An Application on an Inland Waterway utilizing an EPA NCP Listed Surface Washing Agent
**Incident**

* A crude oil tanker truck leaving a tank battery rolled over into a drainage ditch.

* 170 bbls. (7,100 gallons) of crude oil ran down the ditch 300 feet, through a heavily wooded area and into a 140 foot long, 40 to 60 foot wide swamp area. This swamp area drains through a narrow inlet into a 60 to 80 foot wide creek then into a significant waterway.
Incident Overview

Tank Battery
Lease Road
Oil Impacted Soil
Cattle Guard

Pump Unit
Biocell
(Final Booms)

AREA A
AREA B
AREA C
AREA D

Drawing not to scale
A tanker truck spilled its entire load of crude oil. The spill ran east, along the lease road approximately 200 feet then turned north.
Incident Overview

The oil ran under a cattle guard, flowed north through thick trees and heavy underbrush, and impacted another 100 feet of dry creek bed before it entered the swamp area.
Insitu burning was instituted with limited success, leaving the heavier end residuals to be removed from the banks and surface waters.
Thunderstorms in the area the day after the burn caused the heavy oils and soot from the surrounding foliage to re-enter AREAs A through D. The banks were heavily saturated with thick oil. The entire area had been charred by the insitu burn.

(ALL PICTURES WERE TAKEN AFTER BURNING)
The swamp, **AREA A**, is:

- 40 to 60 feet wide
- and 140 feet long
Incident Overview
Incident Overview
The oil then drained through a narrow inlet into **AREA B**
Incident Overview

AREA B is 125 feet long and 60 to 80 feet wide.
Incident Overview
The flow then turned 90° south into AREA C.
Incident Overview
Incident Overview
As part of the initial response, a 60 foot boom was placed 150 feet south of the 90° bend in AREA C. No oil made it past this boom.

A backup boom was placed 150 feet downstream of AREA D.
Incident Overview
Incident Overview

Area D
Physical Countermeasures

Priorities:

Prevent spill from spreading
recover and remove oil
(burn)
Minimize impact

Equipment:

Booms
Torch
Fire Safety Apparatus
Chemical Countermeasures

Priorities:
- Oil recovery/removal
- Minimize impact
- Enhance restoration
- Minimize time and expense

- Chemical Countermeasure:
  - Surface Washing Agent **SW - 20**, BioSolve used in:
    - Power washers - to remove oil from foliage
    - Surface flushing - to speed oil recovery
    - Biocell - to speed bioremediation
Impacted soil was tilled and treated with a 6% solution of BioSolve and nutrient amendments to enhance the natural biodegradation of the residual oil.
Chemical Countermeasures

Oil was flushed from the cattle guard to a recovery zone in AREA A using a 6% BioSolve solution.
A hot 3% BioSolve solution in a power washer was used to release the entrained oils from the grass in NW corner of AREA A for recovery.
A 6% BioSolve solution applied with a hand pump sprayer was used as a pre-soak to release entrained oil from the swamp grasses at the south end of AREA A.
Chemical Countermeasures

After soaking for 1-1/2 hr., the area was flushed with 80 bbls. of a 0.1% solution of BioSolve.
The 0.1% BioSolve solution was used to herd the oil to the recovery area in AREA B.
Chemical Countermeasures

The oil being recovered in AREA B
Chemical Countermeasures

Heavily contaminated soil from the south bank of AREA B was excavated and moved into the biocell for treatment.
Chemical Countermeasures

BioSolve speeds recovery by desorption and mobilization of the heavy oil
Chemical Countermeasures

Heavy oil in AREA B being recovered
Chemical Countermeasures

A heated pressure washer using a 3% BioSolve solution was used in AREA C to flush the heavy oil from the banks and the foliage to the recovery zone in AREA B.
Intermediate boom separates clean AREA C from untreated AREA B.
After BioSolve releases the oil from the foliage, it is easily herded to the recovery zone in AREA C.
The oil in the recovery area was removed with vac trucks.
Oil Recovery

A vac truck was used to transport the recovered oil to a tank
Project Goals

Utilize Chemical Countermeasures Technology to:

- Maximize
  - Oil Recovery
  - Environmental Restoration Rate

- Minimize
  - Impact on Flora and Fauna
  - Cleanup Costs
Competitive Analysis

Dig and Haul

Strengths

- Removal of contaminate
- Usually quicker than other remedial actions

Weaknesses

- Highly Intrusive to shoreline environment
- Long term liability at disposal facility
- Limited shoreline access locations
- High transportation and disposal costs
Competitive Analysis

Pads and Sorbents

Strengths:
- Picks up and removes surface oil
- Does not add to water deterioration

Weaknesses:
- Time and labor intensive
- Creates solid waste
- Can add to shoreline deterioration (manpower)
- Must remove or displace all rocks, etc.
- Cannot effectively remove oil from foliage
Competitive Analysis

Power Wash *without* Agent

**Strengths**
- No chemical costs
- Adds no agents to waterway
- Allows oil recovery

**Weaknesses**
- Extended wash times increases:
  - Labor costs
  - Equipment costs
  - Probable shoreline intrusion
- Could pound oil into sediment
- Residual oil remains on foliage
Competitive Analysis

**BioSolve® was utilized to:**

- Enhance biodegradation in the drainage ditch adjacent to road and the biocell
- Release entrained oils and ash from foliage
- Release oils from banks and enhance recovery
- Desorb oil from burnt debris
- Enhance biodegradation of residual oils
This entire clean-up was done in about 3 days, using only 2 drums (110 gallons) of BioSolve® concentrate.
Comparisons

Before
Comparisons

After BioSolve Treatment
Comparisons

Before
Comparisons

After
Comparisons

Before
Comparisons

After BioSolve Treatment
Comparisons

Before
Comparisons

After BioSolve Treatment
Comparisons

Before
Comparisons

After

BioSolve Treatment
Comparisons

Before
Comparisons

After BioSolve® Treatment
Comparisons

Before
Comparisons

After BioSolve® Treatment
Why BioSolve®?

1) BioSolve suppresses vapors quickly, reducing LEL’s for increased responder and public safety.

2) BioSolve enhances oil recovery from spills making the cleanup faster and more effective by changing the surface tension.

3) BioSolve enhances the natural biodegradation of hydrocarbons, minimizing the long term environmental impact of a spill, thus reducing cleanup costs.
BioSolve® (SW-20) is listed on the EPA NCP Product Schedule as a Surface Washing Agent and may be considered for use by the OSC. BioSolve® is on the U.S. Environmental Protection Agency’s NCP Product Schedule. [This listing does NOT mean that EPA approves, recommends, licenses, certifies, or authorizes the use of BioSolve® on an oil discharge. This listing means only that data have been submitted to EPA as required by subpart J of the National Contingency Plan, 300.915.]
BioSolve Technology

**BioSolve** ® SW-20 Technology

- Increases cleanup efficiency through:
  - **Desorption**
    - Enhances entrained oil recovery
  - **Bioavailability**
    - Elevates biodegradation rates
- Minimizes environmental intrusions
- Reduces on scene time minimizing labor costs
- Effective on all sizes of spill
- Breaks up heavy oil and sludge
One of the techniques used to overcome the problem of the slow release of immobilized NAPL’s is to solubilize them with surfactants. (Edwards, D. A. et al.).

Surfactants are capable of emulsifying NAPL’s to facilitate increased mobility and recovery efficiency (Chevalier et al., 1997; Abdul et al., 1990).

In many cases this technique can then enhance bioremediation if the surfactant is not toxic to the NAPL degrading microorganisms.
Desorption

Trapped Oil at Residual Saturation

Surfactant Flush

Solubilization (microemulsions)

Mobilization
Surfactants are essential to the bioremediation process. This is borne out by the fact that microorganisms produce surfactants in order to solubilize hydrophobic organic compounds (Lange, S. and Wagner, F). Whether the surfactant is produced by microorganisms or manufactured they both act to solubilize the target compound.

Surfactants can act in two ways:
- (1) increase solubility (solubilization) and
- (2) lower the interfacial tension (mobilization).
Microemulsions increase the bioavailability of the hydrocarbons. Increased bioavailability supports increased microbial population.
Bioavailability

Increased microbial population increases biodegradation rates

NCP Product Schedule Bioremediation Agent Efficacy Evaluation of BioSolve
-National Environmental Technology Applications Center

The Westford Chemical Corporation® -USA
The BioSolve Difference

Dispersants create droplets
Droplets are large particles

BioSolve® creates microemulsions
University testing measuring solublized oil
concluded that BioSolve’s® microemulsion size
particles were similar to a naturally occurring
bacterium’s biosurfactant microemulsions

University of Alabama
BioSolve (1-5) does not sink oils like dispersants (1-10) are designed to do. Even at twice the concentration, BioSolve is designed to allow the hydrocarbons to remain buoyant for recovery or biodegradation.

Swirling Flask Dispersant Effectiveness Test (1-10) using South Louisiana Crude

40 CFR Part 300 requires 45% minimum oil dispersion to lower 30 mls.

% Oil in the lower 30 mls. of current listed dispersants as of 3/97

- BioSolve: 79.3%
- Dispersant: 89.8%
- 63.4%
- 54.7%
- 68.0%
- 84.1%
BioSolve allows oils to float to enhance recovery operation. Application ratio’s will vary depending on the petrochemical’s characteristics.
As well as regulatory bodies in many states and countries. Listings are not endorsements and full listing letters available upon request. Contact The Westford Chemical Corporation.
Contact The Westford Chemical Corporation®, Westford, MA, USA
via e-mail at: info@biosolve.com
or your Local Biosolve® Distributor*

*The BioSolve Group of Distributors is made up of professionals in many diverse industries including emergency response, tank and pipeline service, oil field service, chemical/industrial cleaning, and soil remediation

www.biosolve.com
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