HI Services Inc.

Aqua-Barrier®
Water-Inflated Dams

Aqua-Barrier® Installation & Instruction Manual

Matthew 11:28 “Come unto me, all ye that labor and are heavy laden, and I will give you rest”

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HI Services Inc.

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Aqua-Barrier®
Water-Inflated Dams

Introduction, Features, and Accessories

INTRODUCTION

Aqua-Barriers® are a U.S. patented **#9353496** water-inflated damming device produced from flexible reinforced PVC membrane material. The Aqua-Barriers® are used as a temporary water diversion system in construction projects, flood protection and numerous other applications. Aqua-Barriers® are characterized by being light-weight, easily deployed and removed, compact in storage, repairable and reusable.

Stabilization Components
Three components interact together to stabilize the Aqua-Barrier® water-inflated dam.

Internal Baffle System
The internal restraint baffle(s) lock into place when the barrier is exposed to uneven hydrostatic pressure on one side.

Freeboard (amount of inflated barrier above the surrounding water level)
A minimum of at least 25% freeboard is required in all Aqua-Barrier® installations. Freeboard requirements may increase if the barrier is exposed or has the potential to being exposed to surface water velocities of 3ft or more per second, slick soil conditions or other relevant hydrostatic conditions.

Surface Friction
The Aqua-Barriers® also require surface friction to stabilize when exposed to uneven hydrostatic pressures. Barriers that are exposed to weak soils and/or slick soil conditions may require supplemental support, a wider footprint or additional freeboard, as directed by an engineer.

PRODUCT FEATURES

Aqua-Barriers® are designed with unique accessories to facilitate installation and removal.

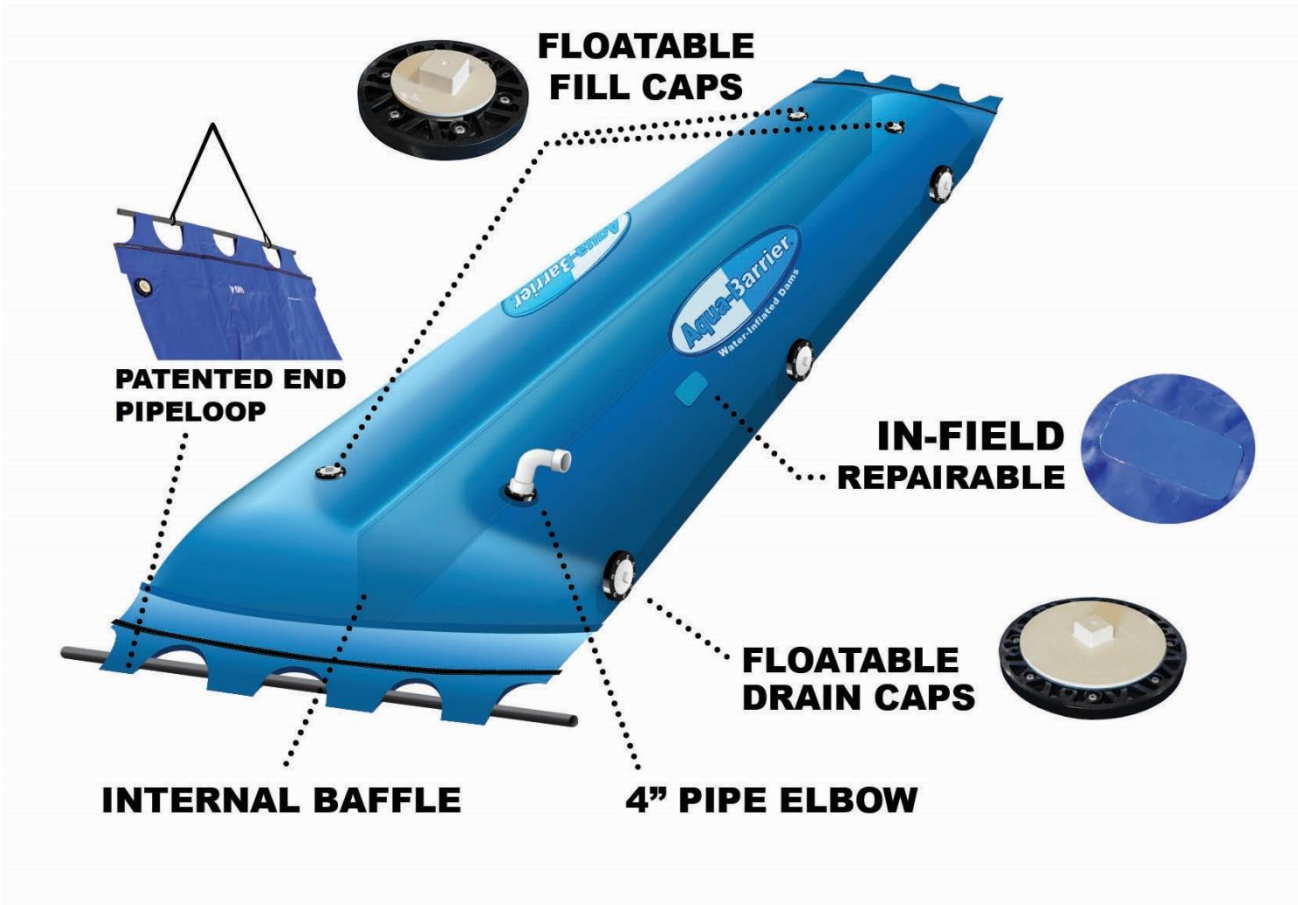
Internal Baffle System
Aqua-Barriers® utilize a unique internal baffle for stability that also allows for single-port inflation.

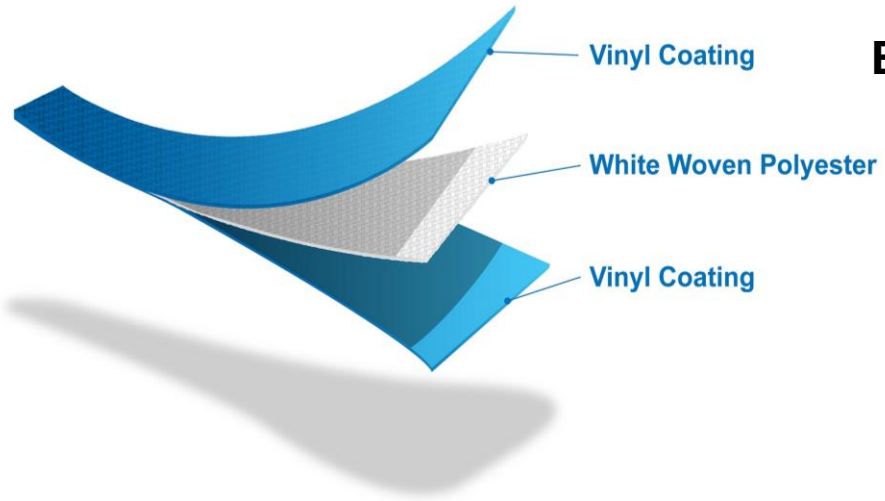
Floatable Fill and Drain Caps
All fill and drain caps are designed to float, perfect for easy tracking and recovery if dropped into the water.

Patented End Pipeloop
Our Patented End Pipeloop allows for a safe connection point for heavy equipment to utilize when adjusting or moving a deflated Aqua-Barrier®.

In-Field Repairable
Heavy gauge vinyl patches allow you to repair the Aqua-Barrier® throughout your project duration, wet or dry.

4” PVC Elbows
4” Pipe Elbows are used when filling the Aqua-Barrier® with water. The adaptable 4” female end, utilizing standard threads, allows for multiple size pumps and\or hose fittings like cam-lock or Baur fittings to suit your needs.



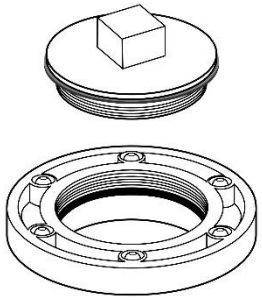


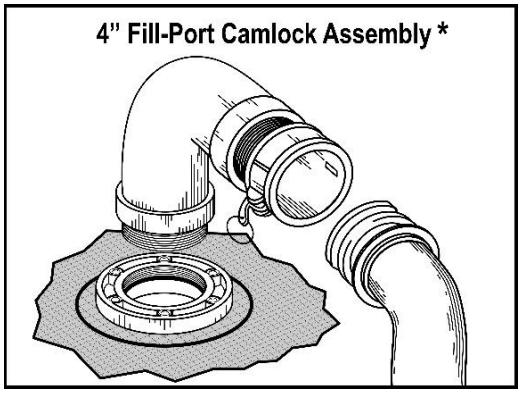
ENGINEERED MATERIAL

The Aqua-Barrier® outer membrane is made of a heavy gauge PVC (polyvinyl chloride) reinforced with polyester.

STANDARD ACCESSORIES

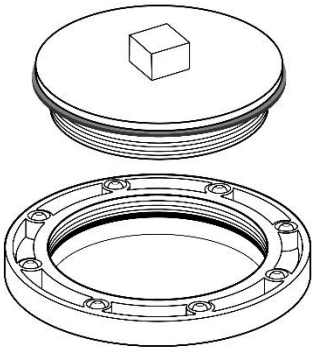
4" Fill/Drain Cap

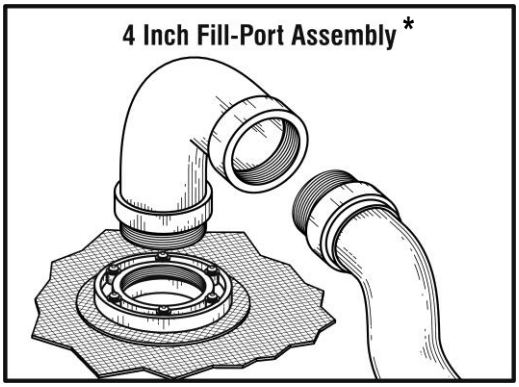




*4" Elbow Provided. 4" Camlock Assembly NOT Provided.

8" Drain Cap

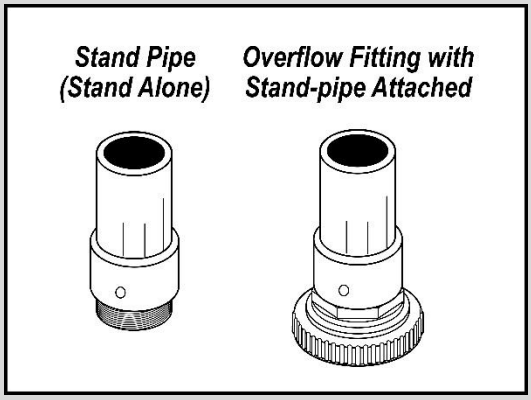


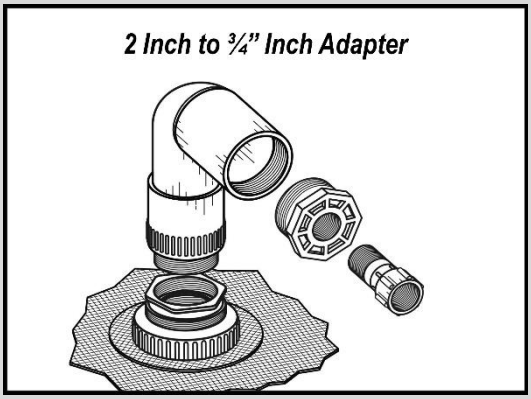


*4" Elbow Provided. Hose NOT Provided.

ADDITIONAL FLOOD PROTECTION ACCESSORIES

Included with Flood Protection Purchases Only





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EZ ROLLER

Additional Purchase Necessary

The EZ Roller rolls your Aqua-Barrier® in minutes using just 1-2 people providing an even roll every time due to its double ratchet roller relationship.

After tucking a small portion of the barrier into the slotted roller and inserting both ratchet arms, you move the handle bars in opposite directions. The device rolls forward rolling your Aqua-Barrier® into a compact bundle for storage. Reverse the process to unroll Aqua-Barrier® when it is time to deploy.

Contact your HSI Services, Inc.
representative for pricing and availability.
Toll Free # 800-245-0199

COMPACT TO STORE

EASY TO USE

JOB IS COMPLETE

READY FOR STORAGE

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Aqua-Barrier®
Water-Inflated Dams

Aqua-Barrier® Technical Information

GENERAL INFORMATION

MAINTENANCE:

To maintain Aqua-Barriers® simply repair worn and punctured areas with the available repair material. Repairing is best accomplished when the barrier surface has been cleaned. Follow the repair instructions provided in this manual or on the can of Vinyl adhesive HH66. If additional repair adhesive is needed, call R H Products at 781-259-9464 to locate the nearest distributor. It is recommended that the Aqua-Barriers® be inflated with air in order to inspect for problem areas and repair as needed. Always allow the barrier surface to dry before tightly rolling up for storage.

STORAGE:

Store Aqua-Barriers® in a covered area, away from harmful UV rays. Do not store where barriers will be in contact with solvents, acids or rodents. Do not store in an area that experiences temperatures that fall below 32° F or above 150° F.

DEFINITIONS:

Dynamic Load – Water pressure created by moving water and/or wave action.

Free Board – Part or height of barrier extending above water surface.

Hydrostatic Pressure – Water pressure

Static Load – Water pressure created by standing or non-moving water.

PVC – Vinyl Coated Polyester. Material used to produce Aqua-Barriers.

SAFETY INSTRUCTIONS – DEFINITION OF TERMS

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE

Indicates a potential situation which, if not avoided, may result in an undesirable result or state, including property damage.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

AQUA-BARRIER® BAFFLE BEHAVIOR

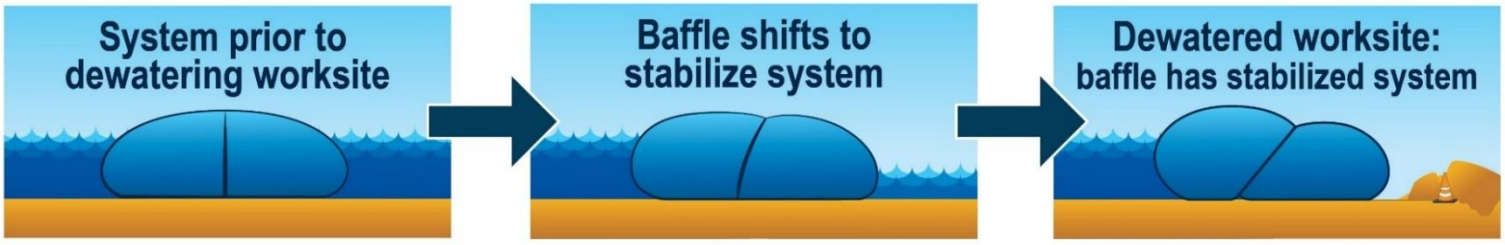
The Aqua-Barrier® system gains its stability through the tensioning of the inner restraint baffle(s). Once the system is inflated, the baffles prevent the barrier from rolling over. As the barrier is exposed to water pressure there is a natural adjustment towards the side of the least hydrostatic (water) pressure.

The maximum length of lateral movement toward the side of least water resistance is 1/2 of the properly inflated barrier height (i.e., 4-ft tall barrier can adjust as much as 2 ft). The adjustment lengths are based upon a barrier being inflated to its recommended height with the baffle being cross-sectional centered. The barrier adjustment length could increase or decrease if not properly inflated and or if slopes or grades are present. These adjustments should be considered when determining the installation location of the barriers.

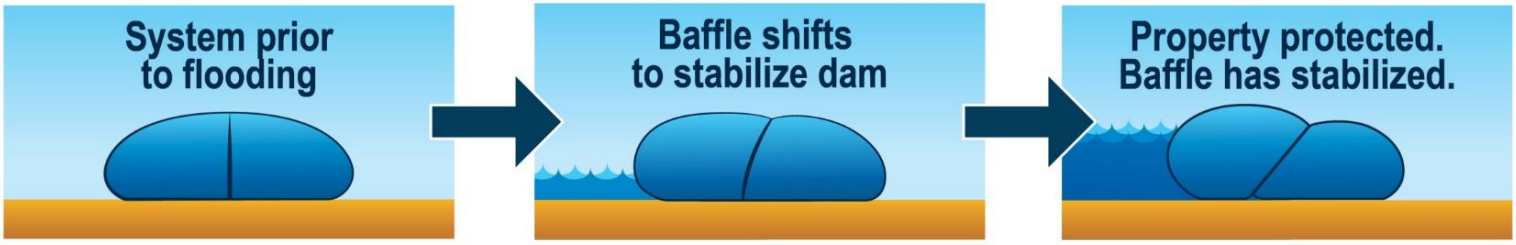
Maximum Adjustment per Aqua-Barrier® Height

Barrier Height (ft.)	Maximum Adjustment Length (ft)
2’	1’
3’	1.5’
4’	2’
5’	2.5’
6’	3’
7’	3.5’
8’	4’

Baffle Stabilization Process - Dewatering



Baffle Stabilization Process – Flood Protection



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STANDARD HEIGHTS AND DIMENSIONS

This depth of water represents 75% of the height of a fully inflated dam. It is required that a 25% freeboard capacity be maintained in static water environments during all phases of a project.

HSI Services, Inc. is NOT responsible for barrier replacement or repair if static water level exceeds 75% of the barrier inflation height, e.g. 4.5-ft water level on a 6-ft high barrier. In moving water environments, or potentially moving water environments, HSI Services, Inc. will designate a maximum water percentage height on a given barrier height. If water level exceeds either of these limitations, the warranty will be considered null and void.

Excess slope and grade, soil composition, moving water and related hydrological criteria may increase or decrease the ability of the Aqua-Barrier® to perform as projected.

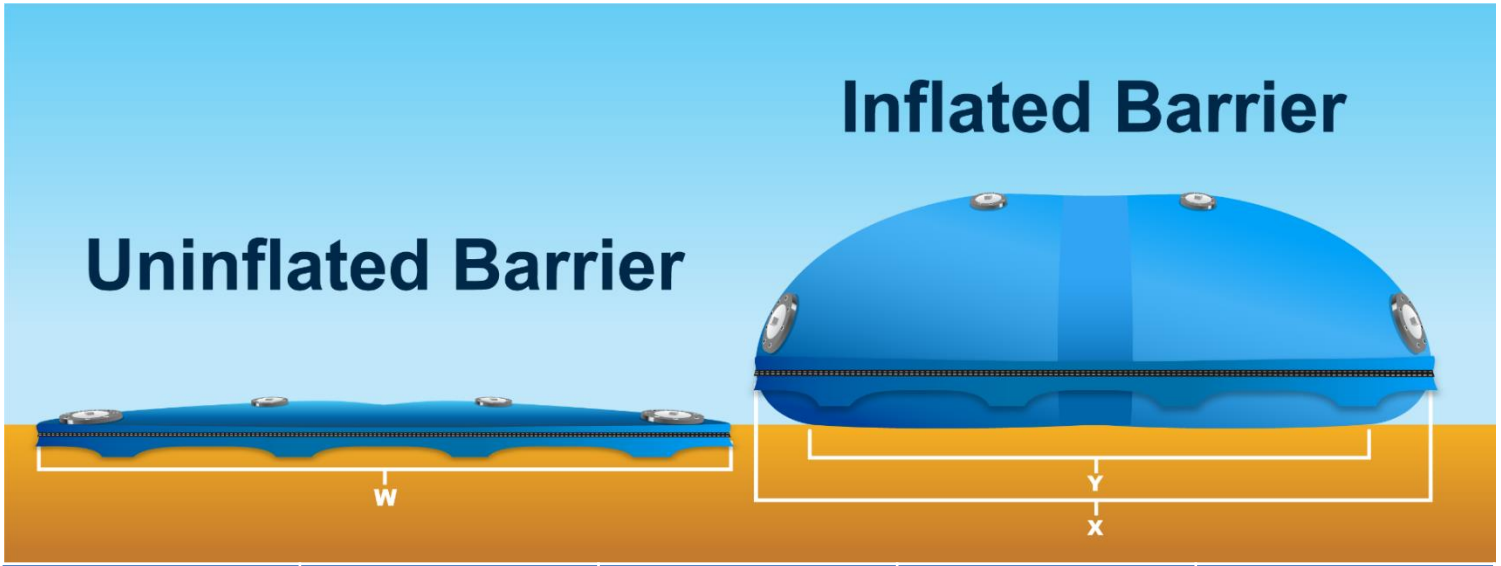
IMPERIAL

Inflated Barrier Height & Width (ft)	Max Controllable Water & Sediment (ft)	Inflated Barrier Volume (Gal. per linear ft.)
2 x 4.5	1.50	56
3 x 6.75	2.25	131
4 x 9	3.00	225
5 x 11.25	3.75	352
6 x 13.5	4.50	506
7 x 15.75	5.25	688
8 x 18	6.00	901

METRIC

Inflated Barrier Height & Width (m)	Max Controllable Water & Sediment (m)	Inflated Barrier Volume (l/m) (approx.)
0.6 x 1.4	0.45	700
0.9 x 2.1	0.65	1,600
1.2 x 2.7	0.90	2,800
1.5 x 3.4	1.10	4,400
1.8 x 4.1	1.35	6,300
2.1 x 4.8	1.60	8,500
2.4 x 5.5	1.80	11,100

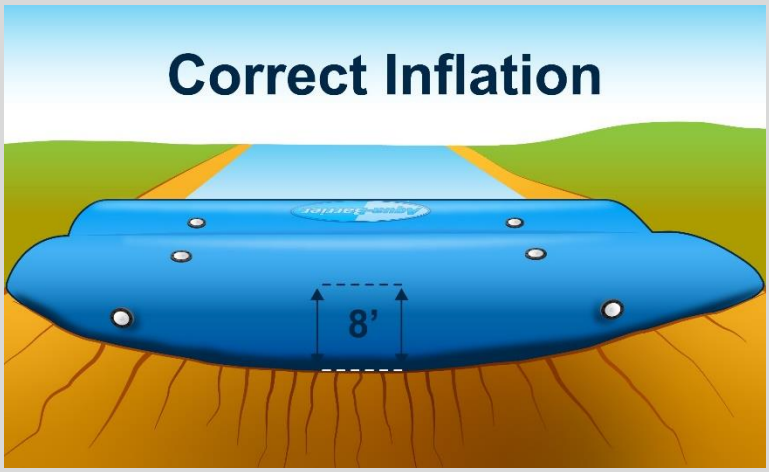
STANDARD HEIGHTS AND DIMENSIONS



BARRIER HEIGHT (ft.)	LAYFLAT WIDTH UNINFLATED (ft)	LAYFLAT WIDTH INFLATED (ft.)	GROUND CONTACT (ft.)	INFLATED WEIGHT (lbs per sq. ft.)
	W	X	Y	
2	5.5	4.5	4	120
3	8.25	6.75	6	185
4	11	9	8	215
5	13.75	11.25	10	260
6	16.5	13.5	12	310
7	19.25	15.75	14	360
8	22	18	16	415

WARNING

Measure barrier height from the lowest elevation. Always inflate an Aqua-Barrier® to its fullest height.



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Aqua-Barrier®
Water-Inflated Dams

Pre-Installation Warnings

WORKSITE SAFETY

When working within the Aqua-Barrier® dewatered area it is required that all federal, state and local safety procedural laws are followed. At a minimum, the company utilizing the Aqua-Barrier® system must comply with OSHA trench and excavation safety procedures. These regulations can be found online at www.osha.gov.

A competent person(s) is required onsite at each work shift during the use of the Aqua-Barrier® system when workers are present. The competent site person is required to inspect the barriers if there has been any change in water depth, height of inflated barrier(s) or change in position. The OSHA definition of a competent person is as follows:

COMPETENT PERSON is an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate or control these hazards and conditions.

IMPORTANT INFORMATION WHEN USING WATER INFLATED COFFERDAM SYSTEMS

Establishing a temporary cofferdam system and dewatering the enclosed area is a process with inherent problems. These problems arise from the inability to gather exact site conditions because water coverage prevents visibility of the underwater surface conditions. Soil conditions directly under the visible surface may also pose unexpected problems such as objects that could damage the barrier and/or porous soil conditions. Extensive site evaluations can be performed, however, it is impossible to precisely determine all relevant hydrological conditions that could affect the success of the water inflated cofferdam system.

Complete inability to keep a barrier inflated if large punctures occur: Recommended solution to the problem is to remove barrier, perform onsite repair, and remove debris that caused the problem or apply protective membrane. If the damage has rendered the barrier un-repairable, a replacement unit will be needed.

Loss of inflation due to small leaks in the barrier: Recommended solutions: 1) Perform onsite repair using the repair kit provided with your order. 2) Remove the barrier to allow the removal of debris that caused a problem or apply a protective membrane at installation location prior to re-installing the barrier. 3) Maintain recommended inflated height of barrier by adding water as needed.

Moving water environments: Bodies of moving water can behave in unusual ways when partially or completely blocked with a temporary damming system. Reducing the normal channel dimensions can cause water depths and velocities to increase. Rain events, channel flows, irregular surface conditions, soil makeup, and other relevant hydrological information may affect the overall effectiveness of the damming system. Due to these unknown behaviours; the original cofferdam design may require alterations.

Slick soil conditions: In environments exhibiting limited surface friction; adjustments to the freeboard (amount of inflated barrier above the surrounding water) and/or a temporary structure may be required for barrier stabilization and must be certified by a licenced professional engineer on a project by project basis. Environments such as lakes, ponds, or other standing water environments are susceptible to long term silt build up. This soft silt media offers very little surface friction. Slopes, grades, and other relevant hydrological data can affect the ability of the inflated barrier to perform successfully in these environments. In the event that not enough soil friction exists to stabilize the system, a structural support such as steel pipes can be used to achieve stability and prevent sliding.

Thorough site preparation is essential to avoiding the problems mentioned above.

HAZARDS

CONSTRUCTION & DEWATERING APPLICATIONS

- Due to close proximity of water, HSI Services, Inc. recommends the use of a Coastal Guard approved PFD (Personal Floatation Device) during the installation and removal process of an Aqua-Barrier®.

- Aqua-Barriers® can slide into the dewatered worksite in the event that the designated freeboard requirements stated in the Standard Heights and Dimensions charts, page 11, are exceeded. Minimum freeboard requirement is 25%. Aqua-Barriers® can be pushed or floated downstream/out of place in a moving water environment due to loss of freeboard or high water velocities.

- Aqua-Barriers® can slide into the dewatered area if the surface friction is not stable enough to support the barrier.

- Aqua-Barriers® can lose their stability and slide into the dewatered area if its recommended inflation height is not maintained.

- Aqua-Barriers® can be vandalized by cutting the exterior of the system or removing the drain ports.

- Avoid deploying Aqua-Barriers® near any electrical sources (i.e. ground transformers, power poles and lines, junction boxes, switch gears, etc.). Please inquire and adhere to all Overhead Power Line Safety Laws and OSHA requirements when elevating the Aqua-Barriers®. HSI Services, Inc. cares about the safety of those working near electrical sources. Accidents involving contact with high voltage can result in serious injury or death. When power lines are present on or near the work site, the safety of the equipment operation is the responsibility of the personnel in charge of the work site. Before setting up or operating equipment on any project: **EVALUATE THE WORK SITE FOR ELECTRICAL HAZARDS**, including both overhead and underground, and if present **EXERCISE EXTREME CAUTION**.

WARNING

The preceding list of hazards does not represent every conceivable potential hazard that may appear at a given worksite. Any change in the Aqua-Barrier(s)'® original installation positions must be evaluated before workers and equipment are allowed into the work area. The local HSI Services, Inc. representative or our installation department (800-245-0199) must be contacted to discuss the safety of the Aqua-Barrier® system before workers or equipment are allowed back into the work area.

HAZARDS
FLOOD PROTECTION APPLICATIONS

- Aqua-Barriers® can slide into the protected area in the event that the designated freeboard requirements stated in the Standard Heights and Dimensions charts, page 11, are exceeded. Minimum freeboard requirement is 25%. Aqua-Barriers® can be pushed or floated out of place in a moving water environment due to loss of freeboard or high water velocities.

- Aqua-Barriers® can slide into the protected area if the surface friction is not stable enough to support the barrier.

- Aqua-Barriers® can lose their stability and slide into the protected area if its recommended inflation height is not maintained.

- Aqua-Barriers® can be vandalized by cutting the exterior of the system or removing the drain ports.

WARNING

The preceding list of hazards does not represent every conceivable potential hazard that may appear at a given property site. Contact HSI Services, Inc. (800-245-0199) with any questions regarding site suitability, installation and removal assistance, or any other concerns.

SAFEGUARDS AND PRECAUTIONS

CAUTION

Read the safeguards and precautions prior to installing or removing Aqua-Barrier® water inflated dams whether it be a dewatering, damming, or flood protection application. Follow instructions and heed all warnings in this manual. The below stated precautions are only a few of many. Each potential Aqua-Barrier® installation location may require different precautions. It is recommended that a HSI Services, Inc. representative be contacted and consulted prior to installing or removing Aqua-Barriers®. See Aqua-Barrier® Worksite Training document for more information on safety, installation and removal procedures.

- Each individual involved in the installation of the Aqua-Barrier® system is required to have a cutting tool (i.e. knife, razor blade, box cutter, etc.) readily accessible in the event of being trapped in some manner by an Aqua-Barrier®. Have an evacuation plan in case the water level exceeds the height capacity of the Aqua-Barriers®.
- Every work site should have a deployment and recovery plan. Assistance can be provided regarding this plan by your local HSI Services, Inc. representative.
- The recommended safety space between workers and the inflated Aqua-Barriers® is 10ft-12ft. A minimum operating distance of 10ft should be maintained between heavy equipment and the inflated Aqua-Barriers®. When work requires excavating near Aqua-Barriers® and the excavation depth will exceed 1ft, you must allow an additional easement area of 1ft (in addition to the required 10ft) away from the barriers and excavation area for each additional foot excavated. The OSHA trench and excavation guidelines should be followed at all times when working with Aqua-Barriers®.
- Personnel should avoid walking on the Aqua-Barriers® unless they are accessing the fill/drain ports or checking the Aqua-Barrier® inflated height.
- When installing, working around inflated Aqua-Barriers®, or removing Aqua-Barriers®, a minimum crew size of 3 workers is mandatory.
- Do not stack objects (i.e.: sandbags, bricks, or another Aqua-Barrier® unit) on top of the Aqua-Barrier® system to increase height.
- It is recommended that you monitor the inflated Aqua-Barrier(s)® 24-hours a day. This will deter any vandalism and be a source of information if any problems occur.
- If Aqua-Barriers® are installed near major roads, overpasses, or recreational boating areas it is recommended a puncture resistant cover be placed over the barriers to protect against floating/thrown objects.
- **Aqua-Barriers® are only a surface water treatment. Water can transmit under the barriers depending on soil porosity. Sump pump area(s) are required in all dewatering projects. The size and number of sump pumps will depend upon the porosity of the soil.**

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ADDITIONAL SAFEGUARDS AND PRECAUTIONS FOR FLOOD PROTECTION APPLICATIONS

CAUTION

Read the safeguards and precautions prior to installing or removing Aqua-Barriers®. Follow instructions and heed all warnings in this manual. The below stated precautions are only a few of many. Each potential Aqua-Barrier® installation location may require different precautions. It is recommended that an HSI Services, Inc. representative be contacted and consulted prior to installing or removing Aqua-Barriers®.

- Block all ways that flood water can invade the property being protected (i.e.: plug toilets and other drains). Shut off main water line leading to the protected property.
- The recommended safety space between the protected property and the Aqua-Barriers® is 10ft to 12ft.
- It is recommended to monitor the inflated Aqua-Barrier(s)® 24-hours a day. This will deter any vandalism and be a source of information if any problems occur.
- You must install the Aqua-Barrier® 2X the inflated height away from the protected structure (i.e. a 2ft tall Aqua-Barrier® must be installed at least 4ft away from the protected property).
- Do not install an Aqua-Barrier® on surfaces unable to bear the weight load such as decks and balconies.

The following websites offer additional flood safety information:

www.fema.gov
www.redcross.org
www.noaa.gov
www.flash.org

EVACUATION PROCEDURE

If, in the event the water depth where the Aqua-Barriers® are to be installed at is expected to exceed the 25% freeboard or recommended freeboard requirement, the worksite should be evacuated.

The evacuation plan is as follows:

All personnel should be evacuated from the dewatered worksite. The worksite equipment can be evacuated if the competent person believes that it is safe.

The Aqua-Barrier® removal process can begin if it is determined that there is sufficient time for removal of the barriers before the 25% freeboard or recommended freeboard requirement is exceeded. Reference pages 56-60 for removal procedures and additional instructions.

In moving water environments, all personnel involved with the removal process should position themselves on the upstream side of the barrier before the actual removal process begins. Water should then be released from the barrier into the dewatered area to equalize the water pressure on both sides of the Aqua-Barrier® prior to removing the drain ports on the watered side of the barrier.

Each installed Aqua-Barrier® is to be removed from the worksite. An HSI Services, Inc. trained advisor can instruct onsite personnel with regard to the proper removal process during the installation training and removal session which may take place on site or virtually prior to installation.

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Aqua-Barrier®
Water-Inflated Dams

Preparing Your Worksite

SITE PREPARATION AND INSTALLATION PRECAUTIONS

CAUTION

Installing Aqua-Barrier(s)® in any type of environment requires thorough preparation. The following represents several general guidelines that need to be complied with when installing Aqua-Barrier(s)®.

- All ground objects that could puncture the Aqua-Barriers® (i.e. sharp rocks, broken glass) should be carefully removed or avoided when deploying. If deploying in a standing or moving water environment, manually walking the site or drag netting will ensure a properly cleared area. When the deployment site cannot be totally cleared of problem objects, it is recommended that a protective material be installed on the site (i.e. non-woven geo textile or other forms of puncture and abrasion resistant plastic sheeting) prior to deployment.

- Before setting up or operating equipment on any project: **EVALUATE THE WORK SITE FOR ELECTRICAL HAZARDS**, including both overhead and underground, and if present **EXERCISE EXTREME CAUTION**.

- Identify the water source that will be used to inflate barriers and maintain clear access to it. Using the shortest length of hose to fill the Aqua Barriers® is preferred because less hose transmits more water volume. Reference page 35-36 for instructions on the proper use of a suction hose.

- Do not drag Aqua-Barrier® barriers on rough surfaces as this could cause permanent damage and affect barrier stability & integrity.

- Assessment of slopes and land contours is very important when evaluating an optimal area for installing Aqua-Barriers®. If the area needing protection is characterized by hills and valleys, barriers may only be needed in the valleys. A barrier will only fill to its expected inflated height at the lowest point it encounters along its length. It is recommended that you consult your local Aqua-Barrier® representative for assistance prior to deployment if faced with extreme land contours.

SITE PREPARATION AND INSTALLATION PRECAUTIONS

CAUTION

Installing Aqua-Barrier(s)® in any type of environment requires thorough preparation. The following represents several general guidelines that need to be complied with when installing Aqua-Barrier(s)®.

- It is required that all of the Safeguards and Precautions and Hazards sections be carefully read prior to installing an Aqua-Barrier® system.
- The inflated height of the Aqua-Barrier® system is measured at the point of lowest elevation where the system is installed. The system must be monitored during the entire inflation process.
- Once the recommended inflation height is achieved, measured from the point of lowest elevation, the inflation process has been completed.
- Caution must be given never to over-inflate an Aqua-Barrier® system. It is recommended that you consult your local Aqua-Barrier® representative for assistance prior to deployment if faced with extreme land contours.
- Personnel involved in the installation and removal process should *never* position themselves beneath any elevated portion of an Aqua-Barrier® or piece of equipment.
- During all Aqua-Barrier® installations, the barriers can tractor or rotate toward the side which possesses less hydrostatic pressure or water depth. The maximum length of movement toward the side of least water resistance is 1/2 of the properly inflated barrier height (i.e., 4-ft tall barrier can adjust as much as 2 ft). See Baffle Behavior on page 10 to determine the adjustment length for your specific Aqua-Barrier® system. The same adjustment behaviour can occur if a slope or grade exists from one side of a barrier to the other. Aqua-Barrier® units that are not inflated to their proper height can tractor toward the dewatered area more than 1/2 of the recommended inflation height. Never over inflate an Aqua-Barrier® system. Reference page 28 for additional information on over-inflation.

SITE PREPARATION AND INSTALLATION PRECAUTIONS

- **For Flood Protection Applications Only:** Locate overflow fittings along the top prior to inflating the system. Screw on the provided stand pipe into the overflow fitting. Once water begins to flow out of the top of the stand pipe, the system has been completely inflated. Immediately stop the inflation process once this happens. If you continue to inflate your barrier after water has begun escaping from the stand pipe, you could cause the system to rupture. It's imperative that you don't over inflate your Aqua-Barrier® system.
- Apply 100% silicone caulk to all cracks, crevices, etc. to prevent water from seeping under the barrier via those cracks and crevices.

EVACUATION PROCEDURE:

In the event the water depth where the Aqua-Barrier® system is to be installed is expected to exceed the freeboard requirement of 25%, the area should be evacuated. Standard evacuation procedures should include a designated path for evacuation. If no safe evacuation path exists, a portable floating device (ie: air inflated raft, boat, etc.) which is capable of safely transporting individuals to safety should be utilized. Reference page 20 for additional information.

HI Services Inc.

Aqua-Barrier®
Water-Inflated Dams

Installing your Aqua-Barrier®

INSTALLATION PROCEDURE

There are three primary types of Aqua Barrier® installations. The following descriptions of the various types of installations are simplified and are only meant to give a general overview of the installation process. Assistance on proper installation procedures can be provided by a trained Aqua-Barrier® representative.

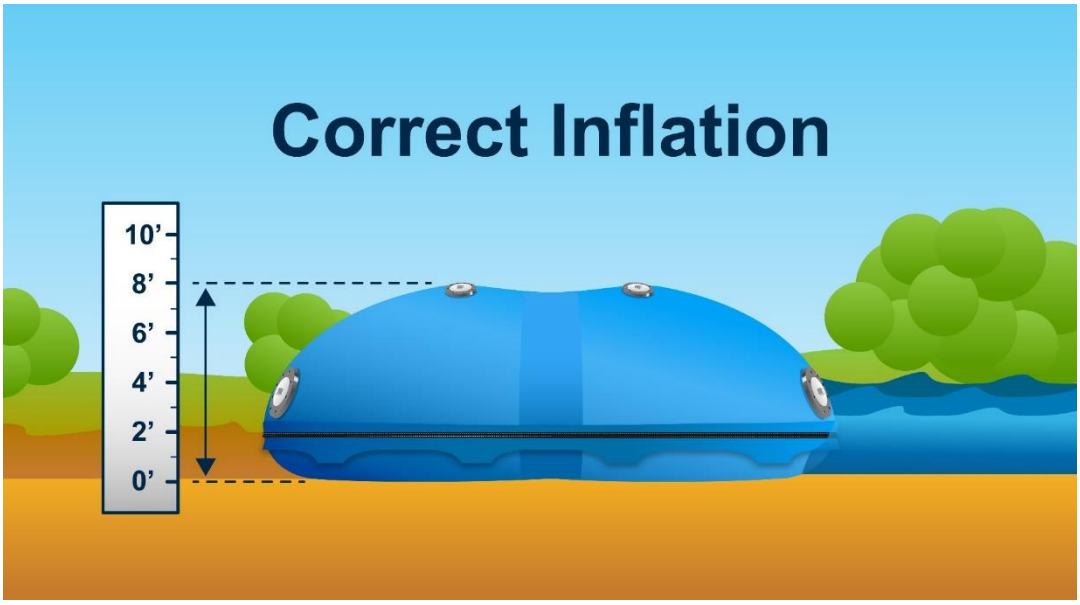
Dry surface installation:
The location where the barriers are to be installed has no water present. The barriers are simply unrolled and inflated. This style of installation is generally used in anticipation of flood waters.

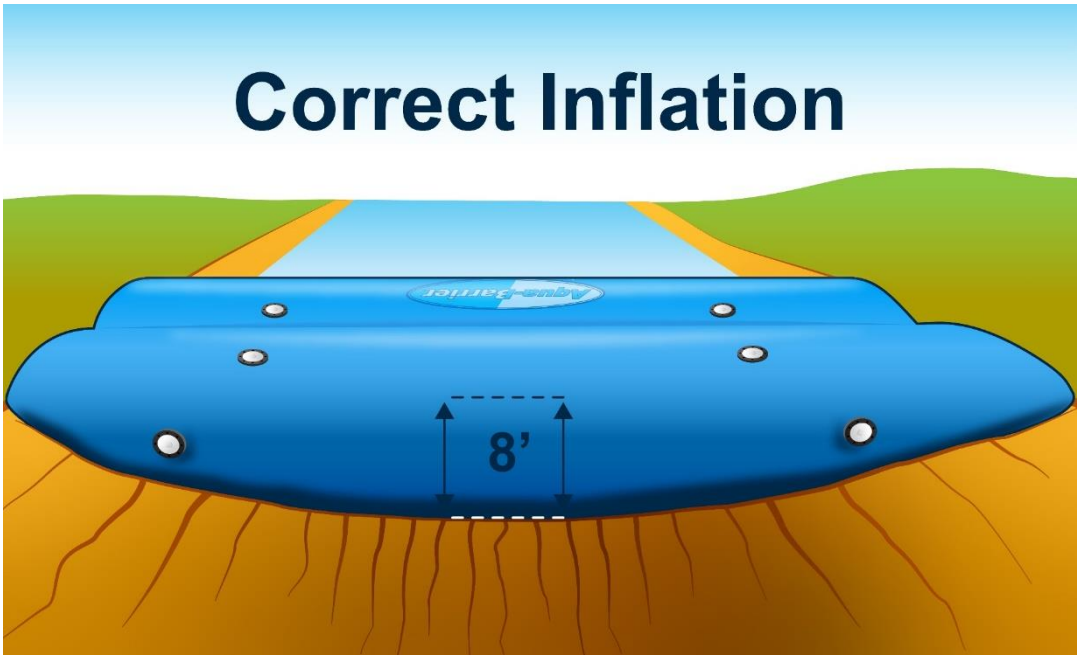
Static water installation:
Non-moving water is present at installation location. The barriers are buoyant and float on the waters surface when empty. The barriers are placed at the waters edge, unrolled on the water's surface and floated into position.

Dynamic water installations:
Dynamic or moving water is present at installation location. Barriers are positioned properly by controlling the ends of the unit with hydraulic equipment (i.e. 200 series or larger track hoe, crane) in junction with the patented end pipe loops and/or anchoring at least one end of the barrier at the shoreline.

CORRECT INFLATION

Always measure barrier height from the lowest point of elevation to avoid over-inflating the barrier.
Always inflate an Aqua-Barrier® to its fullest height.

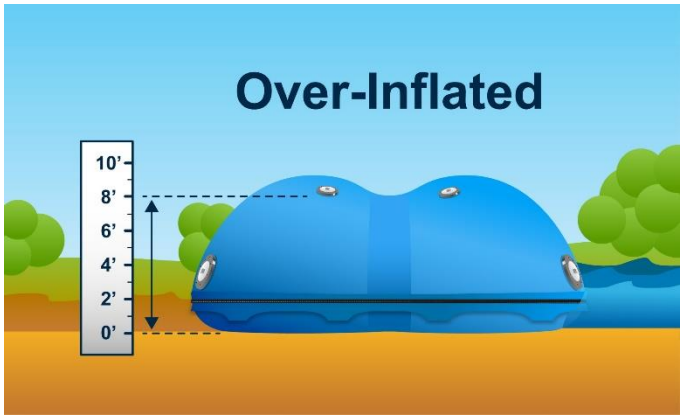


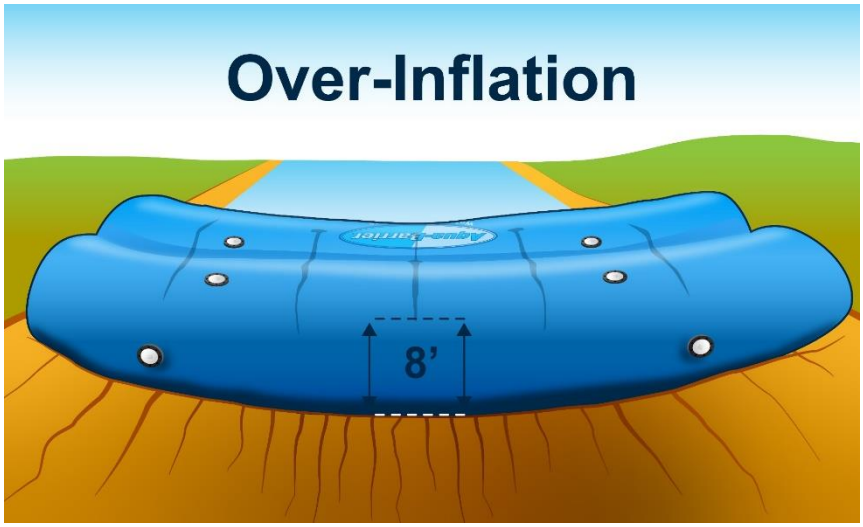


Note: The example illustrations above are using 8ft tall Aqua-Barriers®

OVER-INFLATION AND PREVENTION

Always measure barrier height from the lowest point of elevation to avoid over-inflating the barrier.
Always inflate an Aqua-Barrier® to its fullest height



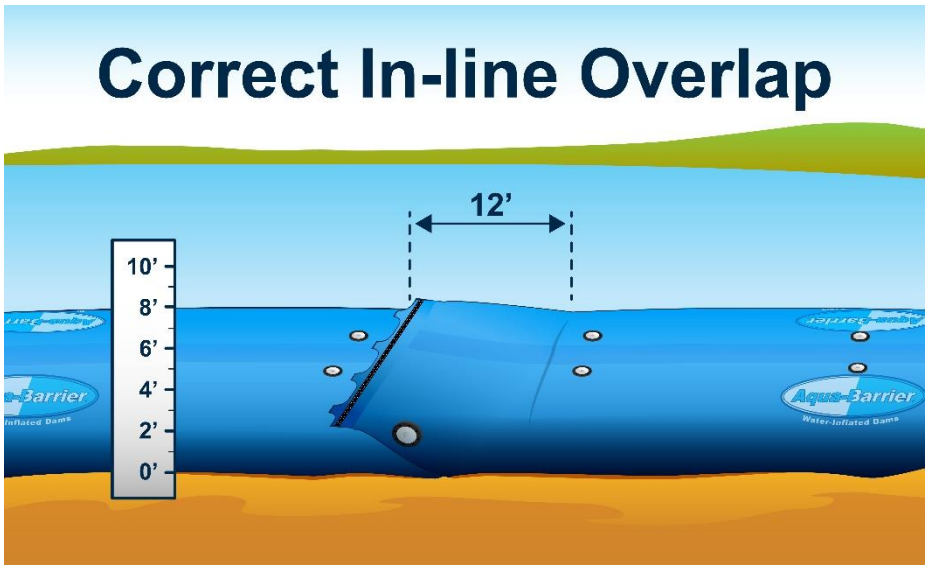


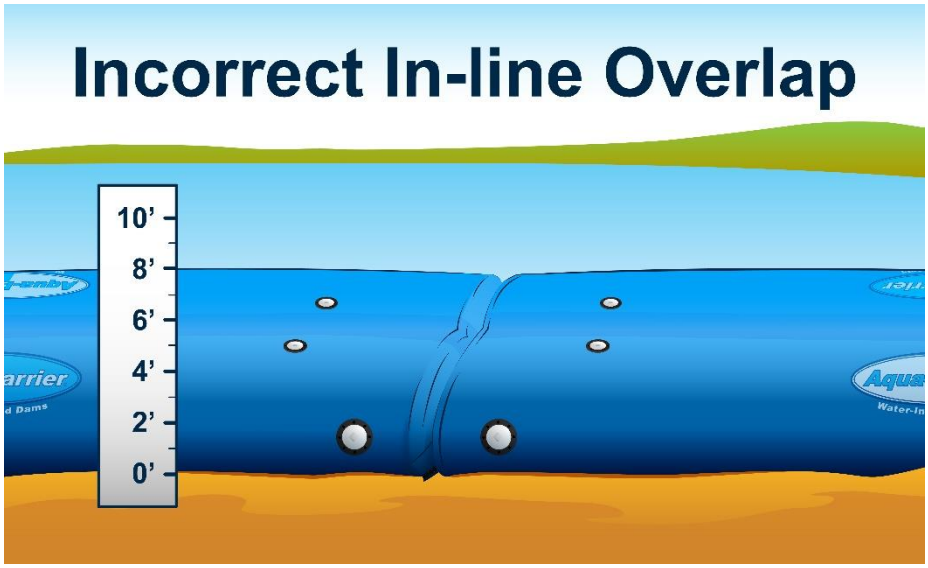
Note: The example illustrations above are using 8ft tall Aqua-Barriers®

WARNING

Do not proceed with dewatering if you have over-inflated your barrier. Contact HSI Services, Inc. or your local Aqua-Barrier® representative for further instructions immediately.

OVERLAP METHOD





The example illustrations above are using 8ft tall Aqua-Barriers®

Aqua-Barriers® are joined together by an overlapping technique. Once the initial Aqua-Barrier® has been inflated, the adjoining barrier is positioned and pulled up onto the end of the inflated barrier. The chart on page 30 illustrates the required barrier overlap lengths for each type of connection.

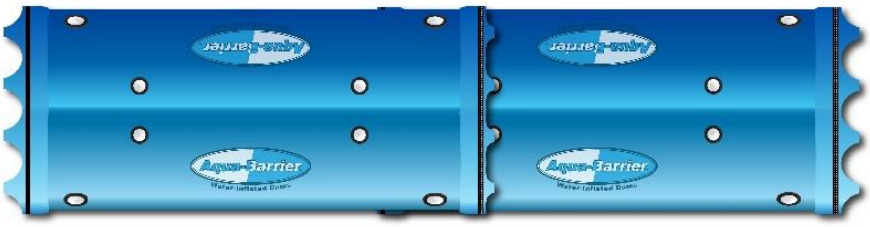
The barrier positioned on top of the inflated barrier is then inflated. The weight of the second barrier will provide downward force to seal the connection joint. Barriers can be joined end to end or at various other angles as depicted on page 30.

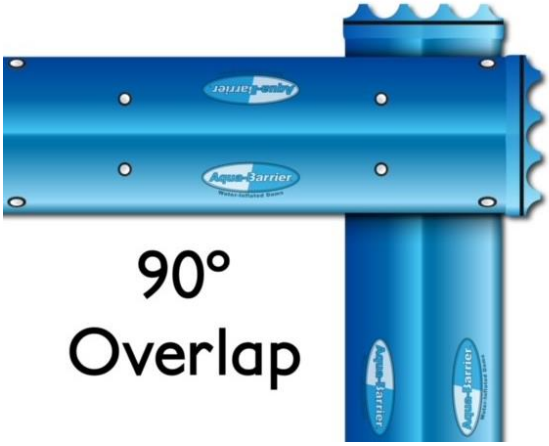
OVERLAP REQUIREMENTS

Inflated Height (ft)	Standard Overlap Length (ft)	90 Degree Overlap (ft)
2	3	4.5
3	4.5	6.75
4	6	9
5	7.5	11.25
6	9	13.5
7	10.5	15.75
8	12	18

All 90 degree overlaps must be created with the required linear footage stated on the chart above. All other overlaps, unless specified by your Aqua-Barrier® representative, must be created with the standard overlap length stated above.

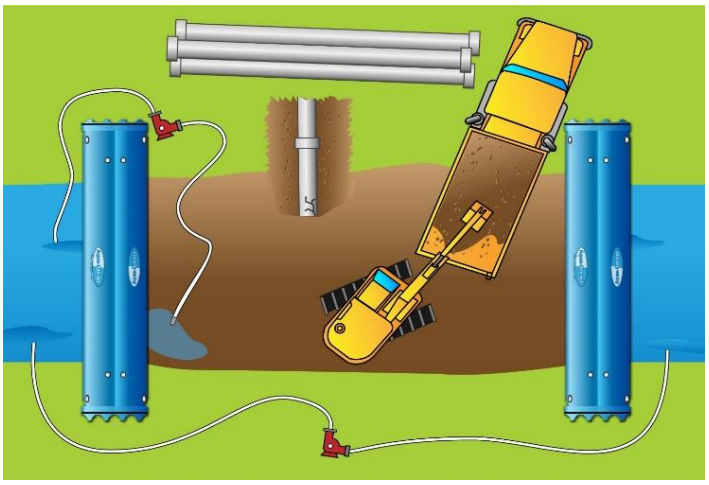
In-Line Overlap



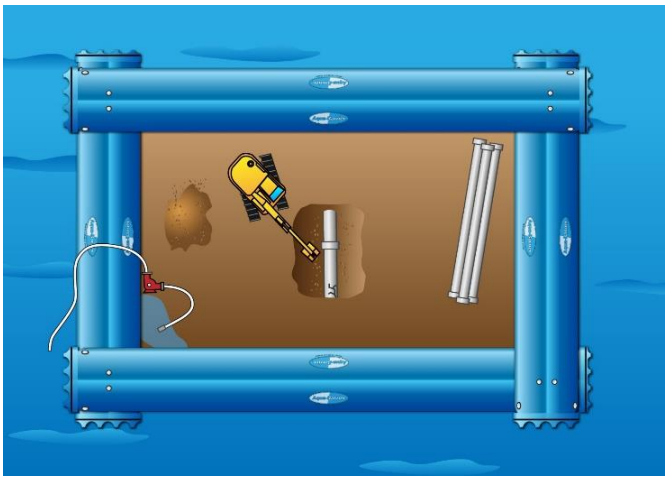


INSTALLATION CONFIGURATIONS FOR DEWATERING

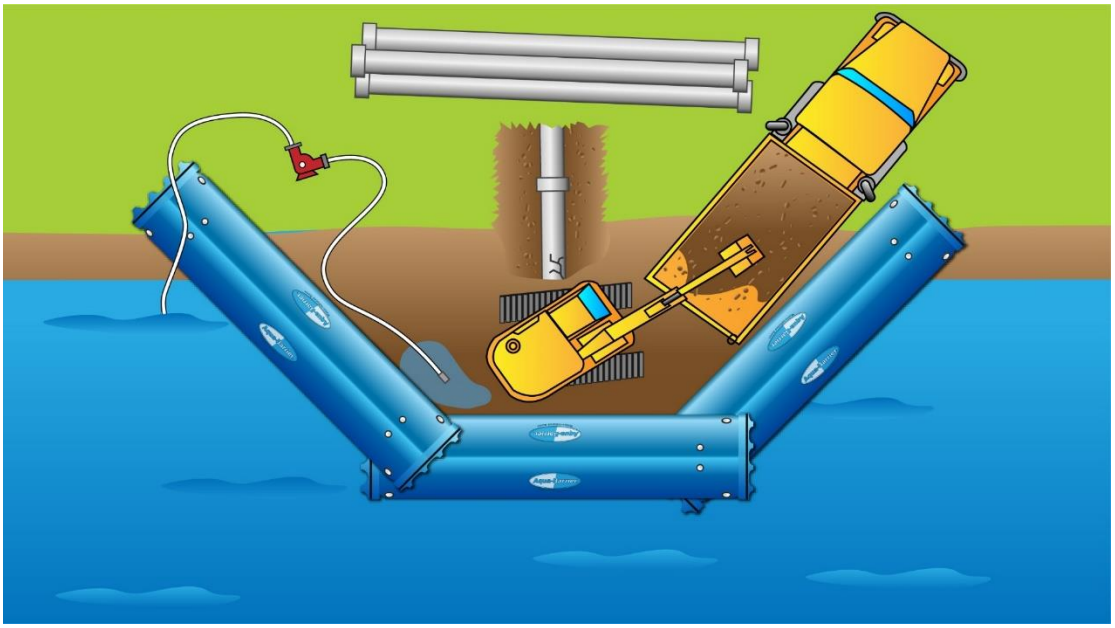
The drawings below represent commonly used configurations. Aqua-Barriers® are not limited to just these choices as you're able to overlap Aqua-Barriers® at any angle.



Bank to Bank Block



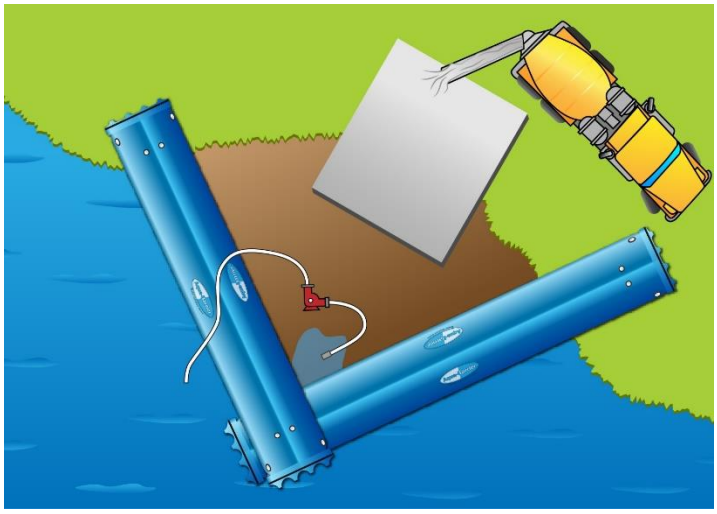
Complete Enclosure



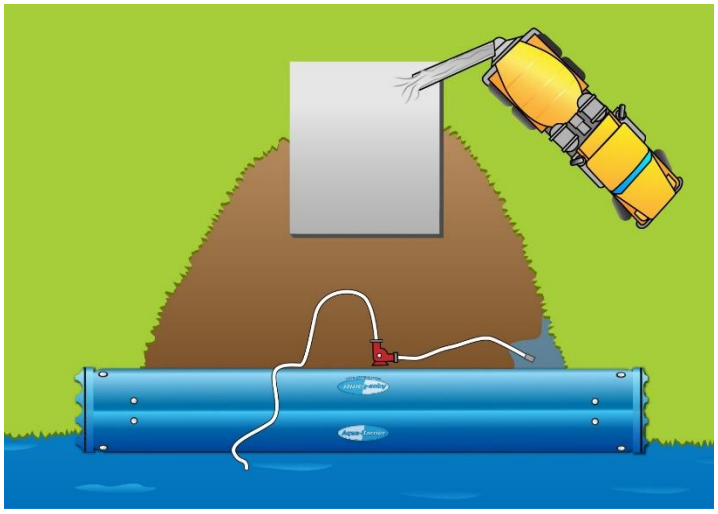
Partial Block

INSTALLATION CONFIGURATIONS FOR DEWATERING

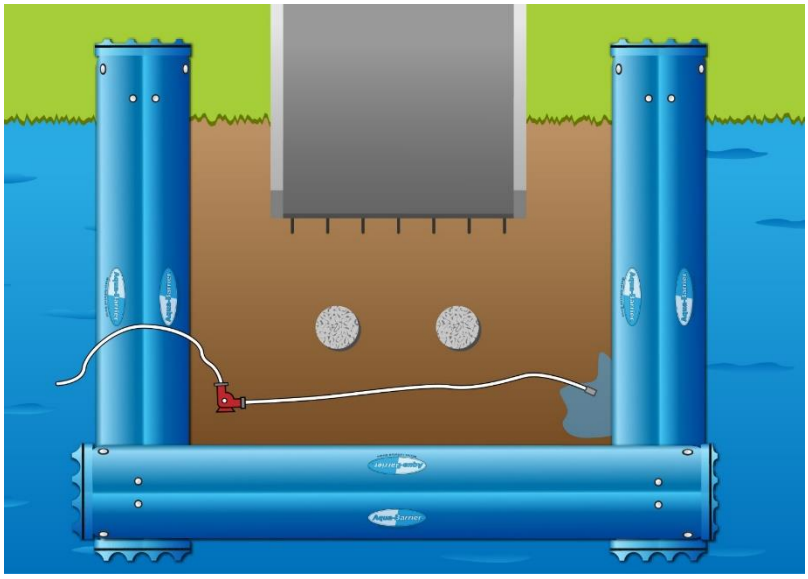
The drawings below represent commonly used configurations. Aqua-Barriers® are not limited to just these choices as you're able to overlap Aqua-Barriers® at any angle.



Tee-Pee Configuration



Straight Shoreline

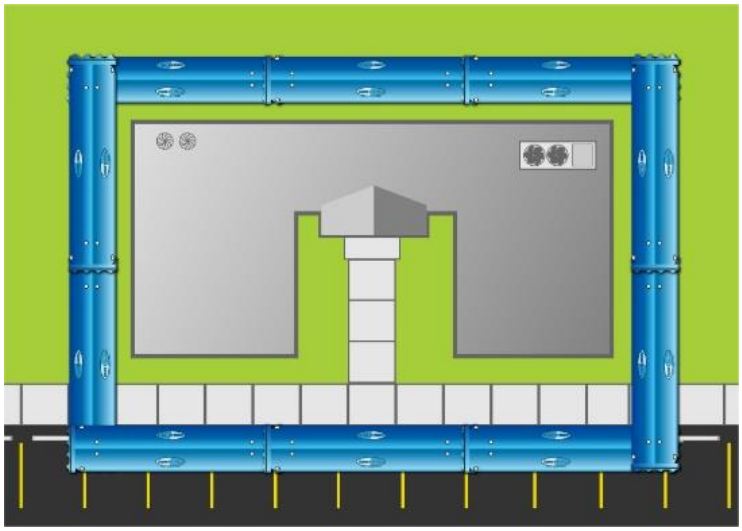


In-Line Partial Block

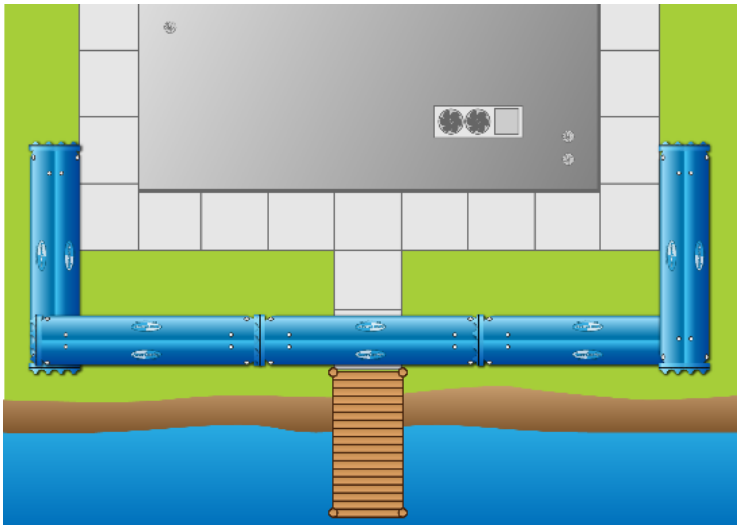
HS Services Inc.

INSTALLATION CONFIGURATIONS FOR FLOOD PROTECTION

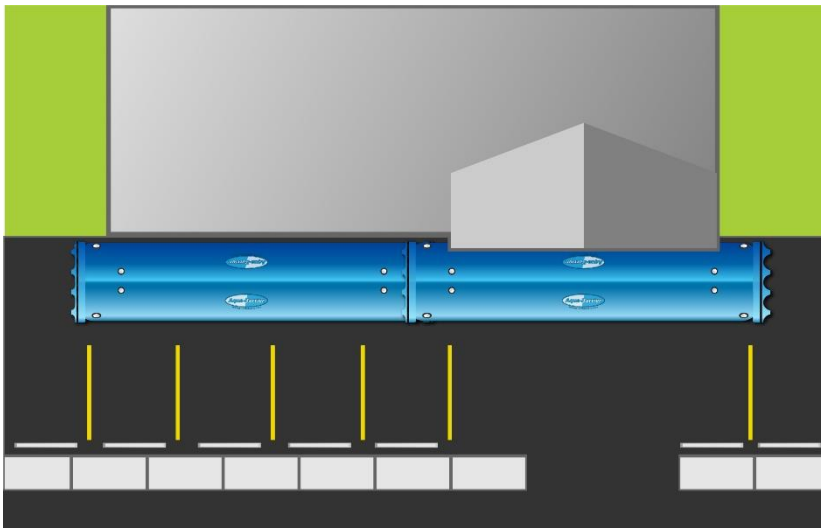
The drawings below represent commonly used configurations. Aqua-Barriers® are not limited to just these choices as you're able to overlap Aqua-Barriers® at any angle.



Complete Enclosure



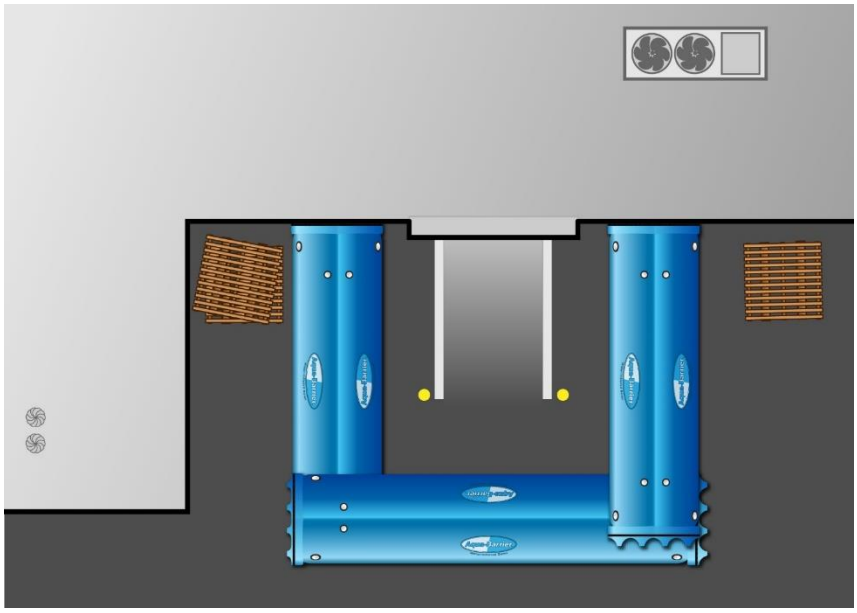
Partial Enclosure



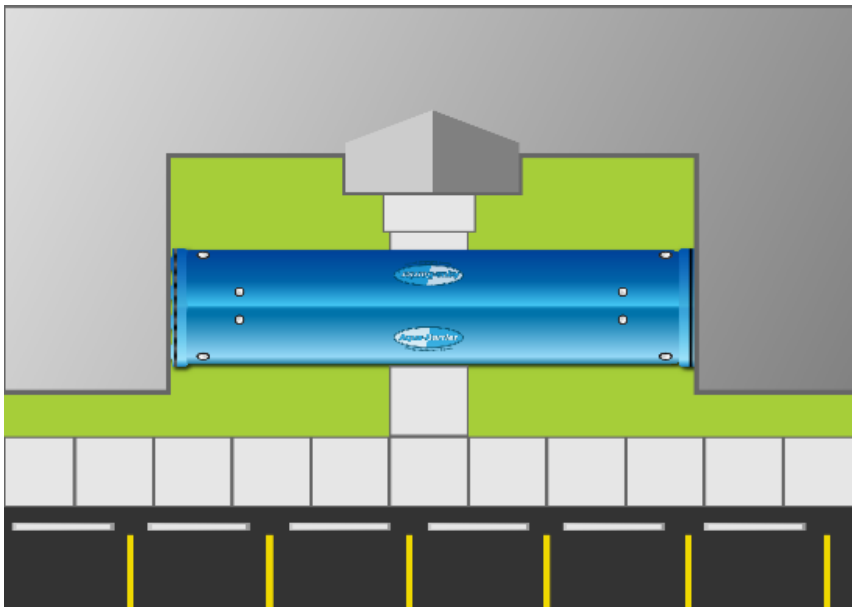
In Front of Doorways

INSTALLATION CONFIGURATIONS FOR FLOOD PROTECTION

The drawings below represent commonly used configurations. Aqua-Barriers® are not limited to just these choices as you're able to overlap Aqua-Barriers® at any angle.



Loading Dock

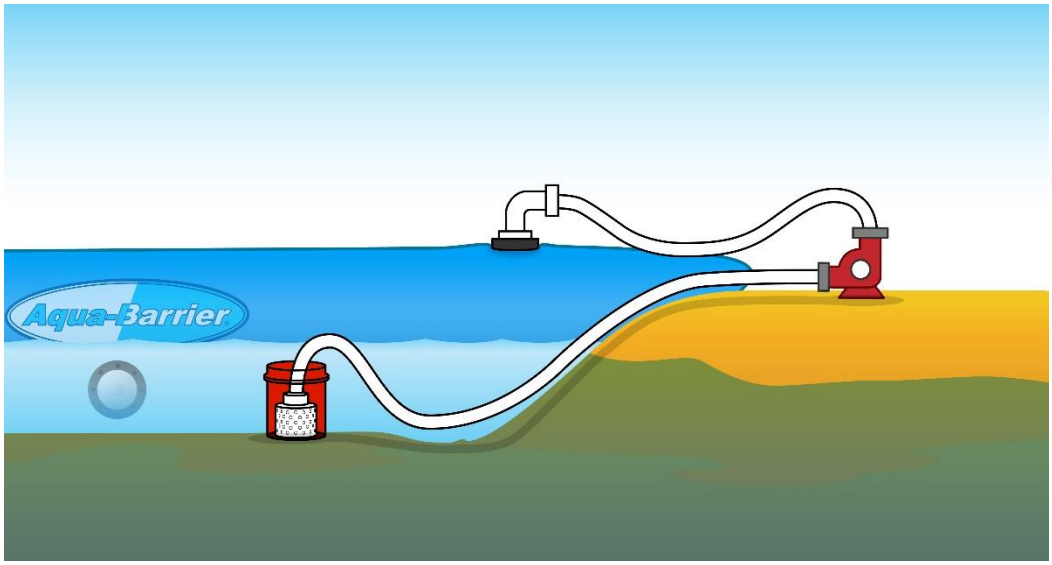


Between Vertical Walls

PROPER USE OF A SUCTION HOSE

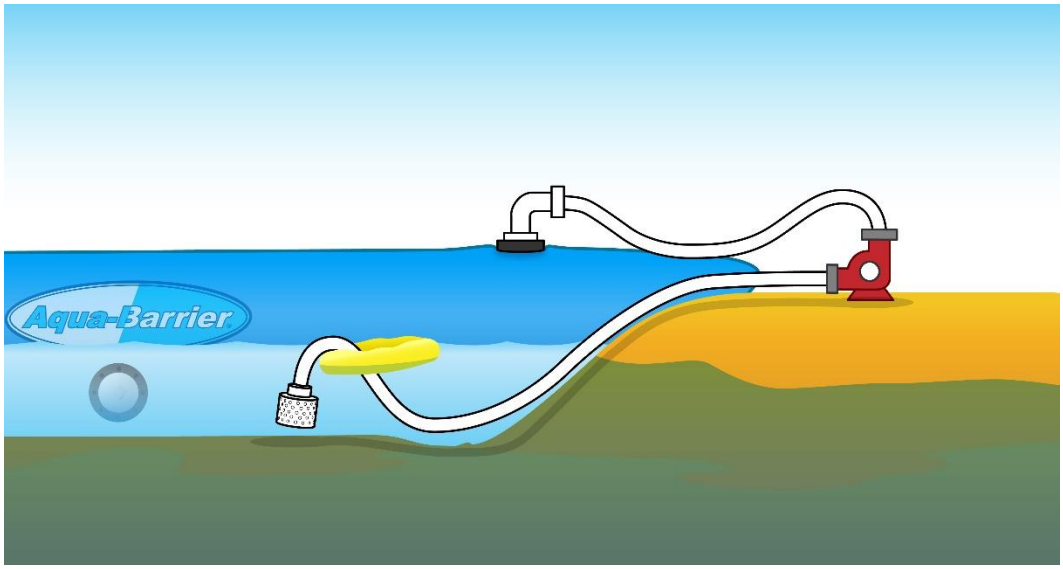
NOTICE

Avoid inflating the barriers with any solids that cannot be removed during the deflation process. Additional charges will apply if the barrier incurs damage beyond normal wear and tear or if the returned freight is higher due to extra weight of the shipment.



Proper Use: Option 1
(Bucket Method)

Submerge suction hose intake within an appropriately sized bucket to avoid sediment from being siphoned into the barrier during inflation.



Proper Use: Option 2
(Floatation Device Method)

Submerge suction hose intake with support of a floatation device to keep it off of the floor of your water source to avoid sediment from being siphoned into the barrier during inflation.

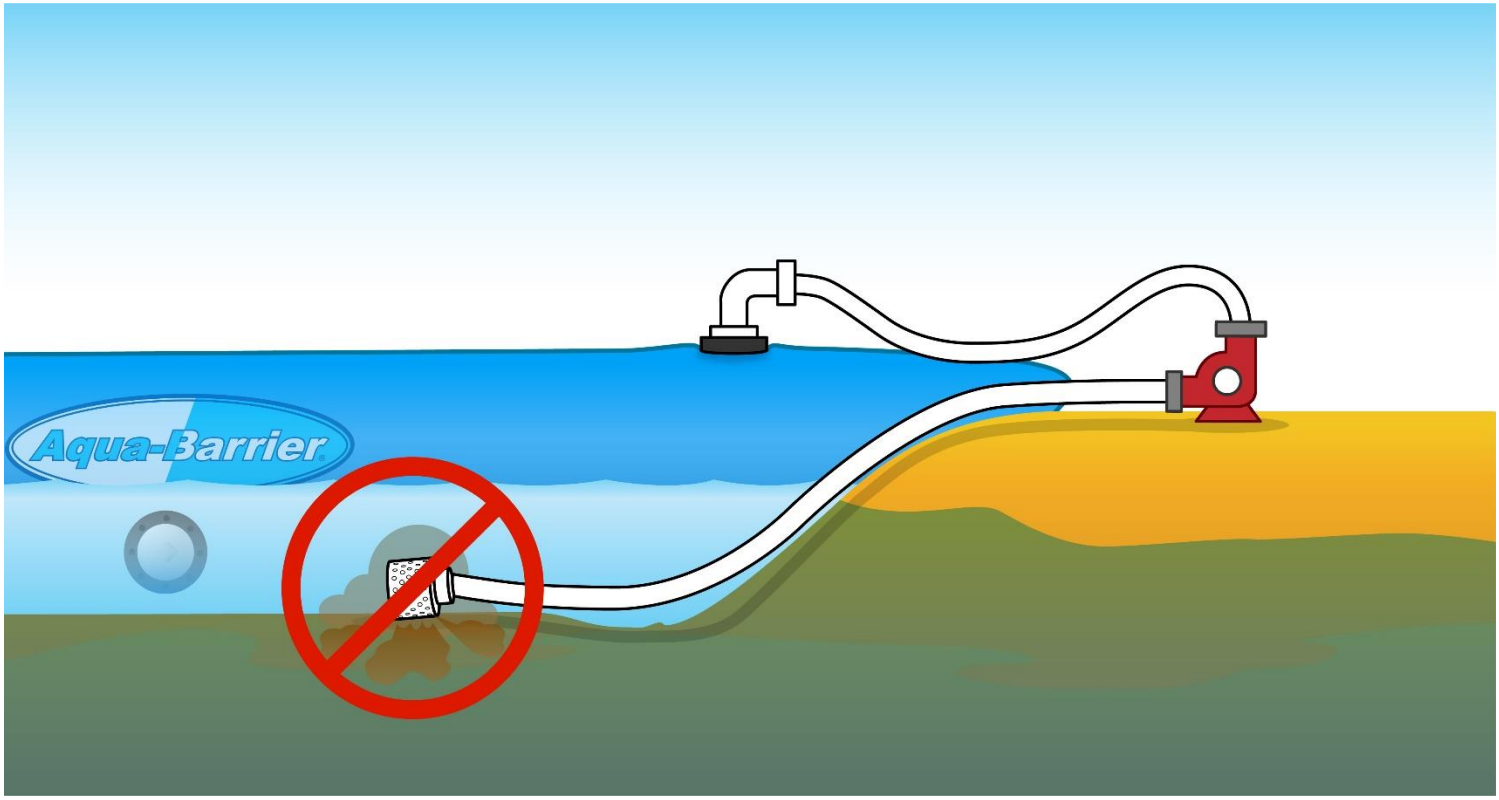
IMPROPER USE OF A SUCTION HOSE

NOTICE

Avoid inflating the barriers with any solids that cannot be removed during the deflation process. Additional charges will apply if the barrier incurs damage beyond normal wear and tear or if the returned freight is higher due to extra weight of the shipment.

Improper Use

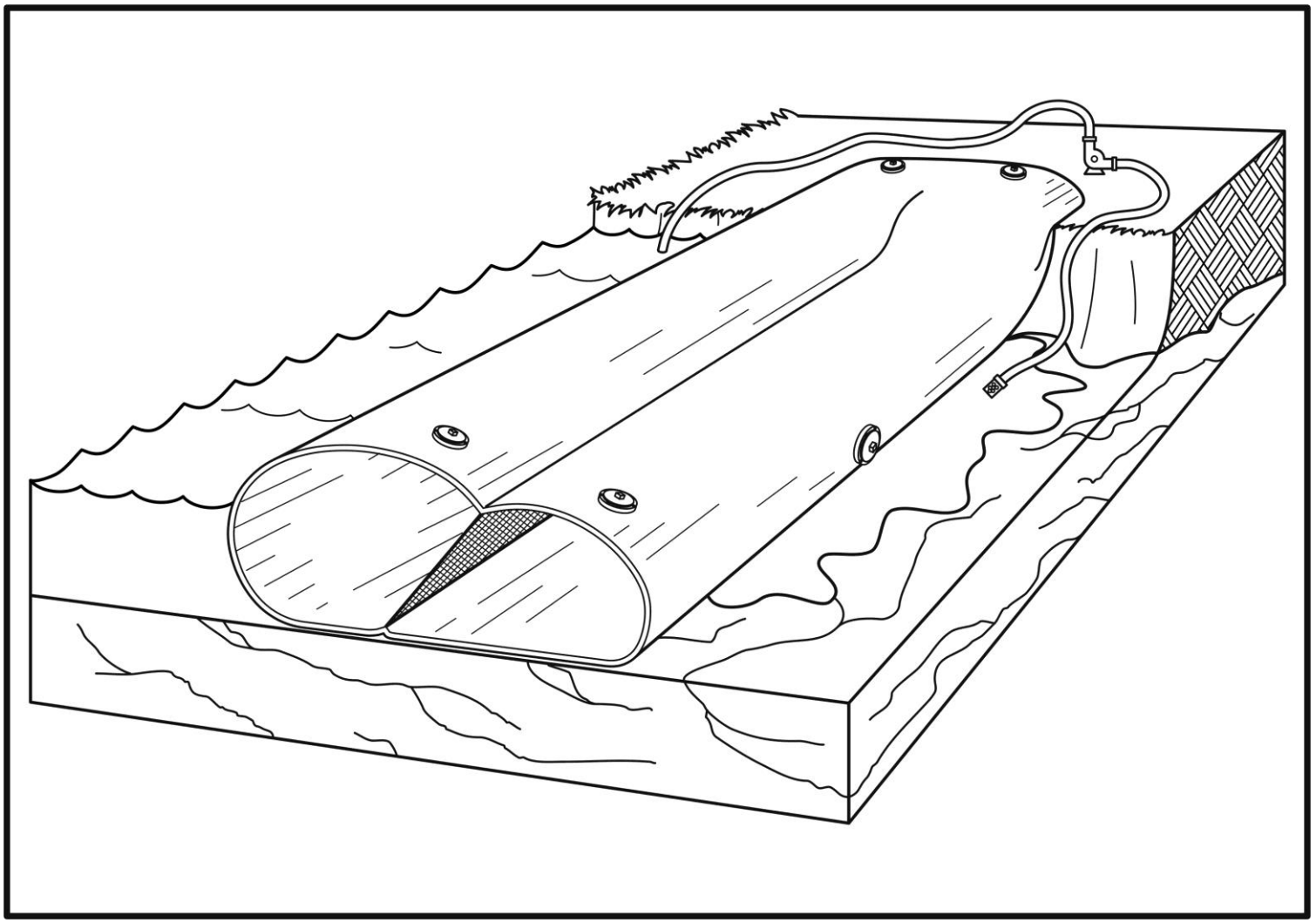
Do not allow suction hose intake to contact water source floor to avoid sediment from being siphoned into the barrier during inflation as shown below.



HSI Services Inc.

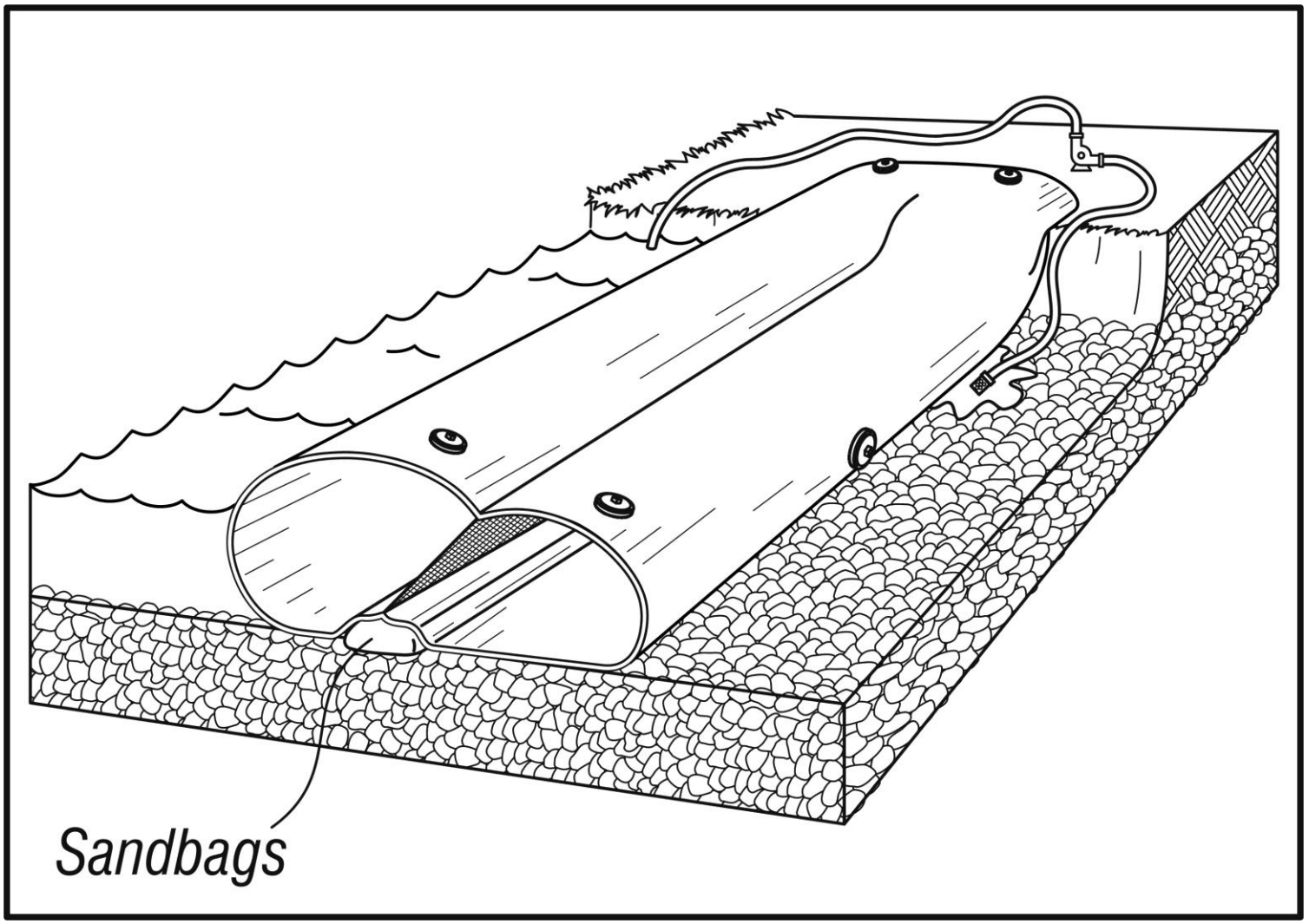
SEEPAGE DISCLAIMER

The Aqua-Barrier® water inflated dam system when properly installed is a temporary barrier against surface water. HSI Services, Inc. accepts no responsibility for water migrating under the Aqua-Barrier® system. The volume of water migrating under the Aqua-Barrier® is a function of soil porosity. A sump area where water can gather and be evacuated during the life of the project is required. The size and number of sump areas would depend on the size of the area being dewatered and porosity of the soil.



Use a pump on the dry side to control seepage that may occur under the barrier due to weak and porous soil.

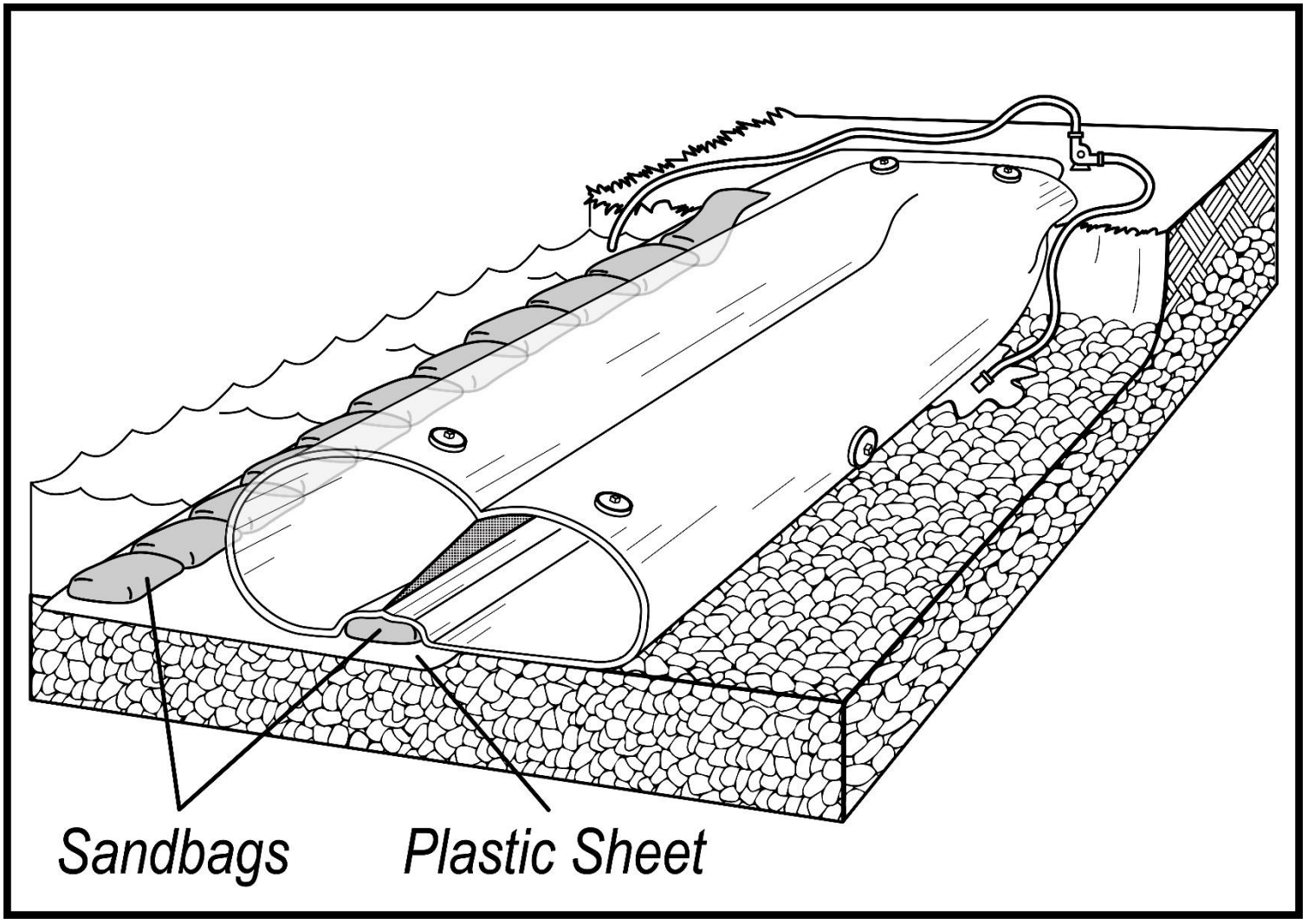
SEEPAGE DISCLAIMER



Another option to control seepage is to apply a row of sand bags on the watered side of the barrier.

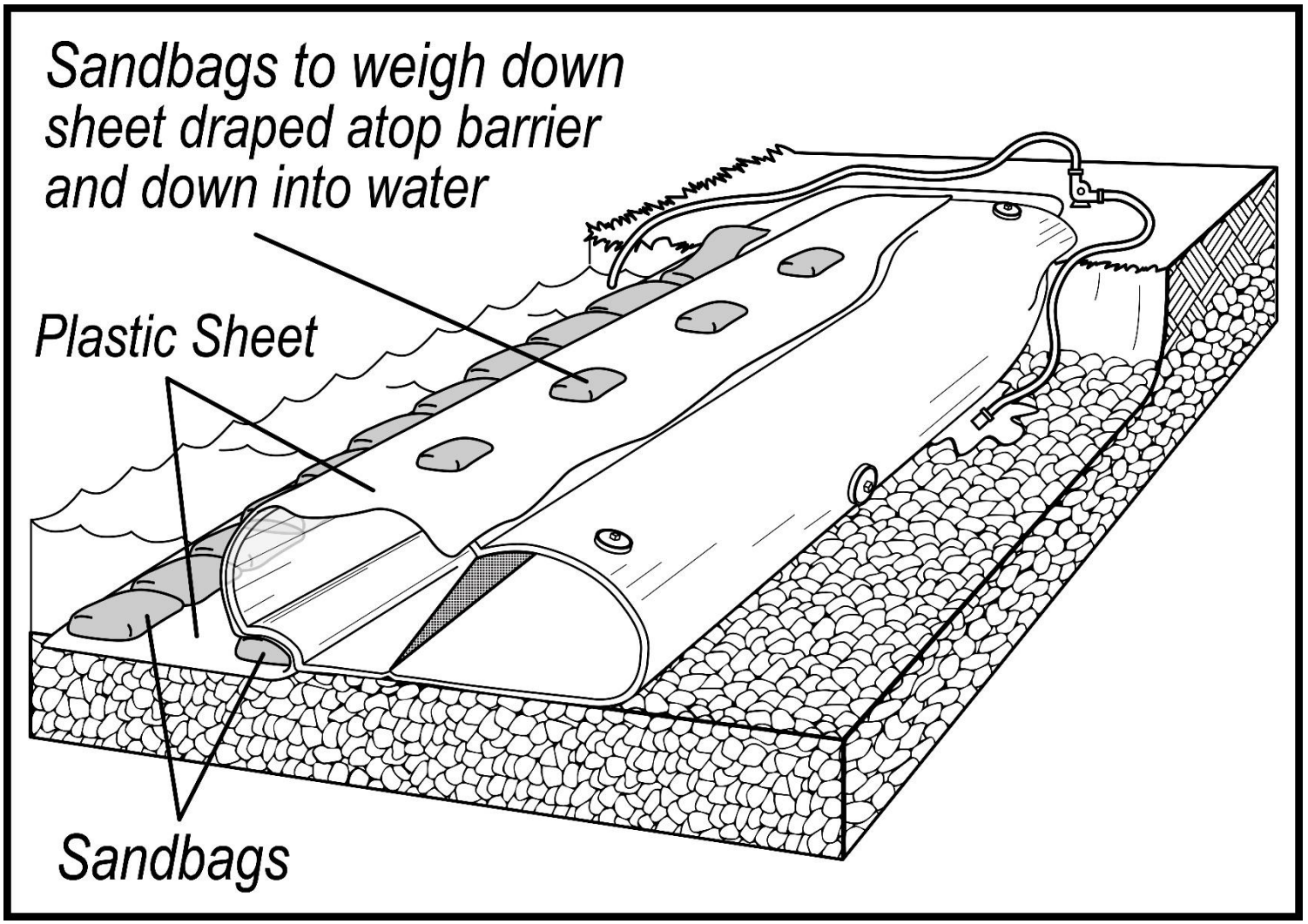
HJ Services Inc.

SEEPAGE DISCLAIMER



You may also lay a sheet of plastic sheeting under the Aqua-Barrier® on the watered side and lay a row of sandbags over it. This can create a "vacuum" and help minimize seepage.

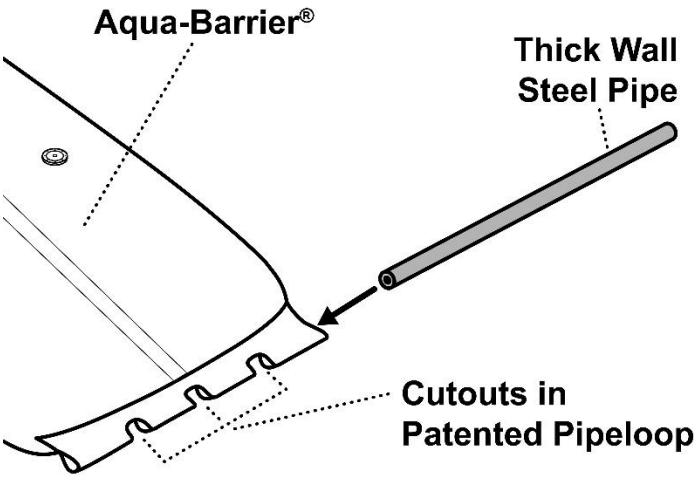
SEEPAGE DISCLAIMER



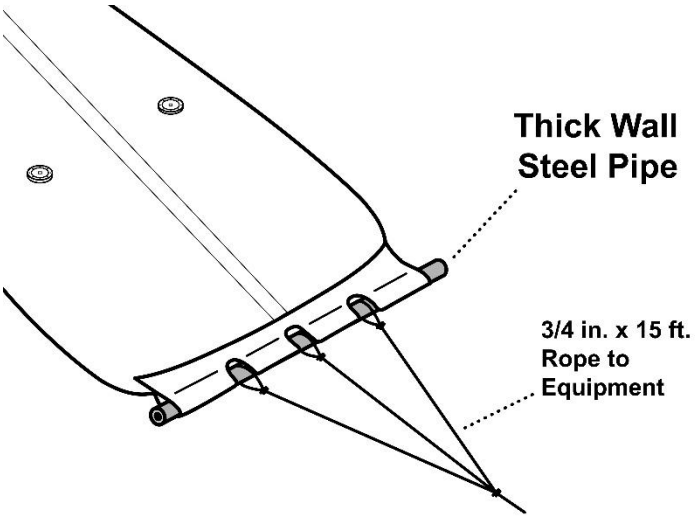
You may also lay a sheet of plastic sheeting draped atop the Aqua-Barrier® and tucked underneath the watered side wedged in with sandbags. Be sure to weigh down the sheet on top of the barrier as well as the submerged sheet edge.

RECOMMENDED LIFTING PIPE INSTALLATION PROCEDURE

The following is subject to change due to site conditions. Reference Equipment Checklist provided by your HSI Services, Inc. representative.



Step 1: Insert steel pipe into pipe loop.



Step 2: Attach (3) 3/4 inch x 15 feet of rope to the steel pipe at the cut outs. These three ropes should then be attached to the lifting apparatus.

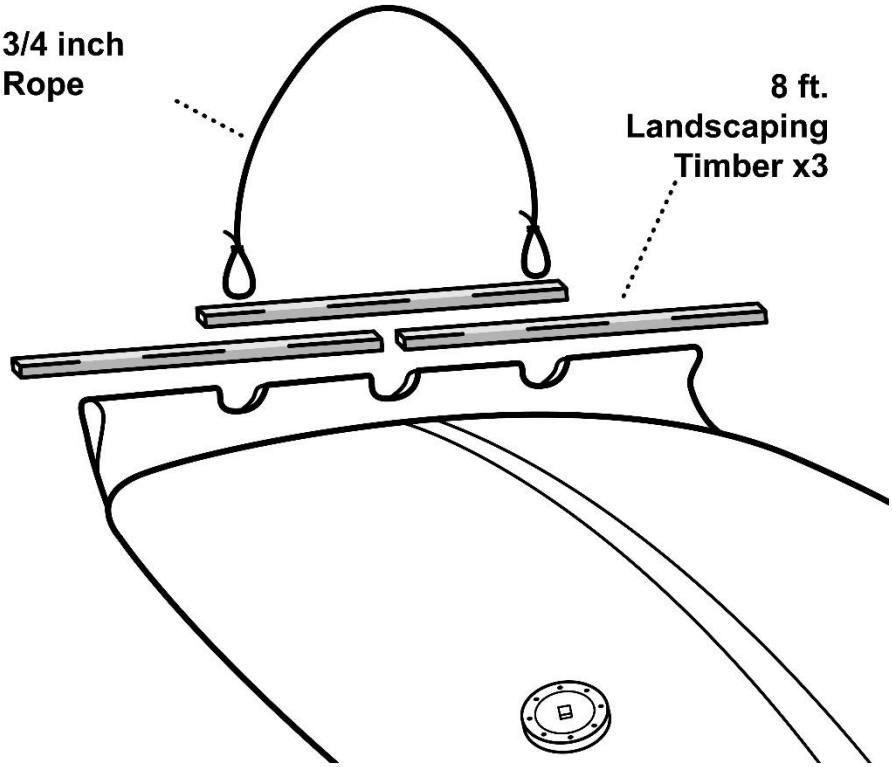
Required Pipe Lengths

Barrier Height (ft.)	Pipe Length (ft.)
2	8
3	8
4	10
5	15
6	15
7	21
8	21

NOTICE

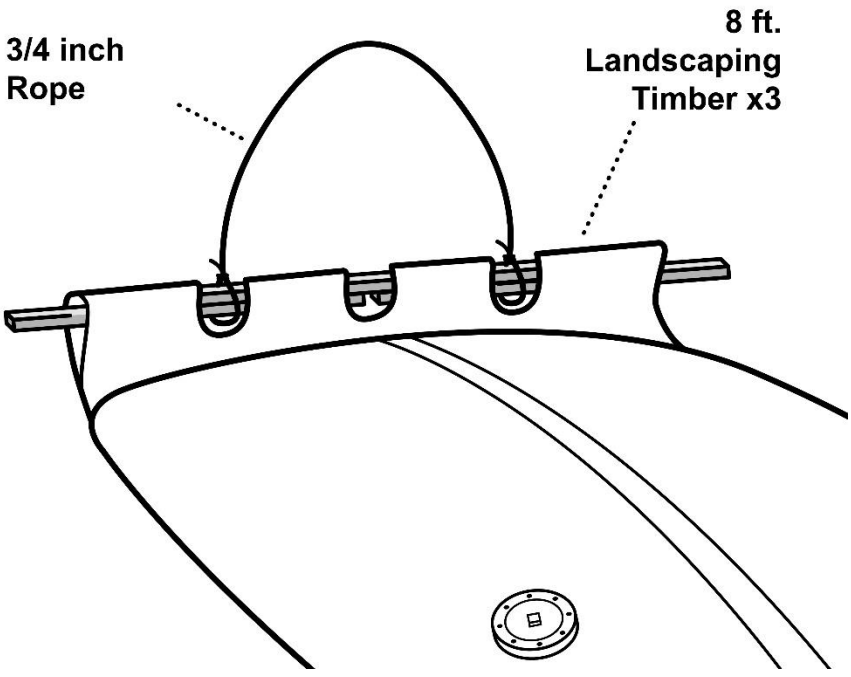
ALL STEEL PIPES MUST BE CONTINUOUS LENGTHS WITH NO JOINTS OR CONNECTIONS

LIFTING TIMBERS INSTALLATION PROCEDURE



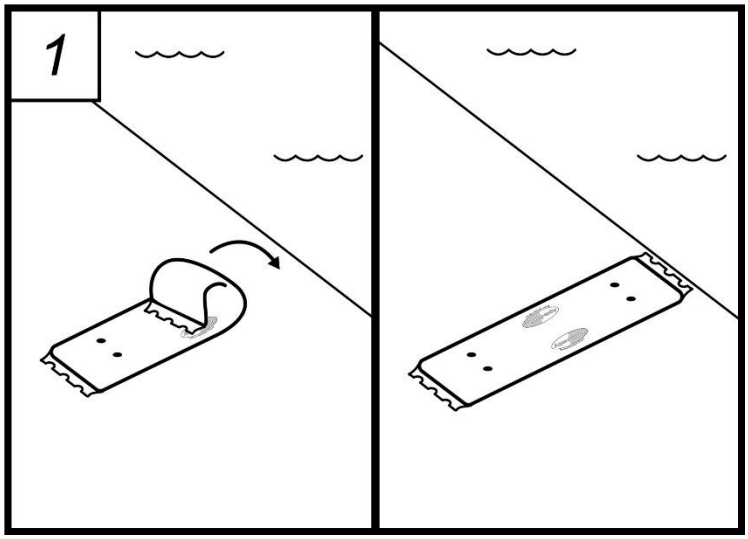
CAUTION

This procedure is not to be used in moving water installations

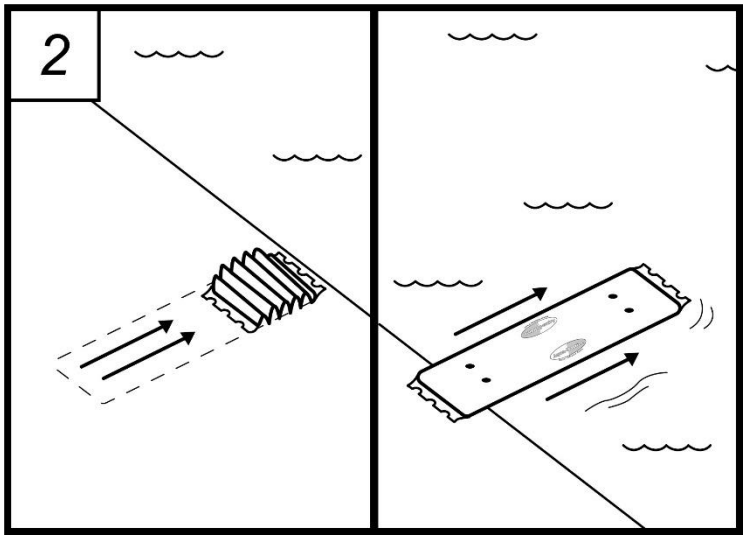


HI Services Inc.

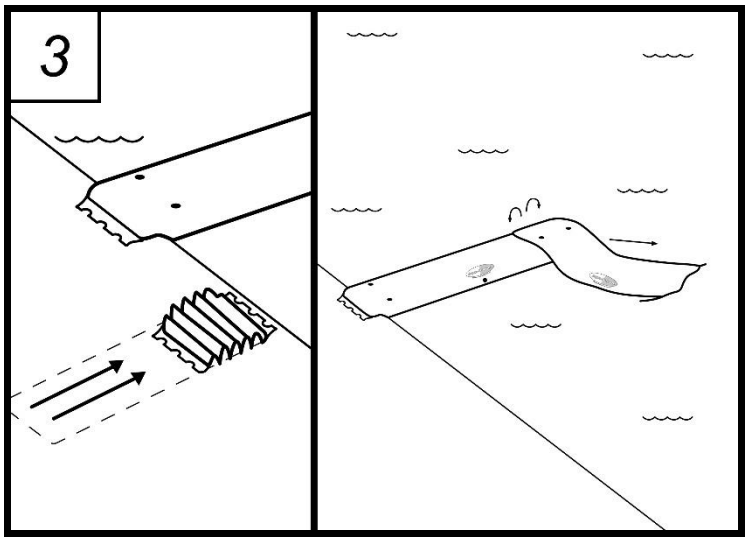
STATIC WATER MANUAL DEPLOYMENT



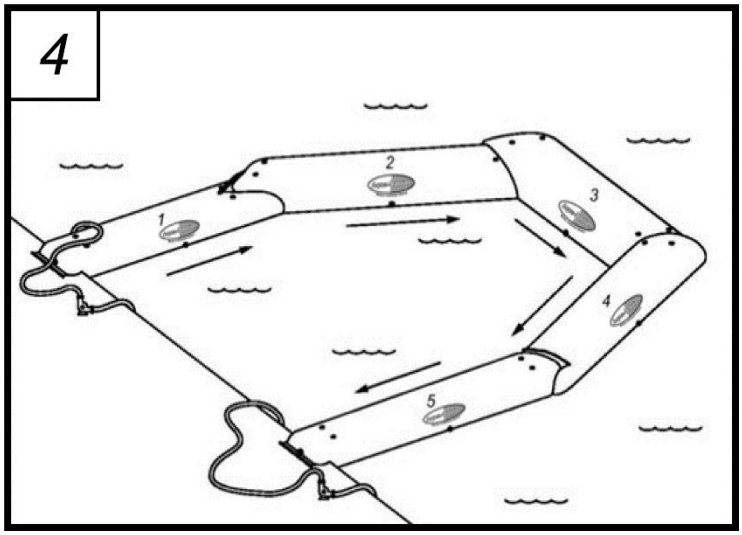
STEP 1: Unroll and unfold barrier on solid ground near deployment area perpendicular to the deployment area shoreline.



STEP 2: Scrunch barrier up to shoreline edge in deployment area, then pull the waterside end of the barrier to extend into the deployment area waters, leaving one end partly on shore.

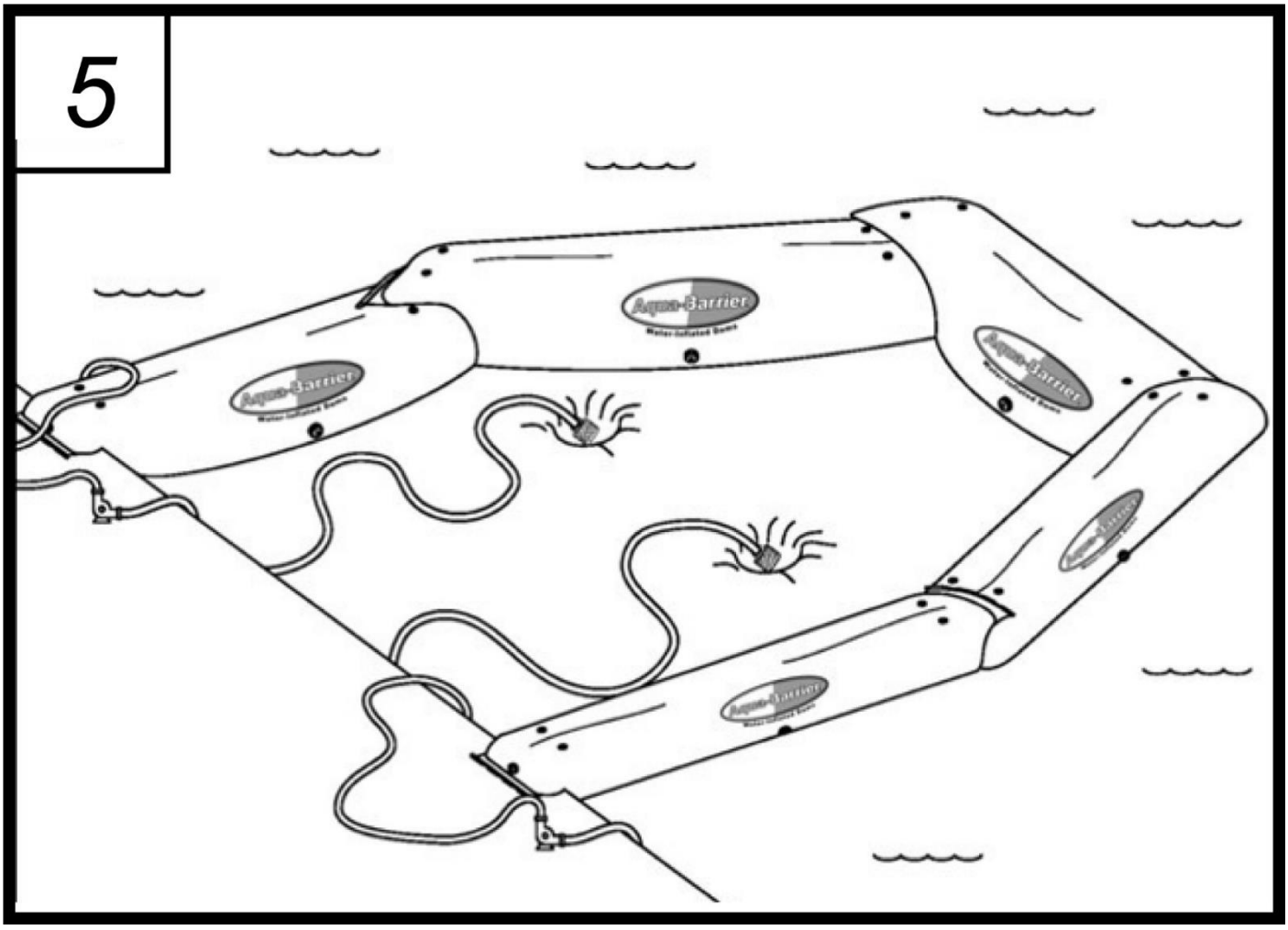


STEP 3: Inflate deployed barrier to 6 inches above the water level and repeat steps 1 and 2 with the second barrier, treating the first barrier as a shoreline. Make sure to create your overlaps with the required linear footage as shown on page 30. Inflate the second barrier 6 inches above the water level.



STEP 4: Repeat steps 1-3 until all barriers are in place. The last barrier placed (on top) should then be inflated to its designated full inflation height measured from the lowest point of elevation.

STATIC WATER MANUAL DEPLOYMENT



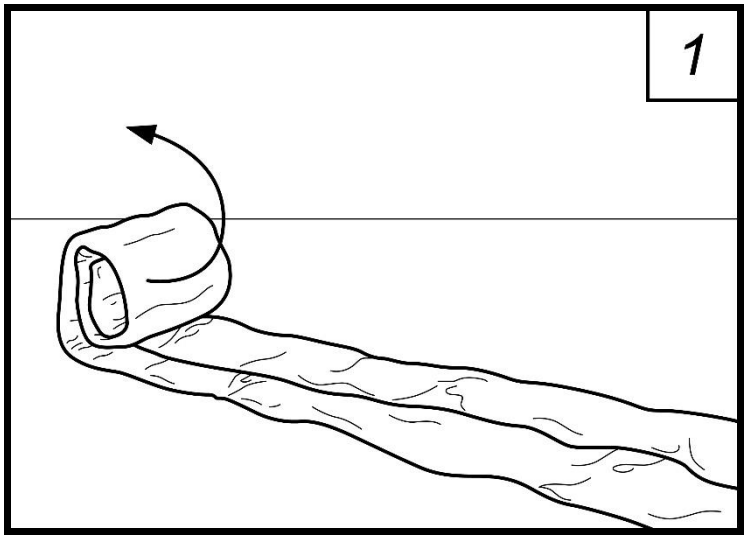
STEP 5: Repeat step 4 with the remaining barriers in reverse order of installation.

Drain the remaining water from your work area. Sump pumps are required throughout the duration of the project.

Top off all barriers to their fullest height.

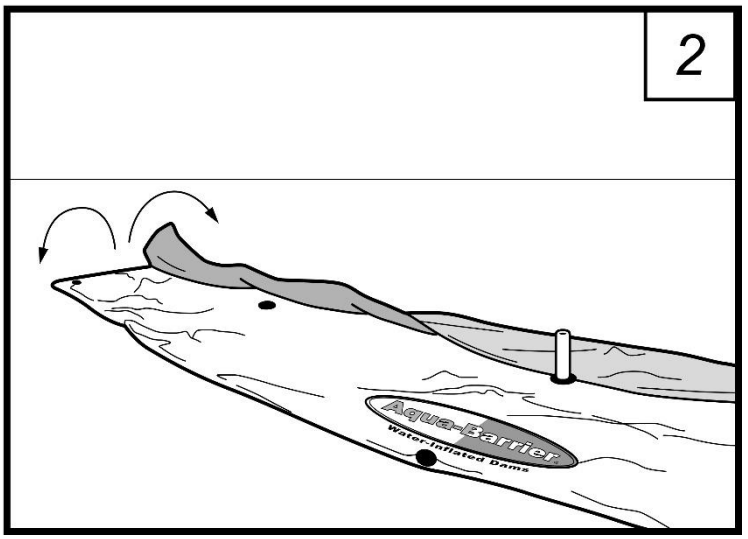
It is necessary for all Aqua-Barrier® to be fully inflated throughout the duration of the project.

DRY SURFACE AND FLOOD PROTECTION DEPLOYMENT



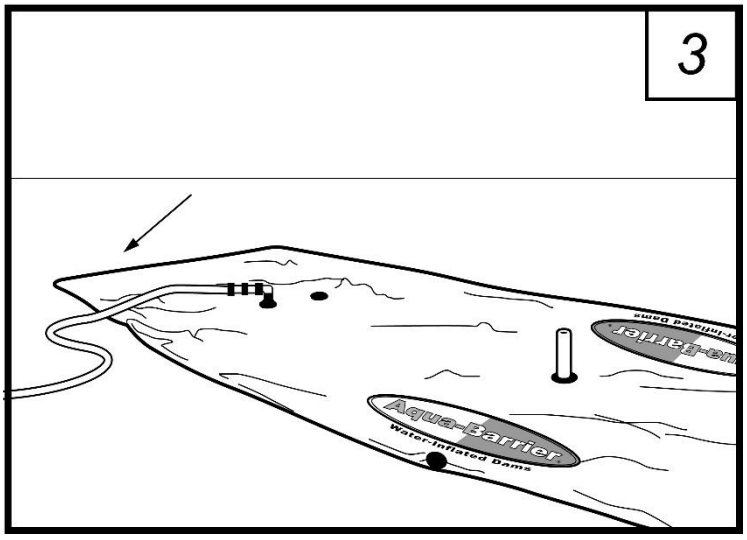
STEP 1:

Unroll the Aqua-Barrier® system.



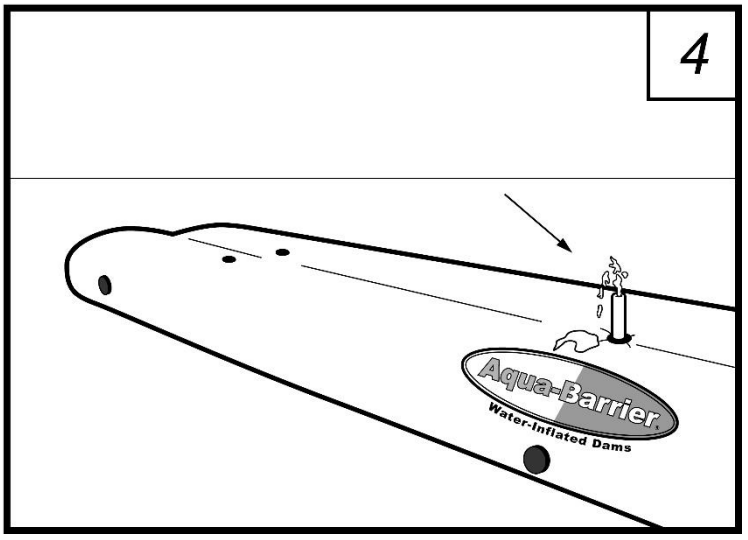
STEP 2:

Unfold the Aqua-Barrier® system from the center out. Insert the stand pipe into the over-inflation fitting.



STEP 3:

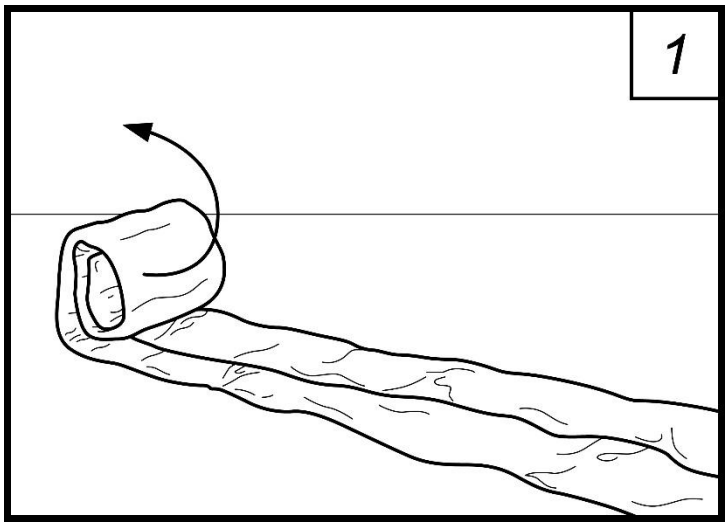
Connect a hose to the fill port.



STEP 4:

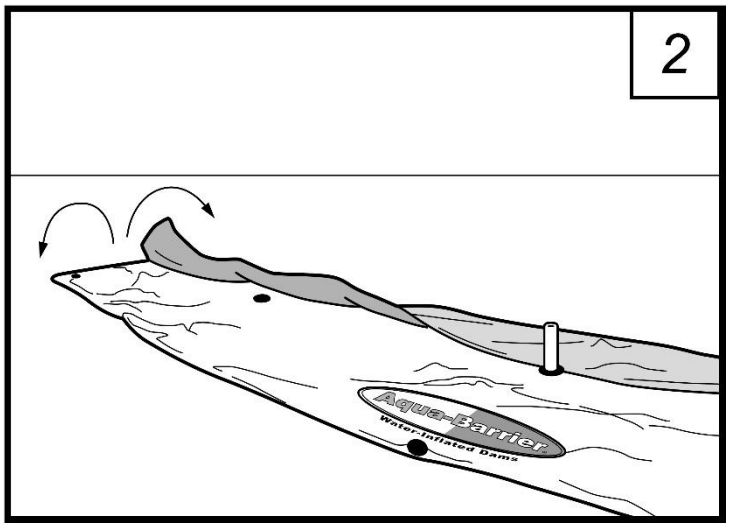
Once water begins to flow out of the top of the stand pipe, the system has been completely inflated. Immediately stop the inflation process once this happens. If you continue to inflate your barrier after water has begun escaping from the stand pipe, you could cause the system to rupture. It's imperative that you don't over inflate your Aqua-Barrier® system.

DRY SURFACE AND FLOOD PROTECTION OVERLAP DEPLOYMENT



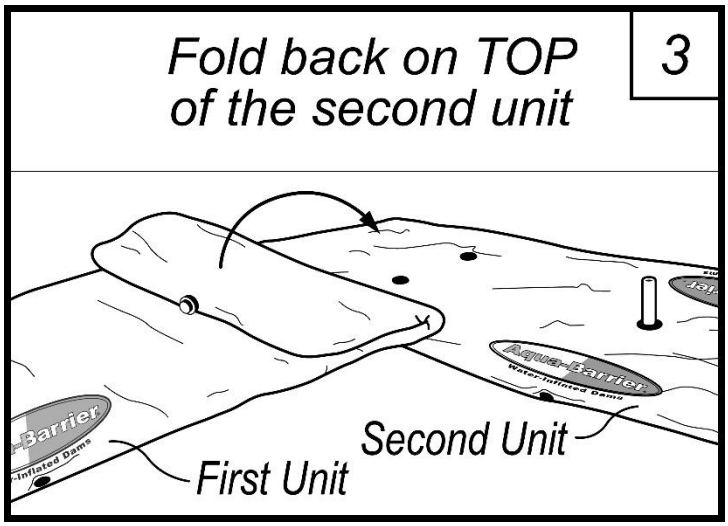
STEP 1:

Unroll the Aqua-Barrier® system.



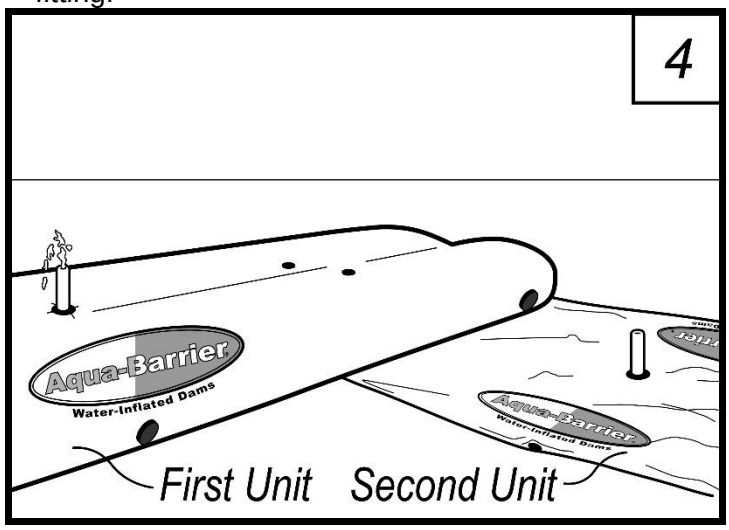
STEP 2:

Unfold the Aqua-Barrier® system from the center out. Insert the stand pipe into the over-inflation fitting.



STEP 3:

Fold the first unit back and place your second unit **UNDER** the first one. Then fold the first unit back on top of the second unit. Make sure to create your overlaps with the required linear footage as shown on page 30.

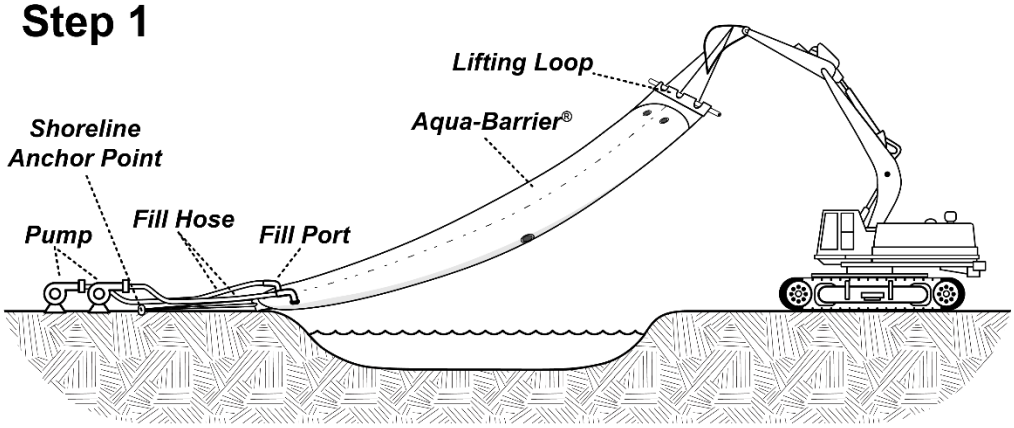


STEP 4:

The last barrier placed (on top) should then be inflated until water begins to flow out of the top of the stand pipe, this means the system has been completely inflated. Immediately stop the inflation process once this happens. If you continue to inflate your barrier after water has begun escaping from the stand pipe, you could cause the system to rupture. It's imperative that you don't over inflate your Aqua-Barrier® system. Finish filling the remaining barriers in reverse order of installation.

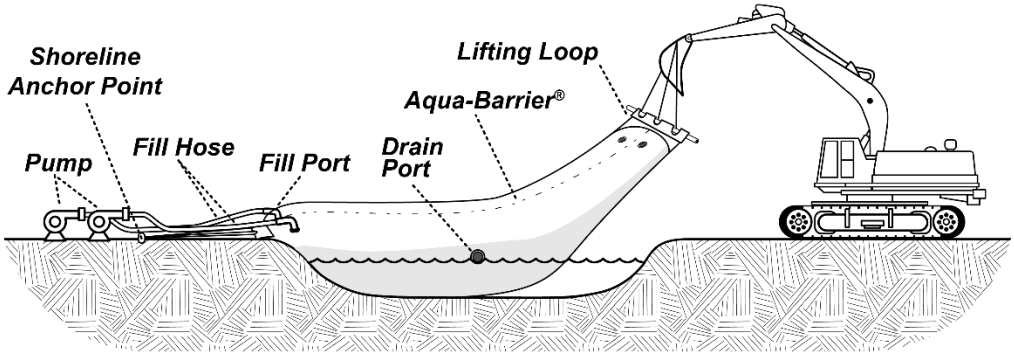
DYNAMIC WATER DEPLOYMENT USING 1 TRACK HOE AND SHORELINE ANCHOR

Step 1

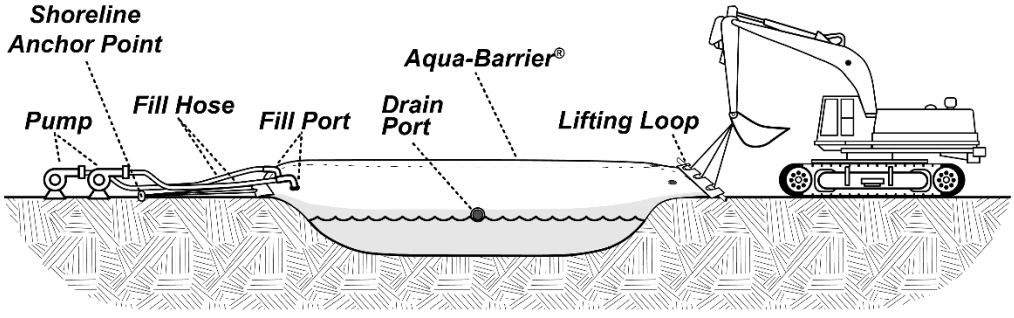


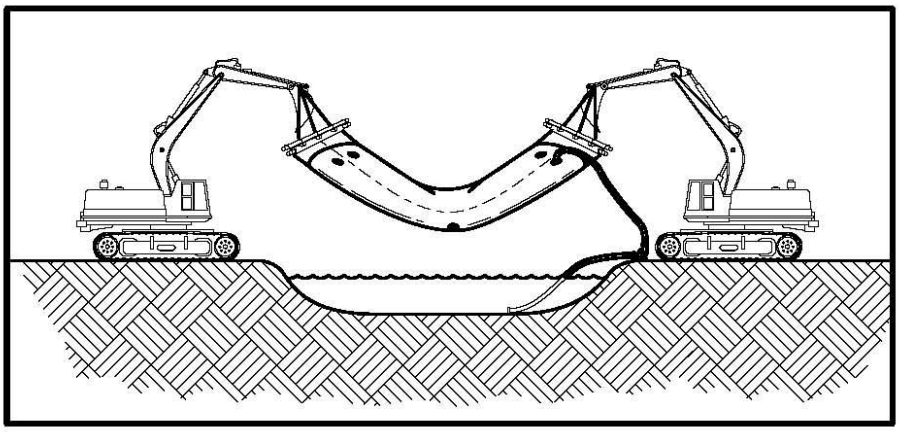
Step 2

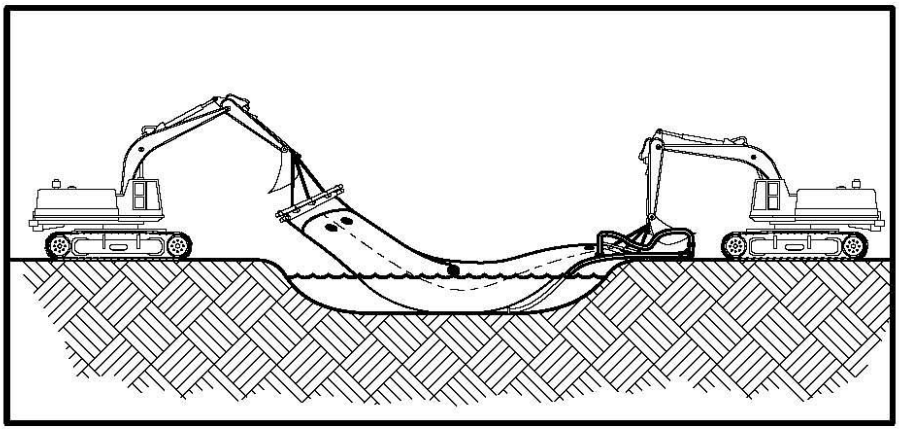
As the Aqua-Barrier® fills from the anchored side, slowly lower the system into place at a 45-degree angle.



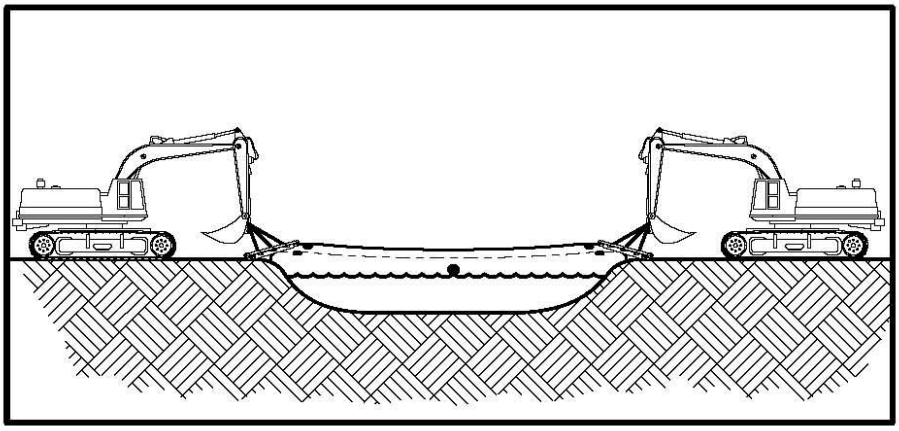
Step 3







DYNAMIC WATER DEPLOYMENT USING 2 TRACK HOES

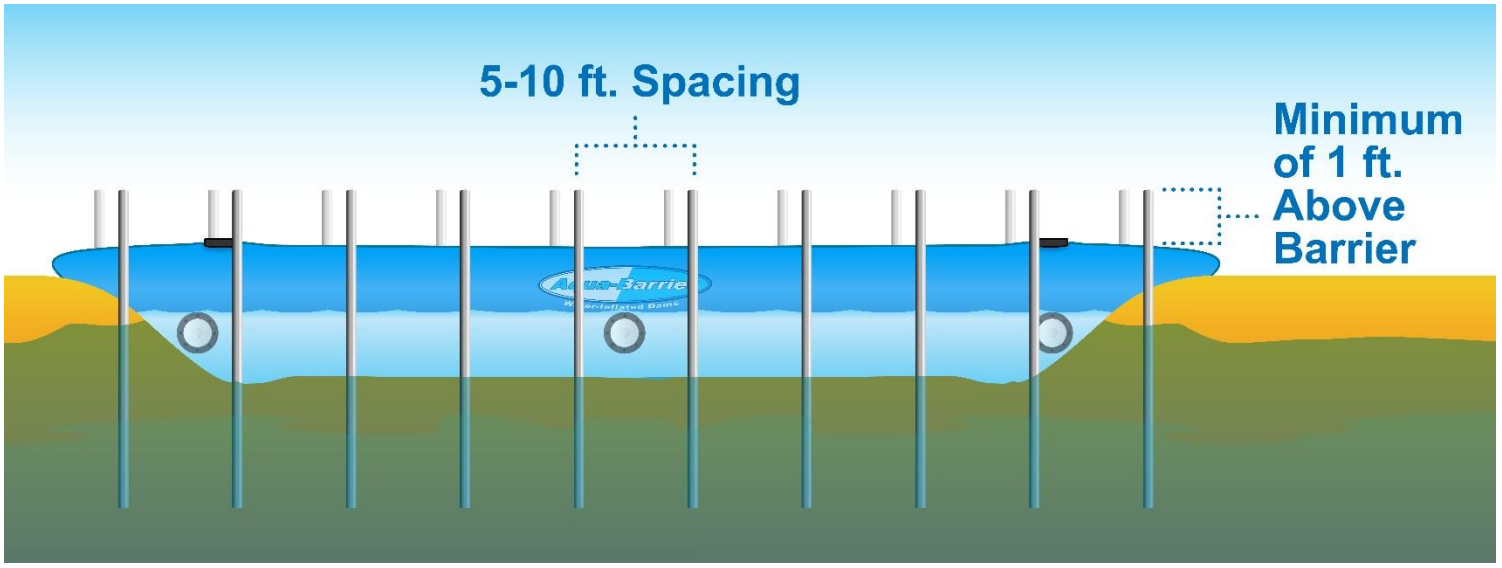


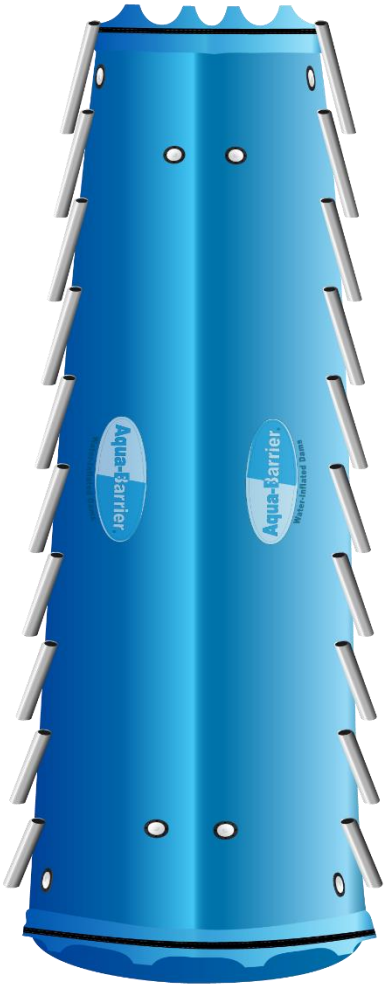
STEEL PIPE SUPPORT

Use 2” or 3” diameter heavy wall steel pipes to support the barriers on slick surfaces or fast-moving water. Reference page 50 for additional information.

HSI Services Inc.

STEEL PIPE SUPPORT





1. The steel pipe support technique may be advised for all Aqua-Barrier® installations dealing with slick surfaces or fast-moving water, when directed by a licensed engineer.

2. When utilized, steel pipes are be to driven into the ground as needed to reach a solid foundation. The steel pipes must extend a minimum of 1ft above the top of the barrier, slightly angled towards the barrier as depicted on the left.

3. Stabilizing steel pipes must be driven on both sides of the barrier with a spacing directed by engineer.

4. You may contact HSI Services, Inc. or your local Aqua-Barrier® representative for a site evaluation.

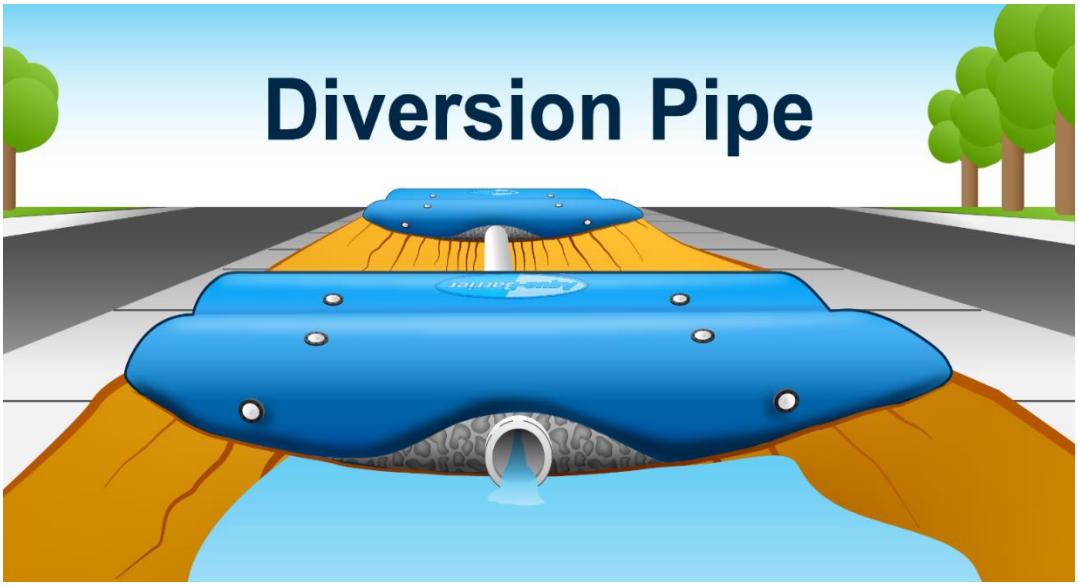
DIVERSION PIPE AND BYPASS PUMP APPLICATIONS

In applications that require continuous water flow to be completely cut off such as a bank to bank block, it may become necessary to maintain water flow using diversion pipes or bypass pumps. Below are examples of this being done.

BYPASS PUMP AROUND

DIVERSION PIPE

CREATING A SEAL AGAINST DIVERSION PIPES AND VERTICAL WALLS



Lay down your diversion pipe and create a sandbag ramp on both sides to ease the slopes against the pipe. When completed, you may install your Aqua-Barrier®.

Create a sandbag ramp against the vertical wall(s) first. Your ramp should be the half the width of the barrier – centered – and at least 3ft high. When completed, you may install your Aqua-Barrier®.

The number of sandbags needed depends on the barrier size and relevant site conditions. Contact HSI Services, Inc. or your local Aqua-Barrier® representative for assistance.

INSTALLING IN FREEZING CONDITIONS

In freezing conditions, it is recommended that all ice and snow be removed prior to installation. Failure to do so may affect barrier stability and integrity.

The Aqua-Barrier® material will hold down to -22°F. Anything below -22°F makes the material brittle. Typically, water inside the barrier is 10 degrees warmer than outside temperature.

You can keep the water inside from freezing solid by using products such as glycol tubes. You can also use ground heaters to warm up the barriers from the bottom. Thermal pool blankets to cover the top may also be helpful.

If you think the barriers will freeze you need to leave the fill ports open and release a little water out of the barriers after you've inflated them completely. Water expands at a rate of 10% when it freezes so you will want to deflate the barrier to 90% capacity to allow for the water expansion, this may prevent internal rips in the material as water turns to ice.

If the body of water in which the barriers are installed starts to freeze you may risk damage from ice ramming the barriers. To minimize this damage, you can cover the barriers with a geo textile protective membrane or place something in front of them to "catch" chunks of ice. Concrete jersey barriers work well and sometimes PE construction fence has been used. HSI Services, Inc. also offers an additional protective membrane which can be installed over the barriers when working in freezing conditions.

When it comes time to remove the barriers, they must be fully thawed and drained before you begin to pull them out of the water. Do not attempt to remove a barrier with ice inside as it could cause permanent damage.

INSTALLING IN FREEZING CONDITIONS

▲ **Shown above: Glycol tubes rest on top of the Aqua-Barriers®**

INSTALLING IN FREEZING CONDITIONS

▲ **Protective membrane installed prior to snow event**

HI Services Inc.

Aqua-Barrier®
Water-Inflated Dams

Removal Procedures

REMOVAL PROCEDURES

There are three primary types of Aqua-Barrier® removal procedures. The following descriptions of the various types of Aqua-Barrier® removal procedures are simplified and are only meant to give a general overview of the removal process. More detailed removal procedure information can be provided by a trained HSI Services, Inc. representative on all Aqua-Barrier® removals.

Dry Surface Removal

When no water is present on either side of the Aqua-Barrier®: Locate the drain ports along the sides and ends of the barrier and remove the plugs. Once a majority of the water has drained from the barrier, you will be able to force the remaining water out by flipping the barrier over itself. Evacuate all water and get ready for storage/return. Reference Folding Procedures on page 61 for additional information.

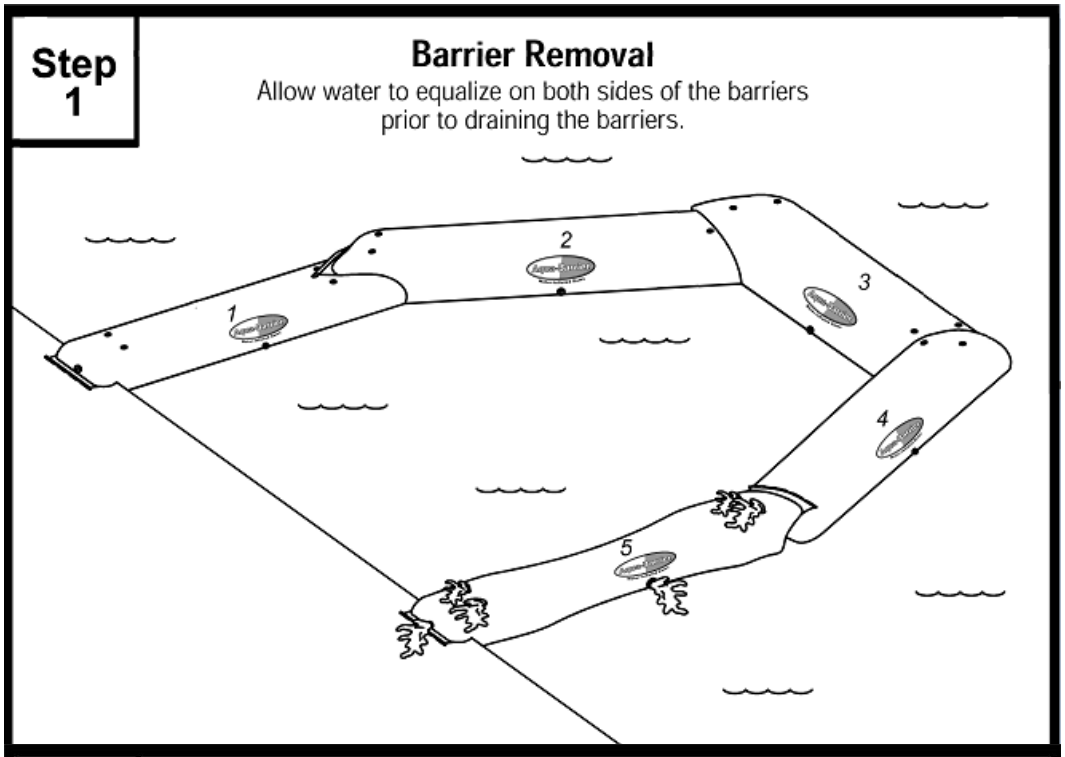
Static Water Removal

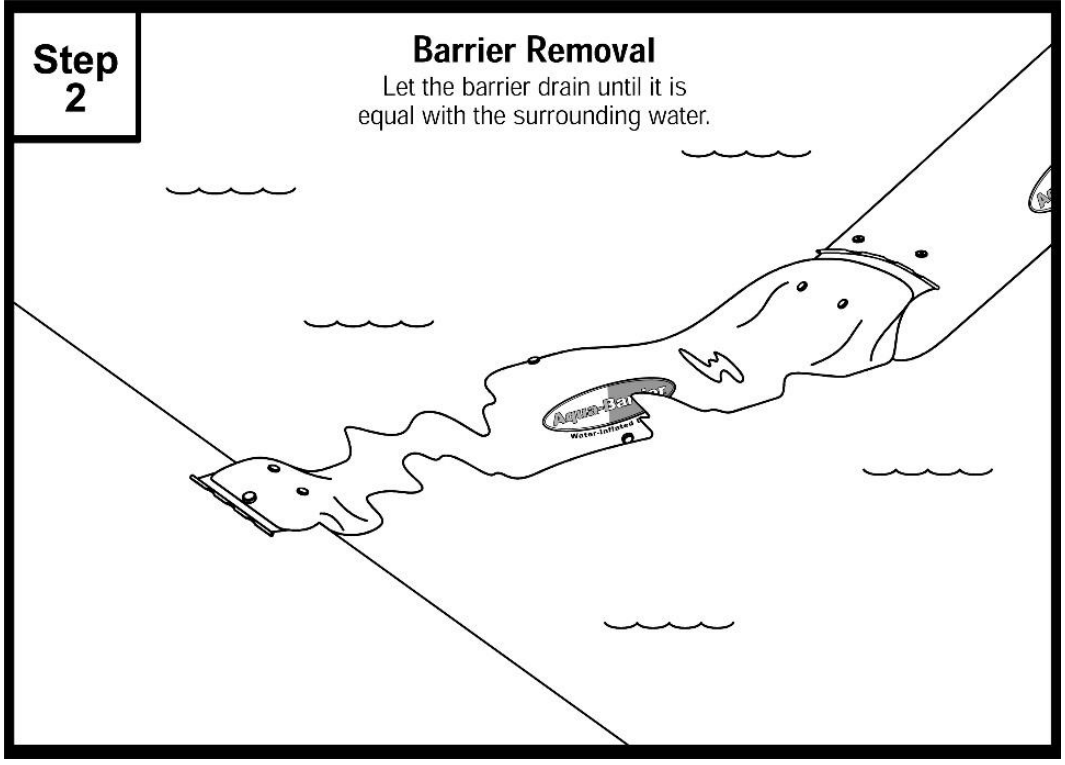
When standing water is present on one side of the barrier only: First attach one end of the barrier to the hydraulic equipment arm (ie: track hoe, crane). Water must be equalized on both sides of the Aqua-Barrier® prior to removing it from the water. You will first need to pump the water back into the dewatered area to equalize pressure on both sides of the barrier. Failure to do this before removing the caps from the drain ports could flood your work area and potentially damage the barrier(s). Once the water has equalized on both sides of the barrier, you will locate the drain ports on both sides of the barrier and remove the caps. You can now pull one end of the barrier over the top and down the length of the barrier. This process will evacuate the remaining water and prevent cuts and abrasions on the bottom of the unit. Once you've evacuated all the water, you will get your barrier(s) ready for storage/return. Reference Folding Procedures on page 61 for additional information.

Dynamic Water Removal

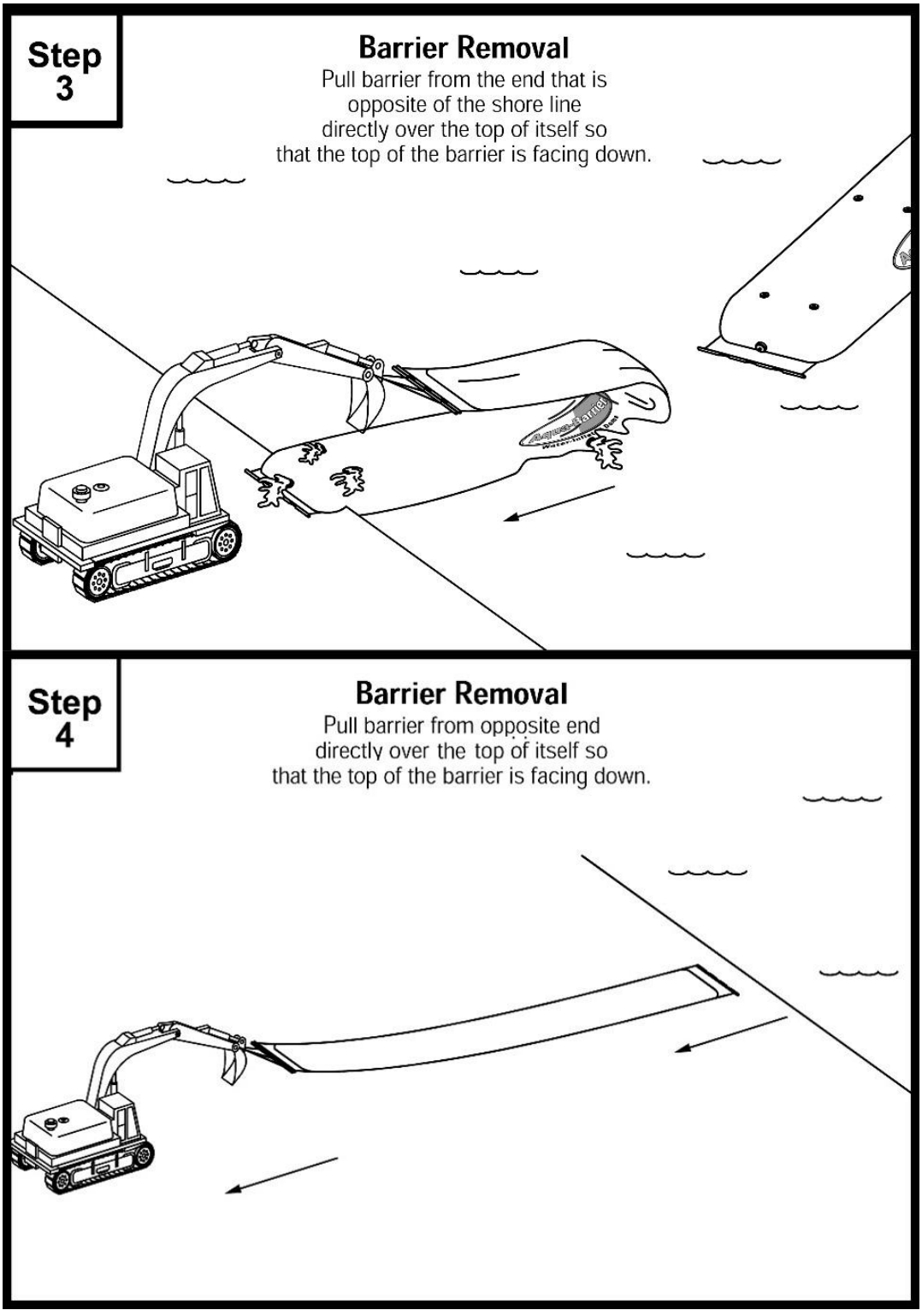
When moving water is present on one side of the barrier only: First attach both ends of the barrier to the hydraulic equipment arm (ie: track hoe, crane). Water must be equalized on both sides of the Aqua-Barrier® prior to removing it from the water. The pipe loops on both ends of the Aqua-Barrier® must have pipes inserted and attached to hydraulic equipment (i.e. track hoe, crane, etc.) to provide control of the barrier. Locate the drain ports on the dry side of the barrier only and remove all plugs. Once the majority of the water has drained from the barrier you can remove the plugs on the opposite side of the barrier. You can now pull one end of the barrier over the top and down the length of the barrier. This process will evacuate the remaining water and prevent cuts and abrasions on the bottom of the unit. Once you've evacuated all the water, you will get your barrier(s) ready for storage/return. Reference Folding Procedures on page 61 for additional information.

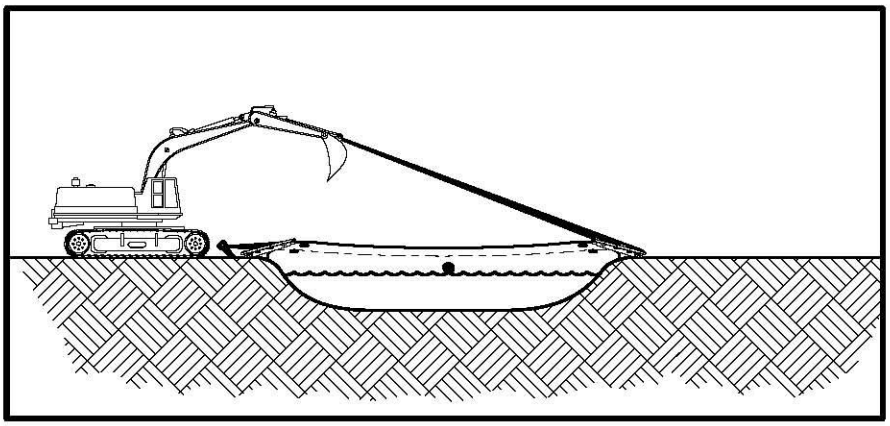
STATIC WATER REMOVAL

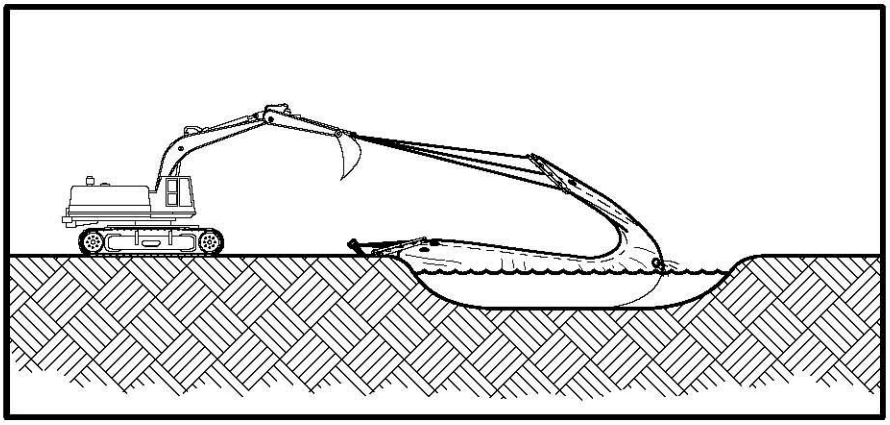




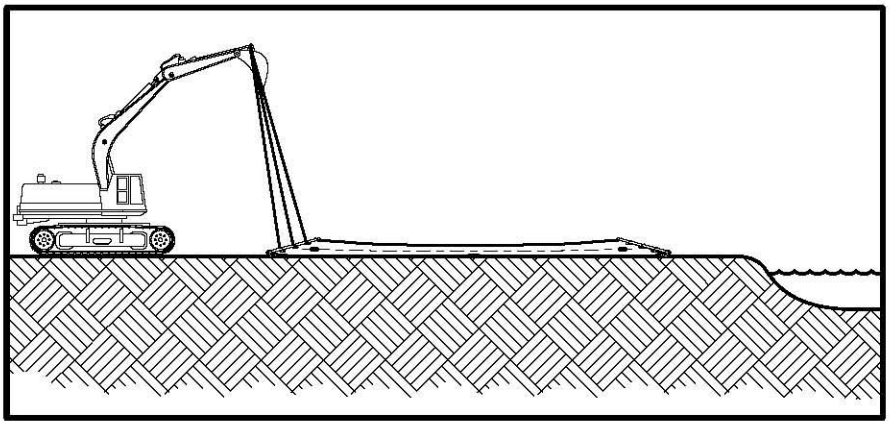
STATIC WATER REMOVAL





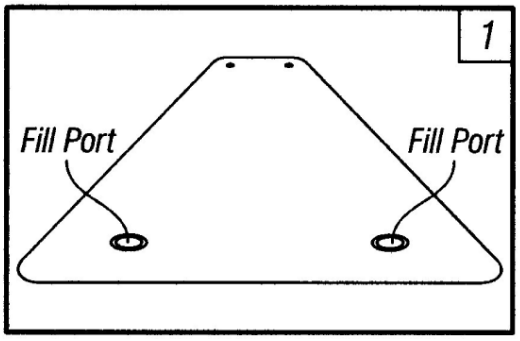


REMOVAL USING 1 TRACK HOE



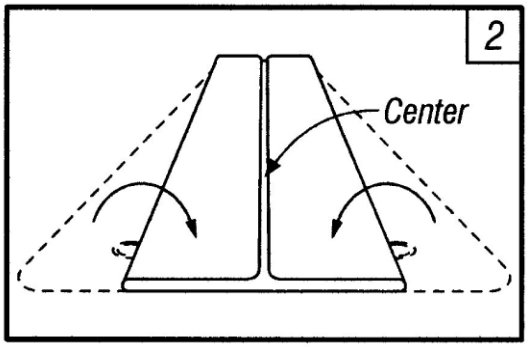
FOLDING PROCEDURE

Barrier must be secured on the pallets they arrived in with NO OVERHANG



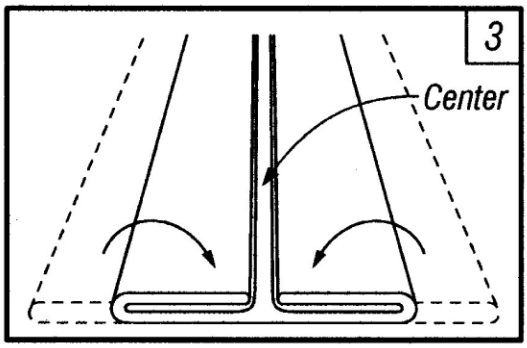
STEP ONE:

After all caps are attached to each fill and drain port, lay barrier out flat on dry land.



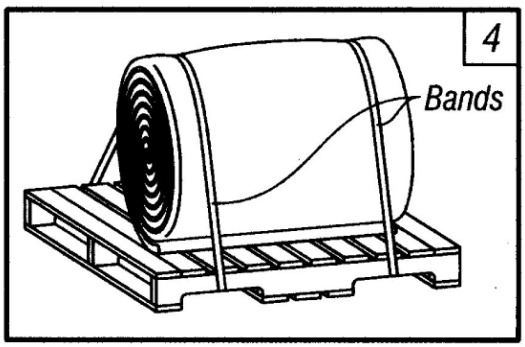
STEP TWO:

Fold one side to the center.
Then fold the other side to the center.



STEP THREE:

Take both sides and fold to center again.



STEP FOUR:

Roll and place on pallet (it is recommended to use a protective covering on the pallet).
Secure the barrier to the pallet using rope or plastic banding strap and ensure there is no overhang.

REPAIR INSTRUCTIONS

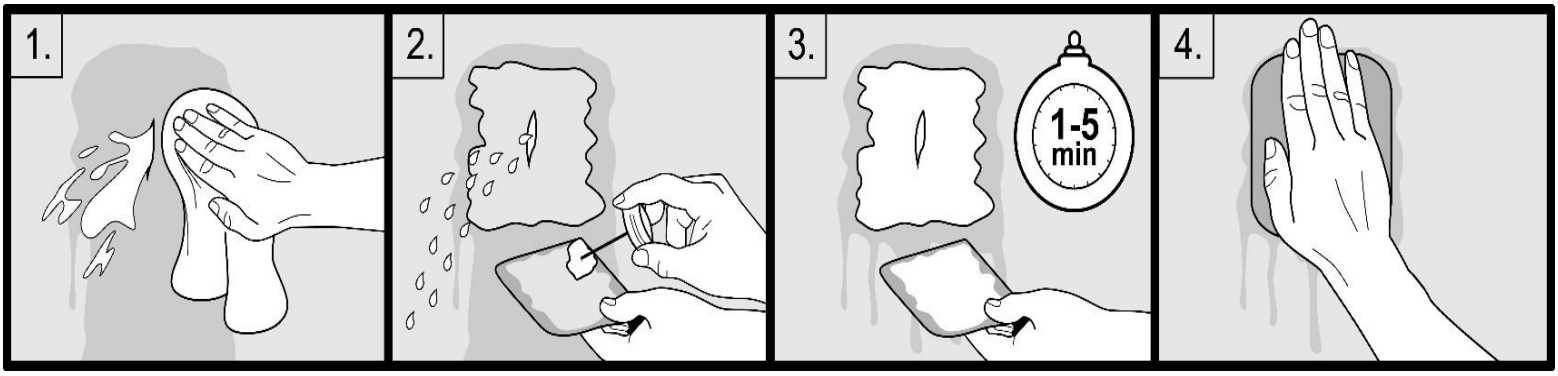
1. Locate the puncture, cut, tear or abrasion on the barrier's surface. Locate the patch material and cut a generous sized repair patch. Clean and remove all debris from the damaged area.

2. Apply a generous layer of the HH66 vinyl adhesive on the **smooth** side of the patch material, make sure to cover the patch entirely with adhesive. Apply a generous layer of the HH66 vinyl adhesive on both the damaged area and the surrounding area. The covered surrounding area should be slightly larger than the repair patch's size.

3. Allow a few minutes for the adhesive to dry until it exhibits a frosty marble white color and is tacky to the touch. This can take anywhere from 1 minute to 5+ minutes depending on weather and temperature variables.

4. Apply the patch material centered over the damaged area. You will need to firmly press on the center of the patch while working your way around its entirety to prevent water from escaping the damaged area. Apply a good amount of pressure on the entirety of the patch from the center out to bond the patch and barrier surface together securely, be sure to not to trap any air bubbles during this process. You may need to keep pressure on the patch for a few minutes depending on the size of the damaged area; the larger the damaged area, the longer you may want to keep pressure on the patch.

Disclaimer:
The HH66 vinyl-coated adhesive loses adhesion properties when applied in temperatures below 40° F. It is recommended that the adhesive be stored in an area where temperatures do not fall below 40° F.



See HH66 MSDS for additional safety precautions and recommendations

Statement of Limited Warranty Page 1

A. General. This warranty is intended solely for the benefit of the original (retail) purchaser ("Purchaser") of the products ("the Products") supplied by HSI Services, Inc. This warranty is effective only in the United States of America.

B. Limited Warranty. HSI Services, Inc. warrants its products against manufacturing defects for 90 days from the date of the original purchase of the Products. The Aqua-Barriers® and all parts and accessories associated with them are warranted for only the purchaser's first installation, which is the inflation, draining, and repositioning, or site removal, of the Aqua-Barrier®. After an Aqua-Barrier® has been partially or completely drained, repositioned, or removed from the initial installation location, no stated or implied warranty or product protection shall apply. The Company's responsibility for defects in the Products is limited to the Company's choice of repair, or replacement. This warranty gives purchasers of the Products specific rights, and such purchasers may also have other rights that vary from state to state. This warranty shall be effective only if the Products manufactured by the Company have not been subjected to negligent use, misuse, or abuse (including any usage not in accordance with the Product instructions, or failure to perform the required preventive maintenance). This warranty is limited to the cost of the manufactured Products that are found to be defective. No agent, employee, or officer of the Company, or any other person, is authorized to give any other warranty, or to assume any other liability on behalf of the Company.

HSI Services, Inc. is not responsible for barrier replacement or repair if static water levels exceed 75% of the proper barrier inflation height, i.e. 4.5 ft water level on a 6ft high properly inflated Aqua-Barrier®. In moving water environments, or potentially moving water environments, HSI Services, Inc. will designate a maximum water percentage height on a given barrier height. If water levels exceed either of these limitations, this warranty shall be null and void.

Aqua-Barriers® are not warranted in moving water environments unless a HSI Services, Inc. agent or representative is on site to monitor the project from commencement to end. A moving body of water shall be defined as any body of water that exhibits movement or any static body of water that becomes dynamic (i.e. rainfall runoff, water released by a dam, etc). THE COMPANY SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, OR CONSEQUENTIAL DAMAGES OF ANY NATURE WHATSOEVER, WHETHER TO THE PURCHASER OF THE PRODUCTS, OR TO THIRD PARTIES, IN TORT, CONTRACT, OR OTHERWISE (some States do not allow the exclusion or limitation of incidental or consequential damages, so the preceding limitation or exclusion may not apply to all Purchasers).

THE COMPANY ASSUMES NO REPSONSIBLITY OR LIABILITY, WHETHER EXPRESSED OR IMPLIED, WHETHER IN TORT OR IN CONTRACT, AS TO THE CAPACITY OF ITS MANUFACTURED PRODUCTS TO SATISFY THE REQUIREMENT OF ANY LAW, RULE, SPECIFICATION, OR CONTRACT PERTAINING THERETO, INCLUDING, BUT NOT LIMITED TO, ANY CONTRACT BETWEEN ANY PURCHASER OF ITS PRODUCTS AND CONTRACTING PARTIES WITH WHOM SUCH PURCHASER HAS CONTRACTED. THE WARRANTIES EXPRESSED HEREIN ARE IN LIEU OF ALL TORT LIABILITY AND ALL OTHER WARRANTIES OR REPRESENTATIONS, WHETHER EXPRESSED OR IMPLIED, BY LAW OR BY CONTACT. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER WARRANTIES, EXPRESSED, OR IMPLIED INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR PURPOSE, AND OF ANY OTHER OBLIGATION OR LIABILITY ON THE PART OF THE COMPANY (SOME STATES DO NOT ALLOW CERTAIN LIMITATIONS ON IMPLIED WARRANTIES, SO THE PRECEDING LIMITATION MAY NOT APPLY TO ALL PURCHASERS).

Statement of Limited Warranty Page 2

C. Repair and Replacement. As a condition precedent to any remedy described herein or otherwise available to Purchaser. Purchaser shall seek and accept the Company's reasonable effort to repair or replace the allegedly defective or nonconforming Products (hereinafter "Affected Products: In furtherance of such undertaking, if Purchaser reasonably believes that (1) any Product contains a defect or nonconformity for which the Company is responsible; or (2) the Purchaser otherwise has a claim pursuant to the warranties contained herein, Purchaser shall inform the Company (in writing by completing a customer complaint form), of the nature of such defect, nonconformity, or claim in reasonable detail and shall request authorization from the Company to return the Affected Products to the Company for repair or replacement. All Products authorized for return shall be shipped prepaid to the Company's facility or authorized service center

HSI Services, Inc.
20581 FM 362
Waller, TX 77484
1-800-245-0199

If the Company repairs or replaces the Affected Products within a reasonable time (normally six to eight weeks) after Purchaser has so returned them to the Company, Purchaser shall be entitled to no further remedy at law or equity.

D. Certain Hazards Related to Products. Purchaser acknowledges that there are hazards associated with the use and storage of the Product(s) delivered hereunder, and Purchaser acknowledges that Purchaser understands and accepts such hazards. Purchaser shall be responsible for warning and protecting Purchaser's employees and others who may be exposed to such hazards due to Purchaser's storage and/or use of Product(s). Purchaser assumes all liability for loss, damage, or injury to persons or to property of Purchaser or others arising out of the delivery, presence or use of the Products whether used singly or in combination with other Products.

HI Services Inc.

ISO 9001: 2015 CERTIFIED

Aqua-Barrier®

Water-Inflated Dams

Questions or Comments?
Call 800-245-0199

Or visit www.aquabarrier.com