ILLINOIS DEPARTMENT OF NATURAL RESOURCES
NATURAL RESOURCE TRUSTEE PROGRAM

RESTORATION PLAN
FOR
MILLHURST FEN, KENDALL COUNTY, ILLINOIS

I. INCIDENT DESCRIPTION

Lakehead Pipe Line Company (Lakehead) installed a 24-inch diameter crude oil pipeline under the Fox River and Millhurst Fen using a horizontal directional drill (HDD) method. The drilling site is located approximately 6 miles west of Yorkville, Illinois in Kendall County. The locations of the Fox River, Millhurst Fen, and drilling site are shown on Figure 1.

During the horizontal directional drilling for the pipeline, a release of drilling mud (bentonite) occurred in the fen on July 23, 1998. Drilling mud was released as a result of a "frac-out" in which the mud migrated from the drilled pilot hole to the surface of the fen via an unknown permeable pathway. Lakehead coordinated the remedial activities at the fen with state and federal agencies. Remediation was completed to the satisfaction of these agencies.

II. GENERAL OVERVIEW OF MILLHURST FEN

The Millhurst Fen is a calcareous fen located on an elevated terrace position within the floodplain of the Fox River. Millhurst Fen Illinois Natural Areas Inventory (INAI) site provides habitat for three state-listed plant species: beaked spike rush (*Eleocharis rostellate*), yellow monkey flower (*Mimulus glabratus*), and slender bog arrow grass (*Triglochin palustris*).

Millhurst Fen is composed of upland and floodplain forest as well as calcareous wetland communities. Millhurst Fen is listed as an INAI site because of its ecological uniqueness and the presence of threatened and endangered species. The location of the fen is shown in Figure 1. Millhurst fen has a number of problems associated with it, including several exotic species, aggressive native species, and woody encroachment. The release of the drilling mud and the activities taken to remove the mud has caused the likelihood of the percentage of invasive and exotic species to increase.

III. DESCRIPTION OF DRILLING MUD RELEASE AND IMPACT

The frac-out occurred approximately 50 feet south of the surveyed pipeline alignment at the base of the hill downslope from Whitefield Road and on the western edge of the Millhurst Fen. The approximate point of release of the drilling mud is shown on Figure 2. The release point was adjacent to a small spring head emanating from a forested fen area. From the release point in the forested area, the bentonite flowed in a northeasterly direction down a small feeder spring run

through a shrub and cattail marsh. The drilling mud entered the main spring run of the fen downstream of an area with numerous spring heads. Once the drilling mud entered the main run, the spring water flowed in a southeasterly direction dispersing the drilling mud past the surveyed pipeline crossing and toward the adjacent southern property. The drilling mud was primarily confined to the swale containing the feeder spring run and within the main spring run. Drilling mud also spread to a depressional area and small channels lateral to the spring runs.

The trade name of the drilling mud is Federal Max Gel™. This product consists of a bentonite/polyacrylamide blend. For typical HDD applications, this product is generally mixed with water at a ratio of 1:20 (i.e., bentonite at approximately 5 percent by volume and water at approximately 95 percent by volume). Polyacrylamide polymer is added to the bentonite to improve viscosity.

A. Estimated Area of Impact

The release of the drilling mud affected approximately 9,866 square feet or 0.23 acres of the Millhurst Fen. The direct impacts were confined to the following wetland community types: forested fen, shrub fen, cattail marsh, and spring run. The forested fen and shrub fen areas appeared to be most affected due to the larger amount of drilling mud deposited in these areas.

B. Estimated Volume of Release

Lakehead estimated that 30 to 60 cubic yards of drilling mud was released into the fen as a result of the frac-out. This estimate was based solely on the depth and extent of the drilling mud in the fen.

C. Environmental impacts

Environmental impacts were primarily related to direct effects on plants in the fen as the result of contact with the drilling mud and/or remedial activities. Low-growing plants such as spike rushes and watercress were completely covered with drilling mud. In areas where remedial activities took place, many plants were trampled and subsequently buried in the drilling mud or inadvertently dug out during the removal of the drilling mud. This disturbance to the habitat increased the rate at which invasive and exotic species would become established in the fen. It is anticipated that some invertebrates, including crayfish and scuds, may have also been buried in the drilling mud.

IV. REMEDIATION AND PRIMARY RESTORATION

Remedial activities were initiated on July 24, 1998, the day after the release was discovered. The drilling mud was removed by hand using shovels, buckets, and soft-bristled brooms, disposed of in 55-gallon drums, and removed from the site. Most (90 to 95 percent) of the drilling mud was removed from the containment area (Area 1, Figure 2) and the upper portions of the main spring run (Area 3, Figure 2) during remediation. Drilling mud was left along the edge of the lower

portion of the main spring run (Area 4, Figure 2) because of the low volume of drilling mud present and because access to the downstream property had been denied by the landowner.

The area downstream of the containment area (Area 2, Figure 2) was the most difficult area to remediate due to the soft peat soils, the dense emergent vegetation, and the soft consistency of the drilling mud. After 2 to 3 days of removing drilling mud from this downstream area, activities were suspended due to the ancillary damage being done to the vegetation and soils. Only 10 percent of the total volume of drilling mud was removed from this area.

State and federal agencies inspected the site on August 20, 1998. Due to the fragile nature of the fen ecosystem, state and federal agencies agreed to stop remedial activities. However, due to the confirmed presence of bentonite still in the fen, continual monitoring of the fragile ecosystem by Lakehead was required.

Due to Natural Resource Damage Assessment action taken by IDNR, Lakehead agreed to compensate the public for interim losses resulting from the release of drilling mud into Millhurst Fen. This compensation included the sum of $14,000 to IDNR to conduct invasive species removal activities at the Millhurst Fen site.

V. EXOTIC AND INVASIVE SPECIES MANAGEMENT

A. Exotic and Invasive Species Removal Activities

In order to control exotic and invasive vegetation in the fen, prescribed burns in conjunction with herbicide treatments will be conducted. Several exotic and invasive plant species have already been identified at Millhurst Fen. The exotics include garlic mustard (*Alliaria petiolata*), water cress (*Nasturtium officinale*), reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites austalis*). Aggressive native and woody species include sawtooth sunflower (*Helianthus grosseserratus*), sandbar willow (*Salix interior*), and cattails (*Typha sp*).

To control reed canary grass prescribed burns will be conducted in the spring followed by the application of Roundup™, Rodeo™, or Poast™ herbicides. The whole site will be burned and herbicides will be used in places where reed canary grass occurs. Silver Springs State Park staff, an IDNR district heritage biologist (DHB), Illinois Nature Preserves Commission (INPC) staff, and a contractor will conduct prescribed burns and apply herbicide.

Cattails and common reeds are located along the main spring run which is a sensitive area where spraying is not recommended. In order to control these species in this area, a prescribed burn will first be conducted to remove dead vegetation in the spring and fall, depending upon weather conditions. This will be followed with a treatment of Rodeo™ utilizing a wick applicator to reduce the possibility of damaging fen vegetation. An IDNR DHB, INPC staff, and a contractor will perform the appropriate management activities.

Water cress will be hand pulled due to the proximity of the state listed yellow monkey flowers. Garlic mustard will also be hand pulled in areas of the fen. An IDNR DHB and INPC staff will conduct this work.

Woody vegetation will be cut or girdled and treated with Garlon 4™ during the dormant season (October-March). An IDNR district heritage biologist and a contractor will conduct this work.

B. Management Decision Criteria

An IDNR DHB and an INPC staff member will conduct periodic site surveillance and monitoring for the status of state listed endangered and threatened species in addition to the presence of invasive and exotic species. Transects will be determined in the summer 2001 for this purpose. These activities will be conducted on a monthly basis during the spring, summer and fall**.** Once the restoration plan is implemented, surveillance and monitoring activities will continue for two years. After this period, IDNR DHBs and INPC staff will determine if state listed endangered and threatened plant species have regained their populations in the fen and if proposed control activities caused a decrease of invasive and exotic species. If needed, a decision will be made to alter or cease the proposed exotic and invasive species control management plan for Millhurst Fen.

C. Budget

A total of $14,000 has been allocated to pay for costs associated with the control and management of exotic and invasive species for Millhurst Fen. All monies will be used to pay for a private contractor to conduct specific activities indicated in the table below. The activities listed below may be implemented as early as the fall of 2001.

Costs	Activity
$5,000.00	Application of herbicide for the control of reed canary grass.
$5,000.00	Brush cutting of woody invasive species within the Fen.
$4,000.00	Brush cutting, tree removal, and hand pulling of invasive species in upland wooded area.

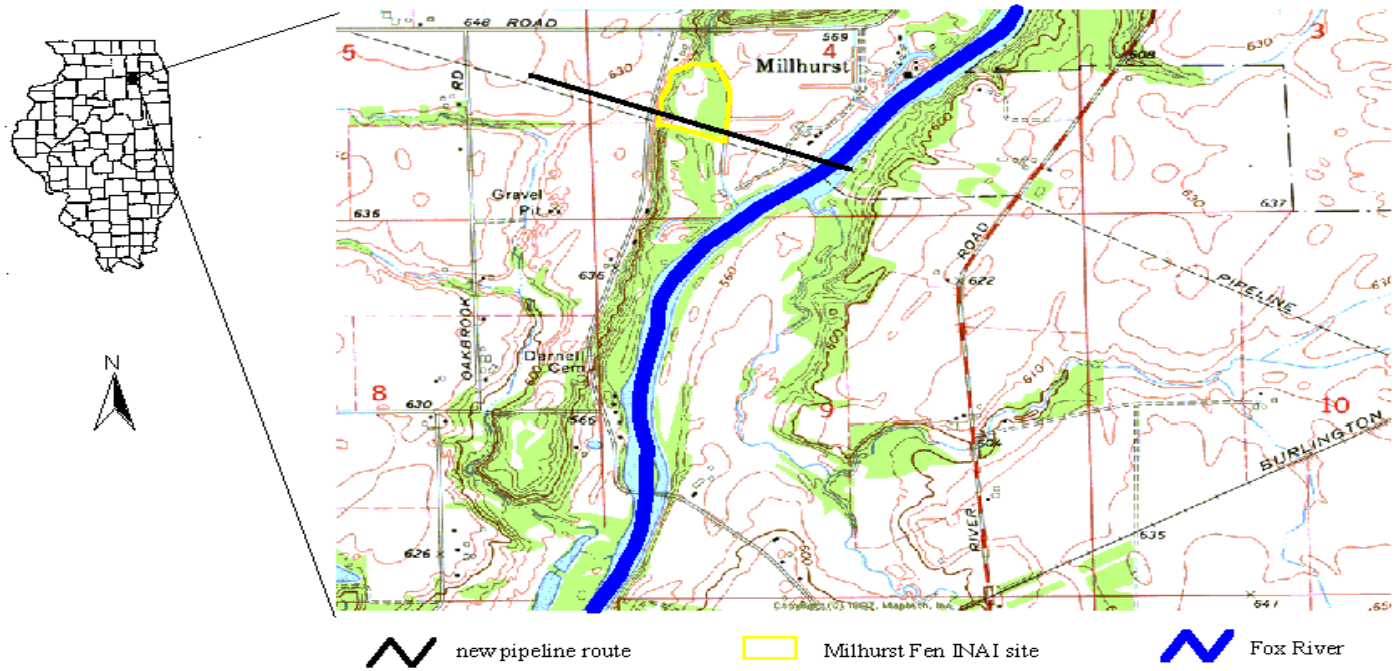

Figure 1. Topographic map depicting location of pipeline route and the Millhurst Fen Illinois Natural Area Inventories site in Kendall County, Illinois.

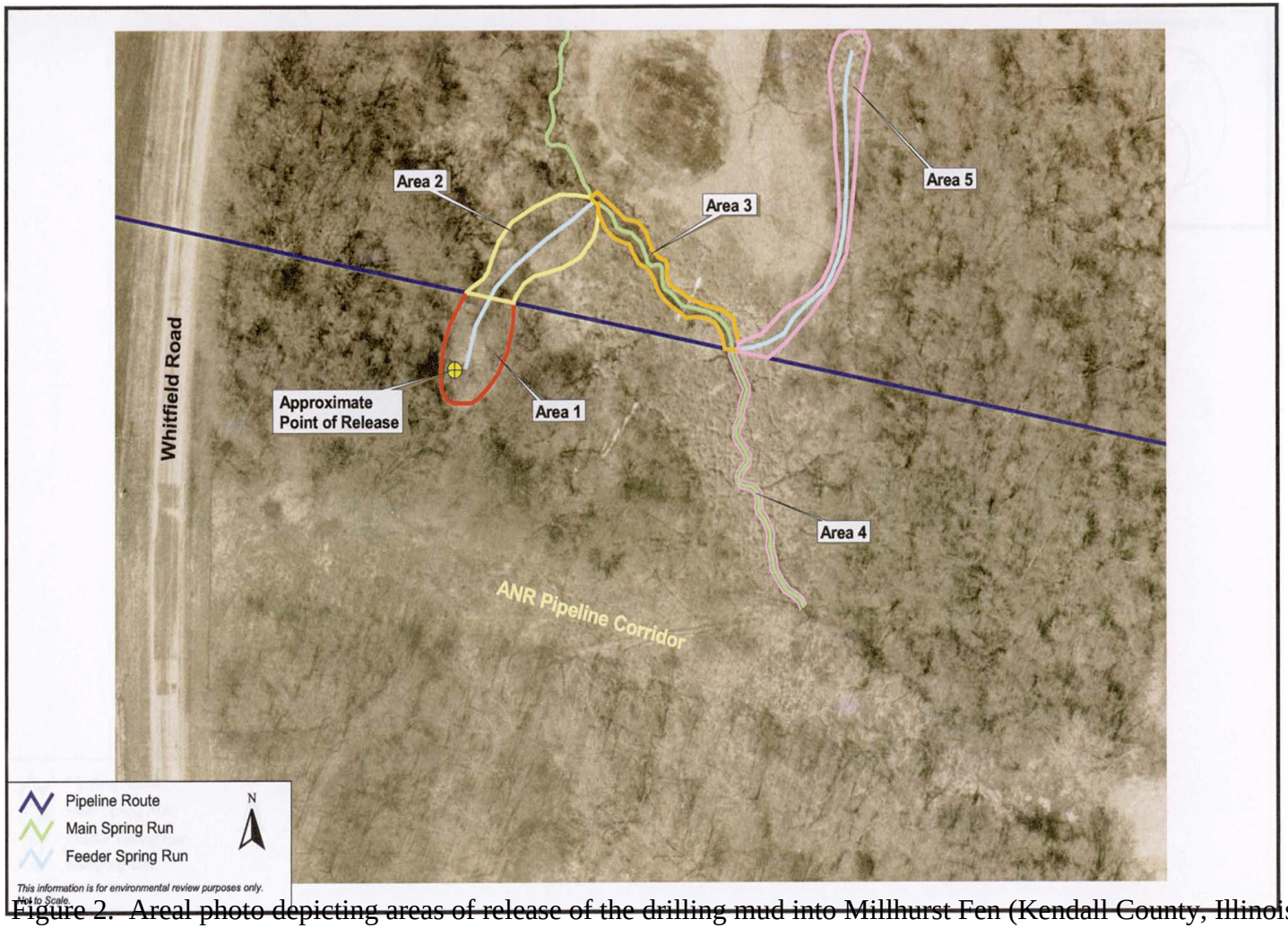

Figure 2. Areal photo depicting areas of release of the drilling mud into Millhurst Fen (Kendall County, Illinois).