

OIL EMULSION PIPELINE RELEASE INTO A WETLAND COMPLEX & FRESHWATER ECOSYSTEM



Surficial petroleum hydrocarbon impacts observed during the initial reconnaissance throughout the wetland complex.

Location: Northern Alberta

Industry: Upstream Oil and Gas

Product Released: Emulsion (50% produced water, 50% crude oil)

Volume Released: 250 m³ (250,000 litres)

Ecosystem Affected:

- * Boreal forest
- * Wetland complex
- * Shoreline
- * Waterbody

Media Affected:

- * Organic soil
- * Mineral soils
- * Vegetation
- * Peat
- * Sediment
- * Pore water
- * Groundwater
- * Surface water

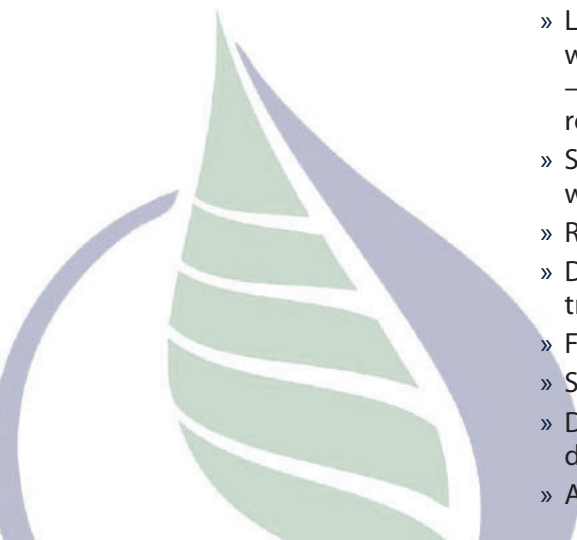
Services Ridgeline Provided

Emergency spill response management and field execution:

- » Hazard identification and safety management
- » Incident command system
- » Initial spill reconnaissance, Geographic Information System (GIS), and plume dispersion mapping
- » Development of the incident action plan(s): Containment Plan, Sampling and Monitoring Plan, Wildlife Protection Plan, Remediation Action Plan, Water Management Plan, Waste Management Plan, and Contingency Plan
- » Temporary Field Authorization (TFA) for off-lease access and remediation
- » Regulatory liaison, first nations and stakeholder engagement
- » Access planning and waste tracking
- » Staging decontamination areas
- » Containment and recovery within the wetland complex and flowing water body
- » Surface water infiltration diversion and control
- » Contractor management: Heavy equipment, haul trucks, labour crews, surveyors, line locators, laboratory, technical subject matter experts, communications, access matting, oilfield service, and waste disposal facilities
- » Budget forecasting and financial tracking
- » Project communications and reporting

Environmental project management and field execution:

- » Initial environmental site assessment and delineation
- » Habitat assessment, ecosite classification, and receptor identification
- » Wildlife management and monitoring
- » Geophysical assessment - electromagnetic surveys
- » Installation of groundwater monitoring and drive point wells
- » Hydrogeological survey, and development of a conceptual site model
- » Laboratory analytical interpretation – characterization of source contaminants, waste materials, and background conditions – delineation of contaminant plume – effectiveness of the remediation system – confirmatory samples indicating if the remediation endpoints have been achieved
- » Sampling and monitoring - soil, pore water, groundwater, vegetation, sediment, wildlife, and surface water
- » Remediation of surficial impacts via excavation and waste disposal
- » Design and construction of a remediation system for soil flushing, recovery, treatment, and disposal
- » Fish rescue license (FRL) to trap and relocate fish from ponded areas
- » Shoreline and sediment remediation by isolation, excavation, and disposal
- » Data management, laboratory quality assurance and control, GIS mapping and dispersion, modeling, analytical trending, waste tracking, and data visualization
- » Annual environmental reporting





UAV photograph of the immediate affected area indicating the stressed vegetation observed upon initial assessment.



Containment boom was immediately deployed within the unnamed tributary of the losegun River at various control points located downstream from the point of entry.



During the investigation and repair, the source impacts from the pipeline breakpoint area were excavated and disposed of at an approved waste management facility.

Incident Details

On October 6, 2016 a crude oil emulsion release due to a pipeline break was identified and the Alberta Energy Regulator (AER) issued an Environmental Protection Order and deemed the release to be in Emergency Phase shortly thereafter. The duration and date of the release was and remains to be unknown. The released fluids surfaced at the pipeline breakpoint and migrated northwest approximately 330 m before entering an unnamed tributary of the losegun River. The losegun River is approximately 9.3 km downstream of the point of entry into the unnamed tributary. The immediate site and surrounding area are located within a large wetland complex that consist primarily of shrubby fens, wooded coniferous fens and wooded coniferous swamps, with areas of marsh and shallow open water occurring in areas affected by beaver activity and subsequent water impoundment. The surficial impact of the release within the wetland was determined to be approximately 36,450 m².

Project Objective

Ridgeline Response was responsible for the Emergency Spill Response and Environmental Management and fieldwork at the site. The emergency phase of the project was called down by the AER once the sampling and monitoring results indicated that containment was successfully achieved, approximately 20 days after Ridgeline initiated the emergency containment and recovery operations. Throughout the containment and recovery phase of the project, approximately 22,000 m³ of impacted water and free fluids were recovered and disposed of at an approved waste management facility. An ecological risk assessment was developed to determine an appropriate remediation action plan. This included removal of surficial free phase petroleum hydrocarbon, heavily impacted vegetation, impacted sediment, and the freshwater flushing of the residual salinity impacted soil profile. Recovery fluids were captured at recovery trenches and cisterns, and at the terrestrial barrier that was installed to protect the unnamed tributary from further contaminant migration. The recovered fluids were piped to an above-ground storage tank for treatment prior to downhole disposal.

Throughout the duration of the remediation seasons from 2017 to 2019, Ridgeline continually monitored wildlife, surface water, groundwater, pore water, sediment and soil apparent conductivity to determine the effectiveness of the remediation and recovery efforts.





Heavily impacted surface soils were excavated and disposed of at an approved waste management facility.



Access roads with swamp matting were constructed to access the impacted areas and point of entry from the wetland complex into the unnamed tributary. A series of terrestrial barriers were keyed into the subsoil to provide primary containment.



The salinity impacts in the soil were remediated by utilizing an active freshwater flushing, recovery, treatment, and disposal system throughout the 2017, 2018, and 2019 remediation seasons.



Project Challenges

Surface water management presented a significant challenge on this project. Diversion, trenches, barriers and bellholes were constructed upgradient of the release area to minimize the volume of freshwater entering the impacted area. In accordance to the temporary diversion license (TDL), the run-off was collected and discharged downgradient of the impacted area within the boundaries of the permitted temporary field authorization.

Due to the very saturated condition of the peat soils within the remediation area, conventional sample collection and laboratory analysis methodologies did not present an accurate depiction of the actual chloride concentrations available to the surrounding ecosystem. Working with the AER and the 3rd party laboratory, Ridgeline was able to develop a sample collection and analysis methodology of the saturated peat soils that provided a more representative chloride concentration.

Project Outcome

Throughout the duration of the emergency and remediation phases of the spill response project, the continual sampling and monitoring results confirmed that containment was never compromised, and no wildlife was affected by the release.

All identified impacts to the surface water and sediment within the unnamed tributary and beaver ponded areas have been successfully remediated to the applicable environmental guidelines accepted by the regulator.

After successfully remediating approximately 53,000 m³ of impacted soil and with 56% of the remediated soils remaining on site, Ridgeline was able to lower the residual contaminants to an acceptable condition to be moved into a long-term risk management program and surface restoration.