APPENDIX A

Table 4 taken from RMT's *Remedial Action Objectives for Penobscot River Sediment and Surface Water, City of Bangor – Bangor Landing, Maine* (2005) summarizing the Remedial Action Objectives

Table 4
Remedial Action Objectives and Remedial Goal Options for Penobscot River Sediment and Surface Water

AREA OF TAR DEPOSIT	DESCRIPTION	RATIONALE FOR REMEDIAL GOAL DEVELOPMENT	REMEDIAL ACTION OBJECTIVES	REMEDIAL GOAL OPTIONS
Sediment				
Active Zone	■ Area of observed gas generation and tar migration ■ High concentration of PAHs and abundant tar in sediment ■ Water depths at low tide < 20 feet ■ Relatively unweathered tar ■ Tar Deposit largely continuous except at edges	■ Tar migrates from Tar Deposit to river surface and poses unacceptable human health risk. ■ Tarry sediment in areas with minimum water depth < 5 feet poses unacceptable human health risk based on direct exposure. Tarry sediment clinging to boat anchors could also cause an unacceptable risk. ■ Tarry sediment with total PAH concentrations > 44 mg/kg has adverse effect on survival and > 39 mg/kg has adverse effect on growth of *Hyallela azteca*.	■ Prevent the ongoing migration of tar blebs to the river surface and the formation of sheens at the river surface. ■ Prevent human exposure to tarry sediment *in situ*. ■ Prevent exposure of benthos to tarry sediment *in situ*. ■ Minimize leaching and erosion of PAHs from the Tar Deposit to river water.	■ Prevent human and ecological exposure to sediment containing total PAH concentration exceeding 32 mg/kg.

Table 4
Remedial Action Objectives and Remedial Goal Options for Penobscot River Sediment and Surface Water

AREA OF TAR DEPOSIT	DESCRIPTION	RATIONALE FOR REMEDIAL GOAL DEVELOPMENT	REMEDIAL ACTION OBJECTIVES	REMEDIAL GOAL OPTIONS
Inactive Zone	■ High concentration of PAHs and abundant tar in sediment ■ Minimum water depths typically > 20 feet at low tide ■ Weathered tar ■ Tar Deposit largely continuous except at edges, and exposed over broad portion of riverbed ■ Tar not observed in shallow sediment at several locations in Inactive Zone ■ Hardened tar layer or weathered tar present over much of the Inactive Zone	■ Tarry sediment with total PAH concentrations > 44 mg/kg has adverse effect on survival and > 39 mg/kg has adverse effect on growth of *Hyallela azteca*.	■ Prevent exposure of benthos to tarry sediment *in situ*. ■ Improve the biological function of the substrate of the Inactive Zone by the addition of materials for the purpose of promoting the accretion of sediments.	■ Stop ecological exposure to tar containing PAHs that, based on their bioavailability, may have an adverse effect on the benthos.

Table 4 (continued)
Remedial Action Objectives and Remedial Goal Options for Penobscot River Sediment and Surface Water

AREA OF TAR DEPOSIT	DESCRIPTION	RATIONALE FOR REMEDIAL GOAL DEVELOPMENT	REMEDIAL ACTION OBJECTIVES	REMEDIAL GOAL OPTIONS
Surface Water Over Tar Deposit (includes all of Dunnett's Cove)				
Water column over entire Tar Deposit	■ PAHs are present at detectable concentrations in shallow (1 ft below surface) and deep (1 ft above riverbed) in surface water.	■ Concentrations of PAHs in surface water pose unacceptable human health risk. ■ PAHs in surface water are thought to be associated with the Active Zone of the Tar Deposit. ■ Weathered tarry sediment in the Inactive Zone is not likely to yield measurable concentrations of PAHs in surface water.	■ Minimize potential human exposure to PAHs leaching to surface water from the Tar Deposit	■ Same as RAO
Sheens and tar blebs on river surface	■ Sheens have very high PAH concentrations; they float with tar blebs to the river surface from the Active Zone of the Tar Deposit, and migrate with river currents.	■ Concentrations of PAHs in sheens and tar blebs pose unacceptable human health risk.	■ Prevent human exposure to tar blebs and sheens.	■ Same as RAO