

*Protecting Our Water Environment*



*Metropolitan Water Reclamation District of Greater Chicago*

***MONITORING AND RESEARCH  
DEPARTMENT***

***REPORT NO. 24-09***

***THORNTON COMPOSITE RESERVOIR  
GROUNDWATER MONITORING REPORT  
FOURTH QUARTER 2023***

***March 2024***

*Protecting Our Water Environment*



**Metropolitan Water Reclamation District of Greater Chicago**

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March 22, 2024

Mr. Michael Brown  
Division Manager  
Bureau of Water  
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Illinois Environmental Protection Agency  
1021 North Grand Avenue East  
Springfield, IL 62794

Dear Mr. Brown:

Subject: Transmittal of the Report “Thornton Composite Reservoir Groundwater Monitoring Report Fourth Quarter 2023”

Please find attached the report entitled “Thornton Composite Reservoir Groundwater Monitoring Report Fourth Quarter 2023” transmitted electronically. The report is prepared for transmittal to the Illinois Environmental Protection Agency (IEPA) in accordance with the Thornton Composite Reservoir Groundwater Monitoring Plan. Also attached is the Excel spreadsheet of the Thornton Composite Reservoir raw data as required by the IEPA.

If you have any questions or would like to have additional information, please contact Mr. Benjamin Morgan at (708) 588-3743 or MorganB@mwr.org.

Very truly yours,

  
Albert Cox, Ph.D.  
Environmental Monitoring and Research Manager  
Monitoring and Research Department

EWP:HZ:BM:lf  
Attachment  
Mr. E. Podczewski

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**THORNTON COMPOSITE RESERVOIR  
GROUNDWATER MONITORING REPORT  
FOURTH QUARTER 2023**

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## LIST OF ABBREVIATIONS

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Acronym	Definition
CCD	Chicago City Datum
CFU	colony forming unit
CSF	combined sewer flow
EC	electrical conductivity
GMP	Groundwater Monitoring Plan
GPS	Groundwater Protection System
IAC	Illinois Administrative Code
TCR	Thornton Composite Reservoir
TDS	total dissolved solids
TOC	total organic carbon

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## **ACKNOWLEDGMENTS**

This report for the Thornton Composite Reservoir Groundwater Monitoring was generated by the Monitoring and Research Department. All samples were collected by A3 Environmental Consultants (contractor) under Thornton Composite Reservoir Contract 21-100-11. Analyses were performed by the Analytical Laboratories Division and the Analytical Microbiology Laboratory of the Metropolitan Water Reclamation District of Greater Chicago (District). Special thanks are due to Ms. Laura Franklin for typing and formatting this report.

## **DISCLAIMER**

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the District.



## INTRODUCTION

A Groundwater Protection System (GPS) was constructed for the Thornton Composite Reservoir (TCR) to protect against the exfiltration of combined sewer flow (CSF) into the surrounding dolomite aquifers. The CSF and minimal amounts of stormwater are stored in the reservoir during and after large storm events. To monitor the performance of the GPS, a network of monitoring wells located outside the perimeter of the GPS is being monitored as discussed in the Revised Groundwater Monitoring Plan (GMP) (Black & Veatch, 2016). As explained in the Revised GMP, one sample of reservoir water, one from the Main Quarry Sump, and one from each of the seven wells are collected annually and analyzed for the Illinois Administrative Code (IAC) Title 35 Part 620 Class I groundwater constituents. In addition, following a reservoir fill event or during a routine quarterly event, groundwater is sampled from the seven wells and the Main Quarry Sump and tested for a targeted list of parameters that are more likely to be detected in CSF water.

The monitoring well system consists of one deep well, TB-124, which monitors the underlying Galena Aquifer, and six vertical Westbay multi-level monitoring wells, TB-118, TB-119, TB-120, TB-121, TB-122, and TB-123, which monitor the Silurian dolomite aquifers. As discussed in the Revised GMP, following a reservoir fill event, sampling is required every two weeks while the water in the reservoir remains above an elevation of -280 feet Chicago City Datum (CCD). Groundwater is sampled from each well at the first sample interval port immediately below the reservoir water elevation. Each of the multilevel monitoring wells is capable of monitoring four distinct 20-foot intervals in the Silurian dolomite aquifer.

The locations of the monitoring wells, the quarry sump, the TCR, and the GPS are presented in [Figure 1](#). The Main Quarry Sump is located beyond the south boundary of the GPS and is not a component of the TCR but is an integral part of the Hanson Material Services mining quarry to the south of the TCR. This sump facilitates mining operations by minimizing the water level at the bottom of the quarry. It is possible that the bottom of this sump could extend beyond the lowest depth of the TCR (-297.5 feet CCD). The sump contains mainly groundwater and small quantities of surface runoff, and it is sampled quarterly and during fill events, along with the wells, to evaluate the potential migration of contaminants from the TCR to the sump.

[Table 1](#) lists the characteristics of all wells at the TCR site (well location coordinates, elevations, and depths, and the sampling port interval elevations).

Prior to the TCR becoming operational in November 2015, eight (8) sampling events were conducted on a quarterly basis for two years (May 2012 through March 2014) to provide background data on the existing groundwater quality. In order to evaluate the effectiveness of the grout curtain and the GPS, the Revised GMP (2016) presents the analysis of data for all samples collected during the background monitoring period and provides a baseline for comparison with routine monitoring data. Changes over time in groundwater calcium and magnesium concentrations would also be useful in tracking the occurrence of infiltration/exfiltration. Groundwater analytical data routinely generated for the monitoring wells, reservoir, and sump will also be compared with the IAC Title 35 Part 620 Class I Groundwater Standards (Illinois Pollution Control Board, Illinois Environmental Protection Agency, 2013) to evaluate any exceedances in groundwater standards.

FIGURE 1: MONITORING WELL AND MAIN QUARRY SUMP LOCATIONS

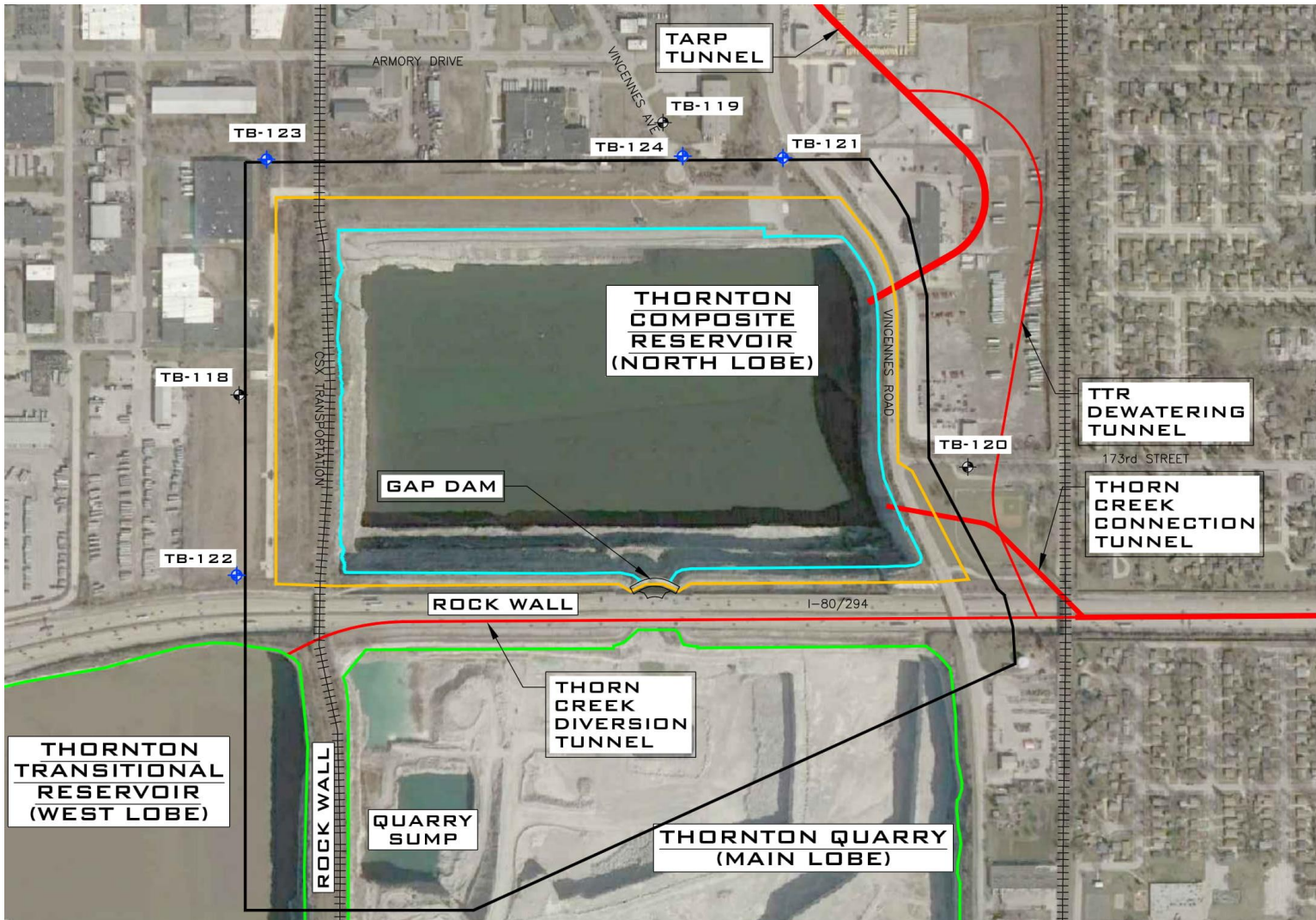


TABLE 1: CHARACTERISTICS OF MONITORING WELLS TB-118 THROUGH TB-124 AT THE THORNTON COMPOSITE RESERVOIR SITE

Well ID	Coordinates <sup>1</sup>		Ground Surface Elevation (ft, CCD <sup>2</sup> )	Top of Riser Elevation (ft, CCD)	Depth of Well (ft)	Sampling Port Interval (ft, CCD)			
	Northing (ft)	Easting (ft)				Interval 1	Interval 2	Interval 3	Interval 4
TB-118	1,791,110.38	693,560.44	38.5	41.5	532	-85 to -105	-212 to -232	-283 to -303	-392 to -412
TB-119	1,792,316.63	695,509.39	27.9	29.5	529	-85 to -105	-212 to -232	-283 to -303	-392 to -412
TB-120	1,790,782.31	696,888.93	40.0	42.1	540	-86 to -106	-213 to -233	-284 to -304	-393 to -413
TB-121	1,792,193.10	696,044.98	29.4	30.4	461	-84 to -104	-211 to -231	-282 to -302	-391 to -411
TB-122	1,790,288.61	693,549.38	48.8	51.7	480	-85 to -105	-212 to -232	-283 to -303	-392 to -412
TB-123	1,792,185.60	693,685.69	28.9	31.8	460	-84 to -104	-211 to -231	-282 to -302	-391 to -411
TB-124 <sup>3</sup>	1,792,200.77	695,591.56	29.6	29.2	728			-663 to -698	

<sup>1</sup>Illinois State Plane Coordinate System (NAD 1927).

<sup>2</sup>Chicago City Datum (CCD).

<sup>3</sup>TB-124 is a conventional well screened from -663 to -698 ft CCD. Samples are taken at approximately 650 ft below ground surface.

There was one fill event during the fourth quarter of 2023 (the fifth event of 2023). The fill event began on October 27 and lasted until October 29, requiring a single sampling. Per the Revised GMP, the annual monitoring event sampling required in the fourth quarter can be combined with a routine fill event sampling. Thus, this sampling serves as both fill event and annual sampling. The start of sampling was delayed beyond October 29 until the sampling equipment was returned from the manufacturer for repair. One complete set of annual monitoring event samples was collected during November 6 – 13, 2023, at the Reservoir, the Main Quarry Sump, and all monitoring wells.

This report presents field activities, observations, and analytical data for surface and groundwater monitoring samples taken at the Main Quarry Sump, the TCR, and at all monitoring wells from November 6 – 13, 2023.

## FIELD ACTIVITIES

For this report period, one complete set of samples for the annual monitoring event was collected at the TCR, the Main Quarry Sump, the deep well, and at sampling port 3 of all multilevel wells from November 6 – 13, 2023. Sample collection dates are shown in Table 2.

Using an Oakton PC450 pH/conductivity/temperature meter, the pH, electrical conductivity (EC), and temperature of each sample were measured and recorded immediately after collection.

Prior to sampling monitoring wells, hydrostatic pressure was measured, at Port 3 in multilevel wells, or at 650 feet below surface level in well TB-124, to calculate the groundwater elevation. Table 3 lists the elevations at Port 3 of each well and the corresponding groundwater elevations during the annual monitoring event sampling in November 2023.

All samples were packed in ice and transported to the Metropolitan Water Reclamation District of Greater Chicago's (District's) Analytical Laboratories Division for the analysis of selected inorganic constituents (IAC Title 35 Part 620 Class I Groundwater Standards) in accordance with the Revised GMP. Additional aliquots were also prepared in the field and transported in ice to the District's Analytical Microbiology Laboratory for fecal coliform (FC) analysis. An additional set of aliquots was prepared in the field and transported in ice to a contract laboratory for analysis of selected organic constituents (IAC Title 35 Part 620 Class I Groundwater Standards) in accordance with the Revised GMP.

TABLE 2: DEVICES AND CORRESPONDING DATES OF SAMPLING DURING THE ANNUAL MONITORING EVENT IN NOVEMBER 2023

Date of Sampling	Device/Structure Sampled
11/06/23	TB-124 <sup>1</sup> , Main Quarry Sump <sup>1</sup> , Sump Duplicate <sup>1</sup>
11/07/23	TB-119 <sup>2</sup> , TB-124 <sup>2</sup> , Main Quarry Sump <sup>2</sup> , Sump Duplicate <sup>2</sup>
11/08/23	TB-118 <sup>2</sup> , TB-122 <sup>2</sup> , TB-123 <sup>2</sup>
11/09/23	TB-120 <sup>2</sup> , TB-121 <sup>3</sup>
11/10/23	TB-118 <sup>1</sup> , TB-122 <sup>1</sup> , TB-123 <sup>1</sup>
11/13/23	TB-119 <sup>1</sup> , TB-120 <sup>1</sup> , Reservoir <sup>3</sup>

<sup>1</sup>Aliquots collected only for analyses of organic parameters.

<sup>2</sup>Aliquots collected only for analyses of fecal coliform and inorganic parameters.

<sup>3</sup>Aliquots collected for all analyses: fecal coliform, inorganic, and organic parameters.

TABLE 3: SUMMARY OF ELEVATIONS AT SAMPLING PORT 3 OF EACH WELL AND CORRESPONDING GROUNDWATER ELEVATIONS DURING ANNUAL MONITORING EVENT SAMPLING IN NOVEMBER 2023

Sample Date	Well ID	Sampling Port	Groundwater Elevation
11/08/23	TB-118	-289	-84
11/07/23	TB-119	-289	-163
11/09/23	TB-120	-290	-216
11/09/23	TB-121	-288	-168
11/08/23	TB-122	-288	-158
11/08/23	TB-123	-288	-47
11/07/23	TB-124 <sup>2</sup>	NA <sup>3</sup>	NC <sup>4</sup>

<sup>1</sup>Chicago City Datum.

<sup>2</sup>TB-124 is a conventional well screened from -663 to -698 ft CCD. Samples were taken at approximately 650 ft below ground surface during the annual monitoring event sampling in November 2022.

<sup>3</sup>Not applicable.

<sup>4</sup>Not calculated because pressure inside the well casing of TB-124 was inadvertently not recorded.

## ANALYTICAL RESULTS

Table 4 lists the analytical methods used by the laboratory for measured parameters. Analytical results were reviewed to identify any analytes that exceeded the Illinois Class I Groundwater Standards (35 IAC Part 620).

The analytical data for all well samples, the Main Quarry Sump, and the TCR collected during the annual monitoring event from November 6 – 13, 2023, are presented in Table 5. There were a few exceedances of the Class I Groundwater Standards, including pH, total dissolved solids (TDS), chloride, sulfate, and boron, as indicated in bold font in Table 5. Among these parameters, only pH showed a value higher than the background maximum. Groundwater FC bacteria were not detected in any well or the Main Quarry Sump during the annual monitoring event (Table 5).

Almost all organic parameters were undetectable in the annual monitoring event samples (Table 5). There were no exceedances of Class I Groundwater Standards for any organic parameter in the annual monitoring samples. Benzo[b]fluoranthene in sample TB-122, benzo[k]fluoranthene in samples TB-119 and TB-122, 2,4-dinitrotoluene in samples TB-120 and TB-123, benzo[a]anthracene in samples TB-119, TB-120, TB-121, and TB-122, and mecoprop, simazine, 1,4-dioxane, and bis(2-ethylhexyl)phthalate in all samples were below the laboratory reporting limits, but the reporting limits were higher than the Class I Groundwater Standards. Laboratory reporting limits for bis(2-ethylhexyl)phthalate in all samples were also higher than the background maximum concentration of 0.0052 mg/L. There were no exceedances of Class I Groundwater Standards for radioactivity parameters in the annual monitoring event samples.



TABLE 4: ANALYTICAL METHODS USED FOR REQUIRED PARAMETERS

Parameters	Analytical Method
<b>Inorganic</b>	
Chloride, fluoride, sulfate	USEPA 300.0
Total dissolved solids	SM 2540C
Boron and Target Analyte List metals except calcium, magnesium, and mercury	USEPA 200.8
Hardness (as calcium and magnesium)	USEPA 200.7
Mercury	SM 3112B
Ammonia (as N)	USEPA 350.1
Total organic carbon	SM 5310B
Cyanide	USEPA Kelada-01
<b>Organic</b>	
Herbicides including 2,4-D, 2,4,5-TP (Silvex), dalapon, dicamba, dinoseb, mecoprop, pentachlorophenol, and picloram	USEPA 8151A
Endothall	USEPA 548.1
Polychlorinated biphenyls	USEPA 8082A
Pesticides including alachlor, alpha-BHC, chlordane, endrin, gamma-BHC, heptachlor, heptachlor epoxide, methoxychlor, and toxaphene; simazine	USEPA 8081B
Aldicarb and carbofuran	USEPA 531.2
All explosives	USEPA 8330B
1,2-dibromo-3-chloropropane and ethylene dibromide	USEPA 504.1
All other volatile organic compounds	USEPA 8260D
Phenolics, total recoverable	USEPA 9066
All other semivolatile volatile organic compounds and atrazine	USEPA 8270E
<b>Radiological</b>	
Radium-226 (pCi/L <sup>1</sup> )	USEPA 903.0
Radium-228 (pCi/L)	USEPA 904.0
<b>Others</b>	
Fecal coliform	SM 9222D

<sup>1</sup>pCi/L = picocuries per liter.

TABLE 5: ANALYSIS OF GROUNDWATER SAMPLED AT MONITORING WELLS TB-118 THROUGH TB-124, THE MAIN QUARRY SUMP, AND THE THORNTON COMPOSITE RESERVOIR DURING THE ANNUAL MONITORING EVENT IN NOVEMBER 2023

Parameter	Part 620 Groundwater			Well										Reservoir
	Standard	Maximum Background	Lab RL <sup>1</sup>	TB-118	TB-119	TB-120	TB-121	TB-122	TB-123	TB-124	Sump	Sump-Dup <sup>2</sup>		
pH	6.5 - 9.0	8.4	NL <sup>3</sup>	7.9	8.2	7.1	7.7	7.7	7.6	<b>11.3</b>	<b>10.4</b>	<b>10.4</b>	8.1	
EC (mS/m)	NL	415	NL	195	102	114	177	155	100	183	174	174	191	
Fecal coliform (CFU/100 mL)	NL	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	2,900	
----- Concentration (mg/L) -----														
TDS	1,200	2,960	25	<b>1,318</b>	NRR <sup>4</sup>	678	1,036	872	586	<b>1,220</b>	<b>1,234</b>	<b>1,234</b>	1,170	
TOC	NL	1	5	<5.00	<5.00	<5.00	<5.00	<5.00	<5.00	20.76	<5.00	<5.00	12.33	
Cyanide, Total	0.2	BRL <sup>5</sup>	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0081	
Fluoride	4	3.2	0.1	0.60	0.54	0.64	0.50	0.94	0.58	NRR <sup>6</sup>	0.35	0.36	0.43	
Chloride	200	1,230	0.5	<b>449</b>	90	131	<b>324</b>	<b>334</b>	74	<b>233</b>	<b>216</b>	<b>214</b>	177	
Sulfate	400	890	1.0	200	116	83	188	83	122	<b>425</b>	<b>480</b>	<b>477</b>	364	
Ammonia as N	NL	ND <sup>7</sup>	0.3	0.45	0.52	0.46	0.72	0.56	0.62	1.70	<0.30	<0.30	30.3	
<u>Metals</u>														
Ag	0.05	0.003	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
As	0.01	0.025	0.002	<0.002	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	
B	2	3.78	0.005	0.775	0.950	0.908	0.979	<b>2.67</b>	1.66	0.648	0.357	0.360	0.541	
Ba	2	0.217	0.002	0.035	0.040	0.039	0.094	0.012	0.051	0.077	0.022	0.022	0.044	
Be	0.004	0.0002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Cd	0.005	0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Co	1	0.035	0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.010	0.010	0.005	
Cr	0.1	86.4	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Cu	0.65	0.004	0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.003	
Fe	5	3.23	0.02	0.139	0.114	0.593	<0.020	<0.020	<0.020	0.072	0.022	0.029	2.314	
Hg	0.002	0.0007	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
Mn	0.15	0.183	0.002	0.005	0.008	0.017	0.003	0.003	0.002	<0.002	<0.002	<0.002	<b>0.227</b>	
Ni	0.1	0.093	0.002	0.005	0.003	0.003	<0.002	<0.002	<0.002	0.004	0.032	0.033	0.020	
Pb	0.0075	0.006	0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Sb	0.006	0.012	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Se	0.05	0.008	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	
Tl	0.002	0.013	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
V	0.049	BRL	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	
Zn	5	9.95	0.01	<0.010	0.035	0.033	<0.010	0.014	<0.010	0.972	<0.010	<0.010	0.021	
Ca	NL	276	0.5	161	95.9	87.6	143	69.5	79.6	62.1	126	128	163	
Mg	NL	153	0.5	79.1	49.2	44.3	73.7	36.8	42.7	<0.50	108	109	77.8	
<u>Herbicides</u>														
2,4-D	0.07	BRL	0.0013	<0.0011	<0.0013	<0.0013	<0.0011	<0.0011	<0.0011	<0.00099	<0.0010	<0.0010	<0.0012	
2,4,5-TP (Silvex)	0.05	BRL	0.001	<0.00085	<0.0010	<0.0010	<0.00088	<0.00085	<0.00085	<0.00077	<0.00078	<0.00081	<0.00090	
Atrazine	0.003	BRL	0.0024	<0.0020	<0.0022	<0.0021	<0.0021	<0.0024	<0.0020	<0.0020	<0.0020	<0.0019	<0.0021	
Dalapon	0.2	BRL	0.0066	<0.0055	<0.0064	<0.0066	<0.0057	<0.0055	<0.0055	<0.0050	<0.0050	<0.0052	<0.0058	
Dicamba	0.21	BRL	0.0006	<0.00050	<0.00059	<0.00060	<0.00052	<0.00050	<0.00050	<0.00045	<0.00046	<0.00048	<0.00053	
Dinoseb	0.007	BRL	0.0006	<0.00050	<0.00059	<0.00060	<0.00052	<0.00050	<0.00050	<0.00045	<0.00046	<0.00048	<0.00053	

TABLE 5 (Continued): ANALYSIS OF GROUNDWATER SAMPLED AT MONITORING WELLS TB-118 THROUGH TB-124, THE MAIN QUARRY SUMP, AND THE THORNTON COMPOSITE RESERVOIR DURING THE ANNUAL MONITORING EVENT IN NOVEMBER 2023

Parameter	Part 620 Groundwater			Well									Sump-Dup <sup>2</sup>	Reservoir
	Standard	Maximum Background	Lab RL	TB-118	TB-119	TB-120	TB-121	TB-122	TB-123	TB-124	Sump			
-----Concentration (mg/L)-----														
Endothal <sup>8</sup>	0.1	BRL	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
Mecoprop	0.007	BRL	0.24	<0.20	<0.23	<0.24	<0.21	<0.20	<0.20	<0.18	<0.18	<0.19	<0.21	
Picloram	0.5	BRL	0.0006	<0.00050	<0.00059	<0.00060	<0.00052	<0.00050	<0.00050	<0.00045	<0.00046	<0.00048	<0.00053	
Simazine	0.004	BRL	0.0055	<0.0049	<0.0052	<0.0052	<0.0047	<0.0055	<0.0052	<0.0051	<0.0048	<0.0048	<0.0052	
<u>Polychlorinated Biphenyls</u>														
PCB-1016	0.0005	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
PCB-1221	0.0005	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
PCB-1232	0.0005	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
PCB-1242	0.0005	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
PCB-1248	0.0005	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
PCB-1254	0.0005	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
PCB-1260	0.0005	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
Total PCB	0.0005	ND	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
<u>Pesticides</u>														
Alachlor	0.002	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
Aldicarb	0.003	0.0048	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
alpha-BHC	0.00011	BRL	0.000044	<0.000039	<0.000041	<0.000042	<0.000038	<0.000044	<0.000042	<0.000040	<0.000038	<0.000039	<0.000041	
Carbofuran	0.04	BRL	0.0009	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090	<0.00090	
Chlordane	0.002	BRL	0.000088	<0.000079	<0.000083	<0.000084	<0.000075	<0.000088	<0.000084	<0.000081	<0.000076	<0.000077	<0.000083	
Endrin	0.002	BRL	0.000044	<0.000039	<0.000041	<0.000042	<0.000038	<0.000044	<0.000042	<0.000040	<0.000038	<0.000039	<0.000041	
gamma-BHC	0.0002	BRL	0.000044	<0.000039	<0.000041	<0.000042	<0.000038	<0.000044	<0.000042	<0.000040	<0.000038	<0.000039	<0.000041	
Heptachlor	0.0004	BRL	0.000044	<0.000039	<0.000041	<0.000042	<0.000038	<0.000044	<0.000042	<0.000040	<0.000038	<0.000039	<0.000041	
Heptachlor epoxide	0.0002	BRL	0.000044	<0.000039	<0.000041	<0.000042	<0.000038	<0.000044	<0.000042	<0.000040	<0.000038	<0.000039	<0.000041	
Methoxychlor	0.04	BRL	0.000088	<0.000079	<0.000083	<0.000084	<0.000075	<0.000088	<0.000084	<0.000081	<0.000076	<0.000077	<0.000083	
Toxaphene	0.003	BRL	0.00044	<0.00039	<0.00041	<0.00042	<0.00038	<0.00044	<0.00042	<0.00040	<0.00038	<0.00039	<0.00041	
<u>Explosives</u>														
1,3-Dinitrobenzene	0.0007	BRL	0.00012	<0.00011	<0.00011	<0.00012	<0.00011	<0.00011	<0.00012	<0.00011	<0.00011	<0.00011	<0.00011	
2,4-Dinitrotoluene	0.0001	0.0684	0.00011	<0.00010	<0.00010	<0.00011	<0.00010	<0.00010	<0.00011	<0.00010	<0.00010	<0.00010	<0.00010	
2,6-Dinitrotoluene	0.0003	0.0197	0.00011	<0.00010	<0.00010	<0.00011	<0.00010	<0.00010	<0.00011	<0.00010	<0.00010	<0.00010	<0.00010	
1,3,5-Trinitrobenzene	0.84	BRL	0.00023	<0.00021	<0.00022	<0.00022	<0.00022	<0.00021	<0.00023	<0.00022	<0.00021	<0.00022	<0.00021	
2,4,6-Trinitrotoluene	0.014	BRL	0.00012	<0.00011	<0.00011	<0.00012	<0.00011	<0.00011	<0.00012	<0.00011	<0.00011	<0.00011	<0.00011	
Nitrobenzene	0.014	BRL	0.00023	<0.00021	<0.00022	<0.00022	<0.00022	<0.00021	<0.00023	<0.00022	<0.00021	<0.00022	<0.00021	
HMX	1.4	0.044	0.00023	<0.00021	<0.00022	<0.00022	<0.00022	<0.00021	<0.00023	<0.00022	<0.00021	<0.00022	<0.00021	
RDX	0.084	0.00021	0.00023	<0.00021	<0.00022	<0.00022	<0.00022	<0.00021	<0.00023	<0.00022	<0.00021	<0.00022	<0.00021	
<u>Volatile Organic Compounds</u>														
1,1,1-Trichloroethane	0.2	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
1,1,2-Trichloroethane	0.005	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
1,1-Dichloroethane	1.4	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	

TABLE 5 (Continued): ANALYSIS OF GROUNDWATER SAMPLED AT MONITORING WELLS TB-118 THROUGH TB-124, THE MAIN QUARRY SUMP, AND THE THORNTON COMPOSITE RESERVOIR DURING THE ANNUAL MONITORING EVENT IN NOVEMBER 2023

Parameter	Part 620 Groundwater			Well									
	Standard	Maximum Background	Lab RL	TB-118	TB-119	TB-120	TB-121	TB-122	TB-123	TB-124	Sump	Sump-Dup <sup>2</sup>	Reservoir
-----Concentration (mg/L)-----													
1,1-Dichloroethene	0.007	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dichloroethane	0.005	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dichloropropane	0.005	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dibromo-3-Chloropropane	0.0002	BRL	0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
Ethylene Dibromide	0.00005	BRL	0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011	<0.000011
1,4-Dioxane	0.0077	BRL	0.019	<0.016	<0.018	<0.017	<0.017	<0.019	<0.016	<0.016	<0.016	<0.015	<0.017
2-Butanone	4.2	BRL	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Acetone	6.3	BRL	0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.019	<0.010	<0.010	<0.010
Benzene	0.005	BRL	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00071	<0.00050	<0.00050	<0.00050
Carbon disulfide	0.7	0.008	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Carbon tetrachloride	0.005	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Chlorobenzene	0.1	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Chloroform	0.07	BRL	0.002	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
cis-1,2-Dichloroethene	0.07	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Dichlorodifluoromethane	1.4	BRL	0.003	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Ethylbenzene	0.7	BRL	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Isopropylbenzene	0.7	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Methylene Chloride	0.005	BRL	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Methyl tert-butyl ether	0.07	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Styrene	0.1	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Tetrachloroethene	0.005	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Toluene	1	0.008	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0018	<0.00050	<0.00050	<0.00050
trans-1,2-Dichloroethene	0.1	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Trichloroethene	0.005	BRL	0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Trichlorofluoromethane	2.1	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Vinyl chloride	0.002	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Xylenes, Total	10	BRL	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.0010
<u>Semivolatiles Organic Compounds</u>													
1,2,4-Trichlorobenzene	0.07	0.05	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,2-Dichlorobenzene	0.6	0.049	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
1,4-Dichlorobenzene	0.075	0.048	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
2-Methylnaphthalene	0.028	0.034	0.0019	<0.0016	<0.0018	<0.0017	<0.0017	<0.0019	<0.0016	<0.0016	<0.0016	<0.0015	<0.0017
2-Methylphenol	0.35	BRL	0.0019	<0.0016	<0.0018	<0.0017	<0.0017	<0.0019	<0.0016	<0.0016	<0.0016	<0.0015	<0.0017
Acenaphthene	0.42	0.077	0.00096	<0.00079	<0.00088	<0.00083	<0.00085	<0.00096	<0.00079	<0.00079	<0.00078	<0.00076	<0.00086
Anthracene	2.1	BRL	0.00096	<0.00079	<0.00088	<0.00083	<0.00085	<0.00096	<0.00079	<0.00079	<0.00078	<0.00076	<0.00086
Benzo[a]anthracene	0.00013	BRL	0.00016	<0.00013	<0.00014	<0.00014	<0.00014	<0.00016	<0.00013	<0.00013	<0.00013	<0.00012	<0.00014
Benzo[a]pyrene	0.0002	BRL	0.00019	<0.00016	<0.00018	<0.00017	<0.00017	<0.00019	<0.00016	<0.00016	<0.00016	<0.00015	<0.00017
Benzo[b]fluoranthene	0.00018	BRL	0.00019	<0.00016	<0.00018	<0.00017	<0.00017	<0.00019	<0.00016	<0.00016	<0.00016	<0.00015	<0.00017
Benzo[k]fluoranthene	0.00017	BRL	0.00019	<0.00016	<0.00018	<0.00017	<0.00017	<0.00019	<0.00016	<0.00016	<0.00016	<0.00015	<0.00017
Benzoic acid	28	BRL	0.019	<0.016	<0.018	<0.017	<0.017	<0.019	<0.016	0.11	<0.016	<0.015	<0.017
Bis(2-ethylhexyl)phthalate	0.006	0.0052	0.0096	<0.0079	<0.0088	<0.0083	<0.0085	<0.0096	<0.0079	<0.0079	<0.0078	<0.0076	<0.0086

TABLE 5 (Continued): ANALYSIS OF GROUNDWATER SAMPLED AT MONITORING WELLS TB-118 THROUGH TB-124, THE MAIN QUARRY SUMP, AND THE THORNTON COMPOSITE RESERVOIR DURING THE ANNUAL MONITORING EVENT IN NOVEMBER 2023

Parameter	Part 620 Groundwater Standard	Maximum Background	Lab RL	Well									Sump-Dup <sup>2</sup>	Reservoir
				TB-118	TB-119	TB-120	TB-121	TB-122	TB-123	TB-124	Sump			
Concentration (mg/L)														
Chrysene	0.012	BRL	0.00019	<0.00016	<0.00018	<0.00017	<0.00017	<0.00019	<0.00016	<0.00016	<0.00016	<0.00015	<0.00017	
Dibenz[a,h]anthracene	0.0003	BRL	0.00029	<0.00024	<0.00026	<0.00025	<0.00025	<0.00029	<0.00024	<0.00024	<0.00023	<0.00023	<0.00026	
Diethyl phthalate	5.6	BRL	0.0048	<0.0040	<0.0044	<0.0042	<0.0042	<0.0048	<0.0039	<0.0040	<0.0039	<0.0038	<0.0043	
Di-n-butyl phthalate	0.7	BRL	0.0048	<0.0040	<0.0044	<0.0042	<0.0042	<0.0048	<0.0039	<0.0040	<0.0039	<0.0038	<0.0043	
Fluoranthene	0.28	0.113	0.00096	<0.00079	<0.00088	<0.00083	<0.00085	<0.00096	<0.00079	<0.00079	<0.00078	<0.00076	<0.00086	
Fluorene	0.28	BRL	0.00096	<0.00079	<0.00088	<0.00083	<0.00085	<0.00096	<0.00079	<0.00079	<0.00078	<0.00076	<0.00086	
Hexachlorocyclopentadiene	0.05	BRL	0.019	<0.016	<0.018	<0.017	<0.017	<0.019	<0.016	<0.016	<0.016	<0.015	<0.017	
Indeno[1,2,3-cd]pyrene	0.00043	BRL	0.00019	<0.00016	<0.00018	<0.00017	<0.00017	<0.00019	<0.00016	<0.00016	<0.00016	<0.00015	<0.00017	
Naphthalene	0.14	BRL	0.00096	<0.00079	<0.00088	<0.00083	<0.00085	<0.00096	<0.00079	<0.00079	<0.00078	<0.00076	<0.00086	
Pentachlorophenol	0.001	0.169	0.0003	<0.00025	<0.00029	<0.00030	<0.00026	<0.00025	<0.00025	<0.00023	<0.00023	<0.00024	<0.00026	
Phenolics, Total	0.1	0.062	0.005	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.023	<0.0050	<0.0050	<0.0050	
Pyrene	0.21	0.126	0.00096	<0.00079	<0.00088	<0.00083	<0.00085	<0.00096	<0.00079	<0.00079	<0.00078	<0.00076	<0.00086	
Radioactivity														
pCi/L														
Radium-226	20	4.31	0.461	2.28	1.48	0.949	1.93	1.18	1.25	<0.422	0.52	0.469	<0.461	
Radium-228	20	2.58	0.96	1.54	1.1	1.3	1.58	1.31	1.1	1.1	0.891	1.41	1.11	

<sup>1</sup> RL: Laboratory reporting limit. Where analyses for the same parameter had different RLs, the maximum RL is shown.

<sup>2</sup> Duplicate sample.

<sup>3</sup> NL: No existing limit.

<sup>4</sup> NRR: No reportable result due to likely sample misidentification.

<sup>5</sup> BRL: Below reporting limit in background monitoring samples.

<sup>6</sup> NRR: No reportable result due to analytical interference that was not resolved by re-analysis.

<sup>7</sup> ND: Not determined during background monitoring.

<sup>8</sup> Extracted and analyzed beyond holding time.

## REFERENCES

- Black & Veatch, 2014, “Background Groundwater Quality Report for Thornton Composite Reservoir,” prepared for the Metropolitan Water Reclamation District of Greater Chicago, July 2014.
- Black & Veatch, 2016, “Revised Groundwater Monitoring Plan, Groundwater Protection System for Thornton Composite Reservoir,” prepared for the Metropolitan Water Reclamation District of Greater Chicago, May 2016.
- Illinois Environmental Protection Agency, 2012, 35 Illinois Administrative Code (IAC) Part 620 Class I Groundwater Standards, 2012.
- Illinois Pollution Control Board, 2013, Illinois Administrative Code Title 35: Environmental Protection, Subtitle F: Potable Water Supplies, Chapter I: Pollution Control Board, Part 620 – Groundwater Quality, October 7, 2013.