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ENV 21
Technology That Separates

TEST REPORT OF THE ENVIRONMENT 21 UNISTORM

Test Report #ENV21 – TR – 071031

ENVIRONMENT 21 AUTHORIZATIONS

Jeffrey Benty Manager, Sales and Marketing Stormwater Specialist	Paul Rowe, P.E. Director, Engineering

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As submitted to the Ohio State Department of Transportation

INDEPENDENT EVALUATION OF THE UNISTORM

- An independent evaluation of the Unistorm model testing was made as follows:
  - The test procedure and model set-up were reviewed and approved prior to the start of the testing.
  - Inspection during the testing was conducted on a periodic basis.
  - The data obtained from the testing was reviewed and approved.
  - The report for submission was reviewed and approved.

REVIEWED AND APPROVED BY
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REPORT SUMMARY

This report outlines how the Environment 21 Unistorm achieves water quality objectives for Stormwater Treatment Systems.

The Unistorm model achieved average water quality efficiencies of 81.6% for TSS removal of OK – 110 sediment. It retained 100% of the floatables and hydrocarbons. In addition, the Unistorm successfully passed the scour test by retaining >99% of the captured sediment during peak flow conditions.

The testing parameters, results, and summary for the Unistorm are in the following report.

It is our recommendation that the Environment 21 Unistorm be used as an approved Proprietary Best Management Practice (BMP) for Stormwater treatment.

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1.0 INTRODUCTION

1.1 Purpose

Environment 21 is an established company that has been in business for over ten years. Environment 21 is based out of East Pembroke, NY (Buffalo Metro Area) and markets products worldwide. Environment 21 has successfully obtained governmental product approvals and, as the company grows, is continuing to obtain approvals throughout the world. It is with this intent that Environment 21 is seeking approval of the Unistorm for use as a stormwater treatment.

1.2 Scope

This test report is meant to detail the testing and verify the performance of the Environment 21 Unistorm.

1.3 Objective

The testing described in this report is intended to demonstrate the Environment 21 Unistorm's effectiveness in removing pollutants from stormwater runoff under intended applications. It was performed according to an Environment 21 approved protocol, see Attachment A "Unistorm Test", and objectively measured the Environment 21 Unistorm's treatment technology in relation to the claims made by Environment 21. Simulated stormwater runoff flows with known, quantified constituents were passed through the model. The simulated pollutants were measured using a mass balance approach for the Total Suspended Solids (TSS) and floatable debris capture. A deductive approach, using measurable observations, was applied for the scouring/re-suspension and hydrocarbon capture tests. The data obtained from the testing was duly recorded, analyzed, and compiled into a spreadsheet; see Attachment B "Unistorm Test Data Spreadsheet". The science and performance of the Unistorm in a vault or round shape is identical. This is shown, and proved, with Stokes Law and clarifier technology equations. Therefore a model of a Unistorm vault configuration was used in this testing.

1.4 Verification Process

1.4.1 Planning – Environment 21 established the methodology (procedures, data gathering and analysis, etc.), personnel roles and responsibilities, site description, materials and equipment, and schedule of the testing during the planning stage.

1.4.2 Testing – The test conditions were established and the test procedure written at the onset of this phase. The tests were then performed and the data was gathered.

1.4.3 Data Analysis and Reporting – During this final stage, all of the test data was analyzed and this report generated for approval.

2.0 TESTING REQUIREMENTS AND SUPPORTING EVIDENCE

2.1 The testing protocol was established based on meeting the USEPA requirements after site construction has been completed and the site is permanently stabilized. This includes reducing the average annual total suspended solid (TSS) loadings by 80 percent. For the purposes of this measure, an 80 percent TSS reduction is to be determined on an average annual basis so as to reduce the post-development loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings and, to the extent practicable, maintain post-development peak runoff rate and average volume at levels that are similar to predevelopment levels.

2.2 The following are the design claims for the Unistorm Structure. The documentation, or location in this test report of the documentation, which provides evidence to support these claims, as needed, is included in **bold** with each respective claim.

2.2.1 The Unistorm is a pre-cast concrete structure and requires no other materials as major components.

See Attachment D, "Unistorm Information Sheets", of this report.

2.2.2 The Unistorm is capable of being placed in an off-line configuration.

EVIDENCE: See Attachment C, "UNISTORM INSTALLATION SCHEMATIC", for the design detail that illustrates Unistorm off-line configuration.

2.2.3 The Unistorm provides 80% capture of the total suspended solids at the water quality flow discharges shown in Table 1. Larger sizes are available to accommodate larger flow rates. These units are sized for a Surface Overflow Rate (SOR) of $\leq$ 28 GPM/ft^2.

EVIDENCE: See section 5.2.1 and "INDEPENDENT EVALUATION OF THE UNISTORM EFFICIENCY sheet at the beginning of this report.

2.2.4 The Unistorm captures all free floatable oil.

EVIDENCE: See section 5.2.3 of this report.

2.2.5 No scour and no re-suspension of material previously collected will occur in the Unistorm.

EVIDENCE: See section 5.2.4 of this report.

2.2.6 The Unistorm has a sediment storage capacity (shown in Table 1).

EVIDENCE: See Attachment D, "Unistorm Information Sheets", of this report.

2.2.7 The Unistorm has a water-lock feature to prevent the introduction of trapped oil and floatable contaminants to the downstream piping during routine maintenance.

EVIDENCE: See Attachment D, "Unistorm Information Sheets", of this report.

2.2.8 The Unistorm has direct access to the sediment and floatable contaminant storage chambers. It provides a maximum distance of 36 inches (915 mm) from the interior wall to the outside edge of the access hole. Additional access holes are furnished at a maximum spacing of 66 inches (1675 mm) measured from the center of access hole to the center of access hole.

EVIDENCE: See Attachment D, “Unistorm Information Sheets”, of this report.

2.2.9 A confined space entry is not a requirement for routine maintenance of the Unistorm.

EVIDENCE: See Attachments D, “Unistorm Information Sheets”, and E, Unistorm Maintenance”, of this report.

2.2.10 No special tools or attachments are required to provide routine maintenance, with a vacuum pumping truck, of the Unistorm.

EVIDENCE: See Attachment E, Unistorm Maintenance”, of this report.

2.2.11 The Unistorm has a minimum access of 24 inches (610 mm) in diameter.

EVIDENCE: See Attachment D, “Unistorm Information Sheets”, of this report.

2.2.12 The Unistorm is capable of supporting a traffic load of H-25 and a dead load as required in the plans.

EVIDENCE: The Unistorm is a pre-cast concrete structure which can be built to support a traffic load of H-25 and a dead load as required in the plans.

2.2.13 The Unistorm is completely housed within one structure excluding a structure containing diversion weir (for offline configuration) and necessary structures to ensure connectivity to the sewer trunk, if applicable.

EVIDENCE: See Attachment D, "Unistorm Information Sheets", of this report.

3.0 LAB TEST EQUIPMENT AND MATERIALS

3.1 Equipment

3.1.1 Test Model

The Unistorm Test Model measured 1' x 2' (0.3 m x 0.6 m) and was constructed of clear acrylic to provide durability, yet to allow visual observations of the testing.

3.1.2 Weigh Scale

A new Metler-Toledo® Balance Toploader (Model XS4002S) was purchased for product testing. The first time this scale was used was for this testing. This particular model was ordered because it provides the precision desired for lab-scale testing, it is made for harsher environments, and the scale was ordered with constant self calibration – Fully Automatic Calibration Technology® (FACT) – to guarantee accuracy. See Attachment F, "Metler-Toledo Production Certificate", of this report.

3.1.3 Flow Monitor

The flow monitor used was a Blue – White® Meter Model # F – 1000 Digi – Flo Paddlewheel. The unit was supplied with molded fittings for 2" NPT applications. It reads out in GPM with a range of 0.4 to 300 GPM. See Attachment G "Blue – White DigiFlo Digital Paddlewheel Meters" technical data sheet.

3.1.4 Water Supply Pump

The water supply pump used was a Goulds® Heavy Duty Sewage Pump, Model 3886. This is a fully submergible pump with a 2” NPT discharge. It has capacity up to 160 GPM and total head up to 26 feet TDH. See Attachment H “Goulds Pumps WS_B Series Model 3886” technical data sheet.

3.1.5 Gravity Feeder

The gravity feeder (used for all feeds) is a polyethylene funnel with a self-cleaning polyethylene stopcock valve, Star Brite Model 37210. This feeder was selected because, due to the valve design, it consistently supplies accurate dispensing without moveable parts (i.e., gears, motors, etc.).

3.1.6 Pipe

The piping used for the lab scale configuration was standard 2” schedule 40 PVC pipe purchased locally from a building supply vendor. The pipes were cleaned with PVC cleaner and glued with PVC glue.

3.1.7 Graduated Cylinder

A 2000 ml polymethylpentene graduated cylinder was used as a measuring device for this testing. The graduations are into 20 ml subdivisions. This cylinder meets ISO 6706 criteria.

3.1.8 Weighing Dishes

In order to weigh and transfer material polystyrene weighing vessels were used. They have a capacity of 280 ml and are antistatic.

3.1.9 Water Flow Control

The water flow through the scale model was controlled with a Hammond® 1" Class 125 Bronze Globe Valve. See Attachment I, "Hammond Globe Valve IB418".

3.1.10 Filter

The filter used for the scouring/re-suspension and hydrocarbon capture tests was a 10 micron filter bag, Rosedale® Model #PE-10-P-9-S. See Attachment J "Rosedale High Capacity Filter Bags".

3.1.11 Sieves

Advantech sieves were used in this test for sediment gradation. The sieve sizes used were: 53 µ (ASTM E – 11 – 95 #270), 75 µ (ASTM E – 11 – 95 #200), 90 µ (ASTM E – 11 – 95 #170),106 µ (ASTM E – 11 – 95 #140),125 µ (ASTM E – 11 – 95 #120),150 µ (ASTM E – 11 – 95 #100), and 212 µ (ASTM E – 11 – 95 #70). See Attachment K for each sieve's individual "Advantech Certificates of Compliance".

3.1.12 Sediment Drying Chamber

A Sharp® Carousel® microwave oven, model #R – 9H84B, was used for drying the wet sediment.

3.1.13 Ancillary Equipment

The remaining equipment used, which was not critical to the test, is as follows:

3.1.13.1 Submersible recirculating pump.

3.1.13.2 Two (2) 350 gallon totes for water supply and catch reservoirs.

3.1.13.3 Plastic five gallon pail

3.2.13.4 Standard hand tools

3.1.13.5 3/8" Tygon® tubing

3.2 Materials

3.2.1 OK – 110

The OK – 110 silica used in this test was purchased from U.S. Silica. See Attachment L, "U.S. Silica Product Data".

3.2.2 Floatable beads

3.2.2.1 Large Beads

The large beads used in the floatable test were wooden Roble beads measuring approximately 0.06 in^3 (1.0 cm^3) each and weighing approximately 0.025 oz (0.71 g each).

3.2.2.2 Small Beads

The small beads used in the floatable test were wooden Roble beads measuring approximately 0.003 in^3 (0.5 cm^3) each and weighing approximately 0.003 oz (0.09 g each).

3.2.3 Hydrocarbon

The hydrocarbon used for this test was 10w – 30 oil that had been drained from an automobile engine. This oil had been used in the engine for approximately 3,000 miles. Used automobile oil was chosen as it is the prevalent hydrocarbon found in urban storm water run-off.

3.2.4 Filters

The filters used to filter the sediment siphoned from the lab scale model were modified Shop-Vac® high efficiency filter bags, model 906-71. These have a 98% efficiency at filtering particles 0.3 – 0.5 microns and larger.

4.0 TEST SET – UP AND METHODOLOGY

4.1 Test Set – up

4.1.1 The Unistorm Test Model size and configuration was chosen for ease of adaptation to standard fittings and existing lab equipment, and its similarity to the full size Unistorm. An effort was made to prevent confusion caused by using both the U.S. Customary Units System and the Metric Units System for measurements. Both are used in this report (where practicable they are shown together) as applicable,

4.1.2 2” PVC pipe and fittings, Fernco® couplings (for ease of dismantle), and 2” PVC threaded slip unions were used to make all connections between the Water Supply Pump, the Flow Monitor, the Feed Port , and the Unistorm, see Attachment M, “Lab Model Pictures”.

4.1.3 The Water Supply Pump was placed into one of the 350 gallon totes.

4.1.4 The Flow Monitor was installed 10 – pipe diameters minimum downstream of any disruptive fittings and 5 – pipe diameters minimum upstream of any disruptive fittings to prevent turbulent false readings.

4.1.5 The Feed Port was fabricated by using a 2" sanitary tee and a 2" x 15" long PVC pipe. This design ensured proper mixing and dispensing.

4.1.6 The submersible recirculating pump was placed in the other tote. One end of a 1 ½ flexible hose was installed on this pump to re-circulate water back to supply tote. The other end of this flexible hose was placed into a 10 µ filter bag in order to keep the recirculation water free of contaminants.

4.2 Test Methodology

4.2.1 The path of a particle in water is determined primarily by two actions: the velocity of the water and the particle settling velocity. In order to portray this on a scale level geometric, dynamic, and kinematice similarities needed to be established between the Unistorm Test Model and the Unistorm Models. The geometric similarity was already established and by applying Froude Similitude the following were calculated:

- 1 cfs = 8.08 GPM (30.59 LPM) in the Test Model
- 2 cfs = 10.10 GPM (38.23 LPM) in the Test Model
- 3 cfs = 11.22 GPM (42.47 LPM) in the Test Model
- 6cfs = 8.53 GPM (32.29 LPM) in the Test Model

Prior to the Uniscreen Test, test flows were run from 2 GPM to 30 GPM in order to establish the Maximum Treatment Rate for the Unistorm Test Model. The MTR that obtained a TSS removal efficiency of around 80% for OK-110 was 18 GPM. The 18 GPM was higher than the calculated (Froude Similitude) rate. But it was chosen nonetheless as a conservative measure.

4.2.2 TSS Capture Calculations and Tests

The TSS test calculations were made as follows: Sediment feed rate tests, completed prior to the Unistorm Test, showed that there was < 4% difference noted in the removal efficiency between rates varying from 300 mg/L to 5,000 mg/L. Since more material is captured using a higher sediment feed rate there will be more accuracy in analyzing the gradation captured. So the TSS feed rate was established at a maximum concentration of 450 mg/L of OK – 110 as the test rate. This is close to the upper end of the averaged sediment concentration found in the environment.

The scale flow rate and duration were already established at 18 GPM (68 LPM) for five minutes (see 4.2.1), so the TSS amount, per test run, was calculated as: 450 mg/L x 68 LPM x 5 minutes x 1 g/1000 mg = 153.00 g. Five tests were run with these flows. After each test run the sediment was siphoned, dried, and weighed.

The mass balance testing method was used on this test as it is currently an endorsed testing method by the University of Minnesota – St. Anthony Falls Laboratory and the Wisconsin Standards Oversight Counsel (SOC). Mass balance testing is currently being reviewed for acceptance as a standard by the American Society for Testing and Materials (ASTM) Subcommittee, C27.70.

4.2.3 The Floatables test was performed to verify the floatable trapping ability of the Unistorm. Three objects were chosen to represent floatable debris commonly found in storm water run-off; an empty soda can, a piece of Styrofoam®, and an empty clear plastic food container. The empty soda can weighed 14.84 g and measured 383.00 cm^3, the piece of Styrofoam® weighed 0.58 g and measured 49.22 cm^3, and the clear plastic container weighed 10.02 g and measured 179.52 cm^3. The density of the empty soda can was 0.04 g/cc, the density of the piece of Styrofoam® was 0.01 g/cc, and the density of the clear plastic container was 0.06 g/cc. These objects were obviously too large to use for the Unistorm Test model so objects needed to be selected that had the same or less comparative buoyancy. Large and small beads were chosen with respective densities of 0.71 g/cc for the large beads and 0.18 g/cc for the smaller beads. The beads were less buoyant than the empty soda can, the piece of Styrofoam® and, the clear plastic container so they were considered acceptable for use.

4.2.4 Again, as in the floatable test, the Hydrocarbon test was performed to verify the hydrocarbon trapping ability of the Unistorm. Hydrocarbons float on water due to their comparative lower density and the tensile force of the water surface. A force of 72 dynes is required to break a surface film of water 1 cm long and thus cause "mixing "of the hydrocarbons and water. A volume of 500 ml was chosen for the test. Though this equates to a full scale spill of 387 L (HazMat situation) this amount was selected more for a factor of the effect of turbulence on a 1.2 cm thick layer of hydrocarbon on a water surface than for the scale volume.

4.2.5 The amount of TSS required for the no scour and no re-suspension test was determined by a test run where four consecutive flows at the established test rates were run. The system was allowed to settle (i.e., residual water stopped flowing) in between the consecutive flows. This test was performed to simulate chamber loading, and thereby ascertain the amounts in the individual chambers. The recommended maintenance pump-out for the full-size Unistorms is 0.5', but they may average 1.5'. So a safety factor of an additional 44% more material (over the 0.5' maintenance level) was incorporated Based on this and the loading test the following conclusion was made as to the amounts to load in each chamber: The first chamber was filled to a depth of 6.35 cm for a volume of 2,949.7 cm^3, the second chamber was filled to a depth 4.6 cm for a volume of 4,247.5 cm^3, and the last chamber was filled to a depth of 2 cm for a volume of 943.0 cm^3. Thus the total volume for testing was 8,140.2 cm^3.
A 10 µ filter bag was placed in-line after the Unistorm Test Model. This bag first was placed into water and allowed to become saturated. It was then removed, hung to drain for 5 minutes and weighed. This was repeated after each no scour and no re-suspension test to obtain accurate readings from test start to test end. Though lower concentrations of smaller particles would be found in actual treatment, the OK – 110 was not graded and adjusted prior to being used for this test.

5.0 TEST PERFORMANCE AND RESULTS

5.1 Test Performance

5.1.1 All calibrations were performed, per the test procedure, prior to the start of tests and the results were recorded on the data sheets. The calibration procedure and subsequent data are explicit enough to warrant not going into a detailed explanation, see Attachment A “Unistorm Test” and Attachment B “Unistorm Test Data".

5.1.2 The TSS test was performed in six runs. A flow of 68 LPM was started and the OK – 110 was added at a rate of 450 mg/L. After each run the system was allowed to settle and the sediment was siphoned and filtered. The filter and the sediment on it were dried in the microwave oven using 70% power (840 W) for five minute intervals. The filter and sediment were final-weighed when there were no visible lumps and the weight of the filter and sediment did not change for three consecutive drying times. The sediment was then carefully poured from the filter to the sieves, graded and weighed. The filter was not brushed or scraped off as this would have yielded obvious errors. The filter, with residual sediment, was weighed and the original weight measurement of the filter was subtracted from this measurement. An average of 1.7% of the original 153.00 g was retained by the filter for each test. This residual amount was theoretically graded and added to the measurement of the trapped sediment.

5.1.3 The Floatable capture test was performed in two tests of five runs each. A flow of 68 LPM was started and the beads were added at a rate of one small bead every two seconds, three large beads at the beginning, three large beads at the three minute mark of the test, and the final large bead at the four minute mark of the test. The flow was stopped at the five minute mark. The beads were left in the Unistorm Test Model and a flow of 68 LPM was established through the Unistorm

Test Model for five minutes before being stopped. This was repeated three more times for a total of four runs without feeding floatables and, with floatable feed run, comprised one test. The five runs were completed again for the second test.

5.1.4 The Hydrocarbon capture test was performed in one run of combined feed and flow and one test of flow only. A flow of 68 LPM was started and the hydrocarbon was added at a rate of 1.47 cc/L for five minutes and the flow was stopped. The hydrocarbon was left in the Unistorm Test model and a flow of 68 LPM was again established through the model for five minutes before being stopped.

5.1.5 The no scour and no re-suspension test was performed in two tests of one run each. The three chambers were loaded with OK – 110 (see 4.2.5). Water was then added to just below the invert level and the system was allowed a three hour settling time. A flow of 68 LPM was started and run for five minutes before the flow was stopped. A flow of 68 LPM was again started and run for five minutes before the flow was stopped.

5.2 Test Results

5.2.1 The sediment for the first TSS capture test was filtered using a filter attached over a container with a 6” diameter opening. The filter had to be changed six times due to low flow caused by clogging. This was time consuming and presented a higher chance of error with using six filters as opposed to using one filter. So for the remaining tests a larger (12") container with the same filter material was used allowing the filtration without changing the filter. This proved to reduce the error as the first test yielded a TSS removal rate of 79.71% and the remaining five tests all yielded TSS removal rates over 80%. The TSS capture test performed proved that the design of the Unistorm meets an annual removal efficiency of 80% for TSS.

5.2.2 The Unistorm is designed to capture floatable debris in the second chamber. Approximately 60% of the beads were still in the first chamber after the test. The remaining 40% of the beads were in the second chamber after the test. None escaped from the test model. The Floatable capture test performed proved the design of the Unistorm for capture of floatable debris.

5.2.3 The Unistorm is designed to capture hydrocarbons in the second chamber. Approximately 75% of the hydrocarbons were still in the first chamber after the first test and approximately 59% of the hydrocarbons remained in the first chamber after the second test. There was no evidence (oil sheen) of hydrocarbon escape from the Unistorm test model. The hydrocarbon could not be collected and quantified after the tests due to the inherent nature of hydrocarbons (i.e., coating the walls, etc.). But, since hydrocarbons will evenly spread over water, the volume could be determined by measuring the hydrocarbon layer as viewed through the clear test model. Additionally, the third chamber and the 10 µ filter bag showed no evidence of hydrocarbons, see Attachment M “Lab Model Pictures”. The Hydrocarbon capture test performed proved the design of the Unistorm for capture of hydrocarbons.

5.2.4 The Unistorm is designed to capture TSS in the first chamber. There was no evidence OK – 110 escaped from the test model, see Attachment M “Lab Model Pictures”. The third chamber and the 10 µ filter bag showed no evidence of scouring or re-suspension. The no scour and no re-suspension test performed proved the design of the Unistorm for prevention of scour and/or resuspension.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

6.1.1 The tests were conducted and the data collected according to an Environment 21 approved protocol, see Attachment A, Unistorm Test. The collected data was analyzed, tabulated, and independently reviewed. This review shows that the design of the Unistorm meets or exceeds the stringent industry requirements.

6.2 Recommendations

6.2.1 It is the recommendation of the Test Engineer/Report Author that the Unistorm be approved for applicable use. This is based on the thorough testing, documentation, and test evaluation. In the opinion of the Test Engineer the testing performed was more rigorous than required, thus ascertaining all parameters were met.

____

Dino Pezzimenti
Test Engineer/Report Author

____

Date

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D. Pezzimenti

Dino Pezzimenti
Test Engineer/Report Author

11/01/07

Date

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ATTACHMENT A

UNISTORM TEST

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UNISTORM TEST

1.0 SCOPE

The scope of this procedure is to conduct lab-testing on a model of the Unistorm to ascertain sediment removal, no scour/ no re-suspension, hydrocarbon capture, and floatable bead capture. This data will be used as verification to satisfy regulatory requirements.

2.0 PURPOSE

The purpose of this test is to verify the performance of the Unistorm using a model application. The data from this testing will be collected, evaluated, put into a test report format and then submitted as required for approval.

3.0 SETUP

3.1 Materials needed

3.1.1 One Unistorm Test Model for lab tests. This should be made of a clear material (e.g., Acrylic) for process viewing.

3.1.2 Test stand with a supply pump, recirculation pump, water supply container, and water catch container.

3.1.3 Sufficient water supply as determined by Test Engineer.

3.1.4 A minimum of 50 kg of OK – 110 silica sediment.

3.1.5 A minimum of one liter of, preferably used, hydrocarbon (e.g., automobile motor oil).

3.1.6 Supply sufficient floatable beads in an amount as determined by the Test Engineer.

3.2 Test Configuration

3.2.1 Configure the test stand as directed by Test Engineer. It should allow a continuous flow of water through the Unistorm Test model. Recirculation is acceptable as long as all sediment, hydrocarbons, and floatable debris that may pass through the Unistorm Test Model are removed from the water before reuse.

3.2.2 Arrange an addition port in line to the Unistorm Test Model inlet pipe. This is to allow the addition of OK-110, hydrocarbons, and floatable beads.

3.2.3 Use a digital camera to record events as determined by the Test Engineer. Verify the camera is operable prior to start of tests.

4.0 PROCEDURE

4.1 Initial Setup – NOTE: THESE INITIAL STEPS MUST BE DONE PRIOR TO THE START OF THE AFFECTED TEST BUT ALL NEED NOT BE DONE PRIOR TO THE START OF THE ENTIRE TEST PROCEUDRE.

4.1.1 Flow Monitor Calculation

4.1.1.1 Activate the supply pump and allow the system to establish a constant flow through the Unistorm Test Model. Set the flow rate to 68 LPM (18 GPM).

4.1.1.2 Use a stop watch to time this step. Place a five gallon pail in a position to collect all of the flow going through and exiting the Unistorm Test Model. Simultaneous to the start of collection, start the stop watch. Immediately stop flow to the pail at exactly ten (10) seconds per the stop watch. Stop the supply pump. Record the watch reading in the data sheets.

4.1.1.3 Pour the pail contents, in increments to prevent overflow, into a graduated cylinder taking care not to spill any water. Note the amount in the cylinder and empty the cylinder after each measurement. Total the incremental volume obtained and record this amount in the data sheets.

4.1.1.4 Repeat steps 4.1.1.1 – 4.1.1.3 two more times for a total of three initial tests.

4.1.1.5 Perform steps 4.1.1.1 – 4.1.1.3 prior to the start of each verification test. Record the readings in the data sheets.

4.1.2 TSS Gravity Feeder Calculation

4.1.2.1 Position a container on and tare the lab scale as determined by the Test Engineer.

4.1.2.2 Use a stop watch to time this step. With the TSS Gravity Feeder valve closed, place a sufficient amount of OK – 110 into the TSS Gravity Feeder. Position the feeder over the container on the scale. Slowly open the TSS Gravity Feeder valve. Using the stop watch, adjust the TSS Gravity Feeder valve to establish the correct flow required in a 10 second span. Stop the flow but leave the valve as set. Record the watch reading and the flow rate in the data sheets.

4.1.2.3 Repeat steps 4.1.2.1 and 4.1.2.2 two more times for a total of three initial tests.

4.1.2.4 Perform steps 4.1.2.1 – 4.1.2.2 prior to the start of each TSS test. Record the readings in the data sheets.

4.1.3 Hydrocarbon Gravity Feeder Calculation

4.1.3.1 Position the Hydrocarbon Gravity Feeder over a graduated cylinder.

4.1.3.2 Use a stop watch to time this step. With the Hydrocarbon Gravity Feeder valve closed, place a sufficient amount of hydrocarbon into the Hydrocarbon Gravity Feeder. Using the stop watch, adjust the Hydrocarbon Gravity Feeder valve to establish a flow of 25 ml in a 15 second span. Stop the flow but leave the valve as set. Record the watch reading and the flow rate in the data sheets.

4.1.3.3 Repeat steps 4.1.3.1 and 4.1.3.2 two more times for a total of three initial tests.

4.2 Sediment Removal Test

4.2.1 Test at 450 mg/l Sediment Feed with 100% Flow

4.2.1.1 Weigh out 153.00 g of OK – 110 (accuracy to .01g). Put the 153.00 g into a container which will allow it to be easily added to the TSS Gravity Feeder. Weigh and then place the TSS Gravity Feeder into the addition port. Record the weights from this step in the data sheets.

4.2.1.2 Start a water flow of 68 LPM (18 GPM) to the Unistorm Vault Scale Model. After the flow is stabilized add the OK – 110, weighed out from step 4.2.1.1, to the TSS Gravity Feeder. It should take five minutes for the TSS Gravity Feeder to empty.

4.2.1.3 Stop the water flow and remove and weigh the TSS Gravity Feeder after it has emptied. Record the weight in the data sheets.

4.2.1.4 Weigh a dry filter and attach it over the top of a pail. Record the weight in the data sheets. Using a piece of 3/8” Tygon ® tubing approximately 3’ long; start a siphon and siphon all the captured sediment from the

Unistorm Test Model. Be careful to position the discharge end of the siphon so all the sediment is collected on the filter.

4.2.1.5 After all of the sediment is removed from the Unistorm Test Model allow the filter to completely drain. Remove the filter and dry it and its contents in a microwave oven; take care to keep all of the TSS on the filter. Record both the time taken to filter and to dry the TSS and filter in the data sheets.

4.2.1.6 Weigh the dried filter and contents. Subtract the initial weight of the empty filter from the weight of the dried filter and contents. Empty the contents into the sieve system. Record the weights obtained in this step.

4.2.1.7 Sieve the sediment from step 4.2.1.6 into the various gradations and weigh them separately. Determine the percentages of each gradation relative to the total. Record the weights and percentages in the data sheets.

4.2.1.8 Repeat step 4.2.1.1 – 4.2.1.7 four more times for a total of five tests. NOTE: THE UNISTORM TEST MODEL MUST BE CLEANED PRIOR TO THE START OF EACH TEST.

4.2.2 Consecutive Test Flows at 450 mg/l Sediment Feed with 100% Flow

4.2.2.1 Weigh out four separate amounts of OK – 110 at 153.00 g each (accuracy to .01g). Put them into containers which will allow them to be easily added to the TSS Gravity Feeder. Weigh and then place the TSS Gravity Feeder into the addition port. Record the weights from this step in the data sheets.

4.2.2.2 Start a water flow of 68 LPM (18 GPM) to the Unistorm Vault Scale Model. After the water flow has stabilized, add one 153.00 g round of the OK – 110, weighed out from step 4.2.2.1, to the TSS Gravity Feeder. It should take five minutes for the TSS Gravity Feeder to empty.

4.2.2.3 Stop the water flow and remove and weigh the TSS Gravity Feeder after it has emptied. Record the weight in the data sheets.

4.2.2.4 Repeat steps 4.2.2.2 and 4.2.2.3 three more times for the remaining measured OK – 110.

4.2.2.5 Weigh a dry filter and attach it over the top of a pail. Record the weight in the data sheets. Using a piece of 3/8" Tygon ® tubing approximately 3' long; start a siphon and siphon all the captured sediment from the 1st chamber of the Unistorm Test Scale Model. Be careful to position the discharge end of the siphon so all the sediment is collected on the filter.

4.2.2.6 Allow the filter to drain after all of the sediment is removed from the 1st chamber of the Unistorm Test Model. Remove the filter and dry it and its contents in a microwave oven. Take care to keep all TSS on the filter. Record both the time taken to filter and to dry the TSS and filter in the data sheets.

4.2.2.7 Weigh the dried filter and contents. Subtract the initial weight of the empty filter from the weight of the dried filter and contents. Empty the contents into the sieve system. Record the weights obtained in this step.

4.2.2.8 Sieve the sediment from step 4.2.2.7 into the various gradations and weigh them separately. Determine the percentages of each gradation relative to the total.

Record the weights and percentages in the data sheets.

4.2.2.9 Repeat steps 4.2.2.5 – 4.2.2.8 two more times for the remaining chambers of the Unistorm Test Scale Model.

4.2.3 Calculate the removal efficiency for the six tests run from steps 4.2.1 and 4.2.2. Use the following as a calculation method example: [(amount of dried filter and contents – initial dry filter)/(153.00 g)] 100 or, theoretically, [(145.00 – 22.6)/153] 100 = 80%. Record these calculated efficiencies in the data sheets.

4.2.4 Using the data obtained from step 4.2.3 average the efficiencies of the test runs. Record this average in the data sheets.

4.2.5 No Scour/No Re-suspension Test

4.2.5.1 Fill the 1st chamber of the Unistorm Test Model to a depth of approximately 6.35 cm with OK – 110, the 2nd chamber to a depth of approximately 4.5 cm, and the 3rd chamber to a depth of 1.8 cm. Add water to just below the pipe invert and allow the system to settle. Weigh the 10 micron catch filter and position it to catch all flow from the Unistorm Test Model. Record this weight in the data sheets.

4.2.5.2 Start a water flow of 68 LPM (18 GPM) to the Unistorm Test Model. Run this test for five minutes and then stop the flow.

4.2.5.3 Remove and weigh the 10 micron catch filter. Record this reading in the data sheets.

4.2.5.4 Repeat steps 4.2.5.2 and 4.2.5.3 one more time.

4.2.6 Hydrocarbon Capture Test

4.2.6.1 Measure 500 ml of hydrocarbons into a graduated cylinder. Place the Hydrocarbon Gravity Feeder into the addition port.

4.2.6.2 Start a water flow of 68 LPM (18 GPM) to the Unistorm Test Model. Once the water flow has stabilized add the hydrocarbon measured out from step 4.2.6.1, to the Hydrocarbon Gravity Feeder. Run this test for five minutes and then stop the flow. Record the observations in the data sheets.

4.2.6.4 Start a water flow of 68 LPM (18 GPM) to the Unistorm Test Model and allow the flow to run for five minutes. Record the observations in the data sheets.

4.2.7 Floatable Debris Capture Test

4.2.7.1 Start a water flow of 68 LPM (18GPM) to the Unistorm Test model. Add floatable test beads at a rate determined by the Test Engineer. Observe the action of the floatable test beads, specifically the retention in the Unistorm Test Model. Stop the flow and allow the system to settle. Record the observations in the data sheets.

4.2.7.2 Do not remove the beads. Start a water flow of 68 LPM (18 GPM) to the Unistorm Test Model. Observe the action of the floatable test beads, specifically the retention in the Unistorm Test Model. Stop the water flow and allow the system to settle. Record the observations in the data sheets.

4.2.7.3 Repeat step 4.2.7.2 three more times.

4.2.7.4 Repeat steps 4.2.7.1 – 4.2.7.3 one more time.

UNISTORM VAULT SCALE MODEL TEST
DATA SHEETS

4.1.1.2 Stop watch reading:

______min ____sec

4.1.1.3 Total incremental volume:

______ml

4.1.1.4 Stop watch reading:

______min ____sec

Total incremental volume:

______ml

Stop watch reading:

______min ____sec

Total incremental volume:

______ml

4.1.1.5 Pre – Test Check

TSS

Stop watch reading:

______min ______sec

Total incremental volume:

______ml

Stop watch reading:

______min ______sec

Total incremental volume:

______ml

Stop watch reading:

______min ______sec

Total incremental volume:

______ml

Stop watch reading:

______min ______sec

Total incremental volume:

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______ml

Stop watch reading:

______min ______sec

Total incremental volume:

______ml

Floatable

Stop watch reading:

______min ______sec

Total incremental volume:

______ml

Stop watch reading:

______min ______sec

Total incremental volume:

______ml

Scour

Stop watch reading:

______min______sec

Total incremental volume:

______ml

Stop watch reading:

______min______sec

Total incremental volume:

______ml

Hydrocarbon

Stop watch reading:

______min______sec

Total incremental volume:

______ml

4.1.2.2 Stop watch reading:

______min______sec

Flow/10 sec.:

______g

4.1.2.3 Stop watch reading:

______min ______sec

Flow/10 sec.:

______g

Stop watch reading:

______min ______sec

Flow/10 sec.:

______g

4.1.2.4 Stop watch reading:

______min ______sec

Flow/10 sec.:

______g

Stop watch reading:

______min ______sec

Flow/10 sec.:

______g

Stop watch reading:

______min______sec

Flow/10 sec.:

______g

Stop watch reading:

______min______sec

Flow/10 sec.:

______g

Stop watch reading:

______min______sec

Flow/10 sec.:

______g

4.1.3.2 Stop watch reading:

______min______sec

Flow/15 sec.:

______ml

4.1.3.3 Stop watch reading:

______min_____sec

Flow/15 sec.:

______ml

Stop watch reading:

______min_____sec

Flow/15 sec.:

______ml

4.2.1.1 OK – 110

_______g

TSS Gravity Feeder

_______g

4.2.1.3 TSS Gravity Feeder

_______g

4.2.1.4 Dry Filter

_______g

4.2.1.5 Time to filter

______min ______sec

Time to dry

______min ______sec

4.2.1.6 Dried Filter/Contents

________g

Emptied Dried Filter

________g

4.2.1.7 Gradation weights and respective percentages of sediment trapped in the Unistorm Vault Scale Model:

70 Mesh ________g ________%

100 Mesh ________g ________%

120 Mesh ________g ________%

140 Mesh ________g ________%

170 Mesh ________g ________%

200 Mesh ________g ________%

270 Mesh ________ g ________ %

4.2.1.8 TSS Tests

2nd Test

OK – 110

________ g

TSS Gravity Feeder

________ g

TSS Gravity Feeder

________ g

Dry Filter

________ g

Time to filter

________ min ______ sec

Time to dry

________ min ______ sec

Dried Filter/Contents

________ g

Emptied Dried Filter

________g

Gradation weights and respective percentages of sediment trapped in the Unistorm Test Model:

70 Mesh ________g________%

100 Mesh ________g________%

120 Mesh ________g________%

140 Mesh ________g________%

170 Mesh ________g________%

200 Mesh ________g________%

270 Mesh ________g________%

3rd Test

OK – 110

________g

TSS Gravity Feeder

________g

TSS Gravity Feeder

________g

Dry Filter

________g

Time to filter

_______min_____sec

Time to dry

_______min_____sec

Dried Filter/Contents

________g

Emptied Dried Filter

________g

Gradation weights and respective percentages of sediment trapped in the Unistorm Test Model:

70 Mesh __________g__________%

100 Mesh __________g__________%

120 Mesh _______ g _______ %

140 Mesh _______ g _______ %

170 Mesh _______ g _______ %

200 Mesh _______ g _______ %

270 Mesh _______ g _______ %

4th Test

OK – 110

_______ g

TSS Gravity Feeder

_______ g

TSS Gravity Feeder

_______ g

Dry Filter

_______ g

Time to filter

_______ min _______ sec

Time to dry

______min _____sec

Dried Filter/Contents

________g

Emptied Dried Filter

________g

Gradation weights and respective percentages of sediment trapped in the Unistorm Test Model:

70 Mesh ________g ________%

100 Mesh ________g ________%

120 Mesh ________g ________%

140 Mesh ________g ________%

170 Mesh ________g ________%

200 Mesh ________g ________%

270 Mesh ________g ________%

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5th Test

OK – 110

______g

TSS Gravity Feeder

______g

TSS Gravity Feeder

______g

Dry Filter

______g

Time to filter

______min ______sec

Time to dry

______min ______sec

Dried Filter/Contents

______g

Emptied Dried Filter

________ g

Gradation weights and respective percentages of sediment trapped in the Unistorm Test Model:

70 Mesh ________ g ________ %

100 Mesh ________ g ________ %

120 Mesh ________ g ________ %

140 Mesh ________ g ________ %

170 Mesh ________ g ________ %

200 Mesh ________ g ________ %

270 Mesh ________ g ________ %

4.2.2.1 OK – 110

________ g

OK – 110

________ g

OK – 110

_______g

OK – 110

_______g

TSS Gravity Feeder

_______g

4.2.2.3 TSS Gravity Feeder

_______g

4.2.2.4 2nd Run

TSS Gravity Feeder

_______g

3rd Run

TSS Gravity Feeder

_______g

4th Run

TSS Gravity Feeder

_______g

4.2.2.5 Dry Filter

_______g

4.2.2.6 Time to filter

______min______sec

Time to dry

______min______sec

4.2.2.7 Dried Filter/Contents

_______g

Emptied Dried Filter

_______g

4.2.2.8 Gradation weights and respective percentages of sediment trapped in the Unistorm Test Model:

70 Mesh ________g________%

100 Mesh ________g________%

120 Mesh ________g________%

140 Mesh ________g________%

170 Mesh ________ g ________ %

200 Mesh ________ g ________ %

270 Mesh ________ g ________ %

4.2.2.9 2nd and 3rd Chambers

2nd Chamber

Dry Filter

________ g

Time to filter

______ min ______ sec

Time to dry

______ min ______ sec

Dried Filter/Contents

________ g

Emptied Dried Filter

________ g

Gradation weights and respective percentages of sediment trapped in the Unistorm Test Model:

70 Mesh ________ g ________ %

100 Mesh ________ g ________ %

120 Mesh ________ g ________ %

140 Mesh ________ g ________ %

170 Mesh ________ g ________ %

200 Mesh ________ g ________ %

270 Mesh ________ g ________ %

3rd Chamber

Dry Filter

________ g

Time to filter

______min ______sec

Time to dry

______min ______sec

Dried Filter/Contents

_______g

Emptied Dried Filter

_______g

Gradation weights and respective percentages of sediment trapped in UNISTORM Test Model:

70 Mesh ______ g ______ %

100 Mesh ______ g ______ %

120 Mesh ______ g ______ %

140 Mesh ______ g ______ %

170 Mesh ______ g ______ %

200 Mesh ______ g ______ %

270 Mesh ______ g ______ %

4.2.3 Removal efficiency calculations:

(______ g - ______ g)/(153g)100 = ______ %

(______ g - ______ g)/(153g)100 = ______ %

(______ g - ______ g)/(153g)100 = ______ %

(______ g - ______ g)/(153g)100 = ______ %

(______ g - ______ g)/(153g)100 = ______ %

(______ g - ______ g)/(153g)100 = ______ %

4.2.4 Efficiencies Average

__________ %

4.2.5.1 Wet 10 micron filter weight

_________ g

4.2.5.3 Wet 10 micron filter weight

_________ g

4.2.5.4 Wet 10 micron filter weight

_________ g

Wet 10 micron filter weight

_________ g

4.2.6.3 Hydrocarbon test observations

____

` ____

4.2.6.4 Hydrocarbon test observations

____

` ____

4.2.7.1 ____

` ____

4.2.7.2 ____

____

4.2.7.3 ____

` ____

____

____

4.2.7.4 ______________________________________

____

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____

____

______________________________ ______________________
TEST ENGINEER SIGNATURE DATE

TEST COMPLETED

ATTACHMENT B

UNISTORM TEST DATA SPREADSHEET

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UNISTORM TESTS - EQUIPMENT CALCS.

INITIAL SETUP	WATER FLOW MONITOR CALC.					
CALC. RUNS	DATE	TIME		MONITOR READING	AMT. COLL.	CALC. ERROR
		START	STOP	GPM	GAL.	%
1	10/15/07	0 min 0 sec	0 min 10 sec	17.80 - 18.20	3.06	2%
2	10/15/07	0 min 0 sec	0 min 10 sec	17.75 - 18.20	3.06	2%
3	10/15/07	0 min 0 sec	0 min 10 sec	17.80 - 18.20	3.00	0%

PRE-TEST CHECK	WATER FLOW MONITOR CALC.					
TSS TESTS	DATE	TIME		MONITOR READING	AMT. COLL.	CALC. ERROR
		START	STOP	GPM	GAL.	%
2	10/16/07	0 min 0 sec	0 min 10 sec	17.65 - 18.10	2.99	0%
3	10/16/07	0 min 0 sec	0 min 10 sec	17.75 - 18.20	3.06	2%
4	10/16/07	0 min 0 sec	0 min 10 sec	17.8 - 18.2	3.06	2%
5	10/16/07	0 min 0 sec	0 min 10 sec	17.8 - 18.2	3.06	2%
6	10/22/07	0 min 0 sec	0 min 10 sec	17.8 - 18.2	3.06	2%

INITIAL SETUP	TSS GRAVITY FEEDER CALC.					
CALC. RUNS	DATE	TIME		SCALE READING	TARGET AMT.	CALC. ERROR
		START	STOP	GRAMS	GRAMS	%
1	10/15/07	0 min 0 sec	0 min 10 sec	25.46	25.5	0.16%
2	10/15/07	0 min 0 sec	0 min 10 sec	25.49	25.5	0.04%
3	10/15/07	0 min 0 sec	0 min 10 sec	25.45	25.5	0.20%

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PRE-TEST CHECK	TSS GRAVITY FEEDER CALC.					
CALC. RUNS	DATE	TIME		READING	AMT.	ERROR
		START	STOP	GRAMS	GRAMS	%
2	10/16/07	0 min 0 sec	0 min 10 sec	25.51	25.5	-0.04%
3	10/16/07	0 min 0 sec	0 min 10 sec	25.47	25.5	0.12%
4	10/16/07	0 min 0 sec	0 min 10 sec	25.47	25.5	0.12%
5	10/16/07	0 min 0 sec	0 min 10 sec	25.49	25.5	0.04%
6	10/22/07	0 min 0 sec	0 min 10 sec	25.50	25.5	0.00%

PRE-TEST CHECK	WATER FLOW MONITOR CALC.					
FLOAT. TESTS	DATE	TIME		MONITOR READING	AMT. COLL.	CALC. ERROR
		START	STOP	GPM	GAL.	%
1	10/22/07	0 min 0 sec	0 min 10 sec	17.72 -18.28	3.06	2%
2	10/22/07	0 min 0 sec	0 min 10 sec	17.75 - 18.31	3.06	2%

PRE-TEST CHECK	WATER FLOW MONITOR CALC.					
SCOUR TESTS	DATE	TIME		MONITOR READING	AMT. COLL.	CALC. ERROR
		START	STOP	GPM	GAL.	%
1	10/22/07	0 min 0 sec	0 min 10 sec	17.72 -18.28	3.06	2%
2	10/22/07	0 min 0 sec	0 min 10 sec	17.75 - 18.31	3.06	2%

PRE-TEST CHECK	WATER FLOW MONITOR CALC.					
HYDRO-CARBON TESTS	DATE	TIME		MONITOR READING	AMT. COLL.	CALC. ERROR
		START	STOP	GPM	GAL.	%
1	10/22/07	0 min 0 sec	0 min 10 sec	17.72 -18.28	3.06	2%
2	10/22/07	0 min 0 sec	0 min 10 sec	17.75 - 18.31	3.06	2%

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INITIAL SETUP	HYDROCARBON GRAVITY FEEDER CALC.					
CALC. RUNS	DATE	TIME		GRADED CYL.	TARGET AMT.	CALC. ERROR
		START	STOP	ML	ML	%
1	10/22/07	0 min 0 sec	0 min 10 sec	25.00	25	0.00%
2	10/22/07	0 min 0 sec	0 min 10 sec	25.00	25	0.00%
3	10/22/07	0 min 0 sec	0 min 10 sec	25.00	25	0.00%

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UNISTORM TESTS - RAW DATA
TSS CAPTURE TESTS

TEST FEED TO UNIT				FILTER SEDIMENT			DRY SEDIMENT		
		TIME			TIME			TIME	
TESTS	DATE	START	STOP	DATE	START	STOP	DATE	START	STOP
1	10/15/07	0 m 0 s	5 m 0 s	10/15/07	0 m 0 s	35 m 20 s	10/15/07	0 m 0 s	75 m 45 s
2	10/16/07	0 m 0 s	5 m 0 s	10/16/07	0 m 0 s	15 m 30 s	10/16/07	0 m 0 s	55 m 36 s
3	10/16/07	0 m 0 s	5 m 0 s	10/16/07	0 m 0 s	14 m 05 s	10/16/07	0 m 0 s	56 m 10 s
4	10/16/07	0 m 0 s	5 m 0 s	10/16/07	0 m 0 s	14 m 13 s	10/16/07	0 m 0 s	55 m 45 s
5	10/16/07	0 m 0 s	5 m 0 s	10/16/07	0 m 0 s	14 m 22 s	10/17/07	0 m 0 s	55 m 28 s
6a	10/22/07	0 m 0 s	5 m 0 s	CHMBR	START	STOP	CHMBR	START	STOP
6b	10/22/07	0 m 0 s	5 m 0 s	1	0 m 0 s	07 m 34 s	1	0 m 0 s	73 m 32 s
6c	10/22/07	0 m 0 s	5 m 0 s	2	0 m 0 s	08 m 02 s	2	0 m 0 s	75 m 05 s
6d	10/22/07	0 m 0 s	5 m 0 s	3	0 m 0 s	05 m 38 s	3	0 m 0 s	34 m 10 s

TESTS	FILTER WT. START		FILTER WT. DRIED w/TSS		FILTER WT. STOP	
	DATE	WEIGHT	DATE	WEIGHT	DATE	WEIGHT
1	10/15/07	18.63 g	10/15/07	140.58 g	10/15/07	20.99 g
2	10/16/07	13.37 g	10/16/07	139.09 g	10/16/07	15.91 g
3	10/16/07	14.07 g	10/16/07	141.30 g	10/16/07	16.83 g
4	10/16/07	13.92 g	10/16/07	137.66 g	10/16/07	16.13 g
5	10/16/07	14.01 g	10/16/07	139.10 g	10/17/07	16.68 g
6 chmb 1	10/22/07	14.06 g	10/22/07	225.29 g	10/22/07	16.82 g
6 chmb 2	10/22/07	14.05 g	10/22/07	236.79 g	10/22/07	17.57 g
6 chmb 3	10/22/07	14.03 g	10/22/07	73.94 g	10/22/07	14.82 g

TESTS	DATE	FLOW RATE	OK-110 START	OK-110 TRAP.	REM. EFF.
1	10/15/07	68.14 LPM	153.00	121.95	79.71%
2	10/16/07	67.91 LPM	153.00	125.72	82.17%
3	10/16/07	69.50 LPM	153.00	127.23	83.16%
4	10/16/07	69.50 LPM	153.00	123.74	80.88%
5	10/16/07	69.50 LPM	153.00	125.09	81.76%
6	10/22/07	69.50 LPM	612.00	493.88	80.70%
OVERALL EFFICIENCY			1377.00	1117.61	81.16%

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UNISTORM TESTS - RAW DATA
FLOATABLES CAPTURE TESTS

TEST FEED TO UNIT				BEAD CARRYOVER					
TEST 1		TIME		PASSED to 2nd CHAMBER			PASSED to 3rd CHAMBER		
RUNS	DATE	START	STOP	BEADS 1ST CM	LGE BEADS	SM BEADS	BEADS 2ND CM	MED BEADS	SM BEADS
1	10/22/07	0 m 0 s	5 m 0 s	8 L 144 S	3	34	0	0	0
2	10/22/07	0 m 0 s	5 m 0 s	5 L 110 S	0	11	3 L 34 S	0	0
3	10/22/07	0 m 0 s	5 m 0 s	5 L 99 S	0	9	3 L 45 S	0	0
4	10/22/07	0 m 0 s	5 m 0 s	5 L 90 S	0	3	3 L 54 S	0	0
5	10/22/07	0 m 0 s	5 m 0 s	5 L 87 S	0	3	3 L 57 S	0	0

TEST FEED TO UNIT				BEAD CARRYOVER					
TEST 2		TIME		PASSED to 2nd CHAMBER			PASSED to 3rd CHAMBER		
RUNS	DATE	START	STOP	BEADS 1ST CM	LGE BEADS	SM BEADS	BEADS 2ND CM	MED BEADS	SM BEADS
1	10/22/07	0 m 0 s	5 m 0 s	8 L 144 S	1	24	0	0	0
2	10/22/07	0 m 0 s	5 m 0 s	7 L 110 S	0	15	1 L 24 S	0	0
3	10/22/07	0 m 0 s	5 m 0 s	7 L 95 S	0	12	1 L 39 S	0	0
4	10/22/07	0 m 0 s	5 m 0 s	7 L 83 S	1	2	1 L 51 S	0	0
5	10/22/07	0 m 0 s	5 m 0 s	6 L 81 S	0	3	2 L 53 S	0	0

TEST 1		
RUNS	DATE	FLOW RATE
1	10/22/07	69.50 LPM
2	10/22/07	69.50 LPM
3	10/22/07	69.50 LPM
4	10/22/07	69.50 LPM
5	10/22/07	69.50 LPM

TEST 2		
RUNS	DATE	FLOW RATE
1	10/22/07	69.50 LPM
2	10/22/07	69.50 LPM
3	10/22/07	69.50 LPM
4	10/22/07	69.50 LPM
5	10/22/07	69.50 LPM

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UNISTORM TESTS - RAW DATA
SCOURING TESTS

TEST FEED TO UNIT				SCOURING CARRYOVER		
		TIME		START		STOP
TEST	DATE	START	STOP	FLOW RATE	WT. OF FILTER IN GRAMS	WT. OF FILTER IN GRAMS
1	10/22/07	0 m 0 s	5 m 0 s	69.50 LPM	962.40	962.38
					CARRYOVER	UNDETECTED

TEST FEED TO UNIT				SCOURING CARRYOVER		
		TIME		START		STOP
TEST	DATE	START	STOP	FLOW RATE	WT. OF FILTER IN GRAMS	WT. OF FILTER IN GRAMS
2	10/22/07	0 m 0 s	5 m 0 s	69.50 LPM	962.38	962.39
					CARRYOVER	UNDETECTED

UNISTORM TESTS - RAW DATA
HYDROCARBONS CAPTURE TESTS

TEST FEED TO UNIT				HYDROCARBON CARRYOVER				
		TIME		START		STOP		
TEST	DATE	START	STOP	FLOW RATE	HYDRO-CARBON IN LITERS	1st CHMBR	2nd CHMBR	3rd CHMBR
1	10/22/07	0 m 0 s	5 m 0 s	69.50 LPM	0.50	75%	25%	0%
2	10/22/07	0 m 0 s	5 m 0 s	69.50 LPM	0.00	59%	41%	0%
				FINALAMOUNT IN LITERS		.294 L	.206 L	0 L

ATTACHMENT C

UNISTORM INSTALLATION SCHEMATIC

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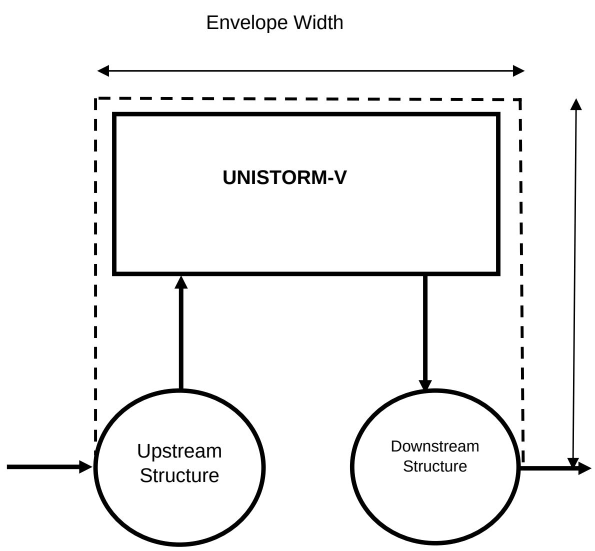
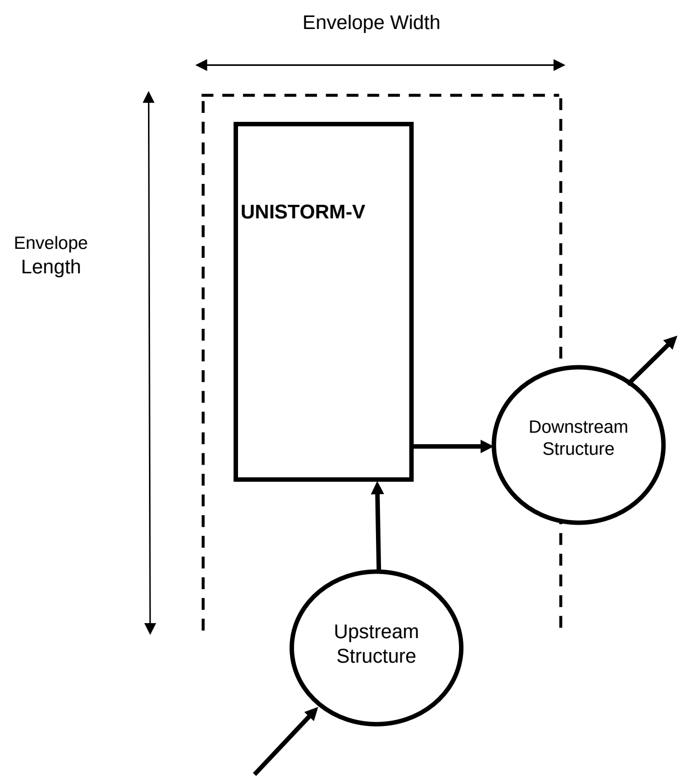
UNISTORM INSTALLATION SCHEMATIC

VAULT ONLINE

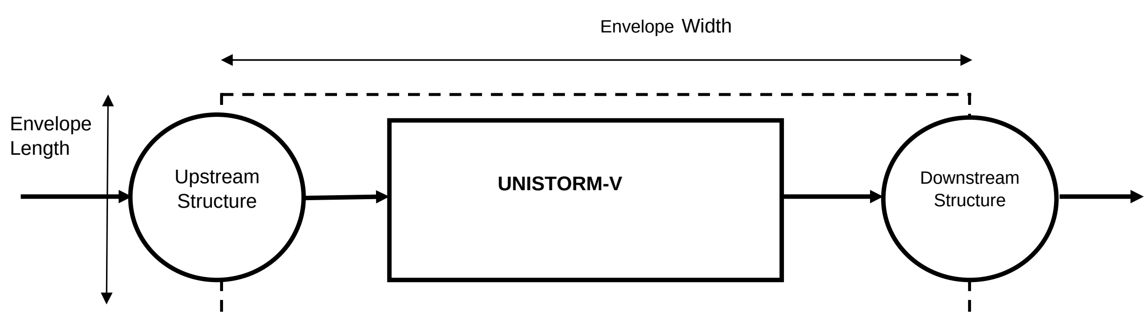
MODEL	DIMENSIONS		ENVELOPE	
VAULT	INSIDE	SUMP	LENGTH	WIDTH
510V	5' x 10'	4.5'	16'	16'
612V	6' x 12'	4.5'	18'	18'
812V	8' x 12'	4.5'	20'	18'
1020V	10' x 20'	4.5'	22'	22'

MODEL	DIMENSIONS		ENVELOPE	
VAULT	INSIDE	SUMP	LENGTH	WIDTH
510V	5' x 10'	4.5'	20'	15'
612V	6' x 12'	4.5'	24'	18'
812V	8' x 12'	4.5'	24"	22'
1020V	10' x 20'	4.5'	30'	22'





MODEL	DIMENSIONS		ENVELOPE	
VAULT	INSIDE	SUMP	LENGTH	WIDTH
510V	5' x 10'	4.5'	16'	30'
612V	6' x 12'	4.5'	18'	32'
812V	8' x 12'	4.5'	20'	34'
1020V	10' x 20'	4.5'	22'	44'



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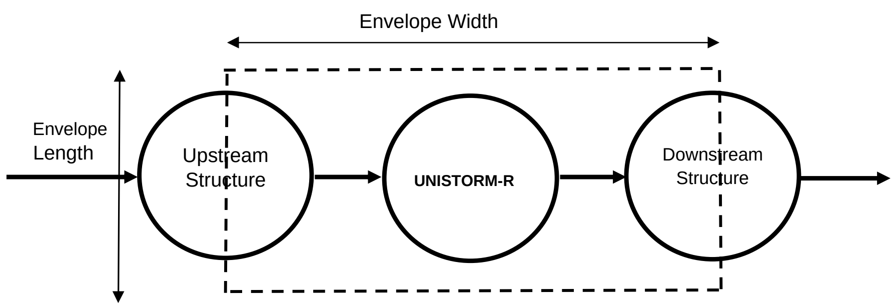
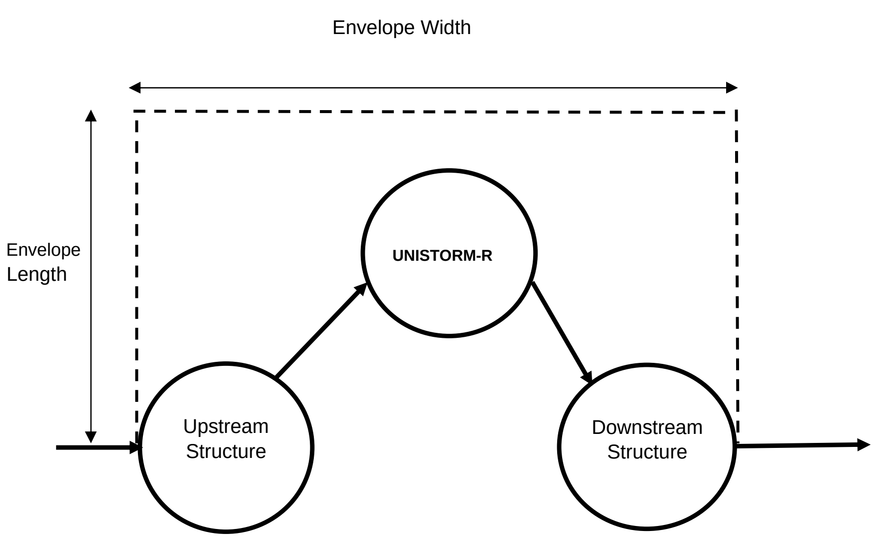
UNISTORM INSTALLATION SCHEMATIC

MANHOLE ONLINE

MODEL MANHOLE	DIMENSIONS		ENVELOPE	
	INSIDE	SUMP	LENGTH	WIDTH
5R	5' dia	4.5'	16'	20'
6R	6' dia	4.5'	18'	22'
8R	8' dia	4.5'	20'	24'
10R	10' dia	4.5'	22'	28'



MODEL MANHOLE	DIMENSIONS		ENVELOPE	
	INSIDE	SUMP	LENGTH	WIDTH
5R	5' dia	4.5'	16'	16'
6R	6' dia	4.5'	16'	16'
8R	8' dia	4.5'	18'	18'
10R	10' dia	4.5'	20'	20'



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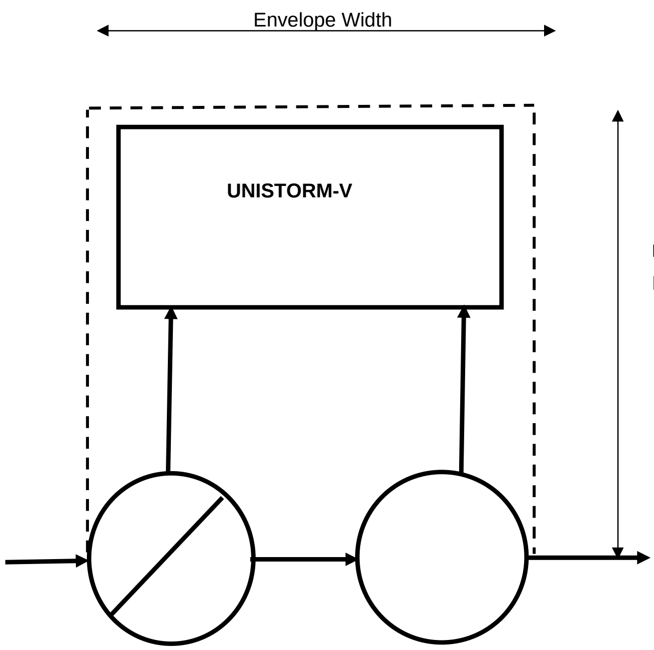
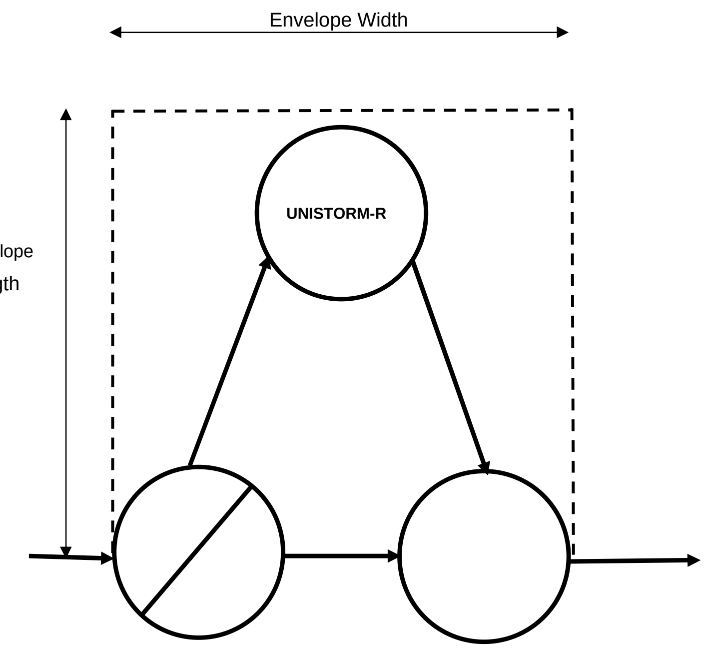
UNISTORM INSTALLATION SCHEMATIC

OFFLINE

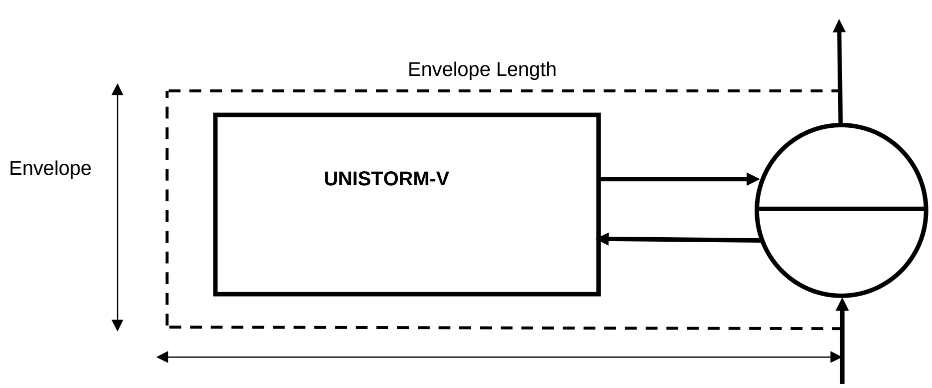
MODEL VAULT	DIMENSIONS		ENVELOPE	
	INSIDE	SUMP	LENGTH	WIDTH
510V	5' x 10'	4.5'	16'	16'
612V	6' x 12'	4.5'	18'	18'
812V	8' x 12'	4.5'	20'	18'
1020V	10' x 20'	4.5'	22'	22'

MODEL MANHOLE	DIMENSIONS		ENVELOPE	
	INSIDE	SUMP	LENGTH	WIDTH
5R	5' dia	4.5'	16'	16'
6R	6' dia	4.5'	16'	16'
8R	8' dia	4.5'	18'	18'
10R	10' dia	4.5'	20'	20'





MODEL VAULT	DIMENSIONS		ENVELOPE	
	INSIDE	SUMP	LENGTH	WIDTH
510V	5' x 10'	4.5'	22'	16'
612V	6' x 12'	4.5'	24'	18'
812V	8' x 12'	4.5'	24'	20'
1020V	10' x 20'	4.5'	40'	22'



ATTACHMENT D

UNISTORM INFORMATION SHEETS

UNISTORM VAULT ONLINE SYSTEM / ADAPT TO SITE LAYOUT

DATE: 1-25-08
DWG. NO.: Detail - Unistorm-V

UNISTORM VAULT SIZING TABLE

UNISTORM MODEL #	WIDTH (ft.)	LENGTH (ft.)	MAX. S (ft.)	IMPERVIOUS AREA (acres)	INLET PIPE (in.)	TREATMENT FLOW (cfs)	PEAK FLOW (cfs)
48V	4	8	5.0±	0 - 2	12	0 - 1	4
510V	5	10	5.3±	2 - 4	15-18	1 - 2	6
612V	6	12	5.6±	3 - 4	18-24	2 - 6	10
1020V	10	20	6.0±	4 - 12	24-30	6 - 10	25

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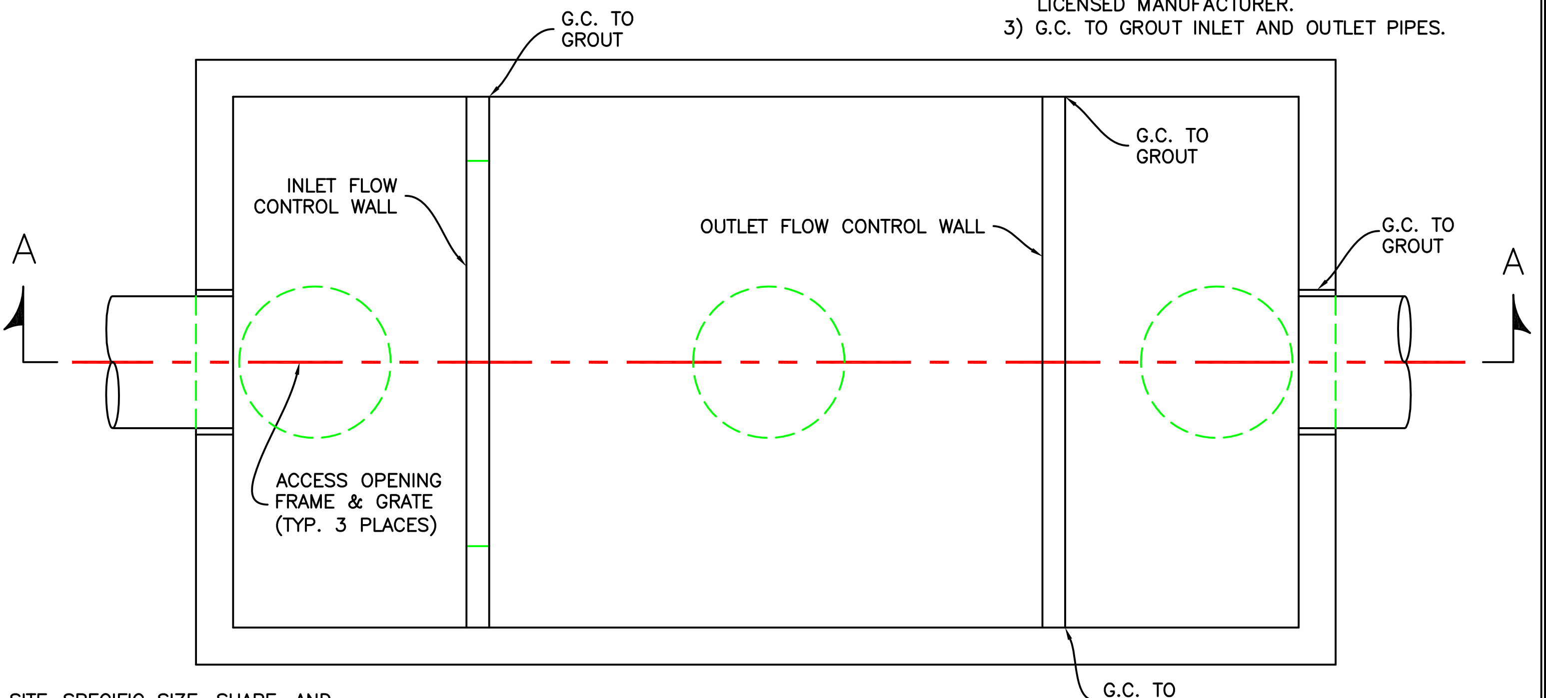
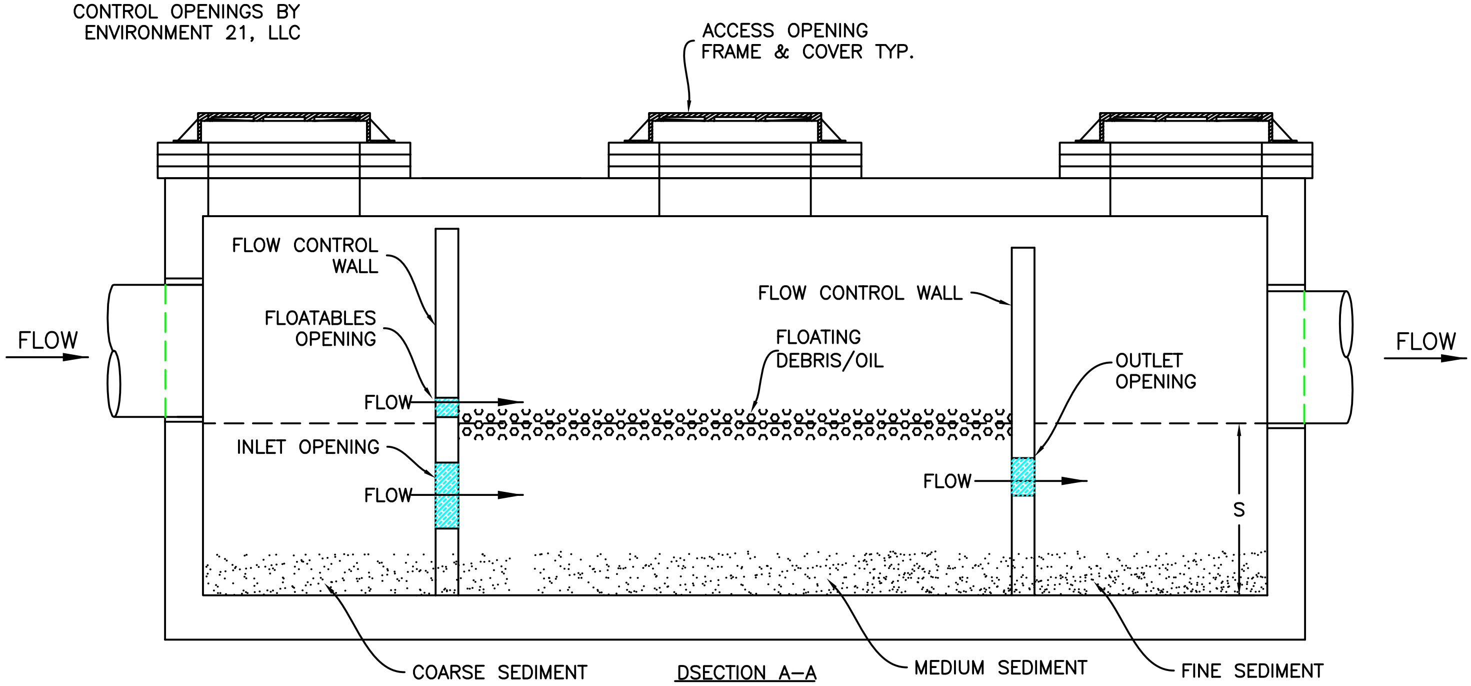
NOTES:
1) RAINFALL INTENSITY USED FOR TREATMENT FLOW = 0.80–1.0 IN/HR
2) MAXIMUM OPERATING LOSS APPROXIMATELY 0.5 FT

MANUFACTURING NOTES:
1) DESIGN OF INTERNAL BAFFLE WALLS PROVIDED TO LICENSED MANUFACTURER BY ENVIRONMENT 21, LLC.
2) LOCATION AND SIZE OF MANHOLE OPENINGS MAY BE ADJUSTED BY LICENSED MANUFACTURER.
3) G.C. TO GROUT INLET AND OUTLET PIPES.



SITE–SPECIFIC SIZE, SHAPE, AND LOCATION OF FLOW CONTROL OPENINGS BY ENVIRONMENT 21, LLC

PLAN



DSECTION A–A

C:\ENV21\Stormwater Treatment\marketing\ENV21 Website\2007 New Website\UniStorm\Specifying Documents\Unistorm-V detail.dwg

DESIGN LOADING: AASHTO HS20–44

UNISTORM ONLINE SYSTEM / ADAPT TO SITE LAYOUT

DATE: 1-25-08
DWG. NO.: Detail - Unistorm-R

UNISTORM SIZING TABLE						
UNISTORM MODEL #	D (ft.)	MAX. S (ft.)	IMPERVIOUS AREA (acres)	INLET PIPE (in.)	TREATMENT FLOW (cfs)	PEAK FLOW (cfs)
5R	5	5.0±	0 - 3	12-15	0 - 2	6
6R	6	5.3±	3 - 4	18	2 - 3	7
7R	7	5.6±	4 - 6	21	3 - 5	9
8R	8	6.0±	6 - 10	24	5 - 7	16
10R	10	6.6±	10 - 12	30	7 - 10	25
12R	12	7.3±	12 - 15	36	10 - 13	35

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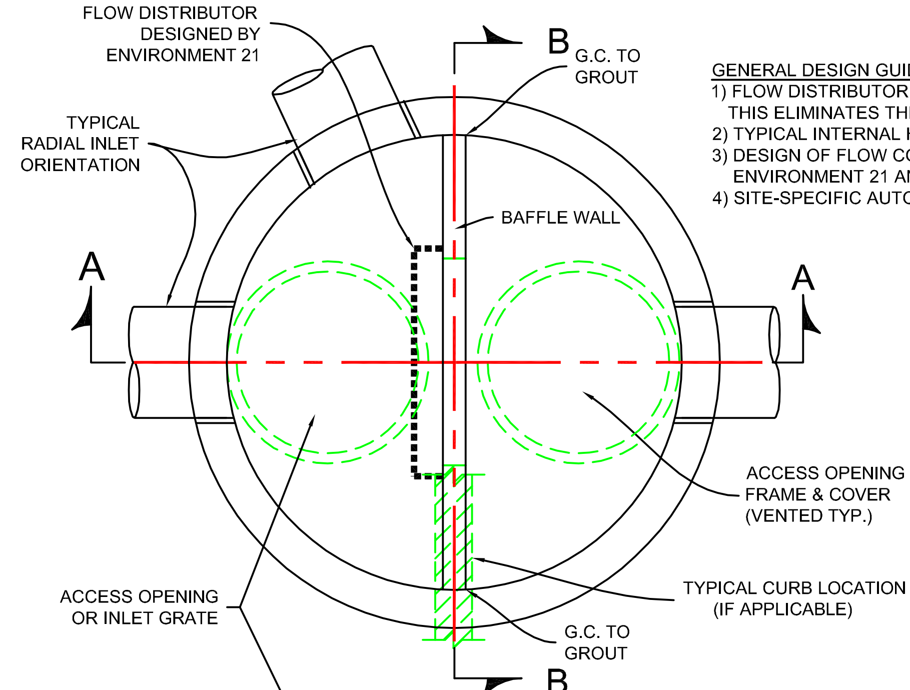
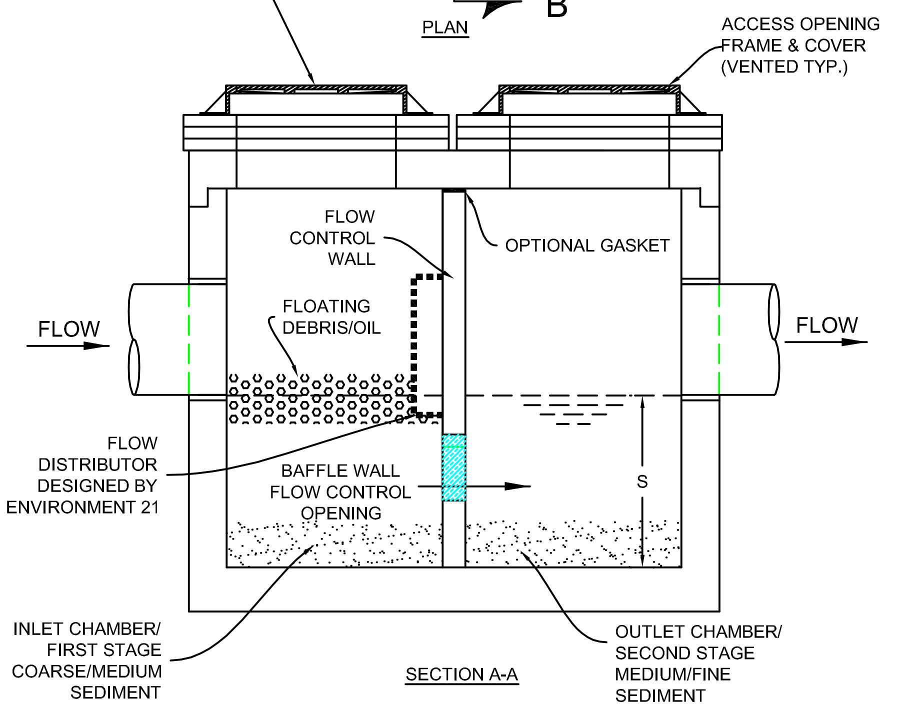
NOTES:
1) RAINFALL INTENSITY USED FOR TREATMENT FLOW = 0.80–1.0 IN/HR

MANUFACTURING NOTES:
1) DESIGN OF INTERNAL BAFFLE WALL PROVIDED TO LICENSED MANUFACTURER BY ENVIRONMENT 21, LLC.
2) LOCATION AND SIZE OF MANHOLE OPENINGS MAY BE ADJUSTED BY LICENSED MANUFACTURER.
3) G.C. TO GROUT INLET AND OUTLET PIPES.

GENERAL DESIGN GUIDELINES FOR UNISTORM TREATMENT CHAMBER
1) FLOW DISTRIBUTOR USED TO DISSIPATE INLET FLOW STIRRING POWER. THIS ELIMINATES THE NEED TO BYPASS HIGH FLOW EVENTS.
2) TYPICAL INTERNAL HEAD LOSS FOR DESIGN STORM IS 0.20 FT.
3) DESIGN OF FLOW CONTROL BAFFLE WALL AND FLOW DISTRIBUTOR BASED ON ENVIRONMENT 21 ANALYSIS OF SITE-SPECIFIC STORM SEWER HYDRAULICS.
4) SITE-SPECIFIC AUTOCAD DRAWING DETAIL PREPARED BY ENVIRONMENT 21 AVAILABLE

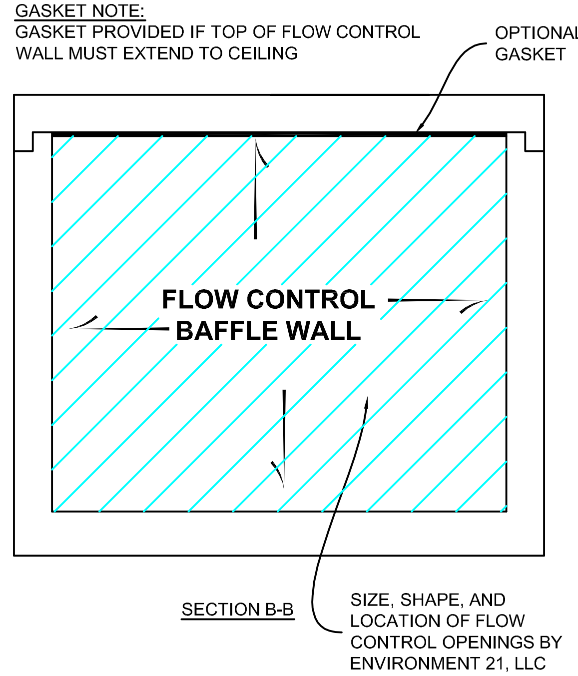


PLAN



SECTION A-A

GASKET NOTE:
GASKET PROVIDED IF TOP OF FLOW CONTROL WALL MUST EXTEND TO CEILING



SECTION B-B

GENERAL NOTES:
MANHOLE DESIGN SPECIFICATIONS CONFORM TO LATEST A.S.T.M. C478 SPEC. FOR PRECAST REINFORCED CONCRETE MANHOLE SECTIONS.

DESIGN LOADING: AASHTO HS20–44

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Hamburg, NY 14075
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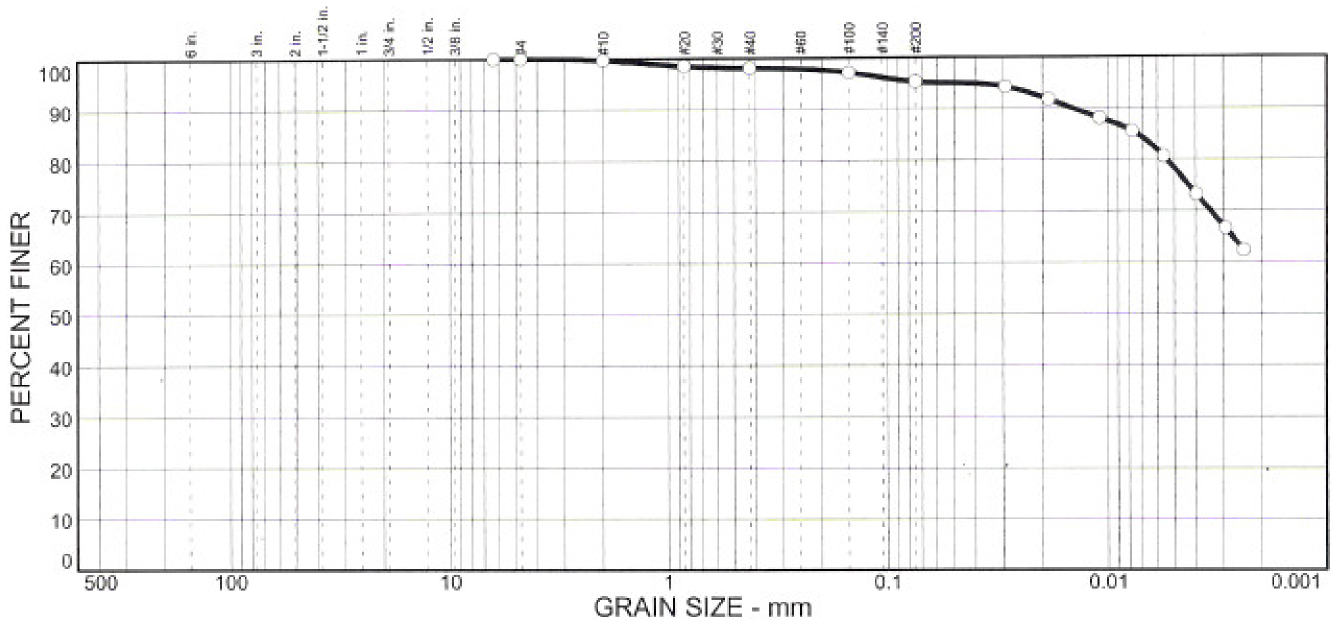
Particle Size Distribution Report

Project: STORM WATER TREATMENT CHAMBER **Project No.:** BEV-04-025

Client: ENVIROMENTAL 21

Sample No: 05-201 **Source of Sample:** SECOND STAGE **Date:** 3/18/05

Location: AMHERST UNISTORM **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	1.6	2.8	17.0	78.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	100.0		
#10	99.7		
#20	98.5		
#40	98.1		
#100	97.1		
#200	95.3		

* (no specification provided)

Soil Description

GREY CLAY, LITTLE SILT, TRACE SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0075 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

LTR-3
SAMPLED BY: SJB
DATE RECEIVED: 3/4/05

Plate

Contract Drilling and Testing

SJB SERVICES, INC.

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Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Storm Water Treatment Chamber**

CLIENT: **Environmental 21**

DATE: **March 18, 2005**

PROJECT NO.: BEV-04-025
REPORT NO.: LTR-3

SAMPLE INFORMATION:
Sample No. 05-201 was received at the SJB Services, Inc. laboratory on March 4, 2005. Sample is described as the second stage material from the Amherst Unistorm.

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
¼"	100.0
#4	100.0
#10	99.7
#20	98.5
#40	98.1
#100	97.1
#200	95.3

PERCENT COMPONENTS

GRAVEL	SAND	SILT	CLAY
0.0 %	4.7 %	17.0 %	78.3 %

ASTM D-2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Organic Content : 5.2 %
Mineral Residue Content : 94.8 %

Bulk Density Results

Wet Bulk Density = 83.64 lbs./ft^3 at 138.25 % received moisture content
Dry Bulk Density = 35.11 lbs./ft^3

SJB Services, Inc.

Paul Gregorczyk
Laboratory Manager

SJB SERVICES, INC.
Contract Drilling and Testing

BUFFALO OFFICE
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

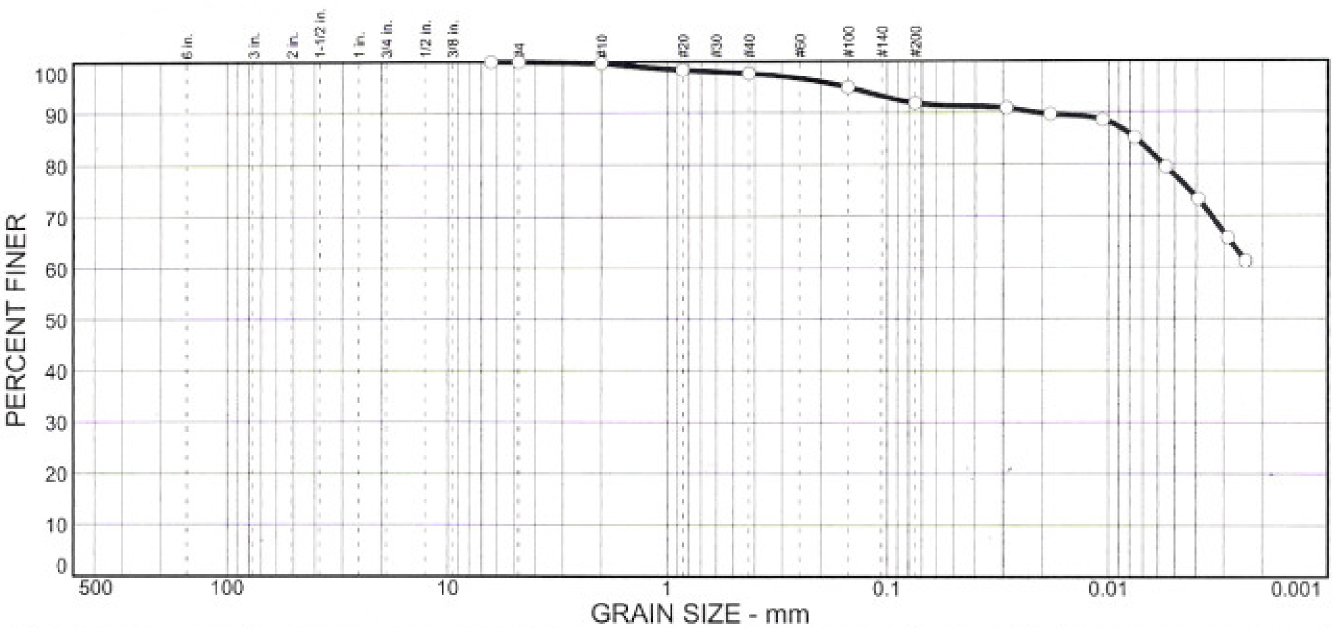
Particle Size Distribution Report

Project: STORM WATER TREATMENT CHAMBER **Project No.:** BEV-04-025

Client: ENVIROMENTAL 21

Sample No: 05-200 **Source of Sample:** FIRST STAGE **Date:** 3/18/05

Location: AMHERST UNISTORM **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.3	2.0	5.9	14.1	77.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.25 in.	100.0		
#4	100.0		
#10	99.7		
#20	98.4		
#40	97.7		
#100	94.9		
#200	91.8		

* (no specification provided)

Soil Description

GREY CLAY, LITTLE SILT, TRACE SAND

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0076 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

LTR-2
SAMPLED BY: SJB
DATE RECEIVED: 3/4/05

Plate

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Drilling
and
Testing

SERVICES, INC.

BUFFALO OF
5167 South Park A
Hamburg, NY 1
Phone: (716) 649
Fax: (716) 649-

Laboratory Test Report

PROJECT: **Storm Water Treatment Chamber**

CLIENT: **Environmental 21**

DATE: **March 18, 2005**

PROJECT NO.: BEV-04-025
REPORT NO.: LTR-2

SAMPLE INFORMATION:
Sample No. 05-200 was received at the SJB Services, Inc. laboratory on March 4, 2005. Sample is described as the first stage material from the Amherst Unistorm.

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
¼"	100.0
#4	100.0
#10	99.7
#20	98.4
#40	97.7
#100	94.9
#200	91.8

PERCENT COMPONENTS

GRAVEL	SAND	SILT	CLAY
0.0 %	8.2 %	14.1 %	77.7 %

ASTM D-2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Organic Content : 6.1 %
Mineral Residue Content : 93.9 %

Bulk Density Results

Wet Bulk Density = 83.51 lbs./ft^3 at 141.89 % received moisture content
Dry Bulk Density = 34.52 lbs./ft^3

SJB Services, Inc.

Paul Gregorczyk
Laboratory Manager

SJB SERVICES, INC.
Contract Drilling and Testing

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Hamburg, NY 14075
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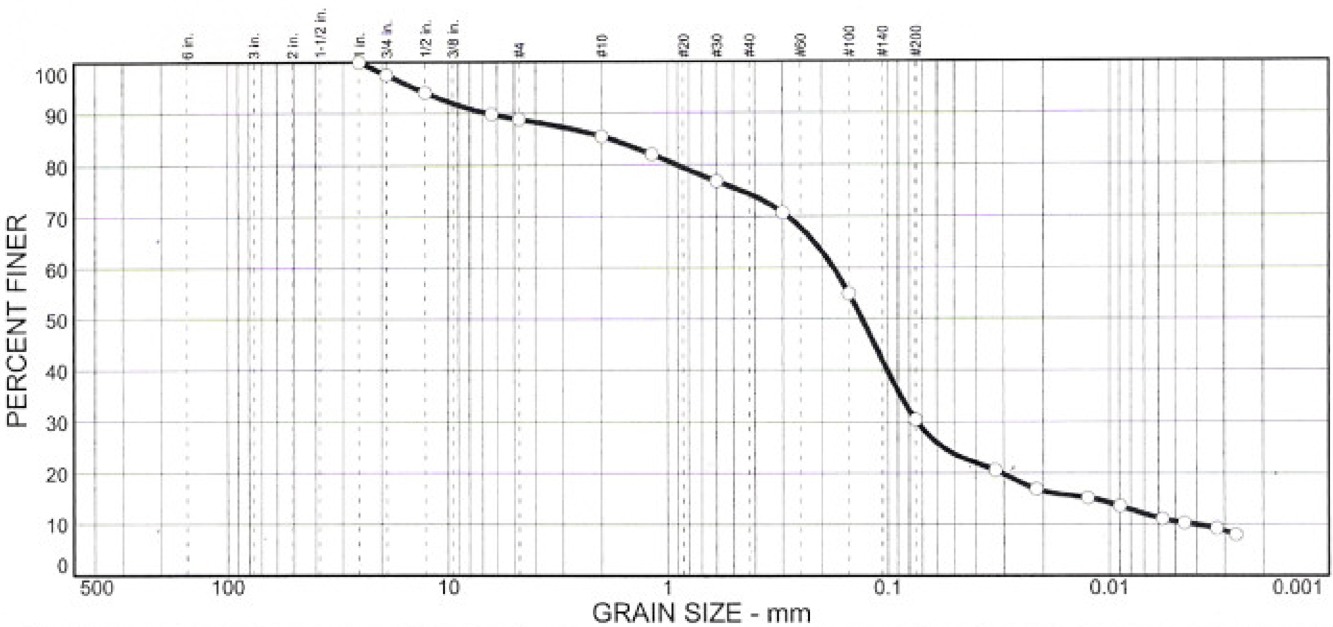
Particle Size Distribution Report

Project: STORM WATER TREATMENT CHAMBER **Project No.:** BEV-04-025

Client: ENVIROMENTAL 21

Sample No: 05-199 **Source of Sample:** SITE SAMPLE **Date:** 3/18/05

Location: AMHERST UNISTROM **Elev./Depth:**



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	2.5	8.7	3.3	11.2	43.9	19.8	10.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
.75 in.	97.5		
.5 in.	94.0		
.25 in.	89.8		
#4	88.8		
#10	85.5		
#16	82.0		
#30	76.8		
#50	70.7		
#100	54.9		
#200	30.4		

* (no specification provided)

Soil Description

BROWN SAND, LITTLE SILT, CLAY & GRAVEL

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.83 D_{60}= 0.177 D_{50}= 0.131
D_{30}= 0.0738 D_{15}= 0.0118 D_{10}= 0.0041
C_u= 43.43 C_c= 7.56

Classification

USCS= AASHTO=

Remarks

LTR-1
SAMPLED BY: SJB
DATE RECEIVED: 3/4/05

Plate

Contract Drilling and Testing

SJB SERVICES, INC.

BUFFALO OFFICE
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Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

Laboratory Test Report

PROJECT: **Storm Water Treatment Chamber**

CLIENT: **Environmental 21**

DATE: **March 18, 2005**

PROJECT NO.: BEV-04-025
REPORT NO.: LTR-1

SAMPLE INFORMATION:
Sample No. 05-199 was received at the SJB Services, Inc. laboratory on March 4, 2005. Sample is described as the site material from the Amherst Unistorm.

ASTM D-422: Particle Size Analysis of Soils

Sieve Size	*Percent Passing*
1"	100.0
¾"	97.5
½"	94.0
¼"	89.8
#4	88.8
#10	85.5
#16	82.0
#30	76.8
#50	70.7
#100	54.9
#200	30.4

PERCENT COMPONENTS

GRAVEL	SAND	SILT	CLAY
11.2 %	58.4 %	19.8 %	10.6 %

ASTM D-2974: Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Organic Content : 1.7 %
Mineral Residue Content : 98.3 %

Bulk Density Results

Wet Bulk Density = 81.19 lbs./ft^3 at 7.5 % received moisture content
Dry Bulk Density = 75.35 lbs./ft^3

SJB Services, Inc.

Paul Gregorczyk
Laboratory Manager

PROJECT DATA		DATES	
SITE:	LAKE FOREST SUBDIVISION STORMWATER TREATMENT CHAMBER	INSTALLATION:	
MUNICIPALITY:	TOWN OF AMHERST, NEW YORK	LAST CLEANOUT:	
PROJECT TYPE:	SEDIMENT SAMPLING AND ANALYSIS	SAMPLING:	
NATIVE SOILS:	SANDS, SILTS, AND CLAYS, TRACE GRAVEL		

LABORATORY DATA SUMMARY

ITEM	ANALYTICAL METHOD	SITE	UNISTORM FIRST STAGE	UNISTORM SECOND STAGE	OUTFALL
WET SEDIMENT ANALYSIS					
Bulk Density, lbs/ft^3	In-House Method	81.19	83.51	83.64	NS
DRY SEDIMENT ANALYSIS					
Bulk Density, lbs/ft^3	In-House Method	75.35	34.52	35.11	NS
Phosphorus Content wt%	EPA 365.2	0.0275	0.0305	0.0398	NS
Organic Content, wt%	ASTM D-2974	1.7	6.1	5.2	NS
Mineral Residue, wt%	ASTM D-2974	98.3	93.9	94.8	NS
DRY MINERAL SEDIMENT ANALYSIS					
Phosphorus Content wt%	EPA 365.2	0.0295	0.0413	0.0383	NS
Particle Size Distribution (Unified Class)	ASTM C566/D421/D422	SM	CL	CL	NS

NS="Not Sampled"

SJB SERVICES, INC.
Contract Drilling and Testing

CORPORATE/ BUFFALO OFFICE
5167 South Park Avenue
Hamburg, NY 14075
Phone: (716) 649-8110
Fax: (716) 649-8051

ALBANY OFFICE
PO Box 2199
Ballston Spa, NY 12020

5 Knabner Road
Mechanicville, NY 12118
Phone: (518) 899-7491
Fax: (518) 899-7496

CORTLAND OFFICE
60 Miller Street
Cortland NY 13045
Phone: (607) 758-7182
Fax: (607) 758-7188

ROCHESTER OFFICE
535 Summit Point Drive
Henrietta, NY 14467
Phone: (585) 359-2730
Fax: (585) 359-9668

SYRACUSE OFFICE
6730 Myers Road
East Syracuse, NY 13057
Phone: (315) 437-3890
Fax: (315) 437-3582

April 15, 2005

Environmental 21, LLC
8713 Read Road
East Pembroke, New York 14056
Phone: (585) 762-8314
Fax: (585) 762-8315

Attention: Michael F. Patterson, P.E.-Director of Engineering

Reference: Sediment Sampling and Analysis
Stormwater Treatment Chambers
Town of Amherst, New York

Dear Mr. Patterson,

SJB Services, Inc. (SJB) is pleased to submit this report summarizing the completion of sediment sampling and analysis for the Lake Forest North stormwater treatment chambers. Following Environment 21's requested scope of work, SJB obtained samples from the first stage and second stage treatment chambers along with a sample collected from the site. The samples were transported to SJB's geotechnical laboratory in Hamburg, New York laboratory analysis of selected physical properties of the sediment. Portions of the sediment samples were transported Paradigm Environmental Services, inc. located in Rochester, New York for additional laboratory analysis of phosphorus content in the sediment.

Presented in Attachment 1 is a table summarizing the laboratory analyses conducted on the sediment samples. SJB's and Paradigm's complete laboratory analytical reports have been included in Attachment 2.

If you should have any questions regarding this report, please do not hesitate to call our office at anytime.

Sincerely,

Charles B. Guzzetta
Project Manager
Geotechnical/Environmental Specialist

environment 21™

STORMWATER TREATMENT SOLUTIONS

East Pembroke, NY 14056
P: 585-762-8314
F: 575-762-8315
E-mail: envengr@env21.com
web site www.env21.com

2004 PRECIPITATION DATA FOR BUFFALO, NY
WEATHER STATION AT BUFFALO AIRPORT

FREQUENCY AND DEPTH OF DAILY PRECIPITATION

Depth range, in.	0.01-0.09	0.10-0.29	0.30-0.59	0.60-0.99	1.0-1.49	1.5-1.99	2.0-2.49	2.5-2.99	3.0-3.49
January	13	7	4	0	0	0	0	0	0
February	6	1	2	0	0	0	0	0	0
March	8	8	2	1	0	0	0	0	0
April	5	5	5	1	0	0	0	0	0
May	8	7	1	3	1	0	0	0	0
June	7	3	2	1	0	0	0	0	0
July	3	5	2	1	1	0	1	0	0
August	7	3	1	1	0	0	0	0	0
September	2	0	0	1	0	0	0	0	1
October	7	2	3	0	1	0	0	0	0
November	5	2	2	2	0	0	0	0	0
December	10	4	5	1	1	0	0	0	0

PRECIPITATION SUMMARY

Frequency, days/yr	81	47	29	12	4	0	1	0	1
Avg. depth, in/day	0.05	0.2	0.45	0.8	1.25	1.75	2.25	2.75	3.25
Annual depth, in/yr	4.1	9.4	13.1	9.6	5	0	2.3	0	3.3

environment 21
STORMWATER TREATMENT SOLUTIONS

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web site www.env21.com

UNISTORM THIRD PARTY SEDIMENT MONITORING TEST RESULTS

TRIBUTARY AREA: LAKE FOREST NORTH SUBDIVISION , AMHERST, NY

ITEM	SAMPLE SOURCE			ANALYTICAL STANDARD
		UNISTORM		
	SITE SOILS	FIRST STAGE	SECOND STAGE	
BULK DENSITY WET, #/CF	81.2	83.5	83.6	
BULK DENSITY DRY, #/CF	75.4	34.5	35.1	
ORGANIC CONTENT, WT%	1.7	6.1	5.2	ASTM D-2974
PHOSPHORUS IN TOTAL SEDIMENT, ppm	275	305	398	EPA 365.2
PHOSPHORUS IN MINERAL SEDIMENT, ppm	295	413	383	EPA 365.2
GRADATION OF TOTAL SEDIMENT, WT%				ASTM D-422
GRAVEL	11.2	0.0	0.0	
SAND	58.4	8.2	4.7	
SILT	19.8	14.1	17	
CLAY	10.6	77.7	78.3	
SEDIMENT DEPTH (BELOW CENTRALLY LOCATED 24" DIAMETER ACCESS OPENINGS)	NA	11"-12"	11"-12"	

SEDIMENT SAMPLING AND ANALYSIS
(1) SEDIMENT SAMPLING AND DEPTH MEASUREMENT BY SJB SERVICES, HAMBURG, NY
(2) DENSITY, ORGANICS, AND GRADATION ANALYSIS BY SJB SERVICES
(3) PHOSPHORUS ANALYSIS BY PARADIGM ENVIRONMENTAL SERVICES, ROCHESTER, NY

ENVIRONMENT 21 COMMENTS ON TEST RESULTS

SITE SOILS AREA ADJACENT TO THE PAVEMENT AREA WAS STRIPPED OF TOPSOIL. GRADATION ANALYSIS INDICATES UNDERLYING SOILS SIMILAR TO LAMSON VERY FINE SANDY LOAM.

BULK DENSITY SEDIMENT DRY DENSITY IN THE CHAMBERS IS APPROXIMATELY 40% OF THAT FOR THE NATIVE SOILS. THIS IS INDICATIVE OF EXTREMELY SLOW SETTLING OF FINELY DIVIDED SUBMERGED CLAY SOLIDS.

ORGANICS LOW ORGANIC CONTECT IS CONSISTENT WITH UNVEGETATED AREAS ADJACENT TO PAVEMENT

PHOSPHORUS CONTENT
(1) HIGHER PPM IN UNISTORM SEDIMENT SUGGESTS INFLUENT PHOSPHORUS IS NOT SOLUBLE
(2) PHOSPHORUS SOURCE IS EXPECTED TO BE FROM PREVIOUS FARMING ACTIVITIES AND/OR ATMOSPHERIC DEPOSITION

GRADATION CLAY FRACTION IN THE UNISTORM IS SEVEN TIMES HIGHER THAT THAT IN THE SITE SOILS. THIS INDICATES THAT RAINFALL EVENTS WERE NOT ADEQUATE TO TRANSPORT COARSER SEDIMENT TO THE STORM SEWER SYSTEM. THIS ALSO SUGGESTS THAT THE TOP LAYERS OF UNVEGETATED SOIL MAY HAVE BEEN REDUCED IN CLAY CONTENT AND WILL BE LESS SUBJECT TO FURTHER EROSION.

UNISTORM OPERATING HISTORY
NOVEMBER 2003-- SYSTEM INSTALLED
NOVEMBER 2004 -- FIRST INSPECTION BY TOWN OF AMHERST HIGHWAY DEPARTMENT
MARCH 2005 -- SEDIMENT SAMPLES REMOVED FOR ANALYSIS
JULY 2005 -- EXPECTED FIRST PUMPOUT BY TOWN OF AMHERST HIGHWAY DEPARTMENT

UNISTORM DIMENSIONS
(1) FIRST AND SECOND STAGES EACH 2.5' W X 10'L (5'X10' PRECAST CONCRETE VAULT)
(2) RIM MINUS FLOOR = 9.6' , SUMP DEPTH = 5' , 24" OUTLET PIPE
(3) TOTAL SUMP VOLUME = 240 CF+/- = 1800 GAL+/-

PARADIGM
ENVIRONMENTAL SERVICES, INC.
179 Lake Avenue Rochester, New York 14608 (585) 647-2530 FAX (585) 647-3311

LABORATORY REPORT OF ANALYSIS

Client: Empire Geo Services, Inc.

Client Job Site: Lake Forest North, Amherst, NY

Client Job No.: N/A

Lab Project No.: 05-1140

Sample Type: Soil
Analytical Method: EPA 365.2
Date Sampled: 4/4/2005
Date Received: 4/6/2005
Date Analyzed: 4/14/2005

Lab Sample ID.	Sample Location/Field ID	Total Phosphorus (mg/kg)
4832	Uni-Storm 1st Stage/Dry Sed.	305
4833	Uni -Storm 2nd Stage/Dry Sed.	398
4834	Site Sample/Dry Sed.	275
4835	Uni-Storm 1st Stage/Dry Mineral Sed.	413
4836	Uni-Storm 2nd Stage/Dry Mineral Sed.	383
4837	Site Sample/Dry Mineral Sed.	295

ELAP ID No. 10709

Comments: ND denotes non-detected.

Approved By Technical Director: ____________________
Bruce Hoogesteger

Chain of Custody provides additional sample information.

File ID: TPhosphorus05-1140.xls

ATTACHMENT E

UNISTORM MAINTENANCE

environment21
Global Stormwater Solutions
P.O. Box 55 | East Pembroke | NY 14056
Phone: 1-800-809-2801 | Fax: 1-585-815-4701
www.env21.com | enveng@env21.com
Technology That Separates

UNISTORM SYSTEM MAINTENANCE

1.0 UNISTORM DESCRIPTION

1.1 The Unistorm is a precast concrete structure. It is available in different configurations (e.g., with an at grade inlet grate, flow control, etc.) and with different attachments (e.g., flow control vanes, flow diffusers, etc.).

1.2 The Unistorm System consists of stages of treatment separated by a precast concrete baffle walls. The baffle walls are designed to meet site-specific flow requirements and provide four functions:

(a) Removes floatables and sediment in the inlet stage

(b) Provides a low head loss flow path between the first and second stages

(c) Provides for additional sediment removal in the second stage.

(d) Provides flow control either with vanes mounted on the upstream side of the baffle wall or through diversion baffles.

1.3 The Unistorm Systems are manufactured from standard precast concrete components. These components are designed to reduce the weight that needs to be handled during shipment and installation.

1.4 Normal water depth in the Unistorm System structure sump will be 3-6 ft dependent on the project requirements. This shallow sump reduces excavation costs and the depth to be accessed from a standard vacuum truck (13' lift).

1.5 Cast iron access frames with vented covers are provided in the Unistorm System roof to make the sediment pile readily accessible for measurement and cleaning in each stage of the structure.

2.0 POLLUTANT STORAGE CAPACITY AND CLEANOUT FREQUENCY

2.1 The recommended maintenance practice for the Unistorm System is to plan on quarterly inspections and an annual pump-out based on the following general design guidelines:

2.1.1 Sediment Sump -- the rate at which sediment is accumulated will depend on land use and other pavement activities (e.g., heavy winter sanding will create extra sediment, while regular sweeping will reduce accumulation). The Unistorm System structure sump is designed to store an average sediment pile depth of up to 1.0 ft. Environment 21 recommends that the sediment should be removed when the first-stage sediment pile depth is 6"-12"

2.1.2 Floatables Chambers -- oil sheen and floating debris will be retained in the inlet stage of the Unistorm System. Annual accumulation of floatables is estimated at less than 0.50 feet but can vary depending on land use.

2.1.3 During the first year of operation, Environment 21 recommends visual inspections in January, April, July, and October. This inspection schedule may be modified in subsequent years according to experience or to meet specific stormwater permit requirements.

2.1.4 Refer to the Environment 21 system specific design package for the estimated maintenance interval or call 1-800-809-2801.

3.0 SAFETY

3.1 Safety is a priority and the following are recommended guidelines while performing maintenance on Unistorm Systems. These guidelines are not all-inclusive and by no means are they meant to usurp any safety program already in place for the individuals performing the maintenance on the Unistorm System.

3.1.1 The Unistorm System is a confined space structure but entry into it is not required and is not recommended by Environment 21. The design of the Unistorm System is

such that all of the maintenance may be completed without entry. In the remote chance that entry into the Unistorm System structure is required only trained, qualified workers with the proper Personal Protective Equipment (PPE) should perform the entry.

3.1.1.1 If a personnel entry is required it should be made per OSHA guidelines and any regulations concerning confined space entry, ladder safety, electrical safety (especially around water), environment safety (hazardous atmosphere, weather, etc.), and any other regulations deemed appropriate by local authorities. These regulations are generally minimum requirements so the most stringent of these should be followed. Physical access equipment should be determined by the prevalent conditions. An example would be to use a properly secured approved ladder (e.g., extension ladder) that is in a low traffic volume (both pedestrian and vehicle) area with an obliging terrain (e.g., flat).

3.1.2 The Unistorm System has cast iron access frames with vented covers which provide access to all stages of the Unistorm system. The openings are normally at ground level so the work area should be staged properly with safeguards to prevent anyone or anything from inadvertently falling through an opening in the Unistorm System structure. The access openings provided are usually sized at 24" or 30", dependent on the diameter of the structure, and conform to ASTM C478 specifications.

3.1.3 After maintenance has been completed on the Unistorm System, the area should be cleared of slip and trip hazards and the cast iron vented covers set securely in place.

4.0 FLOATABLES OBSERVATION AND MEASUREMENT

4.1 Maintain an inventory all tools and equipment used for completion of this procedure.

4.2 Obtain a flood light and a rod (measuring rod from step 5.2)

4.3 Set up the work area using proper safety procedures, equipment (e.g., barricades) and PPE as required.

4.4 Carefully remove the cast iron vented covers using proper lifting and rigging equipment; set the covers off to the side in a safe area and safe configuration (e.g., not suspended).

4.5 Illuminate the water surface in the inlet stage of the Unistorm System with the flood light.

4.6 Gently stir the floatables to estimate the depth. Obtain a sample of the floatables, water, or sediment, if required, for waste disposal. The depth of the oil sheen and floating debris will typically be less than one inch and can be skimmed from the surface prior to the pump-out of the sediment. Organic debris that has become waterlogged and settled to the floor is expected to be present in relatively small quantities that will be removed during the pump out of the mineral sediment.

4.7 Inspect all surfaces, which can be seen, of the Unistorm System structure for wear (e.g., cracking, spalling, etc.). Report signs of degradation to the proper authorities (i.e., owner, municipality, etc.).

4.8 Repeat steps 4.6 and 4.7 for other stages of the Unistorm System.

5.0 SEDIMENT PILE DEPTH MEASUREMENT

5.1 Complete section 4.0 of this procedure prior this section.

5.2 Obtain a measuring rod (increments in inches marked on the rod) that will reach the floor of the Unistorm System structure and still extend a minimum of 2' above the cast iron access frame. The rod should not bend.

5.3 Lower the measuring rod into the inlet stage of the Unistorm System structure until a slight resistance to movement occurs; the rod is now at the top of the sediment pile. Obtain a sight measurement by sighting the rod measuring increments to a point on the cover frame.

5.4 Twist the measuring rod into the sediment pile until the measuring rod is on the floor (verify the expected level using project submittal drawings). Obtain a sight measurement by sighting the rod increments to the same point on the access frame as was used in step 5.3. Subtract the smaller number from the larger number as obtained in this step and step 5.3. For example, if the measurement in step 5.3 is 8' 0" and the measurement in step 5.4 is 8' 3" subtract the 8' 0" from the 8' 3". This is the sediment depth of the Unistorm System.

5.5 Repeat steps 5.3 and 5.4 for all other stages of the Unistorm System.

5.5 If pump-out of the Unistorm System is required and will occur immediately go to Section 6.0 of this procedure; if not go to Section 7.0 of this procedure.

6.0 PUMP-OUT OF THE UNISTORM SYSTEM

6.1 Contact the following for approval and notification of the intent to pump out the Unistorm System:

6.1.1 Owner

6.1.1.1 Obtain permission from the Owner to pump out the contents of the Unistorm System.

6.1.2 Waste Disposal Facility

6.1.2.1 Facilities used by the local Highway Department may be acceptable, while, for industrial sites, the pumper truck contents should be delivered to a disposal site approved by the owner of the industrial site and disposed of in accordance with local requirements for disposal of pollutants.

6.1.2.2 Obtain permission to deliver the waste to the facility.

6.1.3 Government Agencies

6.1.3.1 Obtain permission, as required, from local, State and Federal Agencies.

6.2 Obtain a standard truck-mounted sewer and catch basin cleaner with positive displacement rotary lobe vacuum pumps or other acceptable pump-out equipment.

6.3 If the area was secured after the inspection and Section 7.0 was performed complete steps 4.2 and 4.3 of this procedure.

6.4 Using the truck-mounted sewer and catch basin cleaner, suction the floatables and hydrocarbons from the inlet stage. Segregate this waste from the sediment and water as required by the local regulations and the waste facility.

6.5 Using the truck-mounted sewer and catch basin cleaner, suction the standing water and sediment from the inlet stage. Segregate this waste from the hydrocarbons and floatables as required by the local regulations and the waste facility.

6.6 Using the water supply from the vacuum truck wash down the interior surface of the Unistorm system and suction the waste from the bottom of the structure.

6.7 Repeat steps 6.4 through 6.6 for all other stages of the Unistorm System.

6.8 Using a flood light inspect all surfaces, which can be seen, of the Unistorm System structure for wear (e.g., cracking, spalling, etc.). Report signs of degradation to the proper authorities (i.e., owner, municipality, etc.).

6.9 Refill the Unistorm System, with clean water, to the inlet/outlet pipe invert elevation.

6.10 Properly dispose of the waste removed from Unistorm System as pre-arranged

7.0 SECURING THE AREA

7.1 Verify that no personnel, tools or equipment are in the Unistorm System structure.

7.2 Inspect the cast iron access frames and covers for damage (e.g., cracks, excessive wear, etc.).

7.3 Clear the cast iron access frames of any extraneous material and carefully replace the cast iron vented covers using proper lifting and rigging equipment. Verify that the covers are properly seated.

7.4 Remove the site set-up (tools, equipment, etc.) and verify the work area has been returned to its pre-work condition.

7.5 Complete an inventory of all tools and equipment used for this work, accounting for lost, damaged, or stolen tools or equipment.

8.0 RECORD KEEPING

8.1 Maintenance is a very important aspect in keeping the Unistorm System performance up to par. The attached "UNISTORM SYSTEM MAINTENANCE DATA SHEET" is provided and should be used to document the maintenance performed on the Unistorm System.

8.2 Provide a copy of the "UNISTORM SYSTEM MAINTENANCE DATA SHEET" to the owner, required government agencies, and Environment 21, LLC (P.O. Box 55, East Pembroke, NY 14056-1055.

environment 21
Global Stormwater Solutions
P.O. Box 55 | East Pembroke | NY 14056
Phone: 1-800-809-2801 | Fax: 1-585-815-4701
www.env21.com | enveng@env21.com

ENV 21
Technology That Separates

UNISTORM SYSTEM MAINTENANCE DATA SHEET

STRUCTURE NO.:____________ LOCATION:______________________________

OWNER:___________________________ UNISTORM MODEL_______________

DATE INSTALLED:___________ MUNICIPALITY:___________________________

DATE	SEDIMENT PILE DEPTH	OIL SHEEN YES/NO	FLOATABLE DEPTH	PUMPOUT REQ. YES/NO	SAMPLED YES/NO	SAMPLE RESULTS

PUMPOUT DATA (IF APPLICABLE)

DATE	SEDIMENT VOLUME REMOVED	FLOATABLES VOLUME REMOVED	SEDIMENT/FLOATABLE DISPOSAL INFORMATION:	
			WHERE DISPOSED	HOW DISPOSED

environment 21
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PRIOR TO START OF WORK

- OWNER NOTIFIED AS REQUIRED. ☐
- GOVERNMENT AGENCIES NOTIFIED AS REQUIRED. ☐
- DISPOSAL SITE CONTACTED (IF PUMPOUT IS REQUIRED.) ☐
- ALL REQUIRED PPE, TOOLS, AND EQUIPMENT ARE AVAILABLE AND IN GOOD WORKING ORDER. ☐

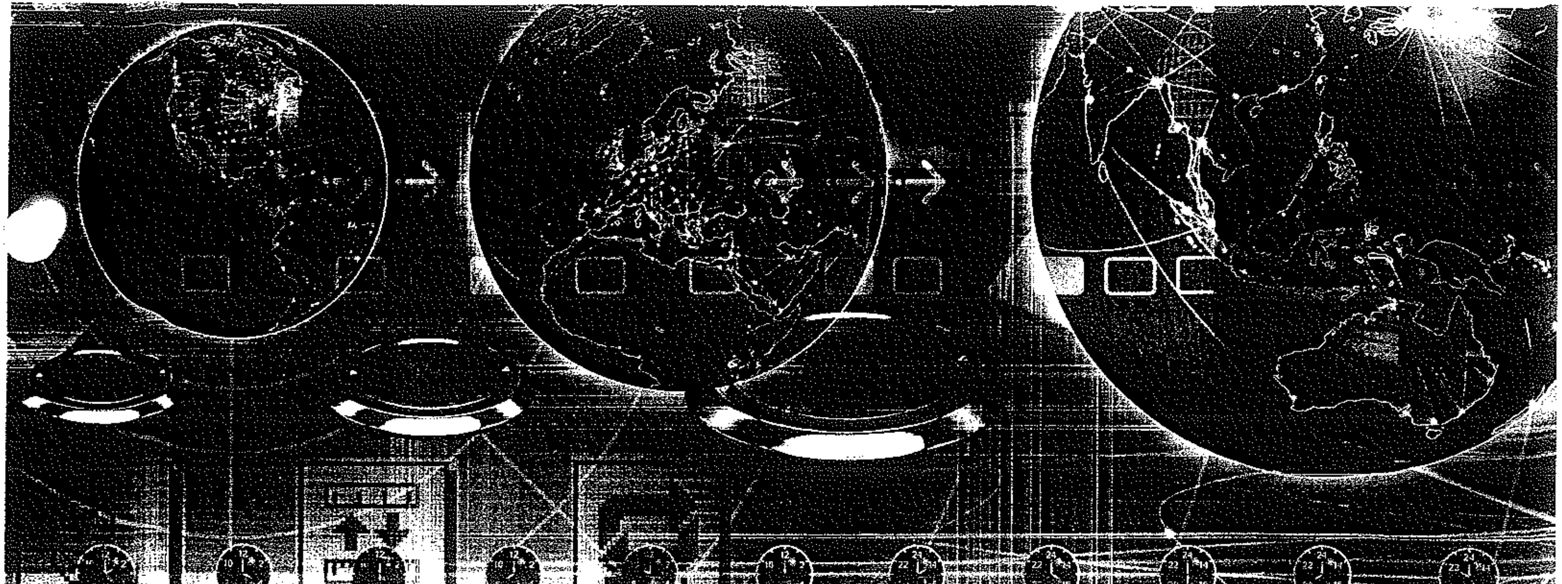
AFTER WORK COMPLETION

- ANY SIGNS OF WEAR NOTED AND REPORTED IF NECESSARY ☐
- UNISTORM SYSTEM HAS BEEN FILLED WITH CLEAN WATER ☐
- ALL CAST IRON COVERS HAVE BEEN PROPERLY REPLACED. ☐
- NO HAZARDOUS CONDITIONS EXIST AS A RESULT OF THE MAINTENANCE WORK. ☐
- ALL PPE, TOOLS, AND EQUIPMENT HAVE BEEN INVENTORIED AND REMOVED FROM THE SITE. ☐
- THE WORK AREA HAS BEEN RETURNED TO A SAFE PRE-WORK CONDITION. ☐
- ALL NOTIFICATIONS HAVE BEEN MADE, AS REQUIRED, THAT THE WORK IS COMPLETED. ☐

DATE: ______________ **SIGNATURE:** ______________________________

ATTACHMENT F

METLER-TOLEDO PRODUCTION CERTIFICATE



Production Certificate

Mettler-Toledo AG
Laboratory & Weighing Technologies
CH-8606 Greifensee, Schweiz

Certificate number: 1128203410
Date of issue: 05/22/2007

Identification of the instrument

Model	XS4002S
Country version	US
Serial number	1128203410
Type definition number of platform	17.33.5.965.490
Software version of platform	4.23
Type definition number of terminal	10.28.0.389.142
Software version of terminal	4.10

Weighing range(s)	Maximum capacity		Readability		Verification scale interval
Max1=	4100 g	d1=	0.01 g	e1=	—
Max2=	—	d2=	—	e2=	—

OIML accuracy class: —

METTLER TOLEDO

Environmental Conditions

Temperature	**22.3** °C
Air pressure (QFE)	**954** hPa
Relative humidity	**54** %

Technical Specifications

	Tolerance	Within tolerance
Repeatability (sd)	**0.008** g	☑
Sensitivity offset	**0.0015** %	☑
Eccentric load	**0.03** g	☑
Linearity	**0.02** g	☑

Stamp and Signatures

METTLER TOLEDO Production Certificate

METTLER TOLEDO is certified according to ISO 9001 and ISO 14001.
The above mentioned balance was produced and metrologically tested by Mettler-Toledo AG. The test results have been found to comply with technical product specifications. We hereby declare that the balance is in conformity with all applicable directives and standards.

Head of Production
D. Steinegger

Director Sales & Marketing
S. v. Wangenheim

 11780593C Printed in Switzerland 0508/40.12 Version 1.20

Mettler-Toledo AG, Laboratory & Weighing Technologies, CH-8606 Greifensee, Switzerland
Phone +41-44-944 22 11, Fax +41-44-944 30 60, Internet: http://www.mt.com

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ATTACHMENT G

BLUE – WHITE DIGIFLO DIGITAL PADDLEWHEEL METERS

Blue-White® Industries, Ltd.

DigiFlo Digital Paddlewheel Meters

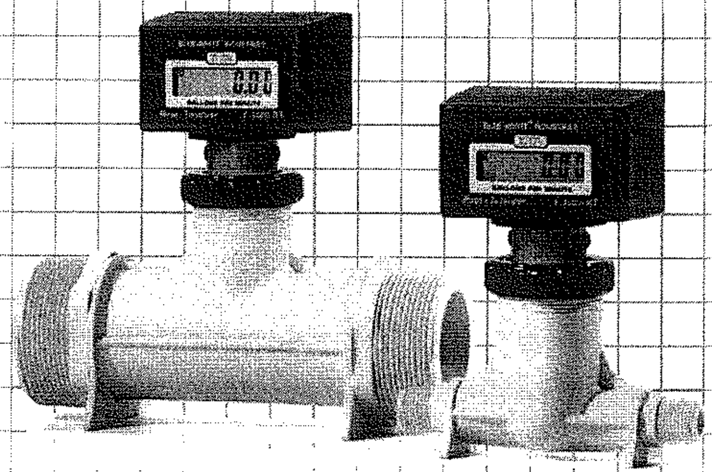
Engineering and Technical Data

F-1000

Molded In-line Fitting

Three Model Variations:

- **Rate of flow display**
- **Total flow display**
- **Rate & Total display**



Features:

- High accuracy digital paddlewheel technology.
- 3/8", 1/2", 3/4", 1", 1-1/2", and 2" male pipe threads.
- Flow rate from .4 to 200 GPM
- Tamper proof factory programming.
- Easy to read 6 digit LCD display, up to 4 decimal places.
- Battery operated (2 AAA batteries included).
- Very low pressure drop.
- Total reset function can be disabled.

Specifications:

Max. working pressure:........300 PSI (20 bar) @ 70° F (21° C)
Max. fluid temperature: ....200° F (93° C) @ 0 PSI
Max. ambient temperature: ..14° to 110° F/ -10° to 43° C
Full scale accuracy:.............+/- 2%
Power requirement: ....2 AAA batteries (included)
Enclosure: ....NEMA 4X (IP56)
Maximum pressure drop:.....8 PSI (varies per model)
Approximate shipping wt: ...2 lb. (.91 kg)

Materials of Construction:

Pipe fitting: ....Polypropylene (options: PVDF)
Sensor, paddlewheel, axle: ..PVDF
Sensor O-ring seals:............Viton® (optional EP)
Enclosure: ....ABS

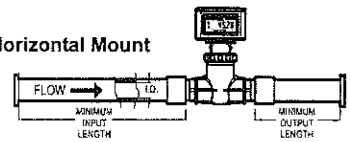
Installation Requirements:

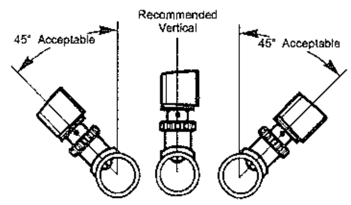
Minimum Straight Pipe Length Requirements

The meter's accuracy is affected by disturbances such as pumps, elbows, tees, valves, etc., in the flow stream. Install the meter in a straight run of pipe **as far as possible** from any disturbances. The distance required for accuracy will depend on the type of disturbance.

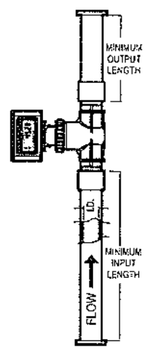
Type Of Disturbance	Minimum Inlet Pipe Length	Minimum Outlet Pipe Length
Flange	10 X Pipe I.D.	5 X Pipe I.D.
Reducer	15 X Pipe I.D.	5 X Pipe I.D.
90° Elbow	20 X Pipe I.D.	5 X Pipe I.D.
Two Elbows -1 Direction	25 X Pipe I.D.	5 X Pipe I.D.
Two Elbows -2 Directions	40 X Pipe I.D.	5 X Pipe I.D.
Pump Or Gate Valves	50 X Pipe I.D.	5 X Pipe I.D.

Horizontal Mount





Angle Mount on Horizontal Pipe



Vertical Mount

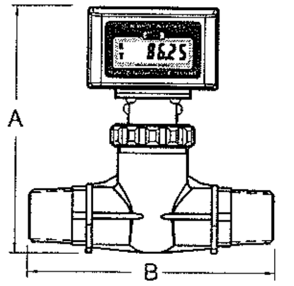
Mounting location

- The meter is designed to withstand outdoor conditions. A cool, dry location, where the unit can be easily serviced is recommended.
- The meter can be mounted on horizontal or vertical runs of pipe. Mounting at the vertical (twelve o'clock) position on horizontal pipe is recommended. Mounting anywhere around the diameter of vertical pipe is acceptable, however, the pipe must be completely full of water at all times. Back pressure is essential on downward flows. See the minimum straight length of pipe requirement chart above.
- The meter can accurately measure flow from either direction.

Blue-White Industries, Ltd.

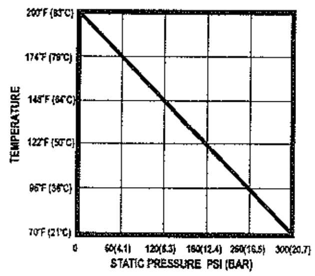
DigiFlo Digital Paddlewheel Meters

Dimensions:



Pipe Size	A	B
3/8"	5-3/8" (137)	4-3/4" (121)
1/2"	5-3/8" (137)	5-1/8" (130)
3/4"	5-5/8" (143)	5-1/4" (133)
1"	5-5/8" (143)	5-5/8" (143)
1-1/2"	6-1/8" (156)	6-1/2" (165)
2"	6-3/8" (162)	6-3/4" (171)

Inches (mm)



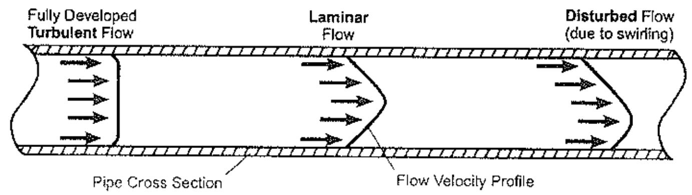
Flow Stream Requirements:

Measuring accuracy requires a fully developed ***turbulent*** flow profile. Pulsating, swirling and other disruptions in the flow stream will effect accuracy. Flow conditions with a ***Reynolds Number*** greater than 4000 will result in a fully developed ***turbulent*** flow. A Reynolds Number less than 2000 is ***laminar*** flow and may result in inaccurate readings.

REYNOLDS NUMBER EQUATION:

$$\text{REYNOLDS NUMBER} = \frac{3160 \times Q \times G}{D \times V}$$

Where:
Flow rate of the fluid in GPM = Q
Specific gravity of the fluid = G
Pipe inside diameter in inches = D
Fluid viscocity in centepoise = V



Pipe Size, Flow Range and Display Model Options:

Models with Polypropylene Pipe Fitting Material

	GPM MODELS				LPM MODELS			
Pipe Size M/NPT	GPM Range	RATE ONLY Model Number	TOTAL ONLY Model Number	RATE & TOTAL Model Number	LPM Range	RATE ONLY Model Number	TOTAL ONLY Model Number	RATE & TOTAL Model Number
3/8"	.8 to 8	RB-375MI-GPM1	TB-375MI-GPM1	RT-375MI-GPM1	3 to 30	RB-375MI-LPM1	TB-375MI-LPM1	RT-375MI-LPM1
3/8"	.4 to 4	RB-375MI-GPM2	TB-375MI-GPM2	RT-375MI-GPM2	1 to 10	RB-375MI-LPM2	TB-375MI-LPM2	RT-375MI-LPM2
1/2"	2 to 20	RB-500MI-GPM1	TB-500MI-GPM1	RT-500MI-GPM1	7 to 70	RB-500MI-LPM1	TB-500MI-LPM1	RT-500MI-LPM1
1/2"	.5 to 5	RB-500MI-GPM2	TB-500MI-GPM2	RT-500MI-GPM2	2 to 20	RB-500MI-LPM2	TB-500MI-LPM2	RT-500MI-LPM2
3/4"	3 to 30	RB-750MI-GPM1	TB-750MI-GPM1	RT-750MI-GPM1	11 to 110	RB-750MI-LPM1	TB-750MI-LPM1	RT-750MI-LPM1
3/4"	.8 to 8	RB-750MI-GPM2	TB-750MI-GPM2	RT-750MI-GPM2	3 to 30	RB-750MI-LPM2	TB-750MI-LPM2	RT-750MI-LPM2
1"	5 to 50	RB-100MI-GPM1	TB-100MI-GPM1	RT-100MI-GPM1	20 to 200	RB-100MI-LPM1	TB-100MI-LPM1	RT-100MI-LPM1
1"	2 to 20	RB-100MI-GPM2	TB-100MI-GPM2	RT-100MI-GPM2	7 to 70	RB-100MI-LPM2	TB-100MI-LPM2	RT-100MI-LPM2
1-1/2"	4 to 40	RB-150MI-GPM1	TB-150MI-GPM1	RT-150MI-GPM1	15 to 150	RB-150MI-LPM1	TB-150MI-LPM1	RT-150MI-LPM1
1-1/2"	6 to 60	RB-150MI-GPM2	TB-150MI-GPM2	RT-150MI-GPM2	25 to 250	RB-150MI-LPM2	TB-150MI-LPM2	RT-150MI-LPM2
1-1/2"	10 to 100	RB-150MI-GPM3	TB-150MI-GPM3	RT-150MI-GPM3	40 to 400	RB-150MI-LPM3	TB-150MI-LPM3	RT-150MI-LPM3
2"	4 to 40	RB-200MI-GPM1	TB-200MI-GPM1	RT-200MI-GPM1	15 to 150	RB-200MI-LPM1	TB-200MI-LPM1	RT-200MI-LPM1
2"	6 to 60	RB-200MI-GPM2	TB-200MI-GPM2	RT-200MI-GPM2	25 to 250	RB-200MI-LPM2	TB-200MI-LPM2	RT-200MI-LPM2
2"	10 to 100	RB-200MI-GPM3	TB-200MI-GPM3	RT-200MI-GPM3	40 to 400	RB-200MI-LPM3	TB-200MI-LPM3	RT-200MI-LPM3
2"	20 to 200	RB-200MI-GPM4	TB-200MI-GPM4	RT-200MI-GPM4	70 to 700	RB-200MI-LPM4	TB-200MI-LPM4	RT-200MI-LPM4

Models with PVDF Pipe Fitting Material

3/8"	.8 to 8	RB-375FI-GPM1	TB-375FI-GPM1	RT-375FI-GPM1	3 to 30	RB-375FI-LPM1	TB-375FI-LPM1	RT-375FI-LPM1
3/8"	.4 to 4	RB-375FI-GPM2	TB-375FI-GPM2	RT-375FI-GPM2	1 to 10	RB-375FI-LPM2	TB-375FI-LPM2	RT-375FI-LPM2
1/2"	2 to 20	RB-500FI-GPM1	TB-500FI-GPM1	RT-500FI-GPM1	7 to 70	RB-500FI-LPM1	TB-500FI-LPM1	RT-500FI-LPM1
1/2"	.5 to 5	RB-500FI-GPM2	TB-500FI-GPM2	RT-500FI-GPM2	2 to 20	RB-500FI-LPM2	TB-500FI-LPM2	RT-500FI-LPM2
3/4"	3 to 30	RB-750FI-GPM1	TB-750FI-GPM1	RT-750FI-GPM1	11 to 110	RB-750FI-LPM1	TB-750FI-LPM1	RT-750FI-LPM1
3/4"	.8 to 8	RB-750FI-GPM2	TB-750FI-GPM2	RT-750FI-GPM2	3 to 30	RB-750FI-LPM2	TB-750FI-LPM2	RT-750FI-LPM2
1"	5 to 50	RB-100FI-GPM1	TB-100FI-GPM1	RT-100FI-GPM1	20 to 200	RB-100FI-LPM1	TB-100FI-LPM1	RT-100FI-LPM1
1"	2 to 20	RB-100FI-GPM2	TB-100FI-GPM2	RT-100FI-GPM2	7 to 70	RB-100FI-LPM2	TB-100FI-LPM2	RT-100FI-LPM2
1-1/2"	4 to 40	RB-150FI-GPM1	TB-150FI-GPM1	RT-150FI-GPM1	15 to 150	RB-150FI-LPM1	TB-150FI-LPM1	RT-150FI-LPM1
1-1/2"	6 to 60	RB-150FI-GPM2	TB-150FI-GPM2	RT-150FI-GPM2	25 to 250	RB-150FI-LPM2	TB-150FI-LPM2	RT-150FI-LPM2
1-1/2"	10 to 100	RB-150FI-GPM3	TB-150FI-GPM3	RT-150FI-GPM3	40 to 400	RB-150FI-LPM3	TB-150FI-LPM3	RT-150FI-LPM3
2"	4 to 40	RB-200FI-GPM1	TB-200FI-GPM1	RT-200FI-GPM1	15 to 150	RB-200FI-LPM1	TB-200FI-LPM1	RT-200FI-LPM1
2"	6 to 60	RB-200FI-GPM2	TB-200FI-GPM2	RT-200FI-GPM2	25 to 250	RB-200FI-LPM2	TB-200FI-LPM2	RT-200FI-LPM2
2"	10 to 100	RB-200FI-GPM3	TB-200FI-GPM3	RT-200FI-GPM3	40 to 400	RB-200FI-LPM3	TB-200FI-LPM3	RT-200FI-LPM3
2"	20 to 200	RB-200FI-GPM4	TB-200FI-GPM4	RT-200FI-GPM4	70 to 700	RB-200FI-LPM4	TB-200FI-LPM4	RT-200FI-LPM4

Blue-White Industries, Ltd.
5300 Business Drive, Huntington Beach, CA 92649
Tel: 714-893-8529 Fax: 714-894-9492
www.blue-white.com Email: sales@blue-white.com

Technical data sheet #85000-022 rev.080106

ATTACHMENT H

GOULDS PUMP WS_B SERIES MODEL 3886

ITT

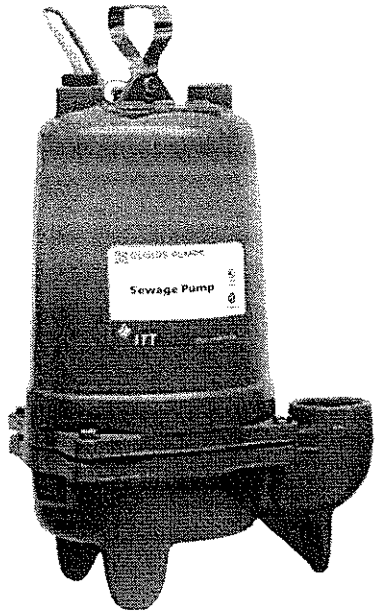
Wastewater

Goulds Pumps

WS_B Series Model 3886

Submersible Sewage Pump

PROSURANCE AVAILABLE FOR RESIDENTIAL APPLICATIONS.



FEATURES

- **Impeller:** Cast iron, semi-open, dynamically balanced, non-clog with pump out vanes for mechanical seal protection. Optional Silicon bronze impeller available.
- **Casing:** Cast iron volute type for maximum efficiency. Designed for easy installation on A10-20 guide rail or base elbow rail systems.
- **Mechanical Seal:** SILICON CARBIDE VS. SILICON CARBIDE sealing faces for superior abrasive resistance, stainless steel metal parts, BUNA-N elastomers.
- **Shaft:** Corrosion-resistant stainless steel. Threaded design. Locknut on all models to guard against component damage on accidental reverse rotation.
- **Fasteners:** 300 series stainless steel.
- Capable of running dry without damage to components.
- Designed for continuous operation when fully submerged.

GOULDS PUMPS

Goulds Pumps is a brand of ITT Corporation.

www.goulds.com

Engineered for life

AGENCY LISTINGS

Tested to UL 778 and CSA 22.2 108 Standards
By Canadian Standards Association
File #LR38549

Goulds Pumps is ISO 9001 Registered.

ITT

GOULDS PUMPS
Wastewater

APPLICATIONS

Specifically designed for the following uses:

- Homes
- Sewage systems
- Dewatering/Effluent
- Water transfer

SPECIFICATIONS

Pump:

- Solids handling capabilities: 2" maximum.
- Discharge size: 2" NPT.
- Capacities: up to 185 GPM.
- Total heads: up to 38 feet TDH.
- Temperature: 104°F (40°C) continuous, 140°F (60°C) intermittent.

MOTORS

- Fully submerged in high grade turbine oil for lubrication and efficient heat transfer. All ratings are within the working limits of the motor.
- **Class B insulation.**

Single phase (60 Hz):

- All single phase models feature capacitor start motors for maximum starting torque.
- Built-in overload with automatic reset.
- SJTOW or STOW severe duty oil and water resistant power cords.
- ⅓ – 1 HP models have NEMA three prong grounding plugs.

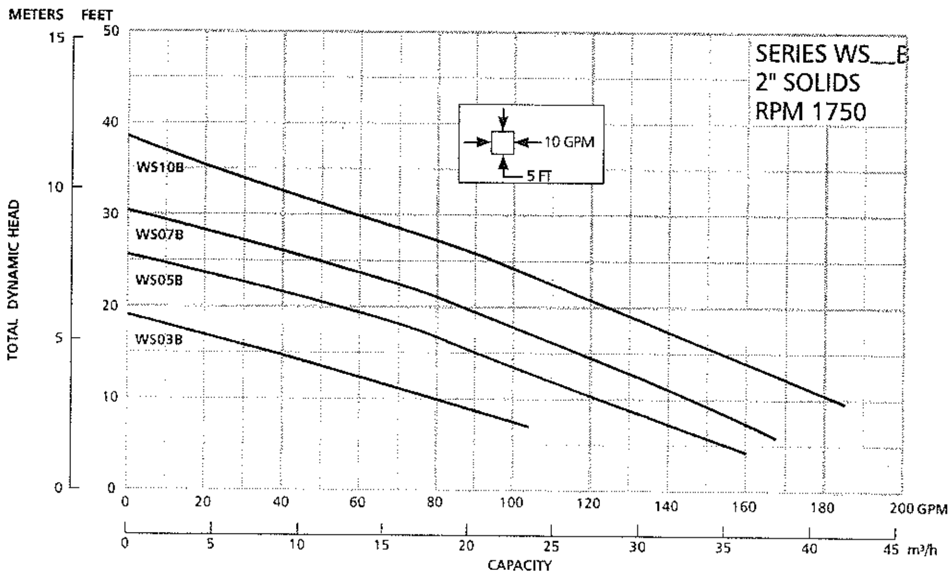
Three phase (60 Hz):

- Class 10 overload protection must be provided in separately ordered starter unit.
- STOW power cords all have bare lead cord ends.

- **Bearings:** Upper and lower heavy duty ball bearing construction.
- **Designed for Continuous Operation:** Pump ratings are within the motor manufacturer's recommended working limits, can be operated continuously without damage when fully submerged.
- **Power Cable:** Severe duty rated, oil and water resistant. Epoxy seal on motor end provides secondary moisture barrier in case of outer jacket damage and to prevent oil wicking. Standard cord is 20'. Optional lengths are available.
- **Motor Cover O-ring:** Assures positive sealing against contaminants and oil leakage.

MODELS

ORDER NUMBER	HP	PHASE	VOLTS	RPM	IMPELLER DIA. (in.)	MAX. AMPS	LRA	KVA CODE	FULL LOAD MOTOR EFF.	RESISTANCE		WT. (LBS.)
										START	LINE-LINE	
WS0311B			115			10.7	30.0	M	54	11.9	1.7	
WS0318B	0.33		208		4.69	6.8	19.5	K	51	9.1	4.2	63
WS0312B		1	230			4.9	14.1	L	53	14.5	8.0	
WS0511B			115			14.5	31.1	J	55	9.3	1.4	
WS0518B			208			8.0	19.5	K	51	9.1	4.2	
WS0512B			230			7.3	16.5	J	54	11.7	5.6	
WS0538B	0.5		200		5.00	3.8	12.3	K	75	NA	6.7	65
WS0532B		3	230			3.3	9.7	K	75	NA	9.9	
WS0534B			460			1.7	4.9	K	75	NA	39.4	
WS0537B			575			1.4	4.3	K	68	NA	47.8	
WS0718B		1	208	1750		11.0	39.0	K	65	2.6	1.4	
WS0712B			230			9.4	24.8	J	57	4.8	2.3	
WS0738B	0.75		200		5.38	4.1	21.2	H	74	NA	4.3	
WS0732B		3	230			3.6	17.3	J	76	NA	5.6	
WS0734B			460			1.8	8.9	J	76	NA	22.4	
WS0737B			575			1.5	7.3	J	71	NA	29.2	
WS1018B		1	208			14.0	39.0	K	65	2.6	1.4	85
WS1012B			230			12.3	30.5	H	60	4.3	1.8	
WS1038B	1		200		5.75	6.0	21.2	H	74	NA	4.3	
WS1032B		3	230			5.8	17.3	J	76	NA	5.6	
WS1034B			460			2.9	8.9	J	76	NA	22.4	
WS1037B			575			2.4	7.3	J	71	NA	29.2	



ITT

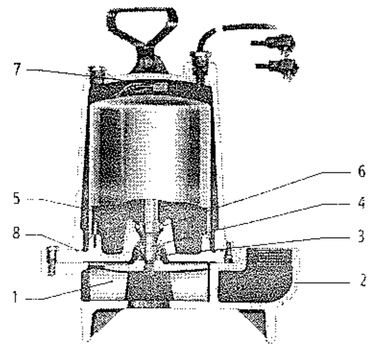
Wastewater

PERFORMANCE RATINGS (gallons per minute)

Order No.		WS03B	WS05B	WS07B	WS10B
	HP ▶	⅓	½	¾	1
	RPM ▶	1750	1750	1750	1750
Total Head Feet of Water	10 ▶	80	122	145	183
	15	36	90	116	152
	20	–	50	86	123
	25	–	–	48	95
	30	–	–	–	58
	35	–	–	–	20

COMPONENTS (for reference only)

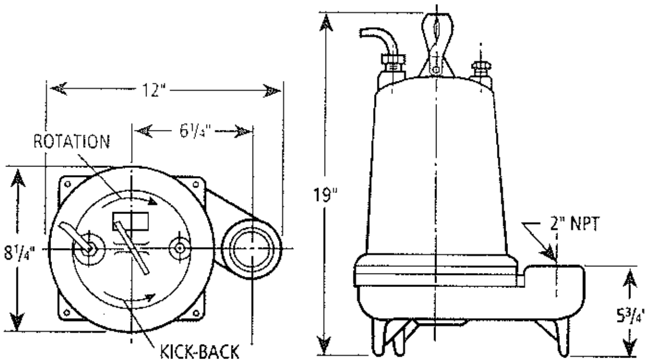
Item No.	Description
1	Impeller
2	Casing
3	Mechanical Seal
4	Motor Shaft
5	Motor
6	Ball Bearings
7	Power Cable
8	Casing O-Ring



NOTE: *For specific parts break-down, see repair parts.*

DIMENSIONS

(All dimensions are in inches. Do not use for construction purposes.)



GOULDS PUMPS

B3886 March, 2007

Engineered for life

ATTACHMENT I

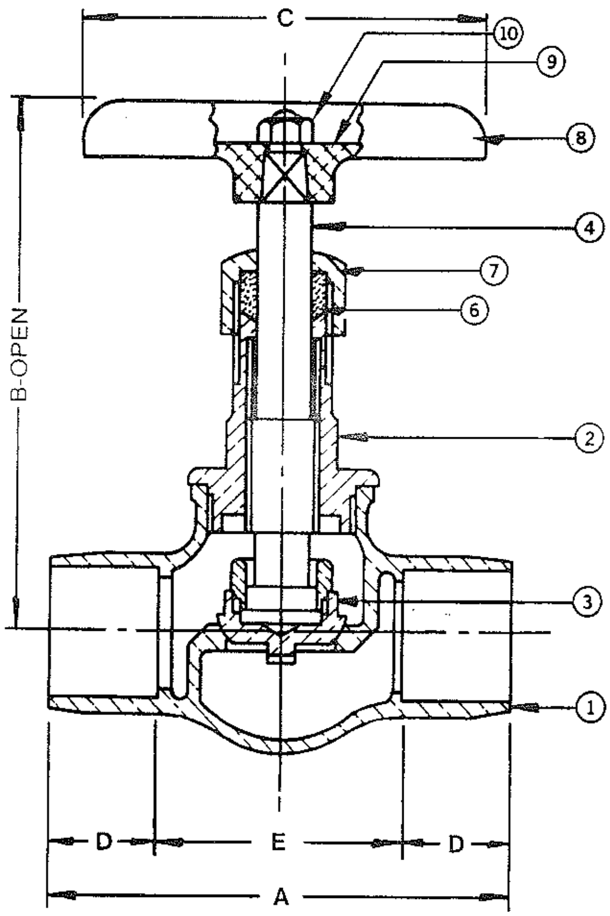
HAMMOND GLOBE VALVE IB418

GLOBE IB418

BRONZE

125 lb. SWP-200 lb. WOG† • Plumbing and Heating
Bronze Disc • Threaded Bonnet • Sweat Ends

3/8" and 1/2" sizes have the disc integral with the stem and have no disc ring.



SPECIFICATIONS

IB418	Conforms to: MSS SP-80. Type 1, Class 125, Soldered Ends.

MATERIAL LIST

NO.	PART	MATERIAL	SPECIFICATION
1	Body	Bronze	ASTM B 62
2	Bonnet	Bronze	ASTM B 62
3	Disc	Bronze	ASTM B 62
4	Stem	Bronze	ASTM B 62
5	Disc Ring	Brass	ASTM B 16 3/4" to 2" Incl.
6	Packing	Non-Asbestos	Commercial
7	Packing Nut	Brass	Commercial
8	Handwheel	Mall. Iron	Commercial
9	Identification Plate	Aluminum	Commercial
10	Handwheel Nut	Brass	Commercial

DIMENSIONS - INCHES / MILIMETERS							
Units	Size	A	B	C	D	E	C_V
Inches	3/8	2.00	3.19	2.00	0.38	1.25	0.61
mm	9.53	50.80	80.98	50.80	9.53	31.75	
Inches	1/2	2.44	3.75	2.25	0.50	1.44	1.16
mm	12.70	61.91	95.25	57.15	12.70	36.53	
Inches	3/4	3.19	4.00	2.50	0.75	1.69	2.21
mm	19.05	80.98	101.60	63.50	19.05	42.88	
Inches	1	3.69	4.38	2.75	0.91	1.88	3.64
mm	25.40	93.66	111.13	69.85	23.01	47.63	
Inches	1 1/4	4.19	5.13	3.13	0.97	2.25	6.65
mm	31.75	106.38	130.18	79.38	24.61	57.15	
Inches	1 1/2	4.75	5.63	3.50	1.09	2.56	11.10
mm	38.10	120.65	142.88	88.90	27.79	65.10	
Inches	2	5.94	6.69	4.00	1.34	3.25	20.00
mm	50.80	150.83	169.88	101.60	34.13	82.55	

† Non-Shock

Rev. 2

BETTER AT EVERY TURN

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Global Stormwater Solutions
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ATTACHMENT J

ROSEDALE HIGH CAPACITY FILTER BAGS

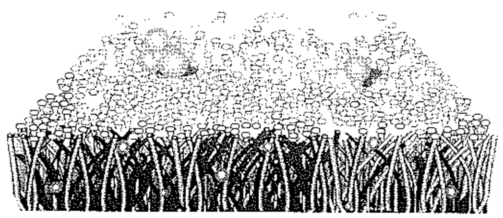
High-Capacity Filter Bags for Rosedale Bag Filters

Fits All Rosedale Filter Housings

Construction

Felt Bags-Standard Grade

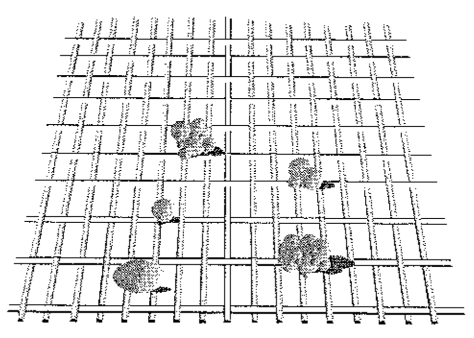
Felt construction is generally chosen where smaller particle retention is required, in the nominal 1 to 100 micron range. It offers higher solids loading capacity than mesh. General-purpose felt bags are offered in polyester and polypropylene materials. Special-purpose felt bags are offered in polyester and polypropylene materials. Special-purpose felt bags include high temperature service (to 500°F) bags of Nomex® nylon or Teflon®.



Mesh Bags

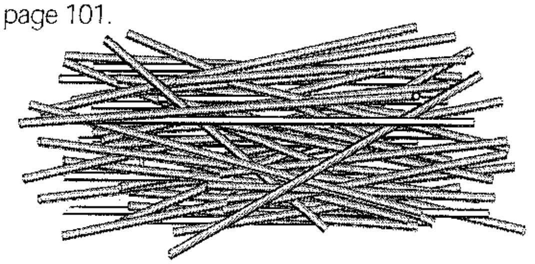
Mesh is a woven construction, generally used where micron ratings of 50 to 800 are required.

Two types are offered. The **multifilament** mesh is a low cost, disposable material offered in polyester. **Monofilament** mesh has higher strength, and is available in nylon. (It should be considered cleanable.)



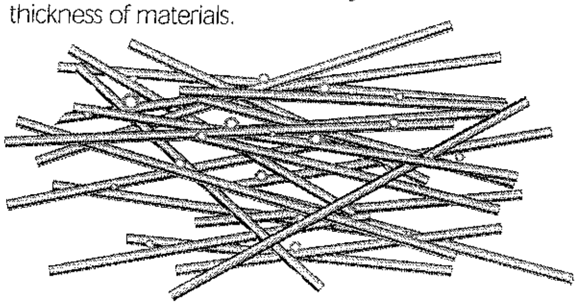
Oil Adsorption Bags

For removal of free oil, bags made of polypropylene microfibers, known as oil-adsorb, are available. A size 2 oil-adsorb bag will remove approximately a half-pound of oil from a water-oil liquid. It is only available with a 25 micron rating. If finer filtration is needed in an oil removal task, or high volume oil removal is required, Rosedale's Sorbent Containment Systems are available and information is located on page 101.



Melt Blown Media (Microfiber)

Polypropylene melt blown media offers unparalleled adsorption capacity for the removal of hydrocarbon contaminates from liquid streams. The melt blown media is also the heart of the high efficiency filter bag. The small diameter fibers create the bag's ability to remove fine particulate at high efficiencies. Fiber diameter is important because the pore size is a function of fiber diameter, density of fibers, and thickness of materials.



Felt Bag Finishes and Covers

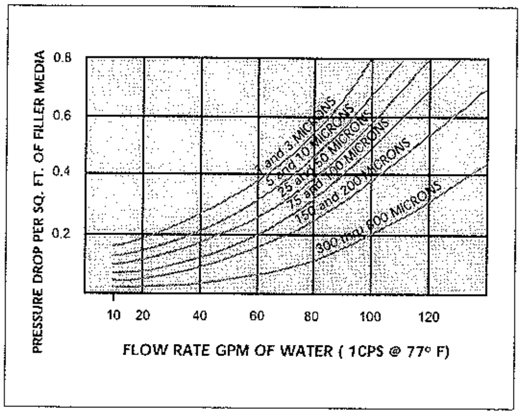
Standard finish. Plain, as manufactured, without treatment or covers.

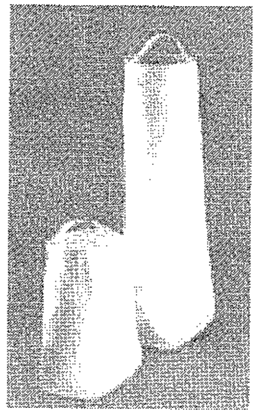
Glazed finish. The outer most surface fibers are melted by a momentary application of high heat. This bonds the fibers together and reduces the possibility of fiber migration.

Mesh covers completely encase the felt bag. This cover acts to contain any fibers that may separate from the filter bag. Materials available in mono and multifilament mesh, spun bonded nylon and polyester.

Pressure Drop Data

The graph shows pressure drop through clean filter bag media of various micron ratings. The curves do not consider pressure drop through the filter housing.





Bag Size Correction

To obtain pressure drop correction for a specific bag size, divide the pressure drop obtained from the graph by the area of the bag.

Viscosity Correction

If viscosity is higher than one, multiply the corrected pressure drop as obtained above by the appropriate viscosity correction factor.

Bag Size	Surface Area (sq. ft.)	Viscosity (cps)	Correction Factor
		50	4.5
		100	8.3
1	2.0	200	16.6
1 (inner)	1.6	400	27.7
2	4.4	800	50.0
2 (inner)	3.6	1000	56.2
3	0.5	1500	77.2
4	1.0	2000	113.6
7	1.8	4000	161.0
8	2.0	6000	250.0
9	3.4	8000	325.0
12	5.6	10000	430.0

Standard Fibers And Micron Ratings
Available Micron Ratings

Construction	Fiber	1	3	5	10	15	25	50	75	100	125	150	175	200	250	300	400	600	800
Felts	Polyester	•	•	•	•	•	•	•	•	•				•					
	Oil-Adsorb (pp)						•												
	Polypropylene	•	•	•	•		•	•		•									
	Nomex (Nylon)			•	•		•	•		•									
	Teflon®				•														
Multifilament Meshes	Polyester								•	•	•	•		•	•	•	•		•
	Nylon									•		•							•
Monofilament Meshes	Polypropylene															•		•	
	Nylon			•	•		•	•	•	•	•	•	•	•	•	•	•	•	•

Compatibility and Temperature Limits For Standard Bag Materials*

Compatibility With

Fiber	Organic Solvents	Animal Vegetable & Petro Oils	Micro-Organisms	Alkalies	Organic Acids	Oxidizing Agents	Mineral Acids	Temperature Limitations (max. deg. F)
Polyester	Excellent	Excellent	Excellent	Good	Good	Good	Good	325
Polypropylene	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Good	225
Nylon	Excellent	Excellent	Excellent	Good	Fair	Poor	Poor	325
Nomex Nylon	Excellent	Excellent	Excellent	Good	Fair	Poor	Poor	450
Teflon	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	500

* Chart is to be used as a guide. User should make tests with specific media to assure compatibility

Filter Bag Sizes

Used on Rosedale Model No.	Bag Size	Length (inches)	Diameter (inches)	Surface Area (sq. ft.)	Bag Volume (gallons)
4-6	3	8	4.12	0.5	0.5
4-12	4	14	4.12	1.0	1.0
6-12	7	15	5.62	1.3	1.3
6-18	8	21	5.62	2.0	1.5
6-30	9	32	5.62	3.4	2.8
8-15	1	16.5	7.06	2.0	2.1
	1 (inner)	14.5	5.75	1.6	1.7
8-30	2	32	7.06	4.4	4.6
and 16 thru 36	2 (inner)	30	5.75	3.6	3.8
LCO	12	32	8.37	5.6	6.0

How To Order

Build an ordering code as shown in this example.
Micron ratings are nominally rated - see page 000 for absolute crossover rating.

Example: PE-25 - P - 7 - S - SS

FIBER AND MICRON RATINGS

Felt, polyester = **PE**
Microns: **1, 3, 5, 10, 15, 25, 50, 75, 100, 200**

Felt, polypropylene = **PO**
Microns: **1, 3, 5, 10, 25, 50, 100**

Felt, Oil-Adsorb, 25-micron = **OA 25**

Felt, Nomex = **HT**
Microns: **5, 10, 25, 50, 100**

Felt, Teflon, 10-micron = **TE 10**

Mesh, monofilament = **NMO**
Microns: **5,10, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 400, 600, 800**

Mesh, monofilament polypropylene = **PMO**
Microns: **300, 600**

Mesh, multifilament polyester = **PEM**
Microns: **75, 100, 125, 150, 200, 250, 300, 400, 800**

ADDITIONAL OPTIONS

SS = Stainless steel ring

BAG STYLE

S = Plated ring

BAG DIMENSIONS

Symbol	Dia. (in.)	Length (in.)	Housing Model
1	7-1/16	16-1/2	8-15
2	7-1/16	32	8-30
3	4-1/8	8	4-6
4	4-1/8	14	4-12
7	5-5/8	15	6-12
8	5-5/8	21	6-18
9	5-5/8	32	6-30
12	8-3/8	32	LCO

BAG FINISH OR COVER

P = None (standard)
G = Fiber-free glazed finish
C = Spun-bonded nylon cover (Cerex)
R = Spun-bonded polyester (Remay) cover

Inner Bags for Model 8 or Multibag Filters

To order inner bags, use a second, separate ordering code. It should be built using the system shown above, but prefixed by the symbol "IN". **Example: IN–PE 25 P 2 S-SS**

ATTACHMENT K

ADVANTECH CERTIFICATES OF COMPLIANCE

CERTIFICATE OF COMPLIANCE

to specifications of

ASTM - American Society for Testing and Materials

ANSI - American National Standards Institute

ISO - International Standards Organization

This is to certify that the openings in the wire cloth of this test sieve have been checked through advanced optical technology to assure conformity to ASTM Specification E-11.

The dimensions of the test sieve frame have also been checked with precision gauges to assure conformity to these specifications.

70BS8F368772

ISSUE DATE: 3/28/2007

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100BS8F374108

ISSUE DATE: 5/10/2007

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120BS8F382523

ISSUE DATE: 9/14/2007

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140BS8F368780

ISSUE DATE: 5/15/2007

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170BS8F388656

ISSUE DATE: 9/19/2007

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200BS8F381164

ISSUE DATE: 7/24/2007

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270BS8F385931

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ISSUE DATE: 9/14/2007

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Global Stormwater Solutions
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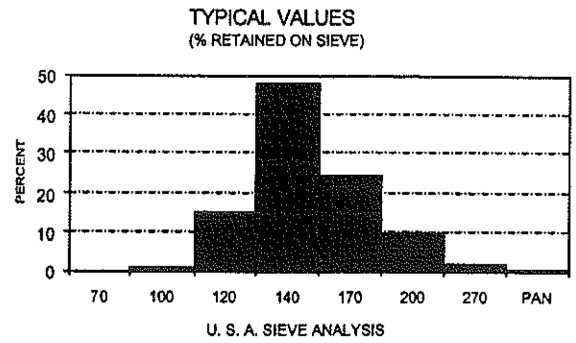
Phone: 1-800-809-2801 | Fax: 1-585-815-4701
www.env21.com | enveng@env21.com

ATTACHMENT L

U.S. SILICA PRODUCT DATA

PRODUCT DATA



OK-110

UNGROUND SILICA

PLANT: MILL CREEK, OKLAHOMA

		TYPICAL VALUES		
USA STD SIEVE SIZE		% RETAINED		% PASSING
MESH	MILLIMETERS	INDIVIDUAL	CUMULATIVE	CUMULATIVE
70	0.212	0.0	0.0	100.0
100	0.150	1.0	1.0	99.0
120	0.125	15.0	16.0	84.0
140	0.106	48.0	64.0	36.0
170	0.088	24.2	88.2	11.8
200	0.075	9.7	97.9	2.1
270	0.053	1.9	99.8	0.2
PAN		0.2	100.0	0.0

TYPICAL PHYSICAL PROPERTIES

AFS[(1)] ACID DEMAND (@pH 7) 0.5
AFS[(] GRAIN FINENESS 119
COLOR .... WHITE
GRAIN SHAPE .... ROUND
HARDNESS (Mohs) 7

(1) AMERICAN FOUNDRYMEN'S SOCIETY

MELTING POINT (Degrees F) 3100
MINERAL .... QUARTZ
MOISTURE CONTENT (%) .... <0.2
pH 7.2
SPECIFIC GRAVITY 2.65

TYPICAL CHEMICAL ANALYSIS, %

SiO_2 (Silicon Dioxide) 99.6
Fe_2O_3 (Iron Oxide) 0.018
Al_2O_3 (Aluminum Oxide) 0.10
TiO_2 (Titanium Dioxide) .... <0.01
CaO (Calcium Oxide) .... <0.01

MgO (Magnesium Oxide) .... <0.01
Na_2O (Sodium Oxide) .... <0.01
K_2O (Potassium Oxide) 0.05
LOI (Loss On Ignition) 0.1

<u>DISCLAIMER</u>: The information set forth in this Product Data Sheet represents typical properties of the product described; the information and the typical values are not specifications. U.S. Silica Company makes no representation or warranty concerning the Products, expressed or implied, by this Product Data Sheet.

<u>WARNING</u>: The product contains crystalline silica - quartz, which can cause silicosis (an occupational lung disease) and lung cancer. **For detailed information on the potential health effect of crystalline silica - quartz, see the U.S. Silica Company Material Safety Data Sheet.**

March 1, 2002

U.S. Silica Company P.O. Box 187, Berkeley Springs, WV 25411-0187 (304) 258-2500

ATTACHMENT M

LAB MODEL PICTURES

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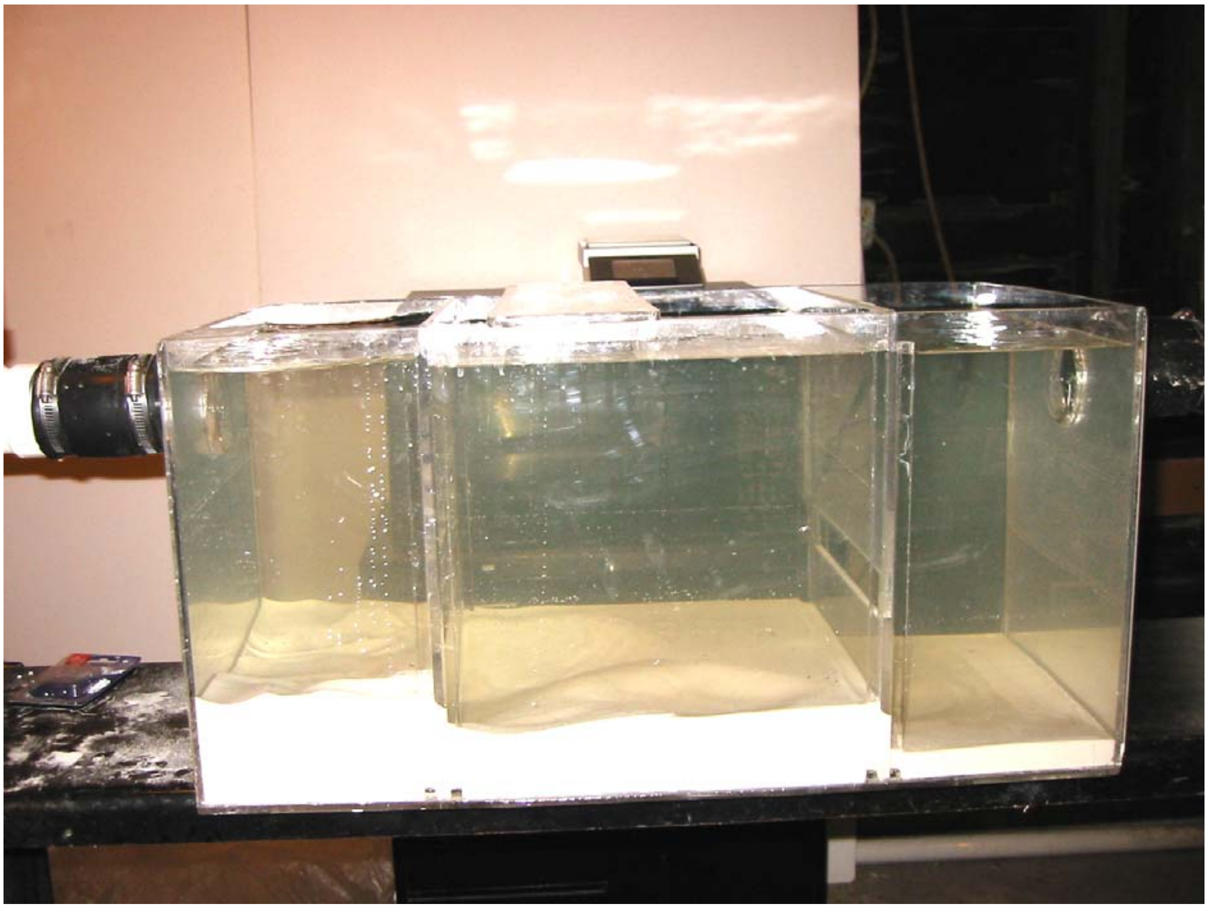

SCALE MODEL DURING NO SCOUR AND NO RE-SUSPENSION TEST

NOTE: NO RE-SUSPENSION IS EVIDENT

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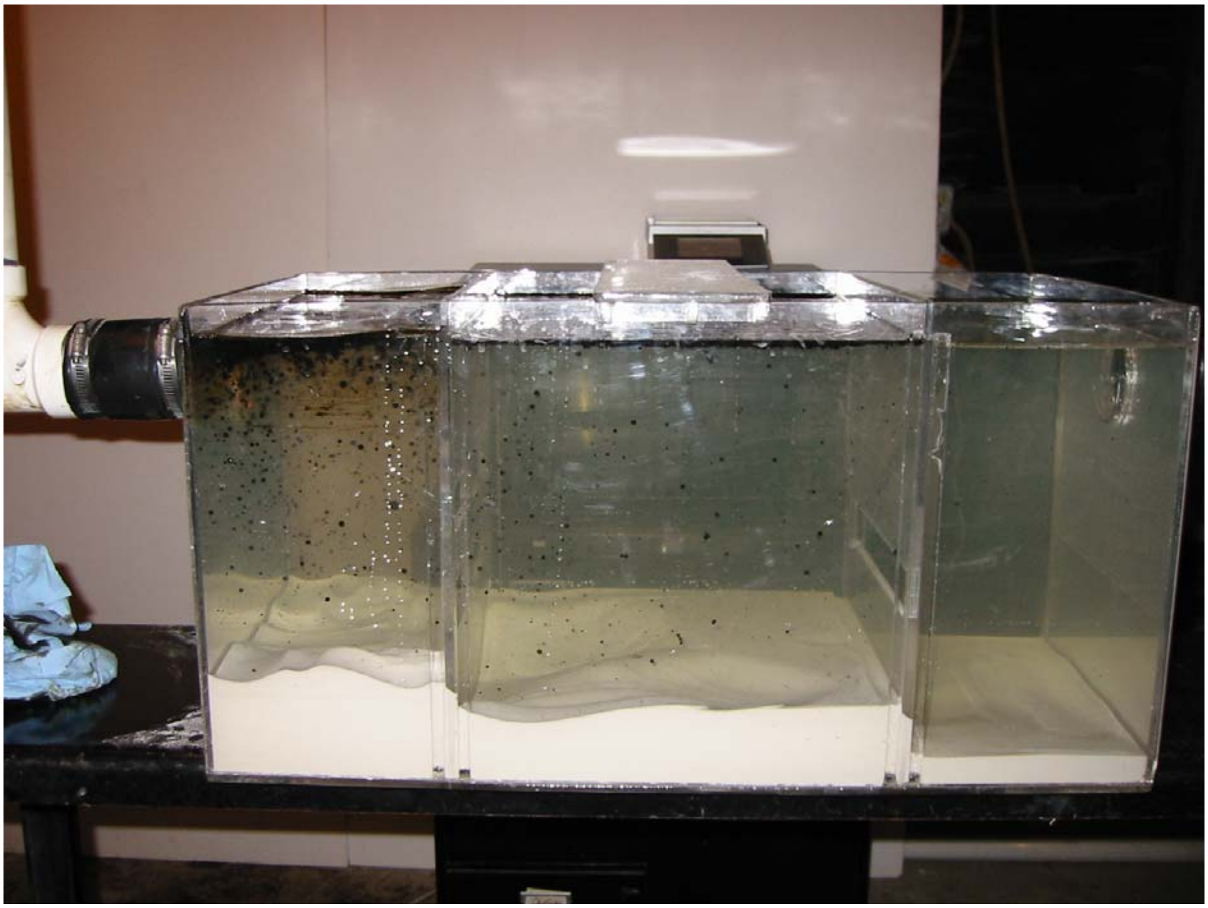
Technology That Separates



SCALE MODEL DURING HYDROCARBON TEST

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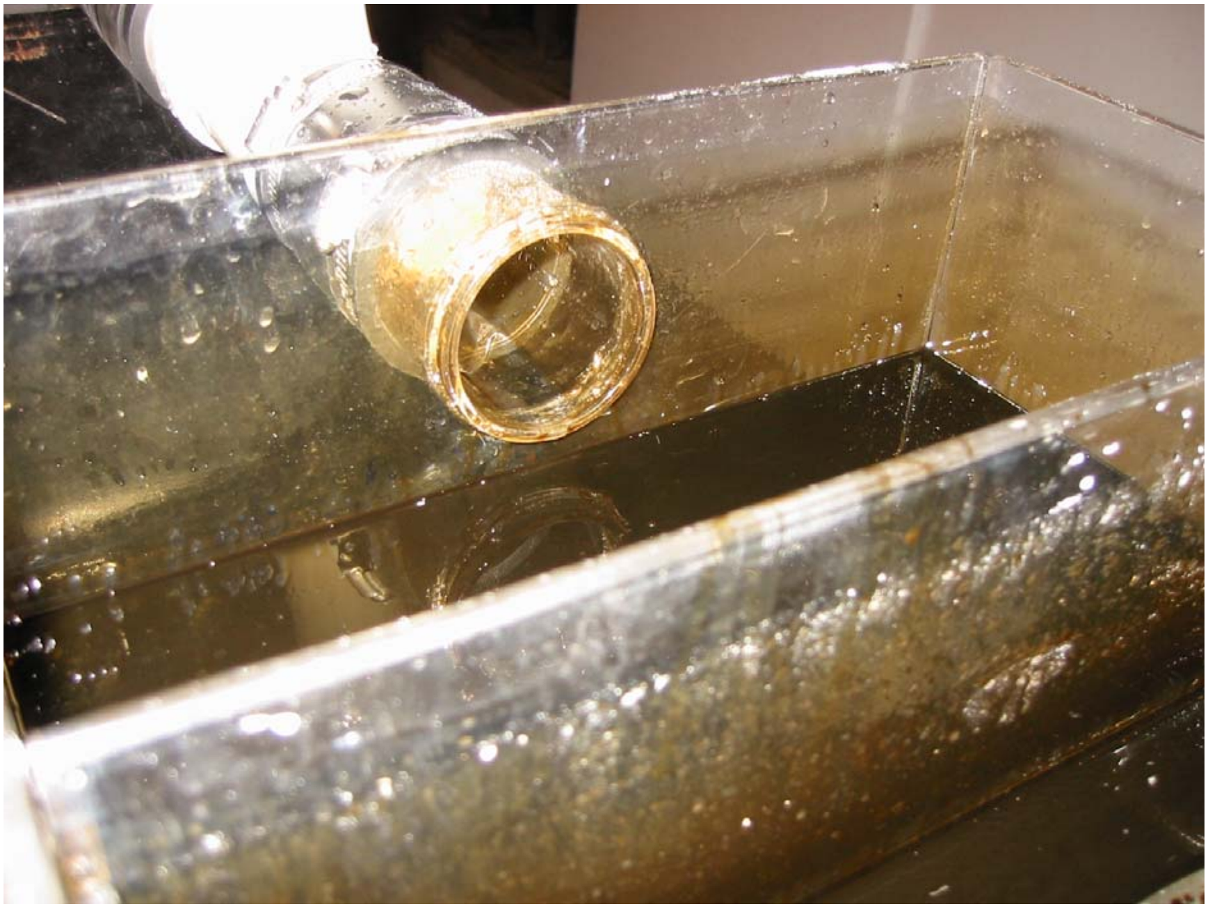

SCALE MODEL INLET AFTER HYDROCARBON TEST

SCALE MODEL RIGHT AFTER TSS CAPTURE TEST

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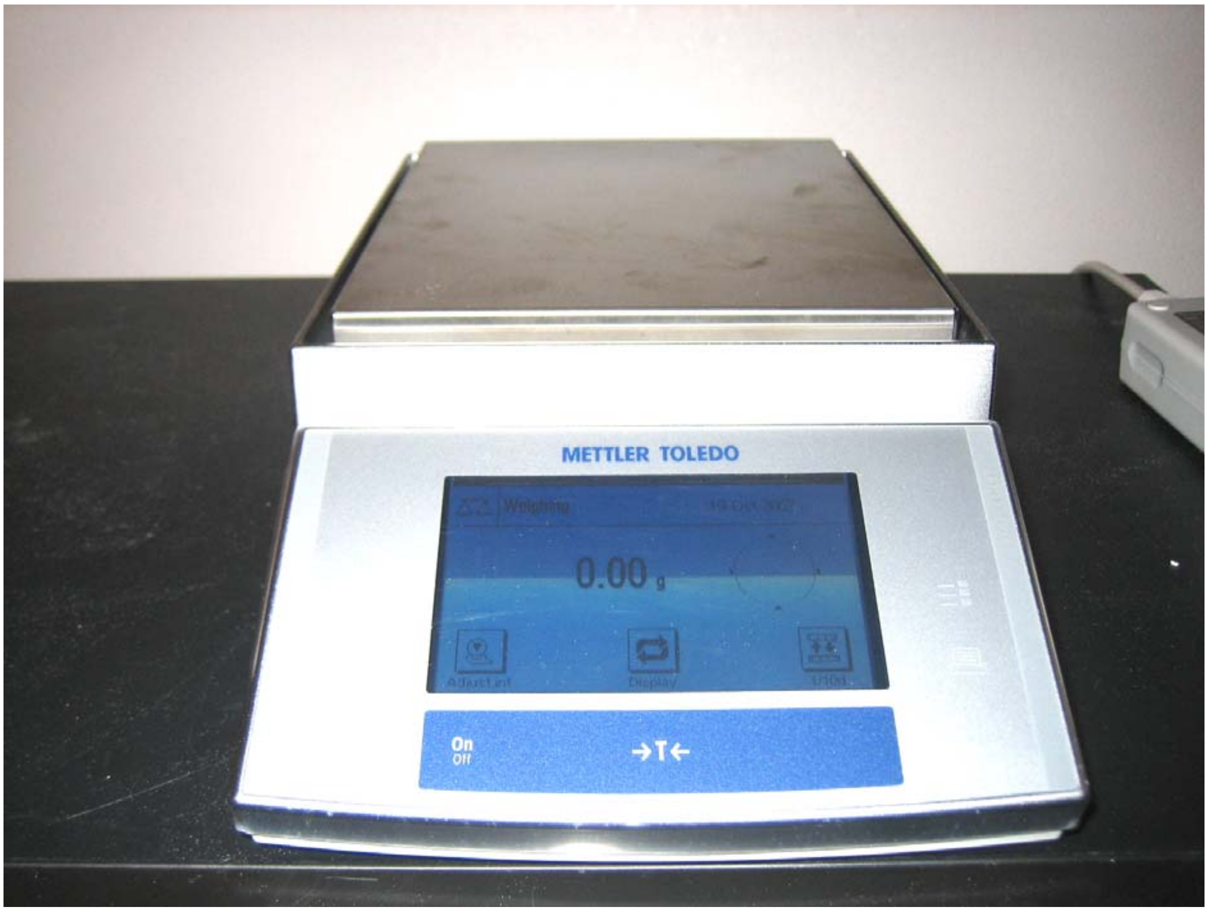

METLER-TOLEDO SCALE USED FOR CALIBRATION/TESTING

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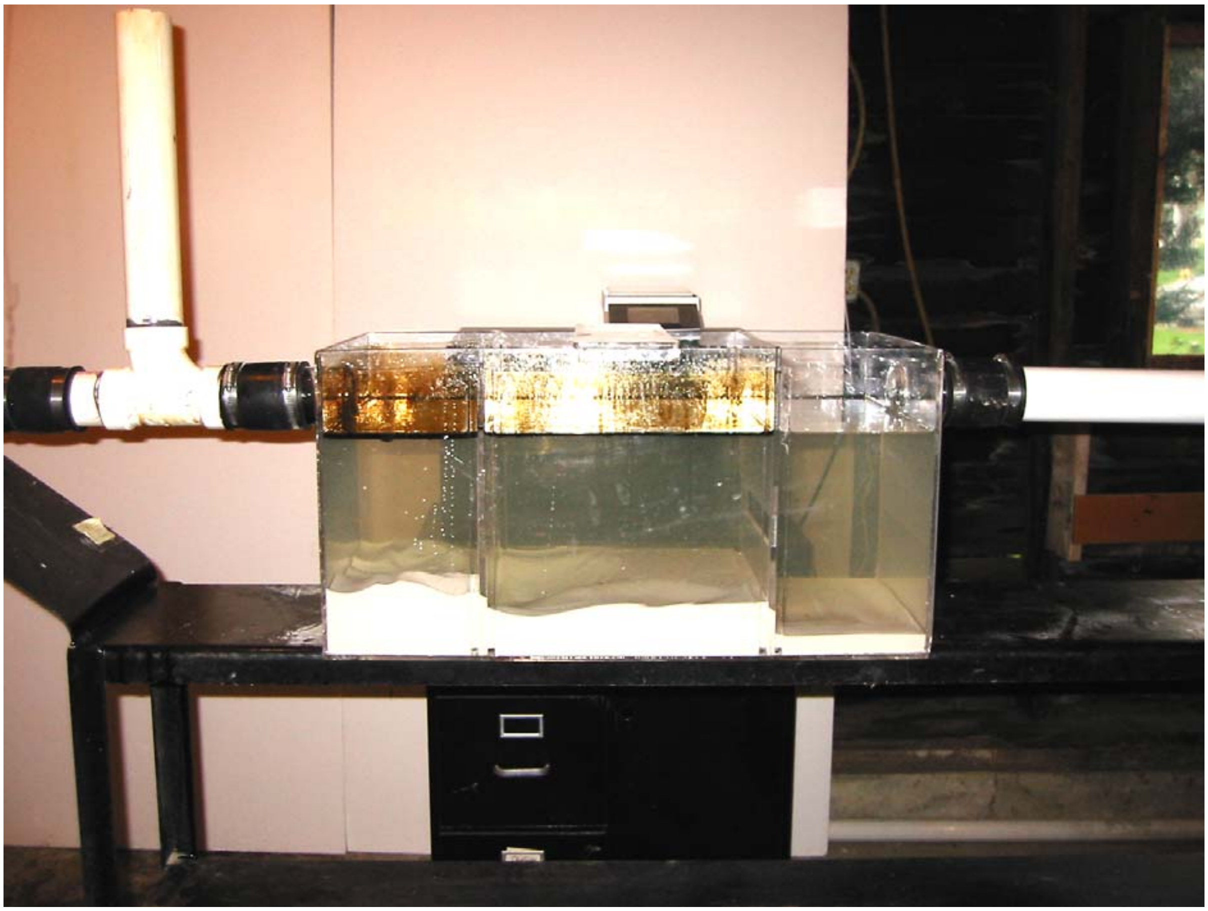
Technology That Separates



SCALE MODEL AFTER HYDROCARBON TEST