
Gunderboom Technology & Projects Overview

Technology Overview

Gunderboom, Inc. provides project specific, Engineered Aquatic Filter Barrier systems. The Gunderboom team designs barrier systems individually for each project that takes into consideration all the parameters of the site, project goals, physical site characteristics, “means and methods” and dynamic forces that will be transmitted into the barrier.

That design is then fabricated in the Gunderboom facility under direct supervision of the design engineers. The Gunderboom fabrication facility was purpose built to assemble these special barrier systems so that the very high tensile strengths required can be achieved. It is not uncommon for connection/mooring point design loads, as an example, to reach 50,000 lbs and be 1.5” thick when all the elements are combined together (See Attachment A – GeoComposite Example).

Typically, the Aquatic Filter Barrier can be described as a full depth, permeable barrier constructed of “GeoComposites” (either floating or fixed) that allows water to pass while retaining/excluding, from side to side, suspended sediments (including contaminated sediments or sediments that carry bacteria), fish/larvae/eggs or sound.

In certain applications these barrier systems may be impermeable, or partially impermeable to accommodate differing strata within the water body. There are also some cases where the barriers have not been full water depth, again for site specific requirements.

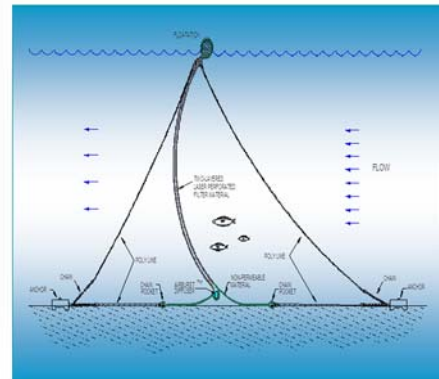
Project Examples

Marine Life Exclusion System (MLESTM)

Lovett Generating Station – Hudson River – New York

Floating, full water depth, boom system to exclude all life stages, including fish eggs, down to 0.5 mm from 425,000 gpm cooling water intake system.

- Length ----- ~1,600 feet
- Depth ----- 60 feet
- Self-Cleaning System ----- Automated AirBurstTM
- Design Basis:
 - Mooring Point Loading ----- 50,000 lbs
 - Current ----- 2 knots
 - Wave Height ----- 6 feet



Sound Attenuation System (SASTM)

Caltrans – Oakland Bay Bridge – PIDP

Fixed, full water depth, curtain system affixed to contractors pile driving template for containment (attenuation) of sound and sediments generated during pile driving and construction.

- Length ----- 240 feet
- Depth ----- 48 feet
- Attenuation System ----- Two-Stage Aeration System

- o Desired Attenuation (Insertion Loss) - - - - - <20 dB
- Design Basis:
 - o Connection Point Loading - - - - - 18,000 lbs
 - o Current - - - - - 2.5 knots
 - o Wave Height - - - - - 3.5 feet



New York Department of Transportation – Tappan Zee Bridge

Fixed, full water depth, curtain system affixed to contractors pile driving template for containment (attenuation) of sound and sediments generated during pile driving and construction.

This contract included provision of five (5) differing types of sound attenuation systems, two (2) curtain style, three (3) aeration rings. Project was a Pile Installation & Demonstration Project (PIDP) for the upcoming replacement of the Tappan Zee Bridge.

- Length - - - - - 280 feet
- Depth - - - - - 36 feet
- Attenuation System - - - - - 5 Differing Systems
- Design Basis:
 - o Connection Point Loading - - - - - 28,000 lbs
 - o Current - - - - - 2.5 knots
 - o Wave Height - - - - - 6 feet



Contaminated Sediment Control System (CPCS™)

General Construction – SeaWorks – Contaminated Dredge Site

Designed and fabricated full water depth, permeable, boom system for dredging project in Oakland Bay.

- Length ----- 75 feet
- Depth ----- 32 feet
- Design Basis:
 - o Current ----- 1 Knot
 - o Wave Height ----- 3 feet



Cascade Pole Creosote Contamination Dredge

Designed and fabricated full water depth, permeable, boom system to surround contaminated dredge project.

- Length ----- 1,200 feet
- Depth -----32 feet
- Design Basis:
 - o Current -----1 knot
 - o Wave Height -----3 feet



Conventional Pollutants	Criteria	Outside Boom	Inside Boom
Total Suspended Solids (EPA 160.2) (mg/L)	NA (b)	350	12
Turbidity (EPA 180.1) (NTU)	12.3 (c)	96	1.5
Naphthalene	2,350 (l)	37	ND
Acansphthene	970 (lf)	36	ND
Phenanthrene	4.5 (l)	66	ND
Benzo(a)anthracene	NA (g)	4.8	ND
Chrysene	NA (g)	4.3	ND
Andeno(1,2,3-cd)pyrene	NA (g)	0.48	ND
Dibenz(a,h)anthracene	NA (g)	0.10 J1	ND
Benzo(g,h,i)perylene	NA (g)	0.22	ND



Anchor QEA – Pawtucket Canal CPCS

Designed, fabricated and installed a full water depth, impermeable curtain system at this former MGP facility located behind a Historic Stone Quay. The purpose of the full depth barrier w/attached sorbent materials is to contain seepage through the stone wall until a plan can be devised to safely remove the contaminated sediments.

- Length ----- 420 feet
- Depth -----12 feet
- Design Basis:
 - o Current ----->0.5 Knots

- o Wave Height ----- -1 foot
- o Secondary Sorbent Curtain (Replaceable Sorbent Material)

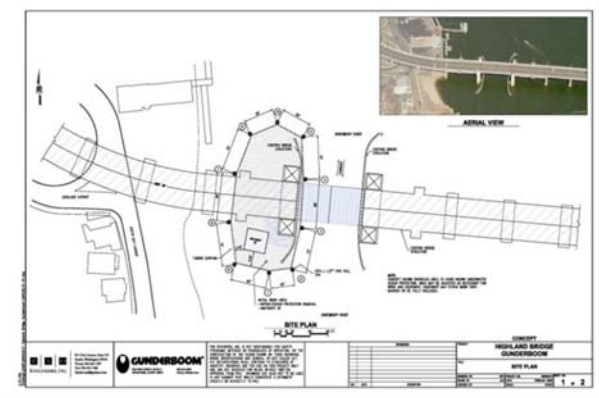


Particulate Control System (PCS™)

New Jersey Department of Transportation – Bridge Pier Removal

Design, fabrication and installation support for PCS™ to surround nine (9) bridge pier and two (2) abutment removals. Shrewsbury River, Highlands Bridge.

- Length ----- -680 feet
- Depth ----- - 24 feet
- Design Basis:
 - o Loading ----- -10,000 psf
 - o Current ----- - 3 knots
 - o Elevation Variation ----- - 12 feet
 - o Wave Height ----- -3 feet



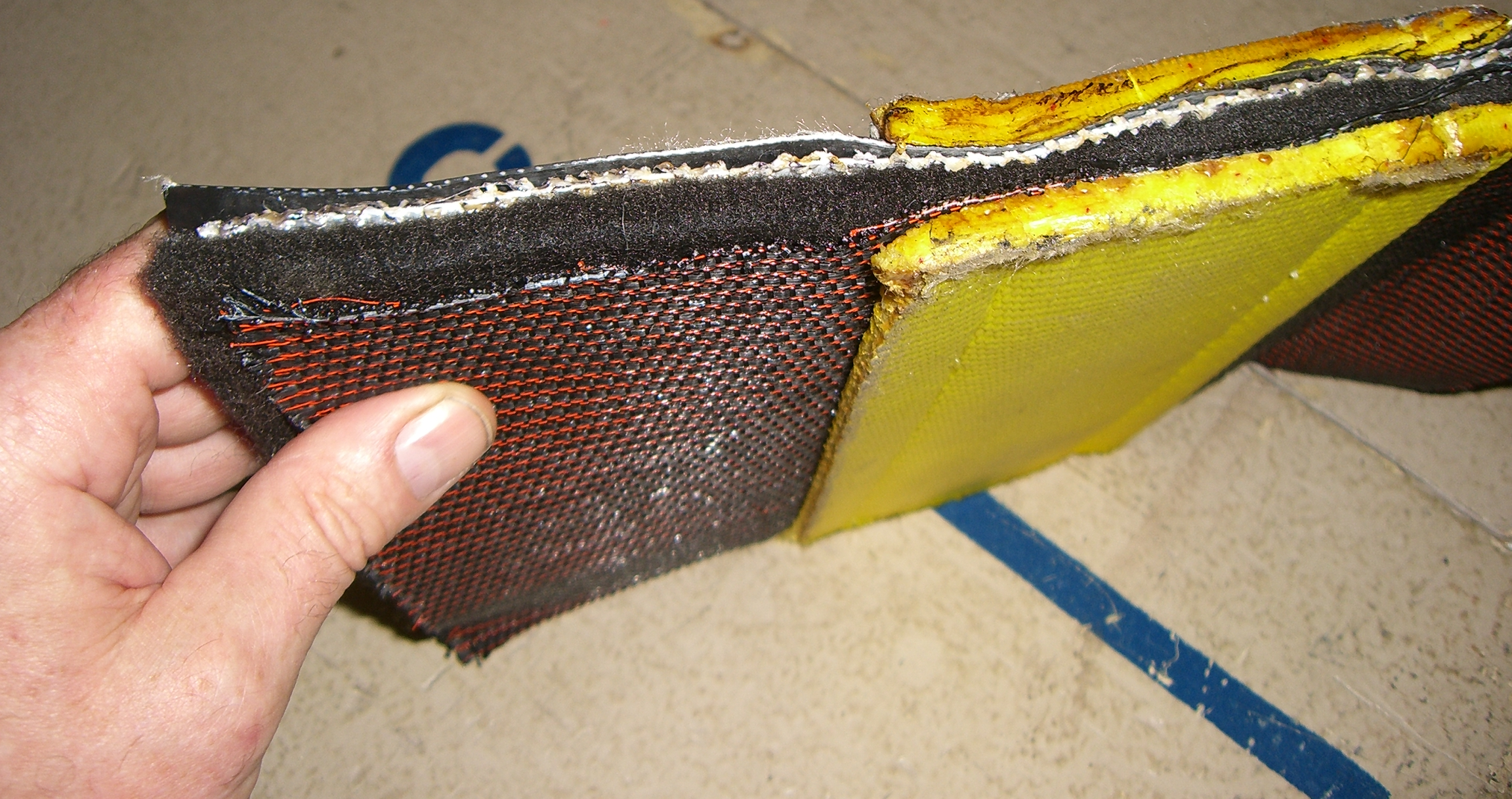
UniSea Alaska – Dutch Harbor, Alaska – Turbidity Barrier

Project involved design, fabrication and installation of full water depth, permeable turbidity barrier at a shore side dredging and fill project for expansion of cannery and hotel installations.

- Length ----- 650 feet
- Depth ----- 55 feet
- Design Basis:
 - o Loading ----- 5,000 psf
 - o Current ----- 1.5 knots
 - o Elevation Variation ----- 6 feet
 - o Wave Height ----- 6 feet



Additional project and support materials can be found in Attachments B-F.



Side-by-Side Comparison of “Off-the-Shelf” Turbidity Curtain vs. Gunderboom Engineered Aquatic Filter Barrier



ATTACHMENT A



Reduces the impact of intake structures on aquatic organisms by preventing entrainment and impingement, while protecting the structure from marine life intrusion.



Marine Life Exclusion System (MLES™)

AFFORDABLE COMPLIANCE UNDER THE CLEAN WATER ACT, SECTION 316(b)

Any standard established pursuant to section 301 or section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. – Section 316 (b)

Best technology available. Gunderboom's MLES™ is a water-permeable barrier that keeps fish eggs, larvae and other aquatic organisms a safe distance away from an industrial intake structure. Engineered, manufactured and supported by Gunderboom, the MLES™ prevents both impingement and entrainment of ichthyoplankton and juvenile aquatic life. State and federal agencies have deemed the MLES™ as the *best technology available* under Section 316(b) of the Clean Water Act.

How the MLES™ works. Comprised of a pocket formed by two layers of treated polypropylene/polyester fabric, the patented, full-water-depth MLES™ curtain is either suspended by flotation billets and anchored in place, or integrated into existing shoreline intake structures. Sealed against the sea floor and shoreline structures, the MLES™ completely surrounds the intake structure, preventing targeted planktonic and neustonic organisms from entering the system.

Since the surface area of the MLES™ is large compared to an intake screen, water velocity through the Gunderboom curtain is up to 98 percent less than the velocity near the intake structure. Low water velocity enables even small fish larvae to drift away from the boom.

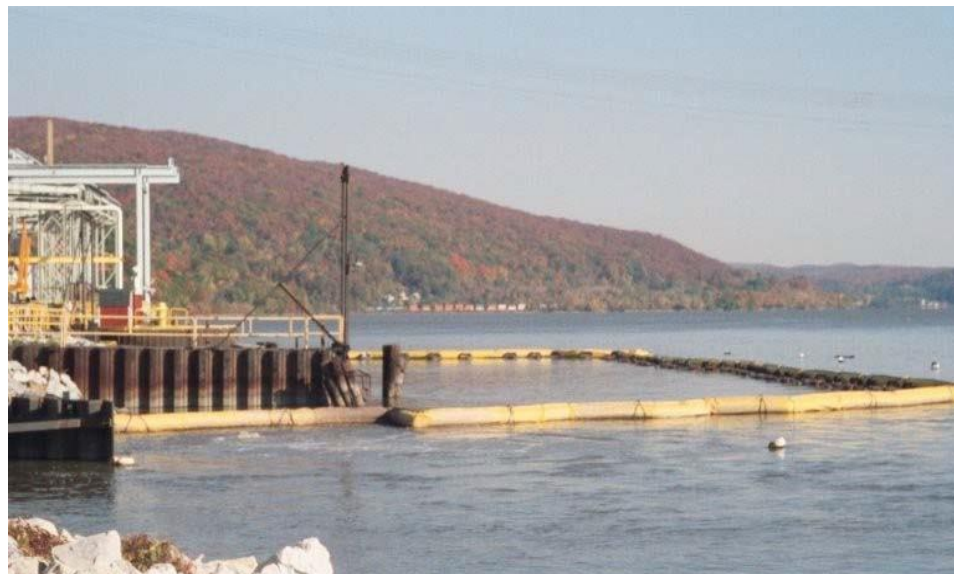
Automatic AirBurst™ cleaning system. Sediment and passively floating organisms drawn onto the fabric are freed when Gunderboom's AirBurst™ cleaning system routinely releases high-pressure air at the boom's base. Bursts of compressed air shake each fabric panel, releasing deposits and ensuring a steady flow of water through the curtain.

MULTIPLE BENEFITS

Minimal impact on aquatic life. Data from worst-case test conditions shows that contact with an operating MLES™ does not adversely affect fish eggs or larvae.

Fossil fuel conservation. Daily operation of dry cooling towers consumes large amounts of fossil fuels. A cost-effective, ecologically sound and aesthetically pleasing alternative, Gunderboom's MLES™ enables plant operators to maintain water intake levels, even during periods of aquatic migration.

Filtering out harmful materials. Fish, debris, aquatic vegetation and passive marine organisms such as jellyfish cannot get inside the barrier to cause problems with the cooling water intake structure (CWIS) or condenser tubes.



PROVEN TECHNOLOGY

Gunderboom offers a number of engineered products that use aquatic filter barrier technology. From creating safe swimming beaches to protecting aquatic organisms from underwater demolition, Gunderboom is a world leader in waterborne pollutant containment systems.

Lovett Generating Station, New York

The operators of Lovett Generating Station needed to minimize ichthyoplankton entrainment and impingement. Working closely with plant managers, Gunderboom designed, built and installed an MLES™ to enclose one of the intake units. After one month of operation, fish entrainment was reduced 80-95 percent, prompting managers to move ahead with a full-plant installation.

Hybrid cooling with an MLES™. In two regulatory decisions, the Environmental Protection Agency (EPA) approved the combined use of hybrid cooling and the Gunderboom MLES™ as the *best technology available*.

CUSTOM DESIGNED AND ENGINEERED

Gunderboom's scientists and engineers work closely with clients to develop systems that meet project needs with maximum efficiency. Using a phased treatments and designs under ambient conditions.

The standard MLES™ boom design filters water at about 5-10 gpm per square foot of submerged fabric and yields an average flow-through velocity of <0.02 fps. Since each MLES™ is designed for site specific application, adjustments are made to the standard design to account for:

- f Target species and stages of aquatic life
- f Facility water flow rates
- f Physical factors, including bathymetry, bottom conditions, configuration of the water body and facility layout
- f Water body characteristics, including elevation changes, currents, wind-induced wave action and suspended sediment concentrations
- f Seasonality of the problem and duration of deployment
- f Degree of automation

The MLES™ can be designed so that specific organisms, particulates and contaminants are effectively filtered and controlled.

FLEXIBLE PURCHASE AND LEASE OPTIONS

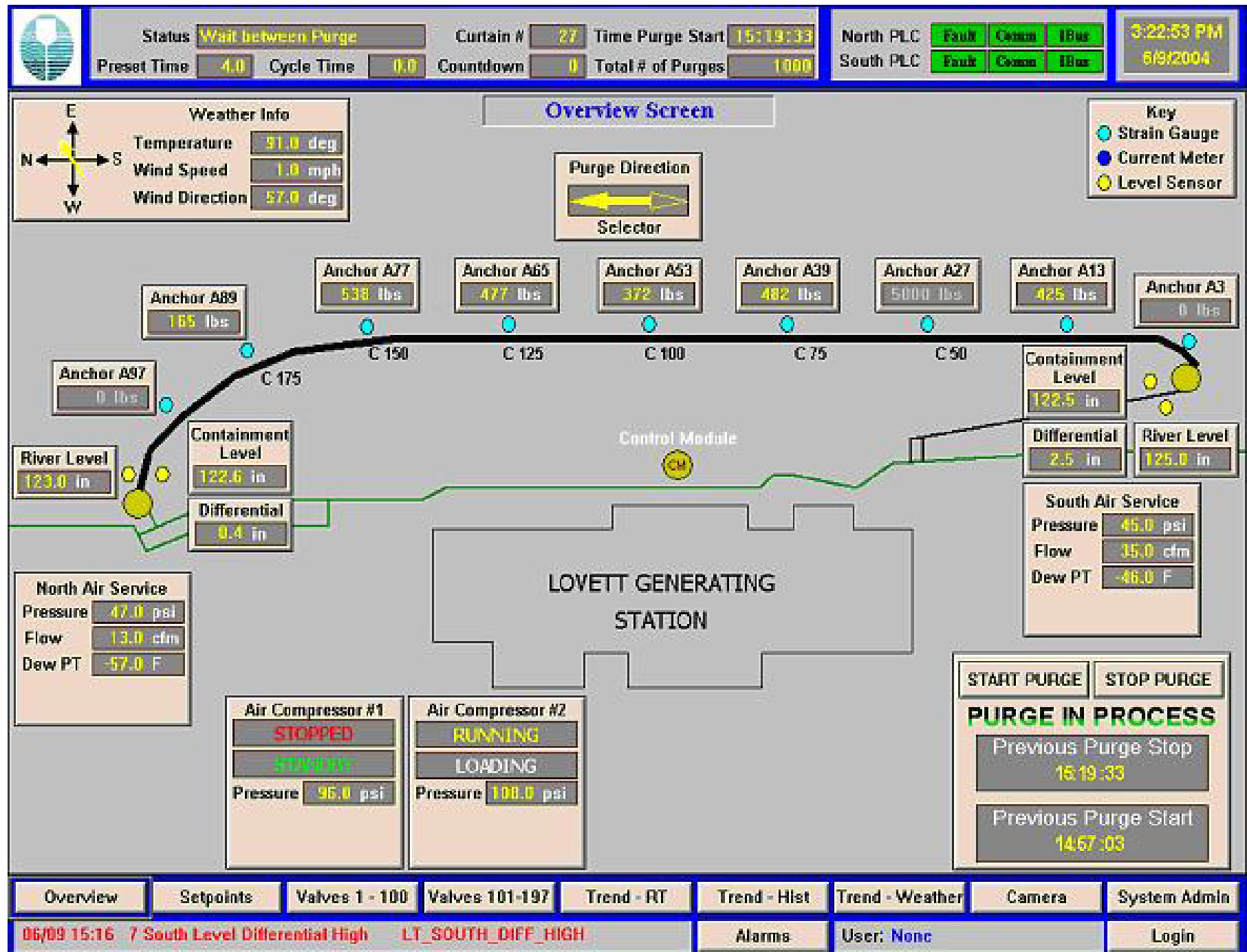
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For more information on Gunderboom containment systems, please visit our web site at www.gunderboom.com or contact us:

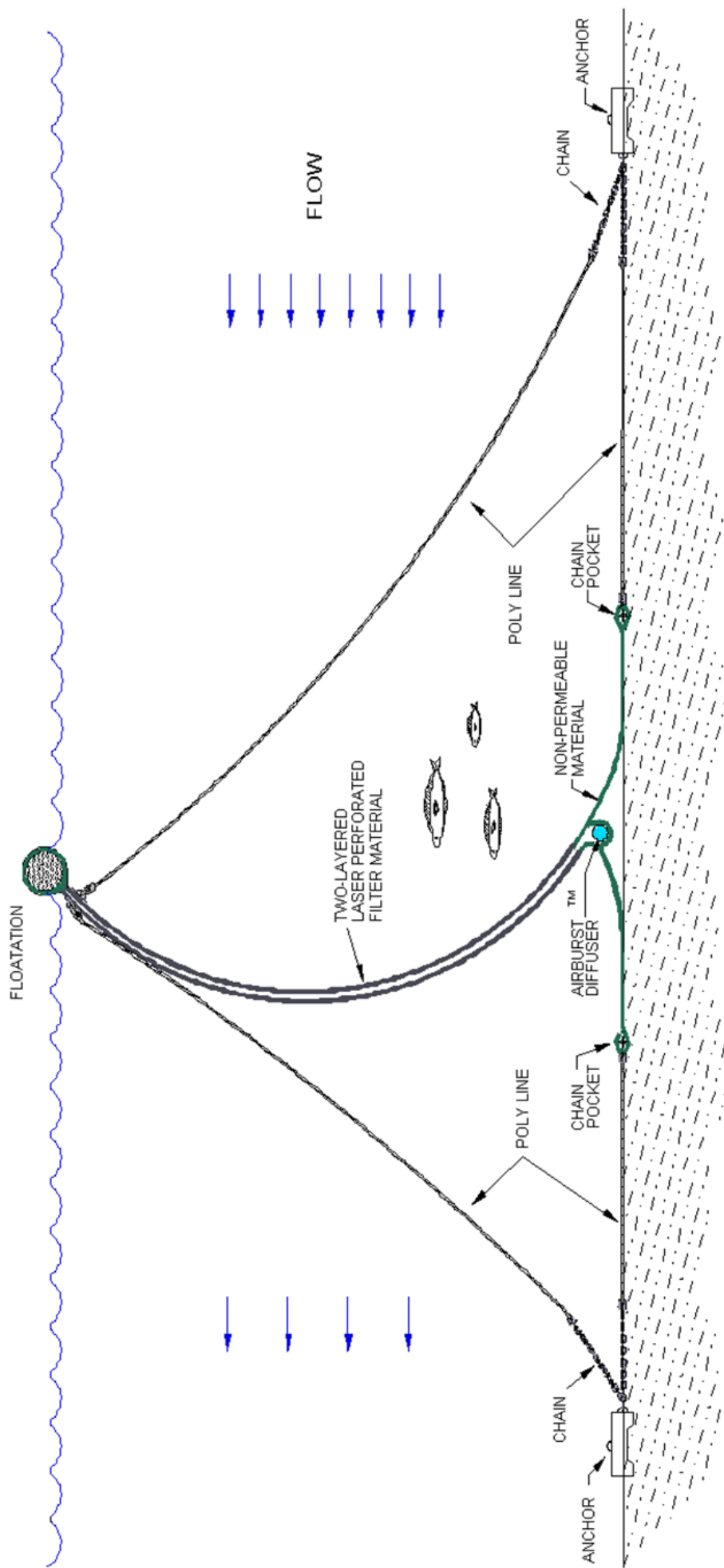
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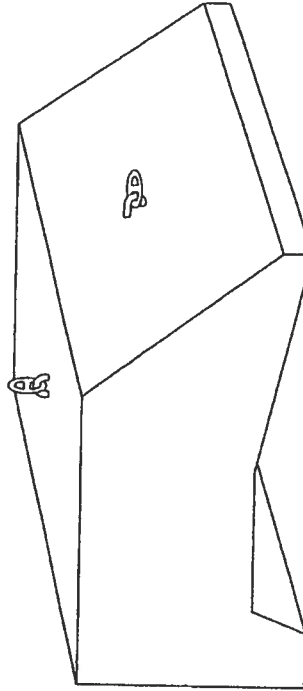


ISOMETRIC VIEW
NTS

REVISION 1/19/2004

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**ISSUED
FOR CONSTR.
12/18/03**



**LOVETT GUNDERBOOM®
FULL PLANT DEPLOYMENT**

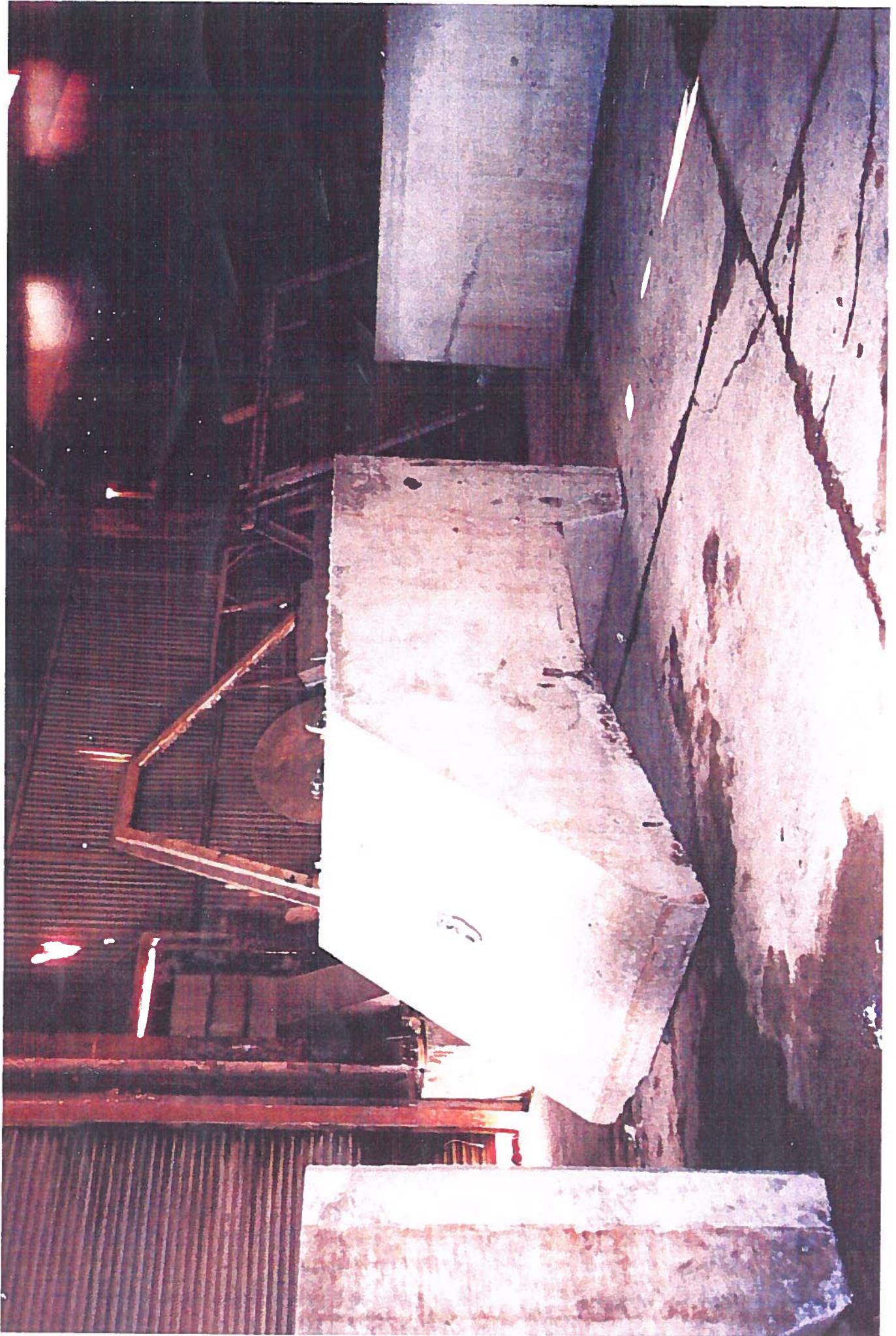


Cost good	5
Draw	for
Charged	for
Project No.	81129

REVISION 1/19/2004

ANCHOR DETAILS

8.9





*Filter barrier control system
for dredging, discharge, storm water
and settling pond management.*



Particulate Control System (PCS™)

WHAT IS A GUNDERBOOM PCS™?

Gunderboom engineers, manufactures and supports a number of systems that use aquatic filter barrier technology. Designed to prevent waterborne particulate migration, the PCS™ can be applied to many different environmental challenges:

- Dredging and dredge-spoil disposal
- Contaminated sediment removal
- Stormwater control
- Mining discharge
- Settling pond discharge
- Oil spill containment

How the PCS™ works. The PCS™ completely encloses an underwater work site or other contaminant source. Acting as a filter, the system prevents contaminants from migrating away from the operation. By slowing water passage, the PCS™ promotes suspended solid settlement. The PCS™ can be deployed to protect resources, such as clam beds and salmon spawning areas. It can also be used to control settling pond and mining discharge.

A highly effective filter. Using proprietary fabric technology, the PCS™ excludes suspended solids down to the 10 micron range or smaller. Comprised of treated polypropylene/ polyester fabric, the patented full-water-depth PCS™ curtain is suspended by flotation billets and anchored in place. Depending on particulate concentrations, required flow rate, and other parameters, higher levels of control may be achieved by using different fabrics, multiple layers, multiple booms and/or lower flow rates through the fabric.

Conventional Pollutants	Criteria	Outside Boom	Inside Boom
Total Suspended Solids (EPA 160.2) (mg/L)	NA (b)	350	12
Turbidity (EPA 180.1) (NTU)	12.3 (c)	96	1.5
Naphthalene	2,350 (l)	37	ND
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Dibenz(a,h)anthracene	NA (g)	0.10 J1	ND
Benzo(g,h,i)perylene	NA (g)	0.22	ND

PROVEN TECHNOLOGY

From creating safe swimming beaches to protecting aquatic organisms from underwater demolition, Gunderboom is a world leader in waterborne pollutant containment systems.

Contaminated Sediment Remediation Pilot Project

Tests from a creosote-contaminated dredge project show the effectiveness of the PCS™. Within the boom, total suspended solids (TSS) was reduced from 350 to 12 mg/L, turbidity dropped from 96 to 1.5 NTU and all other conventional pollutants were below detectable levels (ND).

Exxon Valdez Oil Spill

During the cleanup of Alaska's 1989 oil spill, Gunderboom's PCS™ was deployed in several key locations to protect the region's critical salmon spawning streams and pristine glacier fjords from contamination.

Homer, Alaska

In 1996 Homer needed to double the size of its boat harbor but the project coincided with salmon spawning season. A Gunderboom PCS™ was deployed to enclose the underwater work area. The spawning salmon and other marine life were protected, and the dredging operations were able to proceed.

EACH PCS™ IS CUSTOM DESIGNED AND ENGINEERED

While Gunderboom technology can be applied to a wide range of conditions, each system is designed to meet the project's specific needs. Gunderboom's scientists and engineers work closely with clients to ensure product success. Each PCS™ is designed to account for:

- f Nature and degree of contamination and concentrations of suspended solids
- f Location, fixed or moving operation such as channel dredging
- f Physical factors, including bathymetry, bottom conditions, and configuration of the water body
- f Water body characteristics, including flow rate, elevation changes, currents and wind-induced wave action
- f Problem seasonality and probable duration of deployment

EASY TO DEPLOY, DURABLE AND LOW MAINTENANCE

Deployment is simple. Usually requiring several people, a small vessel and a level surface near the water such as a beach or dock, deployment typically takes about three days. The PCS™ is unfolded and flotation billets are inserted in the boom's top hood. The reefed boom is then towed into position and tied to pre-deployed anchors, providing a protective seal along the bottom.

The PCS™ withstands extreme conditions. Many successful Gunderboom filter barrier sites are located in waters with high water level changes, strong waves and currents. Gunderboom's engineers deal with any site specific environmental concerns, including, heavy debris, seasonal ice and waves over three feet.

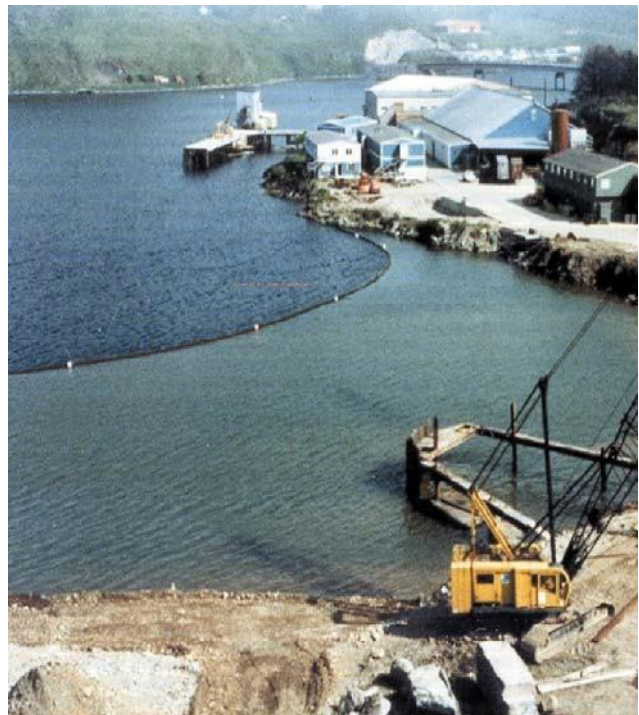
The PCS™ is a self-cleaning filter system. The PCS™ fabric resists particulate buildup and biofouling species such as mussels, barnacles and clams. Winds, wind induced waves and changes in flow, move and flex the boom, helping to keep the fabric clean. An optional, pressurized air cleaning system is available for sites where sediment concentration is high or flows are continuous. Gunderboom's Air Burst™ cleaning system periodically releases compressed air at the base of the boom, shaking loose any deposits in the fabric.

ENVIRONMENTAL COMPLIANCE

Gunderboom systems are engineered to meet environmental performance criteria, such as water quality parameters that require the control of total suspended solids, metals, organics, turbidity or pathogen concentrations.

FLEXIBLE PURCHASE AND LEASE OPTIONS

Gunderboom works with clients to provide products and services that accommodate a range of budgets and schedules.



For more information on Gunderboom containment systems, please visit our web site at www.gunderboom.com or contact us:

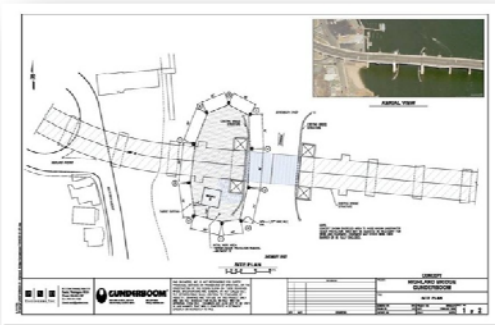
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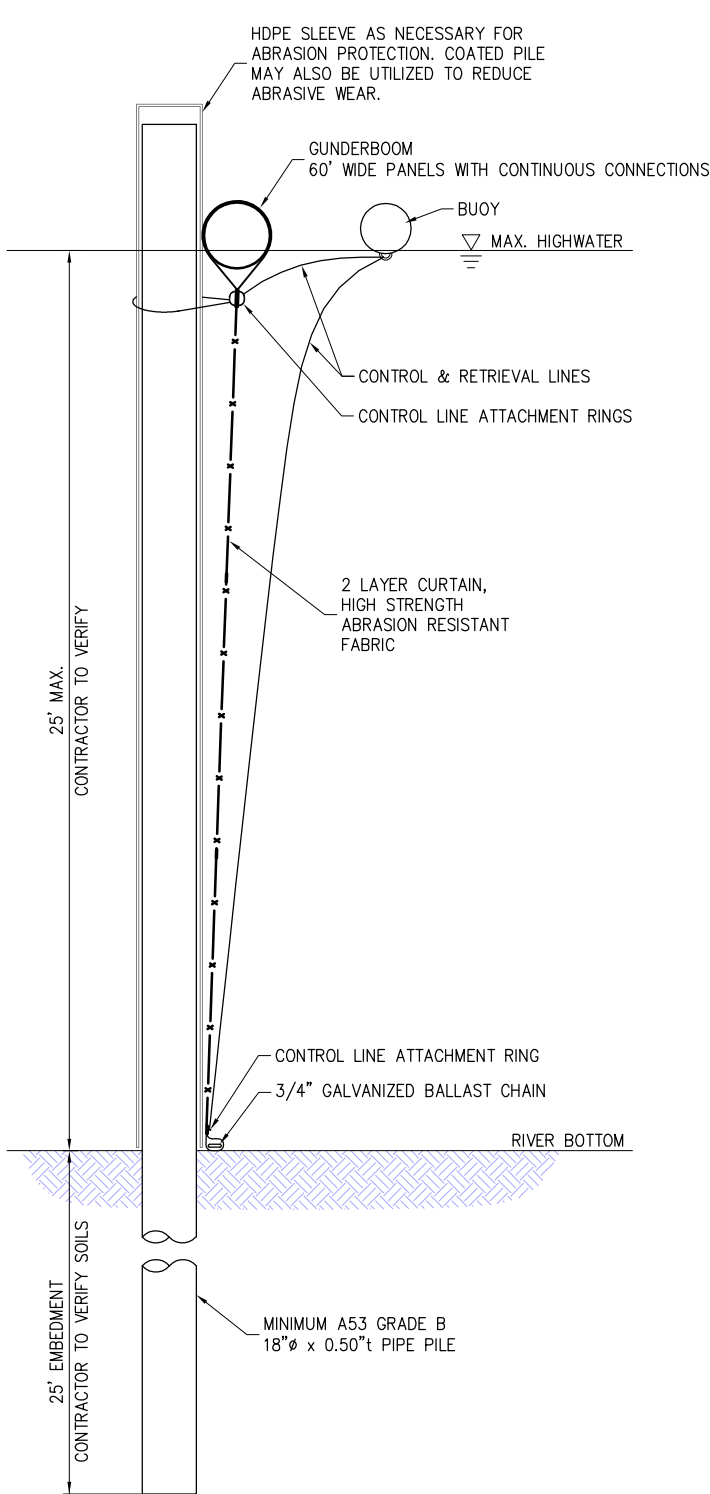




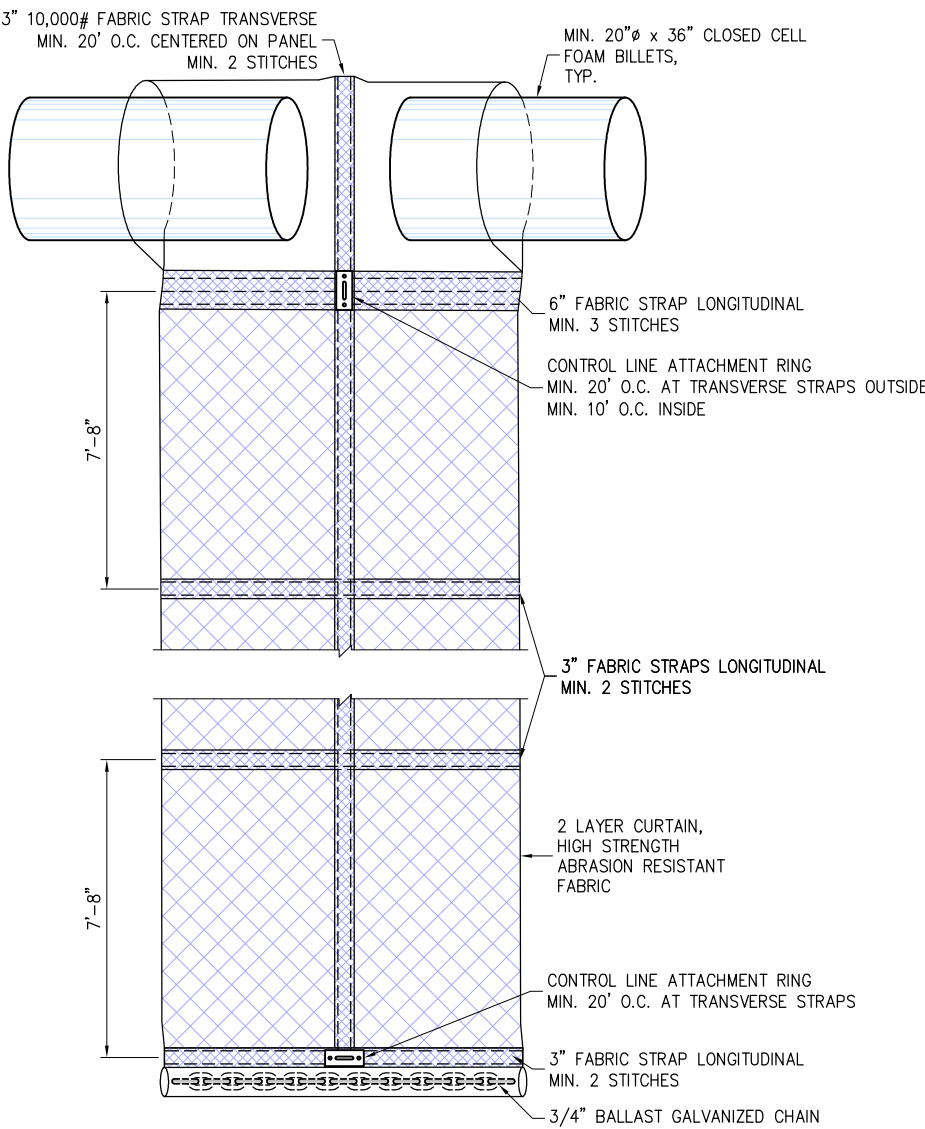
GUNDERBOOM
Engineered Aquatic Filter Barrier Systems

1. **Company Name: J.H.Reid General Contractor**
2. **Name of Project: Heavy Duty Turbidity Barrier for Bridge Demolition and Removal**
3. **Location of Project: Route 36 over the Shrewsbury River, Highlands Bridge, Monmouth County, New Jersey**
4. **Owner: New Jersey Department of Transportation**
5. **Your Role: Design Engineer, Manufacturer and Initial Installation Direction and Oversight**
6. **General Scope of the Project and Purpose of the Turbidity Barrier:**
Containment of sediments, turbidity and demolition debris from the removal of nine bridge piers and two abutments of a 1,610-ft. cantilever bridge across the tidal Shrewsbury River in coastal NJ.
7. **Features of the Turbidity Barrier used on the Project:**
 - Fully functional in wind-driven wave action up to: **3 feet plus all boat wakes**
 - Turbidity requirement outside of barrier: **Not above ambient NTU's at 100 ft.**
 - Load resistance up to **10,000 pounds per square foot**
 - Fully functional during storm events or wind generated water currents of **3 knots or 5 feet per second.**
 - Fully functional during tidal changes up to **12 feet.**
 - Warranty period: **365 days**
8. **Dates Project: Began March 2008 Completed November 2009**
9. **Total Project Cost: \$ 395,700**





TYPICAL SECTION
AT PILE LOCATION

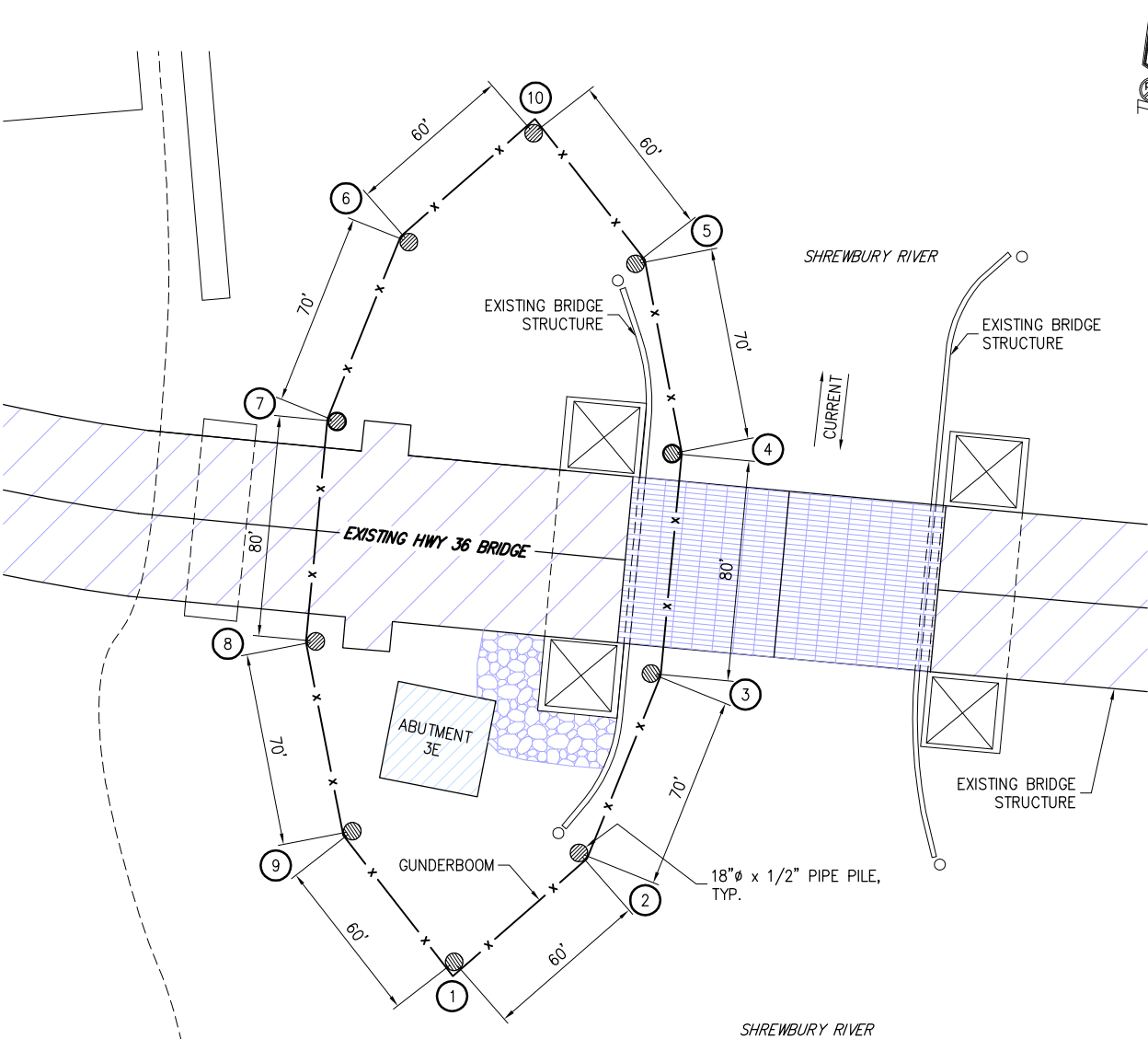


TYPICAL
ELEVATION

AT CONTROL AND RETRIEVAL LINE LOCATION

NOTES:

- DESIGN CRITERIA** (Provided by Contractor)
Current = 2.5 ft/sec maximum uniform profile in either direction (ebb & flood).
Soils = silty sand with N = 10 to 40 in top 25'
Water Depth 25' maximum
- PILE SPACING AND LAYOUT**
– Typical maximum pile spacing is 60'.
– If barrier needs to extend under bridge pile may be spaced a maximum of 80' apart to clear structures provided barrier is installed parallel to current.
– In other locations where barrier must avoid structures pile may be placed a maximum of 70' apart provided barrier is installed less than 30' off direction of current.
– Barrier should not be installed perpendicular to direction of current flow without approval of Engineer.
– Layout shown is for depiction of spacing requirements only; contractor is responsible for final layout and installation which best meets needs of work being conducted.



TYPICAL
INSTALLATION LAYOUT

- Barrier shall be installed around anchor piles during periods of slack tide/low current only.
- Barrier shall be installed tight around anchor pile with minimum slack. Following installation maximum sag/drape between any two pile at any tide/current condition shall not exceed 18 feet.
- Contractor shall maintain barrier and monitor performance.
- Where necessary the Contractor shall provide a full depth HDPE pile sleeve to reduce barrier wear due to abrasion on pile. Coated pile if available may also be utilized to reduce abrasive wear.
- Barrier may not float freely against an anchor pile in strong current conditions. Contractor may need to insure top of barrier is not held under the water surface at a pile location. Minor flow overtopping the barrier into the containment area should not have a detrimental effect on surrounding water quality.
- Contractor is responsible for marking barrier including pile as required by Coast Guard, local regulations, and contract documents to insure it poses no hazard to navigation.



REVISIONS			PROJECT: HIGHLAND BRIDGE GUNDERBOOM		
			TITLE: LAYOUT, SECTION, AND DETAILS		
			DESIGNED BY:	PROJECT NO:	SHEET NO:
			DRAWN BY:	DATE:	
			CHECKED BY:	SCALE:	NOTED:
REV	DATE	DESCRIPTION			

Reduces the impact on marine life from pile driving, demolition and other submarine activities.



Sound Attenuation System (SAS™)

PROTECTING SEA LIFE FROM UNDERWATER SOUND AND PRESSURE

The Gunderboom SAS™ is an aquatic filter barrier that protects marine life from damaging sounds and pressure waves caused by underwater activities. Engineered, manufactured and supported by Gunderboom, the underwater SAS™ combines bubble ring and barrier curtain technology to create a multipurpose enclosure that absorbs sound, attenuates pressure waves, excludes marine life from work areas, and controls the migration of debris, sediments and process fluids.

Protection against high and low frequencies. Submarine construction activities such as underwater demolition and pile driving generally produce sounds over a broad and varying frequency range. By integrating several sound attenuation techniques, Gunderboom's SAS™ cushions against sound waves of all frequencies, including far-reaching, low-frequency sounds that are the most damaging.

How the SAS™ works. Comprised of water-permeable polypropylene/polyester fabric, the patented, double-layer SAS™ curtain is either suspended by flotation billets and anchored in place, or installed on a rigid frame surrounding the area of activity. As compressed air is released at the bottom of the curtain, the space between the two fabric layers inflates, creating a sound-absorbing bubble wall.

Traditional bubble rings use a network of perforated pipe to build a wall of bubbles around an underwater work site. Lacking a containment device to prevent bubble dispersion, traditional bubble rings cannot provide consistent and complete coverage of an operation. Tides and currents cause the bubble wall to drift or break apart, making it ineffective.

Advanced bubble wall technology. Unlike traditional bubble rings, the SAS™ bubble wall is contained by a sound-dampening fabric curtain. Ribbed panels in the curtain create tightly confined spaces that ensure a constant bubble wall width, providing further stability against tides and currents. Bubble size and wall thickness vary according to each operation's attenuation requirements, for example, low-frequency sounds are best attenuated by using large air bubbles.

PROVEN TECHNOLOGY

Gunderboom offers a number of engineered products that use aquatic filter barrier technology. From creating safe swimming beaches to protecting aquatic organisms from underwater demolition, Gunderboom is a world leader in waterborne pollutant containment systems.

The CalTrans Project

As part of the California Department of Transportation (CalTrans) Pile Installation Demonstration Project conducted in 2000, Gunderboom worked with CalTrans to test noise attenuation systems. Measured at 100 feet from the largest piles ever used in a hammer pile driving operation, the Gunderboom SAS™ reduced sound wave intensity by up to 85 percent.



CUSTOM DESIGNED AND ENGINEERED

Experts in the science of submarine acoustics and pressure, Gunderboom scientists and engineers work closely with clients to develop systems that meet project needs with maximum efficiency.

Each SAS™ is designed to account for:

- f Nature and location of underwater activity
- f Nature of the resultant sound or pressure
- f Environmental conditions, wind, currents and waves
- f Physical characteristics including water depth, salinity and bottom characteristics



HIGH PERFORMANCE AT LOW COST

Gunderboom's SAS™ is a cost-effective solution to sound attenuation requirements. In some demolition operations, the SAS™ eliminates the need for expensive cofferdams.

ENVIRONMENTAL COMPLIANCE

Gunderboom's SAS™ can help contractors comply with both the Marine Mammal Protection Act and the Endangered Species Act by mitigating the detrimental effects of submarine activities, including harassment of marine life.

FLEXIBLE PURCHASE AND LEASE OPTIONS

Gunderboom works with clients to provide products and services that accommodate a range of budgets and schedules. Clients may choose from three standard product packages:

The GBOOM Option – Gunderboom will **B**uild, **O**wn, **O**perate and **M**aintain (GBOOM) the SAS™ under contract for a predetermined length of time and monthly rate. This option requires no capital expenditures and provides routine and preventive maintenance, including replacement of any system components.

Outright Purchase – Gunderboom will custom design an SAS™ that the client will operate and maintain. Manuals and training are provided.

Standard Lease Options – Gunderboom will work with facility managers to provide a custom designed SAS™ through a standard lease agreement. Operation and maintenance services are optional.

For more information on Gunderboom containment systems, please visit our web site at www.gunderboom.com or contact us:

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Protects drinking water supply reservoirs from particulates, contaminants and pathogenic microbes.



Reservoir Protection System (RPS™)

AN ECOLOGICALLY SOUND, LOW COST SOLUTION

The Gunderboom RPS™ is an aquatic filter barrier that helps water utility managers provide clean and safe water to customers. Engineered, manufactured and supported by Gunderboom, the RPS™ protects surface water supplies by controlling sediments and pathogens carried by storm runoff. By filtering water before it enters the reservoir, and by creating areas where settling can occur, the RPS™ prevents stormwater-fed tributaries from carrying particulate-related contaminants into water utility intakes.

How the RPS™ works. The RPS™ completely encloses either the mouth of a tributary that supplies the reservoir or the water intake. Acting as a filter, the RPS™ prevents microorganisms and stormwater particulates from migrating into the water source. At the mouth of the tributary, the RPS™ also slows water passage, promoting settlement of suspended solids.

A highly effective filter. Using proprietary fabric technology, the RPS™ excludes suspended solids down to the 10 micron range or smaller. Comprised of treated polypropylene/polyester fabric, the patented, full-water depth RPS™ curtain is suspended by flotation billets and anchored in place. Depending on particulate concentrations, required flow rate and other parameters, higher levels of control may be achieved by using different fabrics, multiple layers, multiple booms and/or lower flow rates through the fabric.

PROVEN TECHNOLOGY

Gunderboom offers a number of engineered products that use aquatic filter barrier technology. From creating safe swimming beaches to protecting aquatic organisms from underwater demolition, Gunderboom is a world leader in waterborne pollutant containment systems.

Kensico Reservoir, New York

In early January 1999, shortly after a Gunderboom RPS™ was installed at Kensico Reservoir, heavy runoff from a 50-year storm flowed into the reservoir. Normally even a small seasonal rainstorm would cause a water utility's intake to exceed Environmental Protection Agency (EPA)-mandated pathogen levels. By enclosing a cove that received high runoff, the RPS™ enabled the reservoir to meet water quality standards.

Kensico Reservoir – After RPS™ Deployment

	Outside Boom	Inside Boom	Reduction
Total Suspended Solids (mg/L)	9.9	0.7	92.9%
Turbidity (NTU)	20.0	1.0	95.8%
Coliforms (MPN)	>2400	22.0	99.1%

Wachusett Reservoir, Massachusetts

Initially part of an EPA-sponsored filter barrier demonstration project at Wachusett Reservoir, the RPS™ was later used by the Massachusetts District Commission to help protect the drinking water supply of Greater Boston and the eastern part of the state. Installed across a cove at the mouth of Malagasco Brook, the 355-foot RPS™ reduced particulates and bacteria concentrates for flows up to 10,000 gallons of stormwater per minute. After three years of continuous deployment, the RPS™ still requires minimal maintenance to perform successfully.

CUSTOM DESIGNED AND ENGINEERED

Gunderboom's scientists and engineers work closely with clients to develop systems that meet project needs with maximum efficiency. Each RPS™ is designed to account for:

- Nature and degree of contamination and concentrations of suspended solids
- Amount of flow from a source such as a stormwater outfall or into a water intake system
- Physical factors, including bathymetry, bottom conditions, and configuration of the water body
- Water body characteristics, including reservoir elevation changes, currents and wind induced wave action

EASY TO DEPLOY, DURABLE AND LOW MAINTENANCE

Deployment is simple. Usually requiring several people, a small vessel and a level surface near the water such as a beach or dock, deployment typically takes about three days. The RPS™ is unfolded and flotation billets are inserted in the boom's top hood. The reefed boom is then towed into position and tied to pre-deployed anchors, providing a protective seal along the bottom.



The RPS™ withstands extreme conditions. Many successful Gunderboom filter barrier sites are located in waters with high water level changes, strong waves and currents. Gunderboom's engineers deal with any site specific environmental concerns, including heavy debris, seasonal ice and waves over three feet.

The RPS™ is a self-cleaning filter system. The RPS™ fabric resists particulate buildup and biofouling species such as mussels, barnacles and clams. Winds, wind induced waves and changes in flow, move and flex the boom, helping to keep the fabric clean. An optional, pressurized air cleaning system is available for sites where sediment concentration is high, or flows are continuous. Gunderboom's AirBurst™ cleaning system periodically releases compressed air at the base of the boom, shaking loose any deposits in the fabric.

ENSURING CLEAN AND SAFE WATER FOR THE PUBLIC

By effective management and protection of surface water supplies, Gunderboom helps water utility managers ensure clean and safe water for their customers. Gunderboom scientists are developing ways to use enhanced filtration materials to provide a higher level of protection against hard-to-control substances.

FLEXIBLE PURCHASE AND LEASE OPTIONS

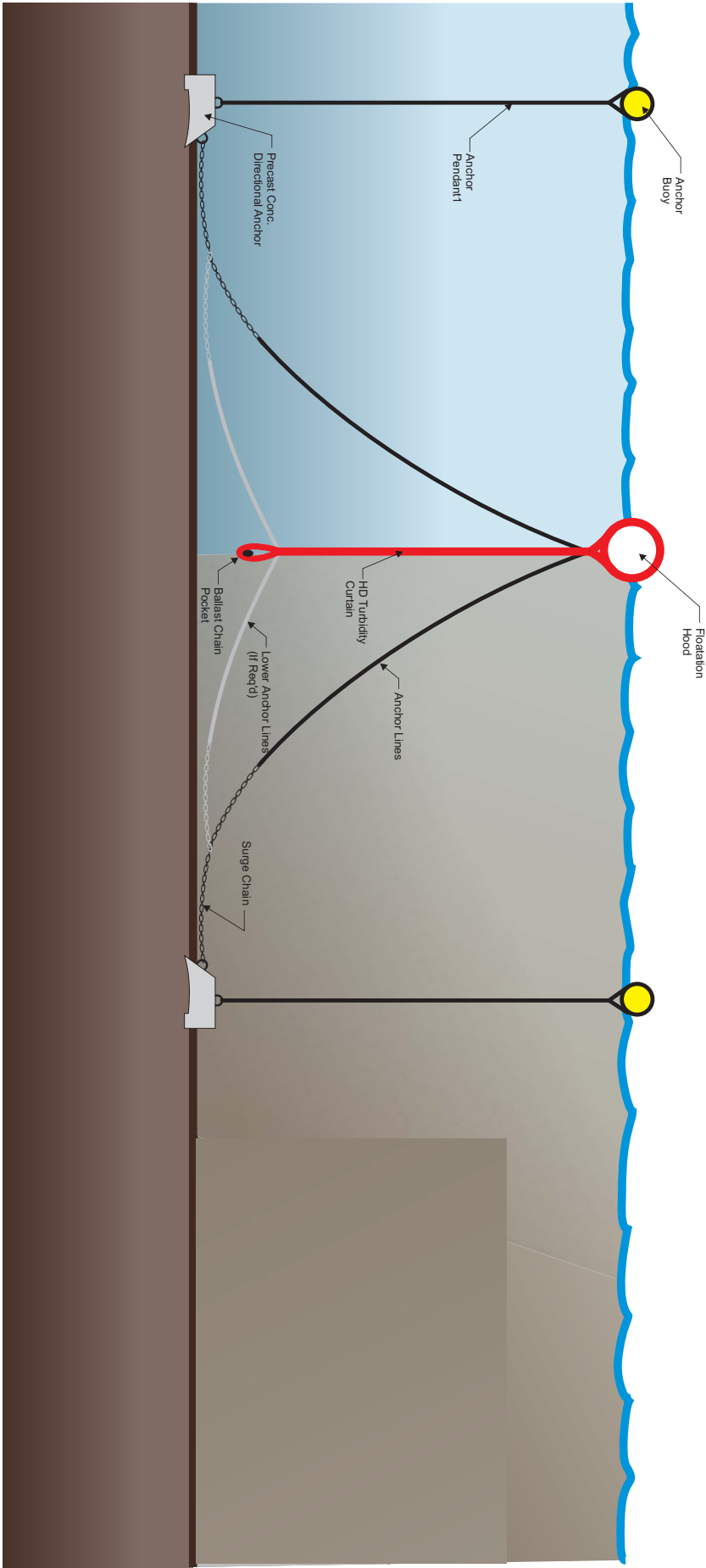
Gunderboom works with clients to provide products and services that accommodate a range of budgets and schedules.

For more information on Gunderboom containment systems, please visit our web site at www.gunderboom.com or contact us:

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TYP. SECTION

Note: The drawings and documents submitted incorporate GUNDERBOOM® systems and implementation of GUNDERBOOM® technologies into or within the referenced project. The concepts and assemblies should be considered proprietary and should not be copied, redistributed for any other purpose without the permission of GUNDERBOOM, Inc. The various GUNDERBOOM® Systems are Patented or the subject of Patent applications. The use of the System(s) depicted herein may be subject to and limited by certain licensing agreements. The drawings and documents are not to be construed as a warranty, representation, or statement of fact. GUNDERBOOM, Inc. All rights reserved.



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HD TURBIDITY BARRIER

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