

Summary of Puerto Rico's Southern Aquifer Drinking Water Sampling

September 2023





Outline of Presentation

- **Brief Recap of Objective**
- Summary of Findings
- Review of Historical Data
- Sampling Approach
- Laboratory Analysis
- Results
- Conclusion and Q&As



Brief Recap of Objective

- Between April and May 2023, EPA conducted a sampling effort of drinking water wells in southern Puerto Rico
- The effort follows the commitment made by Administrator Regan during his July 2022 Journey 2 Justice visit
- The effort was in response to the communities' concerns regarding unencapsulated coal ash deposited in southern Puerto Rico and its potential impact on groundwater used for drinking water
- Objective: Evaluate public drinking water wells for the presence of metals

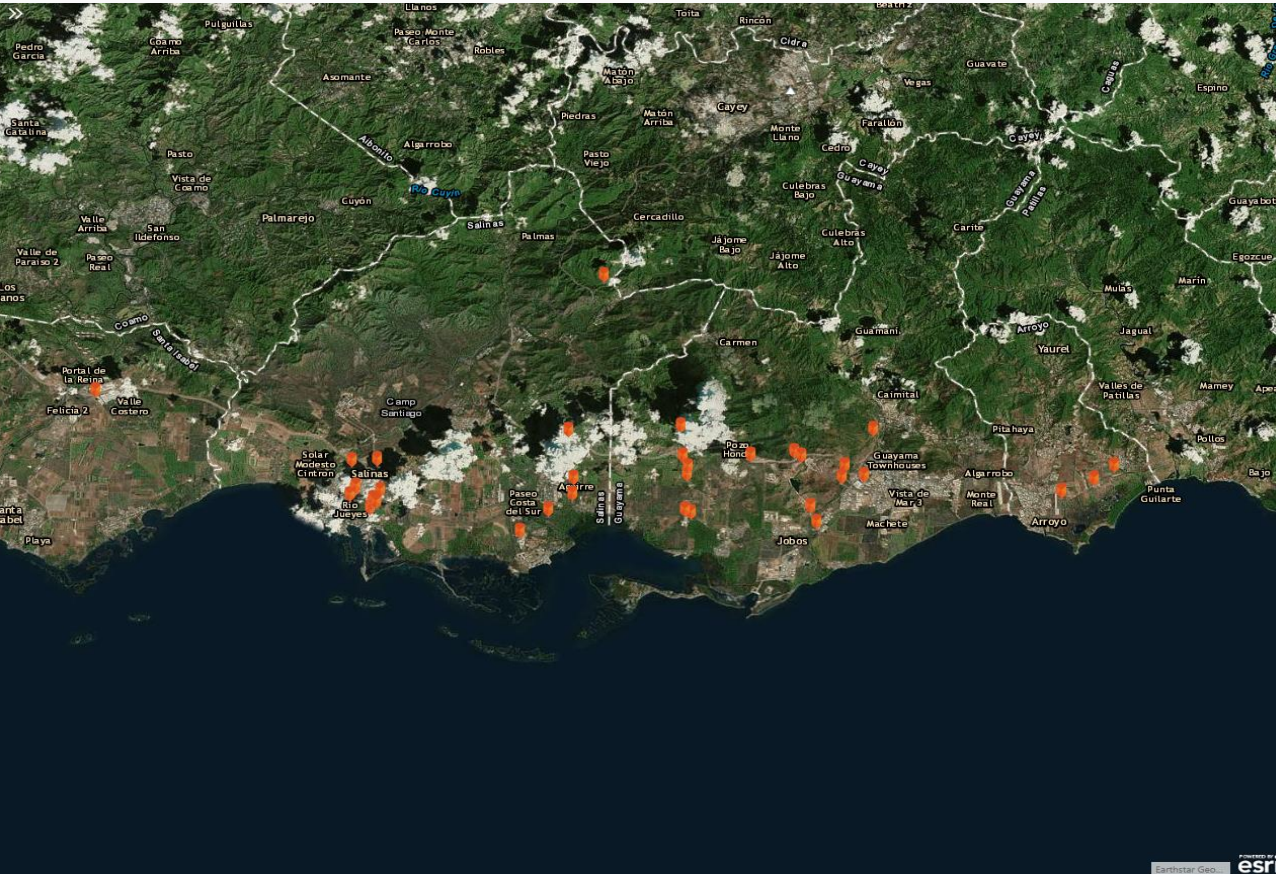


Figure: Map depicting sites with potential deposit of coal combustion residuals in Southern Puerto Rico.



Summary of Findings

- No exceedances of drinking water criteria for metals in PRASA drinking water wells
- No exceedances of drinking water criteria for metals in the effluent of the Guayama drinking water treatment plant
- No exceedances of drinking water criteria for metals in historical results
 - Historical PRASA drinking water results
 - Historical USGS water results



Outline of Presentation

- Brief Recap of Objectives
- Summary of Findings
- **Review of Historical Data**
- Sampling Approach
- Laboratory Analysis
- Results
- Conclusion and Q&As



Historical Information Reviewed

- **EPA reviewed historical data**
 - PRASA Public Water Supply Well Data
 - 22 PRASA wells sampled sporadically from 2015 to 2022
 - Sample analysis includes 8 metals identified in Appendix 4 of CCR Rule
 - No metals results exceeded drinking water criteria
 - USGS Well Sampling Data
 - 26 wells sampled sporadically by USGS from 1986 to 2022
 - Sample analysis includes metals identified in Appendix 4 of CCR Rule except Barium, Flouride and Mercury
 - No metals results exceeded drinking water criteria



Outline of Presentation

- Brief Recap of Objectives
- Summary of Findings
- Review of Historical Data
- **Sampling Approach**
- Laboratory Analysis
- Results
- Conclusion and Q&As



Sampling Approach

- Sampling followed approach discussed with communities in December 2022
- 30 Public Water Supply wells and the Guayama Drinking Water Plant sampled
 - April 18 – 26 : unfiltered raw water samples were collected
 - May 18 : follow-up sampling of the Guayama Drinking Water Plant – filtered and unfiltered samples were collected
- A list of wells sampled is at right

<u>Arroyo</u>	<u>Salinas</u>
Arroyo Urbano 1 ("stand-by")	Buono
Belinda	Coco 2
Texaco ("stand-by")	Coco 3
Yaurel 1 ("stand-by")	Coco 4
Yaurel 2	Coquí 3
	Godreau 1
<u>Guayama</u>	Godreau 2
Hacienda Guamaní	La Margarita ("stand-by")
Villodas	Las Monjas ("stand-by")
	Parcelas Vázquez
<u>Santa Isabel</u>	Salinas Urbano 1
Ollas	Salinas Urbano 3
Paso Seco 1	San Felipe
Paso Seco 2	Texidor
Paso Seco 3	
Paso Seco 4	
Paso Seco 5	
Paso Seco 6	
Playita Cortada	
Santiago Apóstol	

Table: List of public drinking wells sampled. Wells operated by the Puerto Rico Aqueduct and Sewer Authority (PRASA).



Sample Collection and Processing





Sample Collection and Processing



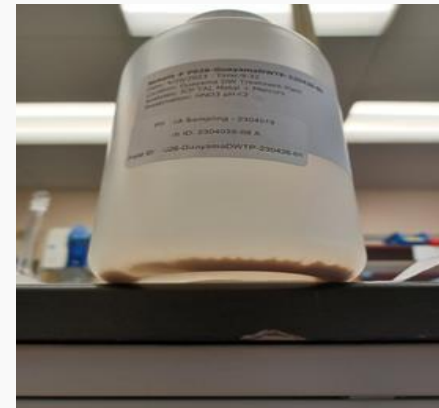


Guayama Drinking Water Treatment Plant

- Two separate sample events were conducted on April 26 and May 18
- Initial samples were collected on April 26 :
 - Samples were collected after a 41.9 mm rainfall event the day prior to sampling
 - Unfiltered raw water samples were collected at the treatment plant's intake tap
 - Samples were preserved in the field with nitric acid per quality assurance requirements



Photograph 1: Collection of influent drinking water samples at the Guayama DW Treatment plant on April 26.



Photographs 2 and 3: View of influent drinking water samples collected from the Guayama DW Treatment Plant on April 26.



Guayama Drinking Water Treatment Plant

- Due to turbidity/color/appearance, resampling occurred on May 18, 2023
 - Both the plant's intake (untreated water) and the treated water were sampled
 - The intake raw surface water samples were taken directly from the irrigation channel that directs water from Patillas Lake via the Patillas irrigation canal
 - Both filtered and unfiltered intake samples were collected



Photograph 1: View of the irrigation channel after the intake location.



Photograph 2: Collection of raw water samples at the entrance of the irrigation channel.



Photograph 3: View of raw water samples collected at the Guayama DWTP on May 18.



Guayama Drinking Water Treatment Plant

- May 18th sampling event – treated effluent water samples
- Unfiltered effluent water (after treatment) was collected



Photograph 1: Collection of treated water samples at the laboratory effluent sampling location.



Photograph 2: View of effluent water samples collected at the Guayama DWTP on May 18.



Outline of Presentation

- Brief Recap of Objectives
- Summary of Findings
- Review of Historical / Existing Data
- Sampling Approach
- **Laboratory Analysis**
- Results
- Conclusion and Q&As



Laboratory Analysis

- Samples were analyzed at the USEPA Regional Laboratory in New Jersey.
- Analysis included Target Analyte List (TAL) elements using USEPA Method 200.7:
 - Includes metals identified in Appendix IV EPA's Coal Combustion Residuals Rule



Analytical Parameters

Metal	Metal Regulated Under Coal Combustion Residual (CCR) Rule (Y/N)	Driking Water Maximum Contaminant Level (MCL) (ppb)	CCR Rule Groundwater Protection Standard (ppb)
Boron	Yes	-	-
Calcium	Yes	-	-
Antimony	Yes	6	-
Arsenic	Yes	10	-
Barium	Yes	2000	-
Beryllium	Yes	4	-
Cadmium	Yes	5	-
Chromium	Yes	100	-
Cobalt	Yes	-	6
Lead	Yes	15	-
Lithium	Yes	-	40
Mercury	Yes	2	-
Molybdenum	Yes	-	100
Selenium	Yes	50	-
Thallium	Yes	2	-

Metal	Metal Regulated Under Coal Combustion Residual (CCR) Rule (Y/N)	Driking Water Maximum Contaminant Level (MCL) (ppb)	CCR Rule Groundwater Protection Standard (ppb)
Copper	-	1300	-
Aluminum	-	-	-
Iron	-	-	-
Magnesium	-	-	-
Manganese	-	-	-
Nickel	-	-	-
Potassium	-	-	-
Silver	-	-	-
Sodium	-	-	-
Vanadium	-	-	-
Zinc	-	-	-

Table: List of analytes include Target Analyte List (TAL) elements using USEPA Method 200.7, plus boron, lithium and molybdenum. The table specifies metals listed in Appendix III of EPA's CCR rule, other metals listed with Yes are listed in Appendix IV of EPA's CCR rule.



Outline of Presentation

- Brief Recap of Objectives
- Summary of Findings
- Review of Historical Data
- Sampling Approach
- Laboratory Analysis
- **Results**
- Conclusion and Q&As



PRASA Wells Sampling Results

Fraction.	Merged 2021 RSL - MCL (ug/L) & GWPS - (greater of MCL, USEPA Amendments Level (August 29, 2019), or Site Background)	Range of PRASA Santa Isabel Active Wells		Range of PRASA Salinas Active Wells		Range of PRASA Guayama Active Wells		Range of PRASA Arroyo Active Wells	
	Action Level	Min	Max	Min	Max	Min	Max	Min	Max
Antimony	6	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Arsenic	10	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Lithium	40	ND	- ND	ND	- 11.4	ND	- ND	ND	- ND
Molybdenum	100	ND	- ND	ND	- 2.71	ND	- 1.34	ND	- ND
Boron	-	103	- 178	63.2	- 662	130	- 222	66.5	- 89.2
Selenium	50	ND	- 2.81	ND	- 2.25	ND	- ND	ND	- ND
Thallium	2	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Cobalt	6	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Barium	2000	1.02	- 26.5	19.6	- 67.9	ND	- 4.42	52.4	- 65.6
Beryllium	4	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Cadmium	5	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Chromium	100	ND	- 5.29	ND	- ND	ND	- ND	ND	- ND
Lead	15	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Mercury	2	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Copper	1300	ND	- 4.03	ND	- 9.91	1.2	- 1.62	1.44	- 2.36
Aluminum	-	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Iron	-	ND	- ND	ND	- ND	ND	- ND	ND	- 64.2
Manganese	-	ND	- 21.2	ND	- 2	ND	- ND	ND	- 5.8
Nickel	-	ND	- 1.02	ND	- 1.02	ND	- ND	ND	- ND
Silver	-	ND	- ND	ND	- ND	ND	- ND	ND	- ND
Vanadium	-	13.8	- 32.4	5.27	- 34.7	13.7	- 20.4	4.38	- 5.67
Zinc	-	ND	- 6.34	ND	- 5.97	ND	- 2.95	2.9	- 5.95
Sodium	-	38200	- 78800	33800	- 241000	50100	- 90900	46300	- 46300
Potassium	-	745	- 1980	727	- 1260	835	- 1340	510	- 675
Calcium	-	44000	- 98300	40900	- 109000	65800	- 66700	40100	- 46500
Magnesium	-	23700	- 37700	13800	- 29100	23800	- 30500	16600	- 18400



Guayama Drinking Water Plant Sampling Results - April

Fraction.	Merged 2022 RSL - MCL (ug/L) & GWPS - (greater of MCL, USEPA Amendments Level (August 29, 2019), or Site Background) Action Level	Lake Patillas Surface Water - After Significant Rainfall Event	Lake Patillas Surface Water - After Significant Rainfall Event
		Guayama DWTP Unfiltered Intake 4/26/2023 Unfiltered Intake after Heavy Rain ug/L Result	Guayama DWTP Unfiltered Intake 4/26/2023 Unfiltered Intake after Heavy Rain Duplicate ug/L Result
Aluminum	-	8710	12300
Lead	15	3.94	4.08
Manganese	-	7910	12200
Molybdenum	100	ND	ND
Nickel	-	3.02	4.21
Silver	-	ND	ND
Thallium	2	ND	ND
Antimony	6	ND	ND
Arsenic	10	1.32	1.62
Barium	2000	232	341
Beryllium	4	ND	ND
Cadmium	5	ND	ND
Chromium	100	4.03	5.4
Cobalt	6	6.69	9.68
Copper	1300	111	153
Vanadium	-	32.1	42.3
Zinc	-	50	58.2
Selenium	50	ND	ND
Iron	-	18700	27100
Lithium	40	ND	ND
Magnesium	-	7310	8640
Potassium	-	1170	1300
Sodium	-	13200	13600
Boron	-	23.4	23.7
Calcium	-	15100	16900
Mercury	2	ND	ND



Guayama Drinking Water Plant Sampling Results - May

		Lake Patillas Water - Guayama Reservoir Surface Water - Normal Low Rainfall		Guayama DWTP - Normal Low Rainfall	
Merged 2022 RSL - MCL (ug/L) & GWPS - (greater of MCL, USEPA Amendments Level (August 29, 2019), or Site Background)		Guayama DWTP Unfiltered Intake	Guayama DWTP Filtered Intake	Guayama DWTP Unfiltered Effluent	Guayama DWTP Unfiltered Effluent
Action Level		5/18/2023 Unfiltered Intake	5/18/2023 Filtered with 0.45µm Filter	5/18/2023 Unfiltered Effluent	5/18/2023 Unfiltered Effluent
Fraction.		ug/L Result	ug/L Result	ug/L Result	ug/L Result
Aluminum	-	185	20.2	59.1	56.5
Lead	15	ND	ND	ND	ND
Manganese	-	137	24	ND	ND
Molybdenum	100	ND	ND	ND	ND
Nickel	-	ND	ND	ND	ND
Silver	-	ND	ND	ND	ND
Thallium	2	ND	ND	ND	ND
Antimony	6	ND	ND	ND	ND
Arsenic	10	ND	ND	ND	ND
Barium	2000	14.9	11	11.8	11.4
Beryllium	4	ND	ND	ND	ND
Cadmium	5	ND	ND	ND	ND
Chromium	100	ND	ND	ND	ND
Cobalt	6	ND	ND	ND	ND
Copper	1300	ND	ND	ND	ND
Vanadium	-	2.2	2.04	1.38	1.47
Zinc	-	ND	4.07	ND	ND
Selenium	50	ND	ND	ND	ND
Iron	-	1270	839	ND	ND
Lithium	40	ND	ND	ND	ND
Magnesium	-	5350	5090	5210	5200
Potassium	-	784	769	815	771
Sodium	-	13200	13200	15200	15200
Boron	-	22.1	21.2	22.1	22.1
Calcium	-	13400	13000	13600	13500
Mercury	2	ND	ND	ND	ND



USGS Historical Data

	Merged 2021 RSL - MCL (ug/L) & GWPS - (greater of MCL, USEPA Amendments Level (August 29, 2019), or Site Background)	USGS Wells Historic Results 1986 - 2016 (n = 62)		
Fraction.	Action Level	Min	-	Max
Antimony	6	ND	-	1.0
Arsenic	10	0.09	-	1.0
Lithium	40	ND	-	9.0
Molybdenum	100	0.219	-	3.0
Boron	-	54	-	286
Selenium	50	0.17	-	2.40
Thallium	2	ND	-	0.30
Cobalt	6	ND	-	1.0
Barium	2000	NA	-	NA
Beryllium	4	ND	-	0.50
Cadmium	5	ND	-	1.0
Chromium	100	ND	-	10.0
Lead	15	ND	-	1.76
Mercury	2	NA	-	NA
Copper	1300	ND	-	8.00
Aluminum	-	ND	-	30
Iron	-	ND	-	58.3
Manganese	-	ND	-	11.30
Nickel	-	ND	-	2.0
Silver	-	ND	-	0.005
Vanadium	-	2.6	-	33.4
Zinc	-	ND	-	128.0
Sodium	-	NA	-	NA
Potassium	-	NA	-	NA
Calcium	-	NA	-	NA
Magnesium	-	NA	-	NA



Conclusion and Questions

- Results from EPA's April-May 2023 sampling effort show that
 - Public drinking water from the PRASA Public Water System wells and the Guayama Water Treatment Plant do not exceed drinking water criteria for metals
 - No exceedances were detected for applicable groundwater protection standards established under the Coal Combustion Residuals Rule
- Moving forward
 - PRASA will continue with its sampling, which includes metals regulated by the Safe Drinking Water Act.



Questions and Discussion