Débits rivière aux Cerises et ruisseau Castle

ENVIRONMENTAL IMPACT INFORMATION

FOR

SNOWMAKING SYSTEM INSTALLATION

AT

MONT ORFORD SKI AREA

MONT ORFORD, MAGOG, P.Q.

MONT ORFORD SKI AREA

JULY 1984

PREAMBLE

La Cie de Gestion Orford Inc. is proposing to install a basic snowmaking system at Mont Orford Ski Area to ensure quality skiing and an annual opening date of November 23rd each season.

The basic snowmaking system will be of the conventional air/water design; and, in its final form the system will cover approximately 40 hectares of trails.

However, the system will be installed in at least two phase construction program, with the first phase to cover approximately 20 hectares.

Extensive amounts of work in the field of snowmaking system design and construction supervision makes it possible for Group Delta, hereafter referred to as the Engineer, to provide accurate technical information regarding the magnitude of the environmental impact that construction of this snowmaking system is expected to generate. On the basis of previous work for other federal, provincial and state agencies, the Engineer feels that there are three major areas in which construction of the snowmaking support system might have some impact. These areas are:

1. Soil disturbance
2. Water contamination
3. Water utilization

These points are discussed below with what is hoped to be sufficient data to enable the applicable regulatory bodies to accurately assess the environmental impact on the existing area and hopefully approve the installation.

GENERAL DESCRIPTION OF WORK

The snowmaking system at Mont Orford is comprised of a Primary Pumphouse located near the cross country ski chalet, on the banks of Etang aux Cerises. The building, 20 feet x 20 feet, is located approximately 30 feet from the shore.

A suction line will connect the lake and the vertical turbine pumps located in the Pumphouse. A feeder line will carry the water from the Primary Pumphouse to the Control Building located at the base of Mont Orford Ski Area. This line is

approximately 9,000 feet long, and crosses the Provincial Park grounds for approximately 3,000 feet to meet highway 141, and from here follows highway 141 to the base of the ski area for the remaining 6,000 feet. Group Delta drawing 84-327-06 appended to this report, shows this routing.

1. Soil Disturbance

In order to install a snowmaking support system, which includes a control building located at the base area, a primary pumphouse located in the Provincial Park area by Etang aux Cerises, and basic subterranean distribution piping system, there could be some minor disturbance to the environment. Minor amounts of disturbance are unavoidable in any installation. However, extensive amounts of construction work in this field have been done in the past years and made it possible to develop construction techniques which do indeed maintain damage to the existing environment to a minimum.

Primary Pumphouse Construction

The Primary Pumphouse will be an open wet well type to house the two vertical turbine pumps. The wet well will be approximately 13 feet deep below grade, forming a rigid reinforced concrete structure with the foundation of the building. The upper structure will be a wood frame type. During the construction of foundations and wet well, dewatering problems are going to be critical. The intent, therefore, is to install a dewatering system based on well points around the perimeter to be excavated. The number of well points and pump capacity will be established according to inflow characteristics. This dewatering system will be maintained until the site is completely restored.

The water pumped from the well points will be discharged into a sedimentation pond; and, water will be allowed to clear before entering the lake.

This will prevent erosion of lake embankment and eliminate water siltation problems.

Pipeline Construction

In conjunction with piping that is to be installed between the Primary Pumphouse and the base of the ski area, trenching will be required to achieve the subterranean configuration that will ultimately characterize this installation. Through the Provincial Park grounds the pipeline will follow, as much as possible, already open trails as well as open areas to minimize unnecessary tree cutting. Where this is not possible great care will be exercised on clearing the minimum area required with the assistance of Park personnel. The trenching will be carefully scheduled in conjunction with actual pipe welding so that the amount of open trench can be kept to a minimum throughout complete construction, and minimize soil erosion during periods of rain.

As piping is welded and pressure tested, it will be placed in the trench and the trench backfilled tamped to original compaction and grade restored to its original line. Details for typical trenching are shown on drawing 84-327-06 appended to this report.

2. Water Contamination

In conjunction with the Primary Pumphouse, the suction line between the lake and the pumps must be installed in such a way to provide free flow of water with minimum friction loss.

The suction line consists of a pipeline with a drop-access intake structure. Details of this intake structure are shown on drawing 84-327-07. As it can be seen, there is no visual evidence of any structure from the shore of the lake at the normal lake water level.

Suction Line Construction

The suction line will extend from the primary pumphouse into Etang aux Cerises some 200 feet. The suction line will consist of 16" diameter steel pipe with a steel basket type intake structure. The intake structure will lay at the lake bottom, approximately 7 feet below normal summer lake level. The pipeline will also lay on the lake bottom near the intake structure and gradually be buried until it enters the pump-house, approximately 12 feet below shore grade. The pipeline

will be fabricated on shore, then floated into its location and by flooding the line it will sink in proper position.

There are two options available for digging of the trench for the suction line.

a) Use of floating excavation equipment such as a small barge with a backhoe.

b) Construction of dike along suction line to support dragline equipment.

In (a) above the equipment could be launched from shore. Great care must be taken to ensure that the suction pipe trench line is in exact position. No equipment is necessary to lift the suction line, as it can be easily floated into position and sunk. The procedure to prevent capsizing of the line is straight forward and will be done under supervision of DELTA personnel.

Removed soil from the lake bottom should be piled well clear of the pipe centre line to ensure no refilling of the trench is possible inadvertently.

Therefore, soil should be piled windward of the center line based on prevailing winds. Due care and attention to actual trench depth must be paid as this depth is variable and critical to proper system operation.

Any barge or floating equipment must possess sufficient anchoring equipment.

In (b) above sufficient soil from the trench area could be excavated to build a dike wide enough to support the excavation equipment.

The dike should extend the entire length of the pipeline (to windward).

The dike must be removed in its entirety and soil replaced to its original position so as not to change the depth of the lake bottom in any way. The shoreline must also be restored.

As the dike is constructed, sufficient time must be allowed to ensure the material drains well enough above the water-line to provide sufficient compaction to support the excavating equipment.

The dike should be a minimum of 2' to 3' above water level.

Environmental disturbance would be kept to a minimum, in both alternatives, with the use of a floating diaper skirt to contain contamination of water within the excavated area.

Both alternatives, (a) and (b) as described above, have been successfully utilized at Mont Tremblant and at Sunapee State Park Ski Area with a minimum of environmental disturbance. The time required for this type of construction under normal circumstance is less than a working day.

3. Water Utilization

Etang aux Cerises is the source of supply of water for snowmaking at Mont Orford. This lake is situated 2.5 kilometres away from the Mont Orford ski area and is in the Mont Orford Provincial Park (see sketch #1). Its total reserve is 1,489,059 cubic meters.

Here are a few of its characteristics:

Altitude (m)	266.7
Max. Width (km)	0.4
Avg. Width (km)	0.3
Max. Length (km)	2.3
Max. Depth (m)	7.6
Avg. Depth (m)	2.1
Number of Tributaries	8.0

The approximate location of the water intake is shown on sketch #2. The water intake consists of a basket type expanded metal structure, and a pipeline to convey water to the wet well located in the primary pumphouse, as shown on sketch #3.

An empirical study for the Castle Basin water shed conducted by Mr. J. Deziel, hydrologist for the Ministry of National Resources in Sherbrooke, has indicated the following expected flows:

Castle Brook Basin

Month	Average Flow litres/sec	Average Flow m^3/min
October	67.3	4.0
November	101.0	6.0
December	81.6	4.9
January	56.7	3.4
February	62.7	3.7
March	137.0	8.2

Due to the fact that the Etang aux Cerises water shed basin is 4.69 times larger than the Castle basin and that similar water basins located in the same region are expected to behave in the same manner, the flows into Etang aux Cerises will be approximately as follows:

Etang aux Cerises

Month	Average Flow litres/sec	Average Flow m^3/min
October	315.6	18.8
November	473.7	28.1
December	382.7	23.0
January	265.9	15.9
February	294.1	17.4
March	642.5	38.5

Snow of the man-made type is never made indiscriminately, mainly because of the economic implications of doing so. However, made according to annual operational plan, the total amount of snow (water) is predictable from year to year with significantly less application of snow (water) in marginal or poor snowmaking years.

Essentially, all of the water utilized for snowmaking will be returned to the source. Evaporation and transpiration will result in some minor losses, but these losses never exceed 4% of the total water withdrawn.

Some 592 cubic meters are needed to place 1.25 hec/dec of snow on the ground at a density of 481 kilogram/cubic meter of snow. The actual water pumped may be some 38 cubic meters/minutes -- 57 cubic meters more per 1.25 hec/dec of coverage due to wind losses and evaporation effect. This would entail no significant environmental problem as there are few problems in applying the snow cover where it is needed.

Therefore, if Mont Orford will cover in Phase I a total of 20 hectares of trails, water required will be a maximum of 237,138 cubic meters over the period November 15th to February end.

The average water required during normal years will be much less than the above quantity, that is 96,900 cubic meters.

Calculated average flows range from:

31.1% of maximum to Nov.20 (ie.) 1.4 m^3/min
31.1% of maximum to Nov.26 (ie.) 1.4 m^3/min
44.6% of maximum to Dec.3 (ie.) 2.0 m^3/min
47.8% of maximum to Dec.9 (ie.) 2.2 m^3/min
53.0% of maximum to Dec.15 (ie.) 2.4 m^3/min
62.7% of maximum to Dec.31 (ie.) 2.9 m^3/min
79.4% of maximum to Jan.31 (ie.) 3.6 m^3/min
75.7% of maximum to Feb.28 (ie.) 3.4 m^3/min

Date	Operating Hours	Avg. Snowmaking Flow Requirements m^3/min	Inflow to Etang aux Cerises m^3/min
Start up - Nov. 20	114.7	1.4	28.1
Nov. 21-Nov. 26	60.9	1.4	28.1
Nov. 27- Dec. 3	82.8	2.0	23.0
Dec. 4-Dec. 9	78.0	2.2	23.0
Dec. 10-Dec. 15	78.0	2.4	23.0
Dec. 16-Dec. 31	241.8	2.9	23.0
Jan. 1-Jan. 31	372.0	3.6	15.9
Feb. 1-Feb. 28	336.0	3.4	17.4
TOTAL	1364.0		
Peak Demand	24.0	4.5	

Total water required = 237,138 m^3