Aquifer Storage and Recovery (ASR) and Water Supply Resilience Strategy Miami-Dade County, FL





Florida Water and Climate Alliance

Virginia Walsh, Ph.D., P.G. Miami Dade Water and Sewer Department September 25, 2020



AGENDA

- ASR
- Overview Miami-Dade Water and Sewer Department (WASD) system
- History WASD ASR
- Current Water Use Permit Modification
- ASR Opportunities





ASR Cluster Evaluation: Phased Approach

Aquifer Storage and Recovery (ASR) Peer Review Panel Kickoff Workshop July 23, 2020



Phase 1

- Site Evaluation / Hydrogeologic Assessment
 - C-38S (A) & C-38N (B)
 - L-63N (C), C-59 (D), L-63S (E)
- Conceptual Site Plan
- Construction Sequencing Plan
- Assessment and repairs to existing ASR wells
 - L-63N (*C)
 - Kissimmee River Pilot (*A)

Treatment technology evaluation





AQUIFER STORAGE AND RECOVERY IN MIAMI-DADE COUNTY Brief History





TIMELINE: PAST, PRESENT, & FUTURE









WWF AND SWWF ASRs





Miles

2.5 5





oo miami-dade

TIMELINE: PAST, PRESENT, & FUTURE



The ASR well system had been operationally tested under previously issued construction and testing permits using raw groundwater from the Biscayne aquifer. During the period when operational testing was conducted if a rain event of more than 0.75 inches occurred injection of raw water was stopped and the Biscayne aquifer production wells were sampled for fecal and total coliform. Injection was allowed to



TIMELINE: PAST, PRESENT, & FUTURE





E. COLI LEVELS AND UV DISINFECTION



To meet the requirements if the Tot ultraviolet light dosage of 40 mJ/c bacterial constituents in the raw w meeting the Total Coliform Rule s Water Standards. The requiremen water quality criteria exemption (

Frequency of Monitoring

Based on the current construction the raw water injectate from its fecal and total coliform bacteria discussed previously. To test t water injectate upstream and c individual wells whenever rai the system has been challenge disinfection system as follow

Constant UV During Injection when the ASR wells begin i ensure that the system is pe for Total Coliform bacteria

Safeguards

The UV units will be size conditions: lamp output quartz sleeve, a minimu continuously measure th these inputs the effectiv

VIP/km

6430-33469-040.DN File:

MDWASD Raw Water ASR UV Disinfection Operating Protocol

(May 3, 2002)

Background

The Miami Dade Water and Sewer Department (MDWASD) has constructed two ASR injection well systems. They are the West Wellfield ASR, and the Southwest Wellfield ASR. Currently the use of these wells is limited by the facilities current construction and testing permit. A condition of the permit requires the MDWASD to stop the injection of ASR water if the rain gauge at the site registers a storm greater or equal to 0.75 inches in one day. After the storm MDWASD is required to sample the Biscayne Aquifer well water for the presence of fecal and total coliform bacteria. Only after the Biscayne Aquifer sample of raw water has received a result from the testing indicating "No Coliforms Present" can the ASR injection system be put back into operation.

coliforms present downstrear During the rainy season in Miami-Dade County (generally accepted as the "Hurricane Season" June 1-November 30) the area is subjected by the state of the UV Season" June 1-November 30) the area is subjected to frequent intense rainstorms usually occurring in the late afternoons. The frequency of these storms, coupled with the one to two day turn around time to take, transport, analyze, and receive bacteriological results prevents the injection of ASR water for a substandard amounts of the wet season. This is occurs as storms overlap while samples are being analyzed. Each storm requires a separate bacteriological sample and analysis that results in the wells infrequently receiving a "No Coliform Present" status before the next rain event. This limits the injection ASR when the wet weather related supply (Biscayne Aquifer) is most available.

Proposed Solution/Objective

By disinfecting the raw ASR feed/injection water to meet primary drinking water standards, the ASR feed/injection system could function at all times irrespective of the precipitation occurring at the Biscayne Aquifer well. MDWASD is considering the use of ultraviolet (UV) light disinfection of raw water prior to injection into ASR wells.

Proposed Effective Dosage

effective UV dosage fall As stated in the objectives, the disinfection system must treat the ASR feed water to meet effective of the ASR feed water to meet the standards for microbial constituents. The focus for the disinfection of the ASR water will be to meet the standards of the Table Of the Table Of the Constituents. MDWASD sectors of the ASR water will be to meet the standards of the Total Coliform Rule. Published data down automatically) if reports 4-log removal of E. *coli* bacteria can be achieved using UV dosage in the range of 5 to



WW 31 Coliform Data



WASD Hydrogeologists worked with FDEP staff to develop sampling plan assess the Coliform issue

Absent Present

	Coliform Present				Percentage of Coliform Present for POR (%)					
Year	WW 29	WW 30	WW 31	FA-MW		14/14/ 20	14/14/ 20	14/14/ 21	FA-MW	
				Upper	Lower	VV VV 29	VV VV 3U	VV VV 51	Upper	Lower
2010	1	1	0	0	0	9.1%	9.1%	0.0%	0.0%	0.0%
2011	1	0	1	0	0	7.7%	0.0%	8.3%	0.0%	0.0%
2012	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%
2013	2	1	0	0	0	13.3%	7.1%	0.0%	0.0%	0.0%
2014	1	0	0	0	0	12.5%	0.0%	0.0%	0.0%	0.0%
2015	0	3	0	0	0	0.0%	21.4%	0.0%	0.0%	0.0%
2016	0	0	1	0	0	0.0%	0.0%	7.7%	0.0%	0.0%
2017	0	1	0	0	0	0.0%	6.7%	0.0%	0.0%	0.0%
2018	0	0	0	0	0	0.0%	0.0%	0.0%	0.0%	0.0%

Note: Wet Season (WS) from May to October and Dry Season (DS) from November to April



WQCE & PERMITTING UPDATES

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION CLASS V ASR WATER QUALITY CRITERIA EXEMPTION

Petition for Water Quality Criteria Exemption for the Miami-Dade Water and Sewer Department West Wellfield ASR System – Total Coliform Permit No: 0127836-016-017-018-UC/5Q Northwest corner of SW 72nd Street and SW 172nd Avenue, Unincorporated Miami-Dade County

WASD WATER QUALITY CRITERIA EX





P.O. Box 330316

Florida Department of **Environmental Protection** Bob Martinez Center 2600 Blair Stone Road

Tallahassee, FL 32399-2400

Ron DeSantis Governo

leanette Nuñez Lt. Governor Voah Valenstein

Secretary

SENT VIA ELECTRONIC MAIL

In the Matter of an Application for Permit by:

May 14, 2019

Mr. Kevin Lynskey, Director Miami-Dade Water and Sewer Department Miami, Florida 33233-0316 Miami-Dade County Kevin.Lynskey@MiamiDade.Gov

FDEP UIC Permit No. 0127837-019-021-UC/5SR FDEP WACS Facility ID 94358 Class V ASR Injection Well System, ASR-1-W ASR-2-W, and ASR-3-W and monitor wells FA-MW-1, BA-29, BA-30, and BA-31 Construction, Miami-Dade Water and Sewer Department West Wellfield ASR

MIT

SR to operational test three non-SR) wells (ASR-1-W, ASR-2-W, and BA-29, BA-30, and BA-31) for the from the Miami-Dade Water and aquifer.

k judicial review of the permit by the filing of a Notice of Appeal Appellate Procedure, with the Clerk 3900 Commonwealth Boulevard, ncy_clerk@dep.state.fl.us; and by the applicable filing fees with the peal must be filed within 30 days Department.

Prepared for:

Florida Department d Twin Towers Office 2600 Blair Stone Rc Tallahassee, FL 3239

> QUALITY, VALUE, ECONOMIC GROW WWW.MIAMIDADE.GOV/WATER

June 2018

Closely worked with FDEP Underground Injection Control for a data-driven decision based permit











AQUIFER STORAGE AND RECOVERY IN MIAMI-DADE COUNTY Water Supply Resilience





MIAMI-DADE'S WATER BALANCE



TRADITIONAL INVESTMENTS IN WATER SUPPLY





Hialeah Reverse Osmosis (RO) Plant

Floridan Brackish Water

Treatment Type	Capital (\$/gallon-day)	O&M (\$/1,000 gallons)			
Floridan RO	\$6.00-\$8.00	\$1.75-\$2.50			

South Miami Heights RO Plant

Primarily Floridan Brackish Water

None of which take advantage of excess flows during the wet season of high quality Biscayne Aquifer water that goes out to tide



Advanced Wastewater Treatment

Reuse

Indirect Potable Reuse	\$12.00-15.00	\$2.50-\$3.00
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Prepared in cooperation with the Miami-Dade Water and Sewer Department

entific Investigations Report 2014-

Hydrologic Conditions in Urban Miami-Dade County, Florida, and the Effect of Groundwater Pumpage and Increased Sea Level on Canal Leakage and Regional Groundwater Flow

Science and Data Driven Tools

County has developed with the USGS advanced modeling tools to evaluate aquifer-canal interactions during WASD pumpage, and the effects of SLR on salt water intrusion





USGS Urban Miami Dade Model Water User Permit Modification

- Optimization of wet/dry season flows
- Response of system compared with Base Scenario (current Permitted Allocation)
- Mass-balance aquifer inflows
 & outflows
 - Regional Flows
 - Exchanges of Sources





Optimization Decision Tool (ODT)

• Purpose

- To determine quantity of additional Biscayne aquifer water (Well Field Allocations) for public water supply not offsetting regional flows
- To minimize impacts or improve Regional Flows: Canal Leakage, WCA-3B/ENP Seepage, and Tidal Flux,
- To optimize wet/dry season flows
- Formulation
 - Integrated with UMD Model
 - Response of system compared with BASE Scenario (current Permitted Allocation)

Regional System Flows (F)







Permit

modification takes

advantage of

seasonal flows and

operational

flexibility to

increase Biscayne

Aquifer allocation

to meet demands

-Total All Sources Finished Water 2020 Permit

2020 WUP Modification Total **394 MGD 390 MGD** raw Biscyane Aquifer Water = 382 MGD Finshed Water 10 MGD Finshed Floridan Aquifer water C-51 15 MGD purchased allocation

WASD Water Supply Chart Draft September 2020 All Sources Finished Water with C-51 Reservoir (15 mgd)



Year

Water Supply Project Stages:

1 and 2. Hialeah Floridan Aquifer R.O. W.T.P. Phase 1a and 1b Final Finshed Water 10.0 mgd)

3. Optimized water allocation incorporating operational flexibility between WASD treatment plant and wellfields and C-51 (15 MGD purcahsed water allocation)

4. Optimized water allocation including future Water Allocation and C-51 (Cluster 10 at 15 MGD)



Integrating ASR into Multiple Stakeholder Solutions

- FS 373.019 ative water supply intended to offset future dependence on traditional water supplies.
- WASD can supply alternative water resources through a composite of sources to meet Potable, agricultural, industrial & Environmental needs.



- Aquifer Storage and Recovery
- Floridan Aquifer Allocation
- Biscayne Supply (delta demand vs. allocation)
- ♦ C-51 Reservoir
- Other Sources







Proposed Wellfield Allocations

Wellfield System (values in MGD)	BASE	Final Draft		
		Dry	Wet	
Southwest	109.4	135.5	134.3	
Alexander Orr	40.0	61.6	61.6	
West	15.0	2.1	11.0	
Snapper Creek	21.9	32.9	25.2	
Plant Alexander Orr	186.3	232.1	232.1	
Northwest	85.4	6 5.4	65.4	
Miami Springs Lower	13.4	.4	13.4	
Miami Springs Upper	1 2	12.8	12.8	
John E. Preston	7_	40.2	40.2	
Hialeah	.1	4.7	4.7	
Plant Hialeah-Pesto	155.4	136.4	136.4	
Elevated Tank	1.3	1.4	1.4	
Leisure City	1.6	4.5	4.5	
Naranja	0.1	0.9	0.9	
Everglades Labor Camp	2.2	2.9	2.9	
Newton	2.6	1.0	1.0	
Plant South Dade	7.8	10.7	10.7	
Cluster 10		15.0	15.0	
τοταί	349.5	394.Z	394.2 5	



Δ water available for Environmental Restoration by integrating existing WASD ASR systems and water supply





Integrating ASR into Multiple Stakeholder Solutions Example South Dade Agricultural Drawdown



DRY (2008) – low flow pumpage and storage in ASR wells



Integrating ASR into the Regional System: C-51 RESERVOIR







Wa	ater Use Permit Modifi	cation Potential	Delta Water				
Year							
Excess Water MGD (allocation minus demand)	2020	2025		2030	2035	2039	
WUP MOD Scenarios							
wellfield Optimization	34	14		0	0	0	
wellfield Optimization + Cluster 10	34	29	l.	13	0	0	
wellfield Optimization + Cluster 10 + C51	34	48	i i i				
wellfield Optimization and C51	34	38					
ASR Existing 25 mgd capacity 75% recovery rate			Cummulative	_			
	2020	2025		P	otenti	al 10 n	ngd
wellfield Optimization	2020	2025		-			
weilfield Optimization	6844	35588					
weilfield Optimization + Cluster 10	6844	41063		in Years			
wellfield Optimization + Cluster 10 + C51	6844	41063	1				
wellfield Optimization and C51	6844	41063					
Non-WUP Potential Water Sources							12
Water Sources	Location	amount	quality				
Reuse	SDWWTP	60	secondary I				
C-51	Regional Delivery	20	Biscayne Aqu				22
SMH FA	SMH	20	brackish				~~
Indirect Potable Reuse BZ SMH	SMH	12	secondary HL				
Cluster 10 - non WUP	Redlands	10-15	Biscayne Aqu				21
							10
							19
							10





QUESTIONS?

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