

5. TREATMENT AND REMEDIATION

Explorer is responsible for the treatment and remediation of areas contaminated by the gasoline spill, including the reservoir. Explorer has worked cooperatively with SRA to monitor and treat water in the reservoir since the release. SRA has focused its interests on the restoration of Lake Tawakoni.

The TNRCC is responsible for ensuring that Explorer remediates all the affected areas, including the spill site, East Caddo Creek, and Lake Tawakoni, to established cleanup levels. The TNRCC developed remediation rules in 1993 for entities to follow when cleaning up a site. These rules are referred to as Risk Reduction Rules (30 Texas Administrative Code, Chapter 335). In 1999, the TNRCC implemented a new set of rules for remediation, the Texas Risk Reduction Program (30 TAC §335), to replace the Risk Reduction Rules.

Explorer had the option of following either set of rules to remediate the areas contaminated by the gasoline spill. Explorer chose to follow the Risk Reduction Rules but has the option to switch to the new Texas Risk Reduction Rules at any time. Each is considered to be equally protective of human health and the environment.

The TNRCC issued a directive to Explorer establishing the cleanup criteria for the spill event in waters. MtBE contamination entering the reservoir from East Caddo Creek may not exceed 15 ppb at a point 200 feet from the mouth of the creek. 15 ppb is the taste and odor threshold level established by the TNRCC for MtBE in drinking water. The compliance point is located 4.5 miles across the reservoir from the nearest raw water intake. Explorer has been cleaning the contaminated soils at the spill site to background levels for volatile organic compounds with the intent to clean the spill site to pre-existing conditions.

5.1 Water

Methods for removal of MtBE from surface waters are fairly limited. It is known to be very minimally degraded by biological organisms, ultraviolet rays of the sun have little impact, and water itself does not break down MtBE to any appreciable degree (USEPA 1998).

Evaporation, while slow, is the best natural treatment method for MtBE removal from surface waters. Dissipation of MtBE contamination in the reservoir appeared to be aided significantly by high spring winds. The winds mixed water in Lake Tawakoni throughout its vertical extent, but especially in the shallower areas of the reservoir.

The half-life of MtBE in a reservoir at a depth of three feet is estimated to be less than two days; at thirty feet the half-life is estimated to be almost fifty days (Zogorski, et al 1999). Given that MtBE dissipates from surface waters primarily by volatilization, the increased residence time for MtBE at depth can be attributed to its lack of interaction with the air. A reservoir with a very low mixing rate would be expected to gradually show higher levels of MtBE contamination near the bottom than at the surface. Monitoring in Lake Tawakoni, however, showed very similar concentrations throughout the vertical column for each sample location. It appears that windy conditions present throughout the spring continued to turn over the water in the reservoir, preventing the development of a vertical concentration gradient.

Typical water treatment plant systems are not considered to be effective for the removal of MtBE in drinking water. Carbon filtration will remove MtBE at low concentrations from water, but the method is fairly expensive and is not a standard part of a typical water treatment plant operations (USEPA 1998).



Carbon Filtration Unit

A granular activated carbon filtration system was installed by Explorer at the West Tawakoni water treatment plant to remove MtBE contamination. MtBE concentrations were approximately 45 ppb at the City's raw water intake on March 22, the first day the filtration system was operational. Finished water collected by the City and by the TNRCC

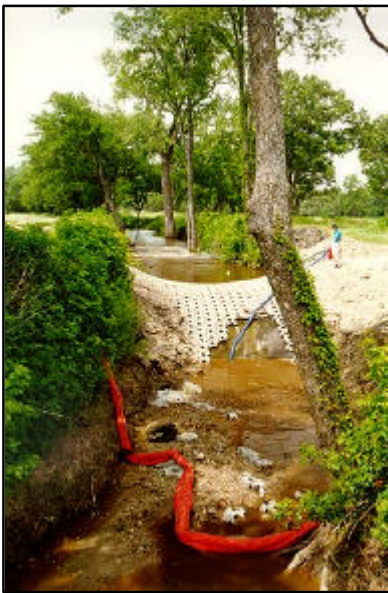
showed effective removal of MtBE after the carbon filtration system was installed. Although no detectable levels of MtBE have been encountered near the City's intake

since May 6, the carbon filtration system remains in place at the treatment plant as a precautionary measure.

5.2 Spill Site and Creek

Explorer Pipeline is currently remediating the contaminated areas at the spill site and along the creek. Several acres immediately west of the ruptured pipeline were contaminated by the gasoline spill, and the fuel collected in a nearby gully that drains into East Caddo Creek. The gasoline penetrated several feet into the ground because of the presence of large surface cracks resulting from very dry conditions in the area at the time of the release.

Treatment at the spill site and along the creek has been conducted primarily by Explorer. The TNRCC, responsible for monitoring Explorer's remedial actions, has collected split samples to confirm Explorer's analyses. SRA has collected several split samples at the spill site for the same purpose.



Creek Dams and Booms

Initial spill site control efforts included earthen berms placed in the creek and wash areas to contain the free product, vacuum trucks to collect several thousand gallons of gasoline from the spill site and the creek, and spill pads to collect small amounts of gasoline. Spill control booms, absorbent booms, and absorbent pads were placed in the creek at various locations to collect free-floating product at the water surface.

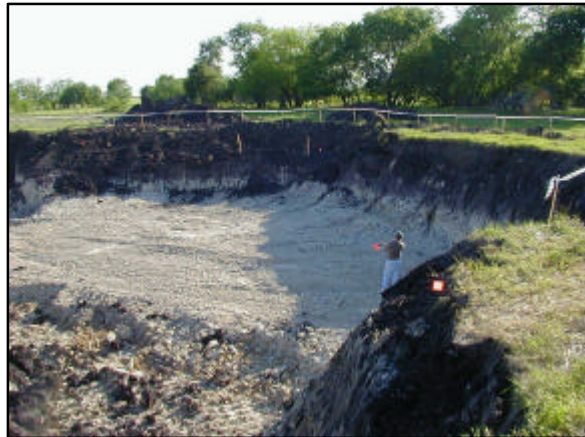
As mentioned earlier, a large rainfall event washed out the berms the day after the controls were put into place, flushing a significant portion of the spilled gasoline into the creek and downstream toward Lake Tawakoni. Lightning associated with the rain event prevented response personnel from continuing to collect spilled gasoline due to the explosion hazard.

Subsequent pollution control efforts were focused initially on the creek to prevent additional gasoline from reaching the reservoir. Underflow dams and spill booms were installed or re-installed at several bridge crossings to contain free-floating product. The

product was then collected by vacuum trucks. This method was effective for all the gasoline components except for MtBE, which bypassed the surface barriers as a dissolved constituent in the water phase. Explorer has estimated that 140,000 gallons of spilled gasoline was collected by vacuum trucks.

Explorer also installed aeration and air stripping systems at several locations along the creek to expedite the volatilization of the compounds, particularly MtBE. The city of Dallas installed an aeration system at the SH 34 Caddo Creek bridge crossing shortly after the spill. All the Explorer systems and the city of Dallas' system were in operation on a nearly continuous basis for several months. The city of Dallas removed its treatment system at SH 34 in mid-July.

On April 11, Explorer began excavating contaminated soil from the spill site. The soil is stockpiled for eventual treatment. A geotechnical consulting team contracted by Explorer monitors the volatile organic compound (VOC) concentration of the soil with a handheld photo-ionization detector (PID) in concert with the excavation. When concentrations are below levels detectable by the handheld PID, samples are collected and sent to an off-site laboratory for confirmation. If sample results are not below levels established by the TNRCC for cleanup



Excavation of Contaminated Soil at Spill Site

standards at the site, excavation continues until contamination is below required levels. The TNRCC is collecting periodic split samples with Explorer to confirm that the cleanup standards are being met. Explorer has stated that the release site is currently being remediated to background contamination levels, which is essentially levels below detectable limits for each gasoline compound.



Thermal Treatment Unit

On May 16, Explorer completed installation of a thermal destruction system to volatilize and incinerate the contaminated soil. Material from the contaminated soil stockpile is fed into the system, where it is heated to approximately 1200°F. Volatilized VOC's are carried by a counterflow air stream

into a combustion chamber and incinerated at 1450°F. Treated soil is then wetted and will be replaced into the excavated area to restore the pasture to its original condition. A second thermal treatment unit was installed at the site at the end of June.

Explorer is presently conducting an ecological risk assessment of the contaminated areas. This information, along with creek sediment analytical data, will be used in the determination of the best method of remediation in the creek. This evaluation and determination will be conducted under the authority of the TNRCC with support from the TPWD.