Land Division with Individual Drilled Well(s)

A proposed land division utilizing individual wells must show compliance with Drinking Water Code (Skagit County Code 12.48) which became effective January 1, 1992 before the proposed plat can be submitted to the Planning and Community Development Department.

If the proposed plat is located in an area where the aquifer is adequate, then one well per 4 lots will be required. If the proposed plat is located in an area where the aquifer has either a quantity or quality problem (e.g. seawater intrusion, arsenic, etc.) then all of the individual wells will have to be drilled for all of the proposed lots before gaining approval from the Health Department. Land divisions must comply with Skagit County Code 12.48 and 14.24.

A complete application includes the following 9 items:

1. Properties requiring or containing on-site SEWAGE SYSTEMS shall include Development Services approved sewage system site evaluations. This shall include the location and general boundaries for components of the proposed or existing sewage systems. We need a **copy of the site plans** that were submitted to DEVELOPMENT SERVICES showing their APPROVAL.

2. FIELD VISIT
A Skagit County Health Department representative must complete a field visit to the parcel. A good time to do this is before the well is drilled to ensure conformity with the Skagit County ordinance. Well site approval could also be provided at the same time.

3. The individual WELL SITE APPROVAL document can be issued either by the Skagit County Health Department or licensed well driller. Some well drillers will type on the bottom of the well log that the well "meets S.C.C. 12.48 siting criteria" and some provide a simple letter. However, we also need to know that the well was drilled in the location noted on the plot plan.

4. Main APPLICATION/Setback FORM/Result FORM – Fill out:
    a. The Main Land Division Application
    b. Lot Setback Forms for **each lot** that has existing features that are pertinent, and one Result Form. Once the evaluation is satisfactory, the result form will be signed by the Health Department. The result form is then given to you so you can show water availability to Planning and Development Services

5. SCALED PLOT PLAN of the plat (S.C.C. 12.48.030 – see Plot Plan enclosed).

6. A detailed WELL LOG(s) with written results of a bailer test, air lift test, or pump test which shows that the test was performed for a minimum of one hour, verifying a minimum well yield of 350 gallons per day (not counting casing storage). The well driller will give this to you. Additional pump /recharge testing may be required for some wells.

7. WATER QUALITY RESULTS for inorganic chemicals and bacteria. These must be analyzed by a Washington State Department of Health certified laboratory. Enclosed in this packet is a list of the inorganic chemicals to be sampled for and 6 certified labs. Your well driller may assist you with the sampling.

8. Water Right, as required. A water right permit application or a well log is not sufficient for proof of water rights.

9. There is a $500 permit fee covering the first demonstration well. A fee of $125 will be charged for each additional well. Time expenditure above 6.5 hours of time required for processing/review of the application will be charged at a rate of $80.00/hr.

Land Division

Individual Wells

Sensitive Aquifer

Drill All Wells

Adequate Aquifer

Drill One Well/4 Lots

Unknown Aquifer

Additional Data Needed: a Hydro-geologist's Report may be required

Evaluation of Each Well

- Satisfactory
  - Take Result to Development Services
- Unsatisfactory
  - Reapply

Public System

public=2 connections

short plat-if parcels are 2 acres or less, public system is required

Existing System

System Evaluated

- Satisfactory
  - Take result to Permit Center
- Unsatisfactory
  - No additional connections are allowed

Proposed System

Approach Nearby Systems

If denied, create new system per WAC 246-290 & SCC 12.48

*If you are not denied and you disagree with the results, an appeal process is available

Well Drilled & Plans Approved

1800 Continental Place • Mount Vernon, WA 98273
Office (360) 336-9410 • Fax (360) 336-9416 • Inspections (360) 336-9306

Land Division Water Review Application

Parcel #'s_____Property tax account#_____

Range_____Township_____Section_____1/4_____1/4_____

owner_____phone_____

address_____city_____zip_____

contact (if different)_____phone_____

address_____city_____zip_____

Describe Land Division: Total acreage:_____Number of lots created:_____

Parcel Is: ( ) Undeveloped ( ) Developed, please describe existing features:

Engineer/Surveyor:_____

Septic System Designer:_____

Source of Water for Each Parcel of Land Division:

( ) Public System (2 connections/more): New ( ) Existing ( )
System Name_____

Engineer Designing Extension_____

( ) Individual Well(s) for Each Parcel
WellDriller_____

( ) Both, please describe_____

Please Attach Maps For:

( ) Directional/Locational Purposes (provide directions)
( ) Current Assessors Map
( ) Parcel Plot Map (see ordinance)

I would like A/An:

( ) Evaluation(s) for individual well(s) with field visit
( ) Aquifer assessment(s) for individual well(s) with field visit
( ) Evaluation of an existing group B public system
( ) Well site inspection for a new public system (please note creating a new public system involves many steps)

I am aware that there is a $500 permit fee which includes one individual well. Each additional well will be charged $125. An hourly charge above 6.25 hours may be charged at $80/hour. Public water review where the source is a public source is charged at a rate of $80/hr. A field visit may be required. SCHD may have additional fees if a Public Water System review and sign-off is required.

Signature _____ Date_____

"Always working for a safer and healthier Skagit County"

Skagit County Department of Public Health and Community Services

Jennifer Johnson, Director
Howard Leibrand, M.D., Health Officer

DEVELOPMENT APPLICATIONS IN SKAGIT RIVER BASIN ECOLOGY APPROVAL OF LEGAL RIGHT TO USE A NEW WATER SOURCE REQUIRED

If you are applying for a building permit or land division that will rely on a new water source within the Skagit River Basin, you must contact the Washington State Department of Ecology for approval of the legal right to use the water. This is true if you are relying on a new well or a public water system that may not have adequate water rights to serve your proposal.

PUD #1 of Skagit County, Anacortes and most public water systems have adequate legal right to supply water for new construction.

Pursuant to RCW 19.27.097 and RCW 58.17.110, Skagit County cannot legally issue residential building permits or approve subdivision applications unless the applicant has a lawful water supply. Typically, the applicant either provides a letter of availability from a public water source such as PUD, or proposes to use a well. Under Washington law, the State of Washington regulates water and its availability for appropriation, determining whether an applicant's proposed use of a well is lawful.

In 2001, the State of Washington adopted an Instream Flow Rule for the Skagit River Basin, establishing minimum river and stream flows for salmon habitat. Although the 2001 Rule in draft form allocated water for rural landowners and agriculture, the published 2001 Rule failed to provide a water allocation for rural landowners or agriculture.

In 2006, the State amended the 2001 Rule in an effort to fix this problem, establishing a small allocation for rural landowners and agriculture in the Skagit River Basin and each of its tributaries (the "**2006 Amendment**").

In 2008, the Swinomish Indian Tribal Community ("**Swinomish**") filed suit against the State in an effort to invalidate the 2006 Amendment. On October 3, 2013, the Washington Supreme Court ruled in favor of Swinomish, invalidating the 2006 Amendment. *Swinomish v. State*, Wa. Sup. Ct. Case No. 87672-0.

As a result of the *Swinomish* lawsuit, the State Department of Ecology has communicated to Skagit County as follows:

> *"Skagit County is legally required to stop issuing building permits and subdivision approvals in the Skagit Basin that rely on new wells, unless Ecology approves a plan for mitigation (or a plan for reliance on an alternative water source during times when the minimum instream flow requirements set in WAC 173-503 are not met)."*

In accordance with the State's foregoing statement, Skagit County is directing all building permit and subdivision applicants that propose to rely on new use of an exempt well within the Skagit Basin as their source of water to obtain Ecology's approval of the applicant's proposed water use prior to submittal of a permit or subdivision application to Skagit County.

If you have additional questions, please direct them to Jacque Klug, Department of Ecology, at (425) 649-7270, or by email at jklu461@ecy.wa.gov.

Public Health and Community Services
700 South 2nd Street Room #301
Mount Vernon, WA 98273
(360) 336-9380 Fax (360) 336-9401

Environmental Public Health
1800 Continental Place
Mount Vernon, WA 98273
(360) 336-9474 Fax (360) 419-3408

Skagit County Planning & Development Services
1800 Continental Place • Mount Vernon, WA 98273
Office (360) 336-9410 • Fax (360) 336-9416 • Inspections (360) 336-9306

Drinking Water Evaluation Result

( ) Building Permit or ( ) Land Division

Parcel #'s_____ Property Acc't #_____

Range_____E, Township_____N, Section_____, 1/4_____1/4_____

Plat Name_____ Plat #_____ Lot_____ Block_____

Site Address_____ City_____

Owner _____ Phone _____

Address_____ City_____ Zip_____

Contact Person_____ Phone _____

Address_____ City_____ Zip_____

Describe Project_____

Exempt: accessory structures, improvements, additions, repairs, & replacements of existing legal buildings of record

Water Public system name_____
(2 connections or more) ID #_____

Supply

Individual: well site approval by?_____

( ) drilled well by licensed well driller_____

( ) alternative source-describe_____

Individual Septic System: yes no (public sewer_____)

I understand that this evaluation is based upon conditions and information that I provided at the time of application and that groundwater may be subject to changes in water quality and quantity over time.

Applicant's Signature_____ date_____
Should result be mailed to the owner address? Yes No

**********Evaluation Health Department Only**********
The individual / public drinking water system has been evaluated and has been found to be:

( ) satisfactory
attached conditions – yes no
conditions to be satisfied before:
( ) building permit issuance
( ) final building inspection
( ) final land division approval

( ) unsatisfactory (see attached problems)

Health Department_____ Date_____

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Drilled Well Setback Form

Fill out one of these forms for each Demonstration well

Owner Last Name

_____

Property Tax #

_____ Lot #_____

Site Address:_____

****

Lot Size:_____acres Dimensions_____feet by_____feet

****

1. Please locate any potential sources of aquifer contamination on your and neighboring properties so that drinking water sources can be placed in the most protected location away from this potential contamination.
2. If the new lot fronts a County/State road please locate the legal boundary so that the well can be located appropriately.
3. For all new lots created after January 1, 1992, the demonstration drilled well(s) must have an 100' well-protection-radius located entirely on it's own lot or appropriate covenants/easements obtained (per Skagit County Code 12.48.240(5).

Setbacks Distances from Well To:

Septic Tank_____Feet

Neighbor's Septic Tank_____Feet

Drainfield_____Feet

Neighbor's Drainfield_____Feet

Replacement Area_____Feet

Neighbor's Replacement Area_____Feet

Cesspool/Privy_____Feet

Underground Storage Tank_____Feet

Chemical/Pesticide Storage_____Feet

Nearest County/State Road_____Feet

Railroad Tracks_____Feet

Nearest Lake/Stream/Swamp_____Feet

Animals (cows, horses, etc.)_____Feet

Manure Lagoon or Pile/Barn_____Feet

Highest Ground Possible? Yes No

Uphill From Contamination Yes No

Nearest Property Line_____Feet

If Less Than 100", Covenants/Easement Obtained? Yes No

****

Multiple well sites Yes No (please identify each well site with a number; preferably the DOE TAG #'s)

Well site approval by: Health Department or licensed well driller_____

Well is drilled? No Yes If yes, attach a well log and answer the following

Date_____ Driller_____

Depth:_____Ft. Well Produces:_____gallons/day?

Form completed by:_____ Date:_____

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Water Quality and Quantity for Individual Wells

In order to drill a well a licensed driller will first obtain a permit from the State Department of Ecology.

Water Quantity – Once the well is drilled, your well driller will test the well for one hour to determine quantity. The well driller will provide you with a Well Water Report which contains the quantity information (located in lower left portion). County water code 12.48 states your well must produce 350 gallons per day. However, it is usually desirable to design for 800 gallons a day for irrigation during the summer months.

Water Quality – To test quality, an inorganic and bacteriological test must be obtained.

Inorganic

The following inorganic parameters are required for an individual well evaluation:

Inorganic	Health or Aesthetic Concerns
Arsenic	Skins and central nervous system damage
Antimony	Gastrointestinal illness & potential human carcinogen (long term)
Barium	Muscle stimulant, increase in blood pressure
Chromium	Liver and kidney damage
Fluoride	Bone damage (4.0+), tooth pitting and discoloration (2.0+), reduces tooth decay (.7 – 1.2)
Lead	Central and peripheral nervous system and kidney damage
Mercury	Central nervous system and kidney damage
Nitrate	Reduces blood's ability to carry oxygen in newborn infants
Selenium	Skin and gastrointestinal damage
Chloride	Objectionable taste and corrosion of pipes
Sodium	Increased blood pressure
Conductivity	Good indicator of contamination
Iron	Gastrointestinal and objectionable taste, odor & staining
Hardness	Deposits
Manganese	Taste, odor and staining; Central nervous system at high levels
PH	Low Ph: bitter metallic taste: corrosion High Ph: slippery feel; soda taste; deposits
Total Dissolved Solids	Hardness: deposits; colored water; staining; salty taste
Turbidity	Cloudy water; interferes with treatment or disinfection

Some people might choose to complete the full inorganic package. This would also include copper, iron, sulfate, and zinc, color, and total dissolved solids. Iron and Manganese can be problematic in our county.

Bacteriological

Health concern potential for infectious disease when there are indicators of contamination.

Certified Laboratories for Inorganic Chemistry and Bacteriological Testing

A statewide list is available from the Health Department.

AM Testing, Inc.
14603 NE 87th Street
Redmond, WA 98052
(206)885-1664

Laucks Testing 940
S. Harney Street
Seattle, WA 98108
(206)767-5060

Edge Analytical
1620 S. Walnut
Burlington, WA 98233
(360)757-1400

Cascade Analytical Service
3640 S. Cedar Street, Suite 0
Tacoma, WA 98409
(206)472-6909

AVOCET Envir. Testing
1500 N. State Street
Bellingham, WA 98225
(360)734-9033

WA State Lab-Envir. Service
1610 NE 150th Street
Seattle, WA 98155-7224
(206)361-2910

Site Plan Requirements

12.48.30 Definition 15. PLOT PLAN

"Plot plan" means a project site drawing depicting:

(a) First and second choice for well location with one hundred (100) foot radius; and

(b) Within one hundred (100) feet of the well:

(i) Property dimensions, easements, related zoning and north indicator arrow,

(ii) Adjoining properties,

(iii) Existing and proposed septic tanks, drainfields and replacement drainfield areas, privies, and wastewater piping,

(iv) Existing and proposed buildings and roads (public and private) with distances,

(v) Lakes, streams, ditches, and swampy areas,

(vi) Slope with direction and percent, and

(vii) Other potential sources of contamination (e.g., underground storage tanks, railroad tracks, etc.).

Flow Sensitive Basins

12.48.060 Flow-sensitive basins—Public water system responsibilities, Health Officer duties and exemptions.

Notice to Applicants: New water systems using wells drilled after April 14, 2001 in the Skagit River Basin and September 26, 2005 in the Stillaguamish River Basin will be counted against their respective tributary reservations (see SCC 12.48.060 or WAC 173-503 Skagit River Rule or 173-505 Stillaguamish River Rule for more details)

Individual Water System Evaluation

12.48.90 Individual well site approval.

(1) Well site approval for an individual water system must be performed by the SCPHD or a licensed well driller. The Health Officer has the option to view the well site prior to drilling. The applicant is responsible for advising the inspecting authority regarding the location of all potential sources of contamination.

(2) Lots with Individual Water Systems.

(a) For lots created before January 1, 1992, individual water systems should have one hundred (100) foot minimum well protection zones.

(i) If the well is located on property not owned by the applicant, the applicant will provide proof of easements and/or covenants to the SCPHD; and

(ii) The well must meet Chapter 173-160 WAC.

(b) For lots created after January 1, 1992, applicants for individual water systems must follow the provisions of SCC 12.48.240.

(c) Single-family residences and private roads are not considered a source of contamination for individual systems. Greater setback distances may be required by the Health Officer based on geological and hydrological data or local water quality trends.

(3) Wells located within the sphere of influence of an underground storage tank will comply with Chapter 173-360 WAC. If it is exempted from the underground storage tank regulations, the SCPHD may require appropriate mitigations. (Ord. O2007004 (part): Ord. 14063 (part), 1991)

12.48.110 Individual water system utilizing drilled wells.

(1) An applicant proposing to rely on an individual water system to provide safe and reliable potable water service shall provide evidence of an adequate water supply by submitting the appropriate documents and meeting the requirements of this section:

(a) Water right permit, if required. Water right permit applications and water well reports are not acceptable substitutes.

(b) If the point of withdrawal for an individual water system is located within a flow-sensitive basin as defined in SCC 12.48.030, the applicant must demonstrate that there are no existingpublic water systems that are able to provide safe and reliable potable water service in a timely and reasonable manner.

(c) Well site approval document issued by the SCPHD or licensed well driller.
(d) Application with scaled plot plan of the project site.
(e) For properties requiring or containing on-site sewage systems, the SCPHD approved sewage system site evaluation(s) shall be included. Site evaluations or designs shall show location and general boundaries for components of the proposed or existing sewage systems.
(f) A detailed water well report.
(g) The written results of a bailer, air line, or pump test, any of which is performed for a minimum of one hour, verifying a minimum well yield of three hundred fifty (350) gallons per day.
(h) Water quality results, analyzed by a DOH certified laboratory, verifying compliance with minimum standards, including:
(i) Bacteriological satisfactory analysis result for sample collected within the past six months;
(ii) Inorganic chemicals and physical characteristics as listed in Table 1.

Table 1

Inorganic chemical or physical characteristic	MCL (in mg/L unless otherwise stated)
Arsenic	0.05
Antimony	0.006
barium	2.0
Chromium	0.1
fluoride	4.0
mercury	0.002
nitrate	10.0
selenium	0.05
chloride	250
conductivity	700 µmhos/cm
iron	*
lead	*
Hardness	*
manganese	*
pH	*
sodium	*
total dissolved solids	*
turbidity	*

*no MCL

(A) Results that are above the maximum contaminant level must be resampled to confirm contamination.
(B) Inorganic testing will be acceptable for five years.
(iii) Such other parameters that the Health Officer deems significant based upon local trends of water quality.

(i) Construction documents or general as-built plans, as required.
(j) Additional information deemed necessary by the Health Officer.

(2) For systems needing water treatment equipment, as determined by the Health Officer, detailed water treatment plans will be reviewed by the SCPHD prior to installation, and raw and finished water will be evaluated for potability.
(3) The SCPHD evaluation will be satisfactorily completed before the applicant connects to the well. If SCPHD finds that a health hazard exists and no remedial treatment is available, and unsatisfactory evaluation will result.
(4) A satisfactory well site evaluation will be valid for five years provided that an updated plot plan demonstrates no potential contamination and that nearby wells drilled after the initial evaluation show adequate quality and quantity.
(5) Connecting an individual water system to another water system or water source without approval is prohibited. (Ord. O2007004 (part): Ord. 15314 (part), 1994; Ord. 14063

Water Requirements for Land Divisions

12.48.240 Water requirements for land divisions.

(1) Each applicant for approval of a land division must provide evidence of an adequate water supply for the land division as provided under this Chapter. Land division .applications to PDS must include:

(a) A satisfactory evaluation by the SCPHD declaring that a public water system will serve the land division; or satisfactory evaluation(s) of the existing individual water system(s) as required in SCC 12.48.110.

(b) If the land is not in a sensitive area and the applicant chooses to submit the land division application without the completed individual water system evaluation(s), the applicant is required to follow the following procedure:

(i) Step one is a SCPHD aquifer assessment with field visit which is to be completed prior to the submission of the PDS application. The applicant will sign and have notarized a disclaimer which acknowledges that the land division will not be approved until the SCPHD satisfactorily evaluates the individual water system(s). Depending on the aquifer assessment information submitted, the SCPHD will conclude one of the following:

(A) The development appears to be within or near a sensitive area and each lot must have a satisfactorily evaluated water system.

(B) The development appears to be in an area which has an adequate potable water supply, requiring only one of every four (4) lots in the proposed development to obtain a satisfactorily evaluated individual water system. Well locations must be representative of the geology and topography of the development and approved by the SCPHD. If any of the representative wells result in an unsatisfactory evaluation, SCPHD will declare all lots in the development to be within a sensitive area per SCC 12.48.260.

(C) If sufficient hydrogeological information is not available to make an assessment, the PDS shall not approve the land division application. Additional hydrogeological information will be requested by the SCPHD and may include additional wells with pump test data.

(ii) Step two is the appropriate evaluation(s) which is to be completed prior to the land division approval.

(c) Bacteriological tests may be waived at the discretion of the SCPHD.

(2) Requests to the PDS for final land division approval must include:

(a) Evidence that all lots have been stubbed at the property line or that buildings have been connected. Appropriate bonding will also be acceptable.

(b) Evidence that the SCPHD has confirmed compliance with Subsection (4) of this Section.

(3) All final plats will have notes that describe the approved public water system. If the water is to be supplied from individual water systems, the following statement shall be shown on the final plat:

Water will be supplied from individual water systems. Contact Skagit County Health Department to determine if additional water quality or quantity testing will be required for building permit approvals.

(4) All land division applicants proposing lots of less than five (5) acres in size must show well protection zone(s) and approved on-site sewage system area(s) on all preliminary and final plat maps.

(5) The one hundred (100) foot radius well protection zone for individual water systems must be located entirely on the proposed lot owned in fee simple, or the owner must have the right to exercise complete sanitary control of the land within the required well protection zone through other legal provisions, such as recorded covenants or easements. (Ord. O2007004 (part): Ord. 14063 (part), 1991)

Skagit County Planning & Development Services
1800 Continental Place • Mount Vernon, WA 98273
Office (360) 336-9410 • Fax (360) 336-9416 • Inspections (360) 336-9306

Washington State Department of Health (DOH)
Nitrates in Drinking Water
Position Paper

Purpose

Nitrate contamination of drinking water supplies is an issue of concern for regional, state, national, and international public and environmental health practitioners. Ingestion of nitrate can cause anemia and, if not treated, death to young infants. The information in this paper is intended to increase local health officials' understanding of nitrate contamination in water and provide helpful recommendations in addressing these problems.

Background: What is the Contaminant, What is the Concern

Nitrate is considered an "acute contaminant" because short-term exposures to levels above the Maximum Contaminant Level (MCL)[1] can cause methemoglobinemia, a blood disorder, in sensitive individuals (especially young infants). Elevated levels of nitrate may also indicate that the water source is susceptible to other contaminants, such as microbial pathogens and pesticides.

The MCL for nitrate is 10 milligrams per liter (10mg/l). Unlike most drinking water MCLs, the nitrate MCL is based upon an observed human effect in highly sensitive persons. There is no safety factor incorporated into the standard. In fact, cases of methemoglobinemia are known to have occurred in infants exposed to nitrate concentrations only slightly above 10mg/l.

No information is currently available linking adverse health impacts for Washington residents to nitrate exposure through drinking water. However, portions of Adams, Benton, Clark, Franklin, Grant, King, Thurston, and Whatcom Counties have nitrate concentrations in ground water that exceed 10mg/l. Of particular concern are persons using private or domestic (nonpublic) wells that receive little or no water quality monitoring. Without monitoring, users may not realize they are being exposed to elevated nitrate levels. In addition, nitrate concentrations often fluctuate, so a single sample may not represent the average or peak concentration within the water supply.

Source of the Contaminant/Agent: Common Routes of Exposure

Sources of excess nitrate in drinking water include fertilizers, animal manure piles, and septic systems. Shallow wells, poorly sealed or constructed wells, and wells that withdraw from unconfirmed water table aquifers are at highest risk.

Infants are most commonly exposed to high nitrate levels when contaminated drinking water is used to make formula and beverages.

Affected Populations and Clinical Manifestations

At particular risk are infants less than one year old, pregnant women, and persons of all ages with reduced gastric acidity or a hereditary lack of methemoglobin reductase. In some situations, ingestion of high levels of nitrate leads to methemoglobinemia, a condition that renders the hemoglobin in an individual's red blood cells less capable of transporting oxygen from the lungs to the rest of the body.

This can result in an anemic condition. A dusky or blue hue may affect the skin tone of persons who suffer methemoglobinemia. Untreated, the condition can be fatal. Elevated levels of nitrate also can cause diarrhea and other gastrointestinal symptoms.

Based upon national data, even short-term consumption of water with nitrate levels above the MCL can cause methemoglobinemia in infants less than one year of age. At greatest risk are infants younger than three months. As the infant matures, its' blood changes over from fetal hemoglobin to adult hemoglobin. As the infant reaches six months of age, most of the hemoglobin is adult hemoglobin. Susceptibility decreases then and the symptoms disappear. Any damage caused by anemia in the early months of life may not be detectable for several years.

Labored breathing, low blood pressure, below average weight gain, failure to meet developmental milestones, and respiratory exhaustion are additional findings in young infants[2]. Methemoglobinemia is difficult to diagnose and is easily mistaken for other "normal" early infant illnesses involving fatigue, diarrhea, lassitude, or failure to thrive. Often the illness may be misdiagnosed unless death occurs and the condition is detected during the autopsy, if a blood sample is taken, or the dusky or bluish skin color is observed by a parent or health care provider aware of the potential for methemoglobinemia caused by drinking water.

Public Health Implications

Among infants less than one year old, pregnant women, and persons of all ages with reduced gastric acidity or a hereditary lack of methemoglobin reductase, those most at risk for exposure are those who depend upon private domestic wells for their drinking water. Most private domestic wells are shallow, often located near potential sources of nitrate contamination (such as septic tanks or agricultural areas), and rarely have their water quality assessed on a periodic basis.

Determination of how common methemoglobinemia caused by exposure to nitrate-contaminated drinking water has been in Washington is difficult because methemoglobinemia is not a reportable illness. Available data are based upon mother or health care provider recall. Until caregivers are made more aware of the potential for methemoglobinemia, the number of cases reported will not be a reliable measure of the problem. Instead, the seriousness of the potential health impacts to infants and other sensitive populations is the criteria defining the public health significance.

Legal Standards and/or Requirements

The MCL of 10mg/l for nitrate-nitrogen in drinking water was established by the World Health Organizations and the US Environmental Protection Agency. This level was adopted as a standard by the Washington State Board of Health under Chapters 246-290 and 246-291 WAC.

Public water systems are required to monitor nitrate concentrations on a periodic basis (every one to three years). If nitrate concentrations above one-half of the MCL are detected, the water system is required to monitor the source on a quarterly basis. If a concentration above the MCL occurs, the water system must notify all customers so sensitive individuals can be protected. Public water systems also are required to evaluate the development of alternate drinking water sources and treatment/blending options when technologically and economically feasible to reduce the nitrate concentration.

Legal water quality monitoring requirements for owners of private domestic drinking water wells apply only at the initial approval stage. Depending upon when and where the well was drilled, requirements for monitoring the nitrates at the time of drilling or subsequently may not exist.

Recommended Prevention and Response Actions

Most preventive measures and response actions to address nitrate contamination in Washington fall into one of several major categories: new drinking water source approvals; public health surveillance and assessments; educational outreach, including targeted outreach for private well owners; and

continued environmental assessments/data collection.

New Source Approvals

One of the most effective preventive measures is to reduce or eliminate the use of nitrate-contaminated water by new drinking water systems. DOH and local health jurisdictions can accomplish this by coordinating with building officials during water supply adequacy and potability determinations for building permit applications under the state's Growth Management Act.

Future water quality monitoring for potability and adequacy of drinking water in Washington should include nitrate as an analyzed parameter.

New Public Water Systems

When nitrate is detected at concentrations between 5 mg/l and 10 mg/l, public water systems are required to monitor for nitrate on a quarterly basis to better characterize changes over time; evaluate potential sources of nitrate, other contaminants, and microbes; and identify available resources for installing, operating, and maintaining a water treatment process or other mitigation measures.

If the concentration of nitrate equals or exceeds the MCL (10 mg/l), public water systems should be required to install and operate a water treatment system, or take other mitigation measures that will reduce nitrate (plus any other contaminants) concentrations below the MCL.

Public water systems should also be required to show the capability to maintain the water treatment process (or other mitigation measures) over an extended period of time prior to receiving approval or a finding of adequacy.

New Individual Water Systems

Health officials should consider requiring private water systems that exceed 5mg/l of nitrate be connected to existing or future public water systems. State guidelines already recommend water treatment systems be installed if nitrate concentrations exceed the MCL of 10mg/l.[3]

Owners or developers of private domestic water systems with nitrate levels at or above 10 mg/l should be required to treat water or provide alternate drinking water supplies if they serve vulnerable persons (e.g., infants less than one year of age, pregnant women, and persons of all ages with reduced gastric acidity or a hereditary lack of methemoglobin reductase). These owners or developers also should be required to inform future owners or consumers of the potential hazards associated with elevated nitrate concentrations (disclosure on the property title plus other mechanisms).

Personal Health Surveillance and Assessments

Immediate, ongoing efforts should be taken to identify and educate vulnerable persons and their health care providers about the potential dangers of nitrate ingestion so they will evaluate the quality of their drinking water supplies.

In conjunction with local public health agencies, the DOH Office of Environmental Health Assessment Services will evaluate establishing an epidemiological surveillance program to detect any new cases of methemoglobinemia for investigation and intervention.

Educational Outreach

Health care professionals and the public should be made aware of the potential hazards and clinical manifestations associated with elevated nitrate levels in drinking water, especially methemoglobinemia. Development and distribution of appropriate educational materials is a joint responsibility of the state and local health jurisdictions. DOH will take the lead in developing educational materials and will assist local health jurisdictions in their distribution.

In areas where evidence suggests there may be nitrate contamination of ground water used for drinking, educational materials should be developed and distributed to private well owners. These materials should explain why it is important to monitor drinking water quality, ways to minimize current and future risks of contamination, and how people can get their well water tested. It is important that these educational materials be used in conjunction with efforts to implement long term solutions to reduce nitrates.

Continued Environmental Assessment

Public and environmental health agencies should continue to assess water supplies to determine the extent and degree of nitrate contamination, incidence of health effects, and the characteristics of the affected persons. When wells are determined to be contaminated with nitrate, a site-specific evaluation should be made to identify the source of the nitrates and corrective measures to lower nitrate concentrations. Efforts to better coordinate water quality data collection and management are needed to summarize and analyze existing information, and identify data gaps and problem areas.

The state Interagency Ground Water Committee is the appropriate lead entity at the state level to lead this data management project.

(1) The maximum permissible level of a contaminant in water delivered to any public water system user. Nitrate is generally measured as NO_3 – N (nitrate – nitrogen). When measured as nitrate – nitrogen, the MCL is 10 milligrams per liter (mg/l). It can also be measured as nitrate only, in which case the MCL is 45mg/l NO_3.

(2) Please refer to *ATSDR's Case Studies in Environmental Medicine: Nitrate/Nitrite Toxicity* for more detailed information on diagnosis and treatment of methemoglobinemia. See reference section at the end of this paper for information on how to obtain a copy.

(3) *Guidelines for Determining Water Availability for New Buildings*, Washington State Departments of Ecology and Health, Ecology Publication 93-27, 1993.

References

An overview of diagnosing nitrate toxicity is presented in the *ATSDR's Case Studies in Environmental Medicine: Nitrate/Nitrite Toxicity*. Copies of this document can be obtained by contacting ATSDR at:

Continuing Education Coordinator
Agency for Toxic Substances and Disease Registry
Division of Health Education, E33
1600 Clifton Road NE
Atlanta, GA 30333

Department of Health Points of Contact:

Division of Drinking Water	-David Jennings	(360)586-9041
Office of Epidemiology	-Paul Stehr-Green	(360)705-6040
Interagency Ground Water Committee (Department of Ecology)	-Diane Dent-White	(360)407-6616
Website:	-http://www.doh.wa.gov/ehp/dw	

C Jimmie Fields — 8/8/97

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Date