

Geotech Plume Eater[®]

Installation and Operation Manual

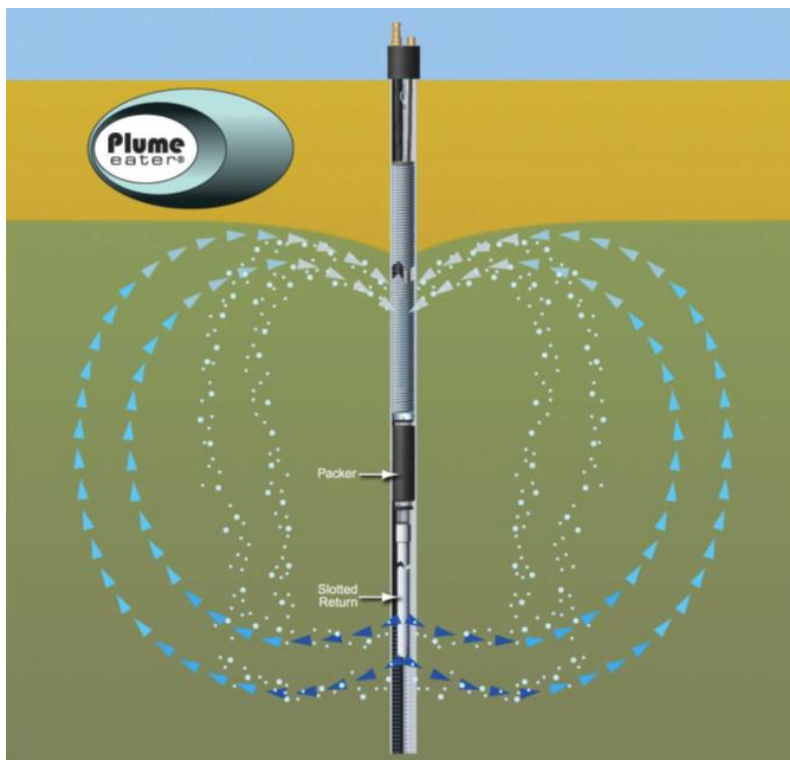


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DOCUMENTATION CONVENTIONS

This uses the following conventions to present information:



WARNING

An exclamation point icon indicates a **WARNING** of a situation or condition that could lead to personal injury or death. You should not proceed until you read and thoroughly understand the **WARNING** message.



CAUTION

A raised hand icon indicates **CAUTION** information that relates to a situation or condition that could lead to equipment malfunction or damage. You should not proceed until you read and thoroughly understand the **CAUTION** message.



NOTE

A note icon indicates **NOTE** information. Notes provide additional or supplementary information about an activity or concept.

Section 1: System Description

Function and Theory

The Geotech Plume Eater[®] is an *in-situ* remediation system, designed to provide the benefits of in-well air stripping, dissolved oxygen enhancement and pump and treat technology into a single, energy efficient product. It operates on the principle of air lifting the groundwater within its housing, thus stripping Volatile Organic Contaminants (VOC's). The treated water is oxygenated throughout the treatment process, and in return is re-injected to the subsurface below the packer. The treated, oxygenated water will assist in microbial growth within the formation, further reducing existing VOC contamination. The Plume Eater[®] Process creates a convectional or circular current that pulls the contaminated groundwater towards the top section of the treatment well and re-injects the treated, oxygenated water through the lower or bottom section of the treatment well back into the formation. The flow direction is facilitated by sectioning off the screen within the treatment well via the integrated packer assembly.



The Geotech Plume Eater[®] is available in two diameters.
(Lengths may vary, explained below)

The 2 Inch Plume Eater[®] is designed for deployment in standard 2 inch (5 cm) schedule 40 PVC recovery wells. The largest outside diameter measures 1.75 inches (4.4 cm), without the packer inflated.

The 4 Inch Plume Eater[®] is designed for deployment in standard 4 inch (10 cm) schedule 40 PVC recovery wells. The largest outside diameter measures 3.25 inches (8.2 cm), without the packer inflated.

Each Geotech Plume Eater[®] length varies based on actual recovery well parameters provided by the customer, prior to purchase. The Plume Eater[®] length should be pre-determined based on the depth of the recovery well, how the actual recovery well is constructed, and water table fluctuates within the recovery well.

The Geotech Plume Eater[®] is designed to work in vertical wells. Actual treatment flow rates will vary, and are dependent on the site specific geology. Flow to and from the Plume Eater[®] is observed when differential pressure is created within the Plume Eater[®] by airlifting the groundwater above the actual static water level. The observed rate of flow is determined by the height of the water column being lifted, as well as the formations permeability and porosity; allowing the treated water to be re-introduced into the subsurface.

Section 2: System Components

The 2 Inch Plume Eater® Components

- Plume Eater®, with attached packer-drop pipe assemblies and 2 inch slip fit well cap assembly.
 - Plume Eater® consists of:
 - Predetermined length of 1 1/2 inch O.D., slotted, flexible, spiral wound schedule 40 PVC Tube.
 - Schedule 80 PVC cap and rubber sleeve, with brass quick connect and barbed fittings attached.
 - Air delivery line: 1/4 inch O.D., reinforced, chemical resistant (gasoline) rated, rubber hose.
 - Packer inflation line: 1/4 inch O.D., reinforced, chemical resistant (gasoline) rated, rubber hose. Stainless steel hose clamp.
 - Treated water return line: 5/8 inch O.D., reinforced, chemical resistant (gasoline) rated, rubber hose. Stainless steel hose clamp.
 - PTFE coated 3/32 inch O.D. stainless steel safety cable.
 - Packer – drop pipe assemblies consist of:
 - 2 inch stainless steel packer with Viton™ sleeve with 3/4 inch (1.9 cm) slotted Schedule 40 PVC drop pipe.
 - Stainless steel safety cable eyelet, and hex locking nut
 - Stainless steel fitting, 1/4 inch (m) barbed x 1/8 inch (m) thread, for packer inflation line.
 - Stainless steel fitting, 3/8 inch (m) barbed x 3/8 inch (m) thread, for treated water return line.
 - Schedule 40 PVC, 3/4 inch (F) threaded end, coupled to 36 inch (91.44 cm) slotted section of pipe, making up the drop pipe assembly.
 - Standard slip fit well cap consists of:
 - 2 inch schedule 80 PVC, machined plastic support disk with a rubber coupler and two steel worm gear clamps.
 - Brass, quick release coupling, self-sealing, pressure fitting for packer inflation, male and female (set). Stainless steel hose clamp.
 - Brass, quick release coupling, non-sealing, air fitting for air delivery line, male and female (set). Stainless steel hose clamp.
 - Stainless steel safety cable eyelet and hex locking nut.

Optional Equipment

- .2 µm or .5 µm Porous Centered, Stainless Steel Diffuser with 1/4" barbed end, and stainless steel hose clamp.
- Stainless Steel Screened Shroud Assembly for 2 inch Plume Eater®, Schedule 80 PVC collection bag adapter, 100 µm bag filter and nylon fastener.

The 4 Inch Plume Eater® Components

- 4 Inch Plume Eater®, with attached packer-drop pipe assemblies and 4 inch slip fit well cap assembly.
 - Plume Eater® consists of “
 - Predetermined length of 3 inch O.D., slotted, flexible, spiral wound schedule 40 PVC Tube
 - Schedule 80 PVC cap, with pass through holes for hoses and attached vent line barb.
 - Air delivery line: 1/2 inch O.D., reinforced, chemical resistant (gasoline) rated, rubber hose.
 - Packer inflation line: 1/2 inch O.D., reinforced, chemical resistant (gasoline) rated, rubber hose. Stainless steel hose clamp.
 - Treated water return line: 1 ¼ inch O.D., flexible, spiral wound schedule 40 PVC Tube. Stainless steel hose clamp.
 - PTFE coated 3/32 inch O.D. stainless steel safety cable.
 - Packer – drop pipe assemblies consist of:
 - 4 inch stainless steel packer with Viton™ sleeve with ¾ inch slotted Schedule 40 PVC drop pipe.
 - Stainless steel safety cable eyelet, and hex locking nut
 - Stainless steel fitting, ½ inch. (m) barbed x ½ inch (m) thread, for packer inflation line.
 - Stainless steel fitting, 1 inch (m) barbed x 1 inch (m) thread, for treated water return line.
 - Schedule 40 PVC, ¾ inch (F) threaded end, coupled to 36 inch slotted section of pipe, making up the drop pipe assembly.
 - Standard well cap consists of:
 - 4 inch schedule 80 PVC, machined plastic support disk with a rubber coupler and two steel worm gear clamps.
 - 1 inch schedule 40 PVC Threaded Plug.
 - Brass, quick release coupling, self-sealing, pressure fitting for packer inflation, male and female (set). Stainless steel hose clamp.
 - Brass, quick release coupling, non-sealing, air fitting for air delivery line, male and female (set). Stainless steel hose clamp.
 - Stainless steel safety cable eyelet and hex locking nut.

Optional Equipment

- .2 µm or .5 µm Porous Centered, Stainless Steel Diffuser with ¼” barbed end, and stainless steel hose clamp.
- Stainless Steel Screened Shroud Assembly for 4 inch Plume Eater®, Schedule 80 PVC collection bag adapter, 100 µm bag filter and nylon fastener.

Operating Parameters

	<u>2 inch System</u>	<u>4 inch System</u>
Standard Air Requirements (PSIG)	5–35 PSIG (.34-2.4 bar)	5–35 PSIG (.34-2.4 bar)
Standard Air Requirements (SCFM)	1–5 SCFM	1–5 SCFM
Minimum Required Submergence	8 feet (2.4 m)	8 feet (2.4 m)
Maximum Outer Housing Length	35 feet (10.7 m)	50 Feet (15.2 m)

Section 3: System Installation and Operation



Wear proper eye and face protection when working with compressed air. Loose debris or objects could become projectiles causing serious injury.

The Plume Eater[®] you have purchased was configured to fit a predefined treatment well. Each Plume Eater[®] is manufactured individually to meet the application requirements or treatment well specifications that were provided at the time of the order.

1. When deploying the Plume Eater[®], make sure the slotted PVC return line, or optional stainless steel shroud assembly is securely attached to the bottom of the stainless steel packer.
2. The next step is to insure that the support cable is securely attached to the well cap, all visible airlines are securely fastened and clamps are in place and tightened. Once these steps have been completed, the Plume Eater[®] is ready for deployment into the treatment well.
3. With the treatment well open, raise the packer assembly to the proper height so that the slotted PVC return pipe or optional stainless steel shroud assembly will fit vertically into the well without being bent or flexed. Slowly lower the Plume Eater[®] assembly into the well until the well cap is in place on top of the treatment well. Tighten well cap fasteners until a secure seal is created against the well pipe.
4. Attach a regulated air source to the packer inflation fitting atop the well cap and inflate the packer to 50 psi (3.5 bar) and disconnect the air source.
5. Once the packer is inflated, connect the Plume Eater[®] air line to a regulated and flow controlled air source.
 - a) Adjust the air source pressure to the calculated psi(g) to overcome the static head pressure (See example below).

1 psi (.07 bar) will overcome 2.3 feet (.7 m) of water column (W.C.). Therefore, if you have 10 feet (3 m) of water column over your air line you would need minimum 4.34 psi (.3 bar) to start the air flow process. It is recommended that the pressure is set at least 5 psi (.34 bar) higher than the calculated pressure needed. This will help if the groundwater being treated is considered to be hard water and help overcome the additional pressure caused by any mineral deposits that accumulate at the air line.

- b) The next step is to regulate the flow to between 1 – 5 scfm. This flow setting is where the Plume Eater[®] has demonstrated to operate efficiently.

6. The Plume Eater[®] should be checked regularly. Between site visits, if a noticeable flow drop is recorded without the loss of any applied pressure, it might indicate cleaning is needed.

Section 4: System Maintenance

The Plume Eater® will require routine maintenance based on the site conditions. If a noticeable loss of flow has been recorded without the applied pressure dropping, this might be an indication of air line/diffuser fouling, due to minerals or debris in the groundwater. The Plume Eater® will have to be removed from the treatment well and cleaned.

Removal and cleaning procedures



Wear proper eye and face protection when working with compressed air. Loose debris or objects could become projectiles causing serious injury.

1. Turn off the air supply to the Plume Eater® and carefully release any stored pressure on the air supply line before disconnecting it from the well cap fitting.
2. Carefully release the pressure from the packer line at the well cap using the packer line fill fitting. Attach the female fitting side to the male fitting side and vent to atmosphere to relieve the stored pressure.



Wear proper protective clothing. It is possible the Plume Eater® can be coated with Iron, minerals or natural occurring biological growth from the treatment process. If the Plume Eater® is too heavy for you to safely remove it by yourself, please seek additional assistance to prevent personal injury.

3. Using the safety cable loop at the top of the well cap, pull up gently until the tubing is exposed.
4. Grasp the tubing and safety cable firmly and slowly lift the Plume Eater® from the recovery well. **Use caution not to lose your grip. It is possible that the Plume Eater® or air lines are coated with iron, minerals or naturally occurring biological growth from the treatment process.** This could result in damage to the recovery well, Plume Eater® or on-site personnel working with the equipment.
5. Once the Plume Eater® is safely removed, stretch the system out and rinse off the outside of the Plume Eater®, removing any materials or debris, it is important to complete this process before removing the outer flexible PVC housing.
6. If required, disconnect the well cap and associated fittings from the air supply line and packer inflation line to allow the outer flexible PVC line removal. Clearly mark or keep record of where each line was originally connected.
7. Remove the two screws/fasteners at the bottom of the Flexible PVC and packer.

8. Secure the packer assembly and pull the flexible PVC back to expose the air supply line and diffuser element. **(Note this process may require two people to complete.)** If the air line or diffuser element is clogged with minerals or debris, it can be cleaned with a mild acidic solution such as CLR or weak muriatic acid solution. When performing such operations please refer to the cleaning solution manufacturers recommendations for proper use, and correct personal protective gear.
9. Once the diffuser is cleaned, thoroughly rinse the inside of the Plume Eater® as needed and inspect the return line for any blockage. If required, remove the upper cap on the flexible PVC, by sliding the cap past the rubber hoses. This will expose the inside of the flexible PVC and hoses from the top for a more thorough inspection and cleaning.
10. Once cleaned, reassemble the Plume Eater® and redeploy into the treatment well. If the packer assembly needs repair, it will have to be removed from the tubing, hoses and safety cable prior to sending it in to Geotech for service. The packer is not a field serviceable item. Call Geotech for a Return Authorization Number (RMA). See Equipment Return Policy section of this manual.

Section 5: Replacement Parts List

2 Inch Plume Eater®

Parts Description	Parts List
TUBING,RBR,1/4"X1/2",FT	16700011
HOSE,PVC CLEAR,1.5",AG,SPRIRAL	16700010
CABLE,SS-FEP,1/16X3/32 PTFE COATED/STAINLESS	77051004
DIFFUSER,POROUS TUBE,SS6,.2UM	26700014
DIFFUSER,POROUS TUBE,SS6,.5UM	26700015
KIT,PE,SS SHROUD & BAG,2"	86700006
BAG,NYL,COLLECTOR,2"PE 36" LONG	16700015

4 Inch Plume Eater®

TUBING,RBR,1/4"X1/2",FT	16700011
HOSE,PVC,CLEAR,1",AG,SPIRAL	16700013
CABLE,SS-FEP,1/16X3/32 PTFE COATED/STAINLESS	77051004
HOSE,PVC CLEAR,2.5",AG,SPIRAL	16700001
DIFFUSER,POROUS TUBE,SS6,.5UM	26700015
KIT,PE,SS SHROUD & BAG,2"	86700006
BAG,NYL,COLLECTOR,4"PE,36" BAG	16700014

NOTES

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The Warranty

For a period of one (1) year from date of first sale, product is warranted to be free from defects in materials and workmanship. Geotech agrees to repair or replace, at Geotech's option, the portion proving defective, or at our option to refund the purchase price thereof. Geotech will have no warranty obligation if the product is subjected to abnormal operating conditions, accident, abuse, misuse, unauthorized modification, alteration, repair, or replacement of wear parts. User assumes all other risk, if any, including the risk of injury, loss, or damage, direct or consequential, arising out of the use, misuse, or inability to use this product. User agrees to use, maintain and install product in accordance with recommendations and instructions. User is responsible for transportation charges connected to the repair or replacement of product under this warranty.

Equipment Return Policy

A Return Material Authorization number (RMA #) is required prior to return of any equipment to our facilities, please call our 800 number for appropriate location. An RMA # will be issued upon receipt of your request to return equipment, which should include reasons for the return. Your return shipment to us must have this RMA # clearly marked on the outside of the package. Proof of date of purchase is required for processing of all warranty requests.

This policy applies to both equipment sales and repair orders.

FOR A RETURN MATERIAL AUTHORIZATION, PLEASE CALL OUR
SERVICE DEPARTMENT AT 1-800-833-7958.

Model Number: _____

Serial Number: _____

Date of Purchase: _____

Equipment Decontamination

Prior to return, all equipment must be thoroughly cleaned and decontaminated. Please make note on RMA form, the use of equipment, contaminants equipment was exposed to, and decontamination solutions/methods used. Geotech reserves the right to refuse any equipment not properly decontaminated. Geotech may also choose to decontaminate the equipment for a fee, which will be applied to the repair order invoice.

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