Operation, Maintenance, and Monitoring Plan

RACER Bay City Industrial Land
Bay City, Michigan

Revitalizing Auto Communities Environmental Response Trust

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The following list tracks revisions to the Operation, Maintenance, and Monitoring Plan and subsequent submittals:

Revision Number	Date	Brief Description of Changes to Plan
Original Submittal	September 23, 2016	Text, Tables, and Figures submitted with Corrective Measures/Remedial Action Plan Construction Completion Report (GHD, September 2016)
1	November 14, 2016	Added Table 3.1, adjusted monthly form (Appendix B), reduced number of pages in Appendix E, complete submittal

Any Changes to the Plan will be incorporated and communicated to field staff, as appropriate.

Table of Contents

1. Introduction 1
   - 1.1 Purpose and Organization of Plan 1
   - 1.2 RACER Site Description 2
2. Remedial Action Plan 2
   - 2.1 Remedial Actions 3
   - 2.2 Remedial Action Plan Components and Modifications 4
     - 2.2.1 Sheet Pile Wall 4
     - 2.2.2 Multi-Layer Cap 4
     - 2.2.3 Groundwater Extraction System 4
     - 2.2.4 Groundwater Treatment System 5
     - 2.2.5 Storm Water Control 5
3. Operation and Maintenance Activities 6
   - 3.1 Exposure Barrier Inspection 6
   - 3.2 Containment Systems Inspection 6
   - 3.3 Permanent Marker and Cornerstone Inspection 6
   - 3.4 Groundwater Extraction Systems 7
     - 3.4.1 Groundwater Extraction System Inspection 7
     - 3.4.2 Extraction Well Pump Maintenance 8
   - 3.5 Groundwater Treatment System Operation 8
     - 3.5.1 Groundwater Treatment System Inspections 10
     - 3.5.2 Groundwater Treatment System Inspections 11
     - 3.5.3 Flow Meter Calibration 12
     - 3.5.4 Groundwater Treatment System Shutdown and Alarms 12
   - 3.6 Storm Water Discharge Inspections 13
   - 3.7 Monitoring Well Inspections 13
4. Monitoring Programs 13
   - 4.1 Groundwater Monitoring Program 13
     - 4.1.1 Hydraulic Monitoring 13
     - 4.1.2 Groundwater Quality Monitoring 14
     - 4.1.2.1 Groundwater Sampling Procedures 14
     - 4.1.2.2 Data Evaluation and Reporting 15
   - 4.2 Groundwater Treatment and Extraction System Program 15
     - 4.2.1 Hydraulic Monitoring 15
     - 4.2.2 Influent/Effluent Quality Monitoring 16
   - 4.3 Storm Water Monitoring 16

Table of Contents

5. Reporting 16
6. Institutional Controls 17
7. Site Health and Safety Plan 17
8. Quality Assurance 17

Figure Index

Figure 1.1 RACER Site Location
Figure 1.2 RACER Site Plan
Figure 4.1 Monitoring Well and Extraction Well Locations

Table Index

Table 3.1 Potential Operating Problems
Table 4.1 Monitoring Well Completion Details and Groundwater Elevations
Table 4.2 Summary of Long-Term Groundwater and Storm Water Monitoring Activities
Table 4.3 Extraction Well Completion Details
Table 5.1 Reporting Requirements
Table 8.1 Analytical Parameters

Appendix Index

Appendix A As-Recorded Drawings
Appendix B Inspection Forms
Appendix C Stratigraphic Logs and Well Completion Details for Monitoring and Extraction Wells
Appendix D Manufacturer Product Information
Appendix E Historical Groundwater Data
Appendix F City of Bay City, Industrial User Discharge Permit
Appendix G Restrictive Covenant

1. Introduction

This report was prepared as the Operation, Maintenance, and Monitoring (OM&M) Plan for Revitalizing Auto Communities Environmental Response Trust (RACER's) Bay City Industrial Land (RACER Site or RACER Property) located at the north end of Crotty Street, Bay City, Michigan. This OM&M Plan summarizes the RACER Site remedy and the operation, maintenance, and monitoring requirements for the Remedial Action implemented at the RACER Site.

On June 1, 2009, General Motors Corporation (GMC) filed for Chapter 11 protection under the U.S. Bankruptcy Code. On July 10, 2009, GMC was renamed Motors Liquidation Company (MLC) and on the same day some of the operating assets of MLC were sold to a newly formed company "General Motors Company." General Motors Company changed its name to General Motors LLC (GM LLC) on October 16, 2009. Assets not sold to GM LLC remained the property of MLC, in its capacity as debtor in possession in the bankruptcy case. An Environmental Response Trust Consent Decree and Settlement Agreement (Settlement Agreement) was entered by the U.S. Bankruptcy Court for the Southern District of New York on March 29, 2011, in the case of In re Motors Liquidation Company, et al., Debtors, Case No. 09 50026 (REG), among the Debtors, the United States of America, certain states including the State of Michigan, the Saint Regis Mohawk Tribe, and EPLET, LLC, (not individually but solely in its representative capacity as Administrative Trustee of the Trust).

Pursuant to the terms of the Settlement Agreement, RACER Trust became effective on March 31, 2011, and interest in the 89 sites formerly owned by MLC, including this Site, were transferred to RACER at that time to conduct, manage, and fund cleanup.

As a result of the bankruptcy process, it was necessary to "separate" the RACER Property from the remaining portion of the Larger Facility (i.e., the adjacent manufacturing facility owned and operated by GM LLC). "Separation" consists of providing for separate utilities for each property, including electricity, storm water management, and treatment for impacted groundwater.

As a result of the Site separation, RACER has constructed a groundwater treatment system and has plans to modify storm water management on RACER's Property.

A generalized OM&M Plan was submitted to Michigan Department of Environmental Quality (MDEQ) as part of the 1999 amended Remedial Action Plan (RAP), for the General Motors Powertrain Group, Bay City Plant.

The Site-specific OM&M Plan presented herein is a continuation of the previous document detailing inspection and maintenance activities for specific aspects of the 1999 amended RAP that pertain to the RACER Site.

1.1 Purpose and Organization of Plan

The purpose of the OM&M Plan is to provide a synopsis of the RACER Site remedy and the operation, maintenance, and monitoring requirements for the Remedial Action implemented at the RACER Site. The OM&M Plan is organized as follows:

- Section 1 - Presents a general introduction to the RACER Site and the purpose and organization of the OM&M Plan.
- Section 2 - Presents a description of the remedial actions for the Site including an explanation of modifications to the plans that were required when the Site was split between RACER and GM LLC.
- Section 3 - Presents the RACER Site operation and maintenance activities.
- Section 4 - Presents the monitoring programs.
- Section5 - Presents the reporting requirements.
- Section 6 - Presents the institutional controls.
- Section 7 - Presents the Site Health and Safety Plan for long-term operation, maintenance, and monitoring activities.
- Section 8 - Presents the Site Quality Assurance Project Plan, including sampling and analysis procedures.

1.2 RACER Site Description

The RACER Site was a portion of a larger automotive components manufacturing facility (Larger Facility) previously owned and operated by General Motors Corporation (GMC) prior to its June 2009 bankruptcy filing (approximately 116 acres). Figure 1.1 presents the RACER Site Location and Figure 1.2 presents the RACER Site Plan. The RACER Site is approximately 10 acres. With the exception of the RACER Property, the remainder of the Larger Facility was acquired by General Motors LLC (GM LLC and GM LLC Bay City Plant). The RACER Property is bounded to the north by the Saginaw River, to the south and east by the GM LLC Bay City Plant and to the west by property owned by CSX Transportation. The RACER Property is surrounded by a mix of industrial and commercial properties.

The RACER Property is primarily comprised of two former areas:

1. The Machine Storage Area (MSA) which was a peninsula of land (approximately 5 acres in size) completely surrounded by a Slurry Wall and Deep Soil Mixing Wall (DSMW) installed in the 1980s.
2. Former Crotty Street Channel (CSC) (approximately 5 acres in size), which was formerly owned by CSX Transportation and GMC, and was connected to the Saginaw River prior to the remedial actions completed in 2000.

2. Remedial Action Plan

Remedial actions were undertaken to address the environmental contamination at the Larger Facility in accordance with Part 201 pursuant to the GMC/State of Michigan On-Site Consent Judgment dated December 14, 1992 (Civil Action No. 92-3740-CE). A final FS report was submitted to MDEQ in June 1997 and a Final Draft Remedial Action Plan (RAP) was submitted to MDEQ on June 18, 1998 (1998 RAP). The 1998 RAP was amended on December 14, 1999 to include the former CSC (combined, the 1999 amended RAP). The former CSC became the western property

boundary of the Larger Facility. The components of the 1999 amended RAP, specific to the RACER Site included: sheet pile and slurry containment walls; vegetated multi-layer cap; a concrete cap over a small area to prevent contact with soil impacted by PCBs; a 12-inch vegetated soil cap to prevent contact with impacted soil; groundwater extraction and treatment; operation, monitoring, and maintenance; a permanent marker; and institutional controls.

All proposed remedial actions were implemented to the satisfaction of MDEQ by 2000, with the exception of the proposed institutional controls and installation of permanent markers.

The institutional controls were implemented on November 9, 2015 when RACER recorded a Declaration of Restrictive Covenant (DRC). The DRC was recorded to prevent damage to or disturbance of any component of the constructed remedy/corrective measures or storm water management system, to prohibit or restrict activities that could result in unacceptable exposure to environmental contamination, and to provide notification of PCB remediation waste present at the Subject Property.

The locations of the permanent marker plaque and cornerstones were approved by MDEQ via email on November 4, 2015. The permanent markers and cornerstones have been manufactured and purchased. Installation of the permanent markers has been delayed as a result of the planned storm water modifications and will be installed once the storm water work is completed.

2.1 Remedial Actions

The implemented remedial actions specific to the RACER Site are as follows:

- Sheet pile wall
- Multi-layer cap
- Groundwater extraction system: MSA and CSC
- Groundwater treatment system
- Existing storm water collection systems modification
- Soil excavation
- Sediment removal or stabilization
- Paving
- Institutional controls
- Fencing
- Groundwater monitoring
- Operation and maintenance
- Permanent markers and cornerstones (to be installed)

The remedial actions will be operated, maintained, and monitored as described in this report. The operation, maintenance, and monitoring activities described herein will be conducted for as long as chemicals pose a risk to public health, safety, welfare, and the environment.

2.2 Remedial Action Plan Components and Modifications

The following sections describe the remedial action components specific to the RACER portion of the Site.

2.2.1 Sheet Pile Wall

Beginning at the northern end of the MSA, the sheet pile wall is keyed into the MSA deep soil mixing wall (DSMW) prior to leaving the shoreline in a westward direction. The sheet pile wall extends in a westerly direction across the mouth of the CSC, continuing west to within close proximity to the Crotty Street Property line continuing south down the west side of the Crotty Street Property, and then turns east and connects to the DSMW on RACER Property (See Appendix A.1 for as-recorded drawing S-02AR).

The sheet pile wall across the mouth of the channel is of dual wall construction for structural stability. The backfill between the walls is clean imported clay. The remainder of the sheet pile wall down the west and south sides of the Crotty Street Property is a single wall. The design life of the sheet pile wall is 40 years.

Across the mouth of the channel the piling has been extended to a depth of 55 feet (ft) with a top-of-wall elevation of 588 ft above mean sea level (AMSL).

2.2.2 Multi-Layer Cap

A multi-layer cap has been placed over the area contained by the sheet pile wall, and the MSA DSMW. The cap will reduce storm water infiltration and prevent direct contact to underlying soil. The cap is graded to direct storm water runoff to catch basins which are connected to a series of storm sewers that ultimately discharge to the Saginaw River through two National Pollutant Discharge Elimination System (NPDES) permitted outfalls. The cap primarily covers the MSA and the CSC (See Appendix A.1 for as-recorded drawing C-08AR).

2.2.3 Groundwater Extraction System

Three groundwater extraction systems were installed as part of the RAP to dewater the Larger Facility; the Lagoon Area (LA), the MSA and the CSC area to maintain an inward gradient to the Larger Facility. The extracted groundwater was collected and discharged to the storm water/non-contact cooling/groundwater treatment system located on and serving the GM LLC Bay City Plant. As part of bankruptcy required separation activities a new groundwater treatment system was constructed by RACER (as described in the next Section) and modifications were made to the groundwater extraction system, which included:

- Prior to completing the separation activities, the CSC area was originally dewatered through three sumps (EW-13, EW-14, and EW-15), which were constructed in the channel prior to the channel being backfilled with granular material. The extracted groundwater was collected through a series of forcemains and gravity sewers and was ultimately discharged to the GM LLC Bay City Plant storm water/non-contact cooling/groundwater treatment system. As a result of the porous nature of the soils in the CSC, the CSC extraction system was modified to operate using one peristaltic pump (with an operating range of 0.26 to 2.55 gallons per minute

[gpm]) in EW-15 controlled through a PLC to dewater the former channel. Extracted groundwater is discharged through a subsurface pipe to the groundwater treatment system for treatment.

- Prior to completing the separation activities, the MSA was originally dewatered through the extraction of groundwater in seven extraction wells (EW-6, EW-7, EW-8, EW-9, EW-10, EW-11, and EW-12) which were screened at depths of 5 to 19 ft below ground surface (bgs) in the shallow sand/fill. From review of operating data collected since 2000, it appeared that the seven extraction wells/pumps exceeded the capacity needed to adequately dewater the area. The MSA extraction system was modified to provide for the use of peristaltic pumps (each with an operating range of 0.017 to 0.167 gpm), in three groundwater extraction wells (EW-6, EW-8, and EW-12) to dewater the area. The extraction wells were equipped with level sensors providing shut off signals to the pumps if a dry well condition occurs. The extraction pump controls in EW-6, EW-8, and EW-12 are within each individual extraction well chamber.
- All extracted groundwater from the MSA and CSC was re-routed to EW-15 which discharges via subsurface piping to RACER's groundwater treatment system for subsequent treatment prior to being discharged to the Bay City sanitary sewer in accordance with the Industrial User discharge permit.

As-recorded drawings for the modifications to the groundwater extraction system are included in Appendix A.2.

2.2.4 Groundwater Treatment System

The new groundwater treatment system includes above and below grade components and is designed to treat water at a nominal rate of 2 gpm. The treatment system incorporates aeration, settling, bag filtration and granular activated carbon (GAC) filtration to remove contaminants of concern. Below grade components primarily consist of two 1,250-gallon (gal) capacity precast concrete tanks, two 4-ft diameter precast concrete manholes, interconnecting piping, power/control conduit and wiring. Above grade components primarily consist of a 10-ft x 12-ft precast concrete building relocated from the southeast corner of the Site that houses two GAC filtration vessels, three bag filter housings, discharge feed pump, sludge transfer pump, aeration blower, interconnecting piping and valves, system instrumentation, PLC based controls, power/control conduit and wiring, a flow meter and other associated appurtenances. After treatment, treated groundwater is discharged to the City sanitary sewer under an Industrial User Discharge permit.

As-recorded drawings for the groundwater treatment system are included in Appendix A.2.

2.2.5 Storm Water Control

The multi-layer cap over the MSA and the CSC area is graded so that surface water flows are directed to two storm water collection inlets in the MSA. Surface water that infiltrates through the soil layer of the cap will drain via the geonet layer, and collect in the same two storm water inlets. Collected storm water is routed from the inlets through subsurface pipes to the GM LLC Bay City Plant storm water/non-contact cooling/groundwater treatment system where it is treated and used as non-contact cooling water or discharged to the Saginaw River under NPDES permit MI0001121.

As part of the RACER Site separation activities, work is ongoing to segregate storm water at the RACER Property and manage it separately from the GM LLC Bay City Plant. RACER is currently working with GM LLC to obtain the necessary agreements for re-routing the storm water.

3. Operation and Maintenance Activities

The monitoring, operation, and maintenance activities at the Site are related to the exposure barriers (e.g., paving, or clay barriers), multi-layer cap, containment systems (e.g., deep soil mixing walls or sheetpiling), groundwater extraction and treatment systems, fences institutional controls, and monitoring wells.

3.1 Exposure Barrier Inspection

Exposure barriers (multi-layer cap, concrete cap, soil cap, and building floor slab), in conjunction with restrictions/prohibitions (which have been placed established for impacted, subsurface soils and sediments located in the MSA and CSC area), are designed to prevent human exposure to these materials. As part of RACER Site inspection activities, each of the above-mentioned areas are field-inspected quarterly for any signs of trespassing or disturbance that may have exposed subsurface soils or sediments. Possible disturbances observed during field inspections include impairment to new or existing pavement, grading, trenching, or excavating activities, animal burrows, growth of woody plants, or erosion of soils in restricted areas. An inspection form is completed to document each RACER Site field inspection.

Maintenance is conducted as visual inspections deem necessary and may include regrading, trapping animals, filling in animal burrows, removal of woody growth, repair of settled or eroded areas, and replacement of deteriorated pavement or liners.

3.2 Containment Systems Inspection

Restrictions/prohibitions were placed on the areas where the containment structures are located (MSA and CSC). These are designed to restrict any activities that may impair the integrity of the containment systems located in these areas. These containment systems include the DSMW and Sheet Piling installed along the Saginaw River and west side of the RACER Property.

The condition of the sheet piling and associated components (cap welds, whaler beams and tie rods) will be visually assessed during each Site inspection performed to look for signs of deterioration, rusting, deformation, excessive movement or visible leakage. All unusual sightings will be noted on the inspection form (Appendix B). Maintenance will be conducted as inspections deem necessary to maintain the integrity of the containment systems. In addition, groundwater recovery rates will be reviewed quarterly for indication of failure of the sheet pile wall or DSMW.

3.3 Permanent Marker and Cornerstone Inspection

Locations for permanent markers for the RACER Site are identified in Exhibit 5 of the Restrictive Covenant. The details for the plaque to be installed on the permanent monument was reviewed and approved by MDEQ via email on November 4, 2015. The permanent markers have been

manufactured and purchased. Installation of the permanent markers has been delayed as a result of the planned storm water modifications and will be completed once the storm water work is completed.

Once installed, the permanent markers will be visually inspected quarterly for signs of deterioration and visibility. All unusual sightings will be noted on the inspection form (Appendix B). Maintenance will be conducted as inspections deem necessary to maintain the integrity and visibility of the permanent markers.

3.4 Groundwater Extraction Systems

The groundwater extraction system installed within the areas contained by the DSM wall in the MSA and within the area contained by the DSM wall and the sheetpile wall in the CSC is designed to reduce groundwater levels within each containment area and to maintain an inward hydraulic gradient. Groundwater is extracted from groundwater extraction wells EW-15, EW-6, EW-8, and EW-12 which are located on as-recorded Figure C-03 presented in Appendix A.2. Stratigraphic logs and well completion details for the extraction wells are presented in Appendix C. The shallow extraction wells are screened at depths of 5 to 19 ft bgs in the shallow sand/fill.

Existing groundwater extraction wells EW-6, EW-8, and EW-12 located in the MSA are equipped with new peristaltic type pumps that are locally controlled with an operating range of 0.017 to 0.167 gpm at a pressure of ≤30-psig and existing groundwater extraction well EW-15 is equipped with a new peristaltic type extraction pump that is operated through the PLC with an operating range of 0.26 to 2.55 gpm at a pressure of ≤30-psig. The extraction pumps in EW-6, EW-8, and EW-12 are equipped with a locally mounted nonresettable run timer, and conductivity type level sensors providing shut off signal to the pumps if a dry well condition occurs. The extraction pump controls in EW-6, EW-8, and EW-12 are local controls only and are not equipped to communicate with the PLC at the treatment building (i.e., once the pump is turned off, it must be manually turned back on).

Groundwater extracted from each extraction well discharges to RACER's groundwater treatment system, as further described in Section 2.2.4 for subsequent treatment prior to being discharged to the City sanitary sewer in accordance with the Industrial User discharge permit. Effluent from the groundwater treatment system is monitored semi-annually, as required by the Industrial User Permit and further described in Section 4.2.2.

The following sections are a detailed description of data collection and documentation, and extraction well components which will require inspection and maintenance.

3.4.1 Groundwater Extraction System Inspection

As part of Site inspection activities, the groundwater extraction systems will require monthly inspections to ensure proper operation of pumps and controls. All O&M activities related to the groundwater extraction systems should be recorded in the inspection form. A copy of the inspection form is presented in Appendix B.

Extraction well vaults will be checked for deterioration of the structure, lids, system piping and any and all system components. Observation will be noted in the inspection form and any repairs will be made in a timely basis.

Extraction well pumps will be inspected to confirm operation. Water level monitoring will be conducted as further detailed in Section 4.2.1, to confirm target levels are being met. The pump speed may be adjusted to account for seasonal fluctuations in the water levels.

Visual inspection will be conducted during operating season for proper heater functioning.

3.4.2 Extraction Well Pump Maintenance

Watson-Marlow model 521 VI/R2C peristaltic pumps are electrically operated in EW-6, EW-8, and EW-12 and Watson-Marlow model 621 VI/R peristaltic pump is electrically operated in EW-15. Manufacturer production information for the peristaltic pumps are enclosed in Appendix D1.1 as well as other extraction system components. Maintenance activities may include such activities as cleaning and repairing or replacing parts (tubing) in the pump or in the discharge lines and removal of iron bacteria.

Pump maintenance will be completed as necessary. Observations will be noted in the inspection form including presence of iron bacteria accumulation, product, silt and any deterioration of the pump, hoses, fittings, and other appurtenances. Pump maintenance is to be conducted by service personnel in a safe and orderly manner, wearing proper PPE and using appropriate tools. Waste, rinse water, spent solution and new solution is to be stored in appropriate containers with proper labeling. Storage and work areas are to be properly identified and secured, as necessary, to protect non O&M personnel. Disposal of pump maintenance by-products will be coordinated by O&M personnel.

Manufacturer product information for appurtenances of the extraction well system is included in Appendix D1.2 (tubing), D1.3 (level sensor), and D1.4 (heater).

3.5 Groundwater Treatment System Operation

The groundwater treatment system is designed to treat groundwater from the extraction well network for removal of total suspended solids (TSS), volatile organic carbons (VOCs), and polychlorinated biphenyls (PCBs). See below for a summary of the groundwater treatment system operation.

A. Impacted groundwater is extracted through peristaltic pumps located in each well enclosure from MSA wells EW-6, EW-8, and EW-12 and discharged to the EW-15 vault.

B. Impacted groundwater that collects in the EW-15 sump from the CSC and from the MSA wells is extracted through a peristaltic pump and discharged to the groundwater treatment system.

C. Groundwater is pumped from EW-15 to the treatment building and passes through a 55-gal plastic inspection drum. The inspection drum serves a dual purpose in that it provides an influent inspection/sampling point and can be utilized as a chemical injection and mixing point, if necessary at a later date.

D. Extracted groundwater then flows by gravity from the inspection drum to the 1,250-gal aeration tank. The aeration tank is the first stage of treatment and is equipped with a 0.75-hp GAST blower and coarse bubble diffusers to promote oxidation of iron and other contaminants. The aeration is a critical treatment stage and the blower will operate continuously during the treatment plant operation. Gas from the tank is passively vented from the tank.

E. An air flow gauge and transmitter is included on the discharge from the blower to monitor airflow to the diffusers. If the airflow drops below the minimum set point of 4.0-cfm or above the maximum set point of 9.0-cfm, an alarm condition will be indicated at the PLC and a notification will be sent to the O&M technician. In addition to the alarm condition, the feed pump and all extraction well pumps will be disabled.

F. From the aeration tank, effluent flows by gravity to the Settling Tank which has an operating capacity of 280-gal plus a 70-gal sludge hopper. The settling tank is equipped with a central inlet well and peripheral effluent trough with scum baffle that allows clear water discharge to flow by gravity to the Clear Well.

G. The bottom of the settling tank slopes to a central sump where the suction line for sludge transfer pump is located. Collected solids are pumped quarterly or as necessary using the Watson Marlow 621 S/R peristaltic pump to the 1,250 gal concrete sludge holding tank.

H. Sludge generation rate is anticipated to be approximately 720-gal per month (assuming 3 percent solids) when the system is operating at the 2-gpm capacity. The sludge transfer pump is operated through the PLC based on operator settings for pumping frequency and duration. Sludge is removed from the sludge holding tank periodically via vac truck and shipped off site for disposal. At the 2-gpm system capacity the sludge holding tank is sufficient to provide up to 10 weeks of sludge storage.

I. The sludge holding tank is equipped with a high level float that will indicate an alarm condition at the PLC and a notification will be sent to the O&M technician. In addition to the alarm condition, sludge transfer pumping from the settling tank will be disabled.

J. Clarified effluent overflows from the settling tank to the clear well which has a 280-gal operating capacity. From the clear well, wastewater is extracted through the feed pump tubing which is within a 4-inch screen. If a high-high level condition in the clear well is reached an alarm will be indicated at the PLC and a notification will be sent to the O&M technician. In addition to the alarm condition, the feed pump and EW-15 pump will be disabled.

K. The feed pump is operated through the PLC based input from high and low level float switches located in the clear well. The discharge from the clear well is pumped through three 8-inch diameter by 30-inch depth bag filter housings equipped with 25-micron bag filters.

L. The bag filter housings are manifolded together to operate in parallel and are intended to provide sufficient filter capacity for the system to operate for extended periods (i.e., > 1-month) without the need for maintenance by an O&M technician.

M. The bag filter operation is monitored by the pressure indicator on the inlet of the filter manifold. When a high pressure condition is reached, indicating that filter bags are plugged,

then an alarm will be indicated at the PLC and a notification will be sent to the O&M technician. In addition to the alarm condition, the feed pump and EW-15 pump will be disabled.

N. Following the bag filters, the water will pass through two granular activated carbon (GAC) filter drums for final polish treatment before discharging to the City sewer system. The GAC drums are operated in series (lead-lag) and are equipped with a pressure sensor on the inlet to lead GAC unit. When a high pressure condition is reached, indicating that filter units are plugged, then an alarm will be indicated at the PLC and a notification will be sent to the O&M technician. In addition to the alarm condition, the feed pump and EW-15 pump will be disabled.

O. The treatment system is also equipped with an effluent flow meter. The flow meter provides an instantaneous flow reading and totalized value at the PLC.

3.5.1 Groundwater Treatment System Inspections

As part of Site inspection activities, the groundwater treatment system will require monthly inspections to ensure proper operation. All O&M activities related to the treatment extraction system should be recorded in the inspection form. A copy of the inspection form is presented in Appendix B.

Exterior Treatment Building Inspection

- Conduct exterior building inspection including: noting evidence of vandals, loose wires, general housekeeping, and exterior light confirmation.
- Open manholes for each underground chamber (aeration tank, settling tank, sludge tank, and clear well) and check for deterioration of the structure, lids, system piping and any and all system components.
- For the aeration tank, confirm visually that the aerator is producing bubbles evenly over the chamber. In addition, inspect chamber components for leaks, iron bacteria or sediment build-up.
- For the settling tank, take measurement of the amount of sediment in the tank and operate the feed pump as necessary to remove sludge. In addition, inspect chamber components for leaks and iron bacteria.
- For the sludge tank, take measurement of the amount of sediment in the tank and schedule removal as necessary. In addition, inspect chamber components for leaks and iron bacteria.
- For the clear well, confirm operation of the feed pump and associated floats. In addition, inspect chamber components for leaks, iron bacteria, and sediment build-up.

Interior Treatment Building Inspection

- Conduct interior building inspection including: noting evidence of vandals, loose wires, general housekeeping, and leaks.
- For the inspection drum, inspect the drum for leaks and note any unusual coloring or cloudiness with the influent.

- For the blower, inspect for leaks and record pressures.
- For the bag filters, inspect for leaks and record pressures.
- For the GAC filters, inspect for leaks and record pressures.
- Visual inspection of the PLC will be conducted by checking for physical impairments.
- Record the instantaneous flow reading as well as the totalized flow reading.
- Visual inspection will be conducted during operating season for proper heater functioning.

3.5.2 Groundwater Treatment System Inspections

GAST Model 102301010-E-279 blower electrically operates in the treatment building to produce air for the aeration tank. Manufacturer production information for the blower is enclosed in Appendix D2.1. In the event the pressure in the blower exceeds normal operating range, maintenance activities may include removing and cleaning the aeration piping, removing sediment from the aeration chamber, or replacement of the aerator.

Regular maintenance will be required on the settling tank to remove accumulated sediment and store in the sludge tank. Once the sludge tank is 3/4 full, an approved vendor will be scheduled to remove and dispose of the sediment in an appropriate manner.

Watson Marlow model 621 VI/RE2 pump is electrically operated in the clear well to pump water through the bag filters, GAC filters and ultimately to discharge to the City sanitary sewer. Manufacturer production information for the pump is enclosed in Appendix D1.1. Maintenance activities may include such activities as cleaning and repairing or replacing parts in the pump or in the discharge lines.

Three model Rosedale Products Inc. (Model No. 8-30-2P-1-150-C-B-S-PB) basket strainer and bag filters operate in parallel for the system to operate for extended periods require regular maintenance. Manufacturer production information for the filters is enclosed in Appendix D2.2. As the filters become clogged as would be evidenced by pressures above the operating range, filters should be removed and replaced. The specification for the replacement bag filters are: PE-25-P2S for the 25 micron filter bag and PE-10-P2S for the 10 micron filter bag.

Two ArtCorp. model D16 GAC filters in parallel provide final polish treatment. Manufacturer production information for the filters is enclosed in Appendix D2.3. The GAC filters require regular maintenance as the carbon is used up as evidenced by pressures above the operating range or leaks. When the GAC has reached the end of its useful life, the carbon is removed and replaced with new carbon.

Maintenance is to be conducted by service personnel in a safe and orderly manner, wearing proper PPE and using appropriate tools. Waste, rinse water, spent solution and new solution is to be stored in appropriate containers with proper labeling. Storage and work areas are to be properly identified and secured, as necessary, to protect non O&M personnel. Disposal of maintenance by-products will be coordinated by O&M personnel.

Manufacturer product information for other appurtenances of the groundwater extraction system are included in Appendix D as identified below:

- Appendix D2.4 – Treatment Building Heater (Dayton)
- Appendix D2.5 – Control Switch (SJE Milliampmaster)
- Appendix D2.6 – In-Line Flow Transmitters (Dwyer)
- Appendix D2.7 – PLC Control Panel (Ino-Tek)
- Appendix D2.8 – RSLogix 500 (Rockwell Automation)
- Appendix D2.9 – Heavy Duty Switch (Siemens)
- Appendix D2.10 – Power Supply
- Appendix D2.11 – Altronic Switch Gauge
- Appendix D2.12 – Lighting (Lithonia)
- Appendix D2.13 – NEMA 2R Hinge Cover
- Appendix D2.14 – Alarm System Communication (Verbatim)
- Appendix D2.15 – Sensor (Gems)

3.5.3 Flow Meter Calibration

The Gems magnetic flow meter was selected to record flow volumes from the groundwater treatment system. Manufacturer product information is enclosed in Appendix D2.16. Meter calibration will be checked and reported at 6 month intervals.

3.5.4 Groundwater Treatment System Shutdown and Alarms

If an alarm occurs for any reason, an evaluation of the system is required before restarting and actions taken should be recorded in the inspection form (Appendix B). The groundwater treatment system will automatically shut down if any of the following occurs:

- Low level in EW15
- High-High alarm in the clear well
- Pressure alarm from the bag filters
- Pressure alarm from the GAC filters
- Pressure alarm from the aerator
- Power failure

The potential sources and solutions for operating problems which may be encountered with the groundwater extraction and treatment system are summarized in Table 3.1.

3.6 Storm Water Discharge Inspections

The condition of the storm water catch basins/outlets will be inspected during Site inspection activities. Evidence of debris or excessive siltation or any damaged or crushed piping will be recorded. Maintenance will be performed as needed. Any collection system piping that has been crushed or damaged will be replaced. Debris and excessive siltation will be removed from the catch basin sumps/outlets, as necessary.

3.7 Monitoring Well Inspections

Monitoring wells will be inspected annually for signs of damage or wear and tear such as rusted or broken locks or bent well casings. Signs of an inadequate seal, such as a cracked or mounded concrete pad, a missing well cap, or a loose cover will also be noted. Additionally, total depths will be collected to check for signs of silting or erosion of the well screen. Any unusual conditions will be noted in the field notebook. An effort will be made to repair or replace any damaged item. If there is evidence of tampering or damage which could impair sample integrity, the well will not be sampled. Monitoring wells must be inspected and replaced if any damage occurs which makes them unusable.

4. Monitoring Programs

Groundwater, storm water, and treatment system monitoring will be undertaken at the Site in order to ensure that materials are not migrating off-Site and to monitor the effectiveness of the implemented remedial actions on the RACER portion of the Site.

4.1 Groundwater Monitoring Program

The purpose of the groundwater monitoring program is to monitor groundwater quality, and to evaluate the performance of remedial actions.

The groundwater monitoring program will consist of the following components:

i. Hydraulic monitoring (all monitoring wells)

ii. Groundwater quality monitoring (7 selected monitoring wells)

The monitoring program will continue for the same duration as O&M activities continue for the Site.

4.1.1 Hydraulic Monitoring

Groundwater elevations will be monitored annually during groundwater sampling activities for 24 monitoring wells. USGS station 04157060 (approximately 1 mile upstream of the Site) will be used for Saginaw River water elevations. The purpose of the hydraulic monitoring program is to evaluate the performance of groundwater containment remedial actions. This includes the groundwater extraction systems. Figure 4.1 shows long-term monitoring well locations, USGS station 04157060. Monitoring well logs for these wells are presented in Appendix C.

For every hydraulic monitoring event, the following procedures will occur and be recorded for each of the above mentioned wells:

1. Monitoring wells will be inspected for signs of damage or wear and tear. If there is evidence of tampering or damage that could impair the ability to accurately measure the static water level, the water level within the well will not be measured, and all corrective measures will be taken to repair the damaged well.
2. Static water level measurements will be taken using an electronic water level indicator to a precision of 0.01 ft. The depth to water will be referenced from the top of the riser pipe. Each measurement will be converted into a mean sea level elevation.

All static water level measurements for an event will be taken within a 24-hour period.

The monitoring well completion details and historical groundwater elevations are presented in Table 4.1. Table 4.2 presents the frequency of hydraulic monitoring.

4.1.2 Groundwater Quality Monitoring

The groundwater quality monitoring program will be conducted annually and will consist of both shallow aquifer groundwater and deep sand aquifer groundwater. The proposed monitoring wells and parameters for groundwater sampling are presented in Figure 4.1 and Table 4.2, respectively. Monitoring well logs for these wells are presented in Appendix C. Historical groundwater analytical data is presented in Appendix E. The groundwater quality monitoring program may be re-evaluated at any time; however, modifications to the plan must be approved by the MDEQ.

4.1.2.1 Groundwater Sampling Procedures

Groundwater samples will be collected immediately following development or purging. All sampling equipment will be cleaned, prior to use. All monitoring wells will be sampled according to the following protocols:

1. New disposable latex gloves will be used when sampling each well.
2. The sampler will measure and record the depth to water in each well to the nearest 0.01 ft using an electric tape. The electric tape will be cleaned prior to use in each well.
3. Standing water will be purged with a low flow pump designed for a flow rate between 0.1 L/min and 0.5 L/min, with a maximum drawdown of 0.3 ft. Temperature, pH, conductivity, turbidity, and DO will be recorded every ten minutes of purging until each water quality parameter has stabilized for three consecutive readings, and the water is deemed to be silt free. All waste groundwater not used for sampling will be treated in the RACER on-Site groundwater treatment system. Calibration of field instruments will be undertaken prior to each sampling event or at the beginning of the day. In the event that a well is purged dry at a rate of 0.1 L/min, groundwater will be permitted to recover to a level sufficient for sample collection.
4. After purging, water samples will be collected using either a peristaltic pump or bladder pump with polyethylene tubing, except where samples will be analyzed for VOCs. Where VOCs will be analyzed, bladder pumps and dedicated Teflon coated tubing will be used. Groundwater

samples will be taken in appropriately preserved, laboratory supplied containers, using the appropriate pump with a flow rate between 0.1 L/min and 0.5 L/min.

5. Containers for sample collection and preservation requirements will be determined as required by the analytical parameters. All sample bottles will be provided by the laboratory and will be prepared using standard laboratory validated washing procedures. The sample bottles will be delivered to the Site in sealed containers. The containers will be labeled with the sample ID, date, time, analysis requested, preservative added, and sampler's initials.
6. A blind field duplicate sample will be collected at a minimum frequency of 1 in 10 groundwater samples.
7. Samples for matrix spike/matrix spike duplicate analysis will be collected at a minimum frequency of 1 per 20 samples.
8. A rinsate blank sample will be collected at a minimum frequency of 1 in 10 groundwater samples. The rinsate sample will consist of deionized water pumped through and then sampled out of, a cleaned pump. This will provide a quality assurance check on the field decontamination procedures employed on the pumps.
9. All disposable gloves, and other solid waste materials will be placed in an appropriate landfill.
10. All samples will be placed in a cooler that maintains a temperature of approximately 4°C. Chain-of-custody forms will be completed in the field and will accompany the sample shipment to the analytical laboratory.

4.1.2.2 Data Evaluation and Reporting

The analytical results for groundwater quality monitoring, once received from the laboratory, will undergo a thorough inspection and data validation will be undertaken to determine if the data is acceptable for use in the monitoring program. If the data is deemed acceptable for use, the data will be entered into a computer database and submitted to the MDEQ in the annual report.

4.2 Groundwater Treatment and Extraction System Program

The purpose of the groundwater treatment and extraction system monitoring program is to monitor effluent quality, and to evaluate the performance of remedial actions.

The groundwater treatment and extraction system monitoring program will consist of the following components:

i. Hydraulic monitoring (10 extraction wells)

ii. Influent/effluent quality monitoring

The monitoring program will continue for the same duration as O&M activities continue for the Site.

4.2.1 Hydraulic Monitoring

Water levels from the 10 extraction wells are to be recorded monthly, as required to evaluate system operation, using a dual phase probe to an accuracy of ±0.01 ft. Pump elevation is to be

adjusted accordingly to ensure an optimum operation. All collected data and adjustments are to be recorded in the inspection form.

The procedures for collecting water levels from the extraction wells will be conducted in accordance with the procedures identified in Section 4.1.1.

The extraction well completion details are presented in Table 4.3.

4.2.2 Influent/Effluent Quality Monitoring

The effluent quality monitoring will be conducted semi-annually in accordance with the City of Bay City Industrial Use Permit No. 120807 (Appendix F). The parameters, frequency and type of sample of the effluent are summarized in Table 4.2. At a minimum, the influent to the groundwater treatment system will be sampled semi-annually from each of the CSC and MSA extraction systems and analyzed for PCBs. Additional parameters may be tested to evaluate the effectiveness of the groundwater treatment system. The groundwater quality monitoring program may be re-evaluated at any time; however, modifications to the plan must be approved by the MDEQ.

The analytical results for influent/effluent quality monitoring, once received from the laboratory, will undergo a thorough inspection and data validation will be undertaken to determine if the data is acceptable for use in the monitoring program. If the data is deemed acceptable for use, the data will be entered into a computer database and submitted to the MDEQ in the annual report. In accordance with the Bay City Industrial Use Permit No. 120807, an Industrial User Monitoring Report will be submitted semi-annually due on the 30th day of July and January each year.

4.3 Storm Water Monitoring

As storm water from the RACER Site currently is transmitted to the GM LLC Bay City Plant storm water/non-contact cooling/groundwater treatment system, there are no monitoring requirements for storm water from the RACER Site.

5. Reporting

A report summarizing Site inspection, maintenance activities and monitoring shall be prepared by RACER and submitted to the MDEQ annually. The plan may be re-evaluated at any time; however, modifications to the plan must be approved by the MDEQ. Monitoring and O&M activities will continue until contaminants on Site no longer exceed applicable criteria.

The report shall document the results of the Site inspection, any necessary maintenance/repair activities, and monitoring results.

All reporting requirements have been summarized in Table 5.1.

6. Institutional Controls

Institutional controls have been implemented to ensure the integrity of the remedy in the form of a Restrictive Covenant which was recorded on November 9, 2015 by RACER for the benefit of the MDEQ. The Restrictive Covenant has been prepared and recorded to prevent damage to or disturbance of any component of the constructed remedy/corrective measures or storm water management system, to prohibit or restrict activities that could result in unacceptable exposure to environmental contamination, and to provide notification of PCB remediation waste present at the RACER Property. A copy of the Restrictive Covenant is provided in Appendix G.

7. Site Health and Safety Plan

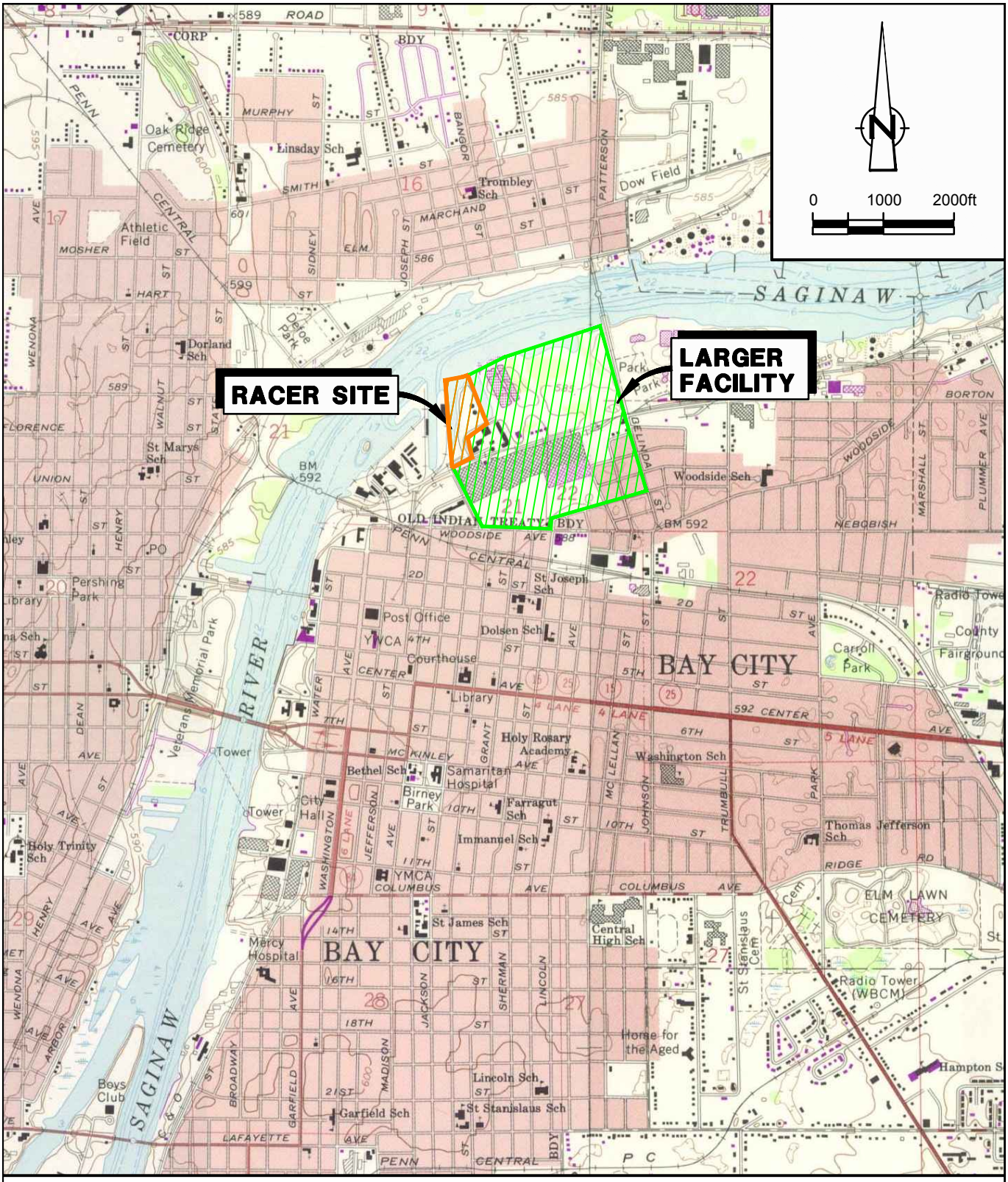
The health and safety procedures for the long-term operation, maintenance, and monitoring activities at the Site are incorporated within the Site Health and Safety Plan (HASP).

8. Quality Assurance

A certified analytical laboratory will be retained to perform the analyses for the groundwater monitoring program. Samples will be analyzed as specified under Part 201 of Act 451.

Quality Control/Quality Assurance samples will be collected as part of the sampling program. These samples will consist of duplicates, equipment rinsate blanks, matrix spike and matrix spike duplicates, and trip blanks. One duplicate sample will be collected for every ten investigative samples. One equipment blank and duplicate will be collected for every ten investigative samples with a minimum of one per day. One matrix spike and one matrix spike duplicate will be collected for every 20 investigative samples. One trip blank will be collected with each shipment of VOCs.

All sample parameters analyzed including analytical method numbers, and target detection limits are presented in Table 8.1.



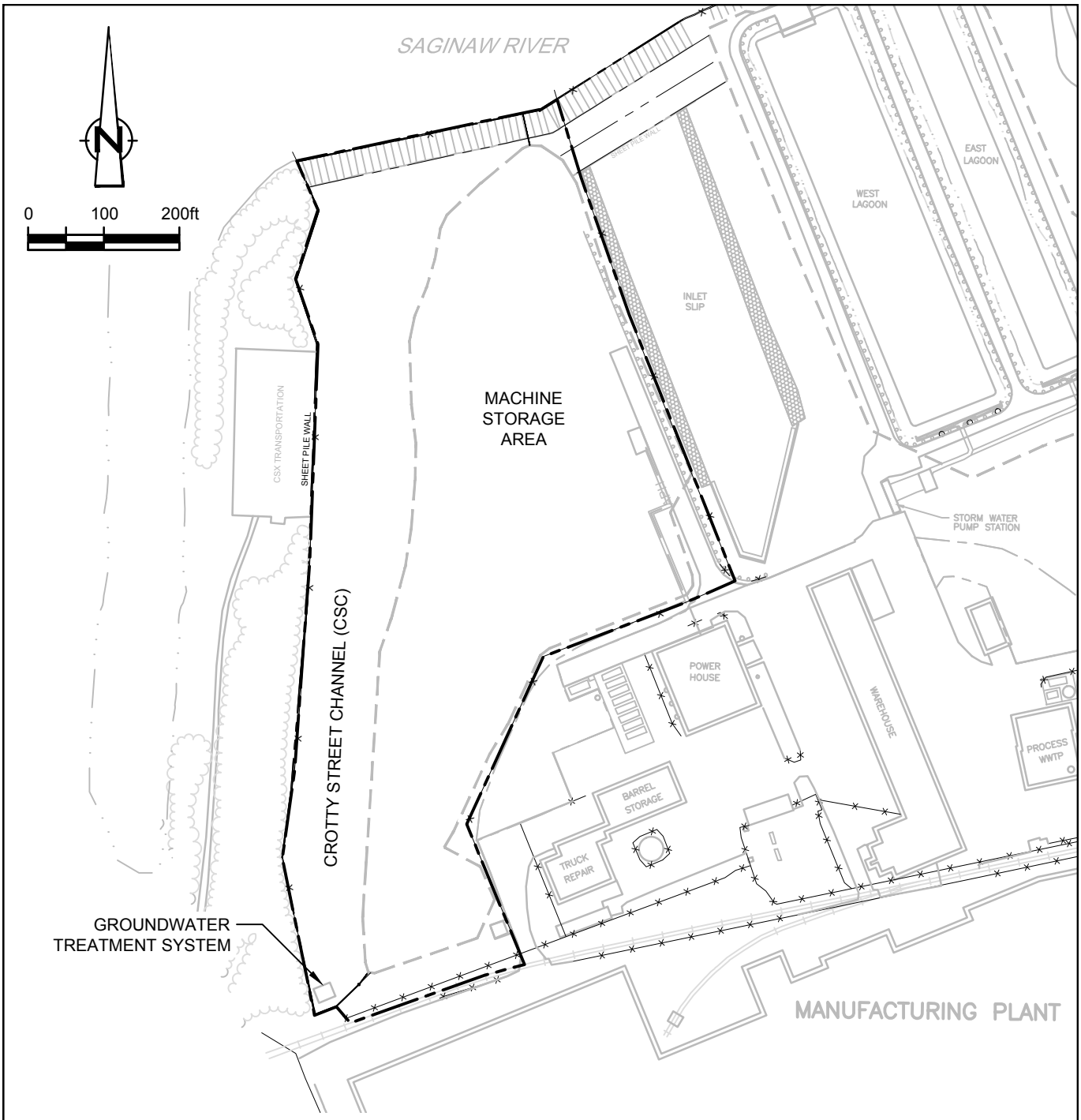
SOURCE: U.S.G.S. QUADRANGLE MAPS;
BAY CITY AND ESSEXVILLE, MICHIGAN
1967 (PHOTO REVISED 1973)

figure 1.1

RACER SITE LOCATION
BAY CITY INDUSTRIAL LAND
Bay City, Michigan

GHD

12610-T01(023)GN-WA005 AUG 23, 2016



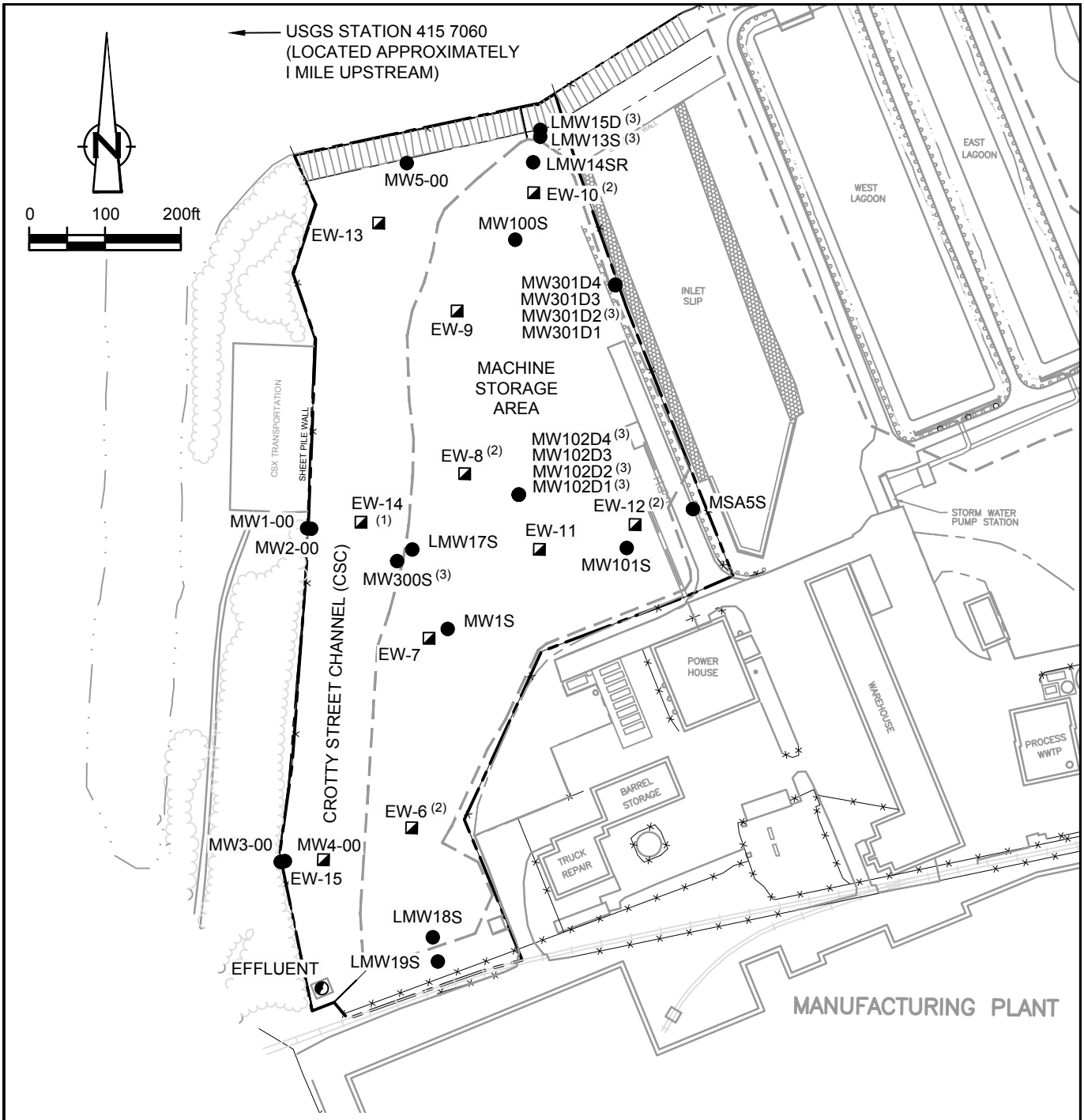
LEGEND

- FENCE
- GUARDRAIL
- RAILROAD
- TREELINE
- SHORELINE
- DEEP SOIL MIXING WALL
- SHEET PILE WALL
- APPROXIMATE RACER PROPERTY BOUNDARY

figure 1.2

RACER SITE PLAN
BAY CITY INDUSTRIAL LAND
Bay City, Michigan

SOURCE:
McLAREN HART ENVIRONMENTAL ENGINEERING CORP.
DATE: 08/29/94 DRAWING: 7900B216



LEGEND

- FENCE
- GUARDRAIL
- RAILROAD
- TREELINE
- SHORELINE
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- SHEET PILE WALL
- APPROXIMATE RACER PROPERTY BOUNDARY

MW403S ● MONITORING WELL LOCATION
WATER LEVELS MONITORED ANNUALLY

EW-6 ◪ GROUNDWATER EXTRACTION WELL LOCATION
WATER LEVELS MONITORED MONTHLY

◐ GROUNDWATER TREATMENT SYSTEM
EFFLUENT SAMPLE LOCATION

(1) CSC SEMI-ANNUAL SAMPLING POINT

(2) MSA SEMI-ANNUAL SAMPLING POINT (COMPOSITE)

(3) ANNUAL MONITORING LOCATION

figure 4.1

MONITORING WELL AND EXTRACTION WELL LOCATIONS
BAY CITY INDUSTRIAL LAND
Bay City, Michigan

SOURCE:
McLAREN HART ENVIRONMENTAL ENGINEERING CORP.
DATE: 08/29/94 DRAWING: 7900B216

Table 3.1

Potential Operating Problems
Groundwater Extraction, Treatment, and Discharge Systems
Racer Bay City Industrial Land
Bay City, MI

	Problem	Potential Sources of Problems	Possible Solutions
Extraction Pumps			
1.	No water to treatment system	- pump malfunction - power failure - line leak - line plugged - low water level in well - influent lines are frozen	- see items #2 and 3 - prepare system for start-up - find leak and repair - find plug and clean - adjust pump level if possible, otherwise verify continued capture and wait for recovery - thaw lines
2.	EW15 not pumping	- tubing worn out - pump failure - possible error in the EW15 pump PLC	- replace tubing - repair or replace pump - contact electrician for electrical inspection
3.	EW6, EW8 or EW12 not pumping	- tubing worn out - build-up of iron bacteria in forcemains - pump failure - sensor failure	- replace tubing - swab forcemain lines - contact pump supplier for pump repair - contact electrician for electrical inspection
4.	Reduced Flow Rate	- tubing worn out - pump malfunction - build-up of iron bacteria in forcemains - Leak in pumping well discharge lines	- replace tubing - swab forcemain lines - find leak and repair - contact pump supplier for pump repair
Groundwater Treatment System			
1.	Clear well High-High Level Alarm	- floats stick - EW15 operating faster than the feed pump	- clean floats - reduce rate from EW15
2.	High air pressure in GACs (system shut down)	- air introduced into system - GAC has reached serviceable life	- bleed air from system - replace GAC units
3.	High air pressure in bag filters	- bag filters are clogged	- replace bag filters

Table 3.1

Potential Operating Problems
Groundwater Extraction, Treatment, and Discharge Systems
Racer Bay City Industrial Land
Bay City, MI

	Problem	Potential Sources of Problems	Possible Solutions
4.	High air pressure in aerator	- aerator assembly is clogged	- clean aerator assembly
5.	Low air pressure in aerator	- Aerator failure	- repair or replace aerator
6.	Flow meter is not accurate	- flow meter is out of calibration - flow meter is broken	- recalibrate meter (this should be done semi-annually) - repair/replace flow meters

Table 4.1

Monitoring Well Completion Details and Groundwater Elevations
Racer Trust - Bay City Industrial Land
Bay City, Michigan

Well Location	Top of Riser Elevation (ft AMSL)	Depth of Well (feet)	Screen Length (feet)	Screen Type	Riser Type	Diameter of Screen (inches)	Groundwater Elevation (feet AMSL)										
							8/6/2014	8/6/2013	8/7/2012	8/22/2011	8/16/2010	8/27/2009	8/19/2008	8/20/2007	8/16/2006	8/29/2005	8/24/2004
Machine Storage Area (MSA)																	
LMW13S	589.40	19.22	10	SS	PVC	2	579.43	578.61	578.19	578.03	578.71	579.31	578.21	577.67	578.23	578.14	579.40
LMW17S	589.31	19.83	10	SS	PVC	2	578.96	578.87	578.85	578.80	578.83	578.81	578.58	577.58	578.63	578.31	578.80
LMW18S	592.33	22.52	10	SS	PVC	2	578.27	577.93	577.82	577.61	577.66	577.99	577.62	578.13	578.00	578.23	578.45
LMW19S	588.61	19.32	10	SS	PVC	2	579.32	578.44	578.58	578.34	578.25	578.53	578.45	579.71	578.45	578.85	579.21
MW1S	591.08	12.95	2	SS	SS	2	578.71	578.80	578.65	578.65	578.68	579.71	580.93	578.48	n/a	577.58	578.63
MW100S	591.97	14.44	10	SS	SS	2	579.32	578.81	578.49	578.18	578.86	579.27	578.40	578.01	578.38	578.57	579.15
MW101S	593.34	19.22	10	SS	SS	2	579.01	579.10	578.94	578.80	578.93	578.78	578.49	578.39	578.31	577.95	578.82
MW102D1	594.86	30.99	10	SS	SS	2	579.39	578.34	577.90	578.71	578.39	579.42	578.83	578.04	578.30	578.30	579.02
MW102D2	594.93	36.21	10	SS	SS	2	579.38	578.31	577.89	578.69	578.37	579.40	578.93	578.03	578.25	578.33	579.01
MW102D3	594.91	46.74	10	SS	SS	2	579.35	578.27	577.84	578.67	579.34	579.41	578.89	577.98	578.25	578.31	578.98
MW102D4 (replacement)	594.90	56.85	10	SS	SS	2	579.30	578.24	577.79	578.63	578.29	579.33	578.76	577.98	578.22	578.25	578.94
MW300S	587.12	15.06	10	SS	SS	2	577.03	577.17	577.69	577.03	577.18	578.22	579.26	576.30	576.81	578.34	577.05
LMW14SR (Replaced LMW14S Jan/00)	589.01	13.00	7	SS	SS	2	579.22	578.55	578.14	577.47	578.60	579.19	577.96	576.98	577.97	577.50	576.94
Perimeter Banks (PB)																	
LMW15D	588.34	32..8	10	SS	PVC	2	579.37	578.02	577.56	578.65	578.21	579.45	578.12	577.89	578.22	578.24	579.34
MW301D1	589.54	27.50	10	SS	SS	2	577.70	576.56	578.38	579.39	578.96	579.96	579.03	578.72	578.94	579.05	580.02
MW301D2	589.16	37.24	10	SS	SS	2	577.78	576.62	577.99	579.00	578.60	579.56	578.64	578.33	578.55	578.62	579.59
MW301D3	589.22	44.04	10	SS	SS	2	577.64	576.46	577.87	578.87	578.47	579.44	578.41	578.20	578.44	578.52	579.47
MW301D4	589.33	55.95	10	SS	SS	2	577.96	576.54	578.15	579.16	578.74	579.70	578.75	578.48	578.69	578.80	579.71
Support Facilities Area (SFA)																	
MSA5S	588.60	18.98			SS	2	579.67	580.22	578.58	578.67	579.10	580.10	578.04	580.10	579.28	579.76	580.57
Crotty Street Channel																	
MW1-00	588.26	12.00	7	SS	SS	2	579.35	577.71	576.44	577.17	577.13	578.95	578.74	577.11	576.92	577.09	578.37
MW2-00	589.29	18.00	7	SS	SS	2	578.75	577.79	576.62	577.29	577.26	578.40	578.83	577.09	576.97	577.23	577.50
MW3-00	588.40	12.50	7	SS	SS	2	579.38	577.67	576.47	577.25	577.14	579.01	578.74	577.19	576.94	577.13	578.51
MW4-00	589.65	19.00	7	SS	SS	2	578.91	577.90	576.76	577.41	577.38	578.55	578.95	577.21	577.07	577.34	577.59
MW5-00	588.89	13.00	7	SS	SS	2	576.99	577.00	576.73	576.77	576.95	578.04	578.82	576.55	576.72	577.85	576.91
Saginaw River Elevation [6]							579.32	577.02	576.71	577.53	577.41	578.34	577.97	577.09	577.41	578.32	578.52

Notes:

(1) Approximate value
(2) Lock Needs Replacing
(3) Gage needs to be relocated
(4) Could not open due to liner attachment
(5) Could not read due to accumulation of snow and ice
(6) Source of Saginaw River Elevation is: NOAA (Essexville, MI) for prior to November 1, 2005, USGS Station (04157065) for November 1, 2005 to December 4, 2013 and USGS Station (04157060) for December 4, 2013 to the
(7) Could not read due to well being covered with equipment
n/a Groundwater elevation not available

Table 4.1

Monitoring Well Completion Details and Groundwater Elevations
Racer Trust - Bay City Industrial Land
Bay City, Michigan

Well Location	Top of Riser Elevation (ft AMSL)	Depth of Well (feet)	Screen Length (feet)	Screen Type	Riser Type	Diameter of Screen (inches)	Groundwater Elevation (feet AMSL)												
							7/28/2003	8/26/2002	8/13/2001	3/19/2001	2/23/2001	1/24/2001	12/15/2000	11/30/2000	10/31/2000	9/11/2000	8/29/2000	7/18/2000	6/30/2000
Machine Storage Area (MSA)																			
LMW13S	589.40	19.22	10	SS	PVC	2	578.45	582.05	578.68	577.85	578.17	578.19	578.06	578.35	578.63	578.90	578.90	580.11	580.62
LMW17S	589.31	19.83	10	SS	PVC	2	582.73	578.91	578.68	578.74	578.83	579.06	578.79	579.17	578.93	579.24	579.20	579.09	579.85
LMW18S	592.33	22.52	10	SS	PVC	2	578.35	578.85	578.10	578.22	578.61	578.39	578.18	578.29	578.52	578.67	579.03	578.52	577.80
LMW19S	588.61	19.32	10	SS	PVC	2	579.24	579.93	578.79	579.56	579.96	579.59	(5)	579.56	579.38	579.34	580.13	579.45	580.56
MW1S	591.08	12.95	2	SS	SS	2	578.56	578.48	578.51	578.41	(5)	578.44	578.36	578.40	578.57	578.43	578.38	578.34	579.31
MW100S	591.97	14.44	10	SS	SS	2	577.27	578.91	578.93	578.36	578.64	578.87	578.65	579.05	579.33	579.57	579.66	579.85	578.03
MW101S	593.34	19.22	10	SS	SS	2	578.87	579.12	578.76	578.84	578.96	579.18	578.84	579.03	578.91	578.99	579.04	579.02	580.22
MW102D1	594.86	30.99	10	SS	SS	2	578.25	578.98	578.18	577.61	577.40	577.47	577.62	577.67	577.87	578.16	578.15	578.71	577.62
MW102D2	594.93	36.21	10	SS	SS	2	578.24	578.95	578.15	577.60	577.39	577.45	577.61	577.65	577.85	578.13	578.13	578.67	577.48
MW102D3	594.91	46.74	10	SS	SS	2	578.20	578.93	578.11	577.56	577.34	577.40	577.56	577.60	577.80	578.08	578.09	578.63	577.52
MW102D4 (replacement)	594.90	56.85	10	SS	SS	2	578.16	578.86	578.03	577.49	577.27	577.33	577.47	577.53	577.73	578.00	578.02	578.55	577.38
MW300S	587.12	15.06	10	SS	SS	2	577.77	578.53	577.00	578.84	578.67	578.99	578.07	578.84	578.27	578.16	578.24	n/a (2)	n/a (4)
LMW14SR (Replaced LMW14S Jan/00)	589.01	13.00	7	SS	SS	2	578.13	578.45	578.23	577.38	577.77	577.88	577.54	578.04	578.13	578.16	578.21	579.19	579.32
Perimeter Banks (PB)																			
LMW15D	588.34	32..8	10	SS	PVC	2	578.04	578.83	578.06	577.37	577.12	577.22	577.33	577.48	577.63	577.94	578.03	578.43	n/a (4)
MW301D1	589.54	27.50	10	SS	SS	2	578.90	579.66	578.89	578.28	578.03	578.09	578.25	578.34	(5)	(5)	578.88	578.65	579.37
MW301D2	589.16	37.24	10	SS	SS	2	578.49	579.25	578.48	577.86	577.62	577.67	577.81	577.92	(5)	(5)	578.47	578.56	578.80
MW301D3	589.22	44.04	10	SS	SS	2	578.36	579.10	578.53	577.72	577.59	577.52	577.67	577.78	(5)	(5)	578.32	578.56	578.80
MW301D4	589.33	55.95	10	SS	SS	2	578.57	579.28	578.48	577.86	577.63	577.68	577.82	577.93	(5)	(5)	578.48	578.48	578.78
Support Facilities Area (SFA)																			
MSA5S	588.60	18.98			SS	2	580.55	580.65	579.74	580.65	580.42	580.62	580.46	580.65	580.34	580.56	580.41	581.32	581.17
Crotty Street Channel																			
MW1-00	588.26	12.00	7	SS	SS	2	577.78	578.44	576.72	578.61	578.14	577.81	577.49	577.75	577.45	577.36	577.60	577.71	579.57
MW2-00	589.29	18.00	7	SS	SS	2	577.60	578.03	576.76	578.69	578.26	577.82	577.51	577.77	577.45	577.36	577.59	577.65	578.67
MW3-00	588.40	12.50	7	SS	SS	2	577.77	578.38	576.70	578.62	578.26	577.79	577.48	577.74	577.45	577.37	577.60	578.68	578.46
MW4-00	589.65	19.00	7	SS	SS	2	577.68	578.07	576.79	578.67	578.30	577.84	577.51	577.78	577.47	577.34	577.57	577.62	578.87
MW5-00	588.89	13.00	7	SS	SS	2	576.28	576.72	577.02	577.06	577.86	576.97	576.91	576.90	577.31	577.91	578.01	n/a (4)	n/a (4)
Saginaw River Elevation [6]							576.83	578.50	577.91	576.80	576.74	576.77	576.78	577.02	577.23	577.49	577.76	578.27	577.81

Notes:

(1) Approximate value
(2) Lock Needs Replacing
(3) Gage needs to be relocated
(4) Could not open due to liner attachment
(5) Could not read due to accumulation of snow and ice
(6) Source of Saginaw River Elevation is: NOAA (Essexville, MI) for prior to November 1, 2005, USGS Station (04157065) for November 1, 2005 to December 4, 2013 and USGS Station (04157060) for December 4, 2013 to the
(7) Could not read due to well being covered with equipment
n/a Groundwater elevation not available

Table 4.1

Monitoring Well Completion Details and Groundwater Elevations
Racer Trust - Bay City Industrial Land
Bay City, Michigan

Well Location	Top of Riser Elevation (ft AMSL)	Depth of Well (feet)	Screen Length (feet)	Screen Type	Riser Type	Diameter of Screen (inches)	Groundwater Elevation (feet AMSL) 5/30/2000	4/26/2000	3/29/2000	2/28/2000	2/2/2000	1/4/2000	11/24/1999	10/25/1999	9/27/1999	9/7/1999	7/20/1999	6/22/1999	5/20/1999	4/20/1999
Machine Storage Area (MSA)																				
LMW13S	589.40	19.22	10	SS	PVC	2	581.63	581.81	581.27	581.74	579.27	580.08	580.68	581.26	580.55	580.02	579.68	579.23	581.42	582.65
LMW17S	589.31	19.83	10	SS	PVC	2	580.06	580.19	579.91	579.96	579.08	579.47	579.71	579.69	578.98	579.19	579.43	579.65	579.77	580.25
LMW18S	592.33	22.52	10	SS	PVC	2	578.10	578.09	577.66	577.80	577.09	577.37	577.32	577.62	577.51	577.89	579.57	579.45	579.39	579.78
LMW19S	588.61	19.32	10	SS	PVC	2	580.96	581.25	580.73	581.39	579.70	580.30	579.58	579.95	579.53	580.01	580.42	580.52	580.51	580.94
MW1S	591.08	12.95	2	SS	SS	2	579.26	579.29	579.28	579.18	579.05	579.07	579.15	579.11	578.51	578.58	--	578.64	579.29	579.49
MW100S	591.97	14.44	10	SS	SS	2	577.79	577.07	576.87	576.69	577.09	577.49	578.09	578.77	578.57	--	579.33	579.07	579.30	579.96
MW101S	593.34	19.22	10	SS	SS	2	580.39	580.14	579.21	579.86	579.61	579.61	579.65	579.81	579.04	579.18	578.83	578.71	579.19	580.44
MW102D1	594.86	30.99	10	SS	SS	2	577.70	577.60	577.25	577.23	576.81	576.80	576.38	577.47	577.64	578.29	579.69	576.82	579.27	579.34
MW102D2	594.93	36.21	10	SS	SS	2	577.58	577.44	577.12	577.08	576.80	576.67	576.24	577.33	577.50	578.15	579.68	576.78	579.34	579.39
MW102D3	594.91	46.74	10	SS	SS	2	577.59	577.47	577.16	577.12	576.88	576.71	576.26	577.35	577.55	578.20	579.66	576.80	579.25	579.35
MW102D4 (replacement)	594.90	56.85	10	SS	SS	2	577.45	577.34	577.01	576.98	575.70	576.56	576.12	577.21	577.40	578.05	579.56	576.70	579.13	579.21
MW300S	587.12	15.06	10	SS	SS	2	579.89	580.18	579.73	No Access	578.55	579.27	579.91	578.87	578.90	579.33	579.69	579.95	579.51	579.86
LMW14SR (Replaced LMW14S Jan/00)	589.01	13.00	7	SS	SS	2	579.22	578.91	578.99	578.55	578.58	Damaged	Damaged	578.58	578.30	578.88	579.97	578.55	580.40	581.12
Perimeter Banks (PB)																				
LMW15D	588.34	32..8	10	SS	PVC	2	578.88	578.74	578.56	578.56	578.23	577.95	577.18	578.49	578.93	579.81	579.68	577.88	579.21	579.23
MW301D1	589.54	27.50	10	SS	SS	2	578.80	578.85	578.59	578.56	578.28	578.05	577.42	578.63	578.99	579.67	579.73	575.75	579.22	579.32
MW301D2	589.16	37.24	10	SS	SS	2	578.89	578.77	578.54	578.51	578.22	577.99	577.35	578.57	578.93	579.62	579.69	576.11	579.19	579.28
MW301D3	589.22	44.04	10	SS	SS	2	578.85	578.74	578.49	578.48	578.18	577.96	577.32	578.54	578.90	579.59	579.65	576.13	579.18	579.25
MW301D4	589.33	55.95	10	SS	SS	2	578.76	578.69	578.45	578.43	578.14	577.90	577.27	578.47	578.85	579.52	579.62	576.08	579.17	579.26
Support Facilities Area (SFA)																				
MSA5S	588.60	18.98			SS	2	582.22	582.37	580.62	582.13	580.96	581.42	581.70	581.77	581.74	581.84	579.38	577.24	579.71	580.83
Crotty Street Channel																				
MW1-00	588.26	12.00	7	SS	SS	2	578.68	578.42	578.04	578.89	577.89	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MW2-00	589.29	18.00	7	SS	SS	2	Not Accessible	577.65	577.26	578.11	579.11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MW3-00	588.40	12.50	7	SS	SS	2	579.05	578.79	578.40	579.25	578.27	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MW4-00	589.65	19.00	7	SS	SS	2	Not Accessible	577.60	577.18	578.03	577.03	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
MW5-00	588.89	13.00	7	SS	SS	2	579.12	578.86	578.66	578.36	577.63	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Saginaw River Elevation [6]							577.48	577.42	577.37	577.24	577.14	577.15	576.54	577.35	578.04	578.59	578.87	578.51	578.37	578.32

Notes:

(1) Approximate value
(2) Lock Needs Replacing
(3) Gage needs to be relocated
(4) Could not open due to liner attachment
(5) Could not read due to accumulation of snow and ice
(6) Source of Saginaw River Elevation is: NOAA (Essexville, MI) for prior to November 1, 2005, USGS Station (04157065) for November 1, 2005 to December 4, 2013 and USGS Station (04157060) for December 4, 2013 to the
(7) Could not read due to well being covered with equipment
n/a Groundwater elevation not available

Table 4.1

Monitoring Well Completion Details and Groundwater Elevations
Racer Trust - Bay City Industrial Land
Bay City, Michigan

Well Location	Top of Riser Elevation (ft AMSL)	Depth of Well (feet)	Screen Length (feet)	Screen Type	Riser Type	Diameter of Screen (inches)	3/19/1999	3/8/1999
Machine Storage Area (MSA)								
LMW13S	589.40	19.22	10	SS	PVC	2	583.17	582.56
LMW17S	589.31	19.83	10	SS	PVC	2	581.57	581.58
LMW18S	592.33	22.52	10	SS	PVC	2	579.44	579.44
LMW19S	588.61	19.32	10	SS	PVC	2	580.90	580.66
MW1S	591.08	12.95	2	SS	SS	2	584.35	584.12
MW100S	591.97	14.44	10	SS	SS	2	582.53	582.71
MW101S	593.34	19.22	10	SS	SS	2	586.50	586.44
MW102D1	594.86	30.99	10	SS	SS	2	582.38	582.32
MW102D2	594.93	36.21	10	SS	SS	2	582.03	581.93
MW102D3	594.91	46.74	10	SS	SS	2	581.92	581.84
MW102D4 (replacement)	594.90	56.85	10	SS	SS	2	581.54	581.45
MW300S	587.12	15.06	10	SS	SS	2	579.37	579.51
LMW14SR (Replaced LMW14S Jan/00)	589.01	13.00	7	SS	SS	2	582.10	582.11
Perimeter Banks (PB)								
LMW15D	588.34	32..8	10	SS	PVC	2	579.86	579.71
MW301D1	589.54	27.50	10	SS	SS	2	579.40	579.29
MW301D2	589.16	37.24	10	SS	SS	2	579.35	579.23
MW301D3	589.22	44.04	10	SS	SS	2	579.38	579.23
MW301D4	589.33	55.95	10	SS	SS	2	579.37	579.18
Support Facilities Area (SFA)								
MSA5S	588.60	18.98			SS	2	580.33	580.54
Crotty Street Channel								
MW1-00	588.26	12.00	7	SS	SS	2	n/a	n/a
MW2-00	589.29	18.00	7	SS	SS	2	n/a	n/a
MW3-00	588.40	12.50	7	SS	SS	2	n/a	n/a
MW4-00	589.65	19.00	7	SS	SS	2	n/a	n/a
MW5-00	588.89	13.00	7	SS	SS	2	n/a	n/a
Saginaw River Elevation [6]							578.55	578.34

Notes:

(1) Approximate value
(2) Lock Needs Replacing
(3) Gage needs to be relocated
(4) Could not open due to liner attachment
(5) Could not read due to accumulation of snow and ice
(6) Source of Saginaw River Elevation is: NOAA (Essexville, MI) for prior to November 1, 2005, USGS Station (04157065) for November 1, 2005 to December 4, 2013 and USGS Station (04157060) for December 4, 2013 to the
(7) Could not read due to well being covered with equipment
n/a Groundwater elevation not available

Table 4.2

Summary of Long-Term Groundwater and Stormwater Monitoring Activities
Racer Trust - Bay City Site
Bay City, Michigan

		2015		
		Groundwater Quality Monitoring		Static Water Level Monitoring [1]
Plant Area	Location	Parameters	Frequency	Frequency
Machine Storage Area (MSA)				
MSA	LMW17S	- -	- -	annually
MSA	LMW18S	- -	- -	annually
MSA	LMW19S	- -	- -	annually
MSA	MW1S	- -	- -	annually
MSA	MW100S	- -	- -	annually
MSA	MW101S	- -	- -	annually
MSA	MW102D1	PCBs	annually	annually
MSA	MW102D2	PCBs	annually	annually
MSA	MW102D3	- -	- -	annually
MSA	MW102D4	PCBs	annually	annually
MSA	MW300S	PCBs	annually	annually
MSA	LMW14S	--	--	annually
Perimeter Banks (PB)				
PB	LMW13S	PCBs	annually	annually
PB	LMW15D	PCBs	annually	annually
PB	MW301D1	- -	- -	annually
PB	MW301D2	PCBs	annually	annually
PB	MW301D3	- -	- -	annually
PB	MW301D4	- -	- -	annually
Support Facilities Area (SFA)				
SFA	MSA5S	- -	- -	annually
Crotty Street Channel (CSC)				
CSC	MW1	- -	- -	annually
CSC	MW2	- -	- -	annually
CSC	MW3	- -	- -	annually
CSC	MW4	- -	- -	annually
CSC	MW5	- -	- -	annually
Groundwater Extraction and Treatment System(3)				
CSC	EW15	PCBs	Semi-annually	- -
CSC	Effluent	(2)	Semi-annually	- -

Notes:

(1) Static water level monitoring refers to independent monitoring program to evaluate containment. Static water level measurements will also be collected at all groundwater quality monitoring wells to evaluate groundwater flow directions.

(2) Sampling in accordance with the Industrial User Discharge Permit with the City of Bay City (120807). Parameters include: TSS, pH, grease/oil, phosphorous, COD, BOD, cadmium, chromium, copper, mercury, lead, nickel, silver, ammonia-nitrogen, PCBs, and vinyl chloride

Table 4.3

Groundwater Extraction System Details
Racer Trust - Bay City Industrial Land
Bay City, Michigan

Extraction Well	Reference Elevation (ft AMSL)	Bottom of Well Elevation (ft AMSL)	Top ICU (ft AMSL)
Machine Storage Area			
EW-6	589.74	570.39	572.39
EW-7	587.99	571.14	571.64
EW-8	588.34	572.29	573.29
EW-9	588.04	572.19	573.69
EW-10	587.77	570.82	572.32
EW-11	591.51	571.91	572.56
EW-12	586.42	571.57	573.07
Crotty Street Channel Containment Area			
EW-13	584.33	571.86	NA
EW-14	582.42	569.92	NA
EW-15	583.71	571.61	NA

Table 5.1

Reporting Requirements
Monitoring, Operation, and Maintenance Activities
Racer Trust - Bay City Industrial Land
Bay City, Michigan

Action	Requirements for Reporting
Site inspection and maintenance activity report	Annually
Static Water Level Monitoring	Annually in conjunction with groundwater sampling events.
Groundwater Sampling	Annually
Extraction well hydraulic	Annually
Effluent Discharge Monitoring	Semi-annually, due by July 30th and January 30th each year

Table 8.1

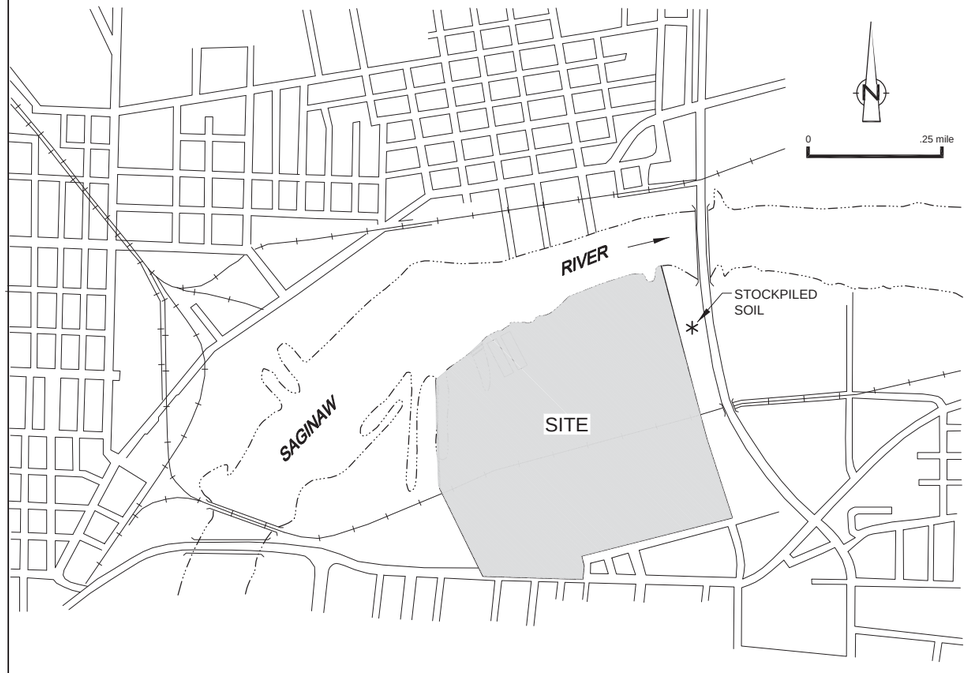
Analytical Parameters
Racer Trust - Bay City Industrial Land
Bay City, Michigan

Sample Parameters	Sample Method	Target Detection Limits (ug/l)
Metals		
Cadmium	EPA-WW200.7/245.1	2.0
Chromium	EPA-WW200.7/245.1	5.0
Copper	EPA-WW200.7/245.1	20.0
Iron	EPA-WW200.7/245.1	100.0
Lead	EPA-WW200.7/245.1	3.0
Mercury	EPA-WW200.7/245.1	0.2
Nickel	EPA-WW200.7/245.1	20.0
Silver	EPA-WW200.7/245.1	5.0
PCBs		***(ug/l)***
Aroclor-1016	EPA-MCA 608	0.1
Aroclor-1221	EPA-MCA 608	0.1
Aroclor-1232	EPA-MCA 608	0.1
Aroclor-1242	EPA-MCA 608	0.1
Aroclor-1248	EPA-MCA 608	0.1
Aroclor-1254	EPA-MCA 608	0.1
Aroclor-1260	EPA-MCA 608	0.1
General Chemistry		**(mg/l)**
pH	SM 4500 H	0.1
Fats, Oils, and Greases (HEM)	EPA-WW 1664	4.7
Phosphorus, Total	SM 4500 P E	0.1
Chemical Oxygen Demand (COD)	EPA-WW 410.4	10.0
Biochemical Oxygen Demand (BOD)	SM 5210 B	2.0
Ammonia Nitrogen	EPA-WW 350.1	2.0
Total Suspended Solids (TSS)	SM 2540 D	4.0
Volatile Organic Carbons		***(ug/l)***
Vinyl Chloride	EPA-MCA 624	1.0

Appendices

Appendix A
As-Recorded Drawings

REMEDIAL ACTION PLAN
AS RECORDED DRAWINGS - SEPTEMBER 2000
GM POWERTRAIN DIVISION
AND CROTTY STREET CHANNEL SITE
BAY CITY, MICHIGAN



KEY PLAN

DWG.No. DRAWING TITLE

GENERAL

GN-WA001	G-01AR	SH01	COVER SHEET/DRAWING INDEX
GN-WA005	G-02AR	SH02	ABBREVIATIONS AND DETAIL DESIGNATIONS
GN-WA004	G-03AR	SH03	CIVIL, STRUCTURAL, AND ARCHITECTURAL LEGEND
GN-WA007	G-04AR	SH04	MECHANICAL LEGEND
GN-WA009	G-05AR	SH05	INSTRUMENTATION AND CONTROL LEGEND
GN-WA006	G-06AR	SH06	ELECTRICAL LEGEND
GN-WA010	G-07AR	SH07	CIVIL STANDARD DETAILS
GN-WA002	G-08AR	SH08	FENCING
GN-WA008	G-09AR	SH09	DISTRIBUTION PIPING
GN-WA011	G-10AR	SH10	GENERAL SITE PRE-CONSTRUCTION PLAN
GN-WA012	G-11AR	SH11	WEST SIDE PRE-CONSTRUCTION PLAN
GN-WA013	G-12AR	SH12	EAST SIDE PRE-CONSTRUCTION PLAN

CIVIL

CI-WA017	C-01AR	SH13	MONITORING WELLS ABANDONED
CI-WA019	C-02AR	SH14	EXISTING MONITORING WELLS
CI-WA004	C-03AR	SH15	WELL EXTENSION DETAILS
CI-WA001	C-04AR	SH16	SOIL EXCAVATION LOCATIONS AND RESULTS
CI-WA012	C-05AR	SH17	GROUNDWATER EXTRACTION SYSTEM
CI-WA005	C-06AR	SH18	GROUNDWATER EXTRACTION SYSTEM DETAILS
CI-WA006	C-07AR	SH19	GROUNDWATER EXTRACTION WELL 13, 14, AND 15 DETAILS
CI-WA003	C-08AR	SH20	SITE CAPPING
CI-WA007	C-09AR	SH21	CAP DETAILS
CI-WA008	C-10AR	SH22	EAST LAGOON LINER PLAN
CI-WA009	C-11AR	SH23	EAST LAGOON LINER DETAILS - 1 OF 2
CI-WA010	C-12AR	SH24	EAST LAGOON LINER DETAILS - 2 OF 2
CI-WA021	C-13AR	SH25	INLET SLIP LINER PLAN AND DETAILS
CI-WA019	C-14AR	SH26	WEST SUPPORT FACILITIES AREA PAVEMENT PLAN
CI-WA018	C-15AR	SH27	EAST SUPPORT FACILITIES AREA PAVEMENT PLAN
CI-WA011	C-16AR	SH28	SUPPORT FACILITIES AREA DETAILS
CI-WA020	C-17AR	SH29	EAST AREA PLAN DRAINAGE
CI-WA022	C-18AR	SH30	MANHOLE AND CATCHBASIN DETAILS

DWG.No. DRAWING TITLE

STRUCTURAL

ST-WA002	S-01AR	SH31	SHEET PILING 1+0 TO 12+78.87
ST-WA003	S-02AR	SH32	SHEET PILING 10+50 TO 25+46
ST-WA001	S-03AR	SH33	SHEET PILING DETAILS SHEET 1 OF 2
ST-WA004	S-04AR	SH34	SHEET PILING DETAILS SHEET 2 OF 2

ELECTRICAL (BY MURDOCK ENGINEERING)

EL-ME001	E-01AR	SH35	ELECTRICAL SITE PLAN
EL-ME002	E-02AR	SH36	EQUIPMENT STORAGE AREA POWER DISTRIBUTION 1 OF 3
EL-ME003	E-03AR	SH37	EQUIPMENT STORAGE AREA POWER DISTRIBUTION 2 OF 3
EL-ME004	E-04AR	SH38	EQUIPMENT STORAGE AREA POWER DISTRIBUTION 3 OF 3
EL-ME005	E-05AR	SH39	CONTROL SCHEMATIC CP1
EL-ME006	E-06AR	SH40	EQUIPMENT STORAGE AREA CONTROL PANEL LAYOUT (CP1)
EL-ME007	E-07AR	SH41	LAGOON AREA POWER DISTRIBUTION 1 OF 2
EL-ME008	E-08AR	SH42	LAGOON AREA POWER DISTRIBUTION 2 OF 2
EL-ME009	E-09AR	SH43	CONTROL SCHEMATIC CP2
EL-ME010	E-10AR	SH44	EQUIPMENT STORAGE AREA CONTROL PANEL LAYOUT (CP2)
EL-ME011	E-11AR	SH45	POWER DISTRIBUTION SINGLE LINE
EL-ME012	E-12AR	SH46	BUILDING ELECTRICAL LAYOUT AND DETAILS

DRAWING INDEX

GM POWERTRAIN
GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No.	SHEET No.
PE-H-96	SH01

AS RECORDED SEPTEMBER 2000

REF. PE-E-81

REALM Remediation and Liability Management Company, Inc.

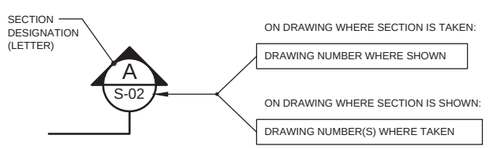
CRA CONESTOGA-ROVERS & ASSOCIATES

ABBREVIATIONS

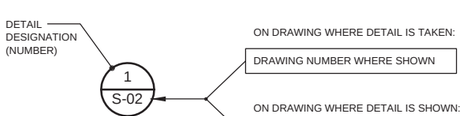
3/C	CONDUCTORS, NUMBER OF (3)
AAP	ALARM ANNUNCIATOR PANEL
AAV	AUTOMATIC AIR VENT
AB	ANCHOR BOLT
ABAN	ABANDON(ED)
ABS	ABSOLUTE
ABV	ABOVE
AC	ALTERNATING CURRENT
ACCUM	ACCUMULATOR
ACNV	AUTOMATIC CONTROL VALVE
ACOUS	ACOUSTICAL
ACP	ASPHALTIC CONCRETE PAVING
ACTR	ACTUATOR
ADDL	ADDITIONAL
ADDM	ADDENDUM
ADH	ADHESIVE
ADJ	ADJUSTABLE
ADJC	ADJACENT
ADPTR	ADAPTOR
AF	AFTER FILTER
AGGR	AGGREGATE
AHR	ANCHOR
AHU	AIR HANDLING UNIT
AL	ALUMINUM
ALM	ALARM
ALT	ALTERNATE
AMB	AMBIENT
AMSL	ABOVE MEAN SEA LEVEL
ANLG	ANALOG
AP	ACID PROOF
APPROX.	APPROXIMATELY
APPX	APPENDIX
APT	APARTMENT
ARCH	ARCHITECT(URAL)
ASL	ABOVE SEA LEVEL
ASPH	ASPHALT(IC)
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ASU	AIR SUPPLY UNIT
ASW	AUXILIARY SWITCH
ASYM	ASYMMETRICAL
AT	AIR TIGHT
ATS	AUTOMATIC TRANSFER SWITCH
AVE	AVENUE
AWG	AMERICAN WIRE GAGE
AZ	AZIMUTH
B&B	BALLED AND BURLAPPED
B&B	BELL AND BELL
B&F	BELL AND FLANGE
B&S	BELL AND SPIGOT
B/B	BACK TO BACK
BAF	BAFFLE
BAL	BALANCE
BAT	BATTERY
BBRG	BALL BEARING
BBS	BOTTOM OF BACKSLOPE
BC	BACK OF CURB
BC	BOLT CIRCLE
BE	BELL END
BETW	BETWEEN
BEV	BEVEL
BF	BOTH FACES
BFS	BOTTOM OF FORESLOPE
BFV	BUTTERFLY VALVE
BFW	BOILER FEED WATER
BGS	BELOW GROUND SURFACE
BHP	BRAKE HORSEPOWER
BI	BLACK IRON
BITUM	BITUMINOUS
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKHD	BULKHEAD
BLO	BLOWER
BLR	BOILER
BLW	BELOW
BM	BEAM
BM	BENCH MARK
BOT	BOTTOM
BP	BASE PLATE
BRG	BEARING
BRK	BRICK
BRKR	BREAKER
BRL	BARREL
BRS	BRASS
BRZ	BRONZE
BS	BOTH SIDES
BSHG	BUSHING
BSMT	BASEMENT
BSP	BLACK STEEL PIPE
BSTR	BOOSTER
BTFL	BUTTERFLY
BTU	BRITISH THERMAL UNIT
BV	BALL VALVE
BW	BOTH WAYS
Cu	COPPER
C&G	CURB AND GUTTER
C/C	CENTER TO CENTER
CAL	CALIBRATE
CAP	CAPACITY
CAT	CATALOG
CB	CATCH BASIN
CCPD	COUPLING CAPACITOR POTENTIAL DEVICE
CCW	COUNTER CLOCKWISE
CER	CERAMIC
CFP	CHEMICAL FEED PUMP
CHAN	CHANNEL
CHEM	CHEMICAL
CHFR	CHAMFER
CHK	CHECK
CHKV	CHECK VALVE
CI	CAST IRON
CIMJ	CAST IRON MECHANICAL JOINT
CIP	CAST IRON PIPE
CIR	CIRCLE
CIRC	CIRCULAR
CISP	CAST IRON SOIL PIPE
CJ	CONSTRUCTION JOINT
CKT	CIRCUIT
CL	CENTER LINE
CLDI	CONCRETE LINED DUCTILE IRON
CLJ	CONTROL JOINT
CLL	COLUMN LINE
CLP	CLAMP
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CND	CONDUIT
CNR	CORNER
CNTFLG	CENTRIFUGAL
CO	CLEANOUT
COAX	COAXIAL CABLE
COL	COLUMN
COMM	COMMUNICATION
CONC	CONCRETE
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONT	CONTINUOUS (CONTINUATION)
COORD	COORDINATE
COV	COVER
CP	CANDLE POWER
CP	CONCRETE PIPE
CP	CONTROL PANEL
CPLG	COUPLING
CR	CONCENTRIC REDUCER
CRCMF	CIRCUMFERENCE
CRN	CROWN
CRS	COLD ROLLED STEEL
CSP	CONCRETE SEWER PIPE
CT	COOLING TOWER
CTV	CABLE TELEVISION
CU	COPPER
CV	CONTROL VALVE
C/W	COMPLETE WITH
CW	COLD WATER
CWP	CIRCULATING WATER PIPE
CYL	CYLINDER
DAT	DATUM
DBC	DIAMETER BOLT CIRCLE
DC	DIRECT CURRENT
DCI	DUCT COVERING INSULATION
DEMO	DEMOLITION
DET	DETAIL
DF	DIESEL FUEL
DI	DUCTILE IRON
DIA	DIAMETER
DIFF	DIFFERENCE
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DIST	DISTANCE
DIV	DIVISION
DIW	DEIONIZED WATER
DL	DEAD LOAD
DLI	DUCT LINER INSULATION
DLV	DOOR LOUVER
DMH	DROP MANHOLE
DMPF	DAMPPROOFING
DMPR	DAMPER
DN	DOWN
DP	DEW POINT
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DR	DRAIN
DS	DOWNSPOUT
DT	DRAIN TILE
DUPL	DUPLICATE
DW	DISTILLED WATER
DWG	DRAWING
DWL	DOWEL
DWV	DRAIN WASTE & VENT
E	EAST
ECC	ECCENTRIC
EF	EACH FACE
EFL	EFFLUENT
EL	EASEMENT LINE
EL	ELEVATION
ELB	ELBOW
ELEC	ELECTRICAL
EMER	EMERGENCY
ENCL	ENCLOSURE
ENG	ENGINE
ENGR	ENGINEER
ENTR	ENTRANCE
EP	EDGE OF PAVEMENT
EP	ELECTRICAL PANEL
EPRF	EXPLOSION PROOF
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ES	EDGE OF SHOULDER
ESMT	EASEMENT
ESP	EMERGENCY SWITCH PANEL
EST	ESTIMATE
EVAP	EVAPORATE
EW	EACH WAY
EWH	ELECTRICAL WATER HEATER
EXC	EXCAVATE (EXCAVATION)
EXCH	EXCHANGER
EXH	EXHAUST
EXP	EXPANSION
EXT	EXTERIOR
F/F	FACE TO FACE
FA	FIRE ALARM
FC	FOOTCANDLE
FD	FLOOR DRAIN
FDMPR	FIRE DAMPER
FDN	FOUNDATION
FDR	FEEDER
FEC	FIRE EXTINGUISHER CABINET
FEM	FEMALE
FEXT	FIRE EXTINGUISHER
FGL	FIBERGLASS
FHC	FIRE HOSE CABINET
FHY	FIRE HYDRANT
FIN	FINISH(ED)
FIN FL	FINISH(ED) FLOOR
FIN GR	FINISH(ED) GRADE
FL	FLASHING
FLA	FULL LOAD AMPS
FLEX C	FLEXIBLE CONNECTION
FLG	FLANGE
FLOC	FLOCCULATOR
FLR	FLOOR(ING)
FLSW	FLOW SWITCH
FLTR	FILTER
FN	FENCE
FO	FUEL OIL
FOC	FACE OF CONCRETE
FP	FREEZING POINT
FPT	FEMALE PIPE THREAD
FR	FIRE RATING
FR	FRAME
FREQ	FREQUENCY
FSTNR	FASTENER
FTG	FITTING
FTG	FOOTING
FU	FUSE
FUR	FURNACE
FUT	FUTURE
FV	FOOT VALVE
FXTR	FIXTURE
G	GAS
GA	GAGE
GAL	GALLON
GALV	GALVANIZED
GEN	GENERATOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTOR
GL	GLASS
GLV	GLOBE VALVE
GLZ	GLAZING
GND	GROUND
GOVT	GOVERNMENT
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPS	GALLONS PER SECOND
GR	GRADE (GRADING)
GR LN	GRADE LINE
GRL	GRILLE
GRTG	GRATING
GSKT	GASKET
GSNK	GOOSENECK
GT	GREASE TRAP
GT	GROUT
GTV	GATE VALVE
GUT	GUTTER
GVL	GRAVEL
GWH	GAS WATER HEATER
H	HIGH
HB	HOSE BIB
HD	HEAD
HDPE	HIGH DENSITY POLYETHYLENE
HDWE	HARDWARE
HEX	HEAT EXCHANGER
HGT	HEIGHT
HH	HANDHOLE
HM	HOLLOW METAL
HMD	HOLLOW METAL DOOR
HMF	HOLLOW METAL FRAME
HNDRL	HAND RAIL
HNDWL	HANDWHEEL
HOA	HAND-OFF-AUTO
HORIZ	HORIZONTAL
HP	HIGH PRESSURE
HP	HORSEPOWER
HPT	HIGH POINT
HR	HOUR
HSB	HIGH STRENGTH BOLT
HT	HEAT
HTG	HEATING
HTR	HEATER
HV	HOSE VALVE
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HVY	HEAVY
HW	HOT WATER
HWB	HOT WATER BOILER
HWCP	HOT WATER CIRCULATING PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HWT	HOT WATER TANK
HWY	HIGHWAY
HYD	HYDRANT
HYDR	HYDRAULIC
HZ	HERTZ
ID	INSIDE DIAMETER
IF	INSIDE FACE
IGN	IGNITION
ILLUM	ILLUMINATION
IN WC	INCHES (WATER COLUMN)
IND	INDICATOR
INDL	INDUSTRIAL
INF	INFLUENT
INL	INLET
INSTL	INSTALLATION
INSTR	INSTRUMENT
INSUL	INSULATION
INTLK	INTERLOCK
INTR	INTERIOR
INV	INVERT
INV EL	INVERT ELEVATION
IP	IRON PIPE
IPS	INTERNATION PIPE STANDARD
IPT	IRON PIPE THREAD
ISO	ISOMETRIC
JAN	JANITOR
JB	JUNCTION BOX
JCT	JUNCTION
KOP	KNOCKOUT PANEL
KPL	KICK PLATE
KSF	KIPS PER SQUARE FOOT
KSI	KIPS PER SQUARE INCH
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR (RESISTANCE)
KW	KILOWATT
KWH	KILOWATT HOUR
L	LEFT
LAB	LABORATORY
LAD	LADDER
LATL	LATERAL
LAV	LAVATORY
LB	POUND
LBL	LABEL
LBR	LUMBER
LDPE	LOW DENSITY POLYETHYLENE
LG	LONG (LENGTH)
LH	LEFT HAND
LIM SW	LIMIT SWITCH
LIN	LINEAR
LKR	LOCKER
LL	LIVE LOAD
LNTL	LINTEL
LO	LUBRICATING OIL
LOC	LOCATION
LONG	LONGITUDINAL
LP	LIGHT POLE
LP	LOW PRESSURE
LPT	LOW POINT
LPV	LUBRICATED PLUG VALVE
LRG	LARGE
LT	LIGHT
LTG	LIGHTING
LTG PNL	LIGHTING PANEL
LV	LOW VOLTAGE
LVL	LEVEL(ER)
LVR	LOUVER
LWC	LIGHTWEIGHT CONCRETE
M	METER
MA	MILLIAMPERE
MACH	MACHINE
MAINT	MAINTENANCE
MAN	MANUAL
MAS	MASONRY
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MBTU	THOUSAND BRITISH THERMAL UNITS
MC	MOMENTARY CONTACT
MCC	MOTOR CONTROL CENTER
MD	MANUAL DAMPER
MECH	MECHANICAL
MET	METAL
MEZZ	MEZZANINE
MFG	MANUFACTURING
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MHT	MEAN HIGH TIDE
MI	MALLEABLE IRON
MI	MILE
MID	MIDDLE
MIN	MINIMUM
MIN	MINUTE
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MK	MARK
MKR	MARKER
MLT	MEAN LOW TIDE
MLWK	MILLWORK
MMDD	MODIFIED MAXIMUM DRY DENSITY
MOBIL	MOBILIZATION
MOD	MOTOR OPERATED DAMPER
MON	MONITOR
MON	MONUMENT
MOT	MOTOR
MOV	MOTOR OPERATED VALVE
MPH	MILES PER HOUR
MPT	MALE PIPE THREAD
MS	MOTOR STARTER
MTD	MOUNTED
MV	MEGAVOLT
MW	MEGAWATT
N	NORTH
NA	NOT APPLICABLE
NAT	NATURAL
NC	NATIONAL COARSE THREAD
NC	NORMALLY CLOSED
NEG	NEGATIVE
NEUT	NEUTRAL
NF	NATIONAL FINE THREAD
NIC	NOT IN CONTRACT
NIP	NIPPLE
NKL	NICKEL
NO	NORMALLY OPEN
NO	NUMBER
NOM	NOMINAL
NOZ	NOZZLE
NPF	NATIONAL PIPE THREAD
NPL	NAMEPLATE
NPT	NATIONAL TAPER PIPE THREAD
NRCP	NON-REINFORCED CONCRETE PIPE
NRS	NON-RISING STEM
NTS	NOT TO SCALE
O/O	OUT TO OUT
OA	OVERALL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OHGW	OVERHEAD GUY WIRE
O/L	OVER LOAD
OPNG	OPENING
OPP	OPPOSITE
ORD	OVERFLOW ROOF DRAIN
ORF	ORIFICE
ORIG	ORIGINAL
OVFL	OVERFLOW
OXY	OXYGEN
OZ	OUNCE
P	PUMP
PA	PIPE ANCHOR
PAR	PARALLEL
PARG	PARGING
PAT	PATTERN
PB	PULL BOX
PB	PUSH BUTTON
PC	PIECE
PC	POINT OF CURVE
PC	PORTLAND CEMENT
PCC	POINT OF COMPOUND CURVE
PCF	POUNDS PER CUBIC FOOT
PED	PEDESTAL
PERF	PERFORATED
PERIM	PERIMETER
PERM	PERMANENT
PERP	PERPENDICULAR
PF	POWER FACTOR
PH	PHASE
PHOTO	PHOTOGRAPH
PI	POINT OF INTERSECTION
PIV	POST INDICATOR VALVE
PIVC	POINT OF INTERSECTION FOR VERTICAL CURVE
PKG	PACKAGE
PKWY	PARKWAY
PL	PLATE
PL	PROPERTY LINE
PLAT	PLATFORM
PLBG	PLUMBING
PLYWD	PLYWOOD
PNEU	PNEUMATIC
PNL	PANEL
PNT	PAINT
POLY	POLYETHYLENE
PORT	PORTABLE
POS	POSITIVE
PPM	PARTS PER MILLION
PR	PAIR
PRC	POINT OF REVERSE CURVE
PRCST	PRECAST
PRCVC	POINT OF REVERSE CURVE VERTICAL CURVE
PREFAB	PREFABRICATED
PREFIN	PREFINISHED
PRELIM	PRELIMINARY
PRI	PRIMARY
PRKG	PARKING
PROJ	PROJECT
PROP	PROPERTY
PRV	PRESSURE REDUCING VALVE
PRV	PRESSURE RELIEF VALVE
PS CONC	PRESTRESSED CONCRETE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PST	POINT OF SPIRAL TANGENT
PT	PIPE TAP
PT	POINT OF TANGENCY
PTD	PAINTED
PV	PAVED
PVC	POINT OF VERTICAL CURVE
PVC	POLYVINYL CHLORIDE
PVG	PAVING
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVT	POINT OF VERTICAL TANGENCY
PWR	POWER
QCV	QUICK COUPLER VALVE
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R	RISER
RAD	RADIUS
RBR	RUBBER
RC	REINFORCED CONCRETE
RD	ROAD
RD	ROOF DRAIN
RDC	REDUCER
REC	RECESSED
RECIRC	RECIRCULATE
RECPT	RECEPTACLE
RECT	RECTANGULAR
REF	REFERENCE
REINF	REINFORCE(D)(ING)(MENT)
REM	REMOVABLE
REQD	REQUIRED
RESIL	RESILIENT
RET	RETURN
RF	RAISED FACE
RFG	ROOFING
RGLTR	REGULATOR
RH	RELATIVE HUMIDITY
RH	RIGHT HAND
RLF	RELIEF
RLG	RAILING
RM	ROOM
RND	ROUND
RO	ROUGH OPENING
ROW	RIGHT-OF-WAY
RPM	REVOLUTIONS PER MINUTE
RPS	REVOLUTIONS PER SECOND
RR	RAILROAD
RV	RELIEF VALVE
RV	ROOF VENT
S	SOUTH
SA	SUPPLY AIR
SALV	SALVAGE
SAN	SANITARY
SAT	SATURATION
SCHED	SCHEDULE
SCRN	SCREEN
SD	STORM DRAIN
SDL	SADDLE
SDMH	STORM DRAIN MANHOLE
SEC	SECOND
SECT	SECTION
SEG	SEGMENT
SF	SAFETY FACTOR
SF	SUPPLY FAN
SGL	SINGLE
SHLDR	SHOULDER
SHR	SHOWER
SHT	SHEET(ING)
SHTNG	SHEATHING
SIG	SIGNAL
SIM	SIMILAR
SK	SINK
SLP	SLOPE
SLV	SLEEVE
SM	SHEET METAL
SM	SMOOTH
SMDD	STANDARD MAXIMUM DRY DENSITY
SMLS	SEAMLESS
SOLV	SOLENOID VALVE
SP	SINGLE POLE
SP	SOIL PIPE
SP	SPACE(ING)
SP GR	SPECIFIC GRAVITY
SP VOL	SPECIFIC VOLUME
SPDT	SINGLE POLE DOUBLE THROW
SPEC	SPECIFICATION
SPKLR	SPRINKLER
SPKR	SPEAKER
SPLY	SUPPLY
SPRT	SUPPORT
SPST	SINGLE POLE SINGLE THROW
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCH
SQ KM	SQUARE KILOMETER
SQ M	SQUARE METER
SQ MM	SQUARE MILLIMETER
SQ YD	SQUARE YARD
SS	SANITARY SEWER
SSK	SERVICE SINK
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STAG	STAGGERED
STD	STANDARD
STIF	STIFFENER
STIR	STIRRUP
STK	STAKE
STL	STEEL
STOR	STORAGE
STR	STRAIGHT
STRUCT	STRUCTURAL
SUCT	SUCTION
SURF	SURFACE
SURV	SURVEY
SV	SAFETY VALVE
SW	SIDEWALK
SWP	SAFE WORKING PRESSURE
SWR	SEWER
SYM	SYMBOL
SYMM	SYMMETRICAL
SYS	SYSTEM
T	TEE
T	THERMOSTAT
T	TREAD
T&B	TOP AND BOTTOM
G&G	TONGUE AND GROOVE
TAN	TANGENT
TB	TOP OF BEAM
TBM	TEMPORARY BENCH MARK
TC	TOP OF CONCRETE
TC	TOP OF CURB
TDH	TOTAL DYNAMIC HEAD
TE	TOP ELEVATION
TE	TOTALLY ENCLOSED
TECH	TECHNICAL
TEL	TELEPHONE
TEMP	TEMPERATURE
TEMP	TEMPORARY
TERM	TERMINAL
TF	TOP OF FOOTING
TFF	TOP OF FINISHED FLOOR
THD	THREAD(ED)
THERM	THERMAL
THK	THICK(NESS)
THRU	THROUGH
TNL	TUNNEL
TOT	TOTAL
TP	TOP OF PAVEMENT
TP	TOTAL PRESSURE
TRANS	TRANSPARENT
TSF	TONS PER SQUARE FOOT
TSL	TOP OF SLAB
TST	TOP OF STEEL
TTB	TELEPHONE TERMINAL BOARD
TV	TELEVISION
TW	TOP OF WALL
TYP	TYPICAL
U	HEAT TRANSFER UNIT
UG	UNDERGROUND
UH	UNIT HEATER
ULT	ULTIMATE
UN	UNION
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNIF	UNIFORM
UNIV	UNIVERSAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTIL	UTILITY
UV	ULTRAVIOLET
V	SANITARY VENT
V	VALVE
V	VOLT
VAC	VACUUM
VAC	VOLTS ALTERNATING CURRENT
VAP	VAPOR
VB	VALVE BOX
VEH	VEHICLE
VEL	VELOCITY
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
VFPE	VERY FLEXIBLE POLYETHYLENE
VIB	VIBRATION
VIN	VINYL
VISC	VISCOSITY
VOL	VOLUME
VP	VACUUM PUMP
W	WASTE
W	WATT
W	WEST
W/O	WITHOUT
WW	WALL TO WALL
WB	WET BULB
WC	WATER CLOSET
WD	WIDTH
WD	WOOD
WDW	WINDOW
WF	WIDE FLANGE
WG	WATER GAGE
WHA	WATER HAMMER ARRESTOR
WHTR	WATER HEATER
WI	WROUGHT IRON
WL	WATER LINE
WL	WATER LEVEL
WLD	WELDED
WP	WORKING POINT
WPR	WORKING PRESSURE
WR	WATER RESISTANT
WT	WEIGHT
WTR	WATER
WTRPRF	WATERPROOF(ING)
WW	WASTE WATER
WWF	WELDED WIRE FABRIC
X ARM	CROSS ARM
X SECT	CROSS SECTION
XFMR	TRANSFORMER
XFR	TRANSFER
YD	YARD DRAIN
YH	YARD HYDRANT

STANDARD DETAIL DESIGNATION

SECTION DESIGNATION



DETAIL DESIGNATION



№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

NOTES:

1. THIS IS A STANDARD LEGEND LIST, THEREFORE SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS LIST AND NOT ON THE DRAWINGS.
2. CONTACT ENGINEER FOR ABBREVIATIONS NOT LISTED.

REALM **Remediation and Liability Management Company, Inc.**

GM **POWERTRAIN**

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96 | SHEET No. SH02

AS RECORDED MAY 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

ABBREVIATIONS AND DETAIL DESIGNATIONS

CRA **CONESTOGA-ROVERS & ASSOCIATES**

Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	RLA	MAY 2000	
Scale: NO SCALE	Project N №: 12610-10	Report N №: 016	Drawing N №: G-02AR

12610-10(016)GN-WA005 APR 16/2002

TOPOGRAPHICAL

PROPERTY BOUNDARY

SITE BOUNDARY

FENCE

DITCH, SWALE

GROUND CONTOUR

GROUNDWATER ELEVATION CONTOUR (PIEZOMETRIC OR POTENTIOMETRIC SURFACE)

SOIL EXCAVATION CONTOUR

FINAL CONTOUR

LIMIT OF REFUSE DISPOSAL

SLOPED SURFACE (TOP OF BANK)

BUILDING

RAILWAY

SHORELINE

ACCESS ROAD

WATERMAIN

SANITARY SEWER

STORM SEWER

PROCESS SEWER

AIR, HIGH PRESSURE

GAS MAIN

TELEPHONE LINE

ELECTRIC CABLE

UNDERGROUND CONDUIT

OVERHEAD CABLE, WIRE

GUARDRAIL

SHALLOW GROUNDWATER EXTRACTION SYSTEM

DEEP GROUNDWATER EXTRACTION SYSTEM

DEEP SOIL MIXING WALL

EXCAVATE AND DISPOSE IN MSA

+ 588.00 SPOT ELEVATION

PROPOSED MONITORING

PROPOSED STORM SEWER

PROPOSED GROUNDWATER EXTRACTION SYSTEM

PROPOSED RELIEF DRAIN

PROPOSED RELIEF DRAIN

MUNICIPAL SYMBOLS

S.I.B.	STANDARD IRON BAR
I.B.	IRON BAR
R.I.B.	ROUND IRON BAR
MONUMENT	MONUMENT/BENCHMARK
C.C.	CUT CROSS
I.P.	IRON PIPE
NAIL	NAIL/CONTROL
S1	SANITARY MANHOLE
ST1	STORM MANHOLE
P1	PROCESS MANHOLE
C.B.	CATCHBASIN
D.C.B.	DOUBLE CATCHBASIN
W.V.	WATER VALVE
V.C.	VALVE CHAMBER
C.S.	CURB STOP
HYD.	HYDRANT
D.I.	DITCH INLET CATCHBASIN
R.S.	ROAD SIGN
U.P.	UTILITY POLE
	GUY ANCHOR
G.V.	GAS VALVE
TEL PED.	TELEPHONE PEDESTAL
TEL CHAMBER	TELEPHONE CHAMBER
H.H.	HAND HOLE
ELEC M.H.	ELECTRICAL MANHOLE
L.S.	LIGHT STANDARD
100Ø	DECIDUOUS TREE AND DIAMETER
100Ø	CONIFEROUS TREE AND DIAMETER
100Ø	SHRUB AND DIAMETER
100Ø STUMP	TREE STUMP AND DIAMETER
3-100Ø	DECIDUOUS CLUMP TREES AND DIAMETER
3-100Ø	CONIFEROUS CLUMP TREES NUMBER AND DIAMETER

PROPOSED MUNICIPAL SYMBOLS

MHA1	PROPOSED SANITARY MANHOLE
MH1	PROPOSED STORM MANHOLE
CB	PROPOSED CATCHBASIN
W.V.	PROPOSED WATER VALVE
VC	PROPOSED VALVE CHAMBER
HYD.	PROPOSED HYDRANT
DCB	PROPOSED DOUBLE CATCHBASIN
U.P.	PROPOSED UTILITY POLE

MONITORING

BH	BOREHOLE
SS	SURFACE SOIL SAMPLE
SP	STANDPIPE
MW	OBSERVATION/MONITORING WELL
SW	SURFACE WATER MONITORING LOCATION
WS	WATER SUPPLY WELL
PZ	PIEZOMETER
BP	BUNDLE PIEZOMETER
EW	EXTRACTION WELL
WP	WELL POINT
TP	TEST PIT
IW	INJECTION WELL
GP	GAS PROBE
GV	GAS VENT
HA	HAND AUGER BORING LOCATION
MPE	MULTI-PHASE EXTRACTION WELL
VE	VAPOR EXTRACTION WELL
AS	AIR SPARGING WELL
OF	OUTFALL LOCATION

PROPOSED MONITORING

BH	PROPOSED BOREHOLE
SS	PROPOSED SURFACE SOIL SAMPLE
SP	PROPOSED STANDPIPE
MW	PROPOSED OBSERVATION/MONITORING WELL
SW	PROPOSED SURFACE WATER MONITORING LOCATION
WS	PROPOSED WATER SUPPLY WELL
PZ	PROPOSED PIEZOMETER
BP	PROPOSED BUNDLE PIEZOMETER
EW	PROPOSED EXTRACTION WELL
TP	PROPOSED TEST PIT
IW	PROPOSED INJECTION WELL
GP	PROPOSED GAS PROBE
GV	PROPOSED GAS VENT
HA	PROPOSED HAND AUGER BORING LOCATION
MPE	PROPOSED MULTI-PHASE EXTRACTION WELL
VE	PROPOSED VAPOR EXTRACTION WELL
AS	PROPOSED AIR SPARGING WELL
OF	PROPOSED OUTFALL LOCATION

GEOLOGIC & HYDROGEOLOGIC SECTIONS

OW50-92 — WELL DESIGNATION

GROUND SURFACE

OBSERVATION WELL INSTALLATION

WATER ELEVATION

SCREENED INTERVAL

TYPICAL WELL INSTALLATION

OW50-92

176.9 — WATER LEVEL IN WELL SCREEN

MEASURED WATER LEVEL

OW50-92

MONITORED/SAMPLING INTERVAL

MONITORING OR SAMPLING LOCATION

OW50-92

(20.0) — TYPICAL CHEMICAL CONCENTRATION

MEASURED CHEMICAL CONCENTRATION

OW50-92

STRATIGRAPHIC BOUNDARY

CL — TYPICAL SOIL CLASSIFICATION

SOIL CLASSIFICATIONS

MATERIAL

CAP

CONTAINMENT CAP

SAND

SEDIMENT

SAND AND GRAVEL

RUBBLE AND DEBRIS

FILL

WASTE, REFUSE

RIPRAP

P-STONE

BEDROCK

SWAMP

TOPSOIL

ASPHALT

CONCRETE

EAST LAGOON LINER

BRICK MASONRY

RIGID INSULATION

WOOD, ROUGH NON-BATT INSULATION

CONTINUOUS

ROCK SURFACE

EARTH SURFACE

GRATING

ARCHITECTURAL

ACTIVE / INACTIVE — INDICATES PAIR OF DOORS

1 — DOOR NUMBER

1 — LINTEL NUMBER

MISCELLANEOUS

SEED AND MULCH, VEGETATION COVER, GRASS

GRADE, TOP OF GROUND

GEOTEXTILE

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

NOTES:

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2. CONTACT ENGINEER FOR ABBREVIATIONS AND SYMBOLS NOT LISTED.

REALM — Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH03

AS RECORDED MAY 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

CIVIL, STRUCTURAL AND ARCHITECTURAL LEGEND

CRA — CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	RLA	MAY 2000	
Scale: NO SCALE	Project N №: 12610-10	Report N №: 016	Drawing N №: G-03AR

12610-10(016)GN-WA004 APR 16/2002

PIPE AND PIPE FITTING SYMBOLS

FITTING	SINGLE LINE FLANGED	SINGLE LINE SCREWED	SINGLE LINE WELDED	DOUBLE LINE FLANGED
STRAIGHT CROSS				
ELBOW 11.25°				
ELBOW 22.5°				
ELBOW 45°				
ELBOW 90°				
ELBOW UP				
ELBOW DOWN				
CAPPED END				
LATERAL				
CONCENTRIC REDUCER				
ECCENTRIC REDUCER				
TEE-STRAIGHT SIZE				
TEE-OUTLET UP				
TEE-OUTLET DOWN				
UNION				
WELD NECK				
EXISTING PIPE				
NEW PIPE				
EXISTING PIPE TO BE ABANDONED				
EXISTING PIPE TO BE REMOVED				

VALVE SYMBOLS

- MULTIPORT BALL VALVE (BALL VALVE SHOWN. ARROWS INDICATE PATTERN, SEAT PORTS ARE IMPLIED
- FOUR WAY VALVE
- AIR AND VACUUM VALVE
- ANGLE GATE VALVE
- ANGLE GLOBE VALVE
- GLOBE VALVE
- GATE VALVE
- KNIFE GATE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- DIAPHRAGM VALVE
- NEEDLE VALVE
- PLUG VALVE
- SEAT PORT — ECCENTRIC PLUG VALVE
- PRV — PRESSURE REDUCING VALVE
- PINCH VALVE
- PRESSURE RELIEF VALVE
- SELF-CONTAINED PRESS. REGULATOR
- E — VALVE WITH ACTUATOR
- S — SOLENOID VALVE OPERATOR
- FI — FLOW INDICATOR
- T — TEMP. CONTROL VALVE
- CONTROL VALVE — FLOW DIRECTION — VALVE SYMBOL
- HOSE VALVE OR BIBB
- SP — SAMPLE PORT
- F — FLUSH

PIPE MATERIAL

CS	CARBON STEEL
CI	CAST IRON
CLDI	CEMENT LINED DUCTILE IRON
CPVC	CHLORINATED POLYVINYL CHLORIDE
CU	COPPER
DI	DUCTILE IRON
ELS	EPOXY LINED STEEL
FRP	FIBERGLASS REINFORCED PLASTIC
GALVS	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
PVC	POLYVINYL CHLORIDE
SST	STAINLESS STEEL

METER SYMBOLS

- M — MAGNETIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- TURBINE FLOW METER
- VORTEX FLOW METER
- WEIR

PROCESS PIPE IDENTIFICATION

AC	ACID
AI	AIR, INSTRUMENT
ALP	AIR, LOW PRESSURE
AHP	AIR, HIGH PRESSURE
AS	AIR SCOUR
BD	BLOWDOWN
BW	BACKWASH WASTE
CD	CONDENSATE DRAIN
CG	CHLORINE GAS
D	DECANT
DDS	DEWATERED DIGESTED SLUDGE
DG	DIGESTER GAS
DR	DRAIN
DS	DIGESTED SLUDGE
EXH	EXHAUST
FC	FERRIC CHLORIDE
GW	GROUNDWATER
M	METHANOL
N	NUTRIENT
O	OXYGEN
OF	OVERFLOW
P	POLYMER
PW	POLISHED WATER
RAS	RETURN ACTIVATED SLUDGE
RW	RAW WATER
S	SUPERNATANT
SA	SAMPLE
SL	SLUDGE
SPD	SUMP PUMP DISCHARGE
TBS	THICKENED BOTTOM SLUDGE
TWAS	THICKENED WASTE ACTIVATED SLUDGE
WAS	WASTE ACTIVATED SLUDGE
WW	WASH WATER
W1	SERVICE WATER, NON-POTABLE
W2	TREATED EFFLUENT USED FOR SERVICE, NON-POTABLE

PIPING DESIGNATION — 16"-CLDI-RAS

16" - CLDI - RAS

- PIPE USE IDENTIFICATION LEGEND
- PIPE MATERIAL
- NOMINAL PIPE DIAMETER (INCH)

EQUIPMENT SYMBOLS

- SG — SIGHT GLASS
- TRANSDUCER MOUNTING
- DISSOLVED OXYGEN ANALYZER
- INLINE MIXER
- INLINE CIRCULATING PUMP
- DIAPHRAGM PUMP
- CENTRIFUGAL PUMP OR BLOWER
- GEAR PUMP OR POS DISPLACEMENT BLOWER

LEVEL SENSOR SYMBOLS

LEVEL SWITCH — ULTRASONIC LEVEL TRANSMITTER — FLOAT SWITCH

MISCELLANEOUS PIPING SYMBOLS

- BFP — BACKFLOW PREVENTOR
- DIRECTION OF SLOPE
- DIRECTION OF FLOW
- INSULATED LINE
- ELEC — INSULATED LINE w/STEAM TRACE
- INSULATED LINE w/ELECTRICAL TRACE
- L R F — LUBRICATOR, REGULATOR, FILTER

GATE SYMBOLS

EL. VIEW — PLAN VIEW

- SLUICE
- BUTTERFLY
- FLAP
- SHEAR
- FABRICATED SLIDE

HVAC SYMBOLS

- OED — OPEN END DUCT
- T — ROOM THERMOSTAT
- T G — ROOM THERMOSTAT w/GUARD
- SUPPLY AIR DUCT SECTION UP
- SUPPLY AIR DUCT SECTION DOWN
- RETURN/EXHAUST AIR DUCT SECTION UP
- RETURN/EXHAUST AIR DUCT SECTION DOWN
- FLEXIBLE CONNECTION
- TURNING VANES
- SUPPLY AIR DIFFUSER
- INSULATED DUCT
- OPPOSED BLADE DAMPER
- FD — FIRE DAMPER
- BDD — BACKDRAFT DAMPER
- BD — BALANCING DAMPER
- M — DAMPER MOTOR
- DG — DOOR GRILLE
- UH — UNIT HEATER

BUILDING SERVICES PIPE IDENTIFICATION

HW	HOT WATER
HWR	HOT WATER RECIRCULATION
CW	COLD WATER
S	COLD WATER (SOFT)
SAN	SANITARY SEWER
STM	STORM SEWER
PS	PROCESS SEWER
RWL	RAIN WATER LEADER
V	VENT
G	GAS
F	FIRE STANDPIPE
SPK	SPRINKLER
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
LPS	LOW PRESSURE STEAM
LPC	GRAVITY STEAM CONDENSATE
FT	FLOAT & THERMOSTATIC TRAP
CWS	CONDENSER WATER SUPPLY
CWR	CONDENSER WATER RETURN
RD	ROOF DRAIN
CO	CLEANOUT
FD	FLOOR DRAIN
HD	HUB DRAIN

GENERAL PIPING NOTES

1. SYMBOLS SHOWN HERE FOR SINGLE LINE FITTINGS ARE GENERIC ONLY. REFER TO PIPING SPECIFICATIONS FOR SPECIFIC END CONNECTIONS FOR SINGLE LINE PIPE AND FITTINGS.
2. EXISTING PIPE AND EQUIPMENT IS SHOWN THIN-LINED AND/OR SCREENED AND IS NOTED AS EXISTING. NEW PIPING AND EQUIPMENT IS SHOWN HEAVY-LINED.
3. ONLY FLANGED END CONNECTIONS ARE SHOWN HERE FOR DOUBLE LINE FITTINGS.
4. SIZE OF FITTINGS SHOWN ON PLANS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
5. ALL FLEXIBLE CONNECTORS OR FLANGED ADAPTERS SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS NOTED OTHERWISE. THRUST PROTECTION SHALL BE ADEQUATE FOR PRESSURES SPECIFIED.
6. NUMBER AND LOCATION OF UNIONS SHOWN ON DRAWINGS IS ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.

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1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

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GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH04

AS RECORDED MAY 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

MECHANICAL LEGEND

CRA **CONESTOGA-ROVERS & ASSOCIATES**

Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	RLA	MAY 2000	
Scale: NO SCALE	Project N º: 12610-10	Report N º: 016	Drawing N º: G-04AR

12610-10(016)GN-WA007 APR 16/2002

PRIMARY ELEMENT SYMBOLS

- TURBINE FLOW METER
- MAGNETIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- WEIR
- VORTEX FLOW METER
- ROTAMETER
- ULTRASONIC LEVEL TRANSMITTER
- FLOAT
- OPEN DRAIN OR SEWER
- CLOSED DRAIN OR SEWER
- SPECIFICATION CHANGE
- CAP
- HOSE CONNECTION
- BLIND FLANGE
- STRAINER
- INLINE MIXER
- FLEXIBLE PIPE

PUMP AND COMPRESSOR SYMBOLS

- CENTRIFUGAL PUMP (DRY PIT)
- CENTRIFUGAL WET PIT PUMP OR TURBINE PUMP
- CHEMICAL FEED PUMP
- DIAPHRAGM PUMP
- GEAR PUMP OR BLOWER (POSITIVE DISPLACEMENT)
- PISTON PUMP
- PROGRESSIVE CAVITY PUMP
- SUBMERSIBLE SUMP PUMP
- COMPRESSOR (CENTRIFUGAL) BLOWER OR TURBINE
- COMPRESSOR (PISTON)
- EJECTOR

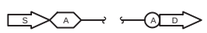
NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC, ELECTRICAL, OR HYDRAULIC)
XX: AS = ADJUSTABLE SPEED
CS-1 = CONSTANT SPEED (SINGLE SPEED)
CS-2 = CONSTANT SPEED (TWO SPEED)

ACTUATOR SYMBOLS

- PNEUMATIC WITH POSITIONER
- PHEUMATIC WITH SOLENOID
- ELECTRIC
- ELECTRIC WITH POSITIONER
- ELECTROHYDRAULIC
- HYDRAULIC
- PNEUMATIC WITH VOLUME BOOSTER
- SOLENOID
- MANUAL

NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC, ELECTRICAL, OR HYDRAULIC)
XX: FD = FAIL OPEN
FC = FAIL CLOSED
FLP = FAIL TO LAST POSITION

INTERFACE SYMBOLS



- PROCESS INTERFACE
- SIGNAL INTERFACE
- A — INTERFACE LETTER
- D — DESTINATION DRAWING NUMBER
- S — SOURCE DRAWING NUMBER

INTERFACE TO/FROM PROCESS EXTERNAL TO PROJECT

INSTRUMENTATION SYMBOLS

- PROGRAMMABLE LOGIC CONTROL FIELD MOUNTED
- PROGRAMMABLE LOGIC CONTROL NORMALLY ACCESSIBLE (BOARD MOUNTED)
- PROGRAMMABLE LOGIC CONTROL BEHIND BOARD MOUNTED
- PROGRAMMABLE LOGIC CONTROL AUX. LOCATION
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE FIELD MOUNTED
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE NORMALLY ACCESSIBLE (BOARD MOUNTED)
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE BEHIND BOARD MOUNTED
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE AUX. LOCATION
- SHARED DISPLAY/CONTROL DEVICE FIELD MOUNTED
- SHARED DISPLAY/CONTROL DEVICE NORMALLY ACCESSIBLE (BOARD MOUNTED)
- SHARED DISPLAY/CONTROL DEVICE BEHIND BOARD MOUNTED
- SHARED DISPLAY/CONTROL DEVICE AUX. LOCATION
- LOCAL INDICATOR LIGHT R - RED, Y - YELLOW, G - GREEN
- INDICATOR LIGHT NORMALLY ACCESSIBLE
- UNDEFINED COMPLEX INTERCONNECTING LOGIC

INSTRUMENTATION LINES

- ELECTRIC ANALOG SIGNAL
- ELECTRIC BINARY SIGNAL
- PNEUMATIC SIGNAL
- PNEUMATIC BINARY SIGNAL
- INTERNAL SYSTEM LINK

ISA LETTER COMBINATIONS

First-Letters	Initiating or Measured Variable	Controllers: Recording	Controllers: Indicating	Controllers: Blind	Controllers: Self-Actuated Control Valves	Readout Devices: Recording	Readout Devices: Indicating	Switches and Alarm Devices *: High **	Switches and Alarm Devices *: Low	Switches and Alarm Devices *: Comb	Transmitters: Recording	Transmitters: Indicating	Transmitters: Blind	Solenoids, Relays, Computing Devices	Primary Element	Test Point	Well or Probe	Viewing Device, Glass	Safety Device	Final Element
A	Analysis	ARC	AIC	AC		AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	Burner/Combustion	BRC	BIC	BC		BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	User's Choice																			
D	User's Choice																			
E	Voltage	ERC	EIC	EC		ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	Flow Rate	FRC	FIC	FC	FCV, FICV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP		FG		FV
FQ	Flow Quantity	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE					FQV
FF	Flow Ratio	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSL						FE					FFV
G	User's Choice																			
H	Hand		HIC	HC						HS										HV
I	Current	IRC	IIC			IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	Power	JRC	JIC			JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	Time	KRC	KIC	KC	KCV	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	Level	LRC	LIC	LC	LCV	LR	LI	LSH	LSL	LSHL LSHH	LRT	LIT	LT	LY	LE		LW	LG		LV
M	User's Choice																			
N	User's Choice																			
O	User's Choice																			
P	Pressure/Vacuum	PRC	PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	Pressure, Differential	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE	PP				PDV
Q	Quantity	QRC	QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE					QZ
R	Radiation	RRC	RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW			RZ
S	Speed/Frequency	SRC	SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE					SV
T	Temperature	TRC	TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW		TSE	TV
TD	Temperature, Differential	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE	TP	TW			TDV
U	Multivariable					UR	UI							UY						UV
V	Vibration/Machinery Analysis					VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE					VZ
W	Weight/Force	WRC	WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE					WZ
WD	Weight/Force, Differential	WDRC	WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WE					WDZ
X	Unclassified																			
Y	Event/State/Presence		YIC	YC		YR	YI	YSH	YSL				YT	YY	YE					YZ
Z	Position/Dimension	ZRC	ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE					ZV
ZD	Gauging/Deviation	ZDRC	ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE					ZDV

Note: This table is not all-inclusive.
* A, alarm, the annunciating device, may be used in the same fashion as S, switch, the actuating device.

** The letters H and L may be omitted in the undefined case.

Other Possible Combinations:

FO	(Restriction Orifice)	PFR	(Ratio)
FRK, HIK	(Control Stations)	KQI	(Running Time Indicator)
FX	(Accessories)	QQI	(Indicating Counter)
TJR	(Scanning Recorder)	WKIC	(Rate-of-Weight-Loss Controller)
LLH	(Pilot Light)	HMS	(Hand Momentary Switch)
LCH	(Level Control High)	LCL	(Level Control Low)

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1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

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3. COMPONENTS AND PANELS SHOWN WITH AN ASTERISK TO BE FURNISHED AS PART OF A PACKAGE SYSTEM.

REALM — Remediation and Liability Management Company, Inc.

GM POWERTRAIN
GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

SHEET No.
PE-H-96 SH05

AS RECORDED MAY 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

INSTRUMENTATION AND CONTROL LEGEND

CRA — CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	RLA	MAY 2000	
Scale: NO SCALE	Project N №: 12610-10	Report N №: 016	Drawing N №: G-05AR

12610-10(016)GN-WA009 APR 16/2002

GROUNDING SYMBOLS

- GROUND ROD
- GROUND CABLE CONNECTION AND GROUND STUB
- ROD ELECTRODE AND GROUND INSPECTION WELL
- ROD GROUNDING ELECTRODE
- CORNER SET GROUNDING ELECTRODES
- GROUND CABLE EMBEDDED OR BURIED, CABLE UP
- GROUND CABLE EXPOSED, CABLE DOWN
- GROUND CABLE CONNECTION TO EQUIPMENT
- GROUND CABLE CONNECTION TO BUILDING STEEL COLUMN

CIRCUIT SYMBOLS

- RECTIFIER BRIDGE
- RESISTOR
- TIME DELAY CAPSULE N/O (15 SECS.)
- TIME DELAY CAPSULE N/C (10 SECS.)
  1. ENTER TIME DELAY REQ'D. (e.g. 10 SECS.)
- NORMALLY OPEN RELAY CONTACT
- NORMALLY CLOSED RELAY CONTACT
- RELAY COIL (CR)
- METER: CTR–COUNTER (AM), AM–AMMETER, VM–VOLTMETER, WHM–WAT (HOURMETER)
- TRANSFORMER (T1)
- PILOT LIGHT (LENS COLOUR) (R)
- POLARIZED CAPACITOR
- FIXED CAPACITOR
- LIGHT EMITTING DIODE
- ZENER DIODE
- DIODE
- ARC SUPPRESSOR
- FUSE (5A)
- BATTERY
- TERMINAL WITH DESIGNATION (1A)
- GROUND
- BREAKER STABS
- THERMAL OVERLOAD
- MOTOR OVERLOAD
- MAGNETIC OVERLOAD
- CIRCUIT BREAKER
- MOTOR (XX)
- MOTOR (100A)
- WIRE LABELING (XX, XX, XX)

SWITCH SYMBOLS

- LIMIT SWITCH N/O
- LIMIT SWITCH N/C
- TIME DELAY N/O DELAY ON CLOSING
- TIME DELAY N/C DELAY ON OPENING
- TIME DELAY N/C DELAY ON CLOSING
- TIME DELAY N/O DELAY ON OPENING
- TIME DELAY COIL
- PROXIMITY LIMIT SWITCH N/O
- PROXIMITY LIMIT SWITCH N/C
- FOOT OPERATED L/S CLOSED
- FOOT OPERATED L/S OPEN
- FLOW OPERATED L/S CLOSED
- FLOW OPERATED L/S OPEN
- FLOAT OPERATED L/S CLOSED
- FLOAT OPERATED L/S OPEN
- PRESSURE OPERATED L/S CLOSED
- PRESSURE OPERATED L/S OPEN
- TEMPERATURE OPERATED L/S CLOSED
- TEMPERATURE OPERATED L/S OPEN
- 2 POSITION SELECTOR SWITCH
- 3 POSITION SELECTOR SWITCH
- SOLENOID
- PUSHBUTTON CLOSED
- PUSHBUTTON OPEN
- DISCONNECT SWITCH N/O
- MAINTAINED EMERGENCY STOP
- HAND–OFF AUTO SELECTOR SWITCH (H O A / R O / X O / O X / O X)

LAYOUT SYMBOLS

- PHOTOCELL EMITTER
- PHOTOCELL RECEIVER
- HORN
- BUZZER
- BELL
- SENSING ELEMENT
- PILOT LIGHT C/W TEST SWITCH (LENS COLOUR)
- SWITCH SINGLE POLE 120V
- SWITCH DOUBLE POLE 120V
- SWITCH THREE WAY 120V
- DUPLEX RECEPTACLE 120V, 20A;
- DUPLEX RECEPTACLE WITH GROUND FAULT PROTECTION, 120V, 20A (GF)
- DUPLEX RECEPTACLE WEATHER PROOF, 120V, 20A (WP)
- TWIST LOCK RECEPTACLE 120V (TW)
- THERMOSTAT
- KW, RATING REQUIRED. 'A' DENOTES ELECTRIC UNIT HEATER, C/W CEILING–MOUNTED BRACKETS. (E.U.H. 2.0 A)
- MOTORIZED DOOR OPERATOR
- POWER TRANSFORMER – T1
- WELDING RECEPTACLE
- TELEPHONE OUTLET MOUNTED 12" ABOVE FINISHED FLOOR LEVEL
- TELEPHONE OUTLET MOUNTED 4'–6" ABOVE FINISHED FLOOR LEVEL
- SINGLE PHASE MANUAL MOTOR STARTER
- THREE PHASE MANUAL MOTOR STARTER/DISCONNECT SWITCH
- START–STOP PUSHBUTTON AND PILOT LIGHT
- LOCKABLE DISCONNECT SWITCH
- FIRE ALARM PULL STATION MOUNTED 4'–6" ABOVE FINISHED FLOOR LEVEL
- PHOTO ELECTRIC SMOKE DETECTOR (P, E)
- SPRINKLER FLOW ALARM SWITCH CONNECTED TO FIRE ALARM SYSTEM
- SOLENOID VALVE CONNECTED TO FIRE ALARM SYSTEM (SV)
- 115V, DUPLEX RECEPTACLE (GFI, A-1) GFI – GROUND FAULT CIRCUIT INTERUPTER, WP – WEATHERPROOF
- DATA GRADE TELEPHONE OUTLET
- LOCAL CONTROL STATION (CS01)
- HEAT DETECTOR (H)
- FIRE BELL (F)
- FIRE ALARM STROBE (S)
- FIRE ALARM INTEGRATED BELL AND LIGHT UNIT

LIGHTING SYMBOLS

- STROBE LIGHT – TYPE S
- LIGHTING FIXTURE – TYPE A
- FLUORESCENT LIGHTING FIXTURE – TYPE F
- LIGHTING FIXTURE WALL MOUNTED TYPE A
- EXIT LIGHT AND CEILING MOUNTED OUTLET BOX. DIRECTIONAL ARROWS AS INDICATED. SHADED AREAS DENOTE FACES.
- EMERGENCY BATTERY PACK WITH CHARGER AND SEALED BEAM HEADS
- EMERGENCY BATTERY PACK WITH CHARGER, EXIT LIGHT AND SEALED BEAM HEADS
- EMERGENCY LIGHTING REMOTE HEAD
- EXIT LIGHT – WALL MOUNTED
- FIRE ALARM PANEL
- LIGHTING OR DISTRIBUTION PANEL 208/120V, 3ø, 4W – PANEL ID NUMBER AS SHOWN (DP01)
- DISTRIBUTION PANEL 240/120V, 1ø, 3W – PANEL ID NUMBER AS SHOWN (UPS01)

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

NOTES:

1. THIS IS A STANDARD LEGEND LIST, THEREFORE SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS LIST AND NOT ON THE DRAWINGS.
2. CONTACT ENGINEER FOR ABBREVIATIONS AND SYMBOLS NOT LISTED.

REALM **Remediation and Liability Management Company, Inc.**

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96 | SHEET No. SH06

AS RECORDED MAY 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

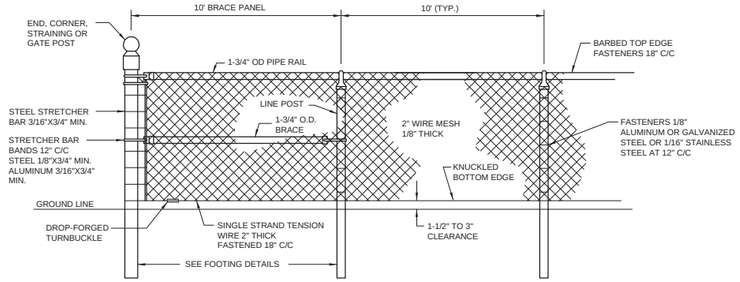
ELECTRICAL
LEGEND

CRA **CONESTOGA-ROVERS & ASSOCIATES**

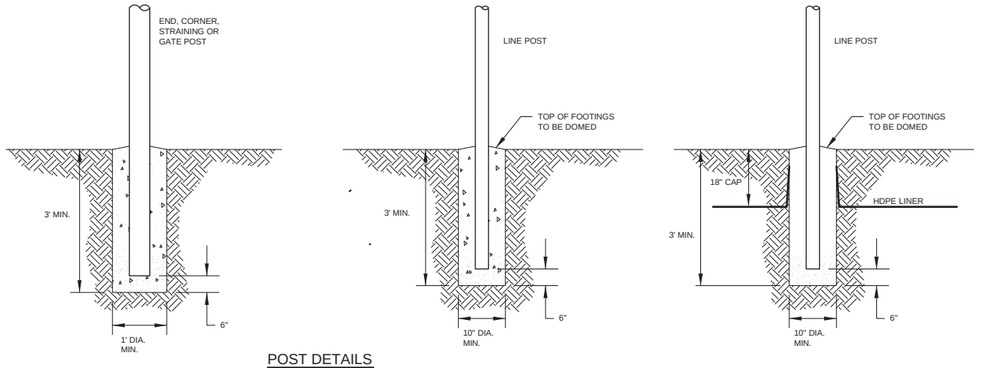
Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	RLA	MAY 2000	
Scale: NO SCALE	Project N №: 12610-10	Report N №: 016	Drawing N №: G-06AR

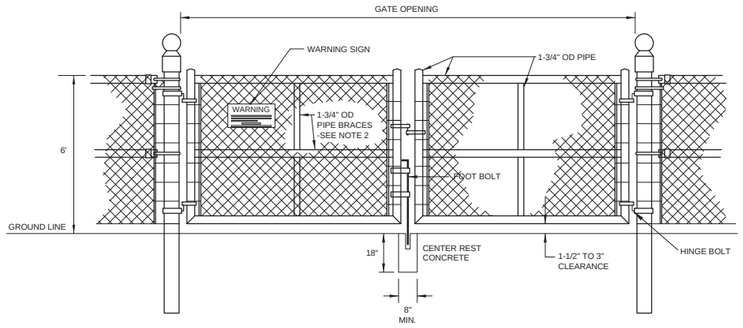
12610-10(016)GN-WA006 APR 16/2002



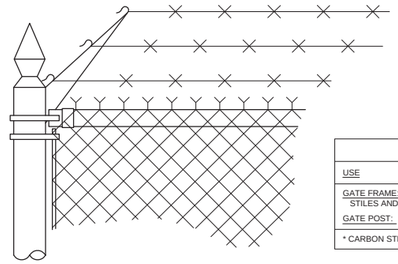
CORNER BRACE



POST DETAILS



DOUBLE GATE



BARBED WIRE CORNER

POST AND RAIL SIZES - FENCE

USE	FABRIC HEIGHT	O.D.*	LBS/FT	BOTTOM PLATE
INTERMEDIATE POSTS	BELOW 9'	2-1/2"	3.65	5"x5"x5/16"
CORNER, END, GATE AND BRACE POSTS	BELOW 9'	3"	5.79	7"x7"x3/8"
RAILS	ALL	1-3/4"	2.27	

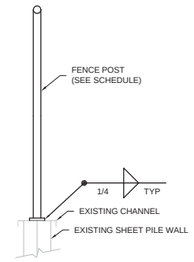
* CARBON STEEL PIPE - ASTM A-20, SCH 40

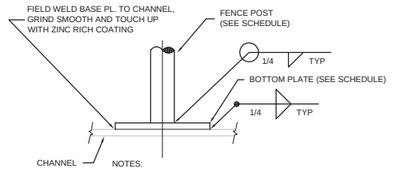
POST AND RAIL SIZES - GATES

USE	LEAF WIDTH		FABRIC HGT	O.D.*		LBS/FT
	DOUBLE	MANGATE		DOUBLE	MANGATE	
GATE FRAME: STILES AND RAILS	2x8'	2x4'	6'	2"	2"	2.27
GATE POST:	16'	4'	6'	6"	4"	18.97/9.11

* CARBON STEEL PIPE - SCHED. 40

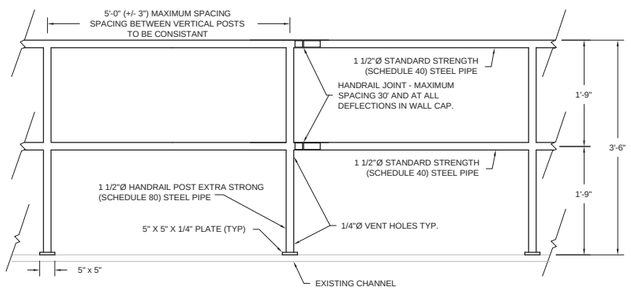
SITE FENCING AND GATES



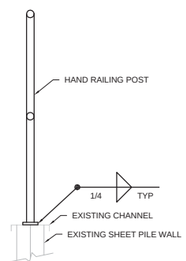


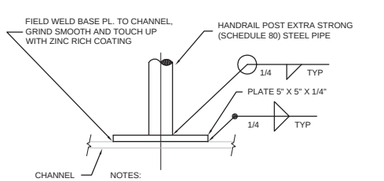
NOTES:
1. PROVIDE PROTECTION FOR DISSIMILAR METALS.
2. FIELD WELD BASE PLATES TO CHANNEL TOUCH UP FIELD WELDS WITH ZINC RICH COATING OR EQUAL
3. HOT DIP GALVANIZE FENCE POST WITH BASE PLATE ATTACHED AFTER FABRICATION.

FENCE POST ANCHORAGE TO STEEL



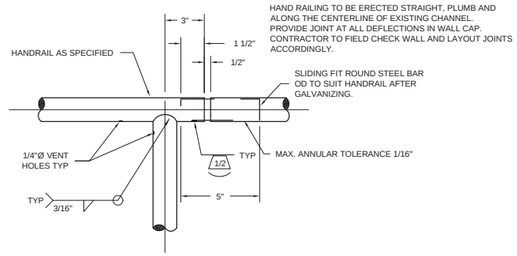
HANDRAIL DETAIL





NOTES:
1. PROVIDE PROTECTION FOR DISSIMILAR METALS.
2. FIELD WELD BASE PLATES TO CHANNEL TOUCH UP FIELD WELDS WITH ZINC RICH COATING OR EQUAL
3. HOT DIP GALVANIZE HAND RAILING WITH BASE PLATE ATTACHED AFTER FABRICATION. MIN. 15' & MAX. 30' SECTIONS

HANDRAIL POST ANCHORAGE TO STEEL



TYPICAL HAND RAIL JOINT
TYPICAL FOR TOP AND MIDDLE RAILS

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH07

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

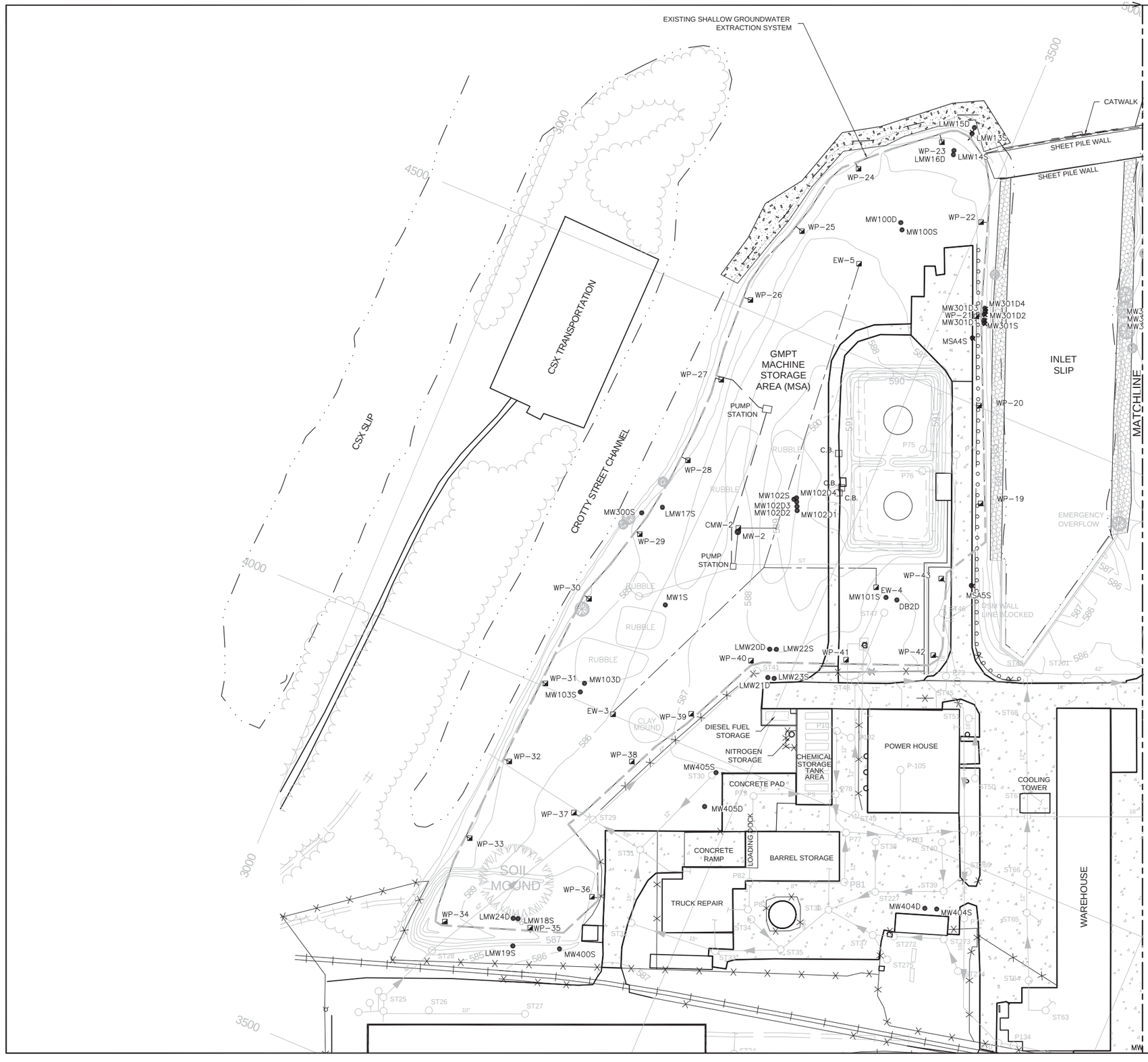
CIVIL
STANDARD DETAILS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: AS SHOWN	Project No.: 12610-10	Report No.: 016	Drawing No.: G-07AR

12610-10(016)GN-WA010 APR 16/2002



№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

NOTES:
1. FOR LEGEND SYMBOLS SEE DWG. G-03 AND G-04.
2. BENCHMARKS:
-CUT CROSS ON RIM OF STORM MANHOLE 292 - ELEV. 586.97 FT. AMSL
-SW CORNER WATER TOWER BASE - ELEV. 587.67 FT. AMSL
-SW CORNER ARCHIMEDES SCREW PUMP STATION - ELEV. 587.97 FT. AMSL

0 20 60ft

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No.: PE-H-96
SHEET No.: SH11

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

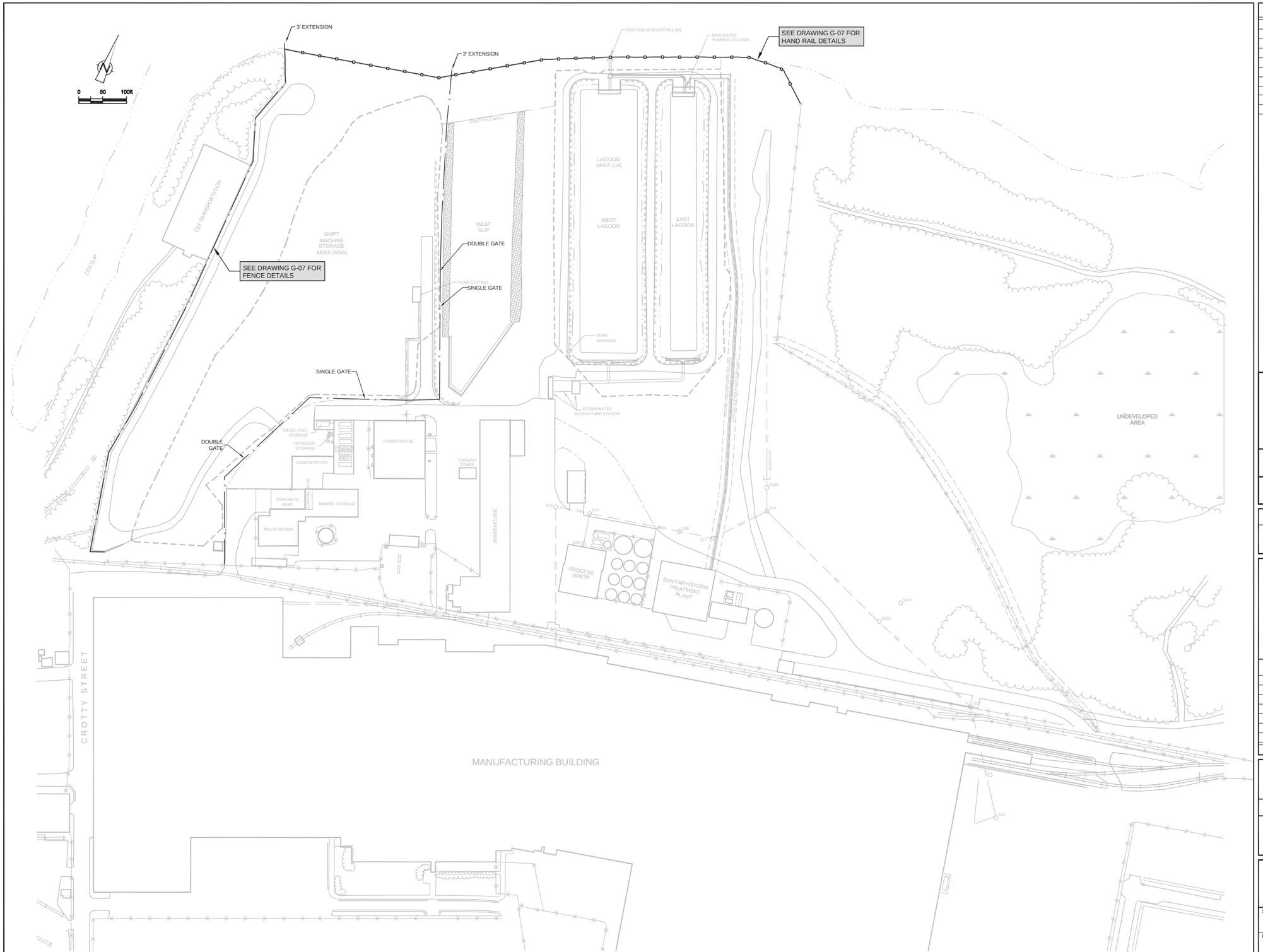
WEST SITE PLAN
PRE-CONSTRUCTION CONDITIONS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
CRA AP001, 12610R RAW OCTOBER 1999

Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: 1"=60'	Project No.: 12610-10	Report No.: 016	Drawing No.: G-11AR

12610-10(016)GN-WA012 APR 16/2002



№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	SEPTEMBER 2000	MRT

LEGEND

HANDRAIL
NEW FENCE
ALL OTHER FENCES PREVIOUSLY SHOWN

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH08

AS RECORDED SEPTEMBER 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY MICHIGAN

AS RECORDED

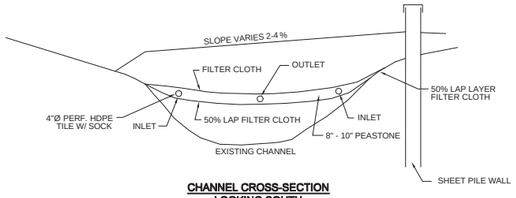
FENCING

CONESTOGA-ROVERS & ASSOCIATES

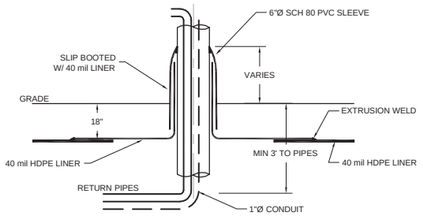
Source Reference:
SPICER GROUP, SAGINAW, MICHIGAN, DRAWING D-352414, SEPTEMBER 2000

Project Manager:	Reviewed By:	Date:	
MRT	AW	JUNE 2000	
Scale: 1"=100'	Project N º: 12610-10	Report N º: 016	Drawing N º: G-08AR

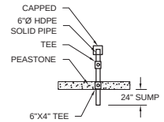
12610-10(016)GN-WA002 APR 16/2002



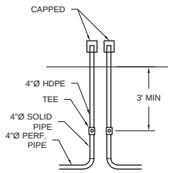
CHANNEL CROSS-SECTION LOOKING SOUTH
N.T.S.



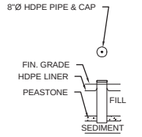
VERTICAL ACCESS INLET AND OUTLET LINER ATTACHMENT
N.T.S.



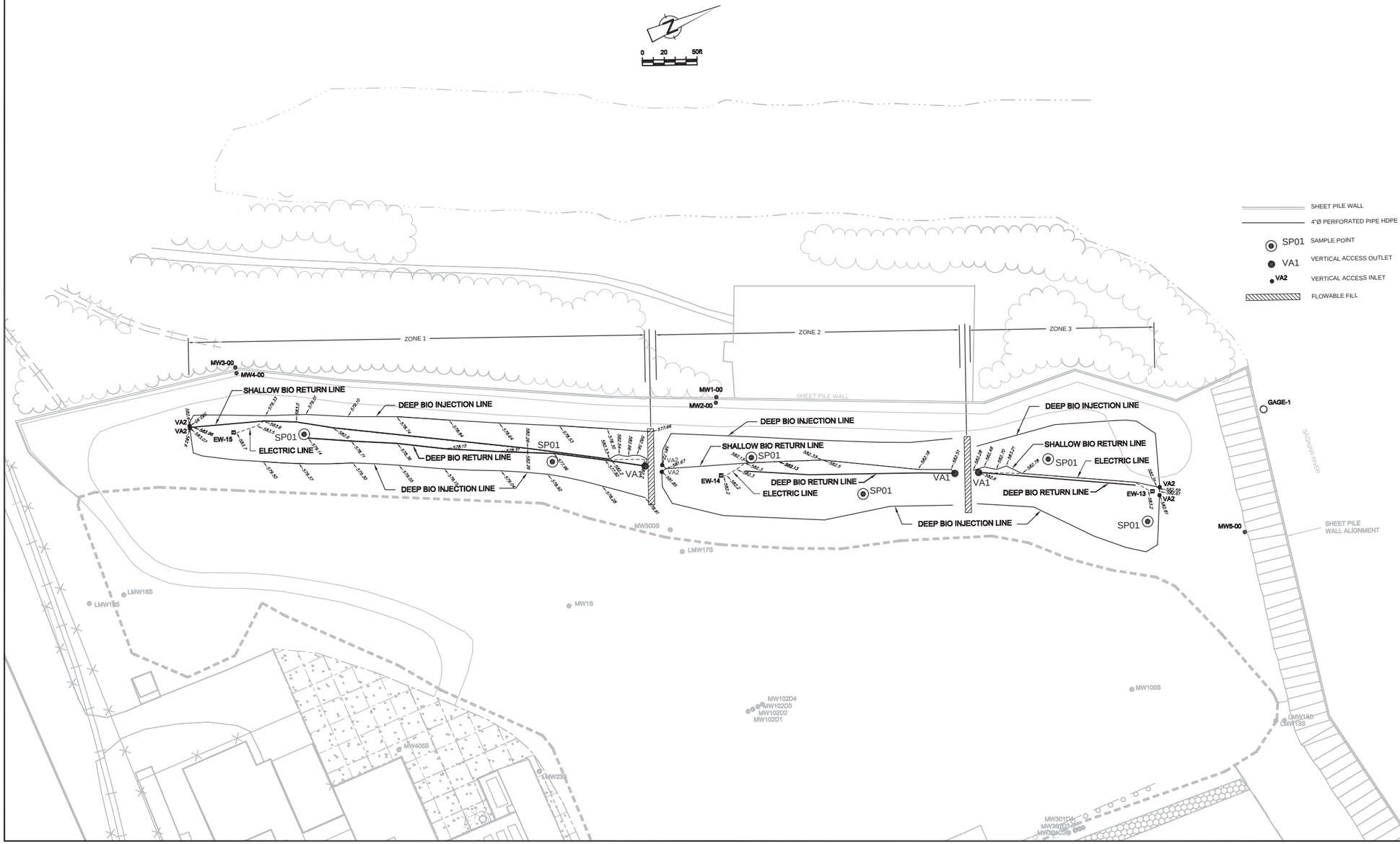
VERTICAL ACCESS OUTLET VA1



VERTICAL ACCESS INLET VA2



SAMPLE POINT SP01



№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	SEPTEMBER 2000	MRT

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No.: PE-H-96
SHEET No.: SH09

AS RECORDED SEPTEMBER 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY MICHIGAN

AS RECORDED

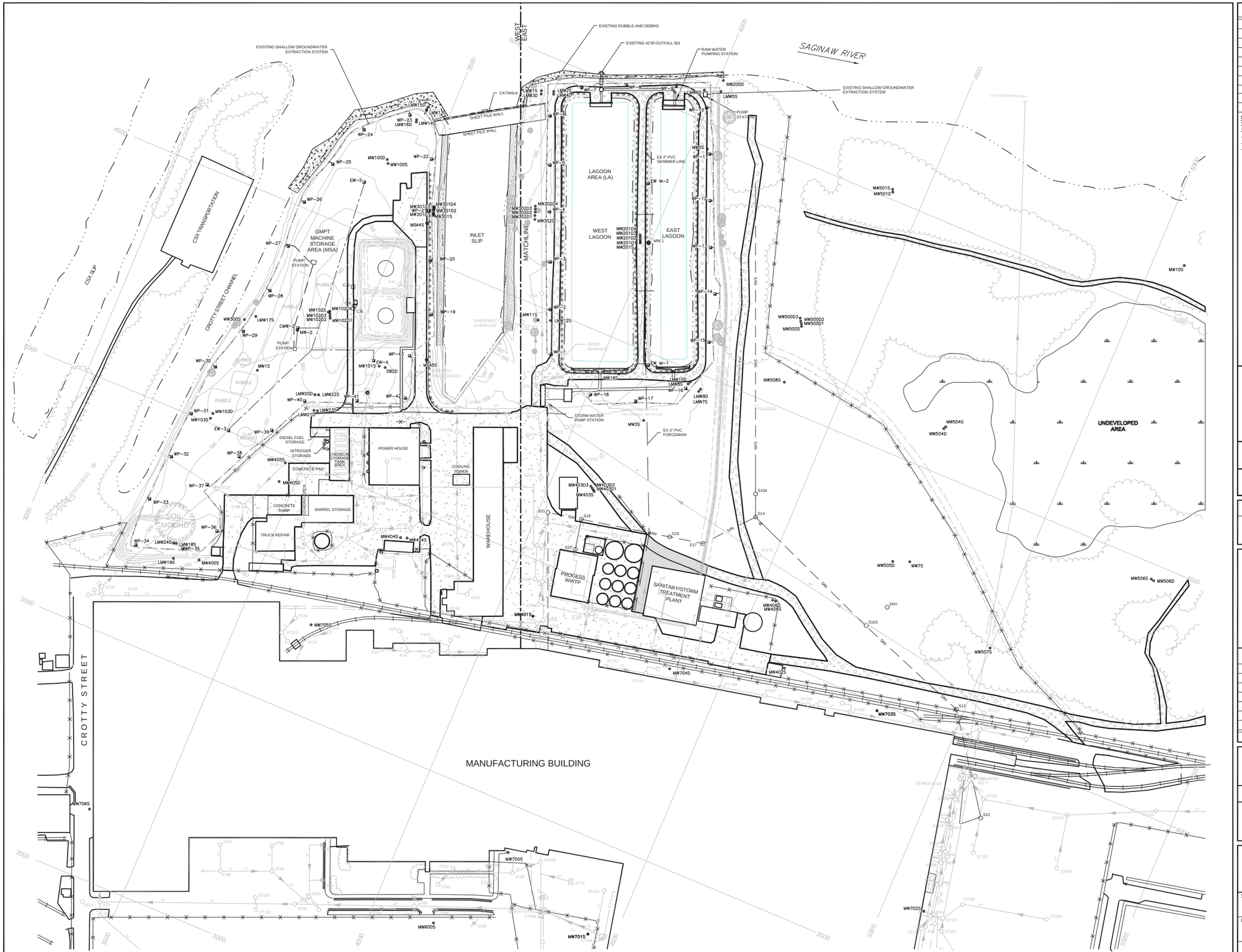
DISTRIBUTION PIPING

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
SPICER GROUP, SAGINAW, MICHIGAN, DRAWING D352413 AND D352410, MAY 2000

Project Manager:	Reviewed By:	Date:	
MRT	MRT	MAY 2000	
Scale: 1"=50'	Project N №: 12610-10	Report N №: 016	Drawing N №: G-09AR

12610-10(016)GN-WA008 APR 16/2002



№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

NOTES:
1. FOR LEGEND SYMBOLS SEE DWG. G-03 AND G-04.
2. BENCHMARKS:
-CUT CROSS ON RIM OF STORM MANHOLE 292 - ELEV. 586.97 FT. AMSL
-SW CORNER WATER TOWER BASE - ELEV. 587.67 FT. AMSL
-SW CORNER ARCHIMEDES SCREW PUMP STATION - ELEV. 587.97 FT. AMSL

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No.: PE-H-96
SHEET No.: SH10

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

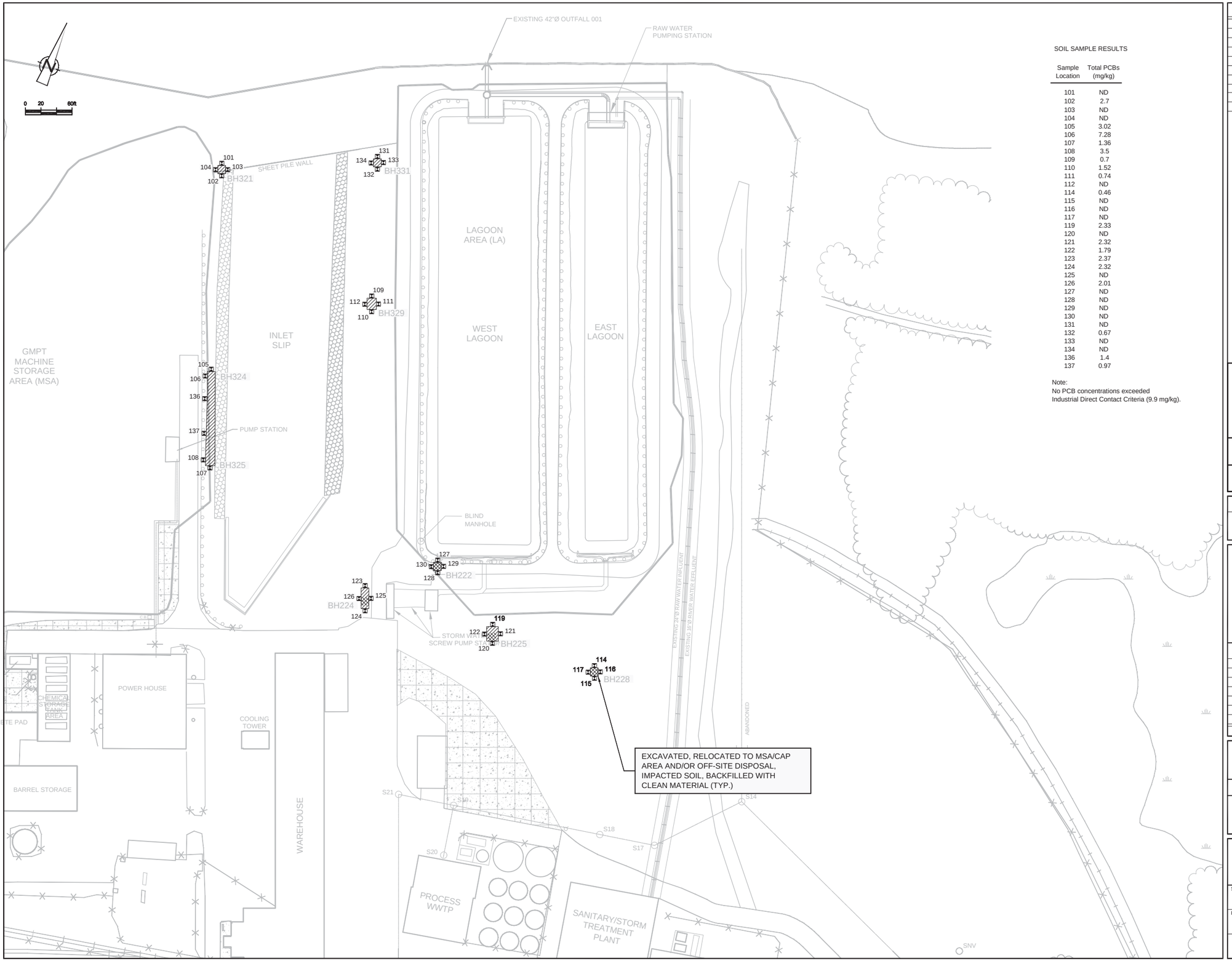
PRE-CONSTRUCTION CONDITIONS

CRA CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
CRA AP001, 12610R RAW OCTOBER 1999

Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: 1"=100'	Project N º: 12610-10	Report N º: 016	Drawing N º: G-10AR

12610-10(016)GN-WA011 APR 16/2002



SOIL SAMPLE RESULTS

Sample Location	Total PCBs (mg/kg)
101	ND
102	2.7
103	ND
104	ND
105	3.02
106	7.28
107	1.36
108	3.5
109	0.7
110	1.52
111	0.74
112	ND
114	0.46
115	ND
116	ND
117	ND
119	2.33
120	ND
121	2.32
122	1.79
123	2.37
124	2.32
125	ND
126	2.01
127	ND
128	ND
129	ND
130	ND
131	ND
132	0.67
133	ND
134	ND
136	1.4
137	0.97

Note:
No PCB concentrations exceeded Industrial Direct Contact Criteria (9.9 mg/kg).

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

LEGEND

114 / 117 116 / 115 BH228 — VERIFICATION SAMPLE ID NUMBER; BOREHOLE ID NUMBER

S-12610-990315-SSH- — SOIL SAMPLE ID

NOTE
1. FINAL LIMITS OF IMPACTED SOIL EXCAVATION WILL BE DETERMINED IN FIELD.

REALM **Remediation and Liability Management Company, Inc.**

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH16

AS RECORDED MAY 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY MICHIGAN

AS RECORDED

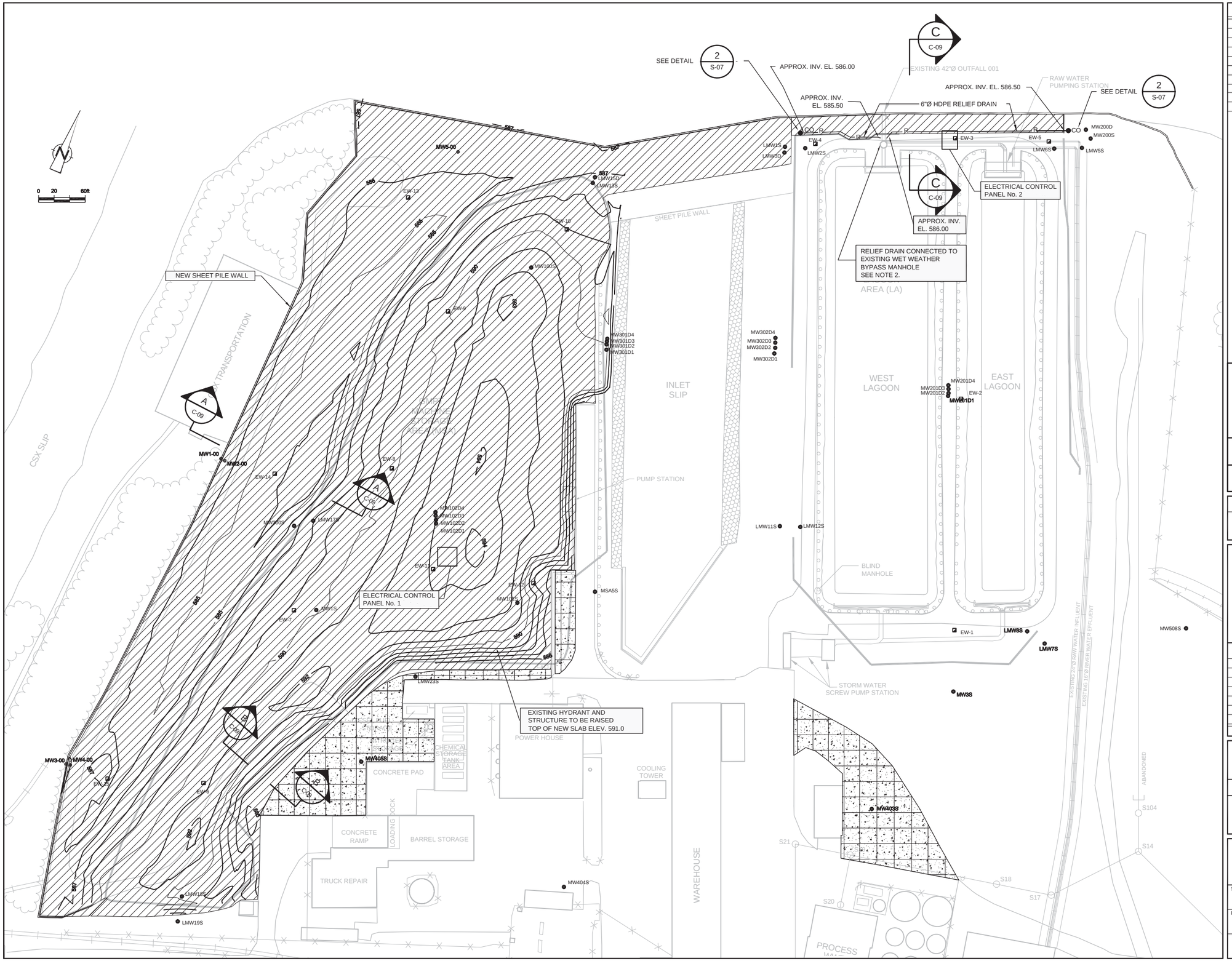
SOIL EXCAVATION LOCATIONS AND RESULTS

CRA **CONESTOGA-ROVERS & ASSOCIATES**

Source Reference: SPICER GROUP

Project Manager:	Reviewed By:	Date:	
MRT	MRT	MAY 2000	
Scale: 1"=60'	Project N º: 12610-10	Report N º: 016	Drawing N º: C-04AR

12610-10(016)CI-WA001 APR 16/2002


SEE DETAIL 2 S-07
APPROX. INV. EL. 586.00
C C-09
EXISTING 42"Ø OUTFALL 001
RAW WATER PUMPING STATION
APPROX. INV. EL. 586.50
SEE DETAIL 2 S-07
APPROX. INV. EL. 585.50
6"Ø HDPE RELIEF DRAIN
ELECTRICAL CONTROL PANEL No. 2
APPROX. INV. EL. 586.00
RELIEF DRAIN CONNECTED TO EXISTING WET WEATHER BYPASS MANHOLE SEE NOTE 2.
AREA (LA)
NEW SHEET PILE WALL
SHEET PILE WALL
A C-09
MW1-00
MW2-00
MW3-00
MW4-00
MW5-00
MW100S
MW101S
MW102S
MW103S
MW104S
MW105S
MW106S
MW107S
MW108S
MW109S
MW110S
MW111S
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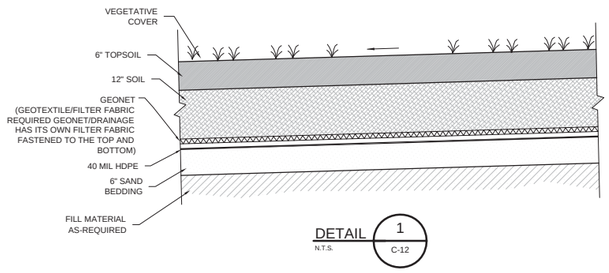
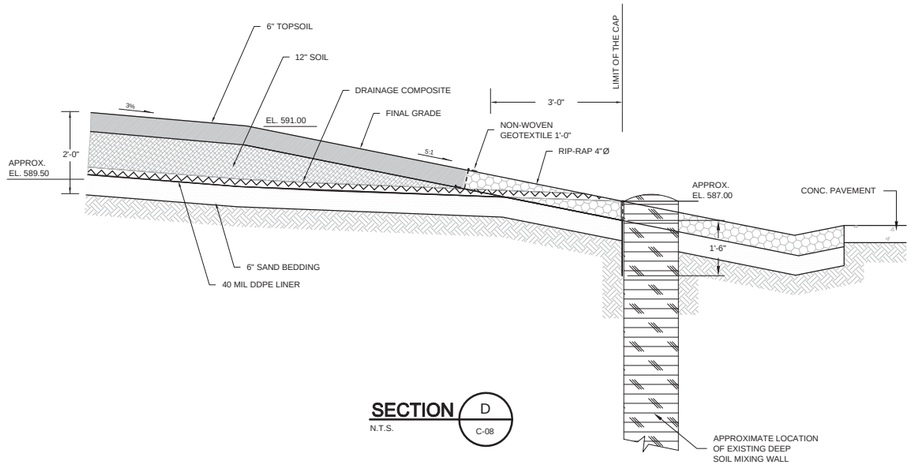
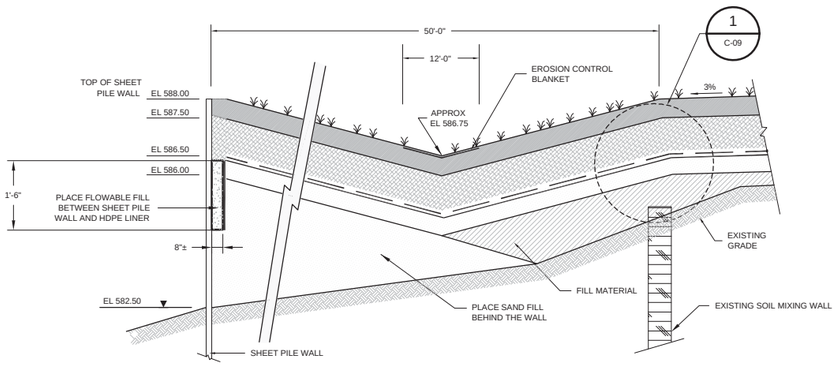


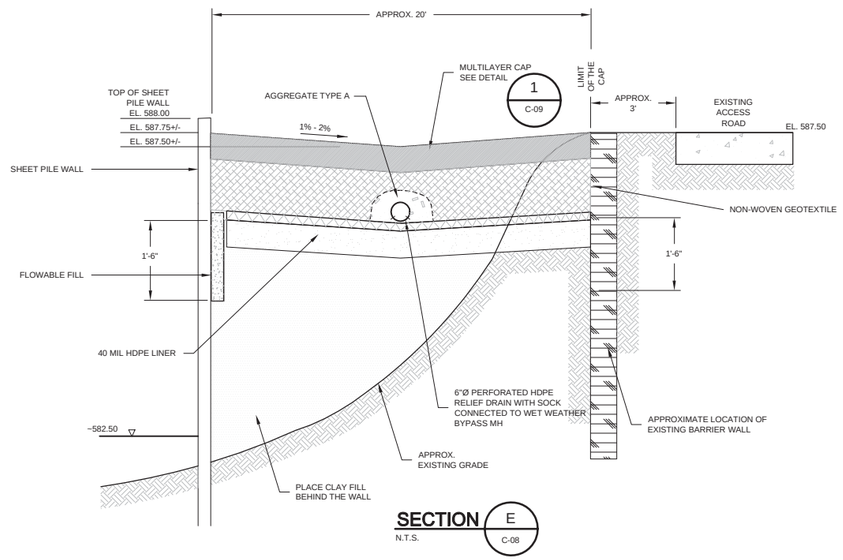
DETAIL 1 / C-12
N.T.S.



SECTION D / C-08
N.T.S.



SECTION A / C-08
N.T.S.



SECTION E / C-08
N.T.S.

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	SEPTEMBER 2000	MRT

REALM **Remediation and Liability Management Company, Inc.**

GM **POWERTRAIN**

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH21

AS RECORDED SEPTEMBER 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

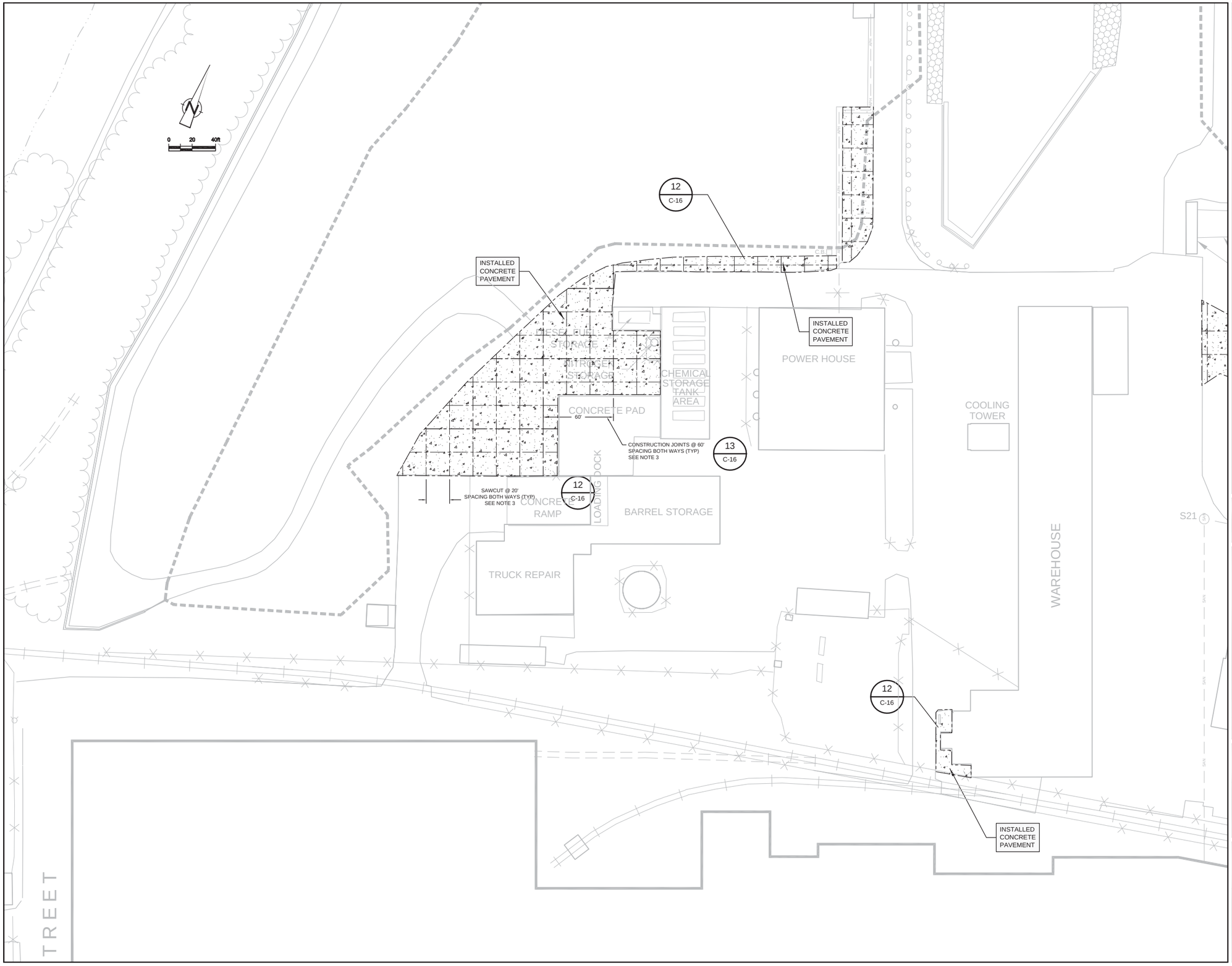
CAP DETAILS

CRA **CONESTOGA-ROVERS & ASSOCIATES**

Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	AW	JUNE 2000	
Scale: NO SCALE	Project № 12610-10	Report № 016	Drawing № C-09AR

12610-10(016)CI-WA007 APR 16/2002



№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

NOTES:

1. PAVEMENT FINAL ELEVATIONS AND GRADES WILL BE DETERMINED IN FIELD.
2. ADJUST PAVEMENT TO MATCH EXISTING GRADES, MANHOLES AND STRUCTURES.
3. FINAL LOCATION AND SPACING FOR SAWCUT AND CONSTRUCTION JOINTS WILL BE DETERMINED IN FIELD.

REALM **Remediation and Liability Management Company, Inc.**

GM **POWERTRAIN**

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH26

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

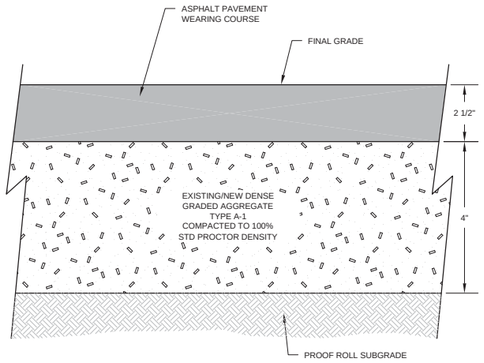
WEST SUPPORT FACILITIES AREA PAVEMENT PLAN

CRA **CONESTOGA-ROVERS & ASSOCIATES**

Source Reference:
SPICER GROUP, SAGINAW, MICHIGAN, DRAWING D352409, OCTOBER 1999

Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: 1"=40'	Project No.: 12610-10	Report No.: 016	Drawing No.: C-14AR

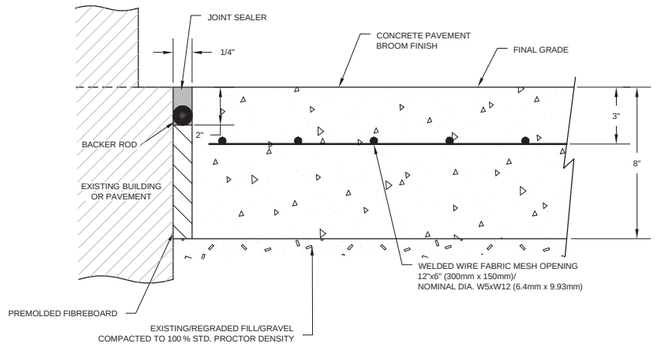
12610-10(016)CI-WA019 APR 16/2002



DETAIL 10 / C-15

FLEXIBLE PAVEMENT DETAIL

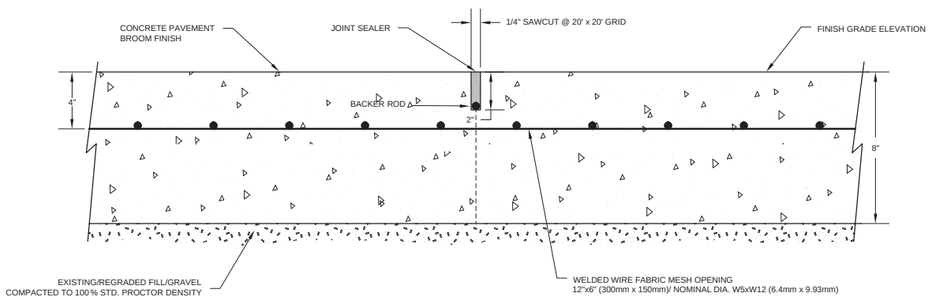
N.T.S.



DETAIL 11 / S-03

RIGID PAVEMENT ISOLATION JOINT DETAIL

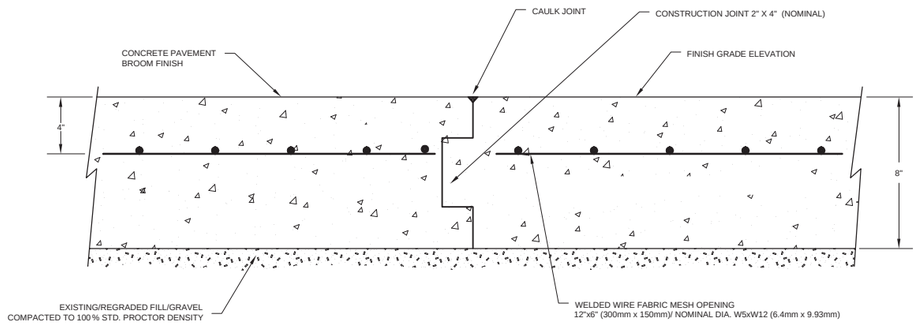
N.T.S.



DETAIL 12 / C-15

SAWCUT DETAIL

N.T.S.



DETAIL 13 / C-15

RIGID PAVEMENT CONSTRUCTION JOINT DETAIL

N.T.S.

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	REVISED CONSTRUCTION JOINT DETAILS	APR 15/99	RLA
3	AS RECORDED	MAY 2000	MRT

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH28

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

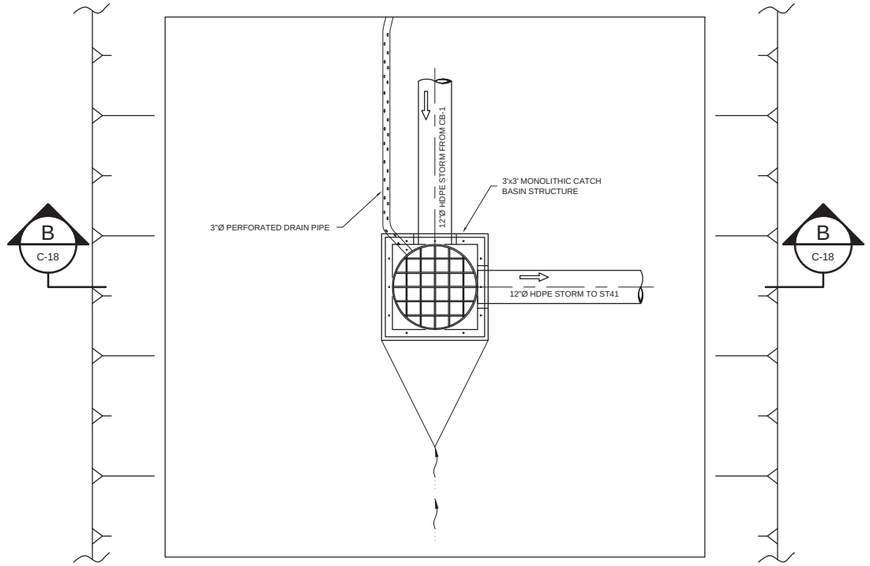
SUPPORT FACILITIES AREA DETAILS

CONESTOGA-ROVERS & ASSOCIATES

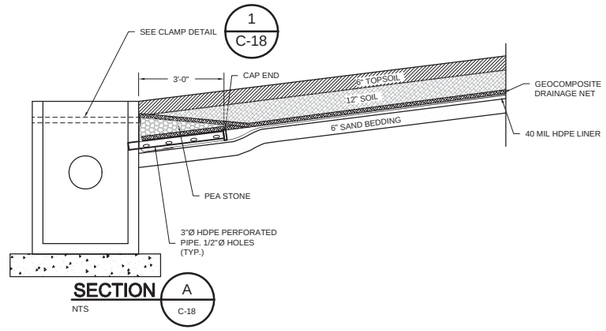
Source Reference:

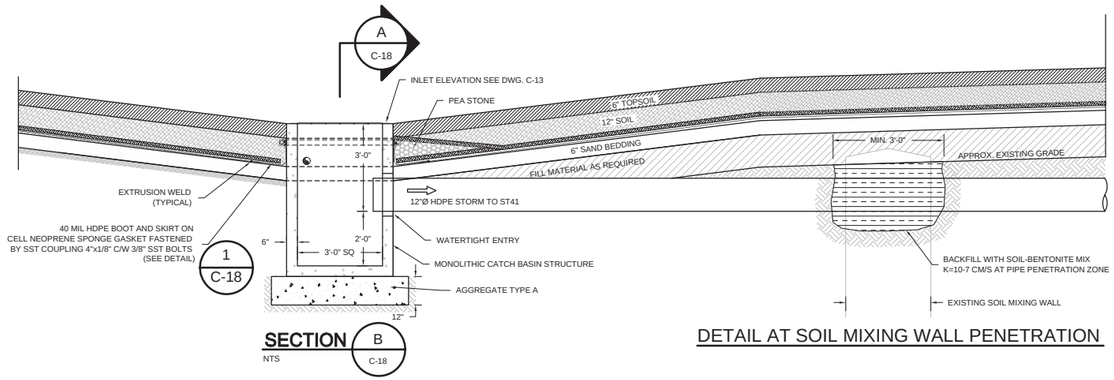
Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: AS SHOWN	Project № 12610-10	Report № 016	Drawing № C-16AR

12610-10(016)CI-WA011 APR 16/2002

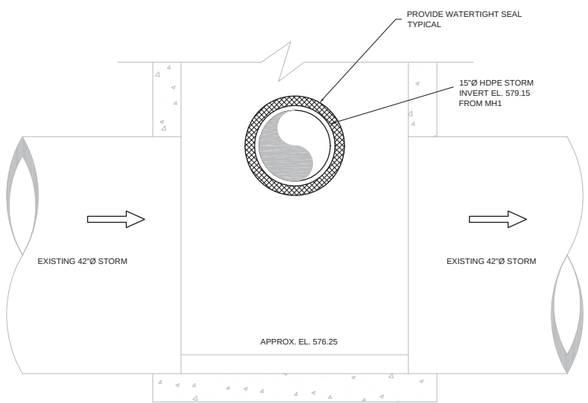


PLAN OF TYPICAL CATCH BASIN DETAIL (CB-2)

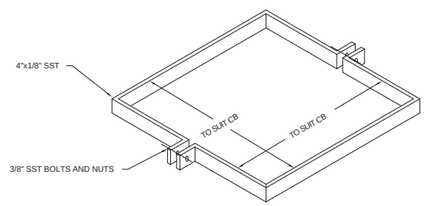




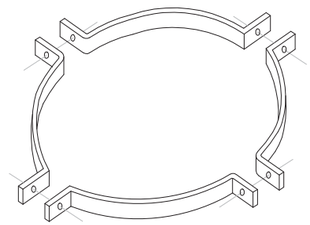
DETAIL AT SOIL MIXING WALL PENETRATION



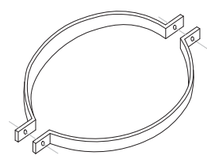
ELEVATION OF EXISTING MANHOLE ST41



TWO PIECE SQUARE COUPLING DETAIL



FOUR PIECE ROUND COUPLING DETAIL



TWO PIECE ROUND COUPLING DETAIL

DETAIL 1 C-18
NTS

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	SEPTEMBER 2000	MRT

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No.: PE-H-96
SHEET No.: SH30

AS RECORDED SEPTEMBER 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

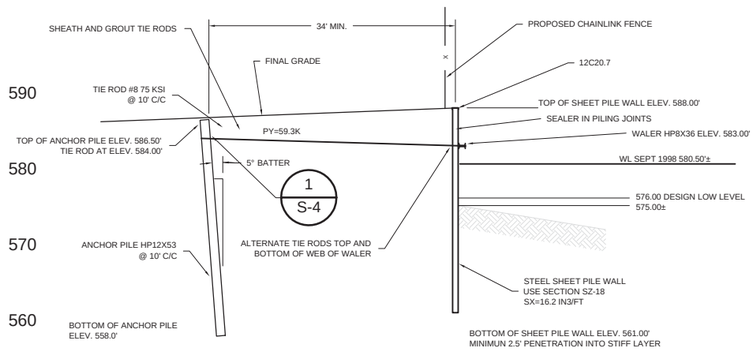
MANHOLE AND CATCHBASIN DETAILS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

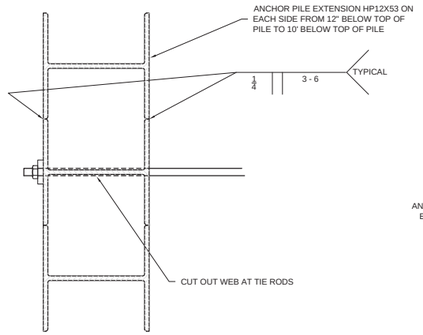
Project Manager:	Reviewed By:	Date:	
MRT	AW	JUNE 2000	
Scale: 3/4"=1'-0"	Project N №: 12610-10	Report N №: 016	Drawing N №: C-18AR

12610-10(016)CI-WA022 APR 16/2002

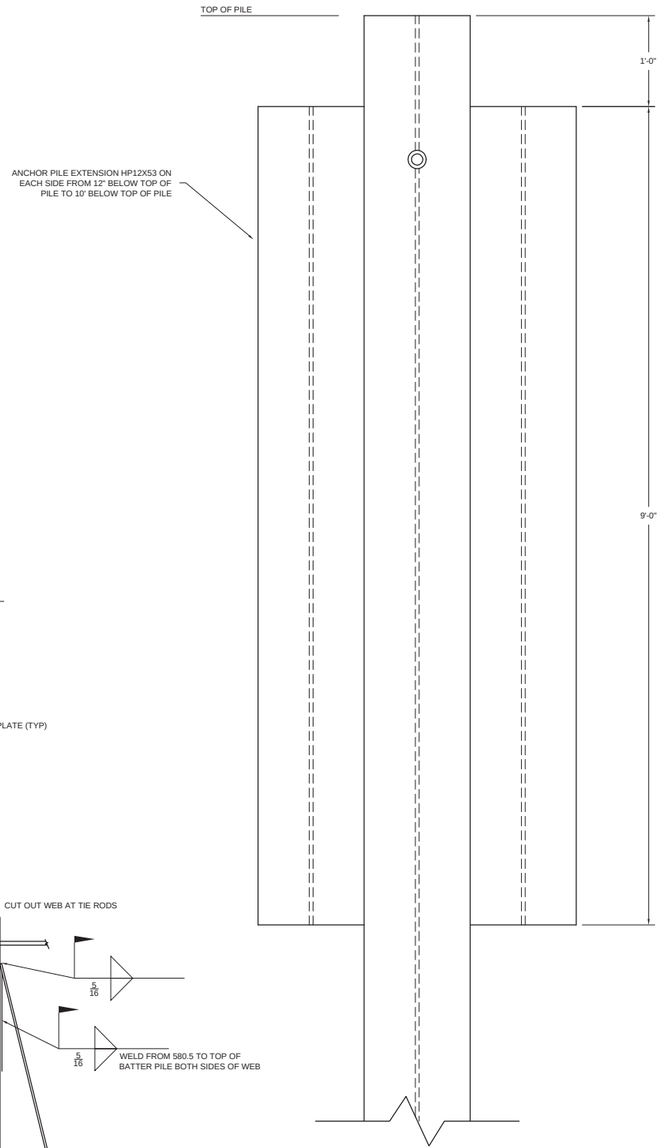


DETAIL D-3 / S-01
NTS

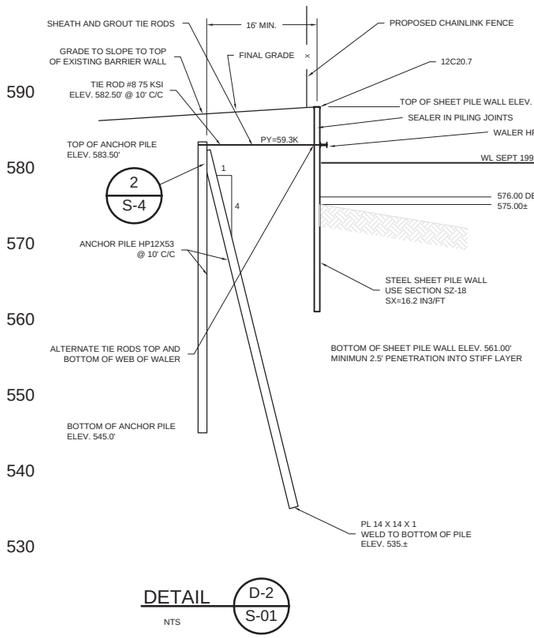
TYPICAL SECTION NOT ADJACENT DSM WALL



DETAIL 1 / S-4 PLAN
NTS

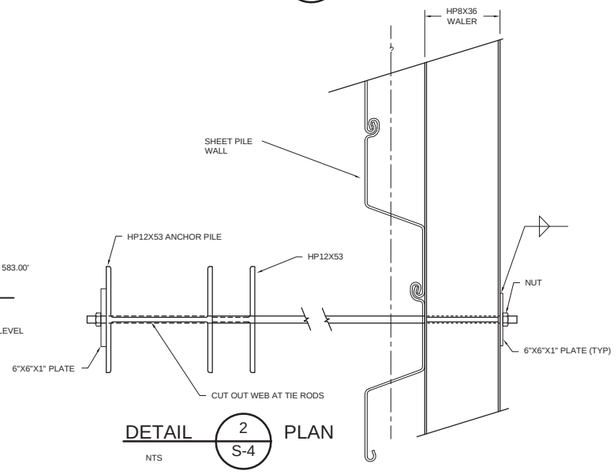


DETAIL 1 / S-4 ELEVATION
NTS

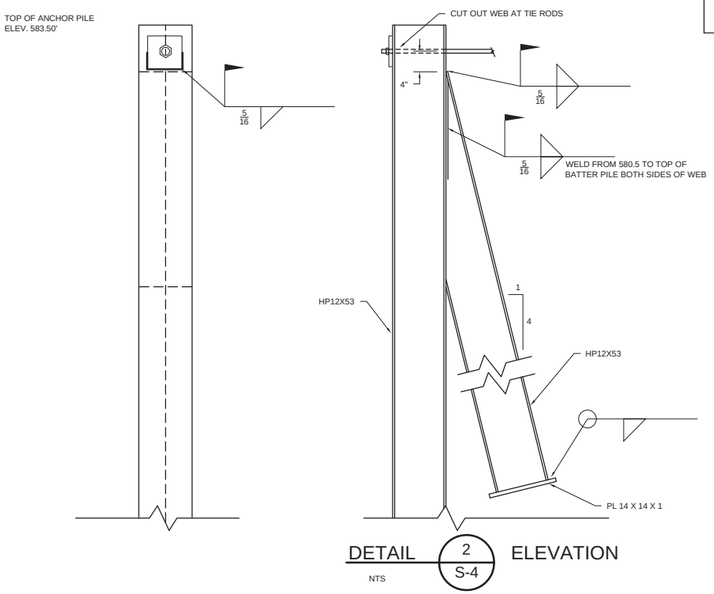


DETAIL D-2 / S-01
NTS

TYPICAL SECTION ADJACENT TO DSM WALL



DETAIL 2 / S-4 PLAN
NTS



DETAIL 2 / S-4 ELEVATION
NTS

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH34

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

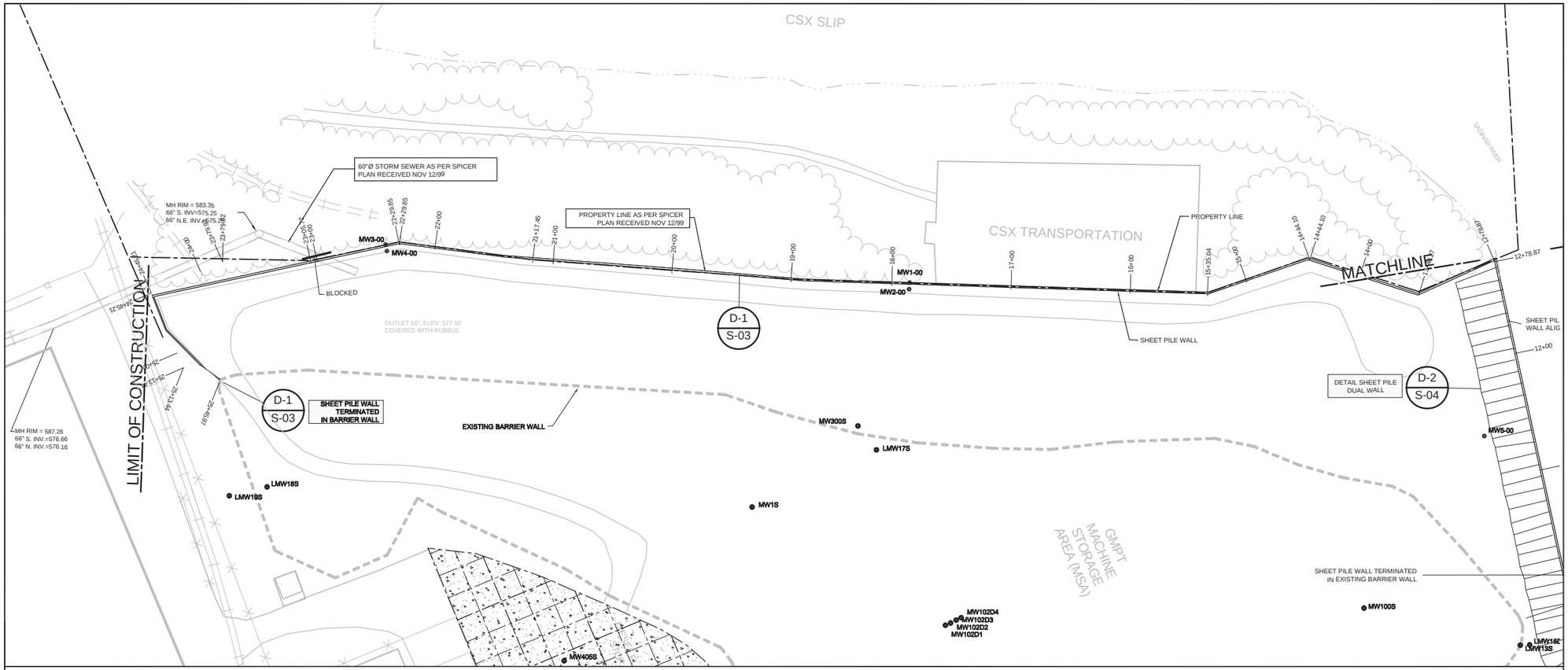
SHEET PILING DETAILS
SHEET 2 OF 2

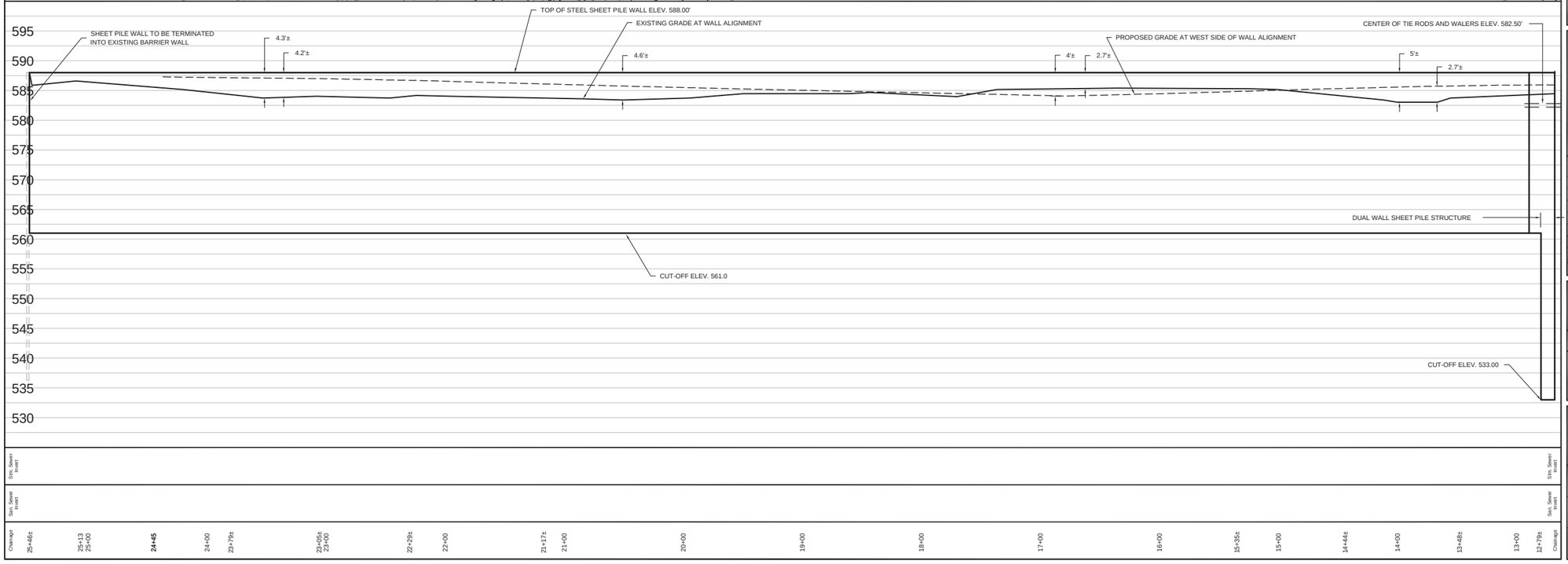
CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: AS SHOWN	Project N º: 12610-10	Report N º: 016	Drawing N º: S-04AR

12610-10(016)ST-WA004 APR 16/2002





№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

REALM **Remediation and Liability Management Company, Inc.**

GM **POWERTRAIN**

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH32

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

CROTTY STREET CHANNEL SITE
BAY CITY, MICHIGAN

AS RECORDED

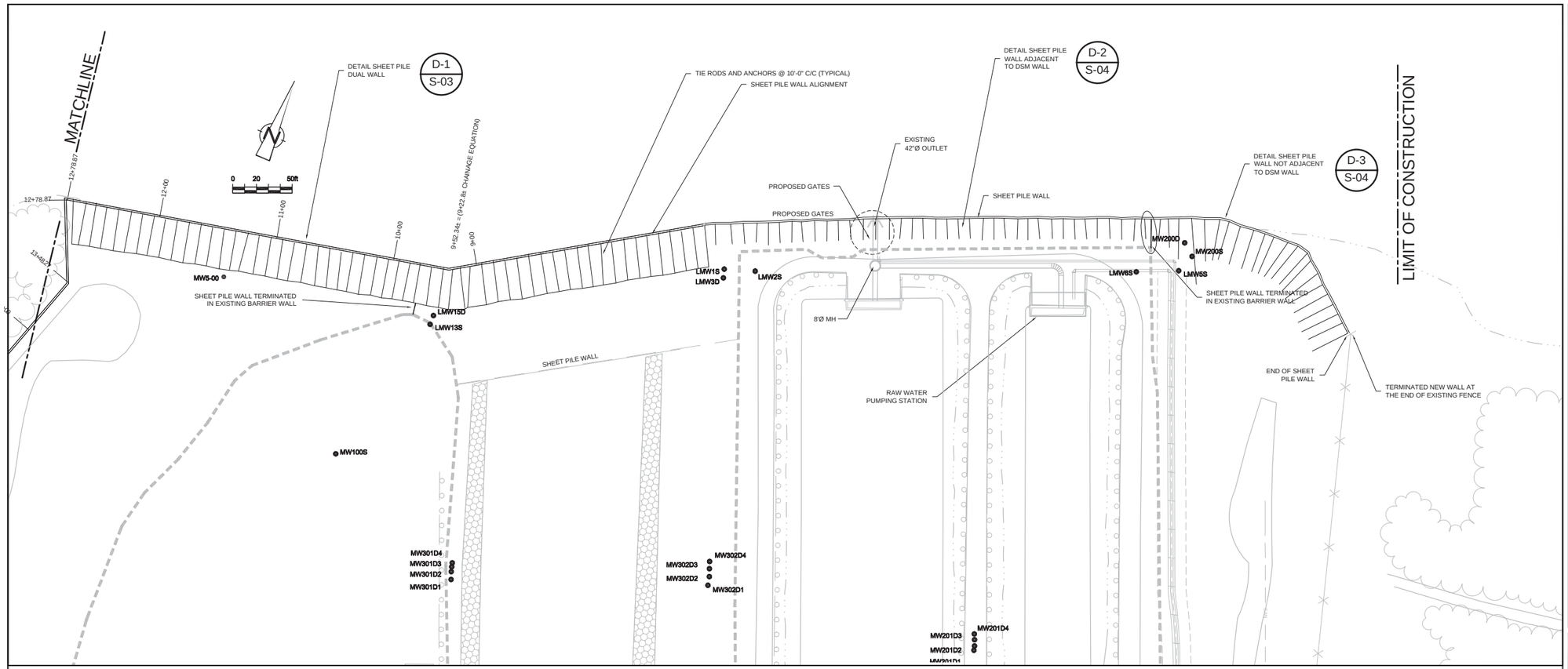
SHEET PILING
PLAN AND PROFILE 10+50 - 25+46

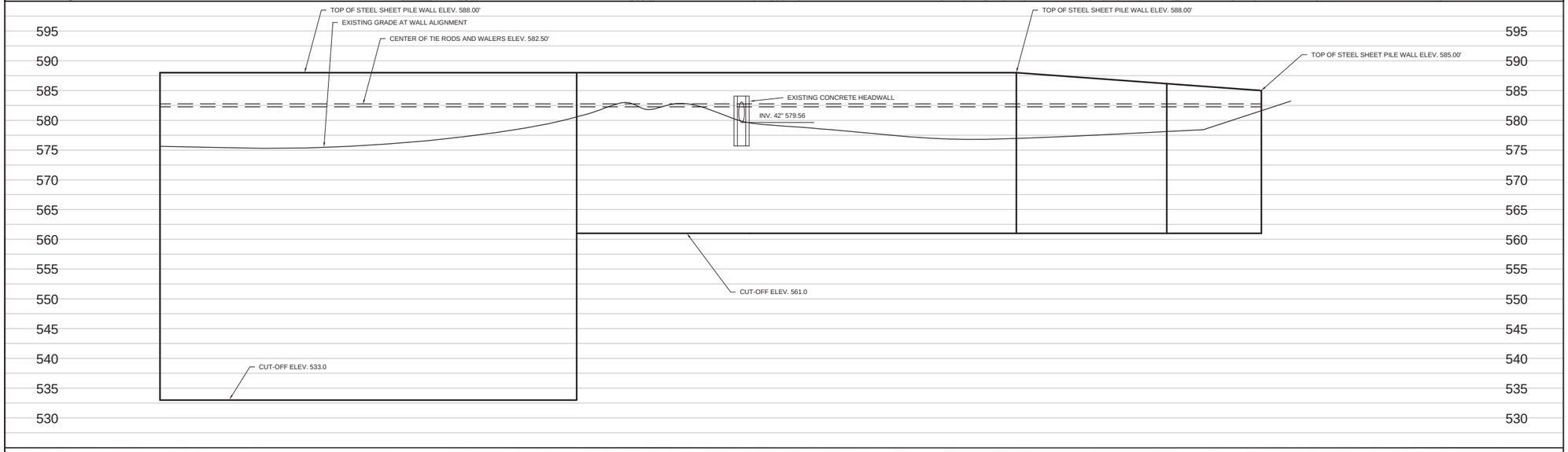
CRA **CONESTOGA-ROVERS & ASSOCIATES**

Source Reference:
SPICER GROUP, SAGINAW, MICHIGAN, DRAWING E23201, FEBRUARY 2000

Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: 1"=50' 1"=10'	Project N №: 12610-10	Report N №: 016	Drawing N №: S-02AR

12610-10(016)ST-WA003 APR 16/2002





№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH31

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

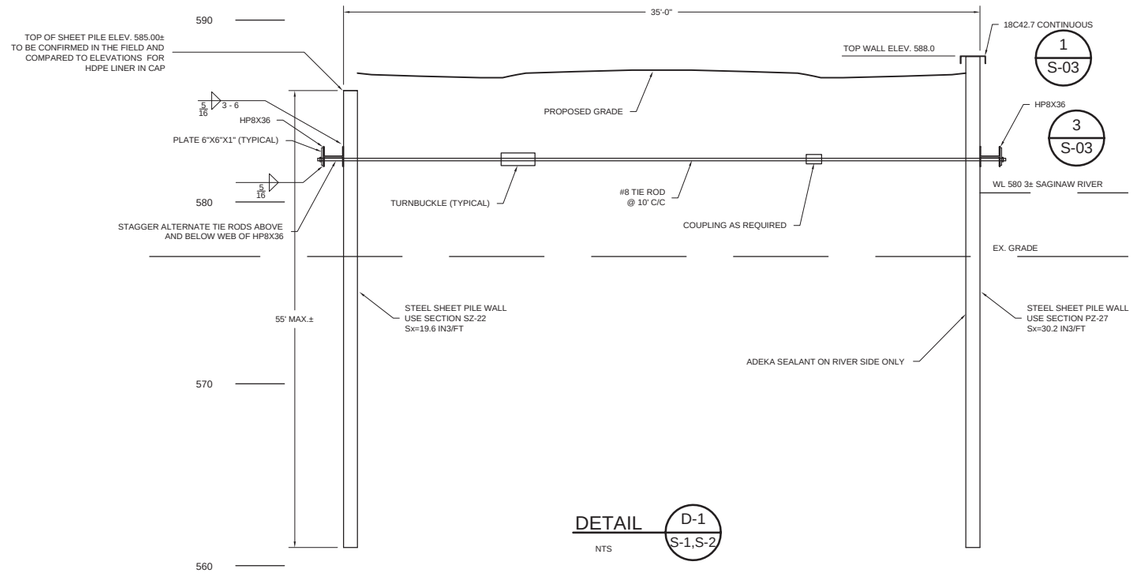
SHEET PILING
PLAN AND PROFILE 1+00 - 12+78.87

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
SPICER GROUP, SAGINAW, MICHIGAN, DRAWING D352408, JULY 1999

Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: 1"=50' 1"=10'	Project N №: 12610-10	Report N №: 016	Drawing N №: S-01AR

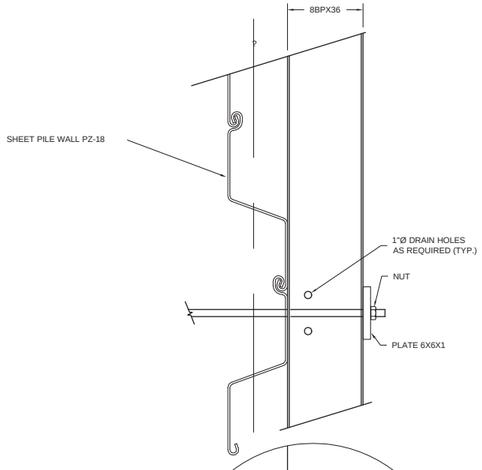
12610-10(016)ST-WA002 APR 16/2002

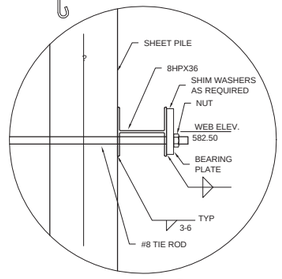


DETAIL D-1 / S-1,S-2

NTS

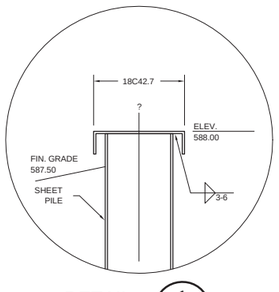
SECTION THROUGH DUAL WALL





DETAIL 3 / S-03

NTS



DETAIL 1 / S-03

NTS

№	Revision	Date	Initial
1	ISSUED FOR CONSTRUCTION	MAR 01/99	MRT
2	AS RECORDED	MAY 2000	MRT

Remediation and Liability Management Company, Inc.

GM POWERTRAIN

GENERAL MOTORS POWERTRAIN DIVISION
BAY CITY OPERATION
BAY CITY, MICHIGAN 48708-5460

PLANT ENGINEERING BUILDING No. PE-H-96

SHEET No. SH33

AS RECORDED JUNE 2000

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

GM POWERTRAIN DIVISION
BAY CITY, MICHIGAN

AS RECORDED

SHEET PILING DETAILS
SHEET 1 OF 2

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

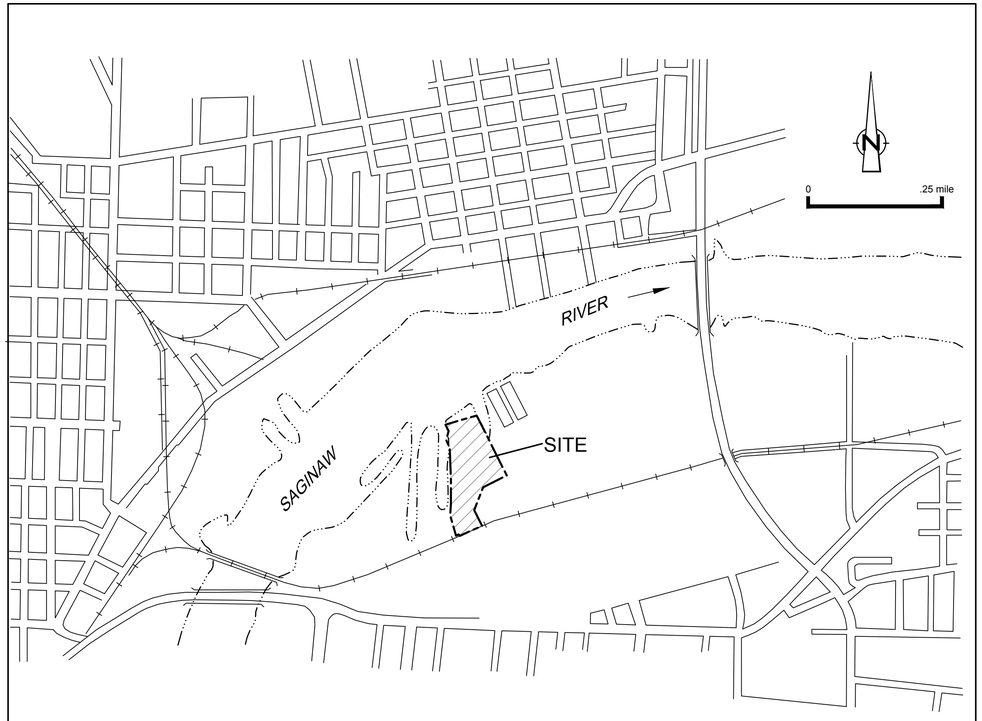
Project Manager:	Reviewed By:	Date:	
MRT	RLA	JUNE 2000	
Scale: AS SHOWN	Project N º: 12610-10	Report N º: 016	Drawing N º: S-03AR

12610-10(016)ST-WA001 APR 16/2002

GROUNDWATER EXTRACTION AND TREATMENT SYSTEM

RACER TRUST - BAY CITY POWERTRAIN

BAY CITY, MICHIGAN



KEY PLAN

DWG.No. DRAWING TITLE

GENERAL

G-01	COVER SHEET
G-02	ABBREVIATIONS AND DETAIL DESIGNATIONS
G-03	INSTRUMENTATION & CONTROL LEGEND
G-04	MECHANICAL LEGEND

PROCESS & INSTRUMENTATION

EF-01	PROCESS FLOW DIAGRAM
EF-02	PIPING & INSTRUMENTATION DIAGRAM

CIVIL

C-01	EXISTING CONDITIONS
C-02	DEMOLITION PLAN
C-03	PROPOSED LAYOUT
C-04	PROPOSED CONDITIONS - CIVIL DETAILS
C-05	PROPOSED CONDITIONS - CIVIL DETAILS
C-06	PROPOSED WWTP CONDITIONS - CIVIL DETAILS
C-07	PROPOSED CONDITIONS - CIVIL DETAILS

MECHANICAL

ME-01	PROPOSED CONDITIONS MECHANICAL DETAILS

ELECTRICAL

E-01	ONE LINE DIAGRAM FOR EW-06, EW-08, EW-10 & EW-12
E-02	ONE LINE DIAGRAM FOR WWTP BUILDING & EW-15
E-03	EQUIPMENT STORAGE AREA - POWER DISTRIBUTION SH. 1 OF 3
E-04	EQUIPMENT STORAGE AREA - POWER DISTRIBUTION SH. 2 OF 3
E-05	EQUIPMENT STORAGE AREA - POWER DISTRIBUTION SH. 3 OF 3
E-06	POWER DISTRIBUTION SINGLE LINE
E-07	BUILDING ELECTRICAL LAYOUT AND DETAILS
E-08	PROPOSED ELECTRICAL PLAN
E-09	PROPOSED CONDITIONS BUILDING ELECTRICAL PLAN
E-10	ELECTRICAL INSTALL NOTES

DRAWING INDEX

No	Revision	Date	Initial

As-recorded information presented in red

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial
ISSUED FOR BID	08/30/12	MPL

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

COVER SHEET

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project No: 012610-00	Report No: PRES001	Drawing No: G-01

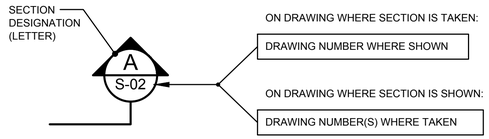
012610-00(PRES001)GN-DE001 AUG 30/2012

ABBREVIATIONS

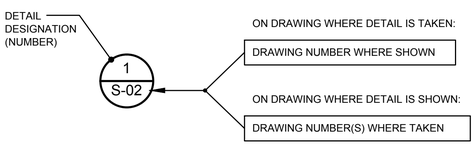
3/C	CONDUCTORS, NUMBER OF (3)
AAP	ALARM ANNUNCIATOR PANEL
AAV	AUTOMATIC AIR VENT
AB	ANCHOR BOLT
ABAN	ABANDON(ED)
ABS	ABSOLUTE
ABV	ABOVE
AC	ALTERNATING CURRENT
ACCUM	ACCUMULATOR
ACNV	AUTOMATIC CONTROL VALVE
ACOUS	ACOUSTICAL
ACP	ASPHALTIC CONCRETE PAVING
ACTR	ACTUATOR
ADDL	ADDITIONAL
ADDM	ADDENDUM
ADH	ADHESIVE
ADJ	ADJUSTABLE
ADJC	ADJACENT
ADPTR	ADAPTOR
AF	AFTER FILTER
AGGR	AGGREGATE
AHR	ANCHOR
AHU	AIR HANDLING UNIT
AL	ALUMINUM
ALM	ALARM
ALP	AIR LOW PRESSURE
ALT	ALTERNATE
AMB	AMBIENT
AMSL	ABOVE MEAN SEA LEVEL
ANLG	ANALOG
AP	ACID PROOF
APPROX.	APPROXIMATELY
APPX	APPENDIX
APT	APARTMENT
ARCH	ARCHITECT(URAL)
ASL	ABOVE SEA LEVEL
ASPH	ASPHALT(IC)
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ASU	AIR SUPPLY UNIT
ASW	AUXILIARY SWITCH
ASYM	ASYMMETRICAL
AT	AIR TIGHT
ATE	AERATION TANK EFFLUENT
ATF	AERATION TANK FEED
ATS	AUTOMATIC TRANSFER SWITCH
AVE	AVENUE
AWG	AMERICAN WIRE GAGE
AZ	AZIMUTH
B&B	BALLED AND BURLAPPED
B&B	BELL AND BELL
B&F	BELL AND FLANGE
B&S	BELL AND SPIGOT
B/B	BACK TO BACK
BAF	BAFFLE
BAL	BALANCE
BAT	BATTERY
BBRG	BALL BEARING
BBS	BOTTOM OF BACKSLOPE
BC	BACK OF CURB
BC	BOLT CIRCLE
BE	BELL END
BETW	BETWEEN
BEV	BEVEL
BF	BOTH FACES
BFE	BAG FILTER EFFLUENT
BFS	BOTTOM OF FORESLOPE
BFV	BUTTERFLY VALVE
BFW	BOILER FEED WATER
BGS	BELOW GROUND SURFACE
BHP	BRAKE HORSEPOWER
BI	BLACK IRON
BITUM	BITUMINOUS
BL	BASE LINE
BLDG	BUILDING
BLK	BLOCK
BLKHD	BULKHEAD
BLO	BLOWER
BLR	BOILER
BLW	BELOW
BM	BEAM
BM	BENCH MARK
BOT	BOTTOM
BP	BASE PLATE
BRG	BEARING
BRK	BRICK
BRKR	BREAKER
BRL	BARREL
BRS	BRASS
BRZ	BRONZE
BS	BOTH SIDES
BSHG	BUSHING
BSMT	BASEMENT
BSP	BLACK STEEL PIPE
BSTR	BOOSTER
BTFL	BUTTERFLY
BTU	BRITISH THERMAL UNIT
BV	BALL VALVE
BW	BOTH WAYS
Cu	COPPER
C&G	CURB AND GUTTER
C/C	CENTER TO CENTER
CAL	CALIBRATE
CAP	CAPACITY
CAT	CATALOG
CB	CATCH BASIN
CCPD	COUPLING CAPACITOR POTENTIAL DEVICE
CCW	COUNTER CLOCKWISE
CER	CERAMIC
CFP	CHEMICAL FEED PUMP
CHAN	CHANNEL
CHEM	CHEMICAL
CHFR	CHAMFER
CHK	CHECK
CHKV	CHECK VALVE
CI	CAST IRON
CIMJ	CAST IRON MECHANICAL JOINT
CIP	CAST IRON PIPE
CIR	CIRCLE
CIRC	CIRCULAR
CISP	CAST IRON SOIL PIPE
CJ	CONSTRUCTION JOINT
CKT	CIRCUIT
CL	CENTER LINE
CLDI	CONCRETE LINED DUCTILE IRON
CLJ	CONTROL JOINT
CLL	COLUMN LINE
CLP	CLAMP
CLR	CLEAR
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CND	CONDUIT
CNR	CORNER
CNTFLG	CENTRIFUGAL
CO	CLEANOUT
COAX	COAXIAL CABLE
COL	COLUMN
COMM	COMMUNICATION
CONC	CONCRETE
CONN	CONNECTION
CONSTR	CONSTRUCTION
CONT	CONTINUOUS (CONTINUATION)
COORD	COORDINATE
COV	COVER
CP	CANDLE POWER
CP	CONCRETE PIPE
CP	CONTROL PANEL
CPLG	COUPLING
CR	CONCENTRIC REDUCER
CRCMF	CIRCUMFERENCE
CRN	CROWN
CRS	COLD ROLLED STEEL
CSP	CONCRETE SEWER PIPE
CT	COOLING TOWER
CTV	CABLE TELEVISION
CU	COPPER
CV	CONTROL VALVE
C/W	COMPLETE WITH
CW	COLD WATER
CWP	CIRCULATING WATER PIPE
CYL	CYLINDER
DAT	DATUM
DBC	DIAMETER BOLT CIRCLE
DC	DIRECT CURRENT
DCI	DUCT COVERING INSULATION
DEMO	DEMOLITION
DET	DETAIL
DF	DIESEL FUEL
DI	DUCTILE IRON
DIA	DIAMETER
DIFF	DIFFERENCE
DIM	DIMENSION
DIP	DUCTILE IRON PIPE
DIST	DISTANCE
DIV	DIVISION
DIW	DEIONIZED WATER
DL	DEAD LOAD
DLI	DUCT LINER INSULATION
DLV	DOOR LOUVER
DMH	DROP MANHOLE
DMPF	DAMPPROOFING
DMPR	DAMPER
DN	DOWN
DP	DEW POINT
DPDT	DOUBLE POLE DOUBLE THROW
DPST	DOUBLE POLE SINGLE THROW
DR	DRAIN
DS	DOWNSPOUT
DT	DRAIN TILE
DUPL	DUPLICATE
DW	DISTILLED WATER
DWG	DRAWING
DWL	DOWEL
DWV	DRAIN WASTE & VENT
E	EAST
ECC	ECCENTRIC
EF	EACH FACE
EFL	EFFLUENT
EL	EASEMENT LINE
EL	ELEVATION
ELB	ELBOW
ELEC	ELECTRICAL
EMER	EMERGENCY
ENCL	ENCLOSURE
ENG	ENGINE
ENGR	ENGINEER
ENTR	ENTRANCE
EP	EDGE OF PAVEMENT
EP	ELECTRICAL PANEL
EPRF	EXPLOSION PROOF
EQUIP	EQUIPMENT
EQUIV	EQUIVALENT
ES	EDGE OF SHOULDER
ESMT	EASEMENT
ESP	EMERGENCY SWITCH PANEL
EST	ESTIMATE
EVAP	EVAPORATE
EW	EACH WAY
EWH	ELECTRICAL WATER HEATER
EXC	EXCAVATE (EXCAVATION)
EXCH	EXCHANGER
EXH	EXHAUST
EXP	EXPANSION
EXT	EXTERIOR
F/F	FACE TO FACE
FA	FIRE ALARM
FC	FOOTCANDLE
FD	FLOOR DRAIN
FDMPR	FIRE DAMPER
FDN	FOUNDATION
FDR	FEEDER
FEC	FIRE EXTINGUISHER CABINET
FEM	FEMALE
FEXT	FIRE EXTINGUISHER
FGL	FIBERGLASS
FHC	FIRE HOSE CABINET
FHY	FIRE HYDRANT
FIN	FINISH(ED)
FIN FL	FINISH(ED) FLOOR
FIN GR	FINISH(ED) GRADE
FL	FLASHING
FLA	FULL LOAD AMPS
FLEX C	FLEXIBLE CONNECTION
FLG	FLANGE
FLOC	FLOCCULATOR
FLR	FLOOR(ING)
FLSW	FLOW SWITCH
FLTR	FILTER
FN	FENCE
FO	FUEL OIL
FOC	FACE OF CONCRETE
FP	FREEZING POINT
FPT	FEMALE PIPE THREAD
FR	FIRE RATING
FR	FRAME
FREQ	FREQUENCY
FSTNR	FASTENER
FTG	FITTING
FTG	FOOTING
FU	FUSE
FUR	FURNACE
FUT	FUTURE
FV	FOOT VALVE
FXTR	FIXTURE
G	GAS
GA	GAGE
GAL	GALLON
GALV	GALVANIZED
GEN	GENERATOR
GFCI	GROUND FAULT CIRCUIT INTERRUPTOR
GL	GLASS
GLV	GLOBE VALVE
GLZ	GLAZING
GND	GROUND
GOVT	GOVERNMENT
GPD	GALLONS PER DAY
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
GPS	GALLONS PER SECOND
GR	GRADE (GRADING)
GR LN	GRADE LINE
GRL	GRILLE
GRTG	GRATING
GSKT	GASKET
GSNK	GOOSENECK
GT	GREASE TRAP
GT	GROUT
GTV	GATE VALVE
GUT	GUTTER
GVL	GRAVEL
GW	GROUNDWATER
GWH	GAS WATER HEATER
H	HIGH
HB	HOSE BIB
HD	HEAD
HDPE	HIGH DENSITY POLYETHYLENE
HDWE	HARDWARE
HEX	HEAT EXCHANGER
HGT	HEIGHT
HH	HANDHOLE
HM	HOLLOW METAL
HMD	HOLLOW METAL DOOR
HMF	HOLLOW METAL FRAME
HNDRL	HAND RAIL
HNDWL	HANDWHEEL
HOA	HAND-OFF-AUTO
HORIZ	HORIZONTAL
HP	HIGH PRESSURE
HP	HORSEPOWER
HPT	HIGH POINT
HR	HOUR
HSB	HIGH STRENGTH BOLT
HT	HEAT
HTG	HEATING
HTR	HEATER
HV	HOSE VALVE
HVAC	HEATING, VENTILATION, AIR CONDITIONING
HVY	HEAVY
HW	HOT WATER
HWB	HOT WATER BOILER
HWCP	HOT WATER CIRCULATING PUMP
HWR	HOT WATER RETURN
HWS	HOT WATER SUPPLY
HWT	HOT WATER TANK
HWY	HIGHWAY
HYD	HYDRANT
HYDR	HYDRAULIC
HZ	HERTZ
ID	INSIDE DIAMETER
IF	INSIDE FACE
IGN	IGNITION
ILLUM	ILLUMINATION
IN WC	INCHES (WATER COLUMN)
IND	INDICATOR
INDL	INDUSTRIAL
INF	INFLUENT
INL	INLET
INSTL	INSTALLATION
INSTR	INSTRUMENT
INSUL	INSULATION
INTLK	INTERLOCK
INTR	INTERIOR
INV	INVERT
INV EL	INVERT ELEVATION
IP	IRON PIPE
IPS	INTERNATION PIPE STANDARD
IPT	IRON PIPE THREAD
ISO	ISOMETRIC
JAN	JANITOR
JB	JUNCTION BOX
JCT	JUNCTION
KOP	KNOCKOUT PANEL
KPL	KICK PLATE
KSF	KIPS PER SQUARE FOOT
KSI	KIPS PER SQUARE INCH
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KVAR	KILOVAR (RESISTANCE)
KW	KILOWATT
KWH	KILOWATT HOUR
L	LEFT
LAB	LABORATORY
LAD	LADDER
LATL	LATERAL
LAV	LAVATORY
LB	POUND
LBL	LABEL
LBR	LUMBER
LDPE	LOW DENSITY POLYETHYLENE
LG	LONG (LENGTH)
LH	LEFT HAND
LIM SW	LIMIT SWITCH
LIN	LINEAR
LKR	LOCKER
LL	LIVE LOAD
LNTL	LINTEL
LO	LUBRICATING OIL
LOC	LOCATION
LONG	LONGITUDINAL
LP	LIGHT POLE
LP	LOW PRESSURE
LPT	LOW POINT
LPV	LUBRICATED PLUG VALVE
LRG	LARGE
LT	LIGHT
LTG	LIGHTING
LTG PNL	LIGHTING PANEL
LV	LOW VOLTAGE
LVL	LEVEL(ER)
LVR	LOUVER
LWC	LIGHTWEIGHT CONCRETE
M	METER
MA	MILLIAMPERE
MACH	MACHINE
MAINT	MAINTENANCE
MAN	MANUAL
MAS	MASONRY
MAU	MAKE-UP AIR UNIT
MAX	MAXIMUM
MBTU	THOUSAND BRITISH THERMAL UNITS
MC	MOMENTARY CONTACT
MCC	MOTOR CONTROL CENTER
MD	MANUAL DAMPER
MECH	MECHANICAL
MET	METAL
MEZZ	MEZZANINE
MFG	MANUFACTURING
MGD	MILLION GALLONS PER DAY
MH	MANHOLE
MHT	MEAN HIGH TIDE
MI	MALLEABLE IRON
MI	MILE
MID	MIDDLE
MIN	MINIMUM
MIN	MINUTE
MISC	MISCELLANEOUS
MJ	MECHANICAL JOINT
MK	MARK
MKR	MARKER
MLT	MEAN LOW TIDE
MLWK	MILLWORK
MMDD	MODIFIED MAXIMUM DRY DENSITY
MOBIL	MOBILIZATION
MOD	MOTOR OPERATED DAMPER
MON	MONITOR
MON	MONUMENT
MOT	MOTOR
MOV	MOTOR OPERATED VALVE
MPH	MILES PER HOUR
MPT	MALE PIPE THREAD
MS	MOTOR STARTER
MTD	MOUNTED
MV	MEGAVOLT
MW	MEGAWATT
N	NORTH
NA	NOT APPLICABLE
NAT	NATURAL
NC	NATIONAL COARSE THREAD
NC	NORMALLY CLOSED
NEG	NEGATIVE
NEUT	NEUTRAL
NF	NATIONAL FINE THREAD
NIC	NOT IN CONTRACT
NIP	NIPPLE
NKL	NICKEL
NO	NORMALLY OPEN
NO	NUMBER
NOM	NOMINAL
NOZ	NOZZLE
NPF	NATIONAL PIPE THREAD
NPL	NAMEPLATE
NPT	NATIONAL TAPER PIPE THREAD
NRCP	NON-REINFORCED CONCRETE PIPE
NRS	NON-RISING STEM
NTS	NOT TO SCALE
O/O	OUT TO OUT
OA	OVERALL
OC	ON CENTER
OD	OUTSIDE DIAMETER
OHGW	OVERHEAD GUY WIRE
O/L	OVER LOAD
OPNG	OPENING
OPP	OPPOSITE
ORD	OVERFLOW ROOF DRAIN
ORF	ORIFICE
ORIG	ORIGINAL
OVFL	OVERFLOW
OXY	OXYGEN
OZ	OUNCE
P	PUMP
PA	PIPE ANCHOR
PAR	PARALLEL
PARG	PARGING
PAT	PATTERN
PB	PULL BOX
PB	PUSH BUTTON
PC	PIECE
PC	POINT OF CURVE
PC	PORTLAND CEMENT
PCC	POINT OF COMPOUND CURVE
PCF	POUNDS PER CUBIC FOOT
PED	PEDESTAL
PERF	PERFORATED
PERIM	PERIMETER
PERM	PERMANENT
PERP	PERPENDICULAR
PF	POWER FACTOR
PH	PHASE
PHOTO	PHOTOGRAPH
PI	POINT OF INTERSECTION
PIV	POST INDICATOR VALVE
PIVC	POINT OF INTERSECTION FOR VERTICAL CURVE
PKG	PACKAGE
PKWY	PARKWAY
PL	PLATE
PL	PROPERTY LINE
PLAT	PLATFORM
PLBG	PLUMBING
PLYWD	PLYWOOD
PNEU	PNEUMATIC
PNL	PANEL
PNT	PAINT
POLY	POLYETHYLENE
PORT	PORTABLE
POS	POSITIVE
PPM	PARTS PER MILLION
PR	PAIR
PRC	POINT OF REVERSE CURVE
PRCST	PRECAST
PRCVC	POINT OF REVERSE CURVE VERTICAL CURVE
PREFAB	PREFABRICATED
PREFIN	PREFINISHED
PRELIM	PRELIMINARY
PRI	PRIMARY
PRKG	PARKING
PROJ	PROJECT
PROP	PROPERTY
PRV	PRESSURE REDUCING VALVE
PRV	PRESSURE RELIEF VALVE
PS CONC	PRESTRESSED CONCRETE
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH ABSOLUTE
PSIG	POUNDS PER SQUARE INCH GAGE
PST	POINT OF SPIRAL TANGENT
PT	PIPE TAP
PT	POINT OF TANGENCY
PTD	PAINTED
PV	PAVED
PVC	POINT OF VERTICAL CURVE
PVC	POLYVINYL CHLORIDE
PVG	PAVING
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
PVT	POINT OF VERTICAL TANGENCY
PWR	POWER
QCV	QUICK COUPLER VALVE
QTR	QUARTER
QTY	QUANTITY
QUAL	QUALITY
R	RISER
RAD	RADIUS
RBR	RUBBER
RC	REINFORCED CONCRETE
RD	ROAD
RD	ROOF DRAIN
RDC	REDUCER
REC	RECESSED
RECIRC	RECIRCULATE
RECPT	RECEPTACLE
RECT	RECTANGULAR
REF	REFERENCE
REINF	REINFORCE(D)(ING)(MENT)
REM	REMOVABLE
REQD	REQUIRED
RESIL	RESILIENT
RET	RETURN
RF	RAISED FACE
RFG	ROOFING
RGLTR	REGULATOR
RH	RELATIVE HUMIDITY
RH	RIGHT HAND
RLF	RELIEF
RLG	RAILING
RM	ROOM
RND	ROUND
RO	ROUGH OPENING
ROW	RIGHT-OF-WAY
RPM	REVOLUTIONS PER MINUTE
RPS	REVOLUTIONS PER SECOND
RR	RAILROAD
RV	RELIEF VALVE
RV	ROOF VENT
S	SOUTH
SA	SUPPLY AIR
SALV	SALVAGE
SAN	SANITARY
SAT	SATURATION
SCHED	SCHEDULE
SCRN	SCREEN
SD	STORM DRAIN
SDL	SADDLE
SDMH	STORM DRAIN MANHOLE
SEC	SECOND
SECT	SECTION
SEG	SEGMENT
SF	SAFETY FACTOR
SF	SUPPLY FAN
SGL	SINGLE
SHLDR	SHOULDER
SHR	SHOWER
SHT	SHEET(ING)
SHTNG	SHEATHING
SIG	SIGNAL
SIM	SIMILAR
SK	SINK
SL	SLUDGE
SLP	SLOPE
SLV	SLEEVE
SM	SHEET METAL
SM	SMOOTH
SMDD	STANDARD MAXIMUM DRY DENSITY
SMLS	SEAMLESS
SOLV	SOLENOID VALVE
SP	SINGLE POLE
SP	SOIL PIPE
SP	SPACE(ING)
SP GR	SPECIFIC GRAVITY
SP VOL	SPECIFIC VOLUME
SPDT	SINGLE POLE DOUBLE THROW
SPEC	SPECIFICATION
SPKLR	SPRINKLER
SPKR	SPEAKER
SPLY	SUPPLY
SPRT	SUPPORT
SPST	SINGLE POLE SINGLE THROW
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCH
SQ KM	SQUARE KILOMETER
SQ M	SQUARE METER
SQ MM	SQUARE MILLIMETER
SQ YD	SQUARE YARD
SS	SANITARY SEWER
SSK	SERVICE SINK
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STAG	STAGGERED
STD	STANDARD
STE	SETTLING TANK EFFLUENT
STIF	STIFFENER
STIR	STIRRUP
STK	STAKE
STL	STEEL
STOR	STORAGE
STR	STRAIGHT
STRUCT	STRUCTURAL
SUCT	SUCTION
SURF	SURFACE
SURV	SURVEY
SV	SAFETY VALVE
SW	SIDEWALK
SWP	SAFE WORKING PRESSURE
SWR	SEWER
SYM	SYMBOL
SYMM	SYMMETRICAL
SYS	SYSTEM
T	TEE
T	THERMOSTAT
T	TREAD
T&B	TOP AND BOTTOM
G&G	TONGUE AND GROOVE
TAN	TANGENT
TB	TOP OF BEAM
TBM	TEMPORARY BENCH MARK
TC	TOP OF CONCRETE
TC	TOP OF CURB
TDH	TOTAL DYNAMIC HEAD
TE	TOP ELEVATION
TE	TOTALLY ENCLOSED
TECH	TECHNICAL
TEL	TELEPHONE
TEMP	TEMPERATURE
TEMP	TEMPORARY
TERM	TERMINAL
TF	TOP OF FOOTING
TFF	TOP OF FINISHED FLOOR
THD	THREAD(ED)
THERM	THERMAL
THK	THICK(NESS)
THRU	THROUGH
TNL	TUNNEL
TOT	TOTAL
TP	TOP OF PAVEMENT
TP	TOTAL PRESSURE
TRANS	TRANSPARENT
TSF	TONS PER SQUARE FOOT
TSL	TOP OF SLAB
TST	TOP OF STEEL
TTB	TELEPHONE TERMINAL BOARD
TV	TELEVISION
TW	TOP OF WALL
TYP	TYPICAL
U	HEAT TRANSFER UNIT
UG	UNDERGROUND
UH	UNIT HEATER
ULT	ULTIMATE
UN	UNION
UNEX	UNEXCAVATED
UNFIN	UNFINISHED
UNIF	UNIFORM
UNIV	UNIVERSAL
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTIL	UTILITY
UV	ULTRAVIOLET
V	SANITARY VENT
V	VALVE
V	VOLT
VAC	VACUUM
VAC	VOLTS ALTERNATING CURRENT
VAP	VAPOR
VB	VALVE BOX
VEH	VEHICLE
VEL	VELOCITY
VERT	VERTICAL
VFD	VARIABLE FREQUENCY DRIVE
VFPE	VERY FLEXIBLE POLYETHYLENE
VIB	VIBRATION
VIN	VINYL
VISC	VISCOSITY
VOL	VOLUME
VP	VACUUM PUMP
W	WASTE
W	WATT
W	WEST
W/O	WITHOUT
W/W	WALL TO WALL
WB	WET BULB
WC	WATER CLOSET
WD	WIDTH
WD	WOOD
WDW	WINDOW
WF	WIDE FLANGE
WG	WATER GAGE
WHA	WATER HAMMER ARRESTOR
WHTR	WATER HEATER
WI	WROUGHT IRON
WL	WATER LINE
WL	WATER LEVEL
WLD	WELDED
WP	WORKING POINT
WPR	WORKING PRESSURE
WR	WATER RESISTANT
WT	WEIGHT
WTR	WATER
WTRPRF	WATERPROOF(ING)
WW	WASTE WATER
WWF	WELDED WIRE FABRIC
X ARM	CROSS ARM
X SECT	CROSS SECTION
XFMR	TRANSFORMER
XFR	TRANSFER
YD	YARD DRAIN
YH	YARD HYDRANT

STANDARD DETAIL DESIGNATION

SECTION DESIGNATION



DETAIL DESIGNATION



NO	Revision	Date	Initial

NOTES:

1. THIS IS A STANDARD LEGEND LIST, THEREFORE SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS LIST AND NOT ON THE DRAWINGS.
2. CONTACT ENGINEER FOR ABBREVIATIONS NOT LISTED.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/12	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

ABBREVIATIONS & DETAIL DESIGNATIONS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NO SCALE	Project No: 012610-00	Report No: PRES001	Drawing No: G-02

PRIMARY ELEMENT SYMBOLS

- TURBINE FLOW METER
- MAGNETIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- WEIR
- VORTEX FLOW METER
- ROTAMETER
- ULTRASONIC LEVEL TRANSMITTER
- FLOAT
- OPEN DRAIN OR SEWER
- CLOSED DRAIN OR SEWER
- SPECIFICATION CHANGE
- CAP
- HOSE CONNECTION
- BLIND FLANGE
- STRAINER
- INLINE MIXER
- FLEXIBLE PIPE

PUMP AND COMPRESSOR SYMBOLS

- CENTRIFUGAL PUMP (DRY PIT)
- CENTRIFUGAL WET PIT PUMP OR TURBINE PUMP
- CHEMICAL FEED PUMP
- DIAPHRAGM PUMP
- GEAR PUMP OR BLOWER (POSITIVE DISPLACEMENT)
- PISTON PUMP
- PROGRESSIVE CAVITY PUMP
- SUBMERSIBLE SUMP PUMP
- COMPRESSOR (CENTRIFUGAL) BLOWER OR TURBINE
- COMPRESSOR (PISTON)
- EJECTOR

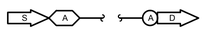
NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC, ELECTRICAL, OR HYDRAULIC)
XX: AS = ADJUSTABLE SPEED
CS-1 = CONSTANT SPEED (SINGLE SPEED)
CS-2 = CONSTANT SPEED (TWO SPEED)

ACTUATOR SYMBOLS

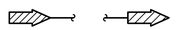
- PNEUMATIC WITH POSITIONER
- PNEUMATIC WITH SOLENOID
- ELECTRIC
- ELECTRIC WITH POSITIONER
- ELECTROHYDRAULIC
- HYDRAULIC
- PNEUMATIC WITH VOLUME BOOSTER
- SOLENOID
- MANUAL

NOTE:
ON LOSS OF PRIMARY POWER (PNEUMATIC, ELECTRICAL, OR HYDRAULIC)
XX: FD = FAIL OPEN
FC = FAIL CLOSED
FLP = FAIL TO LAST POSITION

INTERFACE SYMBOLS



- PROCESS INTERFACE
- SIGNAL INTERFACE
- A INTERFACE LETTER
- D DESTINATION DRAWING NUMBER
- S SOURCE DRAWING NUMBER



INTERFACE TO/FROM PROCESS EXTERNAL TO PROJECT

INSTRUMENTATION SYMBOLS

- PROGRAMMABLE LOGIC CONTROL FIELD MOUNTED
- PROGRAMMABLE LOGIC CONTROL NORMALLY ACCESSIBLE (BOARD MOUNTED)
- PROGRAMMABLE LOGIC CONTROL BEHIND BOARD MOUNTED
- PROGRAMMABLE LOGIC CONTROL AUX. LOCATION
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE FIELD MOUNTED
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE NORMALLY ACCESSIBLE (BOARD MOUNTED)
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE BEHIND BOARD MOUNTED
- DISCRETE INSTRUMENT/ELECTRICAL DEVICE AUX. LOCATION
- SHARED DISPLAY/CONTROL DEVICE FIELD MOUNTED
- SHARED DISPLAY/CONTROL DEVICE NORMALLY ACCESSIBLE (BOARD MOUNTED)
- SHARED DISPLAY/CONTROL DEVICE BEHIND BOARD MOUNTED
- SHARED DISPLAY/CONTROL DEVICE AUX. LOCATION
- LOCAL INDICATOR LIGHT R - RED, Y - YELLOW, G - GREEN
- INDICATOR LIGHT NORMALLY ACCESSIBLE
- UNDEFINED COMPLEX INTERCONNECTING LOGIC

INSTRUMENTATION LINES

- ELECTRIC ANALOG SIGNAL
- ELECTRIC BINARY SIGNAL
- PNEUMATIC SIGNAL
- PNEUMATIC BINARY SIGNAL
- INTERNAL SYSTEM LINK

ISA LETTER COMBINATIONS

First-Letters	Initiating or Measured Variable	Controllers: Recording	Controllers: Indicating	Controllers: Blind	Controllers: Self-Actuated Control Valves	Readout Devices: Recording	Readout Devices: Indicating	Switches and Alarm Devices *: High **	Switches and Alarm Devices *: Low	Switches and Alarm Devices *: Comb	Transmitters: Recording	Transmitters: Indicating	Transmitters: Blind	Solenoids, Relays, Computing Devices	Primary Element	Test Point	Well or Probe	Viewing Device, Glass	Safety Device	Final Element
A	Analysis	ARC	AIC	AC		AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	Burner/Combustion	BRC	BIC	BC		BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	User's Choice																			
D	User's Choice																			
E	Voltage	ERC	EIC	EC		ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	Flow Rate	FRC	FIC	FC	FCV, FICV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP		FG		FV
FQ	Flow Quantity	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE					FQV
FF	Flow Ratio	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSL						FE					FFV
G	User's Choice																			
H	Hand		HIC	HC						HS										HV
I	Current	IRC	IIC			IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	Power	JRC	JIC			JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	Time	KRC	KIC	KC	KCV	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	Level	LRC	LIC	LC	LCV	LR	LI	LSH	LSL	LSHL LSHH	LRT	LIT	LT	LY	LE		LW	LG		LV
M	User's Choice																			
N	User's Choice																			
O	User's Choice																			
P	Pressure/Vacuum	PRC	PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	Pressure, Differential	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE	PP				PDV
Q	Quantity	QRC	QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE					QZ
R	Radiation	RRC	RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW			RZ
S	Speed/Frequency	SRC	SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE					SV
T	Temperature	TRC	TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW		TSE	TV
TD	Temperature, Differential	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE	TP	TW			TDV
U	Multivariable					UR	UI							UY						UV
V	Vibration/Machinery Analysis					VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE					VZ
W	Weight/Force	WRC	WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE					WZ
WD	Weight/Force, Differential	WDRC	WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WE					WDZ
X	Unclassified																			
Y	Event/State/Presence		YIC	YC		YR	YI	YSH	YSL				YT	YY	YE					YZ
Z	Position/Dimension	ZRC	ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE					ZV
ZD	Gauging/Deviation	ZDRC	ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE					ZDV

Note: This table is not all-inclusive.
* A, alarm, the annunciating device, may be used in the same fashion as S, switch, the actuating device.

** The letters H and L may be omitted in the undefined case.

Other Possible Combinations:

FO	(Restriction Orifice)	PFR	(Ratio)
FRK, HIK	(Control Stations)	KQI	(Running Time Indicator)
FX	(Accessories)	QQI	(Indicating Counter)
TJR	(Scanning Recorder)	WKIC	(Rate-of-Weight-Loss Controller)
LLH	(Pilot Light)	HMS	(Hand Momentary Switch)
LCH	(Level Control High)	LCL	(Level Control Low)

Nº	Revision	Date	Initial

NOTES:
1. THIS IS A STANDARD LEGEND LIST, THEREFORE SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS LIST AND NOT ON THE DRAWINGS.
2. CONTACT ENGINEER FOR ABBREVIATIONS AND SYMBOLS NOT LISTED.
3. COMPONENTS AND PANELS SHOWN WITH AN ARE TO BE FURNISHED AS PART OF A PACKAGE SYSTEM.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial
ISSUED FOR BID	08/30/12	MPL

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

INSTRUMENTATION & CONTROL LEGEND

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NO SCALE	Project Nº: 012610-00	Report Nº: PRES001	Drawing Nº: G-03

012610-00(PRES001)GN-DE002 AUG 30/2012

PIPE AND PIPE FITTING SYMBOLS

FITTING	SINGLE LINE FLANGED	SINGLE LINE SCREWED	SINGLE LINE WELDED	DOUBLE LINE FLANGED
STRAIGHT CROSS				
ELBOW 11.25°				
ELBOW 22.5°				
ELBOW 45°				
ELBOW 90°				
ELBOW UP				
ELBOW DOWN				
CAPPED END				
LATERAL				
CONCENTRIC REDUCER				
ECCENTRIC REDUCER				
TEE-STRAIGHT SIZE				
TEE-OUTLET UP				
TEE-OUTLET DOWN				
UNION				
WELD NECK				
EXISTING PIPE				
NEW PIPE				
EXISTING PIPE TO BE ABANDONED				
EXISTING PIPE TO BE REMOVED				

VALVE SYMBOLS

- MULTIPORT BALL VALVE (BALL VALVE SHOWN. ARROWS INDICATE PATTERN, SEAT PORTS ARE IMPLIED
- FOUR WAY VALVE
- AIR AND VACUUM VALVE
- ANGLE GATE VALVE
- ANGLE GLOBE VALVE
- GLOBE VALVE
- GATE VALVE
- KNIFE GATE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- DIAPHRAGM VALVE
- NEEDLE VALVE
- PLUG VALVE
- SEAT PORT
- ECCENTRIC PLUG VALVE
- PRV
- PRESSURE REDUCING VALVE
- PINCH VALVE
- PRESSURE RELIEF VALVE
- SELF-CONTAINED PRESS. REGULATOR
- E — VALVE WITH ACTUATOR
- S — SOLENOID VALVE OPERATOR
- FI — FLOW INDICATOR
- T — TEMP. CONTROL VALVE
- CONTROL VALVE
- FLOW DIRECTION
- VALVE SYMBOL
- HOSE VALVE OR BIBB
- SP — SAMPLE PORT
- F — FLUSH

PIPE MATERIAL

CS	CARBON STEEL
CI	CAST IRON
CLDI	CEMENT LINED DUCTILE IRON
CPVC	CHLORINATED POLYVINYL CHLORIDE
CU	COPPER
DI	DUCTILE IRON
ELS	EPOXY LINED STEEL
FRP	FIBERGLASS REINFORCED PLASTIC
GALVS	GALVANIZED STEEL
HDPE	HIGH DENSITY POLYETHYLENE
PVC	POLYVINYL CHLORIDE
SST	STAINLESS STEEL

METER SYMBOLS

- M — MAGNETIC FLOW METER
- POSITIVE DISPLACEMENT FLOW METER
- TURBINE FLOW METER
- VORTEX FLOW METER
- WEIR

PROCESS PIPE IDENTIFICATION

AC	ACID
AI	AIR, INSTRUMENT
ALP	AIR, LOW PRESSURE
AHP	AIR, HIGH PRESSURE
AS	AIR SCOUR
BD	BLOWDOWN
BW	BACKWASH WASTE
CD	CONDENSATE DRAIN
CG	CHLORINE GAS
D	DECANT
DDS	DEWATERED DIGESTED SLUDGE
DG	DIGESTER GAS
DR	DRAIN
DS	DIGESTED SLUDGE
EXH	EXHAUST
FC	FERRIC CHLORIDE
GW	GROUNDWATER
M	METHANOL
N	NUTRIENT
O	OXYGEN
OF	OVERFLOW
P	POLYMER
PW	POLISHED WATER
RAS	RETURN ACTIVATED SLUDGE
RW	RAW WATER
S	SUPERNATANT
SA	SAMPLE
SL	SLUDGE
SPD	SUMP PUMP DISCHARGE
TBS	THICKENED BOTTOM SLUDGE
TWAS	THICKENED WASTE ACTIVATED SLUDGE
WAS	WASTE ACTIVATED SLUDGE
WW	WASH WATER
W1	SERVICE WATER, NON-POTABLE
W2	TREATED EFFLUENT USED FOR SERVICE, NON-POTABLE

PIPING DESIGNATION: 16"-CLDI-RAS

16" - CLDI - RAS

- PIPE USE IDENTIFICATION LEGEND
- PIPE MATERIAL
- NOMINAL PIPE DIAMETER (INCH)

EQUIPMENT SYMBOLS

- SG — SIGHT GLASS
- TRANSDUCER MOUNTING
- DISSOLVED OXYGEN ANALYZER
- INLINE MIXER
- INLINE CIRCULATING PUMP
- DIAPHRAGM PUMP
- CENTRIFUGAL PUMP OR BLOWER
- GEAR PUMP OR POS DISPLACEMENT BLOWER

LEVEL SENSOR SYMBOLS

- LEVEL SWITCH
- ULTRASONIC LEVEL TRANSMITTER
- FLOAT SWITCH

MISCELLANEOUS PIPING SYMBOLS

- BFP — BACKFLOW PREVENTOR
- DIRECTION OF SLOPE
- DIRECTION OF FLOW
- INSULATED LINE
- INSULATED LINE w/STEAM TRACE
- ELEC — INSULATED LINE w/ELECTRICAL TRACE
- L R F — LUBRICATOR, REGULATOR, FILTER

GATE SYMBOLS

EL. VIEW / PLAN VIEW

- SLUICE
- BUTTERFLY
- FLAP
- SHEAR
- FABRICATED SLIDE

HVAC SYMBOLS

- OED — OPEN END DUCT
- T — ROOM THERMOSTAT
- T G — ROOM THERMOSTAT w/GUARD
- SUPPLY AIR DUCT SECTION UP
- SUPPLY AIR DUCT SECTION DOWN
- RETURN/EXHAUST AIR DUCT SECTION UP
- RETURN/EXHAUST AIR DUCT SECTION DOWN
- FLEXIBLE CONNECTION
- TURNING VANES
- SUPPLY AIR DIFFUSER
- INSULATED DUCT
- OPPOSED BLADE DAMPER
- FD — FIRE DAMPER
- BDD — BACKDRAFT DAMPER
- BD — BALANCING DAMPER
- M — DAMPER MOTOR
- DG — DOOR GRILLE
- UH — UNIT HEATER

BUILDING SERVICES PIPE IDENTIFICATION

- HOT WATER
- HOT WATER RECIRCULATION
- COLD WATER
- S — COLD WATER (SOFT)
- SAN — SANITARY SEWER
- STM — STORM SEWER
- PS — PROCESS SEWER
- RWL — RAIN WATER LEADER
- V — VENT
- G — GAS
- F — FIRE STANDPIPE
- SPK — SPRINKLER
- HWS — HEATING WATER SUPPLY
- HWR — HEATING WATER RETURN
- CHWS — CHILLED WATER SUPPLY
- CHWR — CHILLED WATER RETURN
- LPS — LOW PRESSURE STEAM
- LPC — GRAVITY STEAM CONDENSATE
- FT — FLOAT & THERMOSTATIC TRAP
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- RD — ROOF DRAIN
- CO — CLEANOUT
- FD — FLOOR DRAIN
- HD — HUB DRAIN

GENERAL PIPING NOTES

1. SYMBOLS SHOWN HERE FOR SINGLE LINE FITTINGS ARE GENERIC ONLY. REFER TO PIPING SPECIFICATIONS FOR SPECIFIC END CONNECTIONS FOR SINGLE LINE PIPE AND FITTINGS.
2. EXISTING PIPE AND EQUIPMENT IS SHOWN THIN-LINED AND/OR SCREENED AND IS NOTED AS EXISTING. NEW PIPING AND EQUIPMENT IS SHOWN HEAVY-LINED.
3. ONLY FLANGED END CONNECTIONS ARE SHOWN HERE FOR DOUBLE LINE FITTINGS.
4. SIZE OF FITTINGS SHOWN ON PLANS SHALL CORRESPOND TO ADJACENT STRAIGHT RUN OF PIPE, UNLESS OTHERWISE INDICATED. TYPE OF JOINT AND FITTING MATERIAL SHALL BE THE SAME AS SHOWN FOR ADJACENT STRAIGHT RUN OF PIPE.
5. ALL FLEXIBLE CONNECTORS OR FLANGED ADAPTERS SHALL BE PROVIDED WITH THRUST TIES, BLOCKS, OR ANCHORS, UNLESS NOTED OTHERWISE. THRUST PROTECTION SHALL BE ADEQUATE FOR PRESSURES SPECIFIED.
6. NUMBER AND LOCATION OF UNIONS SHOWN ON DRAWINGS IS ONLY APPROXIMATE. PROVIDE ALL UNIONS NECESSARY TO FACILITATE CONVENIENT REMOVAL OF VALVES AND MECHANICAL EQUIPMENT.

NO	Revision	Date	Initial

NOTES:

1. THIS IS A STANDARD LEGEND LIST, THEREFORE SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS LIST AND NOT ON THE DRAWINGS.
2. CONTACT ENGINEER FOR ABBREVIATIONS AND SYMBOLS NOT LISTED.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/12	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

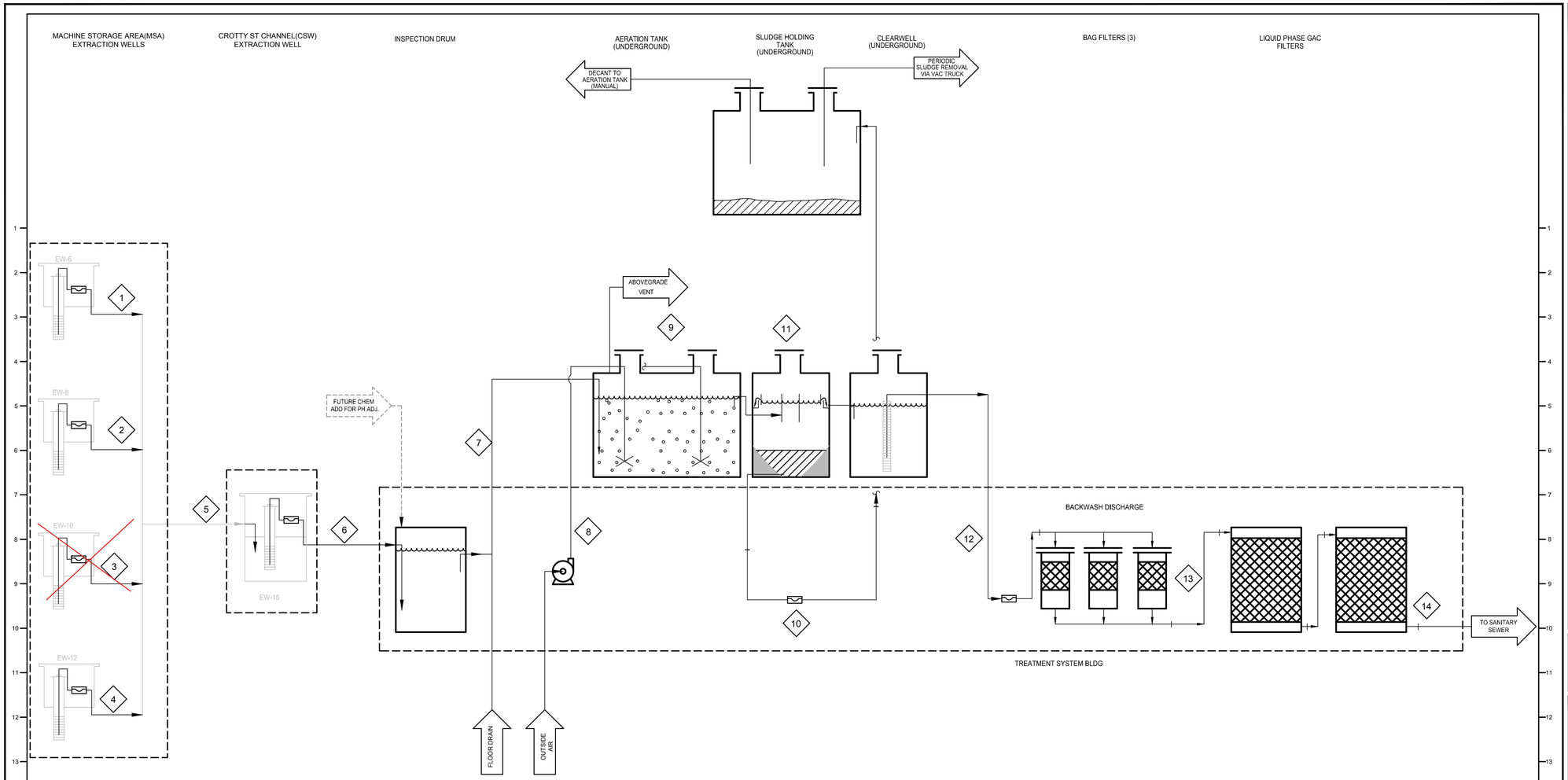
MECHANICAL
LEGEND

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NO SCALE	Project NO: 012610-00	Report NO: PRES001	Drawing NO: G-04

012610-00(PRES001)GN-DE003 AUG 30/2012



	1	2	3	4	5	6	7	8	9	10	11	12	13	14											
WASTEWATER (GPM)	0.06 - 0.12(CONT.)	0.06 - 0.12(CONT.)	0.06 - 0.12(CONT.)	0.06 - 0.12(CONT.)	0.24 - 0.48(CONT.)	0.5 - 2.0(CONT.)	0.5 - 2.0(CONT.)			(35-175 GAL/WEEK)		2 - 4 (INTER.)	2 - 4 (INTER.)	2 - 4 (INTER.)											
AIR (SCFM)								5 - 7,8																	
SLUDGE (lbs/DAY)										50-200 lbs/DAY②															
HRT (HRS)									≥ 10.4 (HRS)		≥ 2.3 (HRS)														
CONTAMINANT BALANCE①																									
VOC ③																									
CIS - 1,2 - DCE						2.58 ug/L	2.58 ug/L					ND	ND	ND											
TRANS - 1,2 - DCE						ND (2 ug/L)	ND (2 ug/L)					ND	ND	ND											
ETHYLBENZENE						1.33 ug/L (J) ④	1.33 ug/L (J)					ND	ND	ND											
TOLUENE						ND (2ug/L)	ND (2ug/L)					ND	ND	ND											
VINYL CHLORIDE						2.58 ug/L (J)	2.58 ug/L (J)					ND	ND	ND											
TOTAL XYLENES						5.60 ug/L	5.60 ug/L					ND	ND	ND											
PCB'S																									
AROCLOR 1242						2.72 ug/L	2.72 ug/L					0.200 ug/L	< 0.200 ug/L	ND (0.02 ug/L)											

LEGEND

- STREAM NUMBER
- GPM
- POUNDS/HR.
- SCFM
- TEMPERATURE F
- PSIA

MATERIAL BALANCE FIGURES AT DESIGN FLOWRATE AND AVERAGE CONTAMINANT CONCENTRATIONS.

NS = NOT SIGNIFICANT

1. BASED ON REPRESENTATIVE INFLUENT SAMPLE COLLECTED IN SEPTEMBER 2011 FOR TREATABILITY STUDY. TABLE ONLY SHOWS ANTICIPATED REMOVAL FOR CONTAMINANTS OF CONCERN FOR DISCHARGE TO MUNICIPAL SEWER (VOC'S & PCB'S).
2. (J) = ESTIMATED RESULT
3. VOC'S ASSUMED REDUCED TO ND LEVELS THROUGH STRIPPING EFFECT OF AERATION.
4. WET WEIGHT AT 3% SOLIDS. DRY WEIGHT OF 1.5 LB/DAY AT 0.5 GPM, 6 LB/DAY AT 2.0 GPM. APPROXIMATE CONCENTRATION OF PCB'S IN SLUDGE BASED ON DRY WEIGHT IS 10 mg/kg.

Nº	Revision	Date	Initial

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/12	MPL
DRAFT FOR REVIEW	05/25/12	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

PROCESS FLOW DIAGRAM GW EXTRACTION & TREATMENT SYSTEM

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NA	Project Nº: 012610-00	Report Nº: PRES001	Drawing Nº: EF-01

012610-00(PRES001)EF-DE001 AUG 30/2012

NO	Revision	Date	Initial

MACHINE STORAGE AREA(MSA) EXTRACTION WELLS

CROTTY ST CHANNEL(CSW) EXTRACTION WELL

INSPECTION DRUM

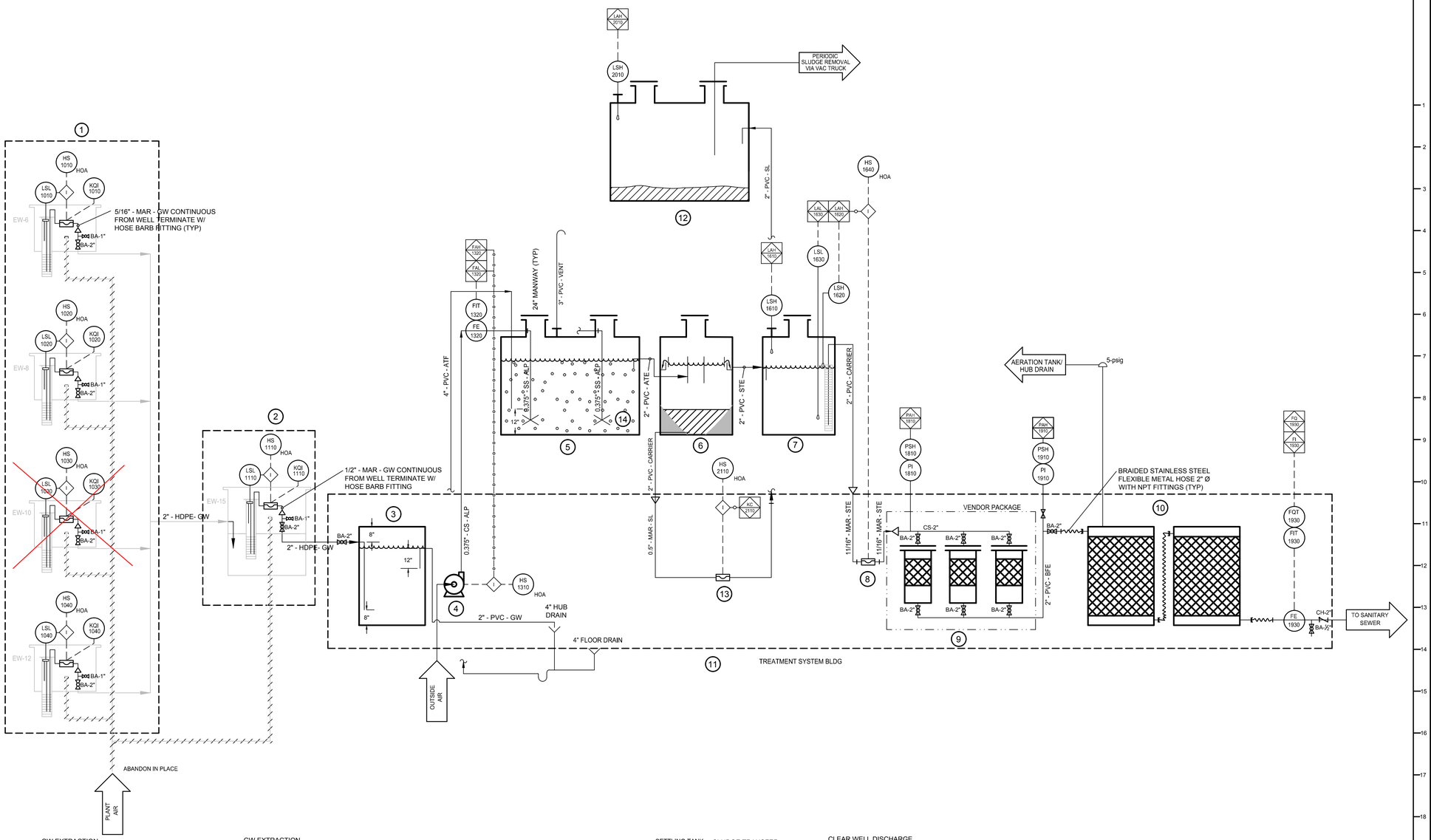
AERATION TANK (UNDERGROUND)

SLUDGE HOLDING TANK (UNDERGROUND)

CLEARWELL (UNDERGROUND)

BAG FILTERS (3)

LIQUID PHASE GAC FILTERS



PLANT ID.	P - 1000	1	P - 1100	2	T - 1200	3	B - 1300	4	T - 1400	5	T - 1500	6	T - 1600	7	P - 1700	8	FIL - 1800	9	FIL - 1900	10		11	T - 2000	12	P - 2100	13		14
NAME	MACHINE STORAGE AREA GW EXTRACTION PUMPS		CROTTY ST GW EXTRACTION PUMP AND COLLECTION SUMP		INSPECTION DRUM		BLOWER		AERATION TANK		SETTLING CHAMBER		CLEAR WELL		FEED PUMP		BAG FILTERS QTY (3)		CARBON STEEL FILTER VESSEL QTY (2)		TREATMENT BLDG		SLUDGE HOLDING TANK		SLUDGE TRANSFER PUMP		DIFFUSERS	
MATERIAL	CAST IRON & STEEL		CAST IRON & STEEL		PLASTIC				CONCRETE		CONCRETE MANHOLE		CONCRETE MANHOLE		CAST IRON & STEEL		CARBON STEEL FILTER HOUSING 3 - 9" DIA x 30" HOUSINGS W/ 25 MICRON BAGS		CARBON STEEL FILTER VESSEL		PRE-FAB CONCRETE		CONCRETE		CAST IRON & STAINLESS STEEL		STAINLESS STEEL	
SIZE	~ 12" x 17" x7.5" H		~ 12" x 17" x7.5" H		22" DIA x 34"		15.9" x 8.5" x 9.3" H		5' x 10'6" x 5'8" H		4' Ø x 5.5' H		4' Ø x 5.5' H		~ 12" x 17" x7.5" H				22" DIA x 34"		10' x 12' x 8' H		5' x 10'6" x 5'8" H		~ 12" x 17" x7.5" H		(6) 0.375" Ø X 12"L, W/ 4 HOLES 0.0625" Ø	
CAPACITY	0.017 - 0.167 gpm		0.26 - 2.55 gpm		~ 450 LBS OP. WT.		7.8 CFM		7250 GAL		280 GAL (OP. CAP.) TO GAL SLUDGE HOPPER		280 GAL (OP. CAP.)		0.41 - 3.99 gpm				200 lb GAC				7250 GAL		0.81 gpm			
TEMP/PRESS	< 30 PSI		< 30 PSI				5 PSI								< 30 PSI				< 6 PSI						< 30 PSI			
MTR/RPM	5 - 53 RPM		27-261 RPM				3/4 HP								27 - 261 RPM										77 RPM			
WEIGHT							471 LBS																					
MANUFACTURE	WATSON MARLOW		WATSON MARLOW				GAST		KERKSTRA		KERKSTRA		KERKSTRA		WATSON MARLOW						ADVANCE CONCRETE PRODUCTS		KERKSTRA		WATSON MARLOW			
MODEL	521VIRJC		621VIR				1023-101Q-G008X		7250 GAL						621 VRE2								7250 GAL		621 S/R			
VENDOR																					EXISTING AT SE COR OF SITE				FLUID PROCESS EQUIPMENT			
LOCATION	EXISTING EXTRACTION WELLS		EXISTING EXTRACTION WELL		TREATMENT BLDG		TREATMENT BLDG		BELOW GRADE		BELOW GRADE		BELOW GRADE		TREATMENT BLDG		TREATMENT BLDG		TREATMENT BLDG		SW COR OF SITE		BELOW GRADE		TREATMENT BLDG		AERATION TANK	

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/12	MPL
DRAFT FOR REVIEW	05/25/12	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

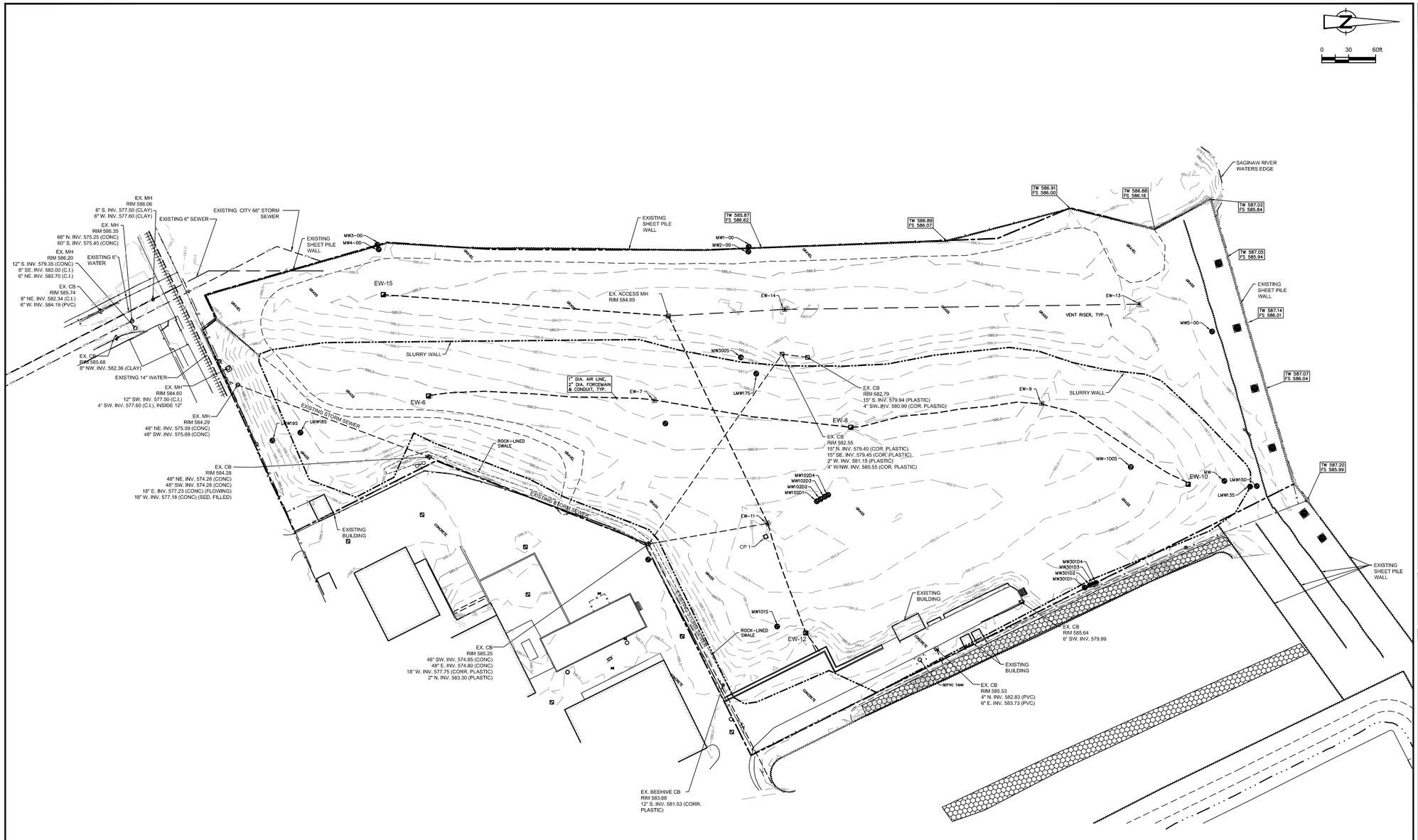
PIPING & INSTRUMENTATION DIAGRAM GW EXTRACTION & TREATMENT SYSTEM

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:
M. TOMKA	M. LAMB	AUGUST 30, 2012
Scale: NA	Project No: 012610-00	Report No: PRES001 / Drawing No: EF-02

012610-00(PRES001)EF-DE002 AUG 30/2012



NO	Revision	Date	Initial

LEGEND

- CAP CONTOUR
- SLURRY WALL
- STORM LINE
- FENCE
- HAND RAIL
- EXTRACTION LINE
- MONITORING WELL (MW102D1)
- EXTRACTION WELL (WITHOUT PUMP) (EW-7)
- APPROXIMATE RACER TRUST PROPERTY LINE
- STM — COMBINED SEWER

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/12	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

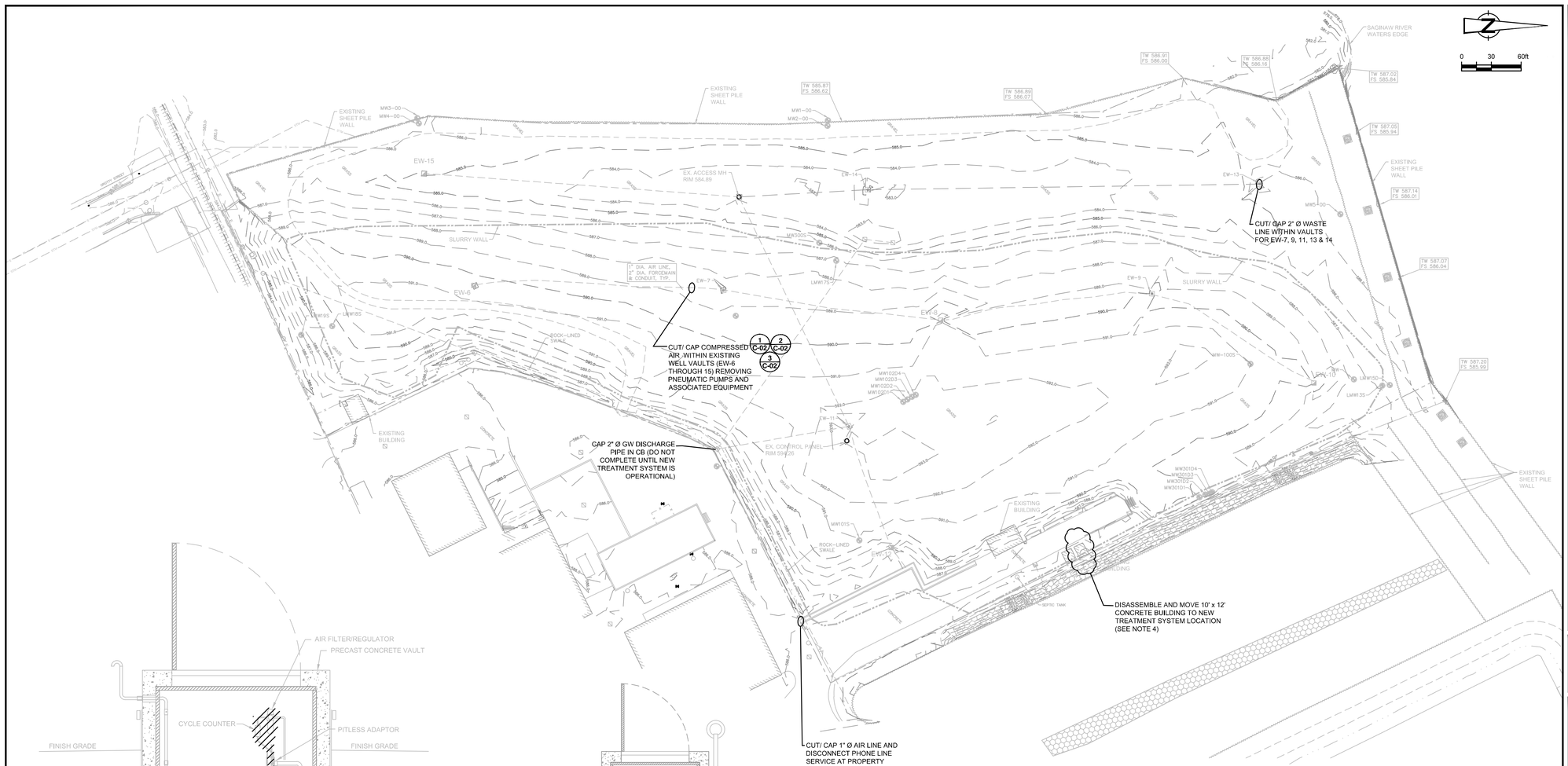
EXISTING CONDITIONS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

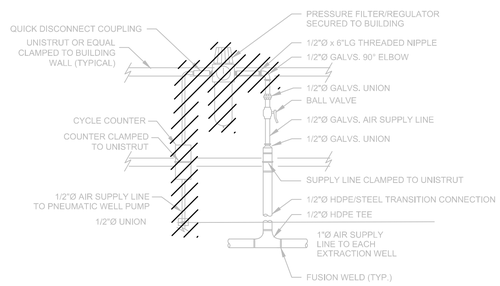
Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	JUNE 2012	
Scale: 1:60	Project No: 012610-T03	Report No: PRES002	Drawing No: C-01

012610-T03(PRES002)CI-DE006 AUG 30/2012



1 C-02 **EXTRACTION WELL DETAIL EW-6 TO EW-12**
NOT TO SCALE

2 C-02 **EXTRACTION WELL DETAIL EW-13, EW-14 AND EW-15**
NOT TO SCALE



3 C-02 **PRESSURE FILTER/REGULATOR MOUNTING DETAIL**
NOT TO SCALE

NO	Revision	Date	Initial

NOTES:

1. CONTRACTOR IS RESPONSIBLE FOR SEQUENCING CUT/CAP WORK WITH NEW TREATMENT SYSTEM INSTALL.
2. CONTRACTOR SHALL PROVIDE TEMPORARY GW EXTRACTION PUMPING FROM EW-6, 8, 10, 12 & 15 DURING TRANSITION TO NEW TREATMENT SYSTEM IF SHUTDOWN OF MORE THAN 1 WEEK IS REQUIRED.
3. WHERE LOCKABLE VALVES ARE PRESENT, VALVES SHALL BE LEFT IN PLACE WHEN LINES ARE CAPPED.
4. CONTRACTOR SHALL DISASSEMBLE AND REASSEMBLE PRECAST CONCRETE BUILDING IN ACCORDANCE WITH MANUFACTURER REQUIREMENTS. ELECTRICAL SERVICE TO BE DISCONNECTED AND INTERIOR CONDUIT, HEATER, LIGHTING AND RECEPTACLES TO BE REMOVED PRIOR TO RELOCATION..

LEGEND

- CAP CONTOUR
- SLURRY WALL
- STORM LINE
- FENCE
- HAND RAIL
- EXTRACTION LINE
- MW102D1 MONITORING WELL
- EW-7 EXTRACTION WELL (WITHOUT PUMP)
- APPROXIMATE RACER TRUST PROPERTY LINE
- STM COMBINED SEWER
- W WATER
- S SEWER

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial
ISSUED FOR BID	08/30/12	MPL

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

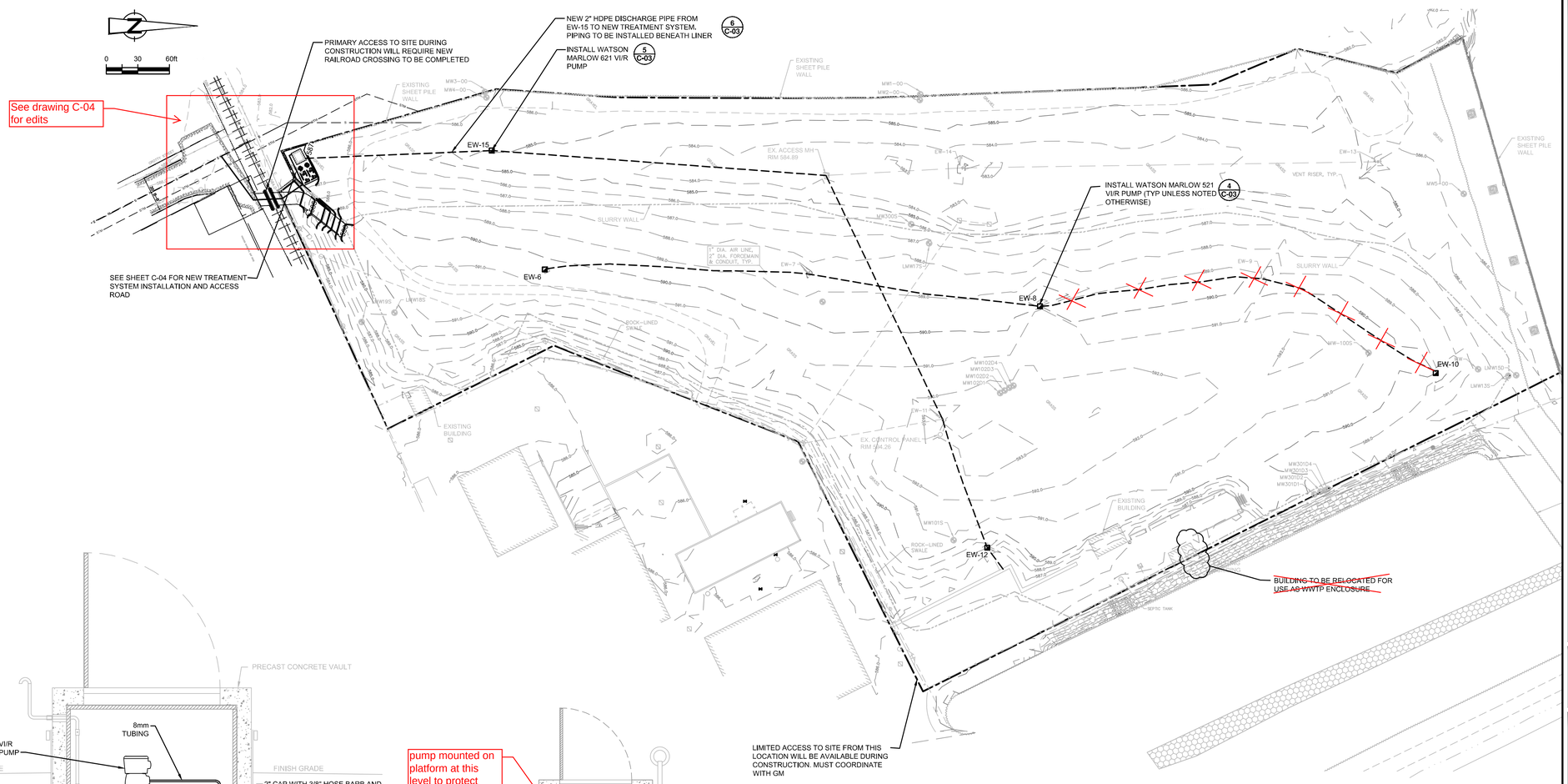
DEMOLITION
PLAN

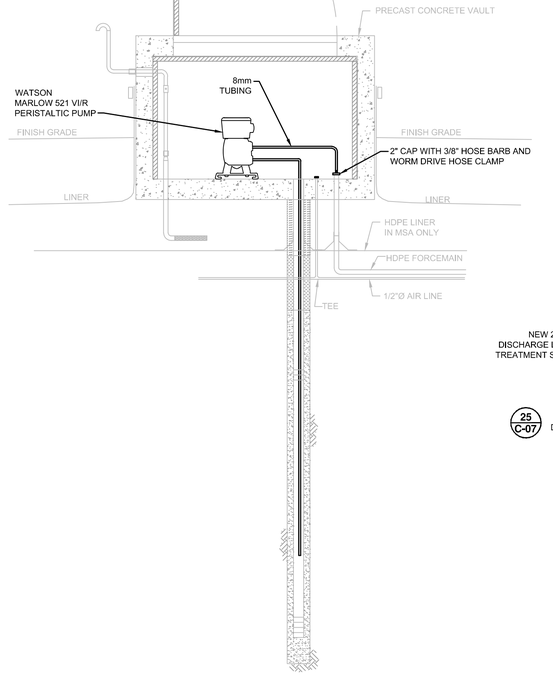
CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

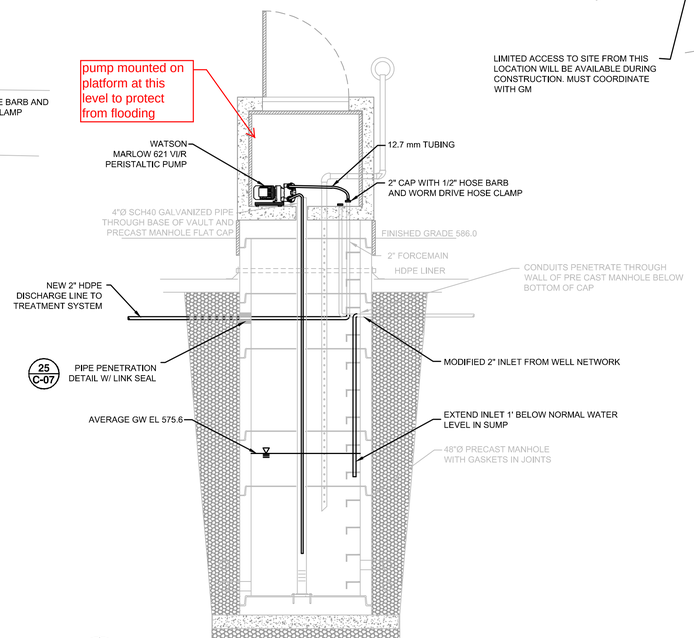
Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: 1:60	Project No: 012610-T03	Report No: PRES002	Drawing No: C-02

012610-T03(PRES002)CI-DE004 AUG 30/2012

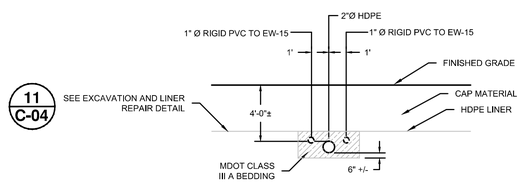




4 C-03 **EXTRACTION WELL DETAIL EW-6, EW-8, ~~EW-10~~ & EW-12**
NOT TO SCALE



5 C-03 **EXTRACTION WELL DETAIL EW-15**
NOT TO SCALE



6 C-03 **EW-15 DISCHARGE PIPE TRENCH**
NOT TO SCALE

NO.	Revision	Date	Initial

NOTES:
1. CONTRACTOR TO MINIMIZE REMOVAL OF LINER, REPLACE IN KIND PER RESTORATION DETAIL 11/C-04.
2. SPOILS FROM BENEATH LINER TO BE SEGREGATED AS PCB IMPACTED MATERIAL AND HANDLED/STAGED APPROPRIATELY. SPOILS ABOVE LINER TO BE HANDLED SEPARATELY AS CLEAN.
3. EXISTING BUILDING SLAB TO BE LEFT IN PLACE.

LEGEND
- APPROXIMATE RACER TRUST PROPERTY LINE
- 587 EXISTING CAP CONTOUR
- SLURRY WALL
- STORM LINE
- FENCE
- HAND RAIL
- EXTRACTION LINE (TO BE ABANDONED)
- MW102D1 MONITORING WELL
- EW-7 EXTRACTION WELL (TO BE ABANDONED)
- STM COMBINED SEWER
- W WATER
- S SEWER
- EXTRACTION LINE (TO REMAIN ACTIVE)
- EW-7 EXTRACTION WELL (TO REMAIN ACTIVE)
- F PROPOSED FORCEMAIN TO CITY SEWER ON CROTTY STREET
- 586 PROPOSED CONTOURS

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial
ISSUED FOR BID	08/30/12	MPL

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

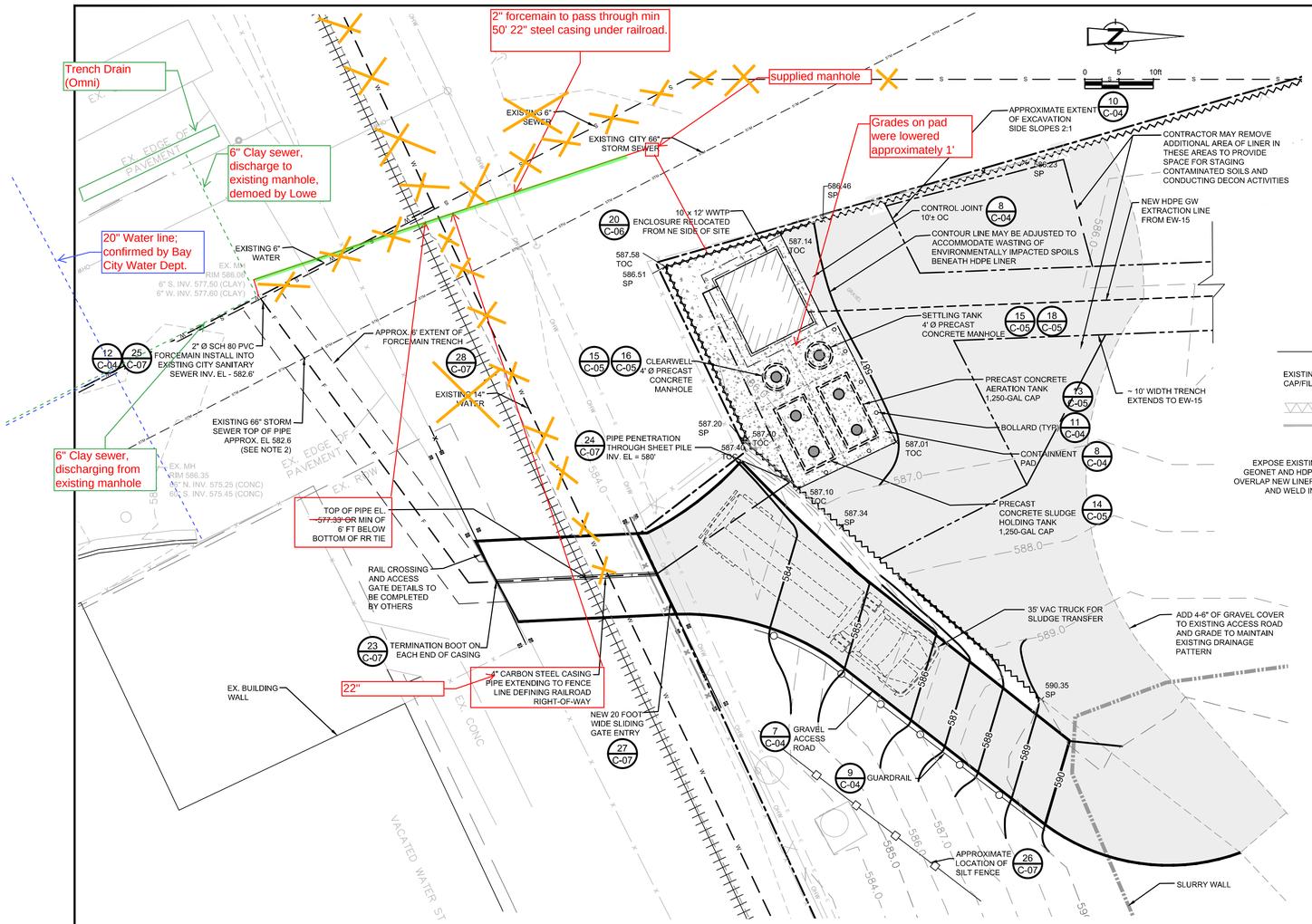
~~PROPOSED~~ LAYOUT

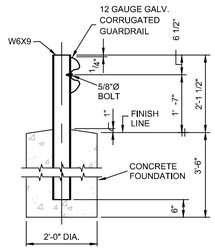
CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

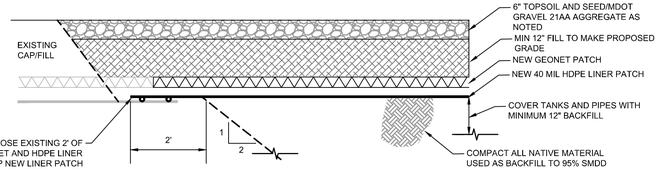
Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: 1:60	Project No: 012610-T03	Report No: PRES002	Drawing No: C-03

012610-T03(PRES002)CI-DE001 AUG 30/2012

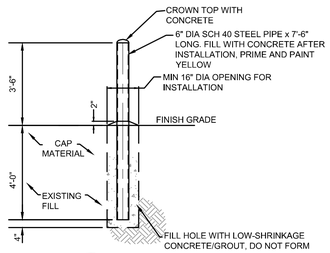




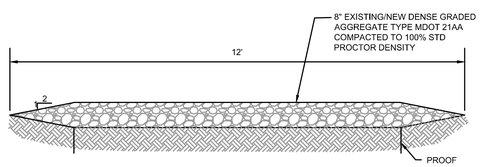
9 C-04 GUARDRAIL
NOT TO SCALE



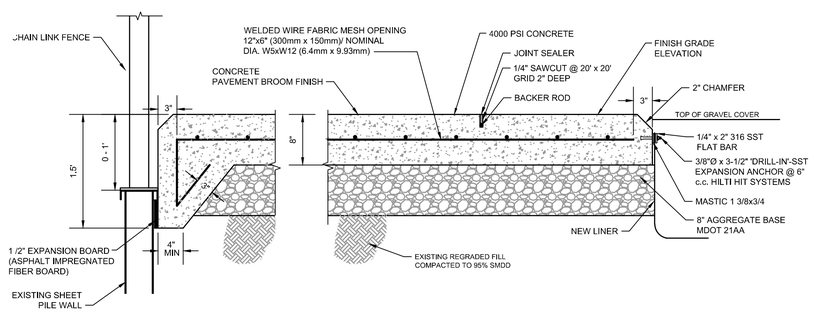
10 C-04 STANDARD EXCAVATION AND CAP DETAIL
NOT TO SCALE



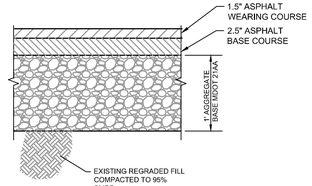
11 C-04 BOLLARD DETAIL
NOT TO SCALE



7 C-04 GRAVEL ACCESS ROAD
NOT TO SCALE

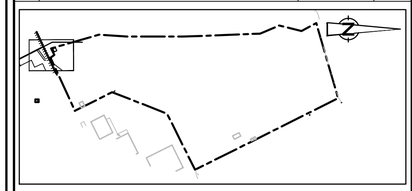


8 C-04 CONTAINMENT PAD
SCALE: 1" = 1'



12 C-04 ASPHALT RESTORATION
SCALE: 1" = 1'

Nº	Revision	Date	Initial



KEY MAP

NOTES:
1. ~~CONTRACTOR~~ TO FIELD VERIFY UNDERGROUND UTILITY ~~LOCATIONS~~.
2. CONTRACTOR ~~TO VERIFY~~ ELEVATION OF ~~66" STORM~~ SEWER AND ANY OTHER UNDERGROUND ~~UTILITIES TO BE CROSSED~~ BY NEW FORCEMAIN. ELEVATIONS ~~AND~~ LOCATIONS SHOWN ARE ~~BASED ON HISTORIC~~ DRAWINGS AND SHOULD BE CONSIDERED APPROXIMATE.

LEGEND

- APPROXIMATE RACER TRUST PROPERTY LINE
- EXISTING CAP CONTOUR
- SLURRY WALL
- STORM LINE
- FENCE
- HAND RAIL
- EXTRACTION LINE (TO BE ABANDONED)
- MW1(SD1) MONITORING WELL
- EW-7 EXTRACTION WELL (TO BE ABANDONED)
- STM COMBINED SEWER
- EXTRACTION LINE (TO BE USED)
- EW-7 EXTRACTION WELL (TO BE USED)
- PROPOSED FORCEMAIN TO CITY SEWER ON CROTTY STREET
- 586 PROPOSED CONTOURS
- EXTENT OF EXCAVATION AND HDPE LINER REMOVE AND REPAIR
- SILT FENCE
- GUARDRAIL
- SHEET PILE WALL
- TOC TOP OF CONCRETE
- SP SHEET PILING
- GRAVEL ROAD OR GRAVEL COVER

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

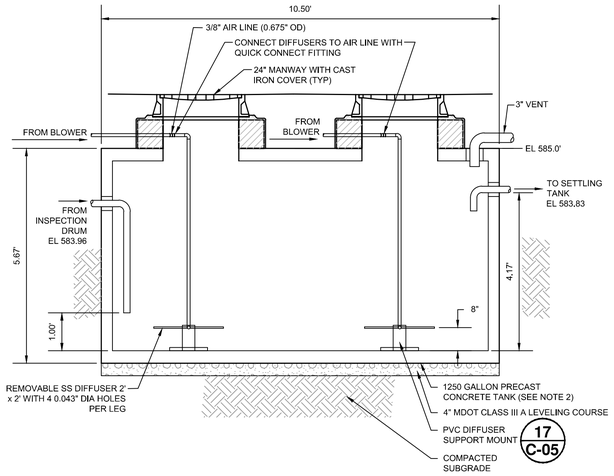
PROPOSED CONDITIONS
CIVIL DETAILS

CONESTOGA-ROVERS & ASSOCIATES

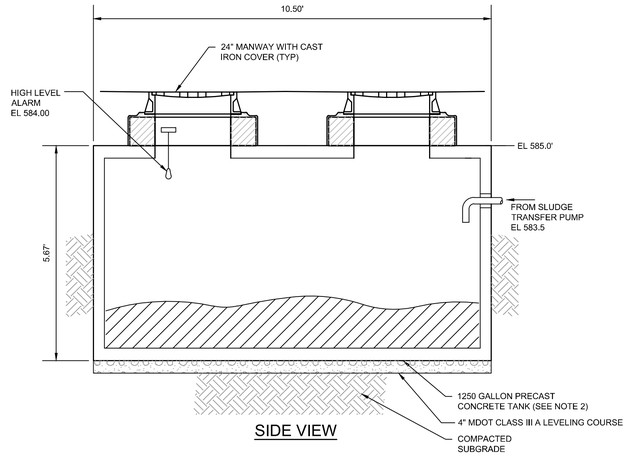
Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	JUNE 2012	
Scale: 1:10	Project Nº: 012610-T03	Report Nº: PRES002	Drawing Nº: C-04

012610-T03(PRES002)CI-DE003 AUG 30/2012

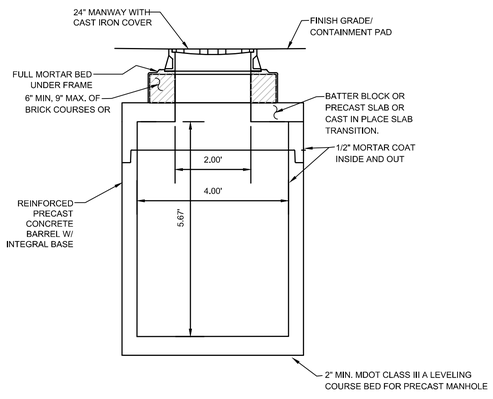


13 C-05 AERATION TANK
SCALE: 1" = 2'

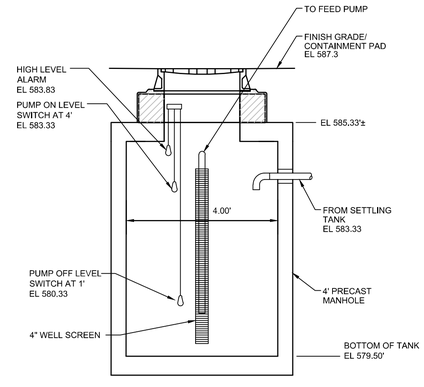


SIDE VIEW

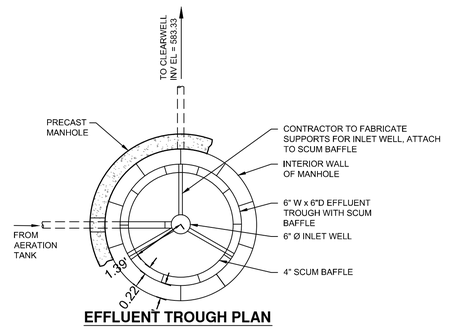
14 C-05 SLUDGE HOLDING TANK
SCALE: 1" = 2'



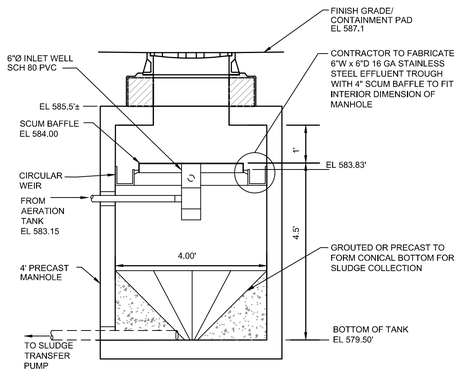
15 C-05 4' PRECAST MANHOLE
SCALE: 1" = 2'



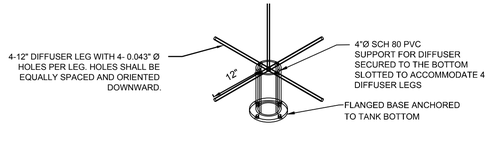
16 C-05 CLEARWELL
SCALE: 1" = 2'



EFFLUENT TROUGH PLAN



18 C-05 SETTLING TANK
SCALE: 1" = 2'



17 C-05 DIFUSER SUPPORT
SCALE: 1" = 1'

NO	Revision	Date	Initial

NOTES:
1. ALL EXTERNAL PENETRATIONS FOR UNDERGROUND CONCRETE TANKS AND MANHOLES SHALL BE SEALED WITH MANUFACTURER RECOMMENDED BOOTS OR MECHANICAL LINK SEAL.
2. CONCRETE TANKS SHALL BE WATER TIGHT AND CONSTRUCTED OF 5,000 PSI REINFORCED CONCRETE. TANKS SHALL BE FABRICATED IN ACCORDANCE WITH NPCA BEST PRACTICES BY A NPCA COMPLIANT AND CERTIFIED MANUFACTURER. TANKS SHALL BE CONSTRUCTED TO ACCOMMODATE THE BURIAL DEPTH AND MANHOLE ACCESS COVERS AS SHOWN. VEHICLE TRAFFIC OVER TANKS WILL BE RESTRICTED. CONCENTRATED LOADS WILL BE LIMITED TO FOOT TRAFFIC AND HAND CARTS FOR REMOVAL OF GAC FILTERS.
3. PRECAST CONCRETE MANHOLES SHALL CONFORM TO THE REQUIREMENTS OF ASTM C-478. ALL STRUCTURES MUST BE 5-INCH THICK PRECAST CONCRETE. ASTM C-478 APPROVED, WITH 1/2-INCH CEMENT PLASTER ON JOINTS INSIDE AND OUT. MANHOLE SECTIONS SHALL HAVE O-RING SEALS OR PREMIUM RUBBER GASKETS TO PROVIDE A WATER TIGHT SEAL. MANHOLES SHALL BE CONSTRUCTED TO ACCOMMODATE THE BURIAL DEPTH AND MANHOLE ACCESS COVERS AS SHOWN. VEHICLE TRAFFIC OVER MANHOLES WILL BE RESTRICTED. CONCENTRATED LOADS WILL BE LIMITED TO FOOT TRAFFIC AND HAND CARTS FOR REMOVAL OF GAC FILTERS.
4. CONTRACTOR SHALL SUBMIT MANUFACTURER SHOP DRAWINGS AND PRODUCT DATA FOR REVIEW AND APPROVAL BY OWNER/ ENGINEER FOR PRECAST CONCRETE STRUCTURES, MANHOLE COVERS, AND ANY CUSTOM FABRICATED EQUIPMENT PRIOR TO FABRICATION.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

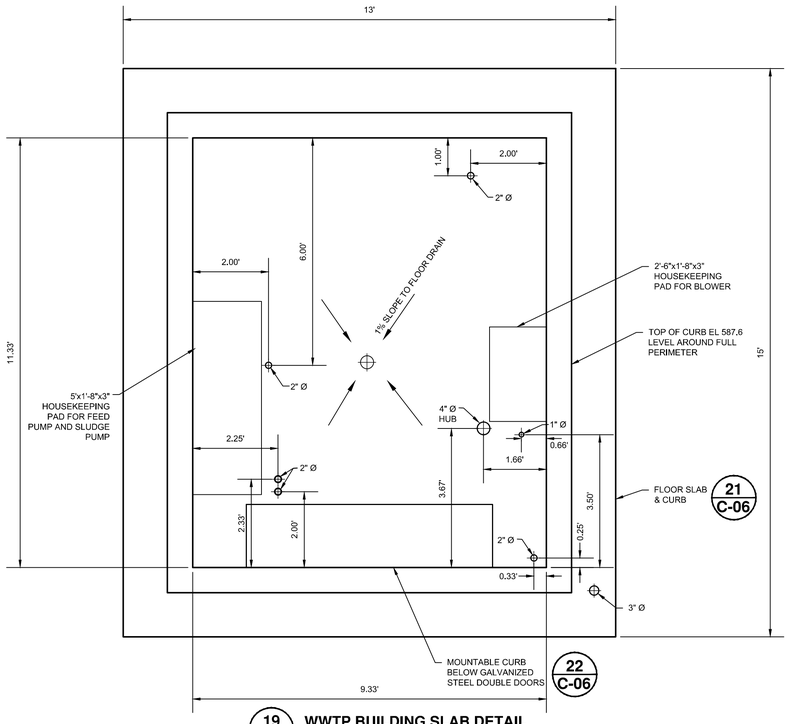
PROPOSED CONDITIONS
CIVIL DETAILS

CONESTOGA-ROVERS & ASSOCIATES

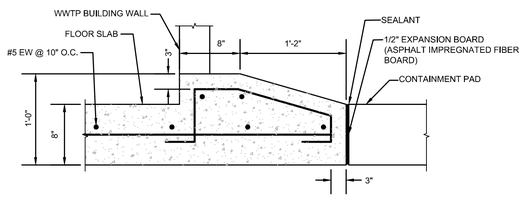
Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	JUNE 2012	
Scale: NTS	Project No: 012610-T03	Report No: PRES002	Drawing No: C-05

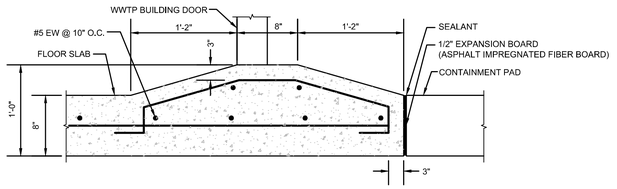
012610-T03(PRES002)CI-DE005 AUG 30/2012



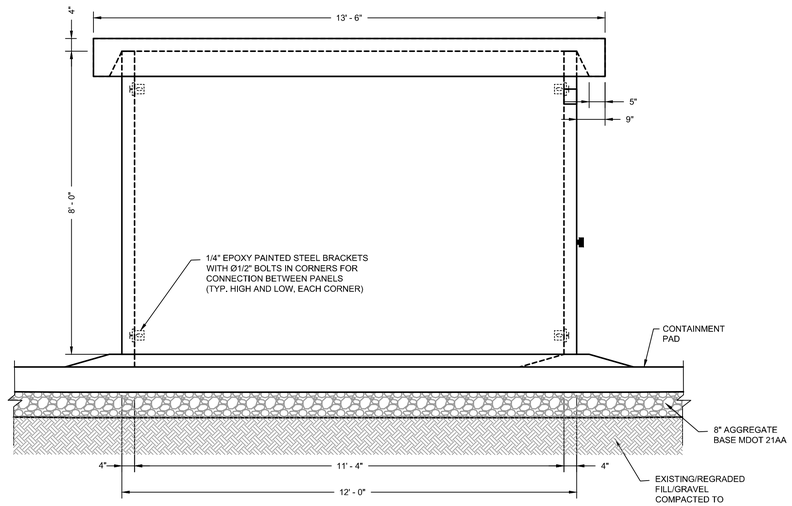
19 C-06 **WWTP BUILDING SLAB DETAIL**
SCALE: 1" = 2'



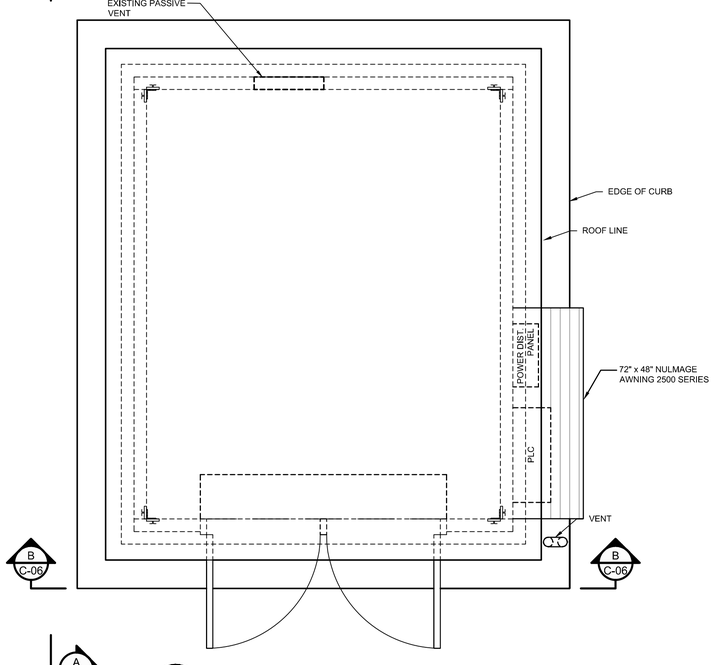
21 C-06 **FLOOR SLAB & CURB DETAIL**
NOT TO SCALE



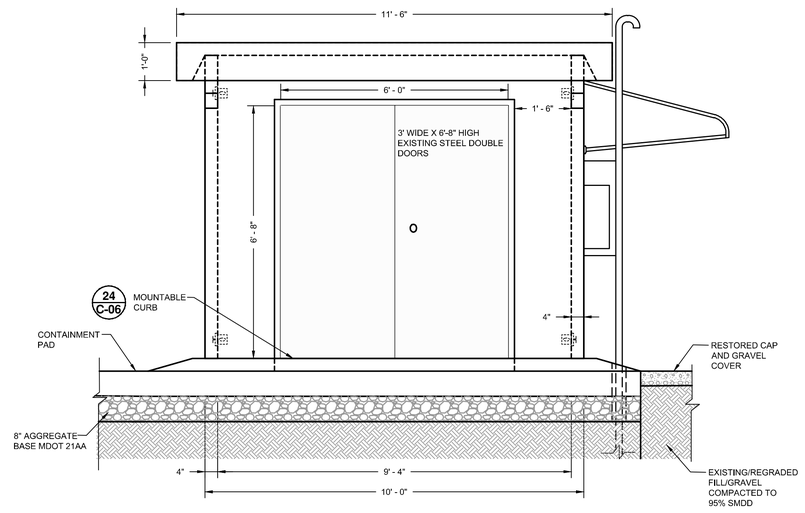
22 C-06 **MOUNTABLE CURB DETAIL**
NOT TO SCALE



A C-06 **WWTP "A" ELEVATION**
SCALE: 1" = 2'



20 C-06 **WWTP BUILDING PLAN VIEW** (SEE NOTE 1)
SCALE: 1" = 2'



B C-06 **WWTP "B" ELEVATION**
SCALE: 1" = 2'

No	Revision	Date	Initial

NOTES:

1. **EXISTING CONCRETE BUILDING TO BE RELOCATED FROM EAST SIDE OF SITE (SEE SHEET C-02). BUILDING WAS MANUFACTURED BY ADVANCE CONCRETE PRODUCTS CO. OF HIGHLAND, MICHIGAN. STRUCTURAL DESIGN BASED ON ROOF LOAD OF 60 PSF, WIND LOAD OF 27 PSF OR 130 MPH, AND FIRE RESISTANCE RATING OF 1.5 HOURS. ALL INTERIOR AND EXTERIOR JOINTS SHALL BE SEALED WITH SILICONE CAULK PER MANUFACTURER INSTRUCTIONS.**
2. **CONTRACTOR MAY PROPOSE INSTALLATION OF A NEW POLE BUILDING AS ALTERNATE TO RELOCATION AND USE OF THE EXISTING PRECAST CONCRETE BUILDING. CONTRACTOR SHALL SUBMIT DESIGN DRAWING AND SPECIFICATIONS FOR PROPOSED ALTERNATE FOR OWNER/ENGINEER REVIEW AND APPROVAL.**

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

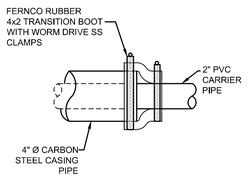
PROPOSED WWTP CONDITIONS
CIVIL DETAILS

CONESTOGA-ROVERS & ASSOCIATES

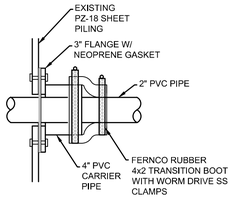
Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project No: 012610-T03	Report No: PRES002	Drawing No: C-06

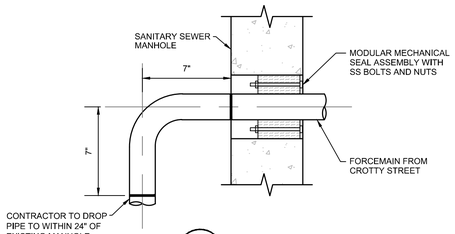
012610-T03(PRES002)CI-DE005 AUG 30/2012



23 / C-07 CASING PIPE TERMINATION
NOT TO SCALE



24 / C-07 SHEET PILE PIPE PENETRATION
NOT TO SCALE



25 / C-07 PIPE SLEEVE
NOT TO SCALE

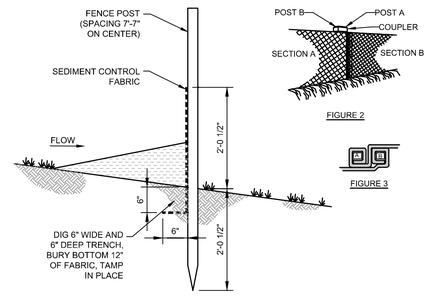


FIGURE 2

FIGURE 3

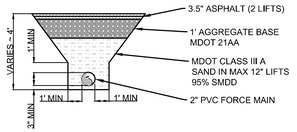
26 / C-07 SILT FENCE DETAIL
NOT TO SCALE

NOTES:

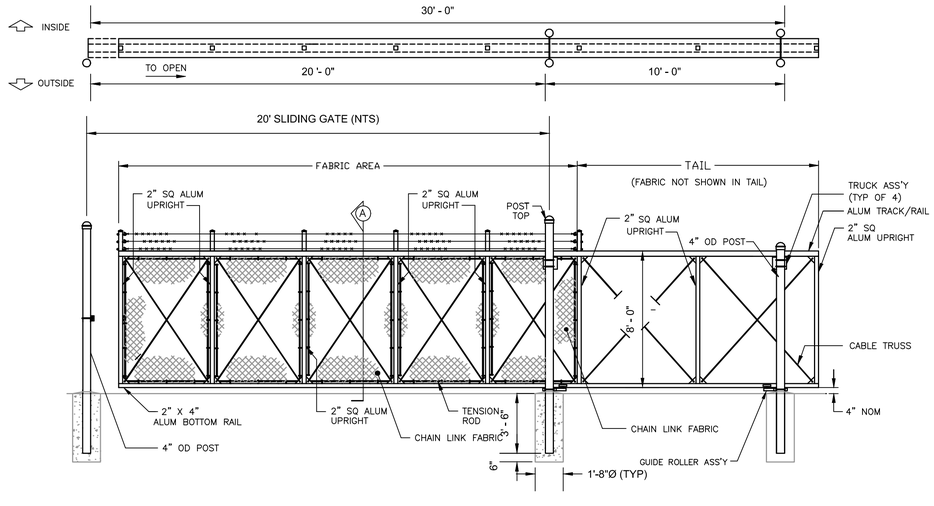
1. SILT FENCE HEIGHT TO BE 36" ABOVE GROUND, CONSTRUCTED OF FABRIC WITH MINIMUM TENSILE STRENGTH OF 136lbs, (MIRAFI ENVIROFENCE, TERRAFIX TERRAFENCE OR APPROVED EQUIVALENT).
2. SILT FENCE TO HAVE FACTORY ATTACHED FENCE POSTS.
3. REFER TO DRAWING FOR LOCATION OF SILT FENCE.

INSTALLATION SEQUENCE:

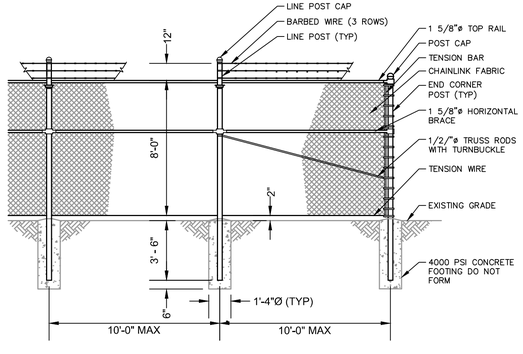
1. DIG A 6" x 6" TRENCH ALONG SILT FENCE LOCATIONS SHOWN
2. UNROLL SILT FENCE POSITIONING THE POSTS ON THE DOWNSTREAM SIDE.
3. DRIVE POSTS INTO THE GROUND AS SHOWN ON FIGURE 1.
4. LAY THE BOTTOM 12" OF FABRIC FLAP IN THE BOTTOM OF THE TRENCH, BACKFILL AND COMPACT.
5. ADJACENT SECTIONS OF THE SILT FENCE ARE JOINED AS SHOWN IN FIGURE 3. A COUPLER CAN BE USED TO SECURE ADJACENT POSTS AS SHOWN IN FIGURE 2.



28 / C-07 TYPICAL FORCE MAIN TRENCH DETAIL
NOT TO SCALE



27 / C-07 GATE DETAILS
NOT TO SCALE



NO	Revision	Date	Initial

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

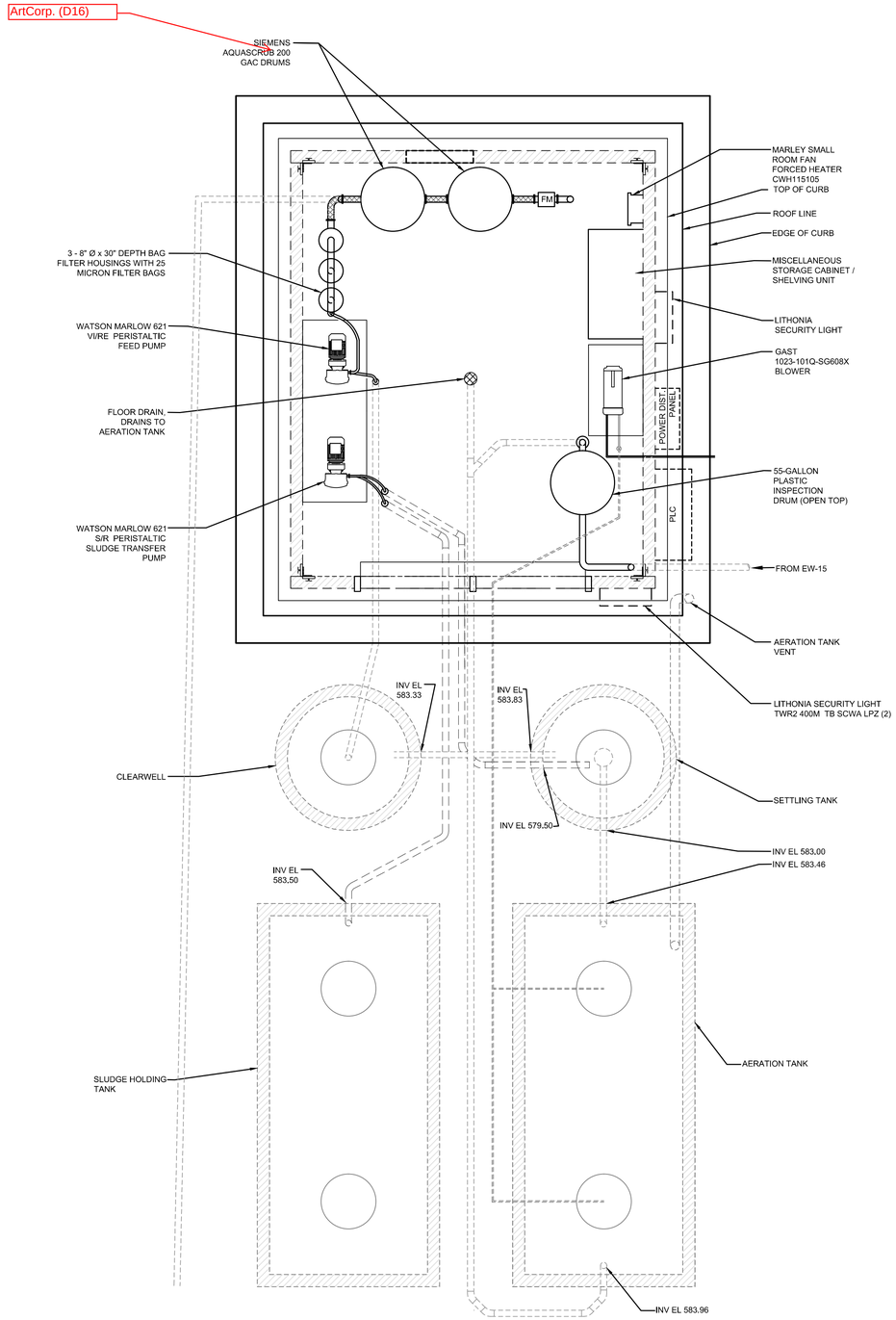
BAY CITY POWERTRAIN

PROPOSED CONDITIONS
CIVIL DETAILS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	JUNE 2012	
Scale: NTS	Project NO: 012610-T03	Report NO: PRES002	Drawing NO: C-07



29
ME-01
GENERAL ARRANGEMENT WWTP
SCALE: 1" = 2'

NO	Revision	Date	Initial

NOTES:
1. THE GENERAL EQUIPMENT AND PIPING LAYOUT SHOWN HERE IS INTENDED TO DEPICT A WORKABLE LAYOUT OPTION. CONTRACTOR SHALL SUBMIT TO OWNER/ENGINEER FOR REVIEW AND APPROVAL A FINAL MECHANICAL LAYOUT AND PIPING PLAN WITH ANY PROPOSED MODIFICATIONS.
2. ALL UNDERGROUND PROCESS PIPING (EXCEPT AIR) SHALL BE INSTALLED USING 45° ELBOWS FOR DIRECTIONAL CHANGE AND SHALL BE EQUIPPED WITH CLEANOUTS AS APPROPRIATE TO SERVICE THE PIPELINE.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

~~PROPOSED~~ CONDITIONS
MECHANICAL DETAILS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project N°: 012610-T03	Report N°: PRES002	Drawing N°: ME-01

012610-T03(PRES002)ME-DE001 AUG 30/2012

NEW

EXISTING

240V / 1PH / 3W / 60HZ SUPPLY
XXXKA RMS SYM AVAILABLE

XX

100A
2P

UL LISTED FOR USE AS
SERVICE EQUIPMENT

80A

1" RGS
3-1/C #2,
1-1/C #8 GND

EXISTING LP1
240 / 120V / 1PH / 3W / 60HZ PANELBOARD

30A
2P

EXISTING 1" PVC CONDUIT
PROPOSED 3-1/C #8,
1-1/C #8 GND

30A
2P

EXISTING
DISC SW.

30A

3/4" RGS
3-1/C #10,
1-1/C #10 GND

EXISTING PANELBOARD LP2042
240 / 120V / 1PH / 3W / 60HZ

15A
1P

15A
2P

15A
1P

15A
1P

15A
1P

15A
1P

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

.33

EXISTING LIGHT

HEATER
240V / 1PH
500W
FLA
(2.1)

PERISTALTIC
PUMP
PACKAGE
FLA
(7.2)

LEVEL
SWITCH
FLA
(.041)

PUMP
RUN TIMER
FLA
(0.5)

GFIC
RECEPTACLE
300W
FLA
(2.5)

EW - 06

EXISTING 1" PVC CONDUIT
3-1/C #10,
1-1/C #10 GND

30A
2P

EXISTING
DISC SW.

30A

3/4" RGS
3-1/C #10,
1-1/C #10 GND

EXISTING PANELBOARD LP2069
240 / 120V / 1PH / 3W / 60HZ

15A
1P

15A
2P

15A
1P

15A
1P

15A
1P

15A
1P

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

.33

EXISTING LIGHT

HEATER
240V / 1PH
500W
FLA
(2.1)

PERISTALTIC
PUMP
PACKAGE
FLA
(7.2)

LEVEL
SWITCH
FLA
(.041)

PUMP
RUN TIMER
FLA
(0.5)

GFIC
RECEPTACLE
300W
FLA
(2.5)

EW - 08

EXISTING 1" PVC CONDUIT
PROPOSED 3-1/C #6,
1-1/C #8 GND

30A
2P

EXISTING
DISC SW.

30A

3/4" RGS
3-1/C #10,
1-1/C #10 GND

EXISTING PANELBOARD LP3018
240 / 120V / 1PH / 3W / 60HZ

15A
1P

15A
2P

15A
1P

15A
1P

15A
1P

15A
1P

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

.33

EXISTING LIGHT

HEATER
240V / 1PH
500W
FLA
(2.1)

PERISTALTIC
PUMP
PACKAGE
FLA
(7.2)

LEVEL
SWITCH
FLA
(.041)

PUMP
RUN TIMER
FLA
(0.5)

GFIC
RECEPTACLE
300W
FLA
(2.5)

EW - 10

EXISTING 1" PVC CONDUIT
3-1/C #10,
1-1/C #10 GND

30A
2P

EXISTING
DISC SW.

30A

3/4" RGS
3-1/C #10,
1-1/C #10 GND

EXISTING PANELBOARD LP3043
240 / 120V / 1PH / 3W / 60HZ

15A
1P

15A
2P

15A
1P

15A
1P

15A
1P

15A
1P

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

3/4" RGS
2-1/C-#12
1-1/C-#12GND

.33

EXISTING LIGHT

HEATER
240V / 1PH
500W
FLA
(2.1)

PERISTALTIC
PUMP
PACKAGE
FLA
(7.2)

LEVEL
SWITCH
FLA
(.041)

PUMP
RUN TIMER
FLA
(0.5)

GFIC
RECEPTACLE
300W
FLA
(2.5)

EW - 12

NΩ	Revision	Date	Initial

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

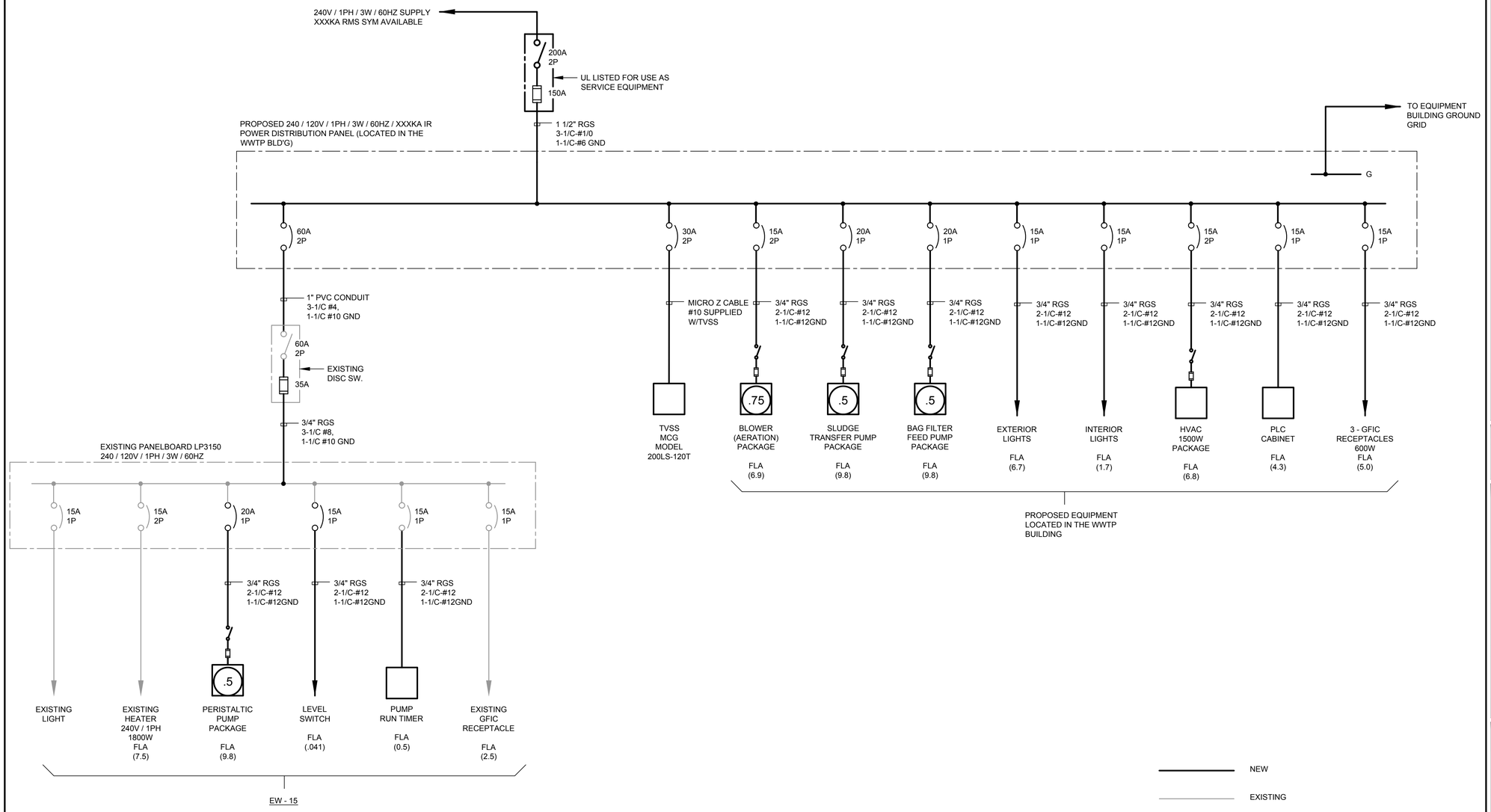
ONE LINE DIAGRAM FOR
EW-06, EW-08, EW-10 & EW-12

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project Nº: 012610-T03	Report Nº: PRES002	Drawing Nº: E-01

012610-T03(PRES002)EL-DE008 AUG 30/2012



NΩ	Revision	Date	Initial

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/12	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

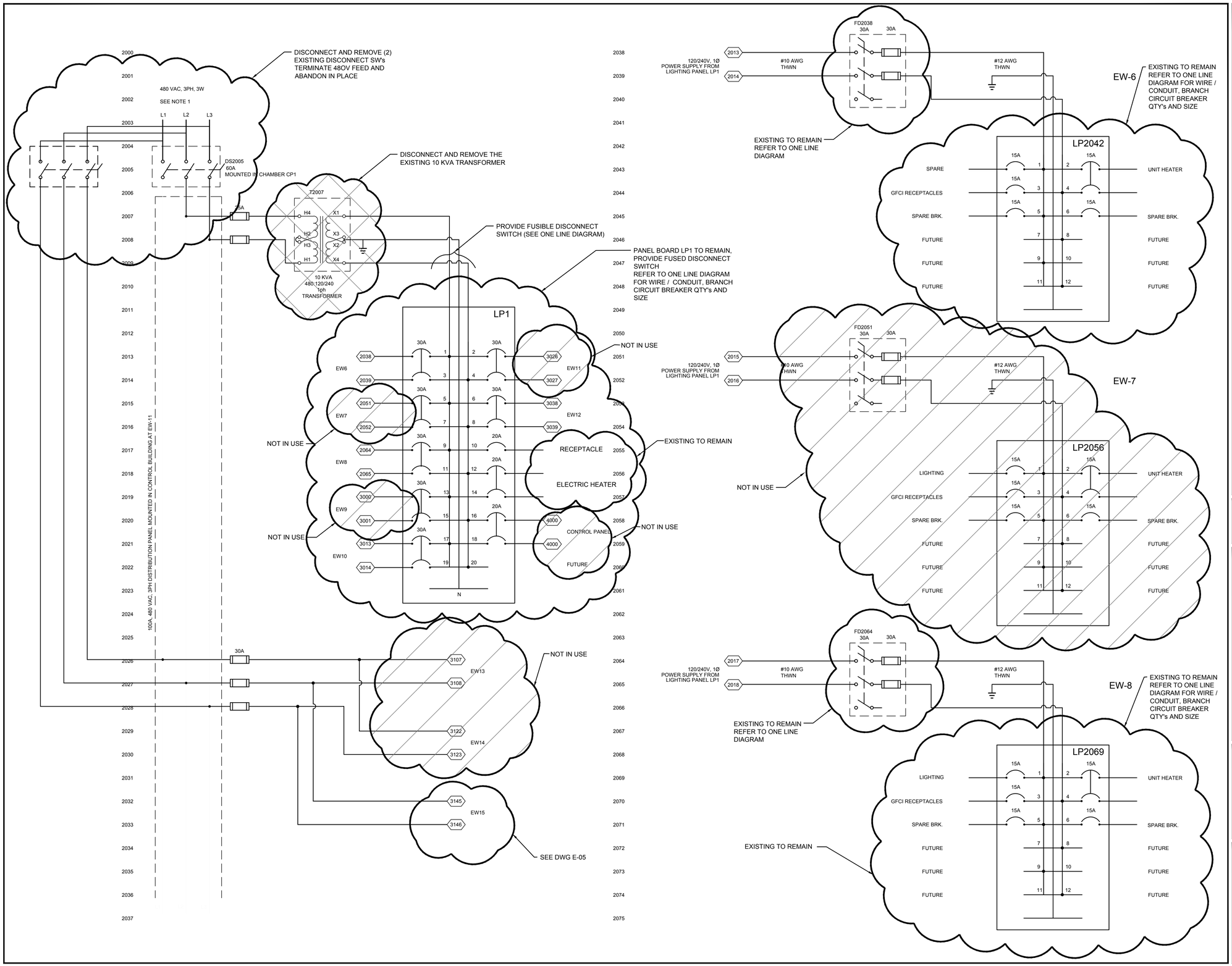
BAY CITY POWERTRAIN

ONE LINE DIAGRAM FOR WWTP BUILDING & EW-15

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project Nº: 012610-T03	Report Nº: PRES002	Drawing Nº: E-02



NO.	Revision	Date	Initial

NOTES:

1. POWER FEED FROM EXISTING PUMPING STATION CONTROL PANEL.
2. EXISTING CONDITIONS FROM AS RECORDED DRAWING MAY 2000 AND 2012 FIELD VERIFICATION
3. REFER TO ONE LINE DIAGRAMS E-01 AND E-02 FOR ADDITIONAL DETAILS.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

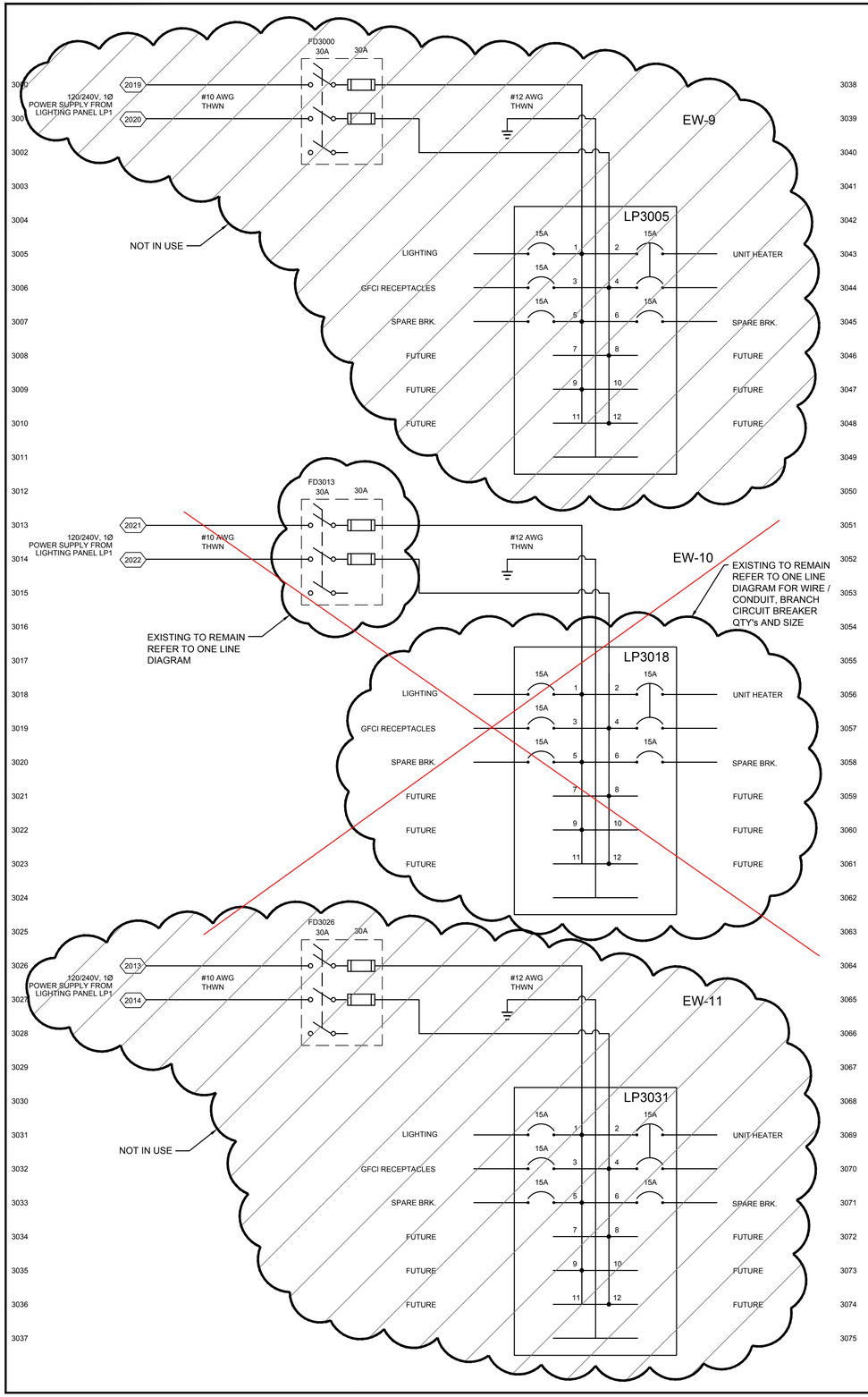
EQUIPMENT STORAGE AREA
POWER DISTRIBUTION SH. 1 OF 3

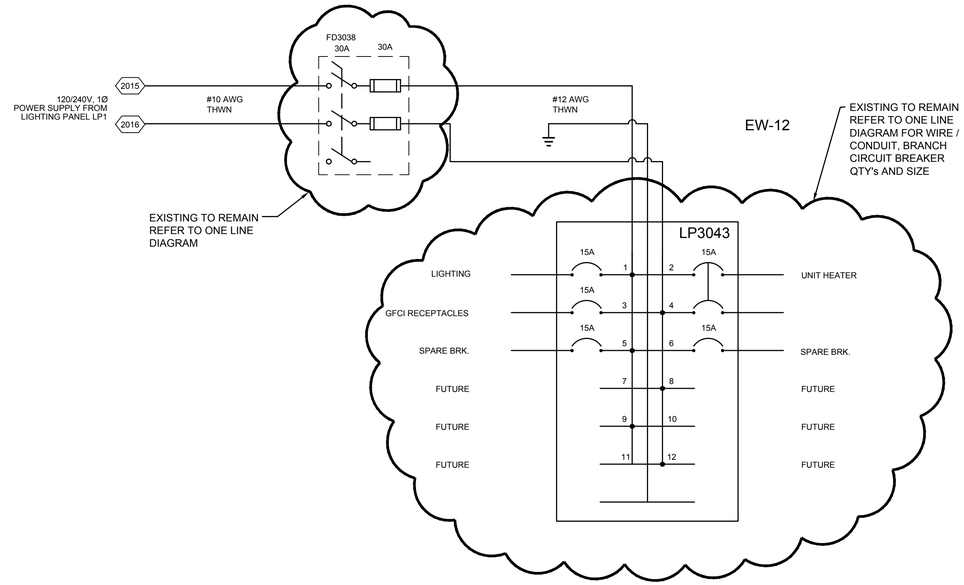
CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project No: 012610-T03	Report No: PRES002	Drawing No: E-03

012610-T03(PRES002)EL-DE001 AUG 30/2012





MAJOR EQUIPMENT LIST

FOR EW-6,7,8,9,10,11,12

SYM	QTY	MANUFACTURER	PART NUMBER	DESCRIPTION
DP1	1	C-H	YS2024/LT2024S	100A, 18CCT 480V 3Ø 3W PANELBOARD
DS.2005	1	SQUARE-D	HU361	30A NON-FUSED DISCONNECT
FD3038,FD2051 FD2064,FD3000,FD3013, FD3026,FD3038	7	SQUARE-D	H362	60A DISCONNECT
LP2042,~~LP2058~~,LP2069	1	SQUARE-D	--	100A, 20cct, 120/240V, 3W
LP2042,~~LP2058~~,LP2069 ~~LP3005~~,LP3018,~~LP3031~~, LP3043	7	SQUARE-D	NQOD12L100CV/ MH20/MHC20/S	100A, 12cct, 120/240V, 3W PANELBOARD, NEMA1
~~T2051~~	~~1~~	SQUARE-D	--	~~480-120/240-10 KVA LIGHTING TRANSFORMER~~

DISCONNECT AND REMOVE

EXISTING TO REMAIN REFER TO ONE LINE DIAGRAM

DISCONNECT AND REMOVE

SEE DWG.12610-20(004)EL-ME003AME FOR MAJOR EQUIPMENT LIST OF EW-13, 14, 15

NO	Revision	Date	Initial

NOTES:

1. EXISTING CONDITIONS FROM AS RECORDED DRAWING MAY 2000 AND 2012 FIELD VERIFICATION
2. REFER TO ONE LINE DIAGRAMS E-01 AND E-02 FOR ADDITIONAL DETAILS.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

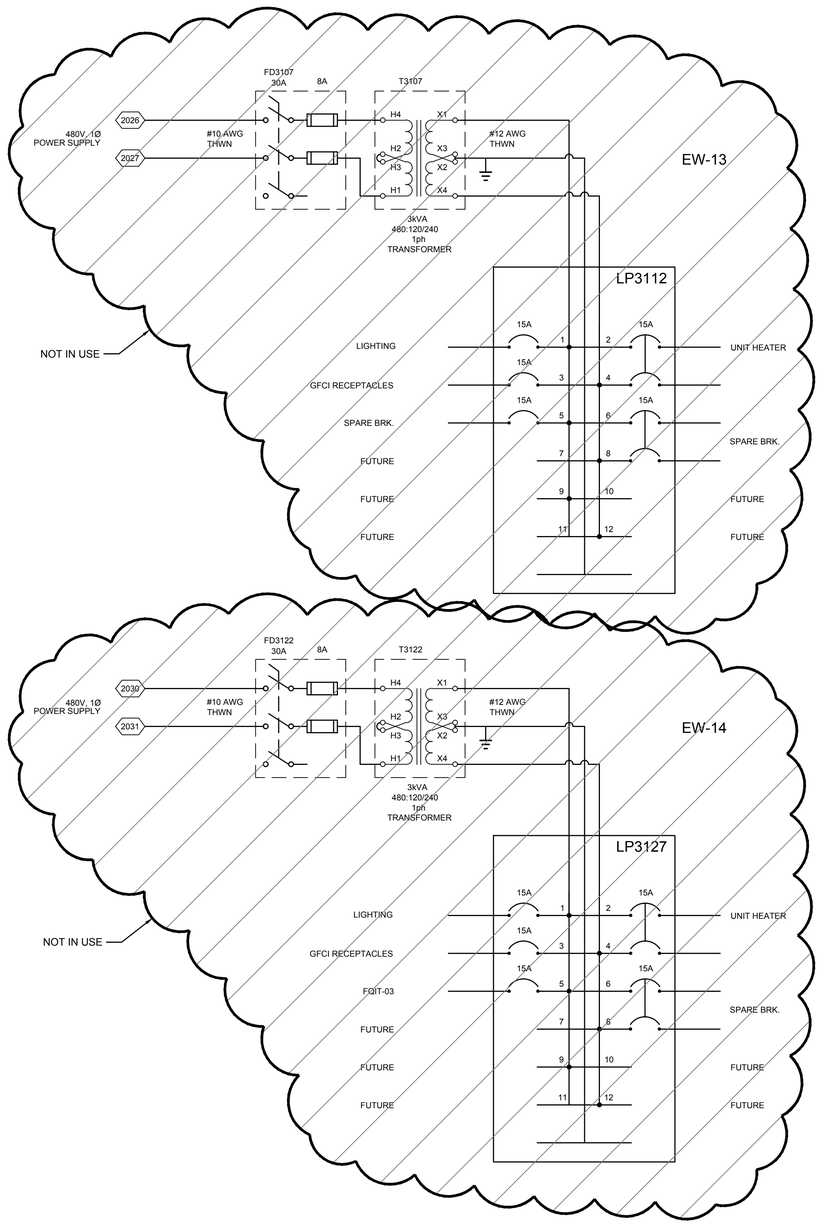
EQUIPMENT STORAGE AREA
POWER DISTRIBUTION SH. 2 OF 3

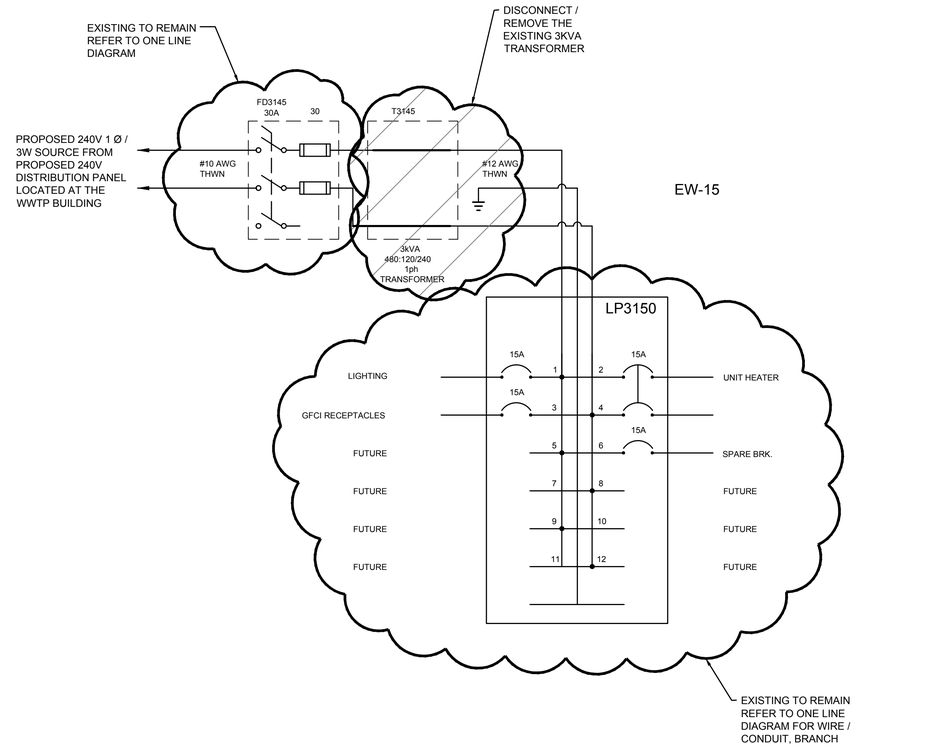
CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project N°: 012610-T03	Report N°: PRES002	Drawing N°: E-04

012610-T03(PRES002)EL-DE002 AUG 30/2012





MAJOR EQUIPMENT LIST

FOR EW-13, 14, 15

SYM	QTY	MANUFACTURER	PART NUMBER	DESCRIPTION
FD3107,FD3122,FD3145	3	SQUARE-D	H361DS	30A DISC. WITH NEMA 4X ENCLOSURE
~~T3107,T3122,T3145~~	~~3~~	~~SQUARE-D~~	~~351F~~	~~480:120/240, 3kVA OUTDOOR LIGHTING TRANSFORMER~~
~~LP3112,LP3127~~,LP3150	3	SQUARE-D	NQOD12L100CV/ MH20WP	100A, 12cct, 120/240V, 3W PANELBOARD, NEMA3R

EXISTING TO REMAIN

DISCONNECT AND REMOVE TRANSFORMERS

LP3150 EXISTING TO REMAIN

EW-13, 14, 15 POWER DISTRIBUTION DIAGRAM

NO	Revision	Date	Initial

NOTES:

1. EXISTING CONDITIONS FROM AS RECORDED DRAWING MAY 2000 AND 2012 FIELD VERIFICATION
2. REFER TO ONE LINE DIAGRAMS E-01 AND E-02 FOR ADDITIONAL DETAILS.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

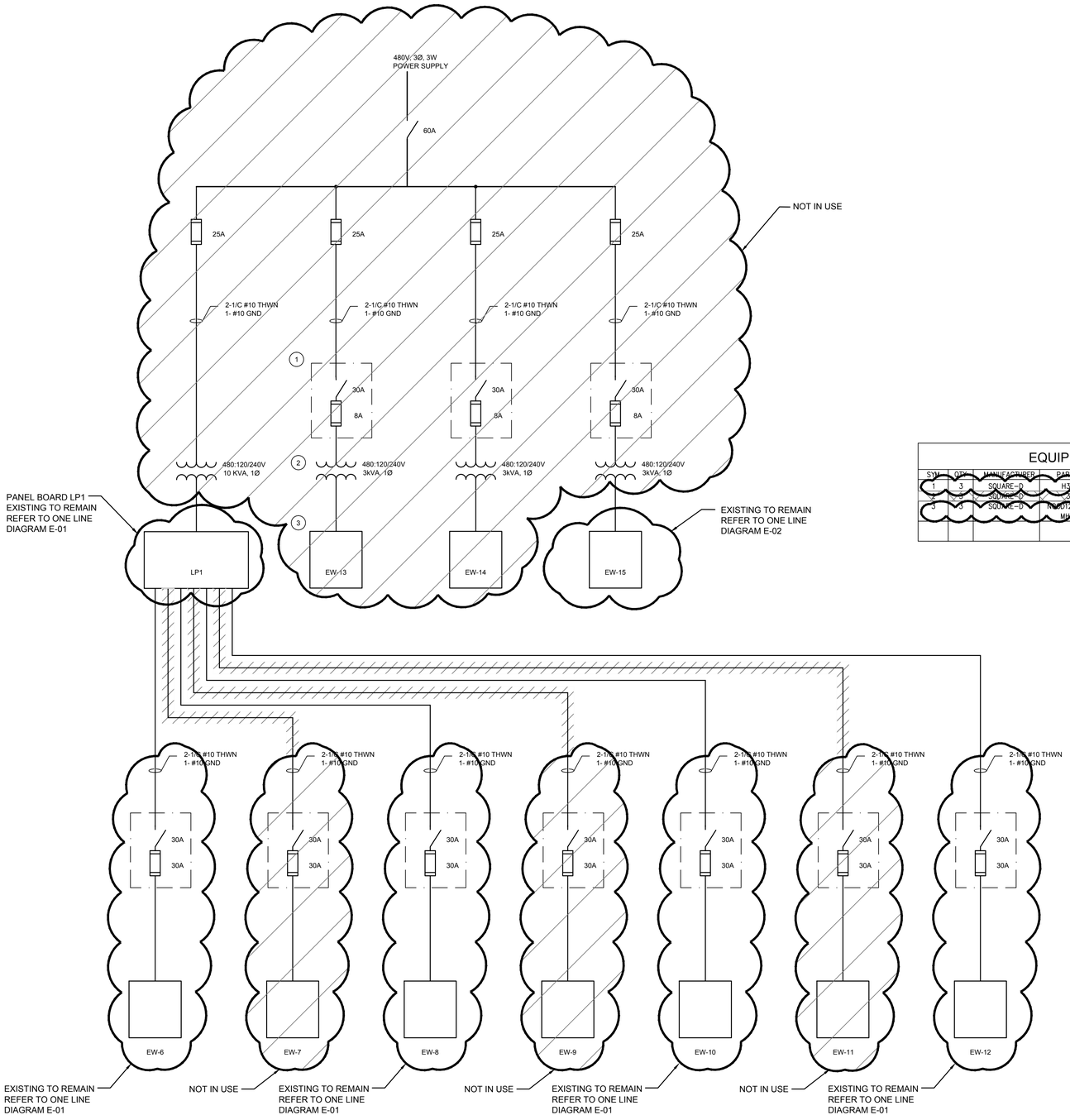
BAY CITY POWERTRAIN

EQUIPMENT STORAGE AREA
POWER DISTRIBUTION SH 3 OF 3

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project No: 012610-T03	Report No: PRES002	Drawing No: E-05



EQUIPMENT SCHEDULE

FOR EW-13, 14, 15

SYM	QTY	MANUFACTURER	PART NUMBER	DESCRIPTION
1	3	SQUARE-D	H361DS	30A DISCONNECT WITH NEMA 4X ENCLOSURE
2	3	SQUARE-D	3SJF	480:2(0,240, 3kVA OUTDOOR LIGHTING TRANSFORMER
3	3	SQUARE-D	NQOD12L100CV	100A, 12cct, 120/240V, 3W
			MLO/MP	PANELBOARD, NEMA 3R

EXISTING TO REMAIN
REFER TO ONE LINE
DIAGRAM

DISCONNECT AND REMOVE

EXISTING TO REMAIN
REFER TO ONE LINE
DIAGRAM

NO	Revision	Date	Initial

NOTES:

1. EXISTING CONDITIONS FROM AS RECORDED DRAWING MAY 2000 AND 2012 FIELD VERIFICATION
2. REFER TO ONE LINE DIAGRAMS E-01 AND E-02 FOR ADDITIONAL DETAILS.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial
ISSUED FOR BID	08/30/2012	MPL

RACER TRUST
BAY CITY, MICHIGAN

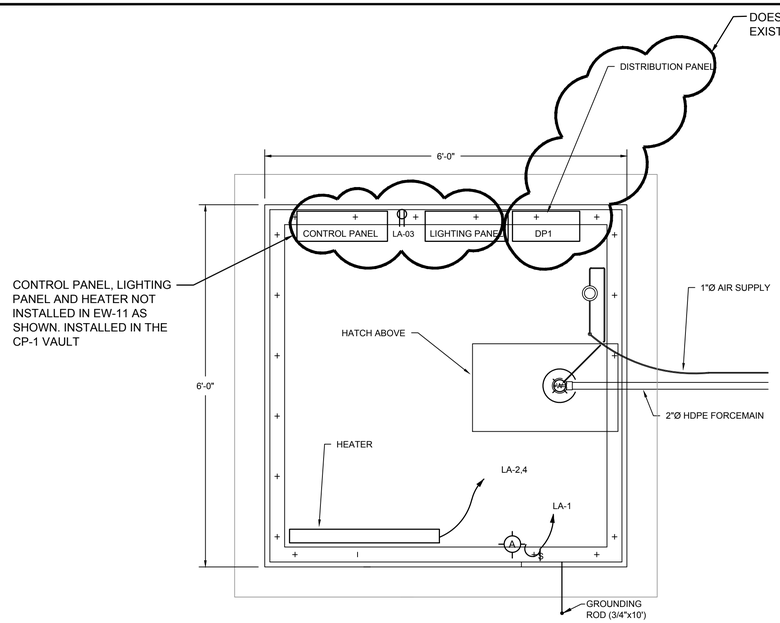
BAY CITY POWERTRAIN

POWER DISTRIBUTION
SINGLE LINE

CONESTOGA-ROVERS & ASSOCIATES

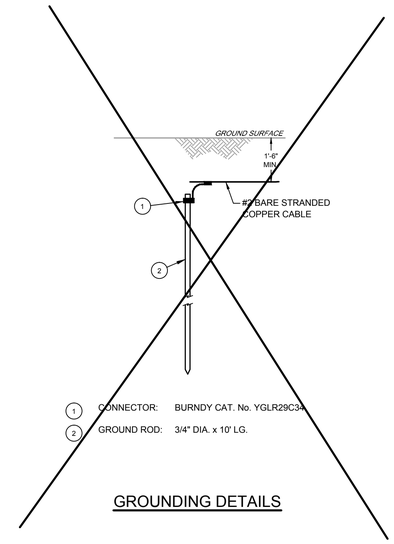
Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project No.: 012610-T03	Report No.: PRES002	Drawing No.: E-06

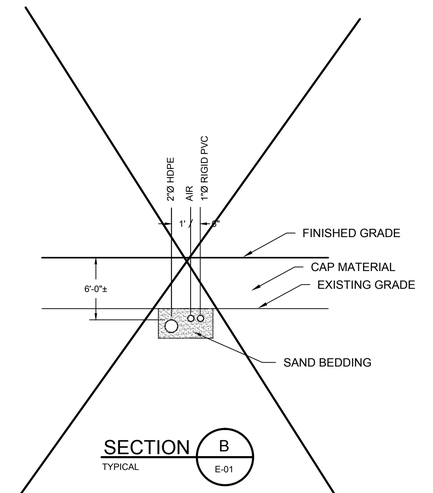


EXTRACTION WELL EW-11 BUILDING LAYOUT

NOT IN USE



GROUNDING DETAILS

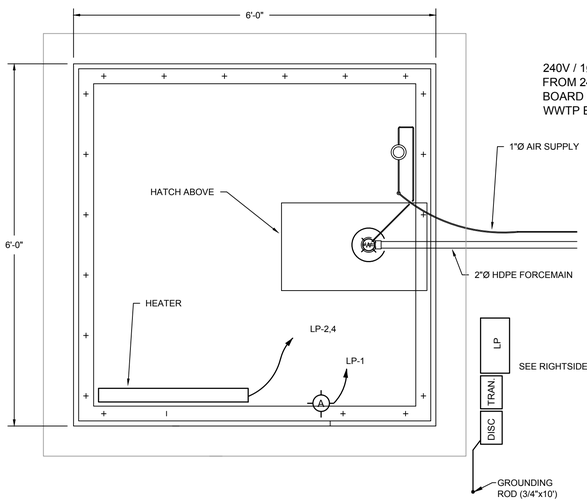


SECTION B
TYPICAL
E-01

LIGHTING SCHEDULE

SYM	QTY	MANUFACTURER	MODEL NUMBER	DESCRIPTION
A	1	HUBBELL	VG-15	150W INCANDESCENT

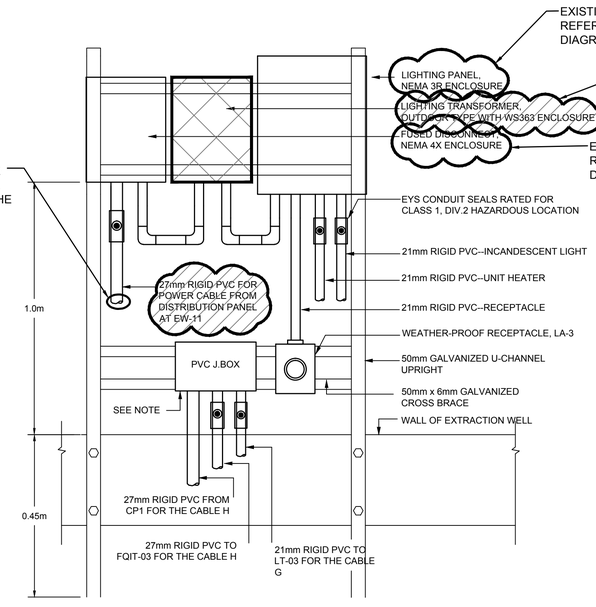
NOT IN USE



TYPICAL BUILDING LAYOUT (EW-13, 14, 15)

N.T.S

NOT IN USE

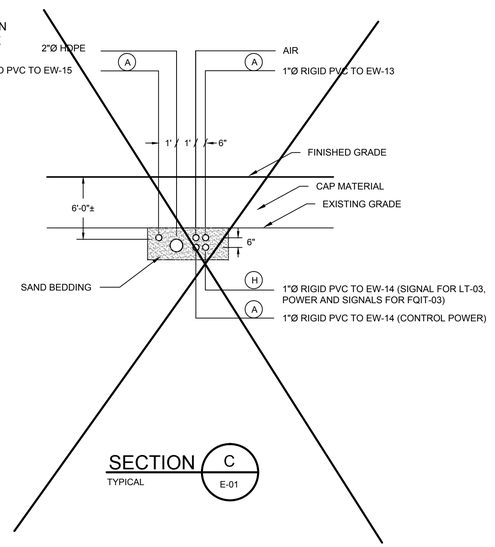


TYPICAL EQUIPMENT LAYOUT (EW-13, 14, 15)

N.T.S

NOTE: THE PVC JUNCTION BOX IS ONLY FOR EW-14.

NOT IN USE



SECTION C
TYPICAL
E-01

NO	Revision	Date	Initial

NOTES:

1. EXISTING CONDITIONS FROM AS RECORDED DRAWING MAY 2000 AND 2012 FIELD VERIFICATION
2. REFER TO ONE LINE DIAGRAMS E-01 AND E-02 FOR ADDITIONAL DETAILS.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

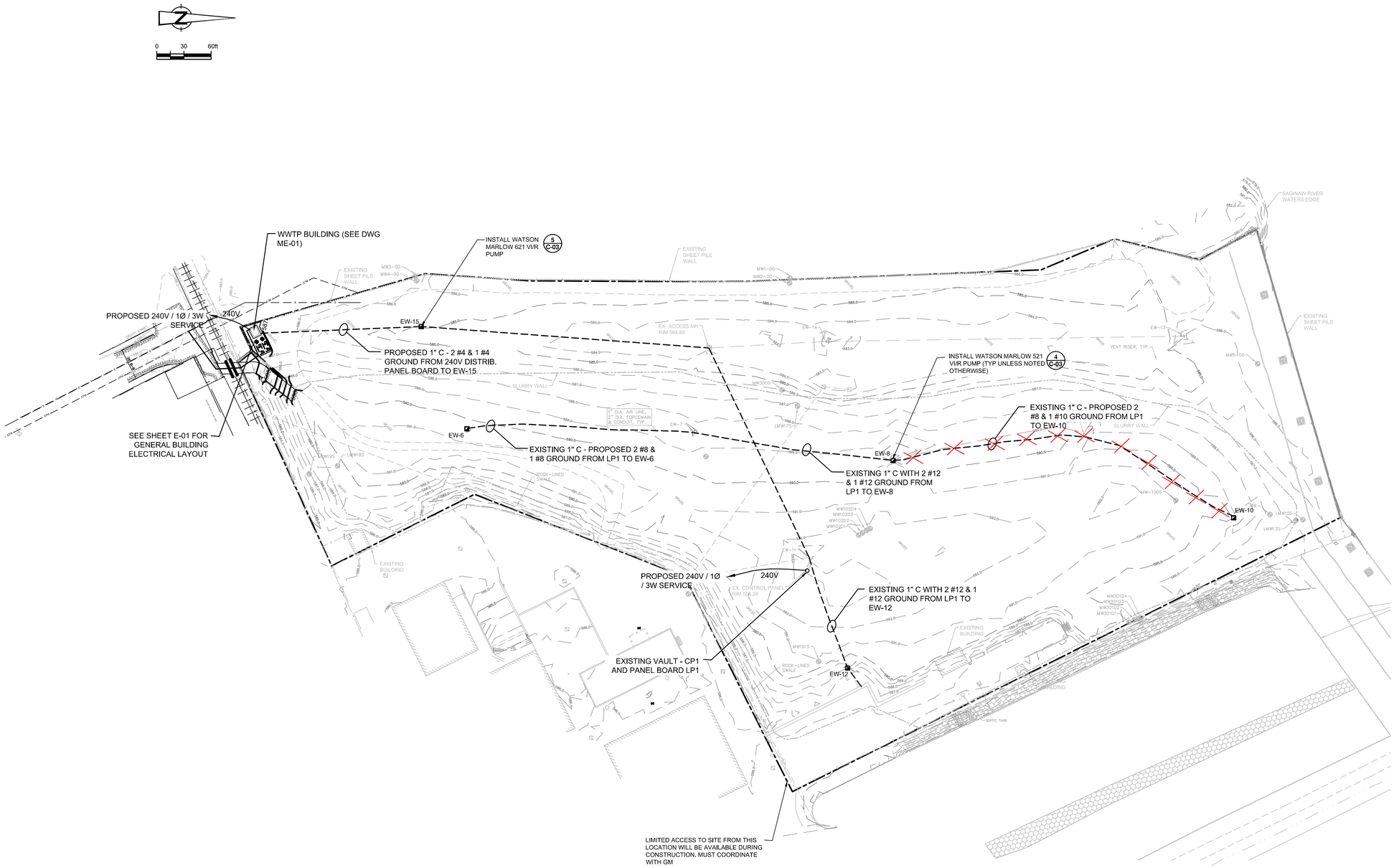
BAY CITY POWERTRAIN

BUILDING ELECTRICAL LAYOUT AND DETAILS

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project NO.: 012610-T03	Report NO.: PRES002	Drawing NO.: E-07



NO.	Revision	Date	Initial

NOTES:

1. ALL EXISTING AND PROPOSED UNDERGROUND CONDUITS ARE PVC.
2. REFER TO ONE LINE DIAGRAMS E-01 AND E-02 FOR ADDITIONAL DETAILS.

LEGEND

- APPROXIMATE RACER TRUST PROPERTY LINE
- EXISTING CAP CONTOUR
- SLURRY WALL
- STORM LINE
- FENCE
- HAND RAIL
- EXTRACTION LINE (TO BE ABANDONED)
- MW1020/1 MONITORING WELL
- EW-7 EXTRACTION WELL (TO BE ABANDONED)
- STM COMBINED SEWER
- W WATER
- S SEWER
- EXTRACTION LINE (TO REMAIN ACTIVE)
- EW-7 EXTRACTION WELL (TO REMAIN ACTIVE)
- F PROPOSED FORCEMAIN TO CITY SEWER ON CROTTY STREET
- 586 PROPOSED CONTOURS

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

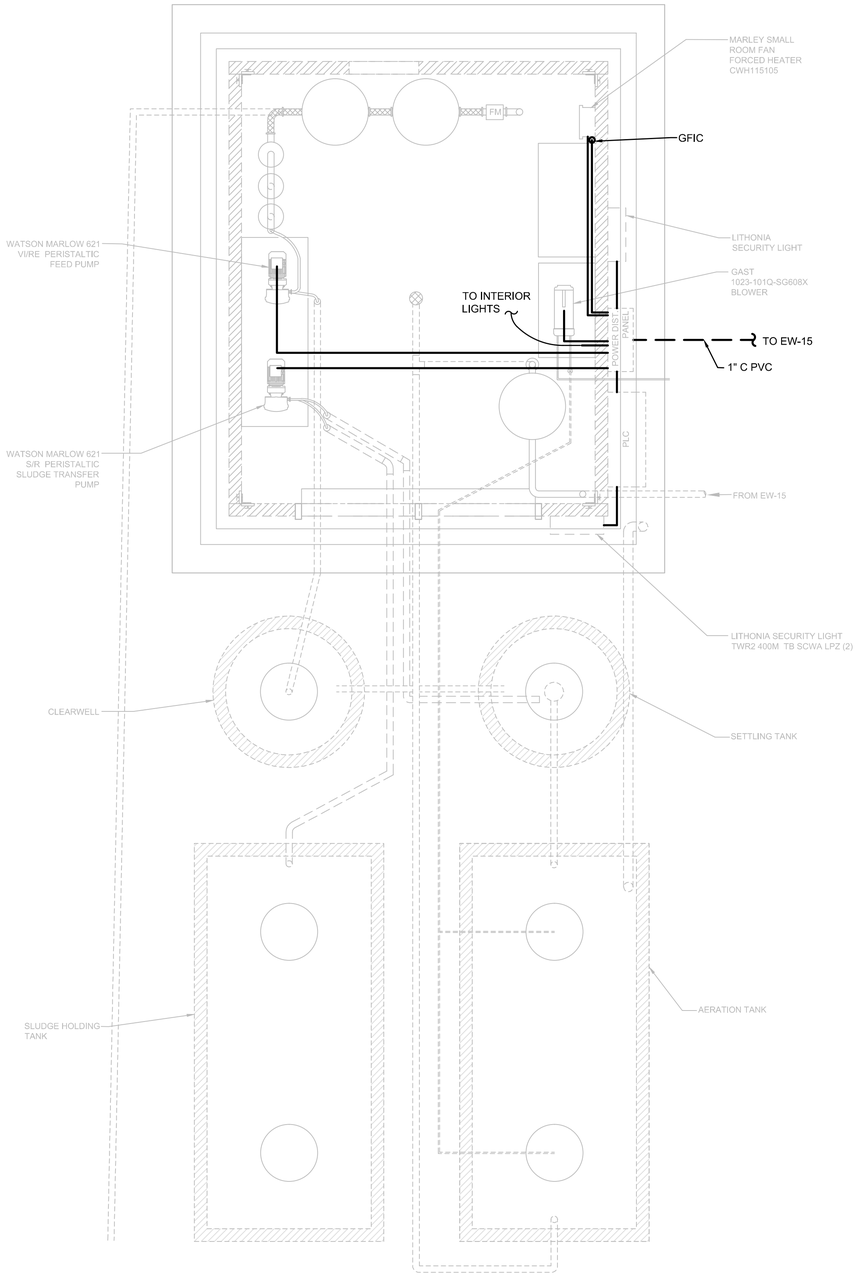
~~PROPOSED~~ ELECTRICAL PLAN

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: 1:60	Project No: 012610-T03	Report No: PRES002	Drawing No: E-08

012610-T03(PRES002)EL-DE006 AUG 30/2012



GENERAL BUILDING ELECTRICAL PLAN
SCALE: 1" = 2'

NO	Revision	Date	Initial

NOTES:

1. REFER TO ONE LINE DIAGRAMS E-01 AND E-02 FOR WIRE / CONDUIT AND BREAKER QUANTITIES AND SIZE.

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/12	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

~~PROPOSED~~ CONDITIONS
BUILDING ELECTRICAL PLAN

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project NO.: 012610-T03	Report NO.: PRES002	Drawing NO.: E-09

ELECTRICAL INSTALLATION NOTES

1. WORK SUMMARY

A. THE FOLLOWING IS A SUMMARY OF THE PROJECT ELECTRICAL WORK BY ELECTRICAL CONTRACTOR (EC), WHICH IS SHOWN ON THE ACCOMPANYING CONSTRUCTION DRAWINGS:

1. COORDINATION OF ELECTRICAL WORK WITH OTHERS: EC SHALL COORDINATE ELECTRICAL WORK WITH OWNER, POWER SERVICE PROVIDER AND ANY OTHER CONTRACTORS PARTICIPATING IN THE EXECUTION OF THIS PROJECT WORK.

2. SUPPLY AND INSTALLATION OF A NEMA3R 240/120V SERVICE DISCONNECT, NEMA12 240/120V POWER DISTRIBUTION PANELBOARD AND TVSS DEVICE AT THE TREATMENT BUILDING. THE 240/120V PANEL SHALL BE SQUARE D NQOD TYPE EQUIPPED WITH BOLT-ON CIRCUIT BREAKERS.

3. SUPPLY AND INSTALLATION OF INDOOR AND OUTDOOR LIGHTING FOR TREATMENT BUILDING: THE OUTDOOR LIGHTING SHALL CONSIST OF (1) 120V 75W WALL-MOUNTED CONTROL SWITCH OPERATED FIXTURE. THE INDOOR NORMAL LIGHTING SHALL CONSIST OF: (4) 120V, 2-40W LAMPS, WET LOCATION, INDUSTRIAL APPLICATION LIGHTING FLUORESCENT FIXTURES; (1) 120V INDUSTRIAL APPLICATION TWO-HEAD SELF-CONTAINED EMERGENCY LIGHTING UNIT; (1) 120V INDUSTRIAL APPLICATION TWO HEAD / LED EXIT COMBO UNIT, A LIGHTING CONTROL SWITCH; AND (3) 120V 15A SPECIFICATION GRADE GFI TYPE CONVENIENCE RECEPTACLES.

4. SUPPLY AND INSTALLATION OF MISCELLANEOUS POWER FUSES AND MOLDED CASE CIRCUIT BREAKERS IN THE EXISTING EXTRACTION WELLS (EW) DISCONNECTS AND PANELBOARDS. THE FUSES SHALL BE 250V-RATED CURRENT-LIMITING DUAL-ELEMENT TYPE. THE CIRCUIT BREAKERS SHALL BE MOLDED CASE, BOLT-ON TYPE MATCHING THE EXISTING PANELS..

5. SUPPLY AND INSTALLATION OF THE PROJECT INTERCONNECTING WIRING. THIS TASK SHALL INCLUDE SUPPLY AND INSTALLATION OF CONDUIT/FITTINGS, WIRING JUNCTION AND TERMINAL BOXES, WIRING SUPPORTS (IF NOT READILY PROVIDED BY OWNER), WIRING TERMINATIONS AND WIRING IDENTIFICATION MEANS TO MAKE IT A COMPLETE INSTALLATION.

6. SUPPLY AND INSTALLATION OF GROUNDING/BONDING FOR THE PROJECT ELECTRICAL WORK. THIS TASK SHALL INCLUDE SUPPLY AND INSTALLATION OF A GROUND GRID AT THE TREATMENT BUILDING.

7. SUPPLY OF THE PROJECT ELECTRICAL WORK CLOSEOUT.

2. REGULATORY REQUIREMENTS

A. ALL ELECTRICAL INSTALLATION WORK SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF THE FOLLOWING REFERENCE DOCUMENTS PERTAINING TO THIS PROJECT:

1. 2011 NFPA 70, NATIONAL ELECTRICAL CODE (NEC).

2. OSHA CER 1910, SUBPART S, ELECTRICAL GENERAL, PARTS 1 & 2.

3. LOCAL AUTHORITY HAVING JURISDICTION (AHJ) REQUIREMENTS.

3. MATERIAL REQUIREMENTS

A. GENERAL REQUIREMENTS: ALL PROJECT ELECTRICAL EQUIPMENT AND MATERIAL, SUPPLIED BY EC, SHALL BE AS SHOWN ON THE DRAWINGS AND AS FOLLOWS:

1. ALL ELECTRICAL ITEMS SHALL BE NEW, PROPERLY SELECTED, SIZED, STANDARD INDUSTRIAL GRADE, AND UL APPROVED AND LABELED FOR APPLICATION. EACH PIECE OF MATERIAL AND EQUIPMENT/DEVICES SHALL BE INSTALLED WITH THE NAME OR TRADEMARK OF THE MANUFACTURER, RATING NAMEPLATE, AND APPROVAL LABEL AS REQUIRED.

2. ALL ELECTRICAL COMPONENTS (I.E. MOTOR STARTERS, MOTOR CONTROL STATIONS, CIRCUIT DISCONNECTS AND THE LIKE ITEMS) SHALL BE NEMA RATED OR NEMA/IEC RATED. STRICTLY IEC RATED EQUIPMENT WILL NOT BE ACCEPTED.

3. UNLESS NOTED OTHERWISE, ALL ELECTRICAL CURRENT CARRYING COMPONENTS SHALL BE MADE OF COPPER. ALUMINUM CURRENT CARRYING COMPONENTS WILL NOT BE ALLOWED.

4. BEFORE ORDERING ANY MATERIALS OR EQUIPMENT, CONTRACTOR SHALL VERIFY ALL MEASUREMENTS AT THE PROJECT SITE AND SHALL BE RESPONSIBLE FOR THE CORRECTNESS OF THE SAME. NO EXTRA CHARGE OR COMPENSATION SHALL BE ALLOWED ON ACCOUNT OF DIFFERENCE BETWEEN ACTUAL DIMENSIONS AND THE MEASUREMENTS DERIVED FROM THE DRAWINGS.

5. CONTRACTOR SHALL BE RESPONSIBLE TO CHECK WITH EQUIPMENT MANUFACTURERS AS TO THE PHYSICAL SIZE OF THEIR EQUIPMENT. CONTRACTOR MUST ENSURE THAT THE EQUIPMENT WILL FIT IN THE SPACE ALLOCATED ON THE DRAWINGS.

B. SHOP DRAWING SUBMITTALS: PROVIDE A COMPLETE SUBMITTAL OF ALL EC-SUPPLIED ITEMS FOR OWNER'S REVIEW AND APPROVAL. THIS SHALL INCLUDE MATERIAL AND EQUIPMENT CATALOG AND TECHNICAL DATA.

4. GENERAL INSTALLATION REQUIREMENTS

A. THE ELECTRICAL WORK SHALL BE AS SHOWN ON THE DRAWINGS, NEC, AS RECOMMENDED BY THE EQUIPMENT AND MATERIAL MANUFACTURES, AND PER LOCAL AHJ REQUIREMENTS.

B. ALL PROJECT ELECTRICAL COMPONENTS INCLUDING DISCONNECTS, PANELS, LIGHTING, EQUIPMENT LOCAL DISCONNECTS, WIRING RACEWAY AND THE LIKE ITEMS SHALL BE INSTALLED AS FOLLOWS:

1. ADHERE TO THE LOCATION SHOWN ON THE DRAWINGS AS FAR AS POSSIBLE.

2. DO NOT INSTALL ELECTRICAL AND CONTROL EQUIPMENT AT LOCATIONS WHERE PROCESS EQUIPMENT IS TO BE INSTALLED.

3. DO NOT OBSTRUCT WALKWAYS OR MAKES INACCESSIBLE OR HARD EQUIPMENT MAINTENANCE ACCESS.

4. SECURE IN PLACE PLUMB AND SQUARE. ALL ELECTRICAL EQUIPMENT ENCLOSURES SHALL BE SECURED IN PLACE WITHOUT COMPROMISING ENCLOSURE INTEGRITY.

5. ALL WORK SHALL BE CONSTRUCTED PLUMB SQUARE, LEVEL, AND TRUE TO LINES AND SURFACES INDICATED, IN A NEAT, SUBSTANTIAL, AND WORKMANLIKE MANNER, AND IN SUCH A WAY AS TO PROPERLY SERVE THE PURPOSE INDICATED.

6. ASSURE THAT THE SPACE ABOUT ALL ELECTRICAL EQUIPMENT IS IN ACCORDANCE WITH NEC.

C. SUPPORTS AND HANGERS: EC SHALL SUPPLY AND INSTALL ALL NECESSARY AND REQUIRED EQUIPMENT AND WIRING HANGERS AND SUPPORTS. THE HANGERS AND SUPPORTS, ANCHORS AND FASTENERS SHALL BE SIZED TO CARRY THE LOADS OF THE PROJECT EQUIPMENT AND WIRING. EC SHALL CONSIDER WEIGHT OF WIRE IN CONDUIT WHEN SELECTING PRODUCTS FOR SUPPORT OF THE PROJECT WIRING.

D. MOUNT EQUIPMENT AS FOLLOWS (DIMENSIONS ARE APPROXIMATE AND REFER TO CENTERLINE OF EQUIPMENT ABOVE FURNISHED FLOOR UNLESS OTHERWISE SHOWN ON THE DRAWINGS):

1. PANELS: 72-INCHES TO TOP.

2. SWITCHES: 60-INCHES.

3. MOTOR CONTROLS: 60-INCHES.

4. LIGHTING FIXTURES: INDOOR - 7' ABOVE FLOOR LEVEL; OUTDOOR -8' ABOVE FINISHED GRADE.

5. LIGHT SWITCHES: 48-INCHES.

6. CONVENIENCE RECEPTACLES: 18-INCHES.

5. WIRING INSTALLATION

A. ALL PROJECT WIRING (CONDUIT, CABLE AND WIRING BOXES) COMPONENTS SHALL BE SUPPLIED, INSTALLED AND SUPPORTED AS REQUIRED BY NEC AND AS RECOMMENDED BY THE MATERIAL MANUFACTURERS.

B. THE EXPOSED PROJECT WIRING SHALL BE EITHER RUN IN NEC RIGID METAL (RIGID GALVANIZED STEEL, RGS) CONDUIT. THE CONDUIT SIZES SHALL BE AS SHOWN ON THE DRAWINGS AND PER NEC REQUIREMENTS. MINIMUM EXPOSED CONDUIT SIZE IS ¾ INCH. THE APPROVED CONDUIT MANUFACTURERS ARE REPUBLIC STEEL OR APPROVED EQUAL. THE APPROVED CONDUIT FITTING MANUFACTURERS ARE CROUSE-HINDS, APPLETON, O-Z GEDNEY, STEEL CITY AND T&B.

C. LIGHTING, POWER AND CONTROL CABLE/WIRE FOR INSTALLATION IN CONDUIT: IT SHALL BE NEC THHN/THWN OR XHHW TYPE; 600 VOLT, 90 C RATED, STRANDED COPPER SINGLE AND MULTI-CONDUCTOR CONDUCTOR CABLE. THE CABLES SHALL BE THHN/THWN FOR INDOOR AND XHHW FOR OUTDOOR/UNDERGROUND APPLICATIONS. THE CABLE SIZES SHALL BE AS SHOWN ON THE DRAWINGS AND PER NEC. APPROVED CABLE MANUFACTURERS ARE OKONITE, GENERAL CABLE AND SOUTHWIRE.

D. USE CONDUCTOR NOT SMALLER THAN #12 A WG FOR POWER AND LIGHTING CIRCUITS, NOT SMALLER THAN #14 AWG FOR CONTROL CIRCUITS, AND NOT SMALLER THAN #16AWG FOR INSTRUMENTATION CIRCUITS.

E. INSTALL ALL WIRING IN CONTINUOUS RUNS.

F. ON COMPLETION OF INSTALLATION PHASE OUT THE INSTALLATION PROVE THAT ALL ELECTRICAL DISTRIBUTION EQUIPMENT SUCH AS PANELS, DISCONNECTS, RECEPTACLES, POWER OUTLETS, ETC., ARE IDENTICAL IN PHASE RELATIONSHIP. THE PHASING SHALL BE OF A -B SEQUENCE, LEFT TO RIGHT, TOP TO BOTTOM, FRONT TO BACK. PROVE ALL INTERCONNECTING CABLE AND WIRE CONTINUITY AND FREEDOM FROM GROUNDS AND SHORT CIRCUIT.

6. GROUNDING AND BONDING

A. SUPPLY AND INSTALL PROJECT GROUNDING AND BONDING AS SHOWN ON THE DRAWINGS AND AS REQUIRED BY NEC ARTICLE 250, AND BY THE LOCAL AHJ.

B. ALL GROUNDING MATERIALS SHALL BE UL-APPROVED COPPER COMPONENTS. THIS SHALL INCLUDE GROUND RODS, INTERCONNECTING GROUNDING WIRE AND GROUNDING CONNECTORS.

C. GROUND AND BOND ALL EXPOSED METAL STRUCTURES, PIPING AND WIRING CONDUIT/CABLE TRAY METALLIC SUPPORTS, EQUIPMENT METAL FRAMES, METALLIC VESSELS AND TANKS, EQUIPMENT GROUND BUS AND METALLIC ENCLOSURES, TRANSFORMERS, MOTORS, CABLE ARMOR AND CABLE SHIELDS, AND THE LIKE ITEMS REQUIRING GROUNDING AND BONDING PER NEC.

D. THE PROJECT RGS CONDUIT SHALL NOT BE USED AS EQUIPMENT GROUNDING CONDUCTOR.

7. CLOSEOUT

A. ON COMPLETION OF ELECTRICAL INSTALLATION WORK EC SHALL PROVE TO OWNER THAT ALL ELECTRICAL ITEMS ARE PROVIDED, INSTALLED, WIRED, GROUNDED, CONNECTED AND FULLY FUNCTIONAL AS SPECIFIED. RECTIFY ALL DEFICIENCIES FOUND DURING OWNER'S ACCEPTANCE INSPECTION AT NO COST TO OWNER.

B. CLEAN-UP: AT COMPLETION OF EC WORK, AND PRIOR TO OWNER'S ACCEPTANCE INSPECTION, EC SHALL REMOVE ALL HIS TEMPORARY STRUCTURES, SCAFFOLDING, TOOLS, SURPLUS MATERIAL, WASTE AND TRASH FROM THE WORK AREAS LEAVING THE PROJECT SITE CLEAN READY FOR IMMEDIATE USE.

C. TOUCH-UP PAINTING: AT COMPLETION OF EC WORK, AND PRIOR TO OWNER'S ACCEPTANCE INSPECTION, EC SHALL "TOUCH_UP" ALL MINOR NICKS AND SCRATCHES, ON ALL EQUIPMENT ENCLOSURES AND RACEWAYS, WITH TWO COATS OF MATCHING PAINT.

D. AS-BUILT DOCUMENTATION: UPON COMPLETION OF WORK, EC SHALL SUBMIT "AS_BUILT" DRAWINGS TO OWNER, AND ANY OTHER DOCUMENTS THAT SHOW ACTUAL CONSTRUCTION OF WORK.

Nº	Revision	Date	Initial

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

ISSUED FOR BID	08/30/2012	MPL
Status	Date	Initial

RACER TRUST
BAY CITY, MICHIGAN

BAY CITY POWERTRAIN

ELECTRICAL INSTALL NOTES

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:

Project Manager:	Reviewed By:	Date:	
M. TOMKA	M. LAMB	AUGUST 30, 2012	
Scale: NTS	Project Nº: 012610-T03	Report Nº: PRES002	Drawing Nº: E-10

Appendix B
Inspection Form

BAY CITY INDUSTRIAL LAND - MONTHLY SITE INSPECTION **Project: 12610**

On-Site Personnel: Steve Hoevemeyer Completed Date: _____

1. DETAILS OF INSPECTION Completed By: SH

- ☐ Routine Monthly Inspection
- ☐ Response to Alarm (list type and/or PLC outputs)
- ☐ Other task:

Weather _____

Temperature _____

2. SITE INSPECTION

(Y/N)		If yes indicate nature of maintenance/repairs required
☐	Exposure Barrier (signs of trespassing, impairment of pavement)	
☐	Multi-layer Cap (evidence of settlement, erosion, disturbance)	
☐	Containment System (signs of deterioration of sheet pile, leaking)	
☐	Monitoring wells (sign of damage)	
☐	Crotty Street Sewer (check level for potential flooding)	
☐	Permanent Markers (signs of damage/visibility issues)	
☐	Storm Water sewer network (signs of debris/silt/damage in CBs and outlets)	

3. GROUNDWATER EXTRACTION SYSTEM

- ☐ Forcemain tubing requires replacement? _____
- ☐ Are the EW vaults deteriorating (structure, lids, piping)? _____

EW (pump)	Target Depth (feet)	DTW (feet)	Pump Operating? (Y/N) What speed?	Heater On? (Y/N)	Comments (product evident, tubing replaced, iron bacteria)
EW-6	12.74				
EW-8	11.34				
EW-12	9.42				
EW-15	6.71				

EW (no pump)	EW-7	EW-9	EW-10	EW-11	EW-13	EW-14
Target Depth	11.00	11.04	10.77	14.51	7.33	5.42
DTW						

4. GROUNDWATER TREATMENT SYSTEM

		Comments
☐	Check piping for leaks	
☐	Check PLC	
☐	check sludge pump	
☐	check inspection drum	
☐	check aeration tank	
☐	check settling chamber	
☐	check clear well	
☐	check floats in clearwell	
☐	check inlet air filter - blower	
☐	check aerator (clean every 6-months)	
	Pressure reading (PSI)	A1 _____
	Normal Range (4 to 9 PSI)	

		Comments
☐	check feed pump (calib. every 6-mon)	(include date of last calib.)
	Flow Reading	(gpm)
	Totalized Flow Reading	(gal)
☐	check sludge tank	
	Sludge thickness	(in)
☐	check bag filters	
	Pressure reading (PSI)	BF1 _____ BF2 _____ BF3 _____
	Normal Range (5 to 25 PSI)	
☐	check GACs for leaks	
	Pressure reading (PSI)	GAC1 _____ GAC2 _____
	Normal Range (4 to 6 PSI)	
☐	check heater	

Collect Samples *Date Initials Sample Numbe Time*

☐ Sample Groundwater Treatment System effluent ***W-12610-***

Notes

Appendix C
Stratigraphic Logs and Well Completion Details for Monitoring and Extraction Wells

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT: CPC - Bay City	WELL/BORING No.: L MW-13S
LOCATION: Bay City, Michigan	DATE DRILLED: December 13, 1988
DRILLING METHOD: Hollow-Stem Auger	CASING TYPE/DIA.: galvanized/2-inch
TOTAL DEPTH DRILLED: 15 feet BGL	TOTAL CASING: 7.5 feet
GROUND ELEVATION: 586.7 feet	T.O.C. ELEVATION: 589.35 feet
GROUT TYPE/QUANTITY: dry bentonite/1 bag	SCREEN TYPE/LENGTH: #7 slot stainless steel 10 feet
GROUT INTERVAL(S): surface - 3 feet BGL	SCREENED INTERVAL: 5 - 15 feet BGL
DEPTH TO WATER: 8 feet BGL	GRAVEL PACK TYPE: sand
WATER LEVEL ELEVATION: NA	GRAVEL PACK INTERVAL: 3 - 15 feet BGL
	STATIC WATER LEVEL: NA DATE:

REMARKS: Geology based on auger cuttings

LOGGED BY: Jim Gell SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-5'		CLAY; sand, brown, concrete debris
5-15'		CLAY; sand, grayish-black, wood fragments, oily odor

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT:	CPC - Bay City	WELL/BORING No.:	MW-15D
LOCATION:	Bay City, Michigan	DATE DRILLED:	December 13, 1988
DRILLING METHOD:	Hollow-Stem Auger	CASING TYPE/DIA.:	galvanized/2-inch
TOTAL DEPTH DRILLED:	30 feet BGL	TOTAL CASING:	27.5 feet
GROUND ELEVATION:	586.2 feet	T.O.C. ELEVATION:	588.77 feet
GROUT TYPE/QUANTITY:	slurry grout/100 gallons	SCREEN TYPE/LENGTH:	#7 slot stainless steel 10 feet
GROUT INTERVAL(S):	surface - 20 feet BGL	SCREENED INTERVAL:	25 - 30 feet BGL
DEPTH TO WATER:	8 feet BGL	GRAVEL PACK TYPE:	sand
WATER LEVEL ELEVATION:	NA	GRAVEL PACK INTERVAL:	20 - 30 feet BGL
		STATIC WATER LEVEL:	NA DATE:

REMARKS: Geology based on auger cuttings

LOGGED BY: Jim Gell SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-5'		CLAY; sand, brown, concrete and wood fragments
5-17'		CLAY; sand, grayish-black, wood fragments, oily odor
17-23'		CLAY; silt, grayish-brown, oily odor
23-30'		SAND; clay, grayish-brown, wet

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT:	CPC - Bay City	WELL/BORING No.:	MW-17S
LOCATION:	Bay City, Michigan	DATE DRILLED:	December 15, 1988
DRILLING METHOD:	Hollow-Stem Auger	CASING TYPE/DIA.:	galvanized/2-inch
TOTAL DEPTH DRILLED:	15 feet BGL	TOTAL CASING:	7.5 feet
GROUND ELEVATION:	586.4 feet	T.O.C. ELEVATION:	589.76 feet
GROUT TYPE/QUANTITY:	dry bentonite/1 bag	SCREEN TYPE/LENGTH:	#7 slot stainless steel 10 feet
GROUT INTERVAL(S):	surface - 3 feet BGL	SCREENED INTERVAL:	5 - 15 feet BGL
DEPTH TO WATER:	5 feet BGL	GRAVEL PACK TYPE:	sand
WATER LEVEL ELEVATION:	NA	GRAVEL PACK INTERVAL:	3 - 15 feet BGL
		STATIC WATER LEVEL:	NA DATE:

REMARKS: Geology based on auger cuttings

LOGGED BY: Jim Gell SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-2'		CLAY; sand, brown, wood fragments
2-6'		CLAY; sand, brownish-gray, wood and metal fragments, oily odor
6-15'		CLAY; sand, dark gray, oily odor

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT:	CPC - Bay City	WELL/BORING No.:	MW-18S
LOCATION:	Bay City, Michigan	DATE DRILLED:	December 8, 1988
DRILLING METHOD:	Hollow-Stem Auger	CASING TYPE/DIA.:	galvanized/2-inch
TOTAL DEPTH DRILLED:	17 feet BGL	TOTAL CASING:	9.5 feet
GROUND ELEVATION:	587.8 feet	T.O.C. ELEVATION:	591.44 feet
GROUT TYPE/QUANTITY:	dry bentonite/2 bags	SCREEN TYPE/LENGTH:	#7 slot stainless stee 10 feet
GROUT INTERVAL(S):	surface - 5 feet BGL	SCREENED INTERVAL:	7 - 17 feet BGL
DEPTH TO WATER:	8 feet BGL	GRAVEL PACK TYPE:	sand
WATER LEVEL ELEVATION:	NA	GRAVEL PACK INTERVAL:	5 - 17 feet BGL
		STATIC WATER LEVEL:	NA DATE:

REMARKS: Geology based on auger cuttings

LOGGED BY: Jim Gell SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-1'		CLAY; sand, brown, moth ball odor
1-9'		CLAY; black, wood and metal fragments, moth ball odor
9-17'		CLAY; silt, black, moth ball odor in water

BORING/WELL LOG DATA

KECK CONSULTING SERVICES, INC.

PROJECT:	CPC - Bay City	WELL/BORING No.:	L MW-19S
LOCATION:	Bay City, Michigan	DATE DRILLED:	December 12, 1988
DRILLING METHOD:	Hollow-Stem Auger	CASING TYPE/DIA.:	galvanized/2-inch
TOTAL DEPTH DRILLED:	15 feet BGL	TOTAL CASING:	7.5 feet
GROUND ELEVATION:	586.6 feet	T.O.C. ELEVATION:	589.19 feet
GROUT TYPE/QUANTITY:	dry bentonite/1 bag	SCREEN TYPE/LENGTH:	#7 slot stainless steel 10 feet
GROUT INTERVAL(S):	surface - 3 feet BGL	SCREENED INTERVAL:	5 - 15 feet BGL
DEPTH TO WATER:	8 feet BGL	GRAVEL PACK TYPE:	sand
WATER LEVEL ELEVATION:	NA	GRAVEL PACK INTERVAL:	3 - 15 feet BGL
		STATIC WATER LEVEL:	NA DATE:

REMARKS: Geology based on auger cuttings

LOGGED BY: Jim Gell SIGNATURE:

DEPTH	H2O/SOIL SAMPLE	FORMATION DESCRIPTION
0-2.5'		CLAY; sand, light brown, moth ball odor
2.5-8'		CLAY; black, wood fragments, moth ball odor
8-15'		CLAY; silt, grayish-black, moth ball odor

0053-434 CRC/Bay City — September 23, 1985

BORING NUMBER MW-1 S TOTAL DEPTH 11' S.W.L. (BGL) approx. 4.74'

Sample Number	Sample Interval	Lithologic Description
-1 1'	0 - 1	TOPSOIL; fine-med. sand, sorted, brown, dry
MW-1 3'	2.5 - 3	SAND; fine-med., sorted, brown, dry
MW-1 5'	4.5 - 5	FILL; fine-med. sand w/bricks, saturated
	5 - 9	SILT; w/sand & small amount of gravel (considerable
		amount of junk; cans, springs, glass, wood)
MW-1 11'	10 - 11	SILT; w/sand, small amount of gravel, black, saturated
		screen set from 8.5 - 10.5 feet BGL
		sand pack installed
		cement grout
		1 well guard and lock
		Ground Elevation = 586.4 ft.
		Top of Casing Elevation = 587.65 ft.

Piezometer: ☐ Screen 924 #7 Pipe 10' Total Depth (BGL) 10.5

SOIL BORING LOG

BORING #: MW102D1

Page 1 of 6

Geologist: B. Crnokrak

McLaren Hart

PROJECT	General Motors Powertrain Division (GMPT)	LOCATION	Bay City, MI
JOB #	070800900.003	DATE (s) 5/18/93 (f) 5/19/93	TOTAL DEPTH 95.5'
MP ELEVATION	591.08 (MSL)	SUBCONTRACTORS	Empire Soils
NORTHING	4305.3800	EQUIPMENT	F-10
EASTING	3432.8200	DRILLERS	Ed Cole, Bob Townsend
SAMPLING METHOD	Split Spoon, Shelby	MONITORING DEVICE	OVM 580-B

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
				Drill to 4 feet			
4.0	5 7 7 12		18.2	Black medium to coarse SAND with asphalt gravel, medium dense, dry, odor	SW		Grain size sample MW102(4-6)
				Black silty fine SAND, medium dense, damp, odor	SM		
6.0				Black medium to coarse SAND with asphalt gravel, medium dense, dry, odor	SW		
				Drill to 12 feet			
12.0	7 5 9 76		35.0	Black wood pulp/fragments/roots, paint fragments and other garbage, loose, wet, stained, strong odor (piece of metal at bottom caused high blow counts)			Grain size sample MW102(12-14) TOC sample MW102(12-16)
14.0	7 6 2 4		39.0	Same as above, piece of glass			
16.0				Continued			

SOIL BORING LOG

BORING #: MW102D1

Geologist: B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
16.0	2 2 2 3		9.2	Medium brown/dark grey SILT, trace clay, soft, damp, some organic fibers and shell fragments	ML		Bottom of shallow sand and fill / Top of I.C.U. TOC sample MW102(16-18)
18.0							
				SHELBY TUBE pushed 19 to 21 feet: NO RECOVERY			
20.0							
22.0				SHELBY TUBE pushed 22 to 24 feet			Shelby Tube sample MW102(22-24)
24.0	4 4 6 6			NO RECOVERY			
26.0	4 5 7 10		3.1	Light grey fine SAND, medium dense, wet	SP		Bottom of I.C.U. / Top of deep sand
28.0	5 3 4 8		4.9	Light grey fine to coarse SAND, some fine gravel, dense, wet Light grey fine SAND, loose, wet	SW SP		TOC sample MW102(28-32)
30.0	5 6 6 9		0.8	Light brown fine SAND, trace silt, trace fine gravel, medium dense, wet			
32.0				Drill to 48 feet			
34.0							

Continued

SOIL BORING LOG

BORING #: MW102D1

Page 3 of 6

Geologist: B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
34.7							
36.0							
38.0							
40.0							
42.0							
44.0							
46.0							
48.0	14 19 23 20		2.0	Medium brown fine to coarse SAND, little fine gravel, trace silt, dense, wet	SW		TOC sample MW102(48-54)
50.0	14 19 23 20		4.6				
52.0	9 12 13 14		1.9	Light brown medium to coarse SAND, little fine gravel, medium dense, wet, clay in tip			Grain size sample MW102(52-54)

Continued

SOIL BORING LOG

BORING #: MW102D1

Page 4 of 6

Geologist: B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description: Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
53.3							
54.0	7 11 19 30		0.6	Medium grey/brown silty CLAY, trace medium sand, little coarse sand to fine gravel, very stiff, dry	CL		Bottom of deep sand / Top of clay till TOC and grain size samples MW102(54-58)
56.0	27 35 47 40		0.0	Medium grey/brown silty CLAY, trace coarse sand, hard, dry			
58.0				SHELBY TUBE pushed 58-60 feet			Shelby Tube sample MW102(58-60)
60.0	7 8 10 10		0.0	Medium brown/grey silty CLAY, little coarse sand to fine gravel, very stiff, plastic, damp	CL		
62.0	9 9 9 9		0.0				
64.0	7 8 10 10		0.0				
66.0	6 7 7 6		0.0	Same as above, very moist and sticky			
68.0	5 4 6 8		0.0	Medium brown/grey silty CLAY, trace coarse sand to fine gravel, shale fragments, less stiff, plastic, saturated			
70.0	8 8 8 8		0.0	Medium brown/grey silty CLAY, trace coarse sandto fine gravel, stiff (very stiff in top 4 inches), very moist to saturated			
72.0				Continued			

SOIL BORING LOG

BORING #: MW102D1

Page 5 of 6

Geologist: B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
72.0	6 6 7 6		0.0	Same as above, stiff, saturated			
74.0	4 5 6 8		0.0	Same as above, some roots			
76.0	8 8 8 9		0.0				
78.0	2 3 5 8		0.0	Same as above, medium stiff			
80.0	5 7 10 9		0.0	Same as above, very stiff			
82.0	9 9 10 9		0.0	Same as above, very stiff, less gravel			
84.0	3 4 3 5		0.0	Medium brown/grey silty CLAY, trace fine gravel, medium stiff, plastic, saturated			
86.0	3 6 7 8		0.0	Same as above, very plastic, stiff			
88.0	3 5 6 8		0.0				
90.0	3 9			NO RECOVERY			

Continued

SOIL BORING LOG

BORING #: MW102D1

Page 6 of 6

Geologist: B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
90.7	22 19						
92.0	10 12 11 11		0.0	Medium grey silty CLAY, some fine sand, stiff, dry Light brown medium SAND, medium dense, wet Light grey sandy CLAY with silt, stiff, dry Light brown medium SAND, medium dense, wet	CL SP CL SP CL		
94.0	9 11 98 50/0"		0.0	Medium grey silty CLAY, some fine sand, little fine gravel, stiff, dry, becoming siltier with depth Medium grey clayey SILT, some fine gravel, hard, dry	ML		
				Medium grey SANDSTONE			Bottom of clay till / Top of bedrock
				END OF BORING @ 95.5 feet			

SOIL BORING LOG

BORING #: MW301D1

Page 1 of 6

Geologist: P. Shiman

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

JOB # 070800900.003 DATE (s) 5/19/93 (f) 5/20/93 TOTAL DEPTH 93.9'

MP ELEVATION 590.14 (MSL) SUBCONTRACTORS Empire Soils

NORTHING 4596.4600 EQUIPMENT CME 550

EASTING 3548.8400 DRILLERS Crew C

SAMPLING METHOD Split Spoon, Shelby Tube MONITORING DEVICE OVM 580-B

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
	1 2 2 3		0.0	FILL: Dark brown sand and clay			
-2.0	6 10 5 7		0.0	Sand matrix, minor clay			
-4.0	4 4 2 2		0.0	Mixed sand and clay FILL, becomes black contaminated CLAY, oily hydrocarbon odor, with peat deposits			
-6.0	4 3 3 2		0.0	Medium to dark grey clayey SAND, loose, soft, moist to wet, woody debris, organics	SC		TOC sample MW301(6-8)
-8.0	3 2 2 3		0.0	Dusky yellow/brown silty SAND, some clay, loose, moist, some wood fragments	SM		
-10.0	3 2 2 3		0.0	Same as above, some black organic staining, peat deposits			
-12.0	2 2 3 3		0.0	Dark olive grey silty to clayey SAND, very organic, moist to wet	SM SC		
-14.0	2 1 2 3		0.0	Same as above, scattered wood fragments			
-16.0				Continued			

SOIL BORING LOG

BORING #: MW301D1

Page 2 of 6

Geologist: P. Shiman

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
16.0	1 2 2 1		0.0	Same as above, loose, wet to saturated			TOC sample MW301(16-18)
18.0				SHELBY TUBE pushed 18 to 20 feet	CL ML		Bottom of shallow sand and fill / Top of I.C.U. Shelby Tube sample MW301(18-20)
20.0	0 1 2 2		0.0	Olive grey organic sandy CLAY to clayey SILT, soft, wet, some shell deposits, few boggy wood fragments			
22.0	8 9 10 10		0.0	Olive grey very fine to fine SAND, medium dense, saturated, trace small shell fragments	SP		
24.0	7 4 3 4		0.0	Same as above, few dark grey/brown clay layers			Bottom of I.C.U. / Top of deep sand
26.0	7 8 8 12		0.0	Brown very fine to fine SAND, medium dense, saturated			
28.0	7 7 8 9		0.0				TOC sample MW301(28-30)
30.0							
32.0							Deep sands
34.0							

Continued

SOIL BORING LOG

BORING #: MW301D1

Page 3 of 6

Geologist: P. Shiman

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
34.7							
36.0							
38.0							
40.0							
42.0							
44.0							
46.0							
48.0							
50.0	13 12 10 13		0.0	Grey/brown gravelly SAND, medium dense, saturated	SW		Grain size sample MW301(50-52)
52.0	15 20 28 32		0.0	Same as above, pale yellow/brown, with fine gravel			

Continued

SOIL BORING LOG

BORING #: MW301D1

Page 4 of 6

Geologist: P. Shiman

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
53.3							
54.0	10 14 12 13		0.0	Same as above, large (1 1/4 inch diameter) gravel fragments			
				Dark yellow/brown silty CLAY with fine gravel and sand, hard, moist	CL		Bottom of deep sand / Top of clay till
56.0	12 16 26 30		0.0				
58.0							Shelby Tube sample MW301(58-60)
60.0	12 11 11 12		0.0	Same as above, stiff to very stiff			
62.0	12 12 13 12						
64.0	5 5 6 8			Same as above, stiff, wet			
66.0	9 10 11 13			Same as above, soft, wet, with coarse-grained sand inclusions			
68.0	2 6 7 9						
70.0	0 2 4 4		0.0	Dark yellow/brown CLAY, soft to stiff, wet, some inclusions of coarse sand and fine gravel	CL CH		
72.0				Continued			

SOIL BORING LOG

BORING #: MW301D1

Page 5 of 6

Geologist: P. Shiman

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
72.0	1 4 4 5		0.0	Same as above, sandy saturated zone			
74.0	5 6 7 5			CLAY, soft, sticky, wet			
76.0	5 5 7 7						
78.0	6 5 5 5			Same as above, medium grey to brown/grey			
80.0	1 5 5 5				CH		
82.0	2 3 4 4						
84.0	1 2 4 4			Same as above, medium grey			
86.0	6 9 10 18			Sandy gravelly CLAY	CL		
88.0	1 25 24 20			Brown/grey sandy gravelly CLAY and clayey SAND, soft, wet to saturated, some sand is partially cemented/indurated	SC CL		
90.0	4 5			Medium grey gravelly clayey SAND, saturated	SC		

Continued

SOIL BORING LOG

BORING #: MW301D1

Page 6 of 6

Geologist: P. Shiman

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
90.7	7 9						
92.0	11 20 50 100/5"			Grades to very sandy CLAY			
				Soft, sandy, silty SHALE or SILTSTONE			Bottom of clay till / Top of bedrock
				END OF BORING @ 93.9 feet			

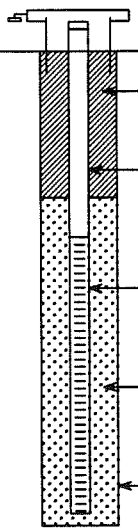
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-26)
Page 1 of 1

PROJECT NAME: BAY CITY GMPT
PROJECT NUMBER: 12610-10
CLIENT: GM
LOCATION: BAY CITY, MI

HOLE DESIGNATION: MW1-00
DATE COMPLETED: JANUARY 19, 2000
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: R. HOAG

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
	SP-SAND (FILL), trace silt, compact, fine grained, brown, frost - no frost, slightly moist		BENTONITE CHIPS	1SS		10	
-2.5	CL/ML-CLAY and SILT (FILL), with fine sand, wood fibers, stiff, low plasticity, dark gray, moist	*-2.5*	2" Ø STAINLESS STEEL RISER PIPE	2SS		10	
-5.0	- shells, very soft - soft			3SS		2	
-7.5	- large wood chunk		WELL SCREEN	4SS		3	
-10.0	- large wood chunk, shells - wet - firm		SAND PACK	5SS		4	
-12.5	END OF HOLE @ 12.0ft BGS	*-12.0*	8" Ø BOREHOLE	6SS		5	
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							



SCREEN DETAILS
Screened interval:
4.7 to 11.7ft BGS
Length: 7.0ft
Diameter: 2"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
3.7 to 12.0ft BGS
Material: #5 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

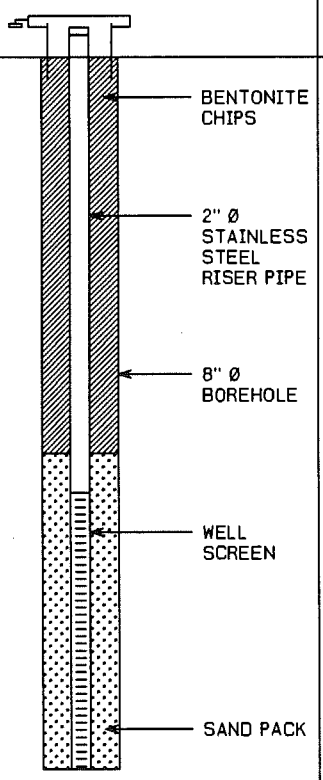
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-27)
Page 1 of 1

PROJECT NAME: BAY CITY GMPT
PROJECT NUMBER: 12610-10
CLIENT: GM
LOCATION: BAY CITY, MI

HOLE DESIGNATION: MW2-00
DATE COMPLETED: JANUARY 19, 2000
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: R. HOAG

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
	Augered through fill, no split spoon sampling						
-2.5							
-5.0							
-7.5							
	SP-SAND (FILL), trace silt, compact, very loose, fine grained, gray, moist	*-8.0* *-8.5*		1SS		2	
-10.0	CL/ML-CLAY and SILT (FILL), with fine sand, shells, very soft, low plasticity, gray, moist - wood chunk, wet - wood chunk			2SS		3	
-12.5	SP-SAND, trace silt, loose, fine grained, gray, wet - wood chunk	*-12.0*		3SS		5	
-15.0	No recovery			4SS		2	
-17.5				5SS		2	
	END OF HOLE @ 18.0ft BGS	*-18.0*					
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							



SCREEN DETAILS
Screened interval:
11.0 to 18.0ft BGS
Length: 7.0ft
Diameter: 2"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
10.0 to 18.0ft BGS
Material: #5 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

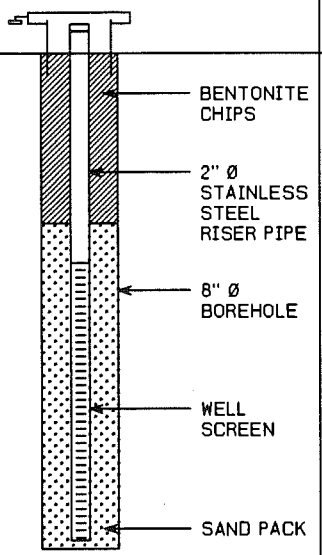
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-28)
Page 1 of 1

PROJECT NAME: BAY CITY GMPT
PROJECT NUMBER: 12610-10
CLIENT: GM
LOCATION: BAY CITY, MI

HOLE DESIGNATION: MW3-00
DATE COMPLETED: JANUARY 20, 2000
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: R. HOAG

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
	Obstruction, augered to clear obstruction, no split spoon sample	*-1.5*					
-2.5	SP-SAND (FILL), some roots, trace silt, compact, fine grained, brown, black stains throughout, frost, slight chemical odor - no frost, dry - loose			1SS		12	
-5.0				2SS		4	
	CL/ML-CLAY and SILT (FILL), with fine sand, wood fibers, soft, low plasticity, gray, moist	*-5.3*		3SS		4	
-7.5				4SS		4	
-10.0	- wet - wood			5SS		7	
-12.5	END OF HOLE @ 12.5ft BGS	*-12.5*					
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							



SCREEN DETAILS
Screened interval:
5.3 to 12.3ft BGS
Length: 7.0ft
Diameter: 2"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
4.3 to 12.5ft BGS
Material: #5 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

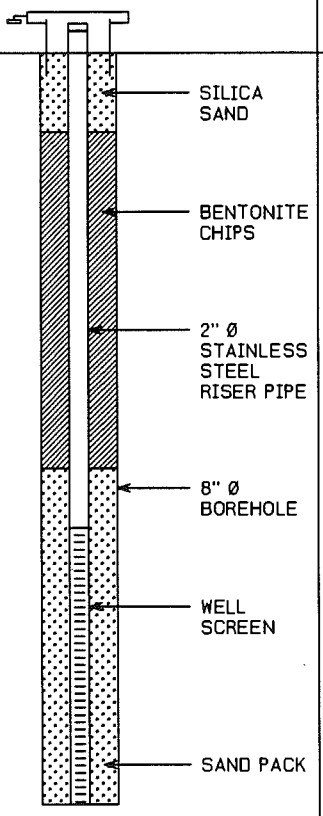
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-29)
Page 1 of 1

PROJECT NAME: BAY CITY GMPT
PROJECT NUMBER: 12610-10
CLIENT: GM
LOCATION: BAY CITY, MI

HOLE DESIGNATION: MW4-00
DATE COMPLETED: JANUARY 20, 2000
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: R. HOAG

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
2.5	Augered through fill, no split spoon sampling						
5.0	SP-SAND (FILL), trace silt, compact, fine grained, brown, dry	*-5.0*		1SS		20	
7.5				2SS		2	
10.0	CL/ML-CLAY and SILT (FILL), trace fine sand, wood fibers, very soft, low plasticity, gray, moist - wood chunks - firm	*-8.9*		3SS		11	
12.5	- wet, water has a chemical odor and sheen - stiff			4SS		7	
15.0	- shells - wood chunks			5SS		11	
17.5	- soft			6SS		10	
20.0	END OF HOLE @ 19.0ft BGS	*-19.0*		7SS		3	
22.5							
25.0							
27.5							
30.0							
32.5							



SCREEN DETAILS
Screened interval:
12.0 to 19.0ft BGS
Length: 7.0ft
Diameter: 2"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
10.5 to 19.0ft BGS
Material: #5 Silica Sand

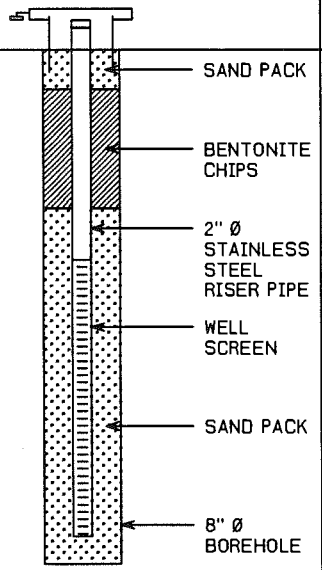
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: BAY CITY GMPT
PROJECT NUMBER: 12610-10
CLIENT: GM
LOCATION: BAY CITY, MI

HOLE DESIGNATION: MW5-00
DATE COMPLETED: JANUARY 19, 2000
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: R. HOAG

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
2.5	CL-CLAY and SAND (FILL), stiff, fine grained, low plasticity, well graded, light brown, frost - no frost, dry - firm			1SS		9	
5.0				2SS		8	
	SP-SAND (FILL), compact, fine grained, poorly graded, light brown, slightly moist	*-5.5*		3SS		10	
7.5	- very loose			4SS		4	
10.0	- gray, wet	*-10.0*		5SS		2	
	CI-CLAY, with silt, wood fibers, very soft, medium plasticity, black, wet, chemical odor						
12.5	- no odor			6SS		1	
	END OF HOLE @ 13.0ft BGS	*-13.0*					
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							



SCREEN DETAILS
Screened interval:
5.3 to 12.3ft BGS
Length: 7.0ft
Diameter: 2"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
4.0 to 13.0ft BGS
Material: #5 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

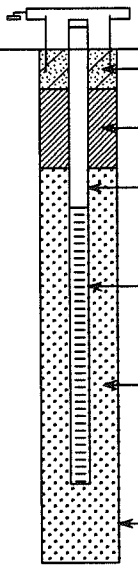
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-23)
Page 1 of 1

PROJECT NAME: BAY CITY GMPT
PROJECT NUMBER: 12610-10
CLIENT: GM
LOCATION: BAY CITY, MI

HOLE DESIGNATION: LMW-14SR
DATE COMPLETED: JANUARY 18, 2000
DRILLING METHOD: 4 ¼" ID HSA
CRA SUPERVISOR: R. HOAG

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
	SM-SAND (FILL), with silt and gravel, compact, gray, frost	*-1.5*	CONCRETE SEAL				
2.5	CI-CLAY (FILL), trace silt, sand and gravel, stiff, medium plasticity, grayish-brown	*-4.0*	BENTONITE CHIPS	1SS		12	
5.0	CL-CLAY (FILL), with sand, firm, low plasticity, brown, dry - moist - wood fibers		2" Ø STAINLESS STEEL RISER PIPE	2SS		8	
7.5	- soft	*-8.0*	WELL SCREEN	3SS		5	
	SC-SAND and CLAY, very loose, well graded, gray, wet		SAND PACK	4SS		3	
10.0	- wood chunk			5SS		5	
12.5		*-13.0*	8" Ø BOREHOLE	6SS		2	
	END OF HOLE @ 13.0ft BGS						
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							



SCREEN DETAILS
Screened interval:
4.0 to 11.0ft BGS
Length: 7.0ft
Diameter: 2"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
3.0 to 13.0ft BGS
Material: #5 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

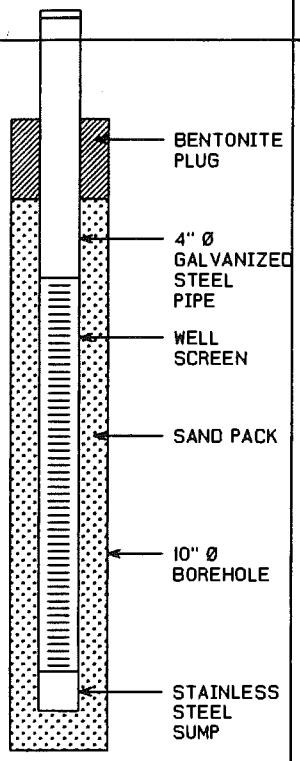
(WL-06)
Page 1 of 1

PROJECT NAME: GROUNDWATER EXTRACTION SYSTEM
PROJECT NUMBER: 12610
CLIENT: GENERAL MOTOR CORP.
LOCATION: BAY CITY, MI

HOLE DESIGNATION: EW-6
DATE COMPLETED: APRIL 14, 1999
DRILLING METHOD: 6 ¼" ID HSA
CRA SUPERVISOR: K. VANDER MEULEN

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL
	REFERENCE POINT (Top of Riser)	*0.00*
	GROUND SURFACE	*0.00*
	SM-SAND (FILL), some silt, little to some gravel, loose, fine grained, poorly graded, brown, moist	
-2.5	- trace to little clay, medium dense, dark brown, iron staining	
	- trace clay, stones, pieces of wood, black/dark gray	
-5.0	- wood and concrete	
-7.5	- trace to little clay, black, wet	
-10.0		*-10.0*
	CL-CLAY, some silt, soft, medium plasticity, gray, very moist	*-11.0*
-12.5	SM-SAND (FILL), some silt, little clay, little gravel, loose, medium grained, poorly graded, black, wet, slight sheen, wood	
	- moderate hydrocarbon odour and sheen	
-15.0		*-15.5*
	ML-SILT (NATIVE), trace to little fine sand, trace to little clay, very loose, organics, brown/black, wet	*-16.0*
-17.5	CL-CLAY, little silt, trace organics, very soft, medium plasticity, gray, moist	*-18.0*
	END OF HOLE @ 18.0ft BGS	
-20.0		
-22.5		
-25.0		
-27.5		
-30.0		
-32.5		

MONITOR INSTALLATION



SCREEN DETAILS
Screened interval:
6.0 to 16.0ft BGS
Length: 10.0ft
Diameter: 4"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
4.0 to 18.0ft BGS
Material: Silica Sand

SAMPLE NUMBER	STATE	'N' VALUE	PID (ppm)
1SS		9	0.0
2SS		29	0.1
3SS		>50	0.1
4SS		20	0.1
5SS		10	1.4
6SS		2	1.2
7SS		2	3.5
8SS		3	2.0
9SS		3	1.9

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

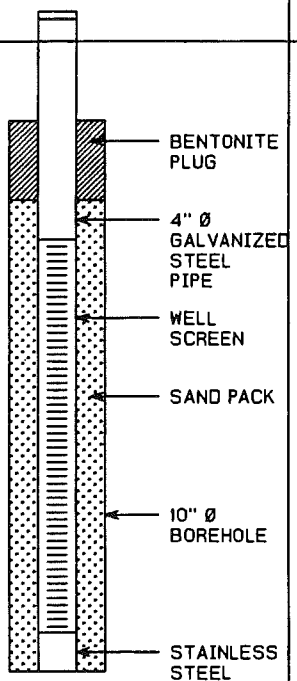
(WL-07)
Page 1 of 1

PROJECT NAME: GROUNDWATER EXTRACTION SYSTEM
PROJECT NUMBER: 12610
CLIENT: GENERAL MOTOR CORP.
LOCATION: BAY CITY, MI

HOLE DESIGNATION: EW-7
DATE COMPLETED: APRIL 14, 1999
DRILLING METHOD: 6 ¼" ID HSA
CRA SUPERVISOR: K. VANDER MEULEN

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL
	REFERENCE POINT (Top of Riser)	*0.00*
	GROUND SURFACE	*0.00*
2.5	SM-SAND (FILL), some silt, little gravel, medium dense, fine grained, poorly graded, dark brown, iron staining, wood, stones	
	- some gravel, trace clay, medium grained	
5.0		
		-6.0
7.5	ML-SILT (FILL), little gravel, little medium sands, medium dense, black, moist, wood, stones, faint hydrocarbon odour	
		-8.0
	SP-SAND (FILL), some gravel, very loose, black, wet, sheen, odour	
10.0	- voids	
	- wood, pieces of metal sheeting, wire	
12.5		
15.0		*-15.0*
	ML/CL-SILT and CLAY, shells, soft, medium plasticity, brown, wet	*-15.5*
		-16.0
17.5	CL-CLAY, little silt, soft, medium plasticity, gray, moist	
	END OF HOLE @ 16.0ft BGS	
20.0		
22.5		
25.0		
27.5		
30.0		
32.5		

MONITOR INSTALLATION



SCREEN DETAILS
Screened interval:
5.0 to 15.0ft BGS
Length: 10.0ft
Diameter: 4"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
4.0 to 16.0ft BGS
Material: Silica Sand

SAMPLE NUMBER	SAMPLE STATE	'N' VALUE	PID (ppm)
1SS		11	0.0
2SS		11	0.6
3SS		7	0.9
4SS		16	2.8
5SS		2	2.6
6SS		2	2.7
7SS		>50	-
8SS		2	1.5

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

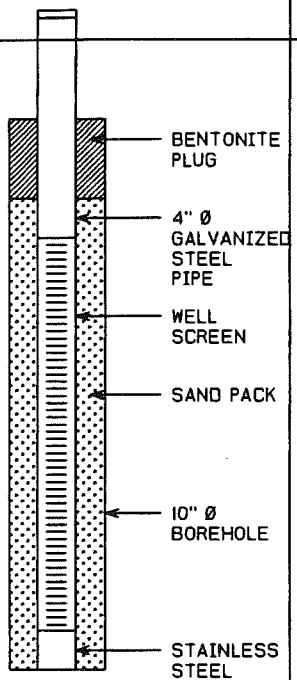
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-08)
Page 1 of 1

PROJECT NAME: GROUNDWATER EXTRACTION SYSTEM
PROJECT NUMBER: 12610
CLIENT: GENERAL MOTOR CORP.
LOCATION: BAY CITY, MI

HOLE DESIGNATION: EW-8
DATE COMPLETED: APRIL 15, 1999
DRILLING METHOD: 6 ¼" ID HSA
CRA SUPERVISOR: K. VANDER MEULEN

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
	SM-SAND (FILL), some silt, some gravel, medium dense, fine grained, poorly graded, brown, moist, stones, wood, glass, iron staining			1SS		11	0.2
2.5				2SS		18	0.1
	- wood, glass, bricks						
5.0				3SS		7	1.0
	- cardboard, newspapers						
7.5				4SS		6	0.4
	- wet, sheen, odor						
10.0				5SS		6	2.4
				6SS		12	2.0
12.5				7SS		3	2.6
15.0		*-15.0*		8SS		8	0.7
	ML/CL-SILT and CLAY, little fine sand, organics, soft, medium plasticity, gray, very moist	*-16.0*					
17.5	END OF HOLE @ 16.0ft BGS						
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							



SCREEN DETAILS
Screened Interval:
5.0 to 15.0ft BGS
Length: 10.0ft
Diameter: 4"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
4.0 to 16.0ft BGS
Material: Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▽

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

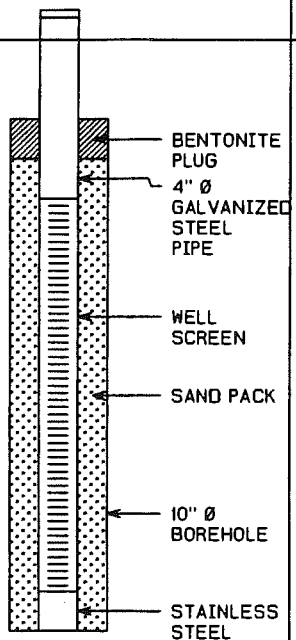
(WL-09)
Page 1 of 1

PROJECT NAME: GROUNDWATER EXTRACTION SYSTEM
PROJECT NUMBER: 12610
CLIENT: GENERAL MOTOR CORP.
LOCATION: BAY CITY, MI

HOLE DESIGNATION: EW-9
DATE COMPLETED: APRIL 15, 1999
DRILLING METHOD: 6 ¼" ID HSA
CRA SUPERVISOR: K. VANDER MEULEN

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL
	REFERENCE POINT (Top of Riser)	*0.00*
	GROUND SURFACE	*0.00*
	TOPSOIL	*-.5*
2.5	SM-SAND (FILL), some silt, some gravel, medium dense, fine grained, poorly graded, brown, moist, stones	
	- dark brown	
	- black, wood fragments, glass	
5.0	- some gray clay	
	- trace clay, medium grained	
7.5		
	- water, sheen, odor	
10.0		
	- brown/dark gray	
12.5		
	ML/CL-SILT and CLAY, little fine sand, soft, medium plasticity, brown, very moist, odors	*-13.5*
15.0	END OF HOLE @ 15.0ft BGS	*-15.0*
17.5		
20.0		
22.5		
25.0		
27.5		
30.0		
32.5		

MONITOR INSTALLATION



SCREEN DETAILS
Screened Interval:
4.0 to 14.0ft BGS
Length: 10.0ft
Diameter: 4"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
3.0 to 15.0ft BGS
Material: Silica Sand

SAMPLE NUMBER	STATE	'N' VALUE	PID (ppm)
1SS		10	0.0
2SS		33	0.0
3SS		15	1.7
4SS		8	1.1
5SS		4	1.3
6SS		6	1.7
7SS		4	4.3

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

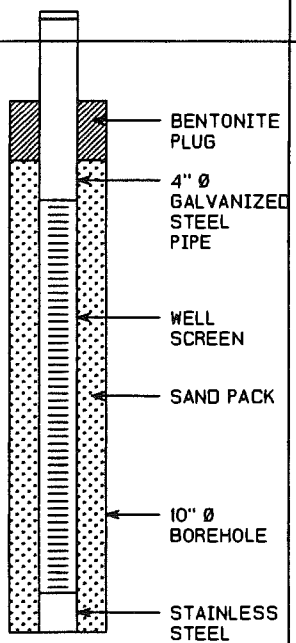
(WL-10)
Page 1 of 1

PROJECT NAME: GROUNDWATER EXTRACTION SYSTEM
PROJECT NUMBER: 12610
CLIENT: GENERAL MOTOR CORP.
LOCATION: BAY CITY, MI

HOLE DESIGNATION: EW-10
DATE COMPLETED: APRIL 16, 1999
DRILLING METHOD: 6 ¼" ID HSA
CRA SUPERVISOR: K. VANDER MEULEN

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL
	REFERENCE POINT (Top of Riser)	*0.00*
	GROUND SURFACE	*0.00*
2.5	SM-SAND (FILL), some silt, some gravel, medium dense, fine grained, poorly graded, dark brown, moist, stone	
		-3.0
5.0	CL-CLAY (FILL), some silt, trace gravel, firm, medium plasticity, gray, moist - wood	
		-6.5
7.5	SM-SAND (FILL), some silt, trace gravel, loose, fine grained, poorly graded, brown, very moist to wet, shells - wet, wood, shells, organics	
10.0		
12.5		
		-13.5
15.0	ML/CL-SILT and CLAY, organics, trace to little fine sand, soft, medium plasticity, gray, very moist, shells	*-15.0*
	END OF HOLE @ 15.0ft BGS	
17.5		
20.0		
22.5		
25.0		
27.5		
30.0		
32.5		

MONITOR INSTALLATION



SCREEN DETAILS
Screened Interval:
4.0 to 14.0ft BGS
Length: 10.0ft
Diameter: 4"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
3.0 to 15.0ft BGS
Material: Silica Sand

SAMPLE NUMBER	STATE	'N' VALUE	PID (ppm)
1SS		12	0.0
2SS		18	0.0
3SS		13	0.0
4SS		6	0.0
5SS		3	0.0
6SS		2	0.0
7SS		2	0.0

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

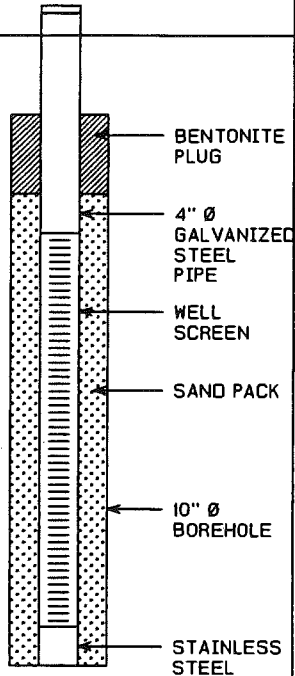
(WL-11)
Page 1 of 1

PROJECT NAME: GROUNDWATER EXTRACTION SYSTEM
PROJECT NUMBER: 12610
CLIENT: GENERAL MOTOR CORP.
LOCATION: BAY CITY, MI

HOLE DESIGNATION: EW-11
DATE COMPLETED: APRIL 19, 1999
DRILLING METHOD: 6 ¼" ID HSA
CRA SUPERVISOR: K. VANDER MEULEN

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL
	REFERENCE POINT (Top of Riser)	*0.00*
	GROUND SURFACE	*0.00*
	SM-SAND (FILL), some silt, little to some gravel, medium dense, fine grained, poorly graded, black, moist, stones	
-2.5	- wood fragments, trace clay, odor	
	- some coarse grained, loose, strong odors	
-5.0		
	- pieces of scrap metal, sheen	
-7.5		
	- wet, sheen and odor, lots of wood fragments	
-10.0		
-12.5		
-15.0		*-15.0*
	CL-CLAY, some silt, trace fine sand, soft, low to medium plasticity, black, very moist to wet, sheen, odor	*-16.0*
-17.5	END OF HOLE @ 16.0ft BGS	
-20.0		
-22.5		
-25.0		
-27.5		
-30.0		
-32.5		

MONITOR INSTALLATION



SCREEN DETAILS
Screened interval:
5.0 to 15.0ft BGS
Length: 10.0ft
Diameter: 4"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
4.0 to 16.0ft BGS
Material: Silica Sand

SAMPLE NUMBER	SAMPLE STATE	'N' VALUE	PID (ppm)
1SS		19	0.0
2SS		19	1.7
3SS		6	19.1
4SS		6	2.5
5SS		20	15.5
6SS		6	25.7
7SS		2	0.9
8SS		5	1.1

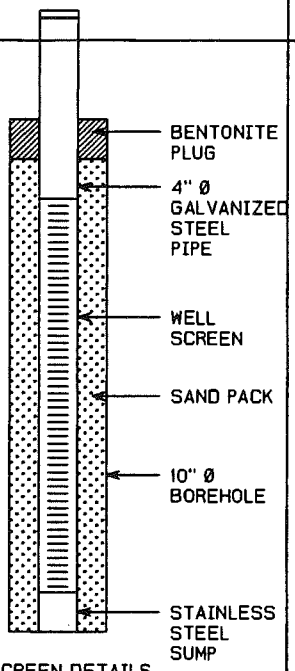
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: GROUNDWATER EXTRACTION SYSTEM
PROJECT NUMBER: 12610
CLIENT: GENERAL MOTOR CORP.
LOCATION: BAY CITY, MI

HOLE DESIGNATION: EW-12
DATE COMPLETED: APRIL 19, 1999
DRILLING METHOD: 6 ¼" ID HSA
CRA SUPERVISOR: K. VANDER MEULEN

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft. AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*0.00* *0.00*					
	SM-SAND (FILL), some silt, some gravel, medium dense, fine grained, poorly graded, dark brown, moist			1SS		17	0.0
-2.5	- black, wood fragments			2SS		15	0.0
	- loose						
-5.0				3SS		4	0.0
	- stone fragments, wood, wet, sheen, odor			4SS		2	
-7.5							
				5SS		4	
-10.0	- pieces of scrap metal						
				6SS		10	
-12.5							
		-13.5		7SS		4	
	ML/CL-SILT and CLAY, organics, shells, trace fine sand, soft, low to medium plasticity, brown/gray, very moist						
-15.0		-15.0					
	END OF HOLE @ 15.0ft BGS						
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							



SCREEN DETAILS
Screened interval:
4.0 to 14.0ft BGS
Length: 10.0ft
Diameter: 4"
Slot Size: #10
Material: Stainless Steel
Sand Pack:
3.0 to 15.0ft BGS
Material: Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

PART 1

OHM

JOB NO. 4294

BORE HOLE NO. MSA 5

PROJECT: GM/CPC Phase II	LOCATION: Bay City, MI
DRILLING CONTRACTOR: CTI	DRILLING EQUIPMENT: CME - 75
HYDROGEOLOGIST: R. Brown	DRILLER: R. Near
DATE START/TIME: 11/11/86 1545	DATE FINISH/TIME: 11/11/86 1700
SURFACE ELEVATION: 586.49	TOTAL DEPTH: 18' BLS
WELL CASING: 2" Stainless Steel	SCREEN TYPE: 2" Stainless Steel
LENGTH: 10'	SLOT: 10

GROUND WATER					CASING	CORE	SAMPLER	TUBE
DATE	TIME	DEPTH	WEATHER	TYPE			S.S.	
				DIAMETER			2"	
				HAMMER WEIGHT			140 lbs	
				FALL			30"	

REMARKS

DEPTH	SAMPLE NO.	BLOW COUNT PER 6"	RECOV-ERY	BORE HOLE LOG: LITHOLOGIC DESCRIPTION	REMARKS	GRAPHIC LOG
0						
1	1	8 5 6	18"	Sand, fine to medium, well graded, light to dark brown, moist (SM)	Gravelly to 9" BLS	
2	2	4 6 9	18"	Sand, fine to medium, well graded, light to dark brown, moist (SM)		
3						
4						
5	3	2 1 1	18"	Sand, fine to medium, well graded, light brown (SM)	Wet after 4.5'	
6						
7	4	5 4 4	15"	Sand, fine to medium, silty, light to dark brown (SM)		
8						
9						
10	5	1 1 1	18"	Sand, fine to medium, silty, with wood fragments (SM)	Abundant wood fragments 9.0'-10.0'	

PART 2

OHM

PAGE 2 OF 2

JOB NO 4294

BORE HOLE NO. MSA 5

PROJECT GM/CPC Phase II

LOCATION Bay City, MI

REMARKS

DEPTH	SAMPLE NO.	BLOW COUNT PER 6"	RECOV-ERY	LITHOLOGIC DESCRIPTION	REMARKS	GRAPHIC LOG
11						
12	6	1 1 1	18"	Sand, fine, with silty clay, dark green to black, wood chips and shell fragments (SM)	Slight odor	
13						
14	7	1 2		Sand, very fine, silty, dark brown with shell fragments (SM)		
15						
16						
17	8	1 1 2		Sand, very fine, silty, clayey, dark brown, with shell fragments (SC)		
18				Total Depth 18.0' BLS	Well 10' of 2" SS casing 10' of 2" SS screen S.I. = 7-17' BLS Sand pack to 4' BLS Casing to 3' ALS	

SOIL BORING LOG

BORING #: MW100D

Page 1 of 4

Geologist: T. Royek, B. Crnokrak

McLaren Hart

PROJECT	General Motors Powertrain Division (GMPT)	LOCATION	Bay City, MI
JOB #	070800900.003	DATE (s) 5/10/93 (f) 5/11/93	TOTAL DEPTH 58.0'
MP ELEVATION	589.02 (MSL)	SUBCONTRACTORS	Empire Soils
NORTHING	4664.0000	EQUIPMENT	CME 55
EASTING	3414.4400	DRILLERS	R. Lubner, F. Minnolera
SAMPLING METHOD	Split Spoon, Shelby	MONITORING DEVICE	OVM 580-B

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description: Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
	1 4 5 6		0.0	Rust brown fine SAND, little silt, trace clay, trace gravel, loose, dry	SP		
				Dark grey SILT, trace clay, stiff, dry	ML		
2.0	10 9 6 7		2.3	Medium grey SILT, trace clay, stiff, dry			
4.0	2 2 1 3		0.0	Medium grey fine sandy SILT, trace clay, soft, firm, moist			
6.0	2 1 1 2		0.0	Medium grey silty fine SAND, trace clay, soft, wet	SP		Grain size sample MW100(6-8)
8.0	1 2 1 2		0.0	Dark brown silty organic matter, soft, moist, few wood fragments	OL		
10.0	2 1 2 2		0.0	Medium grey fine sandy SILT, soft, moist	ML		
12.0	1 1 2 2		0.0	Medium grey SILT, little organic matter, alternating with thin (<2cm) of fine sandy SILT, soft, moist			
14.0				SHELBY TUBE between 14 and 16 feet (no recovery)			
16.0				Continued			

SOIL BORING LOG

BORING #: MW100D

Geologist: T. Royek, B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description: Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
16.0							
18.0				SHELBY TUBE between 18 and 20 feet: Dark grey SILT, trace clay, soft, moist	ML		
20.0	0 1 3 3		0.0	Same as above, few shell fragments Dark grey SILT, some fine sand, very soft, wet, very mucky Dark grey SILT, trace clay, soft, moist			Grain size sample MW100(20-22)
22.0	6 7 10 8			Medium grey silty fine SAND, loose, wet Grey/brown very fine to fine SAND, some silt, trace coarse sand, medium dense, wet	SM SP		Bottom of I.C.U. / Top of deep sand
24.0	7 8 7 9		0.0	Grading to medium brown/grey fine to medium SAND, trace gravel, medium dense, wet	SW		
26.0	5 8 7 8		0.0	Same as above, medium SAND, some fine sand, few shell fragments			
28.0	3 2 5 7		0.0				
30.0	3 6 5 9		0.0	Light brown/grey medium SAND, trace coarse sand, trace fine gravel, medium dense, wet	SP		
32.0	6 6 8 9		0.0	Medium grey/brown fine to medium SAND, little coarse sand to fine gravel, medium dense, wet	SW		
34.0	3 4		0.0	Light grey fine sandy SILT, stiff, wet Medium grey clayey SILT	ML		
				Continued			

SOIL BORING LOG

BORING #: MW100D

Geologist: T. Royek, B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
34.7	7 8			Light brown/grey medium SAND, medium dense, wet	SP		
36.0	10 10 11 14		0.0	Light brown medium SAND, trace fine gravel, medium dense, wet			
38.0	8 9 12 13		0.0				
40.0	3 4 6 4		0.0	Medium brown medium to coarse SAND, trace fine gravel less than 3/4 inch in diameter	SW		
42.0	8 8 10 8		0.0	Light brown fine SAND, trace coarse sand to fine gravel, medium dense, wet	SP		
44.0	3 3 4 15		0.0	Same as above, light grey			
46.0	7 6 7 10		0.0	Medium grey/brown medium to coarse SAND, little fine sand, medium dense, wet Medium brown fine SAND, trace silt			
48.0	10 10 12 14		0.0	Medium brown/grey gravelly medium to coarse SAND, medium dense, wet	SW		
50.0	10 10 14 15		0.0				
52.0	7 7 8 12		0.0				

Continued

SOIL BORING LOG

BORING #: MW100D

Page 4 of 4

Geologist: T. Royek, B. Crnokrak

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
53.3							
54.0	10 12 12 15		0.0	Same as above, little fine gravel			
56.0	7 15 17 21		0.0				
58.0				Medium brown silty CLAY, trace fine gravel, hard, dry	CL		Bottom of deep sand / Top of clay till
				END OF BORING @ 58.0 feet			

SOIL BORING LOG

BORING #: MW101S

Page 1 of 2

Geologist: P. Shiman

McLaren Hart

PROJECT	General Motors Powertrain Division (GMPT)	LOCATION	Bay City, MI
JOB #	070800900.003	DATE (s) 5/18/93 (f) 5/18/93	TOTAL DEPTH 20.0'
MP ELEVATION	589.10 (MSL)	SUBCONTRACTORS	Empire Soils
NORTHING	4251.5000	EQUIPMENT	CME 550
EASTING	3568.4000	DRILLERS	Crew C
SAMPLING METHOD	Split Spoon	MONITORING DEVICE	OVM 580-B

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description: Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
0				FILL: Sand, woody, boggy material with black oily contamination, strong (oily/diesel) hydrocarbon odor, sludge composition			
2.0							
4.0							
6.0							
8.0							
10.0	35 6 4 2			Brown to dark grey silty SAND	SM		Grain size sample MW101(10-12)
12.0							
14.0							
16.0				Continued			

SOIL BORING LOG

BORING #: MW101S

Page 2 of 2

Geologist: P. Shiman

McLaren Hart

PROJECT General Motors Powertrain Division (GMPT) LOCATION Bay City, MI

Depth Below Surface (ft.)	Penetration Test Results: Blows Per 0.5'	Sampler Interval/ Recovery	PID Reading (ppm)	Soil Description Color, Texture, Moisture, Etc.	USCS Designation	Graphic Log	Comments / Notes
16.0	8 3 2 2			Olive grey organic clayey SILT to very silty CLAY, trace very fine sand, very soft, wet, minor shell fragments	MH CL		Grain size sample MW101(16-18)
18.0	3 2 1 2						Grain size sample MW101(18-20)
20.0				END OF BORING @ 20.0 feet			

Appendix D
Manufacturer Product Information

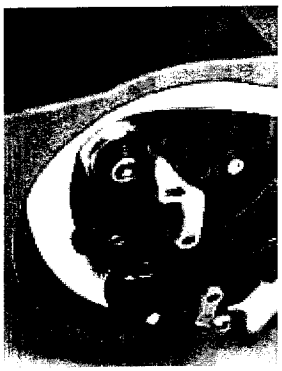
Printing tips ... Search manual for ... Go

Watson-Marlow Pumps Group

WATSON-MARLOW BREDEL E-MANUALS

m-620r-gb-01

Watson-Marlow 620R, 620RE and 620RE4 pumpheads



Clickable index

1. Declaration of incorporation
2. One-year warranty
3. Information for returning pumps
4. Safety
5. Recommended operating procedures
6. 620RE, 620RE4 and 620R Key safety information
7. 620RE, 620RE4 and 620R Safe-guarding
8. 620RE, 620RE4 and 620R Pumping conditions
9. 620RE, 620RE4 and 620R Pump installation
10. 620RE, 620RE4 and 620R General operation
11. 620RE and 620RE4 tube element loading
12. 620RE, 620RE4 and 620R Continuous tube loading
13. 620RE, 620RE4 and 620R Tube element or continuous tube removal
14. 620RE, 620RE4 and 620R Maintenance
15. 620RE, 620RE4 and 620R CIP and SIP
16. Pumphead spares
17. Technical data: performance envelope and flow rates
18. 620R product codes
19. 620RE and 620RE4 LoadSure product codes
20. Trademarks and disclaimer
21. Warning not to use pumps in patient-connected applications
22. Publication history
23. Decontamination certificate

Double clicking anywhere in the manual will take you back to this index.

Declaration of incorporation

When this pump unit is to be installed into a machine or is to be assembled with other machines for installations, it must not be put into service until the relevant machinery has been declared in conformity with the Machinery Directive 2006/42/EC.

Responsible person: Christopher Gadsden, Managing Director, Watson-Marlow Limited, Falmouth, Cornwall TR11 4RU, England. Telephone +44 (0) 1326 370370 Fax +44 (0) 1326 376009.

One-year warranty

Watson-Marlow Limited warrants, subject to the conditions below, through either Watson-Marlow Limited, its subsidiaries, or its authorised distributors, to repair or replace free of charge, including labour, any part of this product which fails within one year of delivery of the product to the end user. Such failure must have occurred because of defect in material or workmanship and not as a result of operation of the product other than in accordance with the instructions given in this manual.

Conditions of and specific exceptions to the above warranty are

- Consumable items such as tubing and rollers are excluded.
- Products must be returned by pre-arrangement carriage paid to Watson-Marlow Limited, its subsidiaries, or its authorised distributor.
- All repairs or modifications must have been made by Watson-Marlow Limited, its subsidiaries, or its authorised distributors or with the express permission of Watson-Marlow Limited, its subsidiaries, or its authorised distributors.
- Products which have been abused, misused, or subjected to malicious or accidental damage or electrical surge are excluded.

Warranties purporting to be on behalf of Watson-Marlow Limited made by any person, including representatives of Watson-Marlow Limited, its subsidiaries, or its distributors, which do not accord with the terms of this warranty shall not be binding upon Watson-Marlow Limited unless expressly approved in writing by a Director or Manager of Watson-Marlow Limited.

Information for returning pumps

Equipment which has been contaminated with, or exposed to, body fluids, toxic chemicals or any other substance hazardous to health must be decontaminated before it is returned to Watson-Marlow or its distributor. A certificate included at the rear of these operating instructions, or signed statement, must be attached to the outside of the shipping carton. This certificate is required even if the pump is unused. If the pump has been used, the fluids that have been in contact with the pump and the cleaning procedure must be specified along with a statement that the equipment has been decontaminated.

Safety

In the interests of safety, this pump and the tubing selected should only be used by competent, suitably trained personnel after they have read and understood this manual, and considered any hazard involved.

Any person who is involved in the installation or maintenance of this equipment should be fully competent to carry out the work. In the UK this person should also be familiar with the Health and Safety at Work Act 1974.

Recommended operating procedures

DO keep delivery and suction lines as short as possible using a minimum number of swept bends.
DO use suction and delivery pipelines with a bore equal to or larger than the bore of the tube fitted in the pumphead. When pumping viscous fluids, the losses caused by increased friction can be overcome by using pipe runs with a cross sectional area several times greater than the pumping element.
DO fit an extra length of pump tube in the system to enable tube transfer. This will extend tube life and minimise the downtime of the pumping circuit.
DO keep the track and rollers clean.

The self-priming nature of peristaltic pumps means valves are not required. Any valves fitted must cause no restriction to flow in the pumping circuit.

When using Marprene tubing, after the first 30 minutes of running, re-tension the tube in the pumphead. Open the guard, hold the tubing at one port whilst pulling the tube tight through the second port. This is to counteract the normal stretching that occurs with Marprene which can go unnoticed and result in poor tube life.

Tube selection The chemical compatibility list published in the Watson-Marlow catalogue is only a guide. If in doubt about the compatibility of a tube material and the duty fluid, request a tube sample card for immersion trials.

620RE, 620RE4 and 620R Key safety information

Before opening the pumphead guard please ensure that the following safety directions are followed.

- For close-coupled drives, ensure that the pump is isolated from mains voltage.
- Ensure that there is no pressure in the pipeline.
- If a tube failure has occurred, ensure that any product in the pumphead has been allowed to drain through the controlled waste to a suitable drain.
- Ensure that protective clothing and eye protection are worn if hazardous products are being pumped.

620RE, 620RE4 and 620R Safe-guarding

- Primary safety on 620 series pumps is provided by the tool-lockable pumphead guard. On electrically-powered cased 600 series pumps, secondary (backup) protection is provided in the form of an electrical interlock which stops the pump if the pumphead guard is opened (and only for so long as the guard is opened). The electrical interlock on cased pumps should never be used as primary protection.

Always disconnect the mains power supply to the pump before opening the pumphead guard.
- Only primary protection through the tool-lockable guard is provided on pneumatically powered 620 series cased pumps. Only primary protection through the tool lockable pumphead guard is provided on 620 series pumps fitted with industrial AC motors, but an interface kit to allow mains power to be switched by the pumphead guard interlock is available as an extra-cost option.

620RE, 620RE4 and 620R Pumping conditions

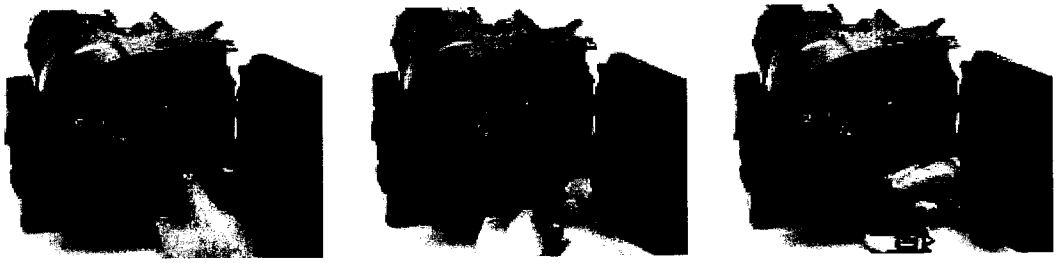
Pressure and viscosity

- All pressure values in this operating instruction, from which performance and life figures have been calculated relate to peak pipeline pressures.
- Although rated to 4 bar working pressure, this pump will generate in excess of 4 bar working pressure if pipeline restrictions are in place. In instances where it is critical that a working pressure of 4 bar is not exceeded, pressure relief valves should be installed in the pipeline.
- For pumping duties of 2-4 bar pressure, only close coupled pumps should be used, fitted with 73 Shore hardness Marprene/Bioprene or standard STA-PURE tube elements. "M" in the tube element's product order code denotes suitability for high pressure use.
- When pumping duties of 0-2 bar pressure, use close coupled or cased pumps fitted with 64 Shore hardness elements or the standard range of continuous peristaltic pump tubing.
- Viscosity handling is maximised by using 73 Shore hardness Marprene/Bioprene or STA-PURE tube elements in the pumphead.
- Ensure that there is always a minimum of one metre of smooth bore flexible tubing connected to the discharge port of the pumphead. This will help minimise any impulse losses and pulsation in the pipeline. This is especially important with viscous fluids and rigid pipework.

620RE, 620RE4 and 620R Pump installation

A correctly engineered installation will promote the best possible tube life, so please ensure that the following guidelines are followed:

- Avoid tight pipeline bends, pipe reducers and excessive lengths of smaller bore tubing than that in the pumphead, particularly in pipelines on the suction side.
- Ensure that connecting pipe work and fittings are suitably rated to handle the predicted pipeline pressure.
- If rigid pipe work comes in close proximity to the pumphead, a drop out section of pipe work will simplify tube replacement.
- Ensure that the controlled waste blanking plug is in position if the controlled waste port is not in use. See below.



- It is advisable to use controlled waste pipe work if pumping hazardous, aggressive or abrasive fluids or products which will harden in contact with air.
- When connecting waste pipe work to the controlled waste port using the coupling adaptor supplied, ensure that there is adequate clearance underneath the pumphead. Waste pipe work should run to a suitable container or drain.
- The leak detector installation procedure is included in the leak detector kit.
- If unsure of an installation please contact your local Watson-Marlow Technical Support Office for further assistance.

620RE, 620RE4 and 620R General operation

Opening the pumphead guard

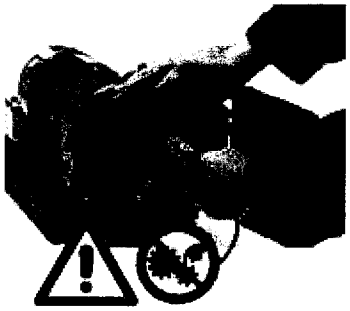
- Unlock the guard with a 5mm Allen key or a screw driver.

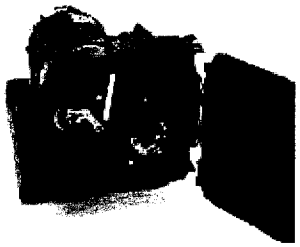
Open the guard to its full extent. This creates the maximum clearance between the tube ports and guard to remove the tubing.

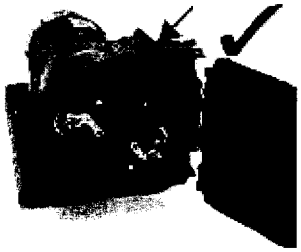
Engaging/disengaging the rollers

- The extent of travel of the roller release levers is indicated below. Do not try and force the levers beyond their normal extent of travel as this will damage the rotor.
- To engage the rollers snap the roller release levers counter clockwise making sure that the rollers locked out against the tubing. To disengage the rollers, snap the release levers clockwise to their disengaged position. For high pressure tubing elements or four roller pumpheads, the 5mm Allen key can be used to aid leverage when engaging/disengaging the rollers with the release levers.

Make sure that fingers are clear of the front face of the rotor hub when using the roller release levers.







Pre-load checks

- Before loading tubing, ensure that all rollers rotate freely, that the tube ports and location grooves are clean and that if in use, the controlled waste pipe work is free of any obstructions.

Closing the pumphead guard and start-up

- Ensure that the guard seal is clean, replacing it if necessary.
- Ensure that the rollers are engaged and locked out against the tubing
- Close the guard and push it against the track until the latch engages.
- Connect suitable pipe work to the pumphead using the appropriate connectors for the tube element.

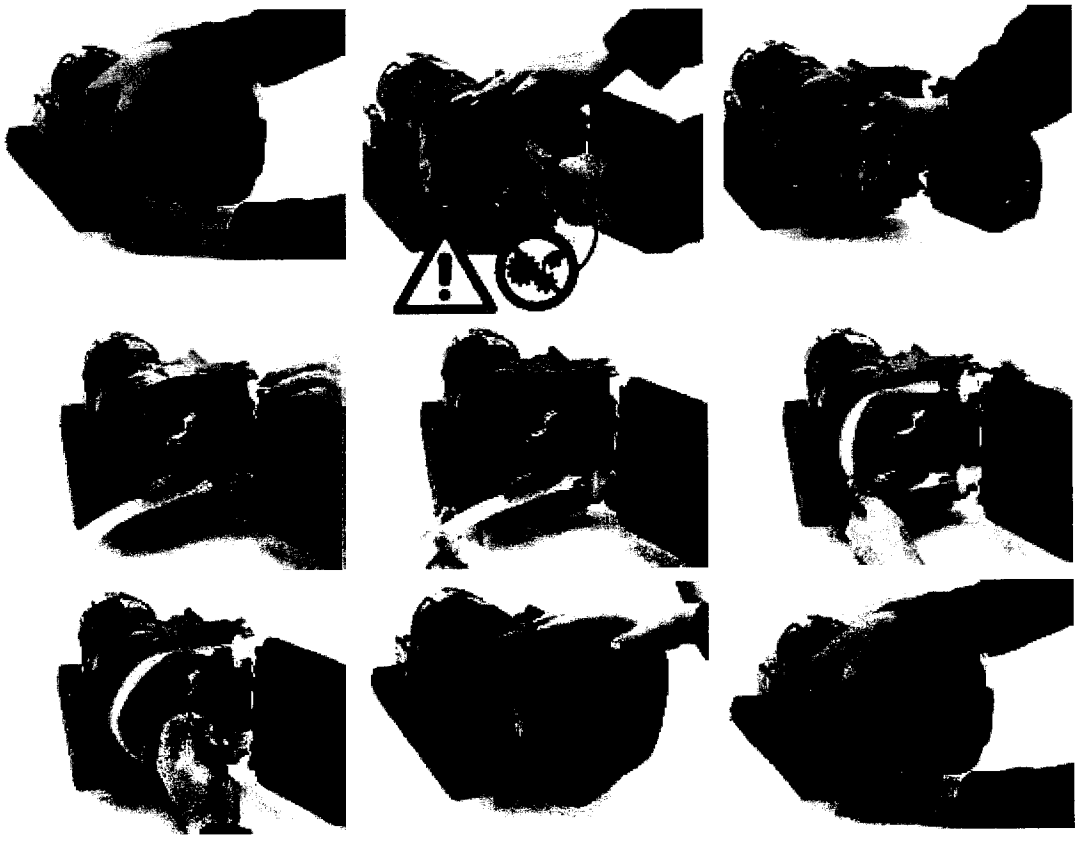
Continuous tubing clamp location in 620R pumpheads

- Select the appropriate tube clamp set for the tubing size to be used.
- Locate the two "U"-shaped track clamp halves into the pumphead ports (The "U"-shape ensures correct loading)
- Locate the corresponding guard clamp halves which have raised "T" locating sections, into the slots on the inner guard face above and below the guard hinge. Push and slide into their locked position.
- Closing the guard will align the two halves of the clamp around the tubing.

620RE and 620RE4 tube element loading

- 620RE element pumpheads are factory set to accept Watson-Marlow LoadSure tube elements. Pumping performance will be adversely affected if LoadSure elements are not used.
- Disengage rollers
- Locate one of the "D"-shaped flanges into the lower port. (The "D" flange ensures that the element can only be loaded correctly).
- Wrap the tube element around the disengaged rollers of the rotor.
- Locate the second "D"-shaped flange into the upper port.
- Ensure the flat face of each "D" flange sits flush to the flange sealing face of the track.
- Engage rollers
- Close the guard and push it against the track until the latch engages.

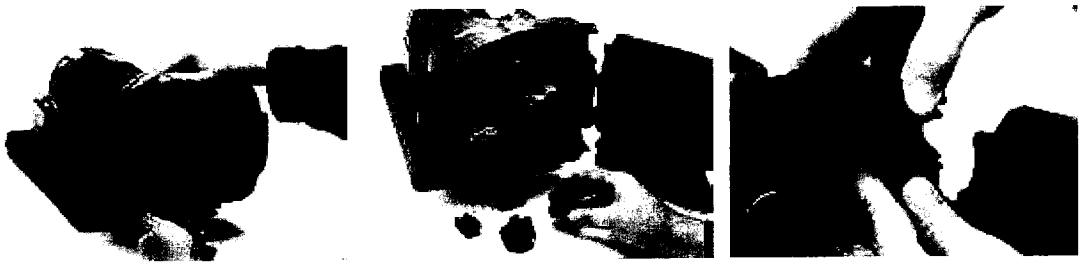
Tube element loading

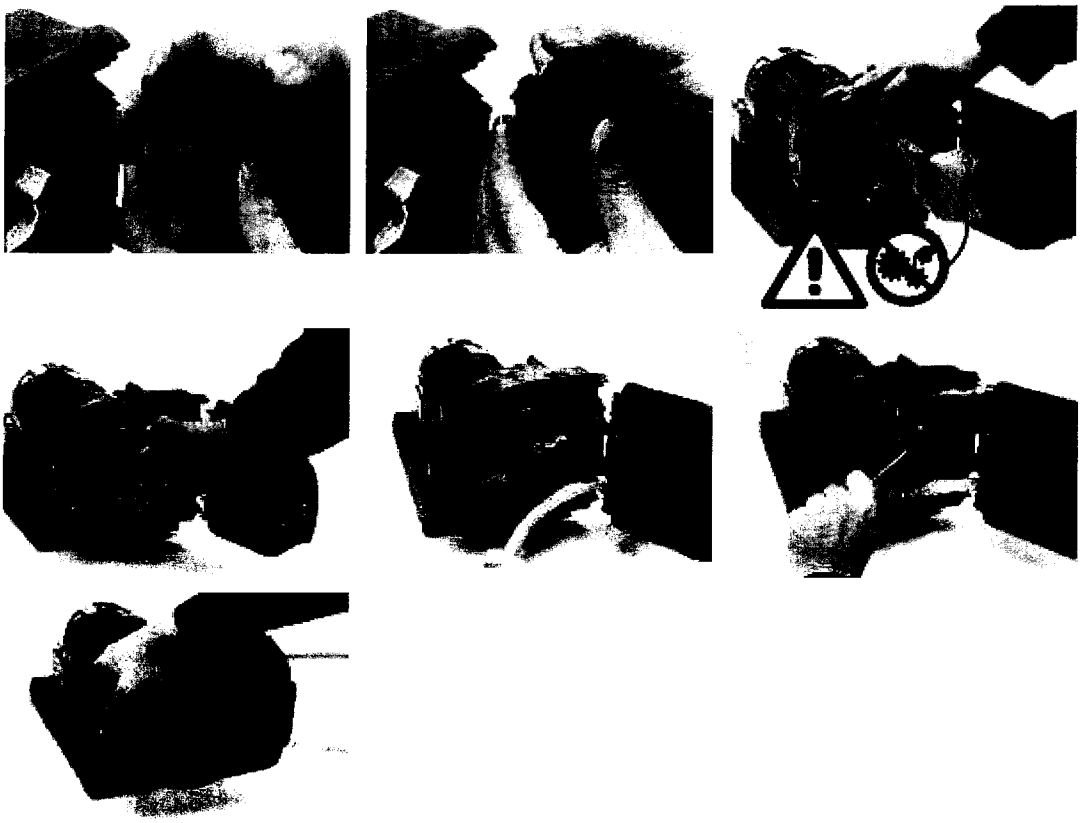


620RE, 620RE4 and 620R Continuous tube loading

- 620R continuous tubing pumpheads are factory set to accept Watson-Marlow 600 series 3.2mm wall tubing. Pumping performance will be adversely affected if Watson-Marlow tubing is not used.
- Select the tube clamp set which is correct for the tubing size to be used.
- Disengage rollers
- Locate one end of the tubing into the lower port "U" clamp and hold firmly in position.
- Wrap the tubing tightly around the retracted rollers, making sure that there is no twisting through its length.
- Locate the other end of the tubing into the upper port "U" clamp.
- Hold both ends of the tubing in one hand maintaining tension around the retracted rollers.
- Engage rollers
- Close the guard and push it against the track until the latch engages
- Ensure that continuous tubing is not loosely clamped at the pumphead ports.
- Ensure that when the pump is re-started all of the rollers have re-engaged. A roller which has not re-engaged will "click" continuously. No damage will occur if this happens but the roller should be re-engaged manually using the 5mm Allen key. Please refer to the Troubleshooting section.

Continuous tube loading





620RE, 620RE4 and 620R Tube element or continuous tube removal

- Unlock the guard and disengage the rollers.
- Disconnect the tubing from the external pipeline.
- Remove the tubing from the pumphead.

620RE, 620RE4 and 620R Maintenance

Scheduled maintenance

- The stainless steel pumping rollers run on sealed bearings and do not require lubrication.
- Remove the rotor and lubricate the follower rollers and roller engaging mechanisms with a lithium-based grease. This should be carried out every six months for intermittent duties and every three months for 24 hour duties.
- If fluid is spilled inside the pumphead, flush the pumphead out with water and mild detergent as soon as possible. If specific cleaning agents are required to clean the spillage, please consult Watson-Marlow Technical Support Office before proceeding, in order to confirm chemical compatibility.
- If the rotor needs to be removed, refer to the guidelines below.

Roller adjustment

620 pumpheads have provision for adjustment to reset the roller/track gap to compensate for wear after extended service in arduous applications.

Roller/track gaps can **only** be accurately judged without tubing in the pumphead. The gap should be **4.6mm** for 3.2mm wall tubing and **5.5mm** for LoadSure elements.

If the gap is more than 0.2mm greater than these dimensions, the following may be carried out:

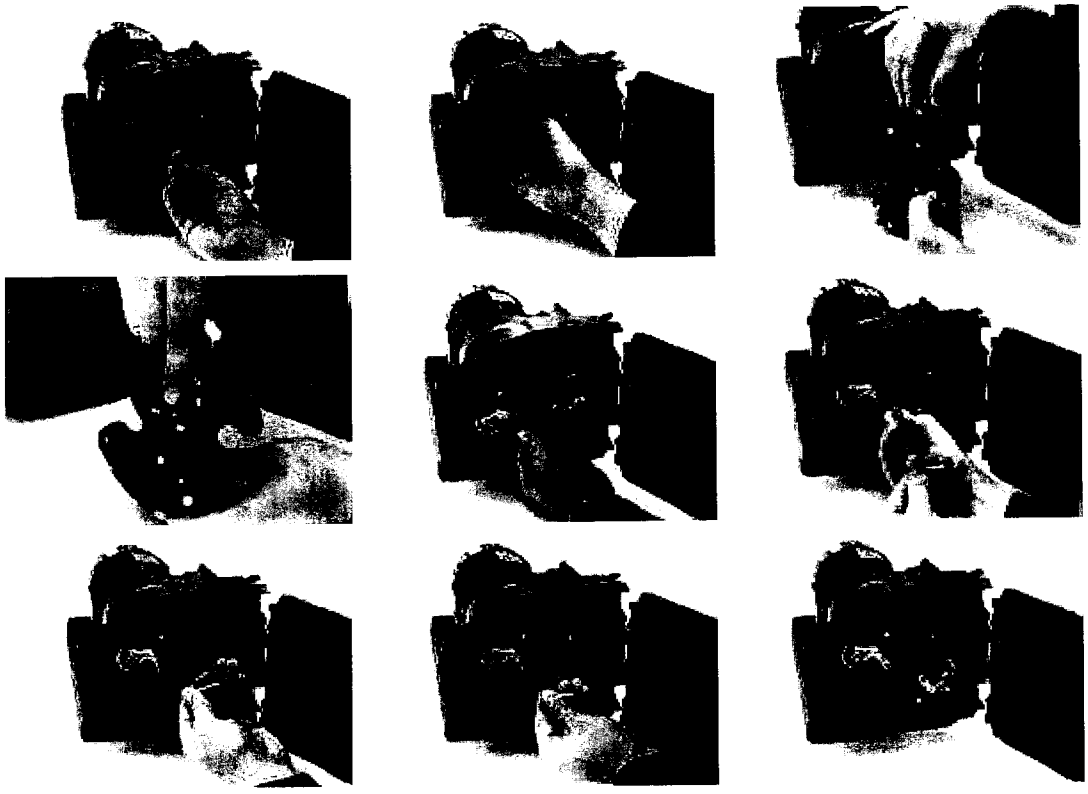
- Note the number on the roller arm to which the engraved line on the hexagon-headed main roller pin corresponds.
- Remove the circlip (snap-ring) and roller pin.
- Relocate the main roller pin, resetting the engraved line to one number lower. For example, if the engraved line was at "-1", reset it to "-2" to reduce the roller track gap.

Ensure the roller pin is correctly seated into the roller arm thrust washer. Replace the circlip.

Rotor removal and re-location

- Remove the rotor cover and central locating bolt using a 5mm Allen key. Pull the rotor off the keyed shaft, remove the key and clean thoroughly. Do not use tools to lever the rear face of the rotor away from the inner face of the track, it should come off by hand.
- To replace the rotor, locate the key into the keyway and apply a thin layer of grease over the shaft and key. Align the keyway of the rotor to the shaft key and slide the rotor into position, ensuring that a positive "stop" is achieved and ensure that the full length of the drive shaft is fitted into the rotor.
- Do not force the rotor into position. The rotor will slide into place easily if correctly aligned.
- Tighten the hexagonal locating bolt to a nominal torque of 10Nm using a 5mm Allen key.
- The rotor bolt, which is impregnated with "Loctite 218" thread lock, should be subjected to a maximum of three removals/relocations before renewal. To avoid rotor bolt renewal after three removals, apply "Loctite 222" thread lock to the rotor thread before relocation. This is critical to ensure prolonged, secure location of the rotor hub to the drive shaft. **Failure to complete this action will invalidate the terms and conditions of the pumphead warranty**.
- Replace the rotor cover.

When closing the guard, check it does not make contact with the rotor. If it does, then the rotor has been fitted incorrectly. Re-open the guard, remove and refit the rotor, and close the guard.



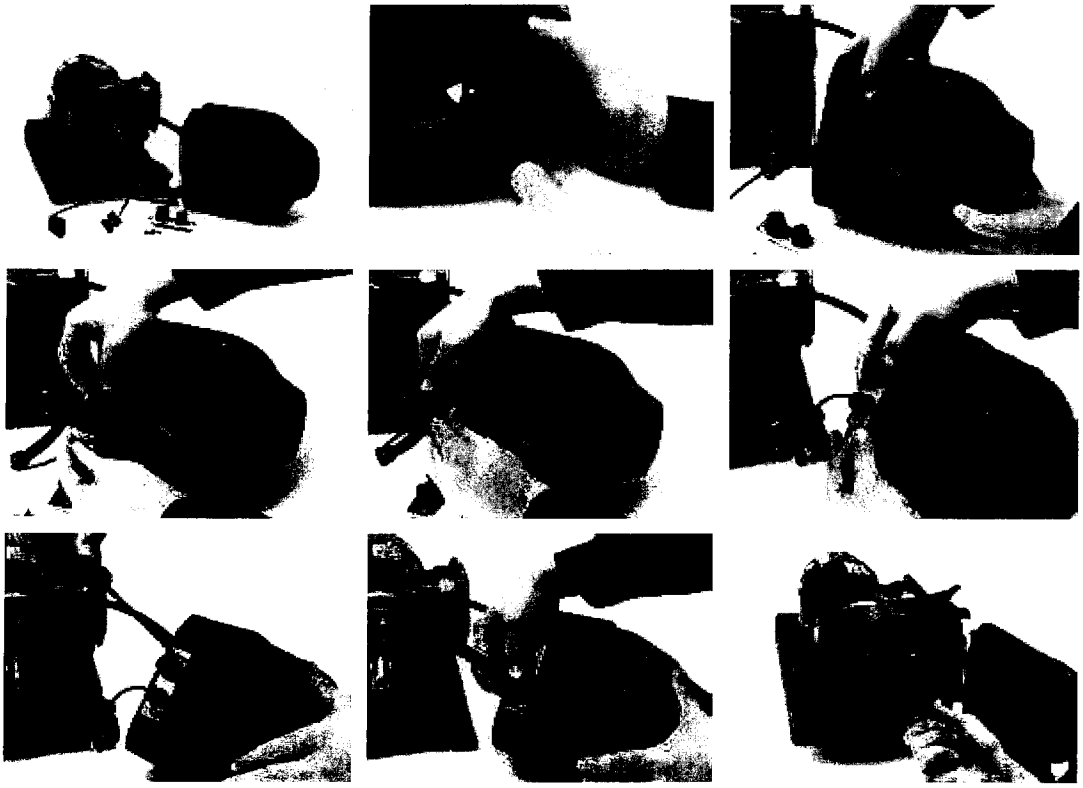
Track removal (close coupled AC motor gearboxes)

- Remove the rotor.
- Disconnect the controlled waste pipework if attached.
- Loosen the four track retaining screws using a Number 2 Pozi-Driv screwdriver.
- Disconnect the mains interlock if connected to a mains contactor
- Withdraw the track fully from the gearbox.

Track re-location (close coupled AC motor gearboxes)

- Ensure that the track is clean.

- Fit the track over the gearbox boss.
- Align the track horizontally so that the location holes are aligned with the threaded gearbox holes.
- Tighten the four track retaining screws using a Number 2 Pozi-Driv screwdriver.
- Re-connect the guard interlock controlled waste pipework if required.



620RE, 620RE4 and 620R CIP and SIP

General

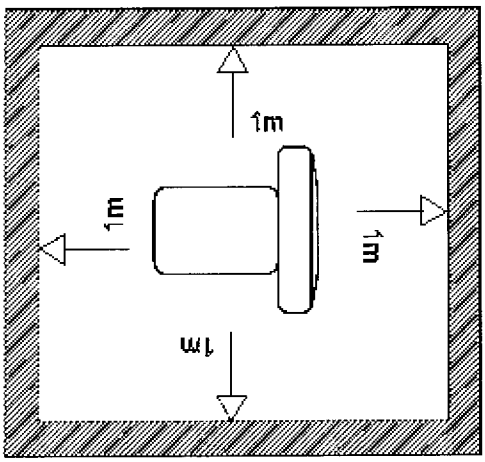
- Unlock the guard and disengage the rollers within the tube zone.
- Close the guard and squeeze against the track until the latch clicks.
- Observe a 1m safety area.

CIP

- LoadSure tube elements and continuous tubing can be cleaned using CIP processes.
- Ensure that the tubing material is chemically compatible with the cleaning agent that is to be used.
- If cleaning agents are spilled over the pumphead, wash down immediately.
- Ensure that controlled waste pipework is fitted to allow a safe release of cleaning agent in the event of a tube failure.

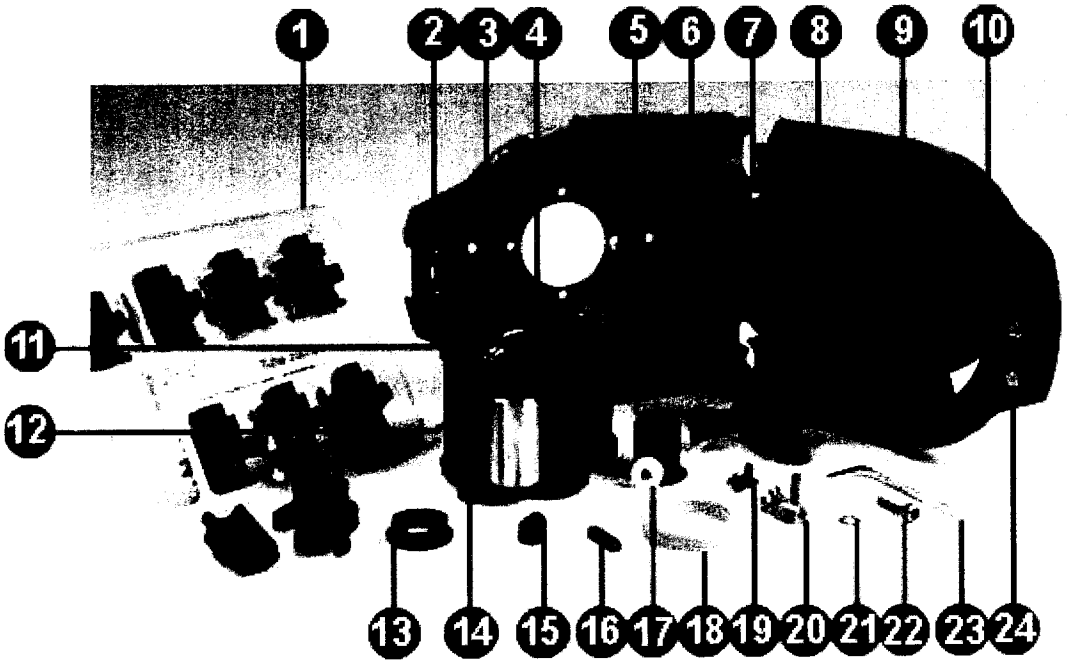
SIP

- Only STA-PURE tube elements can be used in a steam in place sterilisation processes.
- STA-PURE tubing elements can be sterilised to 3A Class two and FDA minimum recommended standard which is 121C (250F) at 1bar (14.5 psi) saturated steam for 20 minutes.
- Monitor the process continuously .
- If a tube failure occurs, shut down the process. Do not touch the pumphead until a 20 minute cooling period has been observed.
- Ensure a 20 minute acclimatisation period is observed before running the pump following SIP.
- Ensure that controlled waste pipework is fitted to allow a safe release of steam in the event of a tube failure.
- Ensure a 1m safety zone is maintained around the pumphead during SIP cycles.



Ensure that the pumphead door is closed and locked before SIP cleaning commences.

Pumphead spares

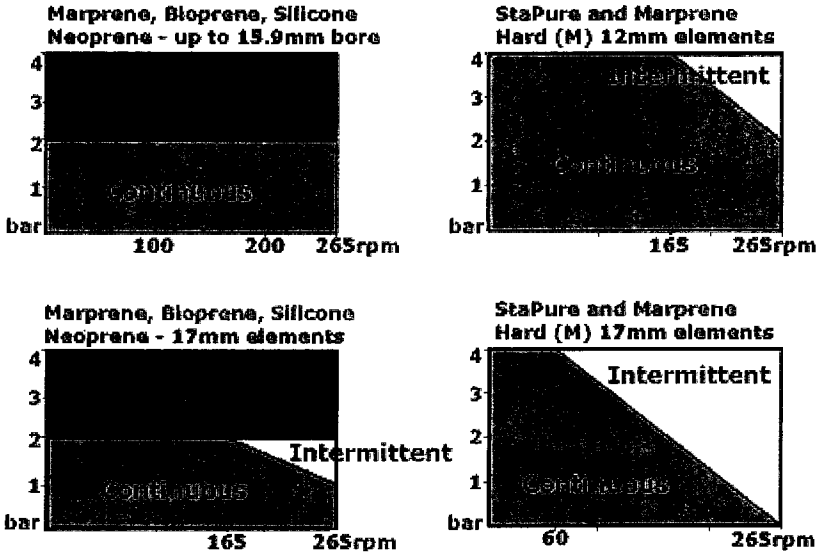


Number	Spare	Description
1	069.4101.000	620RTC: continuous tubing clamp set
2	MR2052C	Oddie fastener
2	MR2053B	Clip: Oddie retainer
2	MR2054T	Oddie washer
2	SG0021	Oddie spring
2	CX0150	Oddie circlip (snap ring)
3	MRA0251A	Track assembly (continuous pumphead)
3	MRA0297A	Track assembly (element pumphead)
3	MR2000C	Track
4	MRA0249A	Roller assembly element pumphead
4	MRA0250A	Roller assembly continuous pumphead

5	MR2027T	Controlled waste threaded fitting 620R
6	MR2028M	Controlled waste port blanking plug
7	MR2018T	Hinge pin
8	MR2055M	Rotor cover
9	MR2021B	Seal - guard
10	MR2002M	Guard without latch and seal
11	MR2015T	Follower roller spindle
12	CX0148	Roller assembly circlip (snap-ring) E type 6 dia
12	MR2014T	Stainless steel roller spindle
12	MR2010T	Thrust washer
13	MR2096T	Controlled waste threaded fitting locking nut
14	MRA0320A	Rotor assembly 2-roller element
14	MRA0321A	Rotor assembly 4-roller element
14	MRA0322A	Rotor assembly 2-roller continuous
15	MR2058B	Grommet - door switch
16	XX0220	Key - metal
17	MR2029T	Cased drive MG605 shaft/rotor hub spacer
18	MR2059T	Adaptor - Bodine (white polypropylene ring)
19	FN0488	Cased drive track locating screws M6x10
20	FN0523	Close-coupled track locating screws M6x20
21	FN0581	Rotor locating washer M6
22	FN0520	Rotor locating bolt M6 x 25
23	TT0006	5mm Allen key
24	MA0017	Magnet
	MRA0268A	Cased drive door switch assembly
	MRA0279A	Close-coupled door switch assembly
	CN0187	Plug blanking 10.72M

Technical data

Performance envelope of the 620R, 620RE and 620RE4 mark II rotor



Flow rates

Tube bore | Tube number - # | rpm | Pressure (+) | Suction (-)

Note: Flow rates quoted have been rounded for simplicity, but are accurate to within 5% - well within the normal tubing-tolerance variation of flow rate. They should therefore be taken as a guide. Real flow rates in any application must be determined empirically.

620R

Flow rates: Marprene, Bioprene (l/min)

	mm	**6.4**	**9.6**	**12.7**	**15.9**
	inch	**1/4**	**3/8**	**1/2**	**5/8**
	#	**26**	**73**	**82**	**184**
	8-76	0.10-1.0	0.20-1.9	0.32-3.0	0.42-4.2
	8-77	0.10-1.0	0.20-1.9	0.32-3.1	0.42-4.2
	8-83	0.10-1.1	0.20-2.1	0.32-3.3	0.42-4.5
	17-83	0.22-1.1	0.43-2.1	0.68-3.3	0.90-4.5
	47-237	0.61-3.1	1.2-5.9	1.9-9.5	2.5-11
	50-251	0.65-3.3	1.3-6.3	2.0-10	2.7-11
	52-259	0.68-3.4	1.3-6.5	2.1-10	2.8-11

Flow rates: Marprene, Bioprene (USGPM)

	mm	**6.4**	**9.6**	**12.7**	**15.9**
	inch	**1/4**	**3/8**	**1/2**	**5/8**
	#	**26**	**73**	**82**	**184**
	8-76	0.03-0.3	0.05-0.5	0.08-0.8	0.11-1.1
	8-77	0.03-0.3	0.05-0.5	0.08-0.8	0.11-1.1
	8-83	0.03-0.3	0.05-0.5	0.08-0.9	0.11-1.2
	17-83	0.06-0.3	0.11-0.5	0.18-0.9	0.24-1.2
	47-237	0.16-0.8	0.31-1.6	0.50-2.5	0.67-2.9
	50-251	0.17-0.9	0.33-1.7	0.53-2.7	0.72-3.0
	52-259	0.18-0.9	0.34-1.7	0.55-2.7	0.75-3.0

Flow rates: Silicone (l/min)

	mm	**6.4**	**9.6**	**12.7**	**15.9**
	inch	**1/4**	**3/8**	**1/2**	**5/8**
	#	**26**	**73**	**82**	**184**
	8-76	0.10-0.9	0.22-2.1	0.34-3.2	0.44-4.7
	8-77	0.10-0.9	0.22-2.1	0.34-3.2	0.44-4.7
	8-83	0.10-1.0	0.22-2.2	0.34-3.5	0.44-5.1
	17-83	0.20-1.0	0.46-2.2	0.71-3.5	0.95-5.1
	47-237	0.56-2.8	1.3-6.4	2.0-10	2.8-14
	50-251	0.60-3.0	1.4-6.8	2.1-11	3.0-14

	52-259	0.62-3.1	1.4-7.0	2.2-11	3.1-15

Flow rates: Silicone (USGPM)

	mm	**6.4**	**9.6**	**12.7**	**15.9**
	inch	**1/4**	**3/8**	**1/2**	**5/8**
	#	**26**	**73**	**82**	**184**
	8-76	0.03-0.2	0.06-0.5	0.09-0.8	0.12-1.2
	8-77	0.03-0.2	0.06-0.5	0.09-0.9	0.12-1.3
	8-83	0.03-0.3	0.06-0.6	0.09-0.9	0.12-1.4
	17-83	0.05-0.3	0.12-0.6	0.17-0.9	0.25-1.4
	47-237	0.15-0.8	0.34-1.7	0.46-2.6	0.73-3.7
	50-251	0.16-0.8	0.36-1.8	0.55-2.8	0.78-3.8
	52-259	0.16-0.8	0.37-1.8	0.58-2.9	0.82-3.9

Flow rates: Neoprene, STA-PURE (l/min)

	mm	**6.4**	**9.6**	**12.7**	**15.9**
	inch	**1/4**	**3/8**	**1/2**	**5/8**
	#	**26**	**73**	**82**	**184**
	8-76	0.10-0.9	0.20-1.9	0.32-3.0	0.49-4.6
	8-77	0.10-0.9	0.20-1.9	0.32-3.1	0.49-4.7
	8-83	0.10-1.0	0.20-2.1	0.32-3.3	0.49-5.1
	17-83	0.20-1.0	0.43-2.1	0.68-3.3	1.0-5.1
	47-237	0.56-2.8	1.2-5.9	1.9-9.51	2.9-14
	50-251	0.60-3.0	1.3-6.3	2.01-10	3.1-15
	52-259	0.62-3.1	1.3-6.5	2.1-10	3.2-16

Flow rates: Neoprene, STA-PURE (USGPM)

	mm	**6.4**	**9.6**	**12.7**	**15.9**
	inch	**1/4**	**3/8**	**1/2**	**5/8**
	#	**26**	**73**	**82**	**184**
	8-76	0.03-0.2	0.05-0.5	0.08-0.8	0.13-1.2
	8-77	0.03-0.2	0.05-0.5	0.08-0.8	0.13-1.2
	8-83	0.03-0.3	0.05-0.5	0.08-0.9	0.13-1.3
	17-83	0.05-0.3	0.11-0.5	0.18-0.9	0.27-1.3
	47-237	0.15-0.8	0.31-1.6	0.50-2.5	0.76-3.8
	50-251	0.16-0.8	0.33-1.7	0.53-2.7	0.81-4.0
	52-259	0.16-0.8	0.34-1.7	0.55-2.7	0.84-4.2

620RE

Flow rates: Marprene TM, Bioprene TM (l/min)

	mm	**12**	**17**
		LoadSure	**LoadSure**
	8-76	0.30-2.8	0.47-4.5
	8-77	0.30.2.8	0.47-4.5

	8-83	0.30-3.1	0.47-4.9
	17-83	0.63-3.1	1.0-4.9
	47-237	1.7-8.8	2.8-14
	50-251	1.9-9.3	2.9-15
	52-259	1.9-9.6	3.1-15

Flow rates: Marprene TM, Bioprene TM (USGPM)

	mm	**12**	**17**
		LoadSure	**LoadSure**
	8-76	0.08-0.7	0.12-1.2
	8-77	0.08-0.8	0.12-1.2
	8-83	0.08-0.8	0.12-1.3
	17-83	0.17-0.8	0.26-1.3
	47-237	0.46-2.3	0.73-3.7
	50-251	0.49-2.5	0.78-3.9
	52-259	0.51-2.5	0.81-4.0

Flow rates: Marprene TL, Bioprene TL (l/min)

	mm	**12**	**17**
		LoadSure	**LoadSure**
	8-76	0.30-2.8	0.54-5.1
	8-77	0.30-2.8	0.54-5.2
	8-83	0.30-3.1	0.54-5.6
	17-83	0.63-3.1	1.1-5.6
	47-237	1.7-8.8	3.2-16
	50-251	1.9-9.3	3.4-17
	52-259	1.9-9.6	3.5-17

Flow rates: Marprene TL, Bioprene TL (USGPM)

	mm	**12**	**17**
		LoadSure	**LoadSure**
	8-76	0.08-0.7	0.14-1.4
	8-77	0.08-0.8	0.14-1.4
	8-83	0.08-0.8	0.14-1.5
	17-83	0.17-0.8	0.30-1.5
	47-237	0.46-2.3	0.84-4.2
	50-251	0.49-2.5	0.89-4.5
	52-259	0.51-2.5	0.92-4.6

Flow rates: Silicone (l/min)

	mm	**12**	**17**
		LoadSure	**LoadSure**

	8-76	0.31-2.9	0.49-4.6
	8-77	0.31-3.0	0.49-4.7
	8-83	0.31-3.2	0.49-5.16
	17-83	0.66-3.2	1.0-5.1
	47-237	1.8-9.2	2.9-14
	50-251	1.9-9.7	3.0-15
	52-259	2.0-10	3.2-16

Flow rates: Silicone (USGPM)

	mm	**12**	**17**
		LoadSure	**LoadSure**
	8-76	0.08-0.8	0.13-1.2
	8-77	0.08-0.8	0.13-1.2
	8-83	0.08-0.8	0.13-1.3
	17-83	0.17-0.8	0.27-1.3
	47-237	0.48-2.4	0.76-3.8
	50-251	0.51-2.6	0.80-4.0
	52-259	0.53-2.6	0.84-4.2

Flow rates: Neoprene, STA-PURE (l/min)

	mm	**12**	**17**
		LoadSure	**LoadSure**
	8-76	0.32-3.0	0.58-5.5
	8-77	0.32-3.1	0.58-5.6
	8-83	0.32-3.3	0.58-6.0
	17-83	0.68-3.3	1.2-6.0
	47-237	1.9-9.4	3.4-17
	50-251	2.0-10	3.6-18
	52-259	2.1-10	3.8-19

Flow rates: Neoprene, STA-PURE (USGPM)

	mm	**12**	**17**
		LoadSure	**LoadSure**
	8-76	0.08-0.8	0.15-1.4
	8-77	0.08-0.8	0.15-1.5
	8-83	0.08-0.9	0.15-1.6
	17-83	0.18-0.9	0.32-1.6
	47-237	0.49-2.5	0.90-4.5
	50-251	0.53-2.6	0.95-4.8
	52-259	0.55-2.7	0.99-4.9

620RE4

Flow rates: Marprene TM, Bioprene TM (l/min)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.25-2.4	0.33-3.1
	8-77	0.25-2.4	0.33-3.2
	8-83	0.25-2.6	0.33-3.4
	17-83	0.54-2.6	0.70-3.4
	47-237	1.5-7.5	1.9-9.8
	50-251	1.6-7.9	2.1-10
	52-259	1.6-8.2	2.1-11

Flow rates: Marprene TM, Bioprene TM (USGPM)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.07-0.6	0.09-0.8
	8-77	0.07-0.6	0.09-0.8
	8-83	0.07-0.7	0.09-0.9
	17-83	0.14-0.7	0.19-0.9
	47-237	0.39-2.0	0.51-2.6
	50-251	0.42-2.1	0.54-2.7
	52-259	0.43-2.2	0.57-2.8

Flow rates: Marprene TL, Bioprene TL (l/min)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.25-2.4	0.38-3.6
	8-77	0.25-2.4	0.38-3.6
	8-83	0.25-2.6	0.38-3.9
	17-83	0.54-2.6	0.80-3.9
	47-237	1.5-7.5	2.2-11
	50-251	1.6-7.9	2.4-12
	52-259	1.6-8.2	2.4-12

Flow rates: Marprene TL, Bioprene TL (USGPM)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.07-0.6	0.10-0.9
	8-77	0.07-0.6	0.10-1.0
	8-83	0.07-0.7	0.10-1.0
	17-83	0.14-0.7	0.21-1.0
	47-237	0.39-2.0	0.58-2.9
	50-251	0.42-2.1	0.62-3.1
	52-259	0.43-2.2	0.65-3.2

Flow rates: Silicone (l/min)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.26-2.5	0.34-3.2
	8-77	0.26-2.5	0.34-3.3
	8-83	0.26-2.7	0.34-3.5
	17-83	0.56-2.7	0.72-3.5
	47-237	1.5-7.8	2.0-10
	50-251	1.6-8.3	2.1-11
	52-259	1.7-8.5	2.2-11

Flow rates: Silicone (USGPM)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.07-0.7	0.09-0.9
	8-77	0.07-0.7	0.09-0.9
	8-83	0.07-0.7	0.09-0.9
	17-83	0.15-0.7	0.19-0.9
	47-237	0.41-2.1	0.53-2.7
	50-251	0.43-2.2	0.56-2.8
	52-259	0.45-2.3	0.59-2.9

Flow rates: Neoprene, STA-PURE (l/min)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.27-2.6	0.40-3.8
	8-77	0.27-2.6	0.40-3.9
	8-83	0.27-2.8	0.40-4.2
	17-83	0.57-2.8	0.86-4.2
	47-237	1.6-8.0	2.4-12
	50-251	1.7-8.5	2.5-13
	52-259	1.8-8.8	2.6-13

Flow rates: Neoprene, STA-PURE (USGPM)

	mm	12	17
		LoadSure	LoadSure
	8-76	0.07-0.7	0.11-1.0
	8-77	0.07-0.7	0.11-1.0
	8-83	0.07-0.7	0.11-1.1
	17-83	0.15-0.7	0.23-1.1
	47-237	0.42-2.1	0.63-3.2
	50-251	0.45-2.2	0.67-3.3

52-259	0.46-2.3	0.69-3.5

620R product codes

mm	inch	#	Marprene	Bioprene	Peroxide silicone	Platinum silicone
6.4	**1/4**	**26**	902.0064.032	903.0064.032	910.0064.032	913.0064.032
9.6	**3/8**	**73**	902.0096.032	903.0096.032	910.0096.032	913.0096.032
12.7	**1/2**	**82**	902.0127.032	903.0127.032	910.0127.032	913.0127.032
15.9	**5/8**	**184**	902.0159.032	903.0159.032	910.0159.032	913.0159.032

mm	inch	#	STA-PURE	Neoprene	Butyl	Tygon
6.4	**1/4**	**26**	960.0064.032	920.0064.032	930.0064.032	950.0064.032
9.6	**3/8**	**73**	960.0096.032	920.0096.032	930.0096.032	950.0096.032
12.7	**1/2**	**82**	960.0127.032	920.0127.032	930.0127.032	950.0127.032
15.9	**5/8**	**184**	960.0159.032	920.0159.032	930.0159.032	950.0159.032

mm	inch	#	Fluorel	Gore fluoroelastomer /PTFE
6.4	**1/4**	**26**	970.0064.032	965.0064.032
9.6	**3/8**	**73**	970.0096.032	965.0096.032
12.7	**1/2**	**82**	970.0127.032	965.0127.032
15.9	**5/8**	**184**	970.0159.032	965.0159.032

620RE and 620RE4 LoadSure product codes

	12mm DIN 15	12mm Tri-clamp 3/4in	17mm DIN 15	17mm Tri-clamp 3/4in
STA-PURE	960.0120.PFD	960.0120.PFT	960.0170.PFD	960.0170.PFT
Gore fluoroelastomer /PTFE	965.0120.PFD	965.0120.PFT	965.0170.PFD	965.0170.PFT
Bioprene TM	903.M120.PFD	903.M120.PFT	903.M170.PFD	903.M170.PFT
Bioprene	903.0120.PFD	903.0120.PFT	903.0170.PFD	903.0170.PFT
Platinum silicone	913.0120.PFD	913.0120.PFT	913.0170.PFD	913.0170.PFT

	12mm Cam and Groove 3/4in	17mm Cam and Groove 3/4in
Marprene TM	902.M120.PPC	902.M170.PPC
Marprene	902.0120.PPC	902.0170.PPC
Peroxide silicone	910.0120.PPC	910.0170.PPC
Neoprene	920.0120.PPC	920.0170.PPC

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STA-PURE is a trademark of W L Gore & Associates.

The information contained in this document is believed to be correct but Watson-Marlow Limited accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

Patient-connected use: warning

Warning: These products are not designed for use in, and should not be used for patient connected applications.

Publication history

m-620r-gb-01.htm: Watson-Marlow 620R
First published 11 02.

Decontamination certificate

In compliance with the *UK Health and Safety at Work Act* and the *Control of Substances Hazardous to Health Regulations*, you are required to declare the substances which have been in contact with product(s) you return to Watson-Marlow or its subsidiaries or distributors. Failure to do so will cause delays. Please ensure that you fax us this form and receive an RGA (Returned Goods Authorisation) before you despatch the product(s). A copy of this form must be attached to the outside of the packaging containing the product(s). Please complete a separate decontamination certificate for each product.

You are responsible for cleaning and decontaminating the product(s) before return.

Your name		**Company**	
Address			
Postcode/zip		**Country**	
Telephone		**Fax**	
Product type		**Serial number**	
To speed the repair, please describe all known faults			

The product has ... ○ Been used ○ Not been used

If the product has been used, please complete all the following sections. If the product has not been used, please just sign this form.

Names of chemicals handled with product(s)	
Precautions to be taken in handling these chemicals	
Action to be taken in the event of human contact	

I understand that the personal data collected will be kept confidentially in accordance with the UK Data Protection Act 1998.

Signature		**RGA number**	
		Your position	
		Date	

Please print out, sign and fax to Watson-Marlow Pumps at +44 1326 376009.

WATSON MARLOW Pumps

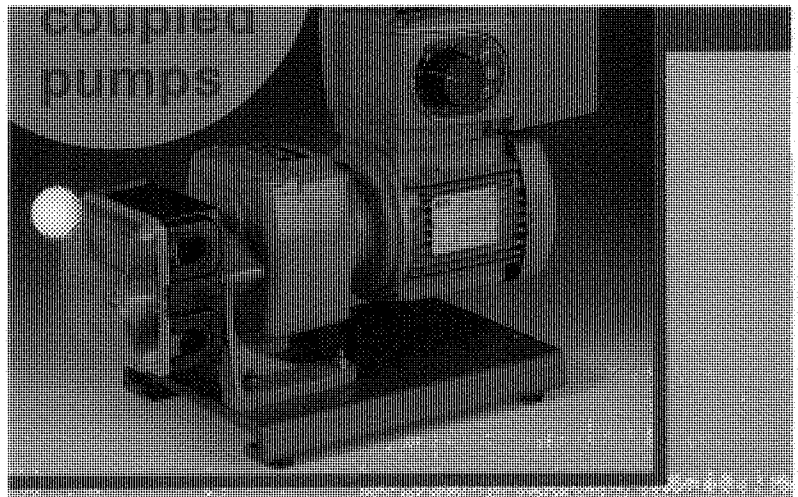
CLOSE-COUPLED PUMPS

NEW

Watson-Marlow. Innovation in Full Flow

- Fixed speed
- Variable speed
- Pneumatic models
- Continuous tubing
- LoadSure™ elements

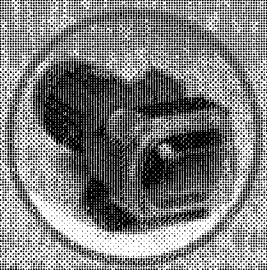
Coupled pumps



These pumps offer quality, rugged, reliable performance with all the pumphead features of coupled drives, including a range of tubing sizes and continuous tubing and LoadSure™ element options, but at the lowest possible whole life ownership cost.

Varmeca variable speed drives

Denoted in the product code by the letters VI, Varmeca drives bring 1001 speed control and constant torque to the 521 and 621 ranges. Controlled by a large speed knob and forward/reverse switching. No external control wiring is required. Analogue or digital remote control modes are available and there is a Profibus option. Single-phase models and three-phase models (an engineered product) are offered. Varmeca drives can be fitted with the full range of 520 and 620 pumpheads. Duplex coupled dispensing pumpheads, denoted by an X in the product code are available as an engineered product.

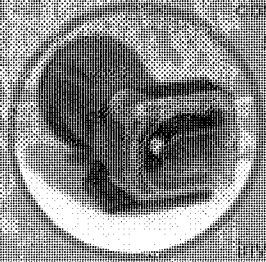


Fixed speed

Denoted by an F in product codes, three-phase fixed speed close coupled pumps are available in all three ranges. There is a choice of drive speed in single pumphead and duplex pumps.

Pneumatic variable speed

For installations where an air operated drive is preferred, Watson-Marlow pneumatic pumps are available, denoted by a P in their product codes. They typically offer 5:1 control ratio at a 7 bar air supply. An exhaust silencer is fitted, and water build-up is prevented by each cycle. A filtered and lubricated air supply is required. Pneumatic drives can be fitted with 520, 620 and 720 pumpheads. Duplex models are not available.

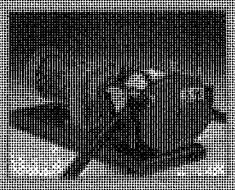


Inverter controlled models are available in all three ranges as are specially engineered variants and CE/ATEX pumps. Models with quick switching are available on 521 and 621 Varmeca and fixed speed drives.

Watson-Marlow...Innovation in Full Flow

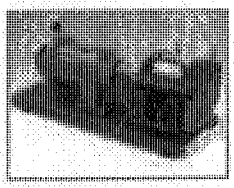
[hour duty] [warranty] 2-4,000 litre/hr

Drives



- Fixed speed: 45 rpm, 134 rpm, 232 rpm or 348 rpm. Other speeds on request
- IP55 protection
- Flow rates to 1656 litre/hour with a single pumphead
- Rugged, chemical and knock-resistant finish

1st choice



701PB

- High torque, reversible pneumatic motor
- Variable speed: 5:1 with suitable regulator; max 316 rpm
- Flow rates to 1800 litre/hour with a single pumphead
- A filtered and lubricated air supply is required
- ATEX II 2G (Zone 1) available on request

Pumpheads

any 701 drive can be coupled to an 701 pumphead

701R

- Flow rates to 2000 litre/hour at 360 rpm
- Continuous tubing in five bore sizes and six materials
- Rugged, tool-unlockable track
- Driven occlusion rollers for longer tube life

701RX

- Extension version of 701R for two-channel pumping
- Double the flow to 4,000 litre/hour

701RE

- Patented LoadSure™ tubing elements in four sizes and five materials
- Guaranteed tube loading: you can't get it wrong; improves tube life
- Industrial Cam and Groove connectors

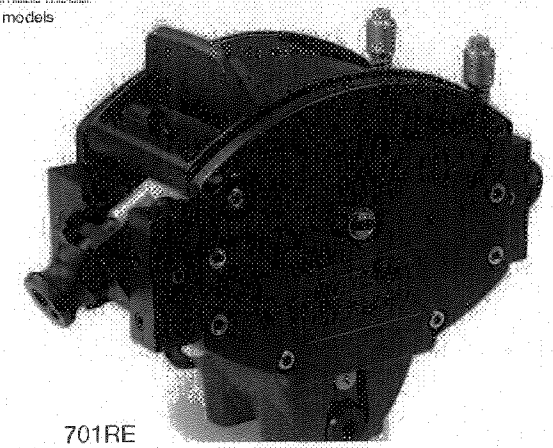
701REX

- Extension version of 701RE for two-channel pumping
- Double the flow to 4,000 litre/hour

701 pumpheads maximum flow rates, three-roller/four-roller, litre/hr

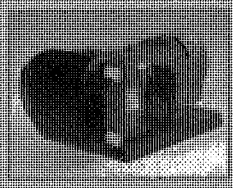
rpm	701R continuous tubing					701RE LoadSure™ elements				
	13 bore, 16 bore, 19 bore**		25 bore	36 bore		13 bore		19 bore	25 bore	
100	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
200	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
300	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
400	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
500	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
600	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
700	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
800	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
900	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800
1000	1200	1600	1800	1800	1800	1200	1600	1800	1800	1800

** Pneumatic model
* ATEX models



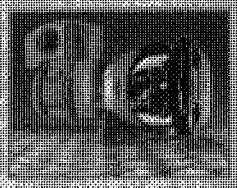
701RE

Drives



621F

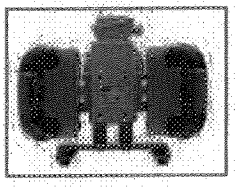
- Fixed speed: 77 rpm or 251 rpm
- IP55 protection
- Flow rates from 0.1 litre/min to 18 litre/min
- Rugged, chemical and knock-resistant finish



621VI

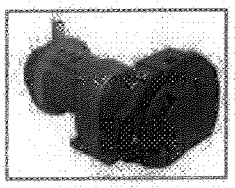
- Varmeca integral inverter offering 10:1 control ratio: 77 rpm, 146 rpm or 251 rpm maximum speeds
- Flow rates from 0.09 litre/min to 18 litre/min
- Manual stop/forward/reverse control and analogue or digital remote control. Profibus option

1st choice



621FX

- Duplex (twin channel) fixed speed: 69 rpm or 183 rpm
- IP55 protection
- Flow rates to 12.2 litre/min from each channel
- Twin pumpheads for balanced flow in two channels



621P

- High torque, reversible four-vane pneumatic motor
- Variable speed: 5:1 with suitable regulator, max 251 rpm
- Flow rates from 3.6 litre/min to 18.1 litre/min
- A filtered and lubricated air supply is required
- ATEX II 2G (Zone 1) available on request

Pumpheads

any 621 drive can be coupled to any 620 pumphead

620R

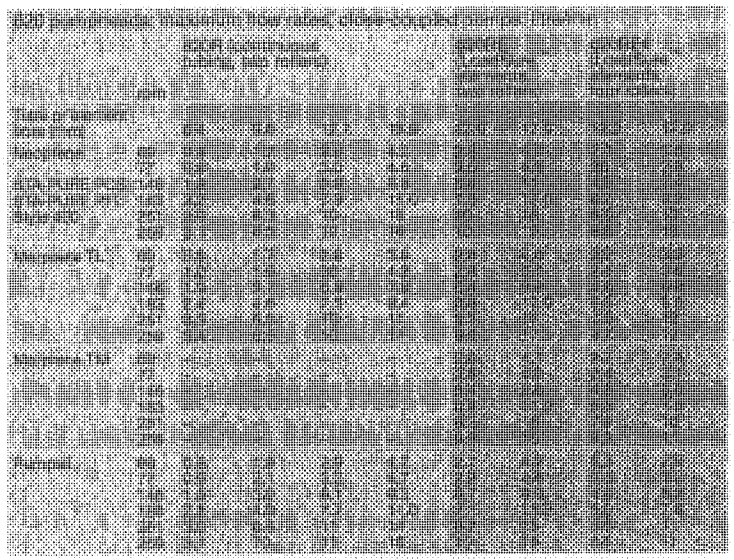
- Flow rates from 0.01 litre/min to 18.1 litre/min
- Pressures to 2 bar, or to 4 bar with STA-PURE PCS tubing
- Twin-roller pumphead for high flow
- Continuous tubing in four bore sizes and seven materials
- Rugged, tool-unlockable guard
- Stainless steel occlusion rollers and bearings
- Large swept volume for long tube life

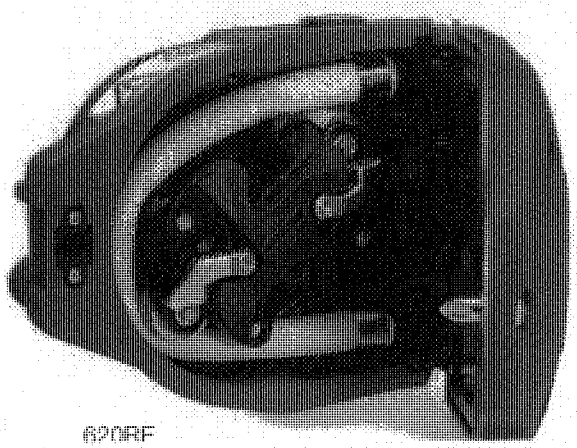
620RE

- Industrial Cam and Groove connectors
- Patented LoadSure™ tubing elements in two sizes and five materials
- Pressures to 2 bar, or to 4 bar with a Marprene, or STA-PURE PCS LoadSure™ element
- Increased wall thickness for enhanced pumping performance
- Guaranteed tube loading: you can't get it wrong; improves tube life

620RE4

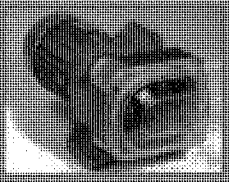
- Four-roller pumphead for reduced pulsation (LoadSure™ elements only)





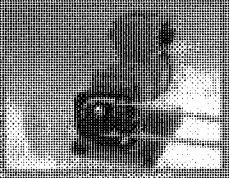
620RF

Drives



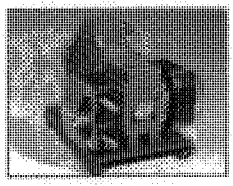
521F

- Fixed speed: 60 rpm, 210 rpm or 291 rpm
- IP66 protection
- Flow rates from 2.5 ml/min to 4600 ml/min
- Rugged, chemical and knock-resistant finish



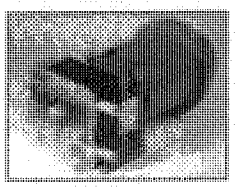
521VI

- Electrical integral inverter offering 10:1 speed ratio: 60 rpm, 1200 rpm or 2716 rpm maximum speeds
- Drive forward/reverse control and analogue or digital remote control



521FX

- Duplex (twin channel) fixed speed: 55 rpm or 183 rpm
- Flow rates to 860 ml/min from each channel
- Twin 520R2C pumpheads for balanced flow in two channels



521P

- High torque, reversible four-vane pneumatic motor
- Variable speed: 5:1, max 257 rpm
- Flow rates from 11 ml/min to 4100 ml/min
- A filtered, lubricated air supply is required
- ATEX II 2G (Zone 1) available on request

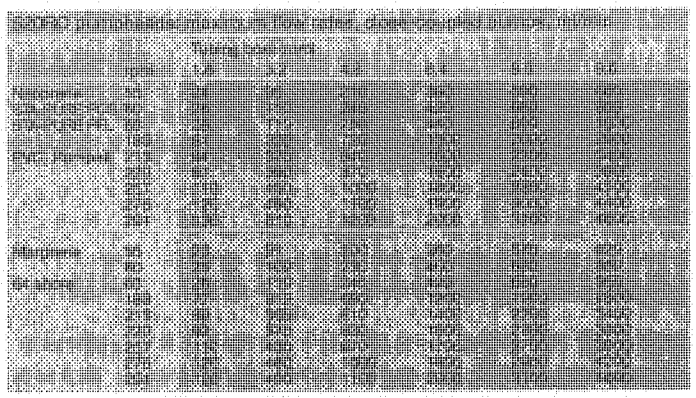
Pumpheads

any 521 drive can be coupled to any 520 pumphead

Continuous tubing models

520R2C

- Flow rates up to 4600 ml/min at 2 bar
- Continuous tubing in six bore sizes and seven materials
- Clutched rotor for rapid, effortless tube loading
- Rugged, tool-unlockable guard
- Polyphenylene sulphide track to resist chemical attack
- Stainless steel occlusion rollers and bearings
- Large swept volume for long tube life



LoadSure™ element models

520REHC

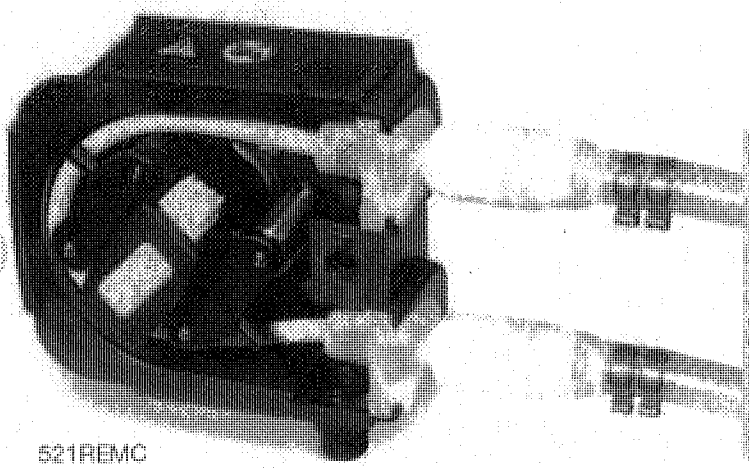
- As 520R2C construction
- Flow rates up to 560 ml/min at **7 bar** constant pressure
- Push-fit industrial connectors
- Patented LoadSure™ tubing elements in three materials

520REMC

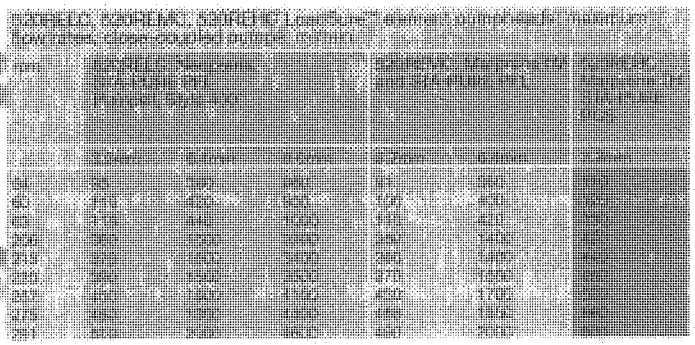
- As 520R2C construction
- Flow rates up to 1900 ml/min at **4 bar** peak pressure
- Patented LoadSure™ tubing elements in two sizes and four materials

520RELC

- As 520R2C construction
- Flow rates up to 4600 ml/min at **2 bar** peak pressure
- Patented LoadSure™ tubing elements in three sizes and six materials

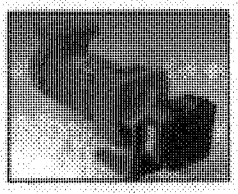


521REMC



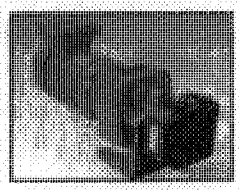
EU Directive 94/9/EC, commonly known as the ATEX directive, carries obligations to the person who places equipment on the market in EU territory for use in potentially explosive environments. All of Watson-Marlow's ATEX pumps have been rated as Group II, Category 2 equipment, intended for use in gas-based environments only. ATEX pumps are available in 521, 621 and 701 ranges.

501DF/RLA



- Flow rates to 1800 ml/min
- Fixed speed: 62 rpm, 223 rpm or 281 rpm
- ATEX II 2G (Zone 1) 0.18kW 3-phase 50Hz industrial drive
- 501RLA pumphead: pressures to 2 bar, (1 bar with 6.4mm and 8.0mm tubing) 1.6mm wall continuous tubing in seven bore sizes
- IP55 protection

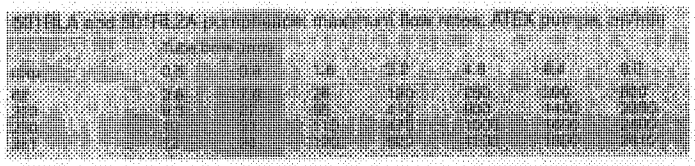
501DF/RL2A



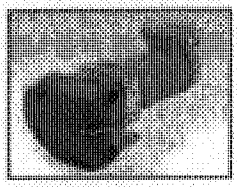
- 501RL2A pumphead: for higher pressures using STA-PURE PCS. 2.4mm wall tubing in six bore sizes for enhanced pumping performance

501DV/RL2A

- Flow rates from 0.29 ml/min to 1600 ml/min
- Variable speed ball drive variator: 7 rpm – 250 rpm
- ATEX II 2G (Zone 1) 0.25kW 230/400V 3-phase 50Hz industrial drive
- 501RL2A pumphead: for higher pressures using STA-PURE PCS or STA-PURE PFL. 2.4mm wall continuous tubing in six bore sizes for enhanced pumping performance
- IP55 protection



621DF/RA and 621DF/REA



- Flow rates from to 18 litre/min
- Fixed speed: 77 rpm or 251 rpm
- ATEX II 2G 0.37kW 3-phase 50Hz industrial motor/gearbox
- Pressures to 2 bar
- 621DF/RA twin-roller pumps for continuous tubing
- 621DF/REA twin-roller pumps for LoadSure™ elements
- For pressures to 4 bar, use a 621REA pumphead with a Marprene or STA-PURE PCS element, or a 620RA pumphead with STA-PURE PCS tubing

621DF/RE4A

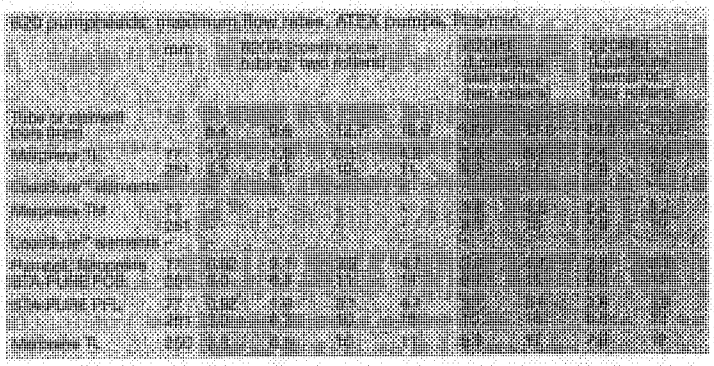
- Four rollers for reduced pulsation
- IP55 protection

621DV/RA

- Flow rates from 0.5 litre/min to 18 litre/min
- Variable speed ball drive variator: 7 rpm – 250 rpm
- ATEX II 2G (Zone 1) 0.25kW 6-pole 230/400V 3-phase 50Hz TEFC electric motor
- Pressures to 2 bar, 3.2mm wall continuous tubing in four bore sizes
- IP55 protection, 24 hour duty rated
- Two year full warranty

621DV/REA

- Pressures to 4 bar, LoadSure™ tubing elements in two bore sizes



701DFB/RA

- Flow rates to 2,000 litre/hour
- Fixed speed: 112 rpm or 360 rpm
- Three-phase ATEX II 2G (Zone 1) motor
- Continuous tubing in five sizes and six materials

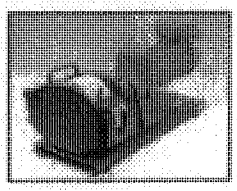
701DFB/REA

- As 701DFB/RA
- LoadSure™ tubing elements in four sizes and five materials

701DFB/RA/RXA and 701DFB/REA/REXA

- As 701DFB/RA
- Extension pumpheads for 701DFB drive to double the flow rates

701DVB/R and 701DVB/RE



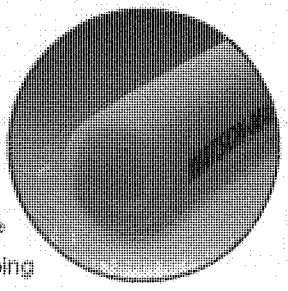
- LoadSure™ tubing elements in four sizes and five materials
- Variable speed ball variator: 7-350 rpm

720 pumpheads, flow ranges, ATEX pumps, litre/hr

rpm	701R continuous tubing					701RE LoadSure™ elements			
	9.6mm	12.7mm	15.0mm	19mm	25.4mm	12.7mm	15.9mm	19mm	25.4mm
112	130	240	340	470	620	240	340	470	620
360	420	780	1100	1500	2000	780	1100	1500	2000

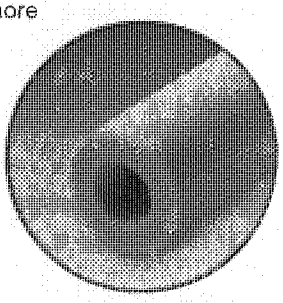
Choosing the PERFECT tube for all of your applications

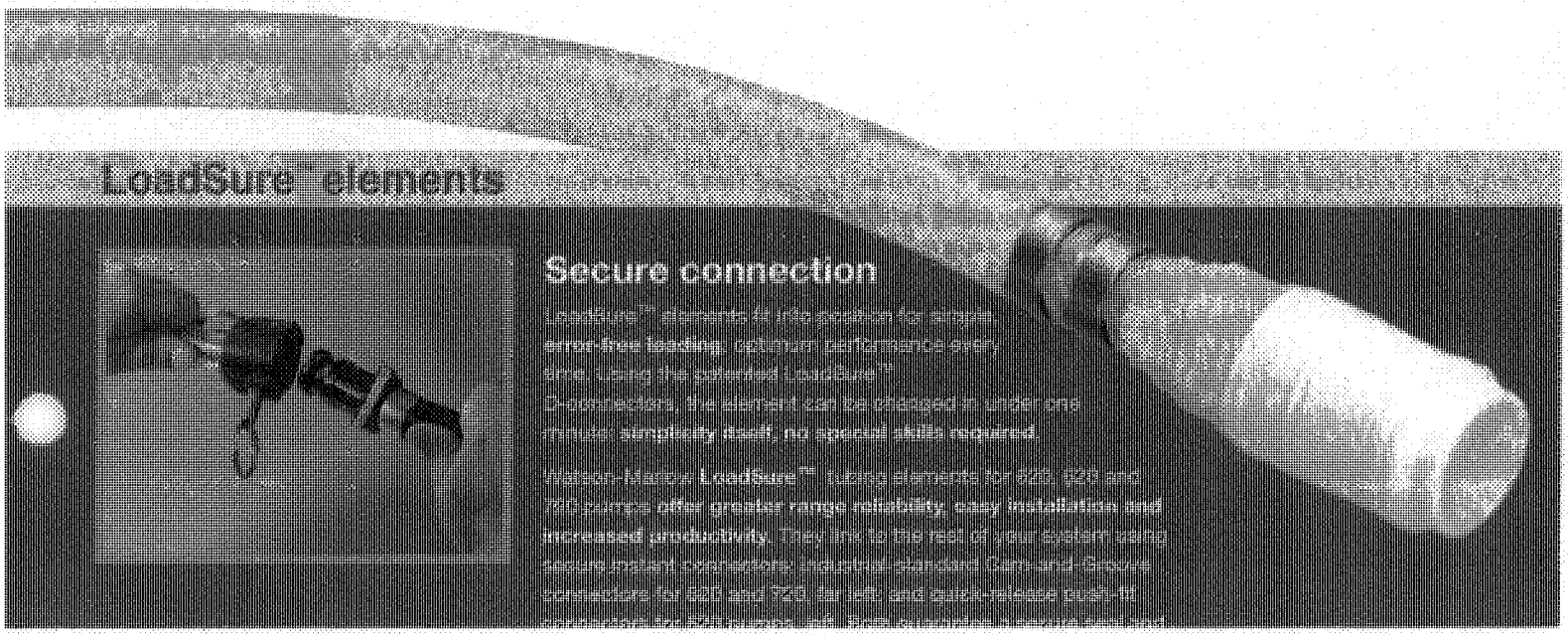
Watson-Marlow is the only peristaltic pump manufacturer in the world to manufacture its own tubing, optimising our tubing tolerances and formulation to deliver the best process pump performance. In a peristaltic pump, the tubing largely dictates pump and system performance: Its restitution creates suction, its strength resists pressure, its flex resistance determines pumping life, its bore defines the flow rate, its wall thickness controls pumping efficiency and its purity protects your product from contamination. Watson-Marlow offers tubing in eight materials and over 40 sizes, giving an extraordinary range of chemical and application capability.



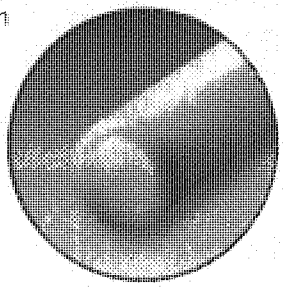
Marprene is our high-performance general-purpose tube. This thermoplastic elastomer provides chemical compatibility, long pumping life and pressure handling. Marprene® is ideal for general-purpose pumping or food handling and is highly resistant to oxidising agents such as ozone, peroxides and sodium hypochlorite. Meets FDA requirements 21 CFR 177.2600 and USDA standards for food handling. Working temperature range 5C to 80C. Autoclavable.

GORE High Resilience Tubing Style 400 is an expanded PTFE and Viton fluoroelastomer and enables the benefits of peristaltic pumps to be introduced to a wide range of applications for pumping concentrated acids like sulphuric and nitric acid, as well as aromatic hydrocarbons like toluene and xylene. Style 400 tubing offers tube life more than 50 times that of extruded Viton or Fluorel tube and can be used for pumping up to 4 bar. The elastomer used in this tubing is Viton GF-600S, a peroxide-cured fluoroelastomer based on DuPont's advanced polymer architecture.



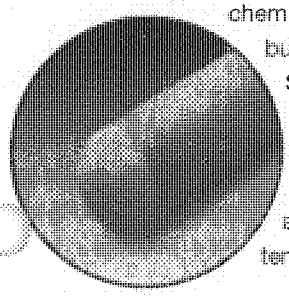


GORE STA-PURE PCS® has a unique composite construction of silicone in a ePTFE lattice giving it superior burst resistance up to 7 bar (100psi) and 18 times longer life than silicone tubing.



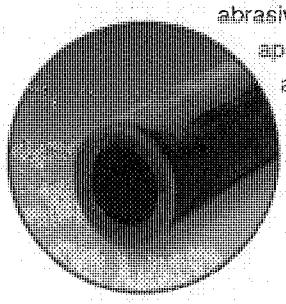
It produces virtually no spalling, is USP Class VI approved and is classified as non-toxic. Working temperature range -20C to 80C. Opaque white. Autoclavable, SIP and CIP compatible.

GORE STA-PURE PFL® is effectively pumpable PTFE – a high performance composite of ePTFE and a high-grade fluoroelastomer – offering extraordinary chemical resistance, long life and very high burst pressures.

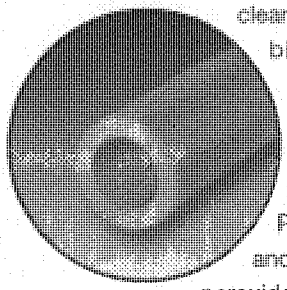


STA-PURE PFL is USP Class VI and food grade approved, making it suitable for foods and pharmaceuticals as well as aggressive chemicals. Working temperature range -20C to 80C.

Neoprene offers excellent performance with abrasive slurries and sustained pressure applications. Good suction and pressure capabilities. Working temperature range 0C to 80C. Black.



Pumpsil platinum-cured silicone tubing is manufactured by Watson-Marlow in our own silicone-dedicated ISO1644-1 class 7 (class J/10,000) cleanroom. Developed specifically for biopharmaceutical application, Pumpsil carries full biopharmaceutical certification USP Class VI and ISO10993 and complies with FDA 21CFR177.2600 for food contact.



Pumpsil is entirely free of 2,4 DCBA and other leachables associated with peroxide-cured silicone and is post-cured to remove linear and cyclic siloxanes, cytotoxic materials which can leach out of other manufacturers' non-post-cured platinum-cured tubing. Pumpsil® has an ultra-smooth bore to control protein binding and bacterial growth, making it ideal for production applications where there is long-term contact with the process fluid. Our LaserTraceability™ provides an ink-free, indelibly etched record of part number, lot number and use-by date right on the tubing. This means that lot traceability is carried through from box to bag to the tube itself. Working temperature range: -20C to 80C. Translucent. Autoclavable.

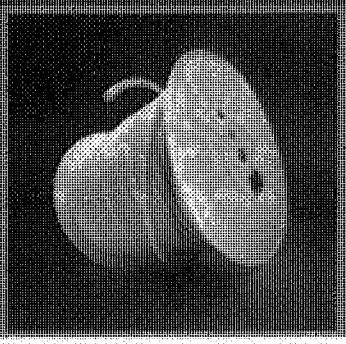
Bulk supply

Pipework and accessories

A range of interface products is available for our LabSure™ element pumps with industrial valves or flow control connectors. Leak detection devices are also available for most of our pump ranges.

Make reel savings

Many of our tubes are available in bulk as well as in the standard shorter lengths – up to 15m at a time, depending on the bore size. Bulk supply gives important benefits in convenience, and huge cost savings. Bulk tube per metre is less than the metre price for pre-cut lengths of the same tube. Further discounts are available on orders for multiple reels. Ask for our price list for the tube materials of your choice.



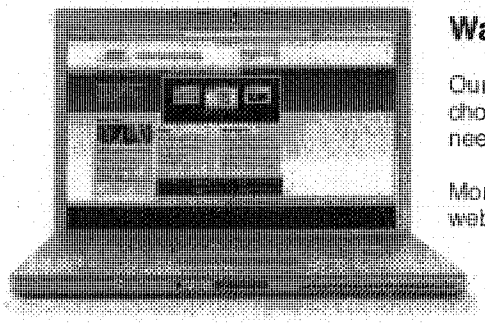
WATSON MARLOW

Watson-Marlow Pumps Group

Watson-Marlow Pumps Group has five world-class factories supported by direct sales operations in 20 countries and distributors in more than 50 countries. For contact details visit our website:

www.wmpg.com

Watson-Marlow *Bredel* *Alitea* *Flexicon* *MasoSine*



Watson-Marlow online

Our engineers around the world can help you choose the perfect pump and tubing for your needs.

More information? Our brochures are on our website - www.wmpg.com

Printed on recycled paper

Watson-Marlow...Innovation in Full Flow

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The information in this document is believed to be correct, but Watson-Marlow

WATSON MARLOW Pumps

CLOSE-COUPLED PUMPS

NEW

Watson-Marlow...Innovation in Full Flow

- Fixed speed
- Variable speed
- Pneumatic models
- Continuous tubing
- LoadSure™ elements

Close-coupled pumps

These pumps offer quality, rugged, industrial pumping, with all the pumphead features of cased drives, including a range of tubing sizes and continuous tubing and LoadSure™ element options, but at the lowest possible whole-life ownership cost.

Varmeca variable speed drives

Denoted in the product code by the letters VI, Varmeca drives bring 10:1 speed control and constant torque to the 521 and 621 ranges. Control is by a large speed knob and forward/reverse switching. No external control wiring is required. Analogue or digital remote control models are available, and there is a Profibus option. Single-phase models and three-phase models (as engineered products) are offered. Varmeca drives can be fitted with the full range of 520 and 620 pumpheads. Duplex models (two pumpheads, indicated by an X in the product code) are available as engineered products.

Fixed speed

Denoted by an F in product codes, three-phase fixed speed close-coupled pumps are available in all three ranges. There is a choice of drive speed in single pumphead and duplex pumps.

Pneumatic variable speed

For installations where an air-operated drive is preferred, Watson-Marlow pneumatic pumps are available, denoted by a P in their product codes. They typically offer 5:1 control ratio at a 7 bar air supply. An exhaust silencer is fitted, and static build-up is prevented by earth bonding. A filtered and lubricated air supply is required. Pneumatic drives can be fitted with 520, 620 and 720 pumpheads. Duplex models are not available.

Inverter-controlled models are available in all three ranges, as are specially engineered variants and OEM pumps. Models with guard switching are available on 521 and 621 Varmeca and fixed speed drives.

Watson-Marlow...Innovation in Full Flow

24 hour duty

2 warranty

701 options

2-4,000 litre/hr

Drives

701FB

- Fixed speed: 45 rpm, 134 rpm, 232 rpm or 348 rpm. Other speeds on request
- IP55 protection
- Flow rates to 1900 litre/hour with a single pumphead
- Rugged, chemical and knock-resistant finish

1st choice

701PB

- High torque, reversible pneumatic motor
- Variable speed: 5:1 with suitable regulator; max 316 rpm
- Flow rates to 1800 litre/hour with a single pumphead
- A filtered and lubricated air supply is required
- ATEX II 2G (Zone 1) available on request

Pumpheads

any 701 drive can be coupled to any 701 pumphead

701R

- Flow rates to 2000 litre/hour at 360 rpm
- Continuous tubing in five bore sizes and six materials
- Rugged, tool-unlockable track
- Driven occlusion rollers for longer tube life

701RX

- Extension version of 701R for two-channel pumping
- Double the flow to 4,000 litre/hour

701RE

- Patented LoadSure™ tubing elements in four sizes and five materials
- Guaranteed tube loading: you can't get it wrong; improves tube life
- Industrial Cam and Groove connectors

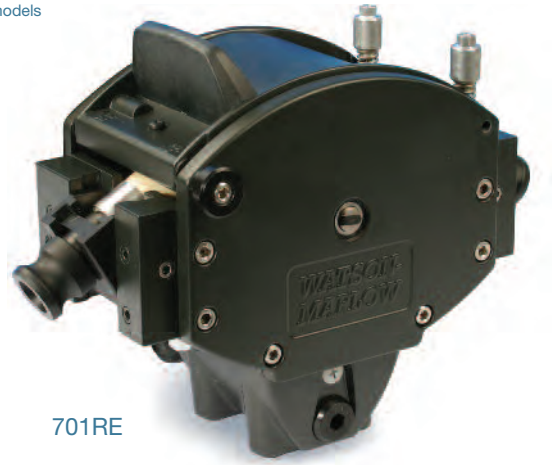
701REX

- Extension version of 701RE for two-channel pumping
- Double the flow to 4,000 litre/hour

701 pumpheads: maximum flow rates, close-coupled pumps, litre/hr

rpm	701R continuous tubing					701RE LoadSure™ elements			
	9.6mm	12.7mm	15.9mm	19mm	25.4mm	12.7mm	15.9mm	19mm	25.4mm
45	53	97	140	190	250	97	140	190	250
112*	130	240	340	470	620	240	340	470	620
134	160	290	400	560	750	290	400	560	750
232	270	500	700	970	1300	500	700	970	1300
316**	370	680	950	1300	1800	680	950	1300	1800
348	410	750	1000	1500	1900	750	1000	1500	1900
360*	420	780	1100	1500	2000	780	1100	1500	2000

** Pneumatic model
* ATEX models



701RE

621 options

0.01-18 litre/min

Drives

- **Fixed speed: 77 rpm or 251 rpm**
- **IP55 protection**
- **Flow rates from 0.1 litre/min to 18 litre/min**
- **Rugged, chemical and knock-resistant finish**

621F

- **Varmeca integral inverter offering 10:1 control ratio: 77 rpm, 146 rpm or 261 rpm maximum speeds**
- **Flow rates from 0.09 litre/min to 19 litre/min**
- **Manual stop/forward/reverse control and analogue or digital remote control. Profibus option**

621VI

1st choice

- Duplex (twin channel) fixed speed: 69 rpm or 183 rpm
- IP55 protection
- Flow rates to 12.2 litre/min from each channel
- Twin pumpheads for balanced flow in two channels

621FX

- High torque, reversible four-vane pneumatic motor
- Variable speed: 5:1 with suitable regulator, max 251 rpm
- Flow rates from 3.6 litre/min to 18.1 litre/min
- A filtered and lubricated air supply is required
- ATEX II 2G (Zone 1) available on request

621P

Pumpheads

any 621 drive can be coupled to any 620 pumphead

620R

- Flow rates from 0.01 litre/min to 18.1 litre/min
- Pressures to 2 bar, or to 4 bar with STA-PURE PCS tubing
- Twin-roller pumphead for high flow
- Continuous tubing in four bore sizes and seven materials
- Rugged, tool-unlockable guard
- Stainless steel occlusion rollers and bearings
- Large swept volume for long tube life

620RE

- Industrial Cam and Groove connectors
- Patented LoadSure™ tubing elements in two sizes and five materials
- Pressures to 2 bar, or to 4 bar with a Marprene, or STA-PURE PCS LoadSure™ element
- Increased wall thickness for enhanced pumping performance
- Guaranteed tube loading: you can't get it wrong; improves tube life

620RE4

- Four-roller pumphead for reduced pulsation (LoadSure™ elements only)

620 pumpheads: maximum flow rates, close-coupled pumps, litre/min

	rpm	620R (continuous tubing, two rollers)				620RE (LoadSure™ elements, two rollers)		620RE4 (LoadSure™ elements, four rollers)	
Tube or element bore (mm)		6.4	9.6	12.7	15.9	12.0	17.0	12.0	17.0
Neoprene	69	0.8	1.7	2.8	4.2	2.8	5.0	2.3	3.5
	77	0.9	1.9	3.0	4.6	3.0	5.5	26	3.8
STA-PURE PCS	146	1.8	3.7	5.8	8.9	5.8	11	4.9	7.4
STA-PURE PFL	183	2.2	4.6	7.3	11.0	7.3	13.0	6.2	9.2
Style 400	251	3.0	6.3	10	15	10	18	8.5	13
	259	3.1	6.5	10	16	10	19	8.8	13
Marprene TL	69	0.9	1.7	2.8	3.8	2.6	4.6	2.2	3.3
	77	1.0	1.9	30	4.2	2.8	5.1	2.4	3.6
	146	1.9	3.7	5.8	7.8	5.4	9.8	4.6	6.9
	183	2.4	4.6	7.3	9.4	6.8	12.0	5.8	8.6
	251	3.3	6.3	10	11	9.3	17	7.9	12
	259	3.4	6.5	10	11	9.6	17	8.2	12
Marprene TM	69	–	–	–	–	2.6	4.1	2.2	2.8
	77	–	–	–	–	2.8	4.5	2.4	3.1
	146	–	–	–	–	5.4	8.6	4.6	6.0
	183	–	–	–	–	6.8	11.0	5.8	7.5
	251	–	–	–	–	9.3	15	7.9	10
	259	–	–	–	–	9.6	15	8.2	11
Pumpsil	69	0.8	1.9	2.9	4.2	2.7	4.2	2.3	2.9
	77	0.9	2.1	3.2	4.7	2.9	4.6	2.5	3.2
	146	1.8	3.9	6.1	9.3	5.7	8.9	4.8	6.2
	183	2.2	4.9	7.7	11.0	7.1	11.0	6.0	7.8
	251	3.0	6.8	11	14	9.7	15	8.3	11
	259	3.1	70	11	15	10	16	8.5	11

620RE

521 options

2.5-4600 ml/min

Drives

- **Fixed speed: 60 rpm, 213 rpm or 291 rpm**
- **IP55 protection**
- **Flow rates from 2.5 ml/min to 4600 ml/min**
- **Rugged, chemical and knock-resistant finish**

521F

- **Varmeca integral inverter offering 10:1 control ratio: 63 rpm, 220 rpm or 275 rpm maximum speeds**
- **Stop/forward/reverse control and analogue or digital remote control**

521VI

1st choice

- Duplex (twin channel) fixed speed: 55 rpm or 183 rpm
- Flow rates to 860 ml/min from each channel
- Twin 520R2C pumpheads for balanced flow in two channels

521FX

- High torque, reversible four-vane pneumatic motor
- Variable speed: 5:1, max 257 rpm
- Flow rates from 11 ml/min to 4100 ml/min
- A filtered, lubricated air supply is required
- ATEX II 2G (Zone 1) available on request

521P

521REMC

Pumpheads

any 521 drive can be coupled to any 520 pumphead

Continuous tubing models

520R2C

- Flow rates up to 4600 ml/min at 2 bar
- Continuous tubing in six bore sizes and seven materials
- Clutched rotor for rapid, effortless tube loading
- Rugged, tool-unlockable guard
- Polyphenylene sulphide track to resist chemical attack
- Stainless steel occlusion rollers and bearings
- Large swept volume for long tube life

520RC pumpheads: maximum flow rates, close-coupled pumps, ml/min

		Tubing bore (mm)					
	rpm	1.6	3.2	4.8	6.4	8.0	9.6
Neoprene	55	24	95	210	380	590	860
STA-PURE PCS	60	26	110	240	420	660	950
STA-PURE PFL	63	28	110	250	440	690	1000
	183	81	320	720	1300	2000	2900
PVC, Pumpsil	213	94	370	840	1500	2300	3400
	220	97	390	870	1500	2400	3500
	257	110	450	1000	1800	2800	4100
	275	120	480	1100	1900	3000	4400
	291	130	510	1200	2000	3200	4600
Marprene	55	23	91	200	360	570	820
	60	25	100	230	400	630	950
64 shore	63	26	110	240	420	660	950
	183	77	310	690	1200	1900	2800
	213	89	360	810	1400	2200	3400
	220	92	370	830	1500	2300	3300
	257	110	430	970	1700	2700	3900
	275	120	460	1000	1800	2900	4200
	291	120	490	1100	2000	3100	4600

LoadSure™ element models

520REHC

- As 520R2C construction
- Flow rates up to 560 ml/min at **7 bar** constant pressure
- Push-fit industrial connectors
- Patented LoadSure™ tubing elements in three materials

520REMC

- As 520R2C construction
- Flow rates up to 1900 ml/min at **4 bar** peak pressure
- Patented LoadSure™ tubing elements in two sizes and four materials

520RELC

- As 520R2C construction
- Flow rates up to 4600 ml/min at **2 bar** peak pressure
- Patented LoadSure™ tubing elements in three sizes and six materials

520RELC, 520REMC, 520REHC LoadSure™ element pumpheads: maximum flow rates, close-coupled pumps, ml/min

rpm	520RELC: Neoprene, STA-PURE PFL Pumpsil, Style 400			520REMC: Marprene TM and STA-PURE PFL		520REHC: Marprene TH STA-PURE PCS
	3.2mm	6.4mm	9.6mm	3.2mm	6.4mm	3.2mm
54	95	380	860	91	360	110
60	110	420	950	100	400	120
63	110	440	1000	110	420	130
206	360	1500	3300	350	1400	420
213	370	1500	3400	360	1400	440
220	390	1500	3500	370	1500	450
257	450	1800	4100	430	1700	530
275	480	1900	4400	460	1800	560
291	510	2000	4600	490	2000	600

ATEX

EU Directive 94/9/EC, commonly known as the ATEX directive, carries obligations to the person who places equipment on the market in EU territory for use in potentially explosive environments. All of Watson-Marlow's ATEX pumps have been rated as Group II, Category 2 equipment, intended for use in gas-based environments only. ATEX pumps are available in 521, 621 and 701 ranges.

501DF/RLA

- Flow rates to 1800 ml/min
- Fixed speed: 62 rpm, 223 rpm or 281 rpm
- ATEX II 2G (Zone 1) 0.18kW 3-phase 50Hz industrial drive
- 501RLA pumphead: pressures to 2 bar, (1 bar with 6.4mm and 8.0mm tubing) 1.6mm wall continuous tubing in seven bore sizes
- IP55 protection

501DF/RL2A

- 501RL2A pumphead: for higher pressures using STA-PURE PCS. 2.4mm wall tubing in six bore sizes for enhanced pumping performance

501DV/RL2A

- Flow rates from 0.29 ml/min to 1600 ml/min
- Variable speed ball drive variator: 7 rpm – 250 rpm
- ATEX II 2G (Zone 1) 0.25kW 230/400V 3-phase 50Hz industrial drive
- 501RL2A pumphead: for higher pressures using STA-PURE PCS or STA-PURE PFL. 2.4mm wall continuous tubing in six bore sizes for enhanced pumping performance
- IP55 protection

501RLA and 501RL2A pumpheads: maximum flow rates, ATEX pumps, ml/min

	Tube bore (mm)						
rpm	0.5	0.8	1.6	3.2	4.8	6.4	8.0
62	2.6	7.6	26	120	250	390	620
223	9.3	27	95	410	900	1400	2230
250	10	31	110	470	1000	1600	2500
281	12	34	120	520	1100	1800	2810

621DF/RA and 621DF/REA

- Flow rates from to 18 litre/min
- Fixed speed: 77 rpm or 251 rpm
- ATEX II 2G 0.37kW 3-phase 50Hz industrial motor/gearbox
- Pressures to 2 bar
- 621DF/RA twin-roller pumps for continuous tubing
- 621DF/REA twin-roller pumps for LoadSure™ elements
- For pressures to 4 bar, use a 621REA pumphead with a Marprene or STA-PURE PCS element, or a 620RA pumphead with STA-PURE PCS tubing

621DF/RE4A

- Four rollers for reduced pulsation
- IP55 protection

621DV/RA

- Flow rates from 0.5 litre/min to 18 litre/min
- Variable speed ball drive variator: 7 rpm – 250 rpm
- ATEX II 2G (Zone 1) 0.25kW 6-pole 230/400V 3-phase 50Hz TEFC electric motor
- Pressures to 2 bar, 3.2mm wall continuous tubing in four bore sizes
- IP55 protection, 24 hour duty rated
- Two year full warranty

621DV/REA

- Pressures to 4 bar, LoadSure™ tubing elements in two bore sizes

620 pumpheads: maximum flow rates, ATEX pumps, litre/min

	rpm	620R (continuous tubing, two rollers)				620RE (LoadSure™ elements, two rollers)		620RE4 (LoadSure™ elements, four rollers)	
Tube or element bore (mm)		6.4	9.6	12.7	15.9	12.0	17.0	12.0	17.0
Marprene TL	77	1.0	1.9	3.1	4.2	2.8	5.2	2.4	3.6
	251	3.3	6.3	10	11	9.3	17	7.9	12
LoadSure™ elements	–	–	–	–	–	–	–	–	–
Marprene TM	77	–	–	–	–	2.8	4.5	2.4	3.2
	251	–	–	–	–	9.3	15	7.9	10
LoadSure™ elements	–	–	–	–	–	–	–	–	–
Pumpsil, Neoprene STA-PURE PCS	77	0.92	2.1	3.2	4.7	3.0	4.7	2.5	3.3
	251	3.0	6.8	11	14	9.7	15	8.3	11
STA-PURE PFL	77	0.92	1.9	3.1	4.7	3.1	5.6	2.6	3.9
	251	3.0	6.3	10	15	10	18	8.5	13
Marprene TL	250	3.3	6.3	10	11	9.3	17	7.9	12

701DFB/RA

- Flow rates to 2,000 litre/hour
- Fixed speed: 112 rpm or 360 rpm
- Three-phase ATEX II 2G (Zone 1) motor
- Continuous tubing in five sizes and six materials

701DFB/REA

- As 701DFB/RA
- LoadSure™ tubing elements in four sizes and five materials

701DFB/RA/RXA and 701DFB/REA/REXA

- As 701DFB/RA
- Extension pumpheads for 701DFB drive to double the flow rates

701DVB/R and 701DVB/RE

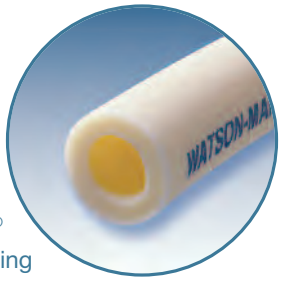
- LoadSure™ tubing elements in four sizes and five materials
- Variable speed ball variator: 7-350 rpm

720 pumpheads: flow ranges, ATEX pumps, litre/hr

rpm	701R continuous tubing					701RE LoadSure™ elements			
	9.6mm	12.7mm	15.9mm	19mm	25.4mm	12.7mm	15.9mm	19mm	25.4mm
112	130	240	340	470	620	240	340	470	820
360	420	780	1100	1500	2000	780	1000	1500	2000

Choosing the PERFECT tube for all of your applications

Watson-Marlow is the only peristaltic pump manufacturer in the world to manufacture its own tubing, optimising our tubing tolerances and formulation to deliver the best process pump performance. In a peristaltic pump, the tubing largely dictates pump and system performance: Its restitution creates suction, its strength resists pressure, its flex resistance determines pumping life, its bore defines the flow rate, its wall thickness controls pumping efficiency and its purity protects your product from contamination. Watson-Marlow offers tubing in eight materials and over 40 sizes, giving an extraordinary range of chemical and application capability.



Marprene is our high-performance general-purpose tube. This thermoplastic elastomer provides chemical compatibility, long pumping life and pressure handling. Marprene® is ideal for general-purpose pumping or food handling and is highly resistant to oxidising agents such as ozone, peroxides and sodium hypochlorite. Meets FDA requirements 21 CFR 177.2600 and USDA standards for food handling. Working temperature range 5C to 80C. Autoclavable.

GORE High Resilience Tubing Style 400 is an expanded PTFE and Viton fluoroelastomer and enables the benefits of peristaltic pumps to be introduced to a wide range of applications for pumping concentrated acids like sulphuric and nitric acid, as well as aromatic hydrocarbons like toluene and xylene. Style 400 tubing offers tube life more than 50 times that of extruded Viton or Fluorel tube and can be used for pumping up to 4 bar. The elastomer used in this tubing is Viton GF-600S, a peroxide-cured fluoroelastomer based on DuPont's advanced polymer architecture.

LoadSure™ elements

Secure connection

LoadSure™ elements fit into position for simple, **error-free loading**: optimum performance every time. Using the patented LoadSure™ D-connectors, the element can be changed in under one minute: **simplicity itself, no special skills required.**

Watson-Marlow **LoadSure™** tubing elements for 520, 620 and 720 pumps **offer greater range reliability, easy installation and increased productivity.** They link to the rest of your system using secure instant connectors: industrial-standard Cam-and-Groove connectors for 620 and 720, far left; and quick-release push-fit connectors for 520 pumps, left. Both guarantee a secure seal and immediate release when required.

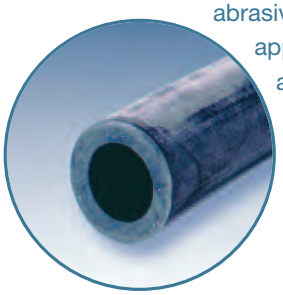
GORE STA-PURE PCS® has a unique composite construction of silicone in a ePTFE lattice giving it superior burst resistance up to 7 bar (100psi) and 18 times longer life than silicone tubing.

It produces virtually no spalling, is USP Class VI approved and is classified as non-toxic. Working temperature range -20C to 80C. Opaque white. Autoclavable, SIP and CIP compatible.

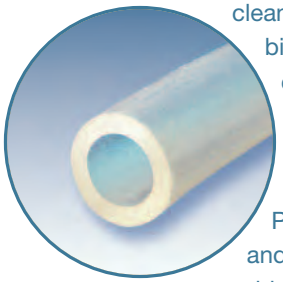
GORE STA-PURE PFL® is effectively pumpable PTFE – a high performance composite of ePTFE and a high-grade fluoroelastomer – offering extraordinary chemical resistance, long life and very high burst pressures.

STA-PURE PFL is USP Class VI and food grade approved, making it suitable for foods and pharmaceuticals as well as aggressive chemicals. Working temperature range -20C to 80C.

Neoprene offers excellent performance with abrasive slurries and sustained pressure applications. Good suction and pressure capabilities. Working temperature range 0C to 80C. Black.



Pumpsil platinum-cured silicone tubing is manufactured by Watson-Marlow in our own silicone-dedicated ISO1644-1 class 7 (class J/10,000) cleanroom. Developed specifically for biopharmaceutical application, Pumpsil carries full biopharmaceutical certification USP Class VI and ISO10993 and complies with FDA 21CFR177.2600 for food contact.



Pumpsil is entirely free of 2,4 DCBA and other leachables associated with peroxide-cured silicone and is post-cured to remove linear and cyclic siloxanes, cytotoxic materials which can leach out of other manufacturers' non-post-cured platinum-cured tubing. Pumpsil® has an ultra-smooth bore to control protein binding and bacterial growth, making it ideal for production applications where there is long-term contact with the process fluid. Our LaserTraceability™ provides an ink-free, indelibly etched record of part number, lot number and use-by date right on the tubing. This means that lot traceability is carried through from box to bag to the tube itself. Working temperature range: -20C to 80C. Translucent. Autoclavable.

Bulk supply

Pipework and accessories

A range of interface pipework is available for our LoadSure™ element pumps with industrial valved or non-valved connectors. Leak detection sensors are also available for most of our pump range.

Make reel savings

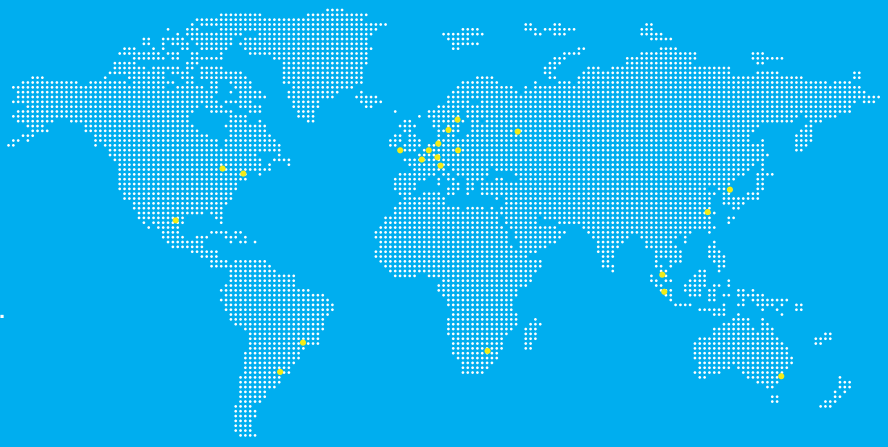
Many of our tubes are available in bulk, as well as in the standard shorter lengths – up to 152m at a time, depending on the bore size. Bulk buying gives important benefits in convenience, and huge cost savings: 36% less per metre than the metre price for 3m and 5m cut lengths. Further discounts are available on orders for multiple reels. Ask for our reel leaflet for the tube material of your choice.

WATSON MARLOW

Watson-Marlow Pumps Group

Watson-Marlow Pumps Group has five world-class factories supported by direct sales operations in 20 countries and distributors in more than 50 countries. For contact details visit our website:

www.wmpg.com



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Watson-Marlow online

Our engineers around the world can help you choose the perfect pump and tubing for your needs.

More information? Our brochures are on our website - www.wmpg.com

Printed on recycled paper

Watson-Marlow...Innovation in Full Flow

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info@wmpg.co.uk

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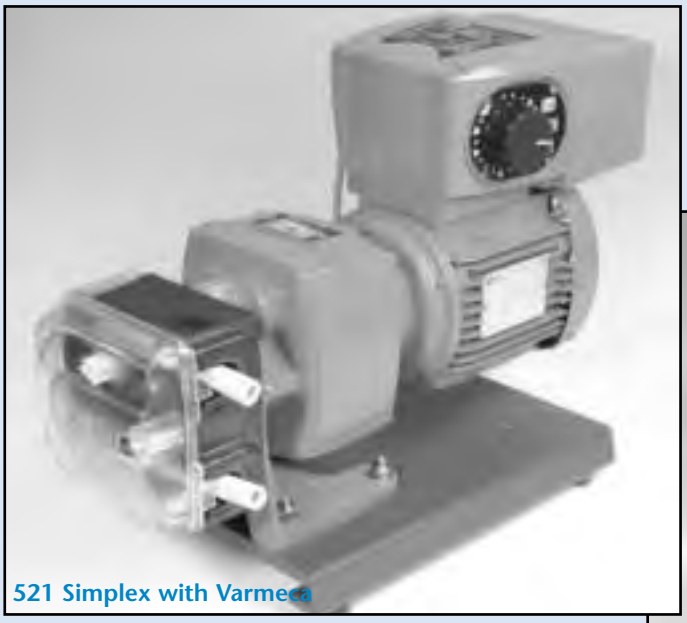
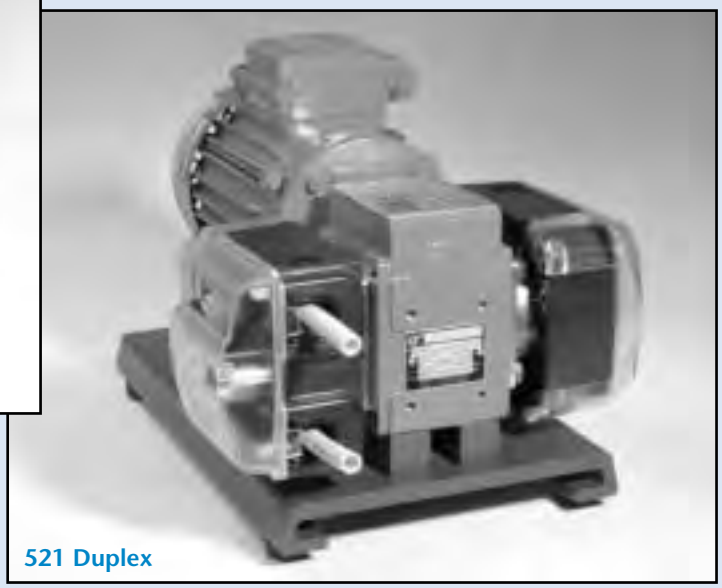


521 Simplex with Varmeca



521 Duplex

521
Close Coupled Simplex and Duplex Pumps

Technical Information and Features

- *Single-head flow rates up to 69 GPH (4,400 ml/min), Duplex flow rates up to to 124 GPH (7,800 ml/min)*
- *Discharge pressures up to 30psi*
- *Fitted with easy loading twin sprung roller pumphead featuring:*
  - ** Corrosion resistant PPS Rotor and Track*
  - ** Impact resistant guard with tool lockable safety latch*
  - ** Ergonomic handgrip rotor hub with shaft disengaging clutch for effortless tube loading*
  - ** Reversible operation*
  - ** 520R2C accepts tube sizes #105,108, 119,120,15,24,121, 122(0.5-9.6mm bore and 2.4mm thick wall)*
  - ** 520RC accepts tube sizes #112, 13, 14, 16, 25, 17, 18 (0.5-8.0mm bore and 1.6mm thin wall)*
- *24 Hr continuous duty with 2 year warrantee*
- *Foot mounting for bolt down installation. Optional baseplate available for free standing installation*
- *Versatile geardrive options including:*
  - ** Varmeca integral electronically variable speed drive featuring 110VAC, 1-Phase*
    - *- Ultra-compact combination gearbox, motor, and VFD for simple installation and operation*
    - *- User friendly local speed potentiometer with 10:1 speed range and fwd/off/rev pushbuttons*
    - *- Terminal strip for optional remote 4-20uA analog speed or fwd/off/rev control*
    - *- IP65 washdown enclosure, UL approved*
  - ** Inverter duty gearmotor 230/460VAC 3-phase for fixed speed or electronic variable speed control with a separate mount AC Variable Frequency Drive*
  - ** NEMA C motors available for fixed speed single phase or fixed or electronic variable speed explosion proof applications*
  - ** Pneumatic motor for air operation*
  - ** Duplex 521, two pumpheads on one gearmotor available, for high flow capability*

Simplex and Duplex Pump Flow Rates - ml/min

Flow Rates 520R2C or 520RC Continuous Tube Close Coupled Pumphead

6-63 RPM VARMECA-CONTROLLED SIMPLEX PUMP

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	.26-2.6	.66-6.6	2.6-26	11-110	24-240	42-420	66-660	95-950
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	.27-2.7	.69-6.9	2.8-28	11-110	25-250	44-440	69-690	100-1000
Butyl, Fluorel®			2.0-20	8.1-81	18-180	32-320	50-500	

27-275 RPM VARMECA-CONTROLLED SIMPLEX PUMP

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	1.1-11	2.9-29	12-120	46-460	100-1000	180-1800	290-2900	420-4200
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	1.2-12	3.0-30	12-120	48-480	110-1100	190-1900	300-3000	440-4400
Butyl, Fluorel®			8.8-88	35-350	79-790	140-1400	220-2200	

57 RPM SIMPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	2.3	6.0	2.4	96	220	380	600	860
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	2.4	6.3	25	100	230	400	630	900
Butyl, Fluorel®			18	73	160	290	460	

227 RPM SIMPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	9.3	24	95	380	860	1500	2400	3400
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	9.8	25	100	400	900	1600	2500	3600
Butyl, Fluorel®			73	290	650	1200	1800	

65 RPM DUPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	5.4	13.6	54	220	500	880	1360	1960
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	5.6	14.4	58	220	520	920	1440	2000
Butyl, Fluorel®			42	166	380	660	1040	

247 RPM DUPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	20	52	200	820	1860	3400	5200	7400
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	22	54	220	860	1960	3400	5400	7800
Butyl, Fluorel®			158	640	1420	2600	4000	

Simplex and Duplex Pump Flowrates - Gal/hr

Flow Rates 520R2C or 520RC Continuous Tube Close Coupled Pumphead

6-63 RPM VARMECA-CONTROLLED SIMPLEX PUMP

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	.004-0.04	.01-0.1	.04-0.4	.17-1.7	.38-3.8	.67-6.7	1.0-10	1.5-15
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	.004-0.04	.01-0.1	.04-0.4	.18-1.8	.40-4.0	.70-7.0	1.1-11	1.6-16
Butyl, Fluorel®			.03-0.3	.13-1.3	.29-2.9	.51-5.1	.8-8	

27-275 RPM VARMECA-CONTROLLED SIMPLEX PUMP

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	.018-0.18	.05-0.5	.18-1.8	.73-7.3	1.6-16	2.9-29	4.6-46	6.6-66
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	.019-0.19	.05-0.5	.19-1.9	.77-7.7	1.7-17	3.1-31	4.8-48	6.9-69
Butyl, Fluorel®			.14-1.4	.56-5.6	1.3-13	2.2-22	3.5-35	

57 RPM SIMPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	0.04	0.1	0.4	1.5	3.4	6.1	9.5	14
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	0.04	0.1	0.4	1.6	3.6	6.4	9.9	14
Butyl, Fluorel®			0.3	1.2	2.6	4.6	7.2	

227 RPM SIMPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	0.15	0.4	1.5	6.0	14.0	24.0	38	54
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	0.15	0.4	1.6	6.3	14.0	25.0	40	57
Butyl, Fluorel®			1.2	4.6	10.0	18.0	29	

65 RPM DUPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	0.08	0.2	0.8	3.4	7.8	13.8	22.0	32
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	0.08	0.2	1.0	3.6	8.2	14.6	22.0	32
Butyl, Fluorel®			0.6	2.6	6.0	10.6	16.4	

247 RPM DUPLEX PUMP*

Tube Material	0.5mm	0.8mm	1.6mm	3.2mm	4.8mm	6.4mm	8.0mm	9.6mm
Marprene, Bioprene, Neoprene	0.32	0.8	3.2	13.2	30	52	82	118
Sta-Pure®, Chem-Sure®, Tygon®, Silicone	0.34	0.8	3.4	13.8	32.0	56.0	86	124
Butyl, Fluorel®			2.6	10.0	22.0	40.0	62	

NOTE: Flow rates shown are max for the stated pump speed under fixed speed operation. Flow is proportional to RPM.

Actual flow rates may vary because of changes in temperature, viscosity, inlet and discharge pressures, and system configuration.

**For variable speed operation with a Variable Frequency Drive (VFD) and inverter duty motor, a 10:1 linear turndown from the listed max flow can be attained. With a pneumatic motor, 5:1 linear turndown from the listed max flow can be attained.*

For duplex pumps, flow is total for both pumpheads. Flow per channel is 1/2 the flow rate listed.

Flow rates quoted are for 1.6mm thin wall and 2.4mm thick wall tubes of nominal bore.

0.5mm and 0.8mm bore are only available in 1.6mm wall thickness except for Platinum-cured silicone.

9.6mm bore is only available in 2.4mm wall thickness

Simplex Pump Configuration, 1/3 HP

Description	Operating Speed	Estimated Weight
Variable Speed Pump with integrated Varmeca IP65 frequency inverter, motor & gearbox. Available 230/460VAC 3-ph or 120/240VAC 1-ph	6-63 or 27-275 rpm	90 lbs
521VI/R2C For use with 2.4 mm thick wall tube 521VI/RC For use with 1.6 mm thin wall tube		
Fixed Speed Pump. Available 230/460VAC 3-ph or 120/240VAC 1-ph[1,2]	57 or 227 rpm	24 lbs*
521F/R2C For use with 2.4 mm thick wall tube 521F/RC For use with 1.6 mm thin wall tube		
Fixed Speed Explosion Proof. Available 230/460VAC 3-ph or 120/240VAC 1-ph[1,2,3,4]	57 or 227 rpm	77 lbs*
521DF/R2C For use with 2.4 mm thick wall tube 521DF/RC For use with 1.6 mm thin wall tube		
Variable Speed Pneumatic Pump Requires 100 psi filtered and lubricated air source[5]	11-57 or 45-227 rpm	48 lbs
521P/R2C For use with 2.4 mm thick wall tube 521P/RC For use with 1.6 mm thin wall tube		

Duplex Pump Configuration, 1/3 HP

Model	Description	Operating Speed	Estimated Weight
Fixed Speed Pump. Available 230/460VAC 3-ph or 120/240VAC 1-ph[1,2]		65 or 247 rpm	23 lbs*
521FD/R2C	For use with 2.4 mm thick wall tube		
521FD/RC	For use with 1.6 mm thin wall tube		
Fixed Speed Explosion Proof. Available 230/460VAC 3-ph or 120/240VAC 1-ph[1,2,3,4]		65 or 247 rpm	64 lbs*
521DFD/R2C	For use with 2.4 mm thick wall tube		
521DFD/RC	For use with 1.6 mm thin wall tube		
Variable Speed Pneumatic Pump. Requires 100 psi filtered and lubricated air source[5]		13-65 or 50-247 rpm	34 lbs
521DP/R2C	For use with 2.4 mm thick wall tube		
521DP/RC	For use with 1.6 mm thin wall tube		

1 3-phase motor is inverter duty variable speed with VFD.

2 Optional VFD available in 230/3/60, 460/3/60, 115/1/60, 230/1/60 and either NEMA 1 or NEMA 4 enclosure, supplied loose.

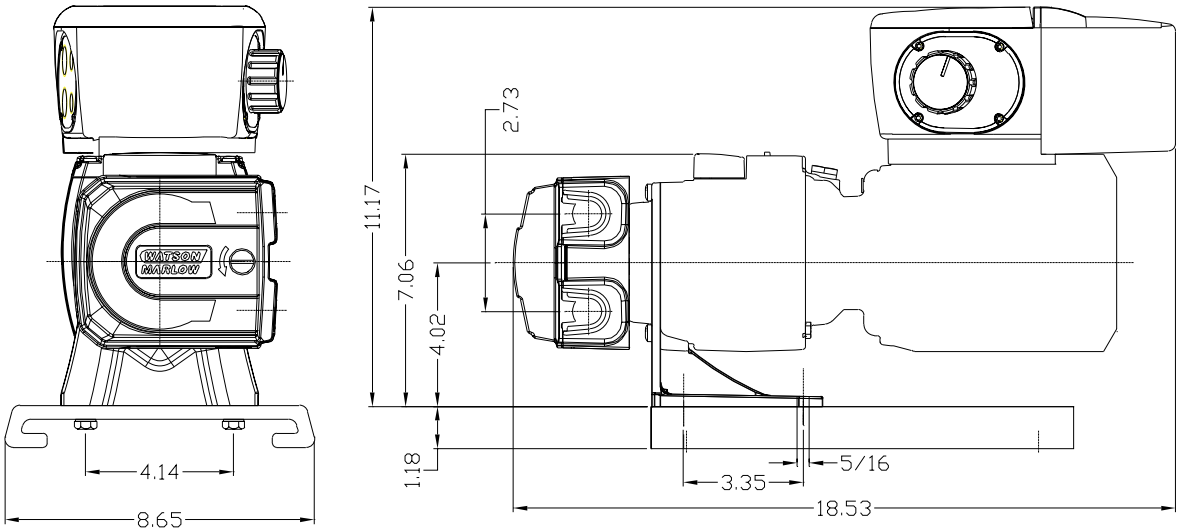
3 Consult Watson-Marlow Bredel for specific Division and Class XP ratings.

4 VFD's must be located outside explosion proof areas.

5 Customer assumes responsibility for selecting and installing an air motor in XP environments.

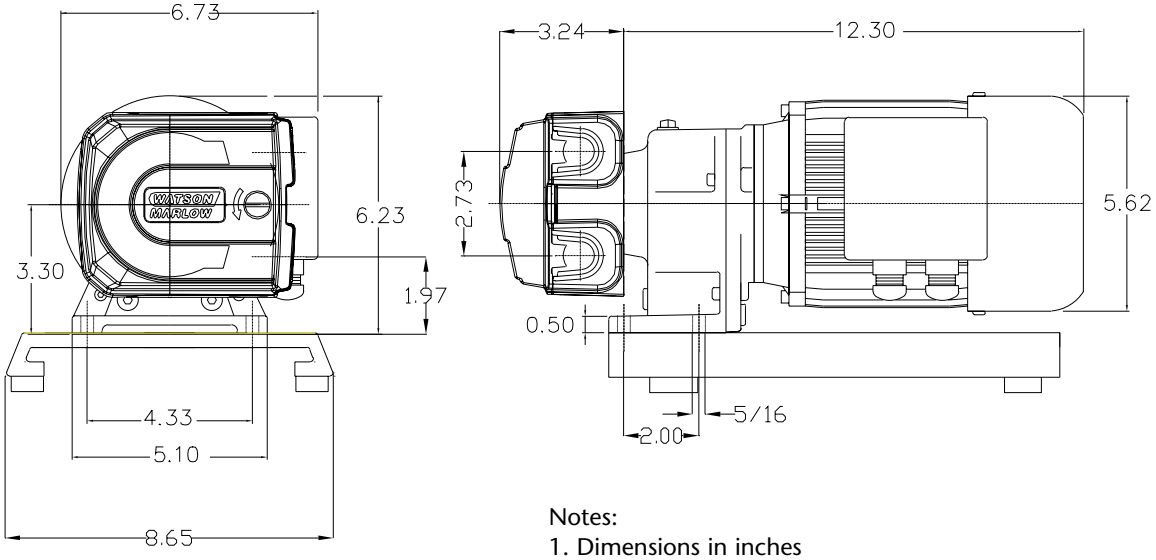
** Weight does not include VFD*

521 Simplex with Varmeca



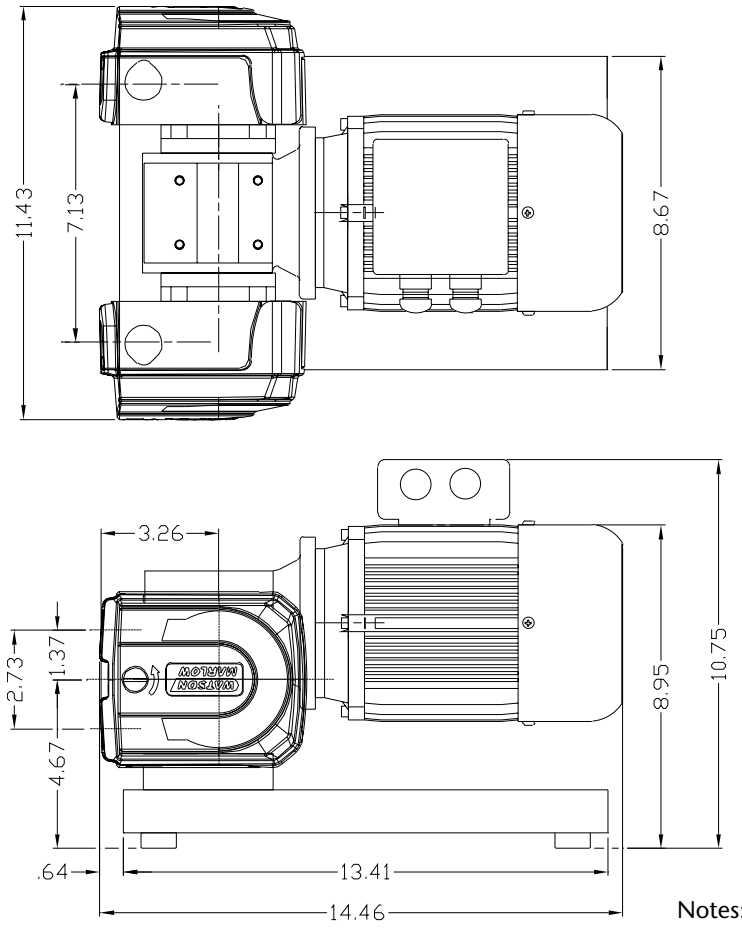
Notes:
1. Dimensions in inches
2. Shown with optional baseplate

521 Simplex



Notes:
1. Dimensions in inches
2. Length may vary if C-faced motor is used
3. Shown with optional baseplate

521 Duplex



Notes:
1. Dimensions in inches
2. Length may vary if C-faced motor is used

Materials of Construction/Specifications

Track, Rotor Body, Rotor Arms: PPS (polyphenylene sulfide) high performance engineering plastic

Guard: Polycarbonate

Rollers and Bearings: Low friction Stainless Steel with PTFE seals

Gearbox: Cast Iron

Motor: TEFC or TENV Construction of XP or alternate motors subject to vary

Operational Temperature Range: 5 deg C to 40 deg C

Noise: Max 70dBA at 1 meter

Standards: Complies with all applicable CE and UL requirements

Available Tubing Materials

2.4 mm wall for 520R2C	**1.6 mm wall for 520RC**
Bioprene® (excl. 0.5&0.8 mm)	Bioprene®
Marprene® (excl. 0.5&0.8 mm)	Marprene®
Silicone	Silicone
Sta-Pure® (excl. 0.5&0.8 mm)	Sta-Pure® (excl. 0.5&0.8 mm)
Chem-Sure® (excl. 0.5&0.8 mm)	Chem-Sure® (excl. 0.5&0.8 mm)
Neoprene (excl. 0.5&0.8 mm)	Neoprene (excl. 0.5 mm)
Butyl (excl. 0.5&0.8 mm)	Tygon® (excl. 0.5&0.8 mm)
Fluorel® (excl. 0.5&0.8 mm)	

Sta-Pure and Chem-Sure are registered trademarks of WL Gore and Associates. Flourel is a registered trademark of 3M Corp.
Tygon is a registered trademark of Saint-Gobain Corp.

The information contained in this document is believed to be correct, but Watson-Marlow Bredel Pumps accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

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621 Simplex

621 Duplex

621
Close Coupled Simplex and Duplex Pumps

Technical Information and Features

- *Simplex flow rates up to 16.2 Liters/min (4.28 GPM), Duplex flow rates up to 35.6 Liters/min (9.40 GPM)*
- *Discharge pressures up to 4 bar (60psi) with element style pumpheads, up to 30 psi with continuous tubing pumpheads*
- *Fitted with 620RE, 620RE4, or 620R pumphead*
- *620RE two roller or 620RE4 four roller pumphead with CIP/SIP rotor and rapid snap-fit tube loading, pumphead accepts both 12mm and 17mm industrial and sanitary LoadSure™ elements*
- *620R two roller pumphead for use with continuous length tubing 6.4 – 15.9mm (1/4" – 5/8") ID and 3.2mm (1/8") wall thickness*
- *Compact design with foot mounted gearbox*
- *24 Hr continuous duty with 2 year warrantee*
- *Reversible operation*
- *Fixed speed, pneumatic, or electronic variable speed using optional AC Variable Frequency Drive*
- *Fixed Speed options: 230/460VAC, 60 Hz 3-phase or 120/240VAC, 60 Hz, 1-phase*
- *Variable Speed options supplied with 230/3/60, 460/3/60, 120/1/60 or 220/1/60 Variable Frequency Drive*
- *Explosion Proof motors available for Fixed Speed or Variable Speed operation*
- *Optional Leak detector and door safety interlock switch*
- *Optional Epoxy coated aluminum or 304SS baseplate kit for a free standing pump*
- *Gearmotor available in orange epoxy or FDA white epoxy*

Simplex Flow Rates

Flow Rates 620RE Element Close Coupled Pumphead

	77 RPM SIMPLEX PUMP				225 RPM SIMPLEX PUMP			
	LoadSure™ 12 mm		LoadSure™ 17 mm		LoadSure™ 12 mm		LoadSure™ 17 mm	
LoadSure™ Element Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene TM, Bioprene TM	2.85	0.75	4.54	1.20	8.33	2.20	13.3	3.51
Marprene TL, Bioprene TL	2.85	0.75	5.18	1.37	8.33	2.20	15.1	3.99
Silicone	2.98	0.79	4.69	1.24	8.71	2.30	13.7	3.62
StaPure, Neoprene	3.06	0.81	5.56	1.47	8.96	2.37	16.2	4.28

Flow Rates 620RE4 Element Close Coupled Pumphead

	77 RPM SIMPLEX PUMP				225 RPM SIMPLEX PUMP			
	LoadSure™ 12 mm		LoadSure™ 17 mm		LoadSure™ 12 mm		LoadSure™ 17 mm	
LoadSure™ Element Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene TM Bioprene TM	2.43	0.64	3.17	0.84	7.09	1.87	9.27	2.45
Marprene TL, Bioprene TL	2.43	0.64	3.63	0.96	7.09	1.87	10.6	2.80
Silicone	2.53	0.67	3.28	0.87	7.40	1.95	9.59	2.53
StaPure, Neoprene	2.60	0.69	3.89	1.03	7.61	2.01	11.4	3.01

Flow Rates 620R Continuous Tube Close Coupled Pumphead

	77 RPM SIMPLEX PUMP							
	6.4 mm (1/4”) ID		9.6 mm (3/8”) ID		12.7 mm (1/2”) ID		15.9 mm (5/8”) ID	
Tube Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene, Bioprene	1.00	0.26	1.93	0.51	3.08	0.81	4.21	1.11
Silicone	0.92	0.24	2.08	0.55	3.23	0.85	4.74	1.25
StaPure, Neoprene	0.92	0.24	1.93	0.51	3.08	0.81	4.70	1.24

Flow Rates 620R Continuous Tube Close Coupled Pumphead

	225 RPM SIMPLEX PUMP							
	6.4 mm (1/4”) ID		9.6 mm (3/8”) ID		12.7 mm (1/2”) ID		15.9 mm (5/8”) ID	
Tube Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene, Bioprene	2.93	0.77	5.63	1.49	9.00	2.38	10.8	2.85
Silicone	2.70	0.71	6.08	1.61	9.45	2.50	13.5	3.57
StaPure, Neoprene	2.70	0.71	5.63	1.49	9.00	2.38	13.7	3.62

Duplex Pump Flow Rates

Flow Rates 620RE Element Close Coupled Pumphead

	65 RPM DUPLEX PUMP				247 RPM DUPLEX PUMP			
	LoadSure™ 12 mm		LoadSure™ 17 mm		LoadSure™ 12 mm		LoadSure™ 17 mm	
LoadSure™ Element Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene TM, Bioprene TM	4.82	1.28	7.66	2.02	18.28	4.82	29.00	7.66
Marprene TL, Bioprene TL	4.82	1.28	8.74	2.30	18.28	4.82	33.20	8.78
Silicone	5.04	1.34	7.92	2.10	19.12	5.06	30.00	7.92
StaPure, Neoprene	5.18	1.36	9.38	2.48	19.66	5.20	35.60	9.40

Flow Rates 620RE4 Element Close Coupled Pumphead

	65 RPM DUPLEX PUMP				247 RPM DUPLEX PUMP			
	LoadSure™ 12 mm		LoadSure™ 17 mm		LoadSure™ 12 mm		LoadSure™ 17 mm	
LoadSure™ Element Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene TM Bioprene TM	4.10	1.08	5.36	1.42	15.56	4.12	20.40	5.38
Marprene TL, Bioprene TL	4.10	1.08	6.12	1.62	15.56	4.12	23.20	6.12
Silicone	4.28	1.14	5.54	1.46	16.26	4.30	21.00	5.54
StaPure, Neoprene	4.40	1.16	6.56	1.74	16.70	4.42	25.00	6.60

Flow Rates 620R Continuous Tube Close Coupled Pumphead

	65 RPM DUPLEX PUMP							
	6.4 mm (1/4") ID		9.6 mm (3/8") ID		12.7 mm (1/2") ID		15.9 mm (5/8") ID	
Tube Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene, Bioprene	1.70	0.44	3.26	0.86	5.20	1.38	7.10	1.88
Silicone	1.56	0.42	3.52	0.92	5.46	1.44	7.88	2.08
StaPure, Neoprene	1.56	0.42	3.26	0.86	5.20	1.38	7.94	2.10

Flow Rates 620R Continuous Tube Close Coupled Pumphead

	247 RPM DUPLEX PUMP							
	6.4 mm (1/4") ID		9.6 mm (3/8") ID		12.7 mm (1/2") ID		15.9 mm (5/8") ID	
Tube Material	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min	Liters/min	Gal/min
Marprene, Bioprene	6.42	1.70	12.36	3.26	19.76	5.22	22.60	5.98
Silicone	5.92	1.56	13.34	3.52	20.8	5.50	28.60	7.56
StaPure, Neoprene	5.92	1.56	12.36	3.26	19.76	5.22	30.20	7.98

NOTE: Flow rates shown are max for the stated pump speed under fixed speed operation. Flow is proportional to RPM. For variable speed operation with a Variable Frequency Drive (VFD) and inverter duty motor, a 10:1 linear turndown from the listed max flow can be attained. With a pneumatic motor, 5:1 linear turndown from the listed max flow can be attained. Consult Watson-Marlow Bredel for variable speed application of 5/8" ID tubing with 620R continuous tube pump, as flow is not proportional to RPM with this tube size.

For duplex pumps, flow is total for both pumpheads. Flow per channel is 1/2 the flow rate listed.

Simplex Pump Configuration, 1/2 HP

Model	Description	Operating Speed		Estimated Weight
621F/RE 621F/RE4 621F/R	Fixed Speed 2 or 4 Roller Pump Available 230/460VAC 3-ph or 120/240VAC 1-ph	77	225	42 lbs
621DF/RE 621DF/RE4 621DF/R	Fixed Speed Explosion Proof 2 or 4 Roller Pump [1] Available 230/460VAC 3-ph or 120/240VAC 1-ph	77	225	85 lbs
621V/RE 621V/RE4 621V/R	Variable Speed 2 or 4 Roller Pump [2] Available VFD enclosure NEMA 1 or NEMA 4 Available VFD mains inputs: 230/3/60, 460/3/60, 240/1/60, 115/1/60	7.7-77	22.5-225	42 lbs*
621DV/RE 621DV/RE4 621DV/R	Variable Speed Explosion Proof 2 or 4 Roller Pump [1,2,3] Available VFD enclosure NEMA 1 or NEMA 4 Available VFD mains inputs: 230/3/60, 460/3/60	7.7-77	22.5-225	98 lbs*
621P/RE 621P/RE4 621P/R	Variable Speed Pneumatic 2 or 4 Roller Pump Requires 100 psi filtered and lubricated air source	16-77	45-225	25 lbs

Duplex Pump Configuration, 3/4 HP

Model	Description	Operating Speed		Estimated Weight
621FD/RE 621FD/RE4 621FD/R	Fixed Speed 2 or 4 Roller Pump Available 230/460VAC 3-ph or 120/240VAC 1-ph	65	247	52 lbs
621DFD/RE 621DFD/RE4 621DFD/R	Fixed Speed Explosion Proof 2 or 4 Roller Pump [1] Available 230/460VAC 3-ph or 120/240VAC 1-ph	65	247	85 lbs
621VD/RE 621VD/RE4 621VD/R	Variable Speed 2 or 4 Roller Pump [2] Available VFD enclosure NEMA 1 or NEMA 4 Available VFD mains inputs: 230/3/60, 460/3/60, 240/1/60, 115/1/60	6.5-65	24.7-247	52 lbs*
621DVD/RE 621DVD/RE4 621DVD/R	Variable Speed Explosion Proof 2 or 4 Roller Pump [1,2,3] Available VFD enclosure NEMA 1 or NEMA 4 Available VFD mains inputs: 230/3/60, 460/3/60	6.5-65	24.7-247	108 lbs*
621PD/RE 621PD/RE4 621PD/R	Variable Speed Pneumatic 2 or 4 Roller Pump Requires 100 psi filtered and lubricated air source	16-65	50-247	44 lbs

1 Consult Watson-Marlow Bredel for specific Division and Class XP ratings. Fixed speed pumps not inverter duty.
2 VFD supplied loose for field mounting. Motors are 3 phase inverter duty ready.
3 VFD's must be located outside of explosion proof area
** Weight does not include VFD*

LoadSure™ Tube Element Codes for 620RE and 620RE4 Pumpheads

	12mm Element with 3/4" Tri-clamp Style Fittings	17mm Element with 3/4" Tri-clamp Style Fittings	12mm Element with 3/4" Male Cam & Groove Fittings	17mm Element with 3/4" Male Cam & Groove Fittings
StaPure	960.0120.PFT	960.0170.PFT	-	-
Bioprene TM	903.M120.PFT	903.M170.PFT	-	-
Bioprene TL	903.0120.PFT	903.0170.PFT	-	-
Plat. Silicone	913.0120.PFT	913.0170.PFT	-	-
Marprene TM	-	-	902.M120.PPC	902.M170.PPC
Marprene TL	-	-	902.0120.PPC	902.0170.PPC
Per. Silicone	-	-	910.0120.PPC	910.0170.PPC
Neoprene	-	-	920.0120.PPC	920.0170.PPC

Tubing Product Codes for 620R Pumphead (15 Meter Pack)

I.D. mm	I.D. "	#	Marprene	Bioprene	Peroxide Silicone	Platinum Silicone
6.4	1/4	26	902.0064.032	903.0064.032	915.0064.032	914.0064.032
9.6	3/8	73	902.0096.032	903.0096.032	915.0096.032	914.0096.032
12.7	1/2	82	902.0127.032	903.0127.032	915.0127.032	914.0127.032
15.9	5/8	184	902.0159.032	903.0159.032	915.0159.032	914.0159.032
I.D. mm	I.D. "	#	Butyl	Neoprene	Tygon	Fluorel
6.4	1/4	26	935.0064.032	925.0064.032	950.0064.032	975.0064.032
9.6	3/8	73	935.0096.032	925.0096.032	950.0096.032	975.0096.032
12.7	1/2	82	935.0127.032	925.0127.032	950.0127.032	975.0127.032
15.9	5/8	184	935.0159.032	925.0159.032	950.0159.032	975.0159.032

Materials of Construction/Specifications

Track: Aluminum LM24M powder coated

Guard: Outer layer - Polyurethane PBA
Inner shell - Grilamid TR55

Guard Catch: EN34 case hardened Xlan 5200 coated

Rotor
Hub & Roller Arms: Fortron 1140L4 (PPS)
Cover: Dupont Hytrel G5544

Main Rollers: Stainless steel 304

Main Roller Bearings: Carbon steel

Guide Rollers: Nylatron

Tube Clamp Sets: Polypropylene

Tri-Clamp Style Fittings: PVDF

Cam & Groove Fittings: Polypropylene

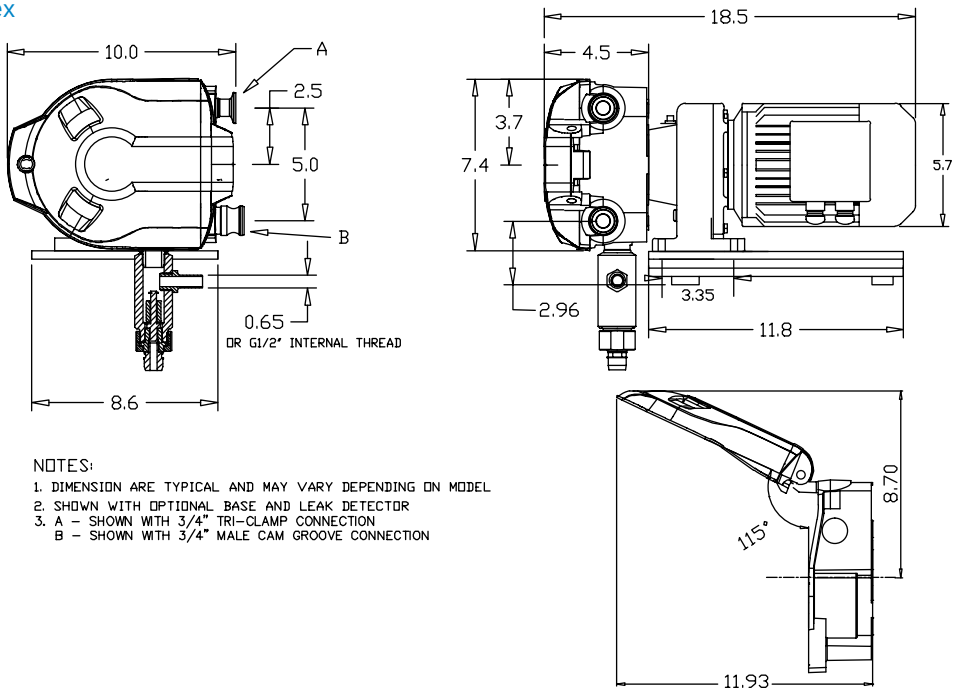
Gearbox: Cast Iron
Motor: TEFC or TENV
Construction of XP or alternate motors subject to vary

Operational Temperature Range: 5 deg C to 40 deg C

Noise: Max 75dBA at 1 meter

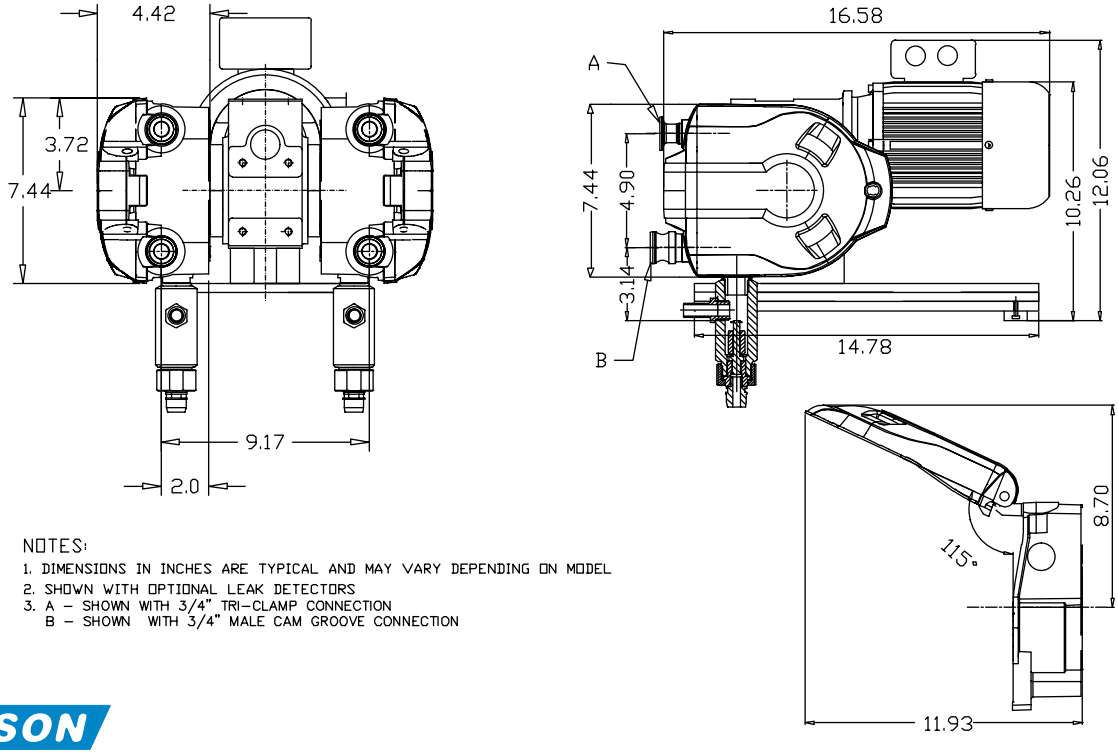
Standards: In conformity with CE, BS0800, IEC335-1, EN60529

621 Simplex



NOTES:
1. DIMENSION ARE TYPICAL AND MAY VARY DEPENDING ON MODEL
2. SHOWN WITH OPTIONAL BASE AND LEAK DETECTOR
3. A – SHOWN WITH 3/4" TRI-CLAMP CONNECTION
   B – SHOWN WITH 3/4" MALE CAM GROOVE CONNECTION

621 Duplex



NOTES:
1. DIMENSIONS IN INCHES ARE TYPICAL AND MAY VARY DEPENDING ON MODEL
2. SHOWN WITH OPTIONAL LEAK DETECTORS
3. A – SHOWN WITH 3/4" TRI-CLAMP CONNECTION
   B – SHOWN WITH 3/4" MALE CAM GROOVE CONNECTION

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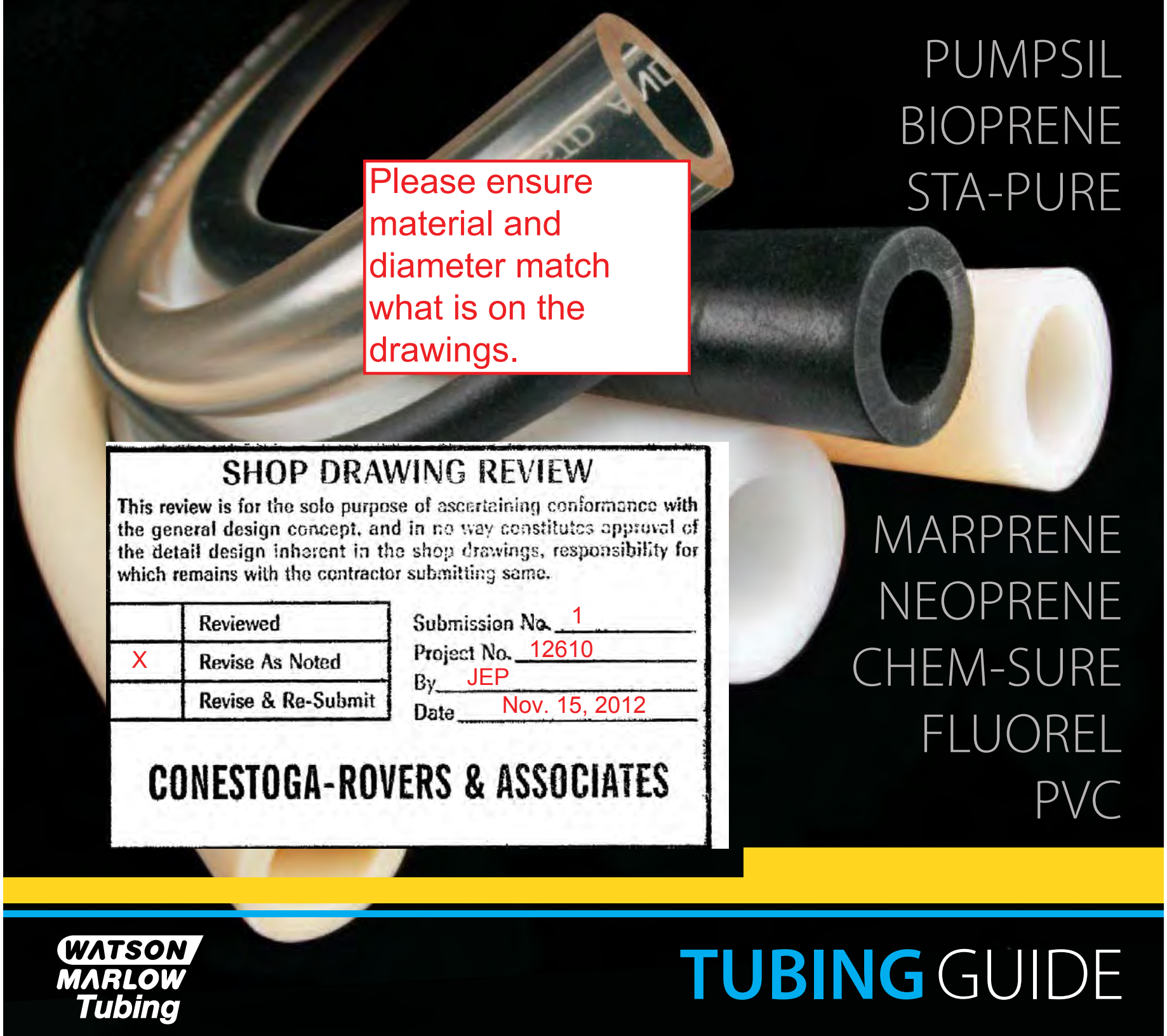

PUMPSIL
BIOPRENE
STA-PURE
Please ensure material and diameter match what is on the drawings.
SHOP DRAWING REVIEW
This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.
Reviewed
X
Revise As Noted
Revise & Re-Submit
Submission No. 1
Project No. 12610
By JEP
Date Nov. 15, 2012
CONESTOGA-ROVERS & ASSOCIATES
MARPRENE
NEOPRENE
CHEM-SURE
FLUOREL
PVC
WATSON MARLOW Tubing
TUBING GUIDE

WATSON MARLOW Tubing

For more than 50 years Watson-Marlow has been the provider of premium pumps and tubing.

This booklet will give a detailed explanation of the tubing we supply to help you make an informed choice for your product.

Choosing the right tube

The best way to select a tube is to decide which materials are chemically suitable, and choose the one which best meets the physical demands of your application. Normally, use the longest tube life material, which will usually be Bioprene or Marprene if they are chemically and physically suitable. Otherwise, Pumpsil or Pumpsil-D are most often chosen for sizes up to 9.6mm (3/8in), and Neoprene tubing for bore sizes of 12.7mm (1/2in) or more.

- For maximum tube life use a large-bore tube at low speed.
- For maximum flow rate use the largest tube at maximum speed.
- For maximum accuracy use a small bore tube at high speed.

Suction lift depends on the tube restituting fully before the advance of the next roller. If it does not, the flow rate will be reduced. For maximum suction lift use the smallest practicable bore size of tubing and run the pump at the slowest speed.

Tubing performance and selection

Ordinary tubing is not designed for peristaltic pumping. The characteristics of the pump, including suction lift, pressure, life,flow rate and efficiency are all largely determined by the tubing. Watson-Marlow peristaltic pumps are designed around Watson-Marlow tubing, and the results of using other tubing are unpredictable. Every Watson-Marlow company and distributor provides qualified technical support. If you have any question about tube performance or the selection of tubing for a new application, they will always be pleased to give you the best possible advice.

Checking with an immersion test

Immerse half a tube sample in a closed container for 48 hours. Then examine against the remaining half for signs of attack, swelling, embrittlement or any other kind of deterioration. Request a tube sample card for samples of tubing materials.

Chemical compatibility

Chemical compatibility tables are available at www.wmtubing.com and from any Watson-Marlow distributor.

Validation packs

Validation packs are available for Pumpsil-D, Bioprene and STA-PURE. Contact your Watson-Marlow tubing representative.

Watson-Marlow Pumpsil and Bioprene are manufactured in an ISO 14644 -1 Class 7(Class J/10,000) clean room to guarantee our customers a product without impurities

Your tubing options

Watson-Marlow tubing is available in nine materials and over 40 sizes, giving an extraordinary range of chemical and application capability. Watson-Marlow pumps are designed for Watson-Marlow tubing tolerances and performance, and no other tubing will provide comparable results. The tubing largely dictates pump performance: its restitution creates suction, its strength resists pressure, its flex resistance determines pumping life, its bore defines the flowrate, and its wall thickness controls pumping efficiency.

Marprene

Marprene is Watson-Marlow's exclusive thermoplastic elastomer. Always our first recommendation. Marprene is the longest life tubing with a wide chemical compatibility, and is highly resistant to oxidising agents such as ozone and peroxides and sodium hypochlorite. Marprene is beige in colour, opaque to both visible and ultra-violet light with low permeability to gases such as oxygen, carbon dioxide and nitrogen, and meets USDA standards for food handling.

Working Temperature range
5°C - 80°C

Other information
Autoclavable. Medium pressure resistance, high pressure options available for some pumpheads. High restitution. Low permeability.

Pumpsil / Pumpsil-D

Pumpsil silicone is an excellent tube for biopharmaceutical applications and general laboratory use. Pumpsil is fully post-cured platinum silicone which meets or exceeds the requirements of USP VI, FDA CFR 177.2600, ISO10993/EP3.1.9. A comprehensive validation pack gives full specification details and all approvals. Developed for the biopharmaceutical industry, Pumpsil offers an ultra-smooth bore which helps minimise protein binding and ensure high purity levels in the finished product. Pumpsil is fully post-cured, a process which removes cytotoxic cyclic siloxanes and other volatile process aids, resulting in an exceptionally pure tube.

It is ideal for fermentation/bioreactors, medical devices, chemical analysis and pharmaceutical production applications. All Pumpsil tubing is fully lot-traceable, with the lot number, part number and use-by date on the box label, bag label and carried through to LaserTraceability the laser etching of this information on the surface of the tube. Pumpsil-D provides higher accuracy and longer life for fill/finish and dispensing applications. Pumpsil-D is a platinum-cured silicone with a superior flex memory which doubles the accuracy of dispensed volumes compared to standard platinum-cured silicone tubing. Extruded specifically for use with 500 series dispensing pumps. Fewer pump calibrations are needed, so maximising process efficiency.

Working Temperature range
-20°C - 80°C (higher in non-pump applications)

Other information
Higher permeability to gases, translucent, autoclavable, gamma and ethylene oxide sterilisable. Medium pressure resistance. High restitution. Average permeability.

Bioprene

Bioprene has the same long life as Marprene but complies with USP Class VI, FDA requirements 21CFR 177.2600 for aqueous foods and NSF and USDA standards for food handling. It has wide chemical compatibility, and can handle repeated autoclaving. Bioprene can also be sterilised by ethylene oxide or gamma irradiation.

Working Temperature range
5°C - 80°C

Other information
Beige. Medium pressure resistance, high pressure options available for some pumpheads. High restitution. Low permeability.

CHEM-SURE®

CHEM-SURE® is a high performance composite of ePTFE and a high-grade fluoroelastomer, giving extraordinary chemical resistance, life and very high burst pressures. It is USP Class VI and food grade approved, and is suitable for foods and pharmaceuticals as well as aggressive chemicals.

Working Temperature range
-20°C - 80°C

Other information
Medium pressure resistance. High restitution. Average permeability.

STA-PURE®

STA-PURE® has a unique composite construction of silicone in a ePTFE lattice giving it superior burst resistance up to 7 bar (100psi) and 18 times longer life than silicone tubing. It produces virtually no spalling, is USP Class VI approved and is non toxic, making it ideal for a wide range of bio-pharm applications.

Working Temperature range
-20°C - 80°C

Other information
Opaque white. Autoclavable.
SIP and CIP compatible. High pressure resistance. High restitution. Low permeability.

Neoprene

Neoprene offers excellent performance with abrasive slurries and sustained pressure applications. Good suction and pressure capabilities.

Working Temperature range
0°C - 80°C

Other information
Black. Medium pressure resistance.
High restitution. Low permeability.

PVC

PVC has a high shore hardness giving excellent pressure and suction performance. Low gas permeability.

Working Temperature range
10°C - 70°C

Other information
Clear. High pressure resistance.
Medium restitution. Low permeability.

Fluorel

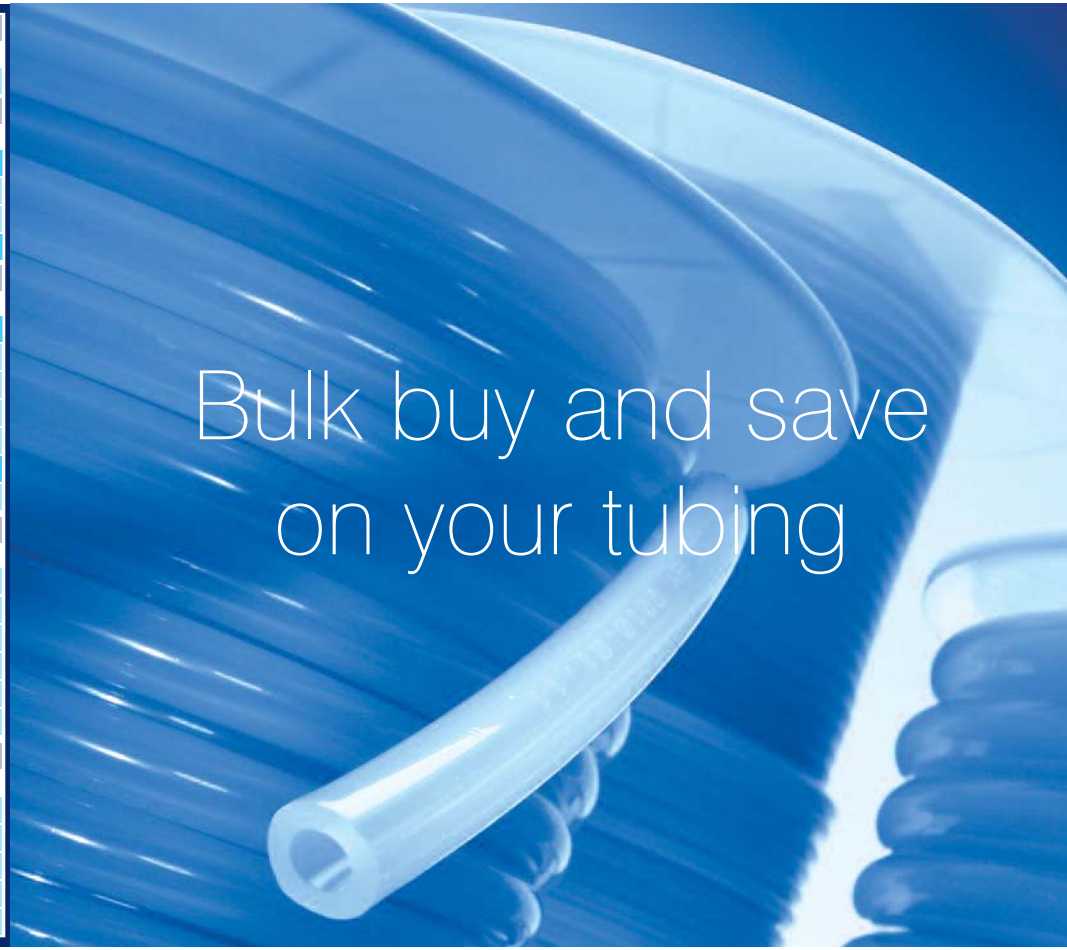
Good for aggressive acids, solvents and alkalis.

Working Temperature range
-5°C - 80°C

Other information
Black. Medium pressure resistance.
Medium restitution. Low permeability.

Tube life

102 tube life range(hours)	
Zero pressure. Water. 32rpm. Clockwise rotation. 4.8mm ($^{3}/_{16in}$) bore tubing.	
Pumpsil	900
313 and 314 pumphead tube life range (hours)	
Zero pressure. Water. 110rpm. 6.4mm bore tubing.	
Marprene/Bioprene	10,000
Neoprene	230
Pumpsil/Pumpsil-D	280
STA-PURE	10,000
520R pumphead tube life range (hours) clockwise rotation	
Zero pressure. Water. 220rpm. Clockwise rotation. 6.4mm bore tubing except Marprene which was 4.8mm bore.	
Marprene/Bioprene	10,000
Neoprene	40
Pumpsil	200
Pumpsil-D	250
CHEM-SURE	6000
STA-PURE	10,000
PVC	90
620R tube life range (hours)	
Zero pressure. Water. 100rpm. Clockwise rotation. 12.7mm bore tubing.	
Marprene/Bioprene	6000
Neoprene	60
Pumpsil/Pumpsil-D	230
CHEM-SURE	5000
STA-PURE	6000
PVC	90
720R tube life range (hours)	
Zero pressure. Water. 100rpm. Clockwise rotation. 12.7mm bore tubing.	
Marprene/Bioprene	3000
Neoprene	100
Pumpsil	300
CHEM-SURE	3000
STA-PURE	5000



Ordering Information

#	Bore		Pumpsil	Pumpsil-D	Marprene	Bioprene	STA-PURE	CHEM-SURE	Neoprene	PVC	Fluorel
					1.6mm (0.063in) wall						
112	0.5mm	1/50in	913.A005.016		902.0005.016	903.0005.016					
13	0.8mm	1/32in	913.A008.016		902.0008.016	903.0008.016			920.0008.016		
	1.2mm	3/64in	913.A012.016								
14	1.6mm	1/16in	913.A016.016		902.0016.016	903.0016.016	960.0016.016	965.0016.016	920.0016.016	950.0016.016	970.0016.016
	2.4mm	3/32in	913.A024.016		902.0024.016	903.0024.016					
16	3.2mm	1/8in	913.A032.016		902.0032.016	903.0032.016	960.0032.016	965.0032.016	920.0032.016	950.0032.016	970.0032.016
25	4.8mm	3/16in	913.A048.016		902.0048.016	903.0048.016	960.0048.016	965.0048.016	920.0048.016	950.0048.016	970.0048.016
17	6.4mm	1/4in	913.A064.016		902.0064.016	903.0064.016	960.0064.016	965.0064.016	920.0064.016	950.0064.016	970.0064.016
18	8.0mm	5/16in	913.A080.016		902.0080.016	903.0080.016	960.0080.016	965.0080.016	920.0080.016	950.0080.016	970.0080.016
					2.4mm (0.094in) wall						
105	0.5mm	1/50in	913.A005.024	913.D005.024							
108	0.8mm	1/32in	913.A008.024	913.D008.024							
119	1.6mm	1/16in	913.A016.024	913.D016.024	902.0016.024	903.0016.024	960.0016.024	965.0016.024			
120	3.2mm	1/8in	913.A032.024	913.D032.024	902.0032.024	903.0032.024	960.0032.024	965.0032.024			
15	4.8mm	3/16in	913.A048.024	913.D048.024	902.0048.024	903.0048.024	960.0048.024	965.0048.024			
24	6.4mm	1/4in	913.A064.024	913.D064.024	902.0064.024	903.0064.024	960.0064.024	965.0064.024			
35	8.0mm	5/16in	913.A080.024	913.D080.024	902.0080.024	903.0080.024	960.0080.024	965.0080.024			
36	9.6mm	3/8in	913.A096.024	913.D096.024	902.0096.024	903.0096.024	960.0096.024	965.0096.024			
					3.2mm (0.126in) wall						
	4.8mm	3/16in	913.A048.032		902.0048.032	903.0048.032					
26	6.4mm	1/4in	913.A064.032		902.0064.032	903.0064.032	960.0064.032	965.0064.032	920.0064.032	950.0064.032	
73	9.6mm	3/8in	913.A096.032		902.0096.032	903.0096.032	960.0096.032	965.0096.032	920.0096.032	950.0096.032	
82	12.7mm	1/2in	913.A127.032		902.0127.032	903.0127.032	960.0127.032	965.0127.032	920.0127.032	950.0127.032	
184	15.9mm	5/8in	913.A159.032		902.0159.032	903.0159.032	960.0159.032	965.0159.032	920.0159.032	950.0159.032	
					4.0mm (0.157in) wall						
185	8.0mm	5/16in	913.A080.040		902.0080.040	903.0080.040			920.0080.040		
186	12.0mm	15/32in	913.A120.040		902.0120.040	903.0120.040			920.0120.040		
187	16.0mm	5/8in	913.A160.040		902.0160.040	903.0160.040			920.0160.040		
					4.8mm (0.189in) wall						
86	9.6mm	3/8in	913.A096.048		902.0096.048	903.0096.048	960.0096.048		920.0096.048		
88	12.7mm	1/2in	913.A127.048		902.0127.048	903.0127.048	960.0127.048		920.0127.048		
89	15.9mm	5/8in	913.A159.048		902.0159.048	903.0159.048	960.0159.048		920.0159.048		
90	19.0mm	3/4in	913.A190.048		902.0190.048	903.0190.048	960.0190.048		920.0190.048		
92	25.4mm	1in	913.A254.048		902.0254.048	903.0254.048	960.0254.048		920.0254.048		

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WATSON MARLOW Tubing

www.wmtubing.com

The information in this document is believed to be correct, but Watson-Marlow Pumps Group accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING
These products are not designed for use in, and should not be used for, patient-connected applications.

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STA-PURE® and CHEM-SURE® are trademarks of WL Gore & Associates Inc. Fluorel is a trademark of 3M.

Watson-Marlow Pumps | ***Watson-Marlow Tubing*** | ***Bredel*** | ***Alitea*** | ***Flexicon***

PB0247 ISSUE 7

Printed on recycled stock

EXTRACTION WELLS

SHOP DRAWING REVIEW

This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

X	Reviewed
	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By JEP
Date Dec. 18, 2012

CONESTOGA-ROVERS & ASSOCIATES

Gems Sensors & Controls

Warrick Fittings and Probes

Series 3Y

Corrosion Resistant Probe

Part No.	3Y1C2
Unit Price	$98.00
Lead Time (Days)	5

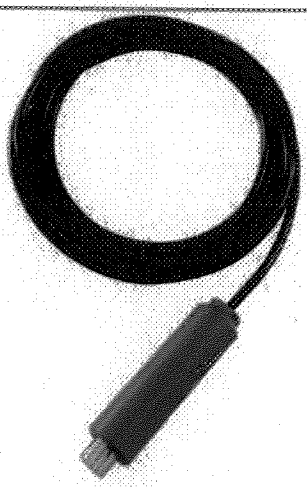


Image is of actual product

Model	3Y
Number of Probes	1
Body Material	PVC
Probe Length	20 Feet
Mounting	N/A
Gauge Tappings	N/A
Tricock Tappings	N/A
Probe Type	Wire Suspended
Probe Material	316 Stainless Steel
Sheathing Material	N/A
Pressure Rating	N/A
Maximum Temperature (°F)	150
Minimum Qty (per Release)	1
Weight (Lbs)	0.062

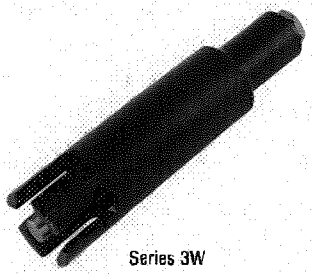
Series 3W – Wire Suspended Probes

- Metallic Bars
- Plastic Shield Protected
- Adaptable to Many Fittings
- Field Assembled

Series 3W probes, consisting of metallic bars within a protective plastic shield, are designed to be suspended in liquid with PVC-insulated wires. They are ideal for applications where rigid electrode rods are impractical or cumbersome, such as:

- Deep Wells
- Pump Control
- Waste Water
- Deep Tanks

7/8″ (2.22 cm) diameter x 3-3/4″ (9.52 cm) length. 3Z1A wire and 3Z1B adaptor kit required for use with 3E, 3F and 3N fittings.



Series 3W

How to Order

Select a 3W electrode, a 3Z1B adaptor and a length of 3Z1A suspension wire to form a complete suspended probe.

1. 3W Electrodes

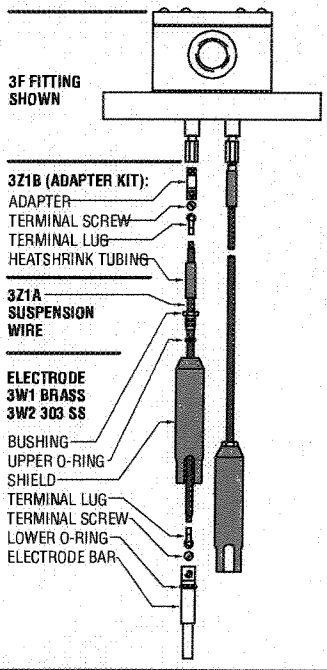
Probe Material	Part Number
Brass	3W1
316 Stainless Steel	3W2

2. 3Z1B Adaptor Kit
For use with 3E, 3F and 3N fittings.
Part Number: 3Z1B

3. 3Z1A Suspension Wire
Order in standard or custom length.

Length (Feet)	Part Number
500	100325-500
1000	100325-1000
5000	100325-5000
Custom	3Z1A-XX └Specify in one foot increments up to 5000 ft.

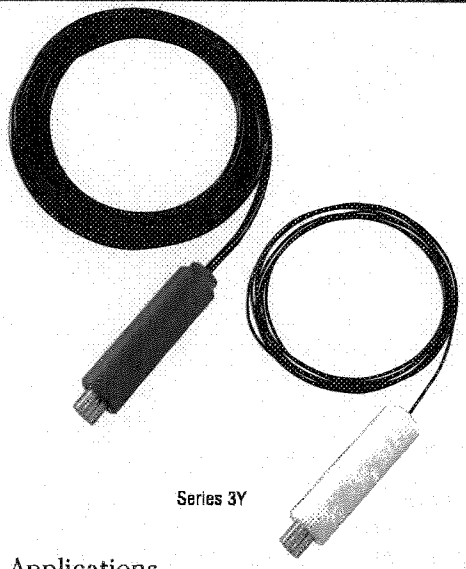
Components Detail



Series 3Y – Corrosion Resistant Probes

- Metallic Bars
- Corrosion Resistant
- Available in Many Materials for Various Requirements
- Adaptable for Various Fittings

Series 3Y wire suspended probes consist of metallic bars within a protective plastic shield, designed to be suspended in liquid. Series 3Y suspension wires are PVC or Teflon® insulated for use in corrosive liquid applications. 7/8″ (2.22 cm) diameter x 3-1/2″ (8.90 cm) length.



Series 3Y

Specifications

Style	Wire suspended
Tip Material	Carp. 20, Hastelloy C, 316 stainless steel
Shield Material	PVC 150°F (66°C), Teflon®

How to Order

Use the **Bold** characters from the chart below to construct a product code.

3Y X X X

Series
3Y

Shield Material
1 – PVC
3 – Teflon®

Probe Tip Material
C – 316 Stainless Steel
D – Carp. 20
F – Hastelloy C

Length of Wire
1 – 10 feet
2 – 20 feet
3 – 30 feet
etc.

Note: 3Z1B Connector is used to connect suspension wire with 3B, 3E, 3F, 3G or 3N fitting.

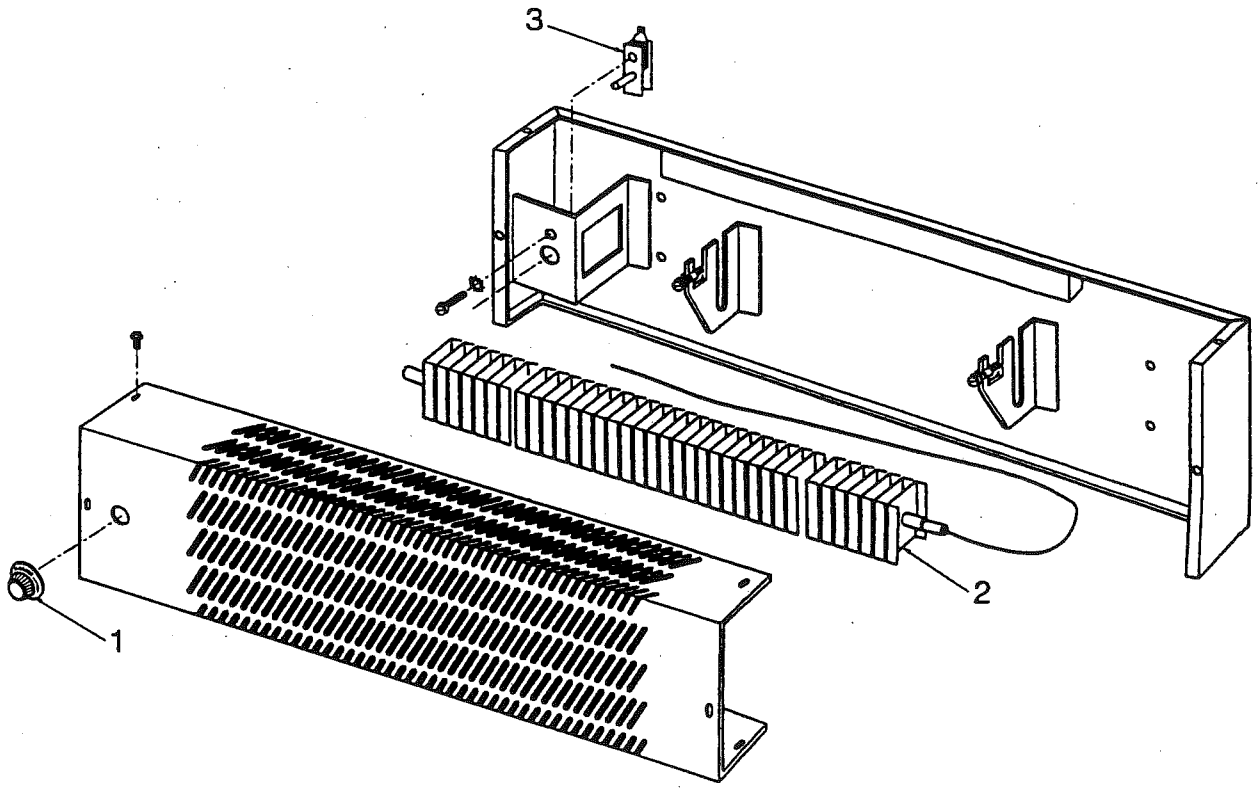
Applications

- General Purpose
- Wire Suspended Probes
- Corrosive Liquids, Chemicals

WHT REPLACEMENT PARTS

WHT500

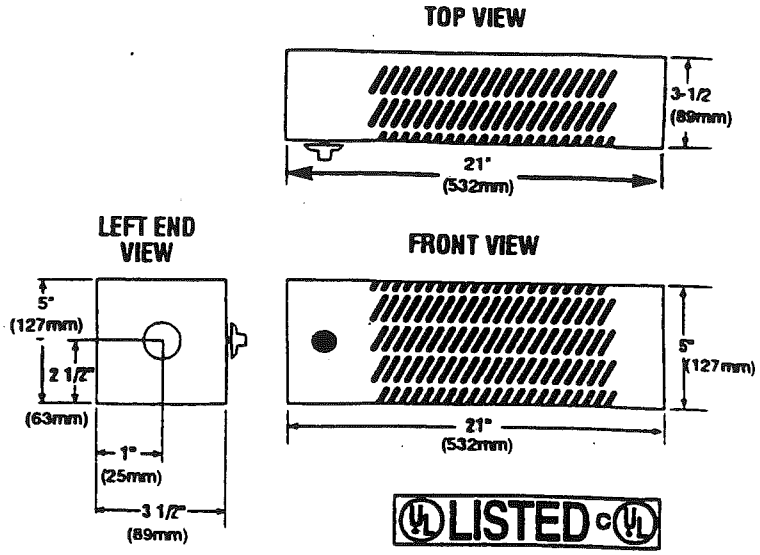
Key No.	Description	Part Number
1	Knob	3301-2020-006
2	Element	1802-2091-000
3	Thermostat	5813-2062-000



QMARK
A Division of Marley Electric Heat
470 Beauty Spot Rd. E
Bennettsville, SC 29512

Marley Electric Heating
A United Dominion Company

Surface Mounted Utility Heater HT500



LISTED

FILE #21609

Installation & Maintenance Instructions

Dear Owner,

Congratulations! Thank you for purchasing this new heater manufactured by a division of Marley Electric Heating. You have made a wise investment selecting the highest quality product in the heating industry. Please carefully read the installation and maintenance instructions shown in this manual. You should enjoy years of efficient heating comfort with this product from Marley Electric Heating... the industry's leader in design, manufacturing, quality and service.

... The Employees of
Marley Electric Heating

WARNING

Read Carefully - This instruction sheet contains vital information for the proper installation, use and efficient operation of the heater. Carefully read the manual before installation, operation or cleaning of the heater. Failure to adhere to the instruction could result in fire, electric shock, death, serious personal injury or property damage. Save these instructions and review frequently for continuing safe operation and instructing future users.

WARNING: HAZARD OF FIRE OR ELECTRICAL SHOCK

1. To prevent a possible electric shock, disconnect all power to heater at main service panel before wiring or servicing.
2. All wiring must be in accordance with the National and Local Electrical Codes and the heater must be grounded.
3. Do not install closer than 18" (456mm) to the floor or 12" (304mm) from the ceiling. End of heater may be next to adjacent walls. Do not install in vertical position.
4. Heater is hot when in use. Do not install the heater behind door, behind towel rack, in closet, where curtains or drapes can touch heater or where air flow through the heater may be obstructed. Keep electrical cords, bedding, furniture and other combustible away from heater.
5. Do not operate heater without cover in place. Cover must be secured with screws to prevent unintentional removal.
6. Do not insert or allow foreign objects to enter or touch the heater or heating element as this may cause an electric shock, fire or damage to heater.
7. Heater has hot and arcing or sparking parts inside. Do not use in areas where gasoline, paint, or flammable liquids are used or stored.
8. Do not use this heater in an environment where heater will be subjected to direct contact with water.
9. Do not use in a corrosive environment.
10. Supply voltage must be the same as heater voltage. Check heater nameplate and supply voltage before energizing.

SAVE THESE INSTRUCTIONS

General

The HT500 Utility Heater is designed for horizontal wall mounting only. The built-in thermostat allows for adjustment of the heat output from 40° to 70° F. The heater is factory wired for use at 240/208 volts but can be re-wired for use at 120 volts.

Installation

1. Remove the grille cover by removing the 2 screws on the front of the cover.
2. Position the heater on wall at desired mounting location maintaining the minimum clearances as noted in Warning 3 and as shown in Figure 1.

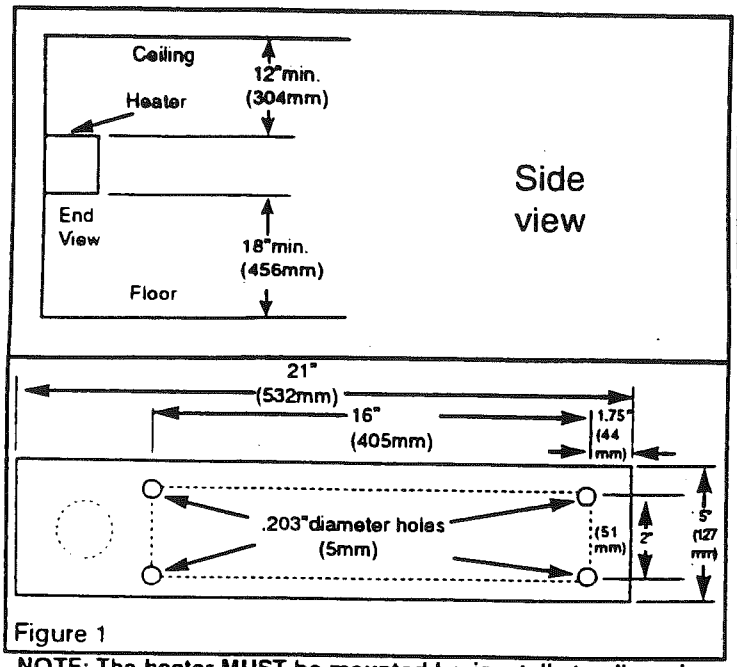


Figure 1

NOTE: The heater MUST be mounted horizontally to allow air flow freely upward through the heating element. Thermostat can be located towards either end of heater.

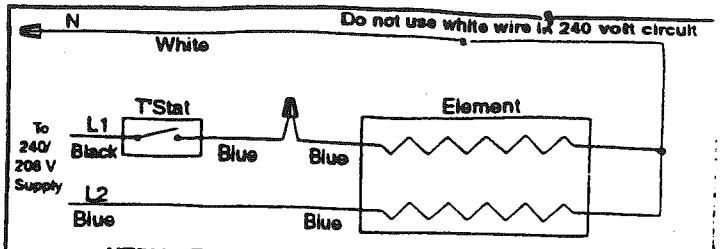
3. Securely fasten the heater to the wall with screws or bolts using the four (4) pre-drilled holes in the heater back.

Wiring

1. Bring power supply cable to heater and install into heater wiring compartment through the pre-punched 7/8" (22mm) hole in the end of control box. Be sure to use cable clamp on cable as required by the National Electric Code.
2. Connect the supply ground wire to the heater using the green colored ground screw.
3. To operate the heater at 208 through 240 volts, connect power supply wiring to heater wiring following the wiring diagram shown in Figure 2. DO NOT USE THE WHITE WIRE MARKED "N" FOR WIRING TO 208 THROUGH 240 VOLTS.
4. To operate the heater at 120 volts requires the heater to be re-wired as shown in Figure 3 by connecting blue L2 lead wire to wire connection of the other element blue lead wire and thermostat blue lead wire. Remove the L2 wire marker. Connect 120 volts to the black L1 lead and the white N lead. See Figure 3.
5. Complete the installation by replacing the grille cover using 2 screws removed earlier and 4 additional screws from parts bag. Remove thermostat knob from the parts bag and install.

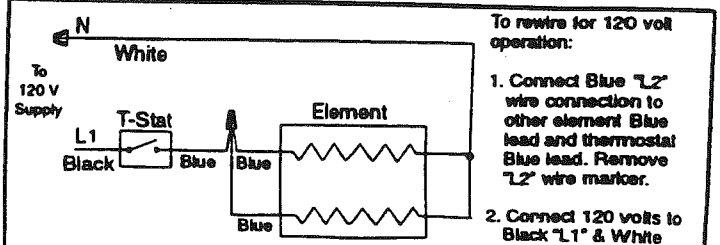
Heater Operation

1. Turn on the power supply to the heater.



HT500 - Factory wired for 240/208 volt operation
500 watts, 2.1 amps @ 240 V
375 watts, 1.8 amps @ 208 V

Figure 2



HT500 - Field re-wired for 120 volt operation
500 watts, 4.2 amps

Figure 3

2. Rotate the thermostat clockwise to the warmest setting. If the air temperature is below 70°F the heater should come on and in a few moments the heating element will become warm. If the air temperature is above 70°F, the heater will not operate. A check of the thermostat setting has to occur when the air temperature is below 70°F
3. The thermostat range is from 40°F at full counterclockwise position to 70°F at full clockwise. Position thermostat at desired location. Thermostat will automatically cycle the heater on and off to maintain the desired temperature.

NOTE: The heater is designed to provide freeze protection and the thermostat may allow the heater to come on at the lowest setting if the space temperature drops below 40° F.

Cleaning and Maintenance

This heater requires no maintenance. Periodic cleaning to remove accumulated dust and dirt is recommended. This should be done using a vacuum with brush. See Warning 1.

LIMITED WARRANTY

All products manufactured by Marley Electric Heating are warranted against defects in workmanship and materials for one year from date of installation, except heating elements which are warranted against defects in workmanship and materials for five years from date of installation. This warranty does not apply to damage from accident, misuse, or alteration; nor where the connected voltage is more than 5% above the nameplate voltage; nor to equipment improperly installed or wired or maintained in violation of the product's installation instructions. All claims for warranty work must be accompanied by proof of the date of installation.

The customer shall be responsible for all costs incurred in the removal or reinstallation of products, including labor costs, and shipping costs incurred to return products to Marley Electric Heating Service Center. Within the limitations of this warranty, inoperative units should be returned to the nearest Marley authorized service center or the Marley Electric Heating Center, and we will repair or replace, at our option, at no charge to you with return freight paid by Marley. It is agreed that such repair or replacement is the exclusive remedy available from Marley Electric Heating.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WHICH EXCEED THE AFORESAID EXPRESSED WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED FROM THIS AGREEMENT. MARLEY ELECTRIC HEATING SHALL NOT BE LIABLE FOR CONSEQUENTIAL DAMAGES ARISING WITH RESPECT TO THE PRODUCT, WHETHER BASED UPON NEGLIGENCE, TORT, STRICT LIABILITY, OR CONTRACT.

Some states do allow the exclusion or limitation of incidental or consequential damages, so the above exclusion or limitation may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

For the address of your nearest authorized service center, contact Marley Electric Heating in Bennettsville, SC, at 1-800-642-4328. Merchandise returned to the factory must be accompanied by a return authorization and service identification tag, both available from Marley Electric Heating. When requesting return authorization, include all catalog numbers shown on the products.

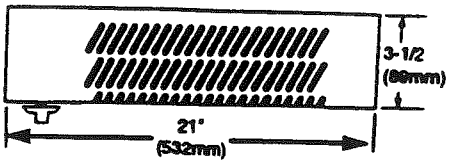
Marley Electric Heating
A United Dominion Company

470 Beauty Spot Rd. East
Bennettsville, SC 29512 USA

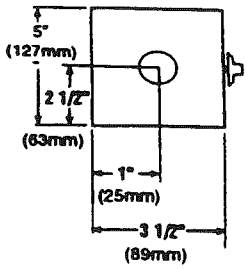
9/96 SWO 308 Part No. 5200-2314-000

Marley Electric Heating
Une société United Dominion

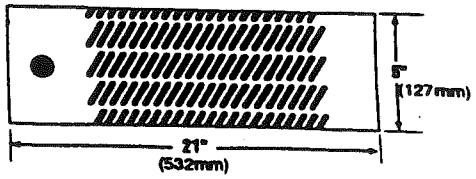
VUE DE DESSUS



VUE CÔTÉ GAUCHE



VUE DE FACE



Radiateur d'appoint apparent HT500

LISTED

DOSSIER #21609

Instructions d'installation et d'entretien

Cher propriétaire,

Félicitations ! Nous vous remercions d'avoir acheté ce nouvel appareil fabriqué par Marley Electric Heating. Vous avez fait un bon investissement en choisissant le produit de la meilleure qualité de l'industrie du chauffage. Veuillez lire soigneusement les instructions d'installation et d'entretien indiquées dans ce manuel. Vous profiterez de nombreuses années de confort de chauffage efficace grâce à ce produit de Marley Electric Heating... le leader de l'industrie en conception, fabrication, qualité et service.

...Les employés de
Marley Electric Heating

⚠ AVERTISSEMENT ⚠

Lire soigneusement- Le présent mode d'emploi contient des informations concernant l'installation, l'utilisation et le fonctionnement approprié de l'appareil. Avant son installation, la mise en marche et le nettoyage du radiateur, lisez attentivement le présent manuel. A défaut de respecter les instructions, on peut provoquer incendie, choc électrique, mort, blessures sérieuses ou dommages matériels. Conservez ces instructions et consultez-les souvent afin de travailler dans des conditions de sécurité et de pouvoir en informer les futurs utilisateurs.

ATTENTION : RISQUE D'INCENDIE ET CHOC ÉLECTRIQUE

1. Pour empêcher un éventuel choc électrique, débranchez le câble d'alimentation du radiateur avant le câblage ou l'entretien.
2. Tout le câblage doit être conforme aux Codes électriques nationaux et locaux et l'appareil de chauffage doit être mis à la terre.
3. Ne montez pas à moins de 456 mm du sol ou 304 mm du plafond. Le bord du radiateur peut être monté à proximité de murs adjacents. Ne montez pas en position verticale.
4. Le radiateur est chaud lorsqu'il est en service. Evitez d'installer le radiateur derrière une porte, un porte-serviette, dans un placard ni en contact avec des rideaux ou tentures ou aux endroits où la ventilation du radiateur peut s'obstruer. Éloignez cordons électriques, literie, mobilier et autres objets inflammables hors de portée du radiateur.
5. Faites fonctionner le radiateur uniquement grille de protection fermée. La grille de protection doit être fixée par vis pour éviter toute ouverture involontaire.
6. Évitez de poser ou introduire des corps étrangers au contact du radiateur ou d'un de ses éléments, car ceci peut provoquer un choc électrique, un incendie ou des dégâts à l'appareil de chauffage.
7. L'appareil de chauffage a des pièces chaudes qui forment un arc ou des étincelles à l'intérieur. Ne l'utilisez pas dans des endroits où de l'essence, de la peinture ou des liquides inflammables sont utilisés ou entreposés.
8. N'utilisez pas le radiateur dans un environnement à contact direct avec de l'eau.
9. Ne l'utilisez pas dans une atmosphère corrosive.
10. Le voltage fourni doit être le même que celui de l'appareil. Se reporter sur a plaque d'identification avant la mise sous tension.

CONSERVEZ CES INSTRUCTIONS

Generalites

Le radiateur HT500 demande un montage horizontal mural. Le thermostat incorporé tient compte du réglage du débit de chaleur dans un environnement de 4° à 21°C (40 à 70° F). Le radiateur est câblé en usine pour une utilisation sous 240/208 Volts mais peut être recâblé pour l'utilisation sous 120 Volts.

Installation

1. Enlevez la grille de protection en dévissant les 2 vis sur le devant.
2. Positionnez le radiateur à l'endroit choisi en gardant un minimum d'espace libre (voir l'avertissement 3 et la figure 1)

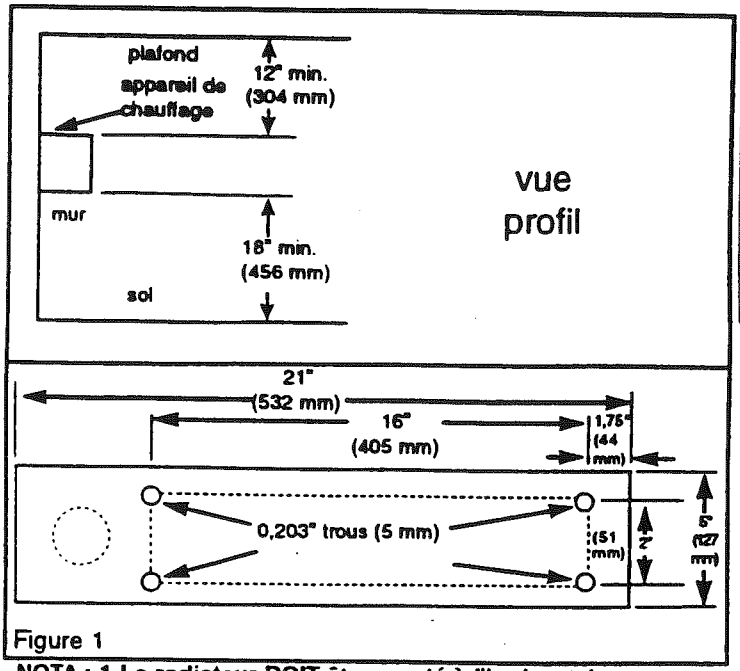


Figure 1

NOTA : 1 Le radiateur DOIT être monté à l'horizontale pour permettre une circulation d'air librement vers le haut. Le thermostat peut être monté indifféremment à gauche ou à droite du radiateur.

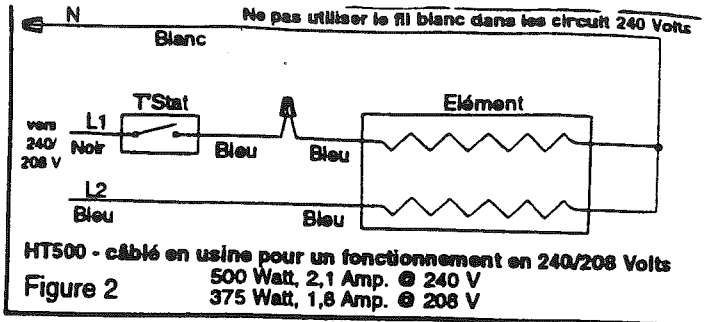
3. Fixez le radiateur solidement au mur à l'aide de vis ou boulons en utilisant les 4 trous pré-perforés sur l'arrière du radiateur.

Câblage

1. Introduisez le câble secteur du radiateur dans le trou de branchement pré-percé 7/8" (22 mm) au fond de la boîte de contrôle. Utilisez le clip câble comme recommandé par le Code National Électrique.
2. Connectez le fil de terre au radiateur en utilisant la vis de terre de couleur verte.
3. Pour faire fonctionner le radiateur à 208-240 Volts, connectez le câble d'alimentation secteur en suivant le diagramme montré dans la figure 2. NE PAS UTILISER LE CÂBLE BLANC MARQUÉ "N" POUR LE MONTAGE EN 208 - 240 VOLTS.
4. Pour faire marcher le radiateur en 120 Volts, référez-vous à la figure 3. Connectez le câble L2 bleu à l'autre câble bleu ainsi que le fil bleu du thermostat. Retirez le repère du câble L2. Connectez le câble de 120 Volts au fil noir L1 et au câble blanc N (voir figure 3).
5. Replacez la grille de protection en la revissant à l'aide des 2 vis enlevées et des 4 vis contenues dans le sachet d'accessoires. Sortez le bouton du thermostat du sac et installez-le.

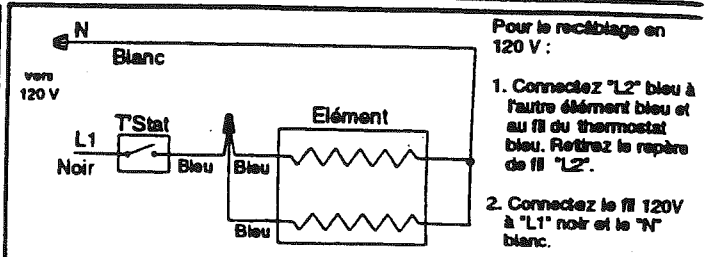
Allumage

1. Allumez le bouton Marche du radiateur.
2. Tournez le thermostat dans le sens des aiguilles d'une montre pour obtenir la chaleur maximale. Si la température de l'air est inférieure à 21°C (70°F), le radiateur se déclenche et en quelques instants l'élément chauffant devient chaud. Si la température de l'air est supérieure à 21°C (70°F), le thermostat ne se déclenchera pas. Un contrôle du dispositif doit avoir lieu lorsque la température de l'air est inférieure à 21° C (70°F) .
3. L'échelle du thermostat s'étend de 4°C (40°F) à la position minimale en sens inverse des aiguilles d'une montre, jusqu'à 21°C (70°F) en position maximale, dans le sens des aiguilles d'une montre. Positionnez le thermostat à l'endroit désiré. Le thermostat maintient le radiateur automatiquement à la température désirée.



HT500 - câblé en usine pour un fonctionnement en 240/208 Volts
500 Watt, 2,1 Amp. @ 240 V
375 Watt, 1,8 Amp. @ 208 V

Figure 2



HT500 - re-câblage pour fonctionnement en 120V
500 Watt, 4,2 Amp.

Figure 3

NOTA : Le radiateur a été conçu, muni d'une protection contre le gel; le thermostat permet de démarrer au plus bas, si la température de l'espace tombe en dessous de 4°C (40°F).

Nettoyage - Entretien

Ce radiateur ne nécessite aucun entretien . Un nettoyage périodique pour enlever poussières et saleté est recommandé, en utilisant de l'air comprimé (voir avertissement 1).

GARANTIE LIMITEE

Tous les produits fabriqués par Marley Electric Heating sont garantis contre les défauts de main d'oeuvre et de matériaux pendant un an à compter de la date de l'installation. Cette garantie ne s'applique pas aux dégâts provenant d'accident, de mauvais emploi ou de modification ; ni là où la tension branchée est supérieure de 5 % à la tension de la plaque signalétique ; ni à un matériel incorrectement installé ou câblé ou entretenu en infraction aux instructions d'installation du produit. Toutes les réclamations relatives à la main d'oeuvre de garantie doivent être accompagnées de la preuve de la date d'installation.

Le client sera responsable de tous les frais encourus par la dépose ou la réinstallation des produits, y compris les frais de main d'oeuvre et les frais d'expédition encourus pour renvoyer les produits au Marley Electric Heating Service Center. Dans le cadre des limites de la présente garantie, les appareils défectueux devraient être retournés au centre de service après-vente autorisé le plus proche ou au Centre Marley Electric Heating, et nous les réparerons ou les remplacerons, à notre choix, gratuitement, les frais d'expédition de retour étant payés par Marley. Il est convenu qu'une telle réparation ou un tel remplacement sont les seuls recours pouvant être obtenus auprès de Marley Electric Heating.

LES GARANTIES CI-DESSUS REMPLACENT TOUTES LES AUTRES GARANTIES EXPLICITES OU IMPLICITES ET TOUTES LES GARANTIES IMPLICITES DE COMMERCIABILITÉ ET D'ADAPTATION À UN USAGE PARTICULIER QUI DÉPASSENT LES GARANTIES EXPLICITES DÉCRITES CI-DESSUS SONT RÉPUDIÉES PAR LA PRÉSENTE ET EXCLUES DE CET ACCORD. MARLEY ELECTRIC HEATING NE SERA PAS RESPONSABLE DES DOMMAGES INDIRECTS SE RAPPORTANT AU PRODUIT, QUE CE SOIT PAR NÉGLIGENCE, DÉLIT, RESPONSABILITÉ STRICTE OU CONTRAT.

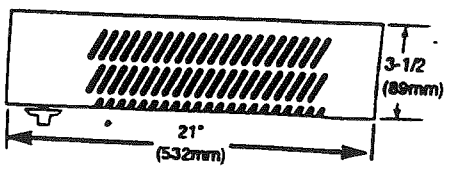
Certaines provinces n'autorisent pas l'exclusion ou la limitation de dommages-intérêts fortuits ou indirects, de sorte que l'exclusion ou la limitation ci-dessus peut ne pas s'appliquer à vous. La présente garantie vous donne des droits légaux spécifiques et vous pouvez aussi avoir d'autres droits qui varient d'une province à l'autre.

Pour l'adresse de votre centre d'entretien autorisé le plus proche, veuillez prendre contact avec Marley Electric Heating à Bennettsville, Caroline du Sud, au 1-800-642-4328. La marchandise renvoyée à l'usine doit être accompagnée d'une autorisation de renvoi et d'une étiquette d'identification de service, les deux sont à votre disposition auprès de Marley Electric Heating. Lors de la demande d'autorisation de renvoi, inclure tous les numéros de catalogue qui figurent sur les produits.

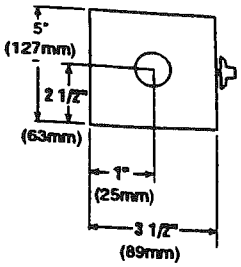
Marley Electric Heating
Une société United Dominion
470 Beauty Spot Rd. East
Bennettsville, SC 29512 USA

Marley Electric Heating
Una compañía United Dominion

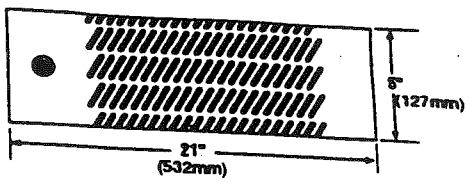
VISTA SUPERIOR



VISTA IZQUIERDA



VISTA FRONTAL



Calentador utilitario de montaje superficial HT500

LISTED c UL
ARCHIVO Nº 21609

Instrucciones de instalación y mantenimiento

Estimado propietario:

¡Felicidades! Gracias por haber comprado este nuevo calentador fabricado por una división de Marley Electric Heating. Usted ha hecho una inversión sabia al elegir el producto de mayor calidad que existe en la industria de la calefacción. Por favor lea con detenimiento las instrucciones de instalación y mantenimiento presentadas en este manual. Así, usted disfrutará de muchos años de calefacción eficiente con este producto de Marley Electric Heating... el líder de la industria en lo referente a diseño, fabricación, calidad y servicio.

...Los empleados de
Marley Electric Heating

⚠ ADVERTENCIA

Lea con atención. Este instructivo contiene información vital para la instalación, uso y operación eficiente del calentador. Lea el manual con detenimiento antes de instalar, operar o limpiar el calentador. La inobservancia de las instrucciones puede ocasionar incendios, electrochoques, la muerte, lesiones graves o daños materiales. Guarde estas instrucciones y consúltelas con frecuencia para cerciorarse de que la operación se lleve a cabo en forma segura y para instruir a los usuarios nuevos.

ADVERTENCIA: RIESGO DE INCENDIO Y ELECTROCHOQUE

1. Para evitar la posibilidad de electrochoque, desconecte en el panel de servicio principal toda la energía que llega al calentador antes de alambrar o dar servicio a la unidad.
2. Todo el alambrado deberá efectuarse de acuerdo con los códigos eléctricos nacionales y locales. Asimismo, el calentador deberá estar puesto a tierra.
3. No instale el calentador a menos de 18" (456 mm) del piso o 12" (304 mm) del techo. El extremo del calentador puede estar junto a un muro adyacente. No instale el calentador verticalmente.
4. Este calentador se calienta mucho cuando está funcionando. No instale el calentador detrás de puertas o toalleros, en clósets, donde las cortinas puedan entrar en contacto con el calentador ni donde se obstruya el flujo de aire al calentador. Mantenga los cordones eléctricos, sábanas y colchas, muebles y otros materiales combustibles lejos del calentador.
5. No opere el calentador sin la cubierta. La cubierta deberá estar sujeta con tornillos para evitar la remoción accidental.
6. No introduzca objetos extraños ni permita que entren en el calentador o toquen el elemento calentador, ya que esto puede ocasionar electrochoques, incendios o daños al calentador.
7. El calentador tiene piezas calientes y generadoras de arcos y chispas. No se use en áreas donde se emplean o almacenan gasolina, pintura o líquidos inflamables.
8. No use el calentador en áreas donde entrará en contacto directo con el agua.
9. No use el calentador en ambientes corrosivos.
10. El voltaje de la fuente debe ser igual al voltaje del calentador. Consulte la placa del calentador y el voltaje de la fuente antes de aplicar la energía.

GUARDE ESTAS INSTRUCCIONES

Información general

El calentador utilitario HT500 ha sido diseñado exclusivamente para el montaje horizontal en paredes. El termostato incorporado permite ajustar la salida térmica entre 40° y 70° F (4,4° y 21° C). El calentador ha sido alambrado en la fábrica para funcionar con 240/208 volts, pero puede realambrarse para operar con 120 volts.

Instalación

1. Quite la cubierta de la parrilla, extrayendo los dos tornillos del frente de la cubierta.
2. Coloque el calentador en la posición deseada en la pared, manteniendo las separaciones mínimas que se indican en la advertencia 3 y se ilustran en la figura 1.

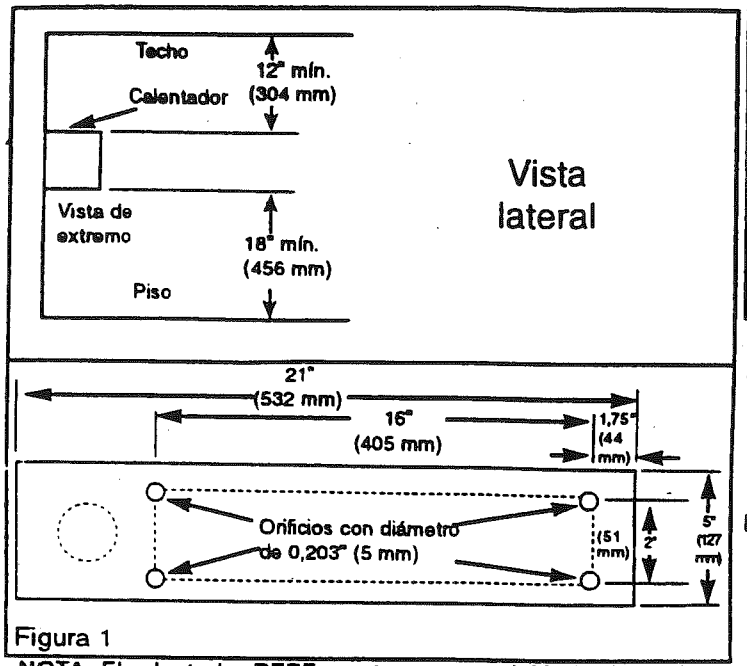


Figura 1

NOTA: El calentador DEBE montarse en posición horizontal para permitir el flujo libre del aire por el elemento calentador. El termostato puede ubicarse en cualquiera de los extremos.

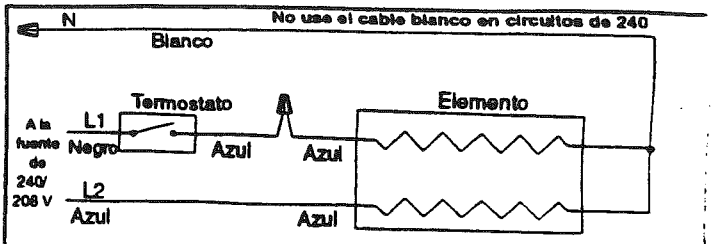
3. Sujete el calentador firmemente a la pared, usando tornillos o pernos introducidos por los cuatro orificios de la parte posterior del calentador.

Alambrado

1. Tienda el cable de energía eléctrica hasta el calentador e introdúzcalo en el compartimiento de alambrado, a través del orificio de 7/8" (22 mm) en el extremo de la caja de control. Cerciórese de usar una abrazadera para el cable, como lo exige el Código Eléctrico Nacional de EE.UU.
2. Conecte el cable de puesta a tierra de la fuente al tornillo verde de puesta a tierra del calentador.
3. Para operar el calentador con 208 a 240 volts, conecte el alambrado de la fuente eléctrica al alambrado eléctrico del calentador de acuerdo con el diagrama de alambrado de la figura 2. NO USE EL CABLE BLANCO MARCADO "N" PARA EL ALAMBRADO DE 208 A 240 VOLTS.
4. Para operar el calentador a 120 volts hay que realambrar el calentador como se ilustra en la figura 3, conectando el cable azul L2 al cable azul del otro elemento y al cable azul del termostato. Quite la marca del cable L2. Conecte los 120 volts al cable negro L1 y al cable blanco N. Consulte la figura 3.
5. Complete la instalación colocando de nuevo la cubierta de la parrilla y sujetándola con los dos tornillos que quitó previamente y cuatro tornillos adicionales de la bolsa de piezas. Saque la perilla del termostato de la bolsa e instale la perilla.

Operación del calentador

1. Encienda el calentador.
2. Gire el termostato en sentido de las manecillas del reloj, hasta la posición más caliente. Si la temperatura del aire es menor que 70°F (21°C), el calentador deberá encenderse y el elemento calentador se calentará. Si la temperatura del aire es superior a 70°F (21°C), el calentador no se encenderá.



HT500 - Alambrado en la fábrica para operar a 240/208 volts
Figura 2 500 watts, 2,1 amperes a 240 V
375 watts, 1,8 amperes a 208 V

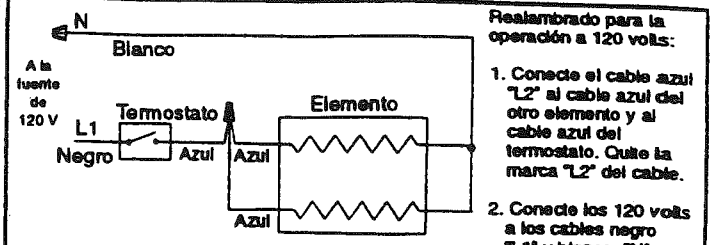


Figura 3 **HT500 - Realambrado para la operación a 120 volts**
500 watts, 4,2 amperes

Para revisar el ajuste del termostato es necesario que la temperatura del aire sea menor que 70°F (21°C).

3. El intervalo operativo del termostato es de 40°F (4,4°C), al girar la perilla totalmente en sentido contrario al de las manecillas del reloj, hasta 70°F (21°C) con la perilla girada totalmente en sentido de las manecillas del reloj. Gire el termostato a la posición deseada. El termostato encenderá y apagará el calentador automáticamente para mantener la temperatura deseada.

NOTA: El calentador ha sido diseñado con protección contra congelamiento y el termostato puede permitir que el calentador se encienda si la temperatura ambiental baja a menos de 40°F (4,4°C).

Limpieza y mantenimiento

Este calentador no requiere mantenimiento. Se recomienda la limpieza periódica con aspiradora y accesorio de cepillo para eliminar el polvo y la tierra acumulados. Consulte la advertencia 1.

GARANTÍA LIMITADA

Todos los productos fabricados por Marley Electric Heating están garantizados contra defectos de mano de obra o materiales durante un año, a partir de la fecha de instalación. Esta garantía no se aplica a daños que resulten de accidentes, mal uso o alteraciones, ni a casos en los cuales el voltaje de alimentación sea más del 5% mayor que el voltaje especificado en la placa del producto. La garantía tampoco se aplica a equipo mal instalado o alambrado o cuyo mantenimiento se haya efectuado sin seguir las instrucciones de instalación del producto. Toda solicitud de trabajo amparado por la garantía deberá ir acompañada por un comprobante de la fecha de instalación.

El cliente será responsable de todos los costos incurridos por la remoción o reinstalación de los productos, incluyendo costos de mano de obra y transporte incurridos en la devolución de los productos al Centro de Servicio de Marley Electric Heating. Dentro de las limitaciones de esta garantía, la unidades inoperantes deberán devolverse al centro de servicio autorizado por Marley más cercano o al Centro de Servicio de Marley Electric Heating. Nosotros repararemos o reemplazaremos la unidad, a discreción nuestra y sin costo para el cliente, con el flete de retorno pagado por Marley. El cliente acepta que esta reparación o reemplazo será el único remedio que podrá exigir a Marley Electric Heating.

LAS GARANTÍAS ANTERIORES SUSTITUYEN A CUALQUIER OTRA GARANTÍA, YA SEA EXPLÍCITA O IMPLÍCITA. TODA GARANTÍA IMPLÍCITA DE COMERCIABILIDAD O IDONEIDAD PARA UN PROPÓSITO ESPECÍFICO QUE EXCEDA A LAS GARANTÍAS ANTERIORES QUEDARÁ EXCLUIDA DE ESTE ACUERDO. MARLEY ELECTRIC HEATING NO SERÁ RESPONSABLE DE DAÑOS CONSECUENTES RELACIONADOS CON EL PRODUCTO, YA SEA QUE ESTÉN BASADOS EN NEGLIGENCIA, AGRAVIO, RESPONSABILIDAD ESTRICTA O CONTRATO.

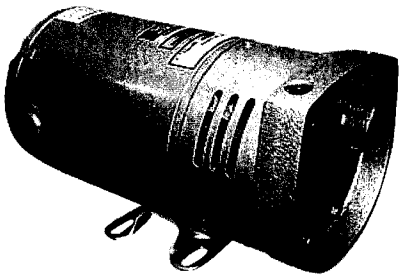
Algunos estados no permiten la exclusión o limitación de los daños incidentales o consecuentes, por lo cual es posible que la exclusión o limitación anterior no sea aplicable en su caso. Esta garantía le otorga derechos legales específicos y usted podrá tener otros derechos que varíen de un estado al otro.

Si desea conocer la dirección del centro de servicio autorizado más cercano a usted, comuníquese con Marley Electric Heating en Bennettsville, Carolina del Sur, llamando al 1-800-642-4328. La mercancía devuelta a la fábrica deberá ir acompañada por una autorización de devolución y un marbete de identificación de servicio, los cuales pueden obtenerse de Marley Electric Heating. Al solicitar la autorización de devolución, por favor incluya todos los números de catálogo que aparecen en los productos.

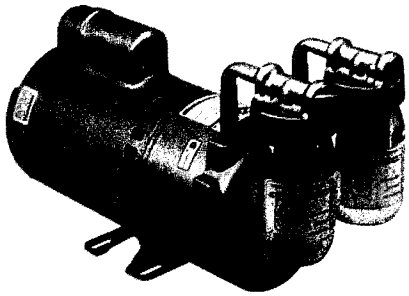
Marley Electric Heating
Una compañía United Dominion
470 Beauty Spot Rd. East
Bennettsville, SC 29512 EE.UU.

23 SERIES OIL-LESS VACUUM PUMPS & COMPRESSORS

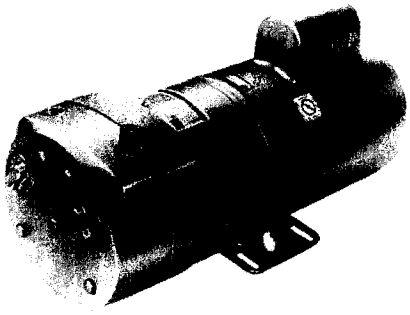
OPERATION & MAINTENANCE MANUAL



Model #0523-101 Shown



Model #1023-V103 Shown



Model #1023-101Q Shown

Thank you for purchasing this Gast product. It is manufactured to the highest standards using quality materials. Please follow all recommended maintenance, operational and safety instructions and you will receive years of trouble free service.

⚠ WARNING

PLEASE READ THIS MANUAL COMPLETELY BEFORE INSTALLING AND USING THIS PRODUCT. SAVE THIS MANUAL FOR FUTURE REFERENCE AND KEEP IN THE VICINITY OF THE PRODUCT.

General information

- **Clearances:** Model 0323/0523
  Top: .0015"
  End: .0015"
  Model 0823/1023
  Tops .003"
  End : .002"

- **Vane Life:** 5,000-15,000 hours depending upon application

- **Model numbers ending in "X"** have automatic thermal protectors which protect the motor by shutting the motor off if it overheats. The motor will automatically restart once the motor has cooled.

Product Use Criteria:

- Pump only clean, dry air.
- Operate at 32°F - 104°F (0°C - 40°C).
- Protect unit from dirt & moisture.
- Do not pump flammable or explosive gases or use in an atmosphere that contains such gases.
- Protect all surrounding items from exhaust air. This exhaust air can become very hot.
- Corrosive gases and particulate material will damage unit. Water vapor, oil-based contaminants or other liquids must be filtered out.
- Consult your Gast Distributor before using at high altitudes.

- Oil-Less rotary-vanes require NO lubrication.
- Sealed bearings are grease packed.
- Use of petroleum or hydrocarbon products will reduce carbon-vane service life.

GAST®
A Unit of IDEX Corporation
ISO 9001 & 14001 CERTIFIED
www.gastmfg.com

Your safety and the safety of others is extremely important.

We have provided many important safety messages in this manual and on your product. Always read and obey all safety messages.

This is the safety alert symbol. This symbol alerts you to hazards that can kill or hurt you and others. The safety alert symbol and the words "DANGER" and "WARNING" will precede all safety messages. These words mean:

⚠ DANGER

You will be killed or seriously injured if you don't follow instructions.

⚠ WARNING

You can be killed or seriously injured if you don't follow instructions.

All safety messages will identify the hazard, tell you how to reduce the chance of injury, and tell you what can happen if the safety instructions are not followed.

INSTALLATION

⚠ WARNING

Electrical Shock Hazard

Disconnect electrical power at the circuit breaker or fuse box before installing this product.

Install this product where it will not come into contact with water or other liquids.

Install this product where it will be weather protected.

Electrically ground this product.

Failure to follow these instructions can result in death, fire or electrical shock.

Correct installation is your responsibility. Make sure you have the proper installation conditions and that installation clearances do not block air flow.

Blocking air flow over the product in any way can cause the product to overheat.

Mounting
This product can be installed in any orientation. Mounting the product to a stable, rigid operating surface and using shock mounts will reduce noise and vibration.

Plumbing
Remove plugs from the IN and OUT ports. Connect with pipe and fittings that are the same size or larger than the product's threaded ports.

Accessories
The product's intake and exhaust filters will provide adequate filtration in most applications. Consult your Gast representative for additional filter recommendations. Install relief valves and gauges at inlet or outlet, or both, to monitor performance. Check valves are required to prevent back streaming through the pump.

Motor Control
It is your responsibility to contact a qualified electrician and assure that the electrical installation is adequate and in conformance with all national and local codes and ordinances.

Determine the correct overload setting required to protect the motor (see motor starter manufacturer's recommendations). Select fuses, motor protective switches or thermal protective switches to provide protection. Fuses act as short circuit protection for the motor, not as protection against overload. Incoming line fuses help to withstand the motor's starting current. Motor starters with thermal magnetic overload or circuit breakers protect motor from overload or reduced voltage conditions.

The wiring diagram attached to the product provides required electrical information. Check that power source is correct to properly operate the dual-voltage motor.

OPERATION

⚠ WARNING

Injury Hazard

Product surfaces become very hot during operation,
allow product surfaces to cool before handling.

Air stream from product may contain solid or liquid material that can result in eye or skin damage, wear proper eye protection.

Failure to follow these instructions can result in burns, eye injury or other serious injury.

It is your responsibility to operate this product at recommended pressures or vacuum duties and room ambient temperatures.

Model numbers ending in "X" have automatic thermal protectors which protect the motor by shutting the motor off if it overheats. The motor will automatically restart once the motor has cooled.

Start Up

If motor fails to start or slows down significantly under load, shut off and disconnect from power supply. Check that the voltage is correct for motor and that motor is turning in the proper direction. Vane life will be drastically reduced if motor is not operating properly. Vanes can break or be damaged if motor/pump runs in the wrong direction.

MAINTENANCE

⚠ WARNING

Electrical Shock Hazard

Disconnect electrical power supply cord before performing maintenance on this product.

If product is hard wired into system, disconnect electrical power at the circuit breaker or fuse box
before performing maintenance on this product.

Failure to follow these instructions can result in death, fire or electrical shock.

⚠ WARNING

Injury Hazard

Product surfaces become very hot during operation,
allow product surfaces to cool before handling.

Air stream from product may contain solid or liquid
material that can result in eye or skin damage, wear proper eye protection.

Flush this product in a well ventilated area.

Failure to follow these instructions can result in burns, eye injury or other serious injury.

General Maintenance

1. Remove end cap and filters. Inspect filters for rips,tears, cuts, brittleness and excessive foreign material.
2. Clean filters if in good condition with compressed air. Re-inspect for wear conditions. Set filters aside.
3. Check filter/muffler (#11) for compacted debris. If debris is present, replace filter/muffler.
4. Check condition of O-ring. It should be soft and flexible. Replace if it is not.
5. Remove and inspect muffler box. Clean box. Set box aside. (Not all models have a muffler box.)
6. Check gasket for cracks or tears. Install new gasket
   if any cracks or tears appear. Replace gasket.
7. Replace muffler box.
8. Reinstall filters or install new filters if required. Reinstall end cap.

Flushing

Flushing this product to remove excessive dirt, foreign particles, moisture or oil that occurs in the operating environment will help to maintain proper vane performance. There are 2 options for this operation. If Option 1 does not remedy your problem, go on to Option 2.

Use only Gast recommended flushing solvent or other non-petroleum based flushing solvent. Do Not use kerosene or ANY other combustible solvents to flush product.

Option 1

You will need 2 pipe nipples at least 4 inches long with 1/4" NPT for 0323 and 0523 products, or 3/8" NPT on one end for 0823 and 1023 products. No nipples are needed if the unit does not have a muffler box.

1. Remove filter and muffler cap (#9).
2. Remove 5 bolts. Use a small hammer to tap on muffler box to remove it. Attach pipe nipples where muffler caps were removed.
3. Start product and add flushing solvent to the inlet port. If using liquid solvent, pour several tablespoons directly into the inlet port. If using Gast recommended spray solvent, spray for 5-10 seconds into inlet port. Place towel over exhaust to clean up solvent.
4. Plug inlet port for 20-30 seconds. Listen for changes in the sound of the pump. If pump sounds smooth, go to next step. If pump does not sound ike it is running smoothly, installing a Service Kit will be required (See Service).
5. Release vacuum.
6. Repeat steps 3-5 three or four times.

If Option 1 is not successful, remove the end plate and examine.

Option 2

1. Remove six end plate bolts. (See exploded view.)
2. Use a small hammer to carefully tap on end plate to remove. Do not use a screwdriver to pry off.
3. Check that vanes are moving freely in and out of vane slots. Replace vanes if more than 50% of the vane extends past the vane slot.
4. Remove vanes and clean both sides with fine emery cloth. Clean end-plate with fine emery cloth.
5. Flush vanes with Gast recommended solvent and remove all solvent from vanes.
6. Flush body, rotor and end plate with Gast recommended solvent, then remove all solvent from each part.
7. Check body, rotor and end plate for scoring. If each part is clean and shows no signs of scoring, re-install parts. If scoring appears, send unit to factory or replace with new part(s).

Check that all external accessories such as relief valves and gauges are attached to cover and are not damaged before re-operating product.

SHUTDOWN PROCEDURES

It is your responsibility to follow proper shutdown procedures to prevent product damage.
NEVER ADD OIL TO THIS OIL-LESS PUMP.

1. Disconnect plumbing.
2. Operate product for at least five minutes without plumbing.
3. Run at maximum vacuum for 10-15 minutes.
4. Repeat step 2.
5. Disconnect power supply.
6. Plug open ports to prevent dirt or other contaminants from entering product.

SERVICE KIT INSTALLATION

⚠ WARNING

Electrical Shock Hazard

Disconnect electrical power supply cord before installing service kit.

If product is hard wired into system, disconnect electrical power at the circuit breaker or fuse box before installing service kit.

Vent all air lines to release pressure or vacuum.

Failure to follow these instructions can result in death, fire or electrical shock.

Gast will NOT guarantee field-rebuilt product performance. For performance guarantee, the product must be returned to a Gast-authorized facility.

Service Kit contents vary. Most contain vanes, gaskets and filter parts.

1. Remove filter/muffler parts from front of muffler box.
2. Remove the 5 muffler box bolts.
3. Use a small hammer to tap on box to remove. Do not use a screwdriver.
4. Remove the 6 end plate bolts.
5. Remove end plate. Check direction of bevel edges of vanes then remove vanes.
6. Clean body and rotor slots.
7. Check end plate, rotor and body for scoring. Severe scoring or worn bearings will require service at a Gast-authorized facility.

DO NOT remove rotor or motor bolts.

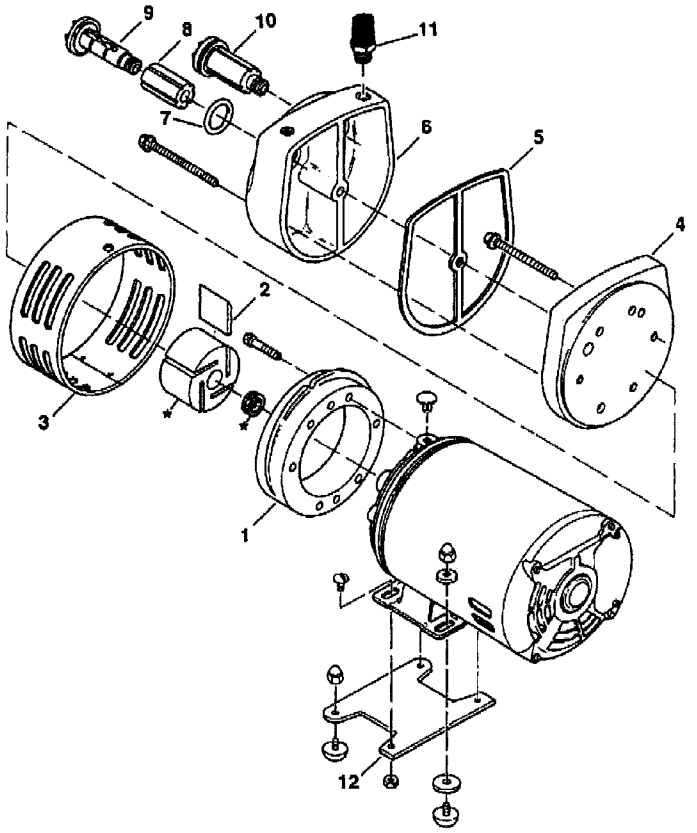
8. Insert vanes, checking that the bevel edges are in the correct direction.
9. Replace end plate. Torque bolts to 90-120 in. lb.
10. Check gasket for damage.
11. Reinstall muffler box. Torque bolts to 90-120 in. lb.

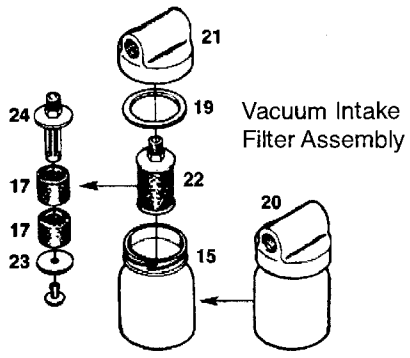
Check that all external accessories such as relief valves and gauges are attached and are not damaged before re-operating product.

EXPLODED PRODUCT VIEW, PARTS & ORDERING INFORMATION

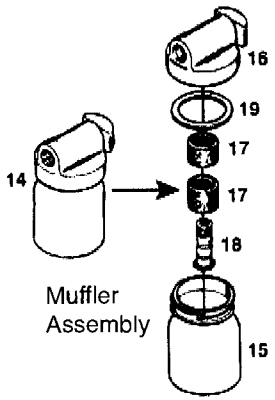
REF	DESCRIPTION	QTY	0323-101	0323-101Q	0523-101	0523-101Q	0523-V103
1	BODY	1	AK503	AK503	AK505	AK505	AK505
2 *	VANE	4	AH850A	AH850A	AH850A	AH850A	AH850A
3	SHROUD	1	AK502	AK502	AK502	AK502	AK502
4	END PLATE	1	AK516A	AK501	AK516A	AK501	AK516A
5 *	GASKET	1		AK521		AK521	
6	MUFFLER BOX	1		AK519		AK519	
7 *	O-RING	2		AK473		AK473	
8 *	FELT	2		AK524		AK524	
9	END CAP	2		AK510		AK510	
10	END CAP ASSEMBLY	2		AK526		AK526	
11	FILTER / MUFFLER	1		AK840A		AK840A	
12	FOOT SUPPORT	1		AC136		AC136	
13	ELBOW ***	2					AD997
14	MUFFLER ASSEMBLY	1					V425L
15	JAR	2					AA125A
16	COVER	1					AV427APC
17	FELT FILTER	4					B344A
18	SUPPORT	1					B345A
19	COVER GASKET	2					B62A
20	FILTER ASSEMBLY	1					V400G
21	COVER	1					AV402CPC
22	FILTER ASSEMBLY	1					B343B
23	SCREEN CAP	1					AJ571
24	FELT SUPPORT	1					B347
	SERVICE KIT	1	K478A	K478	K478A	K478	K559

* Denotes parts included in the Service Kit. Parts listed are for stock models.
** No Service Kit available, order parts separately. *** Not shown.
For specific OEM models, please consult the factory.
When corresponding or ordering parts, please give complete model and serial numbers.





Vacuum Intake Filter Assembly

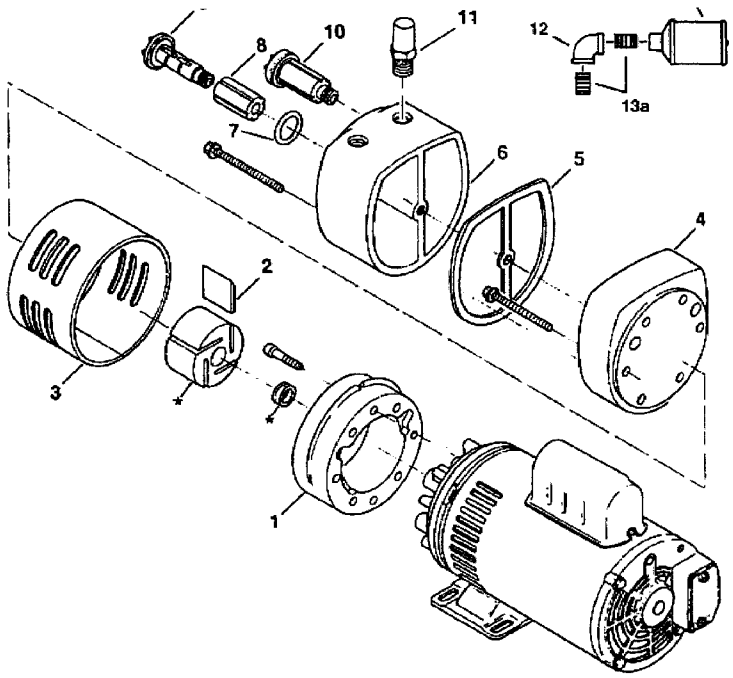


Muffler Assembly

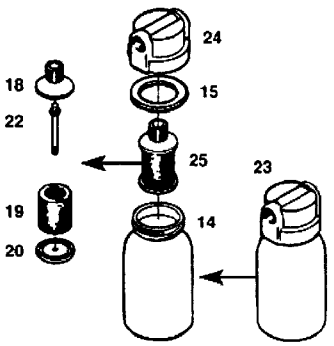
EXPLODED PRODUCT VIEW, PARTS & ORDERING INFORMATION

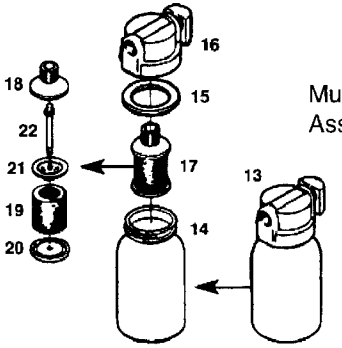
REF	DESCRIPTION	QTY	0823-101	0823-101Q	1023-101	1023-101Q	1023-V103	1423-101Q
1	BODY	1	AK517	AK517	AK518	AK518	AK518	AL283
2 *	VANE	4	AK513	AK513	AK513	AK513	AK513	AL284
3	SHROUD	1	AK511	AK511	AK511	AK511	AK511	AL281
4	END PLATE	1	AK515A	AK514	AK515A	AK514	AK515A	AK514
5 *	GASKET	1		AK522		AK522		AK522
6	MUFFLER BOX	1		AK520		AK520		AK520
7 *	O-RING	2		AK473		AK473		AK473
8 *	FELT	2		AK524		AK524		AK524
9	END CAP	2		AK510		AK510		AK510
10	END CAP ASSEMBLY	2		AK526		AK526		AK526
11	FILTER / MUFFLER	1		AK840		AK840		AC432
12	ELBOW	1						BA206
12	ELBOW ***	2					AF272	
13	MUFFLER ASSEMBLY	1					AB599B	
13a	NIPPLE	2						BA714
14	JAR	2					AA805	
15	COVER GASKET	2					AA405	
16	COVER ASSEMBLY	1					AV805BPC	
17	MUFFLER ASSEMBLY	1					AC434-1	
18	COUPLING	2					AC391	
19	CARTRIDGE	2					AC393	
20	END CAP ASSEMBLY	2					AC394	
21	MUFFLER PLATE	1					AC395	
22	STUD	2					AC396	
23	FILTER ASSEMBLY	1					AB599	
24	COVER ASSEMBLY	1					AV805APC	
25	FILTER ASSEMBLY	1					AC433-1	
	SERVICE KIT	1	K479A	K479	K479A	K479	K479A	K575A

For 1423 Models only.
(Shipped unattached)



Vacuum Intake
Filter Assembly





Muffler
Assembly

* Denotes parts included in the Service Kit. Parts listed are for stock models.
** No Service Kit available, order parts separately. *** Not shown.
For specific OEM models, please consult the factory. When corresponding or ordering parts, please give complete model and serial numbers.

WARRANTY

Gast finished products, when properly installed and operated under normal conditions of use, are warranted by Gast to be free from defects in material and workmanship for a period of twelve (12) months from the date of purchase from Gast or an authorized Gast Representative or Distributor. In order to obtain performance under this warranty, the buyer must promptly (in no event later than thirty (30) days after discovery of the defect) give written notice of the defect to Gast Manufacturing Incorporated, PO Box 97, Benton Harbor Michigan USA 49023-0097 or an authorized Service Center (unless specifically agreed upon in writing signed by both parties or specified in writing as part of a Gast OEM Quotation). Buyer is responsible for freight charges both to and from Gast in all cases.

This warranty does not apply to electric motors, electrical controls, and gasoline engines not supplied by Gast. Gast's warranties also do not extend to any goods or parts which have been subjected to misuse, lack of maintenance, neglect, damage by accident or transit damage.

THIS EXPRESS WARRANTY EXCLUDES ALL OTHER WARRANTIES OR REPRESENTATIONS EXPRESSED OR IMPLIED BY ANY LITERATURE, DATA, OR PERSON. GAST'S MAXIMUM LIABILITY UNDER THIS EXCLUSIVE REMEDY SHALL NEVER EXCEED THE COST OF THE SUBJECT PRODUCT AND GAST RESERVES THE RIGHT, AT ITS SOLE DISCRETION, TO REFUND THE PURCHASE PRICE IN LIEU OF REPAIR OR REPLACEMENT.

GAST WILL NOT BE RESPONSIBLE OR LIABLE FOR INDIRECT OR CONSEQUENTIAL DAMAGES OF ANY KIND, however arising, including but not limited to those for use of any products, loss of time, inconvenience, lost profit, labor charges, or other incidental or consequential damages with respect to persons, business, or property, whether as a result of breach of warranty, negligence or otherwise. Notwithstanding any other provision of this warranty, BUYER'S REMEDY AGAINST GAST FOR GOODS SUPPLIED OR FOR NON-DELIVERED GOODS OR FAILURE TO FURNISH GOODS, WHETHER OR NOT BASED ON NEGLIGENCE, STRICT LIABILITY OR BREACH OF EXPRESS OR IMPLIED WARRANTY IS LIMITED SOLELY, AT GAST'S OPTION, TO REPLACEMENT OF OR CURE OF SUCH NONCONFORMING OR NON-DELIVERED GOODS OR RETURN OF THE PURCHASE PRICE FOR SUCH GOODS AND IN NO EVENT SHALL EXCEED THE PRICE OR CHARGE FOR SUCH GOODS. GAST EXPRESSLY DISCLAIMS ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE WITH RESPECT TO THE GOODS SOLD. THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTIONS SET FORTH IN THIS WARRANTY, notwithstanding any knowledge of Gast regarding the use or uses intended to be made of goods, proposed changes or additions to goods, or any assistance or suggestions that may have been made by Gast personnel.

Unauthorized extensions of warranties by the customer shall remain the customer's responsibility.

CUSTOMER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF GAST PRODUCTS FOR CUSTOMER'S USE OR RESALE, OR FOR INCORPORATING THEM INTO OBJECTS OR APPLICATIONS WHICH CUSTOMER DESIGNS, ASSEMBLES, CONSTRUCTS OR MANUFACTURES.

This warranty can be modified only by authorized Gast personnel by signing a specific, written description of any modifications.

MAINTENANCE RECORD

DATE	PROCEDURE PERFORMED

TROUBLESHOOTING CHART

Low		High		Pump	Motor	Reason and remedy
Vacuum	Pressure	Vacuum	Pressure	Overheat	Overload	for problem.
•	•	At pump		•	•	Filter dirty. Clean or replace.
	•		At pump	•	•	Muffler dirty. Clean or replace.
•		At pump		•	•	Vacuum line collapsed. Repair or replace.
			•	•	•	Relief valve set too high. Inspect and adjust.
•	•					Relief valve set too low. Inspect and adjust.
•	•	At pump	At pump	•	•	Plugged vacuum/pressure line. Inspect and repair.
•	•					Vanes sticking. Clean or replace.
•	•					Vanes worn. Replace.
•	•					Shaft seal worn. Replace.
•	•			•	•	Dust or offset powder in pump. Inspect and clean.
•	•			•	•	Motor not wired correctly. Check wiring diagram and line voltage.

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SHOP DRAWING REVIEW
This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

x	Reviewed
	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By JEP/ML
Date 01/04/2013

CONESTOGA-ROVERS & ASSOCIATES

Model 8 Basket Strainer and Bag Filters

Strainers or bag filters:
Your choice!

Model 8 strainer/filter housings are made in 2 sizes and 2 pressure ratings, and can serve as basket strainers (for particle retention down to 74 micron size) or as bag filters (for particle retention down to 1 micron size). In all cases, covers are easily removed, without tools, and the basket or bag is easily cleaned or replaced.

Features

- NSF 61 listed
- Low pressure drops
- Permanently piped housings
- Covers are O-ring sealed
- Carbon steel, or stainless steel (304 or 316) construction for housings
- All housings are electropolished to resist adhesion of dirt and scale
- Easy to clean!
- Adjustable-height legs, standard
- Large-area, heavy-duty baskets
- O-ring seals: Buna N, EPR, Viton®, Teflon®
- ASME code stamp available
- Two pressure ratings: 150 and 300
- Duplex units are available
- Pipe sizes 3/4 thru 6-inch, NPT or flanged
- Two basket depths: 15 or 30 inches (nominal)

Options

- Sanitary construction
- Different outlet connections
- Higher pressure ratings
- Extra-length legs
- Heat jacketing
- Adapters for holding filter cartridges.
- Liquid displacers for easier servicing
- Can be fitted with an adapter to hold cartridge filter elements

Choosing A Basket Strainer Or Bag Filter

Choose between straining (removing particles down to 74 micron size) or filtering a fluid (removing particles down to 1 micron). This will direct you in selecting the correct basket when ordering.

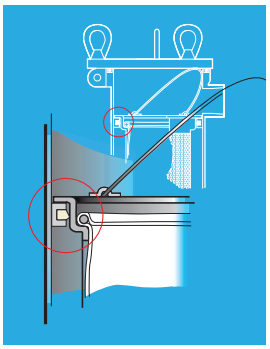
Dual Stage Straining/Filter

All Rosedale Model 8 housings can be supplied with a second, inner basket, which is supported on the top flange of the regular basket. Both baskets can be strainers (with or without wire mesh linings) or both can be baskets for filter bags. They can also be mixed: one a strainer basket, the other a filter bag basket. Dual-stage action will increase strainer or filter life and reduce servicing needs.

Operation

Unfiltered liquid enters the housing above the bag or basket and flows through. Solids are contained inside the bag or basket, where they are easily removed when the unit is serviced.

A basket bail is pushed down by the closed cover to hold the basket against a positive stop in the housing. A radial seal prevents bypass of unfiltered liquid.



Pressure Drop Data

Basket strainers and bag filters are usually selected so that the pressure drop does not exceed 2 psi, when they are clean. Higher pressure drops may be tolerated, when contaminant loading is low. Bag change occurs at 15 psid.

The pressure drop data is accurate for all housings with strainer or filter bag baskets. When filter bags are added, total pressure drop becomes the sum of the pressure drop as determined by the steps below.

Follow these easy steps:

1. Using the desired pipe size and approximate flow rate, determine the basic pressure drop from the appropriate graph.
2. Multiply the pressure drop obtained in step 1 by the viscosity correction factor found in the accompanying table. This is the adjusted (clean) pressure drop for all baskets without filter bags.
3. Add the pressure drop for the bag.

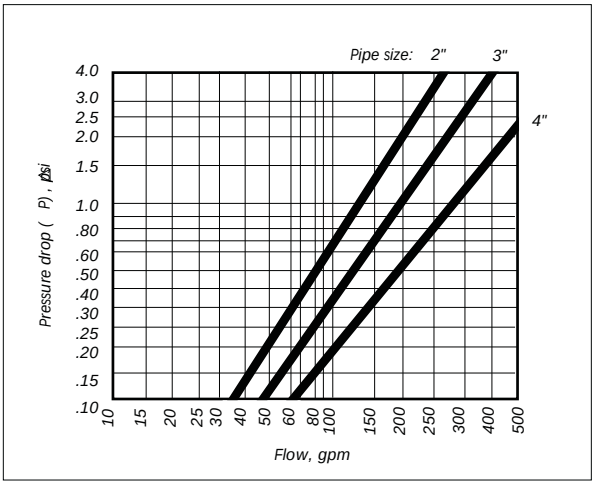
Note: Filter bags are specified separately.
See page 134.

Basket Data

Depth Nominal (inches)	Diameter (inches)	Surface Area (sq. ft.)	Volume (cu. in.)	Bag Size No.
15	6.7	2.3	500	1
30	6.7	4.4	1000	2

	Viscosity, cps								
	1 (H_2O)	50	100	200	400	600	800	1000	2000
All unlined baskets	.65	.85	1.00	1.10	1.20	1.40	1.50	1.60	1.80
40-mesh lined	.73	.95	1.20	1.40	1.50	1.80	1.90	2.00	2.30
60-mesh lined	.77	1.00	1.30	1.60	1.70	2.10	2.20	2.30	2.80
80-mesh lined	.93	1.20	1.50	1.90	2.10	2.40	2.60	2.80	3.50
100-mesh lined	1.00	1.30	1.60	2.20	2.40	2.70	3.00	3.30	4.40
200-mesh lined	1.30	1.70	2.10	3.00	3.40	3.80	4.40	5.00	6.80

Model 8–For flow rates to 220 gpm*



*Based on housing only. Fluid viscosity, filter bag used, and expected dirt loading should be considered when sizing a filter.

Eyenut covers with filter bag and basket.

Dimensions (IN)

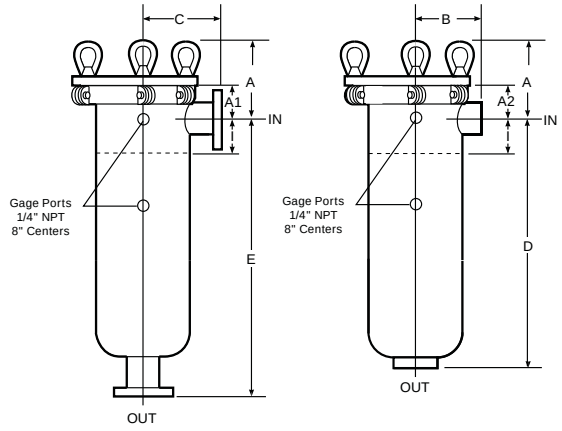
Outlet Styles

Flanged (150 lb. ANSI) | Threaded (NPT)

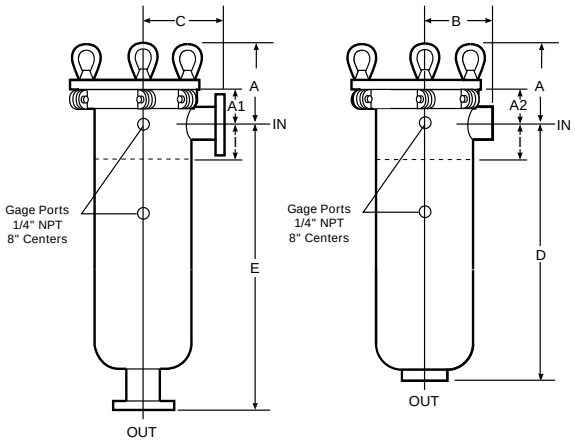
Outlet Styles

Flanged (300 lb. ANSI) | Threaded (NPT)

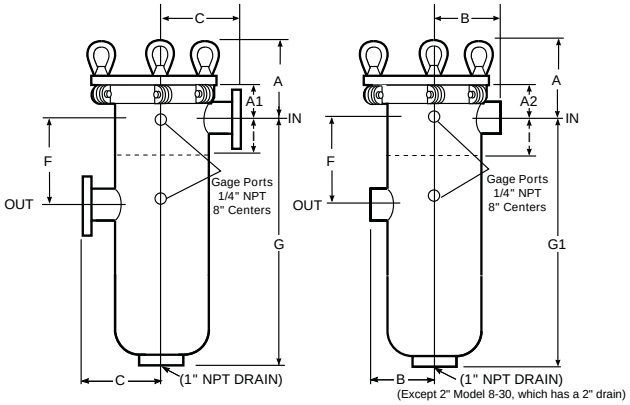
STYLE 1



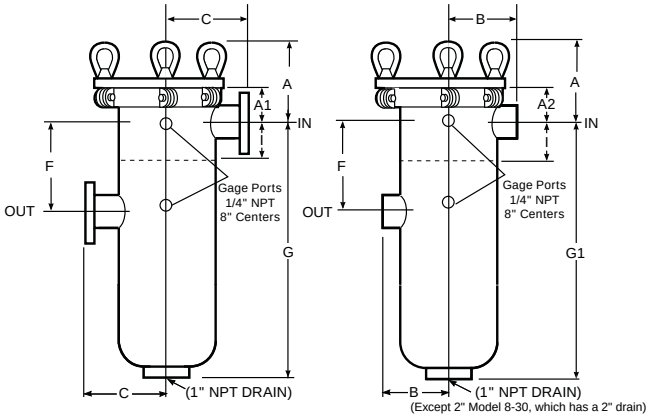
STYLE 1



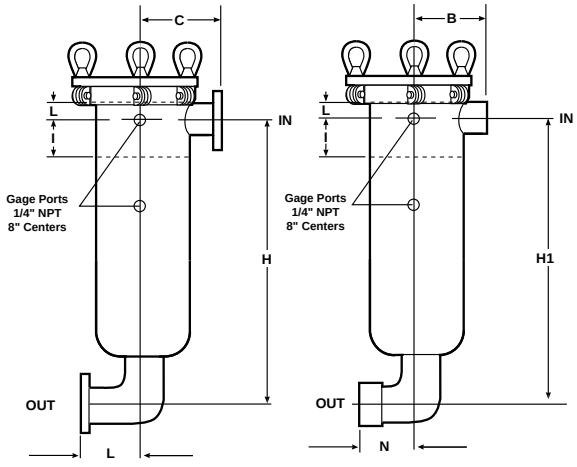
STYLE 2



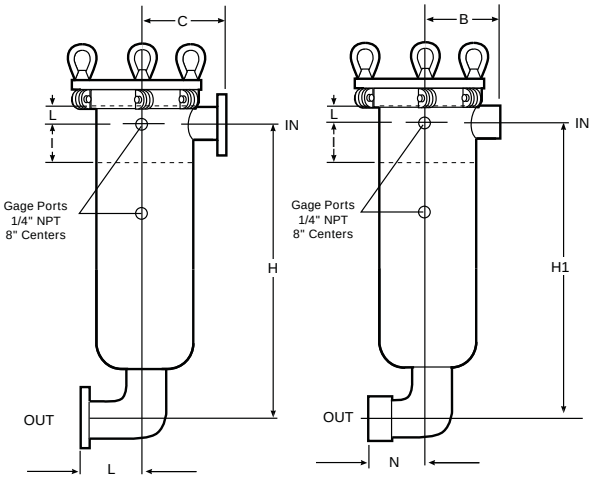
STYLE 2



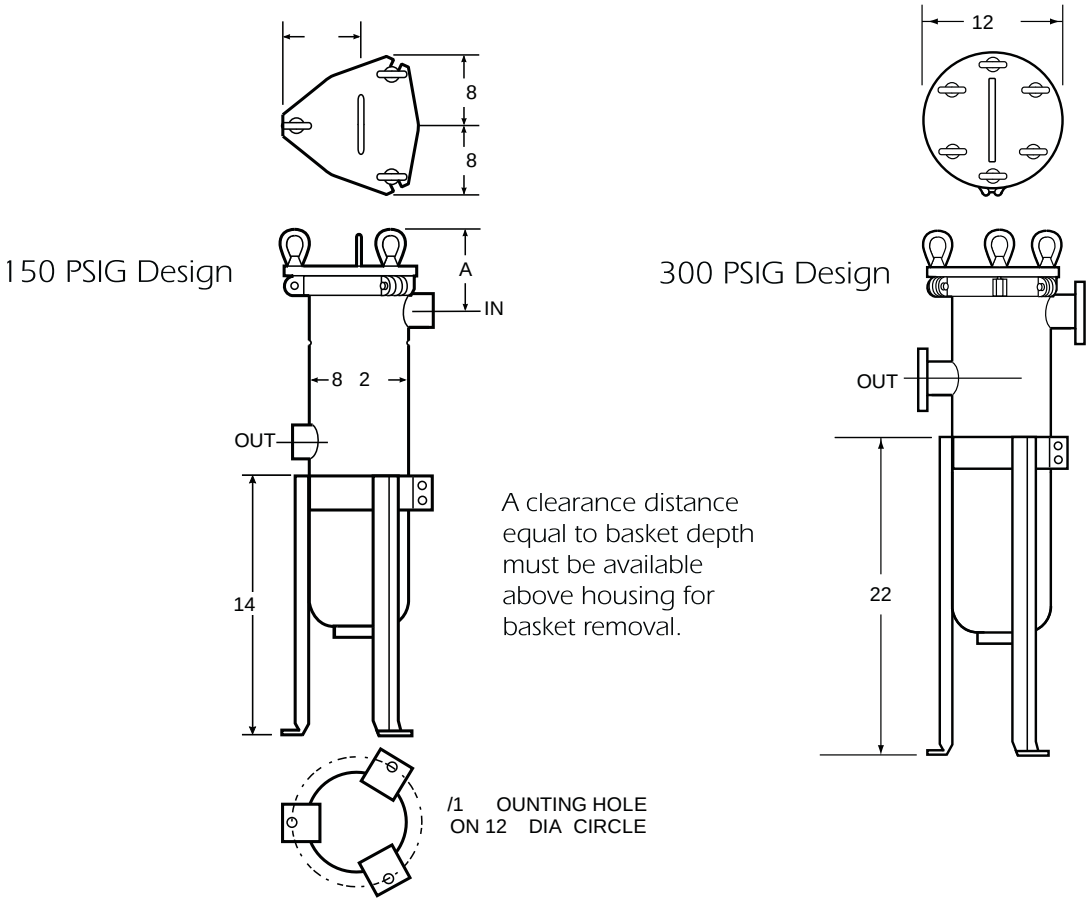
STYLE 3



STYLE 3



Cover Types



Dimensions (IN) 150 PSIG Design

Model	Pipe Size	A	A1	A2	B	C	D	E	F	G/G1	H/H1	I	J	K	L
8-15	2	9.1	5.4	2.9	5.9	7.5	20.6	23.4	8.0	20.9	22.8	3.25	5.0	4.06	4.25
	3	9.1	5.4	3.7	6.8	7.5	21.3	23.4	8.0	20.9	24.3	3.25	7.25	6.12	4.25
	4	9.1	5.4	5.0	6.8	8.6	21.3	23.9	8.0	20.9	25.6	3.25	9.0	7.75	4.25
	6	9.4	5.6	5.9	7.1	8.6	23.6	27.1	9.0	23.4	30.9	4.12	12.5	11.0	4.5
8-30	2	9.1	5.4	2.9	5.9	7.5	35.6	38.4	8.0	35.9	37.8	3.25	5.0	4.06	4.25
	3	9.1	5.4	3.7	6.8	7.5	36.3	38.4	8.0	35.9	39.3	3.25	7.25	6.12	4.25
	4	9.1	5.4	5.0	6.8	8.6	36.3	38.9	8.0	35.9	40.6	3.25	9.0	7.75	4.25
	6	9.4	5.6	5.9	7.1	8.6	38.6	42.1	9.0	38.4	45.9	4.12	12.5	11.0	4.5

Dimensions (IN) 300 PSIG Design

Model	Pipe	A Size	A1/A2	B	C	D	E	F	G/G1	H/H1	I	J	K	L
8-15	2	9.5	5.4	5.9	7.5	20.6	23.4	8.0	20.9	22.8	3.25	5.0	4.06	4.25
	3	9.5	5.4	6.8	8.6	21.3	23.4	8.0	20.9	24.3	3.25	7.25	6.12	4.25
	4	9.5	5.4	6.8	8.6	21.3	23.9	8.0	20.9	25.6	3.25	9.0	7.75	4.25
	6	9.6	5.6	7.1	8.6	23.6	27.1	9.0	23.4	30.9	4.12	12.5	11.0	4.5
8-30	2	9.5	5.4	5.9	7.5	35.6	38.4	8.0	35.9	37.8	3.25	5.0	4.06	4.25
	3	9.5	5.4	6.8	7.5	36.3	38.4	8.0	35.9	39.3	3.25	7.25	6.12	4.25
	4	9.5	5.4	6.8	8.6	36.3	38.9	8.0	35.9	40.6	3.25	9.0	7.75	4.25
	6	9.6	5.6	7.1	8.6	38.6	42.1	9.0	38.4	45.9	4.12	12.5	11.0	4.5

How To Order

Build an ordering code as shown in the example

Example: 8-15-3P-1-150-C-B-S-M-200-D-C - 2M 50

HOUSING | OPTIONS | OPTIONAL INNER BASKET

MODEL NO.
8 = **8**

HOUSING SIZE
15 inch = **15**
30 inch = **30**

PIPE SIZE, NPT and FLANGED[1]
3/4-in. female NPT = **3/4P**
1-in. female NPT = **1P**
1-1/4-in. female NPT = **1-1/4P**
1-1/2-in. female NPT = **1-1/2P**
2-in. female NPT = **2P**
3-in. female NPT = **3P**
3/4-in. 150 class ANSI flange = **3/4F**
1-in. 150 class ANSI flange = **1F**
1-1/4-in. 150 class ANSI flange = **1-1/4F**
1-1/2-in. 150 class ANSI flange = **1-1/2F**
2-in. 150 class ANSI flange = **2F**
3-in. 150 class ANSI flange = **3F**
4-in. 150 class ANSI flange = **4F**
6-in. 150 class ANSI flange = **6F**

OUTLET STYLE
Bottom = **1**
Side = **2**
Bottom elbow = **3**

PRESSURE RATING[2]
150 psi (NPT or flanged) = **150**
300 psi (NPT or flanged) = **300**

HOUSING MATERIAL
Carbon steel = **C**
304 stainless steel = **S**
316 stainless steel = **S316**

COVER SEAL
Buna N = **B**
Ethylene Propylene = **E**
Viton® Fluoroelastomer = **V**
Teflon® Encapsulated Viton® = **TEV**
Teflon® (solid white) (6 Bolt Cover) = **TSW**[5]

BASKET SEAL
Seal required = **S**

FOR MODEL 8 ONLY

OPTIONAL INNER BASKET, MEDIA SIZE-No symbol if type 2B basket was selected

Perforation diameters (for type 2P baskets)
1/4, 3/16, 9/64, 3/32, 1/16

Mesh sizes (for type 2M and 2BM baskets)20, 30, 40, 50, 60, 70, 80, 100, 150, 200

OPTIONAL INNER BASKET TYPE
2B = Filter bag basket, 9/94 perforations[3]
2P = Strainer basket, perforated metal
2BM = Filter bag basket, perforated, mesh lined[3]
2M = Strainer basket, perforated, mesh lined

ASME CODE STAMP
C = Code
NSF = NSF 61 listed

DISPLACER
D = Displacer

BASKET, MEDIA SIZE-No symbol if type B basket was selected
Perforation diameters (for type P baskets)
1/4, 3/16, 9/64, 3/32, 1/16

Mesh sizes (for type M and BM baskets)
20, 30, 40, 50, 60, 70, 80, 100, 150, 200

BASKET TYPE
PB = Filter bag basket, 9/64 perforations[3]
P = Strainer basket, perforated metal
BM = Filter bag basket, perforated, mesh lined[3]
M = Strainer basket, perforated, mesh lined
HWM = Filter bag basket, heavy wire mesh[3]

NOTE:
1. Flanges provided with the housing match the pressure rating of the vessel. Housings rated 150 psi have 150 class flanges. Housings rated 300 psi have 300 class flanges. ANSI B16.5 Pressure-Temperature rating tables determine flange class for ASME code housings. Consult factory.
2. Higher pressure ratings available. Consult factory.
3. Filter bags are specified separately. See page 134.
4. 150 psi unit has 150 class flanges. 300 psi unit has 300 class flanges.
5. 300 psi design only.

Pardys, John-Eric

From: Tomka, Mike
Sent: Thursday, January 03, 2013 2:06 PM
To: Pardys, John-Eric; Lamb, Matt
Subject: FW: Bay City Racer Bag Filters & Housing Submittal
Follow Up Flag: Follow up
Flag Status: Red
Attachments: ROSEDALE MODEL 8 BAG FILTER.pdf

JEP/Matt, can you please review quickly as they need to order it.
Thanks Mike

From: Bruce Cary [mailto:b.cary@phoenixenv.com]
Sent: Thursday, January 03, 2013 1:47 PM
To: Tomka, Mike
Cc: Tom Aker
Subject: Bay City Racer Bag Filters & Housing Submittal

Hi Mike:

Please see attached submittal for the Rosedale Products, Inc. Bag Filter.

I talked to Ken Smith at Rosedale (734-665-8201), and he said the correct ordering for this would be:

Model No. 8-30-2P-1-150-C-B-S-PB

Fortunately, they have them in stock in Ann Arbor too, so that is a good thing for all.

Ken said the reason for the PB letters at the end of the order number is because you do not want the mesh style housing, unless you're planning on taking it apart and washing/cleaning it and re-installing it at each maintenance period. We will be using the PE-25-P2S Disposable Bag Filters recommended by Ken. Please feel free to contact Ken or myself for questions.

Thank you.
Greatly appreciated.
Regards,
Bruce Cary
Phoenix Environmental
734-449-1266 (x408)

D SERIES SPEC SHEETS LIQUID AND VAPOR PHASE MODELS

MODEL **PAGE**

NEW D16..... 2

NEW DV1..... 3

DV2..... 4

DV5..... 5

DV-500 6

DV-1000 7

DV-1500 8

DV-1600 9

SPEC SHEET
ARTCORP D16
SEPTEMBER 1, 2005

DESCRIPTION: A single stage system designed to remove a variety of organic chemicals from industrial waste streams, surface water and groundwater. The adsorber is constructed of steel with a baked on epoxy lining. The internal distributor and piping are made up of schedule 80 PVC. The inlet and outlet connections are made of aluminum. The adsorber has a pressure gauge at the inlet and a sample port and shut off valve at the outlet. Adsorber installation can be individual, in parallel or in series. All ARTCORP adsorbers are designed for easy carbon change-out.

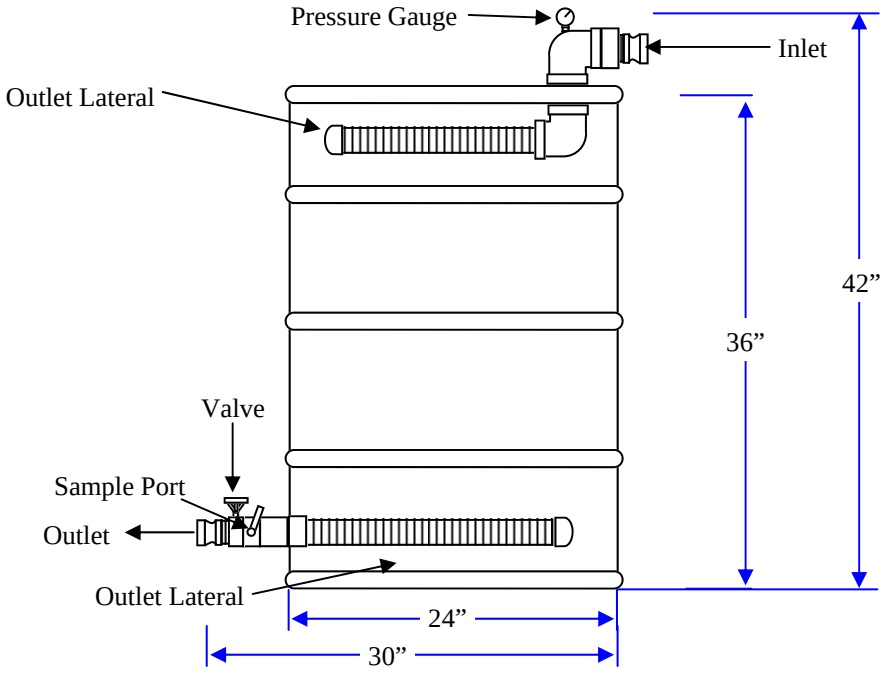
DIMENSIONS: Envelope size 24" x 36"
Tank size 30" x 42"

WEIGHT: 225 pounds (dry)

CONNECTION: Per customer specifications
Typical is 1" quick disconnect

DESIGN: Adsorbent - 6.5 cu. ft.
Resident time - 10 minutes at 5 gpm
Maximum pressure - 7 psig
Pressure drop - 18 inches of water
Carbon capacity - approximately 175 pounds
Empty tank capacity - 55 gallons

CARBON SPEC: Granular activated liquid phase carbon
Iodine number - 850 (typical)
Molasses number - 230 (typical)
Mesh size 12 x 40 or 8 x 30



SPEC SHEET
ARTCORP DV1
SEPTEMBER 1, 2005

DESCRIPTION: A single stage system designed for air purification and soil remediation. The adsorber is constructed of steel with a baked on epoxy lining. The internal distributor and piping are made up of schedule 80 PVC. The inlet and outlet connections are made of aluminum. The adsorber has a pressure gauge at the inlet and a sample port at the outlet. Adsorber installation can be individual, in parallel or in series. All ARTCORP adsorbers are designed for easy carbon change-out.

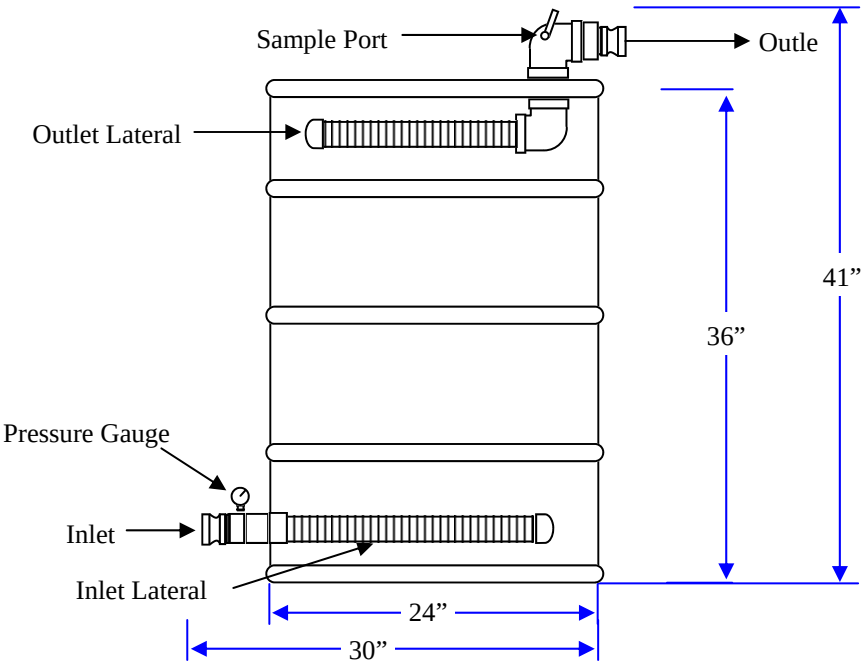
DIMENSIONS: Envelope size 24" x 36"
Tank size 30" x 41"

WEIGHT: 240 pounds (dry)

CONNECTION: Per customer specifications
Typical is 2" quick disconnect

DESIGN: Adsorbent - 6.5 cu. ft.
Resident time - 3.9 sec. at 100 cfm
Maximum pressure - 7 psig
Pressure drop - 22 inches of water
Carbon capacity - approximately 190 pounds
Empty tank capacity - 55 gallons

CARBON SPEC: Granular activated vapor phase carbon
Carbon tetrachloride number - 60% (typical)
Mesh size - 4 x 8



SPEC SHEET
ARTCORP DV2 VAPOR SYSTEM
NOVEMBER 16,2000

DESCRIPTION: The ARTCORP DV2 Vapor System eliminates offensive or unhealthy odors as well as volatile organic compounds (VOC) from the air.

The DV2 Vapor System units consist of a carbon adsorber and a blower to move the air through the carbon. The unit is designed to treat up to 100 cfm at a continuous operation. As the air stream moves through the activated carbon bed, the odor or VOC molecules become adsorbed onto the carbon thereby eliminating them from the air stream.

The carbon adsorber canister is constructed of steel with a baked on epoxy lining. The internal distribution system is made of stainless steel and PVC. The adsorber is designed for easy carbon change-out. A damper valve between the blower and adsorber is provided to adjust the air flow.

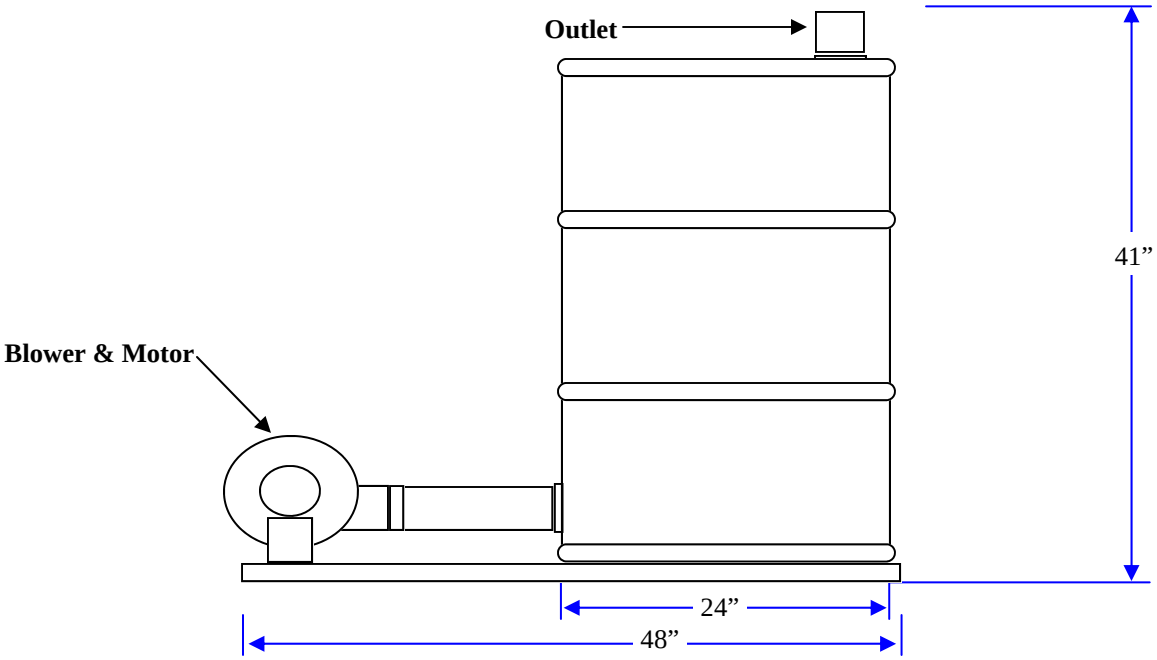
The blower is cast aluminum with high-strength alloys to create strong, corrosion-free housings and wheels which are ideal for adverse industrial environments. The non-sparking properties qualify the blower for AMCA Type B spark resistant rating.

The blower is powered by a direct drive 1/2 horsepower, 120 volt, single phase motor. It is rated class I groups D, class II groups F&G.

DIMENSIONS: Envelope size 48” x 24” x 41”

WEIGHT: 260 pounds (dry)

DESIGN: Adsorbent - 6.5 cu. ft.
Resident time - 4 sec. at 100 cfm
Maximum pressure, adsorber canister - 7 psig
Carbon capacity - approximately 190 pounds



SPEC SHEET
ARTCORP DV5 VAPOR SYSTEM
MAY 9, 2001

DESCRIPTION: The ARTCORP DV5 Vapor System eliminates offensive or unhealthy odors as well as volatile organic compounds (VOC) from the air.

The DV5 Vapor System units consist of a carbon adsorber and a blower to move the air through the carbon. The unit is designed to treat up to 300 cfm at a continuous operation. As the air stream moves through the activated carbon bed, the odor or VOC molecules become adsorbed onto the carbon thereby eliminating them from the air stream.

The carbon adsorber canister is constructed of steel with a baked on epoxy lining. The internal distribution system is made of stainless steel and PVC. The adsorber is designed for easy carbon change-out. A damper valve between the blower and adsorber is provided to adjust the air flow.

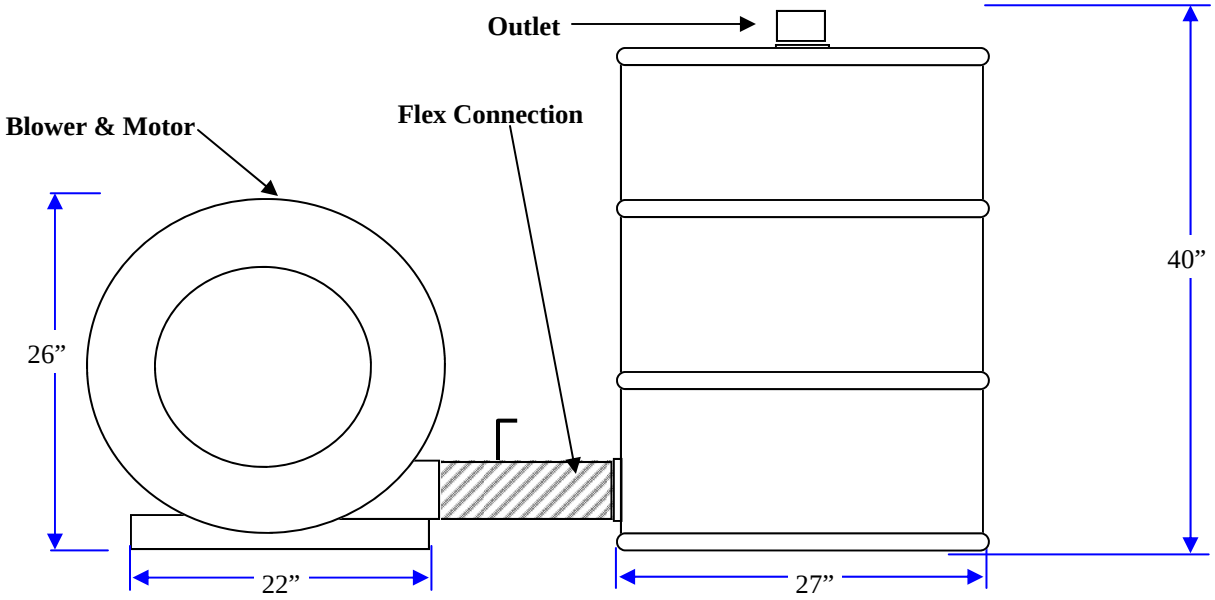
The blower is cast aluminum with high-strength alloys to create strong, corrosion-free housings and wheels which are ideal for adverse industrial environments. The non-sparking properties qualify the blower for AMCA Type B spark resistant rating.

The blower is powered by a direct drive 3 horsepower, 230/460 volt, three-phase explosion proof motor. It is rated class I groups D, class II groups F&G.

DIMENSIONS: Envelope size 40” x 27”
Blower/Motor 22” x 26”

WEIGHT: 525 pounds (dry)

DESIGN: Adsorbent - 9.5 cu. ft.
Resident time - 2 sec. at 300 cfm
Maximum pressure, adsorber canister - 7 psig
Carbon capacity - approximately 290 pounds



SPEC SHEET
ARTCORP DV-500
MARCH 1, 2005

DESCRIPTION: A single stage system designed for air purification and soil remediation. The adsorber is constructed of steel with a baked on epoxy lining. Pressure gauges and sample ports can be added to the adsorbers. The system installation can be individual, in parallel or in series. All ARTCORP adsorbers are designed for easy carbon change-out.

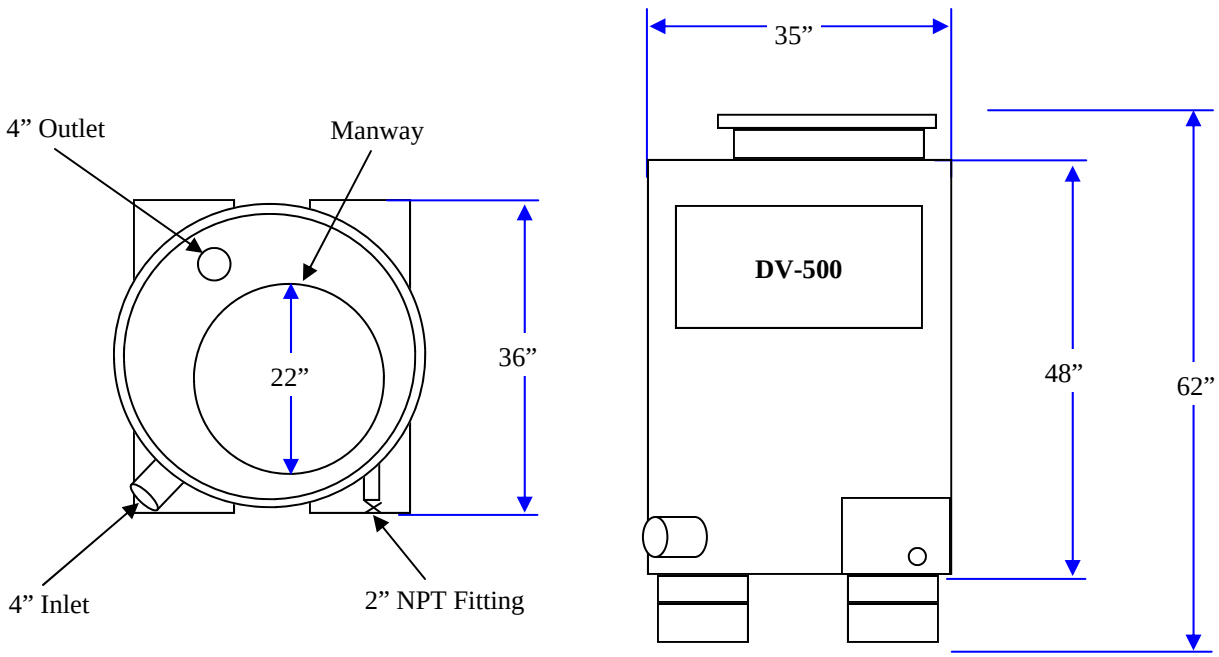
DIMENSIONS: Envelope size 36" x 48"
Tank size 36" x 62"

WEIGHT: 1000 pounds (dry)

CONNECTION: Per customer specifications
Typical is 4" FPT

DESIGN: Maximum flow - 300 cfm
Adsorbent - 17 cu. ft.
Resident time - 3 sec. at 300 cfm
Maximum temperature - 110° F
Pressure drop - 15 inches of water at 300 cfm
Carbon capacity - approximately 500 pounds
Carbon bed depth - 34 inches

CARBON SPEC: Granular activated vapor phase carbon
Carbon tetrachloride number - 60% (typical)
Mesh size - 4 x 8 or 4 x 10



SPEC SHEET
ARTCORP DV-1000
MARCH 1, 2005

DESCRIPTION: A single stage system designed for air purification and soil remediation. The adsorber is constructed of steel with a baked on epoxy lining. Pressure gauges and sample ports can be added to the adsorbers. The system installation can be individual, in parallel or in series. All ARTCORP adsorbers are designed for easy carbon change-out.

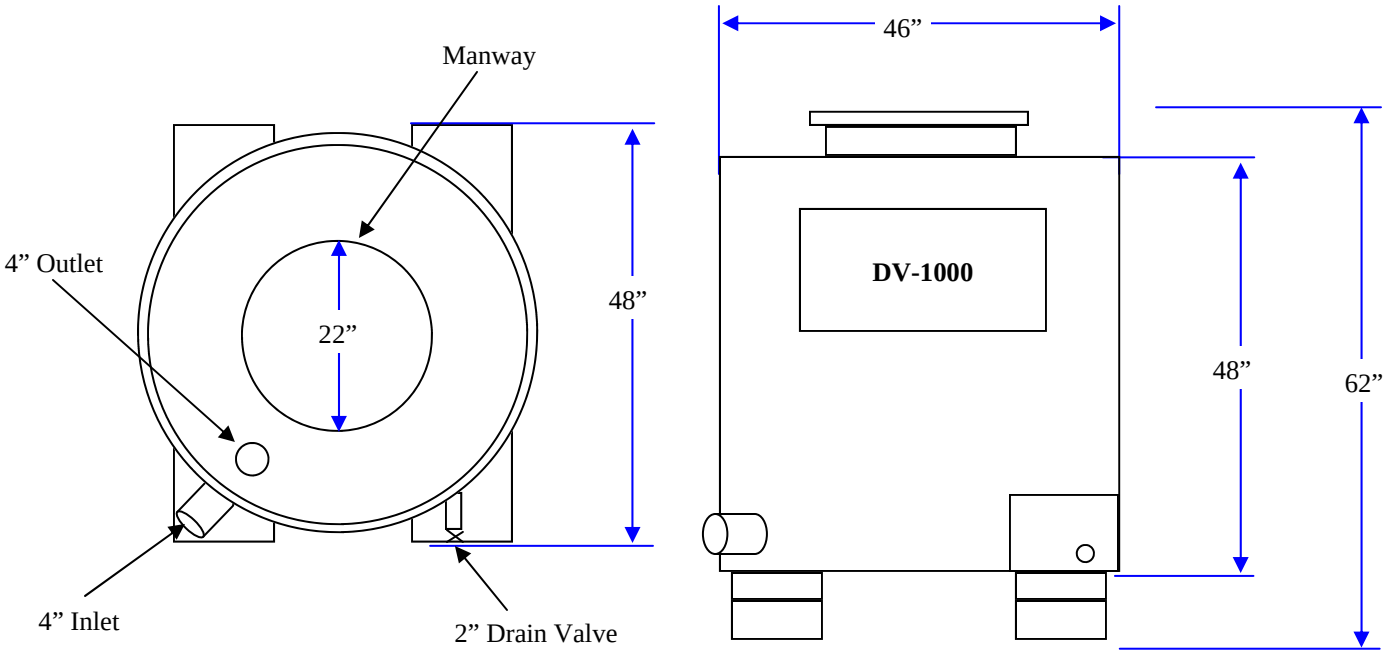
DIMENSIONS: Envelope size 46” x 48”
Tank size 48” x 62”

WEIGHT: 1650 pounds (dry)

CONNECTION: Per customer specifications
Typical is 4” FPT

DESIGN: Maximum flow - 500 cfm
Adsorbent - 34 cu. ft.
Resident time - 4 sec. at 500 cfm
Maximum temperature - 110° F
Pressure drop - 11 inches of water at 500 cfm
Carbon capacity - approximately 1000 pounds
Carbon bed depth - 37 inches

CARBON SPEC: Granular activated vapor phase carbon
Carbon tetrachloride number - 60% (typical)
Mesh size - 4 x 8 or 4 x 10



SPEC SHEET
ARTCORP DV-1500
MARCH 1, 2005

DESCRIPTION: A single stage system designed for air purification and soil remediation. The adsorber is constructed of steel with a baked on epoxy lining. Pressure gauges and sample ports can be added to the adsorbers. The system installation can be individual, in parallel or in series. All ARTCORP adsorbers are designed for easy carbon change-out.

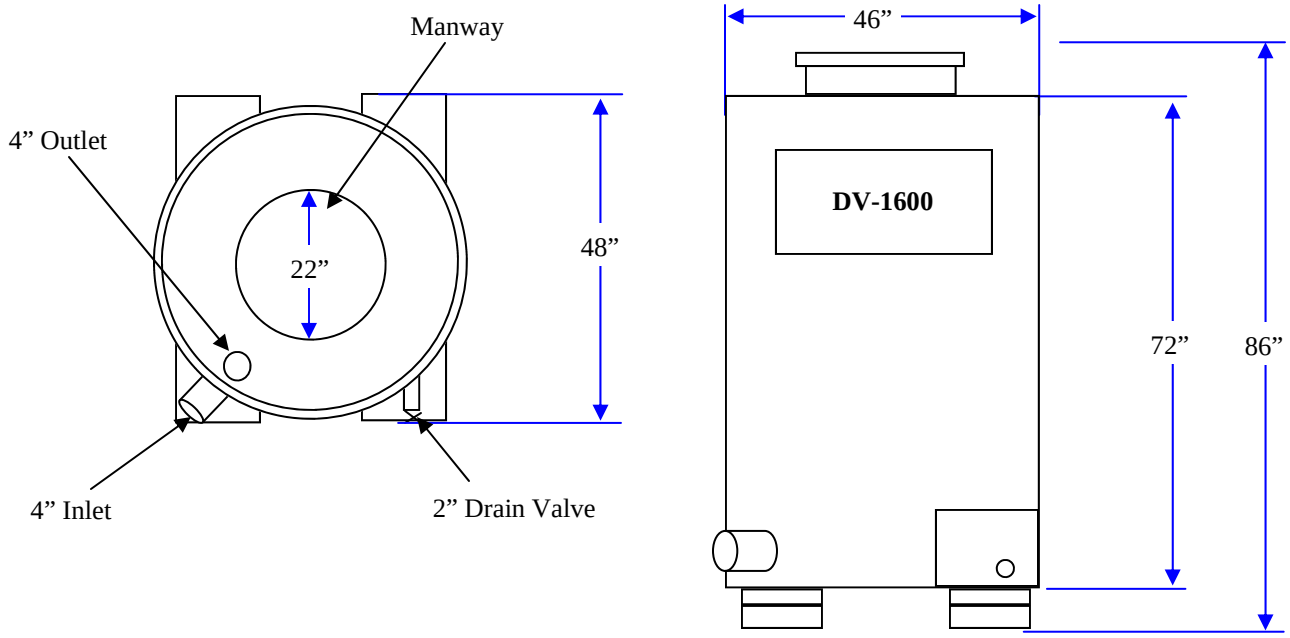
DIMENSIONS: Envelope size 46” x 72”
Tank size 48” x 86”

WEIGHT: 2525 pounds (dry)

CONNECTION: Per customer specifications
Typical is 4” FPT

DESIGN: Maximum flow - 500 cfm
Adsorbent - 55 cu. ft.
Resident time - 6.6 sec. at 500 cfm
Maximum temperature - 110° F
Pressure drop - 19 inches of water at 500 cfm
Carbon capacity - approximately 1600 pounds
Carbon bed depth - 60 inches

CARBON SPEC: Granular activated vapor phase carbon
Carbon tetrachloride number - 60% (typical)
Mesh size - 4 x 8 or 4 x 10



SPEC SHEET
ARTCORP DV-1600
MARCH 1, 2005

DESCRIPTION: A single stage system designed for air purification and soil remediation. The adsorber is constructed of steel with a baked on epoxy lining. Pressure gauges and sample ports can be added to the adsorbers. The system installation can be individual, in parallel or in series. All ARTCORP adsorbers are designed for easy carbon change-out.

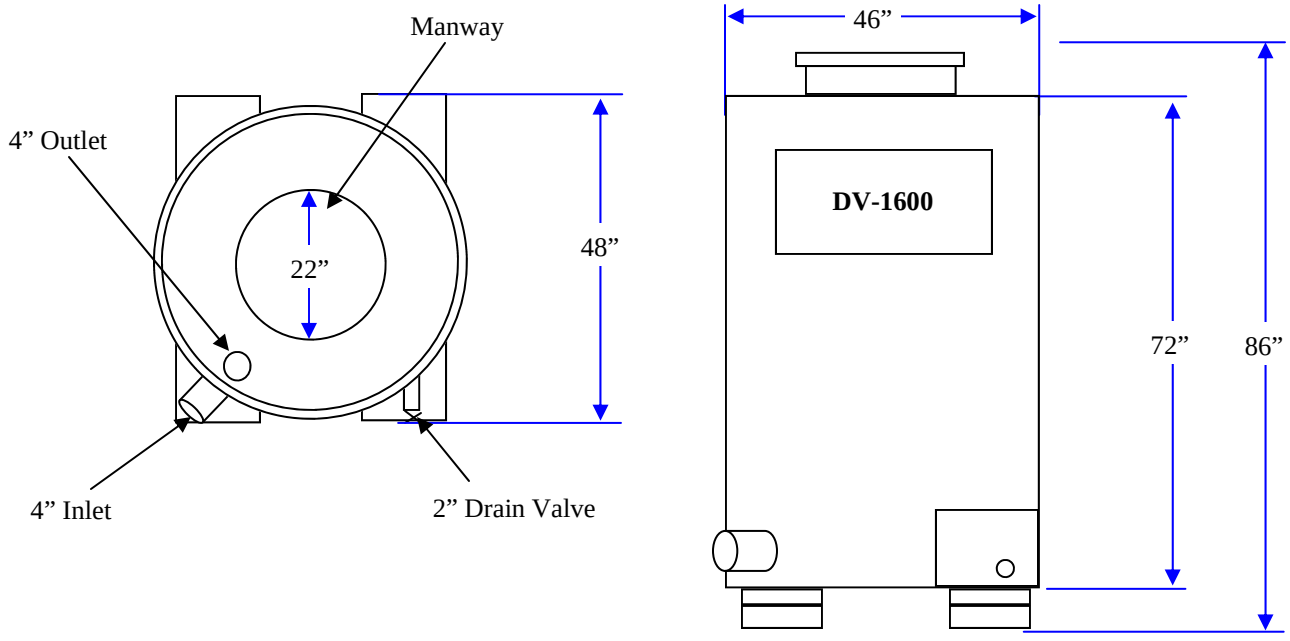
DIMENSIONS: Envelope size 46” x 72”
Tank size 48” x 86”

WEIGHT: 2525 pounds (dry)

CONNECTION: Per customer specifications
Typical is 4” FPT

DESIGN: Maximum flow - 500 cfm
Adsorbent - 55 cu. ft.
Resident time - 6.6 sec. at 500 cfm
Maximum temperature - 110° F
Pressure drop - 19 inches of water at 500 cfm
Carbon capacity - approximately 1600 pounds
Carbon bed depth - 60 inches

CARBON SPEC: Granular activated vapor phase carbon
Carbon tetrachloride number - 60% (typical)
Mesh size - 4 x 8 or 4 x 10



Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Dayton® Fan Forced Wall Heater

Description

Compact design, fast heat response and versatility make this fan-forced wall heater ideal for dens, basements, converted attics, breezeways, garages, bathrooms, small offices and workshops. Heater includes built-in thermostat and disconnect switch. This heater can be mounted in walls or ceilings (1000 watts or less). Do not install heater behind towel racks, behind doors or in floors.

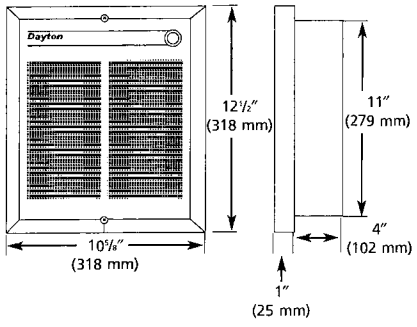
Specifications

Model No.	Volts	Amps	Watts	BTU/HR	Wire Size	Maximum length
2HAD6	120	12.5	1500	5120	12AWG	200 Feet
	120	6.3	750*	2560	12AWG	200 Feet
3ENC7	120	8.4	1000*	3413	14AWG	200 Feet
	120	4.2	500*	1706	14AWG	200 Feet
3ENC8	208	9.6	2000	6826	14AWG	200 Feet
	208	4.8	1000*	3413	14AWG	200 Feet
3WU90D	240	8.4	2000	6826	14AWG	200 Feet
	240	4.2	1000*	3413	14AWG	200 Feet
	208	7.2	1500	5120	14AWG	200 Feet
	208	3.6	750*	2560	14AWG	200 Feet
3ENC9	277	7.3	2000	6826	14AWG	200 Feet

NOTE: 4KA69D Surface Mounting Frame (Accessory) Order Separately
12½" (318 mm) H x 10⅜" (264 mm) W x 4" (102 mm) D

(*) **NOTE:** Heater can be ceiling mounted if wired for wattage / voltage indicated.

Dimensions

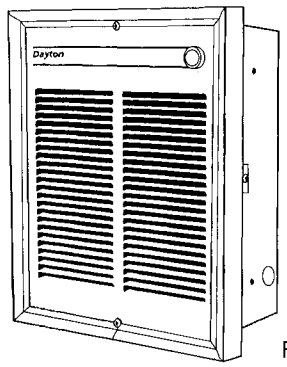


General Safety Instructions

⚠WARNING ***Read Carefully – These instructions are written to help you prevent difficulties that might arise during installation of heaters. Studying the instructions first may save you considerable time and money later. Observe the following procedures, and cut your installation time to a minimum.***

⚠WARNING ***To reduce risk of fire or electric shock:***

1. Disconnect all power coming to heater at main service panel before wiring or servicing.
2. All wiring must be in accordance with the National and Local Electrical Codes and the heater must be grounded as a precaution against possible electric shock.
3. Verify the power supply voltage coming to heater matches the ratings printed on the heater nameplate before energizing.
4. This heater is hot when in use. To avoid burns, do not let bare skin touch hot surfaces.



c UL us
File # E154218

Figure 1

5. Do not insert or allow foreign objects to enter any ventilation or exhaust opening as this may cause an electric shock, fire or damage to the heater.
6. Do not block air intakes or exhaust in any manner. Keep combustible materials, such as crates, drapes, etc., away from heater. Do not install behind doors, furniture, towels, or boxes.
7. A heater has hot and arcing or sparking parts inside. Do not use it in areas where gasoline, paint or flammable liquids are used or stored.
8. Use this heater only as described in this manual. Any other use not recommended by the manufacturer may cause fire, electric shock, or injury to persons.
9. This heater is not approved for use in corrosive atmospheres such as marine, green house or chemical storage areas.

SAVE THESE INSTRUCTIONS

ENGLISH

ESPAÑOL

FRANÇAIS

Form 5S5986

Printed in China
09663
0508/125/VCPVP

MEP100
02/09
Form #88
5200-2697-003
PPD 11697

Dayton® Fan Forced Wall Heater

ENGLISH

General Safety Instructions (Continued)

⚠WARNING ***To prevent hazard of fire or electrical shock, do not install without back box.***

⚠CAUTION ***To provide for safe operation, the following clearances must be maintained:***

Wall mounting • minimum 4" (102 mm) to floor • minimum 12" (305 mm) to adjacent walls • minimum 36" (915 mm) to ceiling.

Ceiling mounting (1000 watts or less) • minimum 12" (305 mm) to any wall.

⚠CAUTION ***The heater is hot when in use. Do not install the heater behind door, behind towel rack, in closet, where curtains or drapes could touch or become scorched by heater, or where airflow to heater may be obstructed. Keep electrical cords, bedding, furniture and other combustibles away from heater.***

Installation

The heater is designed for recessed installation in 2" x 4" (50 mm x 101 mm) stud or larger wall or ceiling sections using the wall box provided. The heater may also be surface mounted by using the Surface Mounting Frame, Model 4KA69D, ordered separately. The heater may be wired with standard building wire (60°C). Refer to Specifications for correct supply voltage and wire size.

NOTE: The optimum mounting height for this heater is 18" to 24" (450 to 600 mm) from floor to bottom of back box. **Do not** install closer than 4" (101 mm) from the floor.

For surface mounting, consult installation instructions packed with 4KA69D.

INSTALLATION OF WALL BOX IN NEW CONSTRUCTION (WALL OR CEILING)

NOTE: If the finished wall surface is already up, follow instructions for "Installation of Back Box In Existing Construction".

1. Determine which side of the back box is to be mounted against a stud and bend the tabs at the rear corners out 90 degrees so that the back box will be square with the stud after installation (See Figure 2).
2. Remove one of the knockouts on socket side of the back box and install a cable or conduit connector.
3. Position back box against side of studs and secure using nails or screws as shown in Figure 2.

NOTE: The back box must be installed with the front edge flush with the finished surface.

4. Run power supply cable through the connector, leaving about 8" of wire inside the box.
5. Connect the supply cable ground wire to green ground screw provided.

NOTE: Lead holes for a #8 sheet metal screw have been provided in the sides of the back box. After the finished wall or ceiling has been put up, drive a #8 (m4) sheet metal screw (recommended 1" long) through the side of the box not mounted to the stud. This will prevent the back box from pulling out when installing the heater assembly. (See Figure 2)

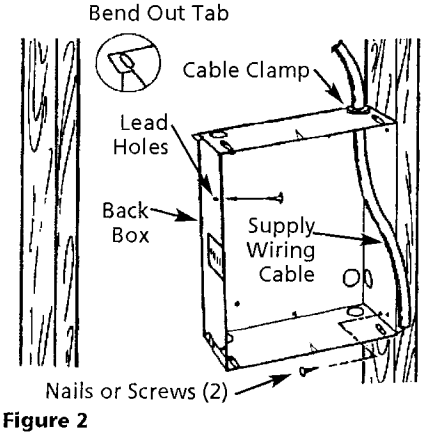


Figure 2

INSTALLATION OF BACK BOX IN EXISTING CONSTRUCTION (WALL OR CEILING)

1. Carefully mark and cut a hole measuring 9⅜" (235 mm) wide by 11⅛" (283 mm) long. One edge of the hole must be cut along the edge of a stud.

⚠CAUTION ***An electrical shock, fire or water damage could result if wiring or piping is damaged during cutting. Make sure all wiring and piping are clear of area before cutting.***

2. Refer to No. 1 through 5 "Installation of Wall Box in New Construction".

FIELD CONVERSION FOR LOWER WATTAGE RATING 3WU90D

NOTE: Refer to Specifications chart for lower wattage ratings which are available.

To convert heater to lower wattage rating, completely remove red jumper wire from both heating elements (See Figure 3). Discard this jumper. Be sure remaining wires are securely connected.

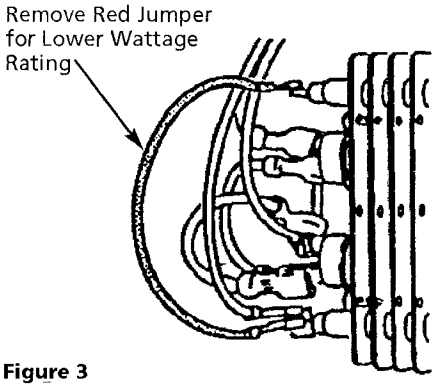


Figure 3

Models 3ENC7 thru 3ENC9, 2HAD6 and 3WU90D

INSTALLATION AND WIRING OF HEATER / FAN ASSEMBLY

⚠CAUTION ***Do not use a remote thermostat with this heater. Built in thermostat cycles the heating element only. Fan delay control automatically turns fan ON and OFF, and provides a fan delay off feature to remove residual heat after thermostat has turned heating elements off. Wiring of heater in any manner which defeats the fan delay OFF feature can result in overheating and permanent damage to heater, and will void the warranty.***

1. Following wiring diagram (Figure 4) connect supply wiring to heater lead-wires in back box.

NOTE: For 120 and 277 volt heaters connect the white neutral supply lead to the heaters white pigtail lead, and connect the black supply lead to the heater black pigtail lead. For **208** and **240 volt** heaters change the color of the heaters white pigtail lead to black by wrapping with black electrical tape. (Most electrical codes require the supply leads to be connected to black leads.) Then connect the two black supply leads to the two black receptacle leads (See Figure 4).

2. Secure supply ground wire under green ground screw in back box.
3. Insert wiring plug from heater/fan assembly into socket in back box.

⚠CAUTION ***Be sure all wiring is securely routed away from fan and element.***

4. Fit heater/fan assembly into back box and secure in place with (2) screws provided through the center slots in the fan assembly.

NOTE: Use the screws provided by the factory to install fan deck to the back box.

INSTALLATION OF FRONT COVER (GRILLE) AND THERMOSTAT KNOB

1. Fasten front cover to heater assembly using the (2) long screws supplied.
2. Fit the thermostat knob on to the thermostat shaft and push into place.

Operation

1. After heater is completely assembled, push the disconnect switch to the "ON" position and rotate thermostat knob counterclockwise until control stops. This is the minimum heat setting.
2. Turn power supply to heater "ON" at main switch panel.
3. Heater should not operate. If it operates, disconnect power and re-check wiring.
4. Rotate thermostat clockwise until it stops (maximum heat setting) and wait at least 2 minutes. Fan control will delay fan coming on until element is warm.
5. If heater and fan do not come on, disconnect power and check wiring.
6. Allow heater to continue to operate until room temperature reaches desired comfort level. Then rotate thermostat knob counterclockwise slowly until thermostat clicks off. Fan will continue to operate for a minute or so until element cools.

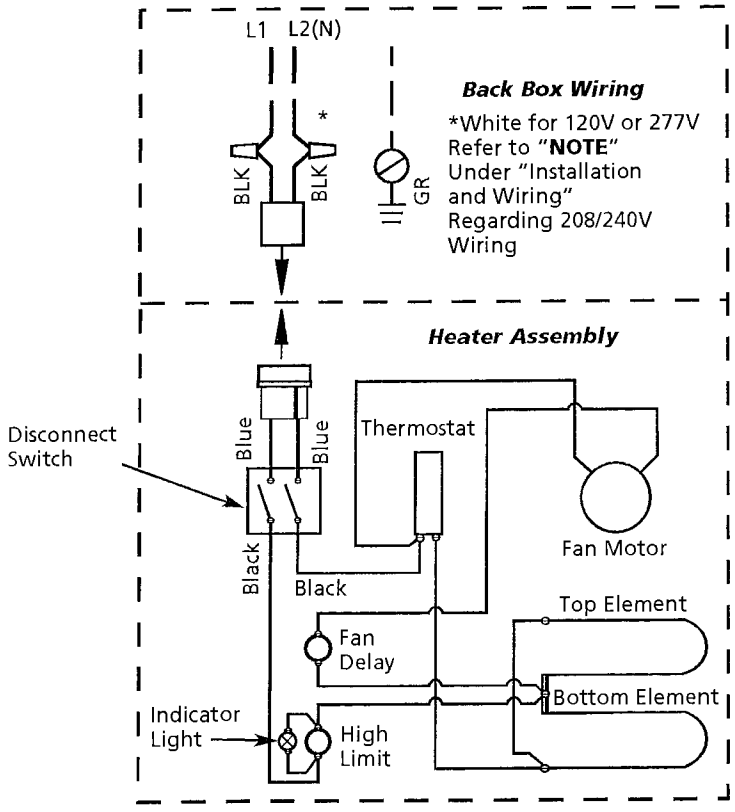


Figure 4

Dayton® Fan Forced Wall Heater

ENGLISH

Operation (Continued)

⚠CAUTION ***If fan shuts off immedately, thermostat wiring is incorrect and must be changed. Fan must delay shutting off to expel residual heat to prevent premature aging of internal heater components that could lead to a hazard or premature failure.***

7. It may be necessary to readjust thermostat a time or so until exact comfort level is attained. Rotation in the clockwise direction will increase the amount of time the heater will produce heat. Rotation in the counter-clockwise direction will reduce the amount of time the heater is on.

NOTE: For best results, the heater should be left "ON" constantly during the heating season as the thermostat, when properly set, will maintain the desired temperature. In the full counterclockwise position the heater will remain off until the room temperature drops well below freezing.

OPERATIONAL NOTICE

Your heater is equipped with an automatic reset high limit control that will automatically turn the heater off to prevent a fire if the heater overheats. Should this occur, the indicator light will illuminate and will continue to shine until the limit resets.

⚠CAUTION ***The illuminated indicator light signifies the heater has been subjected to some abnormal condition. Check heater to insure that it has not been blocked in any manner (if so, remove blockage). If there is no indication of blockage, it is recommended the heater be checked by a reputable electrician or repair service to insure the heater has not been damaged.***

Maintenance

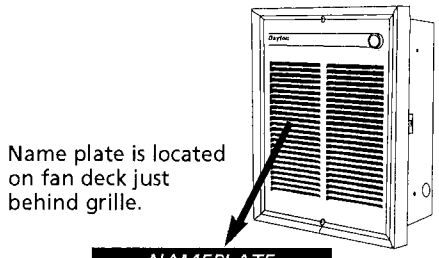
Your heater is designed for years of trouble-free operation and requires no special maintenance other than occasional cleaning. The motor is permanently lubricated.

CLEANING

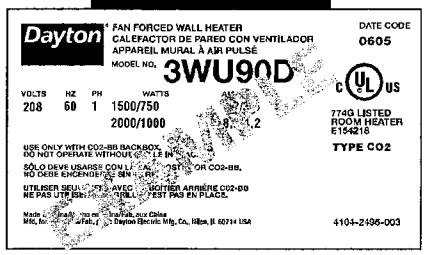
Once each year, the heater should be cleaned to remove dust and other foreign material which has collected during the heating season, as follows:

1. Turn power off at main breaker/fuse.
2. Remove thermostat knob and grille.
3. Use vacuum cleaner with brush attachment to remove dust and dirt that has accumulated in heater (especially around element and fan blade). Do not use water or any cleaners to clean heater components.
4. Replace grille and thermostat knob.
5. Wipe grille clean with a damp cloth. DO NOT use waxes or any cleaners that leave a residue since these may discolor during heater operation.
6. Turn the main breaker/ fuse on at the switch panel to restore power to heater. The heater is now ready for another season of operation.

Name plate is located on fan deck just behind grille.



NAMEPLATE



For Repair Parts, call 1-800-323-0620

24 hours a day – 365 days a year

Please provide following information:
-Model number
-Serial number (if any)
-Part description and number as shown in parts list

ENGLISH

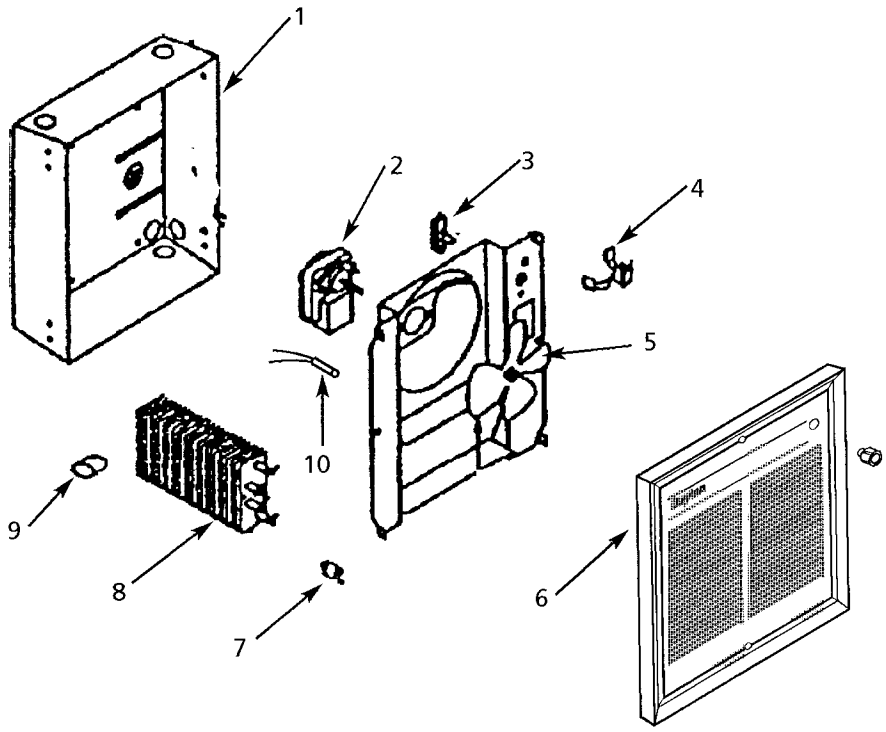


Figure 5 – Repair Parts Illustration for Fan Forced Wall Heater

Repair Parts List for Fan Forced Wall Heater

Ref. No.	Description	Part number for models: 2HAD6	3ENC7	3ENC8	3WU90D	3ENC9	Qty.
-	Parts Bag: Knob, Screws, Plug Button	1205-2004-004	1205-2004-004	1205-2004-004	1205-2004-004	1205-2004-004	1
1	Wall Insert Back Box	1217-2027-510	1217-2027-510	1217-2027-510	1217-2027-510	1217-2027-510	1
2	Motor	490062001	490062001	490062002	490062003	490062004	1
3	Thermostat	5813-2001-000	5813-2001-000	5813-2001-000	5813-2001-000	5813-2001-000	1
4	Disconnect Switch	5216-2021-000	5216-2021-000	5216-2021-000	5216-2021-000	5216-2021-000	1
5	Fan Blade	490061001	490061001	490061001	490061001	490061001	1
6	Grille	2501-2058-001	2501-2058-001	2501-2058-001	2501-2058-001	2501-2058-001	1
7	Fan Delay	410074000	410074000	410074000	410074000	410074000	1
8	Element	302023802	302023801	302023804	302023805	302023806	1
9	High Limit	410143000	410143000	410143000	410143000	410143000	1
10	High Limit Light	3510-2008-002	3510-2008-002	3510-2008-002	3510-2008-002	3510-2008-003	1

Dayton® Fan Forced Wall Heater

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LIMITED WARRANTY

DAYTON ONE-YEAR LIMITED WARRANTY. *DAYTON® FAN FORCED WALL HEATER, MODELS COVERED IN THIS MANUAL, ARE WARRANTED BY DAYTON ELECTRIC MFG. CO. (DAYTON) TO THE ORIGINAL USER AGAINST DEFECTS IN WORKMANSHIP OR MATERIALS UNDER NORMAL USE FOR ONE YEAR AFTER DATE OF PURCHASE. ANY PART WHICH IS DETERMINED TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP AND RETURNED TO AN AUTHORIZED SERVICE LOCATION, AS DAYTON DESIGNATES, SHIPPING COSTS PREPAID, WILL BE, AS THE EXCLUSIVE REMEDY, REPAIRED OR REPLACED AT DAYTON'S OPTION. FOR LIMITED WARRANTY CLAIM PROCEDURES, SEE "PROMPT DISPOSITION" BELOW. THIS LIMITED WARRANTY GIVES PURCHASERS SPECIFIC LEGAL RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION.*

LIMITATION OF LIABILITY. *TO THE EXTENT ALLOWABLE UNDER APPLICABLE LAW, DAYTON'S LIABILITY FOR CONSEQUENTIAL AND INCIDENTAL DAMAGES IS EXPRESSLY DISCLAIMED. DAYTON'S LIABILITY IN ALL EVENTS IS LIMITED TO AND SHALL NOT EXCEED THE PURCHASE PRICE PAID.*

WARRANTY DISCLAIMER. *A DILIGENT EFFORT HAS BEEN MADE TO PROVIDE PRODUCT INFORMATION AND ILLUSTRATE THE PRODUCTS IN THIS LITERATURE ACCURATELY; HOWEVER, SUCH INFORMATION AND ILLUSTRATIONS ARE FOR THE SOLE PURPOSE OF IDENTIFICATION, AND DO NOT EXPRESS OR IMPLY A WARRANTY THAT THE PRODUCTS ARE MERCHANTABLE, OR FIT FOR A PARTICULAR PURPOSE, OR THAT THE PRODUCTS WILL NECESSARILY CONFORM TO THE ILLUSTRATIONS OR DESCRIPTIONS. EXCEPT AS PROVIDED BELOW, NO WARRANTY OR AFFIRMATION OF FACT, EXPRESSED OR IMPLIED, OTHER THAN AS STATED IN THE "LIMITED WARRANTY" ABOVE IS MADE OR AUTHORIZED BY DAYTON.*

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Certain aspects of disclaimers are not applicable to consumer products; e.g., (a) some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you; (b) also, some jurisdictions do not allow a limitation on how long an implied warranty lasts, consequently the above limitation may not apply to you; and (c) by law, during the period of this Limited Warranty, any implied warranties of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. *A good faith effort will be made for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Dayton at address below, giving dealer's name, address, date, and number of dealer's invoice, and describing the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you, file claim with carrier.*

Manufactured for Dayton Electric Mfg. Co., 5959 W. Howard St., Niles, Illinois 60714-4014 U.S.A.

CIRCUIT DIRECTORY

1 Spare	2 Heat
3 Spare	4 Heat
5 TVSS	6 EW-15
7 TVSS	8 EW-15
9 Sludge Pump	10 Blower
11 PLC Panel	12 Feed Pump
13 GFI Plugs	14 Lights Int - Ext
15	16
17	28
19	20
21	22
23	24
25	26
27	28
29	30
31	32
33	34
35	36
37	38
39	40
41	42

SJE MILLIAMPMASTER™ Control Switch

Mechanically-activated control switch designed to activate low current control panels and alarms.

ORDERING INFORMATION

Narrow-Angle Versions

Normally Open		Normally Closed		
Part #	Description	Part #	Description	Shipping Weight
1018838	10MANPCNO	1018839	10MANPCNC	1.04 lbs.
1018840	10MANWENO	1018841	10MANWENC	2.73 lbs.
1018842	15MANPCNO	1018843	15MANPCNC	1.37 lbs.
1018844	15MANWENO	1018845	15MANWENC	3.05 lbs.
1018846	20MANPCNO	1018847	20MANPCNC	1.69 lbs.
1018848	20MANWENO	1018849	20MANWENC	3.30 lbs.
1018850	30MANPCNO	1018851	30MANPCNC	2.34 lbs.
1018852	30MANWENO	1018853	30MANWENC	4.03 lbs.

Wide-Angle Versions

Normally Open		Normally Closed		
Part #	Description	Part #	Description	Shipping Weight
1015725	10MAPCNO	1016180	10MAPCNC	1.04 lbs.
1016181	10MAWENO	1016182	10MAWENC	2.73 lbs.
1016184	15MAPCNO	1016185	15MAPCNC	1.37 lbs.
1016186	15MAWENO	1016187	15MAWENC	3.05 lbs.
1016211	20MAPCNO	1016212	20MAPCNC	1.69 lbs.
1016213	20MAWENO	1016214	20MAWENC	3.30 lbs.
1016215	30MAPCNO	1016216	30MAPCNC	2.34 lbs.
1016217	30MAWENO	1016218	30MAWENC	4.03 lbs.

PC = Pipe Clamp **WE** = Weighted Externally **NO** = Normally Open **NC** = Normally Closed
NOTE: Descriptions are grouped by cable length measured in feet (10, 15, 20, 30).

Click Here to View List Price

OPTIONS

PACKAGING
Bagged - standard
Boxed - optional
Bulk - optional

No Mounting - deduct optional

ADDITIONAL CABLE
Additional cable length over 30 feet is available.

UL Listed for Water & Sewage
LISTED 83N2 LR54245

Passed NSF standard 61 protocol by an approved Water Quality Association laboratory.

MEMBER Water Quality ASSOCIATION

SPECIFICATIONS

CABLE: flexible 18 gauge, 2 conductor (UL, CSA) SJOW, water-resistant (CPE) jacket

FLOAT: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high impact, corrosion resistant, polypropyline housing for use in sewage and water up to 140°F (60°C)

MAXIMUM WATER DEPTH: 30 feet (9 meters), 13 psi

ELECTRICAL:

125 VAC
Maximum Electrical Load: 0.1 amps
Minimum Electrical Load: 0.160 milliamps

30 VDC
Maximum Electrical Load: 0.1 amps
Minimum Electrical Load: 0.160 milliamps

5 VDC
Minimum Electrical Load: 1 milliamps

OTHER INFORMATION

NORMALLY OPEN (HIGH LEVEL) OPERATION
The control switch closes (turns on) when the float tips **above** horizontal signaling a high level, and opens (turns off) when the float drops **below** normal.

NORMALLY CLOSED (LOW LEVEL) OPERATION
The control switch closes (turns on) when the float drops **below** horizontal signaling a low level, and opens (turns off) when the float tips **above** horizontal.

Call or fax your order!
1-888-DIAL-SJE (1-888-342-5753) Fax 218-847-4617

SJE Rhombus
www.sjerhombus.com
sje@sjerhombus.com

Cat Page PN 1016221M

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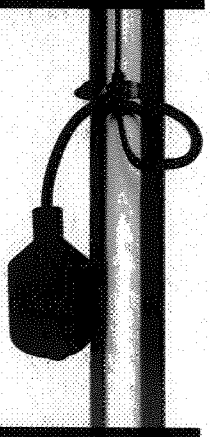
SJE MILLIAMPMASTER™ Control Switch

Mechanically-activated control switch designed to activate low current control panels and alarms.



This wide-angle or narrow-angle control switch offers reliable low current control for AC and DC applications in potable water, wastewater, and sewage. The internal switching mechanism has sealed gold cross-point contacts for reliable low current operation. Common applications include PLC (programmable logic controller) panels, IS panels with intrinsically safe barriers, low current solar applications, and other low current control panels and alarms applications.

The wide-angle version activates/deactivates approximately 4" above and below horizontal with a 3.5" tether. The narrow angle version activates/deactivates at approximately 1.5" above and below horizontal with a 3.5" tether.

3 – **Normally Open Model (high level)**
The control switch turns on (closes) when the float tips **above** horizontal signaling a high level, and turns off (opens) when the float drops below horizontal.

1 – **Normally Closed Model (low level)**
The control switch turns on (closes) when the float drops **below** horizontal signaling a low level, and turns off (opens) when the float tips above horizontal.

FEATURES

- Passed NSF Standard 61 protocol by an approved Water Quality Association laboratory.
- Low current, non-arching applications down to 0.160 mA at 125 VAC.
- Mechanically-activated, snap action contacts.
- High impact, corrosion resistant polypropylene float housing.
- Not sensitive to rotation.
- Blue colored cap for easy identification of SJE MilliAmpMaster™ control switch.
- UL Listed for use in non-potable water and sewage.
- CSA Certified.
- Three-year limited warranty.

LR54245 LISTED 83N2

MEMBER Hydraulic Water Quality Association

OPTIONS

This switch is available:

- for normally open (high level) applications or normally closed (low level) applications.
- with narrow or wide-angle pumping ranges.
- in standard cable lengths of 10, 15, 20, or 30 feet.
- with two mounting options that allow for flexibility in installation:

  Mounting Clamp: for applications where the switch can be attached to a discharge pipe or similar mounting device.

  Externally Weighted: for applications where the switch can be suspended from above.

SPECIFICATIONS

CABLE: flexible 18 gauge, 2 conductor (UL,CSA) SJOW, water-resistant (CPE) jacket

FLOAT: 2.74 inch diameter x 4.83 inch long (7.0 cm x 12.3 cm), high-impact, corrosion resistant, polypropylene housing for use in sewage and water up to 140°F (60°C)

MAXIMUM WATER DEPTH: 30 feet (9 meters), 13 psi

ELECTRICAL:

125 VAC
Maximum Electrical Load: 0.1 amps
Minimum Electrical Load: 0.160 milliamps

30 VDC
Maximum Electrical Load: 0.1 amps
Minimum Electrical Load: 0.160 milliamps

5 VDC
Minimum Electrical Load: 1 milliamps

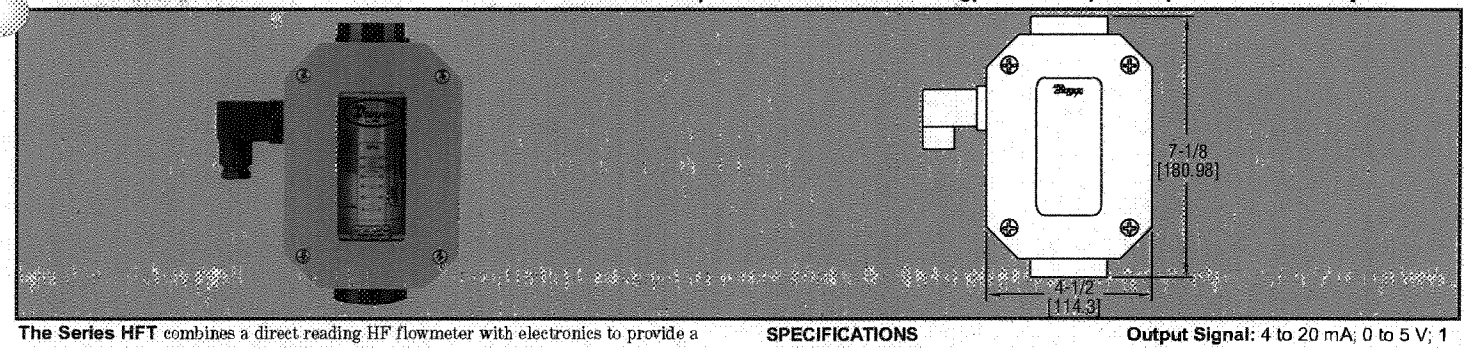
SEE BACKSIDE FOR ORDERING INFORMATION.
SEE PRICE BOOK FOR LIST PRICE.

SJE Rhombus®
PO Box 1708, Detroit Lakes, MN 56502
1-888-DIAL-SJE • 1-218-847-1317
1-218-847-4617 Fax
email: sje@sjerhombus.com
www.sjerhombus.com

Series
HFT

In-Line Flow Transmitters

Local Flow Indication, Unrestricted Mounting, 4-20 mA, 0-5 V, and 1-5 V Output



The Series HFT combines a direct reading HF flowmeter with electronics to provide a proportional analog output of 4 to 20 mA, 0 to 5, and 1 to 5 VDC. Use the output to drive data acquisition devices, meters, or analog input cards. The entire assembly is housed in a rugged cast aluminum NEMA 4X (IP66) enclosure. The unit can be installed in outdoor applications or harsh environments where liquid tight seals are required. The flow transmitter does not require input or output straight plumbing, and can be mounted in any orientation.

Aluminum body for air or other non-corrosive gases: 600 psig (41 bar)
Wetted Parts: Aluminum, PTFE coated Alnico, 304 SS and Buna-N

Model	Connection Size	Range, Air SCFM
HFT-1112	1/4" female NPT	1.5-12
HFT-1123	1/4" female NPT	4-23

Brass body for water based fluids (non-steam): 3500 psig (240 bar)
Wetted Parts: Brass, PTFE coated Alnico, 304 SS and Buna-N

Model	Connection Size	Range, Water GPM (LPM)
HFT-2005	1/2" female NPT	0.2-5.0 (0.75-19)
HFT-2315	3/4" female NPT	1-15.0 (3.8-57)
HFT-2320	3/4" female NPT	5-20.0 (19-75)
HFT-2440	1" female NPT	4-40 (15-151)
HFT-2550	1-1/2" female NPT	5-50 (19-189)

SPECIFICATIONS
Service: Compatible gases or liquids.
Wetted Materials: Body: Aluminum, brass or 304 SS; Seals: Buna-N or Fluoroelastomer; Magnet: PTFE coated Alnico; Other internal parts: 304 SS.
Viscosity: 500 SSU.
Accuracy: ±4% FS over entire range; ±2.5% over center third of the measuring range.
Repeatability: ±1% of full-scale.
Response Time: < 100 msec.
Output Signal: 4 to 20 mA; 0 to 5 V; 1 to 5 V.
Temperature Limits: 170°F (76°C).
Pressure Limits: See chart.
Power Requirements: 12 to 35 VDC.
Enclosure Rating: NEMA 4X (IP66).
Shipping Weight: 1/4 to 1/2" female NPT models: 3 lb (1.4 kg); 3/4 to 1" female NPT models: 4.5 lb (2.0 kg); 1-1/2" female NPT models: 12 lb (5.4 kg).

304 SS body for high-pressure fluids: 6000 psig (413 bar)
Wetted Parts: 304 SS, Fluoroelastomer and PTFE

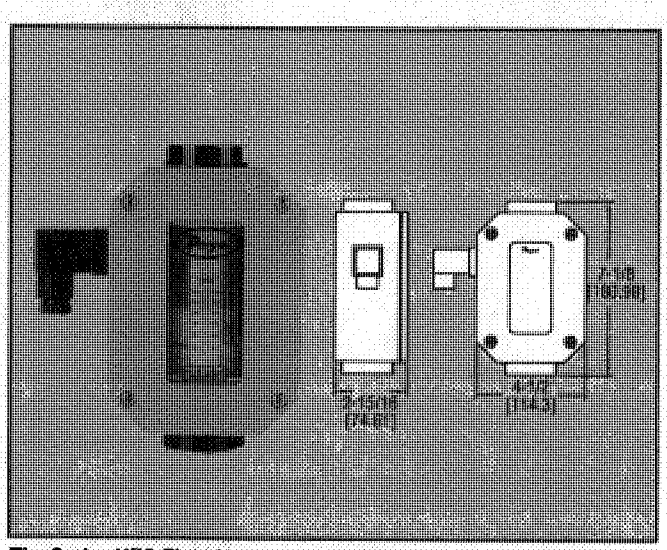
Model	Connection Size	Range, Water GPM (LPM)
HFT-3202	1/2" female NPT	0.2-2.0 (0.75-7.5)
HFT-3210	1/2" female NPT	1-10 (3.8-38)

OPTION
For NIST traceable calibration certificate, use order code NISTCAL-FT1.

Series HFO

In-Line Flow Alarms

Latching Alarm Capabilities, For Air, Water or Caustic Fluids, Unrestricted Mounting



The Series HFO Flow Alarm provides continuous monitoring and control of flow rate levels. The flow alarm can be configured to open or close a contact for an increasing or decreasing set point. The unit includes two 10A SPDT limit switches with field adjustable alarm settings. Integral direct reading scale provides local indication of flow rate. The flow alarm is designed to mount in any orientation and does not require inlet or outlet straight plumbing. The Series HFO is constructed with a rugged cast aluminum NEMA 4X (IP66) enclosure for installations outdoors or in harsh environments.

APPLICATIONS

Monitoring flow in chemical processing, waste water processing, lubrication systems, process control, solar systems, drain lines and pump testing.

Please ensure this will integrate with your proposed PLC

SHOP DRAWING REVIEW

This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

	Reviewed
X	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By MI
Date Nov. 15, 2012

CONESTOGA-ROVERS & ASSOCIATES

SPECIFICATIONS

Service: Compatible gases or liquids.
Wetted Materials:
Body: Aluminum, brass or 304 SS;
Seals: Buna-N or fluoroelastomer;
Magnet: PTFE coated Alnico;
Other internal parts: 304 SS.
Viscosity: 500 SSU.
Temperature Limits: 170°F (76°C).
Pressure Limits: See chart.
Enclosure Rating: NEMA 4X (IP66).
Accuracy: Measuring ±4% FS over entire range; ±2.5% over center third of the measuring range.
Repeatability: ±1% of full-scale.
Switch Type: SPDT, 10A @ 250 VAC; 0.5A @ 125 VDC, (resistive).
Shipping Weight: 1/4 to 1/2" female NPT models: 3 lb (1.4 kg); 3/4 to 1" female NPT models: 4.5 lb (2.0 kg); 1-1/2" female NPT models: 12 lb (5.4 kg).

Aluminum body for air or other non-corrosive gases:
600 psig (41 bar)
Wetted Parts: Aluminum, PTFE coated Alnico, 304 SS and Buna-N

Model	Connection Size	Range, Air SCFM
HFO-21112	1/4" female NPT	1.5-12
HFO-21123	1/4" female NPT	4-23

Brass body for water based fluids (non-steam):
3500 psig (240 bar)
Wetted Parts: Brass, PTFE coated Alnico, 304 SS and Buna-N

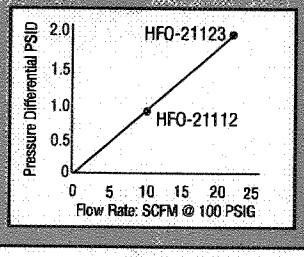
Model	Connection Size	Range, Water GPM (LPM)
HFO-22205	1/2" female NPT	0.5-5.0 (1-19)
HFO-22315	3/4" female NPT	1-15 (3.8-55)
HFO-22320	3/4" female NPT	2-20 (7.5-75)
HFO-22440	1" female NPT	4-40 (15-151)
HFO-22550	1-1/2" female NPT	5-50 (19-189)

304 SS body for high-pressure fluids:
6000 psig (413 bar)
Wetted Parts: 304 SS, Fluoroelastomer and PTFE

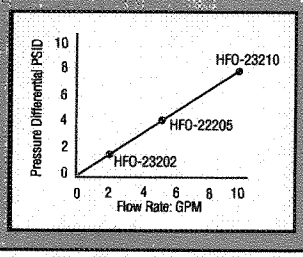
Model	Connection Size	Range, Water GPM (LPM)
HFO-23202	1/2" female NPT	0.2-2.0 (0.75-7.5)
HFO-23210	1/2" female NPT	1-10 (3.8-38)

Pressure Differential VS. Flow Rate

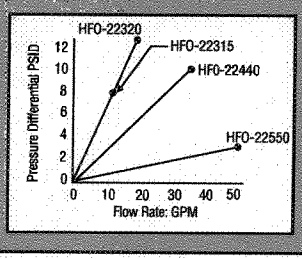
1/4" Female NPT



1/2" Female NPT



3/4", 1" & 1-1/2" Female NPT



RACER TRUST – BAY CITY POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DRAWING INDEX

SHEET	DESCRIPTION
1	ELECTRICAL SCHEMATIC – MAIN CONTROL PANEL
2	ELECTRICAL SCHEMATIC – MAIN CONTROL PANEL
3	ELECTRICAL SCHEMATIC – MAIN CONTROL PANEL
4	ELECTRICAL SCHEMATIC – MAIN CONTROL PANEL
5	ELECTRICAL SCHEMATIC – MAIN CONTROL PANEL
6	SPARE SHEET
7	ELECTRICAL SCHEMATIC – MAIN CONTROL PANEL
8	SPARE SHEET
9	PANEL LAYOUT – MAIN CONTROL PANEL
10	BILL OF MATERIALS – MAIN CONTROL PANEL

Ino-Tek

P.O. BOX 602 ROMEO, MI 48065-0602
PHONE: (586) 336-0866 FAX: (586) 336-0863

GAS DETECTION &
EMERGENCY ALARM SYSTEMS
JOB# J12-143

AS BUILT

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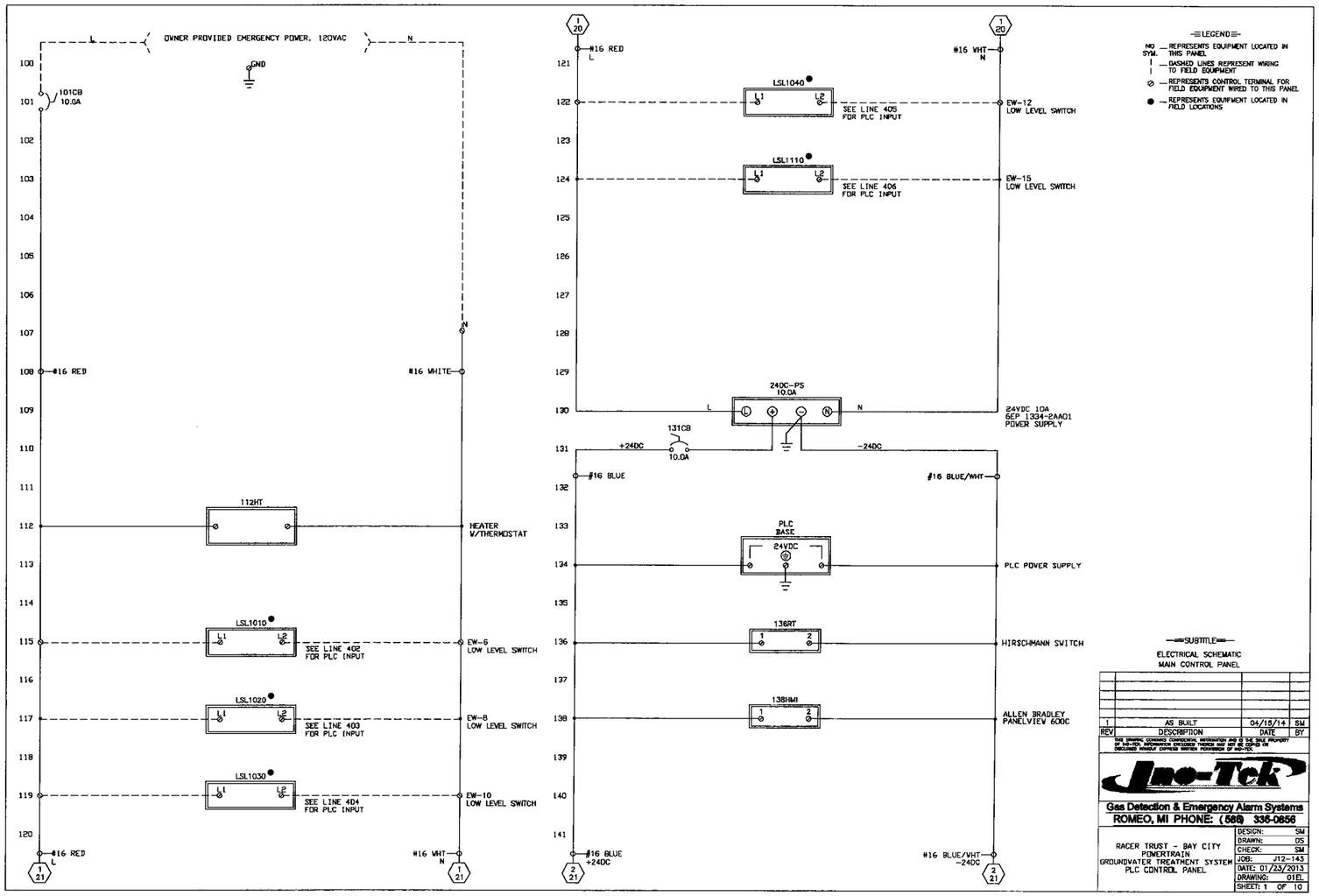

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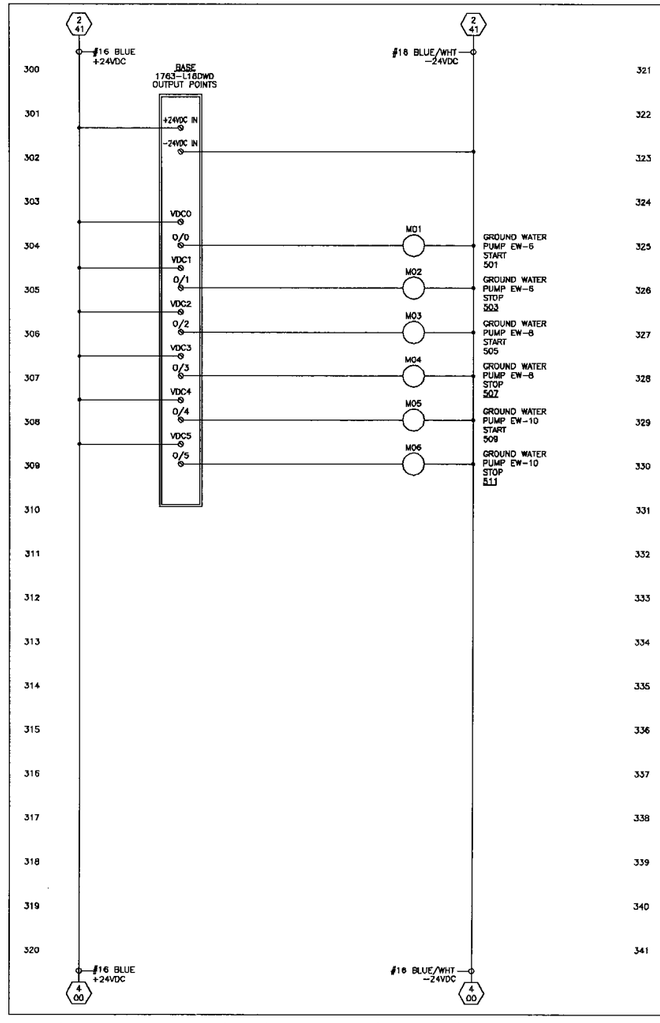

LEGEND

NO SYM. — REPRESENTS EQUIPMENT LOCATED IN THIS PANEL

— DASHED LINES REPRESENT WIRING TO FIELD EQUIPMENT

— REPRESENTS CONTROL TERMINAL FOR FIELD EQUIPMENT WIRED TO THIS PANEL

— REPRESENTS EQUIPMENT LOCATED IN FIELD LOCATIONS

SUBTITLE

ELECTRICAL SCHEMATIC
MAIN CONTROL PANEL

REV	DESCRIPTION	DATE	BY
1	AS BUILT	04/15/14	SM

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ROMEO, MI PHONE: (586) 336-0856

RACER TRUST – BAY CITY
POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DESIGN:	SM
DRAWN:	DS
CHECK:	SM
JOB:	J12-143
DATE:	01/23/2013
DRAWING:	03EL
SHEET:	3 OF 10

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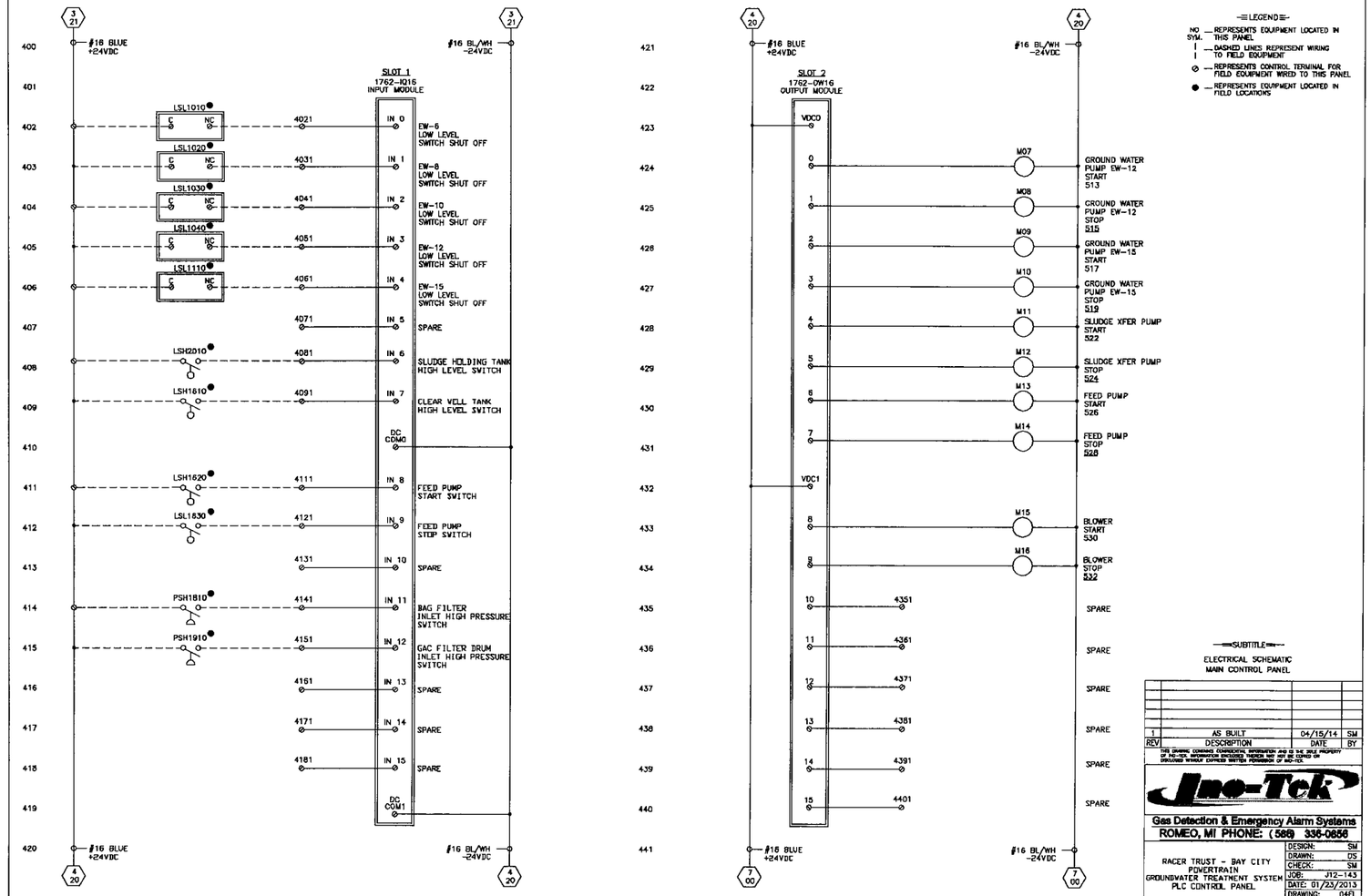

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INTERLOCKS
(ALL WIRE #16 GAGE YELLOW)

500

501 — M01 — GROUND WATER PUMP EW-6 START — 502

503 — M02 — GROUND WATER PUMP EW-6 STOP — 504

505 — M03 — GROUND WATER PUMP EW-8 START — 506

507 — M04 — GROUND WATER PUMP EW-8 STOP — 508

509 — M05 — GROUND WATER PUMP EW-10 START — 510

511 — M06 — GROUND WATER PUMP EW-10 STOP — 512

513 — M07 — GROUND WATER PUMP EW-12 START — 514

515 — M08 — GROUND WATER PUMP EW-12 STOP — 516

517 — M09 — GROUND WATER PUMP EW-15 START — 518

519 — M10 — GROUND WATER PUMP EW-15 STOP — 520

INTERLOCKS
(ALL WIRE #16 GAGE YELLOW)

521

522 — M11 — SLUDGE XFER PUMP START — 523

524 — M12 — SLUDGE XFER PUMP STOP — 525

526 — M13 — FEED PUMP START — 527

528 — M14 — FEED PUMP STOP — 529

530 — M15 — BLOWER START — 531

532 — M16 — BLOWER STOP — 533

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LEGEND

SYM.	
NO	REPRESENTS EQUIPMENT LOCATED IN THIS PANEL
| |	DASHED LINES REPRESENT WIRING TO FIELD EQUIPMENT
Ø	REPRESENTS CONTROL TERMINAL FOR FIELD EQUIPMENT WIRED TO THIS PANEL
●	REPRESENTS EQUIPMENT LOCATED IN FIELD LOCATIONS

SUBTITLE

SPARE SHEET

REV	DESCRIPTION	DATE	BY

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RACER TRUST - BAY CITY POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DESIGN:	SM
DRAWN:	DS
CHECK:	SM
JOB:	J12-143
DATE:	01/23/2013
DRAWING:	05EL
SHEET:	5 OF XXX

FILENAME: K:\J12_143 RACER BAY CITY POWERTRAIN\AS BUILT\05EL.dwg LAST UPDATED (BY IND-TEK BY DS) APR15,2014 9:21AM

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=LEGEND=

NO SYM. — REPRESENTS EQUIPMENT LOCATED IN THIS PANEL.

| — DASHED LINES REPRESENT WIRING TO FIELD EQUIPMENT

⊘ — REPRESENTS CONTROL TERMINAL FOR FIELD EQUIPMENT WIRED TO THIS PANEL.

● — REPRESENTS EQUIPMENT LOCATED IN FIELD LOCATIONS

=SUBTITLE=

SPARE SHEET

REV	DESCRIPTION	DATE	BY
1	AS BUILT	04/15/14	SM

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RACER TRUST – BAY CITY POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DESIGN:	SM
DRAWN:	DS
CHECK:	SM
JOB:	J12-143
DATE:	01/23/2013
DRAWING:	06SP
SHEET:	6 OF 10

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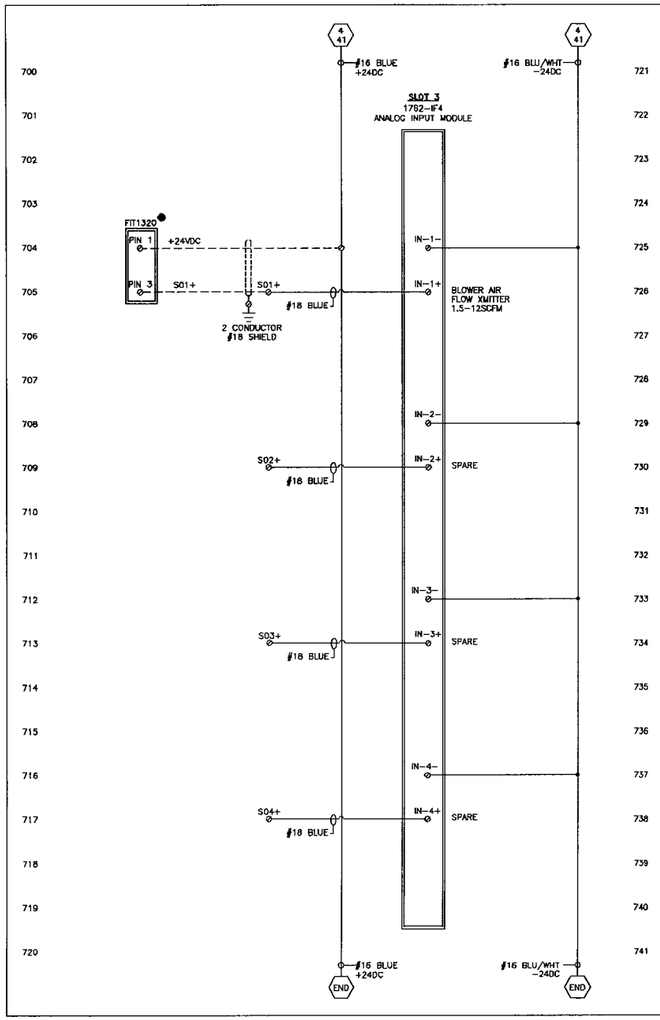

LEGEND

NO SYM.	
|	— DASHED LINES REPRESENT WIRING TO FIELD EQUIPMENT
⊘	— REPRESENTS CONTROL TERMINAL FOR FIELD EQUIPMENT WIRED TO THIS PANEL
●	— REPRESENTS EQUIPMENT LOCATED IN FIELD LOCATIONS
	— REPRESENTS EQUIPMENT LOCATED IN THIS PANEL

SUBTITLE

MAIN CONTROL PANEL
ELECTRICAL SCHEMATIC

REV	DESCRIPTION	DATE	BY
1	AS BUILT	04/15/14	SM

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RACER TRUST - BAY CITY
POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DESIGN:	SM
DRAWN:	DS
CHECK:	SM
JOB:	J12-143
DATE:	01/23/2013
DRAWING:	07EL
SHEET:	7 OF 10

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—SUBTITLE—

SPARE SHEET

REV	DESCRIPTION	DATE	BY
1	AS BUILT	04/15/14	SM

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RACER TRUST – BAY CITY
POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DESIGN:	SM
DRAWN:	DS
CHECK:	SM
JOB:	J12-143
DATE:	01/23/2013
DRAWING:	08SP
SHEET:	8 OF 10

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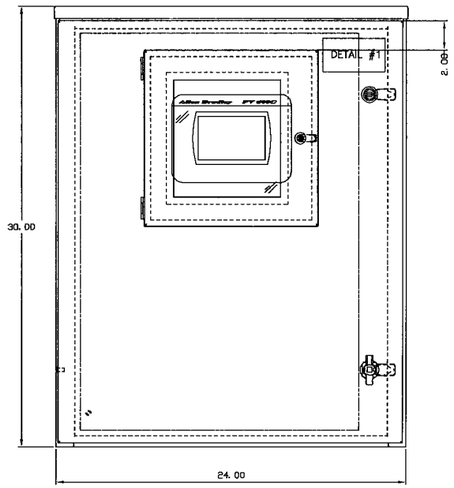
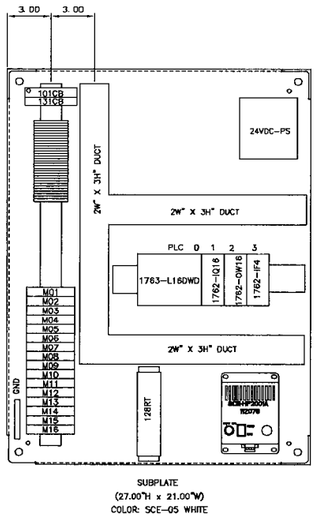


SCE-30R2408LP

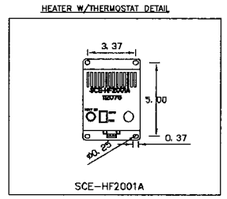
(30.0"H x 24.0"W x 8.0"D)

COLOR: SCE-09 GRAY



SUBPLATE
(27.00"H x 21.00"W)
COLOR: SCE-05 WHITE

HEATER W/THERMOSTAT DETAIL



SCE-HF2001A

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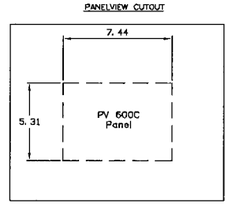
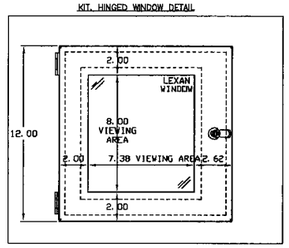


KIT, HINGED WINDOW DETAIL



SCE-HWK1212
COLOR: SCE-09 GRAY

DETAIL #1

RACER TRUST - BAY CITY POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
MAIN CONTROL PANEL
120 VAC, 60 HZ, SINGLE PHASE
IND-TEK JOB #J12-143

NOTE: 1.SEE SENSOR TERMINAL AND RELAY SOCKET TERMINAL DETAILS ON THIS DRAWING.

TERMINAL ROTATION

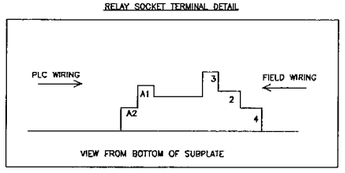
CIRCUIT BREAKERS FAZ MOELLER
101CB
131CB

SENSOR TERMINALS (8) 1492-JD3	
+24DC	-24DC
+S01	-S01
+24DC	-24DC
+S02	-S02
+24DC	-24DC
+S03	-S03
+24DC	-24DC
+S04	-S04

POWER TERMINALS (8) 1492-JD3	
L	N
L	N
L	N
L	N
+24DC	-24DC
+24DC	-24DC
+24DC	-24DC
+24DC	-24DC

INPUTS AND OUTPUTS TERMINALS (16) 1492-JD3	
2261	2271
2281	2291
2311	2321
2331	2341
2351	2361
4021	4031
4041	4051
4061	4071
4081	4091
4111	4121
4131	4141
4151	4161
4171	4181
4351	4361
4371	4381
4391	4401

RELAY SOCKET TERMINAL DETAIL



VIEW FROM BOTTOM OF SUBPLATE

END BARRIERS AND ANCHORS AT THE END OF EACH TERMINAL STACK

SUBTITLE

PANEL LAYOUT
MAIN CONTROL PANEL

REV	DESCRIPTION	DATE	BY
1	AS BUILT	04/15/14	SM

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RACER TRUST - BAY CITY POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DESIGN:	SM
DRAWN:	DS
CHECK:	SM
JOB:	J12-143
DATE:	01/23/2013
DRAWING:	09PL
SHEET:	9 OF 10

FILENAME: K:\J12_143 RACER BAY CITY POWERTRAIN\AS BUILT\09PL.dwg LAST UPDATED (BY IND-TEK BY DS) APR15,2014 9:24AM

MAIN CONTROL PANEL EQUIPMENT BILL OF MATERIALS

SYMBOL	QTY.	PART NO.	DESCRIPTION
ENCLOSURE	1	SCE-30R2408LP	SAGINAW ENCLOSURE TYPE - 3R, HINGED COVER ENCLOSURE 30.00"H x 24.00" W x 8.00" D, FINISH SCE-09 GRAY
	1	SCE-30P24	SAGINAW SUBPLATE, 27.00"H x 21.00"W x 0.88"D FINISH SCE-05 WHITE
	1	SCE-HWK1212	SAGINAW KIT, HINGED WINDOW DETAIL, 12.00"H x 12.00"W x 1.5"D FINISH SCE-09 GRAY
112HT	1	SCE-HFE001A	SAGINAW ELECTRIC PANEL HEATER W/THERMOSTAT
101CB, 131CB	2	FAZ-C10/1NA	MOELLER CIRCUIT BREAKER, 10A, 125V
CONTROL TERMINALS	32	1492-JD3	ALLEN-BRADLEY 2-CIRCUIT CONTROL TERMINAL
	1	199-DR1	ALLEN-BRADLEY DIN MOUNTING RAIL, 35mm X 7.5mm
		NOTE: SEE LAYOUT DRAWING FOR TERMINAL ROTATION	
M1-M16	16	700HK36Z24-4	ALLEN BRADLEY SLIM LINE RELAY SPST, WITH LIGHT, 24VDC
	16	700-HN121	ALLEN BRADLEY RELAY SOCKET
PLC	1	1763-L16DWD	MICROLOGIX 1100 CENTRAL PROCESSING UNIT, (2) COMM PORT, 24VDC
	1	1762-OW16	DISCRETE OUTPUT RELAY CARD 16 POINT, 120VAC
	1	1762-IF4	ANALOG INPUT MODULE 4 POINT
	1	1762-IQ16	MICROLOGIX DC INPUT MODULE
136RT	1	RS2-5TX	HIRSCHMANN, ETHERNET RAIL SWITCH, 5 PORTS OUTPUT 24VDC/10.0A POWER SUPPLY
HMI	1	2711C-T6C	PANELVIEW C600 TOUCH SCREEN, 5.7" TFT COLOR, SERIAL AND ETHERNET COMMUNICATION
	2	1761-CBL-PM02	ALLEN BRADLEY ETHERNET COMMUNICATIONS CABLE
24VDC-PS	1	6EP 1334-2AA01	SIEMENS 240W, STABILIZED LOAD, INPUT 120/230 VAC, OUTPUT 24VDC/10.0A POWER SUPPLY

NOTE: PANDUIT AS REQUIRED (COLOR BLACK) - SEE SUBPLATE LAYOUT
PROVIDE TERMINAL END BARRIERS, TERMINAL MARKERS, ANCHOR AS NEEDED

SUBTITLE:
BILL OF MATERIAL
MAIN CONTROL PANEL

REV	DESCRIPTION	DATE	BY
1	AS BUILT	04/15/14	SM

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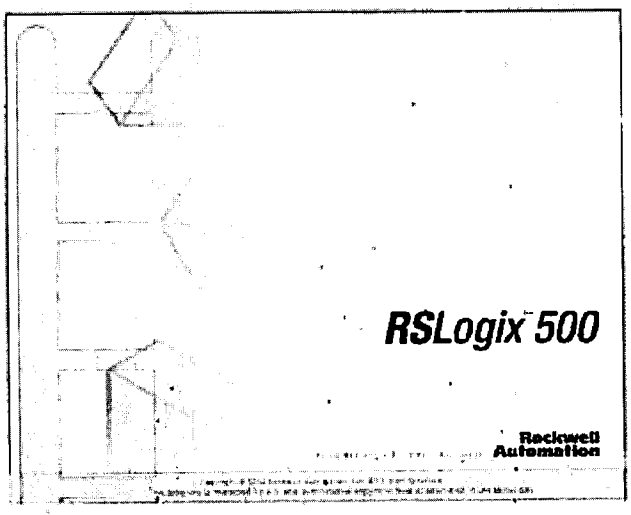
RACER TRUST - BAY CITY POWERTRAIN
GROUNDWATER TREATMENT SYSTEM
PLC CONTROL PANEL

DESIGN:	SM
DRAWN:	DS
CHECK:	SM
JOB:	J12-143
DATE:	01/23/2013
DRAWING:	10BM
SHEET:	10 OF 10

FILENAME: K:\J12_143 RACER BAY CITY POWERTRAIN\AS BUILT\10BM.dwg LAST UPDATED (BY IND-TEK BY DS) APR15,2014 9:23AM

RSLogix 500 Project Report



Processor Information

Processor Type: Bul.1763 MicroLogix 1100 Series A

Processor Name: RACER

Total Memory Used: 488 Instruction Words Used - 453 Data Table Words Used

Total Memory Left: 6168 Instruction Words Left

Program Files: 3

Data Files: 11

Program ID: f136

I/O Configuration

0	Bul.1763	MicroLogix 1100 Series A
1	1762-IQ16	16-Input 10/30 VDC
2	1762-OW16	16-Output (RLY) 240 VAC
3	1762-IF4	Analog 4 Chan. Input
4		

Channel Configuration

```
CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Edit Resource/Owner Timeout:  60
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Passthru Link ID:  1
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Write Protected:  No
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Comms Servicing Selection:  Yes
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex Message Servicing Selection:  Yes
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex 1st AWA Append Character:  \d
   CHANNEL 0 (SYSTEM) - Driver: DF1 Full Duplex 2nd AWA Append Character:  \a

   Source ID:  1 (decimal)
   Baud: 19200
   Parity:  NONE
   Control Line :  No Handshaking
   Error Detection:  CRC
   Embedded Responses:  Auto Detect
   Duplicate Packet Detect:  Yes
   ACK Timeout(x20 ms):  50
   NAK Retries:  3
   ENQ Retries:  3


CHANNEL 1 (SYSTEM) - Driver: Ethernet
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Edit Resource/Owner Timeout:  60
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Passthru Link ID:  1
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Write Protected:  No
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Comms Servicing Selection:  Yes
   CHANNEL 1 (SYSTEM) - Driver: Ethernet Message Servicing Selection:  Yes

   Hardware Address:  00:00:00:00:00:00
   IP Address:  172.27.255.100
   Subnet Mask:  255.255.255.0
   Gateway Address:  0.0.0.0
   Msg Connection Timeout (x 1mS):  15000
   Msg Reply Timeout (x mS):  3000
   Inactivity Timeout (x Min):  30
   Bootp Enable:  No
   Dhcp Enable  No
   SNMP Enable:  No
   HTTP Enable:  Yes
   Auto Negotiate Enable:  Yes
   Port Speed Enable:  10/100 Mbps Full Duplex/Half Duplex
   Contact:
   Location:
```

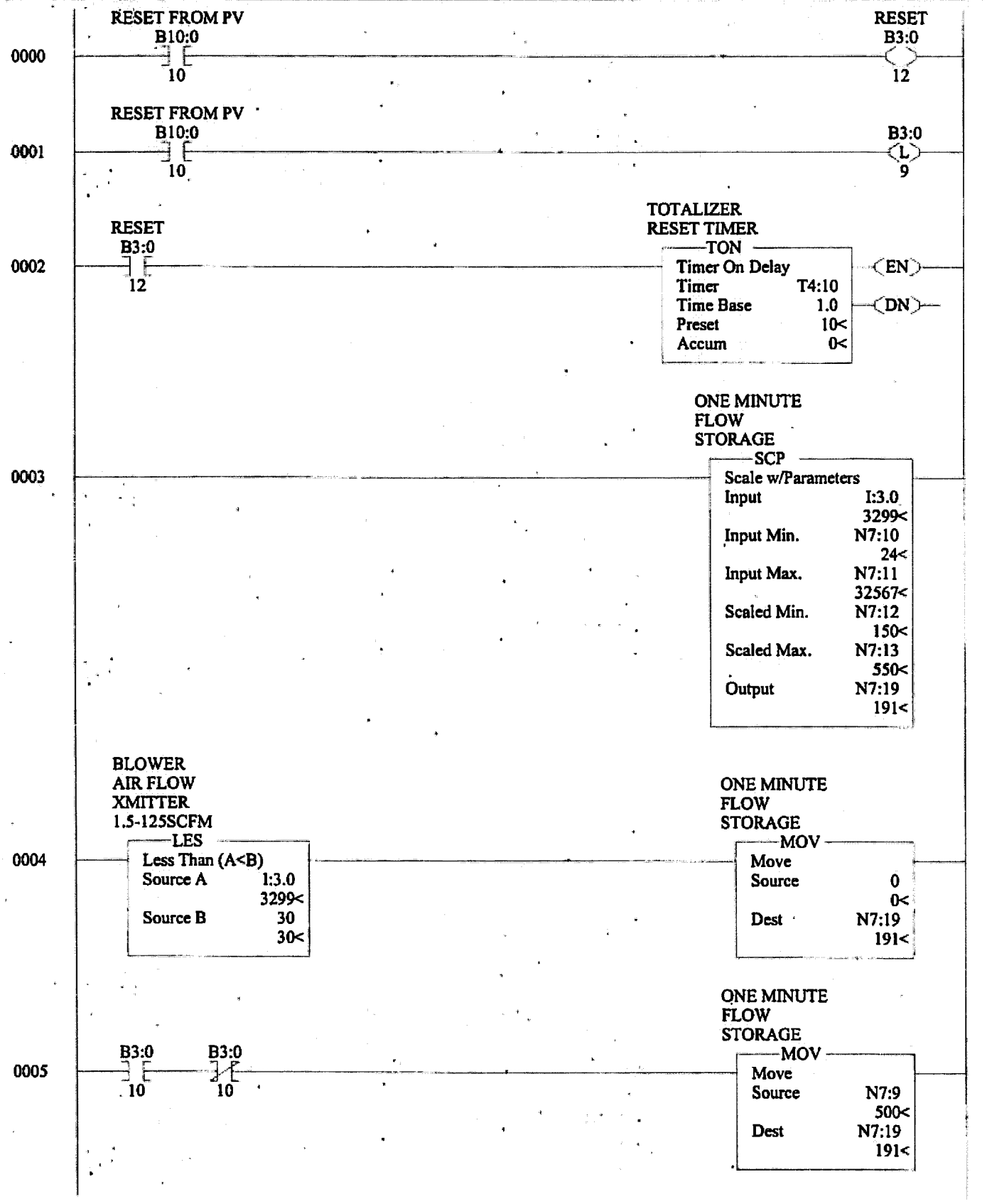
Program File List

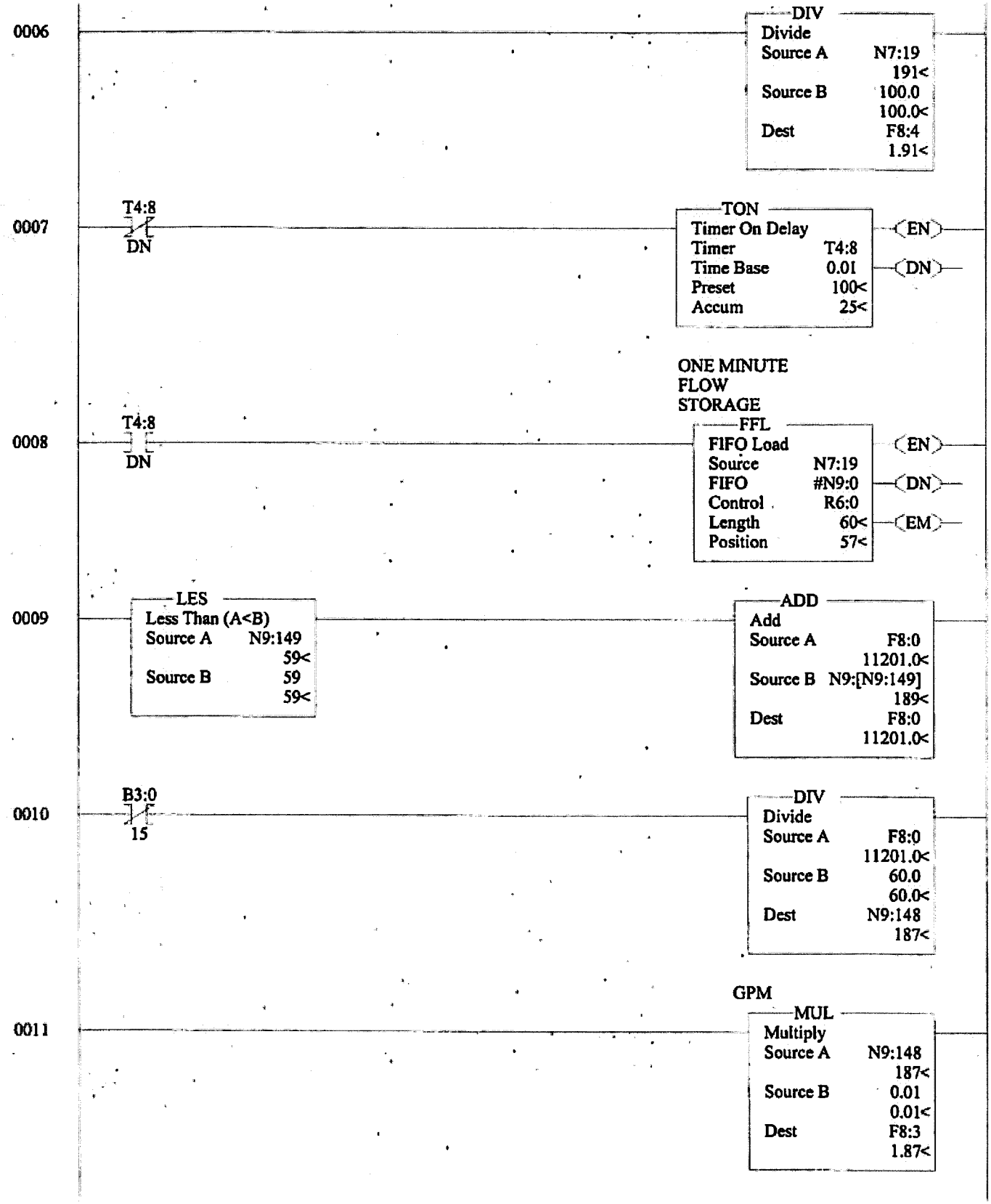
Name	Number	Type	Rungs	Debug	Bytes
[SYSTEM]	0	SYS	0	No	0
	1	SYS	0	No	0
	2	LADDER	46	No	1647

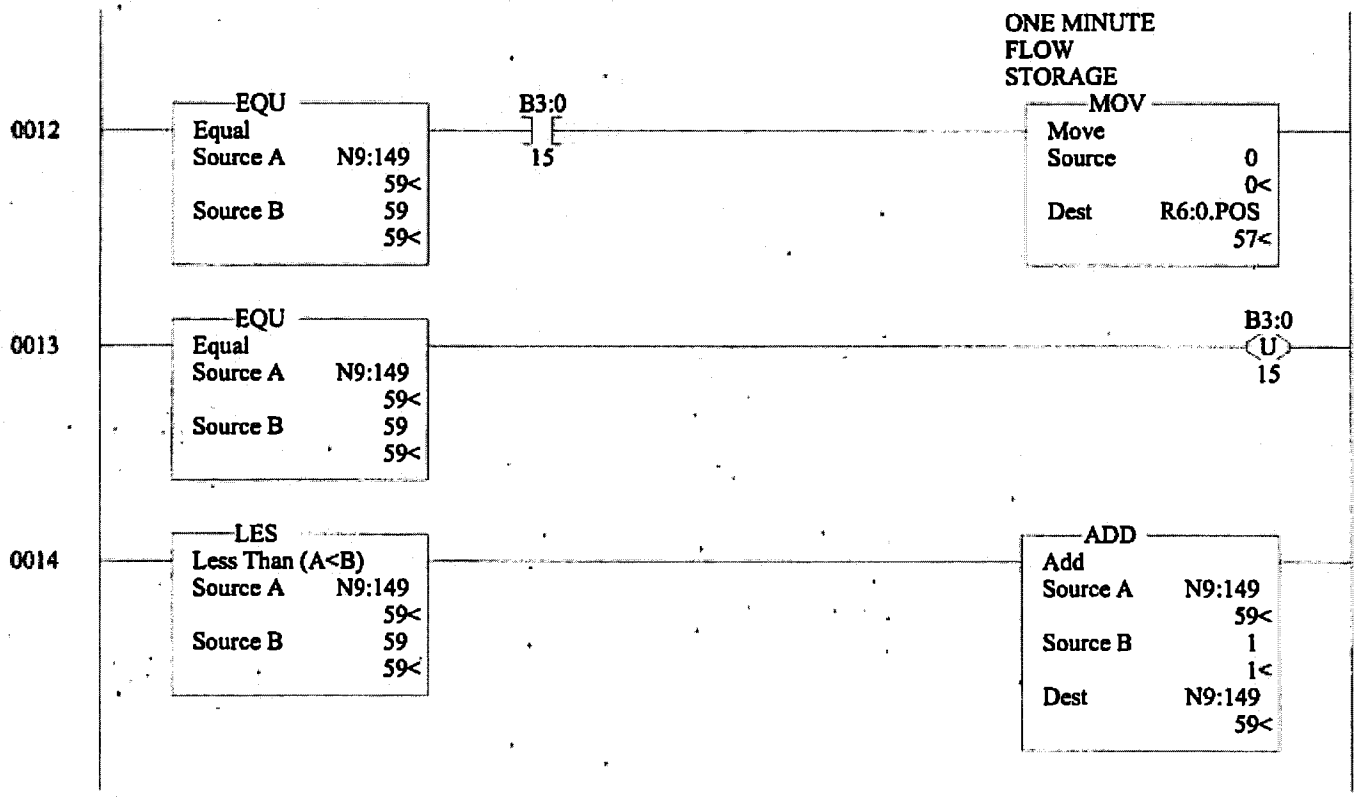
Data File List

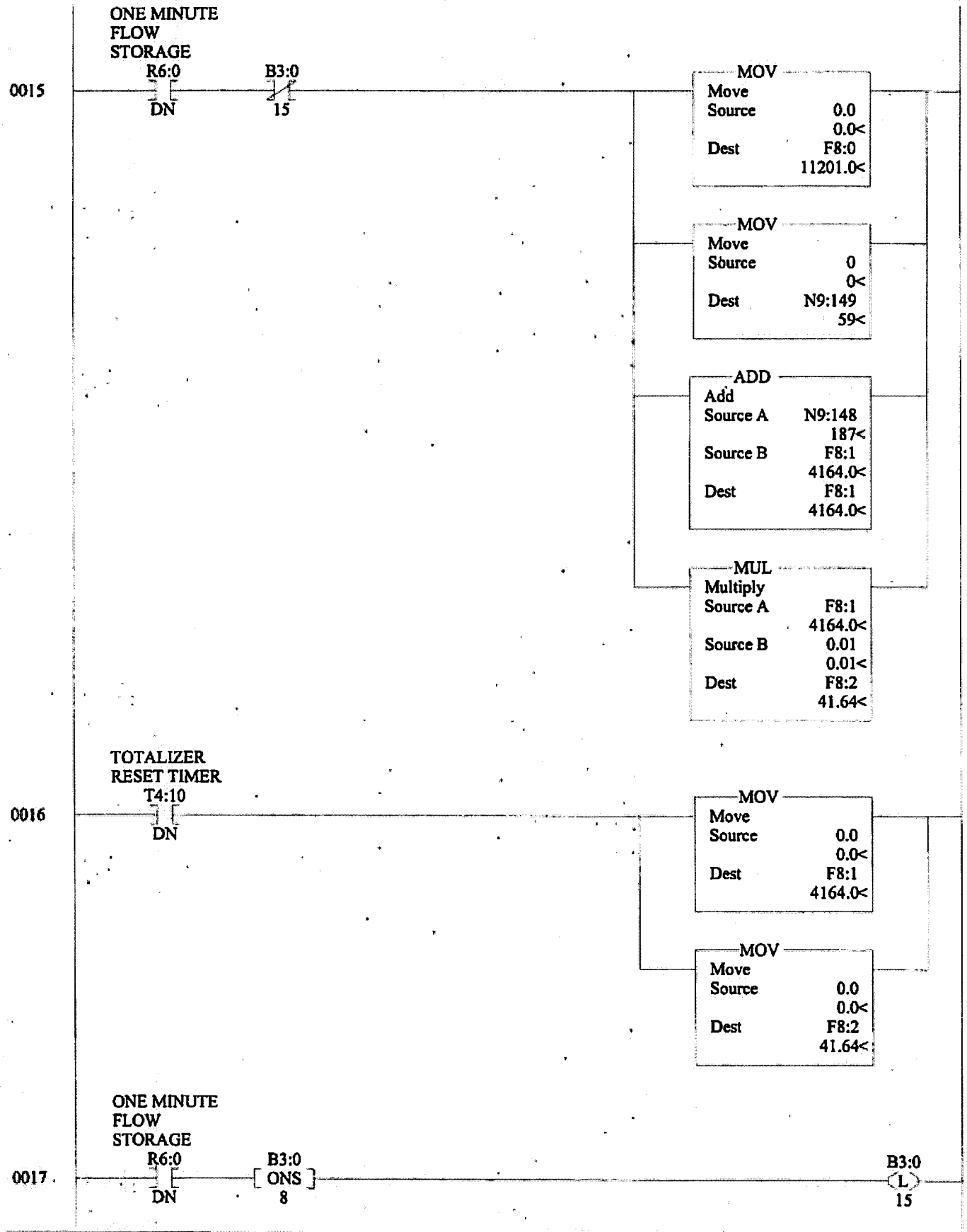
Name	Number	Type	Scope	Debug	Words	Elements	Last
OUTPUT	0	O	Global	No	15	5	O:4
INPUT	1	I	Global	No	42	14	I:13
STATUS	2	S	Global	No	0	66	S:65
BINARY	3	B	Global	No	1	1	B3:0
TIMER	4	T	Global	No	42	14	T4:13
COUNTER	5	C	Global	No	3	1	C5:0
CONTROL	6	R	Global	No	120	40	R6:39
INTEGER	7	N	Global	No	20	20	N7:19
FLOAT	8	F	Global	No	10	5	F8:4
TOATALIZER	9	N	Global	No	150	150	N9:149
PV	10	B	Global	No	50	50	B10:49

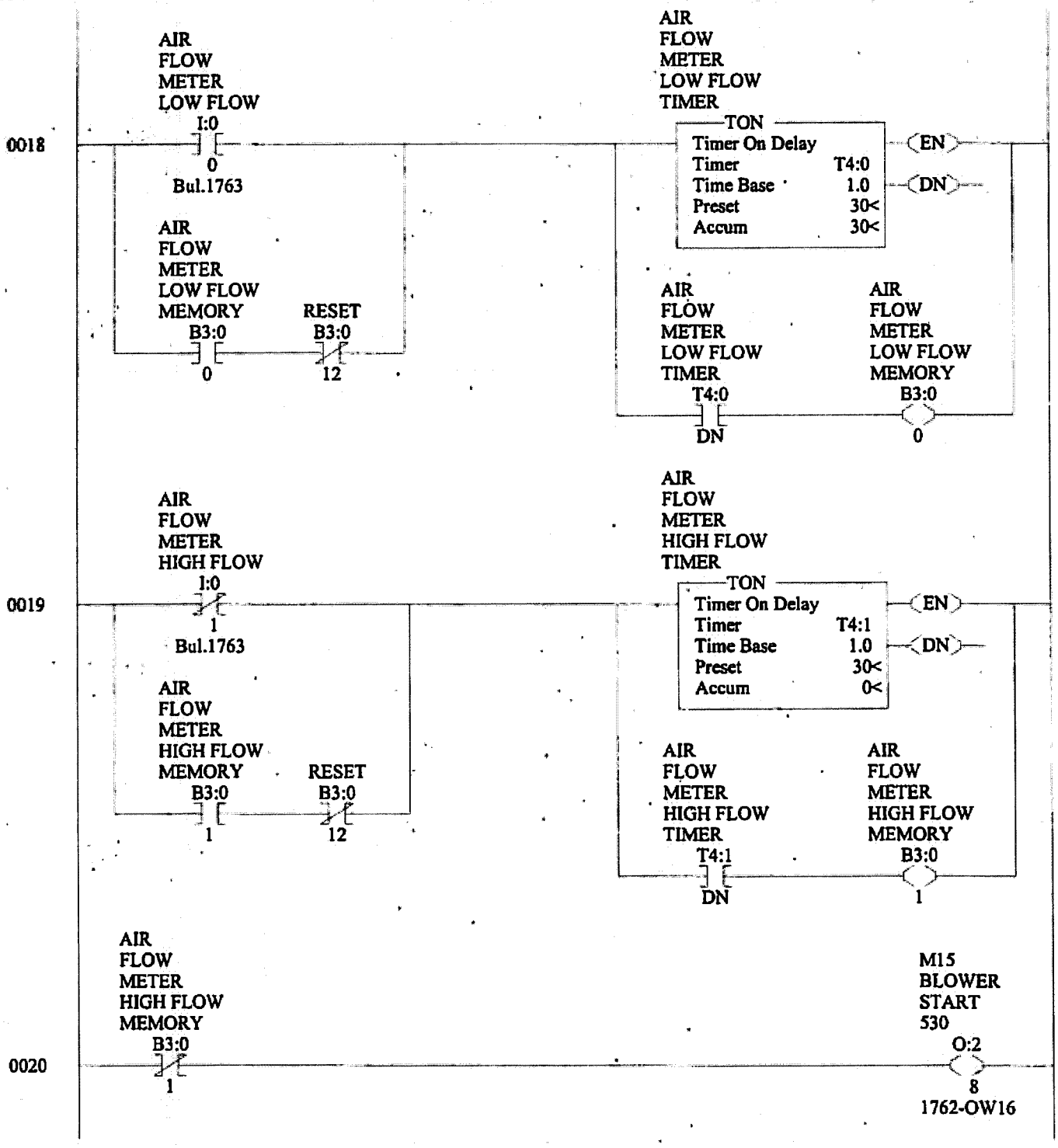
LAD 2 - --- Total Rungs in File = 46

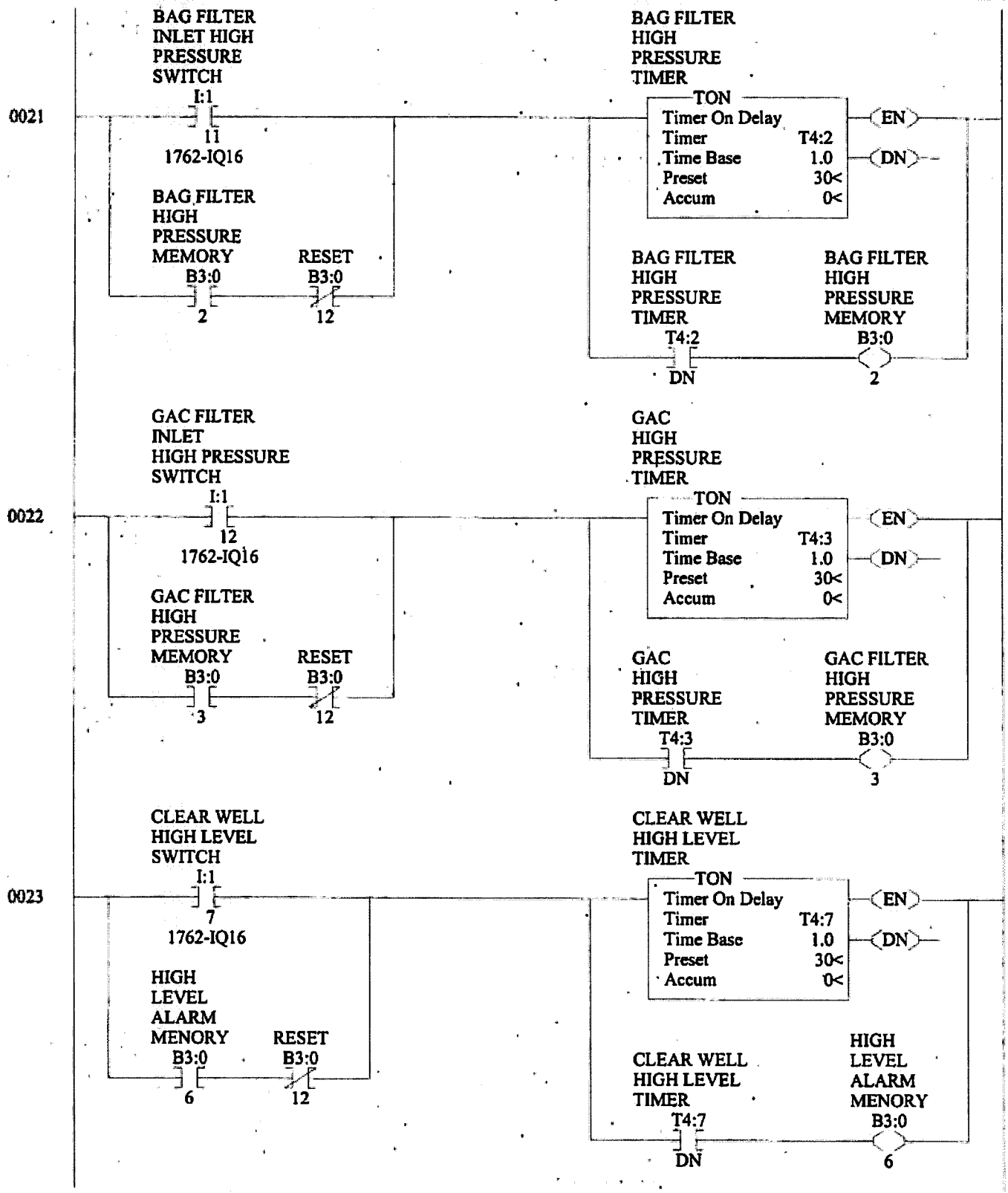


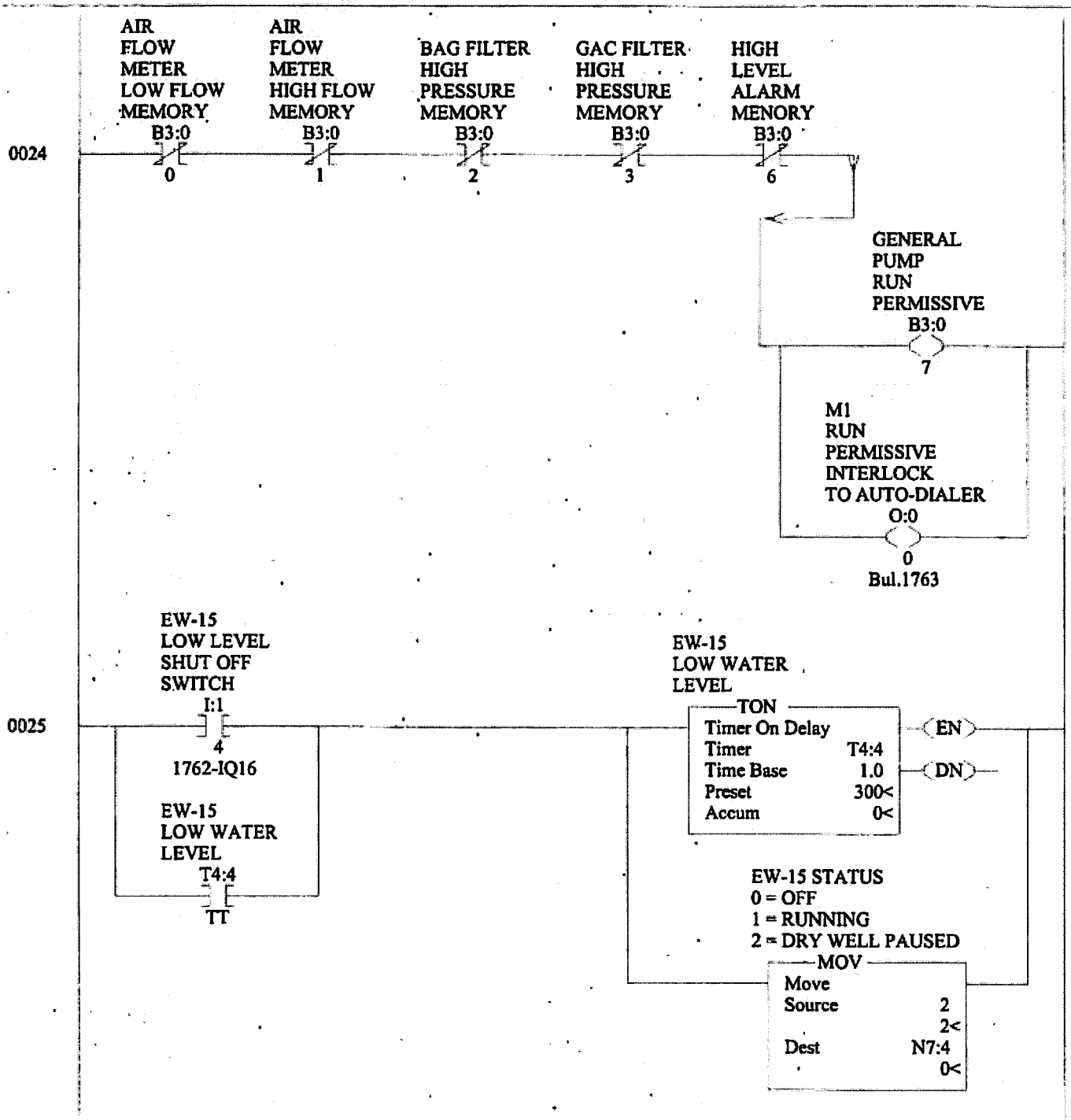

0006
DIV
Divide
Source A N7:19
191<
Source B 100.0
100.0<
Dest F8:4
1.91<
0007
T4:8
DN
TON
Timer On Delay
Timer T4:8
Time Base 0.01
Preset 100<
Accum 25<
EN
DN
ONE MINUTE
FLOW
STORAGE
0008
T4:8
DN
FFL
FIFO Load
Source N7:19
FIFO #N9:0
Control R6:0
Length 60<
Position 57<
EN
DN
EM
0009
LES
Less Than (A<B)
Source A N9:149
59<
Source B 59
59<
ADD
Add
Source A F8:0
11201.0<
Source B N9:[N9:149]
189<
Dest F8:0
11201.0<
0010
B3:0
15
DIV
Divide
Source A F8:0
11201.0<
Source B 60.0
60.0<
Dest N9:148
187<
GPM
0011
MUL
Multiply
Source A N9:148
187<
Source B 0.01
0.01<
Dest F8:3
1.87<

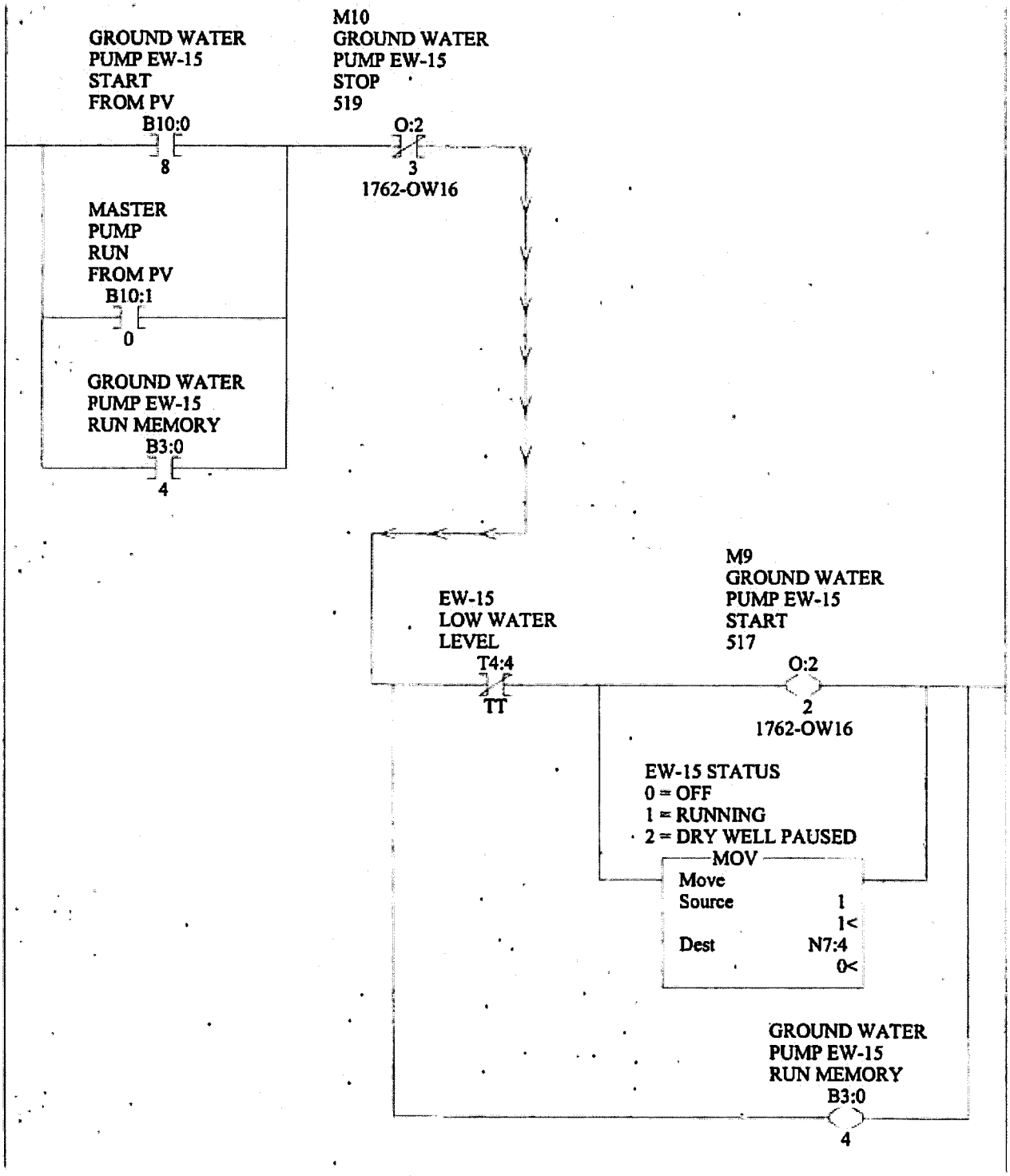

ONE MINUTE
FLOW
STORAGE
0012
EQU
Equal
Source A N9:149
59<
Source B 59
59<
B3:0
15
MOV
Move
Source 0
0<
Dest R6:0.POS
57<
0013
EQU
Equal
Source A N9:149
59<
Source B 59
59<
B3:0
U
15
0014
LES
Less Than (A<B)
Source A N9:149
59<
Source B 59
59<
ADD
Add
Source A N9:149
59<
Source B 1
1<
Dest N9:149
59<

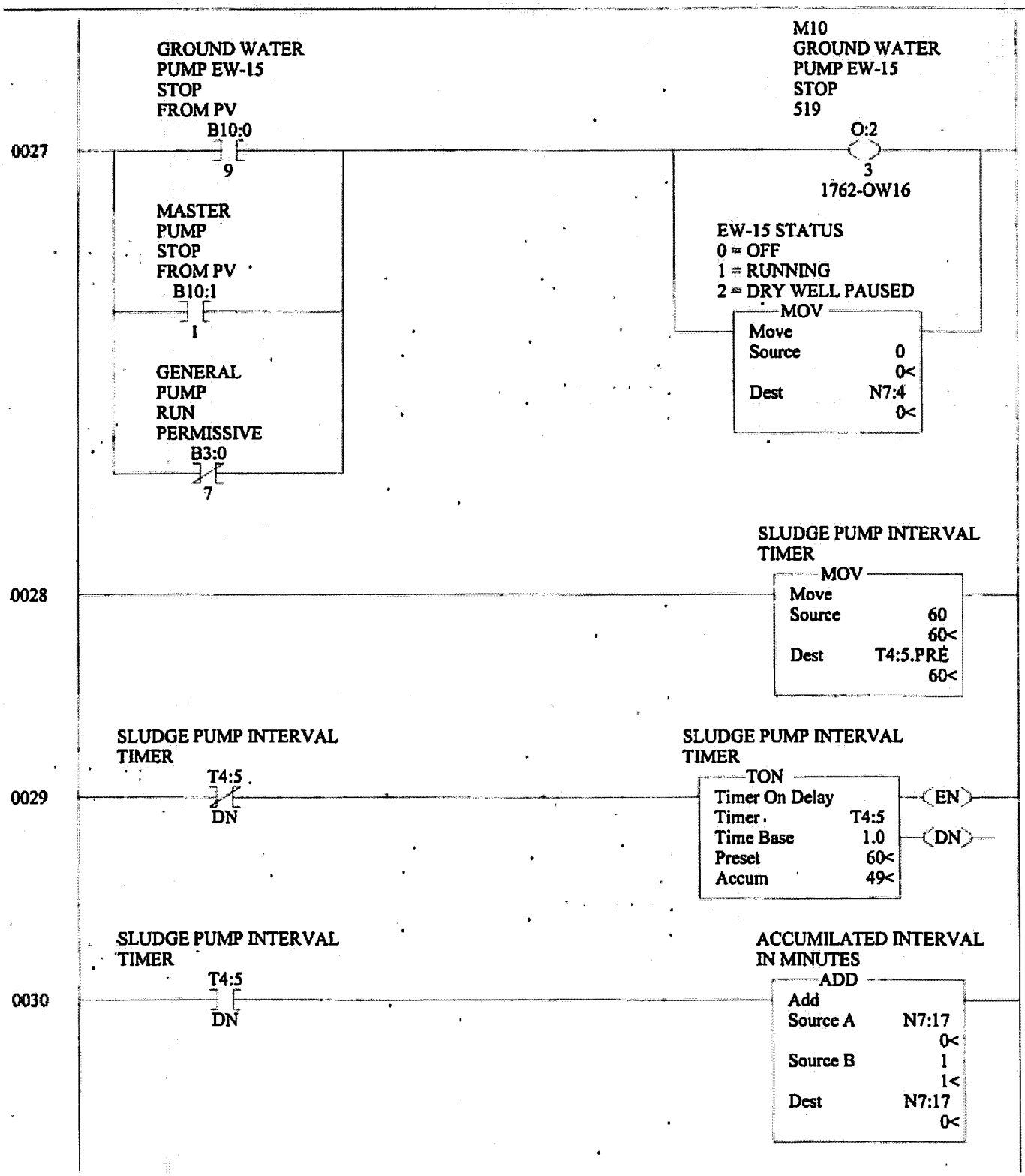

ONE MINUTE
FLOW
STORAGE
R6:0
DN
B3:0
15
0015
MOV
Move
Source 0.0
0.0<
Dest F8:0
11201.0<
MOV
Move
Source 0
0<
Dest N9:149
59<
ADD
Add
Source A N9:148
187<
Source B F8:1
4164.0<
Dest F8:1
4164.0<
MUL
Multiply
Source A F8:1
4164.0<
Source B 0.01
0.01<
Dest F8:2
41.64<
TOTALIZER
RESET TIMER
T4:10
DN
0016
MOV
Move
Source 0.0
0.0<
Dest F8:1
4164.0<
MOV
Move
Source 0.0
0.0<
Dest F8:2
41.64<
ONE MINUTE
FLOW
STORAGE
R6:0
DN
B3:0
ONS
8
0017
B3:0
L
15

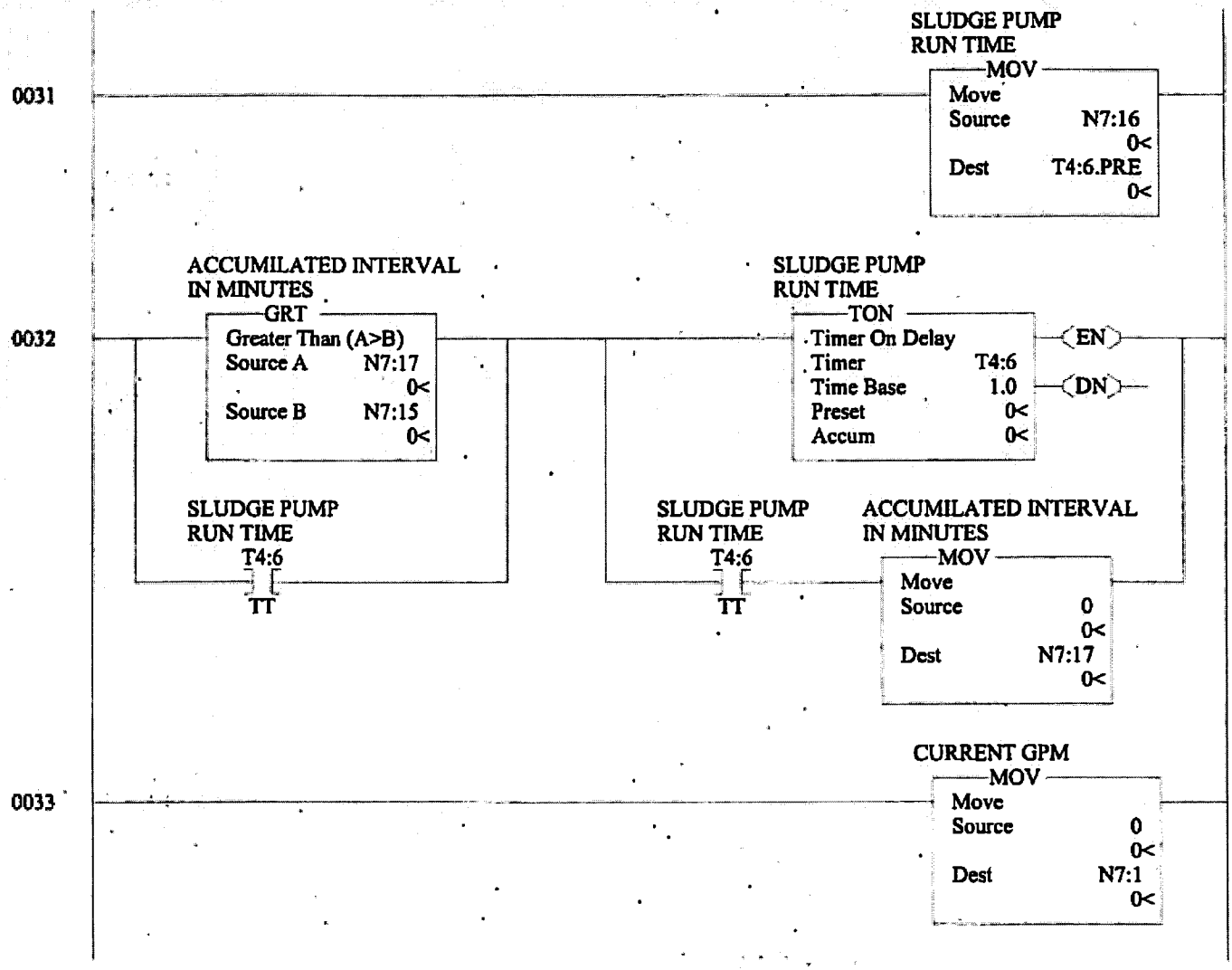

0018
AIR FLOW METER LOW FLOW I:0 0
Bul.1763
AIR FLOW METER LOW FLOW MEMORY B3:0 0
RESET B3:0 12
AIR FLOW METER LOW FLOW TIMER
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 30<
Accum 30<
EN
DN
AIR FLOW METER LOW FLOW TIMER T4:0 DN
AIR FLOW METER LOW FLOW MEMORY B3:0 0
0019
AIR FLOW METER HIGH FLOW I:0 1
Bul.1763
AIR FLOW METER HIGH FLOW MEMORY B3:0 1
RESET B3:0 12
AIR FLOW METER HIGH FLOW TIMER
TON
Timer On Delay
Timer T4:1
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
AIR FLOW METER HIGH FLOW TIMER T4:1 DN
AIR FLOW METER HIGH FLOW MEMORY B3:0 1
0020
AIR FLOW METER HIGH FLOW MEMORY B3:0 1
M15 BLOWER START 530 O:2 8
1762-OW16

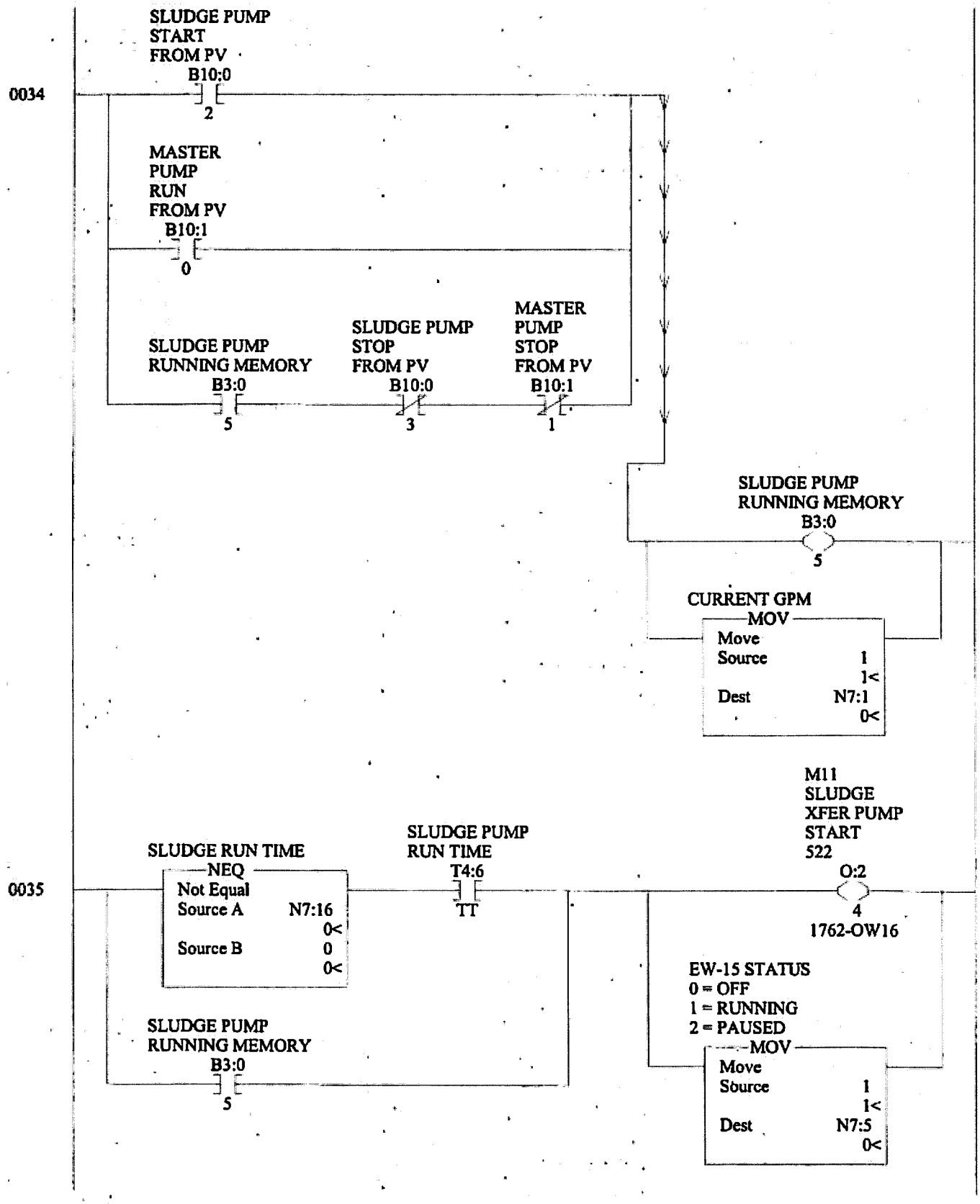

0021
BAG FILTER INLET HIGH PRESSURE SWITCH
I:1
11
1762-IQ16
BAG FILTER HIGH PRESSURE MEMORY
B3:0
2
RESET
B3:0
12
BAG FILTER HIGH PRESSURE TIMER
TON
Timer On Delay
Timer T4:2
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
BAG FILTER HIGH PRESSURE TIMER
T4:2
DN
BAG FILTER HIGH PRESSURE MEMORY
B3:0
2
0022
GAC FILTER INLET HIGH PRESSURE SWITCH
I:1
12
1762-IQ16
GAC FILTER HIGH PRESSURE MEMORY
B3:0
3
RESET
B3:0
12
GAC HIGH PRESSURE TIMER
TON
Timer On Delay
Timer T4:3
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
GAC HIGH PRESSURE TIMER
T4:3
DN
GAC FILTER HIGH PRESSURE MEMORY
B3:0
3
0023
CLEAR WELL HIGH LEVEL SWITCH
I:1
7
1762-IQ16
HIGH LEVEL ALARM MENORY
B3:0
6
RESET
B3:0
12
CLEAR WELL HIGH LEVEL TIMER
TON
Timer On Delay
Timer T4:7
Time Base 1.0
Preset 30<
Accum 0<
EN
DN
CLEAR WELL HIGH LEVEL TIMER
T4:7
DN
HIGH LEVEL ALARM MENORY
B3:0
6

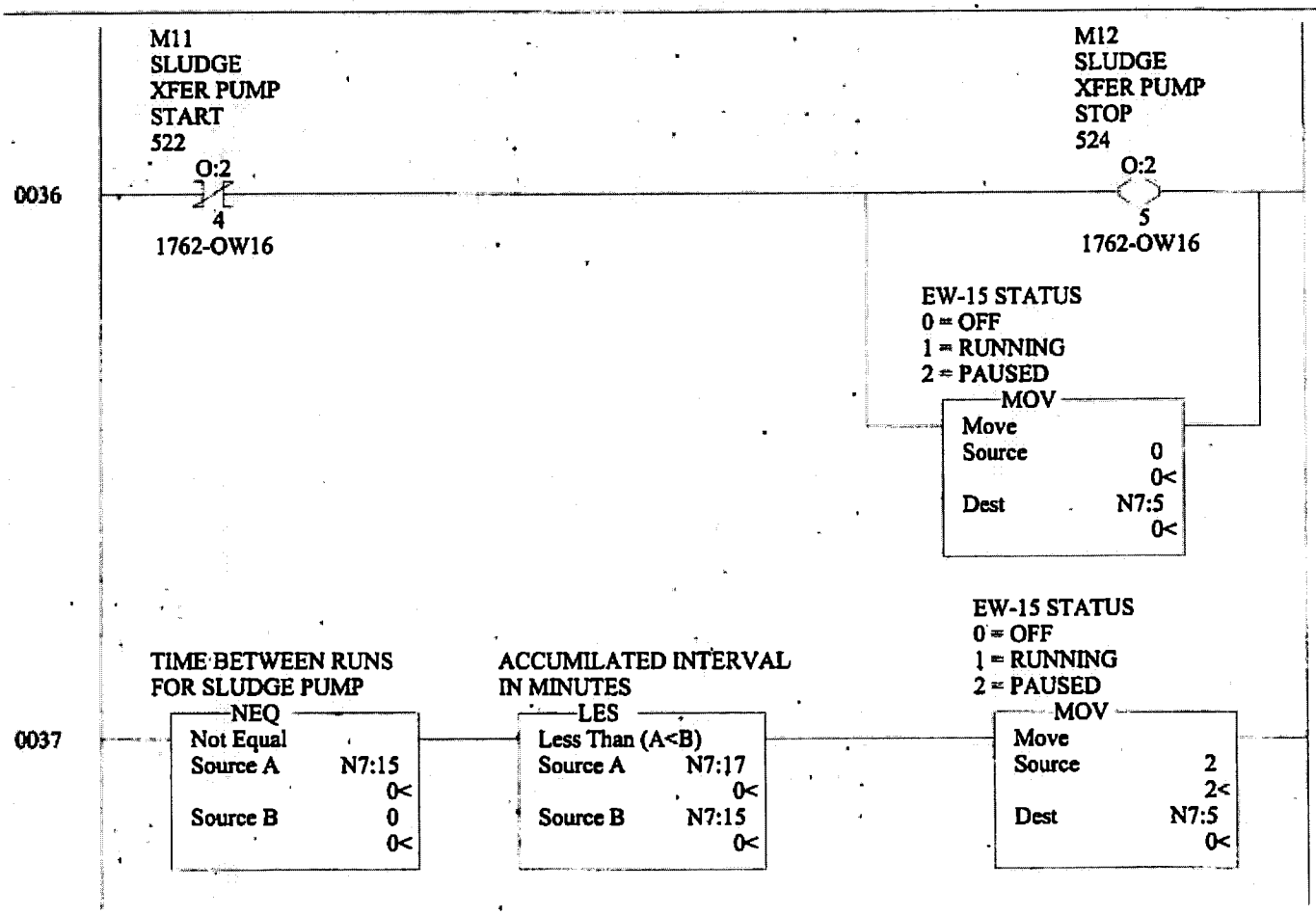

0024
AIR FLOW METER LOW FLOW MEMORY
B3:0
0
AIR FLOW METER HIGH FLOW MEMORY
B3:0
1
BAG FILTER HIGH PRESSURE MEMORY
B3:0
2
GAC FILTER HIGH PRESSURE MEMORY
B3:0
3
HIGH LEVEL ALARM MENORY
B3:0
6
GENERAL PUMP RUN PERMISSIVE
B3:0
7
M1 RUN PERMISSIVE INTERLOCK TO AUTO-DIALER
O:0
0
Bul.1763
0025
EW-15 LOW LEVEL SHUT OFF SWITCH
I:1
4
1762-IQ16
EW-15 LOW WATER LEVEL
T4:4
TT
EW-15 LOW WATER LEVEL
TON
Timer On Delay
Timer T4:4
Time Base 1.0
Preset 300
Accum 0
EN
DN
EW-15 STATUS
0 = OFF
1 = RUNNING
2 = DRY WELL PAUSED
MOV
Move
Source 2
2
Dest N7:4
0

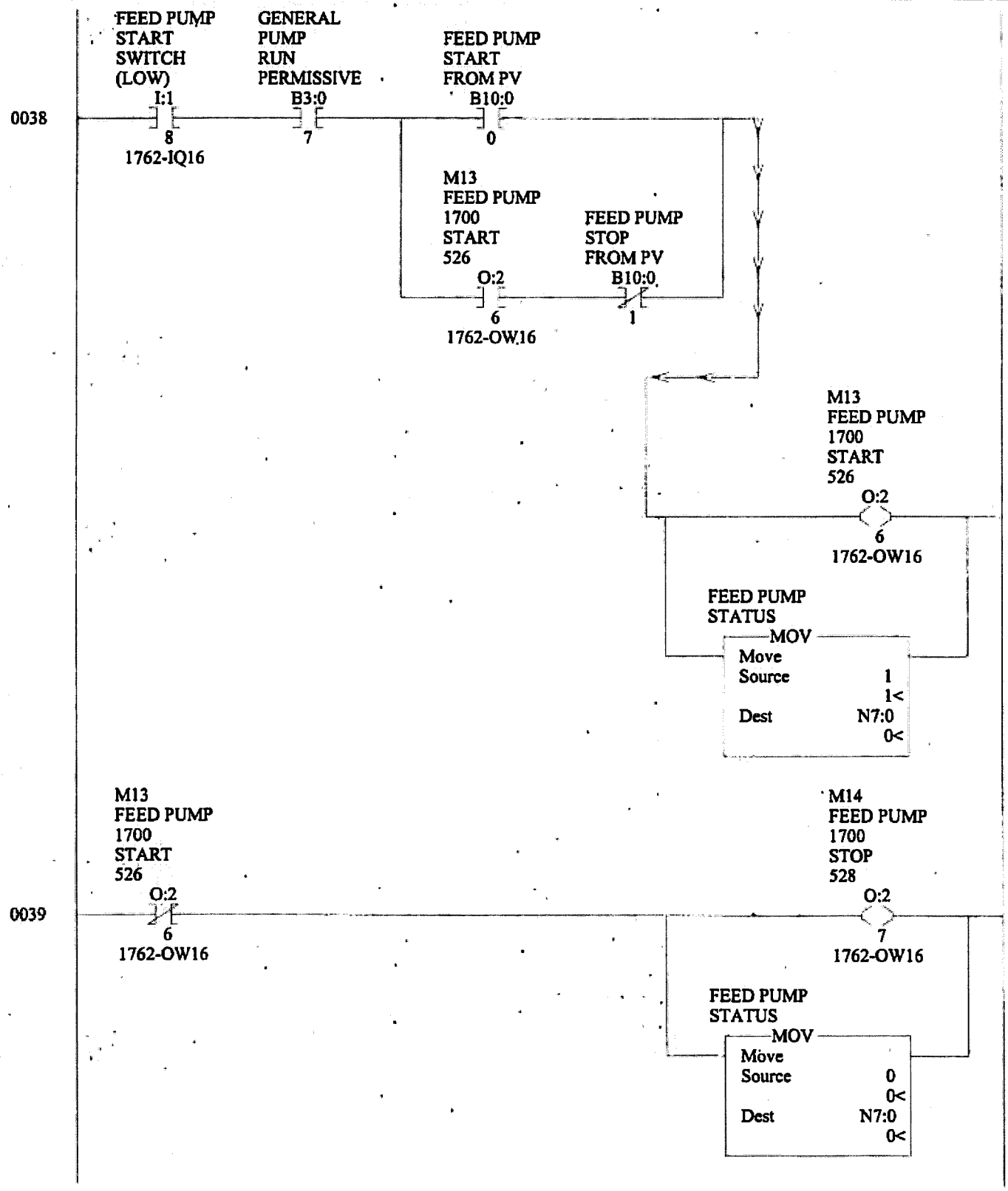

0026
GROUND WATER
PUMP EW-15
START
FROM PV
B10:0
8
M10
GROUND WATER
PUMP EW-15
STOP
519
O:2
3
1762-OW16
MASTER
PUMP
RUN
FROM PV
B10:1
0
GROUND WATER
PUMP EW-15
RUN MEMORY
B3:0
4
EW-15
LOW WATER
LEVEL
T4:4
TT
M9
GROUND WATER
PUMP EW-15
START
517
O:2
2
1762-OW16
EW-15 STATUS
0 = OFF
1 = RUNNING
2 = DRY WELL PAUSED
MOV
Move
Source
1
1<
Dest
N7:4
0<
GROUND WATER
PUMP EW-15
RUN MEMORY
B3:0
4

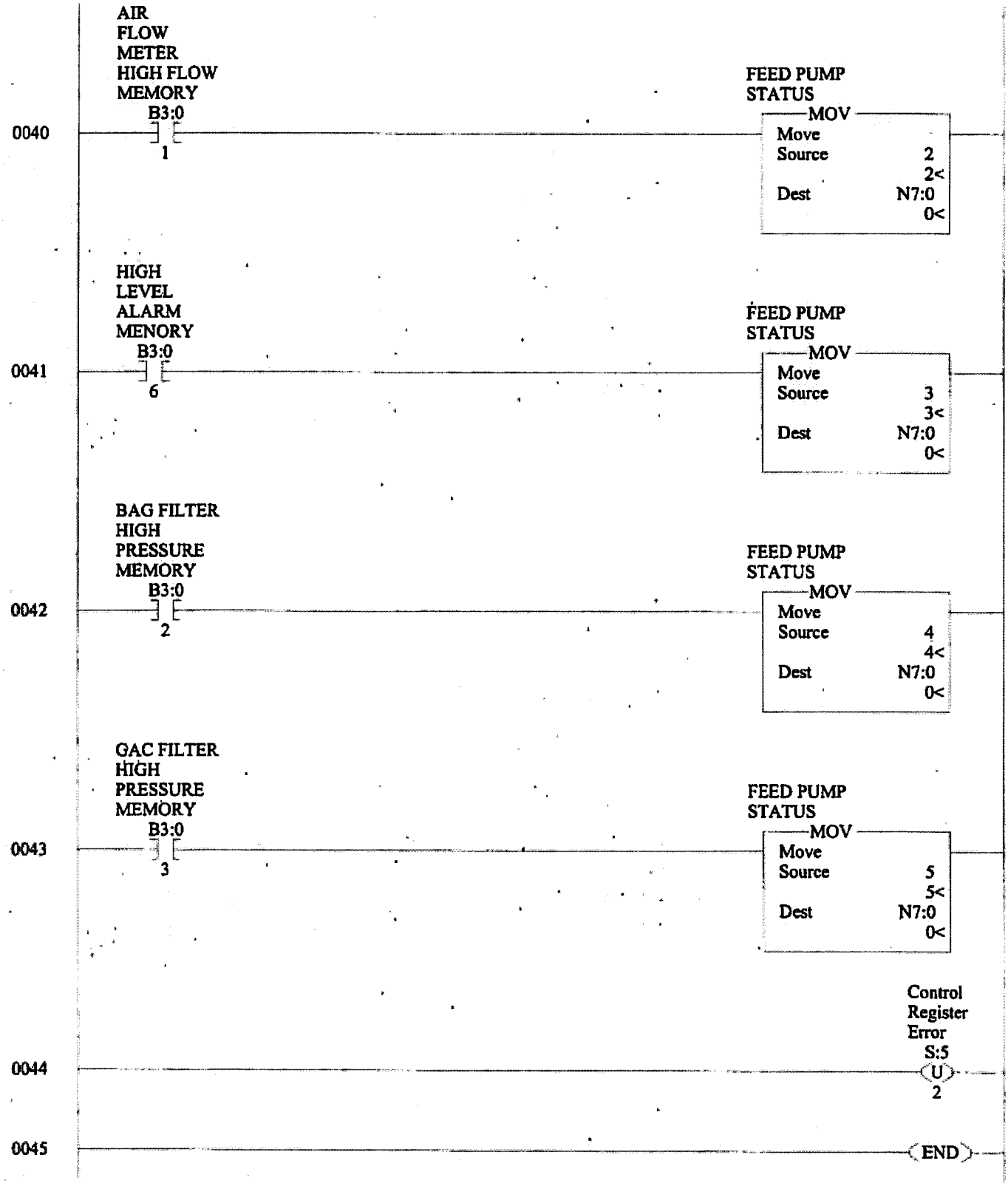

GROUND WATER
PUMP EW-15
STOP
FROM PV
B10:0
9
M10
GROUND WATER
PUMP EW-15
STOP
519
O:2
3
1762-OW16
0027
MASTER
PUMP
STOP
FROM PV
B10:1
1
GENERAL
PUMP
RUN
PERMISSIVE
B3:0
7
EW-15 STATUS
0 = OFF
1 = RUNNING
2 = DRY WELL PAUSED
MOV
Move
Source 0
0<
Dest N7:4
0<
SLUDGE PUMP INTERVAL
TIMER
MOV
Move
Source 60
60<
Dest T4:5.PRE
60<
0028
SLUDGE PUMP INTERVAL
TIMER
T4:5
DN
0029
SLUDGE PUMP INTERVAL
TIMER
TON
Timer On Delay
Timer T4:5
Time Base 1.0
Preset 60<
Accum 49<
EN
DN
SLUDGE PUMP INTERVAL
TIMER
T4:5
DN
0030
ACCUMILATED INTERVAL
IN MINUTES
ADD
Add
Source A N7:17
0<
Source B 1
1<
Dest N7:17
0<


0031
SLUDGE PUMP
RUN TIME
MOV
Move
Source N7:16
0
Dest T4:6.PRE
0
0032
ACCUMILATED INTERVAL
IN MINUTES
GRT
Greater Than (A>B)
Source A N7:17
0
Source B N7:15
0
SLUDGE PUMP
RUN TIME
TON
Timer On Delay
Timer T4:6
Time Base 1.0
Preset 0
Accum 0
EN
DN
SLUDGE PUMP
RUN TIME
T4:6
TT
SLUDGE PUMP
RUN TIME
T4:6
TT
ACCUMILATED INTERVAL
IN MINUTES
MOV
Move
Source 0
0
Dest N7:17
0
0033
CURRENT GPM
MOV
Move
Source 0
0
Dest N7:1
0


SLUDGE PUMP START FROM PV
B10:0
2
0034
MASTER PUMP RUN FROM PV
B10:1
0
SLUDGE PUMP RUNNING MEMORY
B3:0
5
SLUDGE PUMP STOP FROM PV
B10:0
3
MASTER PUMP STOP FROM PV
B10:1
1
SLUDGE PUMP RUNNING MEMORY
B3:0
5
CURRENT GPM
MOV
Move
Source 1
Dest N7:1
0
SLUDGE RUN TIME
NEQ
Not Equal
Source A N7:16
0
Source B 0
0
SLUDGE PUMP RUN TIME
T4:6
TT
M11 SLUDGE XFER PUMP START 522
O:2
4
1762-OW16
0035
EW-15 STATUS
0 = OFF
1 = RUNNING
2 = PAUSED
SLUDGE PUMP RUNNING MEMORY
B3:0
5
MOV
Move
Source 1
Dest N7:5
0


M11
SLUDGE
XFER PUMP
START
522
O:2
4
1762-OW16
M12
SLUDGE
XFER PUMP
STOP
524
O:2
5
1762-OW16
0036
EW-15 STATUS
0 = OFF
1 = RUNNING
2 = PAUSED
MOV
Move
Source 0
0<
Dest N7:5
0<
TIME BETWEEN RUNS
FOR SLUDGE PUMP
NEQ
Not Equal
Source A N7:15
0<
Source B 0
0<
ACCUMILATED INTERVAL
IN MINUTES
LES
Less Than (A<B)
Source A N7:17
0<
Source B N7:15
0<
EW-15 STATUS
0 = OFF
1 = RUNNING
2 = PAUSED
MOV
Move
Source 2
2<
Dest N7:5
0<
0037


0038
FEED PUMP START SWITCH (LOW)
I:1
8
1762-IQ16
GENERAL PUMP RUN PERMISSIVE
B3:0
7
FEED PUMP START FROM PV
B10:0
0
M13 FEED PUMP 1700 START 526
O:2
6
1762-OW16
FEED PUMP STOP FROM PV
B10:0
1
M13 FEED PUMP 1700 START 526
O:2
6
1762-OW16
FEED PUMP STATUS
MOV
Move
Source 1
1<
Dest N7:0
0<
0039
M13 FEED PUMP 1700 START 526
O:2
6
1762-OW16
M14 FEED PUMP 1700 STOP 528
O:2
7
1762-OW16
FEED PUMP STATUS
MOV
Move
Source 0
0<
Dest N7:0
0<


AIR
FLOW
METER
HIGH FLOW
MEMORY
B3:0
1
0040
FEED PUMP
STATUS
MOV
Move
Source
2
2<
Dest
N7:0
0<
HIGH
LEVEL
ALARM
MENORY
B3:0
6
0041
FEED PUMP
STATUS
MOV
Move
Source
3
3<
Dest
N7:0
0<
BAG FILTER
HIGH
PRESSURE
MEMORY
B3:0
2
0042
FEED PUMP
STATUS
MOV
Move
Source
4
4<
Dest
N7:0
0<
GAC FILTER
HIGH
PRESSURE
MEMORY
B3:0
3
0043
FEED PUMP
STATUS
MOV
Move
Source
5
5<
Dest
N7:0
0<
Control
Register
Error
S:5
U
2
0044
0045
END

Data File O0 (bin) -- OUTPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
O:0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Seri
O:0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Seri
O:0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Seri
O:0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763	MicroLogix 1100 Seri
O:2.0	0	0	0	0	0	0	0	1	1	0	1	0	1	0	0	0	1762-OW16	- 16-Output (RLY) 240 V

Data File I1 (bin) -- INPUT

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
I:0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	Bul.1763 MicroLogix 1100 Seri
I:0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763 MicroLogix 1100 Seri
I:0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763 MicroLogix 1100 Seri
I:0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Bul.1763 MicroLogix 1100 Seri
I:0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	Bul.1763 MicroLogix 1100 Seri
I:0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	Bul.1763 MicroLogix 1100 Seri
I:1.0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1762-IQ16 - 16-Input 10/30 VDC
I:3.0	0	0	0	0	1	1	0	0	1	1	1	0	0	0	1	1	1762-IF4 - Analog 4 Chan. Input
I:3.1	0	0	1	1	1	1	0	0	1	1	1	1	0	1	0	0	1762-IF4 - Analog 4 Chan. Input
I:3.2	0	0	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1762-IF4 - Analog 4 Chan. Input
I:3.3	0	0	1	1	1	1	0	0	1	1	1	1	0	1	1	0	1762-IF4 - Analog 4 Chan. Input
I:3.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1762-IF4 - Analog 4 Chan. Input
I:3.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1762-IF4 - Analog 4 Chan. Input
I:3.6	1	0	0	1	1	1	1	0	1	0	1	0	1	0	1	1	1762-IF4 - Analog 4 Chan. Input

Data File S2 (hex) -- STATUS

Main

Processor Mode S:1/0 - S:1/4 = Remote Run
On Power up Go To Run (Mode Behavior) S:1/12 = 0
First Pass S:1/15 = No
Free Running Clock S:4 = 1110-1001-0011-1110

Proc

OS Catalog Number S:57 = 1100
OS Series S:58 = B
OS FRS S:59 =
Processor Catalog Number S:60 =
Processor Series S:61 = B
Processor FRN S:62 =
User Program Type S:63 = 8001h
Compiler Revision Number S:64 =

Scan Times

Maximum (x10 ms) S:22 = 44
Watchdog (x10 ms) S:3 (high byte) = 10
Last 100 uSec Scan Time S:35 = 18
Scan Toggle Bit S:33/9 = 1

Math

Math Overflow Selected S:2/14 = 0
Overflow Trap S:5/0 = 0
Carry S:0/0 = 0
Overflow S:0/1 = 0
Zero Bit S:0/2 = 1
Sign Bit S:0/3 = 0
Math Register (lo word) S:13 = 0
Math Register (high word) S:14-S:13 = 0
Math Register (32 Bit) S:14-S:13 = 0

Chan 0

Processor Mode S:1/0- S:1/4 = Remote Run
Node Address S:15 (low byte) = 0
Baud Rate S:15 (high byte) = ?
Channel Mode S:33/3 = 0
Comms Active S:33/4 = 0
Incoming Cmd Pending S:33/0 = 0
Msg Reply Pending S:33/1 = 0
Outgoing Msg Cmd Pending S:33/2 = 0

Debug

Suspend Code S:7 = 0
Suspend File S:8 = 0

Errors

Fault Override At Power Up S:1/8 = 0
Startup Protection Fault S:1/9 = 0
Major Error Halt S:1/13 = 0
Overflow Trap S:5/0 = 0
Control Register Error S:5/2 = 0
Major Error Executing User Fault Rtn. S:5/3 = 0
Battery Low S:5/11 = 0
Input Filter Selection Modified S:5/13 = 0
ASCII String Manipulation error S:5/15 = 0
Fault Routine S:29 = 0
Major Error S:6 = 0h
Error Description:

Protection

Deny Future Access S:1/14 = No
Data File Overwrite Protection Lost S:36/10 = False

Mem Module

Memory Module Loaded On Boot S:5/8 = 0
Password Mismatch S:5/9 = 0
Load Memory Module On Memory Error S:1/10 = 0
Load Memory Module Always S:1/11 = 0
On Power up Go To Run (Mode Behavior) S:1/12 = 0
Program Compare S:2/9 = 0
Data File Overwrite Protection Lost S:36/10 = 0

Forces

Forces Enabled S:1/5 = Yes
Forces Installed S:1/6 = No

Data File B3 (bin) -- BINARY

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Symbol)	Description
B3:0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1		

Data File T4 -- TIMER

Offset	EN	TT	DN	BASE	PRE	ACC	(Symbol) Description
T4:0	1	0	1	1.0 sec	30	30	AIR FLOW METER LOW FLOW TIMER
T4:1	0	0	0	1.0 sec	30	0	AIR FLOW METER HIGH FLOW TIMER
T4:2	0	0	0	1.0 sec	30	0	BAG FILTER HIGH PRESSURE TIMER
T4:3	0	0	0	1.0 sec	30	0	GAC HIGH PRESSURE TIMER
T4:4	0	0	0	1.0 sec	300	0	EW-15 LOW WATER LEVEL
T4:5	1	1	0	1.0 sec	60	49	SLUDGE PUMP INTERVAL TIMER
T4:6	0	0	0	1.0 sec	0	0	SLUDGE PUMP RUN TIME
T4:7	0	0	0	1.0 sec	30	0	CLEAR WELL HIGH LEVEL TIMER
T4:8	1	1	0	.01 sec	100	25	
T4:9	0	0	0	.01 sec	0	0	
T4:10	0	0	0	1.0 sec	10	0	TOTALIZER RESET TIMER
T4:11	0	0	0	.01 sec	0	0	
T4:12	0	0	0	.01 sec	0	0	
T4:13	0	0	0	.01 sec	0	0	

Data File C5 -- COUNTER

Offset	CU	CD	DN	OV	UN	UA	PRE	ACC	(Symbol)	Description
C5:0	0	0	1	0	0	0	1000	10684		

Data File R6 -- CONTROL

Offset	EN	EU	DN	EM	ER	UL	IN	FD	LEN	POS	(Symbol) Description
R6:0	0	0	0	0	0	0	0	0	60	57	ONE MINUTE FLOW STORAGE
R6:1	0	0	0	0	0	0	0	0	0	0	
R6:2	0	0	0	0	0	0	0	0	0	0	
R6:3	0	0	0	0	0	0	0	0	0	0	
R6:4	0	0	0	0	0	0	0	0	0	0	
R6:5	0	0	0	0	0	0	0	0	0	0	
R6:6	0	0	0	0	0	0	0	0	0	0	
R6:7	0	0	0	0	0	0	0	0	0	0	
R6:8	0	0	0	0	0	0	0	0	0	0	
R6:9	0	0	0	0	0	0	0	0	0	0	
R6:10	0	0	0	0	0	0	0	0	0	0	
R6:11	0	0	0	0	0	0	0	0	0	0	
R6:12	0	0	0	0	0	0	0	0	0	0	
R6:13	0	0	0	0	0	0	0	0	0	0	
R6:14	0	0	0	0	0	0	0	0	0	0	
R6:15	0	0	0	0	0	0	0	0	0	0	
R6:16	0	0	0	0	0	0	0	0	0	0	
R6:17	0	0	0	0	0	0	0	0	0	0	
R6:18	0	0	0	0	0	0	0	0	0	0	
R6:19	0	0	0	0	0	0	0	0	0	0	
R6:20	0	0	0	0	0	0	0	0	0	0	
R6:21	0	0	0	0	0	0	0	0	0	0	
R6:22	0	0	0	0	0	0	0	0	0	0	
R6:23	0	0	0	0	0	0	0	0	0	0	
R6:24	0	0	0	0	0	0	0	0	0	0	
R6:25	0	0	0	0	0	0	0	0	0	0	
R6:26	0	0	0	0	0	0	0	0	0	0	
R6:27	0	0	0	0	0	0	0	0	0	0	
R6:28	0	0	0	0	0	0	0	0	0	0	
R6:29	0	0	0	0	0	0	0	0	0	0	
R6:30	0	0	0	0	0	0	0	0	0	0	
R6:31	0	0	0	0	0	0	0	0	0	0	
R6:32	0	0	0	0	0	0	0	0	0	0	
R6:33	0	0	0	0	0	0	0	0	0	0	
R6:34	0	0	0	0	0	0	0	0	0	0	
R6:35	0	0	0	0	0	0	0	0	0	0	
R6:36	0	0	0	0	0	0	0	0	0	0	
R6:37	0	0	0	0	0	0	0	0	0	0	
R6:38	0	0	0	0	0	0	0	0	0	0	
R6:39	0	0	0	0	0	0	0	0	0	0	

J12_143_V4

Data File N7 (dec) -- INTEGER

Offset	0	1	2	3	4	5	6	7	8	9
N7:0	0	0	0	0	0	0	0	0	0	500
N7:10	24	32567	150	550	5	0	0	0	18000	191

Data File F8 -- FLOAT

Offset	0	1	2	3	4
F8:0	11201	4164	41.64	1.87	1.91

Data File N9 (dec) -- TOATALIZER

Offset	0	1	2	3	4	5	6	7	8	9
N9:0	190	191	190	190	191	192	190	190	191	190
N9:10	191	191	190	191	190	191	191	191	191	191
N9:20	191	191	191	190	191	191	191	190	191	191
N9:30	191	191	191	191	190	191	191	191	191	191
N9:40	191	190	192	190	190	190	189	191	191	191
N9:50	190	190	190	191	191	190	190	189	188	189
N9:60	0	0	0	0	437	1200	948	668	668	668
N9:70	668	668	668	668	668	668	668	668	668	668
N9:80	668	668	668	668	668	668	668	668	668	668
N9:90	668	668	668	583	266	266	266	266	266	266
N9:100	266	266	266	266	266	266	266	266	266	266
N9:110	266	266	266	266	266	266	266	266	266	266
N9:120	266	266	266	266	266	266	266	266	266	266
N9:130	266	266	266	266	266	266	266	266	266	266
N9:140	266	266	0	0	0	1	0	27578	187	59

Data File B10 (bin) -- PV

Offset	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	(Symbol) Description
B10:0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	
B10:1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
B10:49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Address (Symbol) = Value [Description]

```
O:0/0       - M1 RUN PERMISSIVE INTERLOCK TO AUTO-DIALER
              OTE - File #2 - 24
O:2/2       - M9 GROUND WATER PUMP EW-15 START 517
              OTE - File #2 - 26
O:2/3       - M10 GROUND WATER PUMP EW-15 STOP 519
              OTE - File #2 - 27
              XIO - File #2 - 26
O:2/4       - M11 SLUDGE XFER PUMP START 522
              OTE - File #2 - 35
              XIO - File #2 - 36
O:2/5       - M12 SLUDGE XFER PUMP STOP 524
              OTE - File #2 - 36
O:2/6       - M13 FEED PUMP 1700 START 526
              OTE - File #2 - 38
              XIC - File #2 - 38
              XIO - File #2 - 39
O:2/7       - M14 FEED PUMP 1700 STOP 528
              OTE - File #2 - 39
O:2/8       - M15 BLOWER START 530
              OTE - File #2 - 20
I:0/0       - AIR FLOW METER LOW FLOW
              XIC - File #2 - 18
I:0/1       - AIR FLOW METER HIGH FLOW
              XIO - File #2 - 19
I:1/4       - EW-15 LOW LEVEL SHUT OFF SWITCH
              XIC - File #2 - 25
I:1/7       - CLEAR WELL HIGH LEVEL SWITCH
              XIC - File #2 - 23
I:1/8       - FEED PUMP START SWITCH (LOW)
              XIC - File #2 - 38
I:1/11      - BAG FILTER INLET HIGH PRESSURE SWITCH
              XIC - File #2 - 21
I:1/12      - GAC FILTER INLET HIGH PRESSURE SWITCH
              XIC - File #2 - 22
I:3.0       - BLOWER AIR FLOW XMITTER 1.5-125SCFM
              SCP - File #2 - 3
              LES - File #2 - 4
S:5/2       - Control Register Error
              OTU - File #2 - 44
B3:0/0      - AIR FLOW METER LOW FLOW MEMORY
              OTE - File #2 - 18
              XIC - File #2 - 18
              XIO - File #2 - 24
B3:0/1      - AIR FLOW METER HIGH FLOW MEMORY
              OTE - File #2 - 19
              XIC - File #2 - 19, 40
              XIO - File #2 - 20, 24
B3:0/2      - BAG FILTER HIGH PRESSURE MEMORY
              OTE - File #2 - 21
              XIC - File #2 - 21, 42
              XIO - File #2 - 24
B3:0/3      - GAC FILTER HIGH PRESSURE MEMORY
              OTE - File #2 - 22
              XIC - File #2 - 22, 43
              XIO - File #2 - 24
B3:0/4      - GROUND WATER PUMP EW-15 RUN MEMORY
              OTE - File #2 - 26
              XIC - File #2 - 26
B3:0/5      - SLUDGE PUMP RUNNING MEMORY
              OTE - File #2 - 34
              XIC - File #2 - 34, 35
B3:0/6      - HIGH LEVEL ALARM MENORY
              OTE - File #2 - 23
              XIC - File #2 - 23, 41
              XIO - File #2 - 24
```

```
B3:0/7        - GENERAL PUMP RUN PERMISSIVE
                OTE - File #2 - 24
                XIC - File #2 - 38
                XIO - File #2 - 27
B3:0/8        - ONS - File #2 - 17
B3:0/9        - OTL - File #2 - 1
B3:0/10       - XIC - File #2 - 5
                XIO - File #2 - 5
B3:0/12       - RESET
                OTE - File #2 - 0
                XIC - File #2 - 2
                XIO - File #2 - 18, 19, 21, 22, 23
B3:0/15       - OTL - File #2 - 17
                OTU - File #2 - 13
                XIC - File #2 - 12
                XIO - File #2 - 10, 15
T4:0          - AIR FLOW METER LOW FLOW TIMER
                TON - File #2 - 18
T4:0/DN       - XIC - File #2 - 18
T4:1          - AIR FLOW METER HIGH FLOW TIMER
                TON - File #2 - 19
T4:1/DN       - XIC - File #2 - 19
T4:2          - BAG FILTER HIGH PRESSURE TIMER
                TON - File #2 - 21
T4:2/DN       - XIC - File #2 - 21
T4:3          - GAC HIGH PRESSURE TIMER
                TON - File #2 - 22
T4:3/DN       - XIC - File #2 - 22
T4:4          - EW-15 LOW WATER LEVEL
                TON - File #2 - 25
T4:4/TT       - XIC - File #2 - 25
                XIO - File #2 - 26
T4:5          - SLUDGE PUMP INTERVAL TIMER
                TON - File #2 - 29
T4:5/DN       - XIC - File #2 - 30
                XIO - File #2 - 29
T4:5.PRE      - MOV - File #2 - 28
T4:6          - SLUDGE PUMP RUN TIME
                TON - File #2 - 32
T4:6/TT       - XIC - File #2 - 32, 35
T4:6.PRE      - MOV - File #2 - 31
T4:7          - CLEAR WELL HIGH LEVEL TIMER
                TON - File #2 - 23
T4:7/DN       - XIC - File #2 - 23
T4:8          - TON - File #2 - 7
T4:8/DN       - XIC - File #2 - 8
                XIO - File #2 - 7
T4:10         - TOTALIZER RESET TIMER
                TON - File #2 - 2
T4:10/DN      - XIC - File #2 - 16
R6:0          - ONE MINUTE FLOW STORAGE
                FFL - File #2 - 8
R6:0/DN       - XIC - File #2 - 15, 17
R6:0.POS      - MOV - File #2 - 12
N7:0          - FEED PUMP STATUS
                MOV - File #2 - 38, 39, 40, 41, 42, 43
N7:1          - CURRENT GPM
                MOV - File #2 - 33, 34
N7:4          - EW-15 STATUS 0 = OFF 1 = RUNNING 2 = DRY WELL PAUSED
                MOV - File #2 - 25, 26, 27
N7:5          - EW-15 STATUS 0 = OFF 1 = RUNNING 2 = PAUSED
                MOV - File #2 - 35, 36, 37
N7:9          - MOV - File #2 - 5
N7:10         - INPUT MIN
                SCP - File #2 - 3
```

```
N7:11          - INPUT MAX
                 SCP - File #2 - 3
N7:12          - SCALED MIN
                 SCP - File #2 - 3
N7:13          - SCALED MAX
                 SCP - File #2 - 3
N7:15          - TIME BETWEEN RUNS FOR SLUDGE PUMP
                 NEQ - File #2 - 37
                 GRT - File #2 - 32
                 LES - File #2 - 37
N7:16          - SLUDGE RUN TIME
                 MOV - File #2 - 31
                 NEQ - File #2 - 35
N7:17          - ACCUMILATED INTERVAL IN MINUTES
                 MOV - File #2 - 32
                 ADD - File #2 - 30
                 GRT - File #2 - 32
                 LES - File #2 - 37
N7:19          - ONE MINUTE FLOW STORAGE
                 MOV - File #2 - 4, 5
                 DIV - File #2 - 6
                 FFL - File #2 - 8
                 SCP - File #2 - 3
F8:0           - MOV - File #2 - 15
                 ADD - File #2 - 9
                 DIV - File #2 - 10
F8:1           - MOV - File #2 - 16
                 ADD - File #2 - 15
                 MUL - File #2 - 15
F8:2           - MOV - File #2 - 16
                 MUL - File #2 - 15
F8:3           - GPM
                 MUL - File #2 - 11
F8:4           - DIV - File #2 - 6
N9:0           - FFL - File #2 - 8
FILE N9:0 LEN:60 - FFL - File #2 - 8
N9:148         - ADD - File #2 - 15
                 MUL - File #2 - 11
                 DIV - File #2 - 10
N9:149         - MOV - File #2 - 15
                 ADD - File #2 - 9, 14
                 EQU - File #2 - 12, 13
                 LES - File #2 - 9, 14
N9:[N9:149]    - ADD - File #2 - 9
B10:0/0        - FEED PUMP START FROM PV
                 XIC - File #2 - 38
B10:0/1        - FEED PUMP STOP FROM PV
                 XIO - File #2 - 38
B10:0/2        - SLUDGE PUMP START FROM PV
                 XIC - File #2 - 34
B10:0/3        - SLUDGE PUMP STOP FROM PV
                 XIO - File #2 - 34
B10:0/8        - GROUND WATER PUMP EW-15 START FROM PV
                 XIC - File #2 - 26
B10:0/9        - GROUND WATER PUMP EW-15 STOP FROM PV
                 XIC - File #2 - 27
B10:0/10       - RESET FROM PV
                 XIC - File #2 - 0, 1
B10:1/0        - MASTER PUMP RUN FROM PV
                 XIC - File #2 - 26, 34
B10:1/1        - MASTER PUMP STOP FROM PV
                 XIC - File #2 - 27
                 XIO - File #2 - 34
```

Address/Symbol Database

Address	Symbol	Scope	Description	Sym Group	Dev. Co
B3:0/0			AIR FLOW METER LOW FLOW MEMORY		
B3:0/1			AIR FLOW METER HIGH FLOW MEMORY		
B3:0/2			BAG FILTER HIGH PRESSURE MEMORY		
B3:0/3			GAC FILTER HIGH PRESSURE MEMORY		
B3:0/4			GROUND WATER PUMP EW-15 RUN MEMORY		
B3:0/5			SLUDGE PUMP RUNNING MEMORY		
B3:0/6			HIGH LEVEL ALARM MENORY		
B3:0/7			GENERAL PUMP RUN PERMISSIVE		
B3:0/12			RESET		
B10:0/0			FEED PUMP START FROM PV		
B10:0/1			FEED PUMP STOP FROM PV		
B10:0/2			SLUDGE PUMP START FROM PV		
B10:0/3			SLUDGE PUMP STOP FROM PV		
B10:0/4			GROUND WATER PUMP EW-10 START FROM PV		
B10:0/5			GROUND WATER PUMP EW-10 STOP FROM PV		
B10:0/6			GROUND WATER PUMP EW-12 START FROM PV		
B10:0/7			GROUND WATER PUMP EW-12 STOP FROM PV		
B10:0/8			GROUND WATER PUMP EW-15 START FROM PV		
B10:0/9			GROUND WATER PUMP EW-15 STOP FROM PV		
B10:0/10			RESET FROM PV		
B10:0/11					
B10:1/0			MASTER PUMP RUN FROM PV		
B10:1/1			MASTER PUMP STOP FROM PV		
F8:3			GPM		
I:0/0			AIR FLOW METER LOW FLOW		
I:0/1			AIR FLOW METER HIGH FLOW		
I:0/2			SPARE		
I:0/3			SPARE		
I:0/4			SPARE		
I:0/5			SPARE		
I:0/6			SPARE		
I:0/7			SPARE		
I:0/8			SPARE		
I:0/9			SPARE		
I:0/10			NOT A VALAD INPUT		
I:0/11			NOT A VALAD INPUT		
I:0/12			NOT A VALAD INPUT		
I:0/13			NOT A VALAD INPUT		
I:0/14			NOT A VALAD INPUT		
I:0/15			NOT A VALAD INPUT		
I:1/0			EW-6 LOW LEVEL SHUT OFF SWITCH FUTURE		
I:1/1			EW-8 LOW LEVEL SHUT OFF SWITCH FUTURE		
I:1/2			EW-10 LOW LEVEL SHUT OFF SWITCH FUTURE		
I:1/3			EW-12 LOW LEVEL SHUT OFF SWITCH FUTURE		
I:1/4			EW-15 LOW LEVEL SHUT OFF SWITCH		
I:1/5			SPARE		
I:1/6			SLUDGE HOLDING TANK HIGH LEVEL SWITCH		
I:1/7			CLEAR WELL HIGH LEVEL SWITCH		
I:1/8			FEED PUMP START SWITCH (LOW)		
I:1/9			FEED PUMP STOP SWITCH (HIGH)		
I:1/10			SPARE		
I:1/11			BAG FILTER INLET HIGH PRESSURE SWITCH		
I:1/12			GAC FILTER INLET HIGH PRESSURE SWITCH		
I:1/13			SPARE		
I:1/14			SPARE		
I:1/15			SPARE		
I:3.0			BLOWER AIR FLOW XMITTER 1.5-125SCFM		
I:3.1			SPARE		
I:3.2			SPARE		
I:3.3			SPARE		
N7:0			FEED PUMP STATUS		
N7:1			CURRENT GPM		
N7:2			EW-10 STATUS 0 = OFF 1 = RUNNING 2 = DRY WELL PAUSED		
N7:3			EW-12 STATUS 0 = OFF 1 = RUNNING 2 = DRY WELL PAUSED		
N7:4			EW-15 STATUS 0 = OFF 1 = RUNNING 2 = DRY WELL PAUSED		
N7:5			EW-15 STATUS 0 = OFF 1 = RUNNING 2 = PAUSED		
N7:10			INPUT MIN		
N7:11			INPUT MAX		
N7:12			SCALED MIN		
N7:13			SCALED MAX		
N7:14			TOTALIZER EACH COUNT = 100 GALLONS		
N7:15			TIME BETWEEN RUNS FOR SLUDGE PUMP		
N7:16			SLUDGE RUN TIME		
N7:17			ACCUMILATED INTERVAL IN MINUTES		
N7:19			ONE MINUTE FLOW STORAGE		
N9:142			TOTALIZER EACH COUNT = 1000K GALLONS		
N9:143			TOTALIZER EACH COUNT = 100K GALLONS		
N9:144			TOTALIZER EACH COUNT = 10K GALLONS		

Address/Symbol Database

Address	Symbol	Scope	Description	Sym Group	Dev. Co
N9:145			TOTALIZER EACH COUNT = 1K GALLONS		
N9:146			TOTALIZER EACH COUNT = 100 GALLONS		
N9:147			TOTALIZER WITH 2 DECIMAL PLACES		
N9:148					
O:0/0			M1 RUN PERMISSIVE INTERLOCK TO AUTO-DIALER		
O:0/1			M2 GROUND WATER PUMP EW-6 STOP 503		
O:0/2			M3 GROUND WATER PUMP EW-8 START 505		
O:0/3			M4 GROUND WATER PUMP EW-8 STOP 507		
O:0/4			M5 GROUND WATER PUMP EW-10 START 509		
O:0/5			M6 GROUND WATER PUMP EW-10 STOP 511		
O:0/6			NOT A VALAD OUTPUT		
O:0/7			NOT A VALAD OUTPUT		
O:0/8			NOT A VALAD OUTPUT		
O:0/9			NOT A VALAD OUTPUT		
O:0/10			NOT A VALAD OUTPUT		
O:0/11			NOT A VALAD OUTPUT		
O:0/12			NOT A VALAD OUTPUT		
O:0/13			NOT A VALAD OUTPUT		
O:0/14			NOT A VALAD OUTPUT		
O:0/15			NOT A VALAD OUTPUT		
O:2/0			M7 GROUND WATER PUMP EW-12 START 513		
O:2/1			M8 GROUND WATER PUMP EW-12 STOP 515		
O:2/2			M9 GROUND WATER PUMP EW-15 START 517		
O:2/3			M10 GROUND WATER PUMP EW-15 STOP 519		
O:2/4			M11 SLUDGE XFER PUMP START 522		
O:2/5			M12 SLUDGE XFER PUMP STOP 524		
O:2/6			M13 FEED PUMP 1700 START 526		
O:2/7			M14 FEED PUMP 1700 STOP 528		
O:2/8			M15 BLOWER START 530		
O:2/9			M16 BLOWER STOP 532		
O:2/10			SPARE 4351		
O:2/11			SPARE 4361		
O:2/12			SPARE 4371		
O:2/13			SPARE 4381		
O:2/14			SPARE 4391		
O:2/15			SPARE 4401		
R6:0			ONE MINUTE FLOW STORAGE		
S:0			Arithmetic Flags		
S:0/0			Processor Arithmetic Carry Flag		
S:0/1			Processor Arithmetic Underflow/ Overflow Flag		
S:0/2			Processor Arithmetic Zero Flag		
S:0/3			Processor Arithmetic Sign Flag		
S:1			Processor Mode Status/ Control		
S:1/0			Processor Mode Bit 0		
S:1/1			Processor Mode Bit 1		
S:1/2			Processor Mode Bit 2		
S:1/3			Processor Mode Bit 3		
S:1/4			Processor Mode Bit 4		
S:1/5			Forces Enabled		
S:1/6			Forces Present		
S:1/7			Comms Active		
S:1/8			Fault Override at Powerup		
S:1/9			Startup Protection Fault		
S:1/10			Load Memory Module on Memory Error		
S:1/11			Load Memory Module Always		
S:1/12			Load Memory Module and RUN		
S:1/13			Major Error Halted		
S:1/14			Access Denied		
S:1/15			First Pass		
S:2/0			STI Pending		
S:2/1			STI Enabled		
S:2/2			STI Executing		
S:2/3			Index Addressing File Range		
S:2/4			Saved with Debug Single Step		
S:2/5			DH-485 Incoming Command Pending		
S:2/6			DH-485 Message Reply Pending		
S:2/7			DH-485 Outgoing Message Command Pending		
S:2/15			Comms Servicing Selection		
S:3			Current Scan Time/ Watchdog Scan Time		
S:4			Time Base		
S:5/0			Overflow Trap		
S:5/2			Control Register Error		
S:5/3			Major Err Detected Executing UserFault Routine		
S:5/4			M0-M1 Referenced on Disabled Slot		
S:5/8			Memory Module Boot		
S:5/9			Memory Module Password Mismatch		
S:5/10			STI Overflow		
S:5/11			Battery Low		

Address/Symbol Database

Address	Symbol	Scope	Description	Sym Group	Dev. Co
S:6			Major Error Fault Code		
S:7			Suspend Code		
S:8			Suspend File		
S:9			Active Nodes		
S:10			Active Nodes		
S:11			I/O Slot Enables		
S:12			I/O Slot Enables		
S:13			Math Register		
S:14			Math Register		
S:15			Node Address/ Baud Rate		
S:16			Debug Single Step Rung		
S:17			Debug Single Step File		
S:18			Debug Single Step Breakpoint Rung		
S:19			Debug Single Step Breakpoint File		
S:20			Debug Fault/ Powerdown Rung		
S:21			Debug Fault/ Powerdown File		
S:22			Maximum Observed Scan Time		
S:23			Average Scan Time		
S:24			Index Register		
S:25			I/O Interrupt Pending		
S:26			I/O Interrupt Pending		
S:27			I/O Interrupt Enabled		
S:28			I/O Interrupt Enabled		
S:29			User Fault Routine File Number		
S:30			STI Setpoint		
S:31			STI File Number		
S:32			I/O Interrupt Executing		
S:33			Extended Proc Status Control Word		
S:33/0			Incoming Command Pending		
S:33/1			Message Reply Pending		
S:33/2			Outgoing Message Command Pending		
S:33/3			Selection Status User/DF1		
S:33/4			Communicat Active		
S:33/5			Communicat Servicing Selection		
S:33/6			Message Servicing Selection Channel 0		
S:33/7			Message Servicing Selection Channel 1		
S:33/8			Interrupt Latency Control Flag		
S:33/9			Scan Toggle Flag		
S:33/10			Discrete Input Interrupt Reconfigur Flag		
S:33/11			Online Edit Status		
S:33/12			Online Edit Status		
S:33/13			Scan Time Timebase Selection		
S:33/14			DTR Control Bit		
S:33/15			DTR Force Bit		
S:34			Pass-thru Disabled		
S:34/0			Pass-Thru Disabled Flag		
S:34/1			DH+ Active Node Table Enable Flag		
S:34/2			Floating Point Math Flag Disable,Fl		
S:35			Last 1 ms Scan Time		
S:36			Extended Minor Error Bits		
S:36/8			DII Lost		
S:36/9			STI Lost		
S:36/10			Memory Module Data File Overwrite Protection		
S:37			Clock Calendar Year		
S:38			Clock Calendar Month		
S:39			Clock Calendar Day		
S:40			Clock Calendar Hours		
S:41			Clock Calendar Minutes		
S:42			Clock Calendar Seconds		
S:43			STI Interrupt Time		
S:44			I/O Event Interrupt Time		
S:45			DII Interrupt Time		
S:46			Discrete Input Interrupt- File Number		
S:47			Discrete Input Interrupt- Slot Number		
S:48			Discrete Input Interrupt- Bit Mask		
S:49			Discrete Input Interrupt- Compare Value		
S:50			Processor Catalog Number		
S:51			Discrete Input Interrupt- Return Number		
S:52			Discrete Input Interrupt- Accumulat		
S:53			Reserved/ Clock Calendar Day of the Week		
S:55			Last DII Scan Time		
S:56			Maximum Observed DII Scan Time		
S:57			Operating System Catalog Number		
S:58			Operating System Series		
S:59			Operating System FRN		
S:61			Processor Series		
S:62			Processor Revision		
S:63			User Program Type		

Address/Symbol Database

Address	Symbol	Scope	Description	Sym Group	Dev. Co
S:64			User Program Functional Index		
S:65			User RAM Size		
S:66			Flash EEPROM Size		
S:67			Channel 0 Active Nodes		
S:68			Channel 0 Active Nodes		
S:69			Channel 0 Active Nodes		
S:70			Channel 0 Active Nodes		
S:71			Channel 0 Active Nodes		
S:72			Channel 0 Active Nodes		
S:73			Channel 0 Active Nodes		
S:74			Channel 0 Active Nodes		
S:75			Channel 0 Active Nodes		
S:76			Channel 0 Active Nodes		
S:77			Channel 0 Active Nodes		
S:78			Channel 0 Active Nodes		
S:79			Channel 0 Active Nodes		
S:80			Channel 0 Active Nodes		
S:81			Channel 0 Active Nodes		
S:82			Channel 0 Active Nodes		
S:83			DH+ Active Nodes		
S:84			DH+ Active Nodes		
S:85			DH+ Active Nodes		
S:86			DH+ Active Nodes		
T4:0			AIR FLOW METER LOW FLOW TIMER		
T4:0/DN					
T4:1			AIR FLOW METER HIGH FLOW TIMER		
T4:2			BAG FILTER HIGH PRESSURE TIMER		
T4:3			GAC HIGH PRESSURE TIMER		
T4:4			EW-15 LOW WATER LEVEL		
T4:4.PRE					
T4:5			SLUDGE PUMP INTERVAL TIMER		
T4:5/TT					
T4:6			SLUDGE PUMP RUN TIME		
T4:7			CLEAR WELL HIGH LEVEL TIMER		
T4:10			TOTALIZER RESET TIMER		

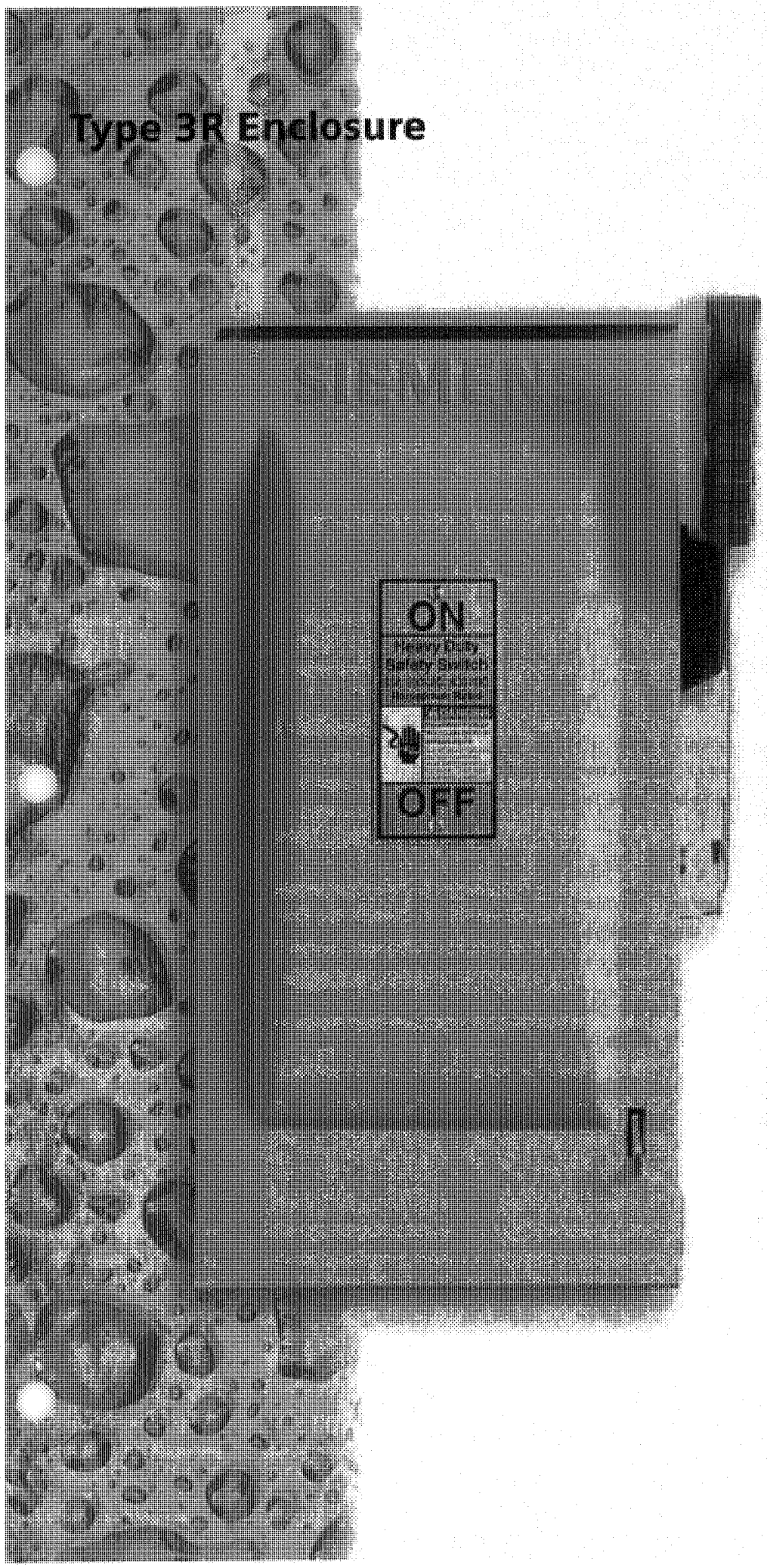
Instruction Comment Database

Address	Instruction	Description

Symbol Group Database

Group_Name	Description

Type 3R Enclosure

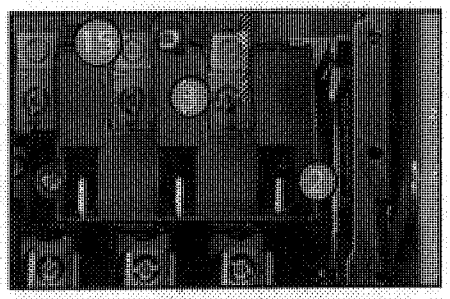


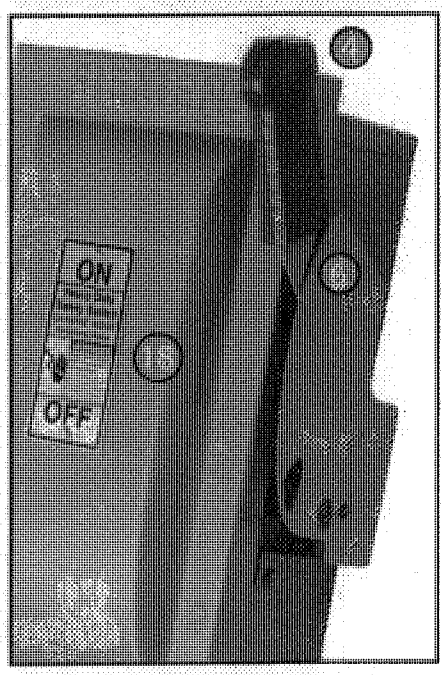
Type 3R enclosures are intended for outdoor use primarily to provide a degree of protection against falling rain and sleet, and must remain undamaged by the formation of ice on the enclosure. They are not intended to provide protection against conditions such as dust, internal condensation or internal icing.

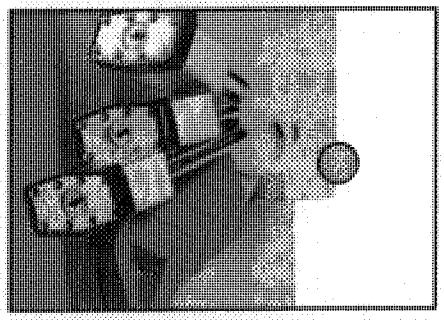
Features

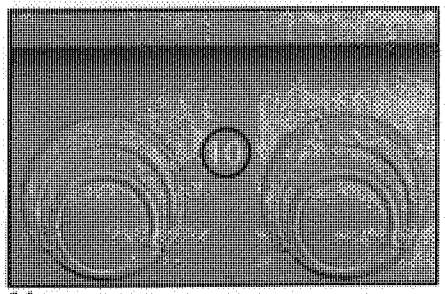
- Tangential knockouts in all box surfaces below lowest live parts (30-600A)
- Two- and three-point mounting with top keyhole
- Formed flange enclosure edges
- 180° plus side opening door
- Double overlap enclosure door top to provide superior protection against entry of rain
- Type HA hub provision 30A general duty
- Type HS hub provision (30-200A switches)
- Galvanized steel construction
- Drawn cover design for increased durability and resistance to damage (30-200A)
- Rugged metal handle with a red insulating grip
- Front operable cover interlock system with positive rotating release action (30-1200A heavy duty and 60-600A general duty)
- Metal nameplates on all heavy duty switches

Heavy Duty Switches
Features

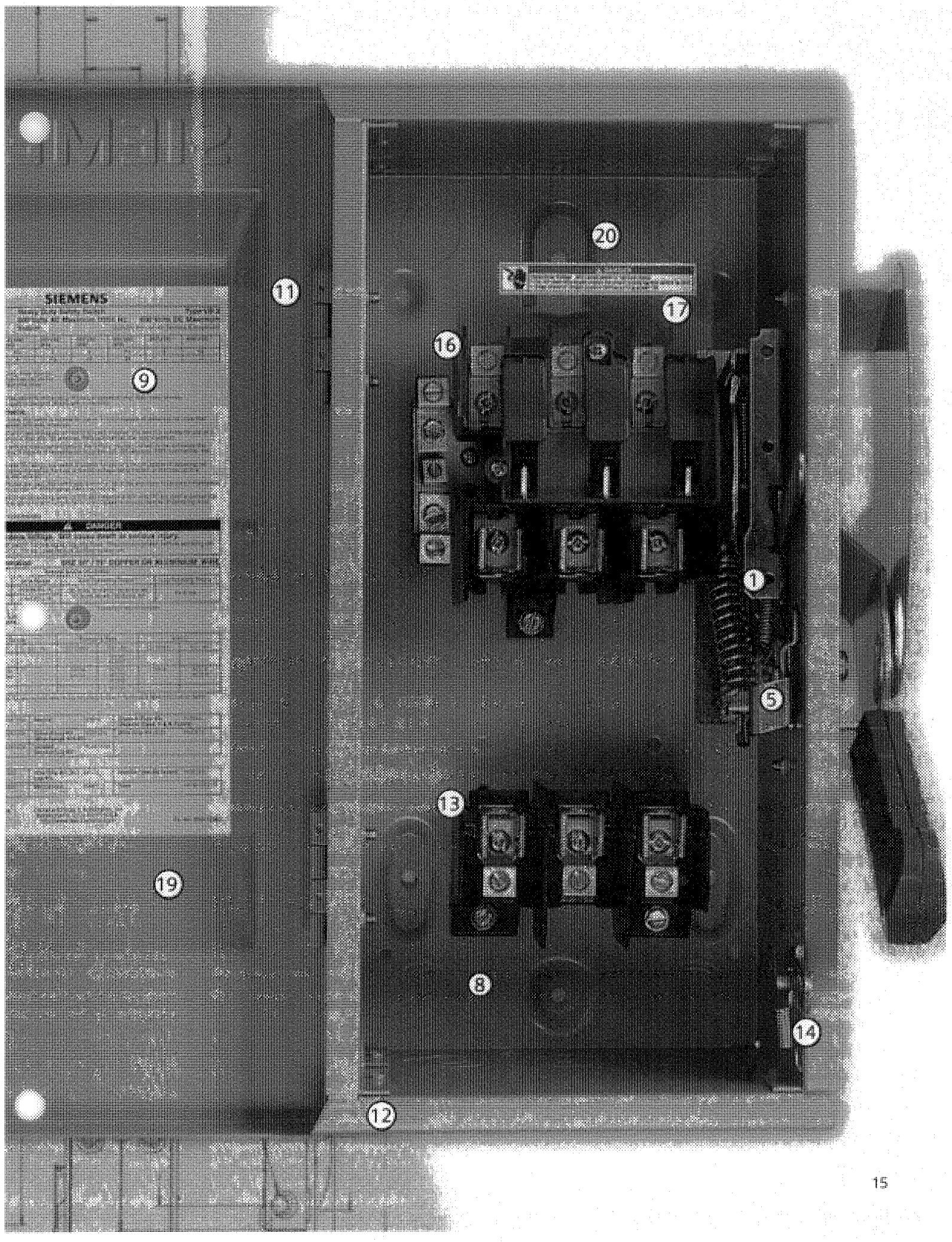








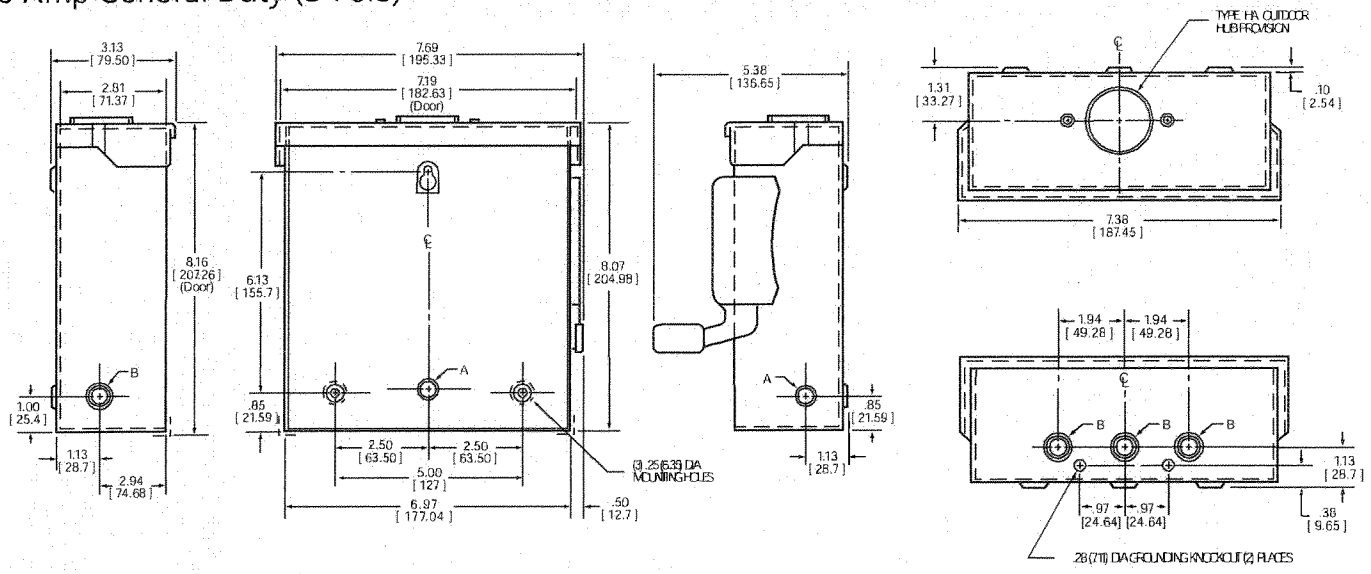
1. Quick-make, quick-break operating mechanism that ensures positive operation
2. Visible blade, double-break switching action
3. Arc chutes dissipate heat and prolong switch life
4. Highly visible red handle grip designed for hook stick operation
5. Defeatable dual cover interlock
6. Center punch provided for field drilling to allow ON padlocking
7. Handle can be padlocked in the OFF position with up to three padlocks with 5/16" hasps
8. Generous top, bottom and side gutters that meet or exceed NEC wire-bending space requirements
9. Informative door labeling, which includes replacement parts list
10. Tangential knockouts through 600A for easy conduit lineup
11. Side-hinged door that opens past 180 degrees for easier wiring
12. Unique enclosure design increases rigidity and prevents cuts and scrapes to conductors and installers' hands
13. Spring reinforced fuse clips that assure reliable contact for cool operation
14. Door latch securely holds door closed and allows cover padlocking
15. Front removable mechanical lugs that are suitable for CU/Al 60˚C or 75˚C conductors
16. Lugs are field convertible to copper body and to a wide variety of compression connectors
17. Hinged clear line terminal shield with probe holes for inspecting or testing line side terminals
18. Embossed aluminum nameplate on Heavy Duty Switches provides highly visible ON/OFF indication
19. Drawn cover for increased rigidity and resistance to abuse
20. Top key hole and bottom mounting holes provide easy two- or three-point mounting


SIEMENS
9
11
20
17
16
1
5
13
8
14
12
19

Detailed Dimension Drawings
Siemens Type VBII Safety Switches

Type 3R (Outdoor)
30 Amp General Duty (3-Pole)

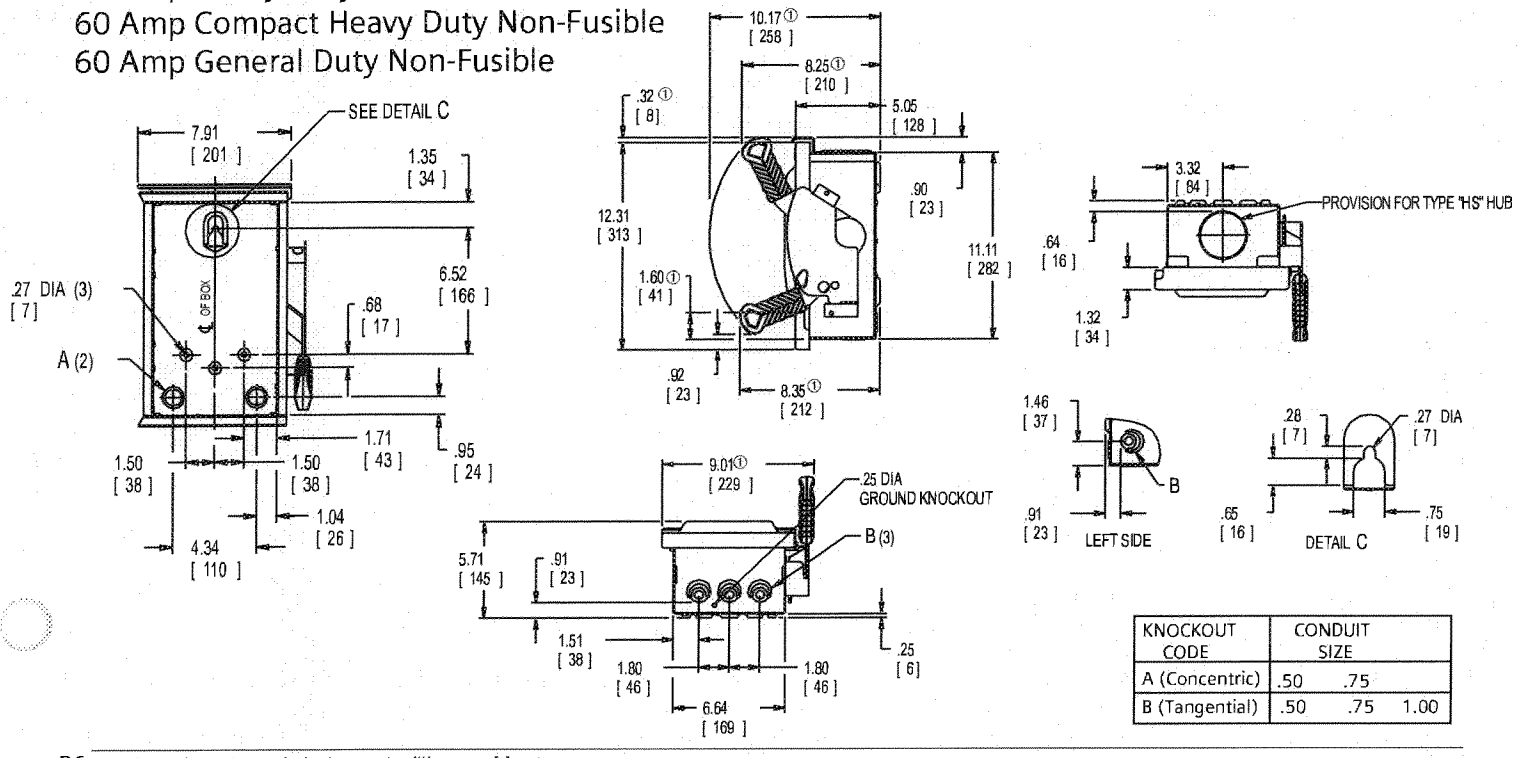
Figure 13



KNOCKOUT CODE	CONDUIT SIZE		
A (Concentric)	.50	.75	
B (Concentric)	.50	.75	1.00

30 Amp Heavy Duty Non-Fusible
60 Amp Compact Heavy Duty Non-Fusible
60 Amp General Duty Non-Fusible

Figure 14



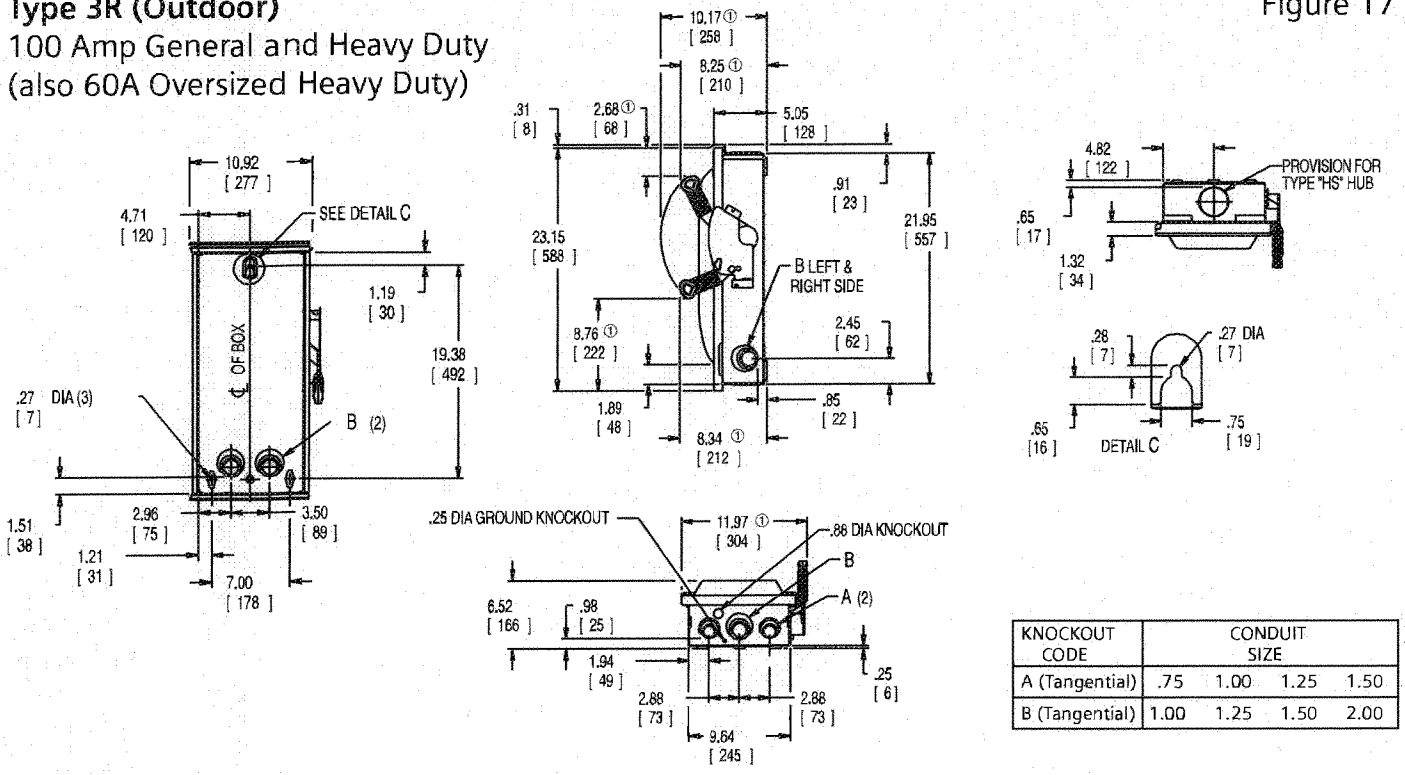
KNOCKOUT CODE	CONDUIT SIZE		
A (Concentric)	.50	.75	
B (Tangential)	.50	.75	1.00

Dimensions shown in inches and millimeters [ ].
Dimensions shown accurate to ± 1/8 inch.
① Dimensions shown apply to heavy duty switches only.

Detailed Dimension Drawings
Siemens Type VBII Safety Switches

Type 3R (Outdoor)
100 Amp General and Heavy Duty
(also 60A Oversized Heavy Duty)

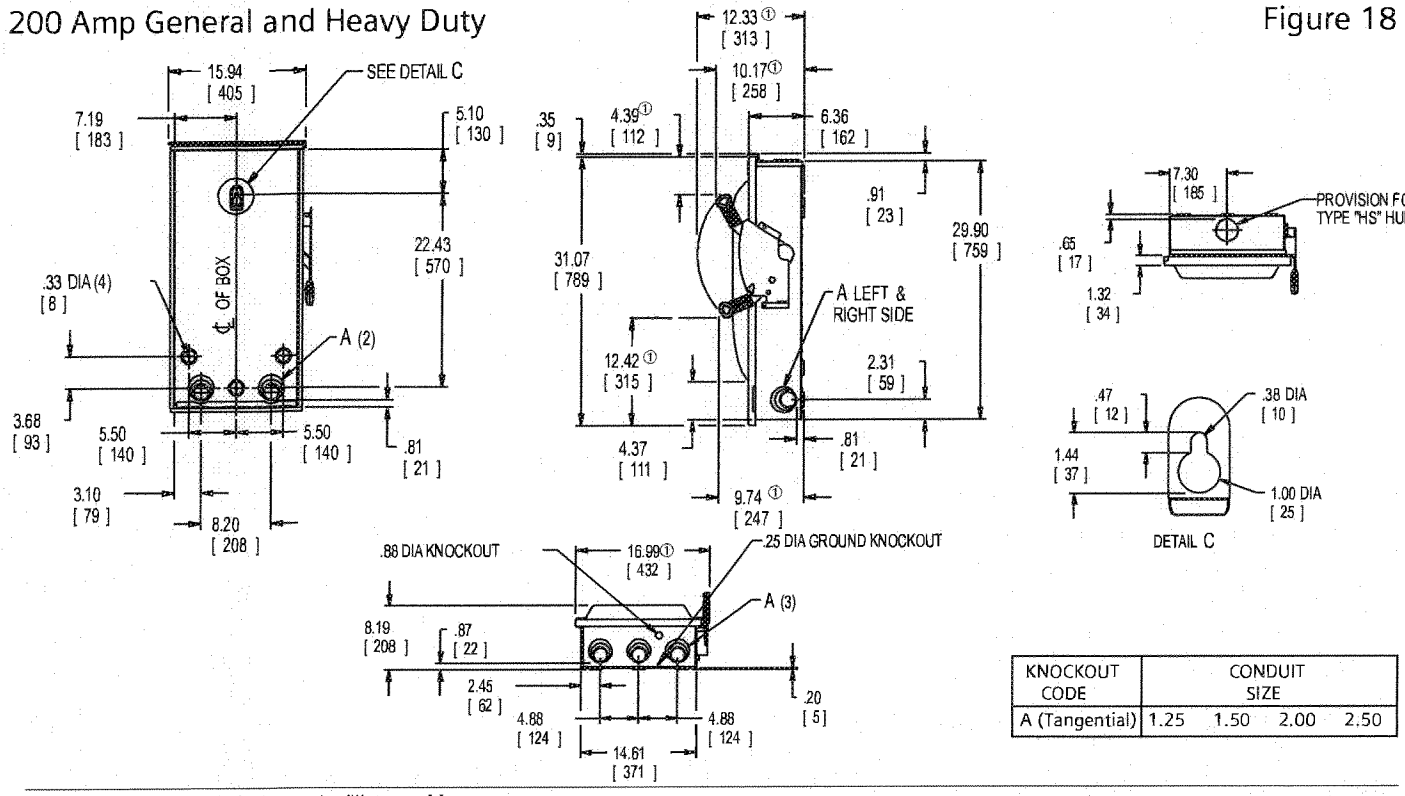
Figure 17



KNOCKOUT CODE	CONDUIT SIZE			
A (Tangential)	.75	1.00	1.25	1.50
B (Tangential)	1.00	1.25	1.50	2.00

200 Amp General and Heavy Duty

Figure 18



KNOCKOUT CODE	CONDUIT SIZE			
A (Tangential)	1.25	1.50	2.00	2.50

Dimensions shown in inches and millimeters [ ].
Dimensions shown accurate to ± 1/8 inch.
① Dimensions shown apply to heavy duty switches only.

Fuse Application and Selection Data
Siemens Type VBII Safety Switch

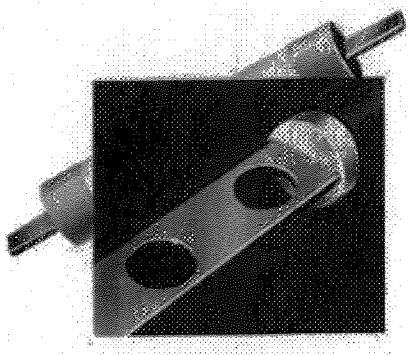
Siemens enclosed safety switches are designed for fuse versatility. Although Siemens is not a manufacturer of fuses, once the type of fuse needed for a particular application is determined, it's easy to select an appropriate switch.

The proper fuse type for the application is selected using the following parameters:

- Voltage requirements
- Conductor ampacity
- Horsepower requirements
- Maximum available RMS fault-current
- UL fuse class when specified

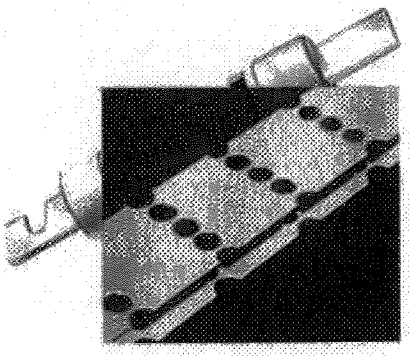
The compatible fusible safety switch is selected following these parameters:

- System voltage requirements
- Fuse amp ratings
- Available fault current
- UL fuse class
- Environmental conditions
- Number of poles required



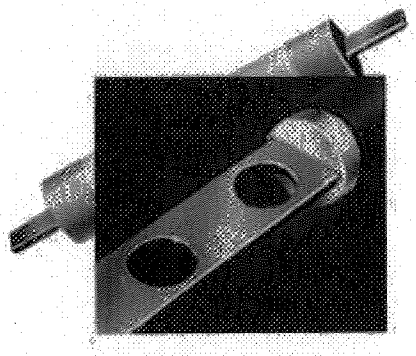
One-Time Fuses
One-time fuses are standard for use in situations calling for 1200 amperes or less with maximum voltages for 250 or 600 volts. Specially designed, current-carrying links are connected to contact pieces at the ends of the enclosure. When an overload occurs, the circuit quickly opens and the arc is quenched by granular insulating material that surrounds the current carrying links.

Available in all classes.



Current Limiting Fuses
This design offers the highest degree of circuit protection among fuses. Inside, usually copper or silver alloy links are embedded in pure quartz sand between heavy copper end blocks. The special design is fast-acting and interrupts during the first half-cycle of a fault. This causes a limitation of both fault-peak current and let-through current.

Available in Classes J, L, R and T.



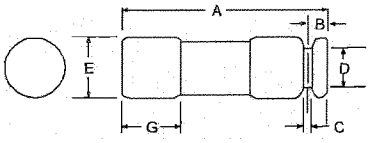
Dual-element Time-delay Fuses
Dual-element fuses may have time-delay designation since these fuses employ two distinctly separate types of elements. One provides overload protection with time delay. (UL states that time delay means having a 10-second operating delay at 500 percent of fuse label rating.) The second provides short circuit protection similar to a single-element fuse. Dual-element fuses are most frequently used on motor loads.

Fuse Applications and Dimensions
Siemens Type VBII Safety Switch

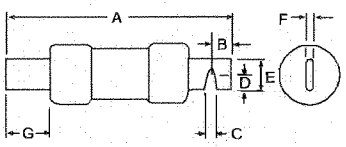
Class R and H Fuses

Class R Application: Over-current and short-circuit protection of motors and transformers, service entrance equipment, feeder and branch circuits. (General Purpose Protection)

Class R Rejection: A UL Class R fuse kit is required that rejects lower-rated fuses (H and K).



Ferrule Type 0-60A



Blade Type 61-600A

Class H Fuse Dimensions

	250 Volts							600 Volts						
Ampere Rating	A	B	C	D	E	F	G	A	B	C	D	E	F	G
0-30	2	—	—	—	9/16	—	1/2	5	—	—	—	13/16	—	17/32
35-60	3	—	—	—	13/16	—	21/32	5 1/2	—	—	—	1 1/16	—	21/32
65-100	5 7/8	—	—	—	3/4	1/8	1	7 7/8	—	—	—	3/4	1/8	1
110-200	7 1/8	—	—	—	1 1/8	3/16	1 3/8	9 5/8	—	—	—	1/8	3/16	1 3/8
225-400	8 5/8	—	—	—	1 5/8	1/4	1 7/8	11 5/8	—	—	—	1 5/8	1/4	1 7/8
450-600	10 3/8	—	—	—	2	1/4	2 1/4	13 3/8	—	—	—	2	1/42	1/4

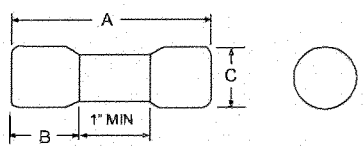
Class R Fuse Dimensions

	250 Volts							600 Volts						
Ampere Rating	A	B	C	D	E	F	G	A	B	C	D	E	F	G
0-30	2	5/32	5/64	3/8	9/16	—	1/2	5	3/16	3/32	5/8	13/16	—	17/32
35-60	3	3/16	3/32	5/8	13/16	—	21/32	5 1/2	1/4	3/32	7/8	1 1/16	—	21/32
61-100	5 7/8	1/2	9/32	23/64	3/4	1/8	1	7 7/8	1/2	9/32	23/64	3/4	1/8	1
101/200	7 1/8	11/16	9/32	35/64	1 1/8	3/16	1 3/8	9 5/8	11/16	9/32	35/64	1 1/8	3/16	1 3/8
201-400	8 5/8	15/16	13/32	51/64	1 5/8	1/4	1 7/8	11 5/8	15/16	13/32	51/64	1 5/8	1/4	1 7/8
401-600	10 3/8	1 1/8	13/32	63/64	2	1/4	2 1/4	13 3/8	1 1/8	17/32	53/64	2	1/4	2 1/4

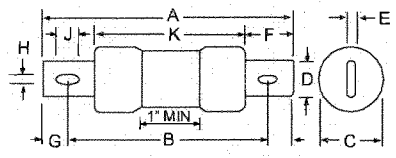
Class J

Application: Current limiting protection to a wide variety of applications, Panelboards, Switchboards, Busway and Feeder Circuits.

Rejection: Its unique dimensions prevent the substitution of another fuse.



Class J Ferrule Type 0-60A



Class J Blade Type 61-600A

Class J Fuse Dimensions

Ampere Rating	A	B	C	D	E	F	G	H	J	K
0-30	2 1/4	1/2	13/16	–	–	–	–	–	–	–
31-60	2 3/8	5/8	1 1/16	–	–	–	–	–	–	–
61-100	4 5/8	3 5/8	1 1/8	3/4	1/8	1	1/2	9/32	3/8	2 5/8
101-200	5 3/4	4 3/8	1 5/8	1 1/8	3/16	13/8	11/16	9/32	3/8	3
201-400	7 1/8	5 1/4	2 1/8	1 5/8	1/4	17/8	15/16	13/32	17/32	3 3/8
401-600	8	6	2 5/8	2	3/8	21/8	1	17/32	11/16	3 3/4

Class L

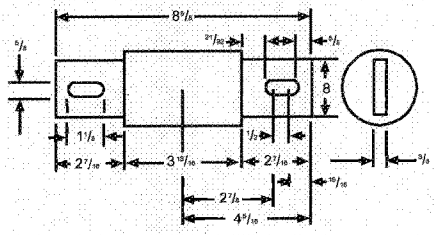
Application: Current limiting protection for service entrance equipment, feeder circuits and metering centers.

Rejection: Its unique dimensions prevent the substitution of another fuse.

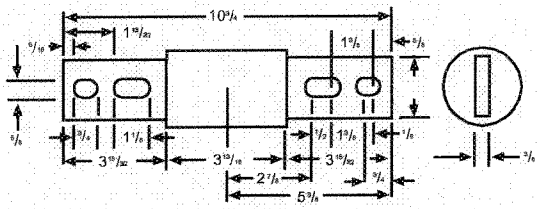
Class T

Application: It combines two highly desirable features—a high degree of current limition and a small physical size. Panelboards, Switchboards and Metering Center.

Rejection: Its unique dimension prevents the substitution of another fuse



Class L Blade Type 601-800A



Class L Blade Type 801-1200A

Fuse Ratings

Class	Amperes	Volts	Dimensions	Int. Ratings	I2t, Ip	Circuits
H	1-600A	250 and 600V or less AC	NEC standards	10,000A –	Less than 10,000A available	General purpose circuits
K5*	1-600A	250 and 600V or less AC	Class H without rejection	100,000A	I^2t - RK5 up to 100A I_p - RK5 up to 100A	Feeder circuits
J	1-600A	600V or less	Diff. from Class H	200,000A	I^2t - Low I_p - Low	Main & feeder circuits
RK1	1/10-600A	600V or less 250V or less	Class H with rejection feature	200,000A	I^2t - Slightly>J I_p - Slightly>J	Main & feeder circuits(motor load small percent)
RK5 (time delay)	1/10-600A	600V or less 250V or less	Class H with rejection feature	200,000A	I^2t - >RK-1 I_p - RK-1	Motor starting currents
T	1-1200A	300V AC	Diff. from Class H	200,000A	I^2t - <J I_p - <J	Main & feeder circuits
T	1-800A	600V AC	Diff. from Class H	200,000A	I^2t - =J I_p - =J	Main & feeder circuits
L	601-6000A	600V or less	Bolt type	200,000A	I^2t - Low I_p - Low	Main & feeder circuits

* Class K5 fuses do not prohibit the use of Class H type fuses in a switch.

Ratings and Test Requirements
Siemens Type VBII Safety Switch

Enclosed Switch Load Ratings
The primary functions of a fusible enclosed switch are to carry current continuously, to provide over current and short-circuit protection, to be capable of disconnecting the circuit, and to provide means for mounting fuses. Safety switches may also have other capabilities covered by load break ratings (in contrast with no-load disconnect switches), such as standard and maximum horsepower ratings and the ability to withstand the maximum I2t energy let-throughs of fuses.

All Siemens safety switches are capable of continuously carrying their full-rated nameplate current at rated voltage. This capability is directly attainable in no-fuse switches and in fusible switches when the fuses are replaced with copper bars, without exceeding permissible temperature rise.

Fuses are capable of carrying their rated current in open air. Under this condition the fuses will not open and will not exceed permissible temperature rise. When fuses are used in a switch or other enclosure, a higher ambient temperature is caused by the switch heat and fuse-generated heat. Since fuses are thermal acting by design, they will not carry full current rating at higher ambient temperatures.

To assist users of fusible equipment, UL requires each fusible switch to carry the statement "Continuous load current not to exceed 80% of the rating of the fuses employed." Good electrical practice may require even further de-ratings depending on the type of fuse, load, altitude and ambient temperature of the switch location.

Load Break Ratings
All Siemens safety switches are load break rated. The load break rating is assigned by UL after the switching unit has successfully performed the following tests for general use enclosed switches:

Load Break Ratings

Switch Ampere Rating	Number of ON-OFF Operations per Minute	Number of Operations		
		With Current	Without Current	Total
30-100	6	6000	4000	10000
200	5	6000	2000	8000
400	4	1000	5000	6000
600	3	1000	4000	5000
800	2	500	3000	3500
1200	1	500	2000	2500

12X Current Rating
In addition to the required UL overload testing, all Siemens VBII Safety Switches have been tested at twelve times rated current at 600V AC to assure compliance to automotive and other heavy industry requirements.

Horsepower Ratings
All Siemens safety switches, where appropriate, are horsepower rated. The assignment of such ratings is made by UL only after the switching unit has undergone tests to determine its acceptability. In addition, the unit must successfully perform on an overload test series which includes repeated interruption of the locked rotor current of the motor for which it is to be rated as follows:

Horsepower Ratings

Max HP Rating	Number of ON/OFF Ops per Minute	Number of Cycles of Operation
100	6	50
500	1	10

Most switches have two or more ratings for a particular voltage and current. Siemens safety switches are UL listed for design E horsepower ratings. With Siemens safety switches no de-rating is required in most cases. Depending on the switch and its application, various ratings have been achieved. All Siemens switches include a complete list of the ratings on the inside of the cover.

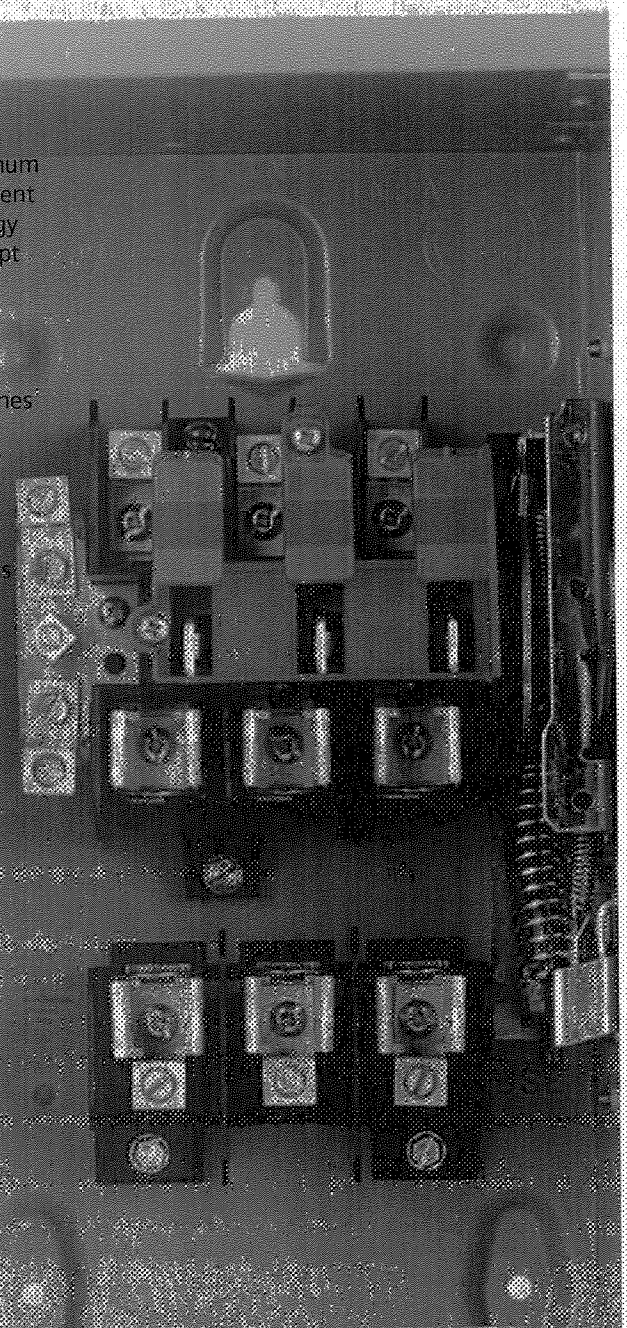
Horsepower Rating Charts
The number and variety of horsepower ratings that can be applied to a switching unit makes it impractical, in most instances, to list all such ratings on the front of the unit. Siemens does, however, provide this data by means of a chart on the inside cover.

Horsepower Rating Range
UL test procedure include ratings up to 500 HP. Siemens safety switch units in appropriate sizes have successfully passed the locked rotor current interrupting test series for ratings through 500 horsepower at both 480 and 600 volts AC and through 50 horsepower at 600 volts DC.

Maximum Horsepower Ratings
The maximum horsepower rating is based upon the largest rating of a time delay fuse: 1) which can be incorporated in the switch and 2) which will permit the motor to be started. Since the fuse has extra time delay, it can hold the starting current of a larger motor longer than a standard fuse.

Standard Horsepower Rating
This rating is assigned to a switch after it has successfully completed the locked rotor test series, on the basis of the largest standard fuse rating: 1) which can be incorporated in the switch and 2) which will permit the motor to be started. The standard fuse does not have a designed time delay to allow for motor starting currents.

Siemens Type VBII Safety Switch



Multiple-Voltage Horsepower Ratings
A switch may have additional standard and maximum horse-power ratings for different voltages. A switch that is horsepower rated at 240V AC or 250V DC may also have horsepower ratings for motors on 120V AC or 125V DC circuits.

Multipole Horsepower Ratings
A switch may have horsepower ratings applicable to the same current and voltage ratings but with fewer poles if the switch is investigated and found suitable for the assigned rating.

Short-circuit Withstandability
UL test procedures for switches and fuses have been expanded to provide realistic standards of performance with respect to clearing high-level fault currents.

These revised standards deal with the control of destructive energy in the shorted circuit. Two types of potential damage are characteristic of high-level short-circuits: mechanical and thermal. Mechanical damage is caused by the electromagnetic force surrounding conductors; thermal damage is the result of excessive current during the fault-clearing time.

The UL fuse standard defines maximum instantaneous peak let-through current (Ip) and maximum destructive energy let-through (I^2t) for each fuse (except Class H). Applications of fuses and safety switches on systems having more than 10,000A are available. Short circuits require selections of the proper UL-listed fuses and switches capable of withstanding I^2t let-throughs. See chart below for withstand ratings on Siemens switches.

I^2t Rated
Suitability tests for service with Class H, R, J, L and T fuses have been conducted. Representative switches with test fuses connected in series with each switch were subjected to I^2t let-through values in excess of the capacities of the largest fuses acceptable by the switches.

To pass the test, the switch must remain operable after being closed into a high-amp available short-circuit current. The test fuse is sized so that higher levels of let-through current and energy will be reached than would ever occur during normal usage in the field. See the chart below for I^2t ratings on Siemens switches.

Short-circuit Withstand Ratings

Fuse Rating	Fuse Class	Short Circuit Rating (RMS Symmetrical Amperes)	
		General Duty	Heavy Duty
Fusible	Plug	10,000	–
	H or circuit breaker	10,000	10,000
	K	10,000	10,000
	J	100,000	200,000
	R	100,000	200,000
	T	100,000	200,000
	L	—	200,000
Non-Fusible ①	H or circuit breaker	10,000	10,000
	K	10,000	10,000
	J	100,000	200,000②
	R	100,000	200,000②
	L	—	200,000

I^2t and I_p Ratings

Switch Rating Ampere	I^2t Rating (Amp2 x sec.)	Ip Rating (Amps)
30	50,000	14,000
60	200,000	26,000
100	500,000	32,000
200	2,000,000	50,000
400	6,000,000	75,000
600	12,000,000	100,000
800	10,000,000	80,000
1200	15,000,000	120,000

① With fuses or circuit breaker in series with switch. Fuse or circuit breaker ampere rating cannot exceed switch ampere rating.
② 60A compact switches are rated 100,000 with 60A max.
Class J or R fuses in series with switch.

Siemens Type VBII Safety Switch

Suggested Specifications

A. GENERAL

1. TYPE

1.1. Switches shall be furnished as shown on the drawings and shall be of the type described and specified herein.

2. STANDARDS
Switches shall comply with the following standards:

2.1 UL 98—Enclosed and Dead Front Switches

2.2 NEMA KS 1—Enclosed Switches

3. SUBMITTAL

3.1 Provide outline drawings with dimensions, conduit entry / exit locations, cable terminal sizes and equipment ratings for voltage, amperage, horsepower and short-circuit. They also must include replacement parts and accessories

B. PRODUCT REQUIREMENTS

1. Switch Mechanism/Handle

1.1 Switch operating mechanism shall be nonteasible, positive, quick-make, quick-break such that during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.

1.2 The operating handle shall be an integral part of the box and not of the cover.

1.3 The handle position, combined with large ON and OFF lettering on the nameplate, shall clearly indicate the switch position.

1.4 The operating handle must be made of steel, with no plastic parts other than the handle grip.

1.5 The operating handle shall be provided with a highly visible red plastic grip and must allow for hook stick operation.

1.6 The operating mechanism must be made of steel, with no plastic parts.

1.7 All Heavy Duty switches (Type 1, 3R, 4/4X stainless steel, 4X non-metallic, 12) shall have a dual-cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

1.8 30-200A 4X stainless steel switches shall have stainless steel interior parts as standard.

1.9 All switches shall have provisions to accept up to three 5/16 inches hasp padlocks to lock the operating handle in the OFF position.

2. SWITCH INTERIOR

2.1 All switches shall have switch blades that are visible when the switch is OFF and the cover is open. (Type 1, 3R, 4/4X stainless steel, 4X non-metallic, 12).

2.2 Lugs shall be front removable and UL-listed for 60°C or 75°C conductors (30-100A), 75°C conductors (200-1200A) aluminum or copper conductors. Except for 30A General Duty line and load lugs shall be removable with no need to remove line shields and arc suppressors.

2.3 30-100A Heavy Duty switches shall be capable of accepting field installed fuse puller kits.

2.4 Optional copper body and crimp type lugs are to be UL approved for field installation in Heavy Duty 30-1200A ratings.

2.5 Heavy Duty Switches all shall have all-copper current carrying parts other than standard aluminum alloy lugs.

2.6 All current-carrying parts shall be plated to resist corrosion.

2.7 Heavy Duty switches shall have provisions for field installable auxiliary switches. There also must be low current PLC type auxiliary interlock available for 30-200A switches.

2.8 All Heavy Duty switches shall have spring reinforced fuse clips.

Siemens Type VBII Safety Switch

Suggested Specifications Continued

3. SWITCH ENCLOSURES

3.1 Switch covers shall be attached with pin-type hinges. Except for outdoor General Duty 30A switches, top-hinged doors are not acceptable.

3.2 Enclosures for Type 3R switches through 200A shall have provisions for interchangeable bolt-on hubs in the top endwall. Hubs shall be Siemens Type HS or HA hubs sized as indicated on the plans.

3.3 Switches shall have wire-bending space and lug capacity for one size larger Al/Cu wire than NEC and UL minimum requirements.

3.4 The enclosure shall be finished with [gray baked polyester paint which is electrodeposited on cleaned, phosphate pre-treated steel (Type 1)], [gray baked polyester paint which is electrodeposited on cleaned, phosphate pre-treated galvanized steel (Type 3R & 12)], [a brush finish on type 304 stainless steel (Type 4/4X stainless steel)].

3.5 All Heavy Duty switch enclosures shall have a formed front flange to provide additional strength and rigidity.

3.6 Tangential knockouts shall be provided for switches rated 30-600A in Type 1 and 3R enclosures where permitted.

3.7 Cover latching means for Type 4/4X & 12 rated through 1200A shall be quick-release, lift-lever type.

3.8 Type 12 enclosures shall be dual rated as Type 3S to allow their use in outdoor applications.

3.9 Cover viewing window shall be an available option on 30-400A NEMA 12 and 4/4X stainless steel switches. The window must allow viewing of both visible blades when the switch is OFF and viewing of indicating fuses in 30-200A ratings.

3.10 All Heavy Duty switches shall have metal nameplates, except for non-metallic switches, which must have plastic nameplates.

4. SWITCH RATINGS

4.1 All switches shall be UL-listed.

4.2 30-200A Heavy Duty switches shall also be horsepower rated for AC and/or DC as indicated on the plans.

4.3 Switches shall be horsepower rated for design E motors on internal labeling.

4.4 The Heavy Duty switch UL-listed short-circuit current rating shall be: [10,000 RMS symmetrical amperes when used with orprotected by Class H or K fuses (30-600 amperes)] [200,000 RMS symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes)]. [200,000 RMS symmetrical amperes when used with or protected by Class L fuses (800-1200 amperes)].

4.5 All switches intended for service entrance shall be UL approved for this application.

4.6 All Heavy Duty switches shall be I2t rated.

C. APPROVED MANUFACTURERS

1.1 Switches shall be manufactured by Siemens (no equal) or approved equal.

Type VBII Safety Switch Catalog Numbering System

H	F	3	6	4	N	R	CU

Switch Type

L	= General Duty 10k AIC Max. (Plug Fused & 60A Max Non-Fused)
G	= General Duty
H	= Heavy Duty
DT	= Double Throw
DTG	= General Duty DT

Fused or Non-Fused

F	= Fused
NF	= Non-Fused

Number of Poles

1	= 1
2	= 2
3	= 3
4	= 4
6	= 6

Voltage

1	= 120V or 120/240V
2	= 240V
6	= 600V

Special Applications With:

CH	= Crouse Hines Receptacle
CJ	= Factory J Fuse Spacings
CR	= Class R Clips Installed
CU	= Factory Installed Copper Wire Grips
G	= Factory Installed Ground Bar
H	= Height or Size Reduced
L	= Oversized Enclosure
PN	= Pyle National Receptacle
W	= Viewing Window

Enclosure Type

Omit	= Type 1, Indoor
R	= Type 3R, Outdoor
S	= Type 4/4X, Stainless Steel
J	= Type 12, Industrial
X	= Type 4/4X, Non-metallic
XL	= Type 4/4X, Non-metallic less lugs

With or Without Neutral

Omit	= Less Neutral
N	= With Neutral

Amperes

1 = 30A	5 = 400A
2 = 60A	6 = 600A
3 = 100A	7 = 800A
4 = 200A	8 = 1200A

Accessories Catalog Numbering System

H	N	6	4

Switch Type

H	= Heavy Duty
G	= General Duty

Accessory Type

A1	= Auxiliary Switch 1/NO & 1/NC	LC	= Copper Lug Kit
A2	= Auxiliary Switch 2/NO & 2/NC	N	= Neutral
A3	= Auxiliary Switch Low Current	N2	= 200% Neutral
CL	= Compression Lug Barrier/ Mounting Kit	P	= Fuse Puller Kit
		R	= Class R - Fuse Clip Kit
G	= Ground Lug Kit	T	= Class T - Fuse Kit
G2	= Insulated Ground Lug Kit		

Amperes

1	= 30A	4	= 200A
2	= 60A	5	= 400A
12	= 30/60A	56	= 400/600A
3	= 100A	5678	= 400/600/800/1200A
23	= 60/100A		
123	= 30/60/100A	6	= 600A
1234	= 30/60/100/200A	78	= 800/1200A

Maximum Voltage

2	= 240V Max
6	= 600V Max

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info.sea@siemens.com

www.sea.siemens.com/power

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Power Supplies

Power Supplies

The CLICK PLC family offers two 24 VDC power supplies. They are identical except for the output current.

It is not mandatory to use one of these CLICK power supplies for the CLICK PLC system. You can use any other 24 VDC power supply that Automationdirect.com offers, including the PSP24-DC12-1 12 VDC to 24 VDC converter shown below.

C0-00AC Power Supply

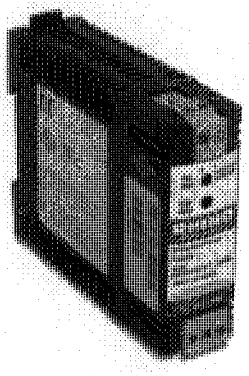
Limited auxiliary AC power supply allows you to power the 24 VDC CLICK C0 series CPUs with 100-240 VAC supply power. The 0.5A DC power supply is capable of controlling the CPU plus a limited configuration based on the power budget of each I/O module. The C0-00AC is a low-cost solution for applications requiring only minimal I/O and power consumption. This power supply will not support a fully-populated CLICK PLC system with all possible I/O module combinations.

C0-01AC Power Supply

Expanded auxiliary AC power supply allows you to power the 24 VDC CLICK C0 series CPUs with 100-240 VAC supply power. The 1.3A DC power supply is capable of supporting a fully-populated CLICK PLC system with all possible I/O module combinations, with no concerns for exceeding the power budget.

PSP24-DC12-1 DC-DC Converter

With this DC-DC converter you can operate the CLICK PLC with 12 VDC input power.



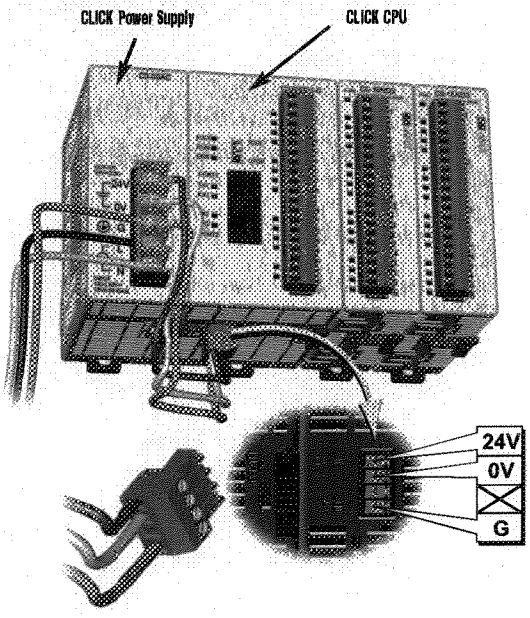
PSP24-DC12-1

CLICK 24 VDC Power Supply Ratings	
Part Number	Output Current
C0-00AC	0.5 A
C0-01AC	1.3 A

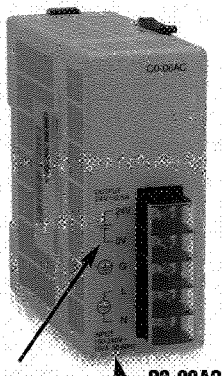
C0-00AC Power Supply Specifications	
Input Voltage Range	85-264 VAC
Input Frequency	47-63 Hz.
Input Current (typical)	0.3 A @ 100 VAC, 0.2 A @ 200 VAC
Inrush Current	30 A
Output Voltage Range	23-25 VDC
Output Current	0.5 A
Over Current Protection	@ 0.65 A (automatic recovery)
Weight	5.3 oz (150g)

C0-01AC Power Supply Specifications	
Input Voltage Range	85-264 VAC
Input Frequency	47-63 Hz.
Input Current (typical)	0.9 A @ 100 VAC, 0.6 A @ 200 VAC
Inrush Current	30 A
Output Voltage Range	23-25 VDC
Output Current	1.3 A
Over Current Protection	@ 1.6 A (automatic recovery)
Weight	6.0 oz (170g)

PSP24-DC12-1 DC-DC Converter Specifications	
Input Voltage Range	9.5-18 VDC
Input Power (no load)	1.0 W max.
Startup Voltage	8.4 VDC
Undervoltage Shutdown	7.6 VDC
Output Voltage Range	24-28 VDC (adjustable)
Output Current	1.0 A
Short Circuit Protection	Current limited at 110% typical
Weight	7.5. oz (213g)



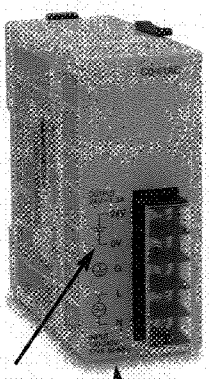
24 VDC power is supplied to the CPU module through wiring connected from the power supply output to the 4-pin 24 VDC input connector located on the bottom of the CPU module.



C0-00AC

24 VDC Output Power Terminals (for CLICK PLC, I/O or field device, etc.)

85-264 VAC Power Source Input Terminals



C0-01AC

24 VDC Output Power Terminals (for CLICK PLC, I/O or field device, etc.)

85-264 VAC Power Source Input Terminals

Power Budgeting

Power Budgeting

There are two areas to be considered when determining the power required to operate a CLICK PLC system. The first area is the power required by the CLICK CPU, along with the internal logic side power that the CPU provides to its own I/O and any connected I/O modules that are powered through the CPU's expansion port; plus any device, such as a C-more Micro-Graphic panel, that is powered through one of the CPU's communication ports.

The second area is the power required by all externally connected I/O devices. This should be viewed as the field side power required. The field side power is dependent on the voltage used for a particular input or output device as it relates to the wired I/O point, and the calculated load rating of the connected device.

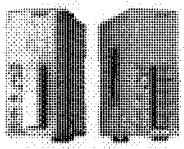
It is strongly recommended that the power source for the logic side be separate from the power source for the field side to help eliminate possible electrical noise.

Power budgeting requires the calculation of the total current that the 24 VDC power source needs to provide to CLICK's logic side, and also a separate calculation of the total current required for all devices operating from the field side of the PLC system.

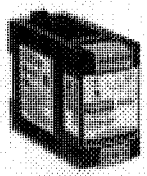
See the Power Budgeting Example shown to the right. The table shows current requirements for a CLICK CPU, two I/O modules, and a C-more Micro. Use the total amperage values to select a proper sized power supply.

Power Budgeting Using the CLICK Programming Software

The CLICK Programming software can also be used for power budgeting. Based on the amperage rating of the power supply selected in the first column, your power budget is calculated by subtracting each consecutive module's power consumption from the total available power budget. If you exceed the maximum allowable power consumption the power budget row is highlighted in red.



CLICK 24 VDC Power Supply
C0-00AC or C0-01AC



Other 24 VDC Power Supply
Example: PSP24-60S

CPU Current Consumption (mA)

Part Number	Power Budget 24 VDC (logic side)	External 24 VDC (field side)
Basic CPU Modules		
C0-00DD1-D	120	60
C0-00DD2-D	120	0
C0-00DR-D	120	0
C0-00AR-D	120	0
Standard CPU Modules		
C0-01DD1-D	140	60
C0-01DD2-D	140	0
C0-01DR-D	140	0
C0-01AR-D	140	0
Analog CPU Modules		
C0-02DD1-D	140	60
C0-02DD2-D	140	0
C0-02DR-D	140	0

I/O Module Current Consumption (mA)

Part Number	Power Budget 24 VDC (logic side)	External 24 VDC (field side)
Discrete Input Modules		
C0-08ND3	30	0
C0-08ND3-1	30	0
C0-16ND3	40	0
C0-08NE3	30	0
C0-16NE3	40	0
C0-08NA	30	0
Discrete Output Modules		
C0-08TD1	50	15
C0-08TD2	50	0
C0-16TD1	80	100
C0-16TD2	80	0
C0-08TA	80	0
C0-04TRS	100	0
C0-08TR	100	0

I/O Module Current Consumption (continued) (mA)

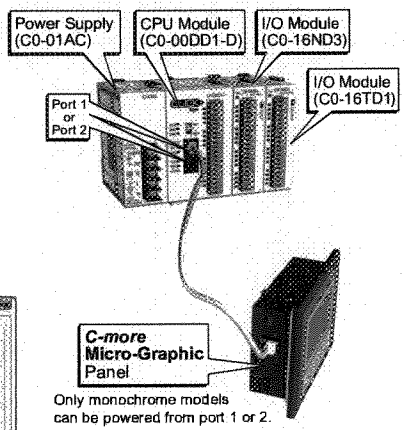
Part Number	Power Budget 24 VDC (logic side)	External 24 VDC (field side)
Discrete Combo I/O Modules		
C0-16CDD1	80	50
C0-16CDD2	80	0
C0-08CDR	80	0
Analog Input Modules		
C0-04AD-1	20	65
C0-04AD-2	23	65
C0-04RTD	25	0
C0-04THM	25	0
Analog Output Modules		
C0-04DA-1	20	145
C0-04DA-2	20	85
Analog Combo I/O Modules		
C0-4AD2DA-1	25	75
C0-4AD2DA-2	20	65
C-more Micro-Graphic Panel		
Monochrome only	90	0

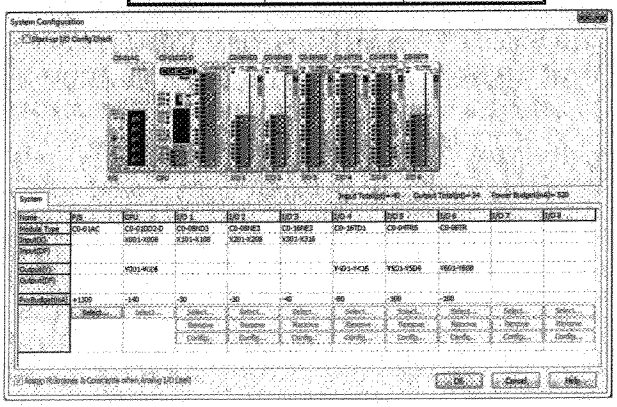
Power Budgeting Example

Current Consumption (mA) Example

Part Number	Power Budget 24 VDC (logic side)	External 24 VDC (field side)
C0-00DD1-D	120	60
C0-16ND3	40	0
C0-16TD1	80	100
C-more Micro	90	0
Total:	330	160 *

* Plus calculated load of connected I/O devices.





CAUTION: The 45PHL series pressure switch-gauges are suitable for use in Class I, Division 1 and 2, Groups C and D hazardous locations when installed in accordance with these instructions.

WARNING: DEVIATION FROM THESE INSTALLATION INSTRUCTIONS MAY LEAD TO IMPROPER DEVICE OPERATION WHICH COULD CAUSE PERSONAL INJURY TO OPERATORS OR OTHER NEARBY PERSONNEL.

1.0 DESCRIPTION

1.1 The Altronic 45PHL series pressure switch-gauge is a mechanical pressure gauge in a 4-1/2" (114mm) case with high/low switch contacts. Utilizing a "direct drive" movement, the conventional C-bourdon tube used in most other pressure gauges is eliminated as are the gears, links, levers and springs used to connect the C-tube to the indicating pointer. In contrast, the 45PHL series uses a special helically-wound coil of Inconel metal, directly connected to the indicating pointer. Fewer parts means fewer problems. Regular recalibration is eliminated because there are no complex, wear-prone parts. Linearity is built-in; no span adjustment is needed. The zero adjustment is accessible from the front of the gauge. The "direct drive" design provides for longer life than even liquid-filled conventional gauges in severe service applications. Accuracy is +/-1% of span across the scale.

1.2 The pressure connection fitting is user adaptable on most models for either a bottom or a back connection - see paragraph 2.2 and figure 2 for details. The fittings are 1/4" NPT male up to 1000 psi and 1/2" male for 1500 psi and above. The gauge has a removable flange which can be used to front mount or back mount the gauge. The gauge can also be direct mounted.

1.3 The two adjustable high/low limit contacts can be used to activate alarms or shutdowns. The high/low adjustment knobs are color-coded (Red for Low, Black for High) and match the switch connection wires.

1.4 The basic design is inherently safe due to the very small tube I.D. The small diameter of the spiral tube effectively limits the flow rate of pressure media into the case. Polycarbonate plastic is used for the front lens and a rubber blow out plug is used in the rear wall of the case.

1.5 Corrosion resistant materials are used throughout making them applicable for most process applications. The case is ABS plastic, with a polycarbonate lens. The helical tube is Inconel, the pressure connection stem is 316 stainless steel, and all hardware is stainless steel.

1.6 The features of the 45PHL series pressure switch-gauges make them ideal for gas compressor and other high pulsation/high vibration use, offering longer life in tough applications. The 4-1/2" round, weather-resistant case fits an industry standard panel cutout allowing easy replacement of OPLFC gauges.

2.0 MOUNTING

2.1 Mount the switch-gauge vertically inside a control panel or to a suitable flat surface so that the dial is at a convenient viewing height. A drilling template is provided. Mount the gauge with the hardware enclosed. Make sure that the case is not distorted. Distortion of the plastic case may cause the internal assemblies to bind.

NOTE: Factory calibration is performed with the gauge dial mounted in a vertical position. If the gauge is to be used in some other position, the factory calibration should be verified in this position.

CAUTION: A rubber blowout plug is located in the back of the case. Do not mount the gauge with the blowout plug flush against a surface. Use shock mounts on inner panel to protect the gauge from high vibration.

2.2 On most models, the pressure connection fitting can be located for either bottom or back attachment and can be changed in the field.

NOTE: See figure 2 to change the position of the pressure connection fitting.

NOTE: Do NOT attempt to change the connection fitting position on gauge models 45PHL-30, 45PHL-30V30, and 45PHL-60.

2.3 To avoid contaminating the pressure measuring system in the gauge, leave the protective cap on the connection fitting until just before the connection is made. The fittings on the gauge and on the pressure line must match. A 1/4" NPT fitting is used on 45PHL gauges with pressure ranges up to 1000 psi and a 1/2" NPT fitting is used on 1500 psi and above. A thread sealant such as Teflon tape is suggested when making the connection. Take care not to clog pressure opening. Make sure the sealant used is compatible with the pressure media. Use proper wrenches to tighten or loosen connection. DO NOT use the gauge case as a handle for screwing the gauge into place on the pressure fitting. DO NOT over tighten the fittings since they may be damaged beyond repair. DO NOT exceed rated gauge pressure.

2.4 All Altronic 45PHL series gauges incorporate a unique needle dampening system that slows down needle bounce. However if large scale and/or high-frequency pressure fluctuations are expected in the pressure system, it may be desirable to attenuate these by use of a pulsation dampening valve. The following Altronic pulsation dampening valves are available for use with the 45PHL switch-gauges.

Stainless steel, 1/4" NPT fitting 618100-2
Steel, 1/4" NPT fitting 618100-1

2.5 As standard, all Altronic 45PHL series gauges are equipped with a particulate filter installed in the fitting connection of the gauge to prevent most particulate matter from plugging the spiral tube.

3.0 WIRING

3.1 A pressure condition at or under the low setpoint causes a switch closure on the red wire (low) and white wire (common). A pressure condition at or above the high setpoint causes a switch closure on the black wire (high) and white wire (common). Note the white wire is common with the pressure fitting (ground).

Each switch is normally open rated at 0.25 amp @ 125 volts (AC or DC). The switch contacts are gold plated at points of contact. Use stranded copper wire, 18 to 22 AWG for switch connections. Use spade or ring terminals when connecting to terminal blocks. Use wire nuts or butt connectors for pigtail connections. Conduit is recommended to protect wires from being damaged.

Caution: Connect the switches to Altronic or other electronic annunciator systems or to C.D. ignition systems with 307-PH-CD tattletales. DO NOT use 45PHL switch-gauges with type 101-PH or 307-PH tattletales.

4.0 HAZARDOUS AREA OPERATION

4.1 The 45PHL contains two dry contacts and can be operated with suitable precautions in Class I, Groups C & D locations.

A. CLASS I, DIVISION 2, GROUPS C & D - Mount the 45PHL in a suitable enclosure and connect the switches to Altronic annunciator models DA, DD-NT, DD-NTS, or DE series systems.

B. CLASS I, DIVISION 1, GROUPS C & D (Intrinsically Safe) - Mount the 45PHL in a suitable enclosure and connect the switches to Altronic annunciator models DA or DD-NT with a division I, 690 series power supply.

5.0 OPERATION

5.1 When pressure is applied to the 45PHL gauge, the needle will travel clockwise for increasing pressure and counter-clockwise for decreasing pressure. The limit switches will be activated when the pointer comes in contact with the low or high setpoint contact arm. The force of the pointer causes the contact arm to flex or "tilt "causing a wiping action. This wiping action cleans the contacts and assures high reliability. In addition, all contact points are gold plated.

5.2 For proper operation the setpoints should be tested. Test the low setpoint by rotating the low (red) setpoint knob clockwise to meet the pointer. A low switch contact will be made. Return the low setpoint arm to the desired point below the pointer. Test the high setpoint by rotating the high (black) setpoint knob counter-clockwise to meet the pointer. A high switch contact will be made. Return the high setpoint arm to the desired point above the pointer.

5.3 Adjust the setpoints to the appropriate setting for the equipment protection. The recommended low setpoint range is from zero to mid-scale. The recommended high setpoint range is from mid-scale to 90% of full scale. NOTE: With the low setpoint switch connected to an Altronic annunciator on either a class B or class C point, there will be no need to manually override the low contact as this will be handled by the annunciator. If the low switch is connected to a tattletale system with no start-up timer, the low switch will have to be manually moved away from the pointer during a start condition. After the process pressure normalizes, the setpoint arm can be moved to the desired low setpoint position.

6.0 MAINTENANCE

6.1 The Altronic 45PHL setpoint gauge is designed to be part of a system to protect critical machinery and processes. As part of a preventative maintenance plan, these gauges should periodically be inspected and tested for proper operation. Visually check that the indicated pressure is in keeping with expected readings and that the needle is not frozen, distorted or otherwise inaccurate. Pressure fittings and tubing should be inspected to insure against leaks and blockages that could impair proper operation of the gauge. Periodically adjust the high and low knobs to cause action of the limit switches and proper alarm or shutdown action per the design of the overall safety shutdown system.

6.2 If the gauge seems to be working improperly, consider the possibilities that may be causing the difficulty. If the zero is off only slightly it may have been caused by over-pressures that were slightly more than 150% of the full scale range of the gauge. In this case, the zero may be reset by using a small screwdriver to turn the drive at the bottom of the dial face on the outside of the case which, in turn, rotates the gauge dial.

If over pressure has been applied in excess of 150% of the full scale range, it will be necessary to check the calibration of the gauge after resetting the zero. The gauge accuracy is guaranteed only when over pressures are less than 150% of the full scale range of the gauge. When checking the gauge calibration, it is necessary to use a reference pressure device with an accuracy of 0.25% or better. The calibration should be checked at 20% increments. These points should be checked while increasing the pressure from zero to the full scale reading and then again while decreasing the pressure from the full-scale reading to zero. Be sure that true zero pressure occurs in the pressure system at zero reading.

6.3 A leak may be indicated by continuously decreasing gauge readings, particularly if the pressure has been "trapped" by a valve. If this is the case, check all components in the pressure system, including the fittings and the valve, for leakage.

6.4 The gauge may be blocked and require cleaning. Contamination from the pressure media may be present. It may be necessary to remove and clean or replace the particulate filter. Certain accessory devices, such as isolators and pressure snubbers should be considered in certain applications.

6.5 It should not be necessary to open an Altronic 45PHL series gauge for adjustment, repair or other purposes. If the gauge seems to be working improperly, please follow the instructions above. If the gauge is still not working properly, return the gauge for factory service.

DIMENSIONS and SPECIFICATIONS

SPECIFICATIONS

ACCURACY
± 1% of Full Scale,
Compound Gauge 2% 20in. to 31in. Hg.

MAX. PRESSURE CAPABILITY
150% of Full Scale.
Burst Pressure: 500% of the Full Scale Pressure.

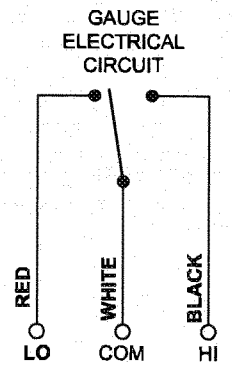
AMBIENT TEMPERATURE RANGE
-65°F to 190°F (-54°C to 88°C).

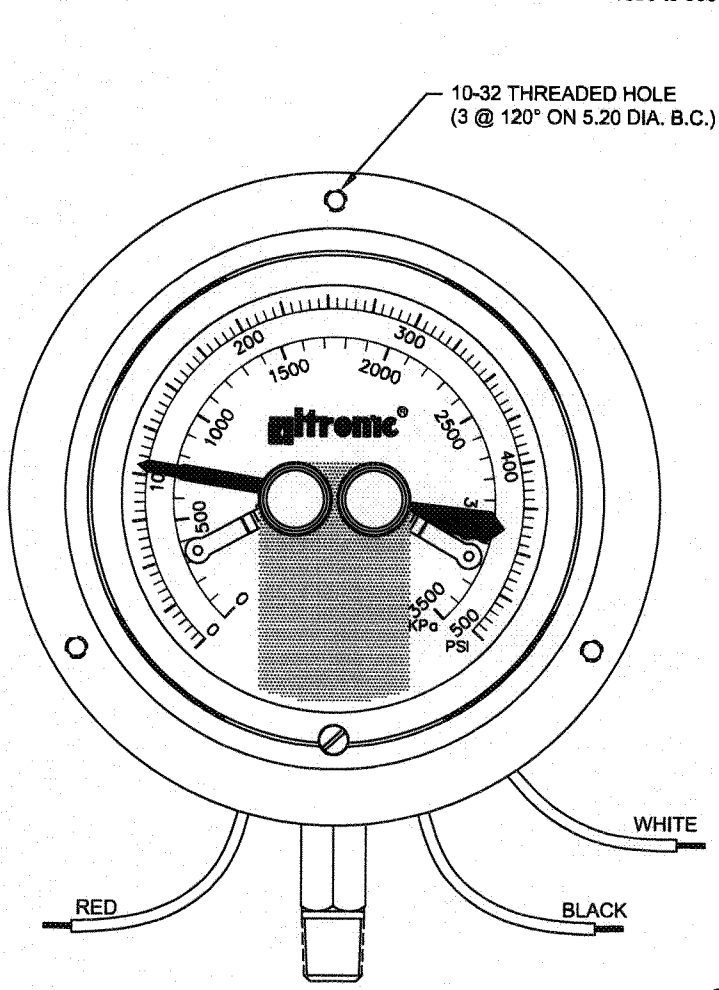
SERVICE MEDIA TEMPERATURE
-65°F to 400°F (-54°C to 204°C).

SETPOINT SWITCH RATING
125 VOLTS @ 0.25 AMPS

MATERIALS
Case - ABS Plastic, Black
Lens - Polycarbonate
Sensing Element - Inconel X-750
Capillary Tube - 316 Stainless Steel
Socket - 316 Stainless Steel
Contacts - Gold Flash

CONNECTION THREAD
0 to 1000 PSI — 1/4" NPT
1500 to 5000 PSI — 1/2" NPT





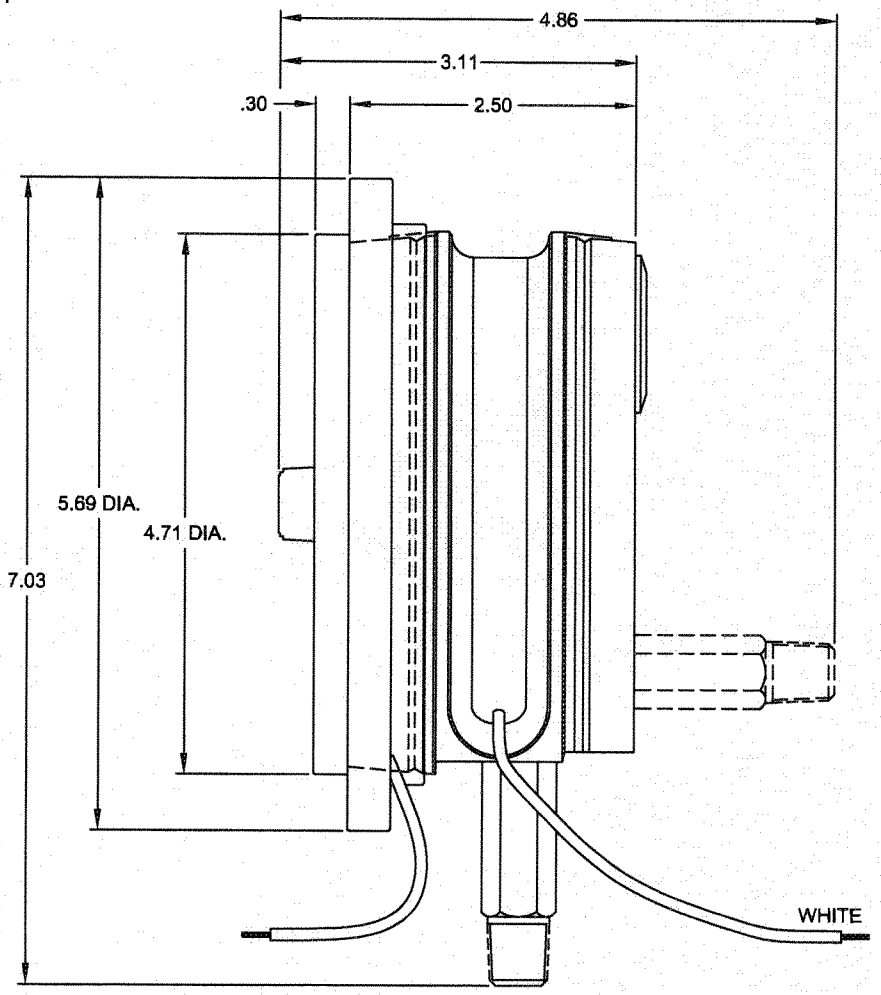
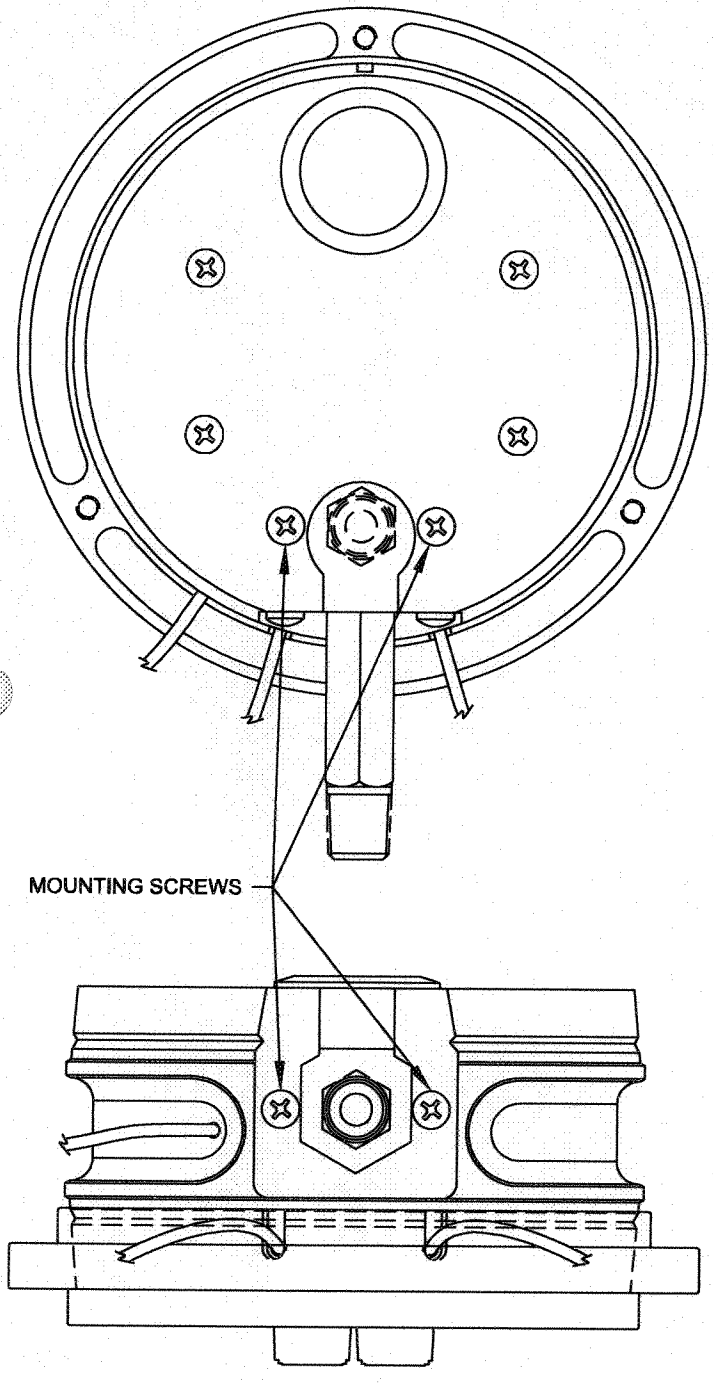
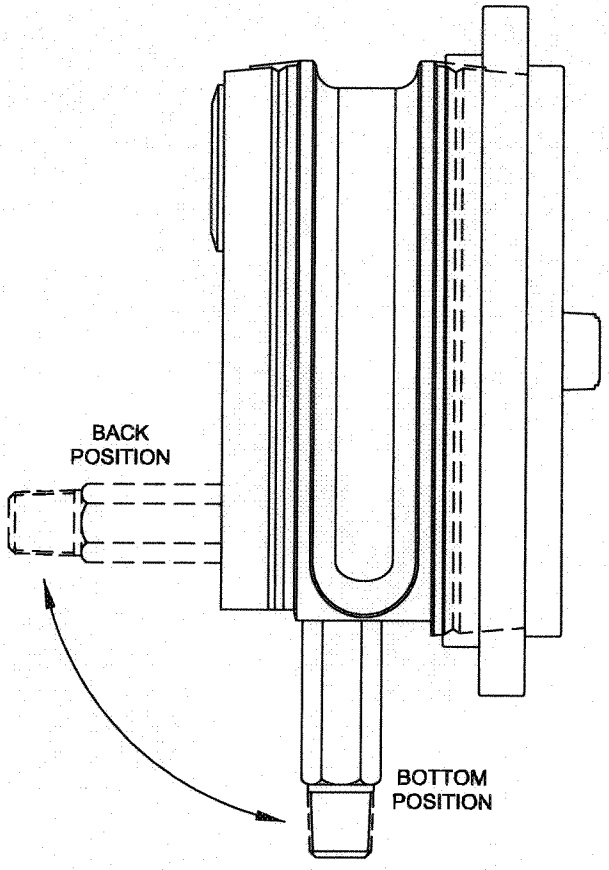


Figure 1

PRESSURE FITTING ADJUSTMENT





TO CHANGE CONNECTION FITTING POSITION:

1. Remove four screws indicated.
2. Carefully rotate fitting 90° to the new position. Take care not to push fitting into the case as this may damage the spiral bourdon tube.
3. With bracket tapped holes lined up in new position, carefully insert and partially thread into place all four attaching screws. When bracket is correctly positioned, tighten four screws.

NOTE: DO NOT attempt to change the fitting on models 45PHL-30, 45PHL-30V30 AND 45PHL-60.

Figure 2

MODEL 722 AND 732 ELECTROMECHANICAL TOTALLY SEALED HOUR METERS (CONT.)

Fig. 4

Fig. 5

Fig. 6

- Model 722 operating range: 90-240VAC 50/60Hz
- Model 732 operating range: 18-30VDC
- Totally Sealed
- UL/cUL Recognized, CE & RoHS Compliant
- 6 Figure, 99999.9

The Reding Model 722 (AC Hour Meter) no longer requires two separate meters, one for 115VAC and one for 230VAC. The Redington Model 732 (DC Hour Meter) are protected for 2x battery voltage and/or reverse polarity. A quartz time base insures accurate long-term time keeping. Models have a square front panel dimension of 1.90" [48mm x 48mm]. Three adapter panels are also available for fitting additional panel dimensions.

AC HOUR METERS

Mfg. Part No.	Fig.	Operating Voltage (VAC)	Mounting	Meter Shape	Stock No.	Price Each 1-9
722-0001	1	90-240	2-Hole Panel	Rectangular	78H0980	
722-0002	2	90-240	Flush-Panel	Rectangular	52M1956	
722-0003	3	90-240	Flush-Round	Round	97H1577	
722-0004	4	90-240	3-Hole Panel	Round	97H1578	
722-0030	5	90-264	Flush-Panel with Clip	Square	05N0105	

DC HOUR METERS

Mfg. Part No.	Fig.	Operating Voltage (VDC)	Mounting	Meter Shape	Stock No.	Price Each 1-9
732-0004	1	10-80	2-Hole Panel	Rectangular	88H4282	
732-0001	4	10-80	3-Hole Panel	Round	82H1901	
732-0013	6	10-80	Cup-Panel	Round	05N0106	

ACCESSORIES

Mfg. Part No.	Description	Stock No.	Price Each 1-24
5003-008	Sealing Gasket for 732-0013, 732-0014, 732-0023, 732-0024	05N0093	
5003-009	Sealing Gasket for 722-0002, 732-0002	05N0094	
5003-010	Sealing Gasket for 722-0001, 732-0004	05N0095	
5003-011	Sealing Gasket for 722-0004, 732-0001	66M8751	

(89-4128)

HOURMETERS

RoHS Compliant Available

REDINGTON COUNTERS INC.

711-0130

711-0113

711-0020

711-0150

711-0160

711-0190

7 digit, numerals magnified to 0.14", 2 oz., 2 watts (nominal AC), 0.4 watts (DC). Temperature range –13°F to +185°F, mounting by retaining clip or 2-screw mounting kit not included, 1.45" x .87" panel cutout. ¼" spade terminals obtainable by removing screws from clamp. All are 99,999.99 hrs. AC models UL recognized, CSA certified, CE compliant. DC models CE compliant only.

AC HOURMETERS

Mfg. Part No.	Voltage Max. (VAC)	Mount	Style	Stock No.	Price Each 1-9
711-0130	115	2-Hole	Rectangular	48M1317	
711-0131	230	2-Hole	Rectangular	48M1318	
711-0113	115	Panel	Rectangular	48M1316	

DC HOURMETERS

Mfg. Part No.	Voltage Max. (VAC)	Mount	Style	Stock No.	Price Each 1-9
731-0040	28	2-Hole	Rectangular	48M1323	

CONTINUED

HOURMETERS (CONT.)

Mfg. Part No.	Voltage Max. (VAC)	Mount	Style	Stock No.	Price Each 1-9

Flush mount, AC hourmeter, 15" leads, 2 watts (nominal), 1.98 x0.99" panel cutout. **711-0019** is 6 figures with bracket retainer for mounting. **711-0020** is 7 figures with snap-in mounting. UL recognized, CSA certified, CE compliant.

711-0020	115	Panel	Rectangular	48M1315	
711-0019	115	Panel	Rectangular	48M1314	

AC ROUND AND SQUARE HOURMETERS

7 digit, 0.14" numerals, 4 oz, 3 watts (nominal), temperature range –22°F to +158°F; panel cutout 1.99" dia. or 1.81" sq; incorporates retaining clip or 3-screw mounting kit included. ¼" spade terminals obtainable by removing screws from clamp. All are 99,999.99 hrs. UL recognized, CSA certified, CE compliant.

Mfg. Part No.	Voltage Max. (VAC)	Mount	Style	Stock No.	Price Each 1-9
711-0160	115	3-Hole	Round	48M1320	
711-0162	230	3-Hole	Round	48M1321	
711-0150	115	Panel	Round	48M1319	
711-0190	115	Panel	Square	48M1322	

(27-72)

MODEL 34 LCD COUNTERS AND HOUR METERS

NEW

RoHS Compliant Available

REDINGTON COUNTERS INC.

Two Hole Mount

Three Hole Mount

Snap-In Mount

Round Flush Mount

No-Hole Mount

Rectangular Flush Mount

- AC or DC voltage input in the same unit
- Hour Meter or Counter versions
- Front face totally sealed from moisture or dirt when used with proper gasket

The Redington Model 34 LCD provides a large, always ON display, with 0.28" [7mm] high characters, in the standard industry size housings (1.45 x 0.95" [36.8 x 24.1mm]). The hour meters and counters are available in 7 different housings. All models are totally sealed. A wide operating voltage, 10-300VDC and 20-300VAC make the Model 34 versatile for all indoor and outdoor applications. All models are NEMA 4/4X, 12, & IP66 rated when used with the optional gasket and have a polarized lens which assures high visibility in an outdoor environment.

Square Flush Mount

LCD COUNTERS

Mfg. Part No.	Mounting Type	No. of Digits	Stock No.	Price Each 1-9
3400-0000	Two Hole Mount	8	05N0078	
3400-0070	Two Hole Mount w/ Front Reset	8	41T0096	
3400-1000	Three Hole Mount	8	05N0079	
3400-1070	Three Hole Mount w/ Front Reset	8	41T0098	
3400-2000	Rectangular Flush Mount	8	05N0080	
3400-2070	Rectangular Flush Mount w/ Front Reset	8	41T0099	
3400-3000	Round Flush Mount	8	05N0081	
3400-4000	No-Hole Mount	8	05N0082	
3400-5000	Snap-In Mount	8	05N0083	
3400-7000	Square Flush Mount	8	05N0084	

LCD HOUR METERS

3410-0000	Two Hole Mount	8	05N0085	
3410-1000	Three Hole Mount	8	05N0086	
3410-1070	Three Hole Mount w/ Front Reset	8	41T0101	
3410-2000	Rectangular Flush Mount	8	05N0087	
3410-2070	Rectangular F			
3410-3000	Round Flush M			
3410-4000	No-Hole Mour			

(115440)

7

SHOP DRAWING REVIEW

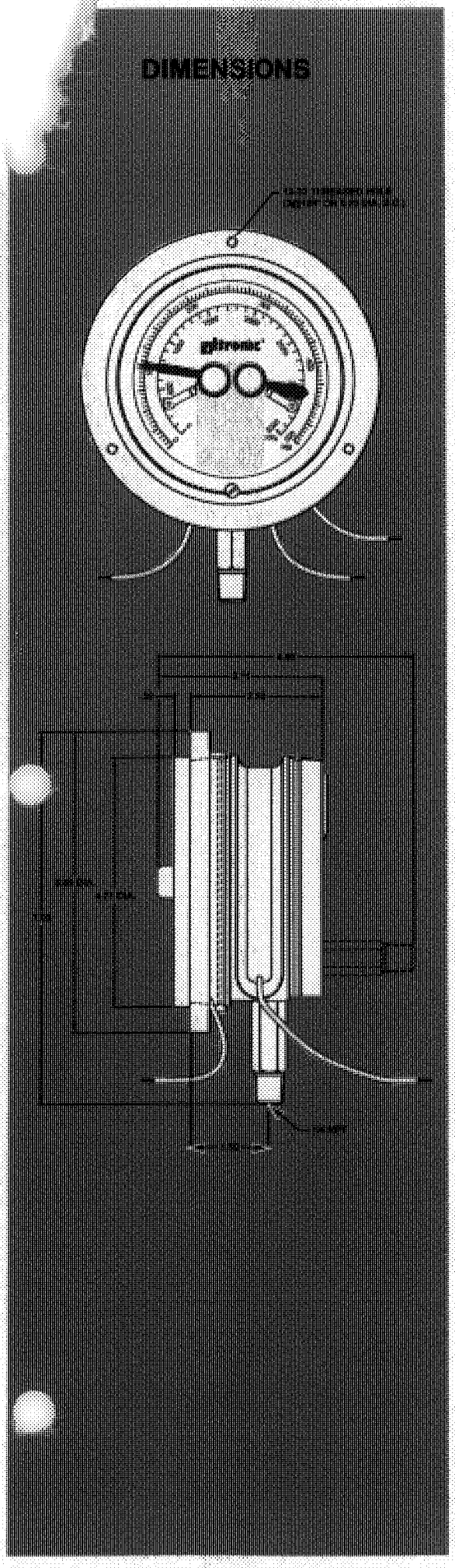
This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

X	Reviewed
	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By ML
Date Nov. 15, 2012

CONESTOGA-ROVERS & ASSOCIATES

DIMENSIONS



SPECIFICATIONS

ACCURACY ..... ±1% OF FULL SCALE
MAX. PRESSURE CAPABILITY ..... 150% OF FULL SCALE
AMBIENT TEMPERATURE RANGE ..... -65° F. TO 190° F. / -54° C. TO 88° C.
SERVICE MEDIA TEMPERATURE ..... -65° F. TO 400° F. / -54° C. TO 204° C.
SETPOINT SWITCH RATING ..... 0.25 AMP @ 125 VOLTS (AC OR DC)

MATERIALS:

CASE ..... ABS PLASTIC, BLACK
LENS ..... POLYCARBONATE
SENSING ELEMENT ..... INCONEL X-750
SOCKET AND CONNECTING TUBE .... 316 STAINLESS STEEL

CONNECTION THREAD:

TO 1000 PSI ..... 1/4" NPT
1500 TO 5000 PSI ..... 1/2" NPT

TO ORDER

PRESSURE SWITCH-GAUGE

30" Hg to 30 psi 45PHL-30V30
30" Hg to 100 psi 45PHL-30V100
0-30 psi 45PHL-30
0-60 psi 45PHL-60
0-100 psi 45PHL-100
0-160 psi 45PHL-160
0-200 psi 45PHL-200
0-300 psi 45PHL-300
0-500 psi 45PHL-500
0-600 psi 45PHL-600
0-1000 psi 45PHL-1000
0-1500 psi 45PHL-1500
0-2000 psi 45PHL-2000
0-3000 psi 45PHL-3000
0-5000 psi 45PHL-5000

CAUTION — Use these gauges only with:

1. Altronic or other electronic annunciator
2. C.D. ignition system with 307-PH-CD tattletales
3. DC signal of 24V., 0.5 Amp max.

DO NOT USE 45PHL SWITCH-GAUGES WITH TYPE 101-PH or 307-PH tattletales.

PULSATION DAMPENING VALVES

The following pulsation dampening valves are available for use with the 45PHL switch-gauges when used in high pulsation applications:

Steel, 1/4 NPT fitting 618100-1
Stainless, 1/4 NPT fitting 618100-2

CLASS I, DIVISION 2, GROUPS C AND D APPLICATION:

Use Altronic annunciator DD-NT, DD-NTS, DE series.

CLASS I, DIVISION 1, GROUP D APPLICATION:

Use Altronic annunciator DD-NT series with Division 1, 690 series power supply.

altronic® inc.
712 TRUMBULL AVE / GIRARD, OH 44420
(330) 545-9768 / Fax: (330) 545-9005
www.altronicinc.com E-mail: sales@altronicinc.com

Form 45PHL 7-02 ©2002 Altronic, Inc.

BA-2 on DRAWING EP-02

0-30 psi pressure gage

altronic®

PRESSURE SWITCH-GAUGE WITH HIGH/LOW SETPOINTS 45PHL SERIES

- SUPERIOR TECHNOLOGY
  - DIRECT DRIVE MOVEMENT
  - NO GEARS, LEVERS OR WEARING PARTS
  - LONGER LIFE IN VIBRATING ENVIRONMENT
  - INHERENT SAFETY DESIGN
  - ACCESSIBLE ZERO ADJUSTMENT FROM FACE
  - ±1% ACCURACY
- CORROSION RESISTANT MATERIALS
  - PLASTIC CASE
  - INCONEL TUBE
  - STAINLESS STEEL SOCKET
- UNIVERSAL APPLICATION
  - INDUSTRY STANDARD 4-1/2" ROUND CASE
  - ADJUSTABLE BACK OR BOTTOM CONNECTION
  - EASY RETROFIT REPLACEMENT
  - INTERCHANGEABLE WITH OPLFC GAUGES

The Altronic 45PHL series pressure switch-gauges offer a new standard for a mechanical pressure gauge with high/low switch contacts. Utilizing a "direct drive" movement, the antiquated C-bourdon tube used in most other pressure gauges is eliminated as are the gears, links, levers and springs used to connect the C-tube to the indicating pointer. The 45PHL series uses a special helically-wound coil of Inconel, directly connected to the indicating pointer. Fewer parts, fewer problems. The "direct drive" design provides for longer life than even liquid-filled conventional gauges in severe service applications. The basic design is inherently safer due to the very small tube I.D. and a rubber blow-out plug in the rear wall of the case. It is also more resistant to pulsation.

A zero adjustment is accessible from the front of the gauge. Linearity and span are built-in and require no adjustment. Accuracy is ±1% across the scale. The connection stem is user-adjustable for either bottom or back connection. Corrosion resistant materials are used throughout—from the plastic housing to the Inconel helical tube, to stainless steel screws and rivets. The connection socket is also 316 stainless steel—standard.

The features of the Altronic 45PHL series pressure switch-gauges make them ideal for gas compressor and other high pulsation/high vibration use, offering longer life in tough applications. The 4-1/2" round, weather-resistant case fits an industry-standard panel cutout allowing easy replacement of OPLFC gauges.

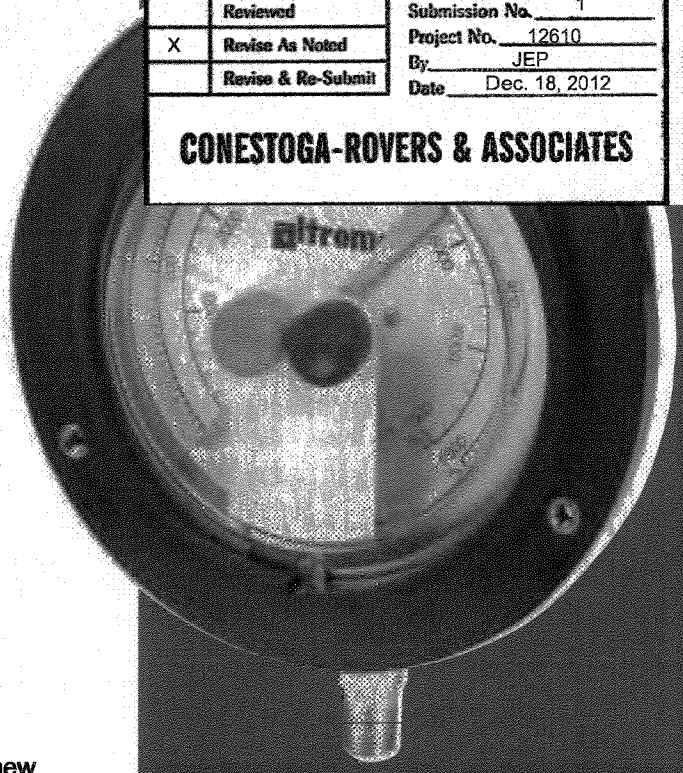
SHOP DRAWING REVIEW

This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

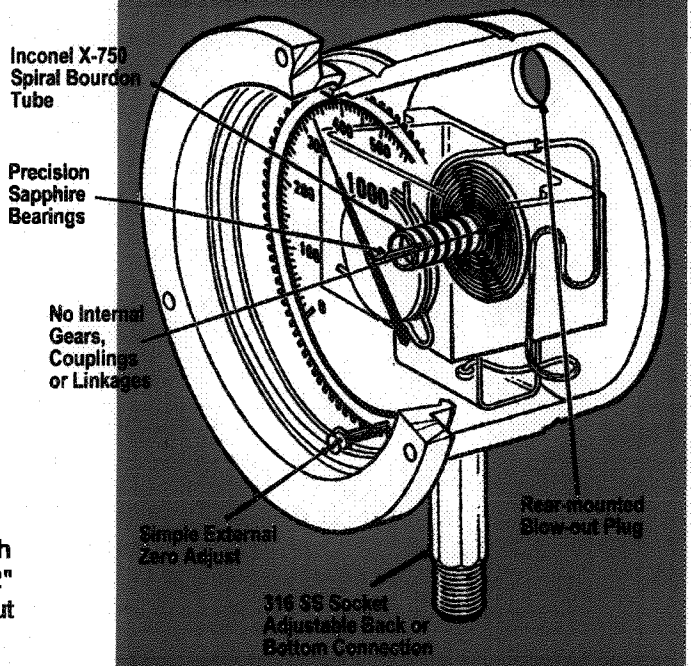
	Reviewed
X	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By JEP
Date Dec. 18, 2012

CONESTOGA-ROVERS & ASSOCIATES



The 45PHL "Direct Drive Difference™"



LITHONIA LIGHTING®

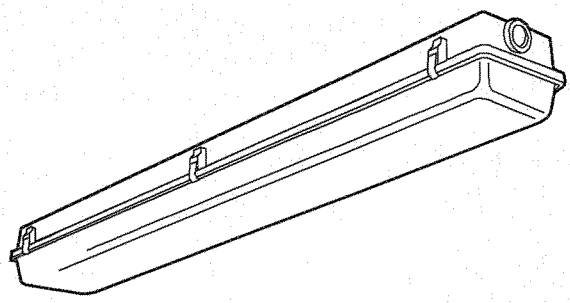
Catalog Number	VRI-2-48T8HO-120-GEB101S
Notes	
Type	

FEATURES & SPECIFICATIONS

Rough Service Wet Location Industrial

VRI

HIGH OUTPUT
4' or 8' length



INTENDED USE — General illumination for rough service (vandal resistant - industrial applications). Ideal for tunnels, canopies, shipping docks, refrigerated areas or any non-hazardous environments that requires a wet location listing. **Certain airborne contaminants can diminish integrity of acrylic.** Click here for Acrylic Environmental Compatibility table for suitable uses.

CONSTRUCTION — Housing made from impact-resistant, UV-resistant fiberglass-reinforced polyester with cold rolled steel enclosed wire way.

Five-stage iron-phosphate pretreatment ensures superior paint adhesion and rust resistance. Painted parts finished with high-gloss, baked white enamel.

OPTICS — High-impact acrylic 50% DR diffuser standard. Secured to fully-gasketed housing by captive tamper-resistant cam-action latches. (6 latches provided on 4' fixtures, 10 on 8' fixture.)

PLEASE NOTE: The standard 4' diffuser is 2-1/4" deep, and the standard 8' diffuser is 3" deep. To order the 4' diffuser so that it matches the depth of the 8' diffuser, order the ARDP option. The 8' diffuser is not available in the 2-1/4" depth.

ELECTRICAL — Ballast is thermally protected, resetting, Class P, HPF, non-PCB, UL listed. CSA certified ballast is standard. Rapid start lamps are sound rated A. Standard combinations are CBM approved and conform to UL 935.

INSTALLATION — Suitable for surface, chain or stem mounting.

LISTING — UL listed (standard). CSA Certified (see Options). UL listed for 25°C ambient and wet locations covered ceiling installations only.

WARRANTY — 1-year limited warranty. Complete warranty terms located at

www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Rough Service products by Lithonia Lighting are engineered to withstand extreme physical assault. When properly installed per instructions for maximum vandal resistance, any rough service polycarbonate lens and/or polycarbonate housing enclosure that is rendered inoperable as a result of physical abuse, will be repaired or replaced without charge for the life of the product.

Note: Specifications subject to change without notice.

Actual performance may differ as a result of end-user environment and application.

Specifications

Length: 50 (127.0)
98 (248.9)

Width: 8-1/8 (20.6)

Fixture Depth: 5-5/8 (14.3)

All dimensions are inches (centimeters) unless otherwise specified.

ORDERING INFORMATION

Lead times will vary depending on options selected. Consult with your sales representative.

Example: VRI 2 96T8HO 120 GLR

Series	Number of lamps[1]	Lamp type[1]	Diffuser	Voltage	Ballast	Options
VRI Rough service wet location industrial For tandem double-length unit, add prefix T. Example: TVRI	1 2	48T8HO Nominal 44W 800mA (48") 96T8HO Nominal 86W T8 380mA (96") 54T5HO 54W T5HO	(blank) Deep high-impact acrylic	120 277 347 MVOLT[2]	GEB10IS Electronic ballast, <10% THD, instant start GEB10RS Electronic ballast, <10% THD, rapid start[3] GEB10PS Electronic ballast, <10% THD, programmed rapid start[4] GEB10PS90 T5HO 90° electronic ballast, ≤10% THD, programmed rapid start	ELDW Emergency battery pack (nominal 600 lumens)[5,6] EL14DW Emergency battery pack (nominal 1400 lumens)[5,6] GLR Internal fast-blow fuse[7] GMF Internal slow-blow fuse[7] RIF1 Radio interference filter, one per fixture CSA Listed and labeled to comply with Canadian Standards NOM Listed and labeled to comply with Mexican Standards WLF Wet location fittings (one pair, installed top) CS88 6' Brad Harrison 16/3 cord & straight blade plug set[7] CS89 6' white cord, 16/3, no plug, wet location IP67 IP67 rated; requires 8 latches for 4' fixtures and 14 latches for 8' fixtures

Accessories: *Order as separate catalog number.*

RK1 T20BIT	Hex-base driver bit, Torx TX20, for tamper-resistant screws with center reject pin
RK1 T20DRV	Torx TX20 screwdriver for use with tamper-resistant screws with center reject pin
WLF	Wet location fittings (one pair, not installed)
HC36	Chain hangers (1 pair, 36" long); Requires BCD
BCD	Bracket for hanger chain; Two per package[8]

NOTES:

1. Lamps not included.
2. Electronic ballast 120-277V. Must specify GEB10IS.
3. Only available with 347V T8.
4. T8HO only.
5. Luminaires ordered with the DW option (Example: ELDW) will bear the UL Emergency Lighting Equipment label for damp or wet locations, depending on the fixture. 900 lumens for T5HO.
6. Must specify voltage, 120V or 277V only.
7. Must specify voltage. Not available with MVOLT.
8. For stainless steel, specify STS (ex.: BCD STS).

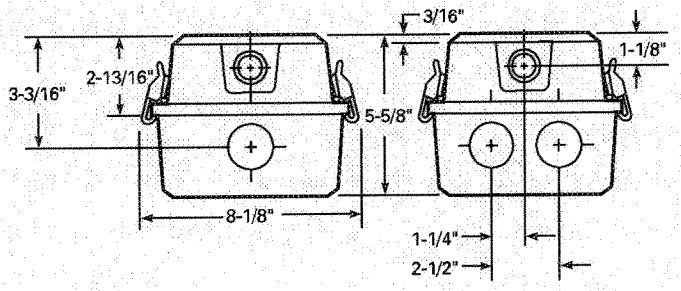
MOUNTING DATA

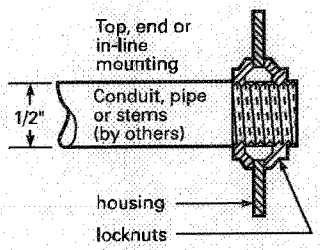
For unit or row installation, suspended mounting. Drill holes through housing at appropriate locations.

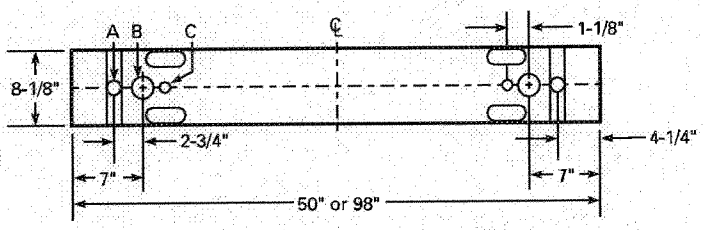
VRI - Includes gasketed wet location fittings on ends for power feeding/mounting. Fitting is threaded for 1/2" rigid conduit (optional WLF for top mounting). Attach to surface using fasteners and sealing washers (by others) appropriate to ceiling materials and security requirements.

Unit installation - Minimum of two hangers required.

Row installation - One hanger per channel plus one per row required.







A = 11/16" Dia. K.O. (2)

B = 1 1/8" Dia. K.O. (2)

C = Location dimple (2)

Dimensions subject to change without notice.

PHOTOMETRICS

Available upon request.

LITHONIA LIGHTING®
An AcuityBrands Company

INDUSTRIAL One Lithonia Way Conyers, GA 30012 Phone: 800-315-4963 Fax: 770-981-8191 www.lithonia.com

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LITHONIA LIGHTING®

Catalog Number	TWR2 400M TB SCWA LPI
Notes	LAMP INCL
Type	

FEATURES & SPECIFICATIONS

INTENDED USE

Ideal for mounting above entryways and loading docks.

CONSTRUCTION

Rugged, corrosion-resistant die-cast aluminum back housing and hinged door frame. Castings are sealed with a one-piece gasket to inhibit the entrance of external contaminants. Finish is bronze polyester powder paint for lasting durability.

ELECTRICAL

Ballast is constant wattage autotransformer. Ballast is 100% factory-tested.

Metal halide: super CWA pulse start ballasts, 88% efficient and EISA compliant, are required for 250-400W (must order SCWA option) Pulse Start for US shipments only. CSA required for pulse start shipments to Canada. 250M and 400M do not comply with California Title 20 regulations.

Socket: Mogul-base socket, nickel-plated screw shell and center contact.

OPTICS

Refractor is prismatic borosilicate glass. Reflector is die-formed anodized stippled aluminum.

Mogul-base lamp included in carton.

INSTALLATION

Housing is configured for mounting directly over a standard 4" outlet box or for surface wiring via any of three convenient 1/2" threaded conduit entry hubs.

LISTING

UL Listed to US and Canadian safety standards (see Options). Suitable for wet locations (25ºC maximum ambient temperature).

Note: Specifications subject to change without notice.

SHOP DRAWING REVIEW

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X	Reviewed
	Revise As Noted
	Revise & Re-Submit

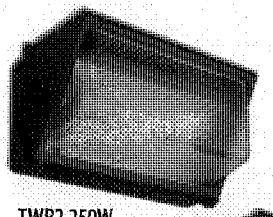
Submission No. 1
Project No. 12610
By JEP
Date Nov. 1, 2012

CONESTOGA-ROVERS & ASSOCIATES

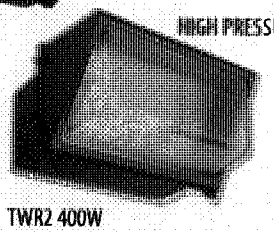
Wall Packs

TWR2

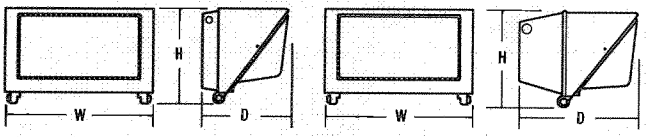
METAL HALIDE: 250-400W
HIGH PRESSURE SODIUM: 250-400W



TWR2 250W



TWR2 400W



TWR2 250W

Specifications

Height: 9-1/4 (23.5)
Width: 17-7/8 (45.4)
Depth: 9-3/8 (23.8)
*Weight: 26 lbs/ 11.8 kg

TWR2 400W

Specifications

Height: 9-1/4 (23.5)
Width: 17-7/8 (45.4)
Depth: 12-1/2 (31.8)
*Weight: 31 lbs/ 14.07 kg

All dimensions shown in inches (centimeters) unless otherwise noted.
*Weight as configured in example below.

Example: TWR2 400M TB SCWA LPI

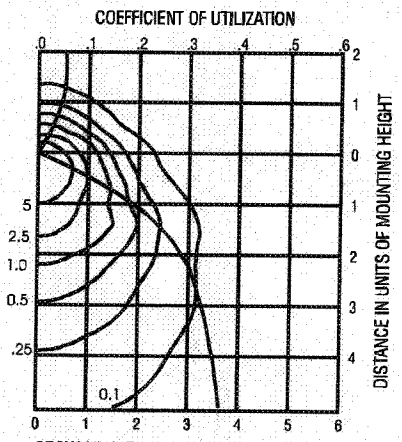
Catalog Number	Wattage	Voltage	Photocell included	Lamp included	Available in Canada
Metal halide					
TWR2 250M 120 PE LPI CSA	250	120	Y	Y	Y
TWR2 250M 120 SCWA PE LPI	250	120	Y	Y	Y
TWR2 250M 277 SCWA PE LPI	250	277	Y	Y	Y
TWR2 250M 120/347 LPI CSA	250	120/347	N	Y	Y
TWR2 250M TB SCWA LPI	250	120/208/240/277	N	Y	N
TWR2 320M 120 SCWA PE LPI	320	120	Y	Y	Y
TWR2 320M 277 SCWA PE LPI	320	277	Y	Y	Y
TWR2 320M TB SCWA LPI	320	120/208/240/277	N	Y	N
TWR2 400M 120 SCWA PE LPI	400	120	Y	Y	Y
TWR2 400M 277 SCWA PE LPI	400	277	Y	Y	Y
TWR2 400M 120/347 LPI CSA	400	120/347	N	Y	Y
TWR2 400M TB SCWA LPI	400	120/208/240/277	N	Y	N
High pressure sodium					
TWR2 250S 120/347 LPI CSA	250	120/347	N	Y	Y
TWR2 250S TB LPI	250	120/208/240/277	N	Y	N
TWR2 400S 120/347 LPI CSA	400	120/347	N	Y	Y
TWR2 400S TB LPI	400	120/208/240/277	N	Y	N

Accessories: *Order as separate catalog number. Shipped separately*	
TWR2WG U	Wireguard

TWR2 High Pressure Sodium/Metal Halide Wall Pack

TWR2 250S

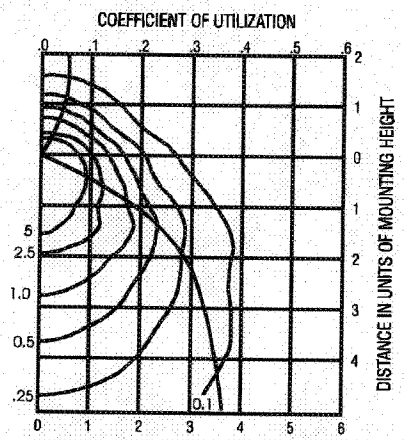
Test No. LTL10411



250W High Pressure Sodium lamp, 29000 rated lumens. Footcandle values based on 20' mounting height, Distribution.

TWR2 400S

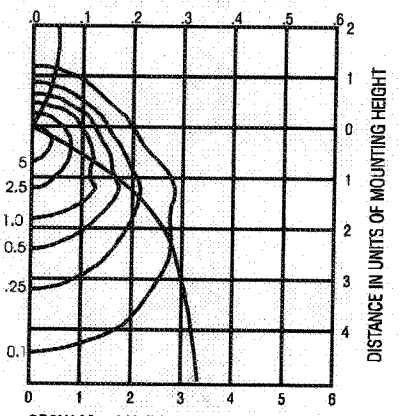
Test No. LTL10376



400W High Pressure Sodium lamp, 50000 rated lumens. Footcandle values based on 20' mounting height, Distribution.

TWR2 250M

Test No. LTL10414



250W Metal Halide lamp, 20000 rated lumens. Footcandle values based on 20' mounting height, Distribution.

OUTDOOR: One Lithonia Way Conyers, GA 30012 Phone: 800-279-8041 Fax: 770-918-1209 www.lithonia.com

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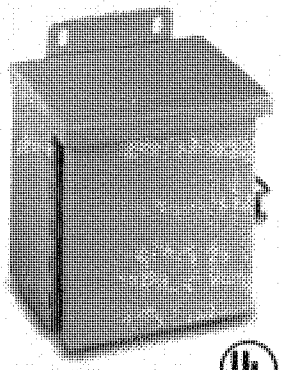
Small RHC Series NEMA 3R H[illegible] Wall Mount

SHOP DRAWING REVIEW
This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

X	Reviewed
	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By ML
Date Dec. 4, 2012

CONESTOGA-ROVERS & ASSOCIATES



Applications

Designed for use as wiring boxes and junction boxes, this model provides protection against rain, sleet and snow in outdoor installations, or against dripping water indoors.

Construction

- Bodies and doors fabricated from 16 gauge carbon steel
- Continuous hinge
- Lid is supplied with a padlockable draw latch
- Hinge is made of carbon steel with a stainless steel hinge pin
- Standard size enclosures provided with knockouts in bottom
- Weldnuts provided for mounting optional back panels
- External mounting plates, top and bottom of enclosure
- Grounding provisions provided

*Subpanels must be ordered separately.

Finish

- Enclosures are ANSI 61 gray polyester powder over phosphatized surfaces inside and out
- Optional back panels are white polyester powder over phosphatized surfaces

Listings

- UL 50, Types 1 & 3R
- UL File E6924
- CSA Certified, Type 1 & 3R CSA File LL66078
- NEMA/EEMAC Type 1 & 3R

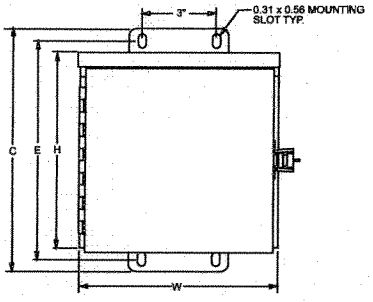
Enclosure Shipping Schedule

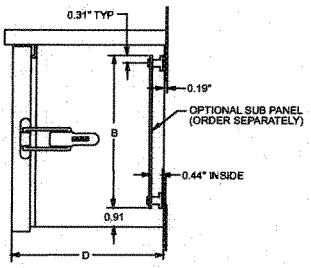
Same day	1-7 days	1-10 days

Color indicates shipping lead time in business days.

Part Number	Price	Body/Door Price Steel Gauge	Enclosure Size HxWxD	Knockout Pattern	Subpanel Part Number	Price	Subpanel Size A&B	C	E
RHC060604	<--->	16/16	6.06x6.00x4.13 (154x152x105)	G-F-G	N1P0606	<--->	4.25x4.25 (108x108)	8 (203)	7 (178)
RHC060804	<--->	16/16	8.06x6.00x4.13 (205x152x105)	G-F-G	N1P0608	<--->	6.25x4.25 (159x108)	10 (254)	9 (229)
RHC080804	<--->	16/16	8.06x8.00x4.13 (205x203x105)	G-F-G	N1P0808	<--->	6.25x6.25 (159x159)	10 (254)	9 (229)
RHC080806	<--->	16/16	8.06x8.00x6.13 (205x203x156)	G-F-G	N1P0808	<--->	6.25x6.25 (159x159)	10 (254)	9 (229)
RHC081006	<--->	16/16	10.06x8.00x6.13 (256x203x156)	G-F-G	N1P0810	<--->	8.25x6.25 (210x159)	12 (305)	11 (279)
RHC101206	<--->	16/16	12.06x10.00x6.13 (306x254x156)	G-F-G	N1P1012	<--->	10.25x8.25 (260x210)	14 (356)	13 (330)
RHC121206	<--->	16/16	12.06x12.00x6.13 (306x305x156)	F-G-H-I-G	N1P1212	<--->	10.25x10.25 (260x260)	14 (356)	13 (330)

Note: Dimensions in inches (millimeters); letters in table correspond to letters on dimensional drawings.





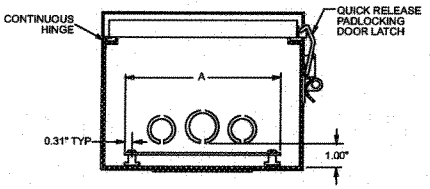
Note: A WGNDKT must be ordered with each RSC enclosure to meet the CSA standard.

No partial CSA orders accepted

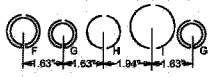
Grounding Kit

Part Number	Description	Price
WGNDKT	Grounding Kit	<--->

Field grounding kit includes necessary parts to properly ground enclosure



KNOCKOUT PATTERN
(PATTERNS ARE CENTERED IN WIDTH)

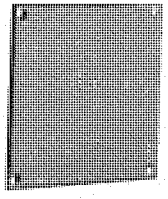


F = 3/4" x 1" CONCENTRIC KO
G = 1/2" x 3/4" CONCENTRIC KO
H = 1" SOLID KO
I = 1-1/4" SOLID KO

Enclosure Subpanels

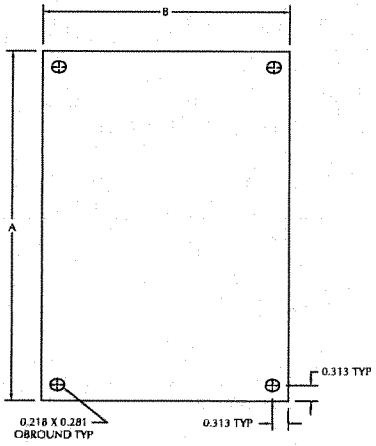
WIEGMANN
Enclosures for Electrical/Electronic Equipment

Subpanels for small NEMA 1, NEMA 3R and NEMA 12 enclosures



- 14 gauge
- Subpanels are painted white polyester powder
- Panels listed fit the following enclosures:

NEMA 1 small (N1C)
NEMA 3R small (RHC)
NEMA 12 WA_GIE



Part Number	Price	Enclosure Size HxW	Subpanel Size AxB
N1P0606	<--->	6x6 (152x152)	4.25x4.25 (108x108)
N1P0608	<--->	6x8 (152x203)	6.25x4.25 (159x108)
N1P0808	<--->	8x8 (203x203)	6.25x6.25 (159x159)
N1P0810	<--->	8x10 (203x254)	8.25x6.25 (210x159)
N1P1010	<--->	10x10 (254x254)	8.25x8.25 (210x210)
N1P1012	<--->	10x12 (254x305)	10.25x8.25 (260x210)
N1P1212	<--->	12x12 (305x305)	10.25x10.25 (260x260)
N1P1214	<--->	12x14 (305x356)	12.25x10.25 (311x260)
N1P1216	<--->	12x16 (305x406)	14.25x10.25 (362x260)
N1P1220	<--->	12x20(305x508)	18.25x10.25 (464x260)

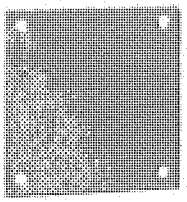
Note: Dimensions in inches (millimeters); letters in table correspond to letters on dimensional drawing.

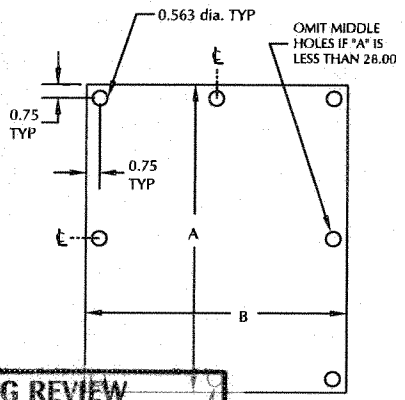
Enclosure Shipping Schedule		
Same day	1 - 7 days	1 -10 days

Color indicates shipping lead time in business days

Subpanels for large NEMA 1 enclosures

- 12 gauge
- Subpanels are painted white polyester powder
- Panels listed fit NEMA 1 large (N1C) enclosures





Part Number	Price	Enclosure Size HxW	Subpanel Size AxB
N1P1216L	<--->	16x12 (406x305)	13x10.50 (330x267)
N1P1616	<--->	16x16 (406x406)	13x14.50 (330x368)
N1P1620	<--->	20x16 (508x406)	17x14.50 (432x368)
N1P1624	<--->	24x16 (914x406)	21x14.50 (533x368)
N1P2016	<--->	16x20 (406x508)	13x18.50 (330x470)
N1P2020	<--->	20x20 (508x508)	17x18.50 (432x470)
N1P2024	<--->	24x20 (610x508)	21x18.50 (533x470)
N1P2030	<--->	30x20 (762x508)	26x18.50 (660x470)
N1P2420	<--->	20x24 (508x610)	17.00x22.50 (432x572)
N1P2424	<--->	24x24 (610x610)	21x22.50 (533x572)
N1P2430	<--->	30x24 (762x610)	26x22.50 (660x572)
N1P2436	<--->	36x24 (914x610)	32x22.50 (813x572)
N1P3030	<--->	30x30 (762x762)	26x28.5 (660x724)
N1P3036	<--->	36x30 (914x762)	32x28.50 (813x724)

Note: Dimensions in inches (millimeters); letters in table correspond to letters on dimensional drawing.

SHOP DRAWING REVIEW

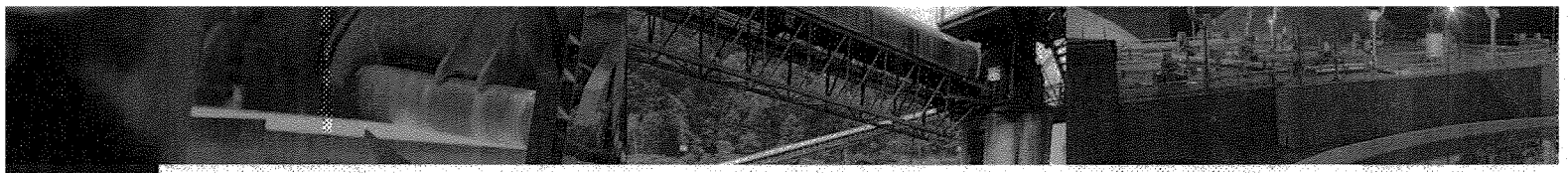
This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

X	Reviewed
	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By MI
Date Dec. 4, 2012

CONESTOGA-ROVERS & ASSOCIATES

OMIT MIDDLE HOLES IF "B" IS LESS THAN 28.00



General Purpose Relays

Allen-Bradley relays and timers offer compatible and versatile solutions for control applications – from programmable controllers and motor starters to push buttons and terminal blocks. General purpose relays feature an excellent flexible design and industry-proven reliability. Each relay is tested during manufacturing – before it is used in your demanding application – and carries international approvals that assure you the relay will stand the test of time anywhere in the world.

	700-HA	700-HB	700-HD	700-HF
Mounting Style	Plug-in	Plug-in	Flange-mounted	Plug-in
Load Capacity [A]	10	15	15	10
2DPDT	✓	✓	✓	✓
3DPT	✓	✓	✓	✓
4DPT				✓
Options				
LED	✓	✓		✓
Manual Override	✓	✓		✓
Visible Indicator	✓	✓	✓	
Comparable w/ Plug Accessories Modules	✓	✓		

Tripping Characteristics

Eaton WMZT miniature circuit breakers are available with "C" and "D" tripping characteristics.

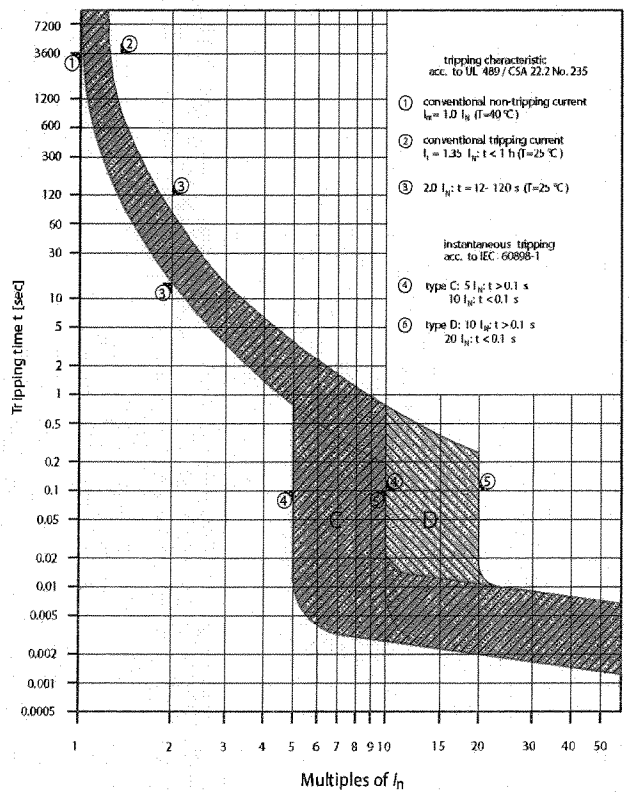
Type C trip curve: 5 to10 *In*

C-curve devices are suitable for applications where medium levels of inrush current are expected. Applications include small transformers, lighting, pilot devices, control circuits and coils. C-curve devices provide a medium magnetic trip point.

Type D trip curve: 10 to 20 *In*

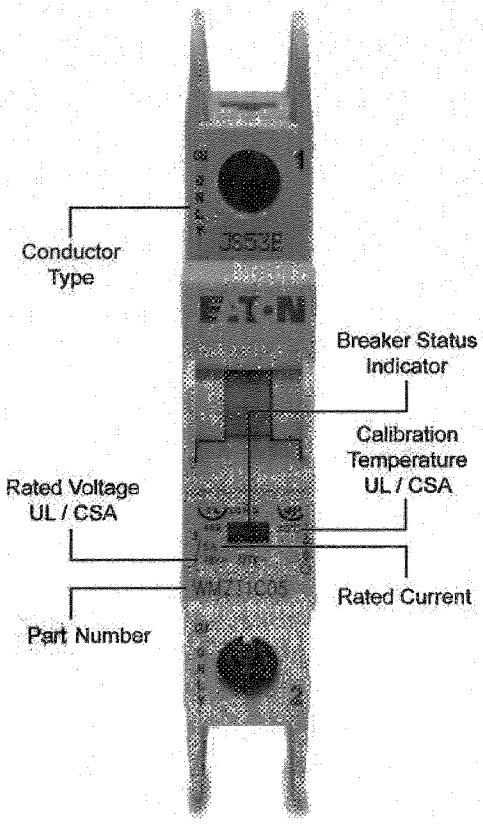
D-curve devices are suitable for applications where high levels of inrush current are expected. The high magnetic trip point prevents nuisance tripping in high inductive applications such as motors, transformers and power supplies.

Eaton WMZT devices are current limiting, which means they interrupt fault currents within one half cycle of the fault. Current limiting devices offer superior protection by reducing peak let-through current and energy.

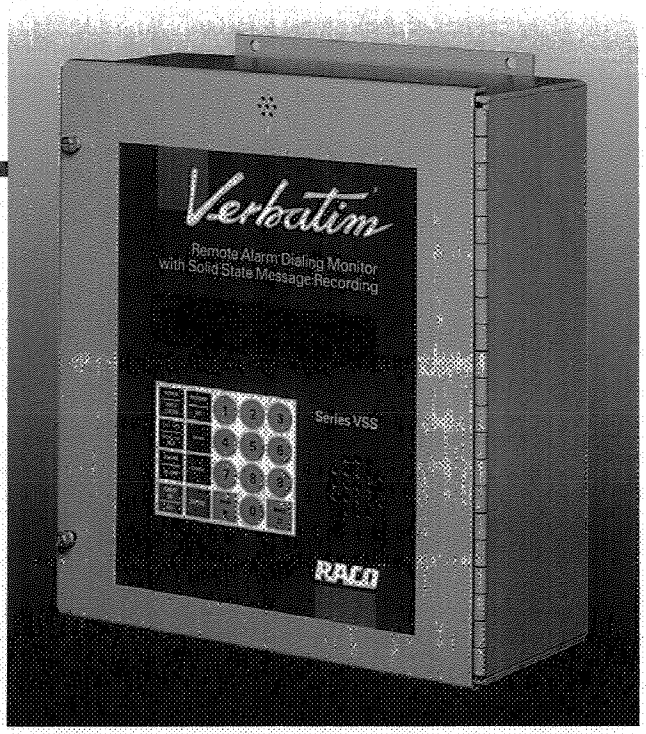


Labeling

The front of each Eaton WMZT miniature circuit breaker is labeled for positive identification.



Verbatim®



...the interactive alarm autodialing, monitoring, reporting, and control system.

RACO Verbatim, the long-standing first choice of the industry, offers pace-setting functionality and expandability–Its an autodialer alarm system, a remote monitoring system, a supervisory control system, a SCADA system, and a PLC network interface–in one compact package.

With an expandable, modular bus architecture and up to 32 digital inputs, 16 analog inputs, and 8 digital control outputs, the system can monitor flow, level, pressure, temperature, pH, and other types of sensors, as well as control remote electrical devices.

■ Alarm Autodialing

The system is designed to continuously monitor preset alarm points. If an alarm condition is sensed at a monitored point, the Verbatim System will automatically dial a list of 16 pre-programmed emergency telephone numbers, calling until it gets an answer. When the call is answered and acknowledged, the system reports the alarm location and status via pre-recorded voice messages.

Communicating over standard landline or wireless telephone networks, the Verbatim delivers alarm messages to standard phones, cell phones, numeric or voice pagers, and voice mail systems, and talks just as easily with computers.

■ User-Recorded Messages

The voice messages are digitally pre-recorded by the user. Anything that can be spoken is accurately stored in memory–from names and numbers to technical terms and detailed instructions. Messages are delivered with maximum clarity, lessening the chance for misunderstanding or error. And, you can easily enter or change your messages over the phone or at the front panel.

■ A Fully Interactive System

With Verbatim, you're never out of touch with your monitoring system. With any standard touch-tone phone, you can call in for a status report, review and change programming, or control a remote device. With the touch of a key, you can listen to local sounds or talk to personnel using the unit's built-in speakerphone.

When calling for status report you hear a comprehensive summary of all conditions monitored by the system, including internal power. Hard copies of event data–alarms, acknowledgements, inquiries, and programming changes–can be printed out at any time using the system's data logging capabilities.

Controls and indicators are provided on the Verbatim's front panel for on-site programming and review of system operation, alarm status, and battery condition.

■ Supervisory Control System

A Verbatim System can be equipped with up to 8 digital control outputs to remotely actuate HVAC systems, pumps, compressors, and other electrical devices from a standard phone, the Verbatim front panel, or a PC.

■ SCADA System

RACO MMI/SCADA Systems provide monitoring and control of up to 200 RACO Verbatim Remote Terminal Units (RTUs) over the standard dial-up telephone network. Each RTU has full alarm monitoring, reporting, and autodialing capabilities, and because Verbatim systems report by exception, they do not need to be polled. When an alarm is sensed, the RTU reports to the central computer. If the computer operator does not acknowledge the alarm, the RTU will commence autodialing.

QUICK START GUIDE - VERBATIM

BEGIN

CONNECT

- ☐ Connect Inputs
- ☐ Connect Battery
- ☐ Connect AC power
- ☐ Connect Phone Line

Section 2.2 of Owners Manual

PROGRAM DIALER:

To program dialer at the front panel press PROGRAM. Put in program code followed by ENTER for each instruction. Press NORMAL to exit program mode.

Procedure	Example
Clear Memory: use code 9 3 5 9 1 1	9 3 5 9 1 1 ENTER *Section 3.1*
Enter Phone Numbers (you must enter at least 1 phone number)	7 0 1 6 5 8 6 7 1 3 ENTER (phone # 1) *Section 3.2*
Set Touch Tone dialing (recommended setting)	9 0 1 1 ENTER *Section 3.2*
Set Alarm Criteria for all channels: with inputs connected and all points being monitored in their normal condition, enter code 500. This tells the dialer that the present condition is normal, and the opposite condition is the alarm condition.	5 0 0 ENTER *Section 3.3*
Enter Speech if desired: 1ZZ enters alarm speech 2ZZ enters normal speech **Remember:** hold the Record button while you are speaking.	Alarm Speech for Channel 1: 1 0 1 ENTER Press and hold RECORD "High Level Alarm" Release-RECORD button *Section 4.3*

TEST

- ☐ Verify that each sensing device will trip the dialer
- ☐ Verify that the dialer will reach each phone number on call out
- ☐ Clear dialer of all test alarms *Section 3.4*

'This diagram is intended to be used as a guide for the initial installation and programming of your Verbatim. For complete instructions you must reference your Verbatim owner's manual

3 Programming and Testing

3.1 Starting Up and Clearing the Unit

Basic set-up and testing of the Verbatim involves:

- Program at least one phone number.
- Program the input channels to reflect alarm conditions.
- Test the alarm conditions to be sure witing and programming are correct.
- Record voice messages, trip delays and other programming as desired.

All programming operations must be done with the unit in the Program mode.

1. To put the Verbatim autodialer in the Program mode, press PROGRAM.
   Program mode is indicated by the lighted PROGRAM LED.

Note:

Before you begin programming the Verbatim for your monitoring application it is best to first clear the unit's memory of any old programming. This step also ensures that memory corruption, which might have occurred during shipment or due to anomalous power distrubances, will be wiped away. See Step 2 below.

Caution:

The following step erases all user programming including recorded messages so normally it is done only at initial start-up.

2. To clear the system memory, press:

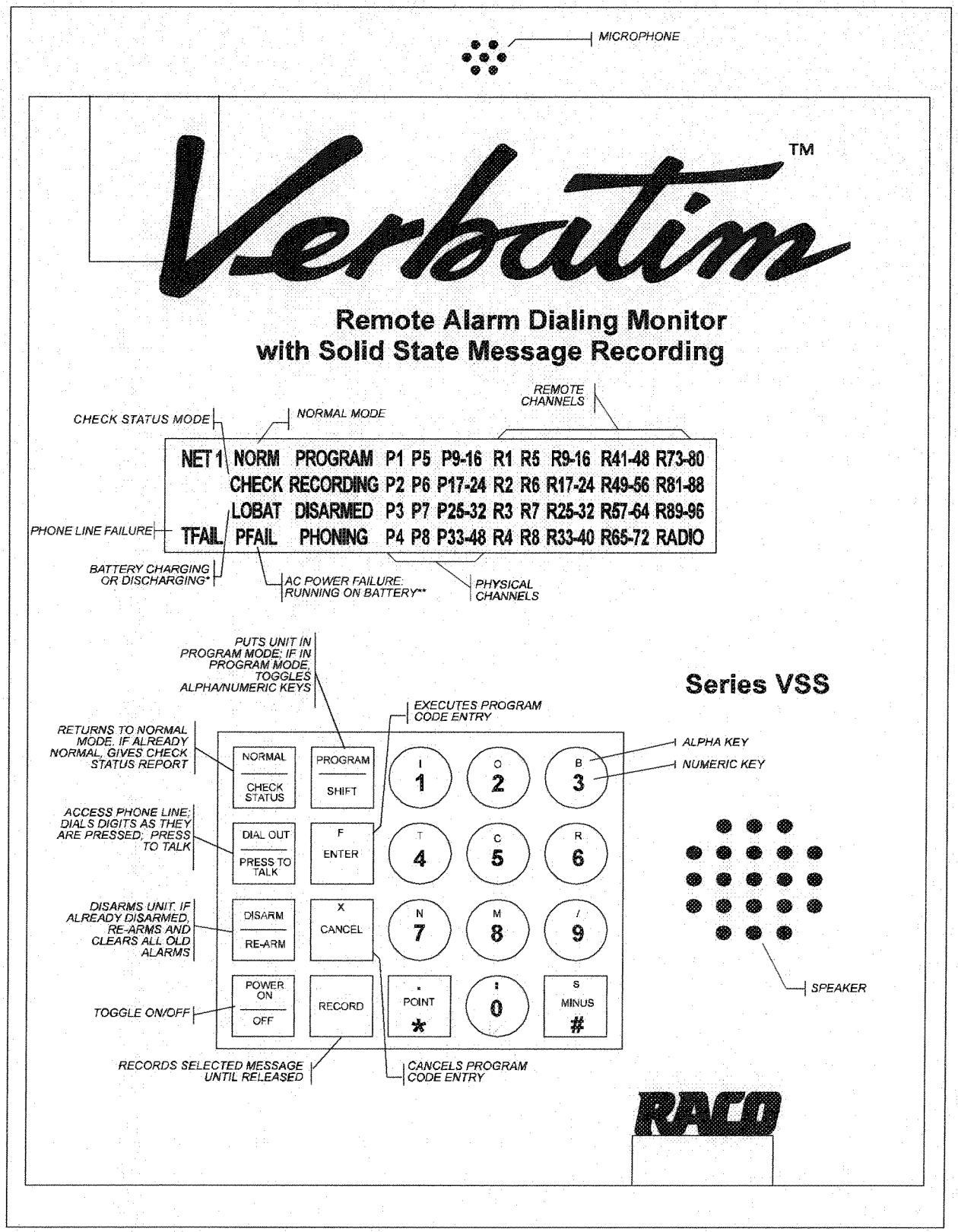
   `9 35 9 ENTER`

   If you make an error in code entry, press CANCEL and start again.

Exceptions:

If you have powered up your Verbatim without connecting a live telephone line to the unit you may observe that the TFAIL indicator is on. This indicates that the unit is checking for the presence of a telephone connection and attempting to determine the line configuration. If you are planning to program your unit without a live telephone connection you may wish to disable the Telephone Line Fault Detection (Phone Fault) feature by pressing `9 17 0 ENTER`
See Section 6.2.6 for information on temporarily disabling this feature.

Front Panel Keys and Indicators Diagram



*** A discharged battery may take up to a day to fully charge. Meanwhile, light may remain on.**

**** During AC power failure, all illuminated LED's will flash to conserve battery power.**

3.2 Programming Phone Numbers

Refer to Programming Worksheet A (See Appendix J). You are encouraged to write down the phone numbers you want to program, along with a person's name for each phone number.

- To program the first dial-out phone number, press:

  `7 01 (then the complete phone number) ENTER`

  For example, to program 1 (510) 658-6713 as the first phone number, press:

  `7 01 1 5 1 0 6 5 8 6 7 1 3 ENTER`

- To program a second phone number:

  Use code 7 02 instead of 7 01, progressing to a maximum of code 7 16 for the 16th phone number.

Each number may be up to 60 digits in length. Be sure to include any necessary area codes or "1" prefixes.

Exceptions:

- To use touch tone dialing, press:

  `9 01 1 ENTER`

- To go back to standard pulse dialing, press:

  `9 01 0 ENTER`

- To insert delays between dialed digits.

  Press the MINUS key once for each additional delay desired in the phone number programming process. Default delay is one second.

- Refer to Section 6. "Advanced Programming," for specialized programming such as *grouping* phone numbers with input channels, *Call Progress Monitoring* phone fault detection, etc., or to establish and use a *call forward* phone number, etc.

3.3 Programming Input Channels

Your Verbatim autodialer needs to know whether its input channels are to be *normally closed* (alarm on Open Circuit), or *normally open* (alarm on Closed Circuit).

All contact inputs are initially set normally closed (i.e. they will alarm on Open Circuit). This is the default setting and, therefore, any open circuits, including any inputs left disconnected during installation, will appear as alarms until the inputs are programmed.

- To automatically program the inputs:

  Make sure all inputs are in their normal (non-alarm) state. Then press:

  ```
  5 0 0 ENTER
  ```

The Verbatim autodialer automatically examines all inputs and programs them to alarm on the opposite input state from their present status. This code 500 does not affect any channels that have been programmed for Disabled Channels, Status Only, Run Time Meter, or Pulse Totalizer function.

Exceptions

In most cases, no further programming of contact inputs is necessary. However, the following configuration options are available:

- To set any input to be disabled and never be annunciated, press:

  ```
  5 ZZ 0 ENTER
  ```

  where ZZ is the 2 digit channel number you are programming. Be sure to always use a leading 0 for channels 1 through 9 to keep the channel number a two-digit entry.

- To set an individual contact input for normally closed operation (i.e. to alarm on Open Circuit), press:

  ```
  5 ZZ 1 ENTER
  ```

- To set an individual contact input channel for normally open operation (i.e. to alarm on Closed Circuit), press:

  ```
  5 ZZ 2 ENTER
  ```

- To set inputs to report status only, program each individual channel as follows:

  ```
  5 ZZ 3 ENTER
  ```

  This setup never causes an alarm to dial out.

- To set contact inputs for the run-time meter function, program each channel as follows:

  ```
  5 ZZ 4 ENTER
  ```

See Section 6.2.3, "Channel Programming (Configuring)." This setup never causes an alarm to dial out but reports the total accumulated hours that the input contact is closed.

- To set any of your contact inputs for the Pulse Totalizer function, see Section 6.2.3, "Channel Programming (Configuring)."

3.4 Initial Testing

Perform the following steps to ensure that your Verbatim autodialer is properly installed.

1. First, temporarily disarm the unit by pressing:

   DISARM/RE-ARM until the DISARM LED is flashing. This prevents the unit from dialing out.

2. Next, physically trip each sensing device in turn (manipulate float switches, relays, etc.).

   Verify that the corresponding input channel LED lights at the front panel, and then restore all sensors to their normal state.

3. Now press DISARM/RE-ARM. This will clear out the channel input LEDs and restore the unit to a ready condition.
4. To test the phone line connection, with the unit's phone cord plugged into its phone jack, temporarily remove the AC power cord to the unit.

   The PFAIL LED will illuminate. At this point all illuminated LEDs will flash on and off in order to conserve battery power. Since the unit is not disarmed this time, after a 0.1 minute Alarm Trip Delay the PHONING light will illuminate and the unit will access the phone line and will begin dialing the first phone number.

   The unit will recite its station ID and power failure messages. You may converse with the person answering by pressing and releasing DIALOUT/PRESS TO TALK. Press this key again when you wish to speak, and release this key to listen. This action will suspend message recital. In this case, when the conversation is done, you should end the call by pressing NORMAL. Ordinarily the alarm call would end automatically.

5. Now press DISARM/RE-ARM twice.

   This step disarms and then rearms the unit clearing all acknowledged alarms. This clearing also occurs automatically after the Alarm Reset Time has elapsed (default value 1 hour). See Section 5.6, "Alarm Reset Time-out After Acknowledgment."

6. Your Verbatim autodialer is now able to operate, having at least one dialout phone number programmed and having its input channels configured.

   However, you may wish to record your own voice messages (see the next section) or perform special advanced programming items (see Section 6, "Advanced Programming") before referring to Section 5, "Using Your Verbatim autodialer."

4 Recording Voice Messages

This chapter describes how to record your own voice messages. Messages may be recorded for the Station ID and for the Alarm and Normal condition for every channel in your Verbatim autodialer.

Note:

Be sure to complete the programming of the input channels as described in the previous chapter before recording any messages.

Using Default Messages Instead of Recording Your Own.

Recording messages is an optional step. Your Verbatim autodialer comes with built-in default normal and alarm messages for all channels. Recording voice messages can be postponed until you have become more familiar with your unit. You may even choose to record or re-record your own messages from a remote telephone at any time.

Using default messages for selected channels or for the Normal condition of channels is an excellent way to conserve speech memory for certain important and lengthy alarm messages.

Types of Default Messages

- Discrete (i.e. digital, contact) physical channel inputs:

  "Channel N Normal" and "Channel N Alarm."

- Discrete remote channel inputs:

  "Remote Channel N Normal" and "Remote Channel N Alarm."

- Discrete Status-only or Run-time meter physical channel inputs:

  "Channel N is ON" when input circuit is closed, and "Channel N is OFF" when input circuit is open.

- Discrete Status-only remote channel inputs:

  "Remote Channel N is ONE" or "Remote Channel N is ZERO."

- Analog (integer) physical or remote channel inputs:

  ["Channel N, present reading is ..."] followed by the recited analog value.

- Station ID message:

  "ID Number N."

There is also a default Network ID message. See Appendix F for details.

4.1 Planning Messages

Worksheet C in Appendix J is provided to assist you with this. Please use the Worksheet! Not only will you then have a written record of your messages for future reference, you will also then be prepared to record your messages with the greatest ease and efficiency.

In general, two different messages are used for each input channel:
One message for the Normal Condition, and another for the Alarm (fault) Condition.

When you have written down the messages that you want to record, you are ready to verify/extend your recording time.

❖ ***Exceptions:***

- Status-only or Run-time Metering Channels. See Section 6.2.3, "Channel Programming (Configuring)."

  To record your own messages for these specially configured channels rather than relying on the default "Channel N is ON" or "Channel N is OFF" messages:

  - Plan a message for the Closed Circuit condition and another message for the Open Circuit condition for each channel.

  For Run-time channels, the unit will add a report of the run-time in hours, using built-in speech, after the Closed or Open Circuit message.

- Pulse Totalizer Channels

  See Section 6.2.3, "Channel Programming (Configuring)," for special guidance in planning Pulse Totalizer messages.

4.2 Managing Available Speech Memory

The table below shows the total available message recording time for units with differing total number of channels. The available message recording time may be extended in two ways. First, you may explicitly change the recording rate from the default Rate 1 to Rates 2, 3, or 4 (See Section 6). Secondly, you may automatically extend the message recording time by using the Autoextend™ feature described in this section.

Unit type	Initial recording time (at Rate 1):	Extendable to: (Rate 2, 3 or 4)
4-8	26 sec	40, 54 or 79 sec
16-32	104 sec	160, 216 or 318 sec
33-40 chan. unit	130 sec	200, 270 or 399 sec
41-48 chan. unit	156 sec	240, 324 or 476 sec
49-56 chan. unit	182 sec	280, 378 or 555 sec
57 or more	208 sec	320, 432 or 624 sec

4.2.1 Verifying/Extending Recording Time

Initially, the unit is set for the fastest memory use rate ("Rate 1"), giving the highest fidelity sound recording. If you are sure that your messages take less than the "initial" time shown above for your unit (14 seconds total for a 4-channel unit), go to Section 4.3, "Record Your Messages." You may also verify your unit's current rate setting and corresponding total message recording time by pressing:

```
9 1 1 ENTER.
```

If, after performing this step, you think you may need more recording time perform the Autoextend™ step described next. The Autoextend™ feature will automatically extend the available recording time, selecting the optimum recording rate (speech memory rate) to give you the highest possible recording sound quality for your length of recording.

Warning:

The following step will erase any existing recorded messages.

To use the Autoextend™ feature to extend recording time, have your message Worksheet handy as you press:

```
9 1 2 ENTER
```

The Verbatim autodialer will prompt you to immediately begin reciting your entire list of messages at the sound of the beep, one after another, at the same speed that you will want to later record them.

During this time, the Verbatim autodialer will *not* be recording your spoken messages. Instead, it will be timing you.

When you have finished reciting (not recording) the last message, immediately press ENTER.

Over the phone, press ZERO to start the timing, and ZERO again to end the timing. See Section 5.7, "Programming by Phone."

Based on how long your message recital took, the Autoextend feature will automatically calculate which recording rate is optimum for your length of recording time, and will then automatically select that rate. It will tell you how many seconds your message took, and how much total recording time it has now given you.

4.3 Record Your Messages

First, minimize any background sounds. Then proceed as follows:

- Have your message Worksheet in front of you and be prepared to recite the first Alarm (fault) Condition message in a loud clear voice within about 6 to 12 inches of the microphone located at the top of the front panel. Press:

  `1 ZZ ENTER`

  where ZZ is the appropriate 2-digit channel number, such as 01 for channel 1. Be sure to use leading zeroes, in order to keep ZZ a 2-digit entry. Use 00 for the Station ID message.

The voice specifically identifies the message you are about to record, and then prompts you to press the RECORD key and hold it just for the duration of your spoken message. Note that the RECORDING light comes on during recording.

Over the phone, since there is no RECORD key, the voice will prompt you to press ZERO to begin recording, and press ZERO again to stop recording. See Section 5.7, "Programming by Phone."

The Verbatim autodialer will immediately play back the message you have just recorded, allowing you to determine if you need to re-record it louder, softer or more clearly, etc.

Experiment with different volume levels to get the best message clarity. If there is too much background noise at the Verbatim autodialer site, record your messages over the phone.

Always stop the recording promptly to avoid wasting recording time.

- To record an alternate "Normal Condition" message for channel ZZ, press:

  `2 ZZ ENTER`

  and follow the same procedure as above.

- To review both existing messages for channel ZZ, press:

  `3 ZZ ENTER`

  The Verbatim autodialer will replay both existing messages for channel ZZ. This will include any default messages remaining in use.

Exceptions:

- For any channels programmed for "Status Only" or for Run Time Meter function, use code 1 ZZ for the Open Circuit message, and 2 ZZ for the Closed Circuit message.
- If you run out of recording time, you will hear the message "No more message time." See Section 4.2 above to re-establish total available recording time. You may elect to shorten some messages, or rely more on selected default messages, or you may Autoextend the available recording time. Then, re-record all messages.
- If you wish to extend the available time for a specific message while leaving the other messages unaffected, enter the code for recording that message, but add an extra digit 1 through 4, before pressing ENTER.

  The digit 1 (Rate 1) gives the shortest time and the best sound quality, while 4 (Rate 4) gives the longest time with poorest sound quality.

- If you wish to reinstate a default message, enter the code for recording that message, and an extra POINT before pressing ENTER. For example:

  `1 ZZ POINT ENTER`

- If you wish to use the default Station ID message but with a different ID number in place of the "one", press:

  `9 1 4 N ENTER`

  where N is the desired ID number which may be up to 16 digits long. Some users program the Verbatim autodialer's own phone number as its ID number.

- If you want to set a specific recording rate rather than letting Autoextend do it, press:

  `9 1 3 N ENTER`

  where N is the desired recording rate 1, 2, 3 or 4.

- You will then need to re-record any messages that were previously recorded at a different rate.

Please note that probes are still needed and that these need to be installed in a small field panel

Gems Sensors

Warrick® Series 16M

Installation and Operatio

SHOP DRAWING REVIEW

This review is for the sole purpose of ascertaining conformance with the general design concept, and in no way constitutes approval of the detail design inherent in the shop drawings, responsibility for which remains with the contractor submitting same.

	Reviewed
X	Revise As Noted
	Revise & Re-Submit

Submission No. 1
Project No. 12610
By ML
Date Nov. 15, 2012

CONESTOGA-ROVERS & ASSOCIATES

This bulletin should be used by experienced personnel as a guide to the installa
or installation of equipment should always be accompanied by competent techn
contact Gems Sensors or its representative if further information is required.

Specifications

Control Design: Solid state components enclosed in clear Lexan plug-in style housing. Housing carries no NEMA rating.

Contact Design: SPDT (1 form C): one normally open (N.O.) and one normally closed (N.C.), non-powered contacts.

Contact Ratings: 10A @ 120 or 240 VAC resistive, 1/3 H.P. @120 or 240 VAC.

Contact Life: Mechanical- 5 million operations. Electrical- 100,000 operations minimum at rated load.

Supply Voltage: 24, 120, or 240 VAC models- factory set. Plus 10%, minus 15%, 50/60 Hz.

Supply Current: 120, 240, 24 VAC, Relay energized 4.4 VA.

Secondary Circuit: 12 VAC RMS voltage on probes, 1.5 milli-amp current.

Sensitivity: Models operate from 0-1,000,000 OHM maximum specific resistance- factory set.

Temperature: -40 to 150° F. ambient.

Terminals: All connections #6-32 screw type with pressure clamps.

Time Delays: Standard, 0.5 seconds on rising level. Additional time delays on rising and/or falling available as option.

Listings: U.L. listed, Industrial Motor Control (508).

Installation

1. Install octal socket in appropriate enclosure using two (2) #6 or #8 metal screws.

1A. Install rail mount socket on appropriate rail (DIN mount) in appropriate enclosure if applicable.

2. Wire control per wiring diagram, following N.E.C. and local codes

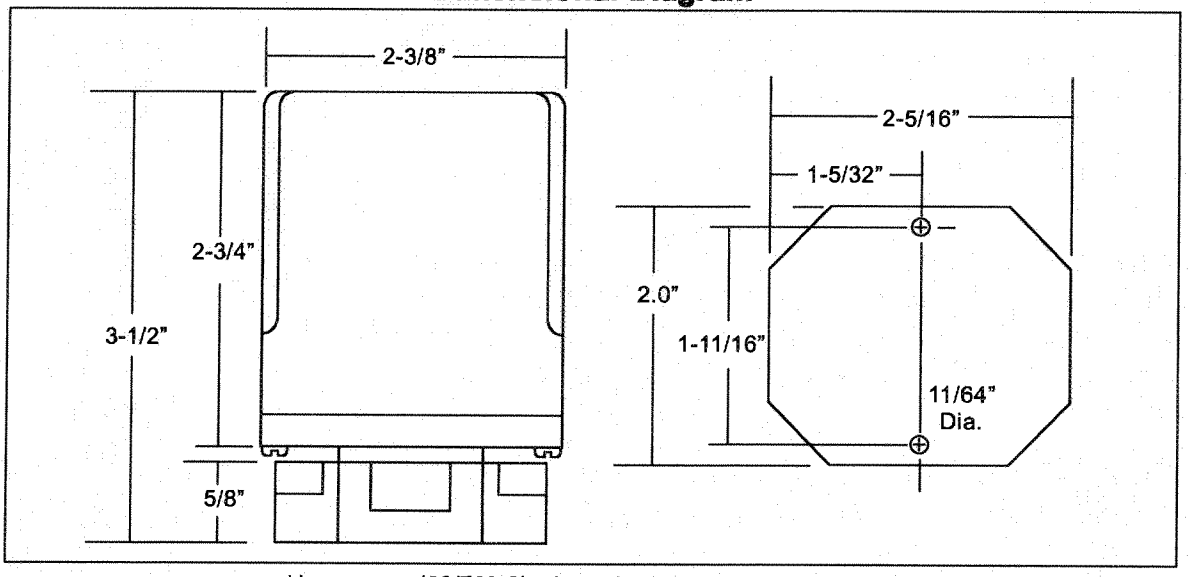
3. Install control module in socket.

Sensitivities vs Maximum Probe Wire Distance*

Sensitivity Character	Sensitivity (K Ohms)	Distance (Ft)
A or K	4.7	10,000
B or L	10	5,700
C or M	26	2,200
D or N	50	1,075
E or P	100	570
F or R	470	270
G or S	1,000	38

* Based on type MTW or THHN wire, #14 or #16 Awg.

Dimensional Diagram



Use copper (60/70° C) wire only. Torque to 20 inch pounds.

Operation

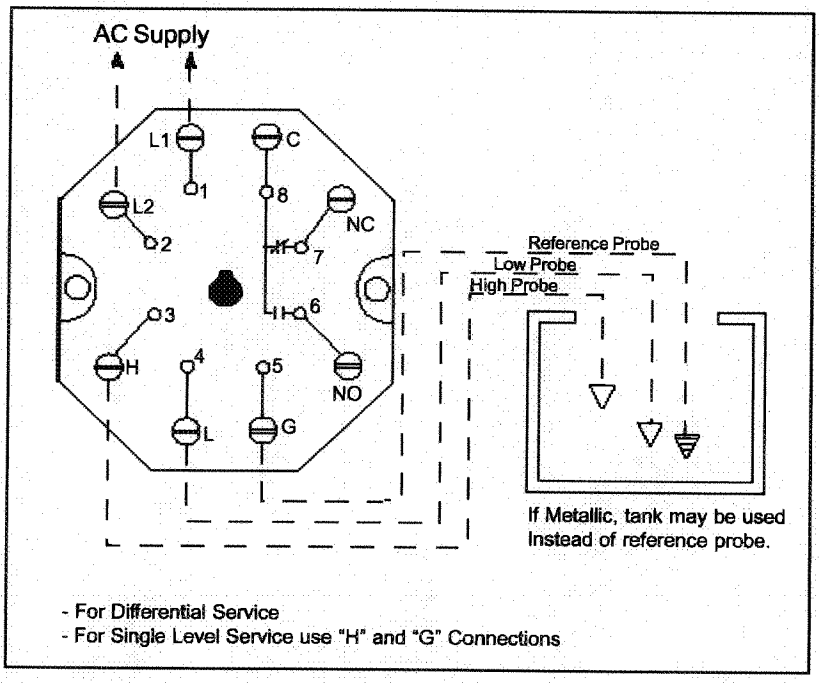
Direct Mode- Single Level Service: When the liquid rises to the electrode on terminal 3, the control energizes, changing state of the load contacts. (LED will be lit) The control remains energized until the liquid level recedes below electrode on terminal 3. The control then de-energizes, (LED will not be lit) returning load to original state.

Inverse Mode- Single Level Service: Control energizes with power, changing state of the load contacts. (LED will be lit) When the liquid rises to the electrode on terminal 3, the control de-energizes, returning the load contacts to shelf state. (LED will not be lit) The control remains de-energized until liquid level recedes below the electrode connected to terminal 3. The control then energizes.

Direct Mode- Differential Service: When the liquid rises to the electrode on terminal 3, the control energizes, changing state of the load contacts. (LED will be lit) The control remains energized until the liquid level recedes below electrode on terminal 4. The control then de-energizes, (LED will not be lit) returning the load contacts to original state.

Inverse Mode- Differential Service: Control energizes with power, (LED will be lit) changing state of the load contacts. When the liquid rises to the electrode on terminal 3, the control de-energizes, returning load contacts to shelf state. (LED will not be lit) The control remains de-energized until the liquid level recedes below the electrode on terminal 4. The control then energizes.

Wiring Diagram



Optional

Time Delays: With time delay on increasing level, the liquid must be in contact with the short electrode for the full duration of the time delay before control will operate. With delay on decreasing level, the liquid must be below long electrode for the full duration of the time delay before control will operate. In single level service, terminals 3 and 4 must be jumpered together to achieve time delays on both increasing and decreasing levels or just decreasing level.

16M- X-X-X-X-XX-XX

- **Time Delay:** (decreasing level) 1-20 sec.
- **Time Delay:** (increasing level) 1-20 sec.
- **Enclosure:** 0-none, 1-NEMA 1, 4-NEMA 4, 7-NEMA 7, 12-NEMA 12
- **Socket Style:** A- 8 Pin Octal, B- 8 Pin DIN mount, M- None, module only
- **Supply Voltage:** 1- 120 VAC, 2- 240 VAC, 3- 24 VAC, 8- 208/240 VAC*
- **Mode/Sensitivity:**
  - **Direct** A- 4.7K, B- 10K, C- 26K, D- 50K, E- 100K, F- 470K, G- 1M
  - **Inverse** K- 4.7K, L- 10K, M- 26K, N- 50K, P- 100K, R- 470K, S- 1M

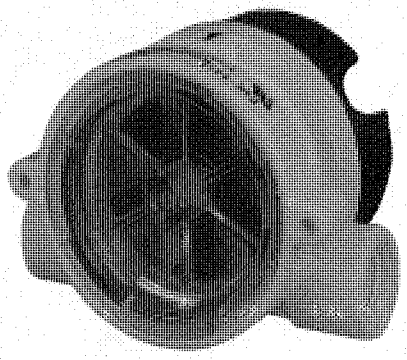
*187 Vmin to 255 Vmax VAC

Gems Sensors Inc.
One Cowles Road
Plainville, CT 06062-1198
Tel: 860-793-4579
Fax: 860-793-4580

Flow Rate Monitoring – RFA Types

▶ 0 to 10 VDC Analog Output

GEMS Sensors popularized the RotorFlow's paddlewheel design by combining high visibility rotors with solid-state electronics that are packaged into compact, panel mounting housings. They provide accurate flow rate output with integral visual confirmation...all with an unprecedented price/performance ratio. RFA Types feature a 0 to 10 VDC analog output which is proportional to flow rate.



Specifications

Wetted Materials	
Body	Brass, 316 Stainless Steel or Polypropylene (Hydrolytically Stable, Glass Reinforced)
Rotor Pin	Ceramic
Rotor	PPS Composite, Black[1]
Lens	Polysulfone
O-Ring	Viton® (Alloy Bodies); Buna N (Polypropylene Body)
Low Flow Adaptor	Glass Reinforced Polypropylene
Operating Pressure, Maximum	
Brass or Stainless Steel Body	200 PSIG (13.8 bar) @ 70°F (21°C), 100 PSIG (6.9 bar) @ 212°F (100°C)[2]
Polypropylene Body	100 PSIG (6.9 bar) @ 70°F (21°C), 40 PSI (2.8 bar) Max. @ 180°F (82°C)
Operating Temperature,	
Brass or Stainless Steel Body	-20°F to 212°F (-29°C to 100°C)
Polypropylene Body	-20°F to 180°F (-29°C to 82°C)
Electronics	150°F (65°C) Ambient
Viscosity, Maximum	200 SSU
Input Power	24 VDC, ±10%
Output Signal	0-10 VDC Analog Signal @ 1mA, Max.
Current Consumption	25 mA, Max.
Accuracy	See Table Below
Electrical Termination	22 AWG PVC-Jacketed, 24″ Cable. Color Coded: Red = +VDC; Black = Ground; White = Signal Output

Notes:
1. Standard on Stainless Steel bodies.
2. For higher pressure/temperature ratings stainless steel face plates are available. Consult factory.

How To Order

For standard configurations, specify Part Number based on desired body material and port size.

Body Material	Port Size NPT	Flow Ranges – GPM: Low Range (Accuracy)	Part Number	Standard Range (Accuracy)	Part Number
Polypropylene	.25″	0.1 to 1.0 (±7.0%)	**230206**⚡	0.5 to 5.0 (±7.0%)	**230205**⚡
	.50″	1.5 to 12.0 (±7.0%)	**230207**⚡	4.0 to 20.0 (±15.0%)	**230201**⚡
Brass	.25″	0.1 to 1.0 (±7.0%)	**230209**⚡	0.5 to 5.0 (±7.0%)	**230202**
	.50″	1.5 to 12.0 (±7.0%)	**230210**	4.0 to 20.0 (±15.0%)	**230203**
	.75″	—	—	5.0 to 30.0 (±10.0%)	**230212**
	1.00″	—	—	8.0 to 60.0 (±15.0%)	**230214**
Stainless Steel	9/16″-18	0.1 to 1.0 (±7.0%)	**230211**	0.5 to 5.0 (±7.0%)	**230204**
	.50″	1.5 to 12.0 (±7.0%)	**230216**	4.0 to 20.0 (±15.0%)	**230208**
	.75″	—	—	5.0 to 30.0 (±10.0%)	**230213**
	1.00″	—	—	8.0 to 60.0 (±15.0%)	**230215**

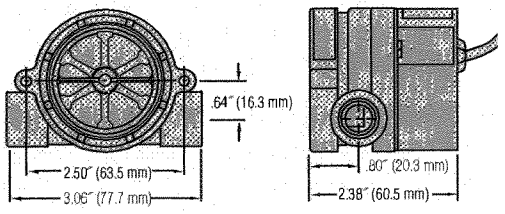
⚡ – Stock Items.

Typical Applications

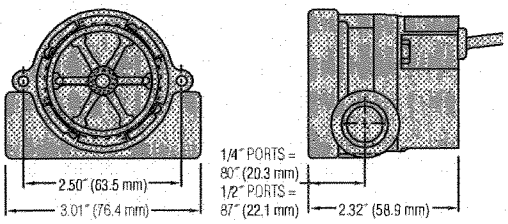
- Water Purification/Dispensing Systems
- Chemical Metering Equipment
- Lasers and Welders
- Water Injection Systems
- Semiconductor Processing Equipment
- Chillers and Heat Exchangers

Dimensions

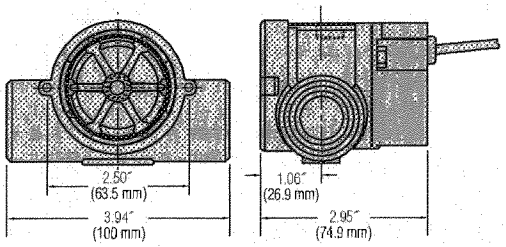
Polypropylene Bodies



Brass and Stainless Steel Bodies - .25″ and .50″ Ports

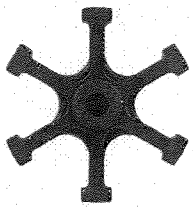


Brass Bodies – .75″ and 1.00″ NPT Ports



High Resolution Black Rotor

PPS composite. Each of the six rotor arms is magnetized. A PTFE loaded bushing ensures long life.



Important Points!

Product must be maintained and installed in strict accordance with the National Electrical Code and Gems product catalog and instruction bulletin. Failure to observe this warning could result in serious injuries or damages.

For hazardous area applications involving such things as (but not limited to) ignitable mixtures, combustible dust and flammable materials, use an appropriate explosion-proof enclosure or intrinsically safe interface device.

The pressure and temperature limitations shown on the individual catalog pages and drawings for the specified flow switches must not be exceeded. These pressures and temperatures take into consideration possible system surge pressures/temperatures and their frequencies.

Selection of materials for compatibility with the media is critical to the life and operation of GEMS flow switches. Take care in the proper selection of materials of construction, particularly wetted materials.

Life expectancy of switch contacts varies with applications. Contact GEMS if life cycle testing is required.

Ambient temperature changes do affect switch set points, since the specific gravity of a liquid can vary with temperature.

Flow switches have been designed to resist shock and vibration; however, shock and vibration should be minimized.

Filter liquid media containing particulate and/or debris to ensure the proper operation of our products.

Electrical entries and mounting points in an enclosed tank may require liquid/vapor sealing.

Flow switches must not be field-repaired.

Physical damage sustained by the product may render it unserviceable.

Gems Sensors Inc.
One Cowles Road
Plainville, CT
06062.1198

tel 860.747.3000
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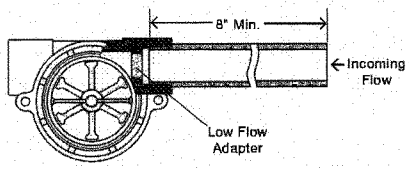
P/N 157258
Rev. H

RFO/RFA-2500 Series Continuous Output RotorFlow® Sensors

Instruction Bulletin No. 157258

RotorFlow units monitor dynamic fluid flow. The rotor reacts to turbulence, pulsation, entrained air, and other flow anomalies induced in the flow stream by other process hardware. For optimum performance, install RotorFlow units where nominal flow conditions exist, with ports located at the top. Incoming flow may be placed to either port. A minimum of 8" of straight pipe on the inlet side is recommended. Note: **Frequency output (RFO) and voltage output (RFA) are determined by the velocity of the monitored fluid acting on the sensor rotor. Input piping with an orifice smaller than that of the sensor input will affect sensor output.**



Low Flow Applications

A low flow adapter is supplied with all RotorFlow units. It is used to produce accurate response at low flow rates. Fit the adapter as shown above, in the port selected for incoming flow. ***See Flow Range Chart below.***

			Flow Range - GPM		
			Standard	Low Flow	
Body Material	Port Size NPT	RFO Part Number	High Range	Low* Range	Adapter Part Number
Polypropylene	.25"	155421	0.5 - 5.0	0.1 - 1.0	152147
	.50"	155481	4.0 - 20.0	1.5 - 12.0	151832
Brass	.25"	156261	0.5 - 5.0	0.1 - 1.0	152147
	.50"	156262	4.0 - 20.0	1.5 - 12.0	151832
	.75"	194761	3.0 - 30.0	N/A	N/A
	1.0"	194762	5.0 - 60.0	N/A	N/A
Stainless Steel	9/16 - 18 J514	165071	0.5 - 5.0	0.1 - 1.0	152147
	1/2" NPT	165075	4.0 - 20.0	1.5 - 12	151832
	.75"	194763	3.0 - 30.0	N/A	N/A
	1.0"	194764	5.0 - 60.0	N/A	N/A

*Note: **Other low flow ranges are available. Please consult the Factory.**

WARNING

When determining chemical compatibility of materials of construction, the flow media and application-associated environmental conditions should be carefully considered.

Installation

RotorFlow sensors connect to piping via NPT mating thread forms. The following guidelines are provided to assist with installation for a leak-free seal, without damage to the unit:

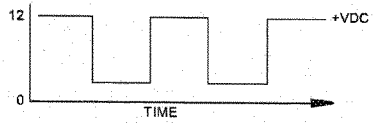
1) Apply pipe thread sealant to male pipe threads.
2) Thread RotorFlow unit onto male pipe thread until hand-tight.
3) Tighten pipe 1 to 1-1/2 additional turns.
4) If improper seal results, continue turning pipe into unit in 1/4 turn increments.
   Do not exceed one additional turn on plastic versions.

Recommended Pipe Sealants: **(a) Permatex® "No More Leaks" (b) Teflon® Thread Tape.**

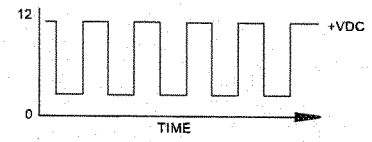
Filtration and Cleaning: 150 micron filtration is recommended. However, should foreign particles enter the RotorFlow sensor, accumulation is easily cleared by removing the lens from the body. The lens is removed by turning its center rib 45° counter-clockwise and then pulling it out. To reinstall the lens, simply reverse the process. Pressure must be relieved from the system prior to sensor clean-out.

Signal Output (RFO): Output signal for RFO types is an on/off pulse of the DC voltage supplied to the unit. It is compatible with all digital logic families. Input voltage range is 4.5 to 24 VDC. Frequency of the output pulse is proportional to the flow rate and ranges from approximately 15 Hz at low flow to 225 Hz at high flow. See example below:

Low Flow



High Flow



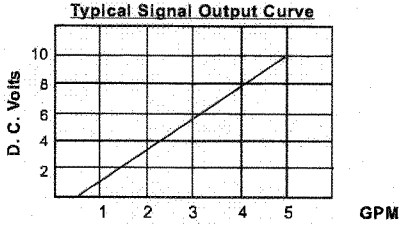
Note: Consult Factory for flow rate/frequency curves.

Electrical Data: Input power and output are connected via a multi-conductor, PVC-jacketed 24" cable. Color codes are shown below:

RFO: 4.5 VDC to24 VDC (Max)
RFA: 24 VDC ± 10%

+VDC	Red
Ground	Black
Signal Output	White

Typical Signal Output Curve



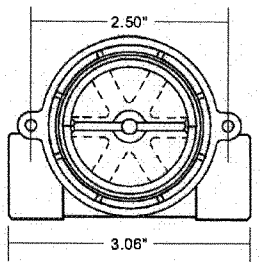
Signal Output (RFA)
Output signal for RFA types is a voltage output from 0-10 VDC and is proportional to the flow rate.

Panel Mounting

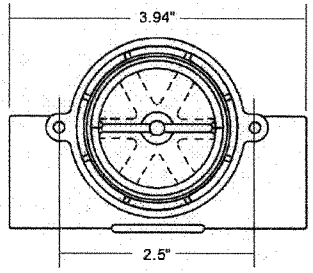
Any RotorFlow sensor may be panel mounted using holes integrated into the bodies:

Plastic (Polypropylene) Bodies: Two (2) mounting ears are provided at the body centerline to receive #8 self-tapping screws. **Note:** ANSI T Type 23 self-tapping screws are recommended. They may be replaced with standard machine screws if reinstallation should be required.

Brass and Stainless Steel Bodies: Two (2) mounting holes are provided on the body centerline, as shown below. #8-32UNC-2B screws are required for mounting.



Plastic, Brass, Stainless Steel
1/4", 1/2", 9/16"-18



Brass/Stainless Steel
3/4" & 1"

Specifications

Wetted Materials		
Body	Stainless Steel, Brass or Polypropylene (Hydrolytically Stable, Glass-Reinforced)†	
Rotor Pin	Ceramic	
Rotor	PPS/Teflon Composite; Black	
Lens	Polysulfone	
O-Ring	Buna N or Viton	
Operating Pressure, Max.		
Brass/Stainless Steel Body	200 PSIG at 70°F/80 PSIG @ 212°F	
Polypropylene Body	100 PSIG at 70°F/40 PSIG @ 212°F	
Operating Temperature, Max.		
Brass Body	212°F (82.2°C)	
Stainless Steel Body	212°F (100°C)	
Polypropylene Body	180°F (82.2°C)	
Electronics (All Bodies)	150°F (65.5°C) - Ambient	
Viscosity, Max.	200 SSU	
Input Power	RFO: 4.5 to 24 VDC/12mA	RFA: 24 VDC (±10%)/22mA
Output Signal	RFO: Frequency Pulses - Proportional to Flow Rate	RFA: 0 - 10 VDC. Proportional to Flow Rate
Current Source Output, Max.	RFO: 70mA (Max)	RFA: 10mA (Max)
Frequency Output Range	RFO: ~15 Hz to 225 Hz	
Electrical Termination	Red (+) VDC, Black (-) Ground, White - Signal Output	

† Hydrolytically stable, glass-reinforced, Polypropylene is UL-recognized to UL746B at a relative temperature index of 65°C

A RotorFlow Repair Kit is available, including the following replacement parts: lens, O-ring, shaft, and rotor. Consult Factory to order.

CE

This product is suitable for Class I and Class II applications only, per the requirements of standard EN60730 and any additional specific requirements for a particular application or medium being sensed. Class I compliance of metal bodied units requires a ground connection between the metal body and the earthing system of the installation. Class I compliance of plastic bodied units in contact with a conductive medium requires that the medium be effectively earthed so as to provide an earthed barrier between the unit and accessible areas. For Class III compliance, a supply at safety extra-low voltage (SELV) must be provided. Please consult the Factory for compliance information on specific part numbers.

Appendix E
Historical Groundwater Data

Appendix E.1

Analytical Results Summary - VOCs
Bay City Industrial Land
Bay City, Michigan

AOI:											
Sample Location:			**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**Crotty Street Channel CB-2**	**Crotty Street Channel EW14**	**Machine Storage Area EW6**	**Machine Storage Area EW7**	**Machine Storage Area EW8**
Sample ID:			**W-12610-021214-SSH-1401**	**W-12610-022614-SSH-1403**	**W-12610-090514-SSH-1411**	**W-12610-031615-SSH-1501**	**W-12610-102511-SSH-027**	**GW-12610-071811-SH-004**	**GW-12610-072011-SH-016**	**GW-12610-071811-SH-001(C)**	**GW-12610-071911-SH-009C**
Sample Date:			**2/12/2014**	**2/26/2014**	**9/5/2014**	**3/16/2015**	**10/25/2011**	**7/18/2011**	**7/20/2011**	**7/18/2011**	**7/19/2011**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	mg/L	0.077	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	0.2	-	-	-	-	-	-	-	-	-
1,1,2,2-Tetrachloroethane	mg/L	0.0085	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane	mg/L	0.005	-	-	-	-	-	-	-	-	-
1,1-Dichloroethane	mg/L	0.88	-	-	-	-	-	-	-	-	-
1,1-Dichloroethene	mg/L	0.007	-	-	-	-	-	-	-	-	-
1,2,3-Trichloropropane	mg/L	0.042	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	mg/L	0.0002	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.00005	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	0.005	-	-	-	-	-	-	-	-	-
1,2-Dichloroethene (total)	mg/L		-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	mg/L	0.005	-	-	-	-	-	-	-	-	-
1,4-Dioxane	mg/L	0.085	-	-	-	-	-	-	-	-	-
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	13	-	-	-	-	-	-	-	-	-
2-Hexanone	mg/L	1	-	-	-	-	-	-	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	1.8	-	-	-	-	-	-	-	-	-
Acetone	mg/L	0.73	-	-	-	-	-	-	-	-	-
Acetonitrile	mg/L	0.14	-	-	-	-	-	-	-	-	-
Acrolein	mg/L	0.12	-	-	-	-	-	-	-	-	-
Acrylonitrile	mg/L	0.0026	-	-	-	-	-	-	-	-	-
Allyl chloride	mg/L		-	-	-	-	-	-	-	-	-
Benzene	mg/L	0.005	-	-	-	-	-	-	-	-	-
Benzofuran	mg/L		-	-	-	-	-	-	-	-	-
Bromoform	mg/L	0.08	-	-	-	-	-	-	-	-	-
Bromomethane (Methyl bromide)	mg/L	0.01	-	-	-	-	-	-	-	-	-
Carbon disulfide	mg/L	0.8	-	-	-	-	-	-	-	-	-
Carbon tetrachloride	mg/L	0.005	-	-	-	-	-	-	-	-	-
Chlorobenzene	mg/L	0.1	-	-	-	-	-	-	-	-	-
Chloroethane	mg/L	0.43	-	-	-	-	-	-	-	-	-
Chloroform (Trichloromethane)	mg/L	0.08	-	-	-	-	-	-	-	-	-
Chloromethane (Methyl chloride)	mg/L	0.26	-	-	-	-	-	-	-	-	-
Chloroprene	mg/L		-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	mg/L	0.07	-	-	-	-	0.001 U	0.001 U	0.001 U	0.001 U	**0.2**
cis-1,3-Dichloropropene	mg/L		-	-	-	-	-	-	-	-	-
Dibromochloromethane	mg/L	0.08	-	-	-	-	-	-	-	-	-
Dibromomethane	mg/L	0.08	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	mg/L	1.7	-	-	-	-	-	-	-	-	-
Ethyl methacrylate	mg/L		-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/L	0.074	-	-	-	-	0.001 U	0.001 U	0.00033 J	0.001 U	0.003 J
Iodomethane	mg/L		-	-	-	-	-	-	-	-	-
Isobutanol (isobutyl alcohol)	mg/L	2.3	-	-	-	-	-	-	-	-	-
m&p-Xylenes	mg/L		-	-	-	-	-	-	-	-	-
Methyl acrylonitrile	mg/L		-	-	-	-	-	-	-	-	-
Methyl methacrylate	mg/L		-	-	-	-	-	-	-	-	-
Methylene chloride	mg/L	0.005	-	-	-	-	-	-	-	-	-
Propionitrile (ethyl cyanide)	mg/L		-	-	-	-	-	-	-	-	-
Styrene	mg/L	0.1	-	-	-	-	-	-	-	-	-
Tetrachloroethene	mg/L	0.005	-	-	-	-	-	-	-	-	-
Toluene	mg/L	0.79	-	-	-	-	0.001 U	0.001 U	0.001 U	0.001 U	0.018
trans-1,2-Dichloroethene	mg/L	0.1	-	-	-	-	0.001 U	0.001 U	0.001 U	0.001 U	0.0029 J
trans-1,3-Dichloropropene	mg/L		-	-	-	-	-	-	-	-	-
trans-1,4-Dichloro-2-butene	mg/L		-	-	-	-	-	-	-	-	-
Trichloroethene	mg/L	0.005	-	-	-	-	-	-	-	-	-
Trichlorofluoromethane (CFC-11)	mg/L	2.6	-	-	-	-	-	-	-	-	-
Vinyl acetate	mg/L	0.64	-	-	-	-	-	-	-	-	-
Vinyl chloride	mg/L	0.002	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	**0.14**
Xylene(ortho) A	mg/L		-	-	-	-	-	-	-	-	-
Xylenes (total)	mg/L	0.28	-	-	-	-	0.002 U	0.002 U	0.002 U	0.00099 J	0.016

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.1

Analytical Results Summary - VOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			EW9	EW9	EW10	EW11	EW12	LMW17S	LMW17S	LMW18S	LMW18S	LMW19S
Sample ID:			GW-12610-071811-SH-002(C)	GW-12610-071811-SH-003	GW-12610-072011-SH-017	GW-12610-071911-SH-008C	GW-12610-072011-SH-015	LMW17S-01	LMW17S-02	LMW18S-01	LMW18S-02	LMW19S-01
Sample Date:			7/18/2011	7/18/2011 (Duplicate)	7/20/2011	7/19/2011	7/20/2011	9/7/1993	3/29/1994	9/7/1993	3/29/1994	9/7/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Volatile Organic Compounds												
1,1,1,2-Tetrachloroethane	mg/L	0.077	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	0.2	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
1,1,2,2-Tetrachloroethane	mg/L	0.0085	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
1,1,2-Trichloroethane	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
1,1-Dichloroethane	mg/L	0.88	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
1,1-Dichloroethene	mg/L	0.007	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
1,2,3-Trichloropropane	mg/L	0.042	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	mg/L	0.0002	-	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.00005	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
1,2-Dichloroethene (total)	mg/L		-	-	-	-	-	0.01	0.045	0.001 U	0.01 U	0.001 U
1,2-Dichloropropane	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
1,4-Dioxane	mg/L	0.085	-	-	-	-	-	-	-	-	-	-
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	13	-	-	-	-	-	0.05 U	0.05 U	0.05 U	0.5 U	0.05 U
2-Hexanone	mg/L	1	-	-	-	-	-	0.05 U	0.05 U	0.05 U	0.5 U	0.05 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	1.8	-	-	-	-	-	0.05 U	0.05 U	0.05 U	0.5 U	0.05 U
Acetone	mg/L	0.73	-	-	-	-	-	0.05 U	0.05 U	0.05 U	0.5 U	0.05 U
Acetonitrile	mg/L	0.14	-	-	-	-	-	-	-	-	-	-
Acrolein	mg/L	0.12	-	-	-	-	-	-	-	-	-	-
Acrylonitrile	mg/L	0.0026	-	-	-	-	-	-	-	-	-	-
Allyl chloride	mg/L		-	-	-	-	-	-	-	-	-	-
Benzene	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	**0.062**	**0.037**	**0.01**
Benzofuran	mg/L		-	-	-	-	-	-	-	-	-	0.58
Bromoform	mg/L	0.08	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Bromomethane (Methyl bromide)	mg/L	0.01	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Carbon disulfide	mg/L	0.8	-	-	-	-	-	0.05 U	0.05 U	0.05 U	0.5 U	0.05 U
Carbon tetrachloride	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	0.002	0.01 U	0.001
Chlorobenzene	mg/L	0.1	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Chloroethane	mg/L	0.43	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Chloroform (Trichloromethane)	mg/L	0.08	-	-	-	-	-	0.005	0.001 U	0.025	0.01 U	0.019
Chloromethane (Methyl chloride)	mg/L	0.26	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Chloroprene	mg/L		-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	mg/L	0.07	0.001 U	0.001 U	0.001 U	**0.63**	0.049	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
cis-1,3-Dichloropropene	mg/L		-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Dibromochloromethane	mg/L	0.08	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Dibromomethane	mg/L	0.08	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	mg/L	1.7	-	-	-	-	-	-	-	-	-	-
Ethyl methacrylate	mg/L		-	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/L	0.074	0.00054 J	0.00054 J	0.001 U	0.029 U	0.0014 J	0.001 U	0.001 U	**0.23**	**0.41**	**0.18**
Iodomethane	mg/L		-	-	-	-	-	-	-	-	-	-
Isobutanol (isobutyl alcohol)	mg/L	2.3	-	-	-	-	-	-	-	-	-	-
m&p-Xylenes	mg/L		-	-	-	-	-	0.002 U	0.002 U	0.36	0.44	0.29
Methyl acrylonitrile	mg/L		-	-	-	-	-	-	-	-	-	-
Methyl methacrylate	mg/L		-	-	-	-	-	-	-	-	-	-
Methylene chloride	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Propionitrile (ethyl cyanide)	mg/L		-	-	-	-	-	-	-	-	-	-
Styrene	mg/L	0.1	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Tetrachloroethene	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Toluene	mg/L	0.79	0.0017	0.0018	0.001 U	0.033	0.0035	0.001 U	0.001 U	0.065	0.069	0.028
trans-1,2-Dichloroethene	mg/L	0.1	0.001 U	0.001 U	0.001 U	0.029 U	0.0011 J	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L		-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
trans-1,4-Dichloro-2-butene	mg/L		-	-	-	-	-	-	-	-	-	-
Trichloroethene	mg/L	0.005	-	-	-	-	-	0.001 U	0.001 U	0.001 U	0.01 U	0.001 U
Trichlorofluoromethane (CFC-11)	mg/L	2.6	-	-	-	-	-	-	-	-	-	-
Vinyl acetate	mg/L	0.64	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	mg/L	0.002	0.001 U	0.001 U	0.001 U	**0.098**	**0.086**	**0.011**	**0.026**	0.001 U	0.01 U	0.001 U
Xylene(ortho) A	mg/L		-	-	-	-	-	0.001 U	0.001 U	0.28	0.2	0.11
Xylenes (total)	mg/L	0.28	0.0034	0.0034	0.002 U	0.057 U	0.014	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.1

Analytical Results Summary - VOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			LMW19S	MW1S	MW1S	MW100S	MW100S	MW101S	MW101S	MW102D1	MW102D1	MW102D2	MW102D2
Sample ID:			LMW19S-02	MW1S-01	MW1S-02	MW100S-01	MW100S-02	MW101S-01	MW101S-02	MW102D1-01	MW102D1-02	MW102D2-01	MW102D2-02
Sample Date:			3/29/1994	9/7/1993	3/17/1994	8/20/1993	3/15/1994	9/3/1993	3/29/1994	9/5/1993	3/24/1994	9/5/1993	3/24/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Volatile Organic Compounds													
1,1,1,2-Tetrachloroethane	mg/L	0.077	-	-	-	0.001 U	0.001 U	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	0.2	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1,2,2-Tetrachloroethane	mg/L	0.0085	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1,2-Trichloroethane	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethane	mg/L	0.88	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethene	mg/L	0.007	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2,3-Trichloropropane	mg/L	0.042	-	-	-	0.005 U	0.005 U	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	mg/L	0.0002	-	-	-	0.1 U	0.1 U	-	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.00005	-	-	-	0.001 U	0.001 U	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2-Dichloroethene (total)	mg/L		0.01 U	0.012	0.22	0.001 U	0.001 U	0.074	0.085	0.002	0.001 U	0.001 U	0.001 U
1,2-Dichloropropane	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,4-Dioxane	mg/L	0.085	-	-	-	0.046	0.048	-	-	-	-	-	-
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	13	0.5 U	0.05 U	0.25 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
2-Hexanone	mg/L	1	0.5 U	0.05 U	0.25 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	1.8	0.5 U	0.05 U	0.25 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Acetone	mg/L	0.73	0.5 U	0.05 U	0.25 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.26	0.05 U
Acetonitrile	mg/L	0.14	-	-	-	0.01 U	0.01 U	-	-	-	-	-	-
Acrolein	mg/L	0.12	-	-	-	0.1 U	0.1 U	-	-	-	-	-	-
Acrylonitrile	mg/L	0.0026	-	-	-	0.001 U	0.001 U	-	-	-	-	-	-
Allyl chloride	mg/L		-	-	-	0.1 U	0.1 U	-	-	-	-	-	-
Benzene	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001	0.001 U	**0.007**	**0.014**	0.001 U	0.001 U	0.001 U	0.001 U
Benzofuran	mg/L		-	-	-	-	-	-	-	-	-	-	-
Bromoform	mg/L	0.08	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Bromomethane (Methyl bromide)	mg/L	0.01	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Carbon disulfide	mg/L	0.8	0.5 U	0.05 U	0.25 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Carbon tetrachloride	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U	0.001	0.001 U
Chlorobenzene	mg/L	0.1	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroethane	mg/L	0.43	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroform (Trichloromethane)	mg/L	0.08	0.01 U	0.013	0.005 U	0.001 U	0.001 U	0.013	0.001 U	0.012	0.001 U	0.018	0.001 U
Chloromethane (Methyl chloride)	mg/L	0.26	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroprene	mg/L		-	-	-	-	0.005 U	-	-	-	-	-	-
cis-1,2-Dichloroethene	mg/L	0.07	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U
cis-1,3-Dichloropropene	mg/L		0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Dibromochloromethane	mg/L	0.08	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Dibromomethane	mg/L	0.08	-	-	-	0.001 U	0.001 U	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	mg/L	1.7	-	-	-	0.02 U	0.02 U	-	-	-	-	-	-
Ethyl methacrylate	mg/L		-	-	-	0.02 U	0.02 U	-	-	-	-	-	-
Ethylbenzene	mg/L	0.074	**0.13**	0.001 U	0.005 U	0.001 U	0.001 U	0.001	0.002	0.001 U	0.001 U	0.001 U	0.001 U
Iodomethane	mg/L		-	-	-	0.005 U	0.005 U	-	-	-	-	-	-
Isobutanol (isobutyl alcohol)	mg/L	2.3	-	-	-	0.2 U	0.2 U	-	-	-	-	-	-
m&p-Xylenes	mg/L		0.15	0.002 U	0.02	-	-	0.012	0.055	0.002 U	0.002 U	0.002 U	0.002 U
Methyl acrylonitrile	mg/L		-	-	-	0.005 U	0.005 U	-	-	-	-	-	-
Methyl methacrylate	mg/L		-	-	-	0.02 U	0.02 U	-	-	-	-	-	-
Methylene chloride	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Propionitrile (ethyl cyanide)	mg/L		-	-	-	0.05 U	0.05 U	-	-	-	-	-	-
Styrene	mg/L	0.1	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Tetrachloroethene	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Toluene	mg/L	0.79	0.01	0.001 U	0.021	0.001	0.001 U	0.002	0.033	0.001 U	0.001 U	0.001 U	0.001 U
trans-1,2-Dichloroethene	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L		0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
trans-1,4-Dichloro-2-butene	mg/L		-	-	-	0.005 U	0.005 U	-	-	-	-	-	-
Trichloroethene	mg/L	0.005	0.01 U	0.001 U	0.005 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Trichlorofluoromethane (CFC-11)	mg/L	2.6	-	-	-	0.005 U	0.005 U	-	-	-	-	-	-
Vinyl acetate	mg/L	0.64	-	-	-	0.01 U	0.01 U	-	-	-	-	-	-
Vinyl chloride	mg/L	0.002	0.01 U	0.001 U	**0.07**	0.01 U	0.01 U	**0.04**	**0.067**	**0.035**	0.001 U	0.001 U	0.001 U
Xylene(ortho) A	mg/L		0.06	0.001 U	0.02	-	-	0.01	0.025	0.001 U	0.001 U	0.001 U	0.001 U
Xylenes (total)	mg/L	0.28	-	-	-	0.003 U	0.003 U	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.1

Analytical Results Summary - VOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			**MW102D3**	**MW102D3**	**MW102D4**	**MW102D4**	**MW300S**	**MW300S**	**LMW13S**	**LMW13S**	**LMW15D**	**LMW15D**	**LMW15D**	**MW301D1**	**MW301D1**
Sample ID:			**MW102D3-01**	**MW102D3-02**	**MW102D4-01**	**MW102D4-02**	**MW300S-01**	**MW300S-02**	**LMW13S-01**	**LMW13S-02**	**LMW150D-01-FD**	**LMW15D-01**	**LMW15D-02**	**MW301D1-01**	**MW301D1-02**
Sample Date:			**9/5/1993**	**3/24/1994**	**9/5/1993**	**3/28/1994**	**9/7/1993**	**3/29/1994**	**9/5/1993**	**3/28/1994**	**9/5/1993 (Duplicate)**	**9/5/1993**	**3/28/1994**	**8/23/1993**	**3/24/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**													
Volatile Organic Compounds															
1,1,1,2-Tetrachloroethane	mg/L	0.077	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	0.2	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1,2,2-Tetrachloroethane	mg/L	0.0085	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1,2-Trichloroethane	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethane	mg/L	0.88	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethene	mg/L	0.007	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2,3-Trichloropropane	mg/L	0.042	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	mg/L	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.00005	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2-Dichloroethene (total)	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.011	0.004	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2-Dichloropropane	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,4-Dioxane	mg/L	0.085	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	13	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
2-Hexanone	mg/L	1	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.09 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	1.8	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Acetone	mg/L	0.73	0.34	0.05 U	0.35	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Acetonitrile	mg/L	0.14	-	-	-	-	-	-	-	-	-	-	-	-	-
Acrolein	mg/L	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-
Acrylonitrile	mg/L	0.0026	-	-	-	-	-	-	-	-	-	-	-	-	-
Allyl chloride	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Benzene	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Benzofuran	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Bromoform	mg/L	0.08	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Bromomethane (Methyl bromide)	mg/L	0.01	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Carbon disulfide	mg/L	0.8	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Carbon tetrachloride	mg/L	0.005	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002	0.001 U	0.001 U	0.001 U
Chlorobenzene	mg/L	0.1	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroethane	mg/L	0.43	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroform (Trichloromethane)	mg/L	0.08	0.02	0.001 U	0.018	0.001 U	0.009	0.001 U	0.015	0.001 U	0.009	0.027	0.001 U	0.001 U	0.001 U
Chloromethane (Methyl chloride)	mg/L	0.26	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroprene	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	mg/L	0.07	0.001	0.001 U	0.002	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
cis-1,3-Dichloropropene	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Dibromochloromethane	mg/L	0.08	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Dibromomethane	mg/L	0.08	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	mg/L	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-
Ethyl methacrylate	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	mg/L	0.074	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Iodomethane	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Isobutanol (isobutyl alcohol)	mg/L	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
m&p-Xylenes	mg/L		0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.004	0.002 U
Methyl acrylonitrile	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl methacrylate	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Methylene chloride	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Propionitrile (ethyl cyanide)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	mg/L	0.1	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Tetrachloroethene	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Toluene	mg/L	0.79	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
trans-1,2-Dichloroethene	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
trans-1,4-Dichloro-2-butene	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Trichlorofluoromethane (CFC-11)	mg/L	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl acetate	mg/L	0.64	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	mg/L	0.002	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.002	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Xylene(ortho) A	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.003	0.001 U
Xylenes (total)	mg/L	0.28	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.1

Analytical Results Summary - VOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Support Facilities Area**	**Support Facilities Area**
Sample Location:			**MW301D2**	**MW301D2**	**MW301D2**	**MW301D3**	**MW301D3**	**MW301D4**	**MW301D4**	**MSA-5S**	**MSA-5S**
Sample ID:			**MW3011D2-01-FD**	**MW301D2-01**	**MW301D2-02**	**MW301D3-01**	**MW301D3-02**	**MW301D4-01**	**MW301D4-02**	**MSA-5-01**	**MSA-5**
Sample Date:			**8/20/1993 (Duplicate)**	**8/20/1993**	**3/15/1994**	**9/2/1993**	**3/25/1994**	**9/2/1993**	**3/25/1994**	**9/5/1993**	**3/16/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Volatile Organic Compounds											
1,1,1,2-Tetrachloroethane	mg/L	0.077	0.001 U	0.001 U	0.001 U	-	-	-	-	-	-
1,1,1-Trichloroethane	mg/L	0.2	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1,2,2-Tetrachloroethane	mg/L	0.0085	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1,2-Trichloroethane	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethane	mg/L	0.88	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethene	mg/L	0.007	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2,3-Trichloropropane	mg/L	0.042	0.005 U	0.005 U	0.005 U	-	-	-	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	mg/L	0.0002	0.1 U	0.1 U	0.1 U	-	-	-	-	-	-
1,2-Dibromoethane (Ethylene dibromide)	mg/L	0.00005	0.001 U	0.001 U	0.001 U	-	-	-	-	-	-
1,2-Dichloroethane	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2-Dichloroethene (total)	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,2-Dichloropropane	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
1,4-Dioxane	mg/L	0.085	0.001 U	0.001 U	0.004	-	-	-	-	-	-
2-Butanone (Methyl ethyl ketone) (MEK)	mg/L	13	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
2-Hexanone	mg/L	1	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	mg/L	1.8	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Acetone	mg/L	0.73	0.05 U	0.19	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Acetonitrile	mg/L	0.14	0.01 U	0.01 U	0.01 U	-	-	-	-	-	-
Acrolein	mg/L	0.12	0.1 U	0.1 U	0.1 U	-	-	-	-	-	-
Acrylonitrile	mg/L	0.0026	0.001 U	0.001 U	0.001 U	-	-	-	-	-	-
Allyl chloride	mg/L		0.1 U	0.1 U	0.1 U	-	-	-	-	-	-
Benzene	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Benzofuran	mg/L		-	-	-	-	-	-	-	-	-
Bromoform	mg/L	0.08	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Bromomethane (Methyl bromide)	mg/L	0.01	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Carbon disulfide	mg/L	0.8	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Carbon tetrachloride	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chlorobenzene	mg/L	0.1	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroethane	mg/L	0.43	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroform (Trichloromethane)	mg/L	0.08	0.004	0.005	0.001 U	0.016	0.001 U	0.016	0.001 U	0.015	0.001 U
Chloromethane (Methyl chloride)	mg/L	0.26	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Chloroprene	mg/L		-	-	0.005 U	-	-	-	-	-	-
cis-1,2-Dichloroethene	mg/L	0.07	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
cis-1,3-Dichloropropene	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Dibromochloromethane	mg/L	0.08	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Dibromomethane	mg/L	0.08	0.001 U	0.001 U	0.001 U	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	mg/L	1.7	0.02 U	0.02 U	0.02 U	-	-	-	-	-	-
Ethyl methacrylate	mg/L		0.02 U	0.02 U	0.02 U	-	-	-	-	-	-
Ethylbenzene	mg/L	0.074	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Iodomethane	mg/L		0.005 U	0.005 U	0.005 U	-	-	-	-	-	-
Isobutanol (isobutyl alcohol)	mg/L	2.3	0.2 U	0.2 U	0.2 U	-	-	-	-	-	-
m&p-Xylenes	mg/L		-	-	-	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Methyl acrylonitrile	mg/L		0.005 U	0.005 U	0.005 U	-	-	-	-	-	-
Methyl methacrylate	mg/L		0.02 U	0.02 U	0.02 U	-	-	-	-	-	-
Methylene chloride	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Propionitrile (ethyl cyanide)	mg/L		0.05 U	0.05 U	0.05 U	-	-	-	-	-	-
Styrene	mg/L	0.1	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Tetrachloroethene	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Toluene	mg/L	0.79	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
trans-1,2-Dichloroethene	mg/L	0.1	-	-	-	-	-	-	-	-	-
trans-1,3-Dichloropropene	mg/L		0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
trans-1,4-Dichloro-2-butene	mg/L		0.005 U	0.005 U	0.005 U	-	-	-	-	-	-
Trichloroethene	mg/L	0.005	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Trichlorofluoromethane (CFC-11)	mg/L	2.6	0.005 U	0.005 U	0.005 U	-	-	-	-	-	-
Vinyl acetate	mg/L	0.64	0.01 U	0.01 U	0.01 U	-	-	-	-	-	-
Vinyl chloride	mg/L	0.002	0.01 U	0.01 U	0.01 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Xylene(ortho) A	mg/L		-	-	-	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Xylenes (total)	mg/L	0.28	0.003 U	0.003 U	0.003 U	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			CB-2	EW14	LMW17S	LMW17S	LMW18S	LMW18S	LMW19S	LMW19S	MW1S	MW1S	MW100S
Sample ID:			W-12610-102511-SSH-027	GW-12610-071811-SH-004	LMW17S-01	LMW17S-02	LMW18S-01	LMW18S-02	LMW19S-01	LMW19S-02	MW1S-01	MW1S-02	MW100S-01
Sample Date:			10/25/2011	7/18/2011	9/19/1993	3/29/1994	9/20/1993	3/29/1994	9/20/1993	3/29/1994	9/19/1993	3/16/1994	9/1/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Semi-volatile Organic Compounds													
1,2,4,5-Tetrachlorobenzene	mg/L	1.3	-	-	-	-	-	-	-	-	-	-	0.01 U
1,2,4-Trichlorobenzene	mg/L	0.07	-	-	0.005 U	-	0.025 U	-	0.013 U	-	0.005 U	-	0.005 U
1,2-Dichlorobenzene	mg/L	0.6	-	-	-	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
1,3-Dichlorobenzene	mg/L	0.0066	-	-	-	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
1,4-Dichlorobenzene	mg/L	0.075	-	-	-	-	-	-	-	-	-	-	-
1,4-Naphthoquinone	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
1-Naphthylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
2,2'-Oxybis(2-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/L		-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
2,3,4,6-Tetrachlorophenol	mg/L		-	-	-	-	-	-	-	-	-	-	0.05 U
2,4,5-Trichlorophenol	mg/L	0.73	-	-	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.05 U
2,4,6-Trichlorophenol	mg/L	0.12	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dichlorophenol	mg/L	0.073	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dimethylphenol	mg/L	0.37	-	-	0.005 U	0.01 U	0.36	0.05 U	0.014	0.005 U	0.005	0.005 U	0.005 U
2,4-Dinitrophenol	mg/L		-	-	0.05 U	0.02 U	0.25 U	0.1 U	0.13 U	0.02 U	0.02 U	0.02 U	0.02 U
2,4-Dinitrotoluene	mg/L	0.0077	-	-	0.01 U	0.005 U	0.05 U	0.01 U	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U
2,6-Dichlorophenol	mg/L		-	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrophenol	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
2,6-Dinitrotoluene	mg/L		-	-	0.01 U	0.005 U	0.025 U	0.01 U	0.15	0.005 U	0.005 U	0.005 U	0.005 U
2-Acetylaminofluorene	mg/L		-	-	-	-	-	-	-	-	-	-	0.1 U
2-Chloronaphthalene	mg/L	1.8	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Chlorophenol	mg/L	0.045	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Methylnaphthalene	mg/L	0.26	0.0048 U	0.002 J	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene A	mg/L		-	-	0.01 U	0.01 U	1.6	0.74	0.4	0.12	0.003	0.01 U	0.01 U
2-Methylphenol	mg/L	0.37	-	-	0.01 U	0.01 U	0.025 U	0.013	0.013 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Naphthylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
2-Nitroaniline	mg/L		-	-	0.02 U	0.02 U	0.05 U	0.02 U	0.025 U	0.02 U	0.02 U	0.02 U	0.02 U
2-Nitrophenol	mg/L	0.02	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Picoline	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
2-Toluidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
3,3'-Dichlorobenzidine	mg/L	0.0011	-	-	0.02 U	0.02 U	0.05 U	0.05 U	0.025 U	0.02 U	0.02 U	0.02 U	0.02 U
3-Methylcholanthrene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
3-Nitroaniline	mg/L		-	-	0.02 U	0.02 U	0.05 U	0.02 U	0.025 U	0.02 U	0.02 U	0.02 U	0.02 U
4,6-Dinitro-2-methylphenol	mg/L	0.02	-	-	0.05 U	0.02 U	0.25 U	0.05 U	0.13 U	0.02 U	0.02 U	0.02 U	0.05 U
4-Aminobiphenyl	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
4-Bromophenyl phenyl ether	mg/L		-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloro-3-methylphenol	mg/L	0.15	-	-	0.005 U	0.01 U	0.025 U	0.05 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloroaniline	mg/L		-	-	0.02 U	0.02 U	0.025 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Chlorophenyl phenyl ether	mg/L		-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Dimethylaminoazobenzene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
4-Methylphenol	mg/L	0.37	-	-	0.01 U	-	0.025 U	-	0.013 U	-	0.01 U	-	0.01 U
4-Nitroaniline	mg/L		-	-	0.02 U	0.02 U	0.05 U	0.02 U	0.025 U	0.02 U	0.02 U	0.01 U	0.02 U
4-Nitrophenol	mg/L		-	-	0.02 U	0.02 U	0.05 U	0.1 U	0.025 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Nitroquinoline-N-oxide	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
5-Nitro-2-toluidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
7,12-Dimethylbenz(a)anthracene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
a,a-Dimethylphenethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Acenaphthene	mg/L	1.3	0.0048 U	0.019 U	0.005 U	0.005 U	0.44	0.26	0.086	0.057	-	0.005 U	0.005 U
Acenaphthylene	mg/L	0.052	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.002	0.005 U	0.005 U	0.005 U
Acetophenone	mg/L	1.5	-	-	-	-	-	-	-	-	-	-	0.01 U
Aniline	mg/L	0.053	-	-	-	-	-	-	-	-	-	-	0.02 U
Anthracene	mg/L	0.043	-	-	0.005 U	0.005 U	0.029	0.014	0.013	0.02	0.005 U	0.005 U	0.005 U
Aramite	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Benzo(a)anthracene	mg/L	0.0021	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	**0.008**	0.005 U	0.005 U	0.005 U
Benzo(a)pyrene	mg/L	0.005	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(b)fluoranthene	mg/L	0.0015	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(g,h,i)perylene	mg/L	0.001	-	-	0.01 U	0.005 U	0.05 U	0.01 U	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(k)fluoranthene	mg/L	0.001	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzofuran	mg/L		-	-	-	-	0.47	0.94	0.15	0.041	-	-	-
Benzyl alcohol	mg/L	10	-	-	-	-	-	-	-	-	-	-	0.01 U
bis(2-Chloroethoxy)methane	mg/L		-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Chloroethyl)ether	mg/L	0.002	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Ethylhexyl)phthalate (DEHP)	mg/L	0.006	0.0048 U	0.019 U	**0.7**	**0.1**	0.025 U	**0.014**	0.013 U	**0.074**	0.005 U	0.005 U	**0.029**
Butyl benzylphthalate (BBP)	mg/L	1.2	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			**CB-2**	**EW14**	**LMW17S**	**LMW17S**	**LMW18S**	**LMW18S**	**LMW19S**	**LMW19S**	**MW1S**	**MW1S**	**MW100S**
Sample ID:			**W-12610-102511-SSH-027**	**GW-12610-071811-SH-004**	**LMW17S-01**	**LMW17S-02**	**LMW18S-01**	**LMW18S-02**	**LMW19S-01**	**LMW19S-02**	**MW1S-01**	**MW1S-02**	**MW100S-01**
Sample Date:			**10/25/2011**	**7/18/2011**	**9/19/1993**	**3/29/1994**	**9/20/1993**	**3/29/1994**	**9/20/1993**	**3/29/1994**	**9/19/1993**	**3/16/1994**	**9/1/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Carbazole	mg/L	0.085	0.0095 U	0.0011 J	0.01 U	0.01 U	**0.3**	**0.22**	0.039	0.029	0.01 U	0.01 U	-
Chlorobenzilate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Chrysene	mg/L	0.0016	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Diallate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Dibenz(a,h)anthracene	mg/L	0.002	-	-	0.01 U	0.005 U	0.05 U	0.01 U	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U
Dibenzofuran	mg/L		0.0038 U	0.015 U	0.005 U	0.005 U	0.32	0.18	0.046	0.059	0.005 U	0.005 U	0.005 U
Diethyl phthalate	mg/L	5.5	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Dimethyl phthalate	mg/L	73	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Di-n-butylphthalate (DBP)	mg/L	0.88	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Di-n-octyl phthalate (DnOP)	mg/L	0.13	-	-	**0.15**	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Dinoseb	mg/L	0.007	-	-	-	-	-	-	-	-	-	-	0.01 U
Diphenylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Ethyl methanesulfonate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Fluoranthene	mg/L	0.21	-	-	0.005 U	0.005 U	0.025 U	0.011	0.013 U	0.036	0.005 U	0.005 U	0.005 U
Fluorene	mg/L	0.88	0.0048 U	0.019 U	0.005 U	0.005 U	0.21	0.12	0.013 U	0.093	0.005 U	0.005 U	0.005 U
Hexachlorobenzene	mg/L	0.001	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorobutadiene	mg/L	0.015	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorocyclopentadiene	mg/L	0.05	-	-	0.005 U	0.005 U	0.05 U	0.025 U	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachloroethane	mg/L	0.0073	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorophene (HCP)	mg/L		-	-	-	-	-	-	-	-	-	-	0.05 U
Hexachloropropene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Indeno(1,2,3-cd)pyrene	mg/L	0.002	-	-	0.01 U	0.005 U	0.05 U	0.01 U	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U
Isophorone	mg/L	0.77	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
Isosafrole	mg/L		-	-	-	-	-	-	-	-	-	-	0.02 U
Methapyrilene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Methyl methanesulfonate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Naphthalene	mg/L	0.52	0.0048 U	0.004 J	0.015	-	0.025 U	-	0.027	-	0.005	-	0.005 U
Nitrobenzene	mg/L	0.0034	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
N-Nitrosodimethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
N-Nitrosodi-n-butylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
N-Nitrosodi-n-propylamine	mg/L	0.005	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiphenylamine	mg/L	0.27	-	-	0.005 U	0.005 U	0.025 U	0.01 U	0.013 U	0.005 U	0.005 U	0.005 U	0.01 U
N-Nitrosomethylethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.005 U
N-Nitrosomorpholine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
N-Nitrosopiperidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
N-Nitrosopyrrolidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Pentachlorobenzene	mg/L	0.0061	-	-	-	-	-	-	-	-	-	-	0.01 U
Pentachloroethane	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Pentachloronitrobenzene	mg/L	0.032	-	-	-	-	-	-	-	-	-	-	0.05 U
Pentachlorophenol	mg/L	0.001	-	-	0.02 U	0.02 U	0.05 U	0.05 U	0.025 U	0.02 U	0.02 U	0.02 U	0.02 U
Phenacetin	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Phenanthrene	mg/L	0.052	0.0019 U	0.0076 U	0.005 U	0.003	**0.23**	**0.11**	**2.6**	**0.064**	0.005 U	0.005 U	0.005 U
Phenol	mg/L	4.4	-	-	0.01 U	0.005 U	0.05 U	0.01 U	0.025 U	0.005 U	0.005 U	0.005 U	0.005 U
p-Phenylenediamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U
Pronamide	mg/L		-	-	-	-	-	-	-	-	-	-	0.05 U
Pyrene	mg/L	0.14	-	-	0.005 U	0.004	0.025 U	0.01 U	0.013	0.033	0.005 U	0.005 U	0.005 U
Pyridine	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	0.05 U
Safrole	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**MW100S**	**MW101S**	**MW101S**	**MW102D1**	**MW102D1**	**MW102D2**	**MW102D2**	**MW102D3**	**MW102D3**	**MW102D4**	**MW102D4**
Sample ID:			**MW100S-02**	**MW101S-01**	**MW101S-02**	**MW102D1-01**	**MW102D1-02**	**MW102D2-01**	**MW102D2-02**	**MW102D3-01**	**MW102D3-02**	**MW102D4-01**	**MW102D4-02**
Sample Date:			**3/17/1994**	**9/3/1993**	**3/29/1994**	**9/4/1993**	**3/23/1994**	**9/4/1993**	**3/23/1994**	**9/15/1993**	**3/21/1994**	**9/15/1993**	**3/28/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Semi-volatile Organic Compounds													
1,2,4,5-Tetrachlorobenzene	mg/L	1.3	0.01 U	-	-	-	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/L	0.07	0.005 U	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-
1,2-Dichlorobenzene	mg/L	0.6	0.005 U	-	-	-	-	-	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
1,3-Dichlorobenzene	mg/L	0.0066	0.005 U	-	-	-	-	-	-	-	-	-	-
1,3-Dinitrobenzene	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene	mg/L	0.075	0.005 U	-	-	-	-	-	-	-	-	-	-
1,4-Naphthoquinone	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
1-Naphthylamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
2,2'-Oxybis(2-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,3,4,6-Tetrachlorophenol	mg/L		0.05 U	-	-	-	-	-	-	-	-	-	-
2,4,5-Trichlorophenol	mg/L	0.73	0.05 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
2,4,6-Trichlorophenol	mg/L	0.12	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dichlorophenol	mg/L	0.073	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dimethylphenol	mg/L	0.37	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dinitrophenol	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2,4-Dinitrotoluene	mg/L	0.0077	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,6-Dichlorophenol	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrophenol	mg/L		-	-	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.031	0.005 U	0.005 U	0.005 U
2-Acetylaminofluorene	mg/L		0.1 U	-	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	mg/L	1.8	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Chlorophenol	mg/L	0.045	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Methylnaphthalene	mg/L	0.26	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene A	mg/L		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Methylphenol	mg/L	0.37	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Naphthylamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
2-Nitroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2-Nitrophenol	mg/L	0.02	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Picoline	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
2-Toluidine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
3,3'-Dichlorobenzidine	mg/L	0.0011	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
3-Methylcholanthrene	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
3-Nitroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4,6-Dinitro-2-methylphenol	mg/L	0.02	0.05 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Aminobiphenyl	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
4-Bromophenyl phenyl ether	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloro-3-methylphenol	mg/L	0.15	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Chlorophenyl phenyl ether	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Dimethylaminoazobenzene	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
4-Methylphenol	mg/L	0.37	0.01 U	0.01 U	-	0.003	-	0.01 U	-	0.01 U	-	0.01 U	-
4-Nitroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Nitrophenol	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Nitroquinoline-N-oxide	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
5-Nitro-2-toluidine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
7,12-Dimethylbenz(a)anthracene	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
a,a-Dimethylphenethylamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Acenaphthene	mg/L	1.3	0.005 U	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Acenaphthylene	mg/L	0.052	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Acetophenone	mg/L	1.5	0.01 U	-	-	-	-	-	-	-	-	-	-
Aniline	mg/L	0.053	0.02 U	-	-	-	-	-	-	-	-	-	-
Anthracene	mg/L	0.043	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Aramite	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Benzo(a)anthracene	mg/L	0.0021	0.005 U	**0.003**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(a)pyrene	mg/L	0.005	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(b)fluoranthene	mg/L	0.0015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(g,h,i)perylene	mg/L	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(k)fluoranthene	mg/L	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzofuran	mg/L		-	-	-	-	-	-	-	-	-	-	-
Benzyl alcohol	mg/L	10	0.01 U	-	-	-	-	-	-	-	-	-	-
bis(2-Chloroethoxy)methane	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Chloroethyl)ether	mg/L	0.002	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Ethylhexyl)phthalate (DEHP)	mg/L	0.006	0.005 U	**0.02**	**0.028**	**0.013**	**0.03**	**0.017**	0.002	**0.27**	**0.007**	**0.012**	0.003
Butyl benzylphthalate (BBP)	mg/L	1.2	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW100S	MW101S	MW101S	MW102D1	MW102D1	MW102D2	MW102D2	MW102D3	MW102D3	MW102D4	MW102D4
Sample ID:			MW100S-02	MW101S-01	MW101S-02	MW102D1-01	MW102D1-02	MW102D2-01	MW102D2-02	MW102D3-01	MW102D3-02	MW102D4-01	MW102D4-02
Sample Date:			3/17/1994	9/3/1993	3/29/1994	9/4/1993	3/23/1994	9/4/1993	3/23/1994	9/15/1993	3/21/1994	9/15/1993	3/28/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Carbazole	mg/L	0.085	-	0.01 U	0.002	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chlorobenzilate	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Chrysene	mg/L	0.0016	0.005 U	**0.005**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Diallate	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Dibenz(a,h)anthracene	mg/L	0.002	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dibenzofuran	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Diethyl phthalate	mg/L	5.5	0.005 U	0.005 U	0.005 U	0.003	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dimethyl phthalate	mg/L	73	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.031	0.005 U	0.005 U	0.005 U
Di-n-butylphthalate (DBP)	mg/L	0.88	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001
Di-n-octyl phthalate (DnOP)	mg/L	0.13	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.26**	0.005 U	0.005 U	0.005 U
Dinoseb	mg/L	0.007	0.01 U	-	-	-	-	-	-	-	-	-	-
Diphenylamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Ethyl methanesulfonate	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Fluoranthene	mg/L	0.21	0.005 U	0.009	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluorene	mg/L	0.88	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorobenzene	mg/L	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorobutadiene	mg/L	0.015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorocyclopentadiene	mg/L	0.05	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachloroethane	mg/L	0.0073	0.005 U	0.005 U	0.003	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorophene (HCP)	mg/L		0.05 U	-	-	-	-	-	-	-	-	-	-
Hexachloropropene	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/L	0.002	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Isophorone	mg/L	0.77	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Isosafrole	mg/L		0.02 U	-	-	-	-	-	-	-	-	-	-
Methapyrilene	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Methyl methanesulfonate	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Naphthalene	mg/L	0.52	0.005 U	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-	0.005 U	-
Nitrobenzene	mg/L	0.0034	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiethylamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
N-Nitrosodimethylamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
N-Nitrosodi-n-butylamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
N-Nitrosodi-n-propylamine	mg/L	0.005	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiphenylamine	mg/L	0.27	0.01 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosomethylethylamine	mg/L		0.005 U	-	-	-	-	-	-	-	-	-	-
N-Nitrosomorpholine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
N-Nitrosopiperidine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
N-Nitrosopyrrolidine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Pentachlorobenzene	mg/L	0.0061	0.01 U	-	-	-	-	-	-	-	-	-	-
Pentachloroethane	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Pentachloronitrobenzene	mg/L	0.032	0.05 U	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	mg/L	0.001	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Phenacetin	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Phenanthrene	mg/L	0.052	0.005 U	0.006	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Phenol	mg/L	4.4	0.005 U	0.005 U	0.005 U	0.003	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
p-Phenylenediamine	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-
Pronamide	mg/L		0.05 U	-	-	-	-	-	-	-	-	-	-
Pyrene	mg/L	0.14	0.005 U	0.009	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Pyridine	mg/L	0.02	0.05 U	-	-	-	-	-	-	-	-	-	-
Safrole	mg/L		0.01 U	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW300S	MW300S	MW300S	LMW13S	LMW13S	LMW15D	LMW15D	LMW15D	MW301D1	MW301D1	MW301D2	MW301D2	MW301D2	MW301D3
Sample ID:			MW300S-01	MW300S-01	MW300S-02	LMW13S-01	LMW13S-02	LMW150D-01	LMW15D-01	LMW15D-02	MW301D1-01	MW301D1-02	MW3011D2-01-FD	MW301D2-01	MW301D2-02	MW301D3-01
Sample Date:			9/15/1993	9/19/1993	3/29/1994	9/15/1993	3/28/1994	9/15/1993	9/20/1993	3/28/1994	8/23/1993	3/23/1994	8/30/1993 (Duplicate)	8/30/1993	3/11/1994	9/16/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Semi-volatile Organic Compounds																
1,2,4,5-Tetrachlorobenzene	mg/L	1.3	-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
1,2,4-Trichlorobenzene	mg/L	0.07	-	0.005 U	-	0.005 U	-	0.005 U	0.005 U	-	0.005 U	-	0.005 U	0.005 U	0.005 U	0.005 U
1,2-Dichlorobenzene	mg/L	0.6	-	-	-	-	-	-	-	-	-	-	-	-	0.005 U	-
1,3,5-Trinitrobenzene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
1,3-Dichlorobenzene	mg/L	0.0066	-	-	-	-	-	-	-	-	-	-	-	-	0.005 U	-
1,3-Dinitrobenzene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
1,4-Dichlorobenzene	mg/L	0.075	-	-	-	-	-	-	-	-	-	-	-	-	0.005 U	-
1,4-Naphthoquinone	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
1-Naphthylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
2,2'-Oxybis(2-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/L		-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,3,4,6-Tetrachlorophenol	mg/L		-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	0.05 U	-
2,4,5-Trichlorophenol	mg/L	0.73	-	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U	0.05 U	0.05 U	0.05 U	0.025 U
2,4,6-Trichlorophenol	mg/L	0.12	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dichlorophenol	mg/L	0.073	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dimethylphenol	mg/L	0.37	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.007	0.011	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dinitrophenol	mg/L		-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2,4-Dinitrotoluene	mg/L	0.0077	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,6-Dichlorophenol	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	0.01 U	-
2,6-Dinitrophenol	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	-	-
2,6-Dinitrotoluene	mg/L		-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Acetylaminofluorene	mg/L		-	-	-	-	-	-	-	-	-	-	0.1 U	0.1 U	0.1 U	-
2-Chloronaphthalene	mg/L	1.8	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Chlorophenol	mg/L	0.045	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Methylnaphthalene	mg/L	0.26	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene A	mg/L		-	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Methylphenol	mg/L	0.37	-	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Naphthylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
2-Nitroaniline	mg/L		-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2-Nitrophenol	mg/L	0.02	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Picoline	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
2-Toluidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
3,3'-Dichlorobenzidine	mg/L	0.0011	-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
3-Methylcholanthrene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
3-Nitroaniline	mg/L		-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4,6-Dinitro-2-methylphenol	mg/L	0.02	-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.05 U	0.05 U	0.05 U	0.02 U
4-Aminobiphenyl	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
4-Bromophenyl phenyl ether	mg/L		-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloro-3-methylphenol	mg/L	0.15	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloroaniline	mg/L		-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Chlorophenyl phenyl ether	mg/L		-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Dimethylaminoazobenzene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
4-Methylphenol	mg/L	0.37	-	0.01 U	-	0.01 U	-	0.01 U	0.01 U	-	0.051	-	0.01 U	0.01 U	0.01 U	0.01 U
4-Nitroaniline	mg/L		0.02 U	-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Nitrophenol	mg/L		-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Nitroquinoline-N-oxide	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
5-Nitro-2-toluidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
7,12-Dimethylbenz(a)anthracene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
a,a-Dimethylphenethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Acenaphthene	mg/L	1.3	-	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Acenaphthylene	mg/L	0.052	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Acetophenone	mg/L	1.5	-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Aniline	mg/L	0.053	-	-	-	-	-	-	-	-	-	-	0.02 U	0.02 U	0.02 U	-
Anthracene	mg/L	0.043	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Aramite	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Benzo(a)anthracene	mg/L	0.0021	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(a)pyrene	mg/L	0.005	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(b)fluoranthene	mg/L	0.0015	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(g,h,i)perylene	mg/L	0.001	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(k)fluoranthene	mg/L	0.001	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzofuran	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzyl alcohol	mg/L	10	-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
bis(2-Chloroethoxy)methane	mg/L		-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Chloroethyl)ether	mg/L	0.002	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Ethylhexyl)phthalate (DEHP)	mg/L	0.006	-	0.006	0.006	0.005 U	**0.046**	**0.007**	**0.25**	**0.007**	0.005	**0.033**	**0.02**	**0.03**	0.005 U	0.005 U
Butyl benzylphthalate (BBP)	mg/L	1.2	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW300S	MW300S	MW300S	LMW13S	LMW13S	LMW15D	LMW15D	LMW15D	MW301D1	MW301D1	MW301D2	MW301D2	MW301D2	MW301D3
Sample ID:			MW300S-01	MW300S-01	MW300S-02	LMW13S-01	LMW13S-02	LMW150D-01	LMW15D-01	LMW15D-02	MW301D1-01	MW301D1-02	MW3011D2-01-FD	MW301D2-01	MW301D2-02	MW301D3-01
Sample Date:			9/15/1993	9/19/1993	3/29/1994	9/15/1993	3/28/1994	9/15/1993	9/20/1993	3/28/1994	8/23/1993	3/23/1994	8/30/1993 (Duplicate)	8/30/1993	3/11/1994	9/16/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Carbazole	mg/L	0.085	-	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	-	-	-	0.01 U
Chlorobenzilate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Chrysene	mg/L	0.0016	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Diallate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Dibenz(a,h)anthracene	mg/L	0.002	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dibenzofuran	mg/L		-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Diethyl phthalate	mg/L	5.5	-	0.005 U	0.005 U	0.005 U	0.002	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dimethyl phthalate	mg/L	73	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Di-n-butylphthalate (DBP)	mg/L	0.88	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Di-n-octyl phthalate (DnOP)	mg/L	0.13	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dinoseb	mg/L	0.007	-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Diphenylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Ethyl methanesulfonate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Fluoranthene	mg/L	0.21	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluorene	mg/L	0.88	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorobenzene	mg/L	0.001	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorobutadiene	mg/L	0.015	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorocyclopentadiene	mg/L	0.05	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachloroethane	mg/L	0.0073	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorophene (HCP)	mg/L		-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	0.05 U	-
Hexachloropropene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Indeno(1,2,3-cd)pyrene	mg/L	0.002	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Isophorone	mg/L	0.77	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Isosafrole	mg/L		-	-	-	-	-	-	-	-	-	-	0.02 U	0.02 U	0.02 U	-
Methapyrilene	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Methyl methanesulfonate	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Naphthalene	mg/L	0.52	-	0.005 U	-	0.005 U	-	0.005 U	0.005 U	-	0.005 U	-	0.005 U	0.005 U	0.005 U	0.005 U
Nitrobenzene	mg/L	0.0034	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
N-Nitrosodimethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
N-Nitrosodi-n-butylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
N-Nitrosodi-n-propylamine	mg/L	0.005	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiphenylamine	mg/L	0.27	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.01 U	0.01 U	0.005 U
N-Nitrosomethylethylamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.005 U	0.005 U	0.005 U	-
N-Nitrosomorpholine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
N-Nitrosopiperidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
N-Nitrosopyrrolidine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Pentachlorobenzene	mg/L	0.0061	-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Pentachloroethane	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Pentachloronitrobenzene	mg/L	0.032	-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	0.05 U	-
Pentachlorophenol	mg/L	0.001	-	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Phenacetin	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Phenanthrene	mg/L	0.052	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Phenol	mg/L	4.4	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.15	0.27	0.005 U	0.005 U	0.005 U	0.005 U
p-Phenylenediamine	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-
Pronamide	mg/L		-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	0.05 U	-
Pyrene	mg/L	0.14	-	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Pyridine	mg/L	0.02	-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	0.05 U	-
Safrole	mg/L		-	-	-	-	-	-	-	-	-	-	0.01 U	0.01 U	0.01 U	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Support Facilities Area**	**Support Facilities Area**
Sample Location:			**MW301D3**	**MW301D4**	**MW301D4**	**MSA-5S**	**MSA-5S**
Sample ID:			**MW301D3-02**	**MW301D4-01**	**MW301D4-02**	**MSA-5-01**	**MSA-5**
Sample Date:			**3/24/1994**	**9/15/1993**	**3/24/1994**	**9/4/1993**	**3/10/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**					
Semi-volatile Organic Compounds							
1,2,4,5-Tetrachlorobenzene	mg/L	1.3	-	-	-	-	-
1,2,4-Trichlorobenzene	mg/L	0.07	-	0.005 U	-	0.005 U	-
1,2-Dichlorobenzene	mg/L	0.6	-	-	-	-	-
1,3,5-Trinitrobenzene	mg/L		-	-	-	-	-
1,3-Dichlorobenzene	mg/L	0.0066	-	-	-	-	-
1,3-Dinitrobenzene	mg/L		-	-	-	-	-
1,4-Dichlorobenzene	mg/L	0.075	-	-	-	-	-
1,4-Naphthoquinone	mg/L		-	-	-	-	-
1-Naphthylamine	mg/L		-	-	-	-	-
2,2'-Oxybis(2-chloropropane) (bis(2-Chloroisopropyl) ether)	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,3,4,6-Tetrachlorophenol	mg/L		-	-	-	-	-
2,4,5-Trichlorophenol	mg/L	0.73	0.025 U	0.025 U	0.025 U	0.025 U	0.025 U
2,4,6-Trichlorophenol	mg/L	0.12	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dichlorophenol	mg/L	0.073	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dimethylphenol	mg/L	0.37	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,4-Dinitrophenol	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2,4-Dinitrotoluene	mg/L	0.0077	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2,6-Dichlorophenol	mg/L		-	-	-	-	-
2,6-Dinitrophenol	mg/L		-	-	-	-	-
2,6-Dinitrotoluene	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Acetylaminofluorene	mg/L		-	-	-	-	-
2-Chloronaphthalene	mg/L	1.8	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Chlorophenol	mg/L	0.045	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Methylnaphthalene	mg/L	0.26	-	-	-	-	-
2-Methylnaphthalene A	mg/L		0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Methylphenol	mg/L	0.37	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
2-Naphthylamine	mg/L		-	-	-	-	-
2-Nitroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2-Nitrophenol	mg/L	0.02	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
2-Picoline	mg/L		-	-	-	-	-
2-Toluidine	mg/L		-	-	-	-	-
3,3'-Dichlorobenzidine	mg/L	0.0011	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
3-Methylcholanthrene	mg/L		-	-	-	-	-
3-Nitroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4,6-Dinitro-2-methylphenol	mg/L	0.02	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Aminobiphenyl	mg/L		-	-	-	-	-
4-Bromophenyl phenyl ether	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloro-3-methylphenol	mg/L	0.15	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Chloroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Chlorophenyl phenyl ether	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
4-Dimethylaminoazobenzene	mg/L		-	-	-	-	-
4-Methylphenol	mg/L	0.37	-	0.01 U	-	0.01 U	-
4-Nitroaniline	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Nitrophenol	mg/L		0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
4-Nitroquinoline-N-oxide	mg/L		-	-	-	-	-
5-Nitro-2-toluidine	mg/L		-	-	-	-	-
7,12-Dimethylbenz(a)anthracene	mg/L		-	-	-	-	-
a,a-Dimethylphenethylamine	mg/L		-	-	-	-	-
Acenaphthene	mg/L	1.3	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Acenaphthylene	mg/L	0.052	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Acetophenone	mg/L	1.5	-	-	-	-	-
Aniline	mg/L	0.053	-	-	-	-	-
Anthracene	mg/L	0.043	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Aramite	mg/L		-	-	-	-	-
Benzo(a)anthracene	mg/L	0.0021	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(a)pyrene	mg/L	0.005	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(b)fluoranthene	mg/L	0.0015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(g,h,i)perylene	mg/L	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzo(k)fluoranthene	mg/L	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Benzofuran	mg/L		-	-	-	-	-
Benzyl alcohol	mg/L	10	-	-	-	-	-
bis(2-Chloroethoxy)methane	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Chloroethyl)ether	mg/L	0.002	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
bis(2-Ethylhexyl)phthalate (DEHP)	mg/L	0.006	0.005	0.003	0.004	0.004	0.005 U
Butyl benzylphthalate (BBP)	mg/L	1.2	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U

Appendix E.2

Analytical Results Summary - SVOCs
Bay City Industrial Land
Bay City, Michigan

AOI:			**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Support Facilities Area**	**Support Facilities Area**
Sample Location:			**MW301D3**	**MW301D4**	**MW301D4**	**MSA-5S**	**MSA-5S**
Sample ID:			**MW301D3-02**	**MW301D4-01**	**MW301D4-02**	**MSA-5-01**	**MSA-5**
Sample Date:			**3/24/1994**	**9/15/1993**	**3/24/1994**	**9/4/1993**	**3/10/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**					
Carbazole	mg/L	0.085	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Chlorobenzilate	mg/L		-	-	-	-	-
Chrysene	mg/L	0.0016	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Diallate	mg/L		-	-	-	-	-
Dibenz(a,h)anthracene	mg/L	0.002	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dibenzofuran	mg/L		0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Diethyl phthalate	mg/L	5.5	0.004	0.005 U	0.005 U	0.005 U	0.005 U
Dimethyl phthalate	mg/L	73	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Di-n-butylphthalate (DBP)	mg/L	0.88	0.005 U	0.004	0.001	0.005 U	0.005 U
Di-n-octyl phthalate (DnOP)	mg/L	0.13	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dinoseb	mg/L	0.007	-	-	-	-	-
Diphenylamine	mg/L		-	-	-	-	-
Ethyl methanesulfonate	mg/L		-	-	-	-	-
Fluoranthene	mg/L	0.21	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluorene	mg/L	0.88	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorobenzene	mg/L	0.001	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorobutadiene	mg/L	0.015	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorocyclopentadiene	mg/L	0.05	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachloroethane	mg/L	0.0073	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Hexachlorophene (HCP)	mg/L		-	-	-	-	-
Hexachloropropene	mg/L		-	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/L	0.002	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Isophorone	mg/L	0.77	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Isosafrole	mg/L		-	-	-	-	-
Methapyrilene	mg/L		-	-	-	-	-
Methyl methanesulfonate	mg/L		-	-	-	-	-
Naphthalene	mg/L	0.52	-	0.005 U	-	0.005 U	-
Nitrobenzene	mg/L	0.0034	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiethylamine	mg/L		-	-	-	-	-
N-Nitrosodimethylamine	mg/L		-	-	-	-	-
N-Nitrosodi-n-butylamine	mg/L		-	-	-	-	-
N-Nitrosodi-n-propylamine	mg/L	0.005	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosodiphenylamine	mg/L	0.27	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
N-Nitrosomethylethylamine	mg/L		-	-	-	-	-
N-Nitrosomorpholine	mg/L		-	-	-	-	-
N-Nitrosopiperidine	mg/L		-	-	-	-	-
N-Nitrosopyrrolidine	mg/L		-	-	-	-	-
Pentachlorobenzene	mg/L	0.0061	-	-	-	-	-
Pentachloroethane	mg/L		-	-	-	-	-
Pentachloronitrobenzene	mg/L	0.032	-	-	-	-	-
Pentachlorophenol	mg/L	0.001	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Phenacetin	mg/L		-	-	-	-	-
Phenanthrene	mg/L	0.052	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Phenol	mg/L	4.4	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
p-Phenylenediamine	mg/L		-	-	-	-	-
Pronamide	mg/L		-	-	-	-	-
Pyrene	mg/L	0.14	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Pyridine	mg/L	0.02	-	-	-	-	-
Safrole	mg/L		-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:											
Sample Location:			**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**Crotty Street Channel CB-2**	**Crotty Street Channel CSA GW Ext. Sys. Discharge**	**Crotty Street Channel EW14**	**Machine Storage Area LMW17S**	**Machine Storage Area LMW17S**
Sample ID:			**W-12610-021214-SSH-1401**	**W-12610-022614-SSH-1403**	**W-12610-090514-SSH-1411**	**W-12610-031615-SSH-1501**	**W-12610-102511-SSH-027**	**W-1261030-010129-SSH-CSA**	**GW-12610-071811-SH-004**	**LMW17S-01**	**LMW17S-01B**
Sample Date:			**2/12/2014**	**2/26/2014**	**9/5/2014**	**3/16/2015**	**10/25/2011**	**1/29/2001**	**7/18/2011**	**9/13/1993**	**11/1/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Metals											
Aluminum	mg/L	0.05	-	-	-	-	0.05 U^	0.20 U	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	0.20 U	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	0.05 U	-	-
Antimony	mg/L	0.006	-	-	-	-	0.0002 J	0.060 U	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	0.060 U	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	0.00018 J	-	-
Arsenic	mg/L	0.01	-	-	-	-	0.005 U	0.010 U	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	0.010 U	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	0.023	-	-
Barium	mg/L	2	-	-	-	-	0.022 JB	0.35	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	0.31	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	0.35	-	-
Beryllium	mg/L	0.004	-	-	-	-	0.001 U	0.0050 U	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	0.0050 U	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	0.001 U	-	-
Cadmium	mg/L	0.005	0.002 U	0.002 U	0.002 U	0.002 U	0.001 U	0.0050 U	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	0.0050 U	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	0.001 U	-	-
Calcium	mg/L		-	-	-	-	70 B	260	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	251	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	160	-	-
Chromium	mg/L	0.1	0.005 U	0.005 U	0.005 U	0.005 U	0.01 U	0.010 U	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	0.010 U	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	0.00098 J	-	-
Cobalt	mg/L	0.04	-	-	-	-	0.00012 J	0.050 U	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	0.050 U	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	0.00095 J	-	-
Copper	mg/L	1	0.02 U	0.02 U	0.021	0.02 U	0.0025 JB	0.025 U	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	0.025 U	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	0.004 U	-	-
Cyanide (total)	mg/L	0.2	-	-	-	-	-	-	-	0.005 U	0.005 U
Iron	mg/L	0.3	0.18	0.18	**0.54**	0.1 U	0.2 U / **1**	**13.6**	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	**9.0**	**53**	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	54	-	-
Lead	mg/L	0.004	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.0030 U	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	0.0030 U	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	0.003 U	-	-
Magnesium	mg/L	400	-	-	-	-	11 B	55.4	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	53.5	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	37	-	-
Manganese	mg/L	0.05	-	-	-	-	0.05 U	**6.1**	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	**5.9**	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	0.9	-	-
Mercury	mg/L	0.002	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00000084 / 0.0002 U	0.00020 U	0.00000036 J	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	0.00020 U	-	-	-
Nickel	mg/L	0.1	0.02 U	0.0078 J	0.02 U	0.02 U	0.00043 JB	0.040 U	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	0.040 U	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	0.0026 J	-	-
Potassium	mg/L		-	-	-	-	-	13.2	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	12.7	-	-	-
Selenium	mg/L	0.05	-	-	-	-	0.0025 J	0.0050 U	-	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	0.0050 U	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	0.005 U	-	-
Silver	mg/L	0.034	0.005 U	0.005 U	0.005 U	0.005 U	0.0002 U	0.010 U	-	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	0.010 U	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	0.0002 U	-	-
Sodium	mg/L	120	-	-	-	-	1.4 B	67.8	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	65.6	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	45	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:											
Sample Location:			**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**Crotty Street Channel**	**Crotty Street Channel**	**Crotty Street Channel**	**Machine Storage Area**	**Machine Storage Area**
Sample ID:			**W-12610-021214-SSH-1401**	**W-12610-022614-SSH-1403**	**W-12610-090514-SSH-1411**	**W-12610-031615-SSH-1501**	**CB-2**	**CSA GW Ext. Sys. Discharge**	**EW14**	**LMW17S**	**LMW17S**
Sample Date:			**2/12/2014**	**2/26/2014**	**9/5/2014**	**3/16/2015**	**W-12610-102511-SSH-027**	**W-1261030-010129-SSH-CSA**	**GW-12610-071811-SH-004**	**LMW17S-01**	**LMW17S-01B**
							10/25/2011	**1/29/2001**	**7/18/2011**	**9/13/1993**	**11/1/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Sulfide	mg/L		-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	0.00024 J	0.010 U	-	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	0.010 U	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	0.0011 J	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	-	-	0.00046 J	0.050 U	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	0.050 U	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	0.0013 J	-	-
Zinc	mg/L	2.4	-	-	-	-	0.0025 JB	0.15	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	0.14	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	0.05 U	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			**LMW17S**	**LMW18S**	**LMW18S**	**LMW18S**	**LMW19S**	**LMW19S**	**LMW19S**	**MSA GW Ext. Sys. Discharge**	**MW1S**	**MW1S**
Sample ID:			**LMW17S-02**	**LMW18S-01**	**LMW18S-01B**	**LMW18S-02**	**LMW19S-01**	**LMW19S-01B**	**LMW19S-02**	**W-1261030-010129-SSH-MSA**	**MW1S-01**	**MW1S-02**
Sample Date:			**3/29/1994**	**9/13/1993**	**11/1/1993**	**3/29/1994**	**9/13/1993**	**11/1/1993**	**3/29/1994**	**1/29/2001**	**9/13/1993**	**3/18/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	-	-	-	-	-	-	-	0.20 U	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	0.20 U	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	-	-	-	0.060 U	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	0.060 U	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	-	-	-	0.010 U	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	0.010 U	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	-	-	-	-	0.54	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	0.41	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	-	-	-	-	0.0050 U	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	0.0050 U	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	-	-	-	0.0050 U	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	0.0050 U	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	-	-	-	200	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	169	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	-	-	-	-	0.010 U	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	0.010 U	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	-	-	-	-	0.050 U	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	0.050 U	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	-	-	-	-	0.025 U	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	0.025 U	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.014	0.005 U	-	0.008	0.097
Iron	mg/L	0.3	-	-	-	-	-	-	-	**32.3**	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	**23.5**	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	-	-	-	-	0.0030 U	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	0.0030 U	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	-	-	-	44.2	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	37.3	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	-	-	-	**4.5**	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	**3.8**	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	-	-	-	-	-	0.00020 U	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	0.00020 U	-	-
Nickel	mg/L	0.1	-	-	-	-	-	-	-	0.040 U	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	0.040 U	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	-	-	-	17.1	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	14.4	-	-
Selenium	mg/L	0.05	-	-	-	-	-	-	-	0.0050 U	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	0.0050 U	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	-	-	-	0.010 U	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	0.010 U	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	-	-	74.7	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	63.0	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**LMW17S**	**LMW18S**	**LMW18S**	**LMW18S**	**LMW19S**	**LMW19S**	**LMW19S**	**MSA GW Ext. Sys. Discharge**	**MW1S**	**MW1S**
Sample ID:			**LMW17S-02**	**LMW18S-01**	**LMW18S-01B**	**LMW18S-02**	**LMW19S-01**	**LMW19S-01B**	**LMW19S-02**	**W-1261030-010129-SSH-MSA**	**MW1S-01**	**MW1S-02**
Sample Date:			**3/29/1994**	**9/13/1993**	**11/1/1993**	**3/29/1994**	**9/13/1993**	**11/1/1993**	**3/29/1994**	**1/29/2001**	**9/13/1993**	**3/18/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	-	-	-	0.010 U	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	0.010 U	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	-	-	-	-	-	0.050 U	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	0.050 U	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	-	-	-	-	0.097	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	0.069	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW1S	MW1S	MW100S	MW100S	MW100S	MW100S	MW100S	MW100S	MW100S	MW100S
Sample ID:			GW-12610-071911-SH-012	GW-12610-071911-SH-013	MW100S-01	MW100S-01	MW100S-01	MW100S-01	MW100S-01	MW100S-01	MW100S-01	MW100S-01
Sample Date:			7/19/2011	7/19/2011 (Duplicate)	8/20/1993	8/21/1993	8/22/1993	8/23/1993	8/24/1993	8/25/1993	8/30/1993	9/1/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	-	0.005 U	-	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	-	-	0.004	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	-	-	-	-	-	-	0.2 U
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	-	-	-	-	-	-	0.005 U
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	-	0.0002 U	-	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	-	-	-	-	-	-	0.05 U
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	-	-	-	-	-	-	0.05 U
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	-	-	-	-	-	-	0.025 U
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	-	-	0.005 U	-	-	-	-	-
Iron	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron (dissolved)	mg/L	0.3	11	12	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		14	14	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	-	-	0.003 U	-	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	-	-	-	-	-	0.0002 U	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	-	-	-	-	-	-	-	0.05 U
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	-	-	0.005 U	-	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	0.0005 U	-	-	-	-	-	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**MW1S**	**MW1S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**
Sample ID:			**GW-12610-071911-SH-012**	**GW-12610-071911-SH-013**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**
Sample Date:			**7/19/2011**	**7/19/2011 (Duplicate)**	**8/20/1993**	**8/21/1993**	**8/22/1993**	**8/23/1993**	**8/24/1993**	**8/25/1993**	**8/30/1993**	**9/1/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	0.2 U	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	-	0.002 U	-	-	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	0.1 U	-
Vanadium	mg/L	0.0045	-	-	-	-	-	-	-	-	-	0.05 U
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	-	-	-	-	-	-	0.02 U
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW101S**	**MW101S**	**MW101S**
Sample ID:			**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**GW-12610-071811-SH-005**	**MW101S-01**	**MW101S-01**	**MW101S-01**
Sample Date:			**4/1/1994**	**4/2/1994**	**4/3/1994**	**4/4/1994**	**4/8/1994**	**4/10/1994**	**7/18/2011**	**9/1/1993**	**9/3/1993**	**9/7/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	-	0.005 U	-	-	0.005 U	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	0.001 U	-	-	-	-	-	0.003
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	0.2 U	-	-	-	-	-	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	0.005 U	-	-	-	-	-	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	0.0002 U	-	-	-	0.0002 U	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	0.05 U	-	-	-	-	-	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	0.05 U	-	-	-	-	-	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	0.025 U	-	-	-	-	-	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	-	0.005 U	-	-	-	-	-	0.005 U
Iron	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	53	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	56	-	-	-
Lead	mg/L	0.004	-	-	-	-	0.003 U	-	-	-	-	0.003 U
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	0.0002 U	-	-	-	-	-	0.0002 U	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	0.05 U	-	-	-	-	-	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	0.005 U	-	-	-	-	-	-	0.005 U
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	-	0.0005 U	-	-	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW101S**	**MW101S**	**MW101S**
Sample ID:			**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**GW-12610-071811-SH-005**	**MW101S-01**	**MW101S-01**	**MW101S-01**
Sample Date:			**4/1/1994**	**4/2/1994**	**4/3/1994**	**4/4/1994**	**4/8/1994**	**4/10/1994**	**7/18/2011**	**9/1/1993**	**9/3/1993**	**9/7/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	0.2 U	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	-	0.002 U	-	-	-	0.002 U
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		0.1 U	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	0.05 U	-	-	-	-	-	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	0.02 U	-	-	-	-	-	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW101S	MW101S	MW101S	MW101S	MW101S	MW101S	MW101S	MW101S	MW101S	MW102D1
Sample ID:			MW101S-01	MW101S-01	MW101S-02	MW101S-02	MW101S-02	MW101S-02	MW101S-02	MW101S-02	MW101S-02	MW102D1-01
Sample Date:			9/9/1993	9/15/1993	3/21/1994	3/24/1994	3/25/1994	3/27/1994	3/29/1994	4/3/1994	4/5/1994	9/1/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	**0.11**	-	-	0.3 U	-	-	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	-	-	-	0.005 U	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	-	-	0.002	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	0.4	-	-	0.2	-	-	-	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	0.001 U	-	-	0.001 U	-	-	-	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	-	-	0.0002 U	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		140	-	-	66	-	-	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	0.05 U	-	-	0.05 U	-	-	-	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	0.004 U	-	-	0.02 U	-	-	-	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	0.02 U	-	-	0.025 U	-	-	-	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	-	-	-	-	0.005 U	-	-	-
Iron	mg/L	0.3	**10**	-	-	**21**	-	-	-	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	-	0.003 U	-	-	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	46	-	-	25	-	-	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	**1.4**	-	-	**0.24**	-	-	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	0.0002 U	-	-	-	-	-	-	0.0002 U
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	0.06	-	-	0.05 U	-	-	-	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		29	-	-	24	-	-	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	-	-	0.005 U	-	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	0.0005 U	-	-	-	0.0005 U	-	-	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	**230**	-	-	86	-	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			**MW101S**	**MW101S**	**MW101S**	**MW101S**	**MW101S**	**MW101S**	**MW101S**	**MW101S**	**MW101S**	**MW102D1**
Sample ID:			**MW101S-01**	**MW101S-01**	**MW101S-02**	**MW101S-02**	**MW101S-02**	**MW101S-02**	**MW101S-02**	**MW101S-02**	**MW101S-02**	**MW102D1-01**
Sample Date:			**9/9/1993**	**9/15/1993**	**3/21/1994**	**3/24/1994**	**3/25/1994**	**3/27/1994**	**3/29/1994**	**4/3/1994**	**4/5/1994**	**9/1/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	-	-	-	-	0.002 U	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	0.008 U	-	-	0.02 U	-	-	-	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	0.03	-	-	0.02 U	-	-	-	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D2	MW102D2	MW102D2
Sample ID:			MW102D1-01	MW102D1-01	MW102D1-01	MW102D1-02	MW102D1-02	MW102D1-02	MW102D1-02	MW102D2-01	MW102D2-01	MW102D2-01
Sample Date:			9/7/1993	9/8/1993	9/9/1993	3/21/1994	3/24/1994	3/29/1994	4/1/1994	9/1/1993	9/7/1993	9/8/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	-	-	**0.12**	-	0.3 U	-	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	0.005 U	-	-	-	0.005 U	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	**0.015**	-	-	-	**0.025**	-	-	-	**0.028**
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	0.2 U	-	0.2	-	-	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	0.001 U	-	0.001 U	-	-	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	0.0002 U	-	-	-	-	0.0002 U	-	-	0.0002 U	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	130	-	200	-	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	0.05 U	-	0.05 U	-	-	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	0.004 U	-	0.004 U	-	-	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	0.02 U	-	0.025 U	-	-	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	0.01	-	-	0.006	-	-	-	-	0.005 U	-
Iron	mg/L	0.3	-	-	**5.3**	-	**26**	-	-	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	0.003 U	-	-	0.003 U	-	-	-	-	0.003 U	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	24	-	40	-	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	**0.6**	-	**1.2**	-	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	-	0.0002 U	-	-	-	0.0002 U	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	0.05 U	-	0.05 U	-	-	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	18	-	5	-	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	0.005 U	-	-	-	0.005 U	-	-	-	0.005 U
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	0.0002 U	-	-	-	0.0005 U	-	-	-	0.0002 U
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	48	-	52	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D2	MW102D2	MW102D2
Sample ID:			MW102D1-01	MW102D1-01	MW102D1-01	MW102D1-02	MW102D1-02	MW102D1-02	MW102D1-02	MW102D2-01	MW102D2-01	MW102D2-01
Sample Date:			9/7/1993	9/8/1993	9/9/1993	3/21/1994	3/24/1994	3/29/1994	4/1/1994	9/1/1993	9/7/1993	9/8/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	0.002 U	-	0.002 U	-	-	-	-	-	0.002 U
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	0.008 U	-	0.02 U	-	-	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	0.02 U	-	0.02 U	-	-	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D3	MW102D3	MW102D3	MW102D3
Sample ID:			MW102D2-01	MW102D2-02	MW102D2-02	MW102D2-02	MW102D2-02	MW102D2-02	MW102D3-01	MW102D3-01	MW102D3-01	MW102D3-01
Sample Date:			9/9/1993	3/21/1994	3/23/1994	3/24/1994	3/29/1994	4/1/1994	9/1/1993	9/7/1993	9/8/1993	9/9/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	**0.08**	-	-	0.3 U	-	-	-	-	-	**0.08**
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	0.005 U	-	-	-	-	0.005 U	-	-	-	0.005 U
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	**0.029**	-	-	-	**0.03**	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	0.4	-	-	0.5	-	-	-	-	-	0.6
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	0.001 U	-	-	0.001 U	-	-	-	-	-	0.001 U
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	0.0002 U	-	-	-	-	-	0.0002 U	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		200	-	-	200	-	-	-	-	-	240
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	0.05 U	-	-	0.05 U	-	-	-	-	-	0.05 U
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	0.004 U	-	-	0.004 U	-	-	-	-	-	0.004 U
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	0.02 U	-	-	0.025 U	-	-	-	-	-	0.02 U
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	0.005 U	-	-	-	-	-	-	-	-
Iron	mg/L	0.3	**20**	-	-	**29**	-	-	-	-	-	**19**
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	0.003 U	-	-	-	-	-	0.003 U	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	42	-	-	41	-	-	-	-	-	54
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	**0.86**	-	-	**0.86**	-	-	-	-	-	**0.38**
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	0.0002 U	-	-	-	0.0002 U	-	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	0.05 U	-	-	0.05 U	-	-	-	-	-	0.05 U
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		7	-	-	2	-	-	-	-	-	3
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	0.005 U	-	-	-	0.005 U	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	0.0005 U	-	-	-	0.0002 U	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	67	-	-	**140**	-	-	-	-	-	**310**
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**MW102D2**	**MW102D2**	**MW102D2**	**MW102D2**	**MW102D2**	**MW102D2**	**MW102D3**	**MW102D3**	**MW102D3**	**MW102D3**
Sample ID:			**MW102D2-01**	**MW102D2-02**	**MW102D2-02**	**MW102D2-02**	**MW102D2-02**	**MW102D2-02**	**MW102D3-01**	**MW102D3-01**	**MW102D3-01**	**MW102D3-01**
Sample Date:			**9/9/1993**	**3/21/1994**	**3/23/1994**	**3/24/1994**	**3/29/1994**	**4/1/1994**	**9/1/1993**	**9/7/1993**	**9/8/1993**	**9/9/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	0.002 U	-	-	-	-	-	-	0.002 U	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	0.008 U	-	-	0.02 U	-	-	-	-	-	0.008 U
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	0.14	-	-	0.05	-	-	-	-	-	0.02 U
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D3	MW102D3	MW102D3	MW102D3	MW102D3	MW102D3	MW102D4	MW102D4	MW102D4	MW102D4
Sample ID:			MW102D3-01	MW102D3-01B	MW102D3-02	MW102D3-02	MW102D3-02	MW102D3-02	MW102D4-01	MW102D4-01	MW102D4-01	MW102D4-01
Sample Date:			9/13/1993	11/1/1993	3/21/1994	3/24/1994	3/29/1994	4/1/1994	9/1/1993	9/7/1993	9/8/1993	9/9/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	-	-	-	0.3 U	-	-	-	-	-	0.04 U
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	-	0.005 U	-	-	-	0.005 U
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	**0.037**	-	-	-	**0.046**	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	0.7	-	-	-	-	-	1.3
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	0.001 U	-	-	-	-	-	0.001 U
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	0.0002 U	-	-	-	-	0.0002 U	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	250	-	-	-	-	-	540
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	0.05 U	-	-	-	-	-	0.05 U
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	0.004 U	-	-	-	-	-	0.004 U
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	0.025 U	-	-	-	-	-	0.02 U
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	0.005 U	0.005 U	0.005 U	-	-	-	-	0.005 U	-	-
Iron	mg/L	0.3	-	-	-	**26**	-	-	-	-	-	**25**
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	0.003 U	-	-	-	-	0.003 U	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	60	-	-	-	-	-	180
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	**0.4**	-	-	-	-	-	**0.36**
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	0.0002 U	-	-	-	0.0002 U	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	-	0.05 U	-	-	-	-	-	0.05 U
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	2	-	-	-	-	-	10
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	0.005 U	-	-	-	0.005 U	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	0.0005 U	-	-	-	0.0002 U	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	**410**	-	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D3	MW102D3	MW102D3	MW102D3	MW102D3	MW102D3	MW102D4	MW102D4	MW102D4	MW102D4
Sample ID:			MW102D3-01	MW102D3-01B	MW102D3-02	MW102D3-02	MW102D3-02	MW102D3-02	MW102D4-01	MW102D4-01	MW102D4-01	MW102D4-01
Sample Date:			9/13/1993	11/1/1993	3/21/1994	3/24/1994	3/29/1994	4/1/1994	9/1/1993	9/7/1993	9/8/1993	9/9/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	0.002 U	-	-	-	-	-	0.002 U	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	-	0.02 U	-	-	-	-	-	0.008 U
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	0.02 U	-	-	-	-	-	0.02 U
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW300S	MW300S
Sample ID:			MW102D4-01	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW300S-01	MW300S-01
Sample Date:			9/10/1993	3/21/1994	3/23/1994	3/29/1994	4/1/1994	4/3/1994	4/4/1994	4/5/1994	9/1/1993	9/3/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	-	0.3 U	-	-	-	-	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	0.005 U	-	-	-	-	0.005 U
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	**0.031**	-	-	-	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	1.5	-	-	-	-	-	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	0.001 U	-	-	-	-	-	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	-	0.0002 U	-	-	-	0.0002 U
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	560	-	-	-	-	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	0.05 U	-	-	-	-	-	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	0.004 U	-	-	-	-	-	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	0.025 U	-	-	-	-	-	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	-	0.005 U	-	-	-	-	-	-
Iron	mg/L	0.3	-	**27**	-	-	-	-	-	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	0.003 U	-	-	-	-	-	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	190	-	-	-	-	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	**0.54**	-	-	-	-	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	0.0002 U	-	-	-	-	-	-	0.0002 U	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	0.05 U	-	-	-	-	-	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	10	-	-	-	-	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	-	-	0.005 U	-	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	0.0005 U	-	-	-	-	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	**1400**	-	**1400**	-	-	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW300S	MW300S
Sample ID:			MW102D4-01	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW102D4-02	MW300S-01	MW300S-01
Sample Date:			9/10/1993	3/21/1994	3/23/1994	3/29/1994	4/1/1994	4/3/1994	4/4/1994	4/5/1994	9/1/1993	9/3/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	-	-	-	0.002 U	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	0.02 U	-	-	-	-	-	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	0.02 U	-	-	-	-	-	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S
Sample ID:			MW300S-01	MW300S-01	MW300S-01	MW300S-01	MW300S-01B	MW300S-02	MW300S-02	MW300S-02	MW300S-02	MW300S-02
Sample Date:			9/7/1993	9/9/1993	9/13/1993	9/15/1993	11/1/1993	3/21/1994	3/24/1994	3/25/1994	3/27/1994	3/29/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Metals												
Aluminum	mg/L	0.05	-	**0.09**	-	-	-	-	0.3 U	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	0.003	-	-	-	-	-	-	-	-	0.003
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	0.3	-	-	-	-	0.3	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	0.001 U	-	-	-	-	0.001 U	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	-	-	-	-	-	0.0002
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	220	-	-	-	-	220	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	0.05 U	-	-	-	-	0.05 U	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	0.016	-	-	-	-	0.02 U	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	0.02 U	-	-	-	-	0.025 U	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	0.018	-	0.019	-	-	-	-	0.019
Iron	mg/L	0.3	-	**0.9**	-	-	-	-	**9.2**	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	0.003 U	-	-	-	-	-	-	0.003 U	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	48	-	-	-	-	53	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	**1.6**	-	-	-	-	**1.4**	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	-	-	-	0.0002 U	-	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	0.05 U	-	-	-	-	0.05 U	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	24	-	-	-	-	31	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	0.005 U	-	-	-	-	-	-	-	-	0.005 U
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	0.0005 U	-	-	-	-	0.0005 U	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	**540**	-	-	-	-	**470**	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			**MW300S**	**MW300S**	**MW300S**	**MW300S**	**MW300S**	**MW300S**	**MW300S**	**MW300S**	**MW300S**	**MW300S**
Sample ID:			**MW300S-01**	**MW300S-01**	**MW300S-01**	**MW300S-01**	**MW300S-01B**	**MW300S-02**	**MW300S-02**	**MW300S-02**	**MW300S-02**	**MW300S-02**
Sample Date:			**9/7/1993**	**9/9/1993**	**9/13/1993**	**9/15/1993**	**11/1/1993**	**3/21/1994**	**3/24/1994**	**3/25/1994**	**3/27/1994**	**3/29/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	0.002 U	-	-	-	-	-	-	-	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	0.008 U	-	-	-	-	0.02 U	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	0.02 U	-	-	-	-	0.02 U	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW300S	MW300S	MW300S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW15D	LMW15D
Sample ID:			MW300S-02	MW300S-02	GW-12610-071911-SH-014	LMW13S-01	LMW13S-01	LMW13S-01	LMW13S-01-F	LMW13S-01	LMW13S-01	LMW13S-01B	LMW13S-02	LMW150D-01-FD	LMW15D-01
Sample Date:			4/3/1994	4/5/1994	7/19/2011	9/1/1993	9/7/1993	9/8/1993	9/8/1993	9/9/1993	9/13/1993	11/1/1993	3/29/1994	9/13/1993 (Duplicate)	9/13/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**													
Metals															
Aluminum	mg/L	0.05	-	-	-	-	-	-	-	**0.33**	-	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	0.005 U	-	-	-	-	-	-	0.005 U	-	-	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	-	0.007	-	-	-	-	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	-	-	-	-	0.2 U	-	-	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	-	-	-	-	0.001 U	-	-	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	0.0002 U	-	-	-	-	-	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	-	-	-	30	-	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	-	-	-	-	0.05 U	-	-	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	-	-	-	-	0.004 U	-	-	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	-	-	-	-	0.02 U	-	-	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	-	-	-	-	-	-	0.005 U	0.008	0.005 U	0.005 U	0.005 U
Iron	mg/L	0.3	-	-	-	-	-	-	-	**0.4**	-	-	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	**26**	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	24	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	-	0.003 U	-	-	-	-	-	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	-	-	-	3.6	-	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	-	-	-	0.02 U	-	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	-	0.0002 U	-	-	-	-	-	-	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	-	-	-	-	-	0.1	-	-	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	-	-	-	49	-	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	-	0.005 U	-	-	-	-	-	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	-	0.0002 U	-	-	-	-	-	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	-	-	73	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			**MW300S**	**MW300S**	**MW300S**	**LMW13S**	**LMW13S**	**LMW13S**	**LMW13S**	**LMW13S**	**LMW13S**	**LMW13S**	**LMW13S**	**LMW15D**	**LMW15D**
Sample ID:			**MW300S-02**	**MW300S-02**	**GW-12610-071911-SH-014**	**LMW13S-01**	**LMW13S-01**	**LMW13S-01**	**LMW13S-01-F**	**LMW13S-01**	**LMW13S-01**	**LMW13S-01B**	**LMW13S-02**	**LMW150D-01-FD**	**LMW15D-01**
Sample Date:			**4/3/1994**	**4/5/1994**	**7/19/2011**	**9/1/1993**	**9/7/1993**	**9/8/1993**	**9/8/1993**	**9/9/1993**	**9/13/1993**	**11/1/1993**	**3/29/1994**	**9/13/1993 (Duplicate)**	**9/13/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**													
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	0.002 U	-	-	-	0.002 U	-	-	-	-	-	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	-	-	-	-	-	0.008 U	-	-	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	-	-	-	-	0.08	-	-	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			LMW15D	LMW15D	LMW15D	LMW15D	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1
Sample ID:			LMW150D-01B	LMW15D-01B	MW15-01B	LMW15D-02	MW301D1-01	MW301D1-01	MW301D1-01	MW301D1-01	MW301D1-01	MW301D1-02	MW301D1-02	MW301D1-02	MW301D1-02	MW301D1-02
Sample Date:			11/1/1993 (Duplicate)	11/1/1993	11/1/1993	3/29/1994	8/24/1993	8/25/1993	8/26/1993	8/30/1993	9/14/1993	3/21/1994	3/24/1994	3/25/1994	3/29/1994	4/1/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Metals																
Aluminum	mg/L	0.05	-	-	-	-	-	-	-	**0.15**	-	-	0.3 U	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	-	-	0.005 U	-	-	-	-	-	-	0.005 U
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	-	**0.012**	-	-	-	-	-	-	0.009	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	-	-	-	-	0.2 U	-	-	0.2 U	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	-	-	-	-	0.001 U	-	-	0.001 U	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	-	0.0002 U	-	-	-	0.0002 U	-	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	-	-	-	12	-	-	18	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	-	-	-	-	0.05 U	-	-	0.05 U	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	-	-	-	-	0.004 U	-	-	0.004 U	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	-	-	-	-	0.02 U	-	-	0.025 U	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	0.005 U	0.005 U	**0.66**	0.005 U	0.008	-	-	-	-	0.01	-	-	-	-
Iron	mg/L	0.3	-	-	-	-	-	-	-	0.2	-	-	0.1	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	-	-	0.003 U	-	-	-	0.003 U	-	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	-	-	-	5.7	-	-	6.5	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	-	-	-	0.02 U	-	-	0.02 U	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	-	-	-	-	0.0002 U	-	-	0.0002 U	-	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	-	-	-	-	-	0.05 U	-	-	-	0.05 U	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	-	-	-	85	-	-	73	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	-	-	0.005 U	-	-	-	-	-	0.005 U	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	-	-	-	-	0.0002 U	-	-	-	0.0005 U	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	-	-	**230**	-	-	**230**	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			LMW15D	LMW15D	LMW15D	LMW15D	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1
Sample ID:			LMW150D-01B	LMW15D-01B	MW15-01B	LMW15D-02	MW301D1-01	MW301D1-01	MW301D1-01	MW301D1-01	MW301D1-01	MW301D1-02	MW301D1-02	MW301D1-02	MW301D1-02	MW301D1-02
Sample Date:			11/1/1993 (Duplicate)	11/1/1993	11/1/1993	3/29/1994	8/24/1993	8/25/1993	8/26/1993	8/30/1993	9/14/1993	3/21/1994	3/24/1994	3/25/1994	3/29/1994	4/1/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	-	0.002 U	-	-	-	0.002 U	-	-	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	-	-	-	-	-	**0.02**	-	-	0.02 U	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	-	-	-	-	0.02 U	-	-	0.02 U	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2
Sample ID:			MW3011D2-01-FD	MW301D2-01	MW3011D2-01-FD	MW301D2-01	MW3011D2-01-FD	MW301D2-01	MW3011D2-01-FD	MW301D2-01	MW3011D2-01-FD	MW301D2-01	MW3011D2-01-FD	MW301D2-01	MW301D2-02
Sample Date:			8/20/1993	8/20/1993	8/21/1993	8/21/1993	8/23/1993	8/23/1993	8/24/1993	8/24/1993	8/25/1993	8/25/1993	8/30/1993	8/30/1993	4/1/1994
			(Duplicate)		(Duplicate)		(Duplicate)		(Duplicate)		(Duplicate)		(Duplicate)		
Parameters:	**Units**	**Michigan Residential Drinking water criteria**													
Metals															
Aluminum	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	0.005 U	0.005 U	-	-	-	-	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	-	-	-	0.007	0.007	-	-	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	-	-	-	-	-	-	-	0.3	0.3	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	0.005 U	0.005 U	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	-	0.0002 U	0.0002 U	-	-	-	-	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	-	-	-	-	-	-	-	0.025 U	0.025 U	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	-	-	-	-	-	-	0.005 U	0.005 U	-	-	-
Iron	mg/L	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	-	0.003 U	0.003 U	-	-	-	-	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	-	-	-	-	-	-	-	0.0002 U	0.0002 U	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	-	-	-	-	0.005 U	0.005 U	-	-	-	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	0.0005 U	0.0005 U	-	-	-	-	-	-	-	-	-	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**
Sample Location:			**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**
Sample ID:			**MW3011D2-01-FD**	**MW301D2-01**	**MW3011D2-01-FD**	**MW301D2-01**	**MW3011D2-01-FD**	**MW301D2-01**	**MW3011D2-01-FD**	**MW301D2-01**	**MW3011D2-01-FD**	**MW301D2-01**	**MW3011D2-01-FD**	**MW301D2-01**	**MW301D2-02**
Sample Date:			**8/20/1993**	**8/20/1993**	**8/21/1993**	**8/21/1993**	**8/23/1993**	**8/23/1993**	**8/24/1993**	**8/24/1993**	**8/25/1993**	**8/25/1993**	**8/30/1993**	**8/30/1993**	**4/1/1994**
			(Duplicate)		**(Duplicate)**		**(Duplicate)**		**(Duplicate)**		**(Duplicate)**		**(Duplicate)**		
Parameters:	**Units**	**Michigan Residential Drinking water criteria**													
Sulfide	mg/L		-	-	0.2 U	0.2 U	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	0.002 U	0.002 U	-	-	-	-	-	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-	0.1 U	0.1 U	0.1 U
Vanadium	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-	0.05 U	0.05 U	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	-	-	-	-	-	-	-	0.02 U	0.02 U	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3
Sample ID:			MW301D2-02	MW301D2-02	MW301D2-02	MW301D2-02	MW301D2-02	MW301D3-01	MW301D3-01	MW301D3-01	MW301D3-01	MW301D3-01	MW301D3-02	MW301D3-02	MW301D3-02	MW301D3-02
Sample Date:			4/2/1994	4/3/1994	4/4/1994	4/8/1994	4/10/1994	9/1/1993	9/3/1993	9/7/1993	9/9/1993	9/14/1993	3/21/1994	3/24/1994	3/25/1994	3/28/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Metals																
Aluminum	mg/L	0.05	-	-	-	-	-	-	-	-	**0.17**	-	-	0.3 U	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	-	0.005 U	-	0.005 U	-	-	-	0.006	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	0.003	-	-	-	-	**0.019**	-	-	**0.022**	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	0.43	-	-	-	-	-	-	-	0.3	-	-	0.5	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	0.005 U	-	-	-	-	-	-	-	0.001 U	-	-	0.001 U	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	-	0.0002 U	-	-	0.0002 U	-	-	-	0.0002 U	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	-	-	-	-	87	-	-	120	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	0.05 U	-	-	-	-	-	-	-	0.05 U	-	-	0.05 U	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	0.05 U	-	-	-	-	-	-	-	0.004 U	-	-	0.004 U	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	0.025 U	-	-	-	-	-	-	-	0.02 U	-	-	0.025 U	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	0.005 U	-	-	-	0.005 U	-	-	-	0.005 U	-	-	-
Iron	mg/L	0.3	-	-	-	-	-	-	-	-	0.1 U	-	-	**4.8**	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	0.003 U	-	-	-	-	-	0.003	0.003 U	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	-	-	-	-	18	-	-	42	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	-	-	-	-	**0.08**	-	-	**0.26**	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	0.0002 U	-	-	-	-	0.0002 U	-	-	-	-	0.0002 U	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	0.05 U	-	-	-	-	-	-	-	0.05 U	-	-	0.05 U	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	-	-	-	-	27	-	-	36	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	0.005 U	-	-	-	-	0.005 U	-	-	-	-	-	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	0.0005 U	-	-	-	-	0.0002 U	-	-	-	0.0002 U
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	-	-	-	**420**	-	-	-	**460**	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**
Sample Location:			**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D2**	**MW301D3**	**MW301D3**	**MW301D3**	**MW301D3**	**MW301D3**	**MW301D3**	**MW301D3**	**MW301D3**	**MW301D3**
Sample ID:			**MW301D2-02**	**MW301D2-02**	**MW301D2-02**	**MW301D2-02**	**MW301D2-02**	**MW301D3-01**	**MW301D3-01**	**MW301D3-01**	**MW301D3-01**	**MW301D3-01**	**MW301D3-02**	**MW301D3-02**	**MW301D3-02**	**MW301D3-02**
Sample Date:			**4/2/1994**	**4/3/1994**	**4/4/1994**	**4/8/1994**	**4/10/1994**	**9/1/1993**	**9/3/1993**	**9/7/1993**	**9/9/1993**	**9/14/1993**	**3/21/1994**	**3/24/1994**	**3/25/1994**	**3/28/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Sulfide	mg/L		0.2 U	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	-	-	0.002 U	-	-	0.002 U	-	-	-	-	-	-
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	0.05 U	-	-	-	-	-	-	-	0.008 U	-	-	0.02 U	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	0.02 U	-	-	-	-	-	-	-	0.02 U	-	-	0.02 U	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D3	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4
Sample ID:			MW301D3-02	MW301D4-01	MW301D4-01	MW301D4-01	MW301D4-01	MW301D4-01	MW301D4-01	MW301D4-01	MW301D4-02	MW301D4-02(F)	MW301D4-02	MW301D4-02	MW301D4-02	MW301D4-02
Sample Date:			3/31/1994	9/1/1993	9/3/1993	9/7/1993	9/9/1993	9/10/1993	9/14/1993	3/21/1994	3/21/1994	3/24/1994	3/25/1994	3/28/1994	3/29/1994	3/31/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Metals																
Aluminum	mg/L	0.05	-	-	-	-	**0.07**	-	-	-	-	0.3 U	-	-	-	-
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	0.005 U	-	-	-	-	0.005 U	-	-	-	-	-	-
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	-	0.01	-	-	-	0.009	-	-	-	-	-	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	-	0.6	-	-	-	-	0.8	-	-	-	-
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	-	0.001 U	-	-	-	-	0.001 U	-	-	-	-
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	-	0.0002 U	-	-	-	-	0.0002 U	-	-	-	-	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	-	320	-	-	-	-	330	-	-	-	-
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	-	0.05 U	-	-	-	-	0.05 U	-	-	-	-
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	-	0.004 U	-	-	-	-	0.004 U	-	-	-	-
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	-	0.02 U	-	-	-	-	0.025 U	-	-	-	-
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	-	0.005 U	-	-	-	-	0.005 U	-	-	-	-	-	-
Iron	mg/L	0.3	-	-	-	-	**1**	-	-	-	-	**4.6**	-	-	-	-
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	-	-	-	-	-	0.003 U	0.003 U	-	-	-	-	-	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	-	87	-	-	-	-	98	-	-	-	-
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	-	**0.26**	-	-	-	-	**0.52**	-	-	-	-
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	-	0.0002 U	-	-	-	-	-	0.0002 U	-	-	-	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	-	-	0.05 U	-	-	-	-	0.05 U	-	-	-	-
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	-	22	-	-	-	-	10	-	-	-	-
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	0.005 U	-	0.005 U	-	-	-	-	-	-	-	-	-	0.005 U	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	-	-	-	-	0.0002 U	-	-	-	-	0.0002 U	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	-	-	**1300**	-	-	-	-	**1400**	-	-	-
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**	**Perimeter Banks**
Sample Location:			**MW301D3**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**	**MW301D4**
Sample ID:			**MW301D3-02**	**MW301D4-01**	**MW301D4-01**	**MW301D4-01**	**MW301D4-01**	**MW301D4-01**	**MW301D4-01**	**MW301D4-02**	**MW301D4-02(F)**	**MW301D4-02**	**MW301D4-02**	**MW301D4-02**	**MW301D4-02**	**MW301D4-02**
Sample Date:			**3/31/1994**	**9/1/1993**	**9/3/1993**	**9/7/1993**	**9/9/1993**	**9/10/1993**	**9/14/1993**	**3/21/1994**	**3/21/1994**	**3/24/1994**	**3/25/1994**	**3/28/1994**	**3/29/1994**	**3/31/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**														
Sulfide	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	0.002 U	-	-	0.002 U	-	-	-	-	-	-	-	-	-	0.002 U
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	-	-	0.008 U	-	-	-	-	0.02 U	-	-	-	-
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	-	0.02 U	-	-	-	-	0.03	-	-	-	-
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area
Sample Location:			**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**
Sample ID:			**MSA-5-01**	**MSA-5-01**	**MSA-5-01**	**MSA-5-01**	**MSA-5**	**MSA-5**	**MSA-5**	**MSA-5**	**MSA-5**
Sample Date:			**9/1/1993**	**9/7/1993**	**9/8/1993**	**9/9/1993**	**3/7/1994**	**3/9/1994**	**3/10/1994**	**3/11/1994**	**3/14/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Metals											
Aluminum	mg/L	0.05	-	-	-	**0.2**	-	-	-	-	0.3 U
Aluminum (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-
Aluminum, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.006	-	-	-	0.005 U	-	-	-	-	0.005 U
Antimony (dissolved)	mg/L	0.006	-	-	-	-	-	-	-	-	-
Antimony, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.01	-	-	0.001 U	-	-	-	-	0.001 U	-
Arsenic (dissolved)	mg/L	0.01	-	-	-	-	-	-	-	-	-
Arsenic, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Barium	mg/L	2	-	-	-	0.2	-	-	-	-	0.2 U
Barium (dissolved)	mg/L	2	-	-	-	-	-	-	-	-	-
Barium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.004	-	-	-	0.001 U	-	-	-	-	0.001 U
Beryllium (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-
Beryllium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005	-	0.0002 U	-	-	-	-	0.0002 U	-	-
Cadmium (dissolved)	mg/L	0.005	-	-	-	-	-	-	-	-	-
Cadmium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Calcium	mg/L		-	-	-	84	-	-	-	-	92
Calcium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-
Calcium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.1	-	-	-	0.05 U	-	-	-	-	0.05 U
Chromium (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-
Chromium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.04	-	-	-	0.004 U	-	-	-	-	0.004 U
Cobalt (dissolved)	mg/L	0.04	-	-	-	-	-	-	-	-	-
Cobalt, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Copper	mg/L	1	-	-	-	0.02 U	-	-	-	-	0.025 U
Copper (dissolved)	mg/L	1	-	-	-	-	-	-	-	-	-
Copper, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Cyanide (total)	mg/L	0.2	-	0.005 U	-	-	-	0.005 U	-	-	-
Iron	mg/L	0.3	-	-	-	**11**	-	-	-	-	**22**
Iron (dissolved)	mg/L	0.3	-	-	-	-	-	-	-	-	-
Iron, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Lead	mg/L	0.004	-	0.003 U	-	-	-	-	-	0.003 U	-
Lead (dissolved)	mg/L	0.004	-	-	-	-	-	-	-	-	-
Lead, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Magnesium	mg/L	400	-	-	-	11	-	-	-	-	9.7
Magnesium (dissolved)	mg/L	400	-	-	-	-	-	-	-	-	-
Magnesium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.05	-	-	-	**0.26**	-	-	-	-	**0.28**
Manganese (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-
Manganese, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.002	0.0002 U	-	-	-	0.0002 U	-	-	-	-
Mercury (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1	-	-	-	0.05 U	-	-	-	-	0.05 U
Nickel (dissolved)	mg/L	0.1	-	-	-	-	-	-	-	-	-
Nickel, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Potassium	mg/L		-	-	-	4	-	-	-	-	3
Potassium (dissolved)	mg/L		-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.05	-	-	0.005 U	-	-	-	0.005 U	-	-
Selenium (dissolved)	mg/L	0.05	-	-	-	-	-	-	-	-	-
Selenium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Silver	mg/L	0.034	-	-	0.0002 U	-	-	-	0.0005 U	-	-
Silver (dissolved)	mg/L	0.034	-	-	-	-	-	-	-	-	-
Silver, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Sodium	mg/L	120	-	-	-	13	-	-	-	-	11
Sodium (dissolved)	mg/L	120	-	-	-	-	-	-	-	-	-
Sodium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-

Appendix E.3

Analytical Results Summary - Metals
Bay City Industrial Land
Bay City, Michigan

AOI:			Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area	Support Facilities Area
Sample Location:			**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**	**MSA-5S**
Sample ID:			**MSA-5-01**	**MSA-5-01**	**MSA-5-01**	**MSA-5-01**	**MSA-5**	**MSA-5**	**MSA-5**	**MSA-5**	**MSA-5**
Sample Date:			**9/1/1993**	**9/7/1993**	**9/8/1993**	**9/9/1993**	**3/7/1994**	**3/9/1994**	**3/10/1994**	**3/11/1994**	**3/14/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Sulfide	mg/L		-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.002	-	-	0.002 U	-	-	-	-	-	0.002 U
Thallium (dissolved)	mg/L	0.002	-	-	-	-	-	-	-	-	-
Thallium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Tin	mg/L		-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.0045	-	-	-	0.008 U	-	-	-	-	0.02 U
Vanadium (dissolved)	mg/L	0.0045	-	-	-	-	-	-	-	-	-
Vanadium, total recoverable	mg/L		-	-	-	-	-	-	-	-	-
Zinc	mg/L	2.4	-	-	-	0.04	-	-	-	-	0.04
Zinc (dissolved)	mg/L	2.4	-	-	-	-	-	-	-	-	-
Zinc, total recoverable	mg/L		-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:											
Sample Location:			**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**Crotty Street Channel CB-2**	**Crotty Street Channel CB-2**	**Crotty Street Channel CB-2**	**Crotty Street Channel CB-2**	**Crotty Street Channel CB-2**
Sample ID:			**W-12610-021214-SSH-1401**	**W-12610-022614-SSH-1403**	**W-12610-090514-SSH-1411**	**W-12610-031615-SSH-1501**	**GW-12610-082702-CA-20**	**GW-12610-073103-RW-042**	**W-12610-050504-SSH-004**	**GW-082404-SSH-010**	**WS-061005-SSH-CB01**
Sample Date:			**2/12/2014**	**2/26/2014**	**9/5/2014**	**3/16/2015**	**8/27/2002**	**7/31/2003**	**5/5/2004**	**8/24/2004**	**6/10/2005**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.000096 U	0.000098 U	0.000095 U	0.000095 U	0.00044 J	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005					-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.000096 U	0.000098 U	0.000095 U	0.000095 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005					-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.000096 U	0.000098 U	0.000095 U	0.000095 U	0.0004 UJ	0.0004 UJ	0.0004 U	0.0004 U	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005					-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.000096 U	0.000098 U	0.000095 U	0.000095 U	0.0002 UJ	0.0002 UJ	0.0002 U	**0.00077**	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005					-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.000096 U	0.000098 U	0.000095 U	0.000095 U	0.0002 UJ	**0.00064 J**	0.0002 U	0.0002 U	**0.0015**
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005					-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.000096 U	0.000098 U	0.000095 U	0.000095 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005					-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.000096 U	0.000098 U	0.000095 U	0.000095 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.00008
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	**0.0015**

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2	Crotty Street Channel CB-2
Sample Location:												
Sample ID:			GW-12610-090105-BW-032	W-040506-SSH-CB04	W-031307-SSH-CB07-4	CB2_8/27/07	CB2-(06/11/08)	CB2_(08/19/08)	CB-2_(03/12/09)	W-12610-032410-SSH-CB10-1	W-12610-102511-SSH-027	W-12610-041712-SSH-SA1202
Sample Date:			9/1/2005	4/5/2006	3/13/2007	8/27/2007	6/11/2008	8/19/2008	3/12/2009	3/24/2010	10/25/2011	4/17/2012
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000095 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000095 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000095 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00044	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000095 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000095 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000095 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000095 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel
Sample Location:			CB-2	CB-2	CB-2	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge
Sample ID:			GW-12610-080712-SSH-001	W-12610-040913-SSH-CB1213	W-12610-122914-SSH-1421	W-1261030-010129-SSH-CSA	GW-12610-082702-CA-10	GW-12610-072903-SSH-003	W-12610-050504-SSH-003	GW-082404-SSH-009
Sample Date:			8/7/2012	4/9/2013	12/29/2014	1/29/2001	8/27/2002	7/29/2003	5/5/2004	8/24/2004
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
Polychlorinated Biphenyls										
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.00019 U	0.00019 U	0.00019 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.00019 U	0.00019 U	0.00019 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.00019 U	0.00019 U	0.00019 U	0.0004 U	0.0004 U	0.0004 U	0.0004 U	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00019 U	0.00019 U	0.00019 U	**0.0006**	**0.0031**	**0.002**	0.0002 U	**0.0027 J**
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00019 U	0.00019 U	0.00019 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00019 U	0.00019 U	0.00019 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00019 U	0.00019 U	0.00019 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel
Sample Location:			CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge
Sample ID:			WG-061005-SSH-CS03	GW-12610-090205-BW-038	W-040506-SSH-C03	GW-081606-SSH-0601	W-031307-SSH-C07-3	CSC	CSC-(06/11/08)	DUP-(06/11/08)
Sample Date:			6/10/2005	9/2/2005	4/5/2006	8/16/2006	3/13/2007	8/23/2007	6/11/2008	6/11/2008 (Duplicate)
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
Polychlorinated Biphenyls										
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.00043	0.00036	0.00047	0.00023 J	**0.00051**	0.000074 J	0.000077 J
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	0.0002 U	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel
Sample Location:			CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge
Sample ID:			CSC_(08/19/08)	CSC_(03/12/09)	CSC	W-12610-043010-SSH-CSC-4	GW-12610-081910-SSH-026	GW-12610-081910-SSH-027	GW-12610-082211-JY-002	W-12610-041712-SSH-SA1201
Sample Date:			8/19/2008	3/12/2009	8/27/2009	4/30/2010	8/19/2010	8/19/2010 (Duplicate)	8/22/2011	4/17/2012
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
Polychlorinated Biphenyls										
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.00019 U	0.000097 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.00019 U	0.000097 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.00019 U	0.000097 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00038	0.00014 J	**0.00075**	**0.00059 J**	**0.00062**	**0.00063**	**0.00096**	**0.00062**
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.00019 U	0.000097 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.00019 U	0.000097 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.000044 J	0.000097 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-

Notes:

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U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Crotty Street Channel	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	CSA GW Ext. Sys. Discharge	EW14	LMW17S	LMW17S	LMW17S	LMW18S
Sample ID:			GW-12610-080712-SSH-002	GW-12610-080514-SSH-1402	W-12610-122914-SSH-1420	W-12610-040915-SSH-1502	GW-12610-071811-SH-004	LMW17S-01	LMW17S-02	LMW17S-02(F)	LMW18S-01
Sample Date:			8/7/2012	8/5/2014	12/29/2014	4/9/2015	7/18/2011	9/14/1993	3/24/1994	3/24/1994	9/14/1993
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.00019 U	0.0002 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0001 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.00019 U	0.0002 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0001 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.00019 U	0.0002 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0001 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	**0.00086**	**0.00068 J**	0.00022	0.00019 U	**0.00054**	0.0001 U	0.0001 U	-	0.0001 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.00019 U	0.0002 U	0.00019 U	0.00019 U	**0.0012**	0.0001 U	-	0.0001 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.00019 U	0.0002 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0001 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.00019 U	0.0002 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0001 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Total PCBs	mg/L	0.0005	-	-	-	-	-				

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**LMW18S**	**LMW18S**	**LMW19S**	**LMW19S**	**LMW19S**	**MSA GW Ext. Sys. Discharge**	**MSA GW Ext. Sys. Discharge**	**MSA GW Ext. Sys. Discharge**	**MSA GW Ext. Sys. Discharge**
Sample ID:			**LMW18S-02**	**LMW18S-02(F)**	**LMW19S-01**	**LMW19S-02**	**LMW19S-02(F)**	**W-1261030-010129-SSH-MSA**	**GW-12610-082702-CA-11**	**GW-12610-072903-SSH-002**	**W-12610-050504-SSH-002**
Sample Date:			**3/24/1994**	**3/24/1994**	**9/14/1993**	**3/24/1994**	**3/24/1994**	**1/29/2001**	**8/27/2002**	**7/29/2003**	**5/5/2004**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	0.001 U	0.0002 UJ	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	0.0001 U	-	-	0.0001 U	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	0.001 U	0.0002 UJ	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	0.0001 U	-	-	0.0001 U	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0001 U	-	0.0001 U	0.0001 U	-	0.0004 U	0.002 U	0.0004 UJ	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	0.0001 U	-	-	0.0001 U	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0001 U	-	0.0001 U	0.0001 U	-	**0.0013**	**0.0035**	0.0002 UJ	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	0.0001 U	-	-	0.0001 U	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0001 U	-	0.0002	0.0001 U	-	0.0002 U	0.001 U	0.0002 UJ	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	0.0001 U	-	-	0.0001 U	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	0.001 U	0.0002 UJ	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	0.0001 U	-	-	0.0001 U	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0001 U	-	0.0001 U	0.0001 U	-	0.00019 J	0.001 U	0.0002 UJ	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	0.0001 U	-	-	0.0001 U	-	-	-	-
Total PCBs	mg/L	0.0005						-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge
Sample ID:			GW-082404-SSH-016	WG-061005-SSH-MSA02	GW-12610-090105-BW-031	W-040506-SSH-M02	GW-081606-SSH-0602	W-031307-SSH-M07-2	MSA	MSA-(06/11/08)
Sample Date:			8/24/2004	6/10/2005	9/1/2005	4/5/2006	8/16/2006	3/13/2007	8/23/2007	6/11/2008
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
Polychlorinated Biphenyls										
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0002 U	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 UJ	0.00046	0.0002 U	0.0002 U	**0.00062**	0.001 U	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002	0.0002 U	0.001 U	0.0003	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.00018 J	0.00024	0.001 U	0.00026	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	0.00046	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge	MSA GW Ext. Sys. Discharge
Sample ID:			MSA_(08/19/08)	DUP_(03/12/09)	MSA_(03/12/09)	MSA	W-12610-032410-SSH-MSA10-2	GW-12610-081910-SSH-028	GW-12610-082211-JY-001	W-12610-041712-SSH-SA1203
Sample Date:			8/19/2008	3/12/2009 (Duplicate)	3/12/2009	8/27/2009	3/24/2010	8/19/2010	8/22/2011	4/17/2012
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
Polychlorinated Biphenyls										
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000096 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000096 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000096 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00025	0.0002 U	**0.0021**	**0.0013**	0.0002 U	0.0002 U	0.00019 U	0.000096 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.0004
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.000096 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00028	0.0002 U	0.0002	0.0002 U	0.0002 U	0.00017 J	0.00019 U	0.00018
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**MSA GW Ext. Sys. Discharge**	**MSA GW Ext. Sys. Discharge**	**MSA GW Ext. Sys. Discharge**	**MSA GW Ext. Sys. Discharge**	**MSA GW Ext. Sys. Discharge**	**MW1S**	**MW1S**	**MW1S**	**MW100S**
Sample ID:			**GW-12610-080712-SSH-003**	**W-12610-040913-SSH-MSA1313**	**W-12610-120913-SSH-010**	**GW-12610-080514-SSH-1401**	**W-12610-122914-SSH-1422**	**MW1S-01**	**MW1S-02**	**MW1S-02(F)**	**MW100S-01**
Sample Date:			**8/7/2012**	**4/9/2013**	**12/9/2013**	**8/5/2014**	**12/29/2014**	**9/14/1993**	**3/16/1994**	**3/16/1994**	**9/2/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.00019 U	0.0019 U	0.0002 U	0.00019 U	0.00019 UH	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.00019 U	0.0019 U	0.0002 U	0.00019 U	0.00019 UH	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.00019 U	0.0019 U	0.0002 U	0.00019 U	0.00019 UH	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00019 U	0.0019 U	0.0002 U	0.00019 U	0.00019 UH	0.0001 U	0.0001 U	-	0.01 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00019 U	0.0019 U	0.0002 U	0.00019 U	0.00019 UH	0.0001 U	0.0001 U	-	**0.058**
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00019 U	0.0019 U	0.0002 U	R	0.00019 UH	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00019 U	**0.0086**	0.0002 U	R	0.00019 UH	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	0.0001 U	-
Total PCBs	mg/L	0.0005	-	-	-	-	-			-	

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW100S	MW101S	MW101S	MW101S	MW101S	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1
Sample ID:			MW100S-02	MW101S-01	MW101S-01(F)	MW101S-02	MW101S-02(F)	MW102D1-01	MW102D1-02	MW102D1-02(F)	GW-TH-007	GW-12610-091200-RW-001
Sample Date:			3/16/1994	9/8/1993	9/8/1993	3/24/1994	3/24/1994	9/8/1993	3/21/1994	3/24/1994	3/23/1999	9/12/2000
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	**0.00056**
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	0.0001 U	-	-	0.0001 U	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	0.0001 U	-	-	0.0001 U	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0001 U	-	0.0001 U	0.0001 U	-	0.0004 U	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	0.0001 U	-	-	0.0001 U	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	0.0001 U	-	-	0.0001 U	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0001 U	**0.0081**	-	**0.0007**	-	**0.0021**	0.0001 U	-	**0.0017**	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	0.0002	-	0.0001 U	-	-	0.0001 U	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	0.0001 U	-	-	0.0001 U	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0001 U	-	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	0.0001 U	-	-	0.0001 U	-	-
Total PCBs	mg/L	0.0005			-		-	-	-	-	-	-

Notes:

J - Estimated concentration.
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- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1
Sample ID:			GW-12610-032001-RW-006	GW-12610-081501-RW-023	GW-12610-082602-CA-02	GW-12610-072903-RW-006	GW-082404-RW-001	GW-082404-RW-002	GW-12610-083005-BW-002	GW-081606-SSH-0604	MW102D1	MW102D1_(08/19/08)
Sample Date:			3/20/2001	8/15/2001	8/26/2002	7/29/2003	8/24/2004	8/24/2004 (Duplicate)	8/30/2005	8/16/2006	8/21/2007	8/19/2008
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 U	0.0004 U	0.0004 U	0.0004 UJ	0.0004 UJ	0.0004 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	**0.00078**	**0.00083**	**0.00063**	0.0002 UJ	0.0002 UJ	0.0002 U	0.00014 J	0.00019 J	0.00044	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	**0.00053 J**	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	R	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D1	MW102D2	MW102D2	MW102D2
Sample ID:			MW102D1	GW-12610-081710-JY-001	GW-12610-082311-JY-010	GW-12610-080912-SSH-012	GW-12610-080713-JY-004	GW-12610-080614-SSH-1403	MW102D2-01	MW102D2-02	MW102D2-02(F)
Sample Date:			8/26/2009	8/17/2010	8/23/2011	8/9/2012	8/7/2013	8/6/2014	9/8/1993	3/21/1994	3/24/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0004 J	0.00031	0.00028	0.00043	0.00019 U	0.00041 J	0.0001 U	0.0001 U	-
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	**0.0024**	0.0001 U	-
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	R	0.00019 U	0.0001 U	0.0001 U	-
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.000046 J	0.00019 U	R	0.00019 U	0.0001 U	0.0001 U	-
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	0.0001 U
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2
Sample ID:			GW-TH-008	GW-12610-091200-RW-004	GW-12610-091200-RW-005	GW-12610-032001-RW-004	GW-12610-081501-RW-025	GW-12610-082602-CA-03	GW-12610-082602-CA-04	GW-12610-072903-RW-004	GW-082404-RW-003
Sample Date:			3/23/1999	9/12/2000	9/12/2000 (Duplicate)	3/20/2001	8/15/2001	8/26/2002	8/26/2002 (Duplicate)	7/29/2003	8/24/2004
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.00023	0.00023	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 U	0.0004 U	0.0004 U	0.0004 UJ	0.0004 U	0.0004 U	0.0004 U	0.0004 UJ	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.00024 J	0.00013 J	0.0001 J	0.00015 J	0.0002 UJ	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00046	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.00026 J	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	R	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2	MW102D2
Sample ID:			GW-12610-083005-BW-001	GW-081606-SSH-0606	MW102D2	MW102D2_(08/19/08)	MW102D2	GW-12610-081710-JY-002	GW-12610-082311-JY-011	GW-12610-080912-SSH-011	GW-12610-080713-JY-005
Sample Date:			8/30/2005	8/16/2006	8/21/2007	8/19/2008	8/26/2009	8/17/2010	8/23/2011	8/9/2012	8/7/2013
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000073 J	0.00013 J	0.0002 U	0.00019 U	0.00019 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00013 J	0.00019 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D2	MW102D3	MW102D3	MW102D3	MW102D3	MW102D3	MW102D3	MW102D3	MW102D3
Sample ID:			GW-12610-080614-SSH-1404	MW102D3-01	MW102D3-02	MW102D3-02(F)	MW102D3-02(F)	GW-TH-009	GW-12610-091200-RW-006	GW-12610-032001-RW-005	GW-12610-081501-RW-024
Sample Date:			8/6/2014	9/8/1993	3/21/1994	3/21/1994	3/24/1994	3/23/1999	9/12/2000	3/20/2001	8/15/2001
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	-	0.0002 U	0.00019 J	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	0.0001 U	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	-	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	0.0001 U	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	-	0.0004 U	0.0004 U	0.0004 U	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	0.0001 U	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00013 J	0.0001 U	0.0001 U	-	-	0.0002 U	0.0002 U	0.0002 U	0.00011 J
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	0.0001 U	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00019 U	**0.001**	0.0001 U	-	-	0.00037	0.0002 U	**0.0006**	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	0.0001 U	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	-	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	0.0001 U	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	-	0.0002 U	0.0002 U	0.0002 U	R
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	0.0001 U	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**MW102D3**	**MW102D3**	**MW102D3**	**MW102D3**	**MW102D3**	**MW102D3**	**MW102D3**	**MW102D3**	**MW102D3**	**MW102D4**
Sample ID:			**GW-12610-082602-CA-06**	**GW-12610-072903-RW-007**	**GW-082404-RW-004**	**GW-12610-083005-BW-003**	**GW-081606-SSH-0607**	**MW102D3**	**MW102D3_(08/19/08)**	**MW102D3**	**GW-12610-081710-JY-003**	**MW102D4-01**
Sample Date:			**8/26/2002**	**7/29/2003**	**8/24/2004**	**8/30/2005**	**8/16/2006**	**8/21/2007**	**8/19/2008**	**8/26/2009**	**8/17/2010**	**9/8/1993**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 U	0.0004 U	0.0004 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.00022	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4
Sample ID:			MW102D4-02	GW-TH-010	GW-12610-091200-RW-002	GW-12610-032001-RW-003	GW-12610-081501-RW-022	GW-12610-082602-CA-05	GW-12610-072903-RW-005	GW-082404-RW-005	GW-12610-083005-BW-004
Sample Date:			3/24/1994	3/23/1999	9/12/2000	3/20/2001	8/15/2001	8/26/2002	7/29/2003	8/24/2004	8/30/2005
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0001 U	0.0002 U	0.000063 J	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0001 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0001 U	0.0004 U	0.0004 UJ	0.0004 UJ	0.0004 U	0.0004 UJ	0.0004 UJ	0.0004 U	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0001 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0004 J	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0001 U	**0.0018**	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0001 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0001 U	0.0002 U	0.0002 UJ	0.0002 UJ	R	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4	MW102D4
Sample ID:			GW-081606-SSH-0605	MW102D4	MW102D4_(08/19/08)	MW102D4	GW-12610-081710-JY-004	GW-12610-082311-JY-012	GW-12610-080912-SSH-010	GW-12610-080713-JY-006	GW-12610-080614-SSH-1405
Sample Date:			8/16/2006	8/21/2007	8/19/2008	8/26/2009	8/17/2010	8/23/2011	8/9/2012	8/7/2013	8/6/2014
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000084 J	0.000082 J	0.00019 U	0.00019	0.00019 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW102D4	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S
Sample ID:			GW-12610-080614-SSH-1406	MW300S-01	MW300-02	MW300S-02(F)	GW-TH-011	GW-12610-091200-RW-003	GW-12610-032001-RW-007	GW-12610-081501-RW-014	GW-12610-082602-CA-01
Sample Date:			8/6/2014 (Duplicate)	9/14/1993	3/24/1994	3/24/1994	3/23/1999	9/12/2000	3/20/2001	8/15/2001	8/26/2002
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.00034 J	0.0002 U	0.00024	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0004 U	0.0004 UJ	0.0004 U	0.0004 U	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.00025
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00019 U	**0.0008**	**0.0046**	-	**0.00081**	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	0.0003	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	**0.002**	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S
Sample ID:			GW-12610-072903-RW-008	GW-082404-RW-011	GW-12610-083105-BW-015	GW-081706-SSH-0608	GW-081706-SSH-0609	MW300S	MW300S_(08/19/08)	DUP 4	MW300S	GW-12610-081810-JY-011
Sample Date:			7/29/2003	8/24/2004	8/31/2005	8/17/2006	8/17/2006 (Duplicate)	8/21/2007	8/19/2008	8/26/2009 (Duplicate)	8/26/2009	8/18/2010
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	R	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	R	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	R	0.0004 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	R	0.0002 UJ	0.0002 U	0.00011 J	0.000095 J	0.00024	0.00021	0.0004 J	0.00039 J	0.00014 J
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	**0.00058 J**	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	R	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	R	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Perimeter Banks
Sample Location:			MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	MW300S	LMW13S
Sample ID:			GW-12610-081810-JY-012	GW-12610-082311-JY-004	GW-12610-082311-JY-005	GW-12610-080912-SSH-007	GW-12610-080912-SSH-008	GW-12610-080713-JY-001	GW-12610-080713-JY-002	GW-12610-080614-SSH-1407	LMW13S-01-F
Sample Date:			8/18/2010	8/23/2011	8/23/2011	8/9/2012	8/9/2012	8/7/2013	8/7/2013	8/6/2014	9/8/1993
			(Duplicate)		(Duplicate)		(Duplicate)		(Duplicate)		
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0001 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0001 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0001 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00016 J	0.00023	0.00024	0.00019 U	0.000083 J	0.00019 U	0.00019 U	0.0001 J	0.0001 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U	0.0003
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	R	R	0.00019 U	0.0001 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	R	R	0.00019 U	0.0001 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S
Sample ID:			LMW13S-01	LMW13S-02	LMW13S-02(F)	GW-TH-006	GW-12610-091200-RW-008	GW-12610-032001-RW-009	GW-12610-081501-RW-016	GW-12610-082602-CA-07	GW-12610-072903-RW-012	GW-082404-RW-012
Sample Date:			9/10/1993	3/24/1994	3/24/1994	3/23/1999	9/12/2000	3/20/2001	8/15/2001	8/26/2002	7/29/2003	8/24/2004
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0002 U	**0.0034 J**	0.001 U	0.0002 UJ	0.0002 U	0.0002 UJ	R
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0002 U	0.002 UJ	0.001 U	0.0002 UJ	0.0002 U	0.0002 UJ	R
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0004 U	0.004 UJ	0.002 U	0.0004 UJ	0.0004 U	0.0004 UJ	R
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0002 U	0.002 UJ	0.001 U	0.0002 UJ	0.0002 U	0.0002 UJ	R
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	**0.0068**	**0.0016**	-	**0.0017**	0.002 UJ	**0.0055**	**0.00099 J**	**0.0029**	**0.0019 J**	**0.00084 J**
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0002 U	0.002 UJ	0.001 U	0.0002 UJ	0.0002 U	0.0002 UJ	R
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0001 U	0.0001 U	-	0.0002 U	0.002 UJ	0.001 U	0.0002 UJ	0.0002 U	0.0002 UJ	R
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	0.0001 U	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S	LMW13S
Sample ID:			GW-12610-083105-BW-020	GW-081706-SSH-0610	LMW13S	LMW13S_(08/18/08)	GW-12610-081710-JY-009	GW-12610-082311-JY-006	GW-12610-080812-SSH-004	GW-12610-080812-SSH-005	GW-12610-080813-JY-008
Sample Date:			8/31/2005	8/17/2006	8/21/2007	8/18/2008	8/17/2010	8/23/2011	8/8/2012	8/8/2012 (Duplicate)	8/8/2013
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 UJ
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 UJ
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 UJ
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.0002 U	**0.001**	0.0002 U	0.0002 U	**0.00072**	**0.00079**	**0.00085**	0.00019 UJ
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	**0.0012**	0.0002 U	**0.0016**	**0.0011**	0.00019 U	0.00019 U	0.00019 U	**0.001 J**
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00045	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.00019 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			LMW13S	LMW15D	LMW15D	LMW15D	LMW15D	LMW15D	LMW15D	LMW15D	LMW15D	LMW15D	LMW15D
Sample ID:			GW-12610-080614-SSH-1408	LMW150D-01-FD	LMW15D-01	LMW15D-02	LMW15D-02(F)	GW-TH-015	GW-TH-016	GW-12610-091200-RW-007	GW-12610-032001-RW-008	GW-12610-081501-RW-015	GW-12610-082602-CA-08
Sample Date:			8/6/2014	9/8/1993 (Duplicate)	9/8/1993	3/24/1994	3/24/1994	3/23/1999	3/23/1999 (Duplicate)	9/12/2000	3/20/2001	8/15/2001	8/26/2002
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Polychlorinated Biphenyls													
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.00039 J	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	0.0001 U	-	0.0004 U	0.0004 U	0.0004 UJ	0.0004 UJ	0.0004 U	0.00027 J
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	**0.001**	**0.0085**	**0.0039**	0.0001 U	-	**0.00082**	**0.00056**	0.0002 UJ	0.0002 UJ	0.000092 J	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 UJ	0.00012 J	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.000045 J	0.0002 UJ	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			LMW15D	LMW15D	LMW15D	LMW15D	LMW15D	LMW15D_(08/18/08)	MW15D	LMW15D	LMW15D	LMW15D
Sample ID:			GW-12610-072903-RW-011	GW-082404-RW-013	GW-12610-083105-BW-021	GW-081706-SSH-0611	LMW15D			GW-12610-081710-JY-010	GW-12610-082311-JY-007	GW-12610-080812-SSH-006
Sample Date:			7/29/2003	8/24/2004	8/31/2005	8/17/2006	8/21/2007	8/18/2008	8/26/2009	8/17/2010	8/23/2011	8/8/2012
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 UJ	0.0004 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.00019 J	0.000073 J	0.0002 U	0.00006 J	0.00013 J
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			LMW15D	LMW15D	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1
Sample ID:			GW-12610-080813-JY-009	GW-12610-080614-SSH-1409	MW301D1-01	MW301D1-02	MW301D1-02(F)	GW-TH-018	GW-12610-091200-RW-010	GW-12610-032001-RW-012	GW-12610-081501-RW-018	GW-12610-081501-RW-019
Sample Date:			8/8/2013	8/6/2014	8/30/1993	3/21/1994	3/21/1994	3/24/1999	9/12/2000	3/20/2001	8/15/2001	8/15/2001 (Duplicate)
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.00019 U	0.00019 U	0.0001 U	0.0001 U	-	0.0004 U	0.0004 UJ	0.0004 U	0.0004 U	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00014 J	0.000065 J	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00019 U	0.00019 U	0.0002	0.0001 U	-	0.0002 U	0.0002 UJ	0.0001 J	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00019 UJ	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00019 UJ	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	0.0001 U	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1	MW301D1
Sample ID:			GW-12610-082702-CA-19	GW-12610-082702-CA-25	GW-12610-073003-RW-020	GW-082404-RW-018	GW-082404-RW-019	GW-12610-090105-BW-025	GW-081706-SSH-0612	MW301D1	MW301D1_(08/19/08)	MW301D1
Sample Date:			8/27/2002	8/27/2002 (Duplicate)	7/30/2003	8/24/2004	8/24/2004 (Duplicate)	9/1/2005	8/17/2006	8/21/2007	8/19/2008	8/26/2009
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 UJ	0.0004 UJ	0.0004 UJ	0.0004 U	0.0004 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.000063 J	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D1	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2
Sample ID:			GW-12610-081710-JY-005	MW3011D2-01-FD	MW301D2-01	MW301D-02(F)	MW301D2-02	GW-TH-019	GW-12610-091200-RW-011	GW-12610-032001-RW-013	GW-12610-081501-RW-020	GW-12610-082702-CA-18	GW-12610-073003-RW-019
Sample Date:			8/17/2010	8/30/1993 (Duplicate)	8/30/1993	3/15/1994	3/16/1994	3/24/1999	9/12/2000	3/20/2001	8/15/2001	8/27/2002	7/30/2003
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Polychlorinated Biphenyls													
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0001 U	0.0001 U	-	0.0001 U	0.0002 U	0.0001 J	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0001 U	0.0001 U	-	0.0001 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0001 U	0.0001 U	-	0.0001 U	0.0004 U	0.0004 U	0.0004 UJ	0.0004 U	0.0004 U	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.0001 U	0.0001 U	-	0.0001 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0001 U	0.0001 U	-	0.0001 U	**0.001**	0.0002 U	0.0002 UJ	0.000066 J	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0001 U	0.0001 U	-	0.0001 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0001 U	0.0001 U	-	0.0001 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2	MW301D2
Sample ID:			GW-082404-RW-017	GW-12610-090105-BW-026	GW-081706-SSH-0615	MW301D2	MW301D2_(08/19/08)	MW301D2	GW-12610-081710-JY-006	GW-12610-082311-JY-008	GW-12610-080912-SSH-009	GW-12610-080713-JY-007
Sample Date:			8/24/2004	9/1/2005	8/17/2006	8/21/2007	8/19/2008	8/26/2009	8/17/2010	8/23/2011	8/9/2012	8/7/2013
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.000085 J	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.00019 U	0.00019 U	0.00019 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D2	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3
Sample ID:			GW-12610-080614-SSH-1410	MW301D3-01	MW301D3-02	MW301D3-02(F)	GW-TH-020	GW-12610-091300-RW-013	GW-12610-032001-RW-014	GW-12610-081501-RW-021	GW-12610-082702-CA-17	GW-12610-072903-RW-013
Sample Date:			8/6/2014	9/1/1993	3/21/1994	3/21/1994	3/24/1999	9/13/2000	3/20/2001	8/15/2001	8/27/2002	7/29/2003
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0004 U	0.0004 U	0.0004 U	0.0004 U	0.0004 U	0.0004 UJ
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	**0.00095 J**
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.00019 U	0.0001 U	0.0001 U	-	0.0002 U	0.0002 U	0.0002 U	R	0.0002 U	0.0002 UJ
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	0.0001 U	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D3	MW301D4	MW301D4	MW301D4	MW301D4
Sample ID:			GW-082404-RW-007	GW-12610-090105-BW-027	GW-081706-SSH-0614	MW301D3	MW301D3_(08/19/08)	MW301D3	GW-12610-081710-JY-007	MW301D4-01	MW301D4-02	MW301D4-02(F)	GW-TH-021
Sample Date:			8/24/2004	9/1/2005	8/17/2006	8/21/2007	8/19/2008	8/26/2009	8/17/2010	9/3/1993	3/21/1994	3/21/1994	3/24/1999
Parameters:	**Units**	**Michigan Residential Drinking water criteria**											
Polychlorinated Biphenyls													
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	-	0.0004 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.00045 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001	0.0001 U	-	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0001 U	0.0001 U	-	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4
Sample ID:			GW-12610-091200-RW-012	GW-12610-032001-RW-010	GW-12610-032001-RW-011	GW-12610-081501-RW-017	GW-12610-082702-CA-15	GW-12610-072903-RW-009	GW-12610-072903-RW-010	GW-082404-RW-006	GW-12610-090105-BW-028
Sample Date:			9/12/2000	3/20/2001	3/20/2001 (Duplicate)	8/15/2001	8/27/2002	7/29/2003	7/29/2003 (Duplicate)	8/24/2004	9/1/2005
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
Polychlorinated Biphenyls											
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0004 UJ	0.0004 U	0.0004 U	0.0004 UJ	0.0004 U	0.0004 U	0.0004 U	0.0004 U	0.0002 U
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 UJ	0.00011 J	0.000084 J	**0.0017 J**	0.00024	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.00014 J	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 UJ	0.0002 U	0.0002 U	R	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.4

Analytical Results Summary - PCBs
Bay City Industrial Land
Bay City, Michigan

AOI:			Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Support Facilities Area	Support Facilities Area	Support Facilities Area
Sample Location:			MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MW301D4	MSA-5S	MSA-5S	MSA-5S
Sample ID:			GW-081706-SSH-0613	MW301D4	DUP3_(08/19/08)	MW301D4_(08/19/08)	MW301D4	GW-12610-081710-JY-008	GW-12610-082311-JY-009	MSA-5-01	MSA-5	MSA5-02(F)
Sample Date:			8/17/2006	8/21/2007	8/19/2008 (Duplicate)	8/19/2008	8/26/2009	8/17/2010	8/23/2011	9/14/1993	3/10/1994	3/10/1994
Parameters:	**Units**	**Michigan Residential Drinking water criteria**										
Polychlorinated Biphenyls												
Aroclor-1016 (PCB-1016)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0001 U	-
Aroclor-1016 (PCB-1016) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1221 (PCB-1221)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0001 U	-
Aroclor-1221 (PCB-1221) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1232 (PCB-1232)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0001 U	-
Aroclor-1232 (PCB-1232) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1242 (PCB-1242)	mg/L	0.0005	0.0002 U	0.00012 J	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0001 U	-
Aroclor-1242 (PCB-1242) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1248 (PCB-1248)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	**0.018**	0.0001 U	-
Aroclor-1248 (PCB-1248) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1254 (PCB-1254)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0001 U	-
Aroclor-1254 (PCB-1254) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U
Aroclor-1260 (PCB-1260)	mg/L	0.0005	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.001 U	0.0001 U	-
Aroclor-1260 (PCB-1260) (dissolved)	mg/L	0.0005	-	-	-	-	-	-	-	-	-	0.0001 U
Total PCBs	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.5

Analytical Results Summary - Pesticides, Herbicides, and Dioxins/Furans
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			**CB-2**	**EW14**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**
Sample ID:			**W-12610-102511-SSH-027**	**GW-12610-071811-SH-004**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**
Sample Date:			**10/25/2011**	**7/18/2011**	**8/30/1993**	**9/1/1993**	**9/2/1993**	**9/3/1993**	**9/5/1993**	**9/12/1993**	**3/14/1994**	**3/15/1994**	**3/16/1994**	**3/17/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**												
Pesticides														
0,0,0-Triethylphosphorothioate	mg/L		-	-	-	-	-	0.00025 U	-	-	-	0.00025 U	-	-
4,4'-DDD	mg/L	0.0091	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
4,4'-DDE	mg/L	0.0043	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
4,4'-DDT	mg/L	0.0036	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Aldrin	mg/L	0.000098	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
alpha-BHC	mg/L	0.00043	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
alpha-Chlordane	mg/L	0.002	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
beta-BHC	mg/L	0.00088	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
delta-BHC	mg/L		-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Dieldrin	mg/L	0.00011	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Dimethoate	mg/L		-	-	-	-	-	0.0005 U	-	-	-	0.0005 U	-	-
Disulfoton	mg/L		-	-	-	-	-	0.00025 U	-	-	-	0.00025 U	-	-
Endosulfan I	mg/L		-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Endosulfan II	mg/L		-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Endosulfan sulfate	mg/L		-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Endrin	mg/L	0.002	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Endrin aldehyde	mg/L		-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Ethyl parathion	mg/L		-	-	-	-	-	0.00025 U	-	-	-	0.00025 U	-	-
Famphur	mg/L		-	-	-	-	-	0.001 U	-	-	-	0.001 U	-	-
gamma-BHC (lindane)	mg/L	0.0002	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
gamma-Chlordane	mg/L	0.002	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Heptachlor	mg/L	0.0004	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Heptachlor epoxide	mg/L	0.0002	-	-	-	-	0.0002 U	-	-	-	-	-	0.00001 U	-
Isodrin	mg/L		-	-	-	-	0.002 U	-	-	-	-	-	0.0001 U	-
Kepone	mg/L		-	-	-	-	0.02 U	-	-	-	-	-	0.001 U	-
Methoxychlor	mg/L	0.04	-	-	-	-	0.01 U	-	-	-	-	-	0.0005 U	-
Methyl parathion	mg/L	0.0018	-	-	-	-	-	0.00025 U	-	-	-	0.00025 U	-	-
Phorate	mg/L		-	-	-	-	-	0.00025 U	-	-	-	0.00025 U	-	-
Sulfotep	mg/L		-	-	-	-	-	0.00025 U	-	-	-	0.00025 U	-	-
Thionazin (O,O-diethyl-O-2-pyrazinyl phosphorothioate)	mg/L		-	-	-	-	-	0.00025 U	-	-	-	0.00025 U	-	-
Toxaphene	mg/L	0.003	-	-	-	-	0.0002 U	-	-	-	-	-	0.0001 U	-
Herbicides														
2,4,5-T	mg/L		-	-	0.002 U	-	-	-	-	-	0.002 U	-	-	-
2,4,5-TP (Silvex)	mg/L	0.05	-	-	0.002 U	-	-	-	-	-	0.002 U	-	-	-
2,4-Dichlorophenoxyacetic acid (2,4-D)	mg/L	0.07	-	-	0.01 U	-	-	-	-	-	0.01 U	-	-	-
Diox Fur														
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	mg/L		0.0000000013 J Q	0.00000000063 J	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	ppm		-	-	-	-	-	-	0.0000013503224	-	-	0.00000075809	-	-
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	mg/L		0.0000000028 J Q	0.000000099 U	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	ppm		-	-	-	-	-	-	0.0000005052666	-	-	0.00000032051	-	-
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	mg/L		0.0000000011 J	0.0000000018 J	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	ppm		-	-	-	-	-	-	0.000001878148	-	-	0.00000119893	-	-
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	mg/L		0.0000000012 J	0.000000049 U	-	0.01 U	-	-	-	-	-	-	-	0.01 U
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	ppm		-	-	-	-	-	-	0.0000001838272	-	-	0.00000012596	-	-
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	mg/L		0.0000000012 J Q	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	ppm		-	-	-	-	-	-	0.000000009704 U	-	-	0.00000001354	-	-
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	mg/L		0.0000000013 J Q	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	ppm		-	-	-	-	-	-	0.0000000513376	-	-	0.00000003805	-	-
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ppm		-	-	-	-	-	-	0.000000008702 U	-	-	0.00000000135 U	-	-
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	mg/L		0.00000000062 J Q	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	ppm		-	-	-	-	-	-	0.0000000173763	-	-	0.00000001397	-	-
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	ppm		-	-	-	-	-	-	0.0000000323638	-	-	0.00000002138	-	-
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	ppm		-	-	-	-	-	-	0.000000006294 U	-	-	0.00000000097 U	-	-
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	ppm		-	-	-	-	-	-	0.000000008152 U	-	-	0.00000000311 U	-	-
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	mg/L		0.000000001 J Q	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	ppm		-	-	-	-	-	-	0.000000007424 U	-	-	0.00000000698	-	-
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	ppm		-	-	-	-	-	-	0.000000008074 U	-	-	0.00000000194	-	-
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	ppm		-	-	-	-	-	-	0.000000055869 U	-	-	0.00000002334	-	-
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-

Appendix E.5

Analytical Results Summary - Pesticides, Herbicides, and Dioxins/Furans
Bay City Industrial Land
Bay City, Michigan

AOI:			Crotty Street Channel	Crotty Street Channel	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area	Machine Storage Area
Sample Location:			**CB-2**	**EW14**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**	**MW100S**
Sample ID:			**W-12610-102511-SSH-027**	**GW-12610-071811-SH-004**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-01**	**MW100S-02**	**MW100S-02**	**MW100S-02**	**MW100S-02**
Sample Date:			**10/25/2011**	**7/18/2011**	**8/30/1993**	**9/1/1993**	**9/2/1993**	**9/3/1993**	**9/5/1993**	**9/12/1993**	**3/14/1994**	**3/15/1994**	**3/16/1994**	**3/17/1994**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**												
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	ppm		-	-	-	-	-	-	0.000000048357	-	-	0.000000028	-	-
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	mg/L		0.0000000098 U	0.0000000099 U	-	-	-	-	-	-	-	-	-	-
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	ppm		-	-	-	-	-	-	0.0000001451247	0.0000000367691	-	0.00000010458	-	-
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	mg/L	0.00000003	0.0000000098 U	0.0000000099 U	-	-	-	-	-	-	-	-	-	-
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	ppm	0.00000003	-	-	-	-	-	-	0.000000007985 U	0.000000007985 U	-	0.0000000009 U	-	-
Total heptachlorodibenzofuran (HpCDF)	mg/L		0.000000003	0.0000000033	-	-	-	-	-	-	-	-	-	-
Total heptachlorodibenzofuran (HpCDF)	ppm		-	-	-	-	-	-	0.0000040965238	-	-	0.00000255154	-	-
Total heptachlorodibenzo-p-dioxin (HpCDD)	mg/L		0.0000000019	0.000000049 U	-	-	-	-	-	-	-	-	-	-
Total heptachlorodibenzo-p-dioxin (HpCDD)	ppm		-	-	-	-	-	-	0.0000003491223	-	-	0.00000022942	-	-
Total hexachlorodibenzofuran (HxCDF)	mg/L		0.0000000032	0.000000049 U	-	-	-	-	-	-	-	-	-	-
Total hexachlorodibenzofuran (HxCDF)	ppm		-	-	-	-	-	-	0.0000011811887	-	-	0.00000073746	-	-
Total hexachlorodibenzo-p-dioxin (HxCDD)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
Total hexachlorodibenzo-p-dioxin (HxCDD)	ppm		-	-	-	-	-	-	0.0000002014674	-	-	0.00000012345	-	-
Total pentachlorodibenzofuran (PeCDF)	mg/L		0.000000001	0.000000049 U	-	-	-	-	-	-	-	-	-	-
Total pentachlorodibenzofuran (PeCDF)	ppm		-	-	-	-	-	-	0.0000003107903	-	-	0.00000022348	-	-
Total pentachlorodibenzo-p-dioxin (PeCDD)	mg/L		0.000000049 U	0.000000049 U	-	-	-	-	-	-	-	-	-	-
Total pentachlorodibenzo-p-dioxin (PeCDD)	ppm		-	-	-	-	-	-	0.000000008074 U	-	-	0.00000000194	-	-
Total tetrachlorodibenzofuran (TCDF)	mg/L		0.0000000098 U	0.0000000099 U	-	-	-	-	-	-	-	-	-	-
Total tetrachlorodibenzofuran (TCDF)	ppm		-	-	-	-	-	-	0.0000004867554	0.0000002673542	-	0.00000031751	-	-
Total tetrachlorodibenzo-p-dioxin (TCDD)	mg/L		0.0000000098 U	0.0000000099 U	-	-	-	-	-	-	-	-	-	-
Total tetrachlorodibenzo-p-dioxin (TCDD)	ppm		-	-	-	-	-	-	0.000000007985 U	0.000000007985 U	-	0.00000000909	-	-

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.6

Analytical Results Summary - General Chemistry and Field Parameters
Bay City Industrial Land
Bay City, Michigan

AOI:										
Sample Location:			**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**effluent-GWTS**	**Crotty Street Channel**	**Crotty Street Channel**	**Crotty Street Channel**	**Crotty Street Channel**
Sample ID:			**W-12610-021214-SSH-1401**	**W-12610-022614-SSH-1403**	**W-12610-090514-SSH-1411**	**W-12610-031615-SSH-1501**	**CB-2**	**CSA GW Ext. Sys. Discharge**	**CSA GW Ext. Sys. Discharge**	**EW14**
Sample Date:			**2/12/2014**	**2/26/2014**	**9/5/2014**	**3/16/2015**	**W-12610-102511-SSH-027**	**W-1261030-010129-SSH-CSA**	**W-1261030-010129-SSH-CSA(D)**	**GW-12610-071811-SH-004**
							10/25/2011	**1/29/2001**	**1/29/2001**	**7/18/2011**
									(Duplicate)	
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
General Chemistry										
Alkalinity, total (as CaCO3)	mg/L		-	-	-	-	200 B	790	780	570
Ammonia	mg/L	10	**33**	4.4	2.0 U	6.8	0.069 J	**14**	-	**12**
Biochemical oxygen demand (BOD)	mg/L		17	2.3	2.0 U	2.3	2.0 U	-	-	2.0 UJ
Chemical oxygen demand (COD)	mg/L		20 U	10 U	10 U	10 U	20	-	-	85
Dissolved organic carbon (DOC)	mg/L		-	-	-	-	-	31	-	-
Hardness, carbonate	mg/L		-	-	-	-	220	-	-	550
N-Hexane extractable material	mg/L		-	-	-	-	-	5.0 U	-	-
Oil and grease (HEM), polar	mg/L		4.8 U	1.7 JB	4.9 U	4.7 U	1.1 J	-	-	1.4 J
pH (water)	s.u.	6.5 - 8.5	-	-	-	-	-	7.5	-	-
pH, lab	s.u.	6.5 - 8.5	8.00 HF	8.09 HF	7.98 HF	7.69 HF	7.39 HF	-	-	6.88 J
Phosphate, total	mg/L		-	-	-	-	0.10 U	-	-	0.14
Phosphorus	mg/L	63	0.22	0.20	0.10 U	0.10 U	-	-	-	-
Total dissolved solids (TDS)	mg/L	500	-	-	-	-	260	-	-	**690**
Total microbial population	cfu/mL		-	-	-	-	-	-	-	105
Total organic carbon (TOC)	mg/L		-	-	-	-	9.4	31	-	31
Total suspended solids (TSS)	mg/L		4.0 U	4.0	4.0 U	4.0 U	4.0 U	-	-	99
Field Parameters										
Conductivity	umhos/cm		-	-	-	-	-	-	-	-
Dissolved oxygen (DO)	mg/L		-	-	-	-	-	-	-	-
Dissolved oxygen (DO), field	mg/L		-	-	-	-	-	-	-	0.17
Oxidation reduction potential (ORP)	millivolts		-	-	-	-	-	-	-	-
pH, field	s.u.	6.5 - 8.5	-	-	-	-	-	-	-	6.69
Temperature, field	Deg C		-	-	-	-	-	-	-	19.75
Temperature, sample	deg c		-	-	-	-	-	-	-	-
Turbidity	ntu		-	-	-	-	-	-	-	-
Turbidity, field	NTU		-	-	-	-	-	-	-	18.4

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.6

Analytical Results Summary - General Chemistry and Field Parameters
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**EW6**	**EW7**	**EW8**	**EW9**	**EW10**	**EW11**	**EW12**	**MSA GW Ext. Sys. Discharge**
Sample ID:			**GW-12610-072011-SH-016**	**GW-12610-071811-SH-001(C)**	**GW-12610-071911-SH-009C**	**GW-12610-071811-SH-002(C)**	**GW-12610-072011-SH-017**	**GW-12610-071911-SH-008C**	**GW-12610-072011-SH-015**	**W-1261030-010129-SSH-MSA**
Sample Date:			**7/20/2011**	**7/18/2011**	**7/19/2011**	**7/18/2011**	**7/20/2011**	**7/19/2011**	**7/20/2011**	**1/29/2001**
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
General Chemistry										
Alkalinity, total (as CaCO3)	mg/L		-	-	-	-	-	-	-	650
Ammonia	mg/L	10	-	-	-	-	-	-	-	9.9
Biochemical oxygen demand (BOD)	mg/L		-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L		-	-	-	-	-	-	-	-
Dissolved organic carbon (DOC)	mg/L		-	-	-	-	-	-	-	39
Hardness, carbonate	mg/L		-	-	-	-	-	-	-	-
N-Hexane extractable material	mg/L		-	-	-	-	-	-	-	5.6
Oil and grease (HEM), polar	mg/L		-	-	-	-	-	-	-	-
pH (water)	s.u.	6.5 - 8.5	-	-	-	-	-	-	-	7.4
pH, lab	s.u.	6.5 - 8.5	-	-	-	-	-	-	-	-
Phosphate, total	mg/L		-	-	-	-	-	-	-	-
Phosphorus	mg/L	63	-	-	-	-	-	-	-	-
Total dissolved solids (TDS)	mg/L	500	-	-	-	-	-	-	-	-
Total microbial population	cfu/mL		4240	9400	1920	9360	19800	7140	3800	-
Total organic carbon (TOC)	mg/L		-	-	-	-	-	-	-	40
Total suspended solids (TSS)	mg/L		-	-	-	-	-	-	-	-
Field Parameters										
Conductivity	umhos/cm		-	-	-	-	-	-	-	-
Dissolved oxygen (DO)	mg/L		-	-	-	-	-	-	-	-
Dissolved oxygen (DO), field	mg/L		4.57	6.19	0.12	0.18	0.33	-	0.07	-
Oxidation reduction potential (ORP)	millivolts		-	-	-	-	-	-	-	-
pH, field	s.u.	6.5 - 8.5	8.30	8.07	6.90	6.69	6.63	-	6.94	-
Temperature, field	Deg C		18.05	19.74	18.45	17.89	14.02	-	17.13	-
Temperature, sample	deg c		-	-	-	-	-	-	-	-
Turbidity	ntu		-	-	-	-	-	-	-	-
Turbidity, field	NTU		66.9	50.8	34.1	12.0	49.3	-	113	-

Notes:

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R - Rejected.
- - Not analyzed.

Appendix E.6

Analytical Results Summary - General Chemistry and Field Parameters
Bay City Industrial Land
Bay City, Michigan

AOI:			**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**	**Machine Storage Area**
Sample Location:			**MSA GW Ext. Sys. Discharge**	**MW1S**	**MW100S**	**MW102D1**	**MW102D1**	**MW102D2**	**MW102D3**	**MW102D4**	**MW300S**
Sample ID:			**W-1261030-010129-SSH-MSA(D)**	**GW-12610-071911-SH-012**	**GW-12610-071811-SH-005**	**GW-082404-RW-001**	**GW-082404-RW-002**	**GW-082404-RW-003**	**GW-082404-RW-004**	**GW-082404-RW-005**	**GW-082404-RW-011**
Sample Date:			**1/29/2001**	**7/19/2011**	**7/18/2011**	**8/24/2004**	**8/24/2004**	**8/24/2004**	**8/24/2004**	**8/24/2004**	**8/24/2004**
			(Duplicate)				**(Duplicate)**				
Parameters:	**Units**	**Michigan Residential Drinking water criteria**									
General Chemistry											
Alkalinity, total (as CaCO3)	mg/L		620	-	-	-	-	-	-	-	-
Ammonia	mg/L	10	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L		-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L		-	-	-	-	-	-	-	-	-
Dissolved organic carbon (DOC)	mg/L		-	-	-	-	-	-	-	-	-
Hardness, carbonate	mg/L		-	-	-	-	-	-	-	-	-
N-Hexane extractable material	mg/L		-	-	-	-	-	-	-	-	-
Oil and grease (HEM), polar	mg/L		-	-	-	-	-	-	-	-	-
pH (water)	s.u.	6.5 - 8.5	-	-	-	-	-	-	-	-	-
pH, lab	s.u.	6.5 - 8.5	-	-	-	-	-	-	-	-	-
Phosphate, total	mg/L		-	-	-	-	-	-	-	-	-
Phosphorus	mg/L	63	-	-	-	-	-	-	-	-	-
Total dissolved solids (TDS)	mg/L	500	-	-	-	-	-	-	-	-	-
Total microbial population	cfu/mL		-	260	130	-	-	-	-	-	-
Total organic carbon (TOC)	mg/L		-	-	-	-	-	-	-	-	-
Total suspended solids (TSS)	mg/L		-	-	-	-	-	-	-	-	-
Field Parameters											
Conductivity	umhos/cm		-	-	-	1530	1530	1840	3990	9270	2810
Dissolved oxygen (DO)	mg/L		-	-	-	0.4	0.4	0.43	0.3	0.17	0.5
Dissolved oxygen (DO), field	mg/L		-	0.23	0.28	-	-	-	-	-	-
Oxidation reduction potential (ORP)	millivolts		-	-	-	-106	-106	-104	-115	-469	-166
pH, field	s.u.	6.5 - 8.5	-	7.96	7.10	6.78	6.78	6.82	6.94	8.01	7.05
Temperature, field	Deg C		-	16.30	15.53	-	-	-	-	-	-
Temperature, sample	deg c		-	-	-	12.5	12.5	13.1	13.02	16.2	17.2
Turbidity	ntu		-	-	-	11.7	11.7	7.6	12.6	21.7	22.5
Turbidity, field	NTU		-	8.88	25.1	-	-	-	-	-	-

Notes:

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U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix E.6

Analytical Results Summary - General Chemistry and Field Parameters
Bay City Industrial Land
Bay City, Michigan

AOI:			Machine Storage Area	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks	Perimeter Banks
Sample Location:			MW300S	LMW13S	LMW15D	MW301D1	MW301D1	MW301D2	MW301D3	MW301D4
Sample ID:			GW-12610-071911-SH-014	GW-082404-RW-012	GW-082404-RW-013	GW-082404-RW-018	GW-082404-RW-019	GW-082404-RW-017	GW-082404-RW-007	GW-082404-RW-006
Sample Date:			7/19/2011	8/24/2004	8/24/2004	8/24/2004	8/24/2004 (Duplicate)	8/24/2004	8/24/2004	8/24/2004
Parameters:	**Units**	**Michigan Residential Drinking water criteria**								
General Chemistry										
Alkalinity, total (as CaCO3)	mg/L		-	-	-	-	-	-	-	-
Ammonia	mg/L	10	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L		-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L		-	-	-	-	-	-	-	-
Dissolved organic carbon (DOC)	mg/L		-	-	-	-	-	-	-	-
Hardness, carbonate	mg/L		-	-	-	-	-	-	-	-
N-Hexane extractable material	mg/L		-	-	-	-	-	-	-	-
Oil and grease (HEM), polar	mg/L		-	-	-	-	-	-	-	-
pH (water)	s.u.	6.5 - 8.5	-	-	-	-	-	-	-	-
pH, lab	s.u.	6.5 - 8.5	-	-	-	-	-	-	-	-
Phosphate, total	mg/L		-	-	-	-	-	-	-	-
Phosphorus	mg/L	63	-	-	-	-	-	-	-	-
Total dissolved solids (TDS)	mg/L	500	-	-	-	-	-	-	-	-
Total microbial population	cfu/mL		2960	-	-	-	-	-	-	-
Total organic carbon (TOC)	mg/L		-	-	-	-	-	-	-	-
Total suspended solids (TSS)	mg/L		-	-	-	-	-	-	-	-
Field Parameters										
Conductivity	umhos/cm		-	1330	1498	1920	1920	1934	1748	3710
Dissolved oxygen (DO)	mg/L		-	0.16	-	0.23	0.23	0.51	0.44	0.69
Dissolved oxygen (DO), field	mg/L		0.14	-	-	-	-	-	-	-
Oxidation reduction potential (ORP)	millivolts		-	-312	-	84	84	69	52	166
pH, field	s.u.	6.5 - 8.5	7.28	**10.28**	7.63	**9.43**	**9.43**	**9.31**	8.29	7
Temperature, field	Deg C		16.78	-	-	-	-	-	-	-
Temperature, sample	deg c		-	16.77	14.3	14.31	14.31	13.99	14.5	12.8
Turbidity	ntu		-	25.5	6.4	0.5	0.5	1	4.9	0.5
Turbidity, field	NTU		4.92	-	-	-	-	-	-	

Notes:

J - Estimated concentration.
U - Not detected at the associated reporting limit.
UJ - Not detected; associated reporting limit is estimated.
R - Rejected.
- - Not analyzed.

Appendix F
City of Bay City, Industrial User Discharge Permit

November 12, 2012

Mr. John-Eric Pardys
Conestoga-Rovers & Associates
14496 Sheldon Rd, Suite 200
Plymouth MI, 48170

RE: Request for Sampling Using Time Proportioned Sample Collection and additional clarifications
Bay City Industrial Land, Bay City, Michigan IU Permit No. 120807

Dear Mr.Pardys:

The City of Bay City has reviewed and approves your request to replace the flow proportioned sampling identified in Part 2, A, (3) with the time proportioned sample collection at the post-treatment sample point annotated on your permit application.

In addition, the information you provided related to the collection of permit required samples has been removed from the permit language as the permit is a template. We have included the information in this letter for reference:

- The flow meter is a Rotorflow – Model: RFO-156262 or approved equivalent.
- The 24-hr composite samples are to be collected utilizing a composite sampler from a sample port located within the treatment building after the flow meter. The treatment system is continuous, however, discharge will be intermittent based on demand.
- Grab samples will be collected from the sample port located in the treatment building after the flow meter.
- The discharge location Outfall 001 is located in a sanitary sewer manhole at the north end of Crotty Street (forcemain – treated groundwater). The permit sampling will be conducted in the groundwater treatment building from a port located after the treatment system.

Lastly, in order to comply with the "Access without delay" clause (Part 11, C), the City will work together with RACER to obtain access to the Facility, which may include RACER providing the City keys to the Facility.

If you have any questions, please do not hesitate to call me.

Sincerely

Carol Injasoulian

Carol L. Injasoulian

Laboratory Manager/ I.P.P. Manager

City of Bay City

C: File

INDUSTRIAL USER PERMIT

CITY OF BAY CITY WASTEWATER TREATMENT PLANT

In accordance with Article II of Chapter 106 of the Bay City Code of Ordinances ("Sewer Use and Industrial Pretreatment") (referred to herein as the "Sewer Use Ordinance"):

RACER Properties LLC
2390 Ecorse Rd
Ypsilanti, MI 48198

Site Managed by Conestoga-Rovers & Associates
14496 Sheldon Rd, Suite 200
Plymouth MI, 48170

(the "Permittee") is hereby authorized to discharge industrial wastewater from the facility identified above and through the outfall(s) identified in this permit into the Bay City POTW ("POTW") in accordance with the conditions set forth in this permit. Compliance with this permit does not relieve the Permittee of its obligation to comply with any or all applicable pretreatment regulations, standards or requirements under local, state, or federal laws, including any regulations, standards, requirements or laws that may become effective during the term of this permit.

Noncompliance with any term or condition of this permit is a violation of the Sewer Use Ordinance and may also violate other applicable state and federal laws and regulations.

Date Permit Issued: December 1, 2012

Permit Effective Date: December 1, 2012

Permit Expiration Date: December 1, 2017

Permit Renewal Application
Must Be Filed No Later Than: July 1,2017

By: _____
WWTP Superintendent

PART 1. EFFLUENT LIMITATIONS AND DISCHARGE PROHIBITIONS.

A. During the period beginning on December 1, 2012 and ending on December 1, 2017, the Permittee is authorized to discharge wastewater to the POTW from the outfall(s) described below:

Outfall	Name and/or Location of Outfall and Type of Discharge
001	Sanitary Sewer Manhole at the North End of Crotty Street (forcemain - Treated Groundwater. See Drawing C-04 for discharge point.

B. The discharge from Outfall 001 as authorized by this permit shall not exceed the following specific effluent limitations:

(1) Pollutants in concentrations that exceed the daily maximum or monthly average concentrations listed below in this subsection:

Parameter	Daily Maximum (mg/l	Monthly Average (mg/l
Arsenic (T)	0.683	0.683
Cadmium (T)	0.057	0.057
Chromium (T)	6.812	6.812
Copper (T)	1.476	1.476
Cyanide (Amenable)	0.068	0.068
Cyanide (T)	0.320	0.314
Lead (T)	0.632	0.632
Molybdenum (T)	294.000	48.199
Nickel (T)	2.548	2.548
Selenium (T)	0.337	0.337
Silver (T)	0.200	0.083
Zinc (T)	1.481	1.481
Benzene (71-43-2)	3.19	3.19
Toluene (108-88-3)	2.72	2.72
Ethylbenzene (100-41-4)	1.86	1.86
Xylene (1330-20-7)	1.60	1.60
Phenols (T)*	27.3	27.3
Tetrachloroethylene (127-18-4)	0.53	0.53
1,2-dichloroethane (107-06-2)	1.69	1.69
Cis-1,2-dichloroethene (156-59-2)	5.27	5.27
Trichloroethylene (79-01-6)	1.42	1.42
Vinyl Chloride (75-01-4)	0.002	0.002
Fluoranthene (206-44-0)	22.2	22.2
Chlorine	30.0	30.0
Acenaphthene (83-32-9)	0.213	0.213

Naphthalene (91-20-3)	1.73	1.73
Ammonia Nitrogen (NH3 as N)	30.0[1]	30.0[1]
BOD	835[2]	835[2]
COD	1670[3]	1670[3]
Phosphorous (T)	13.8[4]	13.8[4]
TSS	1336[5]	1336[5]
Grease/Oil	100[6]	100[6]

Notes:

* For purposes of determining compliance with the daily maximum and monthly average limits for phenols (T), only the gas chromatograph 604 or gas chromatograph/mass spectrometer 625 or 1625 test methods as listed in 40 CFR part 136, Table 1C ("List of Approved Test Procedures for Non-Pesticide Organic Compounds") shall be used. Manual distillation followed by colorimetric methods shall not be used for that purpose.

1. Any discharge of ammonia nitrogen in excess of 14.0 mg/l is subject to surcharge.
2. Any discharge of BOD in excess of 225 mg/l is subject to surcharge as provided by the Sewer Use Ordinance (SUO).
3. Any discharge of COD in excess of 450 mg/l is subject to surcharge as provided by the SUO.
4. Any discharge of total phosphorous in excess of 4.3 mg/l is subject to surcharge as provided the SUO.
5. Any discharge of TSS in excess of 151 mg/l is subject to surcharge as provided the SUO.
6. Any discharge of Grease/Oil in excess of 70 mg/l is subject to surcharge as provided the SUO.
7. pH must be maintained between 6.5 and 11.0.

☐

Discharges which contain more than one pollutant which may contribute to fume toxicity shall be subject to more restrictive limitations, as determined necessary by the POTW. The more restrictive discharge limits will be calculated based on the additive fume toxicity of all compounds identified or reasonably expected to be present in the discharge, including, without limitation, the specific compounds listed in section 106-101(b)(1) of the SUO.

(2) Pollutants in concentrations that exceed the instantaneous maximum, daily maximum or monthly average concentrations listed below in this subsection:

Parameter	Instantaneous Maximum	Daily Maximum	Monthly Average Concentration
Mercury	Nondetect for instantaneous maximum concentration, daily maximum and monthly average. Any discharge of mercury at or above the detection limit is a specific violation of the SUO. The detection limit shall be established pursuant to the procedure for determination of the method detection limit ("MDL") as set forth in section 3(a) of Appendix B of 40 CFR part 136. The MDL study used to determine the MDL shall be made available to the POTW immediately upon request. In no case may the detection limit exceed 0.2 g/l, unless a higher detection limit is approved by the POTW because of sample matrix interference. Mercury sampling procedures, preservation and handling, and analytical protocol for compliance monitoring shall be in accordance with EPA method 245.1, unless other methods are approved in advance by the WWTP Superintendent.		

PCBs (T)	Nondetect for instantaneous maximum concentration, daily maximum and monthly average. Any discharge of PCBs at or above the detection limit is a specific violation of the SUO. The detection limit shall be established pursuant to the procedure for determination of the method detection limit ("MDL") as set forth in section 3(a) of Appendix B of 40 CFR part 136. The MDL study used to determine the MDL shall be made available to the POTW immediately upon request. In no case may the detection limit exceed 0.1 g/l, unless a higher detection limit is approved by the POTW because of sample matrix interference. PCB sampling procedures, preservation and handling, and analytical protocol for compliance monitoring shall be in accordance with EPA method 608, unless other methods are approved in advance by the WWTP Superintendent. Total PCBs is defined as the sum of any identified Aroclors, including, but not limited to, Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260. In addition, any detected Aroclor-specific measurements shall be reported.

C. The Permittee shall not contribute or cause to be contributed to the POTW, directly or indirectly, any pollutant, substance or wastewater which will cause "pass through" or "interference" as those terms are defined by the Sewer Use Ordinance.

D. The Permittee shall not contribute or cause to be contributed to the POTW, directly or indirectly, any of the substances, pollutants, or wastewater prohibited by section 106-101(b) of the Sewer Use Ordinance.

E. The dilution of any of Permittee's effluent or discharge as a partial or complete substitute for adequate treatment to achieve compliance with applicable local, state or federal standards or limitations is prohibited as provided by Section 106-106 of the Sewer Use Ordinance.

F. Permittee's discharges shall at all times comply with all other applicable local, state and federal laws, regulations, standards, and requirements, including, without limitation, the Sewer Use Ordinance, and including any such laws, regulations, standards, or requirements that may become effective during the term of this permit.

PART 2. MONITORING AND SAMPLING REQUIREMENTS

The Permittee shall comply with all monitoring requirements as provided by this permit, the Sewer Use Ordinance and other applicable laws and regulations, including, without limitation, the following:

A. Monitoring Location, Frequency and Sample Type . During the period beginning on December 1, 2012 and ending December 1, 2017, the Permittee shall monitor Outfall 001 for the following sample parameters, according to the following monitoring locations, frequencies (daily, weekly, monthly, quarterly, continuous, etc.), and sample types (composite, grab, meter, etc.):

Parameter	Location [1]	Frequency [2]	Type [3]
TSS	001	Semi-Annually	Composite
pH	001	Semi-Annually	Grab
Grease/Oil	001	Semi-Annually	Grab
Phosphorous	001	Semi-Annually	Composite
COD	001	Semi-Annually	Composite
BOD	001	Semi-Annually	Composite
Cadmium	001	Semi-Annually	Composite
Chromium	001	Semi-Annually	Composite
Copper	001	Semi-Annually	Composite
Mercury	001	Semi-Annually	Composite
Lead	001	Semi-Annually	Composite
Nickel	001	Semi-Annually	Composite
Silver	001	Semi-Annually	Composite
Ammonia Nitrogen	001	Semi-Annually	Composite
Total PCB	001	Semi-Annually	Composite
Vinyl Chloride	001	Semi-Annually	Grab
Flow (gpd)	001	Continuous	Meter [4]

Notes :

1. The precise sample monitoring or measurement location shall be as shown in the permit application materials or as otherwise specified by the POTW.

2. "Daily" means at least once within every 24 hour period; "Weekly" means at least once within every 7 day period; "quarterly" means at least once within every 3 month period; and "continuous" means at all times during discharge.

3. "Grab" sample means an individual sample that is taken from a wastestream on a one-time basis without regard to the flow in the wastestream and over a period of time not to exceed 15 minutes. "Composite" sample means a series of individual samples taken at regular intervals over a specific time period and combined into a single sample (formed either by continuous sampling or by mixing discrete samples) representative of the average stream during the sampling period. For categorical sampling, a composite sample shall consist of at least four (4) individual samples taken within a 24 hour period. Except as provided below, a composite sample shall be a 24-hour flow proportioned composite sample. If it is not feasible to obtain a flow proportioned composite sample, and if the Permittee demonstrates to the POTW's satisfaction that a representative sample will be obtained, the POTW may approve the use of a 24-hour time proportioned composite sample (or a minimum of 4 grab samples, as determined appropriate by the POTW) in lieu of the flow proportioned composite sample.

4. Daily flows are to be recorded from the Permittee's flow meter located within the treatment building on-site Following treatment and prior to discharge.

The Permittee may be required by the POTW to perform additional monitoring of the parameters listed in this section (including, without limitation, different locations, frequencies or sample types) as determined necessary by the POTW or as otherwise authorized under applicable laws and regulations.

B. Monitoring - Special Requirements . In addition to any other applicable monitoring requirements, the Permittee shall also comply with any special monitoring requirements as specified by this section.

C. Automatic Resampling Upon Indication of Permit Violation; Notification and Report Required . If sampling performed by the Permittee indicates a violation, the Permittee shall notify the WWTP Superintendent within 24 hours of becoming aware of the violation. The Permittee shall also repeat the sampling and analysis and submit the results of the repeat analysis to the POTW within 30 days after becoming aware of the violation, except that the Permittee shall not be required to resample if (a) the POTW performs sampling at the Permittee's facility at a frequency of at least once per month, or (b) the POTW performs sampling at the Permittee's facility between the time when the Permittee performs its initial sampling and the time when the Permittee receives the results of the sampling that indicates the violation. If the Permittee uses its own laboratory for sample analysis, the WWTP Superintendent may require the Permittee to send split samples to an independent laboratory at a frequency specified by the Superintendent as a quality control check.

D. Monitoring Points . All samples and measurements shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water or substance. The Permittee shall not change monitoring points without the prior approval of the POTW.

E. Sampling and Analytical Methods to Demonstrate Compliance . All sampling, measurements, tests, and analyses of the characteristics of discharges to the POTW shall be performed in accordance with the procedures approved by the U.S. EPA contained in 40 CFR part 136. If, as determined by the WWTP Superintendent, the sampling and analytical techniques contained in 40 CFR part 136 are not available, do not apply to the discharge or pollutants in question, are not appropriate under the circumstances for application to the discharge or pollutants in question, or where one or more alternate techniques are available under 40 CFR part 136, sampling and analysis shall be performed using validated sampling and analytical methods and procedures approved or required by the POTW.

F. Representative Sampling . All samples and measurements taken as required by this permit shall be representative of the volume and nature of the monitored discharge. This shall be subject to verification by the POTW through the use of split sampling or other means determined necessary by the POTW.

G. Flow Measurement . If the Permittee is required by this permit to measure flow, the Permittee shall use flow measurement devices and methods consistent with approved scientific practices to ensure the accuracy and reliability of measurements of the volume of monitored discharges. Measurement devices used by the Permittee shall be capable of

measuring flows with a maximum deviation of less than 10 percent from true discharge rates throughout the range of expected discharge volumes.

H. Maintenance, Repair and Calibration of Sampling Equipment . All equipment used for sampling, measurement and analysis as required by this permit must be routinely calibrated, inspected, and maintained by the Permittee as provided by the Sewer Use Ordinance. Calibration, inspection and maintenance shall be performed as often as necessary to ensure that monitoring data, measurements and analysis are accurate and representative, and consistent with the accepted capability of the type of equipment used. The Permittee shall keep a complete and accurate written record of all calibrations, inspections and maintenance done (including, without limitation, the date and time of the activity, a description of what was done and the methods used, the names of persons conducting the activity, and any required or recommended follow-up). The record shall also include a description of all problems discovered regarding the equipment whether in response to a regularly scheduled inspection or otherwise. The POTW, in any event, may inspect and test a user's sampling and flow measurement equipment and instruments at all reasonable times.

I. Records of Sampling and Analysis . The Permittee shall keep a written record of all samples, measurements, and analysis required by this permit and the Sewer Use Ordinance. At a minimum, the records shall include the date, exact place, time (including start time and stop time) and method of sampling or measurement, and the name(s) of person(s) taking the samples or measurements; sampler programming information; the sample preservation techniques or procedures used; the full chain-of-custody for each sample; the dates the analyses were performed; who performed the analyses; the analytical techniques and methods used; quality assurance/quality control (QA/QC) procedures used and QA/QC data; and the results of the analyses. Records shall be maintained and retained as provided by Division 13 of the Sewer Use Ordinance.

PART 3. SPECIAL CONDITIONS .

The Permittee shall comply with any special conditions specified by this section.

N/A

PART 4. REPORTING AND NOTIFICATION REQUIREMENTS .

A. Required Reports and Notifications . The Permittee shall comply with all reporting and notice requirements as provided by this permit, the Sewer Use Ordinance, and other applicable laws and regulations, including, without limitation, the following:

1. Baseline Reports . As applicable to the Permittee, the Permittee shall submit to the POTW within the required submission deadlines the reports as required by section 106-151(a) of the Sewer Use Ordinance.

2. Reports on Compliance with Categorical Pretreatment Standard Deadline . As applicable to the Permittee, the Permittee shall submit to the POTW within the required submission deadlines the reports as required by section 106-151(b) of the Sewer Use Ordinance.

3. Periodic Reports on Continued Compliance . All monitoring results obtained by the Permittee as required by this permit shall be summarized and reported on an Industrial User Monitoring Report Form once every 6 months (unless required more frequently by the applicable pretreatment standard or by the POTW) as otherwise required by section 106-151(c) of the Sewer Use Ordinance. The reports are due on the **30th day of July and January** of each year (unless alternate months are specified by the POTW). The first report is due on **July 30, 2013**. Each report shall indicate, without limitation, the following information for the applicable reporting period: the nature and concentration of all pollutants in the effluent for which sampling and analysis were performed; the measured maximum and average daily flows; the names of all person(s) responsible for operating and maintaining any pretreatment equipment, pretreatment processes, or responsible for wastewater management at the Permittee's facilities, with a brief description of each person's duties; information regarding materials or substances which may cause interference or pass through; and any other information required by the Sewer Use Ordinance or deemed necessary by the POTW to assess and assure compliance with applicable discharge requirements or to safeguard the operation of the POTW.

4. Notice of Potential Problems . The Permittee shall immediately notify the POTW of any discharge by the Permittee that could cause problems to the POTW, including, without limitation, slug loadings, or discharges that exceed any applicable discharge prohibition or limitation, or otherwise result in noncompliance with permit requirements.

5. Notice by User of Violation of Pretreatment Standards .If sampling performed by an industrial user indicates a violation, the user shall notify the POTW within 24 hours of becoming aware of the violation (and shall comply with other applicable requirements provided by section 106-176 of the Sewer Use Ordinance regarding repeat sampling and analysis).

6. Notice of Changed Discharge or Change in User Status . The Permittee shall promptly notify the POTW in advance of any substantial change in the volume or character of pollutants in its discharge, or of any facility expansion, production increase, or process modifications that could result in a substantial change in the

volume or character of pollutants in its discharge, as provided by section 106-155 of the Sewer Use Ordinance.

7. Notice Regarding Discharge of Wastes That Are Otherwise Hazardous . If the Permittee discharges to the POTW a substance that, if disposed of other than by discharge to the POTW, would be a hazardous waste under 40 CFR part 261 or under the rules promulgated under the state hazardous waste management act (Part 111 of Act 451 of the Public Acts of Michigan of 1994, MCLA §§ 324.11101 et seq., as amended), the Permittee shall notify the WWTP Superintendent, the U.S. EPA Region V Waste Management Division Director, and the Chief of the Waste Management Division of the Michigan Department of Environmental Quality, of the discharge as required by MAC R 323.2310(15).

8. Notice Regarding Installation of New Pretreatment Facilities . Within 5 days after completing installation of new pretreatment facilities, the Permittee shall notify the POTW in writing of the time and date when it intends to commence operation of the new facilities, and the identity of the person who will conduct any tests to be performed. The pretreatment facilities shall not be placed in regular operation until adequate tests have been conducted to establish that the discharges will comply with the requirements of this permit and other applicable laws and regulations. Upon prior written request by the POTW, the Permittee shall allow a representative of the POTW to observe the tests at the time they are conducted. The cost of the tests shall be paid by the Permittee.

9. Other applicable reporting and notification requirements . The Permittee shall comply with other applicable reporting and notice requirements as provided by this permit, the Sewer Use Ordinance, or any other applicable laws or regulations, including, without limitation, the reporting and notice requirements in connection with resampling where a violation is indicated (Part 2, Section C), accidental discharge (Part 5, Section B), upset (Part 6, Section B), and bypass (Part 7, Section B), and any other reports or notice requirements determined necessary by the POTW to assess and assure compliance with the requirements of the Sewer Use Ordinance.

B. Requirements Applicable to All Reports and Notifications . All reports and notifications submitted by the Permittee to the POTW as required by this permit shall meet the following requirements:

1. All reports required by this permit shall be based upon data obtained through appropriate sampling and analysis performed during the period covered by the report. The data shall be representative of conditions occurring during the applicable reporting period.

2. If the Permittee monitors any pollutant or sampling parameter more frequently than required by this permit, using test procedures prescribed in 40 CFR Part 136,

as amended, (or otherwise approved by EPA or as specified in this permit), the results of such additional monitoring shall be included in any calculations of actual daily maximum, monthly average, or instantaneous pollutant discharge, and these results, along with the increased monitoring frequency, shall be included in all reports and notifications submitted to the POTW pursuant to this permit.

3. The POTW may require that reports, notifications, and other required documents and data be submitted in a standardized format, as specified by the POTW.

4. If the POTW instead of the Permittee collects all of the information, including flow data, required for a report required by sections 106-151 or 106-152 of the Sewer Use Ordinance, the POTW may in its discretion waive the requirement that the report be submitted by the Permittee.

5. The reports, notifications, and other documents and data required to be submitted or maintained by this permit and the Sewer Use Ordinance shall be subject to all of the provisions as specified by MAC R 323.2310(13).

6. Failure to provide the notifications and reports required by this permit constitutes a violation of this permit and the Sewer Use Ordinance. Providing the required notifications and reports shall not relieve the Permittee of any expense, loss, damage, or other liability which may be incurred as a result of damage to the POTW, fish kills, or any other damage to person or property; nor shall such notification or report relieve the Permittee of any fines, penalties, or other liability which may be imposed by applicable laws or regulations. Further, the reporting and notification requirements required by this permit shall not be construed to authorize a discharge which exceeds a discharge prohibition or limitation under this permit or other applicable laws or regulations.

7. All written reports and notifications required by this permit shall be signed and certified as follows:

   a. Required Signatures. The reports and notifications shall be signed by an "authorized representative" of the User as defined in section 106-23 of the Sewer Use Ordinance.

   b. Required Certification. The reports and notifications shall include the following certification statement:

      "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my

knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

8. All written reports and notifications required by this permit shall be submitted to the POTW at the following address:

Bay City Wastewater Treatment Plant
Attn: IPP Coordinator
2905 North Water Street
Bay City, Michigan 48708

9. All non-written or oral notifications required by this permit shall be made by contacting the POTW at the following telephone number: 517-893-5121.

PART 5. ACCIDENTAL DISCHARGE

A. Accidental Discharge Requirements . The Permittee shall meet and maintain compliance at all times with the minimum requirements for preparing for, responding to, and reporting, accidental discharges to the POTW as provided by Division 9 of the Sewer Use Ordinance, and any additional or more restrictive requirements provided by this permit, a slug control plan, or other applicable laws and regulations.

B. Accidental Discharge Notice and Report .

1. Upon the occurrence of any accidental discharge of any substance, pollutant or wastewater prohibited by this permit, or the occurrence of any slug load or spill that may enter the POTW, the Permittee shall *immediately* (regardless of the time of day) notify the POTW of the incident by telephone at 517-893-5121. The notification shall include all available information regarding the date, time and location of the discharge, its volume, duration, constituents, loading and concentrations, corrective actions taken and required, and other available information as necessary to determine what impact the discharge may have on the POTW.

2. Within 5 days of an accidental discharge, the Permittee shall submit to the POTW a detailed written report. The report shall specify the same and any additional available information regarding the accidental discharge, slug load or spill as required by Section (B)(1), above. The report shall also specify the cause of the incident; the exact dates and times of noncompliance and, if the noncompliance is continuing, the time by which compliance is reasonably expected to occur; the impact on the Permittee's compliance status; the measures that have been or will be taken by the Permittee to prevent similar future incidents from occurring.

PART 6. UPSET .

A. Affirmative Defense . An upset constitutes an affirmative defense to an action brought for noncompliance with categorical pretreatment standards if *all* of the requirements of Section (B), below, are met by the Permittee. In any enforcement proceeding, the Permittee shall have the burden of proof by clear and convincing evidence to establish the occurrence of an upset and that the noncompliance in question was attributable to the upset event. Even if the Permittee establishes the upset defense for a particular noncompliance event, the Permittee shall nevertheless be liable for surcharges for exceeding applicable discharge limitations as a result of the upset as provided by this permit and the Sewer Use Ordinance.

B. Conditions Necessary to Demonstrate Upset . To establish the upset affirmative defense, the Permittee must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence, all of the following:

1. An upset occurred and the Permittee can identify the cause(s) of the upset;

2. The facility was at the time being operated in a prudent and workmanlike manner and in compliance with all applicable operation and maintenance procedures;

3. The Permittee submitted the following information to the POTW within 24 hours of becoming aware of the upset (if this information is provided orally, a written report must be provided by the Permittee within 5 days of becoming aware of the upset):

   a. A description of the discharge and cause of non-compliance;

   b. The period of noncompliance, including exact dates and times or, if not corrected, the anticipated time the non-compliance is expected to continue; and

   c. The steps being taken and/or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

C. Permittee Responsibility in Case of Upset . If an upset occurs, the Permittee must halt, reduce or otherwise control its production and all discharges, as necessary to comply with categorical pretreatment standards and other applicable limits, until the cause of the noncompliance is corrected. (See also , Part 10, Section (C), "Duty to Halt or Reduce Activity.")

PART 7. BYPASS

A. Bypass Prohibited. Except as provided by Section (D) of this Part, the bypass of industrial wastes from any portion of the Permittee's facility is prohibited unless:

1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime; and

3. The Permittee provided notice as required under Section (B) of this Part.

B. Required Notices.

1. Anticipated bypass. If the Permittee knows in advance of the need for a bypass, it must submit prior notice of the bypass to the POTW. Such notice shall be submitted to the POTW as soon as the Permittee becomes aware of the need for the bypass, and if possible, at least 10 days before the date of the bypass.

2. Unanticipated bypass. Within 24 hours from the time the Permittee becomes aware of an unanticipated bypass that exceeds applicable pretreatment standards, the Permittee must submit oral notice of the bypass to the POTW. A written report must also be provided to the POTW within 5 days of the time the Permittee becomes aware of the bypass. The written report shall contain a description of the bypass and its cause; the duration of the bypass, including exact dates and times, and, if the bypass has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the bypass. The WWTP Superintendent may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

C. POTW Approved Bypass. The WWTP Superintendent may approve an anticipated bypass, after considering its adverse effects, if the Superintendent determines that it meets the conditions set forth in Section (A)(1), (2) and (3), above. It shall be a violation of this permit and the Sewer Use Ordinance for the Permittee to allow an anticipated bypass to occur without the prior approval of the Superintendent.

D. Bypasses Not Violating Applicable Pretreatment Standards or Requirements. The Permittee may allow a bypass to occur that does not cause or result in noncompliance with this permit, the Sewer Use Ordinance, or applicable state or federal laws or regulations, but only if the bypass is for essential maintenance to assure efficient operation of the Permittee's facility. Such bypasses are not subject to the provisions of Sections (A), (B) and (C) of this Part. However, this section shall not be construed to authorize a discharge which exceeds a discharge prohibition or limitation under this

permit or other applicable laws or regulations; nor to relieve the Permittee for any expense, loss, damage, or liability which may be incurred as a result of the bypass, such as damage to the POTW, fish kills, or any other damage to person or property; nor to relieve the Permittee of any fines, penalties or other liability which may be imposed by applicable laws or regulations as a result of the bypass.

PART 8. MODIFICATION, SUSPENSION, REVOCATION, REISSUANCE, EXPIRATION, CONTINUATION AND/OR TRANSFER

A. Permit Modification This permit may be modified by the POTW for any reason determined necessary by the POTW to assure compliance with the requirements of the Sewer Use Ordinance and other applicable laws and regulations, including, without limitation, any of the following reasons:

1. To incorporate any new or revised local, state or federal pretreatment standards or requirements, or other applicable requirements of law or regulation.

2. Material or substantial changes or additions to the Permittee's operations, processes, or the character or quality of discharge which were not considered in drafting or issuing the existing permit.

3. A change in any condition in either the Permittee's discharge, facility, production or operations, or in the POTW, that requires either a temporary or permanent reduction or elimination of the Permittee's discharge to assure compliance with applicable laws, regulations or the POTW's NPDES permit.

4. Information indicating that the discharge as authorized by the existing permit poses a threat to the POTW's collection or treatment systems, POTW personnel or the receiving waters.

5. Violation of any terms or conditions of the permit.

6. Misrepresentation or failure to disclose fully all relevant facts in the permit application or in any required report or notification.

7. Revision of, or a grant of variance from, categorical standards pursuant to 40 CFR 403.13.

8. To correct typographical or other errors in the permit.

9. To reflect transfer of the facility ownership or operation to a new owner or operator.

10. To add or revise a compliance schedule for the Permittee.

11. To reflect changes or revisions in the POTW's NPDES permit.

12. To ensure POTW compliance with applicable sludge management requirements promulgated by EPA.

13. To incorporate any new or revised requirements resulting from reevaluation of the POTW's local limits.

14. To incorporate a request for modification by the Permittee, as determined appropriate by the POTW and provided the request does not create a violation of any applicable requirement, standard, law, rule or regulation.

The Permittee shall be informed by the POTW of any changes in the permit at least 30 days prior to the effective date of the change, unless a shorter time is determined necessary by the POTW to meet applicable laws or to protect human health or the environment.

B. Permit Suspension and Revocation . This permit may be suspended (for a specified period) or permanently revoked by the POTW for any reason determined necessary by the POTW to assure compliance with the requirements of the Sewer Use Ordinance, the POTW's NPDES permit, or other applicable laws and regulations, including, without limitation, any of the following reasons:

1. Falsifying self-monitoring reports.

2. Tampering with monitoring equipment.

3. Failure to allow reasonable access to the Permittee's premises and records by representatives of the POTW for purposes authorized by this chapter, including, without limitation, inspection or monitoring.

4. Failure to meet effluent limitations.

5. Failure to pay fines or penalties.

6. Failure to pay sewer charges.

7. Failure to pay permit fees.

8. Failure to meet compliance schedules.

9. Failure to comply with any term or condition of the permit, the Sewer Use Ordinance, or any final judicial order entered with respect thereto.

10. Failure to comply with any reporting or notice requirement.

11. Failure to disclose fully all relevant facts in the permit application or during the permit issuance process, or misrepresentation of any relevant fact at any time.

12. A determination by the POTW that the discharge permitted by the permit has a reasonable potential to endanger human health or the environment and the threat can be abated only by suspension or revocation of the permit.

Upon suspension or revocation of a permit, the Permittee shall immediately terminate its discharge to the POTW and shall not thereafter recommence discharge without further authorization from the POTW as provided by the Sewer Use Ordinance.

C. Permit Reissuance . To apply for reissuance of this permit, the Permittee must submit a complete permit application to the POTW at least 180 days prior to the expiration date of the this permit.

D. Permit Expiration; Continuation of Expired Permits .

1. This permit shall expire on the date indicated on page 1 of this permit. Except as provided by Section (D)(2) of this Part, upon expiration of this permit the Permittee shall immediately terminate its discharge to the POTW and shall not thereafter recommence discharge without further authorization from the POTW as provided by the Sewer Use Ordinance.

2. This permit shall continue to be effective (and the Permittee may continue its discharge to the POTW) after the date of expiration until it is reissued only if:

   a. The Permittee has submitted a complete permit application at least 180 days prior to the expiration date of the Permittee's existing permit; and

   b. The failure to reissue the permit, prior to expiration of the previous permit, is not due to any act or failure to act on the part of the Permittee.

E. Limitations on Permit Transfer . This permit was issued to the Permittee for discharge from a specific facility and operation and shall not be assigned or transferred or sold to a new or different owner, operator, user, discharger, facility or premises, or to a new or changed facility or operation, without the prior written approval of the WWTP Superintendent. If the transfer of the permit is approved, any succeeding transferee Permittee must also comply with the terms and conditions of this permit. The Superintendent may approve the transfer of this permit only if all of the following conditions are met:

1. The transferor (Permittee) shall give at least 90 days advance notice to the POTW of the proposed transfer of the permit (unless a shorter notice period is approved

by the Superintendent in advance). The notice shall include a written certification signed by the proposed transferee which (a) states that the transferee has no present intent to change the facility's operations and processes; (b) identifies the specific date on which the transfer is to occur; (c) acknowledges that the transferee has read and fully understands all terms and conditions of the permit; and (d) acknowledges that the transferee accepts all of the terms and conditions of the permit as written and accepts full responsibility for complying with the existing permit if the transfer is approved.

2. As of the date of the proposed transfer, there are no unpaid charges, fines, penalties or fees of any kind due to the POTW or the City from the transferor or the transferee related to use of the POTW.

3. Except as to the identity of the new Permittee (the transferee), the application materials for the permit to be transferred as originally filed by the transferor, as well as the terms and conditions of the permit itself, are completely accurate with respect to, and fully applicable to, the discharge, facilities, and activities of the transferee.

If the transfer of this permit is approved, the POTW shall make the necessary minor modifications to the permit to show the transferee as the new Permittee, and a copy of the permit shall be provided to the transferee for signature and certification by the transferee as provided by section 106-160 of the Sewer Use Ordinance.

F. Permit Not Stayed . Except as otherwise expressly provided by the Sewer Use Ordinance, no action taken or request filed by the Permittee shall operate to stay the effect of this permit or of any provision, term or condition of this permit, including, without limitation, a request for permit modification, reissuance, or transfer, or a notification of planned changes or anticipated noncompliance.

PART 9. RECORDS RETENTION .

The Permittee shall retain and preserve records and information related to matters regulated by this permit in accordance with the Division 13 of the Sewer Use Ordinance.

PART 10 . OPERATION AND MAINTENANCE OF POLLUTION CONTROLS .

A. Provision of Necessary Pretreatment Facilities . The Permittee shall provide all necessary wastewater treatment as required to comply with all applicable pretreatment standards and requirements within the time limitations specified by this permit or other applicable law or regulation. All facilities required to pretreat wastewater shall be provided, operated, and maintained at the Permittee's expense. Detailed plans showing the pretreatment facilities and operating procedures shall be submitted to the POTW for

review, and shall be acceptable to the POTW before construction of the facility. The review of such plans and operating procedures does not in any way relieve the Permittee from the responsibility of modifying the facility as necessary to produce an effluent acceptable to the POTW under the provisions of this permit. Any subsequent changes in the pretreatment facilities or method of operation shall be reported to and be approved by the POTW prior to the Permittee's initiation of the changes. (The Permittee shall notify the POTW regarding the installation of new pretreatment facilities as provided by section 106-157 of the Sewer Use Ordinance.)

B. Proper Operation and Maintenance . The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Permittee to comply with the requirements of this permit. Proper operation and maintenance includes, without limitation, effective performance, adequate funding, adequate operator staffing, and adequate quality assurance/quality control (QA/QC) procedures for sampling and analysis.

C. Removed Substances . Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in accordance with Section 405 of the Clean Water Act and Subtitles C and D of the Resource Conservation and Recovery Act.

D. Duty to Halt or Reduce Activity . Upon reduction of efficiency of operation, or loss, or failure of all or part of the Permittee's pretreatment equipment or facility, the Permittee shall, to the extent necessary to maintain compliance with categorical pretreatment standards and other applicable standards, requirements, and limits, control its production and all discharges until operation of the equipment or facility is restored or an alternative method of treatment is provided. This requirement applies in situations, including, without limitation, where the primary source of power for the pretreatment equipment or facility is reduced, lost, or fails. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate . The Permittee shall take all reasonable steps to minimize or correct any adverse impact to the POTW or the environment resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

F. Duty to Pretreat Prior to Discharge to POTW . Except as otherwise expressly required by this permit, by the Sewer Use Ordinance, or other applicable law or regulation, the prohibitions and limitations provided by this permit shall apply at the point where wastewater and pollutants are discharged or caused to be discharged into the POTW and any required pretreatment shall, at a minimum, be completed before that point of discharge is reached.

PART 11. INSPECTION, SURVEILLANCE AND MONITORING

A. In General. The POTW is authorized to carry out all inspection, surveillance, sampling and monitoring activities and procedures, as necessary to determine, independent of information supplied by the Permittee or any other persons, compliance or noncompliance with applicable pretreatment standards and requirements, with this permit, the Sewer Use Ordinance, and other applicable laws and regulations. This authority includes, without limitation, the authority:

1. To verify the completeness, accuracy and representativeness of self-monitoring data submitted by or on behalf of the Permittee.

2. To determine compliance with the requirements of this permit or the Sewer Use Ordinance.

3. To support enforcement actions taken by the POTW against non-compliant Permittees.

4. To determine if the Permittee has corrected problems identified in previous inspections.

5. To identify whether or to what degree the Permittee influences the quality of the POTW's influent, effluent and sludge quality.

6. To evaluate the impacts of the POTW's influent on its treatment processes and receiving stream.

7. To evaluate the need for revised local limits.

8. To maintain current data on the Permittee.

9. To assess the adequacy of the Permittee's self-monitoring program and wastewater discharge permit.

10. To provide a basis for establishing sampling and monitoring requirements for the Permittee.

11. To evaluate the adequacy of the Permittee's operation and maintenance activities on its pretreatment system.

12. To assess the potential for spills and/or slug discharge control measures, and evaluate the effectiveness of spill and slug discharge control measures.

13. To gather information for industrial user permit development.

14. To evaluate compliance with existing enforcement actions.

15. To require the Permittee to submit one or more representative samples of the wastewater discharged or that the Permittee proposes to discharge into the POTW.

B. Right of Entry . The WWTP Superintendent and other authorized representatives of the city bearing proper credentials and identification are authorized to enter the Permittee's premises to conduct inspection, surveillance and monitoring activities as necessary to determine compliance with this permit and the Sewer Use Ordinance, and in that regard shall have, without limitation, the following minimum authority:

1. To enter into any premises of the Permittee in which a discharge source, treatment system or activity is located or in which records are required to be kept as provided by this permit or the Sewer Use Ordinance, for the purpose of inspecting, observing, measuring, sampling and testing the wastewater discharge, removing samples of wastewater for analysis, and inspecting and making copies of required records.

2. To set up and maintain on the Permittee's property such devices as are necessary to conduct sampling, inspection, compliance monitoring and/or metering operations, or to require the Permittee to do so, at the Permittee's sole expense.

3. To randomly sample and analyze the effluent from the Permittee and conduct surveillance activities to identify occasional and continuing noncompliance with applicable standards and requirements.

4. To inspect any production, manufacturing, fabrication, or storage area where pollutants, subject to regulation under this permit or the Sewer Use Ordinance, could originate, be stored, or be discharged to the POTW.

5. To enter all private properties through which the city or other governmental agency holds an easement for the purposes of, but not limited to, inspection, observation, measurement, sampling, repair, and maintenance of any portion of the POTW or wastewater transmission facilities lying within the easement.

City representatives entering a user's premises for purposes authorized by this Ordinance shall comply with the user's plant safety requirements regarding such matters as entry into confined spaces, use of safety glasses, and hearing protection requirements, as requested by the user.

C. Access Without Delay Required . The Permittee shall allow the POTW ready access at all reasonable times to all parts of the Permittee's facility where wastewater governed by this permit or the Sewer Use Ordinance is created, handled, conveyed, treated or discharged, or where any production, manufacturing, fabrication, or storage area where pollutants regulated by this permit or the Sewer Use Ordinance could originate, be stored, or be

discharged to the POTW, or where wastewater records are kept, for the purposes of inspection, sampling, records examination, or in the performance of any of the POTW's duties. If the Permittee has security measures in force that would require proper identification and clearance before entry into the premises by the POTW, the Permittee shall make necessary arrangements in advance with its security guards so that upon presentation of suitable identification, authorized representatives of the POTW (or authorized state or federal personnel) will be permitted to enter, without delay, for the purposes of performing their specific responsibilities.

D. Refusal to Allow Entry . If the Permittee refuses to permit access to an authorized POTW representative or to permit the representative to obtain, take, and remove samples or make copies of documents or undertake other authorized inspection, surveillance and monitoring activities as provided by this permit or the Sewer Use Ordinance, the WWTP Superintendent may order the termination of the discharge of wastewater to the POTW; order the Permittee to permit access within a time certain; issue the Permittee a notice of violation of this section; or take other appropriate action as provided by this permit or the Sewer Use Ordinance and other applicable laws and regulations.

E. Duty to Provide Information . The Permittee shall furnish to the POTW any available information which the POTW requests to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The Permittee shall also, upon request, furnish to the POTW copies of any records required to be kept by this permit. The information and records requested by the POTW shall be provided by the Permittee to the POTW within 24 hours of the request, unless an alternative time frame is specified by the POTW when making the request or unless the POTW allows additional time for the Permittee to submit the requested information based on a showing by the Permittee of good cause for any delay. The Permittee's failure to submit the requested information to the POTW within 24 hours (or within any alternate time period approved by the POTW as provided by this section) constitutes a violation of this permit.

PART 12. VIOLATIONS AND ENFORCEMENT

A. Duty to Comply . The Permittee must comply with all standards, requirements and conditions of this permit, the Sewer Use Ordinance, any notice, order, decision or determination promulgated, issued or made by the POTW under the Sewer Use Ordinance, and state and federal laws and regulations. Failure to comply shall be grounds for enforcement action or proceedings, including, without limitation, those provided by this Part of the permit.

B. Civil Administrative Fines . If the Permittee has violated, or continues to violate, any provision of this permit or the Sewer Use Ordinance, or any notice, order, decision or determination promulgated, issued or made by the POTW under the Sewer Use Ordinance, the Permittee shall be subject to a civil administrative fine of up to $500.00

per violation, per day, as provided by the Sewer Use Ordinance. The civil administrative fine may be assessed in addition to any other charge, fee, surcharge, penalty or fine authorized or levied under this permit or the Sewer Ordinance. Civil administrative fines assessed by the POTW which have not been paid in full by the Permittee within 30 days of receipt of the notice of assessment shall be added to the Permittee's next scheduled service bill and shall be paid and collected along with other rates, charges, fines or penalties.

C. Judicial Relief . The POTW may commence a civil action for appropriate judicial relief (including, without limitation, imposition of a permanent or temporary injunction, recovery of damages, fines, penalties, costs, surcharges, and such other relief as a court may order) for a violation of any provision of this permit or the Sewer Use Ordinance, or any notice, order, decision or determination promulgated, issued or made by the POTW under the Sewer Use Ordinance.

D. Municipal Civil Infractions . If the Permittee violates any provision of this permit, the Sewer Use Ordinance, or any notice, order, decision or determination promulgated, issued or made by the POTW under the Sewer Use Ordinance, the Permittee shall (except as provided by Part 12, Section E) be responsible for a municipal civil infraction, subject to payment of a civil fine of not less than $1,000.00 per day for each infraction and not more than $10,000.00 per day for each infraction, plus costs and other sanctions, as provided by Section 106-277(a) of the Sewer Use Ordinance. Further, repeat offenses shall be subject to increased fines of not less than $2,500.00 plus costs and other sanctions for a first repeat offense, and not less than $5,000.00 plus costs and other sanctions for a second or any subsequent repeat offense as provided by Section 106-277 (b) of the Sewer Use Ordinance.

E. Criminal Penalties; Imprisonment . If the Permittee (1) at the time of a violation knew or should have known that a pollutant or substance was discharged contrary to any provision of this permit or the Sewer Use Ordinance, or contrary to any notice, order, decision or determination promulgated, issued or made by the POTW under the Sewer Use Ordinance; or (2) intentionally makes a false statement, representation, or certification in an application for, or form pertaining to a permit, or in a notice, report, or record required by this permit or the Sewer Use Ordinance, or in any other correspondence or communication, written or oral, with the POTW regarding matters regulated by this permit or the Sewer Use Ordinance; or (3) intentionally falsifies, tampers with, or renders inaccurate any sampling or monitoring device or record required to be maintained by this permit or the Sewer Use Ordinance; or (4) commits any other act that is punishable under state law by imprisonment for more than 90 days; shall, upon conviction, be guilty of a misdemeanor punishable by a fine of $500.00 per violation, per day, or imprisonment for up to 90 days, or both in the discretion of the court, as provided by Section 106-278 of the Sewer Use Ordinance.

F. Remedies Cumulative The imposition of a single penalty, fine, order, damage, or surcharge upon the Permittee for a violation of any provision of this permit or the Sewer

Use Ordinance, or any notice, order, decision or determination promulgated, issued or made by the POTW under the Sewer Use Ordinance, shall not preclude the imposition by the POTW or a court of competent jurisdiction of a combination of any or all of those sanctions and remedies, or additional sanctions and remedies, with respect to the same violation, consistent with applicable limitations of state and federal laws or regulations. A criminal citation and prosecution of a criminal action against the Permittee shall not be dependent upon and need not be held in abeyance during any civil, judicial, or city administrative proceeding, conference, or hearing regarding the Permittee.

G. Separate Violations . Each day on which a violation occurs or continues is a separate and distinct violation for which applicable remedies may be imposed.

H. Number of Violations . The number of violations resulting from noncompliance with applicable discharge prohibitions or effluent limitations shall be determined as follows:

1. Applicable concentration limitations and mass (or loading) limitations shall be treated as separate limitations, and the Permittee may be liable and penalized separately for exceeding any of those limitations for a single pollutant or sampling parameter.

2. Each violation of a daily maximum limit for a single pollutant or sampling parameter shall constitute a single violation for each day on which the violation occurs or continues.

3. Each violation of an instantaneous maximum limit for a single pollutant or sampling parameter shall constitute a single violation for each such exceedence, and there may be multiple violations for each day on which such a violation occurs or continues.

4. Each violation of a monthly average limit for a single pollutant or sampling parameter shall constitute a violation for each day of the month during which the violation occurred, regardless of the number of days on which samples were actually taken. (For example, in a month with 31 days, a violation of the monthly average limit for that month constitutes 31 violations for each pollutant parameter for which the monthly average limit was exceeded during the month.)

5. If a wastewater discharge permit regulates more than one outfall, each outfall shall be considered separately in computing the number of violations as provided by this section.

I. Reimbursement of POTW . If the Permittee violates any provision of this permit or of the Sewer Use Ordinance, or discharges or causes a discharge that produces a deposit or obstruction or otherwise damages or impairs the POTW, or causes or contributes to a violation of any federal, state or local law governing the POTW, the Permittee shall be liable to and shall fully reimburse the city for all expenses, costs, losses or damages

(direct or indirect) payable or incurred by the POTW or the city as a result of any such discharge, violation, exceedence or noncompliance. The costs that must be reimbursed to the city shall include, without limitation, all of the following:

1. All costs incurred by the POTW and the city in responding to the violation or discharge, including, expenses for any cleaning, repair or replacement work, and the costs of sampling, monitoring, and treatment, as a result of the discharge, violation, exceedence or noncompliance.

2. All costs to the POTW and the city of monitoring, surveillance, and enforcement in connection with investigating, verifying, and prosecuting any discharge, violation, exceedence or noncompliance.

3. The full amount of any fines, assessments, penalties, and claims, including natural resource damages, levied against the POTW or the city by any governmental agency or third party as a result of a violation of the POTW's NPDES permit (or other applicable law or regulation) that is caused by or contributed to by any discharge, violation, exceedence or noncompliance.

4. The full value of any city staff time (including any required overtime), consultant and engineering fees, and actual attorney fees and defense costs (including the city attorney and any special legal counsel), associated with responding to, investigating, verifying, and prosecuting any discharge, violation, exceedence or noncompliance or otherwise enforcing the requirements of this chapter.

The city is authorized to correct any violation of this chapter or damage or impairment to the POTW caused by a discharge and to bill the person causing the violation or discharge for the amounts to be reimbursed to the city. The costs reimbursable under this section shall be in addition to fees, amounts or other costs and expenses required to be paid by users under other sections of this permit. In determining the amounts to be reimbursed to the city, the POTW may consider factors such as, but not limited to, those listed in section 106-282 of the Sewer Use Ordinance. The failure by the Permittee to pay any amounts required to be reimbursed to the POTW or the city as provided by this section shall constitute an additional violation of this permit.

J. Public Nuisance . A violation of this permit, the Sewer Use Ordinance, or of any order, notice or agreement issued or entered into under the Sewer Use Ordinance, is deemed to be a public nuisance and shall be subject to abatement on that basis.

PART 13. FEES .

It is a purpose of this permit and of the Sewer Use Ordinance to provide for the recovery from users of the city's wastewater disposal system of all costs incurred by the city for the administration and implementation by the city of the industrial pretreatment program (IPP) established by the Sewer Use Ordinance. Sewer use fees and charges, including, without

limitation, permit application fees, IPP fees, and other sewer related charges shall be established, paid and collected as provided by Division 20 and other applicable provisions of the Sewer Use Ordinance.

PART 14. ADDITIONAL CONDITIONS

A. Definitions . Except as otherwise specifically defined by this permit, all terms used in this permit shall be defined as provided by the Sewer Use Ordinance.

B. Most Restrictive Standards or Requirements Control . In all cases, the most stringent or restrictive standard or requirement applicable to the Permittee's discharge shall control, whether established by this permit, the Sewer Use Ordinance, any notice, order, permit, decision or determination promulgated, issued or made by the POTW under the Sewer Use Ordinance, state laws or regulations, including the POTW's NPDES permit, or federal laws or regulations. Further, if state or federal laws or regulations provide for standards and requirements not covered by this permit or the Sewer Use Ordinance that are otherwise applicable to the Permittee's discharge, those standards and requirements shall apply to the Permittee in addition to those required by this permit or the Sewer Use Ordinance, and the most restrictive of those additional standards or requirements shall control and shall be complied with by the Permittee within the time period required by the law or regulation.

C. Incorporation By Reference .Unless otherwise expressly provided by this permit, specific provisions of the Sewer Use Ordinance referred to in this permit are incorporated by reference in this permit as if set forth fully herein.

D. Effect of Issuance of Permit . The issuance of this permit does not convey to the Permittee any property or contractual rights or privileges of any kind whatsoever, nor does it authorize any injury to private or public property or any invasion of personal rights, nor any violation of local, state or federal laws or regulations.

E. Severability . The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

PART 15. CERTIFICATION

This permit and the following certification shall be signed by an "authorized representative" of the Permittee (as defined by section 106-23 of the Sewer Use Ordinance) prior to commencing any discharge under this permit:

I certify that I have read, understand, and agree to be bound by all of the provisions, standards, requirements and conditions of this permit. Further, I agree to fully comply with all applicable requirements of the Sewer Use Ordinance and other applicable state and federal pretreatment laws and regulations.

11-16-12
Date

Grant R Trigg
Signature of Authorized Representative

Grant R Trigg
Name (type or print)

Mishg Cleanup Manager
Title

Appendix G
Restrictive Covenant

LIBER 3124 PAGE 124
RECEIVED 11/17/2015 09:45:17
RECORDED 11/17/2015 11:09:47
BRANDON KRAUSE
REGISTER OF DEEDS, BAY COUNTY MICHIGAN
RECEIPT # 1296 JMANZ
$80.00 RESTRICTIONS

DECLARATION OF RESTRICTIVE COVENANT

MDEQ Reference Numbers: RC-OWMRP-111-15-013
Facility MID Number: MID 005 356 688
MDEQ Approval Date: November 4, 2015

This Declaration of Restrictive Covenant (Restrictive Covenant) is made to protect public health, safety, or welfare, or the environment pursuant to the provisions of Part 111, Hazardous Waste Management, Michigan Compiled Laws (MCL) 324.11101, *et seq.* (Part 111) and the applicable Sections of Part 201, Environmental Remediation, MCL 324.20101, *et seq.* (Part 201) of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended, MCL 324.101, *et seq.*, and the adminstrative rules promulgated pursuant to those Parts, MAC R 299.9101 *et seq.* and MAC R 299.5101 *et seq.*and the Solid Waste Disposal Act, commonly referred to as the Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984, 42 U.S.C. §§ 6901 *et seq.*, and the Toxic Substances Control Act, 15 U.S.C. §§ 2601 *et seq.* (TSCA).

This Restrictive Covenant is made on November 9th, 2015, by RACER Properties LLC, the address of which is 500 Woodward Avenue, Suite 2650, Detroit, MI 48226, the Grantor and an entity wholly owned by the Revitalizing Auto Communities Environmental Response Trust (Trust), and the current fee title holder of the Property, for the benefit of the Grantee, State of Michigan, Department of Environment Quality (MDEQ), the address of which is 525 West Allegan Street, P.O. Box 30473, Lansing, MI 48909-7973.

This Restrictive Covenant has been prepared and recorded to prevent damage to or disturbance of any component of the constructed remedy/corrective measures or stormwater management system, to prohibit or restrict activities that could result in unacceptable exposure to environmental contamination, and to provide notification of polychlorinated biphenyls (PCB) remediation waste present at the Property located at Crotty Street, Bay City, Bay County, Michigan 48708, Tax Parcel Identification Number: 09-160-021-201-003-00, legally described and depicted in Exhibit 1 (Property or Site). Recording of this Restrictive Covenant is designed to prevent damage or disturbance to the installed sheet pile and slurry containment walls, the multilayer cap, the concrete cap, the soil cap, the groundwater extraction and treatment system, monitoring wells, the permanent markers, and the storm water management system; to restrict future use of the Property to non-residential use and Low Occupancy use as defined pursuant to TSCA in Part 761.3 of Title 40 of the Code of Federal Regulations (40 CFR Part 761.3); to restrict exposures to groundwater and soil on the Property; and to require any future work, or other activities on the Property by or for the Owner, be conducted in conformance with; i) applicable MDEQ soil

relocation requirements including but not limited to Part 111, Subtitle C of RCRA, the administrative rules promulgated pursuant to Part 111, RCRA, TSCA, and all other relevant state and federal laws, including but not limited to MCL 324.20120c, and any related MDEQ guidance; and ii) applicable due care obligations under MCL 324.20107a and associated administrative rules and guidance, as well as the Hazardous Waste Operations and Emergency Response Standard (HAZWOPER), 29 CFR Part 1910.

The land and resource use restrictions contained in this Restrictive Covenant are based upon information available to MDEQ at the time this document was recorded. Future changes in the environmental condition of the Property or changes in the cleanup criteria developed under Parts 111 and 201 of NREPA; the discovery of environmental conditions at the Property that were not known at the time this document was recorded; or use of the Property in a manner inconsistent with the restrictions described herein – each may result in this Restrictive Covenant not being protective of public health, safety, or welfare, or the environment. Additional restrictions may become necessary. Information pertaining to environmental conditions of the Property and Response Activities undertaken at the Property is on file with MDEQ, Remediation and Redevelopment Division.

Based on the results of Site investigations, the Property contains hazardous substances in soil and groundwater in excess of the concentrations developed as the unrestricted residential criteria under Section 20120a(1)(a) or (17) of NREPA, and above TSCA High Occupancy levels per 40 CFR Part 761.3. Exhibit 2 is a list of hazardous constituents above NREPA criteria in soil or groundwater at the Property.

MDEQ recommends that prospective purchasers or users of the Property undertake appropriate due diligence prior to acquiring or using this Property, and undertake appropriate actions to comply with the requirements of Section 20107a of NREPA.

Summary of Response Activity/Corrective Measures

The Property was part of a larger automotive components manufacturing facility (Larger Facility) previously owned and operated by General Motors Corporation prior to its June 2009 bankruptcy filing. With the exception of the subject Property, the remainder of the Larger Facility was acquired during the bankruptcy process and is currently operated by General Motors LLC. As a result of General Motors Corporation's manufacturing operations, hazardous substances were released at the Property. The hazardous substances include high concentrations of PCB-contaminated waste oil (light nonaqueous phase liguids (LNAPL), and PCB-impacted soils within the PCB Remediation Waste Area. Other substances present in the soil and groundwater at the Property that exceed applicable current MDEQ criteria include benzo(a)pyrene, carbazole, dibenzofuran, 2,4-Dimethylphenol, fluoranthene, fluorene, 4-methylphenol, naphthalene, phenanthrene, ethylbenzene, xylenes, arsenic, chromium, cobalt, cyanide, manganese, mercury, selenium, and silver.

Response activities were undertaken to address the environmental contamination at the Larger Facility in accordance with Part 201 pursuant to the General Motors Corporation/State of Michigan On-Site Consent Judgment dated December 14, 1992 (Civil Action No. 92-3740-CE). The

remedial investigation of soil, groundwater, surface water, and air quality was conducted between 1993 and 1995, consistent with the approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan, dated December 1992. A final FS report was submitted to MDEQ in June 1997 and a Final Draft Remedial Action Plan (RAP) was submitted to MDEQ on June 18, 1998 (1998 RAP). The 1998 RAP was amended on December 14, 1999 to include the former Crotty Street Channel (combined, the 1999 amended RAP). The former Crotty Street Channel now is the western margin of the Property. The 1999 amended RAP was implemented between 1999 and 2000. The components of the 1999 amended RAP included: sheet pile and slurry containment walls; vegetated multi-layer cap; a concrete cap over a small area to prevent contact with soil impacted by PCBs; a twelve (12) inch vegetated soil cap to prevent contact with impacted soil; groundwater extraction and treatment; operation, monitoring, and maintenance; a permanent marker; and institutional controls (in the form of this Restrictive Covenant). Copies of the documents related to this Site are located in the MDEQ Bay City District Office.

All proposed remedial actions have been implemented to the satisfaction of MDEQ except for the proposed institutional controls and installation of permanent markers. With the installation of the permanent markers and recording of this Restrictive Covenant all remedial action proposed in the 1999 amended RAP for the Property will have been implemented. At the time this Restrictive Covenant was recorded, the Trust was working with MDEQ to obtain approval of a Response Activity Plan or other appropriate approval pursuant to the requirements of Section 20120b(3) of NREPA and / or a determination of Corrective Action Complete with Controls pursuant to Section 11101 of NREPA and to install the permanent markers.

The groundwater extraction system was modified and a treatment system was installed at the Property between December 2012 and April 2015 as a part of a process to separate the Site from the remaining portion of the Larger Facility (i.e., the adjacent manufacturing facility owned and operated by General Motors LLC). This separation became necessary as a result of the bankruptcy process. Also as a result of the bankruptcy process, work is ongoing to segregate storm water at the Property and manage it separately from the Larger Facility.

Definitions

"Grantee" shall mean MDEQ, its respective successor entities, and those persons or entities acting on its behalf.

"Grantor" shall mean RACER Properties LLC, an entity wholly-owned by the Trust and the current title holder of the Property at the time this Restrictive Covenant was executed, or any future title holder of the Property or some relevant sub-portion of the Property.

"MDEQ" means the Michigan Department of Environmental Quality, its successor entities, and those persons or entities acting on its behalf.

"NREPA" shall mean the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, MCL 324.101 *et seq*.

"Owner" means at any given time the then-current fee title holder(s) of the Property or any portion thereof, including the fee title holder's lessees and those persons or entities authorized to act on its behalf.

"Part 111" shall mean Part 111, Hazardous Waste Management, of NREPA, in effect at the time of the recording of this restrictive covenant.

"Part 201" shall mean Part 201, Environmental Remediation, of NREPA.

"TSCA" shall mean the Toxic Substances Control Act, as amended, 15 U.S.C. §2601 *et seq.*

"Property" shall mean the property legally described and depicted in the Survey of Property in Exhibit 1.

"Settlement Agreement" shall mean the Environmental Response Trust Consent Decree and Settlement Agreement entered by the U.S. Bankruptcy Court for the Southern District of New York on March 29, 2011, in the case of *In re Motors Liquidation Company*, etc. et al., Debtors, Case No. 09-50026 (REG), among the Debtors, the United States of America, certain states including the State of Michigan, the Saint Regis Mohawk Tribe, and EPLET, LLC, (not individually but solely in its representative capacity as Administrative Trustee of the Trust).

"Site" shall have the same meaning as "Property."

"USEPA" shall mean the United States Environmental Protection Agency, its successor entities, and those persons or entities acting on its behalf.

All other terms used in this document which are defined in Part 3, Definitions, of NREPA, Part 111, Part 201, or the Part 111 and Part 201 Administrative Rules, or TSCA and 40 CFR Part 761, shall have the same meaning in this document as in those statutes and rules as on the date this Restrictive Covenant is made.

NOW THEREFORE,

Declaration of Land Use or Resource Use Restrictions

Grantor as current fee title holder of the Property, hereby declares and covenants that the Property shall be subject to those restrictions on use described below, and intends that said restrictions and covenants shall run with the land, and may be enforced in perpetuity against the Owner by the following entities: (1) Grantor, if it is no longer Owner; (2) MDEQ; and (3) USEPA.

1. Land Use Prohibitions. The Owner shall prohibit all uses of the Property that are not compatible or consistent with the exposure assumptions for the nonresidential cleanup criteria established pursuant to Section 324.20120a(1)(b) of NREPA. Uses that are compatible with nonresidential cleanup criteria are generally described in Exhibit 3 (Description of Allowable Uses).

In addition, the Property has been used for disposal of PCB remediation waste and the Owner shall prohibit all uses of the Property not in accordance with Low Occupancy as defined in 40 CFR 761.3. The Owner is required to apply to USEPA, under 40 CFR 761.61(a), for approval to change this Low Occupancy use restriction.

2. Notification of PCB Remediation Waste. This provision provides the notification required by 40 CFR Part 761.61(a)(8)(i)(A) that PCB Remediation Waste is present on the Property as depicted in Exhibit 4. The PCB Remediation Waste is present beneath the vegetated multilayer, concrete, and vegetated soil cap areas as depicted in Exhibit 5 at concentrations of up to 6,900 parts per million (ppm). These cap areas will be maintained per 40 CFR Part 761.61(a)(8) and the provisions of the Restrictive Covenant.

3. Activities Prohibited. Owner shall prohibit activities on the Property that may damage or disturb any component of the constructed remedy, the storm water management system, or that may result in exposures to hazardous substances above the nonresidential cleanup criteria. These prohibited activities include:

   a. Installation or use of wells or other devices, except for wells and devices that are part of an MDEQ-approved response activity, and for short-term dewatering for construction purposes, provided the dewatering, including management and disposal of the groundwater, is conducted in accordance with all applicable environmental laws and does not cause or result in a new release, exacerbation of any pre-existing environmental condition, or any other violation of environmental laws.

   b. Activities that interfere with any element of the corrective measures, including the performance of operation and maintenance activities, monitoring, or other measures necessary to ensure the effectiveness and integrity of the remedial action described in the 1999 amended RAP and the modifications to the groundwater extraction and storm water systems and the groundwater treatment system as installed by the Trust from 2012 through the date this Restrictive Covenant was recorded.

   c. Activities that would remove, cover, obscure or otherwise alter or interfere with the permanent markers to be placed at the Property at the locations identified in Exhibit 5. The Owner shall keep vegetation and other materials clear of the permanent markers to assure that the markers are readily visible.

   d. Any excavation or other intrusive activities, including but not limited to removal, disturbing, damaging, interfering, or otherwise negatively affecting the integrity, effectiveness, and operation of the exposure barriers (the vegetated multilayer cap, concrete cap, and vegetated soil cap), sheet pile and slurry containment walls, the groundwater extraction and treatment system, monitoring wells, or the storm water management system except if such activity is temporary (less than sixty (60) days in duration), approved by the Trust in writing in advance, and repaired to at

least the pre-disturbance condition within 14 days of work completion. The Trust will provide notice to MDEQ of any activities covered by this provision. The multilayer, concrete, and vegetated soil caps (i.e., Direct Contact Exposure and Infiltration Management Barriers) are shown and their respective base elevations are identified in Exhibit 5 and serve to prevent exposures to contaminated soils and minimize infiltration of water through the contaminated soil. See Exhibit 6 for the approximate location of the water management features at the Site as of September of 2015.

e. "Treatment", "storage", "disposal", or release of any Hazardous Substances, on, at, or below the Property, in a manner that would require a permit under RCRA or Part 111 of NREPA, except pursuant to a plan, permit, or license approved in writing by MDEQ or USEPA, pursuant to these statutory authorities.

f. Constructing a building or structure of any type, except if such building or structure is part of an MDEQ-approved response activity. However, this provision can be modified or rescinded pursuant to the provisions of Paragraph 11.

4. Contaminated Soil Management. The Owner shall manage contaminated soils, media and/or debris and all other soils located on the Property in accordance with the requirements of Part 111 and RCRA Subtitle C, the administrative rules promulgated pursuant to Part 111 and RCRA, TSCA, and all other relevant state and federal laws, including but not limited to MCL 324.20120c; this provision regarding contaminated soil management also applies in the event that the Owner elects to remove any slabs, pavement, or other impervious surface on the Property.

5. Health and Safety Requirement. The Owner shall follow and require that all contractors follow appropriate Health and Safety requirements for all intrusive excavation activities performed at the Property.

6. Access. The Owner shall grant to MDEQ, USEPA, and the Trust the right to enter the Property at reasonable times for the purpose of determining and monitoring compliance with this Restrictive Covenant, including the right to take samples, inspect the operation of corrective measures, and inspect any records relating thereto, and to perform any actions necessary to maintain compliance with Parts 111 and 201, and other applicable federal laws and regulations.

7. Transfer of Interest. The Owner shall provide notice to MDEQ, USEPA, and the Trust at the addresses provided in Paragraph 8 of the Owner's intent to transfer any interest in the Property, or any portion thereof, at least fourteen (14) business days prior to consummating the conveyance. A conveyance of title, easement, or other interest in the Property shall not be consummated by Owner without adequate and complete provision for compliance with the terms and conditions of this Restrictive Covenant and the applicable provisions of Section 20116 of the NREPA. Owner shall include in any instrument conveying any interest in any portion of the Property, including, but not limited to, deeds, leases, and mortgages, a notice which is in substantially the following form:

NOTICE: THE INTEREST CONVEYED HEREBY IS SUBJECT TO A DECLARATION OF RESTRICTIVE COVENANT DATED _____ [*month, day, year*], AND RECORDED WITH THE BAY COUNTY REGISTER OF DEEDS, LIBER _____, PAGE _____.

A copy of this Restrictive Covenant shall be provided to all future owners, heirs, successors, lessees, easement holders, assigns, and transferees by the person transferring the interest.

8. Notices. Any notice, demand, request, consent, approval, or communication that is required to be made or obtained under this Restrictive Covenant shall be made in writing and shall: include a statement that the notice is being made pursuant to the requirements of this Restrictive Covenant; include the Michigan Facility Identification Number: MID 005 356 688 and MDEQ Reference Numbers: RC-OWMRP-111-15-013; and be served either personally, or sent via first class mail, postage prepaid, as follows:

For MDEQ:

Remediation and Redevelopment Division Chief
Michigan Department of Environmental Quality
P.O. Box 30426
Lansing, MI 48909-7926

and

Hazardous Waste Section Chief
Office of Waste Management and Radiological Protection
Michigan Department of Environmental Quality
P.O. Box 30241
Lansing, MI 48909-7741

For USEPA:

Director
Land and Chemicals Division (DR-8J)
U.S. Environmental Protection Agency, Region 5
77 West Jackson Blvd.
Chicago, IL 60604

with a copy to:

Office of Regional Counsel (C-14J)
U.S. Environmental Protection Agency, Region 5
77 West Jackson Blvd.
Chicago, IL 60604

For the Trust:

Michigan Cleanup Manager
RACER Trust
500 Woodward Avenue, Suite 2650
Detroit, MI 48226

9. Term. This Restrictive Covenant shall run with the Property, and shall be binding on the Owner, and all current and future successors, lessees, easement holders, their assigns, and their authorized agents, employees, or persons acting under their direction and control. This Restrictive Covenant may be modified, released or rescinded only with the written approval of MDEQ, USEPA, and the Trust.

10. Enforcement. Grantor is entitled to enforce the restrictions and covenants of this Restrictive Covenant by specific performance or other legal action in a court of competent jurisdiction against subsequent Owners of all or part of the Property. Grantor, on behalf of itself, and its successors in title, intends and agrees that MDEQ and USEPA are entitled to enforce the restrictions and covenants in this Restrictive Covenant by specific performance or other legal action in a court of competent jurisdiction against Grantor, as Owner, and thereafter against subsequent Owners of all or part of the Property. All remedies available hereunder shall be in addition to any and all other remedies at law or equity.

11. Modification/Release/Rescission. Grantor or Owner may request in writing to MDEQ, USEPA, and the Trust at the addresses provided in Paragraph 8, modifications to, or release or rescission of this Restrictive Covenant. This Restrictive Covenant may be modified, released or rescinded only with the written approval of MDEQ, USEPA, and the Trust. Any approved modification to, or release or rescission of, this Restrictive Covenant shall be filed with the Bay County Registrar of Deeds by the Grantor or Owner and a certified copy of such modification or release or rescission returned to MDEQ, USEPA, and the Trust at the addresses provided in Paragraph 8.

12. Severability. If any provision of this Restrictive Covenant is held to be invalid by a court of competent jurisdiction, the invalidity of such provision shall not affect the validity of any other provisions of this Restrictive Covenant and all other provisions shall continue to remain in full force and effect.

13. Limitation on Liability. The liability of the Trust, RACER Properties LLC, and the Administrative Trustee under this Restrictive Covenant is limited by the terms and conditions of the Settlement Agreement, which are incorporated herein by reference.

14. Authority to Execute Restrictive Covenant. The undersigned person executing this Restrictive Covenant represents and certifies that he or she is duly authorized and has been empowered to execute and deliver this Restrictive Covenant.

15. Compliance with this Restrictive Covenant and Applicable Due Care Obligations. The Owner shall at all times comply with the conditions and restrictions of this Declaration of

Restrictive Covenant and the applicable Due Care obligations under Section 20107a of NREPA, MCLA 324.20107a, under the applicable Michigan administrative rules R299.51003, and under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601, *et seq*. Owner agrees to maintain records of its activities to comply with this Declaration of Restrictive Covenant and applicable Due Care obligations, and shall timely supply copies of any records documenting such compliance upon request from MDEQ or the Trust.

16. Miscellaneous.

a) Controlling Law. The interpretation and performance of this Restrictive Covenant shall be governed by the laws of the United States as to the obligations referred to in the Settlement Agreement and the laws and regulations of the State of Michigan for all other purposes hereunder (without reference to choice of laws principles thereof). The right to enforce the conditions and restrictions in this Restrictive Covenant are in addition to other rights and remedies that may be available, including, not limited to, administrative and judicial remedies under CERCLA or Part 201 of the NREPA.

b) Liberal Construction. Any general rule of construction to the contrary notwithstanding, this Restrictive Covenant shall be liberally construed to effect the purpose of this Restrictive Covenant, and the policy and purpose of RCRA and the land use restrictions and prospective use limitations required by Part 201. If any provision of this Restrictive Covenant is found to be ambiguous, an interpretation consistent with the purpose of this Restrictive Covenant that would render the provision valid shall be favored over any interpretation that would render it invalid.

c) Entire Agreement. This Restrictive Covenant and its attachments and appendices supersedes all prior discussions, negotiations, understandings, or agreements relating to the matters addressed herein, all of which are merged herein.

[signature page follows]

IN WITNESS WHEREOF, RACER Properties LLC has caused this Restrictive Covenant, RC-OWMRP-111-15-013, to be executed on this 9th day of November, 2015.

RACER PROPERTIES LLC

By: Revitalizing Auto Communities Environmental Response Trust, Sole Member of RACER Properties LLC

By: EPLET, LLC, acting solely in its capacity as Administrative Trustee of Revitalizing Auto Communities Environmental Response Trust

By: _____
ELLIOTT P. LAWS, not individually, but acting solely in his capacity as Managing Member of EPLET, LLC

* * * * * * *

STATE OF MICHIGAN)
) ss.
COUNTY OF WAYNE)

The foregoing instrument was acknowledged before me this 9th day of November, 2015, by ELLIOTT P. LAWS, not individually, but acting solely in his capacity as Managing Member of EPLET, LLC, a Delaware limited liability company, acting solely in its capacity as Administrative Trustee of Revitalizing Auto Communities Environmental Response Trust, a New York trust, as Sole Member of RACER Properties LLC, a Delaware limited liability company, on behalf of said limited liability company and said trust.

TRACIE L. NICHOLS
Notary Public, State of Michigan
County of Oakland
My Commission Expires 03-19-2017
Acting in the County of Wayne

_____
Notary Public Signature

Name of Notary Public Tracie L. Nichols
Notary Public, State of Michigan
County of Oakland
My Commission Expires: 3/19/17
Acting in the County of Wayne

This document is exempt from state and county transfer taxes pursuant MCL 207.505(a) and MCL 207.526(a).

Prepared by/Return to:
Carl Garvey, General Counsel
RACER Trust
500 Woodward Avenue, Suite 2650
Detroit, MI 48226

EXHIBIT 1

LEGAL DESCRIPTION AND SURVEY OF PROPERTY

Tax Parcel ID: 09-160-021-201-003-00

Land situated in the City of Bay City, County of Bay in the State of Michigan, as depicted and described below:

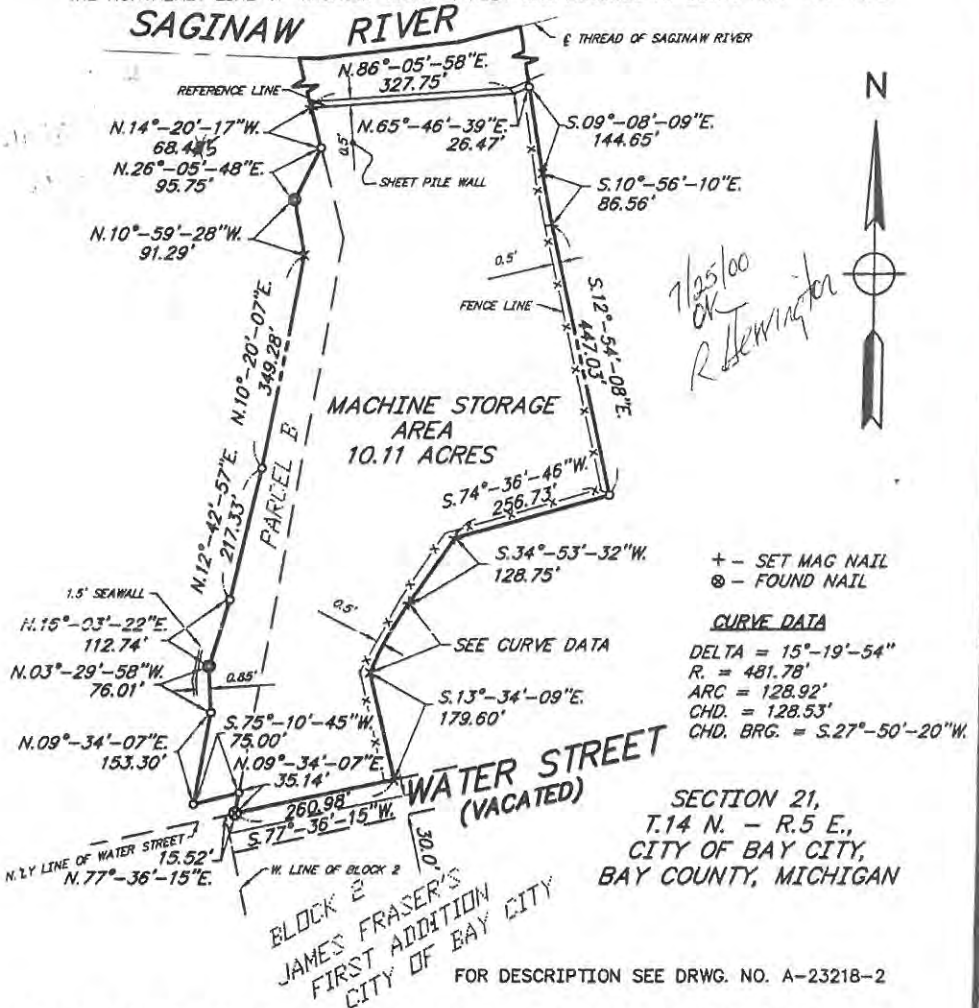
*Corrected survey for

FTID # 09-13-16-476-001
all of Ch 13-21-20 E 393

CERTIFICATE OF SURVEY

DWG. NO. A-23218-1

BEARINGS SHOWN ON THIS SURVEY WERE DETERMINED IN THE FOLLOWING MANNER
THE NORTHERLY LINE OF VACATED WATER STREET WAS ASSUMED AT BEING N.77°-36'-15"E.



7/25/00
OK
R Hewington

FOR DESCRIPTION SEE DRWG. NO. A-23218-2

I hereby certify that I have surveyed and mapped the land above platted and/or described on 06/16/00, and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.

Jeffrey E. Wood

Professional Surveyor No. 41115

STATE OF MICHIGAN
JEFFREY E. WOOD
PROFESSIONAL SURVEYOR
NO. 41115
LICENSED PROFESSIONAL SURVEYOR

SURVEY FOR: Realm - GM Powertrain
101 Fitzgerald Road
Bay City, Michigan 48708

Spicer group ©1995
230 S. WASHINGTON AVENUE
P.O. BOX 1689
SAGINAW, MI. 48605-1689
TEL (517) 754-4717
FAX (517) 754-4440

◎ -FOUND SURVEY CORNER
○ -SET 3/4" ø IRON PIPE WITH CAP No. 41115

SHEET 1 OF 2

DATE: June 16, 2000

SCALE: 1" = 200'
0 100 200 400

JOB NO. S101621.00
DWG. NO. A-23218-1

CERTIFICATE OF SURVEY

DWG. NO. A-23218-2

BEARINGS SHOWN ON THIS SURVEY WERE DETERMINED IN THE FOLLOWING MANNER
THE NORTHERLY LINE OF VACATED WATER STREET WAS ASSUMED AT BEING N.77°-36'-15"E.

A parcel of land in Section 21, T.14 N.-R.5 E., City of Bay City, Bay County, Michigan, described as follows: To fix the point of beginning, commence at the intersection of the North line of vacated Water Street with the Northerly extension of the West line of Block 2 of James Fraser's First Addition to the City of Bay City, as recorded in Liber 1 on Page 6, Bay County records; thence N.77°-36'-15"E., on said North line, 15.52 feet, to the point of beginning of this description; thence N.09°-34'-07"E., on a line previously recorded in Liber 918, Page 305, Bay County Records, 35.14 feet; thence S.75°-10'-45"W., on a line previously surveyed and monumented, 75.00 feet; thence N.09°-34'-07"E., 153.30 feet; thence N.03°-29'-58"W., 76.01 feet; thence N.16°-03'-22"E., 112.74 feet; thence N.12°-42'-57"E., 217.33 feet; thence N.10°-20'-07"E., 349.28 feet; thence N.10°-59'-28"W., 91.29 feet; thence N.26°-05'-48"E., 95.75 feet; thence N.14°-20'-17"W., 68.45 feet to a point on a reference line along the Southerly bank of the Saginaw River, said reference line is for surveying purposes only and it is the intention of this description to include all lands to the centerline thread of the Saginaw River; thence N.86°-05'-58"E., on said reference line 327.75 feet to a deflection point; thence N.65°-46'-39"E., continuing along said reference line, 26.47 feet; thence S.09°-08'-09"E., 144.65 feet; thence S.10°-56'-10"E., 86.56 feet; thence S.12°-54'-08"E., 447.03 feet; thence S.74°-36'-46"W., 256.73 feet; thence S.34°-53'-32"W., 128.75 feet to a point on a 481.78 foot radius nontangental curve to the left; thence Southwesterly on the arc of said curve, a distance of 128.92 feet, said arc being subtended by a chord bearing S.27°-50'-20"W., and distance of 128.53 feet; thence S.13°-34'-09"E., 179.60 feet to the North line of Vacated Water Street; thence S.77°-36'-15"W., on said North line, 260.98 feet to the point of beginning, containing 10.11 acres of land within said reference line and subject to any easement of record and any riparian rights of the public for the waters of the Saginaw River.

I hereby certify that I have surveyed and mapped the land above platted and/or described on 06/16/00 . and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.

Jeffrey E. Wood — Professional Surveyor No. 41115

Jeffrey E. Wood

STATE OF MICHIGAN
JEFFREY E. WOOD
PROFESSIONAL SURVEYOR
NO. 41115
LICENSED PROFESSIONAL SURVEYOR

SURVEY FOR: Realm - GM Powertrain
101 Fitzgerald Road
Bay City, Michigan 48708

Spicer group ©1998
230 S. WASHINGTON AVENUE
P.O. BOX 1689
SAGINAW, MI. 48605-1689
TEL (517) 754-4717
FAX (517) 754-4440

◎ -FOUND SURVEY CORNER
o -SET 3/4" ø IRON PIPE WITH CAP No. 41115

SHEET 2 OF 2

DATE: June 16, 2000

SCALE: 1" = 200' (0, 100, 200, 400)

JOB NO. S101621.00
DWG. NO. A-23218-2

ALSO INCLUDING A PARCEL OF LAND IN THE CITY OF BAY CITY, COUNTY OF BAY, STATE OF MICHIGAN AS DESCRIBED AND DEPICTED BELOW:

IN SECTION 21, TOWNSHIP 14 NORTH, RANGE 5 EAST, FRASER'S ADDITION, BEGINNING AT THE INTERSECTION POINT OF THE NORTH LINE OF VACATED WATER STREET WITH THE NORTHERLY EXTENSION OF THE WEST LINE OF BLOCK 2, FRASER'S ADDITION; THENCE NORTH 77 DEGREES 36 MINUTES 15 SECONDS EAST, 33.59 FEET; THENCE SOUTH 14 DEGREES 18 MINUTES 39 SECONDS EAST, 21.71 FEET; THENCE SOUTH 73 DEGREES 02 MINUTES 26 SECONDS WEST, 34.06 FEET; THENCE NORTH 13 DEGREES 16 MINUTES 04 SECONDS WEST, 24.41 FEET TO THE POINT OF BEGINNING.

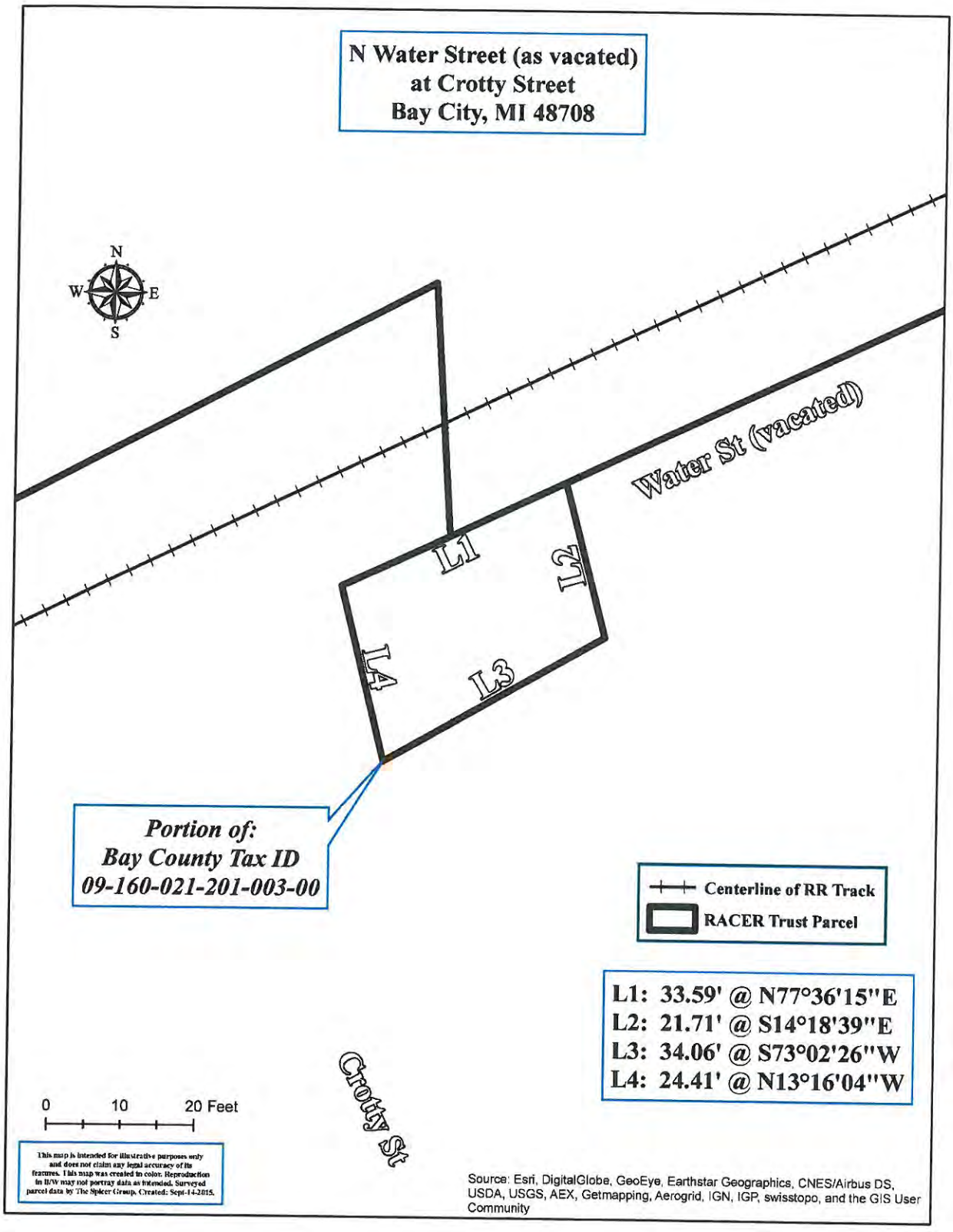

N Water Street (as vacated)
at Crotty Street
Bay City, MI 48708
N
W
E
S
Water St (vacated)
L1
L2
L3
L4
Portion of:
Bay County Tax ID
09-160-021-201-003-00
Centerline of RR Track
RACER Trust Parcel
L1: 33.59' @ N77°36'15"E
L2: 21.71' @ S14°18'39"E
L3: 34.06' @ S73°02'26"W
L4: 24.41' @ N13°16'04"W
0
10
20 Feet
Crotty St
This map is intended for illustrative purposes only and does not claim any legal accuracy of its features. This map was created in color. Reproduction in B/W may not portray data as intended. Surveyed parcel data by The Spicer Group. Created: Sept-14-2015.
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

EXHIBIT 2

HAZARDOUS SUBSTANCES ABOVE CRITERIA IN SOILS AND GROUNDWATER

Media	Substance	Criteria Exceeded
Soil	1,1,2-Trichloroethane	GSIPC, NRDWPC
	Acetone	GSIPC, NRDWPC
	Ethylbenzene	GSIPC
	Methylene chloride	NRDWPC
	Xylenes (total)	GSIPC
	2,4-Dimethylphenol	GSIPC, NRDWPC
	4-Methylphenol	GSIPC, NRDWPC
	Benzo(a)pyrene	NRDC
	Carbazole	GSIPC
	Dibenzofuran	GSIPC
	Fluoranthene	GSIPC
	Fluorene	GSIPC
	Naphthalene	GSIPC, NRVI
	Phenanthrene	GSIPC
	Aluminum	NRDWPC
	Antimony	GSIPC
	Arsenic	NRDC, NRDWPC, GSIPC
	Cadmium	NRDWPC
	Cobalt	GSIPC, NRDWPC
	Cyanide (total)	GSIPC, NRDWPC
	Iron	NRDWPC
	Magnesium	NRDWPC
	Manganese	NRDWPC, NRPIC
	Mercury	GSIPC, NRDWPC
	Nickel	NRDWPC
	Selenium	GSIPC
	Silver	GSIPC, NRDWPC
	Zinc	NRDWPC
	PCBs	NRDC, NRPIC, NRVI, NRSI

Soil
NRDC – Non-Residential Direct Contact Criteria
GSIPC – Groundwater Surface Water Interference Protection Criteria
NRDWPC – Non-Residential Drinking Water Protection Criteria
NRVI – Non-Residential Vapor Intrusion Screening Levels
NRPIC – Non-Residential Particulate Soil Inhalation Criteria
NRSI – Non-Residential – Ambient Air Infinite Source Volatile Soil Inhalation

Media	Substance	Criteria Exceeded
Groundwater	Benzene	NRVISG, DWC
	Ethylbenzene	GSIC, DWC
	Vinyl chloride	NRVIG, NRVISG, GSIC, DWC
	1,2,4-Trimethylbenzene	NRVISG, GSIC, DWC
	4-Methylphenol	GSIC
	Acenaphthene	NRVISG, GSIC
	Anthracene	DWC, GVIA
	Benzo(a)anthracene	DWC
	bis(2-Ethylhexyl)phthalate (DEHP)	GSIC, DWC
	Carbazole	GSIC
	Chrysene	DWC
	Dibenzofuran	NRVIG, NRVISG, GSIC
	Fluoranthene	GSIC
	Fluorene	GSIC
	Naphthalene	NRVIG, NRVISG, GSIC, DWC
	Phenanthrene	NRVISG, GSIC, DWC
	Aluminum	DWC
	Arsenic	GSIC, DWC
	Barium	DWC
	Cyanide (total)	GSIC
	Iron	DWC
	Iron (dissolved)	DWC
	Manganese	DWC
	Nickel	DWC
	Sodium	DWC
	PCBs	NRVIG, GSIC, DWC
	pH	DWC

Groundwater
NRVIG – Non-Residential Land Use/Vapor Intrusion Groundwater Screening Levels
NRVISG - Non-Residential Land Use/Vapor Intrusion Shallow Groundwater Screening Levels
GSIC – Groundwater Surface Water Interface Criteria
DWC – Drinking Water Criteria
GVIA – Groundwater Volatilization to Indoor Air Inhalation

1 – MDEQ Cleanup Criteria Requirements for Response Activity (December 31, 2013)
2 – PCBs up to 6,900 ppm in soil, 3.9 ppm in LNAPL, and 0.0055 ppm in groundwater remain within the designated PCB Remediation Waste area depicted in Exhibit 3.

EXHIBIT 3

DESCRIPTION OF ALLOWABLE USES

Nonresidential Land Use: This land use is characterized by any use which is not residential in nature and is primarily characterized by industrial and commercial uses. Industrial uses typically involve manufacturing operations engaged in processing and manufacturing of materials or products. Other examples of industrial uses are utility companies, industrial research and development, and petroleum bulk storage. Commercial uses include any business or income-producing use such as commercial warehouses, lumber yards, retail gas stations, auto dealerships and service stations, as well as office buildings, banks, and medical/dental offices (not including hospitals). Commercial uses also include retail businesses whose principal activity is the sale of food or merchandise within an enclosed building and personal service establishments which perform services indoors such as health clubs, barber/beauty salons, photographic studios, etc.

Any residential use is specifically prohibited from the non-residential land use category. This would include the primary use of the Property for human habitation and includes structures such as single family dwellings, multiple family structures, mobile homes, condominiums, and apartment buildings. Any uses which are intended to house, educate, or provide care for children, the elderly, the infirm, or other sensitive populations, and therefore could include day care centers, educational facilities, hospitals, elder care facilities, and nursing homes, may not fit the nonresidential exposure assumptions. Residential or site specific environmental protection standards may need to be considered. The use of any accessory building or portion of an existing building as a dwelling unit permitted for a proprietor or storekeeper and their families, located in the same building as their place of occupation, or for a watchman or caretaker is also prohibited. Any authority that allows for residential use of the Property as a legal non-conforming use is also restricted per the prohibitions contained in this restrictive covenant.

EXHIBIT 4

PCB REMEDIATION WASTE

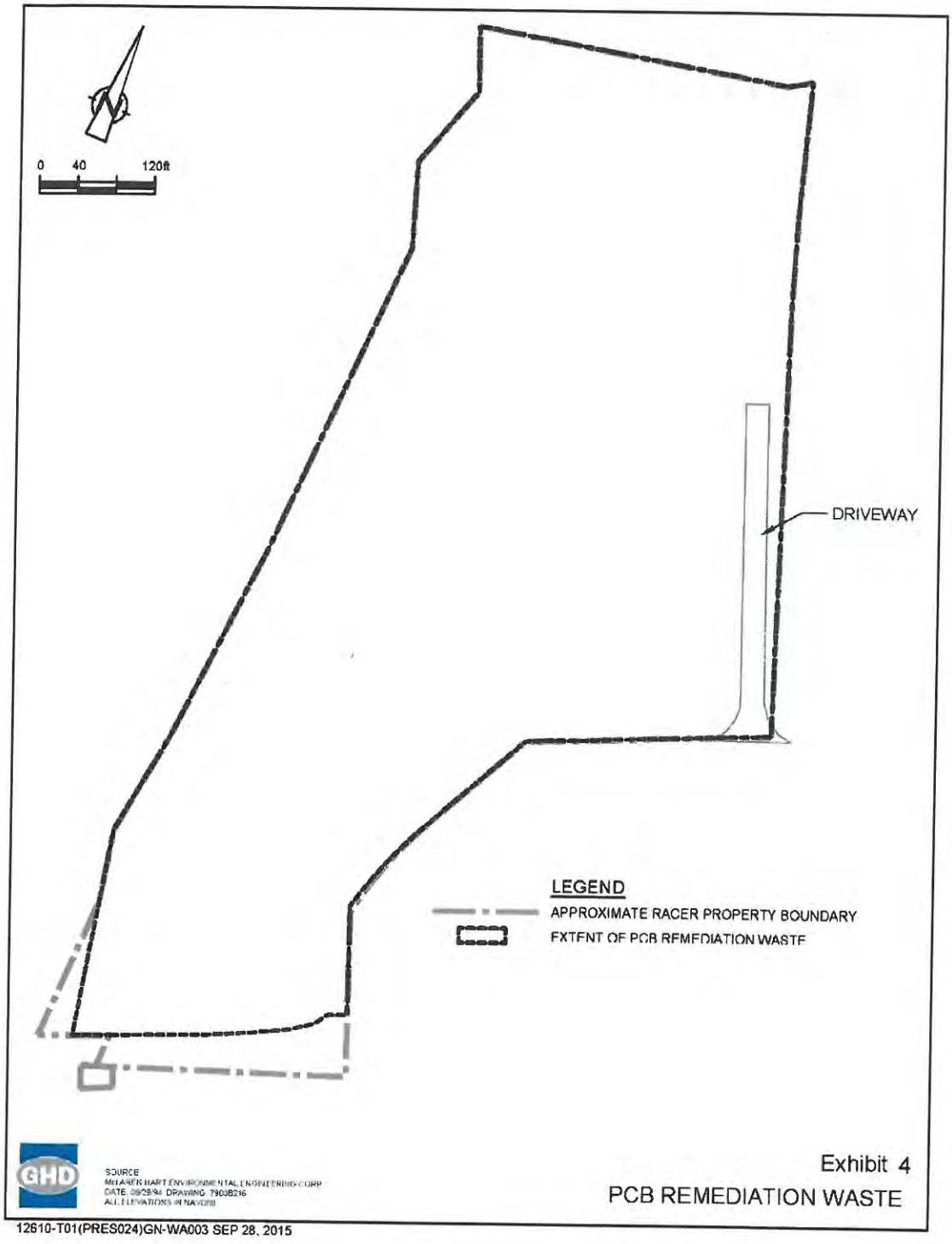
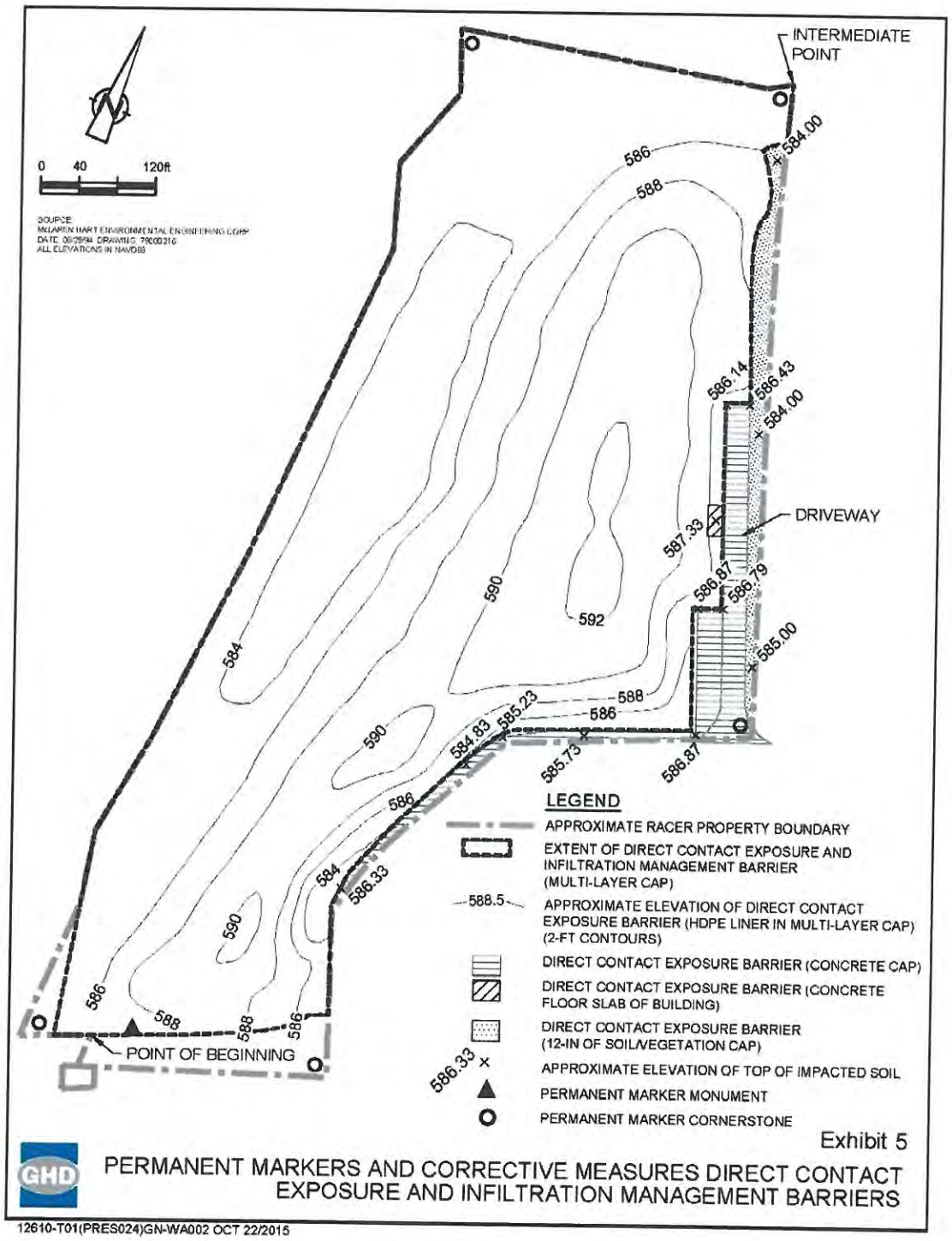


EXHIBIT 5

PERMANENT MARKERS AND CORRECTIVE MEASURES DIRECT CONTACT EXPOSURE AND INFILTRATION MANAGEMENT BARRIERS



12610-T01(PRES024)GN-WA002 OCT 22/2015

DESCRIPTION OF THE PERIMETER OF THE MULTI-LAYER CAP EXPOSURE BARRIER

The bearings and distances in this description are based on a survey for REALM – GM Powertrain by Spicer Group dated June 16, 2000 (Spicer Group Job Number S101621.00, Drawing Number A-23218-1).

An area of land within the perimeter of a multi-layer containment cap located in Section 21, Town 14 North, Range 5 East, City of Bay City, Bay County, Michigan, described as follows: To fix the point of beginning, commence at the intersection of the North line of vacated Water Street with the Northerly extension of the West line of Block 2 of James Frasers First Addition to the City of Bay City, as recorded in Liber 1 on Page 6, Bay County records; thence North 77 degrees 36 minutes 15 seconds East from said North line, 15.52 feet, to the point of beginning of this description:

Thence South 75 degrees 10 minutes 45 seconds West, on a line previously surveyed and monumented in a survey by Spicer Group (Spicer Group Job Number S101621.00, Drawing Number A-23218-1), 39.14 feet;

Thence North 3 degrees 42 minutes 08 seconds West, 142.29 feet, to a point called a set ¾ inch iron pipe with cap number 41115 on the Westerly line of said survey;

Thence continuing along said Westerly line North 3 degrees 29 minutes 58 seconds West, 76.01 feet;

Thence continuing along said Westerly line North 16 degrees 03 minutes 22 seconds East, 112.74 feet;

Thence continuing along said Westerly line North 12 degrees 42 minutes 57 seconds East, 217.33 feet;

Thence continuing along said Westerly line North 10 degrees 20 minutes 07 seconds East, 349.28 feet;

Thence continuing along said Westerly line North 10 degrees 59 minutes 28 seconds West, 91.29 feet;

Thence continuing along said Westerly line North 26 degrees 05 minutes 48 seconds East, 95.75 feet;

Thence continuing along said Westerly line North 14 degrees 20 minutes 17 seconds West, 68.45 feet;

Thence continuing along said Westerly line North 86 degrees 05 minutes 58 seconds East, 327.75 feet, to a point called a set mag nail on a reference line along the Southerly bank of the Saginaw River on said survey;

Thence continuing along said reference line North 65 degrees 46 minutes 39 seconds East, 26.47 feet, to a point called a set ¾ inch iron pipe with cap number 41115 on the Easterly line of said survey TO AN INTERMEDIATE POINT;

Thence South 9 degrees 08 minutes 09 seconds East, 61.66 feet;

Thence South 65 degrees 04 minutes 54 seconds West, 18.83 feet;

Thence South 40 degrees 21 minutes 24 seconds West, 7.61 feet;

Thence South 32 degrees 46 minutes 39 seconds East, 16.78 feet;

Thence South 22 degrees 54 minutes 27 seconds East, 25.26 feet;

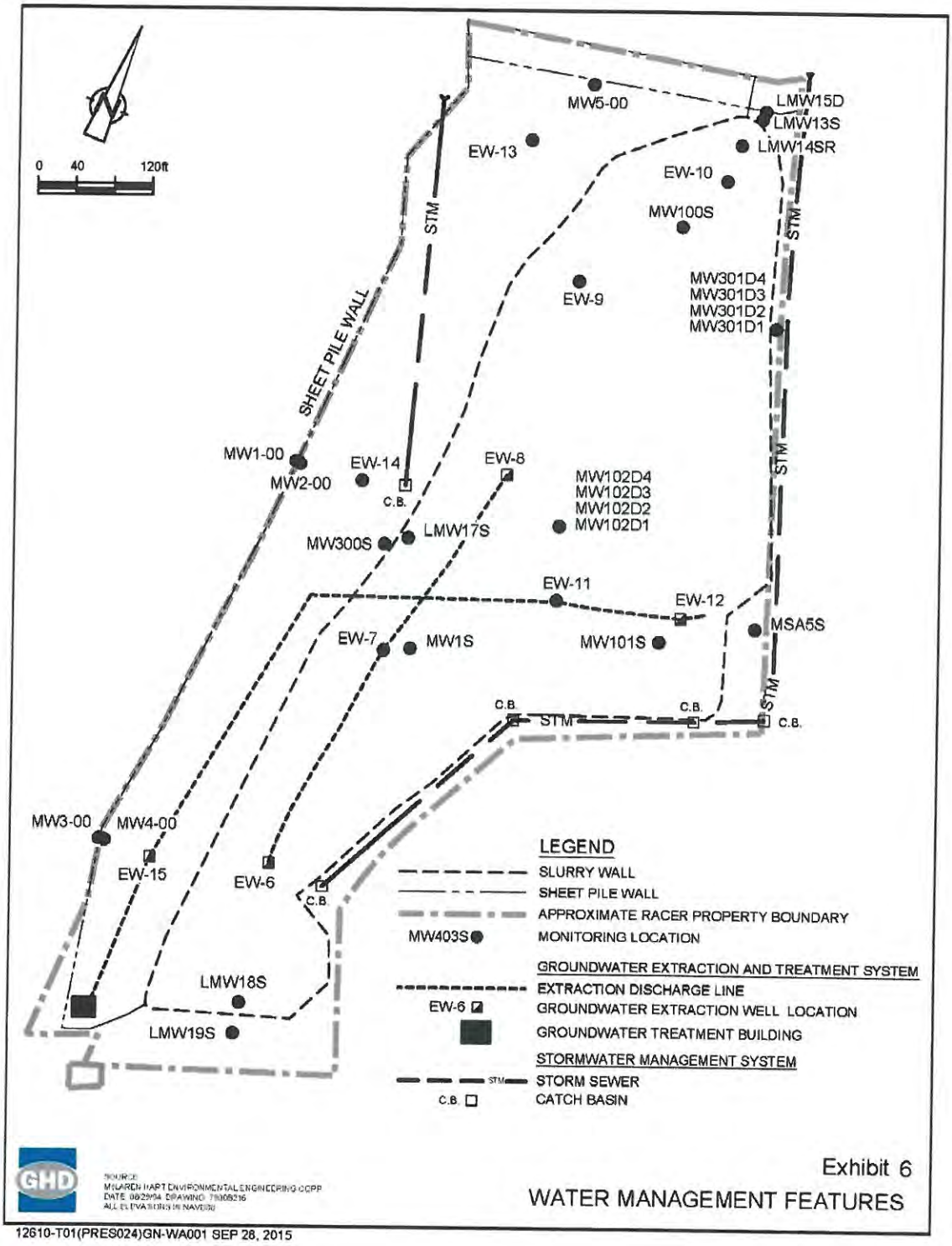
Thence South 11 degrees 18 minutes 57 seconds East, 10.09 feet;

Thence South 4 degrees 20 minutes 06 seconds East, 9.16 feet;

Thence South 3 degrees 18 minutes 14 seconds West, 8.45 feet;
Thence South 29 degrees 03 minutes 00 seconds West, 7.50 feet;
Thence South 10 degrees 48 minutes 42 seconds West, 8.86 feet;
Thence South 1 degrees 25 minutes 49 seconds West, 7.64 feet;
Thence South 4 degrees 33 minutes 24 seconds East, 18.36 feet;
Thence South 12 degrees 54 minutes 49 seconds East, 31.06 feet;
Thence South 14 degrees 46 minutes 05 seconds East, 125.96 feet;
Thence South 76 degrees 27 minutes 11 seconds West, 25.95 feet;
Thence South 13 degrees 59 minutes 20 seconds East, 215.22 feet;
Thence South 76 degrees 01 minutes 43 seconds West, 30.08 feet;
Thence South 14 degrees 26 minutes 33 seconds East, 127.52 feet;
Thence South 75 degrees 25 minutes 15 seconds West, 181.61 feet;
Thence South 61 degrees 42 minutes 31 seconds West, 13.37 feet;
Thence South 45 degrees 37 minutes 00 seconds West, 13.14 feet;
Thence South 38 degrees 59 minutes 33 seconds West, 38.95 feet;
Thence South 32 degrees 19 minutes 04 seconds West, 97.68 feet;
Thence South 28 degrees 23 minutes 30 seconds West, 69.88 feet;
Thence South 12 degrees 51 minutes 19 seconds West, 37.97 feet, to a point called a set mag nail on the Easterly line of said survey;
Thence continuing along said Easterly line South 13 degrees 34 minutes 09 seconds East, 114.87 feet;
Thence South 74 degrees 39 minutes 39 seconds West, 20.61 feet;
Thence South 40 degrees 19 minutes 40 seconds West, 15.22 feet;
Thence South 60 degrees 50 minutes 01 seconds West, 17.35 feet;
Thence South 64 degrees 56 minutes 53 seconds West, 18.15 feet;
Thence South 70 degrees 38 minutes 19 seconds West, 29.36 feet;
Thence South 72 degrees 38 minutes 06 seconds West, 50.44 feet;
Thence South 74 degrees 46 minutes 49 seconds West, 100.22 feet to the point of beginning, containing 9.20 acres of land.

EXHIBIT 6

WATER MANAGEMENT FEATURES



12610-T01(PRES024)GN-WA001 SEP 28, 2015

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