Water Reuse and Conservation Workgroup

Spokane TMDL Collaboration
Second Status Report
July 22, 2205

Presentation Summary

Assignments

- #1 - Water reuse opportunities
- #2 - Aquifer recharge issues
- #3 - Flow reduction estimates
- #4 - Water conservation opportunities

- Questions

Assignment #1

Determine water reuse opportunities:

Define concentric rings from each existing and proposed treatment plant to establish a range of distances for re-use of treated municipal wastewater?

Question, “What is the total quantity of re-use opportunities within those concentric rings?

- *Consider the April 1-October 31 TMDL timeframe (and the growing season) as a first-tier consideration.*
- *Consider other potential opportunities for re-use such as aquifer recharge and industrial re-use which are not as seasonal.*

Workgroup Discussion

- So what's the difference between "re-use of treated municipal wastewater" and "reclaimed water use"?
  - What level of treatment is required for reclaimed water use?

Reclaimed Water

- Defined by statute (Ch. 90.46 RCW)
- Derived from sanitary sewage.
- Adequately and reliably treated – “at all times”.
- Suitable for beneficial use.
- **No longer a waste water.**

A “new” water supply
An exclusive water right

What other types of water reuse are under Ch 90.46 RCW?

- Greywater use
- Use of treated* industrial process water
  - Agricultural industrial process water
  - Industrial reuse water

**requires adequate and reliable treatment that is suitable for the planned use.*

"Water Reuse"
Not under Ch 90.46 RCW

- Internal (on-site) recycling or reuse
- Wastewater effluent disposal
  - Surface water discharges
  - Soil based treatment – discharges to ground
    - Traditional on-site systems
    - Dedicated land treatment sites (sprayfields)

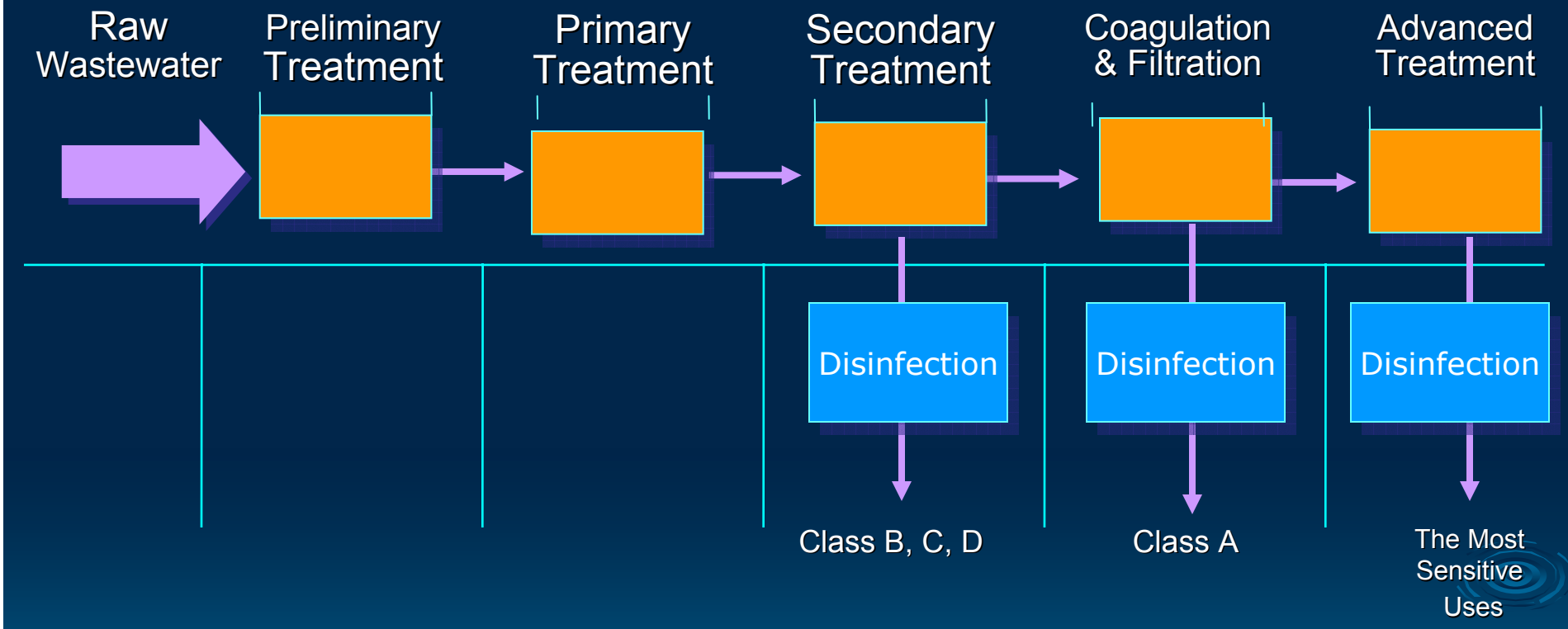
What level of treatment is required?

- For reclaimed water, adequate and reliable treatment is required –
  - State standards set appropriate requirements for specific planned beneficial uses.

Notes:

- Any source of water can be treated to any quality.
- Any contaminant can be removed to undetectable concentrations.
- In general - the more contaminated the source water and the higher the final quality desired - the more treatment required and the higher the cost.

Reclaimed Water Treatment



Increasing levels of treatment for increasing environmental protection

Increasing levels of disinfection for increasing human exposure

How is reclaimed water used?

Examples of seasonal irrigation in Washington

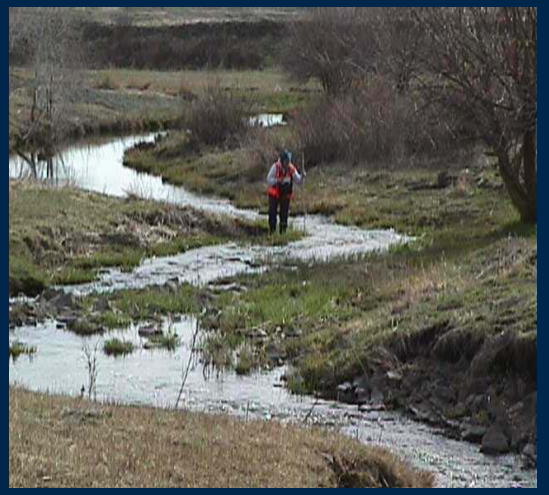
Storage at golf course

Examples of commercial and industrial uses

Cooling tower operation using reclaimed water
Photo Credit: California Energy Commission

Examples of uses that interact with state water supplies.

Wetlands



Stream augmentation

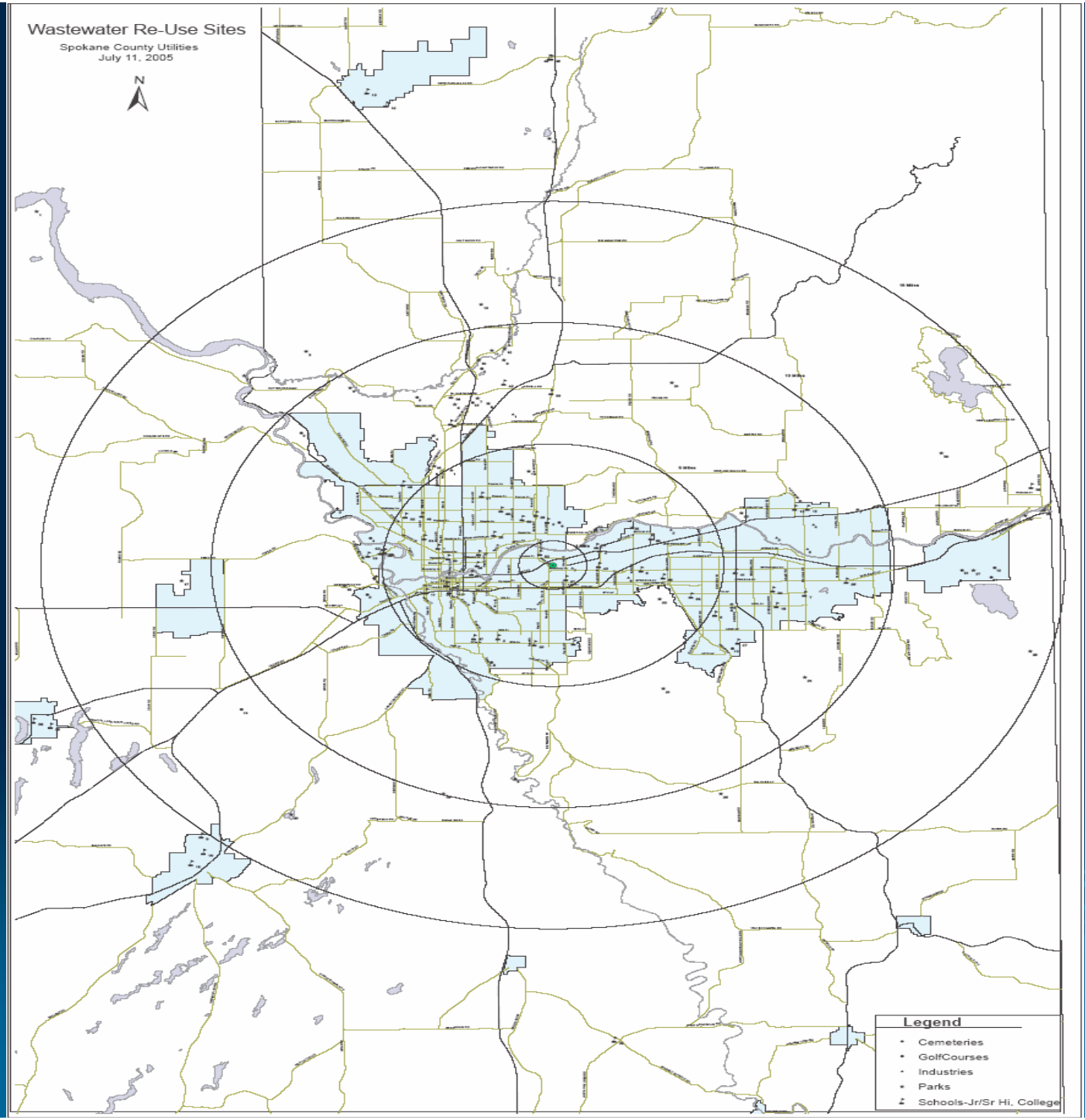
Surface percolation

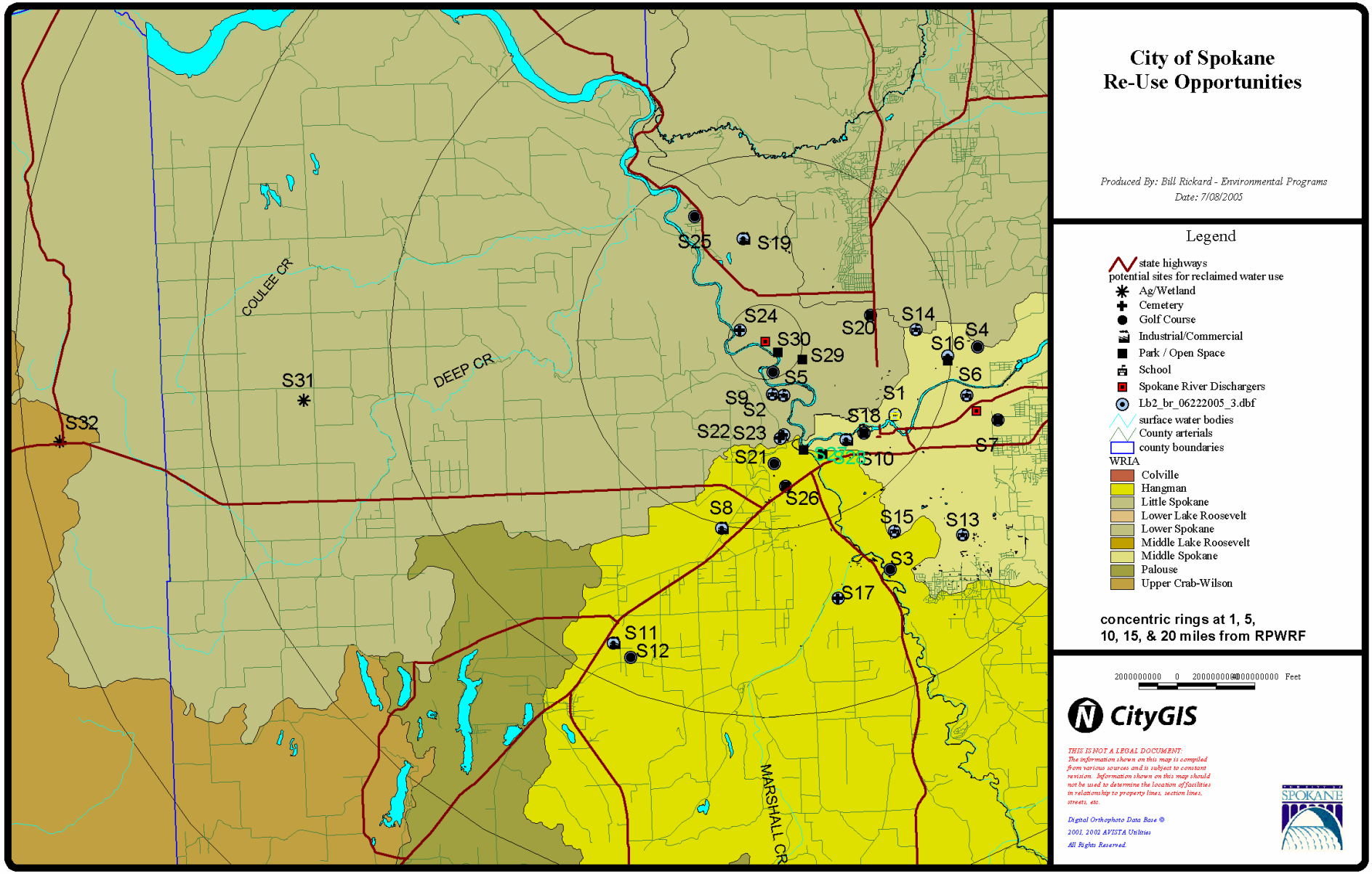
Aquifer recharge

Direct injection

Individual Progress Reports

- Spokane County
- City of Spokane
- Airway Heights
- Liberty Lake
- Idaho
- Private Water Rights
- Conservation District Opportunities


Wastewater Re-Use Sites
Spokane County Utilities
July 11, 2005
N
Legend
Cemeteries
GolfCourses
Industries
Parks
Schools-Jr/Sr Hi, College



City of Spokane
Re-Use Opportunities

Produced By: Bill Rickard - Environmental Programs
Date: 7/08/2005

Legend

state highways
potential sites for reclaimed water use
- Ag/Wetland
- Cemetery
- Golf Course
- Industrial/Commercial
- Park / Open Space
- School
- Spokane River Dischargers
- Lb2_br_06222005_3.dbf

surface water bodies
County arterials
county boundaries

WRIA
- Colville
- Hangman
- Little Spokane
- Lower Lake Roosevelt
- Lower Spokane
- Middle Lake Roosevelt
- Middle Spokane
- Palouse
- Upper Crab-Wilson

concentric rings at 1, 5, 10, 15, & 20 miles from RPWRF

2000000000 0 2000000004000000000 Feet

CityGIS

THIS IS NOT A LEGAL DOCUMENT:
The information shown on this map is compiled from various sources and is subject to constant revision. Information shown on this map should not be used to determine the location of facilities in relationship to property lines, section lines, streets, etc.

SPOKANE

Individual Progress Reports

- Spokane County
- City of Spokane
- Airway Heights
- Liberty Lake
- Idaho
- Private Water Rights
- Conservation District Opportunities

Assignment #2

Aquifer Recharge Opportunities:

- Identify opportunities for aquifer recharge.
- Describe the likely applicability for priority of these various aquifer recharge opportunities.
- Identify “key questions” that need to be answered about aquifer recharge for the Spokane area.

Spokane Valley-Rathdrum Prairie Aquifer

- Designated a “sole source” aquifer under SWDA in 1978.
- Provides drinking water to over 400,000 people in the Metro C’dA/Spokane area.
  - Covers 322 square miles in two states
  - Volume estimated at least 10 trillion gallons – highly productive.
- Highly porous – highly sensitive - potential for contamination.
  - Horizontal hydraulic conductivity of up to 7000 feet per day-vertical K typically similarly high.
  - Wellhead protection zones large
- The Spokane Aquifer and the Spokane River are dynamically connected, the river generally losing water to the aquifer east of Sullivan Road, the river generally gaining water to the west of Sullivan Rd.
- USGS Model – 1980’s – recharge averages 650 MGD
  peak withdrawal at 450 MGD
- Golder model of WRIA 55/57-2003
- Comprehensive study under way of both aquifer properties and surface water connections aquifer wide.

West Plains – Basalt aquifers

- The basalt aquifers system hosted by the Wanapum and Grande Ronde formations are semi-confined. Ground water discharges through surficial materials through the Wanapum to the underlying Grande Ronde. The aquifer system is recharged primarily by precipitation.
- Flow rates are more typical but vary depending on where they are measured.
  - Horizontal hydraulic conductivities have been estimated up to 16 feet per day; vertical as high as 3.5 feet per day.
  - Transmissivities from 4.8 to 20.9 square feet per day
- Ground water in this aquifer generally flows from the steptoes in the southwest near Medical Lake, north and east toward surface water bodies of Deep Creek and the Spokane River.
- A background ground water quality characterization of the West Plains revealed that ground water quality in the area is generally good.
- Water levels are declining in the shallow basalt aquifers.

Eight Key Questions

1. What is the intent (benefits) of the aquifer recharge project?

   - Protection of the Spokane River ?
     - - phosphorus reduction?
   - Water supply needs?
     - Will the water be artificially stored for later withdrawal?
   - Both?

Key Questions

2. What types of aquifer recharge are possible?

   <u>Should any of them be ruled out at this time?</u>

- Surface percolation with high quality reclaimed water
- Direct injection with highest quality (RO) reclaimed water
- Irrigation above agronomic rates – (at what quality?)
  - Reclaimed water sites
  - Land treatment sites
- Subsurface disposal - on-site systems
- Wetlands discharging to the groundwater
- Natural river flows and planned diversions
- Natural precipitation (low impact development)
- Other?

Key Questions

3. What are the hydrogeologic conditions and constraints – is there adequate information?

   - What aquifer characteristics would be most conducive for recharge/reuse?
   - Ideally where should aquifers be recharged?
   - How should the aquifer be recharged?
   - Will changes in hydraulic gradients induce movement of a different quality of water to new areas? How?
   - What is the hydraulic residence time in the aquifer before the water would be withdrawn for use?
   - What is the travel time to water supply wells?
   - What is the travel time to the Spokane River (surface water)?
   - Would aquifer recharge impair downstream water rights?

Key Questions

4. How will aquifer recharge impact water quality?

   - What is the existing aquifer water quality?
   - How would aquifer recharge with reclaimed water (levels of treatment) impact aquifer water quality?
   - How would aquifer recharge (levels of treatment) impact surface water quality?
   - What treated wastewater contaminants - at levels which cause problems for the river - are not problematic in the aquifer?

Key Questions

5. What level of treatment is required?

- To what extent should recharge of any type be allowed to impact water quality (surface or groundwater)?
  - State law Ch 90.46 RCW – surface percolation
  - Standards and WQ standards – antidegradation consistent with benefit.
- What level of treatment is required to protect water quality in the sole source aquifer?
- What level of treatment is required to protect surface water influenced by the aquifer?

Ground Water Recharge
Surface Percolation

More treatment

- Class A
- Nitrogen removal
  - > 10 mg/L

Groundwater limits

- Drinking water standards
- Other necessary parameters

Assumes additional soil treatment and aquifer retention times (6 months) before withdrawal for potable use.

Direct Aquifer Injection

More treatment

- Class A plus
- Reverse osmosis

- More stringent limits:
  - Ground water standards
  - Drinking water MCLs
  - Turbidity < 0.1 NTU
  - Nitrogen less than 10 mg/L
  - Total Organic Carbon <1.0 mg/L

- Assumes no soil treatment and minim
  12 month retention before potable use

Key Questions

6. What would it take for the public (and decision-makers) to accept aquifer recharge?

- Existing perceptions?
- Acceptable risks ?
  - General public
  - Infants, pregnant women, elderly, ill
- Extent of outreach/ education required?

Key Questions

7. Are statutory or regulatory changes required for aquifer recharge to move forward in the Spokane area?

- Travel or retention time?
- Distance from drinking water wells?
- Level of treatment required?

Key Questions

8. What level of coordination is required between Washington and Idaho?

Assignment #3

Water conservation opportunities:

What is a reasonable expectation for reduction in municipal wastewater influent flows from water conservation measures in the Spokane region?

Workgroup Discussion

- Dischargers estimate about 80 gpcd flows to the sewer for treatment.

- Reasonable percentage reduction debate
  - Consider old vs. new construction?
  - Stranded utility costs? Reduced customer costs?
  - Is 10 or 20% reasonable? Is 50% possible?

- Impact of outdoor conservation on river flows and resulting river quality
  - Less withdrawals or diversions?
  - Additional offset from reclaimed water use?

- Status: Need more information – workshop proposed

Water Conservation Workshop

Workshop Goals :

- To explore and discuss why water conservation is in the best interests of the Spokane River Watershed and the Spokane River DO TMDL.
- To educate all about the proposed new water conservation rules and techniques.

Water Conservation Workshop

Proposed Morning Session:

- **Introduction and Welcome**
- **DOH Proposed Rule - Water Use Efficiency**
- **Current Situation**
  - River, Lake and Watershed (TMDL, Instream Flows, Aquifer)
  - Local Water Usage
  - Status of Purveyors and Water Rights
- **Goal Setting Methods**

Water Conservation Workshop

Proposed Afternoon Session:

- **The Barriers (real and perceived)**
  - Stranded Utility Costs
  - Local uniqueness
- **Goal implementation Techniques (The Tool Box)**
  - Interior conservation techniques
  - Exterior conservation techniques
  - Role of water reuse
- **Summation and Next Steps**

Water Conservation Workshop

Preliminary Logistics:

- Time: Full Day Workshop
- Date: Early October???
- Place: Mukagawa Fort Wright Institute???
- Costs: ????
  - None for room, if purchase lunch
  - Expenses for speakers

Assignment #4

Flow Reduction to River:

- Estimate the flow reduction (and later calculate phosphorus reduction) that can be attributed to re-use of municipal wastewater assuming reasonable opportunities are captured over the next 20 year period.
- What are longer term opportunities.

When is water reuse reasonable ?

"Every project is unique"

For treatment costs - table summarized from Asano 1998

Treatment Level	1.0 MGD	5.0 MGD	10.0 MGD
Primary	$3.0 M	$5. 5 M	$ 7.5 M
Secondary	$6. 0 M	$14.0 M	$25.0 M
Advanced (Class A)	$8.5 M	$18.5 M	$35.0 M

- Additional treatment may be required.
- Distribution costs depend on many factors.

When is the cost reasonable?

First - subtract the other wastewater costs:

- Cost of siting and constructing new wastewater treatment facilities and outfalls.
- Costs of upgrading existing wastewater treatment facilities and outfalls.
- Cost of mitigating environmental impacts – TMDLs, discharge standards, aquifer protection.
- Economic impacts of delaying development.

Then subtract the other water supply costs:

- Siting, constructing, or upgrading drinking water supply treatment, storage and distribution systems.
- Obtaining water rights (if available).
- Maintaining instream flows
- Maintaining aquifer levels
- Providing water supplies during drought.
- Economic impacts of the ability to attract new industry requiring water supplies.
- Economic impacts of delayed development.

Then , quantify other benefits:

- Recreational opportunities
- Fish and wildlife
- Quality of life

- Now determine – is reclaimed water reasonable cost?

Questions and Next Steps