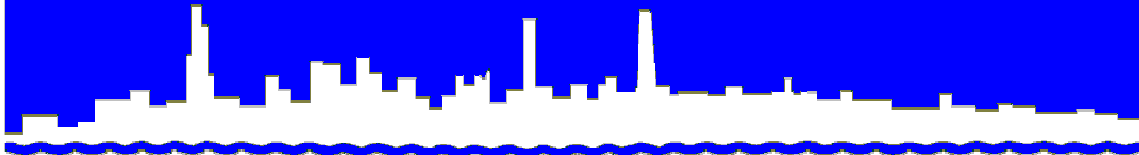


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***MONITORING AND RESEARCH
DEPARTMENT***

REPORT NO. 13-19

TUNNEL AND RESERVOIR PLAN

DES PLAINES TUNNEL SYSTEM

ANNUAL GROUNDWATER MONITORING REPORT

FOR 2012

July 2013

Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

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July 25, 2013

Ms. Marcia Willhite
Bureau Chief
Bureau of Water
Illinois Environmental Protection Agency
P. O. Box 19276
Springfield, IL 62794-9276

Dear Ms. Willhite:

Subject: Tunnel and Reservoir Plan, Des Plaines Tunnel System, Annual
Groundwater Monitoring Report for 2012

Attached are three copies of "Tunnel and Reservoir Plan, Des Plaines Tunnel System,
Annual Groundwater Monitoring Report for 2012."

Very truly yours,

Thomas C. Granato, Ph.D.
Director
Monitoring and Research

TCG:PL:cm

Attachment

cc w/att: Ms. Sally K. Swanson (USEPA Region 5 - WC15J) - (2)

Dr. Zhang

Dr. Cox

Dr. Hundal

Dr. Lindo

cc w/o att: Mr. St. Pierre

Ms. Sharma

Mr. Cohen

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TUNNEL AND RESERVOIR PLAN
DES PLAINES TUNNEL SYSTEM
ANNUAL GROUNDWATER MONITORING REPORT
FOR 2012

Monitoring and Research Department
Thomas C. Granato, Director

July 2013

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ANNUAL DATA FOR MONITORING WELLS

Introduction

All monitoring wells are located along the 13A extension, south leg, middle leg, and north leg of the Des Plaines Tunnel System ([Figure 1](#)). These monitoring wells were sampled either three or six times during 2012. Monitoring wells QD-21 through -26, -28 through -32, -35, -36, and -38 through -60 are sampled three times per year, while QD-27, -33, -34, and -37 are sampled six times per year (Illinois Environmental Protection Agency [IEPA] memoranda dated July 9, 2004, and February 23, 2006).

All monitoring wells in the Des Plaines Tunnel System were visited for the required number of samples. However, in a few instances, samples could not be collected from some of the wells for various reasons. Monitoring well QD-40 could not be sampled and well QD-41 was sampled only once during 2012 because the pumps were inoperable (work orders were generated to replace or repair these defective pumps). Well QD-49 was intermittently dry and therefore generated only two samples during 2012.

Several wells were sampled more frequently than required. Groundwater elevations in the monitoring wells were measured during each sampling event. However, there are no observation wells in the Des Plaines Tunnel System.

Summary of Data for Monitoring Wells

The analytical data for groundwater sampled during 2012 from monitoring wells QD-21 through QD-60 are 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 in this table. Fecal coliform counts for all wells were non-detectable, except for wells QD-26, -52 (maximum of 840 MPN/100 mL), -53 (maximum of 920 MPN/100 mL), and QD-55. [Table 2](#) lists the descriptive statistics for groundwater data of monitoring wells QD-21 through QD-60 for the year 2012.

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

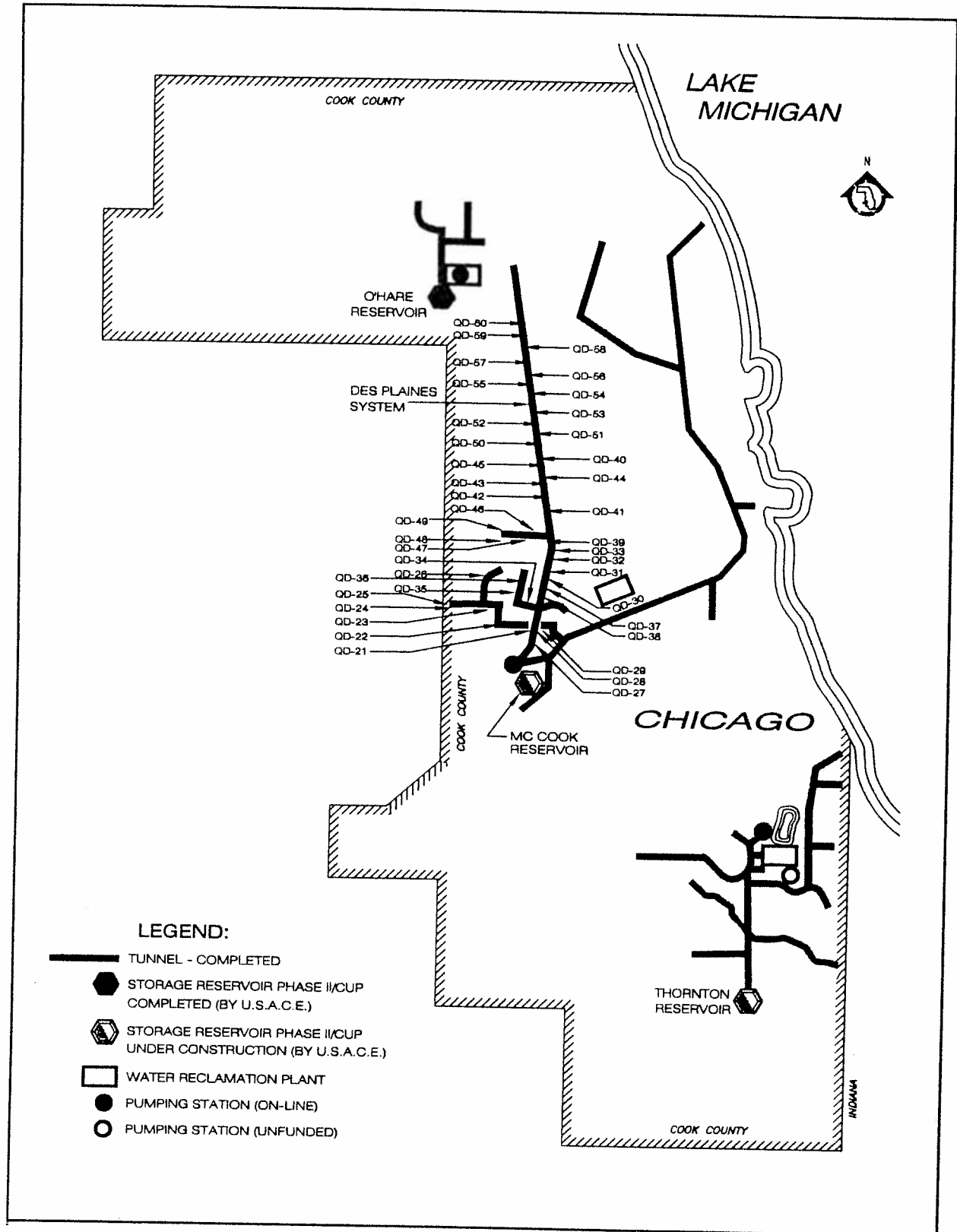


TABLE 1: ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m	----- mg/L -----						MPN/100mL	°C	ft	hr
QD-21	02/15/12	6.6	117	1,398	1	258	309	0.24	796	<1	12.4	-57	<4
QD-21	03/28/12	7.0	112	1,688	1	166	335	0.28	875	<1	13.2	-60	<4
QD-21	06/20/12	6.8	111	1,402	1	265	308	0.23	819	<1	11.9	-62	<4
QD-21	12/18/12	6.8	110	1,476	1	294	303	0.25	783	<1	11.9	-74	<4
QD-22	02/15/12	7.2	98	1,152	1	136	275	0.42	783	<1	12.2	-24	<4
QD-22	03/28/12	7.0	92	1,332	1	140	266	0.43	795	<1	13.5	-30	<4
QD-22	06/20/12	6.8	61	1,134	1	126	231	0.42	730	<1	17.4	-27	<4
QD-22	12/18/12	7.2	67	1,114	1	131	248	0.43	715	<1	11.2	-34	<4
QD-23	02/15/12	7.5	117	1,358	2	201	329	0.51	846	<1	13.0	-29	<4
QD-23	03/28/12	7.1	104	1,490	2	80	343	0.52	862	<1	13.4	-31	<4
QD-23	06/20/12	6.7	106	1,364	2	179	303	0.53	829	<1	14.4	-35	<4
QD-23	12/18/12	6.9	108	1,380	2	196	334	0.52	820	<1	12.9	-39	<4
QD-24	02/15/12	7.7	69	682	2	99	132	0.49	450	<1	11.8	20	<4
QD-24	03/28/12	7.4	79	1,032	2	102	193	0.53	613	<1	12.3	21	<4
QD-24	06/20/12	7.2	84	1,052	2	97	185	0.50	600	<1	12.0	15	<4
QD-24	12/18/12	7.2	98	1,052	2	168	192	0.76	646	<1	11.1	15	<4
QD-25	02/16/12	7.3	156	1,492	2	496	182	0.72	565	<1	11.2	8	<4
QD-25	03/28/12	7.2	144	1,594	2	187	225	0.72	638	<1	11.4	19	<4
QD-25	09/06/12	7.7	NA ⁴	1,702	2	471	252	0.71	663	<1	24.7	28	<4
QD-25	12/18/12	7.1	153	1,394	1	457	209	0.66	514	<1	10.7	27	<4

TABLE 1 (Continued): ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m	----- mg/L -----						MPN/100mL	°C	ft	hr
QD-26	01/12/12	7.6	56	424	<1	27	100	0.38	415	<1	11.1	-30	<4
QD-26	03/14/12	7.5	69	556	1	<10	99	0.34	416	<1	13.0	-12	<4
QD-26	05/02/12	7.1	73	566	1	11	98	0.35	418	<1	13.2	-12	<4
QD-26	07/05/12	6.9	103	552	<1	10	93	0.32	409	5	13.3	-14	<4
4 QD-27	01/12/12	7.6	95	1,360	13	421	37	31	546	<1	10.8	-212	<48
QD-27	03/14/12	7.1	174	1,268	14	351	44	29	533	<1	13.9	-198	<48
QD-27	05/02/12	7.0	222	1,264	13	356	43	27	521	<1	14.0	-191	<48
QD-27	07/05/12	7.4	37	1,208	13	315	49	25	494	<1	12.1	-196	<48
QD-27	09/19/12	7.1	67	1,182	14	332	23	25	506	<1	15.8	-213	<48
QD-27	11/28/12	7.0	60	1,198	18	312	24	29	506	<1	11.2	-217	<48
QD-28	02/16/12	7.3	108	1,208	1	270	210	0.59	615	<1		-114	<4
QD-28	03/28/12	7.0	80	1,400	1	148	234	0.60	664	1	14.4	-119	<4
QD-28	05/09/12	6.9	160	1,262	1	272	238	0.62	670	<1	13.8	-115	<4
QD-28	07/18/12	7.1	155	1,524	7	255	226	0.62	630	<1	15.9	-122	<4
QD-29	02/16/12	7.0	87	1,116	2	144	245	0.44	711	<1	12.4	-162	<4
QD-29	03/28/12	6.7	91	1,268	2	149	247	0.44	727	<1	13.5	-160	<4
QD-29	05/09/12	6.9	132	1,120	3	146	254	0.45	708	<1	13.2	-158	<4
QD-29	07/18/12	7.1	133	1,212	7	138	255	0.44	696	<1	15.7	-161	<4
QD-30	03/01/12	7.0	87	1,070	1	125	307	0.31	715	<1	12.1	-145	<4
QD-30	05/17/12	6.8	107	1,140	1	124	304	0.32	700	<1	12.2	-113	<4

TABLE 1 (Continued): ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m	----- mg/L -----						MPN/100mL	°C	ft	hr
QD-31	03/01/12	7.5	100	946	<1	136	177	0.22	239	<1	11.7	-191	<4
QD-31	05/17/12	7.5	132	964	<1	127	180	0.17	232	<1	11.9	-194	<4
QD-31	07/05/12	7.2	78	958	<1	125	169	0.23	233	<1	12.9	-159	<4
QD-31	10/11/12	7.4	132	958	<1	130	175	0.19	222	<1	11.7	-193	<4
QD-32	03/01/12	8.1	181	1,648	<1	379	196	<0.10	29	<1	11.5	-216	<48
QD-32	05/17/12	9.4	306	2,016	<1	529	222	0.28	51	<1	12.0	-212	<48
QD-32	07/05/12	8.8	120	2,038	<1	537	217	<0.10	27	<1	16.0	-214	<48
QD-32	10/11/12	9.3	310	2,066	<1	551	228	0.24	36	<1	12.1	-208	<48
QD-33	01/12/12	8.1	145	1,644	<1	366	200	0.27	28	<1	10.3	-185	<48
QD-33	03/14/12	8.7	199	1,728	<1	353	197	0.27	28	<1	19.9	-173	<48
QD-33	05/02/12	8.2	245	1,684	1	367	197	0.25	28	<1	12.9	-181	<48
QD-33	07/05/12	8.6	109	1,670	<1	347	187	NRR ⁵	27	<1	14.2	-182	<48
QD-33	09/19/12	7.8	59	1,602	1	355	197	0.22	22	<1	12.1	-179	<48
QD-33	11/28/12	7.9	58	1,654	<1	330	218	0.24	28	<1	13.5	-179	<48
QD-34	02/16/12	7.1	78	1,102	2	130	270	0.41	721	<1	12.3	-99	<4
QD-34	03/28/12	7.0	128	1,334	2	123	302	0.39	758	<1	12.6	-97	<4
QD-34	05/09/12	6.9	124	1,130	1	116	323	0.40	754	<1	13.4	-94	<4
QD-34	07/18/12	7.1	115	1,318	5	120	314	0.40	740	<1	13.5	-101	<4
QD-34	09/06/12	7.6	76	1,318	1	117	323	0.37	752	<1	14.3	-98	<4
QD-34	11/08/12	7.8	79	1,284	1	119	216	0.37	728	<1	12.5	-98	<4

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TABLE 1 (Continued): ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m	----- mg/L -----						MPN/100mL	°C	ft	hr
QD-35	02/08/12	7.5	79	958	2	107	272	0.35	667	<1	11.8	-115	<4
QD-35	03/28/12	6.9	123	1,186	2	107	252	0.33	650	<1	13.0	-94	<4
QD-35	05/09/12	6.9	78	1,018	2	108	266	0.35	678	<1	13.2	-89	<4
QD-35	07/18/12	7.0	58	1,142	7	99	258	0.34	634	1	14.6	-89	<4
QD-36	02/08/12	7.7	81	1,156	2	122	342	0.34	805	<1	11.6	-108	<48
QD-36	03/28/12	7.0	133	1,360	2	119	316	0.34	811	<1	12.2	-109	<48
QD-36	05/09/12	7.0	87	1,132	1	114	301	0.32	773	<1	12.4	-96	<48
QD-36	07/18/12	7.3	70	1,528	6	114	320	0.34	772	<1	13.9	-102	<48
QD-37	01/12/12	7.4	140	1,464	<1	269	371	0.35	574	<1	12.1	-212	<48
QD-37	03/14/12	7.4	178	1,488	<1	272	364	0.26	481	<1	14.4	-203	<48
QD-37	05/02/12	7.5	198	1,508	<1	259	396	0.37	617	<1	14.2	-207	<48
QD-37	07/05/12	7.5	84	1,504	<1	259	375	0.34	594	<1	16.3	-205	<48
QD-37	09/19/12	7.5	71	1,442	<1	267	379	0.31	534	<1	12.4	-213	<48
QD-37	11/28/12	7.3	NA	1,530	<1	269	469	0.35	567	<1	12.2	-212	<48
QD-38	03/01/12	8.3	104	788	<1	181	94	0.38	257	<1	11.0	-208	<48
QD-38	06/27/12	8.2	70	712	1	157	94	0.10	149	<1	13.1	-209	<48
QD-38	08/30/12	8.0	101	820	<1	167	103	0.34	257	<1	13.9	-208	<48
QD-39	03/01/12	8.5	103	824	<1	28	89	<0.10	18	<1	11.1	-140	<48
QD-39	06/27/12	8.4	74	884	<1	26	91	<0.10	20	<1	14.1	-32	<48
QD-39	08/30/12	8.2	99	874	<1	26	92	<0.10	22	<1	14.3	-149	<48

TABLE 1 (Continued): ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m	----- mg/L -----						MPN/100mL	°C	ft	hr
QD-41	03/01/12	7.6	78	776	1	14	333	0.30	429	<1	12.1	-134	<48
QD-42	03/01/12	7.6	78	758	1	19	280	0.32	401	<1	11.9	-110	<48
QD-42	06/27/12	7.8	69	818	1	19	279	0.30	404	<1	13.3	-119	<48
QD-42	08/30/12	7.0	90	824	1	19	292	0.26	406	<1	11.4	-135	<48
QD-43	03/01/12	7.6	64	704	1	45	209	0.34	461	<1	11.5	-110	<4
QD-43	06/21/12	6.9	61	746	1	45	209	0.34	467	<1	12.1	-118	<4
QD-43	08/30/12	7.4	87	848	1	46	221	0.31	470	<1	12.1	-157	<4
QD-44	03/01/12	8.0	52	590	1	18	200	0.36	309	<1	10.9	-29	<48
QD-44	06/21/12	7.8	49	482	1	18	159	0.32	208	<1	12.3	-13	<48
QD-44	08/30/12	7.5	27	688	1	18	215	0.34	325	<1	12.5	-7	<48
QD-44	10/11/12	7.1	25	626	<1	18	210	0.36	314	<1	11.6	13	<48
QD-45	03/01/12	8.2	55	564	1	18	203	0.35	90	<1	11.2	-11	<4
QD-45	06/21/12	7.9	64	632	1	23	208	0.37	86	<1	12.7	-13	<4
QD-45	08/30/12	8.4	30	606	2	17	213	0.33	98	<1	13.3	-4	<4
QD-45	10/11/12	7.9	29	564	1	17	217	0.35	97	<1	12.1	-6	<4
QD-46	02/08/12	7.7	60	610	<1	13	129	0.24	99	<1	11.6	-175	<48
QD-46	03/28/12	7.8	84	582	<1	12	104	0.23	65	<1	12.3	-172	<48
QD-46	05/09/12	7.9	68	586	<1	10	115	0.23	73	<1	12.5	-165	<48
QD-46	07/18/12	7.8	50	662	4	11	111	0.22	67	<1	13.1	-167	<48
QD-46	11/08/12	7.6	89	1,278	1	129	277	0.31	NRR	<1	11.8	-100	<48

TABLE 1 (Continued): ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m			----- mg/L -----				MPN/100mL	°C	ft	hr
QD-47	02/23/12	8.0	46	534	1	16	143	0.29	252	<1	12.4	7	<48
QD-47	04/12/12	7.0	44	518	1	16	155	0.29	245	<1	13.7	7	<48
QD-47	06/21/12	7.7	55	532	1	15	141	0.27	233	<1	13.8	4	<48
QD-47	09/20/12	8.2	44	514	1	15	149	0.26	239	<1	14.6	5	<48
QD-48	02/23/12	8.1	48	502	1	<10	227	0.30	208	<1	12.6	-176	<48
QD-48	04/12/12	8.0	50	608	1	<10	297	0.14	329	<1	12.6	-177	<48
QD-48	06/21/12	8.0	30	642	1	<10	276	0.14	328	<1	14.9	-176	<48
QD-48	08/30/12	8.0	26	658	1	<10	295	0.10	328	<1	13.9	-177	<48
QD-49	06/21/12	7.3	41	674	1	19	205	0.13	386	<1	23.5	-182	<48
QD-49	08/30/12	7.7	28	740	2	13	212	<0.10	371	<1	16.1	-181	<48
QD-50	02/23/12	9.6	73	686	1	13	266	0.13	9	<1	11.3	-125	<48
QD-50	04/12/12	8.1	65	690	1	13	299	0.13	12	<1	12.1	-140	<48
QD-50	06/21/12	9.4	40	702	1	12	260	0.12	20	<1	13.7	-136	<48
QD-50	09/20/12	8.1	50	672	1	11	285	0.13	8	<1	12.9	-132	<48
QD-51	02/29/12	8.3	67	548	2	11	117	<0.10	7	<1	12.5	-102	<48
QD-51	04/12/12	8.1	62	490	1	12	122	<0.10	5	<1	11.9	-89	<48
QD-51	06/21/12	9.3	30	546	2	12	110	<0.10	5	<1	13.1	-120	<48
QD-51	09/20/12	8.4	32	522	1	12	117	<0.10	5	<1	12.9	-115	<48

TABLE 1 (Continued): ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m	----- mg/L -----						MPN/100mL	°C	ft	hr
QD-52	02/29/12	8.9	62	496	1	14	139	0.16	17	<1	12.9	-54	<48
QD-52	04/12/12	8.1	71	470	1	16	143	0.13	20	<1	12.9	-87	<48
QD-52	06/28/12	8.5	49	548	1	15	142	0.13	24	840	14.6	-93	<48
QD-52	09/20/12	8.7	70	486	<1	15	145	0.13	18	<1	14.4	-99	<48
QD-53	02/29/12	8.4	73	600	1	19	163	<0.10	9	<1	12.8	-164	<48
QD-53	04/12/12	9.0	85	584	1	20	169	<0.10	11	<1	11.01	-167	<48
QD-53	06/28/12	8.7	59	668	1	18	162	<0.10	11	920	14.0	-167	<48
QD-53	09/20/12	8.9	88	584	1	18	168	<0.10	10	<1	17.1	-168	<48
QD-54	02/29/12	8.6	54	452	<1	16	148	0.25	30	<1	12.3	-26	<48
QD-54	04/12/12	8.9	62	440	<1	18	150	0.23	38	<1	11.8	-28	<48
QD-54	06/28/12	8.7	44	480	<1	17	148	0.23	33	<1	13.1	-31	<48
QD-54	09/20/12	8.7	66	418	<1	17	148	0.23	37	<1	13.8	-33	<48
QD-55	03/21/12	8.3	44	462	1	16	179	0.42	144	<1	15.4	-134	<48
QD-55	04/12/12	8.4	64	452	1	16	168	0.34	135	<1	11.4	-135	<48
QD-55	06/28/12	8.7	49	476	1	16	175	0.36	135	6	15.2	-135	<48
QD-55	09/27/12	7.7	59	464	1	15	169	0.35	133	<1	13.5	-140	<48
QD-56	03/21/12	8.4	38	302	<1	10	13	0.26	54	<1	12.5	-70	<48
QD-56	04/12/12	8.4	48	284	<1	11	13	0.22	61	<1	10.9	-64	<48
QD-56	06/28/12	8.4	21	356	<1	10	12	0.24	58	<1	12.7	-68	<48
QD-56	09/27/12	8.3	50	304	<1	10	12	0.24	51	<1	11.5	-66	<48

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TABLE 1 (Continued): ANALYSIS OF WATER FROM MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN SAMPLED DURING 2012

Well ¹	Sample Date	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform	Temp	Water Elevation ³	Recharge
			mS/m	----- mg/L -----						MPN/100mL	°C	ft	hr
QD-57	03/21/12	8.5	41	368	<1	12	53	0.26	20	<1	12.7	-114	<48
QD-57	04/26/12	8.2	55	436	<1	13	55	0.27	18	<1	11.1	-115	<48
QD-57	06/28/12	8.6	23	426	1	12	54	0.24	20	<1	12.4	-114	<48
QD-58	03/21/12	8.0	40	266	<1	15	<5	0.33	123	<1	12.5	-104	<48
QD-58	04/26/12	7.6	41	310	<1	11	<5	0.33	116	<1	11.2	-107	<48
QD-58	06/28/12	7.8	17	314	<1	10	<5	0.33	116	<1	13.1	-105	<48
QD-58	09/27/12	7.3	38	248	<1	11	<5	0.32	114	<1	12.2	-103	<48
QD-59	03/21/12	7.6	53	474	1	119	43	0.35	267	<1	12.2	-39	<48
QD-59	04/26/12	7.6	73	604	<1	119	45	0.36	274	<1	12.1	-45	<48
QD-59	06/28/12	7.7	23	460	<1	42	97	0.38	259	<1	12.9	-43	<48
QD-59	09/27/12	7.4	53	530	1	117	43	0.39	281	<1	11.7	-45	<48
QD-60	03/21/12	7.7	44	414	<1	43	98	0.38	251	<1	13.2	-107	<48
QD-60	04/26/12	7.3	57	478	<1	45	96	0.37	250	<1	11.8	-108	<48
QD-60	06/28/12	7.7	36	624	<1	114	44	0.35	276	<1	13.4	-106	<48
QD-60	09/27/12	7.6	44	422	<1	44	97	0.32	251	<1	13.2	-106	<48

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¹Well QD-40 could not be sampled; pump inoperable. QD-41 sampled once; pump broken. QD-49 generated two samples; well intermittently dry.

²EC = electrical conductivity; TDS = total dissolved solids; TOC = total dissolved organic carbon.

³Relative to Chicago city datum (579.48 ft above mean sea level) measured at intersection of Madison and State Streets.

⁴No analysis.

⁵No reportable result.

TABLE 2: DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-21	Minimum	6.6	110	1,398	1	166	303	0.23	783	<1
	Mean	6.8	112	1,491	1	246	314	0.25	818	<1
	Maximum	7.0	117	1,688	1	294	335	0.28	875	<1
	Std. Dev.	0.2	3	136	0	55	14	0.02	41	NA ⁴
	Median	6.8	111	1,439	1	262	308	0.25	808	<1
	Coeff. of Var. (%)	2.3	3	9	0	23	5	8.6	5	NA
QD-22	Minimum	6.8	61	1,114	1	126	231	0.42	715	<1
	Mean	7.0	79	1,183	1	133	255	0.43	756	<1
	Maximum	7.2	98	1,332	1	140	275	0.43	795	<1
	Std. Dev.	0.2	18	101	0.1	6	20	0.01	39	NA
	Median	7.1	79	1,143	1	134	257	0.43	757	<1
	Coeff. of Var. (%)	2.6	23	8	7	5	8	1.4	5	NA
QD-23	Minimum	6.7	104	1,358	2	80	303	0.51	820	<1
	Mean	7.0	109	1,398	2	164	327	0.52	839	<1
	Maximum	7.5	117	1,490	2	201	343	0.53	862	<1
	Std. Dev.	0.3	6	62	0.1	57	17	0.01	19	NA
	Median	7.0	107	1,372	2	188	332	0.52	838	<1
	Coeff. of Var. (%)	4.5	5	4	4	35	5	1.6	2	NA
QD-24	Minimum	7.2	69	682	2	97	132	0.49	450	<1
	Mean	7.3	82	955	2	117	175	0.57	577	<1
	Maximum	7.7	98	1,052	2	168	193	0.76	646	<1
	Std. Dev.	0.2	12	182	0.3	34	30	0.13	87	NA
	Median	7.3	82	1,042	2	101	189	0.52	607	<1
	Coeff. of Var. (%)	3.1	14	19	14	30	17	22	15	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-25	Minimum	7.1	144	1,394	1	187	182	0.66	514	<1
	Mean	7.3	151	1,546	2	403	217	0.70	595	<1
	Maximum	7.7	156	1,702	2	496	252	0.72	663	<1
	Std. Dev.	0.3	6	132	0.1	145	29	0.03	68	NA
	Median	7.3	153	1,543	2	464	217	0.72	602	<1
	Coeff. of Var. (%)	3.7	4	9	8	36	14	4.1	11	NA
QD-26	Minimum	6.9	56	424	<1	10	93	0.32	409	<1
	Mean	7.3	75	525	1	15	98	0.35	415	1
	Maximum	7.6	103	566	1	27	100	0.38	418	5
	Std. Dev.	0.3	20	67	0	8	3	0.03	4	NA
	Median	7.3	71	554	1	11	98	0.35	416	<1
	Coeff. of Var. (%)	4.7	27	13	0	58	3	7.2	1	NA
QD-27	Minimum	7.0	37	1,182	13	312	23	25	494	<1
	Mean	7.2	109	1,247	14	348	37	28	518	<1
	Maximum	7.6	222	1,360	18	421	49	31	546	<1
	Std. Dev.	0.3	73	66	2	40	11	2.4	19	NA
	Median	7.1	81	1,236	14	342	40	28	514	<1
	Coeff. of Var. (%)	3.5	67	5	13	12	30	8.6	4	NA
QD-28	Minimum	6.9	80	1,208	1	148	210	0.59	615	<1
	Mean	7.1	126	1,349	3	236	227	0.61	645	<1
	Maximum	7.3	160	1,524	7	272	238	0.62	670	<1
	Std. Dev.	0.2	39	142	3	59	12	0.02	27	NA
	Median	7.0	132	1,331	1	263	230	0.61	647	<1
	Coeff. of Var. (%)	2.2	31	11	110	25	5	2.5	4	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-29	Minimum	6.7	87	1,116	2	138	245	0.44	696	<1
	Mean	6.9	110	1,179	3	144	250	0.44	711	<1
	Maximum	7.1	133	1,268	7	149	255	0.45	727	<1
	Std. Dev.	0.1	25	74	2	5	5	0.01	13	NA
	Median	7.0	111	1,166	2	145	250	0.44	710	<1
	Coeff. of Var. (%)	2.0	23	6	67	3	2	1.1	2	NA
QD-30	Minimum	6.8	87	1,070	1	124	296	0.31	700	<1
	Mean	7.0	97	1,152	1	127	303	0.32	706	<1
	Maximum	7.3	107	1,266	1	133	307	0.32	715	<1
	Std. Dev.	0.3	9	82	0.1	4	5	0.01	7	NA
	Median	6.9	96	1,136	1	125	305	0.32	705	<1
	Coeff. of Var. (%)	3.6	10	7	8	3	2	1.6	1	NA
QD-31	Minimum	7.2	78	946	<1	125	169	0.17	222	<1
	Mean	7.4	110	957	<1	130	175	0.20	232	<1
	Maximum	7.5	132	964	<1	136	180	0.23	239	<1
	Std. Dev.	0.1	26	8	0	5	5	0.03	7	NA
	Median	7.4	116	958	<1	129	176	0.21	233	<1
	Coeff. of Var. (%)	2.0	24	1	0	4	3	14	3	NA
QD-32	Minimum	8.1	120	1,648	<1	379	196	0.10	27	<1
	Mean	8.9	229	1,942	<1	499	216	0.18	36	<1
	Maximum	9.4	310	2,066	<1	551	228	0.28	51	<1
	Std. Dev.	0.6	94	197	0	81	14	0.09	11	NA
	Median	9.1	243	2,027	<1	533	220	0.17	33	<1
	Coeff. of Var. (%)	6.5	41	10	0	16	6	52	30	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-33	Minimum	7.8	58	1,602	<1	330	187	0.22	22	<1
	Mean	8.2	136	1,664	1	353	199	0.25	27	<1
	Maximum	8.7	245	1,728	1	367	218	0.27	28	<1
	Std. Dev.	0.4	76	42	0.1	14	10	0.02	2	NA
	Median	8.2	127	1,662	1	354	197	0.25	28	<1
	Coeff. of Var. (%)	4.3	56	3	8	4	5	8.5	9	NA
QD-34	Minimum	6.9	76	1,102	1	116	216	0.37	721	<1
	Mean	7.2	100	1,248	2	121	291	0.39	742	<1
	Maximum	7.8	128	1,334	5	130	323	0.41	758	<1
	Std. Dev.	0.4	25	104	1	5	42	0.02	15	NA
	Median	7.1	97	1,301	1	120	308	0.40	746	<1
	Coeff. of Var. (%)	5.0	25	8	69	4	14	4.3	2	NA
QD-35	Minimum	6.9	58	958	2	99	252	0.33	634	<1
	Mean	7.1	84	1,076	3	105	262	0.34	657	<1
	Maximum	7.5	123	1,186	7	108	272	0.35	678	<1
	Std. Dev.	0.3	27	106	3	4	9	0.01	19	NA
	Median	7.0	78	1,080	2	107	262	0.35	659	<1
	Coeff. of Var. (%)	4.2	32	10	86	4	3	2.8	3	NA
QD-36	Minimum	7.0	70	1,132	1	114	301	0.32	772	<1
	Mean	7.2	93	1,294	3	117	320	0.34	790	<1
	Maximum	7.7	133	1,528	6	122	342	0.34	811	<1
	Std. Dev.	0.3	28	187	2	4	17	0.01	21	NA
	Median	7.1	84	1,258	2	117	318	0.34	789	<1
	Coeff. of Var. (%)	4.6	30	14	82	3	5	3.0	3	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
QD-37	Minimum	7.3	71	1,442	<1	259	364	0.26	481	<1
	Mean	7.4	134	1,489	<1	266	392	0.33	561	<1
	Maximum	7.5	198	1,530	<1	272	469	0.37	617	<1
	Std. Dev.	0.1	56	32	0	6	39	0.04	48	NA
	Median	7.4	140	1,496	<1	268	377	0.35	571	<1
	Coeff. of Var. (%)	1.2	42	2	0	2	10	12	9	NA
QD-38	Minimum	8.0	70	712	<1	157	94	0.10	149	<1
	Mean	8.2	92	773	<1	168	97	0.27	221	<1
	Maximum	8.3	104	820	1	181	103	0.38	257	<1
	Std. Dev.	0.1	19	55	0	12	5	0.15	62	NA
	Median	8.2	101	788	<1	167	94	0.34	257	<1
	Coeff. of Var. (%)	1.6	21	7	0	7	5	55	28	NA
QD-39	Minimum	8.2	74	824	<1	26	89	0.10	18	<1
	Mean	8.4	92	861	<1	27	91	0.10	20	<1
	Maximum	8.5	103	884	<1	28	92	0.10	22	<1
	Std. Dev.	0.1	16	32	0	1	2	0.00	2	NA
	Median	8.4	99	874	<1	26	91	0.10	20	<1
	Coeff. of Var. (%)	1.5	17	4	0	4	2	0.00	10	NA
QD-42	Minimum	7.0	69	758	1	19	279	0.26	401	<1
	Mean	7.5	79	800	1	19	283	0.29	404	<1
	Maximum	7.8	90	824	1	19	292	0.32	406	<1
	Std. Dev.	0.4	11	36	0.2	0	7	0.03	3	NA
	Median	7.6	78	818	1	19	280	0.30	404	<1
	Coeff. of Var. (%)	5.6	14	5	12	0	3	10	1	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³	
			mS/m	----- mg/L -----							MPN/100 mL
QD-43	Minimum	6.9	61	704	1	45	209	0.31	461	<1	
	Mean	7.3	70	766	1	45	213	0.33	466	<1	
	Maximum	7.6	87	848	1	46	221	0.34	470	<1	
	Std. Dev.	0.4	14	74	0	1	7	0.02	5	NA	
	Median	7.4	64	746	1	45	209	0.34	467	<1	
	Coeff. of Var. (%)	4.9	20	10	0	1	3	5.2	1	NA	
QD-44	Minimum	7.1	25	482	<1	18	159	0.32	208	<1	
	Mean	7.6	38	597	1	18	196	0.35	289	<1	
	Maximum	8.0	52	688	1	18	215	0.36	325	<1	
	Std. Dev.	0.4	14	86	0	0	25	0.02	54	NA	
	Median	7.6	38	608	1	18	205	0.35	312	<1	
	Coeff. of Var. (%)	5.0	37	14	0	0	13	5.6	19	NA	
QD-45	Minimum	7.9	29	564	1	17	203	0.33	86	<1	
	Mean	8.1	45	592	1	19	210	0.35	93	<1	
	Maximum	8.4	64	632	2	23	217	0.37	98	<1	
	Std. Dev.	0.3	18	33	0.2	3	6	0.02	6	NA	
	Median	8.1	42	585	1	18	210	0.35	94	<1	
	Coeff. of Var. (%)	3.1	40	6	20	15	3	4.7	6	NA	
QD-46	Minimum	7.6	50	582	<1	10	104	0.22	65	<1	
	Mean	7.8	70	744	2	35	147	0.25	76	<1	
	Maximum	7.9	89	1,278	4	129	277	0.31	99	<1	
	Std. Dev.	0.1	16	300	1	53	73	0.04	16	NA	
	Median	7.8	68	610	1	12	115	0.23	70	<1	
	Coeff. of Var. (%)	1.3	23	40	83	150	50	15	21	NA	

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-47	Minimum	7.0	44	514	1	15	141	0.26	233	<1
	Mean	7.7	47	525	1	16	147	0.28	242	<1
	Maximum	8.2	55	534	1	16	155	0.29	252	<1
	Std. Dev.	0.5	5	10	0	1	6	0.02	8	NA
	Median	7.9	45	525	1	16	146	0.28	242	<1
	Coeff. of Var. (%)	6.9	11	2	0	4	4	5.4	3	NA
QD-48	Minimum	8.0	26	502	1	<10	227	0.10	208	<1
	Mean	8.0	39	603	1	<10	274	0.17	298	<1
	Maximum	8.1	50	658	1	<10	297	0.30	329	<1
	Std. Dev.	0.0	12	70	0.1	0	32	0.09	60	NA
	Median	8.0	39	625	1	<10	286	0.14	328	<1
	Coeff. of Var. (%)	0.5	32	12	7	0	12	52	20	NA
QD-49	Minimum	7.3	28	674	1	13	205	0.10	371	<1
	Mean	7.5	34	707	1	16	208	0.12	379	<1
	Maximum	7.7	41	740	2	19	212	0.13	386	<1
	Std. Dev.	0.3	9	47	0.2	4	5	0.02	11	NA
	Median	7.5	34	707	1	16	208	0.12	379	<1
	Coeff. of Var. (%)	3.9	27	7	16	27	2	18	3	NA
QD-50	Minimum	8.1	40	672	1	11	260	0.12	8	<1
	Mean	8.8	57	688	1	12	277	0.13	12	<1
	Maximum	9.6	73	702	1	13	299	0.13	20	<1
	Std. Dev.	0.8	15	12	0	1	18	0.01	5	NA
	Median	8.8	58	688	1	13	275	0.13	11	<1
	Coeff. of Var. (%)	9.2	26	2	0	8	6	3.9	44	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-51	Minimum	8.1	30	490	1	11	110	0.10	5	<1
	Mean	8.5	48	527	1	12	116	0.10	6	<1
	Maximum	9.3	67	548	2	12	122	0.10	7	<1
	Std. Dev.	0.6	20	27	0.2	1	5	0.00	1	NA
	Median	8.4	47	534	1	12	117	0.10	5	<1
	Coeff. of Var. (%)	6.6	41	5	12	4	4	0.00	18	NA
QD-52	Minimum	8.1	49	470	<1	14	139	0.13	17	<1
	Mean	8.6	63	500	1	15	142	0.14	20	5
	Maximum	8.9	71	548	1	16	145	0.16	24	840
	Std. Dev.	0.3	10	34	0.1	1	2	0.01	3	NA
	Median	8.6	66	491	1	15	142	0.13	19	<1
	Coeff. of Var. (%)	4.1	16	7	5	5	2	11	16	NA
QD-53	Minimum	8.4	59	584	1	18	162	0.10	9	<1
	Mean	8.7	76	609	1	19	166	0.10	10	6
	Maximum	9.0	88	668	1	20	169	0.10	11	920
	Std. Dev.	0.2	13	40	0.1	1	4	0.00	1	NA
	Median	8.8	79	592	1	19	166	0.10	11	<1
	Coeff. of Var. (%)	2.8	17	7	10	5	2	0.00	9	NA
QD-54	Minimum	8.6	44	418	<1	16	148	0.23	30	<1
	Mean	8.7	56	448	<1	17	149	0.24	35	<1
	Maximum	8.9	66	480	1	18	150	0.25	38	<1
	Std. Dev.	0.1	10	26	0	1	1	0.01	4	NA
	Median	8.7	58	446	<1	17	148	0.23	35	<1
	Coeff. of Var. (%)	1.6	17	6	0	5	0.5	4.3	11	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-55	Minimum	7.7	44	452	1	15	168	0.34	133	<1
	Mean	8.3	54	464	1	16	173	0.37	137	2
	Maximum	8.7	64	476	1	16	179	0.42	144	6
	Std. Dev.	0.4	9	10	0.1	1	5	0.04	5	NA
	Median	8.3	54	463	1	16	172	0.36	135	<1
	Coeff. of Var. (%)	5.1	16	2	12	3	3	9.8	4	NA
QD-56	Minimum	8.3	21	284	1	10	12	0.22	51	<1
	Mean	8.4	39	312	1	10	13	0.24	56	<1
	Maximum	8.4	50	356	1	11	13	0.26	61	<1
	Std. Dev.	0.1	13	31	0	1	1	0.02	4	NA
	Median	8.4	43	303	1	10	12	0.24	56	<1
	Coeff. of Var. (%)	1.0	34	10	0	5	4	6.8	8	NA
QD-57	Minimum	8.2	23	368	<1	12	53	0.24	18	<1
	Mean	8.4	40	410	<1	12	54	0.26	19	<1
	Maximum	8.6	55	436	1	13	55	0.27	20	<1
	Std. Dev.	0.2	16	37	0	1	1	0.02	1	NA
	Median	8.5	41	426	1	12	54	0.26	20	<1
	Coeff. of Var. (%)	2.4	40	9	0	5	2	6.0	6	NA
QD-58	Minimum	7.3	17	248	<1	10	<5	0.32	114	<1
	Mean	7.7	34	285	<1	12	<5	0.33	117	<1
	Maximum	8.0	41	314	1	15	<5	0.33	123	<1
	Std. Dev.	0.3	11	33	0	2	0	0.01	4	NA
	Median	7.7	39	288	<1	11	<5	0.33	116	<1
	Coeff. of Var. (%)	3.7	33	11	0	19	0	1.5	3	NA

TABLE 2 (Continued): DESCRIPTIVE STATISTICS FOR GROUNDWATER DATA OF MONITORING WELLS QD-21 THROUGH QD-60 IN THE DES PLAINES TUNNEL SYSTEM OF THE TUNNEL AND RESERVOIR PLAN DURING 2012

Well ¹	Statistic	pH	EC ²	TDS ²	TOC ²	Cl ⁻	SO ₄ ²⁻	NH ₃ -N	Hardness	Fecal Coliform ³
			mS/m	----- mg/L -----						MPN/100 mL
QD-59	Minimum	7.4	23	460	<1	42	43	0.35	259	<1
	Mean	7.6	50	517	1	99	57	0.37	270	<1
	Maximum	7.7	73	604	1	119	97	0.39	281	<1
	Std. Dev.	0.1	21	65	0.2	38	26	0.02	9	NA
	Median	7.6	53	502	1	118	44	0.37	271	<1
	Coeff. of Var. (%)	1.6	41	13	14	38	46	4.9	3	NA
QD-60	Minimum	7.3	36	414	<1	43	44	0.32	250	<1
	Mean	7.6	45	485	<1	62	84	0.36	257	<1
	Maximum	7.7	57	624	1	114	98	0.38	276	<1
	Std. Dev.	0.2	8	97	0	35	26	0.03	13	NA
	Median	7.6	44	450	<1	45	96	0.36	251	<1
	Coeff. of Var. (%)	2.5	19	20	0	57	31	7.5	5	NA

¹Well QD-40 could not be sampled; pump inoperable. QD-41 sampled once; pump broken. QD-49 generated two samples; well intermittently dry.

²EC = electrical conductivity; TDS = total dissolved solids; TOC = total dissolved organic carbon.

³Geometric mean calculated.

⁴Not applicable.