Executive Summary

The City of Bend's (City) drinking water sources currently include production from 22 wells that draw water from the productive aquifer that lies beneath the City. As a proactive measure to manage this valuable resource the City has completed a Source Water Assessment (SWA) for their wells. A SWA identifies potential contamination sources (PCSs) associated with existing land uses and ranks them according to their potential threat to the City's wells. From these results, the community can develop management strategies to protect and manage areas identified as higher risk. Given the value of the drinking water, protection is one of the best and least expensive means of ensuring resource sustainability.

The SWA includes compiling a PCS inventory within the recently updated delineations of the wellhead protection areas (WHPAs) for City of Bend wells. The WHPA delineation identifies the land area around the well that overlies that part of the aquifer that supplies groundwater to the well. These areas are where a contaminant, if released on the ground, may migrate straight down, reach the aquifer and move directly to the well. Within the WHPAs, the sensitivity of the aquifer to contamination is evaluated. This WHPA delineations and aquifer sensitivity information are combined to assess and rank the susceptibility of the aquifer to contamination from existing land use activities, (e.g., residential, commercial, agricultural or industrial properties).

PCS Inventory. The PCS inventory is a review of the land use activities within the City of Bend well's WHPAs. Its intent is to locate "significant potential sources" of contamination based on current land uses and the combined experiences of releases and cleanup activities around the country. Specific land uses that have the "potential" to release contaminants that may be a threat to groundwater quality have been identified and ranked as low, medium, or high risk. Although the PCS inventory identifies land uses and associated risks, the inventory itself makes no supposition with respect to any individual site. No onsite inspections are done and no blame with respect to any current contamination is assigned.

The City's PSC inventory was completed using aerial photography, database searches and an on-the-ground field survey. A total of 2,314 PCS were identified within the City's WHPAs, with 1,382 PCS sites identified though database searches. Based on the PCS inventory only, the Bear Creek and Pilot Butte well's WHPA capture zones have the highest relative risk level, having approximately 176 and 251 PCS sites with a high risk, respectively.

Aquifer Sensitivity Evaluation. Aquifer sensitivity is related to the ability of a contaminant on the ground reaching the aquifer. The primary factors in determining sensitivity are the depth to water and the permeability of the soil and underlying materials. Wells constructed with shallow seals around the casing could potentially allow contamination from the surface land uses near the- well to migrate directly down the casing wall to the aquifer. As a result, the production well's construction details are also a factor in determining aquifer sensitivity.

The sensitivity analysis identified 19 of the 23 City wells as having a low aquifer sensitivity level. Because of the relatively shallow well seals, Shiloh #3 and Westwood wells (50 and 80 foot seal depths, respectively) were designated as moderate sensitivity. The Hole Ten wells have only a 30 foot-deep well seal. Because of the proximity of the irrigation canal to these two wells, they were designated as high aquifer sensitivity.

Susceptibility Determination. The overall susceptibility of a drinking water well is the combined relative risk of a given PCS, the sensitivity of the aquifer at that site, and the proximity

of the PCS site within the WHPA to the well. The susceptibility determination prioritizes where protective measures might be taken to minimize the risk to the City's drinking water system's groundwater wells.

Based on the results of this study, the Hole Ten wells are highly susceptible to the high and moderate risk PCSs located within their WHPA capture zones. The Pilot Butte and Bear Creek wells have a moderate to low susceptibility to PCSs , however because these well groups have a large number of PCS sites (581 and 339 respectively) and a large number of UICs (376 and 265 respectively) within these well's WHPAs, they warrant attention. In addition, Shiloh #3 Well, and Westwood Well are moderate to highly susceptible to PCSs within their capture zones. All the other wells have a low susceptibility to PCSs within their capture zones.

Based on these results, GSI believes that the City should consider developing management strategies to proactively track and manage the areas identified as having higher susceptibility risk areas. These include the Hole Ten Wells, and the two well groups with a disproportionally large number of PCSs within their WHPA capture zones, Pilot Butte and Bear Creek wells.

The Department of Environmental Quality (DEQ) and Oregon Health Authority (OHA) have provided the following list of the top 12 drinking water protection strategies that have a history of success:

- Public Education
- Sign Installation
- Water Conservation
- Public/Private Partnerships
- Hazardous Waste Collection
- Spill Response Plans
- Zoning Ordinances/Overlay Districts
- Property Purchase/Donation Programs
- Septic System Upgrades
- Special Chemical Use/Transport Prohibition
- Potential Source Restrictions
- Implementation of Appropriate Best Management Practices/Strategies (BMPs)

The strategies that the City may develop should be tailored to the specific wells or well groupings and likely will not include all of the above listed strategies. Management strategies do not have to be regulatory in nature. In fact, strategies based on voluntary compliance, e.g., outreach efforts and household chemical waste collections, are often more successful. Voluntary strategies, however, can only succeed if the general public is brought into the discussion early. Therefore, we recommend that the effort involve forming a local team to actively engage local input into the decision-making on how to implement water quality protection efforts.