourth drinking water contaminant candidate list and is included in the Third Unregulated Contaminant Monitoring Rule (USEPA 2017).

No federal maximum contaminant level has been established for dioxane in drinking water. However, the Florida Department of Health (FDEP) has set a Health Advisory Level (HAL) for 1,4-dioxane of 0.35 micrograms per liter (0.35 µg/L). This level is set to be protective for both cancer and non-cancer

Job No. 44250-069

effects over a 70-year lifetime. At this time the Town is not required to perform routine sampling of its drinking water wells for this chemical.

Historically, low levels of 1,4-dioxane have been detected in a few SA wells as was previously discussed in **Section 4**. Detection levels were below the HAL and are rejected by current treatment processes. 1,4 dioxane is undetected in the finished water. The Town will continue to monitor for the presence of 1-4 dioxane in its system. Additionally, it is recommended that the Town monitor the rule making process relative to 1,4 dioxane.

5.4.5.5 Per- and Polyfluoroalkyl Substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are a group of man-made chemicals that includes PFOA[q], PFOS [r], GenX, and many other chemicals. PFAS were historically manufactured and used in a variety of industries around the globe, including in the United States since the 1940s. PFOA (Perfluorooctanoic acid) and PFOS (perfluorooctanesulfonic acid) were the most extensively produced and studied of these chemicals. GenX, Chemours' trademark name for a short-chain PFAS compound (ammonium salt of hexafluoropropylene oxide dimer acid (HFPO-DA) fluoride), has more recently been included in research studies as a related PFAS compound with similar environmental occurrence. PFAS chemicals are very persistent in the environment and in the human body – meaning the chemicals do not break down and they can accumulate over time. There is evidence that exposure to PFAS can lead to adverse human health effects.

PFOA and PFOS are chemicals that were once used to make nonstick pans, fire extinguishing foam and water and stain-resistant fabrics; they are no longer produced in the United States, having been phased out of production the early 2000s. GenX has similar applications as PFOA and PFOS, and was developed as a replacement for PFOA. The USEPA does not currently regulate PFOA and PFOS nor GenX. Rather, it has issued a revised health advisory (HA) for PFOA and PFOS, which is a non-enforceable federal limit. EPA's HA are non-enforceable and non-regulatory and provide technical information to State agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination. A provisional HA for PFOA and PFOS was originally issued in 2009 at 200-ng/L. On May 19, 2016, the HA was lowered to 70-ng/L (based on the sum of PFOA and PFOS).

USEPA reports that exposure to PFOA and PFOS over certain levels may result in adverse health effects, including developmental effects to fetuses during pregnancy or to breastfed infants (e.g., low birth weight, accelerated puberty, skeletal variations), cancer (e.g., testicular, kidney), liver effects (e.g., tissue damage), immune effects (e.g., antibody production and immunity), thyroid effects and other effects (e.g., cholesterol changes).

Neither the State of Florida nor the USEPA have issued a MCL for PFOA or PFOS. In 2019, the USEPA established an action plan for regulating these chemicals (USEPA, 2019). The USEPA established a

Job No. 44250-069

[q] PFOA CAS No. 335-67-1

[r] PFOS CAS No. 1763-23-1

PFAS website to keep stakeholders informed of its ongoing actions. On March 3, 2021, USEPA issued a "final regulatory determination" to regulate PFOA and PFOS in drinking water (USEPA, 2021a). A regulatory determination is an announcement that USEPA will begin the process to propose and promulgate a NPDWR for an unregulated contaminant.

It remains unclear what MCL the USEPA will set for PFOA and PFOS. However, multiple states have issued MCLs lower than the USEPA HA (Rosenfeldt, Khunjar, & Blute, 2020). Consequently, it is speculated that the USEPA MCL, when promulgated, would be lower than 70-ng/L. Research indicates that membrane treatment removes 99% of PFOA and PFOS (AWWA, 2020).

5.4.5.6 Health Advisory Expected in Spring 2022 for GenX and PFBS

The USEPA published its *PFAS Strategic Roadmap* in October 2021. This document reports that the EPA plans to publish health advisories for Perfluorobutane sulfonic acid (PFBS) and GenX chemicals in the spring of 2022 (USEPA, 2021d).

Hexafluoropropylene Oxide (HFPO) Dimer Acid and its ammonium salt are also known as "GenX chemicals" because they are the two major chemicals associated with the GenX processing aid technology. GenX is a trade name for a processing aid technology used to make high-performance fluoropolymers without the use of perfluorooctanoic acid (PFOA) (USEPA, 2021c).

PFBS has been used as a replacement chemical for PFOS. PFOS is a chemical that was voluntarily phased out by the primary U.S. manufacturer by 2002. PFBS has been identified in environmental media and consumer products, including surface water, wastewater, drinking water, dust, carpeting and carpet cleaners, and floor wax (USEPA, 2021b).

5.4.5.7 Future Considerations for CECs

The Town's active engagement and continued research on CEC-related topics has them well positioned to understand and prepare for future regulatory impacts. As detailed in Section 4 - Regulatory Compliance Monitoring, CEC research dating back to 2008 has included sampling and evaluation of raw water supply, intermediate and finished, potable waters. Research began with screening evaluations for pharmaceuticals and personal care products (PPCPs) and has shifted to include those contaminants included in EPA's UCMRs with focus on PFAS compounds due to environmental and public health significance.

The Town has demonstrated that membrane treatment effectively rejects CECs including PFAS compounds as they have consistently been undetected in the finished water supply. However, their presence has been detected in the surficial aquifer wellfield. There are no major industrial sites in the service area that could contribute to environmental release. Detections appear to be attributed to anthropogenic influences through use of reclaimed water as the highest CEC levels are found in those supply wells situated in areas that utilize reclaimed water for irrigation needs. Similarly, reclaimed water has been evaluated, and CECs including PFAS compounds have consistently been detected in the irrigation quality water. Figure 4-6 included in Section 4 illustrates the location of surficial aquifer wells with communities that use reclaimed water for irrigation. Table 4-1 included in Section 4

Job No. 44250-069

summarizes the findings and frequency of detection of various CECs. Figure 4-8 included in Section 4 illustrates the average concentrations of PFAS compounds for various sample locations.

The long-term significance of this research is unknown as the NF treatment process effectively rejects CECs including PFAS chemicals at their current levels. PFAS chemicals are known to persist in the environment with potential for accumulation over time. Should PFAS concentrations increase in the surficial aquifer, the NF process' effective rejection of PFAS will likely diminish affecting regulatory compliance and consumer confidence assuming a regulatory determination is finalized concerning PFAS contaminants. As such, the following items are recommended for the Town as it concerns CECs:

- Continue with bi-annual CEC water quality evaluations of its water supplies including surficial aquifer wells within and outside the vicinity of reclaimed water usage maintaining a database of results to evaluate trends over time. A recommended budget for this item is estimated at $20,000 per year and represents sampling 8-10 locations during wet and dry seasons concurrent with varying reclaimed water demand and expected seasonal, aquifer fluctuations
- Continue with NF pilot scale studies to evaluate the effective rejection of CECs including PFAS compounds at increasing concentrations. A recommended budget for this item is estimated at $100,000 per year and represents professional services required to development, implement and evaluate study findings

5.4.6 Four-Log Virus Treatment Certification under the Groundwater Rule

As previously discussed in Section 4.5, the Town has been proactive in pursuing four-log virus treatment certification under the Ground Water Rule (GWR) working collaboratively with the Department of Health in Palm Beach County. As part of these efforts, the Town recently investigated methods for four-log virus treatment certification under the GWR. The purpose of this investigation was to determine if four-log certification could be achieved such that the Town would no longer need to comply with the GWR through the "Triggered" monitoring approach. "Triggered" monitoring requires the Town to issue public notification of coliform bacteria "hits" in the raw water system regardless of the adequacy of the Town's treatment system.

Under this investigation, Hazen demonstrated that compliance with Contact Time (CT) requirements for four-log virus inactivation could be demonstrated through the treatment process if the travel path were continuous through the NF clearwell. As such, the ammonia injection point needs to be relocated. This will ensure that adequate CT is achieved with free chlorine to demonstrate four-log virus compliance while enabling the Town to continue with delivering chloramines as the residual disinfectant. Detailed results of the investigation are presented in **Appendix G**, which includes the Technical Memorandum "Town of Jupiter Assistance with Four-Log Compliance", prepared by Hazen.

The Town has investigated the physical requirements for relocating the transfer pump header above grade and relocating the ammonia injection point to the combined manifold, following free chlorine measurement. The cost of this improvement was previously included in subsection 3.8.2.4.

While investigating and constructing this manifold and ammonia injection point, the Town will maintain the current GWR compliance through triggered and assessment monitoring. In the future, the Town can decide to remain on chloramines or convert to free chlorine disinfectant.

Job No. 44250-069

5.5 Membrane Treatment Concentrate Management Options

5.5.1 Current Practices Overview

The Town's existing water treatment facilities consist of two separate membrane treatment processes: NF and RO treatment, each with permitted capacities of 14.5 mgd and 13.7 mgd, respectively. The products of these treatment processes are combined to create finished water for storage and conveyance through the Town's distribution system.

Each of these treatment facilities produces a separate concentrate byproduct which requires management. Currently, the Town's NF concentrate is reused through the delivery and sale of the concentrate flow (via Interlocal Agreement) to Loxahatchee River District (LRD), for blending and distribution as a supplemental supply to the LRD's irrigation quality water reuse system. The Town also has the ability to discharge NF concentrate to surface water, per emergency stipulations under their RO concentrate discharge permit, discussed below.

The current disposal method for the Town's RO concentrate is through permitted surface water discharge via outfall to the C-18 canal, approximately 2,000 feet north of the water treatment plant. The C-18 canal flows into the Southwest Fork of the Loxahatchee River.

Table 5-6 presents a summary of the Town's concentrate management methods and their related permits/agreements.

Table 5-6: Summary of Current Concentrate Management Methods

WTF Process	WTF Concentrate Production	Description of Current Disposal Method	Permit / Agreement	Permitted Disposal Amount	Permit / Agreement Expiration
NF Concentrate	2.5 MGD	1. Primary: Conveyed to LRD via pipeline	1. Interlocal Agreement with LRD (since May 2006)	1. 2 MGD – 3 MGD	1. June 2026
		2. Emergency Backup: Combined with RO Concentrate for disposal through outfall, during extreme wet weather emergencies or when blending at LRD is not feasible	2. Under the RO Concentrate Discharge Facility Permit (below)	2. Combined NF and RO Concentrate must meet permit requirement (below)	2. Nov. 14, 2022

Job No. 44250-069

WTF Process	WTF Concentrate Production	Description of Current Disposal Method	Permit / Agreement	Permitted Disposal Amount	Permit / Agreement Expiration
RO Concentrate	4.6 MGD	Surface water discharge via outfall to C-18 canal (Waterbody Identification Number, WBID# 3226C)	Industrial Waste – WTP RO Concentrate Discharge Facility Permit Permit Number: FL0042358-009(Minor)	4.6 MGD, Maximum Daily Flow	Nov. 14, 2022

Due to requested changes by LRD in the stipulations of their interlocal agreement and potential regulatory changes that could dictate RO concentrate permit renewal requirements, the Town is evaluating their long-term concentrate management options, discussed herein. Note: Costs presented in this section are feasibility level costs and include engineering and construction management services and supply chain disruption contingency factors.

5.5.2 Nanofiltration Concentrate Management

5.5.2.1 Alternate Options for Reuse/Disposal

As stated above, the Town has provided the NF concentrate to LRD to supplement their reclaimed water system through a mutually beneficial interlocal agreement since 2006. Reuse of the byproduct produced by the Town's NF water treatment system through irrigation was always seen as the best use for the 2-3 MGD of supply, given LRD's past inability to meet its contracted reclaimed water demands during drought periods. During excessively wet periods, the Town would benefit through LRD's disposal of the byproduct water through LRD's deep well injection system. Over the past decade, this arrangement has allowed nearly 80% of the NF byproduct to be effectively reused to a highly beneficial purpose.

Based on evaluation of SFWMD and FDEP permits on record, LRD's total contracted demand with local golf course and homeowner associations total 11.79 MGD. According to LRD, 8 MGD of treated wastewater is available to meet these demands and 2.9 MGD of the contracted volume to its customers is "curtailable", which in their opinion allows LRD in its sole discretion to curtail or cease deliveries when insufficient amounts of reclaimed water is available for delivery. LRD notes that they feel that this supply/demand strategy is "sustainable even during dry-periods." [s]

The Town has expressed concern relative to this irrigation supply strategy offered by LRD, primarily potential lack of supply but also possible environmental harm. In some situations, LRD's reclaimed users may have alternative on-site irrigation supply options such as surface water management lakes or wells into the SA to augment supply needs. However, during prolonged droughts, these resources could be stressed and potentially unavailable. Over pumpage from localized lakes or the SA could cause

[s] Arrington, D. Albrey, Loxahatchee River District. "RE: Nano Interlocal Agreement Term Extension." Received by David Brown, Town of Jupiter, 13 October 2021.

Job No. 44250-069

deterioration of wetlands, reduced water supply to the "wild and scenic" northwest fork of the Loxahatchee River and water supply degradation including saltwater intrusion into the aquifer. Such impacts are of significant concern to the Town. Past water modeling performed by the SFWMD, and the Town has previously established that the SA resources in the Jupiter area are vulnerable if future water supply needs beyond existing permitted allocations are not prudently managed through the use of alternative water supplies (reclaimed water, desalination, etc.).

Presently, LRD's contracted reclaimed water customers include Jupiter Country Club, Bear's Club, Jupiter Hills Club & HOA, Riverbend Golf Club, Jonathan's Landing, Indian Creek (Golf Club of Jupiter), Loxahatchee Club, Trump National, Tequesta Country Club, Admiral's Cove, Turtle Creek Golf Club and Abacoa POA. According to an evaluation of permit and pumpage data on record with the SFWMD performed by the Town's consultant JLA Geosciences, Inc., seven (7) of these customers currently have a deficit in irrigation supply beyond reclaimed water delivered during the hotter summer months and at least six (6) will experience significant harm in a 1:10 year drought if the Town's supplemental NF concentrate supplies are discontinued and LRD attempts to curtail remaining reclaimed water supplies. The consultant also concluded that the entirety of Abacoa does not have any back-up supplies, nor do they report pumpages or reclaimed water deliveries to SFWMD.

With expiration of the current agreement on the horizon in 2026, the Town initiated discussions with LRD in April 2021 relative to renewal of the agreement for another extended term. LRD recently informed the Town that the agreement will not be renewed. As such, the Town examined alternative NF concentrate management options as part of this master planning effort. Numerous concentrate management options were qualitatively considered, primarily with respect to cost avoidance, ease of permitting, and operational flexibility and reliability. From the qualitative considerations, the following alternatives were shortlisted for evaluation and are discussed further in this section:

1. Renewal of Interlocal Agreement with Loxahatchee River District (LRD): Under this option, the Town would maintain the current concentrate management methodology – conveyance of NF concentrate to LRD for use in their water reuse system as primary scheme.

2. Blend NF Concentrate with RO Feed Water for Treatment at RO Treatment Facility: This alternative involves the implementation of a new concentrate management strategy. The Town would blend NF concentrate from the NF Facilities with Floridan Aquifer System (FA) raw water to be reused / treated through existing RO Facilities.

3. Deep Well Injection (DIW): This alternative is to implement a new concentrate management strategy involving injection and disposal through a Town-owned deep injection well (DIW) at the Town's WTP. (The Town is presently siting the IW and developing a cost estimate for this option).

5.5.2.1.1 Renewal of Agreement with Loxahatchee River District (LRD)

LRD has had an interlocal agreement with the Town since 2006, subscribing to the receipt of up to 3 mgd of NF concentrate, with the following mutual benefits:

- The Town currently sends an average of 2.0 mgd NF concentrate to LRD.
- LRD pays the Town for the NF concentrate at a current rate of $0.31 per 1000 gallons.

Job No. 44250-069

- In turn, the Town's NF concentrate augments supply to LRD's reclaimed water reuse system. LRD then resells the NF concentrate at a rate nearly double that charged by the Town.
- During periods of high rainfall, LRD disposes of excess NF concentrate along with excess treated wastewater through its DIW system.

In response to the Town's request to extend the term of the existing interlocal agreement, revised terms were requested by LRD including the following significant elements: [t]

- Town to pay LRD $0.35 per 1,000 gallons of NF concentrate that is pumped into LRD's DIW
- Town to pay one-time connection/capacity fee proportional to allocated capacity of newly constructed $11.5 million DIW, i.e., 3.0 MGD for NF concentrate.
- LRD will reimburse the Town for NF concentrate which LRD uses in its reuse system, at a rate based on the Town's cost to pump and transmit NF concentrate to LRD.
- Town to blend NF concentrate with raw water, as necessary, to ensure established water quality parameters are met when NF concentrate is being blended in LRD's reuse lakes.
- Town shall discontinue NF concentrate delivery during emergency conditions at LRD's sole discretion.
- Termination clause will be added.

As summarized above, the terms of the NF concentrate interlocal agreement extension differs from the current terms. Specific differences in the terms of the agreement include:

- Reduction in the annual revenue to the Town generated by the NF concentrate sale and LRD's resale of the NF concentrate
- The Town would have both upfront and annual fees for NF concentrate disposed of through deep well injection
- The discontinuation of NF concentrate would be at LRD's discretion

Since receipt of LRD's revised terms, Town staff has attempted to discuss the fundamental issues that exist from the Town's perspective. They included:

- The Town cannot discontinue NF concentrate production and disposal at LRD's sole discretion without impacts to the Town's ability to supply potable water to the region while safeguarding the public's health and safety. The revised agreement terms allowing LRD the sole control over when deliveries could occur and the possibility of early termination of the agreement would necessitate the Town's construction of its own DIW disposal system for the NF concentrate.

Job No. 44250-069

[t] Arrington, D. Albrey, Loxahatchee River District. "RE: Nano Interlocal Agreement Term Extension." Received by David Brown, Town of Jupiter, 17 August 2021.

- The requirement of the payment of a connection/capacity fee by the Town for the construction of a new DIW system by LRD would only be appropriate if the service was to be perpetually extended to the Town (not on a limited term or a term subject to termination at LRD's discretion).
- Currently, LRD has no way of measuring the flow of NF concentrate down the deep well, apart from the combined flow from their ponds because there is no dedicated piping for the NF concentrate to the deep well. NF concentrate is discharged into LRD irrigation quality (IQ) ponds. LRD sends the blended IQ water to distribution or to deep well.

LRD notified the Town on December 2, 2021 "that the Loxahatchee River District does not agree to an extension of" the existing interlocal agreement upon its expiration in June 2026[u]. While negotiating with LRD, the Town concurrently worked diligently on developing alternative uses for the NF concentrate. Strategies are being investigated which also provide sustainable environmental value while also enabling the Town to continuously, safely and reliably maintain potable water utility service levels to the region.

5.5.2.1.2 Blending NF Concentrate with RO Feed Water

The Town performed conceptual analysis of a concentrate management alternative involving the concept of blending their NF concentrate with FA raw water to thereby feed their existing RO treatment trains. This concept was also identified and evaluated for potential future benefit to the RO raw water supply and reverse osmosis treatment system, regardless of its implementation as a primary concentrate management strategy, should the water quality of the FA system raw water continue to degrade or remain constant. Key considerations of the evaluation are summarized below:

- Implementing this concept may require additional treatment of the NF concentrate prior to blending with FA system raw water. The NF concentrate may require filtration for precipitants produced during the membrane process and products of oxidation formed during membrane treatment by the oxygen present in the SA raw water. Additional treatment could involve oxidation (using chlorine), oxidant removal (using sodium bisulfide), and sand filtration, though pilot testing is necessary to confirm necessity for additional treatment and establish an optimal treatment regime. It is possible that very little treatment will be required as there may be a positive reaction when the brackish water is mixed with the fresh water containing organic compounds.
- Pilot testing is necessary to test the additional treatment regime of the NF concentrate, evaluate the water quality of the treated NF concentrate blend with the FA system raw water, and test the treatment of the new blend with the RO Pilot unit. Pilot testing is investigative in nature and can be expected to continue for 6 to 12 months.
    - A proposed pilot-scale test plan is discussed in below.

[u] Arrington, D. Albrey, Loxahatchee River District. "RE: Nano Interlocal Agreement Term Extension." Received by David Brown, Town of Jupiter, 2 December 2021.

Job No. 44250-069

- If required, the NF concentrate pretreatment filtration system could be located at the WTP in the area between the existing NF pretreatment filters and the adjacent road to the east. Advantages to this location are the proximity to the FA system raw water piping, electrical power available at the existing NF facilities, and ability to share the existing backwash facilities.
- Residual concentrate pressure is estimated to be adequate to operate the concentrate treatment filtration, if required.
- The proposed concentrate treatment filtration system would require two filter units to maintain NF plant operation during a filter backwash. A single unit with two filter cells, similar to one of the existing units, would be adequate to provide redundancy. Each filter cell would be rated at 3.0 MGD.
- A pump station is needed to provide adequate pressure and flow control to place the treated NF concentrate into the FA raw water flow. A preliminary capacity target is 3 MGD (2,085 GPM) at 40 psi. Assuming three pumps with one being redundant, these would be approximately 40 horsepower each.
    - Proposed pump station wetwell should operate with a nitrogen blanket to prevent oxygen entering the NF concentrate.
    - Proposed pump station wetwell is 10,000 gallons at design flow rate (with 5 minutes of operation). Suggested dimensions, assuming 6-ft storage depth, are 15 feet by 15 feet.
- The recommended budget for implementing the new and modified facilities discussed above, including pilot testing, is $2,760,000.
- Implementing this concept will require alternate disposal of the water treatment plant waste streams currently being combined with NF concentrate and delivered to LRD, either by (1) being reused in the water plant processes, (2) sent to a proposed deep injection well (DIW) at the Town's WTP, or (3) sent to LRD as wastewater through the existing lift station. Water treatment plant waste streams include NF pressure filter backwash, NF instrument/floor drains, NF yard drain, NF membrane cleaning system, ion exchange backwash, RO instrument/floor drains, RO electrical room cooling water, RO membrane cleaning system. The recommended budget for implementing the alternate disposal of waste streams is $1,160,000.

As part of the evaluation, the Town conducted desktop water quality analysis of the NF concentrate blend with the FA raw water, as follows:

1. An analysis was conducted to determine criteria to predict the ratio of FA and SA water in each blend water
2. Projections were prepared of the resulting RO feed water quality
3. Membrane performance projections were prepared using the RO feed water resulting from the blend

Job No. 44250-069

Detailed results of the analysis are presented in **Appendix J-1** of this Master Plan, which includes the Technical Memorandum "Conceptual Analysis of Blending NF Concentrate with FAS Raw Water."

Based on a preliminary analysis, this concept has significant positive potential in reducing capital improvements projected to be required in relation to the water supply and reverse osmosis treatment system, should the FA raw water quality continue to increase in TDS content (exceed approximately 10,000 mg/L TDS). Possible benefits of this concept include the following:

- Reduce the amount of FA raw water required which reduces the FA flow rate and therefore pressure required in the FA raw water pipe network. Elimination of only one future FA well could save an estimated $3,000,000.
- Eliminate the projected need for a second pass on the RO trains to reduce total RO permeate total dissolved solids (TDS) by reducing the raw water TDS. Eliminating this future project could save the $2,500,000 estimated cost of this improvement.
- Eliminate the need for the projected plant site FA raw water booster station by reducing the required RO feed pressure. Eliminating this future project could save the $6,500,000 estimated cost of this improvement.
- Eliminate the projected NF concentrate booster pumps by eliminating concentrate flow to LRD. These pumps will be required in the future as NF plant concentrate pressure increases due to fouling in the concentrate transmission main to LRD as well as increased concentrate flow. Membranes that operate at lower feed pressure will have a lower train concentrate pressure which may not be adequate to operate the concentrate transmission main. Eliminating this project could save the $600,000 estimated cost of these pumps.
- Provide a portion of a parallel SA raw water main along Central Blvd to supplement the existing 24" raw water main along Central Blvd. which is at its capacity. There is no estimated cost savings associated with this element
- Provide the ability to further reduce RO feed pressure and RO permeate TDS, should the Town decide to add lower TDS SA raw water to the blend. If the NF concentrate blend concept is adopted, the facilities will be in place to also allow for addition of SA raw water to the blend. The SA raw water would pass through the same pretreatment process proposed for NF concentrate. There is no estimated cost savings associated with this element.
- Reduce daily plant operating cost by reducing required RO feed pressure which reduces electrical power required. This potential reduction in operating cost varies considerably based on the amount of NF concentrate or SA raw water being blended. There is no estimated cost associated with this element.

For additional details, cost estimate information, and siting considerations, refer to **Appendix J-1** for the complete Technical Memorandum, "Conceptual Analysis of Blending NF Concentrate with FAS Raw Water" and **Appendix K** for the Technical Memorandum "Waste Stream Recovery and Disposal" prepared by Kimley Horn.

Pilot Test Plan and Schedule

Job No. 44250-069

The Town intends to examine the potential for implementing the NF blending concept discussed above via pilot testing. As such, a preliminary pilot study schedule is included in this element of the Master Plan and can be referenced in **Appendix J-2**. The pilot study program is intended to be staffed and conducted by the University of Central Florida (UCF) College of Engineering and Computer Science's Civil, Environmental and Construction Engineering Department (CECE) as part of the continuing research program.

5.5.2.1.3 Deep Well Injection (DIW)

Renewal of the Town's interlocal agreement with LRD would require the Town to pay a connection/capacity fee for deep well injection constructed at LRD's facilities, as well as pay a fee ($ per 1,000 gallon) for NF concentrate which LRD disposes through said deep well.

Conversely, the Town can construct its own injection well(s) at their facility and implement deep well injection as their primary concentrate management strategy, independent of an agreement with an external entity and without a $/gallon fee. As a widely used and permitted concentrate management option within Florida, regulatory permitting would be commonplace.

The Town evaluated the feasibility of implementing Class I deep well injection as the long term primary concentrate management scheme for both NF concentrate, and RO concentrate at the WTP. Results of the evaluation are discussed under Section 5.5.3 - RO Concentrate Options, below.

5.5.2.2 Considerations and Challenges

Table 5-7 presents a summary of the considerations and challenges associated with the NF concentrate management options discussed above and examined as part of the Town's master planning effort. Based on examination of these options, the Town will budget for the study and implementation of the NF concentrate blend with the RO feed water option while continuing discussions with LRD to maintain their existing interlocal agreement for concentrate management. In parallel, the Town will also initiate work to permit construction of a deep well injection system. The deep injection well will be required as a backup disposal option for when reuse through LRD's reclaimed system is no longer a viable option or when the blending operation is offline.

Job No. 44250-069

Table 5-7: Summary of NF Concentrate Management Options and Considerations

Concentrate Management Option	Description of Option	Cost Avoidance	Ease of Permitting	Operational Flexibility / Reliability
Renewal of Interlocal Agreement with LRD (Current Concentrate Management Option)	Agree to revised terms and renew Interlocal Agreement to send NF Concentrate to LRD	Pro: • No major infrastructure upgrades or treatment processes expected Con: • The Town will no longer receive revenue and LRD's new agreement terms stipulate fees.	Pro: • Permitting continues to fall under LRD's purview; Option preserves reuse of concentrate for local irrigation water supplies. Con: • The Town submits water quality testing/results to LRD; Must meet water quality requirements set in interlocal agreement.	Pro: • Status quo maintained where Town still has emergency backup disposal through RO concentrate outfall, subject to requirements of permit set to expire in 2022. Con: • Operational control of the potable water production by the Town is at risk; LRD may direct Town to discontinue NF deliveries at LRD's sole discretion. • Town's current permit allowing emergency surface water discharge expires in 2022, with operation dictated by receiving surface water quality • New agreement terms likely will necessitate Town's construction of a backup disposal option.
Blend NF Concentrate with RO Feed Water for Treatment at RO Treatment Facility	Blend NF concentrate from Nanofiltration Facilities with FA raw water to be reused / treated through existing RO Facilities	Pro: • Town does not pay external entity for disposal; Adding NF concentrate flow will reduce required RO feedwater supply demands and may enhance RO feedwater quality. May remove need for planned RO raw water booster pump station. Con: • Additional treatment unit processes would be required between NF Concentrate and RO Feed • Backup disposal is required	Pro: • Promotes reuse of concentrate and decreases overall concentrate volume for disposal Con: • May affect concentrate water quality and surface water disposal permitting requirements. Combined disposal capacity remains at 4.6 MGD	Pro: • NF Concentrate is reused in a loop system. Town controls operation. • Innovative and sustainable • Town retains autonomy relative to operation of its water treatment systems Con: • May require further pretreatment before blending. • Requires a backup disposal option.

Job No. 44250-069

Concentrate Management Option	Description of Option	Cost Avoidance	Ease of Permitting	Operational Flexibility / Reliability
Deep Injection Well	Town constructs deep injection well at WTP for NF & possible future RO concentrate disposal	• Pro: For options requiring new infrastructure, it is a lower cost option • Con: Construction of new infrastructure necessary	• Pro: Potential environmental benefit associated with elimination of nutrient load in existing RO concentrate surface water discharge to SW Fork of Loxahatchee River. Widely performed practice within State of Florida • Con: Does not promote reuse of waste product	• Pro: Town retains autonomy relative to operation of its treatment systems. Widely used disposal method in South Florida. Town controls operation. • Con: Emergency Discharge to surface water would need to be maintained as a contingency option when injection wells are undergoing mechanical integrity testing (MITs) every five years

Job No. 44250-069

5.5.3 Reverse Osmosis Concentrate Management

5.5.3.1 Alternate Options for Disposal

As summarized previously, the Town's RO concentrate management practice since 1990 is to reuse this resource through permitted surface water discharge via outfall to the C-18 Canal/Southwest Fork of the Loxahatchee River. However, this method is subject to the water quality of the receiving water body and potential regulatory changes that may dictate RO concentrate permit renewal requirements in the future. As such, the Town is evaluating their long-term concentrate management options, discussed herein.

5.5.3.1.1 Continued Discharge to C-18 Canal

The Town's permit, which was renewed in 2017 and expires in November 2022, authorizes discharge to the C-18 Canal with monitoring requirements and water quality limitations at both the outfall and at specified distances within the receiving water body:

- Outfall Effluent Limitations – Include dissolved oxygen (DO), pH, hydrogen sulfide, and total copper, as well as biannual chronic and acute whole effluent toxicity evaluations.
- C-18 Canal Limitations – Include an established mixing zone of 400 meters east and west of the discharge location with limits for fluoride, gross alpha particle activity and combined radium 226+228.

Though the Town has consistently met the conditions of the permit, the water quality of the receiving water body may influence compliance and drive regulatory changes, precluding surface water discharge as the preferable long-term method for concentrate management in the future. The following regulatory drivers have prompted the Town to examine alternative RO concentrate management options:

- Whole Effluent Toxicity Requirements: The Town must meet Whole Effluent Toxicity (WET) monitoring requirements set forth in their concentrate disposal permit. WET test methods consist of exposing living aquatic organisms (plants, vertebrates and invertebrates) to the concentrate stream, to measure effect on the specific aquatic organism's ability to survive, grow and reproduce. The Town's current permit has stipulations for acute toxicity compliance at a mixing zone of three (3)-meter length on either side of the outfall at the canal. A mixing zone of dimensions yet to be determined is authorized for chronic toxicity compliance, based on approval by FDEP.
- Canal Background Water Quality: Receiving water quality in the C-18 Canal has previously exceeded the surface water discharge standard for total fluoride measured at the mixing zone boundary during extended drought conditions.
- Implementation of Numeric Nutrient Criteria (NNC): On June 7, 2015, the estuary-specific NNC were finalized as Rule 62-302.532 F.A.C. The NNC for the Loxahatchee River Estuary (Southwest Fork) are FDEP-established criteria for nutrients and nutrient response, as follows:
  - Total Phosphorus (TP) = 0.075 mg/L
  - Total nitrogen (TN) = 1.26 mg/L

- Chlorophyll a = 5.5 µg/L.

Water quality sampling has indicated many locations in the Loxahatchee River, which is classified as an impaired water body by FDEP, do not meet the published NNC. The stringent criteria may pose challenges to the Town in the future, as RO concentrate disposal to surface water becomes increasingly dependent on the water quality of the receiving Loxahatchee River. Thus, the Town would benefit from a NF concentrate disposal that would allow for parallel disposal of RO concentrate in case this current disposal method should no longer be viable for RO concentrate.

Loxahatchee River Pollutant Reduction Plan

The Loxahatchee River Pollutant Reduction Plan was accepted by FDEP and published in February 2020. The purpose of this plan is to provide information on implementing a voluntary pollutant reduction (4e) plan outlining nutrient management activities to make progress toward achieving the area's water quality criteria set for nutrients. Loxahatchee River stakeholders, including the Town of Jupiter, developed the voluntary plan to proactively remedy water quality impairments and postpone the implementation of a state prescribed total maximum daily load (TMDL). Pollutants of concern include total nitrogen (TN) and total phosphorus (TP), which are contributing to elevated chlorophyll-a levels.

Eliminating RO concentrate discharge to the C-18 canal would prevent discharge of nitrogen, and to a lesser extent phosphorous, contained in the concentrate water to the Loxahatchee River, therefore benefiting the Loxahatchee River Pollutant Reduction Plan. **Table 5-8** shows the estimated nutrient loading reduction to the C-18 Canal / Southwest Fork of the Loxahatchee River that would result from diverting RO concentrate to a deep injection well, based on analysis of monthly RO concentrate data from 2021. The concurrent 2022 Stormwater Master Plan Update provides detailed information on this subject.

Table 5-8: Estimated Nutrient Reduction to C-18 Canal/Loxahatchee River (Based on 2021 Monthly RO Concentrate Data)

RO Concentrate (mgd)	Average TN (mg/L)	TN Load (lb/yr)	Average TP (mg/L)	TP Load (lb/yr)
2.49	4.4	33,370	0.06	470

5.5.3.1.2 Deep Well Injection (DIW)

The Town evaluated the feasibility of implementing Class I deep well injection as their primary concentrate management scheme for both NF concentrate, and RO concentrate at the WTP. The feasibility study examined regulatory requirements, design and hydraulic considerations, siting considerations, and estimated costs. Key results of the evaluation are summarized below in **Table 5-9**.

Table 5-9: Class I Deep Well Injection Design Considerations [1]

Design Considerations	Criteria
Class 1 Injection Well Regulation	• FDEP Underground Injection Control (UIC), under Section 62-528 of the Florida Administrative Code (FAC)
Concentrate Flow (NF & RO Concentrate Combined)	• Estimated at 10 million gallons per day (MGD), or 6,944 gallons per minute (gpm)
One (1) Deep Injection Well:	
• Peak Design Velocity:	• 10 feet per second (FAC Rule 62-528.415(1)(f).2)
• Recommended Well Sizing:	• 28-inch Outside Diameter (OD) / 27-inch Inside Diameter (ID) Final Casing; Nominal 20" Fiberglass Reinforced Plastic (FRP) Injection Tubing with Cemented Annulus
• Estimated Tubing Length	• 2,840 feet
• Hydraulic Design Considerations: ▪ Concentrate Conveyance from Membrane Process to Injection Well [2]	▪ Direct injection into well, utilizing residual reject pressures exiting the membrane processes, or new Injection Well Pump Station [2]
▪ Injection Rate:	▪ Estimated Maximum Injection Rate that can be permitted is 11.4 MGD (7,914 gpm), based on the velocities in the FRP injection tubing and assumed injection pressures.
▪ Assumed Static Wellhead Pressure (estimated)	▪ 24 psi
▪ Dynamic Wellhead Pressure (estimated)	▪ 40 psi
One (1) Dual Zone Monitoring Well	• Within 150 feet of the injection well [3]
Siting Considerations	• Wellhead Protection Area – Dictates protection of potable water wells and requires a protection radius of 500 feet around the Town's Floridan Aquifer Well RO-4, onsite at the WTP, unless a variance is granted by FDEP (Section 62-521, FAC).
Testing of Injection Wells • Injection Testing:	• Typical 12-hour test performed after construction of injection and monitor well is complete to demonstrate that the injection well / formation can accept the required flows.
• Mechanical Integrity Testing (MIT)	• Test to demonstrate mechanical integrity of the injection well system every 5 years; normal operation of the well is disrupted for approximately 3 days, requiring production of concentrate to be discontinued or directed to an approved alternative disposal location.
Contingency Disposal Plan	• The Town plans to keep their existing surface water discharge method as a backup/emergency concentrate disposal method for instances when the injection well might be out of service due to maintenance and testing (described above).

Design Considerations	Criteria
Estimated Construction Cost for Deep Injection Well (4) • Design, Permitting, & Construction Costs	• **$20,812,500**
Estimated Operational Costs for Deep Injection Well • Monthly and Annual Water Quality Sampling Cost • Testing and Permitting – Every 5 Years • Plugging and Abandonment (5)	 • $44,400 (Yearly Total) • $110,000 (Every 5 Years) • $400,000 (Upon Closure of DIW)

Notes:

1. *Design considerations presented in Technical Memorandum, "Discussion of Membrane Concentrate Disposal Using Class I Deep Well Injection – DRAFT," JLA Geosciences, Inc., March 16, 2022.*
2. *Feasibility of utilizing direct injection is dependent on the required injection pressure of the proposed deep injection well. As part of the evaluation, injection pressure of the proposed deep injection well is estimated.*
3. *Unless demonstrated through a hydrogeologic study, that a monitor well located at a greater distance will be capable of adequately monitoring fluid movement adjacent to the borehole, per Rule 62-528.425(1)(g).3 of the F.A.C.*
4. *Cost includes piping, valving, electrical & instrumentation for only the injection well and monitoring well (potential pump station(s) not included); cost does not include any major demolition or WTP modifications, only minor site setup required by the drilling contractor.*
5. *FDEP requires that permit holders provide certification that they are financially responsible for plugging and abandoning the system if deemed necessary. The certification must be updated for every UIC permit application (construction, operation and/or permit renewal). FDEP can order the plugging of an injection well when it has been abandoned or has been "determined to be a threat to the waters of the State."*

The method of concentrate conveyance from the membrane treatment process to the proposed injection well will be dependent upon the required well injection pressure. The method of conveyance is also dependent upon required backflow prevention measures. Factors that affect injection pressures at the wellhead include:

1. Pressures at the wellhead under static (non-pumping) conditions
2. Injection velocity and friction loss inside the injection tubing
3. Capacity of the open-hole injection zone

Injection testing is required to determine the required injection pressure, and this requires the well to be constructed. For the purpose of this evaluation, injection pressures are estimated. It must be understood that each well is unique and while reasonable estimates can be developed, adjustments may be required after the injection test to develop an effective operational system.

As summarized in the above preliminary investigation, the Town can potentially implement deep well injection as their primary NF and RO concentrate management method at an estimated construction cost of approximately $17 million for a 28-inch OD Class 1 Injection Well, lined with a nominal 20-inch tubing. This cost excludes the construction of a pump station (if needed) and excludes any major WTP modifications necessary to site the deep injection well and associated dual-zone monitor well within the WTP. The Town would maintain their surface water discharge as an emergency disposal method during injection well testing. This option would provide long-term independence from LRD and proactively plan for potential regulatory changes related to the receiving C-18 Canal/Southwest Fork of the Loxahatchee River.

For additional detail, refer to **Appendix L** for the complete Technical Memorandum, "Discussion of Membrane Concentrate Disposal Using Class I Deep Well Injection," by JLA Geosciences, Inc.

Pump Station for DIW

The Town further evaluated the implementation of deep well injection by assessing the need for a DIW pump station to meet design and regulatory requirements. A pump station is required to provide an atmospheric air gap to prevent backflow from the DIW, which is under artesian pressure, into the NF and RO plants. This air gap is sometimes not required by FDEP, whereby an RPZ backflow preventer is required. For the proposed concentrate management alternative, an RPZ is not practical due to the corrosive nature of primarily the RO concentrate. This device also imparts a relatively high headloss that would need to be overcome by the residual pressure at both plants. Installation of a pump station will substantially reduce the required concentrate pressure which improves operating efficiency of the membrane treatment systems. For additional detail, cost, and siting considerations, refer to **Appendix M** for the complete Technical Memorandum, "Deep Well Injection Pump Station," by Kimley Horn. Key results of the evaluation are summarized in **Table 5-10**.

Table 5-10: DIW Pump Station Considerations [1]

Design Considerations	Criteria
Class 1 Injection Well Pump Station	• Purpose: To provide an atmospheric air gap to prevent backflow from the DIW into the NF and RO plants. • FDEP may require either an air gap or a RPZ backflow preventer
Design Flow: Concentrate Flow + Other Waste Streams	• Flow Streams: ▪ NF Concentrate = 3.0 MGD, maximum ▪ RO Concentrate = 4.6 MGD, maximum ▪ Onsite Waste Streams = 2.4 MGD (estimated) [2] • Total Capacity: 10.0 MGD, or 6,950 gpm
Pump Station Design: • Number of Pumps: ▪ Redundancy ▪ Pump Capacity ▪ Horsepower • Below-ground Wetwell ▪ Volume at 5-minute Storage Capacity ▪ Estimated Dimensions ▪ Wetwell Interior	 • Four (4) pumps: ▪ 3 Duty Pumps + 1 Standby Pump ▪ 2,3150 gpm at 40 PSI, each ▪ 75 hp, each ▪ 34,750 gallons, or 4,633 cubic feet ▪ Storage Depth = 6 feet; Footprint = 28 feet x 28 feet ▪ Fiberglass Lined
Proposed Siting:	1. BWRB Site: – Locate near DIW in a portion of BWRB; pipe RO concentrate, NF concentrate and other waste streams to the location.
Estimated Cost for DIW Pump Station at Location 1. BWRB Site:	1. Opinion of Probable Construction Cost: **$1,870,000**

Notes:

1. *Design considerations presented in Appendix M - Technical Memorandum, "Deep Injection Well Pump Station," by Kimley Horn.*
2. *For description of the onsite waste streams requiring disposal, refer to Appendix – K - Technical Memorandum, "Waste Stream Recovery and Disposal Improvements," by Kimley Horn.*

5.5.3.2 Challenges

Based on discussion of these options, it is recommended that the Town begin pilot testing, design, and construction for the blending of NF concentrate through the RO water treatment system. Concurrently, the Town should also initiate the design, permitting, and construction of the DIW system.

The injection well may serve as a back-up disposal option for NF concentrate while also concurrently serve as a future emergency or permanent disposal option for RO concentrate as the Town desires or as regulatory

constraints dictate. This strategy should improve the flexibility and reliability of concentrate disposal for the Town. The DIW will also serve as a discharge location for other waste streams generated on the WTP site.

5.5.3.3 Opportunities

While several challenges are associated with the addition of the deep injection well to the Town of Jupiter's Water Treatment Plant, the Town recognizes that several opportunities arise out of this requirement. Firstly, if the Town no longer disposes of RO concentrate via open water discharge, the Town will no longer be required to expend approximately $731K for the RO concentrate treatment facility, $198K for the RO concentrate off-gas treatment and $61K for the RO concentrate water quality monitoring. Compared to the approximately $89K and $45K for the injection well pump station operational costs and water quality monitoring costs, this results in a savings of over $857K annually. These costs are summarized in **Table 5-11**.

Table 5-11: Comparison of Injection Well Costs vs RO Concentrate Treatment Costs

Item	Increase (Reduction)	Notes/Assumptions
Injection Well Pump Station	$ 88,795.74	• 388 KWH per 1 MGD of Flow; $0.10/KWH • FY2021 AADF = 16.5 MGD • Injection Well Flow = 0.38xAADF
Injection Well WQ Monitoring	$ 45,000.00	• JLA estimate from Injection Well Tech Memo including in 2022 MPU
RO Concentrate Treatment Facility	$ (731,834.13)	• 2.3 tons of sulfuric acid required per 1 MGD concentrate • FY2021 AADF of RO Concentrate = 2.75 MGD • 2022 Acid Price Including Increase = $317/ton
RO Concentrate Off-Gas Treatment (1)	$ (198,193.50)	• Avg Annual Chemical Usage (FY18 to FY21): ▪ 15 tons chlorine & 277 tons caustic ▪ FY2023 chlorine cost: $1385/ton ▪ FY2023 caustic cost: $640.50/ton
RO Concentrate WQ Monitoring	$ (61,500.00)	• 2021-22 Costs from testing laboratories including Florida Spectrum and Marinco

Net Change $ (857,731.89)

Notes:

1. *Off-Gas Treatment costs do not account for reductions in power related to blower and recirculation pumps.*

Additionally, removing the RO concentrate from the open canal discharge to the river should assist with improving the waters of the State through the Loxahatchee River Pollutant Reduction Plan and generally promote the Loxahatchee Preserve Initiative.

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6. Renewal and Replacement of Water System Aging Infrastructure

6.1 Introduction

Asset management is a vital Utility function and includes preparation of Capital Improvement Programs to renew and replace components of the Utility that have reached their useful life or functionality. Asset management begins with an inventory of the Utility assets. This inventory must include all assets and be organized to allow each asset item to include its date of acquisition/installation, expected useful life, and current value.

The Town's consultant refined the Utility inventory of assets, referred to as the Master Asset List which includes all water treatment plant components including piping, the treated water storage tanks both off and on site and the treated water pumping facilities both off and on site, all raw water supply components including piping, mechanical and piping components of the water system's wellfield and recharge system. An inventory of assets associated with the water distribution system was not performed as part of this effort.

The Master Asset List should be updated as needed to include asset items that have been added or asset items that have been demolished or removed from the system and not replaced. An annual update should also include modifying any Unit Cost values that do not reflect the current estimated cost to replace an asset as it is described in the "Unit Cost-Life (date)" spreadsheet.

The opinion of probable costs for the Town's Water System asset management capital improvement program is presented in Section 7 (titled "Recommended Capital Improvement Program") of this report.

6.2 Recommended Water System Renewal and Replacement Improvements

Appendix N presents the Master Asset List and currently contains approximately 585 items or Water System Components. The Master Asset List began with a copy of the Water System's Maintenance List which was modified to be a list of the major assets of the Utility and serve as an inventory of the major assets. The listed assets are intended to be major components of the Utility System and the Master Asset List is not intended to be a detailed list of all components that can be replaced or require maintenance. Replacement of the smaller items that have a relatively short useful life or relatively low replacement cost are expected to be replaced as part of a routine maintenance program. Each Asset item includes an "Equipment Description", "Location", and "Equipment Type" that coincide with these categories on the Utility Maintenance list. The intent is that there be some ability to relate the Asset List and Maintenance List.

The Master Asset List should be updated as needed to include asset items that have been added or asset items that have been demolished or removed from the system and not replaced. An annual update should also include modifying any Unit Cost values that do not reflect the current estimated cost to replace an asset as it is described in the "Unit Cost-Life (date)" spreadsheet. For an explanation of the Asset List workbook refer to **Appendix N** - Technical Memorandum, "Water System Asset List, Renewal & Replacement Capital Improvement Plan," prepared by Kimley-Horn. These ongoing maintenance and replacement

projects ensure that the Town's drinking water assets remain reliable and maximizes their useful life.

7. Recommended Capital Improvement Program

Table 7-1 summarizes the 25-year capital plan for the Town's water utility incorporating the operating and capital needs as generated by this 2022 Master Plan Update. The order that the projects are presented in this table is neither an indication of the sequence that the projects should be implemented nor a ranking of their priority. A fundable plan for implementation of identified projects is presented in Section 8 – Financial Forecasts and Recommendations.

Table 7-1: Town of Jupiter 25-Year Capital Improvement Plan

Org	Obj	Proj	Capital Improvement Projects	Funding Source	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	Total 2022 to 2046
																					2,340,407								
40050x33	56400x		Machinery & Equipment	O&M	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
40150033	531000	W1291	Professional Services	R&R	$ 57,686	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 57,686
40151033	563406	W0329	Large Meter Replacement Program	R&R	356,450	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,736	139,808	144,002	148,322	152,772	210,637	210,637	210,637	210,637	210,637	210,637	210,637	210,637	210,637	4,324,816
40151033	563405	W0002	Meter Replacement Program	R&R	748,693	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	604,762	622,905	641,592	660,840	680,665	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	36,797,574
40251333	563405	W0002	Meters New	OS	67,150	49,600	46,888	44,175	41,463	38,750	36,038	33,325	30,613	27,900	25,188	22,475	19,763	17,050	14,338	3,488	-	-	-	-	-	-	-	-	-	518,204
40251133	563402	W0128	North Limestone Creek Wellfield	R&R	9,093,757	-	-	-	1,960,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,053,757
40251133	562400	W0812	Water Utilities Security Improvements - Ph II	CF	10,271	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,271
40151033	566000	W1219	Customer Information & Utility Billing System (V4 Upgrade)	R&R	401,696	-	-	-	-	-	-	-	-	-	856,882	-	-	-	-	-	-	-	-	-	1,151,578	-	-	-	-	2,410,156
40150033	546094	W1290	AMRR - Admin/GIS	R&R	27,797	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27,797
40150133	546080	W1290	AMRR - Nano Bldg Roof Repairs	R&R	100,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100,000
40150133	546083	W1290	AMRR - Stainless St Pipe Clean	R&R	101,105	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101,105
40150133	546085	W1290	AMRR - Salinity Barrier Mt	R&R	211,789	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211,789
40150133	546087	W1290	AMRR - Plant Asset Mgt (Lucity)	R&R	41,184	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41,184
40150133	546088	W1290	AMRR - Plant/NF Concen Main	R&R	32,868	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32,868
40150133	546089	W1290	AMRR - Plant/Fence/Landscaping	R&R	222,412	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	222,412
40150133	546091	W1290	AMRR - Plant/Well Rehab	R&R	866,320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	866,320
40150133	546092	W1290	AMRR - Plant/SCADA	R&R	435,552	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	435,552
40150133	546093	W1290	AMRR - Plant/Painting	R&R	325,770	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	325,770
40150133	546095	W1290	AMRR - Plant/Recharge	R&R	169,212	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	169,212
40150133	546096	W1290	AMRR - Plant/Other	R&R	35,321	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	35,321
40150133	546099	W1290	AMRR - Plant/Nano Acid Tanks	R&R	137,359	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	137,359
40151033	563402	W1290	AMRR - RO Wellhead Reconstruction	R&R	1,363,806	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,363,806
40150233	546093	W1290	AMRR - Field/Painting	R&R	70,829	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	70,829
40150233	546098	W1290	AMRR - Field/Valves/Hydrants	R&R	224,246	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	224,246
40150233	563401	W1290	AMRR - Field/Military Trail Loop/WTP WM (Plant Supply)	R&R	133,035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	133,035
40150133	546xxx	W1290	Asset Maintenance R&R Program	R&R	-	1,652,218	1,156,344	1,425,374	1,292,984	1,441,007	1,335,567	850,727	970,825	1,280,458	1,030,956	1,293,011	1,082,507	1,015,812	1,544,552	1,477,507	1,218,372	1,155,087	1,305,983	1,720,828	1,384,163	1,724,435	1,469,895	1,379,234	1,900,324	32,108,170
40151033	562400	W1401	Ion Exchange Resin Replacement	R&R	-	-	-	-	-	-	-	210,421	-	-	-	-	-	-	-	-	-	-	-	300,010	-	-	-	-	-	510,431
40151033	563404	W1402	Pump Replacement Program	R&R	853,227	-	545,927	778,289	-	241,644	433,467	2,631,190	4,351,655	216,733	839,842	-	81,275	529,853	449,543	1,543,694	-	1,499,234	-	-	-	-	-	-	14,995,573
40151033	562400	W1503	MBA Rehab for RO Permeate Odor Contl	R&R	637,555	-	-	-	-	-	-	-	-	-	2,896,532	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,534,087
40151033	562400	W1508	RO & Nano Membrane Repl Prgm	R&R	2,711,550	-	-	-	-	2,570,646	-	-	-	982,236	-	3,069,486	-	1,363,049	-	-	-	-	3,775,081	-	-	-	-	1,530,290	16,002,338
40151033	563401	W1602	Piping Upgrade-Central Blvd Pump Station	R&R	-	1,313,935	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,313,935
40251233	563401	W1602	Piping Upgrade-Central Blvd Pump Station	OS	17,422	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,422
40251133	562400	W1605	Nitrogen Blanket in Sulfuric Acid Tanks	CF	74,014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74,014
40151033	563401	W1613	Juno Beach Distribution System Improvements	R&R	-	-	-	-	-	-	-	-	-	946,893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	946,893
40151033	562400	W1702	Generator Replacement Program	R&R	-	-	-	359,037	590,070	-	106,291	-	635,159	-	-	-	-	-	151,597	-	764,718	850,721	963,840	859,162	-	285,902	-	1,919,702	-	7,486,199
40151033	563401	W1704	Loxahatchee River Road Area Distribution System Impr	R&R	101,432	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101,432
40151033	562400	W1816	RO Concentrate Treatment Facility Improvements	R&R	165,676	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	165,676
40151033	563402	W1817	Production Well Replacement Prgm (Surficial)	R&R	2,450,409	-	1,810,609	2,117,161	-	2,246,096	4,092,001	3,105,684	-	-	4,446,168	-	1,628,688	-	3,559,573	-	-	-	-	-	-	6,789,740	-	-	2,358,276	34,604,405
40151033	563403	W1817	Production Well Replacement Prgm (Floridan)	R&R	3,507,455	-	-	-	-	-	-	4,412,156	-	5,633,915	-	-	-	-	-	-	-	5,633,915	-	-	-	-	-	-	19,187,441
40151033	563401	W1818	Penn Park Distribution System Improvements	R&R	1,036,319	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,036,319
40151633	563401	W1818	Penn Park Distribution System Improvements	CDBG	420,230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	420,230
40151033	562400	W1912	Nitrogen Trichloride Gas Elimination System	R&R	173,113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	173,113
40151033	562400	W1914	WTP Control System Cybersecurity	R&R	135,424	66,500	66,500	66,500	66,500	66,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	467,924
40151033	562400	W2001	Nano Pretreatment Sand Filter Media Replacement	R&R	957,042	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	957,042
40151033	562400	W2007	WTP Hardened Server Bldg (Training Facility)	R&R	135,000	559,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	694,000
40151633	562400	W2007	WTP Hardened Server Bldg (Training Facility)	FEMA	144,896	741,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	885,896
40151033	562400	W2010	RO Plant Mods to Addr RW Degradation - Incr Interstage Boost	R&R	2,991,165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,991,165
40151033	563402	W2011	Floridan Aquifer Wells RO-14, RO-15, RO-16 & RWMs	R&R	12,865,938	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12,865,938
40151033	563401	W2012	Pine Gardens North Infrastructure Improvements	R&R	1,371,378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,371,378
40151033	563401	W2013	Riverbend Country Club WM Improves (Ph I-2020/Ph II-2024)	R&R	121,036	-	302,890	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	423,926
40151033	563401	W2115	Brentwood North Distribution Improvements	R&R	225,663	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	225,663
40251233	563401	W2116	Distribution System Flow & Pressure Monitoring	OS	752,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	752,600
40151033	563401	W2117	Fisherman's Landing Water Main Replacement	R&R	994,881	92,252	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,087,133
40151033	563401	W2118	Juno Beach Repump Station Valve Replacements	R&R	182,125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	182,125
40151033	563407	W2119	RO Clearwell Interior Structural Repairs	R&R	283,425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	283,425
40151033	563401	W2120	Distribution System Water Quality Sampling Stations	R&R	99,410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,410
40151033	562400	W2121	RO Permeate Degasifier Impr - Testing/Add 4th Degasifier	R&R	10,000	-	-	623,385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	633,385
40151033	563401	W2123	Jupiter Lakes & Wood Duck Water Distr System Improves	R&R	317,706	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	317,706
40151033	562400	W2140	Sodium Hypochlorite Feed System	R&R	131,988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	131,988
40151033	562400	W2226	RO Bulk Surfuric Acid Storage Tanks (2-4000gal)	R&R	134,614	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	134,614
40151033	563401	Wxxxx	Ammonia Injection Relocation/4-Log	R&R	-	286,443	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	286,443
40151033	563401	Wxxx	Dolphin Drive-Replace 6" and 4" AC mains	R&R	-	370,543	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	370,543
40151033	563401	Wxxx	Toney Penna Transmission-Replace 18", 24", and 8" valves	R&R	-	210,058	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	210,058
40151033	562400	Wxxxx	NF Concentrate Blending to RO Feed Pilot Testing	R&R	-	2,928,084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,928,084
40151033	563401	Wxxxx	Pennock Industrial Park Valves and Hydrants	R&R	-	98,345	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98,345
40151033	563402	Wxxxx	Deep Injection Well (JLA)	R&R	-	22,079,981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22,079,981
40151033	563404	Wxxxx	Deep Injection Well Pump Station	R&R	-	-	2,043,399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,043,399
40151033	562400	Wxxxx	Waste Stream Recovery and Disposal	R&R	-	-	1,267,563	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,267,563
40151033	563401	Wxxxx	Indiantown Rd Water Transmission Main Fitting Replace	R&R	-	-	208,220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	208,220
40151033	563401	Wxxxx	Eganfuskee/Carl St/Clark Ln Distribution Improvements	R&R	-	-	-	436,845	-	-	-	-	-	-	-	-	-	-	-	-	1,002,934	-	-	-	-	-	-	-	-	1,439,779
40151033	563100	Wxxxx	Water Treatment Plant Asphalt Mill and Overlay	R&R	-	-	-	-	406,928	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	406,928
40151033	563401	Wxxxx	Bendross Road Distribution Improvements	R&R	-	-	-	-	198,745	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	198,745
40251133	563402	Wxxxx	Construction of Floridan Aquifer Well RO-17, RO-18	R&R	-	-	-	-	3,421,742	-	-	-	-	4,074,070	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,495,812
40151033	563401	Wxxxx	Loxahatchee River Rd Area Distrib System Improves - Ph II	R&R	-	-	-	-	-	716,431	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	716,431
40151033	563401	Wxxx	Via Rio-New 6" WM & Relocate Services to Indiv Properties	R&R	-	-	-	-	-	-	324,687	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	324,687
40151033	562400	Wxxxx	Liquid Chlorine Conversion	R&R	-	-	-	-	-	-	1,916,143	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,916,143
40151033	563407	Wxxxx	Storage Reservoir Replacement Program	R&R	-	-	-	-	-	-	742,207	-	1,270,537	-	-	-	-	-	-	-	-	2,460,370	-	-	-	-	-	4,108,033	-	8,581,147
40151033	563401	Wxxx	Old Ft Jupiter Rd-Loop 6" WM Old Ft Jupiter W to Lox River Rd	R&R	-	-	-	-	-	-	-	217,378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	217,378
40151033	563401	Wxxx	Old Orange Rd-Loop 6" WM Fr Old Orange S to Coco Plumosus	R&R	-	-	-	-	-	-	-	41,803	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41,803
40151033	563401	Wxxx	Holy Ln-New 6" WM Holy Ln & Relocate Services Fr Lox River Rd	R&R	-	-	-	-	-	-	-	167,214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	167,214
40151033	563401	Wxxxx	Old Dixie Highway Water Main Replacement	R&R	-	-	-	-	-	-	-	-	1,628,582	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,628,582
40151033	563404	Wxxxx	Riverbend Repump Rechloramination Chemical Facility	R&R	-	-	-	-	-	-	-	-	809,872	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809,872
40151033	562400	Wxxxx	WTP Replacement Program	R&R	-	-	-	-	-	-	-	-	4,478,878	11,019,529	1,097,980	-	-	-	-	665,688	-	10,457,300	18,529,275	-	1,475,593	-	-	-	47,724,243
40151033	563401	Wxxxx	SAS New 30-inch Raw Water Main	R&R	-	-	-	-	-	-	-	-	8,210,677	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,210,677
40151033	563401	Wxxxx	Jupiter Plantation Distribution Improvements	R&R	-	-	-	-	-	-	-	-	-	350,701	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350,701
40151033	563401	Wxxx	N Delaware-Replace 8" AC WM on N Delaware/Arapaho/Chippewa	R&R	-	-	-	-	-	-	-	-	-	-	623,802	-	-	-	-	-	-	-	-	-	-	-	-	-	623,802
40151033	563401	Wxxx	Woodside Trail-Loop 6" WM Fr Woodside Tr S to Center St	R&R	-	-	-	-	-	-	-	-	-	-	-	71,516	-	-	-	-	-	-	-	-	-	-	-	-	71,516
40151033	563401	Wxxx	Penn Trl / Turner Quay-Loop 6" WM to N End TQ	R&R	-	-	-	-	-	-	-	-	-	-	-	-	106,616	-	-	-	-	-	-	-	-	-	-	-	106,616
40151033	563401	Wxxx	Pompano Drive-Repl 6" AC WM & Loop E to Dolphin Pk	R&R	-	-	-	-	-	-	-	-	-	-	-	-	490,916	-	-	-	-	-	-	-	-	-	-	-	490,916
40151033	563401	Wxxx	Marlin Drive-Replace 6" AC WM on Marlin Dr	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	533,097	-	-	-	-	-	-	-	-	-	-	533,097
40151033	563401	Wxxx	N Loxahatchee Drive-Replace 6" AC WM	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	344,467	-	-	-	-	-	-	-	-	-	344,467
40151033	563401	Wxxx	Jupiter Dunes-Repl/Relocate 10" & 6" WM Out of Golf Course	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	243,594	-	-	-	-	-	-	-	-	243,594
40151033	563401	Wxxxx	Toney Penna at JRE WM-Lower/Protect Shallow WM & Add Isol Vs	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,183,969	-	-	-	-	-	-	-	1,183,969
40151033	563401	Wxxxx	FAS New 36-inch Raw Water Main	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,126,499	-	-	-	-	-	-	-	4,126,499
40151033	563401	Wxxxx	Villas on the Green Distribution Improvements	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,001,801	-	-	-	-	-	-	1,001,801
40151033	563401	Wxxxx	Ocean Parks Condos Distribution Improvements	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	511,146	-	-	-	-	-	511,146
40151033	563401	Wxxxx	Bella Vista Distribution Improvements	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	754,101	-	-	-	-	754,101
40151033	562400	Wxxxx	Nano Sulfuric Acid Bulk Tank Replacements	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,221,709	-	-	-	1,221,709
40051533	563401	Wxxxx	Hampton Pl & Hampton Cir Distribution Improvements	O&M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400,013	-	-	400,013
40151033	563401	Wxxx	Distribution R&R TBD	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	970,000	999,100	1,969,100
			Town Hall Replacement - 2nd Contribution	R&R	2,975,339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,975,339
			Total Projects		$ 52,212,340	$ 31,950,177	$ 8,950,558	$ 7,352,984	$ 9,480,650	$ 8,823,292	$ 10,488,619	$ 13,172,116	$ 23,889,016	$ 26,034,653	$ 13,319,568	$ 5,196,986	$ 4,172,478	$ 4,244,455	$ 6,873,232	$ 4,767,408	$ 10,636,899	$ 25,398,835	$ 27,425,732	$ 5,974,508	$ 7,573,450	$ 11,540,497	$ 8,888,335	$ 6,638,443	$ 8,129,297	$ 343,134,528

8. Financial Forecasts and Recommendations

8.1 Introduction

This section of the Water Master Plan provides a discussion of the financial forecast to i) present the basis for the funding of the capital program as identified in the plan, including the adequacy of the connection fees; ii) evaluate trends in the expenditure requirements to be funded from rates (rate sufficiency and potential changes in rates to fund such expenditures); and iii) estimate the projected financial position of the Water System based on the forecast of assumptions regarding customer growth, inflation, and other factors and observations for consideration by the Town. The overall purpose of this analysis is to provide the Town additional information for strategic and business planning purposes as it evaluates the capital funding and water service delivery plans as well as certain risks to the utility which may affect the projections, and which need to be monitored by the Town in the future. This forecast is intended to be dynamic and will be adjusted yearly by the Town as part of the annual budget and capital planning process.

8.2 Capital Expenditure Overview

The capital plan as identified in the Water Master Plan, which also includes projects that have previously been approved by the Town, as summarized in **Table 8-1** and shown in **Table 8-2**. The capital plan includes the following expenditures by functional type:

Table 8-1: Summary of Water Capital Projects – Fiscal Years 2022 to 2046 ($000s) [1]

	2022 to 2025	2026 to 2030	2031 to 2035	2036 to 2040	2041 to 2046	Totals
Summary of Capital Expenditures:						
Expansion-related Projects	$1,062.1	$180.2	$112.4	$17.8	$---	$1,372.5
Renewals, Replacements, and Rehabilitation Projects	98,097.8	65,673.5	52,855.8	75,084.3	48,344.5	340,055.9
General Operating (budgetary) Projects	---	---	---	---	400.0	400.0
Contributions and Grant Projects	1,306.1	---	---	---	---	1,306.1
Total Capital Expenditures	$100,466.0	$65,853.7	$52,968.2	$75,102.1	$48,744.5	$343,134.5

[1] *Amounts derived from Table 8.2*

As can be seen above, the majority of the identified capital expenditures identified in the Water Master Plan are for renewals, replacements, rehabilitation, improvements, and upgrades ("renewals and replacements") of the Water System (approximately 99% of the identified capital costs). This would be expected since the majority of the Water System service area is approaching a built-out condition from both a service availability and a capacity need standpoint. This is further amplified by the fact that during the next 20 years, most of the installed assets are expected to have reached or will be approaching the end of their average service lives and will need replacement or upgrades in order to continue to provide high quality water service. It should be noted that the capital costs shown in **Table 8-2** include an allowance for inflation at 3.0% annually beginning in Fiscal Year 2023 (i.e., above the estimates assumed for the Fiscal Year 2022 which have been adjusted to reflect current installed / construction costs) to account for the then future cost of the capital needs placed upon the Water System. The 3.0% factor is representative of the average annual increase in construction costs as reported by the Engineering News Record which tracks such changes in cost over the past 25 years. The increased capital needs are allocable to the existing customers and will need to be funded primarily from Water System operations (rates) since the majority of the capital costs are classified as renewals and replacements. This will result in the need for the recognition of continued annual transfers to the Renewal and Replacement Fund and other capital reserves which will be critical to the ability to fund the capital improvements while limiting the need to issue additional utility revenue bonds above amounts considered fiscally prudent for the Water System.

Table 8-2: Summary of Capital Improvement Plan – Fiscal Years 2022 to 2046 [(1)]

Capital Project Description	Project Type	Fiscal Year Planning Period					Total
		2022 to 2025	2026 to 2030	2031 to 2035	2036 to 2040	2041 to 2046	Planning Period
Professional Services	Renewal / Upgrade	$57,686	$-	$-	$-	$-	$57,686
Large Meter Replacement Program	Renewal / Upgrade	762,049	675,998	689,945	933,004	1,263,820	4,324,816
Meter Replacement Program	Renewal / Upgrade	4,849,748	6,835,092	4,603,296	7,730,816	12,778,622	36,797,574
Meters New	Expansion	207,813	180,189	112,376	17,826	-	518,204
North Limestone Creek Wellfield	Renewal / Upgrade	9,093,757	1,960,000	-	-	-	11,053,757
Water Utilities Security Improvements - Ph II	Expansion	10,271	-	-	-	-	10,271
Customer Information & Utility Billing System (V4 Upgrade)	Renewal / Upgrade	401,696	-	856,882	-	1,151,578	2,410,156
Asset Maintenance R&R Program	Renewal / Upgrade	8,732,541	5,891,110	5,702,744	6,701,501	9,578,879	36,606,775
Ion Exchange Resin Replacement	Renewal / Upgrade	-	210,421	-	-	300,010	510,431
Pump Replacement Program	Renewal / Upgrade	2,177,443	7,657,956	1,667,703	3,492,471	-	14,995,573
MBA Rehab for RO Permeate Odor Control	Renewal / Upgrade	637,555	-	2,896,532	-	-	3,534,087
RO & Nano Membrane Replacement Program	Renewal / Upgrade	2,711,550	2,570,646	5,414,771	3,775,081	1,530,290	16,002,338
Piping Upgrade-Central Blvd Pump Station	Renewal / Upgrade	1,313,935	-	-	-	-	1,313,935
Piping Upgrade-Central Blvd Pump Station	Expansion	17,422	-	-	-	-	17,422
Nitrogen Blanket in Sulfuric Acid Tanks	Expansion	74,014	-	-	-	-	74,014
Juno Beach Distribution System Improvements	Renewal / Upgrade	-	-	946,893	-	-	946,893
Generator Replacement Program	Renewal / Upgrade	359,037	1,331,520	-	2,730,876	3,064,766	7,486,199
Loxahatchee River Road Area Distribution System Improvements	Renewal / Upgrade	101,432	-	-	-	-	101,432
RO Concentrate Treatment Facility Improvements	Renewal / Upgrade	165,676	-	-	-	-	165,676
Production Well Replacement Program (Surficial)	Renewal / Upgrade	6,378,179	9,443,781	6,074,856	3,559,573	9,148,016	34,604,405
Production Well Replacement Program (Floridan)	Renewal / Upgrade	3,507,455	4,412,156	5,633,915	5,633,915	-	19,187,441
Penn Park Distribution System Improvements	Renewal / Upgrade	1,036,319	-	-	-	-	1,036,319

Table 8.2 (cont'd.): Summary of Capital Improvement Plan – Fiscal Years 2022 to 2046 [1]

Capital Project Description	Project Type	Fiscal Year Planning Period					Total
		2022 to 2025	2026 to 2030	2031 to 2035	2036 to 2040	2041 to 2046	Planning Period
Penn Park Distribution System Improvements	Contribution	420,230	-	-	-	-	420,230
Nitrogen Trichloride Gas Elimination System	Renewal / Upgrade	173,113	-	-	-	-	173,113
WTP Control System Cybersecurity	Renewal / Upgrade	334,924	133,000	-	-	-	467,924
Nano Pretreatment Sand Filter Media Replacement	Renewal / Upgrade	957,042	-	-	-	-	957,042
WTP Hardened Server Building (Training Facility)	Renewal / Upgrade	694,000	-	-	-	-	694,000
WTP Hardened Server Building (Training Facility)	Contribution	885,896	-	-	-	-	885,896
RO Plant Modifications to Add RW Degradation - Increase Interstage Boost	Renewal / Upgrade	2,991,165	-	-	-	-	2,991,165
Floridan Aquifer Wells RO-14, RO-15, RO-16 & RWMs	Renewal / Upgrade	12,865,938	-	-	-	-	12,865,938
Pine Gardens North Infrastructure Improvements	Renewal / Upgrade	1,371,378	-	-	-	-	1,371,378
Riverbend Country Club WM Improves (Ph I-2020/Ph II-2024)	Renewal / Upgrade	423,926	-	-	-	-	423,926
Brentwood North Distribution Improvements	Renewal / Upgrade	225,663	-	-	-	-	225,663
Distribution System Flow & Pressure Monitoring	Expansion	752,600	-	-	-	-	752,600
Fisherman's Landing Water Main Replacement	Renewal / Upgrade	1,087,133	-	-	-	-	1,087,133
Juno Beach Repump Station Valve Replacements	Renewal / Upgrade	182,125	-	-	-	-	182,125
RO Clearwell Interior Structural Repairs	Renewal / Upgrade	283,425	-	-	-	-	283,425
Distribution System Water Quality Sampling Stations	Renewal / Upgrade	99,410	-	-	-	-	99,410
RO Permeate Degasifier Improvement - Testing/Add 4th Degasifier	Renewal / Upgrade	633,385	-	-	-	-	633,385
Jupiter Lakes & Wood Duck Water Distribution System Improves	Renewal / Upgrade	317,706	-	-	-	-	317,706
Sodium Hypochlorite Feed System	Renewal / Upgrade	131,988	-	-	-	-	131,988

Table 8.2 (cont'd.): Summary of Capital Improvement Plan – Fiscal Years 2022 to 2046 [1]

Capital Project Description	Project Type	Fiscal Year Planning Period					Total
		2022 to 2025	2026 to 2030	2031 to 2035	2036 to 2040	2041 to 2046	Planning Period
RO Bulk Surficial Acid Storage Tanks (2-4000 gal)	Renewal / Upgrade	134,614	-	-	-	-	134,614
Ammonia Injection Relocation/4-Log	Renewal / Upgrade	286,443	-	-	-	-	286,443
Dolphin Drive-Replace 6" and 4" AC mains	Renewal / Upgrade	370,543	-	-	-	-	370,543
Toney Penna Transmission-Replace 18", 24", and 8" valves	Renewal / Upgrade	210,058	-	-	-	-	210,058
NF Concentrate Blending with RO Raw Water	Renewal / Upgrade	2,928,084	-	-	-	-	2,928,084
Pennock Industrial Park Valves and Hydrants	Renewal / Upgrade	98,345	-	-	-	-	98,345
Deep Injection Well (JLA)	Renewal / Upgrade	22,079,981	-	-	-	-	22,079,981
Deep Injection Well Pump Station	Renewal / Upgrade	2,043,399	-	-	-	-	2,043,399
Waste Stream Recovery and Disposal	Renewal / Upgrade	1,267,563	-	-	-	-	1,267,563
Indiantown Rd Water Transmission Main Fitting Replace	Renewal / Upgrade	208,220	-	-	-	-	208,220
Eganfuskee/Carl St / Clark Lane Distribution Improvements	Renewal / Upgrade	436,845	-	-	1,002,934	-	1,439,779
Water Treatment Plant Asphalt Mill and Overlay	Renewal / Upgrade	-	406,928	-	-	-	406,928
Bendross Road Distribution Improvements	Renewal / Upgrade	-	198,745	-	-	-	198,745
Construction of Floridan Aquifer Well RO-17, RO-18	Renewal / Upgrade	-	3,421,742	4,074,070	-	-	7,495,812
Loxahatchee River Rd Area Distribution System Improves - Phase II	Renewal / Upgrade	-	716,431	-	-	-	716,431
Via Rio-New 6" WM & Relocate Services to Individual Properties	Renewal / Upgrade	-	324,687	-	-	-	324,687
Liquid Chlorine Conversion	Renewal / Upgrade	-	1,916,143	-	-	-	1,916,143
Storage Reservoir Replacement Program	Renewal / Upgrade	-	2,012,744	-	2,460,370	4,108,033	8,581,147
Old Ft Jupiter Rd-Loop 6" WM Old Ft Jupiter W to Lox River Rd	Renewal / Upgrade	-	217,378	-	-	-	217,378

Table 8.2 (cont'd.): Summary of Capital Improvement Plan – Fiscal Years 2022 to 2046 (1)

Capital Project Description	Project Type	Fiscal Year Planning Period					Total
		2022 to 2025	2026 to 2030	2022 to 2025	2026 to 2030	2041 to 2046	Planning Period
Old Orange Rd-Loop 6" WM Fr Old Orange S to Coco Plumosus	Renewal / Upgrade	-	41,803	-	-	-	41,803
Holy Ln-New 6" WM Holy Ln & Relocate Services Fr Lox River Rd	Renewal / Upgrade	-	167,214	-	-	-	167,214
Old Dixie Highway Water Main Replacement	Renewal / Upgrade	-	1,628,582	-	-	-	1,628,582
Riverbend Repump Rechloramination Chemical Facility	Renewal / Upgrade	-	809,872	-	-	-	809,872
WTP Replacement Program	Renewal / Upgrade	-	4,478,878	12,117,509	29,652,263	1,475,593	47,724,243
SAS New 30-inch Raw Water Main	Renewal / Upgrade	-	8,210,677	-	-	-	8,210,677
Jupiter Plantation Distribution Improvements	Renewal / Upgrade	-	-	350,701	-	-	350,701
N Delaware-Replace 8" AC WM on N Delaware/Arapaho/Chippewa	Renewal / Upgrade	-	-	623,802	-	-	623,802
Woodside Trail-Loop 6" WM Fr Woodside Tr S to Center St	Renewal / Upgrade	-	-	71,516	-	-	71,516
Penn Trail / Turner Quay-Loop 6" WM to N End TQ	Renewal / Upgrade	-	-	106,616	-	-	106,616
Pompano Drive-Repl 6" AC WM & Loop E to Dolphin Pk	Renewal / Upgrade	-	-	490,916	-	-	490,916
Marlin Drive-Replace 6" AC WM on Marlin Dr	Renewal / Upgrade	-	-	533,097	-	-	533,097
N Loxahatchee Drive-Replace 6" AC WM	Renewal / Upgrade	-	-	-	344,467	-	344,467
Jupiter Dunes-Replace/Relocate 10" & 6" WM Out of Golf Course	Renewal / Upgrade	-	-	-	243,594	-	243,594
Toney Penna at JRE WM-Lower/Protect Shallow WM & Add Isolation Valve	Renewal / Upgrade	-	-	-	1,183,969	-	1,183,969
FAS New 36-inch Raw Water Main	Renewal / Upgrade	-	-	-	4,126,499	-	4,126,499
Villas on the Green Distribution Improvements	Renewal / Upgrade	-	-	-	1,001,801	-	1,001,801
Ocean Parks Condos Distribution Improvements	Renewal / Upgrade	-	-	-	511,146	-	511,146

Table 8.2 (cont'd.): Summary of Capital Improvement Plan – Fiscal Years 2022 to 2046 [1]

Capital Project Description	Project Type	Fiscal Year Planning Period					Total
		2022 to 2025	2026 to 2030	2022 to 2025	2026 to 2030	2041 to 2046	Planning Period
Bella Vista Distribution Improvements	Renewal / Upgrade	-	-	-	-	754,101	754,101
Nano Sulfuric Acid Bulk Tank Replacements	Renewal / Upgrade	-	-	-	-	1,221,709	1,221,709
Hampton Pl & Hampton Cir Distribution Improvements	Operating	-	-	-	-	400,013	400,013
Distribution R&R TBD	Renewal / Upgrade	-	-	-	-	1,969,100	1,969,100
Town Hall Replacement - 2nd Contribution	Renewal / Upgrade	2,975,339	-	-	-	-	2,975,339
Total Projects		$100,466,059	$65,853,693	$52,968,140	$75,102,106	$48,744,530	$343,134,528
Percent of Total		29.28%	19.19%	15.44%	21.89%	14.21%	100.00%

[1] *Amounts represent capital expenditures identified in the Master Plan and by the Town for the Forecast Period; such amounts do not include capital associated with equipment purchases which represent capital expenditures considered as a component of the operating budget (not a capital-related expenditure included in the capital improvement plan). The equipment purchases recognized in the evaluation of the sufficiency of revenues to meet the expenditure needs are as follows:*

	Fiscal Year Planning Period ($000s)					
	2022 to 2025	2026 to 2030	2031 to 2035	2036 to 2040	2041 to 2046	Planning Period
Total Operating Capital	$981.2	$883.0	$999.1	$1,130.4	$1,554.2	$5,547.9

It should be noted that in the development of the capital improvement plan, no capital costs associated with the possible extension of water service to the Jupiter Farms service area or development has been assumed. Although included as an area planned to be served from the Town's water production and treatment (capacity) facilities in prior years, the majority of residents of this community have indicated that they do not desire to receive potable water service from the Water System on a regional water basis from the Town at this time. To the extent this service assumption would change, it is anticipated that the capital program costs would increase above what is presented on **Table 8-2** but also the number of accounts served, the corresponding connections fees received, and the amount of recurring rate revenues that would be earned would increase above what is presented in this section of the report which should provide benefit and financial resources towards the additional capital needs.

The capital improvement program forecast recognizes that the level of the expenditure needs will generally exhibit an increasing trend over time as assets reach their useful service life (many of the primary Water System assets are relatively new, being in service less than 25 years). **Table 8-3** provides a summary of the primary projects recognized during the financial forecast for the Water System:

Table 8-3: Summary of Primary Water System Capital Projects (000s) [(1)]

Project Description	Amount (Rounded)	Fiscal Years of Expenditure
Deep Injection Well and Pump Station	$25,390.9	2023, 2024
North Limestone Creek Wellfield	11,053.8	2022, 2026
Floridan Aquifer Wellfield Improvements RO Wells 14 through 16	12,865.9	2022
Construct Floridan Aquifer RO Wells 17 and 18	7,495.8	2026, 2031
Water Treatment Plant Major Facility Replacement	16,596.4	2030 – 2032
New 36-inch Raw Water Main	8,210.7	2030
Water Treatment Plant Major Facility Replacement	29,652.3	2037 – 2040
Water Production Well Replace. Program (Surficial and Floridan)	53,791.8	Recurring – Generally 5 Annually
Meter Replacement Program	36,797.6	Recurring – Annually
Asset Management Renewal and Replacement Program	32,108.2	Recurring – Annually
Pump Replacement Program	14,995.6	Recurring – Annually
RO and Nanofiltration Water Plant Membrane Replacement	16,002.3	Recurring – Generally 5 Years

(1) Amounts derived from Table 8.2.

8.3 Long-Term Cash Flow Projections and Financial Positions

In order to evaluate the funding of the capital program and the financial position of the Water System, a detailed financial forecast was prepared. Included in **Appendix O** are financial projections for the System. The analysis was for the current budget year 2022 and an additional 24-year period ending 2046 (the "Forecast Period") and includes annual projections of Gross Revenues, Operating Expenses, payment of the debt service requirement, and other required deposits to the various funds and accounts established by

the Bond Resolution, including the Renewal and Replacement Fund, and balances available for capital outlay and other System purposes. Projected revenue includes those from sales (rate revenue), other operating revenues of the System, interest income on the available unrestricted funds as defined in the Bond Resolution, and other miscellaneous revenues derived from System operations. Additionally, projections of Connection Fees were also recognized since this represents a financial resource to the Water System and are used generally to fund expansion-related debt service payments.

The development of the financial forecast required certain assumptions with respect to conditions which may occur in the future. While we believe the assumptions are reasonable for the preparation of the financial forecast, they are dependent upon future events and actual conditions may differ from those assumed. The following is a summary of the primary assumptions recognized in the development of the financial forecast.

1. Projected sales revenue for the Water System were based on growth projections in customers and corresponding water sales (usage) which recognizes the estimated remaining equivalent residential connections (ERC) that are considered available for connection as identified in the master plan. The customer forecast recognizes a compound growth rate until the estimated build-out year of 2037 at 0.36% with a higher growth rate experienced during the first eight (8) years of the development period (0.5%) and a lower growth rate as the Town approaches build-out in the last eight (8) years of the development period (0.2%).

2. The water use or sales forecast was based on the growth rate in ERCs and historical annual per-ERC usage trends and assumes that, over time, average water use per customer will marginally decline (at a declining rate of change until build-out) due to the continued increased conservation awareness by the Town's water customers (both indoor and discretionary use) and other factors (e.g., continued conversion to low flow fixtures in new homes and due to renovation).

   Additionally, the projected revenues included in the financial forecast recognizes the following rate adjustments based on discussions with the Town:

   a. An annual 3.0% price rate index applied each October 1 beginning in Fiscal Year 2023 with such index being generally consistent with Town Council action over the past several years (although the Town has not indexed rates since the beginning of fiscal year 2019, the index provisions are codified in the rate tariff for the water system and should be implemented to maintain operating margins and fund ongoing renewals and replacements to depreciable plant in service).

   b. In order to meet future expenditure needs, to recapture the effects of inflation (especially for Fiscal Years 2021 and 2022 which is experiencing high inflation levels)[22] and recognizing reductions in cash flow due to projected declining margins, additional annual fixed rate increases of 4.5% for the Fiscal Years 2023 and 2024 were assumed in order to

[22] The change in the Consumer Price Index – All Urban Consumers (seasonally adjusted) as published by the Bureau of Labor Statistics has increased as follows:

From April 2020 index of 256.19 to April 2021 index of 266.83 = 4.2% increase
From April 2021 index of 266.83 to April 2022 index of 288.66 = 8.2% increase

meet cash flow needs and operating margins and recapture the historical increases in the cost of service (from both an operating perspective and a capital or infrastructure perspective). Recognizing the additional fixed rate adjustments, the total combined rate adjustments recognized for the first three years of the Forecast Period is summarized below on **Table 8-4.**

Table 8-4: Summary of Recommended Rate Adjustment (%) 2023 – 2025[23]

Fiscal Year	Assumed Price Index	Fixed Rate	Total System Increase
2023	3.0%	4.5%	7.5%
2024	3.0%	4.5%	7.5%
2025	3.0%	---%	3.0%
After 2025	3.0%	---%	3.0%

It should be noted that the change in the Water and Sewer Maintenance Index when comparing the reported May 2022 index (625.03; the most recent index available) to the May 2021 index (601.27) represents a change of approximately 3.95% which is higher than the assumed price index recognized in the financial forecast. Recognition of an annual 3.0% general price index for the twenty year forecast period is considered as being reasonable and conservative for long-term planning purposes and the development of the financial forecast presented in this report.

3. Interest income has been estimated on balances in certain funds created by the Bond Resolution, including balances in the Revenue Fund (operating reserves); Sinking Fund; and the Renewal and Replacement Fund. An assumed average interest earnings rate of approximately 0.10% in Fiscal Year 2022 which was assumed to increase to 1.00% by Fiscal Year 2045 was recognized and applied to the average account balances projected during the Forecast Period. The low interest earnings rates were assumed to be conservative and to not rely on this source of funds to meet the overall financial targets identified for the development of the revenue sufficiency and rate forecast.

4. Guaranteed Revenue and Accrued Guaranteed Revenues were based on i) the current rates in effect for such charges consistent with Town policy during the Forecast Period; ii) projections of the remaining ERCs available to connect to the System as estimated by the Town; iii) the current amount of ERCs that have reserved capacity; and iv) the projected growth in accounts during the Forecast Period that would be subject to the payment of such fees. The amount of revenue from these fees is significant and averages $256,000 annually during the Forecast Period with the higher level of fees being collected early in the Forecast Period with essentially no fees being collected by the Fiscal Year 2037 (the projected year that the service area is considered as being

[23] The change in the Consumer Price Index – All Urban Consumers (seasonally adjusted) as published by the Bureau of Labor Statistics has increased as follows:

From April 2020 index of 256.19 to April 2021 index of 266.83 = 4.2% increase
From April 2021 index of 266.83 to April 2022 index of 288.66 = 8.2% increase

"built-out"); the elimination of this fee would result in an immediate 2.5% increase in water rates to maintain revenue neutrality.

5. Connection fees (which include off-site transmission fees) were based on the projected growth in accounts and the current rates for service; such fees were not indexed during the Forecast Period since the primary infrastructure is currently in service (note that the capital plan does recognize approximately $15.3 Million in expansion-related expenditures during the Forecast Period, including the payment of expansion-related debt service payments from prior new infrastructure financings). The amount of revenue from these fees is significant and averages $323,000 annually during the Forecast Period with the higher level of charges being collected early in the Forecast Period with essentially no fees being collected by the Fiscal Year 2037 coincident with the assumed build-out of the service area. Funds received from the application of Connection Fees from the System have been assumed, not to be a revenue of the Water System for debt coverage purposes but a financial resource which was applied based on the following priority i) funding of expansion-related debt service payments and ii) if remaining funds were available, payment of expansion-related capital expenditures or reimbursement to the System due to capital funding timing issues as mentioned below.

   During the initial portion of the Forecast Period, there are not enough Connection Fees to fund all of the expansion-related debt service and the expansion-related capital expenditures based on the timing of when such expenditures need to be funded. Accordingly, funds from available operating reserves were used to fund such expenditures (referred to as "timing differences"). It was assumed that the use of the operating reserves would be considered as an interest-free loan to the Connection Fee Fund and in the latter part of the Forecast Period such amounts were repaid from available Connection Fees in the latter part of the Forecast Period.

6. It must be emphasized that the forecast of customer growth recognizes providing water service to all the identified development within the service area (approximately 2,800 ERCs). This growth assumption does not include the Jupiter Farms area west of I-95 which represents approximately 5,300 ERCs. This places an element of risk on the financial forecast since i) it is not known if and when development will occur in this area; ii) the extensions of service may not necessarily lead to connections (rate revenues); and iii) that until some experience in the area is achieved, water sales per connected ERC may be less than the current system average since it is expected that irrigation needs will be met by on-site wells. Assuming no connections in the Jupiter Farms service area, end of period annual net rate revenues could be as much as 5% to 10% less than if such customers were being served which would have a financial impact on the cash flow projections of the Water System.

   Based on the financial forecast, the financial resources from growth-related fees is significant and the need to bring the utility to a "revenue from existing customer" basis will become more important as the Water System service area continues to mature as it approaches a built-out position. The need to maintain adequate net revenue margins and capital funding deposits will become critical over time since additional margins / funds produced by growth through the utilization of constructed capacity will begin to diminish.

7. Projected Operating Expenses are based on various factors such as projected expense increases due to inflation and projected changes in expenses associated with anticipated changes in operations. The escalation was based on historical trends, projections of inflation prepared by the Congressional Budget Office, and other factors. The escalation rates ranged from 2.5% (general inflation) to 5.0% for repairs and maintenance and insurance. During the Forecast Period, the change in Operating Expenses is projected to average approximately 3.6% annually. It should be noted that the cost of labor, utilities and chemicals / operating supplies accounts for approximately 61% of the total operating expenses and these costs are required (e.g., set by regulation, uncontrollable as to cost, etc.) for ongoing utility operations and service. This is presented in **Figure 8-1** below for the Forecast Period:

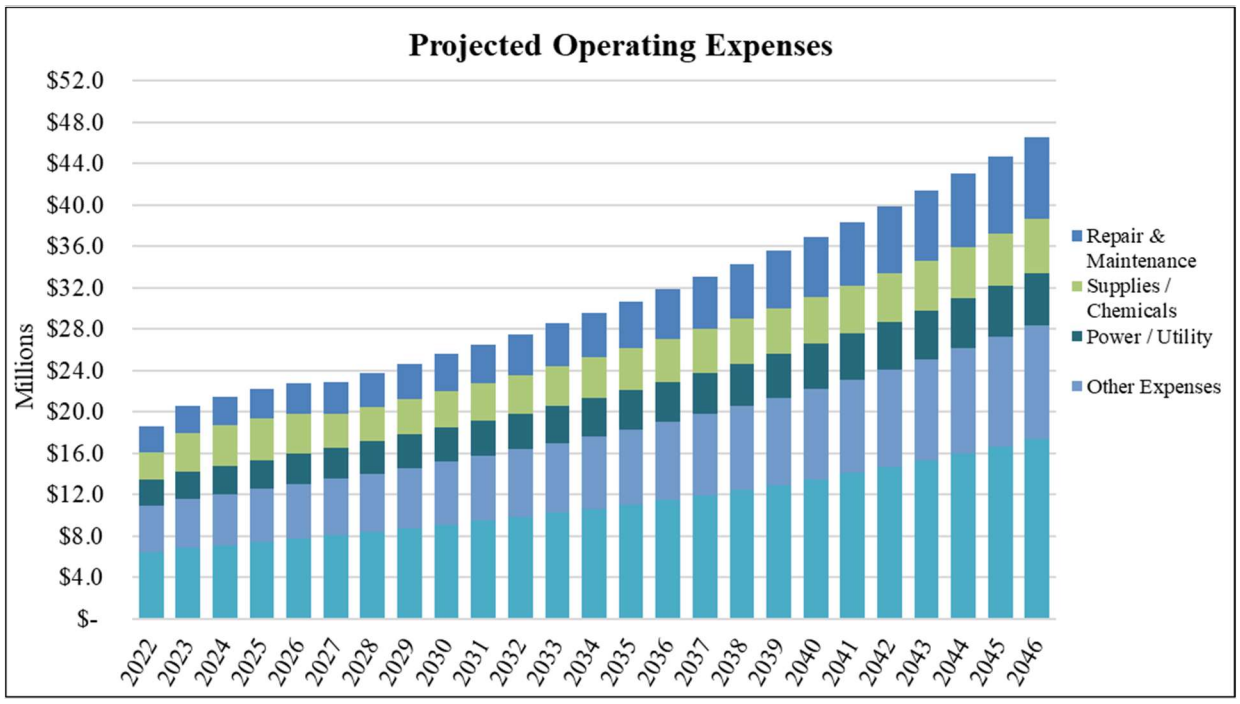


Figure 8-1: Projected Operating Expenses

8. The forecast of operating expenses includes the cost allocation payment to the General Fund to account for expenses accounted for in the General Fund that are allocable to the Water System. The budgeted payment for the Fiscal Year 2022 is $1,304,970 and the anticipated amount for Fiscal Year 2023 is $1,528,157. This payment was assumed to increase 5% annually during the Forecast Period based on discussions with the Town.

9. Although considered a System operating expense for financial reporting purposes, depreciation and amortization expenses have not been recognized as an Operating Expense since such amounts represent non-cash expenses. In lieu of depreciation and amortization expenses, the financial forecast recognizes the annual cash funding of the Renewal and Replacement Fund and the payment of principal on bonds issued to fund capital expenditures of the Water System.

10. The Town originally issued utility system revenue bonds pursuant to the provisions of the Bond Resolution (the "Outstanding Bonds") to finance capital improvements for the Water System. As of October 1, 2021, a total principal amount of $14,136,500 of utility revenue bonds is estimated to be outstanding (the "Outstanding Bonds" and assumes that the October 1 payment is made since funds were deposited in 12 equal installments during the Fiscal Year 2021 to fund such principal payment). The Debt Service Requirements included in this Report for the Outstanding Bonds were based on the actual debt service schedules for each issue and are presented on a "gross" basis (i.e., not net of interest earnings on any debt service related funds or accounts). Furthermore, the amounts shown are based on the monthly funding requirements of the various sinking funds as required by the Bond Resolution which authorized the bonds (essentially an accrual basis) as opposed to when the debt service requirements are actually paid. **Table 8-5** presents a summary of the Outstanding Bonds allocable to the Water System:

Table 8-5: Summary of Existing Principal Amount of Bonds Outstanding

Issue	Year of Debt Maturity	Principal Outstanding [*]
TD Bank Bonds, Series 2010 (the "Series 2010 Bonds")	2023	1,375,000
SunTrust Bank Bonds, Series 2013 (the "Series 2013 Bonds")	2029	12,761,500
Total Principal Outstanding	N/A	$14,136,500

[*] Estimated amount outstanding as of October 1, 2021.

11. The capital program as identified on **Table 8-2** was funded based on i) the nature of the project (e.g., expansion-related); ii) the availability of funds to the Town for project funding; iii) the use of additional bonds to the extent that funds were not readily available; and iv) the policy to maintain an adequate cash balance in the operating reserves and the Renewal and Replacement Fund accounts. With respect to the operating reserves (working capital) and to promote the maintenance of a “AAA” credit rating from the rating agencies, a minimum liquidity target or cash balance reserve equal to 180 days of Operating Expenses was recognized (but never less than 60 days of Operating Expenses). This target level is suggested i) to limit the operating risk to the utility as the system continues to approach a mature (built-out) condition; ii) to maintain a "AAA" credit rating to reduce the future cost of borrowings; and iii) to provide an emergency hedge for major storm events that may strike the service area that could result in an immediate a) reduction in revenues and cash flow and b) increase in operating and maintenance expenditures. Based on the assumptions reflected in the development of the financial forecast, the liquidity balance is projected to be less than the revenue target but always greater than the minimum target as shown on **Figure 8-2**.

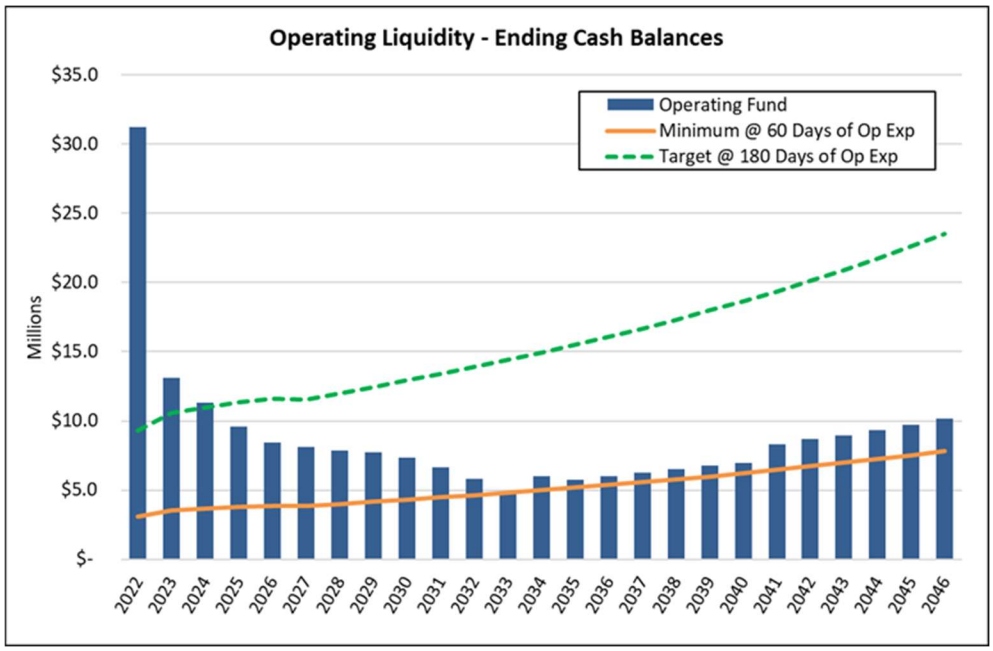


Figure 8-2: Operating Liquidity – Ending Cash Balances

For the Renewal and Replacement Fund, the maintenance of a minimum ending balance equal to approximately the annual depreciation expense at the end of the Forecast Period was targeted (at end of Forecast Period, the minimum target balance was estimated at $13,662,000). This minimum balance allows the Utility to always have funds to continue the renewal and replacement program (which accounts for 92% of the total capital expenditures) to promote the going concern of the System and to minimize the issuance of additional debt on the System.

The following **Table 8-6** summarizes the capital program funding plan recognized in the financial forecast by five- (5) year forecast period increments:

Table 8-6: Capital Program - Funding Plan (000s)

Forecast Period – Capital Expenditures	Total Capital Projects [1]	Recognized Funding Plan			
		R & R Fund	Connection Fee Fund [2]	Operating Fund and Contributions	Additional Parity Bonds
FY 2022 – FY 2025	$100,466	$98,098	$1,062	$1,306	$---
FY 2026 – FY 2030	65,854	40,674	180	---	25,000
FY 2031 – FY 2035	52,968	52,856	112	---	---
FY 2036 – FY 2040	75,102	75,084	18	---	---
FY 2041 – FY 2046	48,745	48,344	---	400	---
Total Forecast Period	$343,135	$315,056	$1,372	$1,706	$25,000
Percent of Total CIP	100.00%	91.8%	0.4%	0.5%	7.3%

Notes:

[1] Amounts shown based on information presented on Table 8.2. Amounts shown do not include equipment purchases estimated to total $5.547 million during the Forecast Period which does reflect expenditures that are capitalized to plant in service but are not considered as part of the capital improvement plan; such amounts are included as an expenditure in the operating budget for the System.

[2] Amounts shown do not include payment of expansion-related debt service expenditures or the repayment of funds to operating reserves (repayment of expansion-related capital financing) during latter portion of Forecast Period.

As can be seen above, approximately $315.0 Million or 92% of the assumed capital expenditure program will be funded from the Renewal and Replacement Fund (derived from deposits from annual operations). Although there is identified over $1.3 Million of expansion-related capital projects identified in the capital plan, due to the timing differences in the collection of Connection Fees relative to when project, such fees essentially do not fund any of the projects since the first priority assumed for fund drawdown is to fund the expansion-related debt service for the benefit of the existing customer. This will result in the need to use operating reserves as a "bridge" in the financing of the expansion-projects in the near-term portion of the Forecast Period. However, as the expansion-related bonds mature, the Connection Fees can then be used to reimburse the operating reserves such that a favorable liquidity position is maintained over the long-term. Based on the projection of expansion-related debt service and capital projects, the existing Connection Fees and the Guaranteed Revenues will not be sufficient to fund all the expansion expenditures over the remainder of the forecast period. The gap in cost recovery is not considered significant especially when one considers the potential Connection Fees time that could be derived from service to the Jupiter Farms area which is considered as a potential service area.

12. In the development of the capital funding plan, additional debt has been assumed to fund the program and improve / maintain liquidity (fund) balance. Specifically, the forecast assumes the issuance of $26.045 million in bonds to fund capital projects totaling $25.0 million (the difference

being to fund the cost of issuance of the future additional bonds). The additional bonds were assumed to be issued during Fiscal Year 2030 which is after the final payment of the Outstanding Bonds to limit the annual debt service payments and the corresponding effects on rates. The bonds were assumed to have a repayment term of 25 years and with an average annual interest rate of 4.0%. The debt repayment schedule recognized for the Forecast Period assumes level debt service payments of approximately $1.672 million per year. Even with the issuance of the additional bonds, the debt to net plant ratio is anticipated to be very favorable (less than 10% - the maximum target is not to exceed 50%) and the System is not considered to be in an "overleveraged" position. This will allow the Town flexibility to fund future capital to the extent unknown issues may arise, such as increased regulations on water treatment and disposal of reject process water and effects of storm events and climate change yet allow the Town to maintain favorable rates.

13. A significant component associated with the funding of the capital program is the continued deposits to the Renewal and Replacement Fund ("R&R Fund"), the annual funding which is critical to the financial health of the System. The forecast recognizes the fund deposits that were initially established at $5.2 Million in Fiscal Year 2012 based on an evaluation of the then utility plant in service by asset type and service life (the "baseline deposit"). The baseline deposit amount has been increased thereafter for construction cost increase allowances (inflation) beginning in Fiscal Year 2013. The estimated deposit balance to the R&R Fund beginning with the Fiscal Year 2022 is now $6.988 million. It is appropriate to fund the renewal and replacement-related expenditures annually from operations since this matches the use of the System depreciable assets by the existing customer base and the need to replace the assets at the end of the useful service life of such assets (a depreciation expense equivalent). It should be noted that the annual funding of the R&R Fund in relationship to annual depreciation expense has become a key indicator with the credit rating agencies since the more "equity-based" capital funding a utility has, the less risk on the utility in terms of funding capital improvements coupled with the need to issue additional bonds. It is recommended that this level of R&R Funding continue to be recognized in the future which is prudent and promotes the long-term stability of rates to the Town's customers. It should also be noted that the deposit to the R&R Fund based on the approximate depreciation of System assets which ensures adequate debt service coverage and efficient renewal of System assets was identified by Fitch Ratings as being prudent and assisted in the affirmation of the AAA rating by Fitch in February 2013 (most recent credit review). This capital funding level is further discussed below regarding the review of certain key financial ratios associated with the evaluation of the projected financial position of the Water System.

    Based on the primary assumptions discussed above, the following **Figure 8-3** illustrates the capital appropriation forecast and corresponding funding sources for the Water System for the Forecast Period.

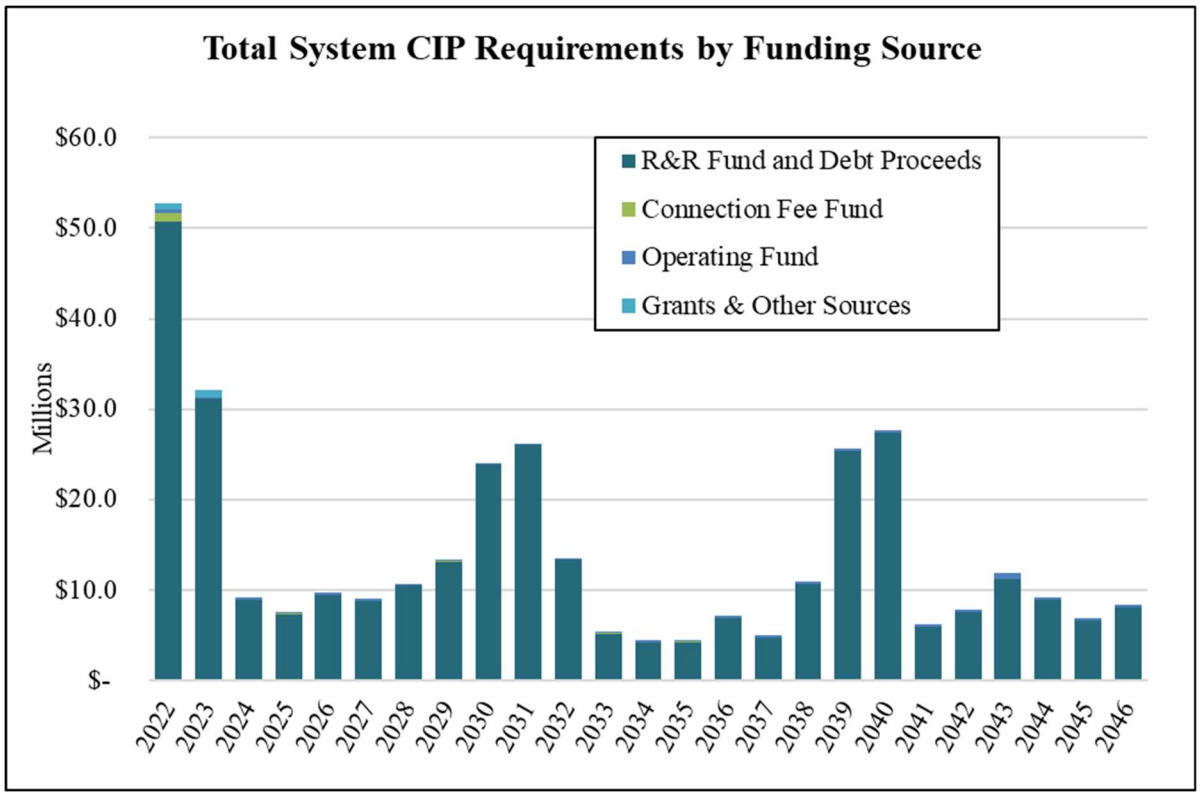


Figure 8-3: Total System CIP Requirements by Funding Source

As can be seen above, the capital program varies from year to year primarily due to when assets reach their useful service life and must be replaced. It must be realized in that until Fiscal Year 2029, operating reserves are used to bridge the cost of expansion capital projects, including the funding of expansion-related debt service payments, which is projected to be partially reimbursed during the latter part of the Forecast Period.

In the development of the financial forecast, a projection of certain other financial ratios was developed to evaluate the projected financial position of the Water System. The analysis includes a series of charts and figures prepared to provide the Town with a visual representation of the financial and statistical trends in the selected financial ratios or benchmarks, which are considered as critical ratios by the credit rating agencies, anticipated for the Water System over the Forecast Period. The performance ratios discussed below considered the credit rating findings identified by Fitch Ratings in prior credit reviews of the System which recognized the following:

- Strong Financial Performance (favorable "all-in" debt service coverage);
- Declining and manageable debt burden (no near-term borrowing plans were also identified);
- Capital plan maintains the System's prudent practice of substantial investment in R&R Funds to upgrade and modernize the water system (results in minimal future additional debt needs);
- Favorable Liquidity position (especially as it related to the funding of the capital plan);

- Rates are competitive (low) relative to regional utilities; and
- Strong Financial management policies and stewardship.

The key rating driver identified by Fitch Ratings in their report was "sustained financial performance at current high levels" and is the key business principal relative to the financial evaluation included herein. The following is a brief description of other financial ratios and financial results evaluated for the Town's consideration based on the primary assumptions mentioned above.

8.3.1 Debt Service Coverage Ratio

An important component in the development of the financial forecast is the determination of whether the rate covenants as outlined in the Bond Resolution authorizing the issuance of Water System Outstanding Bonds will be met. Generally, these covenants are in the form of certain debt service coverage ratios, which are applicable to the level of rates both currently and projected to be in place. The Town's Bond Resolution contains a rate covenant which provides that the Town will at all times fix, charge and collect reasonable rates and charges so that Net Revenues (total revenue less operating expenses) are adequate at all times to pay at least 110% and with the inclusion of Connection Fees 120% of the annual debt service payment. This is viewed as a minimum requirement not to be in default of the Bond Resolution; an AAA-rated utility generally would see a coverage ratio in the 175% to 250% range (assumed a target of 200% to recognize this credit rating).

The Town's anticipated Net Revenue, assuming that the Town continues to index the water rates annually (assumed at 3% per year) and increases the rates for the identified additional fixed rate adjustments (i.e., 4.5% in Fiscal Years 2023 and 2024) for the Forecast Period as recognized in the financial plan, should be adequate for the Forecast Period to meet the rate covenant requirements defined in the Bond Resolution and continue to promote a AAA-credit rating. This is presented in the figure below. The debt coverage ratio is calculated by dividing the annual Net Revenue with/without Connection Fees by the annual debt service payment each year and illustrates the financial margin (ability) of Water System revenues to meet current total debt service payments (higher the percent, the stronger the ratio) and is considered as a key ratio by the credit rating agencies **(Figure 8-4)**.

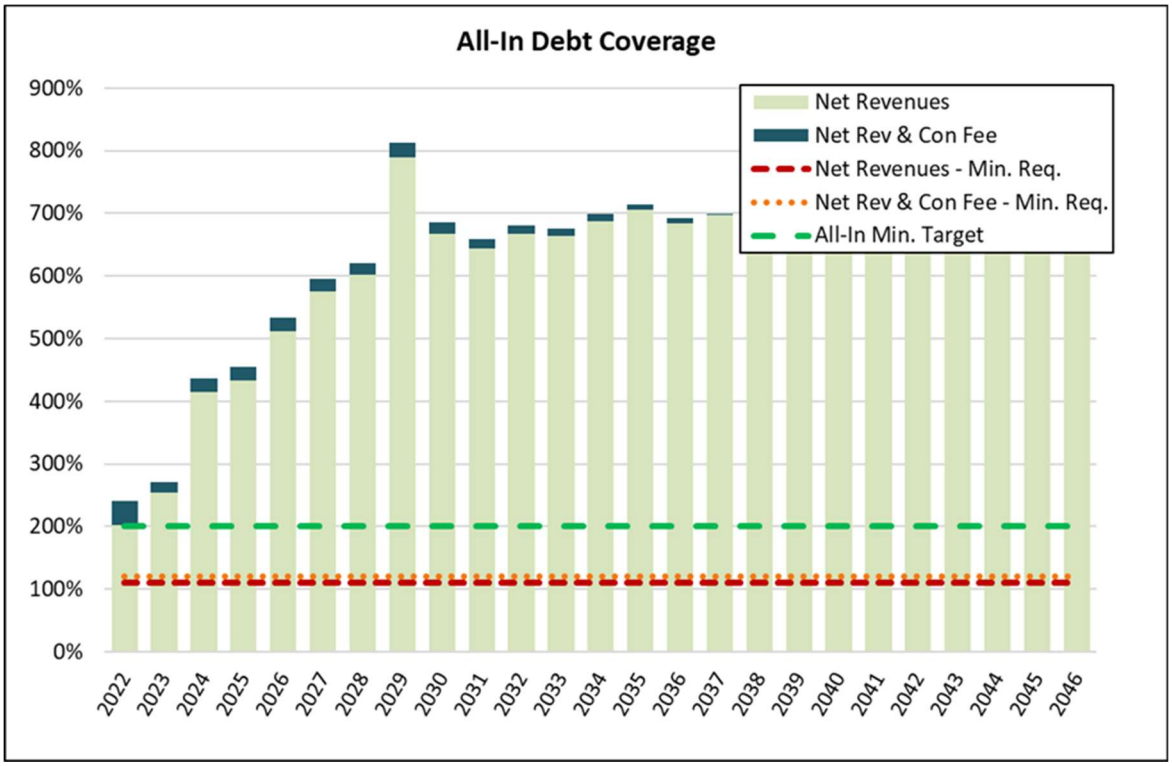


Figure 8-4: All-In Debt Coverage

As can be seen in **Figure 8-4**, the debt service coverage ratio (for Outstanding and anticipated bonds) increases significantly during the Forecast Period. This is due to the Outstanding Bonds maturing during the Forecast Period with a limited increase in the issuance of additional bonds which results in a decline in the overall debt service payments (when compared to Fiscal Year 2023 through 2028 payment levels). This decline in debt service payments i) reduces the fixed cost risk of the utility since the annual debt burden is projected to reduce by approximately $100,000 to $1.0 Million annually; and ii) provides for additional future debt leveraging capability in case there are increased regulations imposed on the Water System or other capital needs that are not currently identified in the Master Plan or by the Town that would materially affect (increase) the capital program identified on **Table 8-2**. The projected annual debt service payments during the Forecast Period are summarized in **Figure 8-5**. As one can see, when the additional bonds are recognized in the debt service coverage calculation (forecast assumes a $26.045 Million debt issue in Fiscal Year 2030), the projected coverage ratio declines but remains well within the AAA-credit range.

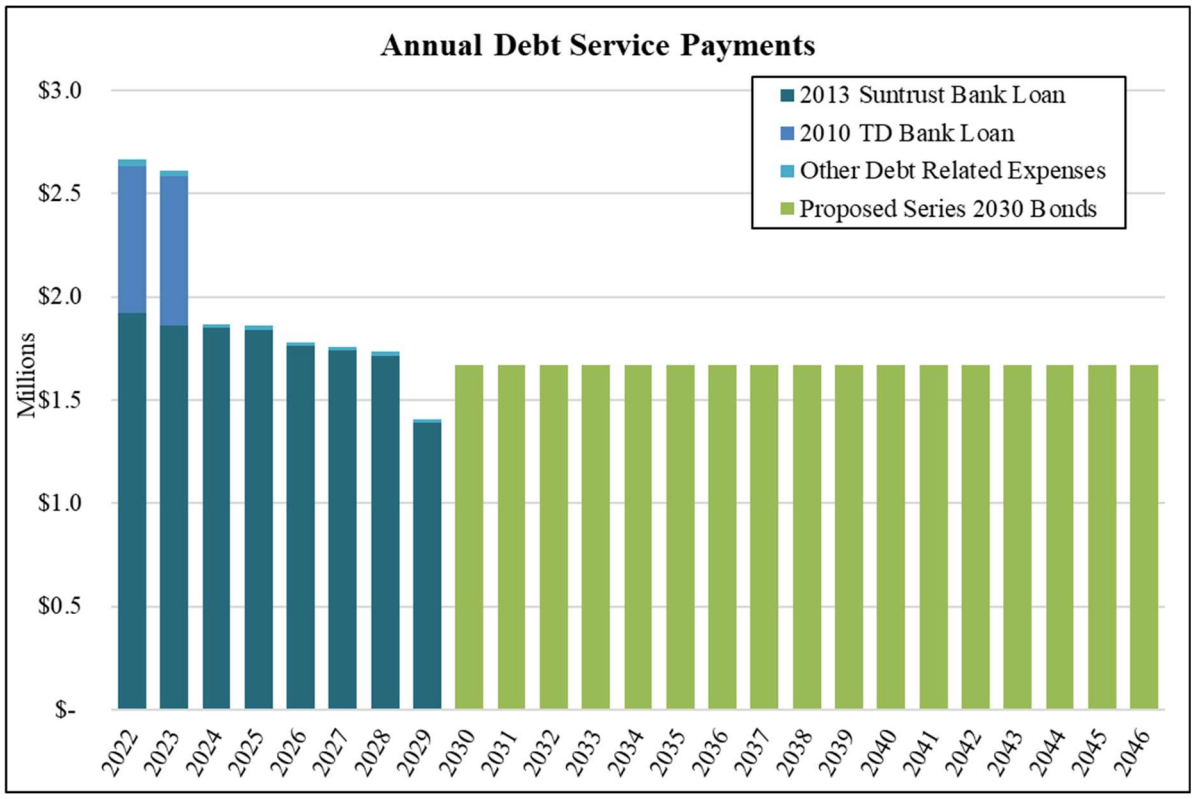


Figure 8-5: Annual Debt Service Payments

8.3.2 Projected Net Revenue Margin

The Net Revenue Margin Ratio is a measure of a utility system's ability to meet its operating expenses and indicates the net contribution margin estimated to be earned by the Water System. The contribution margin represents the amount of Net Revenues from operations that are available to meet the other System expenditure requirements after the payment of the operating expenses (e.g., debt service, deposits to the Renewal and Replacement Fund, etc.). Since Connection Fees are restricted as to use for expansion-related expenditure and are a one-time revenue (not recurring like water sales revenue), Connection Fees are not included in the evaluation of the Net Revenue Margin. A relatively low Net Revenue Margin Ratio (for example, 25%) indicates that a large portion of operating revenue is used to pay operating expenses. A high Net Revenue Margin Ratio (for example, 45%) indicates a significant portion of operating revenues is available for Water System expenditures other than the payment of operating expenses. A minimum target of 35% was assumed as it relates to the median for water utilities for this ratio recognized by credit rating agencies (i.e., the Fitch 2020 Median for AAA-rated utilities). As can be seen in **Figure 8-6** and assuming the implementation of the recommended rate adjustments, the Net Revenue Margin Ratio is projected to decrease during the Forecast Period.

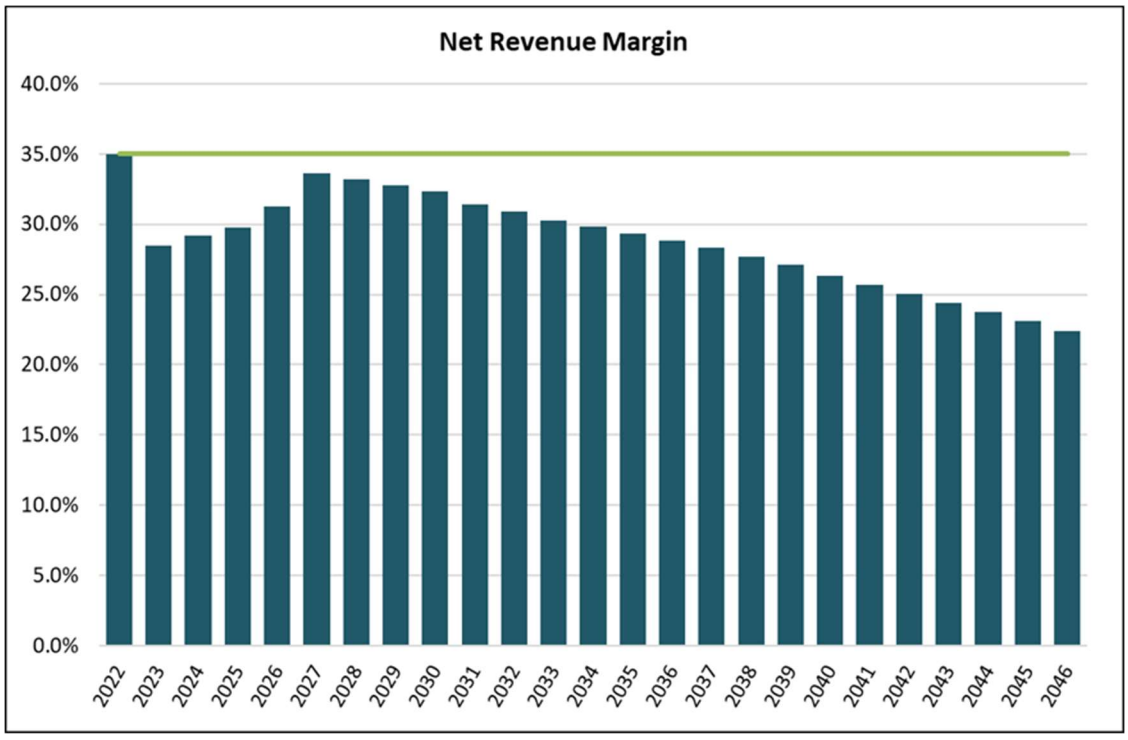


Figure 8-6: Net Revenue (Operating) Margin

The reason for the decrease is due to the price index factor used to increase water service rates (primary source of System revenue) coupled with a decline in Guaranteed Revenues due to the build-out of the service area (overall percentage change in revenues) is less than the average increase in the cost of operations and maintenance assumed during the Forecast Period. Although a higher Net Revenue Margin Ratio is recommended for the latter part of the Forecast Period, one must recognize that the amount of debt service payments (a driver for a higher Net Revenue Ratio) is projected to be very manageable (low) during the Forecast Period and therefore there is less pressure to have a higher ratio. However, it must be recognized that the future rate increases may be required as the Net Revenue Margins continue to decline and the need to continue to fund ongoing capital from Water System operations continues. As previously mentioned, the ratio does not include Connection Fees since they represent non-recurring revenues. If the Connection Fees were recognized, the ratio would be more favorable in the near term but would not affect the latter part of the Forecast Period due to declining growth and the receipt of such fees.

8.3.3 Liquidity (Cash) Position

A major credit component deals with the amount of liquidity a utility maintains relative to working capital (operating) and capital reserves. With respect to working capital reserves, a minimum target of 180 days of operating expenses was recognized which was considered appropriate for a mature water system (limited customer growth). The maintenance of a strong liquidity position was a key indicator in the Fitch Ratings credit report issued for the System. Further, it would be considered prudent for the working capital reserves

to be higher if a low Net Revenue Margin is being experienced in order to provide a rate stabilization hedge on operations. **Figure 8-7** summarizes the projected working capital reserves for the Forecast Period based on the assumptions delineated earlier in this section of the Water Master Plan:

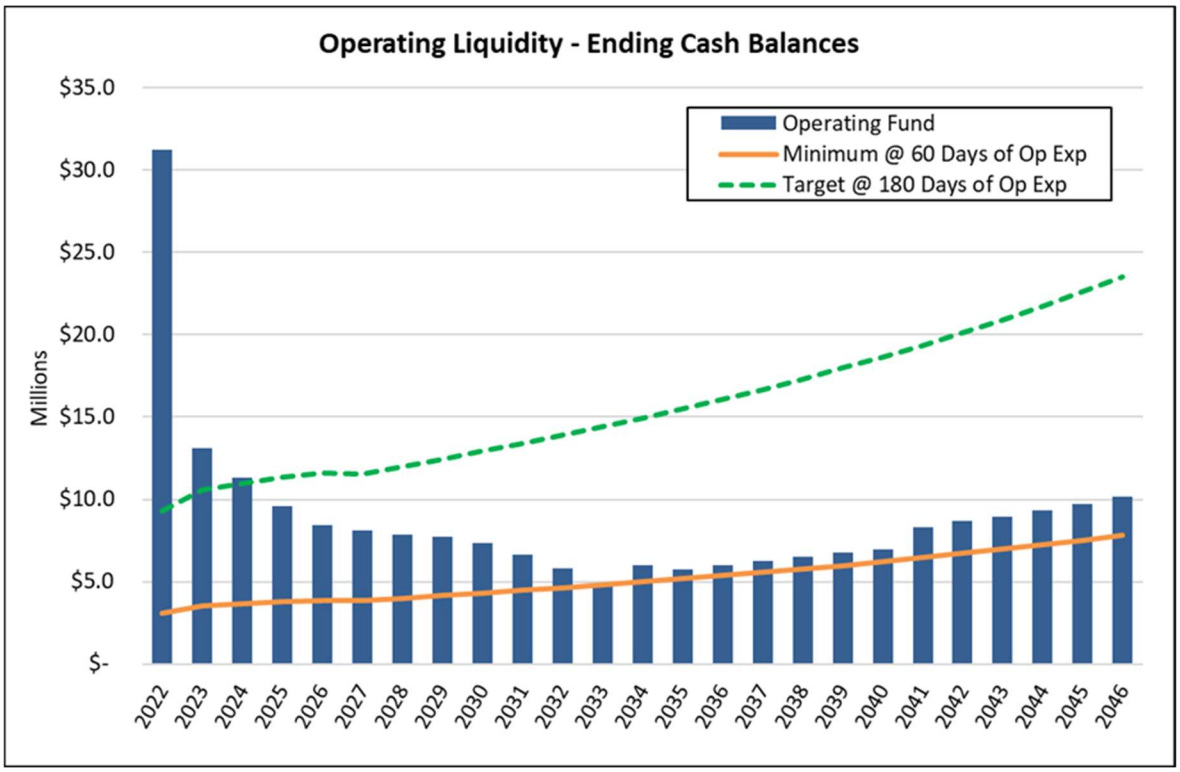


Figure 8-7: Operating Liquidity – Ending Cash Balances

As can be seen above, in the early portion of the Forecast Period, the available working capital reserves approximate the target working capital reserve. However, in the latter part of the Forecast Period, the projected working capital reserves are expected to be less than the preferred financial target. This is due to the decline in the net revenue margin which also recognizes that the operating expenses will represent a significant amount of the total revenue requirements of the System and that the price index assumed to be applied to rates is assumed to be less than the net percentage change in operating expenses. This will need to be monitored closely by the Town.

In addition to working capital reserves which are for ongoing operations and the payment of debt financing, the Water System should also maintain a capital reserve to accrue funds for ongoing renewals and replacements but to also have funds for extraordinary or unplanned capital expenditures that occur from time to time. Further, the capital reserve would allow for the continuity of funding the capital program since funds would be available in advance of appropriation such that the Utility Department can more effectively plan for capital expenditures (e.g., bundling of projects to achieve a better price bid). **Figure 8-8**

summarizes the projected capital reserves for the Forecast Period based on the assumptions delineated earlier in this section of the Water Master Plan.

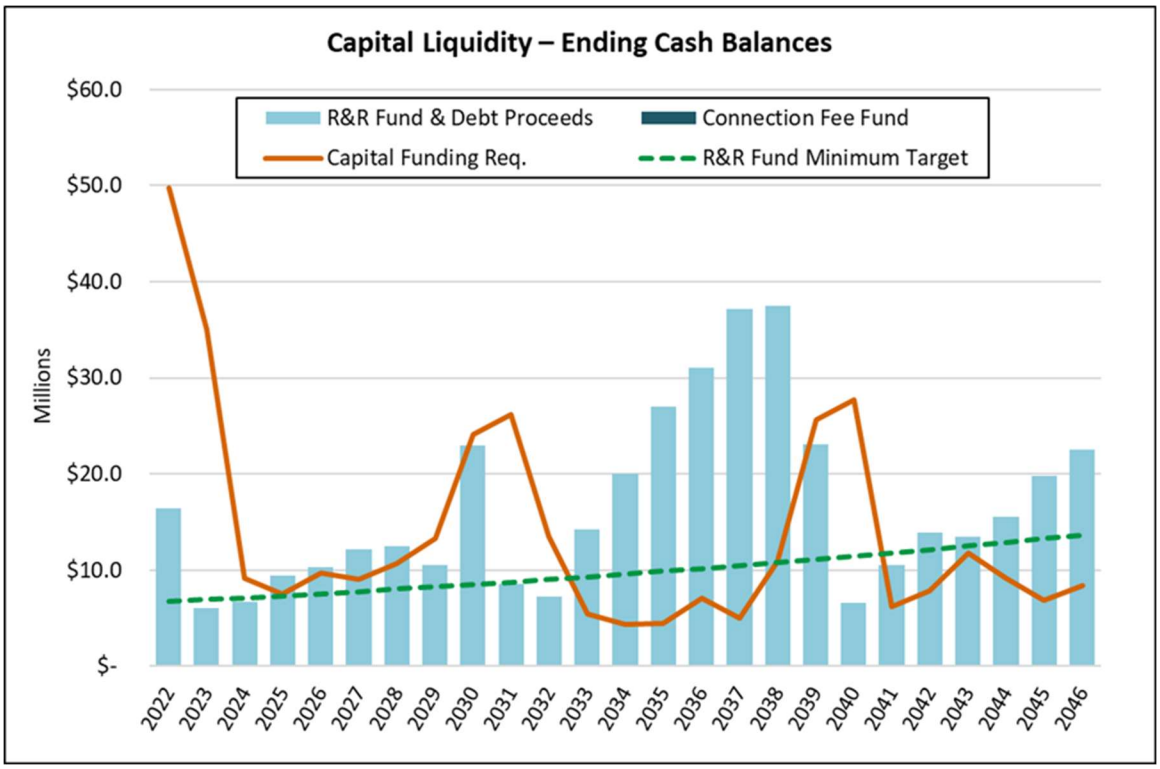


Figure 8-8: Capital Liquidity – Ending Cash Balances

As can be seen in **Figure 8-8** above, the capital expenditures are not linear but tend to track when capital re-investment is required for major infrastructure which results in a "lumpy" expenditure profile which is typical. From a rate evaluation standpoint, the objective is to have a programed (linear) capital funding plan (i.e., deposits to the R&R Fund) that provides sufficient funds to then fund the next primary increment of capital spending. As can be seen above and based on the assumptions regarding the future adjustments to rates and the cost of operations, this objective of accruing capital funds in advance of the expenditures for the significant improvements is being met during the Forecast Period. The benefit from this approach is that the amount of additional debt is minimized which improves the overall financial health of the Water System. As previously mentioned and which is included in the above figure, the forecast does assume the issuance of approximately $26.045 million in additional bonds (provides for a $25.0 million deposit to the R&R Fund). As discussed later in this section, the amount of additional debt being issued is very manageable.

The R&R Fund capital reserve target was estimated to equate to one year of annual depreciation expense, which is expected to increase over time as additional utility plant or assets are added to the Water System (added at a higher cost when compared to the historic embedded cost for the assets being replaced). The funding of the R&R Fund and maintenance of a capital reserve equal at least to the annual depreciation

expense was considered as a prudent financial objective of the Town by Fitch Ratings. Additionally, this reserve allows for the continuation of capital projects for the subsequent year (if there was an issue in making the annual deposit to the R&R Fund) since the funds are considered available for future expenditures which promotes the continuity of the program (essentially would allow the Town a year to correct or recalibrate the R&R Fund deposits to meet the ongoing capital needs of the Water System).

8.3.4 Free Cash as Percent of Depreciation

A key ratio recently identified by the credit rating agencies is the "free cash as a percent of depreciation" which measures the amount of Net Revenues available after the payment of debt service and other required transfers (not including the R&R Fund which is a capital account funded from operations). The ratio indicates the annual financial capacity to maintain facilities at current levels of service from existing cash flows. The issue being addressed by the credit rating agencies is whether there are the proper resources generated annually to maintain capital such that there is less risk in the need to issue additional bonds or due to increased expenditures funded from Net Revenues due to the need for emergency capital / repairs and maintenance expenditures. As can be seen in **Figure 8-9** the ratio is projected to be favorable and indicates that annual re-investment in the System is adequately being accomplished. It should be noted that the reason for the decline in the ratio in Fiscal Year 2030 is due to the assumed issuance of the additional revenue bonds in such year to fund capital needs.

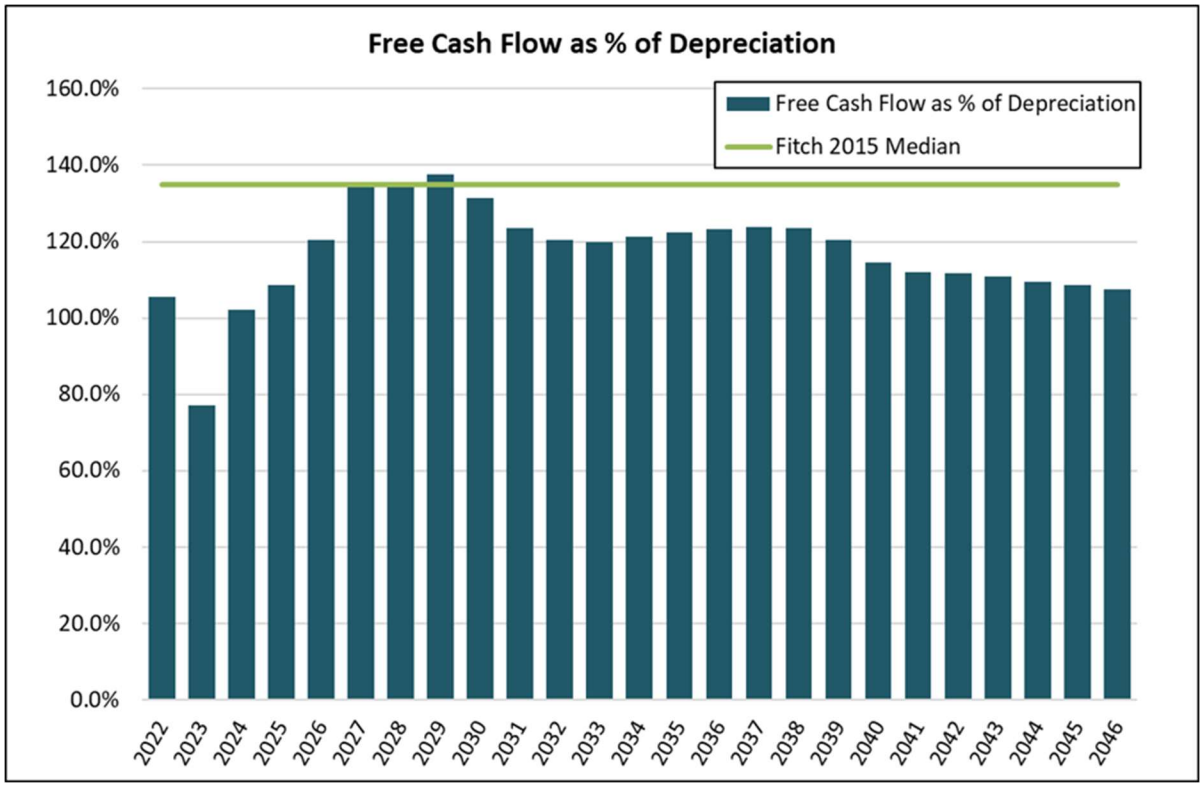


Figure 8-9: Free Cash Flow as % of Depreciation

8.3.5 Debt to Net Plant Investment

As mentioned above, the forecast assumes the issuance of bonds in Fiscal Year 2030 to fund $25 Million of renewal and replacement-related capital projects which we consider as being extremely manageable from a rate perspective. As can be in **Figure 8-10**, even with the issuance of additional bonds, it is projected that the Water System will be well below the maximum debt to net plant ratio identified for the financial forecast as shown below and that the need to potentially leverage the Net Revenues in the future (e.g., for increased regulatory issues) will not adversely affect the amount of debt allocable to the System from a credit perspective.

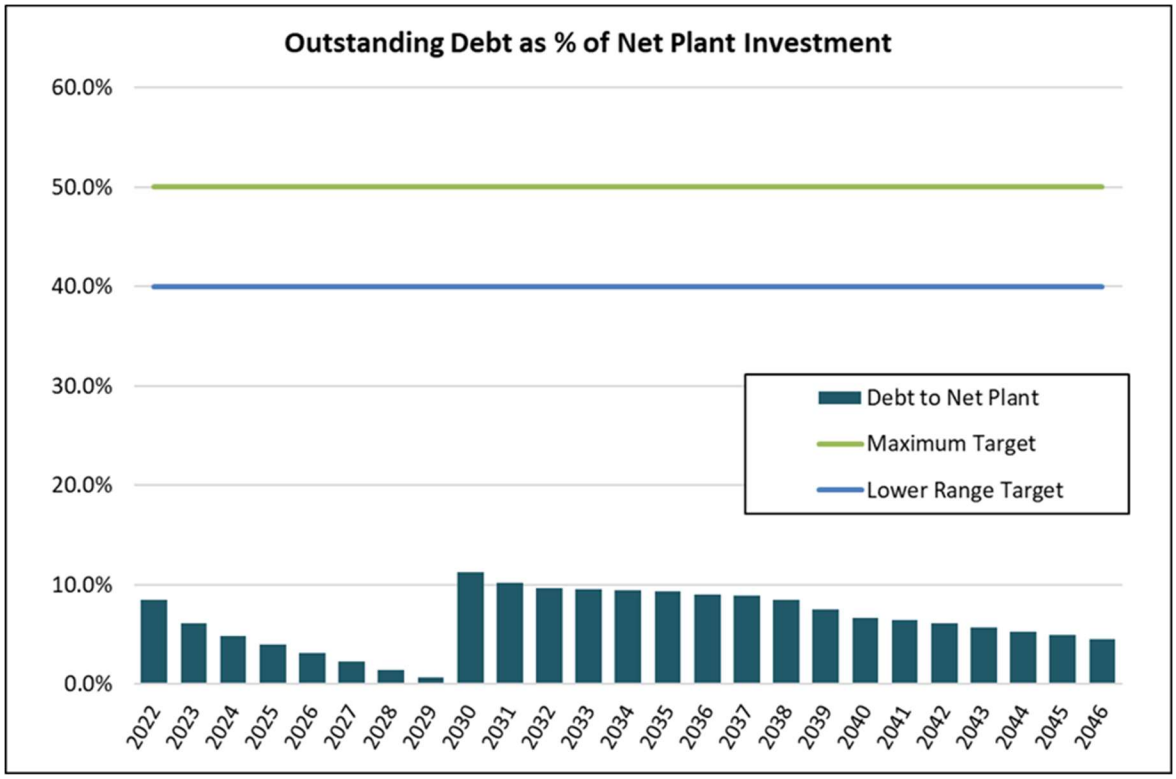


Figure 8-10: Outstanding Debt as % Net Plant Investment

8.4 Rate Comparison

A primary indicator used by credit rating agencies, neighboring utilities, and the Town's peers is the comparability of the rates for monthly service. Generally, a utility that has a strong financial and rate implementation policy has competitive rates. **Table 8-7** below provides a comparison of the monthly cost of providing water service for a 5/8-inch by 3/4-inch water meter at various usage levels calculated under the existing rates of the Town. Also included on the comparison are bills calculated under the rates of other neighboring Florida utilities as of the billing month of April 2022. The 5/8 by 3/4 inch meter comparison was prepared since this represents the majority of the System's water residential customers and the majority of the customers for the other utilities reflected in the comparison. As can be seen in the comparison, the Water System rates produce bills for the Town that are competitive when compared to the other neighboring

utilities. It should be noted that the Town's rates do reflect the high degree of treatment being used by the Water System to provide service (e.g., reverse osmosis water treatment) and the status of the Town's capital program and corresponding asset age (new facilities being built to meet needs with no grant funds received to assist in construction which many utilities historically received).

Table 8-7: Comparison of Typical Monthly Resident Bills for Water Service [1]

Description	Residential Service for a 5/8" or 3/4" Meter							
	0 Gallons	2,000 Gallons	4,000 Gallons	8,000 Gallons	10,000 Gallons	15,000 Gallons	20,000 Gallons	30,000 Gallons
Town of Jupiter								
Existing Rates	$22.21	$24.83	$27.45	$33.63	$37.19	$47.45	$63.15	$94.55
Identified Rates – 2023 [2]	23.88	26.70	30.93	36.16	39.98	51.00	67.90	101.70
Other Florida Utilities:								
City of Boynton Beach	$12.90	$16.34	$19.78	$26.66	$31.47	$46.92	$62.37	$93.27
City of Deerfield Beach [3]	15.00	20.30	25.60	38.24	45.58	65.01	85.16	125.46
City of Delray Beach	15.72	15.72	16.97	21.97	24.47	32.97	42.97	70.47
City of Fort Lauderdale [3]	7.61	13.13	21.97	46.29	61.51	107.54	158.89	307.99
Fort Pierce Utilities Authority	15.07	26.65	30.51	45.95	53.67	77.82	106.77	164.67
Indian River County	9.15	13.75	18.35	31.60	41.96	82.92	133.92	235.92
City of Lake Worth Beach [3]	21.14	27.96	34.78	55.78	70.00	121.54	183.74	339.84
Martin County [3]	18.35	23.05	27.75	37.15	41.85	58.55	79.90	127.25
City of Melbourne [3]	8.44	18.08	27.72	47.00	56.64	80.74	104.84	153.04
Okeechobee Utility Authority	21.46	30.50	41.82	69.02	82.62	116.62	150.62	218.62
Palm Beach County [3]	12.27	16.31	20.35	38.15	47.05	86.45	125.85	210.70
City of Port St. Lucie [3]	11.65	20.95	30.25	53.08	65.20	99.70	137.00	211.60
Riviera Beach Utility District [3]	18.13	23.35	28.57	41.89	49.03	72.53	96.03	155.13
St. Lucie County [3]	25.06	33.06	41.06	66.21	80.31	127.01	181.51	290.51
St. Lucie West Services District [3]	15.42	22.36	29.30	43.18	50.12	67.47	84.82	119.52
Seacoast Utility Authority	30.39	35.57	40.75	54.89	63.85	86.25	108.65	153.45

Description	Residential Service for a 5/8" or 3/4" Meter							
	0 Gallons	2,000 Gallons	4,000 Gallons	8,000 Gallons	10,000 Gallons	15,000 Gallons	20,000 Gallons	30,000 Gallons
South Martin Regional Utility [3]	21.86	23.82	27.09	36.25	40.83	58.03	75.23	121.13
City of Stuart [3]	17.65	24.41	31.17	45.37	57.59	91.17	126.77	202.97
City of Sunrise [3]	20.87	29.05	37.23	53.59	61.77	82.22	102.67	143.57
Village of Tequesta [3]	21.50	27.00	32.50	46.50	55.00	76.25	106.25	166.25
City of Vero Beach [3]	13.60	15.26	16.92	26.09	31.65	45.55	73.35	128.95
Village of Wellington [3]	21.43	26.27	31.11	43.17	50.39	68.44	92.64	156.59
City of West Palm Beach	23.66	30.99	38.31	54.82	64.00	89.40	116.40	173.25
Other Florida Utilities' Average	$17.32	$23.21	$29.12	$44.47	$53.33	$80.05	$110.28	$176.96

Notes:

[1] Unless otherwise noted, amounts shown reflect residential rates in effect April 2022 and are exclusive of taxes or franchise fees, if any, and reflect rates charged for inside the city service area. All rates are as reported by the respective utility. This comparison is intended to show comparable charges for similar service for comparison purposes only and is not intended to be a complete listing of all rates and charges offered by each listed utility. The average monthly water use for the Town is estimated to approximate 10,000 gallons and is referred to as the average use.

[2] Reflects estimated rates with the application of a 7.5% rate adjustment as identified in the development of the financial plan applied uniformly to the monthly water service rates currently in effect.

[3] Utility is currently involved in a rate study, is planning a rate study, or plans to implement a rate revision or price index / pass-through adjustment within the next 12 months.

In the development of the financial forecast, a primary rate assumption included the annual implementation of the price index rate adjustment. The application of the index i) allows the utility a vehicle to maintain utility revenue margins and promote overall financial performance; ii) is considered as a prudent financial and management policy by the credit rating agencies; iii) limits the need for large rate adjustments in the future since rates are marginally increased annually for the customer's benefit; iv) allows the utility to achieve the highest credit rating which reduces the overall cost of borrowing for the long-term benefit of the customers and the Town; v) is acceptable to the customers since there is no one-time large or significant change in rates and a material impact on the affordability of water service to such customers; and vi) generally results in the lowest rates over the long-term since the fiscal position is not significantly eroded by inflation. The Town implemented the price index for these reasons and such application has assisted the Town in securing and maintaining the highest financial credit rating. By not implementing the price index, the utility loses the "time value of money" relative to the financial impact to the System and places the utility in a fiscally greater financial risk position (e.g., results in the inability to fund capital or need to issue more debt beyond what is prudent for the System). For example, if a 3% index had been reflected in the fiscal year 2022, this could have generated an additional $17 million in funds over the Forecast Period (due to the compounding effect over the 25-year period) when compared to the current rate revenue projections. The forecast assumes that the annual price index will be 3.0% annually which is a critical assumption in the ability of the System to fully fund the cost of providing service. The application of the index promotes the sustainability of the System for the long-term in terms of revenue generation and funds availability and use and it is recommended that the price index application be re-instituted beginning with the Fiscal Year 2023 (i.e., effective October 1, 2022).

Recognizing that the Town elected to postpone the rate index over the past three (3) years through Fiscal Year 2022 and based on the utility expenditure forecast recognized in the financial forecast, it is projected that the rates will not be sufficient to meet the expenditure requirements of the Water System and will see declines in fiscal position even with re-instituting the application of the price index adjustment. The result will be the use of operating reserves to fund the annual expenditure requirements. Although the Water System has a strong liquidity position, this current rate policy is not considered to be fully sustainable over the long-term based on the assumptions relied upon in the development of the financial plan and if maintained may adversely affect the utility negatively over the long-term. Furthermore, the rating agencies may look at the lack of the ability to fully adjust rates negatively and could possibly modify its "stable outlook" position of the System. In order to i) recapture the lost "net revenues" due to the recent effect of inflation on the cost of operations and capital (which is at high levels); ii) recognize the effect of reduction in the availability of growth-related revenues coupled with the utility moving towards a 'built-out" condition; iii) continue to perform ongoing renewals and replacements on System assets due to facilities reaching their projected service lives; and iv) maintain a strong financial position, it is recommended that additional fixed rate adjustments above the annual price index be recognized for the Fiscal Years 2023 through 2026 be implemented. These additional rate adjustments would be in addition to the price index adjustment (assumed to be 3.0% applied annually during the Forecast Period beginning with the Fiscal Year 2023). The identified fixed rate adjustments were presented earlier on **Table 8-4** and included a fixed rate adjustment of 4.5% for Fiscal Years 2023 and 2024. A higher fixed rate adjustment is identified for these two Fiscal Years to initiate the recovery of the effects of inflation on the cost of providing service and to provide the necessary funds of over the long-term to fund the CIP and maintain a favorable credit position.

Figure 8-11 presents a summary of revenue sufficiency of the rates for the Forecast Period with the current and, as can be seen, the expenditures and fund transfers are greater than the available revenues from existing rates (reference the figure regarding operating liquidity presented earlier in this section which illustrates a decline in fund balance). This is due to i) increased inflation on the cost of operations (which accounts for approximately 72% of the total revenue requirements during the Forecast Period); ii) reductions in growth (incremental additional revenues) which contribute to increased changes to System costs; and iii) the need to continue to fund deposits to the R&R Fund for capital re-investment. As shown on the **Figure 8-11** below, one can see the difference (which represents the rate revenue requirement funding need) between the Gross Revenues assuming no increase (identified by the red line) and the Gross Revenues with the rate funding plan the calls for two (2) years of rate increases at 4.5% annually coupled with continued price indexing assumed at 3.0% annually thereafter (total of 7.5% annually when combined).

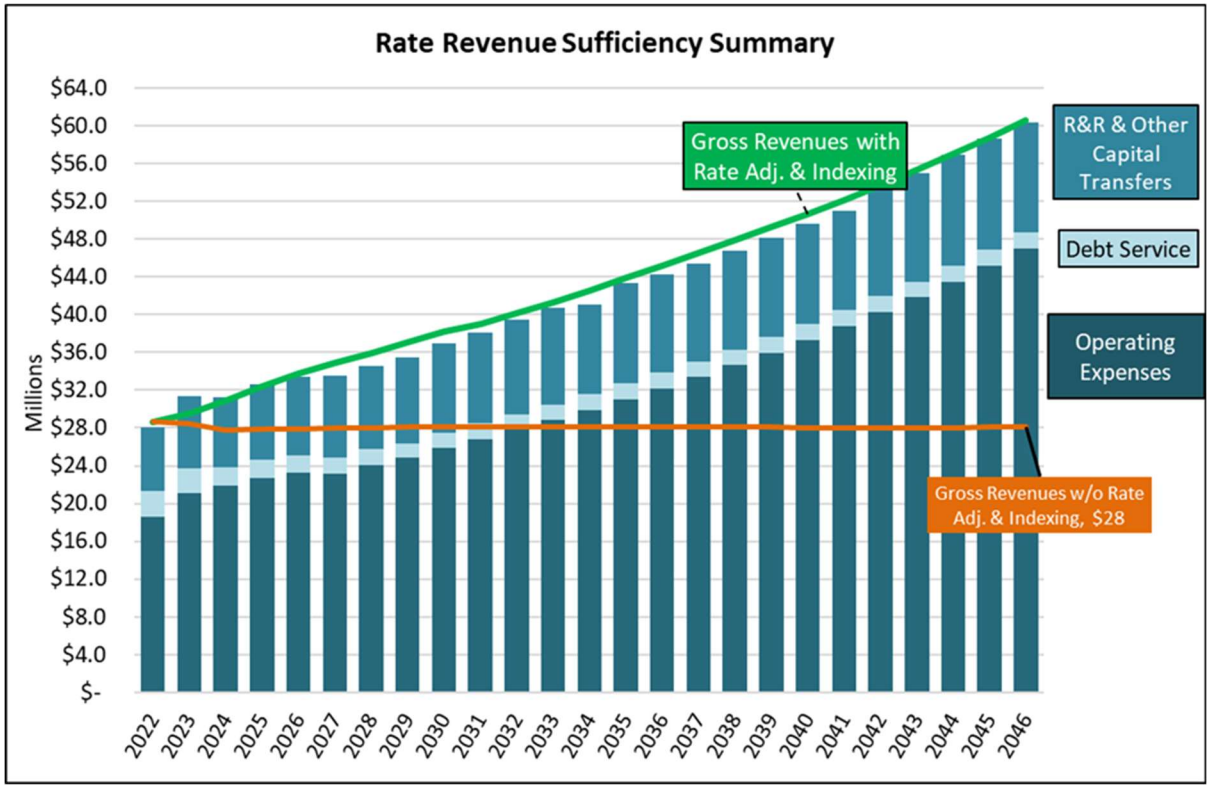


Figure 8-11: Rate Revenue Sufficiency Summary

8.5 Observations and Recommendations

Based on the financial evaluation as presented herein in support of the funding of the anticipated capital needs of the Water System, we offer the following observations and recommendations:

1. The Water System should continue to set policy which will promote the maintenance of the "AAA" rating with the credit agencies. This should i) promote stability in long-term rate competitiveness; ii) limit the risk to the utility due to market changes such as increased regulations; iii) allow for future debt borrowing at lowest interest costs; and iv) provide benefit to the overall credit rating of the Town.

2. The Water Master Plan identifies the need to fund approximately $343.1 Million in capital expenditures for the Fiscal Year 2022 to 2046-time frame. Almost all of the capital expenditures is considered by the Town to be for renewals and replacements (approximately 99% of the total identified needs) and is attributable to utility plant reaching its useful service lives during the Forecast Period. This is typical for a mature system which the Water System is now transitioning in (from a growth-related system) and for the water utilities in the south Florida area.

3. Renewal and replacement-related capital expenditures generally benefit existing customers since the assets are in service to serve such customers. Prudent utility business practices suggest that the funding of such expenditures should be from an annual deposit to a capital fund (i.e., Renewal and Replacement Fund) in order to match asset use to asset replacement. This is generally considered as a "depreciation equivalent." It is recommended that the Town continue to annually fund a deposit to the R&R Fund at the amounts identified in the financial forecast as follows:

    a. Maintain the annual baseline deposit of $5.2 Million which was initially established in Fiscal Year 2012; and

    b. Continue to increase the deposit by the construction cost index as published annually in the Engineering News Record to account for changes in construction costs.

    c. Based on the above formula, the Fiscal Year 2022 baseline deposit (target transfer amount) to the R&R Fund was estimated to be $6,988,365 and the forecasted deposit for the respective fiscal year was estimated at $5,939,812 (which illustrates that current rates are not projected to be sufficient to fund the R&R Fund target deposit – results in the need to utilize cash reserves until rates are adequate to fund the target R&R Fund deposit levels).

4. The Town should annually index the water rates to maintain Net Revenue Margins and provide funds for renewals and replacement capital projects. The indexing of rates is critical to the financial forecast and the ability to maintain a strong financial position of the Water System. The financial forecast assumes an annual 3.0% price index adjustment effective each October 1 beginning in Fiscal Year 2023. By way of example, it the Fiscal Year 2023 price index is not implemented and recognizing that this affects cash flow for the remainder of the Forecast Period (due to the time value of money), the ending working capital reserves assuming no other changes would reduce by approximately $17 Million by Fiscal Year 2046. Delays in adjusting rates is expected to cause greater rate increases in the future, absent any significant change in the financial forecast objectives and assumptions and may place the utility in a financial negative (unsustainable) position.

    Recognizing the financial trends and the need to fund capital reinvestment which requires certainty in rate adjustments, it would be beneficial to establish a floor or minimum index. It is recommended that the Town consider a minimum annual price index equal to 3.0%. The Town currently employs the use of the Water and Sewerage Maintenance Index in the determination of the index to be applied to rates and it is recommended that this index be continued at the present time for consistency. Under this recommendation, the price index factor would be the higher of 3.0% or the actual change in index for the calculation period.

5. Recognizing that i) rates have not been adjusted in three (3) years; ii) the change in the consumer price index since April 2019 has been 13.1% which is an indication of inflation on the cost of operations and the change in the construction cost index since February 2019 has also been 13.1% which illustrates construction cost trends which is affecting cash flow; and iii) the System is approaching a "built-out" condition which reduces changes in realized revenue from such growth (which can be served from existing facilities), it is recommended that the Town adopt a minimum of two (2) years of fixed rate adjustments to fund the projected expenditure and ongoing capital funding needs of the Water System equal to 4.5% annually for Fiscal Years 2023 and 2024. This would be in addition to the price index adjustment for such fiscal years and would result in an annual increase of 7.5% for the Fiscal Years 2023 and 2024.

6. The Town Council is considering the implementation of a 4.5% alternative total rate increase in 2023 due to rate / pricing pressures being experienced by the residents of the Town. If the Town adopts the lower rate adjustment than what has been recognized for the financial forecast, the subsequent rate implementation program will need to be modified. Specifically, and to maintain the same general level of rate being charged and the corresponding liquidity position at the end of the Forecast Period as when compared to the forecast results presented in this study, the alternative rate implementation plan would be needed **(Table 8-8):**

Table 8-8: Summary of Recommended and Alternative Rate Adjustments (%) 2023-2024 [1]

Fiscal Year	Initial Rate Adjustments	Alternative Rate Adjustments
2023	7.5%	4.5%
2024	7.5%	7.5%
2025	3.0%	5.0%
2026	3.0%	5.0%
After 2026	3.0%	3.0%

[1] Amounts shown reflect total water system rate adjustment and include annual price index assumed at 3.0% for each year presented above.

As can be seen above and due to the reduction in the first year of the "up-front" rate adjustments for the alternative rate scenario, the subsequent period rates will need to be increased at a higher level when compared to the initial rate adjustment scenario to recover the "lost" revenue due the lower rate adjustment being recognized, which affects the revenue recovery for every year of the Forecast Period. Pursuant to either rate adjustment, the annual price index adjustment needs to be separately calculated then added to the identified fixed rate adjustment such that the rate adjustments more closely follow the effects of inflation (i.e., the price index component) on the cost of providing service.

7. The Connection Fees were based primarily on the cost of the Nanofiltration Plant as the last increment of capacity and are considered as being reasonable. Furthermore, the Connection Fees are necessary to recover the cost of capacity from new users to the Water System. Any reduction

in the Connection Fees will put additional rate pressure on the monthly rates for service since the Connection Fees are a financial resource to the System. Although provided in the Connection Fee ordinances, the assumed fees for the financial presentation did not assume any indexing in the fees since the majority of the capital costs to provide service have been constructed.

8. The Town should update the financial forecast every 1 to 3 years to monitor trends and changes in Water System operations and capital needs to evaluate business and rate strategies to maintain the financial position of the Water System and the overall sufficiency of rates to meet the financial commitments of the utility.

Appendices

Appendix A: RCAP 2.0 Recommended Actions for Water Systems

Appendix B: Surficial Aquifer Annual Raw Water Withdrawal Per Well

Appendix C: Wellfield Water Quality

C-1 Surficial Aquifer Water Wellfield Water Quality

C-2 Floridan Aquifer Wellfield Water Quality

Appendix D: Final Draft Technical Memorandum RO Phase 3 Improvements

Appendix E: Final Draft Technical Memorandum Conceptual Analysis of Liquid Chlorine Conversion

Appendix F: Final Draft Technical Memorandum Conceptual Analysis of Converting IX Facility to Calcite Contactor

Appendix G: Technical Memorandum Town of Jupiter Compliance with Four-Log Compliance

Appendix H: SAS Raw Water Main Hydraulic Investigation and Improvements

Appendix I: FAS Raw Water Main Hydraulic Investigation and Improvements

Appendix J-1: Technical Memorandum Conceptual Analysis of Blending NF Concentrate with FAS Raw Water

Appendix J-2: Proposed Pilot Study Schedule (Preliminary Draft) for Blending Nanofiltration Concentrate with Reverse Osmosis Feed Water

Appendix K: Technical Memorandum Waste Stream Recovery and Disposal

Appendix L: Technical Memorandum Discussion of Membrane Concentrate Disposal Using Class I Deep Well Injection

Appendix M: Technical Memorandum Deep Well Injection Pump Station

Appendix N: Town of Jupiter Water System Master Asset List

Appendix O – Town of Jupiter Water System Cash Flow Analysis

Appendix A:
RCAP 2.0 Recommended Actions for Water Systems

Regional Climate Action Plan (RCAP) 2.0
Recommended Actions for Water Systems [1]

Category Name	Abbreviated Title	Action Plan Recommendation	Implementation	Reported as Implemented by Town Municipality to Compact [2]	Implemented by Town Water Utility but not Recorded by Compact [3]
Water	WS-01	Foster innovation, development, and exchange of ideas for managing water.	Develop and share new water management information, methods, technical capabilities, and trends addressing key climate variability and sea level rise concerns through the Compact's collaborations with state and federal agency partners and academic institutions, as well as through the RCAP. Establish a method for a periodic exchange of ideas between water resource managers, policymakers, stakeholders, scientists, and researchers in collaboration with the Compact, the South Florida Water Management District, and local academic partners.	—	**Yes**
Water	WS-02	Ensure consistency in water resource scenarios used for planning.	Ensure all water resource policy, planning, and management decisions in the Lower East Coast Water Supply Planning Area are consistently aligned with: -- The latest Southeast Florida unified sea level rise projections. -- Regional climate scenarios for planning (e.g., storm surge, design storm events). -- Hydrologic models used in adaptation planning, from local to regional scales. Ensure all water resource policies consider regional water management issues, including flooding and water variability. For flooding, use impact assessments for observed and predicted climate variability on the frequency, duration, and intensity of flooding connected to sea level rise, extreme tidal excursions, storm surges, 100-year rainfall events. Use impact assessments to determine where impacts will likely be greatest. For water availability, examine the effects of climate change and sea level rise on water availability and groundwater vulnerability to saltwater intrusion, based on potential changes in precipitation and evapotranspiration patterns and associated extreme drought and flood events.	—	**Yes**

Job No. 44250-069

Category Name	Abbreviated Title	Action Plan Recommendation	Implementation	Reported as Implemented by Town Municipality to Compact [2]	Implemented by Town Water Utility but not Recorded by Compact [3]
Water	WS-03	Plan for future water supply conditions.	Encourage the South Florida Water Management District to integrate potential future climate conditions, sea level rise scenarios, and potential impacts to water quality and supply into the regional water management models used to support the Lower East Coast Water Supply Plan, environmental resource permitting, and consumptive use permitting.	—	**Yes**
Water	WS-04	Coordinate saltwater intrusion mapping across Southeast Florida.	Ensure consistency in efforts to map saltwater intrusion across the region to create better information and improve management decisions for protecting regional freshwater aquifers. Coordinate the methodology and schedule for the saltwater intrusion mapping used to maintain and update the regional saltwater intrusion baseline mapping conducted by the South Florida Water Management District and the U.S. Geological Survey, at a minimum of every five years. Utilize saltwater intrusion models and validated data to identify wellfields and underground infrastructure at risk of contamination or infiltration by saltwater due to rising sea levels.	**Yes**	**Yes**
Water	WS-05	Maintain regional inventories of water and wastewater infrastructure.	Coordinate among city and county government public works agencies, water utilities, and other operators of water infrastructure to develop and maintain local and regional inventories of existing potable water supply wellfields, treatment and distribution systems, wastewater treatment and collection infrastructure, and septic tanks and drain fields. Assess the potential for climate change impacts on each component of water infrastructure under different climate change scenarios and develop adaptation strategies for affected systems, including infrastructure that may require replacement, reinforcement, or relocation to ensure the long-term viability of the system.	—	**Yes**
Water	WS-06	Develop a spatial database of resilience projects for water infrastructure.	Track the climate resilience projects for water infrastructure being designed and built by local governments and utility districts across Southeast Florida to aid local peer learning. Develop a regionally coordinated geodatabase to illustrate and catalog local and regional resilience projects, planning tools, and infrastructure investments, and a formal data management strategy for water infrastructure	—	**Yes**

Job No. 44250-069

Category Name	Abbreviated Title	Action Plan Recommendation	Implementation	Reported as Implemented by Town Municipality to Compact [2]	Implemented by Town Water Utility but not Recorded by Compact [3]
			projects that could be scaled in the future to include other infrastructure (e.g., communications, transportation, and energy).		
Water	WS-07	Modernize infrastructure development standards in the region.	Modernize permitting, planning, and design standards for development and infrastructure improvements to drainage systems, surface water management systems, and finished floor elevations based on updates to groundwater table maps, flood elevation maps, and tidal elevations. Prioritize design standards that maintain project compatibility, infrastructure connectivity, and level of service under potential future climate conditions.	—	**Yes**
Water	WS-09	Update the regional stormwater rule.	Advocate for an update of the Florida Department of Environmental Protection's Stormwater Management Rule, SFWMD Environmental Resource Permit Applicant's Handbook Volume II	—	**Yes**
Water	WS-10	Integrate combined surface and groundwater impacts into the evaluation of at-risk infrastructure and the prioritization of adaptation improvements.	Continue to utilize a combination of inundation maps and stormwater models to identify areas and infrastructure at increased risk of flooding. Evaluate the potential impacts of changes in groundwater levels on wastewater and stormwater systems (including septic systems, wastewater collection, and conveyance and storage systems), with consideration of water quantity and quality (including public health-related metrics). Use the results of the above-stated analyses as the basis for site planning and regulation, and for identifying and prioritizing adaptation needs and strategies.	**Yes**	**Yes**
Water	WS-11	Encourage green infrastructure and alternative strategies.	Promote the development of green infrastructure and alternative, net-zero greenhouse gas emission strategies for water supply, stormwater, and wastewater management focused on achieving a balance between water availability and consumption, limiting energy use to the amount produced on-site via renewable energy, and eliminating solid waste sent to landfills. Create comprehensive strategies to advance the multiple benefits and sustainability of services provided by net-zero practices.	—	**Yes**

Job No. 44250-069

Category Name	Abbreviated Title	Action Plan Recommendation	Implementation	Reported as Implemented by Town Municipality to Compact [2]	Implemented by Town Water Utility but not Recorded by Compact [3]
Water	WS-12	Integrate hydrologic and hydraulic models.	Coordinate across regional, state, and federal agencies to develop and apply appropriate hydrologic and hydraulic models to further evaluate the efficacy of existing water management systems and flood control and drainage infrastructure under variable climate conditions. Quantify the capacity and interconnectivity of the surface water control network and develop feasible adaptation strategies. Develop common data standards and database protocol for maintaining water management system components.	**Yes**	**Yes**
Water	WS-13	Practice integrated water management and planning.	Convene forums to promote a joint assessment and planning strategy involving local water utilities, wastewater service providers, water managers, and partners to the Southeast Florida Regional Climate Change Compact for coordinated consideration of: -- Stormwater use and disposal -- Rainfall-derived inflow and infiltration -- Traditional and alternative water supplies -- Wastewater disposal -- Expansion of reuse and water conservation measures (e.g., maintaining adequate aquifer levels and minimizing the use of potable water for irrigation purposes) -- Amendments to applicable development codes and regulations. Develop local integrated water management plans based on joint assessment and planning strategies.	**Yes**	**Yes**
Water	WS-14	Advance comprehensive improvements to regional and local stormwater management practices.	Undertake a comprehensive evaluation of stormwater improvements necessary to expand surface water storage, enhance water quality treatment, and reduce stormwater discharges in the delivery of flood protection needs and environmental priorities for the Everglades and estuarine and coastal ecosystems. Improve stormwater management through distributed storage, integrated stormwater systems, and additional best management practices.	—	**Yes**
Water	WS-15	Foster scientific research for improved water resource management.	Encourage collaborative programs with local universities including the Compact's partnership with the Florida Climate Institute to improve community and stakeholder communication and education efforts regarding potential local and regional climate change impacts. Build partnerships and technology exchanges with public,	—	**Yes**

Job No. 44250-069

Category Name	Abbreviated Title	Action Plan Recommendation	Implementation	Reported as Implemented by Town Municipality to Compact [2]	Implemented by Town Water Utility but not Recorded by Compact [3]
			private, academic, domestic, and international partners to bring additional experience and innovation to resilience planning, projects, and decision support. Continue to encourage, foster, and support collaborative investigative work and scientific research that improves water resource management, including: -- Downscaling global climate models to represent precipitation patterns at the regional and local scale and to develop standardized precipitation scenarios for the region. -- Identifying and targeting gaps in monitoring and data availability (e.g., light detection and ranging, environmental and water quality data, or data supporting regional climate indicators) to improve the quantification of the hydrologic system and its response to climate change (e.g., evapotranspiration, surface and groundwater levels, water quality, precipitation, and local sea level) through local program efforts, agency collaborations, and advocacy for additional state and/or federal resources, as needed. -- Developing integrated risk-based decision-support tools and processes for application in the analysis and selection of infrastructure design, water resource management, natural systems management, and hazard mitigation alternatives. Tools should facilitate the consideration of the potential economic costs of comparative planning scenarios, management decisions, and infrastructure investments, as well as the evaluation of potential trade-offs.		
Water	WS-17	Advance capital projects to achieve resilience in water infrastructure.	Identify, incorporate, and prioritize preferred climate adaptation improvement projects pertaining to water supply, wastewater systems, stormwater management, and flood protection as part of capital improvement plans. Develop projects, pursue funding options (including independent funding mechanisms), and implement projects.	**Yes**	**Yes**
Water	WS-18	Coordinate innovation and regional funding.	Coordinate the implementation of innovative water management technologies across multiple jurisdictions as part of piloted solutions to foster shared investments. Facilitate knowledge sharing about the results, costs, and savings from management technologies. Scale	—	**Yes**

Job No. 44250-069

Category Name	Abbreviated Title	Action Plan Recommendation	Implementation	Reported as Implemented by Town Municipality to Compact [2]	Implemented by Town Water Utility but not Recorded by Compact [3]
			successful cross-jurisdictional technologies to reduce the potential for redundant investments and achieve economies-of-scale while fairly distributing costs and benefits across multiple project beneficiaries.		
Water	WS-19	Recognize adaptable infrastructure.	Identify existing underperforming infrastructure and implement adaptable infrastructure strategies that facilitate targeted investments, allow managed performance, and achieve greater flexibility in system operations.	—	**Yes**
Water	WS-20	Support the Comprehensive Everglades Restoration Plan (CERP).	Continue to support the Comprehensive Everglades Restoration Plan (CERP) and its updated versions as fundamental to Everglades restoration. Contribute to the ongoing implementation of CERP and updates to implementation plans (such as the Integrated Delivery Schedule) through the South Florida Ecosystem Restoration Task Force and relevant working groups. Publicize the role of CERP as a regional climate resilience strategy, particularly as a way to increase freshwater flows to the Everglades system, which improves water quality, maximizes regional freshwater storage and aquifer recharge, and creates the potential to abate saltwater intrusion, an increasingly important effort under variable climate conditions and in the face of sea level rise.	—	**Yes**
Water	WS-21	Expand regional surface water storage.	Develop new and combine existing land acquisition priorities in a regional setting to protect, preserve, and enhance water storage. Develop regional and distributed surface water storage (e.g., C-51 reservoir and interconnected urban systems) to increase the potential for stormwater capture and reuse for water supply, aquifer recharge, flood management, and environmental benefits.	**Yes**	**Yes**

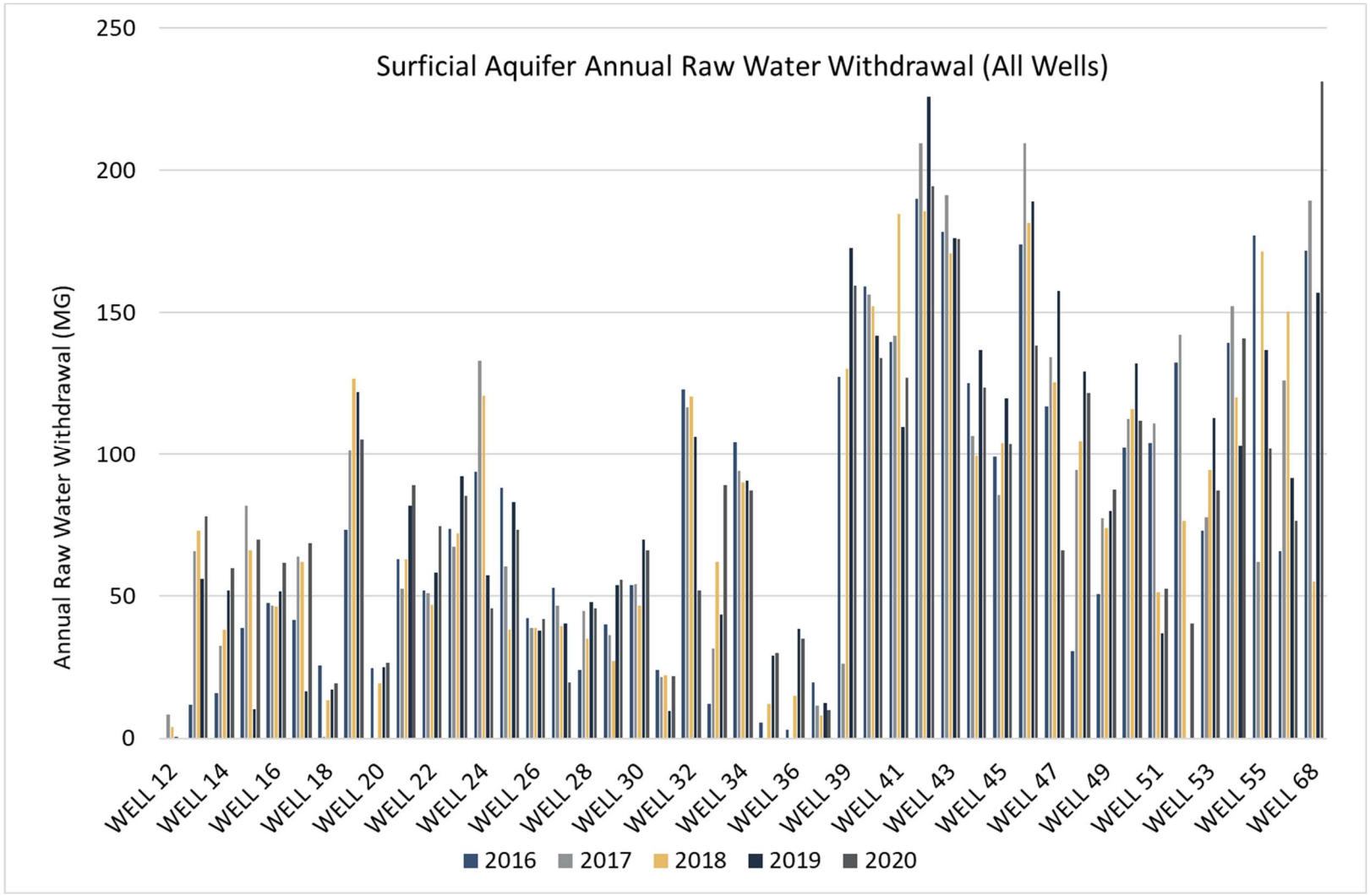
Notes:

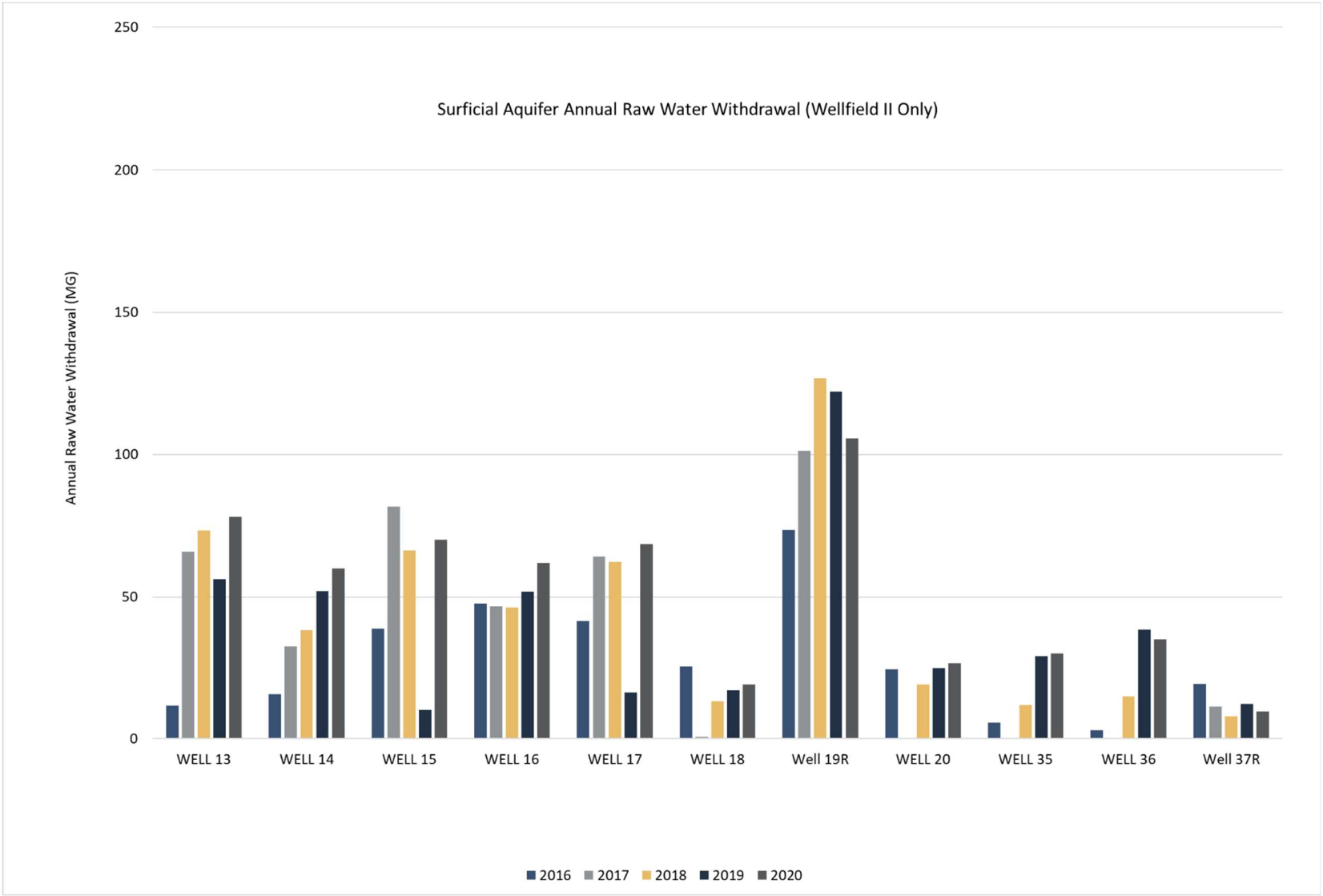
1. *Southeast Florida Regional Climate Compact, RCAP 2.0 Online Tool, Accessed April 15, 2021.*
2. *The implementation data shown was self-reported by Municipalities for RCAP 1.0 recommendations, based on surveys of RCAP implementation conducted in 2014 and 2016.*
3. *Implemented by Town of Jupiter Water System but not recorded by the Compact.*

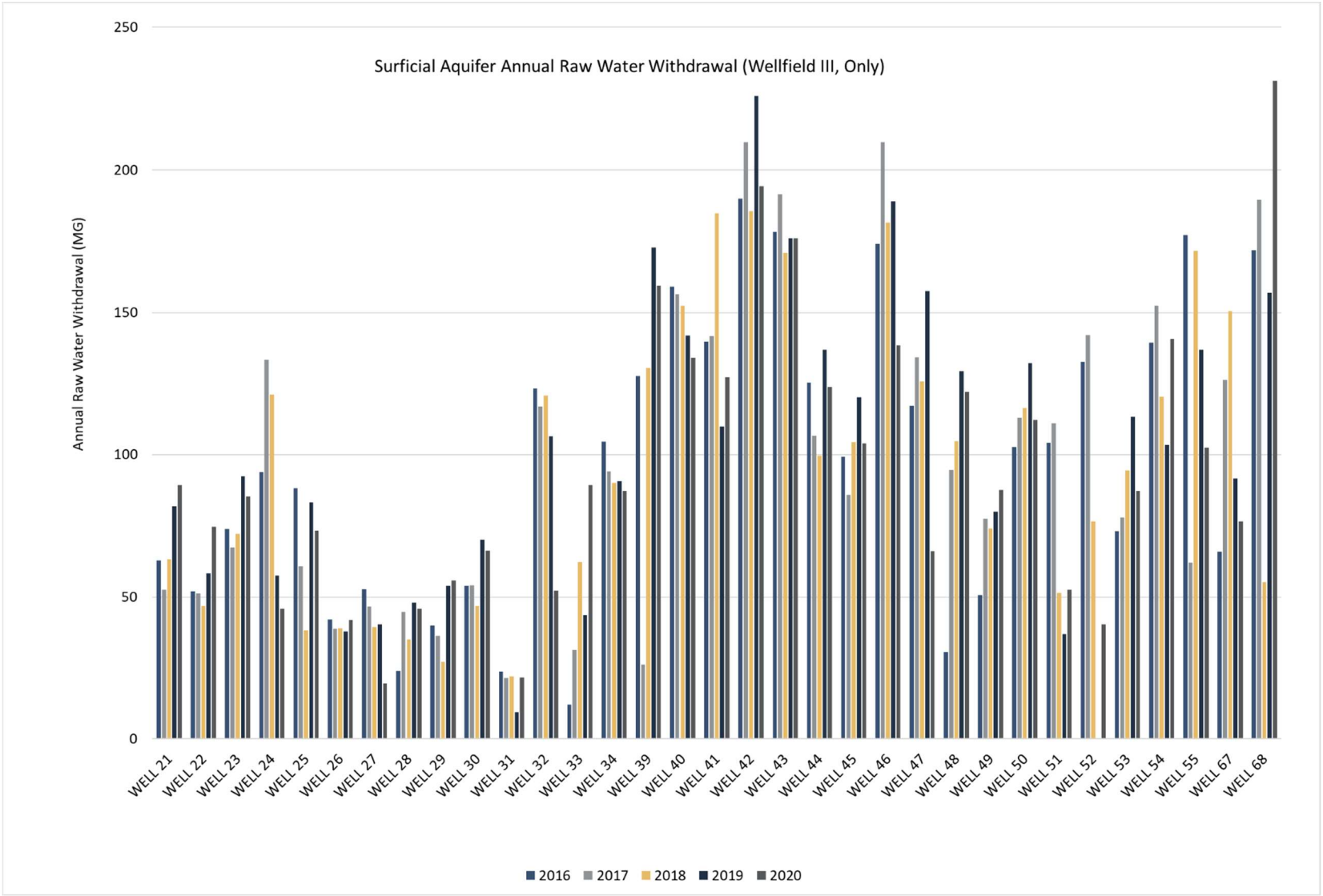
Job No. 44250-069

Appendix B:
Surficial Aquifer Annual Raw Water Withdrawal Per Well

Appendix B: Surficial Aquifer Raw Water Withdrawals for Individual Wells




Surficial Aquifer Annual Raw Water Withdrawal (Wellfield II Only)
Annual Raw Water Withdrawal (MG)
250
200
150
100
50
0
WELL 13
WELL 14
WELL 15
WELL 16
WELL 17
WELL 18
Well 19R
WELL 20
WELL 35
WELL 36
Well 37R
2016
2017
2018
2019
2020


Surficial Aquifer Annual Raw Water Withdrawal (Wellfield III, Only)
Annual Raw Water Withdrawal (MG)
250
200
150
100
50
0
WELL 21
WELL 22
WELL 23
WELL 24
WELL 25
WELL 26
WELL 27
WELL 28
WELL 29
WELL 30
WELL 31
WELL 32
WELL 33
WELL 34
WELL 39
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WELL 41
WELL 42
WELL 43
WELL 44
WELL 45
WELL 46
WELL 47
WELL 48
WELL 49
WELL 50
WELL 51
WELL 52
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WELL 54
WELL 55
WELL 67
WELL 68
2016
2017
2018
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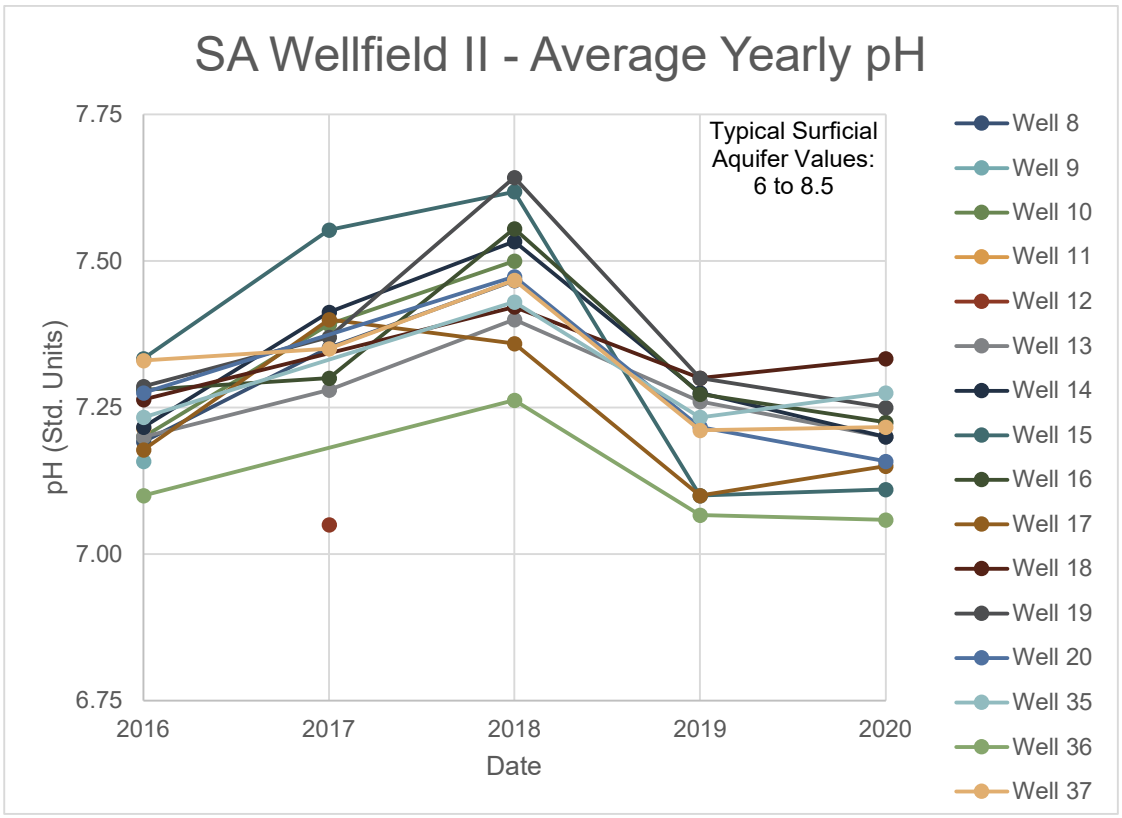
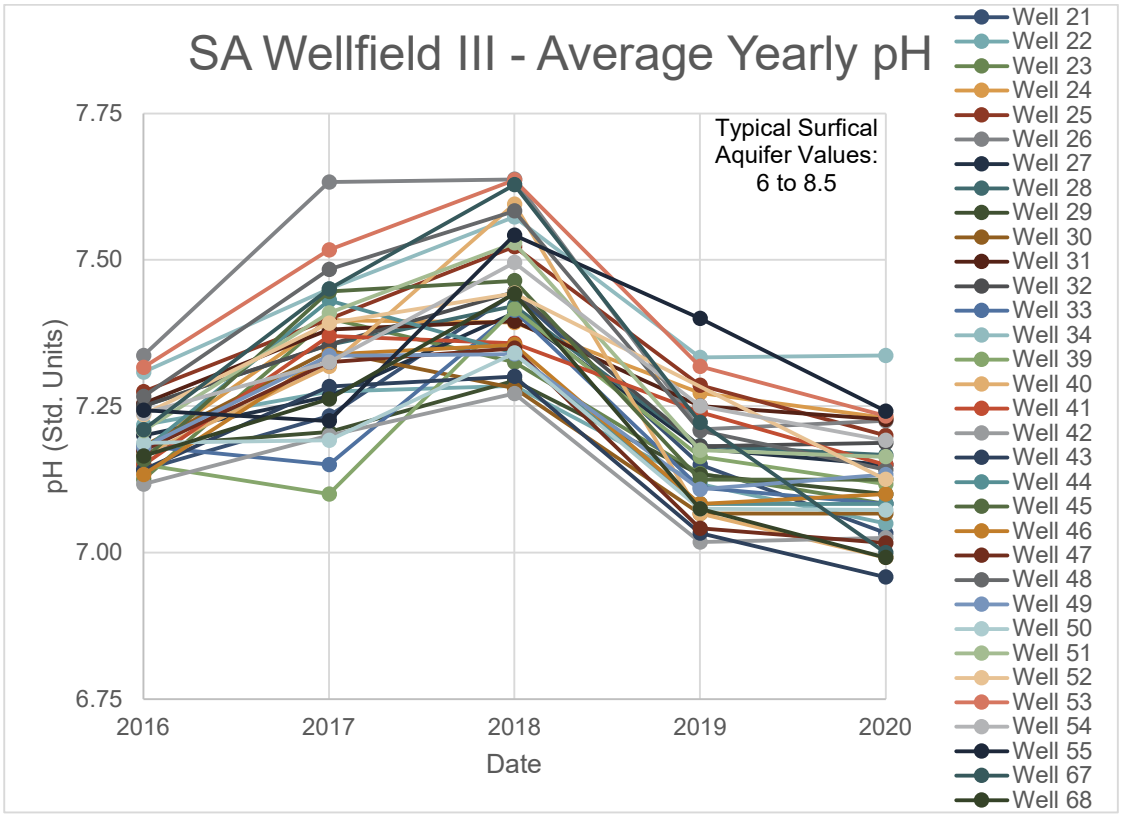
2020

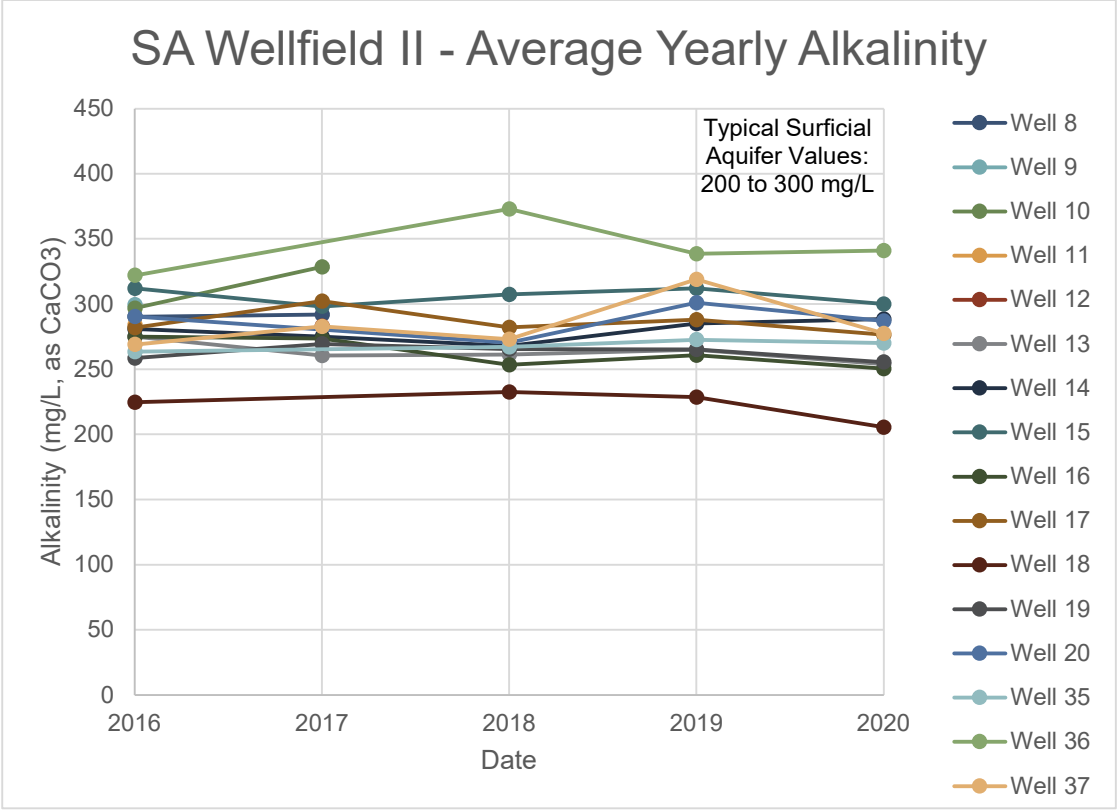
Appendix C:
Wellfield Water Quality

Appendix C-1:
Surficial Aquifer Water Wellfield Water Quality

Appendix C-1 – Surficial Aquifer Wellfield Water Quality






SA Wellfield II - Average Yearly Alkalinity
Typical Surficial Aquifer Values: 200 to 300 mg/L
Alkalinity (mg/L, as CaCO3)
450
400
350
300
250
200
150
100
50
0
2016
2017
2018
2019
2020
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Well 8
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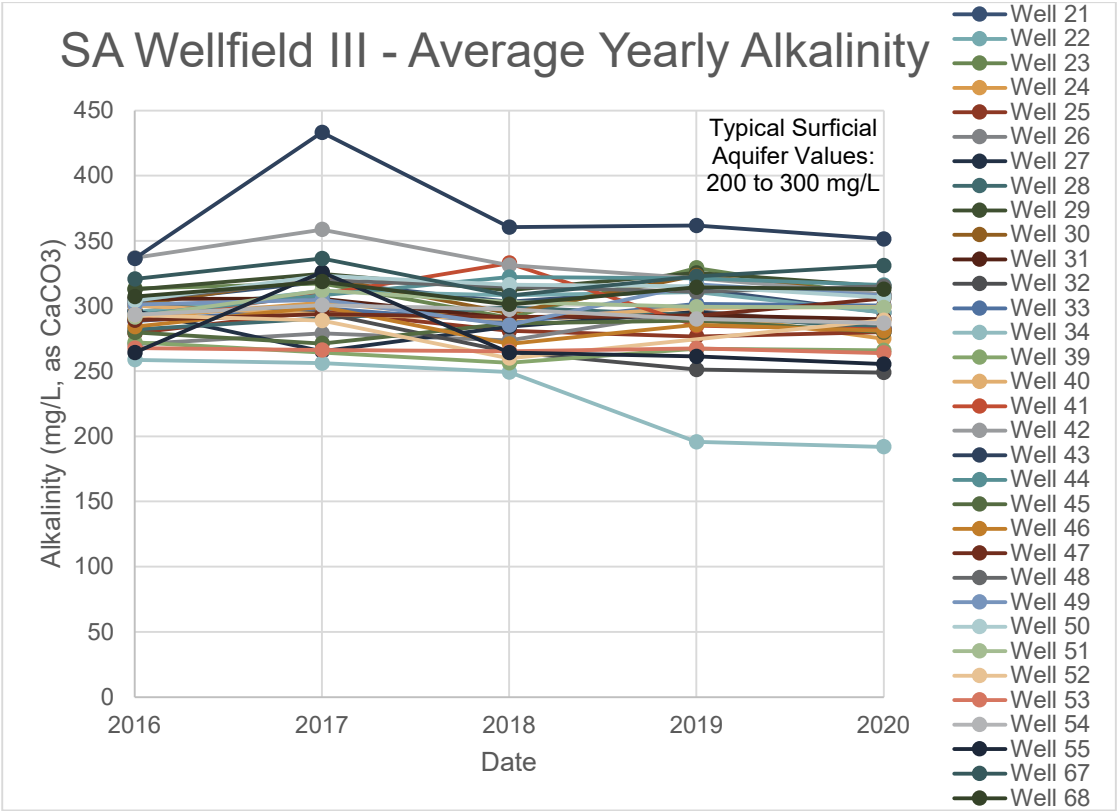
SA Wellfield III - Average Yearly Alkalinity
Typical Surficial Aquifer Values: 200 to 300 mg/L
Alkalinity (mg/L, as CaCO3)
450
400
350
300
250
200
150
100
50
0
2016
2017
2018
2019
2020
Date
Well 21
Well 22
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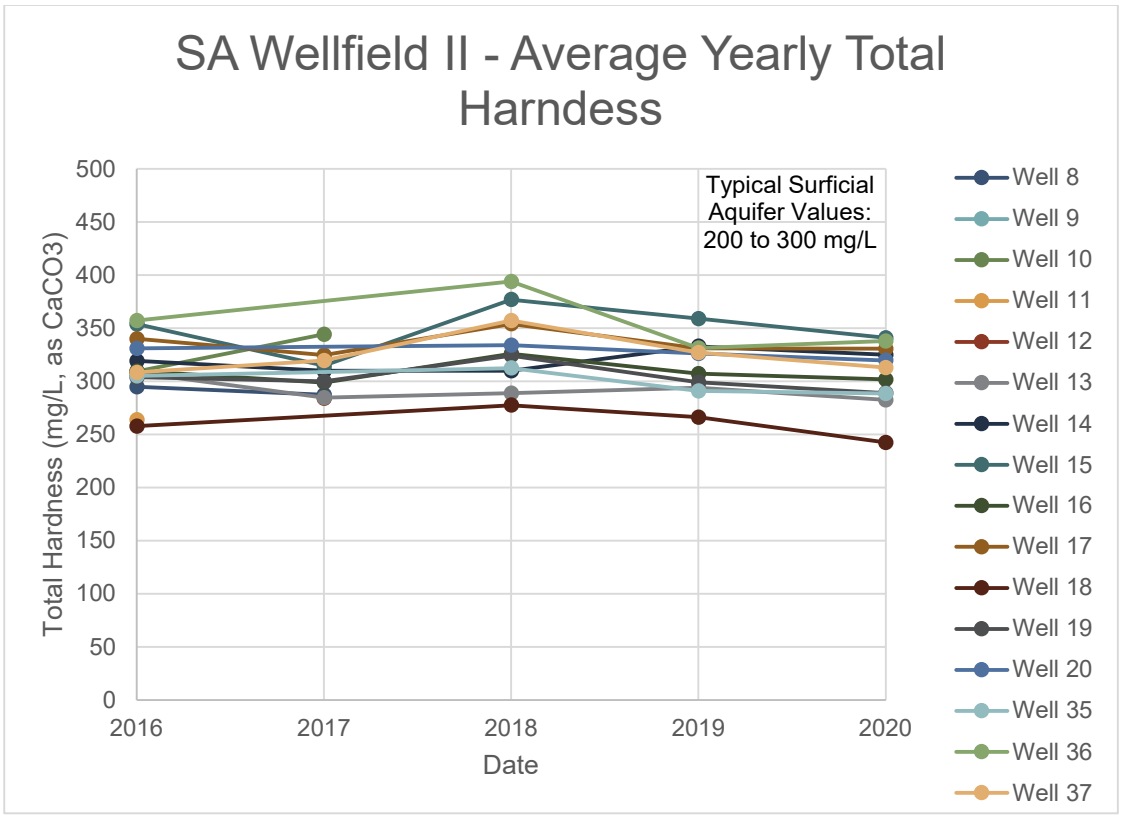
SA Wellfield II - Average Yearly Total Harndess
Typical Surficial Aquifer Values: 200 to 300 mg/L
Total Hardness (mg/L, as CaCO3)
500
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300
250
200
150
100
50
0
2016
2017
2018
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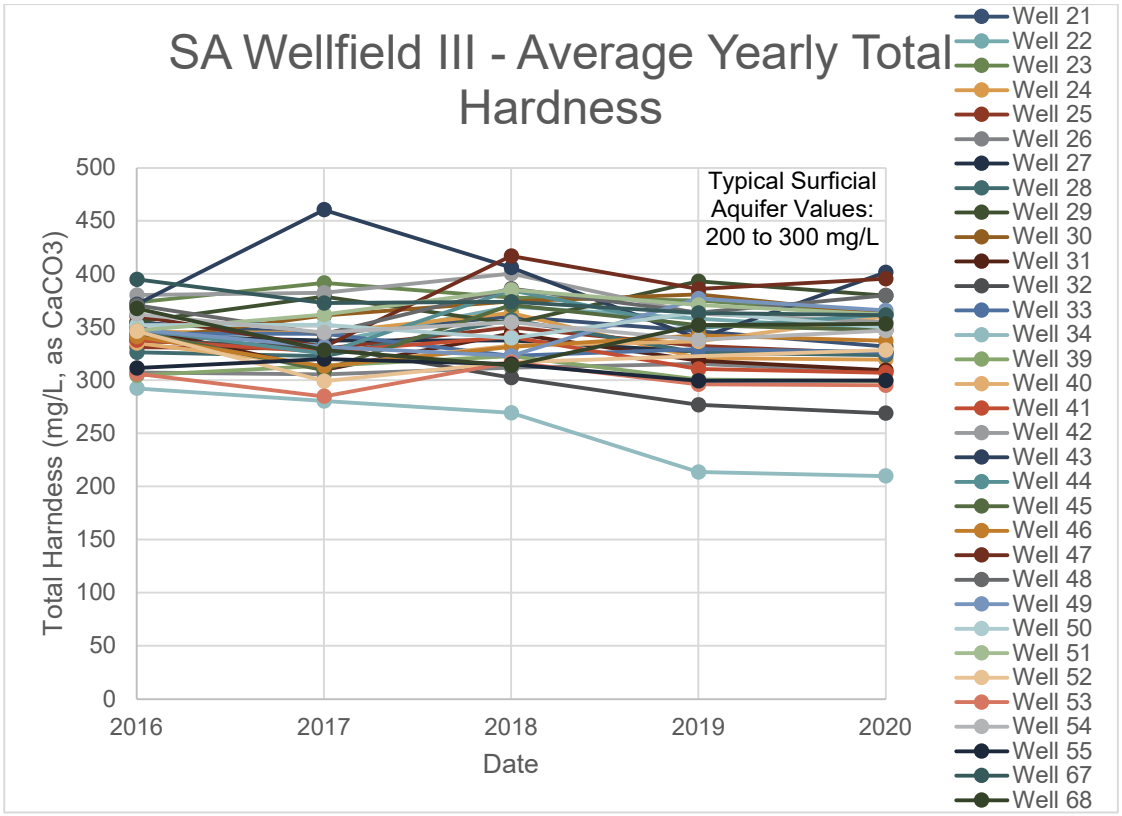
SA Wellfield III - Average Yearly Total Hardness
Typical Surficial Aquifer Values: 200 to 300 mg/L
Total Harndess (mg/L, as CaCO3)
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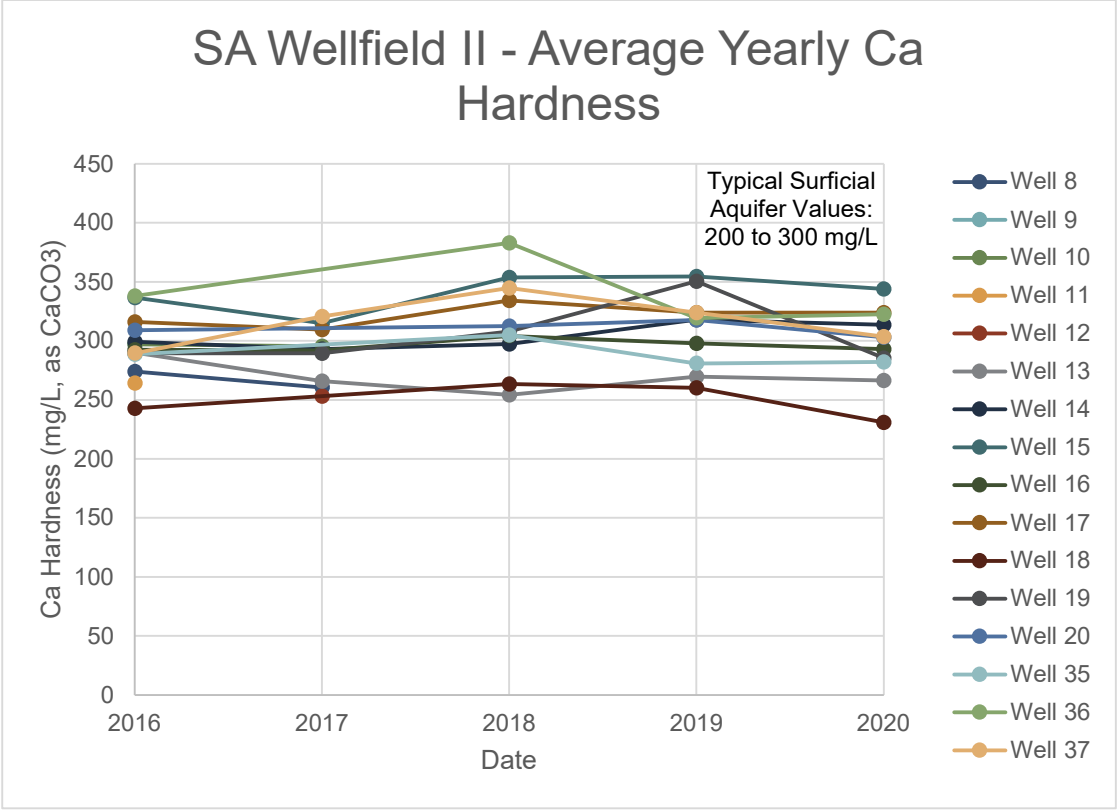
SA Wellfield II - Average Yearly Ca Hardness
Typical Surficial Aquifer Values: 200 to 300 mg/L
Ca Hardness (mg/L, as CaCO3)
450
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250
200
150
100
50
0
2016
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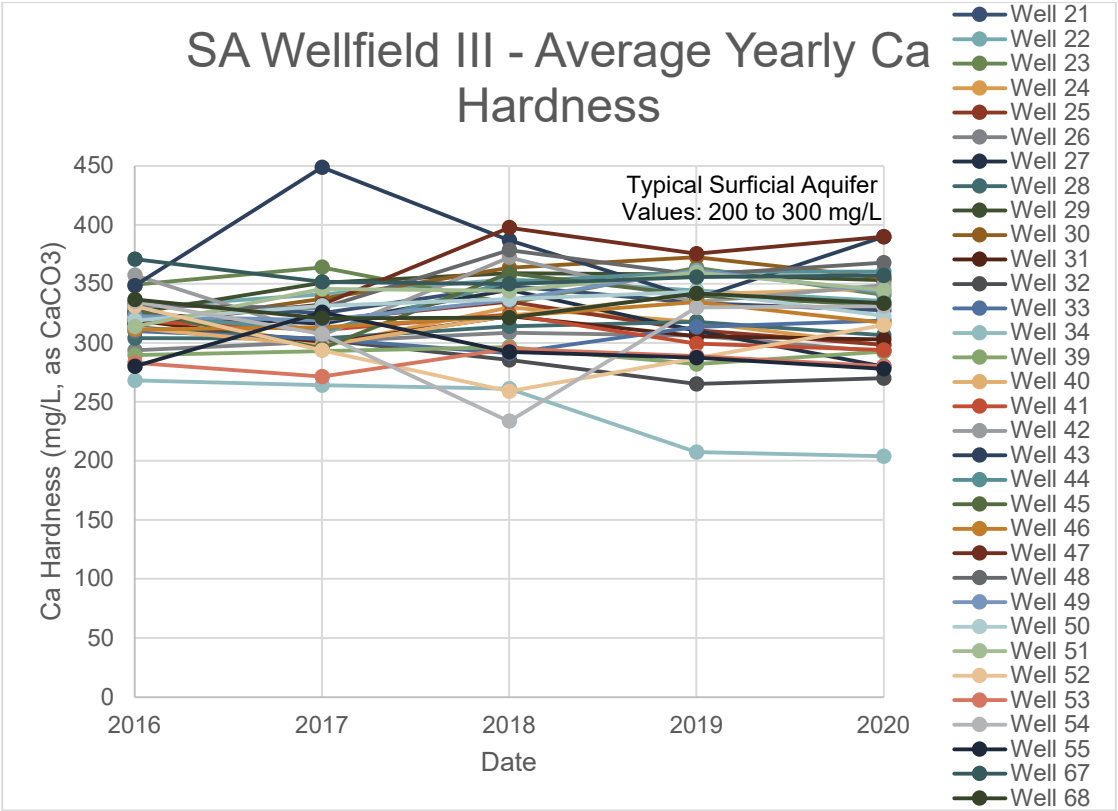
SA Wellfield III - Average Yearly Ca Hardness
Typical Surficial Aquifer Values: 200 to 300 mg/L
Ca Hardness (mg/L, as CaCO3)
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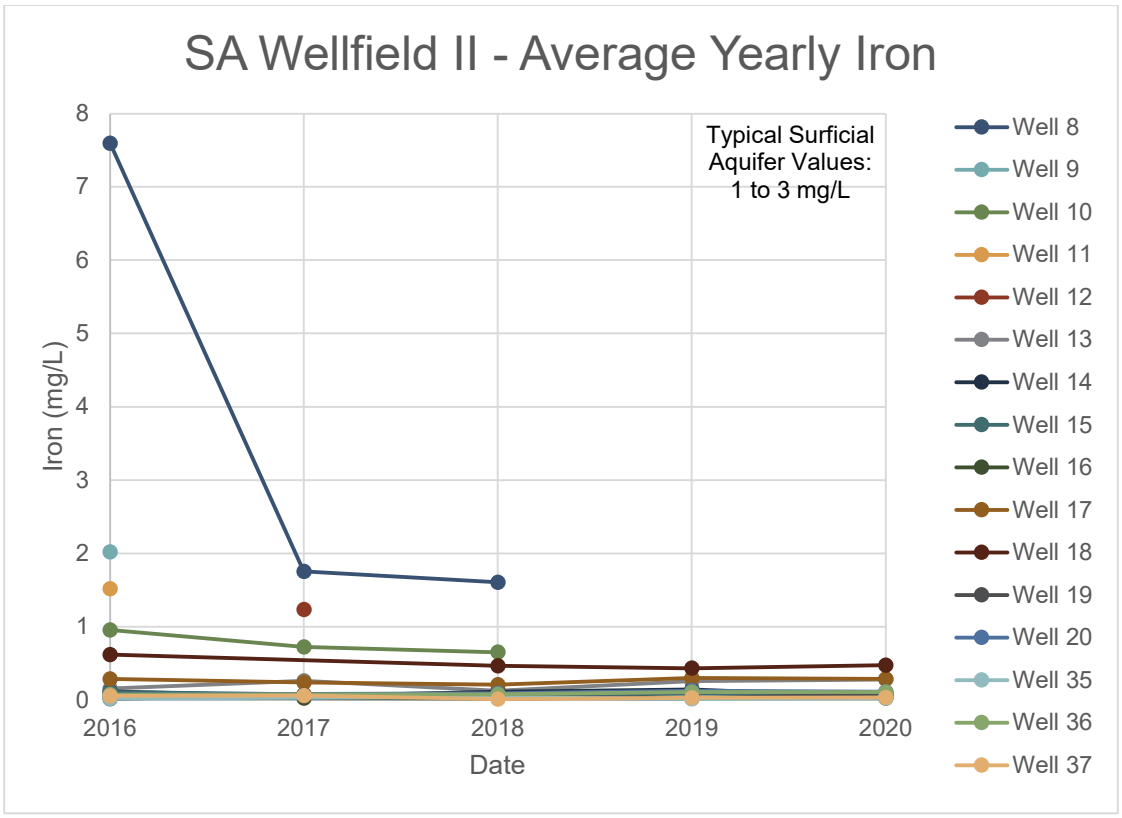
SA Wellfield II - Average Yearly Iron
Typical Surficial Aquifer Values: 1 to 3 mg/L
Iron (mg/L)
0
1
2
3
4
5
6
7
8
2016
2017
2018
2019
2020
Date
Well 8
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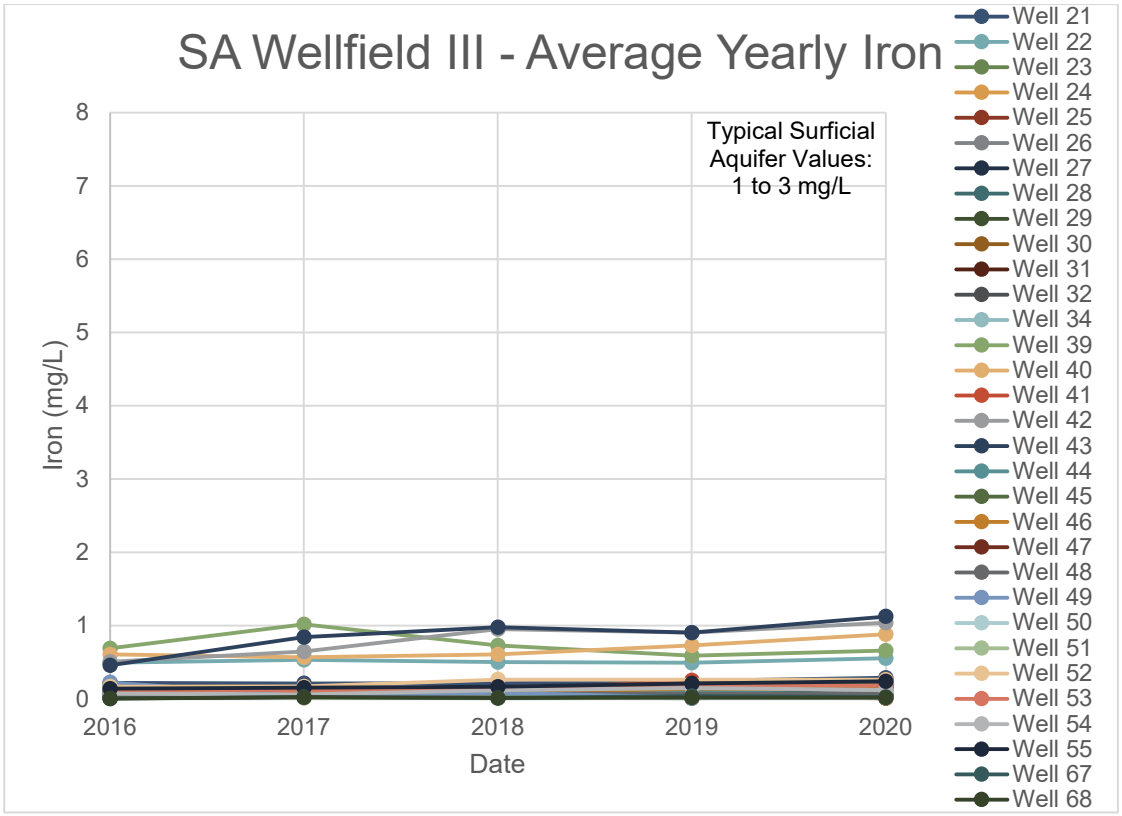
SA Wellfield III - Average Yearly Iron
Typical Surficial Aquifer Values: 1 to 3 mg/L
Iron (mg/L)
0
1
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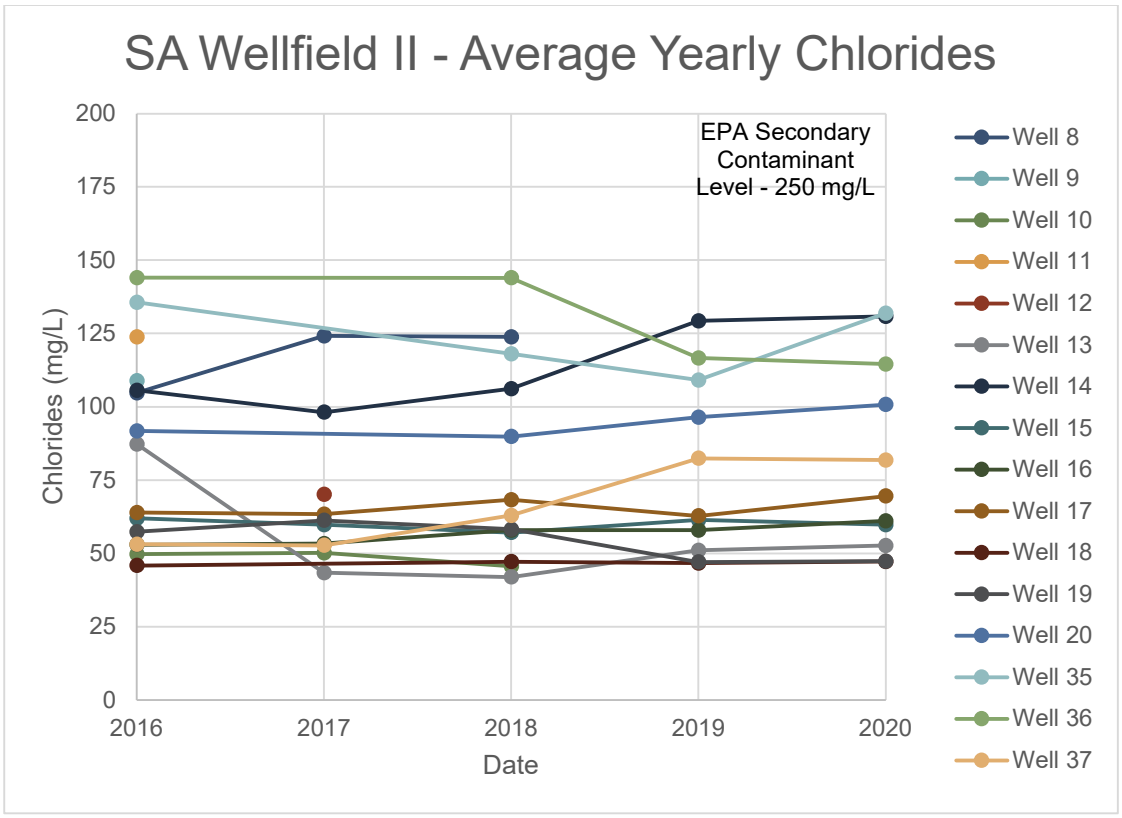
SA Wellfield II - Average Yearly Chlorides
EPA Secondary Contaminant Level - 250 mg/L
Chlorides (mg/L)
200
175
150
125
100
75
50
25
0
2016
2017
2018
2019
2020
Date
Well 8
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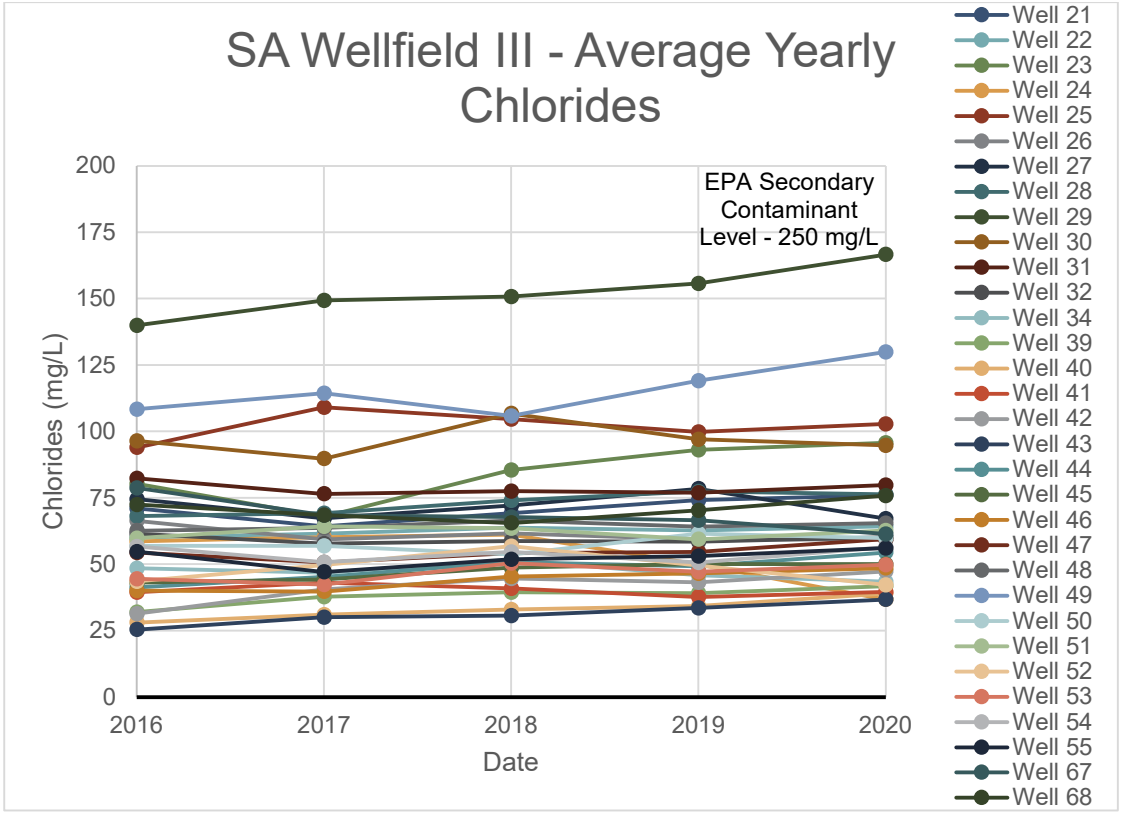
SA Wellfield III - Average Yearly Chlorides
EPA Secondary Contaminant Level - 250 mg/L
Chlorides (mg/L)
200
175
150
125
100
75
50
25
0
2016
2017
2018
2019
2020
Date
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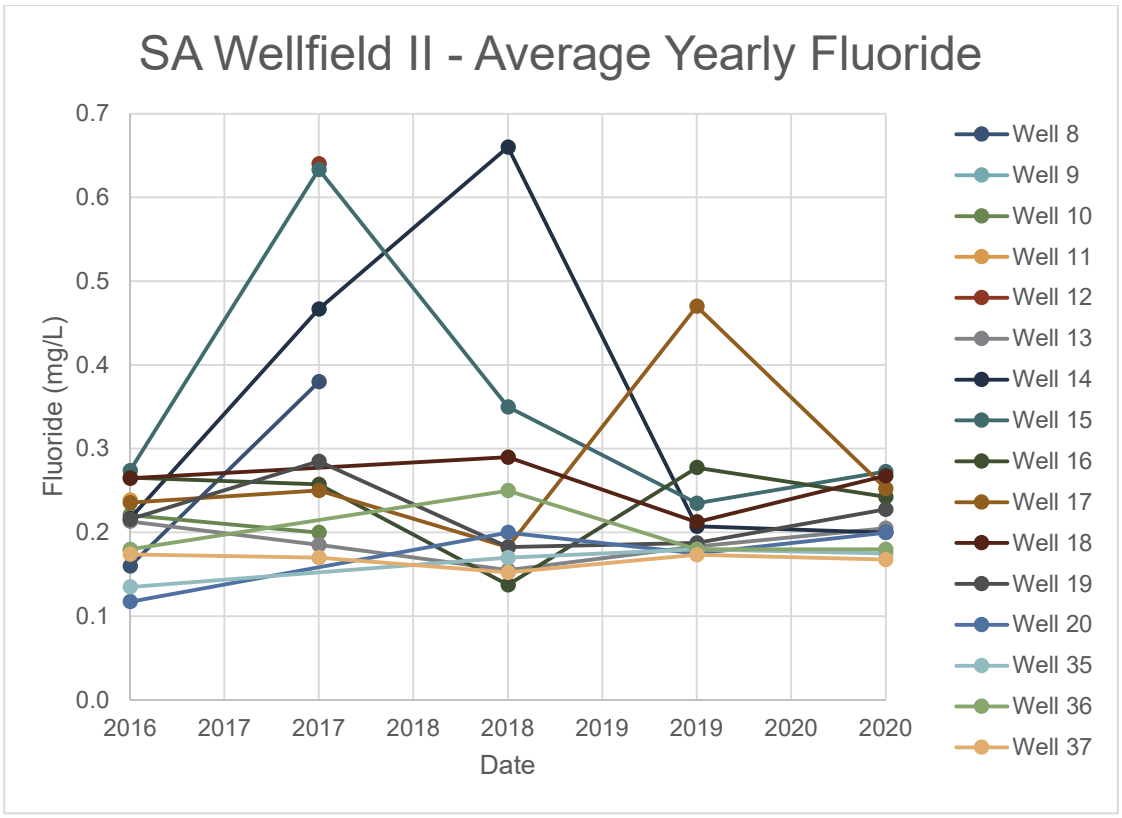
SA Wellfield II - Average Yearly Fluoride
Fluoride (mg/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2016
2017
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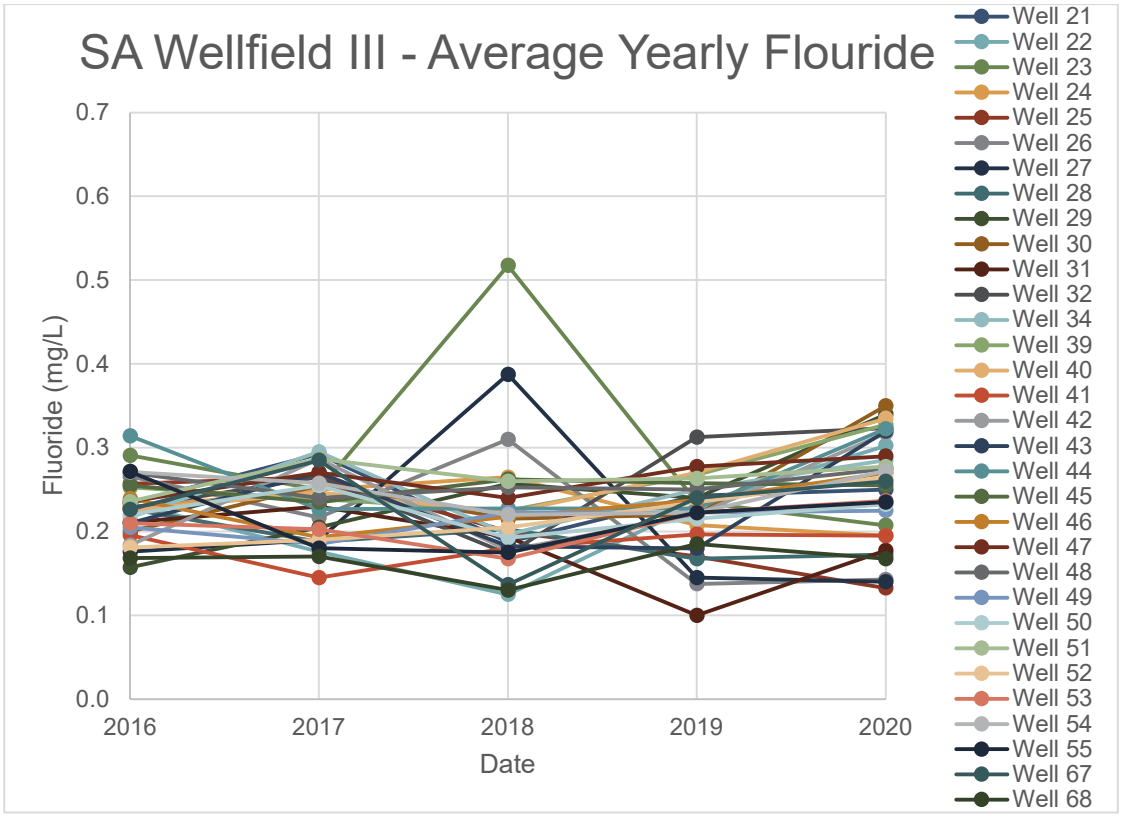
SA Wellfield III - Average Yearly Flouride
Fluoride (mg/L)
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2016
2017
2018
2019
2020
Date
Well 21
Well 22
Well 23
Well 24
Well 25
Well 26
Well 27
Well 28
Well 29
Well 30
Well 31
Well 32
Well 34
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Well 43
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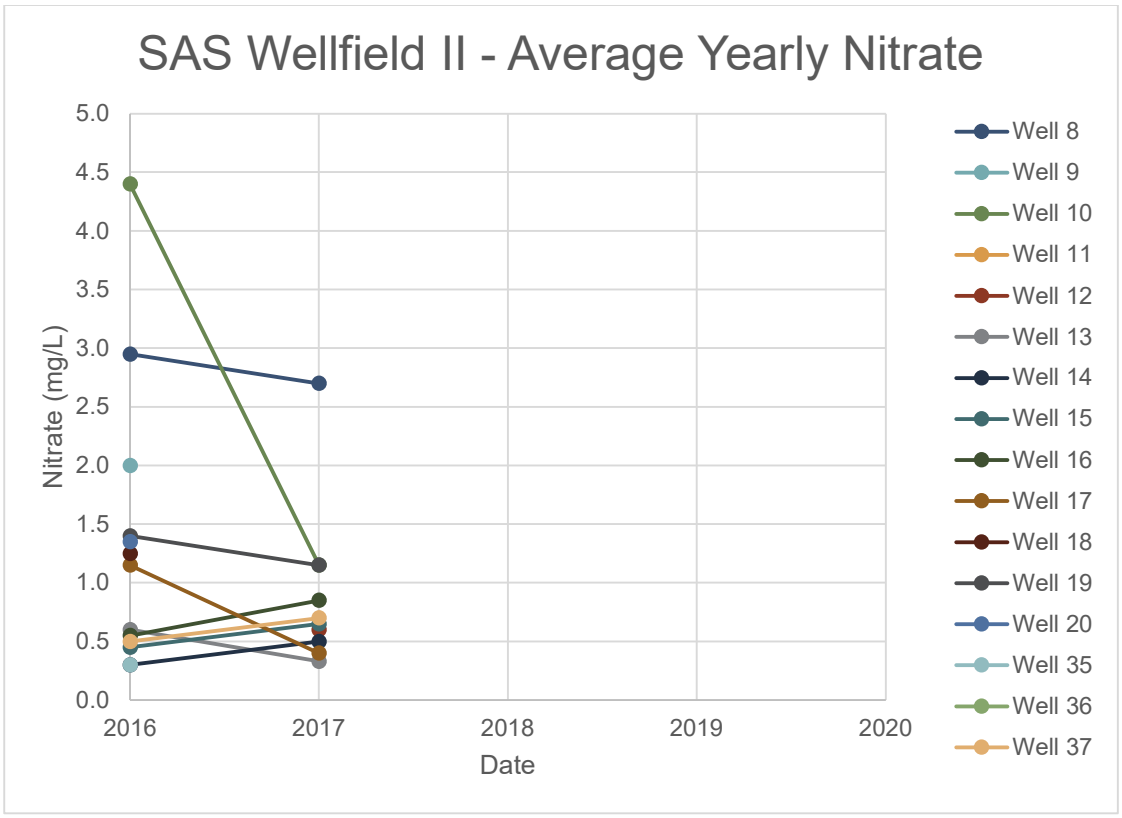
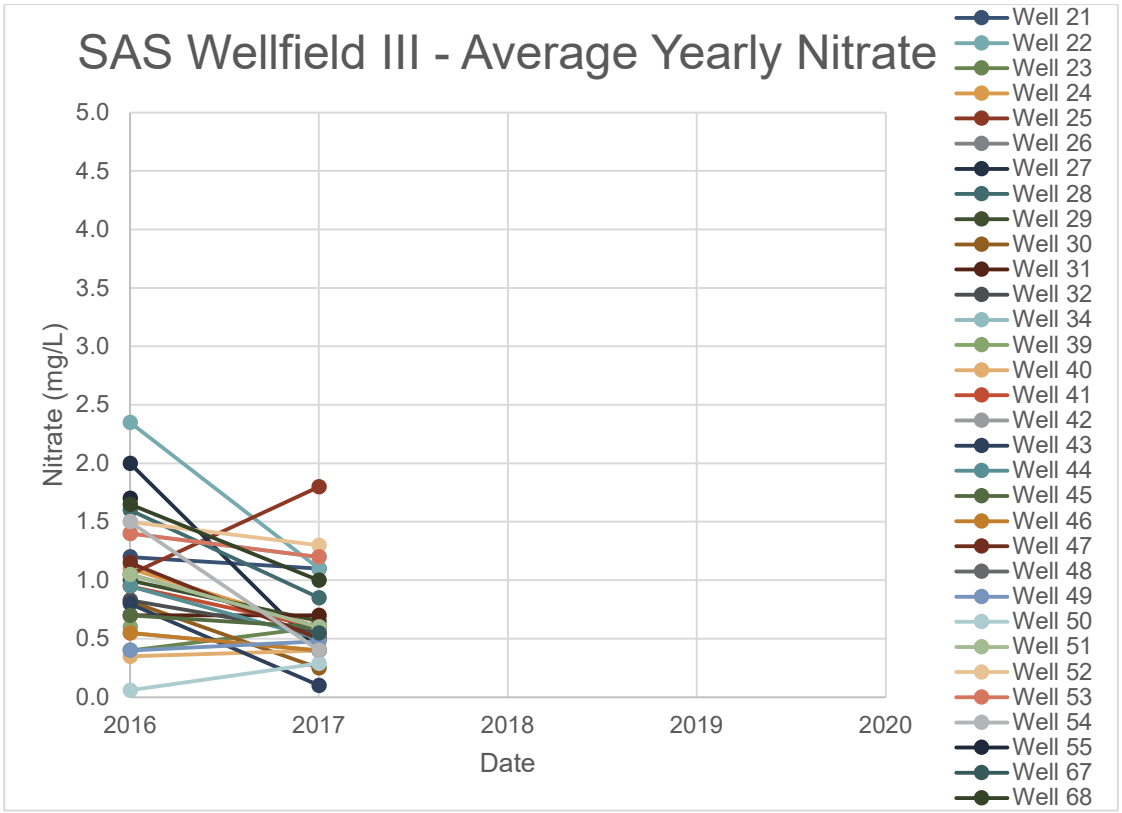
Well 55
Well 67
Well 68


SAS Wellfield II - Average Yearly Nitrate
Nitrate (mg/L)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2016
2017
2018
2019
2020
Date
Well 8
Well 9
Well 10
Well 11
Well 12
Well 13
Well 14
Well 15
Well 16
Well 17
Well 18
Well 19
Well 20
Well 35
Well 36
Well 37


SAS Wellfield III - Average Yearly Nitrate
Nitrate (mg/L)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2016
2017
2018
2019
2020
Date
Well 21
Well 22
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Well 24
Well 25
Well 26
Well 27
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Well 31
Well 32
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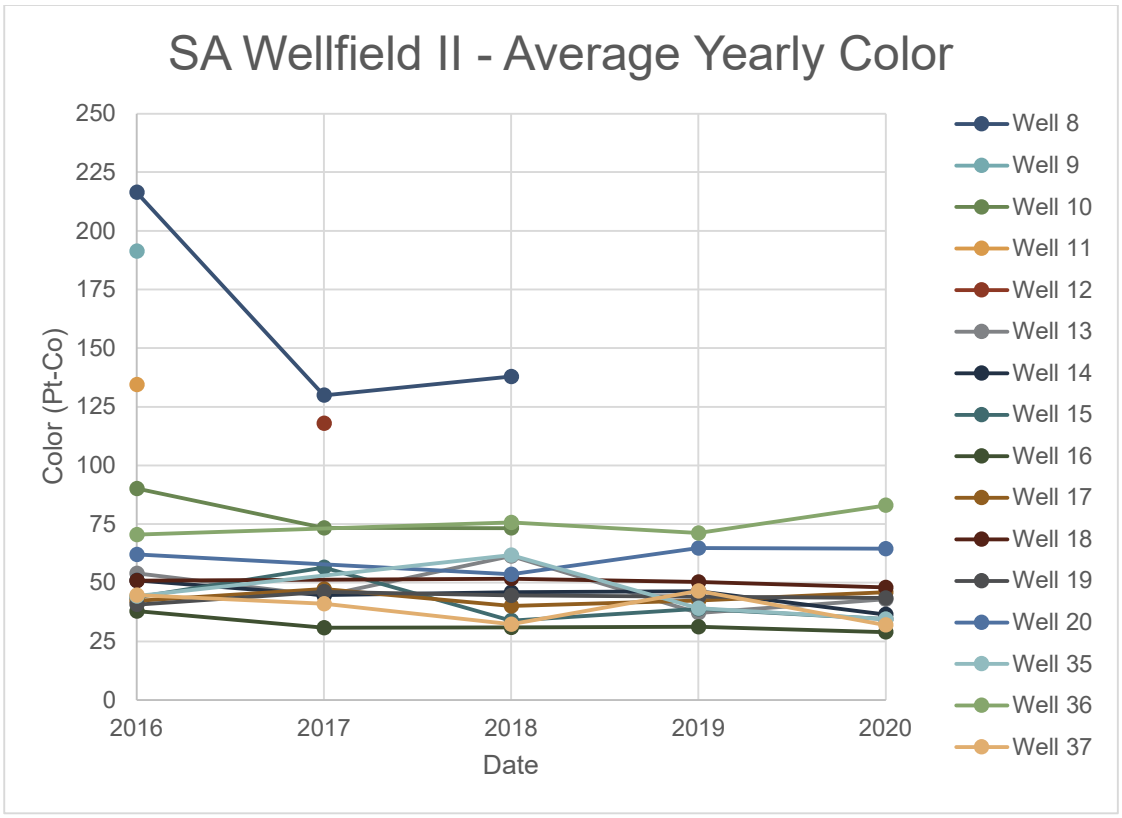
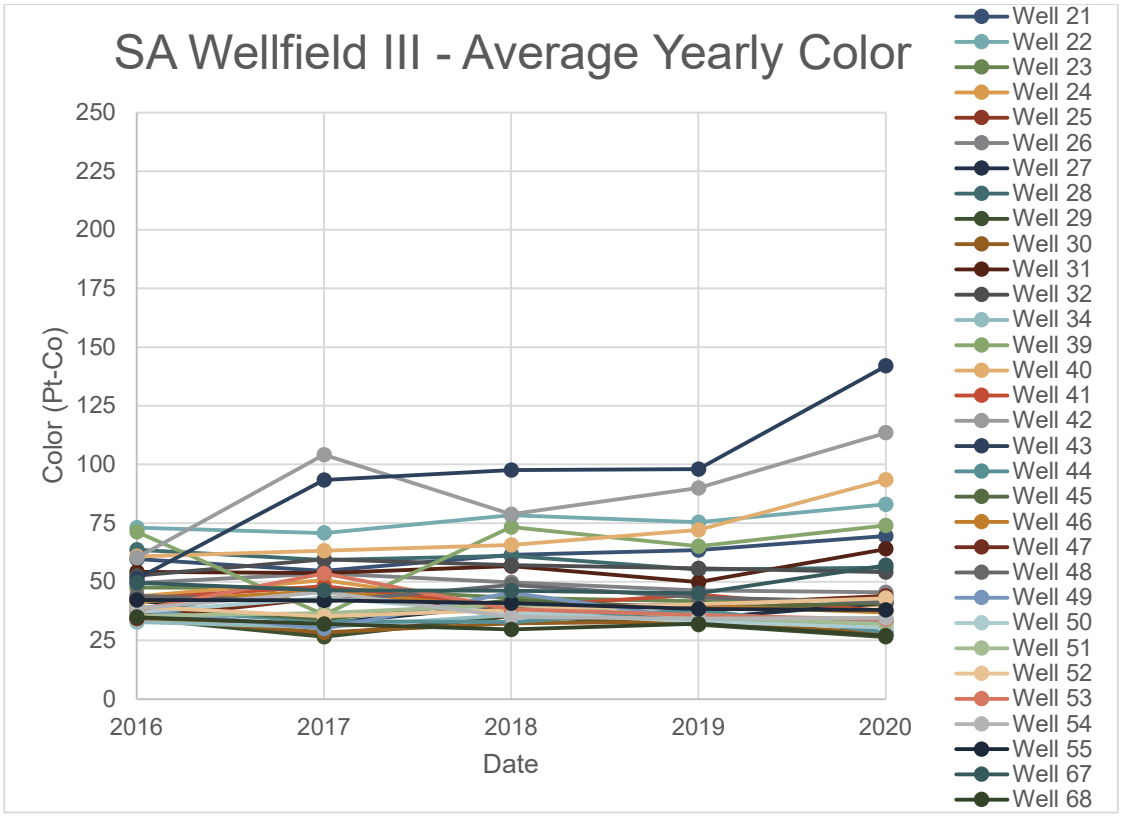
Well 54
Well 55
Well 67
Well 68


SA Wellfield II - Average Yearly Color
Color (Pt-Co)
250
225
200
175
150
125
100
75
50
25
0
2016
2017
2018
2019
2020
Date
Well 8
Well 9
Well 10
Well 11
Well 12
Well 13
Well 14
Well 15
Well 16
Well 17
Well 18
Well 19
Well 20
Well 35
Well 36
Well 37


SA Wellfield III - Average Yearly Color
Color (Pt-Co)
250
225
200
175
150
125
100
75
50
25
0
2016
2017
2018
2019
2020
Date
Well 21
Well 22
Well 23
Well 24
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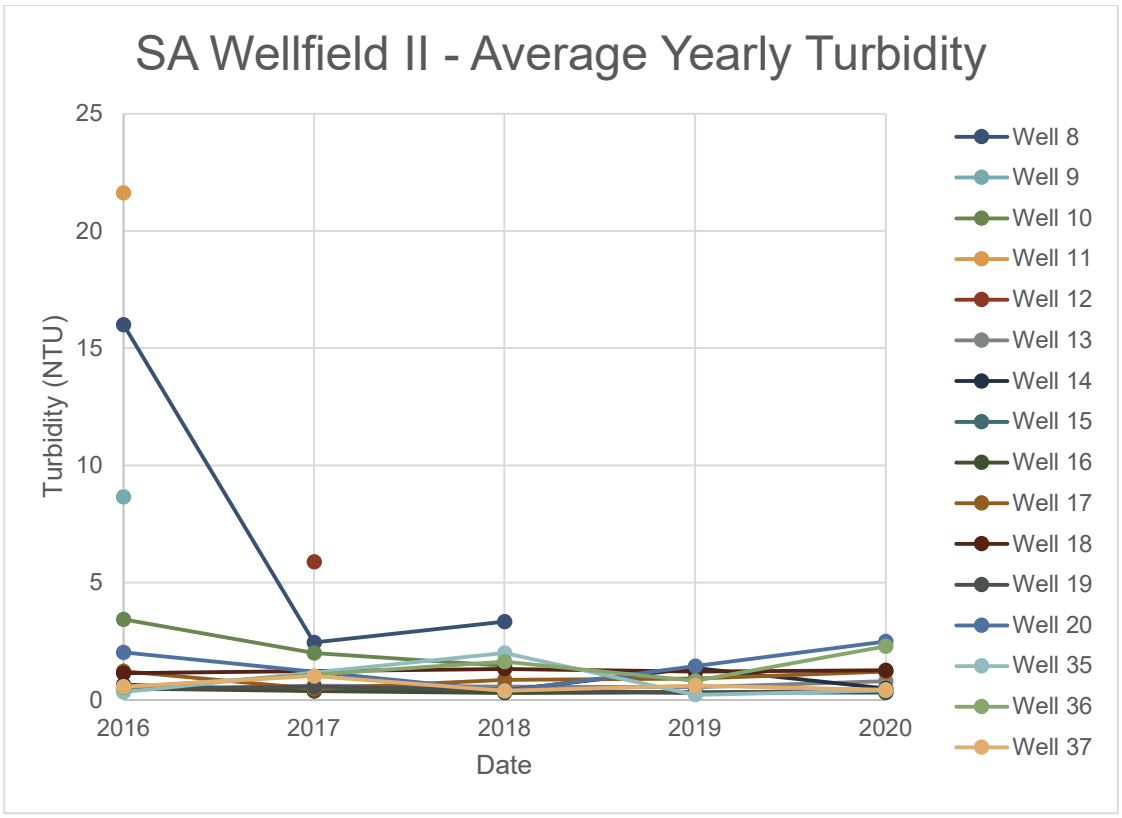
Well 67
Well 68


SA Wellfield II - Average Yearly Turbidity
Turbidity (NTU)
25
20
15
10
5
0
2016
2017
2018
2019
2020
Date
Well 8
Well 9
Well 10
Well 11
Well 12
Well 13
Well 14
Well 15
Well 16
Well 17
Well 18
Well 19
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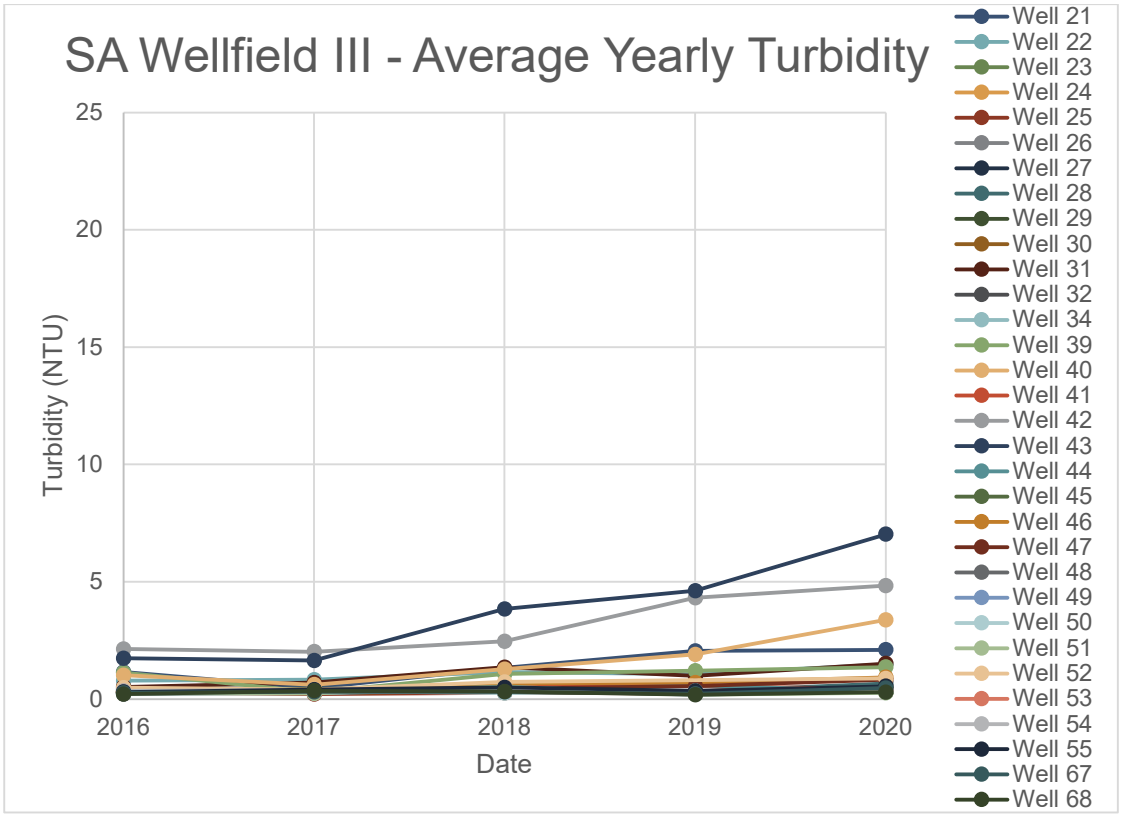
Well 35
Well 36
Well 37


SA Wellfield III - Average Yearly Turbidity
Turbidity (NTU)
25
20
15
10
5
0
2016
2017
2018
2019
2020
Date
Well 21
Well 22
Well 23
Well 24
Well 25
Well 26
Well 27
Well 28
Well 29
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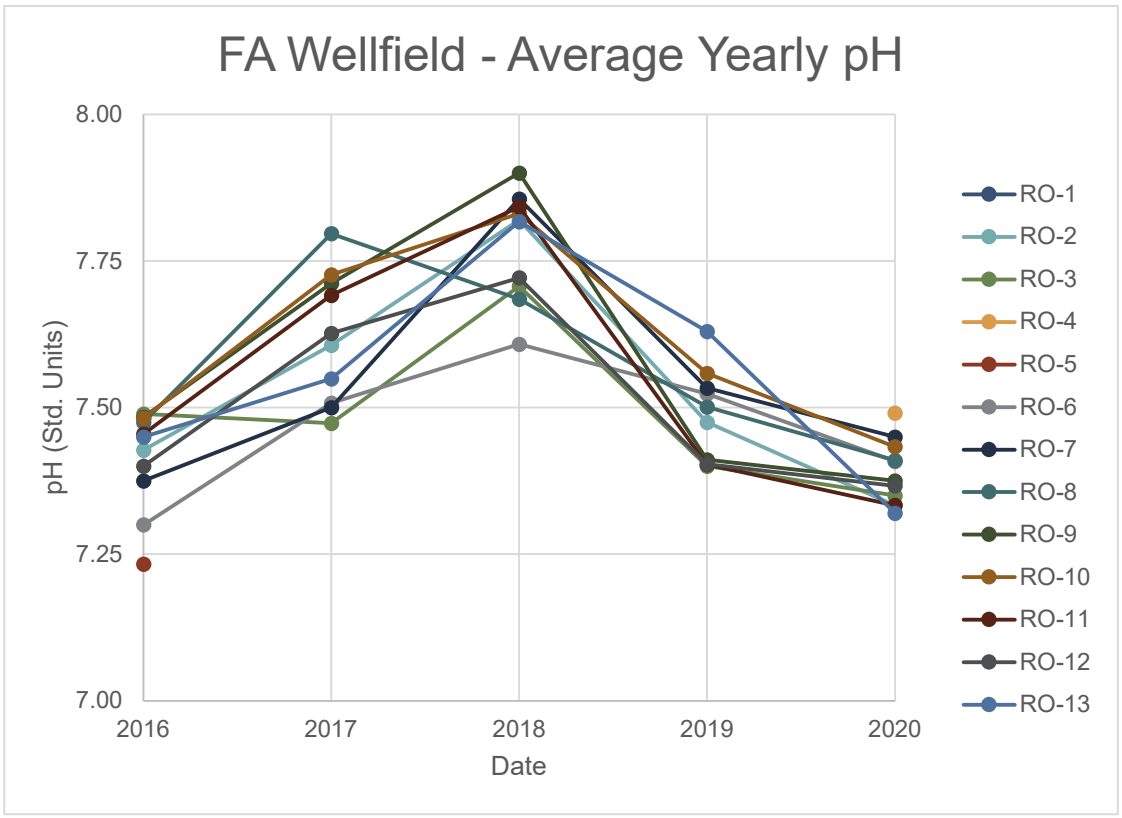
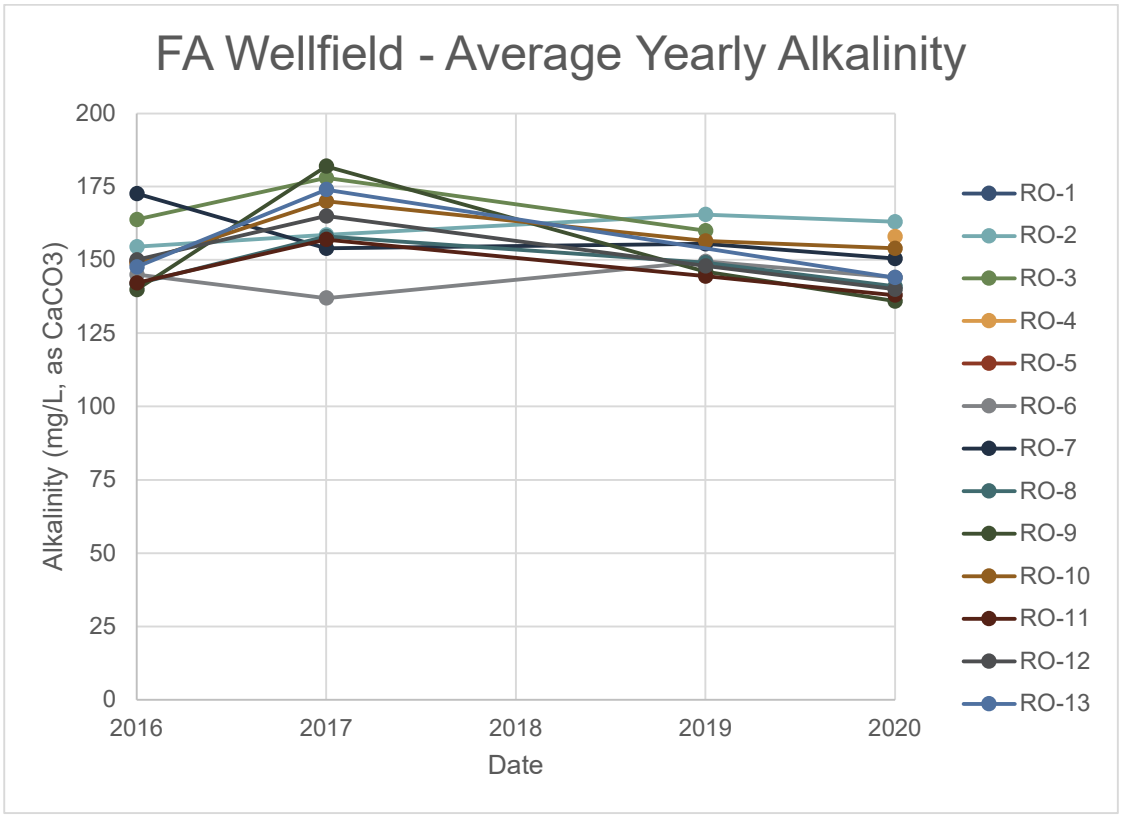
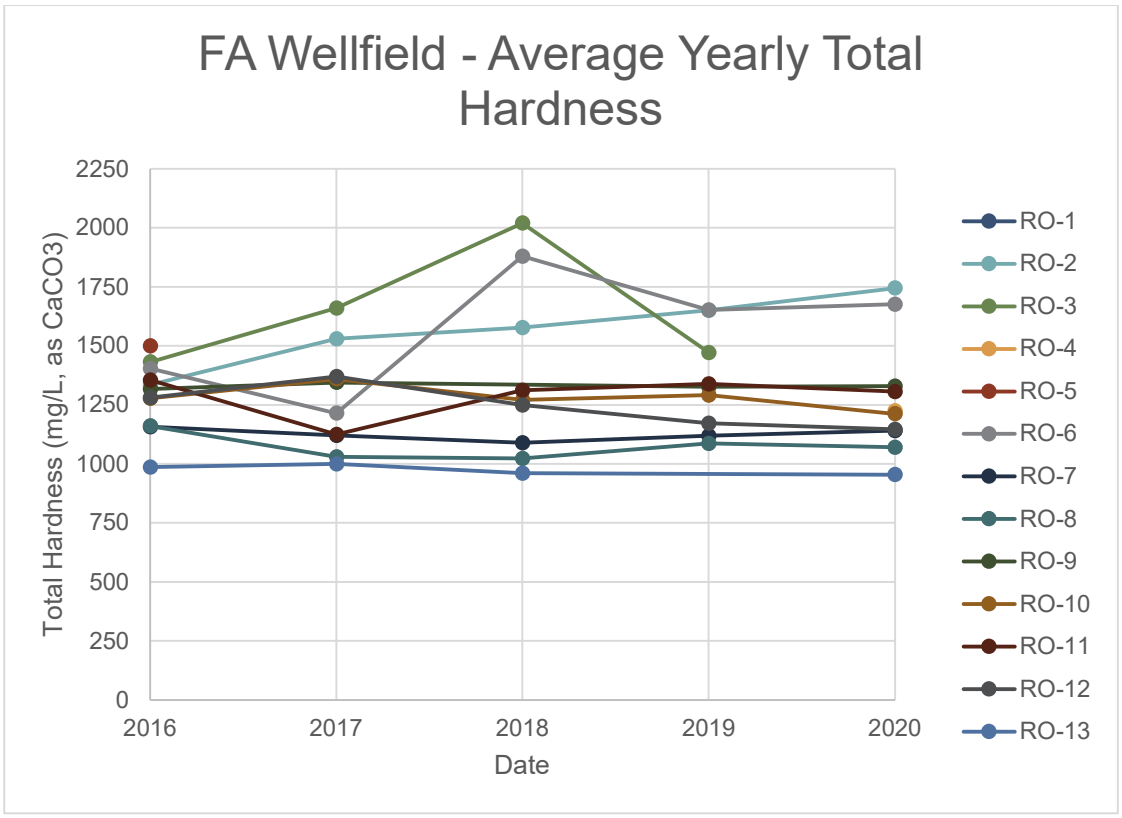
Well 68

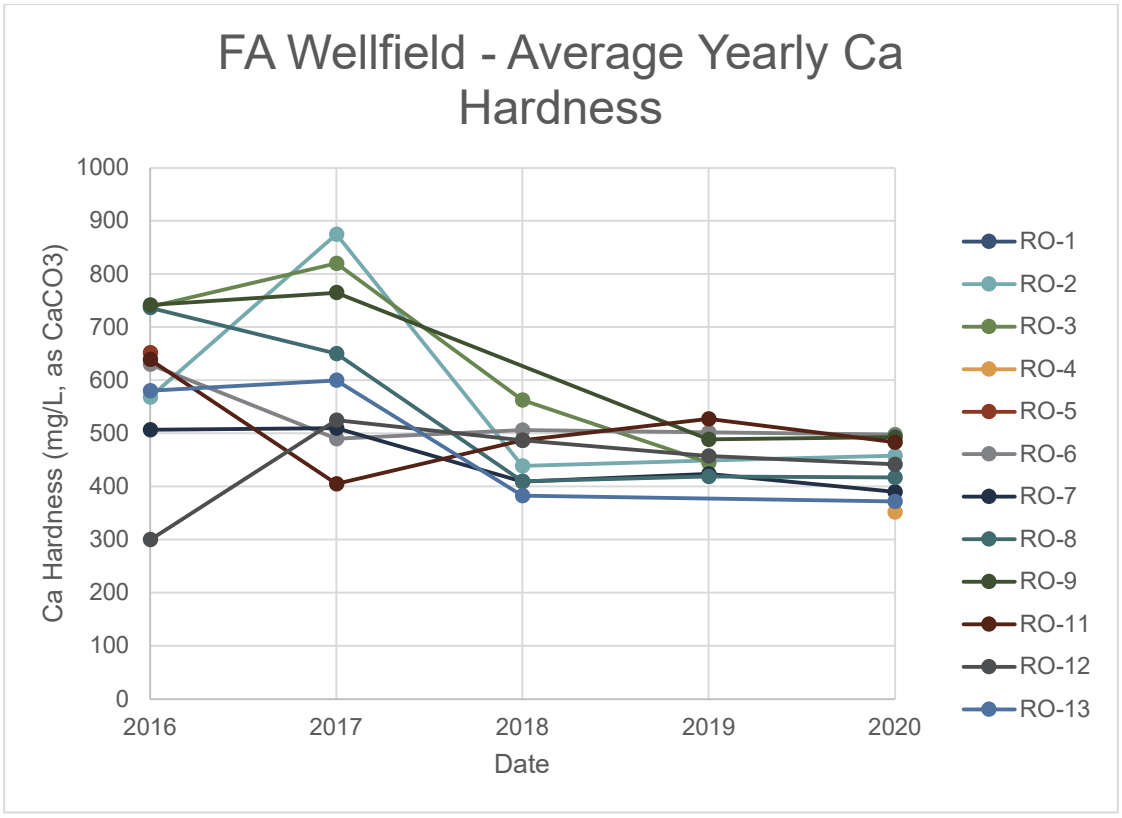
Appendix C-2:
Floridan Aquifer Wellfield Water Quality

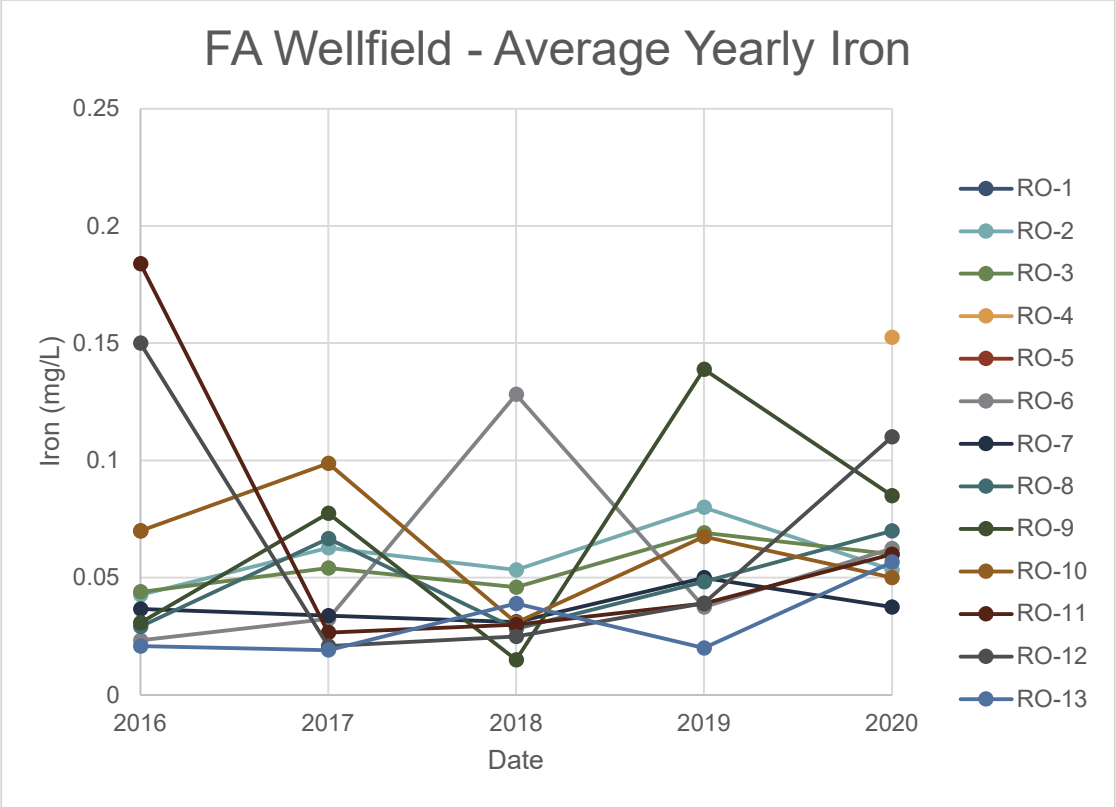
Appendix C-2 – Floridan Aquifer Wellfield Water Quality

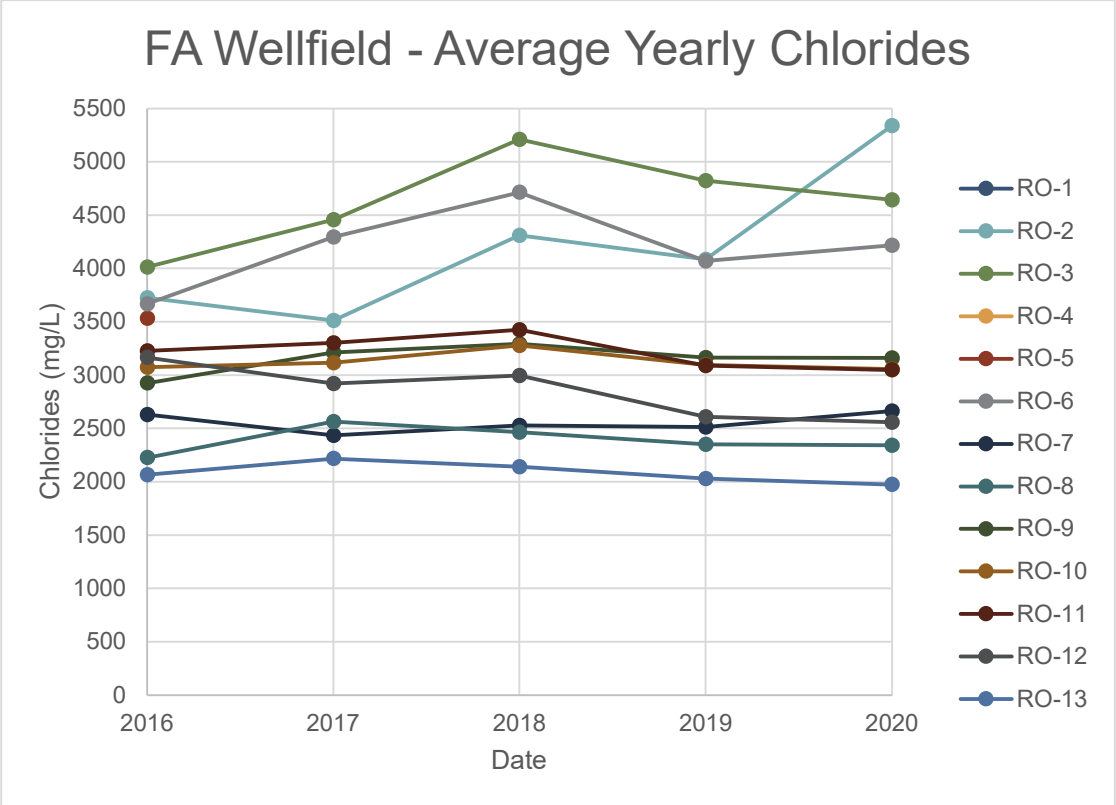


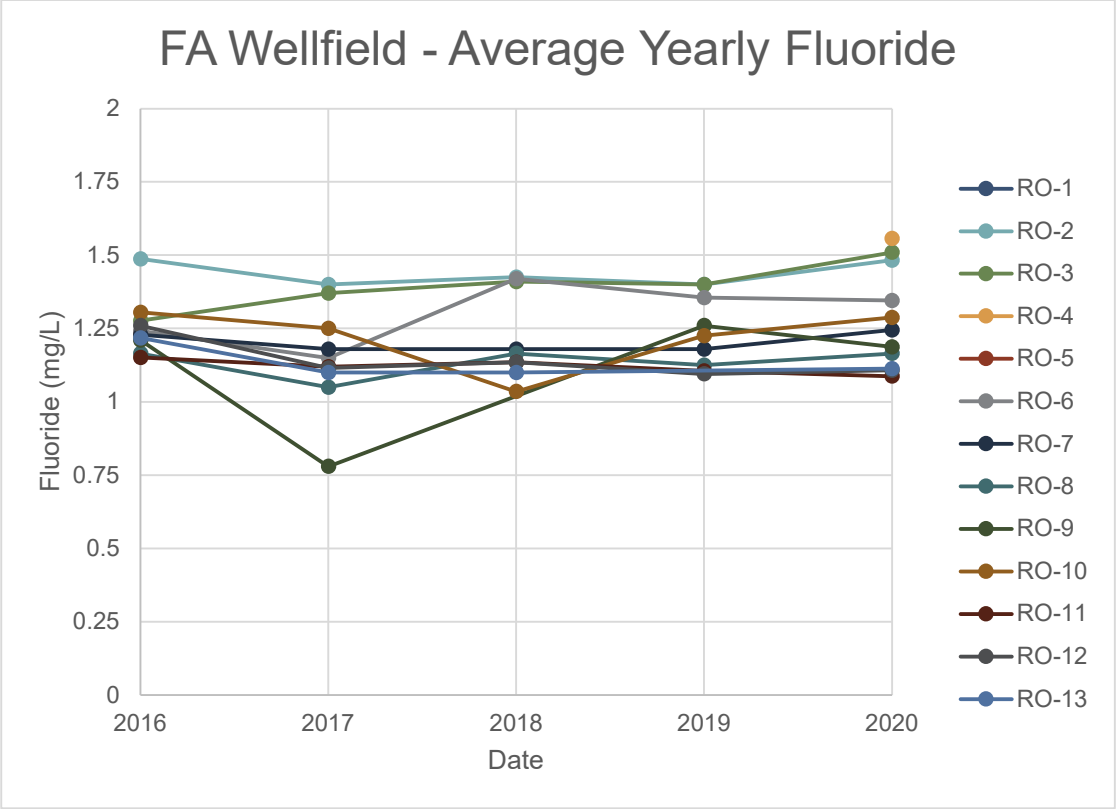


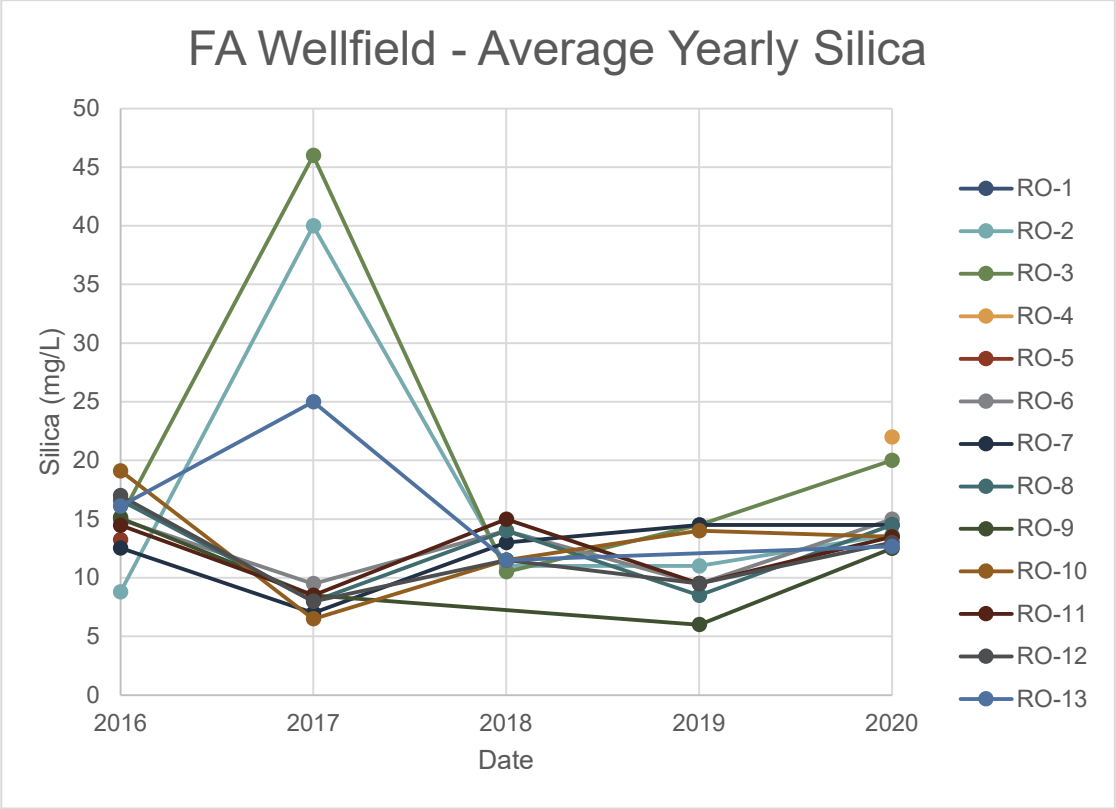

FA Wellfield - Average Yearly Total Hardness
Total Hardness (mg/L, as CaCO3)
2250
2000
1750
1500
1250
1000
750
500
250
0
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13

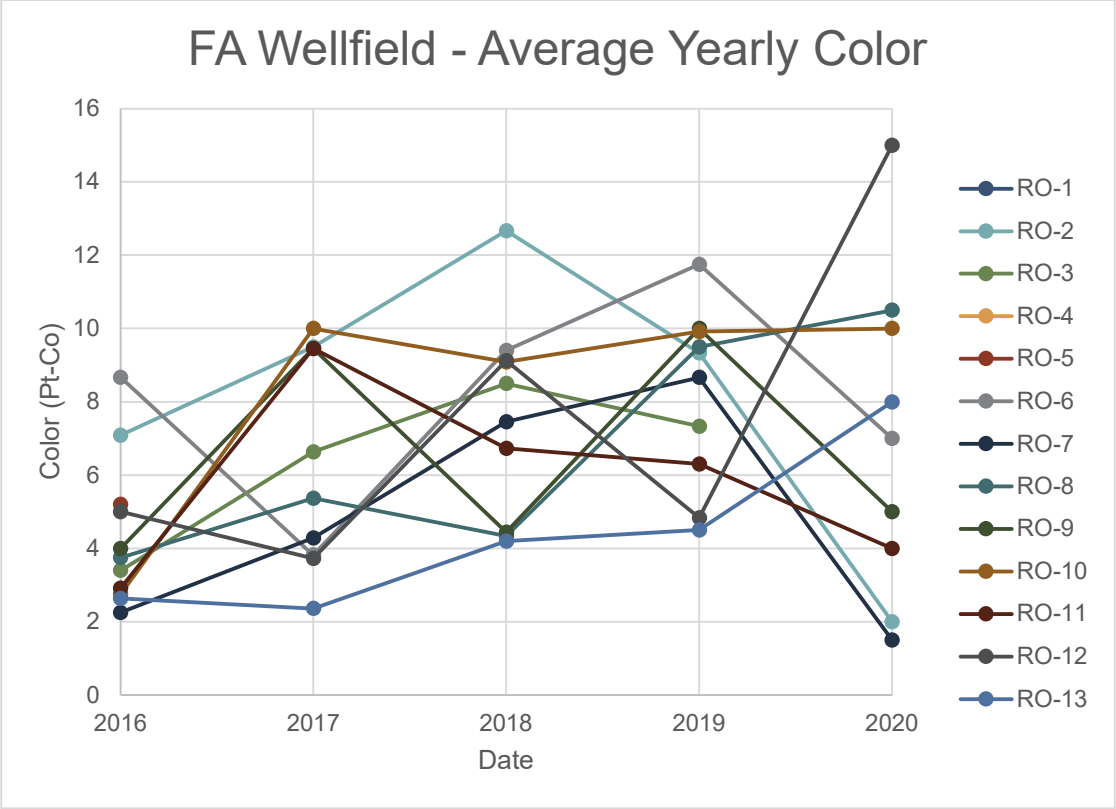

FA Wellfield - Average Yearly Ca Hardness
Ca Hardness (mg/L, as CaCO3)
1000
900
800
700
600
500
400
300
200
100
0
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-11
RO-12
RO-13

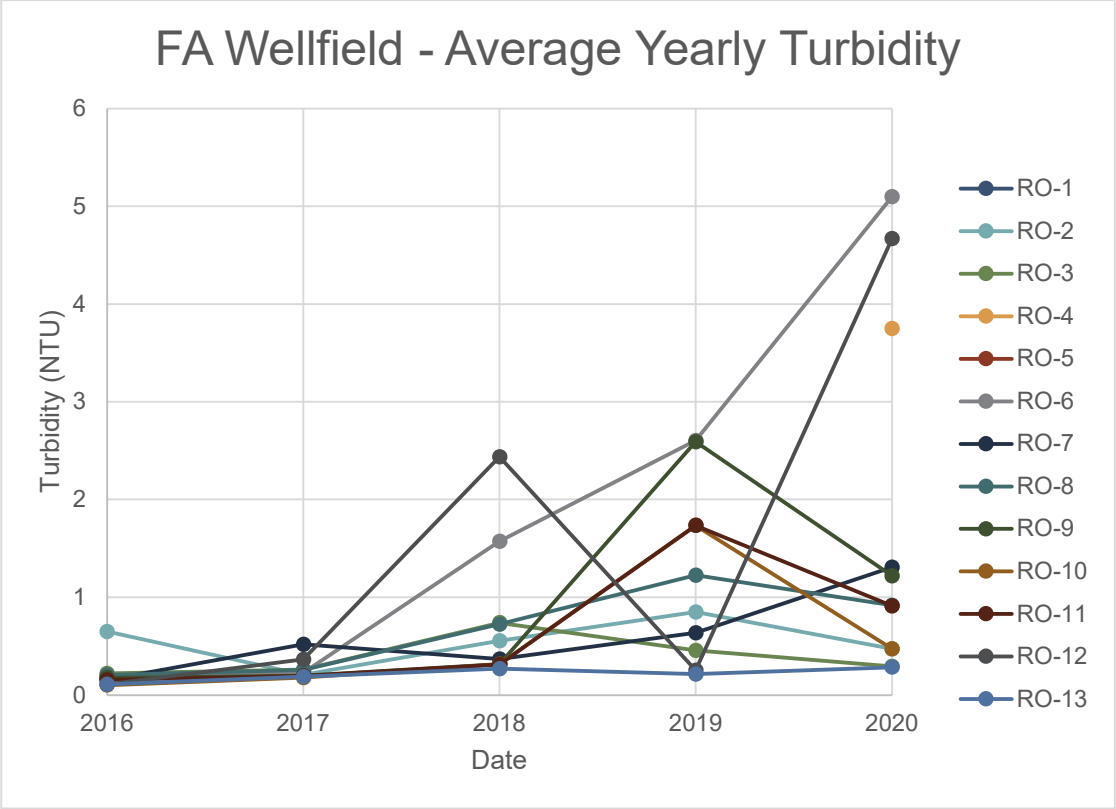

FA Wellfield - Average Yearly Iron
0.25
0.2
0.15
0.1
0.05
0
Iron (mg/L)
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13

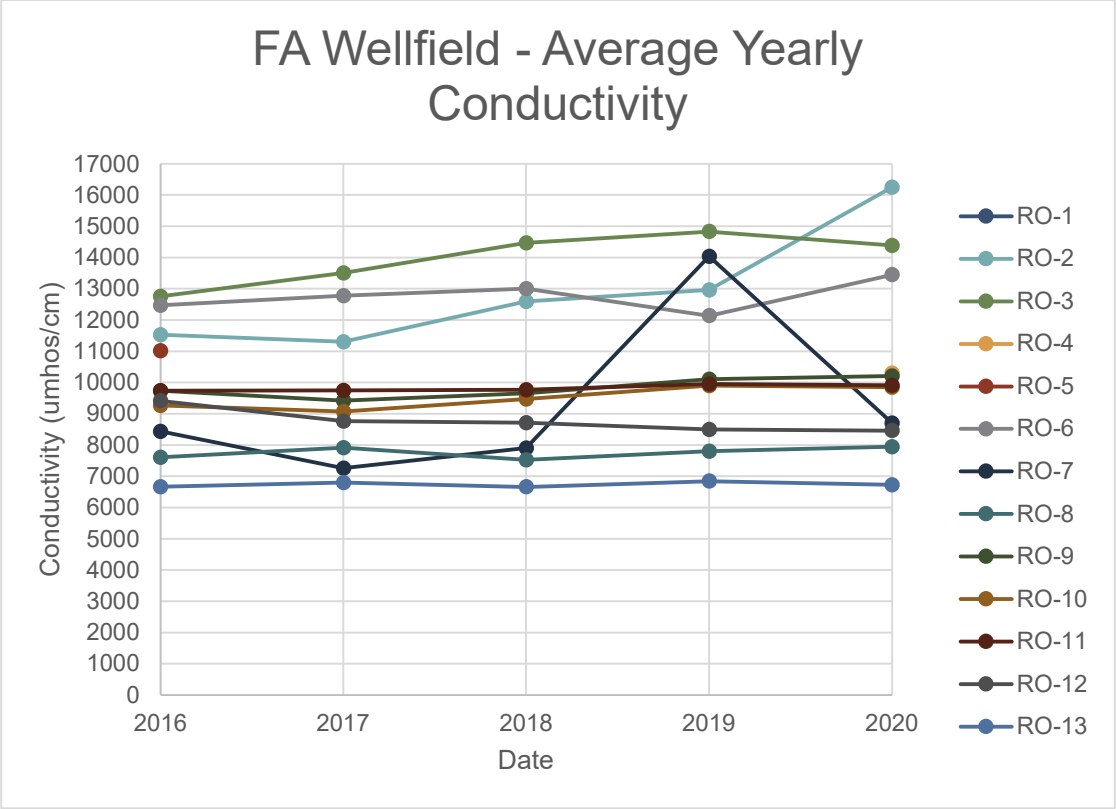

FA Wellfield - Average Yearly Chlorides
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
Chlorides (mg/L)
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13


FA Wellfield - Average Yearly Fluoride
Fluoride (mg/L)
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13


FA Wellfield - Average Yearly Silica
Silica (mg/L)
50
45
40
35
30
25
20
15
10
5
0
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13


FA Wellfield - Average Yearly Color
Color (Pt-Co)
16
14
12
10
8
6
4
2
0
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13


FA Wellfield - Average Yearly Turbidity
Turbidity (NTU)
6
5
4
3
2
1
0
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13


FA Wellfield - Average Yearly Conductivity
Conductivity (umhos/cm)
17000
16000
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
2016
2017
2018
2019
2020
Date
RO-1
RO-2
RO-3
RO-4
RO-5
RO-6
RO-7
RO-8
RO-9
RO-10
RO-11
RO-12
RO-13

Appendix D:
Final Draft Technical Memorandum RO Phase 3 Improvements

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E. and John Potts, P.E.

Re: Conceptual Analysis of RO Phase 3

Date: March 4, 2022

Background

The 2017 Master Plan Update recommended that improvements and additions be made to the Reverse Osmosis (RO) facilities in a three phased approach to address increasing salinity in the Floridan Aquifer (FA) raw water supply. The improvements were recommended to be constructed only as they are required to operate the plant with higher raw water Total Dissolved Solids (TDS). Phase 1 of the program, which included replacement of membranes in RO Bank II (Trains E-H), has been completed. Phase 2 of the program, which includes replacement of energy recovery devices on all nine RO Trains and membrane replacements in Bank I (Trains A-D) and Train I, is underway.

This Technical Memorandum (TM) will review the recommendations for modifications and improvements recommended in the 2017 Master Plan under Phase 3 of the Reverse Osmosis Treatment System when FAS raw water TDS exceeds 8,500 PPM. The improvements required to accommodate the higher raw water TDS have relatively high costs and it is appropriate to review the need, timing, and arrangement of the improvements using current membranes and membrane applications.

2017 Master Plan Recommended Improvements

The 2017 Master Plan Update Phase 3 recommended improvements are summarized in the following excerpt from the Plan.

- *Construct a booster pump station on the RO Water Treatment Plant (WTP) site which would boost raw water pressure to the feedwater pumps. The recommended boost is to 95 PSI, allowing all existing wells, feed pumps, raw water and treated raw water piping, fittings, and cartridge filters to remain in service. The booster pump station configuration would include in line piping to avoid introduction of air into the raw water and five 250 hp pumps with one pump as a redundant backup. It is anticipated that the raw water booster pump station would be installed in the vicinity of the previous sludge handling facility.*

- *The train feed water piping on all nine trains, including the Stage 1 feed manifolds and Stage 1 concentrate manifolds, will be replaced with piping that has a 450 PSI pressure rating.*
- *Stage 2 feed water and Stage 2 concentrate piping will be replaced with piping that has a pressure rating of 650 PSI.*
- *Bank II and Train I Stage 2 pressure vessels will be replaced with units that have a pressure rating of 600 PSI.*
- *Installation of second pass components on each of the existing RO trains. The second pass vessels will be housed in the unused Stage 1 locations. The second pass will use a new feed pump that discharges a metered flow of Stage 2 permeate through the second pass vessels. The expected flow rate of permeate through the second pass is approximately 150 GPM which requires approximately 4 membrane vessels.*

2022 MASTER PLAN UPDATE MODIFICATIONS TO REVERSE OSMOSIS TREATMENT PROCESS

The following describes revised criteria as well as assumptions recommended for modifying the RO WTP and its support systems for Phase 3 improvements allowing the RO WTP to operate with higher raw water TDS. These assumptions vary from those in the 2017 Master plan Update and are necessary to guide this improvement program.

- For a conservative approach, train performance projections will use a membrane equal to the current Dupont BW30HR 440i.
- Assume a maximum Stage 1 feed pressure of 389 PSI which includes the 294 PSI boost from the feed pumps and the 95 PSI raw water booster pump station. This is not considered conservative, as the Stage 1 membrane vessels on trains E, F, G, H, and I all have a pressure limitation of 400 PSI or greater. Stage 1 membrane vessels on trains A, B, C, and D have a 600 PSI pressure limitation.
- Assume the maximum Stage 2 boost will be 185 PSI. This is considered conservative, as a higher interstage boost is available and could be implemented.
- Assume the motor driven interstage boost pump is installed as a Phase 3 improvement.
- All projections will assume a Flow Factor of 0.85 which causes the projecting software to assume the membranes are performing at reduced permeability and salt rejection as is typical in a membrane about three years old.

- Assume a maximum total permeate TDS of 150 ppm. This is considered conservative, as a higher permeate TDS could be acceptable based on other finished water characteristics and the use of corrosion inhibitors.
- Recovery will remain at 75%.
- The existing feed pumps limit Stage 1 feed pressure to each train. The maximum discharge pressure from each existing feed pump, assuming there is a 10 PSI pressure at the inlet to each pump, is as follows.
    - Bank I (Trains A-D) = 354 PSI
    - Bank II (Trains E-H) = 294 PSI
    - Train I = 325 PSI.
- All trains will be limited to 389 feed pressure since all trains operate on the same raw water header. This limitation in available feed pressure is significant as raw water TDS increases. In order to increase Stage 1 feed pressure above 294 PSI, a raw water booster station is required which represents a significant improvement project and a significant capital expenditure.

RO Treatment System Analysis

The proposed 31:13:6E train array was modeled using the current Dupont software and BW30HR 440i membranes. The same raw water TDS was placed in the model as used in the 2017 Master Plan update. Table 1 presents the raw water qualities used in this TM.

TABLE 1
FLORIDAN AQUIFER PROJECTED WATER QUALITY
BASED ON 5/23/16 ANALYSIS

Constituent	Base Water Quality Feed (PPM)	7500 Conductivity 4650 TDS Feed (PPM)	11500 Conductivity 7140 TDS Feed (PPM)	13500 Conductivity 8383 TDS Feed (PPM)	14500 Conductivity 9000 TDS Feed (PPM)	16000 Conductivity 9930 TDS Feed (PPM)	17500 Conductivity 10870 TDS Feed (PPM)	19500 Conductivity 12100 TDS Feed (PPM)
NH4 + +NH3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
K	122.00	99.12	141.30	153.95	179.26	200.35	221.43	242.52
Na	1466.00	1191.05	1697.87	1849.92	2154.02	2407.43	2660.85	2914.26
Mg	268.00	217.74	310.39	338.18	393.78	440.10	486.43	532.76
Ca	202.00	164.11	233.95	254.90	296.80	331.72	366.64	401.56
Sr	17.00	13.81	19.69	21.45	24.98	27.92	30.86	33.79
Ba	0.02	0.02	0.03	0.03	0.04	0.04	0.04	0.05
CO3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HCO3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NO3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cl	3195.00	2595.76	3700.35	4031.72	4694.47	5246.76	5799.05	6351.34
F	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SO4	474.00	385.10	548.97	598.13	696.46	778.39	860.33	942.26
SiO2	11.00	8.94	12.74	13.88	16.16	18.06	19.97	21.87
Boron	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TDS	5785	4700	6700	7300	8500	9500	10500	11500
pH	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20
Conductivity	9316	7569	10789	11756	13688	15299	16909	18519

Projected train performance was calculated with raw water TDS values of 8500, 9500, 10500, and 11500. A summary of the results is presented in Table 2.

TABLE 2
Summary Membrane Performance with Increasing FAS TDS
10/14/2021

Case #	FAS TDS	Stg 1 Feed P	Boost P	Stg 2 Feed P	Flux	Permeate TDS	Comments
1	8500	280	150	413	13.5/11.3	114	Requires installation of Interstage Pump
2	9500	293	185	461	13.2/12.1	131	
3	10500	323	185	492	13.7/11.1	154	Requires installation of raw water booster pump station
4	11500	354	185	523	14.1/10.1	180	Requires installation of Second Pass on Stage 2 Permeate
5 (PASS 2)	407	156			24.5	3	

Projections use DUPONT BW30HR 440i Elements, 0.85 Flow Factor, 31:13:6E Array

Table 2 shows that an interstage pump is needed to increase stage 2 feed pressure to operate the train. This requirement assumes that the interstage boost turbine was installed during the project, referred to as ERD Replacement, recommended to accommodate the raw water TDS associated with Phase 2. These interstage booster pumps will be approximately 25 horsepower, variable speed, and the pumps will be single stage stainless centrifugal pumps.

The raw water booster station to boost raw water pressure to the RO feedwater pumps recommended in the 2017 Master Plan Update, must be on-line when raw water TDS reaches 10,500 ppm. The description of this raw water booster pump station remains as described in the 2017 Master Plan Update. The recommended raw water boost to 95 PSI allows all existing raw water and pretreated raw water piping, fittings, and cartridge filters to remain in service. The recommended configuration for the raw water booster station would include five 250 hp pumps with one pump as a redundant backup. The pump station would use vertical turbine pumps similar to those in use at the RO WTP connected as in-line booster pumps. Constructing the DIW requires the well driller to occupy the entire sludge basin which is the designated location for this FAS raw booster station. To accommodate this, the raw water booster pump station is to be installed in the existing chlorine building as shown in Exhibit E, Chlorine Building Plan.

Table 2 shows that a second pass is to be added on all trains when raw water TDS reaches 11,500 ppm. Installation of second pass components on each of the existing RO trains allows each of the existing nine RO trains to produce drinking water quality permeate, regardless of the number of RO trains online. The second pass vessels will be housed in the unused Stage 1 vessel locations. The second pass will use a new

additional feed pump on each train that discharges a metered flow of Stage 2 permeate through the second pass vessels. The expected flow rate of permeate through the second pass is approximately 180 GPM which requires three membrane vessels. The second pass is intended to be single stage and operate at approximately 75% recovery. Concentrate from the second pass, approximately 45 GPM, will be placed into the Stage 1 raw water pipe. This will reduce TDS of the feedwater coming into each train and reduce Stage 1 and Stage 2 feedwater pressures. Permeate production in Stage 1 and Stage 2 of each train will be increased to accommodate the concentrate flow from the second pass. The second pass feed pump will operate at approximately 180 GPM, 175 PSI and require approximately 25 HP.

Improvements to train piping and vessels that will be installed with Phase 2, as part of the ERD Replacement project, will have adequate pressure capability for the projected pressures when raw water TDS reaches 11,500 ppm.

Conclusions

The series of improvements recommended in the 2017 Plan update remain the appropriate modifications needed to accommodate increasing raw water quality. Installation is required of the booster pumps needed to assist the ERD units installed in Phase 2 improvements.

This TM includes more specific descriptions of the second pass improvements that allowed the estimated costs of this component to be more representative.

The need to implement these improvements is entirely dependent on whether the raw water TDS increases and how quickly any increase occurs. The current projection by JLA Geosciences indicates that the composite raw water TDS may reach 8,500 by 2029.

Recommended Budget

The following is the recommended budget for implementing the new and modified facilities discussed in the above-mentioned recommendations for Phase 3 of this improvement program. Each of these improvement cost estimates includes engineering, permitting, and construction phase.

Installation of 25 horsepower interstage boost pumps with variable frequency drives and stainless steel pumps is required on each of the 9 RO trains. A recommended budget for nine interstage boost pumps, including engineering, permitting, and construction phase, is $900,000.

Construction of a raw water booster pump station for the RO WTP on the WTP site has a recommended budget of $6,200,000, including engineering, permitting, and construction phase.

The addition of a second pass reverse osmosis treatment system for portions of the Stage 2 permeate on each of the nine trains has a recommended budget of $2,500,000, including engineering, permitting, and construction phase.

The total value of these improvements is $9,600,000.

Attachment: Exhibit E- Chlorine Building Plan

Drawing name: K:\WPB_Civil\044001257 2022 Update of Water System MP\CAD\Exhibits\Chlorine Bldg Floor Plan TM Exhibit.dwg Chlorine Bldg Floor Plan Mar 01, 2022 12:01pm by: Casey.Staller

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MAR. 2022

PROJECT NO.
044001257

EXISTING CHLORINE
BUILDING FLOOR PLAN

PREPARED FOR
TOWN OF JUPITER

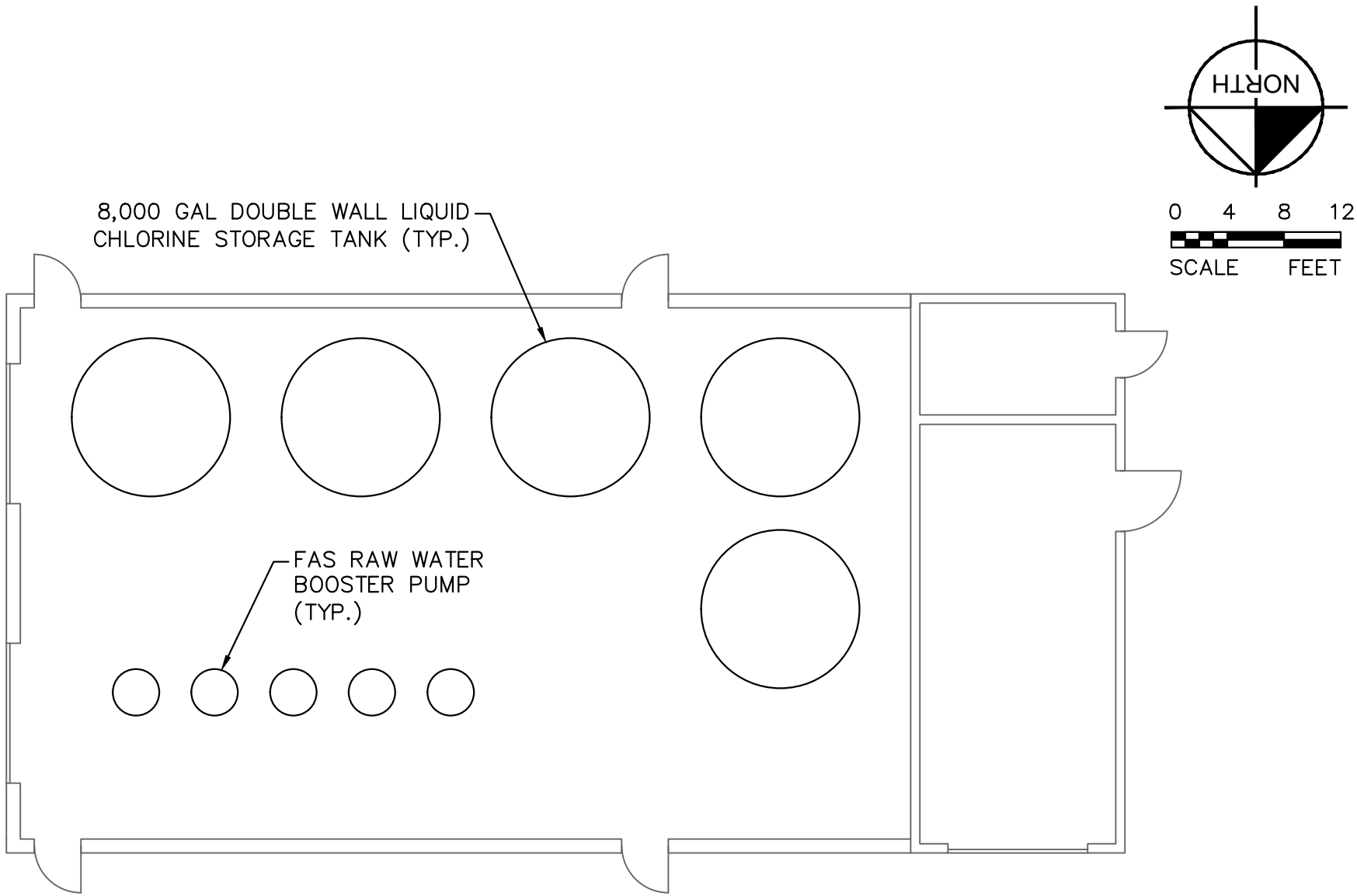
JUPITER FLORIDA

DESIGN ENGINEER:
JOHN E. POTTS

FLORIDA P.E. LICENSE NUMBER:
2281

DATE:

SHEET NUMBER
EXHIBIT E



CHLORINE BUILDING FLOOR PLAN

Appendix E:
Final Draft Technical Memorandum Conceptual Analysis of Liquid Chlorine Conversion

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E., John Potts, P.E.

Re: Conceptual Analysis of Liquid Chlorine Conversion

Date: March 04, 2022

Background

This Technical Memo (TM) will examine the effects on plant facilities and water treatment processes that might occur if liquid chlorine is used instead of chlorine gas.

Regulations for shipping, handling, and storing chlorine gas are becoming stricter, and it is appropriate to examine the current use of chlorine gas as the primary and secondary disinfectant at the water plant.

Chlorine gas is classified as a hazardous substance and if an inadvertent release of the gas is able to spread away from the plant site it may be a hazard to residents in that area. The gas is also potentially hazardous to the plant staff who work with it daily. Liquid chlorine does not pose a significant risk to spreading off of the plant site since it is a liquid that can be contained and represents less of a risk to plant employees as it is a diluted form of chlorine as compared to chlorine gas which is pure chlorine. There are few chlorine gas manufacturing locations which results in long trucking runs to distribute the gas. This leaves delivery more susceptible to supply chain issues and delivery interruptions. The use of chlorine gas has been discontinued at many water plants for the reasons stated in this paragraph reducing the number of suppliers available to manufacture and deliver the gas.

The Jupiter Water Treatment Plant used a fairly large amount of chlorine up until 2010 when the Nanofiltration (NF) facility was placed into operation. Prior to the NF facility, the treatment process required oxidation of the relatively high concentration of Total Organic Compounds (TOC) present in the surficial raw water. This process required approximately 25 parts per million (PPM) of chlorine. The current reverse osmosis and nanofiltration plants have mostly eliminated organic compounds from the treated water significantly reducing chlorine use. Converting from gas to liquid chlorine when the use was approximately 25 PPM would have increased the cost to treat drinking water and required either a large storage facility or installation of facility to manufacture liquid chlorine on-site, both adding cost to plant construction. Installation of an on-site liquid chlorine manufacturing facility would have increased operating staff requirements and posed a risk of allowing hydrogen gas to be released.

Process and Implementation Investigation

Converting from gaseous chlorine to liquid chlorine will involve several modifications to the existing facilities and treatment processes.

The amount of liquid chlorine required to operate the plant and amount of liquid chlorine that must be stored on site is based on current chlorine gas used and the following assumptions.
Chlorine will continue to be delivered by truck and off loaded at the Chlorine Building.

Chlorine will be injected into the treatment stream at each of the current locations.

Chemical metering pumps will replace the current gas ejectors.
Potable water currently used to drive the gas ejectors will be eliminated.
The control system will be modified to start a chemical feed pump instead of opening a solenoid valve and pace a chemical feed pump instead of adjusting a gas flow metering valve.
The devices controlled by the Control System are currently at the point of application and all proposed controlled devices will be relocated to be in the Chlorine Building.
Liquid chlorine applied in the Reverse Osmosis (RO) and NF degasifiers will raise pH of the degasifier effluent instead of lowering it, as with chlorine gas.
Liquid chlorine applied in the RO concentrate and NF scrubbers will raise pH of the circulation fluid instead of lowering it, as with chlorine gas.

This TM is based on the following assumptions:

- 12.5% liquid chlorine, or sodium hypochlorite, will be delivered to the site.
- The amount of liquid chlorine required to operate the plant is based on current chlorine gas used and the following assumptions
- NF System is rated at 17.4 MGD and requires a dose of 12 PPM which uses 1,801 pounds per day (PPD) of pure chlorine
- RO System is rated at 13.7 MGD and requires a dose of 11 PPM which uses 1,156 pounds per day (PPD) of pure chlorine
- The IX system is rated at 1.8 MGD and requires a dose of 10 PPM which uses 150 PPD of pure chlorine.
- RO Concentrate degasifiers use 14 PPD of chlorine for each 1.0 MGD of RO permeate produced and the RO Plant produces 13.7 MGD of permeate which requires 192 PPD of pure chlorine.
- The total projected pure chlorine usage at full plant capacity 3,348 PPD which is 2,678 gallons per day of 12.5% liquid chlorine.
- Storage will be provided for 14 days of operation at plant capacity assumed to be 30.0 MGD which requires 37,497 gallons of liquid chlorine at 12.5% pure chlorine.

- Assume 40,000 gallons of storage is provided and 8,000 gallon double wall HDPE tanks are used.
- Each 8,000 gallon storage tank will be approximately 12' tall and 12' diameter
- Chlorine will continue to be stored in the existing Chlorine Building
- 8,000 gallon capacity double wall tanks will fit in the existing chlorine building,
- Exhibit I provides a floor plan for 5 storage tanks in the existing building

12.5 % liquid Chlorine will be delivered to the following points of application.

- NF Degasifier 1 @ 12 PPM in 6.0 MGD
- NF Degasifier 2 @ 12 PPM in 6.0 MGD
- NF Degasifier 3 @ 12 PPM in 6.0 MGD
- NF Scrubber North @ 14 PPD/MGD RO in 12.5 MGD
- NF Scrubber South @ 14 PPD/MGD RO in 12.5 MGD
- RO Degasifier 401 @ 11 PPM in 4.2 MGD
- RO Degasifier 402 @ 11 PPM in 4.2 MGD
- RO Degasifier 403 @ 11 PPM in 4.2 MGD
- IX Effluent @ 10 PPM in 1.8 MGD
- RO Concentrate Scrubber South @ 14 PPD/MGD RO in 12.5 MGD

Chlorine dose at each application point is as shown above and these dose rates are based on plant chlorine use over the previous 4 years.

The RO chlorine use in this TM is less than indicated in the historical data since the historical data includes approximately 10 PPM chlorine use to treat hydrogen sulfide, and a project is underway to eliminate this chlorine use by restoring air flow through the RO Degasifiers with replacement of the scrubber blowers.

Each point of application will have a dedicated feed pump located in the existing chlorine building.

Tubing with 3/8" inside diameter will be installed from each feed pump to the point of application

The feed pumps will be installed in groups with six pumps for the five NF application points and five pumps for the four RO application points to provide redundancy.

Feed piping from the feed pumps to each application location will be 0.375" inside diameter HDPE tubing. Each application location will be served by a separate feed pipe.

The rise in pH of the treated water caused by the liquid chlorine can be expected to reduce the amount of caustic required in the RO and NF scrubbers, as well as the RO and NF clearwells.

There is a chlorine application point on the NF concentrate pipe located in the northeast corner of the NF Building. This was requested/required by Loxahatchee River District (LRD) during design of the NF plant, to eliminate any hydrogen sulfide present in the NF concentrate before delivering it to LRD for blending with their irrigation quality water. This chlorine application point has never been activated in the 12 years of NF operation. This TM will assume the application point can be eliminated.

Conclusion

Converting from chlorine gas to liquid chlorine is not expected to have any negative impacts on the current treatment process.

Converting from chlorine gas to liquid chlorine will reduce risks to water plant personnel and the area surrounding the Plant Site.

Converting from chlorine gas to liquid chlorine will reduce caustic use.

Opinion Of Probable Construction Costs

The following is the recommended budget for implementing the new and modified facilities discussed in this TM. The budget value presented includes engineering and construction phase.

• 8,000 gallon Double Wall HDPE Storage Tanks, 5 each	$200,000
• Chemical Feed Pumps with Enclosures, 11 each	$165,000
• Control System Modifications	$125,000
• Chlorine Feed Tubing to Application Points	$400,000
• Chlorine Building Modifications	$150,000
• Remove Chlorine Scrubber	$50,000
• Engineering, Permitting, Construction Phase	$250,000
TOTAL	$1,340,000

Attachments: Exhibit E Chlorine Building Floor Plan

Drawing name: K:\WPB_Civil\044001257 2022 Update of Water System MP\CAD\Exhibits\Chlorine Bldg Floor Plan TM Exhibit.dwg Chlorine Bldg Floor Plan Mar 01, 2022 12:01pm by: Casey.Staller

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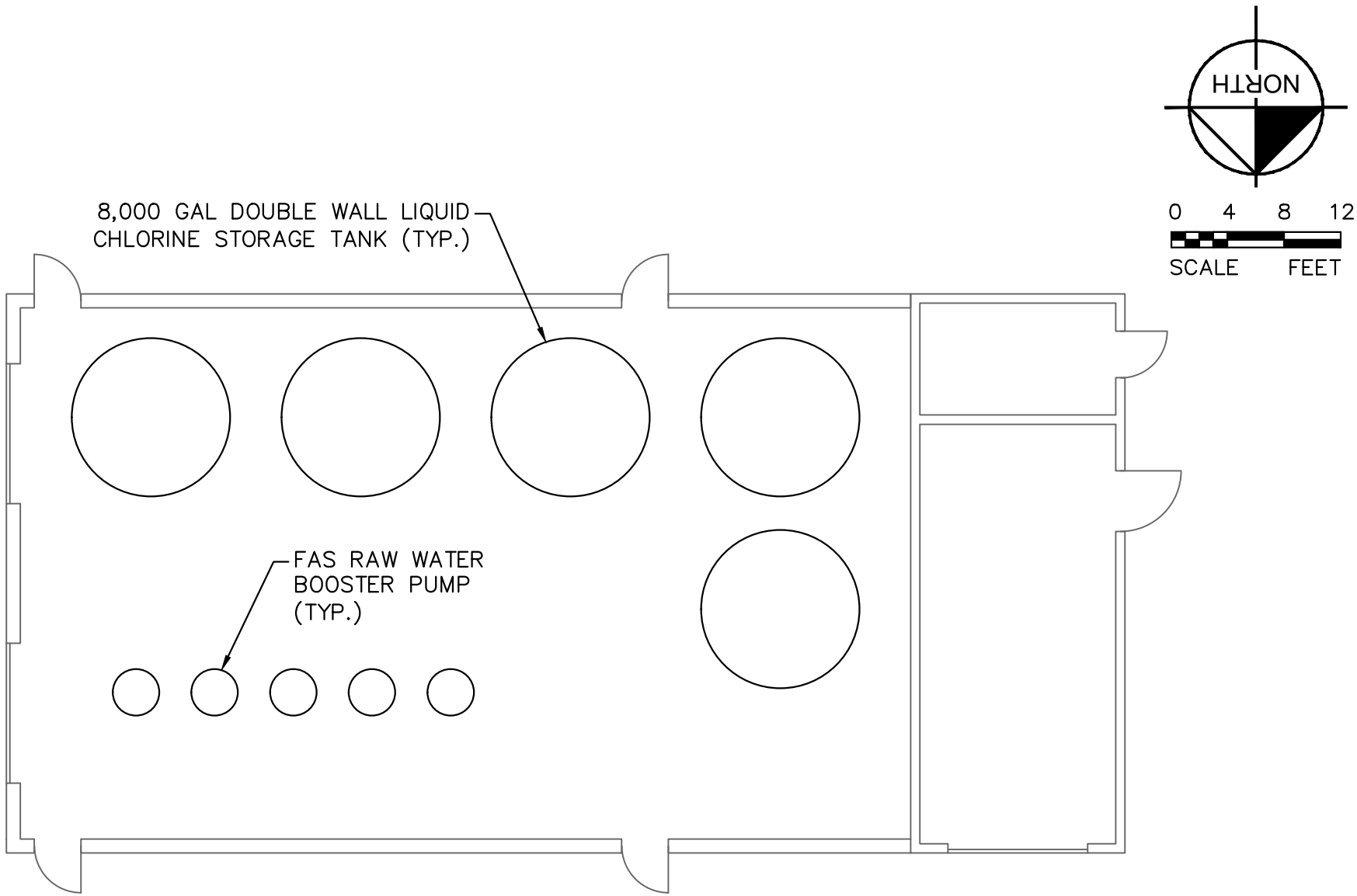


CHLORINE BUILDING FLOOR PLAN

Appendix F:
Final Draft Technical Memorandum Conceptual Analysis of Converting IX Facility to Calcite Contactor

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E. and John Potts, P.E.

Re: Conceptual Analysis of Converting IX Facility to Calcite Contactor

Date: March 4, 2022

Background

The Water System recognizes that changing disinfection technique from chloramine to free chlorine would be beneficial to management of water quality in the distribution system as well as the regulatory perspective and ability to achieve 4 Log disinfection approval. Elimination of ammonia use will reduce nitrification and denitrification issues and associated formation of Nitrobacter within the distribution system. This will reduce the frequency of flushing events and help improve consistent chlorine residual for virus inactivation within the system. Use of free chlorine, in lieu of chloramines, would be possible provided the Total Organic Compound (TOC) concentration is very low in the water produced by the various treatment processes, i.e., nanofiltration (NF), reverse osmosis (RO), and anion exchange (IX), resulting in reduced disinfection byproduct (DBP) formation potential.

The IX process, which has a permitted treatment capacity of 1.8 MGD, treats SAS raw water, and is used to produce water with an elevated hardness that is blended with the RO product for stabilization when NF product is not available. The IX process is capable of removing approximately 60% of the TOC naturally present in Surficial Aquifer (SA) raw water by passing the SA raw water through anion resin beds that selectively remove TOC. However, the remaining concentration of TOC in the IX product is sufficient to create disinfection byproducts (DBP) at concentrations that may exceed allowable Maximum Contaminant Levels (MCLs) during hot summer seasons.

Alternative Process Description

An approach to an alternative treatment process to stabilize RO product is the addition of hardness and alkalinity to the RO product by using a calcite contactor. In this treatment process pH of the RO product water is lowered and flowed through a bed of solid calcium material. The calcium material dissolves as the lower pH RO product water passes through it thereby increasing the hardness and alkalinity of the RO product water. This treatment practice is well known, and common applications use

carbon dioxide to lower the pH and pass the water through a bed of calcite, or small particles of ground limestone.

The existing IX facility is well suited for conversion to an upward flowing calcite contacting process for the RO product water. The four IX treatment vessels are 8' diameter and 21' tall. Standard design criteria typically applied to calcite contactors is a 0.6 feet per minute (fpm) upward flow rate with 6 minutes empty bed contact time (EBCT) between the water and the calcite, resulting in an acceptable flow rate of 225 GPM and a 3.6' deep calcite bed. Based on these contactors being for occasional and emergency use only, the upward flow rate could be increased to 1.0 FPM and to compensate for the increased flow rate increase the empty bed contact time to 10 minutes by increasing the depth of calcite bed. It is believed that the more relevant criteria is empty bed contact time. The velocity criteria is intended to eliminate carryover of fine particles of unreacted calcite and this is compensated for by longer opportunity for the low pH water to dissolve the calcium. These criteria can be adjusted during a design project.

An assumed flow through each 8' diameter vessel will be 0.55 MGD (375 GPM) based on 1.0 FPM upward velocity with a design effluent hardness and alkalinity of 70 PPM. The four vessels could treat 2.2 MGD of RO product and, when blended with 11.5 MGD of RO product, having hardness of 5 PPM, which is the remaining RO flow assuming the plant is operating at full capacity of 13.7 MGD, would yield 13.7 MGD with a hardness of 11.2 PPM. If RO production is 6.0 MGD and 2.2 MGD is stabilized, the resulting product would have approximately 22 PPM hardness.

Implementing this treatment process would require modifications at the IX facility to reverse and increase flow through the facility. Pipe sizes and modifications would be established during project design.

A pump station will be needed to pump a portion of the degasified RO product from the degasifier collector pipe prior to the treated RO flow entering the RO Mixing Chamber and discharge it into the IX influent. This pump station could be located north and east of the existing RO Mixing Chamber. A total of three (3) pumps are recommended. One pump will be redundant. A preliminary design capacity of each pump is 2.2 MGD (375 GPM/vessel) at 30' head. Each pump would be approximately 20 horsepower.

A source of acid is needed to reduce pH of the calcite feed water. Although sulfuric acid is available, and in common use on this site, it is recommended that carbon dioxide be used as the pH reducing chemical. Carbon dioxide is less hazardous than sulfuric acid and, perhaps more significant, will not place sulfate in the produced water. A preliminary selection is a 10-ton insulated liquid carbon dioxide storage tank located between the administration building and the RO chemical Building with delivery truck

access. During project design, an analysis is recommended to determine if the sulfate placed in the water on an infrequent and emergency basis would be tolerable to water quality.

Calcite is delivered as a solid in bags, sacks or in bulk. Since the calcite contactor is a facility to operate only when the NF product water is not available to stabilize the RO product water, this TM recommends calcite be delivered in bags and stored on site. Adding calcite to the vessels is expected to be a manual operation since the calcite depth will be much greater than standard and can be extended to once per week.

Consideration should be given to increasing the hardness above 29 PPM when stabilizing RO product is required. The IX facility was originally designed for future expansion to double its capacity. As a calcite facility, it is recommended that the four additional vessels and trough be constructed east of the existing facility to allow the stabilized RO product to reach approximately 22 PPM hardness. Additional piping would be required to accommodate the additional vessels.

Changing IX treatment to calcite treatment is a different treatment process that will require changes to plant standard operating protocols with added tasks.

A significant outcome if IX is replaced with calcite is the requirement to construct NF Train 6 to replace the plant rated capacity lost if the 1.8 MGD IX treatment is eliminated. The calcite process treats RO product water, not SAS raw water. NF Train 6 will provide treatment capacity using SAS raw water to maintain the current Water Plant rated capacity. Installation of Train 6 will also require installation of a 36” SAS raw water main along the NPBH Canal to accommodate the increased flow of SAS raw water.

It is recommended if additional TOC removal is required in the future, the initial approach to achieving that goal is to work with modifying the IX operating protocol to have shorter time between resin regeneration, more complete regenerations, and replacement resins with improved TOC removal.

Conclusions

Recent Disinfection Byproduct (DBP) testing in the distribution system with IX on-line indicated that conversion to free chlorine may not be possible due to higher levels of DBP than expected.

It is recommended that the improvements recommended in this TM remain a future element in the Master Plan that could be implemented if IX is eliminated due to regulatory requirements or for any other reason.

The need to implement these improvements is dependent on future regulations and other conditions in the distribution system that would allow converting to free chlorine as the secondary disinfectant.

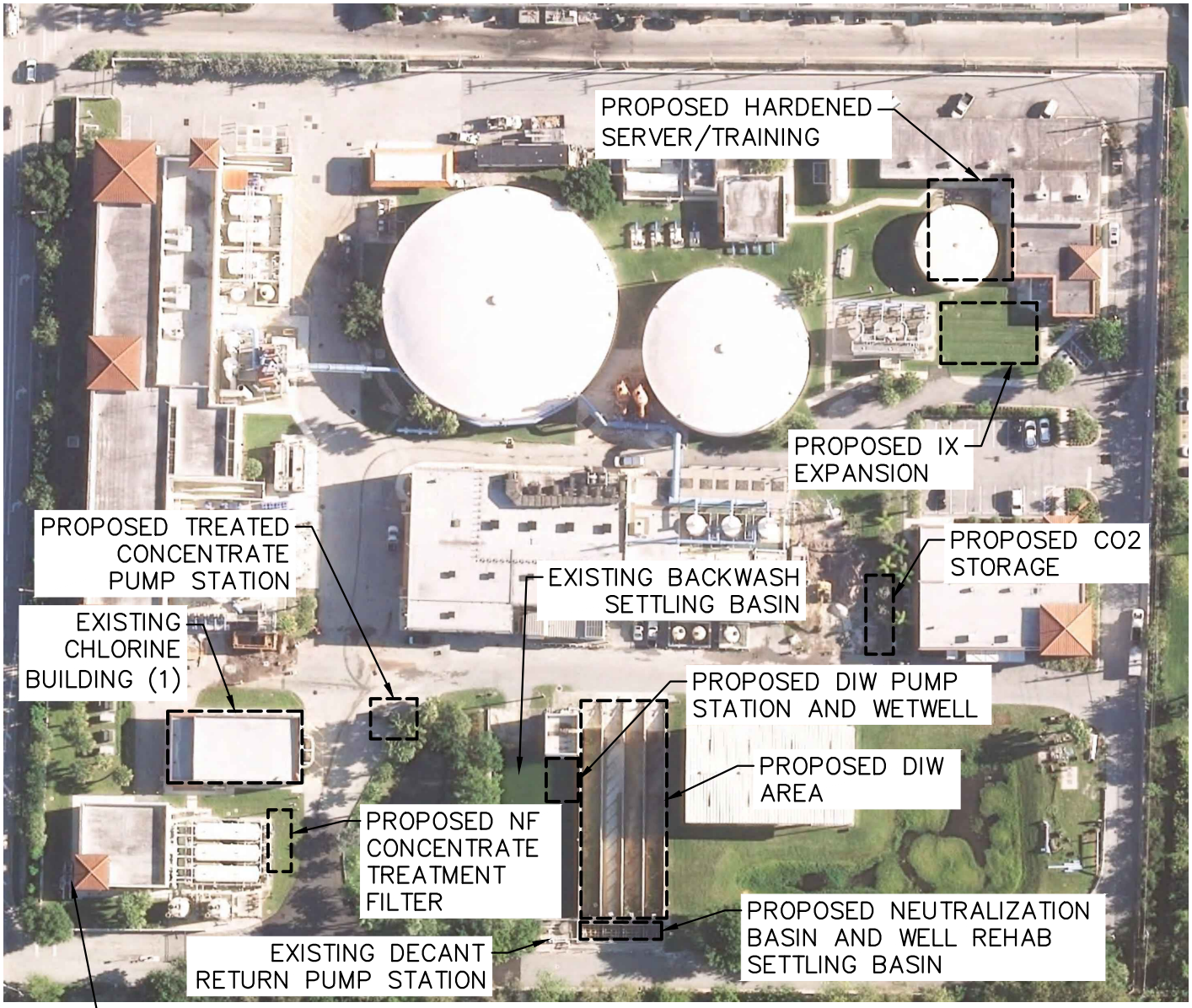
Implementing the change from IX treatment of SAS raw water to calcite treatment of RO product will require Implementation of NF Train 6 as well as SAS raw watermain improvements to replace the WTP rated capacity lost when IX is eliminated.

Recommended Budget

The following is the recommended budget for implementing the new and modified facilities discussed in this TM for converting the existing IX treatment facility to a treatment process using carbon dioxide and solid calcium. The values presented below include engineering and construction phase.

Pump Station, 10' X 10" X 8'D, (3) 20 HP Pumps	$350,000
Piping Modifications	$250,000
10-ton Carbon Dioxide Tank	$250,000
Carbon Dioxide Solution Generator	$200,000
Double Contactor Capacity (4 additional vessels and trough)	$700,000
Instrumentation and Controls	$250.000
Pilot Testing	$150,000
NF Train 6	$2,500,000
36" Raw Water Main	$6,400,000
Engineering and Construction Phase	$1,000,000
TOTAL	$12,050,000

Attachment: Exhibit 1-WTP Site Plan



WTP SITE PLAN

GRAPHIC SCALE IN FEET
0 50 100 200

NORTH

(1) SODIUM HYPOCHLORITE STORAGE AND RAW WATER BOOSTER STATION INSIDE BUILDING

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SCALE: AS NOTED DESIGNED BY JEP DRAWN BY CFS CHECKED BY JRL	Kimley»Horn © 2021 KIMLEY-HORN AND ASSOCIATES, INC. 1920 WEKIVA WAY SUITE 200, WEST PALM BEACH, FL 33411 PHONE: 561-845-0665 FAX: 561-863-8175 WWW.KIMLEY-HORN.COM REGISTRY NO. 35106	MAR. 2022 PROJECT NO. 044001257	OVERALL WTP SITE PLAN PREPARED FOR TOWN OF JUPITER JUPITER FLORIDA	DESIGN ENGINEER: JOHN E. POTTS FLORIDA P.E. LICENSE NUMBER: 2281 DATE:	SHEET NUMBER EXHIBIT 1

Appendix G:
Technical Memorandum Town of Jupiter Compliance with Four-Log Compliance

Hazen *Technical Memorandum*

April 3, 2020

To: Rebecca Wilder, PE

From: Janeen Wietgrefe, PE
Geoff Hart, PE

Town of Jupiter – Assistance with 4-Log Compliance

Background

The United States Environmental Protection Agency (EPA) developed the Ground Water Rule (GWR) to extend disinfection requirements for water treatment plants (WTPs) treating surface water sources to WTPs treating ground water sources. The Florida Department of Environmental Protection (FDEP) began enforcement of the GWR in late 2009. The GWR stipulates that WTPs achieving 4-log virus treatment are exempt from the "triggered" source water monitoring requirements of the GWR. Gaining exemption from the triggered monitoring requirements is an appropriate objective for WTPs such as the Town's that have multiple supply wellfields with a large number of wells.

Options for 4-log treatment include virus removal by physical processes such as membrane treatment and virus inactivation by disinfection. The requirement is that the sum of log credits for each treatment train in series must equal at least 4-log. The EPA left determination of the log removal credits for various processes under the GWR to the individual states.

The FDEP requires membrane integrity testing and monitoring of RO and NF processes if 4-log treatment is claimed. Since integrity testing of RO and NF membranes is typically not feasible, the FDEP allows a 2-log credit for RO and NF treatment meeting stipulated maximum salt passage requirements. This is 25% maximum salt passage for NF. This is an arbitrary limit imposed by the FDEP Draft Guidelines for Four-Log Virus Treatment of Ground Water and is therefore not subject to rational discussion with regulatory authorities. The Jupiter NF plant requires a salt passage greater than 25% in order to meet concentrate disposal water quality and system recovery requirements and 2-log removal credit cannot be claimed for the NF process.

The anion exchange (IX) process at the WTP is not granted any virus removal credit under the GWR by the FAC. Thus, 4-log virus treatment must be achieved entirely by virus inactivation in the blended finished water at the Town's WTP.

1. 4-Log Virus Inactivation Requirement

The 4-log virus inactivation requirement by chemical disinfection is established by a minimum "CT" value that must be met. CT is the product of disinfectant concentration, C, in mg/L and contact time, T, in minutes. The CT required is a function of the following variables:

- Type of disinfectant
- Water pH during disinfection contact time
- Minimum temperature

The type of disinfectant is the most critical factor. For instance, the CT required to achieve 4-log inactivation by chloramines is about 250 times higher than that for free chlorine, the other two variables being equal, because chloramines are a weaker disinfectant than free chlorine.

Minimum temperature can be determined by long term measurements or the values of minimum temperature for aquifers and Water Management Districts determined by the FDEP can be used. For the sources supplying the Town's WTP this temperature is 18.5^0C (65.3^0F) for surficial aquifers in the South Florida Water Management District.

The minimum CT requirement for 4-log virus inactivation is 3.3 as determined by **Table B-1** of the FDEP Guidelines for 4-Log Virus Treatment of Ground Water (Draft) for the following values at the WTP:

- Free chlorine disinfectant
- pH range of 6.0 – 9.0
- Minimum temperature of 18.5^0C

Table B-1 can be found in the **Appendix** to this technical memorandum. This CT must generally be met for a free chlorine concentration of 4.0 mg/L or less. If a greater concentration than 4.0 mg/L is necessary, the water must be partially dechlorinated after the contact time.

There are multiple contact volumes and disinfectant concentrations for this WTP. The relevant volume is the stream with the shortest contact time at the maximum permitted flow. In this case it starts at the exit of the blend chamber where the balance of the NF product is blended with the other combined product streams and ends at the outlet of the NF clearwell where free chlorine concentration is measured for 4-log inactivation compliance. The NF clearwell is split into two halves and the half with the greater flow governs. The rest of the product transferred from the RO cleawell receives much greater free chlorine CT prior to mixing in the blend chamber but credit cannot be taken because of the portion of NF product flowing from the supplemental blend chamber to the blend chamber.

The sum of contact times at the maximum WTP flow of 30 MGD for the pipe between the blend chamber and the NF clearwell half with the greater flow equals the contact time used for CT determination. The flow split between clearwell halves is determined by the number of transfer pumps in operation. The worst case

is at maximum flow with 3 transfer pumps operating in one half and 2 in the other. Thus 60% (18 MGD) flows through one half and 40% (12 MGD) flows through the other half.

The hydraulic detention time in each contact volume is adjusted by a "baffle factor" to arrive at contact time used for CT determination. The baffle factor quantifies the degree of mixing or short-circuiting that occurs and depends on the geometry of the segment. For instance, the flow in the pipe is "plug flow" with essentially no axial mixing so the baffle factor is 1.0. Each half of the clearwell has a length to width ratio of 3.43 and no internal baffles. It would qualify for a presumptive baffle factor of 0.3 under the FDEP Guidelines. Alternatively, a baffle factor can be determined by tracer test. A tracer test is not necessary if required contact time can be met using a factor of 0.3.

The achievable CT at a free chlorine concentration of 4.0 mg/L and the minimum concentration required for the 4-log inactivation CT of 3.3 at a flow of 30 MGD are shown in **Table 1** together with intermediate parameters. The available CT exceeds the required CT for any free chlorine concentration of 2.1 mg/L or higher.

Table 1: CT Calculation for Free Chlorine Contact

Parameter	Pipe from Blend Chamber	Clearwell Half	Totals
Length, ft.	100	60	-
Width or Diameter, ft.	3.5	17	-
Minimum depth, ft.	-	6.8	-
Volume, cu. ft.	962	6,940	-
Volume, gal.	7,200	51,890	-
Maximum flow, MGD	30.0	18.0	
Maximum flow, GPM	20,830	12,500	
Detention time, minutes	0.35	4.15	
Baffle factor	1.0	0.3	
Contact time, minutes	0.35	1.25	1.60
4-log CT required	-	-	3.3
CT achieved at 4.0 mg/L	1.42	4.98	6.40
Minimum C for 4-log inactivation, mg/L	-	-	2.1
Max. log inactivation at 4.0 mg/L			7.8

2. Disinfectant Residual

A free chlorine or chloramines disinfectant residual may be used in distribution systems. Prior to the start of regulation of disinfection byproducts (DBPs) by the EPA over 30 years ago, most South Florida utilities used free chlorine. However, because South Florida surficial aquifer waters tend to contain relatively high concentrations of the organic precursors that readily react with free chlorine to form DBPs, many utilities using conventional treatment switched to chloramines because chloramines are a weaker oxidant than free chlorine. A few utilities adopted chloramines because, being a weaker oxidant, chloramines persisted longer in high water age areas.

The Town's WTP treatment processes were formerly lime softening, RO and IX and a chloramines residual was used to reduce DBP formation in the distribution system. With the replacement of lime softening capacity by NF treatment, the DBP formation potential was reduced and the use of a free chlorine residual in the distribution system may be possible.

When using a free chlorine for virus inactivation, the significant concentration of background ammonia in water from the surficial aquifer is eliminated by breakpoint chlorination. In order to form a chloramines disinfectant residual, ammonia must be added after the free chlorine contact time. When anhydrous ammonia gas is added to water having a free chlorine residual, successive steps of gas dissolution, hydrolysis to form ammonium and hydroxide ions, reaction of hydroxide ions with carbon dioxide to for bicarbonate alkalinity and reaction of ammonium ions to form chloramines occur. The reaction rates are rapid and mixing into the bulk water flow should also be rapid.

Blended finished water at this WTP has a pH of 7.9 and a calcium carbonate precipitation potential (CCPP) of about 5 prior to the addition of ammonia. The addition and mixing of the typical anhydrous ammonia dose increases the pH to 8.0 and CCPP to about 6.5 which is in the ideal range. If mixing is not rapid, much greater localized increases in pH and CCPP will cause precipitation of calcium carbonate as evidence by turbidity and deposits on surfaces. This is exacerbated if excess ammonia is added.

As previously noted, the advantages of chloramines vs. free chlorine residual are reduced DBP formation potential and greater persistence in the distribution system. There are a number of negative side effects that have been documented when switching from free chlorine to chloramines. The most significant of these is the occurrence of nitrification and other microbial problems. When chloramines oxidation and disinfection reactions occur in the distribution system, a usual reaction product is ammonia. The ammonia released by chloramines reactions and any excess added at the WTP is a nutrient that promotes microbial growth and may cause nitrification and growth of biofilms in distribution piping.

Biofilm growth in systems with long-term chloramine usage may be extensive and shield underlying microbial growth from disinfection by chloramines. Somewhat paradoxically, when switching to a stronger oxidant and disinfectant like free chlorine, formerly shielded growths may be released from pipe walls into the water in the short term, such as free chlorine "burns". This may sometimes result in positive bacteriological test results.

The same free chlorine CT segment for achieving 4-log virus inactivation can be used with either chloramines residual or free chlorine in the distribution system. **Figure 1** illustrates the process flow for

option 1 using a chloramines residual and **Figure 2** illustrates the process flow for option 2 using a free chlorine residual. They are identical except that ammonia addition after the NF clearwell transfer pumps is required for option 1.

3. Ammonia Addition to Avoid Precipitation

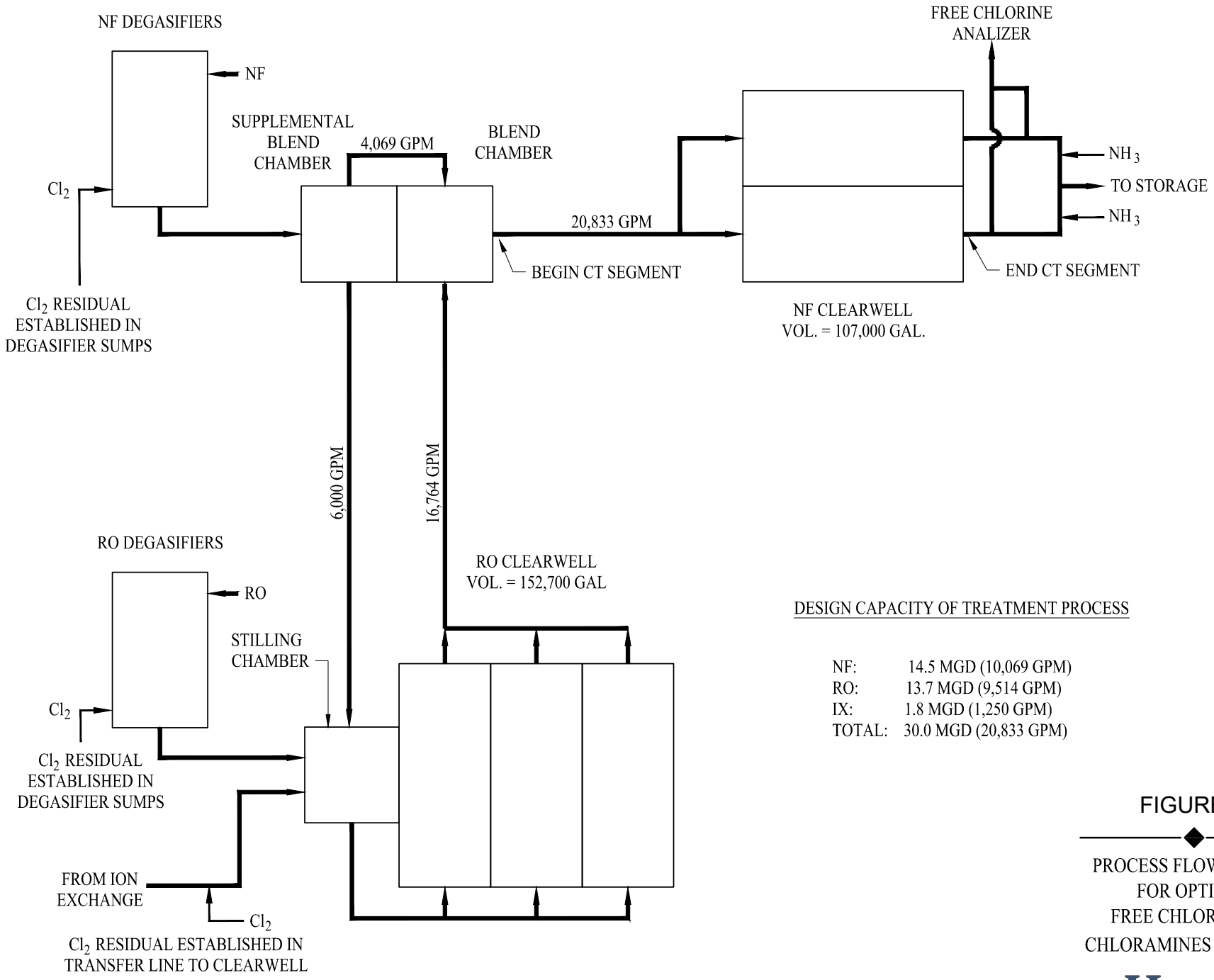
As previously noted, rapid mixing of anhydrous ammonia is required in water with significant CCPP to avoid precipitation. If ammonia is added in a low velocity area such as the NF clearwell, some form of mechanical mixing is required to provide mixing energy as well as interlocks with the transfer pumps to cater for differences in flow between the two sides of the NF clearwell. This makes satisfactory implementation of addition in the clearwell challenging. Addition in relatively high velocity, high turbulence transfer piping can produce suitably rapid mixing. No matter where anhydrous ammonia is added, there will be a tendency for clogging of the injection quills which must be carefully considered during design. Another consideration when adding ammonia is that a uniform ratio of free chlorine to ammonia concentration of 4.5 to 5.0 must be maintained to form monochloramine and avoid the formation of di- and tri- chloramines if the ratio is too high or excess ammonia and increased potential for precipitation if the ratio is too low.

If ammonia is added after free chlorine contact in the NF clearwell, the configuration of the transfer pump discharge manifold means that multiple injection points may be desirable. The six transfer pumps are connected to a double-ended discharge manifold. Both ends of the manifold are connected to a 30-inch transfer pipe to storage tanks that was installed before the NF plant was constructed. There is an isolation valve installed on both manifold connections to the transfer pipe.

Two potential configurations of ammonia injection points on the discharge side of the transfer pumps are presented below. Conceptually, the simpler system is to provide an injection point at both ends of the discharge manifold. The flow will be approximately equal through both ends of the manifold, so the chlorine/ammonia ratio should be fairly consistent. The disadvantages of this configuration are that the injection points are buried and there is physically not enough room for vaults over the piping for access to the injection points. Vertical risers tapped into the ends of the manifold and extending above land surface could provide access to the injection quills without vaults. There are two operational modes possible with this configuration. One is to use both injection points simultaneously. The other, preferred, mode is to use one at a time with the other end of the manifold and its associated ammonia injector valved off. This would provide the flexibility of having an installed spare in case one injector becomes clogged. With one end of the manifold closed, the velocity would be higher which would promote better mixing. At 30 MGD the velocity at the end of the manifold would be 15 fps which acceptable for ductile iron piping. This option is shown conceptually in **Figure 3**.

The other option is to provide an injection point at each of six transfer pump discharge pipes. Each point would be interlocked with pump operation so that ammonia injection is only active on running pumps. This would be accomplished by means of a solenoid valve on each injection point that could be energized by a connection to the existing pressure switch on the discharge of each pump that is energized with 120 VAC when the pump is running. This is comparatively complex but easily implemented since everything is

accessible above ground and local to each pump. It would be relatively fault tolerant since failure of an individual injection point would still allow functional system operation. This system is shown schematically in **Figure 4**.



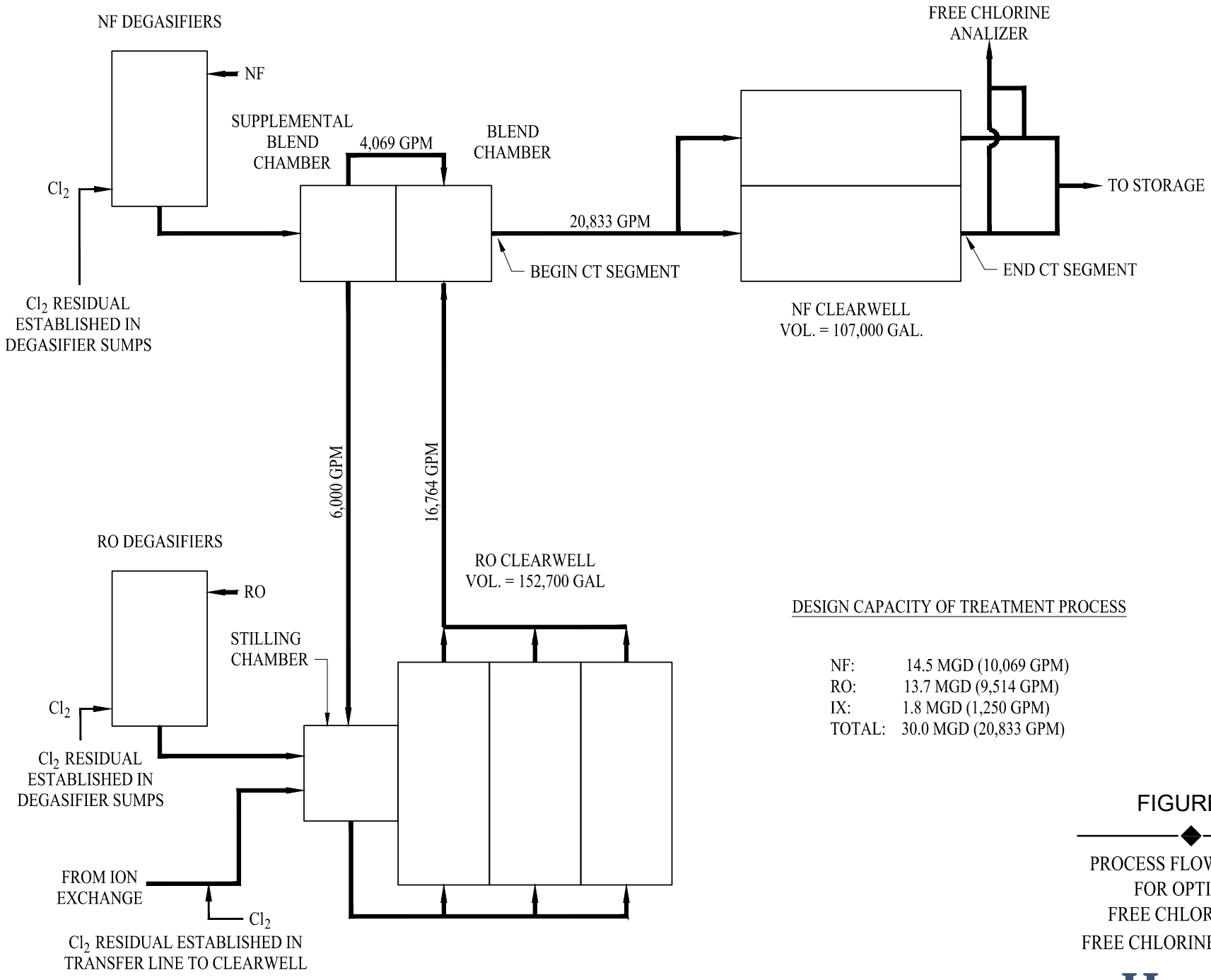
DESIGN CAPACITY OF TREATMENT PROCESS

NF:	14.5 MGD (10,069 GPM)
RO:	13.7 MGD (9,514 GPM)
IX:	1.8 MGD (1,250 GPM)
TOTAL:	30.0 MGD (20,833 GPM)

FIGURE 1

PROCESS FLOW SKETCH
FOR OPTION 1
FREE CHLORINE CT,
CHLORAMINES RESIDUAL

Hazen



DESIGN CAPACITY OF TREATMENT PROCESS

NF:	14.5 MGD (10,069 GPM)
RO:	13.7 MGD (9,514 GPM)
IX:	1.8 MGD (1,250 GPM)
TOTAL:	30.0 MGD (20,833 GPM)

FIGURE 2

PROCESS FLOW SKETCH
FOR OPTION 2
FREE CHLORINE CT,
FREE CHLORINE RESIDUAL

Hazen

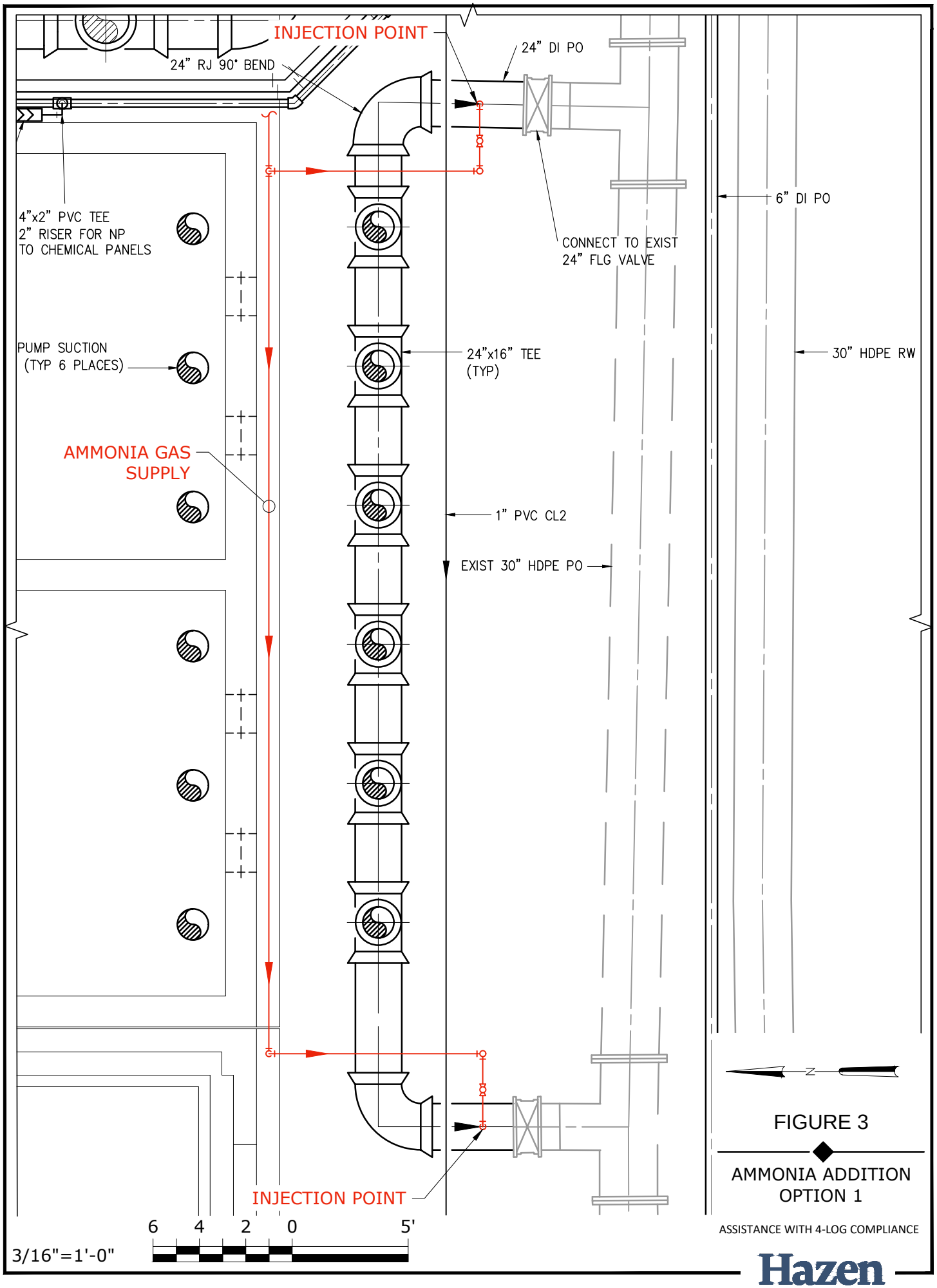


FIGURE 3

AMMONIA ADDITION
OPTION 1

ASSISTANCE WITH 4-LOG COMPLIANCE

Hazen

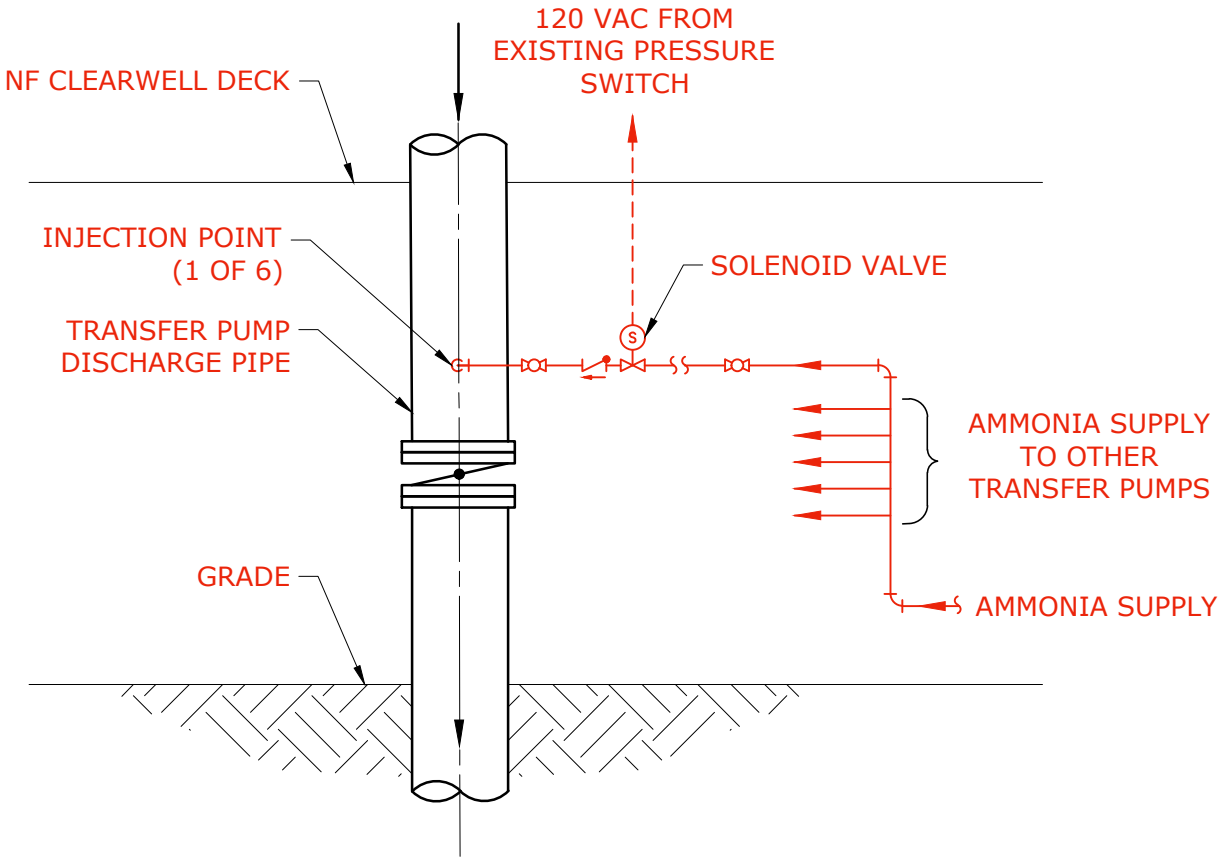


FIGURE 4

AMMONIA ADDITION
OPTION 2

ASSISTANCE WITH 4-LOG COMPLIANCE

Hazen

4. Conclusions

1. 4-log virus inactivation credit using free chlorine contact in the NF clearwell is feasible to exempt the Town from the triggered monitoring requirements of the GWR that the WTP is currently operating under.

2. 4-log virus inactivation credit is feasible with either continuation of a chloramine residual in the distribution system or switching to a free chlorine residual.

3. Because the treatment processes at the WTP are RO, NF and IX which all remove organic precursors of DBP formation, it is probable that a free chlorine residual in the distribution system would produce satisfactory DBP results.

4. Injection of anhydrous ammonia into transfer piping after the NF clearwell is feasible without causing objectionable scale formation should the Town elect to continue the use of a chloramine residual in the distribution system.

5. Recommendations

1. Changing to free chlorine residual should be operationally advantageous for the WTP and distribution system. DBP formation potential testing and sampling for free chlorine disinfectant residuals in high water age areas during a free chlorine "burn" are recommended before making this decision.

2. Whether a free chlorine or chloramines residual is to be used, it is recommended that ammonia injection be relocated to the discharge side of the transfer pumps prior to making application for 4-log virus treatment credit. This will provide flexibility to use either type of residual without affecting the 4-log virus treatment credit.

3. If a decision to relocate ammonia injection to the discharge side of the transfer pumps is made, the decision on which option to use should be made during preliminary design of the modification.

Appendix A: Table B-1 of the FDEP Guidelines for 4-Log Virus Treatment of Ground Water (Draft)

Table B-1: CT Values for Inactivation of Viruses by Free Chlorine at Water pH 6.0 - 9.0

Log Inactivation	Water Temperature (degrees Celsius [°C])																
	5	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	2	1	1.0	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.4	0.4
2	4	2	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1	1.0	0.9	0.9	0.8	0.8
3	6	3	2.9	2.7	2.6	2.4	2.3	2.1	2	1.8	1.7	1.5	1.4	1.4	1.3	1.2	1.1
4	8	4	3.8	3.6	3.4	3.2	3	2.8	2.6	2.4	2.2	2	1.9	1.8	1.7	1.6	1.5

Source: Table E-7 in Appendix E to the United States Environmental Protection Agency's *Guidance Manual for Compliance with the Filtration and Disinfection Requirements for Public Water Systems Using Surface Water Sources*, 1991 (the "Surface Water Guidance Manual"). ▨ = CT value modified or determined by assuming a twofold decrease in CT for every 10-°C increase in temperature above 5 °C (per Appendix F to the "Surface Water Guidance Manual"). ▭ = CT value determined by linear interpolation between 5-°C increments. ▨ = CT value determined by assuming inactivation is a first order reaction (per the "Surface Water Guidance Manual").

DRAFT

Appendix H:
SAS Raw Water Main Hydraulic Investigation and Improvements

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E.,

Re: SAS Raw Water Main Hydraulic Investigation and Improvements

Date: March 4,2022

The Town's Surficial Aquifer (SA) wellfields includes a 24" raw water transmission main that extends from the water plant south along Central Blvd to Indian Creek Blvd and then continues south along the North Palm Beach Heights Outfall Canal, and south down Greenway Drive into Abacoa (See Exhibit A for Existing SA wells and raw watermains).

Water from the SA wells supplies the Town's Nanofiltration (NF) membrane treatment plant which is rated at 14.5 MGD and operates at 85% recovery. The total SA raw water supply required to operate the NF plant at capacity is 17.0 MGD or 11,800 GPM. Velocities through the 24" SA raw watermain located along Central Blvd. range from 8 – 9 fps. These elevated velocities produce high pressures at the southernmost well sites which require higher horsepower well pump motors and higher operating costs in terms of electrical power consumption.

Five potential improvements were reviewed to increase the efficiency of the well pumping system include:

- Installation of a new raw watermain from SA Well 15 (east of the intersection of Central Blvd. and Egret Landing Blvd.) routing north along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive and connecting to the existing 12" SA raw watermain on Toney Penna Drive (see Exhibit B).
- The new raw watermain along Canal NC-6 plus conversion of the existing 14" NF concentrate main to be used as a SA raw watermain (see Exhibit C).
- The new raw watermain along Canal NC-6 plus installation of a new raw watermain along Toney Penna Drive west to Central Blvd. along with the conversion of the 14" NF concentrate main to be used a SA raw watermain (see Exhibit D).
- The new raw watermain along Canal NC-6 plus installation of a new raw watermain along Toney Penna Drive to Bush Road, new raw watermain along Bush Road north to Atria Park of St Josephs, new raw watermain west within an existing utility easement in front of Atria Park of St Josephs and continue west behind Publix within existing utility easements and extend into the Water Plant (see Exhibit E).

- Installation of a booster pump station adjacent to SA Well 15 located east of intersection of Central Blvd. and Egret Landing Blvd. (see Exhibit F) and continued use of the existing 24" main along Central Blvd.

Parallel Raw Watermain – Egrets Landing to Toney Penna Drive

The SAS raw water main system was modeled utilizing WaterCAD modeling software to determine the benefits of the addition of a new raw watermain installed along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive and operated in parallel to the existing 24" raw water main on Central Blvd. The hydraulic model was developed using the previously calibrated hydraulic model of the Town of Jupiter's Surficial aquifer wellfield system. The objective for the evaluation is to determine the most efficient parallel raw watermain pipe diameter and determine the anticipated reduction in operating costs as it relates to power consumption.

The well grouping listed below was modeled to review the benefits of the parallel raw watermain.

Well Group

Well #	Well Flow (GPM)
SA-13	350
SA-19	500
SA-21	300
SA-22	240
SA-24	500
SA-27	200
SA-28	200
SA-29	250
SA-30	260
SA-33	350
SA-34	380
SA-36	230
SA-39	600
SA-41	500
SA-42	650
SA-43	650
SA-44	420
SA-45	350
SA-46	600

SA-47	500
SA-48	400
SA-49	280
SA-53	410
SA-54	500
SA-58	1,000
SA-60	200
SA-62	1,000
Total of 28 Wells in Operation	**Total Raw Water Supply Flow: 11,820 GPM**

Four different scenarios were modeled to establish the potential benefits of a parallel raw watermain along the NC-6 canal. The first scenario is the base condition with no improvements to the raw watermain system which will be used for comparison. The other three scenarios include the installation of a 12" diameter parallel raw watermain, a 16" diameter parallel raw watermain, and a 24" diameter parallel raw watermain along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive.

Well #	Base Condition Well Pressure (PSI)	12" Parallel RWM Well Pressure (PSI)	16" Parallel RWM Well Pressure (PSI)	24" Parallel RWM Well Pressure (PSI)
SA-13	31.1	32.3	33.1	33.7
SA-19	34.7	38.4	40.6	42.3
SA-21	50.9	46.7	45.1	44.0
SA-22	47.8	43.6	42.0	40.9
SA-24	60.6	56.0	54.2	53.1
SA-27	55.5	50.9	49.1	47.9
SA-28	55.5	51.0	49.2	48.1
SA-29	54.9	50.3	48.6	47.4
SA-30	55.9	51.3	49.5	48.4
SA-33	54.8	50.6	48.9	47.8
SA-34	56.5	51.9	50.1	48.9
SA-36	40.3	38.4	37.6	37.1
SA-39	65.3	60.7	58.9	57.8
SA-41	83.1	78.5	76.7	75.6
SA-42	67.9	63.3	61.5	60.3
SA-43	68.8	64.3	62.5	61.3

SA-44	67.1	62.6	60.8	59.6
SA-45	66.9	62.3	60.6	59.4
SA-46	68.3	63.7	62.0	60.7
SA-47	69.0	64.4	62.7	61.5
SA-48	70.2	65.6	63.9	62.7
SA-49	60.3	55.7	53.9	52.8
SA-53	62.4	57.8	56.0	54.9
SA-54	70.1	65.6	63.8	62.7
SA-58	78.2	78.2	78.2	78.2
SA-60	66.2	66.2	66.2	66.2
SA-62	69.5	69.5	69.5	69.5

For evaluation purposes, hypothetical annual operating costs were projected in terms of cost of power for well pumping for each of the scenarios. These operating costs represent well pumps operating to supply the NF plant operating 365 days a year, 24 hours each day, at Plant capacity, which is not indicative of actual operating costs and used only for establishing the most efficient pipe diameter. For this evaluation $0.09 kw/hr was used for cost of power.

Base Condition Annual Operating Cost	**12" Parallel RWM Annual Operating Cost**	**16" Parallel RWM Annual Operating Cost**	**24" Parallel RWM Annual Operating Cost**
$321,000	$305,000	$299,000	$295,000

12" Parallel RWM Annual Cost Savings	**16" Parallel RWM Annual Cost Savings**	**24" Parallel RWM Annual Cost Savings**
$16,000	$22,000	$26,000

The construction costs for each of the three scenarios was determined. The table below lists the opinion of probable construction cost for the installation of 5,300 LF of DIP or PVC raw watermain along the NPBHWCD Canal NC-6.

12" Parallel RWM Opinion of Probable Construction Cost	**16" Parallel RWM Opinion of Probable Construction Cost**	**24" Parallel RWM Opinion of Probable Construction Cost**
$942,000	$1,255,000	$1,882,000

The most efficient pipe diameter for this application is the pipe that yields the shortest payback period of the construction cost required to implement the improvements. A discounted payback period formula was used to determine the payback period. The cost of capital is

assumed to be 1% for this exercise. After reviewing the payback period (listed below) it was found that the most efficient pipe diameter for the parallel raw watermain is the 16" diameter.

12" Parallel RWM Payback Period	16" Parallel RWM Payback Period (Years)	24" Parallel RWM Payback Period (Years)
92 years	87 years	134 years

Operating the NF plant with 3 trains on is more indicative of how the SAS system normally operates and will significantly extend the payback periods. The payback period for the new raw watermain already exceeds the service life of the new raw watermain. For this reason further evaluation of the NF plant operation with 3 trains on was not continued.

Parallel Raw Watermain – Egrets Landing to Toney Penna Drive with the 14" Concentrate Main Converted to Raw Water Main

The four different scenarios were modeled to review the potential benefits of a parallel SA raw watermain along the NC-6 canal with the 14" converted NF concentrate main. The first scenario is the base condition with no improvements to the raw watermain system which will be used for comparison. The other three scenarios include the installation of a 12" diameter parallel raw watermain, a 16" diameter parallel raw watermain, and a 24" diameter parallel raw watermain along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive with the 14" NF concentrate main converted for raw water use and connected at Toney Penna Drive and at the entrance to the water plant.

Well #	Base Condition Well Pressure (PSI)	12" Parallel RWM Well Pressure (PSI)	16" Parallel RWM Well Pressure (PSI)	24" Parallel RWM Well Pressure (PSI)
SA-13	31.1	31.2	31.9	32.5
SA-19	34.7	37.3	39.6	41.3
SA-21	50.9	45.5	43.9	42.9
SA-22	47.8	42.5	40.8	39.7
SA-24	60.6	54.9	53.1	51.9
SA-27	55.5	49.7	48.0	46.8
SA-28	55.5	49.8	48.1	46.9
SA-29	54.9	49.2	47.4	46.2
SA-30	55.9	50.2	48.4	47.2
SA-33	54.8	49.4	47.8	46.7
SA-34	56.5	50.7	49.0	47.8
SA-36	40.3	37.2	36.4	36.0

SA-39	65.3	59.6	57.8	56.6
SA-41	83.1	77.3	75.6	74.4
SA-42	67.9	62.1	60.4	59.2
SA-43	68.8	63.1	61.3	60.1
SA-44	67.1	61.4	59.6	58.4
SA-45	66.9	61.2	59.4	58.3
SA-46	68.3	62.6	60.8	59.6
SA-47	69.0	63.3	61.5	60.4
SA-48	70.2	64.5	62.7	61.6
SA-49	60.3	54.6	52.8	51.6
SA-53	62.4	56.6	54.9	53.7
SA-54	70.1	64.4	62.7	61.5
SA-58	78.2	77.9	77.9	77.9
SA-60	66.2	65.8	65.8	65.8
SA-62	69.5	69.2	69.2	69.2

For evaluation purposes, hypothetical annual operating costs were projected in terms of cost of power for well pumping for each of the scenarios. These operating costs represent well pumps operating to supply the plant operating 365 days a year, 24 hours each day, at Plant capacity, which is not indicative of actual operating costs and used only for establishing the most efficient pipe diameter. For this evaluation $0.09 kw/hr was used for cost of power.

Base Condition Annual Operating Cost	**12” Parallel RWM Annual Operating Cost**	**16” Parallel RWM Annual Operating Cost**	**24” Parallel RWM Annual Operating Cost**
$321,000	$300,000	$294,000	$290,000

12” Parallel RWM Annual Cost Savings	**16” Parallel RWM Annual Cost Savings**	**24” Parallel RWM Annual Cost Savings**
$21,000	$27,000	$31,000

The construction costs for each of the three scenarios was determined. The table below lists the opinion of probable construction cost for the installation of 5,300 LF of raw watermain along the NPBHWCD Canal NC-6 and new connections of the existing 14” NF concentrate main to the SA raw watermain network.

12" Parallel RWM Opinion of Probable Construction Cost	16" Parallel RWM Opinion of Probable Construction Cost	24" Parallel RWM Opinion of Probable Construction Cost
$1,070,000	$1,382,000	$2,009,000

The most efficient pipe diameter for this application is the pipe that yields the shortest payback of the construction cost required to implement the improvements. A discounted payback period formula was used to determine the payback period. The cost of capital is assumed to be 1% for this exercise. After reviewing the payback period (listed below) it was found that the both the 12" and 16" diameter parallel raw watermains are equally most efficient.

12" Parallel RWM Payback Period	16" Parallel RWM Payback Period (Years)	24" Parallel RWM Payback Period (Years)
72 years	73 years	108 years

Operating the plant with 3 NF trains is more indicative of how the SAS system normally operates which will significantly extend the payback periods. The payback period for the new raw watermain already exceeds the service life of the new raw watermain. For this reason further evaluation of the NF plant operation with 3 trains on was not continued.

Parallel Raw Watermain – Egrets Landing to Toney Penna Drive, Toney Penna Drive to Central Blvd with the 14" NF Concentrate Main Converted to a SA Raw Water Main

The four different scenarios were modeled to review the potential benefits of a parallel raw watermain along the NC-6 canal with an additional parallel raw watermain along Toney Penna Drive and the 14" converted NF concentrate main. The first scenario is the base condition with no improvements to the raw watermain system which will be used for comparison. The other three scenarios include the installation of a 12" diameter parallel raw watermain, a 16" diameter parallel raw watermain, and a 24" diameter parallel raw watermain along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive and west along Toney Penna Drive to Central Blvd with the 14" NF concentrate main converted to a SA raw water main and connected at Toney Penna Drive and at the entrance to the water plant.

Well #	Base Condition Well Pressure (PSI)	12" Parallel RWM Well Pressure (PSI)	16" Parallel RWM Well Pressure (PSI)	24" Parallel RWM Well Pressure (PSI)
SA-13	31.1	30.3	30.8	31.5
SA-19	34.7	34.7	36.3	38.3
SA-21	50.9	45.1	42.6	40.4
SA-22	47.8	41.9	39.5	37.3

SA-24	60.6	54.3	51.7	49.3
SA-27	55.5	49.2	46.6	44.1
SA-28	55.5	49.3	46.7	44.2
SA-29	54.9	48.7	46.0	43.6
SA-30	55.9	49.6	47.0	44.5
SA-33	54.8	48.9	46.5	44.2
SA-34	56.5	50.2	47.6	45.1
SA-36	40.3	37.0	35.9	34.8
SA-39	65.3	59.0	56.4	53.9
SA-41	83.1	76.8	74.2	71.8
SA-42	67.9	61.6	59.0	56.5
SA-43	68.8	62.6	59.9	57.5
SA-44	67.1	60.9	58.2	55.8
SA-45	66.9	60.7	58.1	55.6
SA-46	68.3	62.0	59.4	57.0
SA-47	69.0	62.7	60.1	57.7
SA-48	70.2	64.0	61.4	58.9
SA-49	60.3	54.0	51.4	49.0
SA-53	62.4	56.1	53.5	51.0
SA-54	70.1	63.9	61.3	58.8
SA-58	78.2	77.9	77.9	77.9
SA-60	66.2	65.8	65.8	65.8
SA-62	69.5	69.2	69.2	69.2

For evaluation purposes, hypothetical annual operating costs were projected in terms of cost of power for well pumping for each of the scenarios. These operating costs represent well pumps operating to supply the plant operating 365 days a year, 24 hours each day, at Plant capacity, which is not indicative of actual operating costs and used only for establishing the most efficient pipe diameter. For this evaluation $0.09 kw/hr was used for cost of power.

Base Condition Annual Operating Cost	**12” Parallel RWM Annual Operating Cost**	**16” Parallel RWM Annual Operating Cost**	**24” Parallel RWM Annual Operating Cost**
$321,000	$297,000	$288,000	$280,000

12” Parallel RWM Annual Cost Savings	**16” Parallel RWM Annual Cost Savings**	**24” Parallel RWM Annual Cost Savings**
$24,000	$33,000	$41,000

The construction costs for each of the three scenarios was determined. The table below lists the opinion of probable construction cost for the installation of 5,300 LF of DIP or PVC raw watermain along the NPBHWCD Canal NC-6, 2500 LF of DIP or PVC raw watermain along Toney Penna Drive, and new connections to the existing 14" NF concentrate main.

12" Parallel RWM Opinion of Probable Construction Cost	16" Parallel RWM Opinion of Probable Construction Cost	24" Parallel RWM Opinion of Probable Construction Cost
$1,511,000	$1,972,000	$2,891,000

The most efficient pipe diameter for this application is the pipe that yields the shortest payback of the construction cost required to implement the improvements. A discounted payback period formula was used to determine the payback period. The cost of capital is assumed to be 1% for this exercise. After reviewing the payback period (listed below) it was found that the most efficient pipe diameter for the parallel raw watermain is 16" diameter.

12" Parallel RWM Payback Period	16" Parallel RWM Payback Period (Years)	24" Parallel RWM Payback Period (Years)
103 years	93 years	122 years

Operating the plant with 3 NF trains on is more indicative of how the SAS system normally operates and will significantly extend the payback periods. The payback period for the new raw watermain already exceeds the service life of the new raw watermain. For this reason further evaluation of plant operation with 3 trains on was not continued.

Parallel Raw Watermain – Egrets Landing to Toney Penna Drive, Toney Penna Drive to Bush Road, Bush Road north to Atria Park of St Josephs, west in an existing utility easement in front of Atria Park of St Josephs and continue west behind Publix within existing utility easements and extend into the Water Plant

Four different scenarios were modeled to review the potential benefits of a parallel raw watermain. The first scenario is the base condition with no improvements to the raw watermain system which will be used for comparison. The other three scenarios include the installation of a 12" diameter parallel raw watermain, a 16" diameter parallel raw watermain, and a 24" diameter parallel raw watermain along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive, west along Toney Penna Drive to Bush Road, Bush Road north to Atria Park of St Josephs, west in an existing utility easement in front of Atria Park of St Josephs and continue west behind Publix within existing utility easements and extend into the Water Plant.

Well #	Base Condition Well Pressure (PSI)	12" Parallel RWM Well Pressure (PSI)	16" Parallel RWM Well Pressure (PSI)	24" Parallel RWM Well Pressure (PSI)
SA-13	31.1	30.0	29.0	27.0
SA-19	34.7	34.0	33.0	30.7
SA-21	50.9	44.8	40.8	34.5
SA-22	47.8	41.7	37.7	31.4
SA-24	60.6	54.1	49.8	43.2
SA-27	55.5	49.0	44.7	38.0
SA-28	55.5	49.1	44.8	38.1
SA-29	54.9	48.4	44.1	37.5
SA-30	55.9	49.4	45.1	38.5
SA-33	54.8	48.7	44.7	38.4
SA-34	56.5	50.0	45.7	39.0
SA-36	40.3	36.8	34.4	30.5
SA-39	65.3	58.8	54.5	47.9
SA-41	83.1	76.6	72.3	65.6
SA-42	67.9	61.4	57.1	50.4
SA-43	68.8	62.3	58.0	51.4
SA-44	67.1	60.7	56.3	49.7
SA-45	66.9	60.4	56.2	49.5
SA-46	68.3	61.8	57.5	50.9
SA-47	69.0	62.5	58.2	51.6
SA-48	70.2	63.7	59.4	52.8
SA-49	60.3	53.8	49.5	42.9
SA-53	62.4	55.9	51.6	45.0
SA-54	70.1	63.7	59.4	52.7
SA-58	78.2	77.8	77.5	76.8
SA-60	66.2	65.7	65.4	64.7
SA-62	69.5	69.1	68.8	68.1

For evaluation purposes, hypothetical annual operating costs were projected in terms of cost of power for well pumping for each of the scenarios. These operating costs represent well pumps operating to supply the plant operating 365 days a year, 24 hours each day, at Plant capacity, which is not indicative of actual operating costs and used only for establishing the most efficient pipe diameter. For this evaluation $0.09 kw/hr was used for cost of power.

Base Condition Annual Operating Cost	12" Parallel RWM Annual Operating Cost	16" Parallel RWM Annual Operating Cost	24" Parallel RWM Annual Operating Cost
$321,000	$296,000	$280,000	$254,000

12" Parallel RWM Annual Cost Savings	16" Parallel RWM Annual Cost Savings	24" Parallel RWM Annual Cost Savings
$25,000	$41,000	$67,000

The construction costs for each of the three scenarios was determined. The table below lists the opinion of probable construction cost for the installation of 5,300 LF of DIP or PVC raw watermain along the NPBHWCD Canal NC-6, 915 LF of DIP or PVC raw watermain along Toney Penna Drive, 1860 LF of DIP or PVC raw watermain along Bush Road and 1560 LF of DIP or PVC raw watermain through existing utility easements to the plant.

12" Parallel RWM Opinion of Probable Construction Cost	16" Parallel RWM Opinion of Probable Construction Cost	24" Parallel RWM Opinion of Probable Construction Cost
$1,967,000	$2,535,000	$3,670,000

The most efficient pipe diameter for this application is the pipe that yields the shortest payback of the construction cost required to implement the improvements. A discounted payback period formula was used to determine the payback period. The cost of capital is assumed to be 1% for this exercise. After reviewing the payback period (listed below) it was found that the most efficient pipe diameter for the parallel raw watermain is the 24" diameter.

12" Parallel RWM Payback Period	16" Parallel RWM Payback Period (Years)	24" Parallel RWM Payback Period (Years)
161 years	96 years	80 years

Operating the NF plant with 3 trains is more indicative of how the SAS system normally operates and will significantly extend the payback periods. The payback period for the new raw watermain already exceeds the service life of the new raw watermain. For this reason further evaluation of NF plant operation with 3 trains on was not continued.

Booster Pumping Station Option

The SAS raw water system was modeled utilizing WaterCAD modeling software to review the benefits of the addition of a booster pumping station located adjacent to SA Well 15 (east of intersection of Central Blvd. and Egret Landing Blvd.). The hydraulic model was developed

using the previously calibrated hydraulic model of the Town of Jupiter's Surficial aquifer wellfield. The objective for the evaluation is to determine if the addition of a booster pumping station will increase the efficiency of the well pumping system and reduce the operating costs as it relates to power consumption. The well grouping listed below was modeled to review the benefits of the booster pumping station.

Well Group

Well #	Well Flow (GPM)
SA-13	350
SA-19	500
SA-21	300
SA-22	240
SA-24	500
SA-27	200
SA-28	200
SA-29	250
SA-30	260
SA-33	350
SA-34	380
SA-36	230
SA-39	600
SA-41	500
SA-42	650
SA-43	650
SA-44	420
SA-45	350
SA-46	600
SA-47	500
SA-48	400
SA-49	280
SA-53	410
SA-54	500
SA-58	1,000
SA-60	200
SA-62	1,000
Total of 28 Wells in Operation	**Total Raw Water Supply Flow: 11,820 GPM**

Three different scenarios were modeled to review the potential benefits of a booster pumping station. The first scenario is the base condition with no improvements to the raw watermain system which will be used for comparison. The other two scenarios include the installation of a booster pumping station which were modeled for the booster station to maintain suction pressures at 30psi and 15psi. The Booster station only pumps the raw water from wells located south of SA Well 15.

Well #	Base Condition - Well Pressure (PSI)	Booster Station at 30psi Suction - Well Pressure (PSI)	Booster Station at 15psi Suction - Well Pressure (PSI)
SA-13	31.1	33.3	33.3
SA-19	34.7	37.0	37.0
SA-21	50.9	40.1	25.0
SA-22	47.8	37.0	22.0
SA-24	60.6	49.8	34.7
SA-27	55.5	44.6	29.6
SA-28	55.5	44.8	29.7
SA-29	54.9	44.1	29.1
SA-30	55.9	45.1	30.1
SA-33	54.8	43.9	28.9
SA-34	56.5	45.6	30.6
SA-36	40.3	45.9	45.9
SA-39	65.3	54.5	39.5
SA-41	83.1	72.3	57.2
SA-42	67.9	57.0	42.0
SA-43	68.8	58.0	43.0
SA-44	67.1	56.3	41.3
SA-45	66.9	56.1	41.1
SA-46	68.3	57.5	42.5
SA-47	69.0	58.2	43.2
SA-48	70.2	59.4	44.4
SA-49	60.3	49.5	34.5
SA-53	62.4	51.6	36.6
SA-54	70.1	59.4	44.3
SA-58	78.2	79.0	79.0
SA-60	66.2	67.0	67.0
SA-62	69.5	70.3	70.3

The booster pump station discharge pressure is required to be 50psi to deliver 8,540gpm at design operating condition at plant capacity. It is anticipated that the booster station would be equipped with four pumps to meet the design operating condition at plant capacity. The Scenario 2 booster pump station would be equipped with 30hp pumps and the Scenario 3 booster pump station would be equipped with 60hp pumps.

Hypothetical annual operating costs were projected in terms of cost of power for well and booster pumping for each of the scenarios. For the comparison we used $0.09kw/hr for cost of power and used a 24hr operation duration per day.

Base Condition - Annual Operating Cost	Booster Station at 30psi Suction - Annual Operating Cost	Booster Station at 15psi Suction - Annual Operating Cost
$321,000	$356,000	$356,000

The addition of the booster pumping station was found to increase the overall pumping costs. Due to the increased operating costs the booster station option was not reviewed further.

Conclusion

The payback period for the new parallel raw watermain exceeds the service life of the new raw watermain. Due to the payback period the installation of a parallel raw watermain is not recommended at this time.

The Town has assigned a service life of 45 years to underground watermains. The existing 24" raw watermain along Central Blvd. from Well 15 to Toney Penna Drive was installed in 1982 and will reach its useful service life in 2027. The existing 24" raw watermain along Central Blvd. from Toney Penna Drive to the Water Plant was installed in 1979 and will reach its useful service life in 2024. The findings of this investigation indicate that the replacement pipe should be a 30" diameter DIP or PVC C-905 raw watermain. Due to the many utilities that are constructed within the Central Blvd right-of-way it will be very difficult to find an alignment to construct a replacement raw watermain while maintaining service of the existing raw watermain to be replaced. For this reason, we recommend the alignment along the west side of the North Palm Beach Heights Water Control District Canal NC-6 to Toney Penna Drive, west along Toney Penna Drive to Bush Road, Bush Road north to Atria Park of St Josephs, west in an existing utility easement in front of Atria Park of St Josephs and continue west behind Publix within existing utility easements and extend into the Water Plant (refer to Exhibit E) for the replacement raw watermain. This alignment will allow the construction of the new raw watermain while maintaining service of the existing raw water main through the construction duration.

Opinion of Probable Construction Costs

30” Raw Water Main	$4,474,000
Engineering, Survey, Permitting, Construction Phase	$924,000
TOTAL	$5,398,000

Attachments: EXHIBIT A EXISTING SAS
EXHIBIT B SAS
EXHIBIT C SAS
EXHIBIT D SAS
EXHIBIT E SAS
EXHIBIT F SAS



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EXHIBIT A:

EXISTING SURFICIAL AQUIFER SYSTEM

N

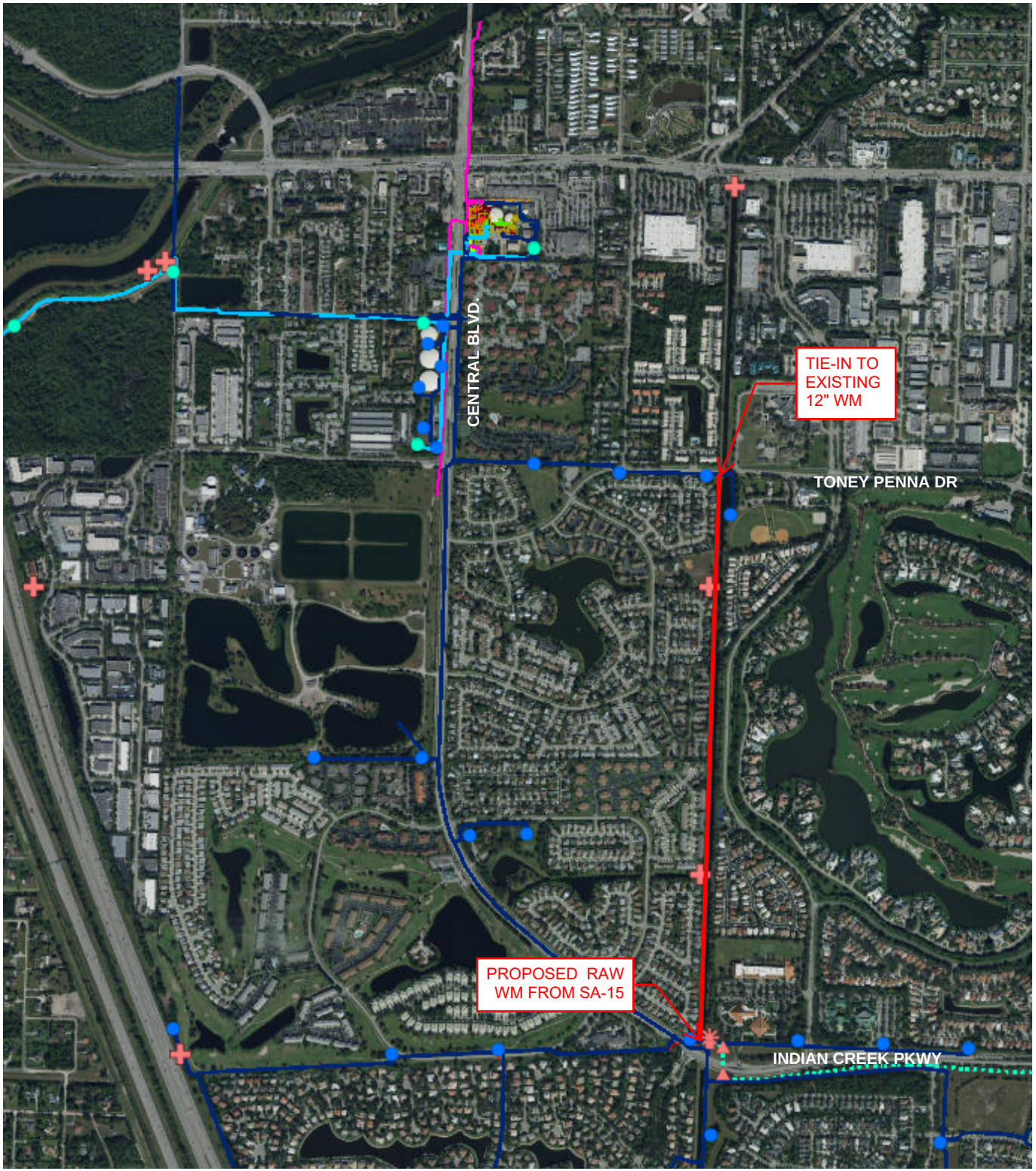

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EXHIBIT B:

PROPOSED ROUTE OF PARALLEL RAW WATERMAIN FROM SA WELL 15 (INTERSECTION OF CENTRAL BLVD. AND EGRETS LANDING BLVD.) TO TONEY PENNA DRIVE ALONG THE WEST SIDE OF THE NPBHWCD N-6 CANAL.

N

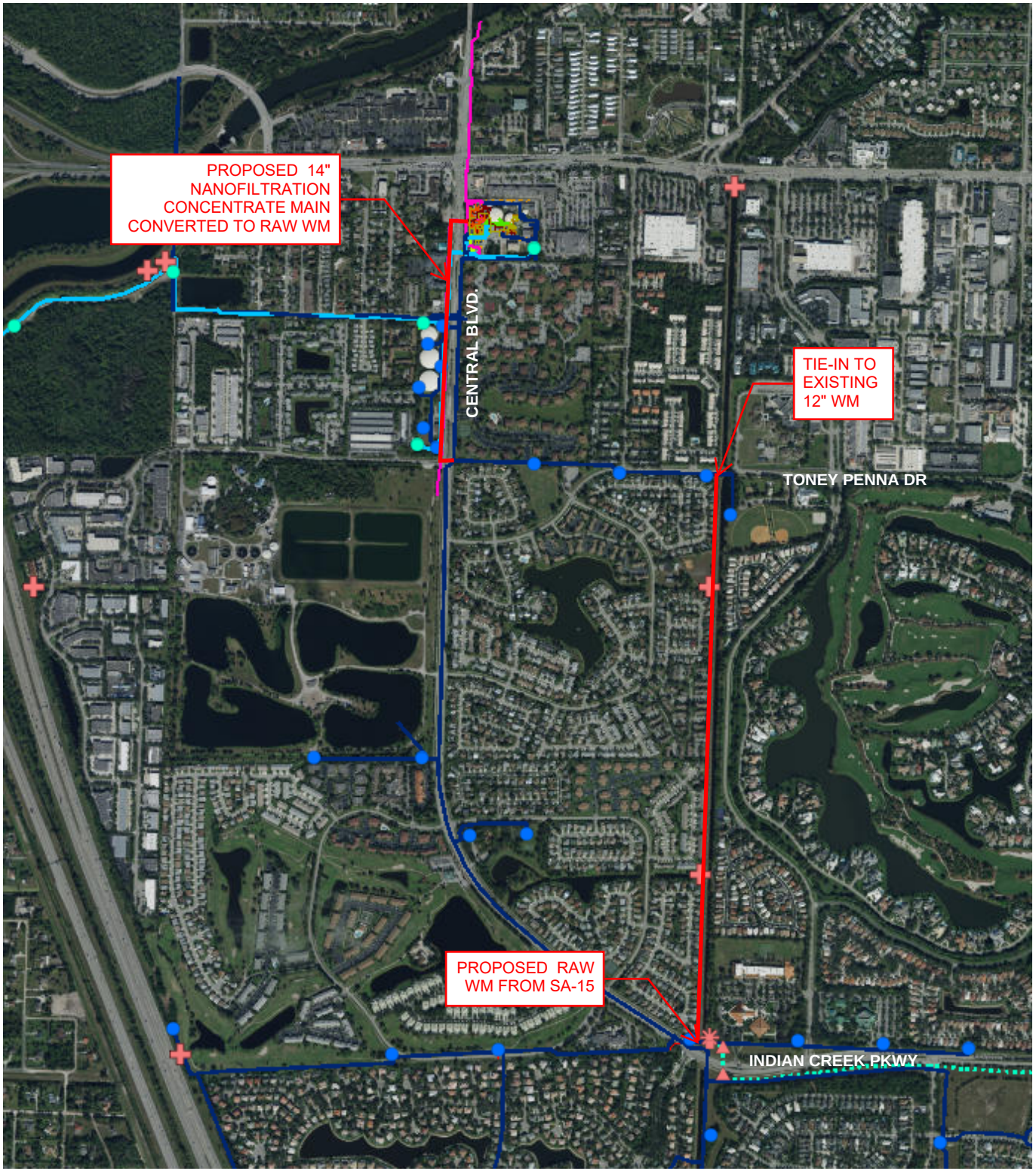

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EXHIBIT C:

PROPOSED ROUTE OF PARALLEL RAW WATERMAIN ALONG THE NPBHWCD N-6 CANAL (INTERSECTION OF CENTRAL BLVD. AND EGRETS LANDING BLVD.) AND THE 14" NANOFILTRATION CONCENTRATE MAIN CONVERTED TO A RAW WATERMAIN.

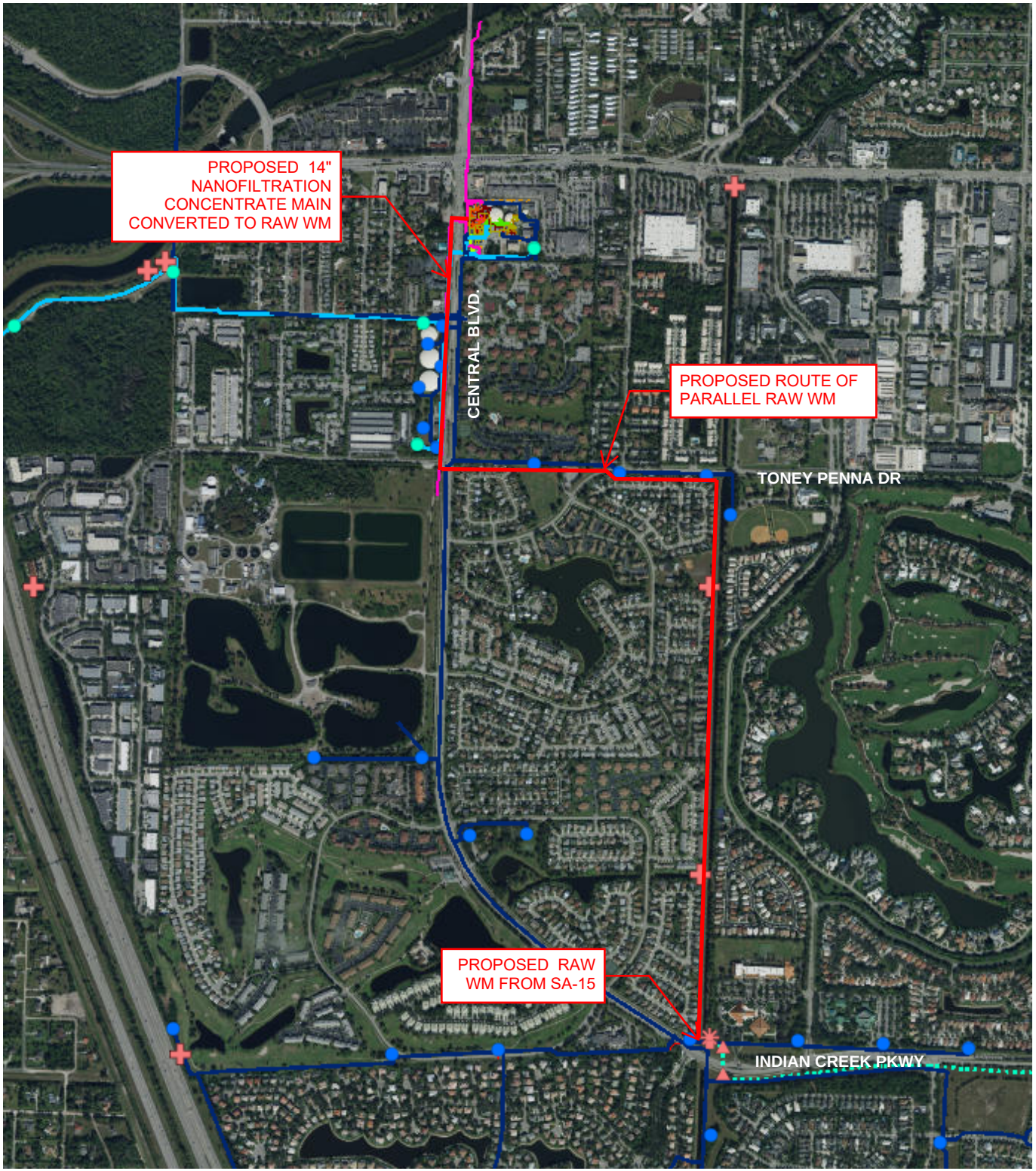

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EXHIBIT D:

PROPOSED ROUTE OF PARALLEL RAW WATERMAIN ALONG THE NPBHWCD N-6 CANAL (INTERSECTION OF CENTRAL BLVD. AND EGRETS LANDING BLVD.), PROPOSED PARALLEL RAW WATERMAIN ALONG TONEY PENNA DRIVE TO CENTRAL BLVD, AND THE 14" NANOFILTRATION CONCENTRATE MAIN CONVERTED TO A RAW WATERMAIN.

N

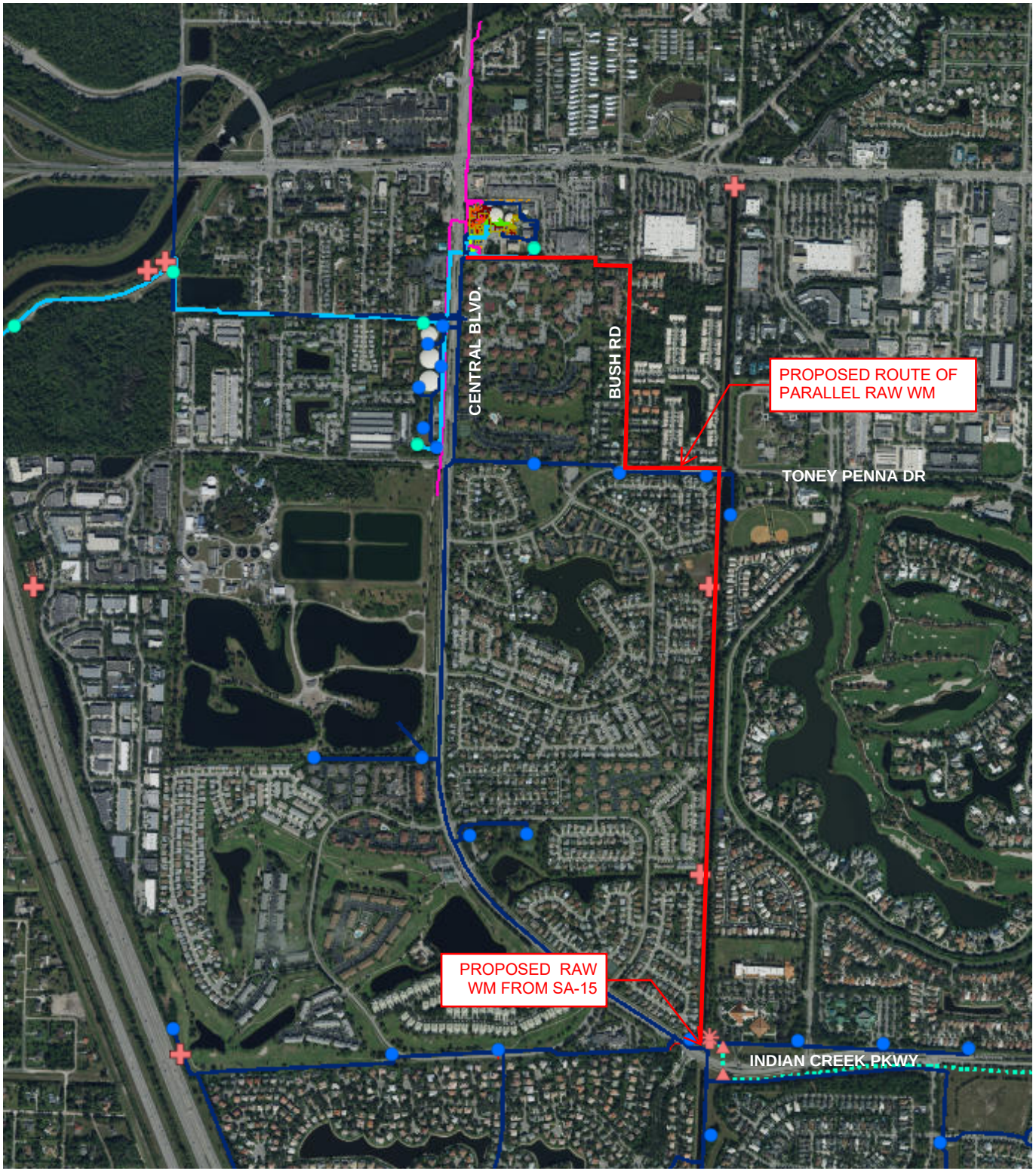

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EXHIBIT E:

PROPOSED ROUTE OF PARALLEL WATERMAIN ALONG THE NPBWCD NC-6 CANAL (INTERSECTION OF CENTRAL BLVD. AND EGRETS LANDING BLVD.) PROPOSED PARALLEL RAW WATERMAIN ALONG TONY PENNA DRIVE TO BUSH ROAD, PROPOSED RAW WATERMAIN SOUTH ALONG BUSH ROAD NORTH TO ATRIA PARK OF ST. JOSEPHS, PROPOSED RAW WATERMAIN WEST IN AN EXISTING UTILITY EASEMENT IN FRONT OF ATRIA PARK OF ST. JOSEPHS AND CONTINUE WEST BEHIND PUBLIX WITHIN EXISTING UTILITY EASEMENTS AND EXTEND INTO THE PLANT.

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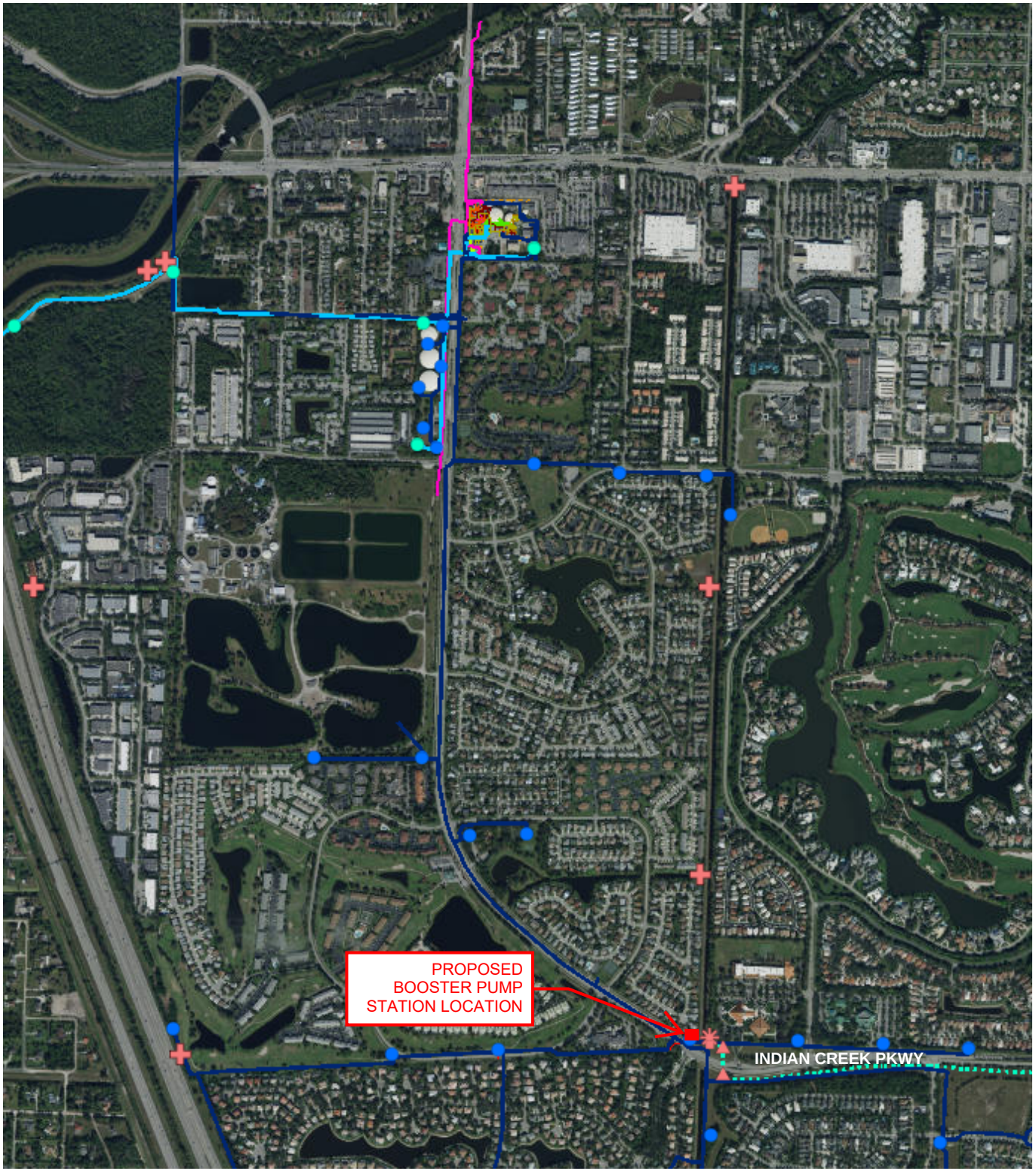
EXHIBIT F:

PROPOSED LOCATION OF BOOSTER PUMP STATION NORTH OF WELL SITE SA-15



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Appendix I:
FAS Raw Water Main Hydraulic Investigation and Improvements

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E.

Re: FAS Raw Water Main Hydraulic Investigation and Improvements

Date: March 4,2022

The Town's Floridan Aquifer (FA) wellfield consists of twelve well sites, one (RO4) is located on the water plant site, two (RO2 & RO3) are located south of the water plant at the Central Blvd Ground Storage Tank site, two (RO7 & RO10) are located west of Jupiter Gardens Boulevard and east of I-95 along the south side of the South Indian River Water Control District (SIRWCD) Rim Canal, and the remaining seven well sites (RO5, RO6, RO8, RO9, RO11, RO12 and RO13) are located west of the Florida Turnpike along the south side of the C-18 Canal. FA raw water is delivered to the water plant through a 24" high density polyethylene (HDPE) iron pipe size (IPS) DR-11 pipe that extends from RO13, the westernmost well site on the C-18 canal, to Jupiter Gardens Blvd. At the intersection of Jupiter Gardens Blvd. and Central Blvd., the raw watermain increases in diameter from 24" to 30" HDPE and heads north on Central Blvd to the water plant site. There are currently three FA wells in design and planned for construction over the next few years. RO14 will be located on the C-18 Canal southwest of RO13, and RO15 along with RO16 will be located north of Indiantown Road at Jupiter Community Park. The raw watermain for RO14 will connect to the existing 24" raw watermain at RO13 and a new raw watermain will be constructed along Island Way and connect to the existing 24" raw watermain near RO7. Well sites for two additional future FA wells (RO17 & RO18) have been identified north of Indiantown Road, along the west side of Island Way, these are important for addressing FA water quality degradation, but will not increase the rated capacity of the water plant. Figure 1 illustrates the FA well site locations and raw watermain routes.

The Town's Reverse Osmosis (RO) water treatment plant is rated at 13.7 million gallons per day (MGD) and operates at 75% recovery. The total raw water supply required to operate at the RO plant's rated capacity is 12,685 gallons per minute (GPM). The 24" raw watermain along Jupiter Gardens Drive delivers flow to the plant from all of the Town's existing and future FA wells except for RO-2, RO-3, and RO-4. Velocities through this section of raw watermain range from 10–12 feet per second (fps) when the RO plant is operating at its maximum rated capacity. These elevated velocities yield high pressures at the well sites which require large well pump motors and high operating costs, in terms of electrical power consumption.

Two potential improvements were reviewed to reduce velocities in the raw water conveyance pipeline and thereby improve efficiencies of the FA well pumps located west of Central Blvd which included:

- Installation of a parallel raw watermain from Well RO7 (west of 174th Street N and Palm Ave.) along Jupiter Gardens Drive and connecting to the existing 30" raw watermain at Central Blvd. (see Exhibit A)

- Installation of a booster pump station adjacent to Well RO7 (west of 174th Street N and Palm Ave.) (see Exhibit B)

Parallel Raw Watermain Option

The FAS raw water system was modeled utilizing WaterCAD modeling software to review the benefits of the addition of a parallel raw watermain along Jupiter Gardens Drive. The hydraulic model was developed using the previously calibrated hydraulic model of the Town of Jupiter's Floridan wellfield and updated with raw watermain design drawings for the future northern wellfield improvements. The objective for the evaluation was to determine the most efficient parallel raw watermain pipe diameter and determine the anticipated reduction in operating costs as it relates to power consumption. The well grouping listed below was modeled to review the benefits of the parallel raw watermain.

Well Group 1

Well #	Well Flow (GPM)
RO-2	1,042
RO-5	612
RO-6	612
RO-7	1,042
RO-8	1,042
RO-9	1,042
RO-10	1,042
RO-11	1,042
RO-12	1,042
RO-13	1,042
RO-14 (Future)	1,042
RO-15 (Future)	1,042
RO-16 (Future)	1,042
Total of 13 Wells in Operation	**Total Raw Water Supply Flow: 12,686 GPM**

Four different scenarios were modeled to review the potential benefits of a parallel raw watermain. The first scenario is the base condition with no improvements to the raw watermain system which will be used for comparison. The other three scenarios include the installation of an 18" diameter parallel raw watermain, a 20" raw parallel raw watermain, and a 24" diameter parallel raw watermain.

Well #	Scenario 1 Base Condition Well Pressure (PSI)	Scenario 2 18" Parallel RWM Well Pressure (PSI)	Scenario 3 20" Parallel RWM Well Pressure (PSI)	Scenario 4 24" Parallel RWM Well Pressure (PSI)
RO-2	42.6	41.9	41.8	41.6
RO-5	89.0	75.9	73.8	70.4
RO-6	82.9	69.8	67.7	64.3
RO-7	67.0	53.9	51.8	48.4
RO-8	95.6	82.4	80.4	76.9
RO-9	99.5	86.3	84.3	80.8
RO-10	75.9	62.8	60.7	57.3
RO-11	101.6	88.5	86.4	83.0
RO-12	102.8	89.6	87.6	84.1
RO-13	103.6	90.4	88.4	84.9
RO-14 (Future)	103.7	90.6	88.5	85.1
RO-15 (Future)	69.0	55.8	53.8	50.3
RO-16 (Future)	72.7	59.6	57.5	54.1

For evaluation purposes, hypothetical annual operating costs were projected in terms of cost of power for well pumping for each of the scenarios. These operating costs represent well pumps operating to supply the plant operating 365 days a year and 24 hr each day at capacity, which is not indicative of actual operating costs and used only for establishing the most efficient pipe diameter. For this evaluation $0.09 kw/hr was used for cost of power.

Base Condition Annual Operating Cost	18" Parallel RWM Annual Operating Cost	20" Parallel RWM Annual Operating Cost	24" Parallel RWM Annual Operating Cost
$461,900	$396,100	$385,700	$368,500

18" Parallel RWM Annual Cost Savings	20" Parallel RWM Annual Cost Savings	24" Parallel RWM Annual Cost Savings
$65,800	$76,200	$93,400

The construction costs for each of the three scenarios was determined. The table below lists the opinion of probable construction cost for the installation of 3,050 LF of HDPE raw watermain.

18" Parallel RWM Opinion of Probable Construction Cost	20" Parallel RWM Opinion of Probable Construction Cost	24" Parallel RWM Opinion of Probable Construction Cost
$978,000	$1,069,000	$1,247,000

The most efficient pipe diameter for this application is the pipe that yields the shortest payback of the construction cost required to implement the improvements. A discounted payback period formula was used to determine the payback period. The cost of capital is assumed to be 1% for this exercise. After reviewing the payback period (listed below) it was found that the most efficient pipe diameter for the parallel raw watermain is the 24" diameter.

18" Parallel RWM Payback Period	20" Parallel RWM Payback Period (Years)	24" Parallel RWM Payback Period (Years)
17 years	16 years	15 years

After determining the most efficient diameter parallel raw watermain with the plant operating at capacity 24 hr each day, the findings were verified with the plant operating with 6 reverse osmosis (RO) trains on, 24 hr each day for a year which is more indicative of how the FAS system normally operates.

Well Group 2

Well #	Well Flow (GPM)
RO-5	521
RO-6	521
RO-7	1,042
RO-8	1,042
RO-9	1,042
RO-10	1,042
RO-11	1,042
RO-12	1,042
RO-13	1,042
Total of 9 Wells in Operation	**Total Raw Water Supply Flow: 8,336 GPM**

The four different scenarios were again modeled to review the potential benefits of a parallel raw watermain. The first scenario is the base condition with no improvements to the raw watermain system which will be used for comparison. The other three scenarios include the

installation of an 18" diameter parallel raw watermain, a 20" raw parallel raw watermain, and a 24" diameter parallel raw watermain.

Well #	Scenario 1 Base Condition Well Pressure (PSI)	Scenario 2 18" Parallel RWM Well Pressure (PSI)	Scenario 3 20" Parallel RWM Well Pressure (PSI)	Scenario 4 24" Parallel RWM Well Pressure (PSI)
RO-5	68	61	60	58
RO-6	63	56	55	53
RO-7	52	45	44	42
RO-8	73	66	65	63
RO-9	75	68	67	65
RO-10	59	52	51	49
RO-11	76	69	68	67
RO-12	77	70	69	67
RO-13	77	70	69	67

For evaluation purposes, hypothetical annual operating costs were projected in terms of cost of power for well pumping for each of the scenarios. These operating costs represent well pumps operating to supply the plant operating 365 days a year and 24 hr each day with 6 RO trains on. For this evaluation $0.09 kw/hr was used for cost of power.

Base Condition Annual Operating Cost	18" Parallel RWM Annual Operating Cost	20" Parallel RWM Annual Operating Cost	24" Parallel RWM Annual Operating Cost
$247,500	$222,500	$218,900	$212,200

18" Parallel RWM Annual Cost Savings	20" Parallel RWM Annual Cost Savings	24" Parallel RWM Annual Cost Savings
$25,000	$28,600	$35,200

The most efficient pipe diameter for this application is the pipe that yields the shortest payback of the construction cost required to implement the improvements. A discounted payback period formula was used to determine the payback period. The cost of capital is assumed to be 1% for this exercise. After reviewing the payback period (listed below) it was found that the most efficient pipe diameter for the parallel raw watermain is the 24" diameter.

18" Parallel RWM Payback Period	20" Parallel RWM Payback Period (Years)	24" Parallel RWM Payback Period (Years)
50 years	48 years	44 years

Booster Pumping Station Option

The FAS raw water system was modeled utilizing WaterCAD modeling software to review the benefits of the addition of a booster pumping station located adjacent to FAS Well RO-7 (west of 174th Street N and Palm Ave.). The hydraulic model was developed using the previously calibrated hydraulic model of the Town of Jupiter's Floridan Aquifer wellfield and updated with raw watermain design drawings for the future northern wellfield improvements along the Island Way corridor. The objective for the evaluation is to determine if the addition of a booster pumping station will increase the efficiency of the well pumping system west of Central Blvd. and reduce the operating costs, as it relates to power consumption. The well grouping listed below was modeled to review the benefits of the booster pumping station.

Well Group 1

Well #	Well Flow (GPM)
RO-2	1,042
RO-5	612
RO-6	612
RO-7	1,042
RO-8	1,042
RO-9	1,042
RO-10	1,042
RO-11	1,042
RO-12	1,042
RO-13	1,042
RO-14 (Future)	1,042
RO-15 (Future)	1,042
RO-16 (Future)	1,042
Total of 13 Wells in Operation	**Total Raw Water Supply Flow: 12,686 GPM**

Three different scenarios were modeled to review the potential benefits of a booster pumping station. The first scenario is the base condition with no improvements to the raw watermain system, which will be used for comparison. The other two scenarios include the installation of a booster pumping station, which was modeled for the booster station to maintain suction

pressures at 30 psi and 15 psi. Flow from RO-2 is not pumped by the Booster Station and therefore the pumping capacity of the Booster Station is 11,644 gpm.

Well #	Scenario 1 Base Condition - Well Pressure (PSI)	Scenario 2 Booster Station at 30psi Suction - Well Pressure (PSI)	Scenario 3 Booster Station at 15psi Suction - Well Pressure (PSI)
RO-2	42.6	46.6	46.6
RO-5	89.0	70.6	55.6
RO-6	82.9	64.5	49.5
RO-7	67.0	48.6	33.6
RO-8	95.6	77.2	62.2
RO-9	99.5	81.1	66.1
RO-10	75.9	57.5	42.5
RO-11	101.6	83.3	68.2
RO-12	102.8	84.4	69.4
RO-13	103.6	85.2	70.2
RO-14 (Future)	103.7	85.3	70.3
RO-15 (Future)	69.0	50.6	35.6
RO-16 (Future)	72.7	54.3	39.3

The booster pump station discharge pressure is required to be 60 psi to deliver 11,644 gpm at design operating condition at plant capacity. It is anticipated that the booster station would be equipped with four pumps to meet the design operating condition at plant capacity. The Scenario 2 Booster Station would be equipped with 75 hp pumps and the Scenario 3 booster pump station would be equipped with 100 hp pumps.

For evaluation purposes hypothetical annual operating costs were projected in terms of cost of power for well and booster pumping for each of the scenarios. These operating costs represent the plant operating 24 hr each day at capacity which is not indicative of actual operating costs and used only for comparison purposes with the parallel raw watermain option. For this evaluation $0.09 kw/hr was used for cost of power.

Base Condition - Annual Operating Cost	Booster Station at 30psi Suction - Annual Operating Cost	Booster Station at 15psi Suction - Annual Operating Cost
$462,000	$521,600	$521,500

The addition of the booster pumping station was found to increase the overall pumping costs. Due to the increased operating costs the booster station option was not reviewed further.

Conclusion

The payback period for the new parallel raw watermain is within one year of the service life of this new pipeline. Due to the payback period the installation of a parallel raw watermain is not recommended at this time. The Town has assigned a service life of 45 years to underground watermains. The existing 24" raw watermain along Jupiter Gardens Drive was installed in 1993 and will reach its useful service life in 2038. Due to the findings of this investigation, it is recommended that the 24" HDPE RO raw watermain on Jupiter Gardens Drive be replaced with a 36" diameter HDPE DR-11 raw watermain when the existing main reaches its useful service life.

Opinion of Probable Construction Costs

36" Raw Water Main	$1,783,000
Engineering, Survey, Permitting, Construction Phase	$357,000
TOTAL	$2,140,000

Attachments: EXHIBIT A- FAS PARALLEL RAW WATERMAIN
EXHIBIT B-FAS BOOSTER PUMP STATION
Figure 1

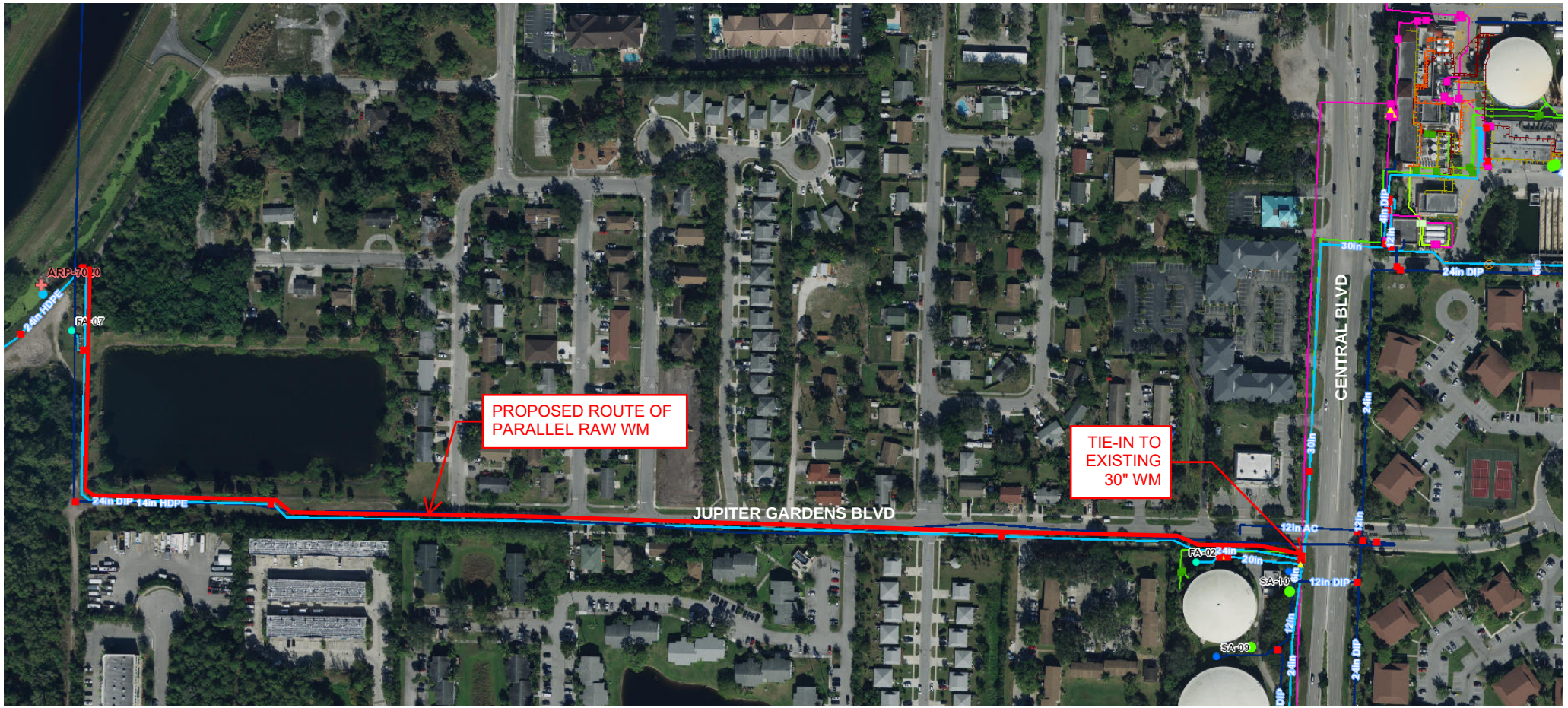

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EXHIBIT A: NEW PARALLEL RAW WATERMAIN

PROPOSED RAW WATERMAIN TO TIE-IN TO EXISTING 30" RAW WATERMAIN ON CENTRAL BLVD AND JUPITER GARDENS BLVD

N

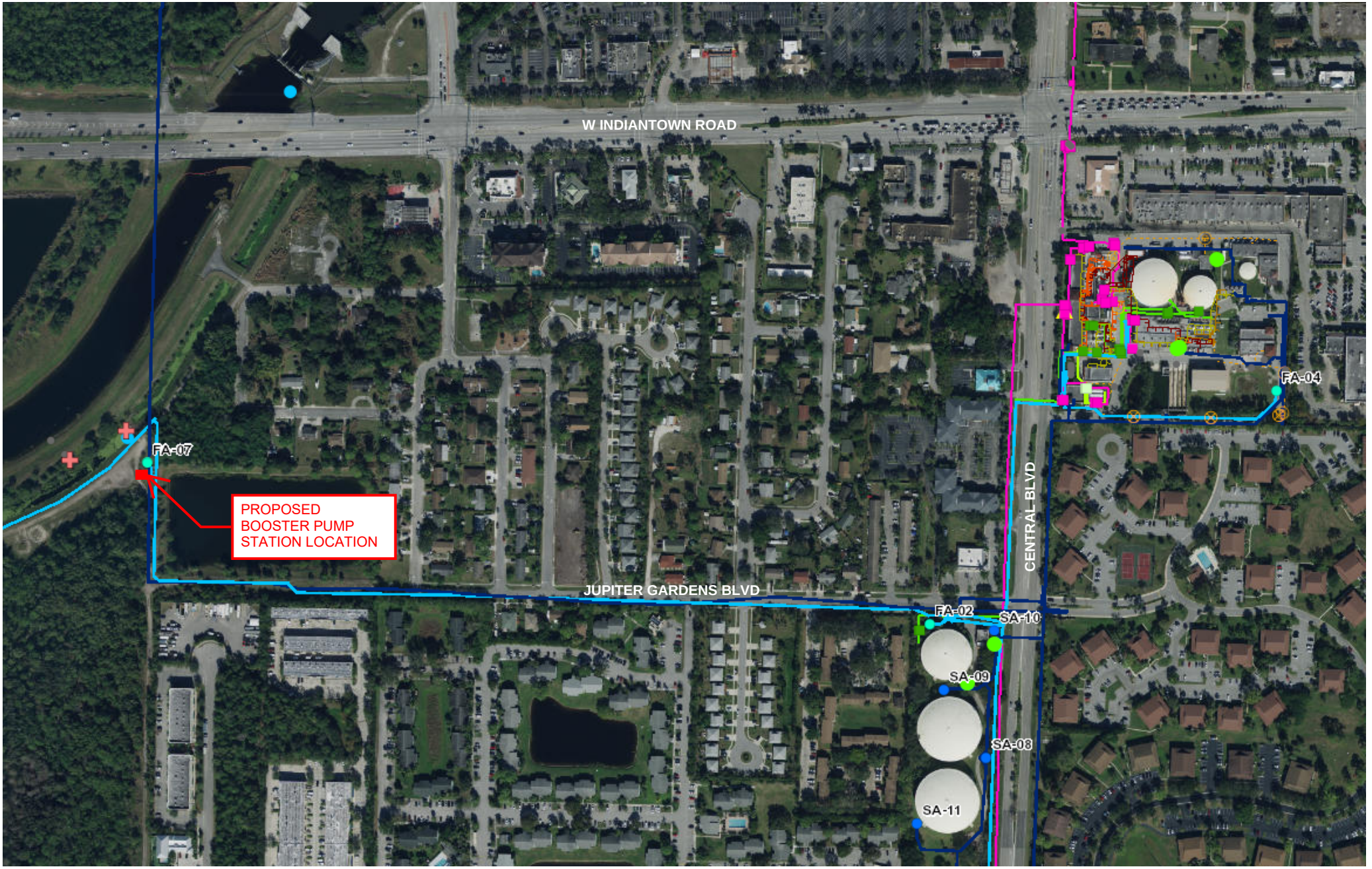

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EXHIBIT B: BOOSTER PUMP STATION

PROPOSED LOCATION OF NEW BOOSTER PUMP STATION

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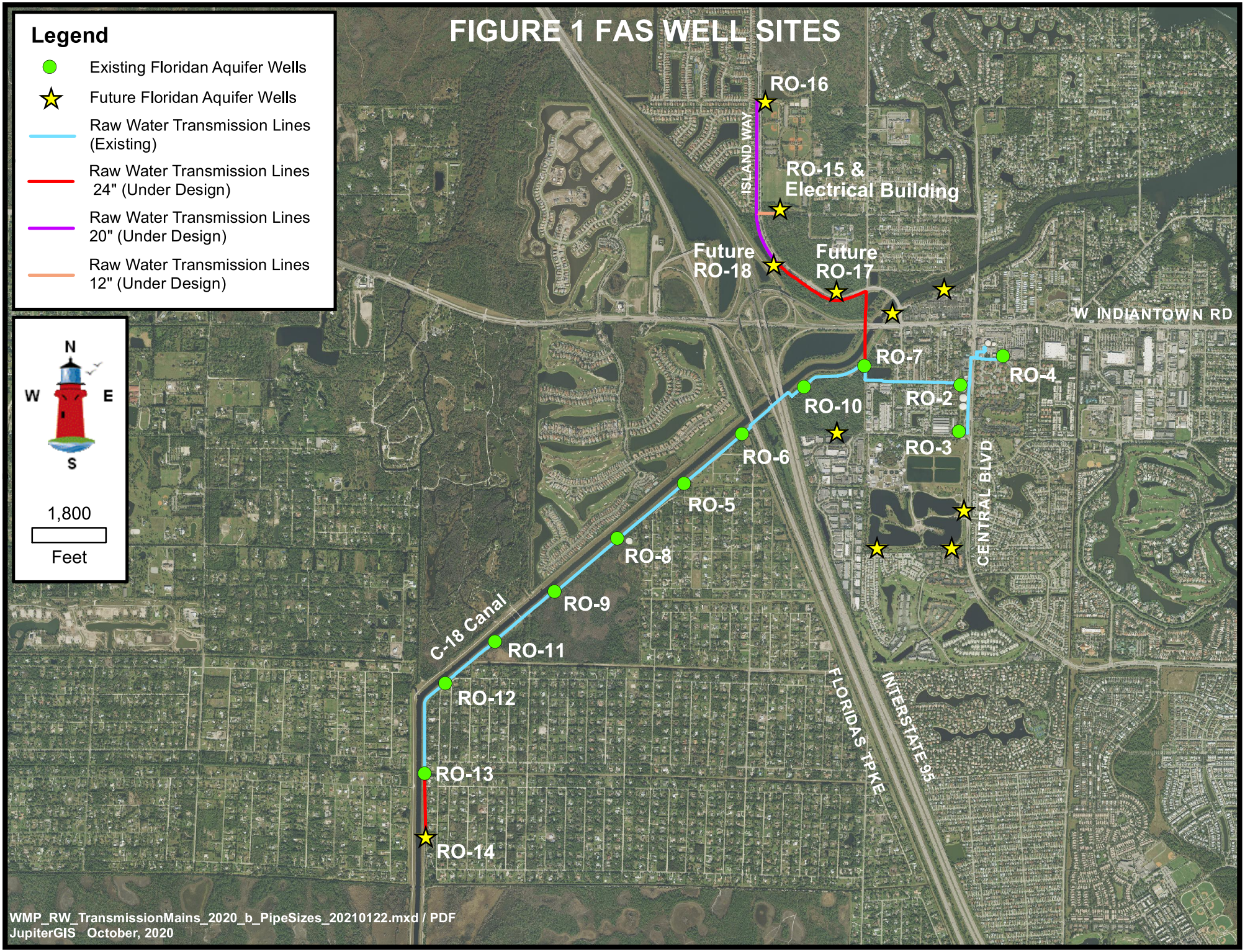


FIGURE 1 FAS WELL SITES
Legend
Existing Floridan Aquifer Wells
Future Floridan Aquifer Wells
Raw Water Transmission Lines (Existing)
Raw Water Transmission Lines 24" (Under Design)
Raw Water Transmission Lines 20" (Under Design)
Raw Water Transmission Lines 12" (Under Design)
N
W
E
S
1,800
Feet
RO-16
ISLAND WAY
RO-15 & Electrical Building
Future RO-18
Future RO-17
W INDIANTOWN RD
RO-7
RO-4
RO-2
RO-10
RO-3
RO-6
CENTRAL BLVD
RO-5
RO-8
RO-9
C-18 Canal
RO-11
RO-12
FLORIDAS TPKE
INTERSTATE 95
RO-13
RO-14
WMP_RW_TransmissionMains_2020_b_PipeSizes_20210122.mxd / PDF
JupiterGIS October, 2020

Appendix J-1:
Technical Memorandum Conceptual Analysis of Blending NF Concentrate with FAS Raw Water

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E., John Potts, P.E.

Re: Conceptual Analysis of Blending NF Concentrate with FAS Raw Water

Date: March 4, 2022

BACKGROUND

The purpose of this Technical Memorandum (TM) is to present preliminary findings regarding the concept of blending nanofiltration (NF) concentrate with Floridan Aquifer Supply (FAS) raw water and the blend becoming feed water to the existing Reverse Osmosis (RO) trains.

This concept was suggested by Water System staff as a method for disposing of NF concentrate in response to statement expressed by Loxahatchee River District (LRD) that their current practice of accepting NF concentrate for use in the Irrigation quality water system would not be continued beyond expiration of the current agreement.

This Master Plan Update includes installation of a Deep Injection Well (DIW) for disposal of both NF and RO concentrate; however, there are a number of benefits to blending NF concentrate with RO raw water and it is appropriate to understand an alternative to installation of a DIW.

Based on a preliminary analysis, this concept has significant positive potential in reducing capital improvements projected to be required in the future if the FAS raw water continues to increase in TDS content. Possible benefits include the following.

1. Reduce the amount of FAS raw water required which reduces the FAS raw water supply system flow rate and therefore also pressure required in the FAS raw water pipe network. Elimination of only one future FAS well could save an estimated $3,000,000.
2. Eliminate the projected need for a second pass on the RO trains to reduce total RO permeate total dissolved solids (TDS) by reducing the raw water TDS. Eliminating this future project could save the $2,500,000 estimated cost of this improvement.

3. Eliminate the need for the projected plant site FAS raw water booster station by reducing the required RO feed pressure. Eliminating this future project could save the $6,500,000 estimated cost of this improvement.
4. Eliminate the projected NF concentrate booster pumps by eliminating concentrate flow to LRD. These pumps will be required in the future as NF plant concentrate pressure increases due to fouling in the concentrate transmission main to LRD as well as increased concentrate flow. Membranes that operate at lower feed pressure will have a lower train concentrate pressure which may not be adequate to operate the concentrate transmission main. The estimated cost of these pumps is $600,000.
5. Provide a portion of a parallel SAS raw water main along Central Blvd. to supplement the existing 24" raw water main along Central Blvd. which is at its capacity. There is no estimated cost associated with this element.
6. Provide the ability to further reduce RO feed pressure and RO permeate TDS by adding lower TDS SAS raw water to the blend. There is no estimated cost associated with this element
7. Reduce daily plant operating costs by reducing required RO feed pressure which reduces electrical power required. This potential reduction in operating cost varies considerably based on the amount of NF concentrate or SAS raw water being blended. There is no estimated cost associated with this element

Implementing this concept will require some level of treatment of the NF concentrate prior to blending with FAS raw water. An extensive amount of information was presented in the series of autopsies performed on the NF membranes that provides indications of the level of treatment that could be required. The NF concentrate would not require filtration for particulate matter in the raw water as this has been provided by the NF pretreatment and NF treatment systems. NF concentrate may require filtration for precipitants produced during the membrane process and products of oxidation formed during membrane treatment by the oxygen present in the SAS raw water. A possible treatment process would be oxidation to complete that process followed by oxidant removal followed by sand filtration. There is a possibility that very little treatment will be needed due to the favorable reactions that may occur when fresh water with an organic content is blended with brackish water.

Establishing the treatment process that can successfully and reliably treat the NF concentrate is critical to this concept remaining a part of the Master Plan. Pretreatment processes can be pilot tested using NF concentrate and pilot scale treatment units. Pilot scale testing of the treatment systems are required that will satisfactorily prepare the NF concentrate to be blended into the FAS raw water with no changes to the FAS

raw water that impacts the RO operation. This pilot testing could be set up in the NF building in the area of the NF Pilot Unit.

A pilot testing element is included in this element of the Master Plan and intended to be started on approval of the Master Plan. The pilot program is intended to be staffed and conducted by the University of Central Florida (UCF) College of Engineering and Computer Science's Civil, Environmental and Construction Engineering Department (CECE) as part of the continuing research program. The recommended budget includes frequent laboratory testing. Pilot testing is investigative in nature and can be expected to continue for 6 to 12 months.

If required, the NF concentrate pretreatment filtration system could be located in the area between the NF pretreatment filters and the adjacent road to the east. This location requires only a short extension of the concentrate pipe and the FAS raw water piping is close to this location. Electrical power is available from the NF facilities. An advantage in this location is the ability to share the existing backwash facilities which reduces implementation cost and operating complexity.

This treatment arrangement would require two filter units to allow the NF plant to operate during a filter backwash. A single unit with two filter cells, similar to one of the existing units, could be adequate to provide redundancy. Each filter cell would be rated at 3.0 MGD.

The oxidant is assumed to be chlorine and would be injected in the NF concentrate near the northwest corner of the NF Building. The concentrate piping would serve as the contact zone.

The oxidant removal chemical is assumed to be sodium bisulfide and would use the filter as the contact zone. These facilities could be located in the existing Pretreatment Polymer Room.

Residual concentrate pressure would be adequate to operate the concentrate treatment filtration, if required; however, a pump station is needed to provide adequate pressure and flow control to place the treated NF concentrate into the FAS raw water flow. This pump station is needed if a filtration system is not required since the NF concentrate residual pressure is not adequate to reliably enter the FAS raw water system. The pump station will require a wet well for flow buffering and operate with a nitrogen blanket to prevent oxygen entering the NF concentrate. A preliminary capacity target is 3 MGD (2,085 GPM) at 40 PSI. Assuming 3 pumps with one being redundant, these would be approximately 40 horsepower each. A preliminary assumption for buffer storage is 10,000 gallons which is 5 minutes of operation at the design flow rate. Assuming storage depth is 6', the wet well would be approximately

15' by 15'. The pump station can be before or after the filter unit which provides flexibility in locating this facility.

This pump station could be located in the currently paved area adjacent to the northwest corner of the existing storm water pond.

The proposed NF concentrate treatment facilities are shown on **Exhibit I**.

The filtration process will generate a backwash stream that requires treatment in the form of settling any particulate matter and disposal of the water. Settling would occur in the existing Backwash Recovery Basin and the settled water added to the DIW Pump station for discharge into the DIW.

Three tasks were conducted to perform a desktop analysis of the concept to blend NF concentrate with FAS raw water. Most of the groundwork for the first 2 tasks was completed by Water System staff.

1. An analysis was conducted to determine criteria to predict the ratio of FAS and SAS water in each blend water.
2. Projections were prepared using the resulting RO feed water quality.
3. Membrane performance projections were prepared using the RO feed water resulting from the blend.

Table 1 presents a summary of RO and NF production during 2019-2021, potential RO to NF ratios based on likely on-line train scenarios, and calculations of FAS raw water to NF concentrate ratios.

The historical RO:NF production ratio is 45%:55%, which is in keeping with the ratio that produces the best quality water drinking water. This desktop study will accept that as the design ratio.

For the purposes of this TM, the following percentages were used which show that there is promise to the concept of blending NF concentrate with RO raw water. The percentages used in this TM are not set in stone and will be refined as needed during bench testing and pilot testing.

The RO and NF plants must operate at production rates based on the flow rate per on-line trains. **Table 1** demonstrates that a ratio of 45%:55% is possible as an average.

Ratios that bracket the 45%:55% ratio were selected to use in preparing projected RO feedwater quality. Ratios of 41%:59% and 61%:39% allow the membrane

performance projections to show sensitivity of RO train performance to the amount of NF concentrate in the blend. The desktop study RO feed water will contain 19% and 9% NF concentrate, respectively.

It must be noted that the RO:NF production ratio will decrease in the future as the RO TDS value increases reflecting the FAS TDS increase.

Tables 2-5 present the projected RO feedwater quality based on assumed FAS TDS of 6,700, 8,500, 9,500, and 11,500 with 9% and 19% NF concentrate in each FAS water TDS value. These tables do not reflect an increase in NF concentrate blend rate that may be instituted to offset an increase in FAS TDS and the resulting increase in RO permeate TDS.

Table 6 presents a summary of selected membrane projections with varying FAS TDS values and varying NF concentrate blends. **Table 6** shows that feed pressure decreases are noticeable, as are decreases in permeate TDS. Membrane projections when FAS TDS reaches 11,500 show that without NF concentrate blend, the feed pressure exceeds the available 290 psi and permeate TDS exceeds the target 130 TDS. A 19% NF concentrate blend brings both of these parameters into a range that would eliminate the need for a raw water booster pump at the WTP and a second pass on each RO Train. The current Master Plan assigns costs of $6,500,000 and $2,500,000 to these improvements.

These tables are attached as Exhibits 1 through 6.

If NF concentrate blend is adopted, the facilities will be in place to also add SAS raw water to the blend. The SAS raw water would pass through the same pretreatment process as proposed for NF concentrate and the reduction in RO feed pressure, as well as permeate TDS, would require only 20% of the concentrate flow since NF concentrate is SAS raw water concentrated 5 times.

Conclusions

The following conclusions were reached in this TM.

Pilot scale testing is required of the treatment systems that will satisfactorily prepare the NF concentrate to be blended into the FAS raw water with no changes to the FAS raw water that impacts the RO operation. This pilot testing could be set up in the NF building in the area of the NF Pilot Unit.

A pilot testing component is included in this element of the Master Plan and intended to be started on approval of the Master Plan. The pilot program is intended to be staffed and conducted by the University of Central Florida (UCF) College of

Engineering and Computer Science's Civil, Environmental and Construction Engineering Department (CECE) as part of the continuing research program. The recommended budget includes frequent laboratory testing. Pilot testing is investigative in nature and can be expected to continue for 6 to 12 months.

The concept offers significant reductions in future improvements that will be needed if the FAS raw water TDS exceeds approximately 10,000. These improvements that could be avoided carry a combined cost of $12,600,000. Additionally, there will be significant reductions in daily operating cost based on the feed pressure reduction that occurs with reducing the RO feed water TDS.

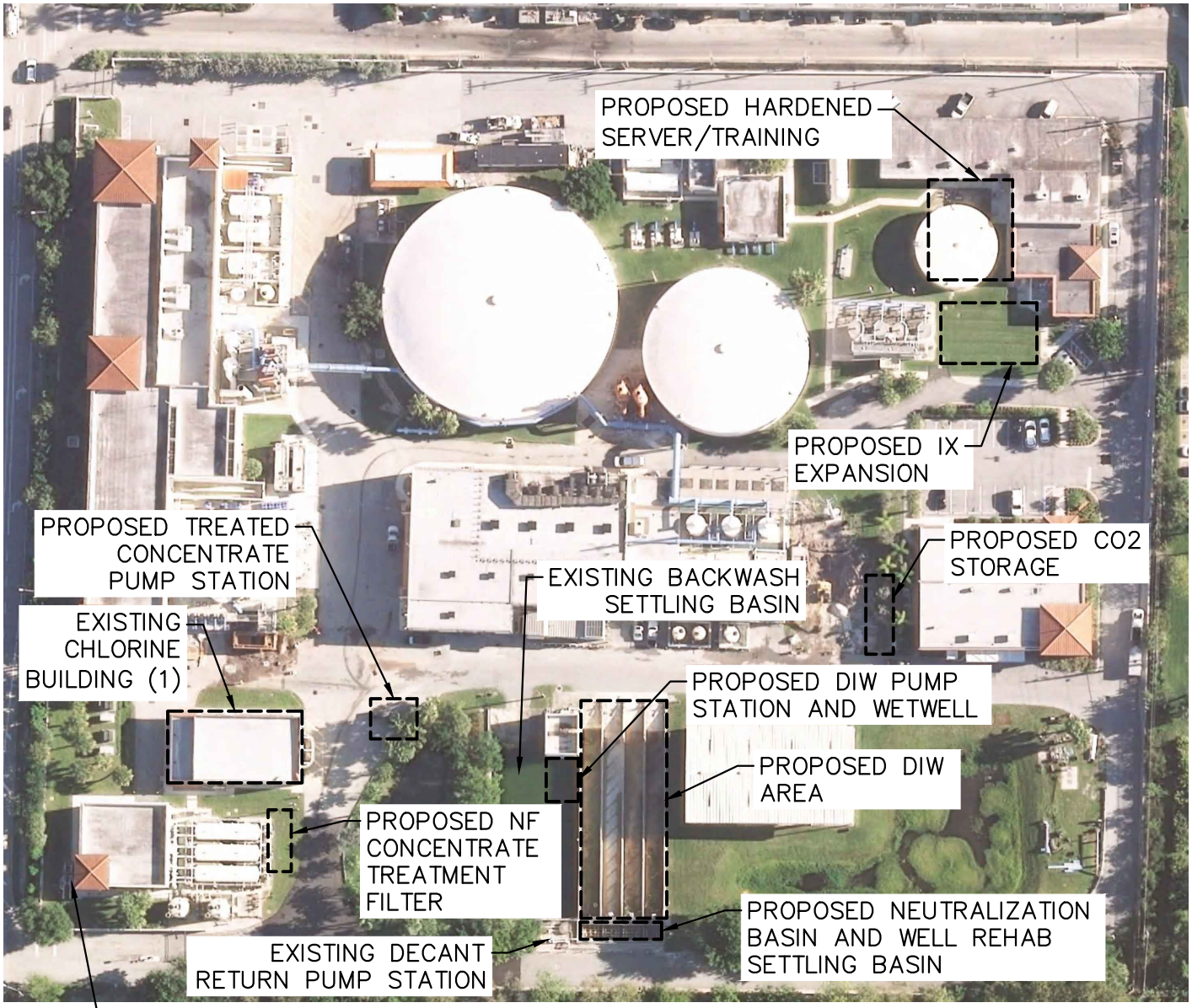
The significant reduction in daily operating cost identified in the preceding paragraph will be realized with implementation of this concept and benefit the Utility even if the FAS raw water does not increase and regardless of how much the raw TDS increases.

OPINION OF PROBABLE COST

The following is the recommended budget for implementing the new and modified facilities discussed in this TM for implementing NF concentrate with FAS raw water. The values presented below include engineering and construction phase.

NF Concentrate Pump Station	$500,000
Dual Section Filter Unit with Backwash Pump & Blower	$300,000
Controls	$200,000
Chemical Injection Facilities	$150,000
Pilot Testing	$600,000
Piping	$200,000
Bioassay Testing	$100,000
Engineering and Construction Phase	$350,000
TOTAL	**$2,400,000**

Attachments: Exhibit I WTP Site Plan
Exhibits 1-6, Tables 1-6



WTP SITE PLAN

GRAPHIC SCALE IN FEET
0 50 100 200

NORTH

(1) SODIUM HYPOCHLORITE STORAGE AND RAW WATER BOOSTER STATION INSIDE BUILDING

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

Drawing name: K:\WPB_Civil\044001257 2022 Update of Water System MP\CAD\Exhibits\Master Plan Water Treatment Plant Overview.dwg Mar 01, 2022 12:00pm by: Casey.Staller

SCALE: AS NOTED DESIGNED BY JEP DRAWN BY CFS CHECKED BY JRL	Kimley»Horn © 2021 KIMLEY-HORN AND ASSOCIATES, INC. 1920 WEKIVA WAY SUITE 200, WEST PALM BEACH, FL 33411 PHONE: 561-845-0665 FAX: 561-863-8175 WWW.KIMLEY-HORN.COM REGISTRY NO. 35106	MAR. 2022 PROJECT NO. 044001257	OVERALL WTP SITE PLAN PREPARED FOR TOWN OF JUPITER JUPITER FLORIDA	DESIGN ENGINEER: JOHN E. POTTS FLORIDA P.E. LICENSE NUMBER: 2281 DATE:	SHEET NUMBER EXHIBIT 1

TABLE 1

Town of Jupiter Water System

2022 Master Plan Update

FAS Raw Water to NF Concentrate Ratio

9/15/2021

Average Blend Ratios from 2019-21

	RO Permeate	NF Permeate
Historical	45%	55%
Max NF	40%	60%
Max RO	50%	50%

Flow per Train, Mgal

	RO	NF
Raw	2.00	3.41
Permeate	1.50	2.90
Concentrate	0.50	0.51

Potential Blend Scenarios Based on Train Operation

RO Trains	NF Trains	% RO	% NF
3	2	44%	56%
4	2	51%	49%
4	3	41%	59%
5	3	46%	54%
6	2	61%	39%
6	4	44%	56%
7	4	48%	52%
7	5	42%	58%
8	4	51%	49%
8	5	45%	55%
4	4	34%	66%
4	5	29%	71%

Run model to predict adjusted RO feedwater

RO/NF Train Blend	RO Raw Water	NF Concentrate	Adj RO Raw Water	% NF Conc in RO Raw
46%/54%	10.00	1.54	8.46	15%
41%/59%	8.00	1.54	6.46	19%
61%/39%	12.00	1.02	10.98	9%
34%/66%	8.00	2.05	5.95	26%
29%/71%	8.00	2.56	5.44	32%

TABLE 2
Town of Jupiter Water System
2022 Master Plan Update
Projected RO Raw Water Feedwater Quality
With FAS TDS at 6700
11/23/2021

Parameter	RO Raw Water at 6700 TDS	NF Concentrate	Adj RO Feedwater 19% NF Conc	Adj RO Feedwater 9% NF Conc
Alkalinity as CaCO3	NA	474.76	#VALUE!	#VALUE!
Aluminum	0.12	0.00	0.10	0.11
Ammonia as N	0.90	0.77	0.87	0.89
Barium	0.0300	0.0180	0.0277	0.0289
Boron	0.57	0.057	0.47	0.52
Bromide	13.70	0.00	11.1	12.4
Calcium	234.00	458.20	277.0	254.8
Chloride	3700.00	66.29	3002.6	3362.4
Conductivity	9181.50	2091.44	7820.8	8522.9
Fluoride	1.80	1.58	1.76	1.78
Iron	0.00	0.99	0.19	0.09
Magnesium	310.00	23.77	255.1	283.4
pH	7.36	6.82	7.3	7.3
Phosphorous	ND	NA	TBD	TBD
Potassium	141.00	5.13	114.9	128.4
Silica	13.00	17.94	13.9	13.5
Sodium	1698.00	56.57	1383.0	1545.5
Strontium	20.00	3.47	16.8	18.5
Sulfate	549.00	786.22	594.5	571.0
Temperature	72.90	NA	TBD	TBD
Total Dissolved Solids	6762.37	1818.11	5813.5	6303.1
Total Nitrogen	1.19	NA	TBD	TBD
Total Organic Carbon	1.45	73.73	15.3	8.2

TABLE 3
Town of Jupiter Water System
2022 Master Plan Update
Projected RO Raw Water Feedwater Quality
With FAS TDS at 8500
11/23/2021

Parameter	RO Raw Water at 8500 TDS	NF Concentrate	Adj RO Feedwater 19% NF Conc	Adj RO Feedwater 9% NF Conc
Aluminum	0.12	0.00	0.10	0.11
Ammonia as N	0.90	0.77	0.87	0.89
Barium	0.0400	0.0180	0.0358	0.0380
Boron	0.57	0.057	0.47	0.52
Bromide	13.70	0.00	11.1	12.4
Calcium	297.00	458.20	327.9	312.0
Chloride	4694.00	66.29	3805.9	4264.1
Conductivity	13688.00	2091.44	11462.5	12610.7
Fluoride	1.80	1.58	1.76	1.78
Iron	0.00	0.99	0.19	0.09
Magnesium	394.00	23.77	322.9	359.6
pH	7.36	6.82	7.3	7.3
Phosphorous	ND	NA	TBD	TBD
Potassium	179.00	5.13	145.6	162.8
Silica	16.00	17.94	16.4	16.2
Sodium	2154.00	56.57	1751.5	1959.2
Strontium	25.00	3.47	20.9	23.0
Sulfate	696.00	786.22	713.3	704.4
Temperature	72.90	NA	TBD	TBD
Total Dissolved Solids	8552.38	1818.11	7260.0	7926.8
Total Nitrogen	1.19	NA	TBD	TBD
Total Organic Carbon	1.45	73.73	15.3	8.2

TABLE 4
Town of Jupiter Water System
2022 Master Plan Update
Projected RO Raw Water Feedwater Quality
With FAS TDS at 9500
11/23/2021

Parameter	RO Raw Water at 9500 TDS	NF Concentrate	Adj RO Feedwater 19% NF Conc	Adj RO Feedwater 9% NF Conc
Alkalinity as CaCO3	NA	474.76	#VALUE!	#VALUE!
Aluminum	0.12	0.00	0.10	0.11
Ammonia as N	0.90	0.77	0.87	0.89
Barium	0.0400	0.0180	0.0358	0.0380
Boron	0.57	0.057	0.47	0.52
Bromide	13.70	0.00	11.1	12.4
Calcium	234.00	458.20	277.0	254.8
Chloride	5247.00	66.29	4252.8	4765.7
Conductivity	15299.00	2091.44	12764.3	14072.1
Fluoride	1.80	1.58	1.76	1.78
Iron	0.00	0.99	0.19	0.09
Magnesium	440.00	23.77	360.1	401.3
pH	7.36	6.82	7.3	7.3
Phosphorous	ND	NA	TBD	TBD
Potassium	200.00	5.13	162.6	181.9
Silica	18.00	17.94	18.0	18.0
Sodium	2407.00	56.57	1955.9	2188.7
Strontium	28.00	3.47	23.3	25.7
Sulfate	778.00	786.22	779.6	778.8
Temperature	72.90	NA	TBD	TBD
Total Dissolved Solids	9449.38	1818.11	7984.9	8740.5
Total Nitrogen	1.19	NA	TBD	TBD
Total Organic Carbon	1.45	73.73	15.3	8.2

TABLE 5
Town of Jupiter Water System
2022 Master Plan Update
Projected RO Raw Water Feedwater Quality
With FAS TDS at 11,500
9/15/2021

Parameter	RO Raw Water at 11500 TDS	NF Concentrate		
			Adj RO Feedwater 19% NF Conc	Adj RO Feedwater 9% NF Conc
Alkalinity as CaCO3	NA	474.76	–	–
Aluminum	0.12	0.00	0.10	0.11
Ammonia as N	0.90	0.77	0.87	0.89
Barium	0.0500	0.0180	0.0439	0.0470
Boron	0.57	0.057	0.47	0.52
Bromide	13.70	0.00	11.1	12.4
Calcium	401.00	458.20	412.0	406.3
Chloride	6351.00	66.29	5144.9	5767.2
Conductivity	18519.00	2091.44	15366.4	16992.9
Fluoride	1.80	1.58	1.76	1.78
Iron	0.00	0.99	0.19	0.09
Magnesium	532.00	23.77	434.5	484.8
pH	7.36	6.82	7.3	7.3
Phosphorous	ND	NA	TBD	TBD
Potassium	242.00	5.13	196.5	220.0
Silica	22.00	17.94	21.2	21.6
Sodium	2914.00	56.57	2365.6	2648.6
Strontium	33.00	3.47	27.3	30.3
Sulfate	942.00	786.22	912.1	927.5
Temperature	72.90	NA	TBD	TBD
Total Dissolved Solids	11534.39	1818.11	9669.7	10631.8
Total Nitrogen	1.19	NA	TBD	TBD
Total Organic Carbon	1.45	73.73	15.3	8.2

TABLE 6
Town of Jupiter Water System
2022 Master Plan Update
Comparison of RO Train Performance
with NF Concentrate Blended in FAS Raw Water
1/6/2022

	FAS TDS	% NF Conc	Feed P	Boost	Flux	Permeate TDS
	6700	0	240	130	13.3/12.1	82
	6700	9	227	130	13.1/12.4	73
	6700	19	217	110	13.1/12.2	12.2
	8500	0	281	150	13.6/11.2	115
	8500	9	260	150	13.3/12.1	100
	8500	19	240	150	12.9/13.0	86
	9500	0	293	185	13.2/12.1	131
	9500	9	273	175	13.1/12.6	114
	9500	19	253	165	12.9/13.0	98
	11500	0	354	185	14.1/10.1	180
	11500	9	323	185	13.7/11.1	154
	11500	19	290	185	13.2/12.2	130

Projections use DUPONT BW30HR 440i Elements, 0.85 Flow Factor, 31:13:6E Array

Appendix J-2:
Proposed Pilot Study Schedule (Preliminary Draft) for Blending Nanofiltration Concentrate with Reverse Osmosis Feed Water

Town of Jupiter FL
Blending Nanofiltration Concentrate into Reverse Osmosis Feed Water Membrane Performance Study
Preparer: Dr. Steve Duranceau, P.E. (UCF)

Proposed Study Schedule (Preliminary Draft)

Task and Brief Description

Bench Test Plan & Protocol Activity 1. Prepare and distribute the test plan and protocol for sampling needs relevant to a bench-scale evaluation designed to study impact of blending nanofiltration (NF) concentrate with reverse osmosis (RO) feedwater; evaluate impacts on turbidity and color formation. Blends may include NF concentrate containing concentrated dispersant inhibitor with RO raw water supply or blends of NF concentrate containing dispersant-based scale inhibitor with RO feed water containing polyacrylic acid-based scale inhibitor. The effectiveness of scale inhibition of the blend will be measured by the ratio of dissolved calcium and total calcium concentration. Test plan to include lit. review of additional pre-treatment unit processes to consider for blend

Pilot Test Plan and Protocol Activity 2. Prepare and distribute the test plan and protocol for sampling needs relevant to an RO pilot-scale evaluation designed to study impact of blending NF concentrate with RO feedwater (note: dependent on bench-study to determine if blend location, either upstream or downstream of RO inhibitor addition.)

Full-Scale Test Plan and Protocol Activity 3. Prepare and distribute the test plan and protocol for sampling needs relevant to an RO full-scale (Train I) demonstration-scale evaluation designed to study impact of blending NF concentrate with RO feedwater (note: the exact blend location, either upstream or downstream of RO inhibitor addition, is to be determined prior to the implementation of this activity.)

Bench Testing Timeline (Activity 1). Bench-scale (lab) NF concentrate blending with RO feed water study timeline. Summarize findings of lit review and short-list recommended pre-treatment processes to consider for blend

Pilot Preparation & Mobilization (Activity 2). Town to plan for and install adequately-sized pipeline to convey NF concentrate from NF building to RO process room and connect to RO feed water for pilot evaluation. It is anticipated that the pipeline include vehicle curb ramps for road crossings on property. Provide necessary appurtenances for connections, bypass valves and control valves together with flow metering for NF concentrate and RO feed water locations. May be sized for both Activity 1 and Activity 3. Town to plan for and procure up to 3 additional, pre-treatment unit processes to evaluate at pilot scale

Pilot Testing Timeline (Activity 2). Pilot-scale (RO process room) NF concentrate blending with RO feed water study timeline. Include evaluation of additional pre-treatment needs

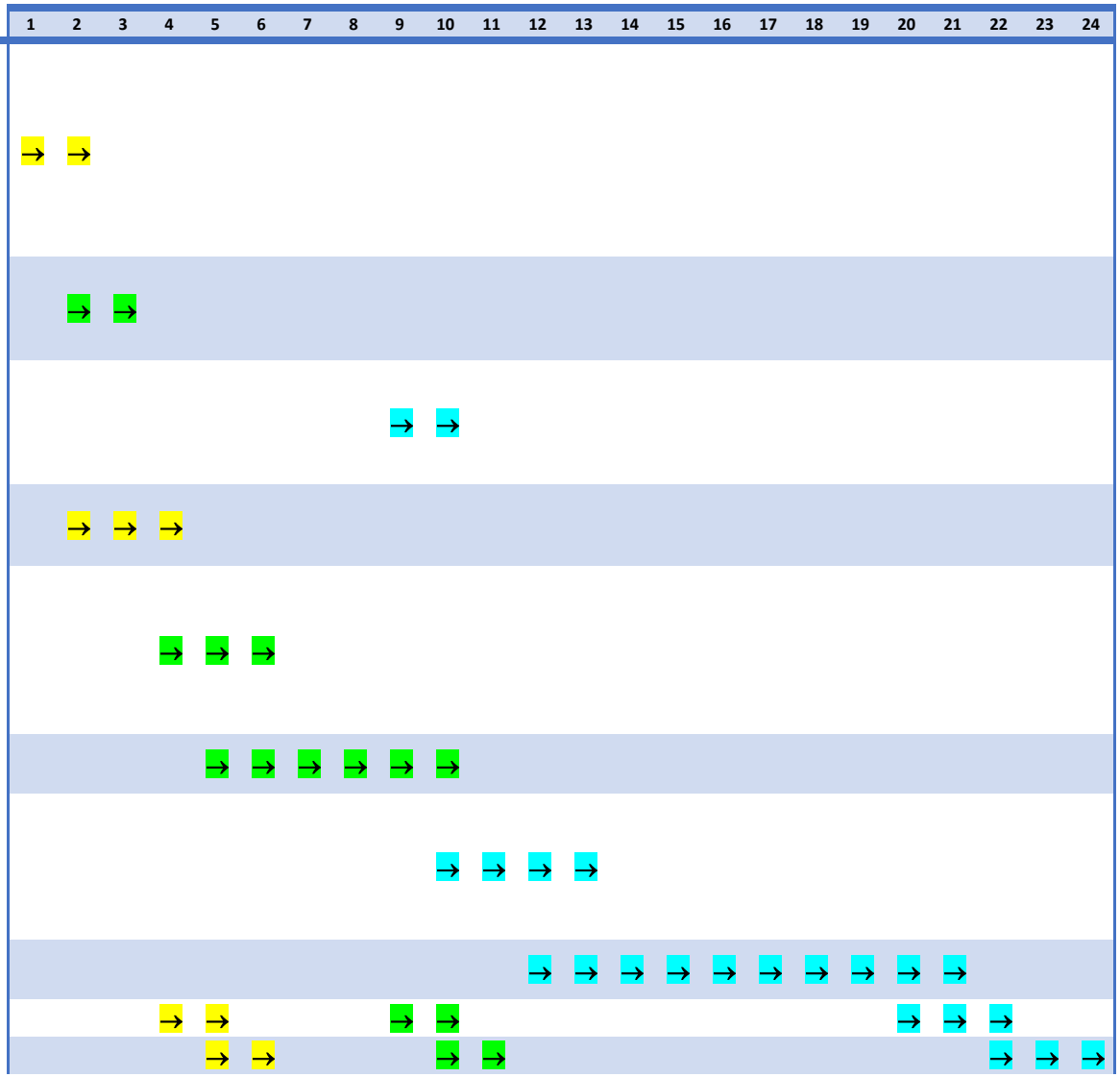
Full-Scale Demonstration Preparation & Mobilization (Activity 3). Town to plan for and install adequately-sized pipeline to convey NF concentrate from NF building to RO process room and connect to RO feed water for Train I process skid evaluation. Provide necessary appurtenances for conveyance protection (excavation trench may be necessary), connections, bypass valves and control valves together with flow metering for NF concentrate and RO feed water locations. Town to procure pre-treatment system (if needed) for full scale train demonstration

Full-Scale Demonstration Testing Timeline (Activity 3). Full-scale, Train I (RO process room) NF concentrate blending with RO feed water study timeline. Include add'l pre-treatment (if needed)

Data Dissemination and Analysis

Reporting

Month - Timeline



NOTE: (1) Site visits and progress meetings and other implementation sub-tasks and associated specific details not shown; (2) Bioassay toxicity testing of final RO processed concentrate containing concentrated NF and RO based feed water perhaps needs to be included into test plan; (3) water quality parameter and operating conditions monitoring also should be evaluated with upmost care; (4) blend may require additional pre-treatment to be evaluated at pilot and full scale demonstrations effecting project timeline

Appendix K:
Technical Memorandum Waste Stream Recovery and Disposal

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E. and John Potts, P.E.

Re: Waste Stream Recovery and Disposal Improvements

Date: March 4, 2022

Background

The Agreement between Loxahatchee River District (LRD) and Town of Jupiter Utilities under which Nanofiltration Concentrate (NF) is sent to LRD will not be renewed as per the LRD letter dated December 2, 2021. Therefore, alternate discharge locations must be identified for the waste streams from various water treatment processes.

This Master Plan Update includes installation of a Deep Injection Well (DIW) on the water plant site which will be used for disposal of both NF and RO concentrate as well as other waste streams generated on the water plant site. This Technical Memorandum (TM) is based on all waste streams being reused in the water plant processes, sent to the DIW, or sent to LRD as wastewater through the existing Waste Stream Lift Station. All flow from this lift station will be billed to the Town by LRD at the standard non-domestic wastewater rate.

Description of Waste Streams

The following list of flows includes an estimate of the flow, as well as a recommended disposition of each. It does not include RO or NF concentrate which will be discharged to the DIW. Some of the flows are intermittent and some are continuous. The intermittent flows are event oriented, such as cleaning of membranes which requires use of the cleaning system. Even the continuous flows will vary in flow rate, depending on production rate within the respective water treatment plants.

In the event a DIW is installed, which is the assumption of this Master Plan, all of these waste streams will be sent to that well for disposal.

1. Nanofiltration Pressure Filter Backwash – intermittent – 64,875 gallons per hour (gph)

a. This represents the highest flow to require an alternate discharge location. The water is a blend of Surficial Aquifer supply (SAS) raw water and potable water and can be discharged to the DIW provided the solids settling treatment of the backwash water facility is continued. Settleable solids should not be placed in a DIW as there is a possibility of restricting well injection flow.

b. This TM assumes that any filtration system associated with the NF concentrate treatment system needed to blend NF concentrate in RO raw water is in place.

c. The existing NF Backwash Basin would remain in service and be equipped with decant pans to remove water that is near the surface and is therefore relatively clear of particulate matter.

d. The decant pans would be connected to the existing adjacent wet well and pumps installed in the wet well.

e. These new pumps will discharge the decanted water to a proposed pump station that discharges into the DIW.

f. Backwashing the NF filters generates approximately 86,000 gallons for each of the 6 filter cells. A backwash cycle can be completed in approximately 1 hour and current operating protocol backwashes all six cells over an 8 hour period. This generates approximately 516,000 gallons of wastewater or a flow rate of 1,075 GPM. This volume exceeds the current 380,000 gallon storage capacity of the BWRB and that storage capacity will be further reduced based on the proposed location of the proposed approximately 30,000 gallon DIW Pump Station Wetwell within the BWRB which is discussed in a separate Technical Memorandum. In order to allow the BWRB sufficient storage time to effectively settle solids, as well as avoid increasing the flow capacity of the DIW, it is recommended that operating protocol be modified to backwashing 2 filter cells per day with a day off between backwash days.

2. Nanofiltration Floor/Instrument Drains – continuous – 5,700 gph, or 136,000 gallons per day assuming all 5 NF trains are in service all day.

    a. Continue to be discharged into the Backwash Recovery system and undergo the treatment described for that waste steam.

3. Nanofiltration Yard Drain at Pretreat – intermittent – 417 gph

    a. This flow will be eliminated by installation of an underground percolation drain field located at the existing catch basin.

4. Nanofiltration Membrane Cleaning System – intermittent – 12,000 gph

    a. This waste stream would be placed in a new neutralization basin where the pH would be brought to a value between 6.0 and 8.0 and then

discharged into the DIW Pump Station at a rate that is within the DIW flow rate.

5. Ion Exchange Backwash – intermittent – 8,000 gph
    a. This flow would be discontinued with conversion of the IX Treatment System to carbon dioxide/calcite stabilizing process. In the event the IX treatment system remains in service, this flow will be directed to the backwash water recovery system and undergo the treatment described for that waste stream. This flow initially is high TDS as some remaining regenerant is removed. This high TDS water will blend with SAS raw water used during the IX Vessel rinsing and backwash cycles.
6. RO Instrument/Floor Drains – continuous – 958 gph
    a. This flow will continue to discharge into the backwash recovery system. This flow is a blend of FAS raw water, RO permeate, and RO concentrate which leaves it with water quality approximately the same as FAS raw water. It is a small flow that will blend with the higher volume flows in the backwash stream.
7. RO Electric Room Cooling Water – continuous – 10,800 gph, or 180 GPM
    a. This flow will be discontinued after modifications are made in the RO Electrical Room cooling system. The existing heat exchangers, which require fresh water as the coolant, should be replaced with heat exchangers similar to the Generator No. 6 unit that can tolerate RO concentrate and/or FAS raw water. An alternate modification would be to install an air-cooled condensing unit similar to the units at the NF electric room.
8. RO Membrane Cleaning System Intermittent – 6,000 gph
    a. This waste stream would be placed in a new neutralization basin where the pH would be brought to a value between 6.0 and 8.0, discharged into the DIW Pump Station at a rate that is within the DIW flow rate.

Conclusions

The current waste streams generated on this site can be directed to the new neutralization tank or treated for settleable solids removal and all sent to the DIW Pump Station for disposal through the DIW.

The existing Backwash Recovery Basin (BWRB) should be restored to a decant basin to reduce the amount of suspended solids being sent to the DIW.

The BWRB pump station should be equipped with new pumps and placed back into service.

Construction of a neutralization basin is recommended to allow proper handling of chemically active waste streams, primarily NF and RO membrane cleaning water. This improvement will be located in the valve trench compartment located on the south end of the sludge handling facility and can hold approximately 40,000 gallons, as shown on Exhibit I, and include limited chemical handling facilities.

The neutralization basin will be able to serve as a settling basin if required for RO-4 or DIW rehabilitation activities.

The existing yard drain located at the southwest corner of the plant site should be disconnected from the existing backwash recovery system and replaced with a percolation sump.

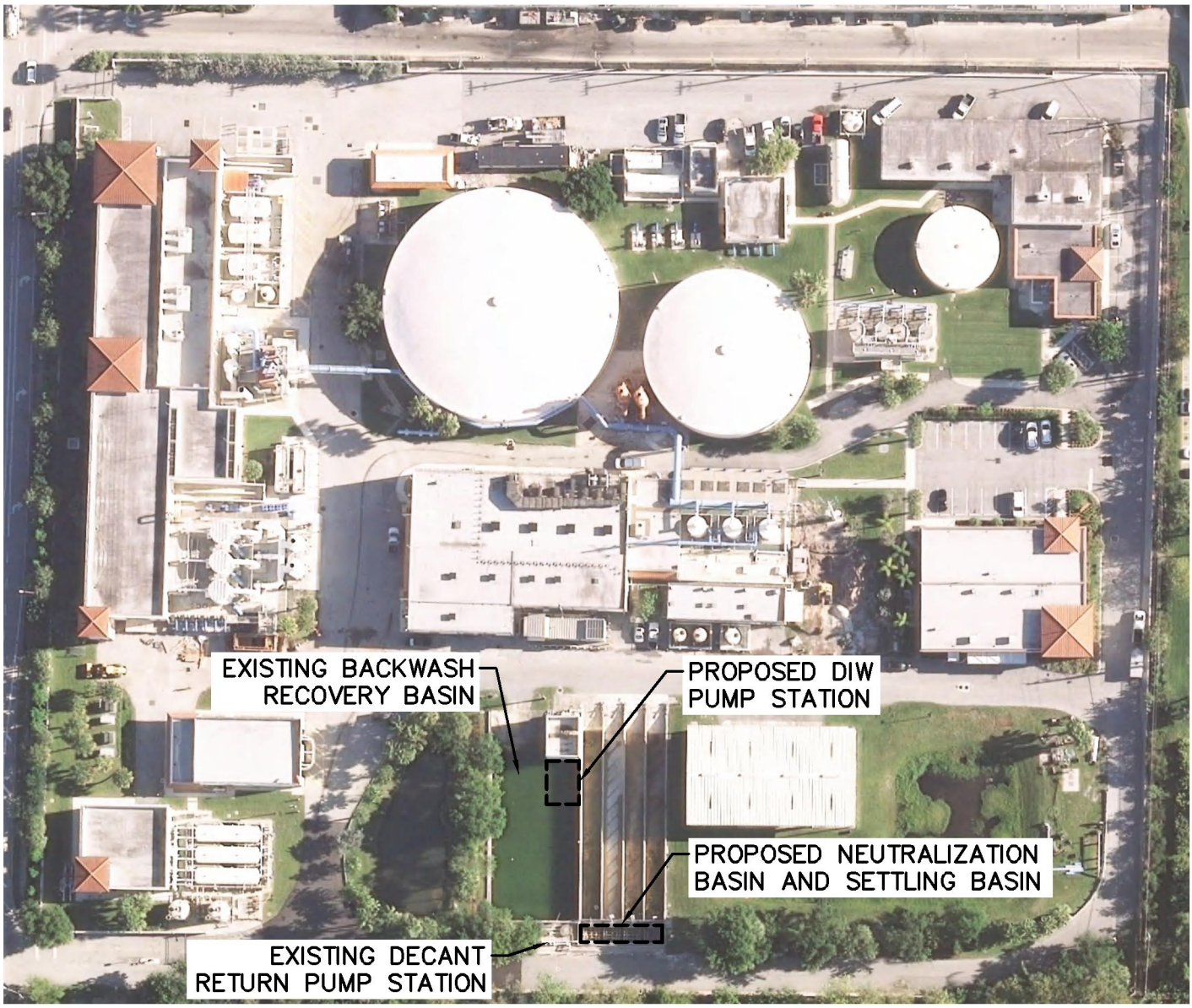
The RO Electrical Room colling system should be modified to eliminate the use of drinking water that then becomes a waste stream requiring disposal.

Opinion of Probable Construction Costs

The following is the recommended budget for implementing the new and modified facilities discussed in this TM. The budget value presented includes engineering and construction phase.

• Modify RO Electric Room Cooling System	$200,000
• Percolation Drain Field	$ 20,000
• Neutralization Tank and Pumps to DIW Pump Station	$100,000
• Decant pans in Backwash Recovery Basin	$ 80,000
• Activate Existing Basin Pump Station	$100,000
• Piping	$150,000
• Controls	$150,000
• Engineering, Permitting, Construction Phase	$200,000
TOTAL	$1,000,000

Attachments: Exhibit I WTP Site Plan



WTP SITE PLAN

GRAPHIC SCALE IN FEET
0 50 100 200

NORTH

Drawing name: K:\WPB_Civil\044001257 2022 Update of Water System MP\CAD\Exhibits\Waste Stream Recovery and Disposal Improvements.dwg Waste Stream Recovery and Disposal Improvements Jan 07, 2022 6:35pm by: Gina.Cassulo
This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

SCALE	Kimley»Horn	JAN. 2022	WASTE STREAM RECOVERY AND DISPOSAL IMPROVEMENTS	DESIGN ENGINEER:	SHEET NUMBER
DESIGNED BY	© 2021 KIMLEY-HORN AND ASSOCIATES, INC.				
DRAWN BY	1920 WEKIVA WAY SUITE 200, WEST PALM BEACH, FL 33411	PROJECT NO. 044001257	PREPARED FOR	FLORIDA P.E. LICENSE NUMBER:	EXHIBIT I
CHECKED BY	PHONE: 561-845-0665 FAX: 561-863-8175		TOWN OF JUPITER		
	WWW.KIMLEY-HORN.COM REGISTRY NO. 696		JUPITER FLORIDA	DATE:	

Appendix L:
Technical Memorandum Discussion of Membrane Concentrate Disposal Using Class I Deep Well Injection

JLA Geosciences, Inc.
HYDROGEOLOGIC CONSULTANTS
1907 Commerce Lane, Suite 104
Jupiter, Florida 33458
(561) 746-0228
fax (561) 746-0119

TECHNICAL MEMORANDUM

To: **Mr. David Brown,**
Director of Utilities,
Town of Jupiter

From: **JLA Geosciences, Inc.**
Rodney Miller, P.G.
Jim Andersen, P.G.

Re: **Discussion of Membrane Concentrate Disposal Using Class I Deep Well Injection**

Date: **March 18, 2022** ***(By Electronic Mail)***

The concentrate by-product of the nanofiltration (NF) and reverse-osmosis treatment processes is estimated at 10 million gallons per day (MGD); 6,944 gallons per minute (gpm). The concentrate is a brine solution that must be disposed of safely to protect the environment. This section evaluates the feasibility of disposal by Class I injection.

Class I Injection Well Regulatory Requirements

A brief discussion of Class I injection well designs and regulatory requirements is necessary to provide justification on the number, size and general placement of the injection well(s) necessary to accommodate the flow rates indicated above. Class I injection is regulated by the Florida Department of Environmental Protection (FDEP) Underground Injection Control (UIC) under Chapter 62-528, Florida Administrative Code (FAC). Rules under Chapter 62-528 FAC that are relevant for the sizing of an injection well system for disposal of a concentrate waste stream are provided below.

Rule 62-528.200(43): Defines municipal injection well as a well that only accepts injected fluids that have passed through the head of a permitted domestic wastewater treatment facility and received at least secondary treatment (recent rules require high-level disinfection treatment for new municipal injection wells). The concentrate from the WTP will not pass through the head of a WWTF prior to injection; therefore, the proposed injection well system will consist of a "non-municipal" injection well. The concentrate waste stream must meet secondary standards, but high-level disinfection will not be required for the proposed system.

Rule 62-528.410(1)(e): Requires the design of a non-municipal injection well to include a "tubing with a packer set immediately above the injection zone, or tubing with an approved fluid seal as an alternative..". For typical non-municipal Class I injection well designs ("non-alternative designs"), the annulus between the tubing and final casing is filled with a fluid that inhibits corrosion.

Rule 62-528.415(1)(e): States, "*Unless an alternative to a packer has been approved under Rule 62-528.410(1)(e)1., F.A.C., the annulus between the tubing, where required, and the final or innermost string of casing shall be filled with a fluid and a pressure shall be maintained on the annulus. Both the type of fluid and the proposed pressure shall be submitted as part of the construction permit approved by the Department;*"

Numerous alternative design wells, approved by FDEP, are in operation in South Florida. A common alternative design includes a well completed with a cemented annulus between the steel final casing and the injection tubing instead of a fluid-filled annulus. An evaluation of an alternative design injection well versus a standard well is provided in this memorandum.

Rule 62-528.415(1)(f).2: Limits the injection velocity to ten feet per second (f/s) unless the applicant demonstrates that higher velocities will not compromise the integrity or operation of the well. FDEP has interpreted the above rule to mean the velocity within the final casing must not exceed 10 f/s. FDEP will allow velocities within the injection tubing to exceed 10 f/s if the annulus between the final casing and tubing is fluid filled. The 10 f/s velocity criteria applies to the tubing with a cemented annulus. Regardless of the completion of the annulus, for design purposes it is recommended that the peak velocities within the injection tubing not exceed approximately 10 f/s. The most commonly used and recommended material for injection well tubing is fiberglass reinforced plastic (FRP).

Rule 62-528.425(1)(g): For Class I injection, FDEP requires the installation of a monitoring well(s) to monitor a formation interval at or near the lowermost base of the underground source of drinking water (USDW) and to monitor a formation interval below the base of the lowermost USDW. The USDW base is defined as the depth at which the total dissolved solids (TDS) concentration of the formation water exceeds 10,000 milligrams per liter (mg/L). The purpose of monitoring is to ensure that the fluids injected in the injection wells are not migrating upward into a USDW. The monitoring is typically performed by installing a dual-zone monitor well. For spacing between an injection well and the dual-zone monitor well, the rule noted below applies.

Rule 62-528.425(1)(g).3: Requires monitor wells to be located within 150 feet of the injection well unless the applicant can demonstrate, through a hydrogeologic study, that a monitor well located at a greater distance will be capable of adequately monitoring fluid movement adjacent to the borehole. There is no regulatory required minimum distance, but distancing the monitor well from the injection well will minimize the risk of creating conduits between the two boreholes.

Hydraulic Considerations

In an effort to minimize capital and operating costs, the preferred disposal method is to utilize residual reject pressures exiting the WTP to directly inject into the well. In order to determine the feasibility of direct injection, it is necessary to know the required injection pressure. Factors that affect injection pressures at the wellhead include: 1) pressures at the wellhead under static (non-pumping) conditions; 2) injection velocity and friction loss inside the injection tubing; and 3) capacity of the open-hole injection

zone. It is not possible to determine the injection pressure without performing an injection test and this requires the well to be constructed. For the purpose of this evaluation, it is necessary to estimate the injection pressures. It must be understood that each well is unique and while reasonable estimates can be developed, adjustments may be required after the injection test to develop an effective operational system. Following is a summary of design parameters to be considered.

Design Parameters and Estimated Head Conditions	**Nominal 18" FRP**		**Nominal 20" FRP**	
FRP Injection Tubing I.D. (in)	16.55	16.55	17.98	17.98
FRP Max O.D. at Couplings	21.25	21.25	22.65	22.65
Final Casing I.D. (in)	25	25	27	27
Annular clearance between FRP couplings & Final Casing (in)	1.88	1.88	2.18	2.18
Injection Rate (MGD)	9.66	10.00	**10.00**	11.40
Injection Rate (gpm)	6,705	6,944	6,944	7,914
Estimated Tubing Length (feet)	2840	2840	2840	2840
Velocity in FRP (ft/sec)	10.0	10.4	**8.8**	10.0
Velocity in Final Casing (ft/sec)	4.4	4.5	3.9	4.4
C-Factor	150	150	150	150
Total Friction Loss in FRP (psi)	17.3	18.5	12.3	15.7
Static Wellhead Pressure (psi)	24	24	24	24
Estimated Formation Loss (psi)	4	4	4	4
Dynamic Wellhead Pressure (psi)	45	46	40	44

Two well sizes were evaluated as shown in the table above. The maximum disposal need is anticipated to be 10 MGD. An injection well completed with a nominal 20-inch diameter injection tubing noted above meets FDEP's velocity requirements (10 f/s or less) up to a rate of 11.40 MGD. The next smaller sized injection tubing (nominal 18-inch diameter) exceeds the FDEP velocity requirements at the maximum disposal rate (10.4 f/s at 10 MGD).

The injection well may accept an injection velocity up to 12 f/s only during planned testing, maintenance, or emergency conditions if FDEP is provided reasonable assurance that the higher velocities will not compromise the integrity or operation of the well (62-528.415(1)(f)). The final casing velocity noted above is relevant only from a permitting perspective and does not affect system hydraulics. FDEP will consider the 10 f/s velocity limitation based on the final casing diameter and not the FRP injection liner if the well is completed with a fluid-filled annulus and not a cemented annulus. The maximum injection rate that can be permitted with a nominal 20-inch FRP injection tubing and a cemented annulus 11.40 MGD (7,914 gpm) at a velocity of 10 f/s in the tubing.

FRP Tubing Information from Future Pipe Industries, Red Box 1,000 (ver. Oct. 2017)

Nominal Size (inches)	Nominal I.D. (inches)	Nominal O.D. (inches)	Nominal Wall (inches)	Coupling O.D. (inches)	Nominal Weight (lbs/ft)	Internal Pressure (psi)	Collapse Rating (psi)	Axial Tension (lbs)	Friction Loss Hazen Williams
18	16.55	17.75	0.60	21.25	35.4	1,000	240	323,500	150
20	17.98	19.28	0.65	22.65	39.4	1,000	240	375,000	150

Static pressures and estimated formation losses are derived from general local experience and information. Friction losses in the FRP injection tubing are based on a total length of 2,840 feet and a Hazen Williams roughness coefficient (C-factor) of 150. The total open depth of the well generally does not impact the values noted above (with the possible exception of increased formation losses if the open hole interval is insufficient), but the anticipated total depth likely will not exceed 3,500 feet below land surface. Please note that the annulus clearance between the final casing and the injection tubing may be reduced for a fluid-filled annulus compared to a cement-filled annulus. The additional clearance for a cemented annulus is to accommodate the installation of cement tubing inside the annulus during the cementing process. This is further explained below under "Design Considerations".

Hydrogeologic Considerations

A Class I injection well system injects into a confined aquifer with total dissolved solids (TDS) concentrations greater than 10,000 milligrams per liter (mg/L). FDEP will permit the use of a Class I injection well if the following can be demonstrated:

- The lowermost USDW base (formation water less than 10,000 mg/L TDS) is identified.
- A suitable injection zone that can accept the proposed injection flows is located.
- Formations with adequate confinement between the injection zone and the lowermost USDW is present that will prevent the migration of the injected fluids vertically upward into a USDW.
- The injection well is adequately constructed and has mechanical integrity to prevent migration of injected fluids immediately adjacent to the well borehole.
- The formation fluids and strata in the injection zone are compatible with the commingled fluids being disposed.

Design Considerations

A typical (non-alternative) non-municipal injection well design includes a steel final casing lined with an injection tubing and a sealed fluid-filled annulus. During operation, pressures in the fluid-filled annulus must be maintained and continuously monitored and recorded. The pressures in the annulus are maintained using a hydro-pneumatic pressure tank. Air in the annulus tank can be replenished using a small air compressor connected to the tank. A common alternative design well includes a final steel casing lined with an injection tubing and a cemented annulus. Other design considerations include:

- The injection tubing in a standard well (with a fluid-filled annulus) can be pulled and replaced if the tubing becomes damaged and loses integrity. A cemented injection tubing cannot be replaced without significant efforts (such as drilling out the tubing and cement). Please note that it is unlikely that FRP tubing will become damaged during operation and FRP tubing is very resistant to corrosion (which is a typical cause of integrity loss).

- Regulatory velocity restrictions (10 f/s) apply to the inside diameter of the injection tubing and not the final casing with a cemented-annulus well. As such, an upsized (more costly) injection well may be required to accommodate buildout disposal needs with a cemented-annulus well.

- Hydrostatic pressure testing (part of 5-year mechanical integrity demonstrations) in a cemented-annulus well will require the installation of an inflatable packer inside the tubing. This is needed to pressurize the inside of the injection tubing and demonstrate integrity. This process and subsequent removal of the packer can result in the well being offline and operations impacted for days. Alternatively, a hydrostatic pressure test can be performed within a fluid-filled annulus without taking the well offline and impacting operations. A fluid-filled annulus well will still need to be taken offline for 16-24 contiguous hours to perform downhole temperature logging and radioactive tracer survey testing.

- The safe implementation of cementing the annulus during construction may require the final casing be upsized (or conversely the tubing be downsized), thus enlarging the annulus space, in order to install the cement tremie pipe and appropriately cement the annulus from bottom to top. This may also require the couplings of the FRP injection tubing to be reduced (shaved) to enlarge the annulus space. This in turn diminishes the pressure rating of the FRP tubing.

- Pressures in a fluid-filled annulus well are required to be maintained and monitored continuously. As such, a loss of pressures and/or loss of annulus fluids could alert the operator of an issue with the well, and corrections/repairs could potentially be made in a timely manner, before the issue escalates. Issues in a well with a cemented annulus may not be discovered until the 5-year mechanical integrity test is performed.

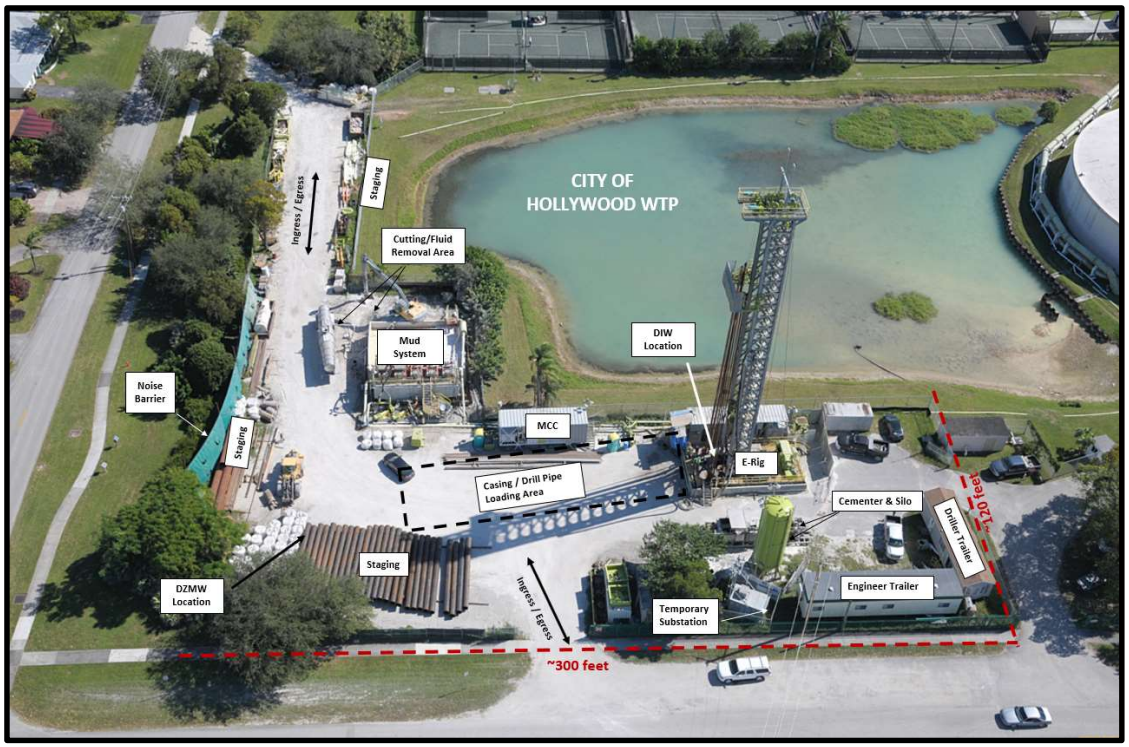
- In a fluid-filled annulus well, a steel packer mandrel is incorporated (welded) to the inside wall of the final casing, and another steel packer mandrel is attached to the base of the FRP injection tubing string. The mating of the two mandrels seals the annulus near the base of the well. The packer mandrels are the most susceptible components of the well to corrosion; especially for a well that primarily accepts an R.O. concentrate wastestream. Excessive corrosion could compromise the annulus and in turn compromise the integrity of the well. A well with a cemented annulus eliminates the need for the packer mandrels, and if cemented properly, significantly reduces the risk of the well losing integrity.

- A hydropneumatic tank and air compressor would not be needed for a cemented-annulus well. Installation of electrical and instrumentation components for maintaining and monitoring annulus pressures also would not be needed.

Injection Well Siting Considerations

Based on discussions with the Town, the preferred location of the proposed injection well system is within the WTP, but it is recognized that there are limited available options for locating the system in the plant. **Figure 1** below shows an example of a Class I injection well system construction area. A large area is needed for the construction of a Class I system to accommodate the drilling rig, associated drilling equipment, and storage for casing and drill pipe. It is noted that the completed injection well and dual-zone monitor well will include dedicated permanent concrete pads that will have a significantly smaller footprint than is required for construction. Each pad (2 total) can have an approximate footprint as small as 20 feet by 25 feet.

Figure 1: Example of a Class I Injection Well System Construction Area



Future access to the injection well system must also be considered when evaluating a potential site. At a minimum, plant operators will need to access and sample the dual-zone monitor well on a monthly basis. Although normal 5-year mechanical integrity testing only requires access for a small crane and a geophysical logging truck, access for a full-size drilling rig must be available for future rehabilitation of the wells (if necessary).

Wellhead Protection Area

The State wellhead protection program is governed by Chapter 62-521, FAC, and the intent of the program is to protect potable water wells from contamination. The wellhead protection program defines a protection radius of 500 feet around a potable water well where a Class I injection well is prohibited. As shown in **Figure 2** below, a significant portion of the WTP is within the wellhead protection setback of Floridan Aquifer Well RO-4.

Figure 2: Wellhead Protection Setbacks



All circles shown in **Figure 2** below have a radius of 500 feet. Circles in yellow and red indicate radial setbacks from wells completed in the Floridan Aquifer and Surficial Aquifer, respectively. In specific circumstances, FDEP will grant a variance to the 500-foot radial setback if it can be clearly demonstrated that the variance is in the public's interest and will not present a danger to the public's health, safety or welfare.

Monitoring, Testing and Permit Compliance

Extensive monitoring, testing, and permit compliance efforts will be required throughout the lifetime operation of the injection well system.

Operating Parameters: Permit conditions will require continuous monitoring of injection rates, wellhead pressures, and volumes. Continuous monitoring of annulus pressures would be required for an injection well completed with a fluid-filled annulus. Continuous monitoring of water levels will be required in both the upper monitor zone (UMZ) and lower monitor zone (LMZ) of the monitor well. Daily and monthly minimum, maximum, and average values need to be reported in monthly operating reports (MORs).

Pressure fall-off testing will be required annually. This test involves shutting in the injection well for 30 to 60 minutes and monitoring the "fall-off" of wellhead pressures.

Water Quality Sampling: Regular water quality sampling and analysis will be required of the injectate fluids and both monitor zones. Water quality parameters will be listed in the FDEP permit and will be representative of the monitored activity. Parameter lists vary by permit, but between 20 and 25 parameters should be anticipated. A laboratory analysis for the Primary and Secondary Drinking Water Standards of Chapter 62-550, F.A.C., shall be submitted annually.

Injection Testing: Performance of an injection test will be required after construction of the injection well and monitor well is complete. The purpose of the test is to demonstrate that the injection well and injection zone formation can accept the required flows. A successful test also will demonstrate that the injected flows are confined within the injection zone, and the overlying monitor zones are not impacted. FDEP will limit the permitted capacity of the well to the injection test rate. FDEP typically requires a 12-hour test. For a permitted capacity of 10.00 MGD (6,944 gpm), a total of 5,000,000 gallons of an FDEP approved water source will be needed.

Mechanical Integrity Testing (MIT): FDEP requires testing to demonstrate mechanical integrity of the injection well system every 5 years. A testing plan must be submitted to FDEP for each 5-year event. The 5-year MIT program includes three main elements: 1) downhole video survey of the injection tubing and the open-hole section of the well, 2) a hydrostatic pressure test of the injection casing, and 3) a radioactive tracer survey log (with background temperature and gamma-ray log plots). In addition to the MIT work, operational and water-quality data from the past five years of operation must be compiled and interpreted.

The hydrostatic pressure test completed in an injection well with a cemented annulus will require installation of an inflatable packer inside the well. During this process, normal operation of the well will be disrupted for approximately 3 days. During this time, the production of concentrate will need to be discontinued or directed to an approved alternative disposal location. For completion of temperature logging and radioactive tracer survey testing, normal operation will be disrupted for approximately 16 to 24 hours.

Permitting: FDEP issued permits must be secured to construct and test the injection well system. This permit covers the construction of the system and operational testing. Separate approval from FDEP must be granted prior to commencement of operational testing. Within two years of operational testing, a permit to operate the system must be secured. A renewed operating permit must be secured every 5 years for the lifetime operation of the system.

Contingency Disposal Plan

During planned testing, maintenance or in the event that the injection well is rendered inoperative due to a catastrophic failure, a contingency plan must be in place and fully operational. All applicable federal, state and local permits must be in place to allow for any alternate discharges due to emergency or planned outage conditions.

The current primary disposal method for R.O. concentrate is by surface discharge to the C-18 Canal, approximately 2,000 feet north of the WTP. The nanofiltration concentrate is disposed of by blending with reclaimed water produced at the Loxahatchee River Environmental Control District (ENCON) Wastewater Treatment Facility (WWTF). During extreme wet weather, emergencies, or when blending is not feasible, nanofiltration concentrate could be combined with R.O. concentrate for disposal, but the combined flow capacity remains at 4.6 MGD, maximum daily flow.

After successful construction, testing and permitting, the injection well system would become the primary disposal method. Identifying a backup (contingency) method is outside the scope of this memorandum, but maintaining surface discharge as a backup option should be considered.

Estimated Costs

Estimated costs for the design, permitting, and construction of a Class I injection well system are provided below. Estimated costs also are provided for water quality sampling (monthly and annual), testing and permitting for the lifetime operation of the system.

FDEP Permit Processing Fees

Construction and Testing Permit Fee (62-4.50(4)(m), FAC)	$12,500
Operation Permit Fee (62-4.50(4)(m), FAC)	$10,000
Total	**$22,500**

Design, Permitting, Construction and Testing

Mobilization and Demobilization	$4,100,000
Construction & Testing Injection Well; includes drilling, testing, wellhead, pad, electrical and instrumentation – Injection well with Nominal 20-inch FRP Injection Tubing	$8,200,000
Construction & Testing Dual-Zone Monitor Well; includes drilling, testing, wellhead, pad, electrical and instrumentation	$3,100,000
Engineering Design, Permitting, Construction Management Services and Reporting (assumes 15% of construction costs)	$2,310,000
Total	**$17,710,000**

Cost above assumes major demolition and WTP modifications are completed by others and only minor site setup is required by the drilling contractor. Costs also assumes piping, valving, electrical and instrumentation for only the injection well and monitor well (pump stations not included).

Monthly and Annual Water Quality Sampling

Monthly Water Quality Sampling (assumes 23 parameters each for injectate, UMZ, & LMZ at $50 each)	$3,450
Annual Primary & Secondary DWS Sampling	$3,000
Yearly Total	**$44,400**

Testing and Permitting – Every 5 Years

5-Year MIT; Contractor and Engineer Fees; assumes an injection well with cement-filled annulus	$75,000
Operating Permit Renewal; Permit Fees and Engineer Fees	$35,000
Total	**$110,000**

Costs for securing permits for contingency disposal plan not included

Plugging and Abandonment

Plugging and Abandonment of injection well & monitor well	$400,000
Total	**$400,000**

FDEP requires that permit holders provide certification that they are financially responsible for plugging and abandoning the system if deemed necessary. The certification must be updated for every UIC permit application (construction, operation and/or permit renewal). FDEP can order the plugging of an injection well when it has been abandoned or has been "determined to be a threat to the waters of the State."

Appendix M:
Technical Memorandum Deep Well Injection Pump Station

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E. and John Potts, P.E.

Re: Deep Injection Well Pump Station

Date: March 4, 2022

Background

An element of the Master Plan provides for installing a Deep Injection Well (DIW) for disposal of both Nanofiltration (NF) and Reverse Osmosis (RO) concentrates. This facility may also be used for disposal of other waste streams identified in the Technical Memorandum (TM) Waste Stream Recovery and Disposal Improvements. This Technical Memorandum will examine location of the DIW, as well as location of a pump station to serve the DIW.

This TM assumes that a pump station is required to provide an atmospheric air gap to prevent backflow from the DIW, which is under artesian pressure, into the NF and RO plants. This air gap is sometimes not required by FDEP and sometimes an RPZ backflow preventer is required. The RPZ is not practical due to the corrosive nature of primarily the RO concentrate. This device also imparts a relatively high headloss that would need to be overcome by the residual pressure at both plants. This pressure loss represents a permanent unnecessary increase in operating costs. Installation of a pump station will substantially reduce the required RO and NF concentrate pressure which improves operating efficiency of the membrane treatment systems.

The DIW will be located in the area currently occupied by the Backwash Recovery Basin (BWRB) as shown in the attached Exhibit 1**.** Other locations were examined but they interfered with plant operation.

DIW and Pump Station Discussion

The pump station will be required to accommodate NF concentrate at 3.0 MGD maximum flow rate, RO concentrate at 4.6 MGD maximum flow rate, and other on-site waste streams at an estimated maximum flow rate of 2.4 MGD for a total of 10.0 MGD, all maximum flow rates. The DIW must be able to accommodate maximum flow rates as there is no storage provided and concentrate must be continuously discharged for the two membrane process plants to function. This establishes the pump station capacity at 10.0 MGD, or 6,950 GPM. A five minute storage capacity

represents 34,750 gallons or 4,633 cubic feet. Assuming a useful storage depth of 6 feet requires a pump station footprint of approximately 28 feet square or 784 square feet. The pump station wet well may be above ground to reduce cost and interferences with existing underground facilities. This TM assumes the cost to construct a new below ground wet well as a conservative approach to the estimated cost of the pump station.

The pump station and wetwell would be best located at the DIW in the BWRB. The recommended wetwell storage volume can be provide using a small portion of the BWRB. The recommended location is in the northeast corner of the BWRB. This location is shown on Exhibit I. The pumps would be vertical turbines located on a new top placed over the proposed wetwell.

The pump station should have four pumps with one being a redundant standby. This leads to each pump having a capacity of 2,315 GPM at a head of 40 PSI. These pumps would require 75 HP each. Power is available in the existing Vacuum Pump Building. The wet well interior will require very durable protection from the high salt and high hydrogen sulfide content of the concentrates. This TM will assume that the wet well interior, sides, bottom, and top have a fiberglass liner that is joined in place to eliminate leaks.

Conclusions

A pump station is required to elevate pressure in the three waste streams sufficiently to overcome injection well pressure as well as provide positive back flow protection.

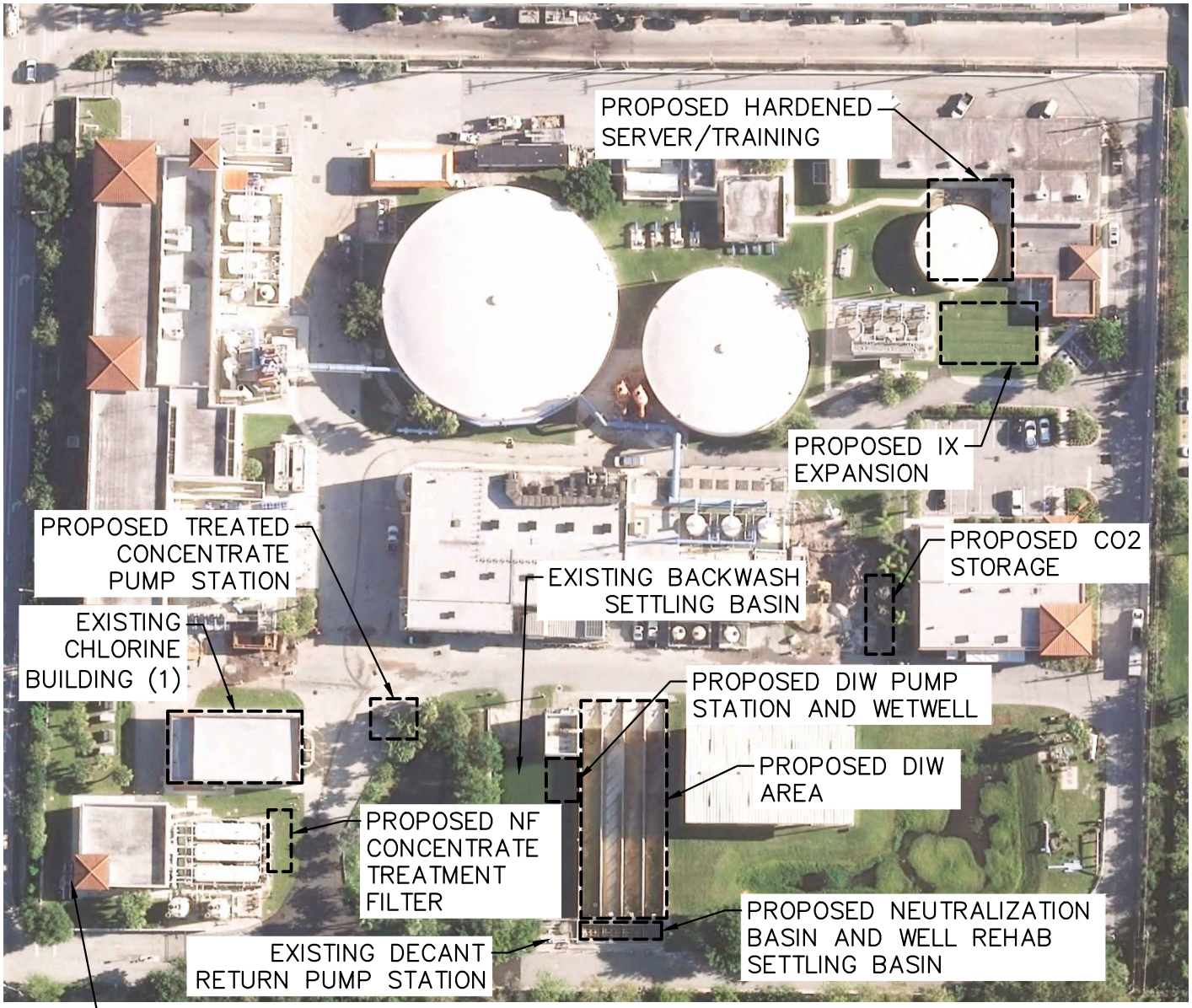
The DIW Pump Station is best located in a small portion of the BWRB and the RO concentrate, NF concentrate, and other waste streams piped to this location. At this location, the pumps would be vertical turbine style.

Opinion Of Probable Construction Costs

The following is the recommended budget for implementing the new and modified facilities discussed in this TM. The budget value presented includes engineering and construction phase. These estimated costs do not include the DIW.

NF, RO, and Waste Stream Piping to Pump Station		$350,000
Pump Station Wet Well		$350,000
Pump Station Pumps		$450,000
Controls		$200,000
Engineering, Permitting, Construction Phase		$250,000
TOTAL	**$1,600,000**	

Attachments: Exhibit 1 Overall WTP Site Plan



WTP SITE PLAN

GRAPHIC SCALE IN FEET
0 50 100 200

NORTH

(1) SODIUM HYPOCHLORITE STORAGE AND RAW WATER BOOSTER STATION INSIDE BUILDING

This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

Drawing name: K:\WPB_Civil\044001257 2022 Update of Water System MP\CAD\Exhibits\Master Plan Water Treatment Plant Overview.dwg Mar 01, 2022 12:00pm by: Casey.Staller

SCALE: AS NOTED DESIGNED BY JEP DRAWN BY CFS CHECKED BY JRL	Kimley»Horn © 2021 KIMLEY-HORN AND ASSOCIATES, INC. 1920 WEKIVA WAY SUITE 200, WEST PALM BEACH, FL 33411 PHONE: 561-845-0665 FAX: 561-863-8175 WWW.KIMLEY-HORN.COM REGISTRY NO. 35106	MAR. 2022 PROJECT NO. 044001257	OVERALL WTP SITE PLAN PREPARED FOR TOWN OF JUPITER JUPITER FLORIDA	DESIGN ENGINEER: JOHN E. POTTS FLORIDA P.E. LICENSE NUMBER: 2281 DATE:	SHEET NUMBER EXHIBIT 1

Appendix N:
Town of Jupiter Water System Master Asset List

Kimley»Horn

Technical Memorandum

To: Amanda Barnes, P.E. Assistant Director

From: Jason Lee, P.E., John Potts, P.E.

Re: Technical Memorandum Water System Asset List, Renewal & Replacement Capital Improvement Plan

Date: March 4, 2022

Background

Asset management is a vital Utility function and includes preparation of Capital Improvement Programs to renew and replace components of the Utility that have reached their useful life or functionality. Asset management begins with an inventory of the Utility assets. This inventory must include all assets and be organized to allow each asset item to include its date of acquisition/installation, expected useful life, and current value.

A component of this Technical Memorandum (TM) is preparation of the Utility inventory of assets, referred to as the Asset List, which includes all water treatment plant components including piping, all treated water storage tanks both off and on site, all treated water pumping facilities both off and on site, all raw water supply components including piping, mechanical and piping components of the water system's wellfield recharge system, and mechanical as well as structural components of the Storm Water Utility system. The attached Asset list does not include the assets associated with the water distribution system.

Asset List

The Asset List prepared for this TM is attached as Exhibit I and currently contains approximately 585 items or Utility System Components. The Asset List includes all water treatment plant components including piping, all treated water storage tanks both off and on site, all treated water pumping facilities both off and on site, and all raw water supply components including piping

The Asset List began with a copy of the Water System's Maintenance List which was modified to be a list of the major assets of the Utility and serve as an inventory of the major assets. The listed assets are intended to be major components of the Utility System and the Asset List is not intended to be a detailed list of all components that can be replaced or require maintenance. Replacement of the smaller items that have a relatively short useful life or relatively low replacement cost are expected to be replaced as part of a routine maintenance program. Each Asset item includes an "Equipment Description", "Location", and "Equipment Type" that coincide with these categories on the Utility Maintenance list. The intent is that there be some ability to relate the Asset List and Maintenance List.

The Asset List should be updated as needed to include asset items that have been added or asset items that have been demolished or removed from the system and not replaced.

An annual update should also include modifying any Unit Cost values that do not reflect the current estimated cost to replace an asset as it is described in the "Unit Cost-Life (date)" spreadsheet.

An explanation of the Asset List workbook follows.

1. The Asset List Excel Workbook includes two spreadsheets, the "Asset List" and the "Unit Cost-Life (date)" spreadsheets. These two spreadsheets are linked and cannot be separated without revising formulas in the "Asset List" spreadsheet.
2. The "Unit Cost-Life (date)" spreadsheet contains estimated values for replacement cost as well as useful life of each asset item. All cells on this spreadsheet are manually entered. The column "Description of Asset Elements" contains a description of the components, accessories, and related equipment that are included in the "Unit Cost" value. This description is not detailed or exhaustive and the intent of this value is that each unit cost includes the labor, materials, and equipment required to provide a fully functional asset. The unit cost values are assumed to be valid as of the "as of date" in the Asset List spreadsheet title, CELL K4. The intent is that these unit costs be adjusted periodically to reflect costs believed accurate for the "as of date", or "Current Replacement Value" on the as of date. The "as of" date is important to the accuracy of the Asset List. The "Asset List" spreadsheet columns "Useful Life" and "Unit Cost" import values from the "Unit Cost-Life (date)" spreadsheet. Updating the asset unit costs and useful life values is accomplished on the "Unit

Cost-Life (date)" spreadsheet and the "Useful Life" and "Unit Cost" columns on the "Asset List" will automatically incorporate any revisions.

3. Categories in the "Category" column of the Asset List are abbreviations for the more complete Category names shown on the document titled "TOWN OF JUPITER UTILITIES WATER TREATMENT, STORAGE, DISTRIBUTON, and STORMWATER FACILITIIES PHYSICAL ASSET CATEGORIES AS OF (date)". The Category column is used to separate the asset items into familiar and logical groups for grouping of similar items.
4. The Asset List column "Complete Date" is an input value for the date the asset was placed into service which also begins the asset's useful life.
5. The Asset List "Sort Code" column is used to arrange the order of identical asset items so they appear in a familiar order when the spreadsheet is sorted.
6. The Asset List "Size/Capacity/Quantity" column carries the estimating units of measure for each asset item. The units for each asset item are shown on the "Unit Cost-LIFE (date)" spreadsheet.
7. The Asset List "Useful Life" column cells contain the life expectancy for the asset items. This value is imported by a formula into the asset item "Useful Life" cell from the "Unit Cost-Life (date)".
8. The Asset List "Unit Cost" column cells contain the estimated cost to replace the asset items. This value is imported by a formula into the asset "Unit Cost" cell from the "Unit Cost-Life (date)".
9. The Asset List "Remaining Life" column cells contain formulas that subtracts the value (DATE) in the "Complete Date" column from the current date and subtracts that value from the value in the "Useful Life" column. The value does not change when it reaches -0-.
10. The Asset List "Current Depreciated Value" column cells contain formulas that multiply the values in the "Unit Cost" column times the values in the "Size/Capacity/Quantity" column and multiplies that product by the value in the "Remaining Life" column divided by the value in the "Useful Life" column. The "Current Depreciated Value" column provides an estimation of the asset values based on straight line depreciation.
11. The Asset List "Current Replace Value" column contains formulas that multiply the values in the "Unit Cost" column times the values in the "Size/Capacity/Quantity" column. The "Current Replace Value" column provides an estimation of the current asset values based on current replacement cost.

12. The Asset List “End of Useful Life” column contains formulas which determine the calendar year that the asset will reach the end of its useful life by adding the “Useful Life” value to the “Complete Date” value.
13. The Asset List “Replace Value at End of Life” column contains formulas that calculate the cost to replace an asset when it reaches the end of its useful life by adding to the “Current Replace Value” the product of the “Remaining Life” divided by the “Useful Life” multiplied by “Units” times “Unit Cost” times 1 plus the appreciation value in Cell J4.
14. The Asset List “Asset Number” column assigns a number to each asset. This number is unique and allows the asset items to be linked to information that has a numerical address.
15. Cells highlighted in Green are asset items that require that the “Unit Cost” and/or “Useful Life” values be entered in the highlighted cell. These asset items are NOT linked to the “Unit Cost-Life (Date)” spread sheet.
16. All cells in all columns with a heading title that is highlighted in BLUE are input directly in the “Asset List” spreadsheet cells.
17. All cells in Columns with a heading title that is highlighted in Gray contain a formula and cannot be input directly in the “Asset List” spreadsheet. These cells are protected to prevent changing of the formulas without proper permission.

Attachments: Utility System Asset List

JUPITER WATER UTILITY SYSTEM

ASSET LIST MASTER

as of 11-24-2021

ANNUAL VALUE ESCALATION PERCENT **0.03** **2021** CALENDER YEAR FOR CALCULATING REMAINING LIFE

Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
AIR COMP	NANO AIR COMPRESSOR #1 42 CFM	NANO PRETREAT BUILDING	$43	2010	15	2025	4	$12	$56	AIRCOMPRESSOR	71	501275	42	1.04
AIR COMP	NANO AIR COMPRESSOR #2 42 CFM	NANO MECHANICAL ROOM	$43	2010	15	2025	4	$12	$56	AIRCOMPRESSOR	72	501276	42	1.04
AIR COMP	RO SI AIR COMPRESSOR - 42 CFM	RO SCALE INHIBITOR ROOM	$43	2013	15	2028	7	$20	$68	AIRCOMPRESSOR		501277	42	1.04
AIR COMP	HS BUILDING AIR COMPRESSOR - 42 CFM	HIGH SERVICE PUMP BUILDING	$43	2013	15	2028	7	$20	$68	AIRCOMPRESSOR		501278	42	1.04
CHEM	NANO ACID BULK STORAGE TANK #1 10,000 GAL	NANO BUILDING	$460	2010	15	2025	4	$123	$597	TANKS OR CLOSED CONTAINERS		501341	10000	0.05
CHEM	NANO ACID BULK STORAGE TANK #2 10,000 GAL	NANO BUILDING	$460	2010	15	2025	4	$123	$597	TANKS OR CLOSED CONTAINERS		501342	10000	0.05
CHEM	NANO CAUSTIC BULK STORAGE TANK 18,000 GAL	NANO BUILDING	$828	2010	15	2025	4	$221	$1,075	TANKS OR CLOSED CONTAINERS		501343	18000	0.05
CHEM	NANO BACKWASH EAST TANK #1 10,000 GAL	NANO BACKWASH FACILITY	$460	2010	15	2025	4	$123	$597	TANKS OR CLOSED CONTAINERS		501344	10000	0.05
CHEM	NANO BACKWASH WEST TANK #2 10,000 GAL	NANO BACKWASH FACILITY	$460	2010	15	2025	4	$123	$597	TANKS OR CLOSED CONTAINERS		501345	10000	0.05
CHEM	RO PERM ACID BULK TANK 3,800 GAL (WEST)	RO CHEMICAL BUILDING	$175	2011	15	2026	5	$58	$242	TANKS OR CLOSED CONTAINERS		500687	3800	0.05
CHEM	CAUSTIC TANK #1 BULK STORAGE 6,000 GAL	RO CHEMICAL BUILDING	$276	2006	15	2021	0	$0	$276	TANKS OR CLOSED CONTAINERS		500688	6000	0.05
CHEM	RO PERM ACID BULK TANK 3,800 GAL (EAST)	RO CHEMICAL BUILDING	$175	2011	15	2026	5	$58	$242	TANKS OR CLOSED CONTAINERS		502113	3800	0.05
CHLOR	CHLORINE SCRUBBER UNIT	CL2 BUILDING ENCLOSED	$144	2020	30	2050	29	$139	$404	CHLORINE PARTS AND SUPPLIES		500671	1	143.75
DP	CL-DP, 400A	CHLORINE BUILDING	$18	2002	45	2047	26	$10	$37	ELECTRICAL POWER CONTROL-SWITCH		600185	1	18.00
DP	HSP PP1, 225 A	HSP BUILDING	$15	1995	45	2040	19	$6	$25	ELECTRICAL POWER CONTROL-SWITCH		600186	1	15.00
DP	IX DP PANEL, 100 A	ION EXCHANGE BUILDING	$18	1990	45	2035	14	$6	$26	ELECTRICAL POWER CONTROL-SWITCH		600187	1	18.00
DP	WH-SHOP, 100 A	WAREHOUSE BUILDING	$24	1995	45	2040	19	$10	$40	ELECTRICAL POWER CONTROL-SWITCH		600188	1	24.00
DP	SHOP DP1, 400 A	SHOP BUILDING	$18	1995	45	2040	19	$8	$30	ELECTRICAL POWER CONTROL-SWITCH		600189	1	18.00
DP	MBA BLDG MCC DP-A, 100 A	MBA BUILDING	$10	2006	45	2051	30	$7	$23	ELECTRICAL POWER CONTROL-SWITCH		600190	1	10.00
DP	PLANT OFFICE DP2, 225 A	WTP OFFICES	$17	1995	45	2040	19	$7	$28	ELECTRICAL POWER CONTROL-SWITCH		600191	1	17.00
DP	NEW WAREHOUSE MDP, 200 A	ADMIN BUILDING	$17	2013	45	2058	37	$14	$46	ELECTRICAL POWER CONTROL-SWITCH		600192	1	17.00
DP	ADMIN BUILDING HLP, 100 A	ADMIN BUILDING	$12	2013	45	2058	37	$10	$33	ELECTRICAL POWER CONTROL-SWITCH		600193	1	12.00
DP	RO DP1 , 800 A	RO ELECTRIC ROOM	$35	1984	45	2029	8	$6	$43	ELECTRICAL POWER CONTROL-SWITCH		600176	1	35.00
FAS ELEC	FAS RWM ELECTRICAL POWER 2005	FAS WELLFIELD	$411	2005	35	2040	19	$223	$762	WELLFIELD POWER CONDUIT-CABLE		600143	2385	0.17
FAS PUMP	R.O. WELL #2 HORIZONTAL PUMP 60 HP	WELLFIELD 2	$83	2020	30	2050	29	$80	$232	HORIZONTAL SS PUMP	2	500271	60	1.38
FAS PUMP	R.O. WELL #3 HORIZONTAL PUMP 60 HP	WELLFIELD 2	$83	2020	30	2050	29	$80	$232	HORIZONTAL SS PUMP	3	500275	60	1.38
FAS PUMP	R.O. WELL #4 TURBINE PUMP 60 HP	WTP SITE	$83	2020	30	2050	29	$80	$232	VERTICAL SS PUMP	4	502360	60	1.38
FAS PUMP	R.O. WELL #5 HORIZONTAL PUMP 60 HP	WELLFIELD RO	$83	1994	30	2024	3	$8	$92	HORIZONTAL SS PUMP	5	500283	60	1.38
FAS PUMP	R.O. WELL #6 HORIZONTAL PUMP 75 HP	WELLFIELD RO	$104	1994	30	2024	3	$10	$115	HORIZONTAL SS PUMP	6	500290	75	1.38
FAS PUMP	R.O. WELL #7 HORIZONTAL PUMP 100 HP	WELLFIELD RO	$138	1994	30	2024	3	$14	$153	HORIZONTAL SS PUMP	7	500298	100	1.38
FAS PUMP	R.O. WELL #8 HORIZONTAL PUMP 100 HP	WESTERN RIVERBEND	$138	1996	30	2026	5	$23	$164	HORIZONTAL SS PUMP	8	500305	100	1.38
FAS PUMP	R.O. WELL #9 HORIZONTAL PUMP 100 HP	WESTERN RIVERBEND	$138	1996	30	2026	5	$23	$164	HORIZONTAL SS PUMP	9	500319	100	1.38
FAS PUMP	R.O. WELL #10 HORIZONTAL PUMP 100 HP	WESTERN RIVERBEND	$138	1996	30	2026	5	$23	$164	HORIZONTAL SS PUMP	10	500336	100	1.38
FAS PUMP	R.O. WELL #11 HORIZONTAL PUMP 125 HP	WESTERN RIVERBEND	$288	2005	30	2035	14	$134	$478	HORIZONTAL SS PUMP	11	502367	125	2.30
FAS PUMP	R.O. WELL #12 HORIZONTAL PUMP 125 HP	WESTERN RIVERBEND	$288	2005	30	2035	14	$134	$478	HORIZONTAL SS PUMP	12	500969	125	2.30
FAS PUMP	R.O. WELL #13 HORIZONTAL PUMP 125 HP	WESTERN RIVERBEND	$288	2005	30	2035	14	$134	$478	HORIZONTAL SS PUMP	13	500970	125	2.30
FAS RWM	24" thru 36" CENTRAL BLVD GARDENS TO RO3 600 LF	WELLFIELD 2 SITE	$207	1989	45	2034	13	$60	$290	UNDERGROUND WATER MAIN PLANT SITE	1	500973	600	0.35
FAS RWM	24" thru 36" HDPE 700 LF	WTP SITE	$242	1999	45	2044	23	$123	$450	UNDERGROUND WATER MAIN PLANT SITE	2	600109	700	0.35
FAS RWM	24" thru 36" HDPE CENTRAL 800 LF	CENTRAL BLVD	$276	1999	45	2044	23	$141	$514	UNDERGROUND WATER MAIN PLANT SITE	3	600110	800	0.35
FAS RWM	12 " (6"-12") PVC PIPE 850 LF	WTP SITE	$147	1989	45	2034	13	$42	$206	UNDERGROUND WATER MAIN PLANT SITE	4	600112	850	0.17
FAS RWM	24" thru 36" GARDENS/C-I8 WELL RO 5 8600 LF	JUPITER GARDENS BLVD & WEST	$2,967	1994	45	2039	18	$1,187	$4,795	UNDERGROUND WATER MAIN COMMON	5	500974	8600	0.35
FAS RWM	24" thru 36" C-18 WELL RO 9 3920 LF	SOUTH SIDE C-18 CANAL	$1,352	1996	45	2041	20	$601	$2,314	UNDERGROUND WATER MAIN COMMON	6	500975	3920	0.35
FAS RWM	24" thru 36" C-18 WELL RO 13 5800 LF	SOUTH SIDE C-18 CANAL	$2,001	2005	45	2050	29	$1,290	$4,412	UNDERGROUND WATER MAIN COMMON	7	500976	5800	0.35
FAS RWM	14" thru 20" JUPITER GARDENS TO RO3 210 LF	WELLFIELD 2	$43	1989	45	2034	13	$13	$61	UNDERGROUND WATER MAIN PLANT SITE	8	500977	210	0.21
FAS WELL	R.O. WELL #2 FLORIDIAN AQUIFER	WELLFIELD 2	$1,150	1988	35	2023	2	$66	$1,220	FAS R.O. WELL	2	500270	1	1150.00
FAS WELL	R.O. WELL #3 FLORIDIAN AQUIFER	WELLFIELD 2	$1,150	1988	35	2023	2	$66	$1,220	FAS R.O. WELL	3	500274	1	1150.00
FAS WELL	R.O. WELL #4 FLORIDIAN AQUIFER	WTP SITE	$1,150	1989	35	2024	3	$99	$1,257	FAS R.O. WELL	4	500278	1	1150.00
FAS WELL	R.O. WELL #5 FLORIDIAN AQUIFER	WELLFIELD RO	$1,150	1994	35	2029	8	$263	$1,476	FAS R.O. WELL	5	500282	1	1150.00
FAS WELL	R.O. WELL #6 FLORIDIAN AQUIFER	WELLFIELD RO	$1,150	1996	35	2031	10	$329	$1,577	FAS R.O. WELL	6	500289	1	1150.00
FAS WELL	R.O. WELL #7 FLORIDIAN AQUIFER	WELLFIELD RO	$1,150	1994	35	2029	8	$263	$1,476	FAS R.O. WELL	7	500297	1	1150.00
FAS WELL	R.O. WELL #8 FLORIDIAN AQUIFER	WESTERN RIVERBEND	$1,150	1996	35	2031	10	$329	$1,577	FAS R.O. WELL	8	500304	1	1150.00
FAS WELL	R.O. WELL #9 FLORIDIAN AQUIFER	WESTERN RIVERBEND	$1,150	1996	35	2031	10	$329	$1,577	FAS R.O. WELL	9	500318	1	1150.00
FAS WELL	R.O. WELL #10 FLORIDIAN AQUIFER	WESTERN RIVERBEND	$1,150	1996	35	2031	10	$329	$1,577	FAS R.O. WELL	10	500335	1	1150.00

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
59	FAS WELL	R.O. WELL #11 FLORIDIAN AQUIFER	WESTERN RIVERBEND	$1,150	2005	35	2040	19	$624	$2,130	FAS R.O. WELL	11	500962	1	1150.00
60	FAS WELL	R.O. WELL #12 FLORIDIAN AQUIFER	WESTERN RIVERBEND	$1,150	2005	35	2040	19	$624	$2,130	FAS R.O. WELL	12	500963	1	1150.00
61	FAS WELL	R.O. WELL #13 FLORIDIAN AQUIFER	WESTERN RIVERBEND	$1,150	2005	35	2040	19	$624	$2,130	FAS R.O. WELL	13	500964	1	1150.00
62	FASELEC	FAS RWM ELECTRICAL POWER 2005	FAS WELLFIELD	$1,020	2005	35	2040	19	$554	$1,890	WELLFIELD POWER CONDUIT-CABLE		600149	5914	0.17
63	FASRWM	FAS RWM 18"-20"-24" WELLFIELD 1992	FAS WELLFIELD	$2,983	1992	45	2037	16	$1,060	$4,552	UNDERGROUND PIPING WELLFIELD		600140	8645	0.35
64	FASRWM	FAS RWM 18"-20"-24" WELLFIELD 1997	FAS WELLFIELD	$2,365	1997	45	2042	21	$1,104	$4,164	UNDERGROUND PIPING WELLFIELD		600141	6855	0.35
65	FASRWM	FAS RWM 18"-20"-24" WELLFIELD 2004	FAS WELLFIELD	$1,466	2004	45	2049	28	$912	$3,145	UNDERGROUND PIPING WELLFIELD		600142	4250	0.35
66	FIN WM	6"-4" (6"-12") NF 850 LF	WTP SITE	$147	2010	45	2055	34	$111	$370	UNDERGROUND WATER MAIN PLANT SITE		500968	850	0.17
67	FIN WM	24" & 30" (24"-36") HSP & DISTRIBUTION 675 LF	WTP SITE	$233	1974	45	2019	0	$0	$233	UNDERGROUND WATER MAIN PLANT SITE		600207	675	0.35
68	FIN WM	24" & 30" (24"-36") HSP & DISTRIBUTION 405 LF	WTP SITE	$140	1986	45	2031	10	$31	$180	UNDERGROUND WATER MAIN PLANT SITE		600208	405	0.35
69	FIN WM	12" & 16 " (14"-20") WM JUNO SITE 450 LF	JUNO SITE	$155	1992	45	2037	16	$55	$237	UNDERGROUND WATER MAIN PLANT SITE		600115	450	0.35
70	FIN WM	24" thru 36" HSP INLT & OUTLET 1320	WELLFIELD 2	$455	1995	45	2040	19	$192	$757	UNDERGROUND WATER MAIN PLANT SITE		600116	1320	0.35
71	FIN WM	24" thru 36" HSP INLT & OUTLET 100 LF	WELLFIELD 2	$35	2000	45	2045	24	$18	$66	UNDERGROUND WATER MAIN PLANT SITE		600117	100	0.35
72	FIN WM	24" thru 36" HSP INLT & OUTLET 780 LF	WELLFIELD 2	$269	2003	45	2048	27	$161	$561	UNDERGROUND WATER MAIN PLANT SITE		600118	780	0.35
73	FIN WM	12"& 16" (14"-20") WM RIVER BEND SITE 500 LF	RIVERBEND SITE	$104	2005	45	2050	29	$67	$228	UNDERGROUND WATER MAIN PLANT SITE		600119	500	0.21
74	GEN TANK	GENERATOR # I 7,500 GAL DIESEL FUEL AST	TOWN OF JUPITER WATER PLANT	$129	2003	20	2023	2	$13	$143	AST DIESEL FUEL TANK	1	502090	7500	0.02
75	GEN TANK	GENERATOR # II 560 GAL DIESEL Fuel AST	WELL 12	$19	1970	20	1990	0	$0	$19	AST DIESEL FUEL TANK	2	502379	560	0.03
76	GEN TANK	GENERATOR # III 1,400 GAL DIESELFuel AST	WELL 15	$138	1982	20	2002	0	$0	$138	AST DIESEL FUEL TANK	3	502380	4000	0.03
77	GEN TANK	GENERATOR # IV 4,700 GAL DIESEL Fuel AST	HSP BUILDING CENTRAL NORTH	$12	1991	20	2011	0	$0	$12	AST DIESEL FUEL TANK	4	502381	700	0.02
78	GEN TANK	GENERATOR # V 1,000 GAL DIESEL Fuel AST	JUNO REPUMP STATION	$35	1992	20	2012	0	$0	$35	AST DIESEL FUEL TANK	5	502377	1000	0.03
79	GEN TANK	GENERATOR # VI 20,000 GAL DIESEL FUEL AST	PLANT SITE NORTH	$345	1991	25	2016	0	$0	$345	AST DIESEL FUEL TANK	6	500134	20000	0.02
80	GEN TANK	GENERATOR # VII 6,000 GAL DIESEL FUEL AST	HSP BUILDING CENTRAL SOUTH	$104	2006	20	2026	5	$26	$133	AST DIESEL FUEL TANK	7	501260	6000	0.02
81	GEN TANK	GENERATOR # VIII 10,000 GAL DIESEL FUEL AST	JUPITER WATER SYSTEM	$173	2005	25	2030	9	$62	$251	AST DIESEL FUEL TANK	8	501261	10000	0.02
82	GEN TANK	GENERATOR # IX 8,000 GAL DIESEL FUEL AST	WESTERN RIVERBEND	$138	2005	20	2025	4	$28	$169	AST DIESEL FUEL TANK	9	501262	8000	0.02
83	GEN TANK	GENERATOR # X 8,000 GAL DIESEL FUEL AST	ABACOA	$138	2007	20	2027	6	$41	$187	AST DIESEL FUEL TANK	10	501644	8000	0.02
84	GEN TANK	GENERATOR # XI 10,000 GAL DIESEL FUEL AST	NANO ELECTRICAL ROOM	$173	2010	25	2035	14	$97	$310	AST DIESEL FUEL TANK	11	502038	10000	0.02
85	GEN TANK	GENERATOR # XII 10,000 GAL DIESEL FUEL AST	NANO ELECTRICAL ROOM	$173	2010	25	2035	14	$97	$310	AST DIESEL FUEL TANK	12	502039	10000	0.02
86	GEN TANK	SEMINOLE AVE GENERATOR FUEL TANK 1,000 GAL	SEMINOLE AVE SWPS SITE	$35	2005	20	2025	4	$7	$42	AST DIESEL FUEL TANK	13	600216	1000	0.03
87	GEN TANK	7th ST.SWPS GENERATOR FUEL TANK 2000 GAL	7th STREET SWPS SITE	$69	2005	20	2025	4	$14	$84	AST DIESEL FUEL TANK	14	600019	2000	0.03
88	GEN TANK	EOC FUEL TANK - 2400 GAL	PUBLIC WORKS SITE	$83	2000	20	2020	0	$0	$83	AST DIESEL FUEL TANK	15	600082	2400	0.03
89	GENSET	GENERATOR # I WTP HSP 1,250 KW	WTP HSP	$431	2003	35	2038	17	$209	$748	EMERGENCY GENERATOR	1	502376	1250	0.35
90	GENSET	GENERATOR # II Well 12 105 KW	WELL 12	$24	1970	35	2005	0	$0	$24	EMERGENCY GENERATOR	2	502378	105	0.23
91	GENSET	GENERATOR # III 310 KW GENSET	GENERATOR ROOM WELL 15	$71	1982	35	2017	0	$0	$71	EMERGENCY GENERATOR	3	500111	310	0.23
92	GENSET	GENERATOR # IV 894 KW GENSET	HIGH SEVICE BUILDING NORTH	$257	1991	35	2026	5	$37	$299	EMERGENCY GENERATOR	4	500117	894	0.29
93	GENSET	GENERATOR # V 200 KW GENSET	HSP BUILDING JUNO	$46	1992	35	2027	6	$8	$55	EMERGENCY GENERATOR	5	500123	200	0.23
94	GENSET	GENERATOR # VI 1,500 KW GENSET	R.O. GENERATOR ROOM	$690	1994	35	2029	8	$158	$886	EMERGENCY GENERATOR	6	500129	1500	0.46
95	GENSET	GENERATOR # VII 1,350 KW	HIGH SERVICE BLDG. CENTRAL S.	$621	2006	35	2041	20	$355	$1,189	EMERGENCY GENERATOR	7	501487	1350	0.46
96	GENSET	GENERATOR # VIII 1,500 KW	JUPITER WATER SYSTEM	$690	2005	35	2040	19	$375	$1,278	EMERGENCY GENERATOR	8	501488	1500	0.46
97	GENSET	GENERATOR # IX 1,500 KW	WESTERN RIVERBEND	$690	2005	35	2040	19	$375	$1,278	EMERGENCY GENERATOR	9	501489	1500	0.4600
98	GENSET	GENERATOR # X 660 KW GEN	ABACOA	$152	2007	35	2042	21	$91	$300	EMERGENCY GENERATOR	10	502029	660	0.2300
99	GENSET	GENERATOR # XI Nano 1 1,500 KW	NANO GENERATOR ROOM	$690	2010	35	2045	24	$473	$1,504	EMERGENCY GENERATOR	11	501361	1500	0.4600
100	GENSET	GENERATOR # XII Nano 2 1,500 KW	NANO GENERATOR ROOM	$690	2010	35	2045	24	$473	$1,504	EMERGENCY GENERATOR	12	501362	1500	0.4600
101	GENSET	SEMINOLE AVE GENERATOR 250 KW	SEMINOLE AVE SWPS SITE	$58	2005	35	2040	19	$31	$107	EMERGENCY GENERATOR	13	501363	250	0.2300
102	GENSET	7th ST.SWPS GENERATOR 355	7th STREET SWPS SITE	$82	2005	35	2040	19	$44	$151	EMERGENCY GENERATOR	14	501363	355	0.2300
103	GENSET	EOC GENERATOR 200 KW	PUBLIC WORKS SITE	$46	2000	35	2035	14	$18	$72	EMERGENCY GENERATOR	15	600081	200	0.2300
104	GST	STORAGE TANK ONE 0.350 MG POTABLE	WTP PLANT SITE	$201	1978	75	2053	32	$86	$370	STORAGE TANK FOR POTABLE	1	500358	350000	0.0006
105	GST	STORAGE TANK TWO 1.5 MG POTABLE	WTP PLANT SITE	$863	1980	75	2055	34	$391	$1,652	STORAGE TANK FOR POTABLE	2	500359	1500000	0.0006
106	GST	STORAGE TANK THREE 3.0 MG POTABLE	WTP PLANT SITE	$1,725	1984	75	2059	38	$874	$3,595	STORAGE TANK FOR POTABLE	3	500360	3000000	0.0006
107	GST	STORAGE TANK FOUR 5.0MG POTABLE	WELLFIELD 2	$2,875	2005	75	2080	59	$2,262	$9,140	STORAGE TANK FOR POTABLE	4	501645	5000000	0.0006
108	GST	STORAGE TANK FIVE 8.0 MG POTABLE	WELLFIELD 2	$4,600	1995	75	2070	49	$3,005	$12,023	STORAGE TANK FOR POTABLE	5	500371	8000000	0.0006
109	GST	STORAGE TANK SIX 8.0 MG POTABLE	WELLFIELD 2	$4,600	2002	75	2077	56	$3,435	$13,805	STORAGE TANK FOR POTABLE	6	500825	8000000	0.0006
110	GST	STORAGE TANK JUNO 1.0 MG POTABLE	JUNO BEACH REPUMP	$575	1992	75	2067	46	$353	$1,414	STORAGE TANK FOR POTABLE	7	600071	1000000	0.0006
111	GST	STORAGE TANK RIVERBEND 3.0 MG POTABLE	RIVERBEND SITE	$1,725	2009	75	2084	63	$1,449	$5,913	STORAGE TANK FOR POTABLE	7	600223	3000000	0.0006
112	HSP	HIGH SERVICE #5 PUMP HORIZ SPL 250 HP	HIGH SERVICE BUILDING PLANT	$460	2019	30	2049	28	$429	$1,250	HORIZONTAL PUMP	5	500137	250	1.8400
113	HSP	HIGH SERVICE #6 PUMP HORIZ SPL 250 HP	HIGH SERVICE BUILDING PLANT	$460	2019	30	2049	28	$429	$1,250	HORIZONTAL PUMP	6	500140	250	1.8400
114	HSP	HIGH SERVICE #7 PUMP VERTICAL 200 HP	STORAGE TANK 2	$391	1985	35	2020	0	$0	$391	VERTICAL PUMP	7	500143	200	1.9550

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
115	HSP	HIGH SERVICE #8 PUMP VERTICAL 200 HP	STORAGE TANK 2	$391	1986	35	2021	0	$0	$391	VERTICAL PUMP	8	500146	200	1.9550
116	HSP	HIGH SERVICE #9 PUMP VERTICAL 200 HP	HIGH SERVICE BUILDING NORTH	$391	1991	35	2026	5	$56	$455	VERTICAL PUMP	9	500150	200	1.9550
117	HSP	HIGH SERVICE #10 PUMP VERTICAL 200 HP	HIGH SERVICE BUILDING NORTH	$391	1991	35	2026	5	$56	$455	VERTICAL PUMP	10	500154	200	1.9550
118	HSP	HIGH SERVICE #11 PUMP VERTICAL 200 HP	HIGH SERVICE BUILDING NORTH	$391	1995	35	2030	9	$101	$519	VERTICAL PUMP	11	500158	200	1.9550
119	HSP	HIGH SERVICE #12 PUMP VERTICAL 200 HP	HIGH SERVICE BUILDING NORTH	$391	1999	35	2034	13	$145	$593	VERTICAL PUMP	12	500691	200	1.9550
120	HSP	HIGH SERVICE #13 PUMP VERT. 200 HP	STORAGE TANK 2	$391	2003	35	2038	17	$190	$678	VERTICAL PUMP	13	500831	200	1.9550
121	HSP	HIGH SERVICE #14 PUMP VERT. 200 HP	STORAGE TANK 2	$391	2003	35	2038	17	$190	$678	VERTICAL PUMP	14	500837	200	1.9550
122	HSP	HIGH SERVICE #15 PUMP VERT. 200 HP	HIGH SERVICE BUILDING SOUTH	$391	2006	35	2041	20	$223	$748	VERTICAL PUMP	15	501459	200	1.9550
123	HSP	HIGH SERVICE #16 PUMP VERT. 200 HP	HIGH SERVICE BUILDING SOUTH	$391	2006	35	2041	20	$223	$748	VERTICAL PUMP	16	501460	200	1.9550
124	HSP	HIGH SERVICE #17 PUMP VERT. 200 HP	HIGH SERVICE BUILDING SOUTH	$391	2011	35	2046	25	$279	$880	VERTICAL PUMP	17	502046	200	1.9550
125	HSP	HIGH SERVICE #18 PUMP VERT. 200 HP	HIGH SERVICE BUILDING SOUTH	$391	2011	35	2046	25	$279	$880	VERTICAL PUMP	18	502048	200	1.9550
126	HSP	HIGH SERVICE #1 PUMP RIVERBEND 75 HP	WESTERN RIVERBEND	$155	2005	35	2040	19	$84	$288	VERTICAL PUMP	21	502296	75	2.0700
127	HSP	HIGH SERVICE #2 PUMP RIVERBEND 75 HP	WESTERN RIVERBEND	$155	2005	35	2040	19	$84	$288	VERTICAL PUMP	22	502297	75	2.0700
128	HSP	HIGH SERVICE #3 PUMP RIVERBEND 75 HP	WESTERN RIVERBEND	$155	2005	35	2040	19	$84	$288	VERTICAL PUMP	23	502298	75	2.0700
129	HSP	HIGH SERVICE #4 PUMP RIVERBEND 75 HP	WESTERN RIVERBEND	$155	2005	35	2040	19	$84	$288	VERTICAL PUMP	24	502299	75	2.0700
130	HSP	HIGH SERVICE #HSPR1 PUMP TURBI 75 HP	HSP BUILDING JUNO	$155	1992	35	2027	6	$27	$187	VERTICAL PUMP	31	500163	75	2.0700
131	HSP	HIGH SERVICE #HSPR2 PUMP TURBI 75 HP	HSP BUILDING JUNO	$155	1992	35	2027	6	$27	$187	VERTICAL PUMP	32	500167	75	2.0700
132	HSP	HIGH SERVICE PUMP #HSPR3 PUMP 75 HP	HSP BUILDING JUNO	$155	2000	35	2035	14	$62	$243	VERTICAL PUMP	33	500761	75	2.0700
133	HSP	HYDRO-PNUEMANTIC TANK 20,000 G	PLANT SITE NORTH	$144	1985	40	2025	4	$14	$160	TANKS OR CLOSED CONTAINERS	40	500171	1	143.7500
134	IX	ION EXCHANGE VESSEL #1	PLANT SITE EAST	$345	1999	30	2029	8	$92	$459	WATER TREATMENT PLANT		500597	1	345.0000
135	IX	ION EXCHANGE VESSEL #2	PLANT SITE EAST	$345	1999	30	2029	8	$92	$459	WATER TREATMENT PLANT		500598	1	345.0000
136	IX	ION EXCHANGE VESSEL #3	PLANT SITE EAST	$345	1999	30	2029	8	$92	$459	WATER TREATMENT PLANT		600200	1	345.0000
137	IX	ION EXCHANGE VESSEL #4	PLANT SITE EAST	$345	1999	30	2029	8	$92	$459	WATER TREATMENT PLANT		600201	1	345.0000
138	MCC	RO MCC 4A, 1600 A	RO ELECTRIC ROOM	$130	1989	45	2034	13	$38	$182	ELECTRICAL POWER CONTROL-SWITCH		600165	1	130.0000
139	MCC	JUNO BEACH MCC, 400 A	HSP BUILDING JUNO	$24	1992	45	2037	16	$9	$37	ELECTRICAL POWER CONTROL-SWITCH		600166	1	24.0000
140	MCC	RO MCC 5A, 3000 A	RO ELECTRIC ROOM	$30	1989	45	2034	13	$9	$42	ELECTRICAL POWER CONTROL-SWITCH		600168	1	30.0000
141	MCC	RO MCC 5B, 600 A	RO ELECTRIC ROOM	$55	1989	45	2034	13	$16	$77	ELECTRICAL POWER CONTROL-SWITCH		600169	1	55.0000
142	MCC	LIME SLUDGE MCC 6, 600 A	LIME SLUDGE BUILDING	$30	1990	45	2035	14	$9	$43	ELECTRICAL POWER CONTROL-SWITCH		600170	1	30.0000
143	MCC	RO MCC 4B, 1600 A	RO ELECTRIC ROOM	$50	1989	45	2034	13	$14	$70	ELECTRICAL POWER CONTROL-SWITCH		600172	1	50.0000
144	MCC	RO MCC 4, 3000 A	RO ELECTRIC ROOM	$90	1990	45	2035	14	$28	$130	ELECTRICAL POWER CONTROL-SWITCH		600174	1	90.0000
145	MCC	RO MCC 8, 1600 A	RO ELECTRIC ROOM	$50	2005	45	2050	29	$32	$110	ELECTRICAL POWER CONTROL-SWITCH		600175	1	50.0000
146	MCC	CTF MCC 9, 400 A	CTF BUILDING	$29	2005	45	2050	29	$19	$64	ELECTRICAL POWER CONTROL-SWITCH		600177	1	29.0000
147	MCC	SWPS MCC 10, 600 A	MBA BUILDING	$24	2007	45	2052	31	$17	$56	ELECTRICAL POWER CONTROL-SWITCH		600178	1	24.0000
148	MCC	NF MCC-NF-1-LEFT, 1200 A	NF ELECTRIC ROOM	$50	2010	45	2055	34	$38	$126	ELECTRICAL POWER CONTROL-SWITCH		600179	1	50.0000
149	MCC	NF MCC-NF-1-RIGHT, 400 A	NF ELECTRIC ROOM	$55	2010	45	2055	34	$42	$139	ELECTRICAL POWER CONTROL-SWITCH		600180	1	55.0000
150	MCC	NF MCC-NF-1, 4000 A	NF ELECTRIC ROOM	$12	2010	45	2055	34	$9	$30	ELECTRICAL POWER CONTROL-SWITCH		600181	1	12.0000
151	MCC	NF MCC-NF-2, 4000 A	NF ELECTRIC ROOM	$12	2010	45	2055	34	$9	$30	ELECTRICAL POWER CONTROL-SWITCH		600182	1	12.0000
152	MCC	NF-MCC NF-2-LEFT, 1000 A	NF PRETREAT BUILDING	$70	2010	45	2055	34	$53	$177	ELECTRICAL POWER CONTROL-SWITCH		600183	1	70.0000
153	MCC	NF MCC NF-2-RIGHT, 1000 A	NF PRETREAT BUILDING	$45	2010	45	2055	34	$34	$114	ELECTRICAL POWER CONTROL-SWITCH		600184	1	45.0000
154	NF CONC	NF CONCENTRATE DISCH PIPE 2,500 LF 16"	CENTRAL BLVD	$661	2008	45	2053	32	$470	$1,583	UNDERGROUND WATER MAIN COMMON		502314	2500	0.2645
155	NF CONC	12" (14"-20") NF CONCENTRATE DISCHARGE 530 LF	WTP SITE	$110	2010	45	2055	34	$83	$277	UNDERGROUND WATER MAIN PLANT SITE		600123	530	0.2070
156	NF H2S	NANO SCRUBBER NORTH	NANO POST TREAT	$403	2010	50	2060	39	$314	$1,084	SCRUBBER		501349	1	402.5000
157	NF H2S	NANO SCRUBBER SOUTH	NANO POST TREAT	$403	2010	50	2060	39	$314	$1,084	SCRUBBER		501350	1	402.5000
158	NF PUMP	NANO MEMBRANE FEED PUMP #1 200 HP	NANO MECHANICAL ROOM	$690	2010	40	2050	29	$500	$1,625	VERTICAL SS PUMP	11	501284	200	3.4500
159	NF PUMP	NANO MEMBRANE FEED PUMP #2 200 HP	NANO MECHANICAL ROOM	$690	2010	40	2050	29	$500	$1,625	VERTICAL SS PUMP	12	501285	200	3.4500
160	NF PUMP	NANO MEMBRANE FEED PUMP #3 200 HP	NANO MECHANICAL ROOM	$690	2010	40	2050	29	$500	$1,625	VERTICAL SS PUMP	13	501286	200	3.4500
161	NF PUMP	NANO MEMBRANE FEED PUMP #4 200 HP	NANO MECHANICAL ROOM	$690	2010	40	2050	29	$500	$1,625	VERTICAL SS PUMP	14	501287	200	3.4500
162	NF PUMP	NANO MEMBRANE FEED PUMP #5 200 HP	NANO MECHANICAL ROOM	$690	2010	40	2050	29	$500	$1,625	VERTICAL SS PUMP	15	501288	200	3.4500
163	NF PUMP	NANO TRANSFER PUMP #1 Clearwell 75 HP	NANO CLEAR WELL	$155	2010	35	2045	24	$106	$338	VERTICAL PUMP	21	501289	75	2.0700
164	NF PUMP	NANO TRANSFER PUMP #2 Clearwell 75 HP	NANO CLEAR WELL	$155	2010	35	2045	24	$106	$338	VERTICAL PUMP	22	501290	75	2.0700
165	NF PUMP	NANO TRANSFER PUMP #3 Clearwell 75 HP	NANO CLEAR WELL	$155	2010	35	2045	24	$106	$338	VERTICAL PUMP	23	501291	75	2.0700
166	NF PUMP	NANO TRANSFER PUMP #4 Clearwell 75 HP	NANO CLEAR WELL	$155	2010	35	2045	24	$106	$338	VERTICAL PUMP	24	501292	75	2.0700
167	NF PUMP	NANO TRANSFER PUMP #5 Clearwell 75 HP	NANO CLEAR WELL	$155	2010	35	2045	24	$106	$338	VERTICAL PUMP	25	501293	75	2.0700
168	NF PUMP	NANO TRANSFER PUMP #6 Clearwell 75 HP	NANO CLEAR WELL	$155	2010	35	2045	24	$106	$338	VERTICAL PUMP	26	501294	75	2.0700
169	NF PUMP	NANO FRP CENTRIFUGAL FAN 1 50 HP	NANO POST TREAT	$43	2010	15	2025	4	$12	$56	BLOWER PROCESS	31	501330	50	0.8625
170	NF PUMP	NANO FRP CENTRIFUGAL FAN 2 50 HP	NANO POST TREAT	$43	2010	15	2025	4	$12	$56	BLOWER PROCESS	32	501331	50	0.8625

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
171	NF PUMP	NANO FRP CENTRIFUGAL FAN 3 50 HP	NANO POST TREAT	$43	2010	15	2025	4	$12	$56	BLOWER PROCESS	33	501332	50	0.8625
172	NF PUMP	NANO BACKWASH RECOVERY PUMP #1 50 HP	NANO BACKWASH FACILITY	$69	2010	15	2025	4	$18	$90	SUBMERSIBLE PUMP	41	502019	50	1.3800
173	NF PUMP	NANO BACKWASH RECOVERY PUMP #2 50 HP	NANO BACKWASH FACILITY	$69	2010	15	2025	4	$18	$90	SUBMERSIBLE PUMP	42	502020	50	1.3800
174	NF PUMP	NANO BACKWASH SUPPLY PUMP #1 40 HP	NANO BACKWASH FACILITY	$46	2010	30	2040	19	$29	$92	HORIZONTAL PUMP	43	502023	40	1.1500
175	NF PUMP	NANO BACKWASH SUPPLY PUMP #2 40 HP	NANO BACKWASH FACILITY	$46	2010	30	2040	19	$29	$92	HORIZONTAL PUMP	44	502024	40	1.1500
176	NF PUMP	NANO AIR SCOUR BLOWER #1 40 HP	NANO PRETREAT BUILDING	$35	2010	15	2025	4	$9	$45	BLOWER PROCESS	50	501328	40	0.8625
177	NF PUMP	NANO AIR SCOUR BLOWER #2 40 HP	NANO PRETREAT BUILDING	$35	2010	15	2025	4	$9	$45	BLOWER PROCESS	51	501329	40	0.8625
178	NF PUMP	NANO PRETREAT BOOSTER PUMP # 1 200 HP	NANO BUILDING	$368	2010	30	2040	19	$233	$734	HORIZONTAL PUMP	61	502078	200	1.8400
179	NF PUMP	NANO PRETREAT BOOSTER PUMP # 2 200 HP	NF PRETREAT BUILDING	$368	2010	30	2040	19	$233	$734	HORIZONTAL PUMP	62	502370	200	1.8400
180	NF PUMP	NANO PRETREAT BOOSTER PUMP # 3 200 HP	NF PRETREAT BUILDING	$368	2010	30	2040	19	$233	$734	HORIZONTAL PUMP	63	502361	200	1.8400
181	NF PUMP	NANO PRETREAT BOOSTER PUMP # 4 200 HP	NF PRETREAT BUILDING	$368	2010	30	2040	19	$233	$734	HORIZONTAL PUMP	64	502371	200	1.8400
182	NF PUMP	NANO CLEANING SYSTEM PUMP 75 HP	NANO BUILDING	$104	2010	30	2040	19	$66	$206	HORIZONTAL SS PUMP	70	502251	75	1.3800
183	NF PUMP	SUPLEMENTAL BLEND BOX PUMP 40 HP	SUPPLEMENTAL BLEND BOX	$184	2010	40	2050	29	$133	$433	VERTICAL SS PUMP	80	502339	40	4.6000
184	NF PUMP	SUPLEMENTAL BLEND BOX PUMP 40 HP SPARE	SUPPLEMENTAL BLEND BOX	$184	2021	40	2061	40	$184	$589	VERTICAL SS PUMP	80	502339	40	4.6000
185	NF TREAT	NANO FILTRATION TRAIN 1	NANO PROCESS ROOM	$2,933	2010	50	2060	39	$2,287	$7,896	FILTRATION TRAIN/BANK	11	502282	3000000	0.0010
186	NF TREAT	NANO FILTRATION TRAIN 2	NANO PROCESS ROOM	$2,933	2010	50	2060	39	$2,287	$7,896	FILTRATION TRAIN/BANK	12	502283	3000000	0.0010
187	NF TREAT	NANO FILTRATION TRAIN 3	NANO PROCESS ROOM	$2,933	2010	50	2060	39	$2,287	$7,896	FILTRATION TRAIN/BANK	13	502284	3000000	0.0010
188	NF TREAT	NANO FILTRATION TRAIN 4	NANO PROCESS ROOM	$2,933	2010	50	2060	39	$2,287	$7,896	FILTRATION TRAIN/BANK	14	502285	3000000	0.0010
189	NF TREAT	NANO FILTRATION TRAIN 5	NANO PROCESS ROOM	$2,933	2010	50	2060	39	$2,287	$7,896	FILTRATION TRAIN/BANK	15	502101	3000000	0.0010
190	NF TREAT	NANO DEGASIFIER #1	NANO POST TREAT	$460	2010	50	2060	39	$359	$1,239	DEGASIFIER		501346	1	460.0000
191	NF TREAT	NANO DEGASIFIER #2	NANO POST TREAT	$460	2010	50	2060	39	$359	$1,239	DEGASIFIER		501347	1	460.0000
192	NF TREAT	NANO DEGASIFIER #3	NANO POST TREAT	$460	2010	50	2060	39	$359	$1,239	DEGASIFIER		501348	1	460.0000
193	NF TREAT	NANO HORIZ PRESSURE FILTER #1 380 SF, 10' D, 40' L	NANO PRETREAT	$403	2010	30	2040	19	$255	$803	TONKA PRESSURE SAND FILTER		501358	1	402.5000
194	NF TREAT	NANO HORIZ PRESSURE FILTER #2 380 SF, 10' D, 40' L	NANO PRETREAT	$403	2010	30	2040	19	$255	$803	TONKA PRESSURE SAND FILTER		501359	1	402.5000
195	NF TREAT	NANO HORIZ PRESSURE FILTER #3 380 SF, 10' D, 40' L	NANO PRETREAT	$403	2010	30	2040	19	$255	$803	TONKA PRESSURE SAND FILTER		501360	1	402.5000
196	NF TREAT	NANO CARTRIDGE FILTER #1120-1	NANO MECHANICAL ROOM	$58	2010	40	2050	29	$42	$135	PRE-FILTER CANISTER		502040	1	57.5000
197	NF TREAT	NANO CARTRIDGE FILTER #1120-2	NANO MECHANICAL ROOM	$58	2010	40	2050	29	$42	$135	PRE-FILTER CANISTER		502041	1	57.5000
198	NF TREAT	NANO CARTRIDGE FILTER #1120-3	NANO MECHANICAL ROOM	$58	2010	40	2050	29	$42	$135	PRE-FILTER CANISTER		502042	1	57.5000
199	NF TREAT	NANO CARTRIDGE FILTER #1120-4	NANO MECHANICAL ROOM	$58	2010	40	2050	29	$42	$135	PRE-FILTER CANISTER		502043	1	57.5000
200	NF TREAT	NANO CARTRIDGE FILTER #1120-5	NANO MECHANICAL ROOM	$58	2010	40	2050	29	$42	$135	PRE-FILTER CANISTER		502044	1	57.5000
201	NF TREAT	NANO PLOT UNIT	NANO PROCESS ROOM	$460	2014	40	2054	33	$380	$1,215	TEST SKID		502110	1	460.0000
202	NF TREAT	NF PRETREAT GANTRY CRANE	WTP SITE	$144	2000	75	2075	54	$104	$415	GANTRY STYLE CRANE		600220	1	143.7500
203	NF TREAT	HORIZONTAL FILTER MEDIA REPLACE	NF PRETREAT	$600	2021	10	2031	10	$600	$1,380	NF PRETREAT FILTER		600246	1	600.0000
204	PAVE	PAVEMENT WTP 13,000 SY	WTP SITE	$75	2014	20	2034	13	$49	$142	SITE PAVING		600013	13000	0.0058
205	PAVE	PAVEMENT WELLFIELD 2 2,100 SY	WELLFIELD @ SITE	$12	2005	20	2025	4	$2	$15	SITE PAVING		600215	2100	0.0058
206	PAVE	PAVEMENT RIVERBEND 1,165 SY	RIVERBEND SITE	$7	2005	20	2025	4	$1	$8	SITE PAVING		600214	1165	0.0058
207	PAVE	PAVEMENT ABACOA 200 SY	ABACOA SITE	$1	2008	20	2028	7	$0	$2	SITE PAVING		600213	200	0.0058
208	PAVE	PAVEMENT JUNO 330 SY	JUNO SITE	$2	2000	20	2020	0	$0	$2	SITE PAVING		600202	330	0.0058
209	PRIM ELEC	PRIMARY ELCTRICAL RO-22,8000 V-1,500 KVA-N	WTP SITE	$886	1990	60	2050	29	$428	$1,686	BURIED PRIMARY ELCTRICAL SERVICE-		600194	770	1.1500
210	PRIM ELEC	PRIMARY ELCTRICAL SERVICE-NF 480 V-4,000 A	WTP SITE	$460	2010	60	2070	49	$376	$1,388	BURIED PRIMARY ELCTRICAL SERVICE-		600195	400	1.1500
211	PRIM ELEC	PRIMARY ELCTRICAL NF-22,8000 V-1,500 KVA	WTP SITE	$529	2010	60	2070	49	$432	$1,596	BURIED PRIMARY ELCTRICAL SERVICE-		600196	460	1.1500
212	PRIM ELEC	PRIMARY ELCTRICAL HSP-XXXXX V-XXXXX KVA	WTP SITE	$115	1978	60	2038	17	$33	$164	BURIED PRIMARY ELCTRICAL SERVICE-		600197	100	1.1500
213	PRIM ELEC	PRIMARY ELCTRICAL RO-22,8000 V-1,500 KVA-W	WTP SITE	$966	1995	60	2055	34	$547	$2,072	BURIED PRIMARY ELCTRICAL SERVICE-		600194	840	1.1500
214	PSW	12" (6"-12") 200 LF	WTP SITE	$35	1998	45	2043	22	$17	$62	UNDERGROUND WATER MAIN PLANT SITE		600203	200	0.1725
215	PSW	4"-6" (6"-12") LIME SLUDGE 600 LF	WTP SITE	$104	1991	45	2036	15	$35	$154	UNDERGROUND WATER MAIN PLANT SITE		600204	600	0.1725
216	RO CONC	RO C18 CONCENTRATE OUTFALL	CENTRAL BLVD	$714	1989	45	2034	13	$206	$1,001	UNDERGROUND WATER MAIN COMMON		501495	2700	0.2645
217	RO CONC	CONCENTRATE DISCHARGE DIFFUSER	C-18 CANAL	$115	1989	50	2039	18	$41	$179	UNDERWATER PIPE		501496	1	115.0000
218	RO CONC	12"&20" (14"-20") CONCENTRATE DISCHARGE 180 LF	WTP SITE	$37	1997	45	2042	21	$17	$66	UNDERGROUND WATER MAIN PLANT SITE		600120	180	0.2070
219	RO CONC	20" (14"-20") CONCENTRATE DISCHARGE 295 LF	WTP SITE	$61	2006	45	2051	30	$41	$138	UNDERGROUND WATER MAIN PLANT SITE		600121	295	0.2070
220	RO H2S	MBA H2S SCRUBBER UNIT WEST	MBA SLAB	$1,725	1991	50	2041	20	$690	$2,829	ODOR CONTROL UNIT	0	500182	1	1725.0000
221	RO H2S	MBA 1802 RECIRCULATION PUMP 75 HP	MBA SLAB	$104	2020	30	2050	29	$100	$291	HORIZONTAL SS PUMP	0	500183	75	1.3800
222	RO H2S	MBA #1801 BLOWER PROCESS FAN 1 100 HP	MBA SLAB	$86	2020	15	2035	14	$81	$201	BLOWER SS PROCESS	0	500184	100	0.8625
223	RO H2S	MBA H2S SCRUBBER UNIT EAST	MBA SLAB	$1,725	1991	50	2041	20	$690	$2,829	ODOR CONTROL UNIT	0	500189	1	1725.0000
224	RO H2S	MBA 1801 RECIRCULATION PUMP 75 HP	MBA SLAB	$104	2020	30	2050	29	$100	$291	HORIZONTAL SS PUMP	0	500190	75	1.3800
225	RO H2S	MBA #1802 BLOWER PROCESS FAN 100 HP	MBA SLAB	$86	2020	15	2035	14	$81	$201	BLOWER SS PROCESS	0	500191	100	0.8625
226	RO H2S	MBA #1801 BLOWER PROCESS FAN 1 100 HP-SPARE	MBA SLAB	$86	2021	15	2036	15	$86	$211	BLOWER SS PROCESS	0	500184	100	0.8625

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
227	RO H2S	TWO STAGE CONCENTRATE SCRUBBER	PLANT SITE CTF	$805	2005	50	2055	34	$547	$1,911	ODOR CONTROL UNIT		501552	1	805.0000
228	RO H2S	CONCENTRATE SCRUBBER SPARE BLOWER	PLANT SITE CTF	$43	2005	15	2020	0	$0	$43	ODOR CONTROL UNIT		501552	50	0.8625
229	RO PUMP	TRAIN A HIGH PRESSURE PUMP R.O 350 HP	RO PROCESS ROOM	$684	1989	40	2029	8	$137	$854	VERTICAL SS PUMP	1	500402	350	1.9550
230	RO PUMP	TRAIN B HIGH PRESSURE PUMP R.O 350 HP	RO PROCESS ROOM	$684	1989	40	2029	8	$137	$854	VERTICAL SS PUMP	2	500410	350	1.9550
231	RO PUMP	TRAIN C HIGH PRESSURE PUMP R.O 350 HP	RO PROCESS ROOM	$684	1989	40	2029	8	$137	$854	VERTICAL SS PUMP	3	500431	350	1.9550
232	RO PUMP	TRAIN D HIGH PRESSURE PUMP R.O 350 HP	RO PROCESS ROOM	$684	1989	40	2029	8	$137	$854	VERTICAL SS PUMP	4	500439	350	1.9550
233	RO PUMP	TRAIN E HIGH PRESSURE PUMP R.O 300 HP	RO PROCESS ROOM	$587	1996	40	2036	15	$220	$905	VERTICAL SS PUMP	5	500445	300	1.9550
234	RO PUMP	TRAIN F HIGH PRESSURE PUMP R.O 300 HP	RO PROCESS ROOM	$587	1996	40	2036	15	$220	$905	VERTICAL SS PUMP	6	500451	300	1.9550
235	RO PUMP	TRAIN G HIGH PRESSURE PUMP R.O 300 HP	RO PROCESS ROOM	$587	1996	40	2036	15	$220	$905	VERTICAL SS PUMP	7	500456	300	1.9550
236	RO PUMP	TRAIN H HIGH PRESSURE PUMP R.O 300 HP	RO PROCESS ROOM	$587	1996	40	2036	15	$220	$905	VERTICAL SS PUMP	8	500462	300	1.9550
237	RO PUMP	TRAIN I HIGH PRESSURE PUMP R.O 350 HP	RO PROCESS ROOM	$147	2005	40	2045	24	$88	$298	VERTICAL SS PUMP	9	500972	75	1.9550
238	RO PUMP	TRANSFER #8 PUMP PEERLESS TURB 75 HP	RO CLEARWELL	$155	1990	35	2025	4	$18	$175	VERTICAL PUMP	18	500465	75	2.0700
239	RO PUMP	TRANSFER #9 PUMP PEERLESS TURB 75 HP	RO CLEARWELL	$155	1990	35	2025	4	$18	$175	VERTICAL PUMP	19	500469	75	2.0700
240	RO PUMP	TRANSFER #10 PUMP PEERLESS TUR 75 HP	RO CLEARWELL	$155	1990	35	2025	4	$18	$175	VERTICAL PUMP	20	500473	75	2.0700
241	RO PUMP	TRANSFER #11 PUMP PEERLESS TUR 75 HP	RO CLEARWELL	$155	1994	35	2029	8	$35	$199	VERTICAL PUMP	21	500477	75	2.0700
242	RO PUMP	TRANSFER #12 PUMP PEERLESS TUR 75 HP	RO CLEARWELL	$155	1994	35	2029	8	$35	$199	VERTICAL PUMP	23	500480	75	2.0700
243	RO PUMP	TRANSFER #13 PUMP PEERLESS TUR 75 HP	RO CLEARWELL	$155	1996	35	2031	10	$44	$213	VERTICAL PUMP	24	500483	75	2.0700
244	RO TREAT	R.O. PERMEATE DEGASIFIER D-401	RO CLEARWELL	$460	1989	50	2039	18	$166	$715	REVERSE OSMOSIS EQUIPMENT	0	500211	1	460.0000
245	RO TREAT	R.O. PERMEATE DEGASIFIER D-402	RO CLEARWELL	$460	1989	50	2039	18	$166	$715	REVERSE OSMOSIS EQUIPMENT	0	500212	1	460.0000
246	RO TREAT	R.O. PERMEATE DEGASIFIER D-403	RO CLEARWELL	$460	1996	50	2046	25	$230	$863	REVERSE OSMOSIS EQUIPMENT	0	500213	1	460.0000
247	RO TREAT	R.O. TEST SKID	RO PROCESS ROOM	$115	2021	30	2051	30	$115	$334	RO TEST UNIT	0	500244	1	115.0000
248	RO TREAT	TRAIN A REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1989	40	2029	8	$345	$2,153	REVERSE OSMOSIS TREATMENT TRAIN	1	500397	1500000	0.0012
249	RO TREAT	TRAIN B REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1989	40	2029	8	$345	$2,153	REVERSE OSMOSIS TREATMENT TRAIN	2	500405	1500000	0.0012
250	RO TREAT	TRAIN C REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1989	40	2029	8	$345	$2,153	REVERSE OSMOSIS TREATMENT TRAIN	3	500426	1500000	0.0012
251	RO TREAT	TRAIN D REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1989	40	2029	8	$345	$2,153	REVERSE OSMOSIS TREATMENT TRAIN	4	500434	1500000	0.0012
252	RO TREAT	TRAIN E REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1996	40	2036	15	$647	$2,663	REVERSE OSMOSIS TREATMENT TRAIN	5	500442	1500000	0.0012
253	RO TREAT	TRAIN F REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1996	40	2036	15	$647	$2,663	REVERSE OSMOSIS TREATMENT TRAIN	6	500448	1500000	0.0012
254	RO TREAT	TRAIN G REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1996	40	2036	15	$647	$2,663	REVERSE OSMOSIS TREATMENT TRAIN	7	500453	1500000	0.0012
255	RO TREAT	TRAIN H REVERSE OSMOSIS UNIT 1.5 MGD	RO PROCESS ROOM	$1,725	1996	40	2036	15	$647	$2,663	REVERSE OSMOSIS TREATMENT TRAIN	8	500459	1500000	0.0012
256	RO TREAT	TRAIN I REVERSE OSMOSIS UNIT 1.7 MGD	RO PROCESS ROOM	$1,955	2005	40	2045	24	$1,173	$3,973	REVERSE OSMOSIS TREATMENT TRAIN	9	500971	1700000	0.0012
257	RO TREAT	THREE TON R.O. GANTRY HOIST #3	RO PROCESS ROOM	$75	1989	75	2064	43	$43	$173	HOISTS		500699	1	75.0000
258	RO TREAT	THREE TON R.O. GANTRY HOIST #4	RO PROCESS ROOM	$75	1989	75	2064	43	$43	$173	HOISTS		500700	1	75.0000
259	RO TREAT	CONCENTRATE DEGASSIFIER 1301	CONCENTRATE TREATMENT FACILITY	$460	1989	50	2039	18	$166	$715	REVERSE OSMOSIS EQUIPMENT		501467	1	460.0000
260	RO TREAT	CONCENTRATE DEGASSIFIER 1302	CONCENTRATE TREATMENT FACILITY	$460	1996	50	2046	25	$230	$863	REVERSE OSMOSIS EQUIPMENT		501468	1	460.0000
261	SAS ELEC	SAS RWM ELECTRICAL POWER 1980	SAS WELLFIELD	$145	1980	35	2015	0	$0	$145	WELLFIELD POWER CONDUIT-CABLE		600133	840	0.1725
262	SAS ELEC	SAS RWM ELECTRICAL POWER 1988	SAS WELLFIELD	$286	1988	35	2023	2	$16	$304	WELLFIELD POWER CONDUIT-CABLE		600134	1660	0.1725
263	SAS ELEC	SAS RWM ELECTRICAL POWER 1992	SAS WELLFIELD	$304	1992	35	2027	6	$52	$365	WELLFIELD POWER CONDUIT-CABLE		600135	1760	0.1725
264	SAS ELEC	SAS RWM ELECTRICAL POWER 1997	SAS WELLFIELD	$199	1997	35	2032	11	$63	$283	WELLFIELD POWER CONDUIT-CABLE		600136	1155	0.1725
265	SAS ELEC	SAS RWM ELECTRICAL POWER 2004	SAS WELLFIELD	$1,665	2004	35	2039	18	$857	$2,985	WELLFIELD POWER CONDUIT-CABLE		600137	9655	0.1725
266	SAS ELEC	SAS RWM ELECTRICAL POWER 2011	SAS WELLFIELD	$163	2011	35	2046	25	$116	$367	WELLFIELD POWER CONDUIT-CABLE		600138	945	0.1725
267	SAS PUMP	WELL #12A PUMP SUBMERSIBLE PUMP 75 HP	WELLFIELD 3	$155	2021	35	2056	35	$155	$474	SUBMER PUMP/WELLHEAD/WELLSITE	12	500526	75	2.0700
268	SAS PUMP	WELL #13 PUMP SUBMERSIBLE PUMP 15 HP	WELLFIELD 3	$35	1997	35	2032	11	$11	$49	SUBMER PUMP/WELLHEAD/WELLSITE	13	500530	15	2.3000
269	SAS PUMP	WELL #14 PUMP SUBMERSIBLE PUMP 15 HP	WELLFIELD 3	$35	1994	35	2029	8	$8	$44	SUBMER PUMP/WELLHEAD/WELLSITE	14	500535	15	2.3000
270	SAS PUMP	WELL #15 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	2008	35	2043	22	$36	$117	SUBMER PUMP/WELLHEAD/WELLSITE	15	500542	25	2.3000
271	SAS PUMP	WELL #16 PUMP SUBMERSIBLE PUMP 10 HP	WELLFIELD 3	$23	1999	35	2034	13	$9	$35	SUBMER PUMP/WELLHEAD/WELLSITE	16	500548	10	2.3000
272	SAS PUMP	WELL #17 PUMP SUBMERSIBLE PUMP 20 HP	WELLFIELD 3	$46	1992	35	2027	6	$8	$55	SUBMER PUMP/WELLHEAD/WELLSITE	17	500554	20	2.3000
273	SAS PUMP	WELL #18 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	1999	35	2034	13	$21	$87	SUBMER PUMP/WELLHEAD/WELLSITE	18	500559	25	2.3000
274	SAS PUMP	WELL #19R PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	1988	35	2023	2	$3	$61	SUBMER PUMP/WELLHEAD/WELLSITE	19	500565	25	2.3000
275	SAS PUMP	WELL #20 PUMP SUBMERSIBLE PUMP 50 HP	WELLFIELD 3	$115	1998	35	2033	12	$39	$169	SUBMER PUMP/WELLHEAD/WELLSITE	20	500570	50	2.3000
276	SAS PUMP	WELL #21 PUMP SUBMERSIBLE PUMP 20 HP	WELLFIELD 3	$46	1999	35	2034	13	$17	$70	SUBMER PUMP/WELLHEAD/WELLSITE	21	500573	20	2.3000
277	SAS PUMP	WELL #22 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	2005	35	2040	19	$31	$107	SUBMER PUMP/WELLHEAD/WELLSITE	22	500578	25	2.3000
278	SAS PUMP	WELL #23 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	1999	35	2034	13	$21	$87	SUBMER PUMP/WELLHEAD/WELLSITE	23	500583	25	2.3000
279	SAS PUMP	WELL #24 PUMP SUBMERSIBLE PUMP 40 HP	WELLFIELD 3	$92	1999	35	2034	13	$34	$139	SUBMER PUMP/WELLHEAD/WELLSITE	24	500588	40	2.3000
280	SAS PUMP	WELL #25 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	2008	35	2043	22	$36	$117	SUBMER PUMP/WELLHEAD/WELLSITE	25	500593	25	2.3000
281	SAS PUMP	WELL #26 PUMP SUBMERSIBLE PUMP 15 HP	WELLFIELD 3	$35	1991	35	2026	5	$5	$40	SUBMER PUMP/WELLHEAD/WELLSITE	26	500595	15	2.3000
282	SAS PUMP	WELL #27 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	2005	35	2040	19	$31	$107	SUBMER PUMP/WELLHEAD/WELLSITE	27	500600	25	2.3000

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
283	SAS PUMP	WELL #28 PUMP SUBMERSIBLE PUMP 15 HP	WELLFIELD 3	$35	1994	35	2029	8	$8	$44	SUBMER PUMP/WELLHEAD/WELLSITE	28	500605	15	2.3000
284	SAS PUMP	WELL #29 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	2008	35	2043	22	$36	$117	SUBMER PUMP/WELLHEAD/WELLSITE	29	500610	25	2.3000
285	SAS PUMP	WELL #30 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$35	1999	35	2034	13	$13	$52	SUBMER PUMP/WELLHEAD/WELLSITE	30	500616	15	2.3000
286	SAS PUMP	WELL #31 PUMP SUBMERSIBLE PUMP 15 HP	WELLFIELD 3	$35	1994	35	2029	8	$8	$44	SUBMER PUMP/WELLHEAD/WELLSITE	31	500621	15	2.3000
287	SAS PUMP	WELL #32 PUMP SUBMERSIBLE PUMP 15 HP	WELLFIELD 3	$35	2007	35	2042	21	$21	$68	SUBMER PUMP/WELLHEAD/WELLSITE	32	500626	15	2.3000
349	SAS PUMP	WELL #33 PUMP SUBMERSIBLE PUMP 20 HP	WELLFIELD 3	$46	1999	35	2034	13	$17	$70	SUBMER PUMP/WELLHEAD/WELLSITE	33	500231	20	2.3000
350	SAS PUMP	WELL #34 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	2004	35	2039	18	$30	$103	SUBMER PUMP/WELLHEAD/WELLSITE	34	500636	25	2.3000
351	SAS PUMP	WELL #35 PUMP SUBMERSIBLE PUMP 25 HP	WELLFIELD 3	$58	1999	35	2034	13	$21	$87	SUBMER PUMP/WELLHEAD/WELLSITE	35	500641	25	2.3000
352	SAS PUMP	WELL #36 PUMP SUBMERSIBLE PUMP 20 HP	WELLFIELD 3	$46	1999	35	2034	13	$17	$70	SUBMER PUMP/WELLHEAD/WELLSITE	36	500646	20	2.3000
353	SAS PUMP	WELL #37R PUMP SUBMERSIBLE PUMP 20 HP	WELLFIELD 3	$46	1994	35	2029	8	$11	$59	SUBMER PUMP/WELLHEAD/WELLSITE	37	500651	20	2.3000
354	SAS PUMP	WELL #39 PUMP SUBMERSIBLE PUMP XX HP	WELLFIELD ABACOA	$2	2005	35	2040	19	$1	$4	SUBMER PUMP/WELLHEAD/WELLSITE	39	502225	1	2.3000
355	SAS PUMP	WELL #40 PUMP SUBMERSIBLE PUMP XX HP	WELLFIELD ABACOA	$2	2005	35	2040	19	$1	$4	SUBMER PUMP/WELLHEAD/WELLSITE	40	502226	1	2.3000
356	SAS PUMP	WELL #41 PUMP SUBMERSIBLE PUMP XX HP	WELLFIELD ABACOA	$2	2005	35	2040	19	$1	$4	SUBMER PUMP/WELLHEAD/WELLSITE	41	502227	1	2.3000
357	SAS PUMP	WELL #42 PUMP SUBMERSIBLE PUMP 60 HP	WELLFIELD ABACOA	$124	2005	35	2040	19	$67	$230	SUBMER PUMP/WELLHEAD/WELLSITE	42	502228	60	2.0700
358	SAS PUMP	WELL #43 PUMP SUBMERSIBLE PUMP 60 HP	WELLFIELD ABACOA	$124	2005	35	2040	19	$67	$230	SUBMER PUMP/WELLHEAD/WELLSITE	43	502229	60	2.0700
368	SAS PUMP	WELL #44 PUMP SUBMERSIBLE PUMP XX HP	WELLFIELD ABACOA	$2	2005	35	2040	19	$1	$4	SUBMER PUMP/WELLHEAD/WELLSITE	44	502230	1	2.3000
369	SAS PUMP	WELL #45 PUMP SUBMERSIBLE PUMP XX HP	WELLFIELD ABACOA	$2	2005	35	2040	19	$1	$4	SUBMER PUMP/WELLHEAD/WELLSITE	45	502231	1	2.3000
370	SAS PUMP	WELL #46 PUMP SUBMERSIBLE PUMP XX HP	WELLFIELD ABACOA	$2	2005	35	2040	19	$1	$4	SUBMER PUMP/WELLHEAD/WELLSITE	46	502232	1	2.3000
371	SAS PUMP	WELL #47 PUMP SUBMERSIBLE PUMP XX HP	WELLFIELD ABACOA	$2	2005	35	2040	19	$1	$4	SUBMER PUMP/WELLHEAD/WELLSITE	47	502233	1	2.3000
409	SAS PUMP	WELL #48 PUMP SUBMERSIBLE PUMP 40 HP	WELLFIELD ABACOA	$92	2005	35	2040	19	$50	$170	SUBMER PUMP/WELLHEAD/WELLSITE	48	500661	40	2.3000
410	SAS PUMP	WELL #49 PUMP SUBMERSIBLE PUMP 30 HP	WELLFIELD ABACOA	$69	1998	35	2033	12	$24	$101	SUBMER PUMP/WELLHEAD/WELLSITE	49	500663	30	2.3000
411	SAS PUMP	WELL #50 PUMP SUBMERSIBLE PUMP 50 HP	WELLFIELD ABACOA	$115	2005	35	2040	19	$62	$213	SUBMER PUMP/WELLHEAD/WELLSITE	50	500798	50	2.3000
412	SAS PUMP	WELL #51 PUMP SUBMERSIBLE PUMP 60 hp	WELLFIELD ABACOA	$124	2008	35	2043	22	$78	$254	SUBMER PUMP/WELLHEAD/WELLSITE	51	500668	60	2.0700
413	SAS PUMP	WELL #52 PUMP SUBMERSIBLE PUMP 60 hp	WELLFIELD ABACOA	$124	2007	35	2042	21	$75	$246	SUBMER PUMP/WELLHEAD/WELLSITE	52	500672	60	2.0700
414	SAS PUMP	WELL #53 PUMP SUBMERSIBLE PUMP 60 HP	WELLFIELD ABACOA	$124	1998	35	2033	12	$43	$182	SUBMER PUMP/WELLHEAD/WELLSITE	53	500675	60	2.0700
415	SAS PUMP	WELL #54 PUMP SUBMERSIBLE PUMP 40 HP	WELLFIELD ABACOA	$92	2006	35	2041	20	$53	$176	SUBMER PUMP/WELLHEAD/WELLSITE	54	500678	40	2.3000
416	SAS PUMP	WELL #55 PUMP SUBMERSIBLE PUMP 20 HP	WELLFIELD ABACOA	$46	2005	35	2040	19	$25	$85	SUBMER PUMP/WELLHEAD/WELLSITE	55	500681	20	2.3000
417	SAS PUMP	WELL #67 PUMP SUBMERSIBLE PUMP 50 HP	WELLFIELD ABACOA	$115	2021	35	2056	35	$115	$351	SUBMER PUMP/WELLHEAD/WELLSITE	67	500799	50	2.3000
418	SAS PUMP	WELL #68 PUMP SUBMERSIBLE PUMP 100 HP	WELLFIELD ABACOA	$207	2021	35	2056	35	$207	$631	SUBMER PUMP/WELLHEAD/WELLSITE	68	500800	100	2.0700
419	SAS RWM	14" thru 20" WTP SITE IX 230 LF	WTP SITE	$48	1993	45	2038	17	$18	$75	UNDERGROUND WATER MAIN PLANT SITE		500801	230	0.2070
420	SAS RWM	24" thru 36" WTP SITE LIME 900 LF	WTP SITE	$311	1982	45	2027	6	$41	$359	UNDERGROUND WATER MAIN PLANT SITE		500802	900	0.3450
421	SAS RWM	24" thru 36" WTP SITE NF 570 LF	WTP SITE	$197	2010	45	2055	34	$149	$497	UNDERGROUND WATER MAIN PLANT SITE		600206	570	0.3450
422	SAS RWM	6" thru 12" RWM 685 LF	WELLFIELD 2	$118	1980	45	2025	4	$11	$130	UNDERGROUND WATER MAIN PLANT SITE		600125	685	0.1725
423	SAS RWM	6" thru 12" RWM 725 LF	WELLFIELD 2	$125	1995	45	2040	19	$53	$208	UNDERGROUND WATER MAIN PLANT SITE		600128	725	0.1725
424	SAS WELL	WELL #08A SHALLOW AQUIFER WELL	WELLFIELD 2	$575	2021	35	2056	35	$575	$1,754	SHALLOW AQUIFER WELL	8	500509	1	575.0000
425	SAS WELL	WELL #09A SHALLOW AQUIFER WELL	WELLFIELD 2	$575	2021	35	2056	35	$575	$1,754	SHALLOW AQUIFER WELL	9	500513	1	575.0000
426	SAS WELL	WELL #10A SHALLOW AQUIFER WELL	WELLFIELD 2	$575	2021	35	2056	35	$575	$1,754	SHALLOW AQUIFER WELL	10	500517	1	575.0000
427	SAS WELL	WELL #11A SHALLOW AQUIFER WELL	WELLFIELD 2	$575	2021	35	2056	35	$575	$1,754	SHALLOW AQUIFER WELL	11	500521	1	575.0000
428	SAS WELL	WELL #12A SHALLOW AQUIFER WELL	WELLFIELD 3	$575	2021	35	2056	35	$575	$1,754	SHALLOW AQUIFER WELL	12	500525	1	575.0000
429	SAS WELL	WELL #13 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1978	35	2013	0	$0	$575	SHALLOW AQUIFER WELL	13	500529	1	575.0000
430	SAS WELL	WELL #14 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1978	35	2013	0	$0	$575	SHALLOW AQUIFER WELL	14	500534	1	575.0000
431	SAS WELL	WELL #15 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1981	35	2016	0	$0	$575	SHALLOW AQUIFER WELL	15	500539	1	575.0000
432	SAS WELL	WELL #16 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1981	35	2016	0	$0	$575	SHALLOW AQUIFER WELL	16	500547	1	575.0000
433	SAS WELL	WELL #17 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1981	35	2016	0	$0	$575	SHALLOW AQUIFER WELL	17	500552	1	575.0000
434	SAS WELL	WELL #18 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1981	35	2016	0	$0	$575	SHALLOW AQUIFER WELL	18	500558	1	575.0000
435	SAS WELL	WELL #19R SHALLOW AQUIFER WELL	WELLFIELD 3	$575	2014	35	2049	28	$460	$1,421	SHALLOW AQUIFER WELL	19	502342	1	575.0000
436	SAS WELL	WELL #20 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1997	35	2032	11	$181	$815	SHALLOW AQUIFER WELL	20	500569	1	575.0000
437	SAS WELL	WELL #21 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1986	35	2021	0	$0	$575	SHALLOW AQUIFER WELL	21	500572	1	575.0000
438	SAS WELL	WELL #22 SHALLOW AQUIFIER WELL	WELLFIELD 3	$575	1985	35	2020	0	$0	$575	SHALLOW AQUIFER WELL	22	500577	1	575.0000
439	SAS WELL	WELL #23 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1999	35	2034	13	$214	$872	SHALLOW AQUIFER WELL	23	500582	1	575.0000
440	SAS WELL	WELL #24 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1987	35	2022	1	$16	$592	SHALLOW AQUIFER WELL	24	500587	1	575.0000
441	SAS WELL	WELL #25 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1986	35	2021	0	$0	$575	SHALLOW AQUIFER WELL	25	500592	1	575.0000
442	SAS WELL	WELL #26 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1986	35	2021	0	$0	$575	SHALLOW AQUIFER WELL	26	500594	1	575.0000
443	SAS WELL	WELL #27 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1986	35	2021	0	$0	$575	SHALLOW AQUIFER WELL	27	500599	1	575.0000
444	SAS WELL	WELL #28 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1986	35	2021	0	$0	$575	SHALLOW AQUIFER WELL	28	500604	1	575.0000
445	SAS WELL	WELL #29 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1989	35	2024	3	$49	$629	SHALLOW AQUIFER WELL	29	500609	1	575.0000

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
446	SAS WELL	WELL #30 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1989	35	2024	3	$49	$629	SHALLOW AQUIFER WELL	30	500615	1	575.0000
447	SAS WELL	WELL #31 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1994	35	2029	8	$131	$738	SHALLOW AQUIFER WELL	31	500620	1	575.0000
448	SAS WELL	WELL #32 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1994	35	2029	8	$131	$738	SHALLOW AQUIFER WELL	32	500625	1	575.0000
449	SAS WELL	WELL #33 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1994	35	2029	8	$131	$738	SHALLOW AQUIFER WELL	33	500230	1	575.0000
450	SAS WELL	WELL #34 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1994	35	2029	8	$131	$738	SHALLOW AQUIFER WELL	34	500635	1	575.0000
451	SAS WELL	WELL #35 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1994	35	2029	8	$131	$738	SHALLOW AQUIFER WELL	35	500640	1	575.0000
452	SAS WELL	WELL #36 SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1994	35	2029	8	$131	$738	SHALLOW AQUIFER WELL	36	500645	1	575.0000
453	SAS WELL	WELL #37R SHALLOW AQUIFER WELL	WELLFIELD 3	$575	1994	35	2029	8	$131	$738	SHALLOW AQUIFER WELL	37	500650	1	575.0000
454	SAS WELL	WELL #39 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	39	500752	1	575.0000
455	SAS WELL	WELL #40 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2007	35	2042	21	$345	$1,137	SHALLOW AQUIFER WELL	40	502071	1	575.0000
456	SAS WELL	WELL #41 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2007	35	2042	21	$345	$1,137	SHALLOW AQUIFER WELL	41	502072	1	575.0000
457	SAS WELL	WELL #42 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2021	35	2056	35	$575	$1,754	SHALLOW AQUIFER WELL	42	502132	1	575.0000
458	SAS WELL	WELL #43 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2021	35	2056	35	$575	$1,754	SHALLOW AQUIFER WELL	43	502234	1	575.0000
459	SAS WELL	WELL #44 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	44	500753	1	575.0000
460	SAS WELL	WELL #45 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	45	500754	1	575.0000
461	SAS WELL	WELL #46 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	46	500755	1	575.0000
462	SAS WELL	WELL #47 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	47	500756	1	575.0000
463	SAS WELL	WELL #48 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	1997	35	2032	11	$181	$815	SHALLOW AQUIFER WELL	48	500660	1	575.0000
464	SAS WELL	WELL #49 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	1997	35	2032	11	$181	$815	SHALLOW AQUIFER WELL	49	500662	1	575.0000
465	SAS WELL	WELL #50 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	50	500757	1	575.0000
466	SAS WELL	WELL #51 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	1992	35	2027	6	$99	$691	SHALLOW AQUIFER WELL	51	500667	1	575.0000
467	SAS WELL	WELL #52 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	1997	35	2032	11	$181	$815	SHALLOW AQUIFER WELL	52	500670	1	575.0000
468	SAS WELL	WELL #53 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	1997	35	2032	11	$181	$815	SHALLOW AQUIFER WELL	53	500674	1	575.0000
469	SAS WELL	WELL #54 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	1997	35	2032	11	$181	$815	SHALLOW AQUIFER WELL	54	500677	1	575.0000
470	SAS WELL	WELL #55 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	1997	35	2032	11	$181	$815	SHALLOW AQUIFER WELL	55	500680	1	575.0000
471	SAS WELL	WELL #60 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2013	35	2048	27	$444	$1,378	SHALLOW AQUIFER WELL	60	502074	1	575.0000
472	SAS WELL	WELL #62 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2013	35	2048	27	$444	$1,378	SHALLOW AQUIFER WELL	62	502075	1	575.0000
473	SAS WELL	WELL #67 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	67	500758	1	575.0000
474	SAS WELL	WELL #68 SHALLOW AQUIFER WELL	WELLFIELD ABACOA	$575	2001	35	2036	15	$246	$932	SHALLOW AQUIFER WELL	68	500759	1	575.0000
475	SASRWM	SAS RWM 6"-8"-10" WELLFIELD 1988	SAS WELLFIELD	$237	1988	45	2033	12	$63	$323	UNDERGROUND PIPING WELLFIELD		502103	1375	0.1725
476	SASRWM	SAS RWM 6"-8"-10" WELLFIELD 1992	SAS WELLFIELD	$885	1992	45	2037	16	$315	$1,351	UNDERGROUND PIPING WELLFIELD		502104	5130	0.1725
477	SASRWM	SAS RWM 6"-8"-10" WELLFIELD 1997	SAS WELLFIELD	$920	1997	45	2042	21	$429	$1,620	UNDERGROUND PIPING WELLFIELD		600145	5335	0.1725
478	SASRWM	SAS RWM 6"-8"-10" WELLFIELD 2004	SAS WELLFIELD	$524	2004	45	2049	28	$326	$1,123	UNDERGROUND PIPING WELLFIELD		600146	3035	0.1725
479	SASRWM	SAS RWM 12"-14"-16" WELLFIELD 1980	SAS WELLFIELD	$582	1980	45	2025	4	$52	$640	UNDERGROUND PIPING WELLFIELD		600148	2530	0.2300
480	SASRWM	SAS RWM 12"-14"-16" WELLFIELD 1988	SAS WELLFIELD	$2,199	1988	45	2033	12	$586	$2,996	UNDERGROUND PIPING WELLFIELD		600092	9560	0.2300
481	SASRWM	SAS RWM 12"-14"-16" WELLFIELD 1997	SAS WELLFIELD	$998	1997	45	2042	21	$466	$1,757	UNDERGROUND PIPING WELLFIELD		600095	4340	0.2300
482	SASRWM	SAS RWM 12"-14"-16" WELLFIELD 2004	SAS WELLFIELD	$4,412	2004	45	2049	28	$2,745	$9,462	UNDERGROUND PIPING WELLFIELD		600098	19181	0.2300
483	SASRWM	SAS RWM 18"-20"-24" WELLFIELD 1980	SAS WELLFIELD	$3,328	1980	45	2025	4	$296	$3,659	UNDERGROUND PIPING WELLFIELD		600113	9645	0.3450
484	SASRWM	SAS RWM 18"-20"-24" WELLFIELD 1988	SAS WELLFIELD	$2,888	1988	45	2033	12	$770	$3,935	UNDERGROUND PIPING WELLFIELD		600122	8370	0.3450
485	SASRWM	SAS RWM 18"-20"-24" WELLFIELD 1992	SAS WELLFIELD	$0	1992	45	2037	16	$0	$0	UNDERGROUND PIPING WELLFIELD		600124	0	0.3450
486	SASRWM	SAS RWM 18"-20"-24" WELLFIELD 1997	SAS WELLFIELD	$0	1997	45	2042	21	$0	$0	UNDERGROUND PIPING WELLFIELD		600129	0	0.3450
487	SASRWM	SAS RWM 18"-20"-24" WELLFIELD 2004	SAS WELLFIELD	$0	2004	45	2049	28	$0	$0	UNDERGROUND PIPING WELLFIELD		600130	0	0.3450
488	SASRWM	SAS RWM 18"-20"-24" WELLFIELD 2011	SAS WELLFIELD	$0	2011	45	2056	35	$0	$0	UNDERGROUND PIPING WELLFIELD		600131	0	0.3450
489	STRUCT	CONCRETE PERIMITER WALL PRECAST 2,200 LF	TOWN OF JUPITER WATER PLANT	$621	2005	55	2060	39	$440	$1,577	MISCELLANEOUS		500496	2700	0.2300
490	STRUCT	COMMUNICATION TOWER	PLANT SITE	$288	2012	65	2077	56	$248	$951	MISCELLANEOUS		502372	1	287.5000
491	STRUCT B	GENERATOR #10 BUILDING 1,100 SF	ABACOA	$506	2003	75	2078	57	$385	$1,548	BUILDING STRUCTURE		501647	1100	0.4600
492	STRUCT B	COVERED STORAGE AREA POLE BARN 6,000 SF	TOWN OF JUPITER WATER PLANT	$600	2010	75	2085	64	$512	$2,095	BUILDING STRUCTURE		502080	6000	0.1000
493	STRUCT B	NANO BUILDING 22,500 SF	NANO PROCESS ROOM	$10,350	2010	75	2085	64	$8,832	$36,139	BUILDING STRUCTURE		502098	22500	0.4600
494	STRUCT B	MBA CHEMICAL BUILDING 750 SF	MBA SLAB	$345	2005	75	2080	59	$271	$1,097	BUILDING STRUCTURE		502107	750	0.4600
495	STRUCT B	RO CHECMICAL BUILDING 1,500 SF	CHEMICAL BUILDING RO	$690	1989	75	2064	43	$396	$1,596	BUILDING STRUCTURE		502108	1500	0.4600
496	STRUCT B	WATER PLANT OFFICE-TRAINING BLDG 5,100 SF	ADMIN BUILDING	$2,346	2002	75	2077	56	$1,752	$7,041	BUILDING STRUCTURE		502112	5100	0.4600
497	STRUCT B	RO BUILDING AND CONTROL ROOM 13,000 SF	RO CONTROL ROOM	$5,980	1989	75	2064	43	$3,429	$13,831	BUILDING STRUCTURE		502116	13000	0.4600
498	STRUCT B	RIVERBEND HSP STATION 1,700 SF	WESTERN RIVERBEND	$782	2005	75	2080	59	$615	$2,486	MISCELLANEOUS		502122	1700	0.4600
499	STRUCT B	WATER PLANT LAB 1,600 SF	OFFICES LAB	$736	2002	75	2077	56	$550	$2,209	BUILDING STRUCTURE		502318	1600	0.4600
500	STRUCT B	CHLORINE BUILDING 2,700 SF	CL2 BUILDING ENCLOSED	$1,242	2000	75	2075	54	$894	$3,585	BUILDING STRUCTURE		502319	2700	0.4600
501	STRUCT B	JUNO HIGH SERVICE PUMP BUILDING 700 SF	JUNO BEACH WTP	$322	1992	75	2067	46	$197	$792	BUILDING STRUCTURE		502341	700	0.4600

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
502	STRUCT B	HIGH SERVICE BLDG. CENTRAL S. 1,900	HIGH SERVICE BLDG. CENTRAL S.	$874	2003	75	2078	57	$664	$2,674	BUILDING STRUCTURE		502343	1900	0.4600
503	STRUCT B	HIGH SERVICE BLDG. CENTRAL N. 1,500 SF	HIGH SERVICE BLDG. CENTRAL OFF SI	$690	1990	75	2065	44	$405	$1,629	BUILDING STRUCTURE		502344	1500	0.4600
504	STRUCT B	LIME SLUDGE VACUUM PUMP BUILDING 500 SF	LIME SLUDGE FACILITY	$230	1999	75	2074	53	$163	$651	BUILDING STRUCTURE		502345	500	0.4600
505	STRUCT B	CONCENTRATE TREATMENT FACILITY 530 SF	PLANT SITE	$244	1989	75	2064	43	$140	$564	BUILDING STRUCTURE		502373	530	0.4600
506	STRUCT B	WTP SITE HSP BUILDING 1,300 SF	WTP NORTH	$598	1976	75	2051	30	$239	$1,052	BUILDING STRUCTURE		600072	1300	0.4600
507	STRUCT B	GENSET 1 BUILDING 450 SF	WTP NORTH	$207	1985	75	2060	39	$108	$441	BUILDING STRUCTURE		600073	450	0.4600
508	STRUCT B	NANO PRETREATMENT BUILDING 2,700 SF	NANO PRETREATMENT	$1,242	2010	75	2085	64	$1,060	$4,337	BUILDING STRUCTURE		600076	2700	0.4600
509	STRUCT B	WTP SHOP 3,200 SF	WTP NORTH	$1,472	1985	75	2060	39	$765	$3,133	BUILDING STRUCTURE		600077	3200	0.4600
510	STRUCT B	UTILITIES ADMINISTRATION BUILDING 8200 SF	ADMIN BUILDING	$3,772	2011	75	2086	65	$3,269	$13,416	BUILDING STRUCTURE		502091	8200	0.4600
511	STRUCT B	EOC MAIN BUILDING 12,300 SF	PUBLIC WORKS SITE	$5,658	2000	75	2075	54	$4,074	$16,331	OFFICE EOC BUILDING		600080	12300	0.4600
512	STRUCT B	GENSET 2 Building 300 SF	SAS WELL 12 SITE	$138	1970	75	2045	24	$44	$214	EQUIPMENT BUILDING		600086	300	0.4600
513	STRUCT B	GENSET 4 Building 625 SF	SAS WELL 15 SITE	$288	1982	75	2057	36	$138	$575	EQUIPMENT BUILDING		600087	625	0.4600
514	STRUCT B	EOC POLE BARN 2700 SF	PUBLIC WORKS SITE	$1,242	2016	75	2091	70	$1,159	$4,836	POLE BARN STRUCTURE		600099	2700	0.4600
515	STRUCT B	EOC METAL BUILDING 625 SF	PUBLIC WORKS SITE	$63	2018	75	2093	72	$60	$252	METAL BUILDING		600100	625	0.1000
516	STRUCT B	EOC METAL BUILDING 625 SF	PUBLIC WORKS SITE	$63	2018	75	2093	72	$60	$252	METAL BUILDING		600101	625	0.1000
517	STRUCT B	ROOF COVERED STORAGE AREA POLE BARN 6,000 SF	TOWN OF JUPITER WATER PLANT	$600	2010	20	2030	9	$270	$943	BUILDING ROOF		600227	6000	0.1000
518	STRUCT B	ROOF NANO BUILDING 22,500 SF	NANO PROCESS ROOM	$495	2010	20	2030	9	$223	$778	BUILDING ROOF		600228	22500	0.0220
519	STRUCT B	ROOF RO CHECMICAL BUILDING 1,500 SF	CHEMICAL BUILDING RO	$33	1989	20	2009	0	$0	$33	BUILDING ROOF		600229	1500	0.0220
520	STRUCT B	ROOF WATER PLANT OFFICE-TRAINING BLDG 5,100 SF	ADMIN BUILDING	$112	2002	20	2022	1	$6	$118	BUILDING ROOF		600230	5100	0.0220
521	STRUCT B	ROOF RO BUILDING AND CONTROL ROOM 13,000 SF	RO CONTROL ROOM	$286	1989	20	2009	0	$0	$286	BUILDING ROOF		600231	13000	0.0220
522	STRUCT B	ROOF RIVERBEND HSP STATION 1,700 SF	WESTERN RIVERBEND	$37	2005	20	2025	4	$7	$46	BUILDING ROOF		600232	1700	0.0220
523	STRUCT B	ROOF WATER PLANT LAB 1,600 SF	OFFICES LAB	$35	2002	20	2022	1	$2	$37	BUILDING ROOF		600233	1600	0.0220
524	STRUCT B	ROOF CHLORINE BUILDING 2,700 SF	CL2 BUILDING ENCLOSED	$59	2000	20	2020	0	$0	$59	BUILDING ROOF		600234	2700	0.0220
525	STRUCT B	ROOF HIGH SERVICE BLDG. CENTRAL S. 1,900	HIGH SERVICE BLDG. CENTRAL S.	$42	2003	20	2023	2	$4	$46	BUILDING ROOF		600235	1900	0.0220
526	STRUCT B	ROOF HIGH SERVICE BLDG. CENTRAL N. 1,500 SF	HIGH SERVICE BLDG. CENTRAL OFF SI	$33	2021	20	2041	20	$33	$86	BUILDING ROOF		600236	1500	0.0220
527	STRUCT B	ROOF NANO PRETREATMENT BUILDING 2,700 SF	NANO PRETREATMENT	$59	2010	20	2030	9	$27	$93	BUILDING ROOF		600237	2700	0.0220
528	STRUCT B	ROOF WTP SHOP 3,200 SF	WTP NORTH	$70	1985	20	2005	0	$0	$70	BUILDING ROOF		600238	3200	0.0220
529	STRUCT B	ROOF UTILITIES ADMINISTRATION BUILDING 8200 SF	ADMIN BUILDING	$180	2011	20	2031	10	$90	$298	BUILDING ROOF		600239	8200	0.0220
530	STRUCT B	ROOF EOC MAIN BUILDING 12,300 SF	PUBLIC WORKS SITE	$271	2000	20	2020	0	$0	$271	BUILDING ROOF		600240	12300	0.0220
531	STRUCT B	ROOF EOC POLE BARN 2700 SF	PUBLIC WORKS SITE	$59	2016	20	2036	15	$45	$124	BUILDING ROOF		600241	2700	0.0220
532	STRUCT B	AIR CONDITION NANO BUILDING 10,000 SF	NANO PROCESS ROOM	$110	2010	15	2025	4	$29	$143	BUILDING AIR CONDITION		600242	10000	0.0110
533	STRUCT B	AIR COND WATER PLANT OFFICE-TRAINING BLDG 5,100	ADMIN BUILDING	$56	2002	15	2017	0	$0	$56	BUILDING AIR CONDITION		600243	5100	0.0110
534	STRUCT B	AIR COND UTILITIES ADMINISTRATION BUILDING 8200 S	ADMIN BUILDING	$90	2011	15	2026	5	$30	$125	BUILDING AIR CONDITION		600244	8200	0.0110
535	STRUCT B	AIR CONDITION EOC MAIN BUILDING 12,300 SF	PUBLIC WORKS SITE	$135	2000	15	2015	0	$0	$135	BUILDING AIR CONDITION		600245	12300	0.0110
536	STRUCT P	PROCESS LIFT STATION	WASTE STREAM LIFT STATION	$173	2004	75	2079	58	$133	$538	PROCESS STRUCTURE		501243	150	1.1500
537	STRUCT P	NF BACKWASH RETURN PS 12' DIA 12' D	NANO PRETREAT	$173	2010	75	2085	64	$147	$602	PROCESS STRUCTURE		600070	150	1.1500
538	STRUCT P	R.O. CLEARWELL 275,000 GAL 4,600 SF	CHANGE TO RO CLEARWELL	$5,290	1989	75	2064	43	$3,033	$12,235	PROCESS STRUCTURE		500830	4600	1.1500
539	STRUCT P	NANO CLEARWELL 140,000 GAL	NANO BUILDING	$3,864	2010	75	2085	64	$3,297	$13,492	PROCESS STRUCTURE		502097	3360	1.1500
540	STRUCT P	NANO BACKWASH TROUGH 575 SF 8' D	NANO PRETREAT	$661	2010	75	2085	64	$564	$2,309	PROCESS STRUCTURE		600074	575	1.1500
541	STRUCT P	RO MIXING CHAMBER 100 SF	RO CLEARWELL	$115	2018	75	2093	72	$110	$464	PROCESS STRUCTURE		600075	100	1.1500
542	STRUCT P	NANO SUPPLEMENTAL & BLEND BOXES 300 SF 8'D	WTP SITE	$345	2018	75	2093	72	$331	$1,392	PROCESS STRUCTURE		600078	300	1.1500
543	STRUCT P	IX INFLUENT TROUGH 550 SF	WTP EAST	$633	1999	75	2074	53	$447	$1,790	PROCESS STRUCTURE		600079	550	1.1500
544	STRUCT P	EMERGENCY STORMWATER PUMP STATION 460 SF	PLANT SITE	$529	2006	75	2081	60	$423	$1,714	SWPS SUBMERSIBLE PUMPS		502374	460	1.1500
545	SW	12"-18" RCP/DIP 1,245 LF	WTP SITE	$258	1990	65	2055	34	$135	$530	RCP/DIP/PVC STORM PIPE WTP SITE		600084	1245	0.2070
546	SW	STORM STRUCTURES 19 EACH	WTP SITE	$219	1990	75	2065	44	$128	$516	RCP/DIP/PVC STORM PIPE WTP SITE		600085	19	11.5000
547	SW	12"-18" RCP/DIP 340 LF	WTP SITE	$70	2010	65	2075	54	$58	$224	RCP/DIP/PVC STORM PIPE WTP SITE		600088	340	0.2070
548	SW	STORM STRUCTURES 7 EACH	WTP SITE	$81	2010	75	2085	64	$69	$281	RCP/DIP/PVC STORM PIPE WTP SITE		600089	7	11.5000
549	SW	18" RCP/DIP/HDPE 230 LF	WTP SITE	$48	2005	65	2070	49	$36	$136	RCP/DIP/PVC STORM PIPE WTP SITE		600090	230	0.2070
550	SW	STORM STRUCTURES 3 EACH	WTP SITE	$35	2005	75	2080	59	$27	$110	RCP/DIP/PVC STORM PIPE WTP SITE		600091	3	11.5000
551	SWBD	HSP NORTH MAIN SWITCHBOARD, 1600 A	HSP CENTRAL NORTH	$95	2019	45	2064	43	$91	$303	ELECTRICAL POWER CONTROL-SWITCH		600158	1	95.0000
552	SWBD	NF SWITCHBOARD-SB_NF, 1200 A	NF ELECTRIC ROOM	$36	2010	45	2055	34	$27	$91	ELECTRICAL POWER CONTROL-SWITCH		600159	1	36.0000
553	SWBD	NF SB-NF LEFT, 1200 A	NF ELECTRIC ROOM	$45	2010	45	2055	34	$34	$114	ELECTRICAL POWER CONTROL-SWITCH		600160	1	45.0000
554	SWBD	NF SB-NF RIGHT, 1200 A	NF ELECTRIC ROOM	$45	2010	45	2055	34	$34	$114	ELECTRICAL POWER CONTROL-SWITCH		600161	1	45.0000
555	SWBD	HSP CENTRAL SOUTH SWBD-1, 1600 A	HSP CENTRAL S BLDG	$40	2006	45	2051	30	$27	$91	ELECTRICAL POWER CONTROL-SWITCH		600162	1	40.0000
556	SWBD	ABACOA MAIN SWITCH BOARD, 1200 A	ABACO GEN BLDG	$95	2006	45	2051	30	$63	$215	ELECTRICAL POWER CONTROL-SWITCH		600163	1	95.0000
557	SWBD	RIVERBEND MAIN SWITCHBOARD, 3000 A	RIVER BEND BLDG	$220	2006	45	2051	30	$147	$499	ELECTRICAL POWER CONTROL-SWITCH		600164	1	220.0000

	A	D	E	G	H	I	J	K	L	M	N	O	P	R	S
4			ANNUAL VALUE ESCALATION PERCENT			0.03		2021	CALENDER YEAR FOR CALCULATING REMAINING LIFE						
5	Category	Equipment Description	Location	Current Replace Value ($1,000)	Complete Date (Year)	Usefull Life (Years)	End of Useful Life (Year)	Remaining Life (Years) As Of J4	Current Depreciated Value ($1,000)	Replace Value at End of Life ($1,000)	Equipment Type	Sort Code	Asset Number Last Used 600246	Size/ Capacity/Quantity	Unit Cost ($1,000) Input This Sht Only
558	SWGR	RO MCC 7A/7B, 1600 A	RO ELECTRIC ROOM	$36	2005	45	2050	29	$23	$79	ELECTRICAL POWER CONTROL-SWITCH		600173	1	36.0000
559	SWGR	HSP CENTRAL NORTH SWITCH GEAR, 1600 A	HSP CENTRAL SOUTH BUILDING	$110	1984	45	2029	8	$20	$134	ELECTRICAL POWER CONTROL-SWITCH		600151	1	110.0000
560	SWGR	RO SWGR SECTION 1, 3000 A	RO ELECTRIC ROOM	$135	1990	45	2035	14	$42	$195	ELECTRICAL POWER CONTROL-SWITCH		600152	1	135.0000
561	SWGR	RO SWGR SECTION 2, 2500 A	RO ELECTRIC ROOM	$170	2010	45	2055	34	$128	$429	ELECTRICAL POWER CONTROL-SWITCH		600153	1	170.0000
562	SWGR	RO SWGR SECTION 3, 3000 A	RO ELECTRIC ROOM	$130	2010	45	2055	34	$98	$328	ELECTRICAL POWER CONTROL-SWITCH		600154	1	130.0000
563	SWGR	RO SWGR SECTION 4, 2500 A	RO ELECTRIC ROOM	$150	2010	45	2055	34	$113	$379	ELECTRICAL POWER CONTROL-SWITCH		600155	1	150.0000
564	SWGR	HSP BUILDING SWGR SB-1, 2000 A	HSP BUILDING, ONSITE	$230	1995	45	2040	19	$97	$382	ELECTRICAL POWER CONTROL-SWITCH		600156	1	230.0000
565	SWGR	NF SWGR-NF, 4000 A	NF ELECTRIC ROOM	$440	2010	45	2055	34	$332	$1,112	ELECTRICAL POWER CONTROL-SWITCH		600157	1	440.0000
566	SWGR	WELL 15 SWITCH GEAR	WELL 15 SITE	$45	2010	75	2085	64	$38	$157	ELECTRICAL GEAR		600221	1	45.0000
567	SWGR	WELL 12 SWITCH GEAR	WELL 12 SITE	$45	2014	75	2089	68	$41	$169	ELECTRICAL GEAR		600222	1	45.0000
568	T MAIN	24" thru 36" BELOW GROUND PIPE 150 LF	WTP SITE	$52	1980	45	2025	4	$5	$57	UNDERGROUND WATER MAIN PLANT SITE		600012	150	0.3450
569	T MAIN	24" thru 36" BELOW GROUND PIPE 1080 LF	WTP SITE & WELLFIELD 2 SITE	$373	1995	45	2040	19	$157	$620	UNDERGROUND WATER MAIN PLANT SITE		600013	1080	0.3450
570	T MAIN	14" thru 20" BELOW GROUND PIPE 276 LF	WTP SITE	$57	2000	45	2045	24	$30	$110	UNDERGROUND WATER MAIN PLANT SITE		600014	276	0.2070
571	T MAIN	42" BELOW GROUND PIPE 120 LF	WTP SITE	$55	2010	45	2055	34	$42	$139	UNDERGROUND WATER MAIN PLANT SITE		600015	120	0.4600
572	T MAIN	24" thru 36" BELOW GROUND PIPE 630 LF	WTP SITE & WELLFIELD 2 SITE	$217	2010	45	2055	34	$164	$549	UNDERGROUND WATER MAIN PLANT SITE		600016	630	0.3450
573	T MAIN	24" thru 36" BELOW GROUND PIPE 300 LF	WELLFIELD 2 SITE	$104	2005	45	2050	29	$67	$228	UNDERGROUND WATER MAIN PLANT SITE		600017	300	0.3450
574	T MAIN	24" thru 36" BELOW GROUND PIPE 280 LF	WELLFIELD 2 SITE	$97	2000	45	2045	24	$52	$185	UNDERGROUND WATER MAIN PLANT SITE		600018	280	0.3450
575	WASTE	SOUTH ADMIN/WAREHOUSE SANITARY	SOUTH UITILITIES ADMINSTRATION	$115	2011	30	2041	20	$77	$238	SANTATION PICK-UP		502124	1	115.0000
576	WASTE	6", 8", 10", 12" (6"-12") IX 445 LF	WTP SITE	$77	1998	45	2043	22	$38	$139	UNDERGROUND WATER MAIN PLANT SITE		502125	445	0.1725
577	WASTE	30" (24"-36") IX-RO 227 LF	WTP SITE	$39	1989	45	2034	13	$11	$55	UNDERGROUND WATER MAIN PLANT SITE		502126	227	0.1725
578	WASTE	6" (6"-12") MBA 223 LF	WTP SITE	$38	2019	45	2064	43	$37	$123	UNDERGROUND WATER MAIN PLANT SITE		502127	223	0.1725
579	WASTE	8" (6"-12") RO 95 LF	WTP SITE	$16	1989	45	2034	13	$5	$23	UNDERGROUND WATER MAIN PLANT SITE		502128	95	0.1725
584	WASTE	4"-6" NF, 4"6" RO 1,440 LF	WTP SITE	$248	2000	45	2045	24	$132	$476	UNDERGROUND WATER MAIN PLANT SITE		502129	1440	0.1725
585	WASTE	16" (14"-20") NF BACKWASH 172 LF	WTP SITE	$36	2000	45	2045	24	$19	$68	UNDERGROUND WATER MAIN PLANT SITE		502130	172	0.2070
586															
587	**THIS LIST DOES NOT INCLUDE DISTRIBUTION SYSTEM**			$243,096						$512,917					
596															

Appendix O:
Town of Jupiter Water System Cash Flow Analysis

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 1 - CASH FLOW ANALYSIS

No.	Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
1	**Growth of Retail Sales Over Prior Yr**	100.8%	107.9%	107.8%	103.3%	103.3%	103.3%	103.3%	103.3%	103.2%	103.2%	103.2%	103.2%	103.2%	103.1%	103.1%	103.0%	103.0%	103.0%	103.0%	103.0%	103.0%	103.0%	103.0%	103.0%	103.0%
2	**Growth Operating IC Net of Xfers & FCA**	66.1%	100.1%	116.3%	102.2%	104.3%	108.8%	102.1%	102.1%	102.3%	100.1%	101.9%	101.9%	101.8%	101.6%	101.5%	101.2%	101.0%	100.9%	100.7%	100.6%	100.5%	100.3%	100.1%	99.9%	99.7%
3	**Adjusted Operating Fund Balance**	$ 36,798,199	$ 31,258,616	$ 14,437,215	$ 13,558,724	$ 12,626,660	$ 11,915,445	$ 11,884,520	$ 11,820,524	$ 12,003,910	$ 11,864,114	$ 11,426,720	$ 10,859,722	$ 10,112,938	$ 10,607,523	$ 10,496,611	$ 10,230,065	$ 9,694,877	$ 9,064,397	$ 8,411,748	$ 7,662,697	$ 8,338,676	$ 8,749,187	$ 8,949,170	$ 9,408,888	$ 9,925,846
4	Add: Operating Income Excluding GF Xfers & FCA	9,776,710	10,010,088	11,469,982	11,768,167	12,289,514	13,303,094	13,640,519	13,980,535	14,351,526	14,466,224	14,812,678	15,163,510	15,510,598	15,852,103	16,187,235	16,484,510	16,766,013	17,041,505	17,308,860	17,566,786	17,813,713	18,047,969	18,268,091	18,471,874	18,657,558
5	Less: General Fund Full Cost Allocation	(1,304,970)	(1,528,157)	(1,604,565)	(1,684,793)	(1,769,033)	(1,857,484)	(1,950,359)	(2,047,877)	(2,150,270)	(2,257,784)	(2,370,673)	(2,489,207)	(2,613,667)	(2,744,350)	(2,881,568)	(3,025,646)	(3,176,929)	(3,335,775)	(3,502,564)	(3,677,692)	(3,861,577)	(4,054,655)	(4,257,388)	(4,470,258)	(4,693,771)
6	Add: Guaranteed Revenues & AGRF	735,675	411,027	393,161	369,631	341,949	314,243	286,596	257,312	229,766	202,552	175,783	149,577	124,064	99,381	75,676	18,280	-	-	-	-	-	-	-	-	-
7	Add: Interest Earned Prior Periods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Add: Capital Surcharge/Loan Program Principal Pymt	128,574	135,413	142,554	150,029	157,861	166,066	174,665	183,672	193,113	203,009	213,384	129,831	122,092	63,359	55,077	39,506	23,358	3,737	3,324	2,925	2,542	2,173	1,829	1,503	1,196
9	Add: GF Loans Principal Repayment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Add: Transfer from Stormwater & Other Funds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	Add: Transfers from Connection Fee Fund	-	-	-	-	-	-	-	-	248,160	226,256	204,188	182,179	160,178	138,157	116,146	28,554	-	-	-	-	-	-	-	-	-
12	Add: Other Fund Loan Principal Pymts (SW & GF)	337,529	345,292	353,234	361,359	369,670	378,172	386,870	395,768	404,871	414,183	423,709	433,454	443,424	-	-	-	-	-	-	-	-	-	-	-	-
13	Less: Loans to Other Funds (SW & GF)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Less: Transfers to R&R Fund	(5,939,812)	(6,297,348)	(7,413,957)	(7,636,375)	(7,865,467)	(8,101,431)	(8,344,473)	(8,594,808)	(8,852,652)	(9,118,231)	(9,391,778)	(9,673,532)	(9,963,738)	(10,262,650)	(10,570,529)	(10,887,645)	(11,050,911)	(11,156,728)	(11,230,185)	(10,996,452)	(11,342,774)	(11,221,911)	(11,371,293)	(11,355,664)	(11,296,044)
15	Less: Additional Transfer to R&R Fund	(2,500,000)	(17,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(2,500,000)	(1,140,000)	(1,140,000)	(1,140,000)	(1,140,000)	(1,140,000)	(1,140,000)	(1,140,000)	-	-	-	-	-	-	-
16	Less: Capital Surcharge Program Loans	(18,271)	(7,388)	(6,654)	(6,263)	(5,941)	(5,614)	(5,281)	(4,863)	(4,517)	(4,164)	(3,803)	(3,436)	(3,060)	(2,676)	(2,284)	(565)	-	-	-	-	-	-	-	-	-
17	Less: Annual Debt Service Payments	(411,366)	(355,852)	(225,786)	(187,771)	(149,056)	(111,286)	(73,132)	(79,720)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)	(1,672,192)
18	Less: Transfers to Gen Fund/Other CIP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	Less: Capital Project Expenditures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(400,013)	-	-	-
20	Less: Capital Equipment Expenditures	(501,424)	(156,000)	(159,900)	(163,898)	(167,995)	(172,195)	(176,500)	(180,912)	(185,435)	(190,071)	(194,823)	(199,693)	(204,686)	(209,803)	(215,048)	(220,424)	(225,935)	(231,583)	(237,372)	(243,307)	(249,389)	(255,624)	(262,015)	(268,565)	(275,279)
21	Less: Capitalized Salaries	(277,700)	(282,600)	(293,621)	(304,779)	(316,056)	(327,434)	(338,894)	(350,416)	(361,980)	(373,564)	(385,144)	(396,698)	(408,599)	(420,857)	(433,483)	(446,487)	(459,882)	(473,679)	(487,889)	(502,526)	(517,601)	(533,129)	(549,123)	(565,597)	(582,565)
22	Less: Transfers to Connection Fee Fund	(5,860,759)	(1,816,317)	(1,247,829)	(1,296,286)	(1,279,115)	(1,318,281)	(1,350,504)	(1,042,788)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	Adj.: Adjustment to Tie To Financial Statements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	Oper. Funds Avail. for Future CIP before Int. Income	$ 30,962,385	$ 14,216,775	$ 13,343,835	$ 12,427,745	$ 11,732,991	$ 11,683,296	$ 11,634,029	$ 11,836,429	$ 11,704,300	$ 11,260,333	$ 10,738,049	$ 9,983,517	$ 10,467,353	$ 10,307,996	$ 10,015,641	$ 9,407,955	$ 8,758,401	$ 8,099,683	$ 7,453,730	$ 8,140,240	$ 8,511,398	$ 8,661,805	$ 9,107,080	$ 9,549,989	$ 10,064,750
25	Add: Interest Income	296,231	220,440	214,888	198,914	182,454	201,224	186,496	167,481	159,814	166,387	121,673	129,421	140,170	188,615	214,424	286,922	305,996	312,065	208,968	198,436	237,789	287,365	301,809	375,857	420,435
26	Total Operating Fund Balance with Working Capital	$ 31,258,616	$ 14,437,215	$ 13,558,724	$ 12,626,660	$ 11,915,445	$ 11,884,520	$ 11,820,524	$ 12,003,910	$ 11,864,114	$ 11,426,720	$ 10,859,722	$ 10,112,938	$ 10,607,523	$ 10,496,611	$ 10,230,065	$ 9,694,877	$ 9,064,397	$ 8,411,748	$ 7,662,697	$ 8,338,676	$ 8,749,187	$ 8,949,170	$ 9,408,888	$ 9,925,846	$ 10,485,185
27	**Renewal & Replacement Fund Balance**	$ 55,683,626	$ 13,457,115	$ 6,097,395	$ 7,114,285	$ 9,950,379	$ 10,887,072	$ 12,703,961	$ 13,095,853	$ 11,051,870	$ 23,546,119	$ 9,157,597	$ 7,754,996	$ 14,754,016	$ 21,705,039	$ 28,880,284	$ 33,731,919	$ 40,995,645	$ 42,549,656	$ 29,447,549	$ 14,392,002	$ 19,413,946	$ 23,183,270	$ 23,264,697	$ 25,747,655	$ 30,464,876
28	Add: Interest Earned Prior Periods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Add: Annual Contributions to R&R Fund	5,939,812	6,297,348	7,413,957	7,636,375	7,865,467	8,101,431	8,344,473	8,594,808	8,852,652	9,118,231	9,391,778	9,673,532	9,963,738	10,262,650	10,570,529	10,887,645	11,050,911	11,156,728	11,230,185	10,996,452	11,342,774	11,221,911	11,371,293	11,355,664	11,296,044
30	Add: Additional Transfer from Operating Fund	2,500,000	17,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	2,500,000	1,140,000	1,140,000	1,140,000	1,140,000	1,140,000	1,140,000	1,140,000	-	-	-	-	-	-
31	Add: Debt/Bond Proceeds for R&R	-	-	-	-	-	-	-	-	25,000,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
32	Add: Other Non-Operating Income (Grants, etc.)	581,462	743,510	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	Add: Transfers In From Other Funds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	Less: Capital Project Expenditures R&R	(51,290,883)	(31,900,577)	(8,903,670)	(7,308,809)	(9,439,187)	(8,784,542)	(10,452,581)	(13,138,791)	(23,858,403)	(26,006,753)	(13,294,380)	(5,174,511)	(4,152,715)	(4,227,405)	(6,858,894)	(4,763,920)	(10,636,899)	(25,398,835)	(27,425,732)	(5,974,508)	(7,573,450)	(11,140,484)	(8,888,335)	(6,638,443)	(8,129,297)
35	Less: Annual Debt Service Payments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	Adj: Adj BS Items - AP/Retainage/US1 FDOT Deposit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	R&R Funds Avail. for Future CIP before Int. Income	$ 13,414,018	$ 6,097,395	$ 7,107,682	$ 9,941,851	$ 10,876,659	$ 12,703,961	$ 13,095,853	$ 11,051,870	$ 23,546,119	$ 9,157,597	$ 7,754,996	$ 14,754,016	$ 21,705,039	$ 28,880,284	$ 33,731,919	$ 40,995,645	$ 42,549,656	$ 29,447,549	$ 14,392,002	$ 19,413,946	$ 23,183,270	$ 23,264,697	$ 25,747,655	$ 30,464,876	$ 33,631,623
38	Add: Interest Income	43,097	-	6,603	8,528	10,414	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	Total R&R Fund Bal. with Minimum Deposit Req & Rsrv	$ 13,457,115	$ 6,097,395	$ 7,114,285	$ 9,950,379	$ 10,887,072	$ 12,703,961	$ 13,095,853	$ 11,051,870	$ 23,546,119	$ 9,157,597	$ 7,754,996	$ 14,754,016	$ 21,705,039	$ 28,880,284	$ 33,731,919	$ 40,995,645	$ 42,549,656	$ 29,447,549	$ 14,392,002	$ 19,413,946	$ 23,183,270	$ 23,264,697	$ 25,747,655	$ 30,464,876	$ 33,631,623
40	**Connection Fees Fund Balance**	$ (3,749,702)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
41	Add: Int. Earned Prior Periods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	Add: Annual Contributions to Connect Fee Fund	1,036,900	467,783	426,559	405,389	379,348	353,969	330,034	303,537	278,773	254,156	229,376	204,654	179,941	155,207	130,484	32,042	-	-	-	-	-	-	-	-	-
43	Add: Transfers from Operating Fund	5,860,759	1,816,317	1,247,829	1,296,286	1,279,115	1,318,281	1,350,504	1,042,788	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	Add: Debt Proceeds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	Less: Annual Debt Service Payments	(2,226,500)	(2,234,500)	(1,627,500)	(1,657,500)	(1,617,000)	(1,633,500)	(1,644,500)	(1,313,000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	Less: Capital Project Expenditures	(921,457)	(49,600)	(46,888)	(44,175)	(41,463)	(38,750)	(36,038)	(33,325)	(30,613)	(27,900)	(25,188)	(22,475)	(19,763)	(17,050)	(14,338)	(3,488)	-	-	-	-	-	-	-	-	-
47	Less: Transfers to Operating Fund	-	-	-	-	-	-	-	-	(248,160)	(226,256)	(204,188)	(182,179)	(160,178)	(138,157)	(116,146)	(28,554)	-	-	-	-	-	-	-	-	-
48	Adj: Adj BS & Other Items - AP/Retainage/PY Fee Refund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	Conn. Fees Avail. for Future CIP before Int. Income	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
50	Add: Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51	Connection Fee Fund Balance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
52	Total Funds Available At Year End	$ 44,715,731	$ 20,534,610	$ 20,673,008	$ 22,577,039	$ 22,802,517	$ 24,588,481	$ 24,916,377	$ 23,055,780	$ 35,410,232	$ 20,584,317	$ 18,614,718	$ 24,866,954	$ 32,312,563	$ 39,376,894	$ 43,961,984	$ 50,690,522	$ 51,614,054	$ 37,859,297	$ 22,054,700	$ 27,752,622	$ 31,932,457	$ 32,213,867	$ 35,156,543	$ 40,390,722	$ 44,116,808

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 2 - CAPITAL IMPROVEMENT PLAN

No.	Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2022- 2046	2022 to 2025	2026 to 2030	2031 to 2035	2036 to 2040	2041 to 2046	2022 - 2046
1	Machinery & Equipment	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2	Professional Services	57,686	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	57,686	57,686	-	-	-	-	57,686
3	Large Meter Replacement Program	356,450	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,200	135,736	139,808	144,002	148,322	152,772	210,637	210,637	210,637	210,637	210,637	210,637	210,637	210,637	210,637	4,324,816	762,049	675,998	689,945	933,004	1,263,820	4,324,816
4	Meter Replacement Program	748,693	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	1,367,018	604,762	622,905	641,592	660,840	680,665	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	2,129,770	36,797,574	4,849,748	6,835,092	4,603,296	7,730,816	12,778,622	36,797,574
5	Meters New	67,150	49,600	46,888	44,175	41,463	38,750	36,038	33,325	30,613	27,900	25,188	22,475	19,763	17,050	14,338	3,488	-	-	-	-	-	-	-	-	-	518,204	207,813	180,189	112,376	17,826	-	518,204
6	North Limestone Creek Wellfield	9,093,757	-	-	-	1,960,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11,053,757	9,093,757	1,960,000	-	-	-	11,053,757
7	Water Utilities Security Improvements - Ph II	10,271	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,271	10,271	-	-	-	-	10,271
8	Customer Information & Utility Billing System (V4 Upgrade)	401,696	-	-	-	-	-	-	-	-	-	856,882	-	-	-	-	-	-	-	-	-	1,151,578	-	-	-	-	2,410,156	401,696	-	856,882	-	1,151,578	2,410,156
9	Asset Maintenance R&R Program	4,498,605	1,652,218	1,156,344	1,425,374	1,292,984	1,441,007	1,335,567	850,727	970,825	1,280,458	1,030,956	1,293,011	1,082,507	1,015,812	1,544,552	1,477,507	1,218,372	1,155,087	1,305,983	1,720,828	1,384,163	1,724,435	1,469,895	1,379,234	1,900,324	36,606,775	4,233,936	5,891,110	5,702,744	6,701,501	9,578,879	32,108,170
10	Ion Exchange Resin Replacement	-	-	-	-	-	-	210,421	-	-	-	-	-	-	-	-	-	-	-	-	300,010	-	-	-	-	-	510,431	-	210,421	-	-	300,010	510,431
11	Pump Replacement Program	853,227	-	545,927	778,289	-	241,644	433,467	2,631,190	4,351,655	216,733	839,842	-	81,275	529,853	449,543	1,543,694	-	1,499,234	-	-	-	-	-	-	-	14,995,573	2,177,443	7,657,956	1,667,703	3,492,471	-	14,995,573
12	MBA Rehab for RO Permeate Odor Contl	637,555	-	-	-	-	-	-	-	-	-	2,896,532	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,534,087	637,555	-	2,896,532	-	-	3,534,087
13	RO & Nano Membrane Repl Prgm	2,711,550	-	-	-	2,570,646	-	-	-	982,236	-	-	3,069,486	-	1,363,049	-	-	-	-	3,775,081	-	-	-	-	1,530,290	16,002,338	2,711,550	2,570,646	5,414,771	3,775,081	1,530,290	16,002,338
14	Piping Upgrade-Central Blvd Pump Station	-	1,313,935	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,313,935	1,313,935	-	-	-	-	1,313,935
15	Piping Upgrade-Central Blvd Pump Station	17,422	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17,422	17,422	-	-	-	-	17,422
16	Nitrogen Blanket in Sulfuric Acid Tanks	74,014	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74,014	74,014	-	-	-	-	74,014
17	Juno Beach Distribution System Improvements	-	-	-	-	-	-	-	-	-	946,893	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	946,893	-	-	946,893	-	-	946,893
18	Generator Replacement Program	-	-	-	359,037	590,070	-	106,291	-	635,159	-	-	-	-	-	151,597	-	764,718	850,721	963,840	859,162	-	285,902	-	1,919,702	-	7,486,199	359,037	1,331,520	-	2,730,876	3,064,766	7,486,199
19	Loxahatchee River Road Area Distribution System Impr	101,432	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101,432	101,432	-	-	-	-	101,432
20	RO Concentrate Treatment Facility Improvements	165,676	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	165,676	165,676	-	-	-	-	165,676
21	Production Well Replacement Prgm (Surficial)	2,450,409	-	1,810,609	2,117,161	-	2,246,096	4,092,001	3,105,684	-	-	4,446,168	-	1,628,688	-	3,559,573	-	-	-	-	-	-	6,789,740	-	-	2,358,276	34,604,405	6,378,179	9,443,781	6,074,856	3,559,573	9,148,016	34,604,405
22	Production Well Replacement Prgm (Floridan)	3,507,455	-	-	-	-	-	-	4,412,156	-	5,633,915	-	-	-	-	-	-	-	5,633,915	-	-	-	-	-	-	-	19,187,441	3,507,455	4,412,156	5,633,915	5,633,915	-	19,187,441
23	Penn Park Distribution System Improvements	1,036,319	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,036,319	1,036,319	-	-	-	-	1,036,319
24	Penn Park Distribution System Improvements	420,230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	420,230	420,230	-	-	-	-	420,230
25	Nitrogen Trichloride Gas Elimination System	173,113	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	173,113	173,113	-	-	-	-	173,113
26	WTP Control System Cybersecurity	135,424	66,500	66,500	66,500	66,500	66,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	467,924	334,924	133,000	-	-	-	467,924
27	Nano Pretreatment Sand Filter Media Replacement	957,042	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	957,042	957,042	-	-	-	-	957,042
28	WTP Hardened Server Bldg (Training Facility)	135,000	559,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	694,000	694,000	-	-	-	-	694,000
29	WTP Hardened Server Bldg (Training Facility)	144,896	741,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	885,896	885,896	-	-	-	-	885,896
30	RO Plant Mods to Addr RW Degradation - Inc: Interstage Boost	2,991,165	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,991,165	2,991,165	-	-	-	-	2,991,165
31	Floridan Aquifer Wells RO-14, RO-15, RO-16 & RWMs	12,865,938	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12,865,938	12,865,938	-	-	-	-	12,865,938
32	Pine Gardens North Infrastructure Improvements	1,371,378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,371,378	1,371,378	-	-	-	-	1,371,378
33	Riverbend Country Club WM Improves (Ph I-2020/Ph II-2024)	121,036	-	302,890	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	423,926	423,926	-	-	-	-	423,926
34	Brentwood North Distribution Improvements	225,663	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	225,663	225,663	-	-	-	-	225,663
35	Distribution System Flow & Pressure Monitoring	752,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	752,600	752,600	-	-	-	-	752,600
36	Fisherman's Landing Water Main Replacement	994,881	92,252	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,087,133	1,087,133	-	-	-	-	1,087,133
37	Juno Beach Repump Station Valve Replacements	182,125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	182,125	182,125	-	-	-	-	182,125
38	RO Clearwell Interior Structural Repairs	283,425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	283,425	283,425	-	-	-	-	283,425
39	Distribution System Water Quality Sampling Stations	99,410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99,410	99,410	-	-	-	-	99,410
40	RO Permeate Degasifier Impr - Testing/Add 4th Degasifier	10,000	-	-	623,385	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	633,385	633,385	-	-	-	-	633,385
41	Jupiter Lakes & Wood Duck Water Distr System Improves	317,706	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	317,706	317,706	-	-	-	-	317,706
42	Sodium Hypochlorite Feed System	131,988	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	131,988	131,988	-	-	-	-	131,988
43	RO Bulk Surfuric Acid Storage Tanks (2-4000gal)	134,614	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	134,614	134,614	-	-	-	-	134,614
44	Ammonia Injection Relocation/4-Log	-	286,443	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	286,443	286,443	-	-	-	-	286,443
45	Dolphin Drive-Replace 6" and 4" AC mains	-	370,543	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	370,543	370,543	-	-	-	-	370,543
46	Toney Penna Transmission-Replace 18", 24", and 8" valves	-	210,058	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	210,058	210,058	-	-	-	-	210,058
47	NF Concentrate Blending with RO Raw Water	-	2,928,084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,928,084	2,928,084	-	-	-	-	2,928,084
48	Pennock Industrial Park Valves and Hydrants	-	98,345	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	98,345	98,345	-	-	-	-	98,345
49	Deep Injection Well (JLA)	-	22,079,981	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22,079,981	22,079,981	-	-	-	-	22,079,981
50	Deep Injection Well Pump Station	-	-	2,043,399	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,043,399	2,043,399	-	-	-	-	2,043,399
51	Waste Stream Recovery and Disposal	-	-	1,267,563	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,267,563	1,267,563	-	-	-	-	1,267,563
52	Indiantown Rd Water Transmission Main Fitting Replace	-	-	208,220	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	208,220	208,220	-	-	-	-	208,220
53	Eganfuskee/Carl St/Clark Ln Distribution Improvements	-	-	-	436,845	-	-	-	-	-	-	-	-	-	-	-	-	1,002,934	-	-	-	-	-	-	-	-	1,439,779	436,845	-	-	1,002,934	-	1,439,779
54	Water Treatment Plant Asphalt Mill and Overlay	-	-	-	-	406,928	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	406,928	-	406,928	-	-	-	406,928
55	Bendross Road Distribution Improvements	-	-	-	-	198,745	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	198,745	-	198,745	-	-	-	198,745
56	Construction of Floridan Aquifer Well RO-17, RO-18	-	-	-	-	3,421,742	-	-	-	-	4,074,070	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7,495,812	-	3,421,742	4,074,070	-	-	7,495,812
57	Loxahatchee River Rd Area Distrib System Improves - Ph II	-	-	-	-	-	716,431	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	716,431	-	716,431	-	-	-	716,431
58	Via Rio-New 6" WM & Relocate Services to Indiv Properties	-	-	-	-	-	-	324,687	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	324,687	-	324,687	-	-	-	324,687
59	Liquid Chlorine Conversion	-	-	-	-	-	-	1,916,143	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,916,143	-	1,916,143	-	-	-	1,916,143
60	Storage Reservoir Replacement Program	-	-	-	-	-	-	742,207	-	1,270,537	-	-	-	-	-	-	-	-	2,460,370	-	-	-	-	4,108,033	-	-	8,581,147	-	2,012,744	-	2,460,370	4,108,033	8,581,147
61	Old Ft Jupiter Rd-Loop 6" WM Old Ft Jupiter W to Lox River Rd	-	-	-	-	-	-	-	217,378	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	217,378	-	217,378	-	-	-	217,378
62	Old Orange Rd-Loop 6" WM Fr Old Orange S to Coco Plumosus	-	-	-	-	-	-	-	41,803	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	41,803	-	41,803	-	-	-	41,803
63	Holy Ln-New 6" WM Holy Ln & Relocate Services Fr Lox River Rd	-	-	-	-	-	-	-	167,214	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	167,214	-	167,214	-	-	-	167,214
64	Old Dixie Highway Water Main Replacement	-	-	-	-	-	-	-	-	1,628,582	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,628,582	-	1,628,582	-	-	-	1,628,582
65	Riverbend Repump Rechloramination Chemical Facility	-	-	-	-	-	-	-	-	809,872	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	809,872	-	809,872	-	-	-	809,872
66	WTP Replacement Program	-	-	-	-	-	-	-	-	4,478,878	11,019,529	1,097,980	-	-	-	-	665,688	-	10,457,300	18,529,275	-	1,475,593	-	-	-	-	47,724,243	-	4,478,878	12,117,509	29,652,263	1,475,593	47,724,243
67	SAS New 30-inch Raw Water Main	-	-	-	-	-	-	8,210,677	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,210,677	-	8,210,677	-	-	-	8,210,677
68	Jupiter Plantation Distribution Improvements	-	-	-	-	-	-	-	-	-	350,701	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350,701	-	-	350,701	-	-	350,701
69	N Delaware-Replace 8" AC WM on N Delaware/Arapaho/Chippewa	-	-	-	-	-	-	-	-	-	-	623,802	-	-	-	-	-	-	-	-	-	-	-	-	-	-	623,802	-	-	623,802	-	-	623,802
70	Woodside Trail-Loop 6" WM Fr Woodside Tr S to Center St	-	-	-	-	-	-	-	-	-	-	-	71,516	-	-	-	-	-	-	-	-	-	-	-	-	-	71,516	-	-	71,516	-	-	71,516
71	Penn Trl / Turner Quay-Loop 6" WM to N End TQ	-	-	-	-	-	-	-	-	-	-	-	-	106,616	-	-	-	-	-	-	-	-	-	-	-	-	106,616	-	-	106,616	-	-	106,616
72	Pompano Drive-Repl 6" AC WM & Loop E to Dolphin Pk	-	-	-	-	-	-	-	-	-	-	-	-	490,916	-	-	-	-	-	-	-	-	-	-	-	-	490,916	-	-	490,916	-	-	490,916
73	Marlin Drive-Replace 6" AC WM on Marlin Dr	-	-	-	-	-	-	-	-	-	-	-	-	-	533,097	-	-	-	-	-	-	-	-	-	-	-	533,097	-	-	533,097	-	-	533,097
74	N Loxahatchee Drive-Replace 6" AC WM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	344,467	-	-	-	-	-	-	-	-	-	-	344,467	-	-	-	344,467	-	344,467
75	Jupiter Dunes-Repl/Relocate 10" & 6" WM Out of Golf Course	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	243,594	-	-	-	-	-	-	-	-	-	243,594	-	-	-	243,594	-	243,594
76	Toney Penna at JRE WM-Lower/Protect Shallow WM & Add Isol Vlv	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,183,969	-	-	-	-	-	-	-	-	1,183,969	-	-	-	1,183,969	-	1,183,969
77	FAS New 36-inch Raw Water Main	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,126,499	-	-	-	-	-	-	-	-	4,126,499	-	-	-	4,126,499	-	4,126,499
78	Villas on the Green Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,001,801	-	-	-	-	-	-	-	1,001,801	-	-	-	1,001,801	-	1,001,801
79	Ocean Parks Condos Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	511,146	-	-	-	-	-	-	511,146	-	-	-	511,146	-	511,146
80	Bella Vista Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	754,101	-	-	-	-	-	754,101	-	-	-	-	754,101	754,101
81	Nano Sulfuric Acid Bulk Tank Replacements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,221,709	-	-	-	-	1,221,709	-	-	-	-	1,221,709	1,221,709
82	Hampton Pl & Hampton Cir Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400,013	-	-	-	400,013	-	-	-	-	400,013	400,013
83	Distribution R&R TBD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	970,000	999,100	-	1,969,100	-	-	-	-	1,969,100	1,969,100
84	Town Hall Replacement - 2nd Contribution	2,975,339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,975,339	2,975,339	-	-	-	-	2,975,339
85	Total Projects	$ 52,212,340	$ 31,950,177	$ 8,950,558	$ 7,352,984	$ 9,480,650	$ 8,823,292	$ 10,488,619	$ 13,172,116	$ 23,889,016	$ 26,034,653	$ 13,319,568	$ 5,196,986	$ 4,172,478	$ 4,244,455	$ 6,873,232	$ 4,767,408	$ 10,636,899	$ 25,398,835	$ 27,425,732	$ 5,974,508	$ 7,573,450	$ 11,540,497	$ 8,888,335	$ 6,638,443	$ 8,129,297	343,134,528	$ 95,967,454	$ 65,853,693	$ 52,968,140	$ 75,102,106	$ 48,744,530	$ 338,635,923
	Funding by Source of Funds																																
86	Water Operating Funds	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 400,013	$ -	$ -	$ -		-	-	-	-	400,013	400,013
87	Water Off-site Transmission Fees	837,172	49,600	46,888	44,175	41,463	38,750	36,038	33,325	30,613	27,900	25,188	22,475	19,763	17,050	14,338	3,488	-	-	-	-	-	-	-	-	-		977,835	180,189	112,376	17,826	-	1,288,226
88	Water Plant Capacity Charges	84,285	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		84,285	-	-	-	-	84,285
89	Water Renewal & Replacement Funds	50,725,757	31,159,577	8,903,670	7,308,809	9,439,187	8,784,542	10,452,581	13,138,791	23,858,403	26,006,753	13,294,380	5,174,511	4,152,715	4,227,405	6,858,894	4,763,920	10,636,899	25,398,835	27,425,732	5,974,508	7,573,450	11,140,484	8,888,335	6,638,443	8,129,297		98,097,813	65,673,504	52,855,764	75,084,280	48,344,517	340,055,878
90	Intergov - Grant Funds - CDBG - PBC	420,230	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		420,230	-	-	-	-	420,230
91	Intergov - Grant Funds - FEMA - Hazard Mitigation Grant	144,896	741,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		885,896	-	-	-	-	885,896
92	Total Projects	$ 52,212,340	$ 31,950,177	$ 8,950,558	$ 7,352,984	$ 9,480,650	$ 8,823,292	$ 10,488,619	$ 13,172,116	$ 23,889,016	$ 26,034,653	$ 13,319,568	$ 5,196,986	$ 4,172,478	$ 4,244,455	$ 6,873,232	$ 4,767,408	$ 10,636,899	$ 25,398,835	$ 27,425,732	$ 5,974,508	$ 7,573,450	$ 11,540,497	$ 8,888,335	$ 6,638,443	$ 8,129,297		$ 100,466,059	$ 65,853,693	$ 52,968,140	$ 75,102,106	$ 48,744,530	$ 343,134,528

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 3 - SUMMARY OF ASSET MAINTENANCE PROGRAMS

Line No.	Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	Total 2022 to 2046
	RECHARGE SYSTEM																										
1	Maintenance Dredging of Canals (every 5 yrs)	-	-	-	-	80,235	-	-	-	-	93,015	-	-	-	-	107,830	-	-	-	-	125,004	-	-	-	-	-	
2	Total Recharge System	169,212	-	-	-	80,235	-	-	-	-	93,015	-	-	-	-	107,830	-	-	-	-	125,004	-	-	-	-	-	575,296
	WELL REHAB																										
3	Continual Well R&R (shallow wells)	268,783	276,847	285,152	293,707	302,518	311,593	320,941	330,570	340,487	350,701	361,222	372,059	383,221	394,717	406,559	418,756	431,318	444,258	457,586	471,313	485,452	500,016	515,017	530,467	546,381	
4	Continual Well R&R (RO wells)	77,250	79,568	81,955	84,413	86,946	89,554	92,241	95,008	97,858	100,794	103,818	106,932	110,140	113,444	116,848	120,353	123,964	127,682	131,513	135,458	139,522	143,708	148,019	152,460	157,033	
5	Wellsite Disposal Drains	191,028	128,652	-	236,766	-	-	230,737	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
6	Clean and Paint Wellhead piping	-	-	7,563	-	-	8,264	-	-	9,031	-	-	9,868	-	-	10,783	-	-	11,783	-	-	12,875	-	-	14,069	-	
7	Total Well Rehab	866,320	485,067	374,670	614,886	389,464	409,411	643,919	425,578	447,376	451,495	465,040	488,859	493,361	508,161	534,190	539,109	555,282	583,723	589,099	606,771	637,849	643,724	663,036	696,996	703,414	13,816,800
	RO WELLHEAD RECONSTRUCTION																										
8	RO Wellhead Reconstruction	225,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	Total RO Wellhead Reconstruction	1,363,806	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,363,806
	PAINTING & CLEANING																										
	Ground Storage Tanks																										
10	On-Site clean/paint every 5 yrs due to MBAs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11	Two Tanks On-Site (3 MG, 1.5 MG)	-	-	-	-	73,816	-	-	-	-	85,574	-	-	-	-	99,203	-	-	-	-	115,004	-	-	-	-	133,321	
12	Replace On-Site Ground Storage Tank Transfer Valve and Piping	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
13	Off-Site clean/paint every 10 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
14	Central Blvd Tanks (2-5MG, 1-8MG)	-	-	-	-	-	247,927	-	-	-	-	-	-	-	-	-	333,193	-	-	-	-	-	-	-	-	-	
15	Juno Tank (3 MG)	-	-	-	-	-	-	-	-	-	55,809	-	-	-	-	-	-	-	-	-	75,002	-	-	-	-	-	
16	Riverbend Tank (3 MG) last painted in 2008	-	-	-	-	-	49,585	-	-	-	-	-	-	-	-	-	66,639	-	-	-	-	-	-	-	-	-	
	Buildings and Other Improvements																										
17	Clean and paint every 10 years	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
18	On-Site Bldgs (Interior & Exterior)	262,733	64,615	66,554	68,551	70,607	72,725	74,907	77,154	79,469	81,853	84,309	86,838	89,443	92,126	94,890	97,737	100,669	103,689	106,800	110,004	113,304	116,703	120,204	123,810	127,524	
19	WTP Administration/Lab/Maintenance Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
20	RO Plant Process/Ctl Rm/Clearwell/Pumps	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
21	RO Chemical Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
22	Nanofiltration Process Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
23	Nanofiltration Pretreatment Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
24	Chlorine Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
25	Concentrate Treatment Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
26	MBA Chemical Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
27	On-Site Generator Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
28	On-Site High Service Pump Bldg (& Pumps)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
29	WTP Warehouse Bldg (Future)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	Sludge Vacuum Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
31	WTP Pole Barn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
32	Off-Site Bldgs (Interior & Exterior)	28,515	29,371	30,252	31,159	32,094	33,057	34,049	35,070	36,122	37,206	38,322	39,472	40,656	41,876	43,132	44,426	45,759	47,131	48,545	50,002	51,502	53,047	54,638	56,277	57,966	
33	Central Blvd HSP Bldgs & Pumps (2)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
34	Indian Creek Generator Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
35	Toney Pena Well House	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
36	Abacoa Generator Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
37	Riverbend Repump Generator/Electric Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
38	Juno Tank Site Electrical Bldg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
39	Emergency Operations Center (EOC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
40	EOC Pole Barn	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Other Plant Facilities Clean & Paint																										
41	IX Facility (Incl Brine Tank, Salt Contain & Piping)	21,386	22,028	22,689	23,370	24,071	24,793	25,536	26,303	27,092	27,904	28,742	29,604	30,492	31,407	32,349	33,319	34,319	35,348	36,409	37,501	38,626	39,785	40,979	42,208	43,474	
42	Hydropneumatic Tank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
43	MBA Scrubbers & Duct Work	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
44	CTF Scrubbers & Duct Work	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
45	Nano Degas/Scrubbers/Ductwork	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
46	RO Generator Muffler (high temp coating)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
47	Above Ground Finished Water Transfer Line	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
48	Bollards on Plant Site	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
49	Backflow Preventors (incld. NF Conc. Piping)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
50	Bulk Fuel & Chemical Containment Areas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
51	Nano Bulk Chemical Tanks	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
52	Misc. Exterior PVC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
53	Total Painting	325,770	116,014	119,495	123,080	200,588	428,087	134,492	138,527	142,683	288,346	151,373	155,914	160,591	165,409	269,574	575,314	180,747	186,168	191,754	387,513	203,432	209,535	215,821	222,295	362,285	5,654,807
	OTHER PLANT IMPROVEMENTS																										
54	Other Plant	35,321	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
55	Ground Storage Tank Repair	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
56	RO & NF Stainless Steel Pipe Cleaning	101,105	41,734	42,986	44,275	45,604	46,972	48,381	49,832	51,327	52,867	54,453	56,087	57,769	59,503	61,288	63,126	65,020	66,971	68,980	71,049	73,181	75,376	77,637	79,966	82,365	
57	Server Room Relocation/Equipment/Programming	-	281,831	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
58	Central Blvd N HSP Bldg Repairs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
59	Salinity Barrier Structure Maintenance	211,789	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
60	Remove RO permeate check valves	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
61	Plant Asset Maintenance (Lucity/Manuals/Etc.)	41,184	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
62	Nano Concentrate Main	32,868	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
63	Nano Acid Tank Interior Clean/Clean & Inspect (2yrs)	137,359	-	80,001	-	76,006	-	90,042	-	85,546	-	101,343	-	96,282	-	114,063	-	108,367	-	128,378	-	121,968	-	144,491	-	137,276	
64	Facility Fencing & Landscaping Repair/Replace (Juno & well sites 29, 30, 68 & 67)	222,412	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
65	Nano Bldg & NF Pretreat Roof Repairs	100,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
66	Mechanical Integrity Testing (MIT)	-	-	-	-	-	-	-	-	-	143,525	-	-	-	-	166,385	-	-	-	-	192,886	-	-	-	-	223,607	
67	Nano Bldg Architectural Foam Replacement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
68	Redundant Water Supply to WTP/NF Plant	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
69	Total Other Plant Improvements	882,038	323,565	122,987	44,275	121,610	46,972	138,423	49,832	136,873	196,392	155,796	56,087	154,051	59,503	341,736	63,126	173,387	66,971	197,358	263,935	195,149	75,376	222,128	79,966	443,248	4,610,784
	DISTRIBUTION SYSTEMS																										
70	Bridge Crossings	70,629	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	12,136	12,500	12,875	13,262	13,660	14,069	14,491	
71	Bridgegate Drive (Jonathan's Landing-8",130')	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
72	Carlin Park (12", 40')	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
73	Lox. River Road Culvert (12", 40')	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
74	Jupiter Beach Resort (8", 45')	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
75	Toney Penna/Mohican (Jones Creek-Culvert)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
76	Bluff's Marina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
77	Indiantown Road (Jones Creek)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
78	Commodore Dr. (Admirals Cove)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
79	Island Way (South, East, West)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
80	Center St. (East, West)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
81	Reach Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
82	Toney Penna (Canal Crossing)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
83	Loxahatchee River Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
84	Alt A1A (East, West)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
85	Subaqueous Crossings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
86	Caseekey Island (Jonathan's Landing)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 3 - SUMMARY OF ASSET MAINTENANCE PROGRAMS

Line No.	Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	Total 2022 to 2046
87	Barrow Island (Jonathan's Landing)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
89	Total Distribution System	70,829	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	12,136	12,500	12,875	13,262	13,660	14,069	14,491	323,612
	VALVES & HYDRANTS																										
	Hydrant Maintenance Painting																										
90	3300 Hydrants (painting ~every 10 yrs)	-	242,308	-	-	-	-	-	-	-	-	-	325,642	-	-	-	-	-	-	-	-	-	437,635	-	-	-	
	Field Distribution Valves & Hydrant Maintenance																										
	E Indiantown Rd (Replace 9 Hydrants), Indiantown/S.Pennock (Valves),																										
91	W. Indiantown Rd (Valves)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
92	Military Trail Loop	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
93	Choctaw/Todd St. (Valves/Hydrants)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
94	Elm/Oak Circle (Valves/Hydrants)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
95	Ocean Pines Terrace (Valves)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
96	Center St (Replace/Add Valves/Hydrants)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
97	Indian Creek (Wingfoot/Pinecrest)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
98	Mallard's Cove/Jupiter Gardens (Valves/Hydrants)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
99	Chasewood North (Valves/Hydrants)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
100	Jupiter Dunes/400 A1A (Valves)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
101	Military Trail- Wood Duck/High School (Valves)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
102	Jupiter Dunes Services (Ph 2)	37,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
103	Ocean Way Valves & Hydrants	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
104	Jonathan's Landing Ph 1 (Valves)	73,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
105	Via Del Mar Service Replacements	-	70,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
106	Jonathan's Landing Ph 2 (Valves/Hydrants)	-	30,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
107	Eagles Nest Ph1 (Valves/Hydrants)	-	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
108	Need project name from Gaddis	-	-	70,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
109	Ocean Walk (Ph 1)	-	-	85,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
110	Chasewood South	-	-	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
111	Eagles Nest (Ph 2)	-	-	-	80,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
112	Whispering Trails	-	-	-	95,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
113	Ocean Walk (Ph 2)	-	-	-	95,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
114	Ocean Dunes	-	-	-	-	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
115	Beachcomber (Ph 1)	-	-	-	-	65,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
116	Admiral's Cove (Valves)	-	-	-	-	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
117	Shores (Valves)	-	-	-	-	-	30,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
118	PBCE (Valves)	-	-	-	-	-	30,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
119	The Heights of Jupiter (Valves)	-	-	-	-	-	50,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
120	Beachcomber (Ph 2)	-	-	-	-	-	40,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
121	Total Hydrant Maintenance	224,246	392,308	205,000	270,000	165,000	150,000	-	-	-	-	-	325,642	-	-	-	-	-	-	-	-	-	437,635	-	-	-	2,169,831
	OTHER DISTRIBUTION SYSTEMS IMPROVEMENTS																										
122	Military Trail Loop	133,035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
123	EOC Roof Repl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
124	Total Other Distribution System Improvements	133,035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	133,035
	INFORMATION SYSTEMS																										
125	GIS Upgrades	27,797	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	12,136	12,500	12,875	13,262	13,660	
126	Total GIS Upgrades	27,797	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	12,136	12,500	12,875	13,262	13,660	266,070
127	SCADA Upgrades - OT	185,000	117,000	38,500	128,000	142,500	207,143	213,357	219,758	226,350	233,141	240,135	247,340	254,759	262,402	270,275	278,383	286,733	295,336	304,196	313,322	322,722	332,403	342,375	352,646	363,226	
	Includes $110,000/yr from 2015-2027 for RO Remote I/O Panels (AZB believes work																										
128	will be completed with FY 24 funding)- Process Controls	157,500	204,000	281,000	230,000	178,000	183,340	188,840	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
129	Surficial Well RTU Panels (Wells 50, 67 & 68)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
130	Server Virtualization ($125,664 in FY17 budget)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
131	New SCADA HMI Upgrades $382,022 (FY19-21)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
132	RO Wellfield PLC and Radio Replacements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
133	Total SCADA Upgrades	435,552	321,000	319,500	358,000	320,500	390,483	402,197	219,758	226,350	233,141	240,135	247,340	254,759	262,402	270,275	278,383	286,733	295,336	304,196	313,322	322,722	332,403	342,375	352,646	363,226	7,692,734
134	**Total Asset Maintenance R&R Program**	**4,498,605**	**1,652,218**	**1,156,344**	**1,425,374**	**1,292,984**	**1,441,007**	**1,335,567**	**850,727**	**970,825**	**1,280,458**	**1,030,956**	**1,293,011**	**1,082,507**	**1,015,812**	**1,544,552**	**1,477,507**	**1,218,372**	**1,155,087**	**1,305,983**	**1,720,828**	**1,384,163**	**1,724,435**	**1,469,895**	**1,379,234**	**1,900,324**	36,606,775
	MEMBRANE / RESIN REPLACEMENT PROGRAMS																										
	Membrane Replacements																										
135	RO Bank I (Trains A-D, every 15 yrs)	-	-	-	-	-	-	-	-	-	-	-	-	-	1,055,264	-	-	-	-	-	-	-	-	-	-	-	
136	RO Bank II (Train I, every 15 yrs)	-	-	-	-	-	-	-	-	-	-	-	-	-	307,785	-	-	-	-	-	-	-	-	-	-	-	
137	RO Bank II (Trains E-F, every 15 yrs)	-	-	-	-	-	-	-	-	-	491,118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	765,145	
138	RO Bank II (Trains G-H, every 15 yrs)	-	-	-	-	-	-	-	-	-	491,118	-	-	-	-	-	-	-	-	-	-	-	-	-	-	765,145	
139	Nano (Trains 1-5, every 7 yrs)	-	-	-	-	-	2,570,646	-	-	-	-	-	3,069,486	-	-	-	-	-	-	3,775,081	-	-	-	-	-	-	
140	Total Membrane Replacements	-	-	-	-	-	2,570,646	-	-	-	982,236	-	3,069,486	-	1,363,049	-	-	-	-	3,775,081	-	-	-	-	-	1,530,290	13,290,788
	Ion Exchange Resin Replacement																										
141	Ion Exchange Resin Replacement (every 12 yrs beginning May 2014; Plant going on standby /Amanda)	-	-	-	-	-	-	-	210,421	-	-	-	-	-	-	-	-	-	-	-	300,010	-	-	-	-	-	
142	Total Ion Exchange Resin Replacement	-	-	-	-	-	-	-	210,421	-	-	-	-	-	-	-	-	-	-	-	300,010	-	-	-	-	-	510,431

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 4 - ASSUMPTIONS BY YEAR FOR PROJECTIONS

No.	Description		2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
	Expenses																										
1	Salaries	Salaries	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
2	OT - Plant	Plt-OT	101.95%	104.26%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
3	OT - Field	Field-OT	104.04%	106.28%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
4	FICA	FICA	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
5	FRS	FRS	104.00%	104.00%	103.90%	104.28%	103.70%	103.60%	103.50%	103.40%	103.67%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
6	Health/Life Insurance	Health	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%
7	Workers Comp	WC	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%
8	OPEB	OPEB	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%
9	Consumer Price Index - Gen Inflation	CPI	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%
10	Repairs and Maintenance	R&M	104.20%	104.30%	104.40%	104.50%	104.60%	104.70%	104.80%	104.90%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%
11	Utility Costs	Utility	103.51%	103.04%	103.02%	103.00%	102.98%	102.96%	102.94%	102.92%	102.90%	102.89%	102.87%	102.85%	102.83%	102.82%	102.80%	102.70%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%
12	Gasoline	Gas	103.00%	120.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
13	Insurance Costs	Insurance	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%
14	Marginal Increase	Marginal	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%
15	Constant	Constant	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
16	Customer Growth Plus Inflation	Customer	103.49%	103.01%	102.98%	102.95%	102.92%	102.89%	102.86%	102.83%	102.80%	102.78%	102.75%	102.72%	102.69%	102.67%	102.64%	102.53%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%
17	Change in Allowance for Doubtful Accounts	Doubtful Accts	99.53%	107.76%	107.85%	103.33%	103.31%	103.29%	103.27%	103.25%	103.23%	103.22%	103.20%	103.18%	103.16%	103.15%	103.13%	103.03%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
18	Depreciation as a % of Total Assets		101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%	101.96%
19	Chemical Costs	Chemical	147.35%	150.50%	105.00%	103.00%	102.98%	102.96%	102.94%	102.92%	102.90%	102.89%	102.87%	102.85%	102.83%	102.82%	102.80%	102.70%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%	102.67%
20	Increase in Water Produced		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
21	Increase Excluding Water Produced		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
22	Annual Compound Growth Rate From 2001		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
23	Other Escalator	Other1	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
24	Cost Allocation	CA	103.61%	117.10%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%
	Other																										
25	Working Capital-% of Oper/Non-Oper Expenses		16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%
	Revenues																										
26	Fuel Reimbursement		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
27	IQ Concentrate		102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%
28	Misc Revenue		100.99%	100.51%	100.48%	100.45%	100.42%	100.39%	100.36%	100.33%	100.30%	100.28%	100.25%	100.22%	100.19%	100.17%	100.14%	100.03%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
29	Interest Rate on Investments		0.10%	0.10%	0.10%	0.10%	0.10%	0.20%	0.20%	0.20%	0.20%	0.30%	0.30%	0.40%	0.40%	0.50%	0.50%	0.60%	0.60%	0.70%	0.70%	0.80%	0.80%	0.90%	0.90%	1.00%	1.00%
30	R&R Contributions	3.00%	5,939,812	6,297,348	7,413,957	7,636,375	7,865,467	8,101,431	8,344,473	8,594,808	8,852,652	9,118,231	9,391,778	9,673,532	9,963,738	10,262,650	10,570,529	10,887,645	11,050,911	11,156,728	11,230,185	10,996,452	11,342,774	11,221,911	11,371,293	11,355,664	11,296,044
31	Growth in Retail Sales	116.23%	100.84%	107.87%	107.85%	103.33%	103.31%	103.29%	103.27%	103.25%	103.23%	103.22%	103.20%	103.18%	103.16%	103.15%	103.13%	103.03%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
	User Charge Index (20yr avg 4.7% - USDOL Water & Sewer Maintenance Cost Index to Water																										
32	Rates) Series ID CUUR0000SEHG01		0.00%	7.50%	7.50%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%	3.00%
33	Rate Increase		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
34	Water Use Adjustment		-0.15%	-0.14%	-0.13%	-0.12%	-0.11%	-0.10%	-0.09%	-0.08%	-0.07%	-0.06%	-0.05%	-0.04%	-0.03%	-0.02%	-0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
35	Customer Growth		100.99%	100.51%	100.48%	100.45%	100.42%	100.39%	100.36%	100.33%	100.30%	100.28%	100.25%	100.22%	100.19%	100.17%	100.14%	100.03%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
36	Growth in Retail Sales w/o Rate Increase		-	100.37%	100.35%	100.33%	100.31%	100.29%	100.27%	100.25%	100.23%	100.22%	100.20%	100.18%	100.16%	100.15%	100.13%	100.03%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
37	ERCs Connected		50,088	50,343	50,584	50,811	51,024	51,223	51,408	51,579	51,736	51,879	52,008	52,123	52,224	52,311	52,384	52,402	52,402	52,402	52,402	52,402	52,402	52,402	52,402	52,402	52,402
38	Increase in ERCs		490	255	241	227	213	199	185	171	157	143	129	115	101	87	73	18	-	-	-	-	-	-	-	-	-

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 5 - SUMMARY OF ABOVE-GROUND ASSETS - ORIGINAL AND REPLACEMENT COST [1]

Line No.	Asset Description	Original Cost	Service Life (Years)	Installation Date (Year)	Useful Life Expiration	Useful Life Expiration Replace Cost [2]
	Pump					
1	High Service Pump 11 (Central Blvd North Station)	60,000	20	1,995	2,035	195,722
2	High Service Pump 12 (Central Blvd North Station)	60,000	20	1,999	2,027	133,277
3	CBN HSP Piping/Valving	505,500	-	2,021	2,022	800,000
4	High Service Pump 13, 14 (Outside HSP Bldg On-Site)	789,689	20	2,002	2,029	1,754,127
5	High Service Pump 15 (Central Blvd South Station)	394,844	20	2,002	2,029	877,063
6	High Service Pump 16 (Central Blvd South Station)	60,000	20	2,005	2,027	108,367
7	High Service Pump 17, 18	120,000	20	2,011	2,031	216,733
8	High Service Pump 5 (In HSP Bldg On-Site)	382,353	20	2,017	2,037	690,572
9	High Service Pump 6 (In HSP Bldg On-Site)	382,353	20	2,017	2,037	690,572
10	Onsite HSP Piping/Valving	691,500	-	2,021	2,025	778,289
11	High Service Pump 7 (Outside HSP Bldg On-Site)	295,000	20	1,984	2,039	1,499,234
12	High Service Pump 8 (Outside HSP Bldg On-Site)	203,901	20	2,016	2,036	368,268
13	High Service Pump 9, 10 (Central Blvd North Station)	548,823	20	1,990	2,030	1,790,281
14	Nano Pretreatment Booster (4) Pump	233,685	20	2,010	2,030	422,061
15	Nano Transfer (6), Feed (5) Pump	1,184,486	20	2,010	2,030	2,139,313
16	RO Transfer Pump 8	45,000	20	2,017	2,037	81,275
17	RO Transfer Pump 9	45,000	20	2,015	2,035	81,275
18	RO Transfer Pump 10	45,000	20	2,014	2,034	81,275
19	RO Transfer Pump 11	45,000	20	2,017	2,037	81,275
20	RO Transfer Pump 12	45,000	20	2,016	2,036	81,275
21	RO Transfer Pump 13	45,000	20	2,012	2,032	81,275
22	RO Transfer Pump Piping/Valving	499,600	-	2,021	2,024	545,927
23	Juno Repump Station	-	20	1,992	2,032	758,567
24	Riverbend Pumps P201, P202, P203, P204	240,000	20	2,008	2,028	433,467
25	SBB Transfer Pump	140,000	20	2,015	2,035	252,856
26	Total Pumps	7,061,734				14,942,346
	Storage Reservoirs					
27	Hydropneumatic Tank	250,000	55	1,975	2,030	1,270,537
28	8 MG Ground Storage Tank ST5	1,277,557	55	1,993	2,048	6,492,735
29	5 MG Ground Storage Tank ST4	808,326	55	1,989	2,044	4,108,033
30	3 MG Ground Storage Tank ST3	484,120	55	1,984	2,039	2,460,370
31	1.5 MG Ground Storage Tank ST2	146,042	55	1,973	2,028	742,207
32	1 MG Juno Beach Water Storage and Repump Facility	262,001	55	1,992	2,047	1,331,528
33	3 MG Riverbend Water Storage Repump Facility	1,392,700	55	2,008	2,063	7,077,908
34	8 MG Ground Storage Tank ST6	3,771,229	55	2,002	2,057	19,165,946
35	Total Storage Reservoirs	8,391,975				42,649,264
	Wells					
36	Surficial Well 8A, 9A, 10A, 11A, 12A	4,969,825	35	2,022	2,057	13,984,404
37	Surficial Well 13,14	241,855	35	1,981	2,024	1,810,609
38	Surficial Well 15, 17	245,838	35	1,982	2,025	2,117,161
39	Surficial Well 16, 18	245,838	35	1,982	2,027	2,246,096
40	Surficial Well 19A	306,524	35	2,015	2,050	862,516
41	Surficial Well 20	185,000	35	1,997	2,032	520,565
42	Surficial Well 21, 22	315,745	35	1,989	2,036	1,727,875
43	Surficial Well 23, 24, 25, 26, 27, 28	881,555	35	1,986	2,028	4,092,001
44	Surficial Well 29, 30	315,745	35	1,989	2,034	1,628,688
45	Surficial Well 31, 32, 33, 34, 35, 36	1,103,709	35	1,994	2,029	3,105,684

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 5 - SUMMARY OF ABOVE-GROUND ASSETS - ORIGINAL AND REPLACEMENT COST [1]

Line No.	Asset Description	Original Cost	Service Life (Years)	Installation Date (Year)	Useful Life Expiration	Useful Life Expiration Replace Cost [2]
46	Surficial Well 37R	306,524	35	2,015	2,050	862,516
47	Surficial Well 39	482,592	35	2,008	2,043	1,357,948
48	Surficial Well 40	419,046	35	2,011	2,046	1,179,138
49	Surficial Well 40 Raw Water Piping	83,996	70	2,011	2,081	665,065
50	Surficial Well 41	419,046	35	2,011	2,046	1,179,138
51	Surficial Well 41 Raw Water Piping	83,996	70	2,007	2,077	665,065
52	Surficial Well 42	484,598	35	2,016	2,051	1,363,592
53	Surficial Well 43	484,598	35	2,016	2,051	1,363,592
54	Surficial Well 42, 43 Raw Water Piping	167,993	70	2,012	2,082	1,330,139
55	Surficial Well 44	482,592	35	2,008	2,043	1,357,948
56	Surficial Well 45	482,592	35	2,008	2,043	1,357,948
57	Surficial Well 46	482,592	35	2,008	2,043	1,357,948
58	Surficial Well 47	482,592	35	2,008	2,043	1,357,948
59	Surficial Well 39, 44, 45, 46, 47 Raw Water Piping	843,550	70	2,000	2,070	6,679,079
60	Surficial Well 48, 49, 51, 52, 53, 54, 55	1,395,094	35	1,997	2,032	3,925,603
61	Surficial Well 50, 67, 68	650,955	35	2,001	2,036	1,831,698
62	Floridan Well (RO) 2, 3	1,174,938	35	1,988	2,022	1,707,455
63	Floridan Well 2, 3 - Salinity Issue	-	-	-	2,022	900,000
64	Floridan Well (RO) 4	810,814	35	2,020	2,055	5,875,100
65	Floridan Well (RO) 5, 6, 7	1,568,007	35	1,994	2,029	4,412,156
66	Floridan Well 5, 6, 7 - Raw Water Collection Piping	733,793	70	1,994	2,064	5,810,042
67	Floridan Well (RO) 8, 9, 10	2,002,200	35	1,996	2,031	5,633,915
68	Floridan Well 8, 9, 10 - Raw Water Collection Piping	375,000	70	1,996	2,066	2,969,183
69	Floridan Well (RO) 11, 12, 13	2,002,200	35	2,004	2,039	5,633,915
70	Floridan Well 11, 12, 13 - RWM Extension To	604,180	70	2,004	2,074	4,783,790
71	Total Wells	25,835,121				97,655,520
	Water Treatment Plant					
72	Chlorine Storage Facility Building	766,183	50	2,000	2,050	3,358,874
73	Chlorine Storage Facility Scrubbers (Single Stage/Single Unit)	147,000	35	2,019	2,054	413,638
74	Concentrate Treatment	214,243	35	1,996	2,031	602,850
75	Concentrate Treatement Facility Recirculation Pumps	74,780	35	2,015	2,050	210,421
76	Enclosed Pole Barn	315,948	50	2,020	2,070	1,385,086
77	Nanofiltration Treatment Facility	42,531,220	75	2,010	2,085	390,390,907
78	Nanofiltration Pre-Treatment Equipment	5,571,206	35	2,021	2,056	15,676,607
79	Nano Sand Filter Media	817,000	10	2,022	2,032	1,097,980
80	Nano Sand Filter Media Replacement	-	10	2,032	2,042	1,475,593
81	Nano Sand Filter Media Replacement	-	10	2,042	2,052	1,983,073
82	Reverse Osmosis Treatment Plant, Trains E, F, G, H, Process Equip (Bank II)	10,883,996	35	1,996	2,040	18,529,275
83	Reverse Osmosis Treatment Plant, Train I, Process Equip	3,375,599	35	2,004	2,039	5,579,350
84	Reverse Osmosis Treatment Plant, Trains A, B, C, D, Process Equip (Bank I)	3,535,668	35	1,989	2,030	4,478,878
85	2-Year Construction Term	7,983,517	35	1,989	2,031	10,416,679
86	Reverse Osmosis Treatment Plant, Building	5,471,821	75	1,989	2,064	50,225,438
87	Reverse Osmosis Permeate Scrubbers (MBAs)	1,112,695	20	1,989 2019		2,700,803
88	MBA New Components Replacement	-	20	2,019	2,039	4,877,950
89	MBA Rehab for RO Permeate Odor Contl (existing units)	427,280	20	2,017	2,037	665,688
90	Total Water Treatment Plant	83,228,156				514,069,090
	Buildings					
91	Administration Laboratory Building	1,557,475	50	2,003	2,053	6,827,824

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 5 - SUMMARY OF ABOVE-GROUND ASSETS - ORIGINAL AND REPLACEMENT COST [1]

Line No.	Asset Description	Original Cost	Service Life (Years)	Installation Date (Year)	Useful Life Expiration	Useful Life Expiration Replace Cost [2]
92	EOC Field Maintenance Facility	2,779,041	50	2,002	2,052	12,183,055
93	Warehouse - Original	295,000	50	2,012	2,062	1,293,252
94	High Service Pump Building - WTP Onsite	1,011,232	50	2,012	2,062	4,433,146
95	High Service Pump Building - South	1,525,977	50	2,008	2,058	6,689,740
96	Riverbend Repump Station - 16491 79th Terr N PBG - 2,335 SF	1,557,300	50	2,008	2,058	6,827,057
97	High Service Pump Building - North	855,000	50	2,021	2,071	3,748,240
98	Total Buildings	9,581,025				42,002,314
	Recharge Systems					
99	C-18 Siphon	53,888	70	1,989	2,059	426,676
100	Jupiter Village Outfall Structure To Heights Canal	13,472	70	1,989	2,059	106,669
101	Indian Creek Outfall Structure To Heights Canal	13,472	70	1,989	2,059	106,669
102	Indian Creek Surface Weir	5,389	70	1,989	2,059	42,669
103	Maplewood Outfall Structure To Heights Canal	13,472	70	1,989	2,059	106,669
104	Salinity Structure	269,442	70	1,989	2,059	2,133,394
105	Recharge Pump Stations (2)	2,066,628	30	2,017	2,047	5,016,249
106	Central Blvd Recharge Pipeline	355,000	70	2,009	2,079	2,810,827
107	Total Recharge Systems	2,790,763				10,749,822
	Generators					
108	17403 Central Blvd Water Plant	271,768	35	2,003	2,038	764,718
109	1451 Tony Penna Well House 12	10,741	35	1,970	2,040	85,045
110	2351 S Central Blvd (CWF #4 WH #15)	31,715	38	1,982	2,025	359,037
111	2534 Jupiter Gardens Blvd H.S.B. North	70,798	35	1,991	2,026	590,070
112	14255 US Highway 1 Juno Repump	37,774	35	1,993	2,028	106,291
113	17403 Central Blvd R.O.	225,725	35	1,995	2,030	635,159
114	620 S Central Blvd H.S.B. South	305,332	35	2,006	2,041	859,162
115	17403 Central Blvd R.O.	312,309	35	2,005	2,040	878,795
116	16491 79th Terr N (Western Repump)	302,332	35	2,004	2,039	850,721
117	3190 Carlstrom Ally - Abacoa Wellfield Gen	101,605	35	2,008	2,043	285,902
118	17403 Central Blvd #Nano 1	341,115	35	2,010	2,045	959,851
119	17403 Central Blvd #Nano 2	341,115	35	2,010	2,045	959,851
120	3133 Washington St	53,875	35	2,001	2,036	151,597
121	Total Generators	2,406,204				7,486,199
122	Totals	139,294,977				729,554,555

TOWN OF JUPITER - WATER SYSTEM

ATTACHMENT 6 - O&M BY YEAR

No.	Description	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
1	Executive Salaries	$ 170,508	$ 177,308	$ 184,223	$ 191,223	$ 198,299	$ 205,438	$ 212,628	$ 219,857	$ 227,112	$ 234,380	$ 241,646	$ 248,895	$ 256,362	$ 264,053	$ 271,975	$ 280,134	$ 288,538	$ 297,194	$ 306,110	$ 315,293	$ 324,752	$ 334,494	$ 344,529	$ 354,865	$ 365,511
2	Staff Salaries	3,878,242	4,056,300	4,214,496	4,374,647	4,536,508	4,699,823	4,864,317	5,029,703	5,195,684	5,361,945	5,528,166	5,694,011	5,864,831	6,040,776	6,221,999	6,408,659	6,600,919	6,798,947	7,002,915	7,213,002	7,429,392	7,652,274	7,881,842	8,118,298	8,361,847
3	Salaries-Salary Adjust Funds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	Overtime	238,222	250,831	260,613	270,517	280,526	290,625	300,797	311,024	321,288	331,569	341,847	352,103	362,666	373,546	384,752	396,295	408,184	420,429	433,042	446,033	459,414	473,197	487,393	502,014	517,075
5	Emergency Compensation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Comp Time Paid	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	Holiday Additional Comp	33,751	35,101	36,470	37,856	39,256	40,670	42,093	43,524	44,961	46,399	47,838	49,273	50,751	52,274	53,842	55,457	57,121	58,834	60,599	62,417	64,290	66,219	68,205	70,251	72,359
8	Workers Comp Wages	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	**Subtotal**	4,320,723	4,519,540	4,695,802	4,874,243	5,054,590	5,236,555	5,419,834	5,604,109	5,789,044	5,974,294	6,159,497	6,344,281	6,534,610	6,730,648	6,932,568	7,140,545	7,354,761	7,575,404	7,802,666	8,036,746	8,277,848	8,526,184	8,781,969	9,045,428	9,316,791
10	F.I.C.A.	331,224	340,597	353,880	367,328	380,919	394,632	408,444	422,331	436,268	450,229	464,186	478,111	492,455	507,228	522,445	538,119	554,262	570,890	588,017	605,657	623,827	642,542	661,818	681,672	702,123
11	Pension - FRS	522,443	629,627	654,182	682,149	707,388	732,854	758,504	784,293	813,051	839,068	865,079	891,032	917,763	945,296	973,655	1,002,864	1,032,950	1,063,939	1,095,857	1,128,732	1,162,594	1,197,472	1,233,396	1,270,398	1,308,510
12	Life/Health Insurance	1,037,670	1,068,062	1,148,167	1,234,279	1,326,850	1,426,364	1,533,341	1,648,342	1,771,967	1,904,865	2,047,730	2,201,309	2,366,408	2,543,888	2,734,680	2,939,781	3,160,264	3,397,284	3,652,081	3,925,987	4,220,436	4,536,968	4,877,241	5,243,034	5,636,262
13	Workers Compensation	51,231	51,231	53,024	54,880	56,801	58,789	60,846	62,976	65,180	67,461	69,823	72,266	74,796	77,414	80,123	82,927	85,830	88,834	91,943	95,161	98,492	101,939	105,507	109,199	113,021
14	OPEB	234,200	234,200	236,633	239,092	241,576	244,086	246,622	249,185	251,774	254,390	257,033	259,703	262,402	265,128	267,883	270,666	273,478	276,319	279,190	282,091	285,022	287,984	290,976	293,999	297,054
15	Compensated Absences	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	**Subtotal**	2,176,768	2,323,717	2,445,887	2,577,728	2,713,534	2,856,725	3,007,758	3,167,127	3,338,240	3,516,013	3,703,850	3,902,422	4,113,822	4,338,954	4,578,785	4,834,357	5,106,784	5,397,266	5,707,087	6,037,628	6,390,371	6,766,905	7,168,938	7,598,303	8,056,969
17	Professional Services	873,256	839,425	852,100	864,967	878,028	891,286	904,745	918,406	932,274	946,352	960,642	975,147	989,872	1,004,819	1,019,992	1,035,394	1,051,028	1,066,899	1,083,009	1,099,362	1,115,963	1,132,814	1,149,919	1,167,283	1,184,909
18	Professional Srvc - Attorney	19,000	21,000	21,525	22,063	22,615	23,180	23,760	24,354	24,962	25,586	26,226	26,882	27,554	28,243	28,949	29,672	30,414	31,175	31,954	32,753	33,572	34,411	35,271	36,153	37,057
19	Other Contractual Services	409,000	411,288	422,042	433,049	444,313	455,840	467,636	479,705	492,054	504,688	517,613	530,834	544,358	558,190	572,337	586,694	601,361	616,395	631,805	647,600	663,790	680,385	697,394	714,829	732,700
20	Employee Health Clinic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21	Travel & Per Diem	30,680	32,606	33,421	34,257	35,113	35,991	36,891	37,813	38,758	39,727	40,720	41,738	42,782	43,851	44,948	46,071	47,223	48,404	49,614	50,854	52,126	53,429	54,764	56,134	57,537
22	Car Allowance	6,000	6,000	6,150	6,150	6,150	6,150	6,150	6,150	6,304	6,304	6,304	6,304	6,304	6,304	6,461	6,461	6,461	6,461	6,461	6,461	6,623	6,788	6,958	7,132	7,310
23	Communications Services	47,875	60,475	61,987	63,537	65,125	66,753	68,422	70,132	71,886	73,683	75,525	77,413	79,348	81,332	83,365	85,450	87,586	89,775	92,020	94,320	96,678	99,095	101,573	104,112	106,715
24	Postage & Freight	120,000	134,700	138,712	142,803	146,971	151,219	155,545	159,951	164,437	169,003	173,648	178,373	183,178	188,063	193,027	197,919	202,867	207,938	213,137	218,465	223,927	229,525	235,263	241,145	247,173
25	Utilities	2,501,520	2,661,033	2,741,396	2,823,638	2,907,782	2,993,853	3,081,872	3,171,863	3,263,847	3,358,172	3,454,552	3,553,006	3,653,556	3,756,587	3,861,771	3,966,039	4,071,932	4,180,653	4,292,276	4,406,880	4,524,544	4,645,349	4,769,380	4,896,722	5,027,465
26	Rentals & Leases	77,264	83,540	85,629	87,769	89,963	92,213	94,518	96,881	99,303	101,785	104,330	106,938	109,612	112,352	115,161	118,040	120,991	124,016	127,116	130,294	133,551	136,890	140,312	143,820	147,416
27	Insurance	515,000	558,351	586,269	615,582	646,361	678,679	712,613	748,244	785,656	824,939	866,186	909,495	954,970	1,002,718	1,052,854	1,105,497	1,160,772	1,218,810	1,279,751	1,343,738	1,410,925	1,481,471	1,555,545	1,633,322	1,714,988
28	Repairs & Maintenance	2,146,391	2,148,065	2,242,580	2,343,496	2,451,297	2,566,508	2,689,700	2,821,495	2,962,570	3,110,699	3,266,234	3,429,545	3,601,023	3,781,074	3,970,127	4,168,634	4,377,065	4,595,919	4,825,715	5,067,000	5,320,350	5,586,368	5,865,686	6,158,971	6,466,919
29	Vehicle Repairs & Maint	58,725	66,125	69,035	72,141	75,460	79,006	82,798	86,856	91,198	95,758	100,546	105,573	110,852	116,395	122,214	128,325	134,741	141,479	148,552	155,980	163,779	171,968	180,566	189,595	199,075
30	Well Repairs & Maint	202,500	217,500	227,070	237,288	248,203	259,869	272,343	285,687	299,972	314,970	330,719	347,255	364,618	382,849	401,991	422,091	443,195	465,355	488,623	513,054	538,706	565,642	593,924	623,620	654,801
31	Grounds Maintenance	102,500	102,500	107,010	111,825	116,969	122,467	128,345	134,634	141,366	148,434	155,856	163,649	171,831	180,423	189,444	198,916	208,862	219,305	230,270	241,784	253,873	266,567	279,895	293,890	308,584
32	EOC Maintenance	46,400	59,140	61,742	64,521	67,489	70,660	74,052	77,681	81,565	85,643	89,925	94,421	99,142	104,100	109,305	114,770	120,508	126,534	132,860	139,503	146,479	153,803	161,493	169,567	178,046
33	Insurance Reimbursement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	Printing & Binding	6,600	6,600	6,765	6,934	7,107	7,285	7,467	7,654	7,845	8,041	8,242	8,449	8,660	8,876	9,098	9,326	9,559	9,798	10,043	10,294	10,551	10,815	11,085	11,362	11,646
35	Promotional/Special	22,100	22,200	22,755	23,324	23,907	24,505	25,117	25,745	26,389	27,049	27,725	28,418	29,128	29,857	30,603	31,368	32,152	32,956	33,780	34,624	35,490	36,377	37,287	38,219	39,174
36	Other Current Charges	54,400	57,400	58,868	60,372	61,912	63,489	65,104	66,758	68,452	70,186	71,963	73,781	75,644	77,550	79,503	81,494	83,531	85,619	87,760	89,954	92,202	94,508	96,870	99,292	101,774
37	Credit Card Processing	163,000	163,000	167,855	172,805	177,849	182,989	188,225	193,557	198,985	204,509	210,131	215,849	221,663	227,574	233,581	239,501	245,488	251,625	257,916	264,364	270,973	277,747	284,691	291,808	299,103
38	Recording Fees	12,500	12,500	3,848	3,379	2,938	2,524	2,137	1,778	1,445	1,140	862	612	388	192	23	(119)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)	(154)
39	Refund Prior Year Fees	7,500	7,500	7,723	7,951	8,183	8,420	8,661	8,906	9,156	9,410	9,669	9,932	10,199	10,471	10,748	11,020	11,295	11,578	11,867	12,164	12,468	12,780	13,099	13,427	13,762
40	Doubtful Accounts	38,000	38,000	40,983	42,347	43,748	45,187	46,666	48,183	49,742	51,342	52,984	54,669	56,399	58,174	59,994	61,815	63,669	65,579	67,547	69,573	71,660	73,810	76,024	78,305	80,654
41	Customer Deposits Interest	15,382	16,000	16,242	16,487	16,736	16,989	17,245	17,505	17,770	18,038	18,310	18,587	18,868	19,153	19,442	19,735	20,033	20,336	20,643	20,955	21,271	21,592	21,918	22,249	22,585
42	Office Supplies	12,000	12,000	12,300	12,608	12,923	13,246	13,577	13,916	14,264	14,621	14,986	15,361	15,745	16,139	16,542	16,956	17,380	17,814	18,259	18,716	19,184	19,663	20,155	20,659	21,175
43	Operating Supplies	399,903	459,453	466,391	473,433	480,582	487,839	495,205	502,683	510,273	517,978	525,800	533,740	541,799	549,980	558,285	566,715	575,272	583,959	592,777	601,728	610,814	620,037	629,400	638,904	648,551
44	Uniforms	27,771	27,856	28,552	29,266	29,998	30,748	31,517	32,304	33,112	33,940	34,788	35,658	36,549	37,463	38,400	39,360	40,344	41,352	42,386	43,446	44,532	45,645	46,786	47,956	49,155
45	Gas, Oil & Lube	177,092	211,842	218,197	224,743	231,485	238,430	245,583	252,950	260,539	268,355	276,406	284,698	293,239	302,036	311,097	320,430	330,043	339,944	350,143	360,647	371,466	382,610	394,089	405,911	418,089
46	Traffic Control Devices	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
47	Lime Softening Chemicals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	RO Chemicals	360,052	655,726	688,512	709,168	730,301	751,918	774,024	796,626	819,728	843,418	867,624	892,351	917,605	943,481	969,899	996,086	1,022,682	1,049,987	1,078,022	1,106,805	1,136,357	1,166,697	1,197,848	1,229,831	1,262,667
49	RO Concentrate	688,860	861,075	904,129	931,253	719,253	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
50	RO Odor Control	253,658	456,579	479,408	493,790	508,505	523,557	538,949	554,687	570,773	587,268	604,123	621,340	638,924	656,942	675,336	693,570	712,088	731,101	750,622	770,663	791,240	812,366	834,056	856,326	879,189
51	Nano Filtration Chemicals	467,981	701,211	736,272	758,360	780,959	804,075	827,715	851,884	876,589	901,922	927,808	954,250	981,255	1,008,927	1,037,177	1,065,180	1,093,621	1,122,820	1,152,800	1,183,579	1,215,181	1,247,626	1,280,938	1,315,139	1,350,253
52	Nano Odor Control	169,042	266,590	279,920	288,317	296,909	305,697	314,685	323,874	333,266	342,897	352,739	362,792	373,059	383,579	394,319	404,966	415,778	426,880	438,277	449,979	461,994	474,329	486,994	499,996	513,346
53	Nano Concentrate Treatmnt	11,786	27,700	29,085	29,958	30,850	31,763	32,697	33,652	34,628	35,629	36,651	37,696	38,763	39,856	40,972	42,078	43,201	44,355	45,539	46,755	48,003	49,285	50,601	51,952	53,339
54	Ion Exchange Resins	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	Maintenance Chemicals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	Lab Chemicals	82,000	91,300	95,865	98,741	101,683	104,693	107,771	110,918	114,135	117,433	120,804	124,247	127,763	131,366	135,044	138,690	142,393	146,195	150,098	154,106	158,221	162,445	166,782	171,235	175,807
57	Emergency Supplies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
58	Hurricane Supplies	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	COVID-19 Prep & Response	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	Mutual Aid Response-KeyWest	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	Books Dues Pubs Subscriptions	197,190	218,005	221,297	224,638	228,030	231,474	234,969	238,517	242,119	245,775	249,486	253,253	257,077	260,959	264,900	268,900	272,960	277,082	281,266	285,513	289,824	294,200	298,643	303,152	307,730
62	Tuition Reimbursement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	**Subtotal**	10,326,928	11,718,285	12,145,633	12,534,958	12,699,699	12,372,502	12,780,705	13,205,951	13,649,361	14,108,696	14,584,124	15,076,256	15,585,726	16,113,871	16,660,906	17,221,041	17,800,343	18,401,943	19,026,752	19,675,760	20,350,162	21,050,884	21,779,057	22,535,864	23,322,543
64	Machinery & Equipment	460,418	156,000	159,900	163,898	167,995	172,195	176,500	180,912	185,435	190,071	194,823	199,693	204,686	209,803	215,048	220,424	225,935	231,583	237,372	243,307	249,389	255,624	262,015	268,565	275,279
65	Building Improvements	41,006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	**Subtotal**	501,424	156,000	159,900	163,898	167,995	172,195	176,500	180,912	185,435	190,071	194,823	199,693	204,686	209,803	215,048	220,424	225,935	231,583	237,372	243,307	249,389	255,624	262,015	268,565	275,279
67	Cost Allocation - General	1,304,970	1,528,157	1,604,565	1,684,793	1,769,033	1,857,484	1,950,359	2,047,877	2,150,270	2,257,784	2,370,673	2,489,207	2,613,667	2,744,350	2,881,568	3,025,646	3,176,929	3,335,775	3,502,564	3,677,692	3,861,577	4,054,655	4,257,388	4,470,258	4,693,771
68	**Total**	18,630,813	20,245,699	21,051,787	21,835,619	22,404,851	22,495,461	23,335,155	24,205,975	25,112,351	26,046,857	27,012,967	28,011,859	29,052,511	30,137,626	31,268,875	32,442,012	33,664,752	34,941,971	36,276,442	37,671,133	39,129,347	40,654,252	42,249,367	43,918,418	45,665,353
69	Total O&M Not Including Equip	18,129,389	20,089,699	20,891,887	21,671,721	22,236,856	22,323,266	23,158,655	24,025,063	24,926,916	25,856,786	26,818,144	27,812,166	28,847,825	29,927,823	31,053,827	32,221,588	33,438,817	34,710,388	36,039,069	37,427,826	38,879,958	40,398,628	41,987,352	43,649,853	45,390,074
70	Percent OpEx Increase - without Equipment	27.74%	10.81%	3.99%	3.73%	2.61%	0.39%	3.74%	3.74%	3.75%	3.73%	3.72%	3.71%	3.72%	3.74%	3.76%	3.76%	3.78%	3.80%	3.83%	3.85%	3.88%	3.91%	3.93%	3.96%	3.99%