As part of its analysis under the Clean Water Act Section 404(b)(1) Guidelines, the Corps must specifically examine potential impacts to sanctuaries and refuges.[113] As previously discussed, the proposed mine is located less than four miles from Okefenokee National Wildlife Refuge, which conserves the nationally renowned and internationally recognized Okefenokee Swamp. Moreover, it is reasonable to conclude that Twin Pines will expand its operations in the future to directly abut the refuge boundary. Yet Twin Pines has failed to demonstrate that industrial resource extraction adjacent to this special aquatic site will not result in a loss of refuge values due to the hydrologic connection between the project site and the Okefenokee Swamp. Any mining-induced changes to current water levels, circulation patterns, turbidity, salinity, fluctuation, flow or discharge of contaminants to this sensitive ecosystem may well result in significant degradation of the Refuge.[114]

As detailed in the enclosed expert reports,[115] the Twin Pines mining project could transform the hydrology of Okefenokee Swamp in a variety of ways that threaten to irreparably damage the biological integrity, diversity and environmental health of the entire national wildlife refuge. The project could alter groundwater flows from the Trail Ridge with excavation of the 25–70 foot-deep mining pits, changing the chemical quality and quantity of water in the refuge. Radioactive uranium and other dangerous waste products could be released into the environment during redeposit of homogenized sand spoils, migrating into the refuge via contaminated groundwater. The intensive resource extraction and fill procedures may destroy Trail Ridge's uniquely layered subsurface strata, changing the permeability of the swamp's geologic foundation. This could cause groundwater to leak from the refuge, draining the Okefenokee Swamp, desiccating refuge habitat and even increasing the threat of wildfire.

The resulting impacts to refuge values would be severe. "Water depth and cycles of flood and drought determine rates of nutrient cycling and population growth [of swamp dependent species and habitat types.] Anything that changes the hydrology can, therefore, have a major influence on the aquatic communities of the Okefenokee Swamp."[116] The proposed mining project could have direct, indirect and cumulative impacts on a host of refuge values and ecological processes,[117] including

- Wildlife breeding, spawning and other critical life requirements
- Migratory movement of fish and wildlife through the refuge
- Impacts from unplanned and incompatible human access to remote aquatic areas
- New needs for frequent maintenance activity

[113] 40 C.F.R. § 230.40.

[114] *See also* Bergstedt, A. E., and K. G. Porter, Aquatic Communities of the Okefenokee Swamp. *Proceedings of the 1997 Georgia Water Resources Conference*, held March 20-22, 1997, at The University of Georgia, at 266, 268 (noting that "maintenance of groundwater levels and hydroperiod is essential for the dynamic integrity of the swamp" and "immediate problems can arise from altered water tables and flow regimes").

[115] *See generally* Hutson Report, Rheinhardt Report.

[116] Bergstedt and Porter at 268.

[117] 40 C.F.R. § 230.40(B) (identifying an array of potential impacts on a refuge the Corps must consider in permit applications).