

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 23-23

TUNNEL AND RESERVOIR PLAN

GLORIA ALITTO MAJEWSKI CHICAGO UNDERFLOW PLAN

RESERVOIR WATER QUALITY MONITORING WELLS

ANNUAL GROUNDWATER MONITORING REPORT

FOR 2022

July 2023

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CECIL LUE-HING RESEARCH AND DEVELOPMENT COMPLEX
6001 West Pershing Road Cicero, Illinois 60804-4112

July 17, 2023

Mr. Sanjay Sofat
Bureau of Water
Illinois Environmental Protection Agency
P. O. Box 19276
Springfield, IL 62794-9276

Dear Mr. Sofat:

Subject: Tunnel and Reservoir Plan Gloria Alitto Majewski Chicago Underflow Plan
Reservoir Water Quality Monitoring Wells Annual Groundwater Monitoring
Report for 2022

The report entitled “Tunnel and Reservoir Plan Gloria Alitto Majewski Chicago Underflow
Plan Reservoir Water Quality Monitoring Wells Annual Groundwater Monitoring Report for 2022” is
attached.

Very truly yours,



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

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

Metropolitan Water Reclamation District of Greater Chicago
100 East Erie Street Chicago, Illinois 60611-2803 (312) 751-5600

**TUNNEL AND RESERVOIR PLAN
GLORIA ALITTO MAJEWSKI CHICAGO UNDERFLOW PLAN
RESERVOIR WATER QUALITY MONITORING WELLS
ANNUAL GROUNDWATER MONITORING REPORT
FOR 2022**

By

**Essam El-Naggar
Environmental Soil Scientist**

**Guanglong Tian
Principal Environmental Scientist**

**Albert Cox
Environmental Monitoring and Research Manager**

**Heng Zhang
Assistant Director of Monitoring and Research
Environmental Monitoring and Research Division**

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LIST OF ABBREVIATIONS

Abbreviation	Definition
°C	degrees Celsius
CFU	colony forming units
Cl ⁻	chloride
EC	electrical conductivity
m	meter
mg	milligram
mL	milliliter
mS	millisiemens
NH ₃ -N	ammonia nitrogen
SO ₄ ²⁻	sulfate
TDS	total dissolved solids
Temp.	temperature
TOC	total organic carbon

ANNUAL DATA FOR MONITORING WELLS

Introduction

Four monitoring wells, QK-1 through QK-4, are located on the perimeter of the Gloria Alitto Majewski Chicagoland Underflow Plan Reservoir (Reservoir). Well QK-1 is positioned at the northwest corner of the Reservoir, with QK-2, QK-3, and QK-4 at the northeast, southeast, and southwest corners, respectively ([Figure 1](#)). In addition, there are nine privately owned water supply wells, W1X through W9X, which are located within 1,000 feet of the Reservoir. The four monitoring wells are sampled quarterly and for at least six consecutive weeks following each Reservoir fill event in which the Reservoir is used to store combined sewer flow from the Metropolitan Water Reclamation District of Greater Chicago's Tunnel and Reservoir Plan system (Illinois Environmental Protection Agency memorandum dated October 14, 1997). Fill-event samples may substitute for quarterly samples, depending on the occurrence of fill events. Groundwater elevations are also measured during each sampling event. There are no observation wells associated with this site.

In 2022, three fill events were observed on March 31, April 22, and May 3, 2022. Extended sampling was implemented for the monitoring wells (QK1, QK-2, QK-3, and QK-4) during these fill events. Following the first fill event, the four monitoring wells were sampled once a week for three consecutive weeks. Subsequently, wells were sampled during the week when the second fill event occurred, and following the third fill event, for six consecutive weeks. Monitoring wells were also sampled during the first, third, and fourth quarters of 2022.

Summary of Data

Monitoring Wells. The analytical data for groundwater sampled during 2022 from monitoring wells QK-1 through QK-4 are presented in [Table 1](#). Physical characteristics, such as elevation, groundwater temperature, and estimated time of recharge for each well between initial pump-down and sampling, are also included along with summary statistics for the fill events data. For total organic carbon and ammonia nitrogen results below reporting limit, the reported limits were used in summary statistics calculations.

TABLE 1: ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Event	Sample Date	pH	EC ¹ mS/m	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻ mg/L	NH ₃ -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation ² feet	Recharge Time hours
-----Well QK-1-----													
1 st Quarter	03/17/22	7.2	129	1,458	<5.0	63	771	<0.30	962	<1	18.1	-76	<4
1 st Fill	04/07/22	7.0	136	1,500	<5.0	74	757	0.50	927	1,200	11.5	-62	<4
	04/12/22	7.1	141	2,034	<10.0	63	767	0.30	932	1,400	12.6	-74	<4
	04/19/22	7.1	139	1,492	<5.0	62	759	<0.30	971	410	11.3	-77	<4
	Minimum	7.0	136	1,492	<5.0	62	757	<0.30	927	410	11.3	-77	
	Median	7.1	139	1,500	5.0	63	759	0.30	932	1,200	11.5	-74	
	Mean	7.0	139	1,675	6.7	66	761	0.37	943	1,003	11.8	-71	
	Maximum	7.1	141	2,034	<10	74	767	0.50	971	1,400	12.6	-62	
	Std. Dev.	0.1	2	311	2.9	7	5	0.11	24	523	0.7	8	
Coeff. of Var. %	0.8	2	19	43	10	1	31	3	52	5.9	11		
2 nd Fill	04/26/22	6.9	140	1,500	<5.0	61	745	<0.30	956	74	11.5	-74	<4
3 rd Fill	05/04/22	7.1	148	1,480	<5.0	61	742	<0.30	843	220	13.2	-76	<4
	05/11/22	7.0	147	1,580	<5.0	63	NDR ³	<0.30	823	8	14.2	-74	<4
	05/19/22	7.1	146	1,568	<5.0	63	750	<0.30	867	1	13.2	-76	<4
	05/24/22	7.0	141	1,502	<5.0	62	742	<0.30	1,029	1	12.8	-75	<4
	06/01/22	7.0	150	1,478	<5.0	65	772	0.42	946	1	14.9	-73	<4
	06/08/22	7.0	148	1,550	<5.0	68	771	<0.30	1,072	<1	13.0	-76	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Event	Sample Date	pH	EC ¹ mS/m	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻ mg/L	NH ₃ -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation ² feet	Recharge Time hours	
	Minimum	7.0	141	1,478	<5.0	61	742	<0.30	823	<1	12.8	-76		
	Median	7.0	148	1,526	<5.0	63	750	0.30	907	1	13.2	-75		
	Mean	7.0	147	1,526	<5.0	63	756	0.32	930	39	13.6	-75		
	Maximum	7.1	150	1,580	<5.0	68	772	0.42	1,072	220	14.9	-73		
	Std. Dev.	0.0	3	45	0.0	3	15	0.05	103	89	0.8	1		
	Coeff. of Var. %	0.5	2	3	0.0	4.0	2.0	15	11	230	6.0	2		
4	3 rd Quarter	08/09/22	6.9	136	1,500	<5.0	63	755	<0.30	1,000	<1	14.0	-75	<4
	4 th Quarter	10/19/22	7.1	137	1,480	<5.0	56	716	<0.30	948	<1	12.3	-76	<4
-----Well QK-2-----														
	1 st Quarter	03/17/22	7.6	84	824	<5.0	5	521	<0.30	481	<1	13.3	-83	<4
	1 st Fill	04/07/22	7.8	87	894	<5.0	5	528	<0.30	458	<1	12.0	-77	<4
		04/12/22	7.8	92	920	<5.0	5	555	<0.30	513	<1	12.4	-81	<4
		04/19/22	7.7	92	944	<5.0	5	498	<0.30	498	<1	11.9	-83	<4
	Minimum	7.7	87	894	<5.0	5	528	<0.30	458	<1	11.9	-83		
	Median	7.8	92	920	<5.0	5	540	<0.30	498	<1	12.0	-81		
	Mean	7.8	90	919	<5.0	5	541	<0.30	490	<1	12.1	-80		
	Maximum	7.8	92	944	<5.0	5	555	<0.30	513	<1	12.4	-77		
	Std. Dev.	0.1	2.6	25	0	0	13	0	28.4	0	0.3	3		
	Coeff. of Var. %	0.7	3	3	0	0	2	0	6	0	2.2	4		

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Event	Sample Date	pH	EC ¹ mS/m	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻ mg/L	NH ₃ -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation ² feet	Recharge Time hours
2 nd Fill	04/26/22	7.9	81	942	<5.0	5	524	<0.30	498	<1	12.1	-78	<4
3 rd Fill	05/04/22	NS ⁴	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	<4
	05/11/22	7.6	93	956	<5.0	5	NDR	<0.30	447	43	14.2	-83	<4
	05/19/22	7.7	94	958	<5.0	5	499	<0.30	510	180	13.5	-82	<4
	05/24/22	7.7	88	926	<5.0	5	491	<0.30	521	290	13.3	-82	<4
	06/01/22	7.8	91	876	<5.0	5	499	<0.30	445	13	14.4	-81	<4
	06/08/22	7.9	88	868	<5.0	5	511	<0.30	520	22	13.6	-81	<4
	Minimum	7.6	88	868	<5.0	5	491	<0.30	445	7	13.3	-83	
	Median	7.7	91	926	<5.0	5	499	<0.30	510.0	33	13.6	-82	
	Mean	7.7	91	917	<5.0	5	500	<0.30	488.6	93	13.8	-82	
	Maximum	7.9	94	958	<5.0	0	511	<0.30	521	290	14.4	-81	
	Std. Dev.	0.1	2.8	43	0	0	8.2	0.0	39	116	0.5	0.8	
	Coeff. of Var. %	1.1	3.1	4.7	0	0	1.6	0.0	8.0	126	3.4	-1.0	
3 rd Quarter	08/09/22	7.8	89	864	<5.0	5	522	<0.30	476	<1	14.5	-82	<4
4 th Quarter	10/19/22	7.8	91	916	<5.0	5	497	<0.30	463	<1	12.4	-81	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Event	Sample Date	pH	EC ¹ mS/m	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻ mg/L	NH ₃ -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation ² feet	Recharge Time hours
-----Well QK-3-----													
1 st Quarter	03/17/22	8.1	76	706	<5.0	67	276	0.60	448	<1	12.2	-90	<4
1 st Fill	04/07/22	7.3	106	1,080	<5.0	115	442	<0.30	620	2,400	11.6	-77	<4
	04/12/22	7.5	104	834	<5.0	81	339	0.40	494	170	12.3	-87	<4
	04/19/22	7.5	81	814	<5.0	70	334	0.44	481	91	11.5	-88	<4
	Minimum	7.3	81	814	<5.0	70	334	<0.30	481	91	11.5	-88	
	Median	7.5	104	834	<5.0	81	339	0.40	494	170	11.6	-87	
	Mean	7.5	97	909	<5.0	89	372	0.38	532	887	11.8	-84	
	Maximum	7.5	106	1,080	<5.0	115	442	0.44	620	2,400	12.3	-77	
	Std. Dev.	0.1	14	148	0.0	23	61	0.1	77	1,311	0.4	6	
Coeff. of Var. %	1.7	14	16	0.0	26	16	19	14	148	3.7	7		
2 nd Fill	04/26/22	7.5	81	768	<5.0	68	284	0.58	458	35	11.7	-89	<4
3 rd Fill	05/04/22	7.6	90	750	<5.0	72	271	0.59	377	11,000	12.0	-85	<4
	05/11/22	7.6	107	786	<5.0	70	NDR	0.65	411	430	13.3	-88	<4
	05/19/22	7.6	86	778	<5.0	69	288	0.66	481	110	13.2	-88	<4
	05/24/22	7.6	82	750	<5.0	69	264	0.49	454	47	12.9	-88	<4
	06/01/22	7.5	85	748	<5.0	73	314	0.52	457	27	13.1	-88	<4
	06/08/22	7.5	81	764	<5.0	72	287	0.50	497	14	13.3	-88	<4

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Event	Sample Date	pH	EC ¹ mS/m	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻ mg/L	NH ₃ -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation ² feet	Recharge Time hours
	Minimum	7.5	81	748	<5.0	69	264	0.49	377	14	12.0	-88	
	Median	7.6	86	757	<5.0	71	287	0.56	456	79	13.2	-88	
	Mean	7.5	88	763	<5.0	71	285	0.57	446	1,938	13.0	-87	
	Maximum	7.6	107	786	<5.0	73	314	0.66	497	11,000	13.3	-85	
	Std. Dev.	0.0	9.6	16	0	1.6	20	0.07	45	4442	0.5	1.2	
	Coeff. of Var. %	0.6	11	2	0	2	7	13	10	229	3.8	1	
3 rd Quarter	08/09/22	7.4	84	764	<5.0	70	301	0.56	475	<1	13.6	-88	<4
4 th Quarter	10/19/22	7.5	86	796	<5.0	54	309	0.49	458	<1	12.5	-88	<4
-----Well QK-4-----													
1 st Quarter	03/17/22	7.6	78	762	NDR	94	299	0.34	443	<1	12.0	-65	<4
1 st Fill	04/07/22	7.6	83	786	<5.0	90	313	0.54	428	40	11.2	-60	<4
	04/12/22	7.5	84	774	<5.0	83	331	0.47	428	<1	12.3	-64	<4
	04/19/22	7.3	111	766	<5.0	94	310	0.52	442	<1	11.3	-70	<4
	Minimum	7.3	83	766	<5.0	83	310	0.47	428	<1	11.2	-70	
	Median	7.5	84	774	<5.0	90	313	0.52	428	1	11.3	-64	
	Mean	7.5	93	775	<5.0	89	318	0.51	433	14	11.6	-64	
	Maximum	7.6	111	786	<5.0	94	331	0.54	442	40	12.3	-60	
	Std. Dev.	0.2	15.8	10.1	0	5.5	11.1	0.03	8.1	23	0.6	5.0	
	Coeff. of Var. %	2.3	17	1	0	6	3	6.4	2	161	5.2	8	

TABLE 1 (Continued): ANALYSIS OF CHEMICAL AND PHYSICAL PARAMETERS AND FECAL COLIFORM IN GROUNDWATER FROM MONITORING WELLS ADJACENT TO THE GLORIA ALITTO MAJEWSKI CHICAGOLAND UNDERFLOW PLAN RESERVOIR OF THE TUNNEL AND RESERVOIR PLAN DURING 2022

Event	Sample Date	pH	EC ¹ mS/m	TDS ¹	TOC ¹	Cl ⁻	SO ₄ ²⁻ mg/L	NH ₃ -N	Hardness	Fecal Coliform CFU/100 mL	Temp. °C	Water Elevation ² feet	Recharge Time hours
2 nd Fill	04/26/22	7.5	83	768	<0.5	81	322	0.52	435	<1	11.0	-64	<4
3 rd Fill	05/04/22	7.5	91	804	<5.0	80	309	0.55	383	<1	11.6	-65	<4
	05/11/22	7.5	85	828	<5.0	108	NDR	0.69	438	<1	13.3	-72	<4
	05/19/22	7.5	90	818	<5.0	84	311	0.70	446	<1	12.4	-79	<4
	05/24/22	7.5	84	778	<5.0	79	325	0.43	435	<1	12.7	-76	<4
	06/01/22	7.5	85	770	<5.0	83	318	0.50	405	<1	13.3	-64	<4
	06/08/22	7.5	86	788	<5.0	83	315	0.47	484	<1	12.7	-77	<4
	Minimum	7.5	84	770	<5.0	79	309	0.43	383	<1	11.6	-79	
	Median	7.5	85	796	<5.0	83	315	0.52	437	<1	12.7	-74	
Mean	7.5	87	798	<5.0	86	315	0.55	432	<1	12.7	-72		
Maximum	7.5	91	828	<5.0	108	325	0.70	484	<1	13.3	-64		
Std. Dev.	0.0	3.0	22.9	0	10.7	6.3	0.1	34.9	0	0.6	6.4		
Coeff. of Var. %	0.3	3	3	0	12	2	21	8	0	5.0	9		
3 rd Quarter	08/09/22	7.4	83	762	<10	85	328	0.54	437	<1	12.9	-64	<4
4 th Quarter	10/19/22	7.5	100	872	<5.0	122	262	0.52	466	<1	14.0	-64	<4

¹EC = electrical conductivity; TDS = total dissolved solids; TOC = total organic carbon.

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

³NDR = No data reported due to storage temperature exceeding the preservation requirement for sulfate analysis or due to measurement error for TOC.

⁴NS = No sample was collected due to restricted access to the well during maintenance at the site.