



Project Number: SC11-650



Pembina Pipeline Corporation
July 24, 2011

RE: "DEER MOUNTAIN" 11-06-067-09 W5M – REMEDIAL ACTION PLAN

Further to our recent conversations with Alberta Environment (AENV) on July 22, 2011 SWAT Consulting Inc. (SWAT) has been requested by Pembina Pipeline Corporation (Pembina) to complete recommendations regarding the containment and recovery strategies at the above listed spill site during the Summer and Fall of 2011.

The information within these strategies will contain detailed information on monitoring the site, product containment and recovery along the creek. These strategies will not include any efforts at the break site pipeline right of way, with the exception of monitoring and mitigating any migration of product out of the point of release.

These recommendations are based on previous site activities, as well as current site conditions and containment and recovery operations currently being conducted. Any extreme changes in the watercourse, such as a 10 year flood, weir breeches, or freeze up will affect these recommendations drastically. Every effort will be taken to account for such unknown occurrences. As containment and cleanup of the spill progresses and additional information is gathered from the field sections, this plan may be amended.

BACKGROUND INFORMATION

On July 19th, 2011 the discovery of a release from an 8 inch pipeline rupture prompted a spill response at the above mentioned location. The release reportedly forced an estimated 200m³ of liquid petroleum hydrocarbon into an unnamed creek. Initial containment and recovery measures implemented by Pembina personnel between the dates July 19, 2011 and July 24, 2011 were the construction of a temporary access to the creek off of an existing wellsite located at 04-18-067-09 W5M. The installation of retention ponds, two inverted weirs, and an additional five containment locations using boom at various locations along the watercourse. Product was then recovered via drum skimmers and vacuum units at the various control points. The recovered fluids were temporarily stored in 400bbl tanks until being transported to CCS for processing.

An earthen berm was constructed along the right of way to prevent further movement of product towards the creek.

Crews then proceeded to slash trails connecting the various control points to allow access for further assessment and recovery operations to be completed. A wildlife management team was brought to site to assess wildlife habitat and install various deterrent and mitigation measures to reduce the impact to the local wildlife population. A wildlife management plan was created and is to be submitted to the local authorities.

Surface water sampling locations were established and consist of the creek system, any tributaries, Swan River and Edith Lake.

Based on the background data, below are the proposed mitigation strategies.

Proposed Strategies:

SITE MONITORING

The site will be monitored continuously throughout the day. There will also be a night shift that will also monitor the site conditions, as required.

1. Complete daily site inspections:
 - Monitoring for visible hydrocarbons, water depth, water flow rate, freeboard and boom condition at pre-selected monitoring locations (as stated above).
 - Daily temperature monitoring and weather forecasting.
 - Any changes in the water course, increases or decreases in the water flow, both upstream and downstream of the site.
 - Signs of wildlife activity in the area.
 - Condition of the access road.
 - Water sampling by a third party contractor at pre-determined locations along the watercourse to monitor potential hydrocarbon migration.
2. Take photographs of any “out of the ordinary” observations.
3. Daily review of the crew task logs and verbal communication with the field crews and site manager will be completed. The implementation of the product recovery techniques will be completed based on site information.

PRODUCT CONTAINMENT

Based on previous site activities and consultation with AENV, the following containment and recovery operations will proceed:

1. Trails will be constructed along the spill path to allow access along the entire creek. This will allow for additional containment and recovery points to be developed as necessary.
2. The use of matting will be installed to aid in containment and recovery operations.
3. Water samples taken along the watercourse will be evaluated to determine the need for additional containment.
4. Containment locations at CP 1, 2, 3, 4, 5, 5b and 6. (see attached site overview). Containment will consist of retention ponds, containment boom, weirs, and sorbent material. Additional containment points will also be installed as recovery operations commence. These containment points will consist of either containment boom or Turner Valley Gates.
5. Weirs will be maintained daily, recovering any accumulation of debris or sheen. As weirs are a temporary containment measure, it will be understood that in the event of heavy precipitation that the weirs may possibly breach. To mitigate any release during these peak water sheds, river containment booms have been set in place upstream of the weirs within the retention ponds.
6. Additional absorbent boom will be installed downstream of the weirs to collect any accumulation of sheen that would result from agitation of the weir waters prior to discharge (i.e. skimmer failure where crews will have to access the skimmer via the retention pond or pulling the skimmer out of the retention pond if it becomes clogged with debris).
7. Areas along the pipeline right of way and along the banks of the creek where surface product/sheen leaching or capillary action is present will be amended with peat moss until the areas can be cleaned by manual or mechanical means. The peat moss will aid in hydrocarbon stabilization and allow easy manual or mechanical recovery.
8. In the event of heavy rainfall, additional containment boom will be installed at select downstream locations to aid in sheen management.

PRODUCT RECOVERY

1. As woody debris is cleared from the creek, crews will proceed to move the product to the existing control points. Additional temporary control points will be installed as warranted during recovery operations.
2. Product movement will consist of crews repositioning the cobble within the creek (not removing the cobble from the creek) to allow water to flush naturally. In areas where the product is stranded atop the cobble, a low volume flush with a water pump will be used to allow the water to lift the product out and off the cobble allowing movement back into the main water channel. This water flushing techniques will only be conducted on the cobble of the creek and not on the banks or where soil is present, thus reducing the 'footprint' we are leaving and the possibility of stratifying the oil within a sediment layer.
3. Any oily woody debris will be placed within 1m³ tote bags for later disposal.
4. Utilize either skimmers, portable vacuum unit or hand skimming techniques to recover the accumulated product at the control points and temporary containment areas, storing into the on-site 400bbl tank.
5. The containment boom and the downstream absorbent booms will be monitored on a daily basis, if any product or debris accumulation occurs within the containment booms hand skimming techniques will be implemented, or absorbents will be utilized for product recovery. All recovered material will either be stored within 45 gallon barrels or 1m³ tote bags. Once full, the barrels or bags will be stored on secondary containment in the form of poly and then managed under ERCB Directive 55 and 58.

IMPACTED BANK/ShORELINE RECOVERY EFFORTS

The creek will be segregated into 100m sections in order to complete bank/shoreline assessments. Due to possible weather constraints a non-detailed bank/shoreline assessment will be completed during bulk product recovery to isolate heavy impact areas.

If there are no weather constraints, once the bulk of the product has been recovered from the creek a detailed visual bank/shoreline assessment will be completed to determine the extent of bank/shoreline impact along the creek. The

visually impacted areas will be broken down into four categories, as outlined below:

- Category 1: Visually clean.
 - No apparent hydrocarbon impact to vegetation, woody debris or surface soils. No work to be completed on these areas.
- Category 2: Low impact.
 - Minor visual hydrocarbon staining present on the vegetation, woody debris and surface soils. No free product present in low lying areas/depressions or coating the vegetation or woody debris. Recovery methods will be completed.
- Category 3: Moderate impact.
 - Hydrocarbon staining present on vegetation, woody debris and surface soils (to a depth up to 1cm). Free product adhering to the vegetation and woody debris with some free product in low lying areas or depressions. Recovery methods will be completed.
- Category 4: Heavy impact.
 - Heavy hydrocarbon impact into the surface soils (to a depth greater than 1 cm). Free product present in low lying areas or depressions. Recovery methods will be completed.

The recovery strategies have also been broken down into three methods as outlined below:

- Recovery Method 1: Manual recovery.
 - Utilizing hand tools (rakes, clippers), remove the impacted vegetation, woody debris and lightly impacted surface soils and store into debris bags. Complete a peat moss application on the area and lightly incorporate into the surface soils with hand tools. Inspect the areas periodically upon completion of the “first pass” and remove any stained peat moss that has absorbed any residual hydrocarbons. Re-apply peat moss as required.
- Recovery Method 2: Mechanical excavation.
 - Use of a track hoe equipped with a “wrist twist” clean out bucket (smooth faced) to excavate the impacted soils and woody debris. The soils would then be managed under EUB directive 58.
- Recovery Method 3: Manual recovery and mechanical excavation.

- Utilize both Methods 1 and 2. Certain areas may require both mechanical excavation and manual recovery due to the undulating terrain and small low lying areas.

Consultation with AENV will need to be conducted to determine the visual criteria to meet. It is anticipated that the visual criteria to meet will be that of category two (2) low impact after treatment.

CLOSURE SAMPLING

Creek Water Quality

Upon completion of remediation activities, water samples will be collected from each of the retention pond locations. The water samples will be analyzed for the suite of parameters of concern as discussed with AENV.

Control Locations - Creek

Baseline values for water quality will be collected from control locations. The control locations will be selected from nearby water features that are similar in nature, setting and vegetation to the three impacted ponds. The data obtained from the control locations together with the guidelines will be used to confirm clean up success.

Confirmatory Soil Sampling

Confirmatory sampling will be completed to document the success of remediation activities. A representative number of soil samples will be collected from the remediation areas to document clean up success. Selected soil samples will be tested for BTEX F1-F4 while others will be tested for the full suite of parameters of concern. The soil test results will be compared to applicable criteria as discussed with AENV, as well as background, control samples.

RECLAMATION

The spill footprint will be reclaimed upon conclusion of remediation activities. Details on reclamation to be provided at a later date.



REGULATORY COMMUNICATION

Pembina is working closely with the regulatory agencies involved with the project. Updates on fluid recovery and remediation activities are presently provided daily. As the project progresses, Pembina will continue to provide regulators with timely project updates.

SAFETY

All field activities (including ground disturbance) will be completed as per the guidance of Pembina's health and safety policies and procedures. Given the volume of activities that will be completed in and around the creek, there will be an emphasis on safety for working around water.