Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

MONITORING AND RESEARCH DEPARTMENT

REPORT NO. 20-33

THORNTON COMPOSITE RESERVOIR

GROUNDWATER MONITORING REPORT

THIRD QUARTER 2020

November 2020

Metropolitan Water Reclamation District of Greater Chicago
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Thornton Composite Reservoir Groundwater Monitoring Report

Third Quarter 2020

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November 19, 2020

Mr. Richard P. Cobb, P.G.
Division Manager
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Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794
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Dear Mr. Cobb:

Subject: Transmittal of the Report "Thornton Composite Reservoir Groundwater Monitoring Report Third Quarter 2020"

Please find attached the report entitled "Thornton Composite Reservoir Groundwater Monitoring Report Thirds Quarter 2020" 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@mwrd.org.

Very truly yours,

Albert E. Cox, Ph.D.
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AC:BM:cm
Attachment
cc: Mr. M. Summer, IEPA
Mr. E. Podczerwinski

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LIST OF ACRONYMS

Acronym	Definition
CCD	Chicago City Datum
CFU	Colony Forming Unit
CSF	Combined Sewer Flow
GMP	Groundwater Monitoring Plan
GPS	Groundwater Protection System
IAC	Illinois Administrative Code
TCR	Thornton Composite Reservoir
TOC	Total Organic Carbon

ACKNOWLEDGMENT

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 the Thornton Composite Reservoir Contract 20-100-11. Analyses were performed by the Analytical Laboratories Division and the Analytical Microbiology Section of the Metropolitan Water Reclamation District of Greater Chicago. Special thanks are due to Ms. Coleen Maurovich for typing and formatting this report.

DISCLAIMER

Mention of proprietary equipment and chemicals in this report does not constitute endorsement by the Metropolitan Water Reclamation District of Greater Chicago.

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 of 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, bi-weekly sampling is required while the water in the reservoir remains above an elevation of -280 ft 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 multi-level monitoring wells is capable of monitoring four distinct 20-ft intervals in the Silurian Dolomite aquifer.

The locations of 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 CCD ft). 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

FIGURE 1: MONITORING WELL AND MAIN QUARRY SUMP LOCATIONS

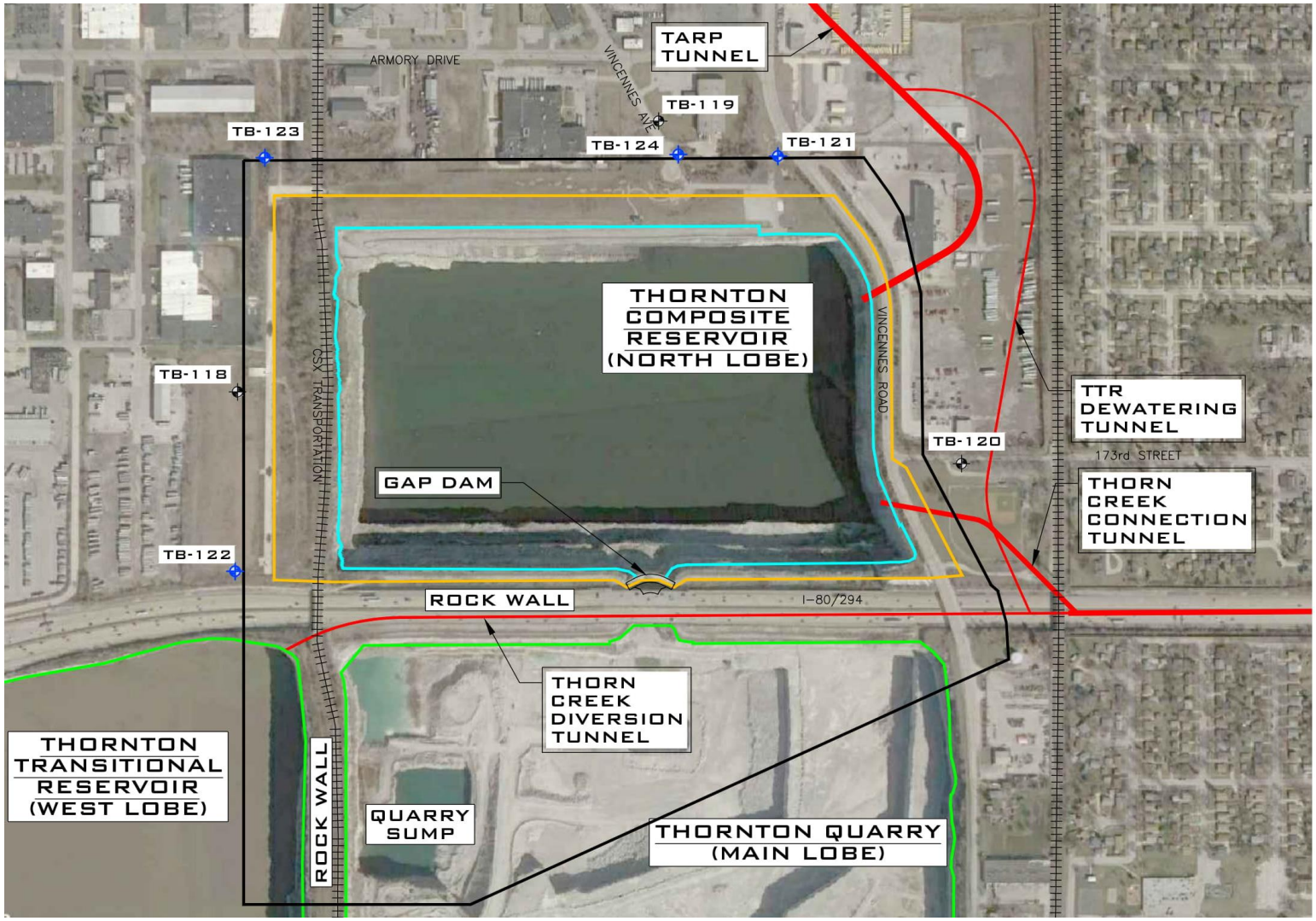

TABLE 1: CHARACTERISTICS OF MONITORING WELLS TB-118 THROUGH TB-124 AT THE THORNTON COMPOSITE RESERVOIR SITE

Well ID	Coordinates[1]		Ground Surface Elevation (ft, CCD[2])	Top of Riser Elevation (ft, CCD[2])	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	1,792,200.77	695,591.56	29.6	29.2	728	-663 to -698			

[1]Illinois State Plane Coordinate System (NAD 1927).
[2]Chicago City Datum (CCD).

will also be compared with the IAC Title 35 Part 620 Class I Groundwater Standards (IPCB, IEPA, 2013) to evaluate any exceedances in groundwater standards.

There were no fill events during the third quarter of 2020. One complete set of samples was collected at the Main Quarry Sump and all monitoring wells as part of quarterly monitoring event sampling from September 22 – 25, 2020.

This report presents field activities, observations, and analytical data for surface and groundwater monitoring samples taken at the Main Quarry Sump and at all monitoring wells during quarterly monitoring event sampling conducted from September 22 – 25, 2020.

FIELD ACTIVITIES

For this report period, one complete set of samples was collected as part of quarterly monitoring event sampling at the Main Quarry Sump, the deep well, and at sampling port interval 3 of all multi-level wells except TB-120, which was sampled at port intervals 3 and 4 due to unexpected pressure data recorded during initial sampling at port interval 3. Samples were collected according to the schedule listed in Table 2.

Using a Myron L Ultrameter 6P pH/conductivity/temperature meter, the pH, electrical conductivity (EC), and temperature of each sample were measured and recorded immediately after collection.

Prior to sampling the multi-level wells, hydrostatic pressure was measured to calculate the groundwater elevation at Port 3 of each well except TB-120, and at Port 4 of well TB-120. Table 3 lists the elevations at the applicable sampling port of each well and the corresponding groundwater elevations during the quarterly monitoring event sampling from September 22 - 25, 2020.

All samples were packed in ice and transported to the Metropolitan Water Reclamation District of Greater Chicago's (District) 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 analysis.

TABLE 2: DEVICES AND CORRESPONDING DATES OF SAMPLING DURING QUARTERLY MONITORING EVENT SAMPLING IN SEPTEMBER 2020

Date of Sampling	Event	Device/Structure Sampled
09/22/2020	Quarterly monitoring	TB-119, TB-119 Duplicate, TB-124
09/23/2020	Quarterly monitoring	TB-121
09/24/2020	Quarterly monitoring	TB-118, TB-120, TB-123
09/25/2020	Quarterly monitoring	TB-122, Sump

TABLE 3: SUMMARY OF GROUNDWATER ELEVATIONS AT SAMPLING PORTS OF EACH WELL AND CORRESPONDING GROUNDWATER ELEVATIONS DURING THE QUARTERLY MONITORING EVENT SAMPLING IN SEPTEMBER 2020

Sample Date	Well ID	Sampling Port Sampled	Sampling Port Elevation	Groundwater Elevation
			---------- (ft CCD[1]) ----------	
05/04/2020	TB-118	3	-289	-87
05/04/2020	TB-119	3	-289	-164
05/07/2020	TB-120	3, 4	-290, -399	ND2
05/07/2020	TB-121	3	-288	-170
05/04/2020	TB-122	3	-288	-160
05/05/2020	TB-123	3	-288	-50
05/06/2020	TB-124[3]	NA[4]	NA	-338

[1]Chicago City Datum.

[2]No data. Pressure outside the well casing could not be reported due to a probe malfunction.

[3]TB-124 is a conventional well screened from -663 to -698 ft CCD. During September, one sample was taken at approximately 650 ft below ground surface.

[4]NA = Not Applicable.

ANALYTICAL RESULTS

Table 4 lists the analytical methods used by the laboratory for various 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 and the Main Quarry Sump sample collected during the quarterly monitoring event sampling from September 22 – 25, 2020 are presented in Table 5. There were a few exceedances of the Part 620 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 values higher than the background maximum. Fecal coliform was not detected in any sample (Table 5).

TABLE 4: ANALYTICAL METHODS USED FOR REQUIRED PARAMETERS

Analytical Parameters	Analytical Method
Chloride, Sulfate	EPA 300.0 Rev 2.1
Total Dissolved Solids	SM 2540-C
Metals except Calcium, Magnesium	EPA 200.8
Calcium, Magnesium	EPA 200.7
Ammonia (as N)	EPA 350.1
TOC	SM 5310-C
Phenols	EPA 420.4
Fecal Coliform	SM 9222D

TABLE 5: ANALYSIS OF GROUNDWATER SAMPLED FROM MONITORING WELLS TB-118 THROUGH TB-124 AND THE MAIN QUARRY SUMP AT THE THORNTON COMPOSITE RESERVOIR SITE FOR THE QUARTERLY SAMPLING MONITORING IN SEPTEMBER 2020

Parameter	Unit	Part 620 Groundwater Standard	Maximum Background	Lab RL[1]	Well								Sump
					TB-118	TB-119	TB-119D[2]	TB-120	TB-121	TB-122	TB-123	TB-124	
pH		6.5 - 9.0	8.4	NL[3]	**10.1**	**9.1**	**9.1**	8.8	**10.3**	8.5	**9.3**	**13.0**	**9.2**
EC	mS/m	NL	415	NL	214	86	86	55	163	141	92	226	163
TDS	mg/L	1,200	2,960	25	**1,722**	512	530	494	1,038	**1,298**	712	**1,400**	**1,708**
TOC	"	NL	1	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	15.9	<5.0
Chloride	"	200	1,230	1	**397**	70	68	86	**304**	**201**	63	**303**	**201**
Sulfate	"	400	890	1	206	111	110	65	202	80	125	**654**	**461**
Ammonia as N	"	NL	ND[4]	0.30	0.55	0.62	0.55	0.49	0.66	0.53	0.68	1.75	<0.30
Total Phenol	"	0.1	0.06	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.014	<0.005
Fecal Coliform	CFU/100 mL	NL	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<10[5]
Ag	mg/L	0.05	0.003	0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
B	"	2	3.8	0.005	0.742	0.891	0.863	0.200	1.02	**2.42**	1.79	0.568	0.403
Be	"	0.004	0.002	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002
Co	"	1	0.035	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.007
Cr	"	0.1	86.4	0.002	<0.004	<0.004	0.008	<0.004	<0.004	0.006	0.015	<0.004	<0.004
Cu	"	0.65	0.004	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002
Mn	"	0.15	0.183	0.005	0.005	0.005	0.006	0.050	0.003	0.004	0.004	<0.002	0.003
Se	"	0.05	0.008	0.002	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
V	"	0.049	ND	0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zn	"	5	10	0.005	0.023	0.062	0.036	4.54	0.044	0.022	0.057	3.34	<0.010
Ca	"	NL	276	0.5	174	86.5	85.4	57.1	141	74.6	82.2	37.8	126
Mg	"	NL	153	0.5	83.6	44.2	43.8	18.0	71.9	37.7	43.6	<0.50	110

[1]Lab reporting limit. Limits may vary among analyses due to dilution.
[2]Duplicate sample.
[3]No existing limit.
[4]Not determined. Analyses were not conducted during background monitoring.
[5]Reporting limit is higher due to dilution during analysis.

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, 2016c, "Revised Groundwater Monitoring Plan, Groundwater Protection System for Thornton Composite Reservoir," prepared for the Metropolitan Water Reclamation District of Greater Chicago, May 2016.

Illinois EPA, 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.