December 1, 2017

Mr. Eugene Melnyk, PE
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203

RE: NYSDEC Standby Contract D007622
American Axle Site, Site No. 915196
Basis of Design Letter Report
WA # D007622-44

Dear Mr. Melnyk:

URS Corporation (URS) is pleased to present the New York State Department of Environmental Conservation (NYSDEC) with this Letter Report that provides our conceptual design for the groundwater/oil interceptor system at the above-referenced site. The intent of the groundwater/oil interceptor system is to decrease the elevation of the groundwater to the extent that it can no longer infiltrate the 5 by 9 foot elliptical sewer that transverses the site and to collect PCB contaminated oil floating on the groundwater's surface in zones farther afield from the sewer. Extracted groundwater/oil will be treated by the existing onsite treatment system prior to discharge to the Buffalo Sewer Authority (BSA).

The conceptual design is based on calculations and recommendations presented in URS' *Pumping Test and Slug Test Letter Report*, dated November 2, 2017 and information provided in the *Remedial Investigation Report* (RI), dated November 2006, prepared by Conestoga-Rovers & Associates.

GROUNDWATER PUMPING AND OIL RECOVERY

Two separate pumping systems will be installed as part of an interim remedial measure (IRM). One system will pump groundwater/oil from the bedrock zone and the other will pump groundwater/oil from the fill/clay zone. Data collected during the September 2017 hydraulic conductivity and pumping tests were used to determine the number and locations of the pumping wells, pumping rates, and radii of influence. Descriptions of these two systems are provided below.

In the *Pumping Test and Slug Test Letter Report*, URS recommended the installation of six bedrock wells set in pairs, one on either side of the sewer. Following NYSDEC's review of the data and in light of uncertainties of how the underlying formation would respond, an additional pair of bedrock pumping wells was added for a total of eight wells.

Bedrock Pumping System

The eight bedrock wells (BW-1 through BW-8) will be installed on each side of the sewer directly across from one another. Each well will be located approximately 14 feet off the centerline of the sewer and spaced approximately 133 feet apart.

URS Corporation
Report 12.1.17.docx
257 West Genesee St.
Buffalo, NY 142032
Tel: 716.856.5636
Fax: 716.856.2545

Groundwater will be pumped from each well at a long-term rate of approximately 0.12 gallons per minute (gpm) - includes groundwater passing through the fill/clay layer) creating a cone of depression (radius of influence) that will extend approximately 176 feet from the pumping well. Figure 1 shows the locations of the bedrock pumping wells (BW-1 through BW-8) and the anticipated radii of influence that will extend along column E between columns 15 and 41.

Oil that accumulates in the bedrock pumping wells will be extracted using a separate product recovery pump. Recovered oil will be conveyed to 275-gallon carboys. Components of the bedrock pumping system are discussed below.

Bedrock Well Construction – As shown on Figure 1, the four bedrock pumping well pairs will be constructed between grid labels 21 and 37. The average elevation of the ground surface in the areas where the bedrock wells will be installed is approximately 67.5 feet (local datum). Top of bedrock varies between 16 to 18 feet below ground surface (bgs) (elev. 52 to 49 feet). Each bedrock well will be installed to an approximate depth of 25 feet bgs (i.e., 7 to 9 feet into bedrock).

Prior to drilling, each well location will be cleared to a depth of at least 5 feet using a Vac-Tron© to identify and avoid buried structures and utilities. Each borehole will be advanced to the bedrock surface using drive and wash or Sonic drilling methods. No samples of unconsolidated soils will be collected. The diameter of the drilling rods must be sufficient to allow for the installation of a 6-inch permanent casing through the drill rods.

Upon reaching bedrock, a minimum 1-foot deep socket will be drilled into the bedrock using a tricone roller bit. A permanent 6-inch diameter Schedule 40 PVC pipe will then be set into the rock socket and grouted into place. After the grout has cured for at least 24 hours, the borehole will be advanced to the target depth (i.e., 25 feet) using a tricone roller bit of sufficient diameter to result in a borehole diameter that will accommodate a 4-inch diameter well screen and riser assembly (e.g., 5-inch diameter roller bit). If inspection of the bedrock is required, the borehole can be initially advanced into bedrock using an NQ or HQ core barrel.

To protect against bedrock collapse into the borehole, each bedrock well will be constructed with 4-inch diameter Schedule 40 polyvinyl chloride (PVC) 20-slot screens and riser. The annular space between the well screen and borehole will be backfilled with 10-20 mesh sand that will extend to approximately 2 feet above the screen and riser coupling. A minimum 2-foot bentonite seal will be placed on top of the sand pack. The PVC riser will extend approximately 2 feet into a precast concrete chamber that will accommodate the groundwater and oil recovery pumping apparatus. A cement/bentonite slurry mixture will extend from bentonite seal to the bottom of the precast concrete chamber.

Each precast concrete chamber will be 4x4x4 foot solid bottom and equipped with a 30-inch diameter water-tight cover rated for H-20 loading. A hole will be cut in the bottom to accommodate the well riser and knockouts will be located approximately 18-inches from the top of the chamber to allow penetrations for the discharge piping and electrical service. The chambers will extend approximately 1-inch above the ground surface. Asphalt or concrete will be used to provide a smooth transition to the adjacent surfaces. A detail of a typical bedrock pumping well is shown on Figure 2.

Bedrock Groundwater Pumps – Peristaltic pumps mounted in the precast concrete chambers will be used to extract groundwater from the bedrock zone. Peristaltic pumps are positive displacement self-priming pumps that can operate dry, do not require any valves or backflow preventers, and are easily maintained – typically only the tubing in contact with the pump rollers requires periodic replacement. These pumps can operate at heads up to approximately 31 feet over a wide range of flow rates that can be adjusted by changing the motor speed (revolutions per minute). In addition, these pumps are low shearing, allowing phase separation to occur more readily than centrifugal pumps.

For this application, we recommend the Verderflex DURA 10 peristaltic pump as manufactured by Verder, Inc. The pump is capable of pumping 0.06 to 0.92 gallons per minute (gpm) using 3/4-inch diameter tubing with a maximum discharge pressure is 175 psi. The pump has flanged fittings on the suction and discharge ends to allow the use of rigid piping instead of tubing. The unit operates on 230/460 VAC, three phase input power. Cut sheets and the pump curve for this unit are provided in Attachment 1.

The suction and discharge pipes will be 1-inch diameter Schedule 40 PVC piping. The suction pipe will be installed approximately 2-feet off the bottom of the well (approximately 23-feet bgs; elev. 45). A foot valve will be installed on the bottom of the suction pipe to facilitate re-priming the pump when necessary.

The invert elevation of the sewer in the subject area is approximately 52 feet (15 feet bgs). This well and pump configuration will theoretically draw the groundwater down to an approximate elevation of 45 feet (i.e., approximately 7 feet below the sewer invert) in the immediate vicinity of the pumping wells and 49 feet (i.e., approximately 3 feet below the invert) approximately 67 feet away from the extraction well (0.04 feet/foot); see Figure 1.

Oil Recovery Pump – As groundwater levels decrease, oil present in the soil pore space will be released and flow on the groundwater surface toward the pumping wells. A separate pump, operating independent of the groundwater pump, will be used to expedite the recovery product that accumulates in the bedrock pumping wells as the groundwater level decreases.

URS is recommending that the Magnum Spill Buster, a self-seeking unit that pumps product only be used. The Spill Buster has a motorized reel that lowers/raises the pumping head automatically, at time set intervals, to intersect the oil/groundwater interface. The unit operates on 115/230 VAC, at 60 hertz power input.

The Spill Buster pump head housing is equipped with a conductivity sensor. When the conductivity sensor reaches groundwater, the reel raises the pump head 1/8-inch above the groundwater surface and pumps the floating oil to a storage vessel. If the conductivity sensor detects water, the pump stops pumping and the reel raises the pump above the water surface. The Spill Buster will automatically seek and pump oil that accumulates in the well at set time intervals.

Recovered oil will be conveyed from the Spill Buster unit to a 275 gallon carboy through 5/8" tubing. The tubing will be placed in a Schedule 80 PVC secondary containment pipe sized to

accommodate multiple tubes. The Spill Buster comes with a remote control panel and high-level float that will stop the unit from pumping when the carboy is full. Literature for the Magnum Spill Buster is provided in Attachment 2.

The recovered oil will be transported offsite for proper disposal/recycling at a licensed facility.

Fill/Clay Pumping System

The thickness of the fill/clay overlying bedrock in the area of interest is between 16 to 18 feet thick. Areas that had oil thicknesses of 0.2 feet or greater in existing monitoring wells were targeted for recovery. In the *Pumping Test and Slug Test Letter Report*, URS recommended that nine pumping wells, located east of the sewer, be installed to expedite the recovery of oil from the fill/clay zone.

The depth to groundwater in the fill/clay zone ranges from 3 to 7 feet bgs. To expedite the recovery of oil from this zone, groundwater will be pumped at an estimated rate between 0.6 to 5.0 gpm from each well. The anticipated radius of influence created to promote the flow of oil toward the pumping well is approximately 30 feet. Figure 1 shows the locations of the fill/clay pumping wells (FCW-1 to FCW-9) and their anticipated radius of influence.

Fill/Clay Well Construction – Nine 4-inch diameter pumping wells will be installed. Prior to drilling, each well location will be cleared to approximately 5 feet bgs using a Vac-Tron© to identify and avoid any buried utilities/structures. Each borehole will be advanced to the top of bedrock (approximately 18 feet bgs) using 6-¼ inch inside diameter hollow stem augers (HSA). Each well will be constructed with 4-inch diameter Schedule 40 PVC 10-slot screen extending from top of bedrock to 1 foot above the groundwater surface. An end cap will be placed at the bottom of the wells.

A 20-40 mesh sand pack will extend from the base of the borehole to approximately 1 foot above the well screen and riser coupling. A bentonite seal will be placed above the sand pack.

Similar to the bedrock wells, each shallow well will be placed in 4x4x4 foot, solid bottom precast concrete chamber, equipped with a 30-inch diameter water-tight cover rated for H-20 loading. A hole will be cut in the chamber bottom to accommodate the well riser. Due to the varying water levels, the well screen lengths will need to be determined in the field with the intent of placing the top of the well screen above the groundwater surface whenever possible. However, the well screens must be below the bottom of the concrete chamber (i.e., at least 4 feet bgs).

Knockouts will be located approximately 18-inches from the top of the chamber to allow penetrations for the discharge piping and electrical service. The chambers will extend approximately 1-inch above the ground surface. Asphalt or concrete will be used to provide a smooth transition to the adjacent surfaces. A detail of a typical fill/clay pumping well is shown on Figure 3.

Fill/Clay Pumps – A mixture of water and oil will be extracted from the fill/clay wells. Due to precipitation and seasonal fluctuations, the depth to groundwater can range between 3 to 7 feet bgs. As such, pumping rates could range between 0.6 to 5 gpm. For this application, the Verderflex DURA 25 peristaltic pump equipped with a variable speed drive (VFD), as manufactured by Verder,

Inc. is recommended. The pump is capable of pumping between 0.8 to 9.8 gpm at 10 to 130 rpm, respectively from depths up to 31 feet using 1-inch diameter tubing. The maximum discharge pressure is 175 psi. The pump has flanged fittings on the suction and discharge ends allowing rigid pipe to be used instead of tubing. The unit operates on 230/460 VAC, three phase input power. Cut sheets and the pump curve for this unit are provided in Attachment 3.

The suction and discharge pipes will be 1-inch diameter Schedule 40 PVC piping. The suction pipes will be installed approximately 1-foot of the bottom of the wells. The mixture of oil and groundwater will be extracted from the wells and conveyed to the treatment system. A foot valve will be installed on the bottom of the suction pipe to facilitate re-priming the pump when necessary.

Optional Oil Recovery Pumps – Mobile Spill Buster recovery units (MRUs) could be used to expedite product recovery from the nine proposed fill/clay wells and from existing monitoring wells that are at least 2-inches in diameter. The MRUs will use the same Spill Buster assembly as those installed in the bedrock well chambers but will be mounted in a wheeled, covered container. Product collected from the fill/clay wells (or existing monitoring wells) will discharge to a 55-gallon drum set in an 85-gallon over-pack drum located near the well. The 55-gallon drums will be equipped with a high level float that will stop oil recovery when the drum becomes full. The MRUs can be rotated between the wells to collected oil. The sequence and frequency that the MRUs are deployed to wells would be determined based on the volume of oil detected in the wells. A catalog cut of the MRU is provided in Attachment 4.

Conveyance System – Groundwater and oil/groundwater mixture pumped from the bedrock and fill/clay zone wells will be conveyed to the existing onsite treatment system where it will be processed prior to discharge to the BSA. Schedule 40 PVC piping that conveys groundwater and the oil/groundwater mixture from the wells to the onsite treatment plant will be installed in multiple Schedule 80 PVC carrier pipes of sufficient size to allow secondary containment of more than one discharge line. The secondary piping will be installed 18-inches bgs in trenches and will be heat traced and insulated to mitigate freezing. Discharge from the eight bedrock wells and nine fill/clay wells will manifold into a common header prior to discharging to the onsite treatment system.

Oil recovered from the eight bedrock wells will flow through the 5/8-inch tubing to 275-gallon carboys. The tubing will also be installed in multiple Schedule 80 PVC pipes of sufficient size to provide secondary containment for more than one discharge tube. The oil secondary containment piping will be installed in the same trench that will accommodate the groundwater discharge piping and electrical service.

Onsite Treatment System – Groundwater will be treated onsite prior to discharge to the BSA. The existing treatment system consists of the following components:

- 500 gallon oil/water separator equipped with coalescing media
- Two primary bag filters in series
- Two 2,000 pound aqueous phase granular activated carbon adsorbers (GAC) in series
- Two secondary polishing bag filters in series

The existing system can accommodate a flowrate of approximately 10 gpm. We recommend that a 10,000-gallon equalization (EQ) tank be installed to provide sufficient volume to ensure the existing system will be able to process the groundwater to meet the BSA discharge criteria. Product that accumulates in the EQ tank will be decanted and placed in a 275-gallon carboy. Groundwater will be pumped from the EQ tank through the oil/water separator and from the oil/water separator through the bag filters, GAC adsorbers, and polishing bag filters and then discharged to the BSA system. Instrumentation in the form of high level floats will be installed in the EQ tank to terminate operation of the peristaltic pumps. Oil storage vessels will also be equipped with floats that will terminate operation of the Spill Buster units when high levels are reached. A flow meter/totalizer will be installed on the effluent to document the volume of treated groundwater discharged to the BSA. No additional instrumentation or telemetry will be provided for the treatment system.

Samples will be collected at the frequency required by the BSA to ensure the effluent does not exceed the limits of the discharge permit.

Well Development – Wells will be developed using the surge block and bail method. Approximately 100 gallons of development water/oil will be removed from each well and drummed. Product collected during well development will be decanted from the groundwater and placed in separate drums for offsite disposal. The remaining groundwater will be processed through the existing treatment system.

Disposal of IDW – All investigation-derived waste (IDW), including personal protective equipment, soil cuttings, oil recovered during development, etc., will be contained in DOT-approved 55 gallon drums with tight fitting lids. Provisions for the proper handling, testing, and disposal of IDW materials will be arranged prior to commencement of field activities. Filled containers will be removed from the Site on a daily basis.

If you are in agreement with this conceptual design, we will proceed in developing the 30% Design submittal. Please call me with any questions or comments at (716) 856-5636.

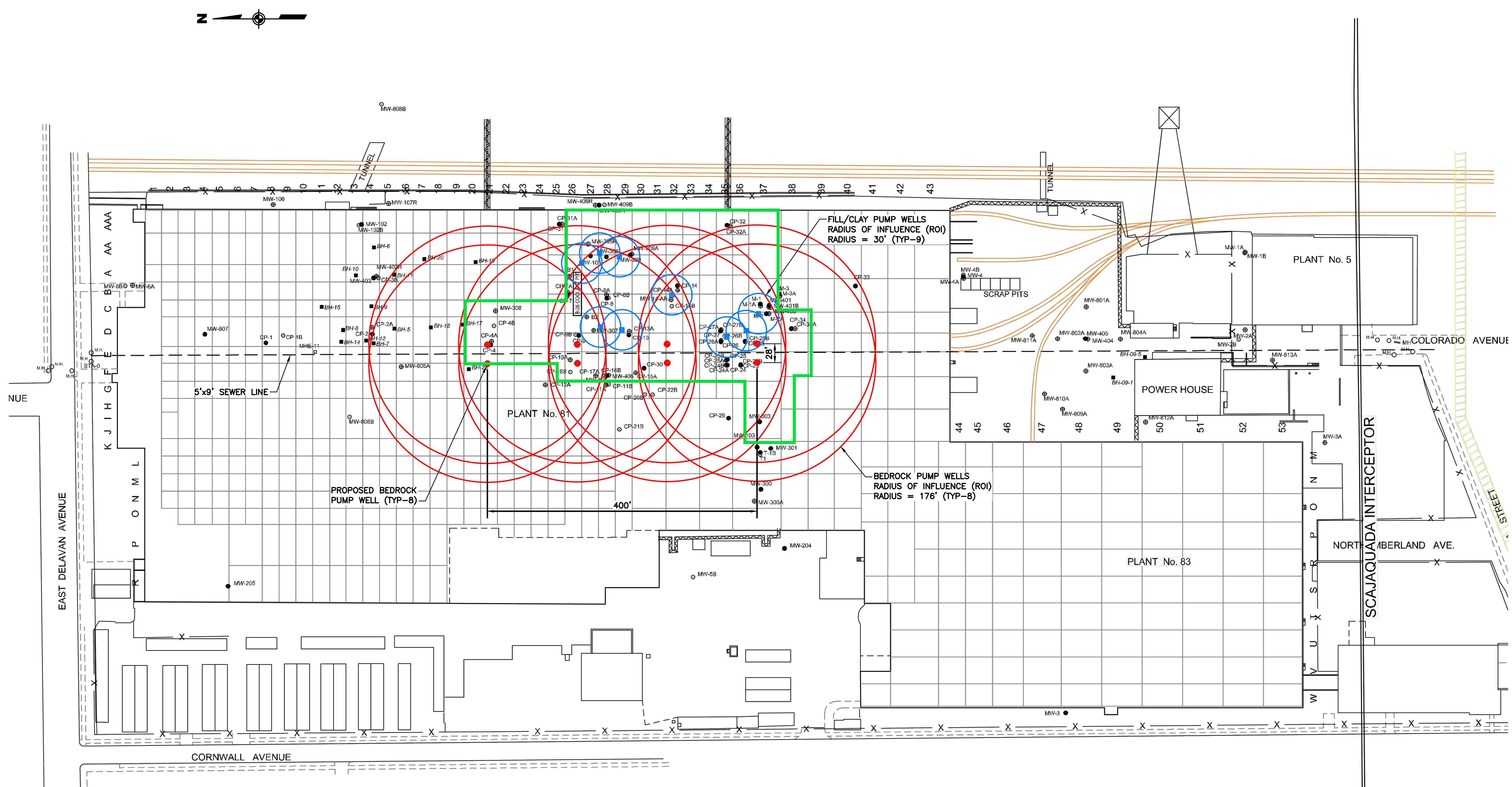
Sincerely,

URS Corporation

Jon Sundquist
Project Manager

cc: File: 60548412

FIGURES



LEGEND

MW-403	FILL MONITORING WELL		PROPOSED FILL/CLAY PUMP WELL (FCW-1 THROUGH FCW-9)
MW-300A	CLAY MONITORING WELL		BEDROCK PUMP WELLS ROI
CP-9B	BEDROCK MONITORING WELL		FILL/CLAY PUMP WELLS ROI
BH-5	SPRING 2008 SOIL BORING		APPROXIMATE LOCATION OF 250 COLORADO STREET PARCEL
BH-09-1	SPRING 2009 SOIL BORING		
	PROPOSED BEDROCK PUMP WELL (BW-1 THROUGH BW-8)		

80' 0 80'
SCALE IN FEET

WARNING
IT IS A VIOLATION OF SECTION 7209, SUBDIVISION 2, OF THE NEW YORK STATE EDUCATION LAW FOR ANY PERSON OTHER THAN WHOSE SEAL APPEARS ON THIS DRAWING, TO ALTER IN ANY WAY AN ITEM ON THIS DRAWING. IF AN ITEM IS ALTERED, THE ALTERING ENGINEER SHALL AFFIX TO TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

NO.	MADE BY	APPROVED BY	DATE	DESCRIPTION

REVISIONS

DESIGNED BY: JL
DRAWN BY: JJS
CHECKED BY: JL
PROJ. ENGR. ___

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(716)856-5636 - (716)856-2545 fax

JOB NO. 60545412

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

AMERICAN AXLE PLANT SITE REMEDIAL INVESTIGATION NYSDEC SITE NO. 915196

CONCEPTUAL SYSTEM LAYOUT

Scale: AS SHOWN | Date: NOV. 2017 | **FIGURE 1**

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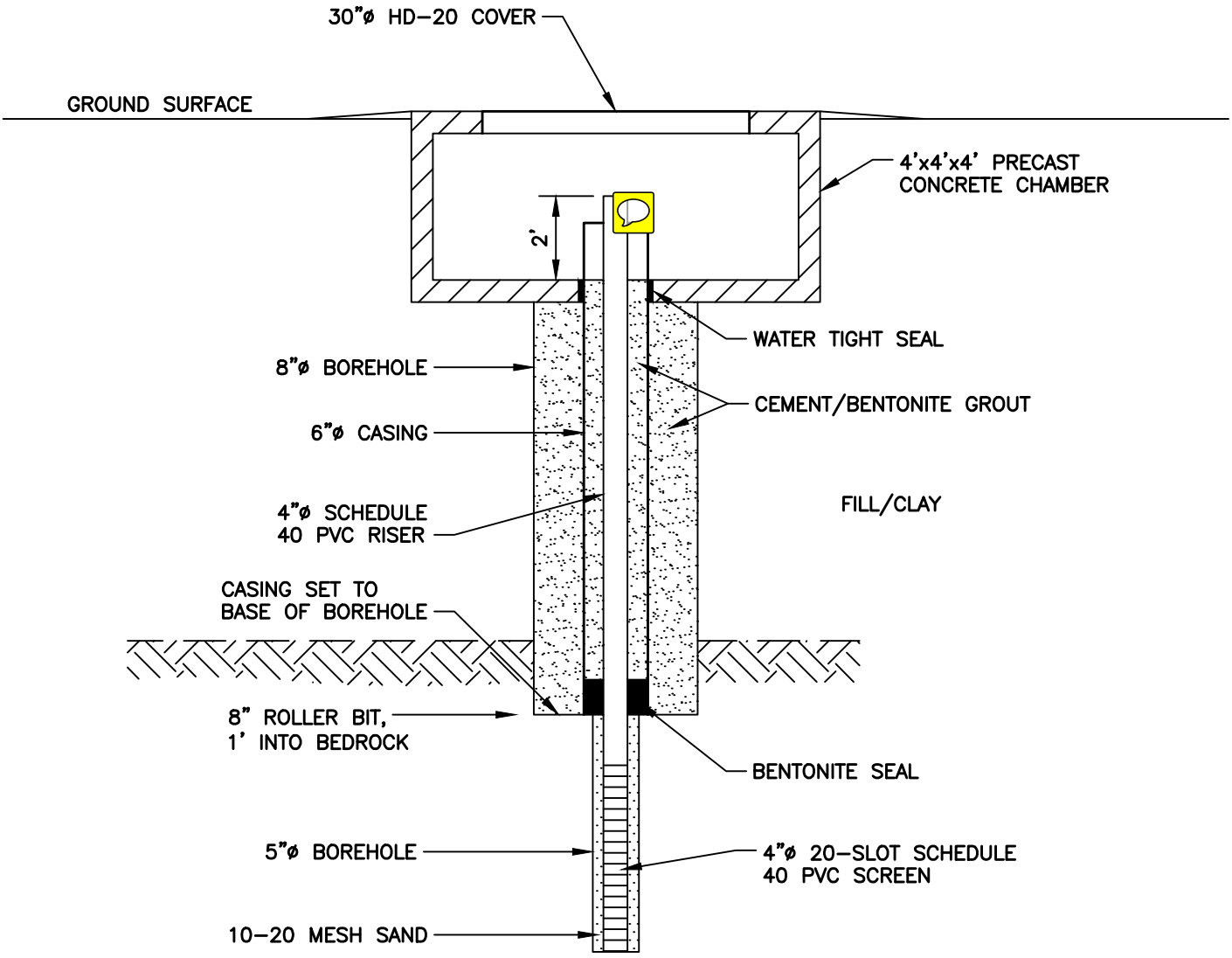


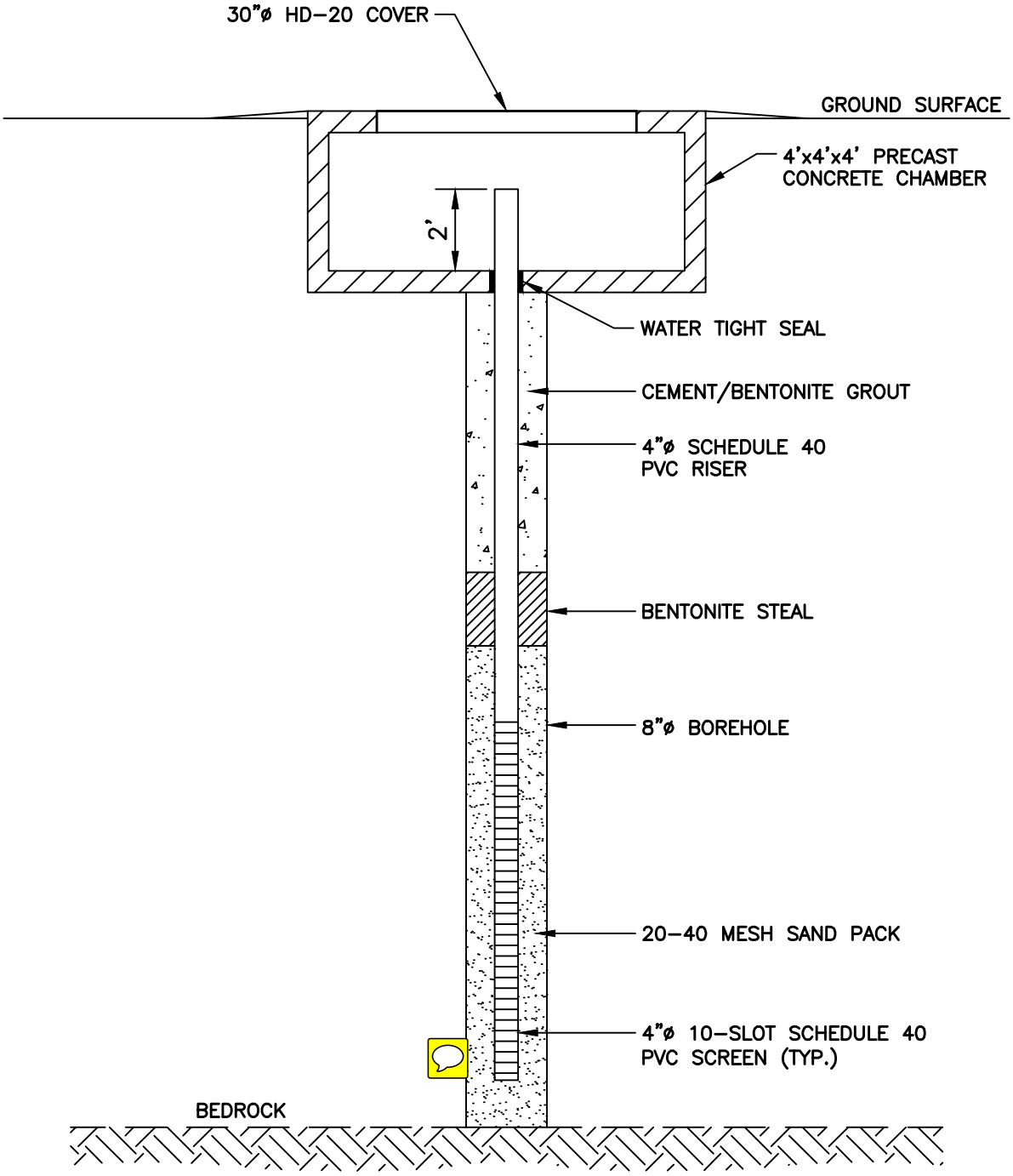
BEDROCK PUMPING WELL DETAIL

J:\Projects\60545412_AmAx_RDCM\900-CAD-GIS\910-CAD\FIGURE 2.dwg 1:1 12/1/17 - 1 JJS

URS

AMERICAN AXLE PLANT SITE
INTERIM REMEDIAL MEASURE
NYSDEC SITE NO. 915196

FIGURE 2



FILL/CLAY PUMPING WELL DETAIL

URS	AMERICAN AXLE PLANT SITE INTERIM REMEDIAL MEASURE NYSDEC SITE NO. 915196	FIGURE 3

J:\Projects\60545412_AmAx_RDCM\900-CAD-GIS\910-CAD\FIGURE 3.dwg 1:1 12/1/17 - 1 JJS

ATTACHMENT 1

VERDERFLEX
DURA 10 PUMP

Verderflex
Dura 10

VERDERFLEX®

Description

The Verderflex Dura 10 is a compact, high pressure hose pump with superior secondary containment. Designed for dosing, metering, sampling, high lift or medium head applications in brewing, chemical processing, industrial plants, water treatment and waste water processing

Features and benefits

- Ideal for abrasive or high solid content slurries
- Self Priming, problem free pumping of gaseous liquids
- Easiliy pumps viscous liquids
- Gentle low shear pumping action
- Dry running capabilities
- Long life hoses
- No seals or valves

Technical data

Maximum Flow Rate	0.98 GPM
Maximum Discharge Pressure	175 PSI
Maximum Suction Lift	31 ftwc
Hose ID	10 mm

Maximum Medium Temperature	176°F *
Maximum Incompressible Solid Size	1/32 in
Maximum Compressible Solid Size	3/32 in

* Continuous use with NR hose

Materials

Description	Material	Paint Detail
Pump Housing	Cast Iron (ASTM A48)	Green Powder Coated
Front Cover	Carbon Steel with Plexiglass Inspection Window	Powder Coated
Rotor	Cast Iron (ASTM A48)	
Drive Shaft	EN24T Steel	
Port Flange	316 Stainless Steel Universal slotted design fits with DIN PN16, ANSI 150# & JIS10K Options: 316 Stainless Steel with Hose Tail Connection 304 Stainless Steel with Polypropylene or P.V.D.F Insert	
Mounting Frame	Carbon Steel	Powder Coated
Gearbox Flange	Aluminium	
Bearing	Bearing Steel	
Shaft Seal	Viton Option: PTFE	
Lubricant	Verderlube - Glycerine based lubricant Verdersil - Silicone based lubricant	
Hose	Natural Rubber (NR) Options: Nitrile Buna Rubber (NBR) Ethylene Propylene Diene Monomer (EPDM), Hypalon® (CSM) and Verderprene	
Weight	Complete pump excluding drive: 48 lb	

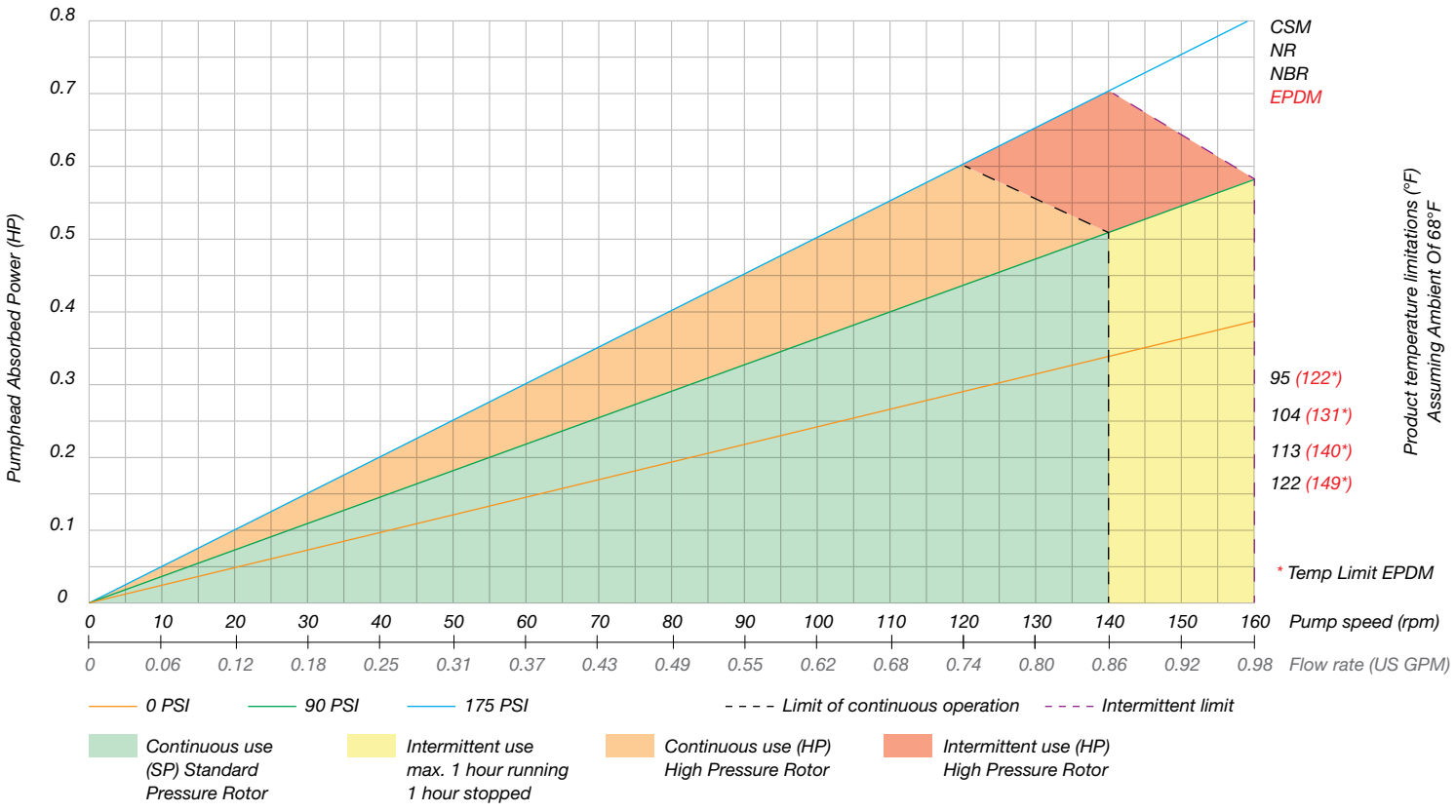
Verderflex
Dura 10

VERDERFLEX®

Standard Pump Options for 60Hz Motor Fitted With Worm Gearbox, Suitable for Inverter Duty

Flow GPM	Pump Speed RPM	Maximum Pressure PSI
0.21	35	174
0.27	44	174
0.36	58	174
0.43	70	174
0.54	88	174

Performance curve



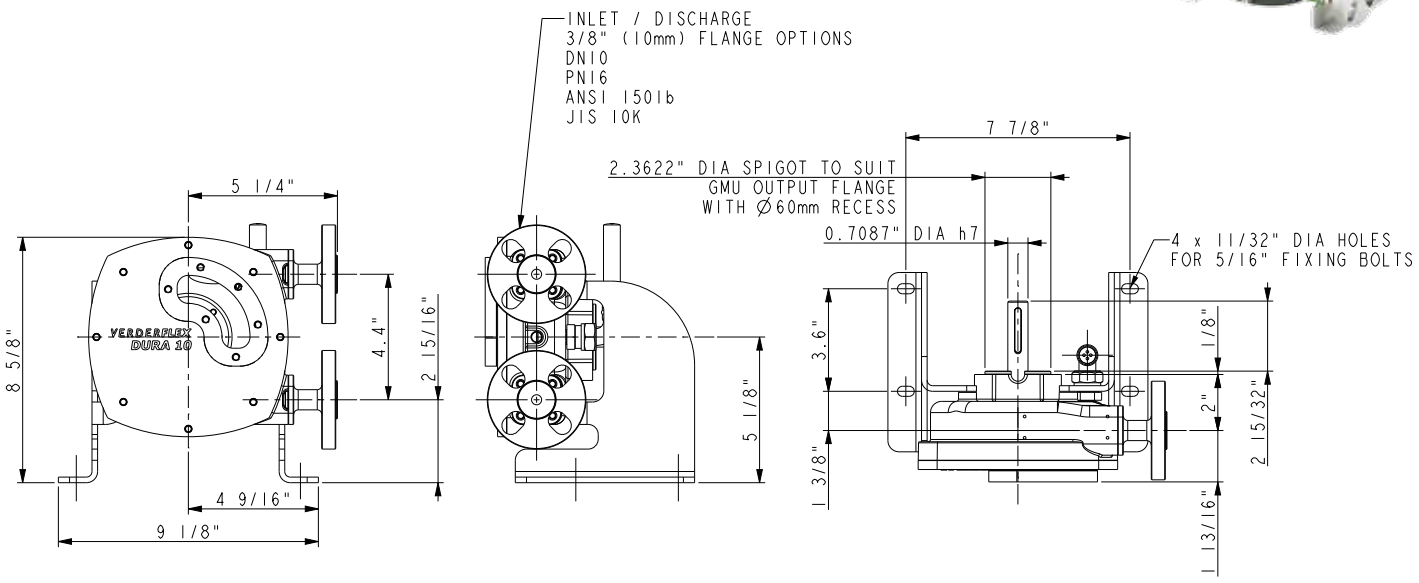
Any application below 15 Hz may require special review. Flows are typical and were measured with water at 70°F with no suction lift or discharge pressure. Actual flows will vary according to suction conditions, discharge pressure and normal component production tolerances.

DURA PUMPS OPERATING ABOVE 90 PSI REQUIRE CONSULTATION WITH MANUFACTURER OR DISTRIBUTOR.

Verderflex
Dura 10

VERDERFLEX®

Dimensions



All dimensions are in inches.

All dimensions and weights are for guidance only.

Find your local supplier at www.verderflex.com

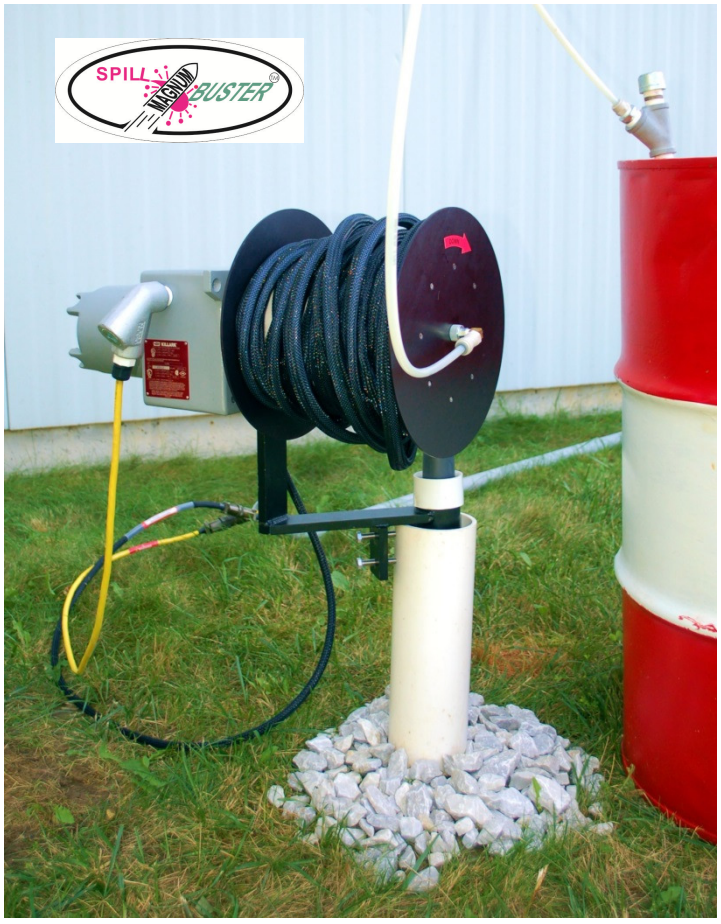
For construction, installation and floor mounting drawings please contact your local authorised Verderflex® distributor.

VERDER
passion for pumps

ATTACHMENT 2

MAGNUM SPILL BUSTER

Magnum Spill Buster
Product Recovery System



Operator's Manual
PN 3013

Rev- Initial Release

About Magnum Spill Buster

Pumps Oil Not Water!

Magnum Spill Buster

The Magnum Spill Buster™ is an automated free phase petroleum contamination pumping system. It is specifically designed to remove NAPL petroleum product from the water table via a 2″ or larger diameter well. Its unique auto-seeking device allows the pump intake to automatically follow the elevation of the oil/water interface as it fluctuates throughout the entire length of the well. The Magnum Spill Buster will not pump any amount of water.

Magnum Spill Buster, Automated free phase petroleum contamination pumping system (shown with Explosion Proof Auto Seeker).

The system can be wired to 115 VAC or 230 VAC power or is capable of true 24 VDC deep cycle battery/solar panel operation for remote site locations.

Optional water depression can be added to the system through a Clean Earth Technology Water Depression Module and a Grundfos Redi-Flo 3 water pump. The Magnum is also very compatible with vacuum extraction systems when a dual phase recovery system is desired.

The Magnum Spill Buster™ system is composed of three interactive modules:

Control Box

The Magnum Spill Buster™ **Control Box** coordinates and displays the condition of the system operation. The control box also allows certain system parameters to be varied according to site requirements.


Magnum Spill Buster Control Box

The NEMA 4 weatherproof enclosure with its connector "pouch" (shown at right with its protective cover) provides easy access to the cables, adjustable controls, and AC wiring.

The input power to the Control Box is 110-120 VAC. Therefore, the box must be located outside of any hazardous areas. If your site conditions require the box to be placed farther than 25' from the well head, we can build custom sized cable lengths to accommodate the extra length required. If the panel must be located in a hazardous location, CET can provide an explosion-proof enclosure (Class 1, Div 1, Groups B,C, & D).


Explosion Proof Enclosure for the Control Box

Cable terminations within the connector pouch utilize our unique, size-coded SLIMLINE connectors that pull through underground conduits easily and are color-coded for intuitive placement. They are extremely rugged and very easy to clean.

Auto Seeker

The **Auto Seeker** is a small, motorized, reel assembly that automatically raises and lowers the probe to follow the NAPL interface through the entire depth of the well. This makes the system operation highly efficient even with large changes in the level of the ground water.


Standard Auto Seeker Installation

This self-winding feature also means that routine maintenance of the product pump is a matter of pushing a button to reel the probe to the top of the wellhead- eliminating the need to haul an oil-covered cable up by hand to spread out all over the ground.

The Standard Auto Seeker is not rated explosion proof and should be mounted outside of all classified hazardous zones. Refer to applicable codes for your site to determine how the Auto Seeker should be installed. On many sites it is possible to remove the Standard Auto Seeker from the classified hazardous area by raising it above the well head. For example, the use of a wood or metal scaffold such as the one pictured to the right may accomplish this.


New Explosion Proof Magnum Spill Buster Auto Seeker

If the Auto Seeker must be located in a hazardous location, CET can provide an explosion-proof enclosure, utilizing Mil-Spec sealed connectors. This version is certified for use in Class1, Div1, Groups B, C and D locations and may be mounted directly on the well head as shown to the right.

Probe

The Magnum Spill Buster Probe is certified NEC 2011, Section 500 compliant for use in the Class 1, Div 1 area within recovery wells. The 1.93" diameter **Probe** contains the patented ALPHA ARRAY™ interface sensors, as well as a small but powerful 12vdc electric product pump. These sensors are non-contact, fluid-interface sensors that are a spin-off of spacecraft fuel gauging developed for NASA. The use of this interface sensor in the environmental industry is unique. Since it is a non-contact sensor, it is highly immune to


Exploded View of Probe and Pump

fouling, which is a problem with virtually all other types of sensing methods (including conductive, float, optical and even radio frequency methods).

The pump used in the Magnum is a modified off the shelf, diesel fuel pump. This pump is a rugged and chemically resistant roller vane unit capable of pumping up to 46 gallons (174 liters) per hour of low viscosity liquids (up to 12 Cp(see System Specifications below).

Also included with every standard system:

- A Recovery Tank Overflow Sensor with 30′ of cable
- 30′ Set of Auto Seeker and Probe cable extensions
- 50′ of nylon discharge tubing with bung

Features and Benefits

- All-modular system installs in 20 minutes
- Pumps only product; the water stays behind- no costly, messy, surface separation
- Keeps on pumping through temperatures -40 to 60°C
- 24/7 automatic operation yields steady, impressive, results
- Quiet & low profile- doesn't draw attention in public places
- Speedy, no-fuss maintenance
- Uses less power to operate than a 60 watt bulb
- Technical support from the designer and manufacturer is only a phone call away

View Specifications

For More Information about the Magnum Spill Buster

What sets the Magnum Spill Buster apart from other technologies?

What site conditions is the Magnum Spill Buster ideally suited to treat?

What optional accessories expand the versatility of the Magnum Spill Buster?

Operator's Manual

p) 802.425.3710 | f) 802.425.2896 | info@cleanearth.biz

ATTACHMENT 3

VERDERFLEX
DURA 25 PUMP

Verderflex
Dura 25

VERDERFLEX®

Description

The Verderflex Dura 25 is a compact, high pressure hose pump with superior secondary containment. Designed for dosing, metering, sampling, high lift or medium head applications in brewing, chemical processing, industrial plants, water treatment and waste water processing

Features and benefits

- Ideal for abrasive or high solid content slurries
- Self Priming, problem free pumping of gaseous liquids
- Easiliy pumps viscous liquids
- Gentle low shear pumping action
- Dry running capabilities
- Long life hoses
- No seals or valves

Technical data

Maximum Flow Rate	10.5 GPM
Maximum Discharge Pressure	175 PSI
Maximum Suction Lift	31 ftwc
Hose ID	25 mm

Maximum Medium Temperature	176°F *
Maximum Incompressible Solid Size	3/32 in
Maximum Compressible Solid Size	1/4 in

* Continuous use with NR hose

Materials

Description	Material	Paint Detail
Pump Housing	Cast Iron (ASTM A48)	Green Powder Coated
Front Cover	Carbon Steel with Plexiglass Inspection Window	Powder Coated
Rotor	Cast Iron (ASTM A48)	
Drive Shaft	EN24T Steel	
Port Flange	316 Stainless Steel Universal slotted design fits with DIN PN16, ANSI 150# & JIS10K Options: 304 Stainless Steel with Polypropylene or P.V.D.F Insert	
Mounting Frame	Carbon Steel	Powder Coated
Gearbox Flange	Aluminium	
Bearing	Bearing Steel	
Shaft Seal	Viton Option: PTFE	
Lubricant	Verderlube - Glycerine based lubricant Verdersil - Silicone based lubricant	
Hose	Natural Rubber (NR) Options: Nitrile Buna Rubber (NBR) Ethylene Propylene Diene Monomer (EPDM), Hypalon® (CSM) and Verderprene	
Weight	Complete pump excluding drive: 115 lb	

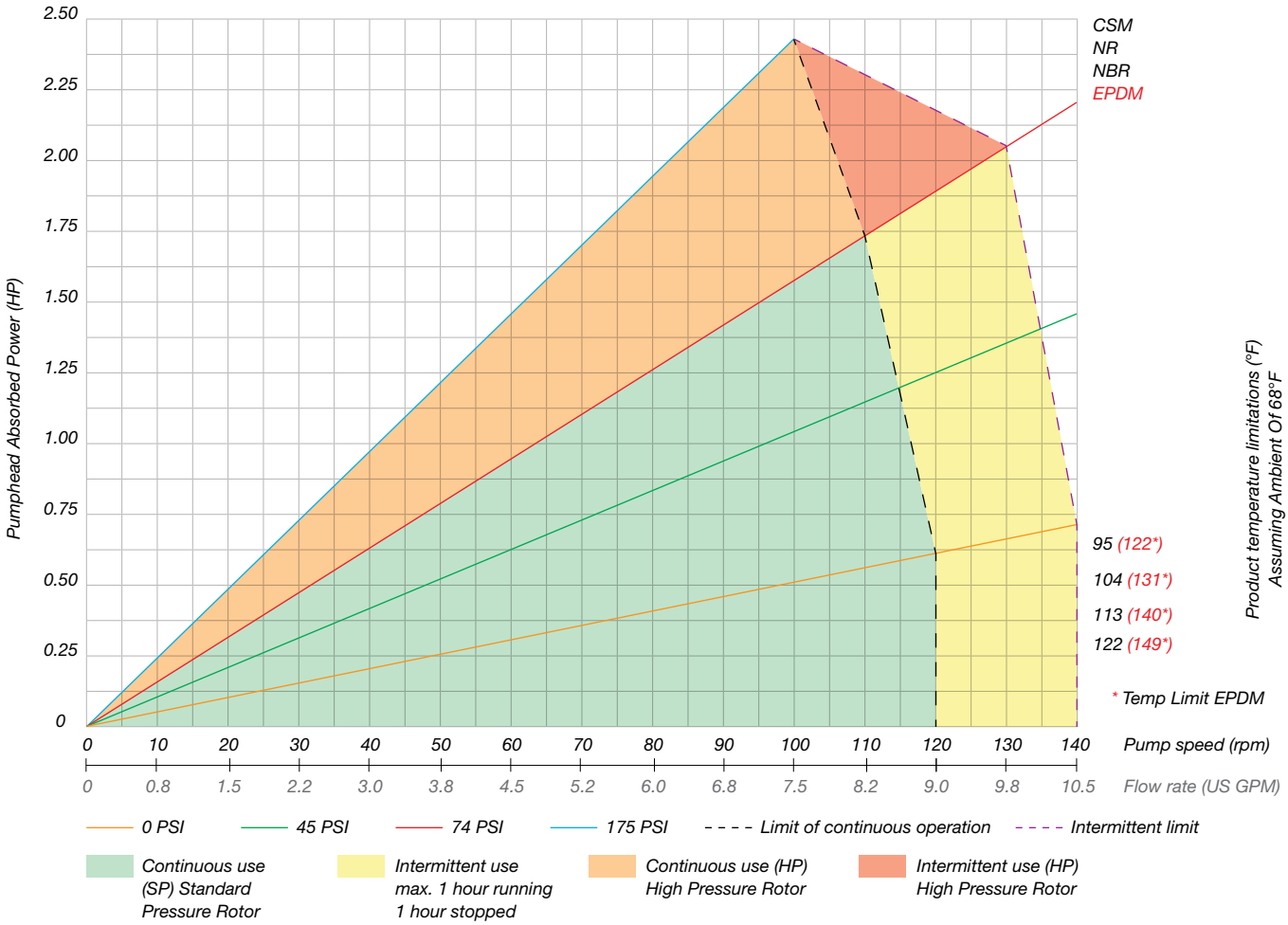
Verderflex
Dura 25

VERDERFLEX®

Standard Pump Options for 60Hz Motor Fitted With Worm Gearbox, Suitable for Inverter Duty

Flow GPM	Pump Speed RPM	Maximum Pressure PSI
2.63	35	174
3.30	44	174
4.36	58	174
5.26	70	174
6.61	88	174

Performance curve



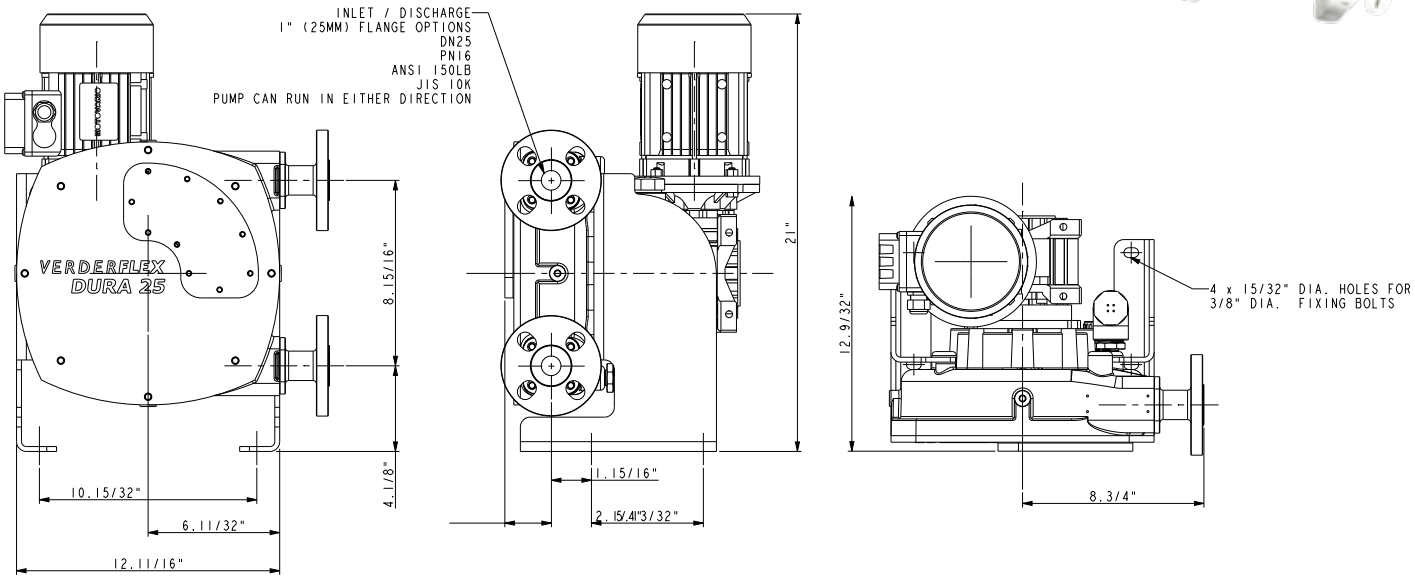
Any application below 15 Hz may require special review. Flows are typical and were measured with water at 70°F with no suction lift or discharge pressure. Actual flows will vary according to suction conditions, discharge pressure and normal component production tolerances.

DURA PUMPS OPERATING ABOVE 90 PSI REQUIRE CONSULTATION WITH MANUFACTURER OR DISTRIBUTOR.

Verderflex
Dura 25

VERDERFLEX®

Dimensions



All dimensions are in inches.

All dimensions and weights are for guidance only.

Find your local supplier at www.verderflex.com

For construction, installation and floor mounting drawings please contact your local authorised Verderflex® distributor.

VERDER
passion for pumps

ATTACHMENT 4

MAGNUM SPILL BUSTER
MOBILE RECOVERY UNIT

4.0 Other Options

Immediate Response Box

The Immediate Response Box (I.R. Box) is a rugged plastic box that contains a Standard Magnum Spill Buster system. The I.R. Box provides an extremely portable system to start removal of product in a 2" or larger well with minimal equipment set-up. A large forged shackle is attached on the left end of the box for security. Since the I.R. Box contains a standard control box, it can be used with any other Spill Buster options.

WARNING
Control Box and Standard Auto Seeker must be located outside of any classified hazardous areas. Refer to applicable codes

The I.R. box can easily be carried in a small pick-up truck or van. The basic setup involves mounting the Auto Seeker outside of any classified hazardous atmospheres (on many sites it is possible to move the Auto Seeker from the classified hazardous zone by raising it above the well head); then connecting the product tank discharge tube and overflow sensor to the product tank, and connecting the Auto Seeker cable and the probe signal cable.

The system is powered by 115VAC from an extension cord (see pg. 63 for extension sizing). In addition, cables can be provided to operate the system from a 24 volt deep cycle battery. See page 51 for battery operation of system.

Battery Operation

For sites with no utility connection available, batteries can be used. It is necessary to ground EVERY battery operated system. [See page 18]. The batteries should be deep cycle type. [NOTE use two 12 volt batteries in series for 24 volt power]. Use 12 AWG wire. One end of the cables will connect to the Control Box inside the I/O extension on the terminal block labeled “Batt”. Connect the other end to the battery, making sure that the polarity is correct. NOTE: hooking up a battery will bypass the power system switch. When the Magnum Spill Buster is hooked up to the battery, the system will activate, as if the power switch were turned on. No dip switch settings or board changes are necessary with battery operation. Battery life will be a function of the battery size, well depth, product viscosity and many other factors.

NOTE:
When operating the Magnum Spill Buster on battery power, remember to ground the system properly. Refer to page 18 for proper grounding procedures.