

Presentation to the Evaluation and Appraisal Task Force
CDMP

CONSERVATION, AQUIFER RECHARGE AND
DRAINAGE ELEMENT

WELLFIELD PROTECTION

Presented by
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January 8, 2026

OBJECTIVE

To evaluate the Miami-Dade County Wellfield Protection Program with respect to implementation of the applicable CDMP objectives and policies.

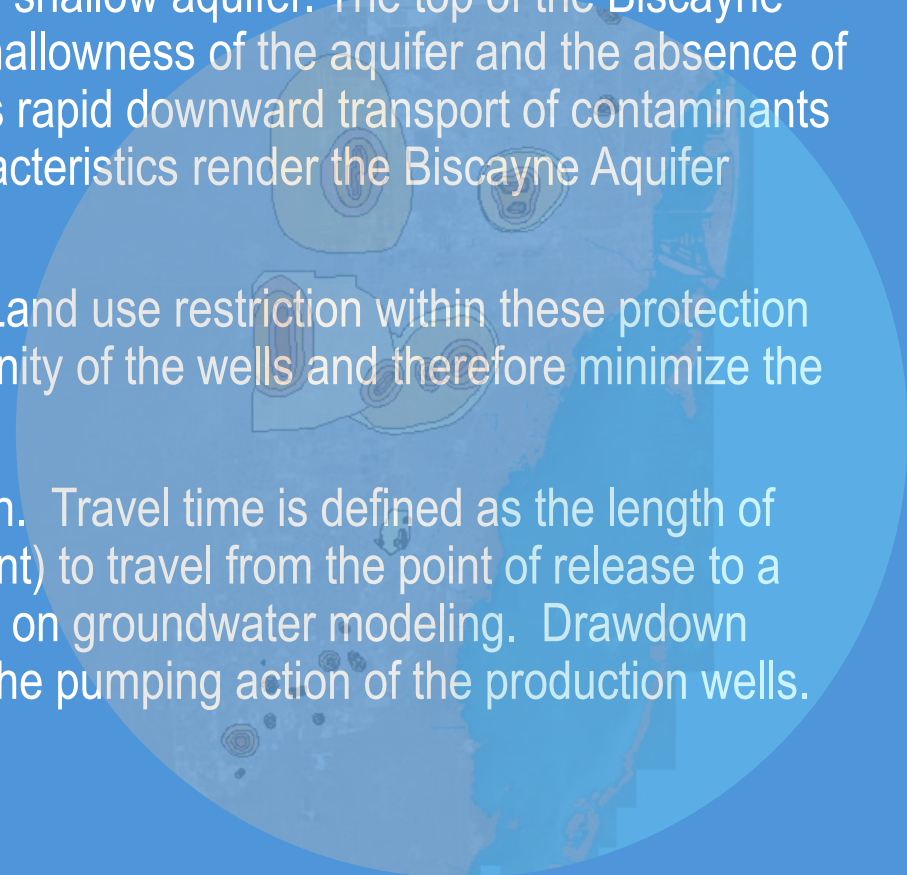




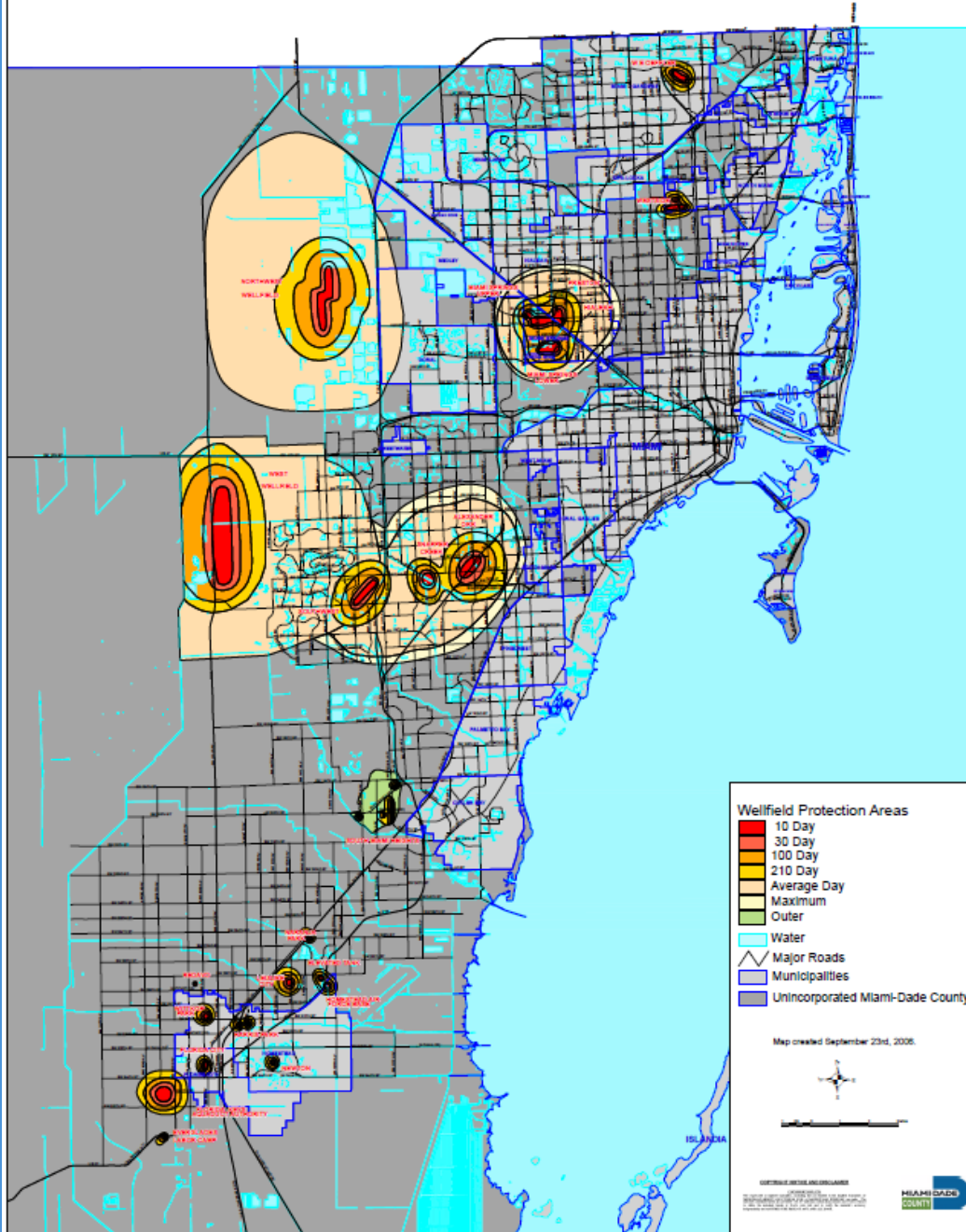
Miami-Dade County Wellfield Protection Program Background Summary

Miami-Dade County (MDC) Wellfield Protection Program

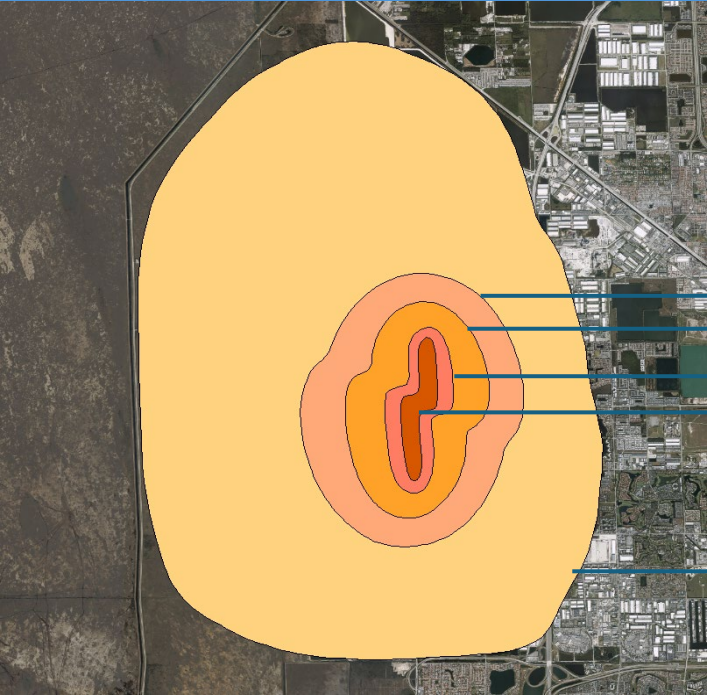
- The Biscayne Aquifer is the main source of drinking water for Miami-Dade County
- The County's public drinking water supply is obtained from over 100 production wells located within twenty wellfield protection areas sited throughout the county. Five (Northwest, Alexander Orr, Southwest, Snapper Creek and Hialeah Preston) of the twenty wellfields account for 90% of the County's allocated drinking water withdrawal.
- The Biscayne Aquifer is an unconfined, highly permeable, highly transmissive, shallow aquifer. The top of the Biscayne Aquifer occurs between 2 to 5 feet below land surface in most of MDC. The shallowness of the aquifer and the absence of a confining layer between the land surface and the top of the aquifer facilitates rapid downward transport of contaminants from a surface discharge to the groundwater. The combination of these characteristics render the Biscayne Aquifer highly vulnerable to contamination
- MDC has established wellfield protection zones around the production wells. Land use restriction within these protection zones restrict land uses that represent potential sources of pollution in the vicinity of the wells and therefore minimize the potential for contamination of the drinking water supply.
- The wellfield protection zones are defined based on travel time, and drawdown. Travel time is defined as the length of time it would take a molecule of water (used as a surrogate for any contaminant) to travel from the point of release to a production well. MDC's wellfield protection travel times are established based on groundwater modeling. Drawdown refers to the extent to which the water table is lowered under the influence of the pumping action of the production wells.



Wellfield Protection Areas



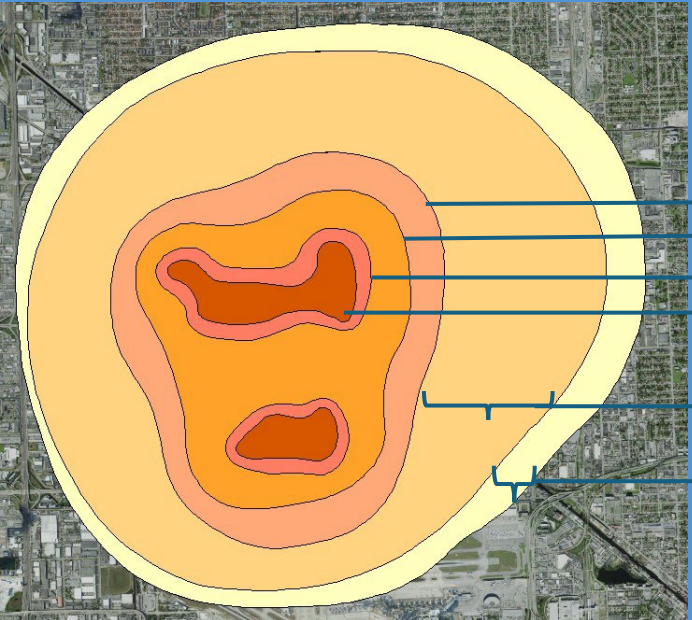
Representation of Typical Wellfield Protection Areas (WPA)



- 210-day travel time contour
- 100-day travel time contour
- 30-day travel time contour
- 10-day travel time contour

Basic WPA

→ drawdown contour

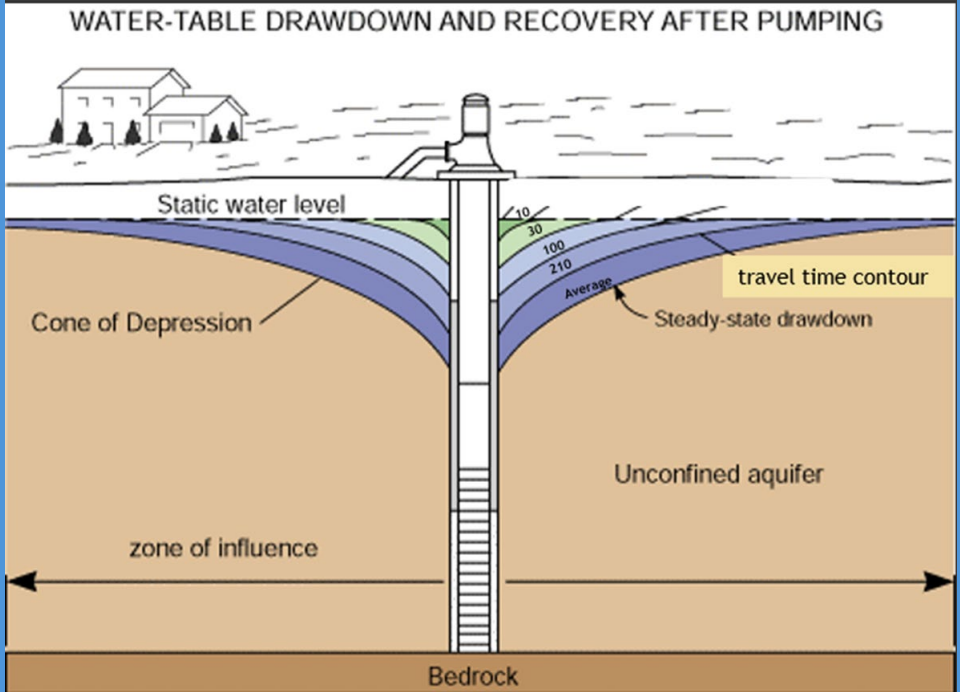


- 210-day travel time contour
- 100-day travel time contour
- 30-day travel time contour
- 10-day travel time contour

→ Average day pumpage

→ maximum day pumpage

Wellfield Protection Area Drawdown illustration



CDMP – Wellfield Protection Component



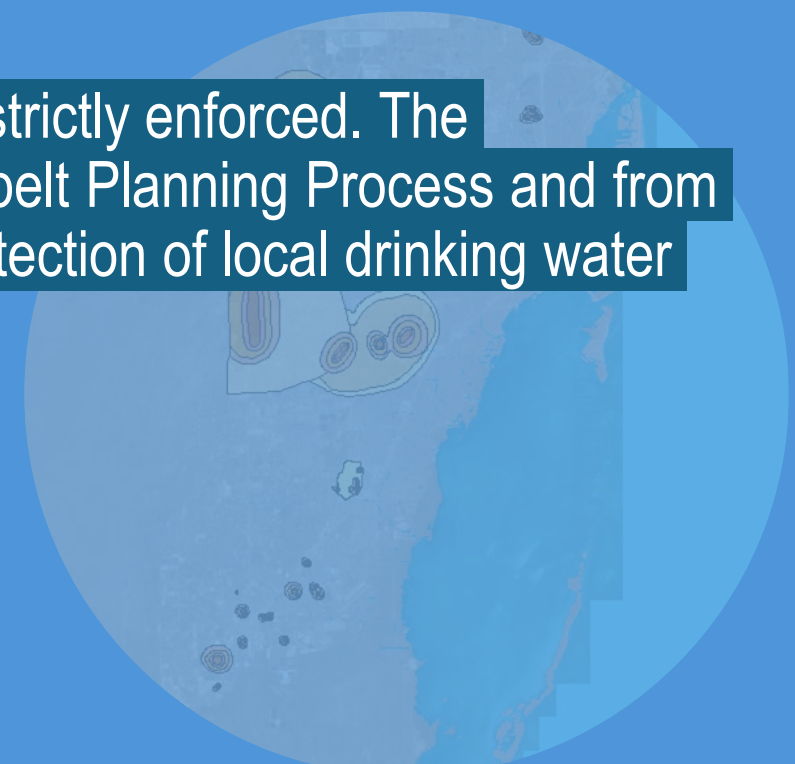
WELLFIELD PROTECTION AND THE CDMP

Wellfield Protection is addressed under the **Conservation, Aquifer Recharge and Drainage Element** of the CDMP.

Specifically: **Objective CON-3**

“Regulations governing approved wellfield protection areas shall be strictly enforced. The recommendations of the NW Wellfield Protection Plan, and the Lakebelt Planning Process and from other ongoing planning activities aimed at refining and improving protection of local drinking water supplies shall continue to be fully implemented.”

Objective Con 3 is supported by 8 policies – Con 3A through Con 3H



CON 3 POLICIES

No new facilities that use, handle, generate, transport or dispose of hazardous wastes shall be permitted within wellfield protection areas, and all existing facilities that use, handle, generate, transport or dispose of more than the maximum allowable quantity of hazardous wastes (as specified in Chapter 24-43 of the Code of Miami-Dade County, as may be amended from time to time) within wellfield protection areas shall be required to take substantial measures such as secondary containment and improved operating procedures to ensure environmentally safe operations

The water management systems that recharge regional wellfields shall be protected and enhanced.

County-owned and operated facilities that use hazardous materials or generate hazardous wastes shall be moved to locations that are outside and downgradient of wellfield protection areas whenever such facilities need to be expanded by more than fifty (50) percent.

Miami-Dade County shall continue to utilize Best Management Practices established for agriculture within wellfield protection areas.

The area west of the Turnpike, east of the Dade-Broward Levee, north of NW 12th Street and south of Okeechobee Road shall be reserved for limestone mining and approved ancillary uses as provided for in Chapters 24 and 33 of the Miami-Dade County Code and the entire area west of the Turnpike, north of NW 25th Street and south of Okeechobee Road shall remain unurbanized.

The ambient groundwater monitoring program, which includes all wellfield protection areas, shall be continued to serve as an "early warning system" for monitoring high- risk land uses and point sources .

Miami-Dade County shall re-evaluate the extent, and mandate periodic updating, of the protection areas for all public water supply wellfields to adjust the protection areas and programs for those wellfields, as warranted. The County shall ensure that new surface water bodies are adequately set back from wellfields to provide an adequate rock buffer to ensure protection of water quality and maintenance of the groundwater classification of the wellfields.

Miami-Dade County shall identify facilities that handle, use or generate hazardous wastes in wellfield protection areas and address the feasibility of removing the grandfathering provision for facilities that have been determined to be significant sources of pollution within wellfield protection areas.

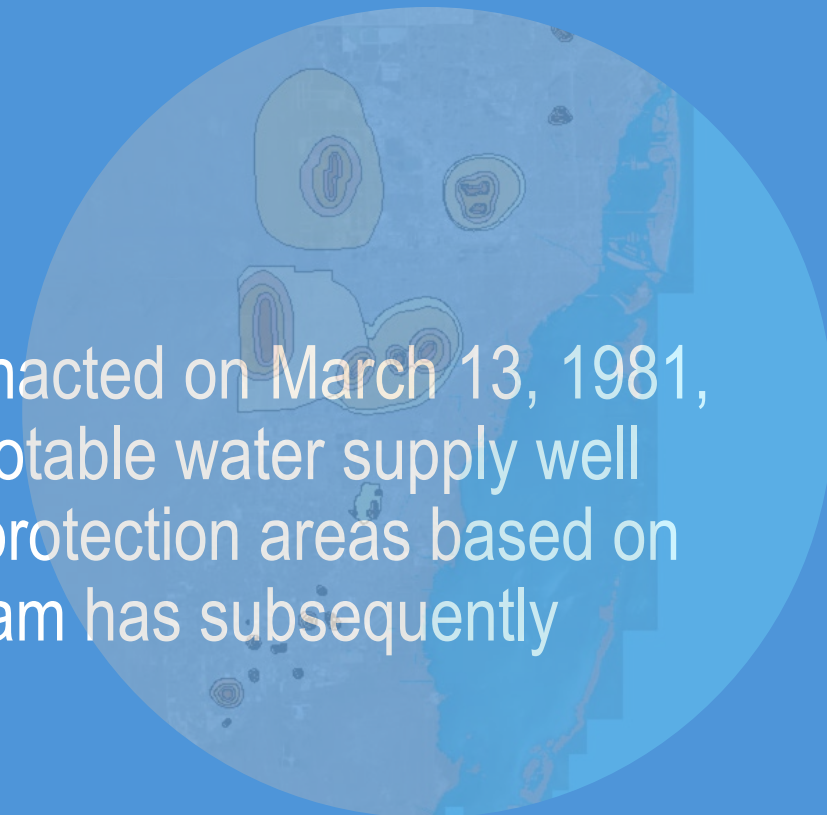
Regulatory framework for implementation of CON 3 objective and policies

The supporting regulation for implementation of Con-3 are provided in Section 24-43 of the Miami-Dade County (MDC) Code: specifically, Section 24-43.

**DIVISION 2. WELLFIELD PROTECTION,
DOMESTIC WELL SYSTEMS AND POTABLE
WATER STANDARDS**

**Sec. 24-43. Protection of utility potable
water supply wells.**

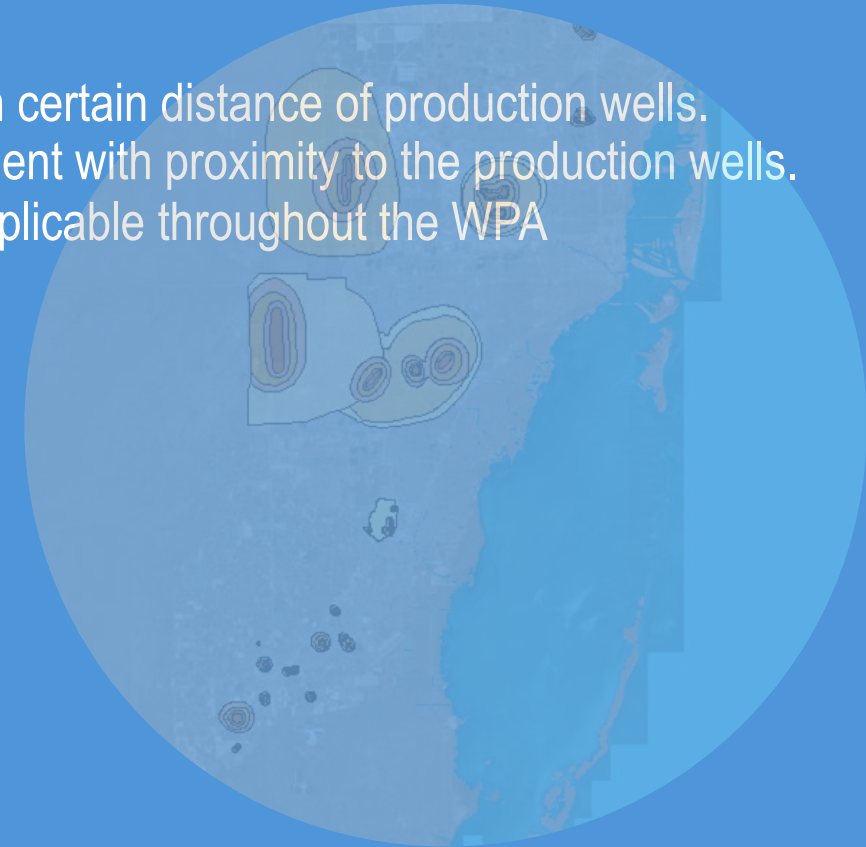
MDC Potable Water Supply Protection Ordinance was first enacted on March 13, 1981, via resolution 81-23 in response to “the need for a rigorous potable water supply well protection program” The ordinance established 41 wellfield protection areas based on computer modeling. The County’s Wellfield Protection program has subsequently undergone several modifications.



CON 3 – Implementation Strategies

Management Tools

- Zoning/Land Use Control
 - Restricts the locating of incompatible land uses within WPA.
 - Section 33-420, establishment of the Rock Mining Overlay Zoning Area.
- Source Prohibition
 - Industries/activities with potential to cause contamination prohibited within certain distance of production wells.
 - Land use restriction and source prohibitions are progressively more stringent with proximity to the production wells.
 - Northwest and West Wellfield Protection Area land use restrictions are applicable throughout the WPA
- Groundwater Monitoring
 - Allows for early detection of threats to the water supply production wells
- Environmental Regulations/Wellfield Permits
- Attrition



CON 3 Implementation cont.,

1. Zoning/Land Use Controls

(examples of MDC Code provisions)

- Section 24-43(11) - Resource Recovery facilities prohibited in WPA.
- Section 33.16 and 24-43(7) MDC Code - lake excavation prohibited within the thirty-day cone of influence of any WPA.
- Section 33.16.01.B(4) - Lakefills prohibited.
- Section 24-43(10) - provides specific types of land uses assumed to not utilize hazardous material and determined to be appropriate for locating within the West and Northwest WPA.



CON 3 Implementation cont.,

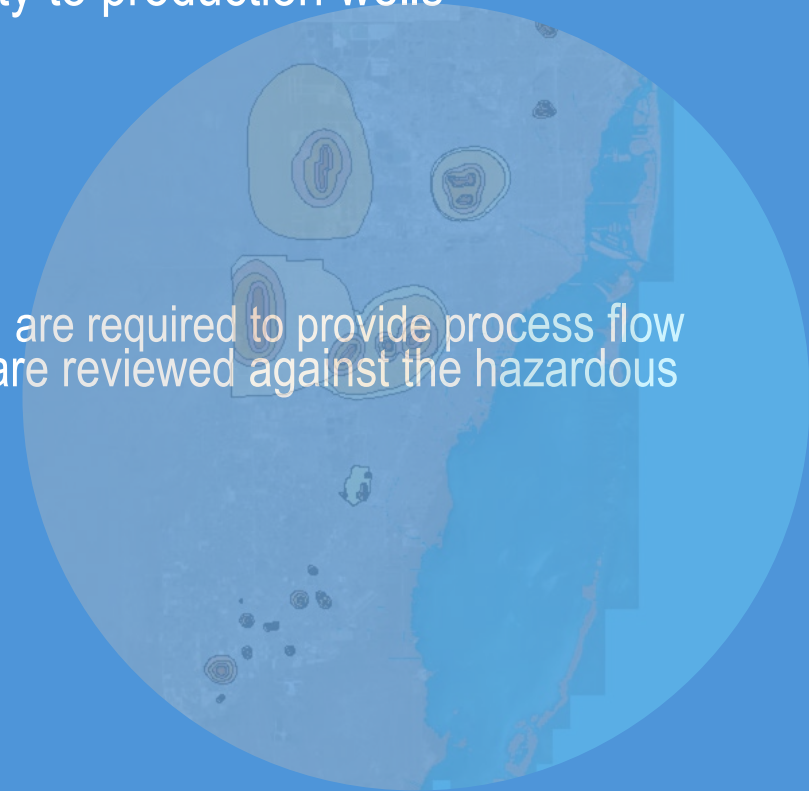
3. Source Prohibition

Section 24-43(5) MDC Code

- Prohibits the use, generation, handling, disposal, discharge or storage within the Northwest and the West WPA and within the basic WPA area of any other utility potable water supply well.
- Hazardous Waste prohibited within the Northwest WPA, or within the West Wellfield Interim WPA or within the average WPA except for small quantity generators.
- Prohibition against certain stormwater disposal methods within proximity to production wells
- Sewage loading restrictions

Implementing practices

- Construction plan review process,
 - Construction plans submitted for commercial/industrial facilities located with WPA are required to provide process flow and inventory of products to be utilized and waste generated. The products are reviewed against the hazardous material definition pursuant to Chapter 24.
 - Water control and wastewater system review
- Operating permit requirements for hazardous waste generators
 - Secondary containment
 - Spill prevention measures
- Annual inspections

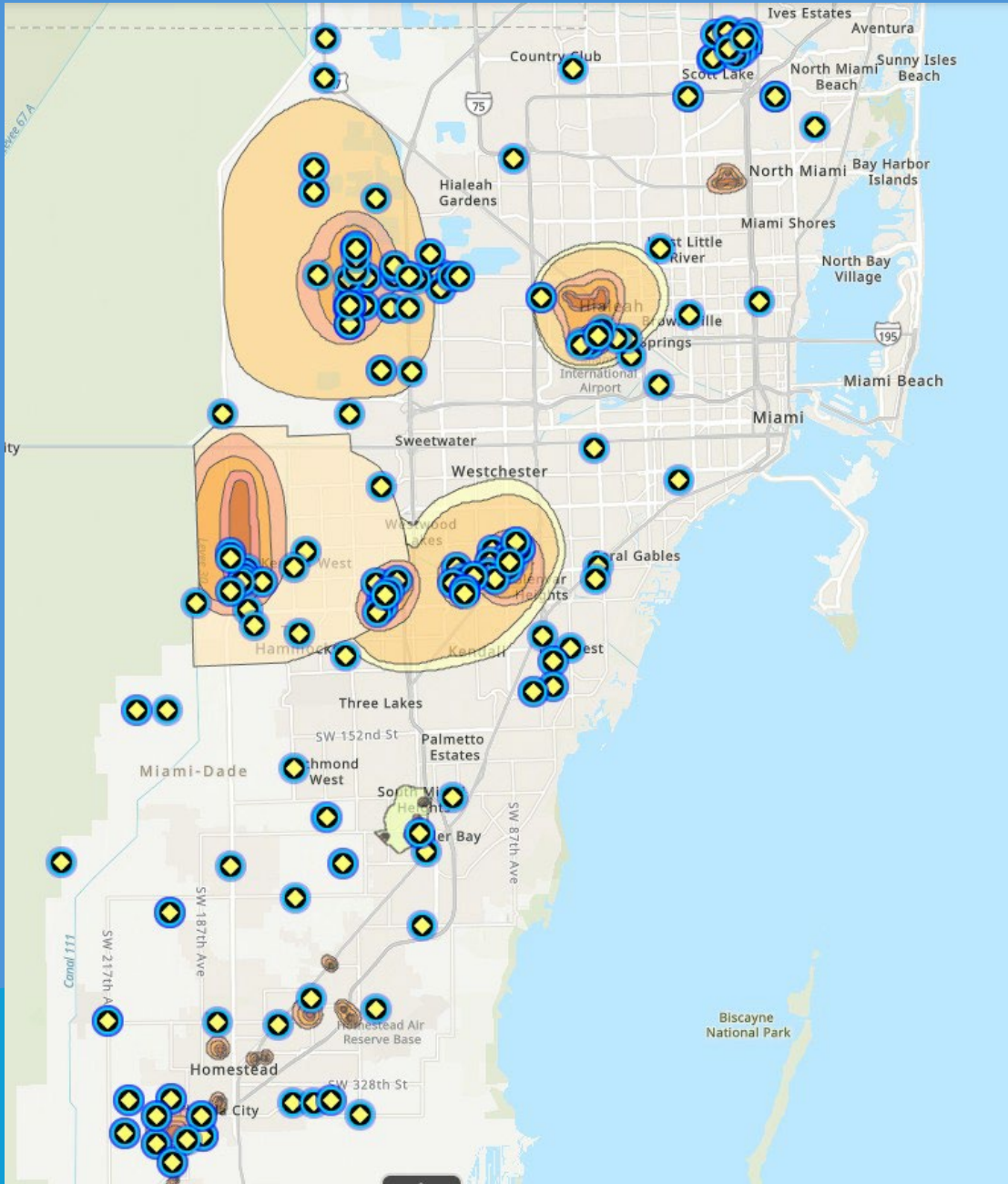


CON 3 Implementation cont.,

4. Groundwater Monitoring

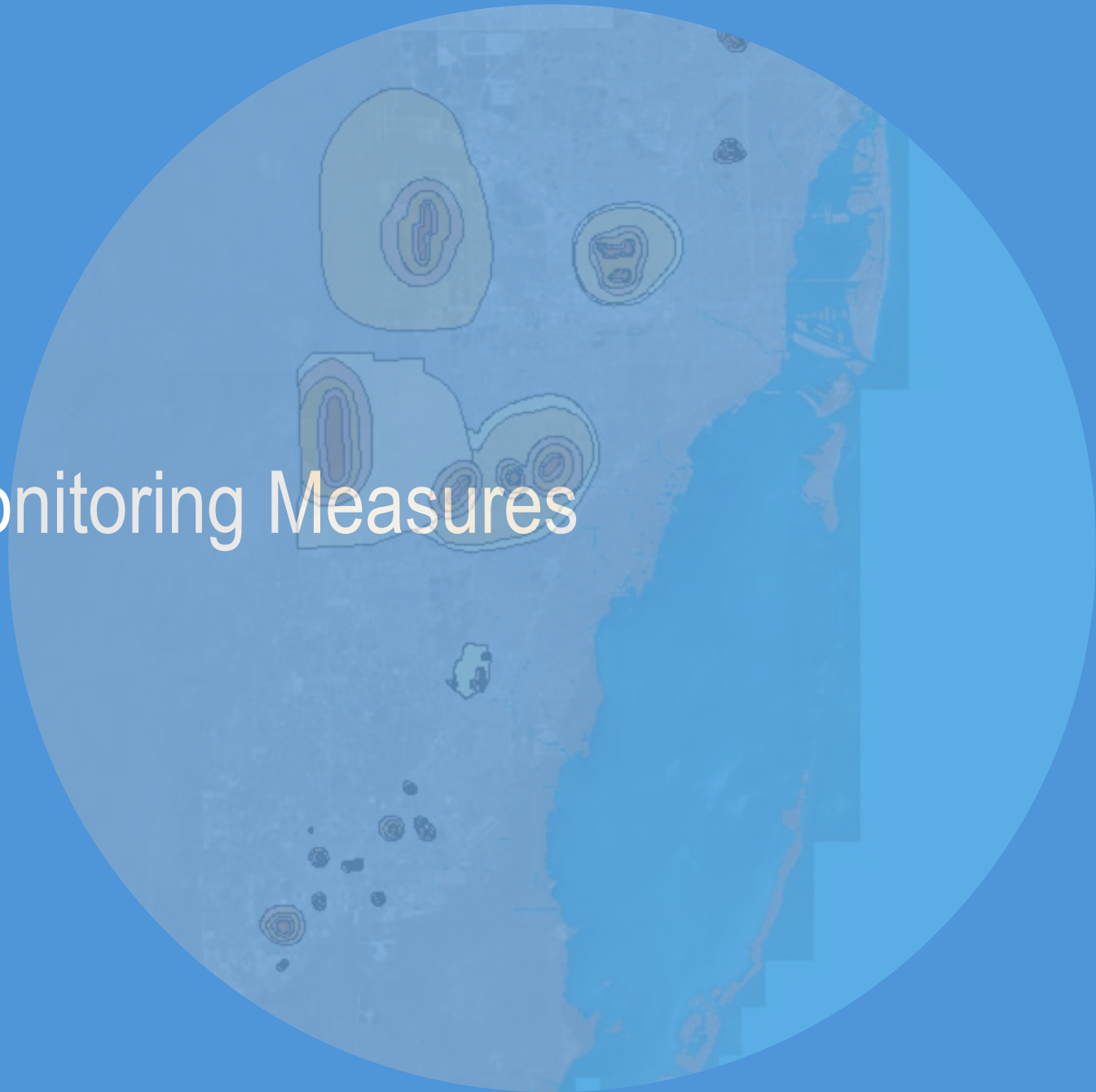
- Ambient groundwater monitoring program
 - 50 wells located throughout the county, outside WPAs, to establish baseline water quality of the aquifer system, determine trends and detect changes in groundwater quality.
 - Sampled semi-annually
- Wellfield Monitoring program
 - 135 wells located within the major WPAs
 - Groundwater monitoring throughout the vertical depth of the Biscayne Aquifer, The wells serve as an early warning system to detect any contaminants that threaten the production wellheads.
 - Sampled quarterly for over 200 parameters
- Special studies
 - Synoptic groundwater study
 - Fertilizer study





MDC Groundwater Quality Monitoring Network

Con 3 – Monitoring Measures



Con 3 - Prescribed Monitoring Measures

“This objective will be measured by the number of exceedances of any applicable water quality standard within wellfield protection areas,

and

the number of times that pumpage has to be curtailed due to pollution incidents that threaten water resources within any defined wellfield protection area.”



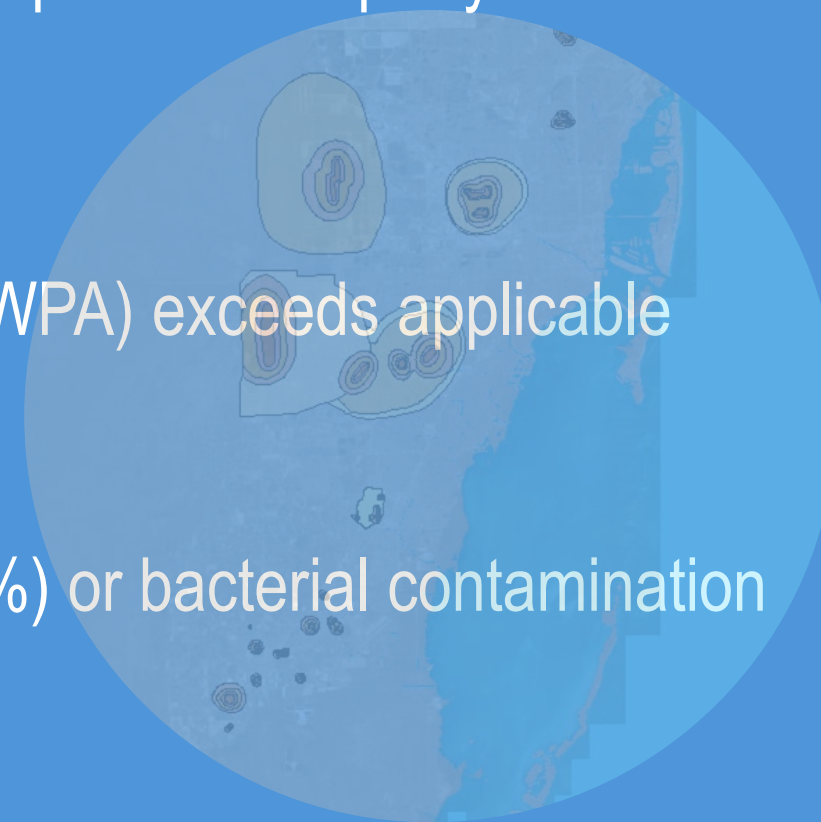
Evaluation of Prescribed Monitoring Measures

Measure

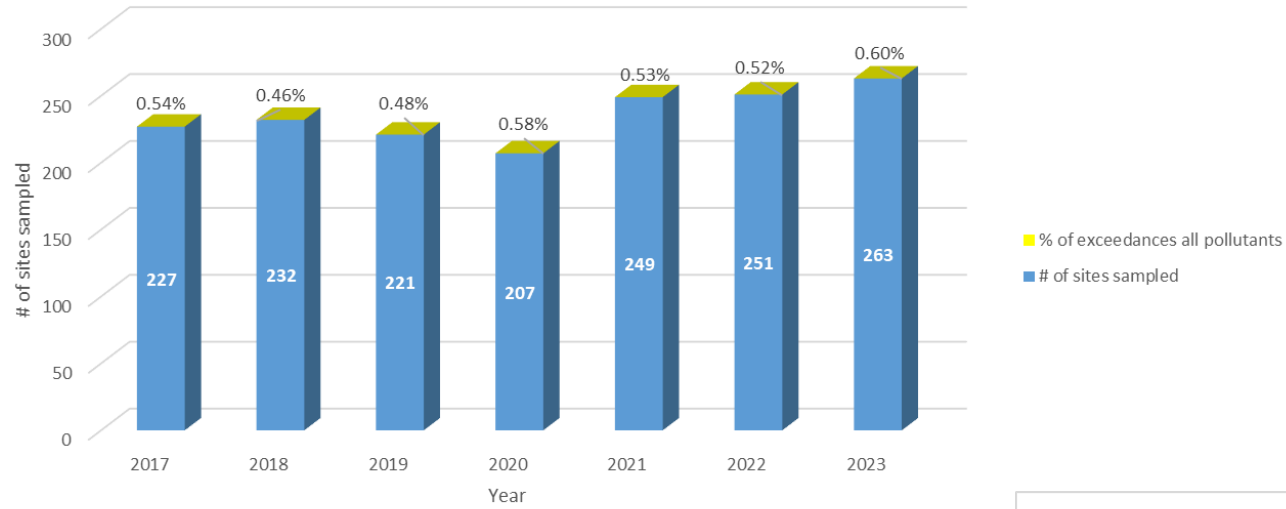
Number of exceedances of any applicable water quality standard within wellfield protection areas

- DERM samples an average of 235 sites for over 77,000 parameters per year
- 64% of the sites are located within WPA
- On average 0.5 percent of the total samples (0.4% for WPA) exceeds applicable criteria
- 70% of all WPA exceedances were based on color (57%) or bacterial contamination

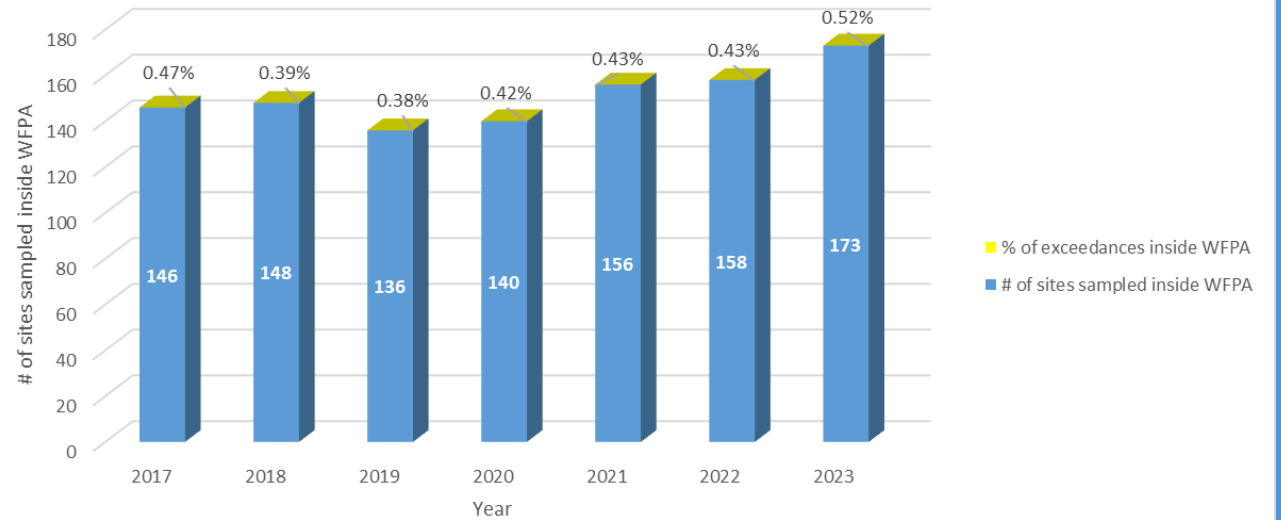
* 2017 to 2023 data



Groundwater Quality Exceedances Per Year (all programs)
(2017-2023)



Groundwater Quality Exceedances inside WPA Per Year
(2017-2023)



Evaluation of Prescribed Monitoring Measures

Measure:

The number of times that pumpage has to be curtailed due to pollution incidents that threaten water resources within any defined wellfield protection area.

- DERM has knowledge of four incidences over the past 10 years where pumpage has been curtailed due to pollution incidents



Evaluation of Prescribed Monitoring Measures

Incident 1

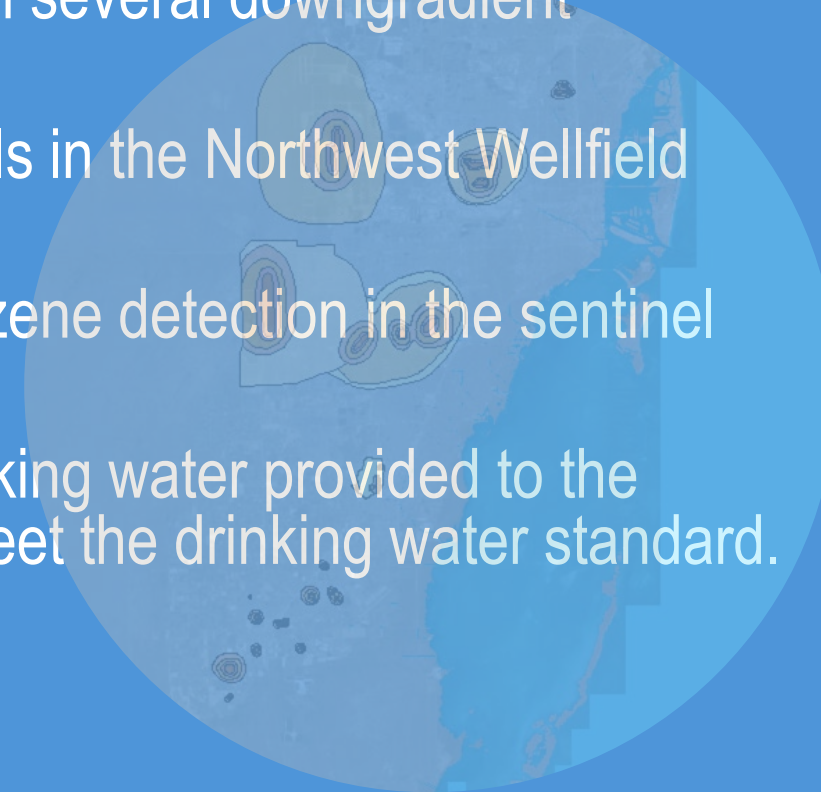
- PFAS was detected at some of the production wells in the Hialeah Preston/Miami Springs WPA in 2019
- Subsequently, MDWASD implemented mitigating procedures:
 - Three wells were taken out of service
 - MDWASD established procedures to optimize the operation of production wells to minimize the potential for impacts to additional production wells and to maximize output from more pristine sources.



Evaluation of Prescribed Monitoring Measures

INCIDENT 2

- In November of 2019 benzene was detected above the drinking water standard in sentinel monitoring wells in the NWWF during routine groundwater monitoring conducted by the Miami-Dade Limestone Producers Association pursuant to DERM requirements.
- Benzene was subsequently also detected above standard in several downgradient production wells
- As a result, between 2019 and 2023 several production wells in the Northwest Wellfield were shut down.
- Since July 2023 there has been only two incidences of benzene detection in the sentinel wells and since June 2025 benzene has not been detected.
- It is important to note that during all these incidents the drinking water provided to the citizens of Miami-Dade County has met and continues to meet the drinking water standard.



Evaluation of Prescribed Monitoring Measures

Incident 3

- In December 2021 a production well in the SWWF, was temporarily shut down due to bacterial contamination from a nearby pump station.
- The pump station was repaired and the well disinfected and place back into service.

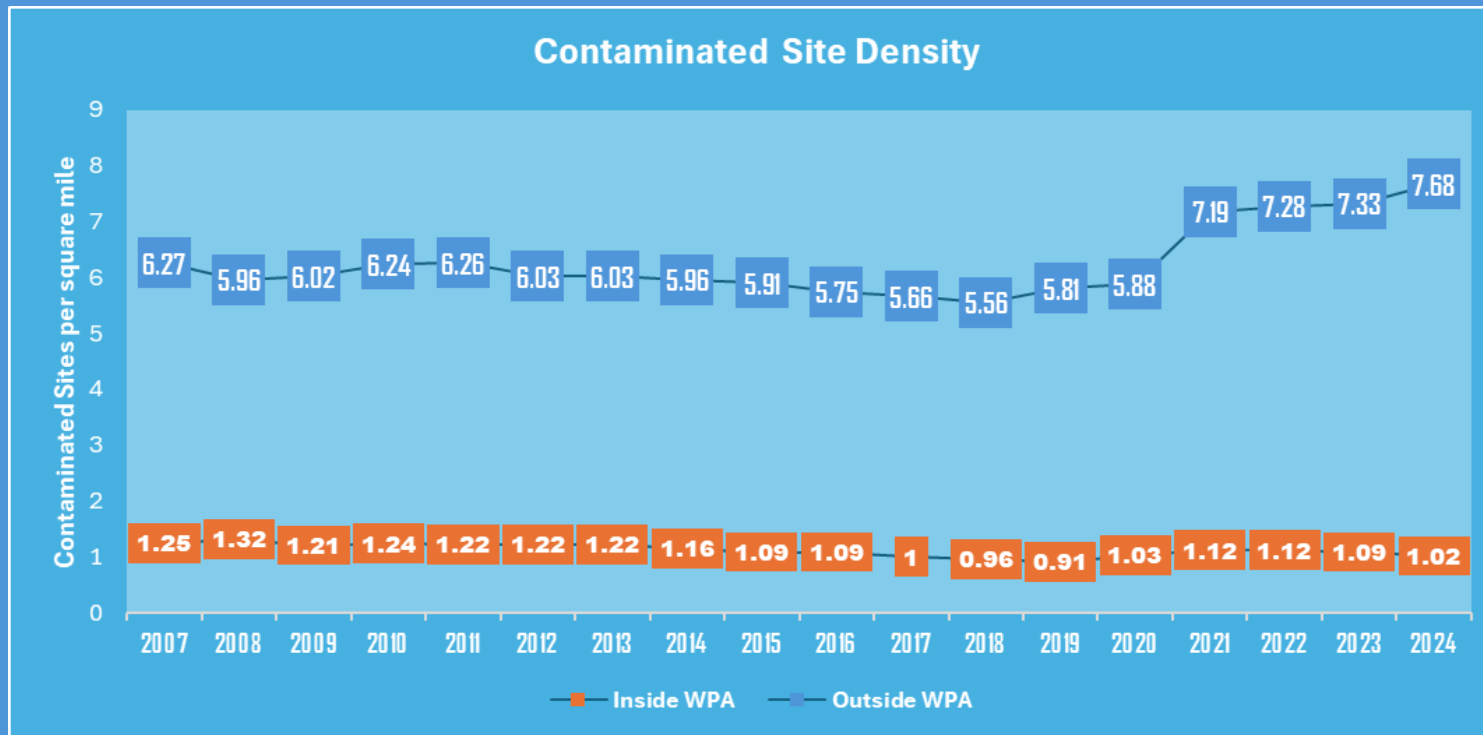
Incident 4

- Production well # 16 in the SWWF has been shut down since 2017 because sludge from the adjacent lime sludge lagoon leaked into the well.

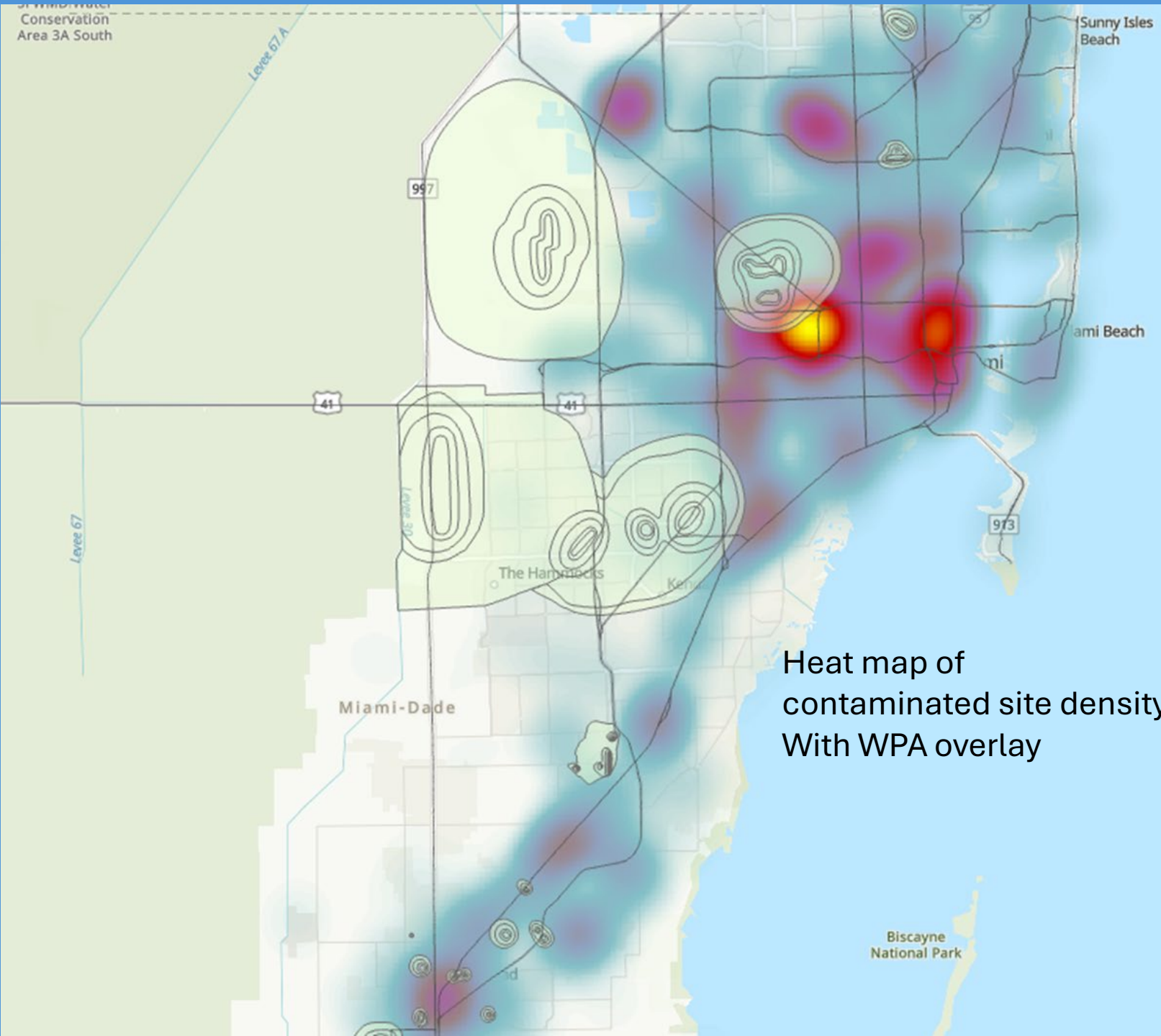


Other Monitoring Measures

In addition to the monitoring measures prescribed in the CDMP to evaluate the overall effectiveness of the land use restrictions and source prohibition measures implemented for WPAs, DERM utilizes the density of contaminated sites per square mile within vs outside of WPAs.



ONLY 7% OF CONTAMINATED SITES ARE LOCATED WITHIN WPAs



Heat map of contaminated site density
With WPA overlay

Conclusion

The measures utilized to evaluate achievement of the CDMP objective with respect to wellfield protection indicates that the programs implemented in support of Con 3 are effective. However, as demonstrated by the pollution incidents described before MDC shall maintain “... a rigorous potable water supply well protection program” and groundwater monitoring program.



Thank You...