LCP Marsh Seeps Phytoremediation Review

October 2003

Overview

The EPA and State of Georgia began remediation of the LCP site in the mid-1990's to stop dangerous heavy metal contamination of the Turtle River marsh and uplands. As part of that action, large deposits of chemicals were also remediated from past industries located at the site, notably petroleum refining sludge buried in the early part of the last century. Work continues at the site to address contamination of the marshlands, groundwater, possible off-site areas, and some areas on-site. One problem is the presence of a visible sheen of chemicals appearing at point sources in the marsh. These "marsh seeps" indicate movement of chemicals by groundwater from contamination sources in the upland areas of the site. Continued contamination of the marsh prevents recovery of the Turtle River. Review of the Remedial Investigation report and various Site Closeout Reports from past remedial work indicates the sources of the chemical in the marsh seeps is not presently known. It may be part of toxin deposits that were not fully treated, or it may be from unknown deposits. Site cleanup activities may have changed water flow patterns across the site. The digging and backfilling that occurred may create conduits of lower permeability in buried trenches, or differences in fill material may produce local "divides" that cause water to move in unexpected directions. These kinds of effects are well documented at landfills and Superfund sites around the country. As part of an attempt to understand the seeps, several shallow monitoring stations were placed near the shore. These indicate the seepage increases in the winter months. No comprehensive studies are available showing the nature and extent of the contamination in this area, no studies have been done to locate the sources causing the contaminate seeps.

Proposed work

Phytoremediation—using growing trees, shrubs, and grasses to perform the cleanup—is proposed for the seeps area. The steps outlined in the proposal are: excavation (dredging) and stockpiling (removal to another place on-site) of 1,160 cubic yards of marsh sediment; installing a rip-rap barrier between the dredged area and the planting zone; replanting dredged areas with Spartina (marsh grass); planting trees, shrubs and grass within a 700 foot by 200 foot stretch of upland portion of the site (along the shoreline of the marsh). The trees proposed are essentially poplars and pines; the shrubs are wax myrtle, and the grasses bentgrass or switchgrass. There are some contingencies if the initial plantings die, such as using different species of plants, watering during drought, and soil additives. The trees will be placed within vertical pipes that force the roots to grow deeper into the groundwater, the shrubs and grasses are also expected to keep the topsoil dry and force the trees to use deeper groundwater. It will be roughly 5 years before any results are obtained.

Comments

Section 1.2 of the proposal defines the seeps as occurring "after major rain events and during winter months…" On pages 5 and 6 of the proposal an engineering model argues that this project will lower groundwater about 0.9 ft in depth, which the authors claim will stop the seepage and the contamination. There were three assumptions used to calculate the 0.9 ft figure:

- It is based on the annual evapo-transpiration rate (the process of water pumping);
- The calculation uses mature trees only; and
- 200 mature poplar and 200 mature Japanese black pine trees were used in the model.

First, poplar trees are not active in the winter, so only the 200 pine trees could actually impact groundwater volumes during the critical winter months when the proposal indicates the problem peaks. And pine trees, while not dormant like the poplars, are still depressed in terms of evapo-transpiration during cooler winter months. Second, neither species is fully mature at 5 years—the time the authors state would impact the seeps. Further, a table on page A-3 of the Bid Specifications attachment states that poplar trees have "high" moisture use, while pines have "medium" water uptake. Actually, the rates of water uptake are very different for the two species.

Even assuming 400 pines it is unlikely groundwater would be reduced during winter months. Without "averaging in" the contribution of water pumping from the poplars over the hot summer months the impact on the groundwater levels is minimal.

According to the information provided in the proposal, during the winter months when the problem of seepage manifests, there is only minimal impact on the water table using the combined set of poplars and pines. Pines alone will not lower the water table constructively. The combined set of trees may also be irrelevant during major summer rain events when the water table can rise considerably.

It is unclear why the rip-rap addition is needed. Also, the marsh soil removal is discussed as a correction of improper remediation from an earlier marsh project. However, the effect of these two actions is to alter the seeps area and move the current set of monitoring stations. Neither of these projects is needed for success of the phytoremediation work. It is not clear why they are included within this study, but they do have the effect of destroying the baseline of observations leading to the remediation. It may be difficult to determine if phytoremediation has any effect after disturbance of the marsh.

Testing to understand the pollution sources is not included in this proposal. It is unclear how the phytoremediation can reduce the sources when the location and extent of the sources are unknown.

Conclusion

There is no scientific basis for the proposed work. There is no reason to expect the placing of trees to impact the source of the chemicals seeping into the marsh, since those sources are unknown. Further, current data indicates that the seepage problem is worse in winter when the phytoremediation action is at its least effect. Based on the information provided, the uplands should still leak during the winter.

The essence of this proposal is to disturb the seeps and shoreline, and then wait five years to see if anything happens. That is not a remediation in the context of Superfund criteria. Under Superfund law cleanups must show short- and long-term effectiveness, and impact the toxicity, volume or mobility of toxins. Potential effectiveness is not demonstrated in this proposal, in fact, the information suggests it would not be effective source control in the crucial winter months. Volume and toxicity of site chemicals are not impacted. There may be an argument for chemical mobility during the spring and summer months, but even this is doubtful and weather dependent.

Most importantly the proposal fails to mention that there are better methods of source control, once the sources are known-- methods that do not require waiting 5 to 10 years for a minor seasonal effect. Without better engineering data this project can be fairly considered a 5+ year delaying tactic, and the

proposal should be rejected until the EPA provides genuine engineering data on the seep sources and the seasonal effects of a phytoremediation barrier between the sources and seeps.

Proper use of phytoremediation techniques for cleanup is desirable, however it should be combined with source control, not used in place of a cleanup. Without knowledge of the size and location of the source this “experiment” is open-ended, there is no way to tell how long phytoremediation will be needed. Without testing to show the nature and extent of the upland sources, and an engineering evaluation on the impacts using phytoremediation, this is landscaping, not phytoremediation.

R. Kevin Pegg, Ph.D.

Mary Starnes Saunders, Ph.D.

"This project has been funded wholly or partly by the U.S. Environmental Protection Agency under Assistance Agreement Number 1-994850-01-0 to The Glynn Environmental Coalition, Inc. The contents of this document do not necessarily reflect the views and policies of the U.S. Environmental Protection agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use."