Nine Minimum Controls – No. 6

6.0 CONTROL OF SOLID AND FLOATABLE MATERIALS IN CSOs

6.1 OVERVIEW

CSOs can contain solid and floatable material that are easily seen and can be the source of pollutants in receiving waters. The sixth of the nine minimum controls contemplates the reduction, if not elimination, of visible floatables and solids using relatively simple measures. Based on the City's experience with its CSS, including that gained through daily visual inspections and via the assessment described below, solids and floatables are not frequently observed at CSO discharge sites. This is perhaps due to the significant pollution prevention measures (e.g. street cleaning, leaf collection, catch basin cleaning, etc.) long undertaken by the City (such measures are described more fully in Chapter 7) and the City's use of catch basins. Nonetheless, the City has identified three sites at which it intends to conduct pilot studies to further ensure adequate solid and floatable controls.

Catch basins are structures used to collect storm water entering the City's CSS. Catch basins are modified inlets where the invert of the outlet pipe is several feet above the bottom of the structure and where a 90 degree trap is installed on the end of the outlet pipe. See Figure 6-1. This configuration causes some storm water to be retained in the structure. This reduces velocity and allows larger solids to collect in the bottom of the structure. This also traps floatable material in the structure and prevents sewer gasses from exiting the structure. Therefore, most of the floatable and solid materials in the storm water can be removed from the combined sewer system by preventing entry into the system through the proper monitoring, operation, and maintenance of the catch basins. There are no similar structures to remove solids and floatable material from the sanitary sewage flows.

In this Chapter the appropriate operating, inspection, and maintenance procedures presented in Chapter 1 will be referenced, the investigation of existing floatable and solid material discharges discussed, and goals for future changes and improvements will be presented. The exhibits of this chapter contain a copy of the investigation of existing floatable and solid material discharges, recommendations for future improvements, and records of annual activities.

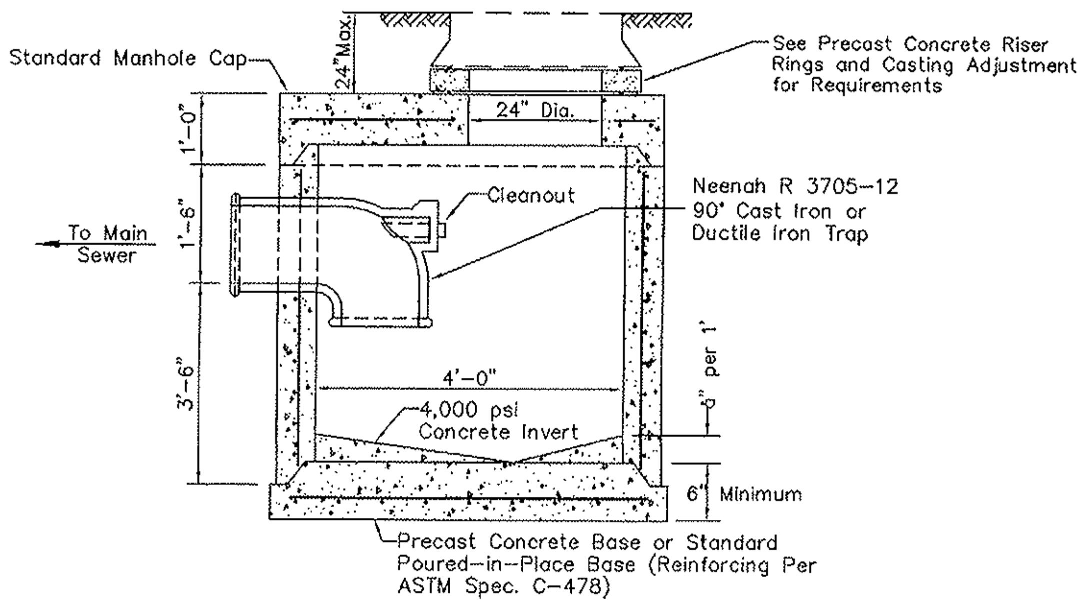
6.2 OPERATING, INSPECTING, AND MAINTAINING

The primary method for controlling the discharge of visible solid and floatable material is the use of catch basins in the CSS. There are more than 4,957 of these structures located throughout the City's CSS area. Each catch basin has a unique identification number with information about its location stored in the City's GIS. The locations of catch basins can be retrieved in a number of ways with GIS tools.

Figure 6-1

City Utilities Department of Water Resources	STANDARD CATCH BASIN	
	Created: January 1, 2002	Revised:

Castings:
24" Beehive Casting;
24" Manhole Frame and Grate



Note:
General Construction Requirements Same as Standard 48" Manhole
Structure Base Alternatives Same as Standard 48" Manhole

STR-34

6.2.1 Operation

Catch basins do not have any moving parts or adjustable features. Therefore, no effort is required to operate them. The most important thing is to make sure they are installed where appropriate.

6.2.2 Inspections

Catch basins are routinely inspected for damage approximately once every 2.5 years. Additionally, catch basins are further inspected whenever street or yard flooding is reported to or observed by the City. When that occurs, inspectors are dispatched to make sure catch basins are neither damaged nor plugged.

6.2.3 Maintenance

Chapter 1 contains detailed procedures and schedules for catch basin maintenance. Table 2 in Exhibit F-2 contains information on reported tons of material collected from 1998 to 2003. Additional information on catch basin cleaning can be found in Chapter 7. Catch basin cleaning has been tracked in the City's GIS database since 2005. Catch basins identified as problematic based on experience are identified in GIS and cleaned with greater frequency.

6.3 INVESTIGATION OF EXISTING SOLID AND FLOATABLE MATERIAL DISCHARGES

6.3.1 Purpose

The purpose of investigating existing solid and floatable material discharges from CSOs is to identify the extent of the problem and the type of material that needs to be controlled.

6.3.2 Process

The steps of the discharge investigation are:

- Conduct and document visual surveys of each CSO discharge point
- Develop criteria for selecting sampling sites
- Sample and characterize solids/floatables discharged
- Summarize solids/floatables control methods currently used
- Identify other suitable solids/floatables control methods not previously identified
- Recommend pilot improvements

This process was utilized to investigate solid and floatable material discharges in the summer of 2004. The report on this investigation consists of 3 documents. “City of Fort Wayne Recommended CSO Sites for Further Solids and Floatables Investigation” dated July 23, 2004 documents the visual survey and information gathered from City staff on 44 CSO discharge points after a 0.2” rain event and is located in Exhibit F-1. The findings summarized in the report are consistent with daily outfall inspections performed by WPCM staff. Consistent with the City’s experience, the study concluded that floatables are not frequently observed at CSO discharge sites. Nonetheless, through the aforementioned study the City has identified three areas that are recommended for further solids and floatables control investigation. In addition to floatables information, the report also contained details on the observed CSO discharge point site conditions. Exhibit F-4 contains an update on recommended follow ups to some of the site conditions observed.

“CSO Solids and Floatables Control Plan for Selected Sites” dated November, 2004 discusses control methods and recommends pilot improvements and is located in Exhibit F-2. The report generally recommends that the City should continue its effective non-structural source control best management practices. It also recommends that a pilot structural facility be constructed for evaluation of floatables control technologies and documentation of their effectiveness in the City.

The “Report Clarification” dated November 22, 2004 shows how this investigation follows the guidance on the sixth of the nine minimum controls and is found in Exhibit F-3.

6.3.3 Pilot Projects – Further Investigation

It is the City’s intent to pilot structural floatable controls at three different outfalls and utilize at least two different technologies. The design goal will be the removal (at a minimum) of solids and floatables ½ inch diameter and larger. These pilot locations will be monitored for approximately 2 years and the results of these pilot facilities will be utilized in confirming the design goal for future LTCP floatables control construction, as specified in the LTCP.

6.4 INTERGRATION WITH LONG TERM CSO CONTROL PLAN

The controls proposed by City’s CSO LTCP generally consist of constructing a new parallel interceptor that will convey overflows from a majority of the regulators to the WPCP and CSO Storage Ponds. The remaining regulators and associated overflow points would be improved with either satellite storage or satellite disinfection facilities. All untreated overflows to receiving waters would be reduced to a specified level of control of a few activations in a typical year. The reduction of overflow events to receiving waters will greatly reduce the introduction of floatables and solids into the receiving waters.

In addition to the reduction in number of overflow events, the City's proposed CSO LTCP includes provisions for construction of structural floatables control (e.g. screens, baffles, seperators or trash racks) at CSO outfalls that currently do not have structural floatables control.

The City has been advised by IDEM that such controls, if installed with respect to existing CSO outfalls, will not be subject to the setback requirements presented at 327 IAC 3-2-6. To the extent such setback requirements are applicable to other types of controls or facilities, the City recognizes that a variance application could be filed with IDEM under IC 13-14-8-8. Whether IDEM would deem the circumstances surrounding the sitting of the facilities then in question to constitute an "undue burden or hardship" under IC 13-14-8-8 is unclear at this time. Moreover, even if IDEM were to find an "undue burden or hardship " to exist, IDEM is not required to grant a variance - IC 13-14-8-8 plainly provides that IDEM has the discretion to grant or deny a variance request even if it finds an undue burden or hardship to exist. Perhaps most significant is the fact that Indiana law expressly limits the duration of variances to a maximum of one year. To obtain permanent regulatory relief via a variance for a structure constructed within a 500-foot setback, an applicant would need to apply annually (and perpetually) for 1 year renewals of that variance. Under IC 13-14-8-8, IDEM would be able to annually revisit both its undue burden or hardship determination and its decision to grant or deny the requested renewal. In short, Indiana law contemplates a variance as a temporary means of regulatory relief of little value to applicants seeking to construct permanent structures. The City intends to construct its pilot facilities between 2008 and 2009. IDEM confirmation that setback requirements to floatables control will not apply will need to be obtained before any floatables control can be constructed.

6.5 RECORD KEEPING

Following the end of each calendar year, information on the catch basin maintenance and repair along with reports on the progress on recommendations and piloting work shall be gathered and added as Exhibit F-4 of this Chapter.

DIRECTORY FOR APPENDIX F
(Items Presented in Order of Appearance in Appendix F)

EXHIBIT F-1

City of Fort Wayne Recommended CSO Sites for Further Solids and Floatables Investigation

TO: Pat Callahan/City of Fort Wayne

COPIES: Kurt Hellerman/CH2M HILL Milwaukee
Rita Fordiani/CH2M HILL Boston
Todd Webster/CH2M HILL Fort Wayne

FROM: Phil Blonn/CH2M HILL Milwaukee

DATE: July 23, 2004

Introduction

To assist the City of Fort Wayne in its ongoing long term control plan for minimizing CSOs, 44 CSO sites within the City were observed by CH2M HILL staff during the week of May 10th, 2004. The purpose of this effort was to identify CSO locations with potential solids and floatables (SF) issues and determine which sites are the best candidates for further investigation into these issues through additional site monitoring/research.

CSO Monitoring Site Evaluations and Recommendations

Data were gathered from 1) City CSO subbasin files; 2) discussions with City staff; and 3) in the field during site visits. Data collected are summarized on the attached CSO Data Forms. Photos taken at each site are also attached. Attachments are ordered by ascending CSO Overflow Point number as presented in the NPDES Permit. CSO activity information was collected from the subbasin reports and assembled into attached Table A. Table 1 presents a summary of the evaluation of each site.

TABLE 1
Summary of Evaluation of CSO Site Solids and Floatables Evaluation and Selection (in **BOLD**) for Further Investigation

Count	Overflow Point	Location Number	Receiving Water	Comment
1	004	J02-090	Saint Mary's River	Clean site and low CSO volume; outfall is submerged and river water flows back into system at a high rate; therefore, SF control is not recommended. Suggest reviewing/ correcting operation of tide flex.
2	005 (Adjacent to 006)	J11-164	Saint Mary's River	Heavy duty paper towels, rags, and sewer-related solids and floatables are regularly observed at this location according to city staff and high CSO activity; therefore, further investigation into SF control is suggested after closure of 006.

Count	Overflow Point	Location Number	Receiving Water	Comment
3	006 (Adjacent to 005)	J11-222	Saint Mary's River	Plans are currently in place to eliminate the 6" diameter outfall; therefore, SF control is not recommended.
4	007 (Adjacent to 056)	K03-092	Saint Mary's River	Sewer-related solids and floatables have been noted here in the past; non-sewer-related material observed during site visit, and there is low CSO activity; therefore, SF control is not recommended. Discharge pipe was completely submerged; suggest reviewing tide gate operation.
5	011 (Adjacent to 012)	K06-233	Saint Mary's River	Clean site at discharge location; however, regulator manhole had surcharged, lifting manhole lid and dumping sewage solids and floatables in area prior to pump station; area around manhole eroded, has occurred in past; high CSO activity. Suggest first researching and correcting the cause and then revisiting this site to determine if SF control is needed.
6	012 (Adjacent to 011)	K06-234	Saint Mary's River	Clean site at discharge location; however, regulator manhole had surcharged, lifting manhole lid and dumping sewage solids and floatables in area prior to pump station; area around manhole eroded, has occurred in past; high CSO activity. Suggest first researching and correcting the cause and then revisiting this site to determine if SF control is needed.
7	013	K06-298	Saint Mary's River	Non-sewer-related material observed during site visit (i.e., beer bottles, litter); high CSO activity staff believes to be due to plugged-up sewer lines; suggest review of sewer maintenance practices, but SF control is not recommended.
8	014	K07-106	Saint Mary's River	Non-sewer-related material observed during site visit (i.e., litter); low CSO activity; therefore, SF control is not recommended.
9	016	K07-109	Saint Mary's River	Headwall completely collapsed, several sections of pipe broken; non-sewer-related material observed during site visit (i.e., litter, household garbage); low CSO activity - never has been observed overflowing; therefore, SF control is not recommended. Suggest looking into closing off CSO.
10	**017**	**K07-176**	**Saint Mary's River**	**Sewer-related and non-sewer related (i.e., litter and garbage) solids and floatables have been noted here in the past and during site visit and there is moderate CSO activity; therefore, further investigation into potential SF control is recommended.**
11	018 (Adjacent to 019)	K11-165	Saint Mary's River	Sewer-related and non-sewer related (i.e., litter and garbage) solids and floatables have been noted here in the past and during site visit; significant CSO activity; other CSO control plans are in place; therefore, SF control is not recommended.

Count	Overflow Point	Location Number	Receiving Water	Comment
12	019 Adjacent to 018)	K11-178	Saint Mary's River	Sewer-related and non-sewer related (i.e., litter and garbage) solids and floatables have been noted here in the past and during site visit; significant CSO activity; other CSO control plans are in place; therefore, SF control is not recommended.
13	020	K15-116	Saint Mary's River	Clean site and high CSO activity; outfall is submerged and river water flows back into system; therefore, SF control is not recommended. Suggest reviewing/correcting operation of flap gate.
14	**021**	**K19-044**	**Saint Mary's River**	**Plume of sewage and solids and floatables observed during visit; high CSO activity; therefore, further investigation into SF control is recommended.**
15	023	L06-103	Saint Mary's River	Clean site and low CSO activity; outfall is submerged and river water occasionally flows back into system; therefore, SF control is not recommended. Suggest reviewing/ correcting operation of flap gate.
16	024 (Adjacent to 025)	L06-420	Saint Mary's River	Clean site and moderate CSO activity; outfall is sometimes submerged and river water occasionally flows back into system; therefore, SF control is not recommended. Suggest reviewing/correcting operation of flap gate.
17	025 (Adjacent to 024)	L06-421	Saint Mary's River	Clean site and low CSO activity; outfall is sometimes submerged and river water occasionally flows back into system; therefore, SF control is not recommended. Suggest reviewing/correcting operation of flap gate.
18	**026** **(Adjacent to 027 and 033)**	**M10-151**	**Saint Mary's River**	**Sewer-related and non-sewer related (i.e., litter) solids and floatables have been noted here in the past and during the site visit and there is high CSO activity; therefore, further investigation into potential SF control is recommended.**
19	**027** **(Adjacent to 026 and 033)**	**M10-202**	**Saint Mary's River**	**Sewer-related and non-sewer related (i.e., litter) solids and floatables have been noted here in the past and during the site visit and there is high CSO activity; therefore, further investigation into potential SF control is recommended.**
20	028	M10-238	Saint Mary's River	Sewer-related solids and floatables have been noted here in the past (believed to occur only when pumps at adjacent pump house have been active) and during the site visit but there is low CSO activity; therefore, SF control is not recommended. Suggest reviewing pump operation/type.
21	029	M10-265	Saint Mary's River	Some sewer-related but mostly non-sewer related (i.e., litter) solids and floatables have been noted here in the past and during the site visit and there is low CSO activity; therefore, SF control is not recommended.

Count	Overflow Point	Location Number	Receiving Water	Comment
22	032	M10-306	Saint Mary's River	Non-sewer related (i.e., litter) solids and floatables have been noted here in the past and during the site visit and there is low CSO activity; therefore, SF control is not recommended. Outfall submerged, exact location and condition unknown. Suggest reviewing whether river water intrusion is an issue and condition of any back flow prevention.
23	**033** **(Adjacent to 026 and 027)**	**M10-313**	**Saint Mary's River**	**Sewer-related and non-sewer related (i.e., litter) solids and floatables have been noted here in the past and during the site visit and there is high CSO activity; therefore, further investigation into potential SF control is recommended.**
24	036	M18-032	Spy Run Creek	Clean site and low-moderate CSO activity; therefore, SF control is not recommended.
25	039	N06-022	Maumee River	Clean site and low-moderate CSO activity; therefore, SF control is not recommended.
26	044	N22-093	Saint Joseph River	Minor sewer-related solids and floatables were noted during the site visit and there is low CSO activity; therefore, SF control is not recommended at this time.
27	045	N22-103	Saint Joseph River	Non-sewer related (i.e., litter) solids and floatables were noted during the site visit and there is low CSO activity; therefore, SF control is not recommended.
28	048	O10-252	Maumee River	Clean site/discharge even with high CSO activity; therefore, SF control is not recommended.
29	049	O10-257	Maumee River	Did not visit; considered eliminated by staff; suggest permanently removing from permit list.
30	050	O10-277	Maumee River	Clean site and low-moderate CSO volume; outfall is submerged and river water was observed flowing back into system; therefore, SF control is not recommended. Suggest reviewing/ correcting operation of flap gate.
31	051	O22-002	Saint Joseph River	Minor sewer-related solids and floatables and more non-sewer-related litter were noted during the site visit and there is low-moderate CSO activity; therefore, SF control is not recommended at this time.
32	**052**	**O22-004**	**Saint Joseph River**	**Solids and floatables (i.e., paper towels) were stuck in the flap gate during the site visit and there is low-moderate CSO activity; therefore, further investigation into SF control is recommended.**
33	053	O22-094	Saint Joseph River	Non-sewer related (i.e., litter) solids and floatables were noted during the site visit; low CSO activity; therefore, SF control is not recommended.
34	054	O23-080	Natural Drain #4, then St. Mary's River	Non-sewer related (i.e., litter) solids and floatables were noted during the site visit; low-moderate CSO activity; therefore, SF control is not recommended.

Count	Overflow Point	Location Number	Receiving Water	Comment
35	055	P06-192	Maumee River	Clean site; however, sewer-related solids and floatables have been observed in the past; high CSO activity. This site would be considered for further SF control investigation, however, city staff indicated that this would be a difficult site and should not be considered further at this time.
36	056	J03-313	Saint Mary's River	Sewer-related solids and floatables have been noted here in the past; non-sewer-related material observed during site visit, and there is low CSO activity; therefore, SF control is not recommended.
37	057	P10-121	Maumee River	Plans are already in place for CSO control; therefore, SF control is not recommended.
38	058	Q06-034	Maumee River	Non-sewer-related (i.e., litter) solids and floatables; low CSO activity; therefore, SF control is not recommended.
39	060	R06-031	Unnamed Ditch to Maumee River	Non-sewer-related (i.e., litter, garbage) solids and floatables; low CSO activity; therefore, SF control is not recommended. Water often discolored; suggest further investigation into surrounding site and potential implementation of best management practices.
40	061 (Adjacent to 062)	R14-137	Baldwin Ditch to stormwater ponds to Maumee River	Clean site; low-moderate CSO activity; therefore, SF control is not recommended.
41	062 (Adjacent to 061)	R14-138	Baldwin Ditch to stormwater ponds to Maumee River	Clean site; low-moderate CSO activity; therefore, SF control is not recommended.
42	064	S02-035	Unnamed Ditch to Maumee River	Non-sewer related (i.e., litter) solids and floatables were noted during the site visit; moderate CSO activity; therefore, SF control is not recommended.
43	067	K19-077	Saint Mary's River	Clean site; low-moderate CSO activity; therefore, SF control is not recommended.
44	068	N18-254	Saint Joseph River	Some sewer-related solids and floatables and some non-sewer-related litter were noted during the site visit; CSO activity is unknown at this time; therefore, SF control is not recommended at this time.
45		P10-001	Maumee River	Clean site; CSO activity unknown at this time; therefore, SF control is not recommended at this time.

In addition to recommending sites for further solids and floatables control investigation, Table 1 also identifies other sewer-related and public nuisance issues along the waterfront areas for informational purposes. For ease of review, Table 2 presents the locations where additional solids and floatables control is recommended for further investigation through additional research/monitoring.

TABLE 2
CSO Sites Recommended for Further Solids and Floatables Control Investigation

Overflow Point	Location Number	Street Location	Receiving Water	Discharge Size:
017	K07-176	Waldron Circle	St. Mary's River	42"
021	K19-044	Old Mill & Fairfax	St. Mary's River	66"
026/027/033	M10-151/M10-202/M10-313	3rd Street and Calhoun	St. Mary's River	2 – 72" / 1- 72" / 4 - 42"
052	O22-004	St. Joseph River Drive behind Concordia Lutheran High School	St. Joseph River	48"

TABLE A

CSO Characterization Based on Subbasin Reports and Staff Comment

Overflow Point	Annual Model Results: CSO Volume (cubic feet)	CSO Volume (million gallons)	CSO Frequency (times/year)	CSO Duration (hours)	Jan. - Apr. Data Frequency (no. of occurrences)	CSO Discharge Diameter	CSO Duration (hours/ event)	Comments
004	677,841	5.1	53	151	4	30"	3	
005	3,562,952	26.7	69	248	7	66"	4	
006	248	0.0	N/A	248	7	6"	N/A	
007	63,215	0.5	10	10	N/A	60"	1	
011	3,721,544	27.8	41	111	N/A	72"	3	
013	5,830,632	43.6	52	211	N/A	72"	4	
014	73,187	0.5	63	104	0	12"	2	
016	6,621	0.0	9	4	0	N/A	0	
017	963,279	7.2	32	88	8	N/A	3	
018	51,159,119	382.7	84	470	8	126"	6	
019	data included with 018					42"	N/A	
020	2,457,734	18.4	72	249	8	6'x6' box	3	
021	1,425,564	10.7	56	344	10	66"	6	
023	267,138	2.0	54	20	6	48"	0	
024	1,195,116	8.9	16	40	6	N/A	3	
025	48	0.0	1	1	5	60"	1	
026	data included with 033					72"	N/A	
028	471,877	3.5	15	24	4	30"	2	
029	604,752	4.5	70 / 26	34 / 2	13	48"	N/A	
032	183,098	1.4	5	44	7	N/A	9	
033	17,562,363	131.4	66	328	N/A	var. ~72"	5	
036	1,864,615	13.9	83	727	4	24"	9	
039	3,051,243	22.8	40	269	N/A	60"	7	
044	9,510	0.1	3	13	4	12"	4	
045	8,680	0.1	3	2	4	10"	1	
048	11,305,463	84.6	63	256	N/A	4 - 30", 5"	4	
050	1,621,933	12.1	52	294	2	36"	6	
051	291,092	2.2	10	26	5	18"	3	
052	782,402	5.9	45 / 17	231 / 27	7	48"	N/A	
053	134,659	1.0	9	19	5	42"	2	
054	511,038	3.8	27	100	5	48"	4	
055	2,959,476	22.1	62	515	7	48"	8	
056	63,215	0.5	10	10	N/A	2 - 36"	1	some data are for both 056 and 007
057	8,673,828	64.9	45	128	4	96"	3	
058	47,734	0.4	3	4	2	24"	1	
060	255,572	1.9	47	218	5	42"	5	
061	295,426	2.2	6	20	8	42"	3	
062	834,303	6.2	7	21	6	60"	3	
064	697,941	5.2	94	588	7	120"	6	
067	215,375	1.6	96	527	0	24"	5	
068	N/A	N/A	N/A	N/A	2	36"	N/A	

CSO Site Data Sheets and Photos

Combined Sewer Overflow Solids/Floatables Control Data Sheet

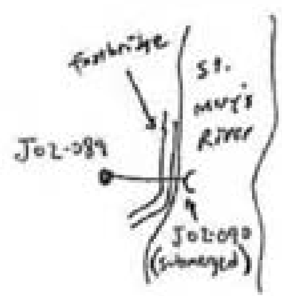
Overflow Point #: 004	Location#: J02-090
Street Location: Rolling Mill Regulator; 1998 Taylor St.	Receiving Water: St. Mary's River
Subbasin: J02-089	Immediate Area Land Use (describe): Industrial
CSO Annual Volume (cf): 677,841 (model)	CSO Annual Frequency (times/year): 53 (model); 4 (Jan.-Apr. data)
CSO Annual Overflow (hours):151 (model)	Tide Gate Type: tide flex, records indicate it is chained open
Discharge Size: 30" diameter	Discharge Invert: N/A; submerged
River Elevation: 738+/- (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

No identifiables have been observed at this location, no flow has ever been observed toward river at this location, river water flows into system at this point at a high rate

Draw site/describe conditions:

Outfall is submerged even when water level is low



Noted debris in water (type, size, quantify):

None

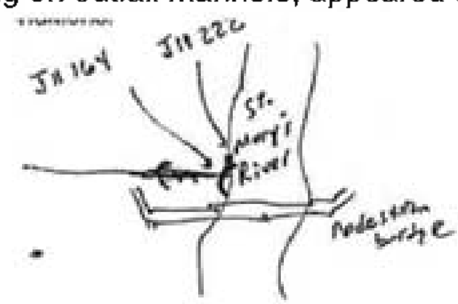
Noted debris on land (type, size, quantify):

None

Date of Visit: 5/12 11:59 a.m.	Name: Phil Blonn

J02-090

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: ~~006~~ 005	Location #: J11-164, ~~J11-222~~
Street Location: Indian Village East of 4400 Bluffton Road	Receiving Water: St. Mary's River
Subbasin: K11-004	Immediate Area Land Use (describe): Park
CSO Annual Volume (cf): 3,562,952 (model)	CSO Annual Frequency (times/year): 69 (model); 7 (Jan.-Apr. data)
CSO Annual Overflow (hours): 248 (model)	Tide Gate Type: J11-164: flapgate; ~~J11-222: duckbill~~
Discharge Size: J11-164: 66" diameter; ~~J11-222:~~ 6"	Discharge Invert: ≈745+/-
River Elevation: 740+/- (low water elev.)	Last Precipitation: 5:00 p.m. yesterday
Summarize site history: Heavy duty paper towels; heavy rags noted in the past; City trying to track source; identifiables observed in past; leaves	
Draw site/describe conditions: Individual observed sitting on outfall manhole; appeared to be intoxicated 	
Noted debris in water (type, size, quantify): None	
Noted debris on land (type, size, quantify): None	
Date of Visit: 5/12 9:45 a.m.	Name: Phil Blonn

J11-164, J11-22



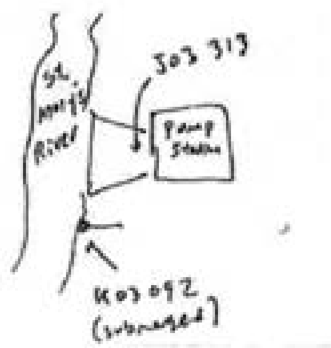



Combined Sewer Overflow Solids/Floatables Control Data Sheet

<table>
<tr><td>Overflow Point #: 007</td><td>Location #: K03-092</td></tr>
<tr><td>Street Location: Brown Street Pump Station Regulator; 1800 Brown Street South Side of Brown Street just east of Electric Avenue</td><td>Receiving Water: St. Mary's River</td></tr>
<tr><td>Subbasin: J03-012</td><td>Immediate Area Land Use (describe):

Residential</td></tr>
<tr><td>CSO Annual Volume (cf): 63,215 (model)</td><td>CSO Annual Frequency (times/year): 10 (model) no Jan.-Apr. data</td></tr>
<tr><td>CSO Annual Overflow (hours): 10 (model)</td><td>Tide Gate Type: flapgate</td></tr>
<tr><td>Discharge Size: K03-092: 60" diameter</td><td>Discharge Invert: 740.31</td></tr>
<tr><td>River Elevation: 735.0 (normal)</td><td>Last Precipitation: 5:00 p.m. yesterday</td></tr>
<tr><td colspan="2">Summarize site history:

Identifiable residential sanitary sewage observed at this site in the past, not on this visit</td></tr>
<tr><td colspan="2">Draw site/describe conditions:

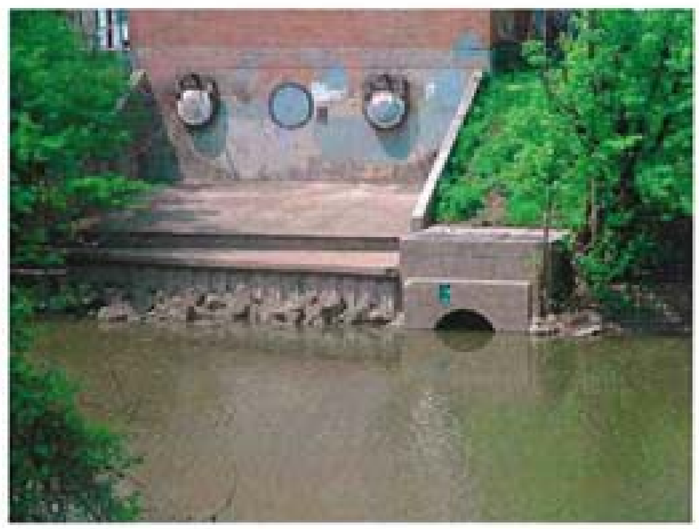
Adjacent to Overflow Point 056,
Location # J03-313


</td></tr>
<tr><td colspan="2">Noted debris in water (type, size, quantify):

None</td></tr>
<tr><td colspan="2">Noted debris on land (type, size, quantify):

Small amount of litter</td></tr>
<tr><td>Date of Visit: 5/12 11:45 a.m.</td><td>Phil Blonn</td></tr>
</table>

K03-092, J03-313



Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 011 + 012	Location #: K06-233 (two from pump station, K06-234 (large submerged one)
Street Location: just east of Nebraska pump station on west bank of St. Mary's River; Camp Allen and Main	Receiving Water: St. Mary's River
Subbasin: K06-290B	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 3,721,544 (model)	CSO Annual Frequency (times/year): 41 (model)
CSO Annual Overflow (hours): 111 (model)	Tide Gate Type: flap gates
Discharge Size: 72" diameter	Discharge Invert: N/A
River Elevation: N/A	Last Precipitation: 5:00 p.m. yesterday

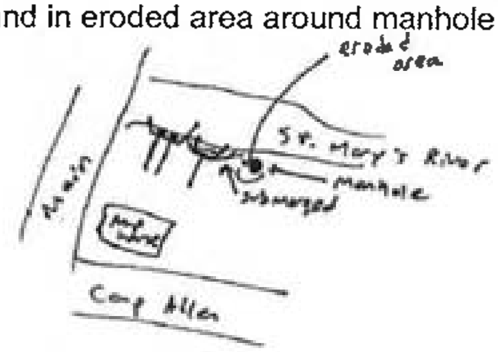
Summarize site history:

Pumphouse with two CSO outfalls
1. One large submerged outfall
2. Two directly from pump station

Problem with river water entering submerged outfall

Draw site/describe conditions:

Manhole (downstream of pump station of upstream siphon structure) surcharged; toilet paper, other identifiables at that location and in eroded area around manhole



Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

Very little, identifiables at surcharged manhole, not at outfalls

Date of Visit: 5/12 1:05 p.m.	Name: Phil Blonn

K06-233, K06-234

K06-233, K06-234

Combined Sewer Overflow Solids/Floatables Control Data Sheet

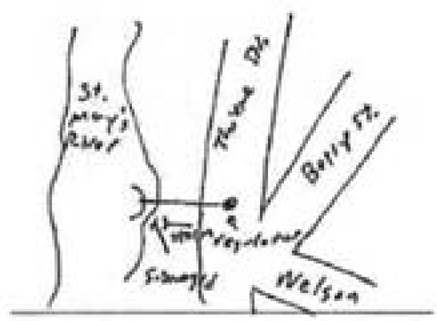
Overflow Point #: 013	Location #: K06-298
Street Location: St. Mary's River at Thieme Dr., Nelson St. and Berry St.	Receiving Water: St. Mary's River
Subbasin: K06-090 A	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 5,830,632 (model)	CSO Annual Frequency (times/year): 52 model; no Jan.-Apr. data
CSO Annual Overflow (hours): 211 (model)	Tide Gate Type: tide gate
Discharge Size: 72"	Discharge Invert: N/A submerged
River Elevation: N/A	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Has overflowed in past due to plugged up sewer lines; no identifiables observed going into river

Draw site/describe conditions:

No identifiables observed; some leaves; stormwater runoff debris; beer bottles; litter



Noted debris in water (type, size, quantify):

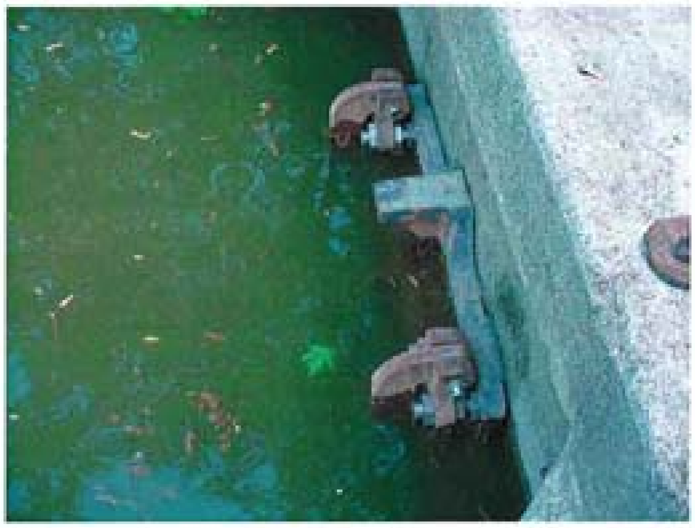
A few leaves

Noted debris on land (type, size, quantify):

Beer bottles

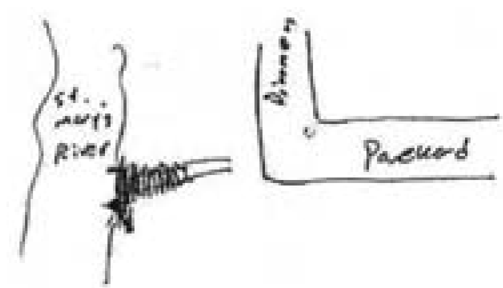
Date of Visit: 5/12 12:45 p.m.	Name: Phil Blonn

K06-298





Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 014	Location #: K07-106
Street Location: Packard and Dinnen	Receiving Water: St. Mary's River
Subbasin: K07-026	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 73,187 (model)	CSO Annual Frequency (times/year): 63 (model); 0 Jan.-Apr. data
CSO Annual Overflow (hours): 104 (model)	Tide Gate Type: None
Discharge Size: 12"	Discharge Invert: 743.3
River Elevation: 743+/- (low flow elev.)	Last Precipitation: 5:00 p.m. yesterday
Summarize site history: Most of the basin served by combined sewers, a few separate storm sewers along southern sections of Broadway	
Draw site/describe conditions: 	
Noted debris in water (type, size, quantify): None	
Noted debris on land (type, size, quantify): Significant amount of litter; stormwater runoff material, leaves, etc. right below outfall before river	
Date of Visit: 5/12 9:45 a.m.	Name: Phil Blonn

K07-106

Combined Sewer Overflow Solids/Floatables Control Data Sheet

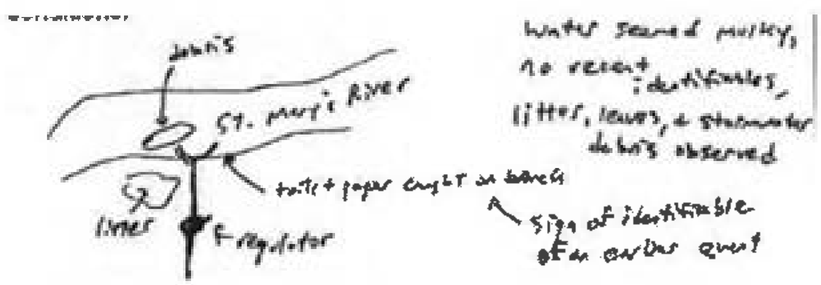
Overflow Point #: 016	Location #: K07-109
Street Location: 3418 Broadway	Receiving Water: St. Mary's River
Subbasin: K07-026	Immediate Area Land Use (describe): Commercial and residential
CSO Annual Volume (cf): 6,621 (model)	CSO Annual Frequency (times/year): 9 (model); 0 (Jan.-Apr. data)
CSO Annual Overflow (hours): 4 (model)	Tide Gate Type: none
Discharge Size: 12"	Discharge Invert: unknown
River Elevation: 743+/- (low flow elev.)	Last Precipitation: 5:00 p.m. yesterday
Summarize site history: Never has been observed overflowing	
Draw site/describe conditions: Headwall completely collapsed; several sections of pipe broken and disconnected; severe erosion at current outfall point; no signs of identifiable sewage; debris at outfall looks like stormwater runoff debris; a lot of leaves, sediment	
Noted debris in water (type, size, quantify): None	
Noted debris on land (type, size, quantify): Large amounts (piles) of household garbage and litter among trees on shore of river	
Date of Visit: 5/12 11:00 a.m.	Name: Phil Blonn

K07-109

K07-109

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 017	Location #: K07-176
Street Location: 2904 Wildmere	Receiving Water: St. Mary's River
Subbasin: K07-026	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 963,279 (model)	CSO Annual Frequency (times/year): 32 (model); 8 (Jan.-Apr. data)
CSO Annual Overflow (hours): 88 (model)	Tide Gate Type: flapgate
Discharge Size: 42" diameter	Discharge Invert: unknown
River Elevation: 743 +/- (low flow elev.)	Last Precipitation: 5:00 p.m. yesterday
Summarize site history: There has been observed overflow with identifiable debris in the past	
Draw site/describe conditions:	
Noted debris in water (type, size, quantify): Litter caught on dead tree in water	
Noted debris on land (type, size, quantify): Litter, pile of trash	
Date of Visit: 5/12 11:30 a.m.	Name: Phil Blonn



K07-176

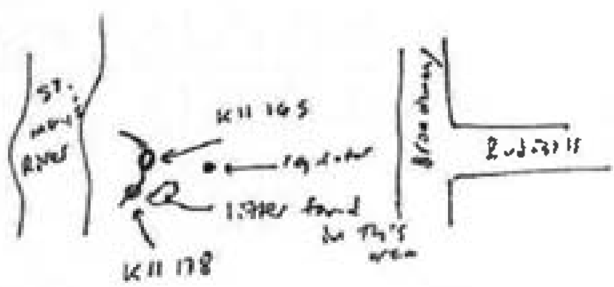
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 018	Location #: K11-165
Street Location: near Broadway and Rudisill	Receiving Water: St. Mary's River
Subbasin: K11-010	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 51,159,119 (model)	CSO Annual Frequency (times/year): 84 (model); 8 (Jan.-Apr. data)
CSO Annual Overflow (hours): 470 (model)	Tide Gate Type: 12' x 12' tidegate
Discharge Size: 126"	Discharge Invert: 744.06'
River Elevation: 743+/-	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

This is about 40% of the total CSO volume for the city.
See also data sheet 019 (K11-178).

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

See also data sheet 019 (K11-178).

Noted debris on land (type, size, quantify):

See also data sheet 019 (K11-178).

Date of Visit: 5/12 10:20 a.m.	Name: Phil Blonn

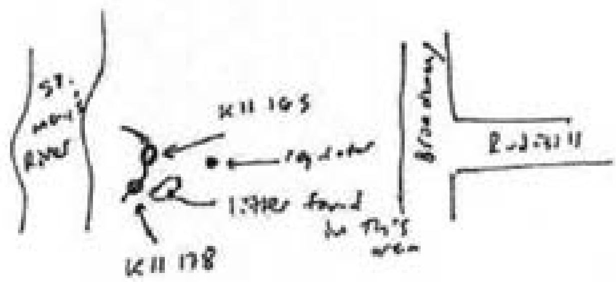
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 019	Location #: K11-178
Street Location: Near Broadway and Rudisill	Receiving Water: St. Mary's River
Subbasin: K11-010	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): included w/K11-165	CSO Annual Frequency (times/year): see K11-165; 5 (Jan.-Apr. data)
CSO Annual Overflow (hours):	Tide Gate Type: flapgate
Discharge Size: 42"	Discharge Invert: 745.75'
River Elevation: 743+/- (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Debris observed in past during heavy rains; bottles, toilet paper, leaves; a lot of storm hooked into this

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

Small amount of leaves

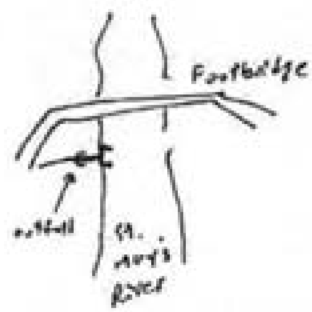
Noted debris on land (type, size, quantify):

Small amount of litter; pop cans, bags, etc.

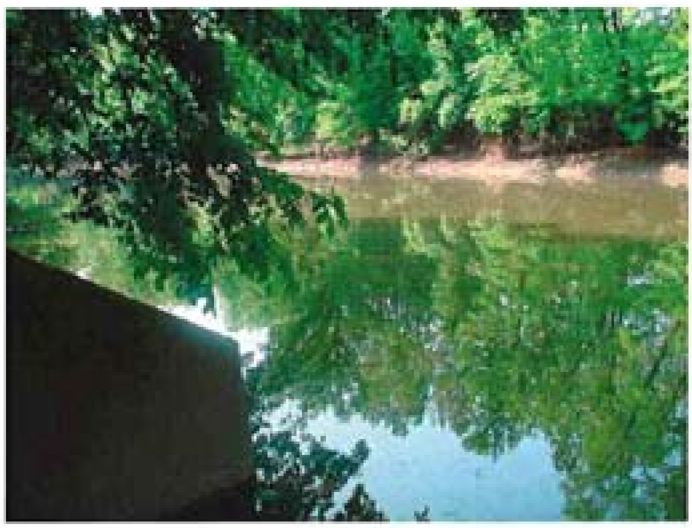
Date of Visit: 5/12 10:20 a.m.	Name: Phil Blonn

K11-165, K11-178

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 020	Location #: K15-116
Street Location: near foot bridge to Foster Park West a couple of thousand feet west of this regulator on the east bank of St. Mary's River	Receiving Water: St. Mary's River
Subbasin: K15-009	Immediate Area Land Use (describe): Park
CSO Annual Volume (cf): 2,457,734 (model)	CSO Annual Frequency (times/year): 72 (model); 8 (Jan.-Apr. data)
CSO Annual Overflow (hours): 249	Tide Gate Type: internal flapgate u/s of outfall
Discharge Size: 6' x 6' box culvert	Discharge Invert: ≈744+/-
River Elevation: 744+/- (low flow elev.)	Last Precipitation: 5:00 p.m. yesterday
Summarize site history: River often backs up into system at this point, debris often gets clogged at internal flapgate	
Draw site/describe conditions: No sign of debris at flapgate or regulator or outfall at time of visit 	
Noted debris in water (type, size, quantify): Small amount of leaves, plant debris	
Noted debris on land (type, size, quantify): None	
Date of Visit: 5/12 10:00 a.m.	Name: Phil Blonn

K15-116



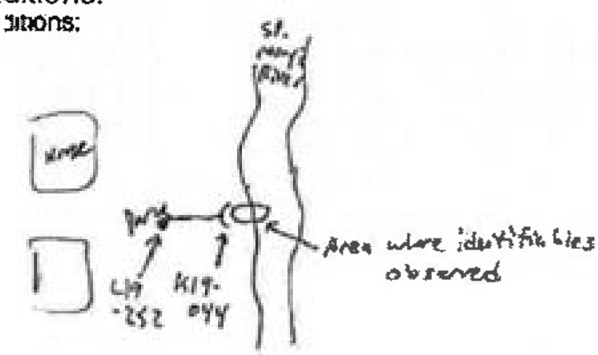
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 021	Location #: K19-044
Street Location: 5340 Century Court	Receiving Water: St. Mary's River
Subbasin: L19-252	Immediate Area Land Use (describe): Residential, park
CSO Annual Volume (cf): 1,425,564 (model)	CSO Annual Frequency (times/year): 56 (model); 10 (Jan.-Apr. data)
CSO Annual Overflow (hours): 344 (model)	Tide Gate Type: flapgate
Discharge Size: 66"	Discharge Invert: less than 1' above water level
River Elevation: 745 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Most combined sewers constructed in 1950s

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

Plume of sewage; identifiables, toilet paper, waste etc. on concrete and in water spillway; right at discharge point

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/12 9:00 a.m.	Name: Phil Blonn

K19-044






K19-044

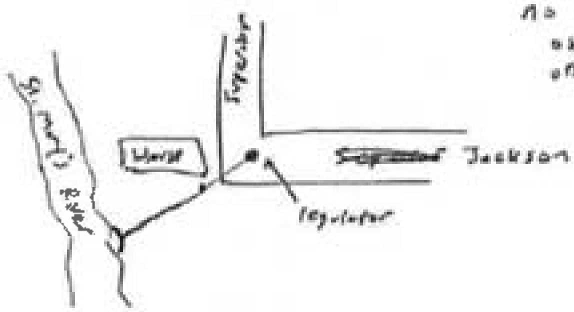
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 023	Location #: L06-103
Street Location: Jackson and Superior	Receiving Water: St. Mary's River
Subbasin: L06-078	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 267,138 (model)	CSO Annual Frequency (times/year): 54 (model); 6 (Jan.-Apr. data)
CSO Annual Overflow (hours): 20 (model)	Tide Gate Type: flapgate
Discharge Size: 48" diameter	Discharge Invert: unknown, bottom is submerged
River Elevation: 733 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Overflows with murky water have been observed, usually no identifiables; occasional river intrusion when water is real high and outfall is submerged

Draw site/describe conditions:



no debris observed other than a few leaves

Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/12 1:15 p.m.	Name: Phil Blonn

L06-103

Combined Sewer Overflow Solids/Floatables Control Data Sheet

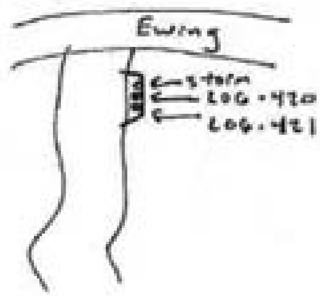
Overflow Point #: 024	Location #: L06-420
Street Location: Ewing and Superior	Receiving Water: St. Mary's River
Subbasin: L06-087	Immediate Area Land Use (describe): Commercial
CSO Annual Volume (cf): 1,195,116 (model)	CSO Annual Frequency (times/year): 16 (model); 6 (Jan.-Apr. data)
CSO Annual Overflow (hours): 40	Tide Gate Type: flapgate
Discharge Size: 72" diameter	Discharge Invert: ≈733+/-
River Elevation: 733 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Identifiables observed in river during one event last year; submerged ≈ 50% of the time; leaks back into system when 50% submerged or more

Draw site/describe conditions:

No debris observed in area; water level at bottom of outfalls



Noted debris in water (type, size, quantify):

One pop bottle in water

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/12 1:30 p.m.	Name: Phil Blonn

Combined Sewer Overflow Solids/Floatables Control Data Sheet

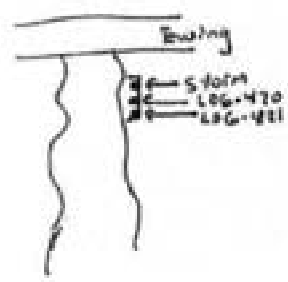
Overflow Point #: 025	Location #: L06-421
Street Location: Ewing and Superior	Receiving Water: St. Mary's River
Subbasin: L06-086	Immediate Area Land Use (describe): Commercial
CSO Annual Volume (cf): 48 (model)	CSO Annual Frequency (times/year): 1 (model); 5 (Jan.-Apr. data)
CSO Annual Overflow (hours): 1 (model)	Tide Gate Type: flapgate
Discharge Size: 60"	Discharge Invert: ≈ 733+/-
River Elevation: 733 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Identifiables observed in river during one event last year; submerged ≈ 50% of the time; leaks back into system when 50% submerged or more

Draw site/describe conditions:

No debris observed in area; water level at bottom of outfalls



Noted debris in water (type, size, quantify):

One pop bottle in water

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/12 1:30 p.m.	Name: Phil Blonn

L06-420, L06-421

Combined Sewer Overflow Solids/Floatables Control Data Sheet

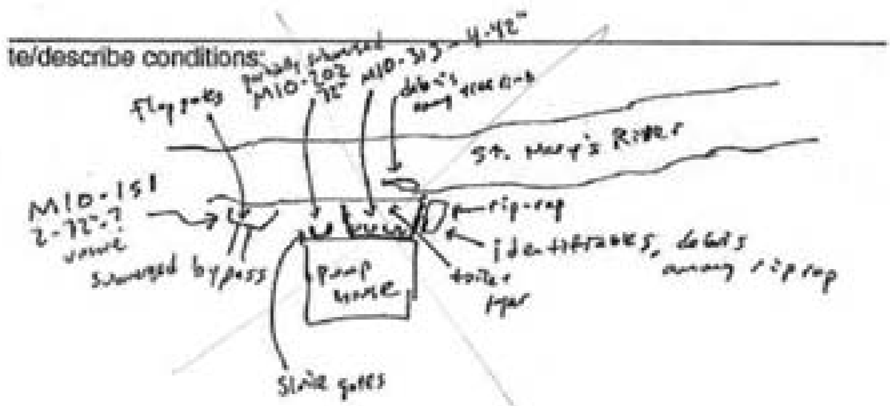
Overflow Point #: 026	Location #: M10-151
Street Location: 3rd Street and Calhoun	Receiving Water: St. Mary's River
Subbasin: M10-120	Immediate Area Land Use (describe): Residential and abandoned commercial/industrial
CSO Annual Volume (cf): 17,562,363 (model)	CSO Annual Frequency (times/year): 66 (model); no Jan.-Apr. data
CSO Annual Overflow (hours): 328 (model) 4 - 6'x6' openings	Tide Gate Type: flapgates
Discharge Size: ~~2 ≈ 72"~~ diameter	Discharge Invert: unknown
River Elevation: 738 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Most sewers built 1893-1930, rest in 1950; toilet paper, fecal, identifiables observed litter, stormwater runoff observed coming out when pumps are on

Draw site/describe conditions:

Adjacent to Overflow Point #027 (Location # M10-202) and Overflow Point #033 (M10-313)



Noted debris in water (type, size, quantify):

Some identifiables, more on rip-rap

Noted debris on land (type, size, quantify):

Identifiables, toilet paper on spillway, in rip-rap

Date of Visit: 5/12 1:45 p.m.	Name: Phil Blonn

Combined Sewer Overflow Solids/Floatables Control Data Sheet

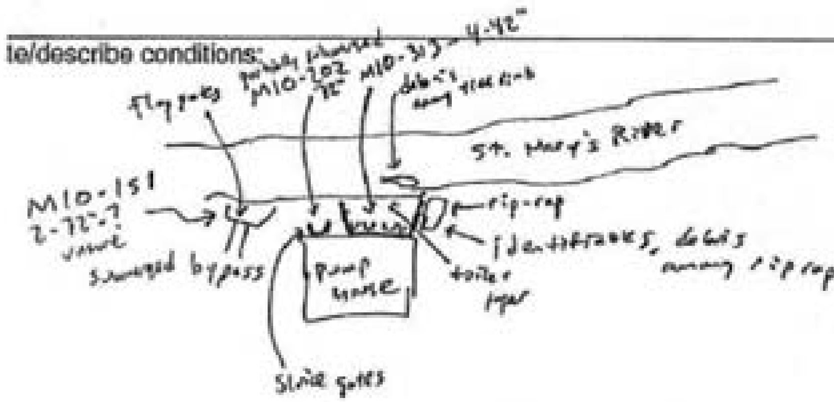
Overflow Point #: 027	Location #: M10-202
Street Location: 3rd Street and Calhoun	Receiving Water: St. Mary's River
Subbasin: M10-120	Immediate Area Land Use (describe): Residential and abandoned commercial/industrial
CSO Annual Volume (cf): ~~17,562,363~~ (model) SEE 026	CSO Annual Frequency (times/year): ~~66 (model)~~; no Jan.-Apr. data SEE 026
CSO Annual Overflow (hours): ~~328~~ (model) SEE 026	Tide Gate Type: sluice gate & FLAP GATE
Discharge Size: 1 ≈ 72" diameter	Discharge Invert: 734.77
River Elevation: 738 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Most sewers built 1893-1930, rest in 1950; toilet paper, fecal, identifiables observed litter, stormwater runoff observed coming out when pumps are on

Draw site/describe conditions:

Adjacent to Overflow ~~Point #026 (Location # M10-151)~~ ~~and~~ Overflow Point #033 (M10-313)



Noted debris in water (type, size, quantify):

Some identifiables, more on rip-rap

Noted debris on land (type, size, quantify):

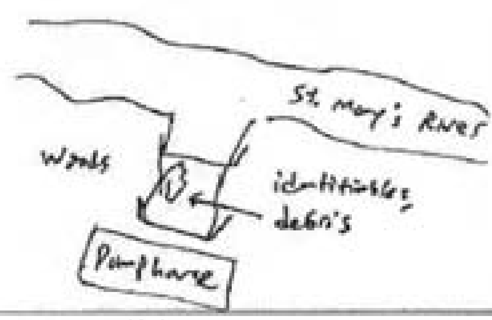
Identifiables, toilet paper on spillway, in rip-rap

Date of Visit: 5/12 1:45 p.m.	Name: Phil Blonn

M10-202, M10-313, M10-151

M10-202, M10-313, M0-151

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 028	Location #: M10-238
Street Location: Griswald pump station	Receiving Water: St. Mary's River
Subbasin: M10-237	Immediate Area Land Use (describe): Commercial; Institutional
CSO Annual Volume (cf): 471,877 (model)	CSO Annual Frequency (times/year): 15 (model); 4 (Jan.-Apr. data)
CSO Annual Overflow (hours): 24 (model)	Tide Gate Type: flapgate
Discharge Size: 30"	Discharge Invert: unknown
River Elevation: 738' (low water elev.)	Last Precipitation: 5:00 p.m. yesterday
Summarize site history: Remnants of identifiable debris usually found after pumps go on	
Draw site/describe conditions:  	
Noted debris in water (type, size, quantify): None	
Noted debris on land (type, size, quantify): Toilet paper caught in branches; 20 sq. ft. area of toilet paper caught on spillway	
Date of Visit: 5/12 2:25 p.m.	Name: Phil Blonn

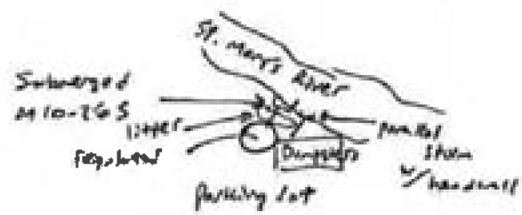
M10-238

Combined Sewer Overflow Solids/Floatables Control Data Sheet

<table>
<tr><td>Overflow Point #: 029</td><td>Location #: M10-265</td></tr>
<tr><td>Street Location: Duck Street and Bass Street</td><td>Receiving Water: St. Mary's River</td></tr>
<tr><td>Subbasin: M10-250</td><td>Immediate Area Land Use (describe):

Commercial</td></tr>
<tr><td>CSO Annual Volume (cf): 604,752 (256) (model); 29,491 (309) (model)</td><td>CSO Annual Frequency (times/year): 70 (256) (model); 26 (309) (model); 13 (Jan.-Apr. data);</td></tr>
<tr><td>CSO Annual Overflow (hours): 34 (256); 2 (309) (model)</td><td>Tide Gate Type: unknown</td></tr>
<tr><td>Discharge Size: 48"</td><td>Discharge Invert: 734.79'</td></tr>
<tr><td>River Elevation: 744-746 normal elev.</td><td>Last Precipitation: 5:00 p.m. yesterday</td></tr>
<tr><td colspan="2">Summarize site history:

Some observed identifiables, toilet paper seen passing through regulator</td></tr>
<tr><td colspan="2">Draw site/describe conditions:

Submerged outfall, could not see it

</td></tr>
<tr><td colspan="2">Noted debris in water (type, size, quantify):

Some litter, a few bottles; large amount of litter, bottles, a volleyball in standing water inside regulator manhole</td></tr>
<tr><td colspan="2">Noted debris on land (type, size, quantify):

Miscellaneous litter</td></tr>
<tr><td>Date of Visit: 5/12 2:10 p.m.</td><td>Name: Phil Blonn</td></tr>
</table>

M10-265

Combined Sewer Overflow Solids/Floatables Control Data Sheet

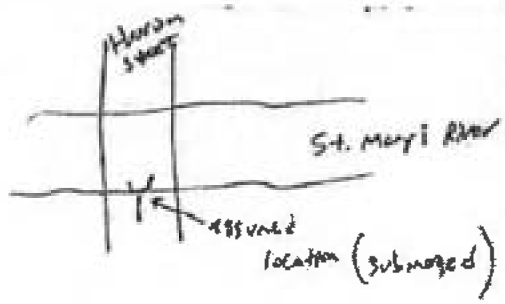
Overflow Point #: 032	Location #: M10-306
Street Location: Harrison St. Bridge	Receiving Water: St. Mary's River
Subbasin: M06-711	Immediate Area Land Use (describe): Commercial
CSO Annual Volume (cf): 183,098 (model)	CSO Annual Frequency (times/year): 5 (model); 7 (Jan.-Apr. data)
CSO Annual Overflow (hours): 44 (model)	Tide Gate Type: flapgate (?)
Discharge Size: 60" or 30" - ?	Discharge Invert: cannot locate, submerged
River Elevation: 738 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

No observed identifiables, but some bubbles observed during an overflow near where location is assumed to be

Draw site/describe conditions:

Outfall submerged, not found under bridge somewhere



Noted debris in water (type, size, quantify):

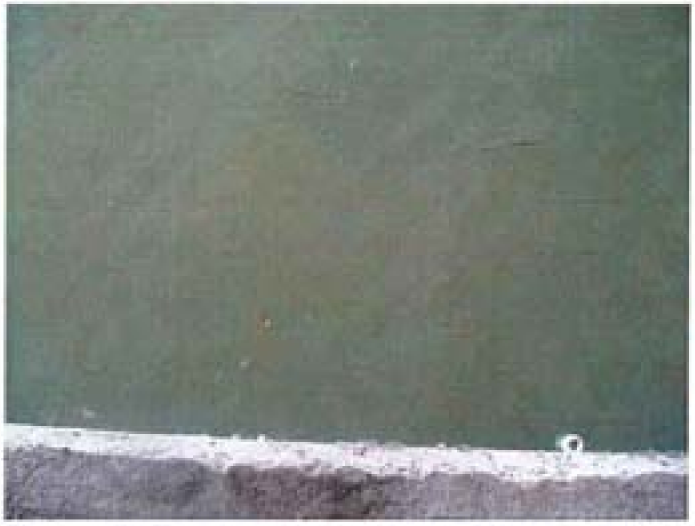
1 beer can

Noted debris on land (type, size, quantify):

Cardboard, clothing

Date of Visit: 5/12 1:35 p.m.	Name: Phil Blonn

M10-306



Combined Sewer Overflow Solids/Floatables Control Data Sheet

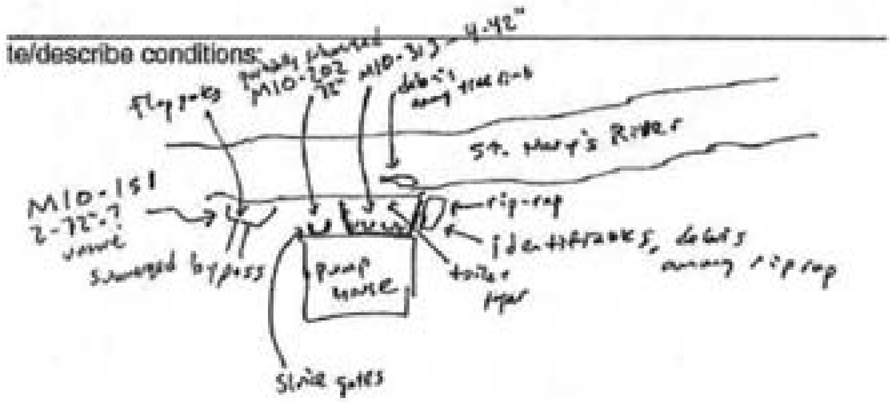
Overflow Point #: 033	Location #: M10-313
Street Location: 3rd Street and Calhoun	Receiving Water: St. Mary's River
Subbasin: M10-120	Immediate Area Land Use (describe): Residential and abandoned commercial/industrial
CSO Annual Volume (cf): ~~17,562,363~~ ~~(model)~~ SEE 026	CSO Annual Frequency (times/year): ~~66~~ SEE 026 ~~(model)~~; no Jan.-Apr. data
CSO Annual Overflow (hours): ~~328~~ ~~(model)~~ SEE 026	Tide Gate Type: flapgates
Discharge Size: 4 - 42" diameter	Discharge Invert: 752.07
River Elevation: 738 (low water elev.)	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Most sewers built 1893-1930, rest in 1950; toilet paper, fecal, identifiables observed litter, stormwater runoff observed coming out when pumps are on

Draw site/describe conditions:

Adjacent to ~~Overflow Point #026 (M10-151) and~~ Overflow Point #027 (Location # M10-202)



Photos follow data sheet 027.

Noted debris in water (type, size, quantify):

Some identifiables, more on rip-rap

Noted debris on land (type, size, quantify):

Identifiables, toilet paper on spillway, in rip-rap

Date of Visit: 5/12 1:45 p.m.	Name: Phil Blonn

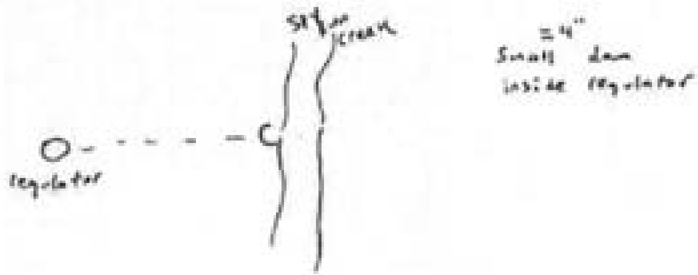
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 036	Location #: M18-032
Street Location: 2315 Westbrook	Receiving Water: Spy Run Creek to St. Mary's River
Subbasin: M18-256	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 1,864,615 (model)	CSO Annual Frequency (times/year): 83 (model); 4 (Jan.-Apr. data)
CSO Annual Overflow (hours): 727 (model)	Tide Gate Type: flapgate
Discharge Size: 24"	Discharge Invert: 747.54
River Elevation: 740 (low water elev.)	Last Precipitation: 7:40 a.m.

Summarize site history:

No identifiables observed

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

None, water looked very murky

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 12:40 p.m.	Name: Phil Blonn

M18-032

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 039	Location #: N06-022
Street Location: 721 Edgewater (we stopped); Hannah and Wayne; outfall at Hannah and Berry	Receiving Water: Maumee River
Subbasin: N06-007	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 3,051,243 (model)	CSO Annual Frequency (times/year): 40 (model)
CSO Annual Overflow (hours): 269 (model)	Tide Gate Type: N/A
Discharge Size: 60"	Discharge Invert: 761.5+/-
River Elevation: 740+/-	Last Precipitation: 7:40 a.m.

Summarize site history:

Most sewage is collected by combination sewers. The Wayne Street interceptor serves this subbasin.

Draw site/describe conditions:

Outfall location not accessible

Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 11:06 a.m.	Name: Phil Blonn

N06-022

Combined Sewer Overflow Solids/Floatables Control Data Sheet

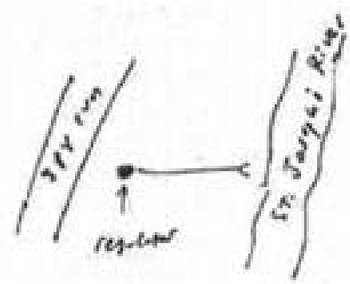
Overflow Point #: 044	Location #: N22-093
Street Location: Dalgren and Spy Run	Receiving Water: St. Joseph's River
Subbasin: M18-261	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 9,510 (model)	CSO Annual Frequency (times/year): 3 (model); 4 (Jan.-Apr. data)
CSO Annual Overflow (hours): 13 (model)	Tide Gate Type: flapgate
Discharge Size: 12"	Discharge Invert: ≈ 745 +/-
River Elevation: 743.5' (low water elev.)	Last Precipitation: 7:40 a.m.

Summarize site history:

Has not seen many overflows

Draw site/describe conditions:

Regulator builds up about 1' before overflowing



Noted debris in water (type, size, quantify):

Identifiables, toilet paper, minimal amount on rip rap immediately d/s of outfall

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 2:00 p.m.	Name: Phil Blonn

N22-093

Combined Sewer Overflow Solids/Floatables Control Data Sheet

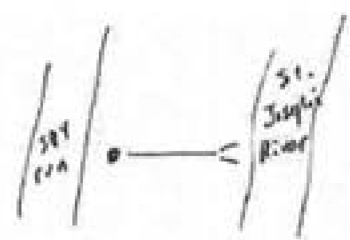
Overflow Point #: 045	Location #: N22-103
Street Location: Spy Run, 400' East of Dalgren	Receiving Water: St. Joseph's River
Subbasin: M18-261	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 8,680 (model)	CSO Annual Frequency (times/year): 3 (model); 4 (Jan.-Apr. data)
CSO Annual Overflow (hours): 2 (model)	Tide Gate Type: flapgate
Discharge Size: 10"	Discharge Invert: ≈ 745 +/-
River Elevation: 743.5' (low water elev.)	Last Precipitation: 7:40 a.m.

Summarize site history:

Has not seen many overflows; some groundwater flow into system

Draw site/describe conditions:

Regulator builds up about 1" before overflowing



Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

Small amount of general litter; a few wrappers; green sludge on rip rap d/s of outfall

Date of Visit: 5/11 2:07 p.m.	Name: Phil Blonn

N22-103

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 048	Location #: O10-252
Street Location: Morton Street Pump Station	Receiving Water: Maumee River
Subbasin: O10-101	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 11,305,463 (model)	CSO Annual Frequency (times/year): 63 (model); no Jan.-Apr. data
CSO Annual Overflow (hours): 256 (model)	Tide Gate Type: shut off valve
Discharge Size: 5", 30" discharges	Discharge Invert: 745.0'
River Elevation: 742+/- (low water elev.)	Last Precipitation: 7:40 a.m.
Summarize site history: Overflows during large rain events; overflows are typically clear-looking sewage	
Draw site/describe conditions: Pump station, 4 pumps, 5 gates, 4 were open 	
Noted debris in water (type, size, quantify): None	
Noted debris on land (type, size, quantify): None	
Date of Visit: 5/11 11:15 a.m.	Name: Phil Blonn

O10-252

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 050	Location #: O10-277
Street Location: Coombs and Herbert	Receiving Water: Maumee River
Subbasin: O06-017	Immediate Area Land Use (describe): Commercial
CSO Annual Volume (cf): 1,621,933 (model)	CSO Annual Frequency (times/year): 52 (model); 2 (Jan.-Apr. data)
CSO Annual Overflow (hours): 294 (model)	Tide Gate Type: 4'-5' wide flapgate in regulator MH and 36" flapgate at outfall
Discharge Size: 36" diameter brick	Discharge Invert: N/A, submerged
River Elevation: 738.0	Last Precipitation: 7:40 a.m.

Summarize site history:

No identifiables observed.

Draw site/describe conditions:

Regulator overtops small dam in MH and then flapgate, but river water was flowing in at this point during visit; outfall site is not accessible

Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 10:55 a.m.	Name: Phil Blonn

O10-277




Combined Sewer Overflow Solids/Floatables Control Data Sheet

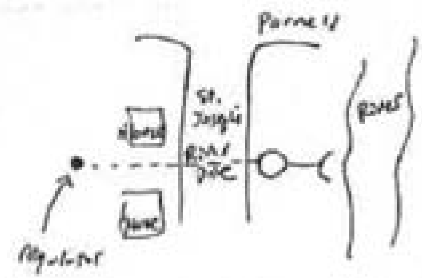
Overflow Point #: 051	Location #: O22-094
Street Location: 1124 St. Joseph's River Drive	Receiving Water: St. Joseph's River
Subbasin: O22-092	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 291,092 (model)	CSO Annual Frequency (times/year): 10 (model); 5 (Jan.-Apr. data)
CSO Annual Overflow (hours): 26 (model)	Tide Gate Type: tide flex valve
Discharge Size: 18" diameter	Discharge Invert: 746.68
River Elevation: unknown ≈ 3-4' below invert	Last Precipitation: 7:40 a.m.

Summarize site history:

Sewers first constructed in area in 1945

Draw site/describe conditions:

Some identifiable debris on rocks immediately d/s of outfall



Noted debris in water (type, size, quantify):

Litter, cigarette butts, toilet paper, toilet paper on rip-rap immediately downstream of outlet port

Noted debris on land (type, size, quantify):

Some street litter

Date of Visit: 5/11 2:45 p.m.	Name: Phil Blonn

O22-094






O22-094

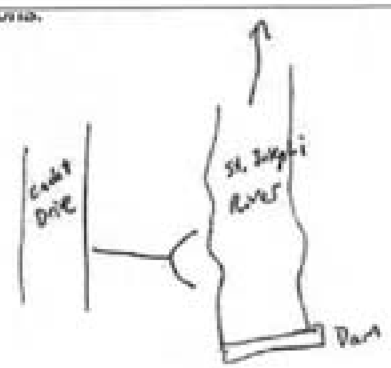
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 052	Location #: O22-004
Street Location: Cadet Drive behind Concordia Lutheran High School	Receiving Water: St. Joseph's River
Subbasin: O22-0618	Immediate Area Land Use (describe): Residential, school
CSO Annual Volume (cf): 453,625 (model); 328,777 (model)	CSO Annual Frequency (times/year): 45,17 (model); 7 (Jan.-Apr. data)
CSO Annual Overflow (hours): 231 (model); 27 (model)	Tide Gate Type: flapgate
Discharge Size: 48"	Discharge Invert: 749.58
River Elevation: 738.50	Last Precipitation: 7:40 a.m.

Summarize site history:

Sewers built in area in 1945

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

Paper towels stuck in flapgate

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 2:30 p.m.	Name: Phil Blonn

O22-004

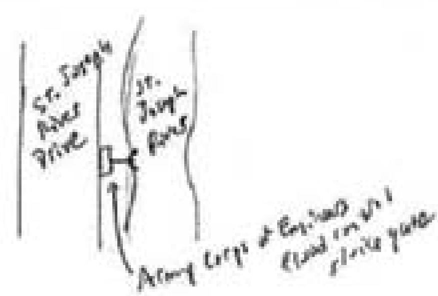
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 053	Location #: O22-002
Street Location: 1324 St. Joseph's River Drive	Receiving Water: St. Joseph's River
Subbasin: O22-092	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 134,659 (model)	CSO Annual Frequency (times/year): 9 (model); 5 (Jan.-Apr. data)
CSO Annual Overflow (hours): 19 (model)	Tide Gate Type: flapgate
Discharge Size: 42" diameter	Discharge Invert: unknown
River Elevation: unknown ≈ 5' below discharge invert	Last Precipitation: 7:40 a.m.

Summarize site history:

No indications of overflows

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

General litter; no identifiable sewer debris

Noted debris on land (type, size, quantify):

Small pile of litter; pile of litter from storm runoff; see photo

Date of Visit: 5/11 2:30 p.m.	Name: Phil Blonn

O22-002

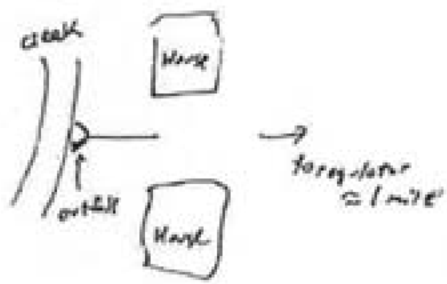
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 054	Location #: O23-080
Street Location: 1274 Farwood	Receiving Water: ditch, then St. Mary's River
Subbasin: N23-078	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 511,038 (model)	CSO Annual Frequency (times/year): 27 (model); 5 (Jan.-Apr. data)
CSO Annual Overflow (hours): 100 (model)	Tide Gate Type: none
Discharge Size: 48" diameter	Discharge Invert: 772.2
River Elevation: 744 +/-	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Area built in two sections in 1950 and 1951

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

None; some identifiables in brush downstream of outflow

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/12 8:30 a.m.	Name: Phil Blonn

O23-080

Combined Sewer Overflow Solids/Floatables Control Data Sheet

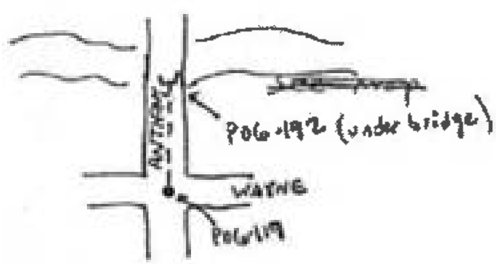
Overflow Point #: 055	Location #: P06-192
Street Location: Anthony and Wayne	Receiving Water: Maumee River
Subbasin: P06-119	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): 2,959,476 (model)	CSO Annual Frequency (times/year): 62 (model); 7 (Jan.-Apr. data)
CSO Annual Overflow (hours): 515 (model)	Tide Gate Type: flapgate
Discharge Size: 48" diameter	Discharge Invert: unknown, ≈ 2-3' above water level
River Elevation: 731.5 (normal water elevation)	Last Precipitation: 7:40 a.m.

Summarize site history:

Solids and identifiables have been observed by staff during overflows; was not overflowing during visit

Draw site/describe conditions:

Overflow water usually clear, some groundwater, stormwater gets in past regulator, flapgate was discharging a trickle of flow during visit, regulator in system of MH's at Anthony and Wayne intersection.



Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 10:40 a.m.	Name: Phil Blonn

P06-192






Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 056	Location #: J03-313
Street Location: Brown Street Pump Station Regulator; 1800 Brown Street South Side of Brown Street just east of Electric Avenue	Receiving Water: St. Mary's River
Subbasin: J03-012	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): ~~63,215 (model)~~ SEE 007 SEE 007	CSO Annual Frequency (times/year): ~~10 (model)~~ no Jan.-Apr. data
CSO Annual Overflow (hours): ~~10 (model)~~	Tide Gate Type: flapgate
Discharge Size: 2-36" diameter	Discharge Invert: 752.75
River Elevation: 735.0 (normal)	Last Precipitation: 5:00 p.m. yesterday

SEE 007

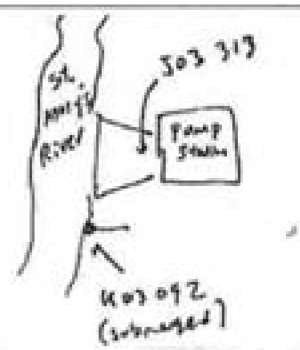
Summarize site history:

Identifiable residential sanitary sewage observed at this site in the past, not on this visit

Draw site/describe conditions:

Adjacent to Overflow Point 007,
Location # K03-092

Photos follow data sheet 007.



Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

Small amount of litter

Date of Visit: 5/12 11:45 a.m.	Phil Blonn

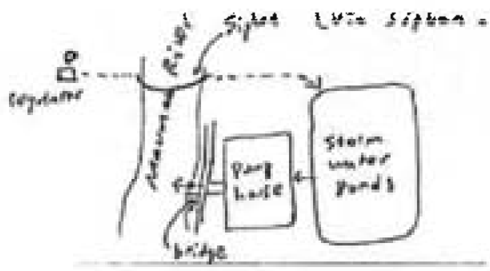
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 057	Location #: P10-121
Street Location: Wayne and Glasgow Regulator	Receiving Water: Storm Pond, then Maumee River
Subbasin: P06-014	Immediate Area Land Use (describe): Stormwater ponds, school, residences
CSO Annual Volume (cf): 8,673,828 (model)	CSO Annual Frequency (times/year): 45 (model); 4 (Jan. – Apr. data)
CSO Annual Overflow (hours): 128 (model)	Tide Gate Type: heavy duty flapgates
Discharge Size: 96" dia; 3 – 84" x 84" boxes	Discharge Invert: 734.25
River Elevation: 732 +/-	Last Precipitation: 7:40 AM

Summarize site history: Identifiable debris can be observed in water, but difficult to know if source is the overflow point

Draw site/describe conditions:

Mechanical regulator gate, chained permanently open, doesn't work, small dam, if overtopped, flow goes to stormwater pump station on other side of river (via siphon under river). Flow can then either be pumped into pond or allowed to flow in to the river through openings in wet well.



Noted debris in water (type, size, quantify):

Condom, floatable biosolids, organic matter

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 10:00 a.m.	Name: Phil Blonn

P10-121

P10-121

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 058	Location #: Q06-034
Street Location: Dwenger and Edsall 300' west of Edsall	Receiving Water: Maumee River
Subbasin: Q06-049	Immediate Area Land Use (describe): Industrial
CSO Annual Volume (cf): 47,734	CSO Annual Frequency (times/year): 3 (model); 2 (Jan.-Apr. data)
CSO Annual Overflow (hours): 4 (model)	Tide Gate Type: flapgate at Q06-035
Discharge Size: 24" diameter	Discharge Invert: ? several feet above river
River Elevation: ? ≈733+/-	Last Precipitation: 7:40 a.m.

Summarize site history:

Older industrial area; no indication of overflows

Draw site/describe conditions:

CSO regulator at street, connects to MH with flapgate, then open system to river, outfall located at river behind industrial building in wooded, steeply declining area, employees taking a break behind building, smoking, eating

Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

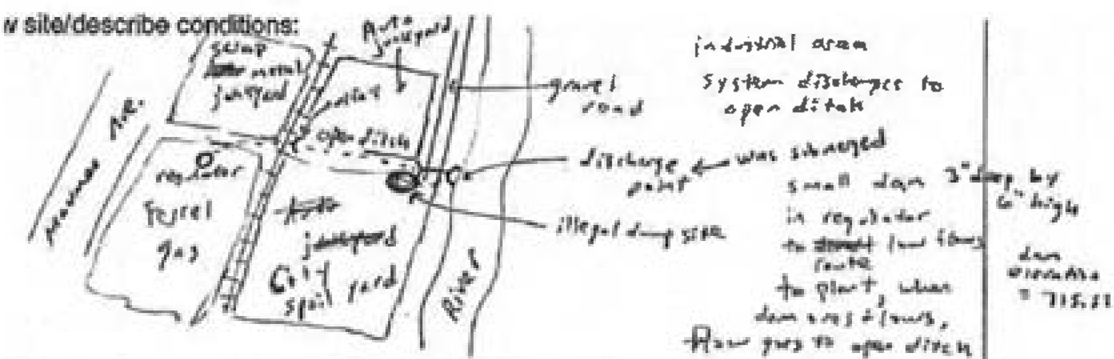
Several pop cans, bottles

Date of Visit: 5/11 8:45 a.m.	Name: Phil Blonn

Q06-034

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 060	Location #: R06-031
Street Location: 3333 Maumee Avenue North of Maumee between Edsall and Kitch	Receiving Water: Open ditch to Maumee River
Subbasin: Q06-002	Immediate Area Land Use (describe): Industrial, dumps
CSO Annual Volume (cf): 255,572 (model)	CSO Annual Frequency (times/year): 47 (model); 5 (Jan.-Apr. data)
CSO Annual Overflow (hours): 218 (model)	Tide Gate Type: flapgate
Discharge Size: 42" diameter	Discharge Invert: unknown
River Elevation: 731.50	Last Precipitation: 7:40 a.m.
Summarize site history: Discharge water is often rusty color, possibly due to auto junkyard	
Draw site/describe conditions:	



Noted debris in water (type, size, quantify): None	
Noted debris on land (type, size, quantify): Large dump of miscellaneous garbage on land next to ditch	
Date of Visit: 5/11 9:10 a.m.	Name: Phil Blonn

R06-031

R06-031

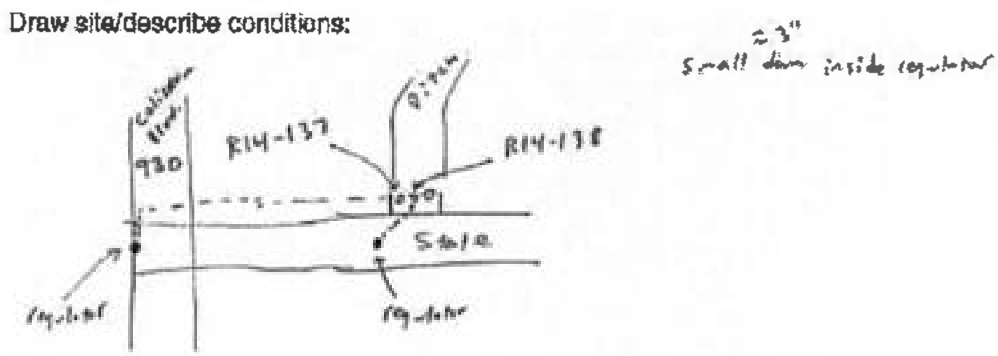
Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 061	Location #: R14-137
Street Location: Laverne and State	Receiving Water: open ditch to stormwater ponds to Maumee River
Subbasin: R14-033	Immediate Area Land Use (describe): Commercial
CSO Annual Volume (cf): 295,426 (model)	CSO Annual Frequency (times/year): 6 (model); 8 (Jan.-Apr. data)
CSO Annual Overflow (hours): 20 (model)	Tide Gate Type: none
Discharge Size: 42"	Discharge Invert: ≈ 765+/-
River Elevation: 733' (low water elevation)	Last Precipitation: 7:40 a.m.

Summarize site history:

No identifiables observed.

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 11:45 a.m.	Name: Phil Blonn

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 062	Location #: R14-138
Street Location: Laverne and State	Receiving Water: Maumee River via Baldwin Ditch
Subbasin: R14-075	Immediate Area Land Use (describe): Commercial
CSO Annual Volume (cf): 834,303 (model)	CSO Annual Frequency (times/year): 7 (model); 6 (Jan.-Apr. data)
CSO Annual Overflow (hours): 21 (model)	Tide Gate Type: flapgate
Discharge Size: 60"	Discharge Invert: 762.66+/-
River Elevation: 733+/- (low water elev.)	Last Precipitation: 7:40 a.m.

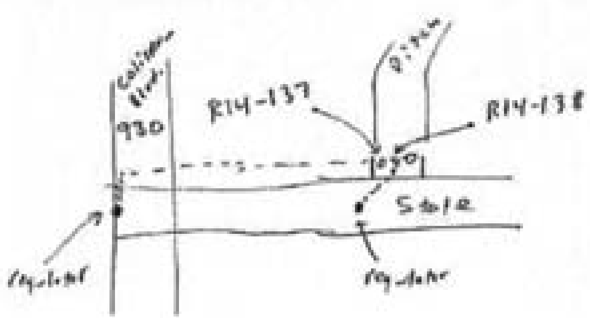
Summarize site history:

Seldomly overflows

Draw site/describe conditions:

Draw site/describe conditions:

~3"
Small dam inside regulator



Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

None

Date of Visit: 5/11 11:45 a.m.	Name: Phil Blonn

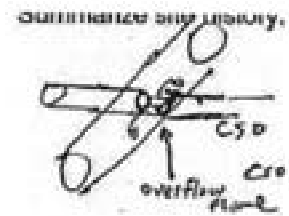
R14-137, R14-138

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 064	Location #: S02-035
Street Location: New Haven Avenue and Coliseum Boulevard	Receiving Water: Unnamed ditch, then Maumee River
Subbasin: Q06-202	Immediate Area Land Use (describe): Commercial/Residential, Industrial, open space
CSO Annual Volume (cf): 697,941 (model)	CSO Annual Frequency (times/year): 94 (model); 7 (Jan.-Apr. data)
CSO Annual Overflow (hours):588 (model)	Tide Gate Type: None
Discharge Size: 120" diameter	Discharge Invert: ≈ 747.0'
River Elevation: unknown	Last Precipitation: 5:00 p.m. yesterday

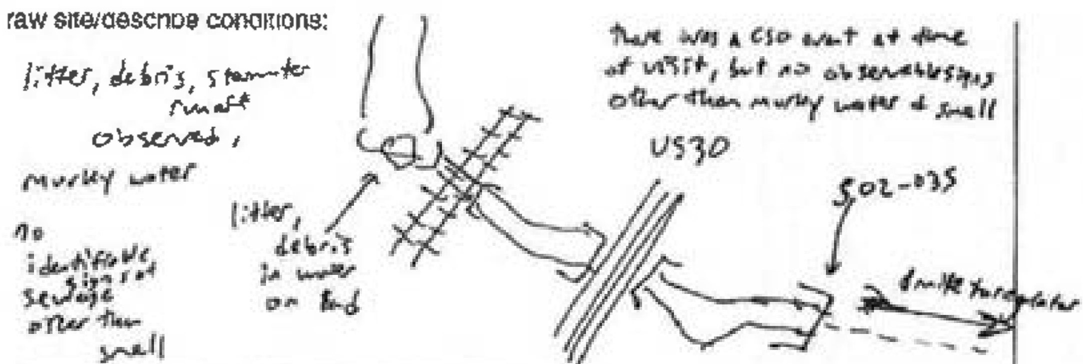
Summarize site history:

A lot of stormwater in this part of system, CSO water gets in through connection where CSO is a half-pipe line crossing through storm and spilling over (see diagram)



Draw site/describe conditions:

There was a CSO event at the time of visit, but no observable signs other than murky water and smell.



Noted debris in water (type, size, quantify):

Some litter

Noted debris on land (type, size, quantify):

Some litter

Date of Visit: 5/12 2:30 p.m.	Name: Phil Blonn

Combined Sewer Overflow Solids/Floatables Control Data Sheet

S02-035





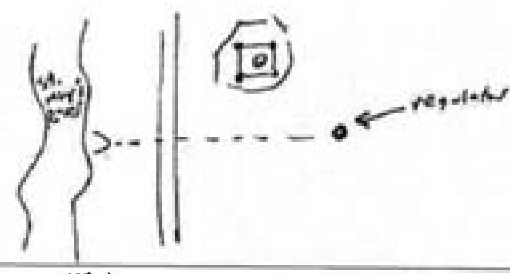

S02-035

Overflow Point #: 067	Location #: K19-077
Street Location: Foster Park at Hartman Road	Receiving Water: St. Mary's River
Subbasin: K15-112	Immediate Area Land Use (describe): Park, ball fields
CSO Annual Volume (cf): 215,375 (model)	CSO Annual Frequency (times/year): 96 (model) (likely high); 0 (Jan.-Apr. data)
CSO Annual Overflow (hours): 527 (model)	Tide Gate Type: flapgate
Discharge Size: 24"	Discharge Invert: N/A; guess ≈ 748-752+/-
River Elevation: ≈744+/-	Last Precipitation: 5:00 p.m. yesterday

Summarize site history:

Observed at regulator that it had overflowed, likely during last night's rain event; no sign of debris at outfall; small trickle at flow coming out of it; according to city; groundwater gets into system and flows out at this point

Draw site/describe conditions:



Noted debris in water (type, size, quantify):

None

Noted debris on land (type, size, quantify):

Some loose bricks

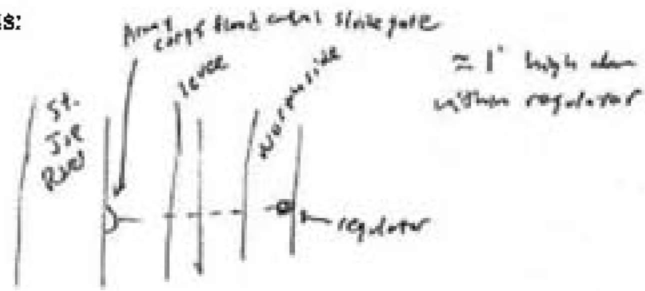
Date of Visit: 5/12 9:30 a.m.	Name: Phil Blonn

K19-077

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #: 068	Location #: N18-254
Street Location: Northside and Glazier	Receiving Water: St. Joseph River
Subbasin: N22-005	Immediate Area Land Use (describe): Residential
CSO Annual Volume (cf): no model info	CSO Annual Frequency (times/year): 2 (Jan.-Apr. data)
CSO Annual Overflow (hours):	Tide Gate Type: sluice gate
Discharge Size: 36" diameter	Discharge Invert: 743.7'
River Elevation: 737.50' (normal water elev.)	Last Precipitation: 7:40 a.m.
Summarize site history: Overflows in past	
Draw site/describe conditions:	
Noted debris in water (type, size, quantify): Identifiables, toilet paper, etc.; solids on rip-rap immediately d/s of outfall	
Noted debris on land (type, size, quantify): None; couch on top of levee	
Date of Visit: 5/11 1:30 p.m.	Name: Phil Blonn

nditions:



N18-254

Combined Sewer Overflow Solids/Floatables Control Data Sheet

Overflow Point #:	Location #: P10-011
Street Location: Northeast of intersection of Pemberton and Niagara at the Maumee River	Receiving Water: Maumee River
Subbasin: residential school	Immediate Area Land Use (describe): Residential; school
CSO Annual Volume (cf): N/A	CSO Annual Frequency (times/year): 5 (Jan.-Apr. data)
CSO Annual Overflow (hours): N/A	Tide Gate Type: tidegate at headwall, sluice gate at MH P10-173
Discharge Size: 60" x 66" concrete sewer	Discharge Invert: 734.06
River Elevation: 732.23	Last Precipitation: 7:40 a.m.
Summarize site history: Overflows several times a year	
Draw site/describe conditions: About one mile from regulators to outfall, a lot of stormwater tapped into system	
Noted debris in water (type, size, quantify): None	
Noted debris on land (type, size, quantify): None	
Date of Visit: 5/11 10:15 a.m.	Name: Phil Blonn

P10-001

EXHIBIT F-2

CSO Solids and Floatables Control Plan for Selected Sites

Prepared for

City of Fort Wayne
Board of Public Works

Prepared by
CH2MHILL
November 2004

City of Fort Wayne
CSO Solids and Floatables Control Plan for Selected Sites

Final Report

Prepared for

The City of Fort Wayne Board of Public Works
920 City-County Building, One Main Street
Fort Wayne, IN 46802

Prepared by

CH2MHILL

2225 Dwenger Avenue
Fort Wayne, Indiana 46803

November 2004

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Appendixes

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1. Introduction

1. Introduction

To assist the City of Fort Wayne in its ongoing long term control plan for minimizing CSOs, 44 CSO sites within the City were observed by CH2M HILL staff during the week of May 10th, 2004. As a result of this effort, four CSO locations (presented in Table 1) were identified as having a possible near-term need for solids and floatables control.

TABLE 1
CSO Sites Recommended for Further Investigation of Solids and Floatables Control

Overflow Point	Location Number	Street Location	Receiving Water	Discharge Size (in.)
017	K07-176	Waldron Circle/ Wildwood Avenue	St. Mary's River	42
021	K19-044	Old Mill & Fairfax/ Foster Park	St. Mary's River	66
026 027 033	M10-151 M10-202 M10-313	3rd Street and Calhoun/ Third Street Pump Station	St. Mary's River	One 72 and one 84 One 72 Four 42
052	O22-004	St. Joseph River Drive/ Concordia High School Access Road	St. Joseph River	48

Available technologies and approaches to CSO control are numerous and a broad initial list of candidate CSO technologies was developed to encompass many potential control objectives.

1.1 CSO Program Overview

CSO control technologies can be grouped into five general classifications:

- Sewer system optimization (regulator modifications; in-system storage)
- Inflow reduction (upstream stormwater storage; stormwater sumps; sewer separation; flow slippage; infiltration reduction)
- Storage (tanks; conduits; flow balancing)
- Source control (street sweeping; catch basin cleaning; sewer flushing; improved land use; public education programs)
- Treatment (booms; nets; baffles; screens; vortex separators; sedimentation)

Selecting the most appropriate technology or mix of technologies for a site or a sewer system depends on a variety of technical, environmental, and implementation factors. Sewer system optimization, inflow reduction, and storage are focused primarily around CSO quantity reduction where as source control and treatment are focused primarily around improving CSO quality.

The City of Fort Wayne is currently developing a long-term CSO control plan for its combined sewer system which includes technologies from the above groups. Additional wet weather conveyance is planned to convey the southern CSOs (along the Saint Mary River) and the CSOs along the Maumee River to the City of Fort Wayne water pollution control facility (WPCF). The drainage areas tributary to the northern CSOs along the Saint Joseph River may be scheduled for separation. A separate project is currently reviewing maximization of the existing system for storage and conveyance of flows to the WPCF. This project, the solids and floatables control project, will focus on source controls and treatment to physically remove solids and floatables from CSOs.

1.2 Site Descriptions

CSO 017 (Location #K07-176, Subbasin #K07-026, (Waldron Circle/Wildwood Avenue)

The 110-acre subbasin tributary to CSO 017 is 86 percent residential and 14 percent commercial. Residential property (¼ to ½ acre in size) is in close proximity to the regulator (#K07-171) and CSO. The regulator and CSO are located in the northwestern corner of the subbasin on the St. Mary's River. A City of Fort Wayne Sewer Utility Map of the area (Map No. K07, 2001) identifies the subbasin as 100 percent combined sewers.

A 42-inch combined sewer parallels the access road before it enters the regulator chamber. There is a weir inside the chamber which diverts dry weather flow away from the 42-inch CSO and toward the double barrel (10-inch and 8-inch) siphon under the St. Mary's River. There is a float-operated mechanical gate inside the structure that can be adjusted to open/close the gate at a specific water elevation in the chamber. There is about a 20-foot wide multiple resident driveway that serves as an access road to the regulator and CSO. The CSO discharges about 50 feet from the regulator.

CSO 021 (Location #K19-044, Subbasin #L19-252, Fairfax Avenue/Foster Park)

The 330-acre subbasin tributary to CSO 021 is 68 percent residential, 14 percent commercial, and 10 percent open space. The regulator (#L19-018) is located in a small grove of trees in between two residential properties (¾ acre in size). The regulator and CSO are located on the western edge of the subbasin on the St. Mary's River. The CSO is located roughly 450 feet southwest of the regulator at the southern end of Foster Park. A City of Fort Wayne Sewer Utility Map of the area (Map No. L19, 2001) identifies the subbasin as predominantly combined sewers with some separated sewers in the southern and eastern portions of the subbasin.

A 66-inch combined sewer parallels Fairfax Avenue before it enters the regulator chamber. There is a weir inside the chamber which diverts dry weather flow away from the 66-inch CSO and toward a 24-inch interceptor sewer. There is a float-operated mechanical gate on the regulator discharge that can be adjusted to open/close the gate at a specific water elevation in the chamber.

CSO 026/027/033 (Location #M10-151, #M10-202, #M10-303, Subbasin #M10-150, Third Street Pump Station)

The 833-acre subbasin tributary to CSOs 026/027/033 is 73 percent residential, 10 percent commercial, 10 percent institutional/industrial, and 10 percent open space. The overflow from regulator M10-150 goes to CSO 026/M10-151. The overflow from regulator M10-199 goes to CSO 027/M10-202 and CSO 033/M10-303. The regulators and CSOs are located on the west bank of the St. Mary's River on city-owned property. A residential neighborhood is across the street. A paved greenway recreation trail parallels the river.

CSO 026 / M10-151

Of these three CSOs, CSO 026 is the northeasternmost. CSO 026 is a submerged discharge and consists of two 4-foot-square head wall openings with flap gates and two 4.5- by 6-foot head wall openings with flap gates. CSO 026 receives the overflow from regulator M10-150. Regulator M10-150 receives flow from regulator M10-148 through an 84-inch pipe and regulator M10-199 through a 72-inch pipe. Both the 84- and 72-inch pipes have hydraulic sluice gates located between upstream regulators M10-148 and M10-199 and downstream regulator M10-150. The sluice gates are maintained in the open position.

CSO 027 / M10-202

CSO 027 is a submerged discharge, just southwest of CSO 026. Regulator M10-199 diverts wet weather flows over a weir through a 108-inch pipe to structure M10-201, where the flow is discharged through either a 72-inch pipe to CSO 027 or through the Third Street Pump Station. A hydraulic sluice gate on the 72-inch pipe is maintained in the closed position. Therefore, CSO 027 is maintained to have zero discharge and functions as an emergency bypass for the pump station.

CSO 033 / M10-313

CSO 033/M10-313 is a pump station discharge, just southwest of CSO 027. Regulator M10-199 diverts wet weather flows over a weir through a 108-inch pipe to structure M10-201, where the flow is discharged through either a 72-inch pipe or through the Third Street Pump Station to CSO 033. The pump station has bar screens with 2-inch spacing. CSO 033 consists of four 42-inch outfall pipes.

CSO 052 (Location #O22-004, Subbasin # O22-061B, Concordia High School Access Road)

The 176-acre subbasin tributary to CSO 052 is 62 percent residential, 15 percent commercial, 15 percent institutional, and 8 percent open space. Institutional and commercial properties are in the immediate vicinity. The regulator and CSO are located in the northwestern corner of the subbasin. A City of Fort Wayne Sewer Utility Map of the area (Map No. P22, 2001) identifies the subbasin as mixed combined and separate sewers.

Regulator P22-001 diverts wet weather flow from the east side of Anthony Boulevard to the west side of Anthony Boulevard through a 30-inch pipeline. Regulator P22-139 divers wet weather flow from the east side of Crescent Avenue to the west side of Crescent Avenue through a 24-inch pipe. The 24-inch pipe runs along St. Joe River Drive to Anthony Boulevard, where it combines with a 48-inch separate storm sewer. The combined sewer flows then run north along Anthony Boulevard through a 54-inch pipe that combines with the 30-inch overflow pipe from Regulator P27-001 at Manhole 027-005. A 42-inch pipeline exits manhole 022-005 and flows roughly 500 feet northwest to CSO 052. CSO 052 is located on the northwest side of Concordia Lutheran High School Access Road and the southern side of the St. Joseph River.

2. Solids and Floatables Control Alternatives

2. Solids and Floatables Control Alternatives

2.1 Non-structural Source Control Best Management Practices

Source controls are characterized by nonstructural techniques and programs that aim to reduce pollutant loading by intercepting or preventing the accumulation of contaminants before they enter the overflow stream. Although this strategy would not reduce or eliminate the solids and floatables associated with the sanitary sewage, it could help control the discharge of the considerable amounts of debris resulting from surface wash during storms. Studies in New York City have shown that street litter and debris can make up as much as 95 percent of the volume of CSO solids and floatables. Thus, this technique may be applicable for reducing the overall mass of solids and floatables and thus reduce the aesthetic problems and nuisances associated with this waste stream.

Because the techniques are not "end-of-pipe" solutions, this control strategy is not associated with particular outfalls. However, it is possible that the level of effort can be adapted for particular drainage areas to ensure that outfalls, which typically are problematic with respect to solids and floatables, are provided with more intensive efforts to relieve the problem.

The City of Fort Wayne has several source control programs in place:

- Street sweeping program
- Catch basin and inlet cleaning program
- Recycling program
- "Great America Clean Up" program
- "Tox-Away" program
- Hazardous spill response team
- Industrial pretreatment program
- Combined sewer flushing
- Trash collection and public education

Each program is described briefly below with estimates of its performance as provided by the Division of Sewer Maintenance.

Street Sweeping Program

Street sweeping reduces the amount of debris entering combined and storm sewers by collecting it prior to entry. This type of control is applicable to highly developed and established urban areas with curbed streets. Added benefits of street sweeping are the reduction of grit and heavy metals that can be easily transported to the receiving stream. Fort Wayne utilizes vacuum sweepers which have higher efficiency than mechanical sweepers.

In addition to the vacuum sweepers, Fort Wayne has a downtown "clean team" created in 1999 to clean alleys, sidewalks, and streets of solid and floatable materials to beautify the downtown area. The effort also helps prevent these items from entering the combined and storm collection systems. Table 2 summarizes the curb miles swept and 33-gallon trash bags collected filled from clean team.

TABLE 2
Clean Team Street Sweeping Program Annual Collection Summary

Year	Curb Miles Swept	33-Gallon Trash Bags Collected	Amount Collected (gal.)
1997	15,068		
1998	12,002		
1999	15,924		
2000	15,900		
2001	15,614	45	1,485
2002	14,375	37	1,221
2003	15,600	16	528
Annual Average	**14,926**	**33**	**1,078**

Catch Basin and Inlet Cleaning Program

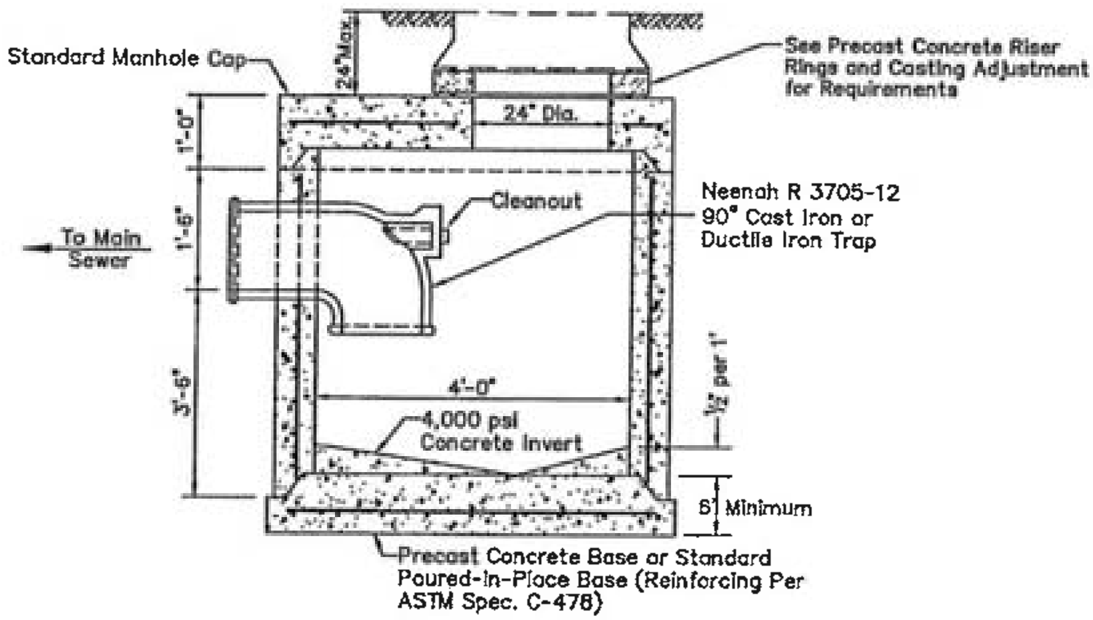
Frequent removal of accumulated catch basin deposits is a method often proposed in CSO control programs to reduce the heavy "first flush" effect of deposited solids from stormwater flows and to help reduce sediment buildup accumulating in the catch basins. Although determining the effectiveness of this control strategy is difficult, it is relatively easy to implement and requires minimal capital cost. This program addresses cleaning of roughly 15,500 known structures within a 2½-year cleaning cycle. Figure 1 depicts the standard design used in 90 percent of Fort Wayne's catch basins. The remaining 10 percent are an inlet grate. Removing the sediment and debris from the catch basin structures on a scheduled basis helps control floatables that might enter a waterway. Table 3 lists the amount of sediment and debris removed annually since 1998.

TABLE 3
Catch Basin and Inlet Cleaning Program Annual Collection Summary

Year	Amount Collected (tons)
1998	1,567
1999	1,164
2000	1,828
2001	1,662
2002	1,450
2003	889
Annual Average	**1, 427**

FIGURE 1
Standard Catch Basin

Castings:
24" Beehive Casting;
24" Manhole Frame and Grate



Note:
General Construction Requirements Same as Standard 48" Manhole
Structure Base Alternatives Same as Standard 48" Manhole

Recycling Program

During household garbage collection each home is given a recycling bin so recyclable items can be collected separately. In 1999 the City added the collection of cardboard and fiberboard and each household received two recycling bins to promote recycling. Table 4 presents the actual tons of recyclable material collected each year.

Great America Clean Up Program (known as "Bag-A-Thon" prior to 2001)

Activities include neighborhood trash pickups and riverbank cleanups. The items collected have included discarded furniture, appliances, plastic bottles, Styrofoam, tires, and so on. Table 5 lists the volume of trash collected each year.

TABLE 4
Recycling Program Annual Collection Summary

Year	Amount Collected (tons)
1997	7,300
1998	7,400
1999	7,400(+)
2000	9,462
2001	9,000
2002	8,973
2003	9,317
Annual Average	**8,407**

TABLE 5
Great America Clean Up Program Annual Collection Summary

Year	Amount Collected (lb)	Amount Collected (tons)
1998	93,000	46.5
1999	306,000	153.0
2000	253,180	126.6
2001	108,320	54.2
2002	124,228 + 6,460 (from 3 additional river cleanups) = 130,688	65.3
2003	153,260	76.6
Annual Average	**174,075**	**87.0**

Tox-Away Program

Tox-Away Day gives residents the opportunity to discard various toxic products in an environmentally safe way. This is held annually and consists of one full weekend at one given location. This is fully implemented but without data.

Hazardous Spill Response Team

The hazardous spill response team responds to potential hazardous spills and performs the appropriate methods of cleanup. Every precaution is taken to contain the spill from entering a waterway. Most hazardous spill incidences relate to traffic accidents.

Industrial Pretreatment Program

Significant industrial users, contract customers and non-major dischargers are monitored from strategic sampling points four times per year. This helps ensure that industrial waste to restaurant grease is discharged into the combined collection system within acceptable levels.

Combined Sewer Flushing

Combined sewer flushing is most applicable to flat sewers where pollutants accumulate and enough water can be surged to produce a significant "first flush" effect. The City of Fort Wayne flushes 500,000 feet of pipe annually.

Trash Collection and Public Education

The City of Fort Wayne reported collection of 88,177 tons of garbage in 2003. Public efforts can reduce the amount of solids and floatables by reducing litter in the streets, properly disposing of leaves and other debris from yards before they are washed to the storm sewers, and paying attention to the types of material that are disposed of in toilets. Each of these areas can be affected to varying degrees by public education and change of behavior.

2.2 Structural Solids and Floatables Control Technologies

Structural CSO solids and floatables control technologies provide physical separation of solids and floatables in the overflow stream before discharge to the receiving water. Due to aesthetic issues along the riverfront , end-of-pipe technologies such as booms and end-of-pipe netting facilities are not being considered. Baffles may be considered with some of the technologies below, but they are not very effective alone. Technologies include the following:

- Baffles
- Booms
- In-line Nets
- Screens (microscreens, mechanical screens, and coarse screens)
- Vortex separation
- Plain sedimentation (primary treatment)
- Flocculation and sedimentation
- High-rate filtration

Table 6 summarizes the attributes of these technologies .

2.3 Design Criteria

The 1992 Rainfall Frequency Atlas of the Midwest by Floyd A. Huff and James R. Angel identifies Fort Wayne in climatic section 3 in Figure 1 which corresponds to a rainfall of 0.56 inch for the 2-month, 1-hour storm in Table 2 (see Appendix A). Estimated Single-Event Overflow Volume graphs were provided by the City of Fort Wayne for each of the four CSO sites and included in Appendix B. Using these graphs, the rainfall depth of 0.56 inch was plotted on the 1-hour curves to determine an overflow volume in million gallons. The results are tabulated in Table 7. CSO peak rates assume the overflow volume duration is 1 hour. This short duration was selected as a conservative approach to equipment design.

TABLE 6
Advantages and Disadvantages of Structural Solids and Floatables Controls

Technology	Advantages	Disadvantages and Limitations	Applicability
Baffles	Inexpensive High floatables capture Low equipment maintenance Relatively small land requirements	Low solids capture Can be unreliable in effectiveness	Applicable to all Fort Wayne sites; consider further in combination with other technologies
Booms	Inexpensive and cost-effective High floatables capture Moderate implementation period No land requirements	Low solids capture Needs to be cleaned after each overflow event Potential for odors and an aesthetic nuisance if near high-use waterfront areas Potential high capital and maintenance costs for skimmer boats	Not applicable to Fort Wayne CSOs due to proximity of the rivers to high-use public areas; do not consider further
In-line Nets	Inexpensive and cost effective High capture of floatables Relatively inexpensive Moderate implementation period Relatively small land requirements	Moderate capture of solids Nets need to be replaced approximately 18 times per year Net replacement can potentially produce odors and be an aesthetic nuisance Potential high maintenance costs for nets	Although the maintenance duration is relatively short, maintenance may be an aesthetic issue at Fort Wayne sites; consider further
Bar Screens	Moderate capture of floatables Uses conventional technology Relatively small land requirements	Limited capture of solids Needs to be cleaned after each overflow event Potential for odors	Applicable to all Fort Wayne sites; consider further
Microscreens	High floatables and solids capture Uses conventional technology Relatively small land requirements	Need to be cleaned after each overflow event Potential for odors and clogging	Applicable to all Fort Wayne sites; consider further
Vortex separator	Moderate solids capture No moving parts Accepts a wide range of flow rates Relatively small land requirements Good cost-effectiveness for TSS removal	Limited floatables capture Influent pumping may be required Solids handling may be required Limited technology success	Applicable to all Fort Wayne sites; consider further

TABLE 6
Advantages and Disadvantages of Structural Solids and Floatables Controls

Technology	Advantages	Disadvantages and Limitations	Applicability
Plain sedimentation (primary treatment)	High capture of solids and floatables Proven, well-understood technology Sedimentation basins will provide some storage	Large land area requirements High cost; moderate cost-effectiveness	One Fort Wayne site (CSO #021) has sufficient space and greater need for more significant pollutant removal; consider further r
Flocculation/ sedimentation	High capture of solids and floatables Proven, well-understood technology Sedimentation basins will provide some storage	Large land area requirements High cost; moderate cost-effectiveness Additional O&M requirements (chemical handling) Additional sludge handling	One Fort Wayne site (CSO #021) has sufficient space and greater need for more significant pollutant removal; however, chemical handling may not be desired at a remote location
High-rate filtration	High capture of floatables and moderate capture of solids Moderate land requirements (about the same as microscreens)	High O&M requirements High cost Limited CSO control experience	Applicable to all Fort Wayne sites; however, not worth the cost in comparison to other more cost-effective technologies

TABLE 7
Calculations for Solids and Floatables Control for Four Selected Sites

CSO #	Geographic Location	Location #	Discharge Size	Tide Gate	Design Rainfall Criteria: 2-month, 1-hour Storm (in./hr)	CSO Volume (MG)	CSO Peak Rate (cfs)	CSO Annual Volume (ft^3)	CSO Annual Frequency	Annual (LTCP CSO Volume (ft^3)	LTCP CSO Annual Frequency	S/F Contol
017	Waldron Circle/ Wildwood	K07-176	42"	flap	0.56	0.5	19	963,279	32	848,473	13	Small footprint screen
021	Avenue/Foster Park Fairfax	K19-044	66"	flap	0.56	0.59	22	1,425,564	56	270,000	10	85% TSS & Particulate BOD; >90% Turbidity removal; 85% P removal
026*	Third Street Pump Station	M10-151	72" & 84"	flap	0.56	1.95	72	8,781,182	66	1,150,000	13	screen; reconstruct outfall
027	Third Street Pump Station	M10-202	72"	flap	sluice gate always closed; does not overflow			0	0	0	0	none needed
033*	Third Street Pump Station	M10-313	4 @ 42" each	flap	2" spacing on bar screens in pump station; therefore, no additional control needed			8,781,182	66	1,150,000	13	2" bar screen already in place
052	Concordia High School Access Road	O22-004	48"	flap	0.56	0.21	8	782,402	45	0	0	Screen that can also be used for stormwater long term
Information Source:		*Fort Wayne Basin Reports*	*Site Visits and Fort Wayne Sewer Utility Maps*	*Site Visits*	*per Pat Callahan and Rainfall Frequency Atlas of the Midwest (1992)*	*Estimated Single Event Overflow Volume Charts from Fort Wayne*	*Calculated*	*Long-Term Water Quality Control Plan excerpts by Pat Callahan*	*Long-Term Water Quality Control Plan excerpts by Pat Callahan*	*Long-Term Water Quality Control Plan excerpts by Pat Callahan*	*Long-Term Water Quality Control Plan excerpts by Pat Callahan*	

* Flows are divided between CSO 026 and CSO 033.

2.4 Vendor Overview

A variety of vendors were contacted and provided with the calculated peak flow rates presented in Table 7. Table 8 summarizes the vendors contacted regarding specific technologies. Additional information regarding these technologies is provided in Appendix C.

TABLE 8
Summary of Vendor Technologies

Vendor	Technology	Removal Effectiveness
CDS Alternative 1 (Appendix C-1)	4-mm raked bar screen	Removes trash and debris greater than 4 mm
CDS Alternative 2 (Appendix C-1)	1-mm gross solids screening	Removes all particles to 200 microns
CDS Alternative 3 (Appendix C-3)	Chemical flocculation with 1mm gross solids screening	Removes all particles to 200 microns and essentially all suspended solids and 90% phosphorus removal
Krüger (Appendix C-2)	Physical-chemical ACTIFLO high rate treatment process	4 mm pre-screening followed by 90% removal of suspended solids
Grande (Appendix C-3)	ACU-screen with 3/16" openings automatically cleaned by brush to return debris to sewer; may require ACU-bend (bending weir) to ensure sufficient head	Removes trash and debris greater than 3/16"
Fresh Creek (Appendix C-4	Net system with ½" mesh	Removes trash and debris greater than 1/2"
Parkson (Appendix C-5)	ROMAG bar screen with 4-mm spacing automatically cleaned by combs to return debris to sewer	Removes large trash and debris greater than 4 mm
Hydro International[a]	Various screens with 4- to 6-mm spacing	Removes trash and debris greater than 4 mm

Note:
Technology descriptions and removal effectiveness information is per vendor information.
[a]Requested but did not receive Fort Wayne-specific information from Hydro International.

Vendors provided equipment costs. Order-of-magnitude construction costs were developed by CH2M HILL and are summarized in Table 9. Operation and maintenance cost information supplied by vendors was inconsistent and subjective as to frequency of inspection, repair, and replacement; therefore, the order-of-magnitude operation and maintenance costs provided in Table 9 is preliminary at this time. Backup documentation on cost estimate development is provided in Appendix D. Table 9 also lists the preferred structural alternatives.

TABLE 9
Cost Estimate Summary of Technologies at Each Site

CH2MHILL

Estimator:	Wm. Griffith / MKE
Project Mgr:	Webster, Todd/MKE
Project #:	316657
Estimate #:	Conceptual / Alternatives
Rev. #:	# 4
Est. Date :	11/29/2004

Order-of-Magnitude Estimate

		/	$849,000 High Value +50 %
Combined	**Engineer's Estimate**	**$566,000.00**	
		\	$396,200 Low Value - 30%

<u>Facility</u>			**Alternate Vendor CDS**	**Equipment Footprint**	**Alternate Vendor KRUGER[1]**	**Alternate Vendor GRANDE**	**Alternate Vendor Fresh Creek Tech**	**Alternate Vendor Parkson Corp**	**Comments**	**Preferred Structural Alternative**
Site # 17	Alt #1	Waldron	$81,000	3.5' x 4.33'	$1,797,223	$125,000	$176,049	$217,922	select smallest	$81,000
Site # 17	Alt #2	Circle/	$273,000	10' x 15'					unit	
Site # 17	Alt #3	Wildwood	$776,000	22' x 45'	43.2' x 15.1'	8.5' x 10'	4' x 16'	12.6'		
Site # 21	Alt #1	Fairfax Avenue/	$85,000	4.25' x 4.33'	$1,878,122	$131,000	$224,497	$231,060	select highest	
Site # 21	Alt #2	Foster	$273,000	10' x 15'					quality screening	$273,000
Site # 21	Alt #3	Park	$813,000	30' x 50'	44.9' x 16.1'	8' x 8'	7.5' x 17'	12.6'	alternative	
Site # 26	Alt #1	Third Steet	$131,000	3.5' x 17.30'	$4,230,509	$197,624	$395,775	$337,366		$131,000
Site # 26	Alt #2	Pump	$739,000	30' x 18'					select smallest	
Site # 26	Alt #3	Station	$1,743,000	61' x 70'	52.8' x 20.8'	20' x 10'	13.33' x 19.33	25.7'	unit	
Site # 52	Alt #1	Concordia	$77,000	2' x 4.33'	$1,423,040	$118,918	$182,175	$180,442		$77,000
Site # 52	Alt #2	High School	$235,000	10' x 12'					select smallest	
Site # 52	Alt #3	Access	$560,324	21' x 30'	31.9' x 10.7'	6' x 8'	4'x 16'	12.6'	unit	
Subtotal -	**Base Capital Construction Costs**									**$562,000**

Operations & Maintenance Costs

Frequency	CDS - Raked Bar Annual Based on trips	CDS - GSS Annual Based on trips	CDS - FSS Annual Based on trips	Est 3 days	Alternate Vendor KRUGER1 Based per Day Quote	Alternate Vendor GRANDE	Alternate Vendor Fresh Creek Tech One trip replacement / 3 maint	Alternate Vendor Parkson Corp 4 annual Trips, elec. inspect, replace fluids	
Site # 17	$372	$2,630	$4,419	$5,083	annual	$2,086	$4,961	$335	**$372**
Site # 21	$372	$2,630	$4,419	$5,899	annual	$2,086	$4,961	$335	**$2,630**
Site # 26	$372	$2,630	$4,419	$20,140	annual	$2,086	$4,961	$335	**$372**
Site # 52	$372	$2,630	$4,419	$2,127	annual	$2,086	$4,961	$335	**$372**
Subtotal -	**Operations & Maintenance Costs**								**$3,746**

Total CCC & O-M **$566,000**
Rounded (3)

[1] Kruger's ACTIFLO process will likely require additional pre-screening best determined by site-specific analysis; therefore, it is likely that the construction price will increase to include some amount of pre-screening should this alternative move forward in selection.

Order-of-Magnitude Estimate

An order-of-magnitude estimate is made without detailed engineering data. Some examples include:

> An estimate from cost capacity curves
> An estimate using scale-up or scale-down factors
> An approximate ratio estimate, base on technologies

Typically, an order-of-magnitude estimate is prepared *at the end of the schematic design phase* of the design delivery process. It is normally expected that an estimate of this type would be accurate within **plus 50 percent to minus 30 percent of the estimated cost.** The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding.

2.5 Indiana Department of Environmental Management Setback Requirement

Indiana has a 500-foot setback requirement relating to construction of wastewater treatment facilities (327 IAC 3-2-6; where IAC is Indiana Administrative Code). The requirement and a August, 13, 2004, draft interpretation of the requirement prepared by IDEM's Wet Weather Section on how the requirement applies to combined sewer overflow projects is provided in Appendix E. 327 IAC 3-2-6b states that the separation distances may be shortened if the affected dwelling owners agree to a shortened separation. The 500-foot setback requirement precludes the selection of structural controls at CSO 017 (Waldron Circle/Wildwood Avenue), CSO 021 (Fairfax Avenue/Foster Park), and CSO 026 (Third Street Pump Station) unless the affected dwelling owners agree to a shortened distance. CSO 017 is adjacent to dwellings; CSO 021 is physically separated from dwellings by a fence and separate access road; and CSO 026 already has many wastewater control structures in place. Construction permits are granted through IDEM's Facilities Construction & Engineering Support Section.

2.6 Proposed Long Term CSO Controls

The ongoing progress of Fort Wayne's other CSO-related programs (long-term control plan development, monitoring, stream characterization, operational plan update) is connected to solids and floatables decisionmaking. The current draft of the long-term plan indicates the following:

TABLE 10
Fort Wayne's Draft CSO Long-Term Control Plan for the Four Selected Sites

Site	Draft CSO Long-Term Control Plan
CSO 017: Waldron Circle/ Wildwood	Proposed tunnel system
CSO 021: Fairfax/Foster Park	Proposed tunnel system
CSO 026: Third Street Pump Station	Proposed tunnel system
CSO 056: Concordia High School Access Road	Proposed sewer separation

2.7 Proposed Short-Term Solids and Floatables Control

Given the effectiveness of the current non-structural programs, Indiana's 500-foot setback requirement for construction, and the long-term CSO control plans and implementation schedule, short-term solids and floatables controls are proposed in Table 11 for the following reasons:

TABLE 11
Comments on Proposed Short-Term Controls

Site	Proposed Short-Term Control	Comments
CSO 017 Waldron Circle/ Wildwood	Non-structural programs	Small, constrained site, in close proximity to residences
CSO 021 Fairfax/Foster Park	Non-structural programs and best piloting option for short-term structural control	End of proposed tunnel system; ample construction space and access; separated from residences; most visible solids and floatables issues; adjacent to well-used parkland; easiest location to incorporate a structural short-term control with a structural long-term control[a]
CSO 026 Third Street Pump Station	Non-structural programs	Congested, visible site in close proximity to residences; existing regulator needs complete rebuild which should be incorporated with long-term plan plans
CSO 056 Concordia High School Access Road	Non-structural programs	Reasonable construction space and access; however, long-term control may include sewer separation rendering a structural control at this site potentially obsolete

[a]CSO 021 structure is within the 500-foot Indiana set-back requirement for construction and would require agreement to a shortened distance by the affected dwelling owners.

3. Conclusions and Recommendations

3. Conclusions and Recommendations

There are several conclusions and recommendations as a result of this study. The order of the conclusions and recommendations do not necessarily reflect their degree of importance.

3.1 Conclusions

1. Out of 44 CSO locations reviewed for solids and floatables nuisances, only 6 sites were recommended for further investigation at this time (CH2M HILL. July 23, 2004. *City of Fort Wayne Recommended CSO Sites for Further Solids and Floatables Investigation*).
2. Of the 6 CSO sites recommended for further solids and floatables investigation at this time, 3 CSO sites are adjacent to each other at the Third Street Pump Station.
3. Of the 3 CSO sites adjacent to each another at the Third Street Pump Station, CSO 027 has a sluice gate maintained in the closed position, resulting in a zero discharge; and CSO 033 includes a 2-inch bar rack, resulting in a screened discharge.
4. Indiana's 500-foot setback requirement for construction of wastewater treatment facilities impacts 3 of the 4 remaining selected sites (CSO 017 Waldron Circle/ Wildwood Avenue, CSO 021 Fairfax Avenue/Foster Park, and CSO 026 Third Street Pump Station) unless the affected dwelling owners agree to a shortened distance.
5. Several effective non-structural solids and floatables control programs are currently in place throughout the City.
6. The ongoing progress of Fort Wayne's other CSO-related programs (long-term control plan development, monitoring, stream characterization, operational plan update) is connected to solids and floatables decisionmaking.
7. Given the effectiveness of the current non-structural programs, the long-term CSO control plans and implementation schedule, and Indiana's 500-foot setback requirement for construction, the solids and floatable controls listed in Table 12 are recommended.

TABLE 12
Proposed Solids and Floatables Control for the Four Selected Sites

CSO	Proposed Solids and Floatables Control
CSO 017 Waldron Circle/ Wildwood	Non-structural programs
CSO 021 Fairfax/Foster Park	Non-structural programs and best piloting option for short-term structural control
CSO 026 Third Street Pump Station	Non-structural programs
CSO 056 Concordia High School Access Road	Non-structural programs

3.2 Recommendations

1. Continue documentation of the non-structural programs currently in place. Consider developing a cost-benefit estimate for each of the programs and recording implementation of the programs by sewer system tributary area. Developing cost-benefit estimates can be achieved by accurate tracking of costs of the program versus quantities and volumes of materials collected. Documentation by sewer system tributary area can be achieved by working closely with the City's geographic information system (GIS) staff.

2. Begin discussions with neighborhood groups in the affected residential areas regarding the possibility of them agreeing to shortened setback distances. Discuss precedence of granting construction permits in similar situations with IDEM's Facilities Construction & Engineering Support Section.

3. Consider only non-structural solids and floatables controls at this time for CSO 017, 026, an 056, and consider integrating structural controls with the long-term controls (that is, include structural solids and floatables control as part of the long-term plan).

4. Consider piloting a structural solids and floatables control at CSO 021 (Fairfax/Foster Park) for the following reasons: (1) it is an upstream site which will have less interference with a long term control; (2) there has been evidence of finer solids discharged at this CSO location; and (3) there is adequate construction space with some physical separation from the public. To pursue this action, the next steps include:

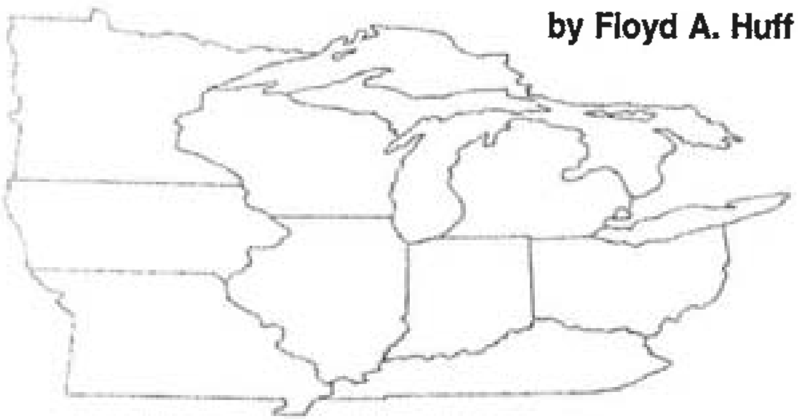
    - Revisiting the 2-month, 1-hour design criteria in concert with the design criteria for the long-term control plan solution at each specific site
    - Refining the design and costs with the preferred vendor
    - Obtaining approval of a shorter set-back requirement from the affected residences
    - Confirming regulatory agency approval prior to any construction

Appendix A
Excerpt from *Rainfall Frequency Atlas of the Midwest* (1992)

Bulletin 71
(MCC Research Report 92-03)

RAINFALL FREQUENCY ATLAS OF THE MIDWEST

by Floyd A. Huff and James R. Angel



Midwestern Climate Center
Climate Analysis Center
National Weather Service
National Oceanic and Atmospheric Administration

and

Illinois State Water Survey
A Division of the Illinois Department of Energy and Natural Resources

1992

(MCC) with Stanley Changnon and Peter J. Lamb as the co-principal investigators. The work was continued and completed under the general direction of Kenneth Kunkel, present MCC Director.

Special appreciation goes to Stan Changnon for his foresight, guidance, and encouragement in establishing and accomplishing the program objectives. He and Ken Kunkel reviewed the report and made useful comments and suggestions. Special thanks go to Richard Katz, National Center for Atmospheric Research; Tibor Farago, Hungarian Meteorological Service; and J.R.M. Hosking, IBM Research Division, for providing software for some of the extreme rainfall analyses. Fred Nurnberger, Michigan State Climatologist, provided valuable long-term precipitation data for his state as well as comments on the manuscript. We also thank the following state climatologists for their review and comments on this project: Wayne Wendland, Illinois; Ken Scheeringa, Indiana; Harry Hillaker, Iowa; Glen Conner, Kentucky; Jim Zandlo, Minnesota; Wayne Decker, Missouri; Jeff Rogers, Ohio; and Pam Naber-Knox, Wisconsin.

John Brother and Linda Hascall supervised the extensive drafting work required for the report. Jean Dennison typed and assembled the report, which Eva Kingston edited and formatted.

Figure 1. Climatic sections for the Midwest

Table 2. Sectional Mean Frequency Distributions for Storm Periods of 5 Minutes to 10 Days and Recurrence Intervals of 2 Months to 100 Years in Indiana

Sectional code (see figure 1 on page 4)

01- Northwes
02 - North Central
03 - Northeast
04 - West Central
05 - Central
06 - East Central
07 - Southwest
08 - South Central
09- Southeast

Rainfall (inches) for given recurrence interval

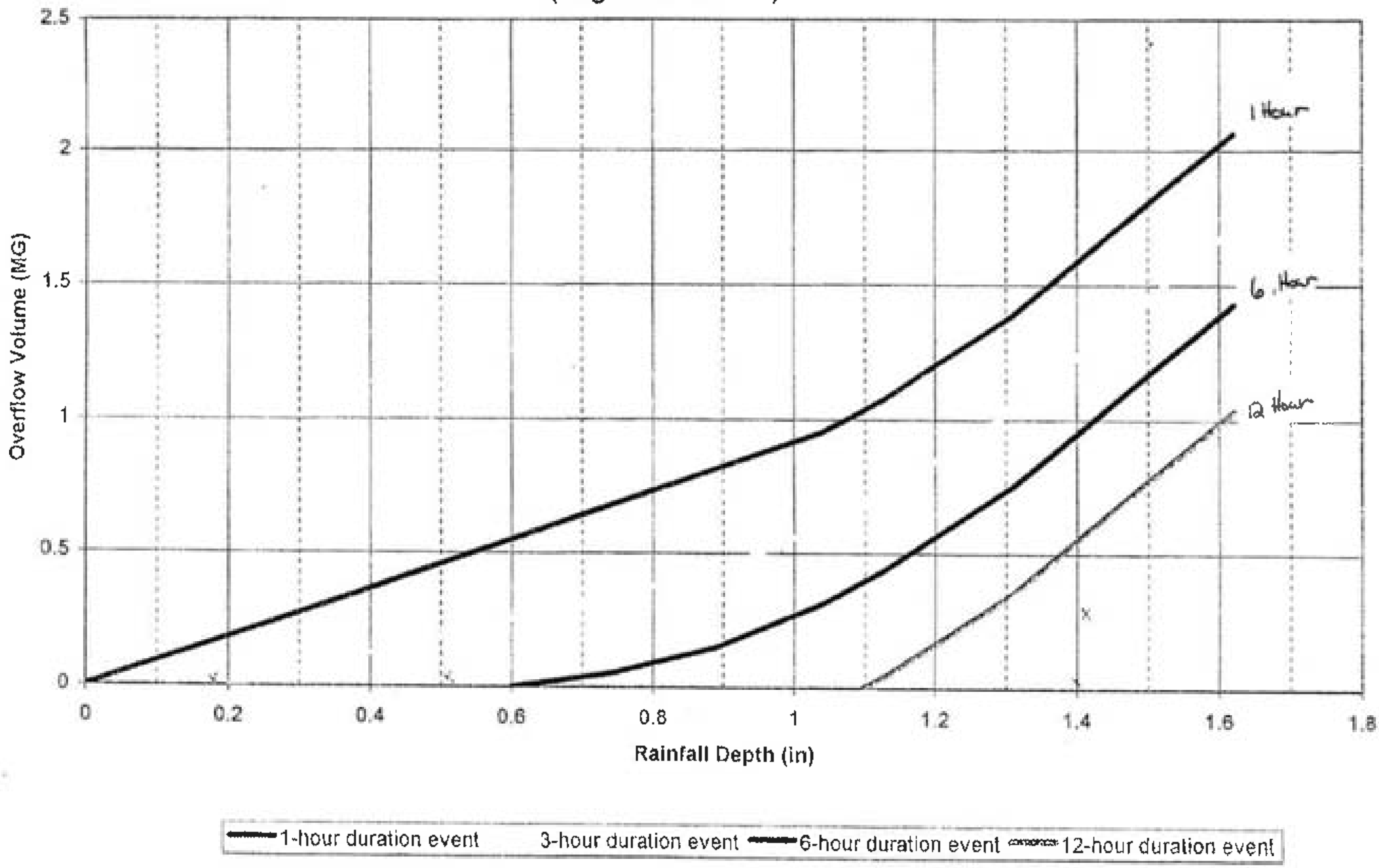
Section	Duration	2-month	3-month	4-month	6-month	9-month	1-year	2-year	5-year	10-year	25-year	50-year	100-year
01	10-day	2.07	2.50	2.88	3.38	3.89	4.23	4.84	5.79	6.67	8.03	9.23	10.58
01	5-day	1.68	2.01	2.27	2.63	3.03	3.29	3.84	4.70	5.50	6.81	7.99	9.37
01	72-hr	1.53	1.80	2.04	2.36	2.71	2.95	3.46	4.24	4.97	6.10	7.17	8.38
01	48-hr	1.40	1.64	1.83	2.12	2.44	2.65	3.12	3.87	4.56	5.58	6.52	7.58
01	24-hr	1.33	1.55	1.69	1.96	2.23	2.42	2.89	3.61	4.22	5.22	6.10	7.12
01	18-hr	1.25	1.45	1.59	1.84	2.09	2.27	2.72	3.39	3.97	4.91	5.73	6.69
01	12-hr	1.16	1.35	1.48	1.71	1.94	2.11	2.51	3.14	3.67	4.54	5.31	6.19
01	6-hr	1.00	1.16	1.27	1.47	1.67	1.82	2.17	2.71	3.16	3.91	4.57	5.34
01	3-hr	0.85	0.99	1.08	1.26	1.43	1.55	1.85	2.31	2.70	3.34	3.90	4.56
01	2-hr	0.77	0.90	0.98	1.13	1.29	1.40	1.68	2.09	2.45	3.03	3.54	4.13
01	1-hr	0.63	0.73	0.80	0.92	1.05	1.14	1.36	1.70	1.98	2.45	2.87	3.35
01	30-min	0.50	0.58	0.63	0.73	0.83	0.90	1.07	1.34	1.56	1.93	2.26	2.63
01	15-min	0.36	0.42	0.45	0.53	0.60	0.65	0.78	0.97	1.14	1.41	1.65	1.92
01	10-min	0.28	0.33	0.36	0.41	0.47	0.51	0.61	0.76	0.89	1.10	1.28	1.50
01	5-min	0.16	0.19	0.20	0.23	0.27	0.29	0.35	0.43	0.51	0.63	0.73	0.85
02	10-day	2.04	2.45	2.83	3.33	3.83	4.16	4.75	5.64	6.45	7.69	8.80	10.03
02	5-day	1.68	2.01	2.28	2.64	3.04	3.30	3.80	4.62	5.38	6.57	7.63	8.85
02	72-hr	1.48	1.74	1.97	2.28	2.62	2.85	3.33	4.10	4.79	5.88	6.86	8.00
02	48-hr	1.37	1.60	1.78	2.06	2.37	2.58	3.02	3.73	4.36	5.36	6.25	7.28
02	24-hr	1.30	1.51	1.65	1.91	2.17	2.36	2.78	3.43	4.00	4.90	5.67	6.54
02	18-hr	1.22	1.42	1.55	1.80	2.04	2.22	2.61	3.22	3.76	4.61	5.33	6.15
02	12-hr	1.13	1.31	1.43	1.66	1.89	2.05	2.42	2.98	3.48	4.26	4.93	5.69
02	6-hr	0.97	1.13	1.24	1.43	1.63	1.77	2.09	2.57	3.00	3.68	4.25	4.90
02	3-hr	0.83	0.97	1.06	1.22	1.39	1.51	1.78	2.20	2.56	3.14	3.63	4.19
02	2-hr	0.75	0.88	0.96	1.11	1.26	1.37	1.61	1.99	2.32	2.84	3.29	3.79
02	1-hr	0.61	0.71	0.78	0.90	1.02	1.11	1.31	1.61	1.88	2.30	2.66	3.07
02	30-min	0.48	0.56	0.61	0.70	0.80	0.87	1.03	1.27	1.48	1.81	2.10	2.42
02	15-min	0.35	0.41	0.45	0.52	0.59	0.64	0.75	0.93	1.08	1.32	1.53	1.77
02	10-min	0.28	0.32	0.35	0.41	0.46	0.50	0.58	0.72	0.84	1.03	1.19	1.37
02	5-min	0.15	0.18	0.20	0.23	0.26	0.28	0.33	0.41	0.48	0.59	0.68	0.78
03	10-day	1.81	2.18	2.52	2.96	3.40	3.70	4.25	5.12	5.84	6.96	8.01	9.16
03	5-day	1.52	1.82	2.06	2.38	2.74	2.98	3.46	4.18	4.81	5.83	6.76	7.80
03	72-hr	1.35	1.59	1.79	2.08	2.39	2.60	3.01	3.68	4.27	5.21	6.06	7.01
03	48-hr	1.27	1.48	1.65	1.91	2.20	2.39	2.77	3.38	3.92	4.78	5.57	6.45
03	24-hr	1.19	1.38	1.51	1.75	1.99	2.16	2.52	3.04	3.52	4.29	5.02	5.77
03	18-hr	1.12	1.30	1.42	1.64	1.87	2.03	2.37	2.86	3.31	4.03	4.72	5.42
03	12-hr	1.03	1.20	1.32	1.52	1.73	1.68	2.19	2.64	3.06	3.73	4.37	5.02
03	6-hr	0.89	1.04	1.13	1.31	1.49	1.62	1.89	2.28	2.64	3.22	3.76	4.33
03	3-hr	0.76	0.88	0.97	1.12	1.27	1.38	1.61	1.95	2.25	2.75	3.21	3.69
03	2-hr	0.69	0.80	0.88	1.01	1.15	1.25	1.46	1.76	2.04	2.49	2.91	3.35
03	1-hr	0.56	0.65	0.71	0.83	0.94	1.02	1.18	1.43	1.65	2.02	2.36	2.71
03	30-min	0.44	0.51	0.56	0.65	0.74	0.80	0.93	1.12	1.30	1.59	1.86	2.13
03	15-min	0.32	0.37	0.41	0.47	0.53	0.58	0.68	0.82	0.95	1.16	1.36	1.56
03	10-min	0.25	0.29	0.31	0.36	0.41	0.45	0.53	0.64	0.74	0.90	1.05	1.21
03	5-min	0.14	0.17	0.18	0.21	0.24	0.26	0.30	0.36	0.42	0.51	0.60	0.69

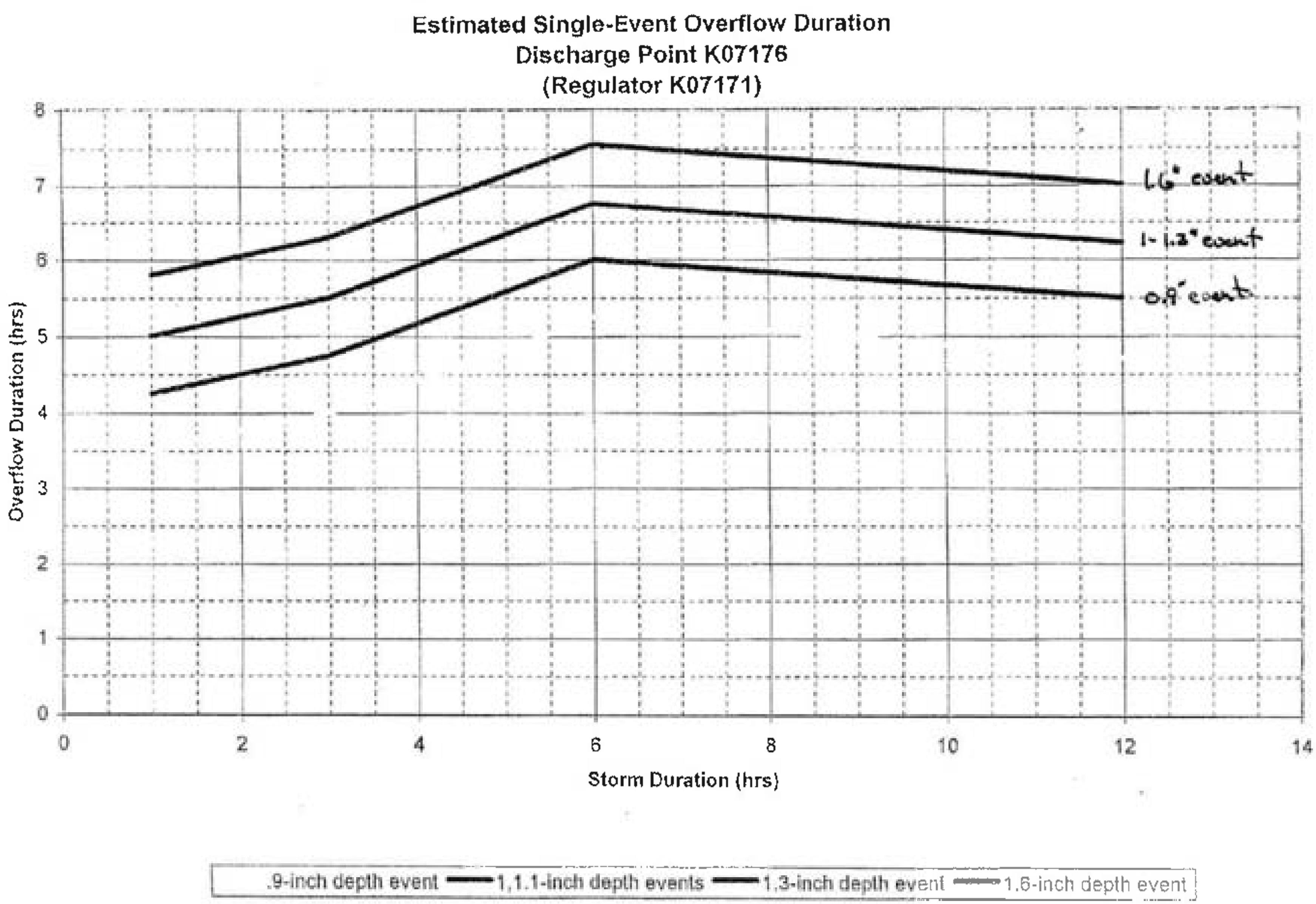
Appendix B

Estimated Single-Event Overflow Volume Graphs

Discharge Point
K07-176

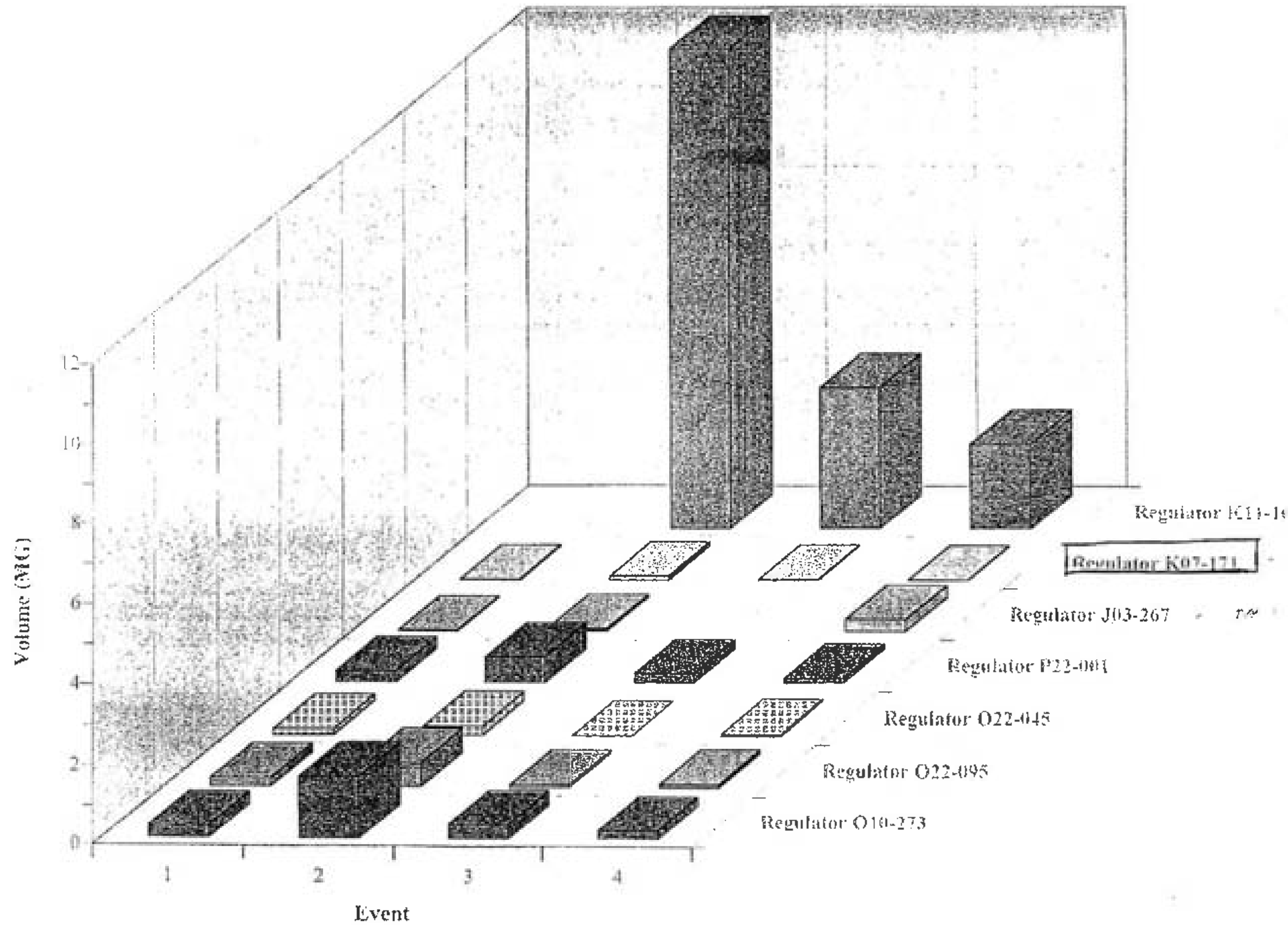
Estimated Single-Event Overflow Volumes
Discharge Point K07176
(Regulator K07171)





Estimated Single-Event Overflow Duration
Discharge Point K07176
(Regulator K07171)
Overflow Duration (hrs)
0
1
2
3
4
5
6
7
8
0
2
4
6
8
10
12
14
Storm Duration (hrs)
1.6" event
1-1.3" event
0.9" event
.9-inch depth event
1,1.1-inch depth events
1.3-inch depth event
1.6-inch depth event

FIGURE 4-1
CSO DISCHARGE VOLUMES



Note: Flow Meters did not work at Regulator K11-163 during Event 1 and Regulator J03-267 during Event 3.

LONG TERM WATER QUALITY PLAN

KO7 171

CURRENT

ANNUAL OVERFLOW VOLUME	743,279	cf (18
ANNUAL OVERFLOW EVENTS	32	EA (12

PLANNED

ANNUAL OVERFLOW VOLUME	548,473	cf
ANNUAL OVERFLOW EVENTS	13	EA

KO7 - 102 (KO7 115)

CURRENT

ANNUAL OVERFLOW VOLUME	73,187	CF
ANNUAL OVERFLOW EVENTS	63	EA

PLANNED

ANNUAL OVERFLOW VOLUME	3,467	CF
ANNUAL OVERFLOW EVENTS	1	EA

KO7 - 006

CURRENT

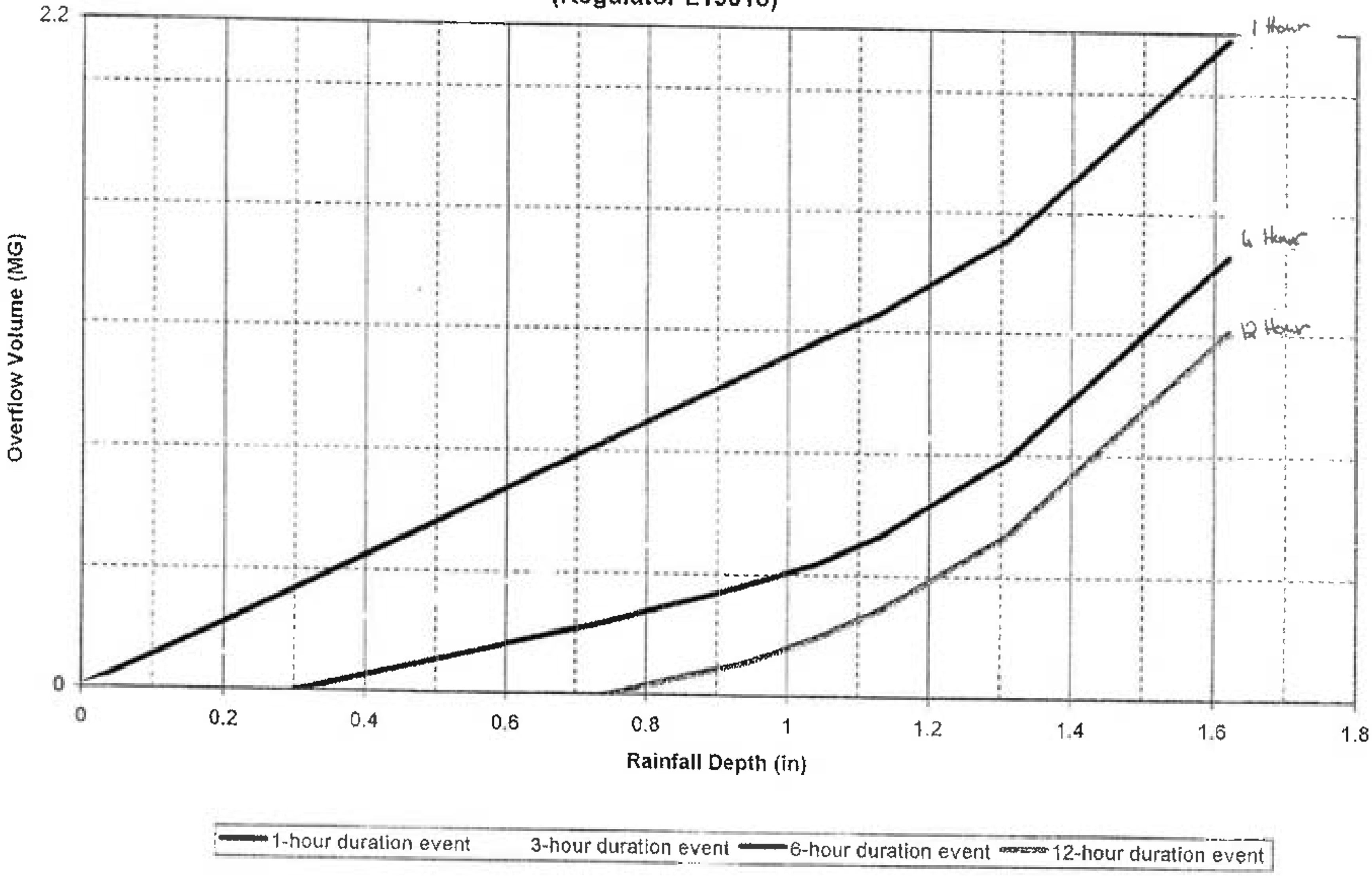
ANNUAL OVERFLOW VOLUME	6,621	CF
ANNUAL OVERFLOW EVENTS	9	EA

PLANNED

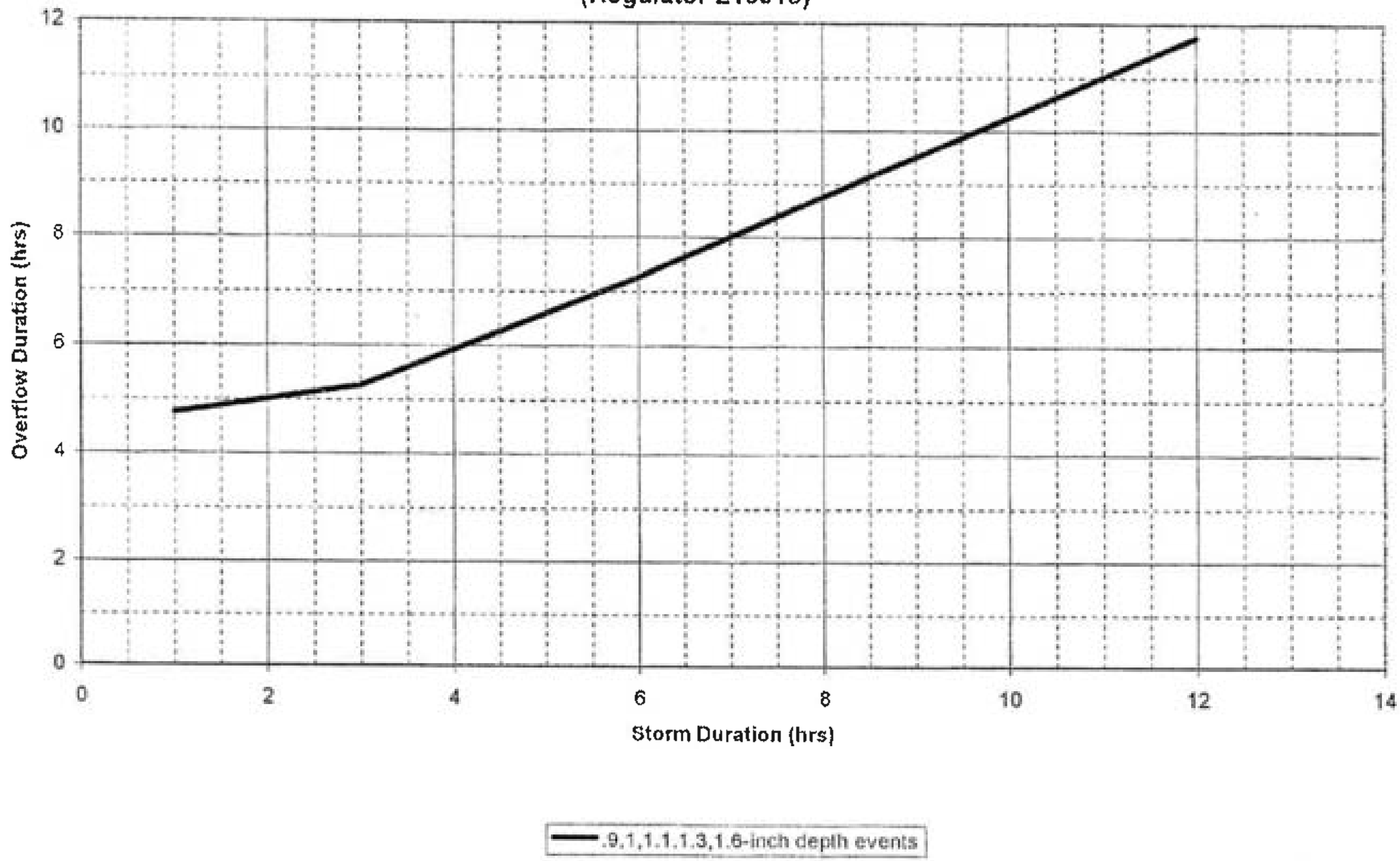
NO CHANGES PLANNED

Discharge Point
K19-044

Estimated Single-Event Overflow Volumes
Discharge Point K19044
(Regulator L19018)



Estimated Single-Event Overflow Duration
Discharge Point K19044
(Regulator L19018)



LONG TERM WATER QUALITY PLAN

Current Events

Annual Overflow Volume	1,425,564 cf.
Annual Number of Overflows	56 ea.

Planned Improvements

CSSCIP – Preliminary Engineering/Improvements

LTCP – Construct St. Marys parallel interceptor, transport cost effective volume of overflows to ponds for treatment.

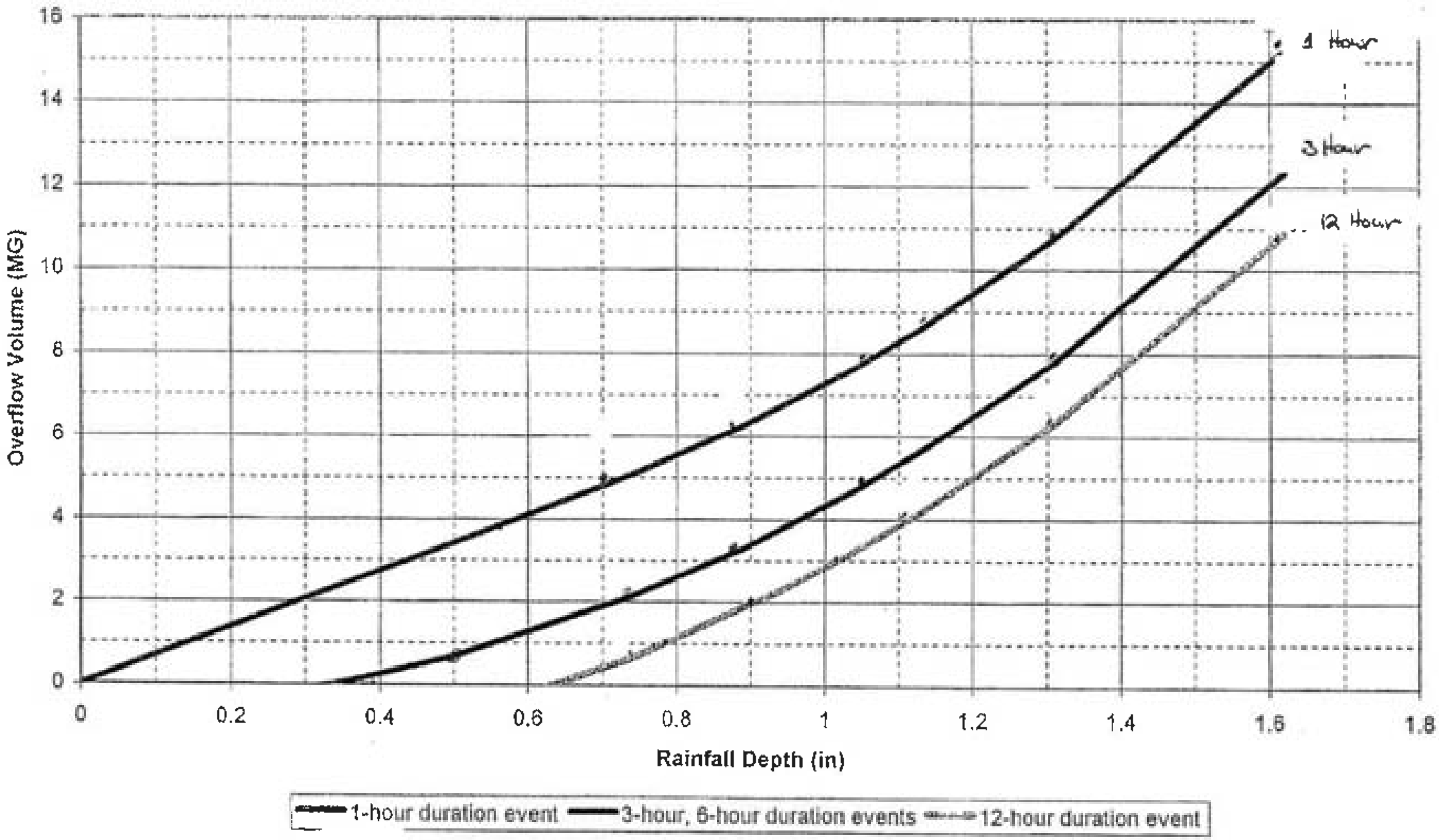
Planned Events

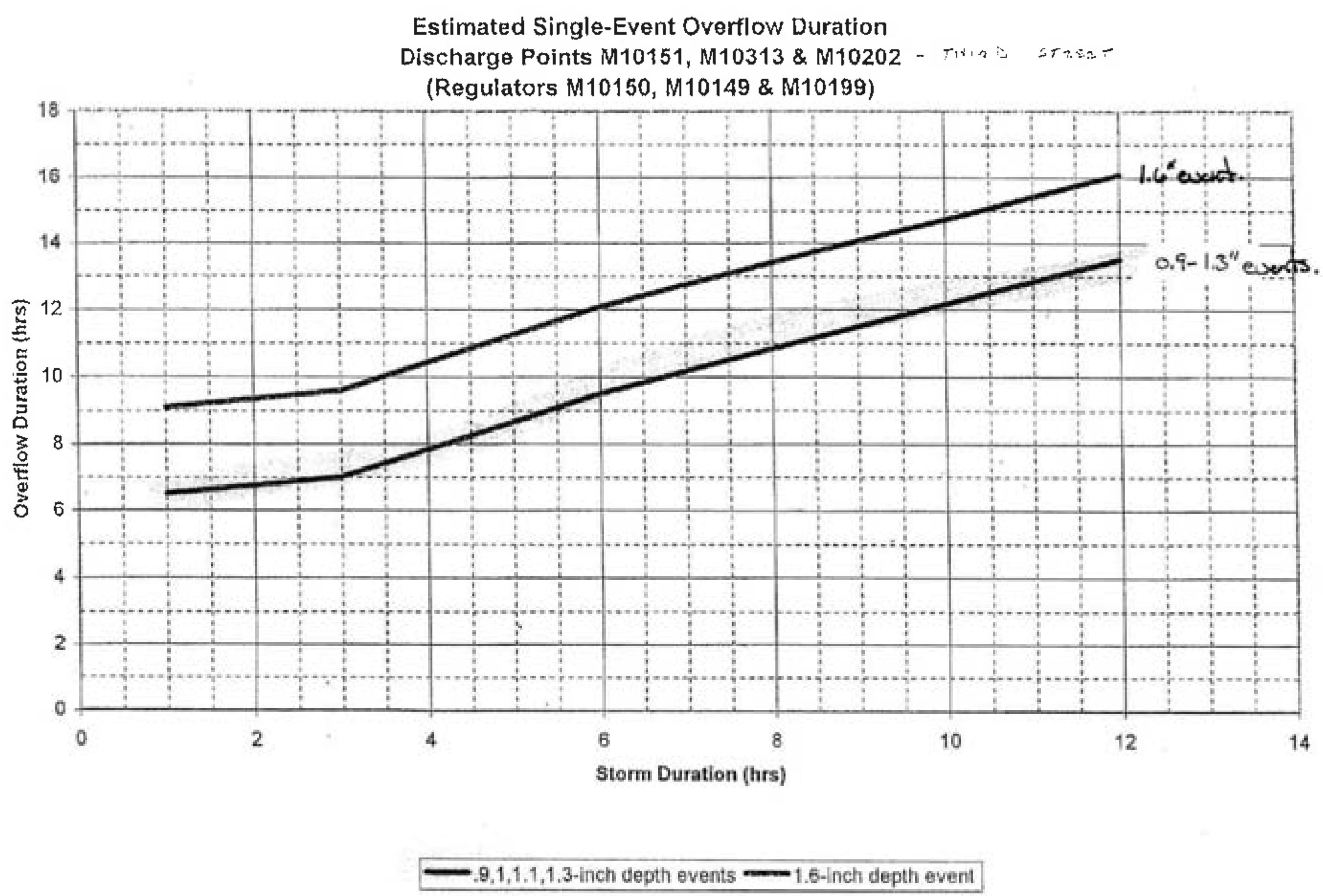
Annual Overflow Volume	270,000 cf.
Annual Number of Overflows	10 ea.

Discharge Point

M10-151, M10-202, M10-303

Estimated Single-Event Overflow Volumes
Discharge Points M10151, M10313 & M10202
(Regulators M10150, M10149 & M10199)




Estimated Single-Event Overflow Duration
Discharge Points M10151, M10313 & M10202 - Third Street
(Regulators M10150, M10149 & M10199)
Overflow Duration (hrs)
Storm Duration (hrs)
18
16
14
12
10
8
6
4
2
0
0
2
4
6
8
10
12
14
1.6" event.
0.9-1.3" events.
.9,1,1.1,1.3-inch depth events
1.6-inch depth event

LONG TERM WATER QUALITY PLAN

Current Events

Annual Overflow Volume	cf. 17,562,363
Annual Number of Overflows	ea. 66

Planned Improvements

CSSCIP – Preliminary Engineering Reports, Planning, and Construction hav been completed

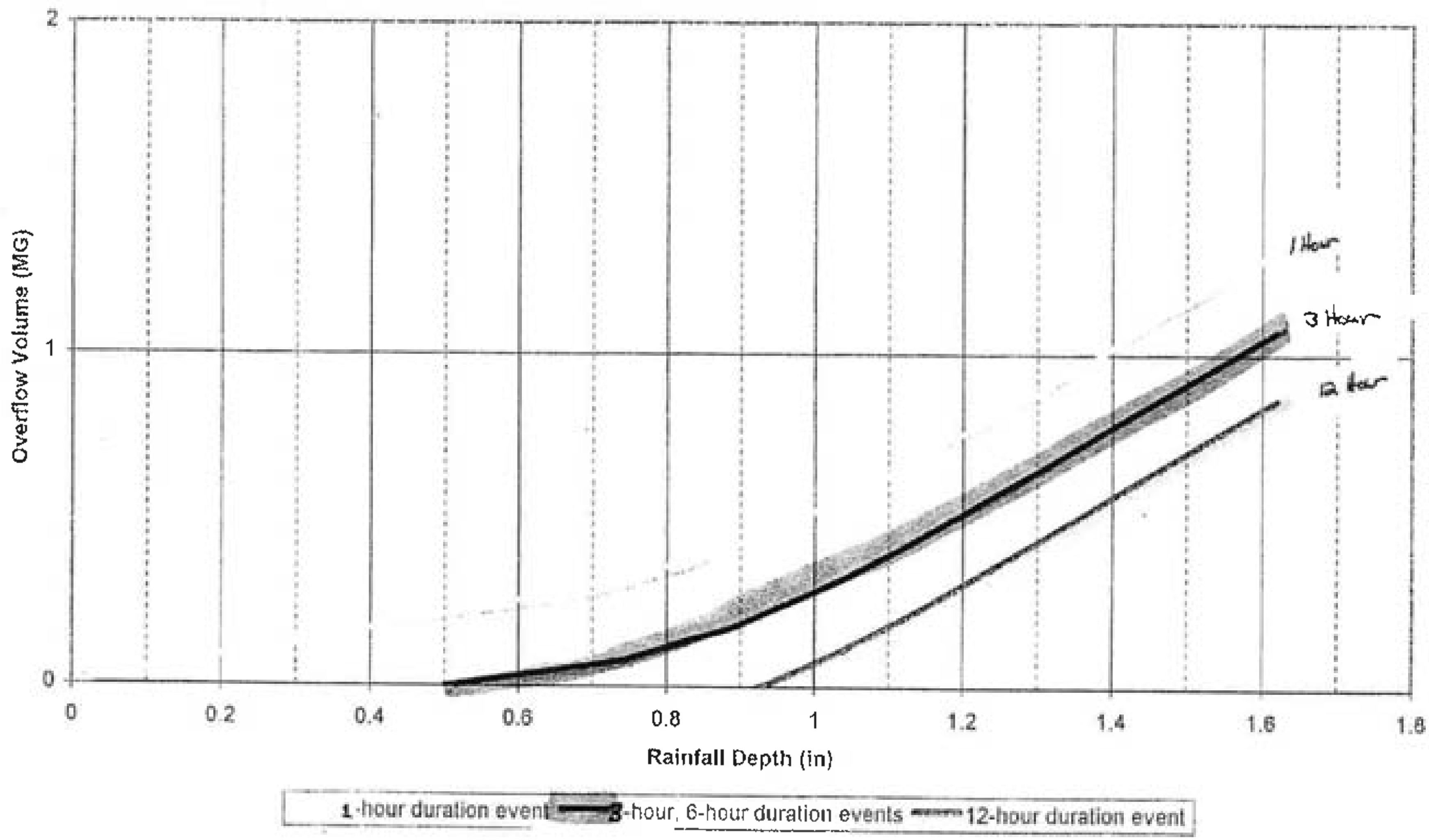
LTCP – Construction of Wayne St. parallel interceptor: Capture 8 of top 15 regulators (those most visible downtown)

Planned Events

Annual Overflow Volume	cf. 2,300,000
Annual Number of Overflows	ea. 13

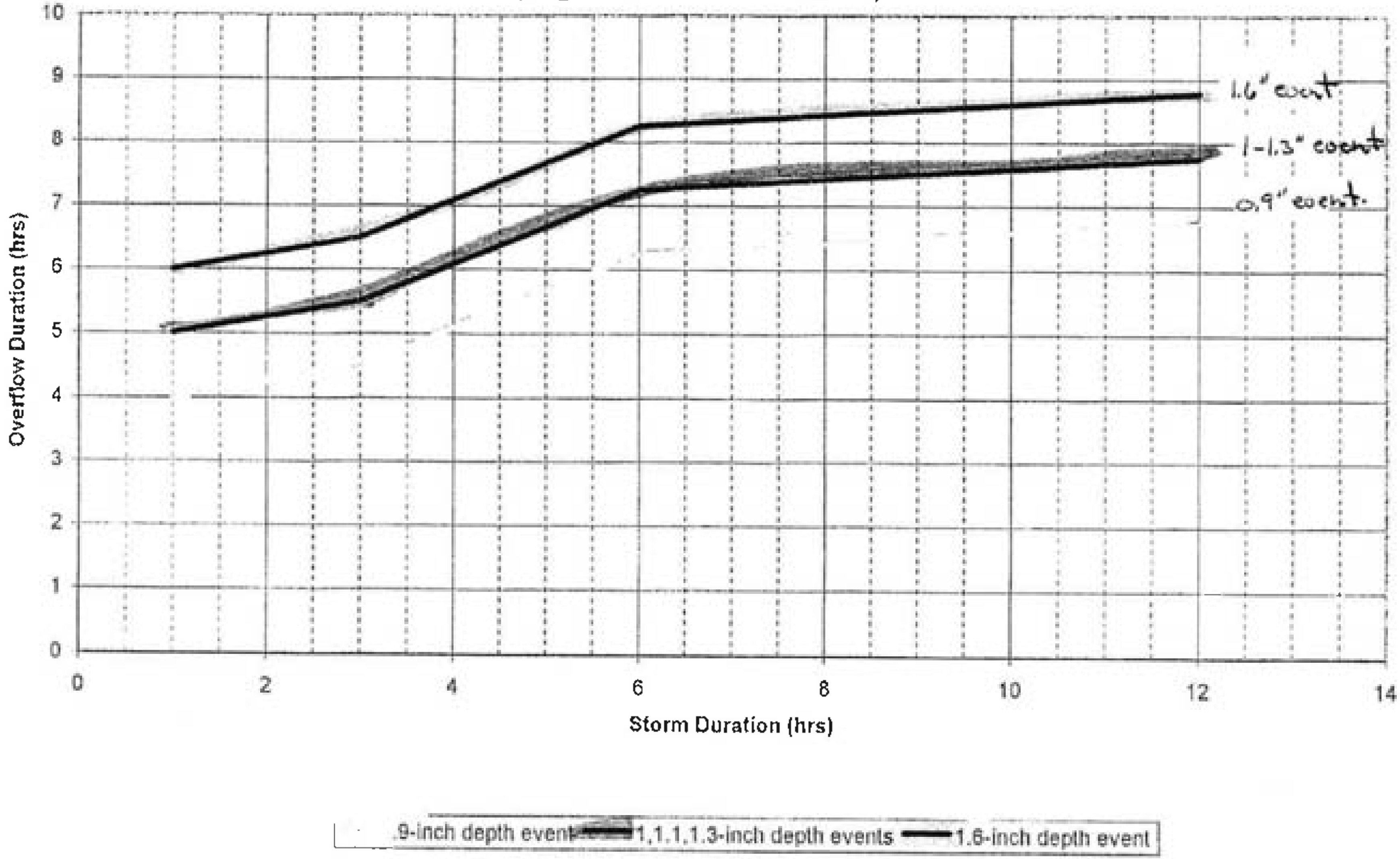
Discharge Point
O22-004

Estimated Single-Event Overflow Volumes
Discharge Point O22004
(Regulators P22001 & P22139)



[redacted]

Estimated Single-Event Overflow Duration
Discharge Point O22004
(Regulators P22001 & P22139)



LONG TERM WATER QUALITY PLAN

Current Overflow Events[1]

	Reg. P22-139	Reg. P22-001
Annual Overflow Volume	328,777 cf.	453,625 cf.
Annual Number of Overflows	17 ea.	45 ea.

Planned Improvements

CSSCIP – Subbasin O22-061B is listed as priority number 20 of 39 subbasins for planned improvements. Preliminary Engineering Report was completed in June 2002, and the following alternatives were favored:

1) Construction of new storm sewers with public and private inflow removal.
2) Construction of new sanitary sewers and conversion of the combined sewers to storm sewers.

LTCP – No short term control is planned. During Stage 3 – Years 15 to 20, partial separation in subbasin O22-061B will allow regulators P22-001 and P22-139 and associated discharge point to be completely eliminated.

Planned Overflow Events[1]

	Reg. P22-139	Reg. P22-001
Annual Overflow Volume	0 cf.	0 cf.
Annual Number of Overflows	0 ea.	0 ea.

[1] From Figure 10-1: City of Fort Wayne CSO LTCP. Estimated from system model.

Appendix C
Vendor Responses

CDS CSO SCREEN ALTERNATIVES

CSO NO	**17**	**21**	**26**	**52**
FLOW, CFS	19	22	72	8
FLOW, L/SEC	538.3	623.3	2039.8	226.6
PIPE SIZE, IN	42"	66"	72"	48"
DESCRIPTION	30' Access Road Very tight site	leaves dark plume best quality required	adjacent to pump sta 6 regulators to 2 CSOs	

ALTERNATIVE #1 - RAKED BAR SCREEN - 4 MM SPACING

Bar Area, m2	1.08	1.25	4.08	0.45
Size / Model	10001	12001	10004	5001
Number	1	1	1	1
Budget Price	$ 38,000.00	$ 40,000.00	$ 65,000.00	$ 36,000.00
app footprint, ft	3.5 x 4.33	4.25 x 4.33	3.5 x 17.33	2 x 4.33
ht, inches	17	17	17	17
impact on HGL	+8 inches	+8 inches	+8 inches	+8 inches
Installation Cost	highly dependent on the details of the job. 50% of purchase price if no structure changes are needed. New structure can increase cost by 5 to 10 times.			
Notes	Budget price includes automation, equipment, mounting frame and covers in 304L ss			

ALTERNATIVE #2 - CDS GSS - 1 mm SCREENING (200 micron effective)

Size / Model	PSW70_70	PSW70_70	PSW100_80	PSWC56_53
Number	1	1	2	1
Budget Price	$80,000	$80,000	$300,000	$60,000
Automation	$75,000	$75,000	$110,000	$75,000
app footprint, ft	10' x 15'	10' x 15'	30' x 18'	10' x 12'
depth, ft	12'	12'	14'	11'
impact on HGL	7.30 ft	9.27 ft	9.31 ft	4.30 ft
Installation Cost	$ 50,000	$ 50,000	$ 250,000	$ 30,000

Notes

Budget price includes screens and other internals and precast manholes to contain the screen. Installation cost includes cost of diversion structure. Costs can be less in ideal soils, and can double in poor soils with a high water table.

Automation costs include control panel, flow and level instrumentation, underflow pump and motor starter in cabinet.

CDS CSO SCREEN ALTERNATIVES

ALTERNATIVE #3 - CDS FSS - CHEMICALLY ENHANCED FLOCCULATION w/ CDS 1 mm SCREENS

Size / Model	PSW56_53	PSWC56_53	PSWC70_70	PSWC40_40
Number	3	3	6	3
Budget Price	$350,000	$350,000	$750,000	$250,000
area, mix tanks	633	733.3	1800	333
app footprint,mix tanks	22 x 33	24 x 38	39 x 55	18 x 28
app footprint, total	22 x 45	30 x 50	61 x 70	21 x 35
depth, ft	15	15	20	12
impact on HGL	3.26 ft	3.85 ft	3.81 ft	2.57 ft
Civil for tanks				
Soil exc & disposal, yd3	623	1133	3479	272
Concrete structures, yd3	220	286	705	127
exc and dispose, $/yd3	50	50	50	50
conc structures, $/yd3	300	300	300	300
app civil costs	$ 97,178	$ 142,511	$ 385,530	$ 51,689
budget install costs	$ 225,000	$ 300,000	$ 800,000	$ 125,000

NOTES

Budget prices include the CDS unit internals and connecting piping, installation hardware, controls, instruments, mixing equipment, chemical storage and preparation equipment, and dosing pumps.
Chemical sludge is much greater volume than the natural solids in the flow. No provisions are made here for dewatering or disposal.
No control buildings or buildings to house equipment, chemical makeup, control room, etc.

CDS TECHNOLOGIES INC SCREENING PRODUCTS

For Treating Sanitary Wet Weather Flows (CSOs, SSOs & POTW By-Passes)

CDS TECHNOLOGIES

PREMISE

- DIFFERENT SITES ...
  - With DIFFERENT CONDITIONS
    - And Requiring DIFFERENT TREATED WATER QUALITY ...create

DIFFERENT TREATMENT REQUIREMENTS

OUTLINE

REGULATORY FRAMEWORK

WATER QUALITY ISSUES

SCREENING OVERVIEW

CDS/COPA SCREENING REVIEW

CDS PERFORMANCE

FACILITY TOUR

COMPARATIVE COSTS

SUMMARY

CDS TECHNOLOGIES

REGULATIONS

- CSO
  - PERMIT FOR DISCHARGE
  - 9 MINIMUM STANDARDS
- SSO
  - NOT PERMITTED – ILLEGAL DISCHARGE
  - BLENDING RULE ISSUED
- TMDL's

CDS TECHNOLOGIES

CSO REGULATIONS

- 9 MINIMUM STANDARDS
  - PROPER OPERATION of the sewer system
  - MAXIMIZE STORAGE in collection system
  - Headworks review & modifications
  - Maximize FLOW TO THE WWTP
  - Eliminate DRY WEATHER FLOWS
  - <u>CONTROL OF SOLIDS AND FLOATABLES</u>
  - Pollution Prevention Programs
  - Public Notification
  - Monitoring ... CSO Impacts ... and ... Efficacy of Controls
- LONG TERM CONTROL PLAN (LTCP)

CDS TECHNOLOGIES

SSO REGULATIONS

- BLENDING RULE
  - TREATMENT LIMITS
    - No Requirement for % Reduction
    - Numerical Limits to Assure Water Quality Protection
  - SECONDARY TREATMENT
    - Doesn't mean biological treatment
    - Treatment to meet 'secondary' Water Quality

TMDL's

- QUALITY OF THE RECEIVING WATERS
  - STATED USE OF THE RECEIVING WATERS
  - CURRENT CONDITION
  - CONTRIBUTION OF THE DISCHARGE
- LOCAL INITIATIVES CONTROL

CDS TECHNOLOGIES

WATER QUALITY ISSUES

- FLOATABLES, TRASH & DEBRIS
- SUSPENDED SOLIDS
- BACTERIAL LEVELS
- NUTRIENTS
  - Dissolved O_2, Nitrogen, Phosphorus
- TOXICS
  - Hydrocarbons, Metals, Pesticides

CDS TECHNOLOGIES

SCREENING OVERVIEW – ISSUES

- TECHNICAL ISSUES
  - PARTICLE SIZE REMOVAL
  - SCREENINGS HANDLING
  - REMOVAL EFFICIENCIES OF TARGETED POLLUTANTS
- COST ISSUES
  - INITIAL
  - OPERATIONS & MAINTENANCE

CDS TECHNOLOGIES

SCREENING OVERVIEW – PRODUCTS

- NETTING SYSTEMS
- STATIC SCREENS
- MECHANICAL SCREENS
- CDS NON-MECHANICAL
- CDS AUTOMATED
- CDS WITH CHEMICAL FLOCCULATION

SCREENING PRODUCTS – PARTICLE SIZE REMOVAL

SCREEN TYPE	LOWEST SIZE REMOVAL
NETTING	12 mm (½″) (2-DIMENSIONS)
STATIC SCREENS	2 mm (.08 in) (2-dimensions)
MECHANICAL SCREENS	4 mm (.15 in) (1 or 2 dimensions)
CDS (All Types)	.25 mm (.01 in) (2+ dimensions)
CDS (With Floccing)	.001 mm (1 micron) (2+ dimensions)

CDS TECHNOLOGIES

SCREENING PRODUCTS – SCREENINGS HANDLING

SCREEN TYPE	SCREENINGS HDLG.
NETTING	STORED
STATIC SCREENS	STORE – LIMITED VOL / UNDERFLOW TO COLLECTION
MECHANICAL SCREENS	PASS THROUGH - UNDERFLOW TO COLLECTION
CDS NON-MECH'L	STORE
CDS AUTOMATED	PUMP TO S. SEWER

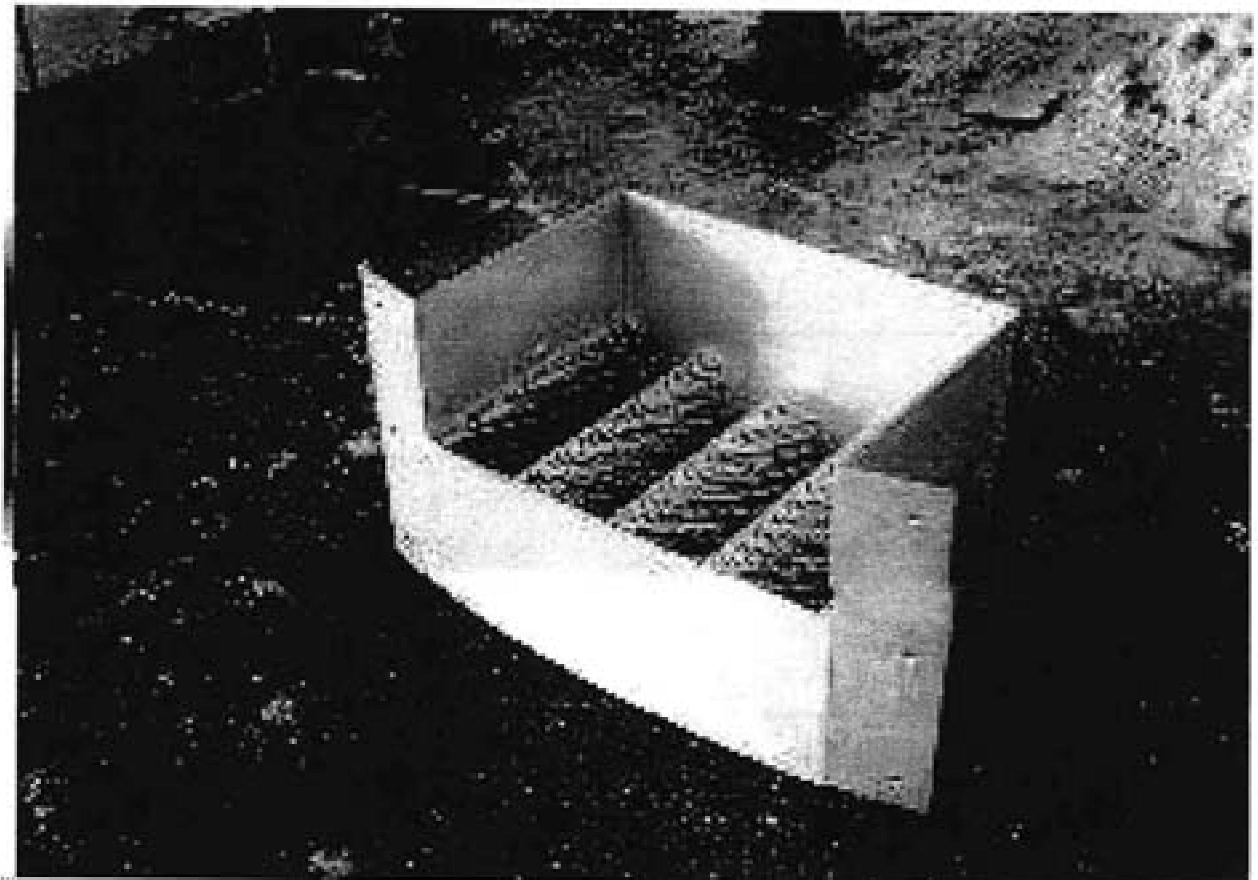
CDS TECHNOLOGIES

SCREENING PRODUCTS – REMOVAL EFFICIENCIES / TARGETED POLLUTANTS

SCREEN TYPE	REMOVAL EFFICIENCY, %			
	TSS	O_2 DEMAND	NUTRIENT	TOXIC
NETS	0-10	5-10	MIN	MIN
STATIC	20-30	5-10	MIN	MIN
MECHANICAL	10-20	5-10	MIN	MIN
CDS – NO CHEM	40-70	20-40	10-30	20-50
CDS – FLOCCING	90-99	40-70	P – 85 N - 40	40-70

CDS TECHNOLOGIES

COPA CROSS WAVE (STATIC SCREEN)



CDS TECHNOLOGIES

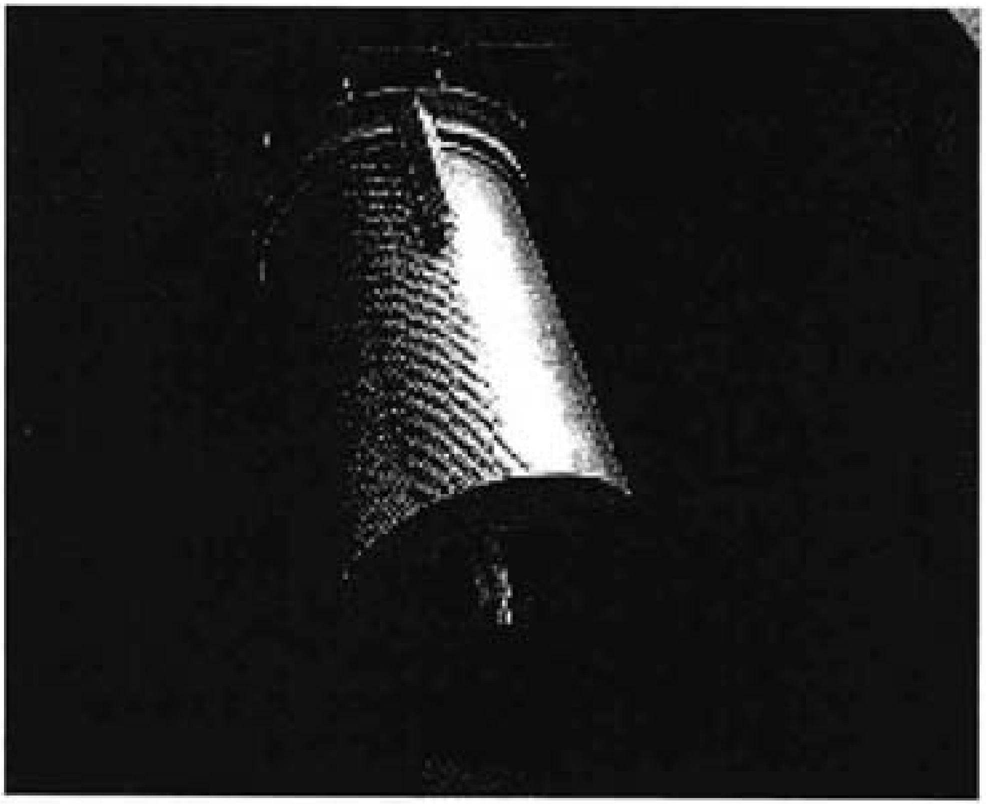
CDS & COPA SCREENING PRODUCTS

STATIC SCREENS – CROSS WAVE

- USES:
  - STORAGE FACILITY OVERFLOWS
  - CSO's WITH < 10 DISCHARGES / YEAR
  - LIMITED DURATION EVENTS
- FEATURES
  - Up-flow, solids accumulate underneath
  - Solids release when flow subsides
  - Clean every 3 to 6 events
  - Use on regulator or at the discharge point

CDS TECHNOLOGIES

COPA CYCLONE SCREEN



CDS TECHNOLOGIES

CDS & COPA SCREENING PRODUCTS

CYCLONE SCREEN –

- USES
  - Smaller (Low Flow) Regulators
- FEATURES
  - Self Powered by Internal Waterwheel
  - 6 mm Perforated Screen
  - Flow in sewer carries screenings to Interceptor

CDS TECHNOLOGIES

COPA RAKED BAR SCREEN

CDS TECHNOLOGIES

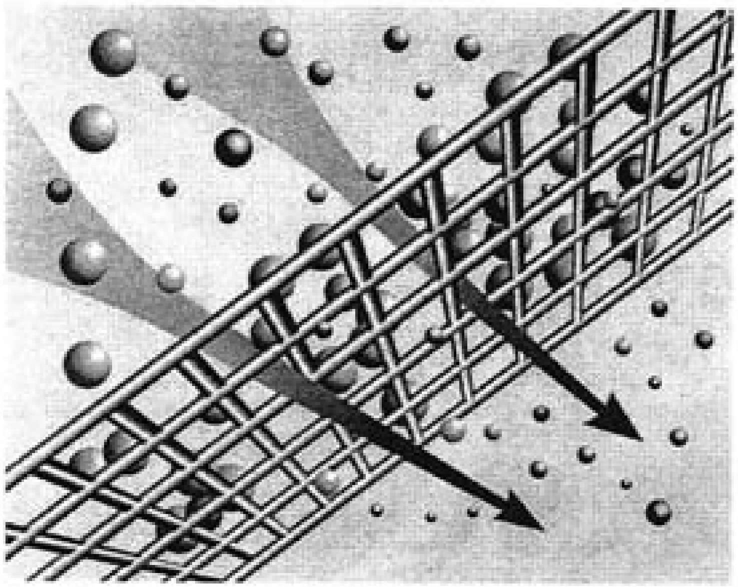
CDS & COPA SCREENING PRODUCTS

COPA RAKED BAR SCREEN

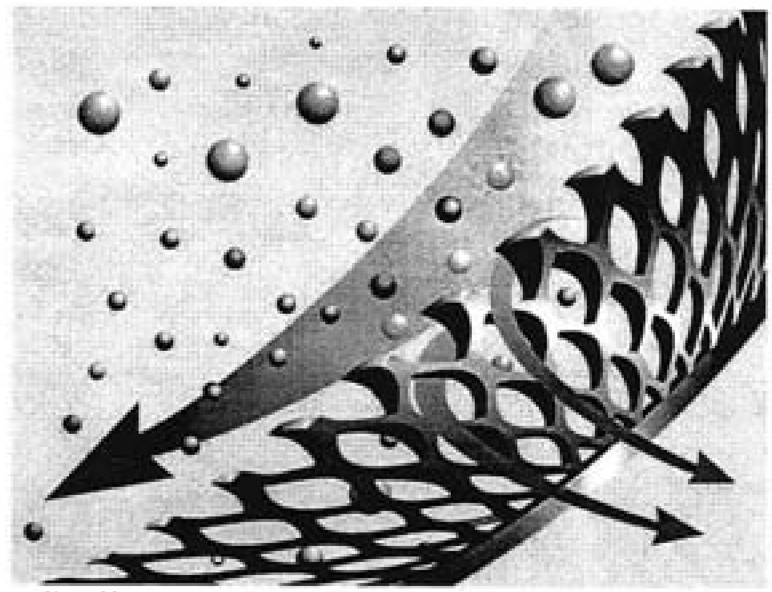
- USES
  - Any Flow Capacity
  - Overflows Before Discharge
  - Pretreat Flow into Storage Facilities
  - Protect Pump Stations
- FEATURES
  - Screen to 4 mm
  - Hydraulic Rake Mechanism
  - Horizontal Screen
  - Need Flow into Interceptor

CDS TECHNOLOGY BASIS

- Strong washing effect of incoming fluid keeps screen free of pollutants
- Conventional devices rely on direct screening - screens become blocked

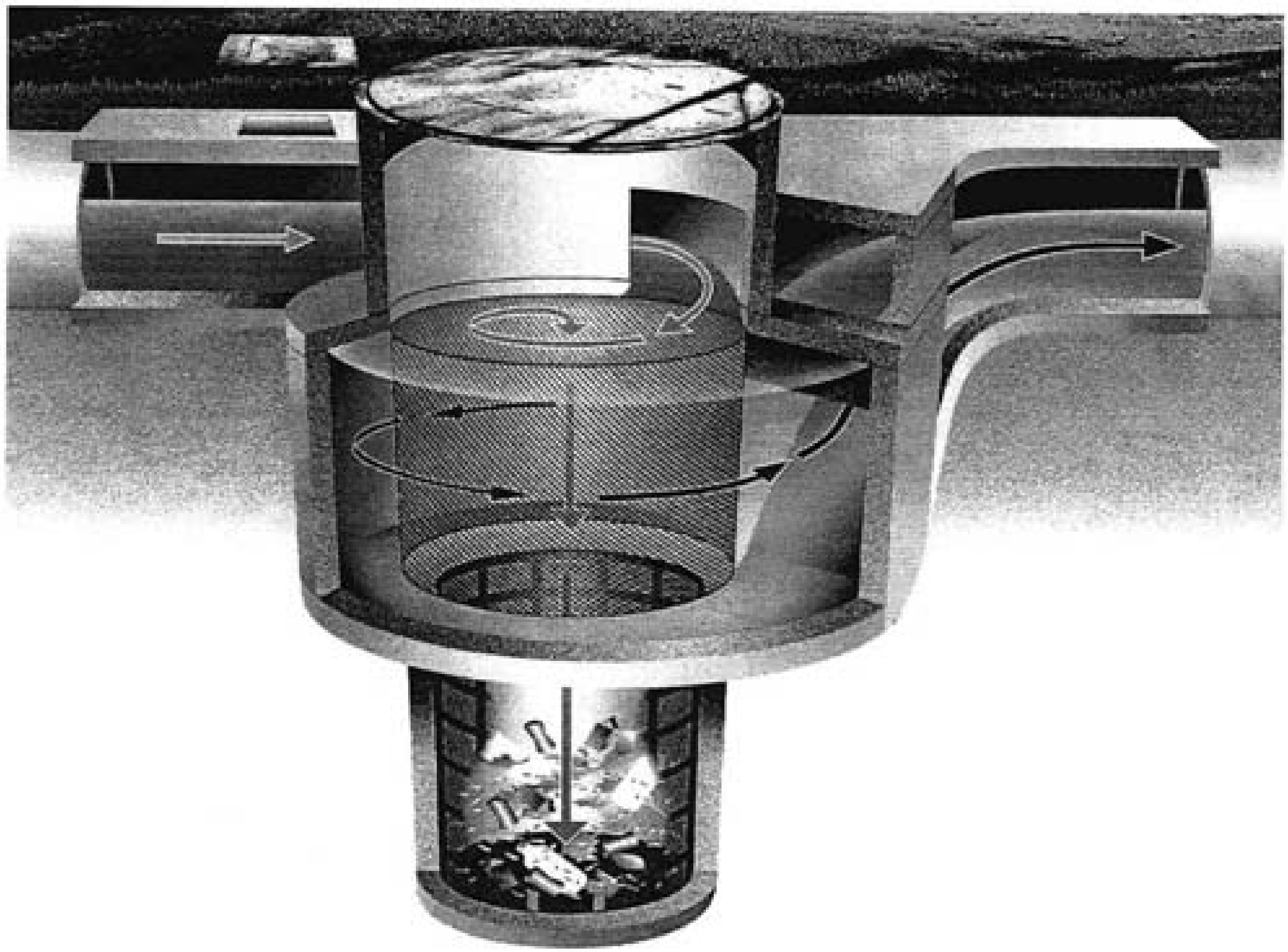


Direct screening - solids become caught on screen

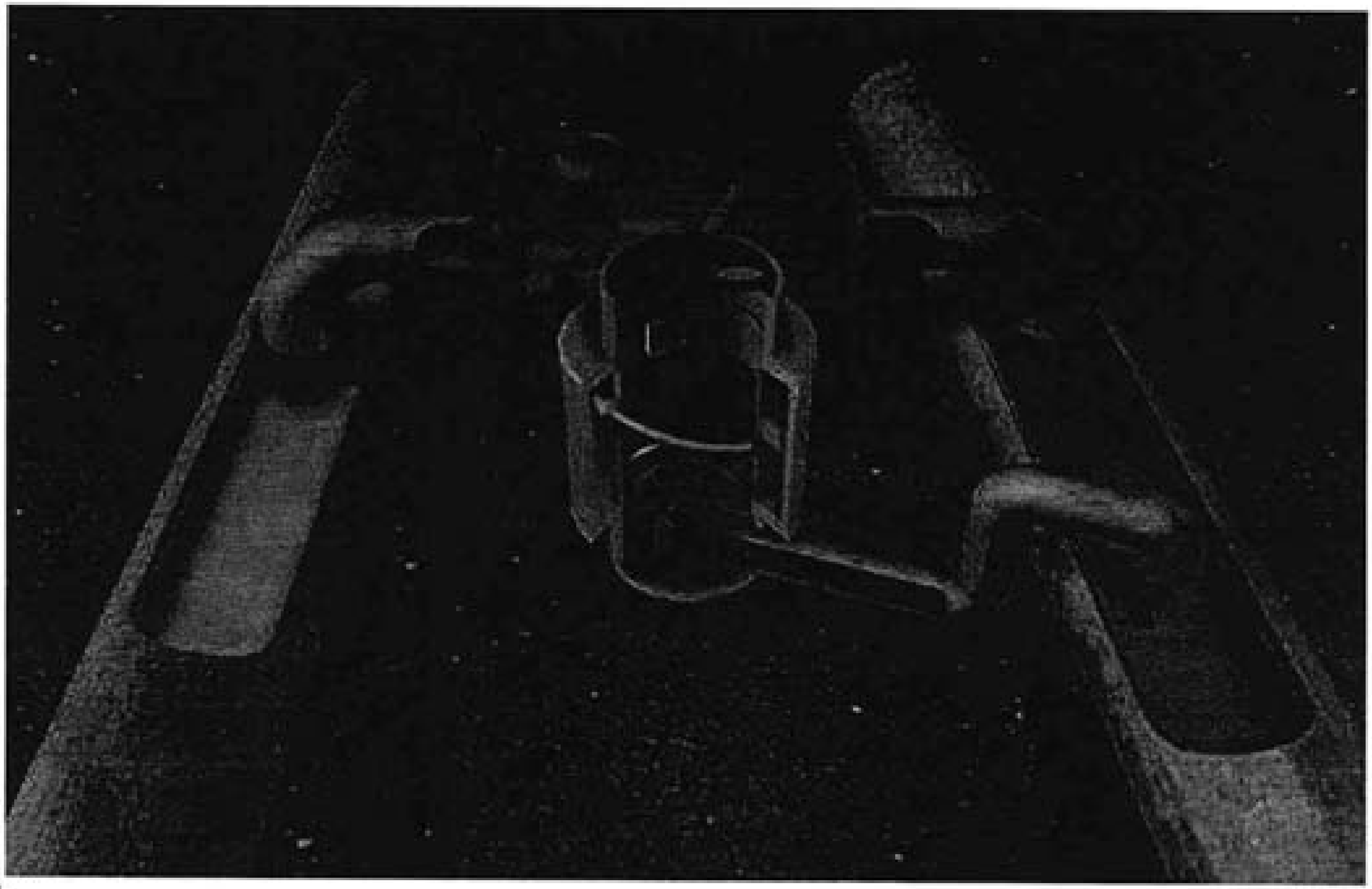


Indirect screening - solids swept past screen

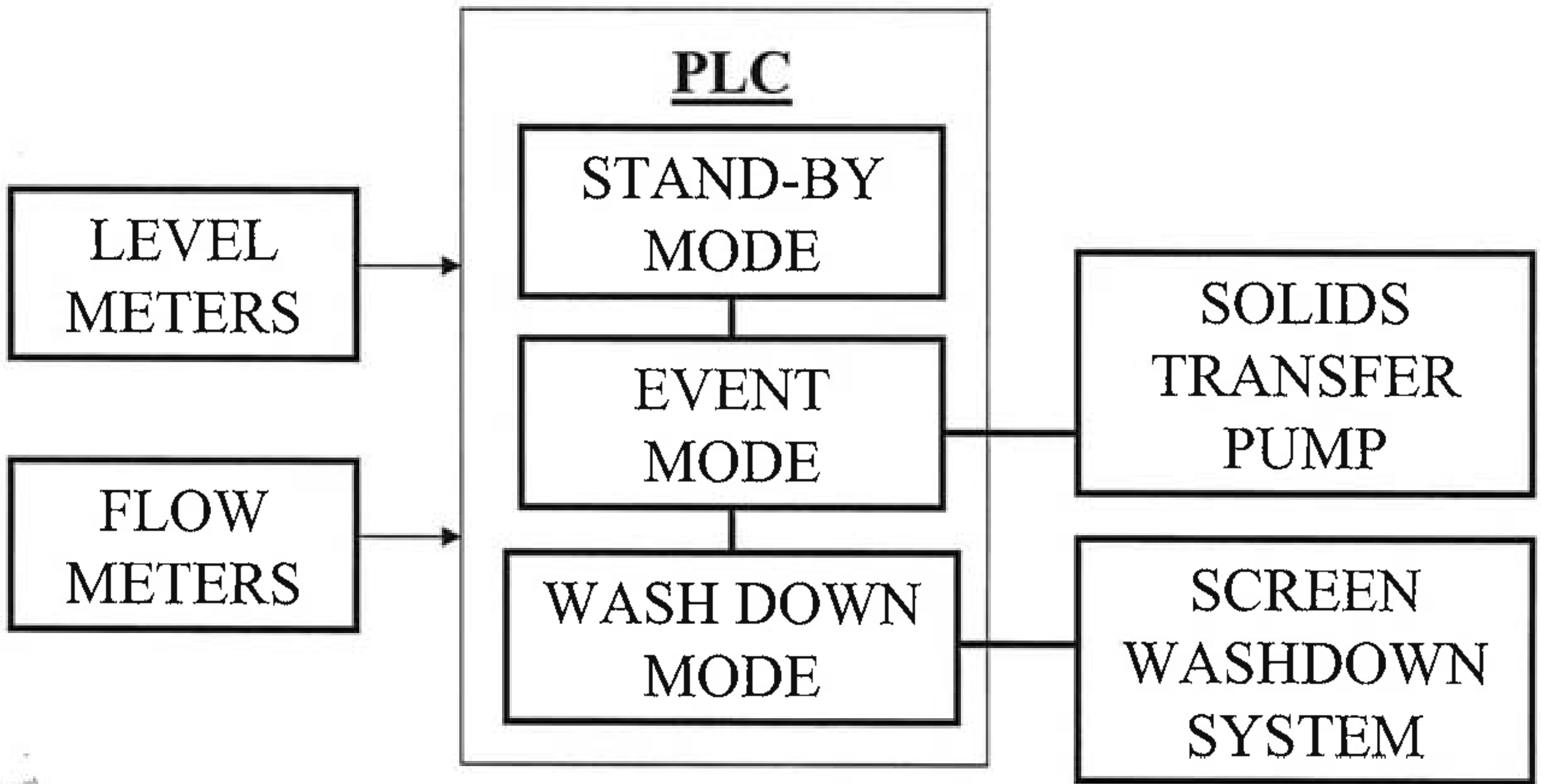
CDS SCHEMATIC



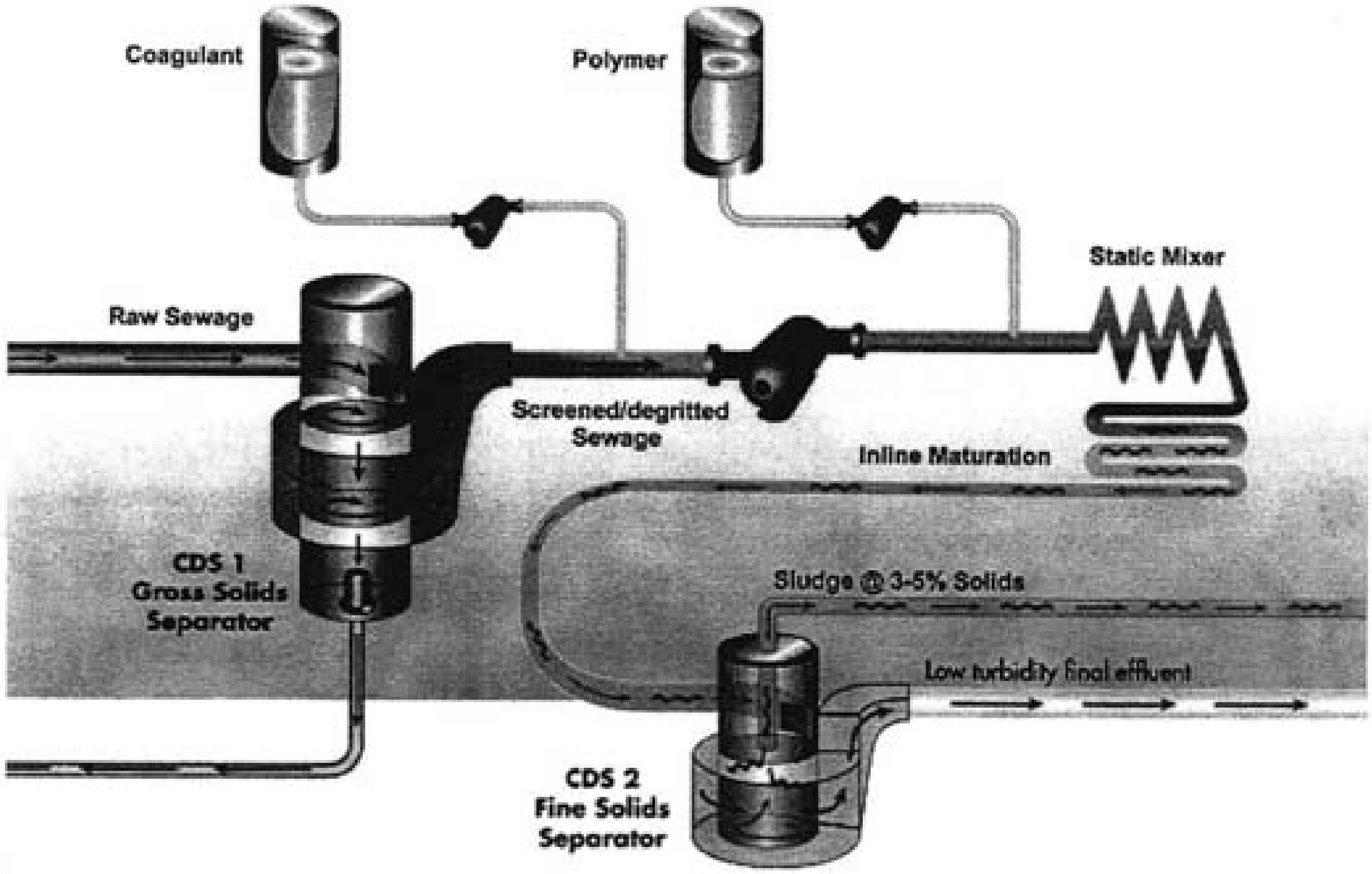
AUTOMATED CDS – FLOW SCHEMATIC



AUTOMATED CDS - CONTROLS



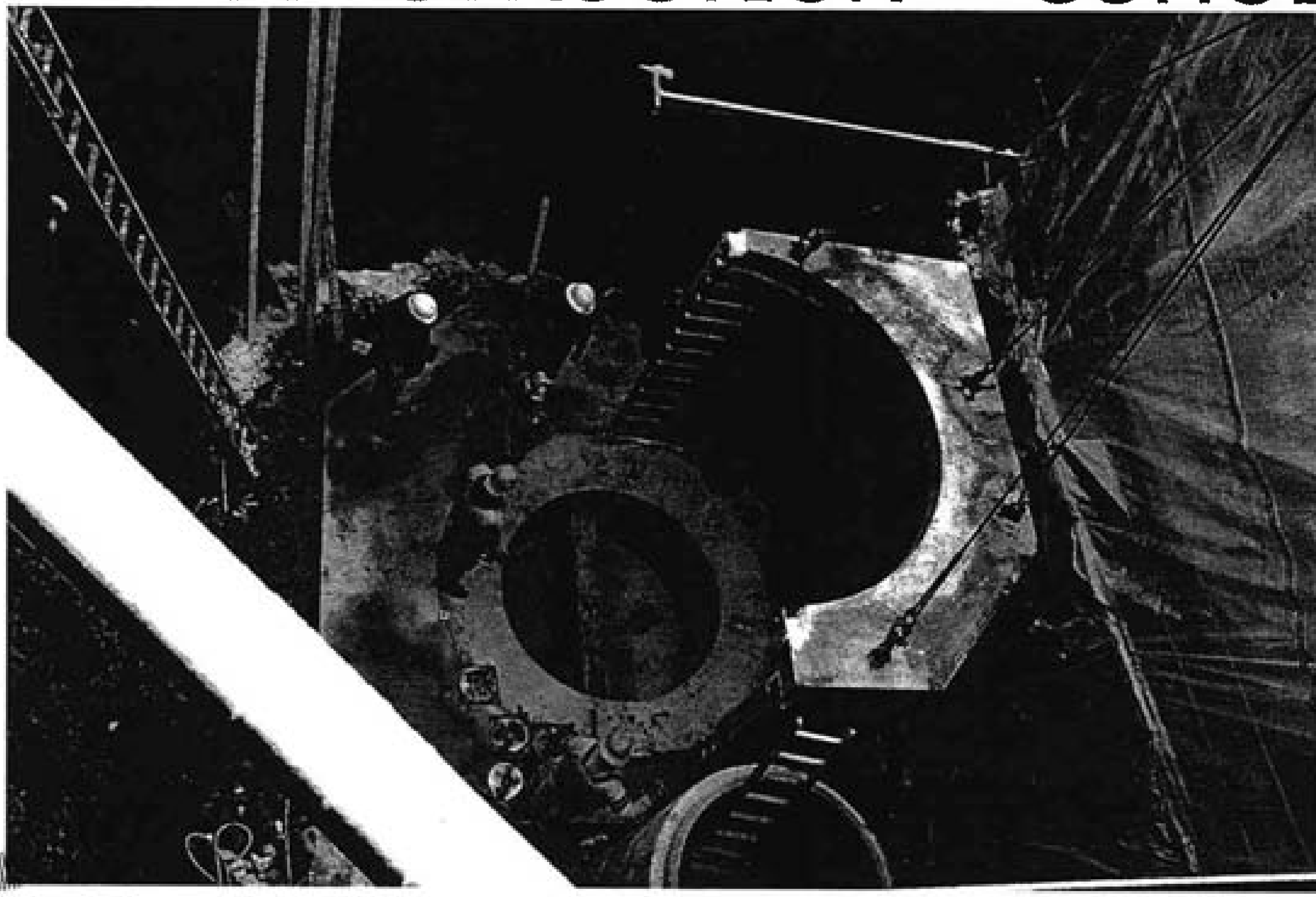
CDS FSS FLOCCING SYSTEM



CDS CSO FACILITIES

AUTOMATED		
LOUISVILLE, KY CSO 108	35 CFS	DUAL 7′ DIA X 7′ TALL
COHOES, NY OUFALL #9	40 CFS	10′ DIA X 10′ TALL
MANUAL		
AKRON, IN	2. CFS & 6. CFS	3′ DIA X 2′ TALL 5′ DIA X 4′ TALL
LOUISVILLE, KY CSO 50	8. CFS	5′ DIA X 5′ TALL

CDS CONSTRUCTION – COHOES



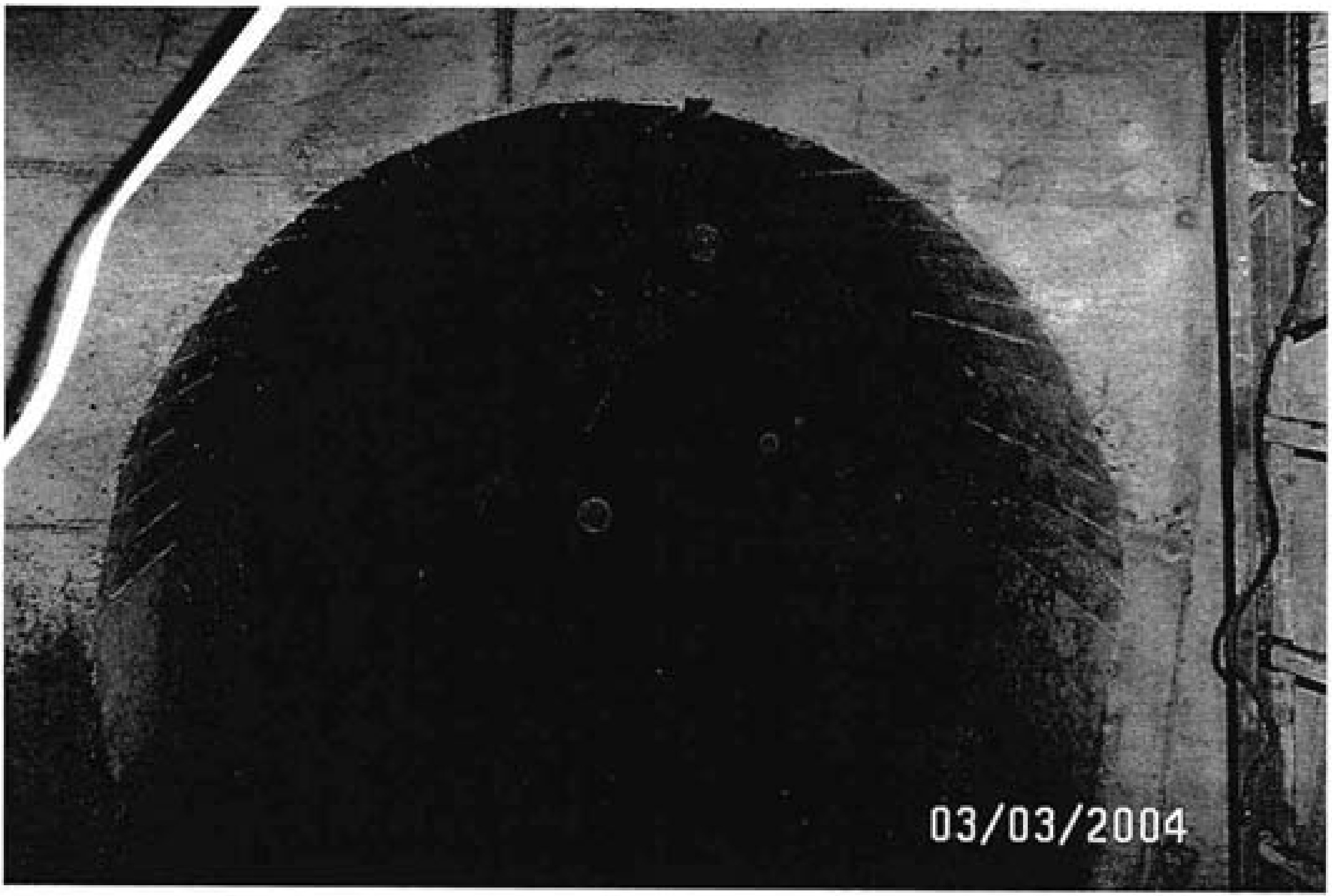
CDS TECHNOLOGIES

CDS GROSS SOLIDS SEPARATOR (GSS)

CDS CONSTRUCTION – COHOES

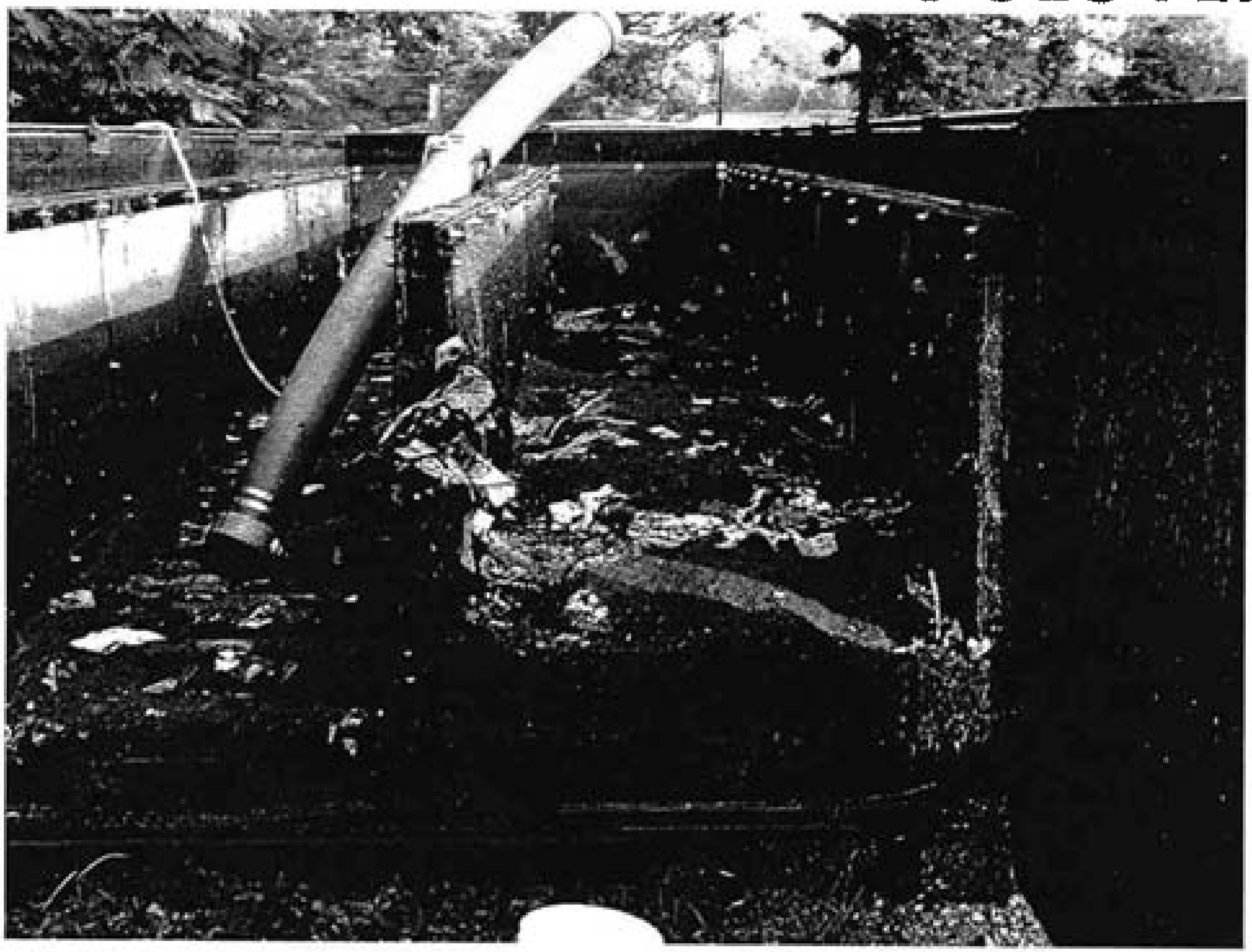
CDS TECHNOLOGIES

CDS CONSTRUCTION - COHOES



CDS TECHNOLOGIES

CDS PEFORMANCE – LOUISVILLE



CDS TECHNOLOGIES

CDS PERFORMANCE – LOUISVILLE

CDS TECHNOLOGIES

CDS PERFORMANCE – LOUISVILLE

POLLUTANT	AS SAMPLED		MASS BALANCE		
	INLET mg/l	OUTLET mg/l	INLET	OUTLE T	SUMP
TSS	63 75 341	33 144 566	1447 mg/l 1207 lb	248 mg/l 207 lb	1000 lb
SSC-B	114 74	38 137	1287 mg/l 1073 lb	87.5 mg/l 73 lb	1000 lb
	TTS Removal %		82.9%		
	SSC Removal %		93.2%		

CDS TECHNOLOGIES

CDS PERFORMANCE – SOLIDS CHARACTERIZATION

WET WEIGHT	2638 LB	
DRY WEIGHT	1000 LB	37.9% dry solids
TRASH	35 LB	3.5 %
ORGANIC	724 LB	72.4 %
INORGANIC	241 LB	24.1 %

CDS PERFORMANCE – SOLIDS CHARACTERIZATION

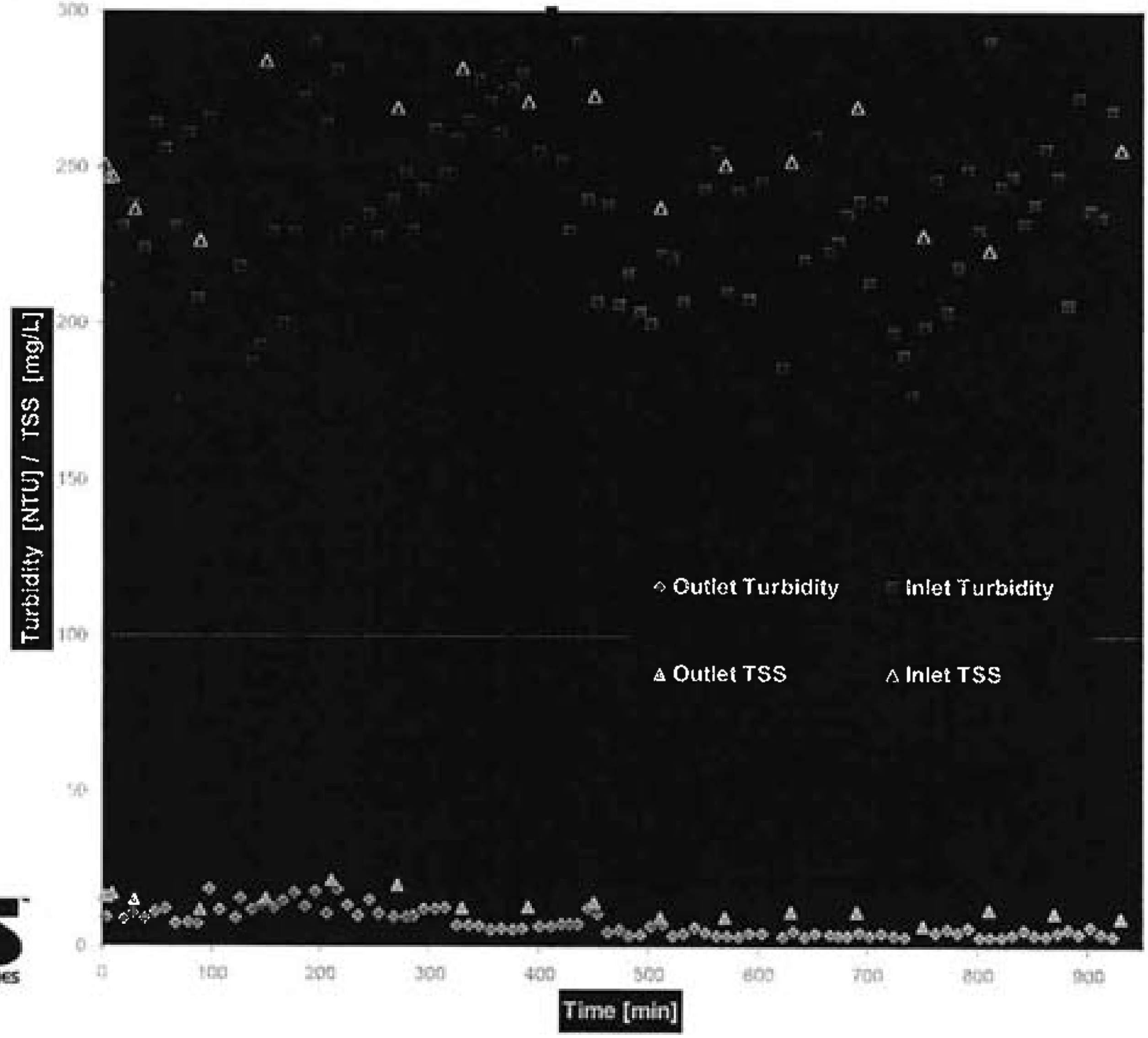
WET WEIGHT	2638 LB	
DRY WEIGHT	1000 LB	37.9% dry solids
TRASH	35 LB	3.5 %
ORGANIC	724 LB	72.4 %
INORGANIC	241 LB	24.1 %

CDS TECHNOLOGIES

CDS PERFORMANCE – FLOCCING

Parameter	Unit	Raw (Range)	Treated (Range)	% Rem.
Turbidity	[NTU]	240 (177-369)	7.6 (3.4-15.2)	97%
TSS	[mg/L]	259 (184-564)	13.5 (4-22)	95%
BOD_5 *	[mg/L]	302 (190-420)	38 (25-46)	87%*
COD *	[mg/L]	531 (454-643)	82 (76-85)	80%*
Faecal Coliforms	[CFU per 100mL]	1.3×10^7 ($5.4\text{-}17 \times 10^6$)	5.8×10^4 ($3\text{-}11 \times 10^4$)	99.5%
TP	[mg/L P]	12 (9.7-17.2)	0.6 (0.4-0.7)	95%
TN	[mg/L N]	71 (60-85)	55 (49-59)	16%
Ammonia	[mg/L]	40 (28-45)	37 (34-39)	8%

CDS PERFORMANCE - FLOCCING



COMPARATIVE COSTS – DESIGN BASIS

- 80 MGD PEAK FLOW FACILITY
- EXISTING OUTFALL
- REQUIRES NEW CONTROL STRUCTURE
- EQUIPMENT & CONSTRUCTION COSTS
  - NO LAND, RIGHT-OF-WAY COSTS
  - NO UNUSUAL CONDITIONS

CDS TECHNOLOGIES

COMPARATIVE COSTS & FOOTPRINT

SYSTEM	CAPITAL COST INSTALLED	FOOTPRINT
4 mm RAKED BAR SCREEN	$400,000 to $500,000	30′ X 8′ or 15′ x 12′
CDS – GSS SCREENING	$1.8 to $2.2 million	50′ x 30′
CDS – FSS W/ FLOCCULATION	$2.9 to $3.4 million	80′ x 50′

CDS TECHNOLOGIES

SUMMARY

- CDS-GSS PROVIDES A HIGHER LEVEL OF SCREENING PERFORMANCE THAN CURRENT CSO SCREENS
- WITH FLOCCULATION THE CDS-FSS SYSTEM CAN ACHIEVE NEAR SECONDARY EFFLUENT LIMITS.
- THEY PROVIDE ECONOMICAL ALTENATIVE WAYS TO ACHIEVE HIGHER QUALITY DISCHARGE LIMITS THAN CONVENTIONAL SCREENING PROVIDES

CDS TECHNOLOGIES

SUMMARY

- WET WEATHER FLOWS ARE VERY DIFFICULT TO SAMPLE AND NO ONE KNOWS HOW TO DO IT ON A LARGE SCALE.

CDS TECHNOLOGIES

FAX COVER SHEET

Fresh Creek Technologies, Inc.

1425 Pompton Ave Suite 1-2
Cedar Grove, NJ 07009

PHONE (973) 237-9099
FAX (973) 237-0744

FROM: Mike Farrelly **TO: Rita Fordiani**

DATE: 9/27/04 **FAX:** (773)691301

Page 1 of 9 including cover sheet

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Rita,

If you have any questions please contact me at (973) 237-9099

Thanks.

FRESH CREEK
TECHNOLOGIES, INC.
1425 Pompton Ave., Cedar Grove, NJ 07009
Tel (973) 237-9099, Fax (973) 237-0744

CONFIDENTIAL

Attention: Ms. Rita Fordiani, PE.
CH2M Hill
40 Tanbark Road
Sudbury, MA 01776

Subject: Midwest CSOs
Floatables Collection System

Dear Ms. Fordiani,

Fresh Creek Technologies, Inc. is pleased to present our Proposal P-10476, for the design, fabrication delivery and installation support of four (4) Inline Netting TrashTrap® systems for installation at four (4) locations in the Midwest. Our proposal is based on your 9/17/04 phone conversation with our Robert Kircher, engineering manager.

Description of the Netting TrashTrap® Technology

The Fresh Creek Technologies, Inc. Netting TrashTrap® system is a low cost, modular, prefabricated floatables collection system that is easy to install, operates unattended and requires no external power. Netting TrashTrap® systems use the natural energy of the flow to drive the trash or floatable materials into disposable mesh nets. Also, due to the downward design of most CSO and stormwater piping, the equipment is designed to drain dry. This feature eliminates the possibility of standing water, which is the breeding ground for mosquito (vector) propagation. Recently reported cases of West Nile virus make this feature of Fresh Creek's equipment an extremely important one from an environmental and health standpoint. The Fresh Creek Technologies, Inc. literature (enclosed), describes the Netting TrashTrap® technology in more detail.

Benefits of the Netting TrashTrap® systems are High Capture Efficiencies - above 98%, Low Installation Cost, and Low Operation and Maintenance Costs. The Netting TrashTrap® technology is included in US EPA CSO guidance documents. It implements both the "Nine Minimum Controls" and Long Term Control floatables requirements of the US EPA and has been approved for use in New Jersey by the NJ DEP.

Fresh Creek's Netting TrashTrap® System, meets and/or exceeds the Full Capture Treatment System requirements identified in the California Regional Water Quality Control Board (RWQCB), Los Angeles Region's Trash Total Maximum Daily Load (TMDL) for the Los Angeles River Watershed. The FCT Netting TrashTrap® system is the **only netting system presently approved by the Los Angeles RWQCB.**

Site Location

Based on the supplied information, FCT is proposing four (4) Inline Netting TrashTrap® systems, sized to accommodate the required design flows as follows:

CSO	Qty	No. of Nets	Size of Nets	Flow Rate	Pipe Dia.
#17	1	1	30" x 30" x 8' x ½" mesh	19 CFS	42"
#21	1	1	30" x 30" x 8' x ½" mesh	22CFS	66"
#26	1	3	30" x 30" x 8' x ½" mesh	72 CFS	72" & 84" **
#52	1	1	30" x 30" x 8' x ½" mesh	8 CFS	48"

** To be combined into one (1) pipe 8' in diameter by others

The overall systems and equipment of the netting system will be designed to process 100% of design flow via the nets. Any additional flow above this design flow rate will pass over the top of the netting internal support structure and will be processed through stainless steel screening material with ½" gaps. Therefore, the entire flow being transmitted through the CSO pipe will be screened for floatables of ½" or larger in size.

Each FCT Inline Netting TrashTrap® system will be in a dedicated concrete chamber. The concrete chambers will be supplied as a multi-piece precast structures. The nets will be inside lift baskets, which will be raised to grade level, at the time net replacement is needed. NO "Confined Space Entry" will be required. Because there is to be no street traffic at three (3) sites, the lift baskets at those sites will be accessed through 300 PSI rated hinged doors, which will be pre-cast into the concrete chamber lids. The site bearing intermittent traffic will have hinged doors rated for AASHTO H-20 wheel loading. All structural internals and hardware will be 316 stainless steel.

Because of the flow velocities that may be encountered at these sites, FCT is proposing the use of our standard 1/2" opening mesh net.

The mounting system for the netting support frame will be sized for the design flow discharging from of the outfall, during a rain/CSO event.

All mounting/anchoring will be "drill-in" type anchors and drilled into the concrete bottom and sidewalls of the concrete chamber walls. All FCT supplied equipment will use 316 stainless steel, anchors and hardware will also be 316 stainless steel.

Our general experience is that Netting TrashTrap® systems may require servicing one, two or more times a month during the wet weather season. The actual service interval is very site specific and depends on rainfall frequency, and the amount of trash that enters the CSO system. FCT recommends that the equipment and nets be inspected after every significant rain event.

Servicing the system is done using a truck equipped with a crane capable of extending out over the system to each of the nets and with a capacity to lift up to 2000 pounds at this reach. The weight of the lifting basket and net is approximately 500 pounds (without trash). The procedure is simple. The lift basket with the used net, is lifted through the open access opening (via crane type lifting equipment) and put on the ground. The used net is removed from the lifting basket using the same crane and put into a watertight dumpster for transport to a transfer station or landfill. We estimate that an experienced crew will be able to change out the net in less than 1 hour or less, per CSO site.

Scope of Supply/Work

I. Equipment to be supplied

A. Netting TrashTrap® System @ CSO #17

1. One Inline Netting TrashTrap® System Model ILNTT-1, consisting of one (1) net support frame & one lifting basket, hinged screening, access ladder; inside a multi-section pre-cast concrete chamber and all hardware required for installation.

   The above listed equipment will consist of the following fully described components, in the concrete chamber:

   A. One (1) 316 stainless steel net support and frame mounting system.

   B. One (1) 316 stainless steel net lifting basket and bridle.

   C. One (1) lot, 316 stainless steel 1/2 inch opening, hinged bar screen and appurtenances.

   D. One (1) 316 stainless steel access ladder, underneath the netting access doors.

E. One (1) concrete chamber, precast (in FCT's mold) by Oldcastle/Rotondo to the FCT design. The chamber will be 4'-0" wide by 16'-0" long by approximately 10'-0" high, (inside dimensions), with precast openings to match up with the CSO piping. The access opening for the chamber will be a 300 PSI rated hinged door (4'-0" wide by 7'-0" long inside dimensions), and a 30" square 300 PSI rated hinged man-door, both are pre-casted into the concrete chamber lid section.

F. One (1) set of access ladder rungs, underneath the manhole.

2. Eighteen (18) disposable standard duty ½" mesh nets with plastic frames, size is 2'-6" by 2'-6" (opening at mouth) by 8'-0" long (nominal). This quantity of nets equals the initial setup set, plus 17 change-outs.

3. All 316 stainless steel hardware and fittings required for the assembly and installation of the system.

B. Netting TrashTrap® System @ CSO #21

1. One Inline Netting TrashTrap® System Model ILNTT-1, consisting of one (1) net support frame & one (1) lifting basket, hinged screening, access ladder; inside a multi-section pre-cast concrete chamber and all hardware required for installation.

The above listed equipment will consist of the following fully described components, in the concrete chamber:

A. One (1) 316 stainless steel net support and frame mounting system.

B. One (1) 316 stainless steel net lifting basket and bridle.

C. One (1) lot, 316 stainless steel 1/2 inch opening, hinged bar screen and appurtenances.

D. One(1) 316 stainless steel access ladder, underneath the netting access doors.

E. One (1) concrete chamber, precast (in FCT's mold) by Oldcastle/Rotondo to the FCT design. The chamber will be 7'-6" wide by 17'-0" long by approximately 10'-0" high, (inside dimensions), with precast openings to match up with the CSO piping. The access opening for the chamber will be a 300 PSI rated hinged door (4'-0" wide by 7'-0" long inside dimensions), and a 30" square 300 PSI rated hinged man-door, both are pre-casted into the concrete chamber lid section.

F. One (1) set of access ladder rungs, underneath the manhole.

2. Eighteen (18) disposable standard duty 1/2" inch mesh nets with plastic frames, size is 2'-6" by 2'-6" high (opening at mouth) by 8'-0" long (nominal). This quantity of nets equals the initial setup set, plus 17change- outs.

3. All 316 stainless steel hardware and fittings required for the assembly and installation of the system.

OPTION: Because this chamber is required to match the existing pipe diameter, a second net could be added to this site (only) for a slight additional charge. This would double of the capacity of the Netting Trash Trap® System at this site.

C. Netting TrashTrap® System @ CSO #26

1. One Inline Netting TrashTrap ® System Model ILNTT-3, consisting of one (1) net support frame & three (3) lifting baskets, hinged screening, access ladder, inside a multi-section pre-cast concrete chamber and all hardware required for installation.

   The above listed equipment will consist of the following fully described components, in the concrete chamber:

   A. One (1) 316 stainless steel net support and frame mounting system.

   B. Three (3) 316 stainless steel net lifting baskets and bridles.

   C. One (1) lot, 316 stainless steel 1/2 inch opening, hinged bar screen and appurtenances.

   D. One (1) 316 stainless steel access ladder.

   E. One (1) concrete chamber, precast by Oldcastle/Rotondo to the FCT design. The chamber will be 13'-4"" wide by 19'-4"" long by approximately 10'-0" high, (inside dimensions), with precast openings to match up with the CSO piping. The access opening for the chamber will be a 300 PSI rated triple access hinged door, and a 30" square 300 PSI rated hinged man-door, both are pre-casted into the concrete chamber lid section.

   F. One (1) set of access ladder rungs, underneath the manhole.

2. Fifty-four (54) disposable standard duty 1/2" inch mesh nets with plastic frames, size is 2'-6" by 2'-6" high (opening at mouth) by 8'-0" long (nominal). This quantity of nets equals the initial setup set, plus 17 change-outs.

3. All 316 stainless steel hardware and fittings required for the assembly and installation of the system.

D. Netting TrashTrap® System @ CSO #52

1. One Inline Netting TrashTrap® System Model ILNTT-1, consisting of one (1) net support frame & one (1) lifting basket, hinged screening, access ladder, inside a multi-section pre-cast concrete chamber and all hardware required for installation.

   The above listed equipment will consist of the following fully described components, in the concrete chamber:

   A. One (1) 316 stainless steel net support and frame mounting system.

   B. One (1) 316 stainless steel net lifting basket and bridle.

   C. One (1) lot, 316 stainless steel 1/2 inch opening, hinged bar screen and appurtenances.

   D. One (1) 316 stainless steel access ladder, underneath the netting access doors.

   E. One (1) concrete chamber, precast (in FCT's mold) by Oldcastle/Rotondo to the FCT design. The chamber will be 4'-0" wide by 16'-0" long by approximately 10'-0" high, (inside dimensions), with precast openings to match up with the CSO piping. The access opening for the chamber will be a H-20 rated triple access hinged door, and a 30" square H-20 rated hinged man-door, both are pre-casted into the concrete chamber lid section.

   F. One (1) set of access ladder rungs, underneath the manhole.

2. Eighteen (18) disposable standard duty 1/2" inch mesh nets with plastic frames, size is 2'-6" by 2'-6" high (opening at mouth) by 8'-0" long (nominal). This quantity of nets equals the initial setup set, plus 17 change-outs.

3. All 316 stainless steel hardware and fittings required for the assembly and installation of the system.

<u>NOTE:</u> The use of a 4' wide chamber here is contingent upon the chamber matching up to the outer diameter of the existing 48" pipe.

II. Construction Supervision and Training

1. Fresh Creek Technologies will supervise the installation of equipment and include an overall work site inspection report at the completion of all work, for each site.

2. Following the completion of the project, Fresh Creek Technologies will conduct an operations and maintenance training program. Training shall be structured to develop a basic understanding of the design, function and capabilities of the equipment. In addition, routine operational and preventive maintenance, safety considerations, responses to abnormalities and startup, shutdown and troubleshooting will be covered. O & M manuals will be provided by Fresh Creek.

<u>NOTE:</u> Installation of FCT supplied equipment/items is by others. Installation includes but is not limited to: site preparation, crane to offload and install the concrete chamber, offloading and installation of FCT supplied internals, modifications to & tie-in to the existing piping and/or return area to original condition.

III. Pricing, Terms and Conditions

As requested, budgetary prices will be provided. The cost of stainless steel has risen sharply over the last 12 months amounting to increases of over 100% for certain grades. This is an important factor for design and costing issues. Some stability has returned to this market pricing, but it is too early to predict where prices will be 6-12 months from now.

The budgetary proposal price for the Fresh Creek Technologies, Netting TrashTrap® systems, as described above as follows:

Netting TrashTrap® System at CSO #17	Price = $ 97,500.00
Netting TrashTrap® System at CSO #21	Price = $124,250.00
Netting TrashTrap® System at CSO #26	Price = $219,350.00
Netting TrashTrap® System at CSO #52	Price = $ 98,675.00

The above proposal prices for the Fresh Creek Technologies, Netting TrashTrap® systems, includes on shipping costs, to the job site. Additional nets are available for <u>$125.00</u> each, plus freight when ordered in a minimum quantities.

Payment terms are net 30 days from the day the Fresh Creek Technologies equipment is shipped.

This FCT pricing is to be handled with "strictest confidence", therefore not to be communicated in any way (verbal, written, faxed, emailed, etc.) to anyone outside of your department and FCT, without FCT's written knowledge and approval.

IV. Comments

Submittals drawings and structural calculations (both including requirements under chambers) will be supplied 4 to 6 weeks of receipt of notice of the award of contract and verified piping inverts and grade elevation, whichever is later.

Delivery of the system to the site is 6 to 8 weeks after receipt of the approval of these submittals.

We estimate that the precast concrete sections can be installed in less than 1 day per site based on a good crane operator and at least four workers. The other FCT supplied equipment/items can be completely installed (by the installing contractor) within 2 days per site, using a crew of three (3) laborers, all required equipment and tools on the site.

The design & installation drawings and required calculations will be signed by a State of __________ licensed professional engineer.

Fresh Creek can provide contract services for maintenance and netting replacement. We presently have contracts with several Northern New Jersey cities. We would be pleased to quote a manual service contract for this installation.

General Comments:

Thank you for the opportunity to present this proposal. We look forward to discussing this proposal and our Netting TrashTrap® technology in more detail.

Sincerely,

P. M. Farrelly

Mike Farrelly
Project Engineer

Reviewed by

Robert Kircher

Robert Kircher
Engineering Manager

For each of the four sites, we have selected the appropriate equipment, determined the approximate required footprint and a budget price. The footprint is expressed in width and length, the width being equal to the required weir length to accommodate the equipment selected, including the space required for debris storage during an overflow event. The footprint will also work if the width and length dimensions are interchanged. Attached you will also find the general information for both the ACU-SCREEN fine overflow screens and the ACU-BEND underflow bending weirs.

For the four sites, we have made the following selections:

SITE # 17: Design Flow (Qd) = 19 cfs; Existing Structure; Access Width = 30 to 40 ft; Influent Pipe = 42"ø; One way check flap required; Existing Chamber = 10' x 10'; The Overflow Weir Sill Elevation is assumed to be = 0.00 ft.; The debris will be directed to the dry weather flow at this site.

- Equipment selected for this site is: One (1) ACU-SCREEN fine screen model GAS-DHS-183 and one (1) ACU-BEND underflow bending weir model GAB-60/183/4. The bending weir, which is sealed on all four sides, will serve two functions. The first is to insure that the available upstream storage is fully utilized and that the upstream water level (USWL) is maintained relatively constant before any overflow event occurs and the second is to act as a backflow preventor in the case of a high downstream water level (DSWL). The screen selected for this site is a diagonal unit with a single 6' screening module driven by an hydraulic power unit with a control panel and water level measuring device. The bending weir is of the underflow type, sealed on four sides, with integral counterweights, a height of 2 ft and a length of 6 ft.
- The required footprint to accommodate this equipment is 8.5' wide x 10' long.
- The ACU-SCREEN / ACU-BEND combination will operate so that the USWL will vary from +1.90 to +2.05 ft for all flows varying from 0 to Qd (19 cfs).
- If the screen is 40 % blocked, then the USWL will rise to +2.25 ft at Qd.
- With the screen operating under normal conditions (no blockage), the screen will have a maximum capacity of 35 cfs before overtopping at elevation +2.30 ft (top of screen).
- If the screen is completely blocked, then the top of the screen will act as an emergency overflow. The depth of water over the top of the screen will be 0.77 ft or elevation +3.07 ft.
- The budget price for this equipment (GAS-DHS-183 & GAB-60/183/4) is $ 60,400 US Funds (includes ACU BEND).

  SITE # 21: Design Flow (Qd) = 22 cfs; New Structure; Influent Pipe = 66"ø; The Overflow Weir Sill Elevation is assumed to be = 0.00 ft.; The debris will require a macerating pump at this site to return it to the dry weather flow.

- Equipment selected for this site is: One (1) ACU-SCREEN fine screen model GAS-HWS-168, water wheel driven. The screen selected for this site is a horizontal unit with a single 5.5' screening module driven by a water wheel. The water wheel requires a 2 ft differential between the crest of the overflow weir and the maximum DSWL.
- The required footprint to accommodate this equipment is 8' wide x 8' long.
- The ACU-SCREEN will operate so that the USWL will vary from +0.00 to +1.21 ft for all flows varying from 0 to Qd (22 cfs).
- If the screen is 40 % blocked, then the USWL will rise to 1.90 ft at Qd.
- With the screen operating under normal conditions (no blockage), the screen will have a maximum capacity of 38 cfs before overtopping at elevation 2.00 ft (top of screen).
- If the screen is completely blocked, then the top of the screen will act as an emergency overflow. The depth of water over the top of the screen will be 0.88 ft or elevation +2.88 ft.

- The budget price for this equipment (GAS-HWS-168) is $ 46,400 US Funds + $14,000 for ACU BEND.

SITE # 26: Design Flow (Qd) = 72 cfs; New Structure; Influent Pipe = 72" & 84"ø; The Overflow Weir Sill Elevation is assumed to be = 0.00 ft.; The debris will be directed to the existing adjacent pump station at this site.

- Equipment selected for this site is: One (1) ACU-SCREEN fine screen model GAS-HWD-500. The screen selected for this site is a horizontal unit with two 8.2' screening modules driven by a water wheel. The water wheel requires a 2 ft differential between the crest of the overflow weir and the maximum DSWL.
- The required footprint to accommodate this equipment is 20' wide x 10' long.
- The ACU-SCREEN will operate so that the USWL will vary from +0.00 to +1.31 ft for all flows varying from 0 to Qd (72 cfs).
- If the screen is 40 % blocked, then the USWL will rise to +2.13 ft at Qd.
- With the screen operating under normal conditions (no blockage), the screen will have a maximum capacity of 127 cfs before overtopping at elevation +2.30 ft (top of screen).
- If the screen is completely blocked, then the top of the screen will act as an emergency overflow. The depth of water over the top of the screen will be 1.05 ft or elevation +3.35 ft.
- The budget price for this equipment (GAS-HWD-500) is $ 65,000 US Funds + $25,000 for ACU BEND.

SITE # 52: Design Flow (Qd) = 8 cfs; New Structure; Influent Pipe = 48"ø; The Overflow Weir Sill Elevation is assumed to be = 0.00 ft.; The debris will be pumped to the dry weather flow at a site approximately 100 ft away.

- Equipment selected for this site is: One (1) ACU-SCREEN fine screen model GAS-HWS-107. The screen selected for this site is a horizontal unit with a single 3.5' screening module driven by a water wheel. The water wheel requires a 2 ft differential between the crest of the overflow weir and the maximum DSWL.
- The required footprint to accommodate this equipment is 6' wide x 8' long.
- The ACU-SCREEN will operate so that the USWL will vary from +0.00 to +0.85 ft for all flows varying from 0 to Qd (8 cfs).
- If the screen is 40 % blocked, then the USWL will rise to +1.15 ft at Qd.
- With the screen operating under normal conditions (no blockage), the screen will have a maximum capacity of 15.9 cfs before overtopping at elevation +1.30 ft (top of screen).
- If the screen is completely blocked, then the top of the screen will act as an emergency overflow. The depth of water over the top of the screen will be 0.54 ft or elevation +1.84 ft.
- The budget price for this equipment (GAS-HWS-107) is $ 44,500 US Funds + $10,000 for ACU BEND.

Please note that the budget prices include the equipment, all gaskets and seals, anchoring system, crating, shipping, O&M manuals, installation assistance, start-up and operator training. The budget prices also include an amount for the two sites requiring pumping of the debris back to the dry weather flow location. The civil costs and installation is not included in our prices.

When you have more information on these sites, we will be pleased to work with you to develop detailed site drawings.

Should you have any questions or comments, do not hesitate to contact me. However, please note that I will be out of the office from September 20 16:00 hours to September 29, 2004. Please speak to Steve Bigelow or leave a message for me during this period.

Nick Grande, M.Eng., P.E.
President
Grande Water Management Systems
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ACU-BEND
Selection Criteria:

Design Data:

Weir Overflow Capacity (Qd):	__________	(indicate L/s, cfs, gpm, etc...)
Maximum Head (H) at Qd:	__________	(indicate ft or m)
Existing Structure:	__________	(yes/no)
Overflow Weir Elevation:	__________	
Overflow Weir Length:	__________	
Maximum Upstream Water Level (Max USWL):	__________	
Preferred number of Weir Modules:	__________	
Sealed on all Four Sides:	__________	(yes/no)

Preferred Counterweight Option:

Concrete Weights:	__________
Galvanized Steel Weights:	__________
Stainless Steel Weights:	__________

Material of Construction Preference:

SS 304:	__________
SS 316:	__________

Weir Monitoring Option:

Discharge Monitoring:	__________	(yes/no)
Installation Assistance Required:	__________	(yes/no)
Start-Up Required:	__________	(yes/no)
Personnel Training Required:	__________	(yes/no)

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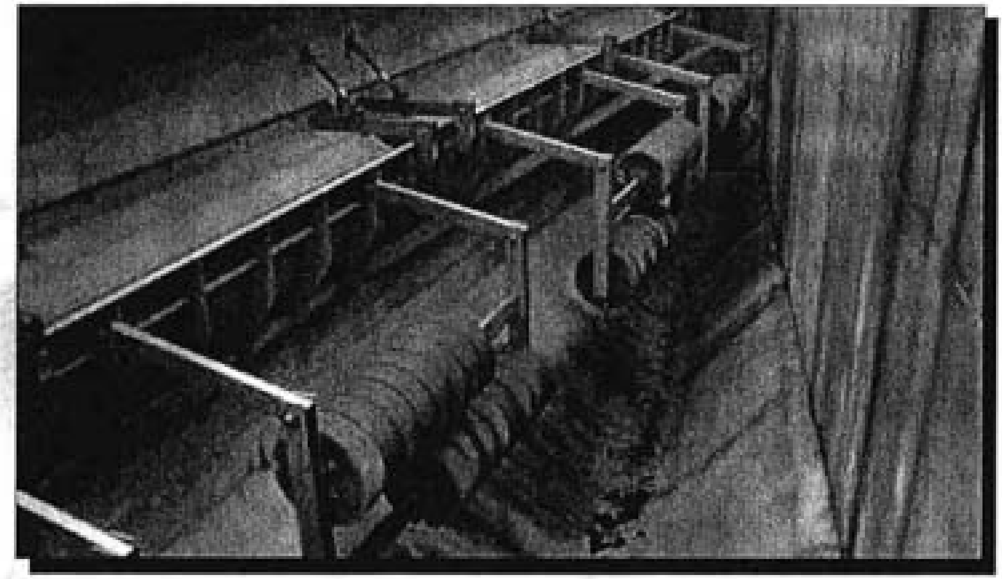
ACU-BEND Bending Weir Type "U"

The Clear Solution



Application

Once a combined sewer overflow (CSO) tank (or sewer) or a stormwater overflow tank (or sewer) is full, any additional influent water must be able to reach the receiving stream. In the past this was usually accomplished with the use of fixed weirs. However fixed weirs have inherent disadvantages including: increased water pollution, lower usable tank and sewer storage volumes and no backflow protection. To avoid the disadvantages of fixed weirs increasing use is made of overflow bending weirs such as the unique and patented **ACU-BEND**.

The **ACU-BEND** is designed to ensure that a constant maximum storage level is maintained upstream of the weir so that full utilization is made of all the available upstream storage volume. The **ACU-BEND** is designed to open just enough to allow the additional influent water to overflow the weir while maintaining the upstream water level. This ensures that the frequency of overflow events is reduced which results in reducing the discharge of highly polluted water to the receiving stream.

The entire overflow weir length can be utilized for overflow level control. The compact design makes the system particularly suitable for structures with limited space and for installation in existing structures. The special weir construction makes virtually constant maximum storage levels possible, even under backflow conditions.

Features

- Lower storage tank construction costs owing to smaller tank volumes (the **ACU-BEND** allows for 100 % utilization of storage tank volume as opposed to only 70 to 80% for conventional weirs).
- Increased water pollution protection since discharge from the storage tank to receiving stream commences only after complete filling of the available storage volume or after reaching maximum storage level.
- Stainless steel 316 construction ensures reliable trouble free operation.
- The maximum storage level setting may be easily modified after installation of the device.
- Hydraulically ideal shape of the weir flap ensures blockage free discharge
- Integrated counterweight design eliminates need for separate counterweight chamber.
- Easy retrofitting of existing basin overflows possible (additional storage volume gain).
- The **ACU-BEND** is available with seals on all four sides, so that it can act as a backflow prevention device for flood protection.

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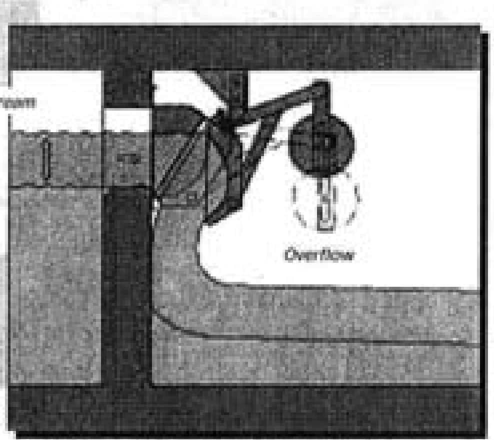
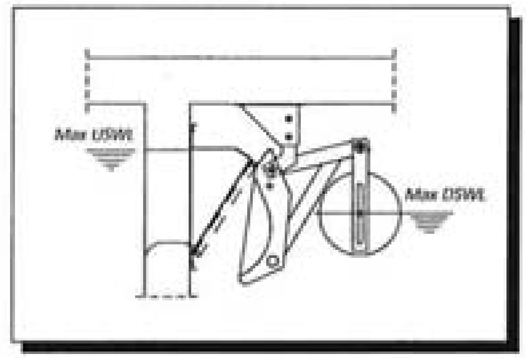


Operational diagram of the ACU-BEND

__ACU-BEND__ Installation



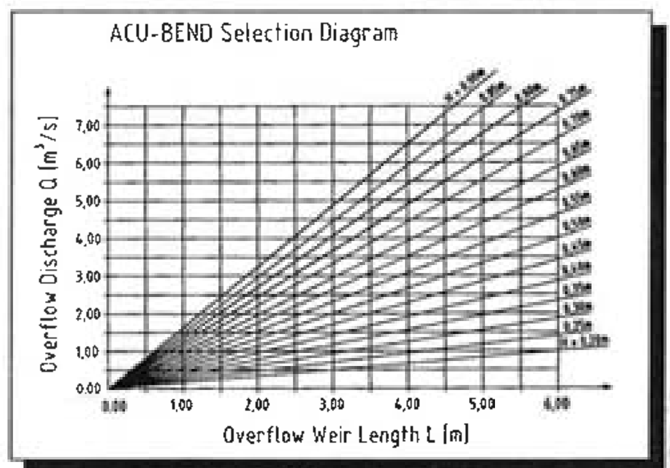
Operation

The **ACU-BEND** is installed on the existing fixed overflow weir, with its pivot points attached to the structure's ceiling, sidewall or crossbeam. The pivot balances the forces produced by the hydrodynamic loading on the overflow weir flap with those of the counterweight. This ensures equilibrium in any weir position, resulting in a highly sensitive response to the slightest change in the upstream water level. The **ACU-BEND** remains in the rest position (closed) until the maximum design storage level is reached. Upon reaching this level, the **ACU-BEND** immediately responds and swings away from the sill, allowing the excess water to overflow while maintaining a constant upstream water level.

The patented special shape of the weir body and the arrangement of the hinged flap and counterweights are the result of extensive calculations and hydraulic testing. The relationship between the static and dynamic hydraulic forces, as well as the passive forces of the counterweights (and weir), have been optimized. This results in a high discharge coefficient for the **ACU-BEND** which ensures that a constant upstream water level is maintained without negatively impacting the upstream hydraulic grade line.

If required, the maximum storage level setting may be adjusted on site by removing or adding counterweights.

Selection diagram



The calculation of the overflow discharge Q is based on the Poleni weir formula :

$$Q = 2/3 * \mu * L * H^{1.5} * \sqrt{2 * g}$$

The overflow coefficient $\mu = 0{,}64$

According to the Poleni formula, the hydraulic capacity of the **ACU-BEND** is at least equal to that of a standard overflow weir. This means that the upstream water level is not adversely affected by the presence of the **ACU-BEND** overflow bending weir type U.

Overflow weir sizes not shown or beyond the diagram limits may be obtained by special request.

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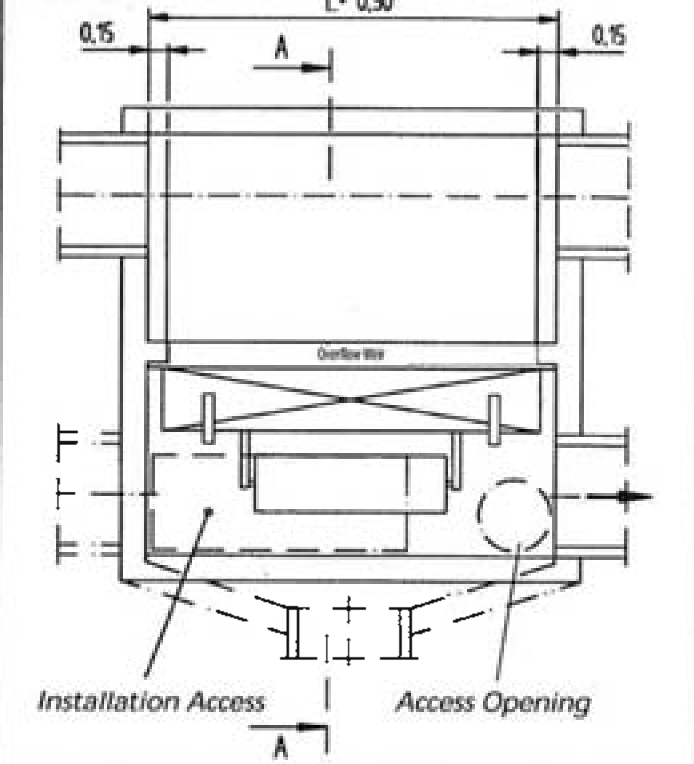
Installation Data for ACU-BEND Weir

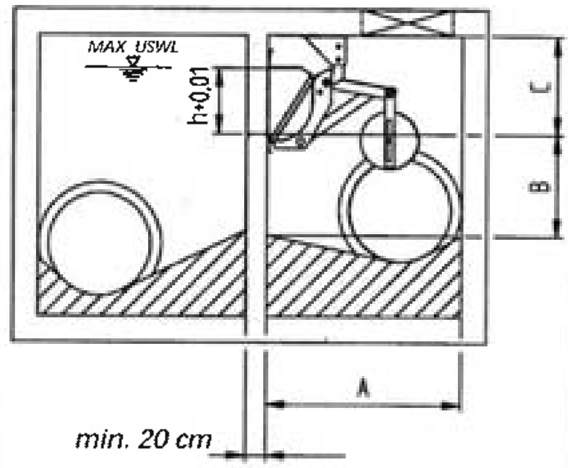
Backflow protection design (sealed on four sides)

Detailed installation drawings will be prepared by GWMS for specific project application

PLAN VIEW



Section A - A



Installation and anchoring on ceiling, crossbeam or sidewalls are optional, depending on site constraints

If a floatables baffle wall is to be installed upstream of the ACU-BEND, insure adequate clearance of approximately 1.5 x h between the baffle and the overflow weir.

Dimensions:

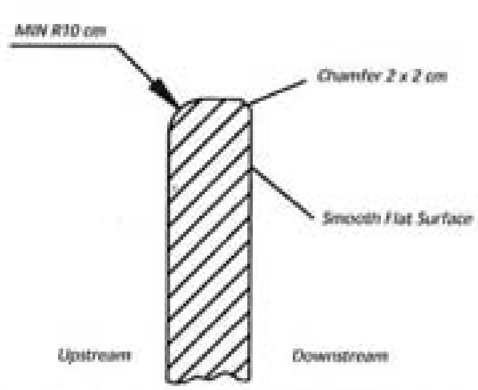
h [m]	0.20 - 0.30	0.30 - 0.40	0.40 - 0.50	0.50 - 0.60	0.60 - 0.70	0.70 - 0.80	0.80 - 0.90
L [m]				up to 10.00			
A [m]	≥0.85	≥1.00	≥1.20	≥1.40	≥1.60	≥1.85	≥2.20
B [m]	≥0.30	≥0.38	≥0.46	≥0.53	≥0.63	≥0.70	≥0.80
C [m]	≥0.50	≥0.60	≥0.70	≥0.80	≥0.90	≥1.10	≥1.30

Other dimensions available upon request

Install secondary concrete only after overflow weir installation is complete.

Size of installation opening depends on specific project requirements and site constraints as well as ACU-BEND dimensions.

Recommended Shape of Overflow Weir



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ACU-SCREEN
Selection Criteria:

Design Data:

Screen Overflow Capacity (Qd):	____________	(indicate L/s, cfs, gpm, etc...)
Maximum Head (H) at Qd:	____________	(indicate ft or m)
Existing Structure:	____________	(yes/no)
Overflow Weir Elevation:	____________	Overflow Weir Length: ____________
Maximum Upstream Water Level (Max USWL):	____________	
Preferred number of Screening Modules:	____________	

Preferred Drive Option:

Water Wheel (WW) Driven:	____________	(Minimum Required Vertical Downstream Clearance 24" [600 mm])
Hydraulic Power Unit (HPU) Driven:	____________	
Electric Motor (EM) Driven:	____________	

Note: Options other than water wheel driven will require a control panel with water level sensor.

Control Panel (Required for HPU Driven Screen):

Enclosure Type:	____________	(NEMA 12, 4 or 4X)
CP Location:	____________	(Non-hazardous, Ex-Proof, etc...)
Panel Voltage Requirements:	____________	(VAC, ph, 60 Hz)
Hydraulic Pump Motor Voltage:	____________	(VAC, ph, 60 Hz)
Distance between HPU and ACU-SCREEN:	____________	

Space required for the control panel enclosure is approximately: 24" x 36" x 16" (w x h x d) for up to 2 modules; 30" x 48" x 16" (w x h x d) for up to 4 modules

Standard Hydraulic Power Unit Components: -High Oil Pressure, Low Oil Level and High Oil Temperature Alarms & Corresponding Gauges; -Breather Cap; -Uses biodegradable hydraulic oil (water pollution class 1); -Manual or Automatic operation; -Automatic reversal in case of blockage

Control Panel (Required for EM Driven Screen):

Enclosure Type:	____________	(NEMA 12, 4 or 4X)
Panel Voltage Requirements:	____________	(VAC, ph, 60 Hz)
Screen Motor Voltage:	____________	(VAC, ph, 60 Hz)
Control Panel Location:	____________	(Non-hazardous, Ex-Proof, etc...)

Space required for the control panel enclosure is approximately :24" x 24" x 10" (w x h x d)

Control Panel Options:

Upstream Water Level Sensor Type:	____________	(Float or Ultrasonic)
Menu-driven display with relevant operating data:	____________	(yes/no)
Dry contacts for remote monitoring:	____________	(yes/no)
Length of Hydraulic Hoses Required:	____________	(ft or m)
Installation Assistance Required:	____________	(yes/no)
Start-Up Required:	____________	(yes/no)
Personnel Training Required:	____________	(yes/no)

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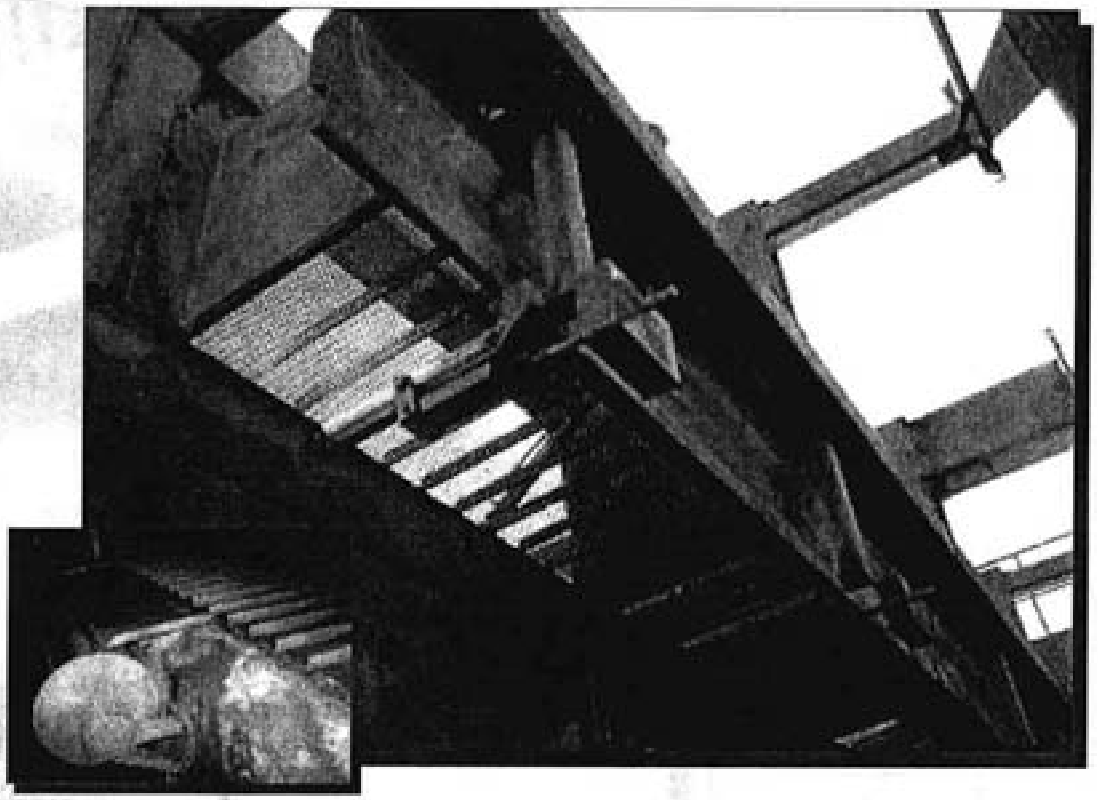
ACU-SCREEN Fine Slotted Overflow Screen

The Clear Solution



Application

Stormwater discharge systems and combined sewer overflows (CSO) are the weak points in sewer systems, usually at the expense of water pollution prevention. They are entry points through which urban pollutants reach the receiving stream. In the past, there were frequently no adequate preventive measures available or in place. Today however, there are legal requirements in many areas for the retention of floating and suspended matter in stormwater and combined sewer overflow systems. The **ACU-SCREEN** economically provides effective receiving stream protection. It is designed to be installed over stormwater discharge sills, settling tank overflow weirs, CSO weirs, flood discharge systems, etc... Its modular design makes it suitable for any type of overflow system and is easily retro-fitted to existing structures

The **ACU-SCREEN** design is based on a special stainless steel screening surface, with slotted screen openings of 3/16" x 1" and a total free area of 50 %, achieving the highest possible degree of solids retention while minimizing the head loss.

Features:

- The **ACU-SCREEN** is constructed entirely of stainless steel 316 ensuring reliable trouble free operation.
- Self adjusting brush provides automatic cleaning of screening surface in both directions.
- The **ACU-SCREEN** cleaning system may be driven by a water wheel (requiring no external energy) or by an electro-hydraulic drive, depending on site constraints.
- Slotted screening surface ensures the retention of all solids greater than 3/16".
- Design of cleaning system mechanism ensures that moving parts are never submerged.
- Modular design allows for installation over virtually any overflow weir type and size.
- Easy to retrofit into existing structures.
- May be installed in the vertical or diagonal position when the preferred horizontal arrangement is not possible due to site constraints.

Printed in Canada

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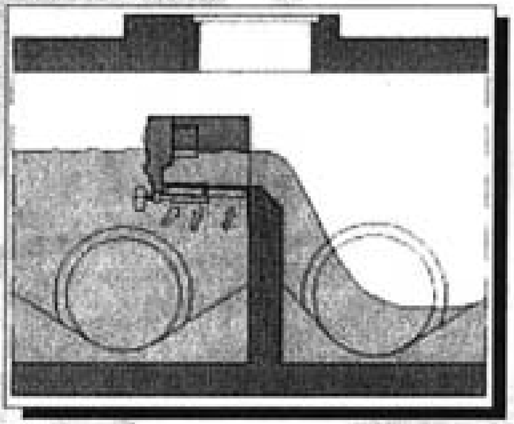

*Operating diagram for the **ACU-SCREEN** with electro-hydraulic drive.*

Operation

The **ACU-SCREEN** screening surface is made up of a series of 3/16"x1" slots and has a clear opening of 50%. During an overflow event, the solids retained by the screen are continuously cleaned by the back and forth movement of the cleaning brush. The preferred installation is horizontal, however it may also be installed vertically or diagonally to satisfy any existing structural constraints.

The **ACU-SCREEN** can be driven without the need for external energy as the cleaning mechanism may be powered by the proven principle of the water wheel. The water wheel powers a gear drive which converts this energy into an oscillatory motion. A weighted, self-adjusting brush, attached to the guide carriage, is driven back and forth across the screening surface, pushing all retained solids into storage areas, found at either end of the screen modules. Because the screen is continuously brushed clean, clogging of the screening surface cannot occur. The retained solids are discharged into the sewage stream at the end of an overflow event and carried to the sewage treatment plant for removal.

The **ACU-SCREEN** may also be equipped with an electro-hydraulic drive (where site constraints warrant), whose electronic components are located well outside the overflow structure. Only biodegradable hydraulic oils are used.

The **ACU-SCREEN** may be installed in combination with an **ACU-BEND** bending weir to maximize the use of all available upstream in-situ storage and to minimize the frequency of an overflow event.

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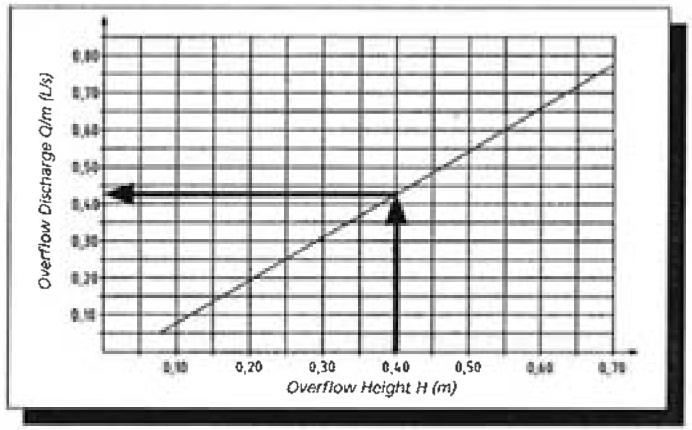


Example:
Determining the required screening surface length (standard screen width of 0.70 m).

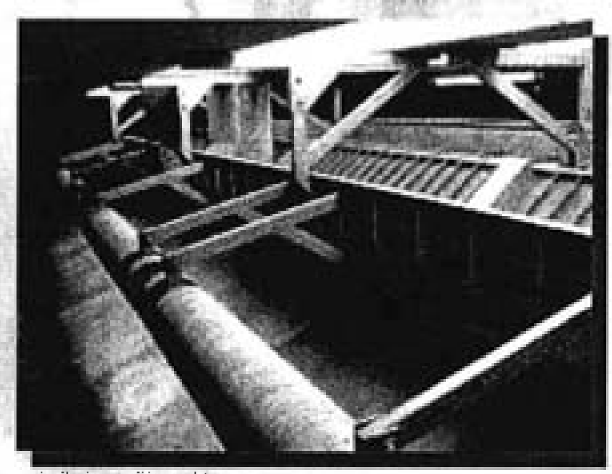
Design overflow discharge Q = 1500 L/s (53 cfs)
Maximum overflow height H = 0.40 m (16")

From selection diagram:
Flow per meter (Q/m) of overflow length is 430 L/s

⇨ Screen Length (l) = Q ÷ Q/m = 1500 / 430 = 3.49 m

Selected: Min. screen module length (l) 3.50 m (11.5')

***ACU-SCREEN** in stormwater overflow basin.*



***ACU-SCREEN** with **ACU-BEND** combination.*

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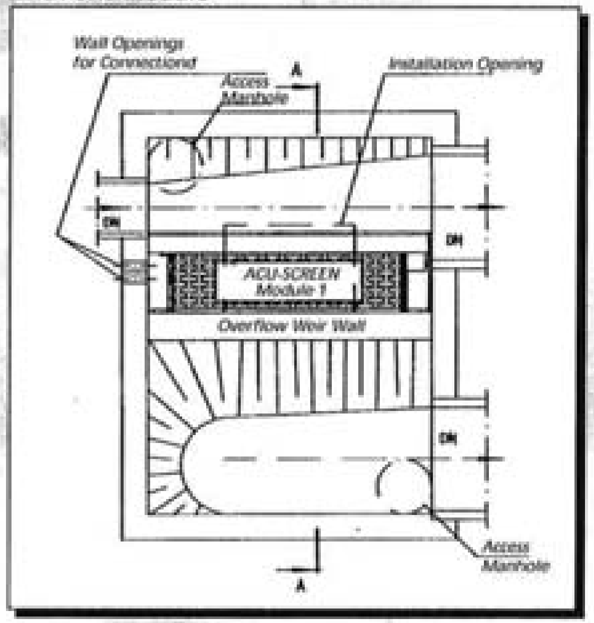
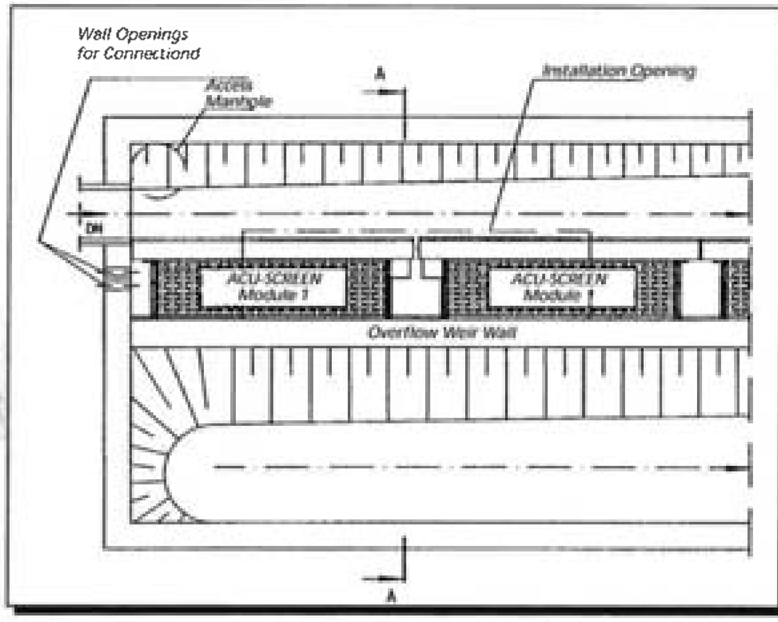
Sample Installations for the ACU-SCREEN

Detailed installation drawings will be prepared by GWMS for specific project application

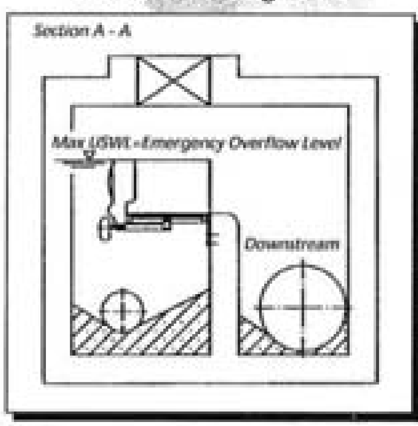
Horizontal Arrangement
With one module



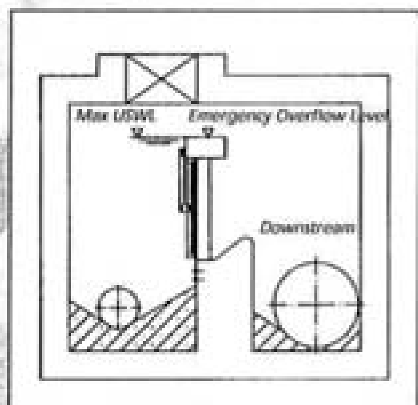
Horizontal arrangement
with 2 or more modules



Horizontal arrangement



Vertical arrangement



Horizontal arrangement
(water wheel driven)

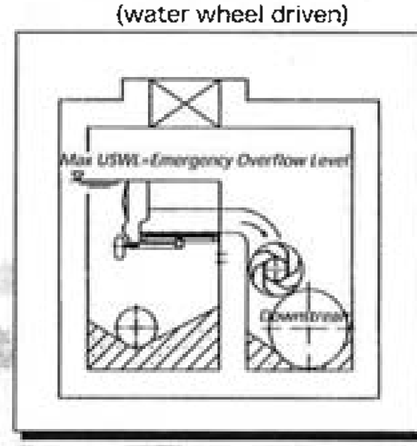
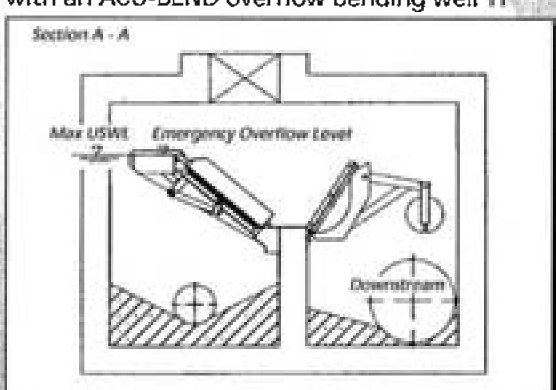
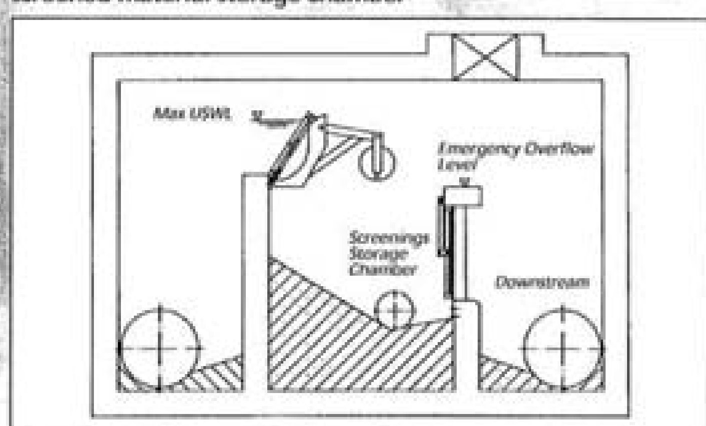


Diagram arrangement in combination
with an ACU-BEND overflow bending weir H



Vertical arrangement with auxiliary sill and
screened material storage chamber



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FACSIMILE 919-677-0082

September 20, 2004

Ms. Rita Fordiani
CH2M Hill
Boston, MA
Tel: 978-443-9218
rfordian@ch2m.com

Re: ACTIFLO® Budgetary Price
CH2M Hill-Boston

Dear Ms. Fordiani,

Thank you for your interest in the Krüger ACTIFLO® process for Combined Sewer Overflow treatment. Enclosed is our price estimate, design summary, layout, and equipment scope of supply for a 1 x 14 MGD ACTIFLO® system. Also enclosed are the layout drawings, price estimates and operating cost estimates for three additional designs: 5 MGD, 12 MGD and 48 MGD (2 x 24 MGD).

Please note that the raw water entering the 12, 14 or 48 MGD ACTIFLO® systems must have particles greater than 10 mm in size removed by means of mechanical fine screening. The 1 x 5 MGD system must have particles greater than 6 mm removed. Additionally, proper dispersion of the coagulant must be achieved through static or induction mixing prior to the entry of the raw water into the ACTIFLO® system.

The corresponding scope of supply is detailed in the following pages and summarized below:

- Mechanical equipment related to the ACTIFLO® system,
- Automatic liquid polymer preparation and dosing system,
- Coagulant metering pumps and control panel,
- ACTIFLO® system based PLC control panel,
- Process instrumentation,
- Spare parts.

Our budgetary prices for the four options are as follows:

Design Option	Site	Flow, cfs	Size	Price
Option 1	#21	22 cfs	1 x 14 MGD	**$1,050,000.00**
Option 2	#52	8 cfs	1 x 5 MGD	**$800,000.00**
Option 3	#17	19 cfs	1 x 12 MGD	**$1,000,000.00**
Option 4	#26	72 cfs	2 x 24 MGD	**$2,400,000.00**

Krüger

Kruger Products
401 Harrison Oaks Blvd.
Ste. 100
Cary, NC 27513

TELEPHONE 919-677-8310
FACSIMILE 919-677-0082

These prices are valid for ninety days from the date of this proposal, are exclusive of any sales or use taxes, and are subject to Krüger Standard Terms and Conditions of Sale.

The above prices also include the following:

- Freight to the job site (FOB shipping points),
- O&M manuals,
- Support in process engineering,
- Advice during construction and installation,
- Start-up assistance,
- Operator training,
- One year warranty.

The terms of payments are 15% on submittal of shop drawings, 75% on the delivery of equipment to the site and the final 10% on start-up of the system not to exceed 120 days from delivery of equipment.

Payment shall not be contingent upon receipt of funds by the Contractor from the Owner. All other terms per our standard conditions of sale are attached. Payment terms are net 30 days from the aforementioned benchmarks.

The schedule of delivery shall be as follows:

- Shop drawings will be submitted within 6-8 weeks of receipt of an executed contract by all parties.
- All equipment will be delivered within 16-18 weeks after receipt of approved shop drawings. Approval must be in the written form.
- Installation manuals will be furnished upon delivery of the equipment.
- Operation and Maintenance Manuals will be submitted within 90 days after receipt of approved shop drawings

If you have any questions or require any additional information please do not hesitate to contact our local representative, Bruce Stevens at (207) 395-4554, or call me directly at 919-677-8310.

Sincerely,

David Holliman
Process Engineer
ACTIFLO® Systems

cc. Will Sullivan, Andy Szekeress, Erica Latker (Krüger)
Bruce Stevens (F.R. Mahony & Associates)

ACTIFLO®
Budgetary Price Package
for
CH2M Hill-Boston
Site # 21

1 x 14 MGD

Krüger, Inc. Project:

I. Krüger, Inc.
401 Harrison Oaks Blvd; Suite 100
Cary, NC 27513
Phone (919) 677-8310
Fax (919) 677-0082

Table of Contents

SECTION ONE

Pricing, Terms, and Schedule

PRICING, TERMS AND SCHEDULE

Price

The prices for the ACTIFLO® Systems, as defined in the following pages, including process and design engineering, field services and equipment are:

Option 1: 1 x 14 MGD	**$1,050,000.00**
Option 2: 1 x 5 MGD	**$800,000.00**
Option 3: 1 x 12 MGD	**$1,000,000.00**
Option 4: 2 x 24 MGD	**$2,400,000.00**

These prices are subject to I. Krüger, Inc. Standard Terms of Sale.

These prices are FOB shipping points, with freight allowed to the job site. These prices do not include any sales or use taxes. In addition, these prices are valid for ninety days from the date of issue and are subject to negotiation of a mutually acceptable contract.

Terms of Payment

The terms of payment are as follows:

1. 15% on submittal of shop drawings
2. 75% on the delivery of equipment to the site
3. Final 10% on start-up of the system not to exceed 120 days from delivery of equipment

Notes: Payment shall not be contingent upon receipt of funds by the Contractor from the Owner. There shall be no retention in payments due to Krüger, Inc. All other terms per our Standard Terms of Sale are attached.

All payment terms are net 30 days from the date of invoice.

Schedule

- Shop drawings will be submitted within 6-8 weeks of receipt of an executed contract by all parties.
- All equipment will be delivered within 16-18 weeks after receipt of written approval of the shop drawings.
- Installation manuals will be furnished per Specification.
- Operation and Maintenance Manuals will be submitted within 90 days after receipt of approved shop drawings.

SECTION TWO

I. Krüger, Inc.
Standard Terms of Sale

I. KRÜGER INC.
STANDARD TERMS OF SALE

1. Applicable Terms. These terms govern the purchase and sale of the equipment and related services, if any (collectively, "Equipment"), referred to in Seller's purchase order, quotation, proposal or acknowledgment, as the case may be ("Seller's Documentation"). Whether these terms are included in an offer or an acceptance by Seller, such offer or acceptance is conditioned on Buyer's assent to these terms. Seller rejects all additional or different terms in any of Buyer's forms or documents.

2. Payment. Buyer shall pay Seller the full purchase price as set forth in Seller's Documentation. Unless Seller's Documentation provides otherwise, freight, storage, insurance and all taxes, duties or other governmental charges relating to the Equipment shall be paid by Buyer. If Seller is required to pay any such charges, Buyer shall immediately reimburse Seller. All payments are due within 30 days after receipt of invoice. Buyer shall be charged the lower of 1 ½% interest per month or the maximum legal rate on all amounts not received by the due date and shall pay all of Seller's reasonable costs (including attorneys' fees) of collecting amounts due but unpaid. All orders are subject to credit approval.

3. Delivery. Delivery of the Equipment shall be in material compliance with the schedule in Seller's Documentation. Unless Seller's Documentation provides otherwise, Delivery terms are F.O.B. Seller's facility.

4. Ownership of Materials. All devices, designs (including drawings, plans and specifications), estimates, prices, notes, electronic data and other documents or information prepared or disclosed by Seller, and all related intellectual property rights, shall remain Seller's property. Seller grants Buyer a non-exclusive, non-transferable license to use any such material solely for Buyer's use of the Equipment. Buyer shall not disclose any such material to third parties without Seller's prior written consent.

5. Changes. Seller shall not implement any changes in the scope of work described in Seller's Documentation unless Buyer and Seller agree in writing to the details of the change and any resulting price, schedule or other contractual modifications. This includes any changes necessitated by a change in applicable law occurring after the effective date of any contract including these terms.

6. Warranty. Subject to the following sentence, Seller warrants to Buyer that the Equipment shall materially conform to the description in Seller's Documentation and shall be free from defects in material and workmanship. The foregoing warranty shall not apply to any Equipment that is specified or otherwise demanded by Buyer and is not manufactured or selected by Seller, as to which (i) Seller hereby assigns to Buyer, to the extent assignable, any warranties made to Seller and (ii) Seller shall have no other liability to Buyer under warranty, tort or any other legal theory. If Buyer gives Seller prompt written notice of breach of this warranty within 18 months from delivery or 1 year from acceptance, whichever occurs first (the "Warranty Period"), Seller shall, at its sole option and as Buyer's sole remedy, repair or replace the subject parts or refund the purchase price therefore. If Seller determines that any claimed breach is not, in fact, covered by this warranty, Buyer shall pay Seller its then customary charges for any repair or replacement made by Seller. Seller's warranty is conditioned on Buyer's (a) operating and maintaining the Equipment in accordance with Seller's instructions, (b) not making any unauthorized repairs or alterations, and (c) not being in default of any payment obligation to Seller. Seller's warranty does not cover damage caused by chemical action or abrasive material, misuse or improper installation (unless installed by Seller). THE WARRANTIES SET FORTH IN THIS SECTION ARE SELLER'S SOLE AND EXCLUSIVE WARRANTIES AND ARE SUBJECT TO SECTION 10 BELOW. SELLER MAKES NO OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE.

7. Indemnity. Seller shall indemnify, defend and hold Buyer harmless from any claim, cause of action or liability incurred by Buyer as a result of third party claims for personal injury, death or damage to tangible property, to the extent caused by Seller's negligence. Seller shall have the sole authority to direct the defense of and settle any indemnified claim. Seller's indemnification is conditioned on Buyer (a) promptly, within the Warranty Period, notifying Seller of any claim, and (b) providing reasonable cooperation in the defense of any claim.

8. Force Majeure. Neither Seller nor Buyer shall have any liability for any breach (except for breach of payment obligations) caused by extreme weather or other act of God, strike or other labor shortage or disturbance, fire, accident, war or civil disturbance, delay of carriers, failure of normal sources of supply, act of government or any other cause beyond such party's reasonable control.

9. Cancellation. If Buyer cancels or suspends its order for any reason other than Seller's breach, Buyer shall promptly pay Seller for work performed prior to cancellation or suspension and any other direct costs incurred by Seller as a result of such cancellation or suspension.

10. LIMITATION OF LIABILITY. NOTWITHSTANDING ANYTHING ELSE TO THE CONTRARY, SELLER SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, PUNITIVE OR OTHER INDIRECT DAMAGES, AND SELLER'S TOTAL LIABILITY ARISING AT ANY TIME FROM THE SALE OR USE OF THE EQUIPMENT SHALL NOT EXCEED THE PURCHASE PRICE PAID FOR THE EQUIPMENT. THESE LIMITATIONS APPLY WHETHER THE LIABILITY IS BASED ON CONTRACT, TORT, STRICT LIABILITY OR ANY OTHER THEORY.

11. Miscellaneous. If these terms are issued in connection with a government contract, they shall be deemed to include those federal acquisition regulations that are required by law to be included. These terms, together with any quotation, purchase order or acknowledgement issued or signed by the Seller, comprise the complete and exclusive statement of the agreement between the parties (the "Agreement") and supersede any terms contained in Buyer's documents, unless separately signed by Seller. No part of the Agreement may be changed or cancelled except by a written document signed by Seller and Buyer. No course of dealing or performance, usage of trade or failure to enforce any term shall be used to modify the Agreement. If any of these terms is unenforceable, such term shall be limited only to the extent necessary to make it enforceable, and all other terms shall remain in full force and effect. Buyer may not assign or permit any other transfer of the Agreement without Seller's prior written consent. The Agreement shall be governed by the laws of the State of North Carolina without regard to its conflict of laws provisions.

SECTION THREE

Design Summary

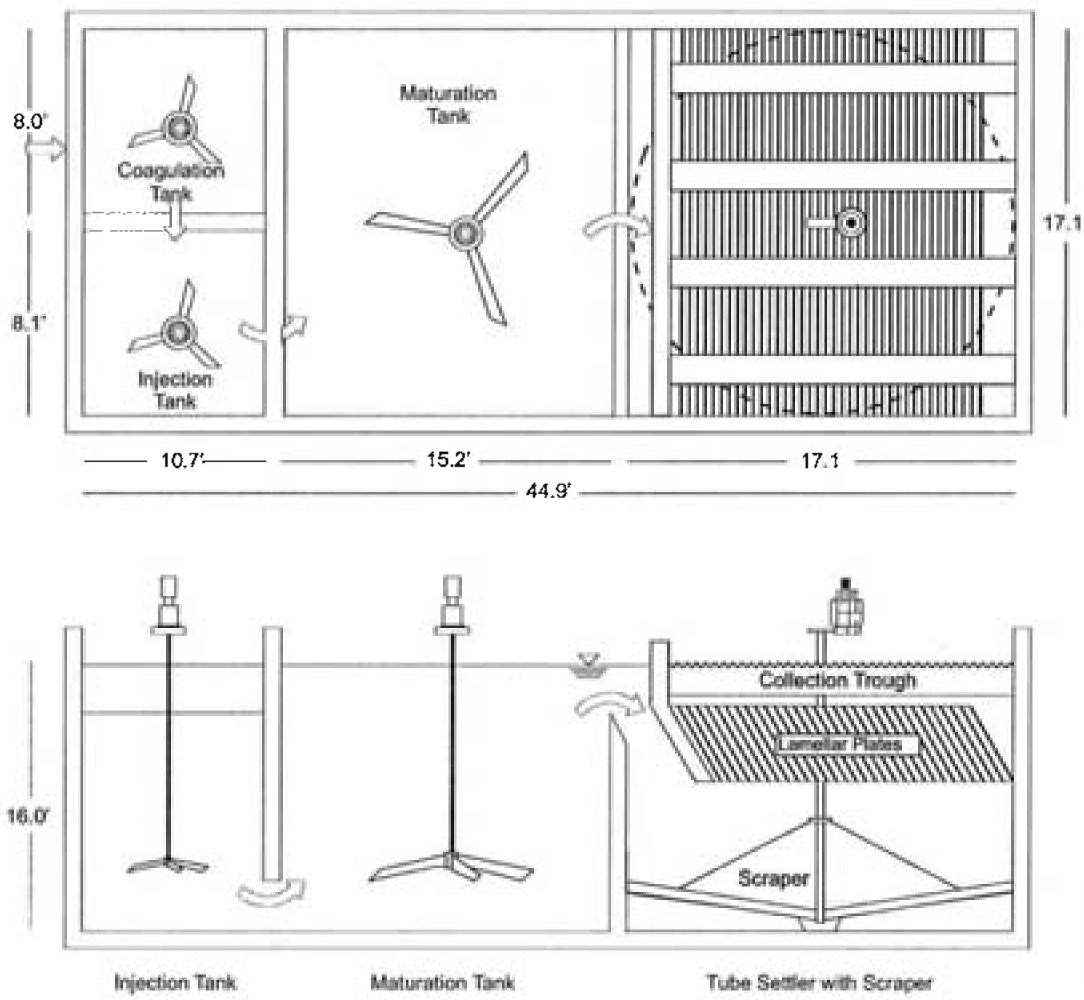
1 x 14 MGD ACTIFLO® Design	
Design Capacity	
Total Design Flow, MGD	14
No. of Trains	1
Capacity Per Train, MGD	14
Coagulation Tank Design	
HRT, min	1
No. of Tanks per Train	1
Length, ft	10.7
Width, ft	8.0
Side Water Depth, ft	16
Injection Tank Design	
HRT, min	1
No. of Tanks per Train	1
Length, ft	10.7
Width, ft	8.1
Side Water Depth, ft	16
Maturation Tank Design	
HRT, min	3
No. of Tanks per Train	1
Length, ft	15.2
Width, ft	17.1
Side Water Depth, ft	16
Settling Tank Design	
No. of Tanks per Train	1
Length, ft	17.1
Width, ft	17.1
Side Water Depth, ft	16
Lamella Settling Area, ft^2	162.45
Overflow Rate at Design Capacity, gpm/ft^2	60
Sand Recirculation Circuit Design	
No. of Pumps per Train	2 duty + 1 stand-by
Total Dynamic Head, ft. of water	TBD
Pump Capacity, gpm	310
Number of Hydrocyclones per Pump	1
Estimated Sludge Concentration, % solids	0.1 to 0.5
Sludge Discharge per Train at Design Flow, gpm	496

SECTION FOUR

Layout Drawings

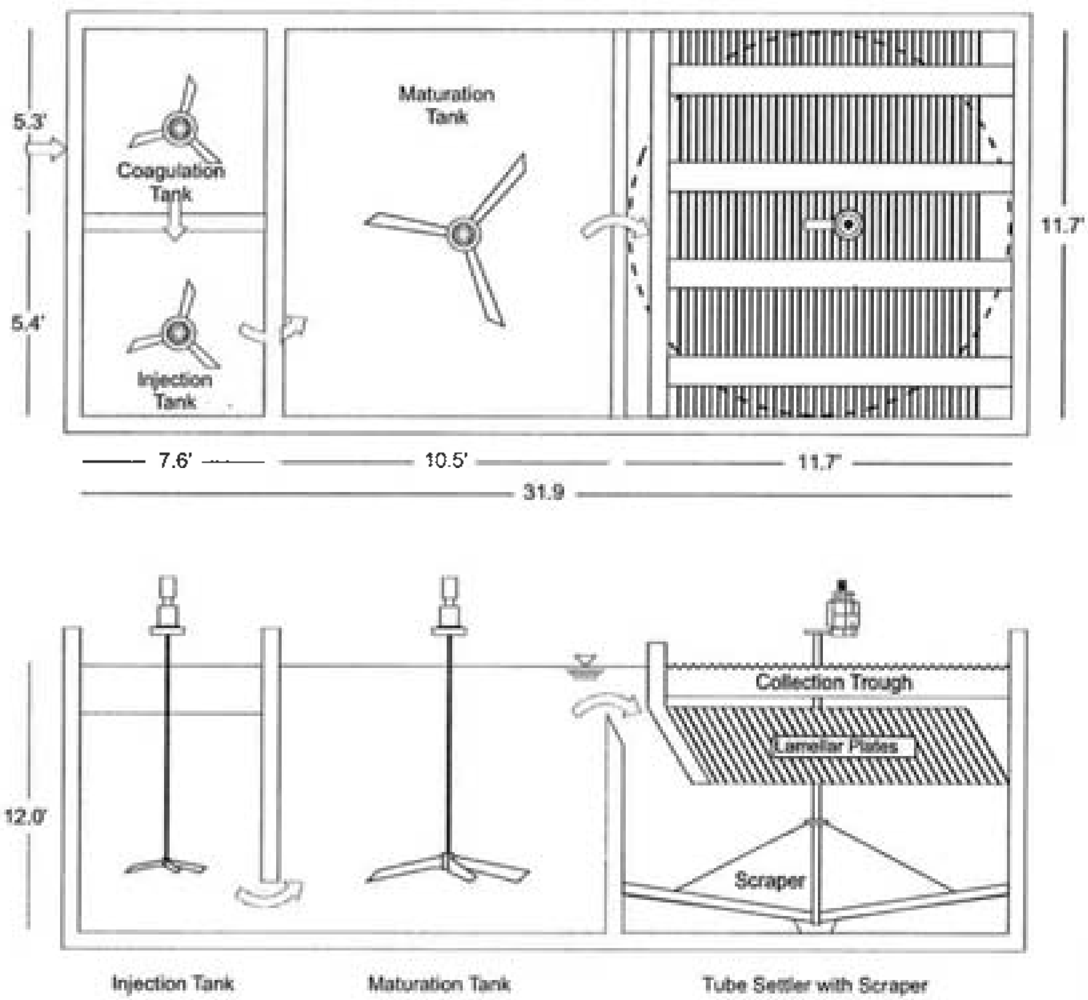
OPTION 1

Preliminary ACTIFLO Single Train Layout
CH2M Hill - Boston, MA - Site # 21
Total Capacity: 14 MGD
No. Of Trains: 1 x 14 MGD



OPTION 2

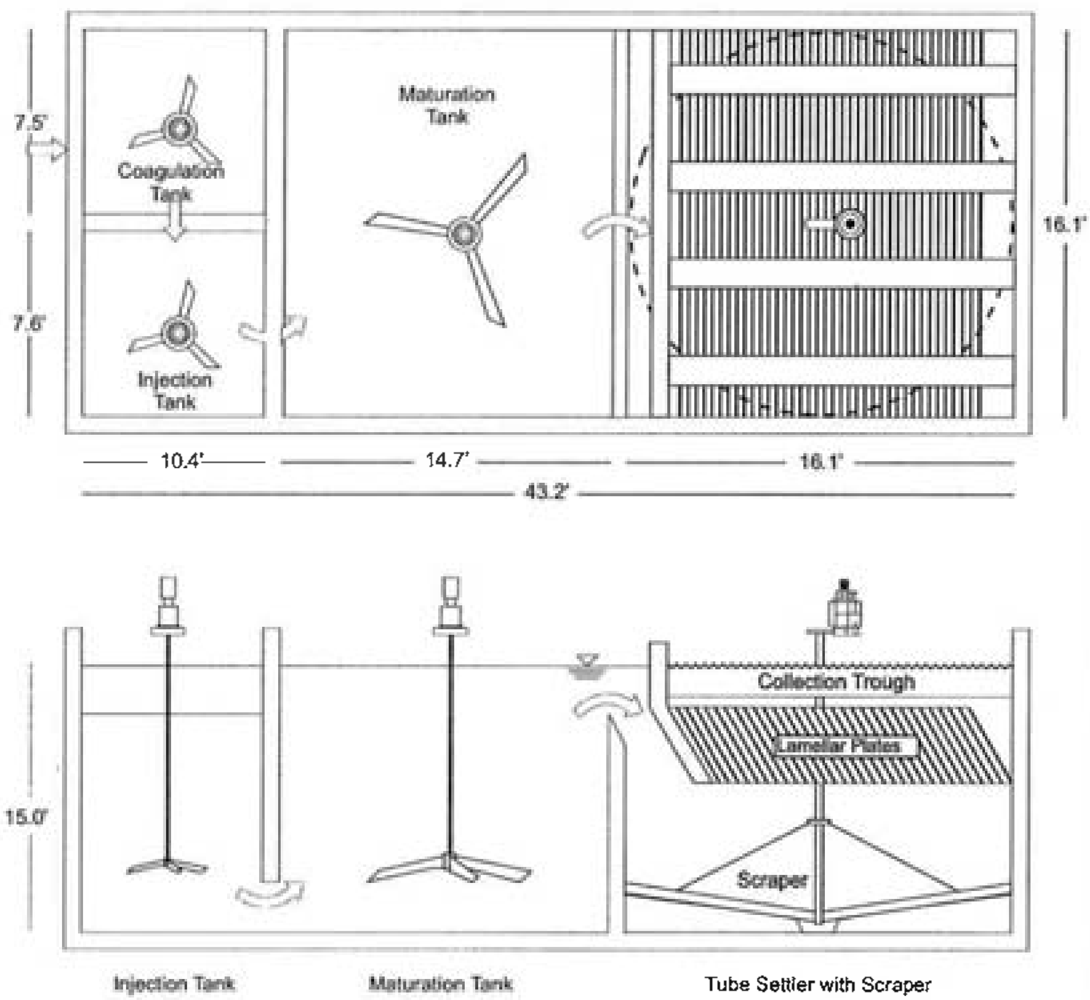
Preliminary ACTIFLO Single Train Layout
CH2M Hill - Boston, MA - Site # 52
Total Capacity: 5 MGD
No. Of Trains: 1 x 5 MGD



OPTION 3

Preliminary ACTIFLO Single Train Layout

CH2M Hill - Boston, MA - Site # 17
Total Capacity: 12 MGD
No. Of Trains: 1 x 12 MGD



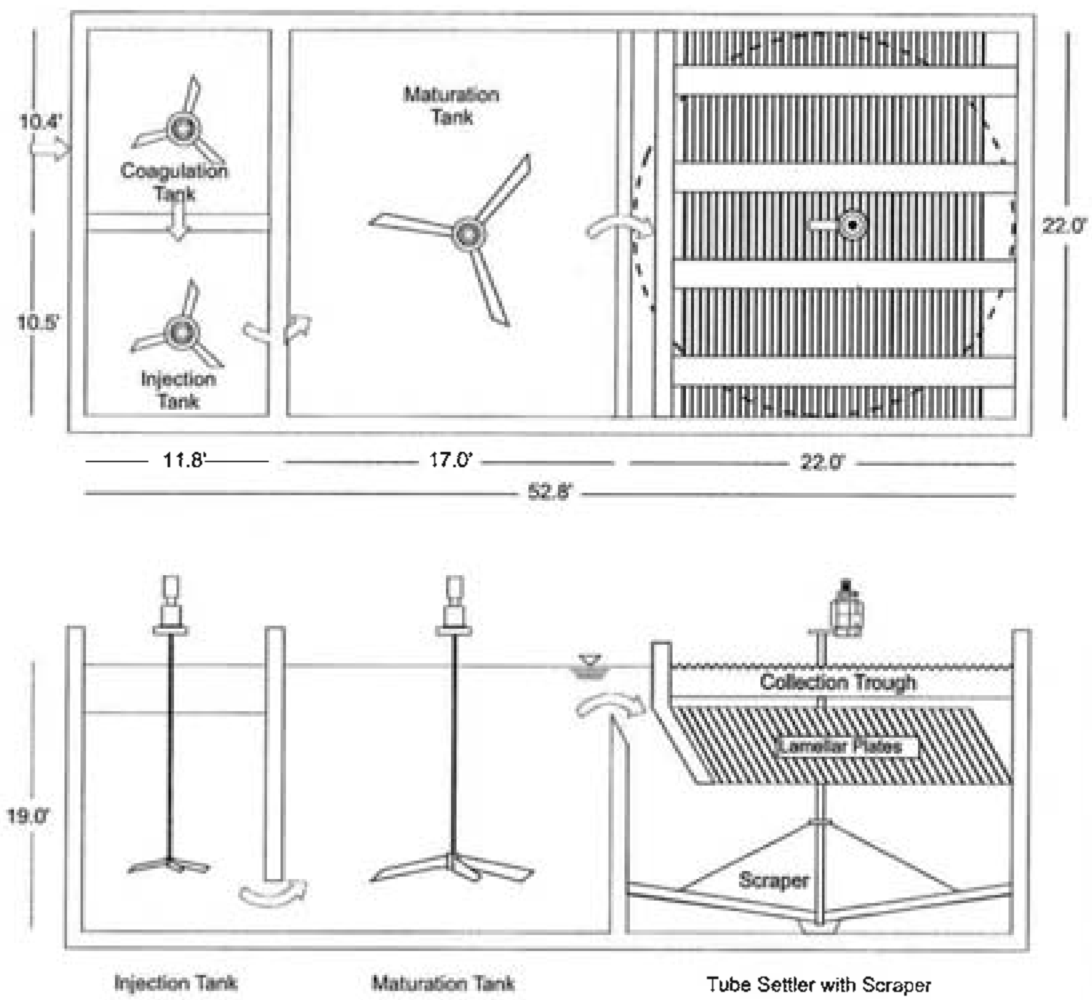
OPTION 4

Preliminary ACTIFLO Single Train Layout

CH2M Hill - Boston, MA - Site # 26

Total Capacity: 24 MGD

No. Of Trains: 1 x 24 MGD



SECTION FIVE

ACTIFLO® Equipment Scope of Supply

ACTIFLO® Equipment Scope of Supply

I. Mechanical Equipment Scope of Supply – 1 x 14 MGD

Description	Units Per Train	Total No. of Units
Coagulation Tanks		
• Coagulation tank top entering mixer(s), 5 HP, TEFC, 460/3/60 motor, 304 stainless steel shaft and impellers.	1	1
Injection Tanks		
• Injection tank top entering mixer(s), 5 HP, TEFC, 460/3/60 motor, 304 stainless steel shaft and impellers.	1	1
Maturation Tanks		
• Maturation tank top entering mixer(s), 7.5 HP, TEFC, 460/3/60 inverter duty motor, 304 stainless steel shaft and impellers.	1	1
• VFD to be supplied by others.	--	By others
• Anti-Vortex Baffles, 304 stainless steel	2	2
Settling Tanks		
• Sludge scraper assemblies, 304 stainless steel, center drive, 1.5 HP, TEFC, 460/3/60 inverter duty motor, speed reducer, complete with drive shaft, shaft protector, rake arms and blades.	1	1
• VFD to be supplied by others.	--	By others
• Wear plates for bottom hoppers, 304 stainless steel.	1	1
• Lamella plate module sets, 304 stainless steel.	1 set	1 set(s)
• Lamella plate supports, 304 stainless steel.	1 set	1 set(s)
• Effluent collection troughs, 9.5' length, 1.33' width, 304 stainless steel.	4	4
• Supports for collection troughs, 304 stainless steel.	1 set	1 set(s)

Description	Units Per Train	Total No. of Units
Microsand Recycle Circuits		
• Microsand recirculation pumps, centrifugal, cast iron body, with rubber-lined volute and impeller, mechanical seal, 310 gpm capacity, 15 HP, TEFC, 460/3/60 motor with V-belt and pulley drive.	2 duty + 1 stand-by	3
• Discharge side pump isolation valves, 6" diameter, eccentric plug type, manual.	3	3
• Suction side pump isolation valves, 6" diameter, eccentric plug type, manual.	3	3
• Flush connection valve, 1½" diameter, ball valve.	3	3
• Pump discharge pressure switch assembly, complete with pressure gauge, isolation valve and diaphragm seal.	3	3
• Hydrocyclones, 310 gpm capacity, urethane.	2 duty + 1 stand-by	3
• Hydrocyclone pressure gauge assembly, complete with diaphragm seals and isolation valves.	3	3
• Hydrocyclone underflow/overflow (sand) collection boxes, 304 stainless steel.	1	1
• Hydrocyclone overflow (sludge) piping, connecting hydrocyclone overflow to overflow box.	3	3
• Hydrocyclone underflow piping, PVC	1	1
• Microsand for Start-up (Tons)	14	14

II. Chemical Feed Equipment – 1 x 14 MGD

Description	Total No. of Units
Automatic Liquid Polymer Processing System • Liquid polymer feed/activation system, skid mounted packaged assembly, high enery mixing chamber, volumetric metering pump, water solenoid valve, pressure switches and gauges, hose connections, ball valves.	1 duty + 1 stand-by
Coagulant Metering Pumps • Volumetric metering pumps, Diaphragm type, corrosion resistant skid mounted, complete with pump bases, variable speed drives, pressure relief valves, back pressure valves, check valves, calibration columns, isolation ball valves, flush connections, strainers, electric motors, piping and fittings.	1 duty + 1 stand-by

III. Electrical Equipment – 1 x 14 MGD

PLC Based Control Panel(s)

The PLC based control panel(s) will be supplied to monitor and control the ACTIFLO® process. All panels are required to be installed **INDOORS ONLY**. Each control panel, will be completely assembled, tested and programmed for the required functionality. Each U.L. labeled panel will be designed according to the scope of supply listed below. The quantity of panels will be based on the number of ACTIFLO® trains in the design. There shall be one control panel per train for odd numbered train configurations and one control panel per two trains for even numbered train configurations.

The PLC Control Panel will include the necessary input/output as listed in the I/O listing. All I/O will be wired to field terminations and include surge arrestion and isolation as required.

One Train	Two Trains	Description	Manufacturer
1	1	NEMA 12 FREESTANDING ENCLOSURE (**INDOOR INSTALLATION ONLY**)	HOFFMAN
1	1	BACKPANEL	HOFFMAN
1	1	PANEL SHELF	HOFFMAN
1	1	SURGE PROTECTION	INNOVATIVE TECH
1	1	20A MAIN CIRCUIT BREAKER, 1-POLE, 120VAC (MCB)	SQUARE D
3	3	24VDC POWER SUPPLY 5A	SOLA
8	8	DC/DC TRANSMITTER ISOLATOR, 4-20 mA	PHOENIX
16	20	M-UFB 2/2-24 VDC MINITRAB SURGE ARRESTOR	PHOENIX
4	5	M-UFB R-4 MINITRAB BASE ELEMENT, 4 PLUGS	PHOENIX
1	1	SLKK 5 DOUBLE LEVEL TERMINAL BLOCK w/GND	PHOENIX
1	1	DIGI-KEY PART NO. 1.5KE30CATR DIODE	DIODES INC.
AS REQUIRED	AS REQUIRED	D-UKK 3/5 END COVER	PHOENIX
AS REQUIRED	AS REQUIRED	FB 10-6 FIXED BRIDGE BAR	PHOENIX
AS REQUIRED	AS REQUIRED	E/UK 1 END CLAMP	PHOENIX
96	128	UKK 5 DOUBLE LEVEL TERMINAL BLOCK	PHOENIX
2	2	2.0A CIRCUIT BREAKER	ALLEN-BRADLEY or equal
11	13	3.0A CIRCUIT BREAKER	ALLEN-BRADLEY or equal
2	2	7.0A CIRCUIT BREAKER	ALLEN-BRADLEY or equal
1	1	15.0A CIRCUIT BREAKER	ALLEN-BRADLEY or equal
30	30	TERMINAL BLOCK	ALLEN-BRADLEY
10	10	TERMINAL BLOCK (GND)	ALLEN-BRADLEY
AS REQUIRED	AS REQUIRED	CENTER JUMPER - 10 POLE	ALLEN-BRADLEY
AS REQUIRED	AS REQUIRED	END BARRIER	ALLEN-BRADLEY
AS REQUIRED	AS REQUIRED	END ANCHOR	ALLEN-BRADLEY
32	32	OUTPUT RELAY, 2PDT, FORM C CONTACT, 24VDC	ALLEN-BRADLEY or equal
32	32	RELAY BASES	ALLEN-BRADLEY or equal
1	1	SLC 5/05 PROCESSOR	ALLEN-BRADLEY
1	1	13 SLOT CHASSIS	ALLEN-BRADLEY
1	1	POWER SUPPLY	ALLEN-BRADLEY
1	1	RACK INTERCONNECT CABLE	ALLEN-BRADLEY
4	6	DC POWERED DISCRETE INPUT CARD	ALLEN-BRADLEY
2	2	DC POWERED DISCRETE OUTPUT CARD	ALLEN-BRADLEY
1	1	DC POWERED ANALOG INPUT CARD	ALLEN-BRADLEY
One Train	**Two Trains**	**Description**	**Manufacturer**

2	3	DC POWERED ANALOG OUTPUT CARD	ALLEN-BRADLEY
1	1	PANELVIEW 1000 WITH ETHERNET	ALLEN-BRADLEY
1	1	10/100 BASE T ETHERNET SWITCH	N-TRON
2	2	PUSH BUTTON, FLUSH, NON-ILL, MOM. N.O. CONTACT	SQUARE D
AS REQUIRED	AS REQUIRED	MISC. (WIRE, CABLE, WIRE DUCT, DIN RAIL, TERMINAL MARKERS, LEGENDS, NAMEPLATES, ETC.)	
1	1	CABINET LIGHT	
1	1	RECEPTACLE W/BOX/COVER, UL LISTED	
1	1	ALARM HORN (SUPPLIED LOOSE FOR MOUNTING BY CONTRACTOR)	

IV. Process Instrumentation – 1 x 14 MGD

Description	Units Per Train	Total No. of Units
• Raw Water Turbidimeter, Hach	--	1
• pH meter for raw water, Great Lakes	--	1
• pH meter after coagulant addition, Great Lakes	1	1
• Flowmeter, Danfoss	1	1
• Settled Water Turbidimeter, Hach	1	1

V. Spare Parts – 1 x 14 MGD

Description	Units Per Train	Total No. of Units
Mechanical Spare Parts		
• Coagulation tank mixer bearings and seals	--	1 set
• Injection tank mixer bearings and seals	--	1 set
• Maturation tank mixer bearings and seals	--	1 set
• Apex tips	3	3
• V-belt sets	3	3

SECTION SIX

I. Krüger, Inc. Scope of Work

I. KRÜGER SCOPE OF WORK

A. I. Krüger, Inc. is responsible for process design and equipment procurement required for ACTIFLO® System. The system will be designed and supplied in accordance with the applicable sections of the project Plans and Specifications as described herein. I. Krüger, Inc. scope of work does not include any engineering, selection, procurement, installation, or operation of any equipment, materials or other services not specifically defined in this proposal.

B. Process and Design Engineering – I. Krüger, Inc. will perform engineering in accordance with the project Plans and Specifications and those applicable national codes, standards and / or regulations (except as otherwise noted) in effect at the time of this submittal. Additionally, I. Krüger, Inc. will provide all necessary design, installation and operating information for equipment within its stated scope of supply. I. Krüger, Inc. is not responsible for the design, selection, installation, operation or maintenance of any materials, equipment or services supplied by others.

C. I. Krüger, Inc. will provide process engineering and design support for the system as follows:

1. Equipment specifications for all equipment supplied by Krüger Inc.
2. Technical instructions for operation and start-up of the system
3. Equipment location drawings
4. Equipment installation plans
5. Project Specific O&M manuals

D. The equipment scope of supply of I. Krüger, Inc. shall include the equipment as shown in the ACTIFLO® Scope of Supply.

E. Field Services

I. Krüger, Inc. will provide the services necessary to start-up, test, and operate the system as follows:

1. Advice during installation
2. Equipment checkout and initial testing, 1 trip(s) with a total of 5 days.
3. Start-up assistance, 2 trip(s) with a total of 10 days.
4. Operator training, 1 trip(s) with a total of 5 days.

SECTION SEVEN

Contractor Scope of Work

CONTRACTOR SCOPE OF WORK

The following is a non-inclusive list of material that shall be furnished by the Contractor:

1. Obtain necessary construction permits and licenses, construction drawings (including interconnecting piping drawings), field office space, telephone service, and temporary electrical service.

2. All site preparation, grading, locating foundation placement, excavation for foundation, underground piping, conduits and drains.

3. Demolition and/or removal of any existing structures, equipment or facilities required for construction, and installation of the Ballasted Flocculation system.

4. Supply and install all bulk storage tanks, pads, and supports including the concrete basins required for the ACTIFLO® system

5. Provide all grouting for the bottom of the settling tank.

6. Provide all concrete work for the ACTIFLO® tankage, including all corner fillets.

7. Provide and installation of all foundations, supply and installation of all embedded or underground piping, conduits and drains.

8. All backfill, compaction, finish grading, earthwork and final paving.

9. Receiving (preparation of receiving reports), unloading, storage, maintenance preservation and protection of all equipment, and materials provided by Krüger Inc.

10. Installation of all equipment and materials provided by Krüger Inc.

11. Supply, fabrication, installation, cleaning, pickling, and/or passivation of all stainless steel piping components.

12. Provide all imbedded pipe sections and valves for tank drains.

13. All cutting, welding, fitting, and finishing for all field fabricated piping.

14. Supply and installation of all flange gaskets and bolts for all piping components.

15. Supply and installation of all pipe supports.

16. Provide, install and terminate all motor control centers, motor starters, panels (other than the ACTIFLO® PLC panel), transformers, and VFD's.

17. Provide, install and terminate all variable frequency drive units as required by Krüger, Inc. for the each maturation tank mixer and each settling tank scraper.

18. Installation and termination of all control panels and instrumentation supplied by Krüger Inc.

19. Supply and install all sample pumps and sample lines required for the instrumentation provided by Krüger Inc.

20. Labor and material for winterizing the ACTIFLO® System; insulating/heat tracing any tanks, piping, or tubing subjected to freezing temperatures, and water heaters when polymer solution make-up water is expected to fall below 55 °F.

21. Supply and install all electrical power and control wiring and conduit to the equipment served plus interconnection between the ACTIFLO® Supplier's furnished equipment as required, including wire, cable, junction boxes, fittings, conduit, etc.

22. Supply and install all insulation, supports, drains, hold down clamps, manhole covers, condensate drain systems, wastewater valves, flanges, flex pipe joints, expansion joints, boots, gaskets, adhesives, fasteners, safety signs, and all specialty items such as strainers and traps.

23. Provide all labor, materials, supplies and utilities as required for start-up, and performance testing including laboratory facilities, analytical work and chemicals.

24. Provide all chemicals, lubricants, glycol, oils, or grease and other supplies required for equipment start-up or plant operation.

25. Provide all anchor bolts and mounting hardware.

26. Provide and install all piping required to interconnect to the ACTIFLO® Supplier's equipment including all microsand recirculation piping.

27. Provide all nameplates, safety signs and labels.

28. Provide, and install all support beams and/or slabs for mixers, scrapers, and/or chemical feed systems.

29. Provide all gratings, handrails, access hatches, ladders, and access platforms.

30. The Contractor shall coordinate the installation and timing of interface points such as piping and electrical with the ACTIFLO® Supplier.

31. Supply and install all sunshields and/or additional enclosures as needed when installing ACTIFLO® equipment and instrumentation outdoors.

32. All other necessary equipment and services not otherwise listed as specifically supplied by the ACTIFLO® Supplier

SECTION EIGHT

ACTIFLO® Estimated Operating Costs

Preliminary Operating Cost Estimate
ACTIFLO® System
CH2M Hill-Boston – Site #21

Mechanical Equipment Summary per Train – 14 MGD

Equipment	1 x 14 MGD	
Coagulation Tank Mixer	5	HP
Injection Tank Mixer	5	HP
Maturation Tank Mixer	7.5	HP
Scraper Motor	1.5	HP
Two Sand Recirculation Pumps	30	HP
Total Power Requirements*:	**49**	**HP**

Estimated Operating Costs – 1 x 14 MGD

ACTIFLO® System:			1 x 14 MGD
Item	Estimated Average Dose	**Estimated Unit Cost**	**Estimated Daily Operating Cost**
Polymer	1.2 mg/L	\$ 3500/ton	\$ 245.20
Sand Loss	2 g/m^3	\$ 200/ton	\$ 23.25
Coagulant (Alum)	100 mg/L	\$ 280/ton	\$ 1,634.64
Power Consumption*	See table above.	\$0.08/KWhr	\$ 63.08
Total Estimated Daily Operating Cost**			**\$ 1,966.17**
Operating Cost per 1,000 Gallons			**\$ 0.141**

***Assumes a power draw of 90% of nameplate rating and does not include stand-by equipment.**
**** For nominal capacity operating 24 hours per day.**

Preliminary Operating Cost Estimates
ACTIFLO® System
CH2M Hill – Boston, MA – Site #52

Mechanical Equipment Summary per Train – 5 MGD

Equipment	1 x 5 MGD	
One Coagulation Tank Mixer	2.0	HP
One Injection Tank Mixer	2.0	HP
One Maturation Tank Mixer	3.0	HP
One Settling Tank Scraper	0.75	HP
Two Sand Recirculation Pumps	15.0	HP
Total Power Requirements:	**22.75**	**HP**

Estimated Operating Costs – 1 x 5 MGD

ACTIFLO® System:			5 MGD
Item	Estimated Average Dose	**Estimated Unit Cost**	**Estimated Daily Operating Cost**
Polymer	1.2 mg/L	$ 3,500/ton	$ 87.57
Sand Loss	2 g/m^3	$ 200/ton	$ 8.34
Coagulant (Alum)	100 mg/L	$ 280/ton	$ 583.80
Power Consumption*	See table above.	$0.08/KWhr	$ 29.29
Total Estimated Daily Operating Cost**			**$ 709.00**
Operating Cost per 1,000 Gallons			**$ 0.142**

***Assumes a power draw of 90% of nameplate rating and does not include stand-by equipment.**
**** For nominal capacity operating 24 hours per day.**

Preliminary Operating Cost Estimates
ACTIFLO® System
CH2M Hill – Boston, MA – Site #17

Mechanical Equipment Summary per Train – 12 MGD

Equipment	1 x 12 MGD	
One Coagulation Tank Mixer	5.0	HP
One Injection Tank Mixer	5.0	HP
One Maturation Tank Mixer	7.5	HP
One Settling Tank Scraper	1.5	HP
Two Sand Recirculation Pumps	30.0	HP
Total Power Requirements:	**49.0**	**HP**

Estimated Operating Costs – 1 x 12 MGD

ACTIFLO® System:			12 MGD
Item	Estimated Average Dose	**Estimated Unit Cost**	**Estimated Daily Operating Cost**
Polymer	1.2 mg/L	$ 3,500/ton	$ 210.17
Sand Loss	2 g/m^3	$ 200/ton	$ 20.02
Coagulant (Alum)	100 mg/L	$ 280/ton	$ 1,401.12
Power Consumption*	See table above.	$0.08/KWhr	$ 63.08
Total Estimated Daily Operating Cost**			**$ 1,694.39**
Operating Cost per 1,000 Gallons			**$ 0.142**

***Assumes a power draw of 90% of nameplate rating and does not include stand-by equipment.**
**** For nominal capacity operating 24 hours per day.**

Preliminary Operating Cost Estimates
ACTIFLO® System
CH2M Hill – Boston, MA – Site #26

Mechanical Equipment Summary per Train – 24 MGD

Equipment	1 x 24 MGD	
One Coagulation Tank Mixer	7.5	HP
One Injection Tank Mixer	7.5	HP
One Maturation Tank Mixer	15.0	HP
One Settling Tank Scraper	3.0	HP
Two Sand Recirculation Pumps	40.0	HP
Total Power Requirements:	**73.0**	**HP**

Estimated Operating Costs – 2 x 24 MGD

ACTIFLO® System:			48 MGD
Item	Estimated Average Dose	**Estimated Unit Cost**	**Estimated Daily Operating Cost**
Polymer	1.2 mg/L	$ 3,500/ton	$ 840.67
Sand Loss	2 g/m^3	$ 200/ton	$ 80.06
Coagulant (Alum)	100 mg/L	$ 280/ton	$ 5,604.48
Power Consumption*	See table above.	$0.08/KWhr	$ 187.96
Total Estimated Daily Operating Cost**			**$ 6,713.17**
Operating Cost per 1,000 Gallons			**$ 0.140**

***Assumes a power draw of 90% of nameplate rating and does not include stand-by equipment.**
**** For nominal capacity operating 24 hours per day.**

PARKSON CORPORATION
...the environmental technology company

562 Bunker Court
Vernon Hills, IL 60061-1831

Facsimile

TO:	Bruce Stevens	DATE:	9/30/04
COMPANY:	F.R. Mahony & Associates	FROM:	Kirk Newcomb
FAX NO:	bruces@frmahony.com	TOTAL PAGES:	8
SUBJECT:	CH2M Hill CSO ROMAG		

Bruce,

Per your request I am sending preliminary sizing information for ROMAG screens for the above project for peak flows of 12.28, 14.22, 46.5 and 5.17 MGD. The ROMAG Screen was developed in Switzerland in 1990 and since then over 800 screens have been sold worldwide, mostly in Europe where stormwater issues preceded interest in North America.

The ROMAG Stormwater Screen has won 2 WEF 'Innovative Technology Awards" in 1998 and 2001 under the category of "collection systems".

For your project called CH2M Hill CSO with the possible peak flows of 12.28, 14.22, 46.5 and 5.17 MGD, your project has the potential to use the following options.

Site	ROMAG Model	Peak Flow	Length	Height	Budget
#17	RSW 4X3	12.28 MGD	12.6'	20.6"	$103,950.00
#21	RSW 5X3	14.22 MGD	12.6'	24.4"	$112,200.00
#26	RSW 5X7	46.50 MGD	25.7'	24.4"	$154,550.00
#52	RSW 2X3	5.17 MGD	12.6'	13"	$84,700.00

NOTE: There are other models of different measurements that could be used in place of the ones above for each site.

Budget pricing for ROMAG Screens includes the following:

- Screen in 304L stainless steel.
- Nema 4x controls
- Ultrasonic level sensor
- Hydraulic power pack driven by a 5 hp 230/460/3/60 motor
- External struts. We need to know where walls and ceilings are for attachment.
- Two days of start up assistance during 1 trip to the job site.
- Freight to the job site.
- Biodegradable hydraulic oil

Please note:

- The power pack should be placed in a building to be protected from freezing and the elements.

- Four 18" long rubber hose pig tails will be provided. Two each to be mounted on the power pack and two on the screen. The contractor is responsible for providing and anchoring the interconnecting stainless steel tubing. Stainless steel tubing to have 0.5" ID and overall system burst pressure shall not be less than 2500 psi.

- The mounting elevation of the screen should be as high as possible off the channel bottom to prevent grit deposition on the bottom of the screen.

- The screen is not designed for reverse flow. Reverse flow can damage the screen.

The CONTRACTOR is responsible for the following:

The concrete weir on which the ROMAG screen mounts must be level and horizontal with perpendicular side walls. This is very important!

- Unloading, uncrating and installation. (Note: Installation will, at minimum, require a forklift and possible a crane/hoist for larger units.
- Anchor bolts.
- Stainless steel hydraulic tubing as mentioned above.
- Electrical connection and interconnecting wiring of:
  - E-Stop button.
  - Motor.
  - Controls.
  - Level sensor.

The ROMAG Screen is sized assuming free discharge over the control weir or 0 point on the enclosed "Water Elevations Profile". This means that downstream conditions do not back up flow above the 0 point. A submerged 0 point or control weir:

- Can be caused by reverse flow through the screen. The rear of the screen is not designed for the removal of screenings.

- Will reduce the screen's ability to handle flow as well as cause the upstream water elevation to rise. If it rises enough then flow will by pass over the top of the screen. We cannot calculate the effects on flow or upstream water elevation with a submerged weir as there are no standard calculations for this purpose.

NOTES:

The ROMAG Screen does not remove solids so the management of the solids the ROMAG Screen deflects is extremely important to the success of the installation. In most cases the solids are allowed to get caught in the flow continuing on to the WWTP. Therefore we suggest a continuous flow to the WWTP.

The installation of ROMAG Screens are best served by a rising water elevation in front of the screen. This is best caused by a downstream restriction in the flow causing a back up of flow in the vicinity of the ROMAG Screen.

Please call Parkson or your local representative whose name and number is listed below with any further questions.

Sincerely,

Kirk Newcomb
Product Specialist

Cc: DJK
DGM

Enc: (3) RSW Drawings

HYCOR ROMAG SCREEN
Design Considerations for Model RSW

Establishing ROMAG Screen location relative to the CSO facility.

1. Set the ROMAG Max Ws at ByPass Elevation at or below the maximum "collection system" water elevation. Note: Water levels above the maximum "collection" system water elevation may cause uncontrolled overflow and potential basement back-ups throughout the collection system.

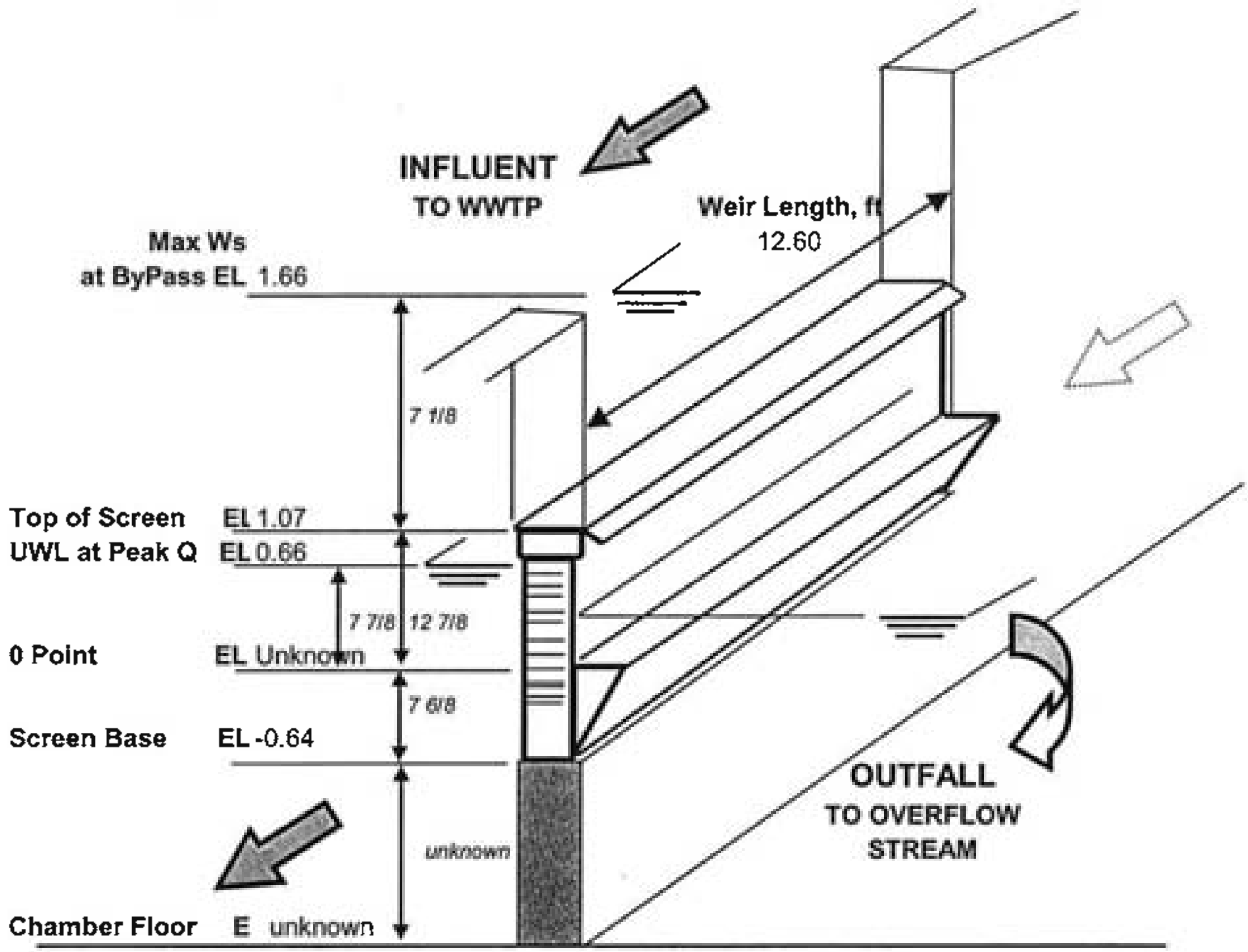
2. Establish a Zero Point Elevation: This is the level which water will begin to overflow through the screen. Relative to the zero point, set the mounting elevation for the ROMAG Screen base.

3. Calculate the required tank dimensions (for a retention basin) or channel dimensions, with the beginning of a controlled overflow set at the Zero Point. Channel or tank side walls should be at least as high as the top of the screen or as high as the emergency discharge Max Ws.

4. Confirm the outfall water elevation is lower than the Zero Point Elevation. The Control weir (or 0 point) of the screen should not be submerged. Out falling water should not back up into the 0 point.

5. Review all water elevations for workable system hydraulic performance. If necessary, revise system and/or screen parameters.

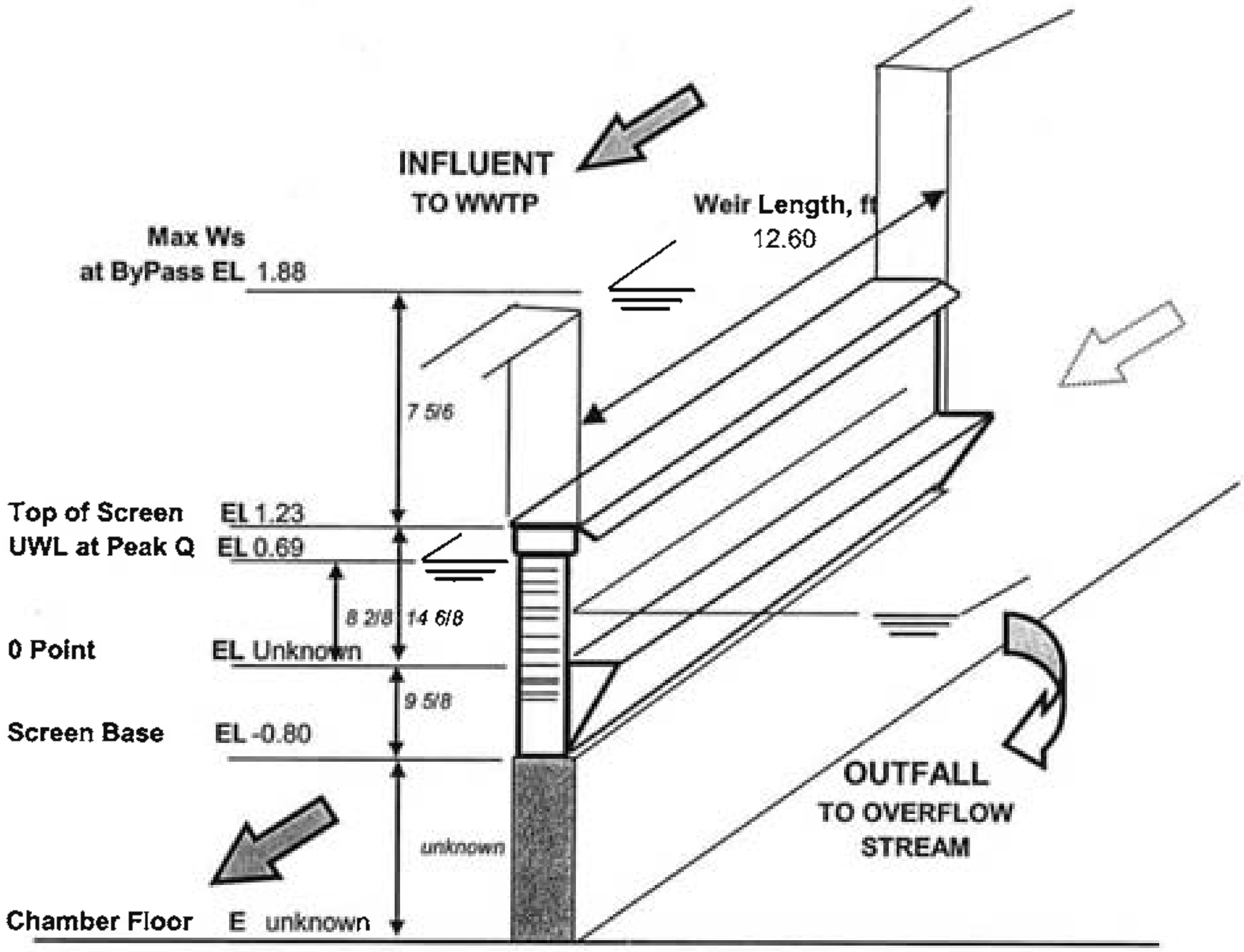
Hycor Romag Screen
Water Elevation Profile



Note: El dimensions shown in feet, italic dimensions in inches

Project Name	CH2M Hill CSO	**Screen Space Needed (min)**		
Screen Model	RSW 4x3	Height	21.00	in
Peak Flow	12.28 mgd	Width	13.12	ft
Date	09/30/04			

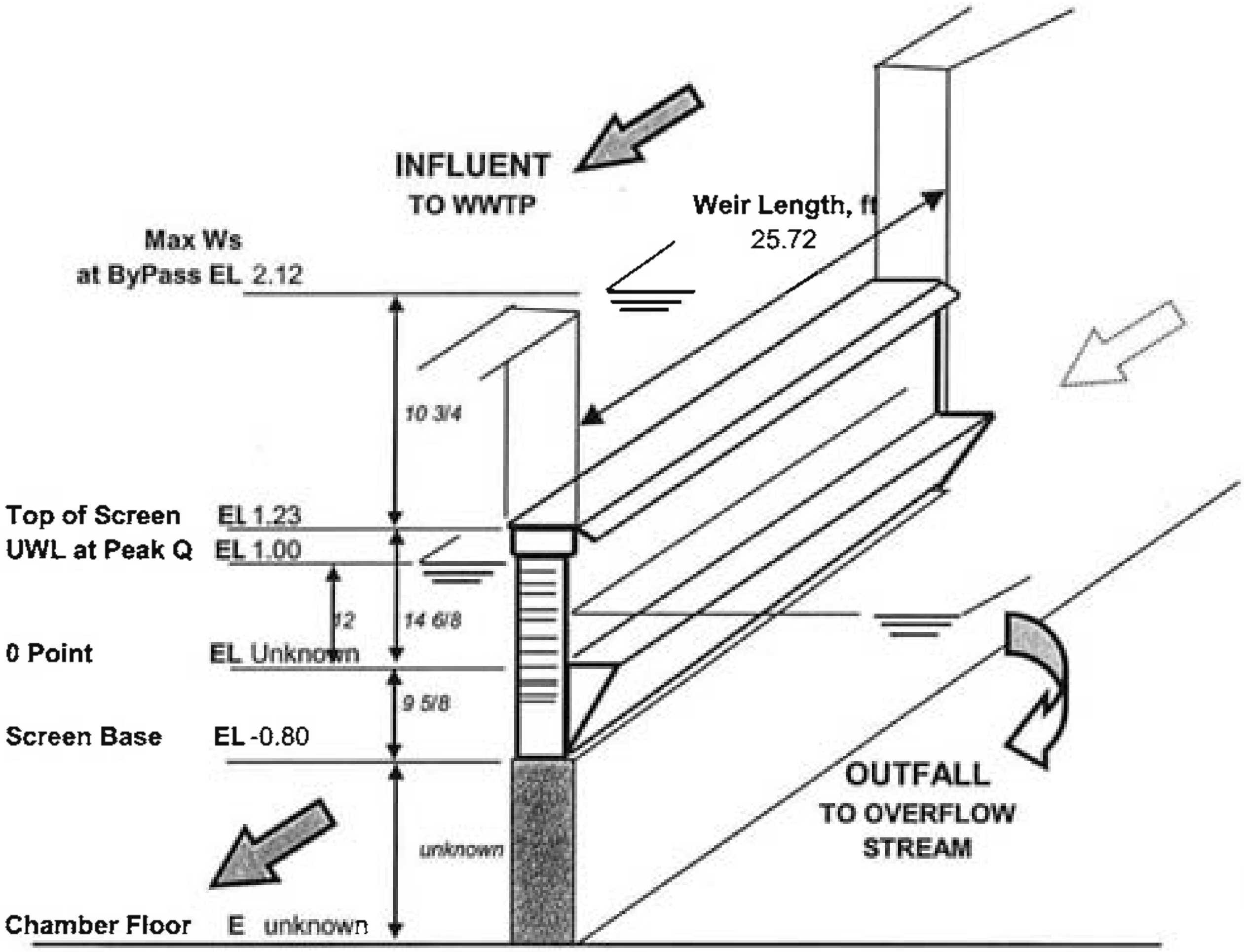
Hycor Romag Screen
Water Elevation Profile



Note: El dimensions shown in feet, italic dimensions in inches

Project Name	CH2M Hill CSO	**Screen Space Needed (min)**		
Screen Model	RSW 5x3	Height	25.00	in
Peak Flow	14.22 mgd	Width	13.12	ft
Date	09/30/04			

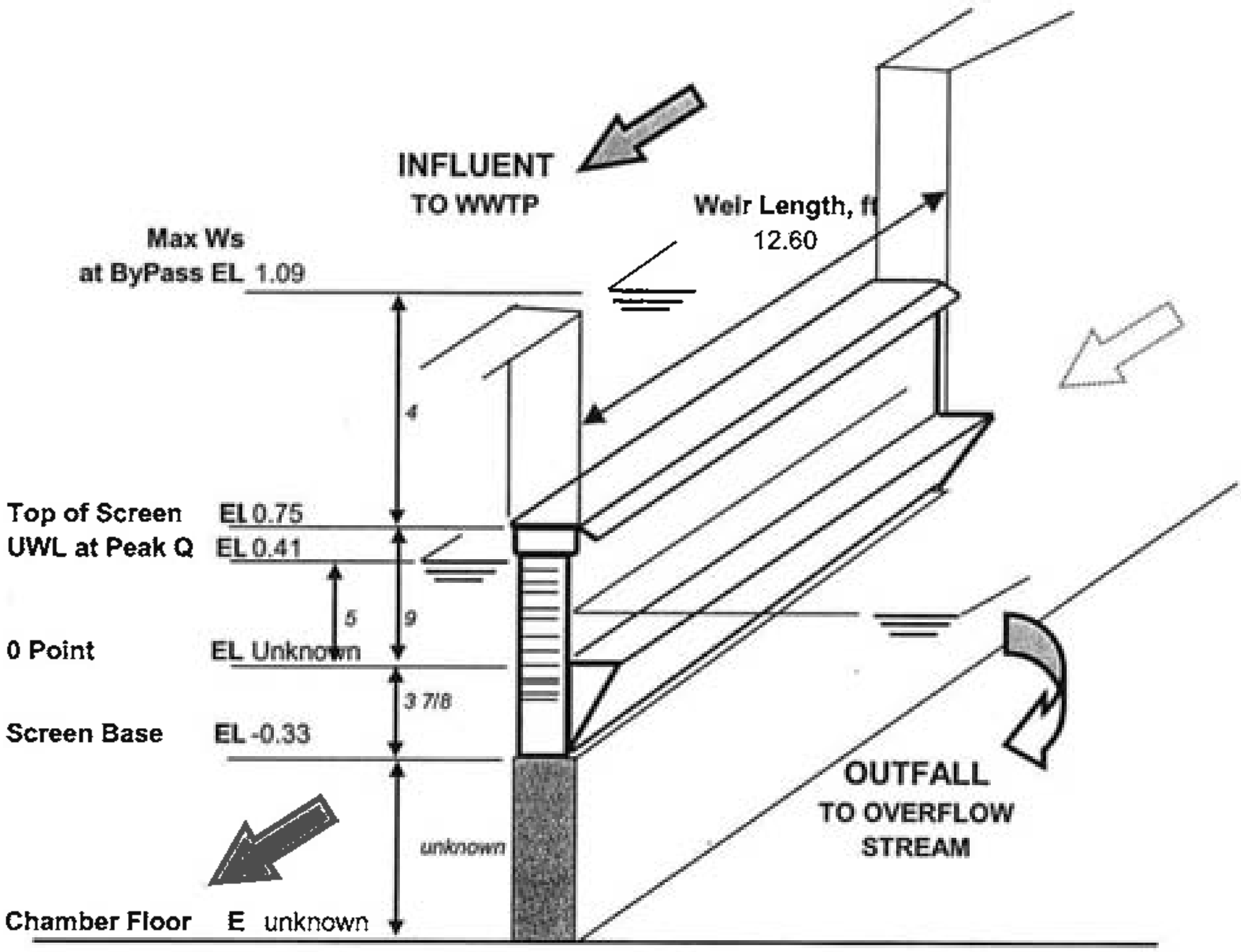
Hycor Romag Screen
Water Elevation Profile



Note: El dimensions shown in feet, italic dimensions in inches

Project Name	CH2M Hill CSO	**Screen Space Needed (min)**		
Screen Model	RSW 5x7	Height	25.00	in
Peak Flow	46.50 mgd	Width	26.24	ft
Date	09/30/04			

Hycor Romag Screen
Water Elevation Profile



Note: El dimensions shown in feet, italic dimensions in inches

Project Name	CH2M Hill CSO	**Screen Space Needed (min)**	
Screen Model	RSW 2x3	Height	13.00 in
Peak Flow	5.17 mgd	Width	13.12 ft
Date	09/30/04		

PARKSON CORPORATION

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

FOR

(2) HYCOR® ROMAG SCREENS
MODEL RMG0908W

SPECIFICATION SECTION 11330
STORMWATER SCREENS

PROJECT NUMBER 580112
SERIAL NUMBERS 58011202 and 58011203

PROJECT NAME AND LOCATION:

LITTLE BLUE VALLEY SEWER DISTRICT
ATHERTON WASTEWATER TREATMENT PLANT IMPROVEMENTS
INDEPENDENCE, MISSOURI

ENGINEER'S PROJECT NUMBER 21003349-164203/MKE

CONTRACTOR:

ALBERICI CONSTRUCTORS
21208 EAST OLD ATHERTON ROAD
INDEPENDENCE, MO 64058
PHONE: (816) 796-1441

YOUR LOCAL PRODUCT REPRESENTATIVE:

FLUID EQUIPMENT COMPANY, INC.
4225 NE PORT DRIVE, SUITE 100
LEE'S SUMMIT, MO 64064
PHONE: (816) 795-8511
FAX: (816) 795-8926

PARKSON CORPORATION
562 BUNKER COURT
VERNON HILLS, IL 60061-1831 • U.S.A.
(847) 816-3700 FAX: (847) 816-3707
SERVICE: 1-888-PARKSON
PARTS (TOLL FREE): 1-800-249-2140

Dated: August 23, 2004

6/04

HYCOR® ROMAG UNIT
RMG-W

INSTALLATION, OPERATION AND MAINTENANCE MANUAL

PARKSON CORPORATION

HYCOR® PRODUCTS
562 BUNKER COURT
VERNON HILLS, IL 60061-1831 • U.S.A.
847-816-3700 FAX: 847-816-3707
SERVICE: 1-888-PARKSON
PARTS (TOLL FREE): 1-800-249-2140

Dated: August 23, 2004

PREFACE

THE OPERATING AND MAINTENANCE PROCEDURES OUTLINED IN THIS MANUAL ARE INTENDED AS GUIDELINES TO ASSIST THE OPERATING PERSONNEL IN THE DAY-TO-DAY OPERATION AND MAINTENANCE OF THE PARKSON UNIT OR EQUIPMENT. OPERATING PERSONNEL SHOULD ALWAYS FOLLOW PROPER SAFETY PROCEDURES IN ACCORD WITH BOTH INDUSTRY SAFETY STANDARDS AND THEIR OWN COMPANY SAFETY POLICIES WHEN PROCEEDING WITH OPERATION, MAINTENANCE AND REPAIR OF THE EQUIPMENT. THIS MANUAL IS NEITHER DESIGNED NOR INTENDED AS A SUBSTITUTE FOR SAFE OPERATING PROCEDURES WHICH MUST BE FOLLOWED WHILE IMPLEMENTING THE MAINTENANCE/OPERATION PROCEDURES OUTLINED IN THIS MANUAL. IT IS ASSUMED THAT OPERATION AND MAINTENANCE PERSONNEL ARE QUALIFIED AND EXPERIENCED. THE PRIMARY RESPONSIBILITY FOR SAFETY IN THE OPERATION AND MAINTENANCE OF THE PARKSON UNIT IS WITH THE OWNER-OPERATOR AND THE PERSONNEL CONDUCTING THE MAINTENANCE AND OPERATION.

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FIGURES

SECTION ONE

Hycor® ROMAG RMG-W Unit
GENERAL INFORMATION

Safety Practices

⚠ DANGER ⚠

THIS UNIT CONTAINS A HIGH-PRESSURE HYDRAULIC CYLINDER. CONTACT WITH THE CYLINDER OR ANY MOVING PART DURING OPERATION WILL CAUSE SERIOUS INJURY.

THIS MACHINE MAY START AUTOMATICALLY.

TO PREVENT SERIOUS INJURY OR DEATH:

- **CONSULT OPERATOR'S MANUAL BEFORE SERVICING.**
- **KEEP AWAY FROM ALL MOVING PARTS AND DISCHARGE CHUTES DURING OPERATION.**
- **DO NOT OPERATE MACHINE WITHOUT ALL GUARDS OR COVERS IN PLACE.**
- **FOLLOW LOCK OUT PROCEDURES BEFORE SERVICING: LOCK OUT POWER WITH PADLOCK FOR WHICH ONLY YOU HAVE THE KEY.**
- **NEVER SERVICE HYDRAULICS WITHOUT FIRST RELIEVING HYDRAULIC PRESSURE.**

IN ADDITION TO THE ABOVE, IN ORDER TO AVOID UNSAFE OR HAZARDOUS CONDITIONS, THE FOLLOWING MINIMUM PROVISIONS MUST BE STRICTLY OBSERVED:

- THIS EQUIPMENT MUST BE OPERATED AND MAINTAINED ONLY BY AUTHORIZED PERSONNEL WHO HAVE READ AND UNDERSTAND THE OPERATOR'S MANUAL, HAVE BEEN TRAINED IN ITS USE, AND FOLLOWING ANY AND ALL APPLICABLE SAFETY PROCEDURES.

- WHEN INSTALLING OR MAINTAINING THE ROMAG UNIT OR ASSOCIATED HARDWARE, BE SURE THAT ANY LIFTING EQUIPMENT IS OF SUFFICIENT CAPACITY BEFORE LIFTING OR MOVING THE ROMAG UNIT OR ASSOCIATED HARDWARE.

- MAKE SURE ANY ELECTRICAL CONNECTIONS ARE DONE BY QUALIFIED PERSONNEL AND ARE IN ACCORDANCE WITH ALL APPLICABLE CODES AND REQUIREMENTS.

- CONSULT MANUFACTURER'S MATERIAL SAFETY DATA SHEET PRIOR TO USE OF HYDRAULIC OIL. HYDRAULIC OIL MAY CAUSE SKIN IRRITATION. WASH CONTACT AREAS WITH SOAP AND WATER. HIGH PRESSURE ACCIDENTAL INJECTIONS THROUGH THE SKIN REQUIRE IMMEDIATE MEDICAL ATTENTION FOR POSSIBLE INCISION IRRIGATION AND/OR DEBRIDEMENT. NEVER SERVICE MACHINE BEFORE RELIEVING HYDRAULIC PRESSURE. IF EYE CONTACT OCCURS, FLUSH THOROUGHLY WITH WATER. IF EYE IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

- DO NOT OPERATE A DAMAGED OR MALFUNCTIONING MECHANISM UNTIL NECESSARY ADJUSTMENTS OR REPAIRS HAVE BEEN MADE.

- OVERLOAD AND/OR SAFETY SWITCHES ARE EMERGENCY DEVICES. DO NOT USE THE OVERLOAD OR SAFETY SWITCHES TO STOP THE MECHANISM DURING NORMAL OPERATION.

- DO NOT OVERLOAD THE ROMAG UNIT OR USE IT FOR ANYTHING BUT THE INTENDED USE.

- DO PRACTICE GOOD HOUSEKEEPING. ALWAYS INSURE THE ROMAG UNIT IS KEPT CLEAN AND THE AREA AROUND THE ROMAG UNIT FREE OF POSSIBLE HAZARDS.

- ALWAYS OPERATE AND PERFORM MAINTENANCE IN A MANNER THAT PROMOTES SAFE CONDITIONS. ALWAYS USE THE PROPER TOOLS, WEAR THE PROPER CLOTHING, ETC. FOR THE TASK AT HAND.

- CONTACT WITH MATERIAL PROCESSED MAY CAUSE INFECTION OR ADVERSE REACTIONS. REPORT ANY CUTS OR INJURIES TO SUPERVISOR IMMEDIATELY AND SEEK APPROPRIATE MEDICAL ATTENTION.

- THIS PRODUCT HAS BEEN SUPPLIED WITH WARNING LABELS, SHOULD THEY BECOME DAMAGED, REMOVED OR ILLEGIBLE, PLEASE CONTACT PARKSON CORPORATION, FOR NO-COST REPLACEMENT LABELS.

WARNING LABEL PART NUMBERS FOR THIS PRODUCT IS 3824-041.

CALL TOLL FREE: 1-800-249-2140 OR
FAX: (847) 837-4996
PARKSON CORPORATION
HYCOR® CORPORATION
ATTENTION: PARTS DEPARTMENT
562 BUNKER COURT
VERNON HILLS, IL 60061-1831

Delivery and Inspection

The ROMAG unit and hydraulic power pack are delivered complete with all attachments and fittings.

After the unit has been unloaded, conduct a visual inspection and count of the shipping containers to determine if any shipping damage or material shortage occurred in transit.

Be careful not to jar crates or to puncture crated materials with lifting forks.

NOTE: **You must report, in writing, any damaged or missing parts to the shipping carrier and Parkson Corporation within 48 hours of receipt of the unit. Purchaser shall bear the responsibility for the replacement of equipment which is determined to be** missing after this period.

To assist in identifying correct quantities and parts, reference the attached packing list on the shipping crate. A purchase order shall accompany any order to Parkson Corporation for replacement of parts which were damaged during shipment. The purchaser shall direct all shipment damage back charges to the carrier.

Storage

Equipment placed in storage and/or installed but awaiting start-up must be properly protected from damage. For long term, store the ROMAG unit indoors or adequately protected from weather if outdoor storage is necessary. Always store the hardware in their originally supplied shipping crates and protected from moisture, construction dust and corrosive fumes.

NOTE: **Stainless steel units will appear to rust if contaminated with weld spatter, carbon steel dust from a grinding wheel or other airborne or waterborne contaminants.**

Some material supplied for this job has had surface preparation and painting. Any bruises, mars and/or scratches caused by loading and unloading the equipment must be immediately touched up in the field prior to any storage.

NOTE: **Any equipment painted with prime coats only should get additional coats of paint (to protect the surface under field storage conditions) within 14 days after receipt. Parkson Corporation will not accept any responsibility for rusting due to material which has not received additional paint in the field.**

SECTION TWO

Hycor® ROMAG RMG-W Unit
TECHNICAL DESCRIPTION

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

Application

The Hycor ROMAG unit is a storm water overflow screen used to remove or deflect solids during a high flow event. The trapped solids are collected for removal from the flow. The screened flow is either processed for further treatment or discharged into a natural water stream.

Unit Description

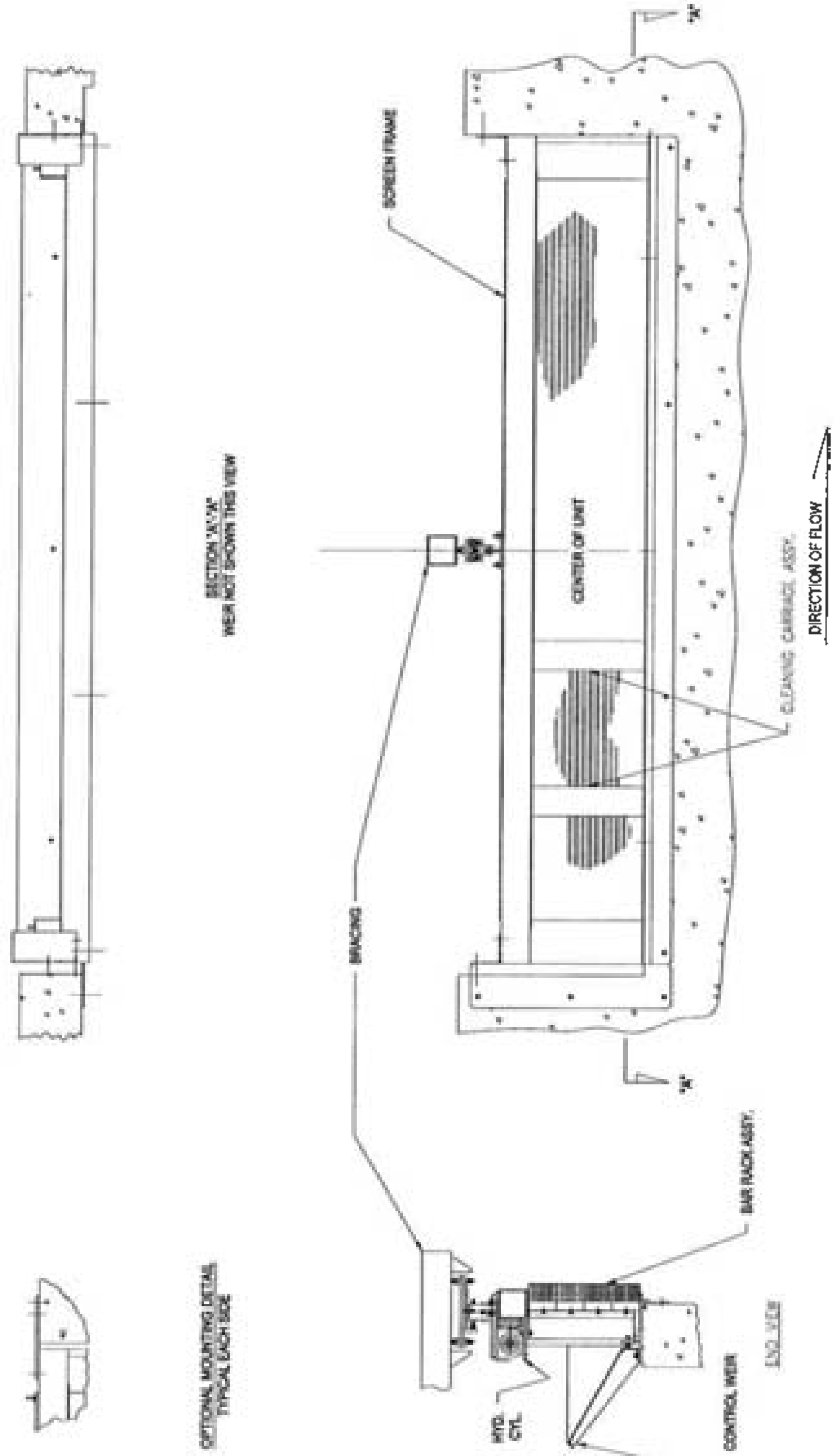
The ROMAG unit consists of a screen frame, bar rack assembly, cleaning carriage assembly, hydraulic power supply and controls.

The screen frame is furnished constructed of 316L stainless steel square tubing and angle, passivated after fabrication. Integral with the frame are the control weir and overflow weir. The control weir is designed to minimize the headloss gradient through the screen. If the water level exceeds the headloss through the ROMAG unit, the top of the frame will act as an emergency overflow weir to by-pass the unit.

The bar rack assembly is formed in modules of precision cut 316L stainless steel plates, spaced 4mm apart. Each module is fastened to the frame by socket head bolts. These bolts are also tightened to maintain tension in the bar rack assembly.

The cleaning carriage assembly is constructed of 316L stainless steel square tubing and angle framework with UHMW slide pads. Attached to the framework are combs fitted in between the bar rack spacing. These combs clean the bar rack assembly of trapped debris as well as provides support for bar racks along the unit's horizontal length.

The carriage assembly is operated by a reciprocating hydraulic cylinder. The hydraulic cylinder is connected to a yoke attached to the carriage framework and to the screen frame by means of a clamp. The cylinder's direction is automatically controlled by the operating pressures and initiated by the water level in the channel. Replaceable plastic slide blocks are installed on the carriage for reduced friction and wear.



Standard Equipment Layout

2-1A

The hydraulic power supply is a separate package suitable for operation at the unit or remotely. The package will normally consist of the following components:

- 3 phase electric motor
- hydraulic gear pump
- directional control valve
- main relief valve
- return oil filter
- pressure gauge
- oil level/temperature switch
- oil reservoir tank fitted with oil level indicator, air breather, and fill port cap
- interconnecting hydraulic hoses and fittings

(Note: For hose lengths greater than 10 feet, it is recommended that hydraulic tubing be used instead.)

The general operating parameters are as follows:

<table>
<tr><th></th><th colspan="7">Pressure Relief Valve</th></tr>
<tr><th>Length Modules</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th></tr>
<tr><td>2</td><td colspan="2" rowspan="9">1750 psi</td><td colspan="2" rowspan="5">1750 psi</td><td colspan="3" rowspan="13">2200 psi</td></tr>
<tr><td>3</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td></tr>
<tr><td>6</td></tr>
<tr><td>7</td><td colspan="2" rowspan="8">2200 psi</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td></tr>
<tr><td>10</td></tr>
<tr><td>11</td><td colspan="2" rowspan="4">1750 psi</td></tr>
<tr><td>12</td></tr>
<tr><td>13</td></tr>
<tr><td>14</td></tr>
</table>

<u>Operation</u>

The ROMAG unit's operation is initiated by a level sensing device in the channel. In the case of a "slow" rising/decreasing water level, screens should start just as, or slightly before, the water level in the channel reaches the lowest bars of the screen.

In the event of rapidly rising water levels, the start level should be placed at elevations lower than the bottom of the screen.

Upon sensing a start level, the cleaning carriage assembly will stroke back and forth, keeping the bar racks clear of solids. The solids are directed downstream to be captured in the flow going to the wastewater treatment plant.

The screened flow can be collected for further treatment or discharged into a receiving body of water.

Screens should shut off when the water has receded below the start point. As a general rule, the Stop point can be placed at approximately 3 inches under the start point.

Should large objects impede the motion of the cleaning carriage, the hydraulic cylinder will short stroke to prevent unit damage.

Also, the screens should not be started when water is already flowing through the screen over the control weir. Under this condition the screen will blind quickly and water will continue to rise. The hydraulics can not move a full screen of matted material under the flow and static pressure of the water.

The design and shape of the cleaning carriage combs allow wedged items to be dislodged and directed downstream for collection.

In the event of flows exceeding the capacity of the unit, or power failure, the top of the ROMAG screen acts as an overflow weir to prevent upstream flooding.

SECTION THREE

Hycor® ROMAG RMG-W Unit
INSTALLATION

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

The RMG-W type ROMAG screen is shipped in multiple assemblies for final assembly on site. The following procedures insure that installation will be speedily and safely accomplished. The following are the major steps to installing a ROMAG unit.

Pre-Installation
Concrete Preparation
Lifting
Mechanical Installation
Hydraulic Installation
Setting Operational Pressure
Electrical Installation

These steps must be followed or problematic operation is likely to occur!!

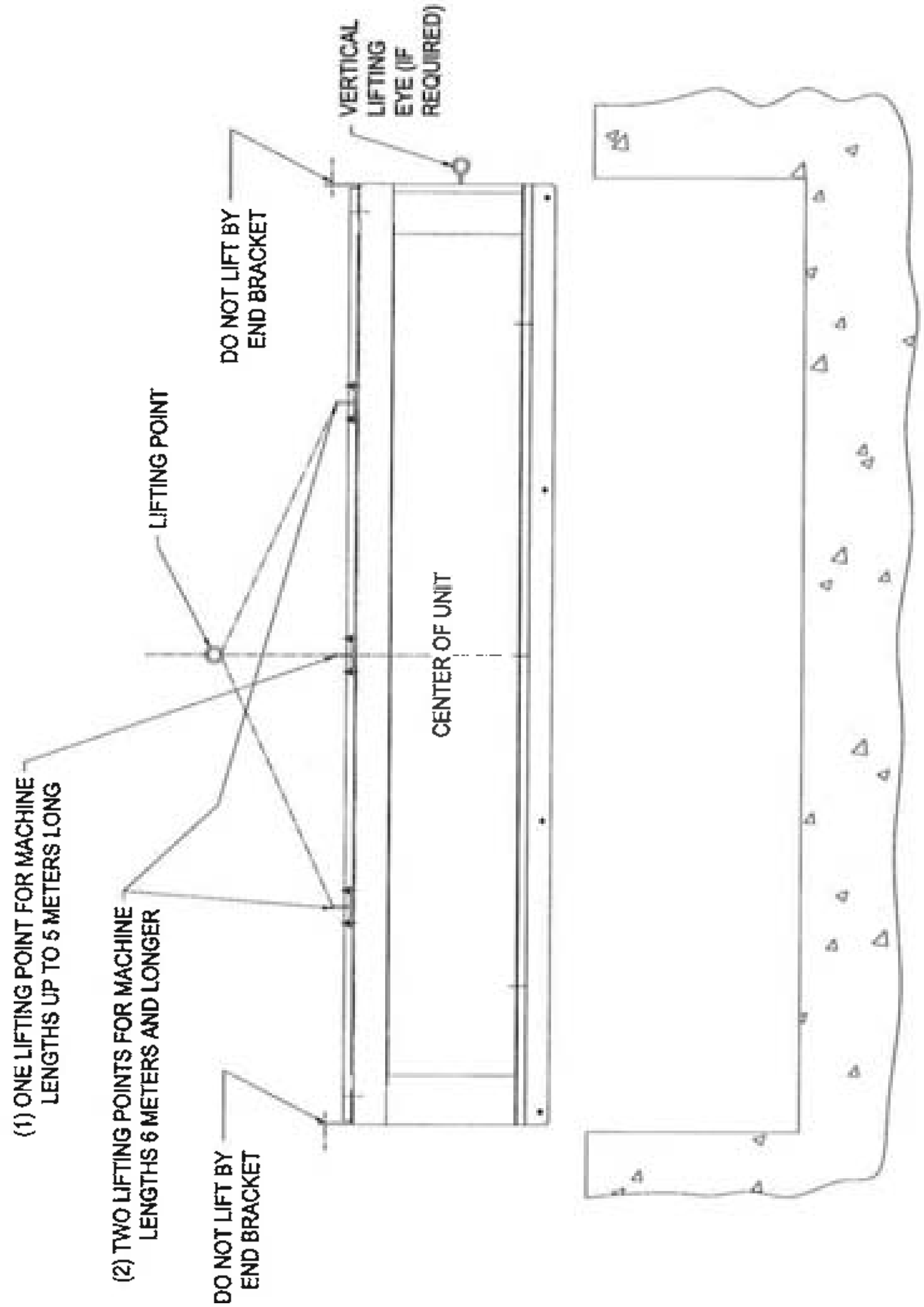
<u>Pre-Installation</u>

1. Verify that lifting and transport equipment of suitable capacity is available. The shipping crates most often can be lifted from underneath with a fork lift truck. However, the unit also can be hoisted by the lifting points on the top frame. If the screen is to be lowered into the chamber vertically, a lifting eye has been installed on the end of the screen. (See page 3-1A)

2. If the installation requires the screen to be leak proof, remove the control weir on the back side of the screen. Caulk the flange of the control weir and re-attach weir to the unit. If required, this can be done once the unit has been lowered into the basin.

3. When installing the screen in an existing facility, drain or pump water away from all sides of the screen.

4. If installed in and active sewer, bypass channel flow around the area where he screen is to be installed. This will insure a safe working environment. Take extreme precautions when using electric power tools around water.



Lifting Points

3-1A

5. If water cannot be drained, provide water tight platforms on both sides of the screen.

6. Installers and inspectors must have access to the mounting elevations of both sides of the screen. Temporary platforms should be placed on both sides of the screen if the screen mounting elevation is over 4' above the floor.

7. The area must have good lighting. Indoor installations should use portable halogen work lights.

8. A water supply with a garden hose must be provided during installation.

9. Ropes, pulleys and a come-a-long should be available to mount the support struts if the crane is not available or possible to use.

10. Wood timbers (2X4's & 4X4's) should be available to support or adjust the screen while it is being set on the concrete wall.

11. The contractor should have the following tools available during the installation:

    A. 12-18" long level.

    B. 4' long level.

    C. One set of channel locks.

    D. Two crescent wrenches - 12" - 18".

    E. One 2-5 pound sledge hammer.

    F. Clean buckets to transfer oil to the hydraulic power packs. Impress the contractor on the importance of not contaminating oil or leaving hydraulic tubing open for dirt and dust to get in system. If so, unit will have to be disassembled and cleaned.

    G. Minimum of 2 ladders suitable for the installation to give access to the screens.

    H. One 4" grinder.

    I. Two sizes of Roto-hammers for drilling anchor bolt holes. A larger one is used for normal drilling. A small one is needed to drill base plate mounting holes. For small screens, a right angle drill design is required because there is not enough clearance for even small drills.

    J. 1/2" diameter by 5" and 6" long masonry drill bits in suitable numbers to complete the installation.

K. Stainless steel shim stock available; washers in various sizes large diameters, up to 1/8" thickness. More will be required when the concrete walls are not level and square.

L. 5 to 6 tubes of silicone per unit to be installed, and a caulk gun.

M. Masking tape, paper towels, small bottle of liquid detergent, rubbing alcohol or thinner and a grease cleaner.

N. Carpenter's square.

O. Passivation paste for cleaning areas that were cut or ground off.

P. Extra bolts and a few drop in anchors for the bolts.

12. Special Care Must Be Taken To Not Contaminate The Hydraulic Tubing, Oil or Hydraulic Power Units During The Installation.

13. There are two stainless steel hydraulic lines coming out of the screen. One tall and one short, connect the short line to the "B" end of the carriage valve on the power pack.

14. The hydraulic lines should be securely anchored to the walls.

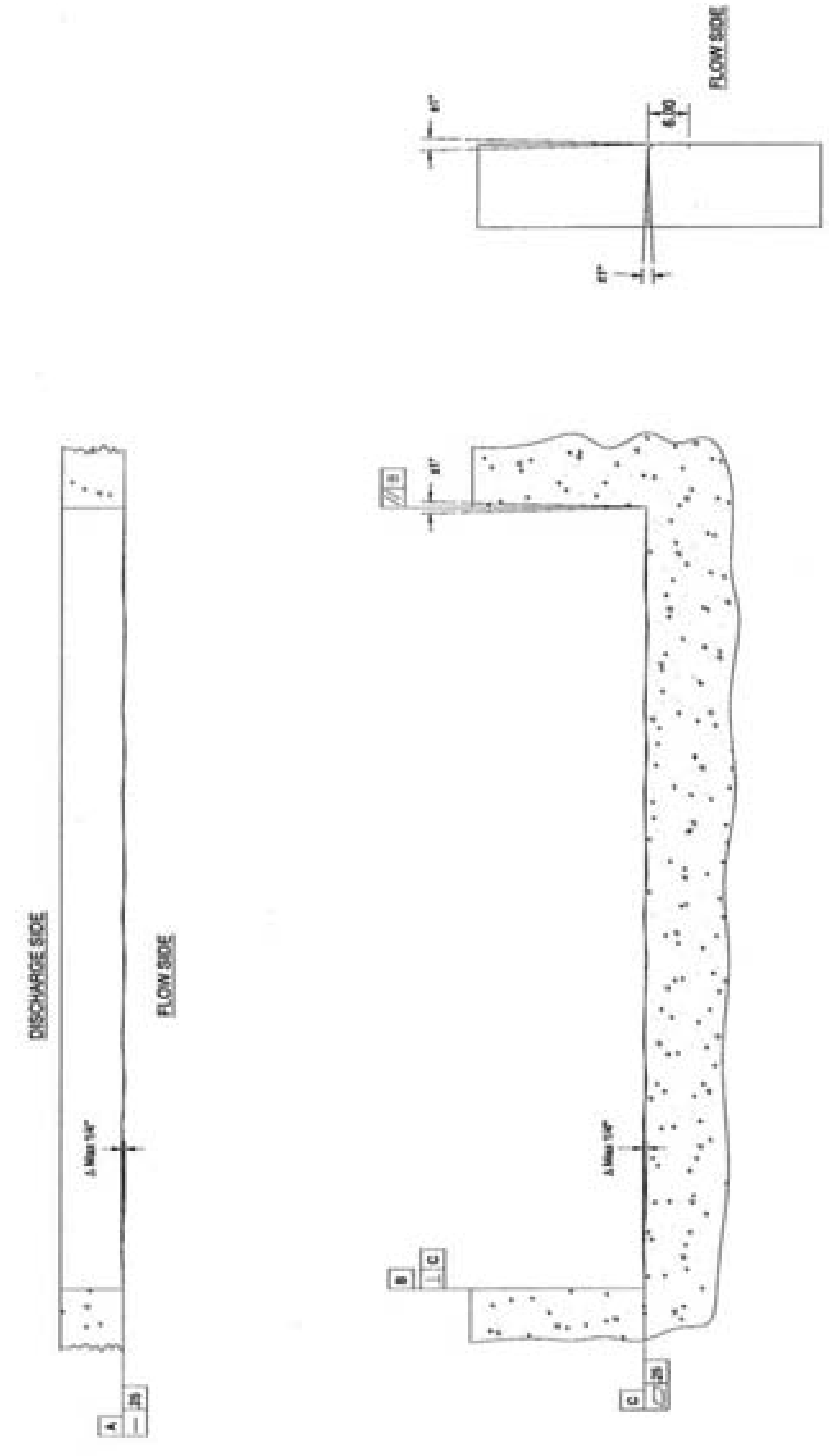
Concrete Preparation (See page 3-3A)

NOTE: **The CONDITION OF THE CONCRETE is the most critical aspect of the installation of the screen. The time and cost of installation can be increased exponentially, due to concrete quality. EVEN SLIGHT DEVIATIONS IN THE CONCRETE MAY MAKE THE SCREEN IMPOSSIBLE TO INSTALL, until corrections have been made.**

Prior to installation of the screen, the installing representative will check the condition of the concrete. If the concrete fails to meet the following test, the screen cannot be installed. From page 3-3A tolerances should be held to 1/16th of an inch.

This Pre-Installation Test involves the following:

- The end walls that the screen will attach to will be checked with a level for vertical. Tolerance 91° to 89°.
- All corners will be checked with a square. Tolerance 91° to 89°.



Concrete Preparations

3-3A

- The influent vertical wall will be checked with a string line. This will require drilling holes in the concrete and setting drop-in anchors and a bolt. Tolerance will be a maximum of 6 mm (1/4 inch) across the width of the opening. **[That is from the highest spot to the lowest spot, the maximum difference has to be 6 mm (1/4 inch) or less.]**

- The top of the wall that the screen will sit on will also be checked with a string line. Tolerance will be a maximum of 6 mm (1/4 inch) across the width of the opening. **[That is from the highest spot to the lowest spot, the maximum difference has to be 6 mm (1/4 inch) or less.]**
- Look for local imperfections (dips or ridges) along the to of the wall that the screen will sit on, or along the influent vertical wall. These will have to be filled in or removed.

Cut/notch or pour concrete weir to required length and depth shown on the installation drawings. A total allowance of 2" is required to facilitate the installation of the screen. The weir opening should be square and level.

After concrete work is completed, inspect concrete for square, level and flatness on the top and influent surface of the concrete.

Remove any grease, and/or scum around the concrete opening using an alcohol based cleaning agent or other suitable concrete cleanser before the screen is placed on the concrete wall.

Lifting

After the preparatory concrete work has been completed, the screen is ready to be installed.

The screen can be lifted by the support bracing mountings on the unit. Depending on the screen's length there may be one or two locations. Do not lift the unit by the end brackets. (See page 3-1A)

The screen must be lifted and installed horizontally. Do not tilt screen beyond 30°.

If your screen has to fit vertically into the containment, it will have been fitted with a removable lifting lug on the side of the unit. (See page 3-1A)

Mechanical Installation

Lay rubber pieces on top of wall to make a continuous length of seal. Cut and fit rubber as necessary.

Set the screen down into the concrete opening.

Slide the screen tight against the downstream side of the opening. There should only be a 2" gap on the tensioning bolt side of the screen. The bottom flange of the screen should be pushed up to the wall as tight as possible.

Level the screen in the opening, using a 4' level. Shim as required along the length of the screen at each bolt hole location, but do not block the bolt hole.

Just below the combs there is a horizontal angle welded to the bottom flange. With a straight edge and chalk draw a horizontal line on the concrete, on both ends of the unit, in line with the lower edge of the angle. On this line, about 8" to 10" away from the unit drill a hole and set a drop-in anchor with a screw sticking out of the concrete. (See page 3-5A)

Tie a tight string between the two bolts. Adjust the string 30 to 40 mm, (pick a specific distance, example 36mm) away from the concrete wall at the bolts. Measure in millimeters, the distance from the flange to the string at the two end mounting holes of the screen. (See page 3-5B)

If - the two end holes on the flange are roughly the same distance to the string, (+/-5 mm tolerance or 1/4 of an inch), adjust the string so that it is the same distance from the two end holes (+/- 1 mm, tolerance). (See page 3-5B)

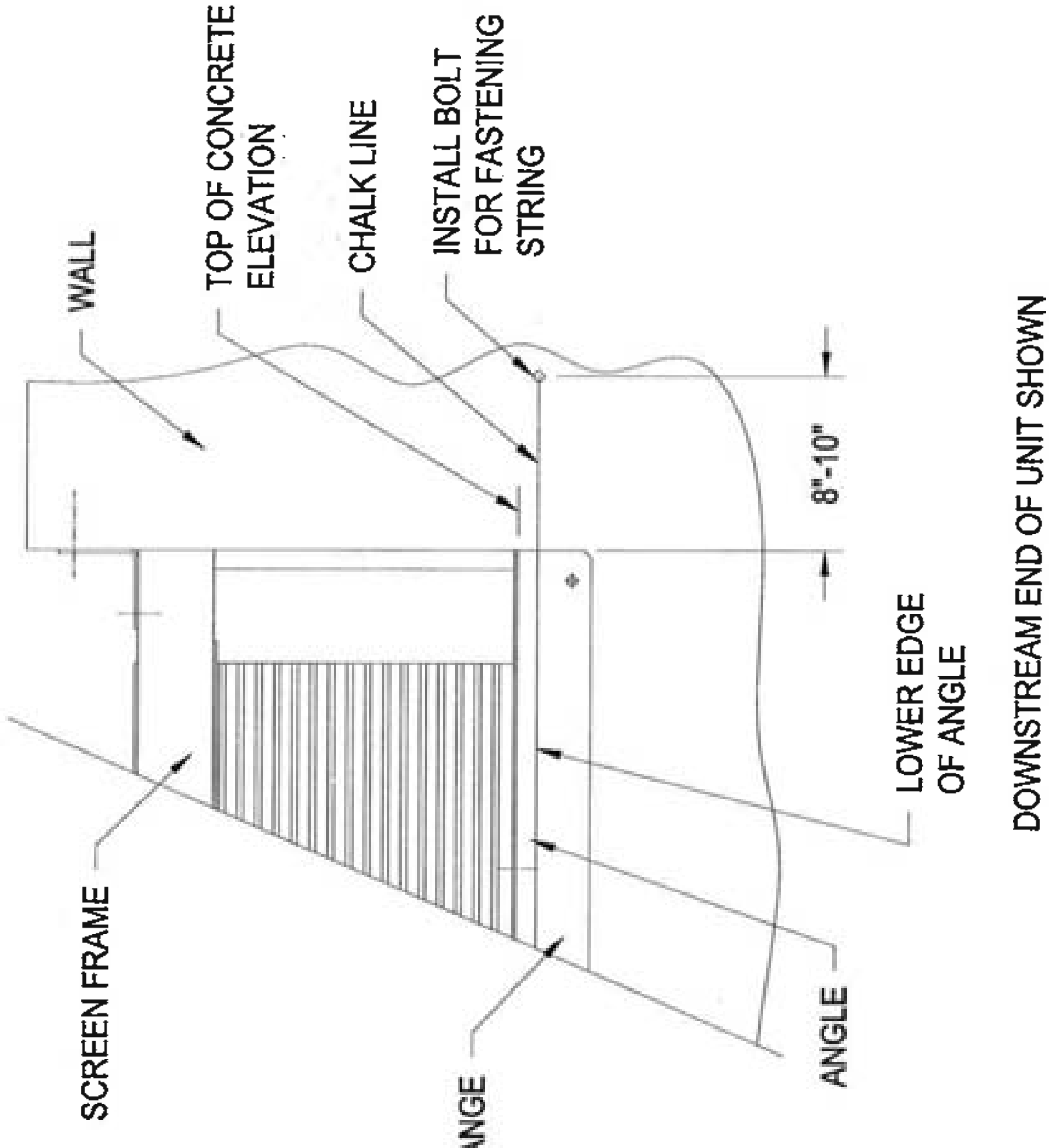
IF NOT - rotate (square) the screen so that the two ends are the same distance to the string, (+/-5 mm tolerance or 1/4 of an inch). Then, adjust the string so that it is the same distance from the two end holes (+/- 1 mm, tolerance). (See page 3-5B)

With the screen in line with the string, drill holes in the concrete using the holes in the flange as a template. Place anchor bolts in holes with enough threads available to adjust later. Shim gaps between the flange and wall with stainless steel shims. Use shims to adjust the screen so that the distance between the flange at each bolt hole, and the string is the same distance along the full length of the screen, tolerance 2 mm. Tighten unit to wall.

Plumb the screen (vertical) on the down stream end and anchor the top flange plate to the wall. Plumb the screen (vertical) on the up stream end and drill holes for anchoring. Place a stainless steel spacer between the wall and the flange in the area of the 2" gap. Anchor top flange to wall.

Drill holes in the lower flange using the bolt holes as a template. Insure that shims installed are the correct height. Remove any length of anchor bolt that will impede the travel of the cleaning carriage assembly. Passivate any areas that were cut or ground down to prevent the appearance of rusting.

<u>NOTE</u>: **Holes under the carriage may not all be accessible until the unit is operational and the carriage can be moved. Do not move the carriage until all debris has been removed from within the unit and the bottom has been thoroughly soaked down with water, to prevent damage to the cleaning carriage.**



String Installation

3-5A

Attach the support braces and brackets to the screen and wall as depicted in the equipment drawings. (Note: Very small screens may not require support braces.) The brace adjusting block, which attaches directly to the screen should be installed with all the settings in the middle of the adjustment range. Install all horizontal members using a 4' level.

Remove the shipping brace(s) on the face of the screen. Replace the bolts to prevent debris from fouling the interior of the upper and lower frames. Note: Small units may not have shipping braces.

Using two installation brackets for a string line, (install the brackets on the two outer top overflow weir bolt locations), and run a string from bracket to bracket. Adjust string distance from the frame to a set distance in millimeters (1mm tolerance) at each bracket location. (See page 3-6A)

Check distance from the frame to the string at each support mounting location, use the adjustments on the brace adjusting block to push or pull the unit into alignment with the string (1 mm tolerance). On units with two (2) or more brace locations, adjust each support mounting location and re-check previous location(s) for changes.

From the weir side of the unit, measure the internal distance from top frame to the bottom frame, at the two ends of the screen. (See page 3-6B) Measure this same distance under the mounting assembly(s). Use the adjustments on the brace adjusting block to raise or lower the top frame so that the top of the unit is level (2 mm tolerance).

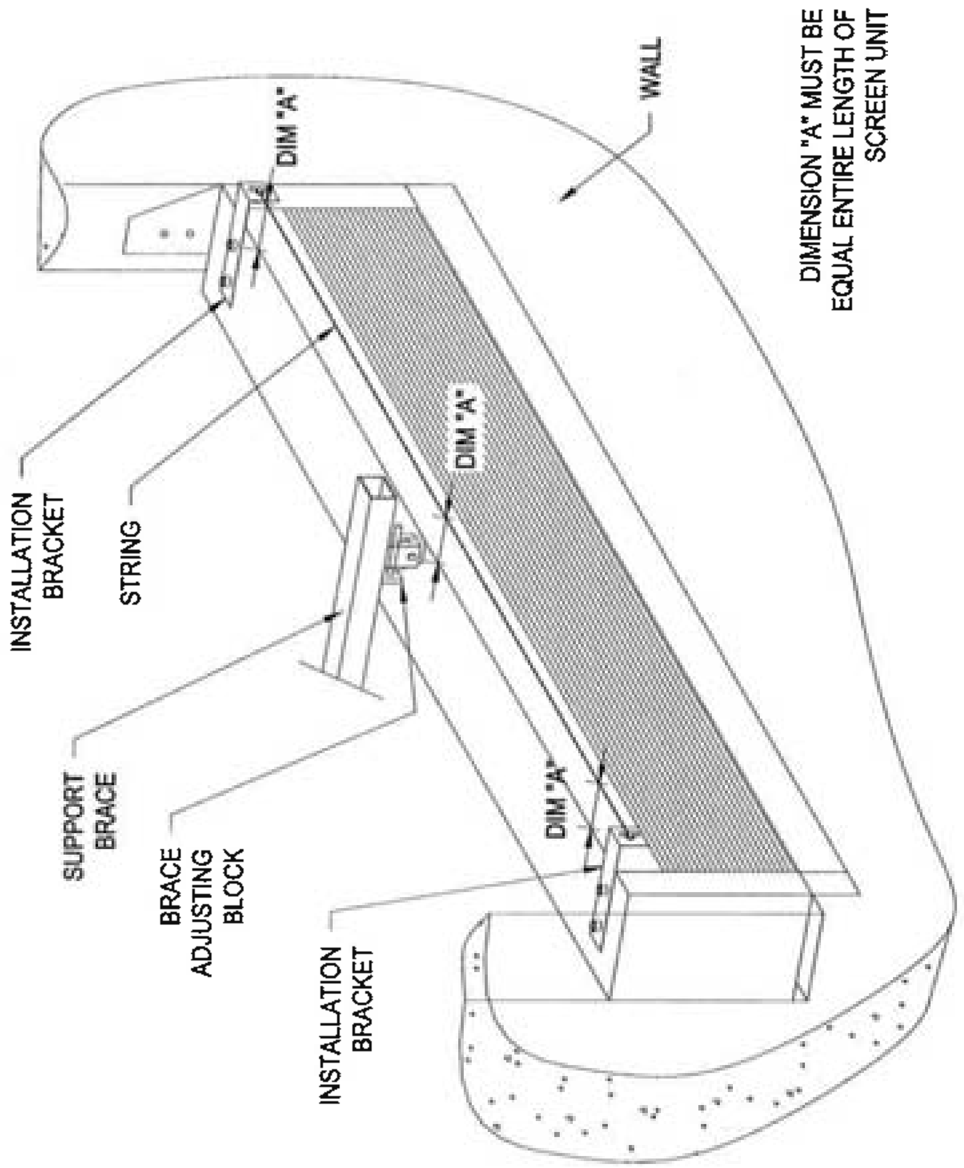
Once the top of the screen has been leveled and straightened, re-check and readjust, if the adjustments made have effected the other settings.

Attach the weir support brace(s) to the weir and concrete. The ends may have to be bent slightly to match the weir and concrete. (See 3-6C)

Butt the vertical end plate (See 3-6D) against the screen on the tensioning bolt end of the screen and anchor it to the wall. The plate should be touching the screen just behind the tensioning bolts. The bottom of the plate should be in line with the bottom of the flange on the screen.

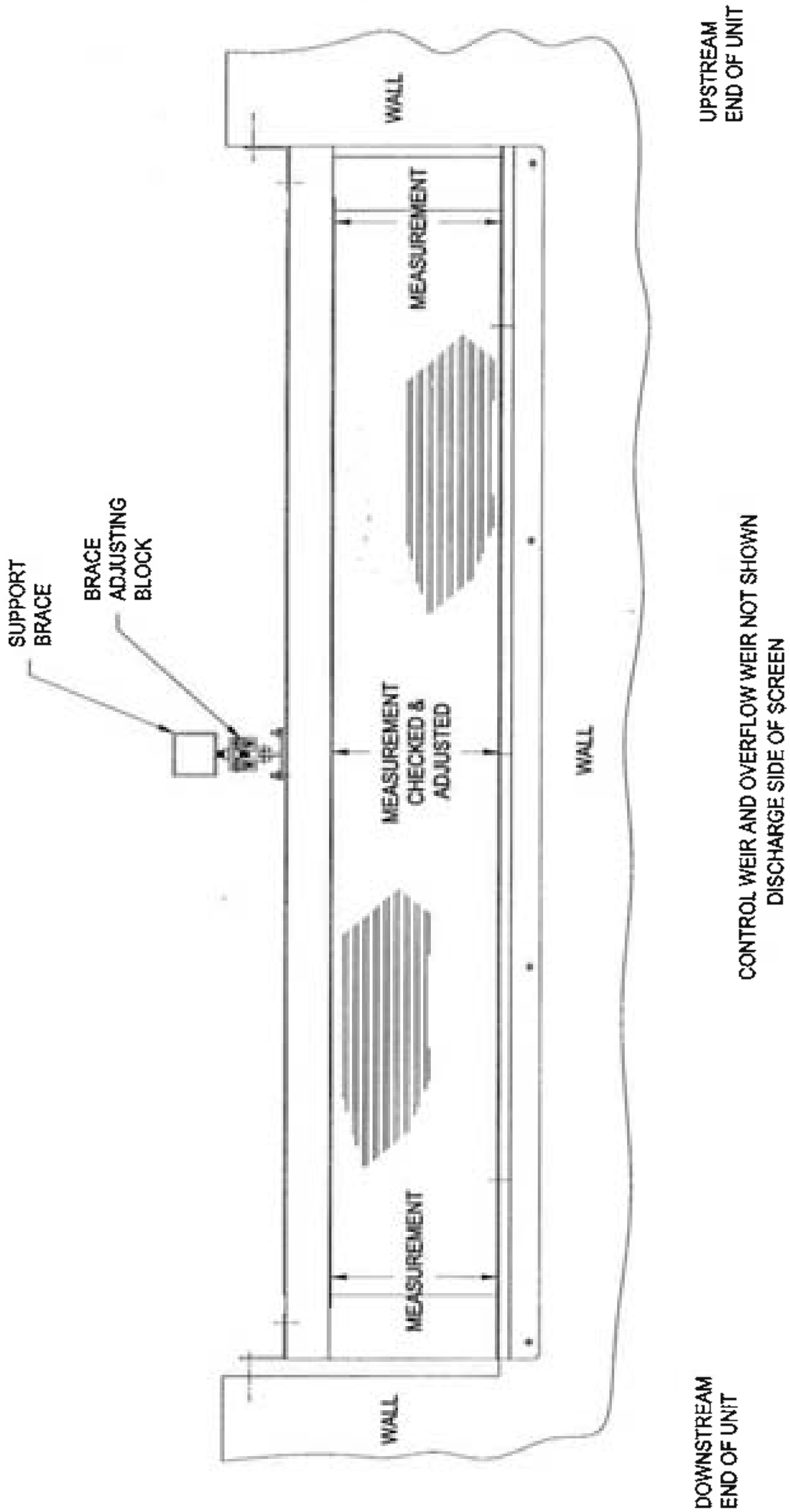
Remove the spring loaded flap covering the screen tensioning bolts, if applicable. Tighten the screen tensioning bolts (See 3-6E) with a 14mm allen wrench. Start in the middle and work up and down from the center. Repeat this process on all the tensioning bolts to achieve uniform tension. Improper tensioning will result in a twisted screen frame. Uniform tension is essential for proper operation. Reattach the spring loaded flap to the screen.

<table>
<tr><td></td><td colspan="7">Tension Torque Value</td></tr>
<tr><td rowspan="2">Length</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td colspan="3">25 Nm (31 ft-lb)</td><td colspan="2">30 Nm (41 ft-lb)</td><td colspan="2">35Nm (48 ft-lb)</td></tr>
</table>



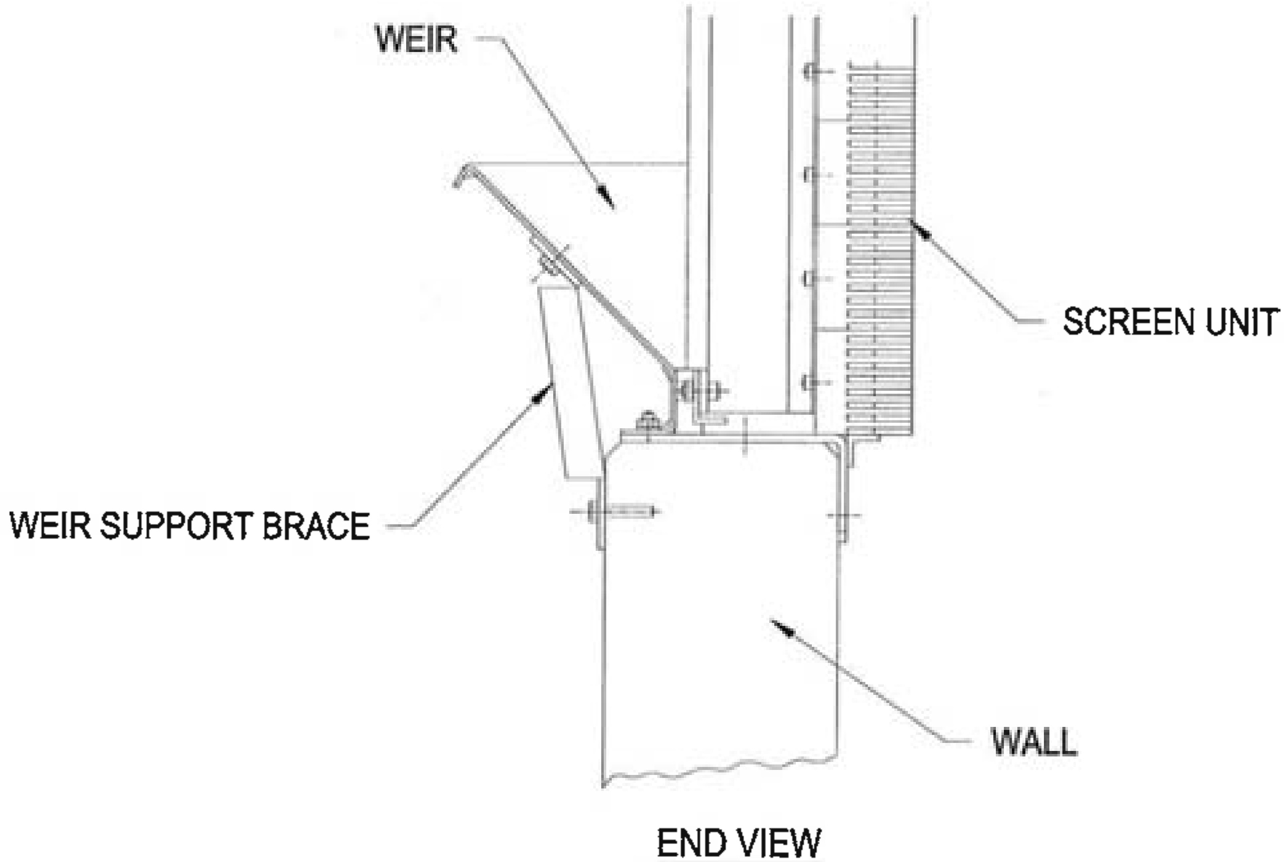
<u>Top Frame Horizontal Alignment</u>

3-6A



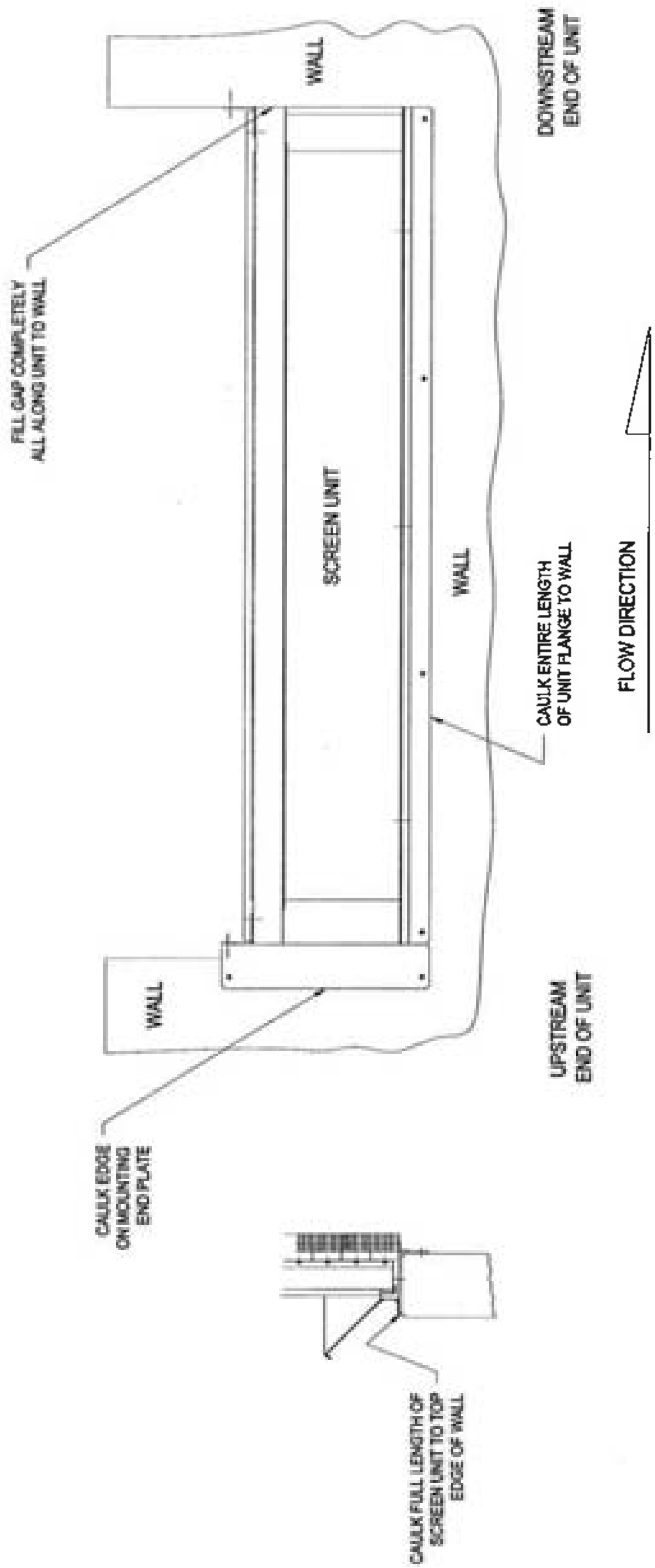
Final Vertical Alignment

3-6B



Weir Support Bracing

3-6C



Caulking Locations

3-6D

With the screen and all components installed. Clean any masking tape marks left from shipping the unit with alcohol or thinner.

Wash all areas to be caulked with an alcohol based primer to remove grit or grease.

Dry all areas to be caulked.

Tape stainless steel pieces prior to chalking for a clean finish.

Apply caulk to bottom and sides of screen. (See page 3-6D)

The gap (approx. 2") between the upstream end of the screen and the concrete wall on the discharge side of the screen has to be filled with concrete up to and including the anchor bolts on the side of the screen. (See page 3-7A)

Hydraulic Installation

⚠ DANGER ⚠

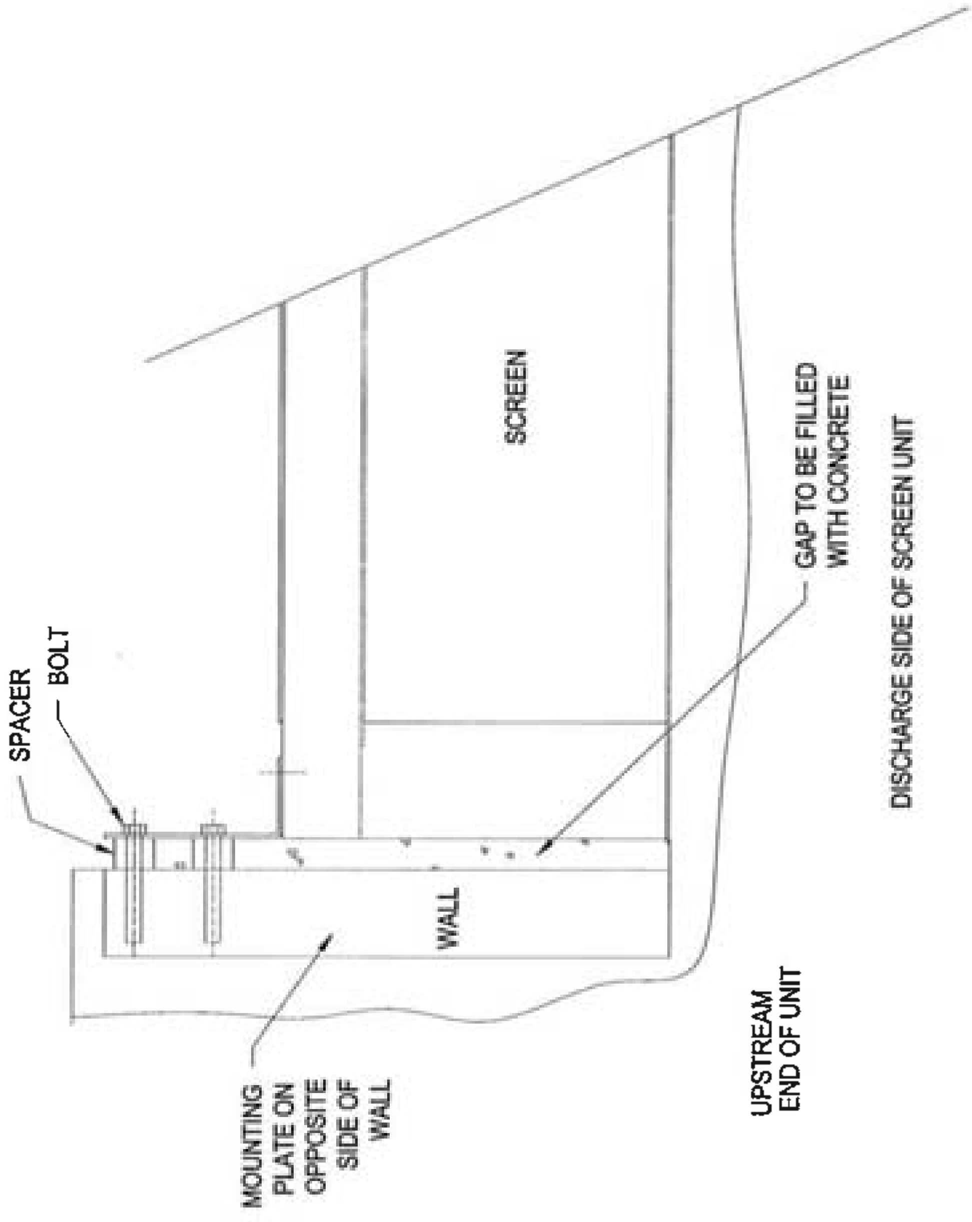
CONSULT MANUFACTURER'S MATERIAL SAFETY DATA SHEET PRIOR TO USE OF HYDRAULIC OIL. HYDRAULIC OIL MAY CAUSE SKIN IRRITATION. WASH CONTACT AREAS WITH SOAP AND WATER. HIGH-PRESSURE ACCIDENTAL INJECTIONS THROUGH THE SKIN REQUIRE IMMEDIATE MEDICAL ATTENTION FOR

POSSIBLE INCISION IRRIGATION AND/OR DEBRIDEMENT. NEVER SERVICE BEFORE RELIEVING HYDRAULIC PRESSURE. IF EYE CONTACT OCCURS, FLUSH THOROUGHLY WITH WATER. IF EYE IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

Follow all SAE recommended practices to insure good workmanship and a safe installation.

The manufacturer recommends the contractor only use long radius bends on the stainless steel hydraulic tubing.

Be sure that proper air circulation is provided to prevent overheating of the motor. If the power pack is enclosed, make provisions to allow heat dissipation from the hydraulic system.



Caulking Locations

3-7A

Secure the hydraulic power pack in place. It is recommended that the hydraulic power pack be placed in a containment curb for safety and housekeeping. It is also recommended that the hydraulic power pack be placed off the floor. To properly drain the tank, the drain plug is installed at the base of the tank. Raising the unit off the floor allows the ease in changing the hydraulic fluid.

Connect the hydraulic hose assemblies between the power pack to the hydraulic cylinder. The "B" side of the hydraulic valve should be connected to the shorter of the stainless steel stub ends on the screen.

NOTE: **Make sure that the hoses and hose connections are clean, do not remove the caps from the connections until ready to install the power unit. For distance over 10', use hydraulic tubing with short hoses on either end to complete the conduit connection. All stainless steel and rubber tubing should be securely anchored to the walls.**

If the hydraulic lines are to pass through a concrete wall, it is recommended that hydraulic tubing be grouted in the wall to conduct the hydraulic fluid through the wall. If the screen and the power pack are within 10', hose can be use to complete the conduit.

The hydraulic power pack is shipped complete, except for hydraulic fluid. The reservoir should be filled to the black upper line on the sight gauge with approximately 10 gallons of high quality anti-wear, anti-foam hydraulic fluid as listed in the Lubrication Chart on page 5-3. It is recommended that the oil be poured in the tank using a clean funnel, pouring can, or pumped directly from the oils original container.

NOTE: **Viscosity changes with temperature and it may be desirable to check with your local oil supplier for specific oils suitable for winter and summer use.**

Electrical Installation

Prepare for the electrical installation by verifying the power requirements for the hydraulic power pack's motor and the control panel. Consult the electrical control schematic for the control interconnect and supply power wiring. Be sure the unit is well grounded.

Reference the motor nameplate for proper power supply and wiring connection data. Wire leads as directed by the diagram on the motor terminal box.

Review the control schematics for termination of the accessory switches such as: channel level; hydraulic oil level; and oil heater (if required). Terminals are normally provided in the control panel for interconnection wiring by the local electrician.

⚠ DANGER ⚠

MAKE SURE ANY ELECTRICAL CONNECTIONS ARE DONE BY QUALIFIED PERSONNEL AND ARE IN ACCORDANCE WITH ALL APPLICABLE CODES AND REQUIREMENTS.

SECTION FOUR

Hycor® ROMAG RMG-W Unit
OPERATING INSTRUCTIONS

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

THIS EQUIPMENT MUST BE OPERATED AND MAINTAINED ONLY BY AUTHORIZED PERSONNEL WHO HAVE READ AND UNDERSTAND THE OPERATOR'S MANUAL, HAVE BEEN TRAINED IN ITS USE, AND FOLLOWING ANY AND ALL APPLICABLE SAFETY PROCEDURES.

Start Up Procedures

Before starting the ROMAG unit's motor, make an installation check on the following:

- ROMAG unit installed per the installation drawing and the anchor bolts are tight.
- Clean the screen area clear of debris. It is important to clear the installation area of sand, stones and debris.
- Hydraulic hoses not damaged and all connections are tight.
- Properly identify the correct supply power with respect to motor nameplate data.
- Check that all lubrication points are lubricated.
- Check hydraulic fluid level and verify the correct fluid has been added.
- Set level sensing device.

Prepare personnel for start up. Normally, the ROMAG unit is delivered set in such a way that the work cycle starts when the electric motor of the hydraulic power supply starts.

Recheck the screen tensioning screws for proper tension after the test run.

⚠ DANGER ⚠

THIS UNIT CONTAINS A HIGH-PRESSURE HYDRAULIC CYLINDER. CONTACT WITH THE CYLINDER OR ANY MOVING PART DURING OPERATION WILL CAUSE SERIOUS INJURY.

Prior to performing the test run, open the bypass valve located near the hydraulic cylinder. This will create a closed loop in the hydraulic lines by bypassing the hydraulic cylinder and will purge the air from the hydraulic lines.

<u>NOTE:</u> **On initial start up, observe the direction of rotation of the motor. It should rotate in the direction of the arrow (clockwise direction when viewed looking down on the motor). Run no longer than 20 seconds. Check hydraulic oil level and refill as necessary. To reverse the motor rotation, switch any pair of input electrical power leads. Observe the pressure gauge on hydraulic power supply. If pressure builds on the gauge, wiring is correct.**

After proper motor rotation has been verified, switch the unit on "Hand".

Run the hydraulic unit for approximately 1 to 2 minutes to remove air from the hydraulic lines. For longer hydraulic lines, this process may take longer. Take all precautions to prevent contamination of the hydraulic system. Add hydraulic oil to the reservoir as needed. After air has been purged from the lines, close the bypass valve. The cleaning carriage should begin to move.

At the end of the carriage stroke, open the bypass valve to remove any air that may have been trapped in the cylinder. After running for 1 to 2 minutes, close the bypass valve. The cleaning carriage should change direction. Open the bypass valve when the cleaning carriage is extended to the opposite end of the screen and repeat the last step again. Finally, close the bypass valve and observe the carriage operation.

During the operating time, the cleaning carriage assembly is completely governed by the oil flow and the oil pressure. Consequently, no electric control is required for continuous reciprocating operation except that which runs the motor. (Should additional controls be supplied, refer to the necessary logic diagrams for control start up.) Allow the hydraulic cylinder to stroke several times. In the event the operating pressure needs to be reset or adjusted, see the step by step procedure in Section Six - Repair and Replacement.

When the unit is switched off, the carriage assembly will stop immediately.

Adding Flow

After the ROMAG unit has been dry run satisfactorily, influent can be added into the channel.

⚠ DANGER ⚠

FOLLOW LOCK OUT PROCEDURES BEFORE SERVICING: LOCK OUT POWER WITH PADLOCK FOR WHICH ONLY YOU HAVE THE KEY.

Shutdown Procedures

Short Duration - The ROMAG unit may be stopped for short durations of time without any undesirable effects. For a duration of greater than 24 hours, the cleaning carriage assembly and bar rack should be thoroughly hosed down to prevent solids from sticking to bar racks.

Long Duration - When the ROMAG unit is shut down for expected long durations, the unit should be thoroughly hosed down to remove solids from sticking to bar racks. Reference Section Six - Repair and Replacement.

SECTION FIVE

Hycor® ROMAG RMG-W Unit
MAINTENANCE

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

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FOLLOW LOCK OUT PROCEDURES BEFORE SERVICING: LOCK OUT POWER WITH PADLOCK FOR WHICH ONLY YOU HAVE THE KEY.

The ROMAG unit is a simple device needing little maintenance over its serviceable lifetime.

Make frequent visual inspections of the mechanical operation on a regular basis. Follow the maintenance instructions below and in the Maintenance Schedule on page 5-4, to extend the life of your machine and decrease the overall operating cost of your system.

First Ten (10) Operating Hours

Check the threaded connections on the hydraulic pipes and hoses.

Check the tension of the bars.

Monthly (or after storm event)

Observe that the unit functions smoothly under load conditions. If any strange sound or abnormal movement is noted, investigate the cause and correct the problem in accordance with the maintenance procedures of this manual.

Perform routine housekeeping - remove accumulated debris from screen and from level sensing components.

Monthly (cont'd.)

Visually inspect the tension of the bars.

Check all threaded connections (hydraulic, structural).

Check hydraulic oil level.

Check the level of the hydraulic fluid in the reservoir (see page 5-2A). The oil level should be approximately mid way between the low level mark (red line at the bottom of the oil level indicator) and the maximum fill level (black line at the top of the oil level indicator). The oil level indicator also has a thermometer to give the temperature of the fluid. Reservoir temperature should not exceed 150°F. (65°C). System reliability and component service life will be reduced when system is operated at higher temperatures.

Inspect the cleaning carriage assembly for excessive wear. Replace plastic and bronze cleaning combs, if necessary.

Semi-Annually

It is recommended that every 2500 hours operating time or twice a year, whichever occurs first, the hydraulic oil filter should be replaced. (See page 5-2A.)

Annually

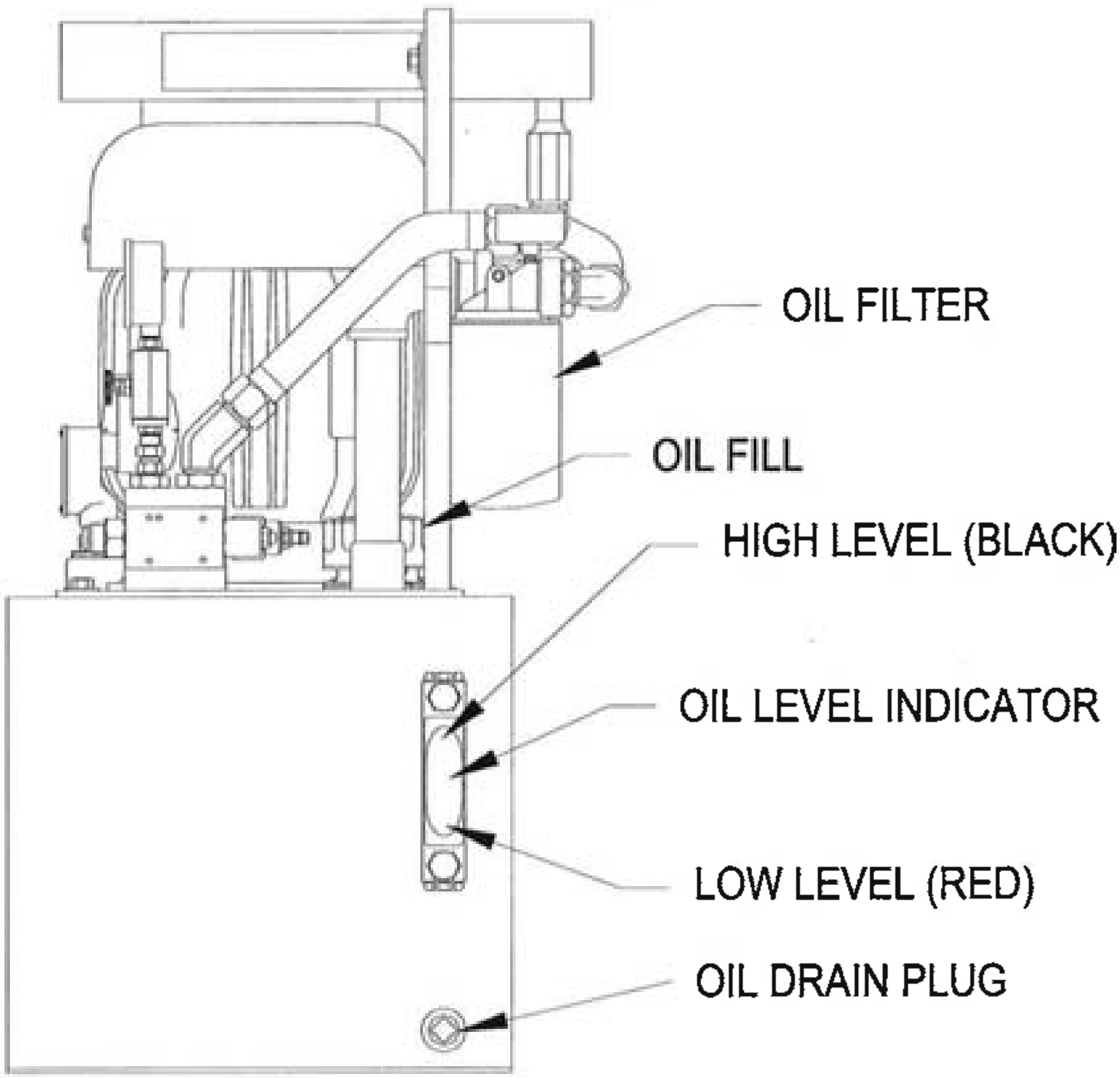
Observe the hydraulic oil operating limitations and change the oil accordingly or at least every 1000 operating hours or once a year. For high use applications, change oil after 700 working hours.

Check screen tension by testing tensioning screws at the end of bar racks.

To drain the hydraulic oil, remove the pipe plug located at the bottom of the hydraulic tank below the sight gauge (see page 5-2A). Reinstall the plug and fill with approximately 10 gallons of hydraulic fluid through the oil fill (see page 5-2A), while observing the oil level indicator (see page 5-2A). Fill until the oil level is midway between the low level mark (red line at the bottom of the oil level indicator) and the maximum fill level (black line at the top of the oil level indicator). Run the ROMAG unit through several cycles. Add oil as necessary. Always change the oil filter when changing the hydraulic oil.

Lubricate motor bearings at least every 5000 operating hours or once a year (see page 5-2A). See the chart on page 5-4 for hydraulic fluid and motor grease type.

NOTE: When changing or adding oil, use care to maintain cleanliness.



Hydraulic Power Pack Lubrication Points

5-2A

⚠ DANGER ⚠

CONSULT MANUFACTURER'S MATERIAL SAFETY DATA SHEET PRIOR TO USE OF HYDRAULIC OIL. HYDRAULIC OIL MAY CAUSE SKIN IRRITATION. WASH CONTACT AREAS WITH SOAP AND WATER. HIGH PRESSURE ACCIDENTAL INJECTIONS THROUGH THE SKIN REQUIRE IMMEDIATE MEDICAL ATTENTION FOR POSSIBLE INCISION IRRIGATION AND/OR DEBRIDEMENT. NEVER SERVICE MACHINE BEFORE RELIEVING HYDRAULIC PRESSURE. IF EYE CONTACT OCCURS, FLUSH THOROUGHLY WITH WATER. IF EYE IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

MAINTENANCE SCHEDULE

PROCEDURE	FIRST TEN (10) OPERATING HRS.	MONTHLY	SEMI-ANNUALLY	ANNUALLY
Check threaded connections on hydraulic pipes and hoses.	•			
Check tension of bars.	•			
General visual inspection.		•		
Routine housekeeping - remove debris from screen and from level sensing components.		•		
Visually inspect tension of the bars.		•		
Check all threaded connections.		•		
Check hydraulic oil level		•		
Inspect cleaning carriage.		•		
Change hydraulic oil filter.			•	
Check screen tension.				•
Change hydraulic oil.				•
Lubricate motor bearings.				•

LUBRICATION CHART

APPLICATION	LUBRICANT		
Hydraulic Power Unit		Oil Temperature	
		10 - 150°F.	40 - 170°F.
Hydraulic Oil	Mobil Oil Corp.: Texaco Inc.: Shell Oil Co.:	DTE24 Rando HD32 Tellus 32	DTE25 Rando HD46 Tellus 46
Environmental Oil	Bioblend: Mobil Oil Corp.:	22032 EAL-224H	22046
Motor	Texaco Inc.: Premium RB Shell Oil Co.: Dolium R Chevron Oil Co.: SRI No. 2		

SECTION SIX

Hycor® ROMAG RMG-W Unit
REPAIR AND REPLACEMENT

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

THIS EQUIPMENT MUST BE OPERATED AND MAINTAINED ONLY BY AUTHORIZED PERSONNEL WHO HAVE READ AND UNDERSTAND THE OPERATOR'S MANUAL, HAVE BEEN TRAINED IN ITS USE, AND FOLLOWING ANY AND ALL APPLICABLE SAFETY PROCEDURES.

FOLLOW LOCK OUT PROCEDURES BEFORE SERVICING: LOCK OUT POWER WITH PADLOCK FOR WHICH ONLY YOU HAVE THE KEY.

<u>Procedure for Setting Operational Pressure</u>

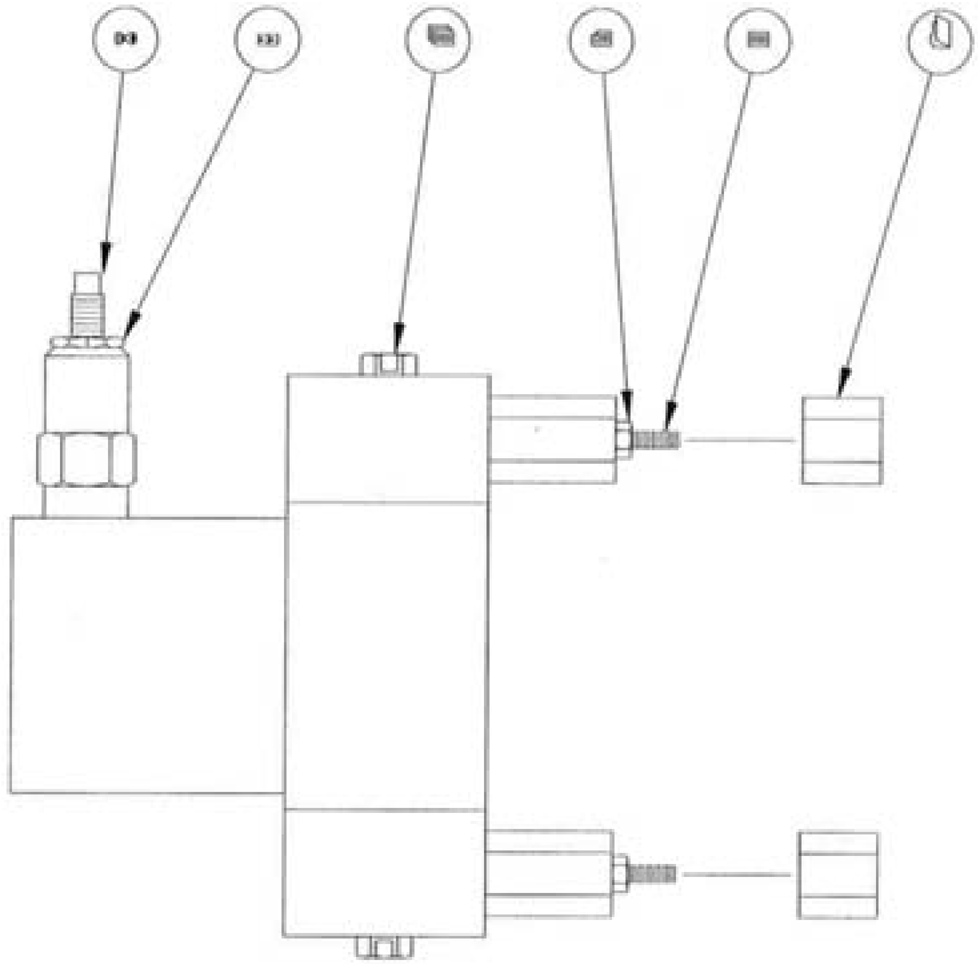
The following procedure shall be used for setting the main relief valve and the directional control valve.

1. Check the wiring schematic provided either in the junction box or attached to the motor to verify wiring is correct for the voltage provided to the unit. Start the unit and verify the motor is running in a clockwise direction when viewed from the fan end (top). (if rotation is wrong, reverse two of the power lead connections to change motor direction.)

2. Observe the cleaning carriage. The carriage may or may not move in an extend or retract direction. It is not, however, of concern at this time.

3. To set the main relief valve, first remove the two hex head caps on the stems protruding out of the directional control valve body (see page 6-1A, item 1). After removing the two hex head caps, you will observe allen-socket head set screws with locknuts (items 2 & 3). Loosen the locknuts and turn the set screws all the way closed. At this point, no flow will be going through the hydraulic hoses.

   <u>NOTE:</u> **Only tighten the set screws until the screw bottoms out. DO NOT OVER TORQUE or you may cause damage to the valve.**



Operating Pressure Adjustment

6-1A

4. Observe the pressure reading on the pressure gauge. The gauge should read 1750 psi as a starting point. To adjust this pressure, locate the main relief valve **1082**

on the side of the manifold block. The main relief valve also has a locknut to hold the desired setting (see page 6-1a, items 5 & 6). Loosen the locknut and tighten or loosen the main relief valve set screw as required to bring the pressure reading on the gauge to the desired 1750 psi. (if necessary for proper operation, this pressure can be set higher, but should not exceed 2250 psi). Tighten the locknut while holding the set screw in place.

5. Return to the directional control valve set screws on the valve body and use the allen wrench to manually press in one of the actuating pistons of the valve (item 4). Then proceed with the adjustment of the valve on the opposite side of the depressed piston (item 3). Carefully unscrew the set screw counterclockwise for about 3-1/2 to 4 turns. Continue turning counterclockwise until the valve reverses. Open the valve an additional 1/4 turn and temporarily lock the set screw in position with the locknut. Now proceed to the opposite side and adjust the other set screw using the same procedure. When completed with adjustment, lock the set screw in place with the locknut.

6. Let the unit operate for several cycles to verify proper operation. Should the carriage stop at the end of its press or return stroke, adjust the directional control valve until the cylinder begins to move again. Continue the adjustment procedure until the carriage will cycle completely without any need for further fine tuning.

7. When adjustment is complete, lock the directional control valve set screws in place by tightening down the locknuts, replace the hex nut caps and shut the unit down. The hydraulic power supply and valve adjustments are now complete and the system is ready for operational use.

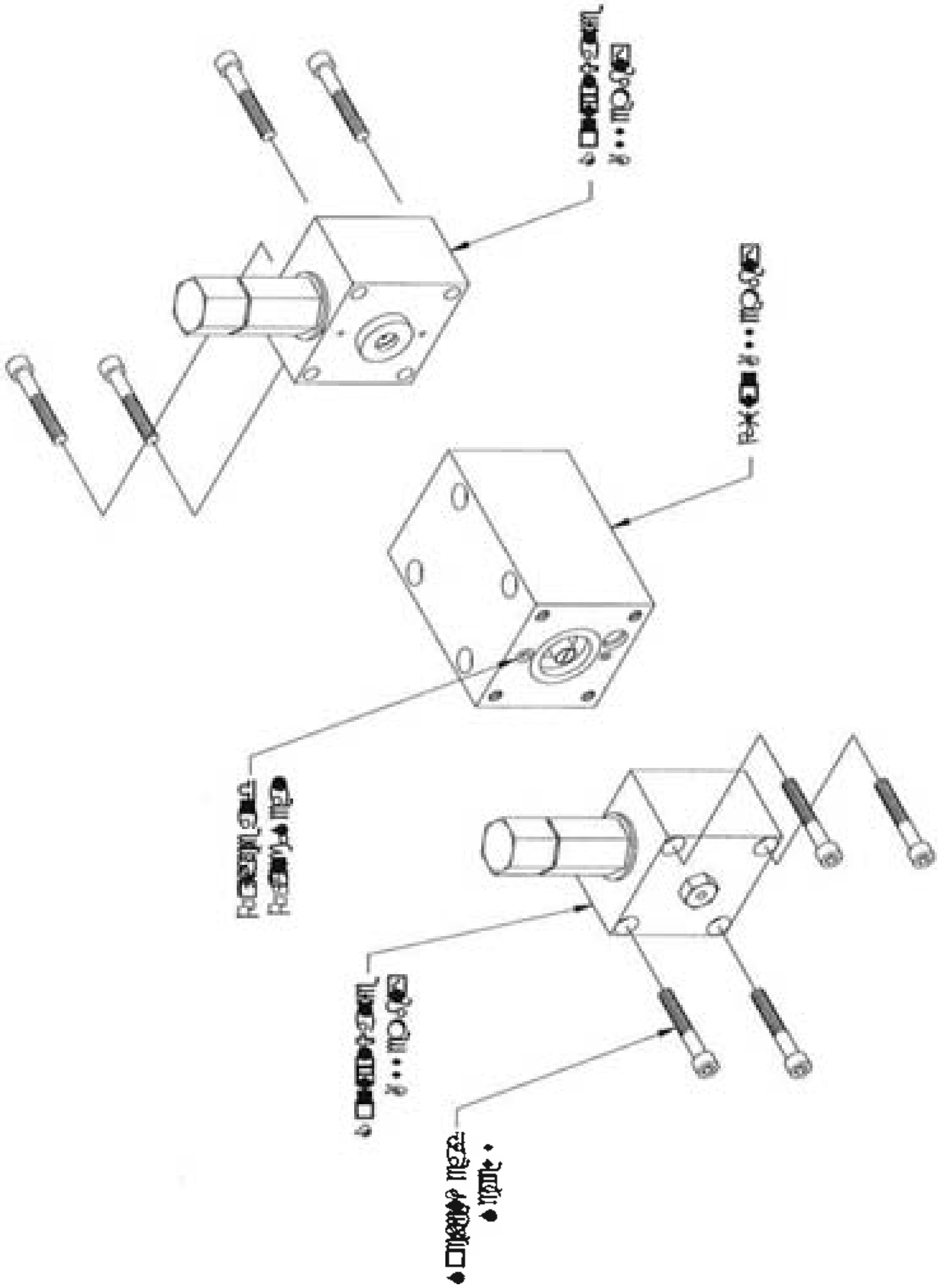
<u>Directional Control Valve Does Not Function</u>

Failure of the cleaning carriage to cycle may be due to a clogged orifice in the directional control valve as a result of dirty, unfiltered hydraulic oil. The following procedure should be used to clean the orifice. (See figure on page 6-2A.)

1. Remove the directional control valves by unscrewing the four screws. Carefully pull the side part from the main body so as to not damage the o-rings at the orifice interface.

2. Clean the orifice using a .4mm diameter drill bit or rod.

3. Clean and install the o-rings at the orifice interface. Place the control valve part carefully over the piston end and push it in place. Check that the o-rings are in position and install the screws, taking care that they are not overtightened.



<u>Directional Control Valve</u>

6-2A

Hydraulic Cylinder Removal

1. Remove the bolts on the top face of the ROMAG unit to expose the hydraulic cylinder.

2. Remove link pin at the rod end.

3. Disconnect hydraulic lines and cap all ports in both hydraulic lines and the hydraulic cylinder to prevent dirt contamination. Remove the clamp securing the cylinder to the frame. Then withdraw the hydraulic cylinder from the ROMAG unit.

4. Repair or replace hydraulic cylinder as required.

5. Reinsert the repaired/new hydraulic cylinder back into the unit.

6. Secure the hydraulic cylinder to the frame with the provided clamp.

7. Replace rod end/link pin connection. Replace hydraulic hose lines and cycle hydraulic system until all air is removed. Refill hydraulic cylinder with hydraulic oil if needed.

Motor Repair (See page 6-3A & 6-3B.)

Should a motor failure occur, evidenced by high current power draw or erratic operation and assuming normal system operating pressures, the motor should be removed and checked out by an authorized Electrical Appliance Service Association (EASA) shop. Motor removal procedure:

1. Disconnect the electrical wiring to the motor and remove the electrical conduit.

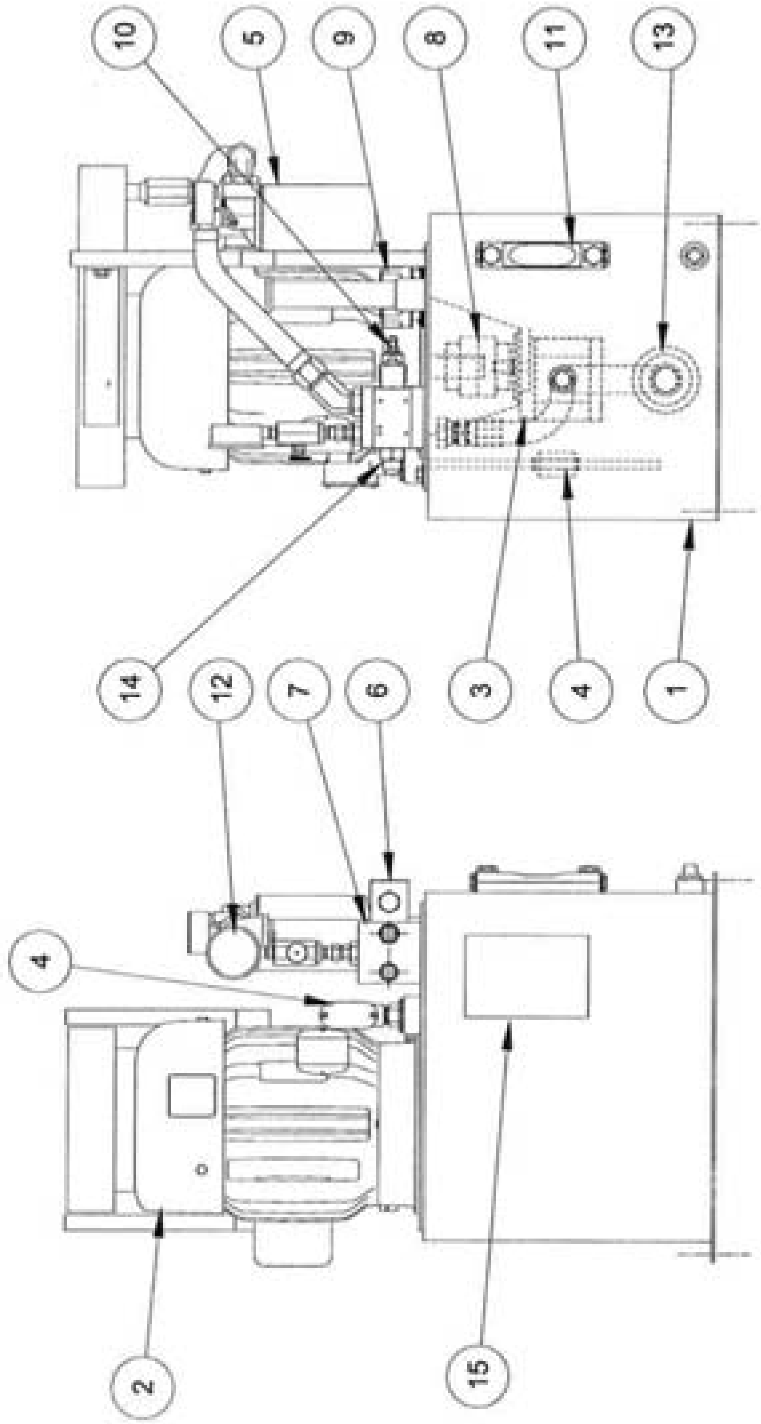
2. Remove the four (4) bolts holding the motor adapter plate to the top of the hydraulic tank.

3. Lift the motor, hydraulic pump, and hydraulic lines vertically and support the assembly on blocking.

4. Remove the four (4) bolts attaching the motor adapter plate to the motor from the underside. Lift the motor vertically to disengage the flexible couplings.

5. Loosen the set screw on the flexible coupling half attached to the motor shaft, and remove.

6. To reinstall, reverse the above procedure, aligning the flexible coupling halves while lowering the motor into position.



Hydraulic Power Supply

HYDRAULIC POWER SUPPLY

Model RMG-W

Item No.	Description
1	Oil Tank, volume about 10 gal.
2	Electric Motor 5 HP
3	Gear Pump
4	Oil Level/Temperature Switch
5	Return Oil Filter
6	Directional Control Valve
7	Manifold
8	Shaft-coupling
9	Oil Filler Breather
10	Main Relief Valve
11	Oil Level/Temperature Gauge
12	Pressure Gauge (0-3000 psig)
13	Suction Filter
14	Hydraulic Hoses couplings
15	Warning Label

Reference unit's project number, serial number and model number when ordering replacement parts.

See Hydraulic Power Unit Data in Section Nine of this Manual for component details.

Hydraulic Pump Repair (See page 6-3A & 6-3B.)

Should a pump failure occur, the following procedure should be used to remove and repair or replace the hydraulic pump.

1. Disconnect the electrical wiring to the motor and remove the electrical conduit.

2. Remove the four (4) bolts holding the motor adapter plate to the top of the hydraulic tank.

3. Lift the motor, hydraulic pump and hydraulic lines vertically and support the assembly on blocking.

4. Disconnect the pump suction line (and suction filter) and pressure line from the hydraulic pump.

5. Remove the two (2) bolts attaching the hydraulic pump to the motor adapter plate through the pump adapter, and lower and remove the hydraulic pump. Remove the pump adapter plate.

NOTE: **The rubber cushion between the flexible coupling halves is not attached to either half. Exercise care when removing the hydraulic pump.**

6. To reinstall, reverse the above procedure, aligning the flexible coupling halves while raising the pump into position.

Oil Filter Replacement

The hydraulic filter is a 10 micron cartridge type. A new filter should be installed every 2500 hours of operation or twice a year (whichever comes first), and any time the hydraulic fluid is changed. This may vary depending on general cleanliness of the area in which the unit is installed, operating temperatures and care taken during replacement of hydraulic oil. The hydraulic fluid should be changed once a year or anytime it has been contaminated (see Lubrication Chart, page 5-3, for hydraulic fluid type).

The oil filter is located under the filler cap. It has a handle on the top for easy removal from the bowl and a helical spring to secure the element in it's location

Cleaning Comb Replacement

The tools required for performing a comb replacement are the following:

rubber mallet
5 mm allen wrench
small phillips screwdriver
thread locking fluid

NOTE: There are six different combs used on ROMAG Screens. Consult the section below to identify which comb(s) to be replaced.

The first step in the replacement process is to shut off and lock out the machinery. Consult your Safety Standard Operating Procedures and the Safety section of this IOM for guidelines on locking out the equipment before doing any work on the equipment. The next step is to identify which set of combs need replacing. After identifying the comb set, remove the two hex head cap screws securing the set to the comb support frame. Using the mallet, push the comb across the screen face until it is free of the comb support. When the half-moon, plastic locking pin is exposed push it down and out of the comb using the screwdriver. (These pins are only used for combs that are in the middle of the screen, that is if there are three or more sets of combs.) Use the mallet to push the comb through the screen until it can be removed by hand. Orient the new comb until its profile matches the other sets and insert its combs into the screen. It is necessary to make sure that each screen bar has a comb separating it from the next screen bar. When the comb is properly aligned and pushed into its required depth insert the half-moon locking pin and tap it flush. Tap the comb until the mounting holes are aligned with the holes in the support. If the tapped holes in the brass mounting rods have rotated, use the tip of the screwdriver to gently realign the hole. Place some thread locking fluid in the holes and insert the mounting screws. Do not over tighten the screw as it will damage the brass threads. If more than one set of combs needs to be replaced, it is recommended that adjacent sets are replaced one at a time.

<u>Comb Identification</u>

- Brass Combs on the <u>down stream end</u> of unit, there are two types:
  Solid - 13 tines and 12 tines

- Plastic Combs on the <u>up stream end</u> of unit, there are two types:
  Solid - 13 tines and 12 tines

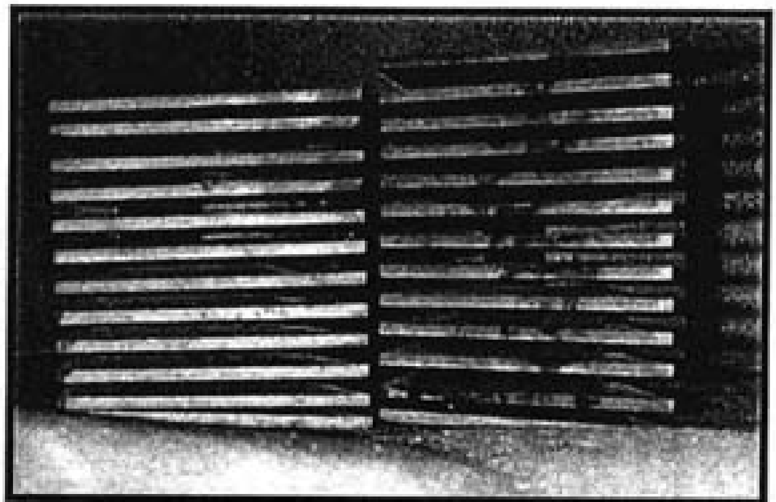
- Plastic Combs in the <u>middle of the unit</u> (if applicable), there are two types:
  Hole w/half moon pin - 13 tines and 12 tines

Looking at the screen from the <u>discharge side</u>, if the screen pushes <u>left</u>, the top combs in each row will be 13 tines tall and the rest of the combs in that row will be 12 tines tall.

Looking at the screen from the <u>discharge side</u>, if the screen pushes <u>right</u>, the bottom combs in each row will be 13 tines tall and the rest of the combs in that row will be 12 tines tall.

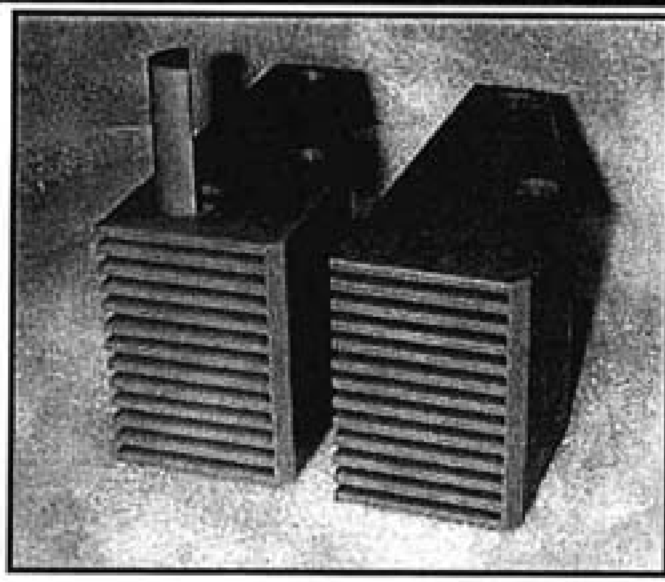
There are 6 different kinds of cleaning combs so be sure to know which type is needed before you begin this operation.

- Brass combs are only used at the end of the ROMAG Screen. The combs either have 12 or 13 tines.



- Green plastic combs also come in 12 or 13 tines.

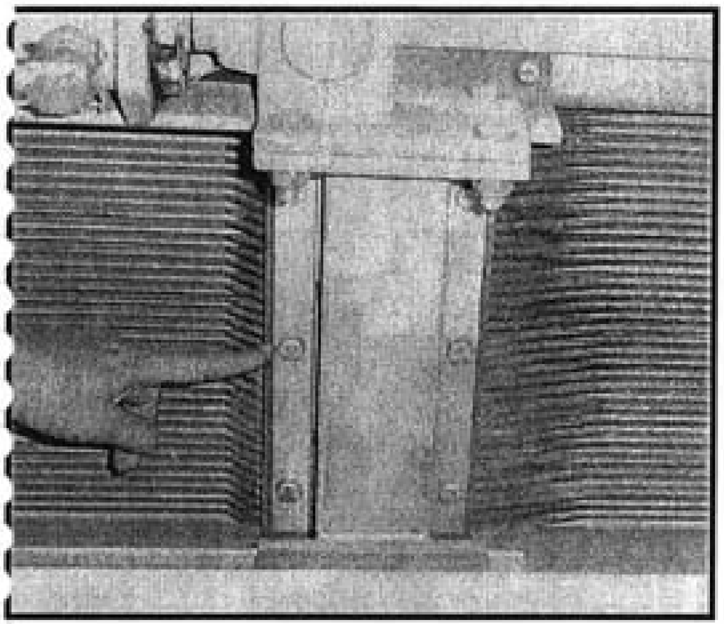
- Green plastic with half circle (moon) pins, also in 12 or 13 tines. The combs with pins are only used in the middle section of the screen as the pins will interfere with the debris take off fins at the end of the screen bars. This photo shows one of each type of comb.

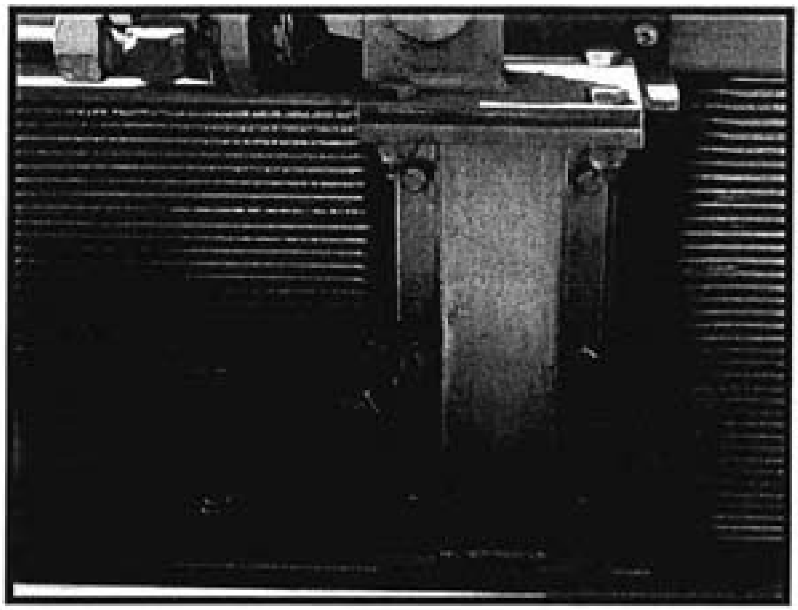


To replace any green comb:

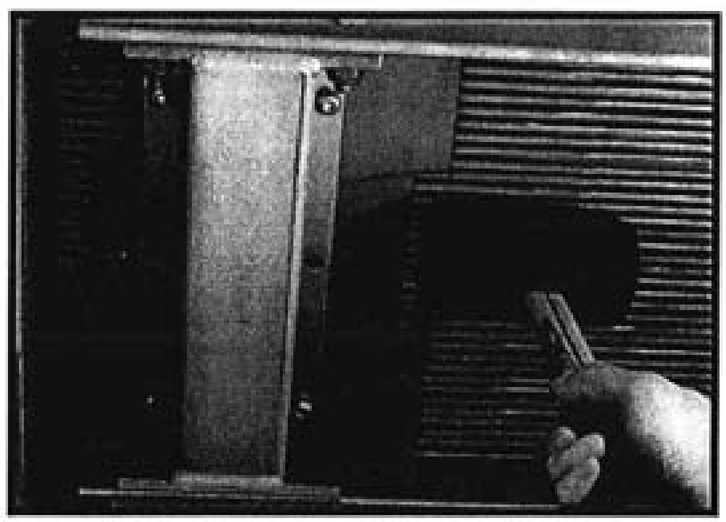
- Shut off and lock out the screen.

- Remove the 2 hex head cap screws securing the comb to the moving carriage. This is done from the back or rear of the screen.

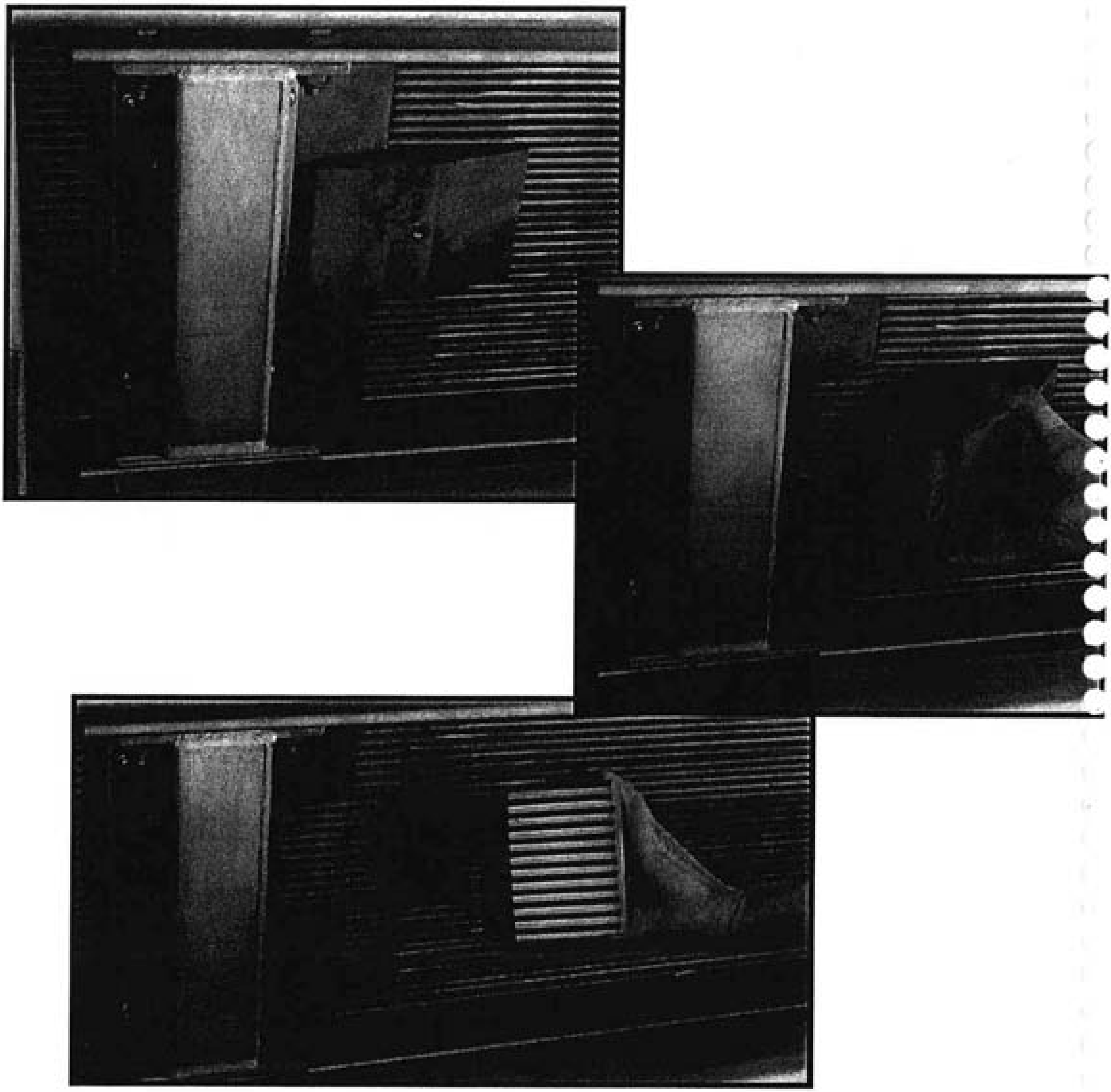




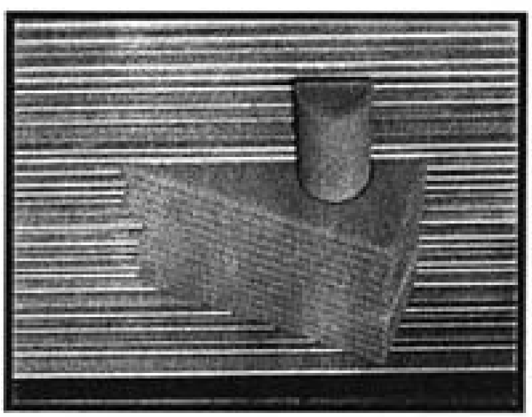
- Use a rubber mallet and gently tap the comb to be replaced forward or backward ALONG the bars until it clears the support frame.



Slide the comb along the bars until it is free of the frame and remove it.



- If the screen has a locking pin, place a screwdriver on the top of the pin and with the rubber mallet, gently knock the pin down and out to free the comb. Then slide the comb out of the bars.

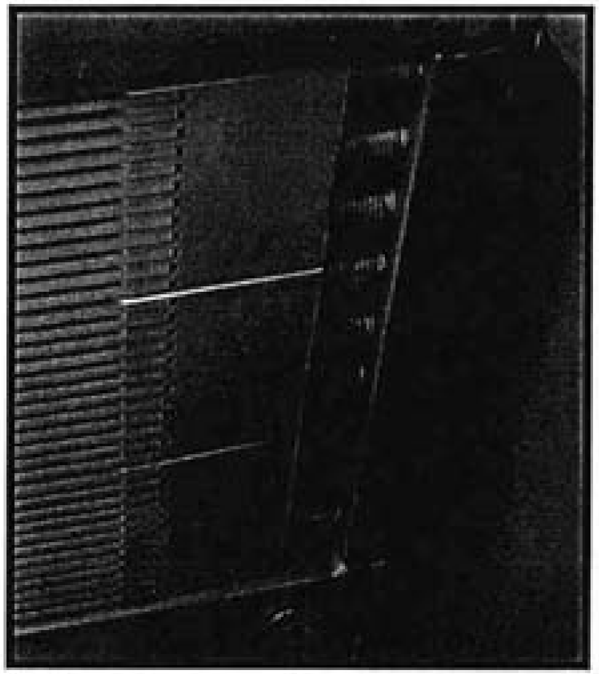


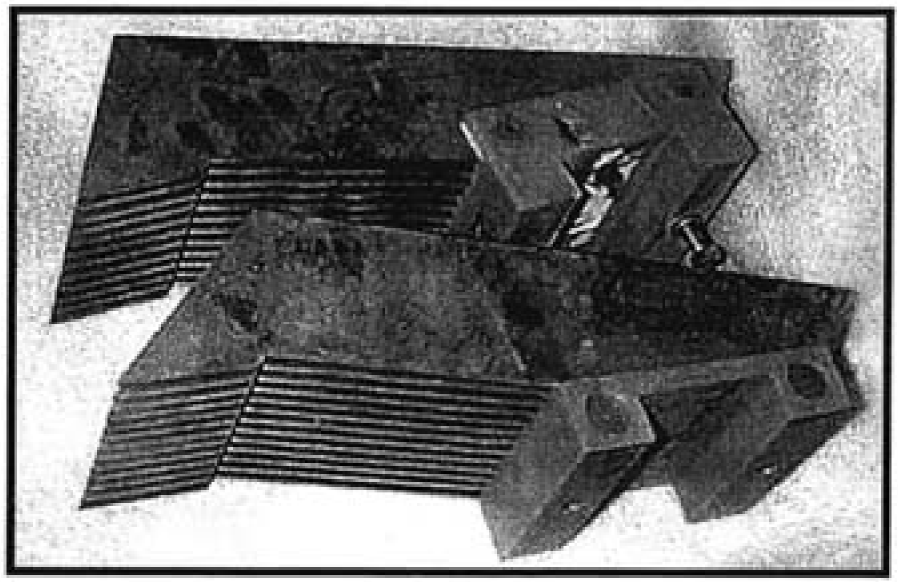
- Replace the comb with the one needing replacement and follow directions in reverse. Do not over tighten hex head screw.

To replace any BRONZE comb:

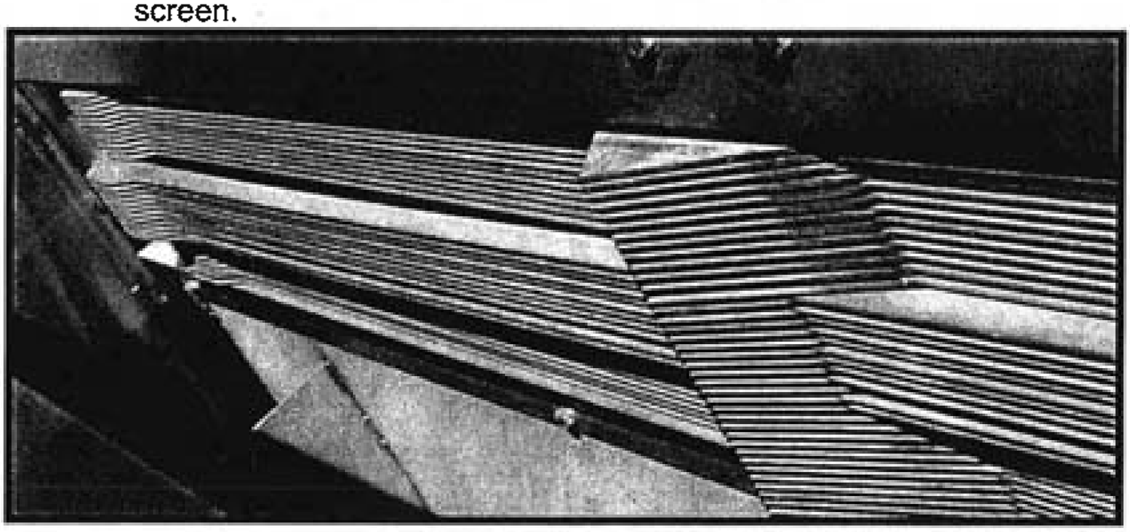
- Shut off and lock out the screen..

- The Bronze combs recess about 1/2" around the cleaning carriage frame so it is necessary to loosed one module section of bars and push that section away from the rest of the bars. First loosen the tensioning end of the bars, shown on the left below.

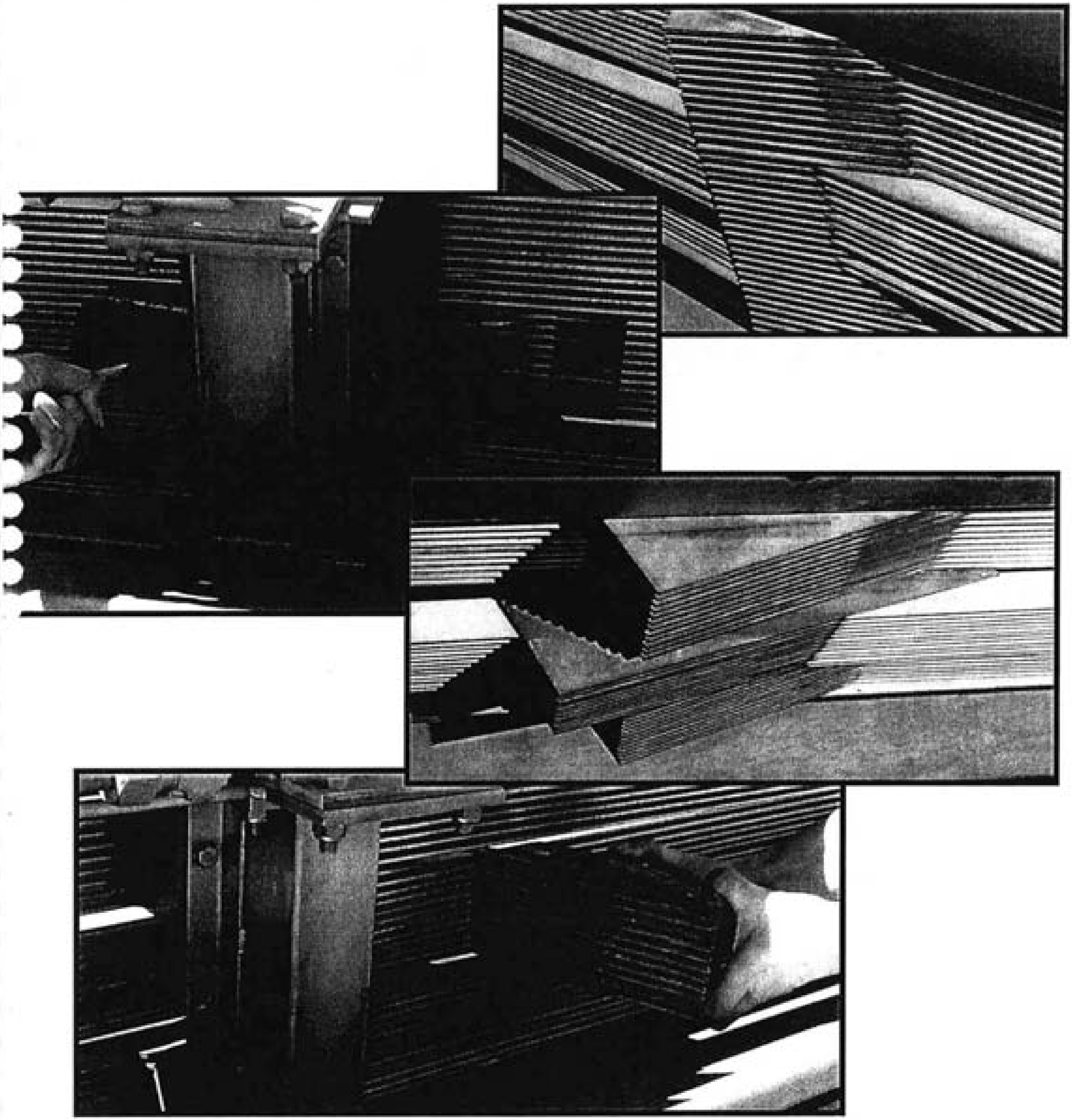




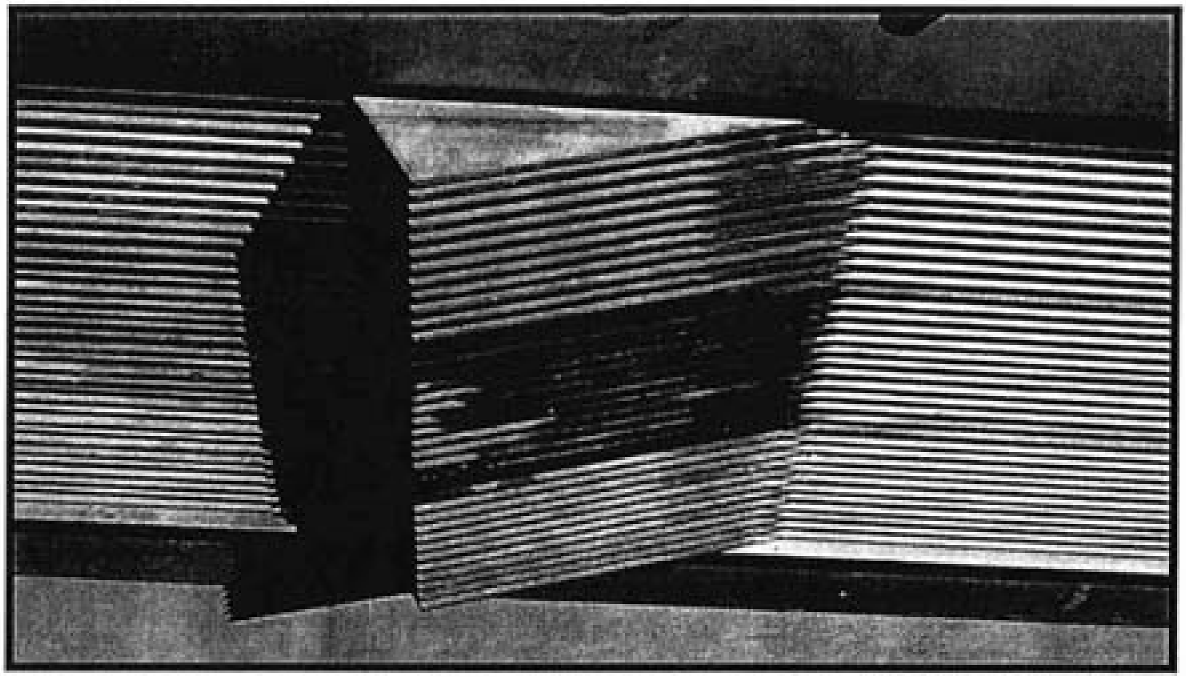
- Loosen the tensioning bolts as above and then push out the bars as shown below. Depending on where on the screen you are replacing a comb you may have to undo the bolts holding the bars to the frame on at the other end of the screen.



Pushing out the bar section ½ to 1.0" gives you room to slide the bronze comb over the frame. Tapping the comb with a rubber mallet will move the comb along the bars until it can be removed. A simple lubricant like WD40 can help.



Slide out the comb to be replaced and insert a new comb by following the steps in reverse. Do not over tighten bolts.



When finished the combs should align with the other combs on the screen. Replace the bar module sections and retention the tension bolts per the IOM to 34.5 Newton meters

Unit Cleaning

When the ROMAG unit is to be shut down for an extended length of time, the carriage assembly and bar racks should be hosed down thoroughly. If this is not done, the solids could dry out and set up, making removal somewhat difficult.

⚠ DANGER ⚠

- **WHEN INSTALLING OR MAINTAINING THE ROMAG UNIT OR ASSOCIATED HARDWARE, BE SURE THAT ANY LIFTING EQUIPMENT IS OF SUFFICIENT CAPACITY BEFORE LIFTING OR MOVING THE ROMAG UNIT OR ASSOCIATED HARDWARE.**

- **MAKE SURE ANY ELECTRICAL CONNECTIONS ARE DONE BY QUALIFIED PERSONNEL AND IN ACCORDANCE WITH ALL APPLICABLE CODES AND REQUIREMENTS.**

- DO NOT OPERATE A DAMAGED OR MALFUNCTIONING MECHANISM UNTIL NECESSARY ADJUSTMENTS OR REPAIRS HAVE BEEN MADE.

- OVERLOAD AND/OR SAFETY SWITCHES ARE EMERGENCY DEVICES. DO NOT USE THE OVERLOAD OR SAFETY SWITCHES TO STOP THE MECHANISM DURING NORMAL OPERATION.

- CONTACT WITH OR EXPOSURE TO MATERIAL PROCESSED OR LUBRICANTS AND OTHER FLUIDS MAY CAUSE INFECTION OR ADVERSE REACTIONS. REPORT ANY CUTS, INJURIES OR EXPOSURE TO YOUR SUPERVISOR IMMEDIATELY AND SEEK APPROPRIATE MEDICAL ATTENTION.

- THIS PRODUCT HAS BEEN SUPPLIED WITH WARNING LABELS, SHOULD THEY BECOME DAMAGED, REMOVED OR ILLEGIBLE, PLEASE CONTACT PARKSON CORPORATION FOR NO-COST REPLACEMENT LABELS.

- WARNING LABEL PART NUMBERS FOR THIS PRODUCT IS 3824-041.

CALL TOLL FREE: 1-800-249-2140 OR
FAX: (847) 837-4996
PARKSON CORPORATION
HYCOR® CORPORATION
ATTENTION: PARTS DEPARTMENT
562 BUNKER COURT
VERNON HILLS, IL 60061-1831

SECTION SEVEN

Hycor® ROMAG RMG-W Unit
TROUBLE-SHOOTING GUIDE

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

PROBLEM	PROBABLE CAUSE	REMEDY
NON-CYCLING CLEANING CARRIAGE	Screen jammed.	Clear obstruction.
	Extremely cold temperature.	Add oil heater to hydraulic reservoir.
	Motor heater overload.	Investigate/repair fault conditions Check fuse or circuit breakers.
	Low oil level.	Replace hydraulic oil as required.
CLOGGED ORIFICE (Directional valve)	Dirty or unfiltered oil.	Clean orifice and change oil. (Always replace oil filter when changing oil - refer to Section Six for instructions.)
LEAKING HYDRAULIC FLUID	Cracked hoses or loose fittings.	Replace hoses and tighten fittings. NOTE: If seepage persists, replace hydraulic fittings.
HIGH OIL TEMPERATURE	Screen Jammed	Clear Obstruction
	Relief Pressure too low	Increase pressure on main relief valve (2250 psi max)

⚠ DANGER ⚠

MOTOR

Since any number of reasons could be responsible for the failure, the following guide lists usual conditions that can lead to difficulties with a motor. Should there be any indication of a premature failure, care must be taken to make certain that:

1. The original motor selection was the proper one.

2. The motor was installed correctly, particularly the electrical connections.

3. The power supply was correct.

4. The motor was of the proper size (speed and horsepower) to do the job.

Verify the above conditions have been completed. Use of the following guide in pinpointing the difficulty will lead to long service life and complete satisfaction.

PROBLEM	PROBABLE CAUSE	REMEDY
MOTOR FAILS TO START	Blown Fuses.	Replace fuses. Should be at least 125% of nameplate amperes.
	Overload Trips.	Check and reset overload in starter.
	Improper power supply.	Check to see that power supplied agrees with motor nameplate and load factor.
	Improper line connections.	Check connections with diagram supplied with motor.
	Open circuit in winding.	Indicated by humming sound when starter is closed. Check for loose wiring connections.
	Mechanical failure.	Check to see if motor and drive turn freely. Check bearings and lubrication.
	Short circuited stator.	Indicated by blown fuses, tripped circuit breakers or heaters. Motor must be rewound.
	If 3 phase, one phase may be open.	Check lines for open phase.
	Low motor voltage.	See that nameplate voltage is maintained. Check connection.

PROBLEM	PROBABLE CAUSE	REMEDY
MOTOR RUNS AND THEN STOPS	Power failure.	Check for loose connections to line, to fuses and to control
MOTOR DOES NOT COME UP TO SPEED	Voltage too low at motor terminals because of line drop.	Verify proper electrical wire size for power draw.
	Open primary circuit.	Locate fault with testing device and repair.
MOTOR TAKES TOO LONG TO ACCELERATE	Poor circuit.	Check for high resistance.
	Applied voltage too low.	Get power company to increase power tap.
WRONG ROTATION	Wrong sequence of phases.	Reverse connections at motor or at switchboard.
MOTOR OVERHEATS WHILE RUNNING UNDER LOAD	Frame or bracket vents may be clogged with dirt and prevent proper ventilation of motor.	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open.	Check for voltage and make sure that all leads are well connected.
	Unbalanced terminal voltage.	Check for faulty leads, connections and transformers.
	Shorted stator.	Rewind or replace stator.

PROBLEM	PROBABLE CAUSE	REMEDY
MOTOR OVERHEATS WHILE RUNNING UNDER LOAD (cont'd.)	Faulty connection.	Indicated by high resistance.
	High voltage. Exceeds +10% of nameplate volts.	Check terminals of motor with a voltmeter.
	Low voltage. Exceeds -10% of nameplate volts.	Check terminals of motor with a voltmeter.
	Rotor rubs stator bore.	If not poor machining on brackets, replace worn bearings.
MOTOR VIBRATES AFTER CONNECTIONS HAVE BEEN MADE	Motor misaligned.	Realign.
	Weak support.	Strengthen base.
	Coupling out of balance.	Balance coupling.
	Defective bearing.	Replace bearing.
	Bearings not in line.	Line up properly.
	Excessive end play.	Adjust bearing or add washer.
UNBALANCED LINE CURRENT ON POLYPHASE MOTORS DURING NORMAL OPERATION	Unequal terminal volts.	Check leads and connections.
SCRAPING NOISE	Fan rubbing.	Remove interference.

PROBLEM	PROBABLE CAUSE	REMEDY
NOISY OPERATIONS	Air gap not uniform.	Check and correct bracket or bearing.
	Rotor unbalance.	Rebalance.
HOT BEARINGS GENERAL	Insufficient grease.	Maintain proper quantity of grease in bearing.
	Deterioration of grease or lubricant contaminated.	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.
	Excess lubricant.	Reduce quantity of grease, bearing should not be more than 1/2 filled.
	Overloaded bearing.	Check alignment, side & end thrust.
	Badly worn bearing.	Replace bearing.
	Broken ball or rough races.	Replace bearing, first clean housing thoroughly.
	Bent or sprung shaft.	Straighten or replace shaft.
	Misalignment.	Correct by alignment of drive.

SECTION EIGHT

Hycor® ROMAG RMG-W Unit
REPLACEMENT PARTS

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

THIS PRODUCT HAS BEEN SUPPLIED WITH WARNING LABELS, SHOULD THEY BECOME DAMAGED, REMOVED OR ILLEGIBLE, PLEASE CONTACT PARKSON CORPORATION, FOR NO-COST REPLACEMENT LABELS.

Replacement parts can be ordered either through your Hycor Products Representative or by contacting the Hycor Products Parts Coordinator toll free at **1-800-249-2140.**

Please have the unit's project number, serial number and model number as shown on the front cover, available. This will ensure the accuracy of the part identification.

Replacement Parts List

Hycor® ROMAG Unit
Model RMG-W

NOTE: **Please give the project number (580112), and serial numbers (58011202 and 58011203) and model number (RMG0908W) when ordering replacement parts. This will ensure accurate part identification.**

Description	Qty. Per Unit	Part No.
Motor, 5 HP, 230/460, 3 Ph, 60 Hz	1	3075-333
Level / Temp Switch	1	3654-008XP
Oil Level Indicator	1	3466-007
Hydraulic Hose	4	3442-062
Directional Control Valve	1	3443-005
Pressure Gauge	1	3444-022
Oil Filter	1	3468-022
Hydraulic Cylinder Packing Set	1 set	Consult Parkson
Hydraulic Cylinder Link Bearing	2	Consult Parkson
Hydraulic Cylinder	1	3451-018
Gear Pump	1	3469-011
Suction Filter	1	3448-008
Shaft-Coupling	1	3452-013
Main Relief Valve	1	3757-008
Plastic Cleaning Comb (12 tines)	16	3487-003
Plastic Cleaning Comb (13 tines)	2	3487-005
Bronze Cleaning Comb (12 tines)	8	3487-004
Bronze Cleaning Comb (13 tines)	1	3487-006
Plastic Cleaning Comb (w/hole -12 tines)	8	3487-007
Plastic Cleaning Comb (w/hole -13 tines)	1	3487-008

SECTION NINE

Hycor® ROMAG RMG-W Unit
COMPONENT DATA

⚠ DANGER ⚠

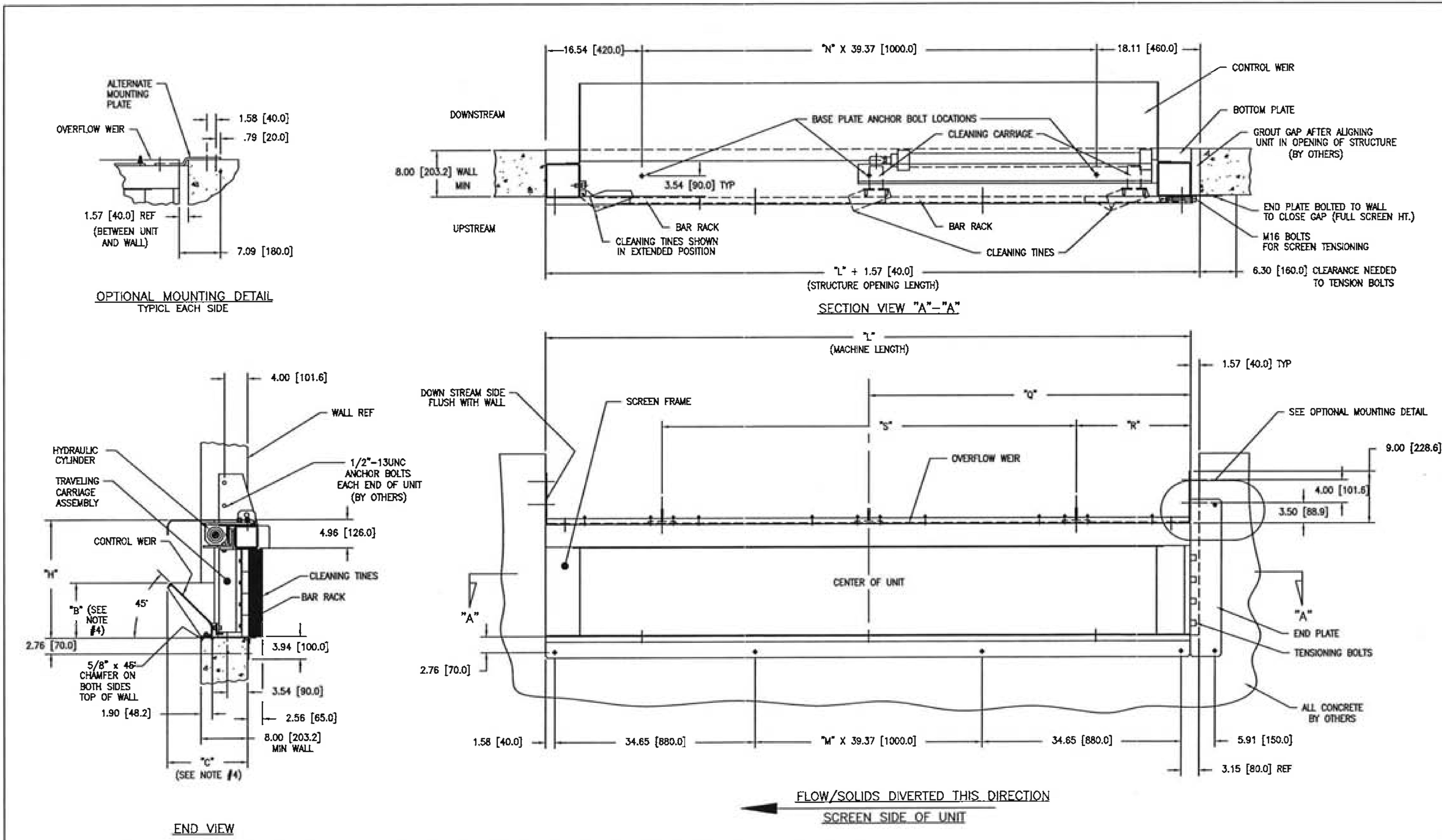
REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.

SECTION TEN

Hycor® ROMAG RMG-W Unit
DRAWINGS

⚠ DANGER ⚠

REVIEW ALL SAFETY PRACTICES LISTED IN SECTION ONE BEFORE PROCEEDING.



PARKSON CORPORATION	___ Preliminary X Information Only ___ For Approval ___ Dimensions Certified	REF. INFORMATION REV DATE: 06/28/01	DRAWN BY: EBC DATE: 06/28/01 CHECKED BY: WWW DATE: 06/28/01 SCALE: 1/16" = 1"	TITLE: RMG____ W HYCOR® ROMAG® SCREEN UNIT ELEVATIONS SHEET 1 OF 3

REV	DESCRIPTION	DATE

PROJECT NAME

DRAWING NO

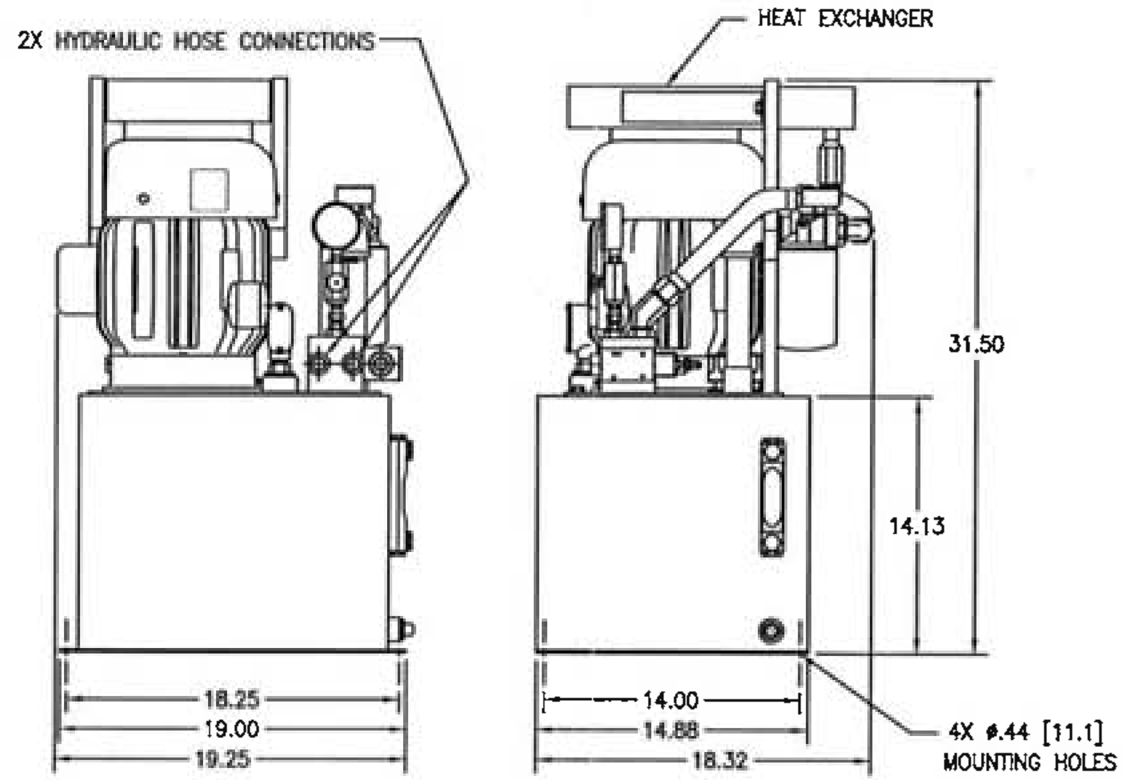
REV

This drawing is limited to functional design, general arrangement and clearance. No responsibility is accepted by PARKSON CORPORATION for other dimensions, quantities, or coordination with other equipment or drawings except as stated in the purchase order.

By ________ Date ________

NOTE:

1. ALL 304L STAINLESS STEEL CONSTRUCTION EXCEPT FOR HYDRAULIC POWER UNIT, CLEANING TINES, AND SLIDE BLOCKS ON CARRIAGE ASSEMBLY.
2. HYDRAULIC POWER UNIT (ELECTRICAL CONTROLS NOT INCLUDED):
   A. MOTOR: 5 HP [3.75 kW], 1800 RPM, 230/460/3/60, "DIRTY DUTY".
   B. OIL RESERVOIR: 10 GALLONS.
3. ANCHORAGE AND DESIGN OF BRACING IS SITE SPECIFIC, CONSULT FACTORY FOR SITE SPECIFIC REQUIREMENTS. SCREENS WITH LENGTHS 2-5 HAVE (1) ONE BRACING POINT. SCREENS WITH LENGTHS 6-8 HAVE (2) TWO BRACING POINTS.
4. DIMENSIONS "B" AND "C" VARY WITH FLOW--CONTACT FACTORY FOR APPLICATION SPECIFIC DIMENSIONS.
5. WEIGHT: (SEE TABLE)
6. DIMENSIONS ARE GIVEN IN INCHES [MILLIMETERS], (FEET WHERE SHOWN).
7. ___ UNIT(S) TO BE SUPPLIED.
8. ___ MGD PEAK CSO FLOW.
9. FOR PROPER INSTALLATION, CONCRETE MUST BE LEVEL, FLAT, AND PERPENDICULAR IN ALL DIMENSIONS.
10. AN E-STOP IS PROVIDED TO BE MOUNTED BY CONTRACTOR AT AGREED UPON LOCATION.
11. IF MULTIPLE SCREENS ARE PLACED ON A COMMON WALL, THEY SHOULD BE SEPARATED BY A MINIMUM OF 1'-0". CONSULT FACTORY FOR SCREENINGS SUMP BAFFLE.
12. THE HYDRAULIC POWER PACK SHOULD IDEALLY BE MOUNTED INDOORS AND BE PROTECTED FROM FREEZING AND THE OUTDOOR ELEMENTS.



HYDRAULIC POWER UNIT
WEIGHT: 225 LBS

WEIGHT LBS [KG] (WITHOUT POWER PACK)							
NUMBER OF MODULES	LENGTH						
	2	3	4	5	6	7	8
2	673 [305]	717 [325]	1125 [510]	1301 [590]	1544 [700]	1731 [785]	1863 [845]
3	761 [345]	1036 [470]	1257 [570]	1455 [660]	1709 [775]	1918 [870]	2117 [960]
4	838 [380]	1147 [520]	1389 [630]	1610 [730]	1885 [855]	2106 [955]	2315 [1050]
5	926 [420]	1257 [570]	1510 [685]	1753 [975]	2051 [930]	2293 [1040]	2525 [1145]
6	1014 [460]	1356 [615]	1643 [745]	1852 [840]	2216 [1005]	2492 [1130]	2734 [1240]
7	1091 [495]	1466 [665]	1775 [805]	2051 [930]	2381 [1080]	2668 [1210]	2944 [1335]
8	1180 [535]	1577 [715]	1896 [860]	2194 [995]	2558 [1160]	3043 [1380]	3142 [1425]
9	1268 [575]	1687 [765]	2018 [915]	2337 [1060]	2734 [1240]	3043 [1380]	3341 [1515]
10	1356 [615]	1797 [815]	2139 [970]	2481 [1125]	2911 [1320]	3219 [1460]	3550 [1610]
11	1444 [655]	1907 [865]	2260 [1025]	2624 [1190]	3087 [1400]	3396 [1540]	3760 [1705]
12	1532 [695]	2018 [915]	2381 [1080]	2767 [1255]	3263 [1480]	3572 [1620]	3969 [1800]

NUMBER OF MODULES	H	SCREEN LENGTH DESIGNATION	MACHINE LENGTH L	STRUCTURE OPENING LENGTH L + 1.57 [40.0]	M	N	Q	R	S
2	13.03 [331.0]	2	111.81 [2840.0] (9.32')	113.38 [2880.0] (9.45')	1 X 39.37 [1000.0]	2 X 39.37 [1000.0]	55.91 [1420]	-	-
3	16.81 [427.0]	3	151.18 [3840.0] (12.60')	152.75 [3880.0] (12.73')	2 X 39.37 [1000.0]	3 X 39.37 [1000.0]	75.59 [1920]	-	-
4	20.59 [523.0]	4	190.55 [4840.0] (15.88')	192.12 [4880.0] (16.01')	3 X 39.37 [1000.0]	4 X 39.37 [1000.0]	95.28 [2420]	-	-
5	24.37 [619.0]	5	229.92 [5840.0] (19.08')	231.49 [5880.0] (19.29')	4 X 39.37 [1000.0]	5 X 39.37 [1000.0]	114.96 [2920]	-	-
6	28.15 [715.0]	6	269.29 [6840.0] (22.44')	270.87 [6880.0] (22.57')	5 X 39.37 [1000.0]	6 X 39.37 [1000.0]		95.28 [2420]	78.74 [2000]
7	31.93 [811.0]	7	308.66 [7840.0] (25.72')	310.23 [7880.0] (25.85')	6 X 39.37 [1000.0]	7 X 39.37 [1000.0]		114.96 [2920]	78.74 [2000]
8	35.71 [907.0]	8	348.03 [8840.0] (29.00')	349.60 [8880.0] (29.13')	7 X 39.37 [1000.0]	8 X 39.37 [1000.0]		114.96 [2920]	118.11 [3000]
9	39.60 [1006]								
10	43.38 [1102]								
11	47.16 [1198]								
12	50.94 [1294]								

ROMAG SCREEN MODEL NUMBER: RMG________

- BAR SPACING OF 4mm
- SCREEN LENGTH DESIGNATIONS (FROM TABLE)
- NUMBER OF MODULES (FROM TABLE)

PARKSON CORPORATION

___ Preliminary X Information Only
___ For Approval ___ Dimensions Certified

This drawing is limited to functional design, general arrangement and clearance. No responsibility is accepted by PARKSON CORPORATION for other dimensions, quantities, or coordination with other equipment or drawings except as stated in the purchase order.

By ________ Date ________

REV | DESCRIPTION | DATE

REFERENCE INFORMATION
REV DATE: 06/28/01

PROJECT NAME

DRAWN BY: EBC DATE: 06/28/01
CHECKED BY: WWW DATE: 06/28/01
SCALE: 3/32" = 1"

TITLE
RMG____ W
HYCOR® ROMAG® SCREEN UNIT
DIMENSIONAL DATA & HYDRAULIC UNIT

DRAWING NO
REV
SHEET 2 OF 3

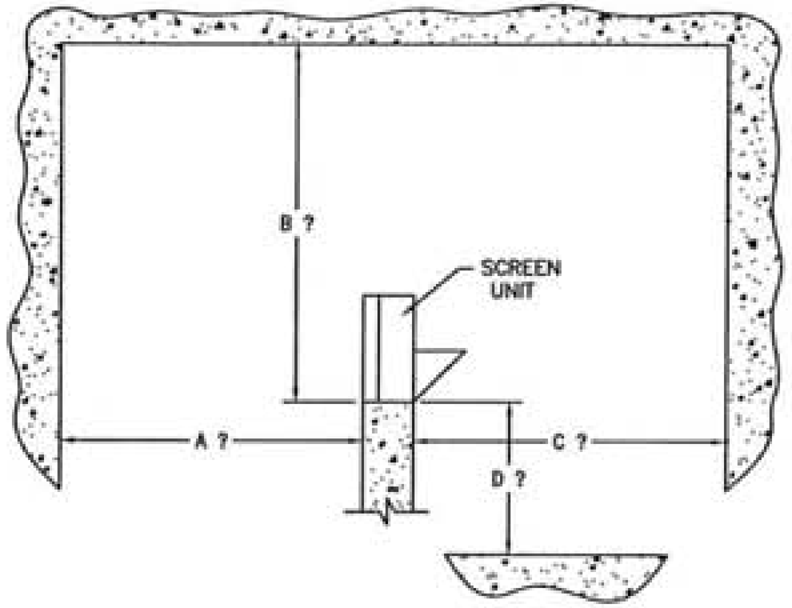
ROMAG SCREEN MODEL RMG ANCHOR BOLTS

	SCREEN LENGTH (METERS)						
	2	3	4	5	6	7	8
MODULES 2–12	13	15	17	19	21	23	25

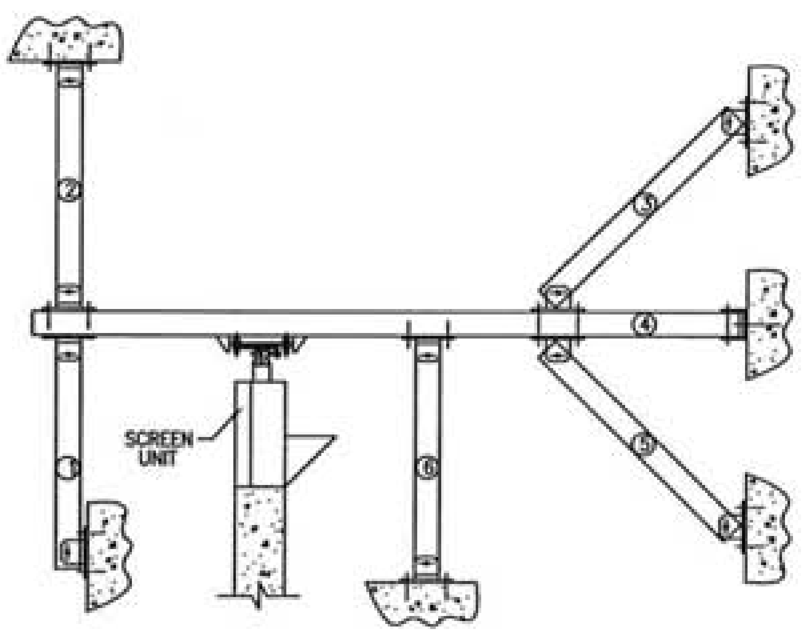
- DOES NOT INCLUDE ANCHORS FOR BRACING
- PRE DRILLED HOLES ARE 1/2" DIAMETER

NOTE:

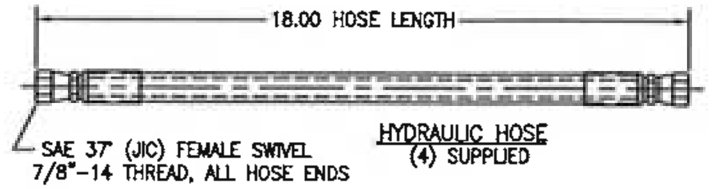
1. THE BRACING OF THE ROMAG SCREEN MODEL RSW IS DEPENDENT ON THE CHAMBER OR SITE. IT IS IMPORTANT TO BRACE THE SCREEN HORIZONTALLY AND VERTICALLY.
2. THE BRACING OPTIONS SHOWN FAR LEFT BOTTOM SHOW MANY VARIOUS BRACING CONFIGURATIONS.
3. ALL MATERIALS ARE MADE FROM 304 SST, 7 GA. SQUARE TUBING. ONCE THE DIMENSIONS TO NEAREST WALLS ARE KNOWN, WE CAN RECOMMEND A SUITABLE BRACING DESIGN.

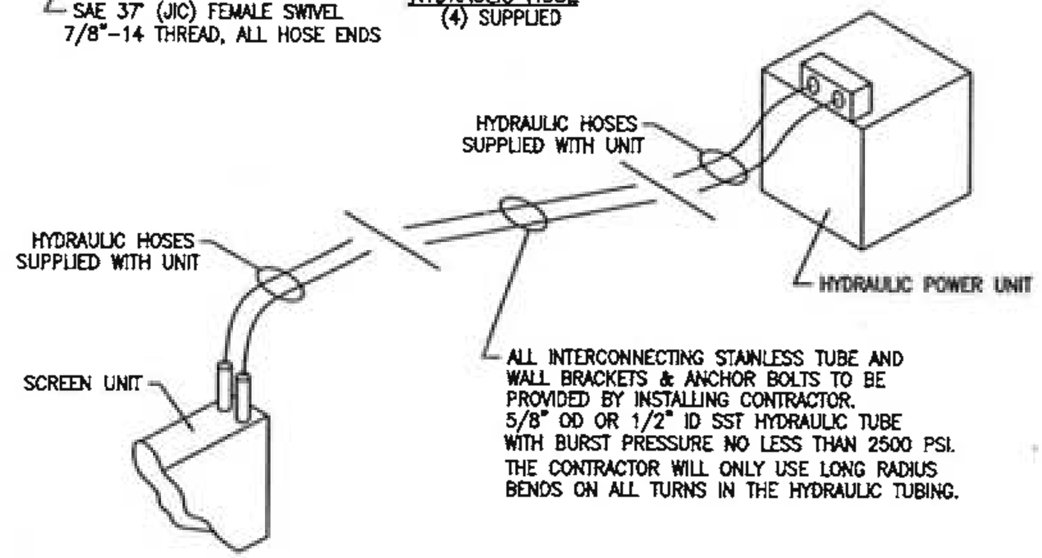


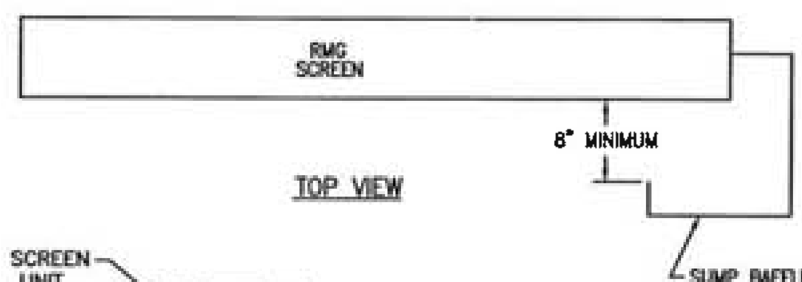
DIMENSIONS REQUIRED TO DETERMINE BRACING



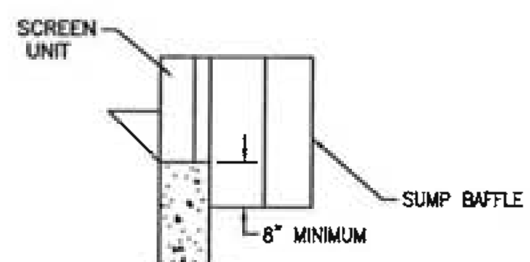
BRACING OPTIONS



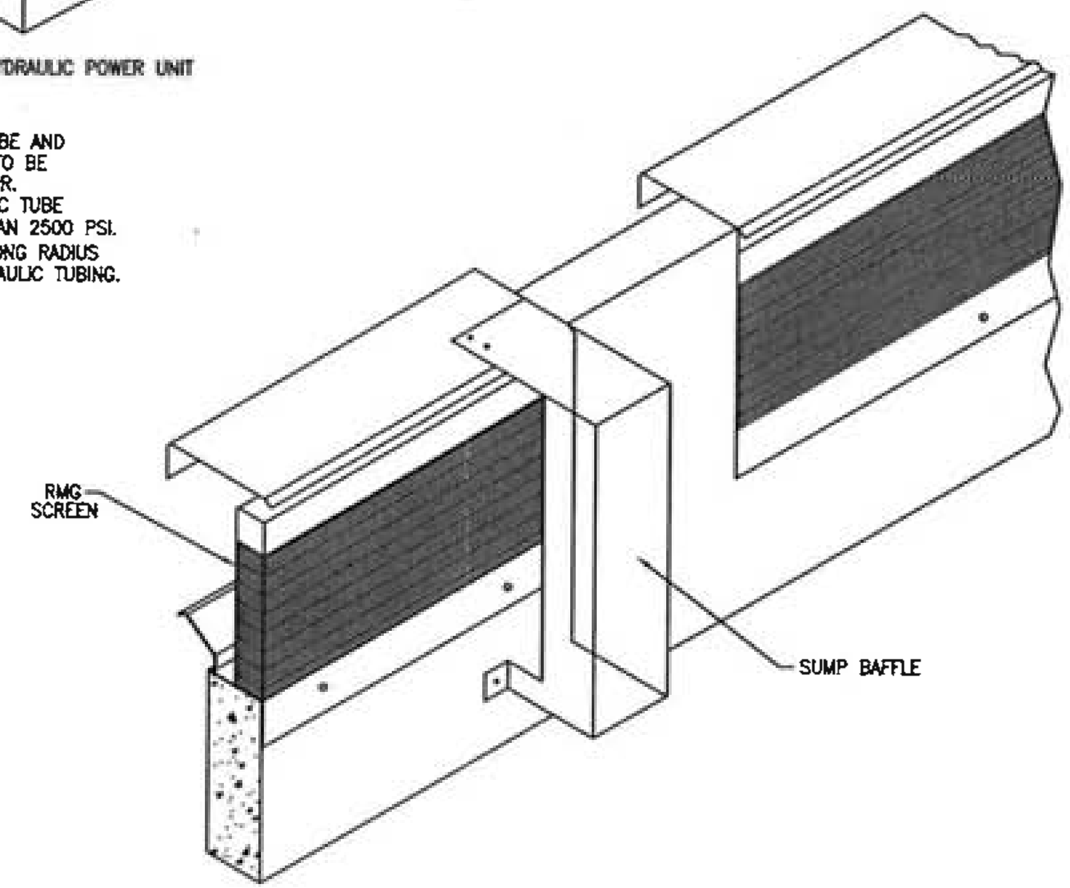




TOP VIEW



END VIEW



SUMP BAFFLE DETAIL

FOR MULTIPLE SCREENS ON A COMMON WALL, A SCREENINGS SUMP BAFFLE IS RECOMMENDED AS SHOWN ABOVE. THIS CAN BE MADE OF STAINLESS STEEL OR CONCRETE.

PARKSON CORPORATION

___ Preliminary X Information Only
___ For Approval ___ Dimensions Certified

This drawing is limited to functional design, general arrangement and clearance. No responsibility is accepted by PARKSON CORPORATION for other dimensions, quantities, or coordination with other equipment or drawings except as stated in the purchase order.

By ________ Date ________

REV	DESCRIPTION	DATE

REFERENCE INFORMATION: REV DATE: 06/28/01

PROJECT NAME

DRAWN BY	DATE
EBC	06/28/01
CHECKED BY	DATE
WWW	06/28/01
SCALE	
NONE	

TITLE: RMG____ W
HYCOR® ROMAG® SCREEN UNIT
ROMAG MISCELLANEOUS DETAILS

DRAWING NO

REV

SHEET 3 OF 3

Appendix D

Cost Estimate Documentation

Cost Estimate Summary of Technologies at Each Site

CH2MHILL

Estimator:	Wm. Griffith / MKE
Project Mgr:	Webster, Todd/MKE
Project #:	316657
Estimate #:	Conceptual / Alternatives
Rev. #:	# 4
Est. Date:	11/29/2004

Order-of-Magnitude Estimate

		↑ $849,000	High Value +50 %
Combined	**Engineer's Estimate**	**$566,000.00**	
		↓ $396,200	Low Value - 30%

Facility			Alternate Vendor CDS	Equipment Footprint	Alternate Vendor KRUGER[1]	Alternate Vendor GRANDE	Alternate Vendor Fresh Creek Tech	Alternate Vendor Parkson Corp	Comments	Preferred Structural Alternative
Site # 17	Alt #1	Waldron	$81,000	3.5' x 4.33'	$1,797,223	$125,000	$176,049	$217,922		$81,000
Site # 17	Alt #2	Circle/	$273,000	10' x 15'					select smallest unit	
Site # 17	Alt #3	Wildwood	$776,000	22' x 45'	43.2' x 15.1'	8.5' x 10'	4' x 16'	12.6'		
Site # 21	Alt #1	Fairfax	$85,000	4.25' x 4.33'	$1,878,122	$131,000	$224,497	$231,060		
Site # 21	Alt #2	Avenue/ Foster	$273,000	10' x 15'					select highest quality screening alternative	$273,000
Site # 21	Alt #3	Park	$813,000	30' x 50'	44.9' x 16.1'	8' x 8'	7.5' x 17'	12.6'		
Site # 26	Alt #1	Third Steet	$131,000	3.5' x 17.33'	$4,230,509	$197,624	$395,775	$337,366		$131,000
Site # 26	Alt #2	Pump	$739,000	30' x 18'					select smallest unit	
Site # 26	Alt #3	Station	$1,743,000	61' x 70'	52.8' x 20.9'	20' x 10'	13.33' x 19.33	25.7'		
Site # 52	Alt #1	Concordia	$77,000	7' x 4.33'	$1,423,040	$118,918	$182,175	$180,442		$77,000
Site # 52	Alt #2	High School	$235,000	10' x 12'					select smallest unit	
Site # 52	Alt #3	Access	$560,324	21' x 30'	31.9' x 10.7'	6' x 8'	4' x 16'	12.6'		
Subtotal -	**Base Capital Construction Costs**									**$562,000**

Operations & Maintenance Costs

Frequency	CDS - Raked Bar Annual Based on trips	CDS - GSS Annual Based on trips	CDS - FSS Annual Based on trips	Est 3 days	Alternate Vendor KRUGER1 Based per Day Quote	Alternate Vendor GRANDE	Alternate Vendor Fresh Creek Tech One trip replacement / 3 maint	Alternate Vendor Parkson Corp 4 annual Trips, elec, inspect, replace fluids	
Site # 17	$372	$2,630	$4,419	$5,083	annual	$2,086	$4,961	$335	**$372**
Site # 21	$372	$2,630	$4,419	$5,899	annual	$2,086	$4,961	$335	**$2,630**
Site # 26	$372	$2,630	$4,419	$20,140	annual	$2,086	$4,961	$335	**$372**
Site # 52	$372	$2,630	$4,419	$2,127	annual	$2,086	$4,961	$335	**$372**
Subtotal -	**Operations & Maintenance Costs**								**$3,746**

Total CCC & O-M **$566,000**
Rounded (3)

[1] Kruger's ACTIFLO process will likely require additional pre-screening best determined by site-specific analysis; therefore, it is likely that the construction price will increase to include some amount of pre-screening should this alternative move forward in selection.

Order-of-Magnitude Estimate

An order-of-magnitude estimate is made without detailed engineering data. Some examples include:

> An estimate from cost capacity curves
> An estimate using scale-up or scale-down factors
> An approximate ratio estimate, base on technologies

Typically, an order-of-magnitude estimate is prepared *at the end of the schematic design phase* of the design delivery process. It is normally expected that an estimate of this type would be accurate within **plus 50 percent to minus 30 percent of the estimated cost.** The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding.

PARKSON ROMAG Screen System

Estimator:	Wm. Griffith / MKE
Project Mgr:	Webster, Todd/MKE
Project #:	316657
Estimate #:	Conceptual / Alternatives
Rev. #:	# 3
Estimate Date:	10/02/2004

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD =	10.0%	10.0%	10.0%	10.0%
PROFIT =	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. =	5.0%	5.0%	5.0%	5.0%
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
			Cost		Marked-up										
Park Site 17	Option 1	ROMAG RSW 4X3	$150,291		$217,922										
1.		Equipment	1.0	ea	$103,950	$103,95	171	171.0	$31.04	$5,30	$10,395	$10,39	$119,65	Vendor Quote	Lbr/Equi
2.	17 x 12 x 10'd	Excavate @ Equipment Structure	76	cy			0.29	22.0	$31.04	$66	$5.85	$44	$1,12	RSM Bldg-04	P-49
3.		Stucture Base Stone	15	cy	$4.49	$6	0.25	3.8	$31.04	$11	$1.71	$2	$21	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	60	cy			0.13	8.0	$31.04	$25	$0.23	$1	$26	RSM Bldg-04	P-53
5.	12' x 8'	12" Slab on Grade	96	sf	$2.89	$27	0.03	2.5	$31.04	$7	$0.01	$	$35	RSM HC-2004	P-151
6.		12" Walls, 10' FOOT HIGH	15	cy	$126.00	$1,86	5.00	74.1	$31.04	$2,29	$18.65	$27	$4,44	RSM HC-2004	P-151
7.	12' x 8'	12" Concrete Roof	3.6	cy	$159.00	$56	5.41	19.2	$31.04	$59	$19.35	$6	$1,23	RSM HC-2004	P-150
8.		Weir Allowance	1	ls	$7,500.00	$7,50	80.6	80.6	$31.04	$2,50	$150	$15	$10,15	Est Judgement	
9.	16 lf	12" Sq Beams	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004	P-150
10.	$975	ENR Index Price Adjustment	17.5%			$1,88							$1,88	Adjustment for Concrete &	
11.		Structure Subtotal			$12,713				$7,467		$1,092			$21,271	
12.		Elec & I&C % of Structure	25%	ls		$3,17				[illegible]			$5,04	Est Judgement	
13.									$31.04						
14.		Misc. Materials & Consumable	[illegible]	%		$3,59		[illegible]	$31.04	[illegible]		[illegible]	$4,32		
ST		ROMAG RSW 4X3			$123,436		423.9		$15,022		$11,831				

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
			Cost		Marked-up										
Park Site 21	Option 1	ROMAG RSW 5X3	$159,352		$231,060										
1.		Equipment	1.0	ea	$112,200	$112,20	185	184.5	$31.04	$5,72	$11,220	$11,22	$129,14	Vendor Quote	Lbr/Equi
2.	17 x 12 x 10'd	Excavate @ Equipment Structure	76	cy			0.29	22.0	$31.04	$68	$5.86	$44	$1,12	RSM Bldg-04	P-49
3.		Stucture Base Stone	15	cy	$4.49	[illegible]	0.25	3.8	$31.04	$11	$1.71	$2	$21	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	60	cy			0.13	8.0	$31.04	$25	$0.23	$1	$26	RSM Bldg-04	P-53
5.	12' x 8'	12" Slab on Grade	96	sf	$2.89	$27	0.03	2.5	$31.04	$7	$0.01	$	$35	RSM HC-2004	P-151
6.		12" Walls, 10' FOOT HIGH	15	cy	$126.00	$1,86	5.00	74.1	$31.04	$2,29	$18.65	$27	$4,44	RSM HC-2004	P-151
7.	12' x 8'	12" Concrete Roof	3.6	cy	$159.00	$56	5.41	19.2	$31.04	$59	$19.35	$6	$1,23	RSM HC-2004	P-150
8.		Weir Allowance	1	ls	$7,500.00	$7,50	80.6	80.6	$31.04	$2,50	$150	$15	$10,15	Est Judgement	
9.	16 lf	12" Sq Beams	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004	P-150
10.	$798	ENR Index Price Adjustment	17.5%			$1,88							$1,88	Adjustment for Concrete &	
10.		Structure Subtotal			$10,830				$6,525		$978			$18,388	
11.		Elec & I&C % of Structure	25%	ls		$2,70				$1,63			$4,33	Est Judgement	
12.									$31.04						
13.		Misc. Materials & Consumable	3%	%		$3,62		12.8	$31.04	$39		[illegible]	$4,59		
ST		ROMAG RSW 5X3			$131,449		437.9		$15,222		$12,681				

Engineer's Estimate

PARKSON ROMAG Screen System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD =	10.0%	10.0%	10.0%	10.0%
PROFIT =	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. =	5.0%	5.0%	5.0%	5.0%
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 3
Estimate Date: 10/02/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
Park Site 26	Option :	ROMAG RSW 5X7	Cost $232,666		Marked-up $337,366										
1.		Equipment	1.0	ea	$154,550	[illegible]	[illegible]	254.2	$31.04	$7,89	$15,455	$15,45	$177,89	Vendor Quote	Lbr/Equi
2.	30 x 12 x 10'o	Excavate @ Equipment Structure	133	cy			0.29	38.8	$31.04	$1,204	$5.85	$78	$1,98	RSM Bldg-04	P-49
3.		Stucture Base Stone	27	cy	$4.49	[illegible]	0.25	6.6	$31.04	$20	$1.71	$4	$37	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	107	cy			0.13	14.2	$31.04	$44	$0.23	$2	$46	RSM Bldg-04	P-53
5.	26' x 8'	12" Slab on Grade	96	sf	$2.89	$27	0.03	2.5	$31.04	$7	$0.01	$	$35	RSM HC-2004	P-151
6.		12" Walls, 10' FOOT HIGH	25	cy	$126.00	$3,17	5.03	125.9	$31.04	$3,90	$18.65	$47	$7,55	RSM HC-2004	P-151
7.	26' x 8'	12" Concrete Roof	7.7	cy	$159.00	$1,22	5.41	41.7	$31.04	$1,29	$19.35	$14	$2,66	RSM HC-2004	P-150
8.		Weir Allowance	2	ea	$7,500.00	$15,00	80.6	161.3	$31.04	$5,00	$150	$30	$20,30	Est Judgement	
9.	16 lf	12" Sq Beams	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004	P-150
9.		ENR Index Price Adjustment	17.5%			$3,54							$3,54	Adjustment for Concrete &	
10.		Structure Subtotal			$23,688				$13,073		$1,684			[illegible]	
11.		Elec & I&C % of Structure	25%	ls		$5,97				$3,26			$9,24	Est Judgement	
12.									$31.04						
13.		Misc. Materials & Consumable	3%	%		$5,53		22.3	$31.04	$62		$52	$6,59		
ST		ROMAG RSW 5X7			$189,242		695.8		$24,866		$17,859				

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
Park Site 52	Option 1	ROMAG RSW 2x3	Cost $124,443		Marked-up $180,442										
1.		Equipment	1.0	ea	$84,700	[illegible]	138	139.3	$31.04	$4,32	$8,470	$8,47	$97,49	Vendor Quote	Lbr/Equi
2.	17 x 12 x 10'd	Excavate @ Equipment Structure	76	cy			0.29	22.0	$31.04	$68	$5.85	$44	$1,12	RSM Bldg-04	P-49
3.		Stucture Base Stone	15	cy	$4.49	[illegible]	0.25	3.8	$31.04	$11	$1.71	$2	$21	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	60	cy			0.13	8.0	$31.04	$25	$0.23	$1	$26	RSM Bldg-04	P-53
5.	12' x 8'	12" Slab on Grade	96	sf	$2.89	$27	0.03	2.5	$31.04	$7	$0.01	$	$35	RSM HC-2004	P-151
6.		12" Walls, 10' FOOT HIGH	15	cy	$126.00	$1,86	5.00	74.1	$31.04	$2,23	$18.65	$27	$4,44	RSM HC-2004	P-151
7.	12' x 8'	12" Concrete Roof	3.6	cy	$159.00	$56	5.41	19.2	$31.04	$59	$19.35	$6	$1,23	RSM HC-2004	P-150
8.		Weir Allowance	1	ls	$5,500.00	$5,50	80.6	80.6	$31.04	$2,50	$150	$15	$8,15	Est Judgement	
9.	16 lf	12" Sq Beams	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004	P-150
9.		ENR Index Price Adjustment	17.5%			$1,53							$1,53	Adjustment for Concrete &	
10.		Structure Subtotal			$10,363				$7,457		$1,092			[illegible]	
11.		Elec & I&C % of Structure	25%	ls		[illegible]				$1,86			$4,45	Est Judgement	
12.									$31.04						
13.		Misc. Materials & Consumable	[illegible]	%		[illegible]		11.4	$31.04	$35		[illegible]	[illegible]		
ST		ROMAG RSW 2x3			$130,583		391.3		$14,011		$9,642				

Fresh Creek System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD =	10.0%	10.0%	10.0%	10.0%
PROFIT =	5.0%	5.0%	5.0%	0.0%
MOB/BOND/INS. =	5.0%	5.0%	5.0%	0.0%
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 2
Estimate Date : 09/30/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RE	
			Cost		Marked-up										
Fresh Creek Site 17		Floatable Collection Systems	$121,413		$176,049										
1.		30" x 30" x 8' x 1/2" Mesh, 19 cfs (qty 1)	1.0	ea	$97,500	[illegible]	273	272.6	$31.04	$8,46	$9,750	$9,75	$115,71	Quote	Lbr/Eq
2.	10' x 20' x 12'd	Excavate @ Equipment Structure	89	cy			0.29	25.9	$31.04	$80	$5.85	$52	$1,32	SM Bldg-04	P-49
3.		Stucture Base Stone	15	cy	$4.49	$6	0.25	3.7	$31.04	$11	$1.71	$2	$20	SM Bldg-04	P-52
4.		Backfill / Vibrating Plate	74	cy			0.13	9.9	$31.04	$30	$0.23	$1	$32	SM Bldg-04	P-53
5.	4' x 16'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			SM HC-2004	P-15
6.		12" Walls, 10' FOOT HIGH		cy	$126.00		5.00		$31.04		$18.65			SM HC-2004	P-15
7.	4' x 16'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			SM HC-2004	P-15
8.	8 lf	12" Sq Beams / Columns		cy	$233.00		12.8		$31.04		$48			SM HC-2004	P-15
9.	#DIV/0!	ENR Index Price Adjustment	17.5%											justment for Concrete	
10		Structure Subtotal			$67				$1 223		$562			1,852	
11		Elec & I&C % of Structure	25%	ls		$1				$306			$32	st Judgement	
12									$31.04						
		Misc. Materials & Consumable	3%	%		$2,92		9.4	$31.04	$29		$30	$3,52		
ST		Floatable Collection Systems			$100,511		321.4		$10,281		$10,622				
			Cost		Marked-up										
Fresh Creek Site 21		Floatable Collection Systems	$154,825		$224,497										
1.		30" x 30" x 8' x 1/2" Mesh, 22 cfs (qty 1)	1.0	ea	$124,250	$124,2	347	347.4	$31.04	$10,78	$12,425	$12,42	$147,45	Quote	Lbr/Eq
2.	12' x 22' x 12'd	Excavate @ Equipment Structure	117	cy			0.29	34.1	$31.04	$1,06	$5.86	$68	$1,74	M Bldg-04	P-49
3.		Stucture Base Stone	20	cy	$4.49	[illegible]	0.25	4.9	$31.04	$15	$1.71	$3	$272	M Bldg-04	P-52
4.		Backfill / Vibrating Plate	98	cy			0.13	13.0	$31.04	$40	$0.23	$2	$42	M Bldg-04	P-53
5.	7.5' x 17'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			M HC-2004	P-15
6.		12" Walls, 10' FOOT HIGH		cy	$126.00		5.00		$31.04		$18.65			M HC-2004	P-15
7.	7.5' x 17'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			M HC-2004	P-15
8.	15 lf	12" Sq Beams / Columns		cy	$233.00		12.8		$31.04		$48			M HC-2004	P-15
9.	#DIV/0!	ENR Index Price Adjustment	17.5%											stment for Concrete	
10		Structure Subtotal			[illegible]				$1,615		$742			[illegible]45	
11		Elec & I&C % of Structure	25%	ls		$2				[illegible]			$42	Judgement	
12									$31.04						
		Misc. Materials & Consumable	3%	%		[illegible]		[illegible]	$31.04	[illegible]		$30	$4,4		
ST		Floatable Collection Systems			$128,091		411.4		$13,173		$13,562				

1120

Fresh Creek System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD =	10.0%	10.0%	10.0%	10.0%
PROFIT =	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. =	5.0%	5.0%	5.0%	5.0%
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 2
Estimate Date : 09/30/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RE	
Fresh Creek Site 26		Floatable Collection Systems	Cost $272,948		Marked-up $395,775										
1.		30" x 30" x 8' x 1/2" Mesh, 72 cfs (qty 3)	1.0	ea	$219,350	[illegible]	613	613.3	$31.04	$19,03	$21,935	$21,93	$260,321	Vendor Quote	Lbr/Eq
2.	18' x 24' x 12'd	Excavate @ Equipment Structure	192	cy			0.29	55.9	$31.04	$1,73	$5.85	$1,12	$2,857	RSM Bldg-04	P-49
3.		Stucture Base Stone	32	cy	$4.49	$144	0.25	8.0	$31.04	$247	$1.71	$5	$446	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	160	cy			0.13	21.3	$31.04	$660	$0.23	$3	$697	RSM Bldg-04	P-53
5.	13.33' x 19.33'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			RSM HC-2004	P-15
6.		12" Walls, 10' FOOT HIGH		cy	$126.00		5.00		$31.04		$18.65			RSM HC-2004	P-15
7.	13.33' x 19.33'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			RSM HC-2004	P-15
8.	26.75 lf	12" Sq Beams / Columns		cy	$233.00		12.8		$31.04		$48			RSM HC-2004	P-15
9.	#DIV/0!	ENR Index Price Adjustment	17.5%											Adjustment for Concrete	
10.		Structure Subtotal			$144				$2,642		$1,215			$4,000	
11.		Elec & I&C % of Structure	25%	ls		$3				$660			$696	Est Judgement	
12.									$31.04						
		Misc. Materials & Consumable	3%	%		$6,58		21.9	$31.04	[illegible]		$69	$7,[illegible]		
ST		Floatable Collection Systems			$226,115		719.4		$22,989		$23,844				

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RE	
Fresh Creek Site 12		Floatable Collection Systems	Cost $125,638		Marked-up $182,175										
1.		30" x 30" x 8' x 1/2" Mesh, 8 cfs (qty 1)	1.0	ea	[illegible]	$98,67	276	275.9	[illegible]	$8,56	$9,868	$9,86	$117,10	Vendor Quote	Lbr/Eq
2.	18' x 25' x 12'd	Excavate @ Equipment Structure	200	cy			0.29	58.2	$31.04	$1,80	$5.85	$1,17	$2,97	RSM Bldg-04	P-49
3.		Stucture Base Stone	33	cy	$4.49	$15	0.25	8.3	$31.04	$25	$1.71	$5	$46	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	167	cy			0.13	22.2	$31.04	$68	$0.23	$3	$72	RSM Bldg-04	P-53
5.	4' x 16'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			RSM HC-2004	P-15
6.		12" Walls, 10' FOOT HIGH		cy	$126.00		5.00		$31.04		$18.65			RSM HC-2004	P-15
7.	4' x 16'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			RSM HC-2004	P-15
8.	8 lf	12" Sq Beams / Columns		cy	$233.00		12.8		$31.04		$48			RSM HC-2004	P-15
9.	#DIV/0!	ENR Index Price Adjustment	17.5%											Adjustment for Concrete	
10.		Structure Subtotal			$150				$2,752		$1,265			$4,157	
11.		Elec & I&C % of Structure	25%	ls		$3				$68			$725	Est Judgement	
12.									$31.04						
		Misc. Materials & Consumable	3%	%		$2,9		10.9	$31.04	[illegible]		$33	$3,53		
ST		Floatable Collection Systems			$101,828		375.5		$12,343		$11,467				

Cost Marked-up

GRANDE ACU SCREEN System

Estimator:	Wm. Griffith / MKE
Project Mgr:	Webster, Todd/MKE
Project #:	316657
Estimate #:	Conceptual / Alternatives
Rev. #:	
Estimate Date :	09/28/2004

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD =	10.0%	10.0%	10.0%	10.0%
PROFIT =	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. =	5.0%	5.0%	5.0%	5.0%
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOU		
GRANDE Site 17		Acu-Screen, ACU-Bend	Cost $86,065		Marked-up $124,795											
1.		Accu Screen / ACU Bend	1.0	ea	[illegible]	[illegible]	169	168.9	$31.04	[illegible]	$6,040	$6,040	$71,68	Vendor Quote	Lbr/Equip -	
2.	15' sq x 12'd	Excavate @ Equipment Structure	100	cy			0.29	29.1	$31.04	$90	$5.85	$58	$1,49	RSM Bldg-04	P-49	02
3.		Stucture Base Stone	6	cy	$4.49	[illegible]	0.25	1.6	$31.04	$4	$1.71	$1	$8	RSM Bldg-04	P-52	02
4.		Backfill / Vibrating Plate	94	cy			0.13	12.5	$31.04	$38	$0.23	$2	$40	RSM Bldg-04	P-53	02
5.	8.5' x 10	12" Slab on Grade	85	sf	$2.89	$24	0.03	2.2	$31.04	$6	$0.01	$	$31	RSM HC-2004	P-151	0
6.		12" Walls, 10' FOOT HIGH	14	cy	$126.00	$1,72	5.00	68.5	$31.04	$2,12	$18.65	$25	$4,10	RSM HC-2004	P-151	0
7.	8.5' x 10'	12" Concrete Roof	3.1	cy	$159.00	$50	5.41	17.0	$31.04	$52	$19.35	$6	$1,09	RSM HC-2004	P-150	0
8.	17 lf	12" Sq Beams / Columns	3	cy	$233.00	$58	12.8	32.2	$31.04	$1,00	$48	$12	$1,70	RSM HC-2004	P-150	0
9.	$433	ENR Index Price Adjustment	17.5%			$53							$53	Ajustment for Concrete & F		
10.		Structure Subtotal			$3,623				$5,063		$1,056			9,742		
11.		Elec & I&C % of Structure	25%	ls		[illegible]				[illegible]			$2,17	Est Judgement		
12.									$31.04							
		Misc. Materials & Consumable	3%	%		$1,94		[illegible]	$31.04	[illegible]		$21	$2,47			
ST		Acu-Screen, ACU-Bend			$96,877			342.0	$11,880		$7,308					

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOU		
GRANDE Site 21		Acu-Screen	Cost $90,503		Marked-up $131,229											
1.		Accu Screen (GAS-HWS-168)	1.0	ea	$46,400	$46,4	130	129.7	$31.04	$4,02	$4,640	$4,64	$55,06	Vendor Quote	Lbr/Equip -	
2.	15' sq x 12'd	Excavate @ Equipment Structure	100	cy			0.29	29.1	$31.04	$90	$5.85	$58	$1,48	RSM Bldg-04	P-49	02
3.		Stucture Base Stone	5	cy	$4.49	[illegible]	0.25	1.2	$31.04	$3	$1.71	$	$6	RSM Bldg-04	P-52	02
4.		Backfill / Vibrating Plate	95	cy			0.13	12.7	$31.04	$39	$0.23	$2	$41	RSM Bldg-04	P-53	02
5.	8' x 8'	12" Slab on Grade	64	sf	$2.89	$18	0.03	1.7	$31.04	$5	$0.01	$	$23	RSM HC-2004	P-151	0
6.		12" Walls, 10' FOOT HIGH	18	cy	$126.00	$2,240	5.00	88.9	$31.04	$2,75	$18.65	$33	$5,33	RSM HC-2004	P-151	0
7.	45' x 17	12" Concrete Roof	2.4	cy	$159.00	$37	5.41	12.6	$31.04	$39	$19.35	$4	$82	RSM HC-2004	P-150	0
8.		Weir Allowance	1	ls	$11,347	$11,34	80.6	80.6	$31.04	$2,50	$150	$150	$14,00	Grande Quote		
9.	16 lf	12" Sq Beams / Columns	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004	P-150	0
10.	$1,066	ENR Index Price Adjustment	17.5%			$2,57							$2,57	Ajustment for Concrete & F		
11.		Structure Subtotal			[illegible]				$7,396		$1,257			26,538		
12.		Elec & I&C % of Structure	25%	ls		$4,32				[illegible]			$6,32	Est Judgement		
13.									$31.04							
		Misc. Materials & Consumable	3%	%		$2,04		[illegible]	$31.04	[illegible]		$17	[illegible]			
ST		Acu-Screen			$70,059			398.7	$14,370		$6,074					

GRANDE ACU SCREEN System

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #:
Estimate Date: 09/28/2004

MARK-UPS:

	MAT'L	LABOR	EQUIP	Indirects
OVERHEAD =	[illegible]	[illegible]	[illegible]	[illegible]
PROFIT =	[illegible]	[illegible]	[illegible]	[illegible]
MOB/BOND/INS. =	[illegible]	[illegible]	[illegible]	[illegible]
CONTINGENCY =	[illegible]	[illegible]	[illegible]	[illegible]

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOU		
			Cost		Marked-up											
GRANDE Site 26		Acu-Screen, ACU-Band	$136,293		$197,624											
1.	25' X 15' x 12'd	Accu Screen (GAS-HWD-500	1.0	ea	[illegible]	[illegible]	182	181.7	$31.04	$5,64	$6,500	$6,50	$77,14	Vendor Quote	Lbr/Equip -	
2.		Excavate @ Equipment Structure	167	cy			0.29	48.5	$31.04	$1,50	$5.85	$97	$2,48	RSM Bldg-04	P-49	02
3.		Stucture Base Stone	6	cy	$4.49	[illegible]	0.25	1.6	$31.04	$4	$1.71	$1	$8	RSM Bldg-04	P-52	02
4.		Backfill / Vibrating Plate	160	cy			0.13	21.3	$31.04	$66	$0.23	$3	$69	RSM Bldg-04	P-53	02
5.	20' x 10'	12" Slab on Grade	144	sf	$2.89	$41	0.03	3.7	$31.04	$11	$0.01	$	$53	RSM HC-2004	P-151	0
6.		12" Walls, 10' FOOT HIGH	23	cy	$126.00	$2,89	5.00	114.8	$31.04	$3,56	$18.65	$42	$6,88	RSM HC-2004	P-151	0
7.	20' x 10'	12" Concrete Roof	7.4	cy	$159.00	$1,17	5.41	40.1	$31.04	$1,244	$19.35	$14	$2,56	RSM HC-2004	P-150	0
8.		Weir Allowance	1	ls	$20,000	$20,00	145.2	145.2	$31.04	$4,50	$495	$49	$25,00	Grande Quote		
8.	20 lf	12" Sq Beams	3	cy	$233.00	$69	12.8	37.9	$31.04	$1,17	$48	$14	$2,01	RSM HC-2004	P-150	0
9.		ENR Index Price Adjustment	17.5%			$4,40							$4,40	Ajustment for Concrete & F		
10.		Structure Subtotal			$29,612				$12,822		$2,233			$44,567		
11.		Elec & I&C % of Structure	25%	ls		[illegible]				$3,20			$10,60	Est Judgement		
12.									$31.04							
		Misc. Materials & Consumable	[illegible]	%		[illegible]		17.8	$31.04	$55		[illegible]	[illegible]			
ST		Acu-Screen, ACU-Band			$105,075			612.7	$22,222		$8,995					
			Cost		Marked-up											
GRANDE Site 52		Acu-Screen, ACU-Bend	$82,012		$118,918											
1.		Accu Screen (GAS-HWS-107)	1.0	ea	$44,500	[illegible]	124	124.4	$31.04	$3,86	$4,450	$4,45	$52,81	Vendor Quote	Lbr/Equip -	
2.	15' sq x 12 d	Excavate @ Equipment Structure	100	cy			0.29	29.1	$31.04	$90	$5.85	$58	$1,48	RSM Bldg-04	P-49	02
3.		Stucture Base Stone	6	cy	[illegible]	[illegible]	0.25	1.6	$31.04	$4	$1.71	$1	$8	RSM Bldg-04	P-52	02
4.		Backfill / Vibrating Plate	94	cy			0.13	12.5	$31.04	$38	$0.23	$2	$40	RSM Bldg-04	P-53	02
5.	6' x 8'	12" Slab on Grade	48	sf	$2.89	$13	0.03	1.2	$31.04	$3	$0.01	$	$17	RSM HC-2004	P-151	0
6.		12" Walls, 10' FOOT HIGH	18	cy	$126.00	$2,24	5.00	88.9	$31.04	$2,75	$18.65	$33	$5,33	RSM HC-2004	P-151	0
7.	6' x 8'	12" Concrete Roof	1.8	cy	$159.00	$28	5.41	9.6	$31.04	$29	$19.35	$3	$61	RSM HC-2004	P-150	0
8.		Weir Allowance	1	ls	$8,348	$8,34	48.4	48.4	$31.04	$1,50	$150	$150	$10,00	Grande Quote		
9.	16 lf	12" Sq Beams / Columns	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004	P-150	0
10.	$917	ENR Index Price Adjustment	17.5%			$2,02							$2,02	Ajustment for Concrete & F		
11.		Structure Subtotal			$13,613				$5,978		$1,249			$21,739		
12.		Elec & I&C % of Structure	25%	ls		$3,40				[illegible]			$5,12	Est Judgement		
13.									$31.04							
		Misc. Materials & Consumable	3%	%		[illegible]		10.4	$31.04	$32		$17	$2,33			
ST		Acu-Screen, ACU-Bend			$53,362			356.4	$12,782		$5,868					

KRUGER ACTIFLO System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD =	10.0%	10.0%	10.0%	10.0%
PROFIT =	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. =	5.0%	5.0%	5.0%	5.0%
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 2
Estimate Date : 09/30/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
ACT Site 21	Option 1	1 X 14 mgd Design	Cost $1,296,257		Marked-up $1,878,122										
1.		Equipment	1.0	ea	$1,050,000	$1,050,00	1,727	1,727.0	$31.04	$53,60	$105,000	$105,00	$1,208,60	Vendor Quote	Lbr/Equi
2.	20 x 50 x 10 d	Excavate @ Equipment Structure	370	cy			0.29	107.8	$31.04	$3,34	$5.85	$2,16	$5,51	RSM Bldg-04	P-49
3.		Stucture Base Stone	74	cy	$4.49	[illegible]	0.25	16.4	$31.04	$57	$1.7	$12	$1,03	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	296	cy			0.13	39.4	$31.04	$1,22	$0.23	$6	$1,29	RSM Bldg-04	P-53
5.	45' x 17'	12" Slab on Grade	765	sf	$2.89	$2,21	0.03	19.9	$31.04	$61	$0.01	$	$2,83	RSM HC-2004	P-151
6.		12" Walls, 10' FOOT HIGH	46	cy	$126.00	$5,78	5.00	229.6	$31.04	$7,12	$18.65	$85	$13,76	RSM HC-2004	P-151
7.	45' x 17'	12" Concrete Roof	28.3	cy	$159.00	$4,50	5.41	153.3	$31.04	$4,75	$19.35	$54	$9,81	RSM HC-2004	P-150
8.	34 lf	12" Sq Beams	5	cy	$233.00	$1,17	12.8	64.5	$31.04	$2,00	$48	$24	$3,41	RSM HC-2004	P-150
9.	5372	ENR Index Price Adjustment	17.5%			$2,39							$2,39	Adjustment for Concrete &	
10.		Structure Subtotal			[illegible]				$19,643		$4,016			[illegible].061	
11.		Elec & I&C % of Structure	25%	ls		$4,[illegible]				$4,81			$9,01	Est Judgement	
12.									$31.04						
13.		Misc. Materials & Consumable	3%	%		$32,1		[illegible]	$31.04	[illegible]		[illegible]	$37,58		
ST		1 X 14 mgd Design			$1,102,618			2,430.7	$80,353		$112,286				

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
ACT Site 52	Option 2	1 x 5 mgd Design	Cost $981,407		Marked-up $1,423,040										
1.		Equipment	1.0	ea	$800,000	[illegible]	1,316	1,315.8	$31.04	$40,83	$80,000	$80,00	$920,83	Vendor Quote	Lbr/Equi
2.	40 x20 x 12'd	Excavate @ Equipment Structure	296	cy			0.29	86.2	$31.04	$2,67	$5.85	$1,73	$4,40	RSM Bldg-04	P-49
3.		Stucture Base Stone	59	cy	$4.49	$26	0.25	14.8	$31.04	$45	$1.71	$10	$82	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	237	cy			0.13	31.5	$31.04	$97	$0.23	$5	$1,03	RSM Bldg-04	P-53
5.	32' X 12'	12" Slab on Grade	384	sf	$2.89	$1,11	0.03	10.0	$31.04	$31	$0.01	$4	$1,42	RSM HC-2004	P-151
6.		12" Walls, 10' HIGH	33	cy	$126.00	$4,10	5.00	162.9	$31.04	$5,05	$18.66	$60	$9,77	RSM HC-2004	P-151
7.	45' x 17'	12" Concrete Roof	14.2	cy	$159.00	$2,26	5.41	76.9	$31.04	$2,38	$19.35	$27	$4,92	RSM HC-2004	P-150
8.	24 lf	12" Sq Beams	4	cy	$233.00	$82	12.8	45.5	$31.04	$1,41	$48	$17	$2,41	RSM HC-2004	P-150
9.		ENR Index Price Adjustment	17.5%			$1,45							$1,45	Adjustment for Concrete &	
10.		Structure Subtotal			[illegible]				$13,281		$2,947			[illegible],253	
11.		Elec & I&C % of Structure	25%	ls		$2,50				[illegible]			$5,82	Est Judgement	
12.									$31.04						
13.		Misc. Materials & Consumable	3%	%		$24,37		[illegible]	$31.04	$1,62		$2,42	[illegible]		
ST		1 x 5 mgd Design			$836,908			1,796.0	$59,064		$85,435				

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KRUGER ACTIFLO System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD =	10.0%	10.0%	10.0%	10.0%
PROFIT =	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. =	5.0%	5.0%	5.0%	5.0%
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 2
Estimate Date: 09/30/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
ACT Site 17	Option 3	1 x 12 mgd Design	Cost $1,239,464		Marked-up $1,797,223										
1.		Equipment	1.0	ea	$1,000,000	[illegible]	1,645	1,644.7	$31.04	$51,04	$100,000	$100,00	$1,151,04	Vendor Quote	Lbr/Equi
2.	60 x 25' x 12'd	Excavate @ Equipment Structure	444	cy			0.29	129.3	$31.04	$4,01	$5.86	$2,60	$6,61	RSM Bldg-04	P-49
3.		Stucture Base Stone	51	cy	$4.49	[illegible]	0.25	12.7	$31.04	$39	$1.71	$8	$71	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	393	cy			0.13	52.3	$31.04	$1,62	$0.23	$9	$1,71	RSM Bldg-04	P-53
5.	43' x 22'	12" Slab on Grade	695	sf	$2.89	$2,00	0.03	18.1	$31.04	$56	$0.01	$7	$2,57	RSM HC-2004	P-151
6.		12" Walls, 10' HIGH	56	cy	$126.00	$7,00	5.00	277.7	$31.04	$8,62	$18.65	$1,03	$16,85	RSM HC-2004	P-151
7.	53' x 22'	12" Concrete Roof	25.7	cy	$159.00	$4,09	5.41	139.2	$31.04	$4,32	$19.35	$49	$8,91	RSM HC-2004	P-150
8.	32 lf	12" Sq Beams	5	cy	$233.00	$1,10	12.8	60.7	$31.04	$1,88	$48	$22	$3,21	RSM HC-2004	P-150
9.		ENR Index Price Adjustment	17.5%			$2,48							$2,48	Adjustment for Concrete &	
10.		Structure Subtotal			$16 92?				$2? 41?		$4,548			[illegible].885	
11.		Elec & I&C % of Structure	25%	ls		$4,230				[illegible]			$9,58	Est. Judgement	
12.									$31.04						
13.		Misc. Materials & Consumable	3%	%		[illegible]		[illegible]	$31.04	$2,17		$3,13	[illegible]		
ST		1 x 12 mgd Design			$1,051,785		2,404.9		$79,997		$107,683				

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESC	
ACT Site 26	Option 4	2 x 24 mgd Design	Cost $2,917,593		Marked-up $4,230,509										
1.		Equipment	1.0	ea	$2,400,000	[illegible]	3,947	3,947.4	$31.04	$122,51	$240,000	$240,00	$2,762,51	Vendor Quote	Lbr/Equi
2.	60 x 25' x 12'd	Excavate @ Equipment Structure	667	cy			0.29	194.0	$31.04	$6,02	$5.85	$3,90	$9,92	RSM Bldg-04	P-49
3.		Stucture Base Stone	111	cy	$4.49	[illegible]	0.25	27.7	$31.04	$85	$1.71	$19	$1,54	RSM Bldg-04	P-52
4.		Backfill / Vibrating Plate	556	cy			0.13	73.9	$31.04	$2,29	$0.23	$12	$2,42	RSM Bldg-04	P-53
5.	53' x 22	12" Slab on Grade	1,166	sf	$2.89	$3,37	0.03	30.3	$31.04	$94	$0.01	$1	$4,32	RSM HC-2004	P-151
6.		12" Walls, 10' FOOT HIGH	56	cy	$126.00	$7,00	5.00	277.7	$31.04	$8,62	$18.65	$1,03	$16,65	RSM HC-2004	P-151
7.	53' x 22'	12" Concrete Roof	43.2	cy	$159.00	$6,86	5.41	233.6	$31.04	$7,25	$19.35	$83	$14,95	RSM HC-2004	P-150
8.	44 lf	12" Sq Beams	7	cy	$233.00	$1,51	12.8	83.5	$31.04	$2,59	$48	$31	$4,42	RSM HC-2004	P-150
9.		ENR Index Price Adjustment	17.5%			$3,28							$3,28	Adjustment for Concrete &	
10.		Structure Subtotal			[illegible]				$2? 576		$6,414			[illegible]7.526	
11.		Elec & I&C % of Structure	25%	ls		$5,63				[illegible]			$12,77	Est. Judgement	
12.									$31.04						
13.		Misc. Materials & Consumable	3%	%		[illegible]		146.0	$31.04	$4,53		$7,39	[illegible]		
ST		2 x 24 mgd Design			$2,53?,015		5,014.1		$152,771		$253,806				

Engineer's Estimate

CDS System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	
OVERHEAD =	[illegible]	[illegible]	[illegible]	
PROFIT =	[illegible]	[illegible]	[illegible]	
MOB/BOND/INS. =	[illegible]	[illegible]	[illegible]	
CONTINGENCY =	[illegible]	[illegible]	[illegible]	[illegible]

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MI
Project #: 318657
Estimate #: Conceptual / Alter
Rev. #: # 2
Estimate Date: 09/30/2004

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 17	Alt #1	**Raked Bar Screen - 4mm Spacing**	Cost $55,867		Marked-up $61,008									
1.		Racked Bar Screen	1.0	ea	$38,000	[illegible]	106.25	106.3	$31.04	$3,29	$3,800.00	$3,80	$45,09	Vendor Quote
2.	10 sq x 10'd	Excavate @ Equipment Structure	37	cy			0.29	10.8	$31.04	$33	$5.85	$21	$55	RSM Bldg-04
3.		Stucture Base Stone	7	cy	$4.49	[illegible]	0.25	1.8	$31.04	$5	$1.71	$1	$10	RSM Bldg-04
4.		Backfill / Vibrating Plate	30	cy			0.13	3.9	$31.04	$12	$0.23	$	$12	RSM Bldg-04
5.	8' x 8' x 1'	12" Slab on Grade	64	sf	$2.89	$18	0.03	1.7	$31.04	$5	$0.01	$	$23	RSM HC-2004
6.		12" Walls, 10' High	12	cy	$126.00	$1,49	5.00	59.2	$31.04	$1,83	$18.65	$22	$3,55	RSM HC-2004
7.	8' x 8'	12" Concrete Roof	2.4	cy	$159.00	$37	5.41	12.8	$31.04	$39	$19.35	$4	$62	RSM HC-2004
8.	16 lf	12" Sq Beams	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004
9.	$393	ENR Index Price Adjustment	17.5%			$45							$45	Ajustment for (
10.		Structure Subtotal			[illegible]				$3,745		$617			$7,459
11.		Elec & I&C % of Structure	25%	ls		$77				$93			$1,71	Est Judgement
12.														
		Misc. Materials & Consumable	3%	%		$1,25		[illegible]	[illegible]	[illegible]		$13	$1,60	
ST		Raked Bar Screen - 4mm Spacing			$43,127		233.7		$8,190		$4,550			
CDS Site 17	Alt #2	**CDS-GSS - 1 mm Screening (200 micron effective)**	Cost $187,941		Marked-up $272,514									
1.		1 mm Screening	1.0	ea	[illegible]	$80,00	171	171.1	$31.04	$5,30	$8,000.00	$8,00	$93,30	Vendor Quote
2.		Automation	1	ea	[illegible]	$75,00	123	123.4	$31.04	$3,82			$78,62	Vendor Quote
3.	15x20 x 14'd	Excavate @ Equipment Structure	156	cy			0.29	45.3	$31.04	$1,40	$5.85	$91	$2,31	RSM Bldg-04
4.		Stucture Base Stone	22	cy	$4.49	$10	0.25	5.5	$31.04	$17	$1.71	$3	$31	RSM Bldg-04
5.		Backfill / Vibrating Plate	133	cy			0.13	17.7	$31.04	$55	$0.23	$3	$58	RSM Bldg-04
6.	10' x 15' x 1'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			RSM HC-2004
7.		12" Walls, 12' HIGH		cy	$126.00		5.00		$31.04		$18.65			RSM HC-2004
8.	10' x 15' x 1'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			RSM HC-2004
9.	20 lf	12" Sq Beams		cy	$233.00		12.8		$31.04		$48			RSM HC-2004
10.		ENR Index Price Adjustment	17.5%											Ajustment for (
11.		Structure Subtotal			$100				$2,127		$979			$3,206
12.		Elec & I&C % of Structure	46%	ls		$1,78				$95			$2,74	Est Judgement
13.		20 hp Pump	1	ea	$3,874.00	$3,87	[illegible]	17.1	$31.04	$53			$4,40	RSM Mech
		Misc. Materials & Consumable	3%	%		$4,82		11.4	$31.04	$35		$26	$5,44	
ST		CDS-GSS - 1 mm Screening (200 micron effective)			$165,585		391.5		$13,108		$9,248			

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CDS System

MARK-UPS:

	MAT'L	LABOR	EQUIP	
OVERHEAD =	10.0%	10.0%	10.0%	
PROFIT =	5.0%	5.0%	5.0%	
MOB/BOND/INS. =	5.0%	5.0%	5.0%	
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MI
Project #: 316657
Estimate #: Conceptual / Alter
Rev. #: # 2
Estimate Date: 09/30/2004

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 17	Alt #3	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens	Cost $535,395		Marked-up $776,323									
1.		1 mm Screening	1.0	ea	$350,000.0	$350,00	748	748.4	$31.04	$23,22	$35,000.00	$35,00	$408,22	Vendor Quote
3.	30 x 50 x 17 d	Excavate @ Equipment Structure	944	cy			0.29	274.8	$31.04	$8,53	$5.85	$5,52	$14,05	RSM Bldg-04
4.		Stucture Base Stone	73	cy	$4.49	[illegible]	0.25	18.3	$31.04	$56	$1.71	$12	$1,02	RSM Bldg-04
5.		Backfill / Vibrating Plate	871	cy			0.13	115.9	$31.04	$3,59	$0.23	$20	$3,79	RSM Bldg-04
6.	22' x 45' x 1'	12" Slab on Grade	990	sf	$2.89	$2,86	0.03	25.7	$31.04	$79	$0.01	$1	$3,67	RSM HC-2004
7.		12" Walls, 14' HIGH	69	cy	$126.00	$8,75	5.00	347.3	$31.04	$10,78	$18.65	$1,29	$20,83	RSM HC-2004
8.	22' x 45' x 1'	12" Concrete Roof	36.7	cy	$159.00	$5,83	5.41	198.4	$31.04	$6,15	$19.35	$71	$12,69	RSM HC-2004
9.	44 lf	12" Sq Beams	7	cy	$233.00	$1,51	12.8	83.5	$31.04	$2,59	$48	$31	$4,42	RSM HC-2004
10.	$427	ENR Index Price Adjustment	17.5%			$3,31							$3,31	Adjustment for (
11.		Structure Subtotal			$22,513				$83,02		$3,173			,911
12.		Elec & I&C % of Structure	25%	ls		$5,65				$6,25			$13,90	Est Judgement
13.		5 hp Pump	1	ea	$2,210.00	$2,21	10.67	10.7	$31.04	$33			$2,54	RSM Mech
14.		20 hp Pump	1	ea	$3,874.00	$3,87	17.14	17.1	$31.04	$53			$4,40	RSM Mech
15.		Control Bldg	225	sf	$112.00	$25,20	0.15	33.8	$31.04	$1,04	$4.00	$90	$27,14	RSM Bldg-04
		Misc. Materials & Consumable	3%	%		$12,28		56.2	$31.04	$1,74		$1,3	$15,35	
ST	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens				$421,836		1,930.0		$68,158		$45,401			

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 21	Alt #1	Raked Bar Screen - 4mm Spacing	Cost $58,312		Marked-up $84,553									
1.		Racked Bar Screen	1.0	ea	$40,000.00	$40,000	111.84	111.8	$31.04	$3,47	$4,000.00	$4,00	$47,47	Vendor Quote
2.	10 sq x 10'd	Excavate @ Equipment Structure	37	cy			0.29	10.8	$31.04	$33	$5.85	$21	$55	RSM Bldg-04
3.		Stucture Base Stone	7	cy	$4.49	[illegible]	0.25	1.8	$31.04	$5	$1.71	$1	$10	RSM Bldg-04
4.		Backfill / Vibrating Plate	30	cy			0.13	3.9	$31.04	$12	$0.23	$	$12	RSM Bldg-04
5.	8' x 8' x 1'	12" Slab on Grade	64	sf	$2.89	$18	0.03	1.7	$31.04	$5	$0.01	$	$23	RSM HC-2004
6.		12" Walls, 10' High	12	cy	$126.00	$1,49	5.00	59.2	$31.04	$1,83	$18.65	$22	$3,55	RSM HC-2004
7.	8' x 8'	12" Concrete Roof	2.4	cy	$159.00	$37	5.41	12.8	$31.04	$39	$19.35	$4	$82	RSM HC-2004
8.	16 lf	12" Sq Beams	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004
9.	$393	ENR Index Price Adjustment	17.5%			$45							$45	Adjustment for (
10.		Structure Subtotal			$3,097				$3,745		$617			,459
11.		Elec & I&C % of Structure	25%	ls		$77				$93			$1,71	Est Judgement
12.									$31.04					
		Misc. Materials & Consumable	3%	%		$1,31		7.0	$31.04	$21		$13	$1,67	
ST		Raked Bar Screen - 4mm Spacing			$45,187		239.5		$8,369		$4,756			

CDS System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	
OVERHEAD =	10.0%	10.0%	10.0%	
PROFIT =	5.0%	5.0%	5.0%	
MOB/BOND/INS. =	5.0%	5.0%	5.0%	
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MI
Project #: 316657
Estimate #: Conceptual / Alter
Rev. #: # 2
Estimate Date: 09/30/2004

Site #	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 21	Alt #2	CDS-GSS - 1 mm Screening (200 micron effective)	Cost	$188,313	Marked-up $273,344									
1.		1 mm Screening	1.0	ea	$80,000.00	$80,03	171	171.1	$31.04	$5,30	$8,000.00	$8,00	$93,30	Vendor Quote
2.		Automation	1	ea	$75,000.00	$75,03	123	123.4	$31.04	$3,82			$78,62	Vendor Quote
3.	20 sq x 12'd	Excavate @ Equipment Structure	178	cy			0.29	51.7	$31.04	$1,60	$5.85	$1,04	$2,64	RSM Bldg-04
4.		Stucture Base Stone	22	cy	$4.49	$100	0.25	5.5	$31.04	$17	$1.71	$3	$31	RSM Bldg-04
5.		Backfill / Vibrating Plate	156	cy			0.13	20.7	$31.04	$64	$0.23	$3	$67	RSM Bldg-04
6.	10' x 15' x 1'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			RSM HC-2004
7.		12" Walls, 12' FOOT HIGH		cy	$126.00		5.00		$31.04		$18.65			RSM HC-2004
8.	10' x 15' x 1'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			RSM HC-2004
9.	20 lf	12" Sq Beams		cy	$233.00		12.8		$31.04		$48			RSM HC-2004
10.		ENR Index Price Adjustment	17.5%											Adjustment for (
11.		Structure Subtotal			$110				$2,420		$1,114			$3,613
12.		Elec & I&C % of Structure	45%	ls		$1,78				$1,08			$2,87	Est Judgement
13.		20 hp Pump	1	ea	$3,874.00	$3,874	17.14	17.1	$31.04	$53			$4,40	RSM Mech
		Misc. Materials & Consumable	3%	%		$4,82		14.7	$31.04	$36		$27	$5,45	
ST	CDS-GSS - 1 mm Screening (200 micron effective)				$165,585		431.2		$13,541		$9,387			

Site #	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 21	Alt #3	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens	Cost	$560,607	Marked-up $812,880									
1.		1 mm Screening	1.0	ea	$350,000.0	$350,000	745	748.4	$31.04	$23,22	$35,000.00	$35,00	$408,22	Vendor Quote
3.	40 x 60 x 15'd	Excavate @ Equipment Structure	1,333	cy			0.29	388.0	$31.04	$12,04	$5.85	$7,60	$19,84	RSM Bldg-04
4.		Stucture Base Stone	111	cy	$4.49	$499	0.25	27.7	$31.04	$85	$1.71	$19	$1,54	RSM Bldg-04
5.		Backfill / Vibrating Plate	1,222	cy			0.13	162.6	$31.04	$5,04	$0.23	$28	$5,32	RSM Bldg-04
6.	30' x 50' x 1'	12" Slab on Grade	1,500	sf	$2.89	$4,33	0.03	39.0	$31.04	$1,21	$0.01	$1	$5,56	RSM HC-2004
7.		12" Walls, 12' FOOT HIGH	74	cy	$126.00	$9,33	5.00	370.3	$31.04	$11,49	$18.65	$1,38	$22,20	RSM HC-2004
8.	30' x 50' x 1'	12" Concrete Roof	55.6	cy	$159.00	$8,83	5.41	300.6	$31.04	$9,32	$19.35	$1,07	$19,23	RSM HC-2004
9.	60 lf	12" Sq Beams / Columns	9	cy	$233.00	$2,07	12.8	113.8	$31.04	$3,53	$48	$42	$6,03	RSM HC-2004
10.	$433	ENR Index Price Adjustment	17.5%			$4,30							$4,30	Adjustment for (
11.		Structure Subtotal			$29,372				$43,512		$11,169			$84,053
12.		Elec & I&C % of Structure	25%	ls		$7,34				$10,87			$18,22	Est Judgement
13.		5 hp Pump	1	ea	$2,210.00	$2,21	10.67	10.7	$31.04	$33			$2,54	RSM Mech
14.		15 hp Pump	1	ea	$3,874.00	$3,874	17.14	17.1	$31.04	$53			$4,40	RSM Mech
15.		Control Bldg	225	sf	$112.00	$25,20	0.15	33.8	$31.04	$1,04	$4.00	$90	$27,14	RSM Bldg-04
		Misc. Materials & Consumable	3%	%		$12,54		66.4	$31.04	$2,06		$1,41	$16,01	
ST	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens				$430,539		2,278.2		$81,587		$48,461			

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CDS System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	
OVERHEAD =	10.0%	10.0%	10.0%	
PROFIT =	5.0%	5.0%	5.0%	
MOB/BOND/INS. =	5.0%	5.0%	5.0%	
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator:	Wm. Griffith / MKE
Project Mgr:	Webster, Todd/MI
Project #:	316557
Estimate #:	Conceptual / Alter
Rev. #:	# 2
Estimate Date:	09/30/2004

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 26	Alt #1	Raked Bar Screen - 4mm Spacing	Cost $90,495		Marked-up $131,218									
1.		Racked Bar Screen	1.0	ea	$65,000.00	$65,000	181.74	181.7	$31.04	$5,641	$6,500.00	$6,500	$77,141	Vendor Quote
2.	10 X 10 X 12'D	Excavate @ Equipment Structure	89	cy			0.29	25.9	$31.04	$803	$5.85	$523	$1,328	RSM Bldg-04
3.		Stucture Base Stone	7	cy	$4.49	[illegible]	0.25	1.8	$31.04	$57	$1.71	$12	$102	RSM Bldg-04
4.		Backfill / Vibrating Plate	81	cy			0.13	10.8	$31.04	$33	$0.23	$1	$35	RSM Bldg-04
5.	3.5' X 17.33'	12" Slab on Grade	72	sf	$2.89	$208	0.03	1.9	$31.04	$59	$0.01	$1	$267	RSM HC-2004
6.		12" Walls, 10' High	15	cy	$126.00	$1,944	5.00	77.1	$31.04	$2,394	$16.65	$28	$4,620	RSM HC-2004
7.	8' x 8'	12" Concrete Roof	2.4	cy	$159.00	$377	5.41	12.8	$31.04	$398	$19.35	$4	$821	RSM HC-2004
8.	8 lf	12" Sq Beams	1	cy	$233.00	$276	12.8	15.2	$31.04	$471	$48	$57	$804	RSM HC-2004
9.	$406	ENR Index Price Adjustment	17.5%			$491							$491	Adjustment for (
10		Structure Subtotal			$3,329				$4,518		$943			[illegible].793
11.		Elec & I&C % of Structure	25%	ls		$832				$1,12[illegible]			$1,962	Est Judgement
12									$31.04					
		Misc. Materials & Consumable	3%	%		[illegible]		9.8	$31.04	[illegible]		$22[illegible]	$2,60[illegible]	
ST		Raked Bar Screen - 4mm Spacing			$71,237		337.1		$11,593		$7,666			
CDS Site 26	Alt #2	CDS-GSS - 1 mm Screening (200 micron effective)	Cost $509,379		Marked-up $738,599									
1.		1 mm Screening	1.0	ea	$300,000.00	$300,000	641	641.4	$31.04	$19,909	$30,000.00	$30,000	$349,909	Vendor Quote
2.		Automation	1	ea	$110,000.00	$110,000	181	180.9	$31.04	$5,615			$115,615	Vendor Quote
3.	40 X 30' x 14 d	Excavate @ Equipment Structure	622	cy			0.29	181.1	$31.04	$5,623	$5.85	$3,64[illegible]	$9,26[illegible]	RSM Bldg-04
4.		Stucture Base Stone	89	cy	$4.49	$399	0.25	22.1	$31.04	$687	$1.71	$152	$1,23[illegible]	RSM Bldg-04
5.		Backfill / Vibrating Plate	533	cy			0.13	70.9	$31.04	$2,202	$0.23	$123	$2,324	RSM Bldg-04
6.	30' x 18' x 1'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			RSM HC-2004
7.		12" Walls, 12' FOOT HIGH		cy	$126.00		5.00		$31.04		$18.65			RSM HC-2004
8.	30' x 18' x 1'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			RSM HC-2004
9.	36 lf	12" Sq Beams		cy	$233.00		12.6		$31.04		$48			RSM HC-2004
10.	#DIV/0!	ENR Index Price Adjustment	17.5%											Adjustment for (
11.		Structure Subtotal			$399				$8,509		$3,915			[illegible]2,522
12.		Elec & I&C % of Structure	45%	ls		$3,66[illegible]				$3,82[illegible]			$7,49[illegible]	Est Judgement
13.		20 hp Pump	2	ea	$3,874.00	$7,748	17.14	34.3	$31.04	$1,064			$8,812	RSM Mech
		Misc. Materials & Consumable	3%	%		$12,65[illegible]		33.9	$31.04	$1,05[illegible]		$1,01[illegible]	$14,72[illegible]	
ST		CDS-GSS - 1 mm Screening (200 micron effective)			$434,468		1,164.7		$39,979		$34,932			

CDS System

MARK-UPS:

	MAT'L	LABOR	EQUIP.	
OVERHEAD =	10.0%	10.0%	10.0%	
PROFIT =	5.0%	5.0%	5.0%	
MOB/BOND/INS. =	5.0%	5.0%	5.0%	
CONTINGENCY =	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MI
Project #: 316657
Estimate #: Conceptual / Alter
Rev. #: # 2
Estimate Date : 09/30/2004

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
			Cost		Marked-up									
CDS Site 20	Alt #3	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens	$1,202,230		$1,743,233									
1.		1 mm Screening	1.0	ea	$750,000.00	$750,00	1,604	1,603.6	$31.04	$49,77	$75,000.00	$75,00	$874,77	Vendor Quote
2.	70 X 83' x 20'd	Excavate @ Equipment Structure	4,148	cy			0.29	1,207.1	$31.04	$37,46	$5.85	$24,26	$61,73	RSM Bldg-04
3.		Stucture Base Stone	415	cy	$4.49	$1,86	0.25	103.3	$31.04	$3,20	$1.71	$70	$5,77	RSM Bldg-04
4.		Backfill / Vibrating Plate	3,733	cy			0.13	496.5	$31.04	$15,41	$0.23	$85	$16,27	RSM Bldg-04
5.	61' X 70' X 20'd	12" Slab on Grade	4,270	sf	$2.89	$12,34	0.03	111.0	$31.04	$3,44	$0.01	$4	$15,82	RSM HC-2004
6.		12" Walls, 20' FOOT HIGH	194	cy	$122.00	$23,67	4.09	794.5	$31.04	$24,66	$15.25	$2,96	$51,29	RSM HC-2004
7.	61' x 70' x 1'	12" Concrete Roof	158.1	cy	$159.00	$25,14	5.41	855.6	$31.04	$26,55	$19.35	$3,06	$54,75	RSM HC-2004
8.	*22 lf	12" Sq Beams	18	cy	$233.00	$4,21	12.8	231.4	$31.04	$7,18	$48	$86	$12,26	RSM HC-2004
9.		ENR Index Price Adjustment	17.5%			$11,44							$11,44	Adjustment for (
10.		Structure Subtotal			$78,67?					$117,928	$32,765			$229,370
11.		Elec & I&C % of Structure	15%	ls		$11,80				$17,68			$29,49	Est Judgement
13.		5 hp Pump	1	ea	$2,210.00	$2,21	10.67	10.7	$31.04	$33			$2,54	RSM Mech
14.		15 hp Pump	1	ea	$3,874.00	$3,87	17.14	17.1	$31.04	$53			$4,40	RSM Mech
15.		Control Bldg	225	sf	$112.00	$25,20	0.15	33.8	$31.04	$1,04	$4.00	$90	$27,14	RSM Bldg-04
		Misc. Materials & Consumable	3%	%		$26,15		[illegible]	[illegible]	[illegible]		$3,25	$34,50	
ST	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens				$897,315		5,628.6		$192,389		$111,925			

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 52	Alt #1	Raked Bar Screen - 4mm Spacing	$53,423		$77,463									
1.		Racked Bar Screen	1.0	ea	$36,000.00	$36,00	100.66	100.7	$31.04	$3,12	$3,600.00	$3,60	$42,72	Vendor Quote
2.	10 sq x 10'd	Excavate @ Equipment Structure	37	cy			0.29	10.8	$31.04	$33	$5.85	$21	$55	RSM Bldg-04
3.		Stucture Base Stone	7	cy	$4.49	[illegible]	0.25	1.8	$31.04	$5	$1.71	$1	$10	RSM Bldg-04
4.		Backfill / Vibrating Plate	30	cy			0.13	3.9	$31.04	$12	$0.23	$	$12	RSM Bldg-04
5.	8' x 8' x 1'	12" Slab on Grade	64	sf	$2.89	$18	0.03	1.7	$31.04	$5	$0.01	$	$23	RSM HC-2004
6.		12" Walls, 10' High	12	cy	$126.00	$1,49	5.00	59.2	$31.04	$1,83	$18.65	$22	$3,55	RSM HC-2004
7.	8' x 8'	12" Concrete Roof	2.4	cy	$159.00	$37	5.41	12.8	$31.04	$39	$19.35	$4	$82	RSM HC-2004
8.	16 lf	12" Sq Beams	2	cy	$233.00	$55	12.8	30.4	$31.04	$94	$48	$11	$1,60	RSM HC-2004
9.	$393	ENR Index Price Adjustment	17.5%			$45							$45	Adjustment for (
10.		Structure Subtotal			$3,037					$3,745	$617			$7,459
11.		Elec & I&C % of Structure	25%	ls		$77				$93			$1,71	Est Judgement
12.									$31.04					
		Misc. Materials & Consumable	3%	%		$1,19		[illegible]	$31.04	[illegible]		$12	$1,52	
ST		Raked Bar Screen - 4mm Spacing			$41,367		227.9		36,011		$4,344			

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Engineer's Estimate

CDS System

MARK-UPS:

	MAT.	LABOR	EQUIP.	
OVERHEAD =	[illegible]	[illegible]	[illegible]	
PROFIT =	[illegible]	[illegible]	[illegible]	
MOB/BOND/INS. =	[illegible]	[illegible]	[illegible]	
CONTINGENCY =	[illegible]	[illegible]	[illegible]	[illegible]

Estimator: Wm. Griffith / MKI
Project Mgr: Webster, Todd/MI
Project #: 316657
Estimate #: Conceptual / Alter
Rev. #: # 2
Estimate Date: 09/30/2004

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 52	Alt #2	CDS-GSS - 1 mm Screening (200 micron effective)	Cost $162,413		Marked-up $235,499									
1.		1 mm Screening	1.0	ea	$60,000.00	$60,00	128	128.3	$31.04	$3,98	$6,000.00	$6,00	$69,96	Vendor Quote
2.		Automation	1	ea	$75,000.00	$75,00	123	123.4	$31.04	$3,82			$78,92	Vendor Quote
3.	15 X 17' x 13'd	Excavate @ Equipment Structure	123	cy			0.29	35.7	$31.04	$1,10	$5.85	$71	$1,82	RSM Bldg-04
4.		Stucture Base Stone	19	cy	$4.49	$8	0.25	4.7	$31.04	$14	$1.71	$3	$26	RSM Bldg-04
5.		Backfill / Vibrating Plate	104	cy			0.13	13.8	$31.04	$42	$0.23	$2	$45	RSM Bldg-04
6.	10' x 12' x 1'	12" Slab on Grade		sf	$2.89		0.03		$31.04		$0.01			RSM HC-2004
7.		12" Walls, 12' FOOT HIGH		cy	$126.00		5.00		$31.04		$18.65			RSM HC-2004
8.	10' x 12 x 1'	12" Concrete Roof		cy	$159.00		5.41		$31.04		$19.35			RSM HC-2004
9.	20 lf	12" Sq Beams		cy	$233.00		[illegible]		$31.04		$48			RSM HC-2004
10	#DIV/0!	ENR Index Price Adjustment	17.5%											Adjustment for (
11.		Structure Subtotal			$55				$1,684		$774			$2,543
12		Elec & I&C % of Structure	45%	ls		$1,6				$75			$2,37	Est Judgement
13		12-15 hp Pump	1	ea	$3,510.00	$3,51	15.00	15.0	$31.04	$46			$3,97	RSM Mech
		Misc. Materials & Consumable	3%	%		$4,20		9.6	$31.04	$29		$20	$4,70	
ST	CDS-GSS - 1 mm Screening (200 micron effective)				$144,419		330.5		$11,016		$6,978			

Site 17	Alt / Size	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	
CDS Site 52	Alt #3	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens	Cost $386,430		Marked-up $560,324									
1.		1 mm Screening	1.0	ea	$250,000	$250,00	535	534.5	$31.04	$16,591	$25,000.00	$25,00	$291,59	Vendor Quote
2.	26 X 40 x 14'd	Excavate @ Equipment Structure	539	cy			0.29	156.9	$31.04	$4,87	$5.85	$3,15	$8,02	RSM Bldg-04
3.		Stucture Base Stone	56	cy	$4.49	$25	0.25	14.0	$31.04	$435	$1.71	$9	$78	RSM Bldg-04
4.		Backfill / Vibrating Plate	483	cy			0.13	64.2	$31.04	$1,994	$0.23	$11	$2,10	RSM Bldg-04
5.	18' x 28'	12" Slab on Grade	735	sf	$2.89	$2,12	0.03	19.1	$31.04	$593	$0.01	$7	$2,72	RSM HC-2004
6.		12" Walls, 12' FOOT HIGH	50	cy	$122.00	$6,07	4.09	203.8	$31.04	$6,325	$15.25	$75	$13,15	RSM HC-2004
7.	61' x 70' x 1'	12" Concrete Roof	27.2	cy	$159.00	$4,32	5.41	147.3	$31.04	$4,571	$19.35	$52	$9,42	RSM HC-2004
8.	42 lf	12" Sq Beams	6	cy	$233.00	$1,45	12.5	79.7	$31.04	$2,473	$48	$29	$4,22	RSM HC-2004
9.	$389	ENR Index Price Adjustment	17.5%			$2,44							$2,44	Adjustment for (
10.		Structure Subtotal			$16,673				$21,251		$4,954			$42,688
11.		Elec & I&C % of Structure	15%	ls		$2,50				$3,189			$5,69	Est Judgement
12.		12-15 hp Pump	2	ea	$3,510.00	$7,02	15.00	30.0	$31.04	$931			$7,95	RSM Mech
13.		Control Bldg	225	sf	$112.00	$25,20	0.15	33.8	$31.04	$1,048	$4.00	$90	$27,14	RSM Bldg-04
		Misc. Materials & Consumable	3%	%		[illegible]		[illegible]	$31.04	$1,195		$92	$11,16	
ST	CDS-FSS Chemically Enhanced Flocculation w/ 1mm Screens				$310,436		1,321.8		$44,215		$31,779			

Operations & Maintenance

MARK-UPS:		MAT'L	LABOR	EQUIP.	Indirects
	OVERHEAD :	10.0%	10.0%	10.0%	10.0%
	PROFIT :	5.0%	5.0%	5.0%	5.0%
	MOB/BOND/INS. :	5.0%	5.0%	5.0%	5.0%
	CONTINGENCY :	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffin / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 3
Estimate Date : 10/02/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOURCE
	Trips		Cost		Marked-up									
1	1	Alternate Vendor CDS - Raked Bar Screen	$287		$372									
1	1	2 person crew	4.0	hrs			1	4.0	$31.04	$124			$124	2 person crew 4 hrs per trip
2	1	Vehicles / fuel	1.0	Trip					$31.04		$100.00	$100	$100	50k truck x .25% / 100trips = trip unit @ 80%
3	1	Utilities / Power							$31.04					
4	1	Equipment Replacement							$31.04					
5	1	Veg Oil	1	ea	$25.00	$25			$31.04				$25	
6	1								$31.04					
7	1								$31.04					
		Misc. Materials & Consumable	3%	%		$1		0.1	$31.04	$4		$3	$7	
ST		Alternate Vendor CDS - Raked Bar Screen				$26		4.1		$128		$103		
	Trips		Cost		Marked-up									
1	4	Alternate Vendor CDS Type GSS	$1,814		$2,630									
1	4	2 person crew	4.0	hrs			1	16.0	$31.04	$497			$497	2 person crew 4 hrs per trip
2	4	Vehicles / fuel	1.0	ea					$31.04		$100.00	$400	$400	50k truck x .25% / 100trips = trip unit @ 80%
3	4	Utilities / Power	1	ea	$500.00	$500			$31.04				$500	Est JudgementAllowance
4	4	Equipment Replacement	1	ea	$60.00	$240	4.00	4.0	$31.04	$124			$364	Est JudgementAllowance
5	4	Chemicals							$31.04					
6	4								$31.04					
7	4								$31.04					
		Misc. Materials & Consumable	3%	%		$23		0.6	$31.04	$19		$12	$53	
ST		Alternate Vendor CDS Type GSS				$762		20.6		$639		$412		
	Trips		Cost		Marked-up									
1	5	Alternate Vendor CDS Type FSS	$3,048		$4,419									
1	5	2 person crew	4.0	hrs			1	24.0	$31.04	$745			$745	2 person crew 4 hrs per trip
2	5	Vehicles / fuel	1.0	ea					$31.04		$100.00	$500	$500	50k truck x .25% / 100trips = trip unit @ 80%
3	5	Utilities / Power	1	ea	$650.00	$650			$31.04				$650	Est JudgementAllowance
4	5	Equipment Replacement	1	ea	$65.00	$390	4.00	4.0	$31.04	$124			$514	Est JudgementAllowance
5	5	Chemicals	1	ea	$75.00	$450			$31.04				$450	Est JudgementAllowance
6	5								$31.04					
7	5								$31.04					
		Misc. Materials & Consumable	3%	%		$45		0.8	$31.04	$26		$18	$89	
ST		Alternate Vendor CDS Type FSS				$1,535		28.8		$895		$618		
			Cost		Marked-up									
2	1	Alternate Vendor KRUGER1	$231		$335									
1	1	2 person crew	4.0	hrs			1	4.0	$31.04	$124			$124	2 person crew 4 hrs per trip
2	1	Vehicles / fuel	1.0	Trip					$31.04		$100.00	$100	$100	50k truck x .25% / 100trips = trip unit @ 80%

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Operations & Maintenance

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD :	10.0%	10.0%	10.0%	10.0%
PROFIT :	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. :	5.0%	5.0%	5.0%	5.0%
CONTINGENCY :	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 3
Estimate Date : 10/02/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOURCE
3.	1.	Utilities / Power							$31.04					
4.	1.	Equipment Replacement							$31.04					
5.	1.	Chemicals							$31.04					
6.	1.								$31.04					
7.	1.								$31.04					
[redacted]		Misc. Materials & Consumable	3%	%				0.1	$31.04	$4		$3	$7	
ST		Alternate Vendor KRUGER1						4.1		$128	$103			

Cost	Marked-up

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Operations & Maintenance

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD :	10.0%	10.0%	10.0%	10.0%
PROFIT :	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. :	5.0%	5.0%	5.0%	5.0%
CONTINGENCY :	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 3
Estimate Date : 10/02/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOURCE
3	4	**Alternate Vendor GRANDE**	$1,439		[illegible]									
1.	4.	2 person crew	4.0	hrs			1	16.0	$31.04	$497			$497	2 person crew 4 hrs per trip
2.	4.	Vehicles / fuel	1.0	Trip					$31.04		$400.00	$400	$400	50k truck x .25% / 100trips = trip unit @ 80%
3.	4.	Utilities / Power							$31.04					
4.	4.	Equipment Replacement							$31.04					
5.	4.	Chemicals							$31.04					
6.	4.	Fluids	1		$125.00	$500			$31.04				$500	
7.	4.								$31.04					
		Misc. Materials & Consumable	3%	%		$15		0.5	$31.04	$15		$12	$42	
ST		Alternate Vendor GRANDE				$515		16.5		$512		$412		

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOURCE
			Cost		Marked-up									
4	1	**Alternate Vendor Fresh Creek Tech**	$1,088		$1,578									
1	1.	2 person crew	8.0	hrs			2	16.0	$31.04	$497			$497	2 person crew 4 hrs per trip
2.	1.	Vehicles / fuel	1.0	Trip					$31.04		$100.00	$100	$100	50k truck x .25% / 100trips = trip unit @ 80%
3.	1.	Utilities / Power							$31.04					
4.	1.	Equipment Replacement	1	ea	$125.00	$125			$31.04		$335	$335	$460	9-28 email
5.	1.	Chemicals							$31.04					
6.	1.								$31.04					
7.	1.								$31.04					
		Misc. Materials & Consumable	3%	%		$4		0.5	$31.04	$15		$13	$32	
ST		Alternate Vendor Fresh Creek Tech				$129		16.5		$512		$448		

Annual

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	LABOR RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOURCE
			Cost		Marked-up									
4	4	**Alternate Vendor Parkson Corp**	$3,421		$4,961									
1.	4.	2 person crew	8.0	hrs			2	64.0	$31.04	$1,98			$1,98	2 person crew 4 hrs per trip
2.	4.	Vehicles / fuel	1.0	Trip					$31.04		$100.00	$40	$40	50k truck x .25% / 100trips = trip unit @ 80%
3.	4.	Utilities / Power	1	ea	$25.00	$10			$31.04				$10	
4.	4.	Equipment Replacement	1	ea	$125.00	$50			$31.04		$335	$33	$83	9-28 email
5.	4.	Chemicals							$31.04					
7.	4.								$31.04					
		Misc. Materials & Consumable	3%	%		$1		1.9	$31.04	$6		$2	$10	
ST		Alternate Vendor Parkson Corp				$618		65.9		$2,046		$757		

Cost	Marked-up

1134

Operations & Maintenance

MARK-UPS:

	MAT'L	LABOR	EQUIP.	Indirects
OVERHEAD :	10.0%	10.0%	10.0%	10.0%
PROFIT :	5.0%	5.0%	5.0%	5.0%
MOB/BOND/INS. :	5.0%	5.0%	5.0%	5.0%
CONTINGENCY :	25.0%	25.0%	25.0%	25.0%

Estimator: Wm. Griffith / MKE
Project Mgr: Webster, Todd/MKE
Project #: 316657
Estimate #: Conceptual / Alternatives
Rev. #: # 3
Estimate Date : 10/02/2004

Item	CSI Div	DESCRIPTION	QTY	UNIT	MATERIALS UNIT $	MATERIALS AMOUNT	LABOR Unit MH	LABOR Man-Hrs	RATE	LABOR AMOUNT	Equipment UNIT $	Equipment AMOUNT	TOTAL	RESOURCE
5	1	**Comments**	$231		$335									
1.	1.	2 person crew	4.0	hrs			1	4.0	$31.04	$124			$124	2 person crew 4 hrs per trip
2.	1.	Vehicles / fuel	1.0	Trip					$31.04		$100.00	$100	$100	50k truck x .25% / 100trips = trip unit @ 80%
3.	1.	Utilities / Power							$31.04					
4.	1.	Equipment Replacement							$31.04					
5.	1.	Chemicals							$31.04					
6.	1.								$31.04					
7.	1.								$31.04					
		Misc. Materials & Consumable	3%	%				0.1	$31.04	$4		$3	$7	
ST		Comments						4.1		$128	$103			

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Appendix E

Application of the Setback Rule to CSO Projects (draft)

Application of the Setback Rule to CSO Projects

DRAFT FOR DISCUSSION PURPOSES
8/13/04

Communities in the process of developing Combined Sewer Overflow (CSO) Long Term Control Plans have requested that IDEM provide an interpretation of the setback requirement found in 327 IAC 3-2-6, particularly as applied to the construction of CSO treatment/control projects. These communities have indicated that the applicability of this requirement may impact their evaluation/selection of long term CSO controls.

327 IAC 3-2-6 states:

> (a) Setback distances for **new wastewater treatment sites** must comply with the following:
>
> (1) No less than five hundred (500) feet shall separate a water pollution treatment/control facility, including aerated lagoon systems, from a dwelling, unless that dwelling is an office owned, occupied by, and located on the property of the owners of the water pollution treatment/control facility, as measured from the outside edge of the equipment involved with the treatment/control of water pollution to the outside edge of the dwelling.
>
> (2) No less than one-fourth (¼) of a mile shall separate a nonaerated facultative treatment lagoon from a dwelling, unless that dwelling is an office owned, occupied by, and located on the property of the owners of the nonaerated facultative treatment lagoon, as measured from the outside edge of the nonaerated facultative treatment lagoon to the outside edge of the dwelling.
>
> (b) The separation distances required in subsection (a) may be modified if the affected dwelling owners agree to a shortened separation distance and record such agreement as easements and deed restrictions with the county recorder's office for the affected property.
>
> 327 IAC 3-2-6 (emphasis added).

A community proposing to construct *a wastewater treatment/control device at a new wastewater treatment site* is subject to the requirements of this rule. While there is no legal definition of the phrase "new wastewater treatment site," IDEM considers it to mean a location at which:

1) wastewater treatment is not currently provided; and

2) construction of a wastewater treatment device is proposed as part of the project for which a construction permit is being sought.

Examples of the application of this rule, in the context of the proposed construction of CSO storage or treatment projects, include the following:

Construction of a "Satellite" Basin: A community proposing to construct a basin in order to store wastewater for future conveyance to a wastewater treatment plant is not subject to the 500'setback requirement, as long as the basin is not designed to overflow to the environment/waters of the state. The setback requirement applies to construction of a water pollution treatment/control device occurring at a new wastewater treatment site. A new wastewater treatment site is a location at which wastewater treatment is not currently provided and construction of a wastewater treatment device is proposed. A basin designed solely for the purpose of storage is not considered to be a wastewater treatment device. Accordingly, construction of such a basin does not constitute construction at a new wastewater treatment site, and therefore, the setback requirement is not applicable.

Construction of "End-of-Pipe" Treatment at an Existing CSO outfall: A community proposing to construct "end-of-pipe" treatment at an existing CSO outfall, where no treatment is currently provided, is subject to the 500'setback requirement. The setback requirement applies to construction of a water pollution treatment/control device occurring at a new wastewater treatment site. A new wastewater treatment site is a location at which wastewater treatment is not currently provided and construction of a wastewater treatment device is proposed. The installation of treatment at a location at which treatment is not currently provided constitutes construction at a new wastewater treatment site, and therefore, the setback requirement is applicable.

Construction of "Satellite" Disinfection Facilities and an Equalization Basin: A community proposing to construct satellite disinfection facilities, and an equalization basin to equalize the flows transported to the satellite disinfection facilities, at a location at which treatment is not currently provided, is subject to the 500' setback requirement with respect to both the disinfection facilities and the equalization basin. The setback requirement applies to construction of water pollution treatment/control devices occurring at a new wastewater treatment site. A new wastewater treatment site is a location at which wastewater treatment is not currently provided and construction of a wastewater treatment device is proposed. The construction of disinfection facilities at a location at which treatment is not currently provided constitutes construction at a new wastewater treatment site, and therefore, the setback requirement applies to the construction of the disinfection facilities. Further, the equalization basin is a water pollution treatment/control device proposed to be constructed at a new wastewater treatment site, and therefore, the setback requirement is applicable to it as well.

A community that is seeking to construct a water pollution treatment/

control device at a new wastewater treatment site, and is therefore subject to the 500' setback requirement, may be permitted to utilize a shorter separation distance if the requirements of 327 IAC 3-2-6(b) are satisfied. A community that is unable to satisfy the requirements of 327 IAC 3-2-6(b) should consider acquiring, through eminent domain, the property or easement needed to comply with the setback requirement. Alternatively, a community that is unable to meet the 500' setback requirement, and unable to satisfy the requirements of 327 IAC 3-2-6(b), may be able to obtain a variance, pursuant to IC 13-14-8-8, from the 500' setback requirement.

Regardless of whether the setback requirement is applicable, communities should consider both satellite storage and satellite/end-of pipe treatment for CSO discharges in their evaluation of alternatives, in order to ensure that an evaluation of a full range of alternatives is conducted. Additionally, information generated during the evaluation of alternatives could help support a request for variance from the setback requirement.

Furthermore, it should be noted that regardless of whether the setback requirement is applicable, the construction of any water pollution treatment/control device requires a construction permit from IDEM, in accordance with 327 IAC 3, unless an exclusion contained in 327 IAC 3-2-4 applies. In all of the above noted examples, a construction permit would be required.

EXHIBIT F-3

Report Clarification

TO: Pat Callahan/City of Fort Wayne

FROM: Todd Webster/CH2M HILL - Fort Wayne
Rita Fordiani/CH2M HILL - Sudbury

DATE: November 22, 2004

The following excerpt is from the EPA CSO Guidance for Nine Minimum Controls (EPA 832-B-95-003), Control of Solid and Floatable Materials in CSOs – Documentation:

The following list provides examples of documentation that could be submitted to demonstrate diligent effort in evaluating this minimum control, and a clear understanding of the measures being implemented:

- *An engineering evaluation of procedures or technologies considered for controlling solid and floatable materials*
- *A description of CSO controls in place for solid an floatable materials*
- *A cost estimate and implementation schedule for each control measures being implemented*
- *An estimate of the decrease in solids and floatables expected from the minimum control efforts*
- *Documentation of any additional controls to be installed or implemented*

This memo documents a response to each of the above points.

Engineering Evaluation of Procedures/Technologies Considered

This was provided in the November Report entitled, *City of Fort Wayne CSO Solids and Floatables Control Plan for Selected Sites*, CH2M HILL November 2004 (November Report).

Description of CSO Controls in Place

This was provided in the November Report and highlights the many non-structural programs currently in place which prevent solids and floatables from reaching surface waters.

Cost Estimate and Implementation Schedule

This was provided in the November Report for structural controls. As recommended in the report, thorough tracking of the costs and benefits of the non-structural programs would provide the data needed to evaluate program effectiveness.

Estimate of the Decrease in Solids and Floatables

Tables 2-5 of the November Report provide an estimate of the decrease in solids and floatables as a result of non-structural programs. Table 8 of the November Report provides an estimate of the decrease in solids and floatables as a result of future structural programs based on typical CSO discharge quality. However, the sites in Fort Wayne did not exhibit typical CSO quality. As presented in a memorandum, *City of Fort Wayne Recommended CSO Sites for Further Solids and Floatables Investigation*, July 23, 2004, CH2M HILL (July Memo), a majority of the CSO discharge sites were relatively free of sewer-related debris (see field notes and photos in the July Memo). For this reason the recommendations in the November Report focus more on maintaining better documentation of existing non-structural programs currently in place and implementing one structural control at Fairfax/Foster Park (Site #21) as a pilot program to better evaluate the cost-effectiveness of the non-structural and structural controls, respectively, before large financial commitments are made by the City.

Documentation of Any Additional Controls

This was provided in the November Report.

EXHIBIT F-4

Status of Follow Up Investigations

Items Noted in "City of Fort Wayne Recommended CSO Sites for Further Solids and Floatables Investigation" dated July 23, 2004

Date: 5-07

Overflow Point No. 004

Comment in Report: Suggest reviewing/correcting operation of tide flex – river backs into system at a high rate.

Action Status: Field investigation revealed that "duck bill" at discharge point was in need of replacement, and the internal upstream flap gate is in need of repair. Project to be developed to address this problem.

Overflow Point No. 007

Comment in Report: Suggest reviewing tide gate operation.

Action Status: Field investigation revealed that the gate was in need of replacement. Gate was replaced.

Overflow Point No. 011

Comment in Report: Suggest reviewing/correcting cause of regulator manhole surcharge and problem with river water entering submerged outfall.

Action Status: Staff unsure why manhole had surcharged. Daily inspections do not observe similar incidents. Tide gate for submerged outfall is normally closed as adjacent pump station (discharge point 012) is primary discharge point for overflows. Gate scheduled to be inspected and identified for yearly maintenance.

Overflow Point No. 013

Comment in Report: Suggest review of sewer maintenance practices in regards to plugged sewer lines in area.

Action Status: WPCM staff is not aware of any unusual or above average maintenance issues in the area that need to be addressed. Intend to "flag" area to watch if overflow occurs again and determined to be due to plugged lines in area.

Overflow Point No. 016

Comment in Report: Suggest looking into closing off CSO discharge point.

Action Status: CSO discharge piping has been bulk headed and not an active discharge point any more.

Overflow Point No. 020

Comment in Report: Suggest reviewing/correcting operation of flap gate.

Action Status: Flap gate is at regulator, over 1500' from discharge point at river. The river does back up into the outfall, but does no significant harm unless regulator flap gate does not operate properly. Regular maintenance is performed on regulator.

Overflow Point No. 023

Comment in Report: Suggest reviewing/correcting operation of flap gate.
Action Status: Field investigation revealed nothing unusual. Flap gate normally submerged and closed. Sealing around gate to be inspected and any obstructions to be removed. Gate scheduled to be inspected and identified for yearly maintenance.

Overflow Point No. 024 and 025

Comment in Report: Suggest reviewing/correcting operation of flap gate.
Action Status: Flap gate normally submerged and closed. Sealing around gate to be inspected and any obstructions to be removed. Gates scheduled to be inspected and identified for yearly maintenance.

Overflow Point No. 032

Comment in Report: Suggest reviewing if river water an intrusion or condition of backflow prevention.
Action Status: Outfall normally submerged completely. River intrusion only reported to be problematic if river level very high. Site scheduled to be inspected to determine if any corrective actions are necessary.

Overflow Point No. 050

Comment in Report: Suggest reviewing/correcting operation of flap gate.
Action Status: Outfall normally submerged completely. Gate scheduled to be inspected and identified for maintenance as necessary.