

WAC 197-11-960
ENVIRONMENTAL CHECKLIST

Tacoma-Pierce County Health Department Fluoridation Resolution

A. BACKGROUND

1. *Name of the proposed project:*

Tacoma-Pierce County Health Department Fluoridation Resolution

2. *Name of Applicant:*

Tacoma-Pierce County Health Department

3. *Address and telephone number of applicant and contact person:*

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4. *Date checklist prepared:*

August 2002

5. *Agency requesting checklist:*

Tacoma-Pierce County Health Department

6. *Proposed timing or schedule (including phasing, if applicable):*

The resolution will be presented to the Tacoma-Pierce County Board of Health for possible adoption in October 2002. The implementation schedule has not been finalized; however, water purveyors are likely to be required to fluoridate by January 1, 2004.

7. *Plans for future additions, expansion, or further activity related to or connected with this proposal:*

The resolution would require all water purveyors in the County serving 5,000 or more people to add fluoride to their water supplies. The purveyors would be installing the fluoridation equipment and fluoridating their water supplies sometime between passage of the resolution and January 1, 2004, the deadline anticipated to be adopted for purveyors to fluoridate drinking water.

8. *Environmental information that has been prepared, or will be prepared, directly related to this project:*

There have been numerous studies prepared on the effects of fluoridation (see attached literature reviews on human health and fish effects). On the national level, an Environmental Assessment was recently prepared related to fluoridation of the Fort Detrick, Maryland water supply (U.S. Army, 2002).

The Tacoma-Pierce County Health Department compiled extensive documentation on fluoridation that was presented to the Board of Health. An index of that information is contained in Appendix A of this document ("Supporting Documents for SEPA Threshold Determination"). Based on the extensive existing environment information, the Department determined it was not necessary to prepare additional environmental analysis directly related to the proposal.

9. *Applications that are pending for governmental approvals or other proposals directly affecting the property covered by the proposal:*

None.

10. *List of governmental approvals or permits that will be needed for the proposal:*

The proposed resolution requires the approval of the Tacoma-Pierce County Board of Health. Purveyors are required to obtain written approval from the Washington Department of Health prior to placing fluoridation treatment facilities in service (WAC 246-290-460).

Site specific building permits may be required if purveyors construct new facilities.

11. *Brief, complete description of the proposal, including the proposed uses and the size of the project and site:*

The Tacoma-Pierce County Board of Health exists under state law to preserve, promote and improve public health, and to control and prevent contagious and infectious disease. The Board has identified dental caries (tooth decay) as an infectious, contagious disease affecting a majority of Pierce County residents, with persons of low socioeconomic status or low levels of parental education believed to be at increased risk. In reviewing the alternatives for addressing this problem, the Board reviewed studies and heard testimony that public education efforts, including distribution of toothbrushes and fluoride toothpaste or mouthwash, have been ineffective alternatives for reducing tooth caries. Based on public testimony and an extensive review of relevant

documentation, the Board believes that fluoridation of the public drinking supply is the most effective, equitable, and cost-effective alternative for improving the dental health of County citizens. Fluoride has been shown to be an effective means of preventing tooth decay. Fluoridation of public water systems has been used as a means of providing this beneficial effect to individuals who receive water from a public source. Fluoridation of public water supplies in the United States began in the 1940s. Numerous studies performed since then have shown a positive correlation between water fluoridation and a reduction in tooth decay (see for example, Department of Health and Human Services, 1991; National Research Council, 1993; Ripa, 1993; American Dental Association, 2000; Banks, M., 2001; American Dental Association, 2002; American Water Works Association, 2002). Fluoridation of water supplies to prevent tooth decay is endorsed by the American Dental Association, the Washington State Dental Association, the American Medical Association, and the Association of State and Territorial Health Officers. The Washington Dental Service Foundation is supporting fluoridation of water supplies in Pierce County by providing purveyors with grants for fluoridation design, equipment, and/or installation.

Fluoridation is widespread in the United States. Approximately 48 water systems in Washington fluoridate their water supplies including Seattle, Poulsbo, Ellensburg, Everett, Cheney, Port Gamble, Centralia, Chehalis, Raymond, Lynden, and Pullman. In Pierce County, Tacoma, Fircrest, Fort Lewis, and McChord Air Force Base already fluoridate their water supplies.

Adoption of the resolution would impose requirements on 14 water suppliers in the County, as listed in the response to question A. 12 below. All of these purveyors use groundwater wells for their water source and would add fluoride to their drinking water supplies at each of their well houses. Purveyors would be required to fluoridate to levels between 0.8 to 1.3 mg/L (0.8 to 0.3 parts per million). If all purveyors comply with the resolution, approximately 238,000 additional people in Pierce County would receive fluoridated drinking water. This would increase the percentage of County residents receiving fluoridated water from 43 percent to 77 percent.

The method of fluoridation that the Tacoma-Pierce County Public Health Department is recommending is sodium fluoride saturation. This method is most applicable to the well supplies of the affected purveyors because it is a fairly simple system, has minimal hazards compared to other fluoridation methods, and is less expensive for small systems (EES, 2002). Sodium fluoride is available as a dry powder or in the form of crystals.

A typical equipment set up for sodium fluoride saturation consists of a fluoride saturator, a water softener, and a fluoride solution metering pump. A typical system is illustrated in Figure 1. The fluoride saturator is a free-standing, polyethylene tank that mixes the sodium fluoride with untreated water. A water softener is required for systems that have a water hardness level above 50 mg/L (U.S. Department of Health and Human Services, 1986). Only the water used for the solution preparation (the make-up water) needs to be softened, not the entire water supply (U.S. Department of Health and Human Services, 1986). The water softener uses sodium chloride and reduces the amount of calcium fluoride that accumulates in the saturator. The fluoride solution metering pump pumps the sodium fluoride from the saturator and injects it into the raw water line.

Additional equipment required includes an electronic flow meter to measure the raw water flow rate and fluoride analytical equipment. All of the sodium fluoride equipment requires a maximum area of approximately 64 square feet (EES, 2002). In addition, each purveyor would need at least one location within its jurisdiction to store the sodium fluoride and sodium chloride. This storage location could be at the well site or at an off-site location. A majority of the purveyors currently store chemicals such as chlorine and sodium hydroxide.

The technology for fluoridating water supplies has been proven to be safe (U.S. Health and Human Services, 1986). Fluoride feeders are designed to stop operating if there is an accident or malfunction. The fluoride solution metering pumps that would be installed would be interlocked to the well pump power so that the metering pumps would not run unless the well pumps are operating. This would avoid excessive concentrations of fluoride entering the water system in the event that the well pumps stopped.

Water purveyors would be required to monitor fluoride levels and report the levels on a regular basis to the Washington Department of Health (WAC 246-290-460). Fluoride levels are required to be monitored daily at each point of fluoride addition and a monthly report of the monitoring results must be submitted to the Washington Department of Health. In addition, purveyors would be required to conduct split sampling on a monthly basis. This process requires the purveyor to test a water sample for fluoride content and submit a portion of the sample to an outside laboratory to confirm the accuracy of the purveyor's testing.

12. Location of the proposal, including street address, if any, and section, township, and range; legal description; site plan; vicinity map; and topographical map, if reasonably available:

Adoption of the resolution would impose requirements on water purveyors throughout Pierce County that serve 5,000 or more people. These include:

- City of Puyallup
- Lakewood Water District
- Parkland Light and Water Company
- City of Bonney Lake Water Department
- Spanaway Water Company
- Firgrove Water Mutual Company
- Summit Water and Supply Company
- Southwood Water System
- Fruitland Mutual Water Company
- Mountain View-Edgewood Water Company
- City of Milton
- City of Sumner
- Sound Water
- Town of Steilacoom

All of these purveyors take their water supply from groundwater wells and would be adding fluoride at those wells as described above. There are 118 wells servicing the purveyors.

B. ENVIRONMENTAL ELEMENTS

1. Earth

Most of the purveyors would use existing buildings for the fluoridation equipment and would not have to construct new facilities. In some cases purveyors may have to expand existing well houses or construct new ones. The size of the new facilities would be approximately 8 feet by 8 feet (64 square feet) (EES, 2002) and would require minor disturbance of soils. The new facilities would be located at the same sites as existing well houses.

a. General description of the site:

Varies from site to site.

b. What is the steepest slope on the site (approximate percent slope)?

Varies according to the individual site. Most well houses are located on flat sites.

c. What general types of soils are found on the site (for example clay, sand, gravel, peat, muck)? Specify the classification of agricultural soils and note any prime farmland.

Varies from site to site. None of the well houses are located on prime farmland.

d. Are there any surface indications or a history of unstable soils in the immediate vicinity? If so, describe.

Not applicable.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate the source of the fill.

Minor grading would be required for the construction of any new well house facilities.

f. Could erosion occur as a result of clearing, construction, or use?

Erosion is unlikely to occur as a result of clearing or construction associated with expanding well house facilities. Construction would occur on existing built-up sites, generally located on flat terrain. The new facilities would be limited in size (approximately 64 square feet) so clearing and grading would be limited.

- g. *About what percent of the site will be covered with impervious surfaces after project construction (for example buildings or asphalt)?*

The expansion of well house facilities would cause only minor increases in impervious surface area.

- h. *Describe the proposed measures to reduce or control erosion, or other impacts to the earth, if any.*

There are no impacts to the earth, therefore, mitigation measures are not necessary.

2. Air

- a. *What types of emissions to the air would result from the proposal (e.g. dust, automobile odors, industrial, wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities, if known.*

No emissions would be released outside the well houses. The only emissions to the air that will occur would be inside each well house when the bags of powdered sodium fluoride are emptied into the fluoride saturators. If the bags are emptied too quickly, the airborne fluoride dust can rise to high levels within the well house and may pose a health hazard to workers who inhale it. As noted below, proper handling of powdered sodium fluoride or use of crystalline sodium fluoride can eliminate the potential health hazard. The fluoride dust would pose no health hazard outside the well houses.

- b. *Are there any off-site sources of emissions or odors that may affect your proposal? If so, generally describe.*

No off-site emissions would affect the proposal.

- c. *Describe proposed measures to reduce or control emissions or other impacts to air, if any.*

The levels of fluoride dust at the well houses can be controlled by proper training of staff in the filling of the equipment. To protect the health of employees, good ventilation must be maintained at the well houses and operators should wear approved safety equipment, such as respirators or dust masks. The use of the crystalline form of sodium fluoride reduces the dust problems.

3. Water

- a. *Surface:*

1. *Is there any surface water body on or in the immediate vicinity of the site (including year round and seasonal streams, saltwater, lakes, ponds, and wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.*

The fluoridation process would add sodium fluoride to the public water supplies of the purveyors listed in A. 12 above. This would require addition of sodium fluoride at each of the purveyors 118 well houses. Fluoride would be released to surface water bodies at the points of discharge for wastewater treatment plants that serve each purveyor's service area. All of the purveyors use groundwater as their source of drinking water. The following purveyors serve areas that discharge some or all effluent or wastewater to surface water bodies. The remaining purveyors serve areas that are on septic systems and do not discharge to surface water bodies.

Purveyor	Principal Point of Discharge*
City of Puyallup	Puyallup River
City of Sumner	Puyallup River
City of Bonney Lake Water Department **	Puyallup River
Lakewood Water District	Puget Sound
Parkland Light and Water Company	Puget Sound
Spanaway Water Company	Puget Sound
Firgrove Water Mutual Company.	Puget Sound
Summit Water and Supply Company	Puget Sound
Southwood Water System	Puget Sound
City of Milton	Puget Sound
Sound Water	Puget Sound
Town of Steilacoom	Puget Sound
Fircrest	Puget Sound

* Some water users discharge to the ground through septic systems.

** Bonney Lake's wastewater is treated at the Sumner Wastewater Treatment Plant.

2. *Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.*

Some of the purveyors may have to construct new well houses or expand existing facilities. None of the wells are located near surface water bodies. However, the discharge of wastewater will occur adjacent to and in the water bodies listed above.

3. *Estimate the amount of fill and dredge material that could be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill materials.*

No fill or dredge material would be placed in or removed from surface water bodies.

4. *Will the proposal require surface water withdrawals or diversion? Give general description, purpose, and approximate quantities, if known.*

None of the purveyors currently withdraw or divert water from surface water bodies. This proposal will result in no changes to existing surface water withdrawals or diversions.

5. *Does the proposal lie within a 100 year flood plain? If so, note location on the site plan.*

According to the Federal Emergency Management Agency (FEMA) floodplain maps, the City of Sumner's wastewater treatment plant is located within the 100 year floodplain. The City of Puyallup's treatment facilities are located within the 500 year flood hazard zone. No other facilities associated with this proposal are located within a 100-year floodplain.

6. *Does the proposal involve discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.*

The fluoridation of water supplies would not change the volume of water discharged by any of the purveyors or the points of discharge. The type of waste discharged would remain unchanged except that some residual fluoride would remain in the wastewater discharge.

The Sumner and Puyallup wastewater treatment plants, which would receive the fluoridated water, discharge to the Puyallup River. A 1987 U.S. Geological Survey (USGS) report examined water quality parameters, including fluoride, in the Puyallup River (USGS, 1987). Fluoride levels were monitored at the inflow to the fish hatchery and near the Sumner and Puyallup wastewater treatment plants between 1983 and 1984. At the hatchery, fluoride concentrations were less than 0.10 mg/L. Fluoride concentrations near the Sumner and Puyallup wastewater treatment plants ranged from less than 0.10 mg/L to 0.20 mg/L.

The most recent measurements of background levels of fluoride in the Puyallup River are posted on the USGS web page (USGS, 2002). The web page has water quality information for the years 1955 to 1994. The highest recorded concentration of fluoride was 0.3 mg/L, recorded once in 1955 and once in 1962. In the most recent report (1992 through 1994), fluoride concentrations have been less than 0.10 mg/L.

The discharge from a municipal wastewater treatment plant to a surface water is regulated by a National Pollutant Discharge Elimination System (NPDES) permit. NPDES permits typically do not require municipal wastewater treatment plants to monitor, or test, for fluoride in the influent to the treatment plant or effluent discharged from the treatment plant. Therefore, information regarding the concentration of fluoride in municipal wastewater treatment plant effluent is limited. However, one study, an evaluation of several treatment plants in California, indicated that the treatment plants removed approximately 57 percent of the fluoride (Masuda, 1964). That removal percentage is consistent with metals removal, typically 60 to 90 percent, for a municipal wastewater treatment plant providing secondary

treatment. A reasonably low fluoride removal efficiency of 50 percent through secondary treatment shall be used for this analysis.

Assuming an influent fluoride concentration of 1.3 mg/L to the Sumner and Puyallup wastewater treatment plants and 50 percent removal by the treatment processes, the discharge from the two treatment plans to the Puyallup River would have a fluoride concentration of 0.65 mg/L.

The NPDES permits for the Sumner and Puyallup wastewater treatment plants authorize mixing zones. Dilution studies have determined dilution factors, the ratio of receiving water to treatment plant discharge, at the boundaries of the mixing zones for the Sumner and Puyallup discharges. For the Puyallup River's summer low flow condition, the dilution factors at the boundary (approximately 300 feet downstream of the discharge) of the chronic mixing zones are 21.1 to 1 for Sumner and 11.5 to 1 for Puyallup, as specified in each entity's NPDES permit. Assuming a fluoride concentration of 0.65 mg/L in the treatment plant discharge and a receiving water fluoride concentration of 0.10 mg/L, the fluoride concentrations at the boundaries of Sumner's and Puyallup's chronic mixing zones would be 0.13 mg/L and 0.15 mg/L, respectively, according to the following equation:

$$C_f = C_a + (C_e - C_a)/DF$$

where,

C_f = final concentration at the edge of the mixing zone boundary
 C_a = ambient concentration upstream of the mixing zone
 C_e = effluent concentration
DF = dilution factor

Additional mixing of effluents from both treatment plants will occur further downstream of the discharges and can be evaluated by mass balance. A mass balance evaluation has been calculated for the low flow, summer conditions using the following assumptions: 1) a September low flow condition in the Puyallup River of 1,689 cubic feet per second (based on the average September flow between 1914 and 2001 at USGS Station No. 12101500), 2) the wastewater treatment plant will remove 50 percent of the fluoride, 3) a maximum discharge of 13.98 million gallons per day (MGD) for the Puyallup treatment plant and 4.5 MGD for the Sumner treatment plant, 4) an ambient, or background, fluoride concentration of 0.10 mg/L in the Puyallup River, and 5) complete mixing of the river and discharges. Using this information, a mass balance calculation indicates that the fluoride concentration in the Puyallup River downstream of the discharges would be less than 0.11 mg/L, an increase in the Puyallup River's fluoride concentration of less than 0.01 mg/L due to adding fluoride to Sumner's and Puyallup's water supply system, according to the following equation:

$$C_{cm} = (Q_a * C_a + Q_s * C_s + Q_p * C_p) / (Q_a + Q_s + Q_p)$$

where,

C_{cm} = complete mix concentration downstream of the Sumner and Puyallup WWTPs

Q_a = Puyallup River discharge

C_a = ambient concentration upstream of the WWTPs

Q_s = Sumner WWTP effluent flow

C_s = Sumner WWTP effluent concentration

Q_p = Puyallup WWTP effluent flow

C_p = Puyallup WWTP effluent concentration

b. Ground

- 1. Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.*

All of the purveyors currently withdraw groundwater for their drinking water supplies. The amount of groundwater withdrawn by the purveyors would not increase as a result of this proposal.

Some of the water users are served by septic systems. Therefore a portion of the wastewater would be discharged to groundwater through leaching of water from septic systems. The proposal would not change the amount of water that would be treated by septic systems, but would introduce fluoride to the receiving groundwater system. In addition, fluoride-treated water used for lawn and garden watering, car washing, etc. could leach into groundwater.

Customers utilizing water supplies from the following purveyors are served by on-site septic systems:

Parkland Light and Water Company
Spanaway Water Company
Firgrove Water Mutual Company
Summit Water and Supply Company
Southwood Water System
Fruitland Mutual Water System
Mountain View-Edgewood Water Company
Sound Water

- 2. Describe waste material that will be discharged into the ground from septic tanks or other sources, if any. Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) is expected to serve.*

The type of waste material that would be discharged will not be changed by the proposal other than the addition of small amounts of fluoride. The size of the septic systems and the houses served by the systems would not change.

The concentration of fluoride that would leach into groundwater is uncertain and would vary depending on local conditions. Some of the fluoride would bind with solids as the water moves underground. A study conducted in Phoenix, Arizona to test the efficacy of soil-aquifer treatment systems indicates that fluoride concentrations decline as water travels underground (Food and Agriculture Organization, 2002). This study suggests that between 40 percent and 50 percent of the fluoride discharged to groundwater would be removed as the water travels through the soil and aquifer.

c. Water Runoff (including storm water)

- 1. Describe the source of runoff (including storm water) and method of collection and disposal, if any (including quantities if known). Where will this water flow? Will this water flow into other waters? If so, describe.*

The proposal will not generate significant amounts of water runoff or stormwater.

- 2. Could waste materials enter ground or surface waters? If so, generally describe.*

The sodium fluoride will be added inside buildings at the purveyors' wells. Therefore, it is unlikely that any waste material could enter the groundwater or surface water other than the fluoride that is intentionally added to the water source. If they are improperly handled, bags of sodium fluoride could be spilled on the ground and the sodium fluoride could enter ground or surface waters.

- d. Describe proposed measures to reduce or control surface, ground, and runoff water impacts, if any.*

No significant amount of surface water runoff is anticipated, therefore, mitigation measures have not been developed. The potential for spills of sodium fluoride on the ground can be reduced by proper training of employees and proper handling of the materials.

4. Plants

- a. Types of vegetation found on site:*

Varies from site to site. All of the well house locations have been disturbed and vegetation consists of landscaped plants or mown lawn.

- b. What kind and amount of vegetation will be removed or altered?*

Small amounts of landscaping may have to be removed for construction of the new or expanded well houses.

- c. *List threatened or endangered species or critical habitat known to be on or near the site.*

Because all the well house locations have been previously disturbed, no threatened or endangered plant species are likely to be located in areas where new construction would occur.

- d. *Describe proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on site.*

Purveyors may choose to landscape the new or expanded facilities.

5. Animals

Refer to question D. 2 on the Supplemental Sheet for Nonproject Actions at the end of this checklist.

- a. *Underline any birds and animals which have been observed on or near the site or are known to be on or near the site:*

Not applicable.

- b. *List any threatened or endangered species or critical habitat near the site.*

Refer to question D. 2 on the Supplemental Sheet for Nonproject Actions at the end of this checklist.

- c. *Is the site part of a migratory route? If so, explain.*

Pierce County is located within the Pacific Flyway, which is a flight corridor for migrating waterfowl and other avian fauna. The Pacific Flyway extends from Alaska south to Mexico and South America.

For a discussion of fish usage of the area, see question D. 2 on the Supplemental Sheet for Nonproject Actions at the end of the checklist.

- d. *Proposed measures to preserve or enhance wildlife, if any.*

Refer to question D. 2 on the Supplemental Sheet for Nonproject Actions at the end of the checklist.

6. Energy and Natural Resources

- a. *What kinds of energy (electric, natural gas, oil, wood, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.*

Electricity would be used to power the fluoridation equipment. The energy requirements of the fluoridation equipment are similar to those of household appliances. The new equipment would have similar energy requirements as existing equipment at the well houses and would use the same energy source.

- b. *Would the project affect the potential use of solar energy by adjacent properties? If so, explain.*

Fluoridation of water supplies would not affect solar energy potential. The equipment for fluoridation would be installed inside existing buildings.

- c. *What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any.*

Fluoridation equipment would require the use of a small amount of additional electricity, therefore, no conservation measures are proposed.

7. Environmental Health

- a. *Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spills, or hazardous waste that could occur as a result of this proposal? If so, describe.*

The Tacoma-Pierce County Health Department fluoridation proposal would result in addition sodium fluoride to the water systems of the purveyors listed above. Current background concentrations of fluoride in existing water supplies within Pierce County's jurisdiction are less than 0.2 mg/L. Tacoma-Pierce County Health Department proposes to fluoridate water supplies to 0.8 to 1.3 mg/L. The sodium fluoride would be added inside buildings at purveyor's wells, so it is unlikely that the proposal would result in any releases to the environment other than the amounts of fluoride intentionally added at the wells. The Tacoma-Pierce County Health Department reviewed information regarding the potential for adverse health affects from fluoridation, concluding that available information does not indicate that there are significant adverse health impacts associated with fluoride.

Concerns over the potential correlation between fluoridation of public water supplies and health problems (e.g., bone fracture incidence, infertility, cancer) have arisen. Numerous studies have been conducted to evaluate the potential relationship between fluoridation and disease, however, the relationship is complex and, in general, no definitive correlations have been shown to exist.

Dental Fluorosis: Dental fluorosis occurs in people with high exposure to fluoride in drinking water (either naturally occurring or artificial). Dental fluorosis is a developmental defect of tooth enamel that occurs when an excessive amount of fluoride is ingested during the period of enamel formation. Dental fluorosis varies from very mild (small, opaque, paper-white areas covering less than 25 percent of tooth surface) to severe (all tooth surfaces affected; brown stain; discrete or confluent pitting) (Ripa, L.W., 1993). The level of severity is dependent upon the amount of fluoride ingested, duration of exposure, and the age(s) when exposure occurred. The majority of cases are mild, but more severe cases, resulting in discoloration, do occur. This condition is cosmetic and does not compromise oral health or tooth function. Increases in dental fluorosis have been reported in communities with fluoridated water supplies. This increase is believed to be the result of the combination of fluoridated water and an increase in the presence of fluoride from other sources, including dental products containing fluoride, fluoride dietary supplements, and beverages prepared with a fluoridated water source (Department of Health and Human Services, 1991; Ripa, L.W., 1993; National Research Council, 1993). The American Dental Association recommends dentists and physicians evaluate all fluoride sources before prescribing dietary supplements and that they should not prescribe these supplements to children residing in fluoridated communities (American Dental Association, 2002).

Bone Fracture: Studies have been conducted that examined the potential relationship between fluoridated water and the incidence of bone fracture. Most studies have looked at people 65 years of age and older and attempted to account for other variables as well (e.g., area of residence, ingestion of medications, ingestion of beverages). Some studies did indicate a weak correlation between bone fracture and fluoridated water, however, flawed methodologies and other confounding factors associated with various studies rendered the data inconclusive (Department of Health and Human Services, 1991; National Research Council, 1993; Karagas, M.R., et al., 1996). Many studies found no correlation at all between fluoridation and bone fracture (see for example, Jacobsen, S.J., et al., 1993; Cauley, J.A., et al., 1995) while other studies indicated a positive correlation between water fluoridation and hip fracture (Ripa, L.W., 1993). In light of these conflicting reports, the role of fluoride exposure through drinking water in bone fracture has not been established (US Public Health Service as reported in Ripa, L.W., 1993).

Skeletal Fluorosis and Osteosclerosis: Cases of skeletal fluorosis are generally confined to tropical climates with very high levels of fluoride in the water (at least 10 mg/L) (National Health and Medical Research Council as reported in Ripa, L.W., 1993). Skeletal fluorosis has not been reported in the U.S. at water fluoride concentrations below 3.9 mg/L (Tacoma-Pierce County Health Department is proposing to fluoridate to levels of .8 to 1.3 mg/L), nor is skeletal fluorosis a public health problem in the U.S. (US Public Health Service as reported in Ripa, L.W., 1993).

Cancer: The potential for a link between cancers and water fluoridation has also been studied. Numerous studies have been conducted in the United States, United Kingdom, Canada, and

Australia. No credible evidence supporting a correlation between water fluoridation and an increased risk of cancer has been shown from these studies (AAAS Selected Symposium, 1979; Chilvers, C., 1983; Dept. of Health and Human Services, 1991; Ripa, L.W., 1993; National Research Council, 1993).

Kidney Disorders: Kidneys remove fluoride from the blood and the kidney cells that concentrate urine are exposed to high fluoride concentrations. Studies have shown that persons with impaired kidney function have a decreased ability to clear fluoride from their blood and will have elevated plasma levels of fluoride compared with unaffected individuals (Kaminsky, L.S., et al., 1990). Water with a low concentration of fluoride, as well as other ions, should be used for hemodialysis of individuals with impaired kidney function. There is no evidence, however, that the risk of death due to a kidney disorder is increased by ingesting water containing 1.0 mg/L fluoride (National Health and Medical Research Council as reported in Ripa, L.W., 1993).

Other: Since the advent of fluoridation of public water supplies, critics of fluoridation have expressed concern that exposure to fluoridated water can lead to health problems of organ systems such as gastrointestinal, genitourinary, etc., as well as cause reproductive and developmental effects (e.g., Down's syndrome, infertility) and hypersensitivity reactions.

There is currently no indication that chronic low level fluoride exposure of normal individuals results in problems in other organ systems, such as gastrointestinal, genitourinary, or respiratory systems (Dept. of Health and Human Services, 1991; National Research Council, 1993). Reports of reproductive and/or developmental effects in animals resulting from fluoride exposure are conflicting. Reproductive toxicity of fluoride requires additional study (ATSDR, 1993 as reported in U.S. Army, 2002). Hypersensitivity reactions to fluoridated water have been reported. Reported hypersensitivity reactions have included skin eruptions, swelling of oral mucosa, gastrointestinal irritation, and headache. However, studies of hypersensitivity reactions to fluoridated drinking water have been criticized for bias and lack of adequate study controls (U.S. Army, 2002).

Summary: In general, no credible evidence indicates a correlation between water fluoridation and increased health risks.

The American Dental Association's *Statement on Water Fluoridation Efficacy and Safety* states in part:

"The American Dental Association (ADA) has endorsed fluoridation of community water supplies as safe and effective for preventing tooth decay for more than 40 years. Fluoride is nature's cavity fighter, occurring naturally in the earth's crust in combination with other minerals in rocks and soil. Small amounts of fluoride occur naturally in all water sources, and varying amounts of the mineral are found in all foods and beverages. . . . The ADA's policies

regarding community water fluoridation are based on generally accepted scientific knowledge. This body of knowledge is based on the efforts of nationally recognized scientists who have conducted research using the scientific method, have drawn appropriate balanced conclusions based on their research findings and have published their results in refereed (peer reviewed) professional journals that are widely held or circulated. Confirmation of scientific findings also reinforces the validity of existing studies" (American Dental Association, 2002).

The American Dietetic Association's position statement reads:

"The American Dietetic Association reaffirms that fluoride is an important element for all mineralized tissues in the body. Appropriate fluoride consumption is beneficial to bone and tooth integrity, and as such, has an important, positive impact on oral health and overall health" (American Dietetic Association Reports, 2000).

The American Academy of Family Physicians' policy statement reads:

"Fluoridation of public water supplies is a safe, economical, and effective measure to prevent dental caries. Family physicians should know the fluoride content of local drinking water supplies, educate patients to prevent excessive fluoride intake, and be knowledgeable about the health risks and benefits associated with fluoride. Dietary fluoride supplements should be considered for children from ages 6 months through 16 years when drinking water levels are suboptimal" (AAFP, 1995, Revised 1996).

The Canadian Dental Association's position statement reads:

"The Canadian Dental Association reaffirms its support for fluoridation of municipal water supplies as a safe, economical and effective means of preventing dental caries in all age groups. Fluoride levels in community water supplies should be monitored and adjusted to ensure consistency in concentrations and avoid fluctuations" (Canadian Dental Association, 2002).

Overdosage: Concerns about accidental overdosage of public water supplies have been expressed by some critics of water supply fluoridation. However, the equipment used for fluoridation is designed to stop operating if an accident or malfunction occurs. In addition, a year's supply of fluoride would have to be added in a single day to produce harmful effects – many times the amount of fluoride a water plant would typically have available for fluoridation (U.S. Department of Health and Human Services, 1986).

Worker Exposure Risks: Water treatment plant workers who operate the fluoride feeders could potentially be exposed to the sodium fluoride dust. Sodium fluoride dust is corrosive and could burn eyes and cause severe chemical burns. Other potential acute health effects from direct exposure to sodium fluoride dust could include fluoride poisoning if swallowed. Symptoms include nausea, vomiting, abdominal pain, diarrhea, stupor, and weakness. More severe exposure could result in muscular weakness, tremors, convulsions, collapse, dyspnea, cardiac failure, and death. Inhaled sodium fluoride dust may lead to acute poisoning, nausea, and difficulty breathing. Severe exposures through inhalation may lead to respiratory failure and death (Mallinckrodt Baker, 2001). These potential worker health effects can be avoided with training and education of workers and the use of appropriate safety procedures. A majority of affected purveyors currently store and handle chemicals such as chlorine and sodium hydroxide. Most purveyors will, therefore, have to supplement existing handling and training procedures to include those appropriate for sodium fluoride. The few purveyors that currently do not use chemicals would have to initiate such procedures.

1. Describe special emergency services that might be required.

The need for special emergency services associated with the fluoridation of water within Pierce County is not anticipated.

2. Describe proposed measures to reduce or control environmental health hazards.

No environmental health hazards are expected as a result of water fluoridation resulting from the Tacoma-Pierce County Board of Health proposed resolution. As described above, no adverse health effects of significance related to the addition of fluoride in water supplies have been shown to occur.

In addition, systems that adjust fluoride of public water sources must meet monitoring and reporting requirements of the Washington Department of Health. Fluoride concentrations must be maintained between 0.8 to 1.3 milligrams per liter throughout the distribution system (WAC 246-290-460). Systems with fluoride levels above the State's 0.2 mg/L reporting level must include fluoride monitoring results in their Consumer Confidence Report (Washington State Department of Health, 2000; Washington State Department of Health, 2002).

To address the concerns of people about the impacts of fluoride, Tacoma-Pierce County Health Department is preparing brochures for citizens and will establish a hotline that citizens can call for information. The Tacoma-Pierce County Health Department also plans to make available at least one well that would not be fluoridated. People who do not want to drink fluoridated water could obtain water free from that well. There is currently an unfluoridated well in Tacoma that serves the same purpose.

To avoid dental fluorosis problems, Tacoma-Pierce County Health Department will notify water purveyors, the public, and all other providers through the public health nurses of the need to discontinue prescribing supplemental fluoride and the use of supplemental fluoride tablets for children receiving fluoridated water. The notification will be timed in advance of the fluoride implementation.

b. Noise

- 1. What types of noise exist in the area which may affect your project (for example: traffic, equipment operation, other)?*

No existing noise sources would affect this proposal.

- 2. What types and levels of noise would be created by or associated with the project on a short-term or long-term basis (for example: traffic, construction, operation, other)?*

The equipment would be housed inside existing buildings where other water treatment equipment operates. The fluoridation equipment would not generate any additional noise at the well houses.

- 3. Describe proposed measures to reduce or control noise impacts, if any.*

There are no noise impacts to reduce or control.

8. Land and Shoreline Use

Refer to question D. 5 on the Supplemental Sheet for Nonproject Actions.

- a. What is the current use of the site adjacent to the properties?*

Site use varies by individual location.

- b. Has the site been used for agriculture? If so, describe.*

Not applicable.

- c. Describe any structures on the site.*

Not applicable.

- d. Will any structures be demolished? If so, what?*

Not applicable.

- e. *What is the current zoning classification of the site?*

Not applicable.

- f. *What is the current comprehensive plan designation of the site?*

Not applicable.

- g. *If applicable, what is the current shoreline master program designation of the site?*

Not applicable.

- h. *Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.*

Not applicable.

- i. *Approximately how many people would reside or work in the completed project?*

Not applicable.

- j. *Approximately how many people would the completed project displace?*

Not applicable.

- k. *Describe proposed measures to avoid or reduce displacement impacts, if any.*

Not applicable.

- l. *Describe proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any.*

Not applicable.

9. Housing

- a. *Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.*

Housing will not be provided by this proposal.

- b. *Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.*

Housing will not be eliminated by this proposal.

- c. *Describe proposed measures to reduce or control housing impacts, if any.*

There are no housing impacts to reduce or control.

10. Aesthetics

- a. *What is the tallest height of any of the proposed structure(s), not including antennas? What is the principal exterior building material(s) proposed?*

The existing well houses are one-story buildings. Any new structures would also be one-story. Exterior building materials would be selected by the individual purveyors and would likely match existing materials.

- b. *What views in the immediate vicinity would be altered or obstructed?*

No views would be altered or obstructed.

- c. *Describe proposed measures to reduce aesthetic impacts, if any.*

There are no aesthetic impacts to reduce.

11. Light and Glare

- a. *What type of light and glare will the proposal produce? What time of day would it mainly occur?*

The proposal would produce no light or glare.

- b. *Could light or glare from the finished project be a safety hazard or interfere with views?*

The proposal would produce no light or glare.

- c. *What existing off-site sources of light or glare may affect your proposal?*

No off-site sources of light would affect this proposal.

- d. *Describe the proposed measures to reduce or control light and glare impacts, if any.*

There are no light and glare impacts to reduce or control.

12. Recreation

- a. *What designated and informal recreational opportunities are in the immediate vicinity?*

There are no recreational opportunities in the immediate vicinity of the drinking water wells. Recreation activities near the wastewater discharge points in the Puyallup River and Puget Sound include boating, fishing, and limited swimming.

- b. *Would the proposed project displace any existing recreational uses? If so, describe.*

The proposal would not displace any existing recreational uses. Fluoride concentrations in the Puyallup River or Puget Sound would not exceed the maximum contaminant level for ingestion of 4 mg/L (U.S. EPA, 1995).

- c. *Describe proposed measures to reduce or control impacts on recreation, including recreational opportunities to be provided by the project or applicant.*

There are no recreation impacts to reduce or control.

13. Historic and Cultural Preservation

The proposal would have no impacts on historic or cultural resources.

- a. *Are there any places or objects listed on or eligible for national, state, or local preservation registers known to be on or next to the site? If so, generally describe.*
Not applicable.

- b. *Generally describe any landmarks or evidence of historic, archeological, scientific, or cultural importance known to be on or next to the site.*

Not applicable.

- c. *Describe proposed measures to reduce or control impacts, if any.*

There are no impacts to historic or cultural resources to reduce or control.

14. Transportation

Refer to question D. 6 on the Supplemental Sheet for Nonproject Actions at the end of this checklist.

- a. *Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.*

Not applicable.

- b. *Is the site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?*

Not applicable.

- c. *How many parking spaces would the completed project have? How many would the project eliminate?*

Not applicable.

- d. *Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe.*

Not applicable.

- e. *Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.*

Not applicable.

- f. *How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.*

Not applicable.

- g. *Describe proposed measures to reduce or control transportation impacts, if any.*

Not applicable.

15. Public Services

Refer to question D. 6 on the Supplemental Sheet for Nonproject Actions at the end of this checklist.

- a. *Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally explain.*

Not applicable.

- b. *Describe proposed measures to reduce or control direct impacts on public services.*

Not applicable.

16. Utilities

Refer to question D. 6 on the Supplemental Sheet for Nonproject Actions at the end of this checklist for a discussion of impacts to utilities, including costs of installation and operation.

a. *Underline utilities currently available at the site:*

Not applicable.

b. *Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.*

Not applicable.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: _____

Date Submitted: _____

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

This question is addressed in the responses to questions B. 2, 3, and 7. b.

Proposed measures to avoid or reduce such increase are :

Refer to responses # B. 2. c for water, B. 3. d for air, and 7. b. 3 for noise.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

The proposal is unlikely to impact plants or animals. The concentration of fluoride in the treated water would not reach levels that could be harmful to any plant or animal species. No analysis is necessary for impacts to plants or animals in Puget Sound because background fluoride concentrations in the Sound are higher than the concentrations of fluoride in effluent that would be discharged under the proposal. The potential for impacts to plants or animals in the Puyallup River warrant analysis because the river has lower background fluoride concentrations than the Sound.

Chinook salmon are a federally listed threatened species. Chinook use the Puyallup River for spawning and rearing (WDFW and Western Washington Treaty Indian Tribes, 1994), and also use Puget Sound for rearing and migration. Bull trout, another federally listed threatened species, are listed by the Washington Department of Fish and Wildlife as currently occupying the Puyallup River. Information on bull trout in the Puyallup River Basin is limited and no spawning or rearing sites have been identified (WDFW, 1998). Coho salmon, a federal candidate species, utilize the Puyallup River for spawning and rearing and migrate through the river and Puget Sound.

Fluoride-Related Literature Review

Research on the impacts of fluoride on salmonids and other fish and marine life is limited. In the literature reviewed, most authors conclude that the effect of fluoride on fish is influenced by the size, species, and physiological state of the individual fish and by the effect of other water quality parameters such as pH and hardness.

Three scientifically reviewed articles identified in the literature review related to the impacts of fluoride levels on salmon. One article discussed impacts of fluoride on migrating salmon through the John Day Dam on the Columbia River and two separate laboratory studies examined the impacts of fluoride on aluminum toxicity on Atlantic salmon (Damkaer, and Dey, 1988; Hamilton and Haines, 1995; and Wilkinson, et al., 1990). The anti-fluoridation perspective is presented in a review article by Foulkes and Anderson (1994). Several studies that examined the impact of fluoride on other fish and aquatic insect species were also reviewed (Pimentel and Bulkley, 1983; Camargo and La Point, 1995; Dave, 1984; Silger and Neuhold, 1972).

General Principles of Fluoride

A specific designated safe level of fluoride for fish and aquatic species is difficult to predict due to the usual factors of size, species, and physiological state of the organism and because toxic levels vary with the chemistry of the water. Fish tolerance to fluoride is increased by low temperature, low concentrations of chloride ion, and water hardness (Pimentel and Bulkley, 1983).

An article published in the Journal of Wildlife Diseases (Sigler and Neuhold, 1972) summarizes research on fluoride from previous articles. The authors note that fluorides are common in the waters of the United States, especially in the West, and concentrations of 0.1 mg/L are common and concentrations exceeding 1.0 mg/L are not unusual. Most fluorides occur naturally and are often leached from fluoride, cryolite, apatite, and sedimentary phosphate rocks by precipitation and groundwater. Aerial and hydric pollution are also contributors of fluoride to the aquatic environment (Sigler and Neuhold, 1972).

The U.S. Environmental Protection Agency (EPA) has a fluoride standard of 1.5 mg/L for marine waters (U.S. EPA, 1973). The EPA has no recommended surface water criteria for fluoride (L. Macchio, EPA Region 10 Office, personal communication, 2002).

Research on Fluoride Impacts on Salmon

The John Day studies indicate that high fluoride concentrations in the Columbia River appear to have caused delays in salmon passage at John Day Dam in 1979 and 1980 (Damkaer and Day, 1989 and NOAA, 1993). Passage time at John Day Dam was 158 and 156 hours in 1979 and 1980 respectively. This compares to passage times at Bonneville Dam of less than 48 hours and less than 24 hours at The Dalles Dam. The increased passage time increased mortality and may have affected spawning success of the returning fish. The migratory delays did not seem to be affected by fishway entrance locations, water discharge volumes or configurations, or turbine operating conditions. The study theorizes that pollutants near the dam, especially fluoride, from an upstream aluminum smelter could have caused the passage delays. There are no measurements of fluoride concentrations during 1979 and 1980, but studies conducted in 1982 and 1983 indicated that fluoride levels at the John Day Dam were generally above 0.2 mg/L. This is believed to be typical of fluoride concentrations at the dam based on fluoride releases from the aluminum smelter. Background concentrations of fluoride in the Columbia River are approximately 0.1 mg/L.

In a follow-up study of the effect of fluoride levels on salmon, over 600 returning salmon were captured and tested with different concentrations of fluoride in a two-choice flume at Big Beef Creek, Washington. The conclusions from the tests are that fluoride concentrations of about 0.5 mg/L would adversely impact the behavior of upstream-migrating adult salmon. Concentrations of 0.2 mg/L were at or below the threshold for fluoride sensitivity of chinook and coho salmon (Damkaer and Dey, 1989). The expected maximum fluoride concentrations in the Puyallup River

during low flows (see the mixing analysis in Section B. 3. 6 of the SEPA Checklist) of 0.11 mg/L are below the threshold of fluoride sensitivity identified in the Damkaer and Dey study.

Studies of Atlantic salmon examined the impact of fluoride on the toxicity of aluminum at different pH levels (Hamilton and Haines, 1995; Wilkinson et al., 1990). Both studies indicate that low fluoride levels may reduce the gill morphological damage in fish exposed to aluminum in acidic waters. These studies are not relevant to an analysis of potential impacts to the Puyallup River, because the river is not acidic and aluminum levels in the water are generally low (20 to 50 µg/L)(USGS, 2002).

A research review by Foulkes and Anderson (1994) was published in *Fluoride*, the journal of the International Society for Fluoride Research, an anti-fluoridation group. Their review summarized the results of previous research related to salmon and fluoride. Foulkes and Anderson state that previous research revealed fluoride levels below 1.5 mg/L have been shown to be lethal and cause other adverse effects on salmon. The article is not based on original research and was not scientifically reviewed. Foulkes and Anderson recommend that 0.2 mg/L should be the appropriate safe level of fluoride for salmon species in freshwater. As noted above, fluoride levels in surface waters are expected to remain well below 0.2 mg/L in the Puyallup River.

Effects of Fluoride on Freshwater Fish

A study summarized by Pimentel and Bulkley (1983) aimed to determine the acute toxicity level of fluoride to rainbow trout based on water hardness. Increased water hardness, directly influenced by the concentration of calcium carbonate (CaCO₃) in the water, causes a decrease in the toxicity of fluoride. Rainbow trout survived concentrations of fluoride in hard water that were lethal in softer water. Fluoride concentrations used in the experiment ranged from 0.12 to 577 mg/L with no fish deaths at concentrations and hardness levels expected to be found in the Puyallup River.

Sigler and Neuhold (1972) state in their review of fluoride intoxication that although fluorides above certain levels have toxic effects, it is difficult to assign specific toxic levels for fish. This is due to the many factors in the environment that affect fish tolerance including the physiological state of fish and the presence of other chemicals in the water. Such factors as levels of chloride and calcium in the water and water temperatures affect the response of fish to moderate fluoride concentrations of 1.5 to 5.0 mg/L. Fluoride levels in the Puyallup River are expected to be lower than 1.5 mg/L.

Effects of Fluoride on Freshwater Invertebrates

Camargo and La Point (1995) aimed to summarize the effects of fluoride toxicity of five species of aquatic insect larvae. All the levels of fluoride tested exceeded 2.51 mg/L. The 2.51 mg/L level is over twice as high as the highest level of fluoride that could be expected in the Puyallup River under worst case conditions (0.11 mg/L during low flow conditions). The 2.51 mg/L concentration was the lowest safe concentration of fluoride demonstrated for the insect larvae with several surviving at much higher concentrations.

Dave (1983) tested the effect of sodium fluoride concentrations on another aquatic invertebrate, *Daphnia magna*. *Daphnia* is a common food source for salmonids. The experiment found that the safe concentration for *Daphnia* in hard water is 4.4 mg/L. This is much higher than highest expected fluoride level in the Puyallup River under low flow conditions.

A discussion by Hemens, et al. (1975) in Progress in Water Technology summarized the effects of fluoride distribution on animal tissues in a bay on the coast of South Africa. Results indicated short-term exposure to fluoride was unlikely to produce toxic effects on fish and crustacea at concentrations in the bay; however, long-term exposure could cause adverse impacts (Hemens, et al, 1975).

Summary

The literature on the impacts of fluoride on fish species does not indicate that the concentrations of fluoride that are expected to be present in the Puyallup River as a result of fluoridation under this proposal would cause a significant adverse impact to fish. As indicated throughout the literature review, the expected levels of fluoride in the Puyallup River (worst case estimates of 0.11 mg/L) are lower than the levels of fluoride shown to be toxic in the studies that have been conducted on salmonids and other fish.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

As described above, no adverse impacts to salmonids or other fish have been demonstrated to occur at the concentrations of fluoride that would be present in the Puyallup River. The background concentration of fluoride in Puget Sound is 1.4 mg/L. This is higher than the concentrations of fluoride in effluent that would be discharged to Puget Sound. Under this proposal, drinking water would be fluoridated to concentrations ranging between 0.8 to 1.3 mg/L. Therefore, no measures are proposed to protect fish or marine life.

3. How would the proposal be likely to deplete energy or natural resources?

The proposal would not cause depletions of energy or natural resources.

Proposed measures to protect or conserve energy and natural resources are:

No mitigation measures are needed because the proposal will cause no depletions of energy or natural resources.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks,

wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

No environmentally sensitive or governmental protection areas would be affected by the proposal with the exception of endangered species habitat for chinook salmon. The impacts to endangered species are discussed in question D. 2 above.

Proposed measures to protect such resources or to avoid or reduce impacts are :

Measures to reduce impacts to endangered species habitat are discussed in question D 2 above.

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans ?

The proposal would have no effect on land or shoreline use. Any new construction would take place at existing well house sites and would be compatible with existing land uses.

Proposed measures to avoid or reduce shoreline and land use impacts are:

There are no impacts to shoreline or land use to avoid or reduce.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

The proposal is unlikely to increase demands on transportation. The sodium fluoride used for treatment would be transported to the wells by truck. It takes approximately 19 pounds of sodium fluoride to treat 1 million gallons of water to 1 mg/L of fluoride. This amount of sodium fluoride is not expected to increase truck traffic to the wells.

The proposal will not increase demands on public services.

As described above, water purveyors in the County that service more than 5,000 people would be required to treat water supplies with fluoride. This would require the utilities to install fluoridation equipment and to incur the costs of fluoridating their water supplies, purchase the fluoridation chemicals, maintain the equipment, and conduct testing. The Tacoma-Pierce County Health Department estimates the cost for all 14 purveyors required to install basic fluoridation equipment would be approximately \$1.5 million. Costs to individual purveyors would vary depending on specific water system conditions.

A cost analysis of two water purveyors in Pierce County (Summit Water and Supply Company and Firgrove Mutual Water Company) conducted by Economic and Engineering Services (EES) for the Tacoma-Pierce County Health Department estimated that the cost of equipment and installation would range from approximately \$7,800 per well for Firgrove and \$12,900 per well for Summit

(EES, 2002). Thomas Reeves, the National Fluoridation Engineer of the Center for Disease Control and Prevention provided Tacoma-Pierce County Health Department with an estimate of \$3,000 to \$8,000 for the necessary equipment not including installation (Reeves, personal communication, 2002).

In addition to the initial costs to install the fluoridation equipment, purveyors would incur annual costs of operation, maintenance, and purchase of the fluoridation chemicals. These costs would also vary depending upon circumstances of the individual purveyors. The EES report estimates the annual operation costs at \$44,329 for Summit and to \$56,800 for Firgrove. The Tacoma-Pierce County Health Department conducted a survey of purveyors in Washington that fluoridate water supplies. The survey indicates that annual operating costs range from approximately \$5,000 for smaller systems up to \$60,000 per year for the City of Vancouver. The cost of fluoridation chemicals varies depending on the quantity purchased but averages \$0.89 per pound for sodium fluoride and \$0.27 for sodium chloride.

Water purveyors may need to increase water rates to pay the increased costs. The cost of fluoridation varies by the size of the population served. The EES report estimates that the operation and maintenance cost per person for Firgrove would be \$5.42 per year and for Summit would be \$4.33 per year. These estimates are higher than the estimates of the Center for Disease Control which reports that for communities with 20,000 residents the cost per person would be \$0.50, \$1.00 for communities with 10,000 to 20,000 residents, and \$3.00 for communities with less than 5,000 residents.

It has been alleged that fluoridation can cause corrosion of water supply pipes and equipment. According to the U.S. Environmental Protection Agency and the National Association of Corrosion Engineers, corrosion is not related to fluoride. Corrosion by potable water is primarily caused by dissolved oxygen concentration, pH, water temperature, alkalinity, hardness salt concentration, hydrogen sulfide content, and the presence of certain bacteria. Fluoride, at concentrations found in potable water, does not cause corrosion. A small increase in the corrosivity of potable water that is already corrosive may occur after treatment with alum, chlorine, hydrofluosilicic acid or sodium silicofluoride which decreases pH. This occurs in potable water with little buffering capacity and can be resolved by adjusting the pH upward. The form of fluoride that will be used in Pierce County is sodium fluoride, which does not cause a pH decrease. Therefore, corrosion would not be increased with the addition of sodium fluoride.

Proposed measures to reduce or respond to such demand(s) are :

The Tacoma-Pierce County Health Department intends to provide financial assistance to the water suppliers. The Washington Dental Services Foundation has awarded the Health Department and water purveyors a grant of \$420,000 to assist with the costs of fluoridation. The Tacoma-Pierce County Health Department intends to provide a match for the grant and thus provide a total of \$840,000 to water purveyors to help offset the costs of purchasing and installing the fluoridation equipment.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements of the protection of the environment.

The proposal would not conflict with any other laws or requirements of the protection of the environment. The amount of fluoride added would not exceed any federal or state guidelines for water quality. Fluoridation of water supplies would support the state authorization to fluoridate water and would comply with state guidelines for water fluoridation (WAC 246-290-460).

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Washington State Department of Health. 2002. Frequently Asked Questions. Environmental Health Programs, Division of Drinking Water. Accessed at http://www.doh.wa.gov/ehp/dw/ccr_material/ccrfaq.htm on July 30, 2002.

Wilkinson, K. J., P. G. C. Campbell, and P. Couture. 1990. *Effect of Fluoride Complexation on Aluminum Toxicity Towards Juvenile Atlantic Salmon (Salmo salar)*. Canadian Journal of Fish Aquatic Science (47):1446-1452.

Figure

Appendix A – Supporting Documents for SEPA Threshold Determination

**TPCHD Fluoride Resolution
Supporting Documents for SEPA Threshold Determination**

Description	Author	Date	TPCHD Doc. #
“Oral Health in America: A Report of the Surgeon General,” with section endorsing fluoridation of public water supplies to combat dental caries	Department of Health and Human Services, U.S. Public Health Services	2000	3-321
“Abuse of the Scientific Literature in an Anti-fluoridation Pamphlet” contains criticism of John Yiamouyiannis’ research entitled, “Lifesavers Guide to Fluoridation” among other criticisms to anti-fluoridation arguments	American Oral Health Institute	1988	322-527
“Fluoridation Facts” – answers to frequently asked questions about community water fluoridation	American Dental Association	Undated	528-584
Statistical analysis of dental caries in students at Bonney Lake Elementary School	Rebecca Sullivan (M.D., TPCHD)	04/04/02 04/05/02	585-586
Document reflecting support by Washington Dental Service Foundation for fluoridation of public water systems	Unknown	Undated	587
PowerPoint presentation regarding fluoridation impacts on human health, and the environment; effectiveness of fluoridating water supplies; and associated costs to water purveyors.	R. Sullivan; Rosemary Thomas (BSN, University of Washington, Tacoma)	09/21/01	588-659
“The Manufacture of the Fluoride Chemicals” – opinion of CDC regarding safety and effectiveness of water fluoridation	U.S. Centers for Disease Control and Prevention (CDC)	Undated	661-662
Information on proposed changes to fluoride standards	Thomas G. Reeves, P.E. (CDC)	03/19/02	663-664
Letter reflecting criticism of study entitled “Fluoride Exposure and Dental Fluorosis in Newburgh and Kingston, New York: Policy Implications”	Jayanth Kumar Elmer Green (State of NY Dept. of Health)	07/18/00	665-665A

Description	Author	Date	TPCHD Doc. #
"Public Affairs Advisory" suggesting that use of silicofluorides in fluoridation increases lead concentrations in children. Includes AWWA fact sheet on fluoridation, and note that CDC disputes the finding.	Jack Hoffbuhr (American Water Works Association)	11/10/99	667
Document on EPA's position on adding fluoride to public water supplies	Tom Reeves (CDC)	04/21/00	668-669
"Evaluating the Impact of Municipal Water Fluoridation on the Aquatic Environment," American Journal of Public Health, Vol. 80, No. 10	John Osterman, MD, ScD (Community Health Dept. Lakeshore General Hospital)	October 1990	670-675
"Fluoride Ingestion from Toothpaste by Young Children," British Dental Journal, Vol. 186, No. 9	E.M. Bentley (Manchester Science Park)	05/08/99	676-680
"Fluoridation: Don't Let the Poisonmongers Scare You!"	Bob Sprague (Emerson College) Mary Bernhardt	1999	681-685
"Fluoride: Regulatory Background" – regulatory background summary reflecting EPA's decision to forego revising fluoride levels for drinking water in 1993	EPA	Undated	686-688
List of cities reflecting status of fluoride referenda in November 2000 elections	U.S. Census Bureau & American Dental Ass'n	2000	689
"Fluoridation Facts" describes arguments used by opponents of fluoridation of public water supplies	L. Ariel Thomson (Utah State Univ.)	Undated	690-697
"Impact of Fluoridation of the Municipal Drinking Water Supply: Review of the Literature" prepared for Escambia County Utilities Authority	Joe Lepo; Richard Synder (Univ. of West Florida)	May 2000	698-723
Discussion of Washington State Senate Bill 6672 relating to fluoride in public water systems	David Hernion	03/05/02	724
"More Government Research Shows Fluoridation Creates More Harm Than Good"	Pennsylvania Environmental Network	09/08/99	725
"Fluoride Exposure and Dental Fluorosis in Newburgh and Kingston, New York: Policy Implications"	Jayanth Kumar; Philip Swango (Bureau of Dental Health, NY State Dept. of Health)	1999	726-735

Description	Author	Date	TPCHD Doc. #
NOAA Tech Memo NWFSC-7: Part 4: Environmental Effects	National Oceanic and Atmospheric Administration	Undated	736-741
"Opposition to Community Water Fluoridation and Connections to the 'Alternative Medicine' Movement"	Michael Easley, DDS	2001	742-753
Letter reflecting costs associated with fluoridating public water supplies	Thomas Reeves (CDC)	06/27/02	754-755
"Reporting on Risk," Chapter 5 from "A Journalist's Handbook on Environmental Risk Assessment"	Martha Walter, et al.	04/23/96	756-767
Statements from American Dental Association, CDC, American Medical Association, U.S. Surgeon General and National Institute of Dental supporting the fluoridation of public water supplies	Unknown	March 2002	768
"Study Finds Some Bottled Water Has More Bacteria and Less Fluoride than Tap Water"	Case Western Reserve University	03/22/00	769-770
"Study Says Black Tea Helps Prevent Cavities"	Susan Heavey (Reuters)	05/22/01	771-772
Public survey in Pierce County reflecting that the majority of respondents approve of adding fluoride to public water supplies	TPCHD	March 2002	773-794
"The Science and Practice of Caries Prevention," Journal of the American Dental Association, Vol. 131, reflecting that adding fluoride to drinking water is beneficial	John Featherstone, PhD.	July 2000	795-807
"A Simple Decoding of Toothpaste Ingredients"	The Pioneer Press	06/07/00	809-810
"Health Effects of Ingested Fluoride" - excerpt	National Research Council, Committee on Toxicology, Subcommittee on Health Effects of Ingested Fluoride	1993	812-813
"Fluoride in Drinking Water" – California Public Health Goal	California Office of Environmental Health Hazard Assessment	December 1997	814-815

Description	Author	Date	TPCHD Doc. #
"Why We Oppose Fluoridation" reflects the opinion of the National Treasury Employees Union	J. William Hirzy (EPA)	Undated	816-822
Letter to TPCHD regarding ineffectiveness of adding fluoride to public water supplies, which reflects the views of the National Treasury Employees Union	J. William Hirzy (EPA)	03/28/02	825-826
Statement Before the Senate Subcommittee on Wildlife, Fisheries and Drinking Water regarding ineffectiveness of water fluoridation	J. William Hirzy (EPA)	06/29/00	827-831
"Water Treatment with Silicofluorides and Lead Toxicity" excerpt	Roger D. Masters (Dartmouth College) Myron Coplan (Intelleguity)	08/26/98	832
"Can Fluoridation Affect Lead (II) in Potable Water? Hexafluorosilicate and Fluoride Equilibria in Aqueous Solution" - excerpt	Edward T. Urbanksy; Michael Schock (EPA)	01/10/99	833
Letter from Lakewood Water District commenting on fluoridation resolution	L.R. Ghilarducci (Lakewood Water District)	03/06/02	834-835
Capital and O&M Fluoridation Cost Estimates with pre-2006 Implementation	Spanaway Water Co. Inc.	Undated	836-839
Jeff Green citing the story "Ingested Fluoride Does Not Reduce Tooth Decay, Action is Topical," from the Journal of the American Dental Assn.	Jeff Green (Citizens for Safe Drinking Water)	July 2000	840-842
"Pit and Fissure Tooth Decay and Fluoridation" – compilation of quotations from various publications concerning fluoridation	Unknown	Undated	845
"Preserving the Perfect Tooth" – a discussion on tooth sealants	Roger Scholle, Editorial in Journal of the American Dental Assn., Vol. 108	March 1984	846
"The Oral Health of California's Children: A Neglected Epidemic: Selected Findings and Recommendations from the California Oral Health Needs Assessment of Children" - excerpt	Unknown	1993-1994	847

Description	Author	Date	TPCHD Doc. #
Letter reflecting that CDC believes adding fluoridation to public water supplies as one of the great public health achievements of the 20 th Century	Jeffrey Koplan, MD (Director, CDC)	08/08/00	848-849
"Baby Bottle Tooth Decay/Early Childhood Caries"	Compiled by Maureen Jones (Citizens for Safe Drinking Water)	Undated	850-853
"Dentist Goes on the Road for Smiles of a Child," New York Times	Adam Gershenson	01/16/98	854
"Study: many poor children live in pain because barriers to dental care too great"	Univ. of North Carolina, School of Public Health	12/26/01	855-857
"Science and Ethics of Water Fluoridation," <i>Journal of Canadian Dental Association</i> , indicating that new guidelines for water fluoridation should be developed to update guidelines developed 50 years ago	Howard Cohen et al.	2001	858-861
"Fluoridation Basics" indicating that exposure to fluoride is greater today than in 1945 due to fertilizers and pesticides in use today	Unknown	Undated	862
"Fluoride Is Already in our Food and Beverages"	Citizens for Safe Drinking Water	Undated	863
"Toxicological Profile for Fluorides, Hydrogen Fluoride and Fluorine"	Prepared by Clement International Corporation for Agency for Toxic Substances and Disease Registry	April 1993	864
"Infants' Fluoride Ingestion from Water, Supplements and Dentifrice," <i>Journal of American Dental Association</i> , Vol. 126 - excerpt	Steven Levy, et al.	December 1998	866
"Dental Caries and Dental Fluorosis at Varying Water Fluoride Concentrations," <i>Journal of Public Health Dentistry</i> , Vol. 57: No. 3 – excerpt	Keith Heller, et al.	1997	867-868
American Academy of Pediatrics Policy Statement "Fluoride Supplementation for Children: Interim Policy Recommendations" (RE 9511), <i>Pediatrics</i> , May 1998, Vol. 95, No. 5 - excerpt	American Academy of Pediatrics	May 1998	869

Description	Author	Date	TPCHD Doc. #
Drug Delivery Comparison: Supplements Versus Fluoridated Water	Unknown	Undated	870
“Systematic Review of Water Fluoridation, “ British Medical Journal, 321: 855-859 - excerpt	Marian McDonagh, et al.	10/07/00	871
“Perceptions of dental fluorosis,” J Dent. Res. 1993, 72(9) - abstract	PJ Riordan (Health Dept. of Western Australia)	09/00/93	872
“Missing the Mark: Oral Health in America” a critique of each state’s dental programs, fluoridation rates, and oral cancer rates – overall grade is “C-“	The Oral Health America National Grading Project	Undated	873-877
“Recent News Reports of Alternative Programs in Britain Aimed at Reducing Decay	Unknown	Undated	878-880
“Pouring Rights: Schools Long-term Deals to Sell Soda Kick Kids’ Nutrition in the Teeth”	Unknown	05/21/01	881
Opposition testimony before the Tacoma-Pierce County Board of Health relating to the fluoride resolution	Lynne Campbell (Oregon Citizens for Safe Drinking Water)	03/06/02	882-883
Testimony before the Washington State Legislature, House Committee on Health Care in Opposition to HB 2703, which would allow a study to be conducted evaluating fluoridation of public water supplies	Jeff Green (Citizens for Safe Drinking Water)	02/07/02	884-886
Letter to Washington State Representative Cody, Committee on Health Care, stating opposition to HB 2703	Gene Mullins	02/07/02	887-888
Letter to Washington State Representative Cody, Committee on Health Care, stating opposition to HB 2703	Dennis Sklar, N.D.	02/06/02	889-892
Editorial, “The Effect of Fluorine on Dental Caries”	The Journal of the American Dental Association	10/01/44	893-894
List of seven facts opposing fluoridation of public water supplies	Ursula Hall, MD	Undated	895

Description	Author	Date	TPCHD Doc. #
"Fluoridated Water," excerpt from Definitive Guide to Cancer	W. John Diamond MD et al.	Undated	896
"Fluoride is not for Infants"	Nicholas Hether, PhD	Undated	897
"Why EPA's Headquarters Union of Scientists Opposes Fluoridation"	J. William Hirzy, PhD	05/01/99	898-903
"US EPA Scientists Take Stand Against Fluoridation"	J. William Hirzy	Undated	904-907
Letter to Dennis Sklar indicating Washington State Department of Health's support for TPCHD's fluoride resolution	Mary Selecky (State of WA Dept. of Health)	03/20/02	908
Letter to Cynthia Clinkscales indicating Washington State Department of Health's support for TPCHD's fluoride resolution	Mary Selecky (State of WA Dept. of Health)	03/20/02	909
Letter to TPCHD stating opposition to fluoridation of public water supplies	Robert Taylor (Mt. View – Edgewood Water Co.)	03/18/02	910-911
"Influence of Chronic Fluorosis on Mebrane Lipids in Rat Brain," Neurotoxicology and Teratology, Vol. 20, Issue 5 - abstract	Zhi-Zhong Guan, et al.	September 1998	912-913
"Impact of Artificial Fluoridation on Salmon Species in the Northwest USA and British Columbia, Canada," Fluoride, Vol. 27, No. 4. indicating that fluoride above 0.2 mg/L have lethal effects on salmon	Richard Foulkes et al.	1994	914-919
"Fluoridation on Point: Congressional Investigation and Recent Events"	Jeff Green (Citizens for Safe Drinking Water)	Undated	920-922
Letter responding to Rep. Calvert's letter to Dr. Jane Henney, Commissioner of Food and Drugs regarding use of fluoride in drinking water and confirmation that FDA regulates fluoride as a drug when used to combat dental caries	Dept. of Health and Human Services, U.S. Public Health Service	12/21/00	923-924
Letter responding to Glasser's letter regarding the need for research on fluorosilicic acid, includes indication by EPA of a literature search and review of the data available on health effects and chemistry of fluoride that is in process	Tudor Davies (Dir., EPA)	April 1998	925

Description	Author	Date	TPCHD Doc. #
Letter responding to Rep. Calvert's letter to Carol Browner, EPA Administrator, regarding fluoridation and the Safe Drinking Water Act	EPA	06/23/99	926-927
Letter to Roger Masters (Dartmouth College), in response to Masters' 12/19/00 letter asking if EPA has data on the effects of fluosilicic acid or sodium silicofluoride on health and behavior. EPA states that National Health and Environmental Effects Research Laboratory (NHEERL) has this data, and with the exception of some acute toxicity data, they were unable to find measurable effects on health and behavior	Robert Thurnau (EPA)	11/16/00	928
Letter to Roger Masters (Dartmouth College), in response to Masters' 12/19/00 letter discussing fluoridation wherein EPA indicates that Office of Research and Development is exploring options to initiate research on fluoride reactions with metals in water.	Sally Gutierrez (EPA)	03/15/01	929
"Treatment Chemicals Contribute to Arsenic Levels"	Cheng-nan Weng (South Central Connecticut Regional Water Authority)	October 2000	931-933
"Study Finds Correlation Between Fluorides in Water and Lead Levels," Dartmouth News	Roger Masters (Dartmouth Foundation for Neuroscience and Society)	08/31/99	934-935
"Association of Silicofluoride Treated Water with Elevated Blood Lead," Neuro Toxicology 21(6) – excerpt	Roger Masters et al.	2000	936
"Fluorine Recovery in the Fertilizer Industry – A Review," Phosphorus and Potassium #103 – excerpt	H.F. Denziger, et al.	September 1979	937
Listing of committee personnel for American Water Works Association's Standards Committee on Fluorides	American Water Works Association	1998	938
Collection of quotes from Councilman Keith Beier, City of Escondido, CA Council Meeting critical of fluoridating public water supplies		03/24/99	939

Description	Author	Date	TPCHD Doc. #
“Request for Due Diligence—Fluoride 2001” with enclosures indicating opposition to fluoridation of public water supplies	Citizens for Safe Drinking Water	2001	943-956
Letters objecting to proposed fluoride resolution with enclosures	Rose Marie Waldram	03/25/02	957-992
Letter discussing proposed research project to determine effects of fluoride and uranium products	John Perry (U.S. Medical Corps)	04/29/44	992
“Law of Halogen Displacement” – Discussion of the functioning of the thyroid gland	Unknown	Undated	993
Bibliography of studies dealing with fluoride and thyroid	Unknown	03/06/02	994-1001
Collection of quotes from Dr. Hardy Limeback re fluoridation and children	Dr. Hardy Limeback (Univ. of Toronto)	1999	1002
“Nutrition and Oral Health”	Floss.com	03/06/02	1003
“Cranberries & Plaque”	Floss.com	Undated	1004
“Assessing Fluoride Levels of Carbonated Soft Drinks,” Journal of the American Dental Association	Judy Heilman et. al.	December 1999	1005-1006
“Can your child be getting too much fluoride through baby food?”	ADA	June 1997	1007
“Subsets of Population Who Should not Have 1 ppm Fluoridated Water”	Unknown	Undated	1008
“Breastfeeding and the Use of Human Milk”- summary of effects of breastfeeding	American Academy of Pediatrics	12/00/97	1009-1013
Memorandum regarding fluoridation, with attached fact sheet summarizing the basis for maximum contaminant level for fluoride	Bob Barles (EPA)	08/28/97	1014-1020
“Response to Masters and Coplan Study Water Treatment with Silicofluorides and Lead Toxicity”	Thomas Reeves	November 1999	1021-1022

Description	Author	Date	TPCHD Doc. #
Letter in response to Russell's letter expressing concerns with fluoridation wherein EPA endorses fluoridation of public water supplies	Rebecca Hanmer (EPA)	03/30/83	1023
"EPA and Fluorides/Fluoridation" draft paper indicating that although union members working at EPA disapprove of fluoridation of public waters systems, EPA as a whole does support fluoridation	Thomas Reeves	2002	1024-1025
Letter to Teran Gall, Director of Special Projects for the California Dental Association, indicating the maximum contaminant level for fluoride in water to prevent skeletal and dental fluorosis	Larry Wright (EPA)	12/09/00	1026-1027
Letter in response to Reeves' letter requesting a revised EPA statement regarding drinking water fluoridation	Michael Cook (EPA)	06/04/86	1028-1029
Letter regarding summary of results and current status of sodium fluoride study conducted at National Institute of Environmental Health Sciences	Richard Irwin (Dept. of Health & Human Services)	01/18/96	1030-1031
Morbidity and Mortality Weekly Report: "Promoting Oral Health: Interventions for Preventing Dental Caries"	CDC	11/30/01	1032-1043
Morbidity and Mortality Weekly Report: "Recommendations for Using Fluoride to Prevent and Control Dental Caries in the US"	CDC	08/17/01	1044-1093
Morbidity and Mortality Weekly Report: "Water Fluoridation and Costs of Medicaid Treatment for Dental Decay – Louisiana, 1995-1996"	CDC	09/03/99	1094-1098
Morbidity and Mortality Weekly Report: "Populations Receiving Optimally Fluoridated Public Drinking Water – US, 2000"	CDC	02/22/02	1099-1102
Morbidity and Mortality Weekly Report: "Achievements in Public Health, 1900-1999: Fluoridation of Drinking Water to Prevent Dental Caries"	CDC	10/22/99	1103-1109

Description	Author	Date	TPCHD Doc. #
“The Fluoride Debate: A Response to the American Dental Association’s Booklet Fluoridation Facts,” article disputes scientific support for fluoridation of public water supplies	Anita Shattuck	February 2001	1110-1200
Surgeon General’s favorable statement on community water fluoridation	David Satcher (Surgeon General)	12/03/01	1201
Letter in opposition to fluoride resolution	Robert C. Richardson & James R. Sherrill (Parkland Light & Water Co.)	01/31/01	2431-2432
Endorsement for fluoride resolution	Rick Ouhl (Pierce County Dental Society)	05/01/02	2434
Letter addressing concerns regarding water fluoridation’s effect on aquatic life	Emily Kalweit (WA State Citizens for Safe Drinking Water)	03/06/02	2438-2441
Brief review of paper entitled, “Impact of Artificial Fluoridation of Salmon Species in the Northwest USA and British Columbia, Canada” indicating various levels at which fluoride can have a toxic effect on fish	Joan Hardy (Toxicologist, WA State Dept. of Health)	01/22/02	2442-2445
Canadian Environmental Protection Act, Priority Substances List, Assessment Report on Inorganic Fluorides	Canadian Government	1993	2446-2451
Sierra Club Position on Mandatory Drinking Water Fluoridation” indicating that communities should have the option of rejecting mandatory fluoridation of their water supplies	Sierra Club	09/25/01	2452
“Stoned Salmon, Pissed Environmentalists,” Willamette Week reporting on opposition by environmentalists to proposed legislation in Oregon to provide for mandatory fluoridation	Nick Budnick	03/28/01	2453-2454
“Evidence for Fluoride Effects on Salmon Passage at John Day Dam, Columbia River, 1982-1986,” North American Journal of Fisheries Management, indicating that fluoride discharged from a nearby aluminum plant had a toxic effect on fish	David Damkaer, et al.	1989	2462-2470

Tacoma Pierce County Health Department
 Fluoridation Resolution

Description	Author	Date	TPCHD Doc. #
Statement Before the Senate Subcommittee on Wildlife, Fisheries and Drinking Water regarding ineffectiveness of water fluoridation	J. William Hirzy (EPA)	06/29/00	2474-2480
Results of survey conducted in Pierce County regarding fluoridation of public water supplies indicating that 68% of the respondents favored fluoridation of water	Scott Schoeggl (Analyst, Market Data Research Corp.)	March 2002	2485-2512
Synopses of Selected State and Territorial Dental Public Health Programs	Unknown	Undated	2514-2517
Collection of addresses of websites containing fluoridation campaign info.	Unknown	Undated	2518-2520
Letter discussing Pierce County fluoridation survey results	Joby Winans	02/21/02	2521
E-mail w/ article: "Fluoridation Damages Teeth, Studies Show"	Paul Beeber (NY State Coalition Opposed to Fluoridation)	03/07/02	2524-2527
Minutes of TPCHD meeting held on 03/25/02		04/01/02	2531-2538
Minutes of TPCBH meeting held on 05/01/02 (also recorded on micro-cassettes)		05/01/02	2544-2549
"Fluoride: the Aging Factor: How to Recognize and Avoid the Devastating Effects of Fluoride"	Doctor John Yiamouyiannis	Undated	2551-2557
"Fluoride, Teeth, and the Atomic Bomb"	Joel Griffiths, et al.	Undated	2558-2569
Minutes of TPCBH meeting held on 04/03/02 (also recorded on micro-cassettes)		04/03/02	2573-2586
"Fluoridation – Why the Controversy?" argues against fluoridation in public water supplies	Dr. Paul Genung, DDS (Seattle, Washington)	03/06/02	2587-2588
E-mail from EPA in opposition to fluoridating public water supplies	J. William Hirzy	04/01/02	2589-2590
Collection of articles linking fluoride to adverse health effects	New York State Coalition Opposed to Fluoridation	March 1993	2591-2596

Description	Author	Date	TPCHD Doc. #
“Statement on the Fluoridation of Drinking Water” – article opposing fluoridation	German Association of Gas and Water Exports	Undated	2597-2600
Letter to Editor, “Kildare Councillors Reveal Alarming High Fluoride Intake”	Robert Pocock	Undated	2601-2602
Director’s comments for TPCBH meeting on 02/06/02	Cruz-Uribe	01/31/02	2637-2638
Minutes of TPCBH meeting held on 02/06/02 (also recorded on micro-cassettes)	BOH	02/06/02	2639-2648
Minutes of TPCBH meeting held on 03/06/02 (also recorded on micro-cassettes)	BOH	03/06/02	2651-2662
Comments and Questions from public fluoridation meeting	BOH	03/28/02	2662A-2662B
Director’s comments for TPCBH meeting on 03/06/02	Cruz-Uribe	02/28/02	2663-2664
Director’s comments for TPCBH meeting on 04/03/02	Cruz-Uribe	03/28/02	2712-2713
Letter supporting fluoridation	Karen Buchanan	03/12/01	2714
Letter supporting fluoridation	Carolyn Robertson	04/02/02	2715-2716
Handout at 04/03/02 TPCBH reflecting international views on fluoridation; handwritten notes on back expressing concerns over fluoridation	Unknown	Undated	2717-2722
“Dangers Associated with Fluoride”	Andreas Schuld	04/02/02	2723-2727
“The Facts About Fluoride” reflecting views opposed to fluoridation of public water supplies	Unknown	04/02/02	2728-2730
“Fluoride Intake and Sky-Rocketing Fluorosis Rates”	T. Aoba	1997	2731-2744
Letter opposing fluoridation	Marianne Lincoln	Undated	2745
Letter indicating that decision to add fluoride should be made by individual water purveyors	Elizabeth Kent (Spanaway Community Action Network)	04/02/02	2746

Description	Author	Date	TPCHD Doc. #
Letter supporting citizen vote on fluoridation	Sarah Casada (WA State Representative, District 25)	04/02/02	2747
“Occurrence of Dental Decay in Children after Maternal Consumption of Xylitol Chewing Gum” - abstract	P. Isokangas	2000	2748-2749
“Researchers developing cavity vaccine”	Jean Enersen (King 5 News)	02/27/02	2750
Letter opposing fluoridation	Pearl Schmitt	03/18/02	2751
The Washington State Children’s Dental Health Survey –abstract reflecting that large groups of children are at high risk for dental caries and have inadequate access to dental care	Ronald Maynard, et al.	August 1985	2752-2755
Director’s comments for TPCBH meeting to be held on 05/01/02	Cruz-Uribe	04/25/02	2762-2763
Minutes of TPCBH meeting held on 06/05/02 (also recorded on micro-cassettes)	BOH	06/05/02	2766-2775
Director’s comments for TPCBH meeting held on 06/05/02	Cruz-Uribe	05/30/02	2776-2777
E-mail and corresponding article from EPA regarding drinking water contaminants including levels for fluoride	Judy Ritchie	05/08/02	2778-2781
Letter opposing fluoridation with accompanying info. indicating that tooth decay is not infectious	Judy Ritchie	Undated	2790-2798
“Fluoride: FDA Unapproved”	Preventive Dental Health Association	03/25/02	2799-2800
“Adverse Health and Behavior from Silicofluorides”	Rogers Masters, et al.	Undated	2801-2802
“Vaccine prevents cavities”	William Cromie (Harvard Univ. Gazette)	Undated	2802-A
Spanaway Water Company – Summary O & M and Capital Cash Flow 2002-2005	Unknown	Undated	2803

Description	Author	Date	TPCHD Doc. #
Documentation of telephone call opposing fluoride	BOH	06/04/02	2804
“A Thumbs up On Fluoridation”	Tacoma News Tribune	04/03/02	2811
“Fluoridation’s benefits are well-established”	Bill Hallett	04/03/02	2812
Letter supporting fluoridation	Larry Momo (Community Dental Outreach)	03/28/02	2813-2814
Letter supporting fluoridation	David Sparling, M.D.	03/13/02	2815-2816
Letter discussing cost of water fluoridation	Thomas Reeves	03/22/02	2817-2818
Documentation on three telephone calls supporting fluoridation	Cheryl Rexroat	03/06/02	2819-2821
“Statement on Community Water Fluoridation” supporting resolution	Maxine Hayes (WA State DOH)	Undated	2822
Letter supporting fluoridation	Tracy Garland (Washington Dental Service Foundation)	05/09/02	2823-2824
“The Valid Truth About Fluoridation” supporting resolution	Unknown	Undated	2825-2827A
“Fluoridation Questions and Answers” supporting resolution	Unknown	Undated	2828-2830
“National and Int’l Orgs that Recognize Public Health Benefits of...Fluoridation”	ADA	03/07/02	2831-2832
Comments to TPCBH during meeting held on 04/03/02	Susan Ferguson (General Counsel, Tacoma-Pierce County Health Department)	04/03/02	2833-2838
“Questions and Answers About Water Fluoridation” reflecting support for fluoride in public water supplies	Unknown	Undated	2839
“Fluoride: The Benefits Can Last a Lifetime	CDC	Undated	2840
“Systems with Adjusted Fluoride Levels” - table reflecting water purveyors in Washington using fluoride supplement	Unknown	December 2000	2841-2842

Tacoma Pierce County Health Department
 Fluoridation Resolution

Description	Author	Date	TPCHD Doc. #
"As Kids' Cavities Rise, Some Dentists Advocate Using Tooth Sealants"	Tara Parker-Pope (Wall Street Journal)	unknown	2843-2844
Newsletter on Fluoride discussing topical application of fluoride	Clinical Research Associates	unknown	2845-2847
Letter opposing fluoridation	Jeff Roscoe	06/14/02	2848-2850
Editorial, Tacoma News Tribune, "Mandated fluoridation policy flawed, outdated"	Marianne Lincoln	07/15/02	2851
Letter opposing fluoridation	Judith Nichols	06/09/02	2852
Presentation to Lakewood City Council regarding fluoridation	Randall Black (Lakewood Water District)	05/28/02	2853-2862
Letter opposing fluoridation	Bobbie Spence	May 2002	2867-2868
Letter opposing fluoridation, w/ accompanying article regarding levels of fluoridation in Ireland	Maria Abdin (Prensa Samizdat Research Service)	05/04/02	2869-2872
Letter opposing fluoridation	Shari Van Enkevort	05/15/02	2874
Letter opposing fluoridation, w/ accompanying research notes	Maria Abdin	07/05/00	2875-2916
Letter opposing fluoridation	George Meinig, D.D.S.	04/14/02	2917
Letter opposing fluoridation	The Animals Crusaders, Inc.	04/12/02	2918
Letter opposing fluoridation	Marcia Girus	04/19/02	2919
Letter opposing fluoridation	Meg Letterman	04/16/02	2920-2921
Letter opposing fluoridation w/ accompanying article "Thyroid Power: 10 Steps to Total Health"	Jean Mitchell	April 2002	2922-2924
Letter opposing fluoridation	Karen MacDonald	04/12/02	2925
Letter opposing fluoridation	Maxine Wymore	04/15/02	2926-2927
Documentation on six telephone calls opposing fluoridation		04/11/02 04/12/02	2928
Letter opposing fluoridation	Mr. & Mrs. Edmond Poulin	04/11/02	2929

Description	Author	Date	TPCHD Doc. #
Letter opposing fluoridation	Mabel Henderson	04/12/02	2930
Letter opposing fluoridation	Marianne Moss	04/11/02	2931
Letter opposing fluoridation, along with resolution condemning fluoridation	Rose Waldram	04/03/02	2932-2935
Letter opposing fluoridation	Dollyann Grimes	04/00/02	2936-2938
Letter opposing fluoridation, along with City of Edgewood Resolution No. 02-122 memorializing opposition	Terri Berry (City of Edgewood Clerk)	03/27/02	2939-2941
Letter opposing mandatory fluoridation without a public vote	Rep. Tom Campbell Rep. Dave Morell	03/27/02	2944
Letter opposing fluoridation	Sharon Williams	03/27/02	2945
Letter opposing fluoridation	Eileen Raye Lawrence	03/20/02	2946-2947
Letter opposing fluoridation	Steve Wieneke (Firgrove Mutual Water Company)	03/20/02	2948
Letter opposing fluoridation w/ excerpts of articles opposing fluoridation	Char Oskamp	03/28/02	2949-2964
"Does health board care about public's input?" Letter to news tribune	Linda Johnson	03/28/02	2965
Letter opposing fluoridation	Roger Bush (WA State House of Representative for 2 nd Legislative District)	04/02/02	2968
Documentation of six telephone calls opposing fluoridation	Cheryl Rexroat	04/02/03 04/03/02	2969-2970
Letter opposing fluoridation	Dan Swecker (WA State Senator for 20 th Legislative District)	04/02/02	2971
Documentation of four telephone calls opposing fluoridation	Cheryl Rexroat	04/01/03 04/02/02	2972-2974
Letter opposing fluoridation w/ accompanying excerpts of newspaper articles for and against fluoridation	Guy Colorossi	03/25/02	2975-3018
Letter opposing fluoridation	T. Hollingsworth	03/11/02	3021
Letter opposing fluoridation	Gloria Lamb	03/04/02	3022-3023

Description	Author	Date	TPCHD Doc. #
Article discussing Calif. Supreme Court ruling allowing citizens to sue water purveyors for contamination found in drinking water	Paul Connett	02/08/02	3024
Letter opposing fluoridation	Betty Pendleton	03/05/02	3025-3026
“Access to Baby and Child Dentistry Program” - Comments from selected articles	Rebecca Sullivan	Undated	3027-3033
“Information on Dental Care, Pierce County”	Rebecca Sullivan	Undated	3034-3036
“Analysis on How to Improve Dental Access for Medicaid Children in Pierce County”	Rebecca Sullivan	Undated	3037-3043
“Summary of Concerns of Antifluoridationists”	Rebecca Sullivan	Undated	3047-3090
Costs of Fluoridation PowerPoint presentation	TPCHD	Undated	3091-3115
“Why I Changed my Mind About Water Fluoridation,” Perspectives in Biology and Medicine – opposing fluoridation	John Colquhoun	1997	3116-3128
PowerPoint presentation to Regional Water Association of Pierce County promoting fluoridation of public water supplies	TPCHD	Undated	3129-3150
“Fluoridation Evaluation for Washington State” discussing implementation costs and examining existing fluoridation efforts in Washington State	CH2MHill for WA Dental Service and Washington Dental Service Foundation	September 2000	3151-3176
Letter opposing fluoridation	Claudia and Chuck Branham	03/06/02	3177
E-mail opposing fluoridation	Harry Bartels	03/05/02	3180
E-mail opposing fluoridation	Ruth Nakasone	03/06/02	3182
Documentation of telephone call opposing fluoridation	Cheryl Rexroat	03/05/02	3183

Description	Author	Date	TPCHD Doc. #
Letter to the Editor, <i>Tacoma News Tribune</i> , entitled, "Many people have allergies to fluoride"	Marianne Lincoln	03/05/02	3184
Documentation of telephone call opposing fluoridation	Kathie	Undated	3185
"In Harm's Way: Toxic Threats to Child Development" –excerpt discussing potential harmful affects of fluoridation in water supplies	Greater Boston Physicians for Social Responsibility	Undated	3186-3188
E-mail w/ Salt Lake City Tribune article "What's in the Water?"	Wini Silko	06/22/02	3190-3191
Chart of water systems by population served	Unknown	Undated	3192-3194
Letter opposing fluoridation w/ accompanying excerpts of articles supporting position	Paul Koslouski	03/20/02	3215-3223
"Analysis of a Mandate to see Medicaid Patients for Dental Care"	Rebecca Sullivan	August 2001	3224-3273
"Unmet Dental Needs of the Uninsured in Pierce County"	Rebecca Sullivan	Undated	3274-3290
"Water Fluoridation Fact Sheet"	WA St. Dept. of Health	01/20/00	3291-3292
Fact Sheet on Kids' Oral Health reflecting support for fluoridation of public water supplies	Washington Kids Count/Citizen's Watch for Kids' Oral Health	January 2001	3294-3295
"Trends in Children's Oral Health" indicating that fluoridation in water supplies reduces dental caries in permanent teeth by 17 to 40%	U.S. Dept. of Health and Human Services/ National Maternal and Child Oral Health Resource Center	February 2001	3296-3297
Charts – Water Systems with More than 5,000 and 10,000 people in Pierce County	Unknown	02/21/02	3298-3300
Chart – "Systems with Adjusted Fluoride Levels by County" in Washington State	Unknown	April 2001	3301
"Fluoridation mandate looms," article on pros and cons of fluoride debate	Eijiro Kawada, et al. (Tacoma News Tribune)	05/20/02	3304-3305

Description	Author	Date	TPCHD Doc. #
“Washington State Dental Concerns” – statistics regarding dental problems of Washington’s children	Rebecca Sullivan	Undated	3318
“Oral health of Lakewood Children”	Rebecca Sullivan	Undated	3319-3327
“Oral Health and Learning”	Surgeon General David Satcher	Undated	3328-3329
Resolution No. 89-1117 “Resolution Endorsing the Adjustment of the Fluoride Level in Water Systems Throughout Pierce County,” w/ accompanying fluoride facts and studies	BOH	05/03/89	3330-3338
Washington State Smile Survey 2000 – summary of statistics including that 55% of 8 year-olds have tooth decay	Rebecca Sullivan	Undated	3339-3346
Map of Fluoridated Water System Service Areas in Pierce County	Unknown	Undated	3349
Letter opposing fluoridation	Dollyann Grimes	April 2002	3352-3353
Notice of 04/03/02 meeting for opponents of fluoridation, w/ collection of articles opposed to fluoridation	Unknown	April 2002	3354-3362
“Influence of Fluoride on Aluminum Toxicity to Atlantic Salmon”	Steven Hamilton, et al.	1995	3379-3391
Paper addressing EPA’s maximum containment level of 10 ppb of arsenic as having no real effect on water fluoridation	Thomas Reeves (CDC)	February 2001	3392
“Manufacture of Fluoride Chemicals” concluding there is no basis for concern on the issue of using silicofluorides in fluoridated water supplies	Thomas Reeves (CDC)	September 2000	3393-3395
“Fluoridated Water: Nature’s Cavity Fighter,” Community Health Forum	Michelle Banks	Undated	3406-3408
“Fluoridation Status: Percentage of U.S. Population on Public Water Supply Systems Receiving Fluoridated Water”	CDC	1992	3410-3411
“Fluoridation Fact Sheet” providing statistics on fluoridation of public water supplies	CDC	1992	3412-3413

Description	Author	Date	TPCHD Doc. #
"Pierce County Fluoridation Evaluation" prepared for TPCHD to provide a preliminary assessment of the probable facility requirements and to develop planning-level estimates of the associated costs for installing and operating fluoridation systems by public water utilities in Pierce County	Economic and Engineering Services	05/07/02	3414-3433
Results of interviews of 19 purveyors of fluoridated water systems within Washington State	Gary Port, RS (TPCHD)	Undated	3441
Minutes of April, May, and June meetings reflecting discussion on TPCHD's fluoride resolution	Regional Water Assoc. of Pierce County	04/23/02	3444-3471
Letter indicating that discharge of fluoridated drinking water from City of Puyallup Wastewater Facility into Puyallup River would not have a significant impact on the environment	Glenn Pieritz (Department of Ecology)	03/20/02	3571
Letter supporting fluoridation of public water supplies	Gregg Gruenfelder (WA DOH, Div. Of Drinking Water)	06/26/02	3636
Report entitled, "Fluoride Safety and Efficacy," analyzing earlier study on rats given high dosages of sodium fluoride	Weisburger, et al.	12/19/90	3637-3641
"The Fluoridation Status of U.S. Public Water Supplies," which addresses legal arguments brought by anti-fluoride groups	Harald Loe, DDS (U.S. Depart. of Health and Human Services)	1986	3642-3645
"Successful and Unsuccessful Experiences in Combating the Antifluoridationists"	Frederick Margolis, MD Sanford Cohen, MD (Wayne State Univ. School of Medicine)	July 1985	3646-3654
"Oral Health and Children's Learning"	Rebecca Sullivan	Undated	3655-3657
"Objections to Community Water Fluoridation"	Rebecca Sullivan	Undated	3658-3688