Washington State Department of Health

CRITICAL AQUIFER RECHARGE AREAS

Office of Drinking Water

Planning for Critical Areas

Passport to 2044 Periodic Update

Nov 30, 2022

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Program Manager

Source Water Protection

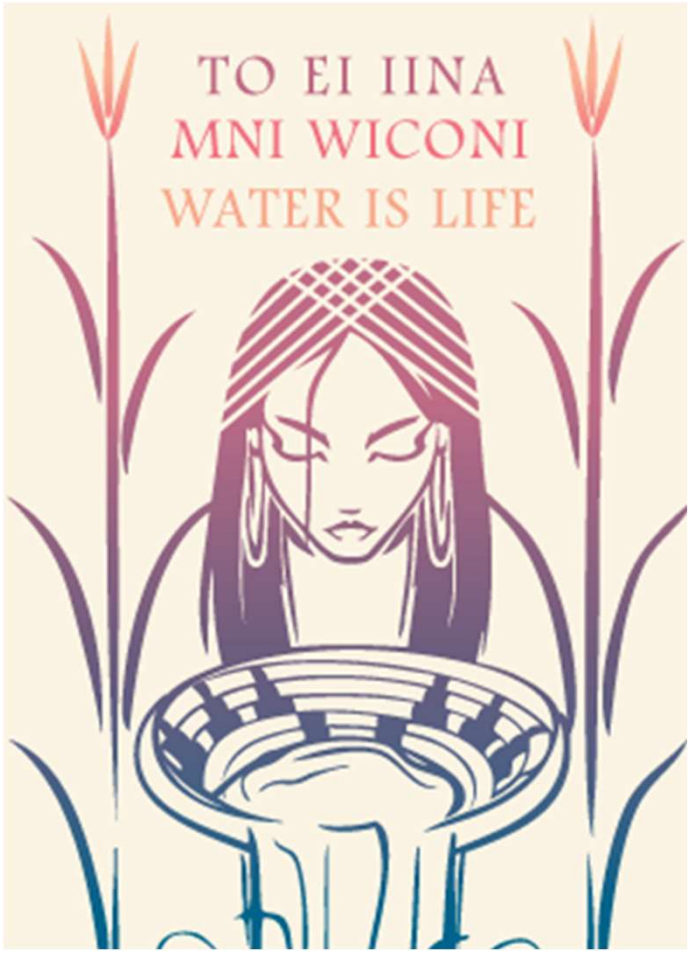
Words Spoken Before All Others

Today we have gathered. We have been given the duty to live in balance and harmony with each other and all living things. So now we bring our minds together as one as we give greetings and thanks to each other as people. Now our minds are one.

We give thanks for all the waters of the world for quenching our thirst and providing us with strength. Water is life. We know its power in many forms—waterfalls and rain, mists and streams, rivers and oceans. With one mind we send greetings and thanks to the spirit of water. Now our minds are one.

Ohenten Kariwatekwen

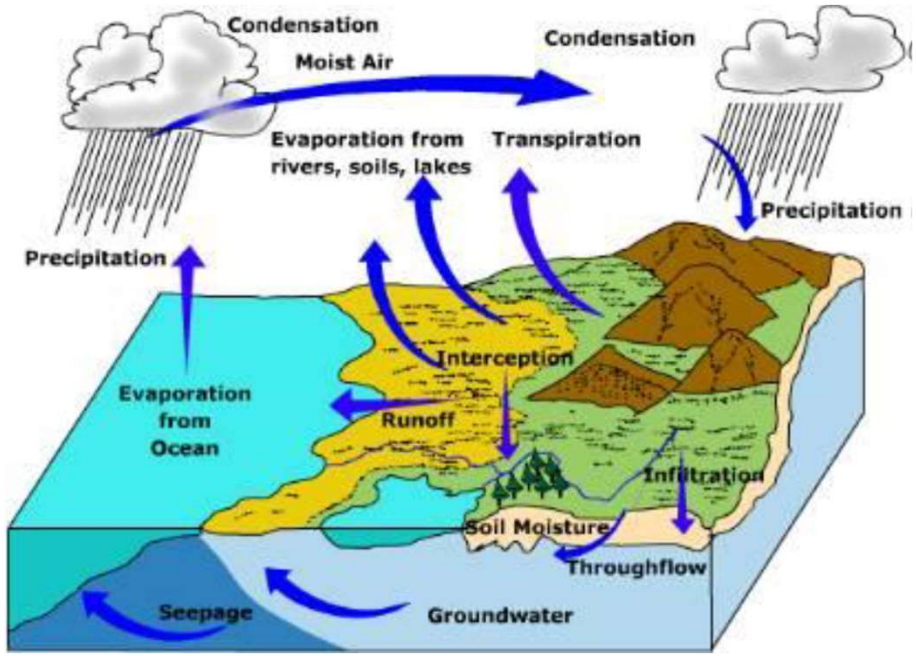
1994 Six Nations Indian Museum



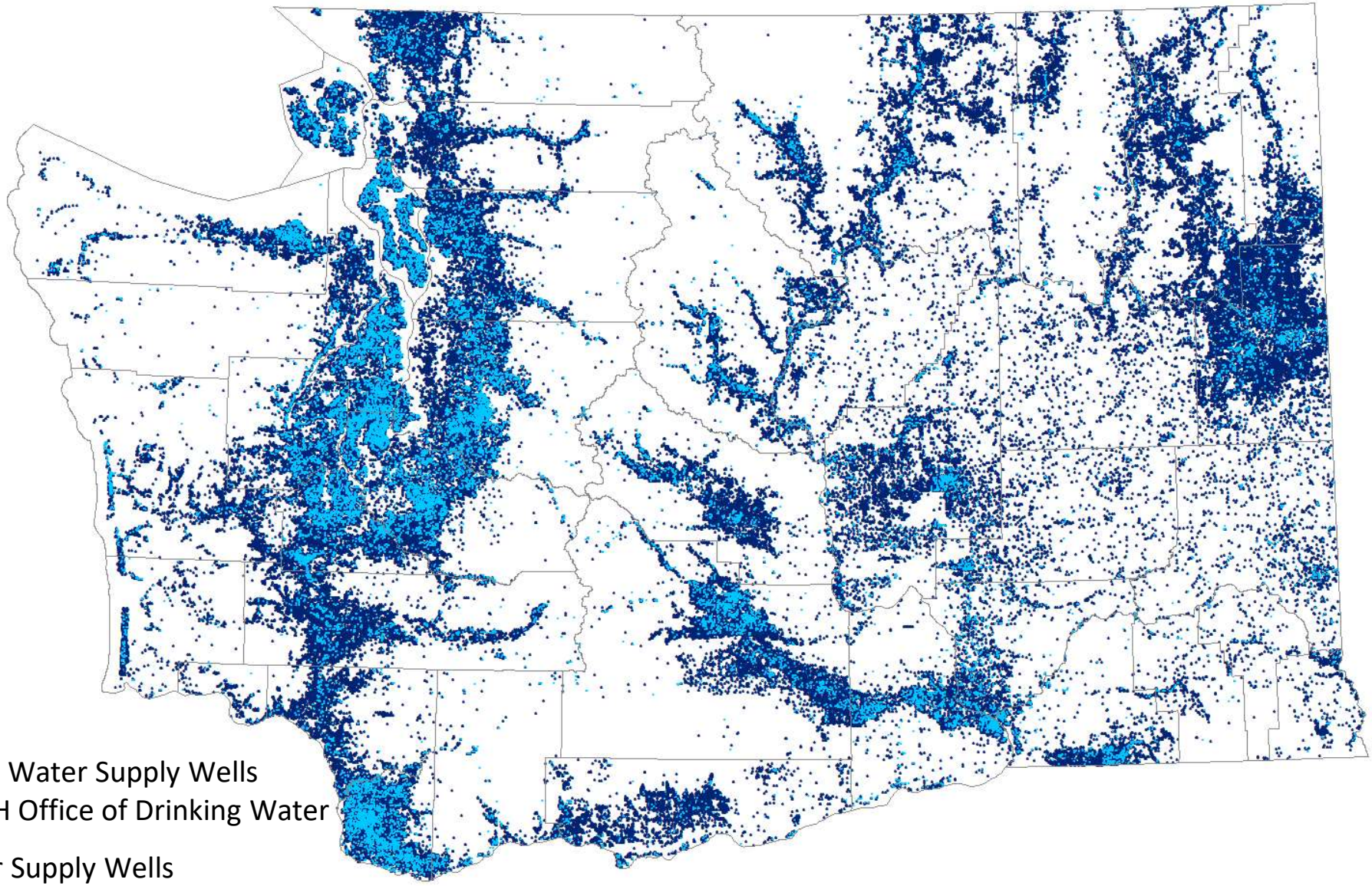
Overview

- Geology and hydrology
- Drinking water and contamination
- Critical Aquifer Recharge Area WAC
- New Guidance from WA Dept of Ecology
- Implementation tips
- Monitoring for CARAs
- Voluntary Stewardship Program
- Resources

Water Cycle


Condensation
Moist Air
Condensation
Evaporation from
rivers, soils, lakes
Transpiration
Precipitation
Precipitation
Interception
Evaporation
from
Ocean
Runoff
Infiltration
Soil Moisture
Throughflow
Seepage
Groundwater

Drinking Water Wells



- Public Water Supply Wells
  WDOH Office of Drinking Water
- Water Supply Wells
  ECY Well Logs

Washington Geology

Hydrogeology

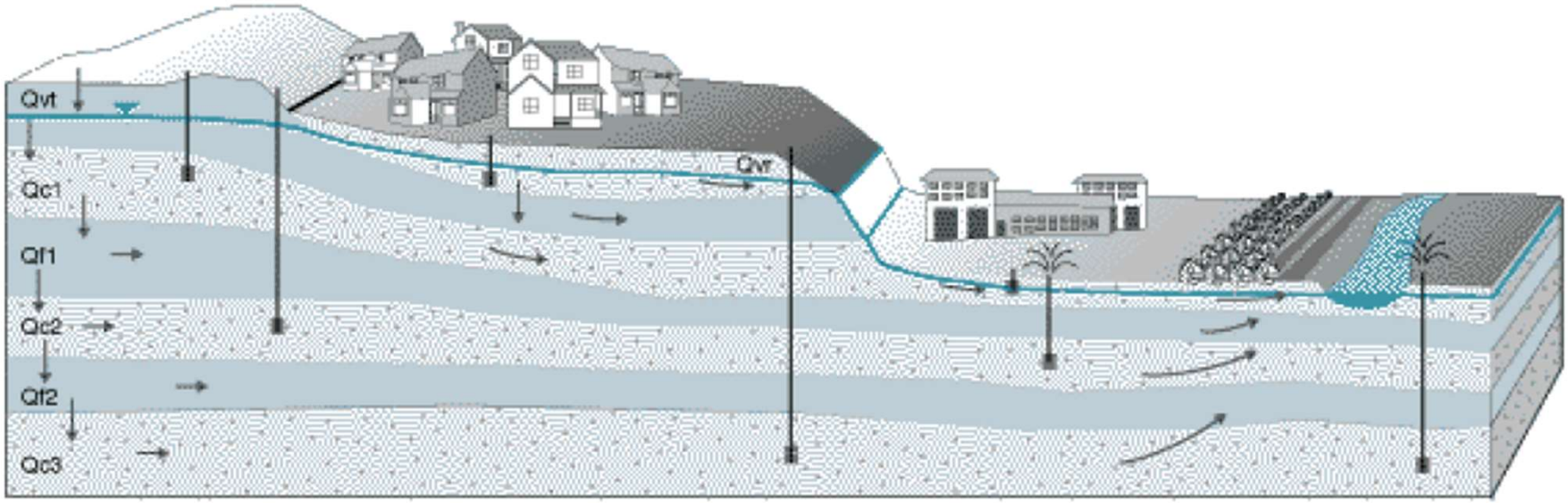


Figure 6: Representation of an aquifer system (Jones, 1999)

Chapter 365-190-100 Critical Aquifer Recharge Areas

Water source

Groundwater

Surface water

Inventory and map

Performance standard

Susceptibility

Soils maps, surficial geology

Contamination sources

Development requirements

Protection

Siting projects

Pollution prevention

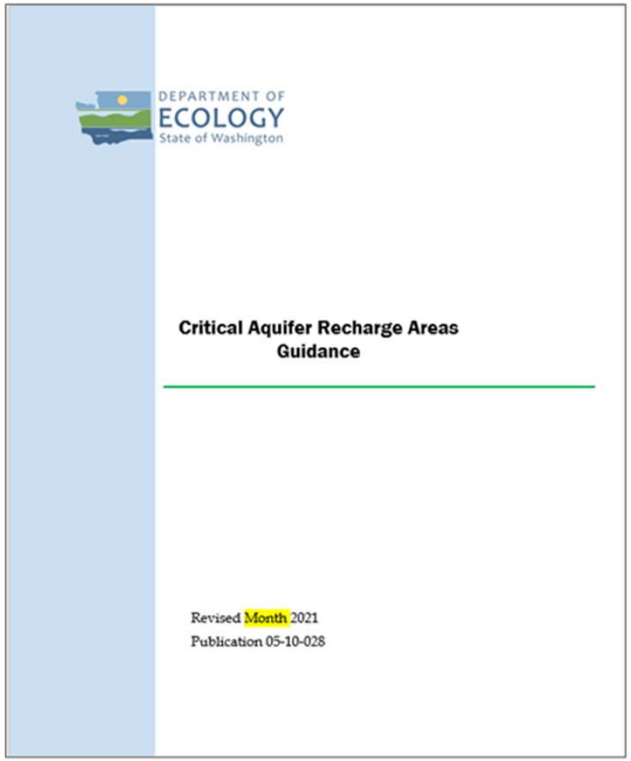
Inspections

Monitoring

Vulnerability

ECY 2021 Technical Guidance

1. Identify where groundwater resources are located
2. Analyze the susceptibility of the natural setting where groundwater occurs
3. Inventory existing potential sources of contamination
4. Classify the relative vulnerability of groundwater to contamination
5. Designate areas that are MOST at risk
6. Protect by minimizing activities and conditions that post risk
7. Ensure that contamination prevention plans and BMPs are implemented
8. Manage groundwater withdrawals and recharge impacts:
    a. Maintain availability for drinking water sources
    b. Maintain stream base flow and groundwater to support in-stream flows, especially for salmon-bearing streams



Qualified Professional Assistance

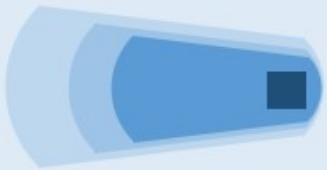
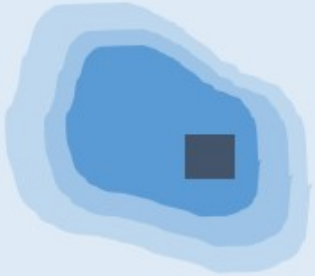
- Professional hydrogeologist, licensed in WA State
  - Delineate and characterize aquifers
  - Fate & transport
  - Modeling
- Other activities
  - Planning
  - Pollution prevention
  - Education & Outreach
  - Enforce ordinances

Ecology Hydrogeologist sampling a groundwater monitoring well.

Best Available Science

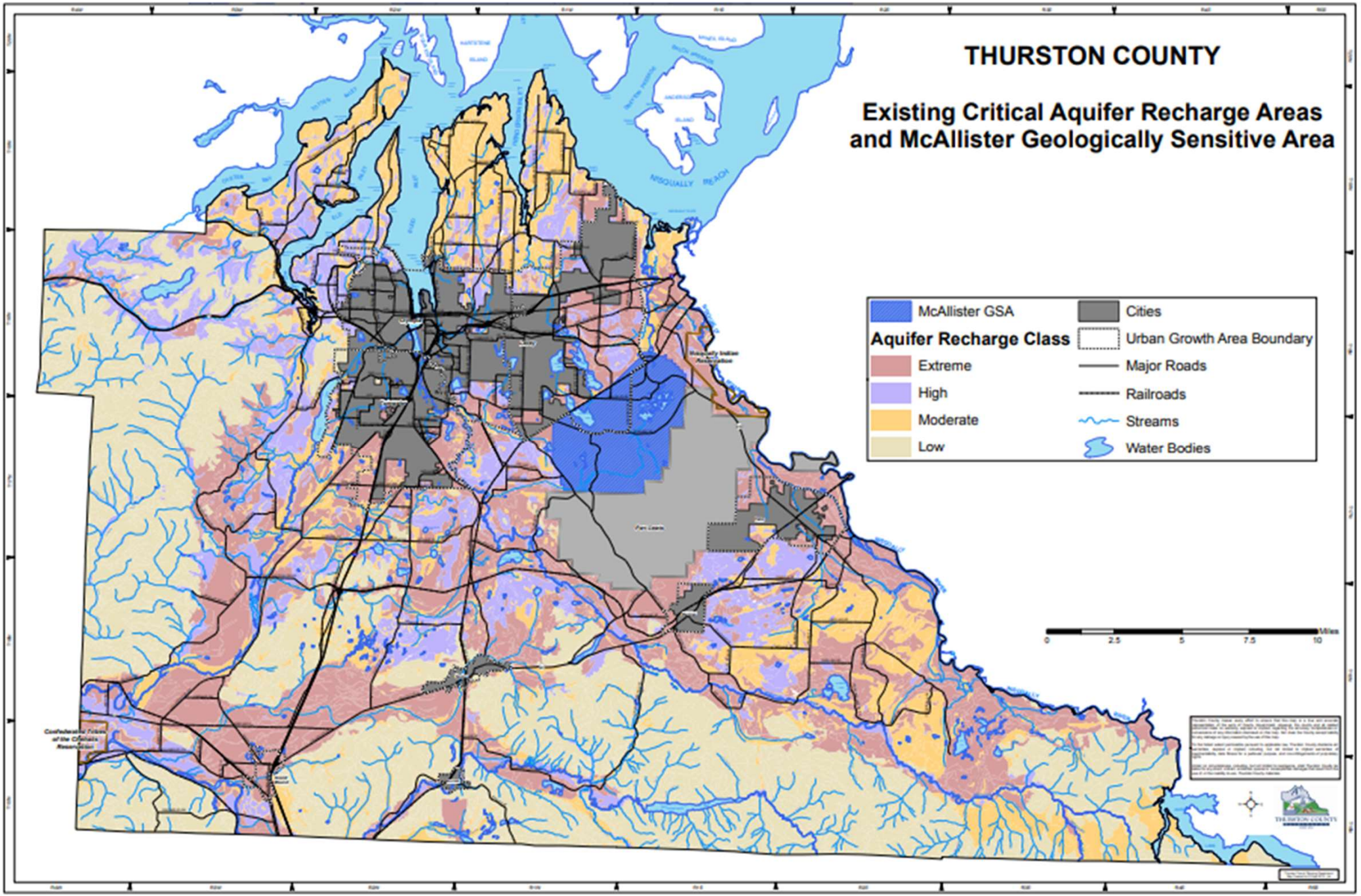
Ask the question of your local water system: what competent science is available?

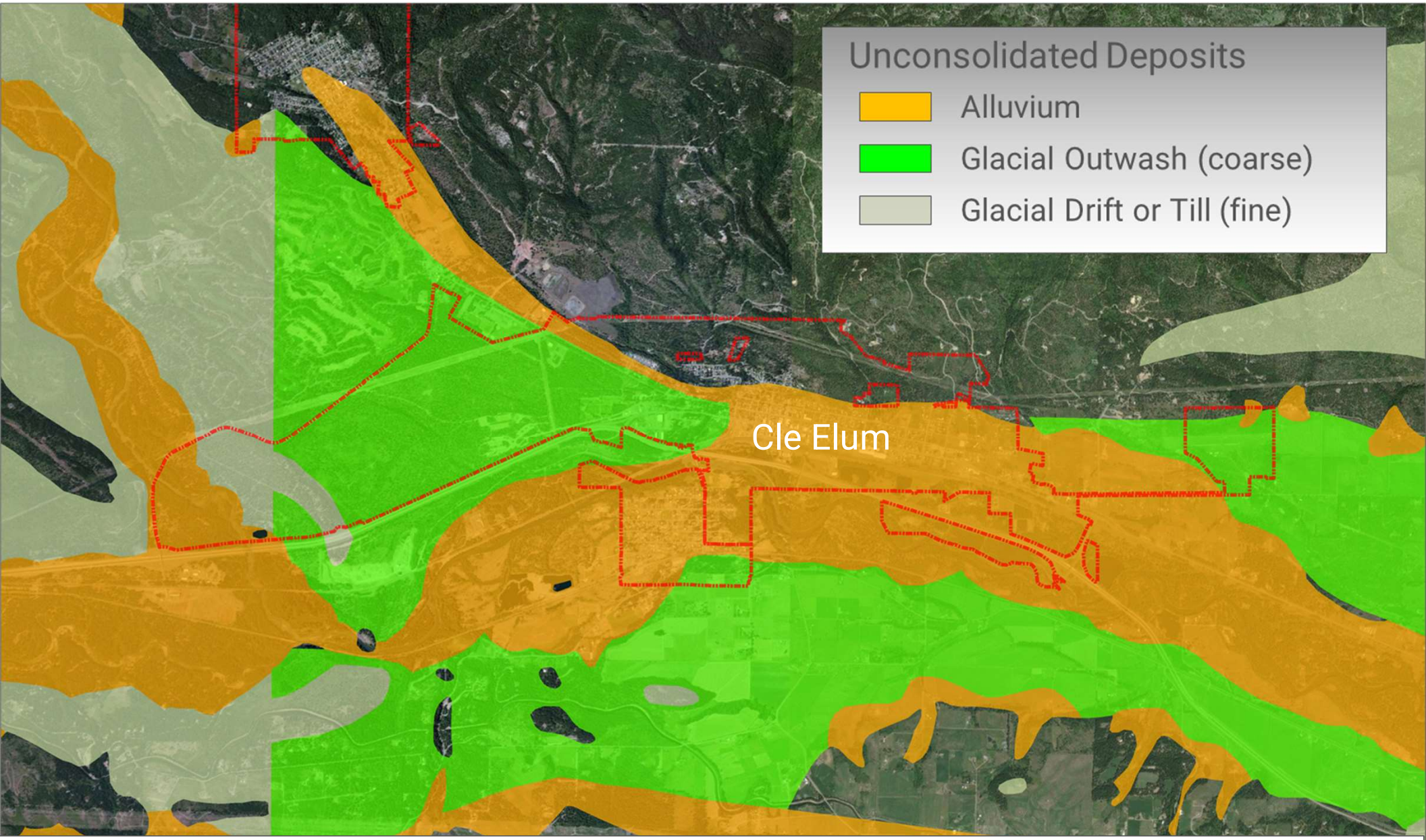
Modeling Approach

Calculated Fixed Radius (CFR)	Analytical Models	Hydrogeologic Mapping	Numerical Flow/ Transport Models
			
The calculated fixed radius method draws a circular protection area for each protective zone. This delineation method is inexpensive and requires minimal technical expertise.	Analytical methods use simple calculations, graphical methods, or simple analytical solution based computerized groundwater-flow models to delineate wellhead protection zones. This method can provide reasonable approximation of capture zones for simple groundwater systems, and it is relatively inexpensive.	Hydrogeologic maps rely on geologic maps, aquifer water level mapping, aquifer pumping test data, hydrogeological reports and well reports. This method can be highly accurate, good for settings where nearby geologic features strongly control groundwater flow patterns, and it is typically much less expensive than numerical modeling.	Numerical flow/transport methods use two and three dimensional computer models that approximate groundwater flow. This method is highly accurate, can be used in all groundwater settings, and can be used for other purposes (such as groundwater management).

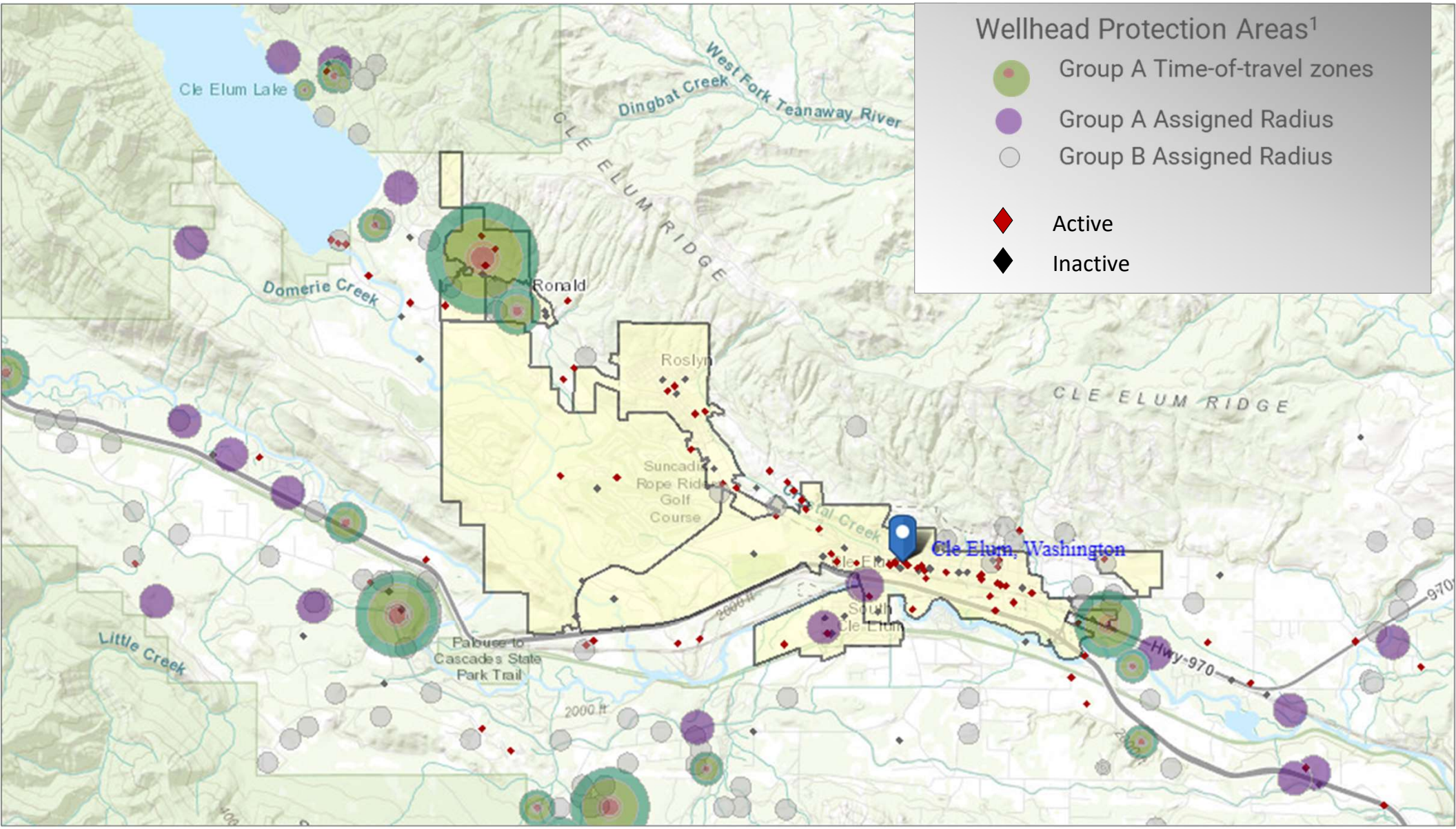
Critical Aquifer Recharge Areas

CHARACTERIZATION EXAMPLES


THURSTON COUNTY
Existing Critical Aquifer Recharge Areas
and McAllister Geologically Sensitive Area
McAllister GSA
Aquifer Recharge Class
Extreme
High
Moderate
Low
Cities
Urban Growth Area Boundary
Major Roads
Railroads
Streams
Water Bodies
0
2.5
5
7.5
10
Miles

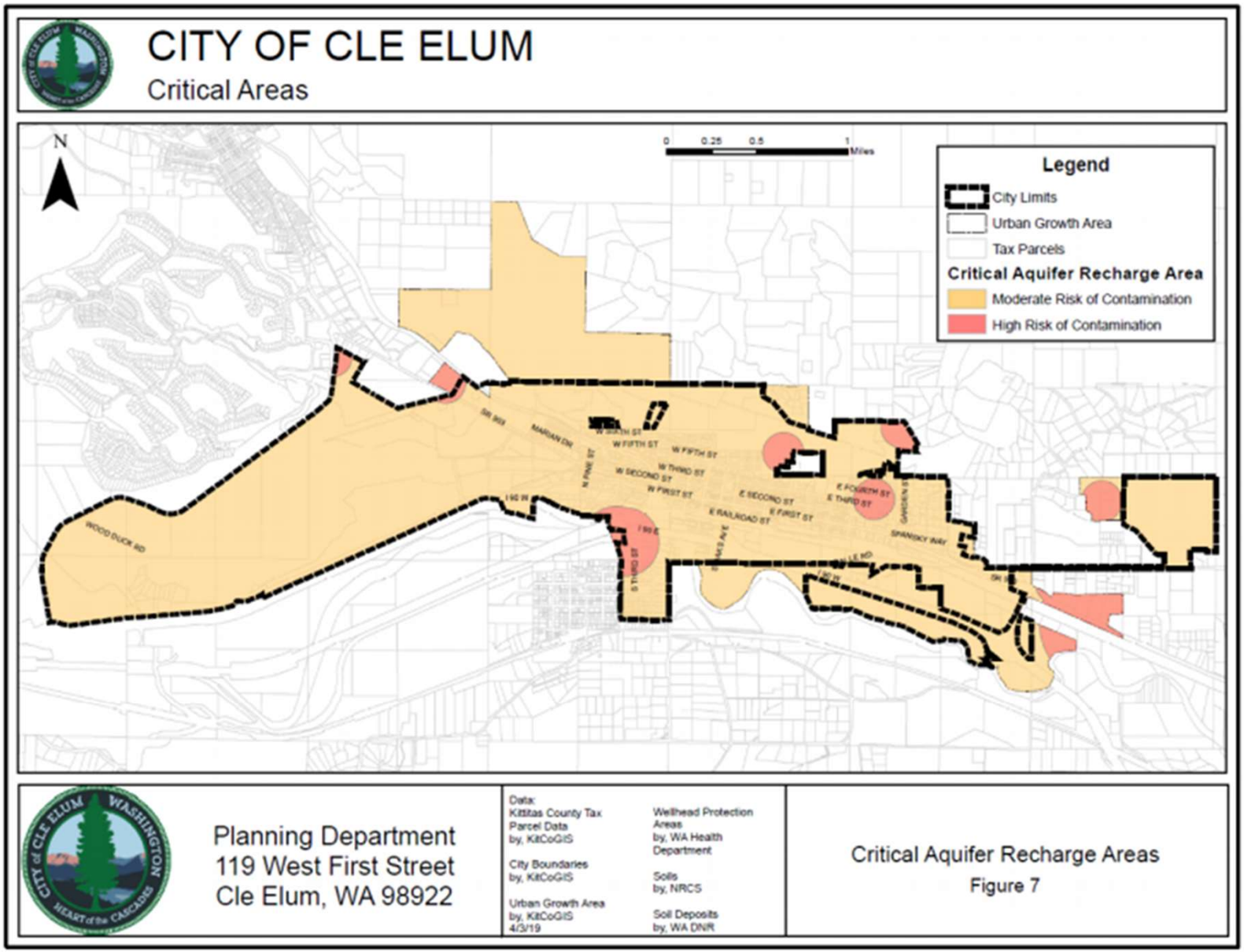


Unconsolidated deposits were derived from the Washington Geological Survey Geology map of Washington. "Glacial Other" consists of finer glacial deposits, like till or drift. The uncolored areas would be hard rock. Glacial outwash is highly permeable.



[1] Washington Department of Health Office of Drinking Water Source Water Assessment Program Online Application
[2] Washington Department of Ecology Facility/Site Online Application

Figure 7: Critical Aquifer Recharge Areas



19-1206_Emergency-Ord-Exhibit-A-Draft-Revised-LU-Element-FNL.pdf (cityofcleelum.com)

Critical Aquifer Recharge Areas

IMPLEMENTATION & MONITORING

Implementation

Integration of pollution prevention programs for shared resources for administration, inspections, outreach & education

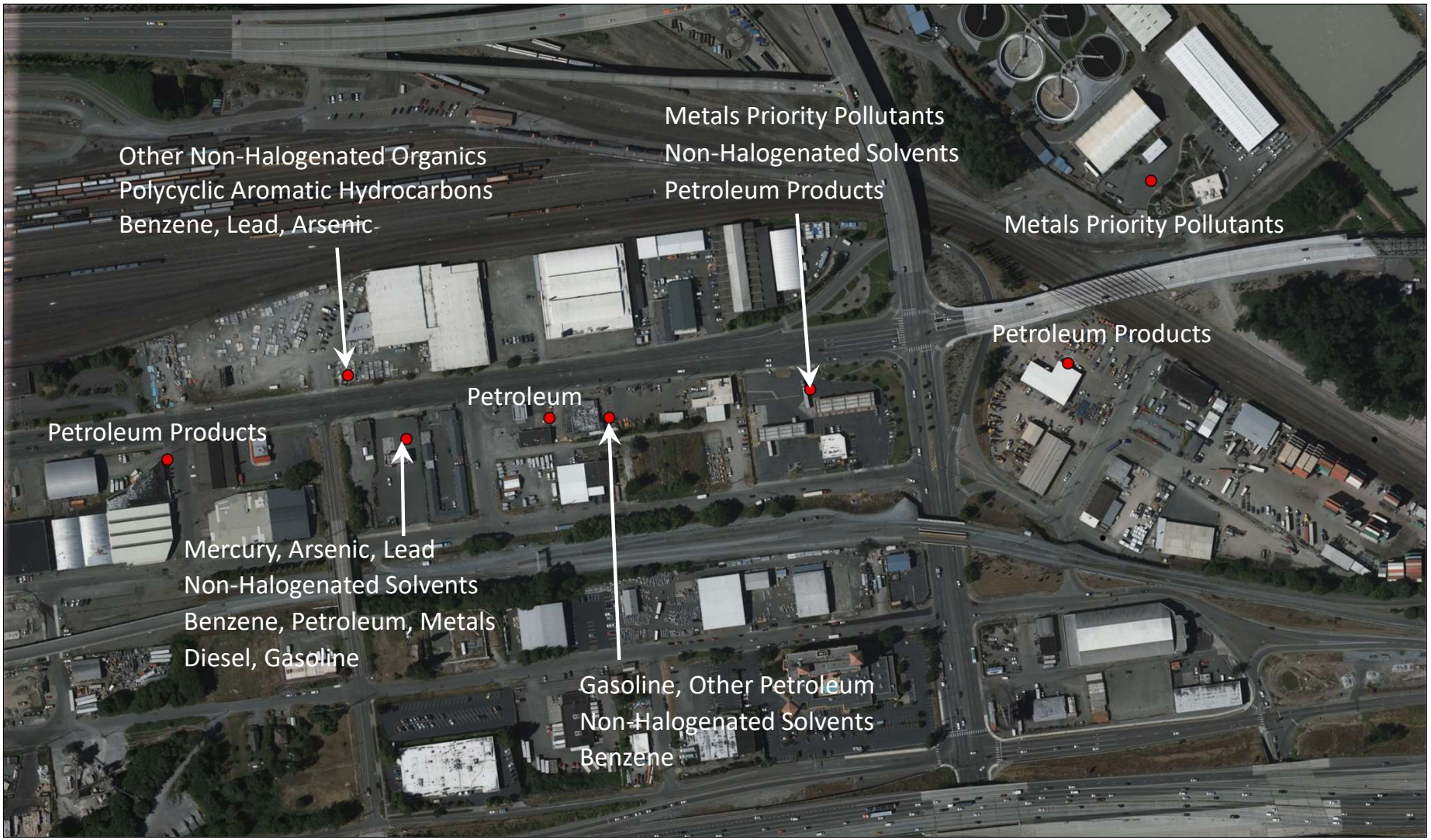
- Spill Response
- Illicit Discharge Investigation
- Hazardous Materials Management Plans
- Hazardous Materials Management Inventories
- Pollution Prevention Technical Assistance
- Fats Oils and Grease management review
- Septic Inspection Verification
- Private Storm System Inspections
- Fire Marshall Inspections
- Ambient Water Quality Sampling

Implementation

Has the jurisdiction given itself authority?

- Require pollution prevention
- Require spill clean up by operator or owner
- Right of entry to inspect and abate violations?
- Collect samples if contamination is suspected
- Develop procedures to inspect, follow up and monitor if contamination is suspected
- Roster of clean up companies, sampling staff or hydrogeologist to review plans

Confirmed groundwater contamination in an Industrial Area



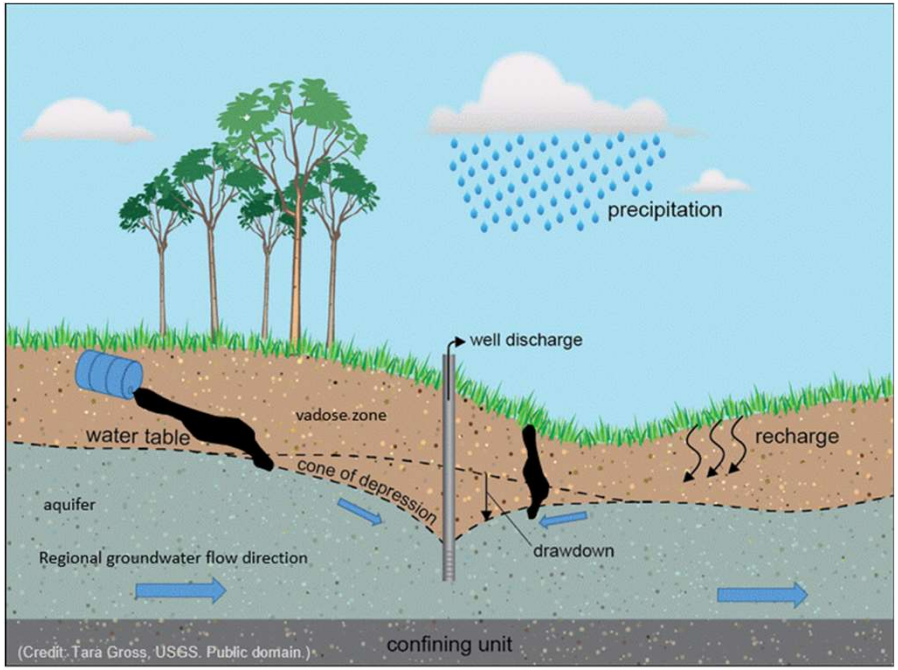
Implementation

Adaptive Management is built in

- GMA requires **continuing review** and evaluation of comprehensive land use plans and development regulations on an 8-year cycle
- Updates recommended in response to changing local knowledge, advances in scientific knowledge and data from monitoring programs

Monitoring

- Follow-up on whether permit requirements (pollution prevention, pervious surfaces, etc.)
- Inspections to watch out for existing pollution threats
  - Code enforcement - Look for problems & correct
  - Contaminant inventories
  - Fire marshal inspections
  - Recommend program integration to leverage other inspection programs (stormwater, surface water, pollution prevention, hazardous waste)



Monitoring

- Using existing groundwater monitoring data
  - Washington State Department of Health Office of Drinking Water online data - SENTRY
  - USGS – NWIS or the federal Water Quality Portal
  - Ecology – Environmental Information Management system (EIM)
- Local groundwater monitoring program
  - Dedicated groundwater monitoring (where there are resources for this)
  - Well sample results from property transfers
- Follow-up when groundwater monitoring detects contamination

Voluntary Stewardship Program

- Growth Management Act – Administered by the Washington State Conservation Commission
- Work plans were submitted
- Five-year reviews required by the Act VSP was set up primarily around riparian buffers and wetlands
- The following terms **do not** apply to Critical Aquifer Recharge Areas in the same way:
  - ✓ No net loss
    Mitigation
    Protect
    Enhance
    "On a watershed basis"

Voluntary Stewardship Program Resources

Washington Conservation Commission VSP Program

Department of Commerce Handbook – Chapter 5

Local VSP Lead Entity – Most often the Conservation District

Wrap Up

- What the ground is like where drinking water is now *or in the future*
  - Where are your aquifers?
  - Are you dependent on them for drinking water?
- What potential contamination sources are there *or could come up in the future*
  - How will you know? How will you track?
- How to prevent costly groundwater contamination
- How to maintain enough recharge

Resources Online

Learn more about the Growth Management Act and critical areas from the Department of Commerce.

Department of Ecology – Critical Aquifer Recharge Areas Guidance Document

Washington Nitrate Prioritization Project

Protecting Washington's Groundwater - The Nitrate Project (storymap)

USGS – Aquifers and Groundwater basics

Department of Health – Source water protection

Department of Health – Water system planning

Department of Ecology – Facility/Site

Department of Ecology – Facility/Site GIS layer

Department of Ecology – Well Logs

Department of Ecology – Low impact development

Puget Sound Partnership – Low impact development manual

RCW 90.44.400 – Groundwater management areas

RCW 36.70A.172 – Criteria for determining which information is the "best available science"

WAC 365-195-905 through 920 – Criteria for determining which information is the "best available science"

Resources –Maps & Data Sources

Washington's Source Water Assessment Program Maps - WA State Dept. of Health

Department of Ecology – Facility/Site

Department of Ecology – Facility/Site GIS layer

Department of Ecology – Well Logs

Washington Geological Survey

Department of Ecology Contaminated sites list

USGS National Water Information System – Groundwater quality data

Department of Ecology EIM Groundwater Data Center

Department of Health – Public water supply information

USGS studies

Department of Ecology – Groundwater studies

The NRCS hosts an online tool called Web Soil Survey, which gives a user access to soil characteristics and maps.

Contact me

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Source Water Protection

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