

**RESEARCH AND DEVELOPMENT
DEPARTMENT**

REPORT NO. 07-45

TUNNEL AND RESERVOIR PLAN

THORNTON TRANSITIONAL FLOOD CONTROL RESERVOIR

WATER QUALITY MONITORING WELLS

2006 ANNUAL GROUNDWATER MONITORING REPORT

July 2007

July 27, 2007

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

Dear Ms. Willhite:

Subject: Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir
Water Quality Monitoring Wells, 2006 Annual Groundwater Monitoring
Report

Enclosed are three copies of "Tunnel and Reservoir Plan, Thornton Transitional Flood Control Reservoir Water Quality Monitoring Wells, 2006 Annual Groundwater Monitoring Report."

Very truly yours,

Louis Kollias
Director
Research and Development

LK:JSJ:lmf

Enclosures

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TUNNEL AND RESERVOIR PLAN
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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 2006. 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 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 four fill events at the Thornton Transitional Reservoir during the year 2006: April 17, 2006; August 29, 2006; September 13, 2006

values once the Reservoir was dry on May 10, 2006: QT-1 chloride; QT-2 iron, sulfate, and manganese; QT-3 chloride and lead; and none were observed for QT-4.

During the August 29, 2006, and September 13, 2006, fill events, the 95 percent upper confidence limit from the background concentration was exceeded for the following parameters in the following wells: QT-1 (Table 7

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

Arsenic
Boron
Chloride
Copper
Fecal Coliform
Iron
Lead
Mercury

TABLE 2: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1 DURING THE APRIL 17, 2006, FILL EVENT

Date	Table 2 (SOW) Parameters										Total	
	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)	Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)
4/20/06*			414		<1					388	2028	0.45

TABLE 2 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1 DURING THE APRIL 17, 2006, FILL EVENT

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)
4/20/06*									14	0.028		
4/27/06	0.0799	<0.0004	<0.004	<0.003	0.37	0.072	0.007	<0.0008	14	<0.005	0	4
5/4/06	0.0833	0.0010	<0.004	<0.003	0.35	0.092	<0.002	<0.0008	15	<0.005	2	4
5/11/06					Well could not be sampled**							
6/15/06	0.0847	0.0010	<0.004	<0.003	0.35	0.088	<0.002	<0.0008	16	0.011	3	3
7/13/06	0.0879	<0.0004	<0.004	<0.003	0.38	0.073	<0.002	<0.0008	16	<0.005	0	4
Revised 95% Upper Confidence Limit	0.0963	0.0012	0.005	0.002	0.57	0.146	NA	***	NA	0.024	NA	NA
Excursion	No	No	No	No	No	No	NA	NA	NA	Yes	NA	NA

NA—not applicable.

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

*Some parameters were not analyzed because the wrong test schedule was used for the analysis.

**Well dry.

***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 APRIL 17, 2006, FILL EVENT

TABLE 3 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-2 DURING THE APRIL 17, 2006, FILL EVENT

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)
4/20/06*									14	0.232	0	5
4/27/06	0.0244	0.0010	<0.004	<0.003	0.25	0.1382	0.017	<0.0008	15	0.277	0	5
5/4/06	0.0370	<0.0004	<0.004	<0.003	0.35	0.1114	0.022	<0.0008	15	0.118	0	5
5/11/06	0.0420	<0.0004	<0.004	<0.003	0.32	0.0571	0.030	<0.0008	15	0.013	0	4
6/15/06	0.0388	0.0010	<0.004	<0.003	0.31	0.0941	0.032	<0.0008	16	0.008	0	5
7/13/06	0.0380	<0.0004	<0.004	<0.003	0.29	0.0303	0.029	<0.0008	16	0.034	0	4
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.

*Some parameters were not analyzed because the wrong test schedule was used for the analysis.

TABLE 4: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-3
DURING THE APRIL 17, 2006, FILL EVENT

TABLE 4 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-3

TABLE 5 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-4 DURING THE APRIL 17, 2006, FILL EVENT

Table 2 (SOW) Parameters

Barium	Cadmium	Chromium	Cyanide	Fluoride	Manganes	Nitrate
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TABLE 6: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN THORNTON TRANSITIONAL RESERVOIR
DURING THE APRIL 17, 2006, FILL EVENT

TABLE 6 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN THORNTON TRANSITIONAL RESERVOIR DURING THE APRIL 17, 2006, FILL EVENT

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)
4/27/06	0.0271	0.0010	<0.004	0.003	0.21	0.0388	0.006	<0.008	11	1.044	4	7
5/3/06	0.0272	<0.0004	<0.004	0.003	0.26	0.0201	0.009	<0.008	14	1.306	7	9

TABLE 7: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1 DURING THE AUGUST 29, 2006, AND SEPTEMBER 13, 2006, FILL EVENTS

Table 2 (SOW) Parameters														
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)	Coliform						Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)	

TABLE 7 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1
DURING THE AUGUST 29, 2006, AND SEPTEMBER 13, 2006, FILL EVENTS

TABLE 8 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-2 DURING THE AUGUST 29, 2006, AND SEPTEMBER 13, 2006, 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)
8/31/06												
9/8/06												
9/13/06	0.0365	<0.0004	<0.004	<0.003	0.28	0.2007	0.085	<0.008	18	0.365	0	4
9/20/06	0.0322	<0.0004	<0.004	<0.003	0.30	0.1829	0.068	<0.008	17	0.267	0	1
9/28/06	0.0317	<0.0004	<0.004	<0.003	0.30	0.1673	0.074	<0.008	17	0.154	0	2
10/5/06	0.0355	<0.0004	<0.004	<0.003	0.26	0.1618	0.063	<0.008	17	0.062	5	4
10/12/06	0.0351	<0.0004	<0.004	<0.003	0.29	0.1614	0.050	<0.008	16	0.024	0	3
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 sample due to pump failure.

TABLE 9 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-3

TABLE 10: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN

TABLE 10 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-4 DURING THE AUGUST 29, 2006, AND SEPTEMBER 13, 2006, 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)
8/31/06	0.0958	<0.0004	<0.004	<0.003	0.26	0.1519	<0.002	<0.008	18	0.009	0	5
9/8/06	0.0784	<0.0004	<0.004	<0.003	0.23	0.1702	<0.002	<0.008	17	0.925	0	3
9/13/06	0.0833	<0.0004	<0.004	*	0.25	0.1471	<0.002	<0.008	17	<0.005	0	2
9/20/06	0.0780	<0.0004	<0.004	<0.003	0.29	0.0687	<0.002	<0.008	18	<0.005	0	2
9/28/06	0.0889	<0.0004	<0.004	<0.003	0.27	0.1536	<0.002	<0.008	17	<0.005	0	4
10/5/06	0.0956	<0.0004	<0.004	<0.003	0.25	0.1479	<0.002	<0.008	16	<0.005	0	5
10/12/06	0.1011	<0.0004	<0.004	<0.003	0.27	0.1954	<0.002	<0.008	17	<0.005	0	2
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	No	No	No	NA	No	NA	Yes	NA	NA

NA—not applicable.

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

*Not analyzed due to insufficient sample size.

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

TABLE 11: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN THORNTON TRANSITIONAL RESERVOIR DURING THE AUGUST 29, 2006, AND SEPTEMBER 13, 2006, 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)
8/30/06	<0.002	0.075	31.6	0.005	178	2.87	0.007	0.09	<2	047	200	0.45	
9/6/06	<0.002	0.007	38.1	<0.003	<100	0.65	0.003	<0.05	<2	050	168	0.13	
9/15/06	<0.002	0.084	40.6	0.004	1300	2.01	0.004	0.07	<2	061	286	0.35	
9/21/06	<0.002	0.098	24.8	<0.003	40	0.63	0.003	<0.05	<2	076	326	0.12	
9/28/06	<0.002	0.108	74.9	<0.003	100	1.20	0.004	<0.05	<2	126	146	0.21	
10/4/06	<0.002	0.109	54.8	0.006	8500	2.36	0.007	<0.05	<2	084	282	0.15	

TABLE 11 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN THORNTON TRANSITIONAL RESERVOIR

TABLE 12: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1 DURING THE DECEMBER 1, 2006, FILL EVENT

Date	Table 2 (SOW) Parameters											Total	
	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)	Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)	
12/7/06	<0.002	0.298	772	0.110	<1	32.640	0.004	<0.05	<2	423	2294	0.36	
12/14/06	<0.002	0.290	801	<0.003	<1	26.090	0.010	<0.05	3	417	2336	0.34	
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	Yes	Yes	NA	No	No	No	NA	No	Yes	NA	

TABLE 12 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-1

TABLE 13: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-2 DURING THE DECEMBER 1, 2006, FILL EVENT

Table 2 (SOW) Parameters														
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)	Coliform						Dissolved Solids (mg/L)	Ammonia Nitrogen (mg/L)	
12/7/06														

Well could not be sampled*

TABLE 13 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-2 DURING THE DECEMBER 1, 2006, FILL EVENT

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)
12/7/06												

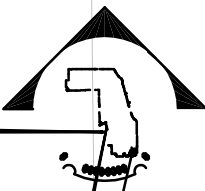
TABLE 15: PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN WATER QUALITY MONITORING WELL QT-4 DURING THE DECEMBER 1, 2006, FILL EVENT

Date	Table 2 (SOW) Parameters											
	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)
12/7/06	<0.002	0.414	392	<0.003	<1	23.69	<0.002	<0.				

TABLE 16 (Continued): PARAMETERS FROM TABLE 2 OF IEPA'S SOW IN THORNTON TRANSITIONAL RESERVOIR DURING THE DECEMBER 1, 2006, FILL EVENT

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)
12/4/06	0.0321	<0.0004	0.005	<0.003	0.27	0.0518	0.005	<0.0008	2	0.666	6	10
12/11/06	Reservoir could not be sampled*											

*Sample could not be collected because the reservoir surface was covered with ice.



175th ST.

THORN

DISTRICT OF C