February 12, 1998

GMP #93

To: District Environmental Health Managers
District Health Directors
OEHS Staff
VPI&SU Soil Scientists

From: Donald J. Alexander, Director
Division of Onsite Sewage and Water Services

Subject: Revisions to the Puraflo™ Variance
Onsite - Product Approval - Puraflo™

The Department has reviewed a variance request which would allow Bord na Mona to expand the number of systems the Department will permit from 100 systems to 500 systems. The variance was granted and will allow a more comprehensive evaluation of the product. I appreciate and thank each of you who took time and responsed to my October 9, 1997, e-mail request for information on the perfomance of the Puraflo® system. This GMP replaces GMP #79, which is hereby rescinded. ***Two revisions have been made to the previous GMP: (1) the total number of systems permitted has been changed to 500, to reflect the recent variance; and (2) the section of the GMP describing testing and evaluation has been revised to clarify the roles of the Division, Bord na Mona, and the individual health departments in this part of the protocol. No other changes have been made to the GMP.*** No other changes are made to the manner in which applications for Puraflo™ systems are processed. The site criteria contained in the **Experimental Protocol** document remain unchanged. The Division will continue to monitor the number of permits issued on a statewide basis. When either 500 permits have been issued or the experimental protocol is completed, you will be notified accordingly. The **Experimental Protocol** specifies that a **Sampling Protocol** will be developed. A copy of this protocol, dated April 3, 1997, is also attached. ***For the actual field sampling to date, Bord na Mona has added analyses of free ammonia, nitrate, and TKN to the list of parameters specified in the Sampling Protocol.***

The Puraflo™ system will continue to be an experimental system. Expansion of the number of systems allowed under the variance is intended to allow the demonstration of the Puraflo™ system for the purposes of determining whether the system can overcome soil and site limitations that would prohibit the use of a conventional onsite system due to the proximity or rock or water table or both.

The Department's approval of this protocol is granted only for the Puraflo™ system and is not transferable to any other product. Applications for products other than Puraflo™, or for sites that exceed the scope of this waiver, are subject to the full provisions of 12 VAC 5-610-370(previously §2.25).

As before, the process to obtain a construction permit for a Puraflo™ system begins with filing an application. Applications may be made to review a new site, to modify a previously issued permit, or to convert a 415 certification letter to a construction permit to allow a Puraflo™ system. Please note that experimental systems cannot be converted to an approval letter and that experimental construction permits cannot be valid beyond the completion of the experiment. All permits issued under this revised protocol must be recorded with a copy of the variance in the same manner that conditional permits are recorded. Please refer to Section XI-E of the protocol which addresses some practical matters related to experimental permits.

As noted in GMP #69 and #79, the experimental protocol submitted by Bord na Mona was prepared by a professional engineer and all testing associated with the protocol will be conducted under the auspices of a professional engineer. Given the simple design and hydraulics aspects of this system, the Division considers this adequate to comply with the requirements of 12 VAC 5-610-370 as they relate to the requirements for a professional engineer. Local health departments may, at their discretion, require either formal or informal plans and specifications, as deemed appropriate for the proposed use and site conditions, prior to issuing a permit. All provisions of 12 VAC 5-610-370, except the requirements for a backup site, apply when issuing a permit. A backup site meeting the requirements of March 11, 1996 variance is required prior to permitting any site. Individual permits shall be issued by the local health department and a copy

of the permit and site conditions sent to the Division on Onsite Sewage and Water Services.

When a new application is made for a construction permit and it specifically requests a Puraflo™ system, an application fee shall be charged and the site shall be evaluated in the same manner as any application for a conventional septic system except that the site and soil conditions contained in the **Experimental Protocol** may be used. If the site and soil conditions meet these criteria, the site shall be deemed suitable for a Puraflo™ system.

Applications to convert a 415 certification letter to a Puraflo™ system shall follow the same general process, including collecting a fee; however, no soil evaluation is specifically required. A site evaluation (as opposed to soil evaluation) may be necessary to assure that conditions have not substantially changed since the letter was issued. If the site and soil conditions are unchanged and meet the criteria contain in the **Experimental Protocol** the site shall be deemed suitable for a Puraflo™ system.

When an application is made to convert an existing Type I or II permit to a Puraflo™ system, no application fee shall be charged as no site evaluation should be necessary. If the documented site and soil conditions indicate the site meets the criteria in the **Experimental Protocol**, the site shall be deemed suitable for a Puraflo™ system.

System design, installation, and operation shall comply with the requirements described in the **Experimental Protocol**, Bord na Mona design, construction and installation literature, the Sewage Handling and Disposal Regulations and standard engineering practices.

This GMP replaces GMP #79, which is hereby rescinded.

Attachments: Variance Request
Variance Response
Experimental Protocol
Sampling Protocol

GMP #93

Onsite - Product Approval - Puraflo™

Conditions of Approval

Puraflo Experimental Protocol

February 12, 1998

I. System description.

The Puraflo wastewater treatment system consists of the following listed key components. This experimental protocol is based on the specific components listed. Equivalent components may be used after receiving written approval from the Division of Onsite Sewage and Water Services. Unless otherwise stated, the components of the Puraflo system shall comply with the intent, objectives and requirements of the Sewage Handling and Disposal Regulations.

A. Building Sewer. The building sewer used in conjunction with a Puraflo system shall comply with Part IV, Article 2 of the Sewage Handling and Disposal Regulations (the regulations).

B. Pretreatment system. The minimum pretreatment system preceding a Puraflo system shall be a septic tank designed and installed in compliance with Part IV, Article 3 of the Sewage Handling and Disposal Regulations but having a holding capacity of not less than 1,000 gallons.

C. Secondary treatment system. The Puraflo system consists of a number of treatment modules, each with a capacity of approximately 125 GPD, nominally 7'1" x 4'7" x 2'6" (L,W,D) containing a proprietary biofibrous media. Septic tank effluent is dosed from a sump to the treatment modules where treatment occurs by a combination of physical, biological and chemical processes. The average treatment capability of the Puraflo is reported in Table 1 and, in part, formed the basis for this approval.

Parameter	Percent Reduction
BOD_5 (mg/l)	>96%
TSS (mg/l)	>95%
NH3-N (mg/l)	>90%

Parameter	Percent Reduction
Tot. coliform	>99.9%
E. coli	>99.9%

Table 1

D. Conveyance system. All effluent conveyance components designed to move effluent from the Puraflo□ system to an absorption area shall comply with the requirements of □ 4.23 of the Sewage Handling and Disposal Regulations. [**Note:** Conveyance system refers to the actual conveyance system and not to the proprietary pump and pump chamber portions of the Puraflo□ system.]

E. Absorption area. When the criteria found in the *Sewage Handling and Disposal Regulations* and Figure 1 (of this document) are met, the absorption field shall be designed in accordance with Tables 2A through 2C, below for all systems serving dwellings of one to four bedrooms inclusive. Systems larger than four bedrooms but less than 1,000 G.P.D. shall be designed on a case by case basis by Bord na Mona Environmental Products under the guidance of a professional engineer, using Tables 2A, 2B and 2C as guides.

Trench Bottom Area for 300 GPD
This chart shows the linear feet of trench needed in addition to the 16'x20' footprint area of the treatment pad in a Puraflo□ system.

Percolation Rate	Length of 1.5' trench needed	Length of 2' trench needed	Length of 3' trench needed
<=20	0	0	0
30	0	0	0
40	16	14	10
50	52	44	33
60	88	74	55
70	124	104	78
80	160	134	100
90	196	164	123

Trench Bottom Area for 300 GPD This chart shows the linear feet of trench needed in addition to the 16'x20' footprint area of the treatment pad in a Puraflo system.			
100	232	194	145
110	269	224	168
120	305	254	191

Table 2A

Trench Bottom Area for 450 GPD This chart shows the linear feet of trench needed in addition to the 16'x20' footprint area of the treatment pad in a Puraflo system.			
Percolation Rate	Length of 1.5' trench needed	Length of 2' trench needed	Length of 3' trench needed
<=20	0	0	0
30	34	29	22
40	88	74	55
50	142	119	89
60	196	164	123
70	251	209	157
80	305	254	191
90	359	299	224
100	413	344	258
110	467	389	292
120	521	434	326

Table 2B

Trench Bottom Area for 600 GPD This chart shows the linear feet of trench needed in addition to the 16'x20' footprint area of the treatment pad in a Puraflo system.			
Percolation Rate	Length of 1.5' trench needed	Length of 2' trench needed	Length of 3' trench needed
<=20	16	14	10
30	88	74	55
40	160	134	100
50	232	194	145
60	304	254	190
70	377	314	236
80	449	374	281
90	521	434	326
100	593	494	371
110	665	554	416
120	738	615	461

Table 2C

When designing a system in accordance with Tables 2A through 2C, the Puraflo treatment unit may rest on a gravel absorption pad that is typically 16' by 20'. This pad area, when present, provides the initial 320 square feet of absorption area. When greater area is required, trenches may be designed to provide the additional absorption area or the pad area may be expanded beyond the modules to a maximum area of 200 sq. ft. per module.

II. Scope of Waiver.

This waiver is granted for facilities generating wastewater flows of 1,000 g.p.d. or less and of residential strength (BOD_5 <250 mg/l). Larger flows may be permitted but shall be reviewed

individually to assure compliance with the requirements of 2.25 of Sewage Handling and Disposal Regulations. A maximum of 500 systems may be installed under this waiver. Of these, 24 systems (six systems in each of the four major soil groups) will be monitored for potential ground water contamination. The sampling protocol is described in Section V.

III. Siting Criteria.

The Puraflo system may be used to provide wastewater treatment at any site that meets one of the following classifications:

1. Any site that does not comply with the minimum stand-off to rock and/or water table requirements contained in the Sewage Handling and Disposal Regulations but does comply with the requirements of Figure 1. **Note:** In accordance with a variance issued on 03/12/96, the first 100 systems require an available repair area equal to 100% of the original Puraflo absorption area (see variance for complete details). Systems meeting these criteria shall be sized in accordance with Bord na Mona s design criteria contained in

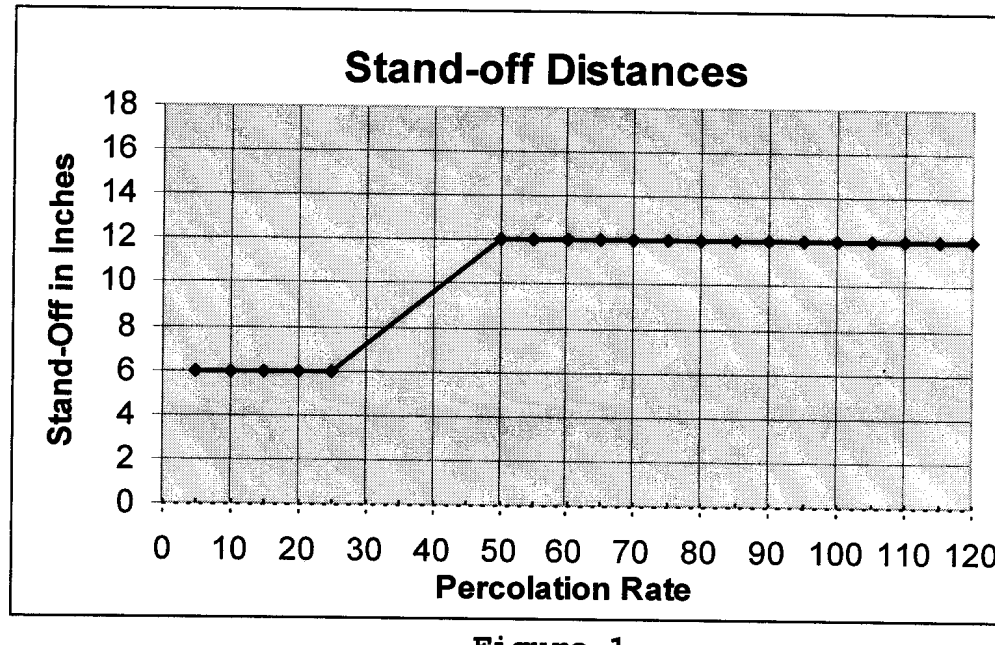

Figure 1

Tables 2A through 2C. A variance of February 4, 1998, extends these requirements and criteria for an additional 400 systems, for a total of 500 systems covered by this

protocol.

2. Any site that fully complies with the criteria contained in the Sewage Handling and Disposal Regulations, including but not limited to absorption area sizing percolation rate, landscape position, stand-off distances, and set-back distances.

3. Any repair permit that complies with 2.16 C.2, where the Puraflo system is used to enhance wastewater treatment and potentially enhance wastewater disposal.

The stand-off distances to rock and water table for conventional septic systems are proposed for revision. These revisions may affect the stand-off distance for this system. If the proposed revisions are adopted as drafted, the stand-off distance for the Puraflo system will be revised to 12 inches in all soil types.

IV. Design Criteria

All portions of the system shall be designed to provide wastewater treatment and disposal which is equal or superior to that which may be obtained with a conventional gravity drainfield system. In general, the system must provide primary treatment, secondary wastewater treatment, and effluent distribution and application to soils capable of providing sufficient additional secondary treatment to render the wastewater harmless to humans and the environment. Specific deviations from the design practices contained in the Sewage Handling and Disposal Regulations are described below.

A. Field Design.

The absorption area required may be achieved by use of the pad area, use of gravel absorption trenches, or a combination of both pad area and trenches provided:

1. The minimum stand-off to water table, or other limiting factor, is achieved over the entire absorption area. This assures that sufficient suitable soil, as may be required, exists between the soil and the limiting factor to provide additional treatment.

2. All trenches shall be installed on contour.

3. All pad areas (bed type design) shall be designed such that in all instances the bottom pad area shall be level while maintaining separation distances to all soil limiting factors. Under no circumstances shall any portion of the pad bottom area be installed above grade. On sites where these conditions cannot be met, another absorption area configuration shall be used.

4. The system shall be designed to provide nominally equal flow throughout all portions of the absorption area. Distribution of effluent by gravity or pressure dosing (before or after the treatment modules) is acceptable.

The total required absorption area may be achieved by using one or more discrete absorption areas. Flows to discrete areas shall be proportioned to match the absorption rates of the discrete areas if the areas are not identical.
Distribution. When the absorption area is located contiguous to the Puraflo treatment unit, Bord na Mona s design for gravity flow through adjacent gravel trenches may be used provided:

1. The bottom of all portions of the absorption area shall be installed at a single elevation (+/- 2") and on contour (requires a flat or essentially flat site), or

2. All absorption trenches shall be installed on contour. On sloping sites, parallel distribution (utilizing a distribution box or pressure distribution) shall be employed when laterals are installed on more than one elevation.

Distribution may be accomplished by pressure distribution before or after the treatment modules, gravity distribution to laterals out of the pad area, or gravity or pressure distribution to a distribution box or manifold provided effluent will be applied proportionally to the absorption area as described in Part IV A (Field Design) above.

Depth. The minimum installation depth of the system i.e., the bottom of the gravel pad and/or trenches that comprise the absorption area, shall be level with the naturally occurring grade. On sloping sites this shall be measured on the downhill side of the installation. Cover material shall be provided from the top edge of the Puraflo units horizontally in all directions to existing grade and shall cover the top and side of the pad area which may be exposed during construction. The minimum cover over the pad area, and any trenches, shall not be less than 4 inches.

Slope. The maximum allowable slope shall be 50%. On slopes up to 30% the four treatment modules will normally be installed using a two-by-two configuration. On steeper slopes, or where physical constraints require it, the modules may be arranged end-to-end.

B. Pump Design.

The Puraflo system contains a pump and pump chamber as an integral part of the system to dose the biofibrous media. The design and installation of this pump is proprietary and does not need to comply with all of the requirements of the *Sewage Handling and Disposal Regulations* provided the following conditions are met:

1. The pump, pump chamber, and appurtenances do not create any health hazards, safety problems or nuisances.

2. The average life of the pump and components is not less than seven years.

V. Installation

A. Installers shall be trained by Bord na Mona Environmental Products US, Inc., and be certified as having passed their minimum training qualifications prior to installing any systems in Virginia.

B. The manufacturer's recommendations shall be followed for system startup.

C. All mechanical components, pumps, pump cycling, filters, systems must be demonstrated to be fully

operational in accordance with their design.

VI. Operation

All system owners shall be provided with written and oral instruction on the proper operation and maintenance of the Puraflo system. At a minimum this will include the items contained in 2.5 of the Bord na Mona proposal. Updates, revisions and other changes to this section are the responsibility of Bord na Mona Environmental Products USA, Inc. Copies of changes should be submitted to the Department on an informational basis.

Nothing in this approval is intended to prevent or restrict the development of instructional materials for public use. No prior approval of such literature is required provided the literature contains no endorsements, approvals, or suggestions that the Department in any manner promotes the use of one system above any other.

VII. Testing and evaluation procedures

A specific Sampling Protocol for field testing, sampling, and evaluation will be developed and conducted under the supervision of the Division, in conjunction with Bord na Mona. The conducting of all sampling and the submission of all reports shall be done by, or under the supervision of, a professional

engineer registered in Virginia, to be designated jointly by the Division and Bord na Mona.

If a local or district health department wishes to monitor a particular system for which they have issued a permit under this protocol, the manager or supervisor from that office shall contact Division staff, who will recommend to Bord na Mona that the system be included in the sampling program. The responsibility for assuring that sampling occurs rests exclusively with Bord na Mona Environmental Products U.S., Inc.

Effluent samples shall be collected from at a depth of 12" below the bottom of the absorption area. For the purposes of evaluating test results, samples will be collected to assess performance at a point below an estimated 12" of unsaturated soil. [Note: As initially permitted, systems installed in soils

with a percolation rate of less than 50 minutes per inch, and in accordance with this protocol, will not always be installed at least 12 inches above a seasonally saturated horizon.] Each system selected by the Division and Puraflo for sampling shall have two sampling ports installed for the purpose of sampling effluent. At least one of these sampling ports shall be located beneath the footprint of the Puraflo system. One port may be located beneath an absorption field trench provided it is located within the first ten feet of the trench. Because of the advantages of installing monitoring devices at the time of system installation, as compared with retrofitting of monitoring devices to systems already installed, the Division or Bord na Mona may contact a local health department for assistance in the scheduling of installation of systems selected for sampling.

The sampling ports must be designed to preclude the entrance of untreated effluent. No sampling port was originally proposed beneath a trench and the Department requests that a design for such a sampling port be developed in conjunction with a University researcher and submitted for review prior to installation.

Tests will be conducted on effluent beneath the trenches for fecal coliform bacteria, pH, and chlorides on a monthly basis. Semiannual tests will be conducted on septic tank effluent and effluent from the Puraflo treatment unit for BOD_5. Tests for NO_3-N may be conducted to demonstrate nitrate removal efficiency if desired.

In the event that interim test results preclude the possibility of the product passing the experimental protocol, the Department may notify Bord na Mona by certified mail that additional testing is not warranted.

Standards

Fecal Coliforms: The average of samples collected from unsaturated soil horizons shall average less than 10 cfu/100mls and have no single sample in excess 200 cfu/100mls. Sample results obtained during the first six months of operation may be discarded from the performance evaluation at the sole discretion of the Department, when there appears to be due cause. [Note: Performance may be adjusted to correspond with research results on conventional septic tank drainfield system technology with 18" stand-off in texture group II, III, and IV soils.]

N03: No performance standard is established; however, results may be used to demonstrated nitrate-nitrogen reduction and used where this is necessary.

Chlorides: An increase in chloride concentrations must be observed to confirm that treated effluent is being collected.

BOD5: Septic tank effluent samples must be greater than 100 and less than 300 for any individual samples and average greater than 150 over the sampling period to verify that a typical strength, residential waste is being treated.

Effluent from the Puraflo unit may be regularly tested to demonstrate treatment effectiveness but is not required for pass fail. Results may be used to qualify the Puraflo system for use as a provisionally or generally approved system under the *Discharge Regulations*.

Surfacing and ponding

Any system that shows surfacing of effluent shall be considered a failure. An evaluation shall be made of the system and the cause of failure and corrective action shall be taken.

Ponding depth within the absorption area shall be monitored on a monthly basis in each system. Two monitoring ports shall be installed exclusively for this purpose and ponding depths reported not less than monthly. Ponding depths shall be compared with systems installed in conventional systems to attempt to determine the life expectancy of the system with the higher application rate of more highly treated wastewater.

VIII. Operation and monitoring.

For the first three years of use after this experimental protocol is granted, Bord na Mona Environmental Products, US Inc. shall maintain a log of all systems installed. Said log shall include the following minimum information: System location (by tax map or owner s name and county) soil conditions where the system was installed, and all associated physical, biological and chemical

data if the system is one being monitored. Said log shall be reported to VDH on a quarterly basis and shall be provided by the 15th of the month following the end of the quarter. The log shall be available to VDH within 5 business days upon request.

IX. Responsibilities and permitting procedures.

A. This approval has been granted specifically for the process described in the application made by Bord na Mona Environmental Products, US, Inc. for the Puraflo system. Any changes to the components used in this process must be reviewed and approved by VDH on a case-by-case basis prior to use.

B. No contractor may install a Puraflo system unless they are first certified by Bord na Mona, Inc., as meeting their minimum competency standards for contractors.

C. The Puraflo system is an experimental system; however for the purposes of permitting, it shall be handled in the same manner as a Type II system.

D. Permitting shall be done by the local health department based on their satisfactory site evaluation and review of plans and specifications prepared in accordance with the manufacturer's specifications and all applicable state regulations and policies and any relevant local ordinances.

E. Construction permits (i.e., not operation permits) normally shall be valid for a period of 18 months; however, no construction permit shall be valid beyond the completion date of the experiment. The Virginia Department of Health shall establish the completion date of the experiment by determining when sampling on the 24 systems being monitored under this protocol will be completed. Upon successful completion of the experimental protocol, the Department will convert unused construction permits to conventional construction permits and extend the life of the permit to 18 months from the date of issuance. Such conversion shall be done at no cost to the permit holder. In the event that the system fails the experimental protocol, unused permits will not be renewed.
Permits shall note the experimental nature of the system and that they cannot be converted to an approval letter. Upon successful completion of the experimental protocol, the holder of a valid experimental permit may convert the same

to either a conventional construction permit or an approval letter. In the event that the experimental system fails to meet the protocol, the Department's is not obligated to reissue either a construction permit or an approval letter.

F. Bord na Mona shall be responsible for providing up to six classes (up to 50 students each) during the first 6 months after this approval is granted and two classes annually thereafter. The training shall include a manual covering proper siting, sizing, construction, installation and inspection processes for the Puraflo system. All training materials, the course syllabus and training locations shall be reviewed and approved by the Division prior to training occurring.

G. Should the Puraflo systems fail to perform to the satisfaction of the Department, the Department may rescind or modify this experimental protocol. Prior to taking such action the Department shall notify Bord na Mona of nature of the problem and of the action the Department intends to take.