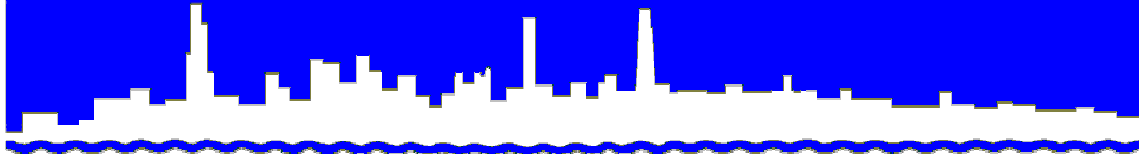


Protecting Our Water Environment



Metropolitan Water Reclamation District of Greater Chicago

***RESEARCH AND DEVELOPMENT
DEPARTMENT***

REPORT NO. 06-43

GROUNDWATER MONITORING REPORT

***TUNNEL AND RESERVOIR PLAN
THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR
WATER QUALITY MONITORING WELLS
2005 ANNUAL REPORT***

AUGUST 2006

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August 8, 2006

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

Subject: Thornton Transitional Flood Control Reservoir Water Quality Monitoring
Wells Annual Report for the Year 2005

Dear Ms. Willhite:

Enclosed are three copies of "Groundwater Monitoring Report, Tunnel and Reservoir Plan
Thornton Transitional Flood Control Reservoir Water Quality Monitoring Wells 2005 Annual Re-
port."

Very truly yours,

Louis Kollias
Director
Research and Development

LK:JSJ:lmf

Enclosures

cc w/enc: Ms. Sally K. Swanson (USEPA Region V—WC15J)

(2)

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GROUNDWATER MONITORING REPORT

TUNNEL AND RESERVOIR PLAN
THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR
WATER QUALITY MONITORING WELLS
2005 ANNUAL REPORT

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**GROUNDWATER MONITORING REPORT
TUNNEL AND RESERVOIR PLAN
THORNTON TRANSITIONAL RESERVOIR
WATER QUALITY MONITORING WELLS
2005 ANNUAL REPORT**

Introduction

The purpose of this report is to meet the reporting requirements of the Illinois Environmental Protection Agency (IEPA) relative to annual flood control utilization for the Thornton Transitional Flood Control Reservoir (Reservoir) for 2005. The specific informational requirements are described in the June 26, 2001, Scope of Work (SOW) for Groundwater Quality Monitoring of the Reservoir. The SOW was approved in a letter from the IEPA dated August 6, 2001.

The reporting requirements are found in Section 7 of the SOW. The requirements for the annual flood control utilization of the Reservoir shall include:

1. The year's monitoring wells sample analysis results.
2. Reservoir content grab sample results.
3. Detailed review and comparison of the monitoring well sampling analysis results, utilizing the monitoring well statistical background determinations.

Objective. The objective of collecting groundwater quality data from the four monitoring wells QT-1, QT-2, QT-3, and QT-4 and Reservoir content grab samples is to assess any possible contamination of the monitoring wells which may result from the seepage produced during the fill event for any of the parameters indicated in Table 2 of the SOW (Table 1).

Project Description. The Reservoir is in the West Lobe of the Thornton Quarry, southeast of the intersection of the Tri-State Tollway and Halsted Street in Thornton, Illinois (Figure 1). The Reservoir is the final structural measure to be implemented for the Little Calumet River Watershed under the Natural Resources Conservation Service (NRCS) Little Calumet Watershed Plan of November 1998. The Reservoir will provide 3.1 billion gallons of floodwater storage, which represents the capture of the 100-year storm event from Thorn Creek at a point just south of the Tri-State Tollway.

The project will provide flood control benefits for 21 businesses and 4,400 residences, for an average benefit of \$6.8 million per year. Within the Little Calumet watershed are the communities of Blue Island, Calumet City, Dixmoor, Dolton, Glenwood, Harvey, Lansing, Phoenix, Riverdale, and South Holland, which will receive flood control benefits.

The Reservoir consists of a diversion structure at Thornton Creek, a 24-foot diameter dropshaft and 22-foot diameter conveyance tunnel to the Lower West Lobe of Thornton Quarry. The project also includes an 8-foot diameter tunnel connected to the Calumet Tunnel and Reservoir Plan (TARP) System that will be utilized for Reservoir dewatering purposes only.

Field Sampling. There were two fill events at the Thornton Transitional Reservoir during 2005, January 12, 2005, and February 14, 2005.

The January fill event began on January 12, 2005, resulting in storage of 1.49 billion gallons in the Reservoir. On February 14, 2005, with 4 to 6 feet of CSO water elevation in the Reservoir from the January 12, 2005, fill event, another diversion occurred. This event resulted in an additional 356 million gallons of stormwater diverted to the Reservoir.

During these fill events, in accordance with the SOW, samples were collected from the four water quality wells surrounding the Reservoir and grab samples were taken from the Reservoir. The parameters analyzed for are found in Table 2 of the SOW ([Table 1](#)).

Analytical Data Results. [Tables 2, 3, 4, and 5](#) contain the results of the analyses of the four water quality monitoring wells along with the calculated upper 95 percent confidence limits for the January 12 through February 14, 2005, fill events. [Table 6](#) contains the results of the grab samples from the Reservoir.

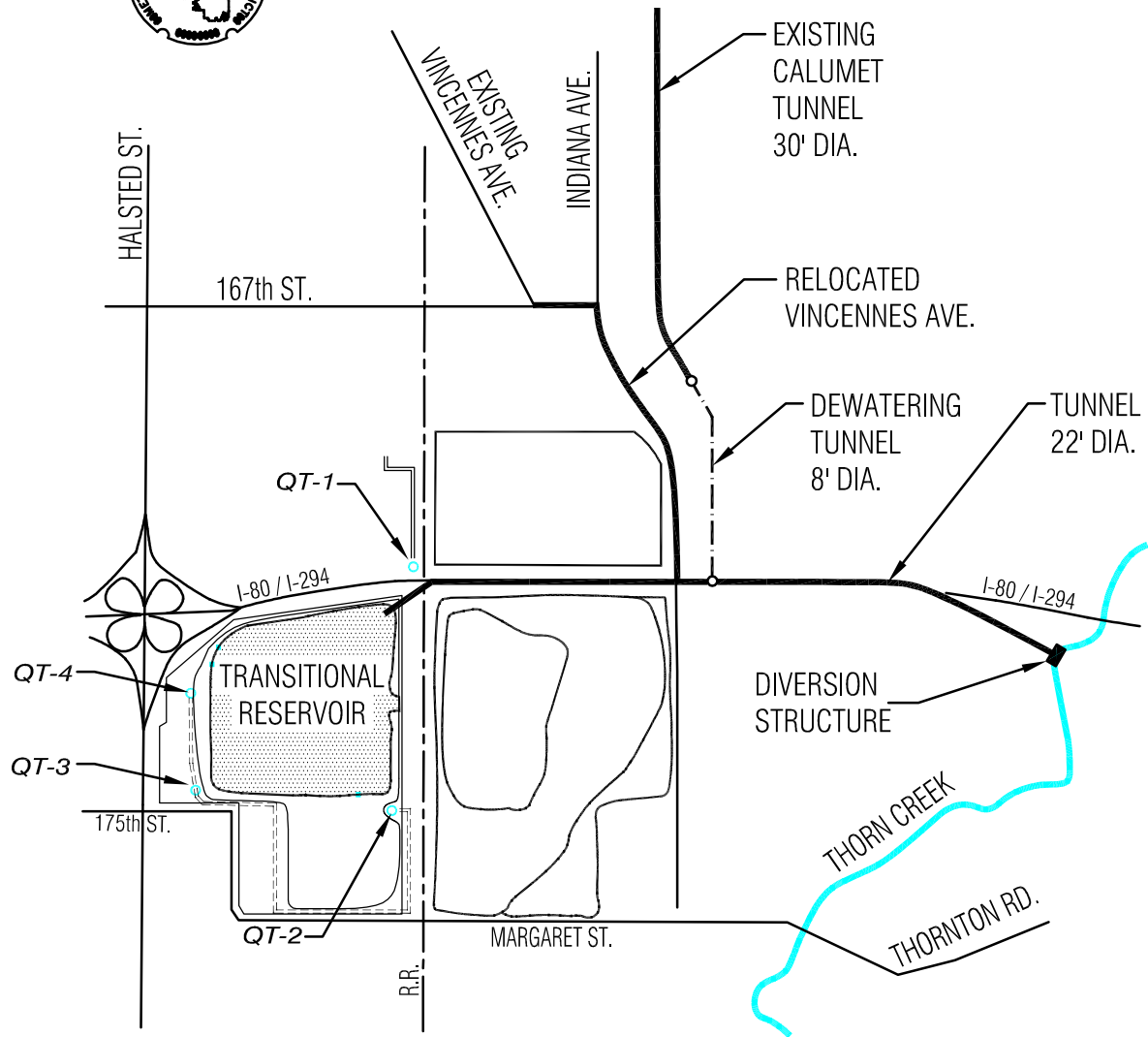
Discussion of Results. During both fill events, samples of both the surrounding water quality monitoring wells and the Reservoir itself were collected as long as there was water in the Reservoir per requirements of the SOW.

During the January 12, 2005, and February 14, 2005, fill events, the 95 percent upper confidence limit from the background concentration was exceeded for the following parameters in the following wells: QT-2 ([Table 3](#)) iron and manganese, QT-3 ([Table 4](#)) chloride and copper, and QT-4 ([Table 5](#)) cyanide. Well QT-1 ([Table 2](#)) showed no water quality exceedances from background concentrations. Following the fill events, when the Reservoir was dry, except for chloride in QT-3, there were no significant changes to background concentrations at any of the monitoring wells.

TABLE 1: LIST OF PARAMETERS TO BE ANALYZED ACCORDING TO TABLE 2 FROM
THE IEPA'S SCOPE OF WORK

Arsenic	Ammonia
Boron	Barium
Chloride	Cadmium
Copper	Chromium
Fecal Coliform	Cyanide
Iron	Fluoride
Lead	Manganese
Mercury	Nickel
Phenols	Silver
Sulfate	Temperature
Total Dissolved Solids	Nitrate

Biochemical Oxygen Demand (5-day and 21-day)

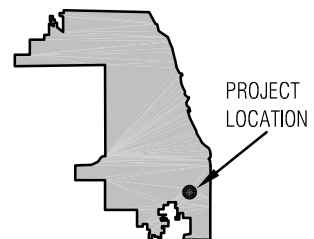


LOCATION MAP
Scale: NTS

LEGEND

-  Monitoring Well
-  New Access Road
-  Existing Access Road (to be improved)

MWRD SERVICE AREA



**THORNTON TRANSITIONAL RESERVOIR
MONITORING WELL LOCATIONS**

**METROPOLITAN WATER RECLAMATION
DISTRICT OF GREATER CHICAGO
ENGINEERING DEPARTMENT
11-03 PLANNING JJK**

Table 2: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal		Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total	
					Coliform (cfu/100 mL)							Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
1/20/05	<0.002	0.312	434	0.007	<1	35.237	<0.002	<0.05	3	372	1614	0.49	
1/26/05	<0.002	0.309	429	0.014	<1	27.237	0.002	<0.05	<2	384	1642	0.48	
2/2/05	<0.002	0.348	363	0.008	<1	4.538	<0.002	<0.05	<2	395	1138	0.39	
2/10/05	<0.002	0.302	422	0.006	<1	25.734	<0.002	<0.05	4	400	1380	0.37	
2/17/05						Well could not be sampled*							
2/25/05	<0.002	0.271	419	0.013	<1	26.340	0.006	<0.05	<2	400	1544	0.29	
3/1/05	<0.002	0.322	442	0.010	<1	13.638	0.011	<0.05	2	466	1572	0.50	
Revised 95% Upper Confidence Limit	0.003	NA	552	0.018	NA	47.612	0.015	0.15	NA	489	2279	NA	
Excursion	No	NA	No	No	NA	No	No	No	NA	No	No	NA	

Table 2 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate		
										Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
1/20/05	0.0711	<0.0004	<0.004	<0.003	0.24	0.0594	<0.002	<0.0008	11.2	0.005	<2	2
1/26/05	0.0701	<0.0004	<0.004	<0.003	0.20	0.0658	<0.002	<0.0008	11.1	0.006	<2	<2
2/2/05	0.0749	<0.0004	<0.004	<0.003	0.15	0.0280	<0.002	<0.0008	11.2	0.005	<2	2
2/10/05	0.0761	<0.0004	<0.004	<0.003	0.21	0.1100	<0.002	<0.0008	11.8	<0.005	4	3
2/17/05					Well could not be sampled*							
2/25/05	0.0740	<0.0004	<0.004	<0.003	0.27	0.0820	<0.002	<0.0008	12.1	0.007	<2	3
3/1/05	0.0693	0.0012	<0.004	<0.003	0.33	0.0286	<0.002	<0.0008	12.3	<0.005	<2	3
Revised 95% Upper Confidence Limit	0.0963	0.0012	0.0048	0.002	0.57	0.1460	NA	**	NA	0.024	NA	NA
Excursion	No	No	No	No	No	No	NA	NA	NA	No	NA	NA

NA—not applicable.

No = concentration did not exceed 95 percent upper confidence limit; Yes = concentration exceeded 95 percent upper confidence limit.

*Unable to collect sample because snow blocked access to the well.

**Background value was below detection limit, 95 percent upper confidence limit could not be determined.

Table 3: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-2 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Table 2 (SOW) Parameters

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (cfu/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total	
											Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
1/20/05	<0.002	0.187	225	0.011	<3	18.187	<0.002	<0.05	6	402	1045	0.44
1/26/05					Well could not be sampled*							
2/2/05	<0.002	0.185	200	0.014	<1	6.905	0.002	<0.05	<2	385	1042	0.17
2/10/05	<0.002	0.343	329	0.007	<1	1.261	<0.002	<0.05	5	642	1783	0.18
2/17/05	<0.002	0.366	357	0.009	<1	1.711	<0.002	<0.05	2	637	1728	0.63
2/25/05	<0.002	0.363	351	0.006	<1	1.744	0.007	0.11	<2	581	1484	0.07
3/1/05	<0.002	0.355	333	0.019	<1	1.549	0.014	<0.05	<2	569	1624	0.12
Revised 95% Upper Confidence Limit	0.006	NA	420	0.027	NA	4.497	0.015	0.23	NA	718	2485	NA
Excursion	No	NA	No	No	NA	Yes	No	No	NA	No	No	NA

Table 3 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-2 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Table 2 (SOW) Parameters												
Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate		
										Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
1/20/05	0.0404	<0.0004	<0.004	<0.003	0.15	0.3478	0.038	<0.0008	13.1	0.216	<2	3
1/26/05					Well could not be sampled*							
2/2/05	0.0422	<0.0004	<0.004	<0.003	0.15	0.1906	0.023	<0.0008	12.5	0.014	<2	3
2/10/05	0.0509	<0.0004	<0.004	<0.003	0.15	0.0533	0.032	<0.0008	12.6	0.366	3	3
2/17/05	0.0524	<0.0004	<0.004	<0.003	0.12	0.0373	0.034	<0.0008	13.0	0.651	<2	3
2/25/05	0.0514	<0.0004	<0.004	<0.003	0.18	0.0435	0.028	<0.0008	13.4	1.195	<2	3
3/1/05	0.0497	0.0012	<0.004	<0.003	0.19	0.0317	0.037	<0.0008	13.2	2.570	<2	2
Revised 95% Upper Confidence Limit	0.0742	0.0012	0.007	0.002	0.35	0.0574	NA	0.0002	NA	4.416	NA	NA
Excursion	No	No	No	No	No	Yes	NA	No	NA	No	NA	NA

NA—not applicable.

No = concentration did not exceed 95 percent upper confidence limit; Yes = concentration exceeded 95 percent upper confidence limit.

*Unable to collect sample because snow blocked access to the well.

Table 4: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-3 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Table 2 (SOW) Parameters

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (cfu/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total	
											Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
1/20/05	<0.002	0.262	178	0.009	<1	10.912	<0.002	<0.05	3	169	870	0.41
1/26/05						Well could not be sampled*						
2/2/05	<0.002	0.184	190	0.023	<1	15.138	<0.002	<0.05	<2	187	958	0.37
2/10/05	<0.002	0.182	194	0.006	<1	15.751	0.002	<0.05	7	185	378	0.90
2/17/05	<0.002	0.163	194	0.010	<1	15.130	<0.002	<0.05	<2	186	972	0.64
2/25/05	<0.002	0.148	190	0.009	<1	17.446	0.006	0.09	<2	178	860	0.24
3/1/05	<0.002	0.181	190	0.011	<1	13.927	0.009	<0.05	<2	179	924	0.27
Revised 95% Upper Confidence Limits	**	NA	180	0.022	NA	30.588	0.012	0.06	NA	224	1270	NA
Excursion	NA	NA	Yes	Yes	NA	No	No	Yes	NA	No	No	NA

Table 4 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-3 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Table 2 (SOW) Parameters												
Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate		
										Nitrogen (mg/L)	BOD ₂₁ (mg/L)	
1/20/05	0.0622	<0.0004	<0.004	<0.003	0.16	0.0798	<0.002	<0.0008	10.4	0.015	<2	2
1/26/05					Well could not be sampled*							
2/2/05	0.0714	<0.0004	<0.004	<0.003	0.14	0.1401	0.003	<0.0008	12.5	<0.005	2	4
2/10/05	0.0731	<0.0004	0.006	<0.003	0.15	0.1590	<0.002	<0.0008	12.6	0.015	<2	4
2/17/05	0.0710	<0.0004	<0.004	<0.003	0.08	0.1557	<0.002	<0.0008	13.1	0.046	<2	3
2/25/05	0.0741	<0.0004	<0.004	<0.003	0.16	0.1741	0.002	<0.0008	12.9	0.026	<2	3
3/1/05	0.0616	0.0005	<0.004	<0.003	0.16	0.1180	<0.002	<0.0008	11.0	<0.005	<2	3
Revised 95% Upper Confidence Limits	0.1000	0.0006	0.007	0.002	0.38	0.1793	NA	0.0196	NA	0.331	NA	NA
Excursion	No	No	No	No	No	No	NA	No	NA	No	NA	NA

NA—not applicable.

No = concentration did not exceed 95 percent upper confidence limit; Yes = concentration exceeded 95 percent upper confidence limit.

*Unable to collect sample because snow blocked access to the well.

**Background value was below detection limit, 95 percent upper confidence limit could not be determined.

Table 5: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-4 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Table 2 (SOW) Parameters

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal Coliform (cfu/100 mL)	Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total	
											Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
1/20/05	<0.002	0.420	437	0.014	<1	18.748	<0.002	<0.05	4	237	1402	0.43
1/26/05						Well could not be sampled*						
2/2/05	<0.002	0.445	430	0.007	<1	1.986	<0.002	<0.05	4	252	1479	0.47
2/10/05	<0.002	0.469	447	0.006	<1	2.220	0.002	<0.05	4	253	1420	0.50
2/17/05	<0.002	0.372	466	0.009	<1	19.352	<0.002	<0.05	<2	253	348	0.48
2/25/05	<0.002	0.371	464	0.015	<1	23.224	0.006	<0.05	<2	231	1434	0.32
3/1/05	<0.002	0.379	462	0.010	<1	13.638	0.011	<0.05	2	230	1572	0.40
Revised 95% Upper Confidence Limit	**	NA	611	0.073	NA	31.510	0.024	0.07	NA	300	1873	NA
Excursion	NA	NA	No	No	NA	No	No	No	NA	No	No	NA

Table 5 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-4 DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate		
										Nitrogen (mg/L)	BOD ₅ (mg/L)	BOD ₂₁ (mg/L)
1/20/05	0.1071	0.0004	0.007	<0.003	0.18	0.1307	<0.002	<0.0008	12.8	<0.005	<2	4
1/26/05					Well could not be sampled*							
2/2/05	0.1027	<0.0004	<0.004	<0.003	0.16	0.0414	<0.002	<0.0008	12.6	<0.005	<2	2
2/10/05	0.1097	0.0006	<0.004	<0.003	0.18	0.0408	<0.002	<0.0008	11.8	0.007	<2	2
2/17/05	0.1044	<0.0004	<0.004	0.003	0.11	0.1711	<0.002	<0.0008	11.9	0.013	<2	2
2/25/05	0.1086	<0.0004	<0.004	<0.003	0.19	0.2197	<0.002	<0.0008	12.0	0.028	<2	2
3/1/05	0.0629	<0.0004	<0.004	<0.003	0.17	0.0783	<0.002	<0.0008	12.9	<0.005	<2	3
Revised 95% Upper Confidence Limit	0.1576	0.0009	0.074	0.002	0.37	0.2332	NA	0.0043	NA	0.262	NA	NA
Excursion	No	No	No	Yes	No	No	NA	No	NA	No	NA	NA

NA—not applicable.

No = concentration did not exceed 95 percent upper confidence limit; Yes = concentration exceeded 95 percent upper confidence limit.

*Unable to collect sample because snow blocked access to the well.

**Background value was below detection limit, 95 percent upper confidence limit could not be determined.

Table 6: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN THORNTON TRANSITIONAL RESERVOIR DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Date	Arsenic (mg/L)	Boron (mg/L)	Chloride (mg/L)	Copper (mg/L)	Fecal		Iron (mg/L)	Lead (mg/L)	Mercury (µg/L)	Phenols (µg/L)	Sulfate (mg/L)	Total	
					Coliform (cfu/100 mL)							Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
1/15/05	<0.002	0.070	93	0.014	3400	3.728	0.004	<0.05	18	40	306	0.19	
1/20/05	<0.002	0.058	82	0.015	90	3.769	0.004	<0.05	14	40	370	0.32	
1/26/08	0.004	0.068	92	0.020	<100	2.632	0.002	<0.05	11	41	389	0.53	
2/3/05					Reservoir could not be sampled*								
2/10/05	<0.002	0.072	95	0.027	<100	1.724	0.004	<0.05	14	42	312	0.33	
2/15/05	<0.002	0.069	101	0.014	<10	1.549	0.005	<0.05	9	46	366	0.46	
2/23/05	<0.002	0.077	107	0.012	9	1.634	0.007	<0.05	5	52	1470	0.21	
3/1/05					Reservoir could not be sampled**								

Table 6 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN THORNTON TRANSITIONAL RESERVOIR DURING THE JANUARY 12 AND FEBRUARY 14, 2005, FILL EVENTS

Table 2 (SOW) Parameters												
Date	Barium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cyanide (mg/L)	Fluoride (mg/L)	Manganese (mg/L)	Nickel (mg/L)	Silver (mg/L)	Temperature °C	Nitrate		
										Nitrogen (mg/L)	BOD ₂₁ (mg/L)	
1/15/05	0.0333	0.0007	0.005	0.003	0.16	0.0607	0.005	0.0033	5.3	1.002	2	7
1/20/05	0.0354	0.0004	0.005	<0.003	0.26	0.0531	0.016	<0.0008	5.2	0.970	5	7
1/26/08	0.0290	0.0005	0.004	<0.003	0.19	0.0313	0.004	<0.0008	4.1	1.094	3	5
2/3/05					Reservoir could not be sampled*							
2/10/05	0.0254	<0.0004	<0.004	<0.003	0.15	0.0276	0.004	<0.0008	4.4	<0.005	4	7
2/15/05	0.0252	<0.0004	<0.004	0.004	0.17	0.0438	0.004	<0.0008	4.2	1.018	18	24
2/23/05	0.0266	0.0005	<0.004	<0.003	0.18	0.0436	0.004	<0.0008	4.2	1.072	3	5
3/1/05					Reservoir could not be sampled**							

*Unable to collect sample because reservoir surface was covered with ice.

**Unable to collect sample because reservoir was dry.