Department of Environmental Quality
Petroleum Technical Section
SB9 and HB613 Status Report
June 25, 2012

SB 9 Petroleum Mixing Zone Report

The department has completed a draft guidance document for the management of petroleum mixing zones (PMZs) that DEQ staff and the Consultant will use. It will change as the process evolves and the department learns how to manage the process more efficiently and effectively.

The PMZ process begins one of two ways. One option is for the owner/operator (O/O) or the site consultant to submit a written request that identifies why a petroleum mixing zone (PMZ) is the best alternative for release closure (as opposed to waiting for groundwater to meet standards). DEQ will then ensure the proposal meets the statutory and rule requirements. Alternatively, the department can also identify potential PMZ closures. In this situation, if the O/O agrees that a PMZ closure is the preferred action, DEQ will request a corrective action plan that summarizes clean-up completed and land uses, demonstrates incomplete exposure routes, and describes notices of residual contamination that would be put in place.

To date, the department has identified four potential PMZs closure candidates:

- One corrective action plan for a PMZ has been submitted and is currently under review.
- Two written requests with the rationale for a PMZ closure have been submitted to DEQ. Both are under initial review by DEQ and a response (including a request for a summary report as applicable) will be issued to the O/O soon.
- DEQ will be initiating another site review for a PMZ shortly and asking the O/O for a summary report.

HB 613 Closure Report

The department has now characterized a total of 92 releases as resolved (or "closed") during Fiscal Year 2012 (July 1, 2011, through June 30, 2012), two more than required by HB 613. The planning necessary to support another 90 closures in Fiscal Year (FY) 2013 is complete, and work plan requests to document closure site conditions have been issued to move forward with these potential closures.

A figure is included at the end of this report showing the number of petroleum releases, by county, closed by DEQ during the FY 2012.

FOLLOW UP FROM DECEMBER MEETING

The Committee's questions following DEQ's December report indicated that it would like further information on funding and petroleum mixing zone closure designation. Specifically, the Committee wanted to know how much funding is being saved because monitoring is not required at sites that will be closing and/or at sites that are closed with a PMZ designation.

The department cannot accurately report a cost, but has estimated that about $160,000 (or approximately 4% of the total petroleum fund budget) was used for compliance monitoring in FY 2012. The database is a legacy system at the limits of its functionality. Many of the questions we are asking were not anticipated when it was structured to meet programs needs. However, we will work with the Petroleum Tank Release Compensation Board each time we approve a PMZ closure to estimate and track what future sampling may have cost for each site.

Petroleum releases are intended to close when the cleanup is complete. One use of monitoring is to determine completeness and to conclude human health and the environment are adequately protected. At this point, no more monitoring is required and resources (staff time and funding) are shifted to releases in need of cleanup. In order to evaluate potential savings attributable to closure and explain the estimated savings, monitoring requirements are described below.

USES OF MONITORING AT PETROLEUM RELEASES

Monitoring Overview

Many types of environmental media (soil, water, air, product, and sludge) are sampled and analyzed during the investigation and cleanup of petroleum releases. Soil and water sampling or monitoring are necessary up front to establish the extent and magnitude of the contamination. Unfortunately, contamination deep within the ground is not easily seen. Soil and water sampling are also necessary to evaluate possible exposure routes or pathways.

Soil sampling results are used to determine whether a person would come in contact with the contamination. Exposure routes for soils include direct contact and inhalation of dust. A common example for surface soil exposure includes children playing in dirt and inadvertently ingesting some of it. A more realistic example at a petroleum release site is the exposure of construction or utility workers to deeper soils when excavation takes place. Subsurface contamination can also contaminate groundwater, permeate buried utility lines possibly impacting municipal water supplies, or travel along the line to other exposure points. Petroleum vapors from soils and water are a risk both during excavation and when the potential exists for vapors to intrude into buildings at concentrations that cause health risks or explosion hazards.

Monitoring and how the results are used to support environmental decision making is explained below in order to clarify the relationship between site monitoring and a closure actions. Groundwater monitoring is necessary during all phases of corrective action: investigation, cleanup, and compliance.

Investigation Monitoring

Investigations to understand the magnitude and extent of the release are typically conducted in phases, starting near the known contamination and using additional sampling to fill data gaps. This process results in a "conceptual site model," which helps determine who and what are at risk and where cleanup needs to occur.

When a petroleum release is large enough to leach into an aquifer (which most do), groundwater monitoring is necessary to "see" the plume of contamination beneath the ground (Figure 1). Monitoring (sampling through time) enables us to determine the magnitude and extent of the plume, and to identify which direction and how fast it is moving, what its seasonal variations are, and, most importantly, how it responds to cleanup efforts. Groundwater monitoring also includes taking field measurements such as the amount of oxygen and other non-petroleum chemicals dissolved in the water. This data helps determine how active treatment technologies or naturally occurring microorganisms in the ground are affecting groundwater quality and cleanup.
Simple sites may only need a few wells (3-6), while large complex plumes threatening drinking water supplies may require up to 20 or more wells and more frequent monitoring.

Monitoring during the investigation is critical in designing an efficient and effective cleanup strategy for the release. Seasonal variations affect the cleanup design and additional monitoring wells may be necessary to provide early warning in case the plume expands in the direction of a drinking water well. Location of monitoring wells is often restricted by overhead and underground utilities, buildings, and roadways. When this happens, additional wells may be needed to gather the same information. Closure of sites will not affect investigation monitoring costs.

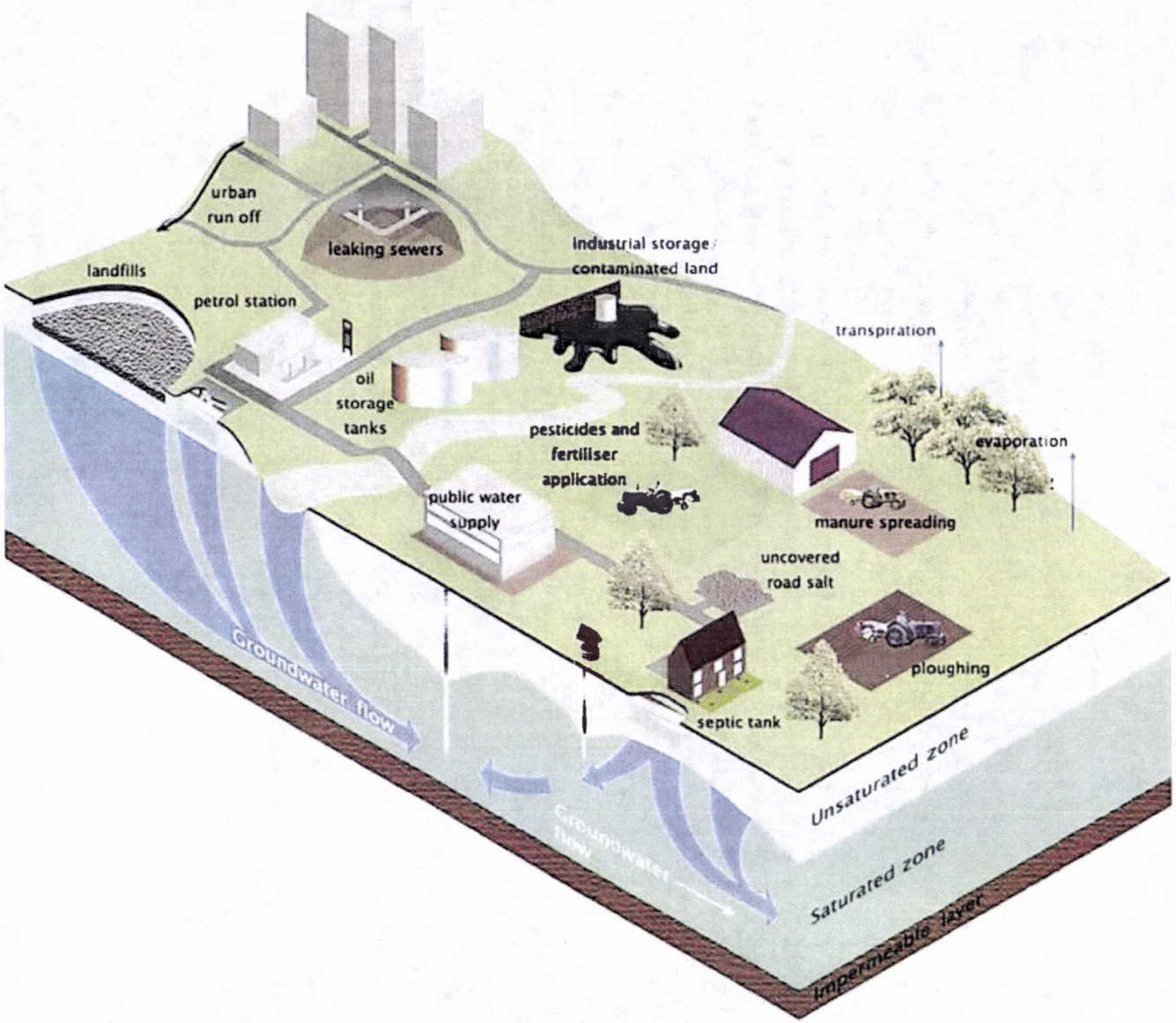


Figure 1: Simple diagram showing how land uses impact groundwater.

Cleanup Monitoring

Groundwater monitoring during cleanup shows whether the cleanup (typically in-situ treatment, soil removal, and/or natural attenuation) is effective and will lead to groundwater cleanup. In-situ treatment methods (injecting or removing fluids (air, gases water, oxidizing chemicals, free product fuel, etc.) from the ground) and natural attenuation (a treatment method that relies on natural processes to break down or disperse residual contaminants in the ground) take from months to years to be effective. Most in-situ technologies work best in areas with areas underlain with higher permeability soils such as Missoula, Bozeman, Dillon, Billings, and other area containing loose sand and gravel.

Removal or excavation is a common cleanup strategy used where the ground is composed of clay ("gumbo") or other low-permeability soils that restrict fluid flow. Low-permeability soils are prevalent in areas such as parts of the Flathead Valley, Great Falls, and much of eastern Montana. It is uncommon to be able to completely excavate an area and removal must be supplemented by in-situ technology or natural attention before cleanup is complete. Thus, regardless of cleanup methods, groundwater monitoring is necessary for a period of time to ensure the contaminant plume responds. These monitoring costs are also not affected by closure.

Compliance (or Natural Attenuation) Monitoring

Monitoring during cleanup, described above, tells us if the initial cleanup activity has a positive effect. It does not tell us that site conditions are back in compliance with statutory requirements. Therefore follow-up or compliance monitoring is needed to document continued progress towards compliance. Compliance monitoring results are used to verify that attenuation is taking place and cleanup activities were effective for the long-term.

The actual frequency of monitoring declines through time, as cleanup progresses and the plume size and concentrations continue to decline as predicted. In addition the number of wells monitored concurrently declines. To optimize the reduction in monitoring, the department has begun using fate and transport modeling. When the site returns to compliance, monitoring is discontinued, whether or not the site is closed. With HB 613, as well as with recent federal emphasis on reducing the nationwide backlog of closures, the department is focusing more effort on site closure but is not seeing an effect on monitoring costs.

Closure

Closure is the process used to document that the cleanup is complete and to inform the O/O that the release is resolved. Historically this process has occurred as resources allow, while focusing efforts on the investigation and cleanup of higher priority sites.

Petroleum Mixing Zones

Natural attenuation processes, like in-situ technologies, are less effective in tight, low-permeability soils, potentially taking decades before contaminants quit leaching to groundwater and water meets water quality standards. This situation can be very frustrating to some property owners trying to sell their land or get a development loan without a final "no further action" (closure) letter from DEQ. The O/O may not understand that residual contamination takes time for the plume to clean up. These are the sites where Petroleum Mixing Zones (PMZs) may help.

The PMZ concept was originally proposed primarily as a way to reduce the stigma of open petroleum releases and to facilitate redevelopment and sale of affected properties. Lending institutions and the Small Business Administration are hesitant to loan money on businesses and properties with an unresolved release when the property would be used for loan collateral.

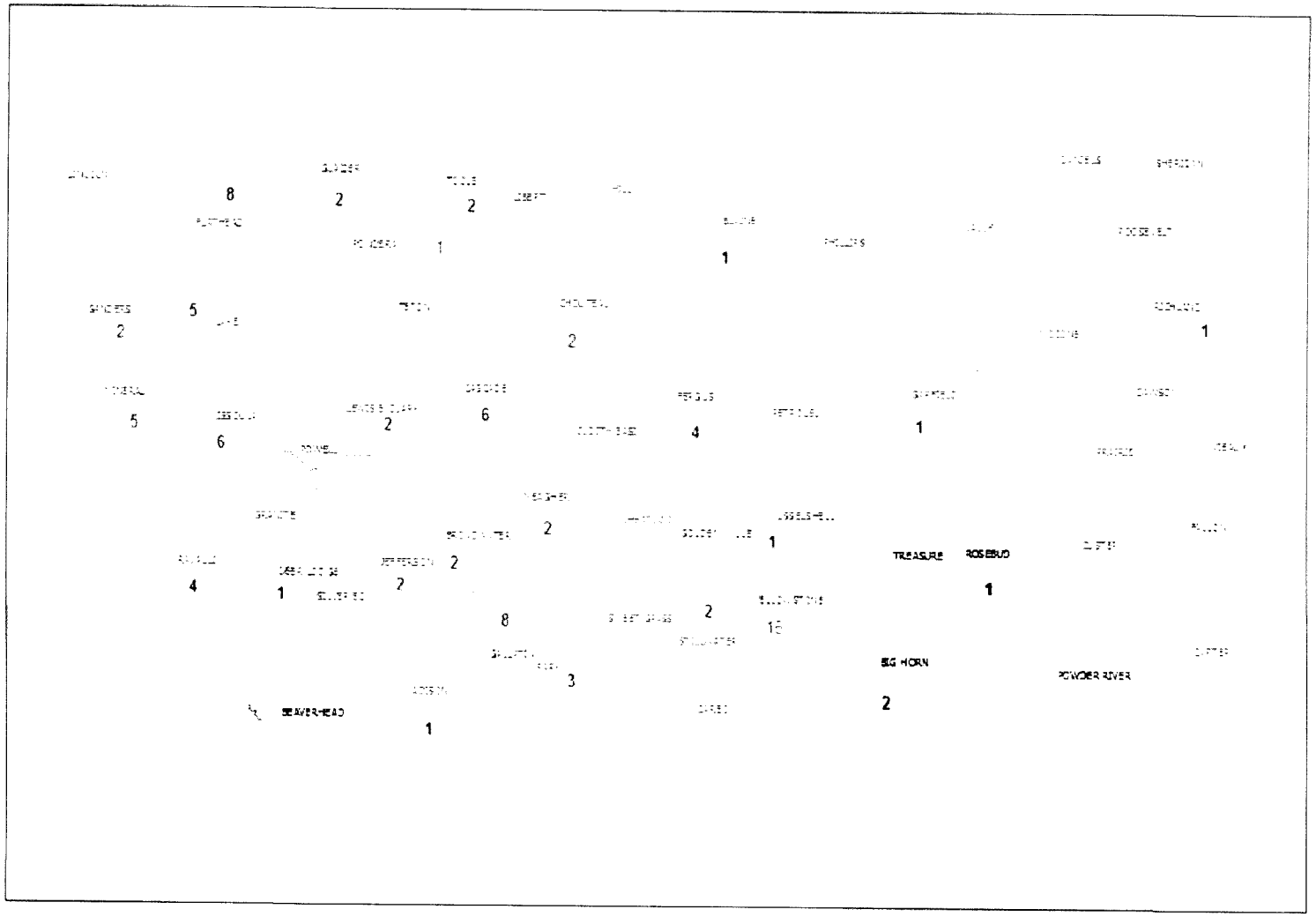
The use of PMZs may reduce expenditures from the Petroleum Tank Release Cleanup Fund (the Fund), because compliance will be reached at the property boundary rather than at the source of the release, reducing the need for. These savings, however, will likely not be significant because only about $160,000 annually (or about 4% of the Fund's annual cleanup budget) appears to be spent on this type of monitoring. Again, future tracking of potential costs that would have been associated with designated PMZ sites will help us gain a better understanding of cost-effectiveness.

One reason compliance monitoring expenditures are historically small is due to DEQ's many cost-cutting measures over the years to limit groundwater monitoring expenses. When a groundwater plume is shown to be stable and shrinking, DEQ has required significantly fewer samples to monitor the plume's progress. In some cases as few as one well may need sampling as infrequently as once every three years. The DEQ has demonstrated that reduced sampling is protective and minimizes expense. This innovative monitoring requirement helped set the groundwork for development of closure with PMZs. Although contamination may still remain above groundwater standards, our experience has shown that under the right conditions many of these sites may not pose an unacceptable risk to human health or the environment.

CONCLUSIONS

In conclusion, closure of a release when compliance with water quality standards is achieved, is unlikely to result in any cost savings associated with monitoring. However, some savings may result from the closure of sites with petroleum mixing zones because compliance goals have been changed.

Monitoring is vital to understanding the risks that a petroleum release poses to human health or the environment. It is a process that cannot be understated or eliminated.



Resolved LUST Sites by County
State FY 2012 (July 1, 2012 - June 30, 2012)

Montana Department of
ENVIRONMENTAL QUALITY