

## APPENDIX L

### ISLAND COUNTY HEALTH DEPARTMENT SALT WATER INTRUSION POLICY FOR PUBLIC WATER SYSTEMS

STATE OF WASHINGTON DEPARTMENT OF HEALTH  
ISLAND COUNTY HEALTH DEPARTMENT  
SALT WATER INTRUSION POLICY  
FOR PUBLIC WATER SYSTEMS

**I. THE PROBLEM**

When groundwater is pumped from aquifers that are in hydraulic connection with the sea, the gradients that are set up may induce a flow of salt water from the sea toward the well. This migration of salt water into freshwater aquifers under the influence of groundwater development is known as sea-water intrusion (Walton, 1970:6). This same process is also known as saline-water intrusion (Dion and Sumioka, 1983:4).

The occurrence of salt water intrusion is identified by increasing concentrations of sodium and chloride and by elevated specific conductivity and dissolved solids. Typically, the concentration of chloride ions in water is used to identify salt-water intrusion.

Salt water intrusion is a problem in the Puget Sound area. This is supported by the U.S. Geological Survey in its National Water Summary 1983 - Hydrologic Events and Issues<sup>2</sup> which states:

"The islands of Island and San Juan Counties are being affected by saline-water intrusion, which is expected to worsen with continued groundwater use. Increased chloride concentrations, some in excess of 500 milligrams per liter, have been detected in water from 10 to 15 percent of the nearly 300 wells sampled by Whiteman and others (1983)<sup>3</sup>. Saline-water intrusion also is occurring at other major islands and along coastal areas, especially along Puget Sound (Dion and Sumioka, 1983)<sup>4</sup>." (U.S. G.S. Water-Supply Paper 2250, 1984, pg 227)

The Rules and Regulations of the State Board of Health Regarding Public Water Systems (WAC 248-54, Maximum Contaminant Levels) lists sodium as a primary chemical contaminant with an unspecified maximum contaminant level. Chloride is listed as a secondary chemical contaminant at levels of 250 mg/l or more.<sup>1</sup> DOH considers the problem of saltwater intrusion worthy of attention through the development of a specific policy.

**II. PURPOSE OF POLICY**

The purpose of this policy is to responsibly manage the approval of new public water systems as well as classify and monitor existing public water systems with respect to the problem of salt water intrusion. Through this policy it is hoped that the problems of degradation of drinking water quality or loss of water system source due to salt water contamination will be reduced or eliminated.

### III. POLICY APPLICATION

This policy shall apply to all new, existing non-expanding and expanding public water supply systems in Island County which use or propose to use ground water as a water source.

### IV. DEFINITIONS

**AQUIFER:** A geological formation, group of formations, or part of a formation capable of yielding a significant amount of ground water to wells or springs.

**COMPLETED WATER SYSTEM:** A public water system not planning to increase its present number of service connections.

**EXISTING EXPANDING WATER SYSTEM:** A public water system identified in the Island County Coordinated Water System Plan (CWSP) as having future service areas.

**EXISTING NON-EXPANDING WATER SYSTEM:** A public water system having no planned future service area and planning to complete service to approved connections.

**NEW WATER SYSTEM:** A public water system created after October 1, 1988 or not identified in the Island County CWSP. (Water systems developing a new well source are included in this category).

**PUBLIC WATER SYSTEM:** Any water supply system intended or used for human consumption or other domestic uses, including source, treatment, storage, transmission, and distribution facilities where water is furnished to any community or group of individuals, or is made available to the public for human consumption or domestic use, but excluding all water supply systems serving one single family residence.

**SALINE-CONTAMINATION:** Occurrence of chloride and or specific conductivity in public water supplies at concentrations which exceed the specified maximum contaminant levels. Maximum contaminant levels are 250 mg/l for chloride and 700 unhos/cm for specific conductivity. Sodium is listed as a primary contaminant with an unspecified maximum concentration level.

**SALT WATER INTRUSION:** Replacement of pumped fresh water by saline contaminated water in an aquifer; typically evidenced by well water samples showing values of 100 mg/l or greater of chlorides.

### V. POLICY ORGANIZATION/PROCEDURE

Requirements for approval for new or existing expanding water systems are outlined in Rules and Regulations of the State Board of Health Regarding Public Water Systems, Rev. Feb 1988, (WAC 248-54). This policy is not intended to substitute or replace any part of WAC 248-54.

This policy establishes three (3) categories of saline contamination risk for all public water supply systems existing and proposed which use or propose to use ground water as the water source. This policy further establishes standard requirements for water systems within each risk category. The requirements are based on information submitted as required under WAC 248-54.

The following is a general outline of the salt water intrusion evaluation process which DOH and Island County Health Department will follow. Island County Health Department will initially classify water systems into one of three categories based on their proximity to existing systems or on the history of a system's chloride analyses. Island County Health Department and DOH will then develop a pump test protocol for existing expanding and new water systems, including chloride analysis requirements. Using the information obtained from the pump test and evaluating site specific characteristics, DOH will make the final classification which will determine departmental requirements. The categorization criteria, supporting information to be requested and Department's requirements are listed under each water system grouping. We advise water purveyors or potential water purveyors to review the categories to get a general idea of what information will be required for DOH/ICHD review.

## VI. RISK CATEGORIES

### LOW RISK

#### 1. Criteria

- a. History of chloride analyses from water system's existing sources showing concentration less than 100 mg/l (existing systems) or;
- b. Chloride concentrations of new source of less than 100 mg/l based on certified lab test. NOTE: A 24 hour pump test may be required, to further assess the salt water intrusion potential.
- c. Not in proximity ( $\frac{1}{2}$  mile) to any groundwater source with chloride concentrations equal to or greater than 100 mg/l.

### MEDIUM RISK

#### 1. Criteria

- a. A history of chloride analyses from water system's existing sources showing concentrations over 100 mg/l but under 200 mg/l (existing systems), or;
- b. Located within  $\frac{1}{2}$  mile of a groundwater source with chloride concentrations between 100 mg/l and 200 mg/l.
- c. Certified lab tests from proposed source showing chloride concentrations in the 100 to 200 mg/l range.

## HIGH RISK

### 1. Criteria

- a. A history of chloride analyses showing concentrations over 200 mg/l; and/or
- b. Located within  $\frac{1}{2}$  mile from a groundwater source with chloride concentrations greater than 200 mg/l.
- c. Results of certified lab test from proposed water source sample showing chloride concentrations in excess of 200 mg/l.

## VII. REQUIREMENTS

### A. COMPLETED WATER SYSTEMS

- 1. Low Risk Areas - No requirements
- 2. Medium Risk Areas
  - a. Chloride and conductivity sampling and analysis by certified lab required for each source in August each year.
- 3. High Risk Areas
  - a. Chloride and conductivity sampling and analysis by certified lab required for each source in April and August each year.

### B. EXISTING NON-EXPANDING WATER SYSTEMS

- 1. Low Risk Area - No requirements
- 2. Medium Risk Area
  - a. Annual reporting to DOH of analysis for chlorides and conductivity required. Sampling and analysis by a certified lab to be performed in April and August of each year.
  - b. Recommend analysis of problem and investigation of solutions. Department is available for assistance.
- 3. High Risk Area
  - a. Annual reporting to DOH of analysis for chlorides and conductivity required. Sampling and analysis by a certified lab to be performed in April and August of each year.
  - b. Annual reporting of monthly source meter readings required.
  - c. Require investigation of possible mitigation measures.
  - d. Existing non-expanding systems within this category with chloride concentrations greater than 250 mg/l will have moratoriums placed on new hook-ups.

## VII. REQUIREMENTS (Continued)

### C. EXISTING EXPANDING WATER SYSTEMS

#### 1. Low Risk Area

- a. A chloride test (for each source) may be required once each year during August.
- b. Water conservation practices incorporated into the operation and maintenance agreement are recommended.
- c. Individual meters may be required in addition to source meter requirement.
- d. Recommend phase development, or require it in the case of rising chloride concentrations - or lack of data.
- e. Special design requirements requested, for example on the construction or operation of the well. This requirement may be needed in some cases to protect other public water supplies that may have previously installed deeper wells.

#### 2. Medium Risk Area

- a. Pump test protocol set up by Island County Health Department and DOH based on hydrogeology of area.
- b. Annual reporting to DOH of analysis for chlorides required. Sampling and analysis by a certified lab to be performed in April and August of each year.
- c. Water conservation practices incorporated into the operation and maintenance agreement are recommended.
- d. Source and individual meters for expansion portion required.
- e. Appropriate design modifications are likely to be required (for example raise pump intake or reduce pumping rate and increase storage).
- f. Phase development is likely to be required.
- g. A current engineering report including a hydrogeologic evaluation of the potential for intrusion, may be required.
- h. Future degradation of water quality or rising of chloride concentrations in water source may halt development at current levels, even if system is approved for additional connections.

#### 3. High Risk Area

- a. (a) through (h) as listed for "Medium Risk".
- b. New or expanding systems will be denied or modified unless applicant can develop mitigating measures to reduce intrusion contaminating risk.

## VII. REQUIREMENTS (Continued)

### D. NEW WATER SYSTEMS (NEW WELL SOURCES)

#### 1. Low Risk Area

- a. Pump test as required by DSHS Policy (Sept 1987). Chloride analysis sample taken at beginning of test. Sample for complete inorganics taken at end of test. Samples must be analyzed at a certified lab.
- b. A chloride test (for each source) may be required once each year during August.
- c. Water conservation practices incorporated into the operation and maintenance agreement are recommended.
- d. Individual meters may be required in addition to source meter requirement.
- e. Recommend phase development, or require it in the case of rising chloride concentrations - or lack of data.
- f. Special design requirements requested, for example on the construction or operation of the well. This requirement may be needed in some cases to protect other public water supplies that may have previously installed deeper wells.

#### 2. Medium Risk Area

- a. Pump test protocol set up by Island County Health Department and DOH based on hydrogeology of area.
- b. Annual reporting to DOH of analysis for chlorides required. Sampling and analysis by a certified lab to be performed in April and August of each year.
- c. Water conservation practices incorporated into the operation and maintenance agreement are recommended.
- d. Source and individual meters required.
- e. Appropriate design modifications are likely to be required (for example raise pump intake or reduce pumping rate and increase storage or multiple wells).
- f. Phase development is likely to be required.
- g. An engineering report including a hydrogeologic evaluation of the potential for intrusion, may be required.
- h. Future degradation of water quality or rising of chloride concentrations in water source may halt development at current levels, even if system is approved for additional connections.

#### 3. High Risk Area

- a. (a) through (h) as listed for "Medium Risk".
- b. New or expanding systems will be denied or modified unless applicant can develop mitigating measures to reduce intrusion contaminating risk.

## VIII. REFERENCES

1. Rules and Regulations of the State Board of Health Regarding Public Water Systems, Revised February 1988.
2. National Water Summary 1983 - Hydrologic Events and Issues, U.S. Geological Survey Water-Supply Paper 2250, 1984.
3. Whiteman, K.J., Molenaar, Dee, Bartleson, G.C. and Jacoby, J.M., 1983. Occurrence, Quality and Use of Ground Water in Orcas, San Juan, Lopez, and Shaw Islands, San Juan County, Washington: U.S. Geological Survey Water Resources Investigations 83-4019, 12 sheets.
4. Dion, N.P., and Sumioka, S.S., 1983, Seawater Intrusion Along Costal Washington, 1978: Washington Department of Ecology Water Supply Bulletin 56. (in press)
5. Davis, S.N. and R.J.M DeWiest, 1966, Hydrogeology, John Wiley and Sons, Inc., pgs 43, 237.
6. Walton, Wm. C., 1970, Groundwater Resource Evaluation, McGraw-Hill, pg 375.

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