
THE MEASURED EFFECTS OF BST ON
PERMAFROST
DAWSON CITY, YUKON

Submitted to:
GOVERNMENT OF YUKON
DEPARTMENT OF COMMUNITY &
TRANSPORTATION SERVICES

0201-4262
FEBRUARY, 1987



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1.0

INTRODUCTION

EBA Engineering Consultants Ltd. (EBA) was retained by the Government of Yukon, Department of Community & Transportation Services (YTG) to install and monitor temperature recording instrumentation beneath a road surface test section in Dawson City, Yukon. The project originated in 1984 through a request from the City of Dawson to have bituminous surface treatment (BST) placed throughout the streets of downtown Dawson. BST is an asphaltic emulsion "chip seal" which provides an all-weather dust and mud-free surface. The road surface colour characteristics are also changed, and preliminary theoretical computer analyses using an assumed albedo showed that an increase in the permafrost active layer would result (see EBA report "A Study of the Effects of BST on Permafrost, Dawson City, Yukon," EBA File 0201-3983, July, 1984). The recently installed buried sewer and water system relies on permafrost stability, and therefore an increase in the active layer would adversely affect these buried utilities. The BST test section and instrumentation installation was authorized by the YTG in June, 1985, under Service Contract number S-5-1797. Reporting and data reduction was authorized in July, 1986 under Service Contract number C-6-7439.

2.0

INSTRUMENTATION INSTALLATION

2.1

General

The ground temperature cables were installed beneath the proposed test section in Dawson during the first week of July, 1985. Within the following week, the Yukon Government's BST Crew applied BST on the test section. The extent of the test section and the thermistor cable locations are shown on Figure 1.



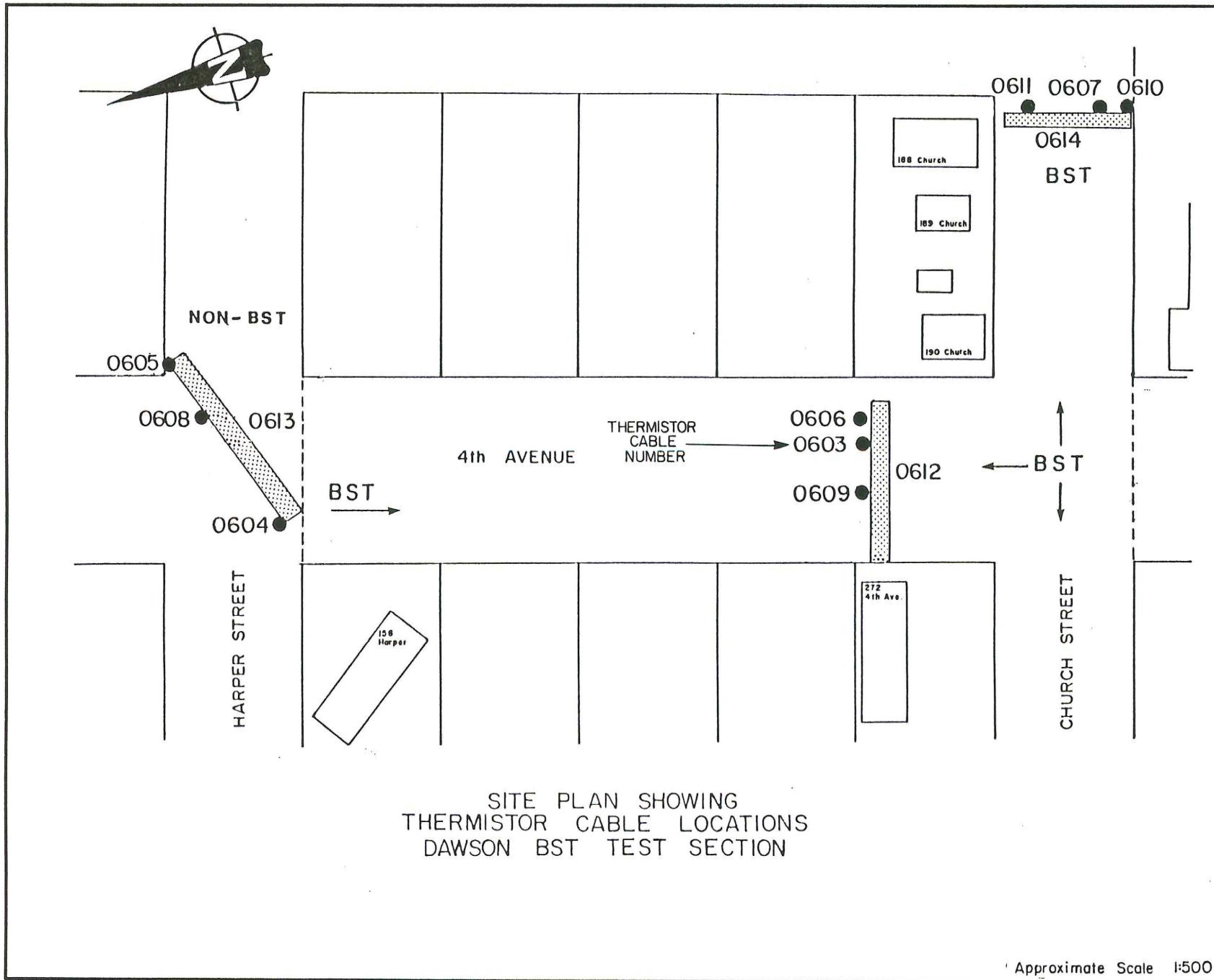


FIGURE 1

0201-4262

2.2 Thermistor Cables

A report detailing the thermistor cable installations was submitted previously (1985-08-30), and a copy is included in Appendix A, for reference. Photographs depicting the cable installations are included as Plates 1 to 6. Subsequent to this original report submission, a Yukon Government survey crew obtained elevations of the top of trenches, and on the TBM used in the original installation. This data provided "as-built" elevations for all the thermistor points, and was used in the resulting analyses.

2.3 Data Logger

For the first year after instrumentation installation, data was recorded manually by Public Works staff of the City of Dawson, using a switchbox and multimeter. Whenever EBA personnel were in Dawson, additional readings were also taken. The frequency of reading was initially requested to be weekly, but this was subsequently reduced to monthly. However, staff changes at the City of Dawson, combined with day-to-day work requirements of the City personnel resulted in irregular and infrequent readings. As the summer approached, it was concluded that a automatic data recorder would be required if meaningful thermal information beneath the test section was to be obtained.

A 21XL Micrologger (see Appendix B) rented from Campbell Scientific Canada Corp. was installed by EBA and Campbell Scientific personnel during the





PLATE 1: Installing vertical thermistor cables on 4th Avenue near Church Street (1985-07-04).



PLATE 2: Excavating trench for horizontal thermistor cable installation at 4th Avenue and Harper Street (1985-07-05)



PLATE 3: General view of thermistor cable leads and read-out box (Church St, 1985-07-05).



PLATE 4: Partially backfilled trench showing compacted lifts (4th Avenue and Harper St., 1985-07-05).



PLATE 5: First lift of crushed gravel compacted over thermistor cables (Church St., 1985-07-05)



PLATE 6: Read-out box containing thermistor cable plugs (4th Avenue near Church St., 1985-07-06).

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second week of June, 1986. The term of the rental contract was from June to October 1986.

Figure 2 shows the location of the data logger and multiplexers. The multiplexers (relays) were installed at each thermistor cable suite, and transmitted temperature information to the data logger via overhead cable. Arrangements were made with a local resident to attach the data logger to a 110 volt AC power supply. This insured that the internal batteries in the logger were always fully charged, and also that the equipment and tape recorder were in a protected location.

3.0 DATA COLLECTION AND REDUCTION

The data logger recorded date, time, temperatures from all thermistor points on an hourly basis, and also recorded maximum and minimum temperatures on each thermistor once per day. The data was recorded onto magnetic cassette tapes which were changed monthly. These tapes were then reduced using a cassette interface board inserted into a Compaq portable computer.

All of the data, including the initial readings taken manually, was copied onto (several) floppy diskettes and then sorted and plotted using the computer.

The data was initially reduced and sorted in EBA's Whitehorse office. The diskettes were then sent to NRC in Ottawa (Harry Baker) who further sorted the data and plotted it in graphical form using NRC's computer.

4.0 RESULTS

Typical raw data (from June 1986) is presented in Appendix B, followed by the reduced version for one of the thermistor cables.



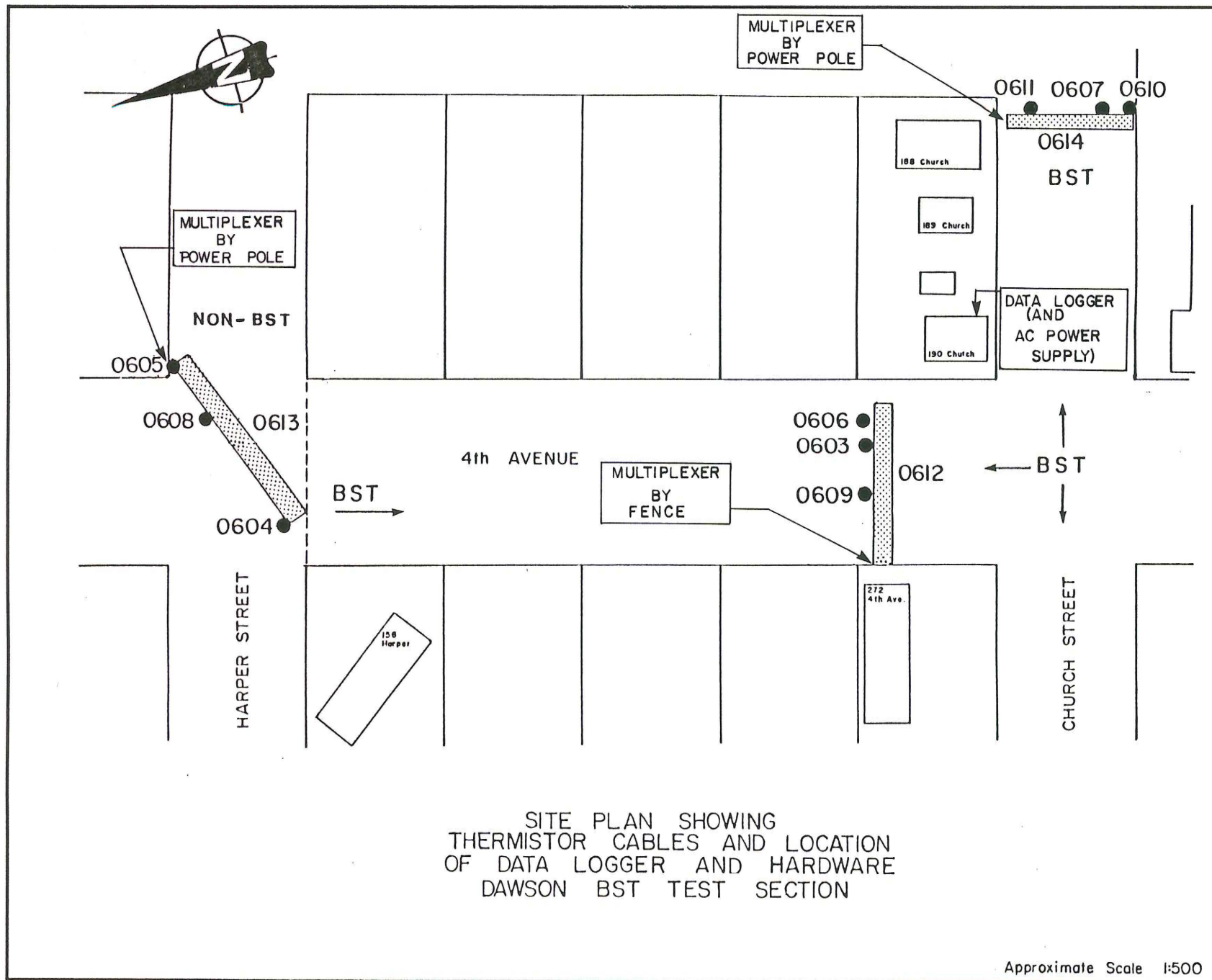


FIGURE 2

0201-4262

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The following graphical summaries of the temperature results are also included in Appendix C.

1. Temperature profiles (temperature vs time) for the 9 vertical cables. Data plotted is the 5-day means for air temperature and ground temperatures (Drawings C-1 to C-9).
2. Graphs indicating the location of the zero degree isotherm (thaw depth). Data is grouped by test site (Drawings C-10 to C-12).
3. Cross-sections showing the maximum recorded depths of thaw at each site in 1985 and 1986 (Drawings C-13 to C-15).
4. Comparison of temperatures (1 m depth) under the centre of the street at each test site (Drawing C-16).

These graphical plots represent a summary of the reduced data from all the sites, and provide a comparison of the two BST surfaced sections with the one non-BST area. A discussion of the data is presented in the following section.

5.0 DISCUSSION

A large volume of temperature data was collected which basically shows little difference in the ground temperature distribution among the three sites. A summary of the maximum recorded soil temperatures for the entire monitoring period is presented in Table 1.

The slight differences in maximum temperatures and thaw depth seem to be related more to direction of exposure (aspect) thickness of various soil layers (particularly peat) and soil moisture content (drier soils show deeper thaw). These factors appear to outweigh the effect of BST on the road surface.



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TABLE 1

SUMMARY OF MAXIMUM RECORDED
SOIL TEMPERATURES AND THAW DEPTH
BST TEST SECTION
DAWSON CITY, YUKON
JUNE TO OCTOBER, 1986

CABLE NUMBER	BOREHOLE NUMBER	DEPTH (m)	ROAD LOCATION	TEMPERATURE (°C)	MAX. THAW* (SEPT., m)
<u>BST FOURTH AVENUE</u>					
606	6	1.0	East	+8	
603	5	1.0	Middle	+14	1.7 -2.1
609	4	1.0	West	+13	
<u>BST CHURCH STREET</u>					
611	7	1.0	North	+13	
607	8	1.1	Middle	+16	1.9 -2.3
610	9	1.1	South	+15	
<u>NON-BST FOURTH AND HARPER</u>					
605	1	0.8	Northeast	+15	
608	2	0.8	Middle	+15	1.5 -1.9
604	3	0.8	Southwest	+15	

* Range of expected maximum thaw depth based on thermistor string precision, isotherm interpretation and soil temperature gradient.



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The depth of thaw measured was less than projected in the original computer modelling. This is due primarily to a higher actual albedo than first predicted (probably 10 - 15% instead of 5%) and also that the actual freezing and thawing indices for the monitoring period were lower than the 30 year normals published by the Atmospheric Environment Service. A summary of the calculated and historical Freezing and Thawing Indices is presented in Table 2, and Figure 3 presents the effects of different albedos on depth of thaw in Dawson City.

TABLE 2

SUMMARY OF THAWING/FREEZING INDICES
DAWSON CITY, YUKON

PERIOD	THAWING CELSIUS DEGREE-DAYS	FREEZING CELSIUS DEGREE-DAYS
April 1985 - Oct. 1985	1489	-
April 1986 - Oct. 1986	1658	-
April 1985 - Oct. 1986	-	3313
Normals (1931 - 1960)	1766 (Boyd, 1973)	3430 (Boyd, 1973)
Normals (1951 - 1980)	1800 (AES, 1982)	3623 (AES, 1982)

NOTE: The calculations of the freezing and thawing indices are different between the two references above. Boyd (1973) in summing the difference between the mean daily temperatures and zero degrees during the freezing and thawing periods of the year included the positive and the negative departures. The AES (1983) normals treat the negative departures as zero values.



ALBEDO vs. DEPTH OF THAW

1-D Analysis, 10 yrs. Data

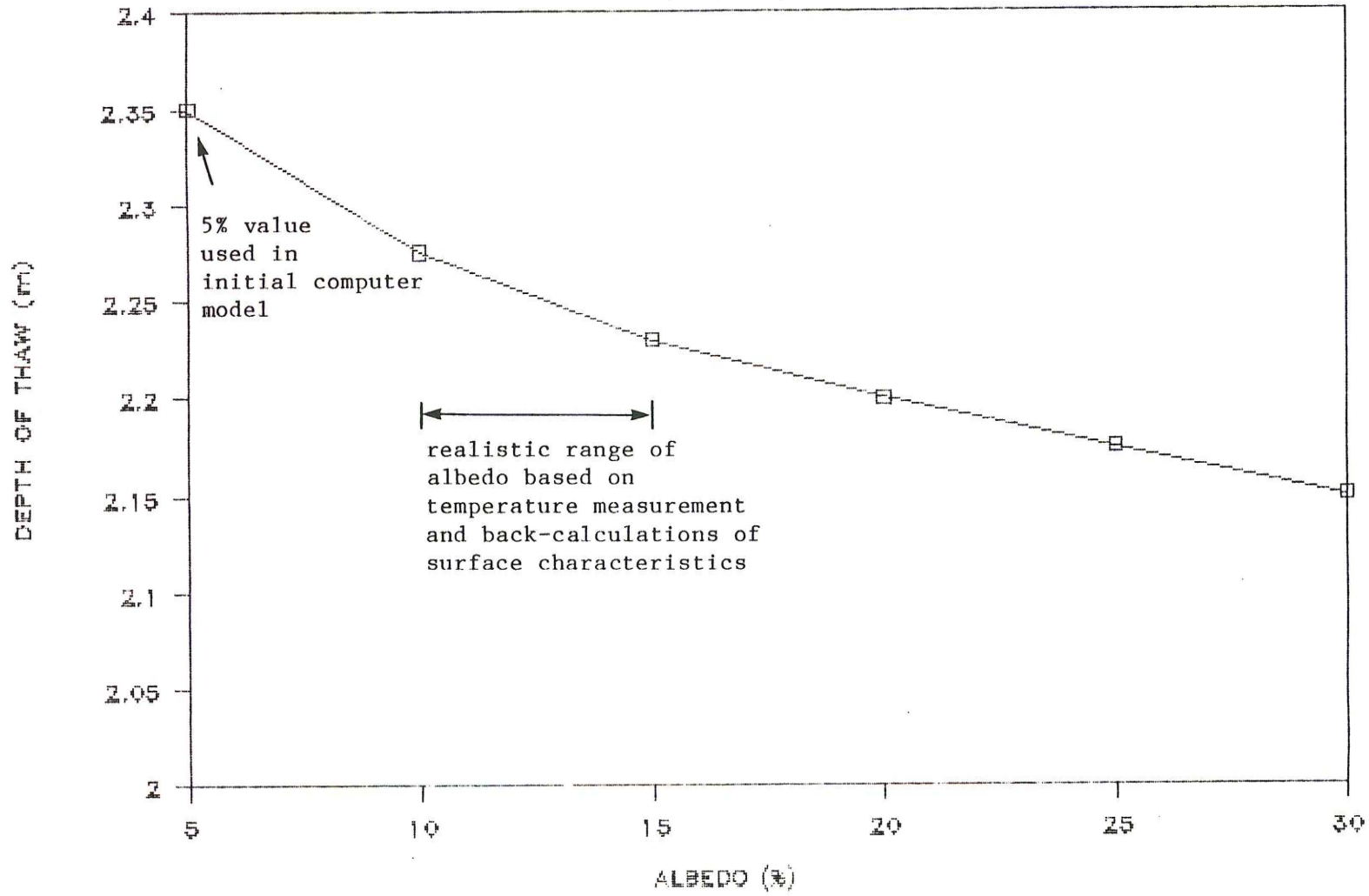


FIGURE 3

0201-4262

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6.0 CONCLUSIONS AND RECOMMENDATIONS

The data shows a negligible difference in permafrost thaw in the test section due to BST application. The measured thaw is less than that predicted in both the one-dimensional and two-dimensional models, previously reported (EBA, 1984). It is therefore concluded that BST may be safely applied to the streets of Dawson City, subject to the following conditions:

1. White Channel gravel must be used as BST aggregate.
2. The BST surface must be kept clean (regular sweepings) so that the reflectivity of the surface is similar to the test section instrumented for the present study. Plates 7 & 8 show two views of the BST and non-BST surfaces. It is imperative to maintain the same surface colour as in the test section. The photographs in fact show that the BST surface appears to be lighter in colour than the surrounding gravel. This likely reflects the addition of calcium chloride to the gravel surface to control dust.
3. If all the City streets are to be covered in BST, the surface cleaning may not be necessary; however, dirt will still be tracked in from lanes, etc., and this must be monitored, with streets cleaned accordingly.
4. Provision should also be made to reapply BST in areas of excessive "bleeding" or potholes. It is imperative that the surface colour and texture be the same as the test section, if the test results are to be applicable.



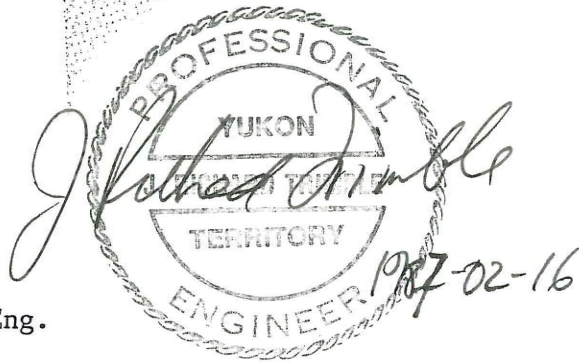


PLATES 7 & 8: Two views of the BST/non-BST contact, showing the difference in surface colour (1986-07-12).

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Respectively Submitted,

EBA Engineering Consultants Ltd.



J.R. Trimble, P. Eng.
Project Director
Office Manager

JRT/was



REFERENCES

1. Andersland, O.B., and Anderson, D.M. (1978). Geotechnical Engineering for Cold Regions. 566 p. McGraw-Hill, New York.
2. Atmospheric Environment Service (1982). Canadian Climate Normals-Degree Days (1951-1980). Vol. 4, 210 p.
3. Boyd, D.W. (1973). Normal Freezing and Thawing Degree Days for Canada (1931-1960). AES Publication - Env. Canada CLI4-73, 37 p.
4. EBA Engineering Consultants Ltd. (1983). Geothermal Performance - Buried Utility System, Dawson, Yukon. Prepared for NRC, DBR. (EBA File No: 101-2607).
5. EBA Engineering Consultants Ltd. (1984). A study of the Effects of BST on Permafrost, Dawson City, Yukon. Prepared for the City of Dawson (EBA File No: 0201-3983).
6. Hwang, C.T. (1976). Predictions and Observations on the Behavior of a Warm Gas Pipeline on Permafrost. Canadian Geotechnical Journal, V. 13(4) pp. 452-480.
7. Johnston, G.H. (ed) (1981). Permafrost Engineering, Design and Construction. Associate Committee on Geotechnical Research, NRC. 540 p. J. Wiley and Sons, Toronto.



APPENDIX A

1. Installation Report

STI

EBA Engineering Consultants Ltd.



EARTH-SCIENCES ENGINEERING

E. W. Brooker, President
D. W. Hayley, Vice President
L. A. Balanko
C. B. Dawley
C. T. Hwang
A. B. MacDonald

1985 08 30

Government of Yukon
Department of Community and
Transportation Services
P.O. Box 2703
Whitehorse, Yukon
Y1A 2C6

ATTENTION: Mr. M. Malinsky, P. Eng.
Project Engineer
Municipal Engineering Branch

Dear Sir:

Subject: Thermistor Installation Report
BST Test Section
Dawson City, Yukon
EBA File No. 0201-4262

This letter presents details of our thermistor cable installation under the BST test section in Dawson City, Yukon. The intent of the instrumentation program was to obtain comparative ground temperature data from beneath the roads in areas with a BST surface and in areas without. The data was deemed to be necessary so that a thorough evaluation of the effects of BST on the underlying permafrost and buried sewer/water system could be determined.

All the ground temperature cables were installed between July 3 and 6, 1985, immediately prior to BST application on the test section. Initially, the vertical cables were installed using a CME 750 drill contracted from Midnight Sun Drilling of Whitehorse. A trench was then excavated with a backhoe immediately adjacent to the boreholes, and the horizontal cable was installed. All cables were backfilled with 19 mm crushed gravel, and the bottom two lifts in the trenches were compacted with a plate tamper. The leads from all the cables were channelled through the trench to a common read out box. Arrangements were made with the BST crew foreman to compact the top of the trenches.

In total, three instrumentation suites were installed -- each suite consisting of 4 cables (3 vertical and one horizontal). The locations are shown on the attached Site Plan (Drawing No. 4262-1) and thermistor details are shown on Drawing No. 4262-2. The borehole logs for the drill holes are also attached, for your reference. The two suites in the BST section were oriented north-south and east-west respectively, and the one suite in the non-BST was oriented northeast - southwest.

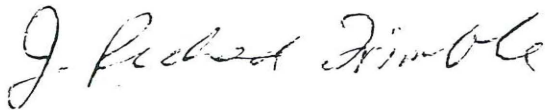
Arrangements have been made with the City of Dawson to take regular readings for us. It is our intention to analyze these over the winter and next summer, at which time we will be able to report on our findings. I have also requested assistance from the NRC, and I hope that they will be able to supply us with an automatic data logger. They have indicated on two previous occasions that no funds are available for contract research at the time, however, I am hoping that they will be able to loan us the data logger.

Finally, once the road surface survey data from your crew in Dawson has been received, I will be able to determine accurate locations and elevations for all the thermistor points. This information is necessary to complete a proper analysis.

Please call me if further information is required.

Yours truly,

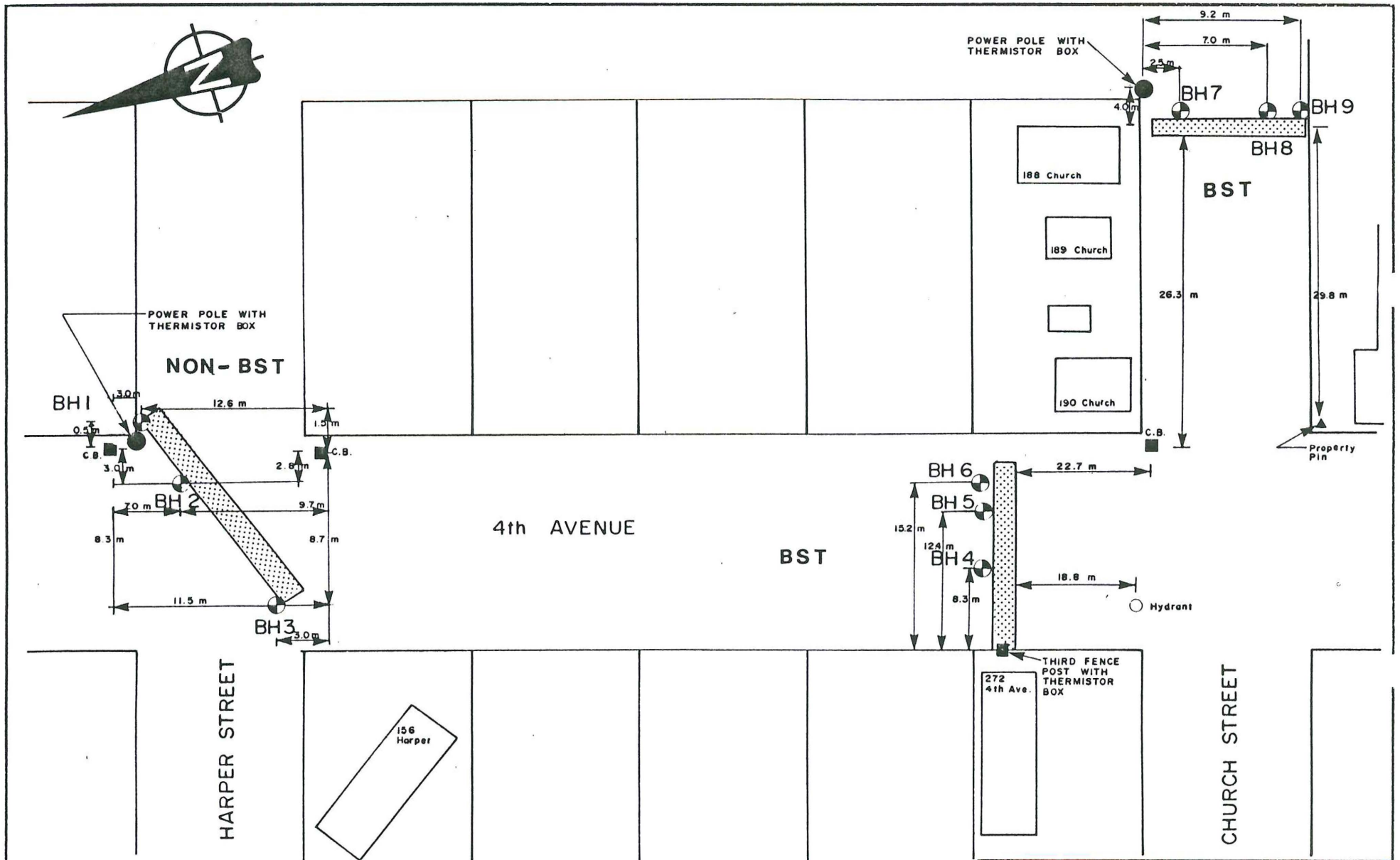
EBA Engineering Consultants Ltd.



J. Richard Trimble, P. Eng.
Senior Project Engineer
Whitehorse, Manager

JRT/was

Encl.



SITE PLAN, BOREHOLE, HORIZONTAL AND VERTICAL THERMISTOR LOCATIONS
 DAWSON BST TEST SECTION

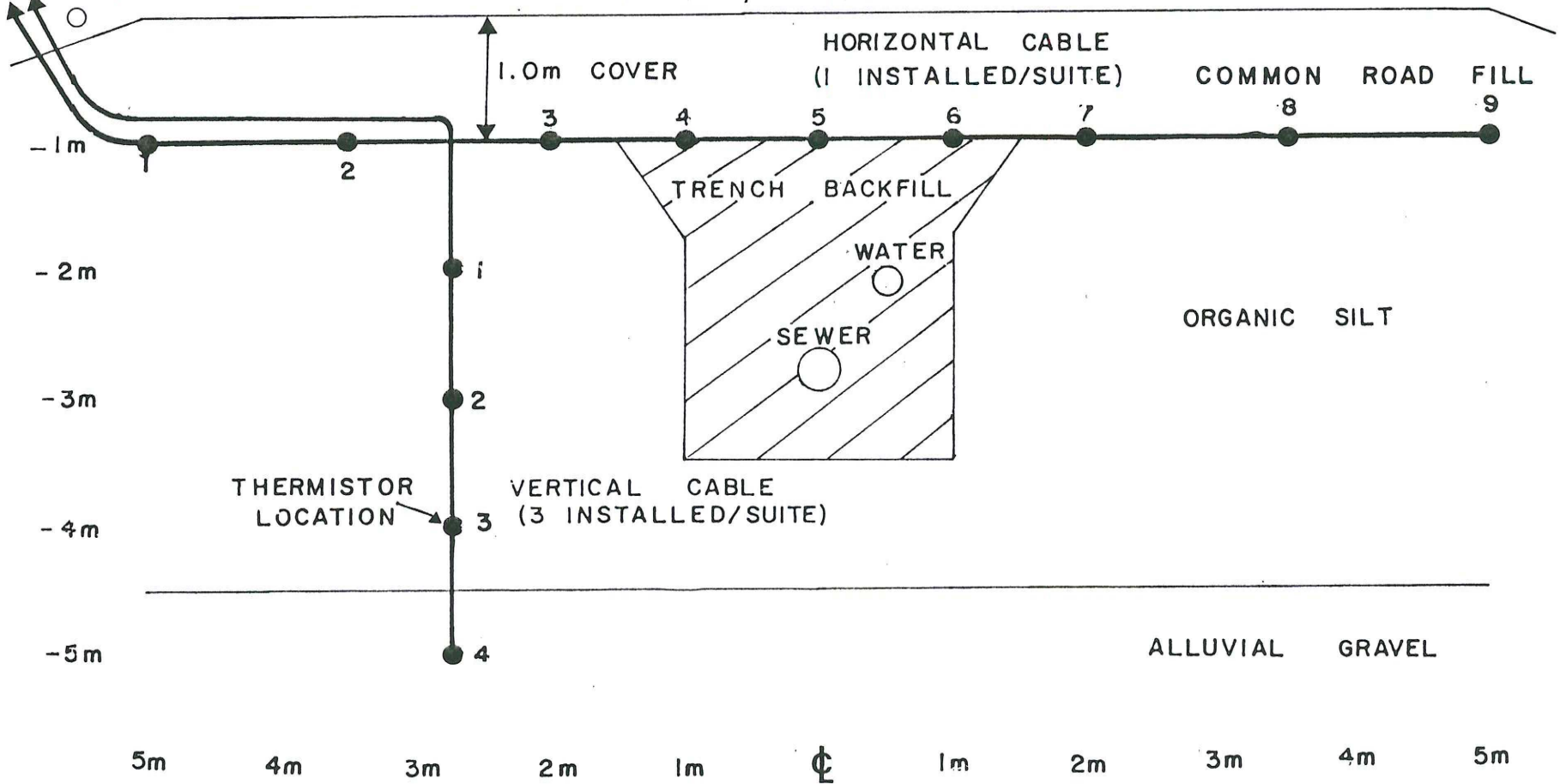
Approx. Scale 1:500

EBA Engineering Consultants Ltd.	
JOB NO.:0201-4262	DATE:1985 07 23
DRAWN BY: NLM	DRAWING NO.:
REVIEWED BY: <i>[Signature]</i>	4262-1

READ OUT BOX



NOTE: 3 suites installed.
(see site plan)

GENERALIZED ROADWAY SECTION
DAWSON CITY, YUKON



INSTALLATION DETAILS OF HORIZONTAL AND VERTICAL THERMISTOR CABLES

BST TEST SECTION
DAWSON CITY, YUKON

EBA Engineering Consultants Ltd. 	
JOB NO.: 0201-4262	DATE: 1985 08 21
DRAWN BY: WAS	DRAWING NO.:
REVIEWED BY: 	4262-02

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m ³) ▲					
				1.4	1.6	1.8	2.0	2.2	
				MOISTURE CONTENT					
				10	20	30	40	50	
0.0 - 0.5	WHITE CHANNEL GRAVEL (GW) - 20 mm crushed, sandy, white, dry		NOT FROZEN						
0.5 - 1.5	FRONT STREET PIT GRAVEL (GW) - sandy, some silt, occas- ional cobble & boulder, dark brown, damp, sub- rounded to angular								
1.5 - 2.0	SILT (PT) - peaty, organic black, damp - moist to wet with depth								
2.0 - 3.3	SILT (OL) - sandy, dark grey, moist to wet - sand is very fine		FROZEN Nbn Nbe						
3.3 - 4.2	GRAVEL (GW) - sandy, trace of silt, medium brown, moist, sub-rounded up to 25 mm Ø		Nbn						
4.2 - 4.7	- coarser - auger grinding on occa- sional cobbles								
4.7 - 5.0	END OF HOLE 4.7 m (Auger Refusal)								
5.0 - 7.0	Note: Thermistor installed to depth of 4.25 m								



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 4.7	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION NE corner of 4th Ave. & Harper

BOREHOLE No. 1
PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory test data samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log may be transitional and approximate in nature. Groundwater conditions are only those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m ³) ▲				
				MOISTURE CONTENT				
				1.4	1.6	1.8	2.0	2.2
				10	20	30	40	50
0	WHITE CHANNEL GRAVEL (GW) - 20 mm crushed, sandy, white, dry		NOT FROZEN					
0.5	FRONT STREET PIT GRAVEL (GW) - sandy, some silt, occasional cobble & boulder, dark brown, damp, sub-rounded to angular							
1.0	SILT (PT) - peaty, organic, black, damp							
1.5	SILT (ML) - (fine sand lenses throughout), grey, moist		FROZEN Nbn					
2.0	- coarser							
3.0	GRAVEL (GW) - sandy, trace of silt, medium brown, moist, sub-rounded up to 25 mm Ø							
4.0	- auger grinding on cobbles							
5.0	END OF HOLE 5.0 m (Auger Refusal)							
6.0	Note: Thermistor installed to depth of 4.6 m							
7.0								



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 5.0 m	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION 2 m NE of ctre,

BOREHOLE No.
2
PAGE 1 OF 1

This log is a compilation of subsurface information obtained from the field and laboratory data. The log is the property of the Yukon Department of Geology and is loaned to the contractor. It is to be used only for the purpose for which it was prepared and is not to be used for any other purpose without the written consent of the Department of Geology.

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG - PERMAFROST

0201-4262

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m ³) ▲				
				1.4	1.6	1.8	2.0	2.2
				MOISTURE CONTENT				
				10	20	30	40	50
0	WHITE CHANNEL GRAVEL (GW) - 20 mm crushed, sandy, white, dry		NOT FROZEN					
0.5	FRONT STREET PIT GRAVEL (GW) - sandy, some silt, occasional cobble & boulder, dark brown, damp, sub-rounded to angular							
1.5	SILT (PT) - peaty, organic, black, damp							
2.0	SILT (ML) - fine sand lenses throughout - organic, black, moist		FROZEN Nbn					
3.0	SAND AND SILT (ML) - trace of gravel, fine grained, medium brown, moist							
4.5	GRAVEL (GW) - sandy, trace of silt, medium brown, moist sub-rounded up to 25 mm Ø, occasional cobble							
5.0	END OF HOLE 4.7 m							
6.0	Note: Thermistor installed to depth of 4.5 m							
7.0								



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 4.7	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION 2.5 m SW of Centre of 4th Ave. & Harper

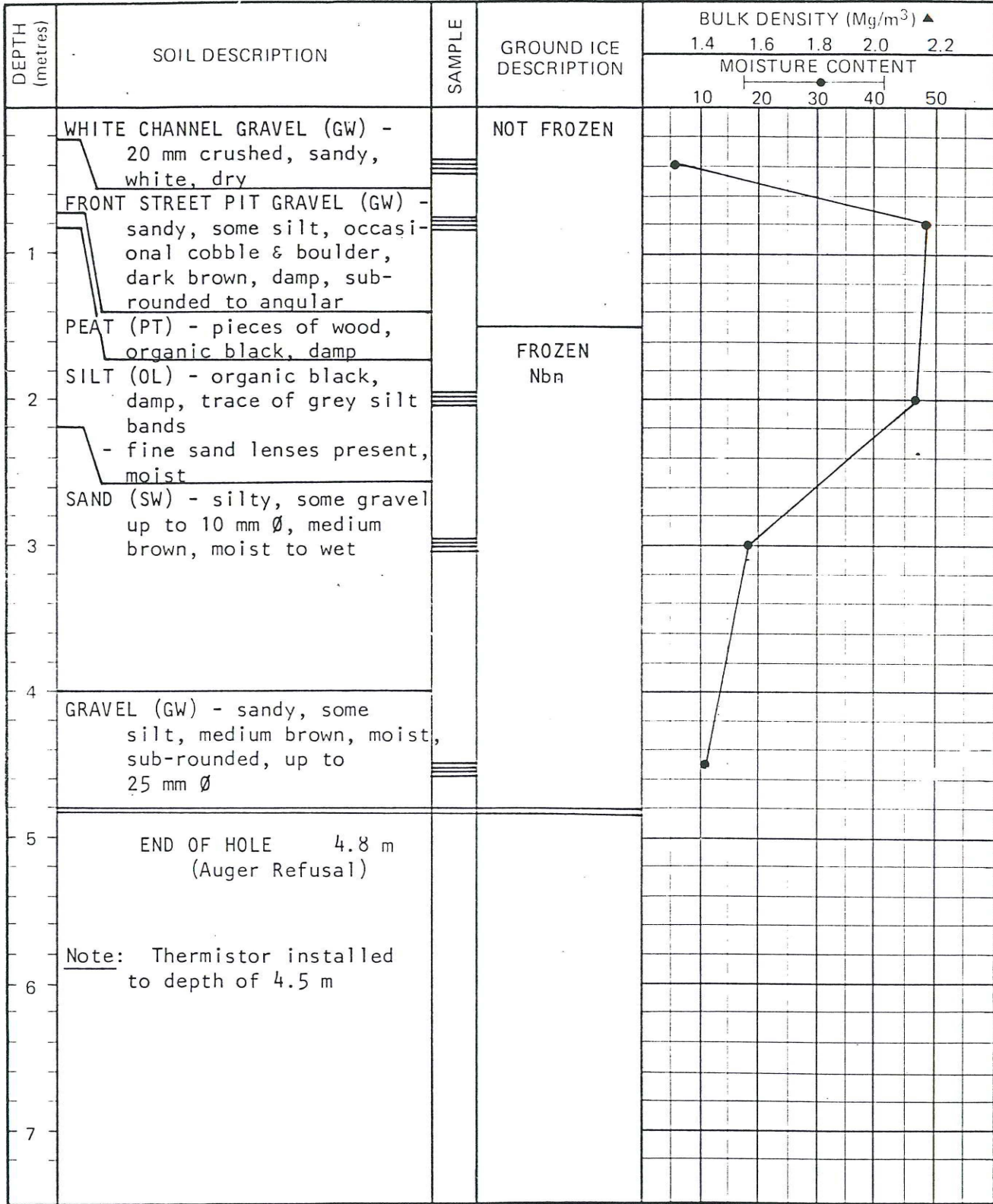
BOREHOLE No. 3
PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory analyses from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions are only those observed at the time and place indicated and that may vary with time, geologic conditions, and other factors.

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 4.8	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION 8.3 m E of Harry Campbell's fence on 4th Ave.

BOREHOLE No. 4
PAGE 1 OF 1

This log is a compilation of data from an electronic data log. It is not intended to be used as a legal document. The data in this log is for informational purposes only and does not constitute a warranty of any kind. The data in this log is for informational purposes only and does not constitute a warranty of any kind.

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m ³) ▲				
				1.4	1.6	1.8	2.0	2.2
				MOISTURE CONTENT				
				10	20	30	40	50
0 - 0.5	WHITE CHANNEL GRAVEL (GW) - 20 mm crushed, sandy, white, dry		NOT FROZEN					
0.5 - 1.5	FRONT STREET PIT GRAVEL (GW) - sandy, some silt, occasional cobble & boulder, dark brown, damp, sub-rounded to angular							
1.5 - 2.0	PEAT (PT) - organic, black, dry SILT - fine sand lenses throughout, organic black, moist		FROZEN Nbe					
2.0 - 3.5	SAND (SW) - silty, medium brown, moist							
3.5 - 5.0	GRAVEL (GW) - sandy, trace of silt, medium brown, moist, sub-rounded up to 25 mm Ø		Nbn					
5.0 - 5.0	END OF HOLE 5.0 m (Auger Refusal)							
5.0 - 7.0	Note: Thermistor installed to depth of 5.0 m							



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 5.0	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION 12.4 m E of Harry

BOREHOLE No. 5
PAGE 1 OF 1

Campbell's Fence on 4th Ave.

This log is a compilation of subsurface conditions and soil or rock classification information obtained from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater and temperature information is presented at the time and place indicated and that may vary with time, seasonal conditions, and construction activity.

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m ³) ▲					
				1.4	1.6	1.8	2.0	2.2	
				MOISTURE CONTENT					
				10	20	30	40	50	
	WHITE CHANNEL GRAVEL (GW) - 20 mm crushed, sandy, white, dry		NOT FROZEN						
1	FRONT STREET PIT GRAVEL (GW) - sandy, some silt, occasional cobble and boulder, dark brown, sub-rounded to angular								
	PEAT (PT) - organic, black, dry, some wood		FROZEN Nbe						
2	SILT (OL) - fine sand lenses throughout, organic black with grey streaks, damp to moist								
3	SAND (SW) - fine, silty, medium to dark brown to organic black - silt lenses throughout		Vs						
4	GRAVEL (GW) - sandy, trace of silt, sub-rounded up to 20 mm Ø, wet		Nbn						
5									
	END OF HOLE 5.2 m								
6	Note: Thermistor installed to depth of 5.0 m								
7									

67.8%



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 5.2	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION 15.2 m E of Harry Campbell's fence on 4th Ave.

BOREHOLE No. 6
PAGE 1 OF 1

This is a computer-generated document. It is not a legal document. It is not a contract. It is not a warranty. It is not a guarantee. It is not a statement of fact. It is not a statement of opinion. It is not a statement of intent. It is not a statement of belief. It is not a statement of hope. It is not a statement of desire. It is not a statement of wish. It is not a statement of prayer. It is not a statement of faith. It is not a statement of love. It is not a statement of kindness. It is not a statement of generosity. It is not a statement of compassion. It is not a statement of mercy. It is not a statement of grace. It is not a statement of peace. It is not a statement of joy. It is not a statement of happiness. It is not a statement of well-being. It is not a statement of health. It is not a statement of wealth. It is not a statement of power. It is not a statement of influence. It is not a statement of authority. It is not a statement of respect. It is not a statement of honor. It is not a statement of glory. It is not a statement of fame. It is not a statement of honor. It is not a statement of glory. It is not a statement of fame. It is not a statement of honor. It is not a statement of glory. It is not a statement of fame.

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262

DEPTH (metres)	SOIL DESCRIPTION	SAMPLE	GROUND ICE DESCRIPTION	BULK DENSITY (Mg/m ³) ▲				
				1.4	1.6	1.8	2.0	2.2
				MOISTURE CONTENT				
				10	20	30	40	50
0.0 - 0.5	WHITE CHANNEL GRAVEL (GW) - 20 mm crushed, sandy, white, dry		NOT FROZEN					
0.5 - 1.5	FRONT STREET PIT GRAVEL (GW) - sandy, some silt, occasional cobble and boulder, dark brown, sub-rounded to angular							
1.5 - 1.8	PEAT (PT) - some silt, organic black, dry, some wood							
1.8 - 2.0	SILT (OL) - fine sand lenses, organic black, grey lenses, damp to moist		FROZEN Nbn					
2.0 - 3.0	SILT (SW) - sandy, (fine), trace of gravel, dark brown, moist							
3.0 - 4.0			Nbe					
4.0 - 5.0	GRAVEL (GW) - sandy, trace of silt, medium brown, wet, sub-rounded to 20 mm Ø							
5.0 - 5.0	END OF HOLE 5.0 m (Auger Refusal)							
6.0 - 6.0	Note: Thermistor installed to depth of 5.0 m							
7.0 - 7.0								



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 5.0	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION *

BOREHOLE No. 7
PAGE 1 OF 1

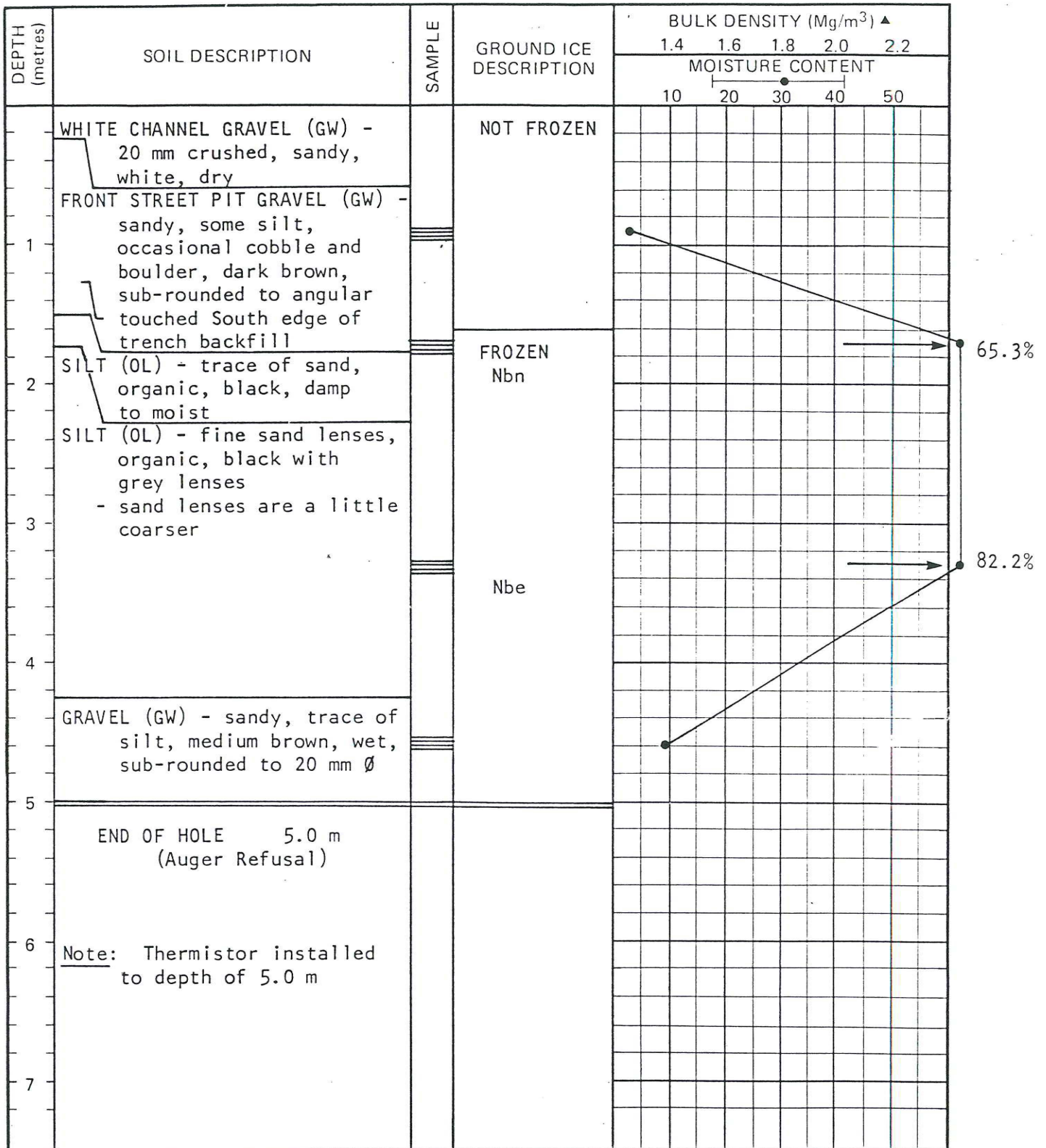
This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

* crossing Church at SE corner of Lot 1, blk HG - 2.5 m S of S Pl of Lot 1, blk HG

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 5.0	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION *

BOREHOLE No.
8
PAGE 1 OF 1

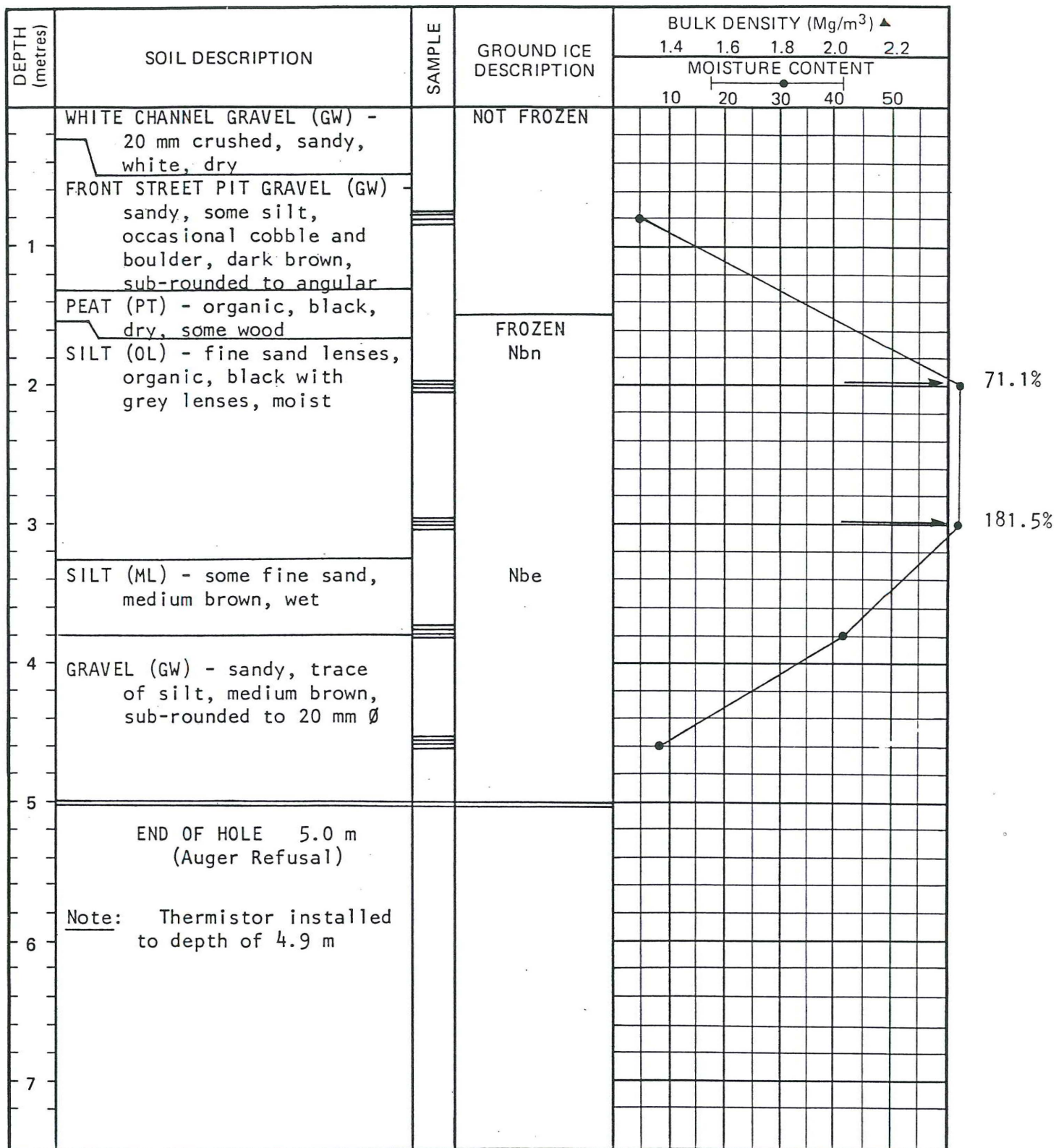
This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate. Natural Ground Water (if present) is not to be observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

* crossing Church at SE corner of Lot 1, blk HG - 7.0 m S of South PL of Lot 13, blk HG

DAWSON BST TEST SECTION
DAWSON CITY, YUKON

BOREHOLE LOG – PERMAFROST

0201-4262



SFC. ELEVATION (m)	DATE DRILLED 1985 07 04
COMPLETION DEPTH (m) 5.0	LOGGED BY MCP
DRILLING RIG CME 750	LOCATION *

BOREHOLE No. 9
PAGE 1 OF 1

This log is a compilation of subsurface conditions and soil or rock classification obtained from the field as well as from laboratory testing of samples from the boreholes. Soil zones have been interpreted according to commonly accepted practice. The change from one zone to another, as indicated on the log, may be transitional and approximate in nature. Groundwater conditions refer only to those observed at the times and places indicated and that may vary with time, geologic conditions, and construction activity.

* crossing Church St. at SE corner of Lot 1, Blk HG - 9.2 m S of South pl of Lot 1, BlkHG

APPENDIX B

1. Details of Campbell Scientific 21XL Data Logger
2. Raw Data from data logger Julian Day 164 (June 13, 1986) 1000 hrs to June 14, 1200 hrs
3. Reduced Data from computer - Cable No. 605, June 13, 1000 hrs to June 29, 0500 hrs.



CAMPBELL SCIENTIFIC, INC.

P.O. Box 551 • Logan, Utah 84321 • (801) 753-2342 • TLX 453058

21X MICROLOGGER

A Rugged, Powerful Little Datalogger

The 21X is a textbook sized, D cell powered precision datalogger. The term "MICROLOGGER" is descriptive of this MICRO-computer based dataLOGGER's MICRO-size, MICRO-power and sub-MICRO-volt sensitivity. It is the combination of a micro-computer, clock, multimeter, calibrator, scanner, frequency counter, controller, and signal generator all in one small box. Small size, low power and the ability to operate in environmental extremes were primary design objectives for portable, remote operation.

SIGNIFICANT FEATURES

PERFORMANCE VERSUS COST: Measurement and processing throughput in excess of 100 channels per second and sensitivity of $\frac{1}{3}$ of a microvolt at 25 channels per second at a remarkably low price.

PERFORMANCE VERSUS SIZE: Sixteen analog and four pulse counting channels plus all the features described here packaged smaller and lighter (including batteries) than the CRC Handbook of Chemistry and Physics.

PERFORMANCE VERSUS POWER CONSUMPTION: Scanning and processing all 16 channels at 1 minute intervals, the 8 alkaline D cells last about 6 months. The rechargeable batteries in the 21XL provide 2 months' operation per charge under the same conditions.

SENSITIVITY AND MEASUREMENT SPEED: Fourteen bit precision on 5 software selectable ranges. 0.33 microvolt resolution at 37 milliseconds per channel with 100 nanovolt RMS input noise. At 2.5ms per channel the input noise is 1.2 microvolt RMS.

SENSOR COMPATIBILITY WITHOUT EXTERNAL SIGNAL CONDITIONING: Linearized thermocouple measurements at 7.3 milliseconds per channel resolve to within 0.05 deg. C. Bridge excitation voltage selectable within a ± 5 V range at .67 mV resolution. Resistance bridge measurements such as RTDs, load cells, pressure transducers, foil strain gages and thermistors optimize accuracy using AC excitation and ratiometric techniques. AC excitation also minimizes polarization errors in soil moisture, salinity, conductivity, and RH sensors. Four pulse counting channels accommodate magnetic pulse flow meters, photochopped or switch closure devices and incremental shaft encoders directly.

EXPANDABILITY: Analog inputs are expandable in 32 channel increments to a maximum of 192 channels using the Model AM32 Relay Scanner.

REAL-TIME DATA PROCESSING: User programmed processing includes linearization, algebraic and transcendental functions, engineering unit scaling, averaging, maximum/minimum, totalizing, standard deviation, wind vector integration with direction sigma, histograms, and more.

REMOTE PROGRAMMING: Programs, parameters and direct commands can be entered directly from the keyboard or via the serial communications port from a remote computer or terminal.

FLEXIBLE DATA STORAGE AND TRANSFER: Data is stored in memory for transfer to the display, cassette, printer, modem, or directly to a computer. Standard 21X memory allows storage of 19,328 data values. The cassette recorder stores up to 180,000 values on one side of a C60 cassette at a maximum rate of 100 values per second.

ANALOG AND DIGITAL CONTROL OUTPUTS: Two continuous analog outputs with 14 bit resolution are available for strip chart recorders or proportional control. Six digital outputs can be set based on time or processed input levels.

PROTECTED INPUTS AND OUTPUTS: All panel connections are protected from electrical transients using spark gaps or transzorbors.

OPERATION IN HARSH ENVIRONMENTS: -25 to +50 deg. C. 0 to 90% relative humidity. The 21X packaging provides protection from excessive humidity and contaminants. On special order, 21X's will be tested and guaranteed to operate over a -55 to +85 deg. C temperature range.

STANDARD CONFIGURATION

The standard 21X Micrologger includes 16 single ended analog inputs (any pair configurable as a differential input), 4 pulse counting inputs, 4 switched excitation outputs, 2 continuous analog outputs and 6 digital control outputs.

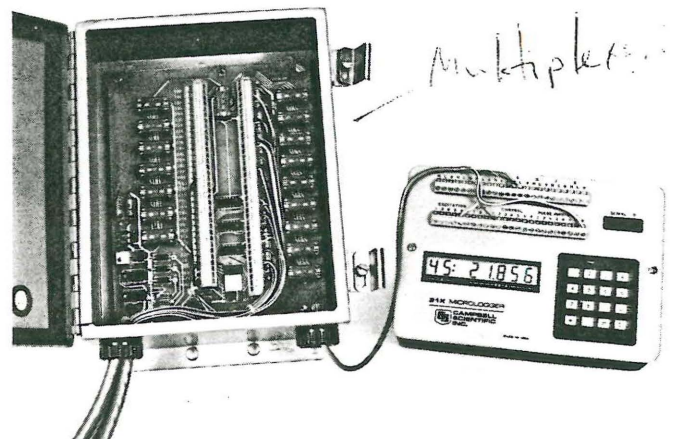
21X processing includes 22 instructions for measurements and control output, 39 instructions for data processing, and 9 instructions for program control.

Data storage includes 28 locations for input and user-processed data, 64 locations for intermediate values, and 19,328 final storage locations. Data storage can be reallocated by the user. Each input location and each intermediate location uses 4 bytes of RAM and each final storage location uses 2 bytes of RAM.

A 9 pin D type connector on the front panel is used for serial data communication to cassette tape, memory module, modem or printer. It is also used for system programming via remote terminal or computer.

EXPANSION

Analog inputs can be added in 32 channel increments using the Model AM32 Relay Scanner. Up to 6 AM32s can be added for an additional 192 analog channels.



21X Micrologger with the Model AM32 Relay Scanner for channel expansion.

COVER PHOTOGRAPH

The 21X is shown with D cells and some of the directly compatible sensors including a load cell, platinum resistance thermometer, thermocouple, silicon pyranometer and a pressure transducer. Background material is the official CAMPBELL of ARGYLL tartan.

A>type b:dawson2.dat

01+0121.	02+0164.	03+1000.	04+10.05	05+10.27	06+09.39	07+09.13	08+09.39
09+09.72	10+09.29	11+08.84	12+09.43	13+3.220	14-0.886	15-1.467	16-1.804
17-0.319	18-1.208	19-1.696	20-1.964	21-0.082	22-1.243	23-1.912	24-1.964
25+5.030	26+4.775	27+6.300	28+07.53	29+07.86	30+07.97	31+6.110	32+2.699
33+1.934	34-0.758	35-1.741	36-2.338	37-2.380	38-0.453	39-1.752	40-2.145
41-2.312	42-1.066	43-1.979	44-2.350	45-2.213	46+07.17	47+6.999	48+07.82
49+08.38	50+08.87	51+09.86	52+09.08	53+08.29	54+08.68	55-0.439	56-1.379
57-1.581	58-1.622	59-0.743	60-1.659	61-1.987	62-2.070	63-1.153	64-2.032
65-2.403	66-2.281						
01+0121.	02+0164.	03+1100.	04+10.06	05+10.27	06+09.39	07+09.13	08+09.39
09+09.72	10+09.30	11+08.85	12+09.41	13+3.225	14-0.890	15-1.467	16-1.792
17-0.319	18-1.200	19-1.699	20-1.960	21-0.082	22-1.251	23-1.912	24-1.983
25+5.046	26+4.787	27+6.315	28+07.54	29+07.88	30+07.98	31+6.124	32+2.717
33+1.936	34-0.758	35-1.744	36-2.326	37-2.380	38-0.446	39-1.744	40-2.145
41-2.311	42-1.066	43-1.979	44-2.345	45-2.216	46+07.17	47+07.01	48+07.83
49+08.39	50+08.88	51+09.87	52+09.09	53+08.29	54+08.67	55-0.439	56-1.372
57-1.577	58-1.622	59-0.736	60-1.659	61-1.987	62-2.069	63-1.153	64-2.032
65-2.395	66-2.281						
01+0121.	02+0164.	03+1200.	04+10.06	05+10.26	06+09.39	07+09.13	08+09.39
09+09.72	10+09.30	11+08.86	12+09.39	13+3.234	14-0.886	15-1.467	16-1.799
17-0.319	18-1.197	19-1.695	20-1.956	21-0.075	22-1.248	23-1.911	24-1.979
25+5.053	26+4.806	27+6.323	28+07.56	29+07.88	30+07.99	31+6.137	32+2.728
33+1.951	34-0.758	35-1.732	36-2.334	37-2.379	38-0.446	39-1.747	40-2.144
41-2.311	42-1.066	43-1.979	44-2.341	45-2.212	46+07.18	47+07.03	48+07.83
49+08.40	50+08.89	51+09.87	52+09.10	53+08.30	54+08.65	55-0.432	56-1.371
57-1.577	58-1.621	59-0.736	60-1.658	61-1.986	62-2.061	63-1.153	64-2.024
65-2.394	66-2.280						
01+0121.	02+0164.	03+1300.	04+10.06	05+10.25	06+09.38	07+09.12	08+09.39
09+09.72	10+09.29	11+08.86	12+09.35	13+3.235	14-0.890	15-1.470	16-1.795
17-0.323	18-1.200	19-1.699	20-1.967	21-0.079	22-1.251	23-1.914	24-1.982
25+5.059	26+4.812	27+6.328	28+07.56	29+07.88	30+07.99	31+6.147	32+2.736
33+1.959	34-0.761	35-1.736	36-2.329	37-2.382	38-0.450	39-1.750	40-2.147
41-2.314	42-1.070	43-1.982	44-2.352	45-2.215	46+07.18	47+07.04	48+07.84
49+08.41	50+08.90	51+09.88	52+09.10	53+08.30	54+08.63	55-0.435	56-1.375
57-1.580	58-1.617	59-0.740	60-1.654	61-1.982	62-2.064	63-1.149	64-2.027
65-2.397	66-2.276						
01+0121.	02+0164.	03+1400.	04+10.06	05+10.23	06+09.36	07+09.11	08+09.38
09+09.70	10+09.28	11+08.85	12+09.32	13+3.248	14-0.890	15-1.470	16-1.794
17-0.316	18-1.200	19-1.698	20-1.958	21-0.073	22-1.243	23-1.914	24-1.981
25+5.061	26+4.820	27+6.335	28+07.57	29+07.89	30+07.99	31+6.154	32+2.746
33+1.964	34-0.761	35-1.735	36-2.335	37-2.381	38-0.450	39-1.742	40-2.146
41-2.313	42-1.070	43-1.981	44-2.343	45-2.214	46+07.18	47+07.05	48+07.85
49+08.41	50+08.91	51+09.88	52+09.10	53+08.29	54+08.60	55-0.436	56-1.374
57-1.580	58-1.617	59-0.740	60-1.654	61-1.981	62-2.063	63-1.149	64-2.026
65-2.396	66-2.275						
01+0121.	02+0164.	03+1500.	04+10.06	05+10.21	06+09.34	07+09.09	08+09.36
09+09.68	10+09.27	11+08.85	12+09.28	13+3.249	14-0.883	15-1.466	16-1.794
17-0.313	18-1.200	19-1.690	20-1.958	21-0.073	22-1.243	23-1.913	24-1.980
25+5.063	26+4.830	27+6.338	28+07.57	29+07.89	30+07.99	31+6.161	32+2.761
33+1.976	34-0.754	35-1.735	36-2.324	37-2.380	38-0.446	39-1.742	40-2.146
41-2.312	42-1.069	43-1.980	44-2.350	45-2.214	46+07.17	47+07.05	48+07.85
49+08.42	50+08.91	51+09.88	52+09.09	53+08.29	54+08.57	55-0.432	56-1.371
57-1.569	58-1.613	59-0.729	60-1.653	61-1.980	62-2.063	63-1.149	64-2.022
65-2.396	66-2.271						
01+0121.	02+0164.	03+1600.	04+10.08	05+10.19	06+09.31	07+09.08	08+09.34
09+09.67	10+09.25	11+08.84	12+09.25	13+3.261	14-0.890	15-1.462	16-1.798
17-0.320	18-1.196	19-1.694	20-1.962	21-0.070	22-1.250	23-1.909	24-1.976
25+5.054	26+4.832	27+6.338	28+07.57	29+07.89	30+07.99	31+6.163	32+2.763

33+1.982	34-0.754	35-1.727	36-2.327	37-2.389	38-0.446	39-1.746	40-2.142
41-2.312	42-1.062	43-1.977	44-2.346	45-2.210	46+07.15	47+07.06	48+07.86
49+08.42	50+08.92	51+09.87	52+09.09	53+08.27	54+08.55	55-0.429	56-1.374
57-1.572	58-1.616	59-0.736	60-1.650	61-1.976	62-2.059	63-1.145	64-2.021
65-2.392	66-2.278						
01+0121.	02+0164.	03+1700.	04+10.10	05+10.17	06+09.30	07+09.06	08+09.32
09+09.65	10+09.24	11+08.83	12+09.24	13+3.267	14-0.883	15-1.462	16-1.794
17-0.317	18-1.192	19-1.690	20-1.958	21-0.059	22-1.247	23-1.906	24-1.980
25+5.054	26+4.836	27+6.338	28+07.58	29+07.89	30+07.98	31+6.172	32+2.769
33+1.989	34-0.754	35-1.735	36-2.327	37-2.380	38-0.443	39-1.742	40-2.138
41-2.304	42-1.062	43-1.977	44-2.342	45-2.206	46+07.15	47+07.07	48+07.86
49+08.42	50+08.92	51+09.86	52+09.08	53+08.26	54+08.53	55-0.429	56-1.371
57-1.576	58-1.616	59-0.736	60-1.646	61-1.980	62-2.059	63-1.142	64-2.018
65-2.392	66-2.274						
01+0121.	02+0164.	03+1800.	04+10.12	05+10.15	06+09.29	07+09.05	08+09.31
09+09.63	10+09.23	11+08.82	12+09.23	13+3.271	14-0.879	15-1.466	16-1.787
17-0.309	18-1.196	19-1.691	20-1.954	21-0.059	22-1.236	23-1.906	24-1.973
25+5.052	26+4.849	27+6.342	28+07.58	29+07.89	30+07.98	31+6.176	32+2.773
33+2.002	34-0.754	35-1.731	36-2.320	37-2.377	38-0.443	39-1.739	40-2.139
41-2.309	42-1.062	43-1.977	44-2.335	45-2.207	46+07.13	47+07.07	48+07.86
49+08.42	50+08.92	51+09.86	52+09.07	53+08.25	54+08.52	55-0.429	56-1.371
57-1.572	58-1.617	59-0.726	60-1.646	61-1.973	62-2.056	63-1.145	64-2.018
65-2.389	66-2.275						
01+0121.	02+0164.	03+1900.	04+10.13	05+10.13	06+09.27	07+09.04	08+09.30
09+09.62	10+09.22	11+08.81	12+09.23	13+3.279	14-0.879	15-1.466	16-1.791
17-0.313	18-1.196	19-1.687	20-1.955	21-0.055	22-1.240	23-1.903	24-1.977
25+5.054	26+4.847	27+6.339	28+07.57	29+07.89	30+07.97	31+6.174	32+2.774
33+2.006	34-0.751	35-1.724	36-2.324	37-2.370	38-0.446	39-1.739	40-2.135
41-2.301	42-1.059	43-1.970	44-2.339	45-2.203	46+07.13	47+07.07	48+07.86
49+08.42	50+08.92	51+09.84	52+09.07	53+08.24	54+08.51	55-0.432	56-1.371
57-1.569	58-1.613	59-0.729	60-1.650	61-1.977	62-2.060	63-1.145	64-2.015
65-2.393	66-2.271						
01+0121.	02+0164.	03+2000.	04+10.15	05+10.13	06+09.26	07+09.03	08+09.29
09+09.62	10+09.21	11+08.80	12+09.24	13+3.282	14-0.879	15-1.459	16-1.791
17-0.306	18-1.189	19-1.687	20-1.959	21-0.055	22-1.233	23-1.895	24-1.970
25+5.052	26+4.843	27+6.341	28+07.58	29+07.88	30+07.97	31+6.176	32+2.782
33+2.007	34-0.751	35-1.724	36-2.321	37-2.370	38-0.439	39-1.732	40-2.136
41-2.306	42-1.059	43-1.974	44-2.340	45-2.204	46+07.12	47+07.06	48+07.86
49+08.42	50+08.92	51+09.84	52+09.06	53+08.24	54+08.52	55-0.425	56-1.367
57-1.573	58-1.613	59-0.729	60-1.643	61-1.970	62-2.053	63-1.142	64-2.015
65-2.386	66-2.272						
01+0121.	02+0164.	03+2100.	04+10.17	05+10.14	06+09.28	07+09.03	08+09.30
09+09.62	10+09.21	11+08.80	12+09.28	13+3.290	14-0.883	15-1.463	16-1.788
17-0.309	18-1.193	19-1.684	20-1.952	21-0.051	22-1.236	23-1.899	24-1.974
25+5.065	26+4.847	27+6.341	28+07.58	29+07.87	30+07.96	31+6.175	32+2.785
33+2.017	34-0.747	35-1.721	36-2.314	37-2.375	38-0.442	39-1.736	40-2.132
41-2.298	42-1.055	43-1.967	44-2.336	45-2.208	46+07.12	47+07.07	48+07.86
49+08.42	50+08.92	51+09.84	52+09.06	53+08.24	54+08.53	55-0.428	56-1.368
57-1.573	58-1.610	59-0.726	60-1.647	61-1.974	62-2.057	63-1.142	64-2.012
65-2.390	66-2.268						
01+0121.	02+0164.	03+2200.	04+10.18	05+10.16	06+09.29	07+09.04	08+09.30
09+09.63	10+09.22	11+08.80	12+09.32	13+3.296	14-0.883	15-1.459	16-1.795
17-0.306	18-1.189	19-1.688	20-1.948	21-0.044	22-1.233	23-1.903	24-1.974
25+5.071	26+4.853	27+6.345	28+07.57	29+07.87	30+07.97	31+6.175	32+2.789
33+2.017	34-0.743	35-1.728	36-2.318	37-2.375	38-0.439	39-1.732	40-2.136
41-2.306	42-1.052	43-1.967	44-2.336	45-2.208	46+07.13	47+07.06	48+07.86
49+08.41	50+08.91	51+09.84	52+09.06	53+08.24	54+08.55	55-0.425	56-1.364
57-1.573	58-1.617	59-0.726	60-1.647	61-1.971	62-2.057	63-1.138	64-2.019
65-2.386	66-2.268						
01+0121.	02+0164.	03+2300.	04+10.20	05+10.18	06+09.31	07+09.06	08+09.32
09+09.65	10+09.24	11+08.82	12+09.38	13+3.303	14-0.879	15-1.467	16-1.792
17-0.302	18-1.189	19-1.688	20-1.952	21-0.048	22-1.233	23-1.903	24-1.971
25+5.086	26+4.862	27+6.349	28+07.57	29+07.88	30+07.97	31+6.184	32+2.799
33+2.021	34-0.751	35-1.721	36-2.314	37-2.371	38-0.439	39-1.732	40-2.136
41-2.299	42-1.055	43-1.971	44-2.337	45-2.201	46+07.14	47+07.07	48+07.86
49+08.42	50+08.92	51+09.84	52+09.07	53+08.25	54+08.59	55-0.425	56-1.364
57-1.566	58-1.614	59-0.729	60-1.643	61-1.978	62-2.061	63-1.138	64-2.016
65-2.386	66-2.272						

41-2.299	42-1.055	43-1.971	44-2.337	45-2.201	46+07.14	47+07.07	48+07.86
49+08.42	50+08.92	51+09.84	52+09.07	53+08.25	54+08.59	55-0.425	56-1.364
57-1.566	58-1.614	59-0.729	60-1.643	61-1.978	62-2.061	63-1.135	64-2.016
65-2.386	66-2.272						
01+0121.	02+0165.	03+0000.	04+10.23	05+10.22	06+09.34	07+09.09	08+09.35
09+09.68	10+09.26	11+08.33	12+09.45	13+3.303	14-0.883	15-1.463	16-1.788
17-0.302	18-1.193	19-1.684	20-1.952	21-0.044	22-1.237	23-1.900	24-1.975
25+5.107	26+4.881	27+6.358	28+07.57	29+07.87	30+07.97	31+6.193	32+2.805
33+2.024	34-0.747	35-1.718	36-2.314	37-2.375	38-0.442	39-1.729	40-2.129
41-2.299	42-1.055	43-1.967	44-2.334	45-2.208	46+07.17	47+07.07	48+07.87
49+08.43	50+08.92	51+09.85	52+09.08	53+08.28	54+08.63	55-0.428	56-1.368
57-1.573	58-1.618	59-0.722	60-1.647	61-1.975	62-2.057	63-1.142	64-2.012
65-2.390	66-2.276						
01+0124.	02+0165.	03+10.23	04+10.27	05+09.39	06+09.13	07+09.39	08+09.72
09+09.30	10+08.86	11+09.45	12+3.303	13-0.879	14-1.459	15-1.787	16-0.302
17-1.189	18-1.684	19-1.948	20-0.044	21-1.233	22-1.895	23-1.964	24+5.107
25+4.881	26+6.358	27+07.58	28+07.89	29+07.99	30+6.193	31+2.805	32+2.024
33-0.743	34-1.718	35-2.314	36-2.370	37-0.439	38-1.729	39-2.129	40-2.298
41-1.052	42-1.967	43-2.334	44-2.201	45+07.18	46+07.07	47+07.87	48+08.43
49+08.92	50+09.88	51+09.10	52+08.30	53+08.68	54-0.425	55-1.364	56-1.566
57-1.610	58-0.722	59-1.643	60-1.970	61-2.053	62-1.138	63-2.012	64-2.386
65-2.268	66+09.89	67+09.99	68+09.12	69+08.90	70+09.14	71+09.45	72+09.06
73+08.63	74+09.15	75+3.186	76-0.894	77-1.475	78-1.807	79-0.333	80-1.211
81-1.711	82-1.972	83-0.110	84-1.263	85-1.927	86-1.995	87+4.825	88+4.613
89+6.166	90+07.47	91+07.79	92+07.85	93+5.979	94+2.592	95+1.856	96-0.772
97-1.755	98-2.349	99-2.395	00-0.460	01-1.763	02-2.160	03-2.326	04-1.088
05-1.998	06-2.360	07-2.224	08+6.932	09+6.900	10+07.79	11+08.32	12+08.77
13+09.68	14+08.92	15+08.09	16+08.48	17-0.449	18-1.394	19-1.589	20-1.636
21-0.754	22-1.674	23-2.002	24-2.084	25-1.168	26-2.047	27-2.418	28-2.296
29+14.02							
01+0121.	02+0165.	03+0100.	04+10.26	05+10.27	06+09.39	07+09.12	08+09.39
09+09.72	10+09.29	11+08.86	12+09.52	13+3.313	14-0.876	15-1.459	16-1.784
17-0.298	18-1.182	19-1.681	20-1.949	21-0.034	22-1.226	23-1.896	24-1.964
25+5.133	26+4.893	27+6.373	28+07.58	29+07.88	30+07.99	31+6.208	32+2.815
33+2.032	34-0.743	35-1.721	36-2.311	37-2.364	38-0.432	39-1.729	40-2.121
41-2.295	42-1.052	43-1.968	44-2.326	45-2.197	46+07.20	47+07.08	48+07.87
49+08.43	50+08.92	51+09.87	52+09.10	53+08.31	54+08.68	55-0.425	56-1.357
57-1.562	58-1.610	59-0.722	60-1.640	61-1.964	62-2.058	63-1.139	64-2.012
65-2.379	66-2.265						
01+0121.	02+0165.	03+0200.	04+10.28	05+10.32	06+09.44	07+09.15	08+09.43
09+09.76	10+09.33	11+08.88	12+09.59	13+3.323	14-0.876	15-1.456	16-1.788
17-0.295	18-1.186	19-1.677	20-1.945	21-0.030	22-1.229	23-1.893	24-1.968
25+5.160	26+4.914	27+6.393	28+07.58	29+07.88	30+08.00	31+6.217	32+2.825
33+2.038	34-0.740	35-1.714	36-2.307	37-2.368	38-0.435	39-1.729	40-2.125
41-2.292	42-1.048	43-1.960	44-2.330	45-2.201	46+07.23	47+07.09	48+07.87
49+08.43	50+08.93	51+09.90	52+09.13	53+08.34	54+08.73	55-0.421	56-1.361
57-1.566	58-1.610	59-0.718	60-1.640	61-1.968	62-2.050	63-1.135	64-2.005
65-2.383	66-2.269						
01+0121.	02+0165.	03+0300.	04+10.31	05+10.37	06+09.49	07+09.20	08+09.47
09+09.81	10+09.37	11+08.91	12+09.67	13+3.330	14-0.872	15-1.449	16-1.785
17-0.298	18-1.182	19-1.681	20-1.949	21-0.023	22-1.226	23-1.893	24-1.960
25+5.187	26+4.939	27+6.411	28+07.59	29+07.90	30+08.03	31+6.238	32+2.838
33+2.048	34-0.740	35-1.718	36-2.308	37-2.365	38-0.428	39-1.722	40-2.118
41-2.296	42-1.052	43-1.953	44-2.323	45-2.197	46+07.26	47+07.10	48+07.87
49+08.44	50+08.94	51+09.93	52+09.15	53+08.37	54+08.77	55-0.421	56-1.364
57-1.559	58-1.607	59-0.718	60-1.633	61-1.960	62-2.051	63-1.139	64-2.005
65-2.376	66-2.266						
01+0121.	02+0165.	03+0400.	04+10.33	05+10.43	06+09.54	07+09.24	08+09.52
09+09.86	10+09.42	11+08.95	12+09.74	13+3.336	14-0.876	15-1.456	16-1.781
17-0.295	18-1.186	19-1.677	20-1.945	21-0.023	22-1.222	23-1.893	24-1.968
25+5.219	26+4.956	27+6.428	28+07.60	29+07.91	30+08.05	31+6.258	32+2.851
33+2.052	34-0.740	35-1.714	36-2.308	37-2.361	38-0.435	39-1.722	40-2.126
41-2.293	42-1.048	43-1.960	44-2.331	45-2.202	46+07.30	47+07.12	48+07.88
49+08.45	50+08.96	51+09.96	52+09.19	53+08.41	54+08.82	55-0.421	56-1.361
57-1.566	58-1.611	59-0.718	60-1.633	61-1.968	62-2.051	63-1.135	64-2.005
65-2.384	66-2.262						
01+0121.	02+0165.	03+0500.	04+10.36	05+10.48	06+09.60	07+09.28	08+09.57
09+09.91	10+09.46	11+08.99	12+09.80	13+3.344	14-0.876	15-1.456	16-1.782

17-0.294	18-1.179	19-1.678	20-1.946	21-0.023	22-1.222	23-1.894	24-1.961
25+5.249	26+4.992	27+6.452	28+07.61	29+07.92	30+08.07	31+6.277	32+2.871
33+2.065	34-0.740	35-1.707	36-2.308	37-2.362	38-0.428	39-1.722	40-2.119
41-2.293	42-1.048	43-1.953	44-2.323	45-2.194	46+07.34	47+07.13	48+07.89
49+08.47	50+08.98	51+09.99	52+09.22	53+08.44	54+08.87	55-0.421	56-1.361
57-1.567	58-1.604	59-0.718	60-1.633	61-1.961	62-2.051	63-1.135	64-2.006
65-2.377	66-2.263						
01+0121.	02+0165.	03+0600.	04+10.38	05+10.54	06+09.65	07+09.33	08+09.61
09+09.96	10+09.50	11+09.03	12+09.85	13+3.350	14-0.872	15-1.453	16-1.778
17-0.291	18-1.175	19-1.678	20-1.942	21-0.012	22-1.219	23-1.890	24-1.957
25+5.272	26+5.019	27+6.477	28+07.63	29+07.94	30+08.09	31+6.302	32+2.889
33+2.078	34-0.729	35-1.707	36-2.305	37-2.358	38-0.431	39-1.722	40-2.115
41-2.293	42-1.038	43-1.953	44-2.328	45-2.194	46+07.38	47+07.16	48+07.89
49+08.48	50+08.99	51+10.03	52+09.26	53+08.48	54+08.91	55-0.417	56-1.357
57-1.563	58-1.607	59-0.715	60-1.630	61-1.965	62-2.051	63-1.132	64-2.006
65-2.373	66-2.259						
01+0121.	02+0165.	03+0700.	04+10.41	05+10.59	06+09.70	07+09.37	08+09.66
09+10.01	10+09.54	11+09.07	12+09.89	13+3.357	14-0.869	15-1.449	16-1.782
17-0.287	18-1.179	19-1.678	20-1.939	21-0.015	22-1.223	23-1.886	24-1.961
25+5.302	26+5.042	27+6.503	28+07.65	29+07.95	30+08.12	31+6.328	32+2.909
33+2.092	34-0.733	35-1.708	36-2.301	37-2.354	38-0.428	39-1.715	40-2.119
41-2.286	42-1.041	43-1.954	44-2.324	45-2.195	46+07.41	47+07.17	48+07.91
49+08.50	50+09.02	51+10.07	52+09.29	53+08.52	54+08.94	55-0.421	56-1.354
57-1.560	58-1.604	59-0.718	60-1.634	61-1.961	62-2.044	63-1.128	64-1.999
65-2.377	66-2.263						
01+0121.	02+0165.	03+0800.	04+10.43	05+10.63	06+09.74	07+09.41	08+09.70
09+10.05	10+09.58	11+09.10	12+09.92	13+3.363	14-0.876	15-1.457	16-1.778
17-0.287	18-1.179	19-1.678	20-1.935	21-0.015	22-1.223	23-1.886	24-1.961
25+5.325	26+5.063	27+6.534	28+07.66	29+07.97	30+08.15	31+6.354	32+2.921
33+2.108	34-0.733	35-1.704	36-2.301	37-2.362	38-0.428	39-1.715	40-2.119
41-2.286	42-1.041	43-1.954	44-2.320	45-2.195	46+07.44	47+07.19	48+07.92
49+08.52	50+09.04	51+10.11	52+09.32	53+08.55	54+08.97	55-0.421	56-1.361
57-1.560	58-1.604	59-0.718	60-1.634	61-1.961	62-2.044	63-1.128	64-1.999
65-2.377	66-2.263						
01+0121.	02+0165.	03+0900.	04+10.45	05+10.66	06+09.77	07+09.44	08+09.73
09+10.09	10+09.61	11+09.13	12+09.94	13+3.378	14-0.872	15-1.453	16-1.786
17-0.291	18-1.183	19-1.674	20-1.939	21-0.005	22-1.219	23-1.890	24-1.957
25+5.344	26+5.093	27+6.548	28+07.68	29+07.99	30+08.17	31+6.379	32+2.942
33+2.114	34-0.736	35-1.704	36-2.305	37-2.358	38-0.431	39-1.719	40-2.112
41-2.290	42-1.045	43-1.950	44-2.324	45-2.198	46+07.47	47+07.22	48+07.93
49+08.53	50+09.06	51+10.14	52+09.35	53+08.58	54+08.98	55-0.414	56-1.357
57-1.563	58-1.607	59-0.715	60-1.626	61-1.954	62-2.047	63-1.128	64-2.002
65-2.373	66-2.259						
01+0121.	02+0165.	03+1000.	04+10.46	05+10.68	06+09.79	07+09.46	08+09.75
09+10.11	10+09.63	11+09.16	12+09.95	13+3.389	14-0.872	15-1.453	16-1.778
17-0.291	18-1.175	19-1.666	20-1.938	21-0.005	22-1.219	23-1.882	24-1.957
25+5.366	26+5.120	27+6.573	28+07.69	29+08.01	30+08.19	31+6.400	32+2.956
33+2.128	34-0.729	35-1.703	36-2.297	37-2.361	38-0.428	39-1.711	40-2.115
41-2.285	42-1.038	43-1.953	44-2.319	45-2.190	46+07.50	47+07.24	48+07.95
49+08.55	50+09.08	51+10.17	52+09.38	53+08.61	54+09.00	55-0.414	56-1.350
57-1.559	58-1.603	59-0.715	60-1.629	61-1.957	62-2.040	63-1.124	64-1.994
65-2.373	66-2.259						
01+0121.	02+0165.	03+1100.	04+10.47	05+10.70	06+09.81	07+09.48	08+09.77
09+10.13	10+09.65	11+09.18	12+09.94	13+3.399	14-0.872	15-1.452	16-1.777
17-0.284	18-1.175	19-1.673	20-1.934	21+0.001	22-1.219	23-1.882	24-1.957
25+5.380	26+5.141	27+6.593	28+07.72	29+08.02	30+08.22	31+6.429	32+2.977
33+2.144	34-0.729	35-1.703	36-2.296	37-2.357	38-0.425	39-1.711	40-2.114
41-2.281	42-1.038	43-1.942	44-2.319	45-2.190	46+07.51	47+07.26	48+07.96
49+08.57	50+09.11	51+10.20	52+09.41	53+08.63	54+09.00	55-0.410	56-1.350
57-1.555	58-1.600	59-0.708	60-1.622	61-1.957	62-2.039	63-1.124	64-1.998
65-2.365	66-2.258						
01+0121.	02+0165.	03+1200.	04+10.48	05+10.71	06+09.81	07+09.49	08+09.78
09+10.14	10+09.66	11+09.20	12+09.92	13+3.408	14-0.876	15-1.452	16-1.777
17-0.281	18-1.175	19-1.673	20-1.934	21+0.000	22-1.215	23-1.881	24-1.956
25+5.389	26+5.162	27+6.605	28+07.73	29+08.04	30+08.23	31+6.449	32+2.994
33+2.162	34-0.729	35-1.703	36-2.295	37-2.349	38-0.425	39-1.714	40-2.106
41-2.280	42-1.037	43-1.953	44-2.318	45-2.189	46+07.52	47+07.29	48+07.97
49+08.59	50+09.13	51+10.22	52+09.42	53+08.64	54+08.99	55-0.411	56-1.350
57-1.553	58-1.603	59-0.708	60-1.621	61-1.958	62-2.040	63-1.124	64-1.998
65-2.373	66-2.259						

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DAWSON BST TEST SECTION --- SUMMARY OF HOURLY READINGS --- JUNE 13 TO
 CABLE NO. 605 - VERTICAL N.E. NON BST

DAY	HOUR	1	2	3	4
164	1000	3.22	-.886	-1.467	-1.804
164	1100	3.225	-.89	-1.467	-1.792
164	1200	3.234	-.886	-1.467	-1.799
164	1300	3.235	-.89	-1.47	-1.795
164	1400	3.248	-.89	-1.47	-1.794
164	1500	3.249	-.883	-1.466	-1.794
164	1600	3.261	-.89	-1.462	-1.798
164	1700	3.267	-.883	-1.462	-1.794
164	1800	3.271	-.879	-1.466	-1.787
164	1900	3.279	-.879	-1.466	-1.791
164	2000	3.282	-.879	-1.459	-1.791
164	2100	3.29	-.883	-1.463	-1.788
164	2200	3.296	-.883	-1.459	-1.795
164	2300	3.303	-.879	-1.467	-1.792
165	0	3.303	-.883	-1.463	-1.788
165	100	3.313	-.876	-1.459	-1.784
165	200	3.323	-.876	-1.456	-1.788
165	300	3.33	-.872	-1.449	-1.785
165	400	3.336	-.876	-1.456	-1.781
165	500	3.344	-.876	-1.456	-1.782
165	600	3.35	-.872	-1.453	-1.778
165	700	3.357	-.869	-1.449	-1.782
165	800	3.363	-.876	-1.457	-1.778
165	900	3.378	-.872	-1.453	-1.786
165	1000	3.389	-.872	-1.453	-1.778
165	1100	3.399	-.872	-1.452	-1.777
165	1200	3.408	-.876	-1.452	-1.777
165	1300	3.421	-.872	-1.452	-1.784
165	1400	3.43	-.865	-1.451	-1.776
165	1500	3.437	-.868	-1.447	-1.779
165	1600	3.45	-.89	-1.444	-1.775
165	1700	3.462	-.868	-1.447	-1.779
165	1800	3.475	-.868	-1.444	-1.776
165	1900	3.481	-.868	-1.448	-1.78
165	2000	3.491	-.865	-1.444	-1.776
165	2100	3.501	-.861	-1.44	-1.772
165	2200	3.516	-.865	-1.444	-1.776
165	2300	3.526	-.861	-1.441	-1.773
166	0	3.532	-.861	-1.441	-1.773
166	100	3.542	-.861	-1.441	-1.773
166	200	3.549	-.858	-1.437	-1.77
166	300	3.559	-.861	-1.437	-1.773
166	400	3.575	-.851	-1.43	-1.763
166	500	3.585	-.854	-1.434	-1.766
166	600	3.594	-.858	-1.427	-1.763
166	700	3.61	-.854	-1.434	-1.767
166	800	3.62	-.851	-1.431	-1.763
166	900	3.634	-.854	-1.434	-1.767
166	1000	3.647	-.851	-1.43	-1.763
166	1100	3.664	-.851	-1.43	-1.762
166	1200	3.672	-.854	-1.434	-1.766
166	1300	3.687	-.854	-1.433	-1.769

DAWSON BST TEST SECTION ---- SUMMARY OF HOURLY READINGS -- JUNE 13 TO
 29, 1986 CABLE NO. 605 - VERTICAL N.E. NON BST

DAY	HOURL	1	2	3	4
166	1400	3.7	-.858	-1.433	-1.764
166	1500	3.713	-.854	-1.432	-1.771
166	1600	3.727	-.85	-1.436	-1.76
166	1700	3.743	-.858	-1.436	-1.764
166	1800	3.759	-.85	-1.429	-1.76
166	1900	3.774	-.847	-1.425	-1.757
166	2000	3.784	-.85	-1.429	-1.761
166	2100	3.8	-.847	-1.426	-1.754
166	2200	3.813	-.847	-1.426	-1.758
166	2300	3.829	-.843	-1.419	-1.754
167	0	3.838	-.847	-1.426	-1.758
167	100	3.852	-.84	-1.426	-1.751
167	200	3.862	-.84	-1.423	-1.755
167	300	3.881	-.84	-1.416	-1.751
167	400	3.891	-.84	-1.419	-1.752
167	500	3.906	-.836	-1.416	-1.748
167	600	3.922	-.833	-1.416	-1.752
167	700	3.928	-.84	-1.412	-1.752
167	800	3.946	-.833	-1.42	-1.744
167	900	3.966	-.836	-1.416	-1.748
167	1000	3.982	-.836	-1.416	-1.748
167	1100	3.999	-.84	-1.415	-1.747
167	1200	4.01	-.84	-1.419	-1.751
167	1300	4.045	-.833	-1.411	-1.75
167	1400	4.042	-.836	-1.415	-1.746
167	1500	4.058	-.84	-1.418	-1.749
167	1600	4.076	-.84	-1.418	-1.749
167	1700	4.088	-.825	-1.418	-1.742
167	1800	4.103	-.836	-1.414	-1.746
167	1900	4.123	-.833	-1.414	-1.746
167	2000	4.14	-.829	-1.407	-1.742
167	2100	4.15	-.833	-1.404	-1.742
167	2200	4.166	-.829	-1.407	-1.739
167	2300	4.175	-.825	-1.411	-1.743
168	0	4.189	-.826	-1.404	-1.743
168	100	4.204	-.829	-1.404	-1.74
168	200	4.217	-.829	-1.408	-1.74
168	300	4.229	-.822	-1.401	-1.74
168	400	4.248	-.822	-1.401	-1.733
168	500	4.258	-.818	-1.397	-1.737
168	600	4.274	-.815	-1.401	-1.733
168	700	4.289	-.822	-1.398	-1.733
168	800	4.307	-.818	-1.398	-1.73
168	900	4.319	-.818	-1.398	-1.733
168	1000	4.335	-.818	-1.397	-1.729
168	1100	4.351	-.818	-1.397	-1.729
168	1200	4.364	-.822	-1.393	-1.732
168	1300	4.379	-.822	-1.4	-1.732
168	1400	4.397	-.818	-1.396	-1.728
168	1500	4.413	-.818	-1.396	-1.735
168	1600	4.429	-.825	-1.389	-1.727
168	1700	4.438	-.815	-1.396	-1.731

DAWSON BST TEST SECTION ---- SUMMARY OF HOURLY READINGS -- JUNE 13 TO
 29, 1986 CABLE NO. 605 - VERTICAL N.E. NON BST

DAY	HOUR	1	2	3	4
168	1800	4.454	-.818	-1.389	-1.735
168	1900	4.475	-.818	-1.385	-1.724
168	2000	4.486	-.815	-1.389	-1.728
168	2100	4.5	-.818	-1.386	-1.724
168	2200	4.511	-.811	-1.389	-1.72
168	2300	4.525	-.808	-1.386	-1.724
169	0	4.54	-.811	-1.389	-1.721
169	100	4.55	-.815	-1.393	-1.725
169	200	4.559	-.811	-1.386	-1.718
169	300	4.573	-.808	-1.383	-1.721
169	400	4.582	-.808	-1.383	-1.718
169	500	4.6	-.804	-1.379	-1.718
169	600	4.605	-.808	-1.379	-1.718
169	700	4.621	-.804	-1.375	-1.714
169	800	4.632	-.804	-1.383	-1.714
169	900	4.644	-.804	-1.375	-1.718
169	1000	4.658	-.797	-1.375	-1.711
169	1100	4.668	-.808	-1.382	-1.718
169	1200	4.681	-.804	-1.382	-1.714
169	1300	4.695	-.804	-1.382	-1.713
169	1400	4.707	-.8	-1.385	-1.709
169	1500	4.721	-.804	-1.378	-1.72
169	1600	4.728	-.808	-1.378	-1.716
169	1700	4.747	-.8	-1.374	-1.716
169	1800	4.757	-.797	-1.374	-1.713
169	1900	4.767	-.79	-1.375	-1.709
169	2000	4.786	-.8	-1.371	-1.71
169	2100	4.795	-.797	-1.375	-1.706
169	2200	4.801	-.797	-1.375	-1.706
169	2300	4.81	-.793	-1.371	-1.71
170	0	4.826	-.797	-1.368	-1.706
170	100	4.831	-.797	-1.368	-1.706
170	200	4.841	-.793	-1.371	-1.703
170	300	4.856	-.793	-1.368	-1.71
170	400	4.862	-.797	-1.364	-1.703
170	500	4.872	-.79	-1.361	-1.699
170	600	4.879	-.79	-1.368	-1.699
170	700	4.895	-.786	-1.364	-1.703
170	800	4.9	-.786	-1.364	-1.703
170	900	4.908	-.79	-1.361	-1.699
170	1000	4.918	-.786	-1.364	-1.703
170	1100	4.926	-.786	-1.364	-1.702
170	1200	4.939	-.79	-1.36	-1.699
170	1300	4.945	-.786	-1.364	-1.702
170	1400	4.949	-.786	-1.36	-1.698
170	1500	4.955	-.79	-1.367	-1.705
170	1600	4.966	-.79	-1.367	-1.697
170	1700	4.976	-.79	-1.356	-1.694
170	1800	4.983	-.786	-1.356	-1.694
170	1900	4.987	-.779	-1.356	-1.694
170	2000	4.991	-.786	-1.353	-1.694
170	2100	5	-.783	-1.36	-1.698

DAWSON BST TEST SECTION --- SUMMARY OF HOURLY READINGS -- JUNE 13 TO
 29, 1986 CABLE NO. 605 - VERTICAL N.E. NON BST

DAY	HOUR	1	2	3	4
170	2200	5.004	-.779	-1.356	-1.695
170	2300	5.014	-.783	-1.353	-1.691
171	0	5.017	-.779	-1.357	-1.695
171	100	5.021	-.776	-1.353	-1.695
171	200	5.027	-.779	-1.346	-1.692
171	300	5.031	-.779	-1.35	-1.695
171	400	5.04	-.776	-1.35	-1.688
171	500	5.046	-.776	-1.346	-1.684
171	600	5.05	-.779	-1.346	-1.684
171	700	5.061	-.772	-1.342	-1.681
171	800	5.067	-.772	-1.342	-1.688
171	900	5.078	-.775	-1.342	-1.681
171	1000	5.086	-.768	-1.346	-1.684
171	1100	5.088	-.776	-1.342	-1.681
171	1200	5.099	-.772	-1.35	-1.681
171	1300	5.105	-.776	-1.346	-1.684
171	1400	5.113	-.776	-1.342	-1.683
171	1500	5.117	-.776	-1.338	-1.683
171	1600	5.128	-.776	-1.341	-1.679
171	1700	5.139	-.761	-1.338	-1.675
171	1800	5.147	-.768	-1.338	-1.676
171	1900	5.154	-.768	-1.338	-1.683
171	2000	5.156	-.765	-1.338	-1.68
171	2100	5.166	-.765	-1.335	-1.676
171	2200	5.171	-.761	-1.339	-1.677
171	2300	5.175	-.768	-1.339	-1.677
172	0	5.19	-.758	-1.331	-1.673
172	100	5.19	-.761	-1.335	-1.673
172	200	5.2	-.761	-1.335	-1.67
172	300	5.204	-.761	-1.331	-1.677
172	400	5.215	-.758	-1.335	-1.673
172	500	5.221	-.758	-1.332	-1.673
172	600	5.23	-.754	-1.332	-1.67
172	700	5.236	-.754	-1.332	-1.67
172	800	5.247	-.754	-1.332	-1.67
172	900	5.253	-.754	-1.324	-1.67
172	1000	5.262	-.751	-1.328	-1.67
172	1100	5.266	-.758	-1.324	-1.662
172	1200	5.274	-.758	-1.328	-1.666
172	1300	5.278	-.754	-1.331	-1.669
172	1400	5.285	-.751	-1.327	-1.665
172	1500	5.295	-.758	-1.327	-1.665
172	1600	5.296	-.754	-1.324	-1.669
172	1700	5.302	-.754	-1.324	-1.661
172	1800	5.306	-.751	-1.32	-1.665
172	1900	5.315	-.751	-1.324	-1.662
172	2000	5.315	-.754	-1.324	-1.662
172	2100	5.319	-.751	-1.324	-1.658
172	2200	5.319	-.751	-1.32	-1.665
172	2300	5.323	-.747	-1.317	-1.662
173	0	5.323	-.747	-1.324	-1.662
173	100	5.327	-.747	-1.32	-1.662

DAWSON BST TEST SECTION ---- SUMMARY OF HOURLY READINGS -- JUNE 13 TO
 29, 1986 CABLE NO. 605 - VERTICAL N.E. NON BST

DAY	HOUR	1	2	3	4
173	200	5.33	-.743	-1.317	-1.655
173	300	5.33	-.747	-1.313	-1.659
173	400	5.334	-.743	-1.317	-1.659
173	500	5.332	-.747	-1.317	-1.655
173	600	5.336	-.743	-1.313	-1.659
173	700	5.34	-.74	-1.31	-1.659
173	800	5.34	-.74	-1.31	-1.655
173	900	5.342	-.743	-1.313	-1.652
173	1000	5.346	-.736	-1.313	-1.651
173	1100	5.344	-.736	-1.313	-1.651
173	1200	5.346	-.74	-1.309	-1.655
173	1300	5.346	-.74	-1.313	-1.655
173	1400	5.349	-.74	-1.313	-1.655
173	1500	5.346	-.74	-1.302	-1.655
173	1600	5.351	-.74	-1.309	-1.655
173	1700	5.347	-.736	-1.313	-1.651
173	1800	5.347	-.736	-1.306	-1.651
173	1900	5.347	-.736	-1.306	-1.651
173	2000	5.342	-.736	-1.306	-1.651
173	2100	5.346	-.736	-1.309	-1.647
173	2200	5.34	-.733	-1.306	-1.655
173	2300	5.338	-.736	-1.306	-1.644
174	0	5.336	-.733	-1.302	-1.651
174	100	5.332	-.729	-1.295	-1.644
174	200	5.329	-.726	-1.302	-1.644
174	300	5.329	-.722	-1.299	-1.636
174	400	5.323	-.729	-1.295	-1.644
174	500	5.321	-.726	-1.295	-1.64
174	600	5.313	-.726	-1.299	-1.64
174	700	5.313	-.729	-1.299	-1.637
174	800	5.308	-.729	-1.299	-1.644
174	900	5.306	-.729	-1.295	-1.637
174	1000	5.302	-.722	-1.292	-1.637
174	1100	5.298	-.726	-1.295	-1.64
174	1200	5.298	-.722	-1.291	-1.636
174	1300	5.291	-.726	-1.295	-1.64
174	1400	5.291	-.718	-1.295	-1.633
174	1500	5.281	-.726	-1.291	-1.64
174	1600	5.281	-.722	-1.291	-1.636
174	1700	5.279	-.718	-1.288	-1.636
174	1800	5.274	-.718	-1.288	-1.633
174	1900	5.268	-.718	-1.288	-1.633
174	2000	5.262	-.718	-1.288	-1.633
174	2100	5.257	-.722	-1.288	-1.633
174	2200	5.251	-.718	-1.288	-1.625
174	2300	5.245	-.722	-1.288	-1.633
175	0	5.243	-.715	-1.284	-1.629
175	100	5.232	-.715	-1.284	-1.629
175	200	5.23	-.711	-1.281	-1.626
175	300	5.224	-.711	-1.288	-1.626
175	400	5.223	-.711	-1.284	-1.622
175	500	5.217	-.708	-1.284	-1.622

DAWSON BST TEST SECTION --- SUMMARY OF HOURLY READINGS -- JUNE 13 TO
 29, 1986 CABLE NO. 605 - VERTICAL N.E. NON BST

DAY	HOUR	1	2	3	4
175	600	5.211	-.708	-1.284	-1.629
175	700	5.205	-.708	-1.284	-1.629
175	800	5.2	-.708	-1.284	-1.629
175	900	5.194	-.708	-1.277	-1.622
175	1000	5.194	-.711	-1.277	-1.622
175	1100	5.185	-.711	-1.281	-1.626
175	1200	5.185	-.704	-1.281	-1.626
175	1300	5.175	-.708	-1.277	-1.618
175	1400	5.169	-.708	-1.277	-1.622
175	1500	5.166	-.704	-1.273	-1.618
175	1600	5.16	-.708	-1.277	-1.621
175	1700	5.156	-.708	-1.273	-1.621
175	1800	5.15	-.708	-1.273	-1.618
175	1900	5.147	-.708	-1.28	-1.625
175	2000	5.139	-.708	-1.273	-1.621
175	2100	5.133	-.715	-1.273	-1.618
175	2200	5.133	-.701	-1.273	-1.618
175	2300	5.122	-.701	-1.269	-1.614
176	0	5.12	-.704	-1.269	-1.614
176	100	5.112	-.697	-1.273	-1.61
176	200	5.107	-.694	-1.27	-1.607
176	300	5.095	-.701	-1.27	-1.611
176	400	5.093	-.697	-1.266	-1.611
176	500	5.082	-.693	-1.27	-1.607
176	600	5.08	-.701	-1.266	-1.615
176	700	5.072	-.697	-1.266	-1.611
176	800	5.067	-.697	-1.266	-1.611
176	900	5.061	-.693	-1.266	-1.615
176	1000	5.055	-.694	-1.27	-1.607
176	1100	5.051	-.694	-1.266	-1.61
176	1200	5.042	-.694	-1.258	-1.614
176	1300	5.036	-.69	-1.265	-1.613
176	1400	5.037	-.694	-1.262	-1.606
176	1500	5.029	-.694	-1.261	-1.605
176	1600	5.018	-.694	-1.265	-1.602
176	1700	5.018	-.697	-1.261	-1.605
176	1800	5.01	-.69	-1.258	-1.609
176	1900	5	-.694	-1.258	-1.602
176	2000	4.993	-.687	-1.262	-1.606
176	2100	4.991	-.694	-1.258	-1.606
176	2200	4.979	-.69	-1.258	-1.603
176	2300	4.977	-.686	-1.262	-1.599
177	0	4.969	-.69	-1.255	-1.603
177	100	4.967	-.686	-1.262	-1.607
177	200	4.962	-.686	-1.255	-1.599
177	300	4.96	-.683	-1.251	-1.596
177	400	4.958	-.679	-1.255	-1.6
177	500	4.956	-.683	-1.251	-1.596
177	600	4.954	-.679	-1.248	-1.592
177	700	4.952	-.679	-1.244	-1.6
177	800	4.952	-.683	-1.252	-1.596
177	900	4.948	-.679	-1.248	-1.592

DAWSON BST TEST SECTION --- SUMMARY OF HOURLY READINGS --- JUNE 13 TO
 29, 1986 CABLE NO. 605 - VERTICAL N.E. NON BST

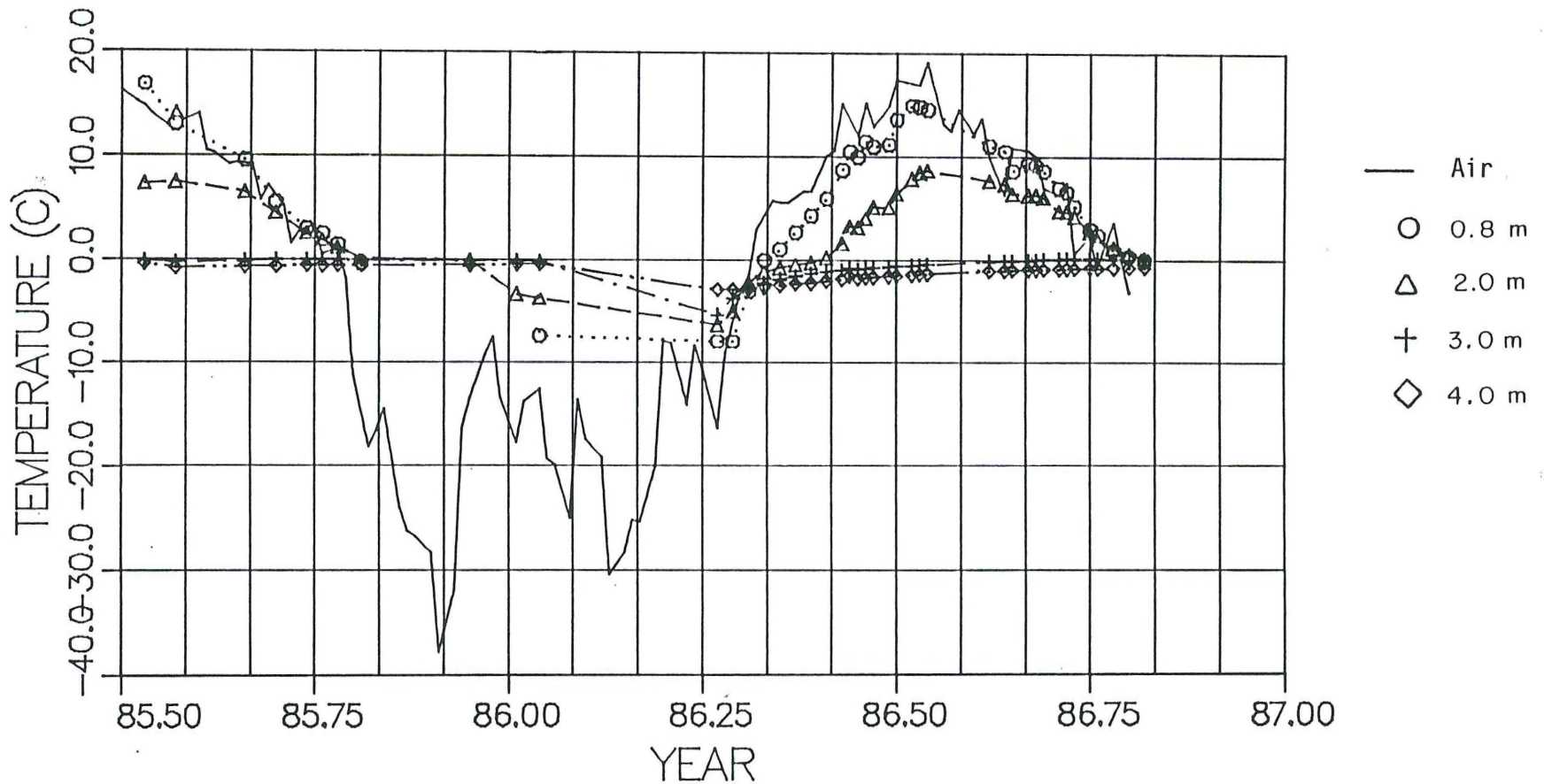
DAY	HOUR	1	2	3	4
177	1000	4.948	-.683	-1.251	-1.596
177	1100	4.956	-.683	-1.248	-1.592
177	1200	4.952	-.683	-1.247	-1.595
177	1300	4.954	-.683	-1.247	-1.591
177	1400	4.958	-.676	-1.251	-1.595
177	1500	4.96	-.679	-1.247	-1.591
177	1600	4.96	-.676	-1.243	-1.59
177	1700	4.964	-.683	-1.247	-1.598
177	1800	4.966	-.672	-1.24	-1.594
177	1900	4.97	-.676	-1.243	-1.595
177	2000	4.968	-.672	-1.247	-1.591
177	2100	4.972	-.676	-1.243	-1.587
177	2200	4.975	-.672	-1.24	-1.591
177	2300	4.979	-.669	-1.244	-1.588
178	0	4.977	-.672	-1.24	-1.592
178	100	4.981	-.676	-1.244	-1.588
178	200	4.988	-.672	-1.244	-1.588
178	300	4.994	-.672	-1.237	-1.581
178	400	4.998	-.665	-1.24	-1.585
178	500	5.007	-.669	-1.237	-1.581
178	600	5.011	-.665	-1.233	-1.578
178	700	5.021	-.665	-1.237	-1.585
178	800	5.026	-.661	-1.237	-1.581
178	900	5.034	-.665	-1.233	-1.578
178	1000	5.04	-.669	-1.237	-1.581
178	1100	5.048	-.665	-1.237	-1.584
178	1200	5.061	-.665	-1.24	-1.584
178	1300	5.071	-.665	-1.232	-1.584
178	1400	5.084	-.669	-1.232	-1.576
178	1500	5.088	-.672	-1.236	-1.583
178	1600	5.102	-.662	-1.236	-1.579
178	1700	5.113	-.662	-1.236	-1.579
178	1800	5.126	-.662	-1.228	-1.583
178	1900	5.136	-.665	-1.232	-1.583
178	2000	5.143	-.665	-1.236	-1.572
178	2100	5.158	-.655	-1.232	-1.576
178	2200	5.168	-.658	-1.225	-1.576
178	2300	5.175	-.662	-1.229	-1.573
179	0	5.187	-.655	-1.233	-1.573
179	100	5.2	-.658	-1.226	-1.577
179	200	5.209	-.662	-1.229	-1.573
179	300	5.219	-.658	-1.226	-1.577
179	400	5.234	-.658	-1.222	-1.566
179	500	5.249	-.651	-1.219	-1.57
179	600	5.26	-.651	-1.226	-1.57
179	700	5.276	-.647	-1.222	-1.566
179	800	5.287	-.654	-1.219	-1.563
179	900	5.31	-.647	-1.215	-1.566
179	1000	5.321	-.651	-1.215	-1.57
179	1100	5.338	-.651	-1.215	-1.57
179	1200	5.353	-.651	-1.218	-1.569
179	1300	5.372	-.651	-1.214	-1.569

DAWSON BST TEST SECTION --- SUMMARY OF HOURLY READINGS --- JUNE 13 TO
 29, 1986 CABLE NO. 605 - VERTICAL N.E. NON BST

DAY	HOUR	1	2	3	4
179	1400	5.389	-.651	-1.214	-1.565
179	1500	5.409	-.655	-1.221	-1.565
179	1600	5.428	-.651	-1.218	-1.568
179	1700	5.445	-.651	-1.218	-1.568
179	1800	5.46	-.648	-1.221	-1.565
179	1900	5.479	-.644	-1.218	-1.561
179	2000	5.5	-.648	-1.211	-1.565
179	2100	5.511	-.644	-1.218	-1.561
179	2200	5.532	-.64	-1.214	-1.558
179	2300	5.547	-.644	-1.211	-1.562
180	0	5.562	-.647	-1.214	-1.558
180	100	5.577	-.644	-1.211	-1.562
180	200	5.597	-.64	-1.211	-1.558
180	300	5.612	-.64	-1.207	-1.562
180	400	5.625	-.644	-1.207	-1.551
180	500	5.646	-.64	-1.204	-1.559

APPENDIX C

Temperature vs Time	Drawings No. 4262-C-1 to 4262-C-9
Cross Section Showing Maximum Recorded Thaw Depth	Drawings No. 4262-C-10 to 4262-C-12
Plot of 0°C Isotherm Beneath Road Surface	Drawings No. 4262-C-13 to 4262-C-15
Ground Temperature at 1.0 m Depth	Drawing No. 4262-C-16



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT
GOVERNMENT OF YUKON

TITLE TEMPERATURE vs TIME
CABLE 605: NON-BST
FOURTH AVE. & HARPER ST.

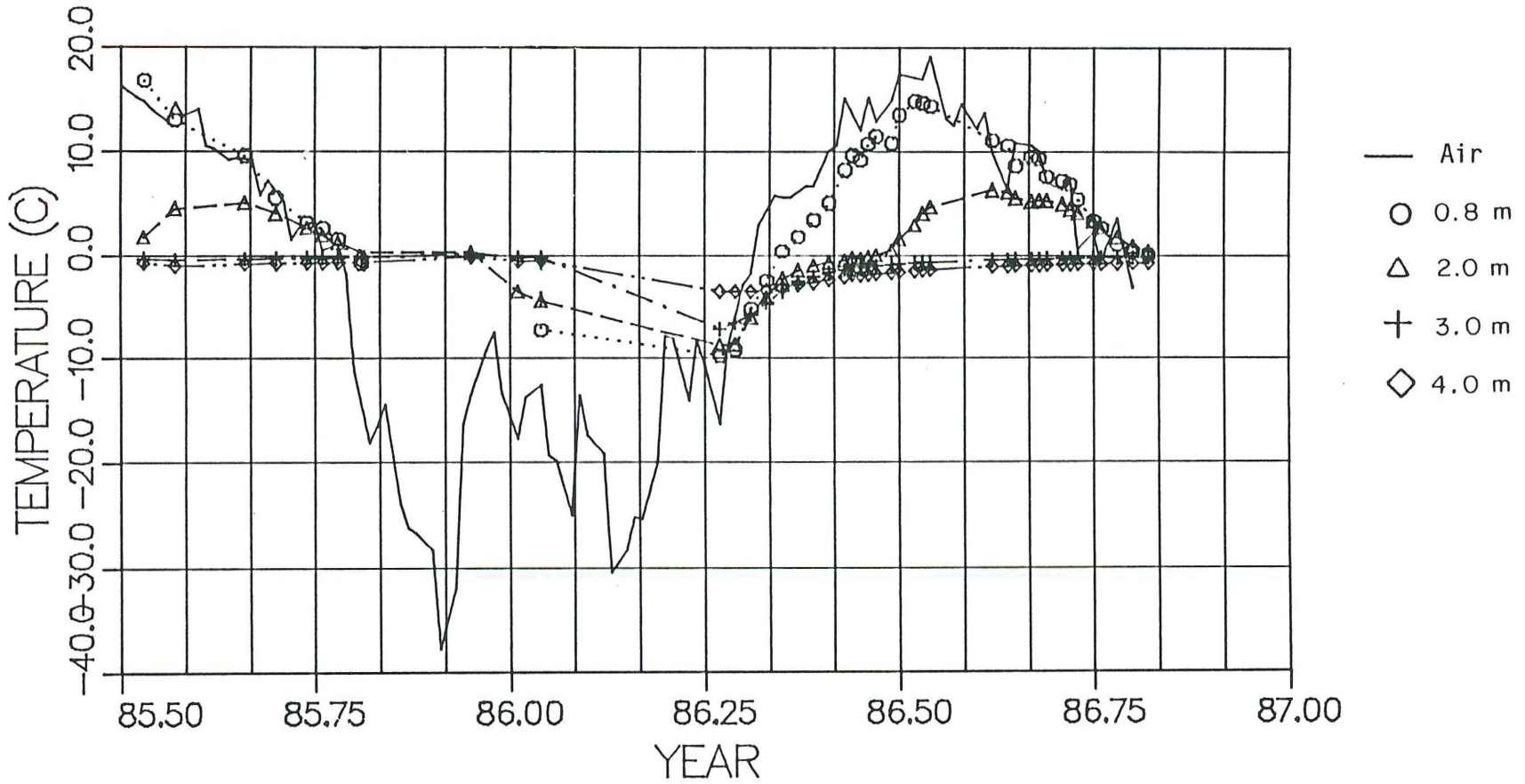
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DWN WAS

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DWG NO. 4262-C-1

0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT
GOVERNMENT OF YUKON

TITLE TEMPERATURE vs TIME
CABLE 608: NON-BST
FOURTH AVE. & HARPER ST.

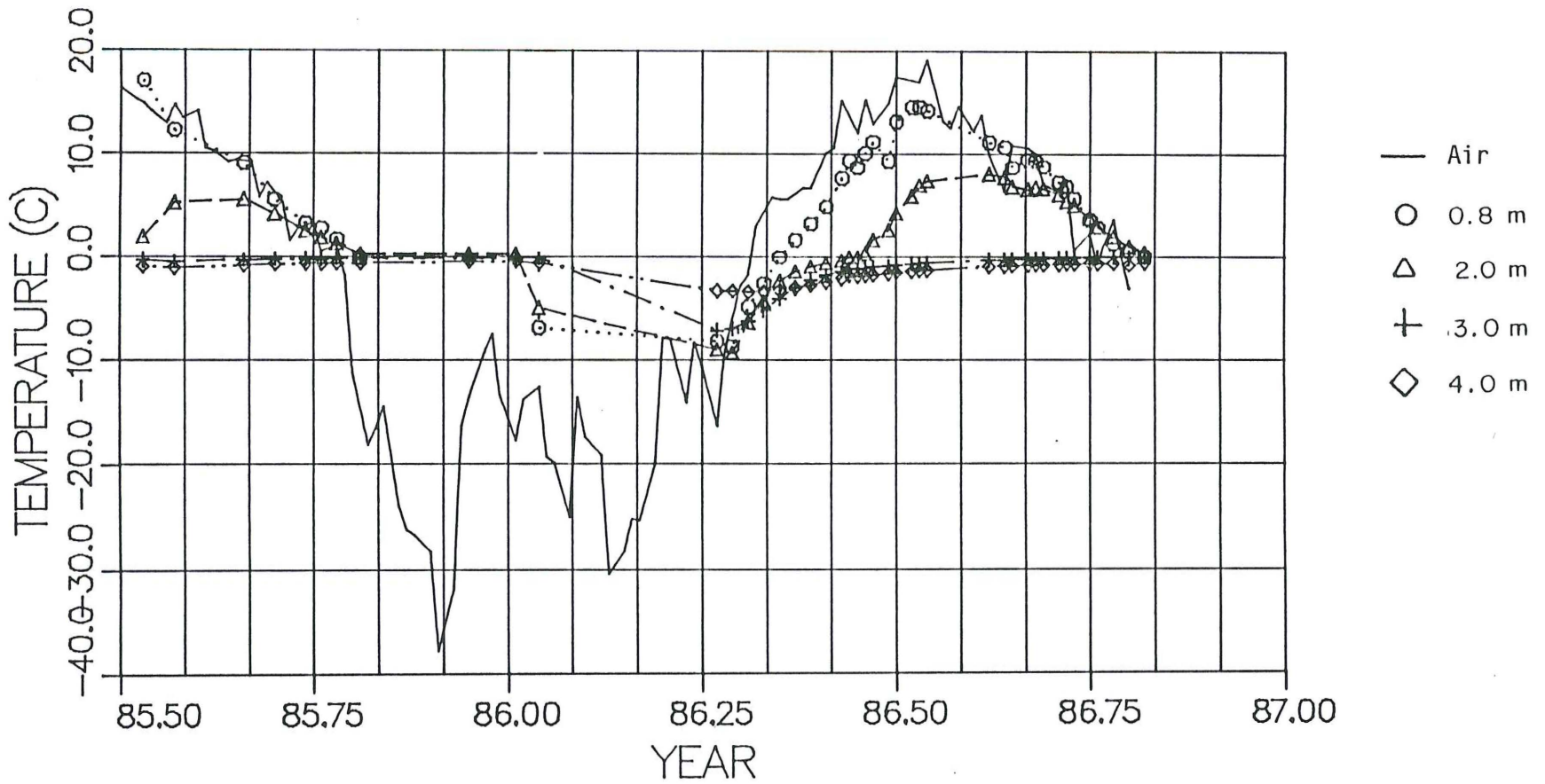
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DWN WAS

CHKD

DWG NO. 4262-C-2

0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT GOVERNMENT OF YUKON

TITLE TEMPERATURE vs TIME
CABLE 604: NON-BST
FOURTH AVE. & HARPER ST.

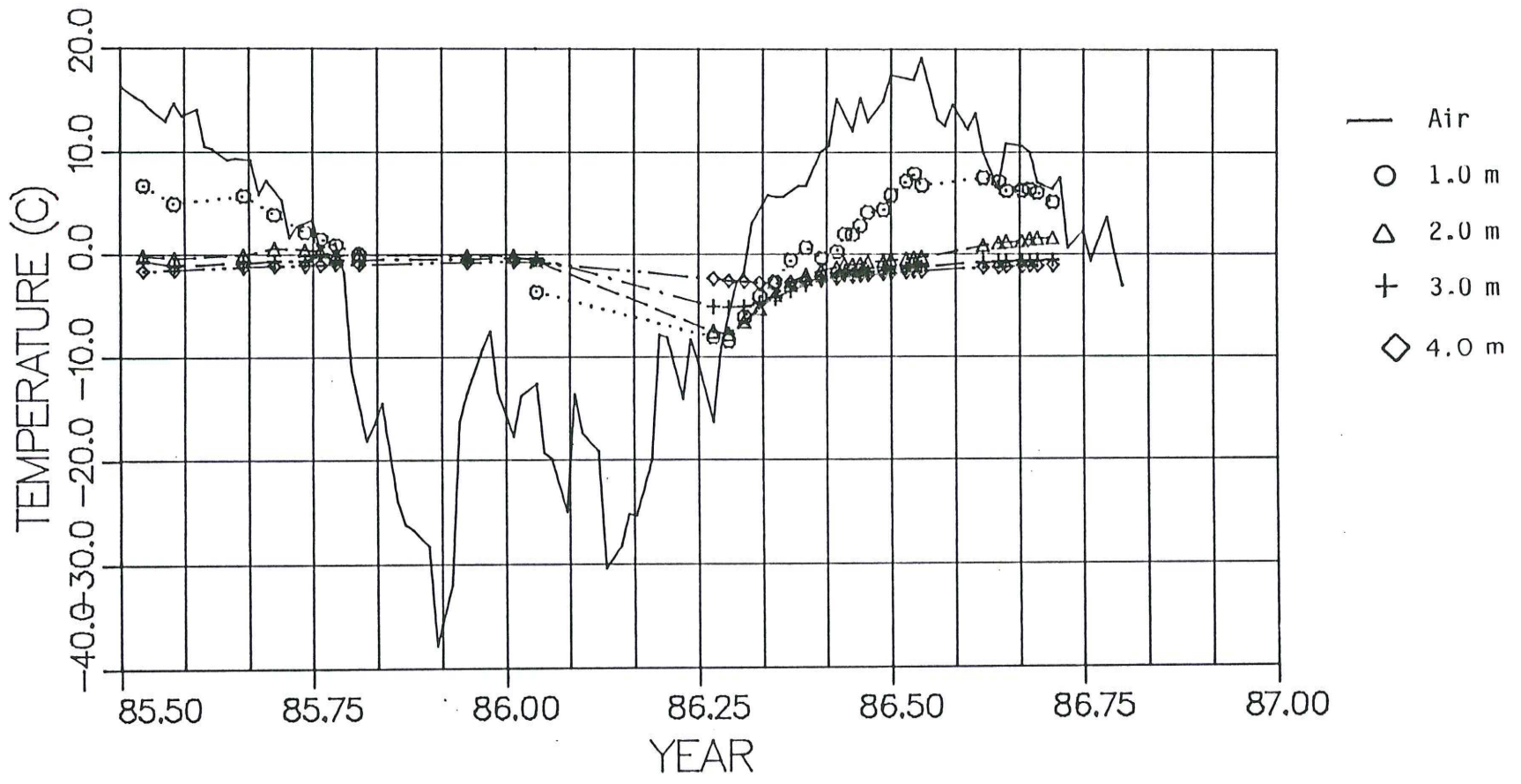
DATE 87-02-10

DWN WAS

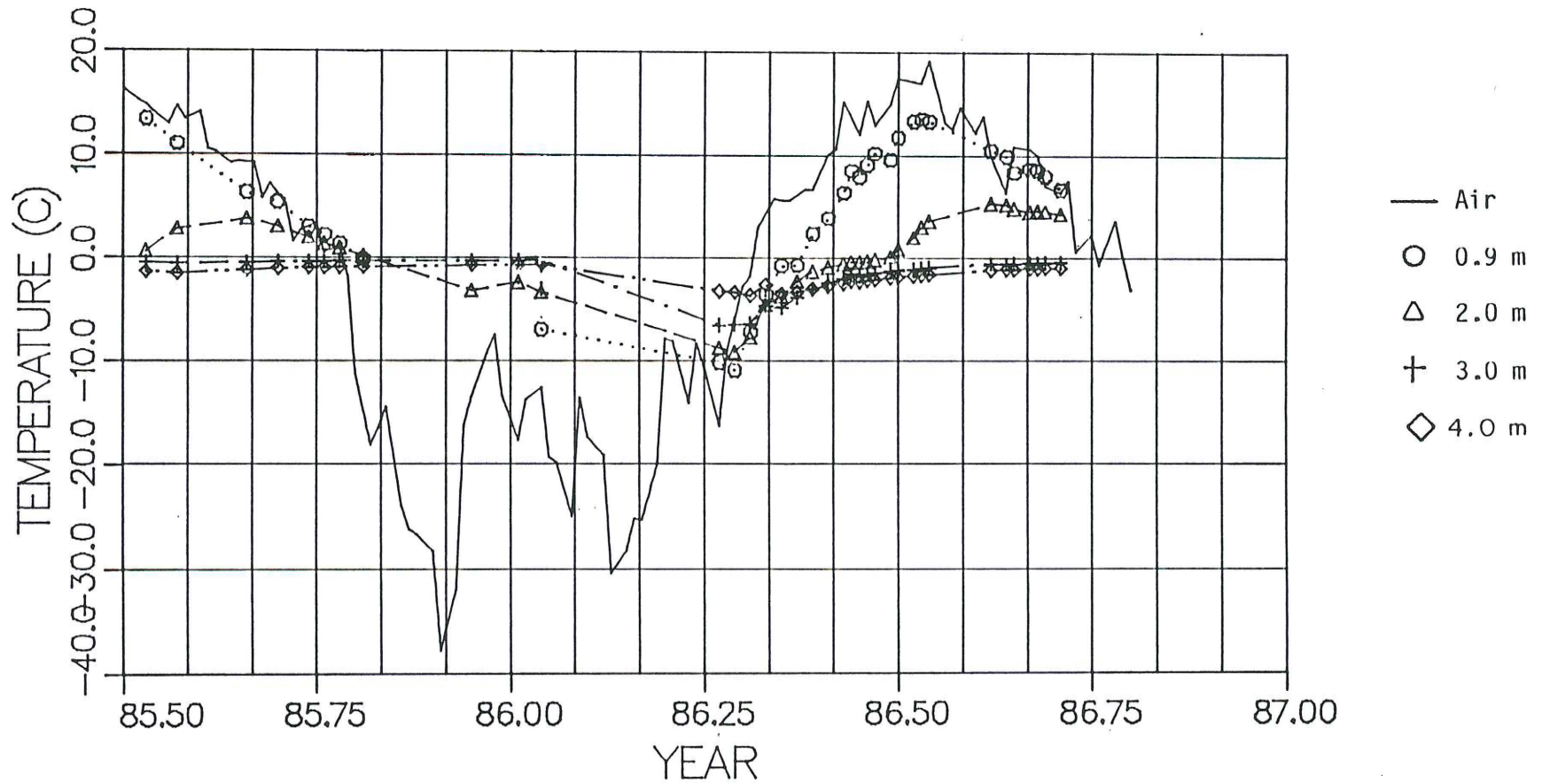
CHKD

DWG NO. 4262-C-3

0201-4262



EBA Engineering Consultants Ltd.			PROJECT	BST TEST SECTION DAWSON CITY, Y.T.
CLIENT GOVERNMENT OF YUKON			TITLE	TEMPERATURE vs TIME CABLE 606: BST FOURTH AVENUE
DATE	DWN	CHKD	DWG NO.	
87-02-10	WAS	<i>[Signature]</i>	4262-C-4	0201 - 4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT
GOVERNMENT OF YUKON

TITLE TEMPERATURE vs TIME
CABLE 603: BST
FOURTH AVENUE

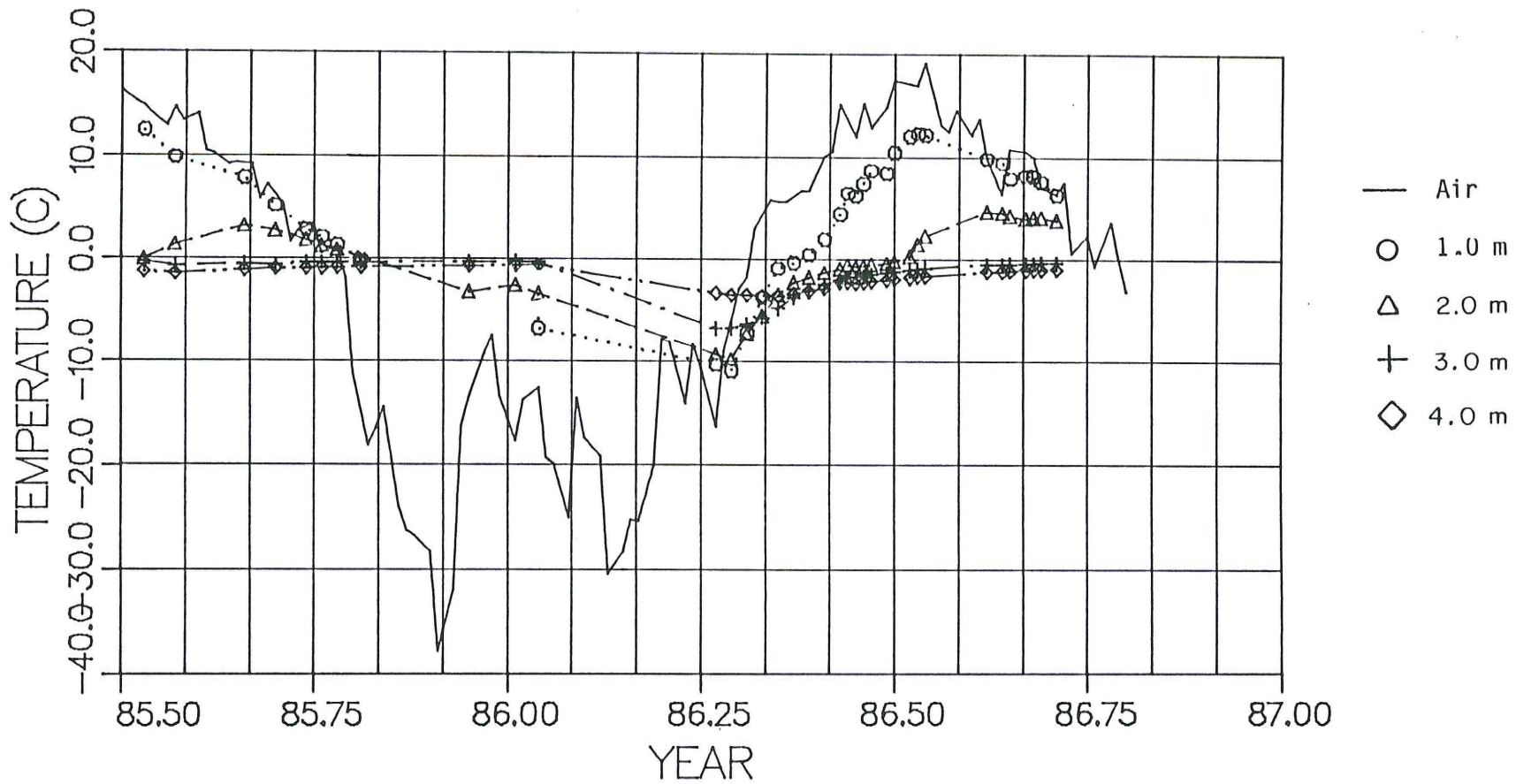
DATE 87-02-10

DWN WAS

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DWG NO. 4262-C-5

0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT
GOVERNMENT OF YUKON

TITLE TEMPERATURE vs TIME
CABLE 609: BST
FOURTH AVENUE

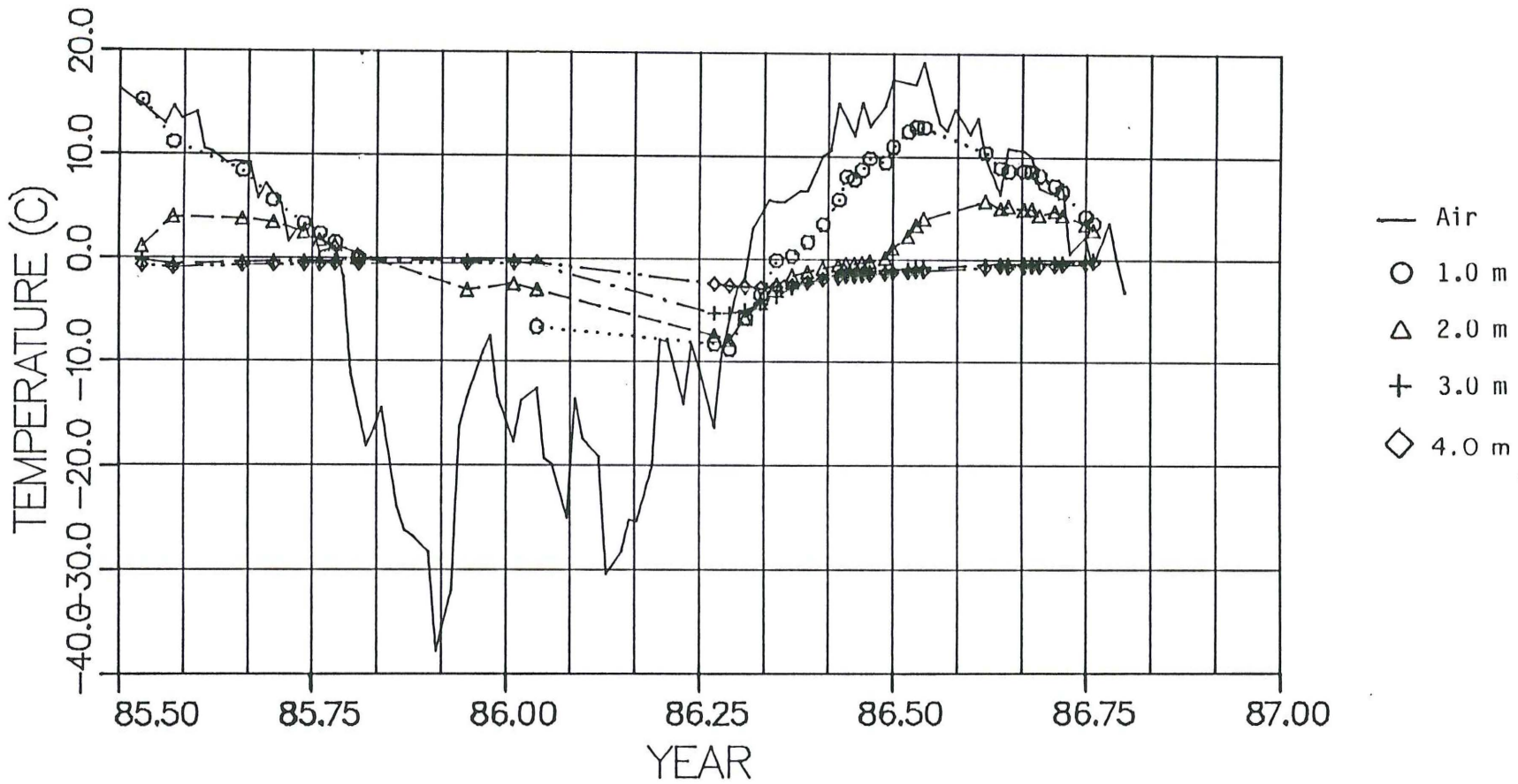
DATE 87-02-10

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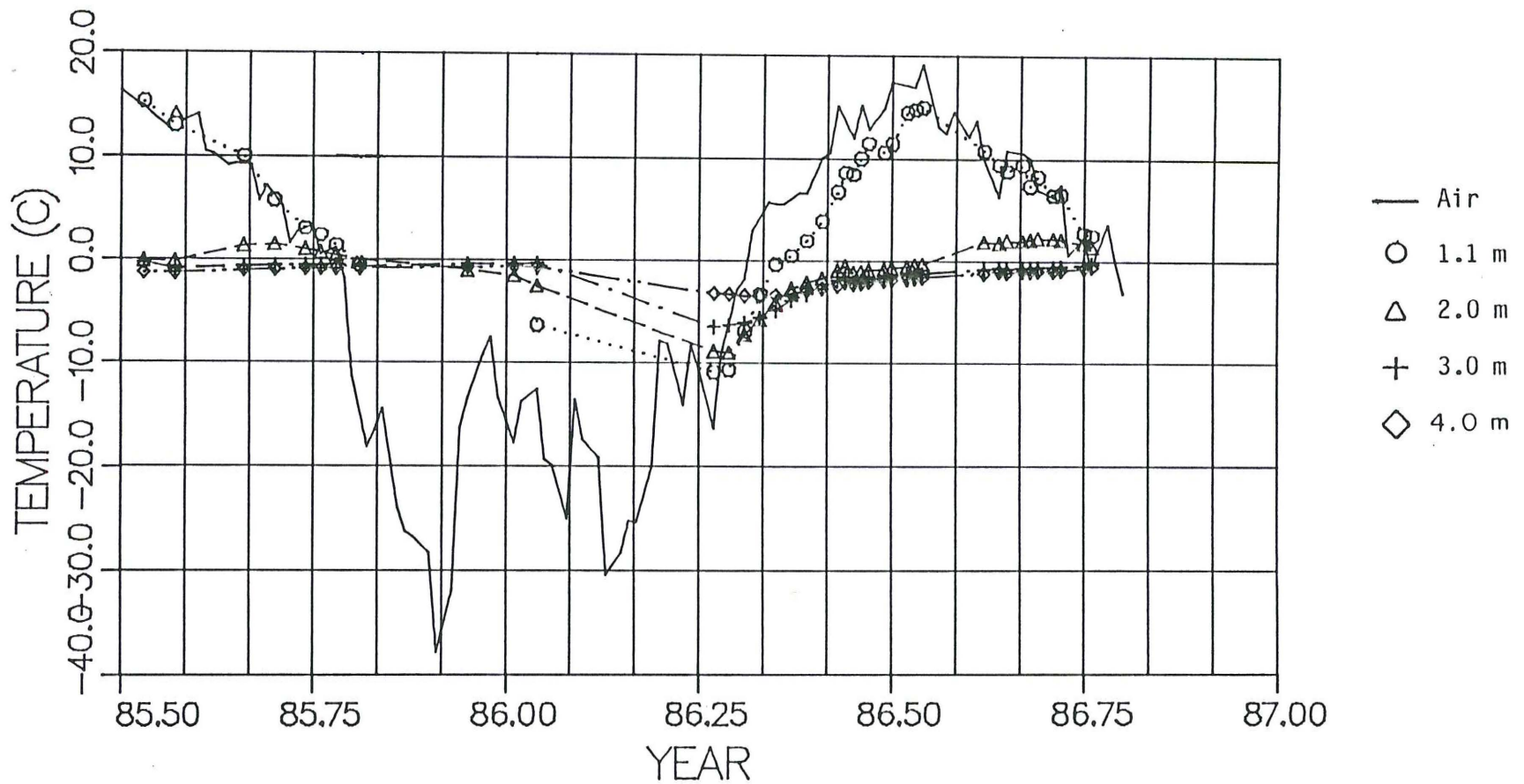
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DWG NO. 4262-C-6

0201-4262



EBA Engineering Consultants Ltd.			PROJECT BST TEST SECTION DAWSON CITY, Y.T.	
CLIENT GOVERNMENT OF YUKON			TITLE TEMPERATURE vs TIME CABLE 611: BST CHURCH STREET	
DATE 87-02-10	DWN WAS	CHKD <i>[Signature]</i>	DWG NO. 4262-C-7	0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT GOVERNMENT OF YUKON

TITLE TEMPERATURE vs TIME
CABLE 610: BST
CHURCH STREET

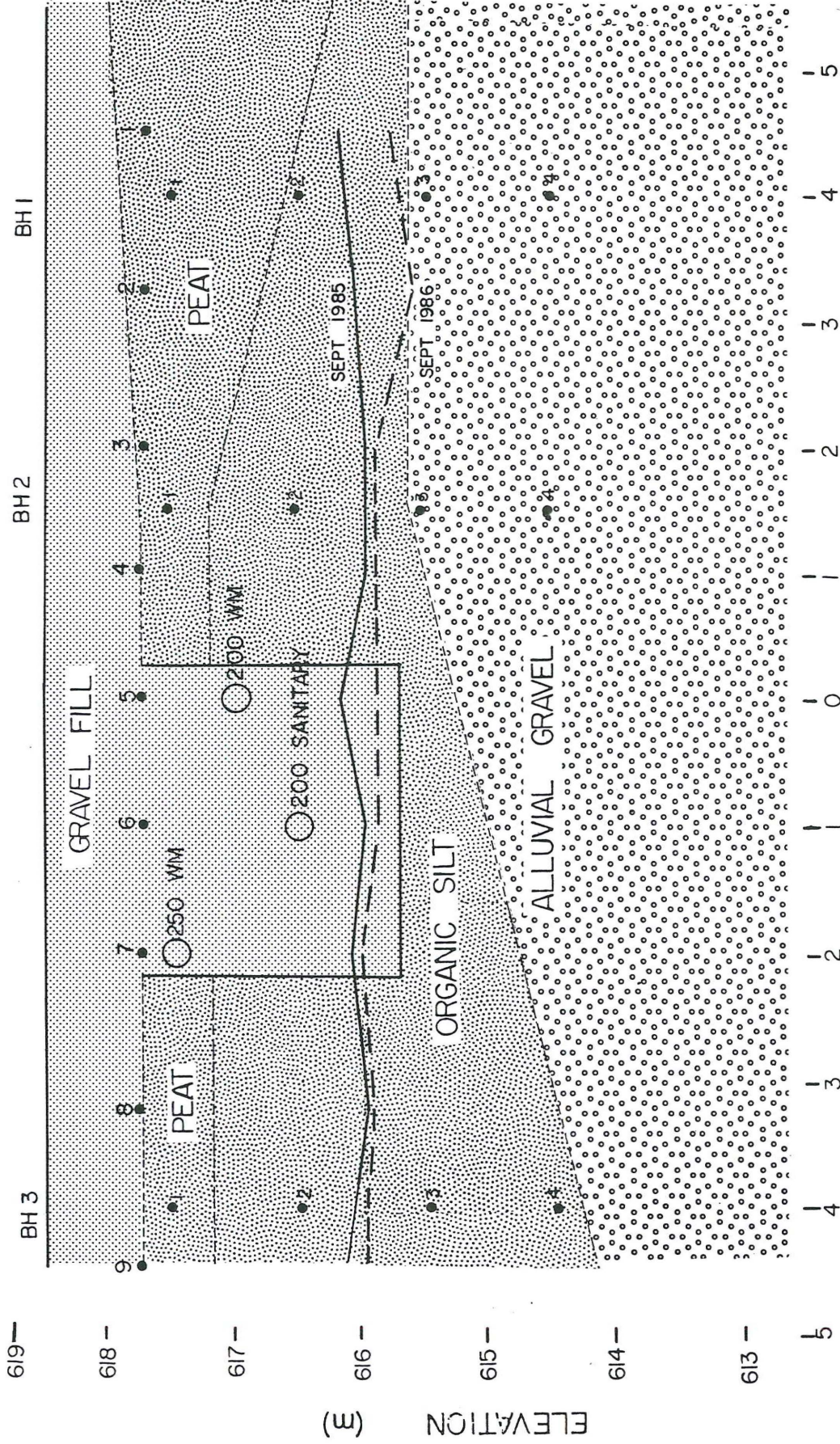
DATE 87-02-10

DWN WAS

CHKD

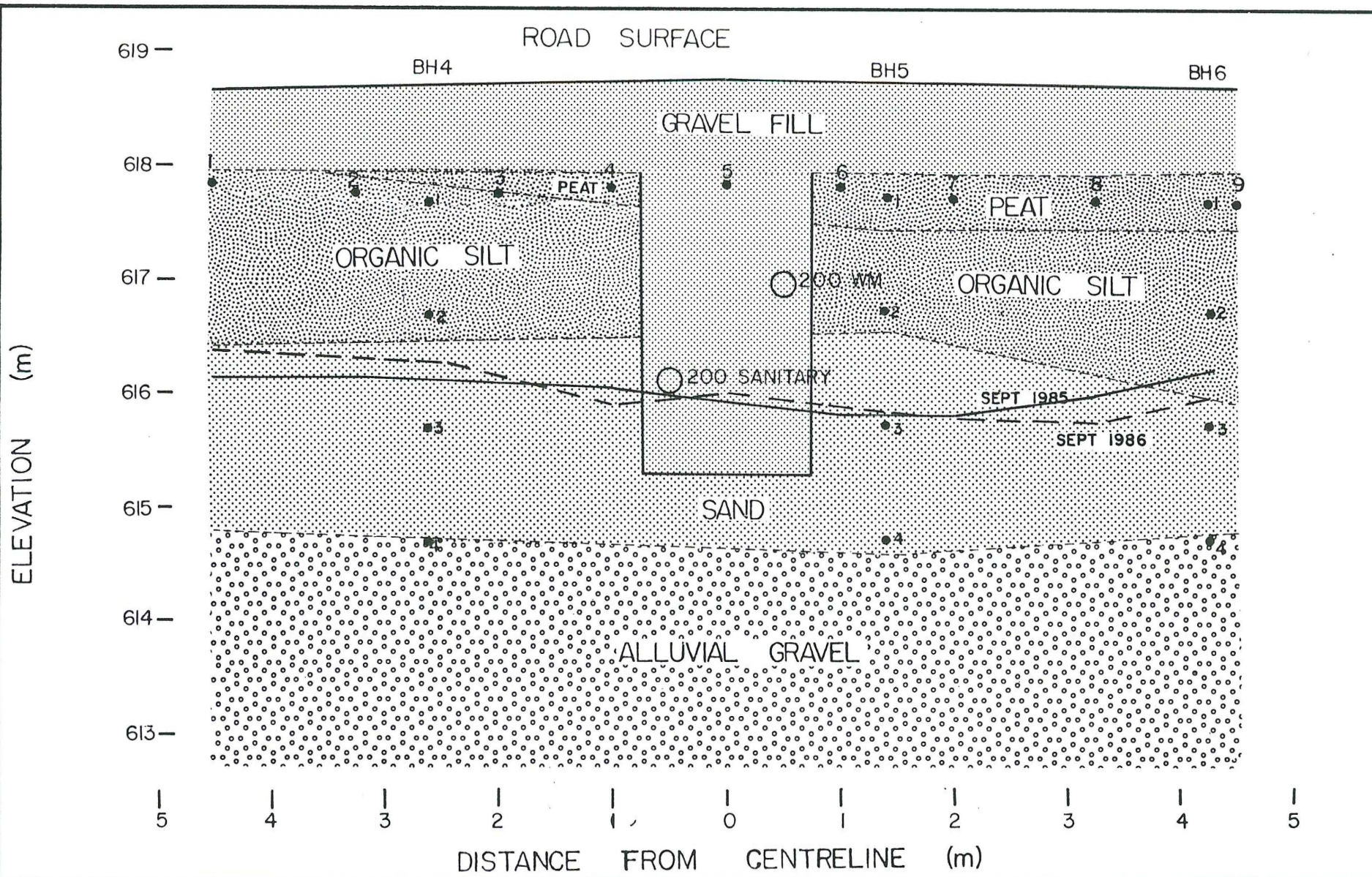
DWG NO. 4262-C-9

ROAD SURFACE

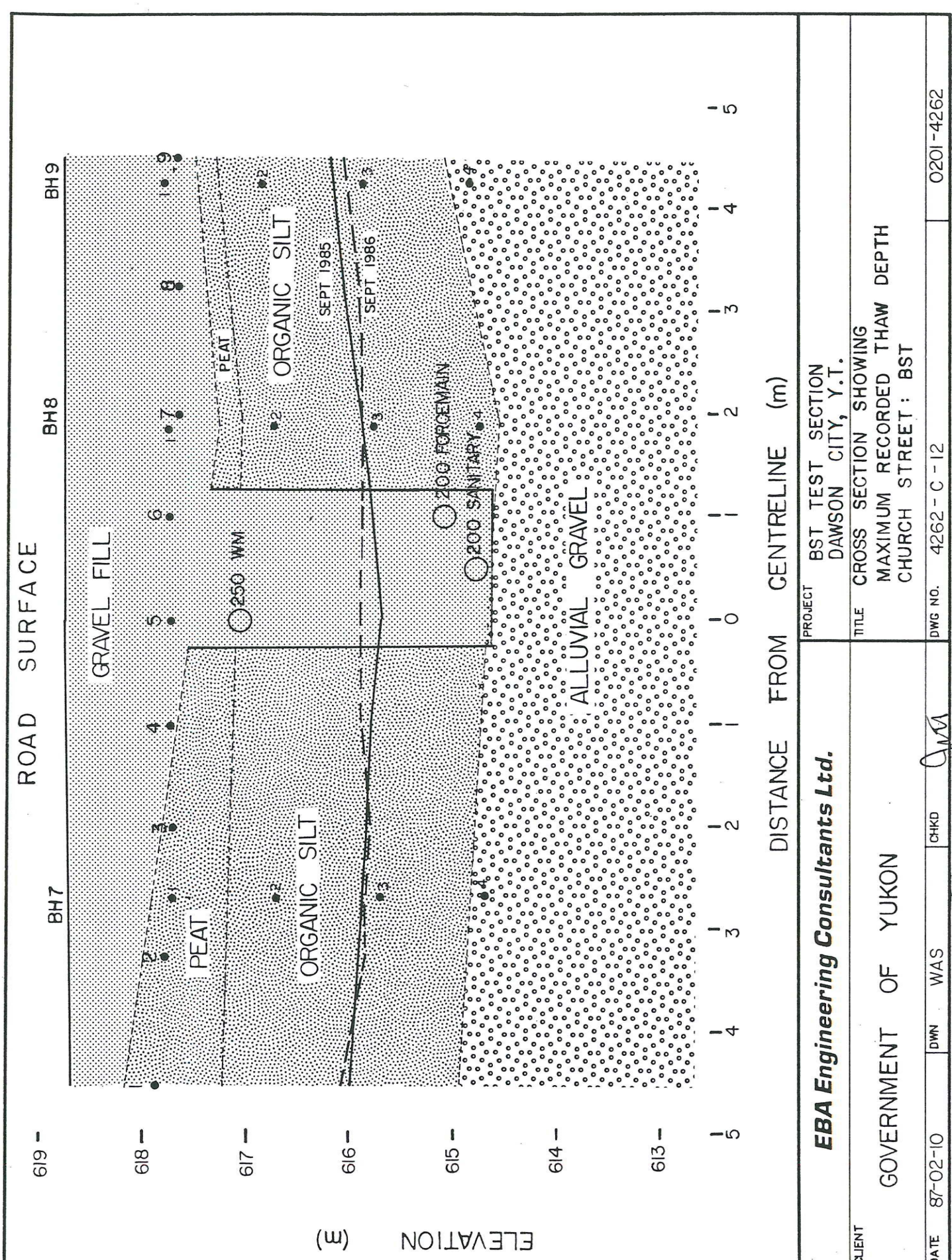


DISTANCE FROM CENTRELINE (m)

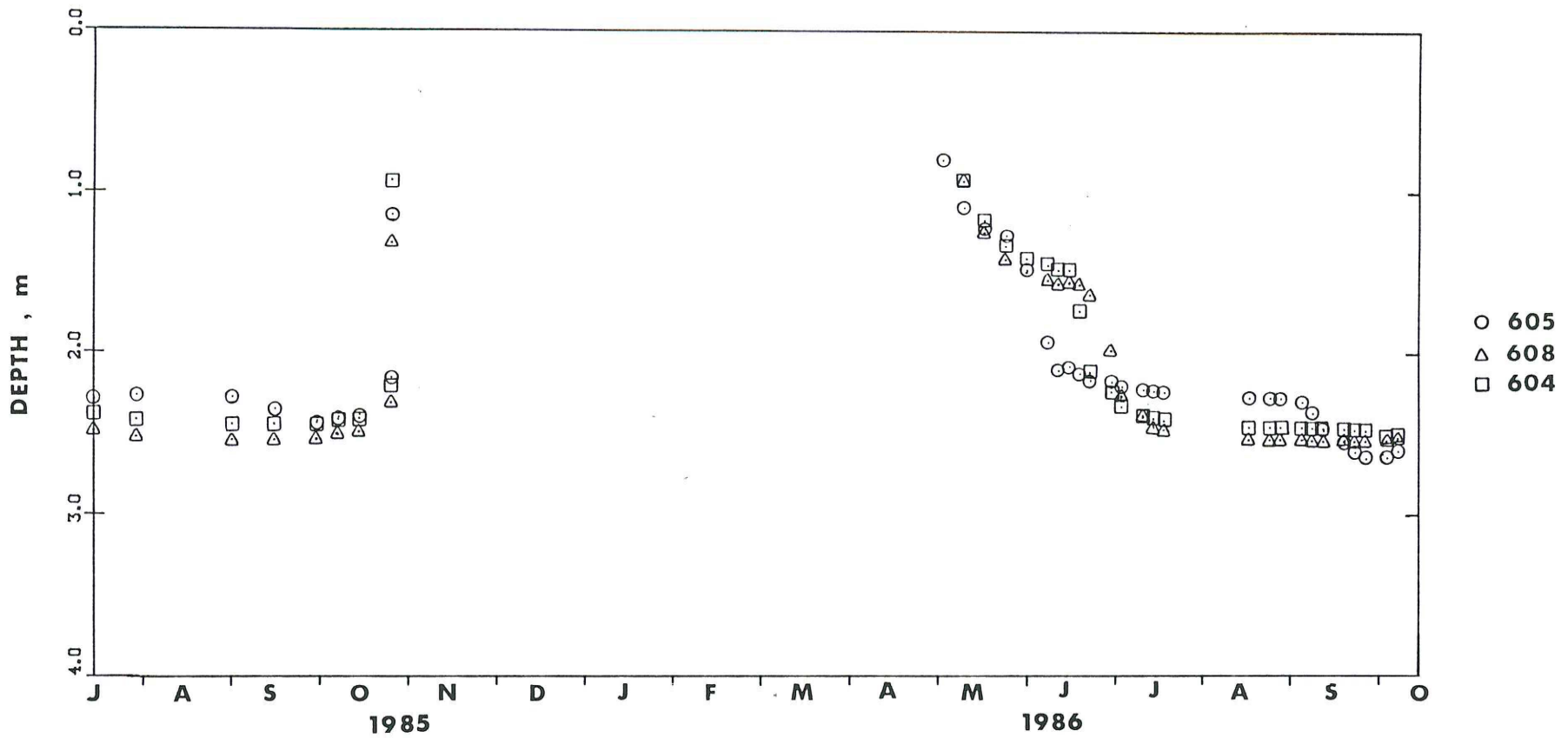
EBA Engineering Consultants Ltd.		PROJECT	BST TEST SECTION DAWSON CITY, Y.T.
GOVERNMENT OF YUKON		TITLE	CROSS SECTION SHOWING MAXIMUM RECORDED THAW DEPTH FOURTH AVE. & HARPER ST.
DATE	87-02-10	DWN	WAS
		CHKD	<i>[Signature]</i>
		DWG NO.	4262-C-10
			0201-4262



EBA Engineering Consultants Ltd.		PROJECT BST TEST SECTION DAWSON CITY, Y.T.	
CLIENT GOVERNMENT OF YUKON		TITLE CROSS SECTION SHOWING MAXIMUM RECORDED THAW DEPTH FOURTH AVENUE: BST	
DATE 87-02-10	DWN WAS	CHKD <i>[Signature]</i>	DWG NO. 4262-C-11
			0201-4262



CLIENT	EBA Engineering Consultants Ltd.		
	GOVERNMENT OF YUKON		
PROJECT	BST TEST SECTION DAWSON CITY, Y.T.		
TITLE	CROSS SECTION SHOWING MAXIMUM RECORDED THAW DEPTH CHURCH STREET: BST		
DATE	87-02-10	DWN	WAS
		CHKD	<i>[Signature]</i>
DWG NO.	4262 - C - 12		0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT GOVERNMENT OF YUKON

TITLE PLOT OF 0°C ISOTHERM
BENEATH ROAD SURFACE
FOURTH AVE. & HARPER ST.: NON-EST

DATE 87-02-10

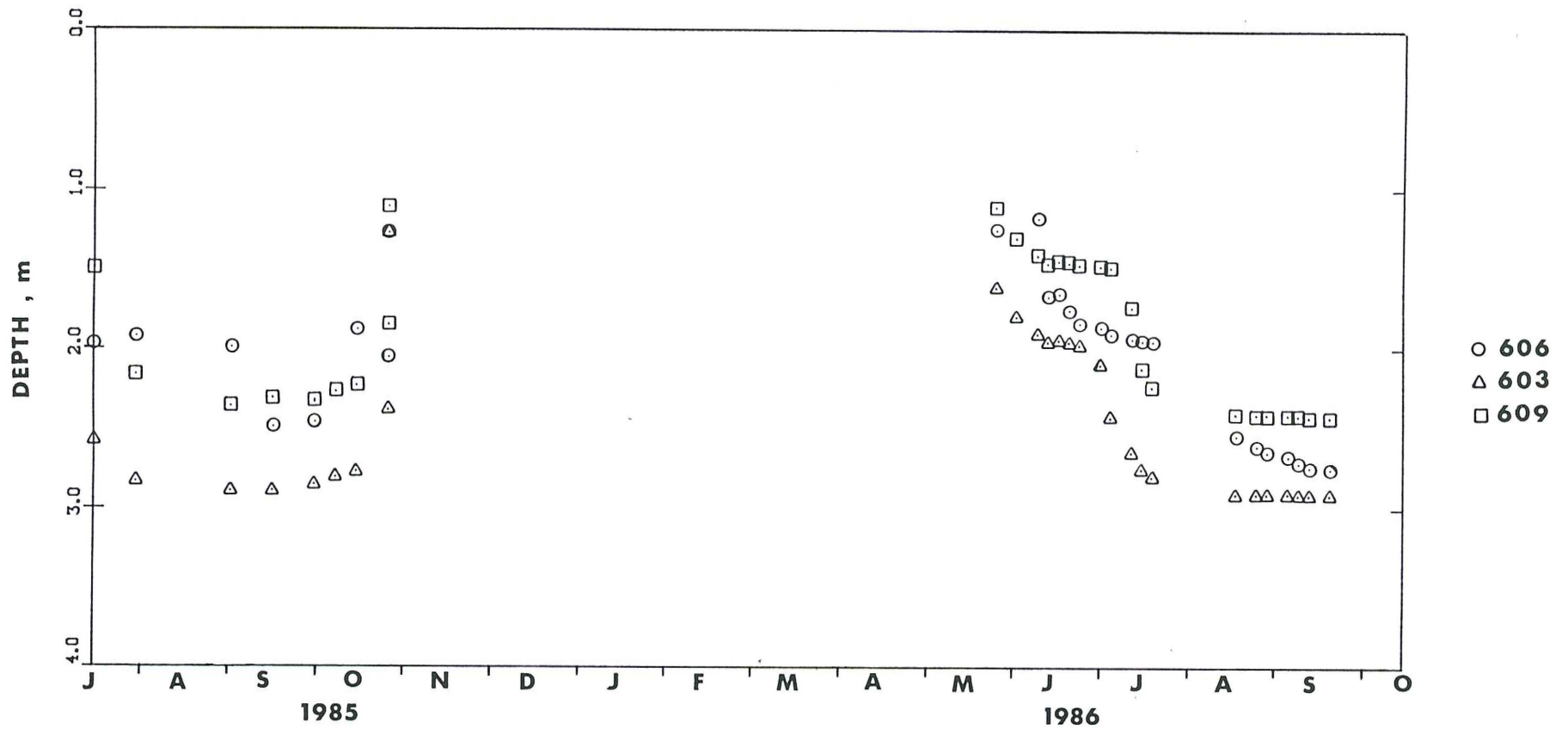
DWN WAS

CHKD

Qut

DWG NO. 4262-C-13

0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT
GOVERNMENT OF YUKON

TITLE PLOT OF 0°C ISOTHERM
BENEATH ROAD SURFACE
FOURTH AVENUE: BST

DATE 87-02-10

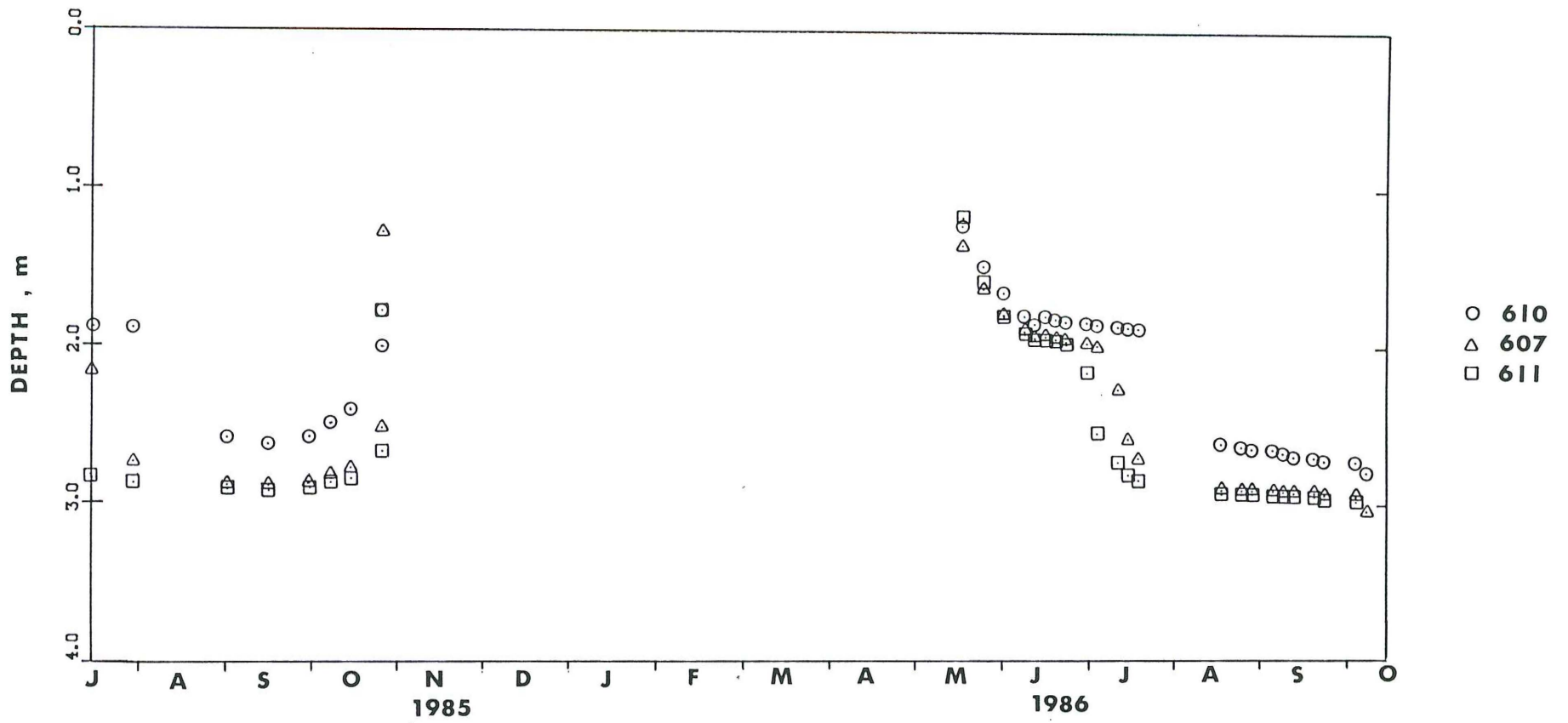
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DWG NO. 4262-C-14

0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
DAWSON CITY, Y.T.

CLIENT
GOVERNMENT OF YUKON

TITLE PLOT OF 0°C ISOTHERM
BENEATH ROAD SURFACE
CHURCH STREET: BST

DATE 87-02-10

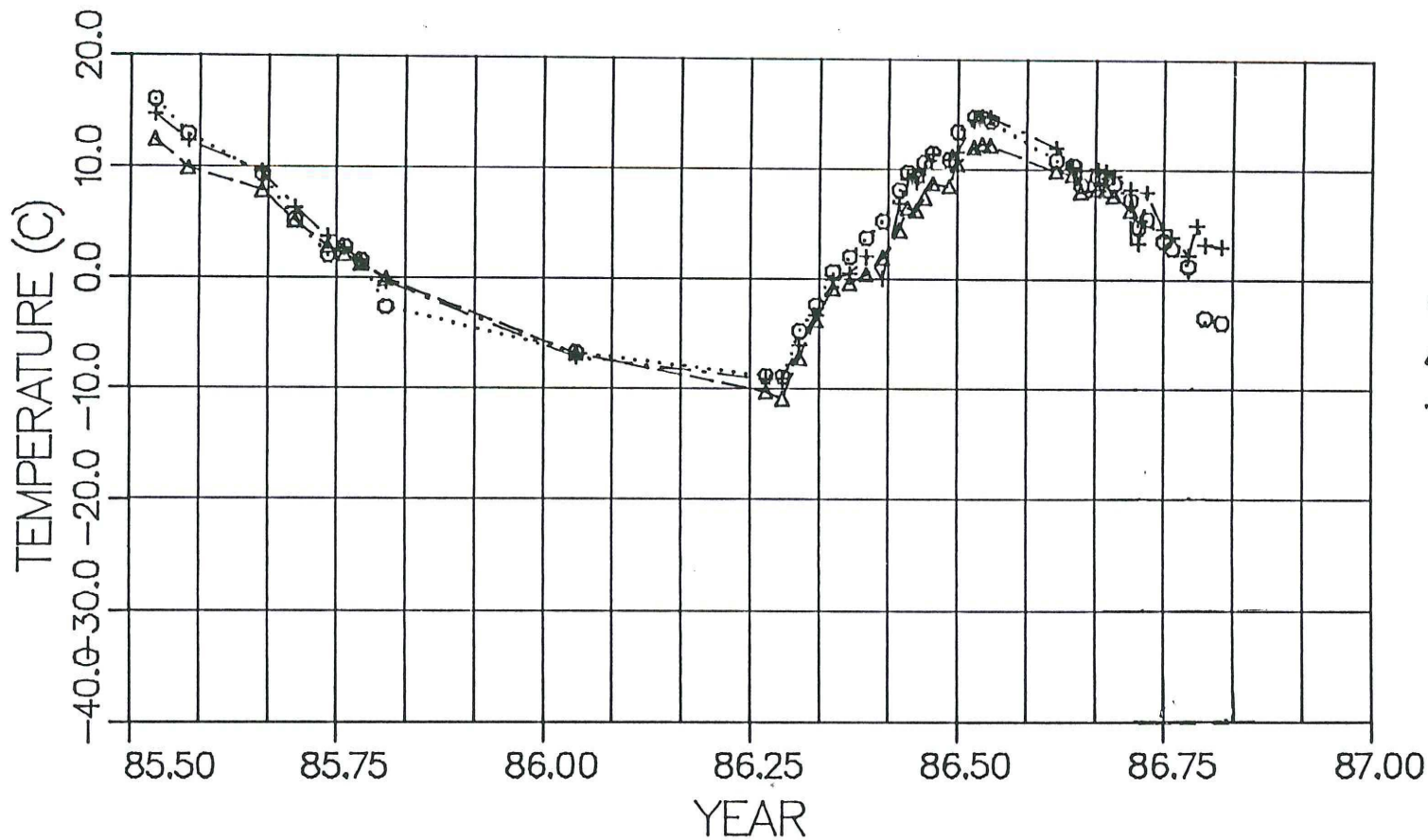
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DWG NO. 4262-C-15

0201-4262



EBA Engineering Consultants Ltd.

PROJECT BST TEST SECTION
 DAWSON CITY, Y.T.

CLIENT
 GOVERNMENT OF YUKON

TITLE
 GROUND TEMPERATURE AT 1.0 m DEPTH

DATE 87-02-10

DWN WAS

CHKD

DWG NO. 4262 - C - 16

0201-4262