

*Protecting Our Water Environment*



*Metropolitan Water Reclamation District of Greater Chicago*

***MONITORING AND RESEARCH  
DEPARTMENT***

*REPORT NO. 21-26*

*TUNNEL AND RESERVOIR PLAN UPPER DES PLAINES TUNNEL  
SYSTEM ANNUAL GROUNDWATER MONITORING REPORT FOR 2020*

*July 2021*

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July 19, 2021

Chief  
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Springfield, IL 62794-9276

Dear Sir or Madam:

Subject: Tunnel and Reservoir Plan Upper Des Plaines Tunnel System Annual  
Groundwater Monitoring Report for 2020

Attached are three copies of "Tunnel and Reservoir Plan Upper Des Plaines Tunnel System  
Annual Groundwater Monitoring Report for 2020."

Very truly yours,



Albert Cox  
Environmental Monitoring and Research Manager  
Monitoring and Research Department

AC:EE:lf  
Attachment  
cc w/att: Mr. Ryan Bahr (USEPA Region 5 - WC15J) - (2)  
          Mr. E. Podczerwinski  
          Dr. H. Zhang  
cc w/o att: Mr. J. Murray  
          Mr. S. Serafino

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**TUNNEL AND RESERVOIR PLAN UPPER DES PLAINES TUNNEL SYSTEM  
ANNUAL GROUNDWATER MONITORING REPORT FOR 2020**

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## LIST OF ABBREVIATIONS

°C	degrees Celsius
CCD	Chicago City Datum
CFU	colony forming units
Cl <sup>-</sup>	chloride
District	Metropolitan Water Reclamation District of Greater Chicago
EC	electrical conductivity
FC	fecal coliform
IEPA	Illinois Environmental Protection Agency
L	liter
m	meter
mg	milligram
mS	millisiemens
NH <sub>3</sub> -N	ammonia nitrogen
SO <sub>4</sub> <sup>2-</sup>	sulfate
TARP	Tunnel and Reservoir Plan
TDS	total dissolved solids
Temp.	temperature
TOC	total organic carbon
UDP	Upper Des Plaines

# ANNUAL DATA FOR MONITORING WELLS

## Introduction

This system consists of two subsystems, Upper Des Plaines (UDP) 20 and UDP 21. The UDP 20 contains six monitoring wells, MW-1 through MW-6, while the UDP 21 contains three monitoring wells, MW-7 through MW-9 ([Figure 1](#)). Groundwater elevations in the monitoring wells were measured during each sampling event. In addition, groundwater elevations were measured biweekly, since these wells also function as observation wells. The monitoring wells were sampled based on the modified groundwater monitoring program for the Metropolitan Water Reclamation District of Greater Chicago's (District)'s Tunnel and Reservoir Plan (TARP) as briefly described below.

## Modified Groundwater Monitoring Program

In a letter dated July 13, 2017, the Illinois Environmental Protection Agency (IEPA) accepted the modifications for the District's TARP groundwater monitoring program effective in January 2017 for a period of three years (2017–2019). Under the revised monitoring plan, four wells (MW-5, MW-6, MW-7, and MW-8), which had fecal coliform (FC) detected in 10 percent or more of samples during the period 1995–2013, will be sampled for four TARP tunnel fill events, based on the water levels in the TARP following storm events (fill event-based). The criterion that triggers a fill event sampling is that the level of water in the TARP Mainstream tunnels reaches -150 feet Chicago City Datum (CCD). At each event, sampling was done weekly for three weeks. The samples collected during the first week of sampling were analyzed for all parameters in the current monitoring program, including pH, temperature, electrical conductivity, total dissolved solids, hardness, ammonia, total organic carbon, chloride, sulfate, and FC. However, the samples from the second and third weeks were analyzed for FC only. The modified program continued to operate in 2020 and beyond until a new program structure is approved by IEPA in 2021.

The other five wells associated with the UDP Tunnel System were sampled once per year under the modified monitoring plan. These wells had FC detected in less than 10 percent of samples during the period 1995–2013.

## Summary of Data for Monitoring Wells

During 2020, there were three tunnel fill events on the following dates: April 30, 2020, May 15, 2020, and October 22, 2020. Sampling was not conducted at the first two fill events with the suspension of TARP monitoring approved by IEPA due to the COVID-19 pandemic. Groundwater sampling was only conducted during the fill event observed on October 22, 2020.

The analytical data for groundwater sampled during 2020 from fill event-based monitoring wells MW-5 through MW-8 is presented in [Table 1](#). Physical characteristics, such as elevation, groundwater temperature, and estimated time of recharge for each well between initial drawdown and sampling, are also included. The FC data for groundwater sampled during 2020 from these monitoring wells are presented in [Table 2](#). The analytical data for groundwater from the wells



FIGURE 1: MAP OF MONITORING WELLS IN THE UPPER DES PLAINES TUNNEL SYSTEM

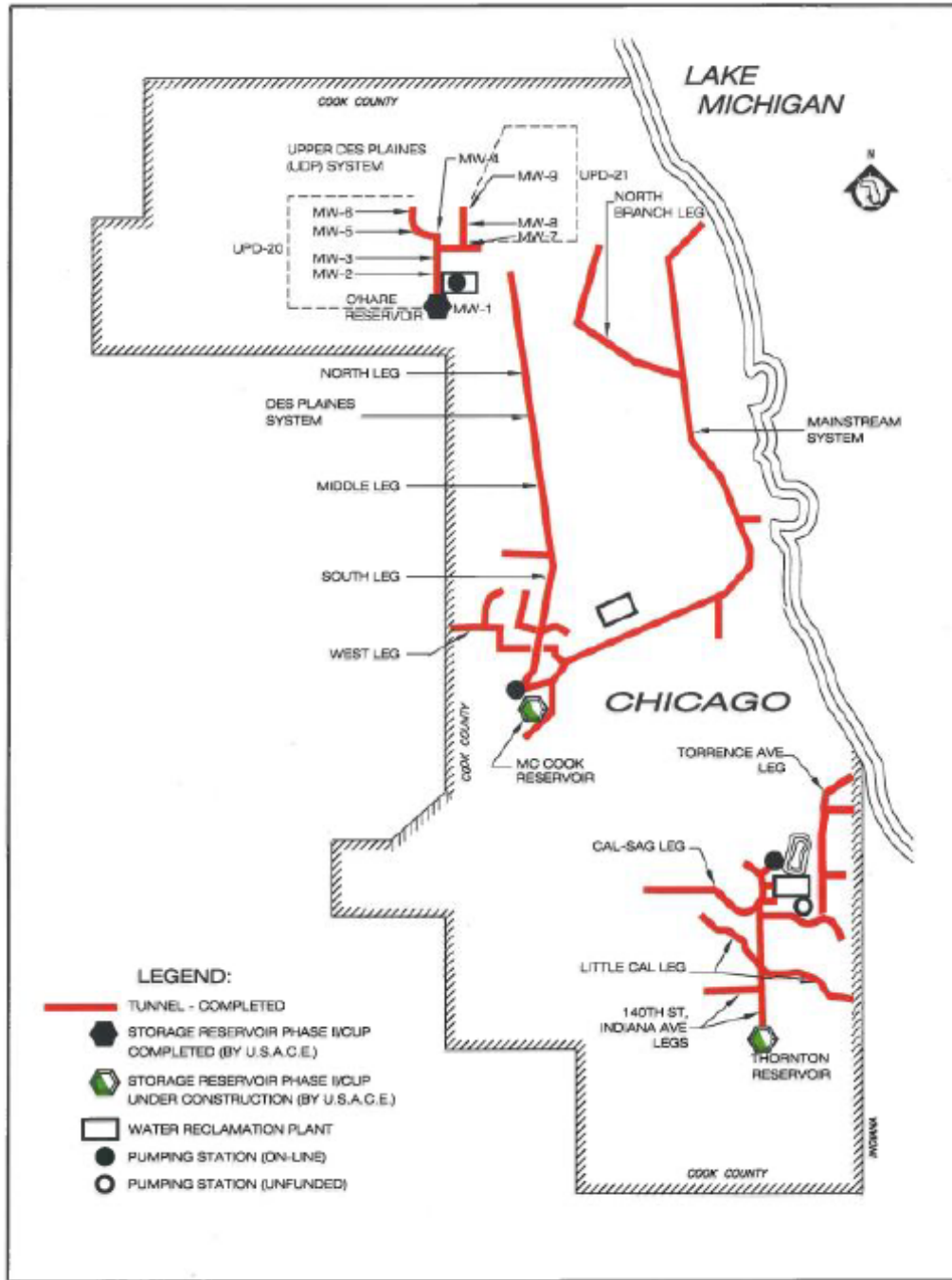


TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS IN GROUNDWATER FROM FILL EVENT MONITORING WELLS IN THE UPPER DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2020

Well	Fill Event <sup>1</sup>	Sample Date	pH	EC mS/m	TDS	TOC	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	NH <sub>3</sub> -N	Hardness	Temp. °C	Water Elevation <sup>2</sup> feet	Recharge Time hours
					-----			-----	-----				
								mg/L					
MW-5	F3	10/29/20	7.9	49	522	<5.0	50	248	<0.30	283	14.3	-49	<48
MW-6	F3	10/28/20	7.8	78	678	<5.0	39	337	0.58	376	13.3	67	<4
MW-7	F3	10/28/20	7.4	85	766	<5.0	41	366	0.61	478	14.9	22	<4
MW-8	F3	10/29/20	7.8	49	474	<5.0	48	204	<0.30	258	15.4	-28	<48

<sup>1</sup>Fill events 1 and 2 were not sampled due to the COVID-19 pandemic.

<sup>2</sup>Relative to Chicago City Datum (579.48 ft above mean sea level) at intersection of State and Madison Streets.

TABLE 2: ANALYSIS OF FECAL COLIFORM IN GROUNDWATER FROM FILL EVENT MONITORING WELLS IN THE UPPER DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2020

Well	Fill Event <sup>1</sup>	Sample Date <sup>2</sup>	Fecal Coliform, CFU/100 mL		
			Week 1	Week 2	Week 3
MW-5	F3	10/29/20	<1	NReq <sup>3</sup>	NReq
MW-6	F3	10/28/20	<1	NReq	NReq
MW-7	F3	10/28/20	<1	NReq	NReq
MW-8	F3	10/29/20	<1	NReq	NReq

<sup>1</sup>Fill events 1 and 2 were not sampled due to the COVID-19 pandemic.

<sup>2</sup>Sampling date of the first week of the fill event.

<sup>3</sup>NReq: Sampling is not required because the fecal coliform level was below detection limit in the previous week.

sampled once per year are presented in Table 3. FC counts in all the annual sampling wells were undetectable (<1 CFU/100 mL).

Groundwater elevations in monitoring wells MW-1 through MW-9 were calculated relative to the CCD (579.48 feet above mean sea level) at the intersection of State and Madison Streets and are presented in Table 4. The minimum, mean, and maximum values for each well were calculated and plotted to determine fluctuations in groundwater elevations during the year (Figure 2). Fluctuations in groundwater elevation were mainly evident in wells MW-1, MW-5, and MW-8 during 2020.

TABLE 3: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM ANNUAL SAMPLING WELLS IN THE UPPER DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2020

Well	Sample Date	pH	EC mS/m	TDS	TOC	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	NH <sub>3</sub> -N	Hardness	Temp.	Water Elevation <sup>1</sup> feet	Fecal Coliform CFU/100 mL
				-----mg/L-----								
MW-1	06/25/20	7.8	82	760	<1.0	33	369	0.49	433	15.5	-3.0	<1
MW-2	06/23/20	7.7	86	858	<1.0	64	404	0.61	498	15.3	48	<1
MW-3	06/25/20	7.9	83	796	<1.0	16	430	0.37	450	15.4	43	<1
MW-4	03/11/20	7.3	70	918	NRR <sup>2</sup>	76	376	<0.30	507	13.9	1.5	<1
MW-9	03/11/20	7.8	57	720	NRR	31	344	0.45	323	14.5	13	<1

<sup>1</sup>Relative to Chicago City Datum (579.48 feet above mean sea level) at intersection of State and Madison Streets.

<sup>2</sup>No result reported due to exceeding sample holding time under COVID-19 pandemic minimal staffing.

TABLE 4: GROUNDWATER ELEVATIONS FOR OBSERVATION WELLS MW-1 THROUGH MW-9 IN THE UPPER DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN MEASURED DURING 2020

Date <sup>1</sup>	Observation Well Number								
	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9
	-----Elevation (feet) <sup>2</sup> -----								
01/24/20	40	51	NA <sup>3</sup>	3	-46	70	NA	23	10
02/07/20	40	49	44	3	-45	70	24	23	10
02/21/20	39	48	44	2	-46	70	23	23	9
03/05/20	41	49	43	3	-46	70	24	22	10
06/08/20	40	49	44	13	-36	69	25	29	12
06/26/20	-19	49	40	6	-36	67	21	28	12
07/07/20	40	47	41	2	-35	65	20	27	13
07/24/20	38	47	42	1	-36	65	20	26	11
08/10/20	38	46	41	1	-35	65	21	24	12
08/28/20	38	46	41	1	-34	64	21	25	10
09/15/20	37	48	37	0	-35	66	21	24	11
09/30/20	38	48	41	2	-34	66	22	25	10
10/20/20	38	47	42	1	-35	65	21	24	6
11/03/20	38	47	42	3	-58	57	22	-39	5
11/12/20	38	47	41	2	-49	66	21	24	5
11/23/20	38	45	41	3	-39	67	21	20	6
12/14/20	39	48	41	3	-35	67	21	21	6
12/18/20	39	47	41	NA	-36	67	22	21	6

<sup>1</sup>Date measurements were taken. No measurements made from mid-March to May with IEPA's approval of TARP monitoring suspension due to the COVID-19 pandemic.

<sup>2</sup>Relative to Chicago City Datum (579.48 feet above mean sea level) at intersection of State and Madison Streets.

<sup>3</sup>No measurements were obtained due to blockage at MW-3, MW-7 well casing or freezing conditions at MW-4.

FIGURE 2: MINIMUM, MEAN, AND MAXIMUM WATER ELEVATIONS FOR MONITORING/OBSERVATION WELLS MW-1 THROUGH MW-9 IN THE UPPER DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN MEASURED DURING 2020

