ABSTRACT

Before Type A or Type B regulations can be implemented to assess damages at a Superfund site, a thorough site investigation must determine the potential for injury to, destruction of, or loss of marine natural resources. This examination is based on data collected by the U.S. Environmental Protection Agency (EPA) during the Remedial Investigation (RI) process. If no past or potential future damages are evident, a release for natural resource damages to the responsible parties may be in order; if damages are probable, a regulated damage assessment may be appropriate.

The procedures to determine whether such an assessment is warranted require a review of the RI and other historical and scientific data concerning impacts to natural resources. The decision to conduct an assessment usually is not clear-cut and involves weighing site-specific factors (e.g., site history, settlement opportunities) and often using partially adequate data. This paper discusses the procedures involved in making these decisions and uses Superfund sites in Massachusetts (Re-Solve) and in Delaware (Wildcat Landfill) as examples.

NOAA worked with EPA throughout the RI of the Re-Solve site to determine both human health risks and injury to natural resources. It was clear from the study and the subsequent remedial plan that contamination from the site would not impact the habitats used by anadromous fish species. It is probable that a significant number of catadromous American eels bioaccumulated polychlorinated biphenyls (PCBs) in their tissue in excess of the Food and Drug Administration (FDA) standard of 2 parts per million (ppm). To determine that natural resources were being damaged, bioaccumulation needed to be translated to injury.

A comprehensive biological assessment conducted for the Wildcat site showed no current impacts to the NOAA habitats or resource. Site remediation included some wetland habitat destruction; EPA, Federal, and State trustees developed a restoration and wetland replacement remedy that obviated the need for damage assessment.

It is apparent from these sites, and others like them, that site data limitations or other extenuating circumstances will result in decisions concerning potential natural resource damages and settlements based on both site-specific factors and professional judgment.

INTRODUCTION

Under Section 107(f) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and Section 1(d)(4) of Executive Order 12316, State and Federal natural resource trustees may pursue damage assessments and damage claims in cases where a release of oil or a hazardous substance has caused injury or damage to specific natural resources. More specifically, damage assessments and subsequent damage claims may proceed where there is actual damage or a threat of damage to a trust resource or a critical habitat of a trust resource. In carrying out responsibilities, the trustee must:

- determine the extent and severity of natural resource damage;
- prepare plans for carrying out preferred restoration/replacement alternatives; and
- determine dollar values for natural resource losses to ensure equitable cost recovery.

In lieu of a damage assessment, the natural resources trustee may agree to release the potentially responsible party(ies) for natural resource damages if the party agrees to undertake appropriate actions to protect and restore the natural resources damaged or threatened by the observed release of hazardous materials. Any funds recovered by a Federal or State trustee may be retained by the trustee only to restore, replace, or acquire the equivalent of such natural resources.

Through the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of Commerce is trustee or co-trustee for fishery resources of the Exclusive Economic Zone and continental shelf, catadromous and anadromous fish species throughout their range, endangered species, marine mammals, tidal wetlands, other important fishery and marine resources, and resources protected by designated marine sanctuaries. NOAA acts on behalf of the public for the protection and restoration of these resources.

EPA has the primary responsibility for implementing Superfund. EPA is required to notify Federal and State natural resource trustees of potential damages to natural resources at Superfund sites, and to coordinate investigations and planning with the trustees. NOAA and other State and Federal trustees may use the natural resource damage assessment regulations (simplified "type A" and alternative "type B"), codified in 43 CFR Part 11 and issued by the U.S. Department of the Interior. The probability of past damages or the potential for future damages must be evident before a trustee can proceed with a formal damage assessment. Preliminary information concerning possible natural resource damages may be contained in the RI.

This paper discusses the process followed by a natural resource trustee to assess trust resource damages, and highlights problems that may arise in light of the trustee's necessary dependence on EPA's data collection, the site history, and settlement opportunities.

THE RE-SOLVE SUPERFUND SITE

The Re-Solve site is a former waste chemical reclamation facility in North Dartmouth, Massachusetts, that operated for 24 years until its closure in 1980. A variety of hazardous materials were handled at the Re-Solve site, including solvents, waste oils, organic liquids and solids, acids, alkalies, inorganic liquids and solids, and PCBs. Residues from the distillation tower, liquid sludge waste, and impure solvents were disposed of in four unlined lagoons on the site.

Off-site migration occurred via the Copicut River. The river is approximately 150 meters east of the site and flows southeast into Cornell Pond, draining into the Shingle Island River and Noquochoke Lake. The Copicut River is classified as Class B waters by Massachusetts, designated for the protection and propagation of fish, other aquatic life, wildlife, and for primary and secondary contact recreation. Cornell Pond supports a popular freshwater recreational fishery. A dam at the base of Noquochoke Lake, 6.5 km from the site, prevents anadromous fish migration.
Gross levels of PCBs have been detected in on-site surface soils (15,000 to 52,000 ppm) and sub-surface soils (4 to 200,000 ppm). High levels of PCBs have been found in off-site sediments of the adjacent wetlands and the unnamed tributary to the Copicut River (600 ppm). Low levels of PCBs have been detected in the sediments of the Copicut River (<0.5 ppm in the lower reach and 1.7 ppm in the upper reach). Three of four Cornell Pond sediment stations demonstrated PCBs with a high value of only 1.1 ppm. PCB levels well below 0.1 ppm were found in two of four samples collected just downstream of Cornell Pond. The lack of PCBs in groundwater samples collected from off-site monitoring wells confirms the absence of PCB migration in groundwater from the site. However, it is possible that PCB mobility in soils and groundwater may be facilitated by the high levels of total volatile organic compounds present.

Catadromous American eel is the only NOAA resource present above the dam at Noquochoke Lake. (There is no commercial eel fishery on the Copicut River, only eel fishing for family use.) One composite sample of red pickerel and American eel collected from the Copicut River contained 20 ppm PCBs. Eel readily bioaccumulate PCBs: levels as high as 600 ppm have been recorded in eel with no apparent effect (1).

Although biota sampling was limited, bioaccumulation is evident in American eel near the site. It is probable that a significant number of cells have PCBs in their tissue in excess of the FDA standard of 2 ppm for support in interstate commerce. This conclusion is based on the measured values and on a significant body of literature that suggests that a bioaccumulation factor of greater than one exists for many aquatic organisms, particularly those at higher trophic levels, such as the eel.

Translating bioaccumulation to injury is the major difficulty in ascertaining impact to eel populations. The effects of high tissue burdens of PCBs on eel survival or function have not been documented. However, in studies of other fish species, sublethal impacts in the form of reproductive impairment have been documented in fish with tissue burdens above 0.1 ppm (2). Because American eel do not spawn in waters near the site (their spawning grounds are in the Sargasso Sea), impacts to sensitive life stages (eggs and larvae) may be less severe than for many other fish, and nearly impossible to document.

Because of the paucity of sublethal toxicity data for the effects of PCBs on eel, the major documentable damage under the regulations is important habitat for the recreationally and commercially valuable blue crab (Callinectes sapidus).

In summary, the procedures to determine whether natural resource damages had occurred at the Re-Solve site and whether a formal damage assessment was necessary were similar to those used at most Superfund sites. That is, NOAA reviewed site-related documents and worked with EPA to encourage the collection of biological data along with EPA’s usual chemical analyses. Although bioassessment procedures could have proved helpful, they were not made available. NOAA concluded that a damage assessment was not warranted because of the size of the potential injury relative to the cost of an assessment. In addition, NOAA concluded that the proposed remedy would protect trust resources from future contamination.

THE WILDCAT LANDFILL SUPERFUND SITE

The Wildcat Landfill site is located along the St. Jones River in Kent County, Delaware, approximately 4 kilometers south of Dover. Residential and commercial establishments border the landfill on the south and west. The landfill is bordered on the north and the east by estuarine wetlands of the St. Jones River, a tidal tributary of Delaware Bay. The approximate 18-hectare site was operated as a permitted sanitary landfill between 1962 and 1973. During these years, industrial hazardous wastes, probably latex waste and paint sludges, and municipal wastes were disposed either by burial or by spreading the waste directly into marshes bordering the St. Jones River. In 1973, Delaware Natural Resources and Environmental Control (DNREC) ordered the landfill to cease operation for failure to comply with permit conditions.

The landfill operations changed 14 hectares of intertidal wetlands, consisting of narrow-leaved cattail and smooth cordgrass, to 11.6 hectares of upland and 2 hectares of isolated palustrine wetlands dominated by Phragmites. Landfilling also created a one-hectare freshwater pond with fringe wetlands by cutting off the discharge of a small stream from the St. Jones River. Creation of the Wildcat Landfill resulted in a net loss of wetland of 11.6 hectares and the establishment of the lesser quality areas dominated by Phragmites. Presently, there are approximately 15 hectares of estuarine tidal wetlands around the landfill and in the vicinity of the St. Jones River that are important habitat under NOAA trusteeship. The St. Jones River and its tributary, Tidbury Creek, is used in the vicinity of the site for recreational fishing. The river supports a typical estuarine distribution of 31 species of fish. The Atlantic silversides (Menidia menidia), the Atlantic menhaden (Brevoortia tyrannus), white perch (Morone americana), and the spot (Leiostomus xanthurus) are some of the most abundant species. The St. Jones serves as spawning and nursery habitat for many other species, the most abundant of which are the anadromous alewife (Alosa pseudoharengus). The river also is important habitat for the recreationally and commercially valuable blue crab (Callinectes sapidus).

The contaminants of concern at the Wildcat Landfill based on EPA site investigation sampling in 1982 were PCB, benzene, lead, and mercury. Groundwater within the landfill was extensively contaminated with low levels of trace metals and organic constituents. The landfill contained some buried, intact drums, which contained relatively high concentrations of organic contaminants, primarily styrene. The Remedial Investigation showed that inorganic contaminants, such as cadmium, copper, lead, and zinc, attributable to the landfill were found in the shallow aquifer southeast of the landfill. Organic contamination was not found.

The major contaminant migration route to the St. Jones River is the discharge of the Columbia (uppermost) Aquifer and a manmade drainage ditch extending along the northwest boundary of the landfill draining into the St. Jones River. Surface water samples from the St. Jones River during the first round of RI sampling in 1985 exceeded chronic marine toxicity criteria for arsenic, barium, lead, nickel, selenium, and zinc. However, the second round of sampling in the spring of 1987 indicated that only copper exceeded Federal ambient water quality criteria (AWQC); the upstream value of 10 micrograms per liter (μg/l) was the highest detected (3). Values decreased successively to below AWQC at the downstream stations. Seeps and leachate samples in areas near the freshwater pond showed concentrations of barium, cadmium, lead, and mercury that exceeded Maximum Contaminant Levels (MCLs) and concentrations of...
two operable units. The first operable unit addressed the geology, environs. The U.S. Fish and Wildlife Service hydrogeology, surface water, and sediment character of the pond, and a biological assessment of the landfill, the pond, and the adjacent environs. The U.S. Fish and Wildlife Service (USFWS) conducted the ecological assessment at the request of EPA. The major components of the study included a biological assessment of the extent of contamination and toxicity in surface waters and sediments in the on-site pond, wetlands, and adjacent St. Jones River, and determination of potential impacts and bioaccumulation pathways in the vegetative and wildlife communities. Anadromous fish were not sampled for the bioaccumulation study because their migratory nature and the presence of several contaminant sources along the St. Jones (including a National Priorities List site and several municipal landfills) make it impossible to establish any site-specific contaminant effects.

Resident fish, the white catfish, channel catfish, and white perch, were analyzed for tissue burden, but the mobility of these species made it difficult to link bioaccumulation to site-specific contamination, given the other possible sources of heavy metal contamination along the tidal St. Jones River. The data, however, were used for a human risk evaluation and for meeting the requirements of the public health evaluation associated with the site. Tissue analyses revealed that only PCBs were elevated in fish samples and this contaminant was not considered site-related. The State of Delaware used the information to issue a fish advisory.

Concurrent surface water and sediment chemistry and sediment toxicity testing conducted at low slack tide in the wetlands and river in the spring of 1987 provided the best site-specific information concerning potential impacts. Results indicated no significantly elevated trace metals nor significant toxicity in river sediments, along with a decrease in surface water concentrations of heavy metals to acceptable levels based on AWQC. The environmental assessment indicated no measurable negative effects to the aquatic community of the St. Jones River (4).

The vegetative survey, small mammal population, and histopathology studies indicated no adverse impacts to the terrestrial community. However, the data for the pond and the aquatic community did indicate adverse effects, including effects in sediments, bioaccumulation of heavy metals in fish and turtles, and histopathological abnormalities in the fish. The pond is an important nesting area for birds and feeding area for migratory birds, and may represent a risk to an important ecological food chain. This area was deferred for further investigation (a second operable unit) in order to determine, based on environmental risk, the type of remediation to be implemented for the pond/freshwater wetland. USFWS developed a study to address the environmental concerns for the freshwater pond and associated wildlife. The food chain effects were to be modeled to evaluate risk to migratory birds and an enzyme assay study on the eastern painted turtles (Chrysemys picta) was conducted in September 1988 to evaluate the impacts of lead on a resident fauna (5).

The major issues, then, were the loss of freshwater wetland habitat and the risk of contamination to resident fauna and migratory birds through direct contact with the leachate seeps and the sediments of the pond or through the food chain.

The first operable unit or landfill remedy developed in the spring of 1988 addressed the landfill contents, surface features, and groundwater contamination. The first operable unit Record of Decision (ROD) issued on June 29, 1988 addressed the source of contamination by eliminating the existing direct contact risks posed by the landfill contents and leachate seeps adjacent to the pond. The ROD included grading, soil cover, and revegetation of areas on-site where direct contact risks had been identified, including covering leachate seeps located at the boundary of the landfill and the pond, institutional restrictions on water well installations, removal of drums containing wastes; institutional restrictions on building development, and ground water monitoring to ensure the effectiveness of the remedial action.

In August 1988, the Potentially Responsible Party (PRP) Group for Wildcat Landfill proposed incorporating the remedy for the pond as an integral part of the landfill remedy and requested a release for natural resource damages. EPA asked the natural resource trustees, the Departments of Interior (DOI), Commerce (DOC/NOAA), and the State of Delaware to propose a permanent solution for the pond remedy and to consider any other conditions necessary for a release.

The remedy for the pond was to address purely environmental concerns. The remedy had to be consistent and compatible with the landfill remedy and minimize or eliminate the impact of contaminants upon biota in or using the pond. The remedy also was required to mitigate any wetland loss and ensure a permanent solution since neither groundwater nor waste treatment was selected for the landfill. The trustees and EPA proposed that the freshwater pond (1.1 hectares) be drained and filled in and a replacement pond and associated wetland habitat of equivalent or greater habitat value be created in the vicinity of the landfill in order to meet the requirement to protect and restore natural resources. This action would include the appropriate water depths, plant types, transition zone areas, and other features to promote wildlife use.

A monitoring program to ensure that the pond was unaffected by the landfill and another monitoring program to document success of wetland creation would be conducted. Prior to drainage, the pond should meet Federal Water Quality Criteria. The draining and filling of the existing pond should change the open water habitat to a vegetated wetland habitat and most of the existing associated wetlands should not be covered, except for areas containing seeps. Wetland area unavoidably lost through the limited capping should be mitigated for by extending the area of transition zone or vegetated wetlands associated with the newly created open-water habitat. This creation or replacement of wetland habitat also met the location-specific Applicable or Relevant and Appropriate Requirements (ARARs) of Executive Orders 11988 and 11990 for Protection of Floodplains and Protection of Wetlands, respectively.

NOAA and DOI are co-trustees for the fisheries resources in the St. Jones River; NOAA is the Federal trustee for the wetland habitat; and DOI is the Federal trustee for migratory birds using the pond, and wetland and terrestrial habitat. Injury to the fisheries was not an issue and no data were available for any previous impacts and it was not possible to establish a present link between on-site contaminants and impact to fisheries resources in the St. Jones River. The low levels of metals in groundwater should not pose a potential threat to the river. In addition, proposed groundwater monitoring wells would be used to ensure that levels did not exceed AWQC.

In October 1988, the U.S. Fish and Wildlife Service documented physiological effects due possibly to the elevated lead levels in turtles (5). Modeling of the potential effects on migratory birds feeding in the pond was curtailed following the PRP's proposal to remedify the pond by creating a new pond and wetland habitat (an area of equivalent wildlife value) while implementing the landfill remedial action as recommended by EPA and the trustees. Approximately 1.1 hectares of surface water and .8 hectare of adjacent freshwater wetland would be lost by fill-in and capping procedures around the contaminated pond. Because the lands would revert back to freshwater wetlands after filling due to groundwater hydrology, approximately two hectares of wetlands would be created from the contaminated ponds and adjacent seeps. In addition, 1.1 hectares of shallow surface water habitat would be constructed around the existing (deep-water) racetrack pond on the site property unaffected by the landfill. Finally, a 16-meter floral transition zone would surround the newly created wetland.

The PRP's proposal addressed the existing and potential environmental concerns (risk) and loss of open water habitat, thus
have required that their review and approval of the Pond Replacement Work Plan and of the Operations and Maintenance Plan include groundwater monitoring (at a newly constructed well) and freshwater wetland monitoring for success of wetland establishment.

Since dumping ceased in 1973, prior to the Clean Water Act and CERCLA, NOAA could not expect compensation for the significant high-quality wetland that had been lost by filling during landfill operations. However, NOAA did require additional components in the remedial alternative that ensured that wetlands lost through remedial action would be restored and/or incorporated in the transition zone of the new habitat and that deed restrictions on construction within 33 meters of the new pond would be instituted by the State of Delaware. Administrative restrictions at and adjacent to the newly created pond would be made to ensure that the integrity of the new pond was maintained and that development would not lower the established habitat value. Institutional controls also would be established to prevent development on the site of the existing pond, which after filling should revert to freshwater wetland. The remedial actions for both operable units should serve to maintain and improve NOAA trust resources in the vicinity of the site.

CONCLUSIONS

The collection of site chemical and biological data is of paramount importance to the natural resource trustee in the assessment of potential damages. However, the trustees do not have access to Superfund for the collection of data delegated solely for this purpose. A thorough environmental assessment for a Remedial Investigation/Feasibility Study can indicate current or potential impacts but cannot provide information for past injury during the worst part of the release. Frequently, the loss of wetland habitat cannot be included in damage assessment because destruction occurred before regulations existed. Injury to diadromous fisheries requires a high level of documentation to establish site-specific effects. In lieu of such data, trustees may evaluate site-specific factors, such as the probable effects on local resources, loss of habitat due to remediation, and fate and transport of contaminants, and use professional judgment to drive decisions concerning natural resource damages and settlements with responsible parties.

REFERENCES

1. Collick, D., Massachusetts Marine Fisheries Division, Department of Fisheries Wildlife and Recreational Vehicles, Sandwich, Massachusetts, February 1988.


