Design Guideline for

Gravity Systems in Soil Type 1

January 2009

Washington State Department of Health
Division of Environmental Health
Office of Shellfish and Water Protection

This page is intentionally blank.

Design Guideline for

Gravity Systems in Soil Type 1

January 2009

Washington State Department of Health
Division of Environmental Health
Office of Shellfish and Water Protection

For information or additional copies of this report contact:
Wastewater Management Program
Physical address: 111 Israel Rd SE, Tumwater, WA 98501
Mailing address: PO Box 47824, Olympia, WA 98504-7824

Telephone: 360.236.3062
FAX: 360.236.2257
Webpage: http://www.doh.wa.gov/wastewater.htm

Mary Selecky
Secretary of Health

For persons with disabilities, this document is available upon request in other formats.
To submit a request, please call 1-888-586-9427 (TDD/TTY 1-800-833-6388).

Para personas discapacitadas, este documento está disponible a su pedido en otros formatos.
Para hacer su pedido llame al 1-888-586-9427 (TDD/TTY 1-800-833-6388).

DOH Publication #337-003 Revised

This page is intentionally blank.

Contents Page

Figures

Guideline for Using Conventional Gravity Distribution On-site Sewage Systems in Soil Type 1

Purpose

The purpose of this guideline is to provide assistance to local health jurisdictions (LHJ) when applying the five criteria listed in On-site Sewage Systems, WAC 246-272A-0234 (6), for permitting a gravity subsurface soil absorption system (SSAS) in Type 1 soils. The guidance should be used in conjunction with local knowledge of the site-specific conditions.

Background

Type 1 soils are defined in Table V in WAC 246-272A as "gravelly and very gravelly coarse sands, all extremely gravelly soils excluding soil types 5 and 6, and all soil types with greater than or equal to 90% rock fragments". A gravity SSAS is typically not permitted in Type 1 soils because soils with a high percentage of rock fragments and/or coarse sands generally have a poor capability for treating pathogens that are present in septic tank effluent. Coarse grained, gravelly soils exhibit higher permeability because of a high volume of large pores. These macropores allow liquid to pass through the soils quicker so there is less opportunity for adequate filtration or adhesion of the pathogens.

Failure of an on-site system to properly treat the pathogens is difficult to detect because it does not result in immediate problems like those caused by hydraulic failure. Public health impacts from incomplete treatment of pathogens can be significant if it results in contamination of a current or potential source of drinking water. Washington State Department of Health recognizes that certain site conditions may mitigate a lack of treatment typically found with a gravity SSAS in a Type 1 soil. An arid climate, deep soil conditions, and a protected aquifer are favorable conditions when considering the use of a gravity SSAS in a Type 1 soil. The criteria listed in Section 0234(6) of the regulation address these conditions.

Applicability

This guideline applies to Type 1 soils with a minimum vertical separation of at least 60 inches. These are sites where pressure distribution and Treatment Level C are required by rule. Figure 1 is highlighted to show where the guideline is applicable.

Figure 1
Chapter 246-272A WAC Table VI
Treatment Component Performance Levels and Method of Distribution

Vertical Separation in inches	Soil Type		
	1	2	3-6
12 < 18	**A** - pressure with timed dosing	**B** - pressure with timed dosing	**B** - pressure with timed dosing
≥ 18 < 24	**B** - pressure with timed dosing	**B** - pressure with timed dosing	**B** - pressure with timed dosing
≥ 24 < 36	**B** - pressure with timed dosing	**C** - pressure	**E** - pressure
≥ 36 < 60	**B** - pressure with timed dosing	**E** - pressure	**E** - gravity
≥ 60	**C** – pressure	**E** - gravity	**E** - gravity

How to Use this Guidance

Step 1: Determine if your site has Type 1 soils and if it has at least 60 inches of vertical separation from the bottom of the trench to a restrictive layer. If the site does not have 60 inches of vertical separation, the regulations do not allow the use of a gravity SSAS. If there is 60 inches, go to Step 2.

Step 2: Use the section on Regulatory Criteria and Figure 2 to determine if your site meets the criteria 1 through 4. If no, a gravity SSAS is not allowed. If yes, go to Step 3.

Step 3: Use the section on Hydrogeologic Conditions (criteria 5) and Figure 4 to determine if your site meets these conditions for a gravity SSAS. If yes, a gravity SSAS is allowed. Three well logs included in this guidance show examples of various hydrogeologic conditions.

Regulatory Criteria

The five regulatory criteria in Section 0234(6) are listed below. **All five of the criteria must be met to install a gravity SSAS in a Type 1 soil.** Figure 2 is a flow chart for applying criteria 1 through 4. Figure 4 is a flow chart for applying criteria 5.

Criteria 1. Single-family residence

The on-site system must be designed and used for a single-family residence. Design flows and wastewater strength must be no more than would be allowed for a single family residence. This criterion eliminates the added risk to groundwater associated with higher strength non-residential wastewaters.

Criteria 2. Lot size

The lot size must be greater than 2.5 acres. A minimum lot size reduces the amount of pathogen and nitrate loading in the groundwater. The location of other pathogen and nitrate sources both within the 2.5 acres and on adjacent property should be considered.

Criteria 3. Annual Precipitation

Annual regional precipitation must be less than 25 inches. State precipitation data can be found at http://www.wrcc.dri.edu/summary/climsmwa.html. Lower precipitation generally means less recharge to groundwater. Less recharge will slow the movement of wastewater and allow greater contact time for the treatment of pathogens. Low rainfall will also slow the movement of nitrate to groundwater.

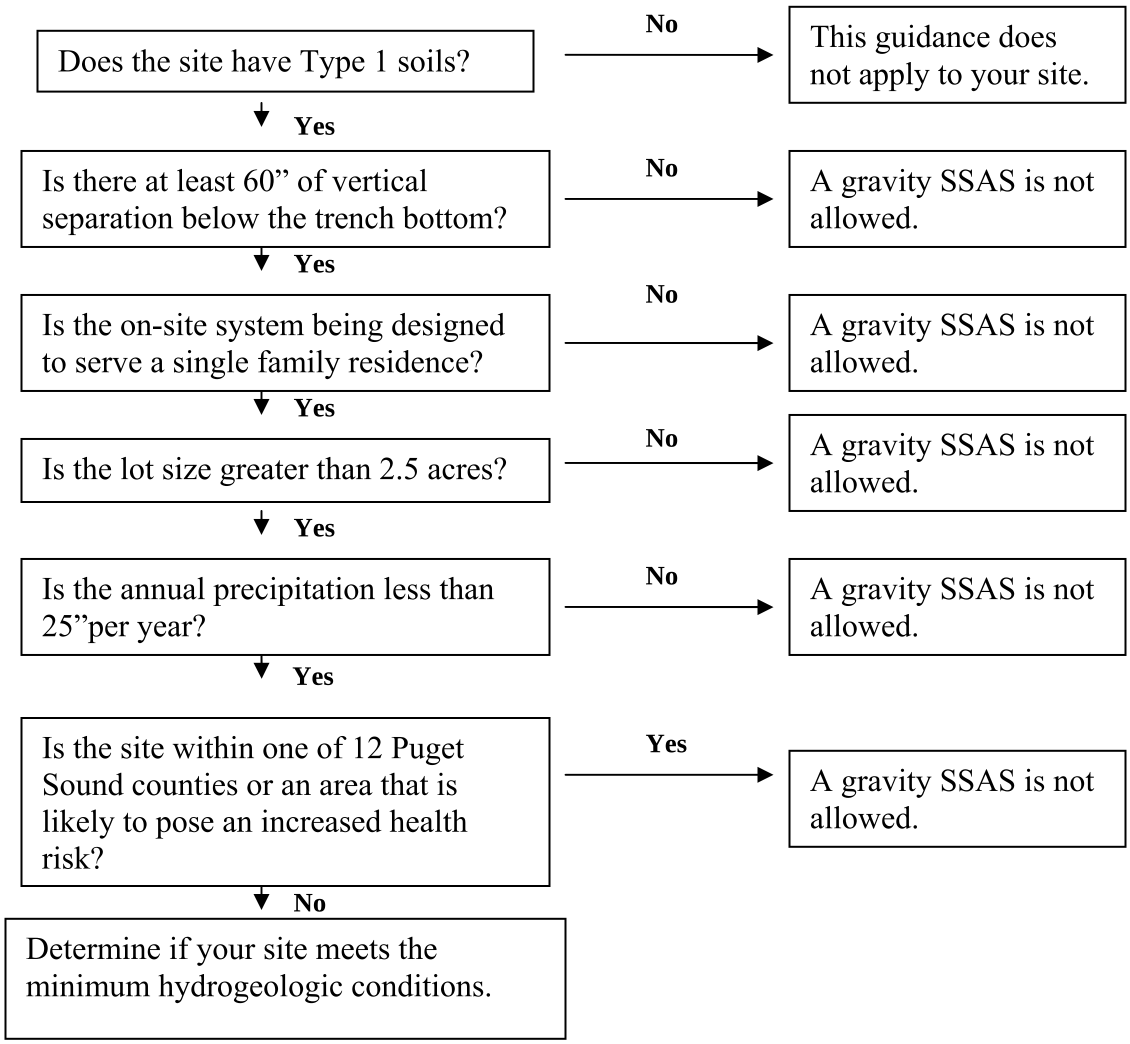
Criteria 4. Puget Sound Counties and Areas of Increased Public Health Risk

A Gravity SSAS on Type 1 soils is not allowed in the twelve counties bordering Puget Sound which are Whatcom, Kitsap, Clallam, Island, Jefferson, Mason, San Juan, King, Skagit, Snohomish, Tacoma, and Pierce. WAC 246-272A-0015 (1) (b) lists other areas that may pose an increased public health risk. These areas may also not be suitable for a Gravity SSAS on Type 1 soils.

Criteria 5. Hydrogeologic Conditions

The hydrogeologic conditions beneath the drainfield must meet minimum requirements for the uppermost aquifer. The uppermost aquifer is the most susceptible to contamination from a gravity SSAS. Protection of this aquifer will minimize the risk to public health and also to the environment.

Figure 2. Regulatory Criteria 1- 4 Flow Chart



Hydrogeologic Conditions

The purpose of the hydrogeology review is to determine whether or not the upper most aquifer is susceptible to contamination from a gravity SSAS. The health officer must be satisfied that the information used to determine the hydrogeologic conditions is accurate, complete and representative of the site. This is true whether the conditions are determined from a detailed hydrogeology report or from local knowledge.

Sources for Hydrogeologic Information

1. Well Logs

Well logs are the most direct and often the most valuable source of information for determining the hydrogeology of a site. The Washington Department of Ecology maintains a water well database for all well logs. The data can be accessed at http://apps.ecy.wa.gov/wellog/. A representative well log is essential for understanding the hydrogeology of an area. Well logs vary in their usefulness and the information they contain has varying degrees of accuracy. Therefore, interpretation of well logs should be conservative.

It is preferable to have at least one representative well log within 500 feet of the drainfield. If a well log is not available within 500 feet, all well logs within ¼ mile surrounding the proposed drainfield should be reviewed. At a minimum, one well log within the ¼ mile radius is needed. The Health Officer must be confident that the well log is representative of the site. Each well log should contain location, depth of completed well, static water level, detailed material description with starting and ending depths, well ID number if available, and driller's signature and date.

2. Washington State Department of Health Drinking Water Data

The Department of Health maintains a drinking water data base for public water systems. The data can be accessed at http://www.doh.wa.gov/ehp/dw/sentry.htm. Data for public water systems within ¼ mile should be reviewed for nitrates or other contaminants. Nitrate in groundwater is often used as an indicator that an aquifer is at risk of contamination. Nitrates in groundwater can originate from sources other than on-site systems. However, whenever there are increased nitrates, the area should be reviewed carefully before approving a gravity SSAS on Type 1 soil.

3. Hydrogeology Reports

The local health officer should consult local hydrogeology reports if they are available. These reports will often contain vadose zone (the area between the surface and the aquifer) information and, in some cases, groundwater data. Hydrogeology reports or geological borings are often completed for the installation of a large on-site system, community well, construction of a commercial building, or a highway construction project. State and federal regional hydrogeology reports may also provide information and are usually available online.

Determine the Upper-Most Aquifer

The first step in the hydrogeologic review is to determine the location of the upper most aquifer. The upper most aquifer is defined as the shallowest saturated zone that can yield sufficient water to support a beneficial use. A beneficial use can be drinking water, irrigation, recharge to surface water or recharge to a deeper aquifer. The upper most aquifer can be shallow, deep, perched, confined, or unconfined. Some saturated zones have an insufficient quantity of water to support a beneficial use and do not meet the definition of an aquifer. These zones are isolated from an aquifer and can be seasonal or due to irrigation. Before deciding if a saturated zone meets the definition of an aquifer, the health officer should have knowledge as to whether the saturated zone can or cannot support a beneficial use. The health officer should also know whether contamination of these zones will pose a risk to public health. If the health officer is unsure, they should consider the saturated zone the uppermost aquifer.

A representative well log is often the best source of information for locating the upper most aquifer. Locate the upper most aquifer by finding the first mention of “water” or “wet” in the “description of material” section (the term “moist” usually does not indicate a saturated zone). Generally, this will be the uppermost aquifer unless it meets the requirements for perched or seasonal zone as described above. On Well Log #1, the upper most aquifer is from 8 to 129 feet. On Well Log #2, the upper most aquifer extends from 250 to 275 feet. On Well Log #3, the upper most aquifer begins at 170 feet.

Confined and Unconfined Aquifers

The second step in the hydrogeology review is to determine if the uppermost aquifer is a confined or unconfined aquifer. Figure 4 can be used to determine the type of aquifer under your site. For the purpose of this guidance, the terms “confined” and “unconfined” aquifer will be used. In actual settings, many “confined” aquifers are only semi-confined.

Confined Aquifer Sites

A confined aquifer has an overlying impervious layer which separates the aquifer from the surface. A confined aquifer will provide physical protection to the aquifer from surface sources of contamination. When a well is drilled into the confined aquifer, water rises in the well to some level above the top of the aquifer. This is called the static water level and is shown on the well log.

Confining layers are identified by their density, thickness, soil texture, level of saturation, and gravel content. Several confining layers can exist above an aquifer. When reviewing a well log for a confining layer, look for terms such as such as fine textures, clay, silt, dense, hardpan, compacted, cemented, till and bedrock that is solid, hard, or massive. Clay layers with no gravel are often good confining layers with or without compaction. Dense or compact silts can also be good confining layers. Sands and gravels do not make a good confining layer unless the layer is highly compacted or cemented as in glacial till. Fractured or highly weathered bedrock also is not a confining layer. The presence of gravel in any layer, except compacted till, means the layer is too permeable to be considered a confining layer. A wet layer is not considered a confining layer regardless of the materials. Well Log #1 has an example of a fine textured layer beginning at 15 feet that is not confined because it is wet.

The confining nature of the aquifer can be assumed to be protective of groundwater if all three of the following site conditions are present:

1. The thickness of the confining layer (as defined above) is 5 feet or greater.

2. The difference between the static water level in the well and the top of the confining layer is 20 feet or greater. For example, if the confining layer above the aquifer is located between 50 and 60 feet on the well log, the static water level would need to be shown at 30 feet or shallower to meet this requirement.

3. The vadose zone between the surface and the top of the confining layer is 25 feet or greater and is not described as wet or containing water.

Well Log #2 is an example of a confined aquifer.

Unconfined Aquifers

For purposes of this guidance, an unconfined aquifer is one that does not meet all three of the conditions listed above for confined aquifers. Unconfined aquifers are not protected from the surface by an impermeable layer and therefore are more susceptible to contamination. The top of the unconfined aquifer is often referred to as the water table because it represents the top of the saturated zone.

Since there is no confining layer above an unconfined aquifer, protection of the groundwater from surface contamination is dependent on the materials in the vadose zone. The materials in the vadose zone must filtrate or attenuate the pathogens and slow down their time of travel so that die-off occurs before they reach the groundwater.

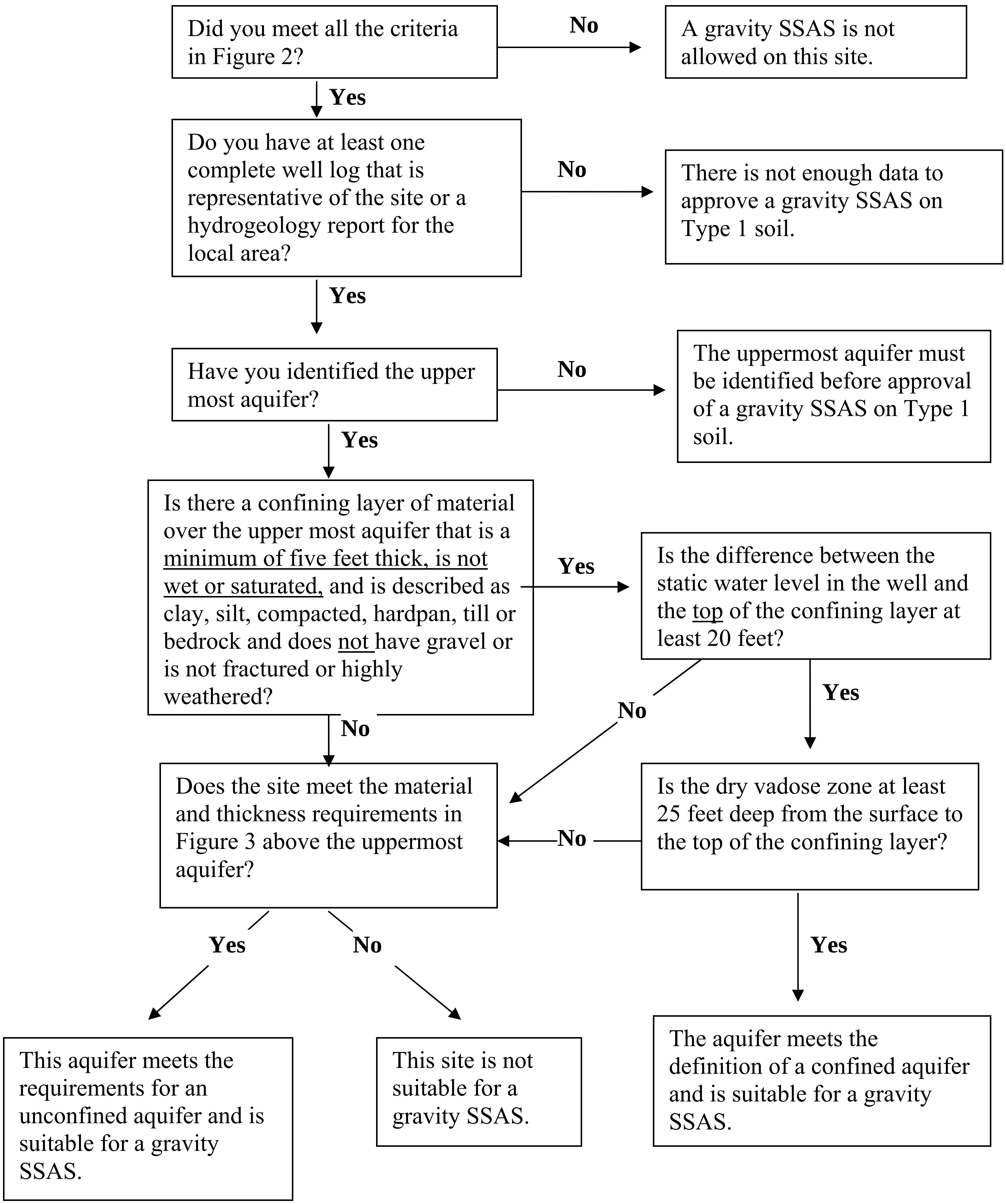
For unconfined aquifers, a gravity SSAS can be used in Type 1 soils with less risk if the minimum cumulative depth of material is fine enough and/or thick enough. Figure 3 shows cumulative thicknesses required for the various materials. If the size of the sand is not described on the well log, medium sand should be assumed. If the well log lists multiple layers of materials above the unconfined aquifer, the cumulative thickness must satisfy the most conservative thickness requirement. For example, if a well log shows 20 feet of coarse sand and 20 feet of silt, this would satisfy the 40 foot thickness requirement for coarse sands with no gravel. However, if there were 20 feet of silt and 10 feet of coarse sand, this would not meet the requirement in Figure 3 for either the silt or coarse sands. Well Logs # 1 and #3 are an example of an unconfined aquifer.

Figure 3
Vadose Zone Materials for Unconfined Aquifers

Descriptive Well Log Entry*	**Cumulative Thickness from Ground Level Down to Top of Water Table**
Fine sand, silt, clay or loam as predominant materials and does not include pebbles, gravel cobbles or boulders.	30 feet or greater
Coarse or medium sand and does not include pebbles, gravel, cobbles or boulders.	40 feet or greater
Medium sand and finer textures which may include pebbles and gravel. Does not include cobbles or boulders.	50 feet or greater
Fractured or broken bedrock, coarse sand with gravel or any materials with cobbles or boulders.	Not allowed to be included for calculations

* Materials cannot be described as wet or having water
** If sand size is not listed on the well log, the LHJ should assume medium sand.

Figure 4. Hydrogeology Flow Chart



Definitions

Aquifer. A geologic formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

Contamination. Degradation of natural groundwater quality by biological, chemical, or physical materials which lower the water quality to a degree which creates a potential hazard to the environment, public health, or interferes with a beneficial use.

Confined Aquifer. An aquifer in which ground water is confined under pressure which is significantly greater than atmospheric pressure.

Extremely Gravelly. Soil with sixty percent or more, but less than ninety percent rock fragments by volume.

Impermeable. Earth materials with a texture or structure that does not permit fluids to perceptibly move into or through its pores or interstices.

Gravelly. Soils with fifteen percent or more, but less than thirty-five percent rock fragments by volume.

Gravity Subsurface Soil Adsorption System. An on-site sewage system consisting of a septic tank and a subsurface soil absorption system (SSAS) with gravity distribution of the effluent. A SSAS means a system of trenches three feet or less in width, or beds between three and ten feet in width, containing distribution pipe within a layer of clean gravel designed and installed in original undisturbed soil for the purpose of receiving septic tank effluent and transmitting it into the soil.

Perched Aquifer. A zone of saturation of groundwater above an impermeable or low permeable layer of soil or rock.

Recharge. The amount of water that reaches groundwater via infiltration and percolation after application to the land surface. The net amount of recharge to groundwater is a function of precipitation and irrigation after subtracting losses due to effects of evaporation, transpiration and run-off. Transpiration losses during subsurface flow tend to be seasonal and range between 10 to 20 percent of the total water budget. Static water level means the vertical distance from the surface of the ground to the water level in the well when the water level is not affected by pumping or free flow.

Rock Fragment. A rock or mineral fragments having a diameter of two millimeters or more; for example, gravel, cobbles, stones, and boulders.

Type 1 Soil. Gravelly and very gravelly coarse sands, all extremely gravelly soils excluding soil types 5 and 6, all soil types with greater than or equal to 90% rock fragments. Refer to WAC 246-272A-0220 for a complete list of soil type definitions.

Unconfined Aquifer. An aquifer with no confining geologic structure on the aquifer (aquifer pressure about the same as atmospheric pressure).

Upper-most Aquifer. The shallowest confined or unconfined aquifer.

Vadose Zone. The zone between the land surface and the water table within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric.

Very Gravelly. Soil containing thirty-five percent or more, but less than sixty percent rock fragments by volume.

Water Table. The upper surface of the saturated zone whether permanent or seasonal.

Well. A excavation that is constructed when the intended use of the well is for the location, diversion, artificial recharge, observation, monitoring, dewatering or withdrawal of ground water for agricultural, municipal, industrial, domestic, or commercial use.

Well Log. A report completed during well construction that describes and identifies the well. It normally provides a description of the depth, thickness, and character of each layer, stratum or formation penetrated by the well.

Well Log #1

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

☐ Construction

☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____

CURRENT

Notice of Intent No. W25391

Unique Ecology Well ID Tag No. BAT 325

Water Right Permit No. ____

Property Owner Name Joe Macay

Well Street Address 234 Taper St

City Soap Lake County Adams

Location SE 1/4-1/4 NE 1/4 Sec 4 Twn 32 R 40 EWM ☐ Or WWM ☐

(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____

Long Deg ____ Long Min/Sec ____

Tax Parcel No. (Required) ____

PROPOSED USE: ☐ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____

TYPE OF WORK: Owner's number of well (if more than one) ____

☑ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven ☐ Deepened ☐ Cable ☑ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 300 ft.

Depth of completed well 285 ft.

CONSTRUCTION DETAILS

Casing Installed: ☑ Welded 6" Diam. from 2 ft. to 175 ft.

☑ Liner installed 4" Diam. from 24 ft. to 284 ft.

☐ Threaded ____ " Diam. From ____ ft. to ____ ft.

Perforations: ☑ Yes ☐ No

Type of perforator used Saw

SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☐ Yes ☐ No ☐ K-Pac Location ____

Manufacturer's Name ____

Type ____ Model No. ____

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☑ No Size of gravel/sand ____

Materials placed from ____ ft. to ____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? ____ ft.

Material used in seal Bentonite

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? ____ Depth of strata ____

Method of sealing strata off ____

PUMP: Manufacturer's Name ____

Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.

Static level 8 ft. below top of well Date 5/14/08

Artesian pressure 0 lbs. per square inch Date "

Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☑ No If yes, by whom? ____

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest 15 gal./min. with stem set at 275 ft. for 2 hrs.

Artesian flow ____ g.p.m. Date ____

Temperature of water ____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Top Soil	0	8
Sand & Gravel, Wet	8	15
Clay & Silt, gray wet	15	129
Quartz broken w/ Clay	129	176
Quartz, hard, fractured	176	275
Quartz broken water	275	284
Quartz	284	300

Start Date ____ Completed Date ____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) ____

Driller/Engineer/Trainee Signature Don Johnson

Driller or trainee License No. ____

IF TRAINEE: Driller's License No: ____

Driller's Signature: [signature]

Drilling Company Drill Right

Address ____

City, State, Zip Soap Lake, WA.

Contractor's Registration No. DR #654 Date 5/21/08

ECY 050-1-20 (Rev 06/08) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

Well Log #2

WATER WELL REPORT

Original & 1st copy – Ecology, 2nd copy – owner, 3rd copy – driller

DEPARTMENT OF ECOLOGY State of Washington

Construction/Decommission *("x" in circle)*

☐ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number*

CURRENT

Notice of Intent No.
Unique Ecology Well ID Tag No. W06889
Water Right Permit No.
Property Owner Name Ted Hahn
Well Street Address 79 Shelton Rd
City Spokane County Spokane
Location NW 1/4-1/4 SW 1/4 Sec 24 Twn 27N R 43E EWM ☐ Or WWM ☐
(s, t, r Still REQUIRED)

Lat/Long Lat Deg ____ Lat Min/Sec ____
Long Deg ____ Long Min/Sec ____
Tax Parcel No. (Required) ____

PROPOSED USE: ☑ Domestic ☐ Industrial ☐ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____

TYPE OF WORK: Owner's number of well (if more than one) ____
☑ New well ☐ Reconditioned *Method:* ☐ Dug ☐ Bored ☐ Driven
☐ Deepened ☐ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 6" inches, drilled ____ ft.
Depth of completed well 275 ft.

CONSTRUCTION DETAILS
Casing Installed: ☑ Welded 6" Diam. from 3" ft. to 265 ft.
☐ Liner installed ____" Diam. from ____ ft. to ____ ft.
☐ Threaded ____" Diam. From ____ ft. to ____ ft.

Perforations: ☑ Yes ☐ No
Type of perforator used ____
SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☑ Yes ☐ No ☐ K-Pac Location ____
Manufacturer's Name Johnsons
Type ____ Model No. ____
Diam. ____ Slot size 10 from 265 ft. to 275 ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☑ No Size of gravel/sand ____
Materials placed from ____ ft. to ____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 30 ft.
Material used in seal Bentonite
Did any strata contain unusable water? ☐ Yes ☐ No
Type of water? ____ Depth of strata ____
Method of sealing strata off ____

PUMP: Manufacturer's Name ____
Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 80 ft. below top of well Date ____
Artesian pressure ____ lbs. per square inch Date ____
Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☑ No If yes, by whom? ____
Yield: 100 gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ____
Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ____
Temperature of water ____ Was a chemical analysis made? ☐ Yes ☐ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Sand Loam w/ gravel	0	26
Clay Dark Brown	26	241
Clay Blue Gray	241	250
Sand fine w/ water	250	260
Sand Coarse w/ water	260	275

Start Date 5/15/99 Completed Date 5/20/2000

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee Name (Print) ____
Driller/Engineer/Trainee Signature ____
Driller or trainee License No. ____
IF TRAINEE: Driller's License No: ____
Driller's Signature: [signature]

Drilling Company H2O Well Inc
Address ____
City, State, Zip Spokane
Contractor's Registration No. ____ Date 5/21/2000

ECY 050-1-20 (Rev 06/08) *If you need this document in an alternate format, please call the Water Resources Program at 360-407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

Well Log #3

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission ("x" in circle)
[x] Construction
[ ] Decommission ORIGINAL INSTALLATION Notice of Intent Number ________

PROPOSED USE: [x] Domestic [ ] Industrial [ ] Municipal [ ] DeWater [ ] Irrigation [ ] Test Well [ ] Other ________

TYPE OF WORK: Owner's number of well (if more than one) ________
[x] New well [ ] Reconditioned Method: [ ] Dug [ ] Bored [ ] Driven [ ] Deepened [ ] Cable [ ] Rotary [ ] Jetted

DIMENSIONS: Diameter of well ____ inches, drilled ____ ft.
Depth of completed well ____ ft.

CONSTRUCTION DETAILS
Casing Installed: [x] Welded 6 " Diam. from 2 ft. to 193 ft.
[x] Liner installed 5 " Diam. from 188 ft. to 193 ft.
[ ] Threaded ____ " Diam. From ____ ft. to ____ ft.

Perforations: [ ] Yes [x] No
Type of perforator used ________
SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: [x] Yes [ ] No [ ] K-Pac Location ________
Manufacturer's Name ________
Type slotted Model No. ________
Diam. 5 Slot size 10 from 193 ft. to 198 ft.
Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: [ ] Yes [ ] No Size of gravel/sand ________
Materials placed from ____ ft. to ____ ft.

Surface Seal: [x] Yes [ ] No To what depth? 18 ft.
Material used in seal Bentonite
Did any strata contain unusable water? [ ] Yes [x] No
Type of water? ________ Depth of strata ________
Method of sealing strata off ________

PUMP: Manufacturer's Name ________
Type: ________ H.P. ________

WATER LEVELS: Land-surface elevation above mean sea level ____ ft.
Static level 150 ft. below top of well Date ________
Artesian pressure ____ lbs. per square inch Date ________
Artesian water is controlled by ________ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? [ ] Yes [x] No If yes, by whom? ________
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Yield: ____ gal./min. with ____ ft. drawdown after ____ hrs.
Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Date of test ________
Bailer Test ____ gal./min. with ____ ft. drawdown after ____ hrs.
Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.
Artesian flow ____ g.p.m. Date ________
Temperature of water ____ Was a chemical analysis made? [ ] Yes [ ] No

CURRENT
Notice of Intent No. ________
Unique Ecology Well ID Tag No. AB Z0 34
Water Right Permit No. ________
Property Owner Name Mr Wick
Well Street Address 6505 18th Ave
City ________ County ________
Location SW 1/4-1/4 SE 1/4 Sec 18 Twn 31 R 24E EWM [ ] Check One or WWM [x]
(s, t, r Still REQUIRED)
Lat/Long Lat Deg ____ Lat Min/Sec ____
Long Deg ____ Long Min/Sec ____
Tax Parcel No. (Required) ________

CONSTRUCTION OR DECOMMISSION PROCEDURE
Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Topsoil	0	1
sand & Gravel	1	35
Gravel	35	95
sand Gravel	95	120
silt & sand medium	120	170
sand w/ water	170	200

Start Date 10/10/95 Completed Date 10/13/95

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

[x] Driller [ ] Engineer [ ] Trainee Name (Print) Jim Adams
Driller/Engineer/Trainee Signature Jim Adams
Driller or trainee License No. 1295
IF TRAINEE: Driller's License No: ________
Driller's Signature: Jim Adams

Drilling Company ABC Drilling
Address ________
City, State, Zip ________
Contractor's Registration No. ________ Date 10/13/95

ECY 050-1-20 (Rev 4/07)

Ecology is an Equal Opportunity Employer