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Akron Water Pollution Control Station
No Feasible Alternative (NFA)

December 29, 2006

APUB

Department of Public Service
Akron Public Utilities Bureau
Water Pollution Control

AEB

Department of Public Service
Akron Engineering Bureau
Environmental Division

City of Akron

Akron Water Pollution Control Station
No Feasible Alternative (NFA)

December 29, 2006

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ABBREVIATIONS/SYMBOLS

A.B.	aeration basin
ADF	average daily flow
&	and
ASCE	American Society of Civil Engineers
BOD_5	biochemical oxygen demand
$CBOD_5$	carbonaceous biochemical oxygen demand
cf	cubic feet
cfs	cubic feet per second
CSO	combined sewer overlfow
CMF	compressed media filtration
DCS	distributed control system
DO	dissolved oxygen
$	dollars
EHRC	enhanced high-rate clarification
=	equals
'/ft.	foot/feet
fps	feet per second
FST	final settling tank
gpm	gallons per minute
>	greater than
hr.	hour
hp	horsepower
HRT	high-rate treatment
"	inch(es)
lbs./day	pounds per day
LCI	Little Cuyahoga Interceptor
<	less than
LTCP	Long-Term Control Plan
max.	maximum
MBR	membrane bioreactor
MCRT	mean cell residence time
mg/l	milligram per liter
MG	million gallons
MGD	million gallons per day
min.	minimum
ml.	milliliter

ABBREVIATIONS/SYMBOLS (con't)

MLSS	mixed liquor suspended solids
mm.	millimeter
NFA	No Feasible Alternative
NH_3-N	ammonia nitrogen
NPDES	National Pollutant Discharge Eliminiation System
No.	number
NSI	Northside Interceptor
OCI	Ohio Canal Interceptor
OEPA	Ohio Environmental Protection Agency
O&M	operation and maintenance
P	phosphorous
PDF	peak daily flow
/	per
%	percent
PFD	process flow diagram
psi	pounds per square inch
PST	primary settling tank
RAS	return activated slugde
RBC	rotating biological contactor
R/W	right-of-way
SBC	submergeged biological contactor
scfm	standard cubic feet per minute
sf	square feet
SOR	surface overflow rate
SRT	storm retention tank
SSO	sanitary sewer overflow
STS	secondary treatment system
SWD	side water depth
TMDL	total maximum daily load
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
WAS	waste activated sludge
WEF	Water Environment Federation
WERF	Water Environment Research Foundation
WPCS	Water Pollution Control Station

SECTION 1
EXECUTIVE SUMMARY

The purpose of the Akron Water Pollution Control Station (WPCS) No Feasible Alternative (NFA) Report is to incorporate the City of Akron's prior NFAs into one report, as well as to evaluate and update the NFA. This NFA was performed in accordance with Section II.C.7 of U.S. EPA's 1994 Combined Sewer Overflow Control Policy (the CSO Policy), and is an amendment to the City of Akron's LTCP. The following elements of Section II.C.7. of the CSO Policy are addressed within the referenced sections of this Report.

1. Justification for the cut-off point at which the flow will be diverted from secondary. This narrative is presented in Sections 3.3 through 3.6.

2. A cost-benefit analysis demonstrating whether providing additional treatment at the plant is more beneficial than other alternatives including storage and pump back for secondary treatment, sewer separation, or satellite treatment. This analysis is presented in Sections 5.1 and 5.2, as well as represented for sewer separation in Section 4.3 and for satellite treatment in Section 4.4.

3. Evidence that the system has been designed to meet secondary limits for flow greater than the peak dry weather flow plus an appropriate quantity of wet weather flow is generally found in Section 3.

4. Evidence that it is technically or financially infeasible to provide secondary treatment at the existing facilities for greater amounts of wet weather flow is presented in Section 5.

5. Consideration of enhanced primary treatment (e.g., chemical addition) and non-biological secondary treatment is given within the Secondary Treatment Alternatives, Sections 4.2 and 4.6.

6. Consideration of possible adverse effects resulting from the bypass is included in Table 5.3.

Section 2 of this Report provides a brief summary of City of Akron's sewage collection and wastewater treatment system infrastructure planning and improvements as they relate to a continual effort to improve service and water quality. The CSO Policies pertaining to this NFA Report are also reviewed.

The existing capabilities of the Akron WPCS are summarized in Section 3. Process and hydraulic capacities are established. This section also summarizes the results from prior stress tests and discusses the results of an additional stress test that was performed in 2006. The WPCS has a firm peak flow capacity of 210 MGD through preliminary and primary treatment systems. The Secondary Treatment system is limited to 110 MGD without further stress testing, process modeling and constructed improvements. Primary effluent quality wastewater flow above 110 MGD, occurring during wet weather events, is currently routed directly to the disinfection facility for combining with secondary effluent prior to chlorination/dechlorination, and discharges to the Cuyahoga River.

Section 4 presents an evaluation of alternatives to alter and/or improve the Akron wastewater collection and treatment systems. Collection system alternatives developed in previously submitted planning documents are summarized and re-presented with updated costs. Additional Secondary Treatment alternatives, including secondary bypass high rate clarification systems, are developed, screened and evaluated.

Section 5 provides a final screening of Secondary Treatment Alternatives and Secondary Bypass Alternatives and a review of constructability issues and water quality benefits. A cost-benefit analysis is presented. The most cost effective and beneficial alternative is identified.

The Conclusions and Recommendations, Section 6, presents the proposed WPCS Improvements to control and treat secondary bypass flows. The proposed plan includes a 100 MGD capacity enhanced high-rate treatment (EHRC) system and improvements to the secondary treatment system (contingent upon successful stress testing/process modeling to support a 120 MGD secondary treatment capacity) at a cost of $16.4 million. It is proposed to construct the EHRC facility in two (2), 50 MGD phases, which is anticipated to increase the project cost to $17.8 million. The Secondary Bypass will continue to be utilized, after maximizing flow to the secondary treatment system, storm retention tank, and the EHRC system, and under very limited conditions (less than 4 events per the design year as defined in the *Facilities Plan '98*[6]). There is no feasible alternative to continued operation of the Secondary Bypass other than the controls presented herein.

SECTION 2
INTRODUCTION

2.1. NFA Report Goal

In limited situations, the WPCS bypasses waste streams around the WPCS's secondary treatment facilities (the "Secondary Bypass"). The City's LTCP includes a demonstration, in accordance with the CSO Policy, that the City will maximize flows to the WPCS for treatment, and that there is no feasible alternative to the limited use of the Secondary Bypass. The City's NFA, as originally set forth within the LTCP, is contained in various parts of the City's LTCP, including, but not limited to, Section 8 of the *Facilities Plan 98*[6], dated December 15, 1998, and Section 14.1.2 of the *Facilities Plan 98 Alternatives*[7], dated April 30, 1999, as well as within other reports. As a result, the City prepared this report in order to include the entire NFA into one, stand alone report. At the same time, the City updated the NFA with an additional analysis of the capacity of the WPCS and the various alternatives to the secondary bypass. The results of this additional analysis are also included in this report.

2.2. The CSO Policy

The CSO Policy is intended to establish a consistent national approach for controlling discharges from CSOs through the NPDES permit program. Section 402(q) of the Clean Water Act requires that each permit, order or decree issued after December 21, 2000 for a discharge from a municipal combined storm and sanitary sewer shall conform to the CSO Policy.

Section II.C.7 of the CSO Policy provides that "[o]ne effective strategy to abate pollution resulting from CSOs is to maximize the delivery of flows during wet weather to the POTW treatment plant for treatment." This same section further recognizes that under certain situations, it is necessary to intentionally divert or bypass waste streams around portions of the treatment facility, including secondary treatment.

Under EPA's bypass regulations at 40 CFR 122.41(m), for a bypass to be authorized a permittee needs to demonstrate that the bypass was unavoidable to prevent loss of life, personal injury or severe property damage, that there was no feasible alternative to the bypass and that the required notices have been submitted. This is typically done on a case-by-case basis. However, Section II.C.7 of the CSO Policy provides that "the study of feasible alternatives in the control plan may provide sufficient support for the permit record and for approval of a CSO-related bypass in the permit itself, and to define the specific parameters under which a bypass can legally occur."

Section II.C.7. of the CSO policy further provides as follows:

> For the purposes of applying this regulation to CSO permittees, "severe property damage" could include situations where flows above a certain level wash out the POTW's secondary treatment system. EPA further believes that the feasible alternatives requirement of the regulation can be met if the record shows that the secondary treatment system is properly operated and maintained, that the system has been designed to meet secondary limits for flows greater than the peak dry weather flow, plus an appropriate quantity of wet weather flow, and that it is either technically or financially infeasible to provide secondary treatment at the existing facilities for greater amounts of wet weather flow. The feasible alternative analysis should include, for example, consideration of enhanced primary treatment (e.g., chemical addition) and non-biological secondary

treatment. Other bases supporting a finding of no feasible alternative may also be available on a case-by-case basis.

As a result, the CSO Policy expressly provides that a CSO related bypass may be authorized within an NPDES permit if the necessary demonstration is set forth within the CSO long-term control plan. This necessary demonstration is set forth in the City's LTCP. An additional, updated demonstration is set forth in this report.

2.3. Background

2.3.1. Facilities Planning Efforts

The City of Akron is proactive in their management and planning of wastewater infrastructure. Planning studies prepared in recent years are listed below. Documents 5, 7, 9, 10, and 15 present fundamental elements of the City's proposed Long Term Control Plan selected alternative and demonstrate the need to maintain the secondary bypass conduit for limited use. This NFA report includes synopses from these previously submitted documents.

1) The Akron Facilities Plan – 1980, this document is a plan for improving and upgrading the entire wastewater infrastructure from collection through treatment and disposal.

2) City of Akron Activated Sludge Plant Stress Test – 1994, this test concluded that flows over 110 MGD flood the aeration tanks and causes degradation of the final clarifiers. Hydraulic capacity is limited by the aeration tanks and final clarifiers.

3) City of Akron Activated Sludge Plant Stress Test – 1997, this test concluded flow must not exceed 120 MGD for Secondary treatment to be effective. During the test, it was noted that adding polymer did not have any effect on final clarifier suspended solids.

4) CSO System Wide Study – 1995, this study concluded that streams receiving CSO discharge would not improve to known water quality standards if all CSO discharges were eliminated. The physical conditions of the streams would not be able to attain targeted aquatic life use even if all CSOs were eliminated.

5) Facilities Plan '98 – 1998, this plan is an update to the 1980 Facilities Plan. It includes alternatives for improving the combined sewer system and means of reaching water quality requirements.

6) City of Akron CSO System Wide Study – Phase II – 1998, this study documents the combined sewer system operation during a storm event, attainability of CSO receiving waters, and biological and chemical impacts of the CSOs in and around the combined sewer flows.

7) Facilities Plan '98 Alternatives – 1999, this is a summary of five Integrated Alternatives.

8) Akron, Ohio WPCS Primary Settling Tank Flow Study – 1996, this study determined that the primary settling tanks could have a peak flow of

150 MGD due to their hydraulics. The performance of the primary settling tanks exceeds what is considered typical even beyond flows of 150 MGD.

9) Long-Term Control Plan ’98 – 2000, this plan is a comprehensive CSO control plan for future improvements to wastewater facilities.

10) Long-Term Control Plan Additional Evaluations – 2002, this includes an evaluation of the proposed Integrated Alternative #2 and Express sewers.

11) WPCS Pre-Aeration Shutdown Study Report – 2002, this study states the potential elimination of the pre-aeration process will reduce costs and provide 1.8 MG of storage capacity for wet weather.

12) WPCS Secondary Bypass Treatability Study – 2004, this study evaluated the Krüger ACTIFLO process to treat secondary bypass during wet weather events.

13) WPCS Secondary Bypass Treatability Study Phase II – 2004 (r. 2006), this study evaluated the Infilco-Degremont DensaDeg process to treat secondary bypass during wet weather events.

14) WPCS Secondary Bypass Treatability Study Phase III – 2006, this study evaluated the WWETCO CMF process for treatment of secondary bypass during wet weather events.

15) City of Akron Long-Term Control Plan Review and Disinfection Investigations – 2005, this document recommends expanding tunnels to add storage. It recommends evaluation of the LTCP every five years.

16) Nine Minimum Control Measures – This document complies with CSO policy by defining the collection system operation and maintenance procedures in place to insure best management practices associated with CSO operation.

2.3.2. Infrastructure Improvements

The City continuously reinvested in its wastewater infrastructure as a result of the planning efforts summarized in the preceding section. The following summarizes the process treatment system improvements completed as a result of these planning efforts. Maintenance related improvements and minor improvements to existing infrastructure are not listed.

- Contract 81-1 – #13 - #24 Primary Tanks, Chemical Treatment, 1981
- Contract 81-2 – #1C – 6C Final Tanks & Hydraulic Improvements, 1981
- Contract 81-3 – Gravity Thickener & Equalization Improvements, Belt Presses, & Waste Liquor Treatment, 1981
- Contract 81-5 – Parkson building, 1981
- Contract 82-2 – Mixing & Holding Tanks, 1982
- Contract 83-1 – Composting Plant, 1983

- Contract 84-1 – Primary Tank Renovations, 1986
- Contract 86-3 – Monitoring & Sampling Improvements – Final Effluent Monitoring System, Permanent Sampling, 1987
- Contract 87-1 – Headworks Improvements – Bar Screen Replacement, Demolition of Chlorine Building, Raw Influent Sampling Station, Back Flow Preventor Building, 1988
- Contract 87-2 – New Plant Discharge Structure, Secondary Bypass Modifications, 1987
- Contract 87-3 – Grit Handling Improvements – Grit Collector & Screw Replacement, Grit Loading Building, 1989
- Contract 88-1A – Distributed Control System, 1992
- Contract 88-1B – Process Control Improvements & DCS I/O Installation, 1992
- Contract 109 – Final Clarifier Covers 1C & 2C, 1991
- Contract 111 – Gravity Thickener Improvements, 1992
- Contract 112 – Waste Liquor Treatment Improvements, 1993
- Contract 114 – Disinfection Improvements, 1993
- Contract 116 – Final Tank Effluent Sample Building, 1993
- Contract 118 – Activated Treatment Renovations, 1993
- Contract 120 – Final Clarifier Covers, 1993
- Contract 123 – South Waste Liquor Equalization Tank, 1993
- Contract 131 – Grease Handling Improvements, 1996
- Contract 134 – Waste Activated Sludge Thickening, 1996
- CSO Rack 40 (Cuyahoga Street) Storage Basin Project, 2006

SECTION 3
EXISTING WPCS CAPABILITIES

3.1. General

Presently, the Akron Water Pollution Control Station (WPCS) is considered to have a firm, preliminary treatment capacity of 210 MGD, primary treatment capacity is 150 MGD, and a 110 MGD secondary treatment capacity. It is operated as a single-stage nitrification process. Figure 3-1, following this section, presents a site plan for the Akron WPCS. Figure 3-2, following this section, is a schematic flow diagram illustrating process treatment and sludge flow at the Akron WPCS (*Facilities Plan 98*[6].)

The WPCS has seen numerous renovations and new processes constructed since it first began operation in 1928. Significant capital improvement projects completed over the past 20 years are listed in Section 2.3. A detailed narrative describing the major projects is provided in Section 8.5.6 of the *Facilities Plan 98*[6]. Numerous projects have been completed to incorporate new, more effective treatment technology into the WPCS. Examples include fine screening, storm water flow control and storage systems, fine pore aeration and effluent aeration using liquid oxygen. These projects have each contributed to improved treatment. WPCS effluent quality has consistently met National Pollutant Elimination System (NPDES) discharge limitations. Table 3-1 summarizes the current (1994) NPDES permit effluent limitations. As shown, WPCS raw influent flows averaged 78.6 MGD for 2005. The flow receiving full secondary treatment averaged 75.7 MGD. The 2005 average dry day (non-rain day) flow averaged 68.7 MGD. The average of peak, dry day flows is approximately 83.1 MGD. Although, this value includes "wet weather day" flow that is received at the plant in the days immediately following the cessation of rainfall and all snow melt impacts due to infiltration and the collection system time of concentration. (A "true" dry day peak average is likely approximately 72 MGD.)

Table 3-1 1994 Modified NPDES Permit Effluent Discharge Limits			
Parameter	Discharge Limitation		Units
	7-day	30-day	
Monitoring Station 602 – Final Settling Tank Effluent			
Total Suspended Solids (TSS)	23	15	mg/l
Nitrogen (NH_3-N)			mg/l
June-September	2.3	1.5	mg/l
March-May, October-November	7.1	4.8	mg/l
December-February	11.3	7.5	mg/l
Phosphorous (P)	1.5	1.0	mg/l
$CBOD_5$	15	10	mg/l
Monitoring Station 603 – Primary Effluent/Secondary Bypass[1]			
Total Suspended Solids (TSS)	---	157	mg/l
$CBOD_5$	---	91	mg/l

[1] Discharge to Station 603 only when plant peak influent flows exceed 110 MGD and the flow to equalization pumping capacity is being maximized due to storm-related events and activities.

Table 3-2 summarizes WPCS performance for 2001 through 2005.

The following sections provide detailed technical data on the overall process design, and a specific review of the secondary treatment system.

3.2. Hydraulic and Process Capabilities

Table 3-3 is a design data summary of the existing facilities including their design loading rates. Process capacities are primarily based on the *Recommended Standards for Sewage Treatment Works*[2] (Ten States Standards) although, in some cases, a process capacity based on ASCE/WEF *Manual of Practice 8*[5] (MOP 8) is indicated. Table 3-3 is reprinted and updated from the City of Akron *Facilities Plan 98*[6]. A detailed narrative describing each process facility accompanies the Design Data Summary table in Section 8.5.3 of that document and may be referenced, as needed.

The focus of this No Feasible Alternative Report is the capabilities of the WPCS secondary treatment system in conjunction with selective utilization of the secondary bypass conduit. The capacities of the secondary treatment system are reviewed in more detail in the following section.

Table 3-2 2005 Performance of Akron Water Pollution Control Station (average)														
Month	Raw Influent Flow (MGD)	Raw Sewage (mg/l)				Primary Flow Treated (MGD)	Primary Effluent (MGD)		Secondary Flow Treated (MGD)	Secondary Effluent (mg/l)			
		$CBOD_5$	TSS	NH_3-N	P		$CBOD_5$	TSS		$CBOD_5$	TSS	NH_3-N	P
January	124.4	64.1	120	6.1	1.85	101.4	31.7	50.0	101.4	2.91	8.2	0.12	0.51
February	93.6	80.3	173	9.7	2.20	90.9	41.9	62.8	90.9	4.0	8.3	0.39	0.50
March	82.0	75.4	152	11.1	2.18	82.7	42.7	64.9	82.7	3.62	8.2	0.19	0.51
April	95.8	64.6	159	8.7	1.98	88.2	50.4	57.3	88.2	<2.44	6.4	0.19	0.43
May	71.7	86.6	190	11.0	2.58	72.0	52.0	60.5	72.0	<2.30	5.4	0.21	0.54
June	59.7	102.0	224	12.1	3.22	60.5	55.6	67.7	605	<2.37	7.0	<1.13	0.77
July	67.8	102.0	243	11.9	3.23	67.8	58.5	59.7	67.8	<2.27	6.7	<0.13	0.89
August	70.2	98.9	223	12.4	3.17	68.0	62.9	55.4	68.0	<2.06	4.4	0.02	0.80
September	72.3	93.1	220	11.8	3.14	71.7	55.8	51.2	71.7	<2.01	4.7	0.11	0.77
October	75.3	97.8	21	12.7	3.25	74.2	51.3	50.1	74.2	<2.10	6.9	0.07	0.77
November	68.2	108.0	254	12.2	3.07	68.3	56.6	55.1	68.3	<2.65	7.6	<0.07	0.75
December	62.4	108.0	229	13.5	3.32	63.0	62.3	60.5	63.0	2.97	7.8	<0.21	0.86
Maximum Month	124.4	108.0	254	13.5	3.32	101.4	52.9	67.7	101.4	4.0	8.3	0.39	0.89
Minimum Month	59.7	64.1	120	6.1	1.85	60.5	31.7	50.0	60.5	<2.01	4.4	<0.07	0.43
2005 Average	78.6	90.1	202	11.1	2.77	75.7	51.0	57.9	75.7	<2.6	7.0	<0.16	0.68
2004 Average	86.0	87.0	157	10.2	2.42	72.8	43.1	45.3	72.8	<2.8	8.0	<0.19	0.64
2003 Average	78.3	87.0	185	10.1	2.63	69.6	50.3	49.4	69.6	<3.0	8.0	<0.30	0.74
2002 Average	67.8	88.0	184	11.6	3.10	64.5	54.2	60.0	64.5	<2.2	9.0	0.18	0.81
2001 Average	64.3	91.0	161	11.8	3.05	65.9	55.2	54.0	65.9	<2.4	7.0	0.24	0.79

Source: *2003 and 2005 Annual Reports of the Akron Water Pollution Control Station*, Department of Public Service, City of Akron, Ohio

Table 3-3 Akron WPCS Existing Design Data Summary						
Unit Processes		Loading Rates[1]				Units
		1997		Design		
		Average	Peak	Average	Peak	
Treatment Efficiency						
Flow		81	175[2]	90	210	MGD
Preliminary Treatment						
Fine Screens		81	175	90	210	MGD
Number of Units	4					
Screen Width	8 ft.					
Screen Clearance	6 mm					
Capacity (each)	70 MGD	27	58	30	70	MGD
Detritus Tanks		81	175	90	210	MGD
Number of Units	4					
Length	40 ft.					
Width	40 ft.					
Depth	2.5 ft.					
Surface Overflow Rate		16,875	36,460	18,750	43,750	gpd/sf
Grit Removal		4	9	5	11	cy/day
No. of Mechanical Grit Collectors	4					
No. of Screw Conveyors	4					
No. of Belt Conveyors	1					
Storm Retention Basin						
Number of Units	1					
Depth (SWD)[3]	26 ft.					
Capacity (total)	9.5 MGD					
Influent pumps at 30 MGD	3					
Preaeration Tanks (decommissioned)						
Volume (total)	1.83 mg					
Primary Settling Tanks		81	175[2]	90	150	MGD
Number of Units	6					
Length	110 ft.					
Width	33 ft.					
Depth (SWD)	10 ft.					
Volume (each) gallons	271,520					
Detention Time (each)		1.8	0.8	1.6	1	hour
Surface Overflow Rate (Area = 3,630 sf each)		1,014	2,191	1,127	1,873	gpd/sf
Weir Length (each)	240 ft.					
Weir Overflow Rate (each)		15,340	33,144	17,045	28,333	gpd/lf

Table 3-3 (con't) Akron WPCS Existing Design Data Summary						
		Loading Rates[1]				
		1997		Design		
Unit Processes		Average	Peak	Average	Peak	Units
Preliminary Treatment (con't)						
Number of Units	18					
Length	120 ft.					
Width	33 ft.					
Depth (SWD)	9 ft.					
Volume (each) gallons	266,590					
Detention Time (each)		1.5	0.6	1.6	1	hour
Surface Overflow Rate (Area = 3,960 sf each)		930	2,009	1,033	1,717	gpd/sf
Weir Length (each)	260 lf					
Weir Overflow Rate (each)		14,161	30,595	15,734	26,154	gpd/lf
Secondary Treatment						
Aeration Basins		81	122[2]	90	1504	MGD
Number of Units	6					
Length	1,200 ft.					
Width	32 ft.					
Depth (SWD)	15 ft.					
Number of Passes in Each Basin	4					
Volume	25.9 mg					
Detention time		7.7	5.1	6.9	4.1	hour
Organic Loading		13.7	16.5	17.3	34.7	lb. BOD_5/ 1000 cf/day
No. of Centrifugal Blowers @ 17,900 cfm	4					
Positive Displacement Blowers @ 11,000 cfm	3					
Available Air Supply (firm) cfm	92,000	32,000	46,000	45,000	83,400	scfm
Return Activated Sludge						
No. of Streams	6					
Flow Rate of Each Stream (typ)	15%	2.0	3.1	2.3	3.8	MGD
Final Settling Tanks		81	122[2]	90	144	MGD
No. of Units	10					
Inside Diameter	100 ft.					
Depth (SWD)	10.6 ft.					
No. of Units	8					
Inside Diameter	100 ft.					
Depth (SWD)	12 ft.					
Surface Area (each)	7,854					

Table 3-3 (con't) Akron WPCS Existing Design Data Summary						
		Loading Rates[1]				
		1997		Design		
Unit Processes		Average	Peak	Average	Peak	Units
Secondary Treatment (con't)						
Final Settling Tanks (con't)						
Total Surface Area (sf)	141,400					
Total Volume (cf)	1,586,508					
Detention Time		3.5	2.4	3.2	1.9	hour
Surface Overflow Rate		572	842	636	1,060	gpd/sf
Weir Length	4,900 ft.					
Weir Overflow Rate		16,530	24,286	18,367	30,612	gpd/sf
Chlorine Contact Tanks		81	175[2]	90	210	MGD
Number of Units	2					
Length	106 ft.					
Width	113 ft.					
Depth (SWD)	11.5 ft.					
Volume	2.06 mg					
Detention Time		36	16	33	14	mins
Dechlorination (in effluent channel)						
Effective Aeration with LOX						
Solids Handling						
Gravity Thickener Tanks						
No. of Units						
Diameter	2					
Sidewall Depth	70 ft.					
Solids Loading	9-16 ft.	8.2			11.0	lb./sf/day
Surface Overflow Rate		58			46	gpd/sf
Dry Tons		952			1,270	tons/mo.
Gravity Belt Thickeners						
No. of Units	2					
Capacity (firm)	300 gpm					
Waste Activated Sludge Flow				170	220	gpm/unit
Mixing and Holding Tanks						
Number of Units	6					
Diameter	95 ft.					
Sidewall Depth	18-26 ft.					
Dry Solids		47.5[3]				tons/day

[1] One unit out of service for preliminary treatment processes and two primary settling tanks out of service for primary treatment.
[2] Peak day flow is the average of the top 12 peak day flows for 1997
[3] 1996 operating data
[4] Historical understanding is this value includes RAS

3.3. Secondary Treatment Limitations

The following narrative reviews previous reports and evaluations of the secondary treatment system limitations. The Akron WPCS secondary treatment system includes the aeration basins, final settling tanks, RAS pumping station system, blowers and all associated influent and effluent conduits.

3.3.1. Process Limitations

Process limitations, for the purpose of this narrative, are those associated with 1) the biomass in the aeration basins and treatment to reduce parameters such as $CBOD_5$, NH_3-N and soluble phosphorous, and/or 2) physical/geometrical design elements that impact the ability to reduce effluent parameters such as Total Suspended Solids and insoluble phosphorous, and also impacts ultimate removal/reduction of biological parameters.

The 1980 *Facilities Plan*[1] identified process limitations that prevented the secondary treatment system (STS) from meeting NPDES permit requirements. It outlined several capital improvements including operating the STS as a single stage nitrification plant, constructing additional final settling tanks and associated hydraulic conduits, and additional aeration blowers. The proposed design capacities were 90 MGD ADF and 150 PDF. The majority of these recommended capital improvements were constructed between 1983 and 1989.

The *Facilities Plan 98*[6] report evaluated STS performance based on 1996 and 1997 operating data and predicted performance at higher flow rates than normal operation. This evaluation is contained in Section 8.5.8 of that Plan. The following conclusions, with regard to current effluent permit parameters and current influent wastewater characteristics, were drawn from the *Facilities Plan 98*[6] evaluation.

- $CBOD_5$ – An average overall removal efficiency of 88% is necessary to meet the 10 mg/l discharge limit. Secondary treatment flows exceeding approximately 123 MGD would not meet the permit limit.

- Total Suspended Solids (TSS) – An average overall removal efficiency of 89% is necessary to meet the 15 mg/l discharge limit. Secondary treatment flows exceeding approximately 120 MGD would not meet the permit limit.

- Ammonia Nitrogen (NH_3-N) – An average overall removal efficiency of 84% is necessary to meet the 1.5 mg/l (summer) discharge limit. Secondary treatment flows exceeding approximately 118 MGD would not meet the permit limit.

- Total Phosphorous (TP) – An average overall removal efficiency of 52% is necessary to meet the 1.0 mg/l discharge limit. Secondary treatment flows exceeding approximately 166 MGD would not meet the permit limit.

The *Facilities Plan 98*[6] evaluation also indicated a faster drop-off in removal efficiencies as flow increases during actual wet weather conditions as compared with dry weather conditions. Therefore, the conclusions noted may be a liberal interpretation of actual WPCS capabilities. Consistent performance at these capacities is questionable.

The Akron WPCS STS was further evaluated with respect to the *Recommended Standards for Wastewater Facilities*[2] (Ten States Standards) design criteria for biological treatment and for settling tanks (as shown in Table 3-3). The aeration basins are loaded within the recommended organic loading of 15 lbs./day/1,000 $ft.^3$ of tank volume. Peak day flows would boost this loading to 135% of this value. The final settling tank capacity is not constrained by the peak solids loading rate of 35 lbs./day/ft.^{2} due to the typical mixed liquor suspended solids concentration of 1,800-2,000 mg/l, and the 16% RAS pumping rate. Based on a maximum 1,000 gpd/sf surface overflow rate, the FSTs should be limited to a process flow of 141 MGD.

> "However, based on Water Environment Federation Manual of Practice No. 8 (MOP 8), it would be appropriate to limit the overflow rate to 800 gpd per square foot for a 100 foot diameter tank with a ten foot side water depth (SWD). Ten of the 18 final settling tanks at the Akron WPCS have ten foot SWD…If the twelve foot deep final settling tanks were operated to the designed maximum SOR of 1,000 gpd/sf and the ten foot deep final settling tanks were operated to a maximum SOR of 800 gpd/sf, a peak flow of 119 MGD may be processed (one ten foot deep unit out-of-service). Although linear regression analysis of available data suggests acceptable performance would occur near this rate, the number of data points is inadequate to provide a high confidence level for this scenario. The relatively shallow depth (10 foot sidewater depth) of ten of these tanks makes it questionable to predict performance at higher SORs. Density current baffles were recently installed to reduce upflow currents along the sidewalls. Historically, a fairly persistent pin floc problem had caused concern for the effluent TSS concentration at high SORs. Recent operational and physical improvements have diminished the pin floc problem." (*Facilities Plan 98*[6])

3.3.2. Hydraulic Limitations

The *1980 Facilities Plan*[1] recommended operating the Akron WPCS to provide complete treatment of all flows up to a rate of 150 MGD. It is the historical understanding of the City that the 150 MGD rate included RAS flow (110 MGD wastewater plus 40 MGD RAS). All flows to 210 MGD were to receive preliminary treatment, including screening and grit removal, and disinfection. The Plan provided for using the storm retention basins to store the first 10 MG of flow in excess of 150 MGD.

In 1996 the plant treated an average day flow of approximately 89 MGD with 80.8 MGD average flow through the secondary treatment facility. Past experience and studies of the various treatment facilities have resulted in the Akron WPCS being operated to limit flows through primary and secondary treatment to approximately 150 MGD and 110 MGD, respectively. The purpose of this hydraulic evaluation (originally presented in the *Facilities Plan 98*[6]), and in conjunction with the 1993 and 1997 stress tests and the process performance evaluation, was to study the hydraulic feasibility of processing higher flow rates through various treatment facilities.

The following three general operating requirements specific to plant hydraulics are considered respective of Ohio EPA and the *Recommended Standards for Wastewater Facilities*[2] (Ten States Standards).

- all treatment facilities shall be protected from flooding caused by the 100-year flood recurrence level in the receiving stream (Cuyahoga River);

- treatment facilities shall function uninterrupted and provide adequate treatment for permit compliance when faced with the 25-year flood level in the receiving stream (Cuyahoga River); and

- treatment facilities shall function adequately and provide treatment to a level meeting permit requirements with the largest unit of any treatment process out-of-service.

The hydraulic evaluation prepared and included in the *Facilities Plan 98*[6] considered these three requirements. The 25- and 100-year Cuyahoga River flood levels were estimated to be elevation 735.5 and 739.0 (National Geodetic Vertical Datum). None of the process treatment facilities' (tops of tank walls, building main floor elevations) were found to be below the 25-year flood elevation. Only the chlorine contact tank is below the 100-year flood elevation of 739.0.

Because it is required for the Akron WPCS to maintain operation in the event of a 25-year flood, the hydraulic model was developed to evaluate hydraulic conditions at a river level of 735.5. This same model was also applied to conditions with an average (normal) river level of elevation 727.2. At normal river levels, the final effluent freely discharges from the Akron WPCS outfall structure.

The hydraulic model was programmed to evaluate six different wastewater flow rates including 70, 97, 120, 150, 210 and 280 MGD. For the 210 and 280 MGD simulations, a flow limitation of 150 MGD was assumed through the secondary treatment processes. A maximum (assumed) RAS flow rate of 36 MGD was input for all six flow rates. Other assumptions and conditions of this model can be reviewed in Section 8.5.9 of the *Facilities Plan 98*[6].

A hydraulic analysis flow path was selected in consideration of "practical" worst case scenarios. Figures presenting the hydraulic analysis flow path and the hydraulic profile developed for the above conditions are provided in the *Facilities Plan 98*[6]. Summary tables of the hydraulic model analysis output for non-submerged outfall conditions (normal river elevation 727.2) and submerged outfall conditions due to a 25-year flood level (river elevation 735.5) are also provided in the *Facilities Plan 98*[6].

In summary of the hydraulic analysis, and specific to the secondary treatment facilities, the following is concluded.

- A peak hydraulic rate of 150 MGD may pass through secondary treatment. Treatability concerns reduce this rate. (See *Facilities Plan 98*[6]Section 8.5.8). It is necessary to use the 96-inch diameter outfall concurrently with the elliptical pipe outfall to prevent submergence of secondary treatment system components for total plant flows of 180 MGD and higher. Loss of final settling tank effluent metering is the only critical effect of this submergence.

- During submerged outfall conditions, and with one of each unit out of service, submergence is experienced from the final settling tank effluent to the final outfall for all flows. At total plant flows of approximately 210 MGD and higher, several secondary treatment structures would be pressurized or have water surfaces exceeding tops of walls. Between a 210 and 280 MGD total plant flow rate the backwater effect caused by the Cuyahoga River's high level would affect water surface elevations all the way through the plant. Effluent pumping would be required to fully address flooding conditions through the secondary treatment and disinfection facilities.

- Hydraulic limitations at the final settling effluent area may be addressed by replacing the existing 6-foot wide rectangular weir troughs. A metering flume may reduce headloss and provide improved metering accuracy.

- At 150 MGD through secondary treatment, the aeration basin freeboard is only a few inches. (Refer also to the 2006 Stress Test observations of no freeboard at this flow rate.)

3.3.3. Stress Tests

Akron WPCS personnel performed two in-house stress tests prior to the *Facilities Plan 98*[6] to evaluate the secondary treatment performance and capabilities. The first stress test was performed between December 1992 and January 1994 (*Activated Sludge Plant Stress Test*, 1994[3]). A second stress test was mandated by the July 17, 1995 Consent Decree. The second stress test was performed from March 1997 to September 1997 (*Activated Sludge Plant Stress Test*, 1997[4]).

A third stress test was performed in November/December 2006 and is being reported as part of this Report. All three stress test reports are provided in Appendix A. The following is a summary of the three stress test results.

1993 Stress Test

The Akron WPCS secondary treatment (activated sludge plant) facility was operated at higher than normal flow rates on 18 separate occasions in 1993 to intentionally stress the performance of these facilities. These stress test events ranged from a 1.75 hours duration to a maximum of 34.5 hours. Target flow rates were 110, 115, 120 and 130 MGD. The complete stress test report is provided in Appendix A.

The following is a synopsis of test observations:

- Observations of “severe degradation” were made at sustained flows of 110 MGD. Short “upsets” were experienced. Sludge blankets were within 6 inches of the effluent launders. However, discharge permit parameters were being met.

- Total Suspended Solids (TSS) effluent concentrations of 38 mg/l were seen at a 115 MGD test flow after only two hours. Plant personnel were unable to restart the test. TSS concentrations exceeded permit limits on forty-four occasions over the next five months; they were believed to have resulted from a loss of biomass and nitrifiers during the cold weather stress test.

- The $CBOD_5$ and TSS concentrations were at or above permit limits during two, 120 MGD stress test events in November 1993.

“Plant personnel proposed the following additional conclusions based on their 1993 stress test experience:

- the recovery phase for the secondary treatment (activated sludge) plant after an event of 110 MGD requires at least a three mean cell residence time (MCRT) duration for proper recovery before continuation of stress testing (experiencing additional high flow events);

- continued and/or frequent storm events will degrade the activated sludge treatment level for any extended period of flows over 100 MGD;

- physical flooding of the aeration tanks occurs at flows over 110 MGD;

- flooding (weir submergence) of the final settling tanks occurs during extended high flow events;

- hydraulic capacity of the aeration basins is limited;

- final settling tank influent distribution is restricted due to the elevations of the distribution chambers and the lengths of the influent conduits; and

- shallow final settling tanks restrict the "hydraulic capacity" as well as the settling capabilities due to high flow, short circuiting and hydraulic lift." (*Facilities Plan 98*[6])

1997 Stress Test

Plant personnel performed additional stress testing during the period March to September of 1997. It is important to note that prior to performing this additional stress testing, and subsequent to the 1993 stress testing, several important improvements to the secondary treatment facilities were completed. These improvements included installation of fine pore ceramic disc (higher efficiency) diffusers in the aeration basins and installation of density current baffles and covers on all final settling tanks. A plant wide distributed control system (DCS) was also installed which included extensive monitoring and controls throughout the secondary treatment facilities. The added control included computer control and monitoring of the dissolved oxygen level, blower air flow, RAS and WAS flows and flow monitoring and flow distribution equipment.

Also, as a result of information obtained from the previous stress test, several operational changes were implemented. These included maintaining a lower mixed liquor suspended solids (MLSS) concentration (typically 1,800 to 2,200 mg/l versus approximately 2,800 mg/l in prior years); wasting sludge on a continuous basis versus periodic (when inventories became high); controlling secondary treatment, including wasting and return sludges, based on mass balance; relying on microscopic examination for operational control; reducing the food to mass (f/m) ratio to below 0.15; and, reducing MCRT to less than 12 days. And, diffuser improvements had improved the oxygen distribution pattern and improved solids control.

The stress test was performed at four levels – 110, 115, 120 and 130 MGD. The 120 MGD level was repeated following the 130 MGD level testing. Testing was performed on 33 separate events beginning March 9, 1997 and ending September 30, 1997. At least seven test events at each level were attempted. The complete 1997 stress test is provided in Appendix A. The following is a synopsis of test observations.

- At the 110 MGD level, the $CBOD_5$, NH_3-N and phosphorous concentrations did not increase during the tests. The TSS concentration increased significantly during one of the events and operators reported sludge blankets increasing to 6 to 8.5 feet. However, none of the effluent limitations were exceeded. Polymer was introduced to the mixed liquor during three of the events but appeared to have no effect.

- The above results were repeated at the 120 MGD level with the longest test being 23 hours duration.

- At the 130 MGD test level, none of the events were longer than approximately six hours. A noticeable increase in all test parameters occurred. Several measured TSS concentrations exceeded permit limits.

Based on the 1997 stress test data, the following was concluded:

- The application of polymer to the aeration basins effluent mixed liquor does not appear to improve settleability in the final settling tanks.

- The secondary treatment facilities can adequately treat wastewater flows of 110 MGD for at least 24 hour periods. Data is not available to support higher peak day flow rates and with colder (winter) weather conditions.

- The secondary treatment facilities can adequately treat wastewater flows of up to 120 MGD for a limited duration, possibly up to 24 hours.

- Flow rates of approximately 130 MGD begin to ‘upset’ the final settling tanks after only 1-2 hours.

2006 Stress Test

Akron WPCS and ARCADIS G & M of Ohio, Inc. personnel performed stress testing of the secondary treatment system on three occasions in November and December 2006. The primary goal of the test was to operate the activated sludge plant for at least 24 hours at a simulated 120 MGD and higher rates without exceeding effluent pollutant parameters. The complete stress test report is provided in Appendix A.

Operation of the secondary treatment facility has been consistent since the 1997 stress test, with MLSS concentrations of 1,800-2,000 mg/l, f/m ratio <0.10 and SRT of approximately 15 days. Operators have also had several years to fine-tune various process monitoring and control equipment in conjunction with the Distributed Control System automation. And, the fine pore aeration diffuser grids have been further optimized since installation.

- It is possible for conditions comparable to test conditions to increase peak flows to secondary treatment from 110 MGD.

Operators have also had several years to fine-tune various process monitoring and control equipment in conjunction with the Distributed Control System automation. And, the fine pore aeration diffuser grids have been further optimized since installation.

One significant difference in this test, as compared with the 1993 and 1997 tests, is that a simulated test flow was imposed during a dry weather period by routing available wastewater flow to only two of the six secondary process treatment trains. And, all testing was performed between November 20 and December 6, 2006 with moderate ambient air and water temperatures.

The following is a synopsis of observations of test observations.

- During the first simulated 120 MGD test, only the ammonia nitrogen (NH_3-N) effluent parameter was exceeded. The process tanks appeared to lose nitrification within four hours of test commencement. A distinct drop in effluent dissolved oxygen (DO) levels was recorded.

- During the simulated 144 MGD test, the air distribution system was actively managed. Despite this, the aeration basin DO began to drop one hour into the test. The degradation of nitrification was delayed and moderated in comparison to the simulated 120 MGD test, but still exceeded 1.5 mg/l after five hours. NH_3-N concentrations exceeded the 4.8 mg/l “Fall” permit limit for most of the trial. TSS, $CBOD_5$ and Total Phosphorous (TP) concentrations were higher, but within permit.

- The simulated 120 MGD test level was repeated while actively managing air distribution. Polymer and sodium aluminate were fed to improve settleability and chemically precipitate phosphorus. The polymer appeared to provide no distinct benefit; the sodium aluminate appears to have aided in maintaining a 0.6 mg/l TP concentration throughout the test. The TSS, $CBOD_5$, TP and NH_3-N concentrations were maintained within permit levels throughout an eight-hour test duration. The test flow was increased in the ninth hour to a simulated 132 MGD rate. A DO sag became prevalent with the DO dropping from approximately 8.5 mg/l at the beginning of the test to as low as 2.6 mg/l. (If this had been a full-scale event, an effluent DO violation would have occurred.) The NH_3-N concentration increased from 0.03 mg/l to 4 mg/l. However, the winter permit limit of 7 mg/l was met.

- The simulated stress test conditions provide only a “snapshot” of the performance under highly controlled conditions.

Based on the 2006 stress test, the following was concluded:

- It is possible to increase peak flows to secondary treatment from 110 MGD to 120 MGD for conditions comparable to test conditions. This will reduce utilization of the secondary bypass conduit during wet weather events. Additional stress testing is necessary to validate the test results during actual wet weather flow conditions, all treatment trains in service, and with seasonal variations in air and water temperature.

- Operation beyond a simulated 120 MGD results in DO sags and diminished nitrification, even with actively managed air supply and distribution. Additional stress testing should be considered to further study process and equipment limitations that maybe modified or improved to support flows above 120 MGD.

- Testing should be performed in early June (moderate water temperature/summer NH_3-N limit) and mid August (hot, humid weather period wherein blower capacity is strained) and during actual wet weather flows

- Actively managing air distribution/air supply is critical to maintaining nitrification. The additional stress testing should further evaluate the aeration system in conjunction with optimizing nitrification in the biological process.

- The RAS system is limited and solids begin to accumulate in the FSTs at simulated flows of approximately 135 MGD.

- A process model is recommended to be prepared in advance of additional stress testing. Model simulation will allow for screening to the most viable stress testing trials.

- As noted above, the 2006 Stress Test showed process limitations relating to DO levels and biological activity associated with nitrification. The sludge blankets were maintained at reasonable levels. These results are generally opposite the results of previous stress tests. It is believed that this is a result of the improved level of process control since the mid-1990s. WPCS operators have determined specific process control points which, with the aid of extensive on-line monitoring and computer control, are constantly checked and adjusted.

  These control points include maintaining f/m ratio <0.10, SRT ~15 days, and MLSS ~2,000 mg/L. DO and RAS target values are setpoint input to the computer control system and automatically adjusted. Subsequently the activated treatment system is optimized and provides a very high quality effluent and a settleable sludge.

3.4. Maximizing Flow to Secondary Treatment

Akron WPCS standard operating procedures for minimizing secondary bypass conduit utilization involve all facilities available at the plant. The Storm Retention Tank (SRT) is an off-line equalization basin that is utilized to moderate peak hour flows during medium to heavy wet weather events. Additionally, the primary settling tanks are operated up to, and at times, beyond a rated capacity of 170 MGD (based on 2004 Ten States Standards limit of 2,000 gpd/sf) in order that all wastewater flow receives at least a primary level of treatment before disinfection. Since 1994, primary effluent flows exceeding 110 MGD are bypassed around the secondary treatment facility through the 96-inch diameter secondary bypass conduit. Overflow from the SRT combines with the excess primary effluent in the bypass conduit prior to disinfection. (Refer to the Process Schematic presented as Figure 3-2.)

The specific operational procedures follow.

- At raw wastewater flows greater than 110 MGD, raw wastewater exceeding 110 MGD is diverted into the SRT at up to a 60 MGD rate (this insures the highest quality of final effluent during a moderate wet weather event). The balance of the peak flows up to 280 MGD, or 220 MGD (280 – 60 = 220 MGD), flow to the primary settling tanks (PSTs).

- Upon filling the SRT, flows up to 150 MGD are directed to the PSTs to prevent any SRT overflow. Raw wastewater flows exceeding 150 MGD continue to be diverted to the SRT, which acts as a primary settling tank providing overflow quality comparable to the PSTs. Based on past operational experience, it is known that the PSTs provide optimal treatment up to approximately 150 MGD. (Refer to *Primary Settling Tank Flow Study*[8], 1996)

3.5. Summary of Secondary Treatment Capabilities

The preceding sections reviewed the various limitations of the Akron WPCS secondary treatment system. Table 3-4 provides a summary of this review.

Table 3-4 Secondary Treatment Facilities Limitations[1] Akron WPCS					
Process/ Parameter	**Ten States Standards**	**ASCE/WEF MOP-8**	***Facilities Plan 98* Hydraulic Model**	***Facilities Plan 98* Process Evaluation**	**2006 Stress Test**
Aeration Basins					
• Organic Loading				123	
• Hydraulics (channels, piping)			150		157
• Ability to Nitrify				118	120
Final Settling Tanks					
• Surface Overflow Rate	141	119	120	122	146
• Peak Solids Loading	256				
• Weir Overflow Rate	147				
• Hydraulics (channels, piping			150		157
Effluent Metering					157
RAS System					135

[1] Flow rates shown are maximum day/peak hour and assume all units are in service

The significant limiting factor, as shown above, is the ability to maintain nitrification in the aeration basins at process flows above 120 MGD. Other limiting factors apply at higher flow rates. Additional modeling and testing should be completed to potentially support increasing peak flows from 110 MGD to 120 MGD during wet weather events. The simulated 120 MGD 2006 Stress Test results require validation under actual wet weather conditions and with seasonal variations in wastewater characteristics. Primary effluent and SRT overflow exceeding these peak day flows must continue to be routed through the secondary bypass conduit.

3.6. Conclusions

The Akron WPCS secondary treatment system consistently produces a high quality effluent meeting all current permit parameters at flows up to 110 MGD. Based on this Report, it may be possible to increase flows through secondary to a maximum day flow of 120 MGD. Beyond 120 MGD, nitrification is diminished and may not result in compliance with the respective seasonal effluent permit limits. The aeration basin pass walls also have negligible free board and are awash at flows above 150 MGD. The ability to operate at 120 MGD should be further evaluated through additional stress testing. This testing should occur during actual wet weather conditions that will account for possible variations in wastewater characteristics between dry (*2006 Stress Test* conditions) and wet weather flows, and with all treatment trains in service.

The benefit of providing an additional 10 MGD of full treatment through the secondary treatment system should be further evaluated in conjunction with other secondary treatment alternatives. Based on the current capabilities and limitations of the WPCS secondary treatment system it is not possible to provide full treatment, or even hydraulically pass, a peak flow of 210 MGD or higher. In addition to the existing 10 MG SRT, the secondary bypass conduit must be available for intermittent and limited use to prevent overflow of process tanks and channels and associated property damage via loss of biomass.

From these conclusions, the alternative evaluation to follow in Section 4 will begin with an established treatment capacity of 110 MGD.

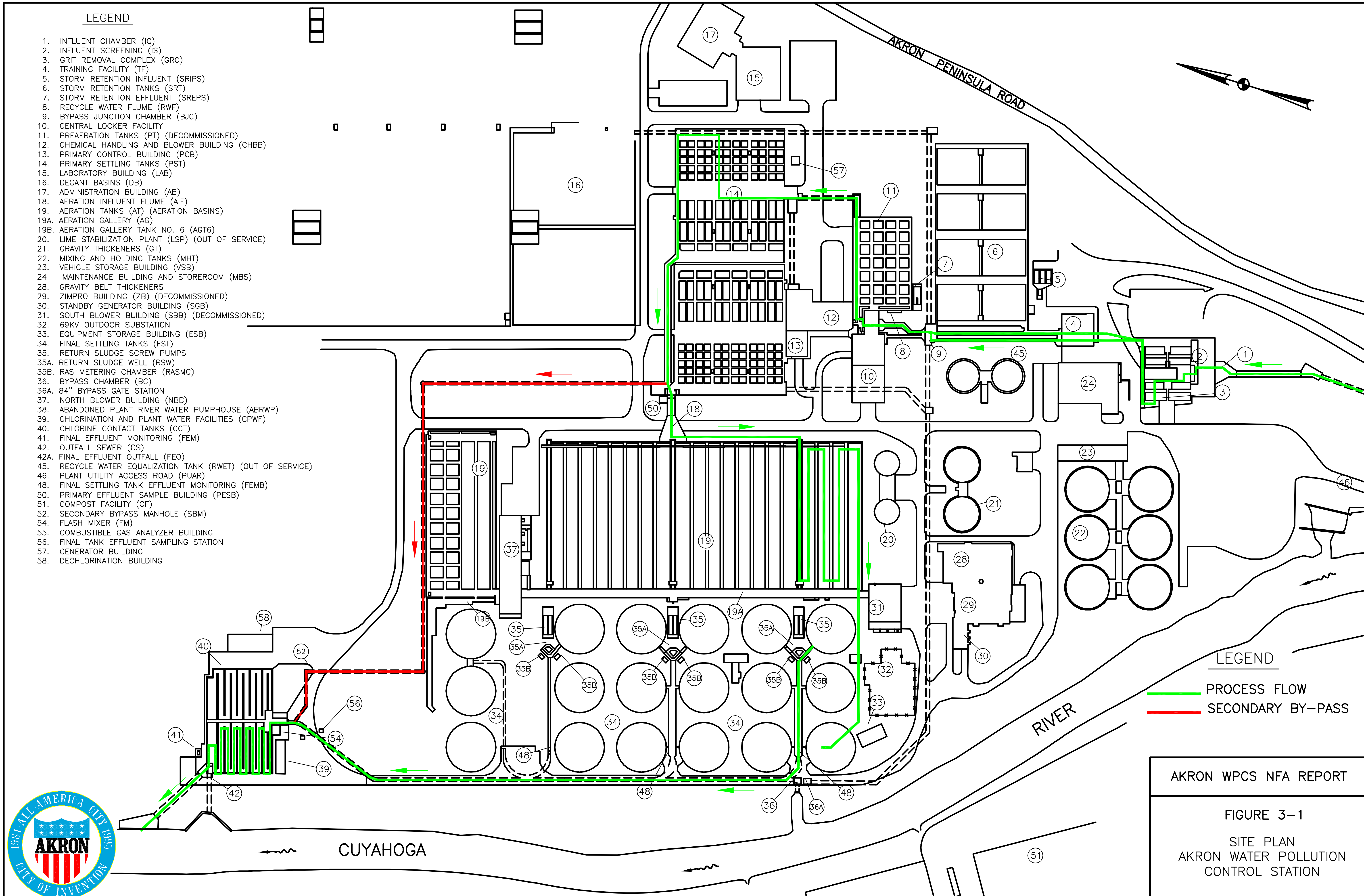
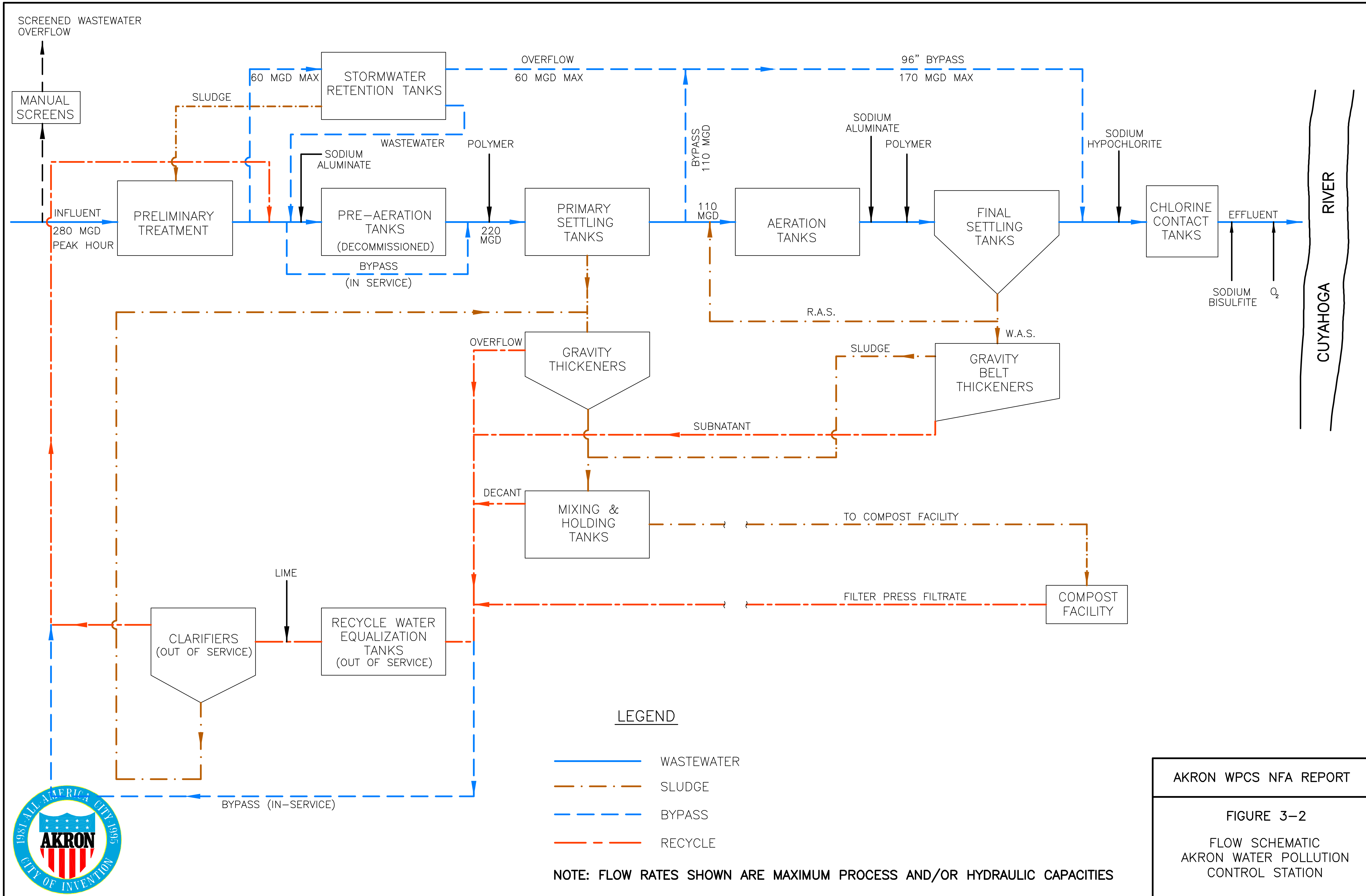


FIGURE 3–1

SITE PLAN
AKRON WATER POLLUTION CONTROL STATION



AKRON WPCS NFA REPORT

FIGURE 3–2

FLOW SCHEMATIC
AKRON WATER POLLUTION CONTROL STATION

SECTION 4
EVALUATION OF ALTERNATIVES

4.1. Evaluation Factors

The planning level evaluation of Akron WPCS alternatives requires general and specific evaluation criteria be established for consistency in the evaluation process. These evaluation factors and criteria are noted below.

- 1994 baseline year data (consistent with system hydraulic model and previous evaluations).

- Maximum sustained capacity of secondary treatment is 110 MGD – this is considered the baseline secondary capacity.

- Due to the expedited deadline for this report, an alternative for operating secondary treatment up to 120 MGD will be considered. However, process modeling and wet weather stress testing would first need to be completed to determine if all effluent permit parameters can be met under all seasonal conditions, and with all treatment trains in operation, at this peak flow rate.

- WPCS secondary treatment alternatives evaluated at several total capacities above 120 MGD, and up to 280 MGD, to provide sufficient data for analysis.

- WPCS storage and enhanced high-rate clarification (EHRC) alternatives maintained at previously defined capacities.

- Cost basis includes *1998 Facilities Plan*[6] and *LTCP* values, updated to December 2006 cost indices, where applicable.

- The Integrated Alternative #2 collection system improvements are considered a completed part of the current LTCP with distinct wet weather flow benefits defined in previous planning documents. Benefits for the WPCS alternatives developed herein are based on the assumption that the Alternative #2 collection system improvements are constructed, as proposed. These improvements are summarized in Table 4-1.

Table 4-1 Summary of Integrated Alternative #2 CSO Control Technology	
Rack Number	**CSO Control Technology**
3	Treatment Basin
4, 16, 17/DC, 18, 19, 20, 23, 24, 37	Ohio Canal Interceptor (OCI) Tunnel
5 + 7	Storage Basin
8	Separation
9	Separation
10 + 11	Treatment Basin
12	Treatment Basin
13	Separation
14	Storage Basin
15	Storage Basin
21	Separation
22	Storage Basin
25	Separation
26 + 28	Treatment Basin
27 + 29	Treatment Basin
30	Separation
31 + 40	Storage Basin
32, 34, 35	Northside Interceptor (NSI) Tunnel
36	Storage Basin
39	Separation

For the 1994 baseline (precipitation) year, the following characteristics for the WPCS Secondary Bypass were established in the *Long-Term Control Plan 98*[9]. (Additional modeling was performed for subsequently presented alternatives assuming that Integrated Alternative #2 collection system improvements are completed.) Reduction of these characteristics to levels satisfying CSO guidelines is the primary focus of this NFA report.

	# of Events	# of Hours	Volume (MG)	$CBOD_5$ (lbs)
WPCS Secondary Bypass without Collection System Improvements	25	439	1,166	291,733

The following sections will:

1. Develop and recommend viable WPCS secondary treatment alternatives.

2. Summarize previously presented collection system sewer separation and express sewer alternatives and recommendations.

3. Summarize previously presented collection system satellite storage and treatment alternatives and recommendations.

4. Summarize previously presented WPCS storage basin alternatives and recommendations.

5. Summarize high-rate treatment pilot testing completed by the City and summarize previously presented enhanced high-rate clarification (EHRC) alternatives and recommendations.

4.2. Secondary Treatment Alternatives

4.2.1. Existing Process Limitations

The process and hydraulic limitations of the Akron WPCS secondary treatment system were reviewed in Section 3. As noted, and based solely on the simulations of the 2006 Stress Test, it appears possible to operate the biological process to flows above 110 MGD for a 24-hour period. A maximum day capacity of approximately 120 MGD may prove possible following process modeling and additional stress testing. The primary limiting factor during these tests was the ability to nitrify. Modifications to improve settling, such as baffling, do not appear necessary.

A significant amount of operator attention and manual override of existing controls was necessary to achieve acceptable discharge quality at flows above 110 MGD. If the WPCS secondary treatment system is operated to 120 MGD capacity in the future, additional study, physical improvements and operational changes are recommended. The capital improvements and studies recommended include:

1. WPCS process model

2. Additional stress testing

3. Remove FST domes/modify and cover launders

4. Aeration influent flume reconstruction

Despite the nitrification concern, the biological system is typically under-loaded due to the low influent $CBOD_5$ concentration and the efficient primary settling tank performance. And, during dry weather periods the low nighttime flows sometimes fall below 30 MGD. Subsequently, constructing additional secondary treatment process trains to provide comparable full treatment up to 210 MGD or higher is not feasible. *Facilities Plan 98*[6] Sections 14.1 and 14.2 discuss these concerns and this practical limitation.

A review of the secondary treatment system biological and hydraulic loadings is presented in Table 4-2. As shown, the biological loadings (concentrations) during wet weather events (flows above 90 MGD) are comparable to dry weather periods.

Table 4-2 Secondary Treatment System Loadings (Based on 1994 Baseline Year Data)				
	90 MGD	110 MGD	150 MGD	200 MGD
Raw BOD_5 (mg/l)	108	100	80	70
Primary Effluent BOD_5 (mg/l)	60	60	56	56
Aeration Basin Loading (lbs/day)	45,036	55,044	70,056	93,408
A.B. Unit Loading[1] (lbs./day/1,000 cf)	13.0	15.9	20.0	27.0
Final Settling Tank Surface Overflow Rate (SOR)[2]	636	778	1,060	1,414
FST Solids Loading[3] (lbs./day/sf)	12.2	14.9	20.3	27.1

[1] Aeration basin total volume = 3,444,000 cf
[2] Final settling tank total surface area = 141,400 sf
[3] Based on 15% RAS rate

Based on the above data, and projecting from 2006 Stress Test simulated results, it may be possible to meet effluent parameters, with the likely exception of NH_3-N, at flows exceeding 150 MGD. Aeration Basin and Final Settling Tank hydraulic limitations would need to be addressed.

Influent flow records for the established 1994 baseline year were reviewed to determine the number of days flow exceeded the 110 MGD secondary treatment capacity, and the higher capacities being reviewed in this report. The year 1994 data was also compared with Years 1995 to 2005 to further support use of 1994 data as the baseline year. A summary of these reviews is presented in Tables 4-3 and 4-4.

Table 4-3 1994 Akron WPCS Influent Flow									
Yearly		Average MGD		Maximum MGD		Minimum MGD		Secondary Bypass
Influent		Days >110	22	Days >110	98	Days <110	359	1274 MG[1]
27,926 MG Total		Days >120	17	Days >120	86	Days <97	357	132 Days
MGD		Days >130	12	Days >130	72	Days <90	353	9.654 MG/Day
24 hr Average	76.51	Days >170	4	Days >170	42	Days <75	342	4.56 % of Influent
24 hr Max	226.01	Days >210	2	Days >210	19	Days <50	195	3.49 MGD Yearly Avg.
24 hr Min	53.78			Days >275	0	Days <30	3	
Instant Max	266							
Instant Min	24.03							

[1] Represents flows exceeding 110 MGD secondary capacity during 1994

Table 4-4 Akron WPCS Average Influent Flow (MGD)						
Year	Average	Days >110	Days >120	Days >130	Days >170	Days >210
1994	76.54	22	17	12	4	2
1995	71.43	12	9	4	0	0
1996	89.22	55	42	33	12	3
1997	80.54	32	20	16	6	2
1998	76.76	20	16	15	5	0
1999	69.91	15	11	9	4	2
2000	71.51	20	11	8	2	0
2001	64.22	4	3	1	0	0
2002	66.88	9	9	5	1	0
2003	78.30	23	15	9	0	0
2004	85.81	43	31	26	9	5
2005	78.52	36	25	19	9	2
Average	**75.80**	**24**	**17**	**13**	**4**	**1**

Table 4-4 shows that the 1994 flow data compares well with the average for the recent 11 years of flow data.

Derived from Table 4-3, 95.4% of flow in a typical year may be captured and treated by the existing 110 MGD secondary treatment capacity. Only 22 days had average flows exceeding the 110 MGD capacity. If secondary treatment capacity is increased to 120 MGD, 17 days, would have flows exceeding the secondary capacity. This is further reduced to 4 days at a 170 MGD capacity and only 2 days at a 210 MGD secondary capacity. A 210 MGD secondary treatment capacity would capture over 99.9% of flows in the representative year (in conjunction with a flow equalization facility to capture peak hour flows exceeding 210 MGD). However, there remains the possibility for occasional storms to contribute extended peak hour flow rates that exceed the 210 MGD treatment capacity (The highest peak day flow in 1994 was 257 MGD). If the available equalization basin (existing 10 MG Storm Retention Tank) becomes full, or is already filled from a previous day storm flow, then an outlet would be needed to prevent a raw bypass or overflow of process tanks and subsequent property damage. The existing secondary bypass conduit serves this function allowing all flow to receive a primary level of treatment before being bypassed.

The hydraulic limitations to increasing capacity through the existing secondary treatment system to 170 or 210 MGD involve all components – aeration basins, final settling tanks and associated flow conduits. Biological treatment would not be sufficient to meet all process parameters at these higher flow rates. Any alternative's design must also consider the typical, dry weather low loading conditions. Alternatives will be developed and evaluated for increasing the secondary treatment capacity with consideration of all these factors.

4.2.2. Secondary Treatment Alternatives

The first alternative proposed is to modify the existing process and operate it up to a 120 MGD maximum day flow as opposed to the current operation limit of 110 MGD. This alternative will be further developed and evaluated even though additional stress testing during summer conditions and actual wet weather conditions is necessary to support this plan. The physical improvements necessary to operate effectively and consistently at this higher flow rate were listed in Section 4.2.1. The **120 MGD alternative** will be referred to as **Alternative 1**. Refer to Figure 4-1.

A variety of other process alternatives were considered for increasing the secondary treatment capacity. These alternatives, upon initial screening, were organized into five groups. For any alternative which provides additional secondary treatment capacity, it is assumed existing facilities are upgraded to increase the 110 MGD capacity to 120 MGD.

Group 1 Alternatives – Single Stage Nitrification Processes

This group includes single stage nitrification processes, including oxidation ditches, vertical loop reactors, step-feed aeration, and high rate pure oxygen that may be employed either within existing tankage and/or in additional, new tankage. With this group of alternatives the primary settling tanks would be removed from service in order to increase the organic and nutrient loading to secondary treatment sufficiently to support additional mixed liquor capacity. Along with this increased capacity would come additional final settling tanks.

<u>These Group 1 alternatives are screened from further evaluation</u> for the following reasons:

- Having additional mixed liquor in suspension will increase annual operation and maintenance (O & M) costs for blower operation and yield no treatment improvement. The sludge settleability may actually deteriorate due to increased sludge retention times (SRTs)

- Abandonment of the primary settling tanks will impact the existing sludge process train that includes a compost facility for final stabilization and disposal, and a planned anaerobic digestion process being initiated in 2007. A significant investment would be required to reconstruct the sludge process train to treat solely waste activated sludge. The sludge processing costs would be higher then the current cost for composting. And, final disposal costs will be significantly higher for land application as compared with the current compost, most of which is sold in bulk or bag to consumers.

Group 2 Alternatives – Conventional and Attached Growth Processes

Conventional activated sludge, contact stabilization, rotating biological contactors (RBCs), Submerged Biological Contactors (SBCs), and trickling filters are included in this group. All Group 2 alternatives require the primary settling tanks remain in service to reduce the organic and nutrient loading; and, they have shorter hydraulic detention times and shorter SRTs. The sludge produced is typically more settleable as supported by the *Recommended Standards For Wastewater Works*[2] (Ten States Standards) which allows higher surface overflow rates (SOR) and peak solids loading rates for settling tanks following these processes. The existing final settling tanks, in theory, could process higher peak flows up to approximately 170 MGD based on these SORs.

The major problem for the Group 2 alternatives is that sufficient nitrification will not occur with these processes to achieve ammonia nitrogen levels meeting the City's NPDES Permit. There are also other unacceptable aspects of these alternatives. First, effluent $CBOD_5$ concentrations would also likely be higher than currently achieved with the existing single stage nitrification process. Second, several hydraulic restrictions within piping and conduits would still need to be addressed to process any increased flows through the secondary system. Third, the peak solids loading rate on the FSTs would become a limiting factor and restrict peak flow to a marginal increase above the current capacity.

For these reasons the Group 2 Alternatives are screened from further evaluation.

Group 3 Alternatives – Increase Solids Separation Capacity

Alternatives in this group are focused on addressing one of the limiting factors of secondary treatment capacity – final settling tank capacity. The following alternatives are proposed for consideration.

Alternative 2 – Additional Final Settling Tanks

This alternative includes the construction of additional final settling tanks (FSTs) to increase the peak day capacity of the secondary treatment process. The new tanks would be constructed in a cluster north of Aeration Basin No. 6 where land is available. The location of the existing FSTs and effluent conduit relative to the Cuyahoga River make it impractical to construct new tanks adjacent to the existing FSTs; it would be necessary to channelize and relocate the Cuyahoga River. To address hydraulic restrictions in existing conduits and provide positive flow division to the new tanks it is proposed to pump mixed liquor from the last pass of each aeration basin to the new FST cluster. Suction lift pumps may be installed in the aeration gallery with discharge headers hung below the floor and routed through the North Blower Building and Unit 6 to the new tanks. Because of hydraulic limitations through the existing aeration basins, it will be necessary to raise the basin walls and reconstruct the secondary influent flow splitting chamber (Aeration Influent Flume). Assuming a 120 MGD existing capacity, two increments of capacity increase were considered as follows.

Alternative 2A will include three (3) new, 135-foot diameter FSTs, plus the necessary hydraulic improvements, to provide 40 MGD additional settling capacity, for a total secondary treatment capacity of 160 MGD. Refer to Figure 4-2.

Alternative 2B will include six (6) new, 135-foot diameter FSTs to provide a nominal 80 MGD additional settling capacity plus the necessary hydraulic improvements, for a total secondary treatment capacity of 200 MGD. Refer to Figure 4-3.

Alternative 3 – FST Effluent Treatment with High Rate Treatment Process

This alternative includes the construction of a high rate treatment (HRT) process to provide filtration of final settling tank (FST) effluent to increase the peak day capacity of the secondary treatment process. A coarse, synthetic media filter can remove biological solids without the complexities associated with HRT processes that utilize chemical precipitation and/or ballast and polymers. Concerns over toxicity due to the chemical addition are also averted. The HRT process tanks will be constructed in a cluster north of Aeration Basin No. 6 where land is available. FST effluent will be pumped to the HRTs. This will raise the plant hydraulic grade line upstream of the chlorine contact tank and provide the side benefit of improved operation during a 25-year flood condition. Because of hydraulic limitations through the existing aeration basins and FSTs, it will be necessary to raise the aeration basin walls and reconstruct the secondary influent flow splitting chamber (Aeration Influent Flume). Piping and flumes conveying process flow from the FSTs must also be replaced to convey the increased flow capacity. For the 170 and 210 MGD capacities, it would be necessary to modify or reconstruct the effluent metering and junction chambers. For the 210 MGD flow rate, it would also be necessary to raise the tops of FST Distribution Chambers to prevent pressurizing the concrete structure. Assuming a 120 MGD existing capacity, two capacity increase increments were evaluated.

Alternative 3A will include four (4) new, 42.5 MGD high-rate treatment processes to provide clarification/filtration of final settling tank overflow plus the necessary hydraulic improvements up to 170 MGD. Refer to Figure 4-4.

Alternative 3B will include five (5) new, 42.0 MGD high-rate treatment processes to provide clarification/filtration of final settling tank overflow plus the necessary hydraulic improvements up to 210 MGD. Refer to Figure 4-5.

Alternative 4 – Membrane Filtration

This alternative considers the application of wastewater membrane technology to filter the mixed liquor effluent from the aeration basins to provide the necessary additional clarification capacity. The membrane filters would work in concert with the existing final settling tanks. Based on a review of this concept with two leading manufacturers, it is proposed to locate the membranes in separate, new tanks north of Aeration Basin No. 6. The required pumping and piping systems would be similar to Alternative 2. Use of membranes will require fine screening of primary effluent and primary effluent pumping. A two or three millimeter screen size is recommended. Because of the additional hydraulic head required for this alternative, it will be necessary to significantly modify the secondary influent flow splitting chamber (Aeration Influent Flume). The aeration basin walls will be raised. Two capacity increase increments were evaluated.

Alternative 4A will include two membrane filtration tanks to provide 40 MGD additional solids separation capacity plus the necessary hydraulic improvements and a new Fine Screening and Pumping Facility, for a total secondary treatment capacity of 160 MGD. Refer to Figure 4-6.

Alternative 4B will include four membrane filtration tanks to provide 80 MGD additional solids separation capacity plus the necessary hydraulic improvements and a new Fine Screening and Pumping Facility, for a total secondary treatment capacity of 200 MGD. Refer to Figure 4-7

Group 5 Alternatives – Membrane Bioreactor (MBR) Facility

The aeration basins would be converted to membrane bioreactor tanks in this alternative. Because MBRs function with a much higher mixed liquor suspended solids concentration (approximately 10,000 mg/l), not all of the six aeration basins will be needed. A new fine screening (two to three millimeter) facility would be located upstream of the MBR tanks following primary treatment (primary settling tanks will remain in service in order to maintain the current sludge process train). To accommodate the headloss imposed by the fine screens, and provide a deeper tank depth as required for the MBR equipment, it is proposed to pump primary effluent to the new fine screening and MBR facility. Because the Cuyahoga River 25-year flood elevation impacts WPCS effluent hydraulics, a primary effluent pumping station will also be required. Permeate pumps will draw mixed liquor through the membranes and discharge the filtrate to the secondary effluent conduits. Piping galleries will be required between compartmentalized sections of the modified aeration basins to provide space and access to influent and effluent piping and to access the permeate pumps. Two capacity increase increments were evaluated.

Alternative 5A will include the conversion of three (3) aeration basins into MBR tanks with an average day capacity of 90 MGD and a maximum day capacity of 170 MGD. A primary effluent pumping and fine screening facility with a 170 MGD capacity will also be included. Approximately 92% of the basin volumes will be utilized. Refer to Figure 4-8.

Alternative 5B will include the conversion of four (4) aeration basins into MBR tanks with an average day capacity of 105 MGD and a maximum day capacity of 210 MGD. A primary effluent pumping and fine screening facility with a 210 MGD capacity will also be included. Approximately 88% of the basin volumes will be utilized. Refer to Figure 4-9.

Alternatives 1 through 5B are considered viable process concepts and therefore are further evaluated in Section 4.2.3.

4.2.3. Feasibility Analysis of Secondary Treatment Alternatives

The predicted Secondary Treatment System BOD_5 loadings for flows from 90 to 200 MGD were shown in Table 4-2. Based on the 2006 Stress Test (Appendix A), secondary removal efficiencies can reasonably be predicted for flows up through 150 MGD, and possibly to 170 MGD. Removal efficiencies are also predicted for the 210 MGD alternatives although the stability of the process over a 24-hour or greater period would be questionable.

One alternative screened from this analysis is Alternative 3B, construction of a 210 MGD HRT facility. Stressing the FSTs to 140% of rated capacity is likely to "blow out" considerable sludge solids. Blinding of the synthetic media would be anticipated, leading to process failure.

Also, although CBOD removal is an important evaluation factor, the Akron WPCS is required to comply with all effluent permit limitations. Therefore, it is necessary to consider other results of the 2006 Stress Test, most notably the nitrification limitations. Based on the results of the stress test, any alternative seeking to process flow greater than approximately 120 MGD through the existing aeration basins may not meet the NH_3-N effluent limit. Subsequently, it is necessary to screen from further consideration Alternatives 2A and 2B, 3A, 4A and 4B as these alternatives cannot be relied on to consistently achieve the required levels of nitrification.

The predicted removal rates for the remaining alternatives, 1, 5A and 5B, are presented in Table 4-5. Because the benefit of increasing secondary treatment capacity is the reduction of secondary bypass conduit utilization, the model developed for the *LTCP 98*[9] was modified to consider the proposed, increased secondary treatment capacities. The resultant impact to the Secondary Bypass utilization for each alternative are shown in Table 4-5 as well. The predicted water quality benefit is based on the assumption that the collection system improvements proposed in the LTCP Integrated Alternative #2 have been constructed.

Table 4-5 Secondary Treatment Alternatives Performance Summary[1]						
Secondary Treatment Alternative	Secondary Capacity	Secondary Treatment % $CBOD_5$ Removal	Secondary Bypass Annual Estimates			
			Bypass # of Events	Bypass # of Hours	Bypass Volume (MG)	Bypass $CBOD_5$ (lbs)
WPCS Secondary Bypass – No Change	110 MGD	90	25	439	1,166	291,733
Alternative 1 – 10 MGD Additional Secondary Treatment	120 MGD	90	19	419	1,113	278,743
Alternative 5A – 170 MGD MBR	170 MGD	95	12	251	418	104,584
Alternative 5B – 210 MGD MBR	210 MGD	95	4	96	12	3,002

[1]10 MG SRT volume is included in analysis.

All alternatives are capable of treating to existing NPDES Permit required levels (although additional stress testing is recommended to validate the 120 MGD nitrification abilities). The MBR alternatives provide the highest level of treatment. All four alternatives are feasible from a process treatment perspective. The capital cost of each will be reviewed in Section 5.

4.2.4. Solids Process Impacts

Each of the secondary bypass treatment alternatives will capture additional solids which require processing and handling at Akron WPCS and at the Akron Composting Facility. Existing solids handling processes were reviewed with respect to the impact from additional loadings. Subsequent expansion to process, if required, will be noted and costs captured in the feasibility analysis for the alternatives.

4.2.4.1. Solids Loading

Review of recent years' solids production at Akron WPCS as well as the base year of 1994 revealed the following.

Year	Treated Flow (MG)	Total Dry Tons Solids Produced	Dry Tons Solids per MG Treated Flow
2003	28,597	11,994	0.419
2004	31,450	14,111	0.449
2005	28,674	14,169	0.494
3-Year Average			0.454
1994 (Base)	27,923		

The 3-year solids production rate at the Akron WPCS is approximately 0.454 tons/MG wastewater treated. This reflects overall removal rates as follows:

TSS = 96%
CBOD = 96%
TP = 74%

To account for variances, the 0.454 tons/MGD value was conservatively increased to 0.50 tons/MG. This value was applied to the base year 1994 wastewater flow rate to determine the base wastewater solids production as follows:

27,923 MG x 0.50 tons/MG = 13,962 tons/year

The total wastewater solids are comprised of 56% primary sludge and 44% waste activated sludge (WAS). Because the Akron WPCS does not bypass any wastewater until after primary treatment (in the PSTs or in the SRT), the historical solids production/capture data already reflects an amount of primary sludge attributable to wet weather flows. Any additional sludge generated by full treatment of additional wet weather flows will be WAS from the secondary process.

The increase in solids to this base value of 13,962 tons/year will result from capture of secondary bypass flows that will be treated through a secondary treatment process or a High Rate Treatment process. These secondary bypass flows for the 1994 base year total 1,166 MG. Application of the historical rate of solids production times 0.44 (44% WAS or “secondary solids”), which assumes secondary bypass flow would receive the same level of treatment, determined the solids increase as follows.

Secondary Bypass @ 1,166 MG x 0.50 tons/MG x 0.44(%) =	257 tons/year
1994 Baseline Solids =	13,962 tons/year
Total	**14,219 tons/year**

An increase of 1.8%

For the MBR alternatives, the impact to solids production would be the greatest as percent (%) capture of TSS, CBOD and TP would increase. For the MBR alternatives, the following pollutant removal rates were assumed:

TSS = 100%
CBOD = 100%
TP = 90%

A weighted average increase in solids production assuming these higher removal rates was determined at 5% (example: TSS increase to 100%/96% = 4.2% increase). Solids production for the MBR alternatives then are calculated using a modified value of 0.50 tons/year x 1.05 = 0.525 tons/year to account for this level of plant performance. Solids increase was then calculated as follows.

1994 Baseline Solids	27,923 MG x 0.525 tons/MG =	14,660 tons/year
Secondary Bypass	1,166 MG x 0.525 tons/MG x 0.44 (%) =	269 tons/year
Total		**14,929 tons/year**

The following solids production values reflecting treatment of secondary bypass flow will be used in review of current solids handling processes.

14,219 tons/year	(38.9 tons/day)	Secondary treatment performance
14,929 tons/year	(40.9 tons/day)	MBR performance

4.2.4.2. Evaluation

Each of the various alternatives was evaluated for their impact on specific solids handling processes at Akron WPCS and Akron Compost Facility. Primary solids handling facilities were not evaluated as they currently handle peak wet weather flow solids production conditions. With regard to secondary solids handling and total solids handling, the following impacted and significant processes were evaluated.

Location	Process	Rated Capacity
WPCS	Gravity Belt Thickeners	46.8 dry tons/day
WPCS	Mixing/Holding Tanks	7.0 MG
Compost	Belt Filter Presses	102 dry tons/day
Compost	Reactors	102 dry tons/day

For the alternatives involving MBR process technology, the worse alternative was evaluated which had a capacity rating of 210 MGD. Assuming that the solids production rate remained constant during wet weather flow conditions, the calculated total secondary solids production for this MBR alternative is:

210 MGD x 0.525 dry tons/MG x 0.44(%) = 48.5 dry tons/day

This value is slightly greater than the noted gravity belt thickener rated capacity of 46.8 dry tons/day. This 3.6% exceedence should not be a concern as the solids not processed through the gravity belt thickeners can be directly pumped to the mixing/holding tanks. At a 2% solids concentration in the unprocessed solids of 1.7 dry tons/day, a volume of approximately 20,400 gallons (less than 1%) would be directed to the 7.0 MG mixing/holding tanks.

Therefore, current solids handling facilities are considered adequate for the MBR alternatives.

4.2.5. Summary

Several secondary treatment alternatives were evaluated that utilize the existing single stage nitrification facilities in conjunction with additionally constructed improvements to provide additional capacity. The developed alternatives also considered conversion of the existing aeration basins to membrane bioreactors (MBRs). Following screening, only three secondary treatment alternatives will meet all effluent permit parameters (once disinfected) and are considered feasible for further cost and non-cost evaluation in Section 5. These include:

- Alternative 1 – Operation of existing facilities at 120 MGD.
- Alternative 5A – Conversion to a 170 MGD MBR.
- Alternative 5B – Conversion to a 210 MGD MBR.

The 120 MGD alternative requires further evaluation through stress testing at the WPCS to validate that nitrification levels are sustainable under all four seasons' conditions. Due to the unpredictable nature of influent water quality at higher flows and varying seasonal conditions, it would be premature to finalize this alternative in the analysis at this time.

If secondary treatment is provided up to 210 MGD, additional sludge will be generated. The existing sludge process facilities have sufficient capacity to handle this additional solids loading.

4.3. Sewer Separation/Express Sewers

4.3.1. Alternatives

The City of Akron has previously analyzed a variety of collection system CSO alternatives. Two of these presented to the Ohio EPA in *Facilities Plan 98*[6] are:

- Complete or partial separation of combined sewers.

- Express sewers to convey primarily sanitary flows away from CSOs.

The following sections describe these alternatives.

4.3.1.1. Sewer Separation

The following excerpts are taken from Section 13.2.2 of the *Facilities Plan 98*[6].

> All combined sewer areas in the city were compared according to attributes such as size, population density or land use, percent permeable, and receiving interceptor/water body. Three land use/density categories were developed, and each area was assigned to one of these categories. One CSO area from each category (Areas 7, 28 and 35) was evaluated in detail to determine the cost of separating existing combined sewers in that area. Cost estimates for the CSO areas examined were reduced to a cost per acre factor based on land use/density categories. System-wide costs were then extrapolated.
>
> Six other CSO areas were identified in the *1980 Facilities Plan*[1] as being easily separable: 8, 9, 13, 20, 25, and 30. The 1980 Plan provided pipe lengths and diameters required to separate the sewers in these areas. Discussions with the City and reviews of the 1980 Plan and underground record drawings indicated separating these six areas would be as feasible now as during the preparation of the 1980 Plan. The separation status of Area 9 was field verified, and the status of the other five areas was considered unchanged for the purposes of preparing cost estimates. CSO Area 21 was also evaluated in detail to determine the cost of separation in that area.

The methodology followed for further development of sewer separation alternatives is outlined in Section 13.2.2 of the *Facilities Plan 98*[6] and excerpts are provided below.

> The lengths and diameters of any required new sewers were measured and entered into a design spreadsheet which calculated the velocity (minimum 3.0 fps) and maximum capacity based on the downstream invert elevation selected. Each pipe diameter, downstream invert elevation, length and price per lineal foot was entered into a cost spreadsheet to calculate costs of installation.

This spreadsheet calculated the trench width and depth, volume excavated, backfill and select fill required, and pavement demolition and repair, along with all associated installation costs. Unit costs were developed.

Items included in the cost calculation of sewer separation included excavation, backfill and select fill, piping material costs, pavement demolition and surface restoration, excavation sheeting, manholes, new catch basins and catch basin connections, house drain pipes/storm laterals, traffic maintenance and excavation dewatering.

Of the CSO areas evaluated for separation, seven were considered viable candidates and are included as such in each of the five Integrated Alternatives. These areas are: 8, 9, 13, 21, 25, 30 and 39. In Integrated Alternative #2, combined flows from a 20" x 32" line at West Market Street and North Howard Street have been routed to the OCI Tunnel; therefore, only the portion of Area 21 which is not tributary to this line was evaluated for the separation components of this alternative.

4.3.1.2. Express Sewers

The following excerpts concerning express sewer alternatives are taken from Section 13.2.3 of the *Facilities Plan 98*[6].

> Express sewers can be an effective method of removing part of the sanitary sewer component from main interceptors, thereby reducing CSO at some racks. Preliminary model results were used to establish which racks in Akron's system were prone to large volumes of overflow during rain events. CSO basins selected for an express sewer alternative were evaluated based on annual volume of CSO and ease of separate sanitary flow interception upstream of the rack. For these reasons, separate sanitary flows upstream of Racks 12 and 18 were selected for express sewer evaluation. Detailed investigations found that sanitary flow from a portion of CSO Area 11 could be easily routed and captured by the collection system in CSO Area 12. One proposed express sanitary sewer was routed from each of the CSO contributing areas to a common point near the intersection of the OCI and LCI. Here the two express sewer lines would join to form a single express sanitary interceptor to convey the flows directly to the headworks of the Akron WPCS.
>
> Once the upstream sanitary components were identified in each of the CSO areas evaluated, the required pipe sizes and lengths for the express sewers were determined and proposed routes selected. Routes were selected based on reasonably direct, convenient routing and the evaluation of topographic maps of the area. A grade was established which would maintain a minimum velocity of at least 2 fps in all three segments of the express sewer.
>
> Unit costs were developed and included costs for piping, excavation, backfill and select fill, demolition and replacement of pavement, new manholes, sheeting, micro-tunneling (i.e., under railroad tracks and roadways) maintaining traffic and excavation dewatering.

4.3.2. Feasibility Analysis

The City of Akron has previously performed a feasibility analysis for the sewer separation and express sewer alternatives summarized in Section 4.3.1. Each is discussed in the following sections.

4.3.2.1. Sewer Separation

The *Facilities Plan 98*[6] in Section 13.2.2.2 and associated supporting documents describes the methodology and resources used to develop the capital, O&M and present worth costs for sewer separation CSO control. A summary of these resources and methods follows.

Type of Cost	Estimating Methodology	Cost Resources/Assumptions
Capital	Means construction cost guide and local unit costs	• Storm sewers, laterals, catch basin, manholes, sheeting, traffic control, dewatering • Non-construction costs of 30%, utility relocation of 10%, contingency of 20% added to unit costs
O&M	Local costs developed at time of estimate	• O&M costs were estimated to be $100/acre
Present Worth	Single Payment, Uniform Sewers and Gradient Series	• 50-year structure life • Interest rate of 7.125% and inflation rate of 3%

The estimated capital cost and corresponding present worth cost to separate sewers system-wide was $985 million and $853 million, respectively. Updated capital costs (December 2006) are $1,312 million and present worth costs are $1,136 million, based on ENR Construction Cost Indexes.

A summary of the capital costs for sewer separation for the viable CSO areas is presented in Table 4-6. The original 1998 costs from the *Facilities Plan 98*[6] document are noted alongside the update costs for sewer separation.

Table 4-6
Sewer Separation Capital Costs

Rack Designation Area	1998 Costs	December 2006 Costs
Rack 8	$2,326,400	$2,905,474
Rack 9	$210,900	$263,396
Rack 13	$4,328,200	$5,405,550
Rack 21	$2,199,500	$2,746,987
Rack 25	$2,974,500	$3,714,895
Rack 30	$7,574,000	$9,549,276
Rack 39	$300,000	$374,674

The impacts of sewer separation are also described in *Facilities Plan 98*[6] in Section 13.2.2.3. Excerpts from this section follow.

> To document the impact of sewer separation in the collection system, the measures of annual overflow volume, annual number of overflow events and annual hours of overflow were investigated on a rack-by-rack basis. The 1994 precipitation year was simulated for both the separated collection system and

water quality models. In most cases, the racks no longer overflowed, as expected.

Another measure that is important when examining sewer separation is the increase in storm water flows to the receiving waters. With separation, storm water flows that were originally captured by the racks and sent to the WPCS would no longer be captured. While separation would almost eliminate overflows at the racks, there would be a substantial increase in storm flows to the receiving waters.

The reduction in the overflow volumes, events, and hours of overflow at each rack were determined. Included is the corresponding storm water flows (totaling 1774.4 MG). Rack overflows were reduced from 779.3 MG to 149.7 MG. Rack 40's overflow was reduced by 251.4 MG, and secondary bypass at the WPCS was reduced by 508.6 MG. The overall reduction in overflows and bypass was 1389.6 MG. Overflow events were eliminated at all but six racks (40, 29, 18, the diversion chamber, 16 and14). In 1994, four major rainfall events triggered the overflows, even with sewer separation.

Another important consideration with respect to the success of sewer separation concerns footer drains as well as unidentified direct connections. It is well recognized that sewer separation results do not measure up to original expectations because of the impractical and improbable footer drain removal success. Sewer separation has been implemented many times without addressing footer drains. This is driven by the cost prohibitiveness of removing/rerouting footer drains. Consequently peak flows in "separated sewer" areas remain high and are unsuccessful. The inability to accurately identify and remove from a sewer system all storm water connections in urban areas also contributes to the lack of success with sewer separation projects.

Cost estimates performed for system-wide separation found this improvement would be prohibitively expensive. Implementation of this improvement would cause lengthy disruptions to traffic and other utilities, along with increased noise and construction traffic in every combined sewer area of the City. In addition, the recreational water quality benefit in terms of attainment of water quality standards from system-wide sewer separation was found by the model to be insignificant, and the overall biological water quality benefit is not predictable. Based on insignificant water quality benefits of system-wide separation, the recreational benefit of partial separation via inflow removal would also be insignificant. However, inflow removal (defined as partial separation) remained in the alternative matrix as a cost-effective means to eliminate or reduce the wet weather volume reaching selected racks.

4.3.2.2. Express Sewers

The *Facilities Plan 98*[6] in Section 13.2.3.2 and associated supporting documents describes the methodology and resources used to develop the capital, O&M and present worth costs for express sewers CSO control. A summary of these resources and methods follows.

Type of Cost	Estimating Methodology	Cost Resources/Assumptions
Capital	Means construction cost guide and local unit costs	• Manholes, sheeting, traffic control, dewatering • Non-construction costs of 30%, utility relocation of 10%, contingency of 20% added to unit costs
O&M	Local costs developed at time of estimate	• O&M costs were estimated to be $100/acre
Present Worth	Single Payment, Uniform Sewers and Gradient Series	• 50-year structure life • Interest rate of 7.125% and inflation rate of 3%

The estimated capital costs and corresponding present worth costs for express sewers were $74 million and $64 million, respectively.

The impacts of express sewers are also described in *Facilities Plan 98*[6] in Section 13.2.3.3. Excerpts from this section follow.

> To document the impact of express sewers in the collection system, three measures were calculated for the 1994 precipitation year on a rack-by-rack basis. These measures included annual overflow volume, annual number of overflow events and annual hours of overflow. Because upstream portions of Racks 11, 12 and 18 would be expressed to the plant, a reduction in all three measures was expected. Similarly, flow was reduced in the main outfall interceptor so overflows at Rack 40 would also be reduced; however, additional flow would be sent to the plant, even when the plant may already be at capacity. Consequently, WPCS bypass was expected to increase with express sewers.
>
> The express sewers would reduce the amount of overflow at Racks 11, 12, 18 and 40 by 239.48 MG; however, WPCS bypass would increase by 284.25 MG. Thus there would be a net volume to receiving water increase of 44.78 MG. For Racks 11, 18 and 40, the express sewers would have a noticeable impact on the number of overflow events and on hours of overflow, with little change in those measures for the WPCS bypass. At Rack 12, the express sewers would do little to reduce any of the measures, including overflow volume.
>
> The evaluation of express sewers revealed that this control technology is cost-prohibitive for the City of Akron. The present worth of this proposed alternative was estimated to be $64,000,000 and would serve portions of only three CSO contributing areas. The evaluation also revealed many practical limitations to the installation and operation of the proposed express sewers. These limitations include construction difficulties, a route through an area of historic and archaeological significance, and the fact that a substantially above-grade alignment is the only configuration which would allow gravity flow from upstream sanitary express lines. In addition, water quality model simulations revealed little if any benefit to receiving water conditions with express sewers.

Additionally, the *Long-Term Control Plan Additional Alternatives, 2002 Report*[10], during its reevaluation of express sewer alternatives, noted significant impacts from “cut and cover” alternatives such as disruption to businesses, traffic and general living conditions. The 2002 reevaluation once again recognized an increase in secondary bypass at WPCS as an impact from the express sewer alternatives.

4.3.3. Summary

A brief summary statement follows for the feasibility of sewer separation and express sewers.

4.3.3.1. Sewer Separation

From the original and updated costs presented it is not financially feasible to implement a system-wide sewer separation CSO control approach. However, it is considered feasible to implement sewer separation in areas designated as Racks 8, 9, 13, 21, 25, 30 and 39 as proposed in Integrated Alternative #2.

4.3.3.2. Express Sewers

From the analysis and evaluation in the *Facilities Plan 98*[6] and the *Long-Term Control Plan Additional Alternatives, 2002 Report*[10] implementation of express sewers is not a feasible CSO control alternative.

4.4. Satellite Storage/Treatment Alternatives

4.4.1. Alternatives

One of the fundamental alternatives for the collection system evaluated in *Facilities Plan 98*[6] was for storage and treatment. Within storage and treatment approaches there are three primary alternatives as follows:

- Deep tunnels.
- Storage basins.
- Treatment basins.

Each of these alternatives was evaluated in detail as described in Section 13.2.1 in *Facilities Plan 98*[6]. Excerpts from Sections 13.2.1.2 and 13.2.1.3 follow which describe the type of facility evaluated.

Storage Basins

> Storage basins proposed would provide storage, screening, and settling for overflow volume from the racks, up to the capacity of a selected design storm. The most cost effective design storm to be used in sizing each basin was determined through procedures described later. During a storm event, CSO currently directed to a receiving stream from a rack, would flow to a basin. CSO volumes greater than the basin's volume would flow through a shunt channel and overflow into the receiving stream.
>
> Screening and odor control would be included with each facility. Course bar screens positioned in the basin influent channel would remove floatables. The bar screens would have 0.5-inch clear spacing and would provide floatables removal and protect downstream equipment from large objects in the CSO. The bar screens would be cleaned by an electrically driven (~5 hp) rake mechanism. The odor control system would consist of an activated adsorber unit (carbon

bed), exhaust fans, and associated ductwork, and would operate when CSO collects in the basin. The fan/blower system would be designed to provide six air changes per hour for the two feet of headspace above the water surface elevation in the basin (i.e., freeboard above the overflow weir elevation). Activated carbon beds would be sized so that the units can effectively operate for at least six months to a year. After the adsorption capacity of the carbon has been depleted, the spent carbon would be removed, replaced, and taken off-site for regeneration.

Basins would be designed to operate automatically; however, operators would be required to inspect operation periodically during storm events. Solids handling dewatering pumps would be used to return the contents of the basin to the interceptor after the storm event. The pumps would be sized to pump the basin volume in 24 hours.

Treatment Basins

Treatment basins would have the same characteristics as the storage basins. Treatment basins require less capacity than storage basins, but include a disinfection system to treat flows entering the basin. The disinfection system would use sodium hypochlorite as the means of CSO treatment.

A control building would be designed to house all equipment associated with treatment at the basin. Space would be provided for sodium hypochlorite storage, the mechanically cleaned bar screens, dewatering, odor control facilities (fans and carbon adsorption beds), and the electrical and instrumentation control panels.

Tunnels

Storage and conveyance tunnels would provide wet weather storage and dry weather conveyance of flow through racks tributary to the tunnels, up to the capacity of a selected design storm. The most cost effective design storm used in sizing the OCI and NSI tunnels was determined through procedures described later. Under non-storm conditions, dry weather flow from tributary racks would be transported via the inner pipe in each tunnel. During a storm event, CSO currently directed to the Cuyahoga River or Ohio Canal from these racks, would flow to the respective storage tunnel. If the storage capacity of the tunnels is exceeded, the tunnel would overflow at one location to the receiving water body. Odor control would be provided for both tunnels, as well as screening of any overflow.

The route proposed for the OCI Tunnel alternative was based on reasonably direct routing, apparent right of way, and the preference to avoid downtown congestion while maintaining a relatively close proximity to the OCI to facilitate connecting existing racks to the tunnel. A profile was chosen which would provide the depth required to maintain a gravity outlet to the LCI while allowing connections from racks to cross underneath the canal.

The route proposed for the NSI Tunnel alternative is generally south of but parallel to the existing NSI. This alignment was developed to maintain a relatively close proximity to the NSI to facilitate connecting existing racks to the tunnel. A profile was chosen that would provide gravity outlet to the LCI and avoid mixed-face tunneling to the greatest extent possible.

4.4.2. Analysis of Alternatives

Section 13.2.1.1 of the *Facilities Plan 98*[6] describes the level of control methodology used to evaluate the storage and treatment alternatives for each CSO Rack. The *Long-Term Control Plan Review and Disinfection Investigation Report*[15] also summarizes this analysis. Excerpts from that document follow:

> To determine if storage or treatment was the preferred alternative, a knee-of-the curve analysis was performed for every Rack. This knee-of-the-curve analysis is intended to select the most cost-effective method of addressing CSOs at each Rack. These are the steps taken for the knee-of-the-curve analysis for each Rack:
>
> 1. The hydraulic model was run under existing conditions for a variety of design storm events; for a one-month storm, a two-month storm, a three-month storm and a five-month storm. The results of these model runs were used to determine the respective CSO volumes to be captured or treated.
>
> 2. Given the CSO volumes determined under Step 1, storage and treatment basins were sized for each storm event and then incorporated into the model. Separate model runs were then conducted under the Typical Year rainfall and with the respective storage and treatment basins. These model runs predicted the effects of the respective storage and treatment basins under the Typical Year rainfall on three design parameters: the number of CSO events, the number of hours that the CSO would be activated, and the effect of Carbonaceous Biochemical Oxygen Demand (CBOD) on the receiving water.
>
> 3. The design storm was plotted on the abscissa (horizontal x-axis) and the results of the design parameter were plotted on the ordinate (vertical y-axis) for both storage and treatment alternatives. Three separate graphs for each rack were thus developed: one for Number of CSO activations, one for the duration of the CSO events, and one for CBOD. Each one of the three graphs had two curves: one curve for treatment and one curve for storage. Reference is made to Figure 13.2 in the *Facilities Plan 98*[6] as an example used for the CBOD analysis for Rack 12.
>
> 4. For each graph, the inflection point for each of the two curves was identified. Since there are two curves per graph, there are two inflection points ("knee-of-the curve" points). A horizontal line was drawn through each inflection point, and intersected with the ordinate (vertical y-axis). The value that corresponded to the intersection was the value for the minimum performance standard for that technology. One value represented the minimum performance standard for treatment, and the other value represented the minimum performance standard for storage. Reference is made to Figure 13.4 in the *Facilities Plan 98*[6] as an example of determining the minimum performance standards for Rack 12 for the CBOD design parameter.
>
> 5. The minimum performance standard for the treatment technology was compared against the minimum standard for the storage technology. Whichever of these standards was less (i.e., resulted in a more stringent requirement) was chosen as the overall minimum performance standard. Reference is made to Figure 13.5 in the *Facilities Plan 98*[6] as an example which shows how the minimum performance standard was selected for Rack 12 for the design parameter of CBOD.

6. For each Rack, the minimum performance standard for each of the three design parameters (i.e., CBOD, number of activations, and hours of activation) was compared against treatment and storage technologies. For a given technology (i.e., either treatment or storage), the performance standard that resulted in the most overall restrictive standard was chosen for that Rack as being the option to be priced. Reference is made to Table 13.7 of the *Facilities Plan 98*[6] as an example showing the minimum performance standard for all three design parameters, when compared to treatment and storage technologies for Rack 12. Table 4-7 summarizes this.

Table 4-7
Six Potential Control Options at Rack 12

Design Parameter	Storage Technology to Meet Minimum Performance Standard (Design Storm Control Level)	Treatment Technology to Meet Minimum Performance Standard (Design Storm Control Level)
CBOD	1.5-month	**3.4-month**
Number of Events	2-month	3-month
Number of Hours	**5.2-month**	2-month

7. For each technology (i.e., treatment or storage), a cost estimate was developed. The alternative that provided the most restrictive performance standard and concurrently provided the lowest overall cost based on a 20-year present worth analysis was selected as the recommended alternative. For a given technology (i.e., treatment or storage), the costs of the alternative for the three design parameters (i.e., CBOD, number of activations, and hours of events) were compared. The highest cost for each given technology was selected. This resulted in two costs: one for the treatment alternative and one for the storage alternative. These two costs were compared against each other, and the lower cost was selected as the preferred alternative. Table 4-8 summarizes the results of this analysis for each Rack.

Table 4-8
Summary of Original 1998 Cost Analysis for Akron Racks

Rack #	CBOD Present Worth ($)	EVENTS Present Worth ($)	HOURS Present Worth ($)	Technology Selection	Parameter Control	Design Storm (Months)	Present Worth ($)
3							
Storage	$2,019,200	$2,063,200	$2,975,700	Treatment	EVENTS	3	$2,969,800
Treatment	$2,856,800	$2,969,800	$2,698,300				
4							
Storage	$1,442,700	$1,471,400	$2,291,300	Treatment	CBOD	2.6	$2,069,600
Treatment	$2,069,600	$2,067,000	$2,019,700				
5 + 7							
Storage	$1,938,500	$1,941,200	$1,941,200	Storage	EVENTS/ HOURS	2.4	$1,941,200
Treatment	$2,518,600	$2,647,900	$2,423,000				
10 + 11							
Storage	$3,828,700	$3,983,900	$5,436,800	Treatment	EVENTS	3.7	$4,990,800
Treatment	$4,664,100	$4,990,800	$4,281,200				
12							
Storage	$2,896,000	$3,368,000	$5,207,300	Treatment	CBOD	3.4	$5,074,700
Treatment	$5,074,700	$4,869,100	$4,265,400				
14							
Storage	$1,836,600	$1,953,700	$2,512,800	Storage	HOURS	3.4	$2,512,800
Treatment	$3,409,600	$2,556,000	$2,235,800				
15							
Storage	$1,646,200	$1,757,600	$2,090,800	Storage	HOURS	3	$2,090,800
Treatment	$2,944,900	$2,638,800	$2,218,900				
16 + 17							
Storage	$8,660,100	$10,305,200	$37,587,700	Treatment	CBOD	8	$14,934,500
Treatment	$14,934,500	$12,412,200	$8,892,000				
18 + 19							
Storage	$9,164,200	$11,348,900	$50,368,500	Treatment	CBOD	8.3	$16,344,300
Treatment	$16,344,300	$13,303,300	$8,280,100				
20							
Storage	$1,158,900	$1,170,000	$1,271,100	Storage	HOURS	3	$1,271,100
Treatment	$1,915,000	$1,719,100	$1,468,400				
22							
Storage	$1,413,200	$1,658,200	$1,742,000	Storage	HOURS	3	$1,742,000
Treatment	$2,073,000	$2,801,300	$3,416,800				
24							
Storage	$1,854,400	$1,931,100	$2,919,100	Storage	HOURS	5	$2,919,100
Treatment	$3,537,300	$2,966,600	$2,406,500				
26 + 28							
Storage	$2,837,200	$2,851,500		Treatment	CBOD	9.6	$4,532,800
Treatment	$4,532,800	$3,954,800	$3,368,900				
27 + 29							
Storage	$2,268,900	$2,243,400		Treatment	HOURS	1.5	$3,674,200
Treatment	$3,251,700	$3,057,500	$3,674,200				

Table 4-8 (con't) Summary of Original 1998 Cost Analysis for Akron Racks							
Rack #	**CBOD Present Worth ($)**	**EVENTS Present Worth ($)**	**HOURS Present Worth ($)**	**Technology Selection**	**Parameter Control**	**Design Storm (Months)**	**Present Worth ($)**
32							
Storage	$2,098,000	$1,997,200	$2,722,800	Storage	HOURS	5	$2,722,800
Treatment	$3,581,300	$2,888,300	$2,580,500				
33							
Storage	$863,100	$935,700	$1,156,300	Storage	HOURS	8.6	$1,156,300
Treatment	$1,505,800	$1,182,000	$1,089,100				
34							
Storage	$1,191,700	$1,115,400	$1,400,900	Storage	EVENTS	5	$1,400,900
Treatment	$1,837,100	$1,691,300	$1,423,500				
35							
Storage	$3,279,100	$3,482,700	$3,326,800	Storage	EVENTS	1.6	$3,482,700
Treatment	$5,704,600	$3,855,300	$3,935,200				
36							
Storage	$1,304,600	$1,193,800	$1,287,300	Storage	CBOD	2	$1,304,600
Treatment	$2,244,800	$1,892,700	$1,779,400				
40 + 31							
Storage	$13,471,200	$16,060,300		Storage	EVENTS	1.4	$16,060,300
Treatment		$11,488,600	$9,946,000				
							$93,195,300

The basis for the costs presented in Table 4-8 are described in Section 13.2.1.2.1 for storage and treatment basins and in Section 13.2.1.3.1 for storage and conveyance tunnels in the *Facilities Plan 98*[6].

A summary of the cost methodologies follows in Table 4-9.

Table 4-9 Summary of 1998 Plan Cost Development Methodologies			
CSO Control Technology	**Type of Cost**	**Estimating Methodology**	**Cost Resources/Assumptions**
Treatment and Storage Basins	Capital	Updated cost resources using the ENR index	• Disinfection (treatment basins): EPA/625/ R-93/007; • Pumping costs: EPA/430/9-80-003; • Pumping costs (O&M): EPA/430/9-78-009; • Screens (treatment basins): EPA/625/R-93/007; • Odor control facilities: EPA/625/1-85/018; • Pumps sized to dewater basins in 24 hours.
		Local unit costs developed at time of estimate	• Concrete tank itself estimated as $2/gallon; • Excavation, backfill, exterior piping unit costs; • Non-construction costs of 30%, utility relocation of 20% added to unit costs. • Land acquisition at 4x the tank size at $30,000/acre. • Tie-down anchors at 15% of total tank capital cost. • Washdown system at 2.75% of total tank capital cost.
		Means construction cost guide	• Fencing (based on approximate tank perimeter), access road and control building costs with non-construction costs of 30%, utility relocation of 10%, contingency of 20% added to unit costs.
	O&M	Updated cost resources using the ENR index	• Disinfection (treatment): EPA/625/R-93/007; • Pumping costs: EPA/430/9-78-009; • Screens: EPA/625/R-93/007; • Odor control facilities: EPA/625/1-85/018; • Pumps operate to dewater basins in 24 hours.
	Present worth	Single Payment, Uniform Series and Gradient Series	• Equipment costs at 8% of the tank total capital cost; • 15-year equipment life, 50-year structure life; • Interest rate of 7.125% and inflation rate of 3%.

Table 4-9 (con't) Summary of 1998 Plan Cost Development Methodologies			
CSO Control Technology	Type of Cost	Estimating Methodology	Cost Resources/Assumptions
Tunnels	Capital	Local unit costs developed at time of estimate	• Soft ground tunnel construction cost = $960(\text{dia.})^{0.56}$; • Rock tunnel construction cost = $90(\text{dia.})^{1.1}$; • Construction shafts (entrance/exit) at $6,000/foot; • Work shafts (i.e., connections to racks) at $2,500/foot; • Microtunneling for outlet control structure ($800-$1,000/foot for 2'-4' diameter); • Rack reconstruction($100,000 each); • Dry weather flow piping for pipe-in-pipe design; • Ventilation duct and fan ($355,000 each); • Odor control facilities ($500,000 each); • Outlet control structure ($1,500,000 each); • Shaft connections ($250,000 each); • Land acquisition ($500,000 to $1,000,000).
	O&M	Related to capital costs	• Annual O&M cost ($1k) = $1.7031(\text{capital cost})^{0.4498}$.
	Present worth	Single Payment, Uniform Series and Gradient Series	• Equipment costs at 8% of the tank total capital cost; • 15-year equipment life, 50-year structure life; • Interest rate of 7.125% and inflation rate of 3%.

Updated costs for the selected satellite storage and treatment alternative for each Rack are presented in Section 6.

4.4.3. Summary

The City of Akron has presented to the Ohio EPA viable satellite storage and treatment CSO alternatives in the *Facilities Plan 98*[6] and the *Long-Term Control Plan Review and Disinfection Investigation Report*[15]. A comprehensive analysis was performed for these alternatives for each CSO Rack. This analysis was integrated with the other CSO control alternatives evaluated for the CSO system and at the WPCS.

The recommendations for satellite storage and treatment alternatives were not based on costs alone, but the following parameters:

- Storm water impacts.
- Water quality improvements.
- Operation and maintenance.
- Costs.
- Public Acceptance.
- Community improvements.

- Constructability.

The previously recommended improvements for satellite storage and treatment within Integrated Alternative #2 remain the most feasible approach to CSO control.

4.5. WPCS Storage

4.5.1. Existing Conditions

The Akron WPCS process facilities include an off-line flow equalization basin referred to as the Storm Retention Tank (SRT). The SRT, in conjunction with connecting conduits, has a nominal storage capacity of 10 MG. The tank is 26 feet deep and was originally constructed as Imhoff tanks. Screened and degritted wastewater is conveyed into the SRT via screw pumps and can be dewatered by a second screw pumping station. Once filled, the SRT overflows into a separate conduit that connects to the secondary bypass conduit. The plant process schematic, Figure 3-2, shows the SRT process and associated process connections.

The SRT is used after first maximizing flow to the secondary treatment system. Operators also manage diversion of flow to the SRT in conjunction with operating the primary settling tanks at optimum rates in order to achieve the highest quality of treatment during moderate wet weather flow events. A description of the SRT operating procedure is provided in Section 3.4, Maximizing Flow to Secondary Treatment.

Based on flow data presented in Table 4-3, it can be presumed that the SRT is typically utilized approximately 98 times per year. It is uncertain how many of the 132 days that the secondary bypass activated that it contained SRT overflow in addition to PST effluent. However, it is known from WPCS in-house sampling that the water quality of SRT overflow is comparable to primary effluent.

4.5.2. WPCS Storage Alternatives

One of the options for reducing, or eliminating, secondary bypass is the construction of additional storage to capture and store peak flows for treatment through secondary after cessation of the wet weather event. Based on calculations presented in Section 14.1.2 of the *Facilities Plan 98 Alternatives*[7], 147 MG of retention would be needed to eliminate all secondary bypass events during an average year, in conjunction with the SRT and a 110 MGD secondary treatment capacity. A total additional volume of approximately 1,240 MG would be captured and subsequently treated in the “average” year.

The *Facilities Plan 98 Alternatives*[7] concluded that sufficient land was not available to construct 147 MG of storage, and it would not be cost effective or practical to operate and maintain. Modeling and knee-of-curve analysis was completed and identified 20 to 30 MG of retention volume as cost effective. The model indicated that 40 MG of storage would be needed to capture 85 percent of secondary bypass volume during an “average” year (1994). This determination is in reference to the presumptive approach. A basin half the volume, 20 MG, would capture 73 percent of volume. Per a general review of available land and probable costs, it was determined to consider two storage capacities – a 20 MG and a 40 MG volume.

Five storage basin concepts were developed and presented in Section 14.3.2 of the *Facilities Plan 98 Alternatives*[7]. Based on a review of cost and non-cost factors, the alternatives were screened to two storage alternatives:

- 20 MG of storage located near primary settling tanks.
- 40 MG of storage located near primary settling tanks.

The basins would be cast-in-place concrete with multiple compartments and wash-down capabilities (similar to the Cuyahoga Street (Rack 40) Basin recently constructed). With the current plant hydraulic grade line at this location and relative ground elevations, it is possible to flow by gravity into the basins. The area north of the primary settling tanks is the preferred location for the storage basin. Several benefits are derived from this location: 1) wet weather flow will be screened and degritted before being stored in the basin and new screening and degritting facilities would not be needed; 2) a large capacity pumping station will not be required to convey peak flows into the basin; 3) the proposed basin could provide storage for overflows from both the SRT and PSTs (both flow trains contributing to secondary bypass); 4) flexibility to divert daily flows to help even out diurnal flows would be possible and; 5) construction activities would be somewhat separated from daily WPCS O&M activities and contracts. Lay-down area is provided. Figure 4-10 shows a conceptual site plan for a 40 MG storage basin, developed with four (4), 10 MG compartments. The 20 MG alternative would have a comparable layout with two (2), 10 MG compartments.

4.5.3. Feasibility Analysis of WPCS Storage

The capture and subsequent treatment of secondary bypass flows would result in an increase in the average day flow through secondary treatment. For the 20 and 40 MG storage basins, an increase of the 76.5 MGD average daily flow (1994) to 79.0 MGD and 79.4 MGD, respectively, is estimated (The 2005 average daily flow is 78.6 MGD). This nominal increase is not significant to plant operations and maintenance. However, as a matter of practical operations, the basin would likely be drained back into the plant within three days. With a 40 MG basin, this increases average daily flow to 89.8 MGD, which is still within secondary treatment capacity.

The benefit of constructing a 20 or 40 MG storage basin was predicted using the same modeling techniques as the *LTCP 98*[9]. The analysis assumed a 120 MGD secondary treatment capacity and 10 MG available storage in the SRT. Table 4-10 presents a summary of these benefits.

Table 4-10
Storage Basin Alternatives Benefit Summary

Alternatives	Annual Estimates					
	Bypass # of Events	Bypass # of Hours	Bypass Volume (MG)	Capture by Volume %	Bypass CBOD (lbs)	Bypass CBOD Reduction (lbs)
WPCS Secondary Bypass – No Change	25	439	1,166	0	291,733	0
Alt. 1A – 20 MG Storage	9	314	878	24.7	219,606	72,127
Alt. 1B – 40 MG Storage	6	260	757	35.0	189,288	102,445

[1]10 MG SRT volume included in analysis

4.5.4. Summary

Construction of a storage basin at the Akron WPCS is a viable alternative for minimizing use of the secondary bypass. Significant bypass volume and $CBOD_5$ reductions can be attained. The basin construction and operation will be similar to facilities already owned and operated by the

City. Land is available north of the PSTs which is a location that provides several added benefits.

The alternatives of constructing a 20 MG or 40 MG storage basin are recommended for further evaluation through cost analysis. This analysis is provided in Section 5.

4.6. Additional Treatment (Secondary Bypass Treatment)

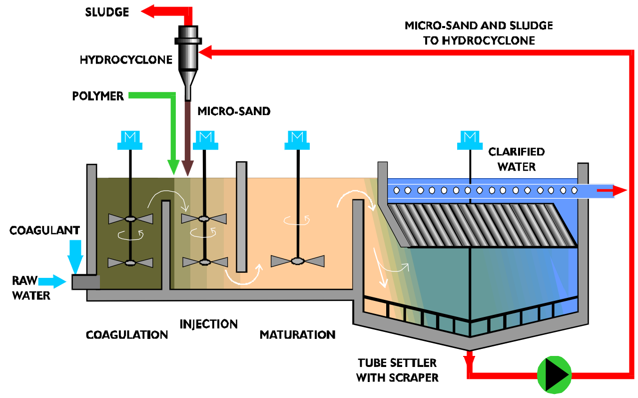
4.6.1. Pilot Testing Summary

The purpose of the pilot studies is to evaluate high rate process technologies for treatment of Secondary Bypass flow. To achieve this objective, three different pilot-scale process units were operated at the Akron WPCS in three phases. They included the Krüger ACTIFLO process, the Infilco Degremont, Inc. (IDI) DensaDeg process and, the Wet Weather Engineering & Technology, LLC (WWETCO) compressed media filter (CMF) process. Other pilot studies for each technology were also reviewed, and existing full-scale processes in the United States were assessed. Evaluation of process treatment performance for treating primary treated municipal wastewater flow (Secondary Bypass) was emphasized in the evaluations. The following summary of this effort is drawn from three documents prepared by ARCADIS FPS/ARCADIS, 1) *City of Akron, Ohio Water Pollution Control Station Secondary Bypass Treatability Study*[12], March, 2004; 2) *City of Akron, Ohio Water Pollution Control Station Secondary Bypass Treatability Study, Phase II*[13], December, 2004; and, 3) *City of Akron, Ohio Water Pollution Control Station Secondary Bypass Treatability Study, Phase III*[14], December 2005.

The Krüger ACTIFLO Process

ACTIFLO is a micro-sand ballasted clarification process that may be used to treat water or wastewater. The process, shown in Illustration 1, utilizes coagulant to destabilize suspended solids and polymer addition to aid in floc formation. A microsand is added to act as a seed for floc formation. The sand and sludge mixture is collected at the bottom of the settling tank with a conventional scraper system and pumped to a hydrocyclone that separates the higher-density sand from the lower-density sludge. The sludge is discharged continuously out of the top of the hydrocyclone while the sand is recycled back into the ACTIFLO process for further use.

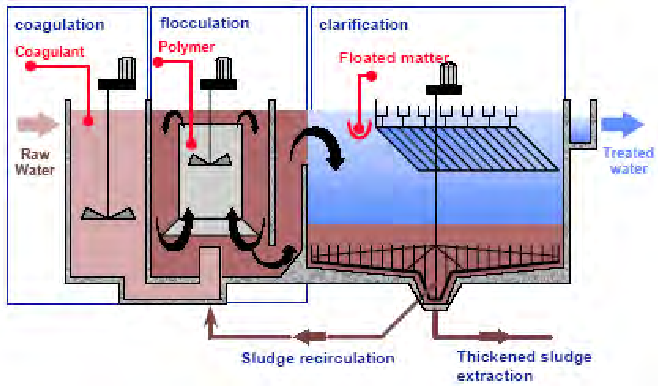
Illustration 1
The ACTIFLO Process. (Source: Krüger/Krüger)



The IDI DensaDeg Process

DensaDeg is a sludge ballasted clarification process that may be used to treat wastewater. The process, shown in Illustration 2, also utilizes a coagulant to destabilize suspended solids. Sludge is collected at the bottom of the clarifier with a conventional scraper system and recirculated back to the reactor tank. Periodically, a separate sludge pump wastes a small portion of the sludge from the system.

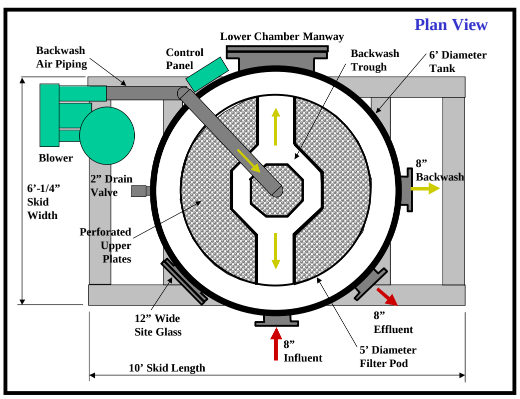
Illustration 2
The DensaDeg Process (Source: Infilco Degremont, Inc.)

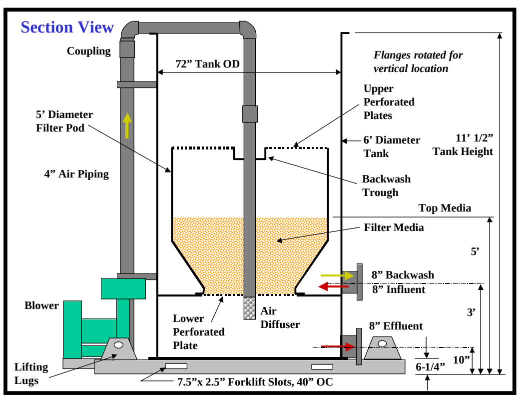


The WWETCO CMF Process

The WWETCO Compressed Media Filter (CMF) is a high-rate, passively-operated, compressible media filter that requires no mechanical devices or chemicals to filter wastewater. No additional hydraulic (driving) head is necessary because the filter operates on the incoming wet weather hydraulic gradient using differential pressure to create a compressed lower media zone and an uncompressed upper zone resulting in removal performance for particles down to the 10 to 20 micron range. Filterable solids are removed by the synthetic media as the wastewater passes through the layer of individual 'fuzzy' balls. Collected solids are removed from the filter balls during the backwashing process. During backwash the filter uses a central airlift to scrub and separate solids minimizing backwash water requirements. The basic configuration of the WWETCO CMF technology for wet weather flow control and treatment, as pilot tested, is shown in Illustrations 3 and 4.

Illustrations 3/4
CMF Pilot Unit Plan/Section Views (Source: WWETCO, LLC)





4.6.2. Pilot Test Treatment Objectives

The Akron WPCS has a National Pollutant Discharge Elimination System (NPDES) permit with limits established for Secondary Bypass flow (daily TSS 157 mg/l and daily $CBOD_5$ 91 mg/l). The plant's current NPDES limit for final effluent was used as a goal for the evaluation of the three technologies. The water quality parameters considered, and their associated NPDES permit numerical limits, are as follows:

• Total Suspended Solids (TSS) – 30 day	15 mg/l
• Total Phosphorus (P) – 30 day	1.0 mg/l
• $CBOD_5$ – 30 day	10 mg/l
• pH	6.5 to 9.0
• Fecal Coliform – 30 day	1000/100 ml (summer)

Each high rate treatment pilot unit was evaluated on its ability to meet the above parameters either by itself or with disinfection. TSS and Total P were tested for all trials. $CBOD_5$ tests were run for a select number of trials.

Wastewater Characteristics

Implementation of a high rate treatment (HRT) process is being considered at the Akron WPCS to treat Secondary Bypass flow during wet weather events. The WPCS secondary bypass flow is of primary effluent characteristic and strength based on historical sampling data. This is shown in Table 4-11. (The WPCS relationship between BOD and CBOD is typically 0.7 BOD = CBOD.) As such, it was deemed appropriate to use PST effluent for the pilot tests.

Table 4-11
Akron WPCS Wastewater Characteristics

	100-150 MGD Plant Primary Influent	150-200 MGD Plant Primary Influent	100-150 MGD Plant Primary Effluent	150-200 MGD Plant Primary Effluent	Sample Station 603: Secondary Bypass	Sample Station 602: Secondary Effluent	Primary Effluent
TSS (mg/l)	146	147	51	60	47	7.2	48
BOD_5 (mg/l)	100	62	56	44	*59*	4.1	63
$CBOD_5$ (mg/l)	*62*	*43*	*39*	*31*	41	1.8	*44*

Results

Table 4-12 provides an overall summary of the treatment results of the pilot unit evaluation.

Table 4-12
Pilot Unit Performance Summary

Parameter	ACTIFLO	DensaDeg	CMF
$CBOD_5$ Reduction	63	66	13
TSS Reduction	80	78	52
Total Phosphorus Reduction	88	91	26
Fecal Coliform Reduction	inconclusive	95	46

Table 4-13 provides a summary of design and operational considerations for the three HRT alternatives.

Table 4-13 HRT Design/Operational Considerations			
	ACTIFLO	DensaDeg	CMF
Rise Rate	60 gpm/sf	40 gpm/sf	13 gpm/sf
Start-up	Wet	Dry	Dry
Screening	¼ to ½ inch	¼ to ¾ inch	¼ inch
Sludge % Solids	~ 0.2 % [2]	~ 0.5 % [2]	~ 0.1 % [1]
Coagulant Dose	50 mg/l Alum	90 mg/l Alum	---
Polymer Dose	0.7 mg/l	2.0 mg/l	---
Backwash	---	---	27 min @ 5 gpm/sf
Run Time			3 hours

[1] Recycle to secondary treatment.
[2] Sludge discharge to gravity belt thickeners.

All three HRT technologies pilot tested are able to be brought on-line from a dormant condition within an hour. Although, the ACTIFLO process should be maintained in a "wet" condition with plant effluent water if complications are to be avoided. This is an important capability considering the HRT process may only be used twice a month.

Both the ACTIFLO and DensaDeg processes rely heavily on coagulants and/or coagulant aids, in conjunction with ballast, to accomplish TSS reduction. For ACTIFLO, if any one of the coagulant, polymer or sand ballast is lost, the TSS reduction efficiency is notably reduced. The DensaDeg process reacts similarly if either chemical feed is lost or the sludge recycle is discontinued. With both processes the loss of chemical feed results in the more significant reduction of treatment. The start up of the chemical systems, and the sand recirculation system, are critical for these two processes.

The Compressed Media Filter (CMF) process requires no chemical addition. However, the CMF pilot unit did not provide a level of treatment comparable to the ACTIFLO and DensaDeg pilot units.

4.6.3. Feasibility Analysis of Additional Treatment

Based on the pilot test results, and other published data on the three HRT processes evaluated, it is feasible to employ this technology for the treatment of secondary bypass flow at the Akron WPCS. However, because the CMF process does not provide the same level of treatment as the ACTIFLO and DensaDeg processes, and would require three to five times more land area to construct, it is screened from further evaluation.

Advantages of the ACTIFLO and DensaDeg technologies include a small footprint, quick start-up time and high removal efficiencies. They are both capable of providing substantive pollutant removal and would be appropriate for the treatment of secondary bypass flow. However, they are limited to removal of particulate pollutants. And, they are reliant on chemical coagulants for this ability. These two processes are also referred to as enhanced high rate clarification (EHRC) and will be further considered in this alternatives analysis. However, because the ACTIFLO and DensaDeg processes provide comparable performance, the concept of EHRC will be evaluated generically. The final selection of equipment is best left to a preliminary design level evaluation.

CBOD reduction is expected to be approximately 65% through the EHRC process, based on the pilot testing. Secondary bypass flows are either primary settling tank (PST) effluent, and/or Storm Retention Tank (SRT) overflow, both of which provide some CBOD removal. The overall CBOD through PST/SRT and the proposed EHRC process is predicted to be approximately 70% (treated effluent averaging 19 mg/l $CBOD_5$).

The *LTCP Additional Alternatives*[10], May 2002, evaluated incorporation of an EHRC process to treat secondary bypass flow. Three different levels of treatment were considered. The impact to secondary bypass characteristics resulting from EHRC treatment of secondary bypass flow is presented in Table 4-14. One additional alternative, a 150 MGD EHRC, has been added. The loads shown were calculated using the same modeling techniques used in the *LTCP 98*[9] and assume the Integrated Alternative #2 collection system improvements have been constructed.

The WPCS chlorine contract tank presently provides adequate contact time for flows up to approximately 210 MGD. Although, existing chemical feed equipment capacity is limiting at flows below 210 MGD. Therefore, Alternatives 1C, 1D and 1E would not require additional facilities with the exception of additional chemical storage and feed equipment, which could be located within the EHRC chemical and control building. Similarly, the 150 MGD EHRC facility, Alternative 1F, would also include a chemical storage and feed facility. However, a chlorine contact tank (CCT) with 15 minutes detention for a 70 MGD peak flow rate is also required. The disinfected EHRC effluent can then be routed around the WPCS CCT to resolve hydraulic limitations with that facility. A 96-inch diameter conduit and junction chambers are subsequently part of the 1F alternative. Figure 4-11 shows a conceptual site plan for the 50 MGD EHRC alternative. The larger capacity alternatives would have a similar layout.

Table 4-14
Secondary Bypass EHRC Alternatives Benefit Summary

EHRC Capacity	Annual Estimates					
	Bypass # of Events	Bypass # of Hours	Bypass Volume (MG)	Treated by Volume %	Total Bypass CBOD[2] (lbs)	Bypass CBOD Reduction (lbs)
WPCS Secondary Bypass – No Change	25	439	1166	0	291,733	0
Alt. 1C – 10 MGD[1]	19	375	950	18.5	251,590	40,143
Alt. 1D – 50 MGD[1]	12	251	418	64.2	163,761	127,972
Alt. 1E – 100 MGD[1]	3	21	5	99.6	95,474	196,259
Alt. 1F – 150 MGD[1]	0	0	0	100	0	291,733

[1] Assumes Integrated Alternative #2 collection system improvements are completed.
[2] Includes EHRC treated and untreated flow.

Benefit

Although the EHRC alternative's overall 70% CBOD reduction (with primary treatment) is less than the reduction of about 90% CBOD load expected through existing primary and secondary treatment, it will provide a reduction in secondary bypass when secondary capacity is exceeded during wet weather. In addition, unlike biological treatment units, EHRC units can be brought on-line within an hour and only when needed during high flow events. It also provides a perpetual removal benefit as compared with storage alternatives which, once full, provide no benefit at all for continuing wet weather events. One potential issue with the EHRC technology is its chemical coagulant and polymer usage. A concern for toxicity exists depending on ambient conditions and the dosage concentrations of chemicals.

4.6.4. Solids Process Impacts

Treatment of secondary bypass flow with an EHRC process will increase the solids loadings to the WPCS sludge process train. This includes sludge solids and chemical sludge as a result of the polymer and coagulant dosed in the process. A review of manufacturers data for the process, and the results of the pilot testing, reveal that 0.33 tons of dry solids per MG treated may be expected.

This value consists of 0.20 dry tons/day of solids production for process removal (compared to 0.22 dry tons/day (0.50 dry tons/day x 44%) for full secondary treatment as noted in Section 4.2.4) plus 0.13 dry tons/ day of chemical solids production.

The following summarizes the impacts of the additional solids production from the EHRC process at the various capacities evaluated.

EHRC Alternative	EHRC Solids (dry tons)	Extg. Sec. Solids @ 120 MGD (dry tons)	Total Solids Loading (dry tons)	GBT Capacity (dry tons)	% Exceedence	Dry Tons Exceeded	Volume at 2% Solids (gallons)
10 MGD	3.3	26.4	29.7	46.8	N/A	N/A	N/A
50 MGD	16.5	26.4	42.9	46.8	N/A	N/A	N/A
100 MGD	33.0	26.4	59.4	46.8	26.9%	12.6	151,100
150 MGD	49.5	26.4	75.9	46.8	62.2%	29.1	348,900

Although the 100 MGD and the 150 MGD EHRC alternatives produce total peak solids loadings which exceed the gravity belt thickener process, these excess solids can be directed to the mixing/holding tanks. With 7.0 MG capacity, even the 348,900 gallon volume is relatively insignificant (less than 5%) in proportion.

Therefore, current solids handling facilities are considered adequate for any of the EHRC alternatives.

4.6.5. Summary

Two HRT processes were identified during pilot testing as providing substantive treatment of secondary bypass flow – the Krüger ACTIFLO process, a sand ballasted EHRC process; and, the Infilco Degremont Desadeg process, a solids contact high rate clarification process. In conjunction with primary treatment in the WPCS PSTs or SRT, an overall 70% reduction in $CBOD_5$ would be expected. And, the ability to treat secondary bypass flow is only limited by the capacity of treatment constructed. Because these EHRC processes can remain in standby mode during extended dry weather periods, and brought online within one hour, they are viable alternatives for treating secondary bypass flows. The alternative of constructing an EHRC process to treat secondary bypass flow is recommended for further analysis. An analysis of project costs and a cost/benefit analysis is provided in Section 5.

4.7. Alternatives Summary

Three groups of alternatives were presented that can increase the capacity to capture and/or store primary effluent flow (secondary bypass) at the Akron WPCS during wet weather events. These groups include 1) increased secondary treatment capacity, 2) enhanced high rate clarification treatment of the secondary bypass flow, and 3) storage of the secondary bypass flow. The water quality benefits of each alternative are summarized in Table 4-15. An analysis of cost and non-cost issues associated with each alternative is provided in Section 5.

Table 4-15
WPCS Annual Bypass Volumes Under Various Secondary Treatment Alternatives[1]

Secondary Treatment Alternative	Secondary Capacity (MGD)	Bypass Storage Volume (MG)	EHRC Capacity (MGD)	Total Treatment & Storage Capacity (MG(D))	Annual Untreated Bypass[2]				Annual EHRC-Treated Bypass Volume (MG)	Total Secondary Bypass Volume Reduction (MG)	EHRC Effluent $CBOD_5$ (lbs)	Total Secondary Bypass $CBOD_5$ (lbs)	Total Secondary Bypass $CBOD_5$ Reduction (lbs)
					Bypass # of Events	Bypass # of Hours	Bypass Volume (MG)	Bypass $CBOD_5$[3] (lbs)					
"No Change" Alternative: Operate Secondary Treatment at 110 MGD	110	10		120	25	439	1,166	291,733		0		291,733	0
Alternative 1 Modified "No Change": 10 MGD Additional Secondary Treatment	120	10		130	19	419	1,113	278,571		53		278,571	13,162
Alternative 1A 20 MG Storage Basin	120	30		150	9	314	878	219,606		288		219,606	72,127
Alternative 1B 40 MG Storage Basin	120	50		170	6	260	757	189,288		409		189,288	102,446
Alternative 1C 10 MGD EHRC	120	10	10	140	19	375	950	237,690	163	216	13,900	251,590	40,143
Alternative 1D 50 MGD EHRC	120	10	50	180	12	251	418	104,616	695	748	59,145	163,761	127,972
Alternative 1E 100 MGD EHRC	120	10	100	230	3	21	5	1,151	1,109	1,161	94,323	95,474	196,260
Alternative 1F 150 MGD EHRC	120	10	150	280	0	0	0	0	1,113	1,166	94,714	94,714	197,019
Alternative 5A – 170 MGD MBR	170				12	251	418	104,584		748		104,584	187,149
Alternative 5B – 210 MGD MBR	210				4	96	12	3,002		1154		3,002	288,731

[1] All scenarios assume implementation of LTCP Integrated Plan No. 2 in the collection system
[2] "Untreated Bypass" is secondary bypass that exceeds either secondary treatment, bypass storage volume and/or EHRC capacity. $CBOD_5$ concentration of 30 mg/l for untreated bypass assumed per original LTCP analysis
[3] CBOD reduction of 66% assumed for EHRC treatment based on pilot testing results

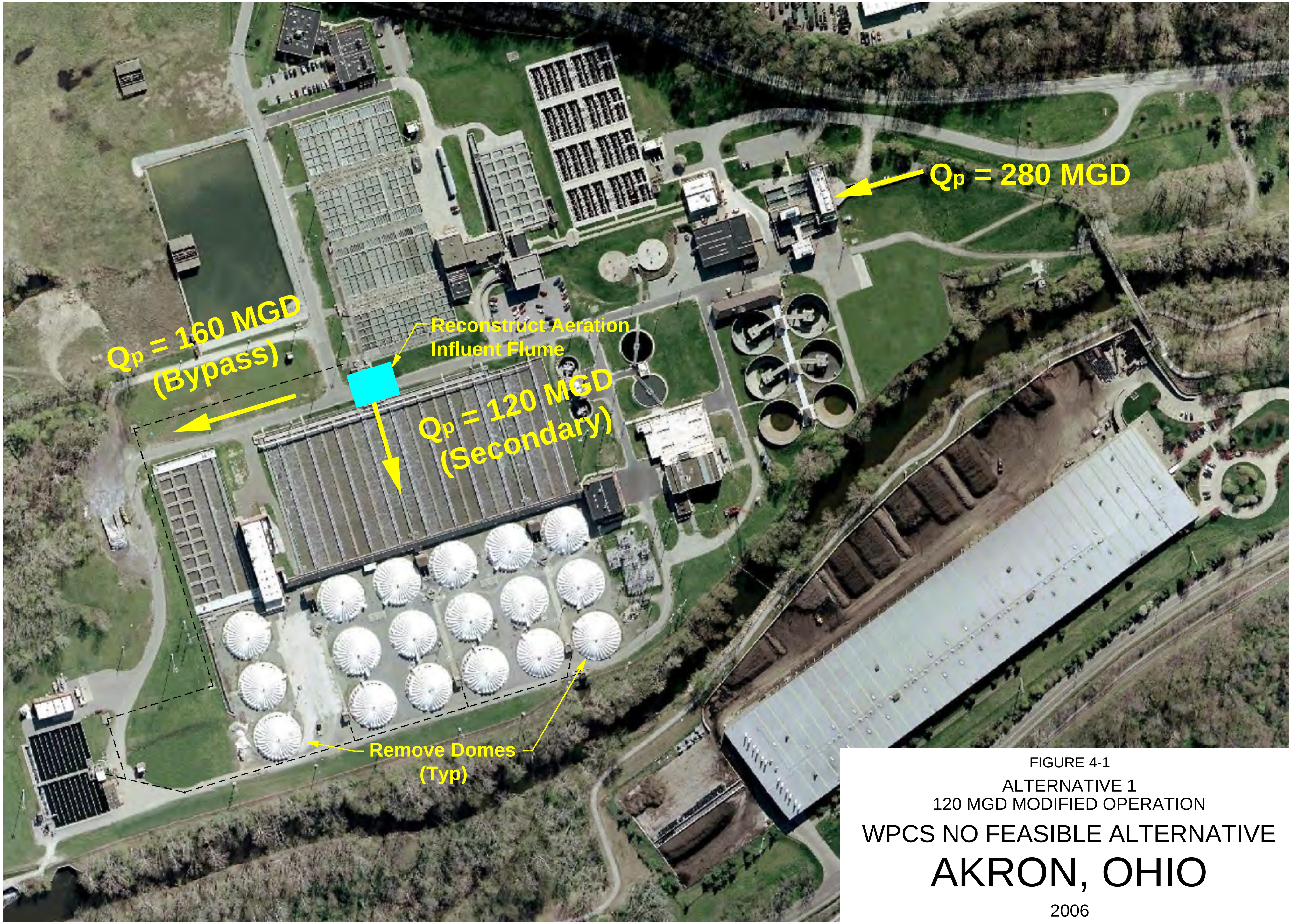


FIGURE 4-1

ALTERNATIVE 1
120 MGD MODIFIED OPERATION

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

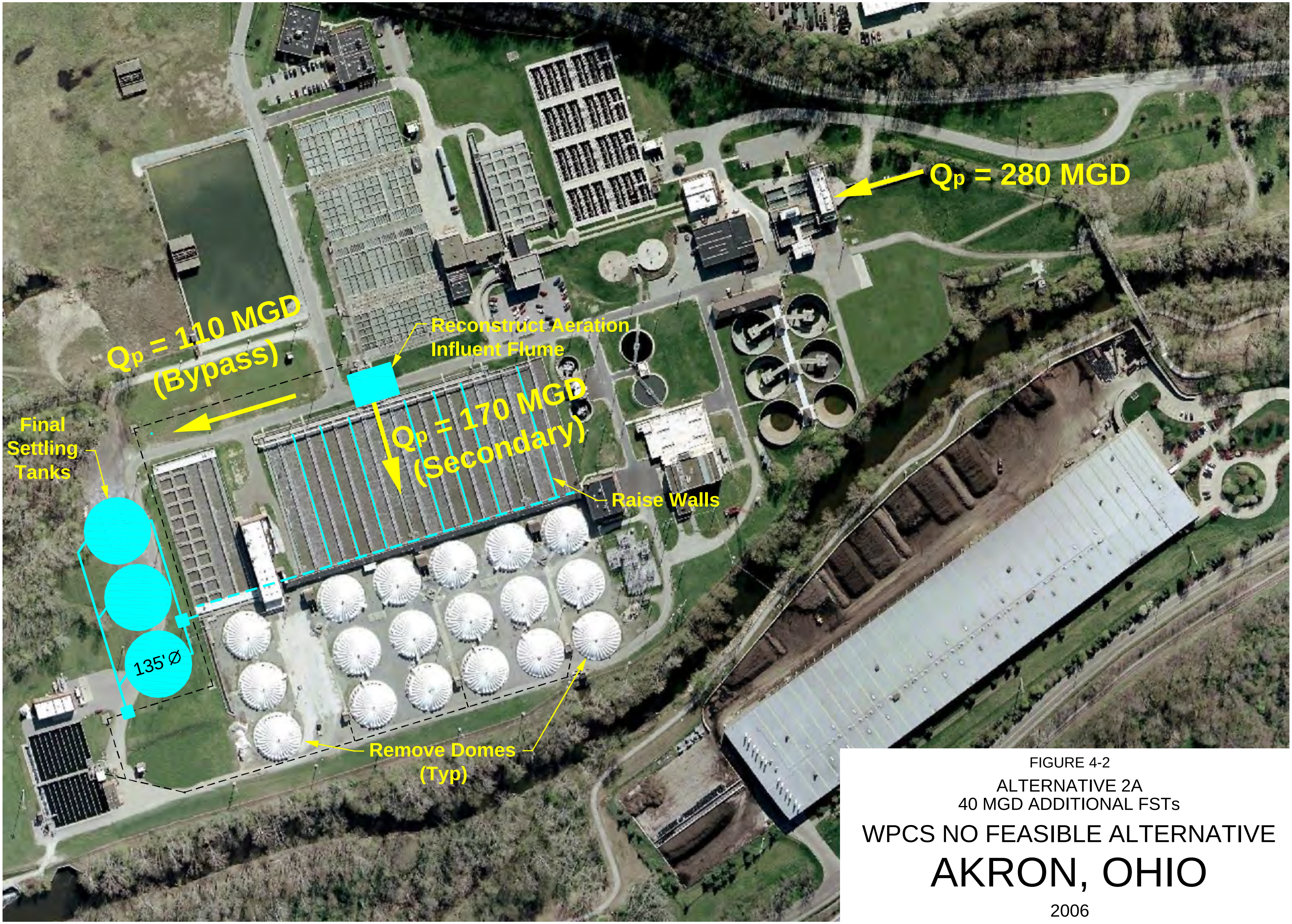


FIGURE 4-2
ALTERNATIVE 2A
40 MGD ADDITIONAL FSTs
WPCS NO FEASIBLE ALTERNATIVE
AKRON, OHIO
2006

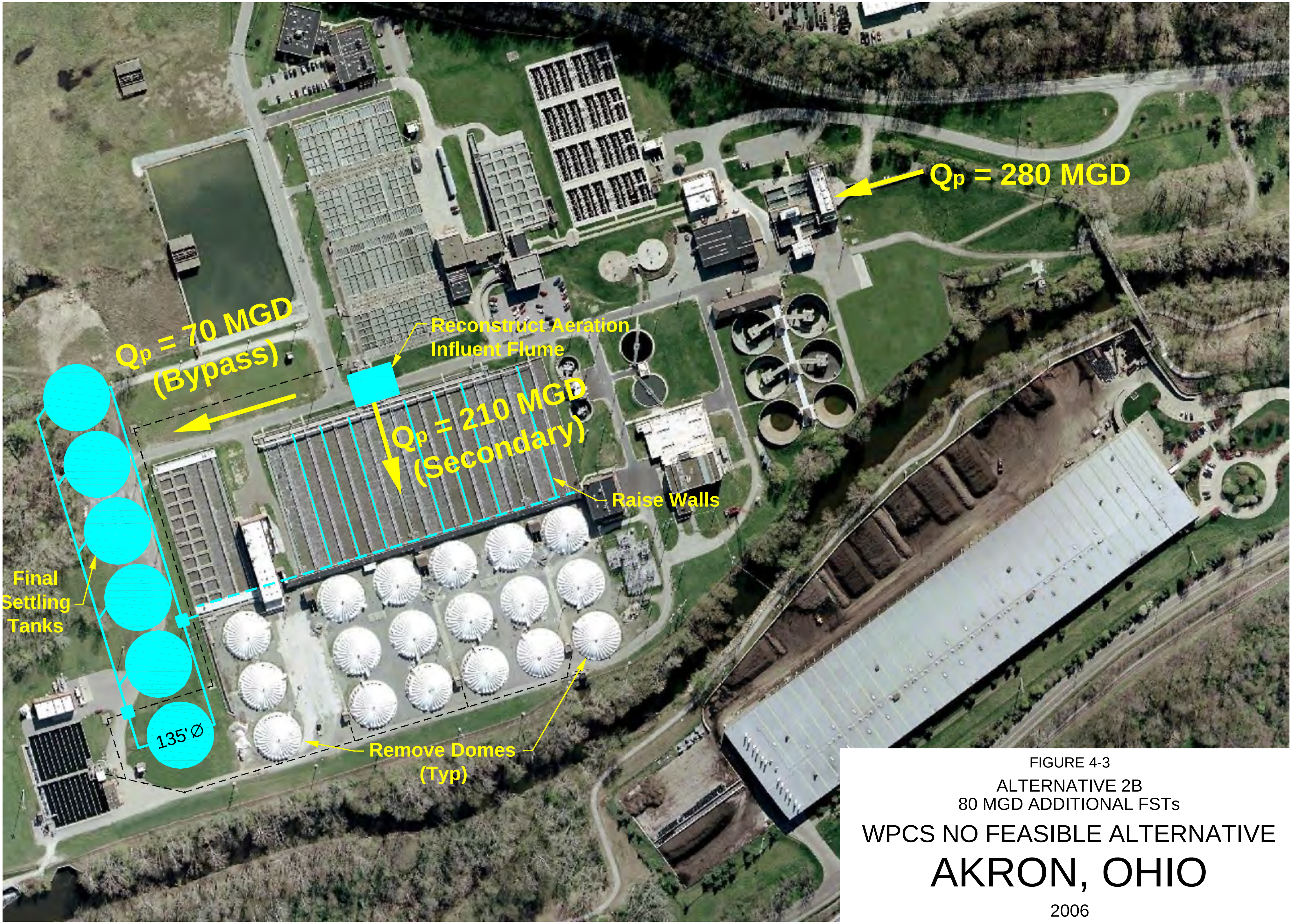


FIGURE 4-3

ALTERNATIVE 2B
80 MGD ADDITIONAL FSTs

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

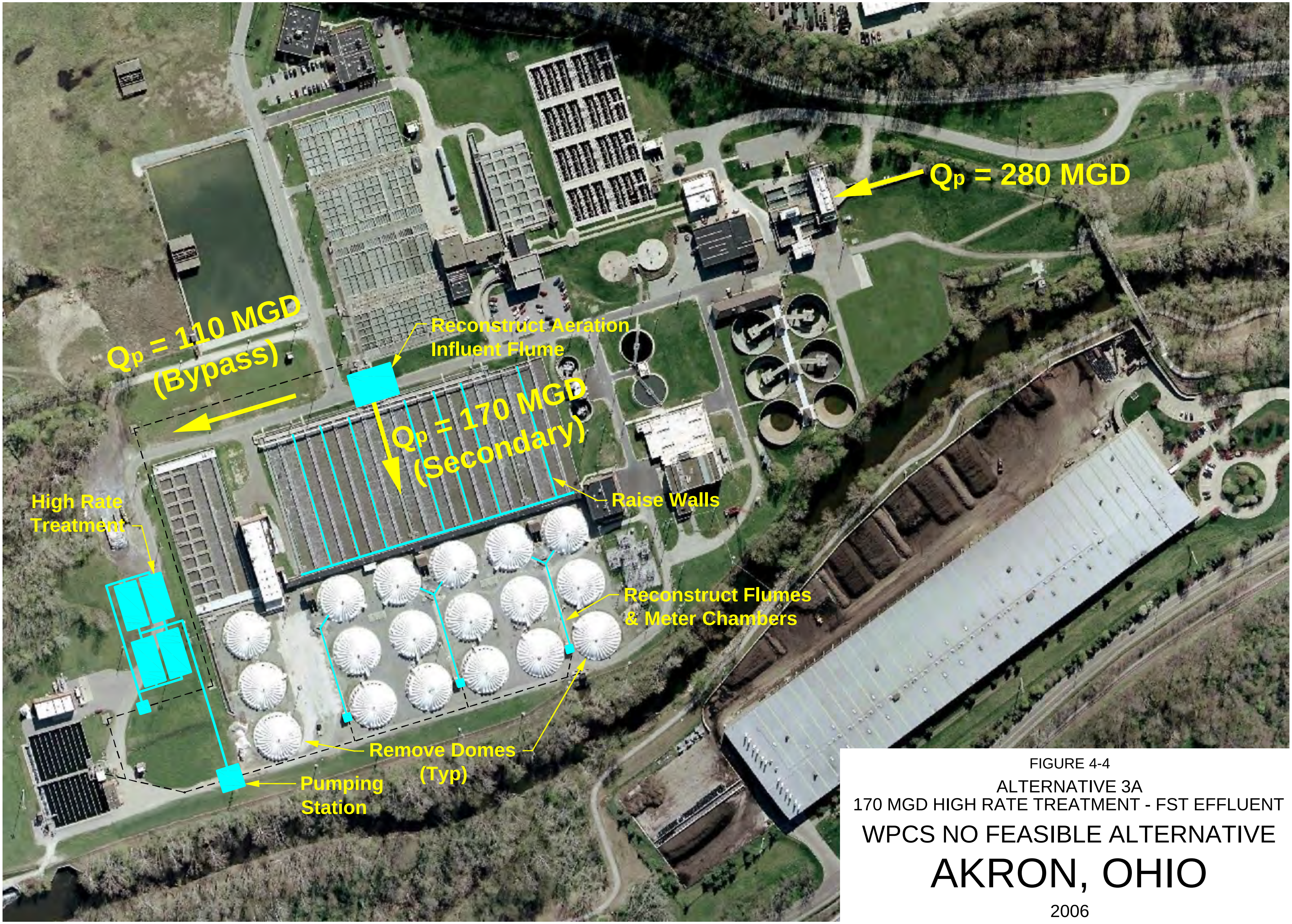


FIGURE 4-4
ALTERNATIVE 3A
170 MGD HIGH RATE TREATMENT - FST EFFLUENT
WPCS NO FEASIBLE ALTERNATIVE
AKRON, OHIO
2006

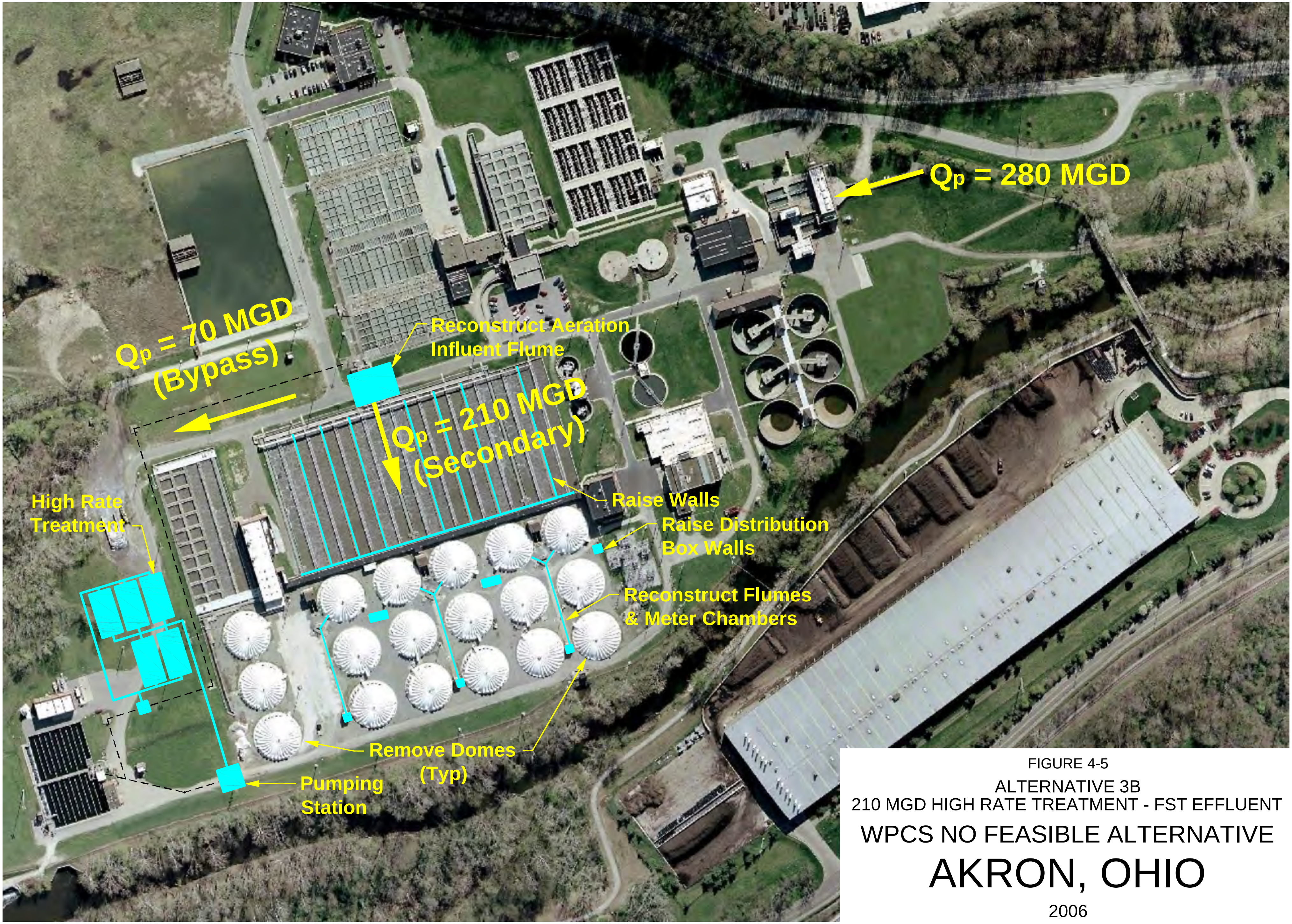


FIGURE 4-5

ALTERNATIVE 3B

210 MGD HIGH RATE TREATMENT - FST EFFLUENT

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

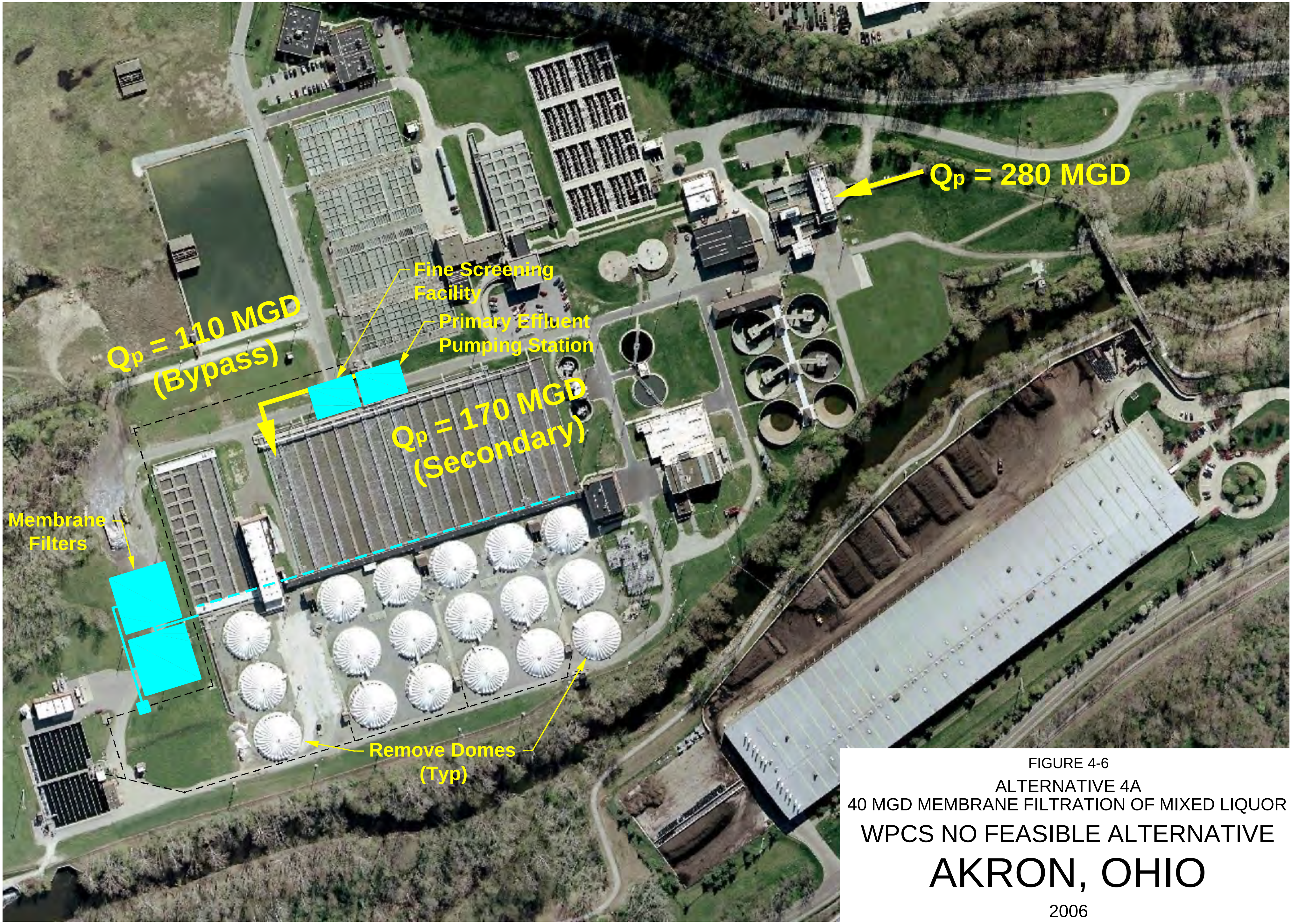


FIGURE 4-6

ALTERNATIVE 4A
40 MGD MEMBRANE FILTRATION OF MIXED LIQUOR

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

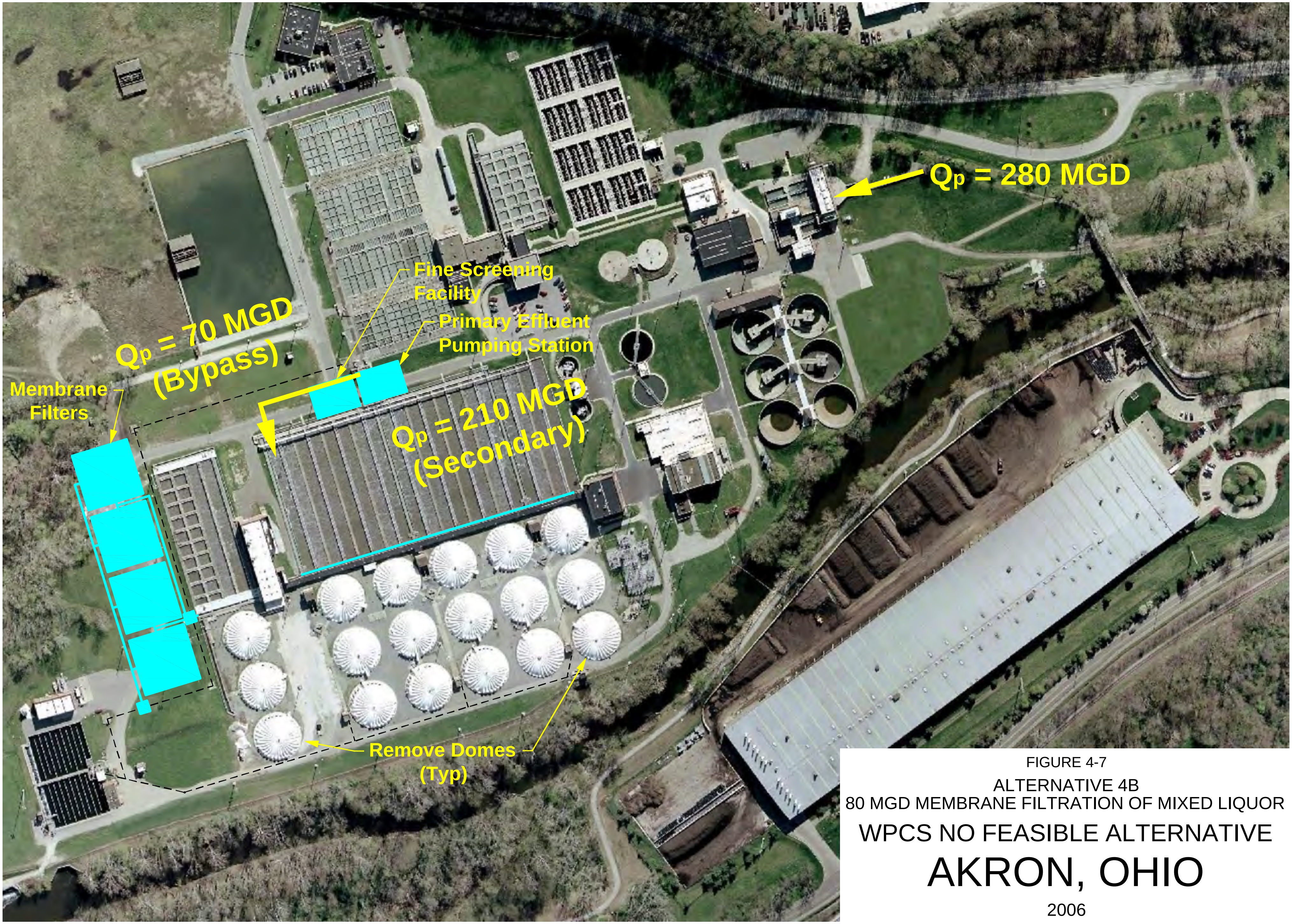


FIGURE 4-7

ALTERNATIVE 4B

80 MGD MEMBRANE FILTRATION OF MIXED LIQUOR

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

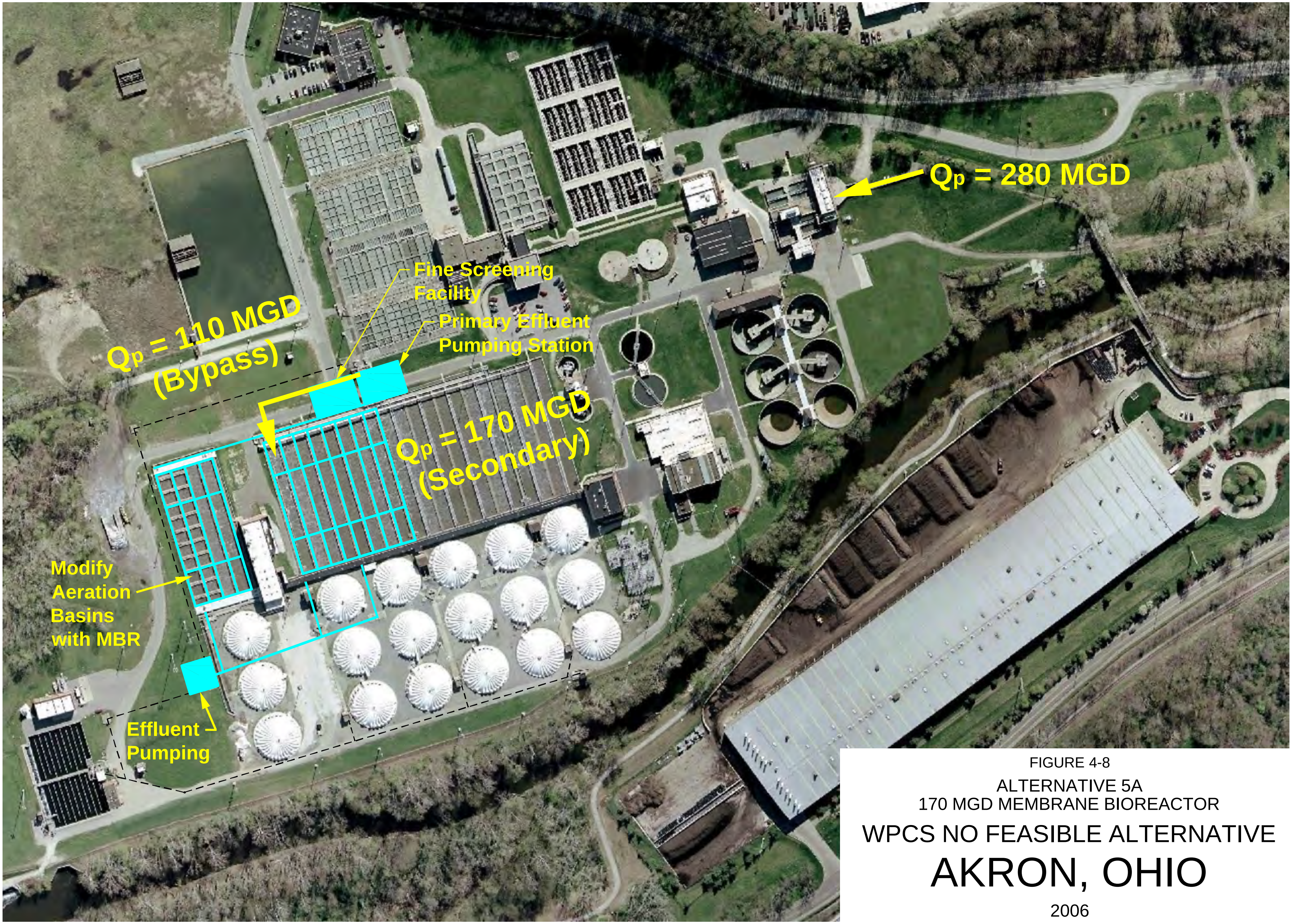


FIGURE 4-8

ALTERNATIVE 5A
170 MGD MEMBRANE BIOREACTOR

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

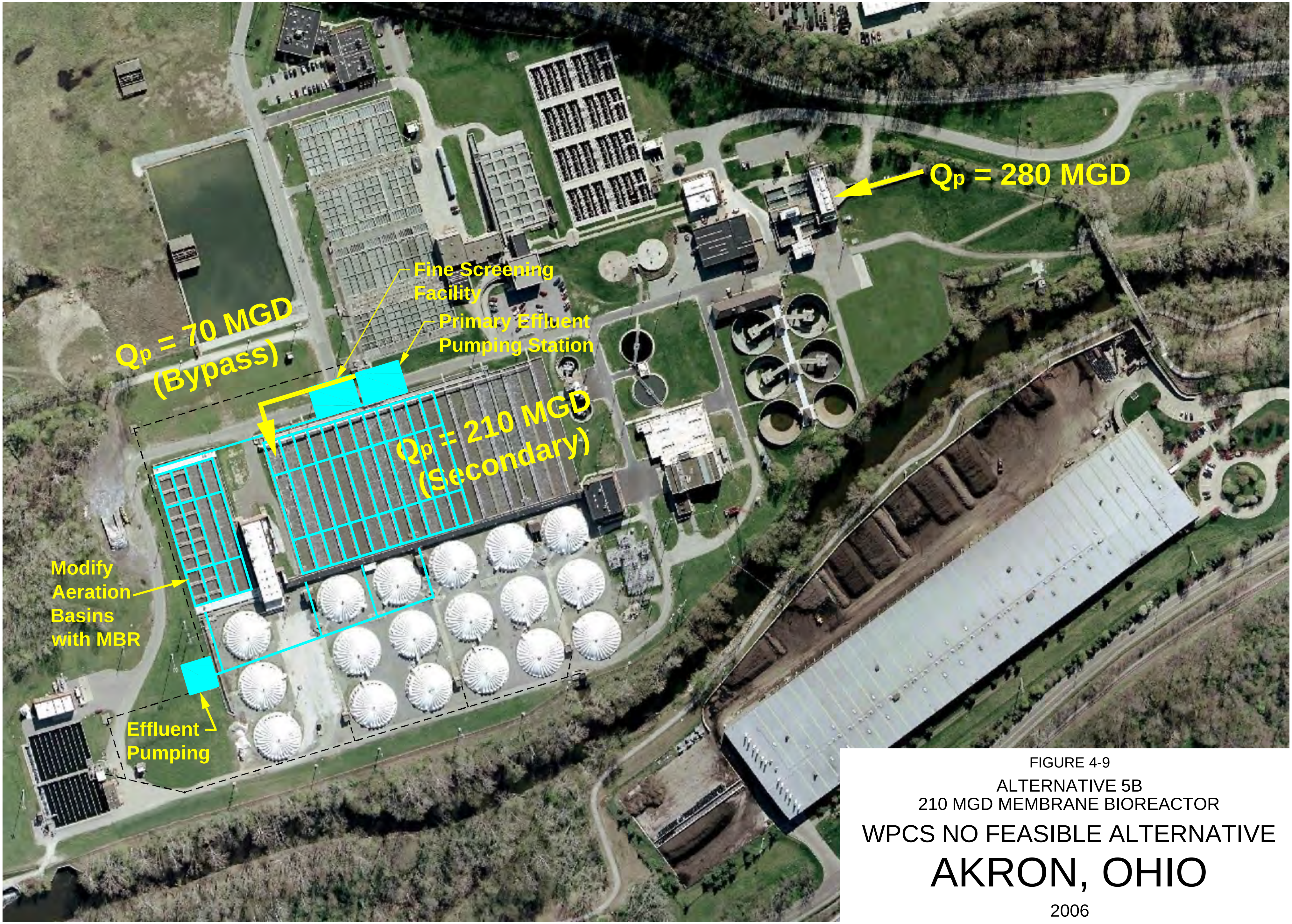


FIGURE 4-9

ALTERNATIVE 5B
210 MGD MEMBRANE BIOREACTOR

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

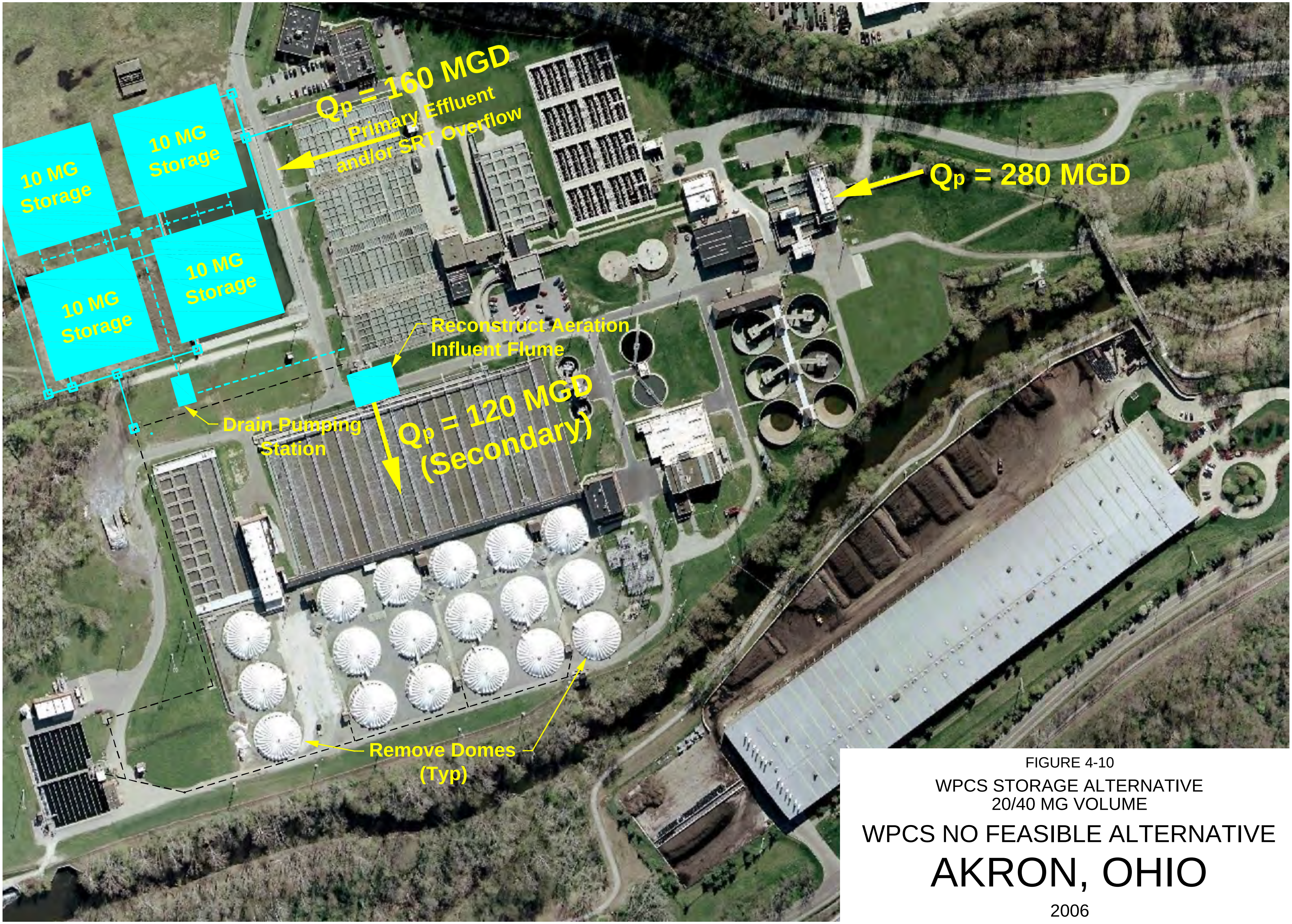


FIGURE 4-10

WPCS STORAGE ALTERNATIVE
20/40 MG VOLUME

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

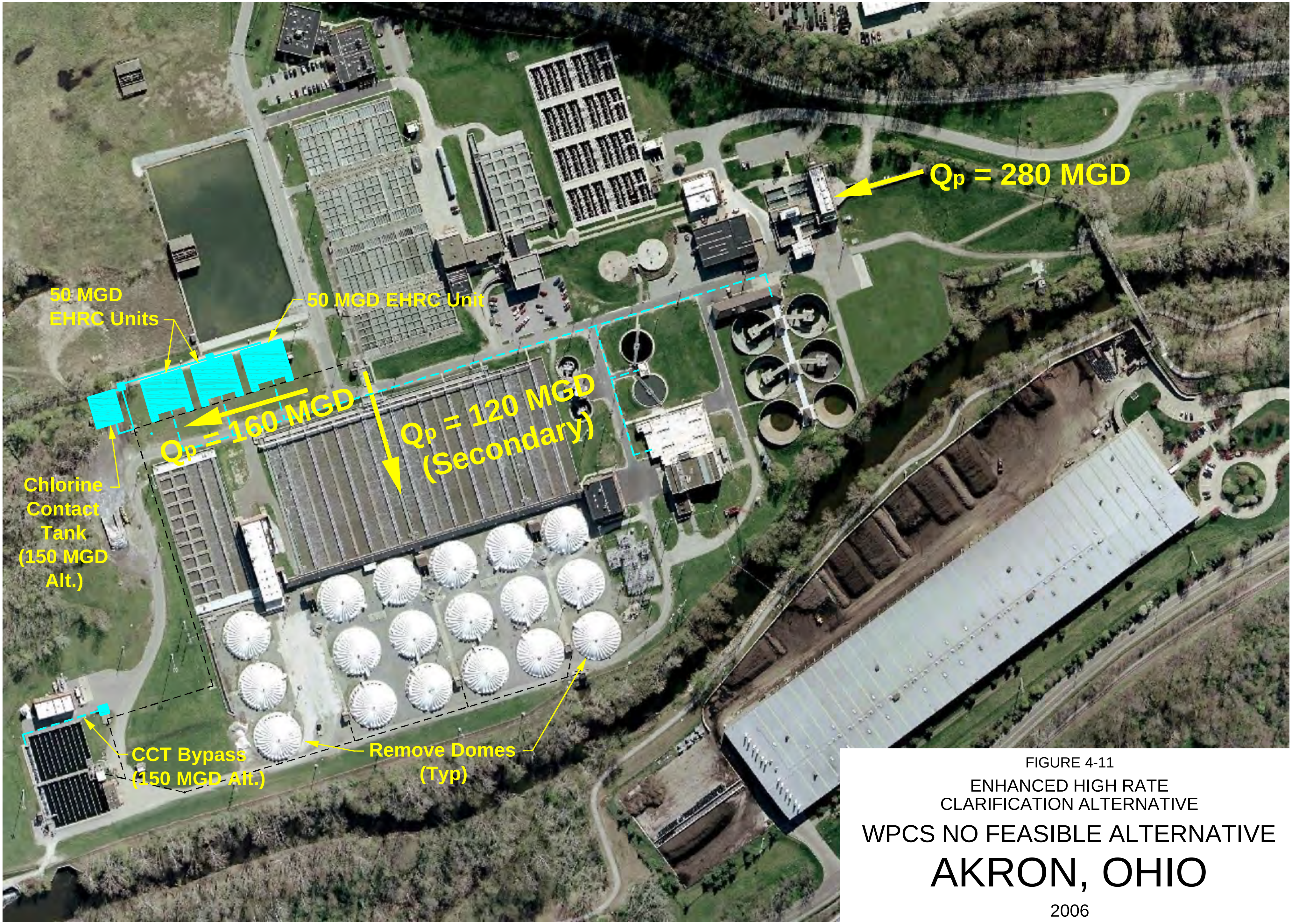


FIGURE 4-11

ENHANCED HIGH RATE CLARIFICATION ALTERNATIVE

WPCS NO FEASIBLE ALTERNATIVE

AKRON, OHIO

2006

SECTION 5
ALTERNATIVE SCREENING

5.1. Alternative Costs

Several WPCS improvement alternatives were developed in Section 4 that would provide additional wet weather capacity and reduce utilization of the secondary bypass conduit. These alternatives are assigned into three groups – secondary treatment system improvements (Section 4.2), storage basins (Section 4.5), and enhanced high-rate clarification of secondary bypass flow (Section 4.6).

An opinion of probable project cost was developed for each WPCS alternative. The estimates follow the cost guidelines applied in previous City of Akron LTCP planning documents. The detailed estimates and summary of the cost guidelines are provided in Appendix C. Table 5-1 presents the total project cost for each evaluated alternative. Alternative 1A through 1F project costs include the secondary treatment facility improvements outlined for Alternative 1. They also include $200,000 in additional stress testing and plant process modeling that is recommended in conjunction with Alternative 1.

Table 5-1
WPCS Secondary Bypass Alternatives Project Costs

Alternative	Total WPCS Capacity[1]	Project Cost
Secondary Treatment Improvements (Section 4.2)		
No Change	120	$0
Alt. 1 – 120 MGD Secondary Operation	130	$2,566,000
Alt. 5A - 170 MGD MBR Process	180	$84,987,000
Alt. 5B - 210 MGD MBR Process	220	$150,362,000
Storage Basins (Section 4.5)		
Alt. 1A - 20 MG Storage Basins	150	$46,200,000
Alt. 1B - 40 MG Storage Basins	170	$90,150,000
EHRC Bypass Treatment (Section 4.6)		
Alt. 1C - 10 MGD EHRC	140	$5,969,000
Alt. 1D - 50 MGD EHRC	180	$10,052,000
Alt. 1E - 100 MGD EHRC	230	$16,387,000
Alt. 1F - 150 MGD EHRC	280	$24,043,000

[1] Volume of flow contained and/or treated in 24-hour period with established 120 MGD Secondary Treatment and existing 10 MG Storm Retention Tank (SRT), except for Alt.s 5A and 5B.

Alternatives 5A and 5B have project costs significantly greater than other alternatives that will provide comparable capture or treatment within a 24-hour period. These alternatives also require difficult and staged reconstruction within the existing, 50-year old concrete tanks. Considering these cost and non-cost issues, these alternatives are screened from further evaluation.

Annual operation and maintenance (O&M) costs for each remaining WPCS alternative were developed. The basis and summary for those costs are presented in Appendix D.

A present worth analysis of each WPCS alternative was completed using the developed project and O&M costs, and considering the following conditions:

- Inflation rate of 4%.
- Interest rate of 4.875% (Federal Discount Rate); 20-year term.
- 24-month construction period.

The present worth analysis is contained in Appendix D.

The project cost, annual O&M cost and present worth cost of each WPCS alternative are presented in Table 5-2. For the purpose of subsequent alternatives analysis, operation at the secondary treatment alternative capacity of 120 MGD (Alternative 1) is assumed. A total treatment capacity in terms of the 120 MGD secondary treatment capacity, plus the existing 10 MG storm retention tank (SRT), plus the storage basin or EHRC process capacity, is noted for each alternative.

Table 5-2
WPCS Secondary Bypass Alternatives Present Worth Cost

Alternative	Total WPCS Capacity[1]	Project Cost[2]	2006 Annual O&M Cost	Present Worth Cost
Secondary Treatment Improvements (Section 4.2)				
No Change	120	$0	$0	$0
Alt. 1 -120 MGD Secondary Operation	130	$2,566,000	$21,200	$2,494,317
Storage Basins (Section 4.5)				
Alt. 1A - 20 MG Storage Basins	150	$46,200,000	$145,600	$44,169,618
Alt. 1B - 40 MG Storage Basins	170	$90,150,000	$235,100	$85,554,078
EHRC Bypass Treatment (Section 4.6)				
Alt. 1C - 10 MGD EHRC	140	$5,969,000	$73,400	$6,917,237
Alt. 1D - 50 MGD EHRC	180	$10,052,000	$254,300	$14,659,712
Alt. 1E - 100 MGD EHRC	230	$16,387,000	$404,200	$23,925,626
Alt. 1F - 150 MGD EHRC	280	$24,043,000	$416,400	$31,948,394

[1]Volume of flow able to be contained and/or treated in 24-hour period.
[2]Includes $200,000 for additional stress testing and process modeling.

5.2. Alternatives Analysis

5.2.1. Screening

The WPCS alternatives in Table 5-1 are retained for further evaluation from screening exercises performed in previous planning documents (storage and EHRC) and Section 4 of this Report (secondary treatment improvements). Therefore, there are no further issues or concerns for these alternatives with the exception of the 170 MGD and 210 MGD Membrane Bioreactor (MBR) alternatives screened in the previous section. As shown, the costs associated with the two MBR alternatives are significantly higher than any other alternative. From a non-cost standpoint, an MBR process could provide a modest increase in secondary treatment performance. However, Akron WPCS operators are unfamiliar with MBR operation. The technology is relatively new and membrane fouling and associated reduction in peak flow capacity are major concerns. The existing aeration basins would require significant modification to support the membrane racks. Lastly, membrane life will require complete membrane replacement in 10-years.

For the cost and non-cost reasons noted, the 170 MGD and 210 MGD MBR alternatives are not considered feasible and are screened from further analysis.

The remaining alternatives include 1) general improvements to increase the existing secondary treatment system capacity; and 2) storage basins previously evaluated in the *Facilities Plan 98*; and 3) EHRC processes that were pilot tested by the WPCS personnel. The WPCS personnel are familiar with each of these processes. Each alternative is viable for further evaluation through a cost-benefit analysis.

5.2.2. Cost-Benefit Analysis

The benefits of each WPCS alternative associated with reducing secondary bypass flow parameters were noted in Section 4. The capital and O & M costs associated with each were presented previously in this Section. Table 5-3 provides a comparison of the water quality benefits of each alternative.

Table 5-3
WPCS Secondary Bypass Alternatives Water Quality Benefits

Alternative	Total WPCS Capacity[1]	Bypass # of Events	Bypass # of Hours	Bypass Volume (MG)	Bypass $CBOD_5$ (lbs)
Secondary Treatment Improvements(Section 4.2)					
No Change	120	25	439	1,166	291,733
Alt. 1 - 120 MGD Secondary Operation	130	19	419	1,133	278,571
Storage Basins (Section 4.5)					
Alt. 1A - 20 MG Storage Basins	150	9	314	878	219,606
Alt. 1B - 40 MG Storage Basins	170	6	260	757	189,288
EHRC Bypass Treatment (Section 4.6)					
Alt. 1C - 10 MGD EHRC	140	19	375	950	251,590
Alt. 1D - 50 MGD EHRC	180	12	251	418	163,761
Alt. 1E - 100 MGD EHRC	230	3	21	5	95,474
Alt. 1F - 150 MGD EHRC	280	0	0	0	94,714

[1]Volume of flow able to be contained and/or treated in 24-hour period.

$CBOD_5$ and overflow volume reduction are goals of the CSO policy. Each of the WPCS alternatives provides a reduction in $CBOD_5$ discharge in relation to its performance potential and relative capacity. To evaluate the cost-effectiveness of each alternative, the cost per pound of $CBOD_5$ removed was calculated and is presented in Table 5-4. Similarly, the cost per million gallons (MG) of secondary bypass captured/treated was also calculated and is shown in Table 5-5.

Table 5-4 WPCS Secondary Bypass Alternatives $CBOD_5$ Removal Cost					
Alternative	Total WPCS Capacity[1]	Bypass $CBOD_5$ (lbs)	$CBOD_5$ Removed (lbs)	Present Worth Cost ($)	$/lb $CBOD_5$ Removed
Secondary Treatment Improvements (Section 4.2)					
No Change	120	291,733	0	$0	N/A
Alt. 1 - 120 MGD Secondary Operation	130	278,571	13,162	$2,494,317	$190
Storage Basins (Section 4.5)					
Alt. 1A - 20 MG Storage Basins	150	219,606	72,127	$44,169,618	$612
Alt. 1B - 40 MG Storage Basins	170	189,288	102,445	$85,554,078	$835
EHRC Bypass Treatment (Section 4.6)					
Alt. 1C - 10 MGD EHRC	140	251,590	40,143	$6,917,237	$172
Alt. 1D - 50 MGD EHRC	180	163,761	127,972	$14,659,712	$115
Alt. 1E - 100 MGD EHRC	230	95,474	196,259	$23,925,626	$122
Alt. 1F - 150 MGD EHRC	280	94,714	197,019	$31,948,394	$162

[1]Volume of flow able to be contained and/or treated in 24-hour period.

Table 5-5 WPCS Secondary Bypass Alternatives Volume Removed Cost					
Alternative	Total WPCS Capacity[1]	Bypass Volume (MG)	Volume Removed[2] (MG)	Present Worth Cost ($)	$/MG Volume Removed
Secondary Treatment Improvements (Section 4.2)					
No Change	120	1,166	0	$0	N/A
Alt. 1 - 120 MGD Secondary Operation	130	1,113	53	$2,494,317	$75,590
Storage Basins (Section 4.5)					
Alt. 1A - 20 MG Storage Basins	150	878	288	$44,169,618	$153,400
Alt. 1B - 40 MG Storage Basins	170	757	409	$85,554,078	$209,180
EHRC Bypass Treatment (Section 4.6)					
Alt. 1C - 10 MGD EHRC	140	950	216	$6,917,237	$32,020
Alt. 1D - 50 MGD EHRC	180	418	748	$14,659,712	$19,600
Alt. 1E - 100 MGD EHRC	230	5	1,161	$23,925,626	$20,610
Alt. 1F - 150 MGD EHRC	280	0	1,166	$31,948,394	$27,400

[1]Volume of flow able to be contained and/or treated in 24-hour period.
[2]Or volume treated.

As shown, the cost-benefit relationships range from $115/lb. CBOD to $835/lb. CBOD removed, with the storage basin alternatives being approximately five times more costly than the EHRC alternatives. The cost-benefit relationship for volume removed/treated ranges from $19,600 to $209,180 per million gallons removed/treated. Again, the storage basin alternatives are approximately seven times more costly per million gallons removed/treated. Based on this cost benefit analysis, it is recommended to screen the storage basin alternatives. The EHRC alternatives are more cost effective in terms of CBOD and volume removal. Also, an EHRC process provides perpetual removal abilities, i.e. can be operated 24/7 for extended periods of time. A storage basin, once filled, provides no further benefit – if back to back storms occur there is no capture of the secondary bypass flow.

Improvements to the secondary treatment facility to enable operation at 120 MGD are similar in benefit cost to the EHRC alternatives. It is recommended to complete these improvements to improve the base flow treatment capacity and add an EHRC facility to treat secondary bypass flow.

A knee-of-curve analysis of the EHRC alternatives was prepared to evaluate the cost-effective overall capacity point. Figure 5-1 presents this analysis curve for the cost per pounds of CBOD5 removed. Figure 5-2 presents the knee-of-curve analysis for the cost per volume of bypass removed/treated.

Figure 5-1
EHRC Knee-of-Curve Analysis
For CBOD Removed

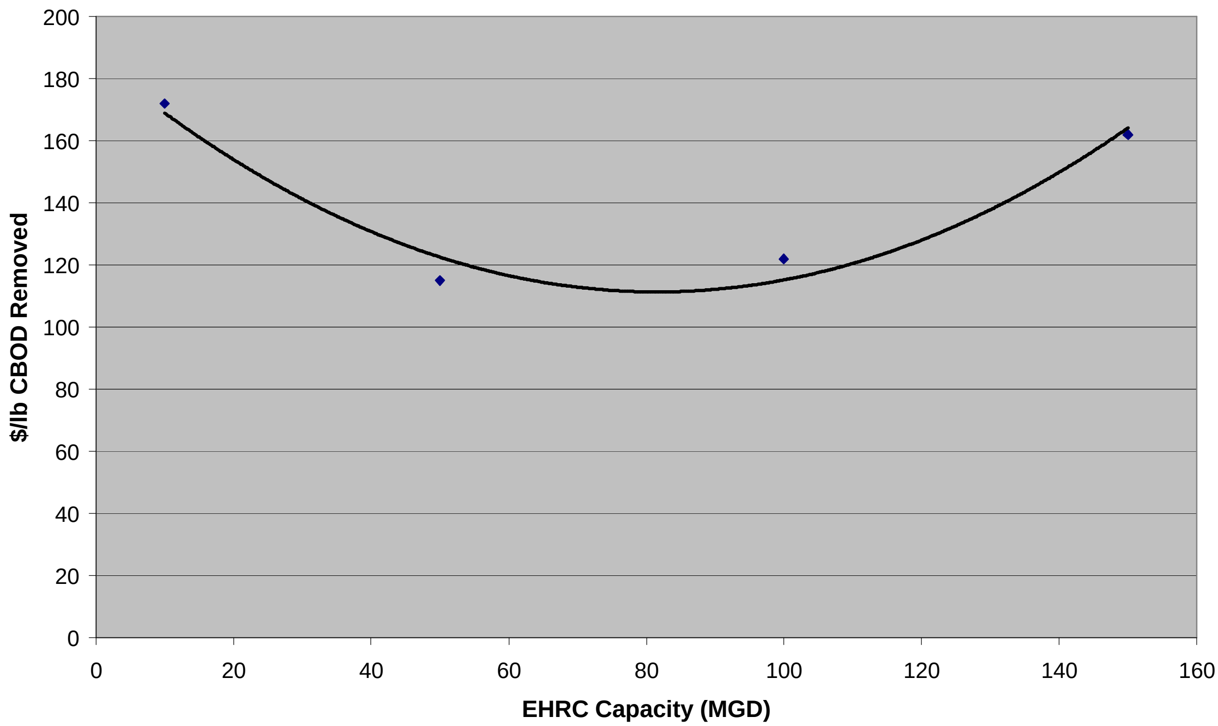
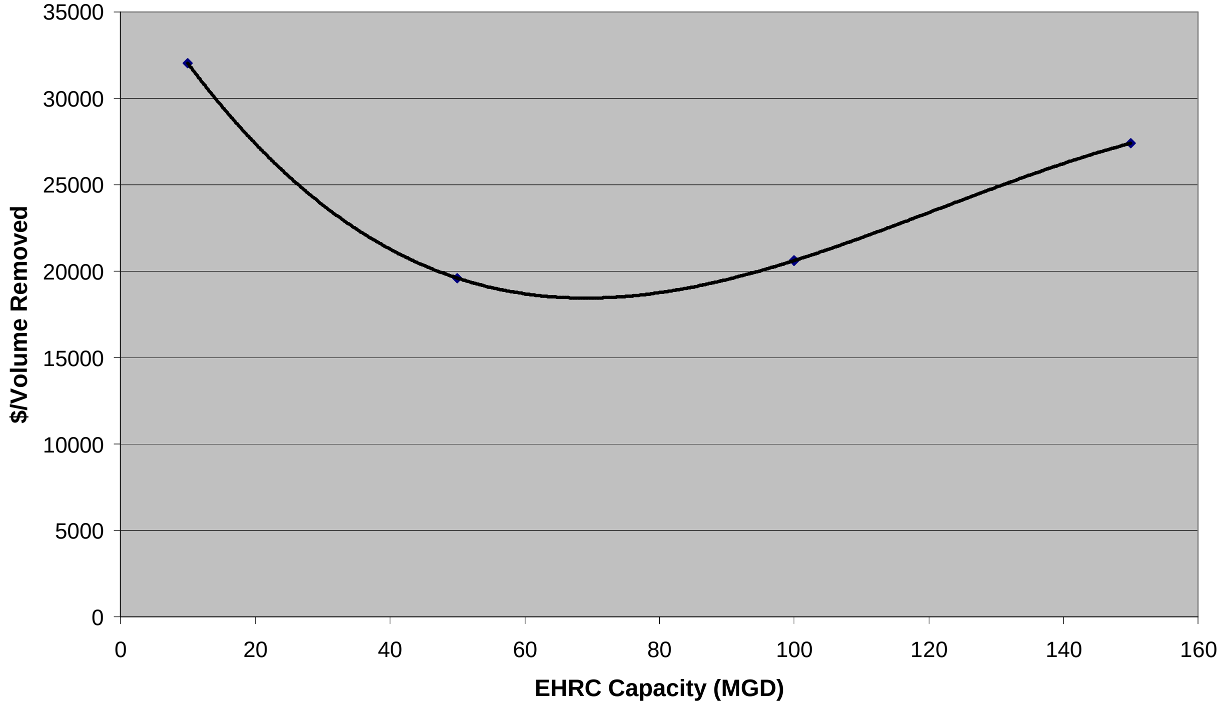


Figure 5-2
EHRC Knee of Curve Analysis
For Volume Removed/Treated



The knee-of-curve basis in Figure 5-1 indicates that an EHRC capacity of approximately 80 MGD, in conjunction with secondary treatment improvements to operate at 120 MGD, is the cost-effective capacity point with respect to secondary bypass $CBOD_5$ reduction. The knee-of-curve basis in Figure 5-2 indicates that an EHRC capacity of approximately 70 MGD, in conjunction with secondary treatment improvements to operate at 120 MGD, is the cost-effective capacity point with respect to secondary bypass volume reduction.

In review again of Table 5-3, the decrease in bypass events, bypass hours and bypass volume is dramatic between the 50 MGD EHRC alternative and the 100 MGD alternative. Considering the economy of scale for a 80 to 100 MGD EHRC facility, the cost difference between an 80 MGD and a 100 MGD EHRC facility may be relatively small. Therefore, it is recommended to construct up to 100 MGD of EHRC to treat secondary bypass.

The 100 MGD EHRC facility, in conjunction with a 120 MGD secondary treatment capacity and the 10 MG SRT, will provide a total capacity of 230 MGD. The 100 MGD EHRC facility will treat 99.6% of secondary bypass volume based on the modeled, baseline year. Also on this basis, three events per year may occur wherein some amount of secondary bypass flow is not treated. Because of this, the secondary bypass conduit must remain in service for these few and extreme wet weather events to allow bypassing of treatment facilities thereby preventing property damage in the form of overflow of mixed liquor and flood damage to the WPCS property. There is no feasible alternative to continued, but limited, use of the WPCS secondary bypass.

5.3. Summary of Recommended Alternative

Based on an evaluation of cost and non-cost issues, found in Sections 4and 5 of this Report, and based on a cost-benefit analysis, the following WPCS improvements are recommended.

1. Perform additional stress testing and prepare a process model of the WPCS to support operation of the secondary treatment system at 120 MGD.

2. Construct improvements to the Secondary Treatment Aeration Influent Flume; modify the existing final settling tanks with launder covers after removing the domes, contingent upon successful stress testing/process modeling as noted in Item 1.

3. Continue operation of the 10 MG SRT.

4. Construct up to a 100 MGD EHRC facility, in two 50 MGD capacity increments, to treat secondary bypass flow. The EHRC process facility will operate during wet weather periods in parallel with the existing single-stage nitrification process and receive disinfection in a common chlorine tank.

5. Continue operation of the Secondary Bypass Conduit on a limited and controlled basis after first maximizing flow through secondary treatment, the EHRC facility and the SRT.

The total opinion of probable project cost for these improvements is $16,387,000. The estimated additional, annual O & M cost is $404,200.

Implementation of this alternative will significantly reduce utilization of the Akron WPCS secondary bypass conduit. The annual reductions in bypass flow include 99.6% by volume. The number of bypass events are estimated to be reduced to three annually. Because the effective control capacity is less than some peak day flows that may occur, there remains a need for a bypass conduit to protect existing facilities from biomass washout, physical damage due to hydraulic surges and/or general property damage caused by overtopping tank walls and area flooding. There is no feasible alternative to continued, but significantly reduced, operation of the secondary bypass conduit.

SECTION 6
CONCLUSIONS AND RECOMMENDATIONS

6.1. Proposed Plan

Several alternatives for reducing or eliminating use of the Akron WPCS secondary bypass were developed in Section 4. These alternatives included 1) increasing secondary treatment system capacity, 2) storage basins to capture secondary bypass flow, and 3) enhanced high-rate clarification (EHRC) treatment of secondary bypass flow. The potential water quality benefits (as measured in terms of reduced volume and reduced $CBOD_5$ of secondary bypass) for each alternative were determined and a cost-benefit analysis was completed. The primary assumption for the water quality benefit and analysis was that the City's previously proposed Integrated Alternative #2 collection system improvements were in-place and providing the predicted benefits.

Based on the benefit analysis for the WPCS alternatives, it is proposed to modify the existing secondary treatment system to operate at a peak day flow of 120 MGD, an increase from the current 110 MGD limit. Additional stress testing is a necessary and prerequisite part of this plan and in conjunction with development of a process model. The existing 10 MG Storm Retention Tank (SRT) will continue to be utilized. And, up to 100 MGD of EHRC treatment will be constructed to treat secondary bypass flow following maximizing flow through primary settling, secondary treatment and the SRT. It is proposed to construct the EHRC facility in two, 50 MGD phases.

The total opinion of probable project cost for these improvements is $16,387,000, if constructed in one phase. With a two-phase approach for the EHRC system, an associated cost increase of 10% was applied to the EHRC system costs. The total opinion of probable project cost then becomes $17,770,000.

6.2. Benefits

The proposed LTCP Integrated Alternative #2 controls will provide a water quality benefit throughout the collection system (watershed) and result in maximizing flows to the Akron WPCS for treatment. The WPCS improvements proposed herein will provide further water quality benefit, reducing the $CBOD_5$ from 291,733 to 95,474 lbs $CBOD_5$. The 100 MGD capacity EHRC facility, in conjunction with 120 MGD secondary treatment and the existing 10 MG SRT, will reduce secondary bypass flows by 99.6% volume. The annual number of secondary bypass events will be less than four per the design year as defined in *Facilities Plan '98*[6].

6.3. No Feasible Alternative

Although implementation of the proposed WPCS improvements will significantly reduce utilization of the Secondary Bypass, it is necessary for this conduit to remain in service for the most extreme wet weather conditions. Secondary Bypass will occur under limited conditions, and after maximizing flow through the SRT, primary settling and secondary treatment systems, and the EHRC system. The Secondary Bypass will serve to protect the process facilities from potential damage under these extreme conditions. Subsequently, there is no feasible alternative to the Secondary Bypass, other than the controls identified herein.

SECTION 7
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APPENDIX A

Stress Test Reports
A-1. 1993 Stress Test
A-2. 1997 Stress Test
A-3. 2006 Stress Test

ATTORNEY/CLIENT PRIVILEGE
ATTORNEY WORK PRODUCT

Mayor
Donald L. Plusquellic
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City of Akron

Akron Water Pollution Control Station
2006 Stress Test

December 2006

Department of Public Service
Akron Engineering Bureau
Environmental Division

City of Akron

Akron Water Pollution Control Station
2006 Stress Test

December 2006

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Akron Water Pollution Control Station
2006 Stress Test

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ABBREVIATIONS

cfs	cubic feet per second
DO	dissolved oxygen
=	equals
FST	final settling tank
‘/ft.	foot/feet
gpm	gallons per minute
“	inch(es)
max.	maximum
mg/l	milligram per liter
MG	million gallons
MGD	million gallons per day
min.	minimum
MLSS	mixed liqour suspended solids
NTU	nephlometric turbidity unit
OEPA	Ohio Environmental Protection Agency
/	per
%	percent
PSI	pounds per square inch
RAS	return activated sludge
scfm	standard cubic feet per minute
sf	square feet
SRT	storm retention tank
SVI	solids volume index
TSS	total suspended solids
WPCS	Water Pollution Control Station

SECTION 1
EXECUTIVE SUMMARY

As part of the development of a No Feasible Alternative report for the Akron Water Pollution Control Station (WPCS) secondary bypass conduit, it was decided by the City to perform additional stress testing of the WPCS secondary treatment system to determine if recent capital improvements and operational changes have provided the ability to process higher flow rates through secondary treatment. The WPCS secondary treatment system had been limited to a 110 MGD peak flow rate during wet weather events over the past 13 years.

City and ARCADIS G&M of Ohio, Inc. representatives performed three stress test trials on November 20, 28 and December 6, 2006, each lasting 24 hours. All three test events were dry weather days; peak flows were simulated by directing an imbalance of available wastewater flow to two predetermined test process trains.

The purpose of the stress testing was to determine the rate of flow at which the secondary treatment system experiences process failure. This was determined by loss of containment of biological suspended solids, and/or violation of one or more effluent permit parameters. A trial was successful if effluent permit limits were met over a 24-hour period.

The WPCS secondary treatment system operated successfully at a simulated 120 MGD test flow. Operation at an actively managed, simulated test flow of 132 MGD met seasonal effluent parameters (winter). However, ambient air and water temperature conditions were more typical at the “fall” season. And, the dissolved oxygen (DO) sag experience for the test trains would have caused an effluent DO violation for a full-scale operation at these conditions. Nitrification was significantly diminished during this simulated wet weather test. And, it required significant operator attention and aggressive air supply management. At a simulated 144 MGD test flow nitrification was lost and the average effluent ammonia nitrogen concentration exceeded the permit limit.

It is recommended to perform additional stress testing during early June and mid-August periods and under actual wet weather conditions to further evaluate the ability to sustain nitrification and associated permit compliance under all seasonal conditions. Also, modifications to the secondary treatment system are recommended to aid operators in maintaining and managing the system during higher, more stressful operating conditions. For operation at 120 MGD, these improvements may include:

- Reconstruction of the aeration influent flume.
- Removal of the final settling tank (FST) domes and replacement with weir trough covers.

It is further recommended to develop a process model of the Akron WPCS to evaluate seasonal loading conditions and predict effluent quality to better plan and prepare protocol for the additional stress testing.

SECTION 2
INTRODUCTION

The Akron Water Pollution Control Station (AWPCS) secondary treatment capacity has been a limiting factor to providing full treatment to wastewater flows above 110 MGD. Previous stress testing in 1993 and 1997 supported the limiting of flow to this level. Historically, sludge in the final settling tanks would bulk and the effluent total suspended solids (TSS) concentration would exceed permit limits above approximately 110 MGD. This capacity limit was accepted by the Ohio EPA and the WPCS was subsequently operated to this limit with excess wastewater flow being routed through a secondary bypass conduit to disinfection.

The City is required to prepare a No Feasible Alternatives report for the secondary bypass conduit. This report will include an updated evaluation of the secondary treatment capacity and limitations. It was decided by the City to perform an updated stress test as part of this evaluation. The following report presents this test.

City and ARCADIS G&M of Ohio, Inc. representatives commenced stress testing of the activated sludge plant on November 20, 2006 and completed testing on December 6, 2006. Testing occurred on three separate events, each lasting 24 hours. All three test events were dry weather days; peak flows were simulated by directing an imbalance of available wastewater flow to two predetermined test process trains.

The purpose of the stress testing was to determine the rate of flow at which the secondary treatment system experiences process failure. This is determined by loss of containment of biological suspended solids, and/or violation of one or more effluent permit parameter. The goal of the stress testing was to maintain treatment within effluent permit limits with simulated flows of 120 MGD and higher for a 24-hour duration. The current National Pollutant Discharge Elimination System (NPDES) permit limits are:

- Total Suspended Solids (TSS) – 30-day 15 mg/l
- Total Phosphorus (P) – 30-day 1.0 mg/
- Ammonia Nitrogen (NH_3-N) – 7-day 1.5 mg/l (summer); 4.8 mg/l (fall/spring); 7.5 mg/l (winter)
- CBOD – 30-day 10 mg/l
- pH 6.5 to 9.0
- Fecal Coliform – 30-day 1000/100 ml (summer)

SECTION 3
TEST PROTOCOL

An Akron WPCS activated treatment system stress test protocol was developed following meetings with ARCADIS and City representatives on October 20, 2006, November 7, 2006 and November 14, 2006. The stress test goal was to determine the flow rate at which the activated system has complete failure by virtue of losing containment of biological solids in the final settling tanks. This was defined, for the purpose of the field trials, as an effluent suspended solids concentration exceeding, and consistently increasing beyond 50 mg/l over a two-hour period. The corresponding ammonia nitrogen limit considered was 4.5 mg/l.

The protocol allowed stress testing to proceed regardless of weather conditions. To accomplish this the protocol utilized existing actuated gates and valves, flow monitoring and available flows to simulate peak flows to selected aeration basins. Available primary effluent flow was diverted to the basins under test by reconfiguration of the gates and valves; any excess wastewater flow, above the test flow rate, was diverted to the basins not under test. The protocol follows.

1. Treatment Trains (Aeration Basins and associated Final Settling Tanks) 1 and 2 were the selected test basins. By performing the test with a pair of treatment trains, it was intended to:

- Better represent actual conditions with multiple trains in service and dampen the effect of any errors or results that may be unique to one treatment train.
- Limit the impact of the test train effluent quality on the overall WPCS effluent quality during the test period.
- Reduce the complexity of flow balancing during the test

2. In preparation for the Stress test, the City checked and adjusted any hydraulic control structures/features that served to control flow to TT 1 and 2.

- At the Aeration Influent Flume, sluice gates serving TT 1 and 2 were full open.
- Weir gates at the head end of Pass 1 of each tank were set at the same elevation to maintain a reasonable flow balance between these two trains.
- Sluice gates at the final settling tank junction chamber were set in comparable positions for FSTs A, B and C. They were set in a full open position, as is standard operating procedure.
- Any isolation and control valves on the RAS were in comparable positions and the RAS rate was set in the DCS to be equivalent.
- <u>At the beginning of each test, the City adjusted gates and controls, as necessary, to bring the flow to TT 1 and 2 up to the test flow rate within 30 to 60 minutes.</u>

3. In further preparation for the test, the following testing was performed:

- The City measured and recorded current biological/operational characteristics of all six (6) treatment trains. This included: MLSS, SVI, F/M ratio, and RAS rate setpoint.
- ARCADIS took samples over a two-hour period and tested for TSS; the turbidity of the samples was concurrently measured to establish a general relationship between these two parameters for use during the stress testing.
- ARCADIS performed jar testing of the WPCS currently utilized polymer to determine optimum dosages for settling of solids.

4. The Stress Test proceeded as follows:

- The City assessed the current, total influent flow rates and forecasted weather to determine if any treatment trains should be isolated and kept fully off-line or just have flow limited to them. City operators partially or fully isolated each of Treatment Trains (TT) 3 through 6.
- The City monitored the TT 1 and 2 effluent flow rates while the TT 3 – 6 sluice gates were throttled toward a closed position, and continued closing any or all of TT 3 – 6 sluice gates until a total flow of 40 MGD (for the first test) was measured at the TT 1 and 2 effluent meters.
- The City maintained the combined total 40 MGD rate through TT 1 and 2 by monitoring the flow rates and modulating TT 3 – 6 sluice gates as necessary.

5. Testing and monitoring during the stress test was conducted to determine when the TTs (basins) under test began to “fail”. The two basic parameters utilized as indicators of treatment failure were the concentrations of suspended solids and ammonia in the final settling tank effluent. The presence of other contaminants such as $CBOD_5$ and phosphorous require testing that does not produce real time results. They were tested at a later time for comparison and analysis. The following occurred during the stress test:

- ARCADIS:
  i. Purchased, provided and operated a portable turbidity meter for real time determination of the presence of suspended solids in the final effluent. Turbidity was measured every 30 minutes to generally assess the process condition and compare to TSS values once received from the City lab.
  ii. Monitored the sludge blanket of each FST using a sludge judge provided by the city every 60 minutes.
  iii. Took grab samples at the secondary effluent sampling station locations at 30 minute intervals for each of TT 1 and TT 2 effluents during the first two hours after reaching the test flow rate and delivered to the WPCS laboratory.
  iv. Beyond the first two hours of testing, the sampling and laboratory testing for TSS was reduced to one per hour. The turbidity was monitored every 30 minutes on each TT effluent to generally assess if the effluent TSS was increasing significantly between the one-hour samples.
  v. Monitored aeration basin water surface elevations during the tests and recorded the freeboard.

- The City:
  i. Performed laboratory testing for all parameters including $CBOD_5$, TSS, NH_3-N and phosphorus.
  ii. Monitored numerous secondary control parameters and equipment settings to aid in controlling the process.
     - Aeration Basin 1 and Basin 2 effluent flow rate.
     - All available Aeration Basin 1 and 2 DO data and the final effluent DO.
     - Wastewater temperature
  iii. Developed trend graphs for key parameters including dissolved oxygen (DO).

6. Test Schedule:

- Day 1 (November 20, 2006) – Steady state test of 20 MGD/each TT 1 and 2 = 40 MGD (simulated a peak total flow of 120 MGD). If process failure was reached in a period less than 24 hours, the following test variations would have been implemented individually.

i. Increase RAS rate from 15% to 30%. If no decrease in effluent TSS concentration is observed within two hours, proceed with step (ii). If TSS concentrations begin to decrease or hold constant, continue test for 24 hour period.
ii. Increase RAS rate to maximum (estimated at ~40% and observe for two additional hours. If no decrease in effluent TSS concentration is observed, return RAS rate to 15% and begin step (iii). If TSS concentrations begin to decrease or hold constant, continue test for 24 hour period.
iii. Return RAS rate to 15% and hold. Initiate chemical feed of polymer at dosage previously determined through jar testing. If no decrease in effluent TSS concentration is observed within two hours, discontinue stress test. If TSS concentrations begin to decrease or hold constant, continue test for 24-hour period.

- Day 2 (November 27, 2006) – Steady State test of 24 MGD/TT (simulated a peak total flow of 144 MGD). Actively managed the air distribution to all TT.

- Day 3 (December 5, 2006) – Steady State test of 20 MGD/TT with aggressive management of air distribution over an 8-hour period and then ramping to 22 MGD/TT for the next 16 hours continuing to aggressively manage air distribution. This modified protocol was developed following results in Tests 1 and 2 that suggested that nitrification was the most limiting factor to the activated treatment system operation.

SECTION 4
STRESS TEST TRIALS

4.1. Simulated 120 MGD Test

The protocol for this test required a simulated 120 MGD be passed through Treatment Trains (TTs) 1 and 2. The test began at 9:00 am on November 20, 2006 and ran until 9:00 am on November 21, 2006. Actual test flow averaged a simulated 125 MGD over the 24-hour test. The simulated flows ranged from 101 to 145 MGD.

The goal was to bring TTs 1 and 2 up to an equivalent simulated rate of 120 MGD and observe at what point the treatment process would fail. Previous stress testing indicated that the process would fail on three monitored parameters – total suspended solids (TSS), ammonia nitrogen (NH_3-N) and total phosphorus (TP).

4.1.1. Test Conditions

The precedent operating conditions of TTs 1 and 2 were as follows:

MLSS Concentration, mg/l	1,900
Food to mass ratio, f/m	0.073
Final Pass DO level, mg/l	7.5
Solids Retention Time, SRT, days	15.0
SVI	80
RAS rate, %	16
Water temperature, degrees C	13.1
Raw Influent NH_3-N, mg/l	8.86 (11/2006 average)
Primary Effluent $CBOD_{5,}$ mg/l	39.8
Primary Effluent TSS, mg/l	26
Primary Effluent TP, mg/l	1.26

AWPCS operators advised that a maximum safe blanket depth was six feet when measured between the influent distribution ring (center) and grease ring. Measurements during the test were taken from a location approximately three feet out from the center distribution ring. The readings showed a blanket depth of approximately one foot greater than measurements made halfway between the center ring and weir trough scum baffle ring.

One of the parameters monitored was TSS. Because TSS is a measure of particulate matter present, a correlation between the TSS concentration (determined by weight) and the turbidity (measured as NTUs) was developed. This allowed the TSS concentration to be estimated through real-time monitoring of the effluent turbidity in the individual FSTs and the TT effluent. Based on testing performed before the test trials, it was determined that a turbidity of 18 NTU correlated to the calculated TSS failure concentration of 50 mg/l. In order to isolate the source of any elevated TSS concentration, turbidity samples from each FST in each treatment train under test were analyzed hourly.

4.1.2. Observations and Data

During this test, the settleability of the mixed liquor suspended solids (MLSS) remained high allowing TSS concentrations in the treatment plant effluent to remain below permit levels. A summary of data collected during the test is presented in Table 4-1 at the end of this section. Additional data provided by the City is included in Appendix A.

Upon test initiation, it was noted that sludge blanket levels in the FSTs increased moderately and remained slightly higher throughout the test, but appeared to reach a nominal level and remained there with certain exceptions. The exceptions noted are that levels were randomly higher and lower in all of the FSTs. This is believed to be caused by small inconsistencies in distribution of mixed liquor to the FSTs, which affected both the solids loading on the FSTs and the ability to remove the settled material from the FSTs.

It was also apparent that modulating primary effluent flow using the sluice gates at the aeration influent flume was difficult and labor intensive. Operators had to constantly monitor and adjust the gates to achieve a desired flow split; even the smallest gate adjustments would overshoot the target flow. If higher flows are processed in the future, it will be important to be able to achieve a balanced flow distribution to all six basins without this level of operator attention.

Also, monitoring of individual FST conditions was made difficult by the domes on each tank. The dome restricts operator egress to a single doorway; observations of process conditions can only be made from the center, half-bridge walkway. Lighting is poor and environmental conditions are extremely humid and stale. Floating grease and scum trapped between the weir trough and the exterior wall can not be easily removed. If higher flows are processed in the future, removal of the domes would allow operators to more effectively and efficiently monitor FST conditions and clean floating solids and scum. Any concern for algae can be addressed with launder covers. Modifications to the weir troughs may also be needed in conjunction with any cleaning system.

At no time during this trial were turbidities greater than 10 NTU observed on the combined FST (TT) effluents. Based on prior trending of turbidity versus TSS, a 10 NTU turbidity was know to be within permit limits for TSS; i.e. none of the FSTs under test showed excessive levels of TSS during the test. This was later confirmed by laboratory TSS testing.

Effluent quality remained consistent between the two test trains. $CBOD_5$ concentrations remained within permit limits throughout the test, with an average day value (averaged between the two treatment trains) of 2.7 mg/l. The average day value for TSS was 6.6 mg/l and total phosphorus (TP) averaged 0.73 mg/l. Figure 4-1 provides a further summary of this data.

During this test it was noted that nitrification began to diminish within a few hours of increasing to the test flow rate. AWPCS operators noticed that dissolved oxygen (DO) levels in the test aeration basins had fallen dramatically. This result can be seen in Figure 4-2. They also noted that the controls for the aeration tanks had been switched to manual, which prevented the automatic controls from responding to the sag in DO. This condition was corrected by returning the flow of air to the automatic controls. However, the extent and duration of the DO sag prevented a full recovery of the system during this test. NH_3-N concentrations increased significantly eight hours into the test and did not recover. However, the applicable “Fall Season” limit of 4.8 mg/l was not exceeded. The DO sag in the test basins caused the effluent DO to drop from 8.2 to 6.6 mg/l. This decrease was not serious enough to cause a violation of the WPCS final effluent permit limit during the test. The current permit requires compliance with a 5.0 mg/l DO concentration on a continuous basis.

4.2. Simulated 144 MGD Test

The protocol for this test required a simulated 144 MGD be passed through Treatment Trains (TTs) 1 and 2. The test began at 9:00 am on November 28, 2006 and ran until 9:00 am on November 29, 2006. Actual test flow averaged 145 MGD during the 24-hour test but ranged from a simulated 103 to 157 MGD due to the limited ability to control flow distribution to the secondary treatment system.

4.2.1. Test Conditions

The precedent operating conditions of TTs 1 and 2 were as follows:

MLSS Concentration, mg/l	2030
Food to mass ratio, f/m	0.075
Final Pass DO level, mg/l	6.7
Solids Retention Time, SRT, days	16.0
SVI	78
RAS rate, %	16
Water temperature, degrees C	13.6
Raw Influent NH_3-N, mg/l	8.86 (11/2006 average)
Primary Effluent $CBOD_5$, mg/l	56
Primary Effluent TSS, mg/l	48
Primary Effluent TP, mg/l	1.64

Early assumptions were that treatment would fail via TSS within 3 to 5 hours. Again, turbidity was used to track TSS in the FST effluent. However, due to relatively low plant influent flow, there was difficulty in getting sufficient flow to the test trains, which extended the ramp-up time. Also, because the flow through the test trains was such a large percentage of the total plant flow smooth regulation of the flow proved to be difficult.

4.2.2. Observations and Data

The test appeared to proceed normally during the first five hours with the only apparent concern being the available freeboard in the aeration basins. At simulated flows above 144 MGD, freeboard was nearly zero; above simulated ~157 MGD, the intermediate basin walls were awash. Turbidity readings indicated stable settling performance after the initial ramp-up, although there was a significant increase in TSS as later measured in the laboratory. The TSS increased from 2.4 mg/l to 8.2 to 12.7 mg/l upon initially reaching the test flow. A summary of data collected during the test is presented in Table 4-2 at the end of this section. Additional data provided by the City is included in Appendix A.

Aeration basin pass walls awash at flows at and above simulated 150 MGD

Problems were encountered with the flow meter readings for Train 1. They would wander. It was discovered that the hose for the sample pump was installed in the channel directly ahead of the flow meter sensor. A V-shaped depression was formed on the downstream side of the hose that caused the meter to register a lower flow. Also, every time the hose was bumped, the location of the depression changed altering the flow reading.

This was critical in that the RAS return rate is paced at 16% of this reading. With the flow meter registering low by approximately 30%, RAS rates would also be reduced, causing the MLSS to fall. This was corrected.

Another metering incident occurred at approximately 9 pm when the TT effluent water surface, at a simulated flow of 157 MGD, encroached into the dead-band zone of the effluent meters. This caused the meter to read “zero flow”. Consequently a number of automatic controls sought to divert more flow to the two test trains resulting in a simulated flow of over 160 MGD to surge into the basins. The resultant effluent concentrations during this incident exceeded TSS permit limits. Although this situation was corrected within an hour the TSS concentrations remained elevated, just below the 15 mg/l limit, for the rest of the test.

Effluent quality remained consistent between the two test trains. $CBOD_5$ concentrations remained within permit limits throughout the test, with an overall average day value of 4 mg/l. The average day value for TSS was 11.4 mg/l and total phosphorus (TP) averaged 0.55 mg/l. Figure 4-3 provides a further summary of this data.

Based on observations and results of Test 1, it was predetermined to actively manage air distribution during this test to try to prevent a significant drop off in DO and, consequently, seek to maintain optimum nitrification levels. Figure 4-4 presents the trend data for TT 1 and 2 and final effluent DO. As shown, despite the air distribution management, the DO still dropped off only an hour into the test. Nitrification began to drop off within two hours of the DO sag, as seen by the NH_3-N data in Table 4-2. Ammonia nitrogen concentrations significantly exceeded the October through November permit limit of 4.8 mg/l (monthly) for most of the test trial. The average NH_3-N for the 24-hour trail exceeded the 4.8 mg/l limit. The WPCS final effluent DO concentration did not fall below the 5.0 mg/l permit limit.

Because the WPCS secondary treatment system appeared to be most limited by the nitrification process, it was decided to continue monitoring NH_3-N for several hours after the secession of the test. As shown in Table 4-2, nitrification recovery occurred in less than nine hours after returning wastewater flows from about a simulated 144 MGD to a normal, dry weather rate of ~72 MGD. This suggests that the DO level is more significant to sustaining nitrifying bacteria than temperature for the given test conditions, and possibly so for other factors. Sufficient information was not gathered to evaluate whether the lower primary effluent NH_3-N levels during this test or, more importantly, during a real wet weather event, could also impact growth of the bacteria. Also, low alkalinity during a wet weather event may cause additional growth inhibition. Additional data collection and evaluation of this relationship should be part of future stress testing.

During the November 27th testing, sludge blanket levels were monitored in the same manner as they were during the November 20th test. It was predicted that, once simulated flows exceeded ~130 MGD, it might not be possible to control or regulate blanket levels. Sludge blanket levels were elevated during the test but were relatively steady. Periodic rises in the blanket depths appear to track with concurrent increases in the hydraulic rate, especially when exceeding a simulated flow of approximately 150 MGD. This is believed to be a consequence of the limited capacity of the RAS system, which cannot convey more than about 4 MGD per TT. This equated to a maximum 16% RAS rate at 135 MGD. Subsequently, at flows above approximately 135 MGD, solids will accumulate in the FSTs at a rate faster than can be withdrawn. This hydraulic limitation should be addressed if higher flow rates are to be processed.

The RAS limitation may also impact nitrification by causing an insufficient nitrifier population in the aeration basins respective of the flow through the basins. This would be especially true at the colder temperatures with lower metabolic rates. However, if the RAS is increased, a couple of things will happen: (1) shorter detention time in the aeration tanks (less time for nitrification) and (2) increased oxygen demand that would further strain the ability to keep the DO up. The higher RAS would also mean: (1) greater flows between the aeration basins and FSTs and increased head loss issues and (2) higher entrance velocities into the FSTs that could upset the already sensitive sludge blanket.

TP removal does not appear to be a major concern at the test flows evaluated and with the current permit limit of 1 mg/l. However, when sludge process facility recycle is returned to the WPCS, the secondary treatment system influent TP concentration increases significantly. Recycle was active in the last hour of this test and resulted in a secondary effluent concentration over 2 mg/l. This problem will be made worse if the proposed permit limit of 0.65 mg/l is made effective. At a minimum, sludge process recycle flows should be equalized. A separate process may be considered to treat the recycle flows.

4.3. Simulated 120/132 MGD Test

The protocol for this test required a simulated 120 MGD for the first 12 hours with aggressive management of air distribution. This was to be followed by a ramp up to a simulated 132 MGD flow for the next 12 hours through TTs 1 and 2. However, the NH_3-N test results over the first several hours at a simulated 120 MGD indicated a very strong performance. Subsequently, the test flow was increased to a simulated 132 MGD in the ninth hour. The overall test began at 9:00 am on December 5, 2006 and ran until 9:00 am on December 6, 2006.

During this test, polymer was fed to the mixed liquor piping between the aeration basins and the FSTs at a rate of 0.3 mg/l based on jar testing to enhance settleability. Sodium aluminate was fed to the primary influent flume at a rate of 2.7 mg/l to provide chemical precipitation of phosphorus.

4.3.1. Test Conditions

The precedent operating conditions of TTs 1 and 2 were as follows:

MLSS Concentration, mg/l	2025
Food to mass ratio, f/m	0.08
Final Pass DO level, mg/l	8.6
Solids Retention Time, SRT, days	14.6
SVI	77
RAS rate, %	16
Water temperature, degrees C	12.1
Raw Influent NH_3-N, mg/l	10.5 (12/14/06)
Primary Effluent $CBOD_{5,}$ mg/l	49.0
Primary Effluent TSS, mg/l	91.0
Primary Effluent TP, mg/l	3.42

Operators closely monitored air distribution and resultant DO levels in the test aeration basins. As needed, the computer control system was manual overridden to attempt to sustain DO levels.

4.3.2. Observations and Data

A summary of data collected during the test is presented in Table 4-3 at the end of this section. Additional data provided by the City is included in Appendix A.

Effluent quality remained consistent between the two test trains. $CBOD_5$ concentrations remained within permit limits throughout the test, with an overall average day value of 2.42 mg/l. The average day value for TSS was 5.5 mg/l and total phosphorus (TP) averaged 0.54 mg/l. Maximum values all parameters were within effluent permit limits. TSS and TP were Figure 4-5 provides a further summary of this data.

Although polymer and sodium aluminate were fed to enhance treatment there appears to be no distinct difference in the TSS results for this test as compared with the first test at a simulated 120 MGD on November 20, 2006. The TP did hold steady at a concentration of approximately 0.5 mg/l throughout the test. An increase to ~0.9 mg/l in the last hour of the test is believed to be due to recycle flows from the compost plant which contain high concentrations of phosphorus. The apparent ineffectiveness of polymer may be due to 1) insufficient concentration of chemical to effect measurable result, and/or 2) ineffective mixing/distribution of the polymer in the flow stream. As further support for this theory it may be noted that the increase in TSS concentrations was distinct during this test with the polymer while the November 20 test experienced only a modest increase in TSS. The November 28 test at simulated 144 MGD experienced TSS results more similar to this simulated 120/132 MGD test.

Nonetheless, it may be of value to further evaluate polymer application and various dosages during additional stress testing. It is also recommended to perform bioassays concurrent with extended periods of polymer usage to evaluate associated potential toxicity. Finally, while further optimizing solids settling can provide benefit, it should be noted that managing the sludge blanket was not a critical issue in these tests.

Air distribution was aggressively managed during this test. Despite this management, the aeration basin final pass DO still dropped from approximately 8.5 mg/l to as low as 2.6 mg/l during the test. Figure 4-6 presents this data. The DO sag impacted the NH_3-N concentrations, which increased from approximately 0.03 mg/l at the beginning of the test to as high as 4 mg/l. The aeration rate to the two TTs was increased from approximately 2,800 SCFM per tank to 6,400 SCFM during the test to mitigate the DO sag. For a full scale event, a total air supply exceeding 38,000 SCFM would be required. This volume requires three of four existing centrifugal blowers be operated, which is more than is normally required with the current water temperatures. During warm water periods (summer conditions), the available air supply will be further strained. This should be further evaluated through stress testing during periods with warmer water and air temperatures. When these conditions are present, the NPDES permit also requires much lower NH_3-N concentrations (1.5 mg/l versus 7.5 mg/l).

This test further supports the belief that the Akron WPCS secondary treatment system is nitrification limited and, subsequently, is heavily dependant upon the DO levels able to be sustained in the aeration basin. During extended flow periods of 120 MGD and up to about 130 MGD the aeration systems must be operated at maximum output to prevent complete loss of nitrification. Potential modifications to the diffuser grid design may be considered in conjunction with additional stress testing performed during warm water and air temperature conditions (mid August testing). Stress testing during early June, with moderate water temperatures and summer permit conditions, should also be performed to determine if the strictest permit level can be met. The RAS rate should also be further evaluated to determine if increased RAS rates help sustain nitrification. If a DO sag cannot be prevented in a full-scale test, the WPCS effluent DO limit will likely be violated.

TABLE 4-1
AKRON WPCS STRESS TEST
SIMULATED 120 MGD TEST DATA

Date	Time	Time	Simulated	Treatment Train 1											Treatment Train 2											#1 DO	#2 DO	Effluent
	(min.)		Flow (MGD)	Turbidity (NTU)	TSS (mg/l)	NH3-N (mg/l)	CBOD5 (mg/l)	Total P (mg/l)	Turbidity (NTU)	FST A Blkt. (ft)	Turbidity (NTU)	FST B Blkt. (ft)	Turbidity (NTU)	FST C Blkt. (ft)	Turbidity (NTU)	TSS (mg/l)	NH3-N (mg/l)	CBOD5 (mg/l)	Total P (mg/l)	Turbidity (NTU)	FST A Blkt. (ft)	Turbidity (NTU)	FST B Blkt. (ft)	Turbidity (NTU)	FST C Blkt. (ft)	(mg/l)	(mg/l)	DO (PPM)
11.20.06	0	9:00 AM	72				3.36											3.29								7.74	7.29	8.20
11.20.06	30	9:30 AM		4.8		0.027		0.68	3.1	3.0	1.6	2.0	1.7	1.0	2.7		0.021		0.64	1.3	2.0	1.3	4.0	1.9	2.5	7.63	7.29	8.20
11.20.06	90	10:30 AM		1.7					1.6	3.0	1.7	2.0	1.3	2.5	2.6					1.3	3.3	1.7	4.5	1.5	2.3	6.98	6.95	8.00
11.20.06	180	12:00 PM	125	1.9		0.000	2	0.64	1.5	4.3	1.7	3.8	1.5	3.5	2.1	8.0	0.000	2	0.61	1.4	4.3	1.7	3.5	1.6	2.0	6.34	6.20	8.20
11.20.06	240	1:00 PM	130	2.6	4.9	0.000	2	0.61	3.0	5.0	2.1	3.0	1.7	2.0	2.5	6.7	0.000	2	0.58	3.0	3.0	2.9	4.0	2.5	1.0	5.55	4.92	8.20
11.20.06	300	2:00 PM	123	2.4	4.2	0.035		0.59	2.3	4.0	1.4	3.0	1.7	2.0	2.3	5.4	0.024		0.56	3.3	3.5	1.7	2.0	1.2	1.0	3.81	3.32	8.00
11.20.06	360	3:00 PM	121	2.4	3.9	0.103		0.63	1.8	3.0	1.7	3.3	2.3	2.0	1.8	3.4	0.000			1.9	3.0	1.7	4.0	3.5	1.5	1.01	3.02	8.00
11.20.06	420	4:00 PM	128	2.2	5.8	0.450		0.71	2.5	3.8	2.2	3.3	2.0	2.8	3.4	5.4	0.317		0.58	1.6	4.3	3.9	3.5	1.4	2.5	1.95	2.72	7.80
11.20.06	480	5:00 PM	126	2.3	6.4	1.120		0.74		3.5		3.5		2.0	2.2	7.1	0.982		0.74		3.0		4.0		3.0	2.91	2.63	7.40
11.20.06	540	6:00 PM	130	2.6	6.0	1.590		0.79	2.7	4.0	1.9	3.5	2.5	2.0	2.8	7.4	1.730		0.75	1.6	3.5	1.8	3.5	3.7	<1	3.16	2.78	7.19
11.20.06	600	7:00 PM	128	2.6	6.2	2.550		0.81		3.5		3.0		2.0	2.3	8.0	2.860		0.77		3.5		3.0		1.0	3.16	2.73	6.99
11.20.06	660	8:00 PM	129	2.3	6.4	3.000		0.80	3.0	3.0	2.0	3.0	3.0	3.0	2.7	7.6	3.410		0.80	2.9	3.5	2.2	3.5	1.7	3.0	2.96	2.42	6.99
11.20.06	720	9:00 PM	132	2.6		2.980		0.88		4.0		2.5		3.5	2.3	5.6	3.460		0.76		3.0		3.5		3.0	2.55	2.13	6.99
11.20.06	780	10:00 PM	145	3.0	9.0	2.810		0.82		4.5		3.5		3.0	2.7	7.5	3.480		0.83		4.5		4.5		5.0	2.31	1.94	6.79
11.20.06	840	11:00 PM	143	2.7	9.3	3.010		0.80	3.4	3.5	2.2	3.3	2.0	3.5	2.8	8.5	3.630		0.79	2.1	4.0	2.0	3.5	2.3	3.0	2.12	1.74	6.79
11.21.06	900	12:00 AM	137	2.1	8.2	3.150		0.85		4.5		3.0		3.5	2.6	8.0	3.830		0.75		3.8		4.0		3.8	2.05	1.94	6.79
11.21.06	960	1:00 AM	136	2.6	7.4	3.130		0.78		3.5		3.5		4.5	2.1	8.7	3.910		0.77		3.0		3.8		4.8	2.08	1.93	6.62
11.21.06	1020	2:00 AM	119	3.1	8.0	3.080	3			4.5		3.5		3.5	2.6	8.0	3.780	3			3.0		3.5		4.5	1.61	1.73	6.62
11.21.06	1080	3:00 AM	113	2.8	7.2	3.010				3.0		3.0		2.5	2.4	9.7	3.960				4.0		4.0		2.5	1.16	1.45	6.99
11.21.06	1140	4:00 AM	101	2.5	5.0	2.980				4.5		2.5		3.5	2.9	5.3	4.090				3.0		3.0		4.0	0.96	1.25	6.99
11.21.06	1200	5:00 AM	107	2.3	5.1	2.930				4.0		3.5		4.0	2.8	3.8	4.120				4.0		4.8		3.0	0.74	1.15	7.19
11.21.06	1260	6:00 AM	125	2.3	5.3	2.870				3.5		3.0		2.0	2.5	7.0	3.810				3.5		3.5		3.5	1.17	1.35	7.19
11.21.06	1320	7:00 AM	130	2.7	5.0	2.520				3.8		4.0		4.0	2.6	6.1	3.360				3.8		3.0		2.0	1.11	1.35	6.79
11.21.06	1380	8:00 AM	128	3.0	6.1	2.930				4.5		3.0		2.5	2.5	7.1	3.540				4.5		4.0		4.0	0.87	1.26	6.78
11.21.06	1440	9:00 AM	134	2.5	6.1	2.880				3.8		3.5		3.5	2.1	7.2	3.630			4.0	3.3	2.6	4.0	1.8	4.5	1.41	1.60	6.78
MAX			**145**	**4.8**	**9.3**	**3.150**	**3.4**	**0.88**	**3.4**	**5.0**	**2.2**	**4.0**	**3.0**	**4.5**	**3.4**	**9.7**	**4.120**	**3.3**	**0.83**	**4.0**	**4.5**	**3.9**	**4.8**	**3.7**	**5.0**	**7.7**	**7.3**	**8.2**
MIN			**72**	**1.7**	**3.9**	**0.000**	**2.0**	**0.59**	**1.5**	**3.0**	**1.4**	**2.0**	**1.3**	**1.0**	**1.8**	**3.4**	**0.000**	**2.0**	**0.56**	**1.3**	**2.0**	**1.3**	**2.0**	**1.2**	**1.0**	**0.7**	**1.2**	**6.6**
AVG			**125**	**2.6**	**6.3**	**2.050**	**2.6**	**0.74**	**2.5**	**3.8**	**1.8**	**3.1**	**2.0**	**2.8**	**2.5**	**6.9**	**2.519**	**2.6**	**0.71**	**2.2**	**3.5**	**2.1**	**3.7**	**2.1**	**2.9**	**2.9**	**2.9**	**7.3**

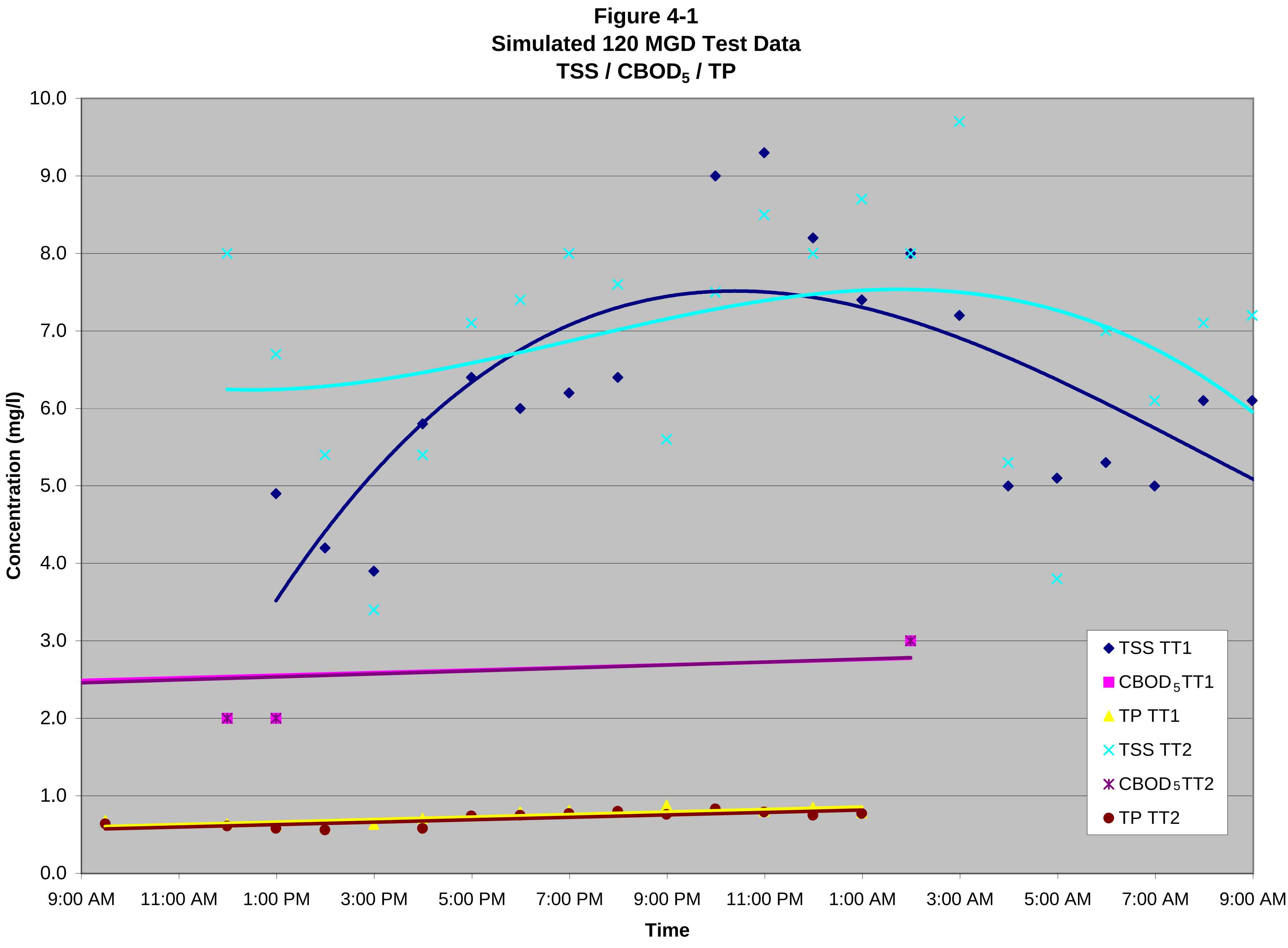


Figure 4-1
Simulated 120 MGD Test Data
TSS / CBOD5 / TP
Concentration (mg/l)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
9:00 AM
11:00 AM
1:00 PM
3:00 PM
5:00 PM
7:00 PM
9:00 PM
11:00 PM
1:00 AM
3:00 AM
5:00 AM
7:00 AM
9:00 AM
Time
TSS TT1
CBOD5 TT1
TP TT1
TSS TT2
CBOD5 TT2
TP TT2

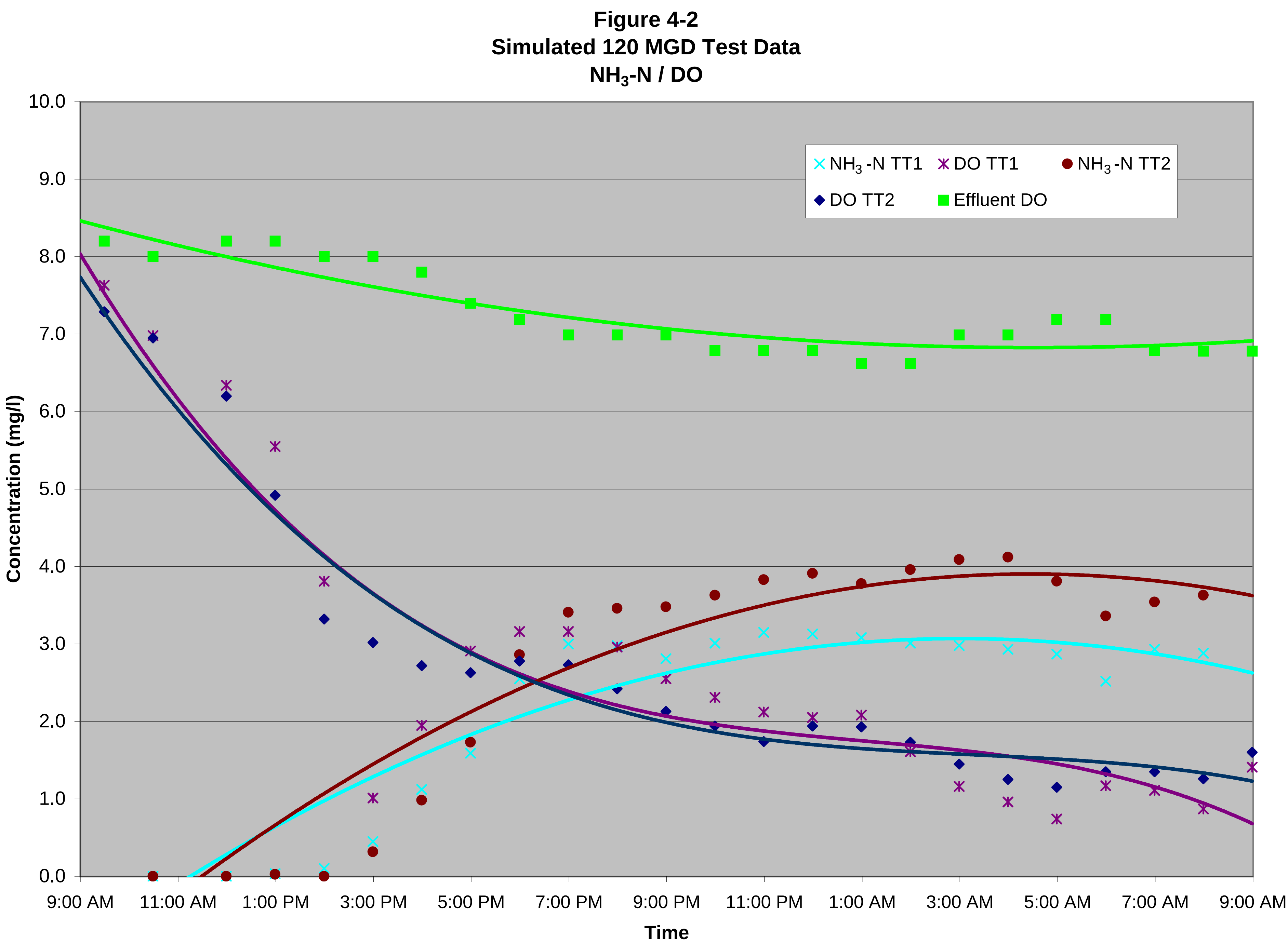


Figure 4-2
Simulated 120 MGD Test Data
NH_3-N / DO
Concentration (mg/l)
Time
NH_3-N TT1
DO TT1
NH_3-N TT2
DO TT2
Effluent DO
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
9:00 AM
11:00 AM
1:00 PM
3:00 PM
5:00 PM
7:00 PM
9:00 PM
11:00 PM
1:00 AM
3:00 AM
5:00 AM
7:00 AM
9:00 AM

TABLE 4-2
AKRON WPCS STRESS TEST
Simulated 144 MGD TEST DATA

Date	Time (min.)	Time	Simulated Flow (MGD)	Treatment Train 1 Turbidity (NTU)	TT1 TSS (mg/l)	TT1 NH3-N (mg/l)	TT1 CBOD5 (mg/l)	TT1 Total P (mg/l)	TT1 Turbidity (NTU)	TT1 FST A Blkt. (ft)	TT1 Turbidity (NTU)	TT1 FST B Blkt. (ft)	TT1 Turbidity (NTU)	TT1 FST C Blkt. (ft)
11.28.06	-60	8:00 AM	45	1.6	2.4	0.082	2	0.4	0.9	4.0	1.1	4.0	0.8	3.5
11.28.06	0	9:00 AM	103	2.2	5.9	0.069	2	0.59	2.8	2.5	0.8	2.5	1.8	3.0
11.28.06	60	10:00 AM	143	3.6	8.2	0.063	2	0.81	2.5	2.5	3.2	2.5	3.9	2.0
11.28.06	120	11:00 AM	146	2.3	5.8	0.064	3	0.50	2.3	4.5	2.8	4.0	1.2	4.0
11.28.06	180	12:00 PM	142	3.3	9.0	0.117	2	0.50	3.9	4.8	3.8	4.5	1.7	5.5
11.28.06	240	1:00 PM	151	4.1	8.8	0.385		0.47	3.1	4.5	2.9	4.5	1.6	5.0
11.28.06	300	2:00 PM	149	4.2	9.5	1.150		0.50	2.8	4.0	2.9	3.0	2.1	3.0
11.28.06	360	3:00 PM	149	3.1	8.2	1.580		0.48	6.5	4.0	3.3	3.0	2.3	5.0
11.28.06	420	4:00 PM	151	6.6	8.8	2.740	4	0.51		5.0		3.0		3.0
11.28.06	480	5:00 PM	151	4.2	11.0	3.690		0.52		4.0		3.0		2.5
11.28.06	540	6:00 PM	147	3.5	9.0	5.000		0.51		3.5		3.5		3.0
11.28.06	600	7:00 PM	155	4.5	10.0	5.960		0.55		3.5		3.0		3.0
11.28.06	660	8:00 PM	156	5.5	10.2	6.530			7.3	4.0	9.8	3.0	2.6	3.5
11.28.06	720	9:00 PM	157	4.7	15.0	7.260				4.0		3.5		3.5
11.28.06	780	10:00 PM	**	10.3	20.5	8.380				5.5		5.0		4.5
11.28.06	840	11:00 PM	146	5.1	13.5	8.250	6	0.64		5.0		4.0		5.0
11.29.06	900	12:00 AM	152	3.3	13.5	7.230				4.5		4.0		3.5
11.29.06	960	1:00 AM	146	2.7	13.5	6.530			4.9	5.0	6.9	4.5	4.3	3.5
11.29.06	1020	2:00 AM	141	4.4	10.5	6.740				3.5		3.0		3.5
11.29.06	1080	3:00 AM	147	5.1	11.8	7.030	5	0.71		3.5		4.0		4.0
11.29.06	1140	4:00 AM	144	4.2	9.0	7.630				4.0		3.0		3.5
11.29.06	1200	5:00 AM	141	4.2	12.0	8.380			4.3	4.5	2.7	4.5	4.0	3.5
11.29.06	1260	6:00 AM	143	5.3	14.2	9.680			5.3	7.0	5.0	3.4		3.4
11.29.06	1320	7:00 AM	141	5.7	15.0	10.000	7	*2.07		5.5		5.0		5.5
MAX			**157**	**10.3**	**20.5**	**10.000**	**7**	**0.81**	**7.3**	**7.0**	**9.8**	**5.0**	**4.3**	**5.5**
MIN			**103**	**2.2**	**5.8**	**0.063**	**2**	**0.47**	**2.3**	**2.5**	**0.8**	**2.5**	**1.2**	**2.0**
AVG			**145**	**4.4**	**11.0**	**4.976**	**4**	**0.56**	**4.2**	**4.3**	**4.0**	**3.6**	**2.6**	**3.7**
11.29.06		12:00 PM				6.720								
11.29.06		4:00 PM				0.170								
11.29.06		8:00 PM				0.123								
11.30.06		12:00 AM				0.095								
11.30.06		4:00 AM				0.089								
11.30.06		8:00 AM				0.097								
11.30.06		12:00 PM				0.089								

Date	Time (min.)	Time	Treatment Train 2 Turbidity (NTU)	TT2 TSS (mg/l)	TT2 NH3-N (mg/l)	TT2 CBOD5 (mg/l)	TT2 Total P (mg/l)	TT2 Turbidity (NTU)	TT2 FST A Blkt. (ft)	TT2 Turbidity (NTU)	TT2 FST B Blkt. (ft)	TT2 Turbidity (NTU)	TT2 FST C Blkt. (ft)	#1 DO (mg/l)	#2 DO (mg/l)	Effluent DO (PPM)
11.28.06	-60	8:00 AM	1.6	2.4	0.067		0.4	0.8	4.0	0.7	2.5	1.1	1.5			
11.28.06	0	9:00 AM	1.8	13.80	0.066	2	0.49	1.20	4.00	1.70	2.50	0.90	2.75	6.59	6.74	8.39
11.28.06	60	10:00 AM	4.2	12.7	0.056		0.54	3.2	3.0	4.2	3.0	1.6	2.5	1.84	5.99	8.39
11.28.06	120	11:00 AM	2.1	6.7	0.049	2	0.46	3.4	4.0	3.9	4.0	2.0	2.0	3.01	2.21	7.99
11.28.06	180	12:00 PM	3.2	8.0	0.093	3	0.52	3.1	4.0	2.9	4.5	1.6	3.5	4.05	3.3	7.79
11.28.06	240	1:00 PM	1.8	10.8	0.366		0.44	2.2	5.0	1.3	4.0	1.6	3.5	3.7	3.51	7.1
11.28.06	300	2:00 PM		8.2	0.948		0.46	3.3	2.0	2.9	4.5	2.7	3.0	3.6	3.3	6.51
11.28.06	360	3:00 PM	3.9		1.810		0.44	2.8	5.0	3.3	5.0	1.7	3.0	3.36	3.31	8.73
11.28.06	420	4:00 PM	4.7	9.5	2.980	3	0.51		4.5		5.0		2.5	3.59	3.42	9.14
11.28.06	480	5:00 PM	3.7	10.8	3.580		0.52		4.0		4.0		3.5	3.15	3.22	6.09
11.28.06	540	6:00 PM	5.5	11.5	4.920		0.51		3.5		4.5		3.5	2.85	3.01	6.09
11.28.06	600	7:00 PM	3.7	11.5	6.060		0.56		3.5		3.5		3.0	2.55	2.81	6.09
11.28.06	660	8:00 PM	5.4	12.5	6.940			11.6	4.0	7.5	3.5	1.7	3.5	2	2.32	5.89
11.28.06	720	9:00 PM	5.1	14.5	7.790				4.5		3.5		3.5	1.75	1.87	7.92
11.28.06	780	10:00 PM	13.7	20.5	9.140				4.0		5.0		4.5	1.6	1.81	7.72
11.28.06	840	11:00 PM	5.6	12.2	8.700	5	0.60		4.5		5.0		3.5	2	2.22	5.3
11.29.06	900	12:00 AM	3.3	13.8	7.850				5.0		4.0		3.5	2.26	2.46	4.7
11.29.06	960	1:00 AM	5.6	14.2	6.940			2.9	3.5	6.7	4.5	1.6	2.0	2.65	2.72	5.88
11.29.06	1020	2:00 AM	4.3	11.2	7.350				4.0		2.5		3.0	1.9	2.27	5.68
11.29.06	1080	3:00 AM	3.6	12.8	7.560	6	0.62		3.5		3.5		2.0	1.18	2.06	5.88
11.29.06	1140	4:00 AM	4.8	9.0	8.180				4.0		4.0		3.0	1.23	1.86	5.68
11.29.06	1200	5:00 AM	2.9	11.8	8.840			2.5	4.5	3.1	4.0	3.0	2.5	1.42	1.62	5.68
11.29.06	1260	6:00 AM		12.5	10.400			5.6	7.0	5.5	4.0	5.2	4.0	1.53	2.02	5.68
11.29.06	1320	7:00 AM	5.6	12.0	10.500	7	*2.07		7.0		5.0		2.5	1.58	1.67	5.68
MAX			**13.7**	**20.5**	**10.500**	**7**	**0.62**	**11.6**	**7.0**	**7.5**	**5.0**	**5.2**	**4.5**	**6.59**	**6.74**	**9.14**
MIN			**1.8**	**6.7**	**0.049**	**2**	**0.44**	**1.2**	**2.0**	**1.3**	**2.5**	**0.9**	**2.0**	**1.18**	**1.62**	**4.70**
AVG			**4.5**	**11.8**	**5.266**	**4**	**0.51**	**3.8**	**4.3**	**3.9**	**4.0**	**2.1**	**3.1**	**2.58**	**2.86**	**6.70**
11.29.06		12:00 PM			7.080											
11.29.06		4:00 PM			0.530											
11.29.06		8:00 PM			0.248											
11.30.06		12:00 AM			0.148											
11.30.06		4:00 AM			0.121											
11.30.06		8:00 AM			0.100											
11.30.06		12:00 PM			0.084											

* Recycle from the Compost Facility occurred, beginning at 6:00am impacted P loading to secondary.
** Meters Not Registering Flow

Notes - 11/28/06
- Between 10:00am and 10:30am flow varied up to at least 25.4 (152 MGD)
- 11:35am
  - Aer. Tank Pass 4 wall overtopped
  - TT1 Flow: 24.9 MGD
  - TT2 Flow: 26.4 MGD
- 9:00pm through 12:00am - Clarifiers cloudy above sludge blanket.
- 10:05pm - Flow drastically increased, meters acting up.
  - Contacted Console, said they would turn it down.
  - T1 Turb. 10.3, T2 Turb. 13.7
- 10:56pm - Flow back under control, monitors working
  - T1 at 24.4 MGD, T2 at 20.6 MGD
- 1:00am - Begin supplementing flow from storm retention.
- 5:00am - Using maximum available flow.

Figure 4-3
Simulated 144 MGD Test Data
TSS / $CBOD_5$ / TP

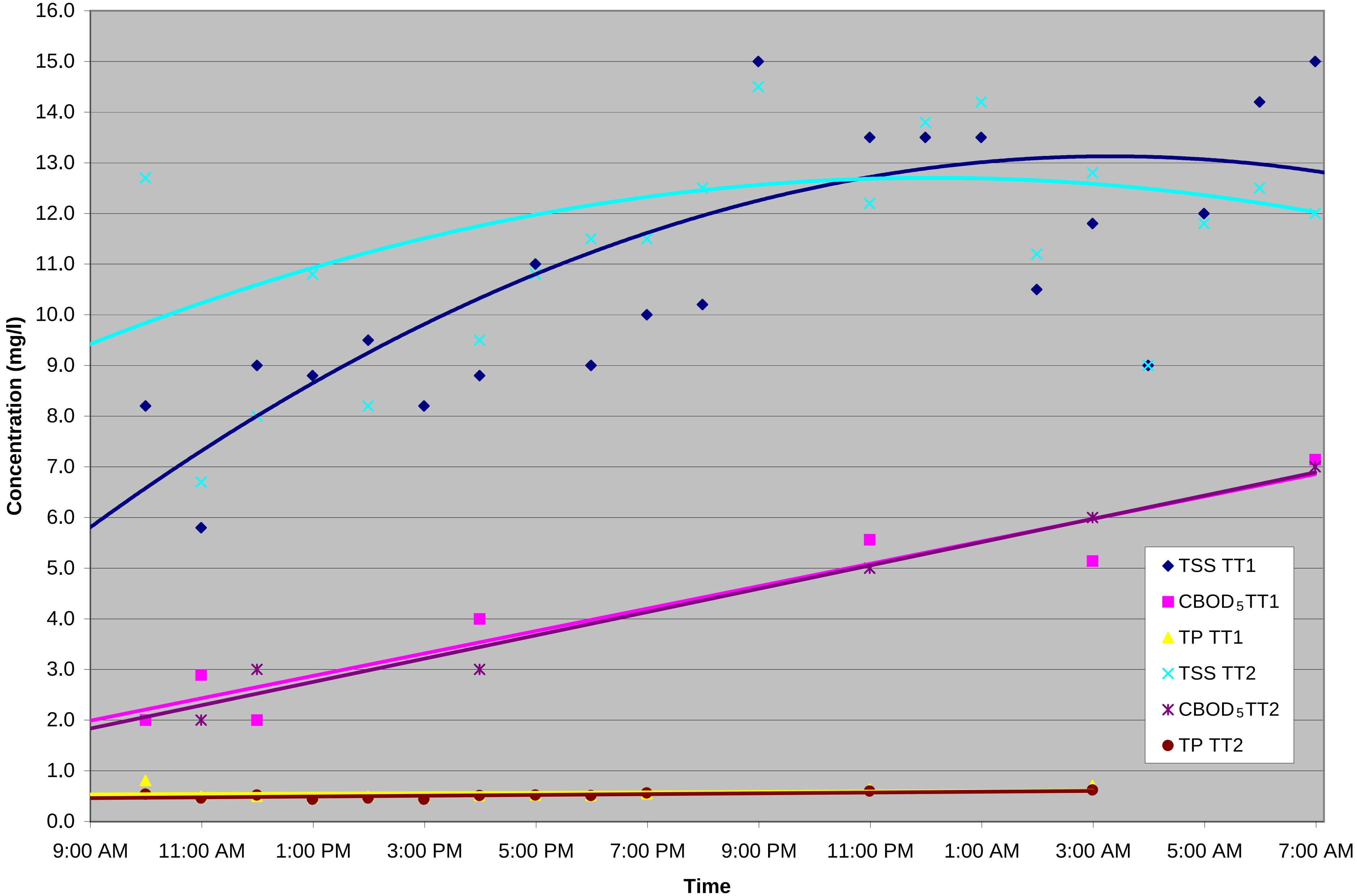


Figure 4-4
Simulated 144 MGD Test Data
NH_3-N / DO

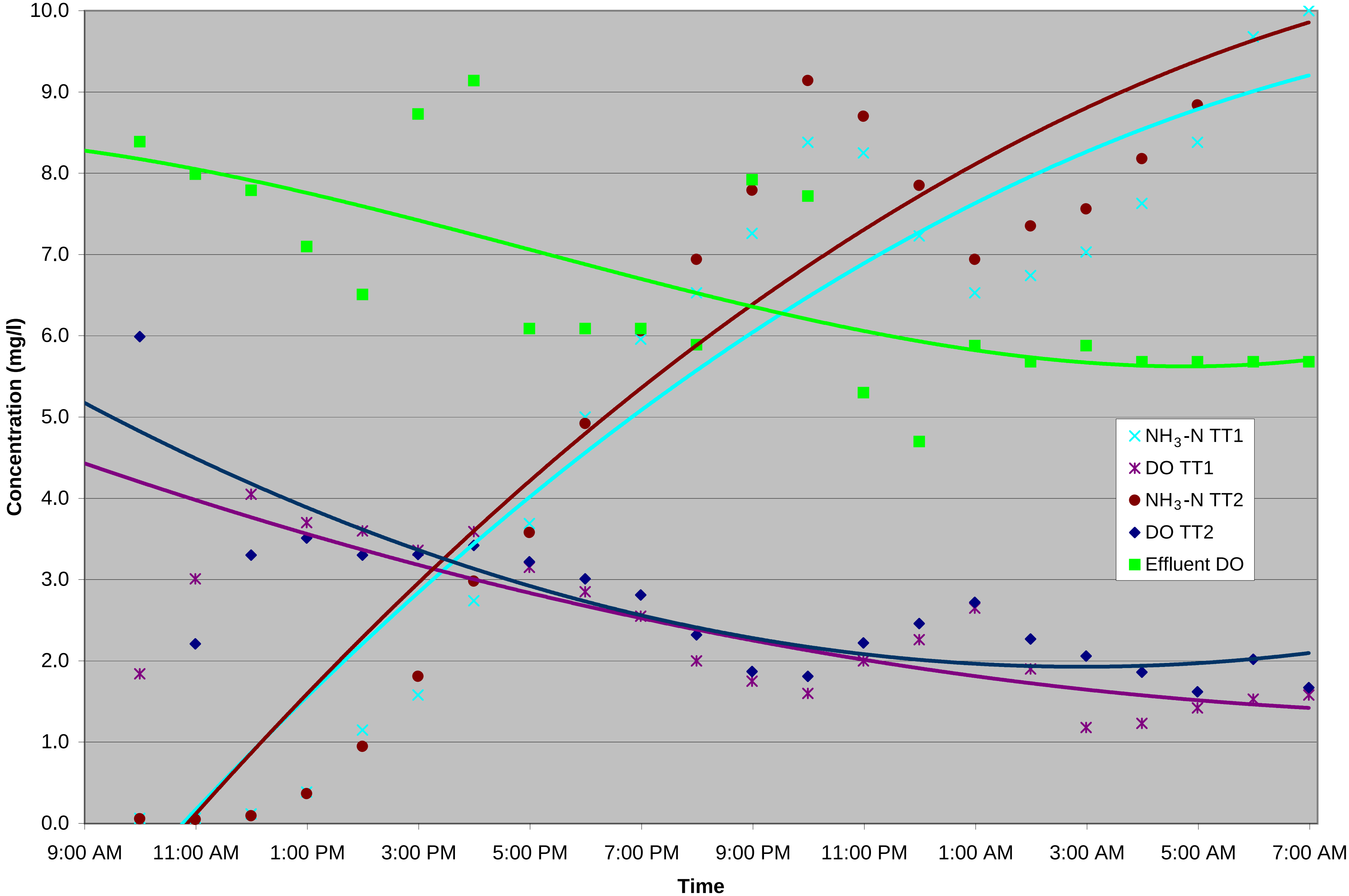


TABLE 4-3
AKRON WPCS STRESS TEST
SIMULATED 120/132 MGD TEST DATA

Date	Time (min.)	Time	Simulated Flow (MGD)	Treatment Train 1											Treatment Train 2											#1 DO (mg/l)	#2 DO (mg/l)	Effluent DO (PPM)
				Turbidity (NTU)	TSS (mg/l)	NH3-N (mg/l)	CBOD5 (mg/l)	Total P (mg/l)	Turbidity (NTU)	FST A Blkt. (ft)	Turbidity (NTU)	FST B Blkt. (ft)	Turbidity (NTU)	FST C Blkt. (ft)	Turbidity (NTU)	TSS (mg/l)	NH3-N (mg/l)	CBOD5 (mg/l)	Total P (mg/l)	Turbidity (NTU)	FST A Blkt. (ft)	Turbidity (NTU)	FST B Blkt. (ft)	Turbidity (NTU)	FST C Blkt. (ft)			
12.05.06	0	8:00 AM	61	1.1	2.3	0.039	2.00	0.5							1.2	1.4	0.035	2.00	0.48									
12.05.06	60	9:00 AM		1.9	3.90	0.030	2.34	0.59		3.0		2.5		2.0	1.7	2.90	0.027	2.00	0.52							8.75	7.40	8.89
12.05.06	120	10:00 AM																								7.90	6.30	8.89
12.05.06	180	11:00 AM		1.5	6.2	0.043	3.32	0.54							1.8	4.0	0.040	2.99	0.50		2.5		2.5		3.0	7.54	6.36	8.89
12.05.06	240	12:00 PM																								8.15	7.55	8.68
12.05.06	300	1:00 PM	125	1.9	4.8	0.038	2.01	0.47							2.5	4.2	0.032	2.00	0.43							8.65	7.99	8.68
12.05.06	360	2:00 PM																								8.25	7.79	8.68
12.05.06	420	3:00 PM	128	2.2	4.2	0.032	2.00	0.40							1.1	3.0	0.032	2.00	0.36							8.25	6.45	8.89
12.05.06	480	4:00 PM																								5.46	5.55	8.89
12.05.06	540	5:00 PM	124	2.8	4.8	0.056	2.00	0.43		4.0		3.0		3.0	1.0	3.2	0.079	2.02	0.39		3.5		1.0		3.0	4.91	5.50	8.89
12.05.06	600	6:00 PM	133																							4.81	5.16	8.89
12.05.06	660	7:00 PM	136	2.4	6.8	0.247	3.67	0.49							1.9	4.6	0.570	2.71	0.44							4.82	5.25	8.28
12.05.06	720	8:00 PM	140																							4.96	5.15	7.88
12.05.06	780	9:00 PM	137	5.7	8.4	1.020	3.98	0.51		3.5		3.5		3.5	4.1	7.0	1.830	3.92	0.47		4.0		3.5		2.5	5.16	5.06	7.68
12.05.06	840	10:00 PM	140																							5.06	4.83	7.48
12.05.06	900	11:00 PM	135	3.7	7.6	1.310	4.30	0.48							4.3	9.9	2.700	3.34	0.45							5.26	4.71	7.27
12.06.06	960	12:00 AM	134																							4.92	4.31	7.27
12.06.06	1020	1:00 AM	141	2.8		1.160	4.43	0.43		4.0		3.0		2.0	2.8		2.620	2.22	0.43		4.0		4.0		2.5	4.62	4.12	7.26
12.06.06	1080	2:00 AM	137																							4.02	3.81	7.07
12.06.06	1140	3:00 AM	130	2.3		1.470	3.48	0.45							1.8		3.180	2.48								3.68	3.42	6.87
12.06.06	1200	4:00 AM	138																							2.63	3.02	6.87
12.06.06	1260	5:00 AM	136	2.1		2.350	4.05			3.5		3.5		3.5	2.0		4.040	2.51	0.74		4.5		4.0		3.0	2.09	3.31	6.67
12.06.06	1320	6:00 AM	143																							1.80	3.22	6.47
12.06.06	1380	7:00 AM	134	3.0	9.4	1.790	4.05	0.93							2.8	8.0	2.700		0.82							2.04	3.61	6.27
12.06.06	1440	8:00 AM	142	3.4	7.6	1.150	4.46	0.86							3.0	7.0	2.080	3.79	0.80							2.34	3.75	6.27
MAX			**143**	**5.7**	**9.4**	**2.350**	**4.46**	**0.93**		**4.0**		**3.5**		**3.5**	**4.3**	**9.9**	**4.040**	**3.92**	**0.82**		**4.5**		**4.0**		**3.0**	**8.75**	**7.99**	**8.89**
MIN			**61**	**1.1**	**2.3**	**0.030**	**2.00**	**0.40**		**3.0**		**2.5**		**2.0**	**1.0**	**1.4**	**0.027**	**2.00**	**0.36**		**2.5**		**1.0**		**2.5**	**1.80**	**3.02**	**6.27**
AVG			**133**	**2.6**	**6.0**	**0.718**	**3.29**	**0.55**		**3.6**		**3.1**		**2.8**	**2.3**	**5.0**	**1.426**	**2.61**	**0.53**		**3.7**		**3.0**		**2.8**	**5.25**	**5.15**	**7.83**

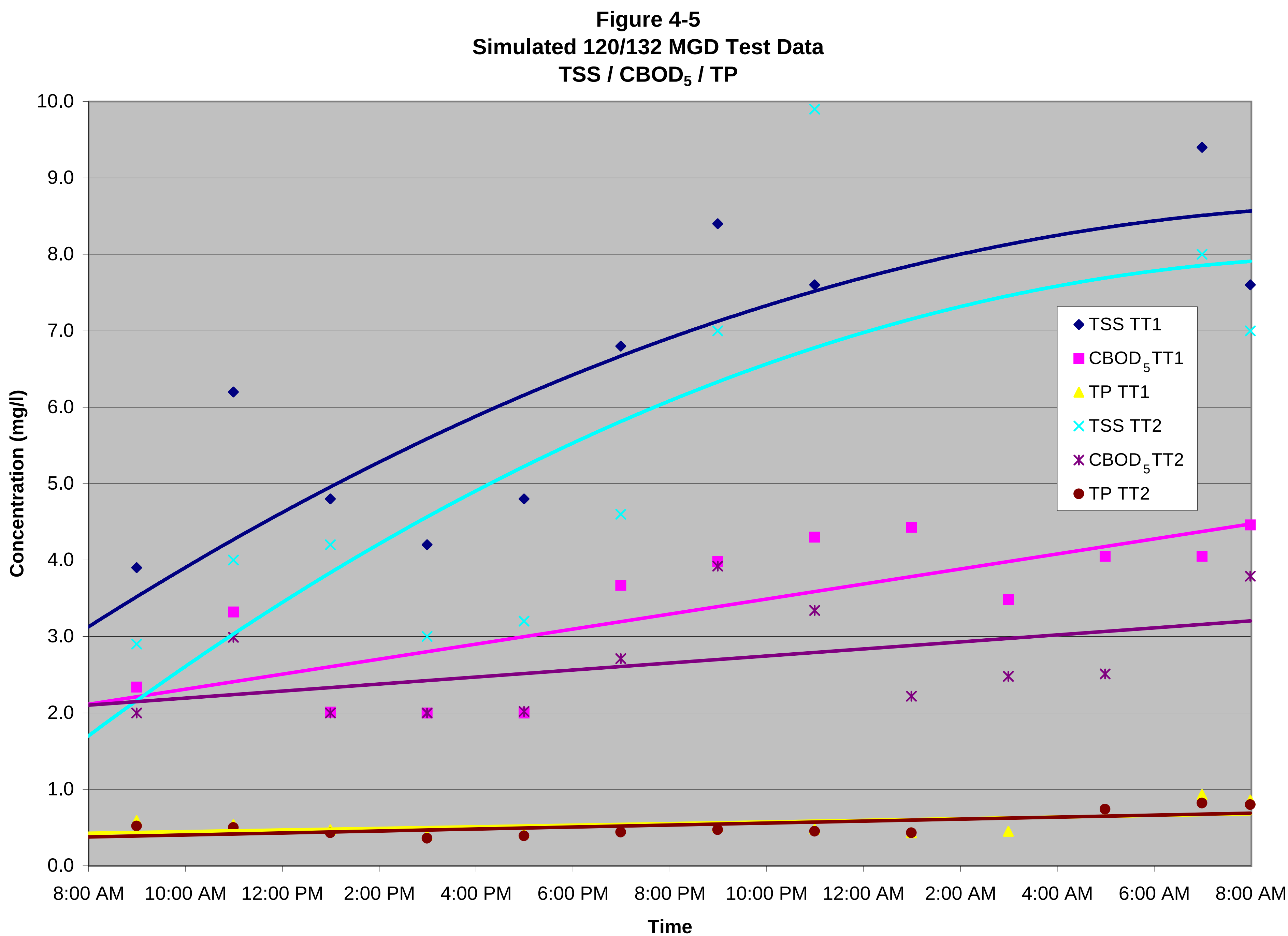
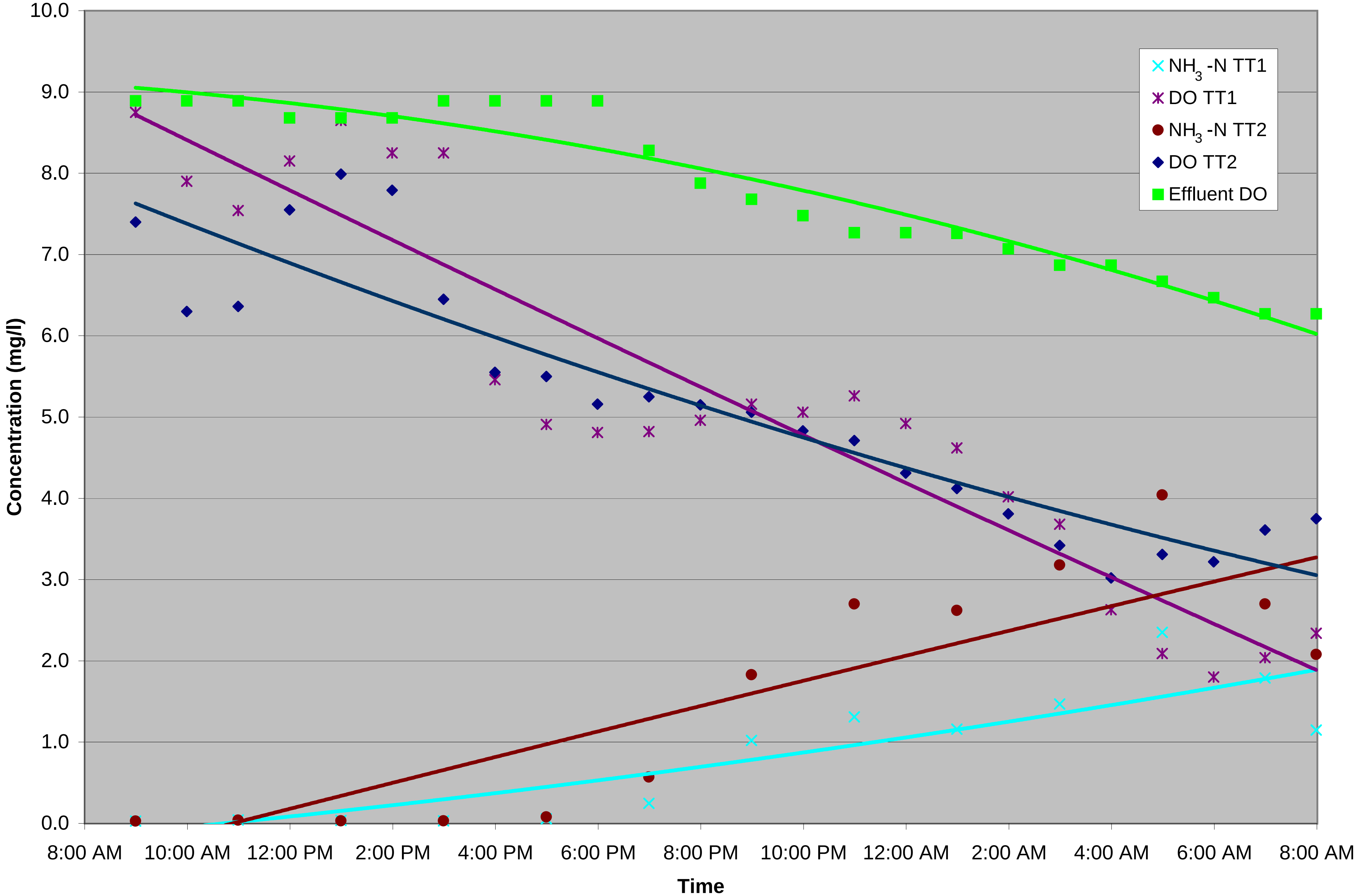


Figure 4-5
Simulated 120/132 MGD Test Data
TSS / CBOD$_5$ / TP
Concentration (mg/l)
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
8:00 AM
10:00 AM
12:00 PM
2:00 PM
4:00 PM
6:00 PM
8:00 PM
10:00 PM
12:00 AM
2:00 AM
4:00 AM
6:00 AM
8:00 AM
Time
TSS TT1
CBOD$_5$ TT1
TP TT1
TSS TT2
CBOD$_5$ TT2
TP TT2

Figure 4-6
Simulated 120/132 MGD Test Data
NH_3-N / DO



SECTION 5
CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the three stress test events, and with respect to current and future operations within the current permit limitations, the following conclusions are presented.

1. Test results were consistent between the two process treatment trains tested. Full scale operation under comparable conditions is needed to determine whether similar results would be realized for all six treatment trains (the entire secondary treatment system).
2. The existing aeration influent flume provides limited flow control, especially at the higher flows tested. Headloss through this area could be reduced and improved control and flow splitting gained with a reconstruction of this facility. (Refer to the *1980 Facilities Plan* and *Facilities Plan 98* for additional background and support for this conclusion.)
3. Significant grease and scum accumulates on the waters surface between the weir troughs and outer tank walls. At higher flows this layer tends to break up and overflow the weirs showing up as additional TSS. The existing FST domes inhibit effective monitoring and maintenance of the FSTs, including the grease/scum build-up. This issue becomes significant when processing higher flows through these tanks.
4. A simulated flow rate of up to approximately 120 MGD can be processed through the secondary treatment process, under the precedent conditions occurring with this test, and comply with all effluent permit parameters at the time of the test. Nitrification appears to be the limiting process mechanism at higher flow rates.
5. Dissolved oxygen levels can drop very quickly when simulated flows increase to 120 MGD and above from normal dry weather flows. Constant monitoring and adjustment of air supply is necessary to prevent degradation of nitrification. Above 120 MGD, a DO sag occurs that would likely result in permit violation in a full-scale operation event.
6. The capacity of the existing centrifugal blowers may be insufficient to support all six basins at actual flows of 120 MGD and above during summer conditions and should be further evaluated in conjunction with maintaining DO and associated NH_3-N levels.
7. Total phosphorus concentrations are significantly impacted by slug-flow recycle from the biosolids processes. Secondary influent TP concentrations may be better managed through flow equalization of the recycle and/or pretreatment.
8. The RAS system is hydraulically limiting for flows above approximately 130 MGD.
9. At simulated flow rates exceeding approximately 140 MGD, and at a 16% RAS rate, aeration basin freeboard is only a few inches. With the variability in flow control at 130 MGD and above the intermediate basin walls could be awash with mixed liquor.

The following recommendations are made.

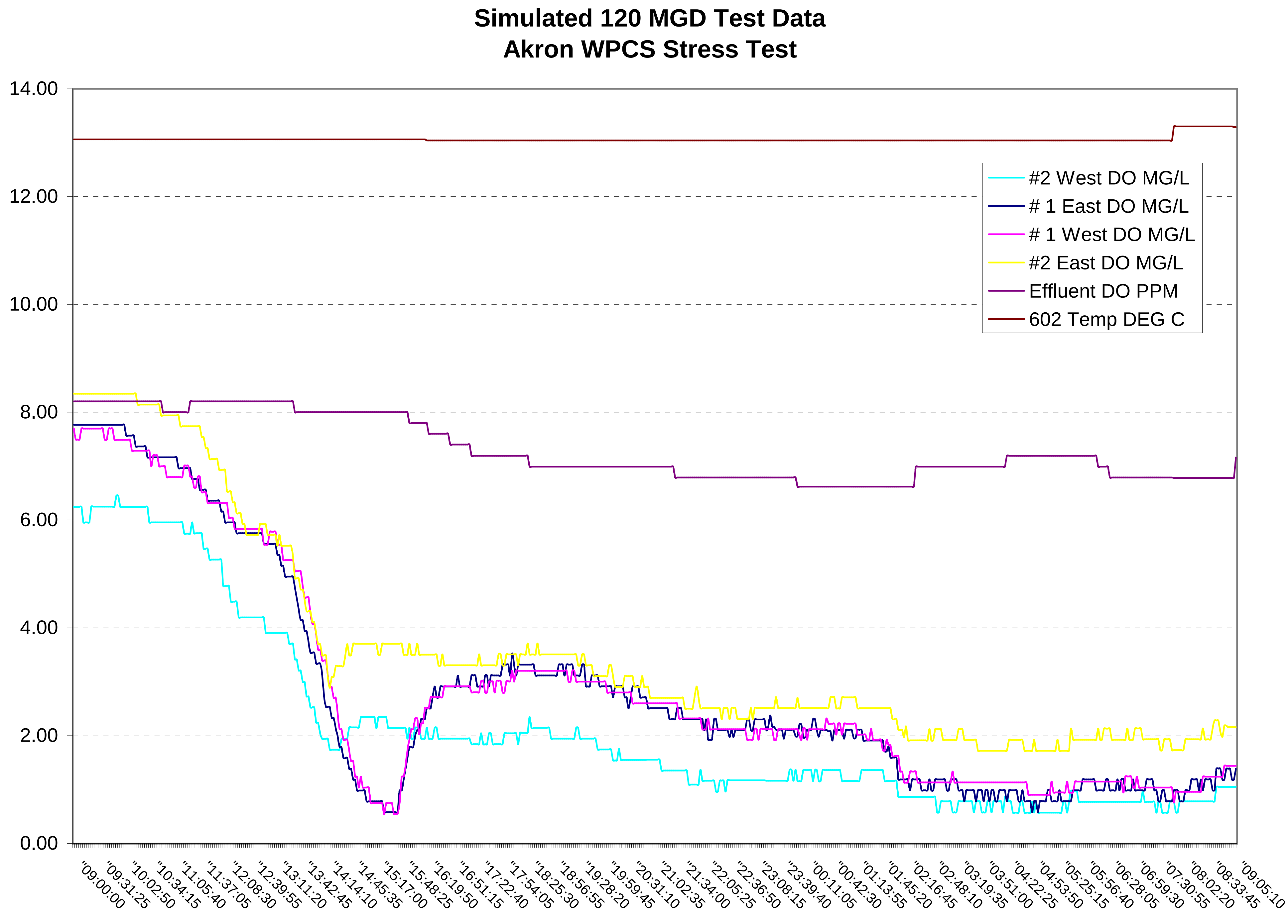
1. Reconstruct the Aeration Influent Flume to reduce headloss through this portion of the plant if flows >110 MGD are planned to be processed. Most importantly, this improvement should provide positive flow splitting to the aeration basins and provide improved flow control.
2. Remove the FST domes and provide weir trough covers to improve maintenance, monitoring and subsequent control of the secondary process. Modifications to the weir troughs may also be required.
3. Develop a computerized process model of the Akron WPCS to perform a desktop evaluation of the secondary treatment process. Utilize this test to plan and implement additional stress testing during actual wet weather events and flow rates of 120 MGD and higher.
4. Perform additional stress testing during cool water temperature/summer permit limit period (early June) and with actual wet weather conditions to determine if the process efficiencies observed during the simulated 120/132 MGD test are repeatable. The sustainable level of

nitrification at 120 to 132 MGD must be validated for different seasonal conditions and associated permit conditions.

5. Perform additional stress testing during warm water temperature/summer permit limit period (mid August) and with actual wet weather conditions to determine if available air supply and distribution facilities are capable of sustaining sufficient DO levels for nitrification at flow rates of 120 to 132 MGD.
6. Return the Recycle Waste Equalization facility to service to dampen slug-flow recycle from the biosolids processes. Consider separate P-removal process for this flow in consideration of anticipated future, lower TP permit limits.
7. Complete Recommendations 3 through 5 in order to confirm process limitations and determine feasibility of reliable and compliant operation at actual wet weather flow rates of 120 MGD and higher flows.
8. Raise the aeration basin intermediate walls to match the elevation of the opposing walls if flows of 130 MGD and higher are to be processed.

Appendix A

City-Provided WPCS Data



Simulated 120 MGD Test Data
Akron WPCS Stress Test
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
#2 West DO MG/L
1 East DO MG/L
1 West DO MG/L
#2 East DO MG/L
Effluent DO PPM
602 Temp DEG C
"09:00:00
"09:31:25
"10:02:50
"10:34:15
"11:05:40
"11:37:05
"12:08:30
"12:39:55
"13:11:20
"13:42:45
"14:14:10
"14:45:35
"15:17:00
"15:48:25
"16:19:50
"16:51:15
"17:22:40
"17:54:05
"18:25:30
"18:56:55
"19:28:20
"19:59:45
"20:31:10
"21:02:35
"21:34:00
"22:05:25
"22:36:50
"23:08:15
"23:39:40
"00:11:05
"00:42:30
"01:13:55
"01:45:20
"02:16:45
"02:48:10
"03:19:35
"03:51:00
"04:22:25
"04:53:50
"05:25:15
"05:56:40
"06:28:05
"06:59:30
"07:30:55
"08:02:20
"08:33:45
"09:05:10

AKRON WPCS 2006 120 MGD STRESS TEST

20-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
"09:00:00	12.06	11.76	2.03	1.78	0.55	8.32	82.30	75.30	7.77	7.70	8.34	6.24	8.20	13.06
"09:02:25	12.01	11.76	2.03	1.78	0.55	8.32	82.30	75.30	7.77	7.49	8.34	6.24	8.20	13.06
"09:04:50	12.05	11.78	2.03	1.78	0.55	8.32	85.10	75.30	7.77	7.49	8.34	6.24	8.20	13.06
"09:07:15	12.39	11.78	2.03	1.78	0.55	8.32	85.10	75.30	7.77	7.49	8.34	6.24	8.20	13.06
"09:09:40	12.40	12.62	2.03	1.91	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.24	8.20	13.06
"09:12:05	13.01	13.14	2.03	1.91	0.55	8.32	85.10	75.30	7.77	7.70	8.34	5.96	8.20	13.06
"09:14:30	14.04	13.89	2.28	2.15	0.55	8.32	85.10	75.30	7.77	7.70	8.34	5.96	8.20	13.06
"09:16:55	15.34	15.54	2.28	2.27	0.55	8.32	85.10	75.30	7.77	7.70	8.34	5.96	8.20	13.06
"09:19:20	16.54	16.23	2.53	2.42	0.55	8.32	85.10	75.30	7.77	7.70	8.34	5.96	8.20	13.06
"09:21:45	17.14	17.25	2.53	2.68	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:24:10	17.84	18.39	2.66	2.80	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:26:35	18.52	19.14	3.03	3.04	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:29:00	19.29	19.52	3.03	3.04	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:31:25	19.96	20.19	3.30	3.18	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:33:50	20.71	20.78	3.30	3.18	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:36:15	20.70	21.40	3.30	3.30	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:38:40	21.32	21.99	3.42	3.42	0.55	8.32	85.10	75.30	7.77	7.49	8.34	6.25	8.20	13.06
"09:41:05	21.72	21.99	3.42	3.42	0.55	8.32	85.10	75.30	7.77	7.49	8.34	6.25	8.20	13.06
"09:43:30	22.12	22.50	3.69	3.55	0.55	8.32	85.10	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:45:55	22.40	22.76	3.56	3.43	0.55	8.32	88.00	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:48:20	22.84	23.21	3.56	3.68	0.55	8.32	88.00	75.30	7.77	7.70	8.34	6.25	8.20	13.06
"09:50:45	22.86	23.71	3.82	3.67	0.55	8.32	88.00	75.30	7.77	7.49	8.34	6.25	8.20	13.06
"09:53:10	23.12	23.63	3.82	3.67	0.55	8.32	88.00	78.90	7.77	7.49	8.34	6.45	8.20	13.06
"09:55:35	23.28	23.94	3.82	3.68	0.55	8.32	88.00	78.90	7.77	7.49	8.34	6.45	8.20	13.06
"09:58:00	23.31	24.18	3.82	3.80	0.55	8.32	88.00	78.90	7.77	7.49	8.34	6.24	8.20	13.06
"10:00:25	23.25	24.27	3.69	3.80	0.55	8.32	85.20	78.90	7.77	7.49	8.34	6.24	8.20	13.06
"10:02:50	23.22	23.94	3.81	3.80	0.55	8.32	85.20	78.90	7.77	7.49	8.34	6.24	8.20	13.06
"10:05:15	23.24	23.53	3.81	3.80	0.55	8.32	88.00	78.90	7.57	7.49	8.34	6.24	8.20	13.06
"10:07:40	22.02	23.01	3.81	3.80	0.55	8.32	88.00	82.70	7.57	7.49	8.34	6.24	8.20	13.06
"10:10:05	21.44	22.42	3.69	3.68	0.55	8.32	88.00	82.70	7.57	7.49	8.34	6.24	8.20	13.06
"10:12:30	20.81	21.63	3.57	3.68	0.55	8.32	88.00	82.70	7.57	7.29	8.34	6.24	8.20	13.06
"10:14:55	20.28	20.54	3.30	3.56	0.55	8.32	88.00	86.20	7.57	7.29	8.34	6.24	8.20	13.06
"10:17:20	19.94	20.07	3.30	3.44	0.55	8.32	85.20	82.70	7.37	7.29	8.34	6.24	8.20	13.06
"10:19:45	19.17	19.42	3.16	3.32	0.55	8.32	85.20	82.70	7.37	7.29	8.14	6.24	8.20	13.06
"10:22:10	18.06	18.78	3.04	3.18	0.55	8.32	85.20	82.70	7.37	7.29	8.14	6.24	8.20	13.06
"10:24:35	17.71	17.97	2.92	2.93	0.55	8.32	85.20	82.70	7.37	7.29	8.14	6.24	8.20	13.06
"10:27:00	17.21	17.81	2.80	2.93	0.55	8.32	85.20	82.70	7.37	7.29	8.14	6.24	8.20	13.06
"10:29:25	16.71	17.00	2.80	2.93	0.55	8.32	85.20	82.70	7.37	7.29	8.14	6.24	8.20	13.06
"10:31:50	17.02	17.29	2.66	2.80	0.55	8.32	85.20	82.70	7.16	7.29	8.14	6.24	8.20	13.06
"10:34:15	17.78	17.65	2.66	2.68	0.55	8.32	85.20	79.00	7.16	7.29	8.14	5.96	8.20	13.06
"10:36:40	18.75	19.10	2.79	2.80	0.55	8.32	85.20	79.00	7.16	7.00	8.14	5.96	8.20	13.06
"10:39:05	19.26	19.84	2.91	2.93	0.55	8.32	85.20	79.00	7.16	7.20	8.14	5.96	8.20	13.06
"10:41:30	19.78	20.51	3.03	3.05	0.55	8.32	85.20	79.00	7.16	7.20	8.14	5.96	8.20	13.06
"10:43:55	20.34	20.88	3.27	3.30	0.55	8.32	85.20	75.30	7.16	7.20	8.14	5.96	8.20	13.06
"10:46:20	20.77	21.90	3.27	3.42	0.55	8.32	85.20	75.30	7.16	7.00	8.14	5.96	8.20	13.06
"10:48:45	21.04	21.90	3.27	3.42	0.55	8.32	88.00	75.30	7.16	7.00	7.94	5.96	8.20	13.06
"10:51:10	21.68	22.15	3.54	3.43	0.55	8.32	88.00	71.80	7.16	7.00	7.94	5.96	8.00	13.06
"10:53:35	21.60	22.69	3.54	3.43	0.55	8.32	88.00	71.80	7.16	7.00	7.94	5.96	8.00	13.06
"10:56:00	22.36	22.66	3.54	3.55	0.55	8.32	88.00	71.80	7.16	6.80	7.94	5.96	8.00	13.06
"10:58:25	22.22	22.66	3.54	3.68	0.55	8.32	88.00	75.10	7.16	6.80	7.94	5.96	8.00	13.06
"11:00:50	21.80	22.54	3.54	3.68	0.55	8.32	88.00	75.10	7.16	6.80	7.94	5.96	8.00	13.06
"11:03:15	21.32	22.21	3.54	3.68	0.55	8.32	88.00	75.10	7.16	6.80	7.94	5.96	8.00	13.06
"11:05:40	20.64	21.30	3.54	3.68	0.55	8.32	88.00	75.10	7.16	6.80	7.94	5.96	8.00	13.06
"11:08:05	20.36	20.64	3.54	3.55	0.55	8.32	88.00	78.20	7.16	6.80	7.94	5.96	8.00	13.06
"11:10:30	19.66	20.43	3.41	3.43	0.55	8.32	88.00	78.20	6.96	6.80	7.94	5.96	8.00	13.06
"11:12:55	19.82	20.18	3.28	3.43	0.55	8.32	88.00	81.70	6.96	6.80	7.74	5.96	8.00	13.06
"11:15:20	19.37	19.93	3.28	3.31	0.55	8.32	88.00	81.70	6.96	6.80	7.74	5.96	8.00	13.06
"11:17:45	19.07	19.87	3.16	3.31	0.55	8.32	88.00	81.70	6.96	7.01	7.74	5.75	8.00	13.06
"11:20:10	19.17	20.09	3.16	3.31	0.55	8.32	88.00	81.70	6.96	7.01	7.74	5.75	8.00	13.06
"11:22:35	19.67	20.34	3.16	3.17	0.55	8.32	88.00	81.70	6.96	7.01	7.74	5.75	8.00	13.06
"11:25:00	19.99	20.15	3.16	3.17	0.55	8.32	88.00	81.70	6.96	6.80	7.74	5.75	8.20	13.06
"11:27:25	20.35	20.58	3.16	3.17	0.55	8.32	88.00	81.70	6.76	6.80	7.74	5.96	8.20	13.06
"11:29:50	20.71	21.22	3.16	3.30	0.55	8.32	88.00	78.10	6.76	6.60	7.74	5.75	8.20	13.06
"11:32:15	20.80	21.57	3.16	3.30	0.55	8.32	88.00	78.10	6.76	6.60	7.74	5.75	8.20	13.06
"11:34:40	21.10	21.75	3.28	3.30	0.55	8.32	88.00	78.10	6.76	6.80	7.74	5.75	8.20	13.06
"11:37:05	21.44	22.18	3.28	3.43	0.55	8.32	88.00	78.10	6.56	6.80	7.74	5.75	8.20	13.06
"11:39:30	21.63	21.92	3.41	3.55	0.55	8.32	88.00	78.10	6.56	6.52	7.54	5.75	8.20	13.06
"11:41:55	21.89	22.22	3.41	3.55	0.55	8.32	88.00	78.10	6.56	6.52	7.54	5.47	8.20	13.06
"11:44:20	21.49	22.23	3.41	3.55	0.55	8.32	88.00	78.10	6.56	6.52	7.34	5.47	8.20	13.06
"11:46:45	21.40	22.25	3.41	3.55	0.55	8.32	88.00	78.10	6.36	6.32	7.34	5.47	8.20	13.06
"11:49:10	21.41	22.11	3.41	3.55	0.55	8.32	88.00	78.10	6.36	6.32	7.13	5.27	8.20	13.06
"11:51:35	21.48	22.11	3.41	3.55	0.55	8.32	88.00	78.10	6.36	6.32	7.13	5.27	8.20	13.06
"11:54:00	21.06	21.85	3.41	3.55	0.55	8.32	88.00	78.10	6.36	6.32	7.13	5.27	8.20	13.06
"11:56:25	21.15	22.11	3.41	3.55	0.55	8.32	88.00	78.10	6.36	6.32	7.13	5.27	8.20	13.06
"11:58:50	21.04	21.55	3.41	3.55	0.55	8.32	88.00	81.40	6.36	6.32	7.13	5.27	8.20	13.06
"12:01:15	20.75	21.29	3.41	3.55	0.55	8.32	88.00	78.10	6.36	6.32	6.93	5.27	8.20	13.06
"12:03:40	21.02	21.30	3.41	3.55	0.55	8.32	88.00	78.10	6.16	6.32	6.93	5.27	8.20	13.06
"12:06:05	20.78	20.77	3.41	3.55	0.55	8.32	88.00	78.10	6.16	6.32	6.93	4.78	8.20	13.06
"12:08:30	20.66	21.16	3.28	3.42	0.55	8.32	88.00	78.10	5.96	6.32	6.93	4.78	8.20	13.06
"12:10:55	20.46	20.89	3.28	3.42	0.55	8.32	88.00	78.10	5.96	6.32	6.53	4.78	8.20	13.06
"12:13:20	20.36	20.64	3.28	3.42	0.55	8.32	88.00	78.10	5.96	6.04	6.53	4.78	8.20	13.06
"12:15:45	19.73	20.84	3.28	3.30	0.55	8.32	88.00	78.10	5.96	6.04	6.53	4.49	8.20	13.06
"12:18:10	20.34	20.59	3.28	3.30	0.55	8.32	88.00	78.10	5.96	6.04	6.33	4.49	8.20	13.06
"12:20:35	19.84	20.23	3.28	3.30	0.55	8.32	88.00	78.10	5.96	5.83	6.33	4.49	8.20	13.06
"12:23:00	19.89	20.56	3.28	3.30	0.55	8.32	88.00	78.10	5.75	5.83	6.13	4.49	8.20	13.06
"12:25:25	19.89	20.22	3.28	3.30	0.55	8.32	88.00	78.10	5.75	5.83	6.13	4.19	8.20	13.06
"12:27:50	20.03	20.93	3.28	3.30	0.55	8.32	88.00	78.10	5.75	5.83	6.13	4.19	8.20	13.06
"12:30:15	20.45	21.17	3.16	3.30	0.55	8.32	90.20	78.10	5.75	5.83	5.93	4.19	8.20	13.06

20-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
"12:32:40	20.70	21.03	3.16	3.30	0.55	8.32	90.20	78.10	5.75	5.83	5.93	4.19	8.20	13.06
"12:35:05	21.04	21.25	3.16	3.30	0.55	8.32	90.20	78.10	5.75	5.83	5.72	4.19	8.20	13.06
"12:37:30	20.74	21.56	3.28	3.30	0.55	8.32	90.20	78.10	5.75	5.83	5.72	4.19	8.20	13.06
"12:39:55	21.02	21.92	3.28	3.43	0.55	8.32	90.20	78.10	5.75	5.83	5.72	4.19	8.20	13.06
"12:42:20	21.37	21.55	3.28	3.43	0.55	8.32	90.20	78.10	5.75	5.83	5.72	4.19	8.20	13.06
"12:44:45	21.23	22.13	3.41	3.43	0.55	8.32	90.20	78.10	5.75	5.83	5.72	4.19	8.20	13.06
"12:47:10	21.23	22.17	3.41	3.43	0.55	8.32	90.20	81.80	5.75	5.83	5.72	4.19	8.20	13.06
"12:49:35	21.16	21.89	3.41	3.43	0.55	8.32	90.20	78.20	5.75	5.83	5.72	4.19	8.20	13.06
"12:52:00	21.54	22.15	3.41	3.43	0.55	8.32	90.20	81.70	5.75	5.83	5.93	4.19	8.20	13.06
"12:54:25	21.55	22.03	3.41	3.43	0.55	8.32	90.20	81.70	5.75	5.83	5.93	4.19	8.20	13.06
"12:56:50	21.44	22.22	3.41	3.43	0.55	8.32	90.20	81.70	5.55	5.55	5.93	4.19	8.20	13.06
"12:59:15	21.44	22.22	3.41	3.55	0.55	8.32	90.20	81.70	5.55	5.55	5.93	3.91	8.20	13.06
"13:01:40	21.67	22.22	3.41	3.55	0.55	8.32	90.30	81.70	5.55	5.55	5.72	3.91	8.20	13.06
"13:04:05	21.76	22.22	3.41	3.55	0.55	8.32	90.30	81.70	5.55	5.79	5.72	3.91	8.20	13.06
"13:06:30	21.43	22.23	3.41	3.55	0.55	8.32	90.30	81.70	5.55	5.79	5.72	3.91	8.20	13.06
"13:08:55	21.79	22.41	3.41	3.55	0.55	8.32	90.30	81.70	5.55	5.79	5.72	3.91	8.20	13.06
"13:11:20	21.57	22.86	3.41	3.55	0.55	8.32	90.30	81.70	5.55	5.79	5.72	3.91	8.20	13.06
"13:13:45	21.80	22.49	3.41	3.55	0.55	8.32	90.30	81.70	5.35	5.54	5.52	3.91	8.20	13.06
"13:16:10	22.15	22.37	3.41	3.55	0.55	8.32	90.30	81.70	5.35	5.54	5.72	3.91	8.20	13.06
"13:18:35	22.02	22.51	3.41	3.55	0.55	8.32	90.30	81.70	5.15	5.54	5.52	3.91	8.20	13.06
"13:21:00	22.19	22.47	3.41	3.55	0.55	8.32	90.30	81.70	5.15	5.26	5.52	3.91	8.20	13.06
"13:23:25	21.57	22.39	3.41	3.55	0.55	8.32	90.30	81.70	4.95	5.26	5.52	3.91	8.20	13.06
"13:25:50	21.20	22.06	3.53	3.55	0.55	8.32	90.30	81.70	4.95	5.26	5.52	3.91	8.20	13.06
"13:28:15	21.46	21.89	3.53	3.55	0.55	8.32	90.30	81.70	4.95	5.26	5.52	3.70	8.20	13.06
"13:30:40	21.29	21.89	3.53	3.55	0.55	8.32	90.30	81.70	4.95	5.26	5.52	3.70	8.20	13.06
"13:33:05	21.29	22.08	3.53	3.55	0.55	8.32	90.30	81.70	4.95	5.26	5.32	3.70	8.20	13.06
"13:35:30	21.03	21.67	3.53	3.55	0.55	8.32	90.30	81.70	4.75	5.05	4.92	3.41	8.00	13.06
"13:37:55	21.09	21.96	3.53	3.55	0.55	8.32	90.30	81.70	4.55	5.05	4.92	3.41	8.00	13.06
"13:40:20	21.12	21.68	3.53	3.55	0.55	8.32	90.30	81.70	4.34	5.05	4.92	3.21	8.00	13.06
"13:42:45	21.18	21.51	3.40	3.55	0.55	8.32	90.30	81.70	4.14	5.05	4.71	3.21	8.00	13.06
"13:45:10	20.59	21.54	3.40	3.55	0.55	8.32	90.30	81.70	4.14	4.77	4.71	3.00	8.00	13.06
"13:47:35	20.74	21.30	3.40	3.43	0.55	8.32	90.30	81.70	3.94	4.56	4.51	3.00	8.00	13.06
"13:50:00	20.59	21.14	3.40	3.43	0.55	8.32	90.30	81.70	3.94	4.56	4.31	2.73	8.00	13.06
"13:52:25	20.44	21.59	3.40	3.43	0.55	8.32	90.30	81.70	3.74	4.56	4.31	2.73	8.00	13.06
"13:54:50	20.45	21.37	3.28	3.31	0.55	8.32	90.30	81.70	3.54	4.28	4.31	2.53	8.00	13.06
"13:57:15	20.70	20.96	3.28	3.31	0.55	8.32	90.30	81.70	3.54	4.08	4.11	2.53	8.00	13.06
"13:59:40	20.74	21.11	3.28	3.31	0.55	8.12	90.30	81.70	3.54	4.08	4.11	2.53	8.00	13.06
"14:02:05	20.48	21.02	3.28	3.43	0.55	8.12	90.30	81.70	3.34	3.88	3.90	2.24	8.00	13.06
"14:04:30	20.75	21.02	3.28	3.43	0.55	8.12	90.30	81.70	3.34	3.59	3.70	2.24	8.00	13.06
"14:06:55	20.68	21.12	3.28	3.31	0.55	8.12	90.30	81.70	3.34	3.59	3.70	2.04	8.00	13.06
"14:09:20	20.70	20.57	3.28	3.31	0.55	8.12	90.30	81.70	3.14	3.39	3.49	1.94	8.00	13.06
"14:11:45	20.09	20.60	3.28	3.31	0.55	8.12	90.30	81.70	2.73	3.39	3.49	1.94	8.00	13.06
"14:14:10	20.43	20.70	3.28	3.31	0.55	8.12	90.30	81.70	2.53	3.39	3.49	1.94	8.00	13.06
"14:16:35	20.38	20.70	3.28	3.31	0.55	8.12	87.40	81.70	2.53	3.11	3.09	1.94	8.00	13.06
"14:19:00	20.35	20.80	3.28	3.31	0.55	8.12	87.40	81.70	2.53	2.90	2.89	1.74	8.00	13.06
"14:21:25	20.42	20.51	3.28	3.31	0.55	8.12	87.40	81.70	2.33	2.90	3.09	1.74	8.00	13.06
"14:23:50	20.06	20.51	3.28	3.31	0.55	8.12	90.30	81.70	2.33	2.70	3.09	1.74	8.00	13.06
"14:26:15	19.67	20.25	3.28	3.31	0.55	8.12	90.30	81.70	2.13	2.70	3.29	1.74	8.00	13.06
"14:28:40	20.03	20.25	3.28	3.31	0.55	8.12	90.30	81.70	1.99	2.41	3.29	1.74	8.00	13.06
"14:31:05	20.23	20.28	3.28	3.31	0.55	8.12	90.30	81.70	1.79	2.12	3.29	1.74	8.00	13.06
"14:33:30	20.01	20.29	3.16	3.31	0.55	8.12	90.30	81.70	1.79	2.12	3.29	1.94	8.00	13.06
"14:35:55	20.29	20.37	3.16	3.31	0.55	8.12	87.50	81.70	1.59	1.93	3.29	1.94	8.00	13.06
"14:38:20	20.07	20.77	3.16	3.31	0.55	8.12	87.50	81.70	1.59	1.93	3.49	1.94	8.00	13.06
"14:40:45	20.30	20.97	3.16	3.31	0.55	8.12	87.50	81.70	1.59	1.93	3.70	1.94	8.00	13.06
"14:43:10	20.38	20.97	3.16	3.31	0.55	8.12	90.30	78.10	1.38	1.73	3.50	2.15	8.00	13.06
"14:45:35	20.45	21.30	3.16	3.31	0.55	8.12	90.30	78.10	1.38	1.53	3.50	2.15	8.00	13.06
"14:48:00	20.60	21.53	3.16	3.31	0.55	8.12	90.30	78.10	1.18	1.53	3.70	2.15	8.00	13.06
"14:50:25	20.54	21.05	3.28	3.31	0.55	8.12	90.30	78.10	1.18	1.24	3.70	2.15	8.00	13.06
"14:52:50	20.05	20.63	3.28	3.31	0.55	8.12	90.30	78.10	0.98	1.24	3.70	2.15	8.00	13.06
"14:55:15	20.06	20.19	3.28	3.31	0.55	8.12	87.30	78.10	0.98	1.04	3.70	2.15	8.00	13.06
"14:57:40	20.06	20.46	3.28	3.31	0.55	8.12	87.30	78.10	0.98	1.24	3.70	2.34	8.00	13.06
"15:00:05	20.15	20.96	3.16	3.31	0.55	8.12	87.30	78.10	0.98	1.04	3.70	2.34	8.00	13.06
"15:02:30	20.31	20.73	3.16	3.31	0.55	8.12	87.30	78.10	0.98	1.04	3.70	2.34	8.00	13.06
"15:04:55	20.36	21.28	3.16	3.31	0.55	8.12	87.30	78.10	0.78	1.04	3.70	2.34	8.00	13.06
"15:07:20	20.92	21.42	3.16	3.31	0.55	8.12	87.30	78.10	0.78	1.04	3.70	2.34	8.00	13.06
"15:09:45	21.14	21.97	3.28	3.31	0.55	8.12	87.30	78.10	0.78	0.75	3.70	2.34	8.00	13.06
"15:12:10	21.49	21.94	3.28	3.43	0.55	8.12	87.30	78.10	0.78	0.75	3.70	2.34	8.00	13.06
"15:14:35	21.80	22.22	3.40	3.46	0.55	8.12	87.30	78.10	0.78	0.75	3.70	2.34	8.00	13.06
"15:17:00	21.70	22.60	3.40	3.46	0.55	8.12	87.30	81.70	0.78	0.75	3.70	2.14	8.00	13.06
"15:19:25	21.52	22.59	3.40	3.46	0.55	8.12	85.00	81.70	0.78	0.75	3.50	2.34	8.00	13.06
"15:21:50	21.85	22.38	3.40	3.58	0.55	8.12	85.00	81.40	0.78	0.75	3.50	2.34	8.00	13.06
"15:24:15	22.16	22.38	3.40	3.58	0.55	8.12	85.00	81.40	0.78	0.75	3.70	2.34	8.00	13.06
"15:26:40	21.65	22.54	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.55	3.70	2.34	8.00	13.06
"15:29:05	21.79	23.13	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.75	3.70	2.34	8.00	13.06
"15:31:30	21.81	22.48	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.75	3.70	2.14	8.00	13.06
"15:33:55	22.06	22.44	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.75	3.70	2.14	8.00	13.06
"15:36:20	21.80	22.43	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.75	3.70	2.14	8.00	13.06
"15:38:45	22.28	22.15	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.55	3.70	2.14	8.00	13.06
"15:41:10	21.89	22.40	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.55	3.70	2.14	8.00	13.06
"15:43:35	21.60	22.51	3.52	3.58	0.55	8.12	85.00	81.40	0.58	0.55	3.70	2.14	8.00	13.06
"15:46:00	21.13	22.38	3.52	3.58	0.55	8.12	85.00	81.40	0.98	0.75	3.70	2.14	8.00	13.06
"15:48:25	21.48	22.17	3.52	3.58	0.55	8.12	85.00	78.20	0.98	1.24	3.70	2.14	8.00	13.06
"15:50:50	21.44	22.15	3.52	3.58	0.55	8.12	85.00	78.20	1.18	1.24	3.50	2.14	8.00	13.06
"15:53:15	21.35	22.31	3.52	3.58	0.55	8.12	85.00	78.20	1.38	1.44	3.50	2.14	8.00	13.06
"15:55:40	21.66	22.03	3.52	3.58	0.55	8.12	85.00	78.20	1.59	1.73	3.50	1.95	8.00	13.06
"15:58:05	21.58	22.31	3.52	3.58	0.55	8.12	85.00	78.20	1.79	1.93	3.70	2.15	7.80	13.06
"16:00:30	21.29	22.12	3.52	3.58	0.55	8.12	85.00	78.20	1.79	2.12	3.50	1.95	7.80	13.06
"16:02:55	21.28	21.87	3.40	3.58	0.55	8.12	85.00	78.20	1.79	2.12	3.50	1.95	7.80	13.06
"16:05:20	21.28	22.10	3.40	3.46	0.55	8.12	85.00	78.20	1.99	2.32	3.50	2.15	7.80	13.06

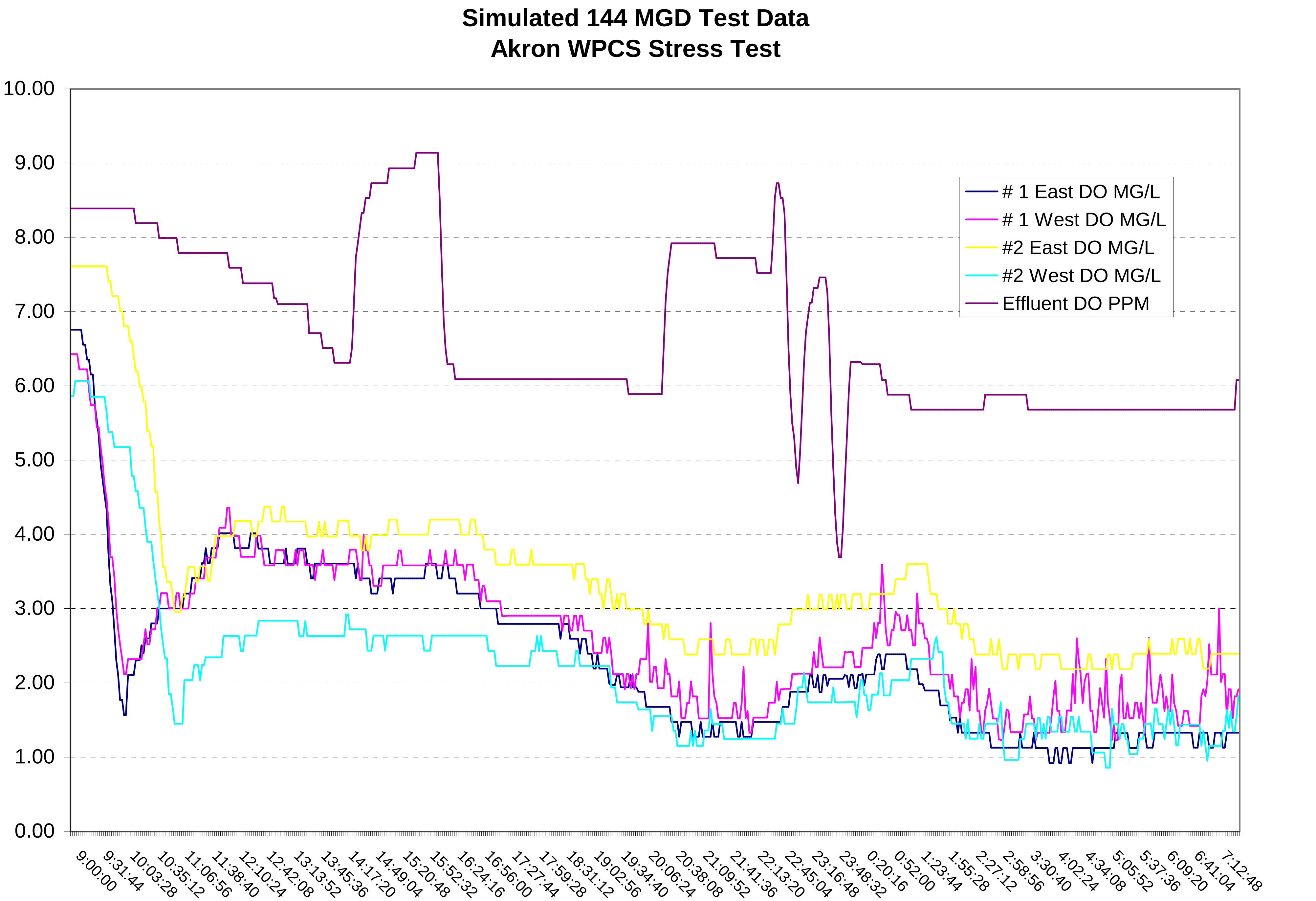
20-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
"16:07:45	21.28	22.23	3.40	3.46	0.55	8.12	85.00	78.20	2.11	2.32	3.70	2.15	7.80	13.06
"16:10:10	21.65	21.98	3.40	3.46	0.55	8.12	85.00	78.20	2.11	2.03	3.50	2.15	7.80	13.06
"16:12:35	21.41	21.98	3.40	3.46	0.55	7.92	85.00	78.20	2.31	2.23	3.50	1.95	7.80	13.06
"16:15:00	21.06	21.98	3.40	3.46	0.55	7.92	85.00	78.20	2.31	2.23	3.50	1.95	7.80	13.06
"16:17:25	21.18	21.98	3.40	3.46	0.55	7.92	85.00	78.20	2.31	2.51	3.50	1.95	7.80	13.06
"16:19:50	21.68	21.98	3.40	3.46	0.55	7.92	85.00	78.20	2.51	2.51	3.50	2.15	7.80	13.04
"16:22:15	21.32	21.82	3.40	3.58	0.55	7.92	85.00	78.20	2.51	2.51	3.50	1.95	7.60	13.04
"16:24:40	21.06	21.82	3.28	3.33	0.55	7.92	85.00	78.20	2.51	2.72	3.50	1.95	7.60	13.04
"16:27:05	21.27	21.77	3.53	3.78	0.55	7.92	85.00	78.20	2.71	2.72	3.50	1.95	7.60	13.04
"16:29:30	21.56	22.11	3.41	3.51	0.55	7.92	85.00	78.20	2.91	2.72	3.50	2.15	7.60	13.04
"16:31:55	21.42	21.89	3.37	3.51	0.55	7.92	85.00	78.20	2.71	2.72	3.50	2.15	7.60	13.04
"16:34:20	21.08	22.28	3.37	3.61	0.55	7.92	82.20	78.20	2.71	2.72	3.30	1.95	7.60	13.04
"16:36:45	21.37	22.00	3.37	3.51	0.55	7.92	82.20	78.20	2.91	2.72	3.30	1.95	7.60	13.04
"16:39:10	21.17	22.16	3.37	3.45	0.55	7.71	82.20	81.70	2.91	2.72	3.51	1.95	7.60	13.04
"16:41:35	21.23	22.03	3.37	3.45	0.55	7.71	82.20	81.70	2.91	2.92	3.31	1.95	7.60	13.04
"16:44:00	20.96	21.76	3.37	3.57	0.55	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.60	13.04
"16:46:25	21.09	21.68	3.35	3.57	0.55	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.60	13.04
"16:48:50	21.03	21.38	3.35	3.57	0.55	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"16:51:15	20.67	21.65	3.35	3.46	0.55	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"16:53:40	20.81	21.65	3.35	3.46	0.55	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"16:56:05	20.81	21.65	3.35	3.32	0.55	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"16:58:30	20.66	20.90	3.35	3.44	0.55	7.71	82.20	78.20	3.11	2.92	3.31	1.95	7.40	13.04
"17:00:55	20.92	21.43	3.35	3.44	0.55	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"17:03:20	20.99	21.43	3.35	3.44	5.13	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"17:05:45	20.35	21.32	3.35	3.44	5.13	7.71	82.20	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"17:08:10	20.59	21.46	3.35	3.44	5.13	7.71	82.50	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"17:10:35	20.43	21.43	3.35	3.44	5.13	7.71	82.50	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"17:13:00	20.75	21.43	3.35	3.44	5.13	7.71	82.50	78.20	2.91	2.92	3.31	1.95	7.40	13.04
"17:15:25	20.69	21.32	3.35	3.44	5.13	7.51	82.50	78.20	3.12	2.81	3.31	1.84	7.19	13.04
"17:17:50	20.83	21.24	3.35	3.44	5.13	7.51	82.50	78.20	3.12	2.81	3.31	1.84	7.19	13.04
"17:20:15	20.78	21.67	3.35	3.44	5.13	7.51	82.50	78.20	3.12	2.81	3.31	1.84	7.19	13.04
"17:22:40	20.86	21.83	3.35	3.44	5.13	7.51	82.50	78.20	2.92	2.81	3.31	1.84	7.19	13.04
"17:25:05	20.84	21.31	3.35	3.44	5.13	7.51	82.50	78.20	2.92	2.81	3.51	1.84	7.19	13.04
"17:27:30	20.90	21.34	3.35	3.44	5.13	7.51	82.50	78.20	2.92	3.01	3.31	2.04	7.19	13.04
"17:29:55	20.91	21.67	3.35	3.44	5.13	7.51	82.50	78.20	2.92	3.01	3.31	1.84	7.19	13.04
"17:32:20	20.65	21.51	3.35	3.44	5.13	7.51	82.50	74.50	3.12	2.80	3.31	1.84	7.19	13.04
"17:34:45	20.85	21.26	3.35	3.44	5.13	7.51	82.50	74.50	3.12	2.80	3.31	1.84	7.19	13.04
"17:37:10	20.33	21.11	3.34	3.44	5.13	7.51	82.50	78.20	2.92	3.00	3.31	2.04	7.19	13.04
"17:39:35	20.99	21.37	3.34	3.32	5.13	7.51	82.50	74.50	3.12	3.00	3.31	2.04	7.19	13.04
"17:42:00	20.70	21.71	3.34	3.45	5.13	7.51	82.50	74.50	3.12	3.00	3.31	1.84	7.19	13.04
"17:44:25	21.47	21.45	3.34	3.45	5.13	7.51	82.50	78.10	3.12	2.80	3.31	1.84	7.19	13.04
"17:46:50	20.96	21.77	3.34	3.45	5.13	7.51	82.50	78.10	3.12	3.01	3.31	1.84	7.19	13.04
"17:49:15	20.78	21.86	3.34	3.45	5.13	7.51	82.50	78.10	3.12	3.01	3.51	1.84	7.19	13.04
"17:51:40	21.15	21.86	3.34	3.45	5.13	7.51	82.50	78.10	3.12	3.01	3.51	1.84	7.19	13.04
"17:54:05	21.15	21.92	3.34	3.45	5.13	7.51	82.50	78.10	3.32	2.80	3.31	1.84	7.19	13.04
"17:56:30	21.51	22.17	3.34	3.45	5.13	7.51	82.50	78.10	3.32	2.80	3.31	2.04	7.19	13.04
"17:58:55	21.35	22.17	3.34	3.45	5.13	7.51	82.50	78.10	3.32	3.01	3.51	2.04	7.19	13.04
"18:01:20	21.61	22.15	3.34	3.45	5.13	7.51	82.50	78.10	3.32	3.01	3.51	2.04	7.19	13.04
"18:03:45	21.61	22.32	3.34	3.57	5.13	7.51	82.50	78.10	3.12	3.01	3.51	2.04	7.19	13.04
"18:06:10	21.12	22.57	3.34	3.57	5.13	7.51	82.50	78.10	3.52	3.21	3.51	2.04	7.19	13.04
"18:08:35	21.50	22.31	3.34	3.57	5.13	7.51	82.50	78.10	3.32	3.00	3.51	2.04	7.19	13.04
"18:11:00	21.30	22.31	3.34	3.57	5.13	7.51	82.50	78.10	3.12	3.20	3.51	2.04	7.19	13.04
"18:13:25	21.55	22.28	3.46	3.57	5.13	7.51	82.50	78.10	3.32	3.20	3.31	1.84	7.19	13.04
"18:15:50	21.28	22.38	3.46	3.57	5.13	7.51	82.50	78.10	3.32	3.20	3.51	2.05	7.19	13.04
"18:18:15	21.46	22.38	3.46	3.57	5.13	7.51	82.50	78.10	3.32	3.20	3.51	2.05	7.19	13.04
"18:20:40	21.60	22.41	3.46	3.56	5.13	7.51	79.50	78.10	3.32	3.20	3.51	2.05	7.19	13.04
"18:23:05	21.59	22.32	3.46	3.56	5.13	7.51	82.30	78.10	3.32	3.20	3.51	2.05	7.19	13.04
"18:25:30	21.83	22.32	3.46	3.44	5.13	7.51	82.30	74.70	3.32	3.20	3.71	2.05	7.19	13.04
"18:27:55	21.46	22.31	3.46	3.57	5.13	7.51	82.30	74.70	3.32	3.20	3.51	2.34	6.99	13.04
"18:30:20	21.51	22.11	3.34	3.56	5.13	7.51	82.30	74.70	3.32	3.20	3.51	2.14	6.99	13.04
"18:32:45	21.51	22.11	3.34	3.56	5.13	7.51	82.30	74.70	3.32	3.20	3.51	2.14	6.99	13.04
"18:35:10	21.33	22.16	3.34	3.57	5.13	7.51	82.30	74.70	3.12	3.20	3.51	2.15	6.99	13.04
"18:37:35	21.59	22.09	3.34	3.57	5.13	7.51	79.50	74.70	3.12	3.20	3.71	2.15	6.99	13.04
"18:40:00	21.38	22.09	3.34	3.57	5.13	7.51	79.50	74.70	3.12	3.20	3.51	2.15	6.99	13.04
"18:42:25	21.36	21.83	3.34	3.57	5.13	7.31	79.50	74.70	3.12	3.20	3.51	2.15	6.99	13.04
"18:44:50	20.62	21.89	3.34	3.57	5.13	7.31	79.50	74.70	3.12	3.20	3.51	2.15	6.99	13.04
"18:47:15	20.90	21.90	3.34	3.59	5.13	7.31	82.30	74.70	3.12	3.20	3.51	2.15	6.99	13.04
"18:49:40	21.06	21.90	3.34	3.58	5.13	7.31	82.30	74.70	3.12	3.20	3.51	2.15	6.99	13.04
"18:52:05	21.32	21.91	3.34	3.46	5.13	7.31	82.30	74.70	3.12	3.20	3.51	2.15	6.99	13.04
"18:54:30	20.94	21.91	3.34	3.58	5.13	7.31	82.30	74.70	3.12	3.20	3.51	1.95	6.99	13.04
"18:56:55	21.06	21.64	3.34	3.58	5.13	7.31	82.30	74.70	3.12	3.20	3.51	1.95	6.99	13.04
"18:59:20	21.06	21.64	3.34	3.46	5.13	7.31	79.50	74.70	3.12	3.20	3.51	1.95	6.99	13.04
"19:01:45	21.34	22.05	3.34	3.44	5.13	7.31	79.50	74.70	3.12	3.20	3.51	1.95	6.99	13.04
"19:04:10	21.19	21.86	3.34	3.57	5.13	7.31	79.50	74.70	3.32	3.20	3.51	1.95	6.99	13.04
"19:06:35	20.74	21.65	3.34	3.57	5.13	7.31	82.30	74.70	3.32	3.20	3.51	1.95	6.99	13.04
"19:09:00	21.25	22.03	3.34	3.57	5.13	7.31	82.30	74.70	3.32	3.20	3.51	1.95	6.99	13.04
"19:11:25	21.41	21.99	3.46	3.57	5.13	7.31	82.30	74.70	3.12	3.20	3.51	1.95	6.99	13.04
"19:13:50	21.43	22.09	3.34	3.57	5.13	7.31	82.30	74.70	3.32	3.20	3.51	1.95	6.99	13.04
"19:16:15	21.65	22.34	3.34	3.57	5.13	7.31	79.50	74.70	3.32	3.00	3.51	1.95	6.99	13.04
"19:18:40	20.87	22.22	3.34	3.56	5.13	7.31	79.50	74.70	3.32	3.00	3.51	1.95	6.99	13.04
"19:21:05	21.28	22.22	3.34	3.56	5.13	7.31	79.50	74.70	3.32	3.20	3.51	1.95	6.99	13.04
"19:23:30	21.47	21.91	3.46	3.56	5.13	7.31	82.40	74.70	3.12	3.20	3.51	1.95	6.99	13.04
"19:25:55	21.46	22.26	3.46	3.56	5.13	7.31	82.40	74.70	3.12	3.00	3.51	2.15	6.99	13.04
"19:28:20	21.69	22.01	3.46	3.56	5.13	7.31	82.40	78.10	3.12	3.00	3.31	2.15	6.99	13.04
"19:30:45	20.99	22.09	3.34	3.56	5.13	7.31	82.40	78.10	3.12	3.00	3.31	1.95	6.99	13.04
"19:33:10	21.41	22.18	3.34	3.56	5.13	7.31	82.40	78.10	3.32	3.00	3.51	1.95	6.99	13.04
"19:35:35	21.32	21.93	3.34	3.56	5.13	7.31	82.40	78.10	3.32	3.00	3.51	1.95	6.99	13.04
"19:38:00	21.58	22.04	3.34	3.56	5.13	7.31	82.40	74.50	2.92	3.00	3.31	1.95	6.99	13.04
"19:40:25	21.58	22.06	3.34	3.56	5.13	7.31	82.40	77.90	2.92	3.00	3.31	1.95	6.99	13.04

20-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
"19:42:50	21.16	22.30	3.34	3.56	5.13	7.31	82.40	77.90	2.92	3.00	3.31	1.95	6.99	13.04
"19:45:15	21.42	22.05	3.34	3.56	5.13	7.31	82.40	74.90	3.12	3.00	3.31	1.95	6.99	13.04
"19:47:40	21.53	22.05	3.34	3.56	5.13	7.31	82.40	74.90	3.12	3.00	3.11	1.95	6.99	13.04
"19:50:05	21.28	21.76	3.34	3.56	5.13	7.31	82.40	74.90	3.12	3.00	3.11	1.95	6.99	13.04
"19:52:30	21.16	21.95	3.34	3.56	5.13	7.31	82.40	78.20	3.12	3.00	3.11	1.74	6.99	13.04
"19:54:55	20.88	22.09	3.34	3.56	5.13	7.31	82.40	78.20	2.92	3.00	3.11	1.74	6.99	13.04
"19:57:20	21.52	21.68	3.46	3.56	5.13	7.31	82.40	78.20	2.92	3.00	3.11	1.74	6.99	13.04
"19:59:45	21.13	21.99	3.34	3.56	5.13	7.31	82.40	78.20	2.92	3.00	3.11	1.74	6.99	13.04
"20:02:10	21.46	21.92	3.34	3.56	5.13	7.31	82.40	78.20	2.92	3.00	3.11	1.74	6.99	13.04
"20:04:35	21.20	21.95	3.34	3.56	5.13	7.31	82.40	78.20	2.92	2.80	3.11	1.74	6.99	13.04
"20:07:00	21.48	22.26	3.34	3.56	5.13	7.31	82.40	78.20	2.92	2.80	3.31	1.74	6.99	13.04
"20:09:25	21.27	21.99	3.34	3.56	5.13	7.31	82.40	78.20	2.92	2.80	3.31	1.74	6.99	13.04
"20:11:50	21.50	21.86	3.34	3.56	5.13	7.31	82.40	74.60	2.72	2.80	3.11	1.54	6.99	13.04
"20:14:15	21.78	22.23	3.34	3.56	5.13	7.31	82.40	74.60	2.92	2.80	2.90	1.54	6.99	13.04
"20:16:40	21.78	22.23	3.34	3.56	5.13	7.31	82.40	74.60	2.92	2.80	2.90	1.54	6.99	13.04
"20:19:05	22.08	22.09	3.48	3.56	5.13	7.31	82.40	74.60	2.92	2.80	2.90	1.75	6.99	13.04
"20:21:30	21.47	22.18	3.48	3.56	5.13	7.31	82.40	78.20	2.92	2.80	2.90	1.55	6.99	13.04
"20:23:55	21.57	22.47	3.48	3.56	5.13	7.31	82.40	78.20	2.92	2.80	2.90	1.55	6.99	13.04
"20:26:20	21.83	22.23	3.48	3.56	5.13	7.31	82.40	78.20	2.71	2.80	3.11	1.55	6.99	13.04
"20:28:45	21.89	22.43	3.48	3.56	5.13	7.31	82.40	78.20	2.71	2.80	3.11	1.55	6.99	13.04
"20:31:10	21.62	22.54	3.48	3.69	5.13	7.31	82.40	78.20	2.51	2.80	3.11	1.55	6.99	13.04
"20:33:35	21.93	22.60	3.48	3.57	5.13	7.31	82.40	78.20	2.71	2.80	3.11	1.55	6.99	13.04
"20:36:00	22.06	22.60	3.48	3.69	5.13	7.31	82.40	78.20	2.91	2.60	3.11	1.55	6.99	13.04
"20:38:25	22.06	22.96	3.73	3.57	5.13	7.31	82.40	78.20	2.91	2.60	2.90	1.55	6.99	13.04
"20:40:50	22.08	22.70	3.73	3.58	5.13	7.31	82.40	78.20	2.91	2.60	2.90	1.55	6.99	13.04
"20:43:15	21.83	22.44	3.60	3.58	5.13	7.31	82.40	78.20	2.91	2.60	2.90	1.55	6.99	13.04
"20:45:40	22.15	22.48	3.60	3.46	5.13	7.31	82.40	78.20	2.71	2.60	2.90	1.55	6.99	13.04
"20:48:05	21.89	22.38	3.60	3.47	5.13	7.31	82.40	78.20	2.71	2.60	3.11	1.55	6.99	13.04
"20:50:30	22.12	22.56	3.60	3.45	5.13	7.31	82.40	78.20	2.71	2.60	2.90	1.55	6.99	13.04
"20:52:55	22.14	22.62	3.60	3.45	5.13	7.31	82.40	78.20	2.71	2.60	2.90	1.55	6.99	13.04
"20:55:20	22.18	22.28	3.60	3.58	5.13	7.31	82.40	78.20	2.51	2.60	2.90	1.56	6.99	13.04
"20:57:45	21.38	22.38	3.60	3.45	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.56	6.99	13.04
"21:00:10	21.97	22.38	3.60	3.57	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.56	6.99	13.04
"21:02:35	21.97	21.99	3.60	3.57	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.56	6.99	13.04
"21:05:00	22.23	22.09	3.60	3.45	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.56	6.99	13.04
"21:07:25	22.11	22.35	3.60	3.58	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.56	6.99	13.04
"21:09:50	21.46	22.27	3.60	3.46	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.56	6.99	13.04
"21:12:15	22.02	22.41	3.60	3.46	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.35	6.99	13.04
"21:14:40	22.02	22.82	3.60	3.46	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.35	6.99	13.04
"21:17:05	22.25	22.77	3.60	3.46	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.35	6.99	13.04
"21:19:30	21.91	22.66	3.60	3.58	5.13	7.31	82.40	78.20	2.51	2.60	2.70	1.35	6.99	13.04
"21:21:55	22.16	22.68	3.60	3.58	5.13	7.31	82.40	78.20	2.31	2.60	2.70	1.35	6.99	13.04
"21:24:20	22.66	23.20	3.60	3.61	5.13	7.31	85.20	78.20	2.31	2.60	2.70	1.35	6.99	13.04
"21:26:45	22.56	23.02	3.60	3.61	5.13	7.31	85.20	78.20	2.31	2.60	2.70	1.35	6.99	13.04
"21:29:10	21.99	23.23	3.60	3.61	5.13	7.31	85.20	78.20	2.31	2.60	2.70	1.35	6.79	13.04
"21:31:35	22.69	23.04	3.60	3.61	5.13	7.31	85.20	78.20	2.51	2.60	2.70	1.35	6.79	13.04
"21:34:00	22.76	23.37	3.60	3.61	5.13	7.31	85.20	78.20	2.51	2.32	2.70	1.35	6.79	13.04
"21:36:25	22.90	23.61	3.60	3.73	5.13	7.31	85.20	78.20	2.51	2.32	2.70	1.35	6.79	13.04
"21:38:50	22.83	23.64	3.60	3.73	5.13	7.31	82.20	78.20	2.31	2.32	2.70	1.35	6.79	13.04
"21:41:15	22.83	23.53	3.60	3.86	5.13	7.31	82.20	78.20	2.31	2.32	2.50	1.35	6.79	13.04
"21:43:40	22.83	23.55	3.60	3.86	5.13	7.31	82.20	78.20	2.31	2.32	2.50	1.35	6.79	13.04
"21:46:05	22.76	23.83	3.60	3.87	5.13	7.31	82.20	78.20	2.31	2.32	2.50	1.09	6.79	13.04
"21:48:30	23.53	23.83	3.60	3.87	5.13	7.31	82.20	78.20	2.31	2.32	2.50	1.09	6.79	13.04
"21:50:55	23.41	23.64	3.86	3.87	5.13	7.31	82.20	78.20	2.31	2.32	2.50	1.09	6.79	13.04
"21:53:20	23.44	23.89	3.86	3.75	5.13	7.31	82.20	78.20	2.31	2.32	2.71	1.09	6.79	13.04
"21:55:45	23.61	24.43	3.86	3.75	5.13	7.31	82.20	78.20	2.31	2.32	2.91	1.09	6.79	13.04
"21:58:10	23.31	23.83	3.86	3.60	5.13	7.31	82.20	78.20	2.31	2.32	2.71	1.09	6.79	13.04
"22:00:35	23.48	24.19	3.86	3.72	5.13	7.31	82.20	78.20	2.31	2.32	2.51	1.37	6.79	13.04
"22:03:00	23.57	24.33	3.86	3.72	5.13	7.31	82.20	78.20	2.31	2.12	2.51	1.17	6.79	13.04
"22:05:25	23.14	23.89	3.86	3.85	5.13	7.31	82.20	78.20	2.10	2.12	2.51	1.17	6.79	13.04
"22:07:50	23.56	24.15	3.86	3.74	5.13	7.11	82.20	81.60	2.30	2.12	2.51	1.17	6.79	13.04
"22:10:15	24.00	23.70	3.86	3.87	5.13	7.11	85.10	78.20	1.93	2.32	2.51	1.17	6.79	13.04
"22:12:40	22.96	24.01	3.86	3.75	5.13	7.11	85.10	78.20	1.93	2.12	2.51	1.17	6.79	13.04
"22:15:05	23.28	24.09	3.86	3.75	5.13	7.11	85.10	78.20	1.93	2.12	2.51	1.17	6.79	13.04
"22:17:30	23.30	24.10	3.86	3.75	5.13	7.11	82.20	78.20	2.31	2.12	2.51	1.17	6.79	13.04
"22:19:55	22.92	24.05	3.86	3.75	5.13	7.11	82.20	78.20	2.31	2.12	2.51	0.96	6.79	13.04
"22:22:20	23.34	23.72	3.86	3.75	5.13	7.11	82.20	78.20	2.11	2.12	2.51	0.96	6.79	13.04
"22:24:45	23.71	24.16	3.86	3.75	5.13	7.11	82.20	81.70	2.11	2.12	2.51	1.17	6.79	13.04
"22:27:10	23.44	23.69	3.86	3.75	5.13	7.11	82.20	78.20	2.11	2.12	2.31	1.17	6.79	13.04
"22:29:35	22.88	23.73	3.86	3.75	5.13	7.11	85.10	78.20	2.11	2.12	2.51	1.17	6.79	13.04
"22:32:00	22.86	23.40	3.86	3.75	5.13	7.11	85.10	78.20	2.11	2.12	2.51	0.96	6.79	13.04
"22:34:25	22.54	23.95	3.86	3.63	5.13	7.11	85.10	78.20	2.11	2.12	2.51	1.17	6.79	13.04
"22:36:50	22.73	23.16	3.74	3.63	5.13	7.11	82.30	78.20	1.98	2.12	2.31	1.17	6.79	13.04
"22:39:15	23.03	23.54	3.74	3.63	5.13	7.11	82.30	78.20	2.11	2.12	2.51	1.17	6.79	13.04
"22:41:40	23.00	23.55	3.74	3.63	5.13	7.11	82.30	78.20	1.98	2.12	2.51	1.17	6.79	13.04
"22:44:05	22.97	23.25	3.74	3.63	5.13	7.11	82.30	78.20	2.11	2.12	2.51	1.17	6.79	13.04
"22:46:30	22.97	23.18	3.74	3.63	5.13	7.11	82.30	78.20	2.11	2.12	2.31	1.17	6.79	13.04
"22:48:55	22.86	23.66	3.74	3.63	5.13	7.11	82.30	78.20	2.11	2.12	2.31	1.17	6.79	13.04
"22:51:20	22.88	23.56	3.74	3.63	5.13	7.11	82.30	78.20	2.11	2.12	2.31	1.17	6.79	13.04
"22:53:45	22.88	23.57	3.74	3.63	5.13	7.11	82.30	78.20	2.11	2.12	2.31	1.17	6.79	13.04
"22:56:10	23.47	23.72	3.74	3.63	5.13	7.11	82.30	78.20	2.11	2.12	2.31	1.17	6.79	13.04
"22:58:35	22.50	23.72	3.74	3.63	5.13	7.11	82.30	78.20	2.31	1.93	2.31	1.17	6.79	13.04
"23:01:00	23.65	24.01	3.74	3.63	5.13	7.11	82.30	78.20	2.31	1.93	2.31	1.17	6.79	13.04
"23:03:25	23.35	23.69	3.74	3.76	5.13	7.11	82.30	81.70	2.10	1.93	2.51	1.17	6.79	13.04
"23:05:50	23.52	23.73	3.74	3.76	5.13	7.11	82.30	78.10	2.10	1.93	2.31	1.17	6.79	13.04
"23:08:15	22.99	23.66	3.74	3.64	5.13	7.11	82.30	78.10	2.30	2.12	2.51	1.17	6.79	13.04
"23:10:40	22.91	23.88	3.74	3.64	5.13	7.11	82.30	78.10	2.30	2.12	2.51	1.17	6.79	13.04
"23:13:05	23.43	23.83	3.74	3.63	5.13	7.11	82.30	78.10	2.30	1.93	2.51	1.17	6.79	13.04
"23:15:30	23.44	23.70	3.74	3.63	5.13	7.11	82.30	78.10	2.30	2.12	2.51	1.17	6.79	13.04

20-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
"23:17:55	23.48	23.86	3.74	3.75	5.13	7.11	82.30	81.20	2.30	2.12	2.51	1.17	6.79	13.04
"23:20:20	23.34	23.88	3.86	3.75	5.13	7.11	82.30	78.10	2.30	2.12	2.51	1.17	6.79	13.04
"23:22:45	23.08	24.17	3.86	3.75	5.13	7.11	82.30	81.10	2.10	2.12	2.51	1.17	6.79	13.04
"23:25:10	23.15	23.76	3.86	3.75	15.50	7.11	82.30	81.10	2.17	2.12	2.51	1.17	6.79	13.04
"23:27:35	23.14	23.76	3.86	3.75	15.50	7.11	82.30	81.10	2.37	2.12	2.51	1.17	6.79	13.04
"23:30:00	23.21	23.49	3.86	3.75	15.50	7.11	82.30	81.10	2.17	2.12	2.51	1.17	6.79	13.04
"23:32:25	23.36	23.77	3.86	3.63	15.50	7.11	82.30	81.10	2.17	1.92	2.51	1.17	6.79	13.04
"23:34:50	23.46	23.70	3.86	3.63	15.50	7.11	82.30	81.10	2.11	1.92	2.72	1.17	6.79	13.04
"23:37:15	22.99	23.57	3.86	3.62	15.50	7.11	82.30	81.10	2.11	2.12	2.51	1.17	6.79	13.04
"23:39:40	23.03	23.83	3.86	3.74	5.43	7.11	82.30	78.10	2.11	2.12	2.51	1.17	6.79	13.04
"23:42:05	22.59	23.75	3.86	3.62	5.43	7.11	79.50	78.10	2.11	2.12	2.51	1.17	6.79	13.04
"23:44:30	22.94	23.73	3.47	3.75	5.43	7.11	82.40	78.10	1.95	2.12	2.51	1.17	6.79	13.04
"23:46:55	22.63	23.91	3.59	3.87	5.43	7.11	82.40	78.10	2.11	2.12	2.51	1.17	6.79	13.04
"23:49:20	22.42	23.56	3.59	3.87	5.43	7.11	82.40	78.10	2.11	2.12	2.51	1.17	6.79	13.04
"23:51:45	22.80	23.06	3.59	3.87	5.43	7.11	82.40	78.10	2.11	2.12	2.51	1.37	6.79	13.04
"23:54:10	22.78	23.15	3.59	3.87	5.43	7.11	82.40	78.10	2.11	2.12	2.51	1.37	6.79	13.04
"23:56:35	22.23	23.15	3.59	3.87	5.43	7.11	79.50	78.10	2.11	2.12	2.51	1.17	6.79	13.04
"23:59:00	22.23	23.08	3.47	3.75	5.43	7.11	79.50	78.10	1.99	2.12	2.51	1.37	6.79	13.04
"00:01:25	22.27	22.95	3.52	3.76	6.04	7.02	79.80	79.10	1.99	2.12	2.70	1.16	6.62	13.04
"00:03:50	22.58	22.91	3.52	3.76	6.04	7.02	79.80	79.10	2.21	2.02	2.51	1.16	6.62	13.04
"00:06:15	21.80	22.64	3.52	3.76	6.04	7.02	79.80	79.10	2.21	1.92	2.51	1.16	6.62	13.04
"00:08:40	21.74	22.57	3.52	3.87	6.04	7.02	79.80	79.10	1.97	2.13	2.51	1.36	6.62	13.04
"00:11:05	21.49	22.15	3.52	3.74	6.04	7.02	79.80	79.10	1.97	2.13	2.51	1.36	6.62	13.04
"00:13:30	21.36	22.44	3.52	3.74	6.04	7.02	79.80	79.10	2.11	1.93	2.51	1.36	6.62	13.04
"00:15:55	21.61	22.19	3.52	3.74	6.04	7.02	79.80	79.10	2.11	2.12	2.51	1.36	6.62	13.04
"00:18:20	21.65	22.45	3.52	3.74	6.04	7.02	79.80	79.10	2.11	2.12	2.51	1.36	6.62	13.04
"00:20:45	21.66	22.41	3.35	3.74	6.04	7.02	79.80	79.10	2.31	2.12	2.51	1.16	6.62	13.04
"00:23:10	21.55	22.41	3.35	3.74	6.04	7.02	79.80	79.10	2.31	2.12	2.51	1.36	6.62	13.04
"00:25:35	21.47	22.34	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.12	2.51	1.36	6.62	13.04
"00:28:00	21.80	22.34	3.35	3.74	6.04	7.02	79.80	79.10	1.98	2.12	2.51	1.16	6.62	13.04
"00:30:25	21.53	22.67	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.12	2.51	1.16	6.62	13.04
"00:32:50	21.29	22.76	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.12	2.51	1.36	6.62	13.04
"00:35:15	21.40	22.38	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.12	2.51	1.36	6.62	13.04
"00:37:40	22.17	22.66	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.32	2.51	1.36	6.62	13.04
"00:40:05	21.86	22.38	3.35	3.74	6.04	7.02	79.80	79.10	2.08	2.22	2.51	1.36	6.62	13.04
"00:42:30	21.88	22.63	3.35	3.74	6.04	7.02	79.80	79.10	2.08	2.22	2.72	1.36	6.62	13.04
"00:44:55	22.09	22.89	3.35	3.74	6.04	7.02	79.80	79.10	1.91	2.22	2.72	1.36	6.62	13.04
"00:47:20	21.79	22.59	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.22	2.72	1.36	6.62	13.04
"00:49:45	21.87	22.38	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.02	2.51	1.36	6.62	13.04
"00:52:10	22.28	22.50	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.22	2.51	1.36	6.62	13.04
"00:54:35	21.93	22.32	3.35	3.74	6.04	7.02	79.80	79.10	2.11	2.22	2.51	1.36	6.62	13.04
"00:57:00	21.67	22.32	3.35	3.74	6.04	7.02	76.60	79.10	2.11	2.02	2.71	1.16	6.62	13.04
"00:59:25	21.81	22.31	3.35	3.74	6.04	7.02	76.60	79.10	1.95	2.22	2.71	1.16	6.62	13.04
"01:01:50	21.44	22.11	3.35	3.74	6.04	7.02	76.60	79.10	2.11	2.22	2.71	1.16	6.62	13.04
"01:04:15	21.28	22.06	3.35	3.74	6.04	7.02	76.60	79.10	2.11	2.22	2.71	1.16	6.62	13.04
"01:06:40	21.27	21.80	3.35	3.61	6.04	7.02	76.60	74.40	2.11	2.22	2.71	1.16	6.62	13.04
"01:09:05	21.21	22.12	3.35	3.61	6.04	7.02	76.60	74.40	2.11	2.22	2.71	1.16	6.62	13.04
"01:11:30	20.99	21.86	3.35	3.61	6.04	7.02	76.60	74.40	1.96	2.22	2.71	1.16	6.62	13.04
"01:13:55	21.10	21.77	3.35	3.61	6.04	7.02	76.60	74.40	1.96	2.22	2.71	1.16	6.62	13.04
"01:16:20	21.41	21.73	3.35	3.61	6.04	7.02	76.60	74.40	2.11	2.02	2.51	1.16	6.62	13.04
"01:18:45	21.09	21.79	3.35	3.61	6.04	7.02	76.60	74.40	2.11	2.02	2.51	1.16	6.62	13.04
"01:21:10	20.82	21.55	3.35	3.61	6.04	7.02	73.80	74.40	2.11	2.02	2.51	1.36	6.62	13.04
"01:23:35	20.87	21.27	3.22	3.61	6.04	7.02	73.80	74.40	1.91	2.02	2.51	1.36	6.62	13.04
"01:26:00	20.68	21.27	3.22	3.61	6.04	7.02	73.80	74.40	1.91	2.02	2.51	1.36	6.62	13.04
"01:28:25	20.56	21.62	3.22	3.61	6.04	7.02	73.80	74.40	1.91	1.92	2.51	1.36	6.62	13.04
"01:30:50	20.65	20.68	3.22	3.35	6.04	7.02	73.80	74.40	1.91	1.92	2.51	1.36	6.62	13.04
"01:33:15	20.41	20.72	3.22	3.35	6.04	7.02	73.80	74.40	1.91	2.12	2.51	1.36	6.62	13.04
"01:35:40	20.06	20.41	3.22	3.35	6.04	7.02	73.80	74.40	1.91	1.93	2.51	1.36	6.62	13.04
"01:38:05	19.52	20.44	3.22	3.32	6.04	7.02	73.80	74.40	1.91	1.93	2.51	1.36	6.62	13.04
"01:40:30	19.62	20.23	3.22	3.32	6.04	7.02	73.80	70.80	1.91	1.93	2.51	1.36	6.62	13.04
"01:42:55	19.19	20.35	3.22	3.32	6.04	7.02	73.80	70.80	1.91	1.93	2.51	1.36	6.62	13.04
"01:45:20	19.53	19.58	2.96	3.32	6.04	7.02	73.80	70.80	1.91	1.93	2.51	1.36	6.62	13.04
"01:47:45	19.71	19.87	2.96	3.31	6.04	7.02	73.80	70.80	1.91	1.73	2.51	1.36	6.62	13.04
"01:50:10	19.40	20.02	3.08	3.31	6.04	7.02	73.80	70.80	1.71	1.73	2.51	1.16	6.62	13.04
"01:52:35	19.03	20.02	3.08	3.31	6.04	7.02	73.80	70.80	1.71	1.93	2.51	1.16	6.62	13.04
"01:55:00	19.92	19.58	3.08	3.29	6.04	7.02	73.80	70.80	1.79	1.82	2.51	1.16	6.62	13.04
"01:57:25	19.66	20.09	3.08	3.29	6.04	7.02	73.80	70.80	1.59	1.82	2.51	1.16	6.62	13.04
"01:59:50	19.39	19.78	3.08	3.29	6.04	7.31	73.80	70.80	1.59	1.62	2.31	1.16	6.62	13.04
"02:02:15	19.68	20.31	3.08	3.29	6.04	7.31	73.80	70.80	1.59	1.62	2.31	1.16	6.62	13.04
"02:04:40	19.82	19.94	3.08	3.29	6.04	7.31	73.80	70.80	1.59	1.62	2.31	1.16	6.62	13.04
"02:07:05	19.43	19.90	3.08	3.29	6.04	7.31	73.80	70.80	1.19	1.62	2.11	0.87	6.62	13.04
"02:09:30	19.06	19.89	3.08	3.29	6.04	7.31	73.80	70.80	1.19	1.34	2.11	0.87	6.62	13.04
"02:11:55	19.32	19.74	3.08	3.29	6.04	7.31	73.80	70.80	1.19	1.34	2.11	0.87	6.62	13.04
"02:14:20	19.40	19.80	3.08	3.29	6.04	7.31	73.80	70.80	1.19	1.13	1.97	0.87	6.62	13.04
"02:16:45	19.51	19.62	3.08	3.29	6.04	7.31	73.80	70.80	1.19	1.13	2.17	0.87	6.62	13.04
"02:19:10	19.19	19.53	3.08	3.29	6.04	7.31	73.80	70.80	1.19	1.13	1.92	0.87	6.62	13.04
"02:21:35	19.14	19.71	3.08	3.29	6.04	7.31	73.80	70.80	0.99	1.34	1.92	0.87	6.62	13.04
"02:24:00	18.48	19.37	3.08	3.29	6.04	7.31	71.00	70.80	1.19	1.34	1.92	0.87	6.62	13.04
"02:26:25	19.01	19.11	3.08	3.17	6.04	7.31	71.00	70.80	1.19	1.34	1.92	0.87	6.62	13.04
"02:28:50	18.77	19.32	3.08	3.05	6.04	7.31	71.00	70.80	1.19	1.34	1.92	0.87	6.99	13.04
"02:31:15	18.45	18.98	3.08	3.05	6.04	7.31	71.00	70.80	1.19	1.13	1.92	0.87	6.99	13.04
"02:33:40	18.73	18.82	3.08	3.05	6.04	7.31	71.00	70.80	1.19	1.13	1.92	0.87	6.99	13.04
"02:36:05	18.69	19.24	3.08	3.05	6.04	7.31	71.00	70.80	0.99	1.13	1.92	0.87	6.99	13.04
"02:38:30	18.79	19.07	3.08	3.05	6.04	7.31	71.00	70.80	0.99	1.13	1.92	0.87	6.99	13.04
"02:40:55	18.75	18.52	3.08	3.05	6.04	7.31	71.00	70.80	0.99	1.13	1.92	0.87	6.99	13.04
"02:43:20	18.57	18.57	3.08	3.05	6.04	7.31	71.00	70.80	0.99	1.13	1.92	0.87	6.99	13.04
"02:45:45	18.64	18.82	2.83	3.05	6.04	7.51	71.00	70.80	1.19	1.13	2.12	0.87	6.99	13.04
"02:48:10	18.23	18.45	2.83	3.05	6.04	7.51	71.00	70.80	0.99	1.13	1.92	0.87	6.99	13.04
"02:50:35	18.06	18.19	2.95	3.17	6.04	7.51	71.00	70.80	0.99	1.13	1.92	0.87	6.99	13.04

20-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
"02:53:00	18.10	18.19	2.95	3.17	6.04	7.51	71.00	67.30	1.19	1.13	2.12	0.87	6.99	13.04
"02:55:25	17.57	18.29	2.95	3.05	6.04	7.51	67.90	67.30	1.19	1.13	2.12	0.58	6.99	13.04
"02:57:50	18.04	18.42	2.95	3.05	6.04	7.51	67.90	67.30	1.19	1.13	2.12	0.58	6.99	13.04
"03:00:15	17.93	18.22	2.95	2.93	6.04	7.51	67.90	67.30	1.19	1.13	2.12	0.78	6.99	13.04
"03:02:40	17.97	17.95	2.95	2.93	6.04	7.51	67.90	67.30	1.19	1.13	1.92	0.78	6.99	13.04
"03:05:05	17.65	18.00	2.95	2.93	6.04	7.51	67.90	67.30	1.19	1.13	1.92	0.78	6.99	13.04
"03:07:30	17.85	17.84	2.95	2.93	6.04	7.51	67.90	67.30	0.99	1.13	1.92	0.78	6.99	13.04
"03:09:55	17.49	17.65	2.95	2.81	6.04	7.51	67.90	67.30	0.99	1.13	1.92	0.78	6.99	13.04
"03:12:20	17.39	17.61	2.82	2.81	6.04	7.51	67.90	67.30	1.19	1.13	1.92	0.78	6.99	13.04
"03:14:45	17.20	17.68	2.82	2.81	6.04	7.51	67.90	67.30	1.19	1.34	1.92	0.58	6.99	13.04
"03:17:10	16.89	17.13	2.82	2.81	6.04	7.51	67.90	67.30	1.19	1.13	1.92	0.58	6.99	13.04
"03:19:35	16.78	16.81	2.82	2.81	6.04	7.51	67.90	67.30	1.19	1.13	1.92	0.58	6.99	13.04
"03:22:00	16.52	16.93	2.82	2.68	6.04	7.51	67.90	63.60	0.99	1.13	2.12	0.78	6.99	13.04
"03:24:25	16.81	16.87	2.70	2.80	6.04	7.51	67.90	63.60	0.99	1.13	2.12	0.78	6.99	13.04
"03:26:50	16.60	16.84	2.70	2.80	6.04	7.51	67.90	66.80	0.99	1.13	2.12	0.78	6.99	13.04
"03:29:15	17.01	16.56	2.70	2.80	6.04	7.51	67.90	66.80	0.79	1.13	1.92	0.78	6.99	13.04
"03:31:40	16.46	16.72	2.70	2.80	6.04	7.51	67.90	66.80	0.99	1.13	1.92	0.78	6.99	13.04
"03:34:05	16.46	16.91	2.70	2.80	6.04	7.51	67.90	63.60	0.99	1.13	1.92	0.78	6.99	13.04
"03:36:30	16.75	16.57	2.70	2.80	6.04	7.51	67.90	63.60	0.99	1.13	1.92	0.78	6.99	13.04
"03:38:55	16.49	16.78	2.70	2.80	6.04	7.51	67.90	67.20	0.99	1.13	1.92	0.78	6.99	13.04
"03:41:20	16.23	16.49	2.70	2.80	6.04	7.51	67.90	67.20	0.99	1.13	1.92	0.58	6.99	13.04
"03:43:45	16.28	16.25	2.70	2.80	6.04	7.51	67.90	67.20	0.79	1.13	1.92	0.78	6.99	13.04
"03:46:10	16.67	16.04	2.70	2.80	6.04	7.51	67.90	63.60	0.99	1.13	1.72	0.78	6.99	13.04
"03:48:35	16.18	16.04	2.70	2.68	6.04	7.51	67.90	63.60	0.99	1.13	1.72	0.78	6.99	13.04
"03:51:00	16.45	16.14	2.70	2.55	6.04	7.51	67.90	63.60	0.99	1.13	1.72	0.58	6.99	13.04
"03:53:25	16.13	16.17	2.70	2.55	6.04	7.51	67.90	63.60	0.79	1.13	1.72	0.58	6.99	13.04
"03:55:50	16.13	16.38	2.57	2.55	6.04	7.51	67.90	63.60	0.99	1.13	1.72	0.58	6.99	13.04
"03:58:15	16.13	15.88	2.57	2.69	6.04	7.51	65.10	63.60	0.99	1.13	1.72	0.78	6.99	13.04
"04:00:40	15.83	16.02	2.57	2.69	6.04	7.51	65.10	63.60	0.79	1.13	1.72	0.78	6.99	13.04
"04:03:05	16.57	15.87	2.57	2.69	6.04	7.51	65.10	63.60	0.99	1.13	1.72	0.58	6.99	13.04
"04:05:30	16.30	16.07	2.57	2.69	6.04	7.51	65.10	63.60	0.99	1.13	1.72	0.78	6.99	13.04
"04:07:55	16.04	15.80	2.57	2.69	6.04	7.51	65.10	63.60	0.79	1.13	1.72	0.78	6.99	13.04
"04:10:20	16.04	16.15	2.57	2.69	6.04	7.51	65.10	63.60	0.79	1.13	1.72	0.78	6.99	13.04
"04:12:45	16.25	15.89	2.57	2.69	6.04	7.51	65.10	63.60	0.99	1.13	1.72	0.78	6.99	13.04
"04:15:10	15.79	15.81	2.57	2.69	6.04	7.51	65.10	63.60	0.99	1.13	1.72	0.78	6.99	13.04
"04:17:35	16.04	16.07	2.57	2.69	6.04	7.51	65.10	63.60	0.99	1.13	1.72	0.58	6.99	13.04
"04:20:00	16.13	15.97	2.57	2.69	6.04	7.51	65.10	63.60	0.99	1.13	1.72	0.87	6.99	13.04
"04:22:25	16.38	15.93	2.57	2.69	6.04	7.51	65.10	63.60	0.79	1.13	1.72	0.87	7.19	13.04
"04:24:50	15.97	15.86	2.57	2.69	6.04	7.71	65.10	63.60	0.99	1.13	1.92	0.78	7.19	13.04
"04:27:15	15.89	15.93	2.57	2.69	6.04	7.71	65.10	63.60	0.99	1.13	1.92	0.78	7.19	13.04
"04:29:40	16.12	16.21	2.57	2.69	6.04	7.71	65.10	63.60	0.99	1.13	1.92	0.57	7.19	13.04
"04:32:05	15.81	16.07	2.57	2.69	6.04	7.71	65.10	63.60	0.99	1.13	1.92	0.57	7.19	13.04
"04:34:30	16.03	15.72	2.57	2.69	6.04	7.71	65.10	63.60	0.99	1.13	1.92	0.57	7.19	13.04
"04:36:55	15.66	15.27	2.57	2.69	6.04	7.71	65.10	63.60	0.79	1.13	1.92	0.57	7.19	13.04
"04:39:20	15.73	15.46	2.57	2.69	6.04	7.71	62.30	63.60	0.79	1.13	1.92	0.78	7.19	13.04
"04:41:45	15.46	15.46	2.57	2.56	6.04	7.71	62.30	63.60	0.99	1.13	1.92	0.78	7.19	13.04
"04:44:10	15.73	15.46	2.57	2.43	6.04	7.71	62.30	63.60	0.79	1.13	1.72	0.57	7.19	13.04
"04:46:35	15.11	15.46	2.57	2.55	6.04	7.71	62.30	63.60	0.79	1.13	1.72	0.57	7.19	13.04
"04:49:00	14.81	15.15	2.57	2.55	6.04	7.71	62.30	63.60	0.79	0.90	1.72	0.57	7.19	13.04
"04:51:25	15.34	15.28	2.57	2.55	6.04	7.71	62.30	59.90	0.79	0.90	1.72	0.57	7.19	13.04
"04:53:50	15.90	15.49	2.57	2.55	6.04	7.71	62.30	59.90	0.59	0.90	1.72	0.77	7.19	13.04
"04:56:15	16.24	16.01	2.57	2.55	6.04	7.71	62.30	59.90	0.79	0.90	1.92	0.57	7.19	13.04
"04:58:40	16.25	16.55	2.57	2.55	6.04	7.71	62.30	59.90	0.79	0.90	1.72	0.77	7.19	13.04
"05:01:05	16.33	16.14	2.57	2.55	6.04	7.71	62.30	59.90	0.59	0.90	1.72	0.57	7.19	13.04
"05:03:30	17.00	16.99	2.57	2.55	6.04	7.71	62.30	59.90	0.79	0.90	1.72	0.57	7.19	13.04
"05:05:55	17.29	16.95	2.69	2.55	6.04	7.71	62.30	59.90	0.79	0.90	1.72	0.57	7.19	13.04
"05:08:20	17.50	17.53	2.69	2.67	6.04	7.71	62.30	59.90	0.79	0.90	1.72	0.57	7.19	13.04
"05:10:45	17.84	18.39	2.81	2.67	6.04	7.71	62.30	63.40	0.79	0.90	1.72	0.57	7.19	13.04
"05:13:10	18.32	18.48	2.81	2.92	6.04	7.71	62.30	63.40	0.99	0.90	1.72	0.57	7.19	13.04
"05:15:35	19.01	18.49	2.94	2.92	6.04	7.71	62.30	63.40	0.99	0.90	1.72	0.57	7.19	13.04
"05:18:00	19.22	18.65	3.07	2.92	6.04	7.71	62.30	63.40	0.79	1.15	1.72	0.57	7.19	13.04
"05:20:25	19.10	19.71	3.34	3.16	6.04	7.71	62.30	66.90	0.79	0.95	1.72	0.57	7.19	13.04
"05:22:50	19.59	19.45	3.34	3.04	6.04	7.71	62.30	66.90	0.79	0.95	1.72	0.57	7.19	13.04
"05:25:15	19.38	19.45	3.34	3.04	6.04	7.71	62.30	63.60	0.79	0.95	1.92	0.57	7.19	13.04
"05:27:40	19.71	20.11	3.22	3.04	6.04	7.71	62.30	63.60	0.99	0.95	1.72	0.57	7.19	13.04
"05:30:05	19.58	20.16	3.22	3.18	6.04	7.71	62.30	63.60	0.79	0.95	1.72	0.57	7.19	13.04
"05:32:30	19.92	20.22	3.22	3.06	6.04	7.71	62.30	63.60	0.79	0.95	1.72	0.77	7.19	13.04
"05:34:55	20.19	20.37	3.22	3.19	6.04	7.71	65.20	67.20	0.79	0.95	1.72	0.77	7.19	13.04
"05:37:20	20.23	20.62	3.22	3.32	6.04	7.71	65.20	67.20	0.79	1.15	1.72	0.57	7.19	13.04
"05:39:45	20.50	20.64	3.22	3.32	6.04	7.71	65.20	67.20	0.79	0.95	1.72	0.77	7.19	13.04
"05:42:10	20.87	21.22	3.22	3.35	6.04	7.71	65.20	67.20	0.79	0.95	2.13	0.98	7.19	13.04
"05:44:35	20.86	21.02	3.22	3.35	6.04	7.71	65.20	67.20	0.99	0.95	1.93	0.98	7.19	13.04
"05:47:00	21.16	21.23	3.46	3.35	6.04	7.71	65.20	67.20	0.99	1.15	1.93	0.98	7.19	13.04
"05:49:25	21.13	21.54	3.46	3.35	6.04	7.71	65.20	67.20	0.99	1.15	1.93	0.98	7.19	13.04
"05:51:50	21.06	21.29	3.46	3.35	6.04	7.71	65.20	67.20	0.99	1.15	1.93	0.77	7.19	13.04
"05:54:15	21.41	21.29	3.46	3.35	6.04	7.71	65.20	67.20	0.99	1.15	1.93	0.77	7.19	13.04
"05:56:40	20.77	21.32	3.46	3.35	6.04	7.71	65.20	67.20	1.19	1.15	1.93	0.77	7.19	13.04
"05:59:05	21.03	21.13	3.46	3.35	6.04	7.71	65.20	67.20	1.19	1.15	1.93	0.77	7.19	13.04
"06:01:30	20.85	20.92	3.46	3.35	6.04	7.71	65.20	67.20	1.19	1.15	1.93	0.77	7.19	13.04
"06:03:55	20.59	20.91	3.46	3.35	6.04	7.71	65.20	67.20	1.19	1.15	1.93	0.77	7.19	13.04
"06:06:20	20.86	20.91	3.46	3.35	6.04	7.71	65.20	70.60	1.19	1.15	1.93	0.77	7.19	13.04
"06:08:45	20.60	20.76	3.46	3.35	6.04	7.71	65.20	70.60	1.19	1.15	1.93	0.77	7.19	13.04
"06:11:10	20.79	20.70	3.46	3.35	6.04	7.51	65.20	70.60	1.19	1.15	1.93	0.77	7.19	13.04
"06:13:35	20.25	20.21	3.46	3.35	6.04	7.51	65.20	70.60	0.99	1.15	1.93	0.77	7.19	13.04
"06:16:00	20.56	20.08	3.33	3.23	6.04	7.51	65.20	70.60	0.99	1.15	2.13	0.77	6.99	13.04
"06:18:25	20.11	20.09	3.33	3.23	6.04	7.51	65.20	67.20	0.99	1.15	1.93	0.77	6.99	13.04
"06:20:50	19.85	19.95	3.33	3.23	6.04	7.51	65.20	67.20	0.99	1.15	1.93	0.77	6.99	13.04
"06:23:15	19.90	19.77	3.33	3.23	6.04	7.51	65.20	67.20	0.99	1.15	2.13	0.77	6.99	13.04
"06:25:40	19.47	20.00	3.33	3.23	6.04	7.51	65.20	67.20	1.19	1.15	2.13	0.77	6.99	13.04

20-Nov-06 Time	# 1 ML MGD	# 2 ML MGD	# 1 RAS MGD	# 2 RAS MGD	Turbidity JTU	Casc DO MG/L	Plt Flow MGD	Final Effl MGD	# 1 East DO MG/L	# 1 West DO MG/L	#2 East DO MG/L	#2 West DO MG/L	Effluent DO PPM	602 Temp DEG C
"06:28:05	19.73	20.07	3.33	3.23	6.04	7.51	65.20	67.20	1.19	1.15	2.13	0.77	6.99	13.04
"06:30:30	19.73	19.87	3.21	3.23	6.04	7.51	65.20	67.20	0.99	1.15	2.13	0.77	6.79	13.04
"06:32:55	20.28	19.99	3.21	3.23	6.04	7.51	65.20	67.20	0.99	1.15	1.93	0.77	6.79	13.04
"06:35:20	20.25	20.25	3.21	3.23	6.04	7.51	65.20	67.20	0.99	1.15	1.93	0.77	6.79	13.04
"06:37:45	20.58	20.51	3.21	3.23	6.04	7.51	65.20	67.20	0.99	1.15	1.93	0.77	6.79	13.04
"06:40:10	20.70	20.60	3.21	3.23	6.04	7.31	65.20	67.20	1.19	1.15	1.93	0.77	6.79	13.04
"06:42:35	20.19	20.74	3.21	3.23	6.04	7.31	65.20	67.20	0.99	1.15	1.93	0.77	6.79	13.04
"06:45:00	21.07	20.57	3.33	3.23	6.04	7.31	65.20	67.20	1.19	1.15	1.93	0.77	6.79	13.04
"06:47:25	20.70	20.81	3.33	3.23	6.04	7.31	65.20	67.20	1.19	0.95	1.93	0.77	6.79	13.04
"06:49:50	20.64	21.14	3.33	3.23	6.04	7.31	65.20	67.20	0.99	1.24	1.93	0.77	6.79	13.04
"06:52:15	20.87	21.03	3.33	3.23	6.04	7.31	65.20	67.20	0.99	1.24	2.13	0.77	6.79	13.04
"06:54:40	20.77	21.29	3.33	3.23	6.04	7.31	65.20	67.20	0.99	1.24	1.93	0.77	6.79	13.04
"06:57:05	20.85	21.29	3.33	3.36	6.04	7.31	65.20	67.20	0.99	1.24	1.93	0.77	6.79	13.04
"06:59:30	20.85	21.29	3.33	3.36	6.04	7.31	65.20	67.20	1.19	1.04	1.93	0.77	6.79	13.04
"07:01:55	21.25	21.47	3.33	3.36	6.04	7.31	65.20	67.20	0.99	1.04	2.14	0.77	6.79	13.04
"07:04:20	21.34	21.47	3.33	3.36	6.04	7.31	65.20	70.70	0.99	1.24	2.14	0.77	6.79	13.04
"07:06:45	21.22	21.54	3.33	3.36	6.04	7.31	65.20	70.70	0.99	1.04	2.14	0.77	6.79	13.04
"07:09:10	21.36	21.48	3.45	3.36	6.04	7.31	65.20	71.90	0.99	1.04	2.14	0.77	6.79	13.04
"07:11:35	21.57	21.28	3.45	3.36	6.04	7.31	65.20	67.20	0.99	1.04	1.93	0.98	6.79	13.04
"07:14:00	21.41	21.62	3.45	3.50	6.04	7.31	65.20	67.20	0.99	1.04	1.93	0.77	6.79	13.04
"07:16:25	21.27	21.62	3.45	3.37	6.04	7.31	65.20	67.20	1.19	1.04	1.93	0.77	6.79	13.04
"07:18:50	20.18	21.24	3.45	3.49	6.04	7.31	65.20	70.20	1.19	1.04	1.93	0.77	6.79	13.04
"07:21:15	21.43	21.48	3.45	3.49	6.04	7.31	65.20	70.20	1.19	1.04	1.93	0.77	6.79	13.04
"07:23:40	21.48	21.90	3.45	3.37	6.04	7.31	65.20	70.20	1.19	1.04	1.93	0.77	6.79	13.04
"07:26:05	21.63	21.40	3.45	3.37	6.04	7.31	68.10	70.20	0.99	1.04	1.93	0.77	6.79	13.04
"07:28:30	21.38	21.68	3.45	3.37	6.04	7.31	68.10	70.20	0.99	1.04	1.93	0.57	6.79	13.04
"07:30:55	21.11	21.72	3.45	3.37	6.04	7.31	68.10	70.20	0.79	1.04	1.93	0.77	6.79	13.04
"07:33:20	21.12	21.47	3.45	3.49	6.04	7.31	68.10	70.20	0.79	1.04	1.73	0.77	6.79	13.04
"07:35:45	21.41	21.89	3.45	3.49	6.04	7.31	68.10	70.20	0.99	1.04	1.73	0.57	6.79	13.04
"07:38:10	21.14	21.83	3.45	3.49	5.13	7.31	68.10	70.20	0.99	1.04	1.93	0.57	6.79	13.04
"07:40:35	21.01	21.88	3.45	3.49	5.13	7.31	68.10	70.20	0.79	1.04	1.93	0.57	6.79	13.04
"07:43:00	21.25	21.63	3.45	3.49	5.13	7.31	68.10	70.20	0.79	1.04	1.93	0.57	6.79	13.04
"07:45:25	20.91	21.34	3.45	3.49	5.13	7.31	68.10	70.20	0.79	1.04	1.93	0.78	6.79	13.04
"07:47:50	20.96	21.32	3.45	3.49	5.13	7.31	68.10	70.20	0.79	1.04	1.73	0.78	6.79	13.04
"07:50:15	21.05	21.32	3.45	3.37	5.13	7.27	70.90	70.20	0.99	0.76	1.73	0.78	6.78	13.3
"07:52:40	21.05	21.32	3.45	3.37	5.13	7.27	70.90	70.20	0.99	0.96	1.73	0.58	6.78	13.3
"07:55:05	20.02	21.38	3.45	3.37	5.13	7.27	70.90	70.20	0.99	0.96	1.73	0.58	6.78	13.3
"07:57:30	20.99	21.38	3.45	3.37	5.13	7.27	70.90	67.20	0.79	0.96	1.73	0.78	6.78	13.3
"07:59:55	21.53	21.38	3.45	3.37	5.13	7.27	70.90	70.80	0.79	0.96	1.73	0.78	6.78	13.3
"08:02:20	21.09	21.37	3.45	3.37	5.13	7.27	70.90	70.80	0.79	0.96	1.73	0.78	6.78	13.3
"08:04:45	21.28	21.22	3.45	3.37	5.13	7.27	70.90	70.80	0.99	0.96	1.93	0.78	6.78	13.3
"08:07:10	21.15	21.50	3.45	3.37	5.13	7.27	70.90	70.80	0.99	0.96	1.93	0.78	6.78	13.3
"08:09:35	20.90	20.95	3.45	3.37	5.13	7.27	70.90	70.80	0.99	0.96	1.93	0.78	6.78	13.3
"08:12:00	20.90	21.52	3.45	3.37	5.13	7.27	70.90	70.80	1.19	0.96	1.93	0.78	6.78	13.3
"08:14:25	21.12	21.67	3.45	3.37	5.13	7.27	70.90	70.80	1.19	0.96	1.93	0.78	6.78	13.3
"08:16:50	21.12	21.57	3.45	3.37	5.13	7.27	70.90	70.80	1.19	0.96	1.93	0.78	6.78	13.3
"08:19:15	21.27	21.57	3.45	3.37	5.13	7.27	70.90	70.80	1.19	0.96	1.93	0.78	6.78	13.3
"08:21:40	21.69	21.86	3.45	3.49	5.13	7.27	70.90	70.80	0.99	0.96	1.93	0.78	6.78	13.3
"08:24:05	21.57	22.15	3.45	3.50	5.13	7.27	73.70	70.80	1.19	0.96	1.93	0.78	6.78	13.3
"08:26:30	21.61	21.98	3.45	3.50	5.13	7.27	73.70	74.40	0.99	1.24	2.14	0.78	6.78	13.3
"08:28:55	21.89	22.13	3.45	3.52	5.13	7.27	73.70	74.40	1.19	1.24	1.93	0.78	6.78	13.3
"08:31:20	21.57	22.13	3.58	3.52	5.13	7.27	73.70	74.40	1.19	1.24	1.93	0.78	6.78	13.3
"08:33:45	22.40	22.05	3.58	3.52	5.13	7.27	73.70	74.40	1.19	1.24	1.93	0.78	6.78	13.3
"08:36:10	22.26	22.41	3.58	3.52	5.13	7.27	73.70	74.40	1.19	1.24	1.93	0.78	6.78	13.3
"08:38:35	21.57	22.15	3.58	3.52	5.13	7.27	73.70	74.40	0.99	1.24	2.14	0.78	6.78	13.3
"08:41:00	21.70	22.22	3.58	3.52	5.13	7.27	73.70	74.40	0.99	1.24	2.28	0.78	6.78	13.3
"08:43:25	21.73	22.24	3.58	3.52	5.13	7.27	76.50	74.40	1.39	1.24	2.28	1.05	6.78	13.3
"08:45:50	21.47	21.84	3.58	3.52	5.13	7.27	76.50	74.40	1.39	1.24	2.28	1.05	6.78	13.3
"08:48:15	21.96	21.53	3.58	3.52	5.13	7.27	76.50	74.40	1.39	1.24	2.08	1.05	6.78	13.3
"08:50:40	21.48	21.54	3.58	3.39	5.13	7.27	76.50	74.40	1.18	1.24	1.98	1.05	6.78	13.3
"08:53:05	21.35	21.56	3.58	3.39	5.13	7.27	76.50	74.40	1.18	1.44	2.18	1.05	6.78	13.3
"08:55:30	21.06	21.04	3.58	3.39	5.13	7.27	76.50	74.40	1.38	1.44	2.18	1.05	6.78	13.3
"08:57:55	21.64	21.32	3.58	3.39	5.13	7.27	76.50	74.40	1.38	1.44	2.16	1.05	6.78	13.3
"09:00:20	20.32	21.04	3.45	3.39	5.13	7.27	76.50	74.50	1.38	1.44	2.16	1.05	6.78	13.3
"09:02:45	20.81	21.20	3.45	3.39	5.13	7.27	76.50	74.50	1.18	1.44	2.16	1.05	6.78	13.3
"09:05:10	20.83	21.28	3.45	3.26	5.13	7.82	79.40	74.50	1.18	1.44	2.16	1.05	6.78	13.29
"09:07:35	20.83	20.76	3.45	3.38	5.13	7.82	79.40	74.50	1.38	1.44	2.16	1.05	7.16	13.29
Average	20.61	21.08	3.31	3.38	4.00	7.63	79.25	75.15	2.83	2.87	3.55	2.13	7.29	13.06
Max	24.00	24.43	3.86	3.87	15.50	8.32	90.30	86.20	7.77	7.70	8.34	6.45	8.20	13.30
Min	12.01	11.76	2.03	1.78	0.55	7.02	62.30	59.90	0.58	0.55	1.72	0.57	6.62	13.04



Simulated 144 MGD Test Data
Akron WPCS Stress Test
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1 East DO MG/L
1 West DO MG/L
#2 East DO MG/L
#2 West DO MG/L
Effluent DO PPM
9:00:00
9:31:44
10:03:28
10:35:12
11:06:56
11:38:40
12:10:24
12:42:08
13:13:52
13:45:36
14:17:20
14:49:04
15:20:48
15:52:32
16:24:16
16:56:00
17:27:44
17:59:28
18:31:12
19:02:56
19:34:40
20:06:24
20:38:08
21:09:52
21:41:36
22:13:20
22:45:04
23:16:48
23:48:32
0:20:16
0:52:00
1:23:44
1:55:28
2:27:12
2:58:56
3:30:40
4:02:24
4:34:08
5:05:52
5:37:36
6:09:20
6:41:04
7:12:48

AKRON WPC 2006 144 MGD STRESS TEST

28-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
9:00:00	15.07	15.14	2.25	2.24	10.32	9.45	67.60	57.30	6.76	6.43	7.61	5.86	8.39	13.56
9:02:16	15.37	15.62	2.51	2.36	10.32	9.45	70.50	57.30	6.76	6.43	7.61	5.86	8.39	13.56
9:04:32	15.92	15.88	2.51	2.48	10.32	9.45	70.50	57.30	6.76	6.43	7.61	6.07	8.39	13.56
9:06:48	16.49	16.36	2.63	2.61	10.32	9.45	70.50	57.30	6.76	6.43	7.61	6.07	8.39	13.56
9:09:04	16.49	16.60	2.63	2.61	10.32	9.45	70.50	57.30	6.76	6.22	7.61	6.07	8.39	13.56
9:11:20	17.09	17.35	2.61	2.61	10.32	9.45	70.50	57.30	6.76	6.22	7.61	6.07	8.39	13.56
9:13:36	17.40	17.35	2.98	2.61	10.32	9.45	70.50	57.30	6.55	6.22	7.61	6.07	8.39	13.56
9:15:52	17.78	17.73	2.94	2.74	10.32	9.45	70.50	60.60	6.55	6.22	7.61	6.07	8.39	13.56
9:18:08	18.03	18.00	2.94	2.74	10.32	9.45	70.50	60.60	6.35	6.22	7.61	6.07	8.39	13.56
9:20:24	18.18	17.48	2.94	2.74	10.32	9.45	70.50	60.60	6.35	5.94	7.61	6.07	8.39	13.56
9:22:40	18.47	18.37	2.94	2.74	10.32	9.45	70.50	60.60	6.15	5.74	7.61	5.85	8.39	13.56
9:24:56	18.81	18.98	2.94	2.87	10.32	9.25	70.50	60.60	6.15	5.74	7.61	5.85	8.39	13.56
9:27:12	18.93	18.87	3.23	2.87	20.69	9.25	70.50	60.60	5.75	5.74	7.61	5.85	8.39	13.56
9:29:28	19.22	19.41	3.05	2.99	20.69	9.25	70.50	60.60	5.55	5.44	7.61	5.85	8.39	13.56
9:31:44	19.85	20.01	3.05	2.85	10.62	9.25	70.50	60.60	5.35	5.44	7.61	5.85	8.39	13.56
9:34:00	20.19	20.00	3.17	3.11	10.62	9.25	70.50	60.60	4.94	5.16	7.61	5.85	8.39	13.56
9:36:16	20.17	20.76	3.17	3.11	10.62	9.25	70.50	60.60	4.74	4.96	7.61	5.85	8.39	13.56
9:38:32	20.58	21.04	3.17	3.09	10.62	9.25	70.50	60.60	4.53	4.67	7.61	5.85	8.39	13.56
9:40:48	21.12	21.08	3.52	3.22	10.62	9.25	70.50	60.60	4.33	4.47	7.61	5.65	8.39	13.56
9:43:04	21.21	21.12	3.39	3.22	10.62	9.25	70.50	60.60	3.73	4.18	7.41	5.38	8.39	13.56
9:45:20	21.21	21.24	3.39	3.34	10.62	9.25	70.50	60.60	3.31	3.69	7.41	5.38	8.39	13.56
9:47:36	21.87	21.85	3.39	3.34	10.62	9.25	73.30	60.60	3.11	3.69	7.21	5.38	8.39	13.56
9:49:52	21.87	22.18	3.39	3.61	10.62	9.25	73.30	60.60	2.71	3.42	7.21	5.18	8.39	13.56
9:52:08	23.24	22.01	3.52	3.61	10.62	9.25	73.30	60.60	2.31	3.00	7.21	5.18	8.39	13.56
9:54:24	22.95	22.92	3.52	3.61	10.62	9.25	73.30	60.60	2.11	2.72	7.21	5.18	8.39	13.56
9:56:40	23.25	23.39	3.76	3.61	10.62	9.25	73.30	60.60	1.77	2.52	7.01	5.18	8.39	13.56
9:58:56	23.23	23.60	3.80	3.61	10.62	9.25	73.30	60.60	1.77	2.32	7.01	5.18	8.39	13.56
10:01:12	23.75	23.50	3.80	3.74	10.62	9.25	73.30	60.60	1.57	2.12	6.80	5.18	8.39	13.56
10:03:28	24.26	23.86	3.81	3.74	10.62	9.25	73.30	60.60	1.57	2.12	6.80	5.18	8.39	13.56
10:05:44	23.95	24.30	3.94	3.74	10.62	9.25	73.30	63.70	2.11	2.32	6.80	5.18	8.39	13.56
10:08:00	24.21	24.49	3.94	3.87	10.62	9.25	73.30	63.70	2.11	2.32	6.60	5.18	8.39	13.56
10:10:16	24.76	24.76	3.94	3.94	20.69	9.25	73.30	63.70	2.11	2.32	6.60	4.78	8.39	13.56
10:12:32	24.16	25.08	3.94	3.95	20.69	9.25	73.30	63.70	2.11	2.32	6.40	4.78	8.39	13.56
10:14:48	24.92	25.08	3.94	3.95	20.69	9.25	73.30	63.70	2.31	2.32	6.19	4.58	8.19	13.56
10:17:04	24.86	25.08	3.94	3.95	20.69	9.25	73.30	63.70	2.31	2.32	6.19	4.58	8.19	13.56
10:19:20	24.50	24.66	3.94	3.95	20.69	9.25	73.30	63.70	2.31	2.32	5.99	4.36	8.19	13.56
10:21:36	24.50	24.60	3.75	4.07	20.69	9.25	73.30	63.70	2.51	2.32	5.99	4.36	8.19	13.56
10:23:52	23.57	23.28	3.99	4.04	20.69	9.25	73.30	67.40	2.40	2.52	5.79	4.36	8.19	13.56
10:26:08	21.85	23.00	3.75	3.88	20.69	9.25	76.20	67.40	2.60	2.72	5.79	4.10	8.19	13.56
10:28:24	21.54	22.49	3.48	3.76	20.69	9.04	76.20	67.40	2.60	2.52	5.39	3.90	8.19	13.56
10:30:40	21.60	22.24	3.48	3.76	20.69	9.04	76.20	70.90	2.60	2.52	5.39	3.90	8.19	13.56
10:32:56	21.22	22.09	3.35	3.76	20.69	9.04	76.20	70.90	2.80	2.72	5.19	3.90	8.19	13.56
10:35:12	21.40	22.46	3.35	3.64	20.69	9.04	73.40	70.90	2.80	2.72	5.19	3.64	8.19	13.56
10:37:28	21.49	22.12	3.35	3.64	20.69	9.04	73.40	70.90	2.80	2.72	4.57	3.44	8.19	13.56
10:39:44	21.25	22.47	3.35	3.64	20.69	9.04	73.40	70.90	2.80	3.01	4.57	3.22	8.19	13.56
10:42:00	21.03	22.47	3.35	3.64	20.69	9.04	73.40	70.90	3.00	3.01	4.17	3.02	7.99	13.56
10:44:16	21.13	22.47	3.23	3.64	20.69	9.04	73.40	70.90	3.00	3.21	3.97	2.73	7.99	13.56
10:46:32	21.35	22.39	3.23	3.52	20.69	9.04	76.30	67.50	3.00	3.21	3.56	2.53	7.99	13.56
10:48:48	21.13	22.64	3.23	3.64	20.69	9.04	76.30	67.50	3.00	3.21	3.56	2.33	7.99	13.56
10:51:04	21.22	22.89	3.23	3.64	20.69	9.04	76.30	67.50	3.00	3.21	3.36	2.33	7.99	13.56
10:53:20	21.28	23.05	3.23	3.64	20.69	9.04	73.50	67.50	3.00	3.01	3.36	1.84	7.99	13.56
10:55:36	21.70	23.58	3.35	3.64	20.69	9.04	73.50	67.50	3.00	3.01	3.36	1.85	7.99	13.56
10:57:52	21.25	23.42	3.35	3.76	20.69	9.04	73.50	63.70	3.00	3.01	3.16	1.65	7.99	13.56
11:00:08	21.82	23.95	3.35	3.76	20.69	9.04	73.50	63.70	3.00	3.01	2.96	1.45	7.99	13.56
11:02:24	22.25	23.66	3.35	3.76	20.69	8.84	73.50	63.70	3.00	3.21	2.96	1.45	7.99	13.56
11:04:40	21.95	23.82	3.48	3.76	20.69	8.84	73.50	63.70	3.00	3.21	2.96	1.45	7.79	13.56
11:06:56	21.93	24.42	3.48	3.76	20.69	8.84	73.50	63.70	3.00	3.00	2.96	1.45	7.79	13.56
11:09:12	22.46	24.73	3.48	3.76	20.69	8.84	73.50	63.70	3.00	3.00	3.16	1.45	7.79	13.56
11:11:28	22.54	24.49	3.48	3.88	20.69	8.84	73.50	63.70	3.20	3.00	3.16	2.04	7.79	13.56
11:13:44	22.78	24.81	3.60	3.88	20.69	8.84	73.50	63.70	3.20	3.00	3.36	2.04	7.79	13.56
11:16:00	21.75	24.63	3.60	3.88	20.69	8.84	73.50	63.70	3.20	3.00	3.56	2.04	7.79	13.56
11:18:16	22.44	25.17	3.60	4.00	20.69	8.84	73.50	63.70	3.20	3.20	3.56	2.04	7.79	13.56
11:20:32	23.28	25.11	3.34	3.88	20.69	8.84	73.50	63.70	3.41	3.20	3.56	2.04	7.79	13.56
11:22:48	17.96	25.11	3.73	3.88	20.69	8.84	73.50	63.70	3.41	3.20	3.56	2.24	7.79	13.56
11:25:04	23.72	25.11	3.70	3.85	20.69	8.84	73.50	63.70	3.41	3.41	3.36	2.24	7.79	13.56
11:27:20	23.90	25.31	3.70	3.85	20.69	8.84	73.50	63.70	3.41	3.41	3.36	2.24	7.79	13.56
11:29:36	21.00	25.31	3.44	4.11	20.69	8.84	73.50	63.70	3.41	3.41	3.57	2.04	7.79	13.56
11:31:52	20.23	25.31	3.44	4.01	20.69	8.84	73.50	67.30	3.61	3.41	3.57	2.24	7.79	13.56
11:34:08	22.34	25.29	3.57	4.15	20.69	8.84	73.50	67.30	3.61	3.41	3.57	2.24	7.79	13.56
11:36:24	24.53	25.29	2.27	4.08	20.69	8.84	73.50	67.30	3.81	3.69	3.57	2.34	7.79	13.56
11:38:40	22.99	25.29	2.91	4.04	20.69	8.84	73.50	67.30	3.61	3.69	3.37	2.34	7.79	13.56
11:40:56	24.46	25.29	3.82	4.16	20.69	8.84	73.50	67.30	3.61	3.69	3.37	2.34	7.79	13.56
11:43:12	24.22	25.29	3.69	4.01	20.69	8.84	73.50	67.30	3.81	3.69	3.57	2.34	7.79	13.56
11:45:28	18.65	25.29	3.43	4.13	20.69	8.84	73.50	67.30	3.81	3.69	3.78	2.34	7.79	13.56
11:47:44	11.61	25.29	2.25	4.11	20.69	8.84	76.40	67.30	3.81	3.69	3.98	2.34	7.79	13.56
11:50:00	23.96	25.29	3.34	4.10	20.69	8.84	76.40	67.30	3.81	3.89	3.98	2.34	7.79	13.56
11:52:16	23.95	25.29	3.44	4.22	20.69	8.84	76.40	67.30	4.02	4.09	3.98	2.34	7.79	13.56
11:54:32	23.81	25.28	3.53	3.95	20.69	8.84	73.60	67.30	4.02	4.09	3.98	2.34	7.79	13.56
11:56:48	23.53	25.28	3.53	4.08	20.69	8.84	73.60	67.30	4.02	4.09	3.98	2.63	7.79	13.56
11:59:04	22.82	24.82	3.65	4.06	20.69	8.84	73.60	67.30	4.02	4.09	3.98	2.63	7.79	13.56
12:01:20	22.40	24.53	3.65	4.06	20.69	8.84	73.60	67.30	4.02	4.36	3.98	2.63	7.79	13.56
12:03:36	22.70	24.32	3.65	4.06	20.69	8.84	73.60	67.30	4.02	4.36	3.98	2.63	7.59	13.56
12:05:52	22.28	24.05	3.65	4.02	20.69	8.84	73.60	67.30	4.02	3.98	3.98	2.63	7.59	13.56
12:08:08	22.26	24.01	3.53	4.02	20.69	8.84	76.60	67.30	4.02	3.98	3.98	2.63	7.59	13.56
12:10:24	21.82	23.69	3.53	4.02	20.69	8.64	73.70	67.30	3.81	3.98	4.18	2.63	7.59	13.56
12:12:40	22.12	23.50	3.53	3.89	20.69	8.64	73.70	67.30	3.81	3.98	4.18	2.63	7.59	13.56
12:14:56	17.39	23.79	3.53	3.89	20.69	8.64	73.70	67.30	3.81	3.98	4.18	2.63	7.59	13.56
12:17:12	21.41	23.47	3.41	3.78	20.69	8.64	73.70	67.30	3.81	3.70	4.18	2.43	7.59	13.56

28-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
12:19:28	21.09	22.83	3.41	3.78	20.69	8.64	73.70	67.30	3.81	3.70	4.18	2.43	7.38	13.56
12:21:44	21.06	23.08	3.41	3.78	20.69	8.64	73.70	67.30	3.81	3.70	4.18	2.64	7.38	13.56
12:24:00	21.25	23.08	3.41	3.78	20.69	8.64	73.70	67.30	3.81	3.70	4.18	2.64	7.38	13.56
12:26:16	21.25	23.08	3.41	3.78	20.69	8.64	73.70	67.30	3.81	3.70	4.18	2.64	7.38	13.56
12:28:32	21.25	22.94	3.41	3.78	20.69	8.64	73.70	67.30	4.02	3.70	4.18	2.64	7.38	13.56
12:30:48	21.25	23.21	3.52	3.78	20.69	8.64	73.70	67.30	4.02	3.70	3.97	2.64	7.38	13.56
12:33:04	21.57	23.21	3.52	3.78	20.69	8.64	73.70	63.80	4.02	3.70	3.97	2.64	7.38	13.56
12:35:20	21.84	23.79	3.40	3.78	20.69	8.64	73.70	63.80	4.02	3.98	3.97	2.64	7.38	13.56
12:37:36	21.84	23.79	3.52	3.78	20.69	8.64	73.70	63.80	3.81	3.98	4.17	2.84	7.38	13.56
12:39:52	21.90	23.81	3.52	3.78	20.69	8.64	73.70	63.80	3.81	3.98	4.17	2.84	7.38	13.56
12:42:08	22.17	24.12	3.52	3.78	20.69	8.64	73.70	63.80	3.81	3.78	4.17	2.84	7.38	13.56
12:44:24	22.38	24.44	3.52	3.78	20.69	8.64	73.70	63.80	3.81	3.58	4.38	2.84	7.38	13.56
12:46:40	22.36	24.13	3.52	3.78	20.69	8.64	73.70	63.80	3.81	3.58	4.38	2.84	7.38	13.56
12:48:56	22.55	24.36	3.52	3.90	20.69	8.64	73.70	63.80	3.81	3.58	4.38	2.84	7.38	13.56
12:51:12	22.96	24.72	3.53	3.78	20.69	8.64	73.70	63.80	3.61	3.58	4.38	2.84	7.38	13.56
12:53:28	16.76	24.71	3.11	4.17	20.69	8.64	73.70	63.80	3.61	3.58	4.17	2.84	7.38	13.56
12:55:44	16.56	24.77	3.13	4.18	20.69	8.44	73.70	63.80	3.61	3.58	4.17	2.84	7.18	13.56
12:58:00	24.11	24.76	3.55	3.83	20.69	8.44	73.70	63.80	3.61	3.79	4.17	2.84	7.18	13.56
13:00:16	22.52	25.02	3.28	4.08	16.11	8.31	73.70	63.80	3.61	3.79	4.17	2.84	7.10	13.56
13:02:32	23.83	24.88	3.41	3.95	16.11	8.31	73.70	63.80	3.61	3.79	4.17	2.84	7.10	13.56
13:04:48	15.33	25.31	3.12	3.72	16.11	8.31	73.70	63.80	3.61	3.79	4.38	2.84	7.10	13.56
13:07:04	10.10	23.76	2.13	4.26	16.11	8.31	73.70	63.80	3.61	3.79	4.38	2.84	7.10	13.56
13:09:20	11.15	24.60	1.69	4.27	16.11	8.31	73.70	63.80	3.81	3.59	4.17	2.84	7.10	13.56
13:11:36	13.38	24.96	2.48	4.32	16.11	8.31	73.70	63.80	3.61	3.59	4.17	2.84	7.10	13.56
13:13:52	6.70	24.70	1.68	4.07	16.11	8.31	73.70	63.80	3.61	3.59	4.17	2.84	7.10	13.56
13:16:08	10.82	25.08	0.88	3.94	16.11	8.31	73.70	63.80	3.61	3.59	4.17	2.84	7.10	13.56
13:18:24	24.47	25.20	1.29	4.18	16.11	8.31	73.70	67.30	3.61	3.59	4.17	2.84	7.10	13.56
13:20:40	9.41	24.82	1.75	4.19	16.11	8.31	73.70	63.70	3.61	3.79	4.17	2.84	7.10	13.56
13:22:56	11.58	24.87	2.72	3.91	16.11	8.31	73.70	63.70	3.81	3.59	4.17	2.84	7.10	13.56
13:25:12	22.92	24.87	3.40	3.53	16.11	8.31	73.70	63.70	3.81	3.79	4.17	2.63	7.10	13.56
13:27:28	21.77	24.72	3.52	4.05	16.11	8.31	73.70	63.70	3.81	3.79	4.17	2.63	7.10	13.56
13:29:44	21.79	24.82	3.52	4.05	16.11	8.31	73.70	63.70	3.81	3.79	4.17	2.63	7.10	13.56
13:32:00	22.08	24.89	3.52	3.93	16.11	8.31	73.70	63.70	3.81	3.59	4.17	2.83	7.10	13.56
13:34:16	21.89	24.63	3.52	4.05	16.11	8.31	73.70	63.70	3.61	3.59	3.97	2.63	7.10	13.56
13:36:32	21.99	24.37	3.52	4.05	14.59	8.01	73.70	63.70	3.61	3.59	3.97	2.63	6.71	13.56
13:38:48	22.22	24.66	3.52	4.05	14.59	8.01	73.70	63.70	3.41	3.59	3.97	2.63	6.71	13.56
13:41:04	22.22	25.05	3.52	4.05	14.59	8.01	73.70	63.70	3.41	3.59	3.97	2.63	6.71	13.56
13:43:20	25.12	25.09	3.65	4.05	14.59	8.01	73.70	63.70	3.61	3.39	3.97	2.63	6.71	13.56
13:45:36	24.44	25.01	3.79	4.05	14.59	8.01	73.70	63.70	3.61	3.59	3.97	2.63	6.71	13.56
13:47:52	24.67	24.69	3.79	4.05	14.59	8.01	76.50	63.70	3.61	3.59	4.17	2.63	6.71	13.56
13:50:08	24.66	24.98	3.79	4.05	14.59	8.01	76.50	63.70	3.61	3.59	3.97	2.63	6.71	13.56
13:52:24	23.63	25.14	3.79	4.05	14.59	8.01	76.50	63.70	3.61	3.79	3.97	2.63	6.51	13.56
13:54:40	25.28	25.03	3.79	4.05	14.59	8.01	73.70	63.70	3.61	3.59	4.17	2.63	6.51	13.56
13:56:56	25.28	25.21	3.79	4.05	14.59	7.81	73.70	63.70	3.61	3.59	3.97	2.63	6.51	13.56
13:59:12	25.02	25.25	3.79	4.05	14.59	7.81	73.70	63.70	3.61	3.59	3.97	2.63	6.51	13.56
14:01:28	25.02	24.94	3.91	4.05	14.59	7.81	73.70	63.70	3.61	3.59	3.97	2.63	6.51	13.56
14:03:44	25.00	24.84	3.91	4.05	14.59	7.81	73.70	63.70	3.61	3.59	3.97	2.63	6.51	13.56
14:06:00	24.98	25.29	3.91	4.17	14.59	7.81	73.70	63.70	3.61	3.39	3.97	2.63	6.31	13.56
14:08:16	23.87	25.16	3.91	4.05	14.59	7.81	73.70	63.70	3.61	3.59	3.97	2.63	6.31	13.56
14:10:32	24.64	25.15	3.91	4.05	14.59	7.81	73.70	63.70	3.61	3.59	4.19	2.63	6.31	13.56
14:12:48	25.04	24.98	3.91	4.05	14.59	7.81	73.70	63.70	3.61	3.59	4.19	2.63	6.31	13.56
14:15:04	25.06	24.97	3.91	4.05	14.59	7.61	73.70	63.70	3.61	3.59	4.19	2.63	6.31	13.56
14:17:20	25.10	24.83	3.91	4.05	14.59	7.61	73.70	63.70	3.61	3.59	4.19	2.63	6.31	13.56
14:19:36	24.84	24.83	3.91	4.05	14.59	7.61	70.80	63.70	3.61	3.59	4.19	2.92	6.31	13.56
14:21:52	24.50	24.69	3.91	4.17	14.59	7.61	73.90	63.70	3.61	3.59	4.19	2.92	6.31	13.56
14:24:08	24.60	24.50	3.91	4.17	14.59	7.61	73.90	63.70	3.61	3.80	3.98	2.72	6.31	13.56
14:26:24	24.33	24.37	3.91	4.04	14.59	9.72	73.90	63.70	3.61	3.80	3.98	2.72	6.52	13.56
14:28:40	24.34	24.31	3.79	4.04	14.59	10.33	73.90	63.70	3.61	3.80	3.98	2.72	7.12	13.56
14:30:56	24.13	24.45	3.79	4.04	14.59	10.53	73.90	63.70	3.41	3.80	3.98	2.72	7.73	13.56
14:33:12	24.25	24.45	3.79	4.04	14.59	10.53	73.90	63.70	3.61	3.59	3.98	2.72	7.93	13.56
14:35:28	24.32	24.73	3.79	4.04	14.59	10.73	70.90	63.70	3.41	3.39	3.98	2.72	8.13	13.56
14:37:44	24.20	24.47	3.79	4.04	14.59	10.73	70.90	63.70	3.41	3.39	3.78	2.72	8.33	13.56
14:40:00	24.03	24.10	3.79	4.04	14.59	9.71	70.90	63.70	3.41	4.00	3.78	2.72	8.33	13.56
14:42:16	24.03	24.21	3.79	3.92	14.59	9.71	70.90	63.70	3.41	3.78	3.99	2.72	8.53	13.56
14:44:32	23.72	24.17	3.79	3.92	14.59	9.71	70.90	63.70	3.41	3.78	3.79	2.43	8.53	13.56
14:46:48	23.90	23.85	3.79	3.92	14.59	9.51	73.80	63.70	3.41	3.58	3.79	2.43	8.53	13.56
14:49:04	23.83	23.74	3.79	3.92	14.59	9.51	73.80	63.70	3.20	3.58	3.99	2.43	8.73	13.56
14:51:20	23.85	23.99	3.79	3.92	14.59	9.51	73.80	63.70	3.20	3.31	3.99	2.64	8.73	13.56
14:53:36	23.76	23.72	3.79	3.92	14.59	9.51	73.80	63.70	3.20	3.31	3.99	2.64	8.73	13.56
14:55:52	23.44	23.97	3.79	3.92	14.59	9.51	73.80	63.70	3.20	3.31	3.99	2.64	8.73	13.56
14:58:08	23.69	24.02	3.79	3.92	14.59	9.51	73.80	63.70	3.41	3.31	3.99	2.64	8.73	13.56
15:00:24	24.00	24.02	3.65	3.80	14.59	9.51	73.80	63.70	3.41	3.31	3.99	2.64	8.73	13.56
15:02:40	23.79	24.02	3.65	3.80	14.59	9.51	73.80	63.70	3.41	3.58	3.99	2.64	8.73	13.56
15:04:56	24.29	23.93	3.65	3.80	14.59	9.51	73.80	63.70	3.41	3.58	3.99	2.43	8.73	13.56
15:07:12	24.15	24.68	3.77	3.80	14.59	9.51	73.80	63.70	3.41	3.58	3.99	2.64	8.73	13.56
15:09:28	24.20	24.18	3.77	3.92	14.59	9.51	73.80	63.70	3.41	3.58	4.20	2.64	8.93	13.56
15:11:44	24.26	24.24	3.77	3.92	14.59	9.51	73.80	63.70	3.41	3.58	4.20	2.64	8.93	13.56
15:14:00	24.80	24.26	3.77	3.92	14.59	9.51	73.80	63.70	3.20	3.58	4.20	2.64	8.93	13.56
15:16:16	24.91	24.82	3.77	3.92	14.59	9.71	73.80	63.70	3.41	3.58	4.20	2.64	8.93	13.56
15:18:32	24.81	25.02	3.89	3.92	14.59	9.71	73.80	63.70	3.41	3.58	4.20	2.64	8.93	13.56
15:20:48	25.03	24.97	3.89	4.05	14.59	9.71	73.80	63.70	3.41	3.78	4.00	2.64	8.93	13.56
15:23:04	24.98	25.15	3.89	4.05	14.59	9.71	73.80	63.70	3.41	3.78	4.00	2.64	8.93	13.56
15:25:20	24.75	25.11	3.89	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	8.93	13.56
15:27:36	24.86	25.11	3.89	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	8.93	13.56
15:29:52	24.86	25.11	3.89	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	8.93	13.56
15:32:08	24.95	24.86	3.89	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	8.93	13.56
15:34:24	24.94	25.31	4.03	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	8.93	13.56
15:36:40	24.94	25.18	4.03	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	8.93	13.56
15:38:56	25.07	25.31	3.91	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	8.93	13.56

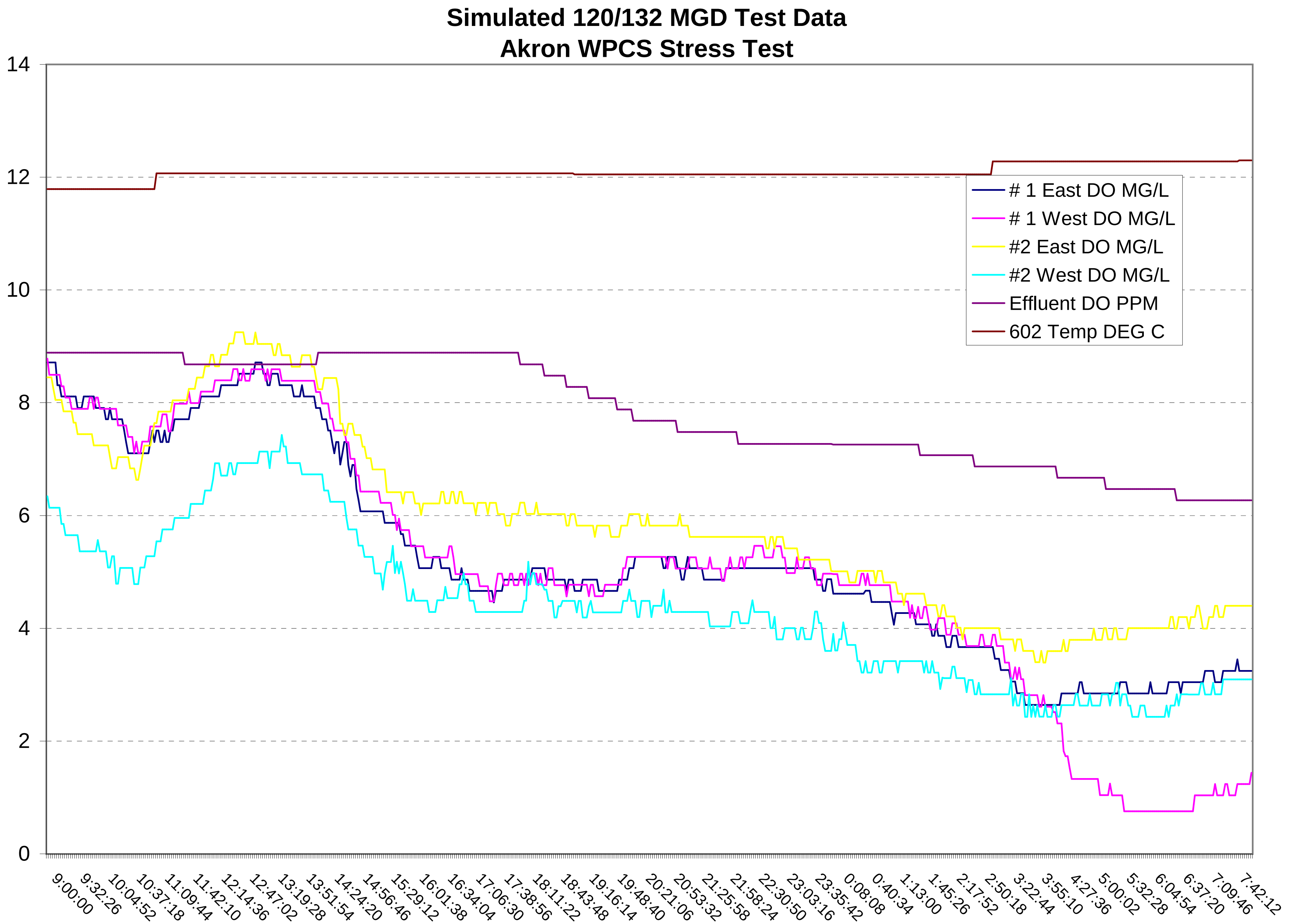
28-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
15:41:12	25.07	25.04	3.91	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	9.14	13.56
15:43:28	25.15	25.09	3.91	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	9.14	13.56
15:45:44	24.90	25.31	3.91	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	9.14	13.56
15:48:00	24.97	25.07	3.91	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.64	9.14	13.56
15:50:16	24.63	24.92	3.91	4.05	14.59	9.71	73.80	63.70	3.41	3.58	4.00	2.43	9.14	13.56
15:52:32	24.85	24.16	3.91	4.02	14.59	9.71	73.80	63.70	3.61	3.58	4.00	2.43	9.14	13.56
15:54:48	25.11	24.96	3.91	3.93	14.59	9.71	73.80	63.70	3.61	3.58	4.00	2.43	9.14	13.56
15:57:04	24.69	24.98	3.91	4.05	14.59	9.71	71.00	63.70	3.61	3.79	4.20	2.43	9.14	13.56
15:59:20	24.82	25.21	3.91	4.05	14.59	9.71	71.00	63.70	3.61	3.58	4.20	2.64	9.14	13.56
16:01:36	24.93	25.15	3.65	3.92	14.59	9.71	71.00	63.70	3.61	3.58	4.20	2.64	9.14	13.56
16:03:52	24.93	24.81	4.03	3.92	14.59	9.71	71.00	63.70	3.61	3.58	4.20	2.64	9.14	13.56
16:06:08	24.78	24.92	4.03	3.92	14.59	9.71	71.00	63.70	3.41	3.58	4.20	2.64	9.14	13.56
16:08:24	24.86	24.92	4.03	3.92	14.59	9.71	73.80	63.70	3.41	3.58	4.20	2.64	8.53	13.56
16:10:40	23.42	25.29	4.03	3.92	14.59	9.09	73.80	63.70	3.41	3.58	4.20	2.64	7.71	13.56
16:12:56	24.98	25.07	3.90	3.92	14.59	8.48	73.80	63.70	3.61	3.58	4.20	2.64	6.90	13.56
16:15:12	24.87	25.09	3.90	3.92	14.59	8.07	73.80	63.70	3.61	3.78	4.20	2.64	6.50	13.56
16:17:28	25.07	25.28	3.90	3.92	14.59	7.87	73.80	63.70	3.61	3.58	4.20	2.64	6.29	13.56
16:19:44	25.13	25.28	4.02	3.92	14.59	7.67	70.90	63.70	3.41	3.58	4.20	2.64	6.29	13.56
16:22:00	25.13	24.32	4.02	3.92	14.59	7.67	70.90	63.70	3.41	3.58	4.20	2.64	6.29	13.56
16:24:16	25.13	25.19	4.02	3.92	14.59	7.67	70.90	63.70	3.41	3.58	4.20	2.64	6.29	13.56
16:26:32	25.11	25.19	4.02	3.92	14.59	7.67	73.70	63.70	3.41	3.79	4.20	2.64	6.09	13.56
16:28:48	25.25	25.29	4.14	3.92	14.59	7.47	73.70	63.70	3.20	3.59	4.20	2.64	6.09	13.56
16:31:04	25.23	24.86	4.02	3.92	14.59	7.47	73.70	63.70	3.20	3.59	4.20	2.64	6.09	13.56
16:33:20	25.23	25.31	4.02	3.92	14.59	7.47	73.70	63.70	3.20	3.59	4.00	2.64	6.09	13.56
16:35:36	25.29	24.75	4.02	3.92	14.59	7.47	73.70	63.70	3.20	3.59	4.00	2.64	6.09	13.56
16:37:52	25.29	25.31	4.02	3.92	14.59	7.47	73.70	63.70	3.20	3.39	4.00	2.64	6.09	13.56
16:40:08	25.30	25.31	4.02	3.92	14.59	7.47	73.70	63.70	3.20	3.59	4.00	2.64	6.09	13.56
16:42:24	25.30	25.31	4.14	3.92	14.59	7.47	70.80	63.70	3.20	3.59	4.00	2.64	6.09	13.56
16:44:40	25.30	25.15	4.12	4.04	14.59	7.47	73.70	63.70	3.20	3.59	4.20	2.64	6.09	13.56
16:46:56	25.28	25.27	4.12	3.92	14.59	7.47	73.70	63.70	3.20	3.59	4.20	2.64	6.09	13.56
16:49:12	25.02	24.41	4.12	3.92	14.59	7.47	73.70	63.70	3.20	3.39	4.20	2.64	6.09	13.56
16:51:28	24.94	25.31	4.00	3.92	14.59	7.47	73.70	63.70	3.20	3.39	4.00	2.64	6.09	13.56
16:53:44	24.92	24.76	4.00	3.92	14.59	7.47	73.70	63.70	3.20	3.39	4.00	2.64	6.09	13.56
16:56:00	24.93	25.31	4.00	3.92	14.59	7.47	73.70	63.70	3.00	3.10	4.00	2.64	6.09	13.56
16:58:16	25.22	25.05	4.00	3.92	14.59	7.47	73.70	63.70	3.00	3.30	4.00	2.64	6.09	13.56
17:00:32	24.59	25.21	4.00	3.92	14.59	7.47	70.90	63.70	3.00	3.30	3.80	2.64	6.09	13.56
17:02:48	24.99	24.97	4.00	3.92	14.59	7.47	70.90	63.70	3.00	3.10	3.80	2.64	6.09	13.56
17:05:04	24.99	25.28	4.00	3.92	14.59	7.47	73.70	63.70	3.00	3.10	3.80	2.43	6.09	13.56
17:07:20	25.07	24.65	4.00	3.92	14.59	7.47	73.70	63.70	3.00	3.10	3.80	2.43	6.09	13.56
17:09:36	24.41	24.79	4.00	3.92	14.59	7.47	73.70	63.70	3.00	3.10	3.80	2.43	6.09	13.56
17:11:52	24.75	24.69	4.00	3.92	14.59	7.47	73.70	63.70	3.00	3.10	3.80	2.43	6.09	13.56
17:14:08	24.75	24.71	4.00	3.92	14.59	7.47	73.70	63.70	3.00	3.10	3.59	2.23	6.09	13.56
17:16:24	24.74	24.66	4.00	3.92	14.59	7.47	70.90	63.70	2.79	3.10	3.59	2.23	6.09	13.56
17:18:40	24.80	24.86	4.00	3.92	14.59	7.47	70.90	63.70	2.79	3.10	3.59	2.23	6.09	13.56
17:20:56	25.24	24.86	4.00	3.92	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.23	6.09	13.56
17:23:12	24.85	24.44	4.00	3.92	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.23	6.09	13.56
17:25:28	24.97	24.60	3.88	3.92	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.23	6.09	13.56
17:27:44	25.04	24.25	4.01	3.92	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.23	6.09	13.56
17:30:00	24.58	24.91	4.01	3.92	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.23	6.09	13.56
17:32:16	24.60	25.01	4.01	3.92	14.59	7.47	70.90	63.70	2.79	2.90	3.80	2.23	6.09	13.56
17:34:32	24.56	24.83	3.89	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.80	2.23	6.09	13.56
17:36:48	25.11	24.81	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:39:04	25.02	24.79	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:41:20	24.60	24.35	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:43:36	24.83	24.79	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:45:52	24.73	24.91	3.89	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:48:08	24.37	25.05	3.89	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:50:24	24.72	25.04	3.89	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:52:40	24.08	25.06	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.23	6.09	13.56
17:54:56	24.89	25.03	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.80	2.43	6.09	13.56
17:57:12	24.73	24.78	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.43	6.09	13.56
17:59:28	24.08	24.78	4.01	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.43	6.09	13.56
18:01:44	24.60	24.69	3.90	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.63	6.09	13.56
18:04:00	24.38	24.80	3.90	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.43	6.09	13.56
18:06:16	24.31	24.60	3.90	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.63	6.09	13.56
18:08:32	24.63	24.79	3.90	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.43	6.09	13.56
18:10:48	24.28	24.79	3.90	3.92	14.59	7.47	70.90	67.40	2.79	2.90	3.59	2.43	6.09	13.56
18:13:04	20.01	24.69	3.90	3.92	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.43	6.09	13.56
18:15:20	22.68	24.54	3.78	3.78	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.43	6.09	13.56
18:17:36	24.21	24.50	3.78	3.90	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.43	6.09	13.56
18:19:52	24.25	23.41	3.91	3.90	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.43	6.09	13.56
18:22:08	24.21	24.39	3.91	3.90	14.59	7.47	70.90	63.70	2.79	2.90	3.59	2.43	6.09	13.56
18:24:24	24.15	24.55	3.78	3.90	14.59	7.47	73.80	63.70	2.79	2.90	3.59	2.43	6.09	13.56
18:26:40	24.39	24.21	3.78	3.90	14.59	7.47	73.80	63.70	2.79	2.90	3.59	2.23	6.09	13.56
18:28:56	24.05	24.23	3.90	3.90	14.59	7.47	73.80	63.70	2.59	2.90	3.59	2.23	6.09	13.56
18:31:12	24.31	24.20	3.90	3.90	14.59	7.47	73.80	63.70	2.79	2.70	3.59	2.23	6.09	13.56
18:33:28	24.78	24.24	3.90	3.90	14.59	7.47	73.80	63.70	2.79	2.90	3.59	2.23	6.09	13.56
18:35:44	24.17	24.56	3.90	3.90	14.59	7.47	73.80	63.70	2.79	2.90	3.59	2.23	6.09	13.56
18:38:00	24.53	24.52	3.78	3.90	14.59	7.47	73.80	63.70	2.79	2.90	3.59	2.23	6.09	13.56
18:40:16	24.99	24.77	3.90	3.90	14.59	7.47	73.80	63.70	2.59	2.70	3.59	2.23	6.09	13.56
18:42:32	24.87	24.88	3.90	3.90	14.59	7.47	73.80	67.40	2.59	2.70	3.59	2.23	6.09	13.56
18:44:48	25.25	25.31	3.90	3.90	14.59	7.47	73.80	67.40	2.59	2.90	3.39	2.23	6.09	13.56
18:47:04	24.97	25.09	3.90	3.90	14.59	7.47	73.80	67.40	2.59	2.90	3.60	2.43	6.09	13.56
18:49:20	25.29	25.09	3.90	4.02	14.59	7.47	73.80	67.40	2.59	2.70	3.60	2.43	6.09	13.56
18:51:36	25.03	25.15	3.89	4.02	14.59	7.47	73.80	67.40	2.39	2.90	3.60	2.23	6.09	13.56
18:53:52	25.29	25.15	3.89	4.02	14.59	7.47	70.90	67.40	2.59	2.90	3.60	2.23	6.09	13.56
18:56:08	25.30	25.15	3.89	4.02	14.59	7.47	70.90	67.40	2.59	2.70	3.60	2.23	6.09	13.56
18:58:24	25.29	25.15	3.89	4.02	14.59	7.47	70.90	67.40	2.59	2.70	3.40	2.23	6.09	13.56
19:00:40	25.27	25.15	3.89	4.02	14.59	7.47	70.90	67.40	2.39	2.70	3.40	2.23	6.09	13.56

28-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
19:02:56	25.27	25.15	3.89	4.02	14.59	7.47	70.90	67.40	2.39	2.70	3.20	2.23	6.09	13.56
19:05:12	25.27	25.15	4.01	4.02	14.59	7.47	70.90	67.40	2.39	2.70	3.40	2.23	6.09	13.56
19:07:28	25.27	25.15	4.01	4.02	14.59	7.47	70.90	67.40	2.19	2.40	3.40	2.23	6.09	13.56
19:09:44	25.27	25.15	4.01	4.06	14.59	7.47	70.90	67.40	2.19	2.40	3.40	2.23	6.09	13.56
19:12:00	25.27	25.15	4.01	4.06	14.59	7.47	70.90	67.40	2.39	2.40	3.40	2.23	6.09	13.56
19:14:16	25.27	25.15	4.01	4.06	14.59	7.47	70.90	67.40	2.19	2.40	3.20	2.23	6.09	13.56
19:16:32	25.27	25.15	4.01	4.06	14.59	7.47	70.90	67.40	2.19	2.40	3.20	2.23	6.09	13.56
19:18:48	25.27	25.15	4.01	4.06	14.59	7.47	70.90	67.40	2.19	2.61	3.00	2.23	6.09	13.56
19:21:04	25.27	25.15	4.01	4.06	14.59	7.47	70.90	67.40	2.19	2.61	3.20	2.23	6.09	13.56
19:23:20	25.27	25.15	4.01	4.06	14.59	7.47	70.90	67.40	2.19	2.40	3.40	2.23	6.09	13.56
19:25:36	25.27	25.12	4.01	4.06	14.59	7.47	70.90	67.40	1.99	2.61	3.40	2.23	6.09	13.56
19:27:52	25.27	25.12	4.01	4.06	14.59	7.47	73.70	67.40	1.97	2.40	3.20	1.94	6.09	13.56
19:30:08	25.27	25.12	4.01	4.06	14.59	7.47	73.70	67.40	1.97	2.12	3.00	1.94	6.09	13.56
19:32:24	25.27	25.12	4.01	4.06	14.59	7.47	73.70	67.40	1.97	2.12	3.00	1.94	6.09	13.56
19:34:40	25.27	25.28	4.01	4.06	14.59	7.47	73.70	67.40	2.11	2.12	3.20	1.74	6.09	13.56
19:36:56	25.27	25.28	4.01	4.06	14.59	7.47	73.70	67.40	2.11	2.12	3.00	1.74	6.09	13.56
19:39:12	25.27	25.28	4.13	4.06	14.59	7.47	73.70	67.40	1.94	2.12	3.20	1.74	6.09	13.56
19:41:28	25.27	25.28	4.13	4.06	14.59	7.47	70.90	67.40	1.94	2.12	3.20	1.74	6.09	13.56
19:43:44	25.27	25.28	4.13	4.06	14.59	7.47	73.80	67.40	1.94	1.92	3.20	1.74	6.09	13.56
19:46:00	25.27	25.28	4.13	3.94	14.59	7.47	73.80	67.40	1.94	2.12	2.99	1.74	6.09	13.56
19:48:16	25.27	25.28	4.01	3.94	14.59	7.47	73.80	70.80	1.94	2.12	2.99	1.74	5.89	13.56
19:50:32	25.27	25.28	4.01	3.94	14.59	7.47	73.80	67.70	2.11	1.93	2.99	1.74	5.89	13.56
19:52:48	25.27	25.30	4.01	4.07	14.59	7.47	73.80	67.70	1.94	2.12	2.99	1.74	5.89	13.56
19:55:04	25.27	25.30	4.01	4.07	14.59	7.47	73.80	71.00	1.94	1.92	2.99	1.74	5.89	13.56
19:57:20	25.27	25.30	4.01	4.07	14.59	7.47	73.80	71.00	1.94	2.12	2.99	1.74	5.89	13.56
19:59:36	25.27	25.30	4.01	4.07	14.59	7.47	73.80	71.00	1.88	2.12	2.99	1.64	5.89	13.56
20:01:52	25.28	25.30	4.01	4.07	14.59	7.27	73.80	71.00	1.88	2.32	2.99	1.64	5.89	13.56
20:04:08	25.28	25.30	4.01	4.19	14.59	7.27	73.80	71.00	1.88	2.32	2.99	1.64	5.89	13.56
20:06:24	25.28	25.30	4.01	4.19	14.59	7.27	73.80	71.00	1.88	2.32	2.79	1.64	5.89	13.56
20:08:40	25.28	25.30	4.12	4.19	14.59	7.27	73.80	71.00	1.68	2.32	2.79	1.64	5.89	13.56
20:10:56	25.28	25.30	4.00	4.06	14.59	7.27	73.80	71.00	1.68	2.80	2.99	1.64	5.89	13.56
20:13:12	25.28	25.30	4.00	4.06	14.59	7.27	73.80	71.00	1.68	2.01	2.79	1.64	5.89	13.56
20:15:28	25.28	25.30	4.00	4.06	14.59	7.27	73.80	71.00	1.68	2.01	2.79	1.35	5.89	13.56
20:17:44	25.28	25.30	4.00	4.06	14.59	7.27	73.80	71.00	1.68	2.21	2.79	1.56	5.89	13.56
20:20:00	25.28	25.30	4.00	4.06	14.59	7.27	73.80	71.00	1.68	2.21	2.79	1.56	5.89	13.56
20:22:16	25.28	25.30	4.00	4.06	14.59	7.27	73.80	71.00	1.68	1.93	2.79	1.56	5.89	13.56
20:24:32	25.28	25.30	4.00	4.06	14.59	7.27	76.70	71.00	1.68	1.93	2.79	1.56	5.89	13.56
20:26:48	25.28	25.30	4.00	4.06	14.59	7.27	76.70	71.00	1.68	1.93	2.79	1.56	5.89	13.56
20:29:04	25.28	25.30	4.00	4.06	14.59	7.47	76.70	71.00	1.68	1.93	2.59	1.56	6.51	13.56
20:31:20	25.28	25.30	4.00	4.06	14.59	8.07	76.70	71.00	1.68	2.32	2.79	1.56	7.12	13.56
20:33:36	25.29	25.30	4.00	4.06	14.59	8.48	76.70	71.00	1.68	2.12	2.79	1.56	7.52	13.56
20:35:52	25.29	25.30	4.00	4.06	14.59	8.68	76.70	71.00	1.68	2.12	2.59	1.56	7.72	13.56
20:38:08	25.29	25.30	4.00	4.06	14.59	8.68	76.70	71.00	1.48	1.82	2.59	1.56	7.92	13.56
20:40:24	25.27	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.48	1.82	2.59	1.35	7.92	13.56
20:42:40	25.27	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.48	1.82	2.59	1.35	7.92	13.56
20:44:56	25.27	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.48	1.82	2.59	1.15	7.92	13.56
20:47:12	25.27	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.27	2.02	2.59	1.15	7.92	13.56
20:49:28	25.28	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.48	1.53	2.59	1.15	7.92	13.56
20:51:44	25.28	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.48	1.53	2.59	1.15	7.92	13.56
20:54:00	25.28	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.48	1.53	2.39	1.15	7.92	13.56
20:56:16	25.28	25.30	4.00	4.06	14.59	8.88	73.80	71.00	1.48	1.73	2.39	1.15	7.92	13.56
20:58:32	25.28	25.30	4.00	4.06	14.59	8.88	73.80	71.00	1.48	1.73	2.39	1.15	7.92	13.56
21:00:48	25.28	25.30	4.00	4.06	14.59	8.88	73.80	71.00	1.48	2.02	2.39	1.35	7.92	13.56
21:03:04	25.28	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.27	1.82	2.39	1.15	7.92	13.81
21:05:20	25.28	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.27	1.82	2.39	1.35	7.92	13.81
21:07:36	25.29	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.27	1.82	2.39	1.15	7.92	13.81
21:09:52	25.29	25.30	4.00	4.06	14.59	8.88	76.70	71.00	1.27	1.52	2.59	1.15	7.92	13.81
21:12:08	25.26	25.20	4.00	4.06	14.59	8.88	76.70	71.00	1.48	1.52	2.59	1.15	7.92	13.81
21:14:24	25.08	25.20	4.00	4.06	14.59	8.88	76.70	67.40	1.27	1.52	2.59	1.15	7.92	13.81
21:16:40	25.28	25.20	4.00	4.06	14.59	8.88	76.70	70.90	1.27	1.52	2.59	1.36	7.92	13.81
21:18:56	25.28	25.20	4.00	4.06	14.59	8.88	76.70	70.90	1.27	1.52	2.59	1.36	7.92	13.81
21:21:12	25.29	25.20	4.00	4.06	14.59	8.88	73.90	70.90	1.27	1.52	2.59	1.36	7.92	13.81
21:23:28	25.29	25.20	4.00	4.06	14.59	8.88	73.90	70.90	1.27	2.81	2.59	1.65	7.92	13.81
21:25:44	25.29	25.20	4.12	4.06	14.59	8.88	76.70	70.90	1.48	2.12	2.59	1.45	7.92	13.81
21:28:00	25.29	25.20	4.12	4.06	14.59	8.88	76.70	70.90	1.27	1.82	2.39	1.45	7.92	13.81
21:30:16	25.29	25.20	4.12	4.06	14.59	8.88	76.70	70.90	1.27	1.73	2.39	1.45	7.72	13.81
21:32:32	25.29	25.20	4.12	4.06	14.59	8.88	76.70	70.90	1.27	1.53	2.39	1.45	7.72	13.81
21:34:48	25.27	25.20	4.12	4.06	19.78	8.88	76.70	70.90	1.48	1.53	2.39	1.45	7.72	13.81
21:37:04	25.18	25.20	4.02	4.19	19.78	8.88	76.70	70.90	1.48	1.53	2.39	1.45	7.72	13.81
21:39:20	25.18	25.20	4.02	4.19	19.78	8.88	76.70	70.90	1.48	1.53	2.39	1.24	7.72	13.81
21:41:36	25.28	25.20	4.02	4.19	19.78	8.68	76.70	70.90	1.48	1.53	2.59	1.24	7.72	13.81
21:43:52	25.24	25.20	3.90	4.19	19.78	8.68	76.70	70.90	1.48	1.53	2.59	1.24	7.72	13.81
21:46:08	25.24	25.20	3.90	4.06	19.78	8.68	76.70	70.90	1.48	1.53	2.59	1.24	7.72	13.81
21:48:24	25.24	25.20	3.90	4.06	19.78	8.68	76.70	70.90	1.48	1.53	2.39	1.24	7.72	13.81
21:50:40	10.58	25.20	2.98	4.19	19.78	8.68	79.50	70.90	1.48	1.73	2.39	1.24	7.72	13.81
21:52:56	19.29	25.20	2.10	4.06	19.78	8.68	79.50	70.90	1.48	1.73	2.39	1.24	7.72	13.81
21:55:12	21.74	20.48	3.37	3.17	19.78	8.68	76.70	70.90	1.27	1.52	2.39	1.24	7.72	13.81
21:57:28	22.43	25.27	3.37	3.74	19.78	8.68	76.70	64.60	1.27	1.52	2.39	1.24	7.72	13.81
21:59:44	22.54	25.27	3.50	3.99	19.78	8.68	76.70	67.80	1.48	1.73	2.39	1.24	7.72	13.81
22:02:00	18.46	24.92	3.50	3.99	19.78	8.68	76.70	71.00	1.27	2.21	2.39	1.25	7.72	13.81
22:04:16	4.34	21.74	1.64	3.99	19.78	8.68	76.70	71.00	1.27	1.53	2.39	1.25	7.72	13.81
22:06:32	2.80	16.57	0.65	2.96	19.78	8.68	76.70	71.00	1.27	1.62	2.39	1.25	7.72	13.81
22:08:48	4.72	12.41	0.90	2.32	19.78	8.68	76.70	74.80	1.27	1.33	2.39	1.25	7.72	13.81
22:11:04	3.36	6.51	1.90	1.57	19.78	8.68	76.70	74.80	1.27	1.33	2.59	1.25	7.72	13.81
22:13:20	3.36	3.71	1.90	1.08	19.78	8.68	76.70	74.80	1.48	1.53	2.59	1.25	7.72	13.81
22:15:36	2.19	2.10	1.90	0.59	19.78	8.68	76.70	74.80	1.48	1.53	2.59	1.25	7.72	13.81
22:17:52	1.83	1.24	1.90	1.22	19.78	8.48	76.70	74.80	1.48	1.53	2.38	1.25	7.52	13.81
22:20:08	2.85	0.99	2.02	1.22	19.78	8.48	76.70	74.80	1.48	1.53	2.58	1.25	7.52	13.81
22:22:24	1.35	1.27	2.02	1.22	19.78	8.48	76.70	74.80	1.48	1.53	2.58	1.25	7.52	13.81

28-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
22:24:40	1.35	0.41	2.02	1.22	19.78	8.48	76.70	74.80	1.48	1.53	2.58	1.25	7.52	13.81
22:26:56	1.00	0.41	2.02	1.22	19.78	8.48	76.70	74.80	1.48	1.53	2.38	1.25	7.52	13.81
22:29:12	0.48	0.62	2.02	1.22	19.78	8.48	76.70	74.80	1.48	1.53	2.38	1.25	7.52	13.81
22:31:28	0.85	0.30	2.02	1.22	19.78	8.48	76.70	74.80	1.48	1.73	2.58	1.25	7.52	13.81
22:33:44	0.57	0.61	2.02	1.22	19.78	8.48	76.70	74.80	1.48	1.73	2.58	1.25	7.52	13.81
22:36:00	1.37	0.35	2.02	1.22	19.78	8.68	73.80	74.80	1.48	1.73	2.58	1.25	7.92	13.81
22:38:16	1.00	0.35	2.02	1.22	19.78	8.88	73.80	74.80	1.48	1.73	2.38	1.25	8.53	13.81
22:40:32	0.43	0.89	2.02	1.22	19.78	9.29	73.80	71.50	1.48	2.01	2.58	1.45	8.73	13.81
22:42:48	0.43	0.89	2.02	1.22	19.78	9.29	73.80	71.50	1.48	1.76	2.79	1.45	8.73	13.81
22:45:04	1.26	0.29	2.02	1.22	19.78	9.29	73.80	74.70	1.48	1.92	2.79	1.45	8.53	13.81
22:47:20	14.54	3.46	2.02	1.22	19.78	9.29	73.80	74.70	1.68	1.92	2.79	1.65	8.53	13.81
22:49:36	22.48	13.96	2.02	1.22	19.78	9.09	76.70	74.70	1.68	1.92	2.79	1.45	8.32	13.81
22:51:52	24.20	23.12	3.17	1.22	19.78	8.89	76.70	74.70	1.68	1.92	2.79	1.45	7.51	13.81
22:54:08	17.71	25.24	3.17	3.50	19.78	8.08	76.70	71.00	1.68	1.92	2.79	1.45	6.50	13.81
22:56:24	21.70	21.24	3.29	3.64	19.78	7.48	73.90	71.00	1.88	1.92	2.79	1.45	5.89	13.81
22:58:40	22.70	19.14	3.90	3.27	19.78	7.07	73.90	67.60	1.88	2.12	2.99	1.45	5.49	13.81
23:00:56	19.29	17.46	3.52	3.01	19.78	6.87	73.90	67.60	1.88	2.12	2.99	1.45	5.30	13.81
23:03:12	25.28	25.31	2.30	2.85	19.78	6.67	73.90	78.40	1.88	2.12	2.99	1.65	4.89	13.81
23:05:28	24.73	24.06	3.82	3.95	19.78	6.27	73.90	67.40	1.88	2.12	2.99	1.94	4.69	13.81
23:07:44	24.13	24.01	3.82	3.95	19.78	6.27	73.90	67.40	1.88	2.12	2.99	1.94	5.10	13.81
23:10:00	23.50	23.72	3.82	3.95	19.78	6.87	76.70	63.70	1.88	2.12	2.99	1.94	5.71	13.81
23:12:16	24.54	24.05	3.82	3.95	19.78	7.48	76.70	63.70	1.88	2.12	2.99	2.14	6.32	13.81
23:14:32	24.73	24.05	3.82	3.95	19.78	7.68	76.70	63.70	1.88	2.12	2.99	1.94	6.72	13.81
23:16:48	24.44	24.40	3.82	3.95	19.78	8.09	76.70	63.70	1.88	2.12	3.19	1.74	6.92	13.81
23:19:04	24.73	24.53	3.82	3.95	19.78	8.29	73.90	63.70	2.11	2.12	2.99	1.74	7.12	13.81
23:21:20	22.80	24.82	3.82	3.95	19.78	8.29	73.90	63.70	2.11	2.12	2.99	1.74	7.12	13.81
23:23:36	24.76	24.70	3.95	3.95	19.78	8.49	73.90	63.70	1.94	2.42	2.99	1.74	7.32	13.81
23:25:52	24.88	24.82	3.95	3.95	19.78	8.49	76.70	63.70	1.94	2.21	2.99	1.74	7.32	13.81
23:28:08	24.60	24.65	3.95	3.95	19.78	8.49	76.70	63.70	2.11	2.21	2.99	1.74	7.32	13.81
23:30:24	25.03	25.15	3.95	3.95	19.78	8.49	76.70	67.40	1.87	2.61	3.19	1.74	7.46	13.81
23:32:40	25.03	24.80	3.95	3.95	19.78	8.49	76.70	67.40	1.87	2.41	3.19	1.74	7.46	13.81
23:34:56	25.29	24.81	3.95	3.95	19.78	8.49	76.70	67.40	2.11	2.21	2.99	1.74	7.46	13.81
23:37:12	24.64	24.15	3.95	3.95	19.78	8.49	76.70	67.40	2.11	2.21	2.99	1.74	7.46	13.81
23:39:28	25.05	25.01	3.95	3.95	19.78	8.49	76.70	67.40	1.96	2.21	2.99	1.74	7.25	13.81
23:41:44	25.06	25.08	3.95	3.95	19.78	8.29	76.70	67.40	2.06	2.21	3.19	1.74	6.64	13.81
23:44:00	25.17	25.31	3.95	3.95	19.78	7.67	73.90	67.40	2.06	2.21	3.19	1.74	5.61	13.81
23:46:16	25.30	25.27	3.95	3.95	19.78	6.86	76.70	67.40	2.06	2.21	2.99	1.94	4.90	13.81
23:48:32	25.27	24.69	3.95	4.08	19.78	6.45	76.70	67.40	2.06	2.21	2.99	1.74	4.29	13.81
23:50:48	23.57	25.02	3.95	4.08	19.78	5.85	76.70	67.40	2.06	2.21	3.19	1.74	3.89	13.81
23:53:04	25.10	24.72	3.95	4.08	19.78	5.64	76.70	67.40	2.06	2.21	2.99	1.74	3.69	13.81
23:55:20	25.10	25.05	4.08	4.08	19.78	5.47	76.70	67.40	2.06	2.21	3.19	1.74	3.69	13.81
23:57:36	25.10	24.96	4.08	4.08	19.78	5.63	73.70	67.40	2.06	2.21	3.19	1.74	4.09	13.81
23:59:52	25.29	24.79	4.08	3.95	19.78	6.03	73.70	70.90	2.11	2.42	3.19	1.74	4.70	13.81
0:02:08	25.24	25.08	4.03	4.00	22.22	6.44	73.20	69.20	2.09	2.41	2.99	1.74	5.32	13.82
0:04:24	25.24	25.08	3.95	4.00	22.22	7.04	73.20	69.20	1.95	2.42	2.99	1.74	5.92	13.82
0:06:40	25.14	24.86	4.08	4.00	22.22	7.45	73.20	69.20	2.11	2.42	2.99	1.74	6.32	13.82
0:08:56	25.23	25.12	3.96	4.00	22.22	7.65	73.20	69.20	2.11	2.42	3.20	1.74	6.32	13.82
0:11:12	25.29	24.98	3.96	4.00	22.22	7.65	73.20	69.20	1.93	2.21	3.20	1.74	6.32	13.82
0:13:28	25.08	24.70	3.96	4.00	22.22	7.65	73.20	69.20	1.93	2.21	3.20	1.54	6.32	13.82
0:15:44	24.58	24.18	3.96	4.00	22.22	7.65	73.20	67.40	2.11	2.21	3.20	1.74	6.32	13.82
0:18:00	24.35	24.32	3.96	4.00	22.22	7.65	73.20	67.40	2.11	2.21	3.20	2.04	6.32	13.82
0:20:16	24.06	24.31	3.96	4.00	22.22	7.65	73.20	67.40	2.12	2.47	3.00	2.04	6.29	13.82
0:22:32	24.19	24.02	3.96	3.83	22.22	7.65	70.90	67.40	1.96	2.47	3.00	1.84	6.29	13.82
0:24:48	24.28	23.78	3.83	3.83	22.22	7.65	70.90	67.40	2.11	2.47	3.00	1.84	6.29	13.82
0:27:04	24.01	24.05	3.83	3.83	22.22	7.65	70.90	67.40	2.11	2.47	3.00	1.64	6.29	13.82
0:29:20	24.34	24.05	3.83	3.83	22.22	7.65	70.90	67.40	2.11	2.47	3.20	1.64	6.29	13.82
0:31:36	21.55	23.80	3.83	3.83	22.22	7.65	70.90	67.40	2.11	2.47	3.20	1.84	6.29	13.82
0:33:52	23.87	23.83	3.83	3.83	22.22	7.65	70.90	67.40	2.11	2.81	3.20	1.84	6.29	13.82
0:36:08	24.20	23.79	3.83	3.83	22.22	7.65	70.90	67.40	2.31	2.61	3.20	1.84	6.29	13.82
0:38:24	24.22	23.79	3.83	3.83	22.22	7.65	70.90	67.40	2.39	2.81	3.20	1.84	6.29	13.82
0:40:40	24.23	23.79	3.83	3.83	22.22	7.65	70.90	67.40	2.39	2.81	3.20	2.13	6.29	13.82
0:42:56	24.14	23.47	3.83	3.83	22.22	7.65	70.90	67.40	2.18	3.59	3.20	2.13	6.08	13.82
0:45:12	24.19	24.12	3.83	3.83	22.22	7.65	70.90	67.40	2.18	3.19	3.20	1.83	6.08	13.82
0:47:28	24.27	24.12	3.83	3.83	22.22	7.45	70.90	67.40	2.39	2.71	3.20	1.83	6.08	13.82
0:49:44	24.21	24.15	3.83	3.83	22.22	7.45	70.90	67.40	2.39	2.51	3.20	1.83	5.88	13.82
0:52:00	24.24	24.33	3.83	3.83	22.22	7.45	70.90	67.40	2.39	2.51	3.20	1.83	5.88	13.82
0:54:16	24.54	24.76	3.95	3.83	22.22	7.45	70.90	67.40	2.39	2.71	3.20	2.04	5.88	13.82
0:56:32	24.29	24.32	3.95	3.83	22.22	7.25	70.90	67.40	2.39	2.71	3.20	2.04	5.88	13.82
0:58:48	24.63	24.18	3.95	3.95	22.22	7.25	70.90	67.40	2.39	2.96	3.40	2.04	5.88	13.82
1:01:04	24.58	24.84	3.95	3.95	22.22	7.25	70.90	67.40	2.39	2.91	3.40	2.04	5.88	13.82
1:03:20	24.89	24.86	3.95	3.95	22.22	7.25	70.90	67.40	2.39	2.91	3.40	2.04	5.88	13.82
1:05:36	24.86	24.89	3.95	3.95	22.22	7.25	70.90	67.40	2.39	2.71	3.40	2.04	5.88	13.82
1:07:52	24.40	24.16	3.95	3.95	22.22	7.25	70.90	71.10	2.39	2.71	3.40	2.04	5.88	13.82
1:10:08	23.18	24.66	3.95	3.95	22.22	7.25	70.90	71.10	2.39	2.71	3.40	2.04	5.88	13.82
1:12:24	24.73	24.39	3.95	3.95	22.22	7.25	70.90	71.10	2.18	2.91	3.60	2.04	5.88	13.82
1:14:40	24.89	24.37	3.95	3.95	22.22	7.25	70.90	71.10	2.18	2.71	3.60	2.04	5.88	13.82
1:16:56	24.98	24.41	3.95	3.95	22.22	7.25	70.90	71.10	2.18	2.71	3.60	2.32	5.68	13.82
1:19:12	24.82	24.65	3.95	3.95	22.22	7.25	70.90	71.10	2.18	2.51	3.60	2.32	5.68	13.82
1:21:28	24.59	24.22	3.95	3.95	22.22	7.25	70.90	71.10	2.18	2.51	3.60	2.32	5.68	13.82
1:23:44	24.65	24.50	3.95	3.95	22.22	7.25	70.90	71.10	2.18	3.20	3.60	2.32	5.68	13.82
1:26:00	24.71	24.69	3.95	3.95	22.22	7.25	70.90	71.10	1.98	2.80	3.60	2.32	5.68	13.82
1:28:16	24.44	23.63	3.95	3.95	22.22	7.25	70.90	71.10	1.98	2.80	3.60	2.32	5.68	13.82
1:30:32	24.44	24.15	3.95	3.95	22.22	7.25	70.90	71.10	1.98	2.80	3.60	2.32	5.68	13.82
1:32:48	23.97	23.78	3.95	3.95	22.22	7.25	70.90	71.10	1.90	2.60	3.60	2.32	5.68	13.82
1:35:04	21.28	23.82	3.95	3.95	22.22	7.25	68.10	71.10	1.90	2.60	3.60	2.32	5.68	13.82
1:37:20	24.24	23.97	3.83	3.95	22.22	7.25	68.10	71.10	1.90	2.51	3.40	2.32	5.68	13.82
1:39:36	24.31	23.89	3.83	3.95	22.22	7.25	68.10	71.10	1.90	2.11	3.20	2.32	5.68	13.82
1:41:52	23.99	23.42	3.83	3.95	22.22	7.25	68.10	71.10	1.90	2.11	3.20	2.32	5.68	13.82
1:44:08	23.82	23.16	3.83	3.95	22.22	7.25	68.10	71.10	1.90	2.11	3.20	2.53	5.68	13.82

28-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
1:46:24	23.49	23.11	3.83	4.04	22.22	7.25	68.10	67.40	1.90	2.11	3.20	2.62	5.68	13.82
1:48:40	23.51	22.88	3.71	3.92	22.22	7.25	68.10	67.40	1.90	2.11	3.00	2.42	5.68	13.82
1:50:56	23.56	22.80	3.71	3.79	22.22	7.25	68.10	67.40	1.70	2.11	3.00	2.42	5.68	13.82
1:53:12	23.26	23.38	3.71	3.79	22.22	7.25	68.10	67.40	1.70	2.11	3.00	2.42	5.68	13.82
1:55:28	23.33	23.12	3.71	3.79	22.22	7.25	68.10	67.40	1.70	2.11	3.00	1.94	5.68	13.82
1:57:44	23.33	23.15	3.71	3.73	22.22	7.25	65.20	67.40	1.70	2.11	3.00	1.74	5.68	13.82
2:00:00	23.57	23.60	3.68	3.73	22.22	7.25	65.20	67.40	1.70	2.11	2.79	1.74	5.68	13.82
2:02:16	23.73	22.82	3.68	3.73	22.22	7.25	65.20	67.40	1.49	1.92	2.79	1.54	5.68	13.82
2:04:32	23.54	23.26	3.68	3.73	22.22	7.25	65.20	67.40	1.53	2.11	2.79	1.45	5.68	13.82
2:06:48	22.57	22.90	3.68	3.73	22.22	7.25	65.20	64.30	1.53	1.82	3.00	1.45	5.68	13.82
2:09:04	23.73	23.60	3.68	3.73	22.22	7.25	65.20	64.30	1.53	1.82	2.79	1.45	5.68	13.82
2:11:20	23.63	23.60	3.80	3.73	22.22	7.25	65.20	64.30	1.33	1.82	2.79	1.45	5.68	13.82
2:13:36	23.74	23.65	3.80	3.85	22.22	7.25	65.20	64.30	1.53	1.53	2.79	1.45	5.68	13.82
2:15:52	24.37	23.63	3.80	3.85	22.22	7.25	65.20	64.30	1.33	1.73	2.59	1.45	5.68	13.82
2:18:08	24.07	23.28	3.80	3.85	22.22	7.25	65.20	64.30	1.33	1.73	2.79	1.45	5.68	13.82
2:20:24	24.10	23.63	3.80	3.85	22.22	7.25	65.20	64.30	1.33	1.92	2.79	1.25	5.68	13.82
2:22:40	24.60	24.12	3.80	3.85	22.22	7.25	65.20	64.30	1.33	1.92	2.79	1.51	5.68	13.82
2:24:56	24.08	24.09	3.80	3.73	22.22	7.25	65.20	64.30	1.33	1.63	2.59	1.25	5.68	13.82
2:27:12	24.46	24.09	3.80	3.86	22.22	7.25	65.20	64.30	1.33	2.32	2.59	1.25	5.68	13.82
2:29:28	24.37	24.12	3.80	3.86	22.22	7.25	65.20	64.30	1.33	1.92	2.59	1.25	5.68	13.82
2:31:44	25.04	24.39	3.80	3.86	22.22	7.25	65.20	67.30	1.33	2.21	2.39	1.25	5.68	13.82
2:34:00	24.48	24.28	3.93	3.99	22.22	7.25	65.20	67.30	1.33	1.62	2.39	1.25	5.68	13.82
2:36:16	24.73	24.73	3.93	3.99	22.22	7.25	65.20	67.30	1.33	1.62	2.39	1.45	5.68	13.82
2:38:32	24.95	24.57	3.93	3.99	22.22	7.25	65.20	67.30	1.33	1.34	2.39	1.25	5.68	13.82
2:40:48	25.25	24.27	3.93	3.99	22.22	7.25	65.20	67.30	1.33	1.34	2.39	1.25	5.68	13.82
2:43:04	25.27	24.87	4.05	4.11	22.22	7.25	65.20	64.10	1.33	1.63	2.39	1.45	5.88	13.82
2:45:20	24.98	24.95	3.92	4.11	22.22	7.25	65.20	64.10	1.33	1.73	2.39	1.45	5.88	13.82
2:47:36	24.89	24.36	3.92	3.99	22.22	7.25	65.20	64.10	1.33	1.92	2.39	1.45	5.88	13.82
2:49:52	24.67	24.90	3.92	3.99	22.22	7.25	65.20	64.10	1.13	1.72	2.59	1.45	5.88	13.82
2:52:08	24.67	24.87	3.92	3.99	22.22	7.25	65.20	64.10	1.13	1.52	2.39	1.45	5.88	13.82
2:54:24	24.63	24.75	3.92	3.99	22.22	7.25	65.20	67.30	1.13	1.52	2.39	1.45	5.88	13.82
2:56:40	24.51	24.54	3.92	3.99	22.22	7.25	65.20	67.30	1.13	1.52	2.39	1.45	5.88	13.82
2:58:56	24.61	24.76	3.92	3.99	22.22	7.25	62.40	67.30	1.13	1.24	2.59	1.54	5.88	13.82
3:01:12	24.79	24.08	3.92	3.99	22.22	7.25	62.40	63.60	1.13	1.23	2.39	1.74	5.88	13.82
3:03:28	25.07	24.22	3.92	3.99	22.22	7.25	62.40	67.40	1.13	1.23	2.18	1.25	5.88	13.82
3:05:44	25.09	24.61	3.92	3.99	22.22	7.25	62.40	67.40	1.13	1.43	2.18	0.96	5.88	13.82
3:08:00	24.74	24.62	3.92	3.99	22.22	7.25	62.40	67.40	1.13	1.64	2.18	0.96	5.88	13.82
3:10:16	24.75	24.37	3.92	3.99	22.22	7.25	62.40	67.40	1.13	1.62	2.39	0.96	5.88	13.82
3:12:32	24.26	24.63	3.92	3.99	22.22	7.25	62.40	67.40	1.13	1.34	2.39	0.96	5.88	13.82
3:14:48	24.29	24.21	3.80	3.87	22.22	7.25	62.40	67.40	1.13	1.34	2.39	0.96	5.88	13.82
3:17:04	24.43	24.29	3.80	4.00	22.22	7.25	62.40	67.40	1.13	1.34	2.39	0.96	5.88	13.82
3:19:20	24.48	23.51	3.80	4.00	22.22	7.25	62.40	67.40	1.13	1.34	2.39	0.96	5.88	13.82
3:21:36	24.34	24.18	3.92	4.00	22.22	7.25	62.40	67.40	1.13	1.34	2.18	0.96	5.88	13.82
3:23:52	24.35	23.57	3.80	4.00	22.22	7.25	62.40	67.40	1.33	1.34	2.39	1.24	5.88	13.82
3:26:08	24.28	23.68	3.80	3.87	22.22	7.25	62.40	67.40	1.13	1.34	2.39	1.24	5.88	13.82
3:28:24	23.91	23.86	3.80	3.87	22.22	7.25	62.40	67.40	1.13	1.57	2.39	1.24	5.88	13.82
3:30:40	23.83	23.67	3.80	3.87	22.22	7.25	62.40	63.80	1.13	1.57	2.39	1.45	5.88	13.82
3:32:56	24.07	23.79	3.80	3.87	22.22	7.25	62.40	63.80	1.13	1.57	2.39	1.45	5.68	13.82
3:35:12	23.79	23.41	3.80	3.75	22.22	7.25	59.40	63.80	1.13	1.82	2.39	1.45	5.68	13.82
3:37:28	24.08	23.49	3.80	3.75	22.22	7.25	59.40	63.80	1.13	1.52	2.39	1.45	5.68	13.82
3:39:44	23.81	23.65	3.80	3.75	22.22	7.25	59.40	63.80	1.33	1.52	2.39	1.45	5.68	13.82
3:42:00	23.83	24.07	3.80	3.87	22.22	7.25	59.40	63.80	1.12	1.23	2.18	1.25	5.68	13.82
3:44:16	23.92	23.50	3.80	3.87	22.22	7.25	59.40	63.80	1.12	1.33	2.18	1.53	5.68	13.82
3:46:32	24.21	22.92	3.80	3.87	22.22	7.25	59.40	63.80	1.12	1.33	2.18	1.53	5.68	13.82
3:48:48	23.93	23.55	3.80	3.87	22.22	7.25	59.40	63.80	1.12	1.33	2.39	1.25	5.68	13.82
3:51:04	23.93	23.68	3.80	3.75	22.22	7.25	59.40	63.80	1.12	1.33	2.39	1.45	5.68	13.82
3:53:20	23.96	23.81	3.80	3.75	22.22	7.25	59.40	63.80	1.12	1.33	2.39	1.25	5.68	13.82
3:55:36	24.47	24.08	3.80	3.87	22.22	7.25	59.40	63.80	1.12	1.33	2.39	1.54	5.68	13.82
3:57:52	24.06	23.63	3.80	3.75	22.22	7.25	59.40	63.80	0.92	1.33	2.39	1.54	5.68	13.82
4:00:08	24.06	23.94	3.93	3.87	22.22	7.25	59.40	63.80	0.92	1.53	2.39	1.34	5.68	13.82
4:02:24	24.02	24.21	3.93	3.75	22.22	7.25	59.40	63.80	0.92	1.82	2.39	1.34	5.68	13.82
4:04:40	24.02	24.00	3.93	3.87	22.22	7.25	59.40	63.80	1.12	2.03	2.39	1.34	5.68	13.82
4:06:56	24.02	23.73	3.93	3.87	22.22	7.25	59.40	63.80	1.12	1.62	2.39	1.34	5.68	13.82
4:09:12	24.10	24.00	3.93	3.87	22.22	7.25	59.40	63.80	0.92	1.62	2.39	1.54	5.68	13.82
4:11:28	24.40	24.03	3.93	3.87	22.22	7.25	59.40	63.80	0.92	1.34	2.18	1.54	5.68	13.82
4:13:44	23.95	24.20	3.93	3.87	22.22	7.25	59.40	63.80	1.12	1.34	2.18	1.34	5.68	13.82
4:16:00	24.37	23.83	3.93	3.87	22.22	7.25	59.40	63.80	1.12	1.34	2.18	1.34	5.68	13.82
4:18:16	24.11	23.66	3.93	3.87	22.22	7.25	59.40	63.80	1.12	1.63	2.18	1.34	5.68	13.82
4:20:32	24.09	23.73	3.93	3.87	22.22	7.25	59.40	63.80	0.92	1.63	2.18	1.34	5.68	13.82
4:22:48	24.15	23.78	3.87	3.87	22.22	7.25	59.40	63.80	0.92	1.62	2.18	1.54	5.68	13.82
4:25:04	24.18	23.83	3.87	3.87	22.22	7.25	59.40	63.80	1.12	2.12	2.18	1.54	5.68	13.82
4:27:20	24.35	23.85	3.87	3.87	22.22	7.25	59.40	63.80	1.12	1.73	2.18	1.34	5.68	13.82
4:29:36	24.13	23.80	3.87	3.84	22.22	7.25	59.40	63.80	1.12	2.60	2.18	1.34	5.68	13.82
4:31:52	24.13	23.76	3.87	3.84	22.22	7.25	59.40	63.80	1.12	2.31	2.18	1.54	5.68	13.82
4:34:08	24.12	23.57	3.75	3.84	22.22	7.25	59.40	60.00	1.12	2.12	2.18	1.34	5.68	13.82
4:36:24	24.44	23.57	3.75	3.84	22.22	7.25	59.40	60.00	1.12	1.73	2.18	1.34	5.68	13.82
4:38:40	24.18	23.67	3.75	3.84	22.22	7.25	59.40	63.80	1.12	2.02	2.18	1.34	5.68	13.82
4:40:56	23.99	24.17	3.87	3.84	22.22	7.25	59.40	63.80	1.12	2.12	2.18	1.34	5.68	13.82
4:43:12	24.47	23.71	3.87	3.84	22.22	7.25	59.40	63.80	1.12	2.12	2.39	1.34	5.68	13.82
4:45:28	24.02	23.23	3.87	3.84	22.22	7.25	59.40	60.00	1.12	1.62	2.39	1.34	5.68	13.82
4:47:44	23.72	23.31	3.75	3.72	22.22	7.25	59.40	60.00	0.92	1.62	2.18	1.06	5.68	13.82
4:50:00	22.31	23.30	3.75	3.84	22.22	7.25	59.40	60.00	1.12	1.34	2.18	1.06	5.68	13.82
4:52:16	23.53	23.28	3.75	3.84	22.22	7.25	59.40	60.00	1.12	1.34	2.18	1.06	5.68	13.82
4:54:32	23.79	23.07	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.64	2.18	1.06	5.68	13.82
4:56:48	23.79	23.33	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.93	2.18	1.06	5.68	13.82
4:59:04	23.79	22.87	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.73	2.18	1.06	5.68	13.82
5:01:20	23.26	22.97	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.53	2.18	1.06	5.68	13.82
5:03:36	23.53	23.09	3.75	3.84	22.22	7.25	56.50	60.00	1.12	2.32	2.18	0.86	5.68	13.81
5:05:52	23.08	23.11	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.73	2.39	0.86	5.68	13.81

28-Nov-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C
5:08:08	22.34	23.16	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.53	2.39	0.86	5.68	13.81
5:10:24	24.17	23.01	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.23	2.18	1.65	5.68	13.81
5:12:40	24.41	23.80	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.43	2.39	1.45	5.68	13.81
5:14:56	24.07	23.64	3.75	3.84	22.22	7.25	56.50	60.00	1.32	1.23	2.39	1.45	5.68	13.81
5:17:12	24.17	23.99	3.75	3.84	22.22	7.25	56.50	60.00	1.32	1.23	2.39	1.45	5.68	13.81
5:19:28	24.17	23.68	3.75	3.84	22.22	7.25	56.50	60.00	1.32	1.92	2.18	1.24	5.68	13.81
5:21:44	24.47	23.96	3.75	3.84	22.22	7.25	56.50	60.00	1.32	2.11	2.18	1.45	5.68	13.81
5:24:00	24.22	23.96	3.75	3.84	22.22	7.25	56.50	60.00	1.32	1.53	2.18	1.45	5.68	13.81
5:26:16	24.27	23.55	3.75	3.84	22.22	7.25	56.50	60.00	1.32	1.53	2.18	1.24	5.68	13.81
5:28:32	24.12	23.85	3.75	3.84	22.22	7.25	56.50	60.00	1.32	1.73	2.18	1.24	5.68	13.81
5:30:48	24.47	24.07	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.53	2.18	1.04	5.68	13.81
5:33:04	24.08	23.98	3.75	3.84	22.22	7.25	56.50	60.00	1.12	1.53	2.18	1.04	5.68	13.81
5:35:20	24.63	24.24	3.75	3.84	20.39	7.25	56.50	60.00	1.12	1.53	2.39	1.04	5.68	13.81
5:37:36	24.44	24.25	3.75	3.84	20.39	7.25	56.50	60.00	1.12	1.73	2.39	1.04	5.68	13.81
5:39:52	24.36	24.01	3.88	3.84	20.39	7.25	56.50	60.00	1.12	1.73	2.39	1.04	5.68	13.81
5:42:08	24.55	24.08	3.88	3.97	20.39	7.25	56.50	60.00	1.33	1.53	2.39	1.25	5.68	13.81
5:44:24	20.90	24.29	3.88	3.97	20.39	7.25	56.50	60.00	1.33	1.73	2.39	1.25	5.68	13.81
5:46:40	24.25	23.98	3.88	3.97	20.39	7.25	56.50	60.00	1.33	1.53	2.39	1.25	5.68	13.81
5:48:56	24.33	23.95	3.88	3.97	20.39	7.25	56.50	56.40	1.33	1.32	2.39	1.45	5.68	13.81
5:51:12	24.60	23.95	3.88	3.97	20.39	7.25	56.50	56.40	1.13	2.12	2.39	1.45	5.68	13.81
5:53:28	24.92	23.54	3.88	3.84	20.39	7.25	56.50	59.60	1.13	2.61	2.59	1.45	5.68	13.81
5:55:44	24.39	24.50	3.76	3.84	20.39	7.25	56.50	59.60	1.13	2.03	2.39	1.45	5.68	13.81
5:58:00	24.39	24.16	3.88	3.84	20.39	7.25	56.50	59.60	1.13	1.73	2.39	1.24	5.68	13.81
6:00:16	24.03	24.13	3.88	3.84	20.39	7.25	56.50	59.60	1.33	1.73	2.39	1.65	5.68	13.81
6:02:32	24.41	24.47	3.88	3.84	20.39	7.25	56.50	59.60	1.33	1.73	2.39	1.65	5.68	13.81
6:04:48	24.21	23.79	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.92	2.39	1.45	5.68	13.81
6:07:04	24.16	23.40	3.75	3.84	20.39	7.25	56.50	59.60	1.33	2.11	2.39	1.45	5.68	13.81
6:09:20	24.20	23.58	3.87	3.84	20.39	7.25	56.50	59.60	1.33	1.92	2.39	1.45	5.68	13.81
6:11:36	24.44	23.69	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.62	2.39	1.24	5.68	13.81
6:13:52	24.45	23.31	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.82	2.39	1.45	5.68	13.81
6:16:08	23.89	23.31	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.62	2.39	1.65	5.68	13.81
6:18:24	23.63	23.55	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.62	2.39	1.44	5.68	13.81
6:20:40	23.85	23.48	3.75	3.84	20.39	7.25	56.50	59.60	1.33	2.11	2.59	1.64	5.68	13.81
6:22:56	23.69	23.19	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.73	2.39	1.44	5.68	13.81
6:25:12	23.94	23.18	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.62	2.39	1.16	5.68	13.81
6:27:28	23.26	22.80	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.42	2.59	1.16	5.68	13.81
6:29:44	23.26	23.05	3.75	3.84	20.39	7.25	56.50	59.60	1.33	1.42	2.59	1.44	5.68	13.81
6:32:00	23.57	22.89	3.63	3.84	20.39	7.25	56.50	59.60	1.33	1.42	2.59	1.44	5.68	13.81
6:34:16	23.95	22.31	3.68	3.84	20.39	7.25	56.50	59.60	1.33	1.62	2.59	1.44	5.68	13.81
6:36:32	23.37	22.73	3.68	3.84	20.39	7.25	56.50	59.60	1.33	1.62	2.39	1.44	5.68	13.81
6:38:48	23.39	22.96	3.68	3.72	20.39	7.25	56.50	59.60	1.33	1.62	2.39	1.44	5.68	13.81
6:41:04	23.92	22.76	3.68	3.84	20.39	7.25	56.50	59.60	1.33	1.42	2.59	1.44	5.68	13.81
6:43:20	23.92	23.55	3.68	3.84	20.39	7.25	56.50	59.60	1.33	1.42	2.39	1.44	5.68	13.81
6:45:36	23.88	23.44	3.68	3.84	20.39	7.25	56.50	59.60	1.13	1.42	2.39	1.44	5.68	13.81
6:47:52	23.96	23.14	3.68	3.84	20.39	7.25	56.50	59.60	1.13	1.42	2.39	1.44	5.68	13.81
6:50:08	23.77	23.50	3.68	3.84	20.39	7.25	56.50	59.60	1.13	1.42	2.59	1.44	5.68	13.81
6:52:24	23.95	23.45	3.68	3.84	20.39	7.25	56.50	59.60	1.33	1.42	2.59	1.44	5.68	13.81
6:54:40	24.24	23.55	3.80	3.84	20.39	7.25	56.50	59.60	1.33	1.82	2.39	1.15	5.68	13.81
6:56:56	24.38	23.84	3.80	3.84	20.39	7.25	56.50	59.60	1.33	1.92	2.19	1.35	5.68	13.81
6:59:12	24.41	23.47	3.80	3.84	20.39	7.25	56.50	59.60	1.33	1.82	2.19	1.15	5.68	13.81
7:01:28	24.17	23.54	3.80	3.84	20.39	7.25	56.50	59.60	1.33	2.03	2.19	0.95	5.68	13.81
7:03:44	23.69	23.45	3.80	3.84	20.39	7.25	56.50	59.60	1.13	2.52	2.19	1.15	5.68	13.81
7:06:00	22.96	23.72	3.80	3.84	20.39	7.25	56.50	59.60	1.13	2.11	2.39	1.15	5.68	13.81
7:08:16	23.97	24.12	3.80	3.84	20.39	7.25	56.50	59.60	1.13	2.11	2.39	1.15	5.68	13.81
7:10:32	23.95	23.35	3.80	3.84	20.39	7.25	56.50	59.60	1.33	2.11	2.39	1.15	5.68	13.81
7:12:48	24.48	23.70	3.80	3.84	20.39	7.25	56.50	59.60	1.33	2.11	2.39	1.15	5.68	13.81
7:15:04	24.32	23.57	3.80	3.84	20.39	7.25	56.50	59.60	1.33	3.00	2.39	1.15	5.68	13.81
7:17:20	24.02	23.69	3.80	3.84	20.39	7.25	56.50	59.60	1.33	2.01	2.39	1.15	5.68	13.81
7:19:36	24.05	23.69	3.80	3.84	20.39	7.25	56.50	59.60	1.13	2.12	2.39	1.35	5.68	13.81
7:21:52	24.05	23.53	3.80	3.84	20.39	7.25	59.40	59.60	1.13	2.12	2.39	1.35	5.68	13.81
7:24:08	24.43	23.46	3.80	3.84	20.39	7.25	59.40	59.60	1.33	1.53	2.39	1.64	5.68	13.81
7:26:24	23.70	23.63	3.80	3.84	20.39	7.25	59.40	59.60	1.33	1.92	2.39	1.40	5.68	13.81
7:28:40	24.02	23.63	3.80	3.84	20.39	7.25	59.40	59.60	1.33	1.92	2.39	1.62	5.68	13.81
7:30:56	24.37	23.40	3.80	3.84	20.39	7.25	59.40	59.60	1.33	1.53	2.39	1.35	5.68	13.81
7:33:12	23.83	23.10	3.80	3.84	20.39	7.25	59.40	59.60	1.33	1.82	2.39	1.35	5.68	13.81
7:35:28	22.76	21.85	3.80	3.84	20.39	7.25	59.40	59.60	1.33	1.82	2.39	1.55	6.08	13.81
7:37:44	22.22	20.67	3.80	3.43	20.39	7.25	59.40	56.60	1.33	1.92	2.39	1.83	6.08	13.81
Average	22.93	23.43	3.68	3.79	18.18	8.02	69.90	65.41	2.38	2.64	3.44	2.16	6.73	13.68
Max	25.30	25.31	4.14	4.32	22.22	10.73	79.50	78.40	6.76	6.43	7.61	6.07	9.14	13.82
Min	0.43	0.29	0.65	0.59	10.32	5.47	56.50	56.40	0.92	1.23	2.18	0.86	3.69	13.56



Simulated 120/132 MGD Test Data
Akron WPCS Stress Test
14
12
10
8
6
4
2
0
1 East DO MG/L
1 West DO MG/L
#2 East DO MG/L
#2 West DO MG/L
Effluent DO PPM
602 Temp DEG C
9:00:00
9:32:26
10:04:52
10:37:18
11:09:44
11:42:10
12:14:36
12:47:02
13:19:28
13:51:54
14:24:20
14:56:46
15:29:12
16:01:38
16:34:04
17:06:30
17:38:56
18:11:22
18:43:48
19:16:14
19:48:40
20:21:06
20:53:32
21:25:58
21:58:24
22:30:50
23:03:16
23:35:42
0:08:08
0:40:34
1:13:00
1:45:26
2:17:52
2:50:18
3:22:44
3:55:10
4:27:36
5:00:02
5:32:28
6:04:54
6:37:20
7:09:46
7:42:12

AKRON WPC 2006 120/132 MGD STRESS TEST #3

5-Dec-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp	# 1 1/2 Air	# 1 3/4 Air	# 2 1/2 Air	# 2 3/4 Air
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C	SCFM	SCFM	SCFM	SCFM
9:00:00	21.40	20.48	3.38	3.06	-0.67	9.47	84.50	71.50	8.72	8.78	8.45	6.34	8.89	11.79	1760	1369	1813	869
9:02:19	22.30	21.13	3.63	3.32	-0.67	9.47	84.50	67.90	8.72	8.50	8.45	6.14	8.89	11.79	1760	1369	1813	976
9:04:38	22.49	21.06	3.63	3.32	-0.67	9.47	84.50	71.50	8.72	8.50	8.45	6.14	8.89	11.79	1760	1369	1813	676
9:06:57	22.33	23.81	3.63	3.84	-0.67	9.47	84.50	71.50	8.72	8.50	8.25	6.14	8.89	11.79	1760	1289	1813	197
9:09:16	22.76	23.00	3.51	3.72	-0.67	9.47	84.50	71.50	8.72	8.50	8.05	6.14	8.89	11.79	1760	1289	1733	263
9:11:35	23.02	23.75	3.64	3.78	-0.67	9.47	84.50	71.60	8.31	8.50	8.05	6.14	8.89	11.79	1760	1289	1733	476
9:13:54	23.29	23.41	3.72	3.78	-0.67	9.47	87.50	75.10	8.31	8.50	8.05	6.14	8.89	11.79	1760	1208	1816	712
9:16:13	22.94	23.76	3.72	3.78	-0.67	9.47	87.50	75.10	8.11	8.29	8.05	5.85	8.89	11.79	1760	1208	1728	256
9:18:32	23.23	22.99	3.72	3.78	-0.67	9.47	87.50	75.10	8.11	8.29	7.85	5.85	8.89	11.79	1760	1208	1809	749
9:20:51	22.63	22.78	3.72	3.78	-0.67	9.47	87.50	75.10	8.11	8.09	7.85	5.65	8.89	11.79	1760	1208	1809	996
9:23:10	22.77	23.00	3.72	3.78	-0.67	9.47	87.50	79.60	8.11	8.09	7.85	5.65	8.89	11.79	1760	1208	1809	690
9:25:29	21.94	22.24	3.72	3.66	-0.67	9.47	87.50	79.80	8.11	8.09	7.85	5.65	8.89	11.79	1760	1127	1809	324
9:27:48	21.61	21.90	3.72	3.66	-0.67	9.47	87.50	79.80	8.11	7.89	7.85	5.65	8.89	11.79	1760	1127	1809	571
9:30:07	20.82	21.21	3.60	3.54	-0.67	9.47	87.50	79.80	8.11	7.89	7.65	5.65	8.89	11.79	1840	1127	1809	568
9:32:26	20.81	20.64	3.48	3.54	-0.67	9.47	87.50	79.80	8.11	7.89	7.65	5.65	8.89	11.79	1840	1127	1806	1013
9:34:45	20.06	20.29	3.35	3.41	-0.67	9.47	90.20	79.80	7.91	7.89	7.45	5.65	8.89	11.79	1840	1127	1806	693
9:37:04	19.63	19.80	3.23	3.30	-0.67	9.47	90.20	79.80	7.91	7.89	7.45	5.36	8.89	11.79	1840	1042	1806	275
9:39:23	19.37	19.90	3.10	3.18	-0.67	9.47	90.20	79.90	7.91	7.89	7.45	5.36	8.89	11.79	1843	1042	1806	925
9:41:42	18.78	18.36	3.10	3.06	-0.67	9.47	90.20	79.80	8.11	7.89	7.45	5.36	8.89	11.79	1845	878	1806	1091
9:44:01	18.49	18.25	2.83	3.06	-0.67	9.47	90.20	79.80	8.11	7.89	7.45	5.36	8.89	11.79	1762	302	1806	932
9:46:20	18.30	18.13	2.95	3.06	-0.67	9.47	90.20	79.80	8.11	7.89	7.45	5.36	8.89	11.79	1762	185	1806	1081
9:48:39	18.13	18.33	2.95	3.06	-0.67	9.47	90.20	79.80	8.11	8.09	7.45	5.36	8.89	11.79	1762	36	1806	874
9:50:58	18.25	18.10	2.95	3.06	-0.67	9.47	87.30	79.80	8.11	8.09	7.45	5.36	8.89	11.79	1762	36	1806	542
9:53:17	18.22	18.28	2.95	2.94	-0.67	9.47	87.30	79.90	8.11	7.89	7.24	5.36	8.89	11.79	1762	36	1806	849
9:55:36	18.63	18.16	2.95	2.94	-0.67	9.47	90.20	76.10	7.91	8.09	7.24	5.36	8.89	11.79	1762	36	1806	849
9:57:55	19.06	18.56	2.95	2.94	-0.67	9.47	90.20	76.20	7.91	8.09	7.24	5.57	8.89	11.79	1762	36	1806	849
10:00:14	18.97	18.59	2.95	2.94	-0.67	9.47	90.20	76.20	7.91	7.89	7.24	5.36	8.89	11.79	1762	36	1806	849
10:02:33	19.55	19.37	2.95	2.94	-0.67	9.47	90.20	76.20	7.91	7.89	7.24	5.36	8.89	11.79	1762	36	1806	849
10:04:52	19.67	20.38	2.95	3.06	-0.67	9.47	90.20	76.20	7.91	7.89	7.24	5.36	8.89	11.79	1843	36	1806	849
10:07:11	19.83	20.05	3.07	3.19	-0.67	9.47	90.20	76.20	7.71	7.89	7.24	5.36	8.89	11.79	1843	41	1806	849
10:09:30	20.68	20.64	3.20	3.19	-0.67	9.47	90.20	76.20	7.71	7.89	7.24	5.08	8.89	11.79	1843	41	1806	854
10:11:49	20.61	20.81	3.20	3.19	-0.67	9.47	90.20	76.20	7.91	7.89	7.04	5.08	8.89	11.79	1843	41	1806	532
10:14:08	20.95	21.41	3.32	3.31	-0.67	9.47	90.20	76.20	7.71	7.89	6.84	5.28	8.89	11.79	1843	41	1806	415
10:16:27	21.68	21.52	3.32	3.31	-0.67	9.47	90.20	76.20	7.71	7.89	6.84	5.28	8.89	11.79	1843	41	1806	180
10:18:46	21.60	21.38	3.59	3.45	-0.67	9.47	90.20	76.20	7.71	7.89	6.84	4.79	8.89	11.79	1843	41	1806	273
10:21:05	21.55	21.60	3.47	3.45	-0.67	9.47	90.20	76.20	7.71	7.60	7.04	4.79	8.89	11.79	1843	41	1726	939
10:23:24	21.85	21.53	3.47	3.33	-0.67	9.47	90.20	79.40	7.71	7.60	7.04	5.07	8.89	11.79	1843	41	1726	1059
10:25:43	22.44	22.24	3.47	3.33	-0.67	9.47	90.20	79.40	7.71	7.60	7.04	5.07	8.89	11.79	1843	41	1726	847
10:28:02	22.43	22.63	3.47	3.33	-0.67	9.47	90.20	79.40	7.51	7.60	7.04	5.07	8.89	11.79	1762	41	1726	1088
10:30:21	22.22	22.21	3.47	3.60	-0.67	9.47	90.20	79.40	7.31	7.60	7.04	5.07	8.89	11.79	1762	41	1726	998
10:32:40	22.12	22.10	3.73	3.60	-0.67	9.47	90.20	78.90	7.10	7.40	7.04	5.07	8.89	11.79	1762	41	1726	1025
10:34:59	22.90	22.51	3.73	3.48	-0.67	9.47	90.20	78.90	7.10	7.40	6.84	5.07	8.89	11.79	1762	41	1726	209
10:37:18	22.95	22.83	3.61	3.48	-0.67	9.47	90.20	78.90	7.10	7.40	6.84	5.07	8.89	11.79	1843	41	1806	219
10:39:37	23.17	23.13	3.61	3.48	-0.67	9.47	90.20	82.30	7.10	7.11	6.84	4.78	8.89	11.79	1843	41	1806	893
10:41:56	23.39	23.39	3.73	3.47	-0.67	9.47	90.20	82.30	7.10	7.31	6.63	4.78	8.89	11.79	1762	1589	1892	1604
10:44:15	23.03	22.69	3.73	3.75	-0.67	9.47	90.20	82.50	7.10	7.11	6.63	4.78	8.89	11.79	1843	1674	1811	1606
10:46:34	23.55	23.17	3.61	3.75	-0.67	9.47	93.00	82.50	7.10	7.11	6.84	5.08	8.89	11.79	1843	1669	1811	1606
10:48:53	23.76	23.42	3.61	3.75	-0.67	9.47	93.00	78.90	7.10	7.31	7.04	5.08	8.89	11.79	1843	1589	1811	1604
10:51:12	23.90	23.18	3.88	3.63	-0.67	9.47	93.00	82.50	7.10	7.31	7.24	5.08	8.89	11.79	1843	1589	1811	1601
10:53:31	23.44	23.41	3.88	3.63	-0.67	9.47	93.00	82.50	7.10	7.31	7.24	5.28	8.89	11.79	1843	1589	1811	1601
10:55:50	23.21	23.66	3.88	3.75	-0.67	9.47	98.80	82.50	7.10	7.31	7.24	5.28	8.89	11.79	1843	1669	1811	1601
10:58:09	23.22	23.50	3.88	3.75	-0.67	9.47	91.40	82.50	7.31	7.58	7.24	5.28	8.89	11.79	1843	1669	1811	1601
11:00:28	23.02	23.21	3.88	3.63	-0.67	9.47	80.90	82.50	7.51	7.58	7.44	5.28	8.89	11.79	1762	1669	1730	1599
11:02:47	23.25	22.51	3.88	3.62	-0.67	9.47	82.80	82.50	7.31	7.58	7.64	5.28	8.89	11.79	1762	1669	1811	1601
11:05:06	23.00	22.80	3.88	3.76	-0.67	9.47	77.80	86.00	7.51	7.58	7.64	5.54	8.89	12.07	1762	1669	1811	1601
11:07:25	23.14	22.80	3.88	3.64	-0.67	9.47	80.80	86.00	7.51	7.58	7.84	5.54	8.89	12.07	1762	1669	1811	1601
11:09:44	22.35	22.99	3.88	3.64	-0.67	9.47	75.40	86.00	7.31	7.58	7.84	5.54	8.89	12.07	1762	1589	1811	1518
11:12:03	22.57	22.15	3.88	3.64	-0.67	9.47	83.20	86.00	7.31	7.79	7.84	5.75	8.89	12.07	1762	1589	1811	1518
11:14:22	22.88	22.28	3.76	3.63	-0.67	9.47	87.40	86.00	7.51	7.79	7.84	5.75	8.89	12.07	1762	1589	1811	1604
11:16:41	22.18	21.69	3.64	3.64	-0.67	9.47	90.20	89.20	7.31	7.79	7.84	5.75	8.89	12.07	1762	1669	1811	1604
11:19:00	21.33	21.19	3.64	3.51	-0.67	9.47	90.20	86.10	7.31	7.49	7.84	5.75	8.89	12.07	1762	1669	1811	1604
11:21:19	21.02	20.93	3.64	3.38	-0.67	9.47	91.50	86.10	7.51	7.49	7.84	5.75	8.89	12.07	1762	1669	1892	1687
11:23:38	20.86	20.22	3.39	3.51	-0.67	9.47	91.50	85.60	7.51	7.70	8.04	5.75	8.89	12.07	1762	1669	1892	1687
11:25:57	20.86	20.16	3.39	3.38	-0.67	9.47	91.50	82.60	7.71	7.98	8.04	5.96	8.89	12.07	1762	1669	1811	1687
11:28:16	20.86	20.23	3.27	3.38	-0.67	9.47	91.50	82.60	7.71	7.98	8.04	5.96	8.89	12.07	1762	1669	1811	1687
11:30:35	20.36	20.34	3.27	3.36	-0.67	9.47	91.50	82.60	7.71	7.98	8.04	5.96	8.89	12.07	1762	1589	1811	1687
11:32:54	20.16	20.00	3.27	3.23	-0.67	9.47	91.50	82.60	7.71	7.98	8.04	5.96	8.89	12.07	1762	1589	1811	1606
11:35:13	20.27	19.34	3.13	3.11	-0.67	9.47	91.50	82.60	7.71	7.98	8.04	5.96	8.89	12.07	1848	1672	1730	1525
11:37:32	19.90	19.39	3.13	3.11	-0.67	9.47	91.50	82.60	7.71	7.98	8.04	5.96	8.68	12.07	1848	1672	1730	1525
11:39:51	19.67	19.22	3.13	3.23	-0.67	9.27	91.50	82.60	7.71	7.98	8.04	5.96	8.68	12.07	1848	1672	1811	1525
11:42:10	19.59	19.21	3.13	3.23	-0.67	9.27	91.50	82.60	7.71	8.20	8.25	5.96	8.68	12.07	1848	1672	1811	1525
11:44:29	19.51	19.66	3.13	3.23	-0.67	9.27	91.50	82.60	7.91	7.99	8.25	6.21	8.68	12.07	1848	1586	1811	1606
11:46:48	19.39	19.77	3.13	3.23	-0.67	9.27	91.50	82.60	7.91	7.99	8.25	6.21	8.68	12.07	1767	1586	1811	1687
11:49:07	20.09	19.59	3.13	3.11	-0.67	9.27	91.50	82.60	7.91	7.99	8.25	6.21	8.68	12.07	1767	1586	1811	1606
11:51:26	19.86	19.71	3.13	3.11	-0.67	9.27	91.50	82.60	7.91	7.99	8.45	6.21	8.68	12.07	1767	1586	1811	1525
11:53:45	20.88	20.21	3.26	3.23	-0.67	9.27	91.50	82.60	7.91	7.99	8.45	6.21	8.68	12.07	1767	1586	1811	1606
11:56:04	20.87	20.19	3.26	3.23	-0.67	9.27	91.50	82.60	8.11	8.20	8.45	6.21	8.68	12.07	1767	1506	1811	1606
11:58:23	21.11	20.70	3.26	3.23	-0.67	9.27	91.50	82.60	8.11	8.20	8.45	6.21	8.68	12.07	1767	1586	1811	1606
12:00:42	21.19	21.04	3.26	3.23	-0.67	9.27	91.50	78.90	8.11	8.20	8.65	6.44	8.68	12.07	1767	1584	1811	1606
12:03:01	21.83	21.38	3.26	3.23	-0.67	9.27	91.50	78.90	8.11	8.20	8.65	6.44	8.68	12.07	1848	1584	1811	1606
12:05:20	21.26	21.61	3.38	3.35	-0.67	9.27	91.50	78.90	8.11	8.20	8.65	6.44	8.68	12.07	1848	1584	1811	1606
12:07:39	22.03	21.61	3.38	3.35	-0.67	9.27	91.50	78.90	8.11	8.20	8.85	6.44	8.68	12.07	1848	1665	1728	1525
12:09:58	22.12	22.07	3.50	3.49	-0.67	9.27	91.50	78.90	8.11	8.20	8.85	6.65	8.68	12.07	1848	1665	1728	1525
12:12:17	22.38	21.80	3.50	3.49	-0.67	9.27	91.50	82.20	8.11	8.40	8.65	6.93	8.68	12.07	1848	1665	1728	1525
12:14:36	22.46	22.24	3.50	3.49	-0.67	9.27	91.50	78.90	8.11	8.40	8.65	6.93	8.68	12.07	1848	1665	1728	1525
12:16:55	22.08	21.24	3.74	3.76	-0.67	9.27	91.50	78.90	8.11	8.40	8.65	6.93	8.68	12.07	1848	1665	1809	1525
12:19:14	22.61	22.01	3.62	3.52	-0.67	9.27	91.50	82.60	8.31	8.40	8.85	6.71	8.68	12.07	1848	1665	1809	1608
12:21:33	22.31	22.22	3.62	3.52	-0.67	9.27	91.50	79.00	8.31	8.40	8.85	6.71	8.68	12.07	1848	1665	1809	1608
12:23:52	22.19	22.22	3.62	3.52	-0.67	9.27	91.50	82.60	8.31	8.40	8.85	6.71	8.68	12.07	1848	1665	1809	1608
12:26:11	22.31	22.00	3.62	3.52	-0.67	9.27	91.50	82.60	8.31	8.40	8.85	6.71	8.68	12.07	1767	1662	1809	1608
12:28:30	22.18	22.09	3.62	3.52	-0.67	9.27	91.50	86.10	8.31	8.40	9.05	6.93	8.68	12.07	1767	1662	1809	1608
12:30:49	22.25	22.11	3.62	3.52	-0.67	9.27	91.50	82.60	8.31	8.40	9.05	6.93	8.68	12.07	1767	1662	1809	1608
12:33:08	22.51	22.05	3.62	3.52	6.96	9.27	91.50	82.60	8.31	8.60	9.05	6.73	8.68	12.07	1767	1582	1809	1608
12:35:27	22.12	22.09	3.62	3.52	6.96	9.27	91.50	83.30	8.31	8.60	9.25	6.73	8.68	12.07	1767	1582	1809	1608
12:37:46	21.90	21.70	3.62	3.52	6.96	9.27	91.50	82.60	8.31	8.60	9.25	6.93	8.68	12.07	1848	1582	1889	1608
12:40:05	22.12	21.48	3.62	3.52	6.96	9.27	91.50	82.60	8.51	8.40	9.25	6.93	8.68	12.07	1848	1579	1970	1608
12:42:24	22.04	21.85	3.62	3.52	6.96	9.27	88.70	82.60	8.51	8.40	9.25	6.93	8.68	12.07	1848	1579	1970	1608
12:44:43	22.11	21.85	3.62	3.52	6.96	9.27	88.70	82.60	8.51	8.60	9.25	6.93	8.68	12.07	1928	1660	1970	1608
12:47:02	21.98	21.67	3.62	3.39	6.96	9.27	88.70	82.50	8.51	8.39	9.04	6.93	8.68	12.07	1928	1660	1887	1691
12:49:21	22.31	21.76	3.62	3.39	6.96	9.27	88.70	82.50	8.51	8.39	9.04	6.93	8.68	12.07	1928	1660	1887	1611
12:51:40	21.93	21.52	3.62	3.39	6.96	9.27	88.70	82.50	8.51	8.39	9.04	6.93	8.68	12.07	1928	1577	1887	1611
12:53:59	21.64	21.42	3.62	3.39	6.96	9.27	88.70	82.50	8.51	8.59	9.04	6.93	8.68	12.07	1928	1657	1887	1611
12:56:18	21.61	21.05	3.62	3.39	6.96	9.27	88.70	82.50	8.51	8.59	9.04	6.93	8.68	12.07	1928	1657	1887	1530
12:58:37	21.29	20.82	3.62	3.39	6.96	9.27	88.70	82.50	8.72	8.59	9.25	6.93	8.68	12.07	1928	1657	1887	1611
13:00:56	21.96	21.08	3.62	3.39	6.96	9.27	88.70	82.50	8.72	8.59	9.04	6.93	8.68	12.07	1928	1577	1889	1611
13:03:15	21.29	21.09	3.50	3.39	6.96	9.27	88.70	82.50	8.72	8.59	9.04	7.13	8.68	12.07	1928	1577	1889	1611
13:05:34	20.98	20.75	3.50	3.39	6.96	9.27	88.70	82.50	8.72	8.59	9.04	7.13	8.68	12.07	1928	1577	1889	1611
13:07:53	21.17	20.84	3.50	3.39	6.96	9.27	88.70	82.50	8.51	8.59	9.04	7.13	8.68	12.07	1928	1577	1889	1611
13:10:12	20.96	21.14	3.50	3.39	6.96	9.27	88.70	82.50	8.51	8.39	9.04	7.13	8.68	12.07	1928	1577	1889	1611
13:12:31	20.99	20.74	3.50	3.27	6.96	9.27	88.70	82.50	8.31	8.59	9.04	7.13	8.68	12.07	1928	1577	1889	1611
13:14:50	20.95	20.33	3.50	3.27	6.96	9.27	88.70	82.50	8.31	8.39	9.04	6.84	8.68	12.07	1928	1577	1889	1611
13:17:09	20.90	20.76	3.50	3.27	6.96	9.27	88.70	82.50	8.51	8.59	9.04	7.13	8.68	12.07	1928	1657	1889	1694
13:19:28	20.90	20.58	3.50	3.27	6.96	9.27	88.70	82.50	8.51	8.59	8.84	7.13	8.68	12.07	1928	1657	1970	1613
13:21:47	20.89	20.51	3.36	3.27	6.96	9.27	88.70	82.50	8.51	8.59	8.84	7.13	8.68	12.07	1928	1657	1889	1613
13:24:06	20.32	20.23	3.36	3.27	6.96	9.27	88.70	78.90	8.51	8.59	9.04	7.13	8.68	12.07	1928	1657	1892	1613
13:26:25	20.40	20.14	3.36	3.27	6.96	9.27	88.70	78.90	8.31	8.59	9.04	7.13	8.68	12.07	1928	1657	1892	1613
13:28:44	20.72	20.16	3.36	3.27	6.96	9.27	88.70	78.90	8.31	8.39	8.84	7.43	8.68	12.07	1928	1657	1892	1533
13:31:03	20.90	19.92	3.36	3.27	6.96	9.27	88.70	78.90	8.31	8.39	8.84	7.23	8.68	12.07	1928	1657	1892	1613
13:33:22	20.70	19.99	3.36	3.27	6.96	9.27	88.70	78.90	8.31	8.39	8.84	7.23	8.68	12.07	1928	1657	1892	1613
13:35:41	20.61	20.49	3.36	3.27	6.96	9.27	88.70	78.90	8.31	8.39	8.84	6.93	8.68	12.07	1928	1657	1892	1533

5-Dec-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp	# 1 1/2 Air	# 1 3/4 Air	# 2 1/2 Air	# 2 3/4 Air
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C	SCFM	SCFM	SCFM	SCFM
13:38:00	20.49	20.24	3.36	3.27	6.96	9.27	88.70	82.60	8.31	8.39	8.84	6.93	8.68	12.07	1928	1657	1892	1533
13:40:19	20.47	19.74	3.36	3.27	6.96	9.27	88.70	82.60	8.31	8.39	8.64	6.93	8.68	12.07	1928	1657	1892	1533
13:42:38	20.77	19.70	3.36	3.15	6.96	9.27	88.70	82.20	8.11	8.39	8.64	6.93	8.68	12.07	1928	1657	1892	1533
13:44:57	20.34	20.12	3.36	3.27	6.96	9.27	88.70	79.00	8.11	8.39	8.64	6.93	8.68	12.07	1928	1657	1892	1533
13:47:16	20.67	20.06	3.36	3.27	6.96	9.27	88.70	79.00	8.11	8.39	8.64	6.93	8.68	12.07	1928	1657	1892	1533
13:49:35	20.65	20.03	3.36	3.27	6.96	9.27	88.70	79.00	8.11	8.39	8.64	6.93	8.68	12.07	1928	1657	1892	1533
13:51:54	20.87	20.30	3.36	3.27	6.96	9.27	88.70	79.00	8.31	8.39	8.84	6.73	8.68	12.07	1928	1657	1892	1533
13:54:13	20.55	19.64	3.36	3.27	6.96	9.27	88.70	82.60	8.11	8.39	8.84	6.73	8.68	12.07	1928	1657	1892	1616
13:56:32	20.57	20.02	3.36	3.27	6.96	9.27	88.70	82.60	8.11	8.39	8.84	6.73	8.68	12.07	1928	1657	1892	1616
13:58:51	20.48	19.90	3.36	3.27	6.96	9.27	88.70	82.60	8.11	8.39	8.84	6.73	8.68	12.07	1928	1657	1892	1616
14:01:10	20.70	20.16	3.40	3.14	6.96	9.27	88.70	82.60	8.11	8.39	8.84	6.73	8.68	12.07	1928	1657	1892	1616
14:03:29	20.53	19.74	3.40	3.14	6.96	9.27	88.70	82.60	8.11	8.39	8.64	6.73	8.68	12.07	1928	1657	1892	1616
14:05:48	20.53	19.82	3.40	3.27	6.96	9.27	88.70	82.60	8.11	8.39	8.64	6.73	8.68	12.07	1928	1657	1892	1616
14:08:07	20.53	19.95	3.40	3.15	6.96	9.27	88.70	82.60	7.91	8.19	8.44	6.73	8.68	12.07	1928	1657	1892	1616
14:10:26	20.65	19.74	3.40	3.27	6.96	9.27	88.70	79.50	7.91	8.19	8.24	6.73	8.89	12.07	1928	1657	1892	1616
14:12:45	20.19	20.29	3.40	3.27	6.96	9.27	88.70	78.90	7.91	8.19	8.24	6.73	8.89	12.07	1928	1657	1892	1616
14:15:04	20.71	19.53	3.40	3.15	6.96	9.47	88.70	78.90	7.71	7.99	8.24	6.73	8.89	12.07	1928	1657	1892	1616
14:17:23	20.28	19.18	3.26	3.15	6.96	9.47	88.70	82.50	7.71	7.99	8.44	6.44	8.89	12.07	1928	1657	1892	1616
14:19:42	20.22	19.86	3.26	3.15	6.96	9.47	88.70	82.50	7.71	7.99	8.44	6.44	8.89	12.07	1928	1577	1892	1696
14:22:01	20.81	19.92	3.26	3.15	6.96	9.47	88.70	78.80	7.51	7.99	8.44	6.44	8.89	12.07	1928	1577	1972	1696
14:24:20	19.94	19.82	3.26	3.15	6.96	9.47	88.70	78.80	7.51	7.72	8.44	6.24	8.89	12.07	1928	1577	1972	1613
14:26:39	20.58	19.93	3.26	3.15	6.96	9.47	88.70	78.80	7.31	7.72	8.44	6.24	8.89	12.07	1848	1577	1972	1613
14:28:58	21.02	20.35	3.34	3.15	6.96	9.47	88.70	78.80	7.10	7.51	8.44	6.24	8.89	12.07	1848	1577	1892	1613
14:31:17	20.77	20.35	3.34	3.15	6.96	9.47	88.70	78.80	7.31	7.51	8.44	6.24	8.89	12.07	1848	1577	1892	1613
14:33:36	20.92	20.00	3.30	3.28	6.96	9.47	88.70	78.80	7.31	7.51	8.24	6.24	8.89	12.07	1848	1577	1892	1613
14:35:55	20.64	20.33	3.30	3.16	6.96	9.47	88.70	78.80	6.90	7.51	7.63	6.24	8.89	12.07	1848	1577	1884	1613
14:38:14	20.99	20.55	3.30	3.16	6.96	9.47	88.70	78.80	7.10	7.51	7.63	6.24	8.89	12.07	1848	1577	1884	1613
14:40:33	20.83	20.57	3.30	3.28	6.96	9.47	88.70	78.80	7.31	7.51	7.43	6.24	8.89	12.07	1848	1577	1884	1613
14:42:52	21.14	20.54	3.30	3.16	6.96	9.47	88.70	78.80	7.31	7.30	7.43	5.96	8.89	12.07	1848	1577	1884	1613
14:45:11	21.44	20.75	3.30	3.28	6.96	9.47	88.70	78.80	6.90	7.30	7.63	5.75	8.89	12.07	1848	1577	1884	1613
14:47:30	21.39	20.77	3.42	3.28	6.96	9.47	88.70	78.80	6.69	7.01	7.63	5.75	8.89	12.07	1848	1577	1884	1613
14:49:49	21.26	20.67	3.42	3.28	6.96	9.47	88.70	78.80	6.90	7.01	7.63	5.75	8.89	12.07	1848	1577	1884	1613
14:52:08	21.19	21.15	3.42	3.29	6.96	9.47	88.70	78.80	6.90	7.01	7.43	5.75	8.89	12.07	1848	1577	1884	1613
14:54:27	21.00	20.84	3.42	3.29	6.96	9.47	88.70	78.80	6.48	6.71	7.43	5.75	8.89	12.07	1848	1577	1884	1613
14:56:46	21.25	20.93	3.42	3.29	6.96	9.47	88.70	78.80	6.27	6.71	7.43	5.47	8.89	12.07	1848	1577	1884	1613
14:59:05	21.67	20.93	3.42	3.27	6.96	9.47	88.70	78.80	6.07	6.43	7.43	5.47	8.89	12.07	1848	1577	1884	1613
15:01:24	21.38	20.85	3.54	3.28	6.96	9.47	88.70	78.80	6.07	6.43	7.22	5.47	8.89	12.07	2009	1738	1967	1774
15:03:43	21.15	20.85	3.54	3.41	6.96	9.47	85.80	78.80	6.07	6.43	7.22	5.27	8.89	12.07	2009	1738	1967	1774
15:06:02	21.32	21.14	3.54	3.27	6.96	9.47	84.80	78.80	6.07	6.43	7.02	5.27	8.89	12.07	2009	1818	1967	1774
15:08:21	21.32	20.70	3.54	3.39	6.96	9.47	84.80	78.80	6.07	6.43	7.02	5.27	8.89	12.07	2009	1818	1967	1774
15:10:40	20.81	20.74	3.41	3.27	6.96	9.47	84.80	78.80	6.07	6.43	7.02	5.27	8.89	12.07	2009	1818	1967	1774
15:12:59	21.09	21.23	3.41	3.27	6.96	9.47	84.80	78.80	6.07	6.43	6.82	5.27	8.89	12.07	2009	1818	1967	1774
15:15:18	20.84	20.86	3.41	3.27	6.96	9.47	84.80	78.80	6.07	6.43	6.82	4.97	8.89	12.07	2009	1818	2050	1774
15:17:37	20.82	20.19	3.53	3.27	6.96	9.47	84.80	75.30	6.07	6.43	6.82	4.97	8.89	12.07	2009	1818	1970	1774
15:19:56	20.70	20.13	3.41	3.27	6.96	9.47	84.80	75.30	6.07	6.43	6.82	4.97	8.89	12.07	2009	1818	1970	1774
15:22:15	20.05	19.88	3.41	3.27	6.96	9.47	84.80	79.00	6.07	6.22	6.82	4.97	8.89	12.07	2009	1811	1970	1774
15:24:34	20.77	19.88	3.41	3.27	6.96	9.47	84.80	79.00	6.07	6.22	6.82	4.69	8.89	12.07	2009	1811	1970	1774
15:26:53	20.01	19.58	3.41	3.15	6.96	9.47	84.80	78.90	5.87	6.22	6.82	4.97	8.89	12.07	2009	1811	1970	1774
15:29:12	20.13	19.37	3.28	3.15	6.96	9.47	84.80	78.90	5.87	6.22	6.41	5.18	8.89	12.07	2009	1730	1970	1774
15:31:31	20.14	19.69	3.27	3.15	6.96	9.47	84.80	78.90	5.87	6.22	6.41	5.18	8.89	12.07	2009	1730	1970	1774
15:33:50	19.87	19.61	3.27	3.15	6.96	9.47	84.80	78.90	5.87	6.22	6.41	5.18	8.89	12.07	2009	1730	1970	1774
15:36:09	20.22	20.09	3.27	3.15	6.96	9.47	84.80	78.90	5.87	6.01	6.41	5.46	8.89	12.07	2009	1730	1970	1774
15:38:28	20.44	19.90	3.27	3.15	6.96	9.47	84.80	78.90	5.87	6.01	6.41	4.98	8.89	12.07	2009	1730	1970	1855
15:40:47	20.64	19.87	3.27	3.15	6.96	9.47	84.80	75.20	5.87	5.74	6.41	5.18	8.89	12.07	2009	1730	1970	1855
15:43:06	20.20	20.40	3.27	3.15	6.96	9.47	84.80	75.20	5.87	5.94	6.41	4.97	8.89	12.07	2009	1730	1970	1855
15:45:25	20.64	20.17	3.27	3.15	6.96	9.47	84.80	79.00	5.67	5.74	6.41	5.18	8.89	12.07	2009	1730	1970	1855
15:47:44	20.32	19.90	3.27	3.15	6.96	9.47	82.00	79.00	5.67	5.74	6.21	4.98	8.89	12.07	2009	1730	1970	1774
15:50:03	20.79	20.18	3.27	3.20	6.96	9.47	82.00	79.00	5.47	5.74	6.41	4.78	8.89	12.07	2009	1730	1970	1774
15:52:22	20.22	20.13	3.27	3.20	6.96	9.47	82.10	79.00	5.47	5.74	6.41	4.49	8.89	12.07	2009	1730	1970	1774
15:54:41	20.23	20.25	3.27	3.20	6.96	9.47	82.10	79.00	5.47	5.74	6.41	4.49	8.89	12.07	2009	1730	1970	1774
15:57:00	20.64	20.16	3.27	3.20	6.96	9.47	82.10	79.00	5.47	5.46	6.41	4.49	8.89	12.07	2009	1730	1970	1774
15:59:19	20.45	19.50	3.27	3.08	6.96	9.47	82.10	79.00	5.47	5.46	6.41	4.69	8.89	12.07	2009	1730	1970	1774
16:01:38	19.95	19.55	3.27	3.20	6.96	9.47	82.10	75.30	5.47	5.46	6.21	4.49	8.89	12.07	2009	1730	1970	1774
16:03:57	19.61	19.40	3.27	3.20	6.96	9.47	82.10	75.30	5.27	5.46	6.21	4.49	8.89	12.07	2009	1894	1970	1855
16:06:16	19.87	19.32	3.27	3.20	6.96	9.47	80.60	75.30	5.07	5.46	6.21	4.49	8.89	12.07	2009	1894	1970	1855
16:08:35	19.87	19.38	3.27	3.20	6.96	9.47	80.60	75.30	5.07	5.46	6.01	4.49	8.89	12.07	2009	1894	1970	1855
16:10:54	19.77	19.24	3.27	3.20	6.96	9.47	77.80	75.30	5.07	5.46	6.21	4.49	8.89	12.07	2009	1894	1970	1855
16:13:13	19.61	19.13	3.15	3.20	6.96	9.47	77.80	75.30	5.07	5.25	6.21	4.49	8.89	12.07	2009	1894	1970	1855
16:15:32	19.45	18.65	3.15	3.32	6.96	9.47	77.80	75.30	5.07	5.25	6.21	4.49	8.89	12.07	2009	1894	1970	1855
16:17:51	19.03	18.58	3.15	3.05	6.96	9.47	77.80	75.30	5.07	5.25	6.21	4.29	8.89	12.07	2009	1894	2050	1855
16:20:10	19.38	18.65	3.15	3.05	6.96	9.47	77.80	75.30	5.07	5.25	6.21	4.29	8.89	12.07	2009	1977	2050	1855
16:22:29	19.37	18.31	3.15	3.05	6.96	9.47	74.90	75.30	5.27	5.25	6.21	4.29	8.89	12.07	2009	1977	2050	1855
16:24:48	18.73	18.26	3.15	3.05	6.96	9.47	72.00	75.30	5.27	5.25	6.21	4.29	8.89	12.07	2009	1977	2050	1855
16:27:07	18.97	18.24	2.90	3.05	6.96	9.47	72.00	75.30	5.27	5.25	6.21	4.50	8.89	12.07	2009	1977	2050	1855
16:29:26	18.65	17.99	2.90	3.05	6.96	9.47	72.00	71.70	5.27	5.25	6.21	4.50	8.89	12.07	2009	1977	1970	1855
16:31:45	18.38	17.78	2.90	3.05	6.96	9.47	72.00	71.70	5.07	5.25	6.42	4.50	8.89	12.07	2009	1977	1970	1855
16:34:04	18.04	17.25	2.90	3.05	6.96	9.47	74.90	71.70	5.07	5.25	6.42	4.50	8.89	12.07	2009	1977	1970	1855
16:36:23	17.94	17.45	2.90	3.05	6.96	9.47	77.80	71.70	5.07	5.25	6.22	4.74	8.89	12.07	2009	1896	1970	1855
16:38:42	17.67	17.20	2.90	2.92	6.96	9.47	83.40	71.70	5.07	5.25	6.22	4.53	8.89	12.07	2009	1896	1970	1855
16:41:01	17.97	17.51	2.90	2.92	6.96	9.47	86.20	71.70	5.07	5.46	6.22	4.53	8.89	12.07	2009	1896	1970	1855
16:43:20	18.50	17.88	2.90	2.92	6.96	9.47	86.20	71.70	4.86	5.46	6.42	4.53	8.89	12.07	2009	1896	1970	1855
16:45:39	18.75	18.19	2.90	2.92	6.96	9.47	86.20	71.70	4.86	5.25	6.42	4.53	8.89	12.07	2009	1896	1970	1855
16:47:58	19.26	18.59	2.90	2.92	6.96	9.47	89.20	71.70	4.86	4.96	6.22	4.53	8.89	12.07	2009	1896	1970	1855
16:50:17	19.62	19.21	2.90	2.92	6.96	9.47	89.20	71.70	4.86	4.96	6.22	4.53	8.89	12.07	2009	1896	1970	1855
16:52:36	19.72	19.38	3.02	3.05	6.96	9.47	89.90	75.20	4.86	4.96	6.42	4.78	8.89	12.07	2009	1982	1970	1855
16:54:55	19.95	20.07	3.02	3.05	6.96	9.47	89.90	75.20	5.07	4.96	6.42	4.78	8.89	12.07	2009	1982	1970	1855
16:57:14	20.80	20.25	3.14	3.17	6.96	9.47	86.90	75.20	4.86	4.96	6.22	4.98	8.89	12.07	2009	1982	1970	1855
16:59:33	20.88	20.65	3.39	3.17	6.96	9.47	86.90	75.20	4.86	4.96	6.22	4.78	8.89	12.07	2009	1982	1970	1855
17:01:52	21.29	20.23	3.39	3.17	6.96	9.47	86.90	75.20	4.86	4.96	6.22	4.78	8.89	12.07	1926	1982	1970	1855
17:04:11	21.03	21.14	3.39	3.17	6.96	9.47	86.90	78.90	4.66	4.96	6.22	4.49	8.89	12.07	1926	1982	1970	1855
17:06:30	21.89	21.06	3.39	3.30	6.96	9.47	86.90	78.90	4.66	4.96	6.22	4.49	8.89	12.07	2006	1982	1970	1855
17:08:49	21.83	20.72	3.64	3.50	6.96	9.47	85.00	78.90	4.66	4.96	6.22	4.49	8.89	12.07	2006	1896	1970	1855
17:11:08	22.44	21.86	3.64	3.38	6.96	9.47	85.00	78.90	4.66	4.96	6.02	4.29	8.89	12.07	2006	1896	1970	1855
17:13:27	22.31	21.80	3.64	3.50	6.96	9.47	85.00	78.90	4.66	4.96	6.22	4.29	8.89	12.07	2006	1896	1970	1855
17:15:46	22.50	22.09	3.64	3.50	6.96	9.47	85.00	78.90	4.66	4.75	6.22	4.29	8.89	12.07	1921	1977	1970	1855
17:18:05	22.57	21.97	3.64	3.50	6.96	9.47	85.00	78.90	4.66	4.75	6.22	4.29	8.89	12.07	2001	1977	1970	1855
17:20:24	22.58	22.23	3.64	3.52	6.96	9.47	85.00	78.90	4.66	4.75	6.22	4.29	8.89	12.07	2001	1977	1970	1855
17:22:43	22.46	21.98	3.64	3.52	6.96	9.47	85.00	78.90	4.66	4.75	6.22	4.29	8.89	12.07	2001	1977	1970	1855
17:25:02	22.73	22.31	3.64	3.52	6.96	9.47	85.00	78.90	4.66	4.75	6.02	4.29	8.89	12.07	2001	1977	1970	1855
17:27:21	22.72	22.21	3.64	3.52	6.96	9.47	82.30	75.30	4.66	4.48	6.22	4.29	8.89	12.07	2001	1977	1970	1855
17:29:40	22.72	22.54	3.77	3.52	6.96	9.47	82.30	78.90	4.66	4.48	6.22	4.29	8.89	12.07	2001	1977	1970	1855
17:31:59	22.31	22.58	3.77	3.40	6.96	9.47	82.30	75.30	4.46	4.48	6.22	4.29	8.89	12.07	2001	2141	1970	1855
17:34:18	22.60	22.15	3.77	3.40	6.96	9.47	82.30	75.30	4.66	4.77	6.22	4.29	8.89	12.07	2001	2141	1970	1855
17:36:37	22.58	22.07	3.77	3.40	6.96	9.47	82.30	75.30	4.66	4.97	6.02	4.29	8.89	12.07	2001	2141	1970	1855
17:38:56	22.86	22.12	3.77	3.40	6.96	9.47	82.30	75.30	4.66	4.97	6.02	4.29	8.89	12.07	2001	2141	1970	1855
17:41:15	22.86	22.11	3.77	3.43	6.96	9.47	82.30	75.30	4.66	4.97	6.02	4.29	8.89	12.07	2001	2141	1970	1855
17:43:34	22.62	22.42	3.77	3.43	6.96	9.47	82.30	75.40	4.86	4.77	6.02	4.29	8.89	12.07	2001	2141	1970	1855
17:45:53	22.70	22.32	3.77	3.43	6.96	9.47	82.30	75.40	4.86	4.77	5.82	4.29	8.89	12.07	2001	2141	1970	2019
17:48:12	22.70	22.07	3.77	3.43	6.96	9.47	82.30	75.40	4.86	4.77	5.82	4.29	8.89	12.07	2001	2141	1970	2019
17:50:31	22.29	21.93	3.77	3.43	6.96	9.47	82.30	75.40	4.86	4.97	5.82	4.29	8.89	12.07	2001	2141	1970	2019
17:52:50	22.40	21.93	3.77	3.43	6.96	9.47	82.30	75.40	4.86	4.97	6.03	4.29	8.89	12.07	2001	2141	1970	2019
17:55:09	22.23	21.92	3.77	3.43	6.96	9.47	79.50	75.40	4.86	4.77	6.03	4.29	8.89	12.07	2001	2141	1970	2019
17:57:28	22.46	21.61	3.64	3.43	6.96	9.47	79.50	75.40	4.86	4.77	6.03	4.29	8.89	12.07	2001	2221	1970	2019
17:59:47	21.95	22.02	3.64	3.43	6.96	9.47	79.50	75.40	4.86	4.77	6.03	4.29	8.89	12.07	2001	2221	1970	2019
18:02:06	22.31	21.71	3.54	3.43	6.96	9.47	79.50	75.40	4.86	4.97	6.23	4.29	8.68	12.07	2001	2221	1970	2019
18:04:25	22.18	22.31	3.64	3.34	6.96	9.27	79.50	75.40	4.86	4.97	6.23	4.29	8.68	12.07	2001	2221	1970	2019
18:06:44	22.12	21.99	3.77	3.34	6.96	9.27	79.50	75.40	4.86	4.77	6.23	4.49	8.68	12.07	2001	2221	1970	2019
18:09:03	22.80	21.41	3.77	3.34	6.96	9.27	79.50	75.40	4.86	4.97	6.03	4.49	8.68	12.07	2001	2221	1970	2099
18:11:22	22.57	21.93	3.77	3.46	6.96	9.27	79.50	75.40	4.86	4.77	6.03	5.18	8.68	12.07	2001	2221	1970	2099
18:13:41	22.44	22.00	3.77	3.46	6.96	9.27	79.50	75.40	4.86	4.97	6.03	4.78	8.68	12.07	2001	2221	1970	2099
18:16:00	22.44	21.66	3.65	3.46	6.96	9.27	79.50	75.40	5.07	4.97	6.03	4.98	8.68	12.07	2001	2221	1970	2099

5-Dec-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp	# 1 1/2 Air	# 1 3/4 Air	# 2 1/2 Air	# 2 3/4 Air
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C	SCFM	SCFM	SCFM	SCFM
18:18:19	22.56	21.91	3.65	3.46	6.96	9.27	79.50	75.30	5.07	4.97	6.03	4.98	8.68	12.07	2001	2221	1970	2099
18:20:38	22.50	21.71	3.65	3.34	6.96	9.27	79.50	75.30	5.07	4.97	6.23	4.78	8.68	12.07	2001	2221	1970	2099
18:22:57	22.31	21.97	3.65	3.34	6.96	9.27	79.50	75.30	5.07	4.77	6.02	4.78	8.68	12.07	2001	2221	1970	2099
18:25:16	22.31	21.80	3.65	3.34	6.96	9.27	79.50	75.30	5.07	4.97	6.02	4.78	8.68	12.07	2001	2221	1970	2099
18:27:35	22.06	22.18	3.65	3.34	6.96	9.27	79.50	75.30	5.07	4.77	6.02	4.78	8.68	12.07	2001	2221	1970	2099
18:29:54	22.15	21.89	3.65	3.34	6.96	9.27	79.50	75.30	5.07	4.77	6.02	4.69	8.48	12.07	2001	2221	1970	2099
18:32:13	21.83	21.89	3.65	3.34	6.96	9.27	79.50	75.30	4.86	4.77	6.02	4.69	8.48	12.07	2001	2221	1970	2099
18:34:32	22.28	21.78	3.65	3.34	6.96	9.27	79.50	75.30	4.86	5.07	6.02	4.49	8.48	12.07	2001	2221	1970	2099
18:36:51	21.93	21.78	3.65	3.34	6.96	9.07	79.50	75.30	4.86	5.07	6.02	4.49	8.48	12.07	2001	2221	1970	2099
18:39:10	22.11	22.31	3.65	3.34	6.96	9.07	79.50	75.30	4.86	5.07	6.02	4.49	8.48	12.07	2001	2221	1970	2099
18:41:29	22.57	22.12	3.65	3.34	6.96	9.07	79.50	75.30	4.86	4.77	6.02	4.19	8.48	12.07	2001	2221	1970	2099
18:43:48	22.23	21.93	3.65	3.34	6.96	9.07	79.50	75.30	4.86	4.77	6.02	4.19	8.48	12.07	2001	2221	1970	2099
18:46:07	22.24	21.93	3.65	3.34	6.96	9.07	79.50	75.30	4.86	4.77	6.02	4.39	8.48	12.07	2001	2221	1970	2099
18:48:26	22.11	22.19	3.66	3.34	6.96	9.07	79.50	72.30	4.86	4.77	6.02	4.39	8.48	12.07	2001	2221	1970	2099
18:50:45	22.37	22.19	3.66	3.34	6.96	9.07	79.50	75.30	4.86	4.77	6.02	4.49	8.48	12.07	2001	2221	1970	2099
18:53:04	22.67	22.19	3.66	3.34	6.96	9.07	79.50	72.30	4.86	4.77	6.02	4.49	8.48	12.07	2001	2221	1970	2099
18:55:23	22.72	22.37	3.66	3.46	6.96	9.07	79.50	72.30	4.66	4.56	5.82	4.49	8.28	12.07	2243	2307	2053	2180
18:57:42	22.70	22.75	3.66	3.46	6.96	9.07	79.50	72.30	4.86	4.77	5.82	4.49	8.28	12.07	2243	2307	2053	2180
19:00:01	22.70	22.80	3.66	3.46	6.96	9.07	79.50	72.30	4.86	4.77	6.02	4.49	8.28	12.07	2243	2307	2053	2180
19:02:20	23.26	22.67	3.66	3.46	6.96	9.07	79.50	75.30	4.86	4.77	6.02	4.49	8.28	12.07	2243	2307	2053	2180
19:04:39	22.99	23.00	3.66	3.46	6.96	9.07	79.50	75.30	4.66	4.77	6.02	4.49	8.28	12.05	2243	2307	2053	2180
19:06:58	23.09	22.67	3.78	3.46	6.96	9.07	79.50	75.30	4.66	4.77	5.82	4.28	8.28	12.05	2243	2307	2053	2180
19:09:17	23.40	22.63	3.78	3.52	6.96	9.07	79.50	75.30	4.66	4.77	5.82	4.49	8.28	12.05	2243	2387	2053	2180
19:11:36	23.13	22.92	3.78	3.52	6.96	9.07	79.50	75.30	4.66	4.77	5.82	4.49	8.28	12.05	2243	2387	2053	2180
19:13:55	23.55	23.35	3.78	3.52	6.96	9.07	79.50	75.30	4.86	4.77	5.82	4.19	8.28	12.05	2243	2387	2053	2180
19:16:14	23.22	23.05	3.78	3.80	6.96	8.87	79.50	75.30	4.86	4.77	5.82	4.19	8.28	12.05	2243	2387	2053	2180
19:18:33	23.44	23.35	3.66	3.67	6.96	8.87	79.50	78.90	4.86	4.77	5.82	4.19	8.28	12.05	2243	2387	2053	2180
19:20:52	23.52	23.10	3.66	3.67	6.96	8.87	82.30	78.20	4.86	4.57	5.82	4.39	8.08	12.05	2243	2387	2053	2180
19:23:11	23.18	23.22	3.62	3.67	6.96	8.87	82.30	78.20	4.86	4.77	5.82	4.49	8.08	12.05	2243	2387	2053	2180
19:25:30	23.21	22.71	3.62	3.79	6.96	8.87	82.30	74.50	4.86	4.77	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:27:49	23.21	22.91	3.62	3.66	6.96	8.87	82.30	74.50	4.86	4.57	5.62	4.28	8.08	12.05	2243	2387	2053	2180
19:30:08	23.21	23.17	3.74	3.66	6.96	8.87	82.30	74.50	4.86	4.57	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:32:27	23.63	22.96	3.74	3.67	6.96	8.87	82.30	74.50	4.66	4.57	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:34:46	23.31	23.29	3.74	3.67	6.96	8.87	82.30	74.40	4.66	4.57	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:37:05	23.31	22.77	3.78	3.67	6.96	8.87	82.30	74.50	4.66	4.57	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:39:24	23.11	23.16	3.78	3.68	6.96	8.87	82.30	78.10	4.66	4.77	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:41:43	23.43	23.01	3.61	3.68	6.96	8.87	82.30	78.10	4.66	4.77	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:44:02	23.40	23.27	3.74	3.68	6.96	8.87	82.30	78.10	4.66	4.77	5.82	4.28	8.08	12.05	2243	2387	2053	2180
19:46:21	22.83	22.89	3.74	3.68	6.96	8.87	82.30	78.10	4.66	4.77	5.62	4.28	8.08	12.05	2243	2387	2053	2180
19:48:40	23.22	22.81	3.74	3.79	6.96	8.87	82.30	78.10	4.66	4.77	5.62	4.28	8.08	12.05	2243	2387	2053	2180
19:50:59	23.32	21.99	3.74	3.66	6.96	8.67	82.30	78.10	4.66	4.77	5.62	4.28	8.08	12.05	2243	2387	2053	2180
19:53:18	23.23	23.12	3.74	3.66	6.96	8.67	82.30	78.10	4.66	4.77	5.62	4.28	7.88	12.05	2246	2478	2053	2341
19:55:37	22.99	22.86	3.74	3.66	6.96	8.67	82.30	78.10	4.86	4.77	5.62	4.28	7.88	12.05	2246	2915	2053	2258
19:57:56	23.27	23.14	3.74	3.66	6.96	8.67	82.30	78.10	4.86	4.77	5.82	4.28	7.88	12.05	2246	2915	2053	2341
20:00:15	23.10	23.26	3.74	3.66	6.96	8.67	82.30	78.10	4.86	5.07	5.82	4.49	7.88	12.05	2246	2915	2053	2341
20:02:34	23.26	23.15	3.74	3.66	6.96	8.67	82.30	74.90	4.86	5.07	5.82	4.49	7.88	12.05	2246	2915	2053	2341
20:04:53	23.10	22.81	3.74	3.66	6.96	8.67	82.30	74.90	4.86	5.27	5.82	4.49	7.88	12.05	2246	2915	1970	2341
20:07:12	22.99	23.15	3.74	3.66	6.96	8.67	82.30	78.10	5.07	5.27	6.02	4.69	7.88	12.05	2246	2915	1970	2341
20:09:31	23.21	22.99	3.74	3.66	6.96	8.67	82.30	78.10	5.07	5.27	6.02	4.49	7.88	12.05	2246	2915	1970	2341
20:11:50	23.21	23.26	3.74	3.66	6.96	8.67	82.30	78.10	5.07	5.27	6.02	4.49	7.68	12.05	2246	2915	1970	2341
20:14:09	23.47	23.06	3.74	3.66	6.96	8.67	82.30	78.10	5.27	5.27	6.02	4.49	7.68	12.05	2246	2915	1970	2341
20:16:28	23.60	23.40	3.74	3.66	6.96	8.67	82.30	74.60	5.27	5.27	6.02	4.20	7.68	12.05	2246	2915	1970	2341
20:18:47	23.13	22.64	3.74	3.66	6.96	8.46	82.30	78.20	5.27	5.27	6.02	4.20	7.68	12.05	2246	2915	1970	2341
20:21:06	23.24	23.14	3.74	3.66	6.96	8.46	82.30	78.20	5.27	5.27	5.82	4.49	7.68	12.05	2246	2915	1970	2341
20:23:25	23.49	23.31	3.74	3.66	6.96	8.46	82.30	78.20	5.27	5.27	5.82	4.49	7.68	12.05	2246	2915	1970	2341
20:25:44	23.54	23.13	3.74	3.66	6.96	8.46	82.30	78.20	5.27	5.27	5.82	4.49	7.68	12.05	2246	2915	1970	2341
20:28:03	23.28	23.01	3.74	3.66	6.96	8.46	82.30	78.20	5.27	5.27	6.02	4.49	7.68	12.05	2246	2915	1970	2341
20:30:22	23.57	23.26	3.74	3.66	6.96	8.46	82.30	78.20	5.27	5.27	5.82	4.49	7.68	12.05	2246	2915	1970	2341
20:32:41	22.88	22.98	3.74	3.83	7.57	8.46	82.30	78.20	5.27	5.27	5.82	4.20	7.68	12.05	2246	2915	1970	2341
20:35:00	23.23	22.76	3.74	3.69	7.57	8.46	82.30	74.40	5.27	5.27	5.82	4.40	7.68	12.05	2246	2915	1970	2341
20:37:19	23.24	22.76	3.74	3.69	7.57	8.46	82.30	74.40	5.27	5.27	5.82	4.40	7.68	12.05	2246	2915	1970	2341
20:39:38	23.12	23.05	3.74	3.71	7.57	8.46	82.30	78.10	5.27	5.27	5.82	4.40	7.68	12.05	2246	2915	1970	2341
20:41:57	23.00	22.92	3.74	3.58	7.57	8.46	82.30	78.10	5.27	5.27	5.82	4.40	7.68	12.05	2246	2915	1970	2341
20:44:16	22.82	22.72	3.74	3.70	7.57	8.46	82.30	78.10	5.27	5.27	5.82	4.40	7.68	12.05	2246	2915	1970	2341
20:46:35	23.06	23.16	3.74	3.69	7.57	8.46	82.30	74.90	5.07	5.27	5.82	4.69	7.68	12.05	2246	2915	1970	2341
20:48:54	22.98	22.54	3.74	3.57	7.57	8.46	82.30	74.90	5.07	5.27	5.82	4.28	7.68	12.05	2246	2915	1970	2341
20:51:13	23.03	22.83	3.74	3.57	7.57	8.46	82.30	74.50	5.27	5.06	5.82	4.28	7.68	12.05	2246	2915	1970	2341
20:53:32	22.99	22.83	3.74	3.57	7.57	8.46	82.30	74.50	5.27	5.26	5.82	4.49	7.68	12.05	2246	2915	1970	2341
20:55:51	23.05	22.79	3.61	3.57	7.57	8.46	82.30	74.50	5.27	5.26	5.82	4.29	7.68	12.05	2246	2915	1970	2341
20:58:10	23.17	23.28	3.61	3.57	7.57	8.46	82.30	74.50	5.27	5.26	5.82	4.29	7.68	12.05	2246	2915	1970	2341
21:00:29	23.10	22.95	3.61	3.69	7.57	8.46	82.30	74.50	5.27	5.06	5.82	4.29	7.68	12.05	2246	2915	1970	2341
21:02:48	23.20	23.11	3.68	3.57	7.57	8.46	82.30	78.10	5.07	5.06	5.82	4.29	7.48	12.05	2246	2915	1970	2341
21:05:07	22.96	23.11	3.68	3.57	7.57	8.46	82.30	78.10	5.07	5.06	6.02	4.29	7.48	12.05	2246	2915	1970	2341
21:07:26	22.94	22.56	3.68	3.56	7.57	8.46	82.30	78.10	4.86	5.06	5.82	4.29	7.48	12.05	2246	2915	1970	2341
21:09:45	23.24	22.81	3.68	3.68	7.57	8.46	82.30	78.10	4.86	5.06	5.82	4.29	7.48	12.05	2246	2915	1970	2341
21:12:04	23.20	22.85	3.68	3.55	7.57	8.46	82.30	74.90	5.07	5.06	5.82	4.29	7.48	12.05	2246	2915	1970	2341
21:14:23	23.60	22.85	3.68	3.67	7.57	8.46	82.30	78.10	5.27	5.06	5.82	4.29	7.48	12.05	2246	2915	1970	2341
21:16:42	23.52	23.18	3.68	3.67	7.57	8.46	82.30	78.10	5.07	5.26	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:19:01	23.11	23.05	3.68	3.67	7.57	8.46	82.30	78.10	5.07	5.26	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:21:20	23.60	23.41	3.80	3.67	7.57	8.46	82.30	78.10	5.07	5.26	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:23:39	23.59	23.80	3.80	3.67	7.57	8.46	82.30	78.10	5.07	5.26	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:25:58	23.59	23.52	3.80	3.67	7.57	8.46	82.30	78.10	5.07	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:28:17	23.77	23.95	3.80	3.67	7.57	8.46	82.30	78.10	5.07	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:30:36	23.81	23.92	3.80	3.92	7.57	8.26	82.30	78.10	5.07	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:32:55	23.61	23.73	3.93	3.80	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:35:14	24.21	23.81	3.81	3.81	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:37:33	24.05	23.79	3.81	3.95	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
21:39:52	24.41	23.98	3.81	3.95	7.57	8.26	82.30	78.10	4.86	5.26	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:42:11	24.31	24.33	3.93	3.83	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:44:30	24.02	24.17	3.81	3.83	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:46:49	24.02	23.90	3.81	3.83	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:49:08	24.02	23.71	3.81	3.83	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:51:27	24.02	23.67	3.81	3.83	7.57	8.26	82.30	78.10	4.86	5.06	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:53:46	24.02	23.57	3.81	3.83	7.57	8.26	82.30	78.10	4.86	4.84	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:56:05	24.09	23.54	3.81	3.83	7.57	8.26	82.30	78.10	4.86	4.84	5.62	4.03	7.48	12.05	2246	2915	1970	2341
21:58:24	23.95	23.83	3.81	3.83	7.57	8.26	82.30	78.10	5.07	5.06	5.62	4.03	7.48	12.05	2246	2915	1970	2341
22:00:43	24.02	23.83	3.81	3.83	7.57	8.26	82.30	78.10	5.07	5.06	5.62	4.03	7.48	12.05	2246	2915	1970	2341
22:03:02	23.98	23.55	3.81	3.83	7.57	8.26	82.30	78.10	5.07	5.26	5.62	4.03	7.48	12.05	2246	2915	1970	2341
22:05:21	23.72	23.34	3.81	3.83	7.57	8.26	82.30	78.10	5.07	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
22:07:40	23.18	23.35	3.81	3.83	7.57	8.26	82.30	78.10	5.07	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
22:09:59	23.75	23.21	3.81	3.71	7.57	8.26	82.30	78.10	5.07	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
22:12:18	23.38	23.57	3.81	3.70	7.57	8.26	85.10	78.10	5.07	5.06	5.62	4.29	7.48	12.05	2246	2915	1970	2341
22:14:37	22.91	23.43	3.68	3.70	7.57	8.26	82.20	78.10	5.07	5.26	5.62	4.09	7.27	12.05	2246	2915	1970	2341
22:16:56	23.50	23.75	3.69	3.70	7.57	8.26	82.20	78.10	5.07	5.26	5.62	4.09	7.27	12.05	2246	2915	1970	2341
22:19:15	23.48	23.44	3.81	3.70	7.57	8.26	82.20	78.10	5.07	5.06	5.62	4.09	7.27	12.05	2246	2915	1970	2341
22:21:34	23.24	23.36	3.81	3.69	7.57	8.26	82.20	78.10	5.07	5.26	5.62	4.09	7.27	12.05	2246	2915	1970	2341
22:23:53	23.23	23.23	3.81	3.65	7.57	8.26	82.20	78.10	5.07	5.26	5.62	4.09	7.27	12.05	2246	2915	1970	2341
22:26:12	23.22	23.28	3.69	3.65	7.57	8.26	82.20	78.00	5.07	5.26	5.62	4.30	7.27	12.05	2246	2915	1970	2341
22:28:31	23.21	23.13	3.69	3.65	7.57	8.06	82.20	78.00	5.07	5.26	5.62	4.50	7.27	12.05	2246	2915	1970	2341
22:30:50	23.14	23.13	3.81	3.65	7.57	8.06	82.20	78.00	5.07	5.46	5.62	4.29	7.27	12.05	2246	2915	1970	2341
22:33:09	22.99	22.80	3.81	3.65	7.57	8.06	82.20	78.00	5.07	5.46	5.62	4.29	7.27	12.05	2246	2915	1970	2341
22:35:28	22.98	22.45	3.81	3.65	7.57	8.06	82.20	78.00	5.07	5.46	5.62	4.29	7.27	12.05	2246	2915	1970	2341
22:37:47	22.98	22.65	3.69	3.53	7.57	8.06	82.20	78.00	5.07	5.46	5.62	4.29	7.27	12.05	2246	2915	1970	2421
22:40:06	23.28	22.32	3.69	3.66	7.57	8.06	82.20	78.00	5.07	5.46	5.62	4.29	7.27	12.05	2246	2915	1970	2421
22:42:25	22.80	22.31	3.69	3.66	7.57	8.06	82.20	78.00	5.07	5.25	5.62	4.29	7.27	12.05	2246	2915	2050	2421
22:44:44	22.68	22.12	3.69	3.64	7.57	8.06	82.20	78.00	5.07	5.25	5.42	4.29	7.27	12.05	2246	2915	2050	2421
22:47:03	22.68	22.70	3.69	3.64	7.57	8.06	82.20	78.00	5.07	5.25	5.42	4.29	7.27	12.05	2246	2915	2050	2421
22:49:22	22.75	22.44	3.56	3.64	7.57	8.06	82.20	78.00	5.07	5.25	5.62	4.00	7.27	12.05	2246	2915	2050	2421
22:51:41	22.75	22.44	3.69	3.64	7.57	8.06	82.20	78.00	5.07	5.25	5.62	4.00	7.27	12.05	2246	2915	2050	2421
22:54:00	22.75	22.25	3.69	3.64	7.57	8.06	82.20	78.00	5.07	5.46	5.42	4.20	7.27	12.05	2246	2915	2050	2421
22:56:19	22.78	22.45	3.57	3.64	7.57	8.06	82.20	78.00	5.07	5.46	5.62	3.80	7.27	12.05	2246	2915	2050	2421

5-Dec-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp	# 1 1/2 Air	# 1 3/4 Air	# 2 1/2 Air	# 2 3/4 Air
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C	SCFM	SCFM	SCFM	SCFM
22:58:38	22.85	22.71	3.57	3.64	7.57	8.06	82.20	78.00	5.07	5.46	5.62	3.80	7.27	12.05	2246	2915	2050	2421
23:00:57	22.80	22.39	3.57	3.64	7.57	8.06	82.20	78.00	5.07	5.46	5.62	3.80	7.27	12.05	2246	2915	2050	2421
23:03:16	22.47	22.14	3.57	3.62	7.57	8.06	82.20	78.00	5.07	5.25	5.62	3.80	7.27	12.05	2246	2915	2050	2421
23:05:35	22.54	22.49	3.57	3.63	7.57	8.06	82.20	78.00	5.07	5.25	5.42	4.00	7.27	12.05	2246	2915	2050	2421
23:07:54	23.22	22.16	3.57	3.61	7.57	8.06	82.20	78.00	5.07	4.98	5.42	4.00	7.27	12.05	2246	2915	2050	2421
23:10:13	22.72	22.54	3.57	3.61	7.57	8.06	82.20	78.00	5.07	4.98	5.42	4.00	7.27	12.05	2246	2915	2050	2421
23:12:32	22.60	22.02	3.57	3.61	7.57	8.06	82.20	78.00	5.07	4.98	5.42	4.00	7.27	12.05	2246	2915	2050	2421
23:14:51	22.57	22.40	3.58	3.63	7.57	8.06	82.20	78.00	5.07	4.98	5.42	4.00	7.27	12.05	2246	2915	2050	2421
23:17:10	22.60	22.28	3.70	3.63	7.57	8.06	82.20	78.00	5.07	4.98	5.42	4.00	7.27	12.05	2246	2915	2050	2421
23:19:29	22.47	22.15	3.70	3.63	7.57	8.06	82.20	78.00	5.07	5.26	5.42	3.80	7.27	12.05	2326	2915	2050	2421
23:21:48	22.55	21.80	3.58	3.63	7.57	8.06	82.20	78.00	5.07	5.06	5.22	3.80	7.27	12.05	2326	2915	2050	2341
23:24:07	22.15	21.91	3.58	3.61	7.57	8.06	82.20	78.00	5.07	5.06	5.22	4.01	7.27	12.05	2326	2915	2050	2341
23:26:26	22.44	22.20	3.58	3.49	7.57	8.06	82.20	78.00	5.07	5.06	5.22	4.01	7.27	12.05	2326	2915	2050	2341
23:28:45	22.51	22.20	3.58	3.50	7.57	8.06	82.20	78.00	5.07	5.26	5.22	3.81	7.27	12.05	2326	2915	2050	2341
23:31:04	22.09	21.86	3.58	3.63	7.57	8.06	82.20	78.00	5.07	5.26	5.22	3.81	7.27	12.05	2326	2915	2050	2341
23:33:23	22.32	22.09	3.57	3.63	7.57	8.06	82.20	78.00	5.07	5.26	5.22	3.81	7.27	12.05	2326	2915	2050	2341
23:35:42	22.26	21.89	3.57	3.61	7.57	8.06	82.20	78.00	5.07	5.06	5.22	3.81	7.27	12.05	2326	2915	2050	2341
23:38:01	22.29	22.22	3.57	3.61	7.57	8.06	82.20	78.00	5.07	5.06	5.22	4.01	7.27	12.05	2326	2915	2050	2341
23:40:20	22.60	22.07	3.69	3.62	7.57	8.06	82.20	78.00	4.86	5.06	5.22	4.30	7.27	12.05	2326	2915	2050	2341
23:42:39	22.26	21.93	3.57	3.63	7.57	8.06	82.20	78.00	4.86	4.77	5.22	4.30	7.27	12.05	2326	2915	2050	2341
23:44:58	22.67	22.22	3.57	3.51	7.57	8.06	82.20	78.00	4.86	4.77	5.22	4.09	7.27	12.05	2326	2915	2050	2341
23:47:17	22.47	22.35	3.57	3.63	7.57	8.06	82.20	78.00	4.86	4.77	5.22	4.09	7.27	12.05	2326	2915	2050	2341
23:49:36	22.47	22.35	3.57	3.64	7.57	8.06	82.20	78.00	4.66	4.97	5.22	3.80	7.27	12.05	2326	2915	2050	2341
23:51:55	22.41	22.35	3.57	3.51	7.57	8.06	82.20	78.00	4.66	4.97	5.22	3.60	7.27	12.05	2326	2915	2050	2341
23:54:14	22.69	22.10	3.57	3.51	7.57	8.06	82.20	78.00	4.87	4.97	5.22	3.60	7.27	12.05	2326	2915	2050	2341
23:56:33	22.63	22.21	3.57	3.50	7.57	8.06	82.20	78.00	4.87	4.97	5.22	3.60	7.27	12.05	2326	2915	2050	2341
23:58:52	22.49	22.06	3.57	3.63	7.57	8.06	82.20	78.00	4.87	4.97	5.02	3.60	7.27	12.05	2326	2915	2050	2341
0:01:11	22.29	22.35	3.58	3.50	9.40	8.15	82.10	78.10	4.61	4.96	5.01	3.90	7.26	12.05	2277	2949	2033	2341
0:03:30	22.79	22.22	3.58	3.49	9.40	8.15	82.10	78.10	4.61	4.96	5.01	3.61	7.26	12.05	2277	2949	2033	2341
0:05:49	22.60	21.92	3.58	3.61	9.40	8.15	82.10	78.10	4.61	4.96	5.01	3.61	7.26	12.05	2277	2949	2033	2341
0:08:08	22.25	21.92	3.58	3.61	9.40	8.15	79.30	78.10	4.61	4.77	5.01	3.81	7.26	12.05	2277	2949	2033	2341
0:10:27	22.25	22.06	3.58	3.49	9.40	8.15	79.30	78.10	4.61	4.77	5.01	3.81	7.26	12.05	2277	2949	2033	2341
0:12:46	22.50	22.06	3.58	3.49	9.40	8.15	79.30	74.40	4.61	4.77	5.01	4.11	7.26	12.05	2277	2949	2033	2341
0:15:05	22.44	22.22	3.58	3.49	9.40	8.15	79.30	74.40	4.61	4.77	5.01	3.91	7.26	12.05	2277	2949	2033	2341
0:17:24	22.51	21.88	3.58	3.49	9.40	8.15	79.30	74.40	4.61	4.77	5.01	3.70	7.26	12.05	2277	2949	2033	2341
0:19:43	22.42	22.16	3.58	3.61	9.40	8.15	79.30	74.40	4.61	4.77	4.81	3.70	7.26	12.05	2277	2949	2033	2341
0:22:02	22.47	22.04	3.58	3.62	9.40	8.26	79.30	74.40	4.61	4.77	4.81	3.70	7.26	12.05	2277	2949	2033	2341
0:24:21	22.32	22.34	3.58	3.61	9.40	8.26	79.30	74.40	4.61	4.77	4.81	3.70	7.26	12.05	2277	2949	2033	2341
0:26:40	22.60	22.25	3.58	3.60	9.40	8.26	79.30	74.40	4.61	4.77	4.81	3.70	7.26	12.05	2277	2949	2033	2341
0:28:59	22.73	22.22	3.58	3.60	9.40	8.26	79.30	74.40	4.61	4.77	5.02	3.42	7.26	12.05	2277	2949	2033	2341
0:31:18	22.58	22.31	3.57	3.47	9.40	8.26	79.30	74.40	4.61	4.77	5.02	3.42	7.26	12.05	2243	2949	2033	2341
0:33:37	22.82	22.35	3.70	3.59	9.40	8.26	79.30	74.40	4.61	4.97	5.02	3.22	7.26	12.05	2243	2949	2033	2341
0:35:56	22.61	22.42	3.58	3.60	9.40	8.26	79.30	74.40	4.61	4.97	5.02	3.22	7.26	12.05	2243	2949	2033	2341
0:38:15	22.61	22.10	3.58	3.61	9.40	8.26	79.30	74.40	4.67	4.77	5.02	3.42	7.26	12.05	2243	2949	2033	2341
0:40:34	22.47	22.30	3.58	3.59	9.40	8.26	79.30	74.40	4.67	4.97	5.02	3.22	7.26	12.05	2243	2949	2033	2341
0:42:53	22.61	22.02	3.58	3.61	9.40	8.26	79.30	74.40	4.67	4.77	5.02	3.22	7.26	12.05	2243	2949	2033	2341
0:45:12	22.86	22.28	3.70	3.49	9.40	8.26	79.30	74.40	4.47	4.77	5.02	3.22	7.26	12.05	2243	2949	2033	2341
0:47:31	22.87	22.62	3.58	3.49	9.40	8.26	79.30	74.40	4.47	4.77	5.02	3.42	7.26	12.05	2243	2949	2033	2341
0:49:50	22.91	22.91	3.58	3.60	9.40	8.26	79.30	74.40	4.47	4.77	4.81	3.42	7.26	12.05	2243	2949	2033	2341
0:52:09	23.20	22.68	3.58	3.60	9.40	8.26	79.30	74.40	4.47	4.77	5.02	3.42	7.26	12.05	2243	2949	2033	2341
0:54:28	23.80	22.90	3.70	3.72	9.40	8.26	79.30	74.40	4.47	4.77	5.02	3.22	7.26	12.05	2243	2949	2033	2341
0:56:47	23.25	23.15	3.70	3.73	9.40	8.26	79.30	74.40	4.47	4.77	5.02	3.22	7.26	12.05	2243	2949	1970	2260
0:59:06	23.09	22.93	3.70	3.59	9.40	8.26	79.30	74.40	4.47	4.77	4.81	3.42	7.26	12.05	2243	2949	1970	2260
1:01:25	23.76	23.05	3.57	3.72	9.40	8.26	79.30	74.40	4.47	4.77	4.81	3.42	7.26	12.05	2243	2949	1970	2260
1:03:44	23.32	23.05	3.69	3.72	9.40	8.26	79.30	74.40	4.47	4.77	4.81	3.42	7.26	12.05	2243	2949	1970	2260
1:06:03	23.43	23.21	3.69	3.72	9.40	8.26	79.30	74.40	4.47	4.77	4.81	3.42	7.26	12.05	2243	2949	1970	2260
1:08:22	23.28	23.45	3.69	3.72	9.40	8.26	79.30	74.40	4.27	4.47	4.81	3.42	7.26	12.05	2243	2949	1970	2260
1:10:41	23.30	23.00	3.69	3.84	9.40	8.26	79.30	74.40	4.06	4.47	4.81	3.42	7.26	12.05	2243	2949	1970	2260
1:13:00	23.71	23.89	3.81	3.81	9.40	8.26	79.30	74.40	4.27	4.47	4.81	3.42	7.26	12.05	2243	2949	1970	2260
1:15:19	23.73	23.63	3.81	3.81	9.40	8.26	79.30	74.40	4.27	4.47	4.61	3.22	7.26	12.05	2243	2949	1970	2260
1:17:38	23.61	23.47	3.81	3.79	9.40	8.26	79.30	74.40	4.27	4.47	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:19:57	23.72	23.44	3.81	3.79	9.40	8.26	79.30	74.40	4.27	4.47	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:22:16	24.02	23.44	3.81	3.79	9.40	8.26	79.30	74.40	4.27	4.47	4.41	3.42	7.26	12.05	2243	2949	1970	2260
1:24:35	23.47	22.94	3.81	3.79	9.40	8.26	79.30	74.40	4.27	4.47	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:26:54	23.52	23.18	3.68	3.77	9.40	8.26	79.30	74.40	4.27	4.47	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:29:13	23.09	22.80	3.81	3.77	9.40	8.26	79.30	74.40	4.27	4.19	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:31:32	23.09	23.08	3.69	3.78	9.40	8.26	79.30	74.40	4.27	4.41	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:33:51	23.32	22.67	3.69	3.78	9.40	8.26	76.50	74.40	4.27	4.18	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:36:10	23.25	22.83	3.81	3.78	9.40	8.26	76.50	74.40	4.07	4.18	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:38:29	23.19	22.83	3.69	3.77	9.40	8.26	76.50	74.40	4.07	4.38	4.61	3.42	7.26	12.05	2243	2949	1970	2260
1:40:48	23.16	22.76	3.69	3.64	9.40	8.26	76.50	74.40	4.07	4.18	4.61	3.42	7.07	12.05	2243	2949	1970	2260
1:43:07	23.14	22.80	3.57	3.64	9.40	8.06	76.50	74.40	4.07	4.18	4.61	3.42	7.07	12.05	2243	2949	1970	2260
1:45:26	23.40	22.96	3.57	3.64	9.40	8.06	76.50	74.40	4.07	4.38	4.61	3.22	7.07	12.05	2243	2949	1970	2260
1:47:45	23.64	22.76	3.57	3.64	9.40	8.06	76.50	74.40	4.07	4.38	4.41	3.42	7.07	12.05	2243	2949	1970	2260
1:50:04	23.36	23.24	3.70	3.64	9.40	8.06	76.50	74.40	4.07	4.18	4.41	3.22	7.07	12.05	2243	2949	1970	2260
1:52:23	23.28	23.05	3.70	3.64	9.40	8.06	76.50	74.40	4.07	3.98	4.41	3.22	7.07	12.05	2243	2949	1970	2260
1:54:42	23.47	23.18	3.70	3.63	9.40	8.06	76.50	74.40	3.87	3.98	4.41	3.42	7.07	12.05	2243	2949	1970	2260
1:57:01	23.45	22.67	3.70	3.75	9.40	8.06	76.50	74.40	3.87	3.98	4.41	3.22	7.07	12.05	2243	2949	1970	2260
1:59:20	22.96	22.81	3.70	3.74	9.40	8.06	76.50	74.40	4.07	3.98	4.41	3.22	7.07	12.05	2243	2949	1970	2260
2:01:39	23.21	23.09	3.70	3.75	9.40	8.06	76.50	74.40	3.87	4.18	4.21	3.22	7.07	12.05	2243	2949	1970	2260
2:03:58	23.25	22.63	3.70	3.61	9.40	8.06	76.50	74.40	3.87	4.18	4.21	2.92	7.07	12.05	2243	2949	1970	2260
2:06:17	23.15	23.15	3.70	3.73	9.40	8.06	76.50	74.40	3.87	4.18	4.41	3.12	7.07	12.05	2243	2949	1970	2260
2:08:36	23.47	22.96	3.70	3.73	9.40	8.06	73.60	74.40	3.87	4.18	4.41	3.12	7.07	12.05	2243	2949	1970	2260
2:10:55	23.64	23.24	3.70	3.73	9.40	8.06	73.60	74.40	3.67	3.89	4.21	3.12	7.07	12.05	2243	2949	1970	2260
2:13:14	23.37	23.09	3.70	3.61	9.40	8.06	73.60	74.40	3.67	3.89	4.21	3.12	7.07	12.05	2243	2949	1970	2260
2:15:33	23.40	22.67	3.70	3.61	9.40	8.06	73.60	74.40	3.67	3.89	4.21	3.12	7.07	12.05	2243	2949	1970	2260
2:17:52	23.14	23.17	3.58	3.59	9.40	8.06	73.60	74.40	3.87	4.09	4.21	3.32	7.07	12.05	2243	2949	1970	2260
2:20:11	22.89	22.95	3.71	3.71	9.40	8.06	73.60	74.40	3.87	4.09	4.21	3.32	7.07	12.05	2243	2949	1970	2260
2:22:30	23.18	22.83	3.71	3.69	9.40	8.06	73.60	74.40	3.87	4.09	4.01	3.12	7.07	12.05	2243	2949	1970	2260
2:24:49	23.19	22.71	3.59	3.69	9.40	8.06	73.60	74.40	3.67	3.89	4.01	3.12	7.07	12.05	2243	2949	1970	2260
2:27:08	23.34	22.82	3.59	3.69	9.40	8.06	73.60	74.40	3.67	3.89	4.01	3.12	7.07	12.05	2243	2949	2138	2260
2:29:27	22.95	22.51	3.72	3.69	9.40	8.06	73.60	74.40	3.67	3.89	3.80	3.12	7.07	12.05	2324	2834	2299	2341
2:31:46	22.95	22.47	3.72	3.69	9.40	8.06	73.60	74.40	3.67	3.89	4.00	3.12	7.07	12.05	2404	2834	2299	2341
2:34:05	22.42	22.15	3.60	3.68	9.40	8.06	73.60	74.40	3.67	3.69	4.00	2.87	7.07	12.05	2404	2834	2299	2341
2:36:24	22.43	22.55	3.61	3.68	9.40	8.06	73.60	74.40	3.67	3.69	4.00	3.08	7.07	12.05	2485	2834	2380	2426
2:38:43	22.25	22.29	3.61	3.68	9.40	8.06	73.60	74.40	3.67	3.69	4.00	3.08	7.07	12.05	2402	2915	2380	2426
2:41:02	22.15	22.00	3.61	3.64	9.40	8.06	73.60	70.70	3.67	3.69	4.00	3.08	7.07	12.05	2402	2915	2380	2426
2:43:21	22.41	21.57	3.61	3.63	9.40	8.06	73.60	70.70	3.67	3.69	4.00	2.83	6.87	12.05	2402	2915	2380	2426
2:45:40	22.40	22.15	3.61	3.63	9.40	8.06	73.60	70.70	3.67	3.69	4.00	2.83	6.87	12.05	2321	2915	2380	2426
2:47:59	22.03	21.82	3.61	3.63	9.40	8.06	73.60	70.70	3.67	3.69	4.00	3.03	6.87	12.05	2321	2915	2380	2426
2:50:18	22.32	21.61	3.48	3.49	9.40	8.06	73.60	70.70	3.67	3.89	4.00	2.83	6.87	12.05	2321	2915	2460	2426
2:52:37	22.17	21.37	3.60	3.62	9.40	8.06	70.80	70.70	3.67	3.89	4.00	2.83	6.87	12.05	2663	2915	2543	2426
2:54:56	22.14	21.38	3.48	3.61	9.40	8.06	70.80	70.70	3.67	3.69	4.00	2.83	6.87	12.05	2663	2915	2543	2426
2:57:15	21.98	21.38	3.48	3.49	9.40	8.06	70.80	70.70	3.67	3.69	4.00	2.83	6.87	12.05	2663	2915	2543	2426
2:59:34	22.06	21.58	3.48	3.35	9.40	8.06	70.80	70.70	3.67	3.69	4.00	2.83	6.87	12.05	2753	2834	2634	2426
3:01:53	21.93	21.76	3.48	3.34	9.40	8.06	70.80	70.70	3.67	3.69	4.00	2.83	6.87	12.05	2917	2753	2971	2507
3:04:12	21.59	21.51	3.48	3.46	9.40	8.06	70.80	67.10	3.67	3.89	4.00	2.83	6.87	12.28	2917	2670	2971	2507
3:06:31	21.90	21.76	3.48	3.56	9.40	8.06	70.80	70.40	3.46	3.89	4.00	2.83	6.87	12.28	2998	2670	2971	2507
3:08:50	22.34	22.22	3.48	3.56	9.40	8.06	70.80	70.40	3.46	3.69	4.00	2.83	6.87	12.28	2998	2670	2971	2507
3:11:09	22.34	22.22	3.48	3.42	9.40	8.06	70.80	70.40	3.46	3.69	4.00	2.83	6.87	12.28	2998	2670	2971	2507
3:13:28	22.47	22.38	3.48	3.55	9.40	8.06	70.80	70.40	3.26	3.69	3.80	2.83	6.87	12.28	2998	2670	2971	2507
3:15:47	22.85	22.29	3.48	3.67	9.40	8.06	70.80	70.40	3.26	3.69	3.80	2.83	6.87	12.28	3078	2670	3054	2507
3:18:06	22.85	22.48	3.48	3.55	9.40	8.06	70.80	70.40	3.26	3.39	3.80	2.83	6.87	12.28	3078	2590	3054	2507
3:20:25	23.43	22.65	3.60	3.68	9.40	8.06	70.80	70.40	3.26	3.39	3.80	2.83	6.87	12.28	3654	2429	3564	2343
3:22:44	22.71	22.99	3.60	3.65	9.40	8.06	70.80	70.40	3.26	3.39	3.80	2.83	6.87	12.28	4064	2429	3972	2263
3:25:03	23.41	22.84	3.60	3.65	9.40	8.06	70.80	73.30	3.06	3.11	3.80	3.12	6.87	12.28	4064	2429	4052	2263
3:27:22	23.67	22.99	3.74	3.78	9.40	8.06	70.80	73.30	3.06	3.11	3.80	2.63	6.87	12.28	4064	2429	4052	2263
3:29:41	23.24	23.25	3.74	3.66	9.40	8.06	70.80	73.30	3.06	3.31	3.60	2.83	6.87	12.28	4064	2429	4052	2263
3:32:00	23.25	23.49	3.74	3.80	9.40	8.06	70.80	73.30	2.85	3.10	3.80	2.63	6.87	12.28	4064	2429	4052	2263
3:34:19	23.57	23.37	3.74	3.78	9.40	8.06	70.80	73.30	2.85	3.30	3.80	2.63	6.87	12.28	4064	2429	4052	2263
3:36:38	23.48	23.56	3.74	3.78	9.40	8.06	70.80	73.30	2.85	3.10	3.80	2.84	6.87	12.28	4064	2429	4052	2263

5-Dec-06	# 1 ML	# 2 ML	# 1 RAS	# 2 RAS	Turbidity	Casc DO	Plt Flow	Final Effl	# 1 East DO	# 1 West DO	#2 East DO	#2 West DO	Effluent DO	602 Temp	# 1 1/2 Air	# 1 3/4 Air	# 2 1/2 Air	# 2 3/4 Air
Time	MGD	MGD	MGD	MGD	JTU	MG/L	MGD	MGD	MG/L	MG/L	MG/L	MG/L	PPM	DEG C	SCFM	SCFM	SCFM	SCFM
3:38:57	23.48	23.27	3.74	3.78	9.40	8.06	70.80	73.30	2.85	3.10	3.60	2.84	6.87	12.28	4064	2429	4052	2263
3:41:16	23.78	23.40	3.74	3.77	9.40	8.06	70.80	73.30	2.64	2.81	3.60	2.43	6.87	12.28	4064	2429	4052	2263
3:43:35	23.85	23.80	3.74	3.78	9.40	8.06	70.80	73.30	2.64	2.81	3.60	2.43	6.87	12.28	4064	2429	4052	2263
3:45:54	23.74	23.53	3.72	3.65	9.40	8.06	68.00	73.30	2.64	2.81	3.60	2.83	6.87	12.28	4064	2429	4052	2263
3:48:13	24.09	23.34	3.72	3.78	9.40	8.06	68.00	73.30	2.64	2.81	3.60	2.43	6.87	12.28	4064	2429	4052	2263
3:50:32	23.40	23.79	3.85	3.78	9.40	8.06	68.00	73.30	2.64	2.81	3.60	2.63	6.87	12.28	4064	2429	4052	2263
3:52:51	23.25	23.77	3.73	3.79	9.40	8.06	68.00	73.30	2.64	2.81	3.40	2.43	6.87	12.28	4064	2429	4052	2263
3:55:10	23.08	23.02	3.85	3.79	9.40	8.06	68.00	73.30	2.64	2.81	3.40	2.64	6.87	12.28	4064	2429	4052	2263
3:57:29	23.64	22.94	3.73	3.79	9.40	8.06	68.00	73.30	2.64	2.61	3.40	2.43	6.87	12.28	4064	2429	4052	2263
3:59:48	23.52	23.09	3.72	3.77	9.40	8.06	68.00	69.90	2.64	2.61	3.60	2.43	6.87	12.28	4064	2429	4052	2263
4:02:07	23.44	22.92	3.84	3.77	9.40	8.06	68.00	73.50	2.64	2.81	3.39	2.43	6.87	12.28	4064	2429	4052	2263
4:04:26	23.44	22.92	3.83	3.76	9.40	8.06	68.00	73.50	2.64	2.61	3.39	2.64	6.87	12.28	4064	2429	4052	2263
4:06:45	23.47	23.18	3.71	3.75	9.40	8.06	68.00	73.50	2.64	2.61	3.59	2.43	6.87	12.28	4064	2429	4052	2346
4:09:04	23.60	23.05	3.71	3.75	9.40	7.86	68.00	73.50	2.64	2.61	3.59	2.43	6.87	12.28	4064	2590	4052	2431
4:11:23	23.18	22.84	3.71	3.74	9.40	7.86	68.00	73.50	2.64	2.61	3.59	2.43	6.87	12.28	4064	2590	4052	2431
4:13:42	23.18	22.49	3.71	3.74	9.40	7.86	68.00	69.90	2.64	2.51	3.59	2.64	6.87	12.28	4064	2590	4052	2431
4:16:01	22.91	22.68	3.71	3.72	9.40	7.86	68.00	69.90	2.64	2.51	3.59	2.64	6.87	12.28	4064	2590	4052	2431
4:18:20	22.89	22.12	3.71	3.72	9.40	7.86	68.00	69.90	2.64	2.31	3.59	2.43	6.67	12.28	4064	2590	4052	2431
4:20:39	22.54	22.12	3.59	3.72	9.40	7.86	68.00	69.90	2.64	2.31	3.59	2.43	6.67	12.28	4064	2590	4052	2431
4:22:58	22.53	22.60	3.71	3.58	9.40	7.86	68.00	69.90	2.84	2.31	3.59	2.64	6.67	12.28	4064	2590	4052	2431
4:25:17	22.65	21.77	3.58	3.70	9.40	7.86	68.00	69.90	2.84	1.82	3.80	2.64	6.67	12.28	4064	2590	4052	2431
4:27:36	22.44	22.31	3.58	3.56	9.40	7.86	68.00	69.90	2.84	1.73	3.59	2.64	6.67	12.28	4064	2590	4052	2431
4:29:55	21.28	21.93	3.58	3.68	9.40	7.86	68.00	69.90	2.84	1.73	3.59	2.64	6.67	12.28	4064	2590	4052	2431
4:32:14	22.70	22.25	3.58	3.56	9.40	7.86	68.00	69.90	2.84	1.53	3.80	2.64	6.67	12.28	4064	2590	4052	2431
4:34:33	22.70	22.17	3.58	3.55	8.48	7.86	68.00	69.90	2.84	1.33	3.80	2.64	6.67	12.28	4064	2590	4052	2431
4:36:52	22.76	22.56	3.58	3.58	8.48	7.86	68.00	69.90	2.84	1.33	3.80	2.64	6.67	12.28	4064	2590	4052	2431
4:39:11	23.01	22.70	3.58	3.57	8.48	7.86	68.00	69.90	2.84	1.33	3.80	2.84	6.67	12.28	4064	2590	4052	2431
4:41:30	22.73	22.41	3.58	3.57	8.48	7.86	68.00	69.90	2.84	1.33	3.80	2.84	6.67	12.28	4064	2590	4052	2431
4:43:49	23.02	22.44	3.58	3.69	8.48	7.86	68.00	69.90	3.04	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
4:46:08	22.79	22.76	3.71	3.67	8.48	7.86	65.20	69.90	3.04	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
4:48:27	22.60	22.35	3.58	3.55	8.48	7.86	65.20	69.90	2.84	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
4:50:46	22.95	22.61	3.58	3.67	8.48	7.86	65.20	69.90	2.84	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
4:53:05	23.30	22.46	3.58	3.67	8.48	7.86	65.20	69.90	2.84	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
4:55:24	22.68	22.55	3.58	3.67	8.48	7.86	65.20	69.90	2.84	1.33	3.80	2.83	6.67	12.28	4064	2590	4052	2431
4:57:43	22.67	22.26	3.59	3.67	8.48	7.86	65.20	69.90	2.84	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
5:00:02	22.80	22.52	3.60	3.53	8.48	7.86	65.20	69.90	2.84	1.33	4.00	2.63	6.67	12.28	4064	2590	4052	2431
5:02:21	22.51	22.17	3.72	3.65	8.48	7.86	65.20	69.90	2.84	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
5:04:40	22.76	22.04	3.71	3.54	8.48	7.86	65.20	69.90	2.84	1.33	3.80	2.63	6.67	12.28	4064	2590	4052	2431
5:06:59	22.70	22.02	3.59	3.66	8.48	7.86	65.20	69.90	2.84	1.04	3.80	2.63	6.67	12.28	4064	2590	4052	2431
5:09:18	22.70	22.68	3.72	3.67	8.48	7.86	65.20	69.90	2.84	1.04	3.80	2.83	6.67	12.28	4064	2590	4052	2512
5:11:37	22.72	22.05	3.72	3.67	8.48	7.86	65.20	69.90	2.84	1.04	4.00	2.83	6.67	12.28	4064	2590	4052	2512
5:13:56	22.23	22.06	3.72	3.54	8.48	7.86	65.20	69.90	2.84	1.04	4.00	2.83	6.47	12.28	4064	2590	4052	2512
5:16:15	22.23	21.80	3.59	3.67	8.48	7.86	65.20	69.90	2.84	1.04	3.80	2.83	6.47	12.28	4064	2590	4052	2512
5:18:34	22.27	21.78	3.59	3.55	8.48	7.86	65.20	69.90	2.84	1.24	3.80	2.63	6.47	12.28	3984	2590	4052	2512
5:20:53	22.02	22.05	3.59	3.54	8.48	7.86	65.20	69.90	2.84	1.04	3.80	2.83	6.47	12.28	3984	2590	4052	2512
5:23:12	22.25	21.51	3.59	3.55	8.48	7.86	65.20	69.90	2.84	1.04	4.00	2.83	6.47	12.28	3984	2590	4052	2512
5:25:31	22.03	21.48	3.59	3.43	8.48	7.86	65.20	69.90	2.84	1.04	4.00	3.03	6.47	12.28	3984	2590	4052	2512
5:27:50	22.34	21.68	3.47	3.44	8.48	7.86	65.20	69.90	2.84	1.04	3.80	3.03	6.47	12.28	3984	2590	4052	2512
5:30:09	22.59	22.22	3.59	3.31	8.48	7.86	65.20	69.90	3.04	1.04	3.80	2.63	6.47	12.28	3984	2590	4052	2512
5:32:28	22.76	22.39	3.59	3.55	8.48	7.86	65.20	66.30	3.04	1.04	3.80	2.83	6.47	12.28	3984	2590	4052	2512
5:34:47	23.30	22.67	3.59	3.55	8.48	7.86	65.20	66.30	3.04	0.76	3.80	2.83	6.47	12.28	3984	2590	4052	2512
5:37:06	22.96	22.24	3.59	3.67	8.48	7.86	65.20	66.30	3.04	0.76	3.80	2.83	6.47	12.28	3984	2590	4052	2512
5:39:25	22.91	22.53	3.59	3.54	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.63	6.47	12.28	3984	2590	3969	2512
5:41:44	23.05	22.80	3.59	3.67	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.63	6.47	12.28	3984	2590	3969	2512
5:44:03	23.38	23.47	3.59	3.65	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.43	6.47	12.28	3984	2590	3969	2429
5:46:22	23.64	23.42	3.71	3.65	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
5:48:41	23.97	23.42	3.71	3.65	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
5:51:00	23.67	23.27	3.71	3.77	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
5:53:19	23.71	23.39	3.71	3.77	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.63	6.47	12.28	3996	2509	3969	2429
5:55:38	23.99	23.47	3.83	3.77	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.63	6.47	12.28	3996	2509	3969	2429
5:57:57	23.86	23.55	3.83	3.77	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.63	6.47	12.28	3996	2509	3969	2429
6:00:16	23.99	23.58	3.83	3.77	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:02:35	24.21	23.70	3.83	3.77	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:04:54	23.90	23.67	3.83	3.77	8.48	7.86	65.20	66.30	3.04	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:07:13	24.05	23.79	3.83	3.77	8.48	7.86	65.20	66.30	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:09:32	23.68	22.88	3.83	3.77	8.48	7.86	65.20	69.90	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:11:51	23.72	23.34	3.83	3.76	8.48	7.86	65.20	69.90	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:14:10	23.72	23.39	3.83	3.76	8.48	7.66	65.20	69.90	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:16:29	23.38	23.36	3.83	3.76	8.48	7.66	65.20	69.90	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:18:48	23.42	22.82	3.83	3.75	8.48	7.66	65.20	69.90	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:21:07	23.38	22.91	3.83	3.75	8.48	7.66	65.20	69.90	2.84	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:23:26	23.31	23.13	3.83	3.75	8.48	7.66	65.20	69.90	2.84	0.76	4.00	2.63	6.47	12.28	3996	2509	3969	2429
6:25:45	22.91	22.69	3.71	3.75	8.48	7.66	65.20	69.90	3.04	0.76	4.00	2.43	6.47	12.28	3996	2509	3969	2429
6:28:04	23.06	22.75	3.71	3.60	8.48	7.66	65.20	69.90	3.04	0.76	4.20	2.63	6.47	12.28	3996	2509	3969	2429
6:30:23	23.28	22.81	3.71	3.60	8.48	7.66	65.20	69.90	3.04	0.76	4.20	2.63	6.47	12.28	3996	2509	3969	2429
6:32:42	23.23	22.73	3.71	3.59	8.48	7.66	65.20	69.90	3.04	0.76	4.00	2.63	6.47	12.28	3996	2509	3969	2429
6:35:01	22.76	22.21	3.71	3.69	8.48	7.66	65.20	69.90	3.04	0.76	4.00	2.83	6.27	12.28	3996	2509	3969	2429
6:37:20	22.70	22.48	3.71	3.67	8.48	7.66	65.20	69.90	3.04	0.76	4.20	2.63	6.27	12.28	4077	2509	3969	2429
6:39:39	22.64	22.41	3.71	3.67	8.48	7.46	65.20	69.90	2.84	0.76	4.20	2.83	6.27	12.28	4077	2509	3969	2429
6:41:58	22.34	21.84	3.71	3.64	8.48	7.46	65.20	69.90	3.04	0.76	4.20	2.83	6.27	12.28	4077	2509	4050	2429
6:44:17	22.36	22.60	3.71	3.64	8.48	7.46	65.20	69.90	3.04	0.76	4.20	2.83	6.27	12.28	4077	2509	4050	2429
6:46:36	22.51	21.99	3.71	3.52	8.48	7.46	65.20	69.90	3.04	0.76	4.20	2.83	6.27	12.28	3996	2509	4050	2429
6:48:55	22.51	22.20	3.71	3.52	8.48	7.46	65.20	69.90	3.04	0.76	4.00	2.83	6.27	12.28	3996	2509	4050	2429
6:51:14	22.54	21.94	3.71	3.63	8.48	7.46	65.20	69.90	3.04	0.76	4.20	2.83	6.27	12.28	3996	2509	4050	2429
6:53:33	22.54	21.94	3.71	3.49	8.48	7.46	65.20	69.90	3.04	0.76	4.20	2.83	6.27	12.28	3996	2509	4050	2429
6:55:52	22.28	22.38	3.71	3.63	8.48	7.46	65.20	69.90	3.04	1.04	4.20	2.83	6.27	12.28	3996	2509	4050	2429
6:58:11	22.56	21.98	3.71	3.51	8.48	7.46	65.20	69.90	3.04	1.04	4.40	2.83	6.27	12.28	3996	2509	4050	2429
7:00:30	22.63	22.26	3.71	3.51	8.48	7.46	65.20	66.40	3.04	1.04	4.40	2.83	6.27	12.28	3996	2509	4050	2429
7:02:49	22.69	22.09	3.71	3.63	8.48	7.46	65.20	69.90	3.04	1.04	4.20	3.03	6.27	12.28	3996	2509	4050	2429
7:05:08	22.38	22.41	3.71	3.60	8.48	7.46	65.20	69.90	3.04	1.04	4.00	3.03	6.27	12.28	3996	2509	4050	2429
7:07:27	22.47	21.57	3.71	3.62	8.48	7.46	65.20	69.90	3.25	1.04	4.00	2.83	6.27	12.28	3996	2509	4050	2429
7:09:46	22.41	22.15	3.71	3.50	8.48	7.46	65.20	66.20	3.25	1.04	4.00	2.83	6.27	12.28	3996	2509	4050	2429
7:12:05	22.53	22.02	3.59	3.49	8.48	7.46	65.20	66.20	3.25	1.04	4.20	2.83	6.27	12.28	3996	2509	4050	2429
7:14:24	22.73	21.99	3.59	3.49	8.48	7.46	65.20	66.20	3.25	1.04	4.20	2.83	6.27	12.28	3996	2509	4050	2429
7:16:43	22.95	22.11	3.59	3.50	8.48	7.46	68.10	69.90	3.25	1.04	4.20	3.03	6.27	12.28	3996	2509	4050	2429
7:19:02	22.48	21.51	3.59	3.37	8.48	7.46	68.10	69.60	3.04	1.24	4.40	2.83	6.27	12.28	3996	2509	4050	2429
7:21:21	22.55	22.13	3.59	3.61	8.48	7.46	68.10	69.60	3.04	1.04	4.40	2.83	6.27	12.28	3996	2509	4050	2429
7:23:40	22.55	21.86	3.59	3.61	8.48	7.46	68.10	69.60	3.04	1.04	4.20	2.83	6.27	12.28	3996	2509	4050	2429
7:25:59	22.60	22.09	3.59	3.60	8.48	7.46	68.10	66.20	3.04	1.04	4.20	2.83	6.27	12.28	3996	2509	4050	2429
7:28:18	22.60	22.20	3.59	3.60	8.48	7.46	68.10	66.20	3.25	1.04	4.20	3.09	6.27	12.28	3996	2509	4050	2429
7:30:37	22.57	22.37	3.59	3.60	8.48	7.46	68.10	66.20	3.25	1.24	4.40	3.09	6.27	12.28	3996	2509	4050	2429
7:32:56	22.88	22.44	3.72	3.60	8.48	7.46	68.10	69.20	3.25	1.24	4.40	3.09	6.27	12.28	3996	2509	4050	2429
7:35:15	23.12	22.44	3.72	3.60	8.48	7.46	68.10	69.20	3.25	1.04	4.40	3.09	6.27	12.28	3996	2509	4050	2429
7:37:34	22.97	22.40	3.72	3.60	8.48	7.46	68.10	69.20	3.25	1.04	4.40	3.09	6.27	12.28	3996	2509	4050	2429
7:39:53	22.94	22.48	3.72	3.61	8.48	7.46	70.90	69.20	3.25	1.04	4.40	3.09	6.27	12.28	3996	2509	4050	2429
7:42:12	22.96	22.39	3.72	3.60	8.48	7.46	70.90	69.20	3.25	1.04	4.40	3.09	6.27	12.28	3996	2509	4050	2429
7:44:31	23.01	22.72	3.72	3.60	8.48	7.46	70.90	69.20	3.45	1.24	4.40	3.09	6.27	12.28	3996	2509	4050	2429
7:46:50	23.15	22.54	3.72	3.60	8.48	7.46	70.90	69.20	3.25	1.24	4.40	3.09	6.27	12.3	3996	2509	4050	2429
7:49:09	23.23	23.07	3.72	3.60	8.48	7.46	70.90	69.20	3.25	1.24	4.40	3.09	6.27	12.3	3996	2509	4050	2429
7:51:28	23.56	22.81	3.72	3.60	8.48	7.46	70.90	69.20	3.25	1.24	4.40	3.09	6.27	12.3	3996	2509	3969	2429
7:53:47	23.56	23.07	3.72	3.58	8.48	7.46	70.90	69.20	3.25	1.24	4.40	3.09	6.27	12.3	3996	2509	3969	2429
7:56:06	23.79	23.37	3.72	3.69	8.48	7.46	70.90	69.20	3.25	1.24	4.40	3.09	6.27	12.3	3996	2509	3969	2429
7:58:25	23.79	23.42	3.72	3.69	8.48	7.46	73.70	69.20	3.25	1.24	4.40	3.09	6.27	12.3	3996	2509	3969	2429
8:00:44	23.83	23.50	3.72	3.68	8.48	7.46	73.70	69.20	3.25	1.44	4.40	3.09	6.27	12.3	3999	2429	3969	2429
Average	22.25	21.92	3.58	3.51	6.59	8.66	80.07	75.84	5.22	5.02	5.89	4.34	7.83	12.08	2480	2237	2392	2016
Max	24.41	24.33	3.93	3.95	9.40	9.47	98.80	89.20	8.72	8.78	9.25	7.43	8.89	12.30	4077	2949	4052	2512
Min	17.67	17.20	2.83	2.92	-0.67	7.46	65.20	66.20	2.64	0.76	3.39	2.43	6.27	11.79	1760	36	1726	180

CITY OF AKRON, OHIO

WATER POLLUTION CONTROL DIVISION

ACTIVATED SLUDGE PLANT

STRESS TEST
1997

INTRODUCTION

The Akron Water Pollution Control Station, in accordance with the requirement of the Consent Decree part IV.5.C.5 with the United States of America, State of Ohio and the City of Akron, commenced stress testing of the Activated Sludge Plant (ASP) on March 9, 1997 and, following testing on thirty-three separate events, completed testing on September 30, 1997. The purpose of the stress test of the ASP was to study the effects of maximizing influent flow to the process yielding effective treatment without washing out the system or rendering it inoperable. It is of interest to investigate if improvements to the ASP since the last stress testing effort performed in 1993 have appreciably changed the effectiveness of the system. Those improvements include the implementation of automatic influent flow distribution, dissolved oxygen control, return sludge metering and control, final settling tank baffle installation and fine pore diffuser installation.

METHODOLOGY

The stress testing was formatted into a six-month plan to gradually increase the hydraulic loading to the ASP. An overview of how the ASP is currently operated during periods of high flow and specific procedures followed for the testing and data collection can be found in Appendix A.

RESULTS

The first level testing encompassed seven separate events at a target flow rate of 110 MGD. See Table 1 for a complete listing of laboratory data for individual test events. The first event, the longest duration event of the entire stress test, spanned 3 days lasting 31.1 hours with a peak plant influent flow of 262 MGD.

During this event, it was determined that the ASP influent flow value was questionable, as evidenced by visual observations of the influent channels and aeration basins and the information from other in-plant flow meters. Investigation determined that the flow velocity in the channels prior to the aeration basins was not being recorded accurately. The fixed-point velocity measurement, when combined with the channel depth was yielding a lower flow rate than what was actually being applied to the ASP. Portable velocity probe measurements verified that the point of mean velocity was variable with increasing flow. Since obtaining a variable point velocity was not possible, the Primary Influent and Secondary Bypass flows were utilized to determine ASP influent flow.

The laboratory results showed an increase in the During Event (DE) suspended solids, but all physical observations of the final clarifiers showed heavy pin floc on units #1, #2 and #5 with sludge blankets in the 6 to 8.5 feet range. All other events at this level showed some pin floc on the final clarifiers and lower sludge blankets.

Polymer was introduced to the mixed liquor during three events at this level, with 11,200 gallons being added during event 4A. The addition of polymer does not appear to have had any effect on the final clarifier DE suspended solids.

The next level of testing raised the influent flow to the ASP to 115 MGD. There were seven stress test events at this flow rate with the longest occurring on April 12 that lasted 15.5 hours with a peak plant influent flow of 269 MGD. The laboratory results did not show much of a difference in the tested parameters between the Before Event (BE) samples and the DE samples. The physical observation of the final clarifiers showed most tanks were clear with sludge blankets in the 1 to 5 feet range. The addition of polymer for three events at this level appears not to have had any effect on the final clarifier DE samples.

The third target flow rate for testing was at 120 MGD influent to the ASP. There were six separate events at this flow rate with the longest occurring on May 25th and 26th lasting 23.0 hours at a peak plant influent flow of 279 MGD. The laboratory results once again did not show much of an increase between the BE and DE samples. Most of the final clarifiers were clear for all the events with the exception of the event occurring on May 25th and May 26th, which shows most of the final clarifiers as cloudy and the sludge blankets in the 1 to 4 feet range. The addition of polymer during three events had little to no impact on treatment.

The fourth level of testing raised the influent flow to the ASP to 130 MGD. There were six stress test events at this flow rate with the longest occurring on June 18 that lasted 6.25 hours with a peak plant influent flow of 260 MGD. The laboratory results began showing an increase in suspended solids and phosphorus levels in the final effluent. Visual observations of the final clarifiers showed that most tanks were cloudy or had pin floc with sludge blanket levels in the 1 to 3 feet range. The addition of polymer made little to no impact on final effluent parameters.

The final level of testing lowered the influent flow to the ASP back down to 120 MGD due to the increase in effluent suspended solids and phosphorus at the 130 MGD level. There were seven stress test events again at this flow rate with the longest occurring on September 20 that lasted 11.25 hours with a peak plant influent flow of 274 MGD. The first event at this juncture still showed an increase in the suspended solids. But after five weeks of no testing due to the lack of high flows, the next event showed improved suspended solids and phosphorus levels in the effluent. This trend then continued for the duration of testing at this level. Visual observations of the final clarifiers showed a marked improvement over testing at the previous level, with light pin floc on some of the tanks.

DISCUSSION

Although there were thirty-three stress testing events, Figure 1 shows that the average duration flow rate for all events was just under seven hours. There were only eight events that lasted longer than seven hours. The longest duration stress testing events occurred at times of highest plant influent flows. Most other stress events were less than five hours in duration. At one point, there was a period of thirty-eight days when no testing was performed because of the lack of high influent flows.

From the laboratory data in Table 1, it can be seen that the ASP effluent suspended solids increase as the stress testing flow rate is raised above 120 MGD. It became extremely difficult to contain the suspended solids in the system both before and during stress test events at the 130 MGD level (See Figure 2).

For the month of June 1997, the period of time at the 130 MGD level, the suspended solids for reporting station 602 was reported as 11.8 mg/l in the monthly operating report. This approached the thirty-day limit of 15 mg/l for suspended solids and was substantially higher than the facility's typical performance of 6 to 7 mg/l.

It was only after the setpoint was lowered to 120 MGD that the suspended solids in the effluent began to decline. Phosphorus and CBOD5 levels similarly increased after the stress test level was increased above 120 MGD (See Figures 3 and 4). The effect on these parameters was more lingering as evidenced by a gradual decline as the stress testing flow rate was brought back down to 120 MGD.

The manpower required to perform the stress testing was utilized from on-site staff as well as call-in staff. The overtime paid to employees performing stress testing functions amounted to over 350 hours. The testing required those individuals to devote a substantial amount of time away from their normal duties. Therefore, it must be noted that higher flows through the ASP may result in the need for increased personnel to perform functions as necessary to maintain effective treatment.

CONCLUSIONS

It is the opinion of the Akron Water Pollution Control Station, after reviewing all data collected during each stress testing event, which includes lab analyses and physical observations of the ASP, that the maximum sustainable flow for effective Secondary treatment is 120 MGD instantaneous flow rate. The individual stress events were of relatively short duration. Continued or frequent storm events may force chronic effects that would impair effective treatment through the ASP.

AKRON WATER POLLUTION CONTROL STATION
STRESS TEST LOG

TEST	DATE/TIME START	DATE/TIME STOP	DURATION (Hours)	PEAK FLOW (MGD)	TARGET FLOW (MGD)	POLYMER APPLIED (lbs)	S.S. (B.E.) mg/l	S.S. (D.E.) mg/l	CBOD5 (B.E.) mg/l	CBOD5 (D.E.) mg/l	NH_3-N (B.E.) mg/l	NH_3-N (D.E.) mg/l	Phos (B.E.) mg/l	Phos (D.E.) mg/l
1A	09-Mar-97 18:55	11-Mar-97 02:00	31.1	262	110	No	6.8	12.0	2.48	3.21	0.06	0.04	0.34	0.46
2A	11-Mar-97 12:10	12-Mar-97 01:00	12.8	130	110	Yes	5.0	5.8	<2	2.38	0.02	0.02	0.25	0.29
3A	12-Mar-97 09:40	12-Mar-97 15:30	5.8	115	110	No	5.5	7.8	2.14	3.25	0.02	0.02	0.32	0.33
4A	13-Mar-97 22:22	15-Mar-97 03:15	28.9	251	110	Yes	6.4	6.8	2.36	2.92	0.04	0.06	0.40	0.36
5A	18-Mar-97 09:10	18-Mar-97 13:25	4.25	127	110	No	5.8	7.5	<2	3.17	0.03	0.02	0.49	0.34
6A	21-Mar-97 23:15	22-Mar-97 01:30	2.25	117	110	Yes	Non event	Non event	Non event	Non event	Non event	Non event	Non event	Non event
7A	25-Mar-97 02:55	25-Mar-97 03:50	1.1	113	110	Yes	Non event	Non event	Non event	Non event	Non event	Non event	Non event	Non event
8A	25-Mar-97 09:30	25-Mar-97 11:45	2.25	132	110	Yes	4.1	5.9	<2	2.62	0.05	0.02	0.66	0.63
9A	25-Mar-97 16:30	26-Mar-97 01:30	9.0	172	110	No	4.0	6.2	<2	3.22	0.03	0.19	0.50	0.63
1B	12-Apr-97 09:00	13-Apr-97 00:30	15.5	269	115	No	4.6	5.5	4.67	3.37	0.02	< 0.02	0.83	0.69
2B	16-Apr-97 20:00	17-Apr-97 00:00	4.0	212	115	Yes	5.0	6.2	<2	2.02	0.06	0.10	0.57	0.61
3B	17-Apr-97 01:30	17-Apr-97 05:30	4.0	227	115	No	5.0	6.2	<2	<2	0.09	0.08	0.58	0.59
4B	22-Apr-97 09:10	22-Apr-97 13:40	4.5	197	115	Yes	6.2	5.4	4.01	2.51	0.42	0.15	0.70	0.65
5B	24-Apr-97 10:30	24-Apr-97 14:30	4.0	145	115	No	4.6	5.9	2.44	2.49	0.10	0.05	0.66	0.60
6B	02-May-97 22:15	03-May-97 06:15	8.0	239	115	Yes	3.2	4.0	N/A	N/A	0.06	0.05	0.80	0.82
7B	03-May-97 12:20	03-May-97 23:05	10.75	174	115	No	3.6	4.5	<2	<2	0.04	0.04	0.66	0.63
1C	05-May-97 20:45	06-May-97 01:00	4.25	210	120	No	4.1	5.7	<2	<2	0.06	0.05	0.71	0.74

AKRON WATER POLLUTION CONTROL STATION STRESS TEST LOG														
TEST	DATE/TIME START	DATE/TIME STOP	DURATION (Hours)	PEAK FLOW (MGD)	TARGET FLOW (MGD)	POLYMER APPLIED (lbs)	S.S. (B.E.) mg/l	S.S. (D.E.) mg/l	CBOD5 (B.E.) mg/l	CBOD5 (D.E.) mg/l	NH_3-N (B.E.) mg/l	NH_3-N (D.E.) mg/l	Phos (B.E.) mg/l	Phos (D.E.) mg/l
2C	06-May-97 18:45	06-May-97 20:00	1.25	127	120	Yes	Non event	Non event	Non event	Non event	Non event	Non event	Non event	Non event
3C	08-May-97 16:00	08-May-97 21:00	5.0	226	120	Yes	3.6	3.8	<2	2.11	0.03	0.04	0.57	0.63
4C	14-May-97 21:30	15-May-97 01:30	4.0	219	120	No	4.8	6.3	2.24	3.26	0.05	0.05	0.73	0.72
5C	18-May-97 20:00	18-May-97 22:00	2.0	179	120	Yes	Non event	Non event	Non event	Non event	Non event	Non event	Non event	Non event
6C	19-May-97 16:30	19-May-97 20:30	4.0	219	120	Yes	4.1	5.0	<2	2.13	0.06	0.05	0.61	0.65
7C	25-May-97 05:30	26-May-97 04:30	23.0	279	120	No	2.6	4.4	<2	<2	0.06	0.07	0.84	0.75
8C	26-May-97 11:45	26-May-97 17:15	5.5	129	120	Yes	3.8	2.6	<2	<2	0.05	N/A	0.51	N/A
1D	29-May-97 12:50	29-May-97 16:20	3.5	216	130	No	5.2	5.8	<2	2.07	0.04	0.11	0.56	0.55
2D	12-Jun-97 18:00	12-Jun-97 20:30	2.5	189	130	Yes	6.8	12.0	2.52	4.39	0.06	0.21	0.61	0.70
3D	13-Jun-97 02:15	13-Jun-97 03:30	1.25	141	130	Yes	Non event	Non event	Non event	Non event	Non event	Non event	Non event	Non event
4D	16-Jun-97 21:00	16-Jun-97 23:50	1.8	213	130	No	7.4	11.0	3.36	4.17	0.04	0.13	0.46	0.53
5D	18-Jun-97 06:45	18-Jun-97 13:00	6.25	260	130	Yes	8.4	10.0	2.44	3.30	0.08	0.05	0.57	0.62
6D	25-Jun-97 22:30	26-Jun-97 01:30	3.0	227	130	No	10.0	15.0	2.74	4.05	0.17	0.34	0.85	0.96
7D	01-Jul-97 06:30	01-Jul-97 08:30	2.0	181	130	Yes	11.0	18.0	<2	2.41	0.11	0.13	0.93	1.06
1E	09-Jul-97 03:30	09-Jul-97 07:00	3.5	244	120	No	8.2	10.0	2.09	3.23	0.24	0.33	0.70	0.73
2E	16-Aug-97 20:30	17-Aug-97 02:45	6.3	269	120	Yes	5.0	5.2	<2	4.96	0.15	0.35	0.83	0.87
3E	17-Aug-97 18:00	17-Aug-97 23:30	5.5	257	120	No	3.8	4.0	<2	4.70	0.15	0.10	0.71	0.71

Table 1

AKRON WATER POLLUTION CONTROL STATION

STRESS TEST LOG

TEST	DATE/TIME START	DATE/TIME STOP	DURATION (Hours)	PEAK FLOW (MGD)	TARGET FLOW (MGD)	POLYMER APPLIED (lbs)	S.S. (B.E.) mg/l	S.S. (D.E.) mg/l	CBOD5 (B.E.) mg/l	CBOD5 (D.E.) mg/l	NH_3-N (B.E.) mg/l	NH_3-N (D.E.) mg/l	Phos (B.E.) mg/l	Phos (D.E.) mg/l
4E	24-Aug-97 14:00	24-Aug-97 18:00	4.0	213	120	Yes	5.2	7.0	<2	5.87	0.15	0.07	0.89	0.89
5E	24-Aug-97 22:45	25-Aug-97 04:30	5.75	257	120	No	6.8	7.6	<2	4.52	0.10	0.07	0.88	0.79
6E	10-Sep-97 03:30	10-Sep-97 07:00	3.5	196	120	Yes	7.6	8.2	3.15	6.53	0.36	0.29	0.81	0.78
7E	20-Sep-97 00:00	20-Sep-97 11:15	11.25	274	problem w/flow	No	4.8	7.4	<2	2.17	0.19	0.21	0.74	0.82

Table 1

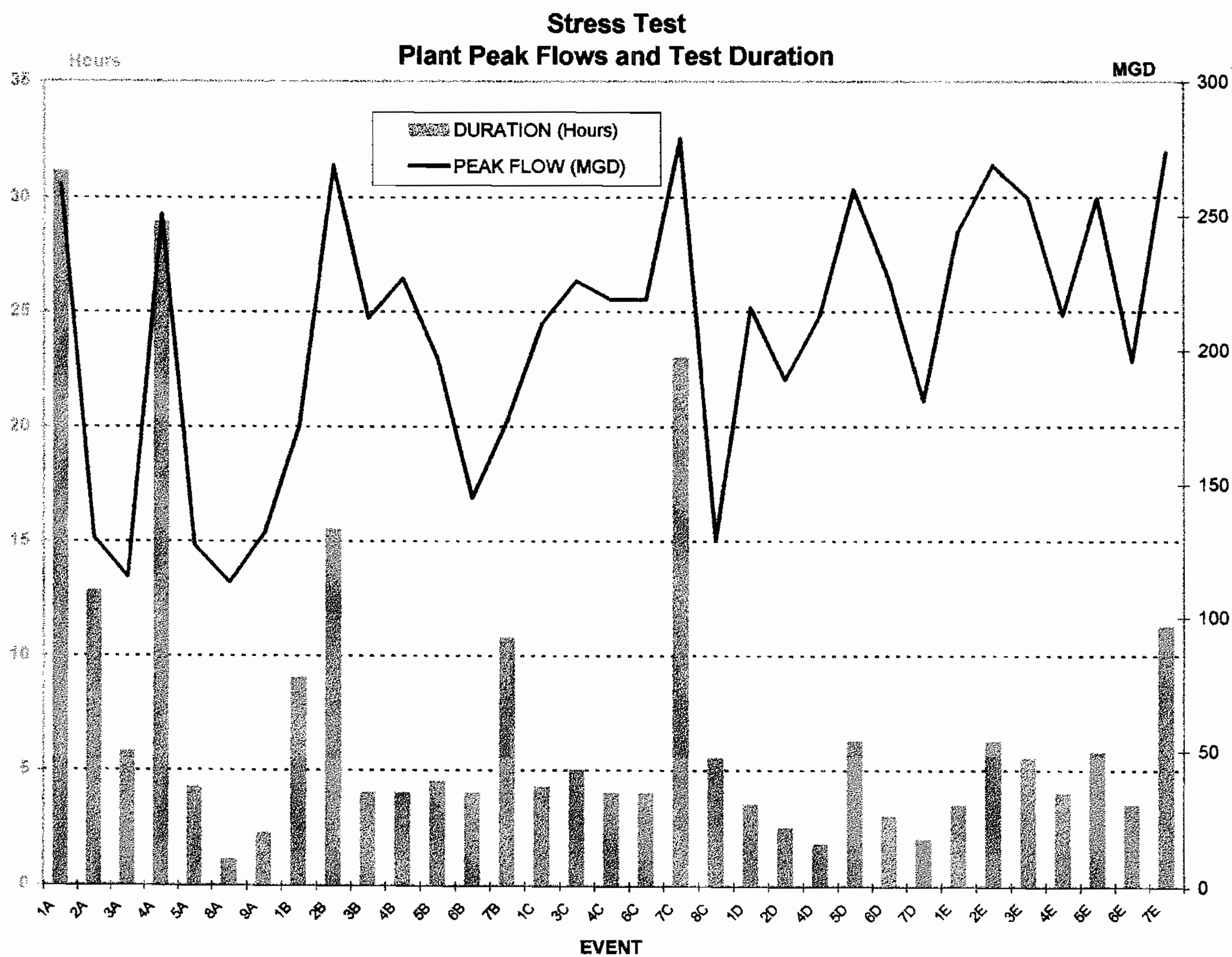

Stress Test
Plant Peak Flows and Test Duration
Hours
MGD
DURATION (Hours)
PEAK FLOW (MGD)
35
30
25
20
15
10
5
0
300
250
200
150
100
50
0
1A 2A 3A 4A 5A 8A 9A 1B 2B 3B 4B 5B 6B 7B 1C 3C 4C 6C 7C 8C 1D 2D 4D 5D 6D 7D 1E 2E 3E 4E 5E 6E 7E
EVENT

FIGURE 1

Stress Test
Effluent Suspended Solids

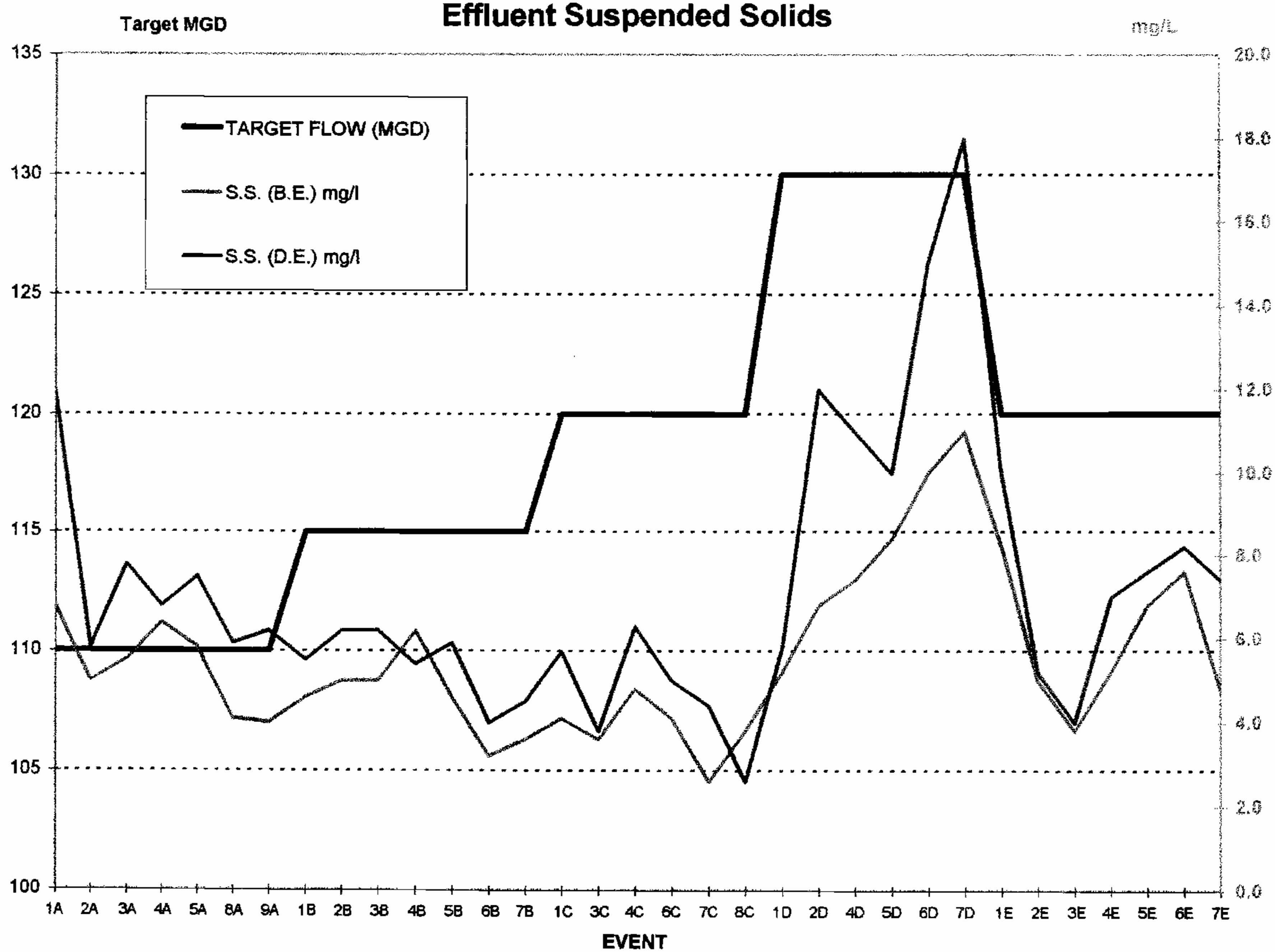


FIGURE 2

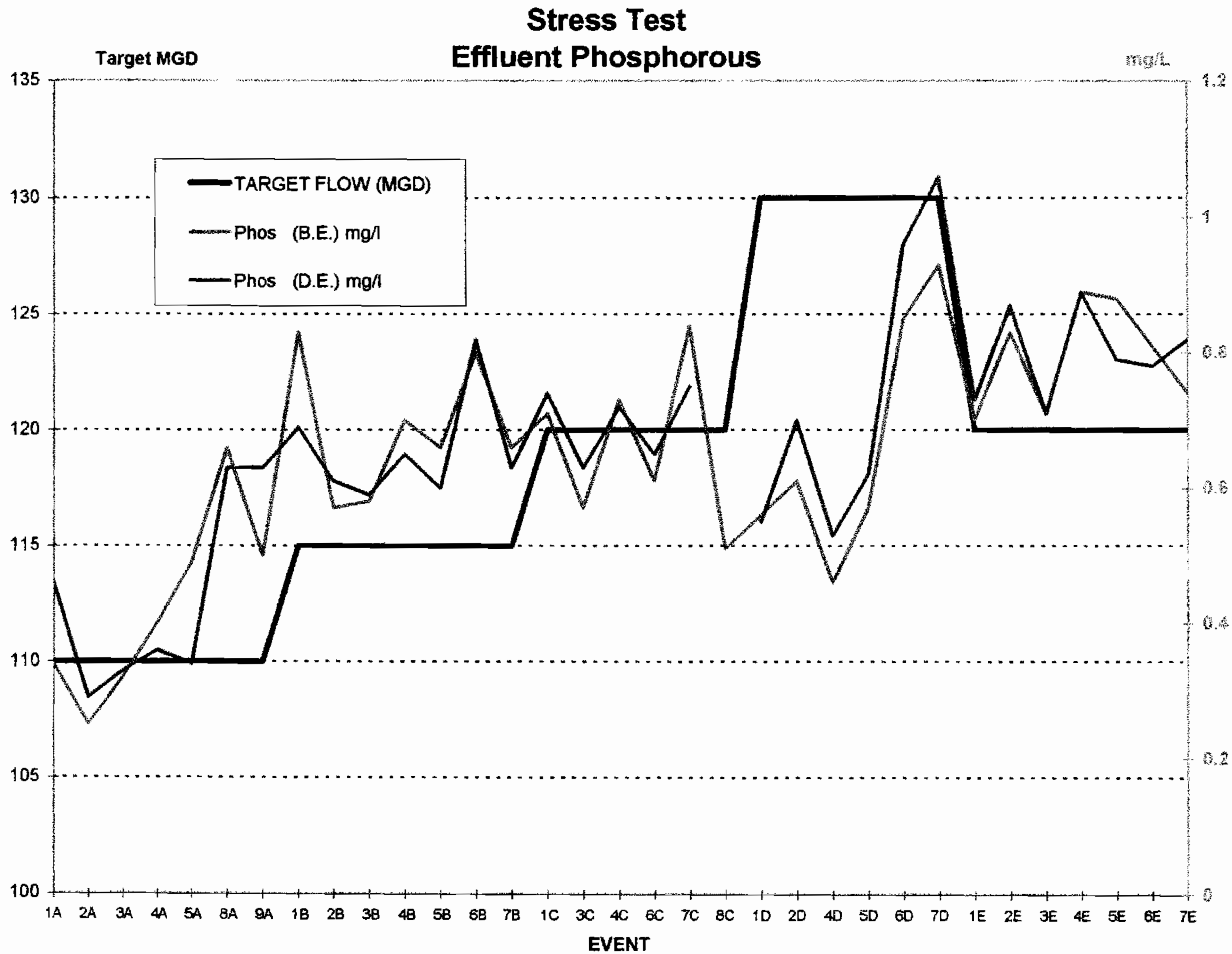

Stress Test
Effluent Phosphorous
Target MGD
mg/L
135
130
125
120
115
110
105
100
1.2
1
0.8
0.6
0.4
0.2
0
TARGET FLOW (MGD)
Phos (B.E.) mg/l
Phos (D.E.) mg/l
1A 2A 3A 4A 5A 8A 9A 1B 2B 3B 4B 5B 6B 7B 1C 3C 4C 6C 7C 8C 1D 2D 4D 5D 6D 7D 1E 2E 3E 4E 5E 6E 7E
EVENT

FIGURE 3

Stress Test
Effluent CBOD

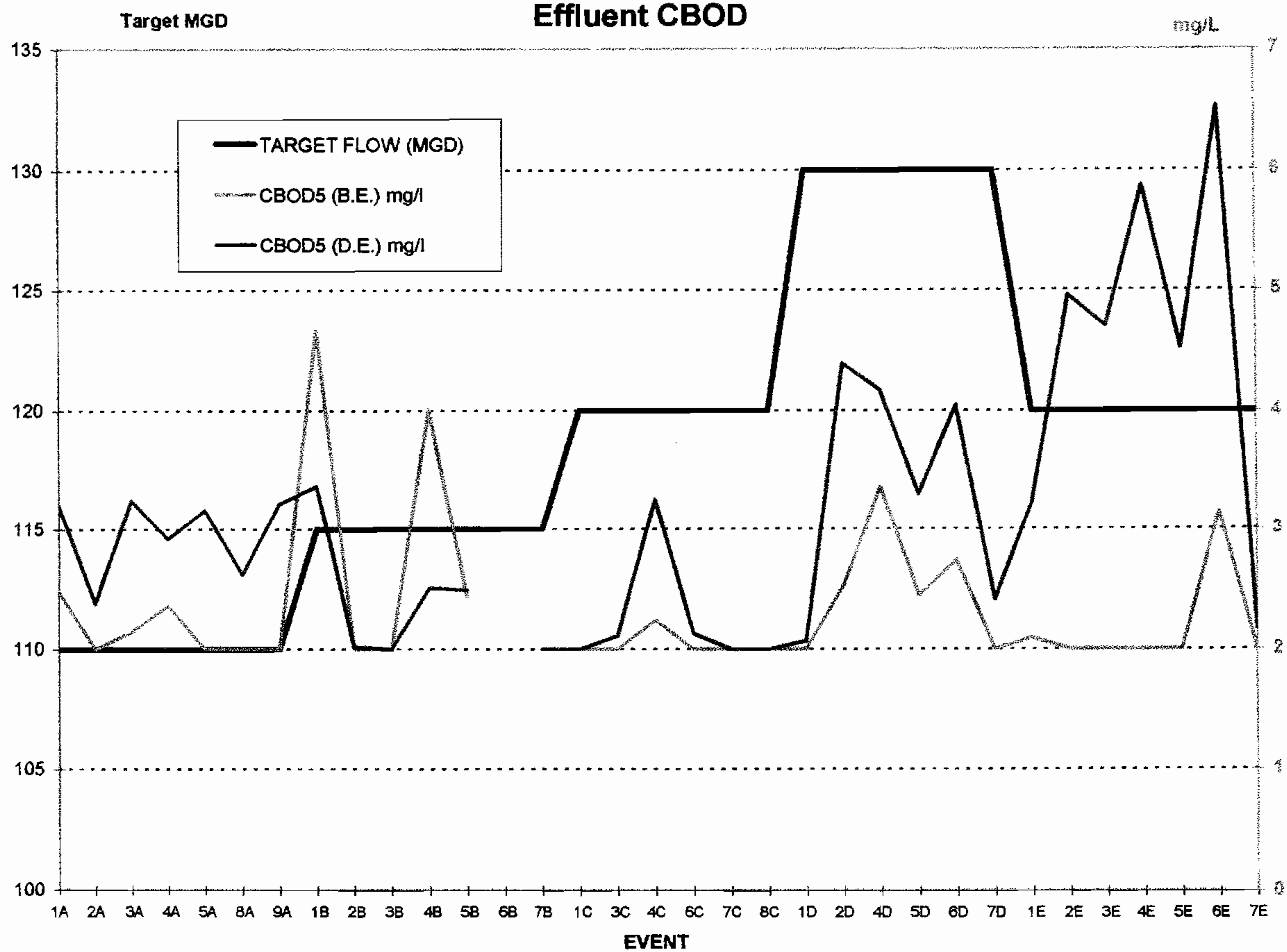


FIGURE 4

APPENDIX A.

CITY OF AKRON, OHIO
WATER POLLUTION CONTROL STATION

STRESS TESTING OF ACTIVATED SLUDGE PLANT

The proposed plan for testing of the Activated Sludge Plant (ASP) at the Akron Water Pollution Control Station can be divided into three main parts:

1. An overview of how the ASP is currently operated during periods of high flow.

2. A six month plan to gradually increase hydraulic loading to the ASP.

3. Specific procedures for conducting the test and data collection.

A codicillary set of flow diagrams and sample forms will keep the reader oriented.

As a preclude to the overview, we must state here our concerns for major environmental impact resulting from massive secondary clarifier upsets and resulting poor quality effluent. We believe these upsets may occur during any phase of the testing. Therefore, we have included a recovery phase in the procedures which will supersede any stress flow targets. The recovery phase will be effected whenever it is felt that control of the ASP may be in jeopardy.

High influent flows to the ASP as a result of storm events are regulated by the activated influent sluice gates (see Secondary Influent Flow Control Strategy). The gates are modulated to provide flow equalization/proportioning among the individual activated units and limiting of the total influent flow to this process. Automatic flow proportioning is provided to maintain desired/balanced flows regardless of the total plant influent flow and to automatically adjust the flows to account for out-of-service conditions. Excess flows are allowed to spill over the secondary bypass weirs that surround the effluent channel of Primary Settling Tanks 1 through 12. Rising water in the Primary Effluent/ Activated Influent Channels caused by the restriction of flows into the ASP may necessitate opening of the Secondary Bypass Gate (see Secondary Bypass Flow Control Strategy) to maintain desired channel levels.

The Stress Test is formatted into a Six Month Plan (see schedule). Prior to any specific phase of the plan, the Storm Retention Tanks (SRT) will be set to receive flow only after the target flow for that phase has been attained. For example, month three calls for a target flow of 120 MGD...the SRT would be set to receive flows above 120 MGD, and all flows below 120 MGD would receive Primary and Secondary treatment.

Stress Test events will be coordinated by an operations foreman in the field and lead operator located at the supervisory console in the Administration Building with assistance from the lead operator located at the ASP. All will be in constant radio contact. The lead operator at the supervisory console (Controller) will control flows into the ASP while the foreman and other lead operator (Sampler/Observer) will coordinate sampling of the final settling tanks effluent and observe system performance. Additional staff will be called in on an overtime basis on 'off- shifts' and weekends to assist with final settling tank observations and testing. Normal work-week stress test events during the day will be assisted by additional on-site staff.

Any particular phase of the stress test will generally proceed as follows:

1. At the onset of a high flow event, the designated personnel will come to the plant, if not already there. This period is known as 'Before Event' (BE) on sample sheets, lab sheets, etc.. The Sampler/Observer will take a BE grab sample at sample station 602 and observe the condition of the final settling tanks and record any pertinent information.

2. The Controller will be in radio contact with the Sampler/Observer as the flows continue to rise up to the target flow rate. If and when the target flow is attained, the Sampler/Observer will wait 30 minutes and then initiate the composite sampler located at sample station 602. The time delay is included in an effort to capture a sample that is representative of the effluent as affected by the increase in flow to the ASP. This sample will be labeled 'During Event' (DE).

3. An event will be concluded when plant influent flow does not exceed the target flowrate. Influent flow to the ASP will be returned back the permit required rate of 97 MGD. The composite sampler will continue sampling for an additional 30 minutes after the conclusion of the event in an effort to capture a sample of the effluent that was affected by the increase in flow through the ASP.

4. If at any time during the event the Sampler/Observer feels that system performance has degraded appreciably and threatens the welfare of the receiving stream, he may call for an initiation of a 'Recovery Phase' (RP). The call for the RP will alert the Controller to reduce flow to the ASP to the current permit required rate of 97 MGD. The composite sampler will continue sampling for an additional 30 minutes following the initiation of the RP in an effort to capture a sample that is representative of the effluent as affected by the increase in flow to the ASP.

The Recovery Phase will be initiated by the Sampler/Observer whenever two or more final tanks have sludge blankets within two feet of the surface of the water. The length of time of the RP will vary depending on how long it takes to regain control of the ASP. There is a possibility of large upsets even after the Controller reduces influent flow to the ASP. If recovery is complete and plant flows are to exceed the target flow rate, the event will be retried.

Multiple stress test events within the same month and target flow rate will be alternated with the addition of polymers to determine if a higher quality effluent can be realized during the event. Current operation of the ASP does not incorporate the use of polymers. With limited polymer pumping and handling facilities, the addition of polymers may not prove worthwhile when considering the volume of wastewater to be treated. Stress test events incorporating polymers will be noted as such, including the pounds of polymer applied to each unit during the event.

AKRON WATER POLLUTION CONTROL STATION
ACTIVATED SLUDGE PLANT STRESS TEST
SIX MONTH PLAN

MONTH ONE - March 31, 1997 through April 30, 1997

Target Flowrate	110 MGD
Primary Tanks #1 and #13	Out-of-service
Final Clarifier #1C	Out-of-service

Duration limited by near upset conditions or flow lower than target flowrate.

MONTH TWO - May 1, 1997 through May 31, 1997

Target Flowrate	115 MGD
Primary Tanks #2 and #14	Out-of-service
Final Clarifier #2C	Out-of-service

Duration limited by near upset conditions or flow lower than target flowrate.

MONTH THREE - June 1, 1997 through June 30, 1997

Target Flowrate	120 MGD
Primary Tanks #3 and #15	Out-of-service
Final Clarifier #3C	Out-of-service

Duration limited by near upset conditions or flow lower than target flowrate.

MONTH FOUR - July 1, 1997 through July 31, 1997

Target Flowrate	130 MGD
Primary Tanks #4 and #16	Out-of-service
Final Clarifier #4C	Out-of-service

Duration limited by near upset conditions or flow lower than target flowrate.

MONTH FIVE - August 1, 1997 through August 31, 1997

Target Flowrate	140 MGD
Primary Tanks #5 and #17	Out-of-service
Final Clarifier #5C	Out-of-service

Duration limited by near upset conditions or flow lower than target flowrate.

MONTH SIX - September 1, 1997 through September 30, 1997

Target Flowrate	150 MGD
Primary Tanks #6 and #18	Out-of-service
Final Clarifier #6C	Out-of-service

Duration limited by near upset conditions or flow lower than target flowrate.

Note: Treatment units will be taken out-of-service to simulate theoretical maintenance downtime. This schedule may expand or contract depending on flows. A minimum of five (5) events at each target flowrate will be performed. If there are five (5) successful events at a given flowrate, then the next target flowrate will be attempted irregardless of the date.

AKRON WATER POLLUTION CONTROL STATION

STRESS TEST LOG

TEST	DATE	TIME Start/Stop	DURATION (Hours)	PEAK FLOW (MGD)	TARGET FLOW (MGD)	POLYMER APPLIED (lbs)	S.S. (B.E.) mg/l	S.S. (D.E.) mg/l	CBOD5 (B.E.) mg/l	CBOD5 (D.E.) mg/l	NH4 (B.E.) mg/l	NH4 (D.E.) mg/l	Phos (B.E.) mg/l	Phos (D.E.) mg/l

Notes:

AKRON WATER POLLUTION CONTROL STATION

STRESS TEST
FINAL SETTLING TANK OBSERVATIONS

DATE: ___________

TARGET FLOW: ______

TEST NUMBER: ______

TIME	UNIT #1			UNIT #2			UNIT #3			UNIT #4			UNIT #5			UNIT #6		
	1A	1B	1C	2A	2B	2C	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	6C

LEGEND

CLR = CLEAR
P = PIN FLOC
CL = CLOUDY
FL = FLOODED WEIR
U = TANK UPSET
# = NUMBER OF FEET BLANKET BELOW SURFACE

COMMENTS:

AKRON WATER POLLUTION CONTROL STATION

STRESS TEST
SAMPLE TIME SHEET

DATE: ____________

TARGET FLOW: __________

TEST NUMBER: __________

Before Event Grab Sample: __________

602 Composite Sampler Start: __________

602 Composite Sampler Stop: __________

COMMENTS:

____

____

____

____

____

____

____

____

AKRON WATER POLLUTION CONTROL STATION

STRESS TEST
POLYMER USAGE DATA

DATE: __________

TARGET FLOW: ______

TEST NUMBER: ______

	UNIT #1	UNIT #2	UNIT #3	UNIT #4	UNIT #5	UNIT #6
INITIAL TOTALIZER READING						
FINAL TOTALIZER READING						
TOTAL GALLONS USED						

COMMENTS:

____

____

____

____

____

____

____

____

Strstst2.xls

SECONDARY INFLUENT FLOW CONTROL

PURPOSE

The secondary influent flow control logic provides manual, and modulating control of the secondary influent gates for the following purposes.

- Flow equalization/proportioning among the (3) secondary influent channels.
- Limiting of the total secondary influent to flows which can be properly treated.

Automatic flow proportioning is provided to maintain desired/balanced flows regardless of the total influent flow (hydraulic head over the intake horns) and to automatically adjust the flows to account for out-of-service conditions of the final settling tanks.

PROCESS DESCRIPTION

The primary effluent is collected in the secondary influent flume and distributed to the secondary aeration units via (6) inverted bell type intakes (horns). Flow is split into (3) trapezoidal influent channels, each feeding (2) aeration tanks, via a pair of intakes and corresponding influent gates, as follows.

- Gates 1 and 2 serve tanks 1 and 2 via channel 1.
- Gates 3 and 4 serve tanks 3 and 4 via channel 2.
- Gates 5 and 6 serve tanks 5 and 6 via channel 3.

For control and recording purposes, aeration influent (AI) flow is measured in each channel (for each pair of aeration units) except that flows are separately measured for units 5 and 6.

It is noted that, for aeration units 5/6 only, additional <u>individual</u> influent gates are provided for each unit, providing for proportioning control between these two units. (Reference the Secondary units 5/6 Flow Control strategy.)

It is also noted that primary effluent flows exceeding the limit imposed on the total secondary influent flow result in an increasing level in the influent flume (and primary effluent channel). The secondary bypass gate serves to relieve a high level condition in the channel, when the level reaches the maximum desired point. (Reference the Secondary Bypass Flow Control strategy.)

A flow diagram of the secondary influent system is depicted on Drawing 3.09-1 Secondary Influent Flow Control Block Diagram, included as an attachment to Section 3.09.

PROCESS CONTROL

BASIC STRATEGY

Control of the influent (channel) flows is effected via a pair of secondary influent gates for each channel. Each pair of gates is operated together (in unison) as though they were a single gate.

Control of the secondary influent gates is provided via a "cascaded" PID control strategy, which functions as follows.

The secondary influent control scheme acts to maintain a constant level (head) in the secondary influent flume, thereby enforcing the requirement that the secondary influent equal the primary effluent. Specifically, the total secondary influent flow required to maintain the level is calculated via the primary PID controller (outer loop). The total calculated flow is then split in proportion to the percent of the total which is to be diverted to each channel, which values (representing the required separate AI flows) are then input as the flow setpoints to the secondary PID controllers (inner loops) which, in turn, control the secondary influent gates.

The control variables for outer and inner loops are listed below.

Outer Loop

- PV (process variable): Flume level measured via level transmitter.
- SP (setpoint): Flume level desired (transparent to user).
- OP (output): Total calculated flow setpoint used to develop flow setpoints for the inner loops (internally generated).

Inner Loops

- PV (process variable): Influent channel flow measured via flow transmitter(s).
- SP (setpoint): Influent channel flow setpoint calculated from the total flow setpoint from the outer loop and the percent split call for based on the operational settings (internally generated and inaccessible to the user).
- OP (output): Secondary influent gate position (% open).

MANUAL/AUTOMATIC CONTROL

The PID control strategy provides for operation in automatic or manual modes, as follows.

- Automatic: The gates are modulated (in time) as required to track/maintain the secondary influent flume level setpoint, while maintaining the required percent split to the three influent channels, and also to limit the flow such that the total influent flow does not exceed the allowable total AI flow prescribed by the user.
- Manual: The gates are positioned directly by the user.

The automatic mode provides for proportioning the influent channel flows either automatically, by equalizing the flows based on aeration/final tank out-of-service conditions, or in the proportions as specified by the user, which modes are further defined under the respective control window functions.

CONTROL FEATURES

The control logic provides for the following tracking/limiting features. (Tracking refers to the control method used to "freeze" PID control action under certain mode or limiting conditions in order to inhibit PID reset "windup", and to provide for a "bumpless" transfer when switching from the manual mode to automatic.)

- The level loop output (total flow setpoint) tracks the sum of the channel flows whenever all gates are in manual mode, preventing saturation in the level loop.
- The level loop output (total flow setpoint) tracks and is limited to a variable maximum flow, which depends on the percent split, such that the individual setpoints are limited to the range of the channel flow loops (50 MGD).

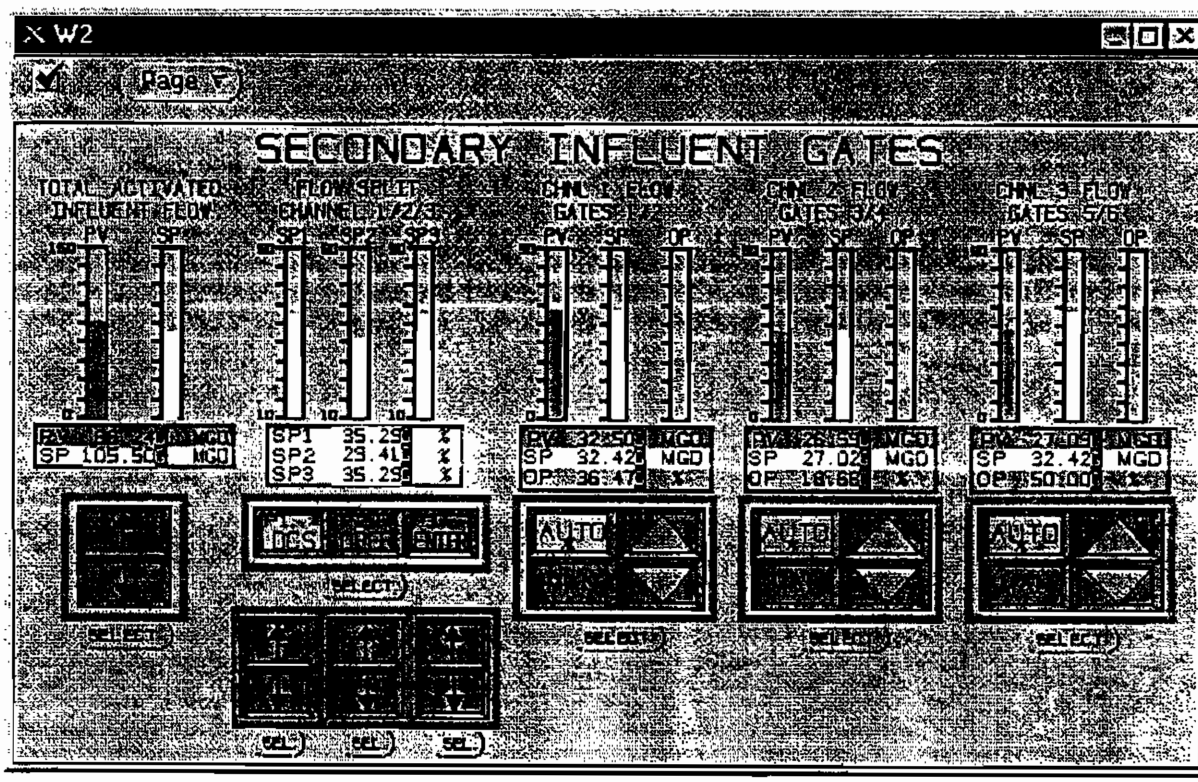
- The level loop output (total flow setpoint) tracks and is limited to the maximum total secondary influent flow specified by the user, in order to maintain the proportions under limiting conditions.

- Setpoints are non-tracking, meaning that when the controller is placed in the manual mode, they retain their entered values.

FAULT CONTROL

A gate position fault is generated whenever the actual position (as sensed via the position transmitter) disagrees (by more than +/- 5%) with the position called for, for longer than a preset time period (which is set to allow full stroke at normal operating speed). When a gate fault is detected, the corresponding alarm (fault on transition to open or closed position) is generated, and the PID control is automatically placed in manual mode.

CONTROL WINDOWS



The operator interface to the control system is presented via the appropriate control window. The control functions (buttons) provided on the window and their operation are described below.

Up/down "arrow" buttons:	Increases/decreases the total activated influent flow.
DCS mode button:	Selects the DCS mode in which the channel flows are automatically equalized, in proportion to the number of final tanks that are out-of-service. (As an example, if final tank 1A were out-of-service, the percent splits would be calculated as 29.4%, 35.3%, and 35.3%.)
OPER mode button:	Selects the OPER mode in which the channel flows are proportioned in accordance with the percent split setpoints entered by the user.
ENTER select button:	Submits the percent split setpoints entered by the user to the control system. (The function is applicable in the Operator mode only.) If the values entered do not total to 100%, the displayed setpoints are returned to their last valid entries, and an alarm is generated and the enter button flashes *red* informing the user of the error condition. When the total equals 100%, the enter button flashes ***green*** to indicate that the change was valid. Setpoint data is only effected when entered.
Up/down "arrow" buttons: (Percent split)	Increases/decreases the percent split setpoints, which defines the percent of the total secondary flow to be diverted to the respective channels. The total must equal 100%. (The functions are applicable in the Operator mode only.) Percent split setpoints are restricted to a range of 10 to 50 percent. If setpoints are adjusted (not totaling 100%) but not entered, the setpoints are returned to their last valid entries after a 60 sec. delay (allowing for the data entry procedure) and an alarm is generated informing the user of the error condition.
AUTO/MAN. mode buttons:	Selects the automatic/manual PID control mode.
Up/Down "triangle" buttons:	Increases/decreases the gate position output (applicable in the manual mode only).

OPERATION

Operational procedures/requirements are outlined below.

AUTOMATIC MODE

The automatic mode is used for normal operation. Procedures required for automatic operation include the following.

- Enter the desired maximum total secondary (AI) influent flow setpoint via the control window buttons or the Digital Entry sub-window.
- Select the operational mode - DCS or Operator.
- Adjust the desired percent split setpoints via the control window buttons or the Digital Entry sub-window (applicable in the Operator mode only).
- Enter the setpoint data via the ENTER button (applicable in the Operator mode only).
- Place all gate controllers in the automatic mode.

It is noted that automatic control is in effect so long as one gate is in the automatic mode. although control response may suffer. and it recommended that the system not be operated in this manner.

MANUAL MODE

The manual mode is used only for selected operational situations where direct positioning of the gates is dictated. Situations include process upset situations where the manual mode may be required to stabilize conditions, where the controlled variable signal (PV) is lost or otherwise unusable (to enable limited process control), and maintenance/troubleshooting operations. Procedures required for manual operation include the following.

- Place the gate controller in the manual mode.
- Adjust the gate position for the flow rate desired via the control window buttons or the Digital Entry sub-window.

FAULT MODE

A gate fault (defined as a mismatch between the position command and the actual position) which has not self-cleared should be corrected as soon as possible, as control of the gate is not possible (from the distributed control system) in either the automatic or manual modes.

Local control of the gate may or may not be possible, depending on the nature of the fault.

LOCAL OPERATION

Local (field) operation of the gates (either of the pair) is seen as a fault condition by the distributed control system and gate control is automatically placed in the manual mode (to prevent controller "windup"). A return to remote (DCS) operation requires re-selection of the automatic mode if so desired.

Whenever a gate is repositioned under local operation (via the gate actuator) the DCS gate output should be manually set to match the actual gate position, prior to switching back to remote operation. In this manner, a "bumpless" transfer is provided, and the disturbance seen by the control system is minimized.

REMARKS

The following comments are made regarding the secondary influent flow control system.

- The system may be operated in the manual mode, in similar fashion to operation in the local mode, although without the benefits of automatic control. Gate positions are set to the positions via the control window as they would be set locally in the field.
- FLOWS:
  - Primary Influent = [four venturi meters – Storm Retention Bypass + Aux.(recycle liq.) flow]
  - Primary Effluent = [Primary Influent – Secondary Bypass]
  - Secondary Influent = [Sum of Activated influent Channel flows]
- BYPASS CONTROL:
  - Leave in manual until *primary effluent channel* reaches approximately 15 inches (horn channel level) then crack open the bypass gate 10% to start filling the *bypass channel*. After flow is sensed over the *secondary bypass weir*, put the bypass gate into automatic mode. Note: it may take 15-20 minutes when cracking open the gate before seeing a bypass flow.
- Return Sludge Flow control uses Ratio of EFFLUENT flows.

SECONDARY BYPASS FLOW CONTROL

PURPOSE

The secondary bypass flow control logic provides manual, and modulating control of the secondary bypass gate which acts to limit the *level* in the primary effluent (PE) channel (and secondary influent flume) and secondary influent *flow*, typically required under higher flow conditions.

The *level* in the primary effluent channel is limited primarily to minimize the effects of high channel level on the primary tank effluent weirs.

PROCESS DESCRIPTION

The secondary influent flow control system limits the influent flow to the maximum total activated (AI) influent flow prescribed by the user; primary effluent flows exceeding the maximum permitted through secondary result in an increasing level in the primary effluent channel. The secondary bypass gate, to the extent possible, limits the level in the channel and secondary influent flow to the values prescribed by the user (secondary bypass gate setpoint) via diverting (bypassing) a portion of the primary effluent flow.

The secondary bypass gate provides a bypass path from the primary effluent channel to the primary overflow channel (located beneath the effluent channels for primary tanks 1 through 12) which is then connected to the 96" secondary bypass chamber via a connecting spillway. A secondary bypass event occurs only when sufficient level is built up in the overflow channel to flow over the secondary bypass weir and into the 96" bypass. The secondary bypass flow is the measured flow over the weir.

A flow diagram of the secondary influent system is depicted on Drawing 3.09-1 Secondary Influent Flow Control Block Diagram, included as an attachment to Section 3.09.

PROCESS CONTROL

BASIC STRATEGY

Control of the secondary bypass gate is provided via a PID control strategy, utilizing the proportional mode only, with the following control variables.

- PV (process variable): Primary Effluent flow (Primary influent-Secondary bypass flow)
- SP (setpoint): Maximum Primary effluent flow entering Secondary
- OP (output): Bypass gate position (% open).

MANUAL/AUTOMATIC CONTROL

The PID control strategy provides for operation in automatic or manual modes, as follows.

- Automatic: The gate is closed for Primary effluent flows less than the setpoint flow. For Primary effluent flow above the setpoint, the gate is opened to a position proportional to the Primary effluent flow above setpoint (proportional to the difference between actual flow and setpoint flow).
- Manual: The gate is positioned directly by the user.

Deadband operation is provided in the automatic mode (such that the gate is closed at a lower level than it is opened) in order to prevent rapid open/close cycling at levels close to the setpoint level.

CONTROL FEATURES

The control logic provides for the following tracking/limiting features. (Tracking refers to the control method used to "freeze" PID control action under certain mode or limiting conditions in order to inhibit PID reset "windup", and to provide for a "bumpless" transfer when switching from the manual mode to automatic.)

- The flow setpoint is non-tracking, meaning that when the controller is placed in the manual mode. it retains its entered value.

FAULT CONTROL

A gate position fault is generated whenever the actual position (as sensed via the position transmitter) disagrees (by more than +/- 5%) with the position called for, for longer than a preset time period (which is set to allow full stroke at normal operating speed). When a gate fault is detected, the corresponding alarm (fault on transition to open or closed position) is generated, and the PID control is automatically placed in manual mode.

CONTROL WINDOWS

The operator interface to the control system is presented via the appropriate control window. The control functions (buttons) provided on the window and their operation are described below.

AUTO/MAN. mode buttons:	Selects the automatic/manual PID control mode.
Up/down "arrow" buttons:	Increases/decreases the flow setpoint (applicable in the automatic mode only).
Up/down "triangle" buttons:	Increases/decreases the gate position output (applicable in the manual mode only).

OPERATION

Operational procedures/requirements are outlined below.

AUTOMATIC MODE

The automatic mode is used for normal operation. Procedures required for automatic operation include the following.

- Adjust the flow setpoint via the control window buttons or the Digital Entry sub-window.

  The flow setpoint should be set to the maximum flow that secondary can accept (depending on the number of final tanks in service) such that unnecessary bypasses are minimized, yet levels are kept, as much as possible, below the primary effluent weirs during higher flow conditions.

- Place the gate controller in the manual mode.

- When the Influent flow to Secondary approaches the operator entered set point, the operator must initially open the Bypass gate 5-10%. While monitoring flume level and Secondary influent flow, manually adjust gate position to achieve the desired values.

- The Bypass gate must remain in manual until the Secondary bypass chamber south of the bypass weir fills. When this channel is full you will see a flow reading over the weir.

- Once sufficient flow over the secondary bypass weir is established (2-5MGD) the secondary bypass controller should be placed in the auto mode for the duration of the event.

  Note: The Secondary bypass flow versus the bypass setpoint is what positions the bypass gate. When the bypass gate is initially open in the manual mode, the flow controller will not see a change in the primary effluent flow until there is a flow established over the secondary bypass weir (Secondary controller PV= Primary effluent-Secondary bypass). The time it takes to fill the secondary bypass chamber will not be reflected in the calculated primary effluent flow reading. With this in mind, it becomes clear why the controller cannot be placed in the auto mode initially. If this were attempted the secondary gate would drive full open trying to achieve setpoint by the primary effluent flow will not change until flow is established over the secondary bypass weir.

MANUAL MODE

The manual mode is used only for selected operational situations where direct positioning of the valve is dictated. Situations include process upset situations where the manual mode may be required to stabilize conditions, where the controlled variable signal (PV) is lost or otherwise unusable (to enable limited process control), and maintenance/troubleshooting operations. Procedures required for manual operation include the following.

- Place the gate controller in the manual mode.

- Adjust the gate position (based on the level & flow desired) via the control window buttons or the Digital Entry sub-window.

FAULT MODE

A gate fault (defined as a mismatch between the position command and the actual position) which has not self-cleared should be corrected as soon as possible, as control of the gate is not possible (from the distributed control system) in either the automatic or manual modes.

Local control of the gate may or may not be possible, depending on the nature of the fault.

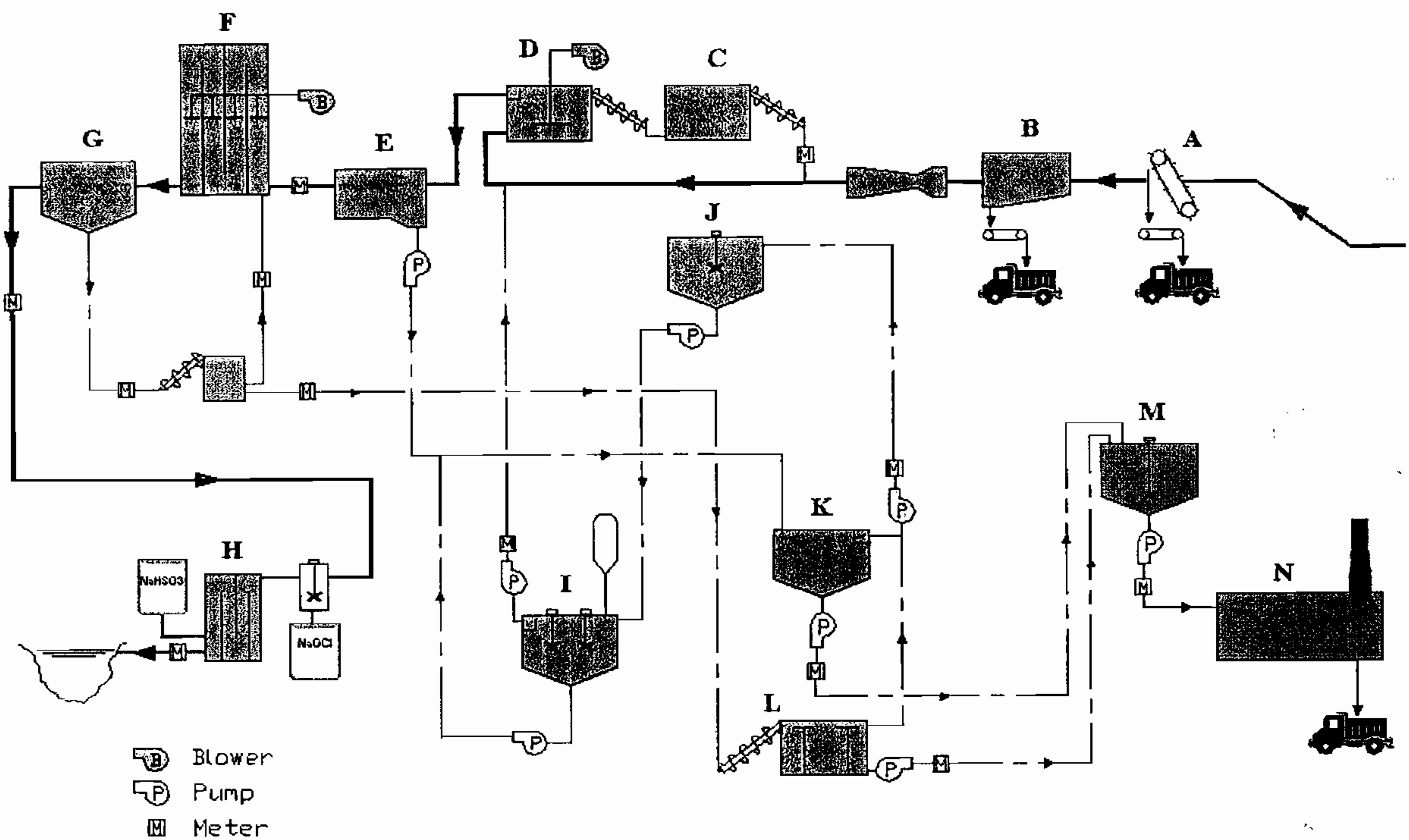
LOCAL OPERATION

Local (field) operation of the gate is seen as a fault condition by the distributed control system and gate control is automatically placed in the manual mode (to prevent controller "windup"). A return to remote (DCS) operation requires re-selection of the automatic mode if so desired.

Whenever the gate is repositioned under local operation (via the gate actuator) the DCS gate output should be manually set to match the actual gate position, prior to switching back to remote operation. In this manner, a "bumpless" transfer is provided. and the disturbance seen by the control system is minimized.

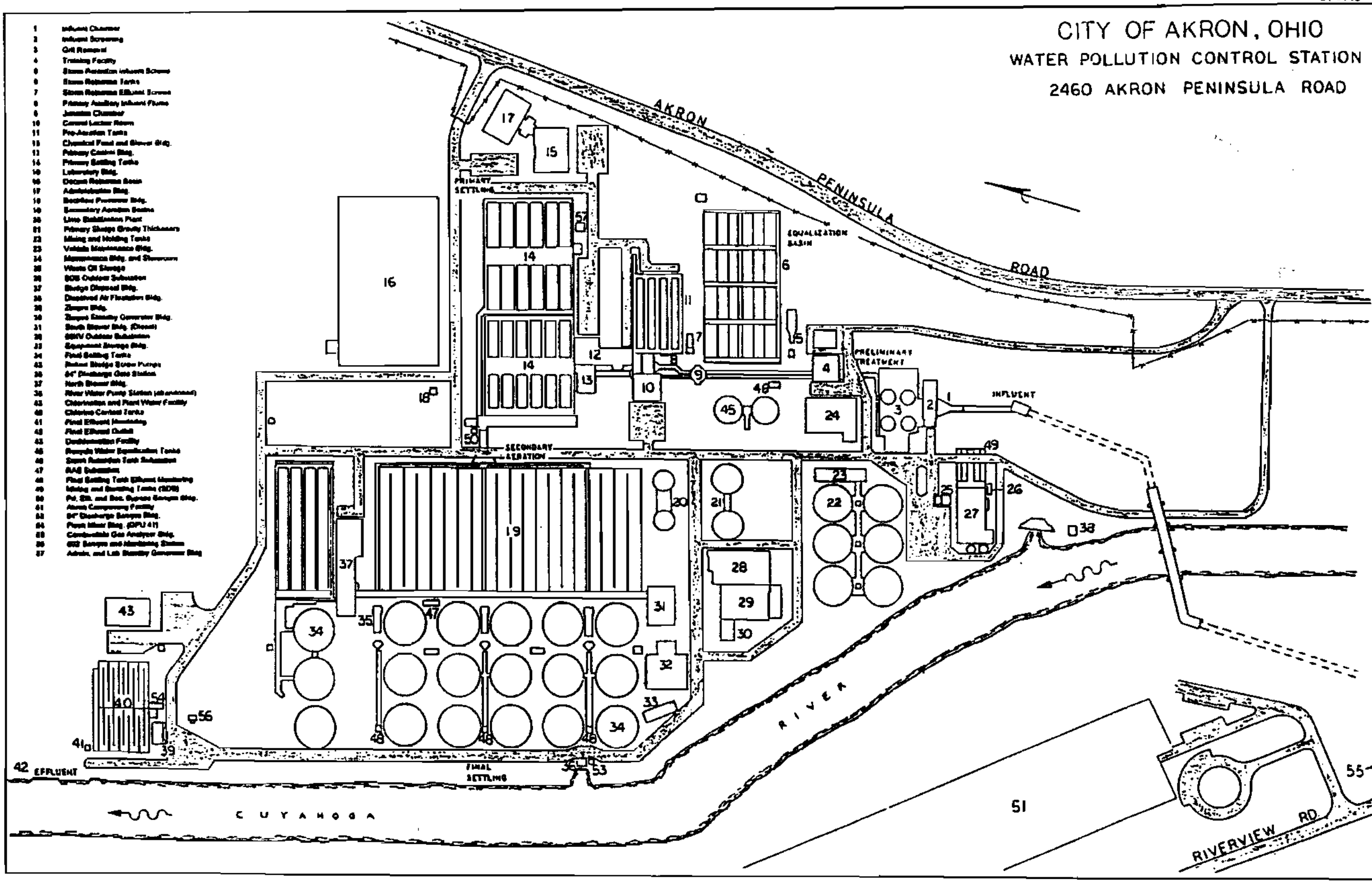
Akron Water Pollution Control Station

Process Flow Diagram



A. Influent Screens	B. Grit Removal	C. Storm Retention Tanks
D. Pre-aeration Tanks	E. Primary Settling Tanks	F. Secondary Aeration
G. Secondary Clarifiers	H. Effluent Disinfection	I. Recycle Flow Stabilization
J. Recycle Flow Equalization	K. Primary Gravity Thickeners	L. Dissolved Air Floation
M. Mixing and Holding Tanks	N. Akron Composting Facility	

3/10/95



CITY OF AKRON, OHIO
WATER POLLUTION CONTROL STATION
2460 AKRON PENINSULA ROAD
AKRON PENINSULA ROAD
EQUALIZATION BASIN
PRELIMINARY TREATMENT
INFLUENT
PRIMARY SETTLING
SECONDARY AERATION
FINAL SETTLING
EFFLUENT
CUYAHOGA RIVER
RIVERVIEW RD

CITY OF AKRON, OHIO

WATER POLLUTION CONTROL DIVISION

ACTIVATED SLUDGE PLANT

STRESS TEST

1994

Personnel of the Akron Water Pollution Control Station were able to stress the Activated Sludge Plant on eighteen separate occasions from December 19, 1992 through January 25, 1994. Durations of stress flows to the Activated Sludge Plant range from a low of 1.75 hours to a maximum of 34.5 hours on separate occasions. The consensus of Akron Water Pollution Control Station personnel conducting the stress test and reviewing all the data collected during each event which includes lab analyses and physical observations of the Final Clarifiers is that the maximum sustainable flow through the Activated Sludge Plant is 110 MGD instantaneous flow rate.

Much of the laboratory analysis does not, on the surface, seem to support this conclusion; but physical observation certainly does. It must be remembered that in the plan for the stress test the intention was to back away from stress testing if there was noticable degradation of the Final Clarifiers during a stress test; such as, high solids, blanket levels or upsets of Final Clarifiers. It is quite apparent from the visual observations that flows above 110 MGD instantaneous led to severe degradation or near degradation of the Final Clarifiers. During the longest event, 34.5 hours, from 4:00 p.m. on January 4, 1993 to 2:45 a.m. on January 6, 1993, and instantaneous flow rate of 110 MGD, there were short upsets of approximately one hour duration on two Final Clarifiers. Throughout this event most Final Clarifiers had pin flocking and some were very cloudy. Lab analysis did not support the conditions visually observed during this event.

Another long term stress event, of 32.5 hours, from 9:00 p.m.on January 12, 1993 to 4:50 a.m. January 14, 1993, showed very similar results for instantaneous flow rates of 110 MGD. High sludge blankets were observed on six Final Clarifiers, with most of these up to within six inches of the weirs, one Final Clarifier upset of one hour and ten minutes duration, and pin flocking on all other Final Clarifiers. Lab results for this event were also very good.

The first eleven stress events were for a flow target of 110 MGD. Of the eleven events, six had upsets of Final Clarifiers that could be termed "mild" for the best case to "moderate" for the worst case. After completing stress testing at the 110 MGD stress target rate, an attempt was made to increase the next stress event, No. 12, February 21 1993/February 22, 1993, to a stress target rate of 115 MGD. At this target rate there were upsets on five separate clarifiers. It was necessary to back off from the stress, regain control of the Activated Sludge Plant and attempt to stress again; but upsets and high solids blankets on several tanks forced the intiation of the recovery phase and limit flow to the Activated Sludge Plant below the stress target rate. Laboratory analysis confirmed solids unloading during this event with a result of 38 mg/l for suspended solids for the event.

It is important to review the events of the stress test for February 21, 1993 and February 22, 1993. This event lasted from 7:21 p.m. on February 21, 1993 to 3:50 a.m. February 22, 1993. It was necessary to back down from the target flow after only two hours due to upsets in five Final Clarifiers and degradation of conditions in the majority of all other Final Clarifiers. Several attempts were made after recovery phases to reach 115 MGD with no success, so the stress event was aborted after eight hours and 29 minutes. The Activated Sludge Plant did not recover from this stress event until July of 1993 when an attempt was made to conduct stress testing with one full aeration unit out-of-service for construction work related to the Distributed Control System project. From the event in February 1993 until restress in July, 44 separate occasions were experienced where the final effluent suspended solids were above 15 mg/l. Additionally, on February 24, 1993 a power outage was planned that was supposed to last for a maximum of four hours. The outage was to allow an electrical contractor to make a tie in at the main substation for a new transformer for the Compost Facility. The actual power outage lasted for over ten hours during which time the Activated Sludge Plant was without air supply. This occurrence added to the problems experienced in the Activated Sludge Plant through loss of solids and nitrification. Given all of these conditions it was impossible to regain good operational control of the system. Several theories as to the cause of the problems were presented, but there was no way to confirm them.

The services of Dr. Robert Marino, Phd., who has an extensive background in microbiology in wastewater and has done several projects in Michigan for the Michigan Health Department on wastewater and stream microbiology, were solicted. Dr. Marino was hired to determine the cause of the poor performance after the February stress event. Dr. Marino's theories and analysis for microscopic and microbiology work are attached in preliminary draft form as appendix A. Dr. Marino's findings support most of the theories for poor performance of the Activated Sludge Plant after February 1993. The initial theories on the poor performance were :

1. Cold weather stress testing caused reduced activity in the organisims in the biomass.
2. Stress testing had thinned out the Mixed Liquor and Return Sludge solids resulting in the inability of the organisims to recover completely.
3. Loss of air, due to the contractor's lack of timely performance, had destroyed the nitrifiers in the biomass.
4. A significant change in the make up of the organisims had occurred due to stress testing and the loss of air.

In July 1993, after the Activated Sludge Plant had recovered sufficiently to restress, subsequent stress testing events at 115 MGD flow were attempted with one aeration unit out-of-service due to construction activities. This left five aeration units and 14 Final Clarifiers to stress test. The flow rate was extrapolated to continue the stress testing based on design parameters of 25 MGD per aeration unit or with five units in service a maintained stress instantaneous flow rate of 96 MGD for the stress event equivalent of 115 MGD. Attempts were made on three separate events during July of 1993 with one aeration unit out-of-service. The longest event was for two hours 30 minutes. For these events the flow did not remain at the target rate or was not reached. However, attempts to reach this target rate produced pin flocking in most Final Clarifiers and dissolved oxygen levels below 5 mg/l on two of these events in which the target flow rate was reached. The previous attempt at a target flow rate of 115 MGD with all six aeration units in service was during February 1993. At that time it was felt that the maximum stress level of 110 MGD had been reached but the level was increased to 115 MGD to verify the theory.

Higher levels of stress testing were attempted on November 14, 1993 /November 15, 1993 and November 17, 1993 /November 18, 1993 in order to reach extrapolated test target rates of 120 MGD with five aeration units and 14 Final Clarifiers in service. The first event, November 14 through November 15, lasted 29.5 hours. Final Clarifiers had high solids blanket levels in several tanks and pin flocking on others. A suspended solids level of 17 mg/l was reached with a CBOD5 of 9 mg/l. The second event at extrapolated 120 MGD instantaneous flow rate showed results much the same as the first event with high blanket levels, pin flocking and a suspended solids level of 21 mg/l and CBOD5 level of 12 mg/l. At this point, due to construction and previous observations, continuation of stress testing was delayed. On January 25, 1994 an attempt to stress test at an extrapolated instantaneous flow rate of 130 MGD was made. This event lasted for a period of two hours and 45 minutes before upsets on several clarifiers and high solids blankets on several other clarifiers were experienced. At this point it was necessary to back down from the stress test and regain control of the Activated Sludge Plant. No further attempts to reach flows over 110 MGD were made after this event. It appeared that the information gained once the flow rates were extrapolated for five units in service and one unit out for construction was questionable.

Discussions with the City's instrumentation contractor confirmed suspicions that the measured flows were questionable. Once a unit was taken out-of-service for construction the channel configurations for feed flows to the aeration units changed and affected the metering parameters. The metering used during the stress events, and all other times, is located in the influent channels to the aeration basins. This metering is ranged to expected normal daily flow levels of approximately 80 MGD. Flows are measured by the use of velocity meters and level sensors calibrated to the configurations of the influent channels. Each channel feeds two aeration units. With one aeration unit out-of-service the meter ranging is changed by the flow distribution of the affected channel thereby giving false flow readings. To compensate for the meter ranging it would have been necessary to rerange all the flow metering to accommodate the unit out-of-service. This was not feasible for the time frame of the stress events. It is the instrumentation contractor's opinion the metering was reading high with one aeration unit out-ot-service during stress testing and that the actual Activated Sludge Plant influent flow readings would have been approximately 96 MGD. With this information it was concluded that the evidence is strong that the maximum through put of the Activated Sludge Plant that can be sustained for any length of time (1-1/2 to 2 days) is 110 MGD. Short excursions over 110 MGD can be accomplished for very limited times, 2 hours or less in duration.

With the information gained through the stress test and the intimate system knowledge of the operations staff it was determined:

1. Recovery phase for the Activated Sludge Plant after an event of 110 MGD requires at least a three MCRT duration for proper recovery before continuation of stress events. (See photos attached.)
2. Continued and/or frequent storm events will degrade the Activated Sludge Plant level of treatment for any extented period of flows over 100 MGD.
3. Physical flooding of the aeration tanks occurs at flows over 110 MGD.
4. Flooding of the Final Clarifiers takes place during extended high flow events.
5. The hydraulic capacity of the aeration tanks is limited.
6. Final Clarifier influent distribution is restricted due to the elevations of the distribution chambers and the lengths of the influent conduits.
7. The shallow Final Clarifiers (10-1/2 ft. average depth) restrict the Clarifier hydraulic capacity as well as the settling capabilities due to high flow short circuiting and hydraulic lift.

SUMMARY AKRON WWTP CONDITIONS SEPT. 1992 - SEPT. 1993
PRELIMINARY DRAFT

Prepared by: Robert P. Marino, Ph.D.
Environmental Health Sciences Consultant

April 4, 1993

1) Unavoidable personnel changes in Fall 1992 resulted in changes in activated sludge operations due to less experienced management.

2) A comparison of activated sludge operations pre-stress test (September 1, 1992 - October 31, 1992) vs. during (December 1-15, 1992) and post-stress test (December 16, 1992 - September 30, 1993) is as follows:

a) a post-test increase in F/M of about 75% for two months followed by a decrease of about 50%;

b) a large post-test variation in waste activated sludge (WAS) rate such that WAS increased about 100% in February and March 1993 and remained at 33-66% of the pre-test rate from April through June 1993;

c) a post-test increase in sludge blanket depth of 180% through June 1993 followed by a gradual decrease to one to two foot depths by September 30, 1993;

d) a post-test increase in return activated sludge (RAS) rate of 130% through June 1993, followed by a decrease to about pre-test rates by September 30, 1993;

e) a post-test decrease in mixed liquor detention time (MLDT) of 14% (from about 7h to 6h);

f) a post-test decrease in final mixed liquor dissolved oxygen (MLDO) of 20-30%;

g) a post-test decrease in mixed liquor volatile suspended solids (MLVSS) of 4%;

h) a post-test increase in mixed liquor suspended solids (MLSS) of 7%;

i) a post-test increase in sludge retention time (SRT) of 30-50%;

j) a post-test increase in mean cell residence time (MCRT) of 5-20%.

3) The post-test period was characterized by a chronic bulking sludge condition resulting in solids carry-over into

the final effluent from about 2/22/93 to 4/31/93. Polymer usage averaged about 150 lbs/day through August 1993, declining to 50-100 lbs/day in September. Upset conditions initiated by the December 1992 stress test were seriously worsened by an electrical service interruption on 2/22/93 that resulted in loss of most aeration capabilities. MLDO was at 0.3-0.6 mg/L for about 10 hour.

4) Prolonged anoxic conditions in the sludge on 2/22/93 combined with higher F/M, WAS, and sludge blankets, very low wastewater temperatures (8-9^o C), and chronically low MLDO resulted in the loss of nitrification (typically maintained during the winter) and frequent daily NPDES permit violations through August 1993. Nitrifying bacteria are thought to be important in the formation of good settling floc. Since about 50% of the bacterial population in the activated sludge is nitrifying (based on total BOD5 minus CBOD5), loss of the nitrifying bacteria appears closely associated with the occurrence of bulking sludge conditions and excessive polymer usage.

5) Operation of the activated sludge process at lower F/M (about 0.06-1.0) combined with longer SRT, MCRT, higher sludge blanket depths, and lower MLDO (0.4-2.0 mg/L) from about April through August 1993 resulted in the excessive growth and dominance of filamentous bacteria in the sludge. These bacteria are the cause of bulking sludge problems in the activated sludge process.

6) During September 1993, decreases in the SRT, MCRT, and sludge blanket depths, and increase in the MLDO resulted in an improvement floc development and settleability. Nitrification consistently improved with fewer ammonia limit violations. Polymer usage decreased by 33-66%. The process appeared to have recovered from the upset conditions that developed during December 1992 through February 1993.

7) On-going maintenance and renovation work on the activated sludge process system will preclude "normal" treatment operations and reduce treatment capacity until 1997. Until that time, the system can be expected to perform reasonably well under restricted conditions recommended as follows:

a) influent to activated sludge treatment not to exceed about 90 MGD for short periods (e.g., less than one to three days);

b) SRT to be maintained at about 10-12 days;

c) MLDO to be maintained at about 4 mg/L;

d) MLSS to be maintained at about 2800 mg/L (+/- 200 mg/L) during cold weather months and at about 2200 mg/L (+/- 200 mg/L) during warm weather months.

e) F/M (lbs BOD5/1000 lbs MLSS/d) to be maintained at 0.05-0.15;

f) aeration time to be about 6-8 h;

g) solids recirculation to be 30-100% of Q;

h) pH to be 7.0 (+/- 0.2); NB, an acidic pH inhibits nitrification and encourages fungal filament growth.

8) Microbiological monitoring of activated sludge is recommended as an indicator of process efficiency. Routine monitoring should include:

a) daily microscopic examination of protozoan and metazoan populations for each reactor or paired reactors (i.e., 1 + 2, 3 + 4, 5 + 6);

b) weekly microscopic examination of filamentous bacterial populations for each reactor and daily examination during upset conditions (NB, examine filamentous bacteria at least once per SRT).

THE CITY OF AKRON, OHIO

Department of Public Service
Public Utilities Bureau
WATER POLLUTION CONTROL DIVISION

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WATER POLLUTION CONTROL STATION

December 21, 1992
(Replaces original)

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
FIRST ACTIVATED SLUDGE PLANT STRESS TEST EVENT

First Stress Test Event December 19-20, 1992.
Stress Test Target Rate: 110 MGD

Flow started approximately 12:00 a.m. Event ended 4:30 a.m.

Control:	Kenneth Lott
Observer:	Vincent Zampelli
Reserve Observer:	Frank Ertle
Lab Sampler:	Mark Maki
Plant Supervisor:	Edward Schreiner

Maximum flow to the plant during the Event: 180 MGD Flow Rate

There was one 15-20 minute D.O. violation that did not correspond to first flush. The Activated Sludge Plant influent flows varied from 105 MGD to 115 MGD flow rate. 110 MGD flow rate was difficult to maintain until we took the storm retention basins off line. In future stress testing the storm retention basins will be in manual mode and used primarily in the Activated Sludge Plant recovery phase. This will allow us to control the Activated Sludge Plant influent and utilize the storm basins to relieve the flow during recovery or near upset.

Things went very well. Everyone responded in time. Only one Final Clarifier was in danger of upset (4-B), but did not. The center column seal (lower) on 4-B may be bad. We will check it and replace if necessary at the first opportunity. During the event the outfall turbidity JTU registered between 50 and 170, even with secondary bypass. The next event we will maintain 110 MGD to Activated Sludge Plant throughout the event if maintainable.

FDE:mld

cc: K. Lott
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WATER POLLUTION CONTROL STATION

January 5, 1993
(Replaces original)

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #2

Stress Test Event #2 on December 29, 1992.
Stress Test Target Rate: 110 MGD

Time: 15:00 to 17:00

Controller: Michael Mesek

Observer: Ronald Balca

Lab Sampler: --

Maximum flow to the plant during the Event only reached 90 MGD Flow Rate

The plant flow never reached the event rate of 110 MGD. Therefore, no test was achieved.

FDE:mld

cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 19, 1993
(Replaces original)

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station

RE: **ACTIVATED SLUDGE PLANT STRESS TESTING SUMMARY EVENT #3**

Stress Test Event #3 on December 30, 1992.
Stress Test Target Rate: 110 MGD

Duration: 4 hours 15 minutes

Time: 6:15 a.m. to 10:30 a.m.

Controller:	Michael Mesek
Observer:	Ronald Balca
Reserve Observer:	Richard Anderson
Lab Sampler:	Robert Katzmark
Plant Supervisor:	Richard Anderson

Maximum flow to the plant during the Event:	115 MGD Flow Rate
Minimum flow rate to the plant during the Event:	86 MGD Flow Rate

The Activated Sludge Plant influent flows varied from 100 to 109 MGD flow rate. Most tanks looked excellent. There was some cloudiness on scattered tanks, but mostly perimeter pin flocing was observed in all tanks. Analysis for the secondary effluent suspended solids during the event was 14 mg/l, the $CBDO_5$ during the event was 6 mg/l. Ammonia nitrogen from analysis during the event was 3.01 mg/l, and the phosphorous level during the event was 0.96 mg/l.

cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 25, 1993
(Replaces original)

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Starion

RE: **ACTIVATED SLUDGE PLANT STRESS TESTING SUMMARY EVENT #4**

Stress Test Event #4 on December 30, 1992 through December 31, 1992
Stress Test Target Rate: 110 MGD

Duration: 17 hours 30 minutes

Time: 2:30 p.m. to 8:00 a.m.

Controller: Michael Mesek

Observer: Ronald Balca

Reserve Observer: None

Lab Sampler: Robert Katzmark and Mark Maki

Plant Supervisor: Richard Anderson

Maximum flow to the plant during the Event: 240 MGD Flow Rate

Minimum flow rate to the plant during the Event: 87 MGD Flow Rate

The stress test progressed much the same as others. The exception was that one Final Clarifier 5B upset, but we were able to get it under control without difficulty within 20 minutes. All tanks were cloudy with a few very cloudy. The rains continued and Event #4 was ended at 12:00 mid. due to a holiday schedule. Activated Sludge Plant influent flow rates were at or above 110 MGD rate through most of the event. Activated Sludge Plant flow rate exceeded 110 MGD on eight separate readings and went as high as 115 MGD. Secondary effluent analysis for suspended solids during the event are 19 mg/l, the $CBDO_5$ during the event was 6 mg/l, the ammonia nitrogen during the event was 1.61 mg/l, and the phosphorous during the event was 0.72 mg/l.

FDE:mld

cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 25, 1993
(Replaces original)

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station FDE

RE: **ACTIVATED SLUDGE PLANT STRESS TESTING SUMMARY EVENT #5**

Stress Test Event #5 from January 3, 1993 through January 4, 1993
Stress Test Target Rate: 110 MGD

Duration: 8 hours

Time: 8:00 p.m. to 4:00 a.m.

Controller: Edward Schreiner

Observer: Ronald Balca

Reserve Observer: Michael Mesek

Lab Sampler: Mark Maki and Raymond Preski

Plant Supervisor: David Horner

Maximum flow to the plant during the Event: 216 MGD Flow Rate

Minimum flow rate to the plant during the Event: 106.91 MGD Flow Rate

We were able to main an average of 110 MGD flow rate through the Activated Sludge Plant during the entire event; some cloudy tanks, most tanks were clear. There were no upsets of the Final Clarifiers. The secondary effluent parameters from analysis for suspended solids during the event was 12 mg/l, the $CBDO_5$ during the event was 5 mg/l, ammonia nitrogen was 1.03 mg/l, and phosphorous during the event was 0.41 mg/l.

cc: K. Lott
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February 25, 1993
(Replaces original)

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station FDE

RE: **ACTIVATED SLUDGE PLANT STRESS TESTING SUMMARY EVENT #6**

Stress Test Event #6 from January 4, 1993 through January 6, 1993
Stress Test Target Rate: 110 MGD

Duration: 34 hours 30 minutes

Time: January 4, 1993 4:00 p.m. to 2:45 a.m. January 6, 1993

Controller: Edward Schreiner and Charles Harshbarger, Edward Schreiner and Ronald Balca

Observer: David Horner, Ronald Balca, Michael Mesek, and Vincent Zampelli

Reserve Observer: None

Lab Sampler: Pamela Lester, Christine Fisher, Pamela Lester and Christine Fisher

Plant Supervisor: Vincent Zampelli, Edward Schreiner, Kenneth Lott, Vincent Zampelli and Edward Schreiner

Maximum flow to the plant during the Event: 242 MGD Flow Rate

Minimum flow rate to the plant during the Event: 106 MGD Flow Rate

This is the longest sustained event yet. No final effluent DO violation during the event. The minimum DO recorded during the event was 5.4 mg/l. Due to continuous event of rain, the flow remained above 120 MGD to the plant. During two separate periods, one of eight hours and one of four hours duration, the flow rate was above 220 MGD. River levels rose and flooded the Chlorine Contact Tanks and Final Clarifier weirs in Unit #6. Final Clarifiers in 5A and 5B had short upset periods during the event. Both were controlled within one hour. Throughout the event most tanks exhibited pin floccing with relatively few being cloudy. The secondary effluent parameters from lab analysis during the event for suspended solids on January 4, 1993 was 16 mg/l and on January 5, 1993 was 7 mg/l, the $CBDO_5$ was 6 mg/l for the event, the ammonia nitrogen for January 4, 1993 was 0.47 mg/l and for January 5, 1993 was 0.18 mg/l and the phosphorus for January 4, 1993 was 0.46 mg/l and for January 5, 1993 was 0.30 mg/l.

cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station FDE

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #7

Stress Test Event #7 on January 6, 1993
Stress Test Target Rate: 110 MGD

Duration: 14.5 hours

Time: 9:00 a.m. - 11:30 p.m.

Controller: Charles Harshbarger and Edward Schreiner

Observer: Ronald Balca and Charles Harshbarger

Lab Sampler: Robert Katzmark

Plant Supervisor: Kenneth Lott and David Horner

Maximum flow to the plant during the Event: 113 MGD Flow Rate

Minimum flow to the plant during the Event: 104 MGD Flow Rate

Flows were maintained for the duration of the test. Some cloudy Final Tanks were observed and only 4A Final Tank was close to upsetting. Sludge blanket dropped when the telescope was lowered. The secondary effluent parameter from analysis for suspended solids during the event was 8 mg/l. The CBOD5 during the event was 3 mg/l. Ammonia nitrogen was 0.56 mg/l and phosphorous during the event was 0.30 mg/l.

FDE:mld

cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #8

Stress Test Event #8 from January 12, 1993 to January 14, 1993
Stress Test Target Rate: 110 MGD

Duration: 32.5 hours

Time: January 12, 1993 21:00 p.m. - 4:50 a.m. January 14, 1993

Controller: Edward Schreiner, Ronald Balca and Charles Harshbarger

Observer: Michael Mesek, David Horner and Vincent Zampelli

Lab Sampler: Christine Fisher

Plant Supervisor: Kenneth Lott, David Horner and Edward Schreiner

Maximum flow to the plant during the Event: 229 MGD Flow Rate

Minimum flow to the plant during the Event: 90 MGD Flow Rate

This event was the next longest stress test duration. The longest stress test being one week prior to this test. High sludge blankets on Final Tanks 1A, 1B, 2B, 4A, 4B and 5B. Only Final tank to upset for one hour and ten minutes was Final Tank 5B; the rest of the final tanks had pin flock on them. The secondary effluent lab results were as follows:

Minimum D. O.	5.42 mg/l
Suspended Solids	9 mg/l on January 12, 1993 7 mg/l on January 13, 1993
CBOD5	3 mg/l on January 12, 1993 2 mg/l on January 13, 1993
Ammonia Nitrogen	0.65 mg/l on January 12, 1993 0.07 mg/l on January 13, 1993
Phosphorous	0.41 mg/l on January 12, 1993 0.30 mg/l on January 13, 1993

FDE:mld

cc: K. Lott
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February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station FDE

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #9

Stress Test Event #9 on January 14, 1993
Stress Test Target Rate: 110 MGD

Duration: 13.5 hours

Time: 9:30 a.m. - 11:00 p.m.

Controller: Charles Harshbarger and Edward Schreiner

Observer: Michael Mesek and Charles Harshbarger

Lab Sampler: Dale Sroka

Plant Supervisor: Kenneth Lott and David Horner

Maximum flow to the plant during the Event: 119 MGD Flow Rate

Minimum flow to the plant during the Event: 102 MGD Flow Rate

Light pin flock on most final tanks with high sludge blankets on Final Tanks 1B, 2B, 4B, 5B and slight upset on Final Tank 6C. Lab results are as follows for secondary effluent:

Suspended Solids	3 mg/l	Ammonia Nitrogen	0.56 mg/l
CBOD5	2 mg/l	Phosphorous	0.26 mg/l

FDE:mld

cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #10

Stress Test Event #10 on January 21, 1993
Stress Test Target Rate: 110 MGD

Duration: 4 hours

Time: 12:00 noon - 4:00 p.m.

Controller: Charles Harshbarger

Observer: Charles Harshbarger

Lab Sampler: Robert Katzmark

Plant Supervisor: Kenneth Lott

Maximum flow to the plant during the Event: 143 MGD Flow Rate

Minimum flow to the plant during the Event: 106 MGD Flow Rate

Minimum D. O. violation occurred at 1:00 p.m. Most final tanks had pin flock and #5B Final Tank had a high sludge blanket. #5A Final Tank had an upset at 1:30 p.m. Lab analysis for the secondary effluent are:

Suspended Solids	9 mg/l	Ammonia Nitrogen	1.43 mg/l
CBOD5	6 mg/l	Phosphorous	0.27 mg/l

FDE:mld
cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station FDE

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #11

Stress Test Event #11 on January 24, 1993
Stress Test Target Rate: 110 MGD

Duration: 14.5 hours

Time: 8:30 a.m. - 11:00 p.m.

Controller: Kenneth Lott and Edward Schreiner

Observer: David Horner and Michael Mesek

Lab Sampler: Dale Sroka and Paul Sulongteh

Plant Supervisor: Ronald Balca and David Horner

Maximum flow to the plant during the Event: 207 MGD Flow Rate

Minimum flow to the plant during the Event: 102 MGD Flow Rate

Minimum D. O. was 4.88 mg/l at 9:45 a.m. Pin flock on all the final tanks with high sludge blankets on Final Tanks 1B, 2B, 3B, 4A, 4B, 4C and 5B. Slight upset on Final Tank 6C. Lab analysis for the secondary effluent are:

Suspended Solids	11 mg/l	Ammonia Nitrogen	0.09 mg/l
CBOD5	6 mg/l	Phosphorous	0.39 mg/l

FDE:mld
cc: K. Lott
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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #12

Stress Test Event #12 from February 21, 1993 to February 22, 1993
Stress Test Target Rate: 115 MGD

Duration: 8 hours 30 minutes

Time: February 21, 1993 19:00 p.m. - 3:50 p.m. February 22, 1993

Controller: Edward Schreiner and Ronald Balca

Observer: Michael Mesek and Vincent Zampelli

Lab Sampler: Paul Sulongteh

Plant Supervisor: Vincent Zampelli and Edward Schreiner

Maximum flow to the plant during the Event: 195.39 MGD Flow Rate

Minimum flow to the plant during the Event: 101.58 MGD Flow Rate

Had to back off from stress test target rate of 115 MGD after 2 hours due to most final tanks being cloudy and Final Tank 3A, 3C, 5A, 5B and 5C upsetting. Tried for target rate again after all tanks settled back down; but after a short time, Final Tanks 3A and 5A upset and high sludge blankets on Final Tanks 1A, 2B, 3C and 4A. Secondary effluent lab analysis during the event were as follows:

Suspended Solids	38 mg/l
CBOD5	8 mg/l
Ammonia Nitrogen	0.56 mg/l
Phosphorous	0.62 mg/l

FDE:mld
cc: K. Lott
File

Department of Public Service
Public Utilities Bureau
WATER POLLUTION CONTROL DIVISION

"People dedicated to protecting the environment, for this and future generations, through innovative and cost effective means."

WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #13

Stress Test Event #13 on July 11, 1993
Stress Test Target Rate: 115 MGD (96 MGD)*

Duration: 1 hour 45 minutes

Time: 8:00 a.m. - 9:45 a.m.

Controller: Edward Schreiner

Observer: Charles Harshbarger

Lab Sampler: Robert Katzmark

Plant Supervisor: Kenneth Lott

Maximum flow to the plant during the Event: 147.65 MGD Flow Rate

Minimum flow to the plant during the Event: 90.91 MGD Flow Rate

(*#6 Unit out-of-service for construction so target rate of 96 MGD for five units in service is the same as 115 MGD with six units in service.) Minimum D.O. was 4.0 mg/l for eight minutes. Short duration for the stress test due to flow dropping quickly. Secondary effluent lab analysis are as follows:

Suspended Solids	5 mg/l	
CBOD5	AE (3)	AE = data unreliable
Ammonia Nitrogen	0.92 mg/l	
Phosphorous	0.44 mg/l	

FDE:mld

cc: K. Lott
File

Department of Public Service
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WATER POLLUTION CONTROL DIVISION

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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #14

Stress Test Event #14 on July 11, 1993 through July 12, 1993
Stress Test Target Rate: 115 MGD (96MGD)*

Duration: 2 hours 30 minutes

Time: July 11, 1993 11:00 p.m. - 1:30 a.m. July 12, 1993

Controller: Edward Schreiner

Observer: Michael Mesek and Ronald Balca

Lab Sampler: Paul Sulongteh

Plant Supervisor: David Horner

Maximum flow to the plant during the Event: 186.64 MGD Flow Rate

Minimum flow to the plant during the Event: 97.69 MGD Flow Rate

(*#6 Unit out-of-service for construction so target rate of 96 MGD for five units in service is the same as 115 MGD with six units in service.) Minimum D.O. was 4.19 mg/l for a total of 73 minutes. Pin flock on all final tanks. Secondary effluent lab analysis was as follows:

Suspended Solids	5 mg/l	
CBOD5	AE (3)	AE = data unreliable
Ammonia Nitrogen	0.92 mg/l	
Phosphorous	0.44 mg/l	

FDE:mld

cc: K. Lott
File

THE CITY OF AKRON, OHIO

Department of Public Service
Public Utilities Bureau
WATER POLLUTION CONTROL DIVISION

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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #15

Stress Test Event #15 on July 28, 1993
Stress Test Target Rate: 115 MGD (96 MGD)*

Duration: 2 hours

Time: 9:00 p.m. - 11:00 p.m.

Controller: Edward Schreiner

Observer: David Horner

Lab Sampler: J. Gregory Cox

Plant Supervisor: David Horner

Maximum flow to the plant during the Event: 112.65 MGD Flow Rate

Minimum flow to the plant during the Event: 97.76 MGD Flow Rate

Stress test was called off after two hours due to the flow not reaching the target rate. (* #6 Unit out-of-service for construction so target rate of 96 MGD for five units in service is the same as 115 MGD with six units in service.)

FDE:mld

cc: K. Lott
File

Department of Public Service
Public Utilities Bureau
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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #16

Stress Test Event #16 from November 14, 1993 through November 15, 1993
Stress Test Target Rate: 120 MGD (100 MGD)*

Duration: 30 hours

Time: November 14, 1993 8:30 a.m. - 2:00 p.m. November 15, 1993

Controller: Vince Zampelli, Charles Harshbarger and Ronald Balca

Observer: Brian Gresser, Michael Mesek and David Horner

Lab Sampler: J. Gregory Cox and Gilbert Stadler

Plant Supervisor: Ronald Balca, David Horner and Vincent Zampelli

Maximum flow to the plant during the Event: 258.77 MGD Flow Rate

Minimum flow to the plant during the Event: 100.74 MGD Flow Rate

(* #5 Unit out-of-service for construction so target rate of 100 MGD for five units in service is the same as 120 MGD with six units in service.) #6 Unit went back-in-service and #5 Unit was taken out-of-service. High sludge blankets on Final Tanks 6A, 6B and 6C. All other tanks had light pin flock on them. Secondary effluent lab analysis was as follows:

Suspended Solids	17 mg/l
CBOD5	9 mg/l
Ammonia Nitrogen	1.35 mg/l
Phosphorous	0.80 mg/l

FDE:mld

cc: K. Lott
File

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Department of Public Service
Public Utilities Bureau
WATER POLLUTION CONTROL DIVISION

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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #17

Stress Test Event #17 from November 17, 1993 through November 18, 1993
Stress Test Target Rate: 120 MGD (100 MGD)*

Duration: 32 hours 45 minutes

Time: November 17, 1993 6:35 a.m. - 3:15 p.m. November 18, 1993

Controller: Charles Harshbarger, Edward Schreiner and Ronald Balca

Observer: Charles Harshbarger, Michael Mesek and Vincent Zampelli

Lab Sampler: Soumitra Ghosh and Gilbert Stadler

Plant Supervisor: Kenneth Lott, Vincent Zampelli and Edward Schreiner

Maximum flow to the plant during the Event: 282.31 MGD Flow Rate

Minimum flow to the plant during the Event: 99.34 MGD Flow Rate

(* #5 Unit out-of-service for construction so target rate of 100 MGD for five units in service is the same as 120 MGD with six units in service.) Secondary effluent sampler out-of-service due to construction of that station using final effluent analysis at 001. All final tanks had pin flock on them. Secondary effluent lab analysis are as follows:

Suspended Solids	21 mg/l
CBOD5	12 mg/l
Ammonia Nitrogen	0.34 mg/l
Phosphorous	0.66 mg/l

FDE:mld

cc: K. Lott
File

THE CITY OF AKRON, OHIO

Department of Public Service
Public Utilities Bureau
WATER POLLUTION CONTROL DIVISION

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WATER POLLUTION CONTROL STATION

February 14, 1994

TO: Randall A. Monteith, P.E., Manager
Water Pollution Control Division

FROM: Frank D. Ertle, Superintendent FDE
Water Pollution Control Station

RE: **SHORT SUMMARY**
ACTIVATED SLUDGE PLANT STRESS TEST EVENT #18

Stress Test Event #18 on January 25, 1994
Stress Test Target Rate: 130 MGD (108 MGD)*

Duration: 2 hours 45 minutes

Time: 4:45 p.m. - 7:30 p.m.

Controller: Edward Schreiner

Observer: Kenneth Lott

Lab Sampler: Gilbert Stadler

Plant Supervisor: David Horner

Maximum flow to the plant during the Event: 123.25 MGD Flow Rate

Minimum flow to the plant during the Event: 101.61 MGD Flow Rate

(* #4 Unit out-of-service for construction so target rate of 108 MGD for five units in service is the same as 130 MGD with six units in service.) #5 Unit back-in-service. #4 Activated Unit out-of-service due to construction. Secondary effluent sampler station in service. High blankets on Final Tanks 1A, 2C, 3A and 3B. Small upsets on Final Tanks 1A, 2C and 3A. Secondary effluent lab analysis are as follows:

Suspended Solids	11 mg/l
CBOD5	4 mg/l
Ammonia Nitrogen	3.10 mg/l
Phosphorous	0.76 mg/l

FDE:mld

cc: K. Lott
File

CITY OF AKRON WATER POLLUTION CONTROL STATION
STRESS TEST LOG

TEST	DATE	TIME	DURATION (Hours)	PEAK FLOW (plant)	TARGET FLOW (Sec)	S.S. (602) mg/l	S.S (001) mg/l	CBOD5 (602) mg/l	CBOD5 (001) mg/l	NH4 (602) mg/l	NH4 (001) mg/l	P (602) mg/l	P (001) mg/l
1 - A	12/20/92	00:00 04:30	4.50	180	110	7	7	3	4	2.11	AN	0.42	AN
2 - A	12/29/92	15:00	non-event	90	110	14	5	6	3	3.01	2.14	0.96	0.97
3 - A	12/30/92	06:15 10:30	4.25	115	110	14	5	6	3	3.01	2.14	0.96	0.97
4 - A	12/30-31/92	14:30 08:00	17.50	240	110	19	32	6	15	1.61	2.45	0.72	0.87
5 - A	1/3-4/93	20:00 04:00	8.00	216	110	12	14	5	9	1.03	1.10	0.41	0.44
6 - A	1/4-6/93	16:00 02:45	34.50	242	110	16 / 7	30 / 14	- / 6	- / 14	.47 / .18	1.26 / .97	.46 / .30	.60 / .45
7 - A	1/6/93	09:00 11:30	14.50	113	110	8	7	3	10	0.56	0.41	0.30	0.28
8 - A	1/12-14/93	20:00 04:50	32.50	229	110	9 / 7	20 / 18	3 / 2	10 / 8	.65 / .07	1.12 / .92	.41 / .30	.53 / .48
9 - A	1/14/93	09:30 23:00	13.50	119	110	3	6	2	2	0.56	0.47	0.26	0.23
10 - A	1/21/93	12:00 16:00	4.00	143	110	9	9	6	6	1.43	1.71	0.27	0.33
11 - A	1/24/93	08:30 23:00	14.50	207	110	11	13	6	4	0.09	0.53	0.39	0.38
12 - B	2/21/93	19:21 03:50	8.50	195	115	38	33	8	12	0.56	1.05	0.62	0.57
13 - B	7/11/93	08:00 09:45	1.75	148	115	-	5	-	AE	-	0.92	-	0.44
14 - B	7/11-12/93	23:00 01:30	2.50	187	115	-	5	-	AE	-	0.92	-	0.44
15 - B	7/28/93	21:00	non-event	113	115	-	3	-	AA	-	4.99	-	0.48
16 - C	11/14-15/93	08:30 14:00	29.50	259	120	-	17 / 6	-	9 / AA	-	1.35 / .28	-	.80 / .61
17 - C	11/17-18/93	06:35 15:15	32.75	282	120	-	21 / 5	-	12 / AA	-	0.34 / .12	-	.66 / .38
18 - D	1/25/94	16:45 19:30	2.75	123	130	11	-	4	-	3.10	-	0.76	-

* Starting July 8, 1993 sampling at secondary effluent was discontinued due to 602 sampling station being built.
** Effective January 1, 1994 sampling was discontinued at 001.
AE - Data unreliable.

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT #: 1 DATE: 12/19-20/92	TOTAL HOURS : 4HRS 30MIN. SEC. BYPASS HOURS : 3HRS. 20MIN.	TARGET RATE : 110MGD PRECIPITATION : 0.3IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	180	-	-	113	-	155
MIN. FLOW	84	-	-	93	-	72
AVG.FLOW	82.59	-	2.01	78.13	-	83.74
S.S.	184	-	72	53	7	7
CBOD5	118	-	60	-	3	4
NH3	-	-	-	-	2.11	-
P.	-	-	-	-	0.42	-

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT # : 2 DATE : 12/29/92	TOTAL HOURS : 2HRS. SEC. BYPASS HOURS : 0HRS.	TARGET RATE : 110MGD PRECIPITATION : -

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	90	-	-	103	-	-
MIN. FLOW	75	-	-	78	-	-
AVG.FLOW	65.05	-	-	74.75	-	67.88
S.S.	169	-	-	-	14	5
CBOD5	129	-	-	-	6	3
NH3	-	-	-	-	3.01	2.14
P.	2.96	-	-	-	0.96	0.97

Non event did not reach target rate.

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT #: 3 DATE: 12/30/92	TOTAL HOURS : 4HRS. 15MIN. SEC. BYPASS HOURS : 8HRS.	TARGET RATE : 110MGD PRECIPITATION : 0.2IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	115	-	-	107	-	124
MIN. FLOW	86	-	-	92	-	98
AVG.FLOW	163.61	12.65	19.16	103	-	166.53
S.S.	169	-	-	65	14	5
CBOD5	129	-	-	84	6	3
NH3	-	-	-	-	3.01	2.14
P.	1.85	-	-	-	0.96	0.97

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT #: 4 DATE: 12/30-31/92	TOTAL HOURS : 17HRS. 30MIN. SEC. BYPASS HOURS : 8HRS	TARGET RATE : 110MGD PRECIPITATION : 1.25IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	240	-	-	112	-	240
MIN. FLOW	87	-	-	98	-	90
AVG.FLOW	163.61	12.65	19.16	103	-	166.53
S.S.	142	-	-	56	19	32
CBOD5	58	-	-	-	6	15
NH3	-	-	-	-	1.61	2.45
P.	1.30	-	-	-	0.72	0.87

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT # : 5 DATE : 1/3-4/93	TOTAL HOURS : 8HRS. SEC. BYPASS HOURS : -	TARGET RATE : 110MGD PRECIPITATION : 0.52IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	216.32	-	-	110.28	-	240
MIN. FLOW	106.91	-	-	97.98	-	90
AVG.FLOW	112.44	2.22	10.24	93.52	-	113.76
S.S.	57	-	-	62	12	14
CBOD5	42	-	-	-	5	9
NH3	4.90	-	-	-	1.03	1.10
P.	1.27	-	-	-	0.41	0.44

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT # : 6 DATE : 1/4-6/93	TOTAL HOURS : 34HRS. 30MIN. SEC. BYPASS HOURS : 44HRS.	TARGET RATE : 110MGD PRECIPITATION : 1.19IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	242.28/234.84	-	-	115.23/114.56	-	240/240
MIN. FLOW	134.02/106.02	-	-	110.82/102.57	-	120/150
AVG.FLOW	169.33/138.59	11.93/5.96	21.02/27.23	111.36/106.24	-	172.15/141.38
S.S.	115/43	-	69/-	43/64	16/7	30/14
CBOD5	-/57	-	-/40	-	-/6	-/14
NH3	-	-	-	3.99/4.96	0.47/0.18	1.26/0.97
P.	1.55/1.16	-	-	0.46/0.30	0.46/0.30	0.60/0.45

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT # : 7 DATE : 1/6/93	TOTAL HOURS : 14HRS. 30MIN. SEC. BYPASS HOURS : 7.5HRS.	TARGET RATE : 110MGD PRECIPITATION : -

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	113.48	-	-	113.58	-	190
MIN. FLOW	104.14	-	-	110.10	-	115
AVG.FLOW	100.44	-	2.13	107.18	-	103.08
S.S.	81	-	8	49	8	7
CBOD5	48	-	-	41	3	10
NH3	-	-	-	5.31	0.56	0.41
P.	1.64	-	-	1.66	0.30	0.28

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT # : 8 DATE : 1/12-14/93	TOTAL HOURS : 32HRS. 30MIN. SEC. BYPASS HOURS : 31HRS.	TARGET RATE : 110MGD PRECIPITATION : -

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	225.76/229.53	-	-	112.71/117.06	-	186/240
MIN. FLOW	89.77/93.74	-	-	98.19/102.11	-	99/108
AVG.FLOW	128.02/141.79	5.38/11.50	13.32/24.73	102.91/109.15	-	130.27/144.24
S.S.	148/61	-	-	55/35	9/7	20/18
CBOD5	63/34	-	-	39/38	3/2	10/8
NH3	-	-	-	5.54/3.72	0.65/0.07	1.12/.0.92
P.	1.88/1.02	-	-	1.51/1.06	0.41/0.30	0.53/0.48

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT # : 9 DATE : 1/14/93	TOTAL HOURS : 13HRS 30MIN. SEC. BYPASS HOURS : 7HRS. 30MIN.	TARGET RATE : 110MGD PRECIPITATION : -

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	119.54	-	-	115.02	-	120.9
MIN. FLOW	101.95	-	-	101.32	-	113
AVG.FLOW	99.36	-	0.68	104.69	-	101.69
S.S.	74	-	-	39	3	6
CBOD5	52	-	-	40	2	2
NH3	-	-	-	5.31	0.56	0.47
P.	1.71	-	-	1.38	0.26	0.23

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT #: 10 DATE: 1/21/93	TOTAL HOURS : 4HRS. SEC. BYPASS HOURS : 4HRS	TARGET RATE : 110MGD PRECIPITATION : 0.3IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	142.13	-	-	106.60	-	150
MIN. FLOW	106.82	-	-	101.06	-	104
AVG.FLOW	95.15	-	4.46	90.56	-	97.97
S.S.	108	-	-	47	9	9
CBOD5	72	-	-	52	6	6
NH3	-	-	-	6.84	1.43	1.71
P.	1.22	-	-	0.88	0.27	0.33

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT #: 11 DATE: 1/24/93	TOTAL HOURS : 14HRS. 30MIN. SEC. BYPASS HOURS : 13HRS.	TARGET RATE : 110MGD PRECIPITATION : 0.6IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	207.13	-	-	112.42	-	165
MIN. FLOW	102.22	-	-	103.04	-	110
AVG.FLOW	118.82	3.94	9.76	102.04	-	120.04
S.S.	113	-	-	54	11	13
CBOD5	50	-	-	41	6	4
NH3	-	-	-	5.17	0.09	0.53
P.	1.12	-	-	0.88	0.39	0.38

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT # : 12 DATE : 2/21-22/93	TOTAL HOURS : 8HRS. 30MIN. SEC. BYPASS HOURS : 8HRS.	TARGET RATE : 115MGD PRECIPITATION : 0.33IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	195.39	-	-	112.01	-	179
MIN. FLOW	101.58	-	-	86.83	-	97.5
AVG.FLOW	102.36	1.42	8.22	85.36	-	103.24
S.S.	170	-	-	57	38	33
CBOD5	73	-	-	41	8	12
NH3	-	-	-	6.83	0.56	1.05
P.	1.36	-	-	0.85	0.62	0.57

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT # : 13 DATE : 7/11/93	TOTAL HOURS : 1HR. 45MIN. SEC. BYPASS HOURS : 2HRS. 30MIN.	TARGET RATE : 115MGD *96MGD PRECIPITATION : -

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	147.65	-	-	95.30	-	138
MIN. FLOW	90.91	-	-	82.15	-	94.9
AVG.FLOW	86.53	-	5.09	74.13	-	88.11
S.S.	150	-	46	43	-	5
CBOD5	70	-	48	-	-	**AE (3)
NH3	-	-	-	-	-	0.92
P.	2.24	-	-	1.50	-	0.44

with six units in service.
** AE = Data unreliable.

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT # : 14 DATE : 7/11-12/93	TOTAL HOURS : 2HRS 30MIN. SEC. BYPASS HOURS : 3HRS.	TARGET RATE : 115MGD * 96MGD PRECIPITATION : 0.19IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	186.64	-	-	101.14	-	162
MIN. FLOW	97.69	-	-	88.61	-	90.3
AVG.FLOW	86.53	-	5.09	74.13	-	88.11
S.S.	150	-	46	43	-	5
CBOD5	70	-	48	-	-	**AE (3)
NH3	-	-	-	-	-	0.92
P.	2.24	-	-	1.5	-	0.44

* #6 Unit out of service so target rate of 96MGD for five units in service is the same as 115MGD with six units in service.

** AE = Data unreliable.

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT #: 15 DATE: 7/28/93	TOTAL HOURS : 0HRS. SEC. BYPASS HOURS : 0HRS.	TARGET RATE : 115MGD * 96MGD PRECIPITATION : -

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	112.65	-	-	-	-	97.6
MIN. FLOW	97.76	-	-	-	-	73.5
AVG.FLOW	69.03	-	-	68.36	-	71.41
S.S.	202	-	-	117	-	3
CBOD5	-	-	-	-	-	-
NH3	-	-	-	-	-	4.99
P.	3.23	-	-	-	-	0.48

Non event did not reach target rate.

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT # : 16 DATE : 11/14-15/93	TOTAL HOURS : 30HRS. SEC. BYPASS HOURS : 30HRS.	TARGET RATE : 120MGD * 100MGD PRECIPITATION : 1.9IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	258.77/140.43	-	-	104.51/102.76	-	240/153
MIN. FLOW	142.04/100.74	-	-	94.56/93.31	-	66/98.7
AVG.FLOW	181.76/88.58	13.25/ -	22.8/1.03	97.25/87.41	-	182.88/90.83
S.S.	158/80	-	-	-	-	17/6
CBOD5	46/110	-	-	-	-	9 / AA
NH3	3.25/ -	-	-	-	-	1.35/0.28
P.	1.43/1.82	-	-	-	-	0.80/0.61

* #5 Unit out of service so target rate of 100MGD for five units in service is the same as 120MGD. with six units in service.

CITY OF AKRON

WATER POLLUTION CONTROL STATION

STRESS TEST EVENT DATA

EVENT # : 17 DATE : 11/17-18/93	TOTAL HOURS : 32HRS 45MIN. SEC. BYPASS HOURS : 26HRS. 45MIN.	TARGET RATE : 120MGD * 100MGD PRECIPITATION : 1.2IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	282.31/138	-	-	106.44/103	-	240/160
MIN. FLOW	114.26/99.34	-	-	91.38/83.89	-	90/97.8
AVG.FLOW	184.39/97.86	15.14/ -	31/0.82	100.90/93.93	-	186.08/100.20

S.S.	120/68	-	-	-	-	21/5
CBOD5	31/72	-	-	-	-	12/3
NH3	-	-	-	-	-	0.34/0.12
P.	1.19/1.82	-	-	-	-	0.66/0.38

* #5 Unit out of service so target rate of 100MGD for five units in service is the same as 120MGD. with six units in service.

CITY OF AKRON
WATER POLLUTION CONTROL STATION
STRESS TEST EVENT DATA

EVENT #: 18 DATE: 1/25/94	TOTAL HOURS : 2HRS 45MIN. SEC. BYPASS HOURS: 5HRS. 35MIN.	TARGET RATE : 130MGD * 108MGD PRECIPITATION : 0.2IN.

	PLANT INFLUENT	EQ. BYPASS	SECONDARY BYPASS	ACTIVATED INFFLUENT	SECONDARY EFFLUENT	FINAL EFFLUENT
MAX FLOW	123.25	-	-	101	-	-
MIN. FLOW	101.61	-	-	90.3	-	-
AVG.FLOW	82	-	1.73	77.96	-	84.05
S.S.	152	-	93	-	11	11
CBOD5	86	-	75	-	4	-
NH3	-	-	-	-	3.10	-
P.	2.72	-	-	-	0.76	-

* #4 Unit out of service so target rate of 108MGD for five units in service is the same as 130MGD. with six units in service.

FIGURE 1.
ML reactor 1, pre-stress test 11/9/1993. Good settling floc. Dense, medium-sized floc with little filament out-growth (Center floc 350 um diam., 10x obj., total mag. 100x)

FIGURE 2.
ML reactor 1, stress test 11/18/1993. Sludge bulking. Floc with excessive filamentous growth and interfloc bridging. (Bottom center floc 150 um diam., 10x obj., total mag. 100x)

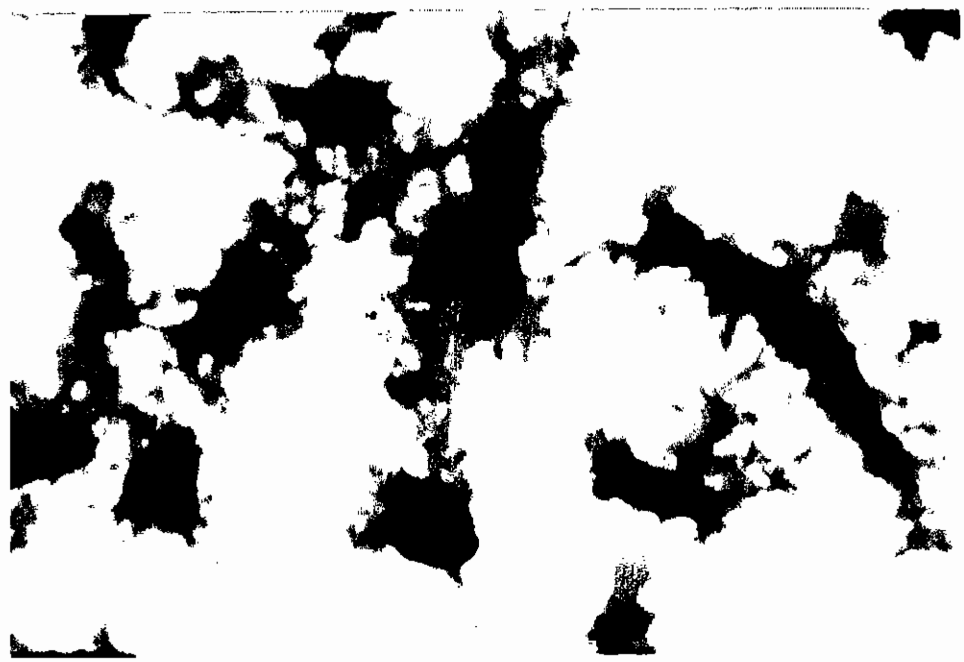

FIGURE 3.
ML reactor 1, post-stress test 11/26/1993. Recovering floc with improved settling. Filamentous growth reduced, interfloc bridging absent. (Center floc 300 um diam., 10x obj., total mag. 100x.)

APPENDIX B

Secondary Treatment Alternatives Cost Estimates

Appendix B
Akron WPCS NFA
Alternatives Cost Analysis

Cost Development Guidelines

The following guidelines were considered in the development of project costs for the proposed alternatives:

- Engineering News Record (ENR) Construction Cost Index factors were utilized for escalating previous estimates to December 2006, as follows:
  - December 2006 factor = 7888 (current costs)
  - 2004 factor = 7115 (year average)
  - March 2002 factor = 6502
  - 1998 factor = 5920 (year average)
- A non-construction cost of 30% of the total construction cost is considered to account for planning, design and construction phase engineering, financing and bond council, and general administration of the project.
- A construction cost contingency of 20% is added to the total construction cost only.

Alternative 1 – Operation at 120 MGD

An opinion of probable project cost was developed for improvements to operate the secondary treatment system at a peak rate of 120 MGD. These costs are presented in the following pages.

Alternative 1A & B – Storage Basins

These alternatives (20 MG basin and 40 MG basin) were originally developed and evaluated in the *Facilities Plan 98*. Project costs from this document were considered. The City also completed construction of the 10 MG Cuyahoga Street (Rack 40) storage basin in 2006. The 2004 construction bid and final construction costs were also considered. An opinion of probable project cost for the storage basin alternatives was developed based on these sources and is presented in the following table. A 10 MG storage basin is shown for reference. The 20 and 40 MG basin costs include the costs for improving the secondary treatment system to operate at 120 MGD.

Basin Volume (MG)	2006 Construction Cost	Non-Construction Cost (30%)	Construction Contingency (20%)	Total Project Cost
10	$16,900,000	$5,070,000	$3,380,000	$25,350,000
20	$30,800,000	$9,240,000	$6,160,000	$46,200,000
40	$60,100,000	$18,030,000	$12,020,000	$90,150,000

Alternatives 1C through 1E – 10, 50, 100 & 150 EHRC

Opinions of probable project costs were developed for each of the EHRC alternatives. Each estimate includes the cost to improve the secondary treatment system to operate at 120 MGD. The EHRC alternative costs are presented in the following pages.

PROBABLE COST - 21 DECEMBER 2006

WPCS NO FEASIBLE ALTERNATIVES

AKRON, OHIO

Items	No.	Dimensions			Quantities	Rate	Amount
		Length	Width	Depth			
ALTERNATIVE 1 - 120 MGD SECONDARY OPERATION							
Reconstruct Aeration Influent Flume					Lump Sum		$315,600.00
24" Plug Valve Motor Operators	6				6.0 each	$25,000.00	$150,000.00
Electrical					Lump Sum		$36,000.00
Remove FST Domes							
Crane Rental	2				2.0 mo.	$10,800.00	$21,600.00
Crane Operator	320				320.0 hrs.	$50.00	$16,000.00
Laborers (4)	1280				1,280.0 hrs.	$40.00	$51,200.00
Cut-up, Hauling and Disposal	18				18.0 each	$3,400.00	$61,200.00
FST Launder Covers	18	314.00	5.00		28,260.0 s.f.	$22.00	$621,700.00
Railing	18	320.00			18.0 each	$52.80	$304,128.00
					Total Construction Cost		**$1,577,000.00**
					Non-Construction Cost	**30%**	**$473,100.00**
					Additional Stress Testing		**$80,000.00**
					WPCS Process Modeling		**$120,000.00**
					Contingencies	**20%**	**$315,400.00**
					Total		**$2,565,500.00**

PROBABLE COST - 21 DECEMBER 2006

WPCS NO FEASIBLE ALTERNATIVES

AKRON, OHIO

Items	No.	Dimensions			Quantities	Rate	Amount
		Length	Width	Depth			
ALTERNATIVE 1C - 10 MGD SINGLE UNIT							
Alternative 1 Secondary Treatment Improvements					Lump Sum		$1,577,428.00
Treatment Unit, Structure					Lump Sum		$451,200.00
Equipment	1				1.0 each	$460,000.00	$460,000.00
Installation - Labor	1				1.0 each	$115,000.00	$115,000.00
Piping - Wall Castings and Piping under Tank					Lump Sum		$46,800.00
Electrical					Lump Sum		$92,000.00
Polymer & Ferric Chemical Systems Equipment					Lump Sum		$50,000.00
Piping					Lump Sum		$8,000.00
Electrical					Lump Sum		$5,000.00
Influent and Effluent Piping		550.00			550.0 l.f.	$700.00	$385,000.00
Splitter Box Structure	1	40.00	40.00		1.0 each	$250,000.00	$250,000.00
Dewatering	60				60.0 days	$600.00	$36,000.00
Stop Gates	6				6.0 each	$8,000.00	$48,000.00
Electrical					Lump Sum		$15,000.00
Sludge Blowdown Pumps	2				2.0 each	$20,000.00	$40,000.00
Sludge Return Pumps	2				2.0 each	$20,000.00	$40,000.00
Piping					Lump Sum		$75,000.00
8 inch Force Main		1600.00			1,600.0 l.f.	$95.00	$152,000.00
				Total Construction Cost			**$3,846,000.00**
				Non-Construction Cost		**30%**	**$1,153,800.00**
				Additional Stress Testing			**$80,000.00**
				WPCS Process Modeling			**$120,000.00**
				Contingencies		**20%**	**$769,200.00**
				Total			**$5,969,000.00**

ARCADIS

PROBABLE COST - 21 DECEMBER 2006

WPCS NO FEASIBLE ALTERNATIVES

AKRON, OHIO

Items	No.	Dimensions			Quantities	Rate	Amount
		Length	Width	Depth			
ALTERNATIVE 1D - 50 MGD SINGLE UNIT							
Alternative 1 Secondary Treatment Improvements					Lump Sum		$1,577,000.00
Treatment Unit, Structure					Lump Sum		$1,190,400.00
Equipment	1				1.0 each	$1,612,300.00	$1,612,300.00
Installation - Labor	1				1.0 each	$403,075.00	$403,075.00
Piping - Wall Castings and Piping under Tank					Lump Sum		$87,325.00
Electrical					Lump Sum		$230,000.00
Polymer & Ferric Chemical Systems Equipment					Lump Sum		$120,000.00
Piping					Lump Sum		$20,000.00
Electrical					Lump Sum		$12,000.00
Influent and Effluent Piping		550.00			550.0 l.f.	$1,200.00	$660,000.00
Splitter Box Structure	1	40.00	40.00		1.0 each	$250,000.00	$250,000.00
Dewatering	60				60.0 days	$600.00	$36,000.00
Stop Gates	6				6.0 each	$8,000.00	$48,000.00
Electrical					Lump Sum		$15,000.00
Sludge Blowdown Pumps	2				2.0 each	$20,000.00	$40,000.00
Sludge Return Pumps	2				2.0 each	$20,000.00	$40,000.00
Piping					Lump Sum		$75,000.00
8 inch Force Main		1600.00			1,600.0 l.f.	$95.00	$152,000.00
				Total Construction Cost			**$6,568,000.00**
				Non-Construction Cost		**30%**	**$1,970,400.00**
				Additional Stress Testing			**$80,000.00**
				WPCS Process Modeling			**$120,000.00**
				Contingencies		**20%**	**$1,313,600.00**
				Total			**$10,052,000.00**

ARCADIS

PROBABLE COST - 21 DECEMBER 2006

WPCS NO FEASIBLE ALTERNATIVES

AKRON, OHIO

Items	No.	Dimensions			Quantities	Rate	Amount
		Length	Width	Depth			
ALTERNATIVE 1E - 100 MGD UNITS							
Alternative 1 Secondary Treatment Improvements					Lump Sum		$1,577,000.00
Treatment Unit, Structure					Lump Sum		$2,309,600.00
Equipment	2				2.0 each	$1,402,000.00	$2,804,000.00
Installation - Labor	2				2.0 each	$350,500.00	$701,000.00
Piping - Wall Castings and Piping under Tank					Lump Sum		$173,500.00
Electrical					Lump Sum		$460,000.00
Polymer & Ferric Chemical Systems Equipment					Lump Sum		$240,000.00
Piping					Lump Sum		$40,000.00
Electrical					Lump Sum		$24,000.00
Influent and Effluent Piping		700.00			700.0 l.f.	$1,200.00	$840,000.00
Splitter Box Structure	2	40.00	40.00		2.0 each	$250,000.00	$500,000.00
Dewatering	120				120.0 days	$600.00	$72,000.00
Stop Gates	12				12.0 each	$8,000.00	$96,000.00
Electrical					Lump Sum		$30,000.00
Chemical Storage and Feed Facility					Lump Sum		$400,000.00
Sludge Blowdown Pumps	2				2.0 each	$20,000.00	$40,000.00
Sludge Return Pumps	2				2.0 each	$20,000.00	$40,000.00
Piping					Lump Sum		$75,000.00
Electrical					Lump Sum		$150,000.00
8 inch Force Main		2300.00			2,300.0 l.f.	$95.00	$218,500.00
				Total Construction Cost			**$10,791,000.00**
				Non-Construction Cost		**30%**	**$3,237,300.00**
				Additional Stress Testing			**$80,000.00**
				WPCS Process Modeling			**$120,000.00**
				Contingencies		**20%**	**$2,158,700.00**
				Total			**$16,387,000.00**

ARCADIS

PROBABLE COST - 21 DECEMBER 2006

WPCS NO FEASIBLE ALTERNATIVES

AKRON, OHIO

Items	No.	Dimensions			Quantities		Rate	Amount
		Length	Width	Depth				
ALTERNATIVE 1F - 150 MGD UNITS								
Alternative 1 Secondary Treatment Improvements					Lump Sum			$1,577,000.00
Treatment Unit, Structure					Lump Sum			$3,463,300.00
Equipment	3				3.0	each	$1,402,000.00	$4,206,000.00
Installation - Labor	3				3.0	each	$350,500.00	$1,051,500.00
Piping - Wall Castings and Piping under Tank					Lump Sum			$260,400.00
Electrical					Lump Sum			$690,000.00
Polymer & Ferric Chemical Systems								
Equipment					Lump Sum			$360,000.00
Piping					Lump Sum			$60,000.00
Electrical					Lump Sum			$36,000.00
Influent and Effluent Piping		850.00			850.0	l.f.	$1,200.00	$1,020,000.00
Splitter Box								
Structure	3	40.00	40.00		3.0	each	$250,000.00	$750,000.00
Dewatering	180				180.0	days	$600.00	$108,000.00
Stop Gates	18				18.0	each	$8,000.00	$144,000.00
Electrical					Lump Sum			$45,000.00
Chlorine Contact Tank					Lump Sum			$1,200,000.00
Chemical Storage and Feed Facility					Lump Sum			$400,000.00
Sludge Blowdown Pumps	2				2.0	each	$20,000.00	$40,000.00
Sludge Return Pumps	2				2.0	each	$20,000.00	$40,000.00
Piping					Lump Sum			$75,000.00
Electrical					Lump Sum			$150,000.00
8 inch Force Main		2300.00			2,300.0	l.f.	$95.00	$218,500.00
				Total Construction Cost				**$15,895,000.00**
				Non-Construction Cost			**30%**	**$4,768,500.00**
				Additional Stress Testing				**$80,000.00**
				WPCS Process Modeling				**$120,000.00**
				Contingencies			**20%**	**$3,179,500.00**
				Total				**$24,043,000.00**

APPENDIX C

Secondary Treatment
Present Worth Analysis

Appendix C
Akron WPCS NFA
Alternatives Present Worth Analysis

Cost Development Guidelines

The following guidelines were considered in the development of operation and maintenance (O & M) costs and the present worth (PW) analysis:

- Engineering News Record (ENR) Construction Cost Index factors were utilized for escalating previous estimates to December 2006, as follows:
  - December 2006 factor = 7888 (current costs)
  - 2004 factor = 7115 (year average)
  - March 2002 factor = 6502
  - 1998 factor = 5920 (year average)
- A 4.875% interest rate (2007 Federal Discount Rate)
- An inflation rate of 4% (the last six years average was 3.74%; two year average 4.38%; previous year 4.1%).
- Year 1 = 2006; 20 year planning period. At 4%, the total inflation factor for year 20 is 2.191.
- Akron WPCS current burdened hourly rates:
  - Lead operator - $27.68
  - Mechanic – $26.56
  - Utility worker - $23.18
- Current Akron WPCS electrical cost of $0.062/KWH.
- Per Akron 2003 through 2005 Annual Reports, the average total cost of treatment is approximately $400 per million gallons treated; $200 per million gallons of this cost is for sludge treatment/disposal.
- O & M costs will be generated for the <u>additional</u> annual cost (beyond current expenditures) to capture and/or treat additional wastewater through each alternative at the WPCS.
- The $200,000 for stress testing and process modeling included in Appendix C Project Cost estimates is excluded from this analysis.

Alternative 1 – Operation at 120 MGD

This alternative will result in 53 MG of additional wastewater per year being treated through the secondary treatment facility. At a cost of $400 per year the additional annual O & M cost is $21,200 in year 2006; $46,450 in year 2026.

Alternative 1A & B – Storage Basins

These alternatives will result in 288 MG (20 MG basin) and 409 MG (40 MG basin) of additional wastewater per year being treated through the secondary treatment facility after being captured during the wet weather event. At a cost of $400 per year the additional annual O & M costs are $115,200 and $163,600 in year 2006, respectively.

Add to this treatment cost the cost for operation and maintenance of the basins themselves. It is assumed that cleaning of the 20 MG basin will require 48 manhours of utility worker and 24 manhours of lead operator effort following each wet weather event. At the applicable hourly rates, and for the 16 events per year, this is a cost of $28,400 annually. The effort for the 40 MG basin is assumed to be double, and for 19 events per year, for an annual cost of $67,450. The electrical cost for operating the dewatering pumps during a 24 to 48 hour period following the event will cost $2,000 and $4,000 per year for the 20 and 40 MG basins, respectively.

The total estimated annual O & M cost for the storage basins is:

- Alternative 1A – 20 MG Basin = $145,600 (2006); $319,000 (2026)
- Alternative 1B – 40 MG Basin = $235,100 (2006); $515,000 (2006)

Alternatives 1C through 1E – 10, 50, 100 & 150 EHRC

EHRC O&M costs consider a $0.14/1,000 gallons treated ($140/MG) cost plus the $200 per MG cost for sludge treatment and disposal, for a total cost of $340 per MG treated. For the 100 MGD and 150 MGD facilities, there are also general O&M costs for the chemical building and chlorine contact tank (150 MG only). The following table summarizes these costs.

EHRC Capacity (MGD)	Volume Treated Annually (MG)	EHRC O&M w/Sludge	Additional General O&M	Total O&M Cost 2006	Total O&M Cost 2026
10	216	$73,400		$73,400	$160,800
50	748	$254,300		$254,300	$557,200
100	1161	$394,700	$9,500	$404,200	$885,600
150	1166	$396,400	$20,000	$416,400	$912,300

Present Worth Analysis

A Present Worth (PW) Analysis calculation was completed for each of the Alternatives using the project costs identified in Appendix C and the O&M costs listed above. The PW analysis spreadsheets for each alternative follow.

COST EFFECTIVE ANALYSIS - DATA INPUT

Project Name:		Akron WPCS NFA
Alternative Name:		Alternative 1 -Secondary Treatment Operated at 120 MGD
Planning Period in years:		20
Initial Year of Planning Period:		2006
Construction Period, in years:		1.0
Interest Rate %:		4.88
Structures Value, year 0:		$1,391,000
Process Equipment		
20 yr. Equipment Value, year 0:		$186,000
15 yr. Equipment Value, year 0:		$0
Auxiliary Equipment		
15 yr. Equipment Value, year 0:		$0
10 yr. Equipment Value, year 0:		$0
Land Cost:		$0
Total Construction Cost:		$1,577,000
Contingences, % :		20.00
Technical Services, % :		30.00
Salaries & Administrative Cost, year	2006	
year	2026	
Power & Gas? type Y, just Power? type P:		
Power & Gas Cost, year	2006	
year	2026	
Chemical Cost, year	2006	
year	2026	
Repair & Maintenance Cost, year	2006	
year	2026	
Additional O & M Cost year	2006	$21,200
year	2026	$46,450

Akron WPCS NFA

Alternative 1 -Secondary Treatment
Operated at 120 MGD

ESTIMATE OF OPERATION AND MAINTENANCE COST

	2006		2026
Salaries & Administrative	$0		$0
Power	0		0
Chemicals	0		0
Repair & Maintenance	0		0
Additional O & M Cost	21,200		46,450
TOTAL O&M COSTS	$21,200		$46,450
TOTAL FIXED O&M	21,200		21,200
TOTAL VARIABLE O&M	$0		$25,250
Yearly Increase		$1,263	

Akron WPCS NFA

Alternative 1 -Secondary Treatment
Operated at 120 MGD

REPLACEMENT COST AND SALVAGE COST SUMMARY

	Initial Cost at Year 0	Replacement Cost at Year 10	Replacement Cost at Year 15	Salvage Value Year 20
A. Structures				
50 year life	$1,391,000			
Salvage Value				$834,600
B. Process Equipment				
20 year life	186,000			
15 year life	0			
Replacement Cost			0	
Salvage Value				0
C. Auxiliary Equipment				
15 year life	0			
10 year life	0			
Replacement Cost		0	0	
Salvage Value				0
D. Other Costs				
Contingencies	315,400			
Technical Services	473,100			
Land	0			0
TOTAL PROJECT COST	$2,365,500			
TOTAL REPLACEMENT COST		$0	$0	
TOTAL SALVAGE VALUE				$834,600

Akron WPCS NFA

Alternative 1 -Secondary Treatment
Operated at 120 MGD

AVERAGE EQUIVALENT ANNUAL COST DETERMINATION

COST AND OTHER DATA UTILIZED

Planning Period: 20 Years					
Initial Cost of Project:	$2,365,500		Construction Period:	1.0	Year
Replacement Cost at Year 10:		$0			
Replacement Cost at Year 15:		$0			
Salvage Value at Year 20:					
Structures	-	$834,600			
Process Equipment	-	0			
Auxiliary Equipment	-	0			
Land	-	0			
Total	-	$834,600			
Constant Annual Operation & Maintenance Cost:			$21,200		
Variable Annual Operation & Maintenance Cost:			$0	Year 0 to	
			$25,250	Year 20	
Interest Rate: 4.875 %					

DETERMINE PRESENT WORTH & AVERAGE EQUIVALENT ANNUAL COST OF THIS PLAN OVER 20 YEARS

Factors: (20 years at 4.875 %, unless noted)	
Present worth (PW) of constant annual O&M cost:	12.5954
PW of variable annual O&M cost (annual increase):	100.0172
Present worth of replacement cost - Year 10:	0.6213
Present worth of replacement cost - Year 15:	0.4897
Present worth of salvage value:	0.3860
Interest during construction = Initial cost x (0.5) x Period of Construction (Years) x Interest rate.	
Equivalent annual cost = Total present worth x	0.0794

CALCULATIONS - PRESENT WORTH

1.	Initial Cost		$2,365,500
2a.	Constant O&M		267,022
2b.	Variable O&M		126,272
3.	Replacement Cost		0
4.	Salvage Value	(minus)	322,136
5.	Interest During Construction		57,659
6.	Total Present Worth		$2,494,317

AVERAGE EQUIVALENT ANNUAL COST

$2,494,317	x	0.0794	**$198,035**

COST EFFECTIVE ANALYSIS - DATA INPUT

Project Name:		Akron WPCS NFA
Alternative Name:		Alternative 1A 20 MG Storage Basin
Planning Period in years:		20
Initial Year of Planning Period:		2006
Construction Period, in years:		2.0
Interest Rate %:		4.88
Structures Value, year 0:		$29,600,000
Process Equipment		
20 yr. Equipment Value, year 0:		$200,000
15 yr. Equipment Value, year 0:		$800,000
Auxiliary Equipment		
15 yr. Equipment Value, year 0:		$0
10 yr. Equipment Value, year 0:		$0
Land Cost:		$0
Total Construction Cost:		$30,600,000
Contingences, % :		20.00
Technical Services, % :		30.00
Salaries & Administrative Cost, year	2006	
year	2026	
Power & Gas? type Y, just Power? type P:		P
Power Cost, year	2006	$2,000
year	2026	$4,400
Chemical Cost, year	2006	
year	2026	
Repair & Maintenance Cost, year	2006	$28,400
year	2026	$62,200
Additional O & M year	2006	$115,200
year	2026	$252,400

Akron WPCS NFA

Alternative 1A
20 MG Storage Basin

ESTIMATE OF OPERATION AND MAINTENANCE COST

	2006		2026
Salaries & Administrative	$0		$0
Power	2,000		4,400
Chemicals	0		0
Repair & Maintenance	28,400		62,200
Additional O & M	115,200		252,400
TOTAL O&M COSTS	$145,600		$319,000
TOTAL FIXED O&M	145,600		145,600
TOTAL VARIABLE O&M	$0		$173,400
Yearly Increase		$8,670	

Akron WPCS NFA

Alternative 1A
20 MG Storage Basin

REPLACEMENT COST AND SALVAGE COST SUMMARY

	Initial Cost at Year 0	Replacement Cost at Year 10	Replacement Cost at Year 15	Salvage Value Year 20
A. Structures				
50 year life	$29,600,000			
Salvage Value				$17,760,000
B. Process Equipment				
20 year life	200,000			
15 year life	800,000			
Replacement Cost			800,000	
Salvage Value				533,333
C. Auxiliary Equipment				
15 year life	0			
10 year life	0			
Replacement Cost		0	0	
Salvage Value				0
D. Other Costs				
Contingencies	6,120,000			
Technical Services	9,180,000			
Land	0			0
TOTAL PROJECT COST	$45,900,000			
TOTAL REPLACEMENT COST		$0	$800,000	
TOTAL SALVAGE VALUE				$18,293,333

Akron WPCS NFA

Alternative 1A
20 MG Storage Basin

AVERAGE EQUIVALENT ANNUAL COST DETERMINATION

COST AND OTHER DATA UTILIZED

Planning Period: 20 Years					
Initial Cost of Project:	$45,900,000	Construction Period:		2.0	Years
Replacement Cost at Year 10:		$0			
Replacement Cost at Year 15:		$800,000			
Salvage Value at Year 20:					
Structures	-	$17,760,000			
Process Equipment	-	533,333			
Auxiliary Equipment	-	0			
Land	-	0			
Total	-	$18,293,333			
Constant Annual Operation & Maintenance Cost:			$145,600		
Variable Annual Operation & Maintenance Cost:			$0	Year 0 to	
			$173,400	Year 20	
Interest Rate:	4.875 %				

DETERMINE PRESENT WORTH & AVERAGE EQUIVALENT
ANNUAL COST OF THIS PLAN OVER 20 YEARS

Factors: (20 years at 4.875 %, unless noted)	
Present worth (PW) of constant annual O&M cost:	12.5954
PW of variable annual O&M cost (annual increase):	100.0172
Present worth of replacement cost - Year 10:	0.6213
Present worth of replacement cost - Year 15:	0.4897
Present worth of salvage value:	0.3860
Interest during construction = Initial cost x (0.5) x Period of Construction (Years) x Interest rate.	
Equivalent annual cost = Total present worth x	0.0794

CALCULATIONS - PRESENT WORTH

1.	Initial Cost		$45,900,000
2a.	Constant O&M		1,833,884
2b.	Variable O&M		867,149
3.	Replacement Cost		391,751
4.	Salvage Value	(minus)	7,060,791
5.	Interest During Construction		2,237,625
6.	Total Present Worth		$44,169,618

AVERAGE EQUIVALENT ANNUAL COST

$44,169,618 x 0.0794 **$3,506,817**

COST EFFECTIVE ANALYSIS - DATA INPUT

Project Name:		Akron WPCS NFA
Alternative Name:		Alternative 1B 40 MG Storage Basin
Planning Period in years:		20
Initial Year of Planning Period:		2006
Construction Period, in years:		2.0
Interest Rate %:		4.88
Structures Value, year 0:		$57,900,000
Process Equipment		
20 yr. Equipment Value, year 0:		$400,000
15 yr. Equipment Value, year 0:		$1,600,000
Auxiliary Equipment		
15 yr. Equipment Value, year 0:		$0
10 yr. Equipment Value, year 0:		$0
Land Cost:		$0
Total Construction Cost:		$59,900,000
Contingences, % :		20.00
Technical Services, % :		30.00
Salaries & Administrative Cost, year	2006	
year	2026	
Power & Gas? type Y, just Power? type P:		P
Power Cost, year	2006	$4,000
year	2026	$8,800
Chemical Cost, year	2006	
year	2026	
Repair & Maintenance Cost, year	2006	$67,500
year	2026	$147,800
Additional O & M year	2006	$163,600
year	2026	$358,400

Akron WPCS NFA

Alternative 1B
40 MG Storage Basin

ESTIMATE OF OPERATION AND MAINTENANCE COST

	2006		2026
Salaries & Administrative	$0		$0
Power	4,000		8,800
Chemicals	0		0
Repair & Maintenance	67,500		147,800
Additional O & M	163,600		358,400
TOTAL O&M COSTS	$235,100		$515,000
TOTAL FIXED O&M	235,100		235,100
TOTAL VARIABLE O&M	$0		$279,900
Yearly Increase		$13,995	

Akron WPCS NFA

Alternative 1B
40 MG Storage Basin

REPLACEMENT COST AND SALVAGE COST SUMMARY

	Initial Cost at Year 0	Replacement Cost at Year 10	Replacement Cost at Year 15	Salvage Value Year 20
A. Structures				
50 year life	$57,900,000			
Salvage Value				$34,740,000
B. Process Equipment				
20 year life	400,000			
15 year life	1,600,000			
Replacement Cost			1,600,000	
Salvage Value				1,066,667
C. Auxiliary Equipment				
15 year life	0			
10 year life	0			
Replacement Cost		0	0	
Salvage Value				0
D. Other Costs				
Contingencies	11,980,000			
Technical Services	17,970,000			
Land	0			0
TOTAL PROJECT COST	$89,850,000			
TOTAL REPLACEMENT COST		$0	$1,600,000	
TOTAL SALVAGE VALUE				$35,806,667

Akron WPCS NFA

Alternative 1B
40 MG Storage Basin

AVERAGE EQUIVALENT ANNUAL COST DETERMINATION

COST AND OTHER DATA UTILIZED

Planning Period: 20 Years					
Initial Cost of Project:	$89,850,000		Construction Period:	2.0	Years
Replacement Cost at Year 10:		$0			
Replacement Cost at Year 15:		$1,600,000			
Salvage Value at Year 20:					
Structures	-	$34,740,000			
Process Equipment	-	1,066,667			
Auxiliary Equipment	-	0			
Land	-	0			
Total	-	$35,806,667			
Constant Annual Operation & Maintenance Cost:			$235,100		
Variable Annual Operation & Maintenance Cost:			$0	Year 0 to	
			$279,900	Year 20	
Interest Rate:	4.875 %				

DETERMINE PRESENT WORTH & AVERAGE EQUIVALENT
ANNUAL COST OF THIS PLAN OVER 20 YEARS

Factors: (20 years at 4.875 %, unless noted)	
Present worth (PW) of constant annual O&M cost:	12.5954
PW of variable annual O&M cost (annual increase):	100.0172
Present worth of replacement cost - Year 10:	0.6213
Present worth of replacement cost - Year 15:	0.4897
Present worth of salvage value:	0.3860
Interest during construction = Initial cost x (0.5) x Period of Construction (Years) x Interest rate.	
Equivalent annual cost = Total present worth x	0.0794

CALCULATIONS - PRESENT WORTH

1.	Initial Cost		$89,850,000
2a.	Constant O&M		2,961,169
2b.	Variable O&M		1,399,740
3.	Replacement Cost		783,502
4.	Salvage Value	(minus)	13,820,521
5.	Interest During Construction		4,380,188
6.	Total Present Worth		$85,554,078

AVERAGE EQUIVALENT ANNUAL COST

$85,554,078	x	0.0794	**$6,792,508**

COST EFFECTIVE ANALYSIS - DATA INPUT

Project Name:		Akron WPCS NFA
Alternative Name:		Alternative 1C 10 MGD EHRC
Planning Period in years:		20
Initial Year of Planning Period:		2006
Construction Period, in years:		2.0
Interest Rate %:		4.88
Structures Value, year 0:		$2,843,000
Process Equipment		
20 yr. Equipment Value, year 0:		$298,000
15 yr. Equipment Value, year 0:		$705,000
Auxiliary Equipment		
15 yr. Equipment Value, year 0:		$0
10 yr. Equipment Value, year 0:		$0
Land Cost:		$0
Total Construction Cost:		$3,846,000
Contingences, % :		20.00
Technical Services, % :		30.00
Salaries & Administrative Cost, year	2006	
year	2026	
Power & Gas? type Y, just Power? type P:		P
Power Cost, year	2006	
year	2026	
Chemical Cost, year	2006	
year	2026	
Repair & Maintenance Cost, year	2006	
year	2026	
Total O & M Cost year	2006	$73,400
year	2026	$160,800

Akron WPCS NFA

Alternative 1C
10 MGD EHRC

ESTIMATE OF OPERATION AND MAINTENANCE COST

	2006		2026
Salaries & Administrative	$0		$0
Power	0		0
Chemicals	0		0
Repair & Maintenance	0		0
Total O & M Cost	73,400		160,800
TOTAL O&M COSTS	$73,400		$160,800
TOTAL FIXED O&M	73,400		73,400
TOTAL VARIABLE O&M	$0		$87,400
Yearly Increase		$4,370	

Akron WPCS NFA

Alternative 1C
10 MGD EHRC

REPLACEMENT COST AND SALVAGE COST SUMMARY

	Initial Cost at Year 0	Replacement Cost at Year 10	Replacement Cost at Year 15	Salvage Value Year 20
A. Structures				
50 year life	$2,843,000			
Salvage Value				$1,705,800
B. Process Equipment				
20 year life	298,000			
15 year life	705,000			
Replacement Cost			705,000	
Salvage Value				470,000
C. Auxiliary Equipment				
15 year life	0			
10 year life	0			
Replacement Cost		0	0	
Salvage Value				0
D. Other Costs				
Contingencies	769,200			
Technical Services	1,153,800			
Land	0			0
TOTAL PROJECT COST	$5,769,000			
TOTAL REPLACEMENT COST		$0	$705,000	
TOTAL SALVAGE VALUE				$2,175,800

Akron WPCS NFA

Alternative 1C
10 MGD EHRC

AVERAGE EQUIVALENT ANNUAL COST DETERMINATION

COST AND OTHER DATA UTILIZED

Planning Period: 20 Years				
Initial Cost of Project:	$5,769,000	Construction Period:	2.0	Years
Replacement Cost at Year 10:		$0		
Replacement Cost at Year 15:		$705,000		
Salvage Value at Year 20:				
Structures	-	$1,705,800		
Process Equipment	-	470,000		
Auxiliary Equipment	-	0		
Land	-	0		
Total	-	$2,175,800		
Constant Annual Operation & Maintenance Cost:			$73,400	
Variable Annual Operation & Maintenance Cost:			$0	Year 0 to
			$87,400	Year 20
Interest Rate:	4.875 %			

DETERMINE PRESENT WORTH & AVERAGE EQUIVALENT ANNUAL COST OF THIS PLAN OVER 20 YEARS

Factors: (20 years at 4.875 %, unless noted)

Present worth (PW) of constant annual O&M cost:	12.5954
PW of variable annual O&M cost (annual increase):	100.0172
Present worth of replacement cost - Year 10:	0.6213
Present worth of replacement cost - Year 15:	0.4897
Present worth of salvage value:	0.3860
Interest during construction = Initial cost x (0.5) x Period of Construction (Years) x Interest rate.	
Equivalent annual cost = Total present worth x	0.0794

CALCULATIONS - PRESENT WORTH

1.	Initial Cost		$5,769,000
2a.	Constant O&M		924,499
2b.	Variable O&M		437,075
3.	Replacement Cost		345,231
4.	Salvage Value	(minus)	839,807
5.	Interest During Construction		281,239
6.	Total Present Worth		$6,917,237

AVERAGE EQUIVALENT ANNUAL COST

$6,917,237 x 0.0794 **$549,189**

COST EFFECTIVE ANALYSIS - DATA INPUT

Project Name:		Akron WPCS NFA
Alternative Name:		Alternative 1D 50 MGD EHRC
Planning Period in years:		20
Initial Year of Planning Period:		2006
Construction Period, in years:		2.0
Interest Rate %:		4.88
Structures Value, year 0:		$3,909,000
Process Equipment		
20 yr. Equipment Value, year 0:		$443,000
15 yr. Equipment Value, year 0:		$2,216,000
Auxiliary Equipment		
15 yr. Equipment Value, year 0:		$0
10 yr. Equipment Value, year 0:		$0
Land Cost:		$0
Total Construction Cost:		$6,568,000
Contingences, % :		20.00
Technical Services, % :		30.00
Salaries & Administrative Cost, year	2006	
year	2026	
Power & Gas? type Y, just Power? type P:		P
Power Cost, year	2006	
year	2026	
Chemical Cost, year	2006	
year	2026	
Repair & Maintenance Cost, year	2006	
year	2026	
Total O & M Cost year	2006	$254,300
year	2026	$557,200

Akron WPCS NFA

Alternative 1D
50 MGD EHRC

ESTIMATE OF OPERATION AND MAINTENANCE COST

	2006		2026
Salaries & Administrative	$0		$0
Power	0		0
Chemicals	0		0
Repair & Maintenance	0		0
Total O & M Cost	254,300		557,200
TOTAL O&M COSTS	$254,300		$557,200
TOTAL FIXED O&M	254,300		254,300
TOTAL VARIABLE O&M	$0		$302,900
Yearly Increase		$15,145	

Akron WPCS NFA

Alternative 1D
50 MGD EHRC

REPLACEMENT COST AND SALVAGE COST SUMMARY

	Initial Cost at Year 0	Replacement Cost at Year 10	Replacement Cost at Year 15	Salvage Value Year 20
A. Structures				
50 year life	$3,909,000			
Salvage Value				$2,345,400
B. Process Equipment				
20 year life	443,000			
15 year life	2,216,000			
Replacement Cost			2,216,000	
Salvage Value				1,477,333
C. Auxiliary Equipment				
15 year life	0			
10 year life	0			
Replacement Cost		0	0	
Salvage Value				0
D. Other Costs				
Contingencies	1,313,600			
Technical Services	1,970,400			
Land	0			0
TOTAL PROJECT COST	$9,852,000			
TOTAL REPLACEMENT COST		$0	$2,216,000	
TOTAL SALVAGE VALUE				$3,822,733

Akron WPCS NFA

Alternative 1D
50 MGD EHRC

AVERAGE EQUIVALENT ANNUAL COST DETERMINATION

COST AND OTHER DATA UTILIZED

Planning Period: 20 Years					
Initial Cost of Project:	$9,852,000		Construction Period:	2.0	Years
Replacement Cost at Year 10:		$0			
Replacement Cost at Year 15:		$2,216,000			
Salvage Value at Year 20:					
Structures	-	$2,345,400			
Process Equipment	-	1,477,333			
Auxiliary Equipment	-	0			
Land	-	0			
Total	-	$3,822,733			
Constant Annual Operation & Maintenance Cost:			$254,300		
Variable Annual Operation & Maintenance Cost:			$0	Year 0 to	
			$302,900	Year 20	
Interest Rate:	4.875 %				

DETERMINE PRESENT WORTH & AVERAGE EQUIVALENT ANNUAL COST OF THIS PLAN OVER 20 YEARS

Factors: (20 years at 4.875 %, unless noted)

Present worth (PW) of constant annual O&M cost:	12.5954
PW of variable annual O&M cost (annual increase):	100.0172
Present worth of replacement cost - Year 10:	0.6213
Present worth of replacement cost - Year 15:	0.4897
Present worth of salvage value:	0.3860
Interest during construction = Initial cost x (0.5) x Period of Construction (Years) x Interest rate.	
Equivalent annual cost = Total present worth x	0.0794

CALCULATIONS - PRESENT WORTH

1.	Initial Cost		$9,852,000
2a.	Constant O&M		3,203,000
2b.	Variable O&M		1,514,760
3.	Replacement Cost		1,085,151
4.	Salvage Value	(minus)	1,475,484
5.	Interest During Construction		480,285
6.	Total Present Worth		$14,659,712

AVERAGE EQUIVALENT ANNUAL COST

$14,659,712 x 0.0794 **$1,163,898**

COST EFFECTIVE ANALYSIS - DATA INPUT

Project Name:		Akron WPCS NFA
Alternative Name:		Alternative 1E 100 MGD EHRC
Planning Period in years:		20
Initial Year of Planning Period:		2006
Construction Period, in years:		2.0
Interest Rate %:		4.88
Structures Value, year 0:		$6,176,000
Process Equipment		
20 yr. Equipment Value, year 0:		$820,000
15 yr. Equipment Value, year 0:		$3,795,000
Auxiliary Equipment		
15 yr. Equipment Value, year 0:		$0
10 yr. Equipment Value, year 0:		$0
Land Cost:		$0
Total Construction Cost:		$10,791,000
Contingences, % :		20.00
Technical Services, % :		30.00
Salaries & Administrative Cost, year	2006	
year	2026	
Power & Gas? type Y, just Power? type P:		P
Power Cost, year	2006	
year	2026	
Chemical Cost, year	2006	
year	2026	
Repair & Maintenance Cost, year	2006	
year	2026	
Total O & M Cost year	2006	$404,200
year	2026	$885,600

Akron WPCS NFA

Alternative 1E
100 MGD EHRC

ESTIMATE OF OPERATION AND MAINTENANCE COST

	2006		2026
Salaries & Administrative	$0		$0
Power	0		0
Chemicals	0		0
Repair & Maintenance	0		0
Total O & M Cost	404,200		885,600
TOTAL O&M COSTS	$404,200		$885,600
TOTAL FIXED O&M	404,200		404,200
TOTAL VARIABLE O&M	$0		$481,400
Yearly Increase		$24,070	

Akron WPCS NFA

Alternative 1E
100 MGD EHRC

REPLACEMENT COST AND SALVAGE COST SUMMARY

	Initial Cost at Year 0	Replacement Cost at Year 10	Replacement Cost at Year 15	Salvage Value Year 20
A. Structures				
50 year life	$6,176,000			
Salvage Value				$3,705,600
B. Process Equipment				
20 year life	820,000			
15 year life	3,795,000			
Replacement Cost			3,795,000	
Salvage Value				2,530,000
C. Auxiliary Equipment				
15 year life	0			
10 year life	0			
Replacement Cost		0	0	
Salvage Value				0
D. Other Costs				
Contingencies	2,158,200			
Technical Services	3,237,300			
Land	0			0
TOTAL PROJECT COST	$16,186,500			
TOTAL REPLACEMENT COST		$0	$3,795,000	
TOTAL SALVAGE VALUE				$6,235,600

Akron WPCS NFA

Alternative 1E
100 MGD EHRC

AVERAGE EQUIVALENT ANNUAL COST DETERMINATION

COST AND OTHER DATA UTILIZED

Planning Period: 20 Years					
Initial Cost of Project:	$16,186,500		Construction Period:	2.0	Years
Replacement Cost at Year 10:		$0			
Replacement Cost at Year 15:		$3,795,000			
Salvage Value at Year 20:					
Structures	-	$3,705,600			
Process Equipment	-	2,530,000			
Auxiliary Equipment	-	0			
Land	-	0			
Total	-	$6,235,600			
Constant Annual Operation & Maintenance Cost:			$404,200		
Variable Annual Operation & Maintenance Cost:			$0	Year 0 to	
			$481,400	Year 20	
Interest Rate:	4.875 %				

DETERMINE PRESENT WORTH & AVERAGE EQUIVALENT
ANNUAL COST OF THIS PLAN OVER 20 YEARS

Factors: (20 years at 4.875 %, unless noted)	
Present worth (PW) of constant annual O&M cost:	12.5954
PW of variable annual O&M cost (annual increase):	100.0172
Present worth of replacement cost - Year 10:	0.6213
Present worth of replacement cost - Year 15:	0.4897
Present worth of salvage value:	0.3860
Interest during construction = Initial cost x (0.5) x Period of Construction (Years) x Interest rate.	
Equivalent annual cost = Total present worth x	0.0794

CALCULATIONS - PRESENT WORTH

1.	Initial Cost		$16,186,500
2a.	Constant O&M		5,091,045
2b.	Variable O&M		2,407,413
3.	Replacement Cost		1,858,370
4.	Salvage Value	(minus)	2,406,793
5.	Interest During Construction		789,092
6.	Total Present Worth		$23,925,626

AVERAGE EQUIVALENT ANNUAL COST

$23,925,626	x	0.0794	**$1,899,559**

<u>**COST EFFECTIVE ANALYSIS - DATA INPUT**</u>

Project Name:	Akron WPCS NFA		
Alternative Name:	Alternative 1F 150 MGD EHRC		
Planning Period in years:			20
Initial Year of Planning Period:			2006
Construction Period, in years:			2.0
Interest Rate %:			4.88
Structures Value, year 0:			$9,090,000
Process Equipment			
20 yr. Equipment Value, year 0:			$1,107,000
15 yr. Equipment Value, year 0:			$5,698,000
Auxiliary Equipment			
15 yr. Equipment Value, year 0:			$0
10 yr. Equipment Value, year 0:			$0
Land Cost:			$0
Total Construction Cost:			$15,895,000
Contingences, % :			20.00
Technical Services, % :			30.00
Salaries & Administrative Cost, year		2006	
	year	2026	
Power & Gas? type Y, just Power? type P:			P
Power Cost, year		2006	
	year	2026	
Chemical Cost, year		2006	
	year	2026	
Repair & Maintenance Cost, year		2006	
	year	2026	
Total O & M Cost	year	2006	$416,400
	year	2026	$912,300

Akron WPCS NFA

Alternative 1F
150 MGD EHRC

ESTIMATE OF OPERATION AND MAINTENANCE COST

	2006		2026
Salaries & Administrative	$0		$0
Power	0		0
Chemicals	0		0
Repair & Maintenance	0		0
Total O & M Cost	416,400		912,300
TOTAL O&M COSTS	$416,400		$912,300
TOTAL FIXED O&M	416,400		416,400
TOTAL VARIABLE O&M	$0		$495,900
Yearly Increase		$24,795	

Akron WPCS NFA

Alternative 1F
150 MGD EHRC

REPLACEMENT COST AND SALVAGE COST SUMMARY

	Initial Cost at Year 0	Replacement Cost at Year 10	Replacement Cost at Year 15	Salvage Value Year 20
A. Structures				
50 year life	$9,090,000			
Salvage Value				$5,454,000
B. Process Equipment				
20 year life	1,107,000			
15 year life	5,698,000			
Replacement Cost			5,698,000	
Salvage Value				3,798,667
C. Auxiliary Equipment				
15 year life	0			
10 year life	0			
Replacement Cost		0	0	
Salvage Value				0
D. Other Costs				
Contingencies	3,179,000			
Technical Services	4,768,500			
Land	0			0
TOTAL PROJECT COST	$23,842,500			
TOTAL REPLACEMENT COST		$0	$5,698,000	
TOTAL SALVAGE VALUE				$9,252,667

Akron WPCS NFA

Alternative 1F
150 MGD EHRC

AVERAGE EQUIVALENT ANNUAL COST DETERMINATION

COST AND OTHER DATA UTILIZED

Planning Period: 20 Years					
Initial Cost of Project:	$23,842,500		Construction Period:	2.0	Years
Replacement Cost at Year 10:		$0			
Replacement Cost at Year 15:		$5,698,000			
Salvage Value at Year 20:					
Structures	-	$5,454,000			
Process Equipment	-	3,798,667			
Auxiliary Equipment	-	0			
Land	-	0			
Total	-	$9,252,667			
Constant Annual Operation & Maintenance Cost:			$416,400		
Variable Annual Operation & Maintenance Cost:			$0	Year 0 to	
			$495,900	Year 20	
Interest Rate:	4.875 %				

DETERMINE PRESENT WORTH & AVERAGE EQUIVALENT
ANNUAL COST OF THIS PLAN OVER 20 YEARS

Factors: (20 years at 4.875 %, unless noted)	
Present worth (PW) of constant annual O&M cost:	12.5954
PW of variable annual O&M cost (annual increase):	100.0172
Present worth of replacement cost - Year 10:	0.6213
Present worth of replacement cost - Year 15:	0.4897
Present worth of salvage value:	0.3860
Interest during construction = Initial cost x (0.5) x Period of Construction (Years) x Interest rate.	
Equivalent annual cost = Total present worth x	0.0794

CALCULATIONS - PRESENT WORTH

1.	Initial Cost		$23,842,500
2a.	Constant O&M		5,244,708
2b.	Variable O&M		2,479,925
3.	Replacement Cost		2,790,248
4.	Salvage Value	(minus)	3,571,309
5.	Interest During Construction		1,162,322
6.	Total Present Worth		$31,948,394

AVERAGE EQUIVALENT ANNUAL COST

$31,948,394	x	0.0794	**$2,536,521**