ATL SYSTEM MOUND

COMPONENT MANUAL

November 2018

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This component manual was produced exclusively for use with ATL products. This manual is originally based upon the "Mound Component Manual for Private Onsite Wastewater Treatment Systems" Ver. 2.0, October 2012, by the State of Wisconsin, Department of Safety and Professional Services, with periodic updates applied.

Infiltrator Water Technologies (Infiltrator) reserves the right to revise this component manual according to changes in regulations or ATL system installation instructions.

Preface

ATL SYSTEM APPLICATIONS INFORMATION

ATL System Type[1]	Infiltrator ATL System Design Document	1-ft Depth Credit Allowed	System Sand Depth (inches)	Effluent Distribution Method
Subsurface bed	Design and Installation Manual for the Infiltrator ATL System in Wisconsin	No	6	Gravity
Subsurface bed	Design and Installation Manual for the Infiltrator ATL System in Wisconsin	Yes	6	Pressure
Above-ground bed	ATL System Mound Component Manual	Yes	6	Pressure
Mound	ATL System Mound Component Manual	Yes	6	Pressure

[1] If any part of the ATL distribution cell is above grade then the ATL System Mound Component Manual shall be used.

I. INTRODUCTION AND SPECIFICATIONS

This Private Onsite Wastewater Treatment System (POWTS) component manual provides design, construction, inspection, operation, and maintenance specifications for an ATL System mound component. However, these items must accompany a properly prepared and reviewed plan acceptable to the governing unit to help provide a system that can be installed and function properly. Violations of this manual constitute a violation of SPS 383 and 384, Wis. Adm. Code. The ATL System mound component must receive influent flows and loads less than or equal to those specified in Table 1. When designed, installed, and maintained in accordance with this manual, the ATL System mound component provides treatment and dispersal of domestic wastewater in conformance with SPS 383 of the Wis. Adm. Code. Final effluent characteristics will comply with SPS 383.41, Wis. Adm. Code when inputs are within the range specified in Tables 1 to 3.

Note: Detailed plans and specifications must be developed and submitted to be reviewed and approved by the governing unit having authority over the plan for the installation. Also, a Sanitary Permit must be obtained from the department or governmental unit having jurisdiction. See Section XII for more details.

Table 1 **INFLUENT FLOWS AND LOADS**	
Design wastewater flow (DWF)	≤ 5,000 gal/day
Monthly average value of Fats, Oil and Grease (FOG)	≤ 30 mg/L
Monthly average value of five-day Biochemical Oxygen Demand (BOD_5)	≤ 220 mg/L
Monthly average value of Total Suspended Solids (TSS)	≤ 150 mg/L
Design loading rate of fill	≤ 0.93 gal/ ft^2/day if BOD_5 and TSS ≤ 30 mg/L
Design loading rate of the basal area	= soil application rate of effluent with maximum monthly average values of BOD_5 and TSS of ≤ 30 mg/L as per SPS Table 383.44-1 or Table 383.44-2
Volume of a single dose to absorption component	≥ 5 times void volume of the distribution lateral (s) and ≤ 25% of the design wastewater flow.
Design wastewater flow (DWF) from one- or two-family dwellings	Based on SPS 383.43 (3), (4), or (5), Wis. Adm. Code
Design wastewater flow (DWF) from public facilities	≥ 150% of estimated daily wastewater flow in accordance with Table 4 of this manual or SPS 383.43 (6), Wis. Adm. Code
Linear loading rate for systems with in-situ soils having a soil application rate of ≤ 0.3 gal/ft^2/day within 12 inches of fill material	≤ 4.5 gal/ft/day
Wastewater particle size	≤ 1/8 inch
Distribution cell area per orifice	≤ 12 ft^2

Table 2a **SIZE AND ORIENTATION**	
Distribution cell width (A)[a]	≤ 9 ft = Product widths are shown in Table 2b
Distribution cell length (B)[a]	Product length is shown in Table 2c
Total distribution cell area (A x B)[a]	A x B (See Table 2b)
Required product amount	70 linear feet/bedroom
Orientation	Longest dimension parallel to surface grade contours on sloping sites.
Deflection of distribution cell on concave slopes	≤ 10%
Fill material depth at up slope edge of distribution cell (D)[a]	The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-1 or Table 383.44-3 WI Adm. Code. Under the 6 inches of system sand required for the ATL System, any additional sand fill that is required is on an inch-by-inch basis. If 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4 inches.
Distribution cell depth (F)[a]	Product height of 12 inches + system sand of 6 inches = 18 inches
Depth of cover material at top center of distribution cell area (H)[a]	≥ 12 inches
Depth of cover material at top outer edge of distribution cell area (G)[a]	≥ 6 inches
Basal area	≥ Design wastewater flow rate ÷ Design loading rate of basal area as specified in Table 1

[a] Letter corresponds to letters referenced in figures, formulas and on worksheets

Table 2b MINIMUM SYSTEM SAND FOOTPRINT DIMENSIONS AND AREA						
Minimum Length of Conduit (ft)	2 Conduit Rows		3 Conduit Rows		4 Conduit Rows	
	Dimensions (A' x B') [a]	Area (sf)	Dimensions (A' x B') [a]	Area (sf)	Dimensions (A' x B') [a]	Area (sf)
140	5 x 72	360	7 x 52	364	9 x 42	378
210	5 x 112	560	7 x 72	504	9 x 62	558
280	5 x 142	710	7 x 102	714	9 x 72	648
350	5 x 182	910	7 x 122	854	9 x 92	828

Table 2c MINIMUM TOTAL LENGTH OF CONDUIT	
Number of Bedrooms	Minimum Conduit Length Required (ft)
2	140
3	210
4	280
5	350
Each additional	70

NOTES:

a. Corresponds to letters referenced in figures, formulas and on worksheets.
b. The conduit rows must be extended to within 12 inches of each end of the bed. The dimensions above include 12 inches of system sand in between each of the conduit rows.
c. Table 2b provides examples of dimensions and area; other configurations are allowed.
d. The conduits are manufactured in 10-foot lengths; all conduit row length calculations in Table 2c are rounded up to the nearest 10 feet.
e. Multiple bed systems: where site conditions or other considerations require multiple beds, the row-specific length dimensions in Table 2c may be modified to account for the number of beds.

Table 3 OTHER SPECIFICATIONS	
Bottom of distribution cell	Level
Slope of original grade	≤ 25% in area of basal area of the mound
Depth of in-situ soil to high groundwater elevation and bedrock under basal area	≥ 6 inches
Vertical separation between distribution cell infiltrative surface and seasonal saturation defined by redoximorphic features, groundwater, or bedrock	≥ 2 ft measured to the bottom of the ATL system sand.
Horizontal separation between distribution cells	≥ 3 ft
Fill material	Meets ASTM Specification C33 for fine aggregate
Size for basal area (for level sites) (B x W) [a]	Cell length x [Total mound width]
Size for basal area (for sloping sites) (B x {A +I})[a]	Cell length x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width]
Observation pipe material	Shall conform with requirements in SPS 383 Table 384.30-1, Wis. Adm. Code
Effluent application	By use of pressure distribution network only. Conforming to sizing methods of either Small Scale Waste Management Project publication 9.6, entitled "Design of Pressure Distribution Networks for Septic Tank – Soil Absorption Systems" or Dept. of Safety and Professional Services publications SBD-10573-P or SBD-10706-P, entitled "Pressure Distribution Component Manual for Private Onsite Wastewater Treatment Systems"
Piping Material	Meets requirements of SPS 384.30 (2), Wis. Adm. Code for its intended use
Distribution cell aggregate material	ATL conduits as listed in Table 2b
Number of observation pipes per distribution cell	≥ 2
Location of observation pipes	At opposite ends of the distribution cell. Observation pipes must be located at the junction point between two products to not create separation of the bundles within a product.
Maximum final slope of mound surface	≤ 3:1

Table 3 **OTHER SPECIFICATIONS** (continued)	
Cover material	Soil that will provide frost protection, prevent erosion and excess precipitation or runoff infiltration and allow air to enter the distribution cell
Grading of surrounding area	Graded to divert surface water around mound system
Limited activities	Unless otherwise specifically allowed in this manual, vehicular traffic, excavation, and soil compaction are prohibited in the basal area and 15 feet down slope of basal area, if there is a restrictive horizon that negatively affects treatment or dispersal
Installation inspection	In accordance with SPS 383, Wis. Adm. Code
Management	In accordance with SPS 383, Wis. Adm. Code and this manual

Note a: Letter corresponds to letters referenced in figures, formulas and on worksheets.

II. DEFINITIONS

Definitions not found in this section, are in SPS 381 of the Wisconsin Administrative Code or the terms use the standard dictionary definition.

A. "Basal Area" means the effective in-situ soil surface area available for infiltration of partially treated effluent from the fill material.

B. "Conduit" means Infiltrator ATL System component made up of 4-inch-diameter pipe, large-diameter synthetic aggregate, coarse geotextile, small-diameter synthetic aggregate, fine geotextile

C. "Deflection of distribution cell" means the ratio between the maximum distance between the down slope edge of a concave distribution cell to the length of a perpendicular line that intersects the furthest points of the contour line along the down slope edge of the distribution cell.

D. "Distribution cell area" means the area within the ATL System mound where the effluent is distributed into the system sand and then into the fill material or in-situ soil.

E. "Fill Material" means sand that meets specifications of ASTM Specification C33 for fine aggregate and is used along the sides of and could be under the distribution cell to provide treatment of effluent.

F. "Limiting Factor" means high groundwater elevation or bedrock.

G. "Mound" means an on-site wastewater treatment and dispersal component. The structure contains a distribution cell area surrounded by suitable fill material. The fill material provides a measurable degree of wastewater treatment and allows effluent dispersal into the natural environment under various soil permeability.

H. "Original Grade" means that land elevation immediately prior to the construction of the mound system.

I. "Parallel to surface grade contours on sloping sites" means the mound is on the contour except that a 1% cross slope is allowed along the length of the mound. See SPS 383 Appendix A-383.44 ORIENTATION (6).

J. "Permeable Soil" means soil with textural classifications according to the U.S. Department of Agriculture, Natural Resource Conservation Service, classification system of silt loam to gravelly medium sand.

K. "Product" means one ATL conduit manufactured by Infiltrator.

L. "Sand Extension" means addition system sand which is added to the system sand footprint to meet the minimum basal area requirement.

M. "Slowly Permeable Soil" means soil with textural classifications according to the U.S. Department of Agriculture, Natural Resource Conservation Service, classification system of clay loams and silty clay loams that exhibit a moderate grade of structure; and loams, silt loams, and silts with weak grades of structure; or soils with weak to moderate grades of platy structure.

N. "System Sand" means the sand material that is used along the sides of and under the ATL System Conduits to provide treatment of effluent. Acceptable system sand shall meet ASTM Specification C33.

O. "Unsaturated flow" means liquid flow through a soil media under a negative pressure potential. Liquids containing pathogens and pollutants come in direct contact with soil/fill material microsites, which enhances wastewater treatment by physical, biological, and chemical means.

P. "Vertical Flow" means the effluent flow path downward through soil or fill material, which involves travel along soil surfaces, or through soil pores.

Q. "Vertical Separation" means the total depth of unsaturated soil that exists between the infiltrative surface of a distribution cell and limiting factor (as indicated by redoximorphic features, groundwater, or bedrock).

III. DESCRIPTION AND PRINCIPLE OF OPERATION

The ATL System mound component operation is a two-stage process involving both wastewater treatment and dispersal. Treatment is accomplished within the ATL System mound by physical and biochemical processes within the product, the fill material, and the in-situ soil. The fill material and in-situ soil also provide dispersal and separation distance to limiting conditions and form the mound.

Cover material consisting of material that provides erosion protection, a barrier to excess precipitation infiltration, and allows gas exchange is added. See Figure 1 for a typical mound system.

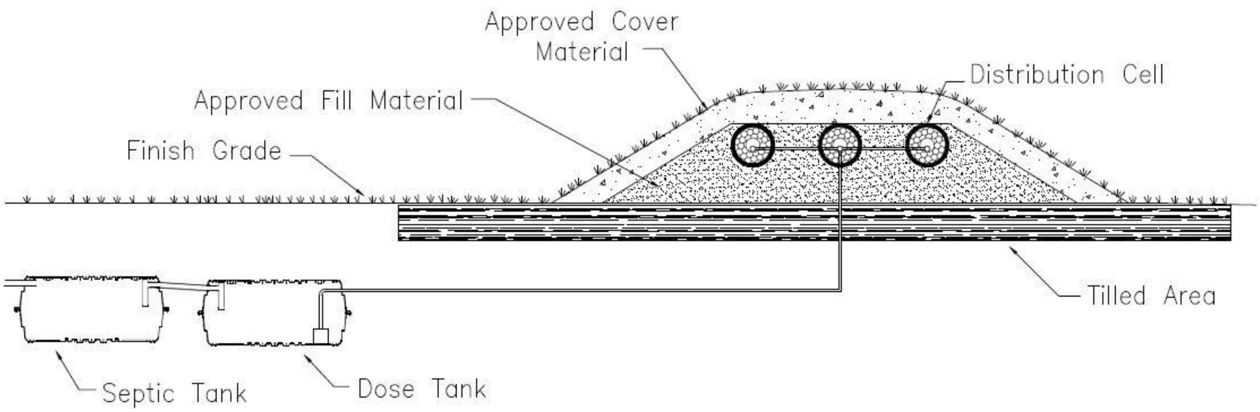

Figure 1. A cross-section of an ATL System mound for POWTS

IV. SOIL AND SITE REQUIREMENTS

Every ATL System mound design is ultimately matched to the given soil and site.

The design approach presented in this manual is based on criteria that all applied wastewater is successfully transported away from the system, that it will not affect subsequent wastewater additions, and that the effluent is ultimately treated.

A. <u>Minimum Soil Depth Requirements</u> - The minimum soil factors required for successful ATL System mound performance are listed in the introduction and specification section of this manual.

   Soil evaluations must be in accordance with SPS 385 of the Wis. Adm. Code. In addition, soil application rates must be in accordance with SPS 383 of the Wis. Adm. Code.

B. <u>Other Site Considerations</u> -

   1. <u>Slopes</u> - The slope on which an ATL System mound is to be installed may not indicate the direction of groundwater movement. If there is documentation that the direction of groundwater movement is different than the slope of the land, the direction of groundwater movement must be considered during ATL System mound design.

      On a crested site the fill can be situated such that the effluent can move laterally down both slopes. A level site allows lateral flow in all directions but may present problems as the water table could rise higher beneath the fill in slowly permeable soils. The sloping site allows the liquid to move in one direction away from the fill. Figure 3 shows a cross-section of an ATL System mound and the effluent movement in a slowly permeable soil on a sloping site. Systems that are installed on a concave slope may have a deflection that does not exceed that allowed in Table 2a.

ATL System mound components rely on lateral effluent movement through the upper soil horizons. Lateral movement becomes more important as soil permeability decreases.

2. ATL System mound location - In open areas, exposure to sun and wind increases the assistance of evaporation and transpiration in the dispersal of the wastewater.

3. Sites with trees and large boulders - Generally, sites with large trees, numerous smaller trees or large boulders are less desirable for installing an ATL System mound because of difficulty in preparing the surface and the reduced infiltration area beneath the ATL System mound. Areas that are occupied with rock fragments, tree roots, stumps and boulders reduce the amount of soil available for proper treatment. If no other site is available, trees in the basal area of the ATL System mound must be cut off at ground level. A larger fill area is necessary when any of the above conditions are encountered, to provide sufficient infiltrative area.

4. Setback distances - The setbacks specified in SPS 383, Wis. Adm. Code for soil subsurface treatment/dispersal component apply to ATL System mounds. The distances are measured from the up slope and end slope edge of the distribution cell and from the down slope toe of the ATL System mound.

V. FILL AND COVER MATERIAL

A. Fill Material - The fill material and its placement are one of the most important components of the ATL System mound. Quality control of the fill material is critical to system performance, each truckload of material must meet specifications for the fill.

Determining whether a proposed fill material is suitable or not requires that a textural analysis be performed. The standard method to be used for performing this analysis conforms to ASTM C-136, Method for Sieve Analysis of Fine and Coarse Aggregates, and ASTM E-11, Specifications for Wire-Cloth Sieves for Testing Purposes, Annual Book of ASTM Standards, Volume 04.02. Information concerning these methods can also be obtained from Methods of Soils Analysis Part 1, C. A. Black, ed., ASA, Monograph #9, American Society of Agronomy, Inc., 1975.

B. Cover material - The cover material is a soil that will allow air exchange while promoting plant growth. The gas exchange will increase the treatment performance of the system by providing oxygen to the wastewater to help ensure aerobic conditions in the ATL System mound. The plant growth will provide frost protection in the winter season. Clays may not be used for cover material, as they will restrict oxygen transfer. Often, excavated soil from the site can be used. Seeding or other means must be done to prevent erosion of the ATL System mound.

VI. DESIGN

A. Location, Size and Shape - Placement, sizing and shaping of the ATL System mound and the distribution cell within the ATL System mound must be in accordance with this manual. The means of pressurizing the distribution network must provide equal distribution of the wastewater. A pressurized distribution network using a method of sizing as described in either Small Scale Waste Management Project publication 9.6, entitled "Design of Pressure Distribution Networks for Septic Tank – Soil Absorption System" or Dept. of Safety and Professional Services publications SBD-10573-P or SBD-10706-P, entitled "Pressure Distribution Component Manual for Private Onsite Wastewater Treatment Systems" is acceptable.

B. Component Design - Design of the ATL System mound is based upon the design wastewater flow and the soil characteristics. It must be sized such that it can accept the design wastewater flow without causing surface seepage or groundwater pollution. Consequently, the basal area, which is the in-situ soil area beneath the fill, must be sufficiently large enough to absorb the effluent into the underlying soil. The system must also be designed to avoid encroachment of the water table into the required minimum unsaturated zone.

Design of the ATL System mound includes the following three steps: (A) calculating design wastewater flow, (B) design of the distribution cell within the fill, (C) design of the entire ATL mound. This includes calculating total width, total length, system height, distribution lateral location and observation pipes. Each step is discussed. A design example is provided in Section XI, page 26, of this manual. The letters for the various dimensions correlate with those in Figures 2 and 3.

Step A. Design Wastewater Flow Calculations

One and two-family dwellings. Distribution cell size for one and two-family dwelling application is determined by calculating the design wastewater flow (DWF). To calculate DWF use, Formulas 1, 2 or 3. Formula 1 is for combined wastewater flows, which consist of blackwater, clearwater and graywater. Formula 2 is for only clearwater and graywater. Formula 3 is blackwater only.

Formula 1	Formula 2	Formula 3
Combined wastewater	Clearwater & Graywater	Blackwater
DWF = 150 gal/day/bedroom	DWF = 90 gal/day/bedroom	DWF = 60 gal/day/bedroom

Public Facilities. Distribution cell size for public facilities application is determined by calculating the DWF using Formula 4. Only facilities identified in Table 4 are included in this manual. Estimated daily wastewater flows are determined in accordance with Table 4 or SPS 383.43(6), Wis. Adm. Code. Many commercial facilities have high BOD_5, TSS and FOG (fats, oils and grease), which must be pretreated in order to bring their values down to an acceptable range before entering into the ATL System mound component described in this manual.

Formula 4

DWF = Sum of each estimated wastewater flow per source per day x 1.5

Where 1.5 = Conversion factor to convert estimated wastewater flow to design wastewater flow

Table 4 Public Facility Wastewater Flows		
Source	**Unit**	**Estimated Wastewater Flow (gpd)**
Apartment or Condominium	Bedroom	100
Assembly hall (no kitchen)	Person (10 sq. ft./person)	1.3
Bar or cocktail lounge [a] (no meals served)	Patron (10 sq. ft./patron)	4
Bar or cocktail lounge [a] (w/meals – all paper service)	Patron (10 sq. ft./patron)	8
Beauty salon	Station	90
Bowling alley	Bowling lane	80
Bowling alley [a] (with bar)	Bowling lane	150
Camp, day and night	Person	25
Camp, day use only (no meals served)	Person	10
Campground or Camping Resort	Space, with sewer connection and/or service building	30
Campground sanitary dump station [a]	Camping unit or RV served	25
Catch basin	Basin	65
Church (no kitchen)	Person	2
Church [b] (with kitchen)	Person	5
Dance hall	Person (10 sq. ft./person)	2
Day care facility (no meals prepared)	Child	12
Day care facility [b] (with meal preparation)	Child	16
Dining hall [a] (kitchen waste only without dishwasher and/or food waste grinder)	Meal served	2
Dining hall [a] (toilet and kitchen waste without dishwasher and/or food waste grinder)	Meal served	5
Dining hall [a] (toilet and kitchen waste with dishwasher and/or food waste grinder)	Meal served	7
Drive-in restaurant [a] (all paper service with inside seating)	Patron seating space	10
Drive-in restaurant [a] (all paper service without inside seating)	Vehicle space	10
Drive-in theater	Vehicle space	3
Employees (total all shifts)	Employee	13
Floor drain (not discharging to catch basin)	Drain	25
Gas station / convenience store	Patron	3
Hospital [a]	Bed space	135
Hotel, motel or tourist rooming house	Room	65
Manufactured home (served by its own POWTS)	Bedroom	100
Manufactured home community	Manufactured home site	200
Medical office building Doctors, nurses, medical staff Office personnel Patients	 Person Person Person	 50 13 6.5
Migrant labor camp (central bathhouse)	Employee	20
Nursing, Rest Home, Community Based Residential Facility [b]	Bed space	65
Outdoor sport facilities (toilet waste only)	Patron	3.5
Parks (toilets waste only)	Patron (75 patrons/acre)	3.5
Parks (toilets and showers)	Patron (75 patrons/acre)	6.5

Table 4 **Public Facility Wastewater Flows** (continued)		
Source	**Unit**	**Estimated Wastewater Flow (gpd)**
Public shower facility	Shower taken	10
Restaurant [a], 24-hr. (dishwasher and/or food waste grinder only)	Patron seating space	4
Restaurant [a], 24-hr. (kitchen waste only without dishwasher and/or food waste grinder)	Patron seating space	12
Restaurant, 24-hr. (toilet waste)	Patron seating space	28
Restaurant [a], 24-hr. (toilet and kitchen waste without dishwasher and/or food waste grinder)	Patron seating space	40
Restaurant [a], 24-hr. (toilet and kitchen waste with dishwasher and/or food waste grinder)	Patron seating space	44
Restaurant [a] (dishwasher and/or food waste grinder only)	Patron seating space	2
Restaurant [a] (kitchen waste only without dishwasher and/or food waste grinder)	Patron seating space	6
Restaurant (toilet waste)	Patron seating space	14
Restaurant [a] (toilet and kitchen waste without dishwasher and/or food waste grinder)	Patron seating space	20
Restaurant [a] (toilet and kitchen waste with dishwasher and/or food waste grinder)	Patron seating space	22
Retail store	Patron (70% of total retail area ÷ 30 sq. ft. per patron)	1
School [a] (with meals and showers)	Classroom (25 students/classroom)	500
School [a] (with meals or showers)	Classroom (25 students/classroom)	400
School (without meals or showers)	Classroom (25 students/classroom)	300
Self-service laundry (toilet waste only)	Clothes washer	33
Self-service laundry (with only residential clothes washers)	Clothes washer	400
Swimming pool bathhouse	Patron	6.5

[a] = Expected to be high in biochemical oxygen demand (BOD), total suspended solids (TSS), or fats, oils, and grease (FOG).

[b]= At-risk system (potentially high in BOD, TSS, and FOG).

Step B. Design of the Distribution Cell - This section determines the required infiltrative surface area of the distribution cell/fill interface, as well as the dimensions of the distribution network within the fill.

a. Design of the ATL System distribution cell is a four-step process:

1. Determine the minimum total conduit length
2. Design the system sand configuration
3. Calculate the minimum basal area required
4. Make basal area adjustments as necessary

Step 1: Determine the minimum total conduit length

The minimum length of conduit per bedroom is 70 feet. Determine the minimum total length of conduit from Table 5 below, based on the number of bedrooms.

Table 5 MINIMUM TOTAL LENGTH OF CONDUIT	
Number of Bedrooms	Minimum Conduit Length Required (ft)
2	140
3	210
4	280
5	350
Each additional	70

Step 2: Design the system sand configuration

Use Table 6 below to determine the minimum system sand footprint using the minimum length of conduit (determined using Table 5 above) and the number of rows into which the total length of conduit will be divided. The system should be designed as long and narrow as site conditions allow.

Table 6 MINIMUM SYSTEM SAND FOOTPRINT DIMENSIONS AND AREA						
Minimum Length of Conduit (ft)	**2 Conduit Rows**		**3 Conduit Rows**		**4 Conduit Rows**	
	Dimensions (A' x B')	**Area (sf)**	**Dimensions (A' x B')**	**Area (sf)**	**Dimensions (A' x B')**	**Area (sf)**
140	5 x 72	360	7 x 52	364	9 x 42	378
210	5 x 112	560	7 x 72	504	9 x 62	558
280	5 x 142	710	7 x 102	714	9 x 72	648
350	5 x 182	910	7 x 122	854	9 x 92	828

NOTES:

1. The conduits are manufactured in 10-foot lengths; all conduit row length calculations in Table 5 are rounded up to the nearest 10 feet.
2. The conduit rows must be extended to within 12 inches of each end of the bed. The dimensions above include 12 inches of system sand in between each of the conduit rows.
3. Multiple bed systems: where site conditions or other considerations require multiple beds, the row-specific length dimensions in Table 6 may be modified to account for the number of beds.
4. Table 6 provides examples of dimensions and area; other configurations are allowed.

Step 3: Calculate the minimum basal area required

Investigate the site in accordance with The Code to determine the soil loading rate. Calculate the minimum basal area required by dividing the daily design flow by this soil loading rate.

Step 4: Make basal area adjustments as necessary

The minimum basal area required in Step 3 cannot be reduced. This area must be maintained to ensure adequate infiltration of treated effluent into the native soil.

Sand extensions are necessary as follows:

- If the minimum basal area determined in Step 3 is smaller than the area of the system sand footprint determined in Step 2, no sand extensions are necessary.

- If the minimum basal area determined in Step 3 is larger than the area of the system sand footprint determined in Step 2, sand extensions must be added to meet the minimum basal area footprint requirements. When adding sand extensions in level system applications, additional width shall be evenly divided on each side of the ATL System;
- In sloped or mound systems applications, additional width shall be entirely placed on the downslope side of the ATL System.

The length of the bed area may be altered by extending the conduit rows. This method may be preferred over increasing the width of the system under certain site and system design considerations.

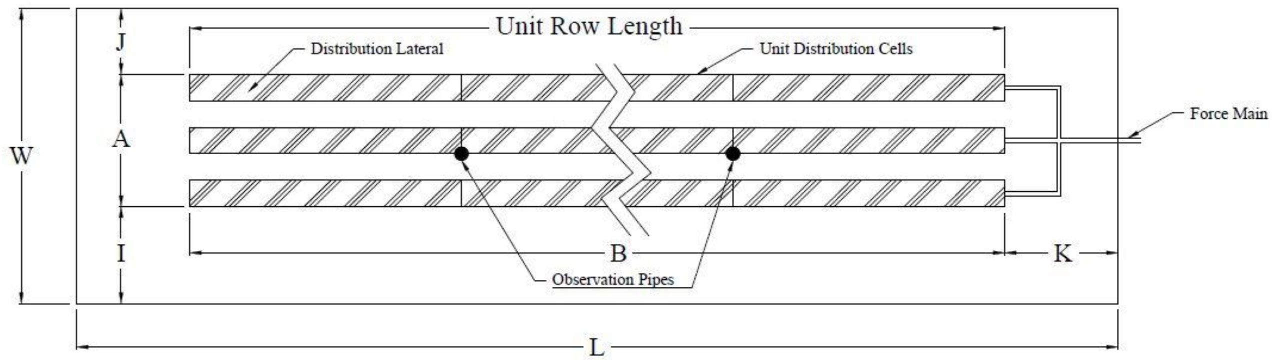

Figure 2. Detailed plan view of an ATL System mound

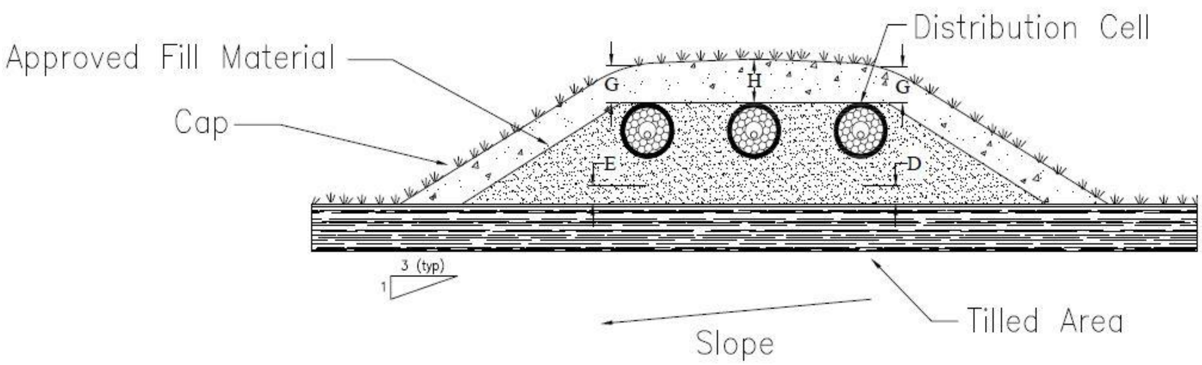

Figure 3. Detailed cross-section of an ATL System mound

2. System Configuration - The ATL System mound distribution cell must be longer than it is wide. The maximum width of the distribution cell is 9 feet. The maximum length of the distribution cell is dependent on setback requirements and soil evaluation.

   The distribution cell is aligned with its longest dimension parallel to surface grade contours on sloping sites as required by the specifications of this package so as not to concentrate the effluent into a small area as it moves laterally down slope.

   The bottom of the distribution cell is level, so no area of the distribution cell is not overloaded.

3. Concave ATL System Mound Configuration – The maximum deflection of a concave distribution cell of an ATL System mound is 10%. The percent of deflection of a distribution cell is determined by dividing the amount of deflection by the effective distribution cell length of the concave distribution cell. The deflection is the maximum distance between the down slope edge of a concave distribution cell to the length of a perpendicular line that intersects furthest points of the contour line along the down slope edge of the distribution cell. The effective distribution cell length of the concave distribution cell is the distance between the furthest points along the contour line of the down slope edge of the concave distribution cell. See Figures 4 and 5.

The deflection of a distribution cell on concave slopes is calculated using Formula 4.

Formula 4

Percent of Deflection = (Deflection ÷ Effective distribution cell length) x 100

Where: Deflection = Maximum distance between the down slope edge of a concave distribution cell to the length of a perpendicular line that intersects furthest points of the contour line along the down slope edge of the distribution cell

Effective distribution cell length = Distance between the furthest points along the contour line of the down slope edge of the concave distribution cell

100 = Conversion factor

The actual distribution cell length must be checked to determine if the cell area is sufficient. The actual distribution cell length is calculated using Formula 5.

Formula 5

Actual distribution cell length = [(% of deflection x 0.00265) + 1] x effective distribution cell length

Where: % of deflection = Determined by Formula 4

0.00265 = Conversion factor from percent to feet

1 = Constant

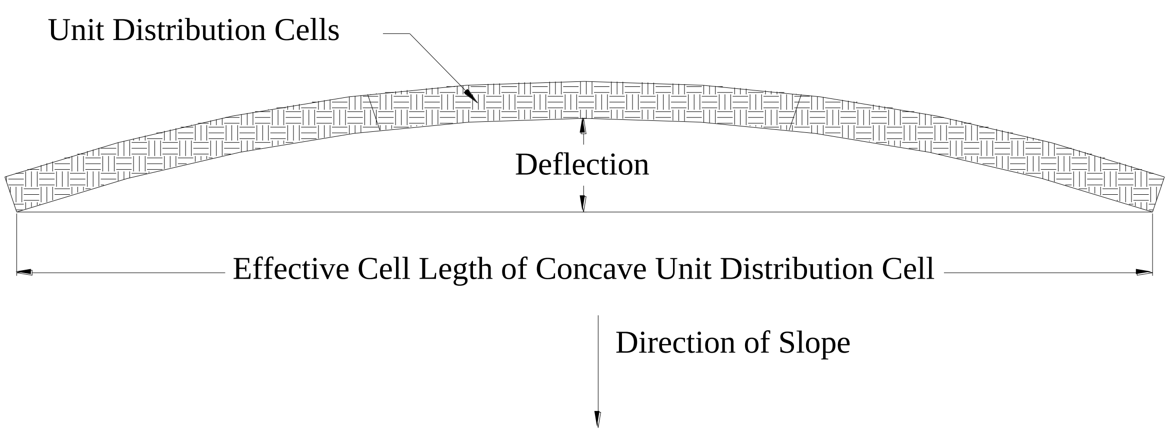

Figure 4. Simple concave distribution cell

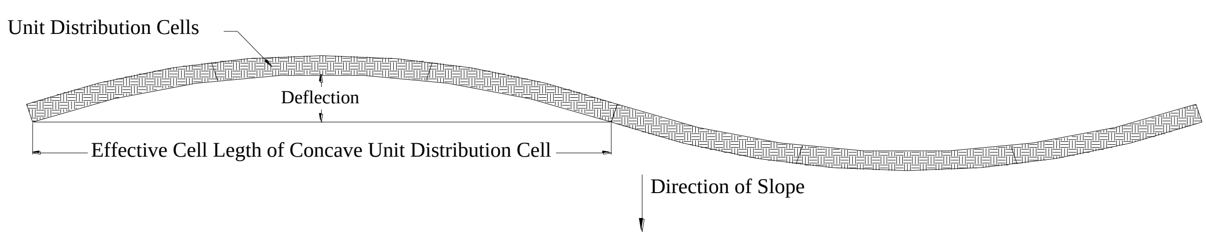

Figure 5. Complex concave distribution cell

Step C. Sizing the ATL System Mound

1. Mound Height - The ATL System mound height on sloping sites is calculated using Formula 6.

Formula 6

ATL System Mound Height = (D + E) ÷2 + F + H

Where: D = Sand fill depth
E = Down slope fill depth
F = ATL product distribution cell depth
H = Cover material depth

2. Fill Depth - The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-1 or Table 383.44-3 WI Adm. Code. Beneath the 6 inches of sand required for the ATL System, any additional sand fill that is required is on an inch-by-inch basis. So that if 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4 inches.

   For sloping sites, the fill depth below the down slope edge of distribution cell (E) ≥ D + [% slope of original grade as a decimal x width of distribution cell (A)]

3. Distribution Cell Depth - The distribution cell depth (F) provides wastewater storage within the distribution cell. For an ATL System mound, the distribution cell depth (F) shall be defined as the height of the product and system sand.

Formula 7

Distribution cell depth (F) = 18 inches

4. Cover Material - The cover material (G & H) provides frost protection and a suitable growth medium for vegetation. For design purposes, use a depth of 12 inches above the center of the distribution cell (H) and 6 inches above the outer edge of the distribution cell (G).

   Cover material depth at product distribution cell center (H) ≥ 12 inches

   Cover material depth at product distribution cell edges (G) ≥ 6 inches

5. Fill Length and Width - The length and width of the fill are dependent upon the length and width of the product, fill depth and side slopes of the fill. Side slopes may not be steeper than 3:1 over the basal area, (i.e. 3 feet of run to every 1 foot of rise). Soil having textures other than those specified for the fill media may be used to make the slopes gentler than the required 3:1 slopes, once the 3:1 slope exists with the fill material. The distribution cell length is generally perpendicular to the direction of slope, so the effluent is spread out along the contour.

   The fill length consists of the end slopes (K) and the distribution cell length (B). The fill width consists of the up-slope width (J), the distribution cell width (A), and the down slope width (I). On sloping sites, the up-slope width (J) is less while the down slope width (I) is greater than on a level site to maintain the 3:1 side slope (see Fig. 2). To calculate the up slope and down slope widths when a 3:1 side slope is maintained, multiply the calculated width by the correction factor found by using the following equations or the correction factor listed in Table 7.

Up slope correction factor = 100 ÷ [100 + (3 x % of slope)]
Down slope correction factor = 100 ÷ [100 - (3 x % of slope)]

Table 7 **Down slope and up slope width correction factors**		
Slope %	Down slope correction factor	Up Slope correction factor
0	1.00	1.00
1	1.03	0.97
2	1.06	0.94
3	1.10	0.915
4	1.14	0.89
5	1.18	0.875
6	1.22	0.85
7	1.27	0.83
8	1.32	0.81
9	1.37	0.79
10	1.43	0.77
11	1.49	0.75
12	1.56	0.735
13	1.64	0.72
14	1.72	0.705
15	1.82	0.69
16	1.92	0.675
17	2.04	0.66
18	2.17	0.65
19	2.33	0.64
20	2.50	0.625
21	2.70	0.61
22	2.94	0.60
23	3.23	0.59
24	3.57	0.58
25	4.00	0.57

The most critical dimensions of the fill are: fill depths (D) & (E), distribution cell length (B), distribution cell width (A), and the down slope width (I).

End slope width (K) = Total fill at center of distribution cell {[(D + E) ÷2] + F + H} x horizontal gradient of selected side slope (3 if 3:1 side-slope)

Fill Length (L) = Distribution cell length (B) + 2 x end slope width (K)

Up slope width (J) = Fill depth at up slope edge of distribution cell (D + F + G) x horizontal gradient of side slope (3 if 3:1) x slope correction factor {100 ÷ [100 + (3 x % of slope)] if 3:1}

Down slope width (I) = Fill depth at down slope edge of distribution cell (E + F + G) x horizontal gradient of side slope (3 if 3:1) x slope correction factor {100 ÷ [100 - (3 x % of slope)] if 3:1}

Fill Width (W) = Up slope width (J) + down slope width (I) + width of distribution cell (A)

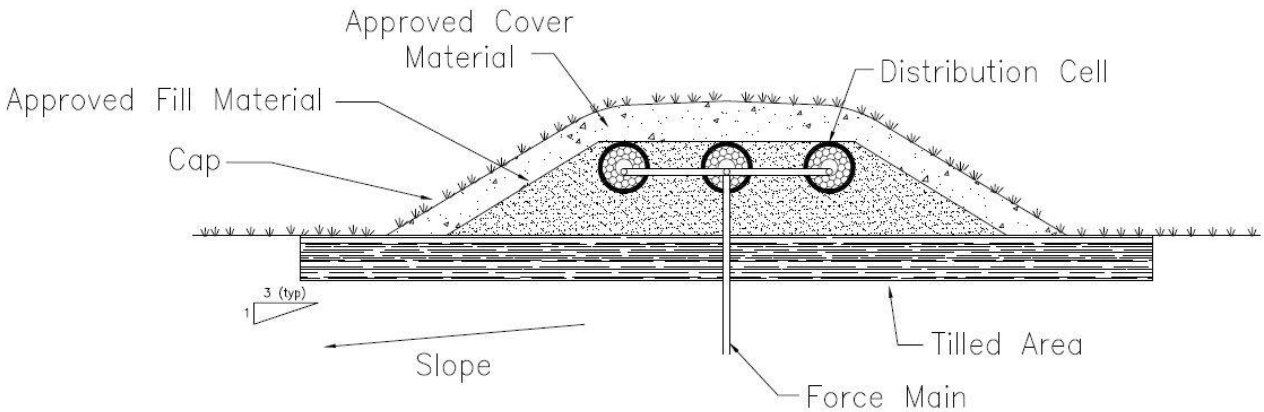

Figure 6. Cross-section of an ATL System mound

6. Basal Area - The basal area is the in-situ soil/fill interface between the soil and the fill material. Its function is to accept the effluent from the fill, assist the fill in treating the effluent, and transfer the effluent to the subsoil beneath the fill or laterally to the subsoil outside of the fill.

   The soil infiltration rate of the in-situ soil determines how much basal area is required. When the wastewater applied to fill material or in-situ soil has gone through the ATL distribution cell it has values for BOD_5 and TSS of ≤ 30 mg/L so the soil application rates for the basal area may be those specified in Table 383.44-1 or Table 383.44-2 for maximum monthly average BOD_5 and TSS of ≤ 30 mg/L.

   For level sites, the total basal area, excluding end slope area [(B) x (W)] beneath the fill and soil cover is available for effluent absorption into the soil (see Figure 7a.). For sloping sites, the available basal area is the area down slope of the upslope edge of the distribution cell to the down slope edge of the fill and soil cover or (A + I) x (B) (see Figure 7b.). The upslope width and end slopes are not included as part of the total basal area. It is important to compare the required basal area to the available basal area.

   The available basal area must equal or exceed the required basal area.

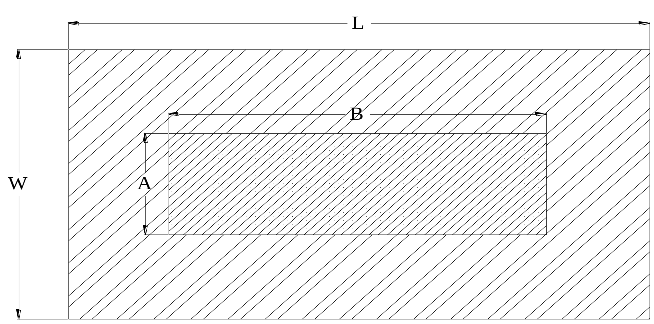

Figure 7a. Level site

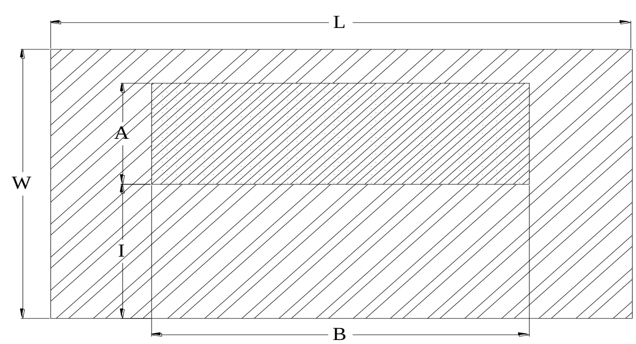

Figure 7b. One direction slope

Basal area required = DWF ÷ Infiltration rate of in-situ soil

Basal area available = B x W on a level site or = B x (A+I) on a sloping site.

If sufficient area is not available for the given design and site conditions, corrective action is required to increase (J) and (I) on level sites or (I) on sloping sites.

7. Location of the observation pipes - Each product distribution cell shall have two observation pipes, located approximately 1/5 to 1/10 of the distribution cell length from each end of distribution cell along the center of the cell width. Observation pipes must be located at the junction point between two products to not create separation of the bundles within a product.

Step D. Distribution Network and Dosing System A pressurized distribution network based on a method of sizing as described in either Small Scale Waste Management Project publication 9.6, entitled "Design of Pressure Distribution Networks for Septic Tank – Soil Absorption Systems" or Dept. of Safety and Professional Services publications SBD-10573-P or SBD-10706-P, entitled "Pressure Distribution Component Manual for Private Onsite Wastewater Treatment Systems" is acceptable.

VII. SITE PREPARATION AND CONSTRUCTION

Procedures used in the construction of an ATL System mound are just as critical as the design of the system. A good design with poor construction results in system failure. It is emphasized that the soil only be tilled when it is not frozen, and the moisture content is low to avoid compaction and puddling. The construction plan to be followed includes:

A. Equipment - Proper equipment is essential. Track type equipment that will not compact the ATL System mound area or the down slope area is required.

B. Sanitary Permit - Prior to the construction of the system, a sanitary permit, obtained for the installation must be posted in a clearly visible location on the site. Arrangements for inspection(s) must also be made with the department or governmental unit issuing the sanitary permit.

C. Construction Procedures

1. Check the moisture content of the soil to a depth of 8 inches. Smearing and compacting of wet soil will result in reducing the infiltration capacity of the soil. Proper soil moisture content can be determined by rolling a soil sample between the hands. If it rolls into a 1/4-inch wire, the site is too wet to prepare. If it crumbles, site preparation can proceed. If the site is too wet to prepare, do not proceed until it dries.

2. Lay out the fill area on the site so that the distribution cell runs perpendicular to the direction of the slope.

3. Establish the original grade elevation (surface contour) along the upslope edge of the distribution cell. This elevation is used throughout the ATL System mound construction as a reference to determine the bottom of the distribution cell, lateral

elevations, etc., and is referenced to the permanent bench mark for the project. A maximum of 4 inches of sand fill may be tilled into the surface.

4. Determine where the force main from the dosing chamber will connect to the distribution system in the distribution cell. Place the pipe either before tilling or after placement of the fill. If the force main is to be installed in the down slope area, the trench for the force main may not be wider than 12 inches.

5. Cut trees flush to the ground and leave stumps, remove surface boulders that can be easily rolled off, remove vegetation over 6 inches long by mowing and removing cut vegetation. Prepare the site by breaking up, perpendicular to the slope, the top 7-8 inches to eliminate any surface mat that could impede the vertical flow of liquid into the in-situ soil. When using a moldboard plow, it should have as many bottoms as possible to reduce the number of passes over the area to be tilled and minimize compaction of the subsoil. Tilling with a moldboard plow is done along contours. Chisel type plowing is highly recommended especially in fine textured soils. Rototilling or other means that pulverize the soil is not acceptable. The important point is that a rough, unsmeared surface be left. The sand fill will intermingle between the clods of soil, which improves the infiltration rate into the natural soil.

   Immediate application of at least 6 inches of fill material is required after tilling. All vehicular traffic is prohibited on the tilled area. For sites where the effluent may move laterally, vehicle traffic is also prohibited for 15 ft. down slope and 10 ft. on both sides of level sites. If it rains after the tilling is completed, wait until the soil dries out before continuing construction, and contact the local inspector for a determination on the damage done by rainfall.

6. Place the approved sand fill material, around the edge of the tilled area being careful to leave adequate perimeter area, not covered by the sand fill, on which to place the soil cover. There should be approximately two feet of basal area adjacent to the ATL System mound perimeter that is not covered by the sand fill. This area serves to tie the soil cover into the natural surface material that has been tilled and helps seal the toe from leakage. Work from the end and up slope sides. This will avoid compacting the soils on the down slope side, which, if compacted, affects lateral movement away from the fill and could cause surface seepage at the toe of the fill on slowly permeable soils.

7. Move the fill material into place using a small track type tractor with a blade or a large backhoe that has sufficient reach to prevent compaction of the tilled area. Do not use a tractor/backhoe having tires. Always keep a minimum of 6 inches of fill material beneath tracks to prevent compaction of the in-situ soil.

8. Place the fill material to the required depth.

9. Form the distribution cell. Hand level the bottom of the distribution cell.

10. Shape the sides with additional fill to the desired slopes.

11. Install the ATL products and pressure distribution piping per instructions, pressure distribution design and applicable sections of SPS 382, 383, and 384, Wis. Adm. Code. Distribution pipe should be sleeved through the 4-inch corrugated pipe located in the ATL product. One out of every five orifices in each distribution pipe shall be installed at the 6 o’clock position to allow for thorough drainage of the distribution pipe following each dose. The remaining four orifices shall be installed in the 12 o’ clock position. All pipes must drain after dosing.

12. At the end of the lateral, place a 90° long sweep with a capped piece of pipe pointing up through the soil surface. Cover the capped pipe with a valve box and lid of an adequate size. The cover of the valve box shall be located above the final grade of the ATL System mound (Figure 8).

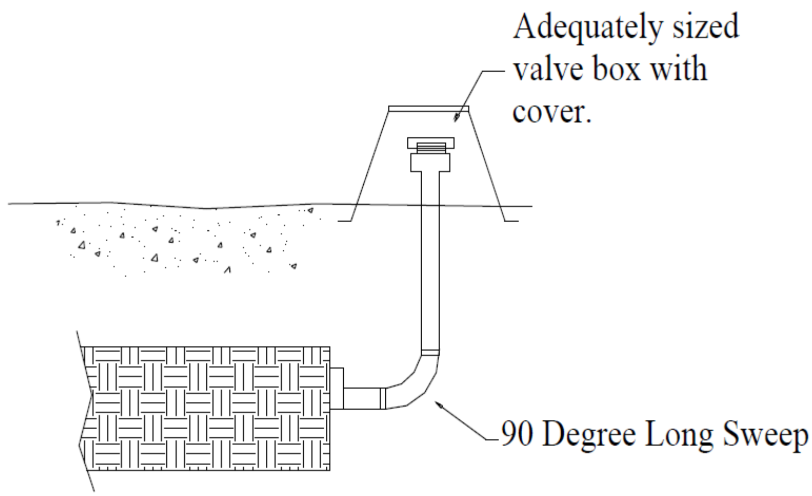

Figure 8

13. Install an observation pipe in each row of ATL products with the bottom 6 inches of the observation pipe slotted. Installations of all observation pipes include a suitable means of anchoring (Figures 9 and 10).

Observation Pipe Detail

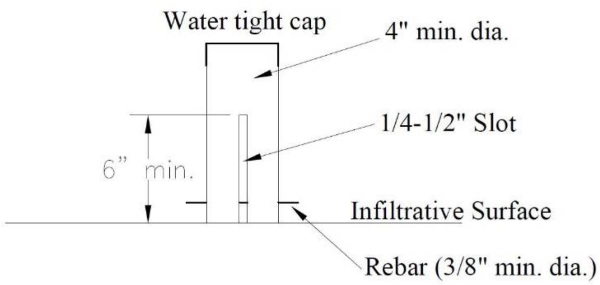

Figure 9

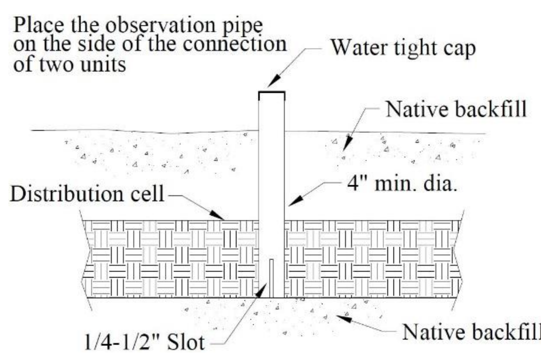

Figure 10

14. Place approved barrier cover, conforming to requirements of SPS 384, Wis. Adm. Code or otherwise approved by the Dept. of Safety and Professional Services, over the product rows, cover barrier cover with cover material, and extend the soil cover to the boundaries of the overall component. Be sure to keep the required 6-inch minimum compacted cover over the system.
15. Complete final grading to divert surface water drainage away from ATL mound. Sod or seed and mulch the entire ATL System mound component.

VIII. OPERATION, MAINTENANCE AND PERFORMANCE MONITORING

A. The component owner is responsible for the operation and maintenance of the component. The county, department or POWTS service contractor may make periodic inspections of the components, checking for surface discharge, treated effluent levels, etc.

   The owner or owner's agent is required to submit necessary maintenance reports to the appropriate jurisdiction and/or the department.

B. Design approval and site inspections before, during, and after the construction are accomplished by the county or other appropriate jurisdictions in accordance to SPS 383 of the Wis. Adm. Code.

C. Routine and preventative maintenance aspects:

   1. Treatment and distribution tanks are to be inspected routinely and maintained when necessary in accordance with their approvals.
   2. Inspections of the ATL System mound component performance are required at least once every three years. These inspections include checking the liquid levels in the observation pipes and examination for any seepage around the ATL System mound component.
   3. Winter traffic on the ATL System mound is not advised to avoid frost penetration and to minimize compaction.
   4. A good water conservation plan within the house or establishment will help assure that the ATL System mound component will not be overloaded.

D. User's Manual: A user's manual is to accompany the component. The manual is to contain the following as a minimum:

   1. Diagrams of all components and their location. This should include the location of the reserve area, if one is provided.
   2. Names and phone numbers of local health authority, component manufacturer or POWTS service contractor to be contacted in the event of component failure or malfunction.
   3. Information on periodic maintenance of the component, including electrical/mechanical components.
   4. Information on limited activities on reserve area if provided.

E. Performance monitoring must be performed on ATL System mounds installed under this manual.

   1. The frequency of monitoring must be:

a. At least once every three years following installation and,

b. At time of problem, complaint, or failure.

2. The minimum criteria addressed in performance monitoring of ATL System mounds are:

a. Type of use.

b. Age of system.

c. Nuisance factors, such as odors or user complaints.

d. Mechanical malfunction within the system including problems with valves or other mechanical or plumbing components.

e. Material fatigue or failure, including durability or corrosion as related to construction or structural design.

f. Neglect or improper use, such as exceeding the design rate, poor maintenance of vegetative cover, inappropriate cover over the ATL mound, or inappropriate activity over the ATL mound.

g. Installation problems such as compaction or displacement of soil, improper orientation or location.

h. Pretreatment component maintenance, including dosing frequency, structural integrity, groundwater intrusion or improper sizing.

i. Dose chamber maintenance, including improper maintenance, infiltration, structural problems, or improper sizing.

j. Distribution piping network, including improper maintenance or improper sizing.

k. Ponding in distribution cell, prior to the pump cycle, is evidence of development of a clogging mat or reduced infiltration rates.

l. Siphon or pump malfunction including dosing volume problems, pressurization problems, breakdown, burnout, or cycling problems.

m. Overflow/seepage problems, as shown by evident or confirmed sewage effluent, including backup if due to clogging.

3. Reports are to be submitted in accordance with SPS 383, Wis. Adm. Code.

IX. REFERENCES

"Wisconsin Mound Soil Absorption System: Siting, Design and Construction." Converse, J.C., and E. J. Tyler. Publication 15.22, Small Scale Waste Management Project., 1 Agriculture Hall, University of Wisconsin, Madison, WI.

"Mound Component Manual for Private Onsite Wastewater Treatment Systems." State of Wisconsin Department of Safety and Professional Services Division of Industry Services. Version 2.0, January 30, 2001.

X. ATL SYSTEM MOUND WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

- Surface water movement.
- Measure elevations and distances on the site so that slope, contours, and available areas can be determined.
- Description of several soil profiles where the component will be located.
- Determine the limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - ____%

Occupancy – One or Two-Family Dwelling - ___(# of bedrooms)

Public Facility - ______ gal/day (Estimated wastewater flow)

Depth to limiting factor - _____inches

Minimum depth of unsaturated soil required by Table 383.44-3, Wis. Adm. Code - ____ inches

In-situ soil application rate used - ______ gal/ft^2/day

FOG value of effluent applied to component - _______ mg/L

BOD_5 value of effluent applied to component - <30 mg/L

TSS value of effluent applied to component - <30 mg/L

Fecal Coliform monthly geometric mean value of effluent applied to component > 10^4 CFU/100ml ___Yes X No

Product(s) to be installed in one laying length of distribution cell - _________________________

Total width of installed product(s) per laying length of product - ____ ft

Area of product(s) per 10- ft. laying length of distribution cell - _______ ft^2

B. DESIGN WASTEWATER FLOW (DWF)

One or Two-family Dwelling.

Combined wastewater flow:

DWF = 150 gal/day/bedroom x # of bedrooms

= 150 gal/day/bedroom x ____# of bedrooms

= ______ gal/day

Clearwater and graywater only:

DWF = 90 gal/day/bedroom x # of bedrooms

= 90 gal/day/bedroom x ______# of bedrooms

= ____________ gal/day

Blackwater only:

DWF = 60 gal/day/bedroom x # of bedrooms

= 60 gal/day/bedroom x ______# of bedrooms

= ____________ gal/day

Public Facilities.

DWF = Estimated wastewater flow x 1.5

= __________ gal/day x 1.5

= __________ gal/day

C. DESIGN OF THE ATL SYSTEM DISTRIBUTION CELL

a. Determine the minimum total conduit length

The minimum length of conduit per bedroom is 70 feet. Determine the minimum total length of conduit from Table 5, based on the number of bedrooms.

Table 5
MINIMUM TOTAL LENGTH OF CONDUIT

Number of Bedrooms	**Minimum Conduit Length Required (ft)**
2	140
3	210
4	280
5	350
Each additional	70

b. Design the system sand configuration

Use Table 6 below to determine the minimum system sand footprint using the minimum length of conduit (determined using Table 5) and the number of rows into which the total length of conduit will be divided. The system should be designed as long and narrow as site conditions allow.

Table 6
MINIMUM SYSTEM SAND FOOTPRINT DIMENSIONS AND AREA

Minimum Length of Conduit (ft)	2 Conduit Rows		3 Conduit Rows		4 Conduit Rows	
	Dimensions (A' x B')	Area (sf)	Dimensions (A' x B')	Area (sf)	Dimensions (A' x B')	Area (sf)
140	5 x 72	360	7 x 52	364	9 x 42	378
210	5 x 112	560	7 x 72	504	9 x 62	558
280	5 x 142	710	7 x 102	714	9 x 72	648
350	5 x 182	910	7 x 122	854	9 x 92	828

NOTES:

1. The conduits are manufactured in 10-foot lengths; all conduit row length calculations in Table 6 are rounded up to the nearest 10 feet.
2. The conduit rows must be extended to within 12 inches of each end of the bed. The dimensions above include 12 inches of system sand on each end of the conduit rows.
3. Multiple bed systems: where site conditions or other considerations require multiple beds, the row-specific length dimensions in Table 6 may be modified to account for the number of beds.
4. Table 6 provides examples of dimensions and area; other configurations are allowed.

c. Check percent of deflection and actual length of concave distribution cell length

Percent of deflection = Deflection ÷ Effective distribution cell length x 100

Percent of deflection = __________ ft ÷ _______ ft x 100

Percent of deflection = ______ % (≤ 10%)

Actual distribution cell length = [(% of deflection x 0.00265) + 1] x effective distribution cell length

Actual distribution cell length = [(__ % x 0.00265) +1] x _______ ft

Actual distribution cell length = _______ ft

d. Check the distribution cell length (B)

For linear loading rate:

Linear Loading Rate ≤ DWF ÷ Cell length (B) or effective cell length for concave mound

Linear Loading Rate ≤ ___gal/day ÷ __ft

Linear Loading Rate ≤ ___ gal/ft

Linear loading rate for systems with in-situ soils having a soil application rate of ≤ 0.3 gal/ft^2/day within 12 inches of fill must be less than ≤ 4.5 gal/ft/day.

Is the linear loading rate ≤ what is allowed? __ yes ____no. If no, then the length and/or width of the distribution cell must be changed so it does.

D. DESIGN OF ENTIRE ATL PRODUCT MOUND AREA

1. Fill Depth

a. The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-1 or Table 383.44-3 WI Adm. Code. Beneath the 6 inches of sand required for the ATL System, any additional sand fill that is required is on an inch-by-inch basis. If 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4 inches.

1) Depth at up slope edge of distribution cell (D) = distance required by Table 383.44-3, Wis. Adm. Code, minus distance in inches to limiting factor

D = ____ inches - ____ inches

D = ____ inches (at least 6 inches, but not greater than 36 inches in accordance with Table 2a)

2) Depth at down slope edge of distribution cell (E)

E = Depth at up slope edge of distribution cell (D) + (% natural slope expressed as a decimal x distribution cell width (A))

E = ____ inches + (__ x ____ feet x 12 inches/ft)

E = ______ or _____ inches

b. Distribution cell depth for ATL product distribution cell.

F = ATL conduit diameter + system sand height = 12 inches + 6 inches
F = 18 inches

c. Cover material

Depth at distribution cell center (H) ≥ 12 inches

Depth at distribution cell edges (G) ≥ 6 inches

2. ATL System mound length

   a. End slope width (K)= Total fill at center of distribution cell x horizontal gradient of side slope

      K = {([(D + E) ÷ 2] + F + H) x horizontal gradient of side slope} ÷ 12 inches/foot

      K = {([(_ inches + _____ inches) ÷ 2] + _____ inches + ______ inches) x ___} ÷ 12 inches/ft

      K = ______ or _____ ft

   b. ATL System mound length (L) = Distribution cell length + (2 x end slope width)

      L = B + 2K

      L = ______ ft + (2 x _____ ft)

      L = ______ feet

3. ATL System mound width

   a. Up slope width (J) = Fill depth at up slope edge of distribution cell (D + F + G) x Horizontal gradient of side slope x Slope correction factor {100 ÷ [100 + (gradient of side slope x % of slope or value from Table 7)]}

      J = (D + F + G) x horizontal gradient of side slope x Slope correction factor 100 ÷ [100 + (gradient of side slope x % of slope or value from Table 7)]}

      J = (__ in + _____ in + ____ in) ÷ 12 in/ft x ____ x 100 ÷ [100 + (____ x ___) or (__)]

      J = _____ or _____ feet

   b. Down slope width (I) = Fill depth at down slope edge of distribution cell (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {100 ÷ [100 - (gradient of side slope x % of slope or value from Table 7)]}

      I = (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {100 ÷ [100 - (gradient of side slope x % of slope or value from Table 7)]}

      I = (____ in + ____ in + _____ in) ÷ 12 in/ft x 3 x 100 ÷ [100 - (___ x ___) or (___)]

      I = _____ in ÷ 12 in/ft x 3 x 100 ÷ _____

      I = ______ or _____ feet

   c. ATL System mound width (W) = Up slope width (J) + Distribution cell width (A) + Down slope width (I)

      W = J + A + I

W = ______ ft + ____ ft + _____ ft

W = _______ feet

4. Check the basal area

a. Basal area required = Daily wastewater flow ÷ soil application rate of in-situ soil (See Table 1.)

Basal area required = _____ gal/day ÷ _____ gal/ft^2/day

= _______ft^2

b. Basal area available

1) Sloping site = Cell length (B) x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width] (I)

Basal area available = _____ ft x [(__ x ___ ft) + ({ ___ -1} x 0 ft) + _____ ft]

= _____ ft x (__ft + ___ ft + ____ ft)

= _____ ft x _______ ft

= ________ ft^2

2) Level site = Cell length (B) x total ATL System mound width (W)

Basal area available = _____ft x ____ ft

= ________ ft^2

c. Is available basal area sufficient? ___ yes _____ no

Basal area required < Basal area available

_______ft^2 ≤ _________ft^2

The available basal area must be increased by ____ ft^2. This can be accomplished by increasing the down slope width (I) by ___ ft making it ___ ft.

See d. for recalculation of basal area.

d. Basal area available (recalculation of basal area)

1) Sloping site = Cell length (B) x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width] (A+I)

= ___ ft x [(___ x ___ ft) + ({__ -1} x 0 ft) + ____ ft]

= ___ ft x (___ ft + __ ft + ___ ft)

= _____ ft x ___ ft

= ______ ft^2

2) Level site = Cell length (B) x total ATL System mound width (W)

= _____ft x ____ ft

= ________ ft^2

5. Determine the location of observation pipes along the length of distribution cell.

At opposite ends of the distribution cell. Observation pipes must be located at the junction point between two products to not create separation of the conduit ends within a product.

XI. EXAMPLE ATL SYSTEM MOUND WORKSHEET

A. SITE CONDITIONS

Evaluate the site and soils report for the following:

- Surface water movement.
- Measure elevations and distances on the site so that slope, contours and available areas can be determined.
- Description of several soil profiles where the component will be located.
- Determine the limiting conditions such as bedrock, high groundwater level, soil permeability, and setbacks.

Slope - 6 %

Occupancy – One or Two-Family Dwelling - 3 (# of bedrooms)

Public Facility - 0 gal/day (Estimated wastewater flow)

Depth to limiting factor - 13 inches

Minimum depth of unsaturated soil required by Table 383.44-3, Wis. Adm. Code - 24 inches

In-situ soil application rate used - 0.5 gal/ft^2/day

FOG value of effluent applied to component - < 30 mg/L

BOD_5 value of effluent applied to component - ≤ 30 mg/L

TSS value of effluent applied to component - ≤ 30 mg/L

Fecal Coliform monthly geometric mean value of effluent applied to component > 10^4 CFU/100ml __Yes X No

B. DESIGN WASTEWATER FLOW (DWF)

One or Two-family Dwelling.

Combined wastewater flow:

DWF = 150 gal/day/bedroom x # of bedrooms

= 150 gal/day/bedroom x 3 # of bedrooms

= 450 gal/day

Clearwater and graywater only:

DWF = 90 gal/day/bedroom x # of bedrooms

= 90 gal/day/bedroom x ______# of bedrooms

= ____________ gal/day

Blackwater only:

DWF = 60 gal/day/bedroom x # of bedrooms

= 60 gal/day/bedroom x ______# of bedrooms

= ____________ gal/day

Public Facilities.

DWF = Estimated wastewater flow x 1.5

= __________ gal/day x 1.5

= __________ gal/day

C. DESIGN OF THE ATL SYSTEM DISTRIBUTION CELL

a. Determine the minimum total conduit length

The minimum length of conduit per bedroom is 70 feet. Determine the minimum total length of conduit from Table 5, based on the number of bedrooms.

Table 5
MINIMUM TOTAL LENGTH OF CONDUIT

Number of Bedrooms	**Minimum Conduit Length Required (ft)**
2	140
3 →	210
4	280
5	350
Each additional	70

c. Design the system sand configuration

Use Table 6 below to determine the minimum system sand footprint using the minimum length of conduit (determined using Table 5 above) and the number of rows into which the total length of conduit will be divided. The system should be designed as long and narrow as site conditions allow.

Table 6 MINIMUM SYSTEM SAND FOOTPRINT DIMENSIONS AND AREA						
Minimum Length of Conduit (ft)	**2 Conduit Rows**		**3 Conduit Rows**		**4 Conduit Rows**	
	Dimensions (A' x B')	**Area (sf)**	**Dimensions (A' x B')**	**Area (sf)**	**Dimensions (A' x B')**	**Area (sf)**
140	5 x 72	360	7 x 52	364	9 x 42	378
210 →	5 x 112	560	7 x 72	504	9 x 62	558
280	5 x 142	710	7 x 102	714	9 x 72	648
350	5 x 182	910	7 x 122	854	9 x 92	828

c. Check percent of deflection and actual length of concave distribution cell length

Percent of deflection = Deflection ÷ Effective distribution cell length x 100

Percent of deflection = _________ ft ÷ _______ ft x 100

Percent of deflection = ______ % (≤ 10%)

Actual distribution cell length = [(% of deflection x 0.00265) + 1] x effective distribution cell length

Actual distribution cell length = [(_ % x 0.00265) +1] x _______ ft

Actual distribution cell length = _______ ft

e. Check the distribution cell length (B)

For linear loading rate:

Linear Loading Rate ≤ DWF ÷ Cell length (B) or effective cell length for concave mound

Linear Loading Rate ≤ 450 gal/day ÷ 112 ft

Linear Loading Rate ≤ 4.02 gal/ft

Linear loading rate for systems with in-situ soils having a soil application rate of ≤ 0.3 gal/ft^2/day within 12 inches of fill must be less than ≤ 4.5 gal/ft/day.

Is the linear loading rate ≤ what is allowed? _X_ yes ____no. If no, then the length and/or width of the distribution cell must be changed so it does.

D. DESIGN OF ENTIRE ATL PRODUCT MOUND AREA

Fill Depth

a. The depth of additional sand fill under the distribution cell is based on the minimum depth of unsaturated soil required from treatment listed in Table 383.44-1 or Table 383.44-3 WI Adm. Code. Beneath the 6 inches of sand required for the ATL System, any additional sand fill that is required is on an inch-by-inch basis. So that if 24 inches of suitable in-situ soil is available, then D = 0 inches. If 20 inches of in-situ soil is available, then D = 4inches.

1) Depth at up slope edge of distribution cell (D) = distance required by Table 383.44-1 or -3, Wis. Adm. Code, minus distance in inches to limiting factor

D = _24_ inches - _13_ inches

D = _11_ inches (at least ≥ 6, but not greater than 36 inches in accordance with Table 2a)

2) Depth at down slope edge of distribution cell (E)

E = Depth at up slope edge of distribution cell (D) + (% natural slope expressed as a decimal x distribution cell width (A))

E = _11_ inches + (0.06 x _5_ feet x 12 inches/ft)

E = 14.6 or 14.6 inches

b. Distribution cell depth for ATL product distribution cell.

F = ATL conduit diameter + system sand height = 12 inches + 6 inches

F = _18_ inches

c. Cover material

1) Depth at distribution cell center (H) ≥ 12 inches

2) Depth at distribution cell edges (G) ≥ 6 inches

2. ATL System mound length

a. End slope width (K) = Total fill at center of distribution cell x horizontal gradient of side slope

K = {([(D + E) ÷ 2] + F + H) x horizontal gradient of side slope} ÷ 12 inches/foot

K = {([(11_ inches + _14.6_ inches) ÷ 2] + _12_ inches + _12_ inches) x _3} ÷ 12 inches/ft

K = 9.2_ ft or 9.5_ ft

b. ATL System mound length (L) = Distribution cell length + (2 x end slope width)

L = B + 2K

L = _112_ ft + (2 x _9.5_ ft)

L = _131_ feet

3. ATL System mound width

a. Up slope width (J) = Fill depth at up slope edge of distribution cell (D + F + G) x Horizontal gradient of side slope x Slope correction factor {100 ÷ [100 + (gradient of side slope x % of slope or value from Table 7)]}

J = (D + F + G) x horizontal gradient of side slope x Slope correction factor 100 ÷ [100 + (gradient of side slope x % of slope or value from Table 7)]}

J = (11 in + 18 in + 6 in) ÷ 12 in/ft x 3 x 100 ÷ [100 + (3 x 6)]

J = 7.42 or 7.5 feet

b. Down slope width (I) = Fill depth at down slope edge of distribution cell (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {100 ÷ [100 - (gradient of side slope x % of slope or value from Table 7)]}

I = (E + F + G) x Horizontal gradient of side slope x Down slope correction factor {100 ÷ [100 - (gradient of side slope x % of slope or value from Table 7)]}

I = (14.6 in + 18 in + 6 in) ÷ 12 in/ft x 3 x 100 ÷ [100 - (3 x 6)]

I = 11.77 or 12.0 feet

c. ATL System mound width (W) = Up slope width (J) + Distribution cell width (A) + Down slope width (I)

W = J + A + I

W = 7.5 ft + 5 ft + 12.0 ft

W = 24.5 feet

4. Check the basal area

a. Basal area required = Daily wastewater flow ÷ soil application rate of in-situ soil (The soil application rate is that which is listed for BOD_5 and TSS ≤ 30 mg/L. See Table 1.)

= 450 gal/day ÷ 0.5 gal/ft^2/day

= 900 ft^2

b. Basal area available

1) Sloping site = Cell length (B) x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width] (I)

= 112 ft x [(1 x 5 ft) + ({1 - 1} x 0 ft) + 12.0 ft]

= 112 ft x (5 ft + 0 ft + 12.0 ft)

= 112 ft x 17.0 ft

= 1,904 ft^2

2) Level site = Cell length (B) x total ATL System mound width (W)

= _____ft x ____ ft

= ________ ft^2

c. Is available basal area sufficient? X yes ___ no

Basal area required < Basal area available _____ft^2 ≤ ____ft^2

The available basal area must be increased by ___ ft^2. This can be accomplished by increasing the down slope width (I) by ___ ft. making it ___ ft.

See d. for recalculation of basal area.

d. Basal area available (recalculation of basal area)

1) Sloping site = Cell length (B) x [(# of cells x cell width) + ({# of cells – 1} x cell spacing) + down slope width] (A+I)

= ___ ft x [(___ x ___ ft) + ({__ -1} x 0 ft) + ____ ft]

= ___ ft x (___ ft + __ ft + ___ ft)

= ____ ft x ___ ft

= ______ ft^2

2) Level site = Cell length (B) x total ATL System mound width (W)

= _____ft x ____ ft

= ________ ft^2

5. Determine the location of observation pipes along the length of distribution cell.]

At opposite ends of the distribution cell. Observation pipes must be located at the junction point between two products to not create separation of the conduit ends within a product.

XII. PLAN SUBMITTAL AND INSTALLATION INSPECTION

A. Plan Submittal

In order to install a system correctly, it is important to develop plans that will be used to install the system correctly the first time. The following checklist may be used when preparing plans for review. The checklist is intended to be a **general guide**. Not all needed information may be included in this list. Some of the information may not be required to be submitted due to the design of the system. Conformance to the list is not a guarantee of plan approval. Additional information may be needed or requested to address unusual or unique characteristics of a particular project. Contact the reviewing agent for specific plan submittal requirements, which the agency may require that are different than the list included in this manual.

General Submittal Information

- Photocopies of soil report forms, plans, and other documents are acceptable. However, an original signature is required on certain documents.
- Submittal of additional information requested during plan review or questions concerning a specific plan must be referenced to the Plan Identification indicator assigned to that plan by the reviewing agency.
- Plans or documents must be permanent copies or originals.

Forms and Fees

- Application form for submittal, provided by reviewing agency along with proper fees set by reviewing agent.

Soils Information

- Complete Soils and Site Evaluation Report (form # SBD-8330) for each soil boring described; signed and dated by a certified soil tester, with license number.
- Separate sheet showing the location of all borings. The location of all borings and backhoe pits must be able to be identified on the plot plan.

Documentation

- Architects, engineers or designers must sign, seal and date each page of the submittal or provide an index page, which is signed, sealed and dated.
- Master Plumbers must sign, date and include their license number on each page of the submittal or provide an index page, which is signed, sealed and dated.
- Three completed sets of plans and specifications (clear, permanent and legible); submittals must be on paper measuring at least 8-1/2 by 11 inches.
- Designs that are based on department approved component manual(s) must include reference to the manual by name, publication number and published date.

Plot Plan

- Dimensioned plans or plans drawn to scale (scale indicated on plans) with parcel size or all property boundaries clearly marked.
- Slope directions and percent in system area.
- Bench mark and north arrow.
- Setbacks indicated as per appropriate code.
- Two-foot contours or other appropriate contour interval within the system area.
- Location information; legal description of parcel must be noted.
- Location of any nearby existing system or well.

Plan View

- Dimensions for distribution cell(s).
- Location of observation pipes.
- Dimensions of ATL mound.
- Pipe lateral layout, which must include the number of laterals, pipe material, diameter and length; and number, location and size of orifices.
- Manifold and force main locations, with materials, length and diameter of each.

Cross Section of System

- Include tilling requirement, distribution cell details, percent slope, side slope, and cover material.
- Lateral elevation, position of observation pipes, dimensions of distribution cell, and type of cover material such as geotextile fabric, if applicable.

System Sizing

- For one and two-family dwellings, the number of bedrooms must be included.
- For public buildings, the sizing calculations must be included.

Tank and Pump or Siphon Information

- All construction details for site-constructed tanks.
- Size and manufacturer information for prefabricated tanks.
- Notation of pump or siphon model, pump performance curve, friction loss for force main and calculation for total dynamic head.
- Notation of high water alarm manufacturer and model number.
- Cross section of dose tank / chamber to include storage volumes; connections for piping, vents, and power; pump “off” setting; dosing cycle and volume, high water alarm setting, and storage volume above the highwater alarm; and location of vent and manhole.
- Cross section of two compartments tanks or tanks installed in a series must include information listed above.

B. Inspections

Inspection shall be made in accordance with ch. 145.20, Wis. Stats. and SPS 383.26, Wis. Adm. Code. The inspection form on the following two pages may be used. The inspection of the system installation and/or plans is to verify that the system at least conforms to specifications listed in Tables 1 - 3 of this manual.

XIII. POWTS INSPECTION REPORT
(ATTACH TO PERMIT)

GENERAL INFORMATION

Permit Holder's Name	☐ City ☐ Village ☐ Town of	County	Sanitary Permit No.
State Plan ID No.	Tax Parcel No.	Property Address if Available	

TREATMENT COMPONENT INFORMATION			**SETBACKS (FT)**				
TYPE	MANUFACTURER AND MODEL NUMBER	CAPACITY	P/L	WELL	WATER LINE	BLDG.	VENT
SEPTIC							
DOSING							
AERATION							
HOLDING							
FILTER							

PUMP / SIPHON INFORMATION

Manufacturer:	Model No.	Demand in GPM	TDH - Design

FORCE MAIN INFORMATION			**FRICTION LOSS (FT)**			
Length	Diameter	Dist. To Well	Component Head	Force Main Losses	Vert. Lift	TDH - As Built

SOIL ABSORPTION COMPONENT

TYPE OF COMPONENT:				COVER MATERIAL:		
Cell Width	Cell Length	Cell Depth	Cell Spacing	No. of Cells		
UNIT	Manufacturer: ATL L.P.				Model No.	
SETBACK INFO. (FT)	Property Line	Bldg.	Well		Water Line	OHWM

DISTRIBUTION COMPONENT
Elevation data on back of form

Header / Manifold		Distribution Lateral(s)			Orifice size	Orifice Spacing	Obs. Pipes Inst. & No.
Length	Dia.	Length	Dia.	Spacing			

SOIL COVER

Depth over center of cell:	Depth over edge of cell:	Depth of Cover material	Texture	Seeded / Sodded	Mulched

DEVIATIONS FROM APPROVED PLAN

DATE OF INST. DIRECTIVE:	DATE OF ENFORCEMENT ORDER:
DATE OF REFERRAL TO LEGAL COUNSEL:	

COMMENTS (Persons present, discrepancies, etc.)

COMPONENTS NOT INSPECTED

Plan Revision Required ☐ Yes ☐ No	Date:	Signature of Inspector:	Cert. Number

Sketch on other side

ELEVATION DATA

Point	Back sight	Height of instrument	Foresight	Elevation	Comments
Bench mark					
Bldg. Sewer					
Tank inlet					
Tank outlet					
Tank inlet					
Tank outlet					
Dose tank inlet					
Bottom of dose tank					
Dist. lateral 1					
System elev. 1					
Dist. lateral 2					
System elev. 2					
Dist. lateral 3					
System elev. 3					
Grade elev. 1					
Grade elev. 2					
Grade elev. 3					

SKETCH OF COMPONENT & ADDITIONAL COMMENTS