WMC INTERNATIONAL LTD.
MELIADINE WEST GOLD PROJECT
WATER BALANCE STUDY
2000 DATA REPORT

Submitted to:

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Submitted by:

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CW1525.2

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4.0 MONITORING IN THE LAKE A37 SUB-BASIN

4.1 Introduction

The probable area in which initial development of a mine is proposed is in the Tiriganiaq Zone, which is located in the sub-basin draining largely through Lake A37 into Lake A8 (Pump Lake), as shown on Figure 4.1. Mine development may interrupt the natural drainage pattern, requiring water diversion and other water management facilities. It was therefore decided to obtain further data on the hydrologic characteristics of the Lake A37 sub-basin. Monitoring was conducted in the Lake A37 sub-basin for both snowpack water equivalent (snow depth and density), and the snowmelt runoff.

4.2 Snowpack Monitoring

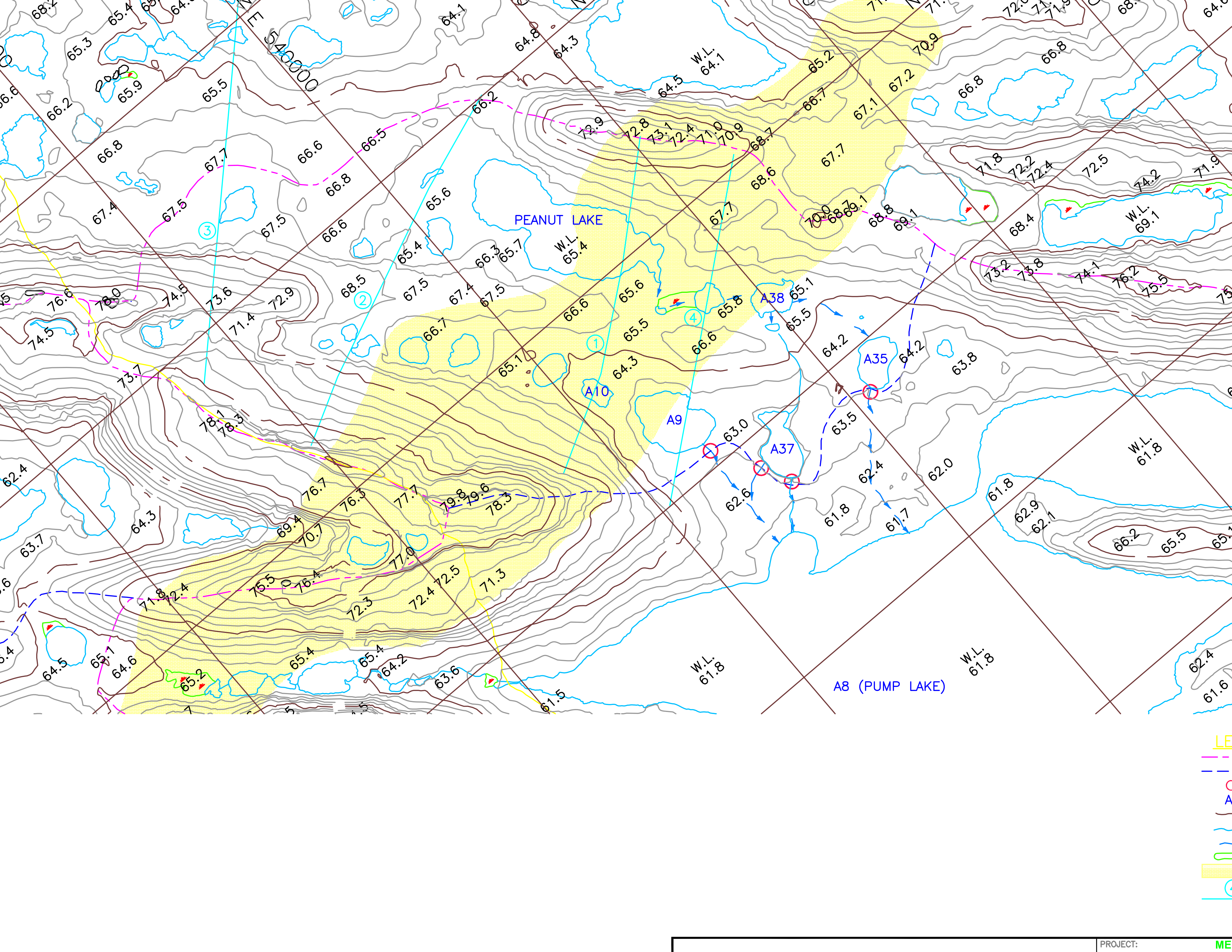
Snow surveys to determine the spring snowpack snow water equivalents (SWE) in the Lake A37 sub-basin were conducted on 13 May 2000. Four transects were located and surveyed, as shown on Figure 4.1.

The measured snow depths and densities and the topography traversed by each transect are shown graphically on Figures 4.2 through 4.5. A complete tabulation of the snow survey data are provided on Tables C.1.1 through C.1.4 in Appendix C.1. The tables include the GPS coordinates for the transect end points as observed in the field.

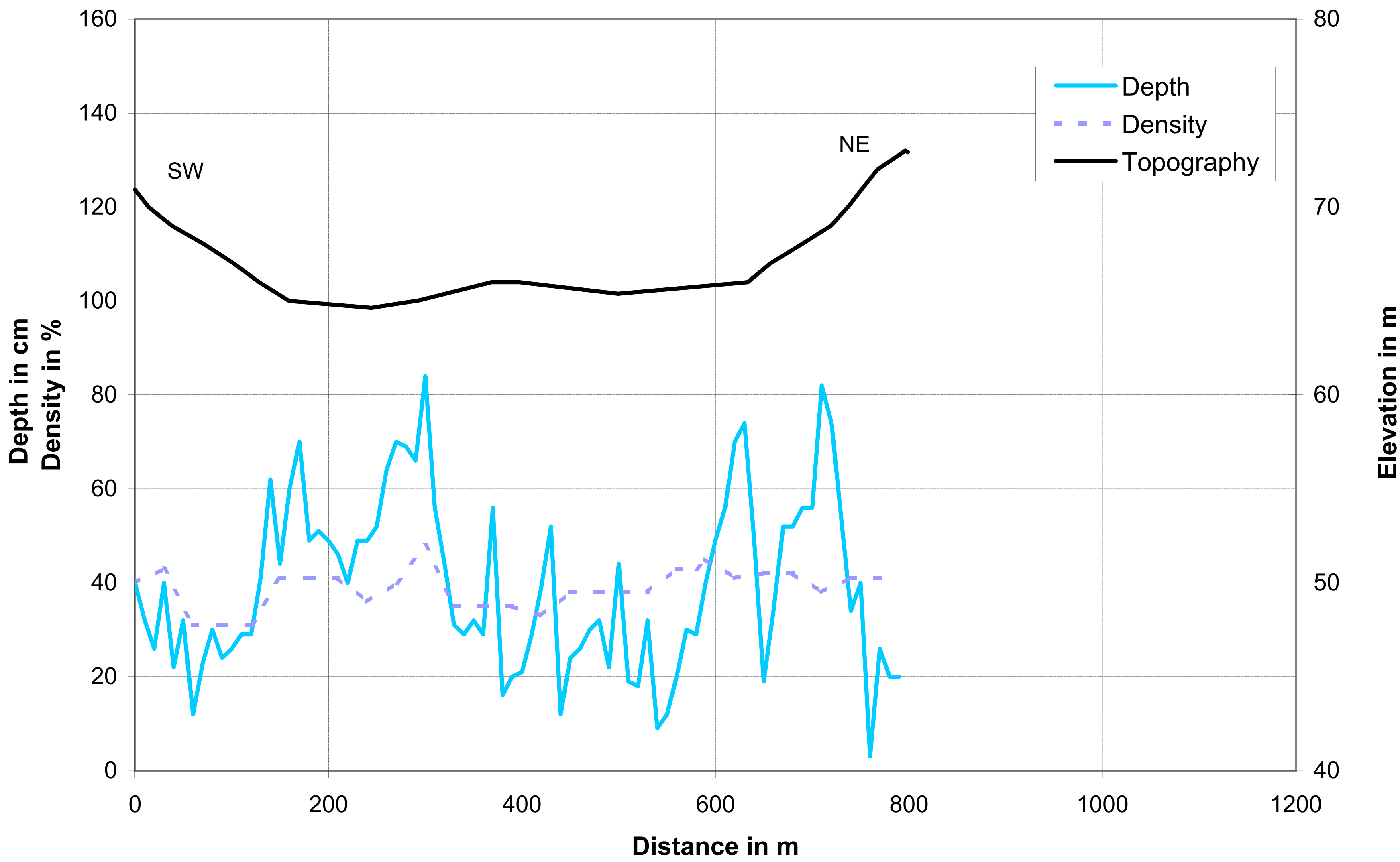
The Lake A37 sub-basin was analysed using GIS methods and ten terrain units were classified, as described in the AGRA 1998 Data Report. The definition of the terrain units is given in Appendix C.2. The definitions developed in 1998 were retained except that the definition for the “crest” terrain unit (no. 3) was revised slightly to reduce its overall area. The distribution of the terrain units within the Lake A37 sub-basin is shown in Figure 4.6.

The characteristic snow water equivalent (SWE) for each terrain unit was obtained by manually examining the data shown in Figures 4.2 through 4.5 and dividing transects into terrain unit segments. The data points within each terrain unit were then averaged to obtain the characteristic SWE. The results are summarized in Table 4.1.

The snow survey did not provide sufficient data points to characterize SWE values for terrain units 9 and 10, which together account for only 2.2 percent of the Lake A37 sub-basin area. The SWE values for terrain units 9 and 10 were therefore estimated by applying the ratio of the 2000 to 1998 SWE values for unit 4 (equal to 1.7) to the 1998 SWE values for units 9 and 10.


PEANUT LAKE
W.L. 65.4
A8 (PUMP LAKE)
W.L. 61.8
W.L. 64.1
W.L. 69.1
A35
A37
A38
A9
A10
E 540000
PROJECT:

Snow Survey 2000
Transect 1
Topography, Snow Depth and Density



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Snow2000.xls [T1]
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Figure 4.2

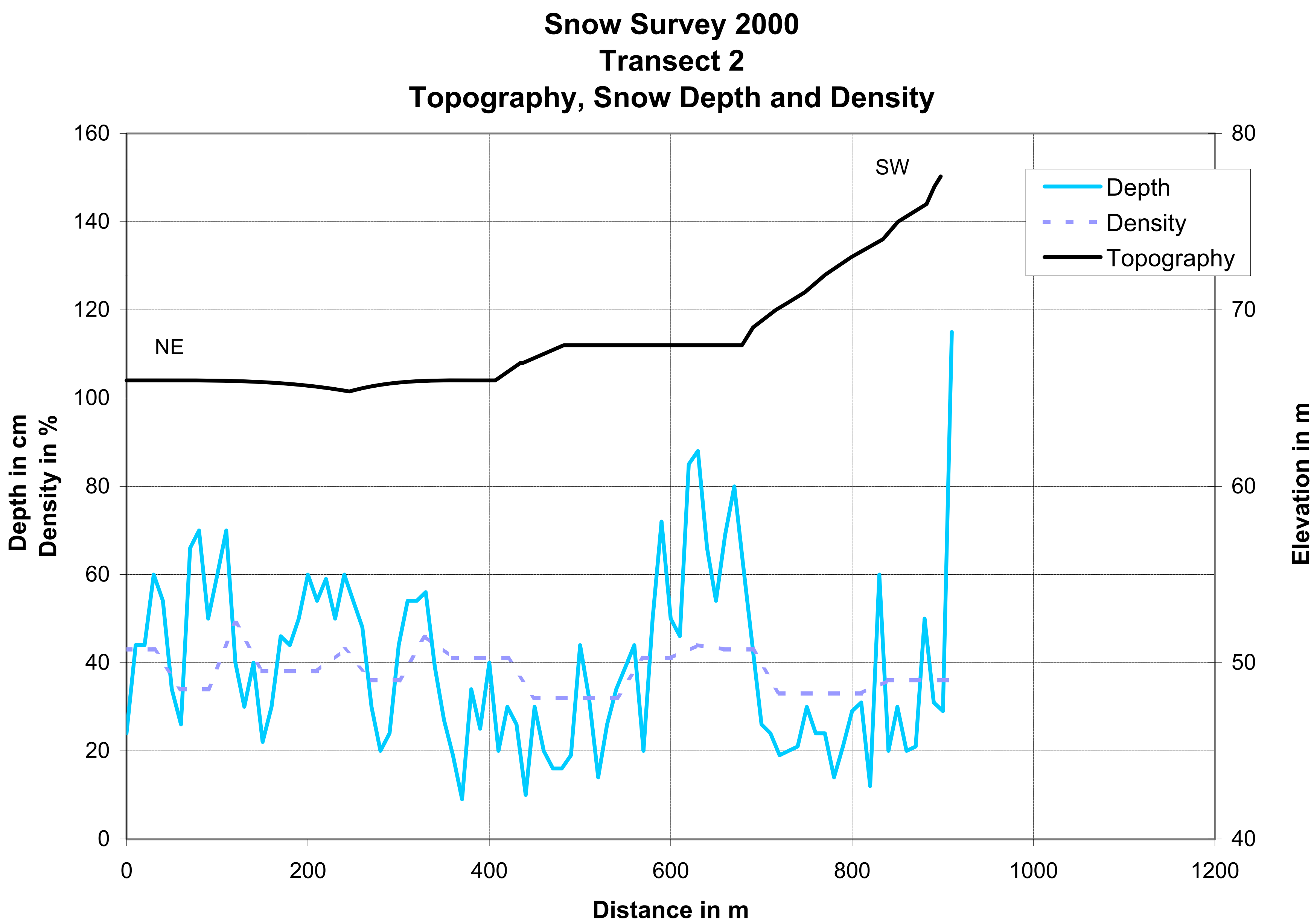

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Figure 4.3

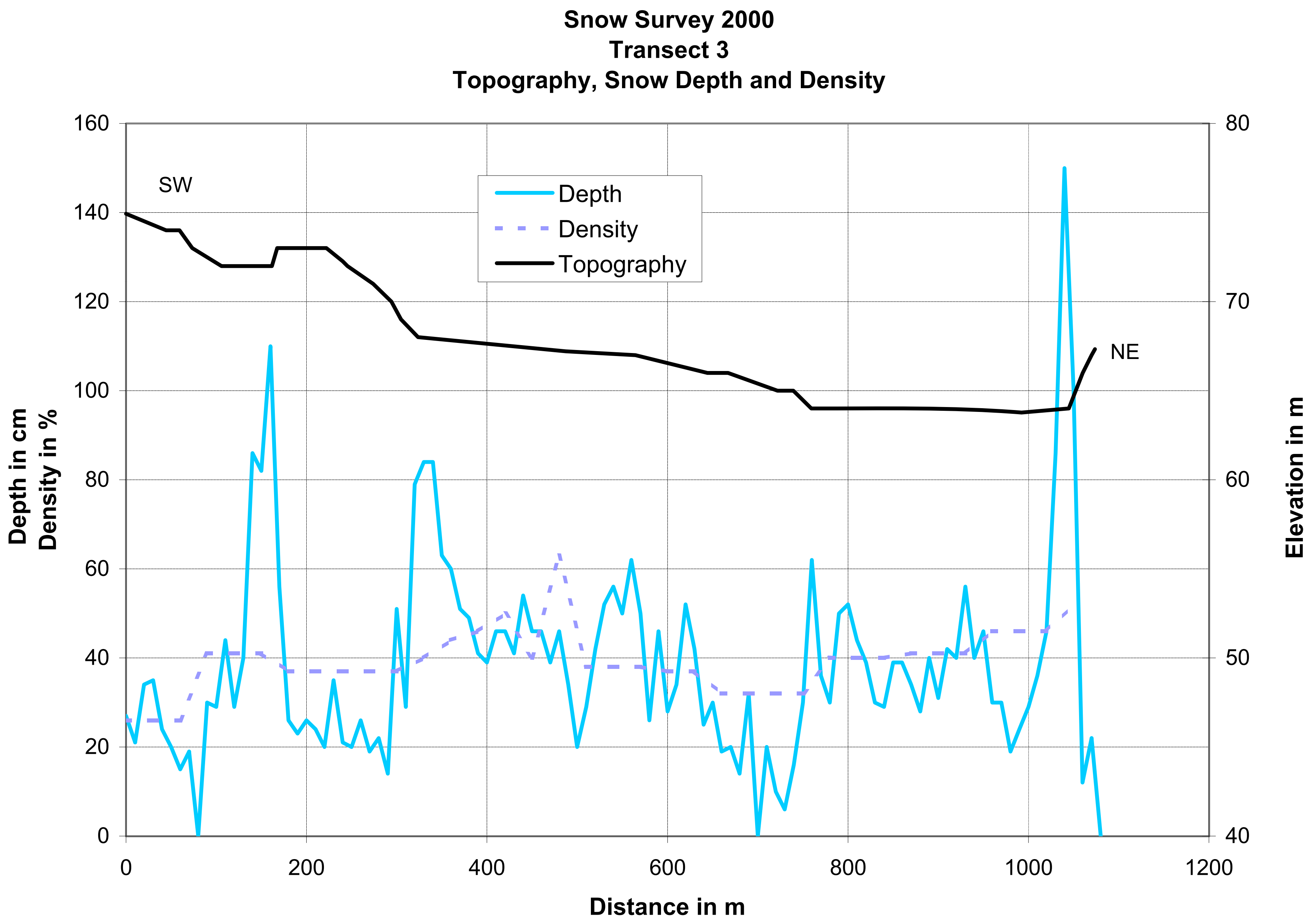

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Figure 4.4

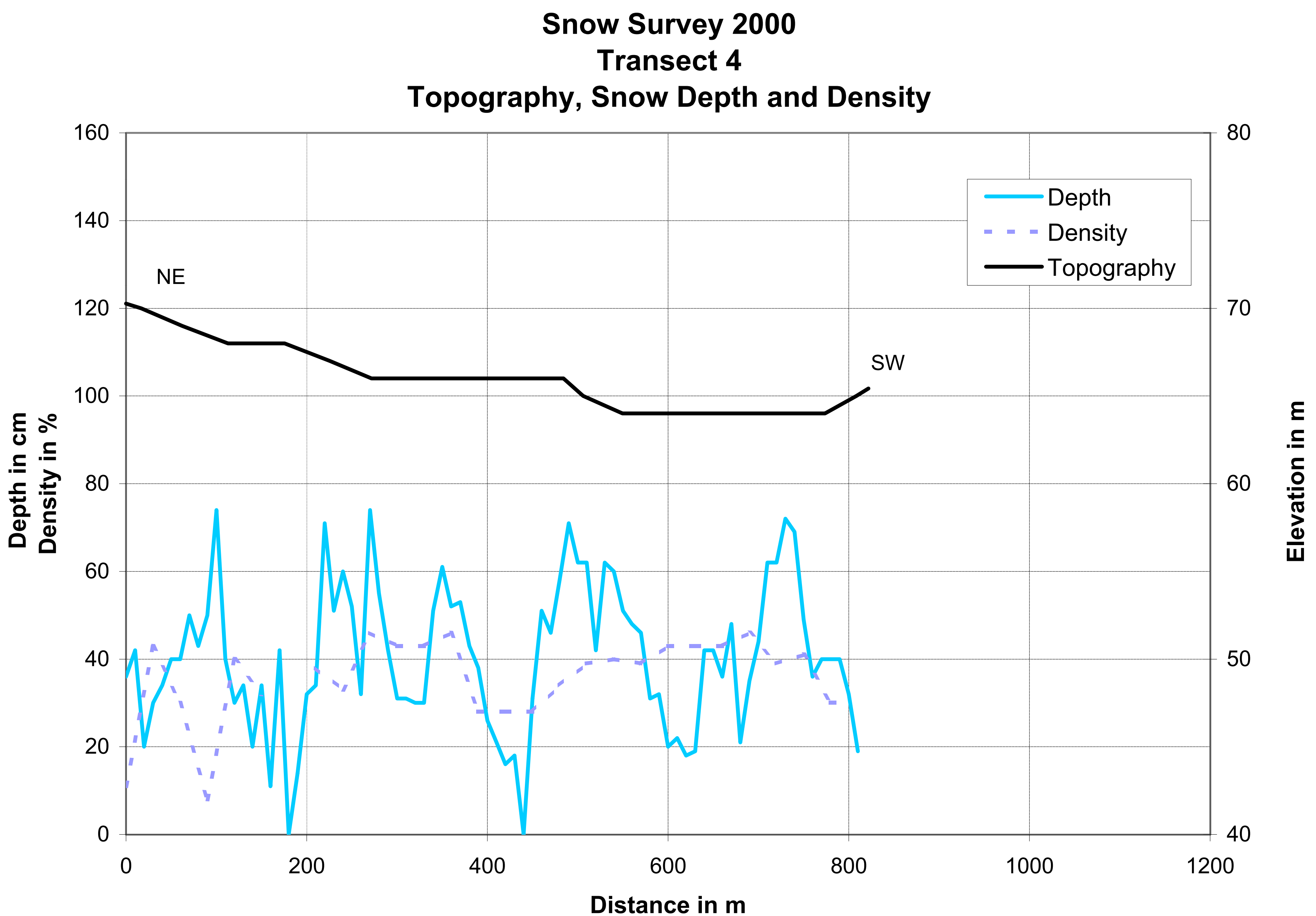

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Figure 4.5

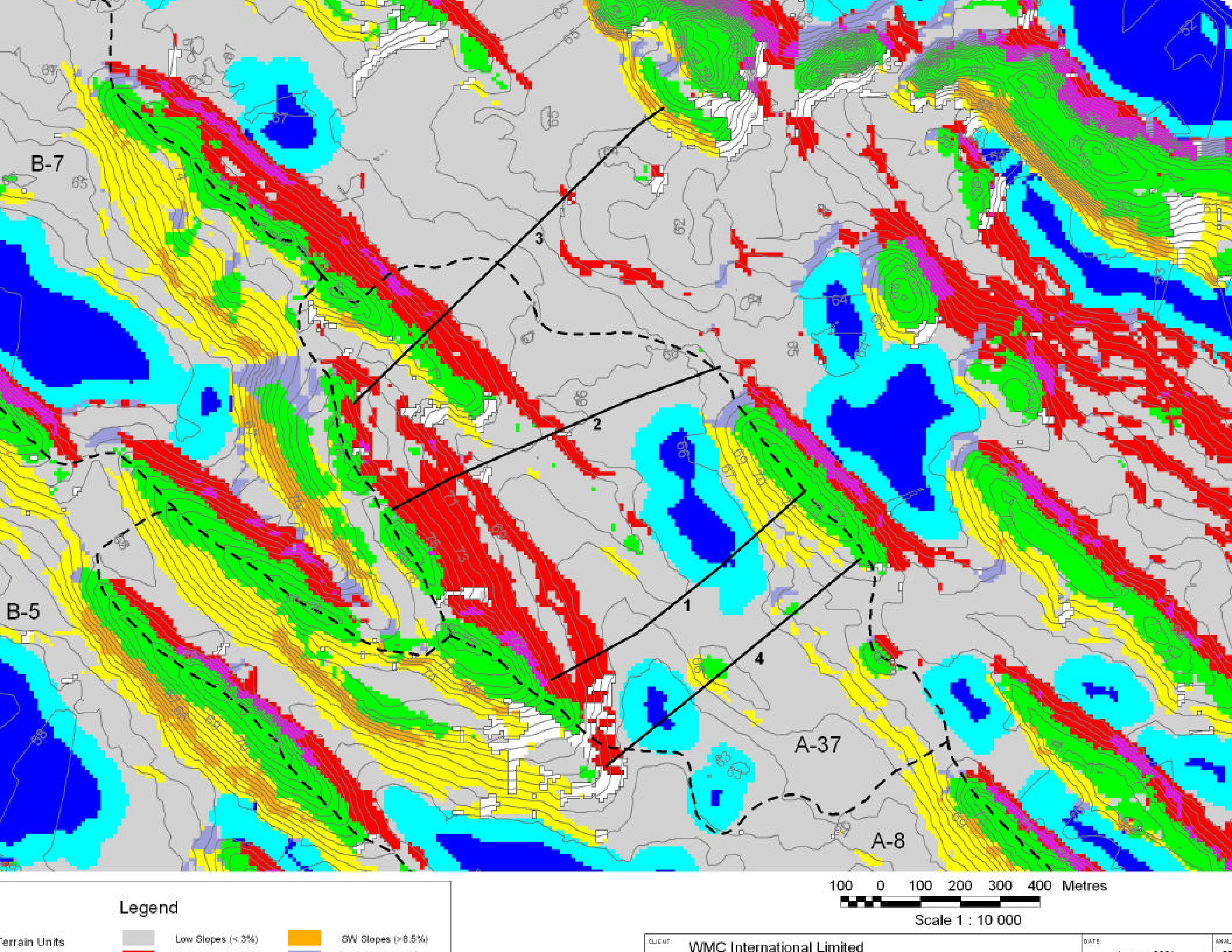
B-7
B-5
A-37
A-8
1
2
3
4
100 0 100 200 300 400 Metres
Scale 1 : 10 000
Legend
Terrain Units
Low Slopes (< 3%)
SW Slopes (>6.5%)
CLIENT:
WMC International Limited
DATE:

TABLE 4.1
2000 Snow Survey Results
Terrain Units and Characteristic Snow Water Equivalent (SWE)

Terrain Unit		Snow Course Transect	Start Station	End Station	SWE (mm)	
No.	Description				Mean	SD[2]
1	Lake	1	500	560	85.8	45.1
		4	590	700	137.3	48.7
		Combined	170[1]		**118.3**	**52.7**
2	Lake Edges	1	570	630	211.1	71.4
		3	850	1020	154.8	36.2
		4	710	740	265.5	201.0
		Combined	260[1]		**183.6**	**60.1**
3	Crest	1	760	790	70.7	40.6
		3	180	290	85.1	19.1
		3	1060	1080	58.9	57.3
		Combined	160[1]		**77.9**	**31.1**
4	Low Slopes (<3%)	1	200	490	160.7	84.5
		2	0	640	161.7	79.2
		3	370	840	150.0	68.0
		4	0	480	129.7	71.8
		4	750	810	123.3	43.7
		Combined	1940[1]		**149.5**	**75.3**
5	NE Slopes (3-8.5%)	1	0	190	140.2	68.1
		2	650	870	125.8	86.3
		3	0	130	87.3	49.5
		3	300	360	260.4	85.0
		Combined	600[1]		**136.6**	**86.5**
6	NE Slopes (>8.5%)	2	880	910	**202.5**	**145.1**
7	SW Slopes (3-8.5%)	1	640	750	287.3	165.3
		4	490	580	207.3	42.3
		Combined	230[1]		**250.9**	**129.4**
8	SW Slopes (>8.5%)	3	140	170	335.0	91.4
		3	1030	1050	560.9	172.3
		Combined	50[1]		**431.8**	**169.3**
9	NW Slopes (>3%)	estimated			**554.0**	-
10	SE Slopes (>3%)	estimated			**699.0**	-

Notes:
1. Total length of transects used to obtain characteristic snow values.
2. SD = standard deviation of sample data.

The characteristic SWE values listed in Table 4.1 were checked by comparing the observed total SWE value for all the transect data points with the total SWE value obtained by applying the characteristic SWE values to the transect terrain units. The results agreed to within 98 percent. No adjustments were therefore made to the characteristic SWE values obtained from the transect data.

The characteristic SWE values were applied to the Lake A37 sub-basin according to the distribution of the terrain units, and a snow water volume obtained of 203.36 dam^3, which equals a depth of 163.7 mm over the drainage area of 1.2425 km^2. To obtain the snow water depth for the June 14 start of snow melt runoff, the total precipitation amount of 3.3 mm recorded at Rankin Inlet over the period May 14 to June 14 was added to the above, giving 167.0 mm.

The above procedure was also applied to the other monitored basins, as the GIS and terrain unit data were available from the updated 1998 model. The resulting values are summarized in Table 4.2, along with a comparison to the 1998 results.

Table 4.2
Lake A37 and Peninsula Basins 2000 Snow Water Equivalents (SWE)

Basin	Area km^2	Snow Survey SWE		Post Survey SWE mm	2000 Total SWE mm	1998 Total SWE mm	Ratio of 2000/1998 SWE
		dam^3	mm				
Lake A37	1.2425	203.36	163.7	3.3	167.0	N/A	N/A
Lake A1	9.3913	1673.9	178.2	3.3	181.5	135.6	1.34
Lake B7	2.393	410.25	171.4	3.3	174.7	130.6	1.34
Lake B2	22.3178	4056.43	181.8	3.3	185.1	134.5	1.38

The SWE value obtained for the Lake A37 sub-basin is compared to the snowmelt runoff in the following section. The SWE values obtained for the Lake A1, B7 and B2 basins are discussed further in Section 5.6.

4.3 Snowmelt Runoff Monitoring

Snowmelt runoff was monitored during the snowmelt period in June. Monitoring consisted of spot measurements of the outflow discharged from the sub-basin, over the period 15 June – 20 June. Water level datalogger monitoring stations were not set up.

Outflow from the sub-basin to Lake A8 was observed to occur via the outlets from Lakes A9, A37 and A35, as shown on Figure 4.1. Lake A37 discharged from two outlets: a west outlet which joined the Lake A9 outlet, and an east outlet. The discharge measurement data are summarized in Table 4.3.

TABLE 4.3

Lake A37 Sub-Basin
Snowmelt Runoff Monitoring Data

Date	Discharge in m^3/s					
	A9	A37 West	A37 East	A35	A37+A35	Total Sub-Basin
15-Jun	0.101	0.011	0.051	0.133	0.195	**0.296**
16-Jun	0.072					
17-Jun	0.070	0.004	0.018	0.063	0.085	**0.155**
20-Jun	0.029	0.001	0.004	0.023	0.028	**0.057**

Observations of the sub-basin during the 21 – 24 July 2000 monitoring showed that outflow was not occurring from any of the outlets of Lakes A9, A35, and A37. This zero outflow condition was also observed on 18 September 2000. It is concluded that the runoff was essentially zero from the Lake A37 sub-basin after completion of snowmelt runoff, i.e., rainfall over the summer (July - September) produced no runoff. It was estimated that snowmelt runoff ceased on 30 June 2000.

The discharge hydrograph for the Lake A37 sub-basin was estimated by interpolation between measured discharges (Table 4.3) and the observed zero outflow conditions, using the discharge hydrograph for Lake B7 as a guide. Lake B7 data were used as Lake B7 is the most comparable lake for which data are available (those data are reported in Section 5.5). The results are shown on Figure 4.7. It was estimated that the last day of zero discharge was 13 June, that discharge started on 14 June, and that the peak occurred on 16 June.

The total snowmelt runoff is estimated from Figure 4.7 to equal 119 dam^3, which corresponds to a yield of 96 mm over the sub-basin drainage area of 1.24 km^2. The estimated runoff amount represents 57 percent of the snow water equivalent available. The peak discharge from the sub-basin was estimated to equal 0.40 m^3/s.

Lake A37 Sub-Basin
Discharge 2000

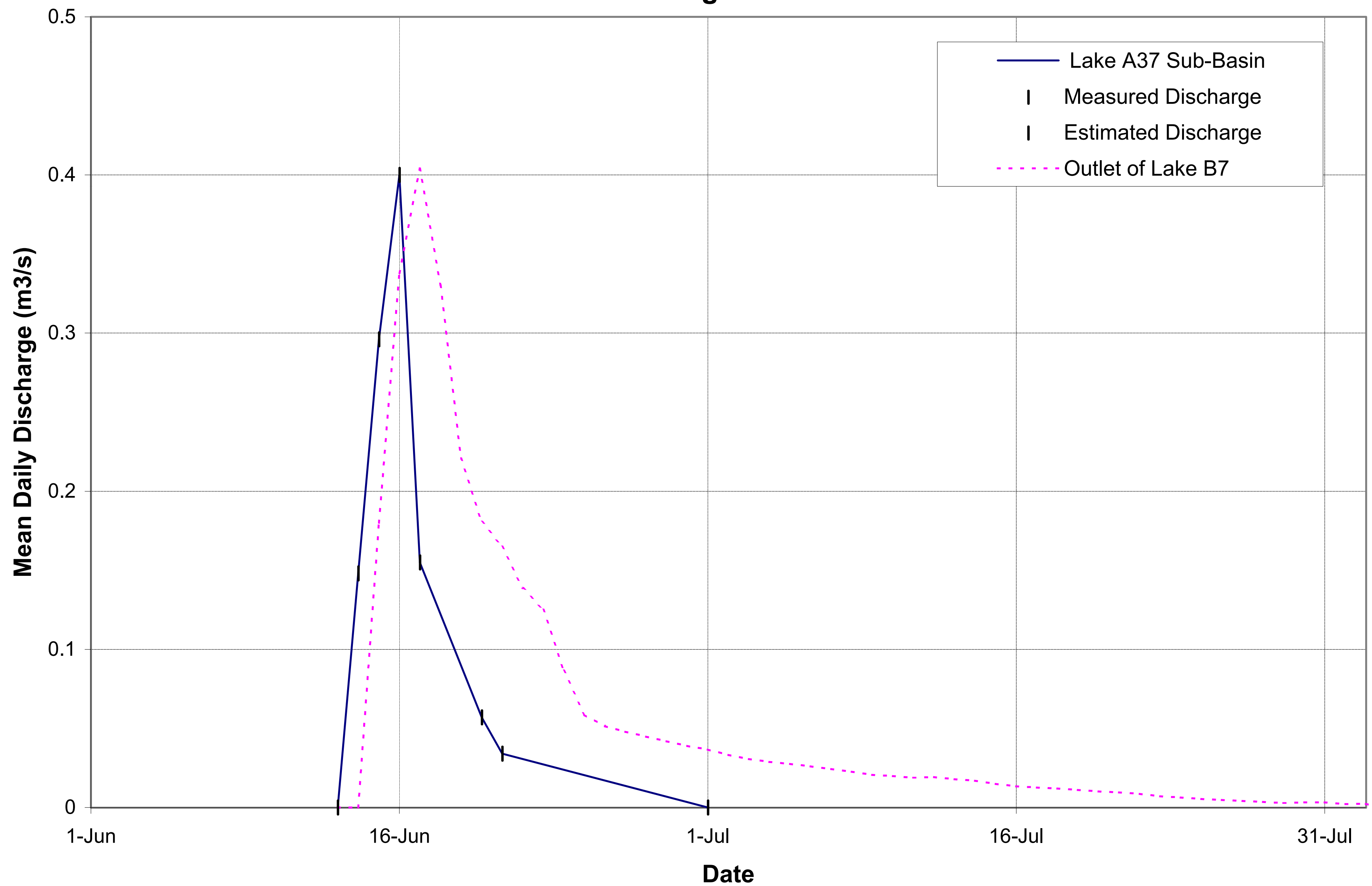

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Figure 4.7