

*DRAFT*

**SEPTIC SYSTEM ASSESSMENT  
AND EVALUATION PLAN**

**for the  
McKenzie River Watershed, Oregon**



**Karl A. Morgenstern  
Eugene Water & Electric Board  
February 2005  
Revision 2**

## **Introduction**

The McKenzie River is the sole source of drinking water for more than 200,000 people in Eugene and surrounding communities. In October 2000, EWEB developed a drinking water source protection plan, which included a risk assessment of all potential threats to this valuable source of drinking water. The high-risk threat categories included stormwater outfalls, urban runoff, hazardous materials spills, agricultural activities and forest management activities (EWEB, 2000).

The Septic Systems Assessment in the McKenzie watershed implements a portion of EWEB's drinking water source protection program (EWEB, 2000; EWEB, 2001a). The overall concept of drinking water source protection is to have the ability to measure the balance between watershed health and human use over time and implement actions that maintain a healthy balance for production of exceptional water quality. This requires not only being aware of all the different human activities going on within the watershed, but also requires understanding the limits of what the river can handle and still maintain a healthy watershed with good water quality.

EWEB's source protection program consists of the following eight subprograms:

- ? Comprehensive Monitoring;
- ? Disaster Preparedness and Response;
- ? Education and Research Assistance;
- ? Point Source Evaluation and Mitigation;
- ? Nonpoint Source Evaluation and Mitigation;
- ? Land Acquisition;
- ? Public Outreach and Information Sharing; and,
- ? Watershed Land Use Tracking and Management.

EWEB received Oregon Department of Environmental Quality Section 319 grant funds to implement the nonpoint sources of pollution evaluation and mitigation subprogram.

Specifically, implementation of this subprogram includes inventorying, mapping and assessing the risk associated with forestry or silviculture activities, septic systems, agricultural activities, and building or construction activities in the McKenzie River watershed upstream of EWEB's intake at Hayden Bridge. Stormwater and urban runoff is not included in this effort because EWEB is already working with partner agencies to assess the potential impacts from this nonpoint source of pollution (NPS).

All work conducted under this grant will be accomplished using ArcGIS, a geographic information system (GIS) tool that allows for efficient data management and provides powerful data analysis and map production. The purpose of this report is to provide the various agencies, businesses, organizations, landowners, and other interested parties with basic information about the proposed project approach, objectives, scope, tasks, and outcomes as a starting point for discussing the best approach for this baseline assessment.

## **Potential Threats From Septic Systems**

In the McKenzie watershed upriver of EWEB's drinking water intake approximately 4,000 households rely on septic systems to dispose of their wastewater and sewage. A typical septic system uses a tank to capture solids and the wastewater is distributed through a subsurface drain field and allowed to percolate through the soil. On-site septic systems rely on the soil column to filter and attenuate the sewage effluent assuming the system is properly located, installed and maintained. Septic systems represent the highest total volume of wastewater discharged to groundwater and are the most frequently recorded sources of contamination of groundwater and surface water (Novotny and Olem, 1994). Approximately 10 to 25% of septic systems fail often releasing untreated wastewater into the underlying groundwater and/or nearby surface water (U.S. EPA, 2003; Schueler and Holland, 2000). The causes of septic system failures are numerous: inadequate soils, poor design, improper siting, hydraulic overloading, tree growth in the drain field, old age, and failure to conduct regular maintenance and clean outs.

On-site septic systems release high concentrations of organic matter, ammonia nitrogen, phosphates, bacteria, viruses, nitrates, synthetic organics, toxic metals, and pharmaceuticals to the groundwater (Novotny and Olem, 1994; NRC, 2000; Kolpin et. al., 2002). Various studies have shown that bacteria and viruses can travel long distances (50 to 200 feet) downgradient of a properly sited and functioning on-site septic system (NRC, 2000). Nitrates, dissolved organic compounds, and pharmaceuticals are also mobile in the groundwater and could impact nearby wells and surface water bodies.

Bacteria, viruses, nitrates and other contaminants from failing septic systems pose the greatest risk to people who come into direct contact with tainted water or via ingestion through shallow drinking water wells. EWEB's water-filtration plant is designed to continually treat the raw water from the McKenzie River for bacteria, metals, nutrients, sediment and organic matter, which would address the majority of contaminants emanating from failed septic systems. However, increases in bacteria, nutrients, and other contaminants from failed septic systems would increase raw water treatment costs, treatment chemical use and potential production of disinfection byproducts resulting in reduced drinking water quality and taste.

Septic systems that pose the highest risk to drinking water sources are systems that are older than 20 years, clustered with other septic systems on smaller lots, located adjacent to ditches, lakes, streams or rivers, and are on thin or excessively permeable soils (U.S. EPA, 2003; Schueler and Holland, 2000; Novotny and Olem, 1994). Approximately 2,250 of the total 4,000 septic systems in the McKenzie watershed are in clusters and located adjacent to streams or the McKenzie River. About 330 of the 2,250 are also located in highly permeable soils (Figures 2-4).

EWEB has conducted storm event and monthly baseline monitoring of the lower McKenzie River watershed (between Hayden and Hendricks bridges) since October 2001 (EWEB, 2001b) (Figure 2). Preliminary results of this effort show that:

- 1) Runoff from storm events are responsible for the majority of pollution that reaches the river;
- 2) Fecal bacteria levels detected in storm runoff from Cedar Creek, Camp Creek, and

- Keizer Slough at times exceeded human health-based standards;
- 3) Some nutrient and metals detected in storm runoff from Cedar Creek, Camp Creek and Keizer Slough exceeded aquatic and human health-based standards; and,
  - 4) Low levels of fecal bacteria and nutrients were detected in the McKenzie River (EWEB, 2004).

### **Purpose, Objectives and Scope**

The purpose of this assessment is to collect baseline information about on-site septic systems in the McKenzie watershed and, through GIS analysis and water quality monitoring, evaluate those areas that may impact the McKenzie River. This baseline data will be used to evaluate trends over time and to identify impacts before they become a drinking water problem. The McKenzie River has excellent drinking water quality. The goal of EWEB's drinking water source protection program is to maintain this level of quality for future generations of customers.

The idea is to focus on specific areas in the watershed where clusters of aging septic systems are in highly permeable soils and in close proximity to surface water. These conditions provide a greater potential to find failing septic systems that are impacting surface water with bacteria, viruses, nitrates, toxic metals, synthetic organic compounds and pharmaceuticals. If potential problems exist, EWEB and partner organizations would work with interested homeowners to voluntarily implement actions that would reduce risks to drinking water.

The objectives of the septic systems assessment project are to:

- ? Bring watershed stakeholders, Lane County Land Management, Oregon Department of Environmental Quality (DEQ), septic system construction contractors, and homeowners together to share information and engage in meaningful discussions on septic system impacts in the watershed and ways to assist homeowners to reduce these impacts to maintain the exceptional water quality of the McKenzie River;
- ? Develop a baseline inventory of on-site septic systems in the watershed and establish a procedure for periodic updates of this information;
- ? Evaluate septic systems to better understand potential threats and identify high priority areas for further study;
- ? Determine if high priority areas are currently impacting water quality in nearby streams and/or the McKenzie River;
- ? Work with interested homeowners to implement actions that would reduce potential risks in high priority areas; and
- ? Initiate and strengthen long-term relationships and cooperation among EWEB, watershed residents, regulatory agencies, contractors, watershed stakeholders, researchers, and others.

To achieve these objectives the following general tasks will be conducted:

1. Meet one-on-one with individual stakeholders, regulatory agencies, contractors, U.S. Geological Survey (USGS) researchers, and others to discuss the septic system assessment project, gain a better understanding of current roles and responsibilities, and explore potential involvement and partnership opportunities with this project;
2. Collect watershed data on septic systems and import the information into a geographic information system (GIS);
3. Conduct GIS analyses of septic systems to identify specific areas susceptible to impacting nearby surface water bodies with untreated wastewater and sewage;
4. Meet and discuss the NPS assessment project with homeowners in these high priority areas to gain a better understanding of individual septic systems and to solicit participation in this project;
5. Conduct water quality monitoring during optimum conditions that increase likelihood of septic impacts upstream and downstream of these high priority areas. Water samples will be analyzed for fecal bacteria, detergent brightener, nutrients, metals and synthetic organic compounds;
6. Share results with stakeholders and homeowners through various meetings and mailings;
7. Conduct follow-up water quality monitoring upstream and downstream of areas with measured impacts and analyze water samples for pharmaceuticals;
8. Conduct brainstorming sessions with interested stakeholders, contractors and homeowners to create strategies for funding a program that assists homeowners with septic system upgrades, replacement, and/or maintenance to reduce potential risks to water quality;
9. Assist interested homeowners to implement voluntary actions; and,
10. Continue monitoring high priority areas to determine if voluntary actions are working.

### **Existing Septic System Data**

The main data needs for this project are residential address points, age of residential structure, septic system data, and soil properties. Residential address points, age of residential structures and soil properties are available from Lane Council of Governments (LCOG). Specific septic system data is available from Lane County Land Management, but consists of hard copy files that appear to be incomplete and inconsistent. Lane County Land Management does have an electronic database that houses building permit data, which includes general septic system information. However, the database reflects building activities since approximately 1998 and does not capture older construction activity. The Oregon DEQ has data on WPCF permits issued

to commercial or larger septic systems (i.e., nonresidential). Approximately 8 locations have been issued WPCF permits by DEQ and these facilities will be incorporated into this assessment.

### **Existing Septic System Practices and Laws**

Approximately 4,000 individual on-site septic systems and 8 larger commercial sewage disposal systems exist in the McKenzie watershed upriver of EWEB's drinking water intake. The main applicable rules regarding on-site septic disposal and protection of water quality are Oregon DEQ's On-Site Sewage Disposal rules (OAR 340-071 and 073) and The Three Basin Rule (OAR 340-041-0350).

Rules governing on-site sewage disposal are contained in Oregon Administrative Rules (OAR) Chapter 340, Division 71 and Division 73. These rules "prescribe the requirements for the construction, alteration, repair, operation, and maintenance of on-site sewage disposal systems. Their purpose is to restore and maintain the quality of public waters and to protect public health and general welfare of the people of the State of Oregon" (OAR 340-71-0110). Lane County Land Management is DEQ's "Agent" for performing the duties of DEQ for all on-site disposal systems that do not need a WPCF permit. DEQ retains authority over larger sewage disposal systems that require a WPCF permit.

The Three Basin Rule was established to preserve or improve the existing high quality water for municipal drinking water supplies in the Clackamas, McKenzie, and Santiam river basins. In order to protect these three critical drinking water basins OAR 340-041-0350 maintains that new or increased waste discharges are prohibited with a number of exceptions. Individual on-site sewage systems and domestic sewage facilities that discharge less than 5,000 gallons per day under WPCF permit are excluded from these rules.

EWEB's on-site septic sewage system assessment project aligns closely with DEQ on-site rules by identifying areas with failing septic systems that are impacting a critical drinking water source protected under the Three Basin Rule. EWEB's hopes to accomplish the objectives of this project by promoting partnerships, providing education and outreach opportunities to homeowners, working with homeowners to implement voluntary actions that reduce impacts to surface water and long-term water quality monitoring.

### **On-Site Septic Systems and Watershed Health - Food For Thought**

EWEB has been involved in the McKenzie watershed since 1911 and will continue its reliance on the McKenzie for drinking water and hydroelectric power generation for the foreseeable future. This project provides an opportunity to develop long-term relationships with homeowners, regulatory agencies, contractors, researchers, and watershed stakeholders that would be beneficial to all parties involved. The following brief discussion is provided as food for thought.

It has been well documented that on-site septic systems are a significant source of groundwater and surface water contamination. Based on U.S Census data over 10 percent of all septic systems backed up into homes or have wastewater emerging on the ground surface (U.S. EPA,

2003). More than half of the approximately 20 million septic systems used in the United States were installed over 30 years ago when on-site rules were nonexistent or poorly enforced (U.S. EPA, 2003; Novotny and Olem, 1994). There is a need for a program that provides homeowners with educational and financial support to upgrade, maintain, and/or replace old on-site systems that are impacting or threatening to impact groundwater and/or surface water in the McKenzie watershed. It would be important to develop long-term relationships with watershed residents, developers, septic system installation contractors, and regulatory agencies to maintain the inventory of septic systems, insure proper placement and construction of new systems and work to replace old systems. Homeowners would benefit from this program by obtaining assistance to protect their investment while maintaining the excellent water quality of the McKenzie River

### **Septic System Assessment Project Approach**

It should be noted that this specific project is the initial effort associated with a long-term program to develop mutually beneficial relationships with homeowners, watershed stakeholders, regulatory agencies, contractors, researchers, local businesses, and others. The septic system assessment project is funded with Oregon DEQ grant funds and will be completed within one year. The results, lessons learned and partnerships developed from this initial effort will be used to shape future directions and projects with the community in the McKenzie watershed. The following is an overview of the conceptual approach to implementing the agricultural activities assessment project.

#### *Phase 1: Meet, Listen, Learn, and Collect Information*

- ? Contact and distribute this draft plan to the initial list of stakeholders and partners listed in Table 1 (add/remove stakeholders based on initial phone conversations).
- ? Meet with each stakeholder/partner to learn about their current involvement in septic system issues, the watershed community, feedback on the draft plan, and discuss potential involvement in this project.
- ? Collect data and information on septic systems in the McKenzie watershed.

#### *Phase 2: Share information and initial analysis*

- ? Hold stakeholder/partner meeting(s) to share feedback received on draft plan, present the final plan, share information collected as part of the assessment, and discuss how information will be analyzed to identify high priority areas of potential septic impacts.
- ? Conduct initial analysis and share results with stakeholders and partners to get feedback, new information, identify errors, etc.
- ? Revise analysis based on feedback and share final analysis results with stakeholders and partners that identifies high priority areas for further study.
- ? Meet and share results with specific homeowners in high priority areas and learn about specific septic systems in these areas.

#### *Phase 3: Monitor Water Quality in High Priority Areas*

- ? Work with homeowners, researchers, and regulatory agencies to select monitoring sites and collect initial information on these sites.

- ? Conduct water quality monitoring upstream and downstream of high priority areas to collect water samples for fecal bacteria, nutrients, metals, detergent brighteners, synthetic organic compounds and other water quality parameters.
- ? Input analytical data into database. Return to areas of documented impacts and collect water samples for pharmaceuticals in partnership with the USGS.
- ? Input pharmaceutical data into database.

*Phase 4: Share Data and Brainstorm on Next Steps*

- ? Share monitoring data results with homeowners, researchers, regulatory agencies, and watershed stakeholders.
- ? Conduct multiple meetings to brainstorm on approaches to implement a septic system management program to reduce impacts from failing septic systems while providing support, funding and other assistance to homeowners.
- ? Complete draft project report that discusses all aspects of the project and distribute to homeowners and stakeholders/partners for comments and feedback.
- ? Finalize project report and distribute to homeowners, stakeholders, partners and other interested parties.
- ? Develop new projects/approaches based on lessons learned and ideas from brainstorm sessions.

**Project Timeline**

Distribute Plan and Contact Stakeholders	March to April 2005
Collect Data on Septic Systems	September 2004 to March 2005
Meeting to Share Data/Analysis Approach	May 2005
Revise GIS Analysis Based on Feedback	June 2005
Share GIS Analysis Results/Contact Homeowners	June to July 2005
Meet with Homeowners/Select Monitoring Sites	July 2005
Conduct Water Quality Monitoring	August 2005
Meet to Share Analytical Results	October 2005
Conduct Follow-up Monitoring	October 2005
Hold Brainstorm Sessions	November 2005
Draft & Final Project Reports	November to December 2005
Meet to Discuss New Approaches/Projects	December 2005

**Summary of Potential Stakeholders and Partners**

The following list of potential stakeholders and partners that may have an interest in participating in this project are summarized in Table 1. It is anticipated that this table will change after initial discussions with the various agencies, organizations and contractors listed in Table 1.

**TABLE 1  
Summary of Septic System Stakeholders**

<b>Organization Name</b>	<b>Contact Information</b>	<b>Potential Role</b>
McKenzie Watershed Council	Megan Finnessy	Data sharing, coordinate w/council partners, monitoring, assist w/homeowners
Lane Council of Governments	Bob Denouden	Data sharing, GIS analysis support
U.S. Geological Survey	Steve Hinkle	Pharmaceuticals monitoring, data analysis & interpretation
Oregon Department of Environmental Quality	Randy Trox	Data sharing, coordinate w/DEQ activities, regulatory feedback & direction
Oregon Department of Environmental Quality	Rachel Burr	319 grant administrator, project coordination
Lane County Land Management	George Ehlers	Data sharing, coordinate w/Lane Co. activities, regulatory feedback & direction
Deerhorn Water District	Barb Heinz	Drinking water concerns, provide feedback
Blue River Water District	Dick Pierce	Drinking water concerns, provide feedback
McKenzie Palasides Water District	John Steven	Drinking water concerns, provide feedback
Springfield Utility Board	Nancy Moreno	SUB drinking water concerns, provide feedback
Septic System Installation Contractors	To Be Named	Local contractors to provide knowledge of septic systems in McKenzie

## References

Eugene Water & Electric Board (EWEB). 2000. *Drinking Water Source Protection Plan*.

EWEB, 2001a. *Proposal for Implementation of the Drinking Water Source Protection Program*. Prepared By Karl Morgenstern. November 2001.

EWEB, 2001b. *Lower McKenzie River Watershed, Stormwater and Urban Runoff Monitoring Plan, Drinking Water Source Protection Program*. Prepared By Karl Morgenstern. November 2001.

EWEB, 2004. *Water Quality Laboratory Analytical Data, 2001 to 2004*.

Koplin, Dana W., Edward Furlong, Michael Meyer, Michael Thurman, Steven Zaugg, Larry Barber, and Herbert Buxton (Koplin, et. al). 2002. *Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000: A National Reconnaissance*. Environmental Science & Technology. Vol. 36, No. 6.

National Research Council (NRC). 2000. *Watershed Management for Potable Water Supply: Assessing the New York City Strategy*. Washington D.C.: National Academy Press.

Novotny, Vladimir and Harvey Olem. *Water Quality: Prevention, Identification, and Management of Diffuse Pollution*. New York: Van Nostrand Reinhold.

Schueler, Thomas R. and Heather K. Holland. 2000. *The Practice of Watershed Protection*. The Center for Watershed Protection.

United States Environmental Protection Agency (U.S. EPA). 2003. *Voluntary National Guidelines for Management of On-Site and Clustered (decentralized) Wastewater Treatment Systems*. EPA 832-B-03-001. March 2003.