NORTH CAROLINA DEPARTMENT
OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL HEALTH
ON-SITE WATER PROTECTION SECTION

EXPERIMENTAL COMPONENT APPROVAL

EXPERIMENTAL WASTEWATER SYSTEM NO: EWWS-08-02

ISSUED TO: JaMac and Associates, Inc.
163 Hwy 56, East
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FOR: W.A.S.T.E. X-Box Component

APPROVAL DATE: October 6, 2008

In accordance with General Statute 130A-343 and 15A NCAC 18A .1969, an application by JaMac and Associates, Inc., of Louisburg, NC, for approval of a wastewater device utilizing the W.A.S.T.E. X-Box, has been submitted and been found to meet standards for approval as an Experimental subsurface wastewater device when all of the following conditions are met:

A. GENERAL

1. Scope of this Experimental Approval:

    a. A field assessment of the performance specifically of the W.A.S.T.E. X-Box Component (WXBC), installed within or immediately adjacent to nitrification trenches for both new and/or repair systems, as an Experimental device under various system and site conditions in North Carolina.
    b. Background information regarding the WXBC and how this device works.
    c. Use, design and construction requirements for the specified model of the WXBC.
    d. Trench sizing specifications for the WXBC. Note that the WXBC, when installed within the trench, does not require any increase in total length of drainline compared to when the WXBC is installed outside of the trench.
    e. Monitoring of the WXBC to collect data on liquid ponding in the trenches and relative distribution of effluent between trenches.

2. The Experimental WXBCs are applicable to subsurface wastewater systems that treat domestic wastewater (from single and multiple dwelling units and other facilities generating similar domestic wastewater) or that treat higher strength wastewater if

advanced pretreatment is utilized bringing the expected wastewater strength down to domestic-equivalent strength prior to effluent distribution within the drainfield.

3. This Experimental approval is proposed for up to fifty (50) wastewater systems (with design flows of up to 3,000 gallons per day) and includes use of up to 400 X-Box devices in those 50 systems.

4. All WXBC-served systems installed as per this Experimental approval shall have at least one monitoring port per unit in the system up until such time as this approval is upgraded. Once the research protocol is completed and formal application is made for Innovative status monitoring ports will not be required. However, prior to that time monitoring ports shall be installed to grade in each trench that includes an X-Box, with the monitoring ports located approximately at a point five to ten feet (5-10') down the trench length from the X-Box that is located in or near the proximal end of the trench.

B. SITING CRITERIA

The WXBC shall be used as an add-on device or adjunct component anywhere that a conventional wastewater system, modified conventional wastewater system, alternative wastewater systems, approved Accepted wastewater system or approved Innovative wastewater system is used. The WXBC can also be used at sites where any approved Controlled Demonstration or approved Experimental wastewater system for pretreatment systems or for other components are used if those are not Controlled Demonstration or Experimental trench product approvals. Hence, no adjustments to the siting criteria in effect for those approved systems are proposed in concert with use of the X-Box device.

C. SIZING CRITERIA

The system sizing criteria shall be based upon the Long Term Acceptance Rate (LTAR) specified in the appropriate portion of the Rules or appropriate Accepted, Innovative, Controlled Demonstration or Experimental Approval.

D. INSTALLATION AND TESTING PROCEDURES

1. A third-party monitoring and testing protocol is required for evaluation of this Experimental device. An independent 3rd party organization selected by JaMac and Associates, Inc. and approved by the State OWPS will conduct the monitoring and testing of the experimental components.

2. There are three parts (Parts 1, 2 and 3) to the approved test protocol (described below). Once all three of these aspects of the protocol included herein are

successfully completed, the applicant may apply for Innovative Status by the State OWPS.

Part 1. A minimum of twenty-five (25) X-Box devices installed as distribution devices on existing or new wastewater systems will be monitored.

a. Ponding within 25 (minimum) trenches with the X-Box device will initially be assessed monthly for at least three consecutive months. .
   i. If at least 90% of the monitored X-Box devices function successfully (as defined per Section 2i below) for a minimum of three consecutive months then Part 1 of the protocol will be considered successfully completed and monitoring for Part 1 of the test protocol will be discontinued.
   ii. If less than 90% of the X-Box devices function successfully, then the monitoring period will be extended and these devices will continue to be monitored as per Sections b, c and d of this part as shown below.

b. Monitoring of these WXBCs shall continue quarterly until at least 90% of the X-Box devices monitored during the latest monitoring period indicate the X-Box device is operating correctly as intended. Once 90% of the devices are successfully functioning for at least 3 months then this part of the test protocol shall be considered successfully complete and monitoring can be stopped.

c. More frequent inspections than quarterly can be made or required by the test organization if they find it necessary based upon the quarterly inspection findings. All inspection data collected shall be included in the test report.

d. If during monitoring more than 25% of the installed devices are not working successfully, then the monitoring and testing protocol will be revised as follows.
   i. The number of devices monitored will at least be doubled to obtain data from a broader range of existing sites for performance assessments.
   ii. The state OWPS will be notified of the issue with any changes appropriately documented regarding the expected resolution as it understood at that time.
   iii. Adjustments will be made to bring existing units into compliance where possible and/or to replace them with new units.
   iv. Then, 90% of the new combined total of monitored devices must meet the requirements of Section 3 of this part.

e. The WXBC is typically installed either:
   i. within the drainfield trench at its proximal end (the end of the trench nearest the supply line from the septic tank) or
   ii. alternatively installed between the septic tank and drainfield trench (outside the trench near its proximal end) as per typical for drop boxes and other distribution devices such as D-Boxes.

f. The WXBC shall be installed in the proximal end of the nitrification trench on gravel aggregate or an equivalent non-compressible base. The elevation of the device shall be set to pond sewage effluent to the top of the drainfield aggregate (usually 12 inches of ponding within the trench). When chamber systems are utilized, the ponding level in the trench shall be set to the depth specified as per requirements of the appropriate state approvals and manufacturers installation manuals for each of the chamber manufacturer's products. The WXBC also includes a manual adjustment (a long 440-grade stainless steel bolt) attached to the shut-off valve arm that also allows manual setting of the ponding level that is controlled by the shut-off valve, for any special situations where that might be needed.

g. The WXBC can be installed outside the trench at the trench's proximal end per Rule .1955(l) for drop boxes or as per Rule .1955(j) for other distribution devices such as D-Boxes.

h. During the time period of the Experimental Approval testing assessment a capped, two-inch to four-inch diameter PVC stand pipe (inspection monitoring port) will be installed within the trench up to the ground surface in the proximal end of each trench that includes an WXBC. This monitoring port will be placed within five to ten feet (5-10') of the WXBC for the purpose of periodically monitoring sewage effluent ponding levels within the trench and collecting data over the duration of the test period.

i. Sewage effluent ponding within the monitoring port at elevations equal to (or less than) the designated depth (i.e. normally a maximum of 12 inches of effluent ponding in the trench, i.e. a full trench, unless purposely set higher or lower than 12 inches) indicates proper functioning of the WXBC.

j. Sewage effluent ponding in the monitoring port at elevations higher than the designated depth, indicates malfunctioning of the WXBC. Failure of the unit to distribute effluent from a full trench to the next available trench shall also define failure of the device.

k. Any malfunctioning WXBC observed as part of this protocol will be repaired and/or replaced by JaMac and Associates, Inc. upon documentation by and under the direction of the test organization and the local health department.

l. JaMac and Associates, Inc. shall not conduct any adjustments nor repairs to any WXBCs included within the sample set without the acknowledgement of the test organization and the local health department. The local health department will be consulted prior to any repairs being made to the WXBC to determine if a repair permit is required.

Part 2. A minimum of seven (7) X-Box devices shall be installed in research-length trenches (at succeeding lower elevations) at one to three research test drainfields. These research drainfields will be located to facilitate testing under relative elevation differences ranging from no less than one foot to no more than thirty feet of elevation head.

a. These seven (minimum) research-length trenches shall be a minimum of four feet long and one foot wide and shall include at least one monitoring port located in the trench, near to, but outside of the X-Box device. Sewage effluent shall be continuously ponded within these trenches and the level of ponding assessed twice monthly on these research units.

b. The X-Box devices will be taken apart at a three months stage of usage (or sooner if excessive ponding occurs or if the devices fail to hold effluent at the correct elevations in the trenches) to investigate (1) the formation of any potential slimes and/or (2) potential accumulation of any solids and (3) determine whether there is any affect of clogging within the shut-off valve and (4) assess if there is any leakage through the shut-off valve.

c. At the conclusion of testing with sewage, dyes will be utilized to observe if there is any leakage through pipe penetration points.

d. If neither substantial clogging nor leakage is observed in these seven (minimum) units then Part 2 of the experimental testing protocol will be considered successfully completed.

e. If clogging or leakage is observed, screens or similar adjustments may be installed and the tests repeated.
   i. If leakage is observed the compromised areas of leakage will be identified and appropriate adjustments made.
   ii. If clogging is observed then screens or other methods to prevent solids from affecting the unit will be determined and tested.
   iii. The state OWPS will be notified of the issue, with any changes appropriately documented regarding the expected resolution as it is understood at that time and approved of by the OWPS.
   iv. Part 2 of this testing protocol will be repeated.

Part 3. Three additional X-Box devices will be tested using water instead of sewage to determine leakage rates at very high heads of between fifty and approximately one hundred feet. Tests will be conducted to observe whether the WXBC devices hold water levels appropriately or whether excess leakage occurs from the supply line into the X-Box device.

a. Excessive leakage for the purposes of this test will be determined to be a leakage rate greater than 5 gallons per day.

b. These tests will be conducted and leakage measured within a fifty (50) to approximately one hundred (100) feet tall, one-inch to two-inch (1-2") diameter vertical standpipe attached to a nearly full X-Box.

c. Leakage will be determined and measured by observation of the extent of water drop in the standpipe (after reaching steady state conditions) during a one-hour test period.

d. Or an equivalent hydrostatic test using pressure gauges can be substituted for the standpipe test using pressures no less than 50 feet of head and no more than 100 feet of head.

3. Upon completion of the research and testing protocol, the approved 3rd party organization will prepare a final monitoring and testing report for JaMac and Associates, Inc. The report shall also be submitted to the State OWPS including the results from all of the systems monitored as a part of this protocol during the Experimental Approval process.

E. REPORTING

1. The manufacturer shall obtain services of a third party testing organization for evaluation of the performance of the Experimental wastewater system with supervision by a University faculty member from a Research I University, an independent wastewater consultant, or other entity that has expertise in the evaluation of wastewater systems and that is approved by the Section.

2. The third party evaluator shall submit a report to JaMac and Associates, Inc. and the OSWP Section that summarizes all data for the sites. This report is due by July 31, 2009 and shall include all data gathered through June 30, 2009.

3. This report shall provide information to the Section based upon the monitoring data and observations made from the Experimental systems installed pursuant to this Approval. This should include an assessment of system performance in relation to the testing protocol described here; an assessment of physical and chemical properties of the materials used to construct the system, in terms of strength, durability, and chemical resistance to loads and conditions experienced; recommended areas of applicability for the system; and any conditions and limitations related to the use of the system.

4. This report shall be in electronic format and may be published on the On-Site Water Protection Section's website with the approval from JaMac and Associates, Inc. The contents of this report shall not be altered from the original document without approval from JaMac and Associates, Inc, X-Box.

5. Any failure observed during this experiment shall be reported to the local health department and OSWPS within 48 hours of discovery.

6. The monitoring, testing and reporting outlined in Section E3 through 5, above, shall be carried out by or under the direct supervision of Dr. Mike Hoover and/or Dr. Sushama Pradhan, or another prior-approved Third Party investigator.

F. RESPONSIBILITIES AND PERMITTING PROCEDURES

1. Prior to the installation of an X-Box device at a site, the owner or owner's agent shall notify the local health department of their proposed use of such a device. The local health department shall issue an Authorization to Construct or amend a previously issued Authorization to Construct allowing for the use of X-Box devices at up to fifty (50) systems upon a finding that all provisions of this Approval and all other applicable rules shall be met. Use of the proposed Experimental device and any conditions shall be described in the Authorization to Construct as well as described on the Operation Permit to be issued upon the acceptable completion of the system installation. **Notification of the issuance of all permits/Authorizations by the local health department pursuant to this Experimental Approval shall be submitted to the On-Site Water Protection Section.**

2. Manufacturer's installation instructions, as approved by the State OWPS, shall be provided with each X-Box device offered for sale.

3. Any malfunctioning X-Box devices are to be repaired or replaced at no cost to the homeowner, by JaMac and Associates, Inc., for the period of this Experimental approval.

Approved By: _____ Date: _____

Attachment A

BACKGROUND: How The W.A.S.T.E. X-Box Device Works And Its Uses

1. The WXBC is a distribution device, specifically a drop box as defined and allowed for use in North Carolina according to Rule .1955. The three primary functions of drop boxes within serially loaded trenches are to:
    a. deliver effluent to the trench,
    b. stop sending effluent to the trench when the trench is full and
    c. then deliver effluent to the drop box located at the front (proximal end) of the next trench in series in the drainfield.

    The X-Box performs these three functions just like any drop box. And, it is installed at the proximal end of each trench, just like other drop boxes.

2. One defining characteristic of the X-Box makes it unique in its look and function compared to other drop boxes. The WXBC includes a simple internal shut-off valve that is automatically controlled by the height of water ponded within the trench (Attachment B). This shut-off valve closes when a trench fed by an X-Box is full of sewage effluent. This shut-off valve performs the same function (shutting off flow to a full trench and shunting flow to the next trench in the series) as relative differences in outlet elevations perform within other, more traditional types of drop boxes (shutting off flow to the trench due to elevation differences of the outlet inverts and then shunting flow to the next trench in the series due to the force of gravity).

3. Most drop boxes distribute (or "feed") effluent into trenches one at a time starting from the trench at the top of the slope and then going downhill to trenches at succeeding lower contour elevations. The X-Box works similarly, but just backs flow up into the next higher trench on the slope, rather than shunting flow to the next lower trench. The X-Box controls the ponding level within any trench to which it is attached due to the aforementioned shut-off valve. The valve closes and stops flow from going into the trench (this automatically happens when the trench is full of effluent or if desired, such as in a repair situation when the shut-off valve activation level can be adjusted and set at a slightly different elevation within a range of ± 1 inch).

4. As the effluent in a full trench infiltrates into the soil, the ponding level starts to drop in that trench. Then, as the sewage effluent level in the adjacent X-Box declines at the same time, the shut-off valve opens back up allowing sewage effluent to flow into the X-Box device from the supply line. This flow transfers from the X-Box into the trench allowing the trench to refill with sewage effluent. This cycle repeats itself throughout the day as effluent in the trench is slowly absorbed into the soil. Both the X-Box device and other drop boxes shunt sewage effluent to the next trench, one to a higher trench and the other to a lower trench on the slope when the trench in question is full ---- and so on, if needed, until all trenches are utilized.

5. Typical uses of the X-Box include (1) controlling flow to serial distribution trenches, (2) allowing gravity distribution on very flat sites that have very shallow limiting conditions in the soil, (3) controlling use of previously failing trenches to maximize their utilization when new repair trenches have been installed, and (4) reducing the need for pressure manifold or other pump distribution methods to drainfields with unequal line lengths where the drainfield is located downhill of the septic tank by using gravity flow into trenches that have varying trench lengths. These are described in greater detail below.

    a. The W.A.S.T.E. X-Box Component can be configured to allow effluent in serially loaded trenches to be delivered first to the trench at the lowest elevation (bottom of the hill) and then to deliver effluent uphill to trenches at succeeding higher elevations. This occurs due to the internal shut-off valve closing when the lowest trench is full of effluent (but not allowing it to become overfilled and cause surface failure) and thereby shunting flow (backing it up the hill) to the next highest trench on the hillslope.

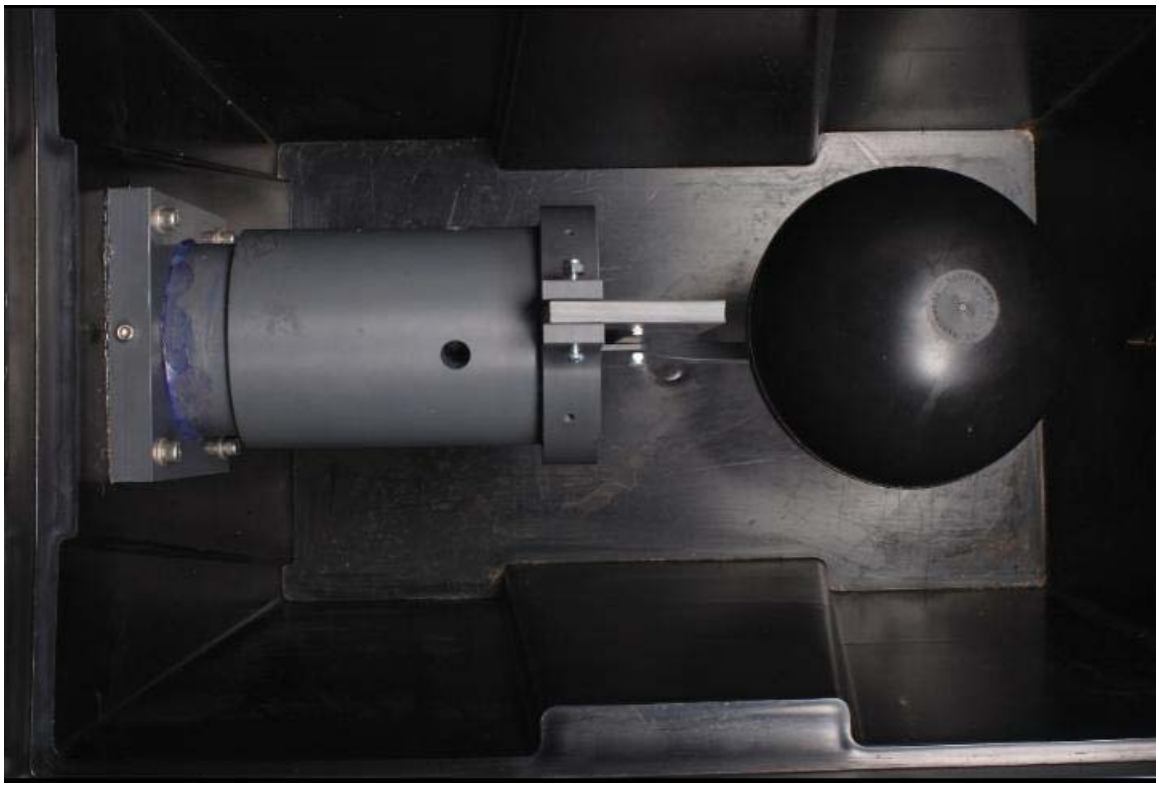
    b. Parallel distribution on flat sites can be difficult to achieve without use of pumps when the soil limiting condition (shallow to unsuitable morphology, soil wetness, parent material, rock or restrictive horizons) occurs relatively close to the ground surface. Or the same problem can occur where the household plumbing has been stubbed out slightly too deep for gravity flow to work effectively. This is often a problem on flat lots with shallow at-grade drainfields and shallow soils, or even with better-suited soils, where differences of inches in elevation can become critical for maintaining gravity flow conditions to a drainfield. The X-Box can effectively replace a D-Box or flow divider tees in some of these situations and still allow gravity distribution. The X-Box does not require the additional elevation drop between the inlet invert and outlet invert elevations that is necessary on a D-Box or that is needed when using a flow splitter. Hence the WXBC when used in these situations can sometimes save 2 to 4 inches or more of elevation, thereby allowing for the installer to avoid using a pump system.

    c. The WXBC also has uses in serial loaded drainfields in repair situations, and even has uses where parallel distribution with a D-Box has already been used for the initial system. In those situations adding an X-Box can control the delivery of effluent into the existing (currently failing) trenches so as to hold them as full as possible (to maintain their maximum capacity) but to bring them out of failure status (Attachment C). Then the X-Box shunts flow, on an as-needed basis, to the more recently installed repair lines as long as all trenches are located below the elevation of the septic tank outlet invert.

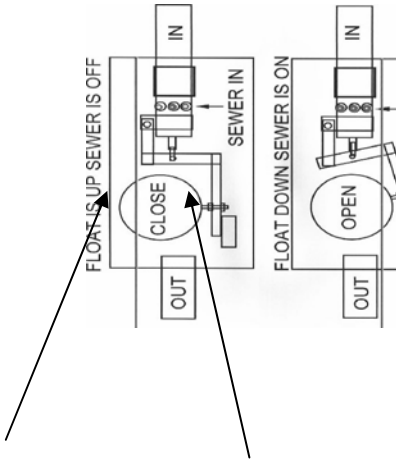
    d. The X-Box also serves as a controlled distribution device that can replace a pressure manifold in situations where pumping is planned to drainfields located at lower elevations than the septic tank. This is particularly useful in counties (or for designers) who do not allow unequal line lengths with gravity-

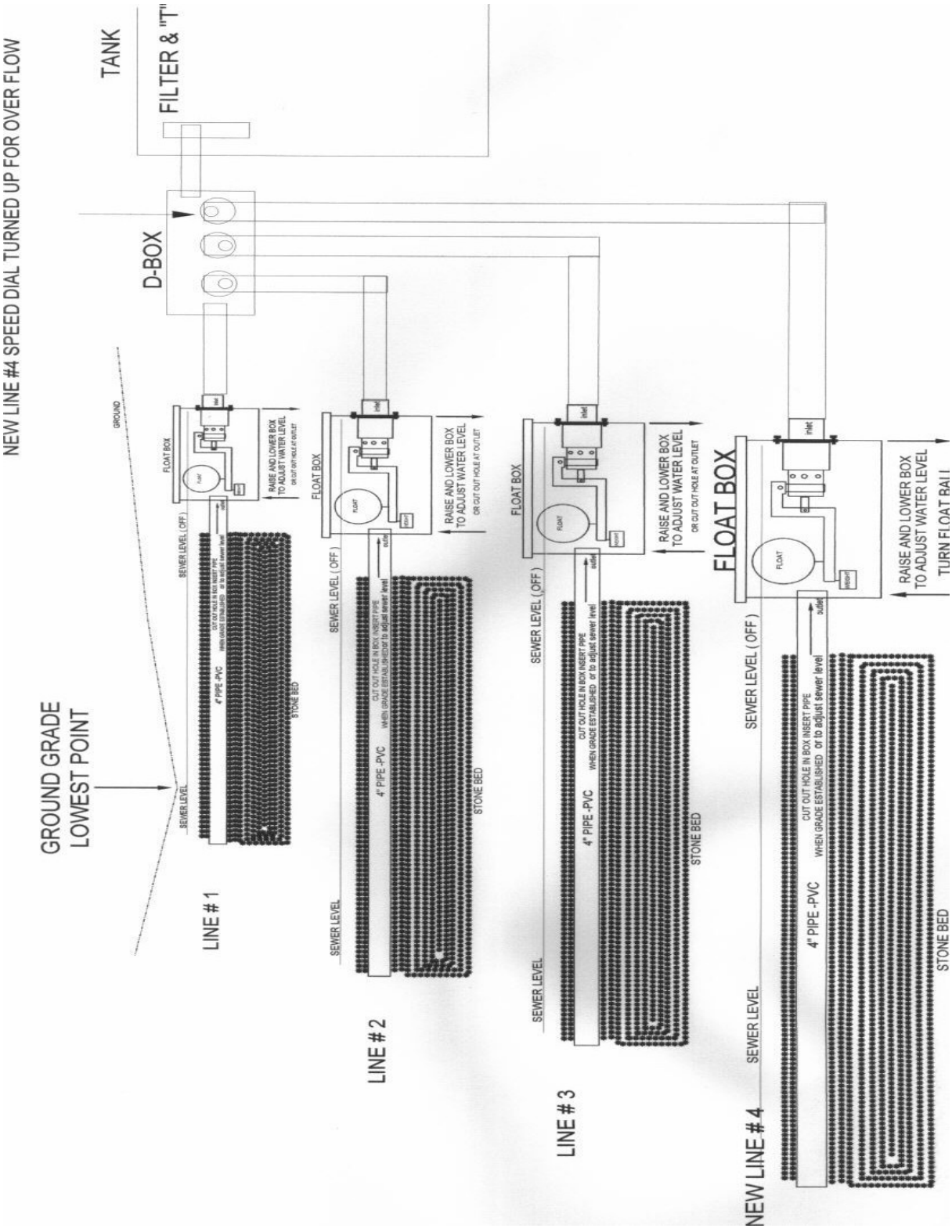
fed parallel (D-box) distribution. In situations with unequal line lengths pressure manifolds with varying tap sizes are oft-times required to assure that shorter trenches receive less effluent than longer ones. Hence, pump systems are frequently required when pumping downhill to unequal line lengths even though a pump would not be otherwise needed (not needed to overcome elevation differences). The X-Box controls flow within drainfields that have unequal line lengths on sites where the drainfield is downhill from the septic tank. This option removes the need for the pump, pump tank, floats, control panel and requisite pressure manifold, resulting in a substantial saving in capital and maintenance costs for the homeowner and installer. It also saves time for local health departments since they are legally required to periodically monitor pressure manifold systems.

Attachment B



Attachment C




NEW LINE #4 SPEED DIAL TURNED UP FOR OVER FLOW
TANK
FILTER & "T"
D-BOX
GROUND GRADE
LOWEST POINT
GROUND
SEWER LEVEL
FLOAT BOX
SEWER LEVEL (OFF)
4" PIPE -PVC
STONE BED
RAISE AND LOWER BOX
TO ADJUST WATER LEVEL
OR CUT OUT HOLE AT OUTLET
LINE # 1
LINE # 2
LINE # 3
NEW LINE # 4
FLOAT BOX
TURN FLOAT RAI