BANGOR INTERNATIONAL AIRPORT STORMWATER IMPROVEMENTS
EXPECTED PERFORMANCE

International Canal Stormwater System.

The Best Management Practices for the International Canal portion of the airport stormwater system are targeted at reducing the Biochemical Oxygen Demand (BOD) caused by Propylene Glycol in stormwater runoff. This is considered the key water quality stressor at this location, and impacts dissolved oxygen levels in downstream areas of the stormwater system. The combination of powered and supplementary aeration, detention, filtration and wetland treatment is designed to provide a reduction of approximately 80% in the BOD load under base flow conditions (+/- 1cfs). The Upper Quartile BOD concentration from recorded values at the head of the International Canal system between 2005 and 2009 was 185mg/L. The treatment system is designed to reduce this to approximately 37mg/L prior to dilution by other system inflows. The overall dilution factor provided by other system flows upstream of the Detention Basin Dam is in excess of 8:1. Therefore, the expected BOD at the Detention Basin outlet during baseflow conditions is approximately 5mg/L.

During storm conditions the system retention time, and hence treatment efficiency of the BMPs will be significantly reduced. However, this will be coupled with a significant increase in both the volume and rate of runoff from contributing areas. The increased flow will dilute the pollutant concentration in the influent and substantially offset the reduced level of treatment. Outflow BOD concentrations are expected to remain around the same level during storm events as during baseflow conditions.

The pre-treatment provisions in the International Canal system include stabilized channels, outlet aprons and checkdams. These are designed to trap coarse suspended solids in runoff entering the system. An Underdrained Filter is also include in the upstream portion of the system to aid in the removal of finer suspended solids from the flow. Under baseflow conditions it is estimated that these BMPs will reduce Total Suspended Solids (TSS) in the runoff by 70-80%. During storm conditions, higher flow rates will decrease settling potential and reduce the efficiency of the treatment BMPs. It is estimated that during a one-inch, 24-hour storm event (90% storm) TSS removal rates will drop to around 40%. During larger storm events TSS removal performance will be difficult to predict, as surcharging of the system will introduce significant amounts of debris and other washdown materials from areas not normally exposed to moving water.

Domestic Canal Stormwater System.

The improvements to the Domestic Canal system are targeted at reducing Total Suspended Solids (TSS) and reducing Thermal Impacts to downstream receiving waters. These are both identified as key stressors in the Birch Stream watershed. The stabilized low-flow channel and checkdams will significantly reduce during baseflow conditions. Even with the large contributing area, TSS removal rates of 70-80% should be expected under these conditions. As with the International Canal system, it is estimated that during a one-inch, 24-hour storm event (90% storm) TSS removal rates will drop to around 40%. During larger storm events TSS removal rates will vary seasonally, and depending on vegetation condition, rate of system inflow and maximum water elevation.

The new configuration will reduce the potential for thermal impacts to downstream receiving water by significantly reducing the area of shallow, slow flowing, or standing water in the Domestic Canal system. The improved channel will increase the low flow velocity through the system, and provides areas for riffles that will promote aeration. New low flow outlets at the Detention Basin dam provide gravel filters to cool the outflow before it discharges towards Union Street. Historical data from Birch Stream (MDEP BLWQ Birch Stream report 2003) indicates maximum weekly water temperatures above 25C during the summer months. It is probable that water temperatures in the BIA Domestic Canal system were at this level prior to construction of the current improvements. Temperature reductions are difficult to predict due to variable influences from groundwater and other subsurface inflows. However, it is estimated that maximum weekly temperatures in the improved Domestic Canal system will be 3C-5C lower than before the work.

Godfrey Boulevard Bioretention Swale.

The new Bioretention Swale in the center of Godfrey Boulevard provides water quality treatment for the contributing paved areas in accordance with the State of Maine Stormwater BMP Manual. The swale is expected to provide 80% TSS removal and 65% Phosphorus removal for runoff from the contributing area of approximately two acres of pavement.

Peak Stormwater Outflow from the BIA System.

The BIA Stormwater Improvements will moderate outflows from the airport stormwater system, particularly during baseflow conditions and small, frequent storm events. The new Detention basin outlets and the reduction in the standing water elevation in the Domestic Canal system combine to reduce peak outflow from the system by approximately 48% in a one-inch, 24-hour storm event (90% storm). The reductions in peak outflow rates provided by the new system become smaller as the storms become larger and less frequent. A reduction of approximately 20% is predicted for the 2-year (or 50%), 24-hour storm, and reductions of just over 10% are predicted for the 10-year (10%) and 25-year (4%) storms.