Birch Case Study House
Composting Toilet Review Response

Date. May 5, 2014

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Kyle & Lee,

I have been researching and discussing composting toilet technology with a number of groups over the last few months. I wanted to get all my information inline prior to making my response to the permit review comments supplied by Lee Phipps on February 26, 2014.

The System

Our goal is to develop a safe, clean, easy to use permanent composting sytem for human waste.

The system that we are proposing is a passive, remote, batch composting toilet system. With this system there would be two distinct pieces of infrastructure.

The first is a “toilet” containing a removable catchment chamber. This chamber collects excrement that is layered with organic material after each use. The chamber is used until it is 75% full at which point the chamber is removed and replaced with another chamber.

The full chamber is then transferred to a bulk-composting unit housed within a lockable and vented shed dedicated to the composters. Two 90 gallon HDPE totes receive the waste from the smaller composting chambers. One tote is filled at a time and layered with organic material. The second tote is a moldering unit and sits for over a year allowing the contents to fully compost to ‘humus’.

After the second year of use, the first 90-gallon tote that has been moldering for over a year [with no new excrement being added during that time period] will be ready to be emptied by an approved method. Once emptied, this tote will be ready to receive new composting excrement while the other tote is left to compost for a year. This will be the normal process of operation with annual removal of the compost and change-over of the bulk composters. We anticipate that the filling of a 90-gallon bulk composter will take up to two years, requiring removal and change-over of the bulk composters every two years.”

See the drawings of the totes and shed attached to this document.

Response to Permit Review

Comment 1

"excrement is to composted in place, that it does not have to be moved prior to the completion of the composting process…..3 to 6 weeks is not long enough to provide adequate composting."

As stated above we are proposing a batch composting system. A batch composter is defined in the Water Conserving OSS as "Batch composters (multiple chamber systems using two or more **interchangeable** composting chambers, where one is filled at a time and allowed to cure, while another chamber fills)". Under this definition, once one chamber is filled it is removed and replaced by another chamber. The RS&G only outline that chambers are "interchangeable" but does not define that multiple chamber reside within the toilet.

There are multiple batch composting systems available commercially.

Nature Loo	http://nature-loo.com.au/products/composting-toilets/full-product-list/
Biolet NE	http://www.biolet.com/store/bts-33-c-5/bts-33-waterless-toilet-p-3
Ez Loo	http://www.ez-loo.com/waterless-toilet-systems/waterless-toilet-system-ez-loo-air.html
Separett	http://www.separett.eu/villa-9000-en
Ecotech	http://ecotechproducts.net/product/ecotech-carousel-composting-toilet-system/

Within this list only the Ecotech has containers within one housing. The Ecotech system consists of 5 gallon buckets on a lazy susan below a dry toilet. The five gallon buckets are the only composting chamber in this system. All other systems listed above are similar to what we are proposing and have removable composting chambers.

An email from Lee Phipps to Mike Moren dated February 27, 2014, Lee stated that there was a batch system on the approved list. This is not the case. The email continues to describe the Sun Mar Excel NE (non electric). I have been working specifically with Sun Mar to form a partnership for our project. According to Sun Mar, their system is **NOT** a batch system but a continuous composting unit. Their literature states they have 3 chambers: a drum, an evaporation chamber, and a finishing tray. The drum collects the fresh waste and drips leachate into the evaporation chamber. As the toilet fills the user turns the drum and waste spills into the finishing chamber. There is no way to separate partially composted excrement from fresh excrement in this process, it is all mixed.

In reality, there is no way for any of the proprietary composting toilets on the Washington State Department of Health (WDOH) List of Registered On-Site Treatment and Distribution Products, April 1, 2014 (List) to completely separate out the finish compost from the new excrement material. All proprietary composting toilets on the List are continuous composters. Section 4.4.7 of the WDOH Water Conserving On-Site Wastewater Treatment Systems RS&Gs, July 2012 (Water Conserving RS&Gs) states "*Means must be provided to keep separate waste undergoing treatment from finished end products*." Since all are continuous composters, all run the risk of transporting unfinished end products when compost is removed and therefore do not meet the intent of the RS&Gs. Transporting unfinished end product is no different than carring a closed container of partially composted human waste to another receptacle – the bulk

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composter – to complete the composting process. It is actually no different than carrying a dirty diaper out to the trash can in the street. The best method to ensure the highest removal of pathogens in the compost is to finish the composting process in a completely separate composting chamber where no new excrement is being added over the course of a year or more, which is the method being proposed for this system.

Additionally, I had a lengthy conversation with Carol Steinfeld from http://www.ecowaters.org/ . She is one of three authors of The Composting Toilet System Book, A Practical Guide to Choosing, Planning and Maintaining Composting Toilet Systems, a Water-Saving, Pollution-Preventing Alternative, reference #2 in the RS&G. According to Ms Steinfeld, the definition of batch composters referenced from their book should **NOT** imply that multiple chambers must remain within the toilet, or remain in place for composting. As an expert in the field her company was responsible for bringing high quality batch toilets to the USA.

Comment 2

"The composting toilet proposed in your design 1) does not compost human excrement, it only stores it, 2) requires un-composted excrement to be transported manually to another location to be composted, increasing the risk of human contact, and 3) stores the human excrement in an anaerobic state once moved to the shed in the backyard."

We believe our design to be the safest, most user-friendly way to successfully compost human excrement in a residential setting. As stated in the response to Comment 1, all composting toilets currently on the WDOH List are continuous composters that run the risk of releasing partially composted waste when "finished" compost is removed. All systems on the List run the risk of cross-contamination between new excrement and finished product.

To state that "*The composting toilet proposed in your design 1) does not compost human excrement, it only stores it*" is simply incorrect. Because the chamber underneath our proposed toilet is mechanically vented, a small amount of carbon-rich bulking material will be added after each use, and urine is diverted to the greywater OSS (all of which have been proven to enhance composting), composting will begin in the smaller chamber and it will continue to completion in the large bulk composting totes. The periodic dumping of the smaller chambers into the larger totes will enhance aeration and aerobic conditions even further. The 90-gallon compost totes will not store composting material in an anaerobic condition.

Once again, transporting partially composted waste to another larger compost bin in a sealed container is no different than transporting a dirty diaper to the street-side trash can.

Unlimited use

A batch system with removable chambers allows for unlimited use. In the continuous composting units on the state list, if the toilet becomes full (parties or family visitors) or problems arise, the toilet and safety of the occupants is compromised. To solve the issue uncomposted excrement must be removed by hand or the toilet must not be used until compost has matured.

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With a batch system if these issues arise the chamber is removed and new container is placed in the toilet and use can continue. The chamber is then emptied into the bulk composter where it will have adequate time and conditions to fully compost.

Limited Human Contact
With a batch system the compost chamber is removed and taken to the bulk composter. This is the extent of potential contact with uncomposted excrement. All chambers have lids that are secured during transport to limit potential spills.

With the continuous composting units on the state list there is no way to separate fresh excrement from partially or fully composted humus. Truly there should be no compost within the unit that could be considered fully composted or safe for human contact. During the use of a continuous composting unit, fresh excrement, urine and leachate drip from uncomposted material through the bulk of the material carrying with it pathogens that endanger occupants maintaining the toilets.

Aerobic Composting Conditions
The key to successful composting is moisture control and access to oxygen. In the batch system that we have designed the bulk composters are filled with the contents of the composting chambers and mixed or layered with organic materials. This process both adds oxygen and controls the moisture of the container. If additional moisture or organic material is needed it can be added piecemeal.

When using the continuous composters on the state approved list fresh excrement and urine are constantly being added. This constant adding of wet materials saturates the pile and decreases the oxygen carrying capacity. The only way to counter this problem is to stop using the toilet to allow moisture to reach acceptable levels or add massive amounts of heat to evaporate the excess moisture.

Comment 3
Also, in your cover letter for the redesign submitted on January 14, 2014, item #1 discusses public domain composting toilets. The first bullet states that the public domain composting toilet proposed includes "a composting chamber connected to a dry toilet". This is not the case, as a composting chamber is a location where composting is to occur. A 5 gallon bucket is not sufficient to be considered a "composting chamber".

As stated previously in this document our design has 2 main pieces of infrastructure, a "dry" composting toilet with interchangeable composting "chambers" and alternating bulk composters. Both of these units have a part in the composting process. The 5 gallon composting chamber is the beginning of the process. This accepts the excrement, some organic material and starter enzymes to increase the composting rate. The composting 'chambers' were never indented to bring the compost to maturity, that is the job of the bulk-composting unit, but they will begin the composting process.

As a container, we believe any HDPE container to be the ideal vessel for composting toilets. The material resists all conditions that may be found in the composting environment, acidic, alkaline, hot, cold, wet and dry. The material is non-porous, smooth and does not absorb harmful substances. This material meets the intent of the RS&G and is beyond sufficient.

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Meeting

We are all trying to get to the same point, a safe, acceptable, easy to use composting system that does not endanger public health or place unnecessary liability on the Department of Health or the City of Bellingham. We would like the opportunity to have a sit down meeting to discuss these technologies with you. There are small items that we feel can be resolved with a face to face discussion that cannot be accomplished through email or submittals.

Please contact us at any time with questions.

Thank you for your consideration,

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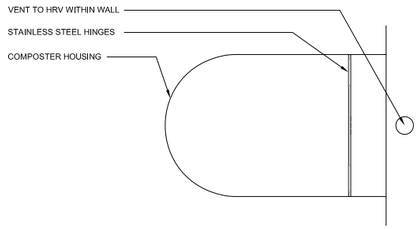

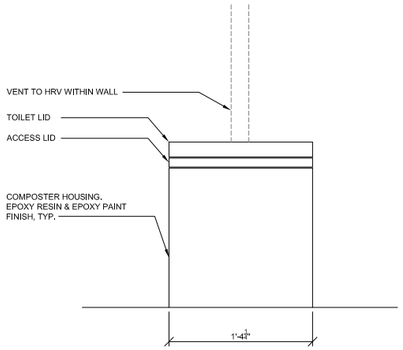

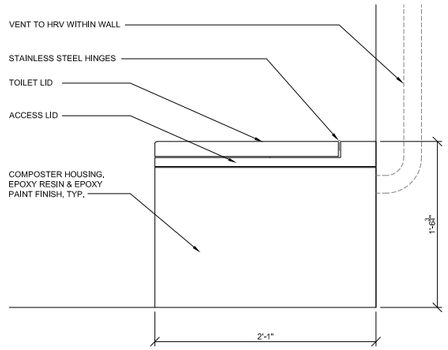

1 COMPOSTING TOILET ELEVATIONS
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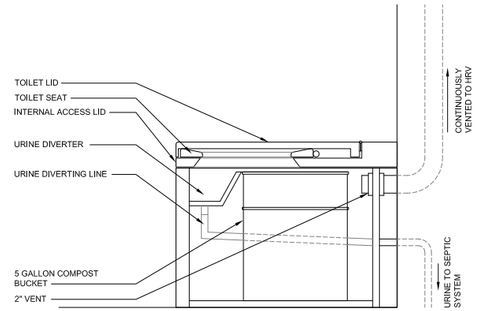


2 COMPOSTING TOILET SECTION
SCALE: 1 1/2" = 1'-0"

PUBLIC DOMAIN COMPOSTING TOILET

Composting Toilet Description

The toilet is a urine diverting batch composter with unlimited capacity. The Composter housing consists of a wood and fiberglass housing that contains a 5 gallon HDPE composting vessel. This vessel holds all of the solid waste. Once full this vessel can be removed for additional aging and replaced with a clean composting vessel. The urine is diverted through a trough in the front of the composter housing that is sloped to a drain. The urine drains into the septic system.

Using the Toilet

The use of the composting toilet is simlar to the use of a regular toilet. When a person makes a solid deposit in the composting vessel and small scoop of wood chips or peat moss is used to 'flush' or cover the waste and "bulk" the compost for proper composting. This repeats till the vessel is full. Compost addatives or effective micro-organisms can be added to increase the composting rate. All users, both men, women, boys and girls, must sit at the toilet and urinate into the trough at the front the composter. An occational cup of water may be poured into the trough to clean risidual urine from the trough and drain.

Composting Toilet Housing Construction

The composting toilet is constructed of wood and coated with fiberglass epoxy to make a seamless waterproof container. The fiberglass resin is sanded smooth and painted with epoxy paint. This is similar construction to fiberglass boat hulls. All hardware is either HDPE or stainless steel.

Ventilation

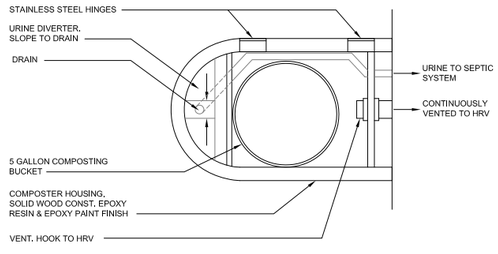
One of the most important features of any composting toilet is the venting of the composting unit. This keeps the compost at the correct moisture content. This composting toilet is continuously mechanically ventilated through a Heat Recovery Ventilator (HRV). The HRV pulls air continuously through the lid of the toilet, across the urine diverter and the composting vessel, keeping smells and gasses from being released into the bathroom.

Compost Aging

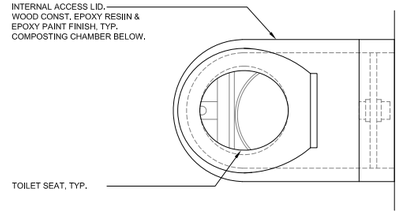
Once a 5 gallon vessel is filled with solid waste it is removed and replaced with a clean vessel. A lid with a rubber gasket is placed on the full vessel and the vessel is placed in a locked shed (noted on the site plan) for additional composting. Vessels remain in the shed for a minimum of 6 months. At the end of six months the vessel is emptied to a compost pile and mixed with additional carbonic materials, such as wood chips or grass clippings. This pile ages for another six months to a year. Once the aging process it complete the compost can be spread on forest land or orinmental plants on the property.

Cleaning the Composter

Cleaning the toilet is the same as any toilet. Organic soaps, vinegar and non-abrassive cleaners can be used on the composting vessel and composter housing.



3 COMPOSTING CHAMBER
SCALE: 1 1/2" = 1'-0"



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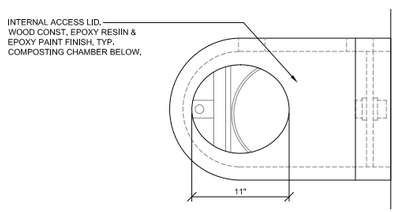

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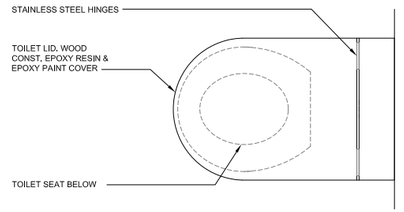

6 COMPOSTING TOILET LID
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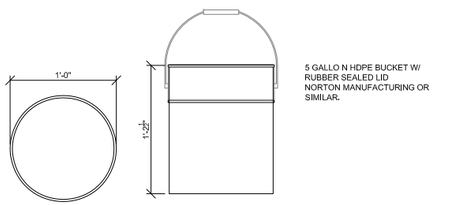

7 COMPOSTING TOILET SOLID WASTE VESSEL
SCALE: 1 1/2" = 1'-0"

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Sheet Contents:
COMPOSTING TOILET

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Checked:
Date: 1.1.2014

Job No: 001

Sheet No:
X2.0

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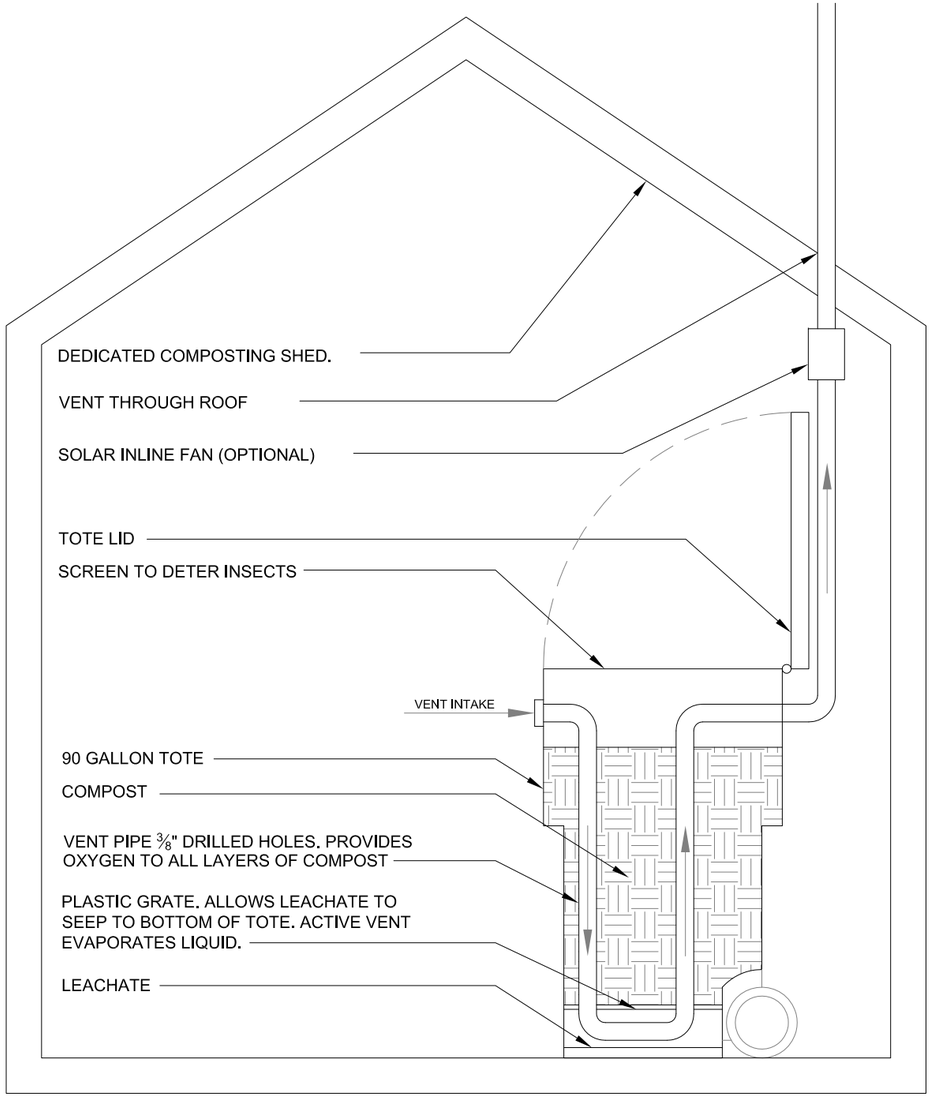

1 SECTION_ BULK COMPOSTERING UNIT
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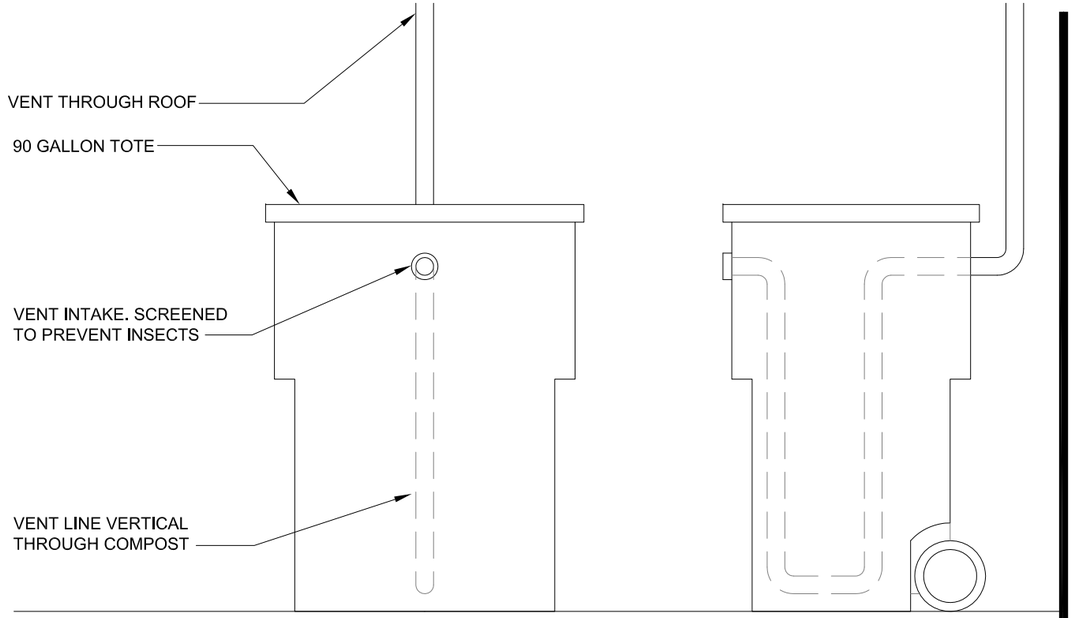

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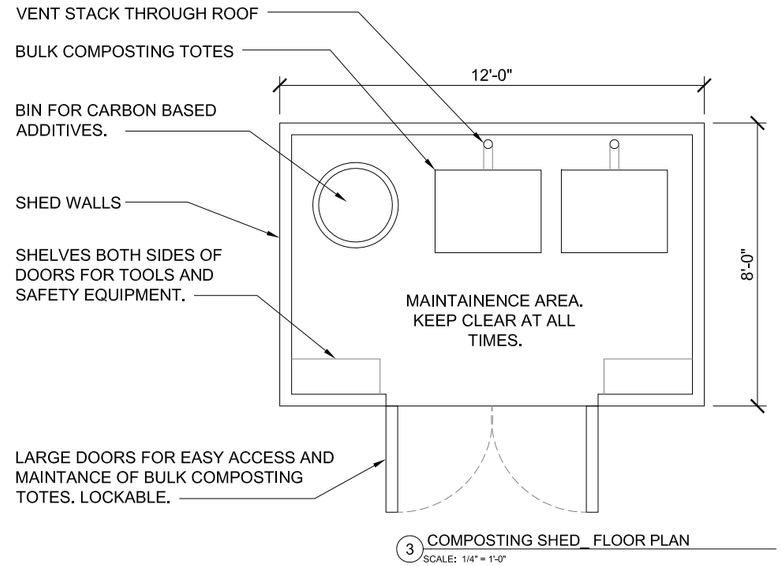

3 COMPOSTING SHED_ FLOOR PLAN
SCALE: 1/4" = 1'-0"

PUBLIC DOMAIN COMPOSTING TOILET SYSTEM_ BULK COMPOSTER

Bulk Composter Description

The bulk composter is a 90 gallon plastic wheelie tote that holds solid waste. Two composters sit in a shed dedicated to the composting process. This shed is locked and screened to keep insects and animals out.

Composting Toilet Housing Construction

The bulk composter is constructed of HDPE. The vent pipe is typical PVC or ABC plumbing pipe.

Ventilation

One of the most important features of any composting toilet is the venting of the composting unit. This keeps the compost at the correct moisture content. The bulk composter is ventilated by pipes that are burried in the compost. The vent stack draws air through the bulk composter providing oxygen to keep compost in an aerobic state.

Compost Aging

5 gallon vessel from the house composting toilets are empied into the bulk composter and mixed with additional carbonic materials, such as wood chips or dry grass clippings. Waste and mulch are layered till the tote is ¾ full. Once full the tote is retired and sits to molder. During this time the second tote is filled. Once the aging process it complete the compost can be spread on forest land or orinmental plants on the property.

Cleaning the Composter

The composter can be cleaned with organic soaps, vinegar and non-abrassive cleaners. Rubber gloves should be worn and occupants should wash their hands after doing any maintance in the composting shed.

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Sheet Contents:
BULK COMPOSTER

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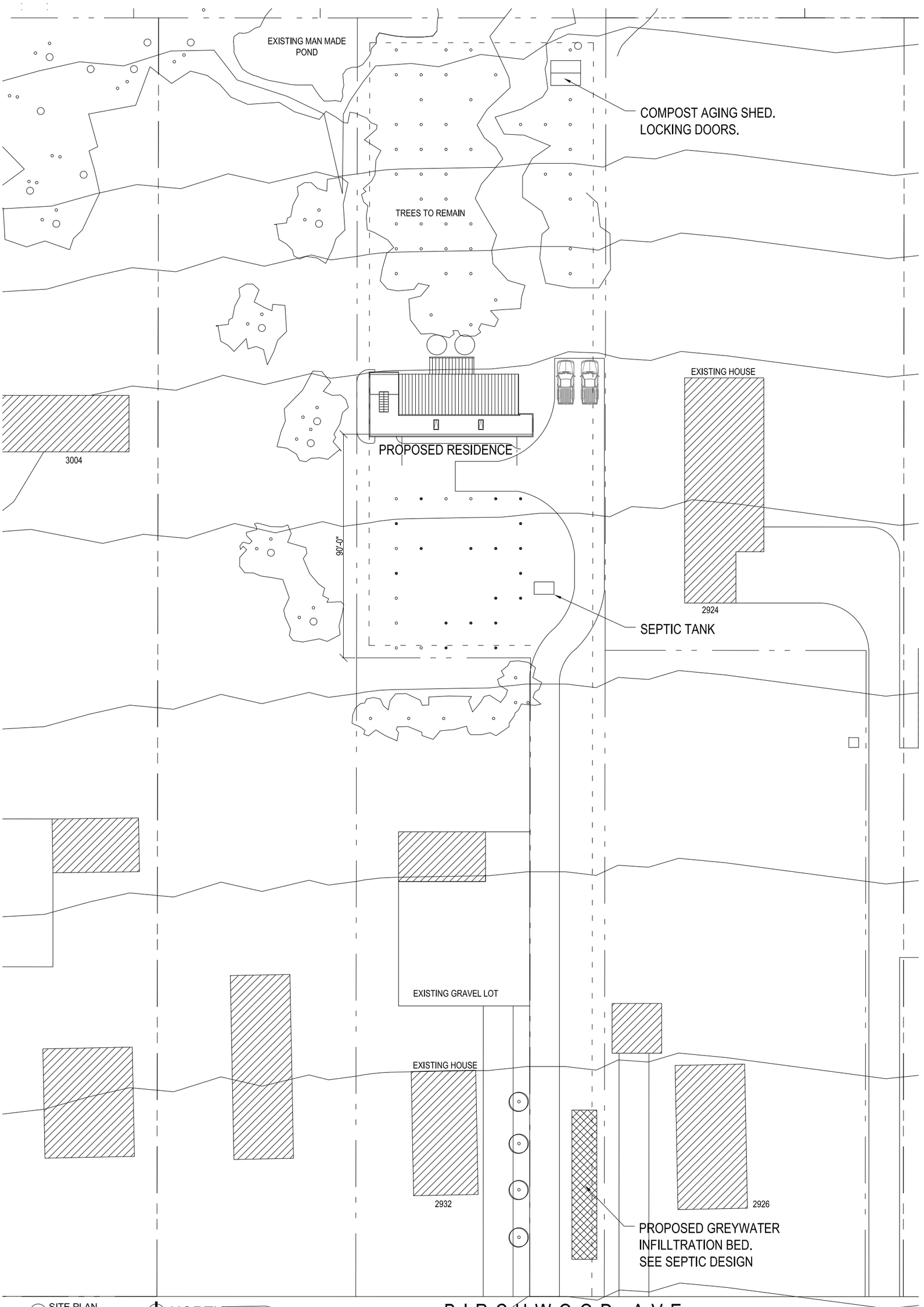

1 SITE PLAN
SCALE: NTS

NORTH

Sheet Contents: ONSITE SEWAGE SITE PLAN

Revisions:

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