

Table 6-1. Fireworks Site Groundwater – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained?	Comments
No Action	None	Also known as natural attenuation, this action relies on the naturally occurring subsurface processes (such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface materials) to attenuate the groundwater contaminants over time. Although the concentrations of metals in the groundwater will not likely decrease appreciably over time unless the contamination sources are removed, the mobility and toxicity of metals can decrease as the site conditions mature.	No	Not Applicable	Yes	This GRA is retained as a baseline for comparative purposes.
Monitored Natural Attenuation	Natural Recovery Processes and Periodic Monitoring	As with natural attenuation, monitored natural attenuation relies on the naturally occurring subsurface processes (such as dilution, volatilization, biodegradation, adsorption, and chemical reactions with subsurface material) to attenuate the groundwater contaminants over time. Although the concentrations of metals in the groundwater will not likely decrease appreciably over time unless the contamination sources are removed, the mobility and toxicity of metals can decrease as the site conditions mature. In addition, a comprehensive long term monitoring plan would be developed and implemented which would include groundwater sampling to evaluate changes in the concentrations of the contaminants over time.	Yes - permanent solution when used in conjunction with removal GRAs	Yes	Yes	This GRA has been retained to be combined with removal GRAs to assemble alternative(s) that are likely to achieve a permanent solution.

Table 6-1. Fireworks Site Groundwater – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained?	Comments
Non-Engineering Measures	Activity and Use Limitations	AULs specify which activities and uses in an area or relative to a resource are prohibited and, consequently, which are permitted in the future. AULs are registered on property deeds and include a Grant of Environmental Restriction or a Notice of Activity and Use Limitation. A groundwater use restriction could be implemented as an AUL.	Yes - temporary solution	Yes	Yes	The AULs portion of this GRA has been retained to be potentially combined with other remedial technologies and/or GRAs to assemble alternative(s) that are likely to achieve a temporary solution. Fencing, warning signs, and hazard education programs would not reduce the potential for exposure to the groundwater significantly if AULs are put in place.
	Fencing	Permanent fencing could be installed in around areas with groundwater UCL exceedances.	Yes - temporary solution	Yes	No	
	Warning Signs	Areas where groundwater UCL exceedances exist would be posted with warning signs.	Yes - temporary solution	Yes	No	
	Hazard Education Programs	Community information and education programs could be undertaken to enhance awareness of potential hazards.	Yes - temporary solution	Yes	No	
Removal	Source Removal - Excavation of Contaminated Soil	This process is the physical removal of contaminated soil using traditional mechanical methods. This option would also involve removal and treatment of the associated groundwater (if drained from wet soil or collected from the excavation footprint) and the backfill of the excavation with clean material. The treated groundwater would be discharged back into the waterway via a permitted discharge.	Yes – permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with treatment and discharge or with pre-treatment, transportation and disposal (if water is present in excavation).

Table 6-1. Fireworks Site Groundwater – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained?	Comments
	Groundwater Pumping	Placement of groundwater wells in the areas with groundwater UCL exceedances to pump out contaminated groundwater. The extracted groundwater would then be treated prior to discharge back into the waterway via a permitted discharge or be pre-treated, transported and disposed.	Yes – permanent solution	Yes	No	This technology has not been retained. There are only two groundwater UCL exceedances and these are located adjacent to and/or down-gradient of locations with soil UCL exceedances for the same chemicals of concern that must be addressed.
Treatment of Groundwater from Pumping or Dewatering of Wet Soil or Excavation Areas (Prior to Permitted Discharge)	Filtration and GAC Adsorption	Filtration is the physical process of mechanical separation based on particle size whereby particles suspended in a fluid are separated by forcing the fluid through a porous medium. As fluid passes through the medium, the suspended particles are trapped on the surface of the medium and/or within the body of the medium. Assuming that the majority of the metals contamination in the groundwater is bound up in soil, filtration would remove much of it. Passing the collected groundwater through GAC would allow organics contamination in the groundwater to adsorb onto the surface of the carbon particles. Over some period of time, the activated carbon surfaces would “fill up” and the carbon would need to be replaced or regenerated.	Yes	Yes	No – for groundwater from pumping Yes – for groundwater from dewatering of wet soil or the excavation areas.	This technology was not retained for groundwater from pumping because pumping was not retained. This technology has been retained for groundwater from the dewatering of wet soils/sediments or the excavation areas when used in conjunction with discharge of the treated water back into the waterway via a permitted discharge.

Table 6-1. Fireworks Site Groundwater – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained?	Comments
Pre-Treatment of Groundwater from Pumping or Dewatering of Wet Soil or Excavation Areas	Filtration	Filtration is the physical process of mechanical separation based on particle size whereby particles suspended in a fluid are separated by forcing the fluid through a porous medium. As fluid passes through the medium, the suspended particles are trapped on the surface of the medium and/or within the body of the medium. Assuming that the majority of the metals contamination in the groundwater is bound up in soil, filtration would remove much of it and allow the water to be accepted into a POTW system.	Yes	Yes	No – for groundwater from pumping Yes – for groundwater from dewatering of wet soil or the excavation areas.	This technology was not retained for groundwater from pumping because pumping was not retained. This technology has been retained for groundwater from dewatering of wet soils or the excavation areas when used in conjunction with removal, transportation and disposal actions.
Transportation	Truck Transport (water)	Transport pre-treated groundwater from wet soil or sediment or excavation dewatering by truck to local POTW for final treatment in conjunction with removal, pre-treatment and disposal actions.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal, pre-treatment and disposal actions.
	Truck Transport (soil)	Transport excavated soil by truck to treatment/disposal facility in conjunction with removal, treatment and disposal options.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and disposal actions.

Table 6-1. Fireworks Site Groundwater – Initial Screening of Remedial Technologies

General Response Action	Remedial Technology/ Process Option	Description of Option	Likely to Achieve a Permanent or Temporary Solution?	Are Individuals with Expertise Needed to Effectively Implement Solution Available?	Retained?	Comments
Disposal	On-Site Return of Treated Groundwater from Dewatering of Wet Soil or Sediment or the Excavation Areas into the Waterway at a Permitted Discharge	Treated (filtration+GAC) groundwater will be discharged back into the local waterway.	Yes – could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal actions.
	Off-Site Disposal of Groundwater from Dewatering of Wet Soil or Sediment or the Excavation Areas at a Permitted POTW	Pre-treated (filtered) groundwater will be transferred to local POTW for final treatment	Yes - could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions.
	Off-Site Disposal of Excavated Soil at a Permitted Disposal Facility	Hazardous and/or non-hazardous soil will be disposed of at an off-site, permitted disposal facility.	Yes - could be part of a permanent solution	Yes	Yes	This technology has been retained to be used in conjunction with removal and transportation actions.

Table 6-2. Assembled Alternatives for Groundwater in the Southern Disposal Area [1]

Alternative	Remedial Technologies/Process Options	Natural Attenuation	Activity and Use Limitations	Long-Term Monitoring	Source Removal/Backfill	Treatment of Water	Transport of Waste	On-Site Discharge of Treated Water	Off-Site Disposal of Soil at Solid Waste and/or RCRA Landfill
SDGW-1	No Action	•							
SDGW-2	MNA and Implementation of Non-Engineering Measures	•		•					
SDGW-3	Source Removal (Excavation of Soil with Exceedances of the UCL for Lead), Solidification/Stabilization (if needed), Transport and Off-Site Disposal of Lead-Contaminated Soil + MNA of Groundwater Lead Concentrations at PZ-24 + Treatment and On-Site Discharge of Water from Wet Soil or Excavation Area Dewatering	•		•	•	•		•	•
SDGW-4	Extensive Source Removal (Excavation of Soil with Exceedances of the Soil UCL or the Site-Specific Human Health or Ecological Soil PRGs for Lead), Solidification/Stabilization (if needed), Transport and Off-Site Disposal of Lead-Contaminated Soil + MNA of Groundwater Lead Concentrations at PZ-24 + Treatment and On-Site Discharge of Water from Wet Soil or Excavation Area Dewatering	•		•	•	•		•	•
<p>NOTES: [1] These alternatives address only the Groundwater UCL exceedance for lead. No human health or ecological risks were identified due to exposure to the Site groundwater.</p>									

Table 6-3. Assembled Alternatives for Groundwater in the Marsh Upland Area [1]

Alternative	Remedial Technologies/Process Options	Natural Attenuation	Activity and Use Limitations	Long-Term Monitoring	Source Removal/Backfill	Treatment of Water	Transport of Waste	On-Site Discharge of Treated Water	Off-Site Disposal of Soil at Solid Waste and/or RCRA Landfill
MUGW-1	No Action	•							
MUGW-2	MNA and Implementation of Non-engineering Measures	•		•					
MUGW-3	Source Removal (Excavation of Soil with Exceedances of the UCL for Mercury), Solidification/Stabilization (if needed), Transport and Off-Site Disposal of Mercury-Contaminated Soil + MNA of Groundwater Mercury Concentrations at DP-MW1 + Treatment and On-Site Discharge of Water from Wet Soil or Excavation Area Dewatering	•		•	•	•		•	•
MUGW-4	Extensive Source Removal (Excavation of Soil with Exceedances of the Soil UCL or the Site-Specific Human Health or Ecological Soil PRGs for Mercury), Solidification/Stabilization (if needed), Transport and Off-Site Disposal of Mercury-Contaminated Soil MNA of Groundwater Mercury Concentrations at DP-MW1 + Treatment and On-Site Discharge of Water from Wet Soil or Excavation Area Dewatering	•		•	•	•		•	•

NOTES:

[1] These alternatives address only the Groundwater UCL exceedance for mercury. No human health or ecological risks were identified due to exposure to the Site groundwater.