Shell: natural reclamation and erosion control for onshore pipelines

**Source/organisation:** Shell Canada Limited

**Scale:** Large – several reclamation plots are located in the Deep Basin Ojay Project site. The Ojay pipeline has eight reclamation research sites each approximately 20 metres wide by 100 metres long.

**Key stakeholder(s):** British Columbia government (Oil and Gas Commission), First Nation communities, ReClaimit Ltd (execution contractor)

**Project phase:** Fully implemented, has been operational for three years; optimisation studies ongoing

**Geographical location:** NE British Columbia, Canada

**Project overview**
Shell's projects often involve the construction of pipeline corridors in ecologically diverse areas on previously undeveloped lands called 'greenfield' development. The pipeline is routed along what is known as a ‘right of way’.

When building a pipeline, the construction activities not only cover the civil works to lay the pipeline and build the pump/compressor stations, but also the reclamation work to return disturbed land to an equivalent land capability with minimal impact on the environment. There is heightened recognition and popularity of natural reclamation and soil erosion abatement techniques as these ancient techniques address the shortfalls related to man-made pipeline protection techniques, particularly in terms of reduced installation and maintenance costs.

The technique of using living plant materials to create structures that perform some soil related engineering function is referred to as soil ‘bioengineering’. Often, soil bioengineering is used to treat sites where
surface stability and erosion problems exist. Bioengineering solutions can be applied to a wide variety of sites disturbed by construction activities. These solutions use natural components of pioneering plant communities and thus align well with ecological restoration strategies.

It is preferred to use local plant species to construct soil bioengineering solutions for naturally disturbed sites. Some recent innovations in reclamation approaches include the use of willows and other tree/shrub/plant species to control soil erosion and establish a re-naturalisation path. In the past 15 years, Shell has proven success in willow staking in several upstream projects. Poplars and willows are highly valued for erosion control and efficient control of groundwater due to their rapid growth, high rooting capacity, extensive root systems and high water use.

Shell continues to investigate different reclamation methods, using direct seeding, nursery stock grown from native seed and possibly peat pucks (seed with nutrients), to better understand the feasibility of the technology as well as the costs and time involved in growing such solutions.

Pipeline projects involve many stakeholders with specific interests and concerns. The pipeline right of way often traverses lands with rights of use belonging to multiple indigenous communities. The indigenous communities are often concerned with the fragmentation of the land and its impacts on the local ecosystem. Therefore, all solutions are strictly reviewed with these local concerns in mind.

**Technology Maturity**
Proven, with improvements being developed.

**Investment/Costs/Time**
- Natural reclamation techniques have the added benefit of having significantly lower costs than concrete and metal piling methods.
- Timelines for implementation generally fit very well with the overall project timeline as pipeline construction and tree planting share a common seasonal criteria and the activities can therefore be executed within the same timeframe.

**Project Management Considerations**
- Natural reclamation does not provide a broad base solution, i.e. it is only applicable to certain sites.
- Project teams need to be willing to assess such alternative approaches.
- Natural reclamation solutions require different skill sets (horticulture, biology).
– Joining forces with external experts is critical for the success of these pilot studies.
– It is important to build relationships with all key stakeholders early on in the project.
– It is important to identify and mitigate local environmental risks (e.g. care was taken to maintain moose habitat in the harvested areas by leaving clumps of willows standing).
– Timing is key for success of this solution (e.g. when to cut and plant willows).
– It is important to secure manual labour for large scale projects.
– Reclamation is often a compliance-driven sustainability effort.

**Benefits**
– Lower overall environmental impact, potentially including CO₂ offsets.
– Solutions are known to be superior overtime compared to the more traditional stabilisation methods.
– Hands-on work can be structured as a team building/educational activity for Shell employees.
– Job creation for local labour.
– The solution can be designed to be sensitive to the local environment (e.g. allow access to local wildlife).
– These green solutions do not require regular maintenance as compared to gray solutions that often require mechanical intervention, e.g. for the excavation of existing banks or transport of materials.
– Low operating and maintenance cost.

**Risks/challenges**
– Not a one-stop solution, but very much site specific (dependent on soil types, moisture level, light, etc.).
– Requires a different skill set for the design and implementation phase.
– Time constraints: any project would need to be started as early in the winter as possible.
– Survivability of the planting sites is an important requirement to establish long-term success.

**Resilience aspects**
– The green solution self-repairs and improves performance over time as opposed to gray solutions that depreciate over time and require maintenance.
– Solutions are modular; it is easy to select the required planting density along the pipeline corridor.
– Solutions are multi-functional: they reduce loss and fragmentation of wildlife habitat, reduce soil compaction and improve land capability and productivity in agricultural, prairie and forested areas.
– These types of natural re-vegetation systems reduce anthropogenic disturbances to local ecosystems.

**Key learning**
– The environmental agencies are very focused on achieving sustainable outcomes and are typically sympathetic to soft engineering solutions.