Technical Guidelines for the Development of Environmental Management Plans for Underground Infrastructure
Revised - July 2013

Rationale

Underground infrastructure may be at risk from valley, streambank or streambed erosion. If at-risk erosion areas are not adequately monitored and effectively mitigated, during storm events there is increased risk that erosion of the natural cover will expose the infrastructure, and the exposed infrastructure may fail.

The *Technical Guidelines for the Development of Environmental Management Plans for Underground Infrastructure* are designed to assist the proponent in developing a proactive monitoring and mitigation programs in advance of a spill. Through its monitoring programs, TRCA may have available aquatic, hydraulic, soil, terrestrial natural heritage, or erosion data as well as technical expertise to assist the proponent, as well as information related to infrastructure on its lands.

TRCA recognizes that protecting human health and the environment are primary concerns in the event of a spill. Short-term and long term containment of materials from a spill is key to minimizing the risks. Thus, measures to prevent spills are seen as a priority. In the event of a spill, measures to contain it as close to its source are of primary concern, followed by measures to contain it within a river basin prior to its reaching Lake Ontario. Should a spill occur, it is imperative that baseline information be available to facilitate development of a remediation and compensation plan.

EMP Documentation

The EMP intended to be is an action oriented document. It summarizes the results of the studies undertaken in Steps I, II and III. The EMP provides detailed mitigation, monitoring, and contingency plans, and provides a detailed plan for reporting and communications for implementing the EMP based on adaptive management principles. TRCA reviews the EMP based on requirements under *Ontario Regulation 166/06* and the Canada *Fisheries Act*.

TRCA Concerns

As watershed managers, land owners and regulators, TRCA is concerned with three aspects of underground infrastructure operations as related to spills management:

1. Proactive pipeline exposure and failure risk assessment
2. Spills response planning
3. Rehabilitation and restoration planning

To develop these assessments and plans, it is essential that baseline information be collected.

Step I: Proactive Pipeline Exposure and Failure Risk Assessment

To ensure there is a proactive approach to managing potential areas of pipeline failure or fracture at valley, stream and wetland crossings, TRCA strongly recommends that a proactive risk assessment criterion be developed at each crossing of a valley, stream or wetland, based on various critical in-stream and slope stability parameters. A numerical rating matrix should be developed to assess the time frame and the storm event that would necessitate further pipe remediation. Following are the factors that are critical in the exposure and failure assessment:

i. Depth of cover survey at all crossings
ii. Stream geomorphic conditions
iii. Valley slope conditions
iv. Emergency procedure for pipeline repair or securement. Note: *Ontario Regulation 166/06* regular or emergency works permits may be required.

Baseline Information Requirements:
To complete the proactive risk assessment at each crossing of a valley, stream or wetland, field investigations and study is required. The following baseline information should be collected on frequently sufficient basis, depending on initial investigations and peak storm events, to establish and confirm the following:

1. Depth of cover at pipe crossing locations (stream bank/bed and valley slope)
    a. In-stream vertical depth of the pipe from the bottom of the watercourse to the top of the pipe - when downcutting of the watercourse occurs, there must be sufficient natural cover to ensure the integrity of the pipe is protected.
    b. Horizontal distance of the pipe from the edge of the watercourse to the side of the pipe – when streambank erosion occurs, there must be sufficient natural cover to ensure the integrity of the pipe is protected.
    c. Horizontal distance of the pipe from the edge of the valley wall to the side of the pipe – when valley wall erosion occurs, there must be sufficient natural cover to ensure the integrity of the pipe is protected
2. Fluvial geomorphic assessments upstream of the infrastructure, including:
    a. Stream geomorphic indicators
    b. Bed scour
    c. Bed material characteristics
    d. Stream meander
3. Slope stability assessment at valley walls, including:
    a. Toe erosion assessment
    b. Slope stability assessment

Step II: Spills Response Planning

To ensure there is a proactive approach to managing spills response timing, TRCA recommends a proactive spills response plan be established that coordinates confirmed access points to watercourse and wetland areas, as well as Lake Ontario that is based on an analysis of:

i. Spills response timing, including spills detection, shut-off valve activation, and site mobilization
ii. Predicted times of travel from pipeline downstream under various streamflow conditions (baseflow, 2 – 100 year storm events, regional storm events)
iii. Inventory of vulnerable receptors (significant habitats or uses) downstream of the pipeline
iv. Mitigation methods (river based, lake-based)
v. Spills response protocols (communication, access points through natural areas, methods). Note: *Ontario Regulation 166/06* permits may be required.
vi. Spill containment protocols (communication, access points, methods for containment under base flow and high flow conditions). Note: *Ontario Regulation 166/06 emergency works* permits may be required.
vii. Emergency procedure for pipeline repair or securement. Note: *Ontario Regulation 166/06* emergency works permits may be required, as may be approvals under the Canada *Fisheries Act*.

Baseline Information Requirements:
To develop a proactive spills response plan that addresses TRCA concerns, the following baseline information is required:

1. Pre-planned access routes to watercourses, wetland or shoreline/lake areas based an analysis of on:

    a. Spills response timing (see above)
    b. Hydraulic and hydraulic data (baseflow, 2 – 100 year storm events, regional storm events)
    c. Storm sewer outfall locations (related to infrastructure where a spill on tableland could travel through catch basins to watercourses and require cleanup in natural areas).

2. Pre-planned mitigation requirements in watercourses, wetland or shoreline/lake areas based an analysis of on:

    a. Aquatic surveys downstream of the infrastructure, including lake-based
    b. Terrestrial natural heritage surveys downstream of the infrastructure, including lake-based
    c. Land use analysis in valley, stream and natural areas, including land ownership, recreational facilities, parks, trails and other public use

Step III: Rehabilitation and Restoration Planning

It is acknowledged that legislative requirements for spill rehabilitation and restoration fall under the purview of provincial and federal governments. However, it is TRCA's expectation that spill clean-up and will include as a minimum, complete rehabilitation and restoration of impacted areas through a floodplain, riparian area or parkland restoration plan, as appropriate. To ensure there is a proactive approach to rehabilitating and restoring areas that are damaged through a spill, TRCA recommends that commitments be established including:

i. Commitments for rehabilitation and restoration (financial, timing)
ii. Baseline information for downstream areas, including riverine, wetland and shoreline, including terrestrial, ecological, and land use information
iii. Ontario *Regulation 166/06* permits may be required for rehabilitation and restoration efforts in valley lands, flood plains, streambeds (including the removal of deposits), and riparian zones, as may be approvals under the Canada *Fisheries Act*.

Baseline Information Requirements:
To facilitate the development of a rehabilitation and restoration plan in the event of a spill, it is recommended baseline information be available to proactively guide the extent and the nature of clean-up activities occur. This information should be updated on a five to 10 year cycle:

1. Aquatic surveys downstream of the infrastructure, including lake-based
2. Terrestrial natural heritage surveys downstream of the infrastructure, including lake-based
3. Hydraulic data
4. Soil data
5. Water quality information
6. Watershed management strategies and plans, including natural heritage and aquatic strategies, produced by TRCA and updated on a regular basis for each of its watersheds
7. Land use analysis in valley, stream and natural areas, including land ownership, recreational facilities, parks, trails and other public uses
8. Photo inventories of land uses, and terrestrial and aquatic systems.

Summary

It is increasingly recognized that underground infrastructure, including sewers, oil and gas pipelines in or near valley and stream corridors, and wetland areas may pose a significant risk to terrestrial and aquatic ecosystems, public park systems, as well as to human health should they fail.

In urban areas, historically infrastructure was built in and through valley and stream corridors and now, that same infrastructure is vulnerable to stream flows that are ever stronger and more frequent. These changes to stream flow, is resulting in increased rates of erosion on valley side slopes and in the watercourses and wetlands themselves. The result is there is an ever increasing risk of failure if the erosion exposes the pipeline, and the exposed pipeline then fractures. Climate change is affecting stream flow, and that is further increasing the vulnerability of our watersheds and is exacerbating issues related to erosion and the potential for pipeline failure. A secondary concern is that if the pipeline fractures on table land, and the

sewage, gas or oil travels unmitigated through the storm sewer system, it will also impact the natural and park systems. These guidelines have been developed by TRCA over a number of years through working with proponents of sewer, gas and oil pipeline infrastructure under emergency situations. The guidelines were developed as a proactive approach to managing potential failures or fractures of pipelines in valley and stream corridors and wetland areas, and as a means of ensuring the protection, mitigation and restoration of our terrestrial, aquatic and public park systems.