April 15, 2005
KX0439801

City of Quesnel
410 Kinchant Street
Quesnel, BC V2J 7J5

Attention: Mr. Jack Marsh, Director of Public Works

RE: ON-GOING MONITORING – UPDATE REPORT FOR 2004
WEST QUESNEL LAND STABILITY STUDY

1.0 INTRODUCTION

This purpose of this letter report is to provide the City of Quesnel (CoQ) with an update of the on-going monitoring of slope inclinometer (SI) instruments, groundwater levels, precipitation data and Terasen's ground surface movement hubs for the West Quesnel area conducted during 2004.

2.0 SLOPE INCLINOMETER MONITORING

Since installation and initial survey of the seven SI installations in the late fall of 2000, AMEC has conducted 15 monitoring visits and one groove spiral survey. Table 1 summarizes the SI monitoring schedule to date:

Table 1: Slope Inclinometer Monitoring Schedule

Installation:	SI-1	SI-2	SI-3	SI-4	SI-5	SI-6	SI-7
Location:	Avery Lane	Avery Lane	Abbott Drive	Voyager School	Abbott Drive	Dixon Street	Pierce Crescent
Depth SI Read	142 ft / 43 m	244 ft/ 74 m	334 ft / 102 m	504 ft / 154 m	474 ft / 144 m	502 ft / 153 m	410 ft / 125 m
Initial Reading	21 Nov 2000	21 Nov 2000	21 Nov 2000	03 Nov 2000	28 Oct 2000	22 Nov 2000	22 Nov 2000
Reading 1				24 Nov 2000	24 Nov 2000		
Reading 2	07 Dec 2000	07 Dec 2000	06 Dec 2000	06 Dec 2000	06 Dec 2000	06 Dec 2000	07 Dec 2000
Reading 3	12 Jan 2001	11 Jan 2001	12 Jan 2001	11 Jan 2001	12 Jan 2001	11 Jan 2001	12 Jan 2001
Reading 4	05 Mar 2001	05 Mar 2001	06 Mar 2001	05 Mar 2001	06 Mar 2001	05 Mar 2001	06 Mar 2001
Reading 5	02 Apr 2001	02 Apr 2001	03 Apr 2001	02 Apr 2001	03 Apr 2001	02 Apr 2001	03 Apr 2001
Reading 6	28 Apr 2001	28 Apr 2001	28 Apr 2001	28 Apr 2001	29 Apr 2001	28 Apr 2001	29 Apr 2001
Spiral Survey	11 Jun 2001	11 Jun 2001	12 Jun 2001	11 Jun 2001	12 Jun 2001	11 Jun 2001	12 Jun 2001
Reading 7	18 Jun 2001	13 Jun 2001	14 Jun 2001	14 Jun 2001	14 Jun 2001	13 Jun 2001	14 Jun 2001
Reading 8	04 Oct 2001	04 Oct 2001	04 Oct 2001	04 Oct 2001	04 Oct 2001	26 Sep 2001	04 Oct 2001
Reading 9	20 Nov 2001	19 Nov 2001	19 Nov 2001	19 Nov 2001	19 Nov 2001	19 Nov 2001	20 Nov 2001
Reading 10	06 May 2002	06 May 2002	06 May 2002	06 May 2002	06 May 2002	**Blocked-28m**	06 May 2002
Reading 11	19 Nov 2002	19 Nov 2002	**Blocked-39m**	**Blocked-51m**	19 Nov 2002	"	**Blocked–68m**
Reading 12	15 Aug 2003	15 Aug 2003	"	"	15 Aug 2003	"	15 Aug 2003*
Reading 13	02 Dec 2003	02 Dec 2003	"	"	02 Dec 2003	"	02 Dec 2003*
Reading 14	24 Jun 2004	24 Jun 2004	"	"	**Blocked-35m**	"	24 Jun 2004*
Reading 15	10 Nov 2004	10 Nov 2004	"	"	"	"	10 Nov 2004*

* The SI casing was blocked at a depth of 68 m on November 19, 2002; subsequent measurements conducted above 68 m depth.

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The SI-3, SI-4, SI-6 and SI-7 installations became blocked at depth by slide movement during 2002. For 2004 the intent was to monitor the remaining functional installations, SI-1, SI-2, SI-5 and just the upper portion of SI-7 twice per year. SI-5 was found blocked at a depth of 35.4 m during the monitoring trip conducted on 24 June 2004. The latest set of measurement readings was gathered on 10 November 2004, which included the remaining fully functional installations SI-1, SI-2, and only the upper portion of the partially blocked SI-7.

Attached in Appendix A, are plots of the SI readings to date. The SI readings are generally presented in incremental and cumulative displacement plots, with a 50 mm and 100 mm horizontal displacement scale versus depth. The incremental plots show the individual changes in inclination of the casing at each reading depth. Consistent sharp sideways spikes in the incremental data plots are typical of slide shearing surfaces at depth. The cumulative displacement plots are constructed by adding together the incremental changes starting from the bottom of the installation and show the overall apparent lateral displacement profile of the SI casing relative to its initial location. Consistent sharp kinks or bends in the cumulative displacement profiles are typical of slide shearing surfaces.

Two channels (directions) of measurement are presented: A and B. The A channel is oriented to be approximately “down slope” whereas the B channel is approximately “across slope”. The actual orientation of each of the casing channels is shown on previously supplied mapping. Positive movements on the cumulative plots are down slope (east) on Channel A and across the slope to the right (south) when looking downhill for Channel B.

Table 2 presents AMEC’s observations based on the slope inclinometer data gathered to date. Figure 1 shows the locations of the slope inclinometers, along with their displacement vectors at approximately ground surface level measured up till November 2004 or when blocked.

Table 2: Slope Inclinometer Casing Displacement Summary

Installation No.	Location	Casing Displacement (mm)*		Interpretation	Notes
		(A) Max. Down Slope	(B) Max. Across Slope		
SI-1	Avery Lane	26	20	sliding at 26 and 40 m depths	operational
SI-2	Avery Lane	87	11	sliding at 42 and 60 m depths	operational
SI-3	Abbott & Bettcher	62**	10**	sliding at 39 m depth	Casing blocked at 39 m between May 2002 and Nov 2002.
SI-4	Voyageur School	60**	8**	sliding at 51 m depth	Casing blocked at 51 m between May 2002 and Nov 2002.
SI-5	Abbott Drive	105**	3**	sliding at 37 m depth	Casing compression, 37 to 92 m depth. Casing blocked at 35 m between Dec 2003 and June 2004.
SI-6	Dixon Street	90**	23**	sliding at 28 m depth	Casing blocked at 28 m between Nov 2001 and May 2002.
SI-7	Lewis & Pierce	55***	20***	sliding at 27 m and 68 m depths	Casing blocked at 68 m between May 2002 and Nov 2002, continued reading casing above 68 m depth to monitor slip surface at 27 m depth

* Maximum total lateral displacement measured at depth, from Nov. 2000 to Nov. 2004 or until blocked.

** Displacements are reported until last reading prior to the SI being blocked.

*** Displacements above 27 m depth relative to below 68 m only are reported after May 2002.

The following notes should be read while reviewing the SI data presented in Appendix A:

- A second set of plots for SI-5 has been included with the readings previous to 3 April 2001 omitted to eliminate the wave like profile (casing compression) observed in the raw data. This plot may present a clearer representation of how much of the SI deformation may have been attributable to lateral ground movement, as opposed to vertical compression of the casing.
- A second set of plots has been included for SI-7 for the portion of the borehole above 68 m depth which is still being monitored, but these plots do not reflect movements that are likely occurring below 68 m depth.

Included in Appendix B are plots of cumulative horizontal displacement versus time (velocity plots) at selected depths for the remaining active slope inclinometers. Velocity plots are given in the downhill A channel direction (positive displacements indicate movement toward the east, and negative toward the west) and in the cross slope B channel direction (positive displacements indicate movement toward the south and negative displacements toward the north).

Review of the 2004 slope inclinometer data indicates that there has been relatively little slope movement (maximum of approximately 6 mm in SI-2) detected over the last year. This is similar to the slowing trend noted over the last two years (since late 2002). It should however be pointed out that only two of the initial seven slope inclinometers are fully operational, and these are concentrated on the toe at one location on the slide area. Movements may be greater in other areas within the study area.

3.0 GROUNDWATER LEVEL (PIEZOMETER) MONITORING

Table 3 summarizes the standpipe and vibrating wire piezometer installation details for the study area.

Table 3: Standpipe and Vibrating Wire Piezometer Installation Details

BH No.:	BH-2A	BH-3A	BH-4A1	BH-4A2	BH-6A1	BH-6A2
Location:	Avery Lane	Abbott Drive	Voyager School		Dixon Street	
Installation Type:	Standpipe	Vibrating Wire Piezometer	Standpipe	Vibrating Wire Piezometer	Standpipe	
Date of Completion:	2 Nov. 2001	15 Nov. 2001	6 Dec. 2001		18 Dec. 2001	
Screen or Tip Depth (m)*	54.2-60.2	38.0	39.6-39.9	49.0	44.0-45.2	26.4-27.8
Type of Casing Protector	Stick-up	Stick-up	Stick-up	Stick-up	Flush-Mount	
Casing Stick-up	800 mm	N/A	860 mm	N/A	N/A	

* Depths are measured from ground surface. Screen depth is for standpipes, tip depth is for vibrating wire piezometers.

The standpipes were monitored by lowering a water level measurement tape into each pipe during routine visits to Quesnel and then manually recording the depth to the water. The standpipe monitoring schedule is shown in Table 4:

Table 4: Standpipe Piezometer Monitoring Schedule

BH No.:	BH-2A	BH-4A1	BH-6A1	BH-6A2
Location:	Avery Lane	Voyager School	Dixon Street	Dixon Street
Reading 1	9 Nov. 2001			
Reading 2	15 Nov. 2001			
Reading 3	20 Nov. 2001			
Reading 4	23 Nov. 2001			
Reading 5	29 Nov. 2001			
Reading 6	04 Dec. 2001			
Reading 7	12 Dec. 2001	12 Dec. 2001		
Reading 8		13 Dec. 2001		
Reading 9		14 Dec. 2001		
Reading 10	18 Dec. 2001	18 Dec. 2001		
Reading 11			19 Dec. 2002	19 Dec. 2002
Reading 12	28 Jan. 2002	28 Jan. 2002	28 Jan. 2002	28 Jan. 2002
Reading 13			20 Mar. 2002	20 Mar. 2002
Reading 14	28 Mar, 2002	28 Mar. 2002		
Reading 15	11 Apr. 2002	11 Apr. 2002	11 Apr. 2002	11 Apr. 2002
Reading 16		06 May. 2002		
Reading 17	08 Jun. 2002	08 Jun. 2002		
Reading 18	25 Jun. 2002	25 Jun. 2002	25 Jun. 2002	25 Jun. 2002
Reading 19	17 Aug. 2002	17 Aug. 2002	17 Aug. 2002	17 Aug. 2002
Reading 20	31 Oct. 2002	31 Oct. 2002	31 Oct. 2002	31 Oct. 2002
Reading 21	18 Nov. 2002	18 Nov. 2002	18 Nov. 2002	18 Nov. 2002
Reading 22	19 Jun. 2003	19 Jun. 2003	19 Jun. 2003	19 Jun. 2003
Reading 23	25 Nov. 2003	25 Nov. 2003	frozen over	frozen over
Reading 24	24 Jun. 2004	24 Jun. 2004	24 Jun. 2004	24 Jun. 2004
Reading 25	1 Oct. 2004	1 Oct. 2004	1 Oct. 2004	1 Oct. 2004
Reading 26	10 Nov. 2004	10 Nov. 2004	10 Nov. 2004	10 Nov. 2004

Two test pumping wells (PW03-01, PW03-02) and 3 multi-depth observation wells (BH03-02A-B-C, BH03-03A-B-C and BH03-04A-B-C) were installed as part of trial dewatering well pump testing carried out in 2003 and 2004 (summarized in AMEC report to the City of Quesnel dated 28 May 2004[1]). These wells act essentially as standpipe piezometers. Water levels in some of these installations were also measured during monitoring visits to Quesnel during 2004.

The vibrating wire (VW) piezometers are water pressure transducers sealed in the boreholes and connected to electronic data loggers (VW mini-loggers) located at surface. The VW mini-loggers were programmed to record daily pore water pressure readings. Near continuous readings were recorded for 2004. This data was downloaded during monitoring visits and subsequently converted to equivalent groundwater levels.

Figure 1 shows the locations of the groundwater measurement installations. Appendix C provides graphs displaying the water levels versus time for the various installations. For 2004, measured groundwater levels generally remained relatively constant and similar to previous years' levels. In most instances these levels were quite high, being at or near ground surface.

[1] Polysou, N.C. & Green, S. 2004. Pilot Dewatering Well Test, West Quesnel Land Stability Study. AMEC Earth & Environmental.

4.0 PRECIPITATION

Monthly total precipitation data was obtained from Environment Canada for the closest recording station, the Quesnel Airport. The 2004 precipitation data is preliminary and still requires official verification. A plot of the recorded total monthly precipitation from 1975 through 2004 along with historical "monthly normal" data is shown as Chart 1 in Appendix D. The historical normal precipitation is based on a 30 year moving mean, where an average over the preceding 30 years was calculated for each month to derive what could be considered as a "normal" amount of precipitation for that month.

Chart 2 in Appendix D presents a plot of the cumulative difference between the actual total precipitation experienced each month and the calculated normal total monthly precipitation, starting in 1975. This plot shows the trend of the recorded precipitation, and gives an indication of overall increasing or decreasing (i.e. wetter or drier) trends compared to what could be expected to be normal. Generally horizontal trends in the plot indicate relatively normal precipitation, rising trends indicate extended wetter periods and falling trends indicate extended drier conditions than normal.

The cumulative difference precipitation plot indicates that the period from 1975 through 1980 was slightly drier than normal. This was followed by a wetter period up to about 1983 and relatively normal conditions from 1983 to 1986. From 1986 to 1989 a significant drying trend occurred. Between 1989 and 1986 precipitation conditions were generally close to normal. However, starting in 1996 a longer term of wetter than normal precipitation occurred all the way up till early 2002. From early 2002 to mid 2003 a drier period was experienced, followed by an only slightly wetter but probably normal amounts of precipitation to the end of 2004.

5.0 GROUND SURFACE MOVEMENT HUBS

Terasen Gas (formerly BC Gas) has provided AMEC with global positioning system (GPS) survey data for ground surface movement hubs located in the West Quesnel study area. An initial set of 29 hubs was installed in September 1998, some of which were benchmarks or references located well away from the slide study area. An additional 11 hubs were installed in December 2001. Survey firms contracted by Terasen Gas have conducted semi-annual and later annual determinations of the coordinates of these hubs. The most recent survey was conducted in January 2005. Appendix E contains spreadsheets with the various GPS survey coordinates over time, as well as Charts E1 and E2, which graph the horizontal displacement versus time.

Figure 2 shows the locations of the GPS surveyed movement hubs in the study area together with vectors depicting the detected horizontal ground movement. An indication of total vertical movement detected at each hub location is also provided on the figure.

Table 5 below summarizes the movement hub data in or near the slide study area collected to date.

Table 5: Terasen Gas Movement Hub Data to January 2005

Movement Hub	Date Installed	Horizontal Displacement Since Installation	
		Magnitude (mm)	Vector* (°)
2	September 1998	260	99
4	September 1998	221	55
5	September 1998	237	89
6	September 1998	287	43
7	September 1998	237	62
8	September 1998	228	66
9	September 1998	296	90
14	September 1998	279	92
15	September 1998	213	76
16	September 1998	148	72
17	September 1998	322	96
18	September 1998	282	97
19	September 1998	251	102
20	September 1998	235	106
21	September 1998	139	112
22	September 1998	37	95
23	September 1998	21	104
30	December 2001	69	100
31	December 2001	108	86
32	December 2001	13	154
33	December 2001	58	101
34	December 2001	78	108
35	December 2001	11	117
36	December 2001	18	89
37	December 2001	81	98
38	December 2001	13	122
39	December 2001	48	137
40	December 2001	42	86

Generally the survey hub movements appear to have continued to show displacements over the last monitoring period from November 2003 to January 2005. However, these displacements were generally less than 20 mm. The 2004 movement was similar to that detected in 2003 and represents a much slower maximum movement rate (approximately 20 mm per year) as compared to the period from September 1998 to November 2002 when maximum movement rates in the order of 70 to 80 mm per year were measured.

6.0 FUTURE WORK

Given the nature of the movements observed to date, AMEC recommends continued monitoring of the operable SI installations and continuing collection of groundwater level data. Installation of 6 new slope inclinometers is currently underway, and additional groundwater instrumentation is also planned for 2005. For 2005, monitoring of existing instrumentation will be combined with regular monitoring of new slope inclinometer and groundwater instrumentation.

In previous reporting and discussions with the City of Quesnel, AMEC has recommended installing a total precipitation monitoring device directly within the West Quesnel area. Establishment of a system to regularly monitor surface water levels in the various ponds has also been recommended and should be implemented as soon as possible.

Movement hub data has been very useful in determining the boundaries and rates of movement within the slide study area. It is recommended that a GPS survey of the movement hubs be conducted at least annually (by Terasen Gas or the City of Quesnel), with an increased frequency of survey if increasing rates of movement are indicated.

AMEC recommends that a separate annual monitoring report be produced in early 2006 once all the 2005 data has been collected and collated.

7.0 CLOSURE

Thank you for the opportunity to provide assistance in this matter. Please do not hesitate to contact the undersigned at 1-250-564-3243 should you have any questions or require further information.

Respectfully submitted,

AMEC Earth & Environmental
a division of AMEC Americas Limited

Reviewed by:

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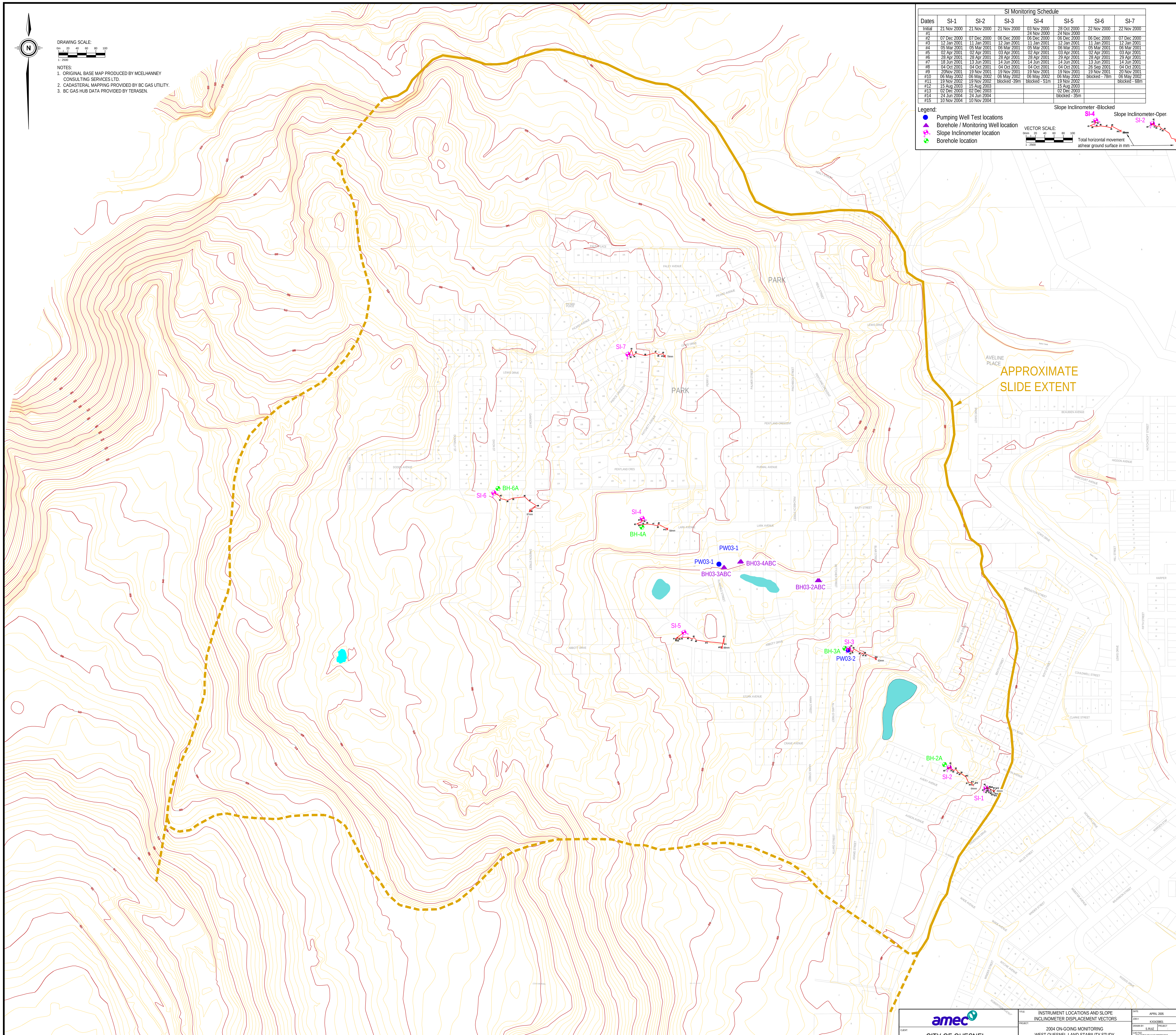
Senior Associate, Geotechnical Engineer
Regional Manager, Central BC

NCP/lad

Attachments:

- Figure 1: Plan, Instrument Locations and Slope Inclinometer Displacement Vectors
- Figure 2: Plan, Terasen GPS Movement Hubs and Displacement Vectors
- Appendix A: Slope Inclinometer Profile Plots
- Appendix B: Slope Inclinometer Velocity Plots
- Appendix C: Groundwater Level Plots
- Appendix D: Precipitation Data Plots
- Appendix E: Terasen GPS Movement Hub Survey Data and Plots



SI Monitoring Schedule

Dates	SI-1	SI-2	SI-3	SI-4	SI-5	SI-6	SI-7
Initial	21 Nov 2000	21 Nov 2000	21 Nov 2000	03 Nov 2000	28 Oct 2000	22 Nov 2000	22 Nov 2000
#1				24 Nov 2000	24 Nov 2000		
#2	07 Dec 2000	07 Dec 2000	06 Dec 2000	06 Dec 2000	06 Dec 2000	06 Dec 2000	07 Dec 2000
#3	12 Jan 2001	11 Jan 2001	12 Jan 2001	11 Jan 2001	12 Jan 2001	11 Jan 2001	12 Jan 2001
#4	05 Mar 2001	05 Mar 2001	06 Mar 2001	05 Mar 2001	06 Mar 2001	05 Mar 2001	06 Mar 2001
#5	02 Apr 2001	02 Apr 2001	03 Apr 2001	02 Apr 2001	03 Apr 2001	02 Apr 2001	03 Apr 2001
#6	28 Apr 2001	28 Apr 2001	28 Apr 2001	28 Apr 2001	29 Apr 2001	28 Apr 2001	29 Apr 2001
#7	18 Jun 2001	13 Jun 2001	14 Jun 2001	14 Jun 2001	14 Jun 2001	13 Jun 2001	14 Jun 2001
#8	04 Oct 2001	04 Oct 2001	04 Oct 2001	04 Oct 2001	04 Oct 2001	26 Sep 2001	04 Oct 2001
#9	20Nov 2001	19 Nov 2001	19 Nov 2001	19 Nov 2001	19 Nov 2001	19 Nov 2001	20 Nov 2001
#10	06 May 2002	06 May 2002	06 May 2002	06 May 2002	06 May 2002	blocked - 78m	06 May 2002
#11	19 Nov 2002	19 Nov 2002	blocked -39m	blocked - 51m	19 Nov 2002		blocked - 68m
#12	15 Aug 2003	15 Aug 2003			15 Aug 2003		
#13	02 Dec 2003	02 Dec 2003			02 Dec 2003		
#14	24 Jun 2004	24 Jun 2004			blocked - 35m		
#15	10 Nov 2004	10 Nov 2004					

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CLIENT: CITY OF QUESNEL

TITLE: INSTRUMENT LOCATIONS AND SLOPE INCLINOMETER DISPLACEMENT VECTORS

PROJECT: 2004 ON-GOING MONITORING WEST QUESNEL LAND STABILITY STUDY

DATE: APRIL 2005

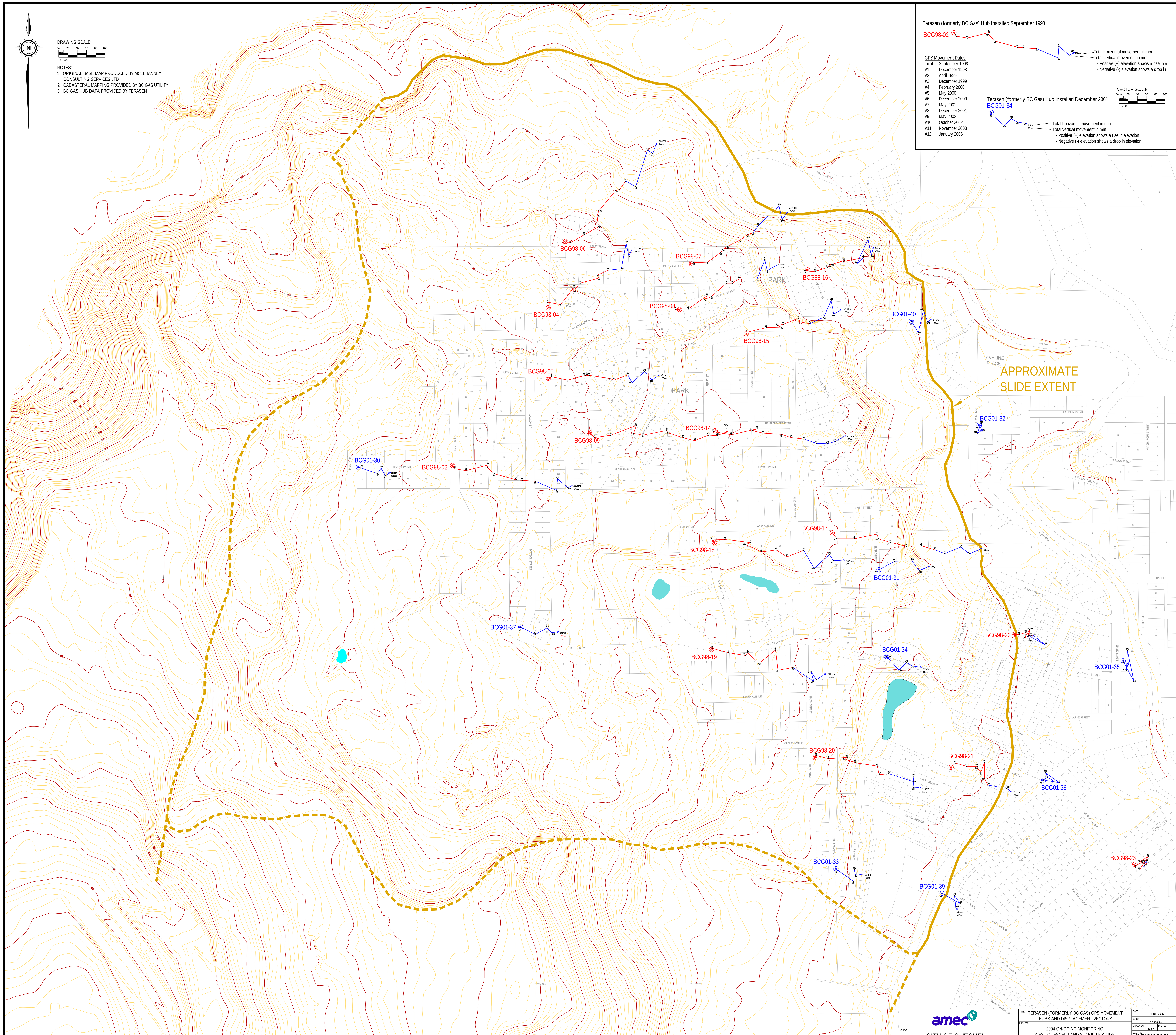
JOB #: KX0439801

DRAWN BY: S.RUIZ

PROJECT

CAD FILE: DRAFTING\KX0439801\FIG

FIGURE #: FIGURE 1


N
DRAWING SCALE:
0m 20 40 60 80 100
1 : 2500
NOTES:
1. ORIGINAL BASE MAP PRODUCED BY MCELHANNEY CONSULTING SERVICES LTD.
2. CADASTERAL MAPPING PROVIDED BY BC GAS UTILITY.
3. BC GAS HUB DATA PROVIDED BY TERASEN.
Terasen (formerly BC Gas) Hub installed September 1998
BCG98-02
260mm
-24mm
Total horizontal movement in mm
Total vertical movement in mm
- Positive (+) elevation shows a rise in e
- Negative (-) elevation shows a drop in
GPS Movement Dates
Inital September 1998
#1 December 1998
#2 April 1999
#3 December 1999
#4 February 2000
#5 May 2000
#6 December 2000
#7 May 2001
#8 December 2001
#9 May 2002
#10 October 2002
#11 November 2003
#12 January 2005
VECTOR SCALE:
0mm 20 40 60 80 100
1 : 2500
Terasen (formerly BC Gas) Hub installed December 2001
BCG01-34
78mm
-28mm
Total horizontal movement in mm
Total vertical movement in mm
- Positive (+) elevation shows a rise in elevation
- Negative (-) elevation shows a drop in elevation
BCG98-06
BCG98-07
BCG98-16
BCG98-04
BCG98-08
BCG01-40
BCG98-15
PARK
BCG98-05
PARK
AVELINE PLACE
APPROXIMATE SLIDE EXTENT
BCG01-32
BCG98-14
BCG98-09
BCG01-30
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BCG98-18
BCG01-31
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BCG98-23
BCG01-39
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CLIENT:
CITY OF QUESNEL
TITLE: TERASEN (FORMERLY BC GAS) GPS MOVEMENT HUBS AND DISPLACEMENT VECTORS
PROJECT: 2004 ON-GOING MONITORING WEST QUESNEL LAND STABILITY STUDY
DATE: APRIL 2005
JOB #: KX0439801
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FIGURE #: FIGURE 2

APPENDIX A

Slope Inclinometer Profile Plots

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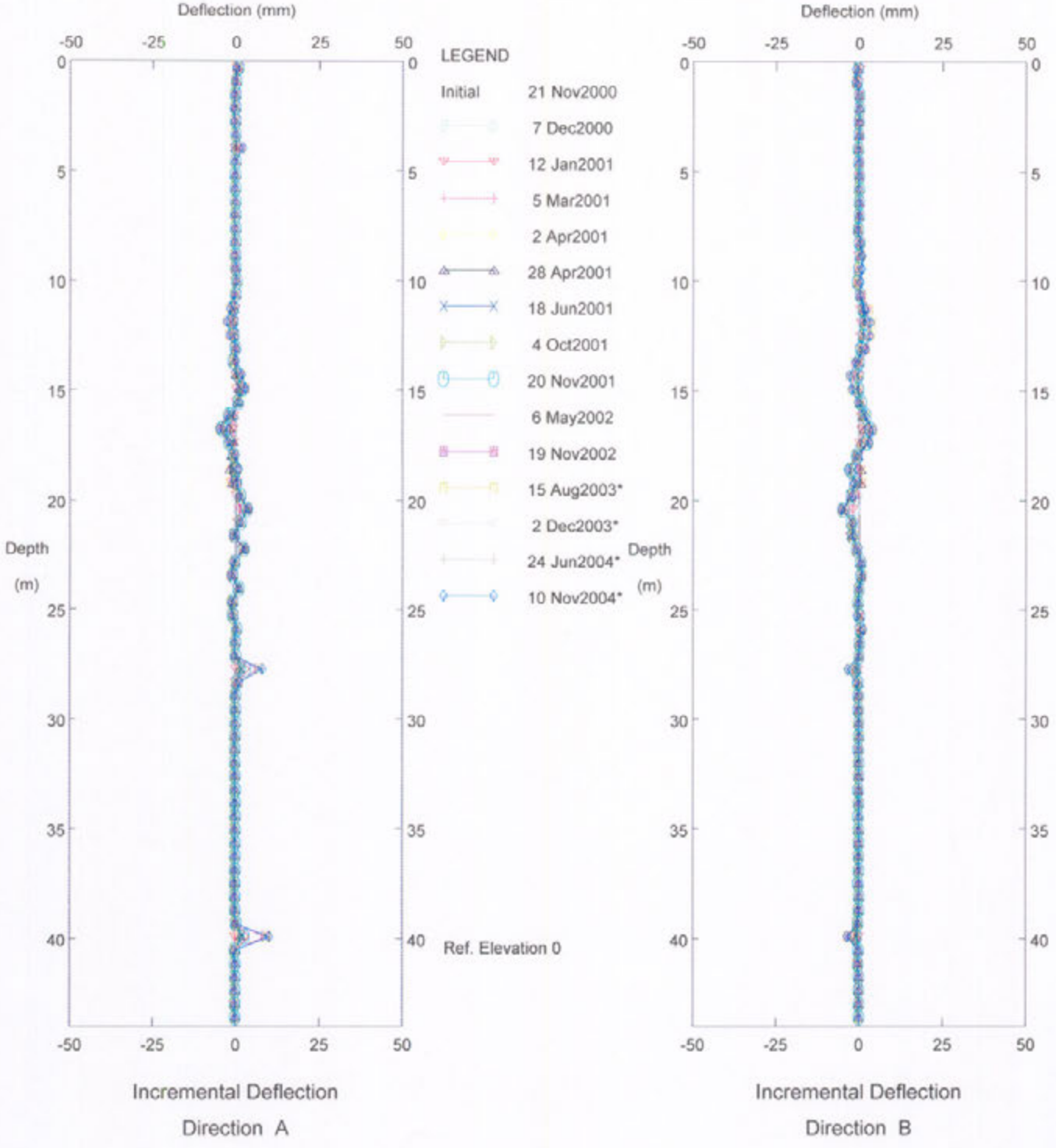

KX03904 W. Quesnel Stability Study, Inclinometer SI-1 Corr.

Lower Avery Lane

Sets marked * include zero shift and/or rotation corrections.

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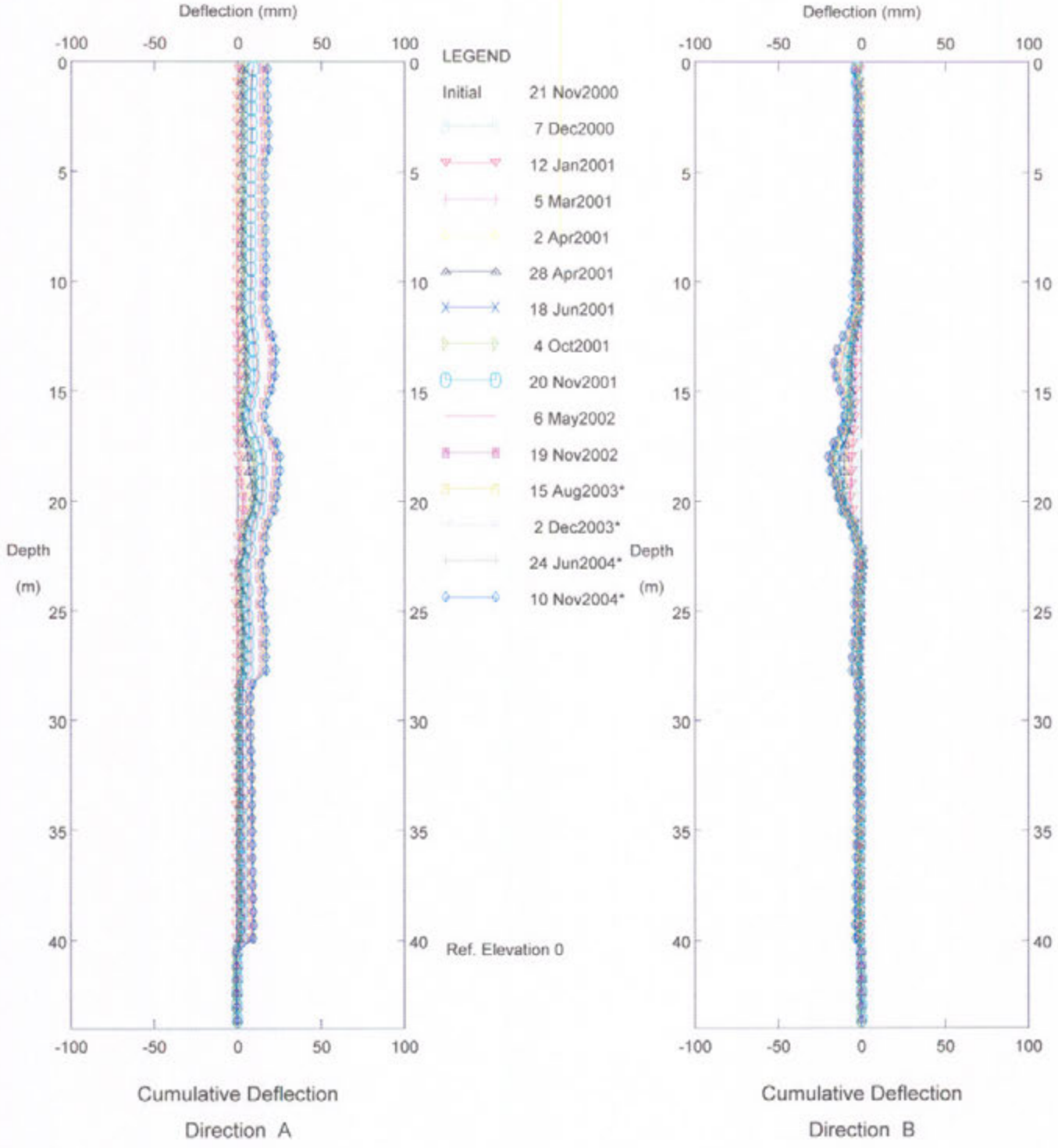

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Lower Avery Lane

Sets marked * include zero shift and/or rotation corrections.

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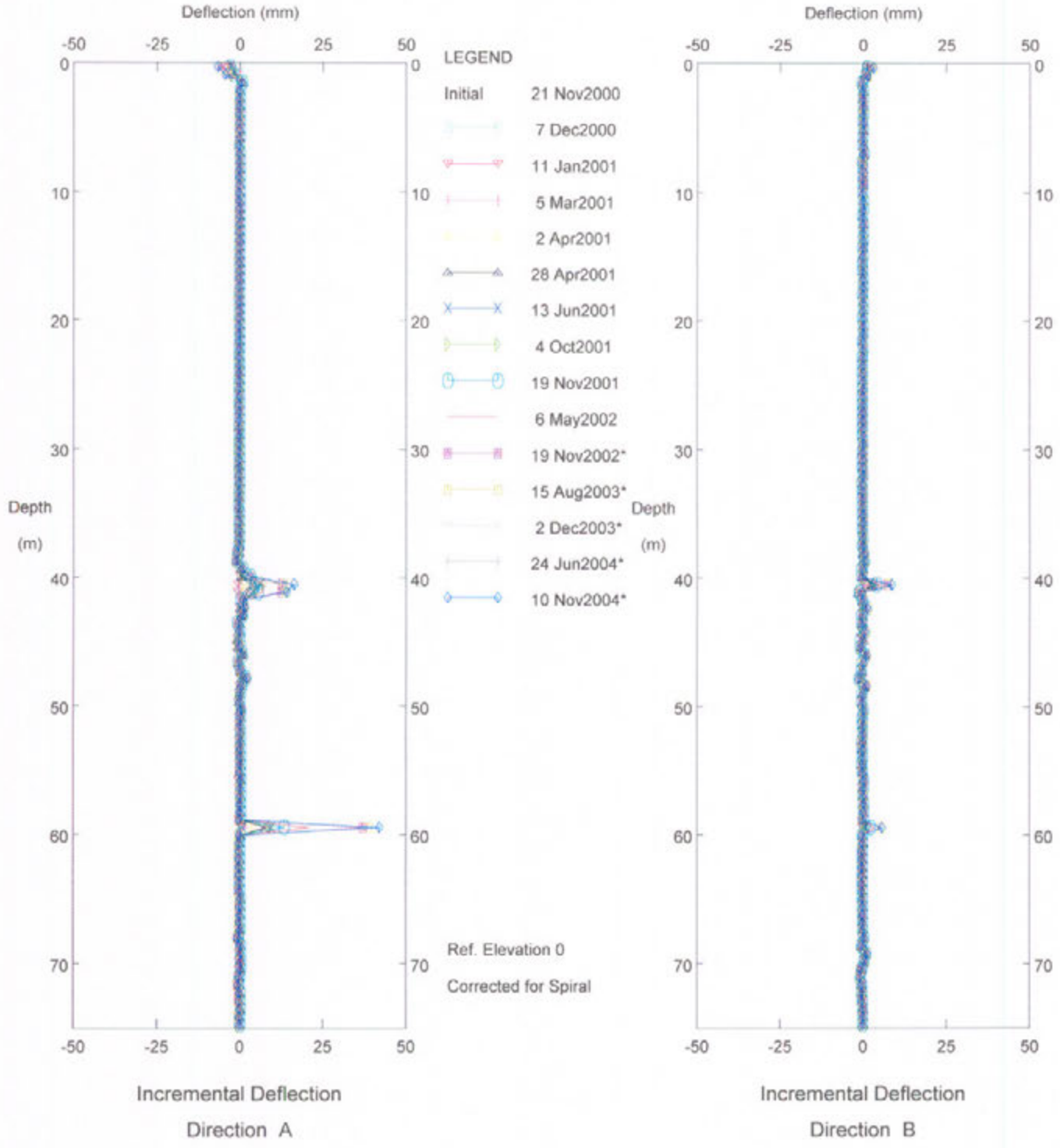

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Upper Avery Lane

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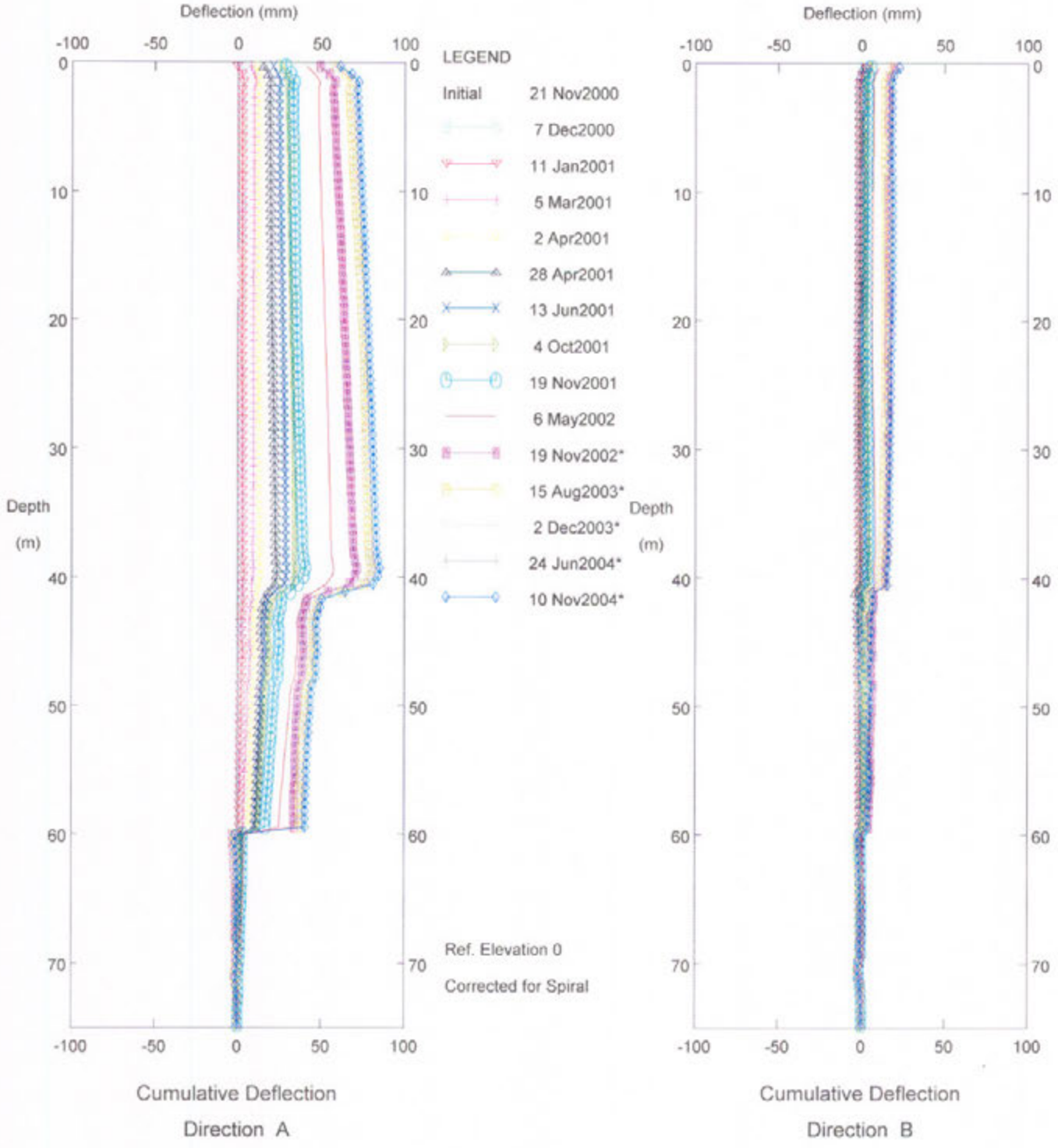

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Upper Avery Lane

Sets marked * include zero shift and/or rotation corrections.

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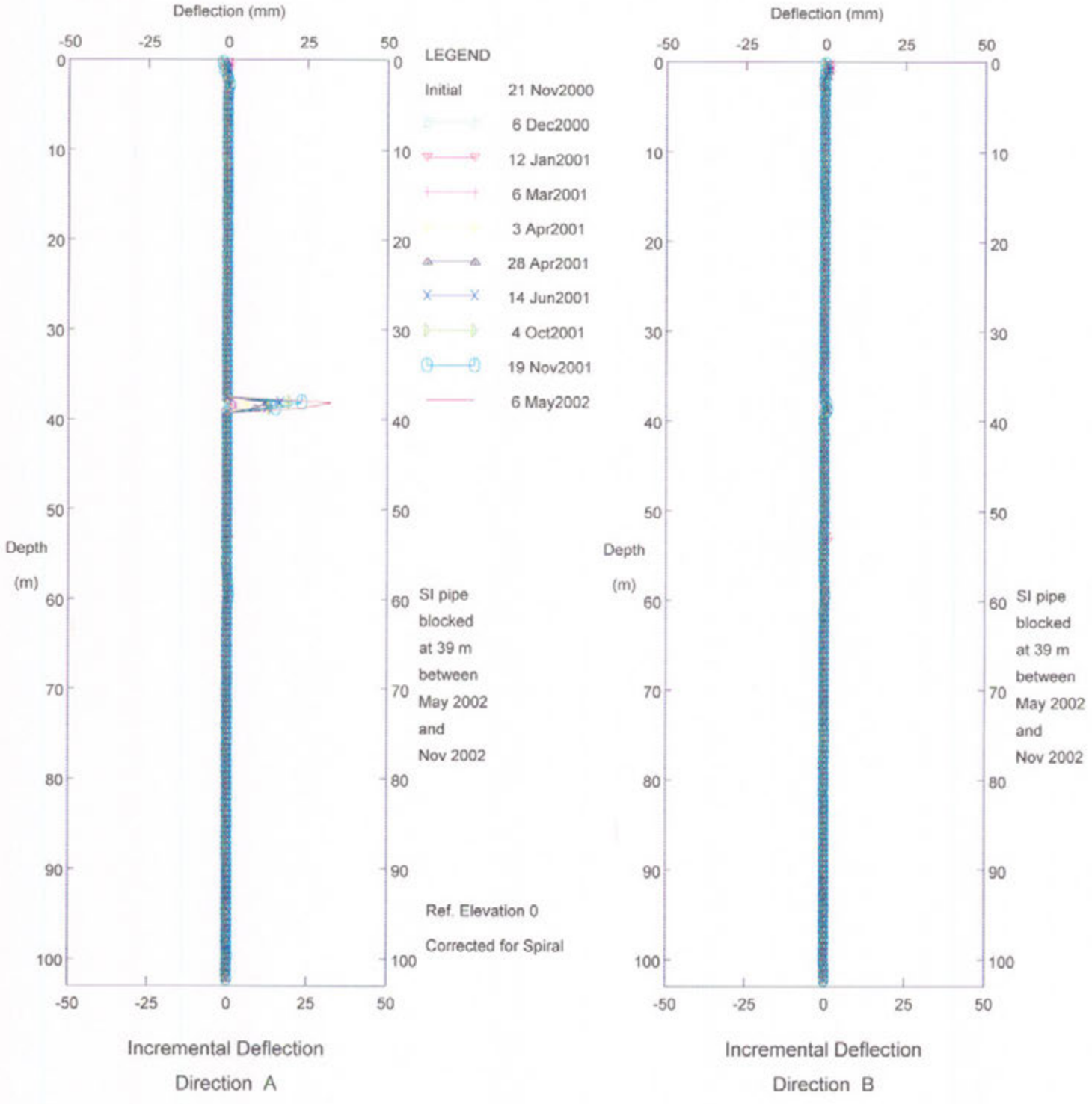
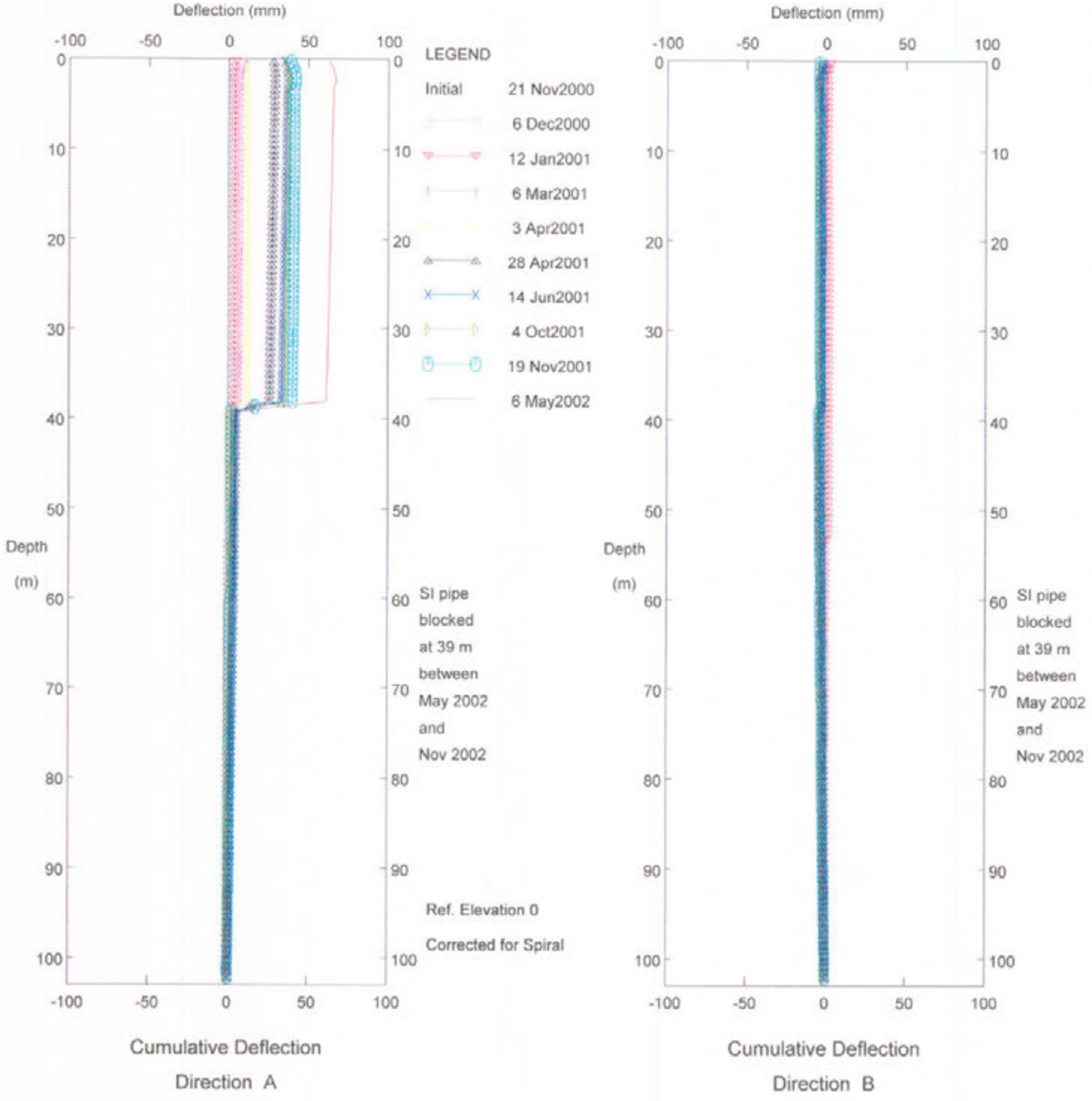


KX03904 W. Quesnel Stability Study, Inclinometer SI-3 Corr.

Abbott Drive near Bettcher

AMEC Earth and Environmental - Pr. George



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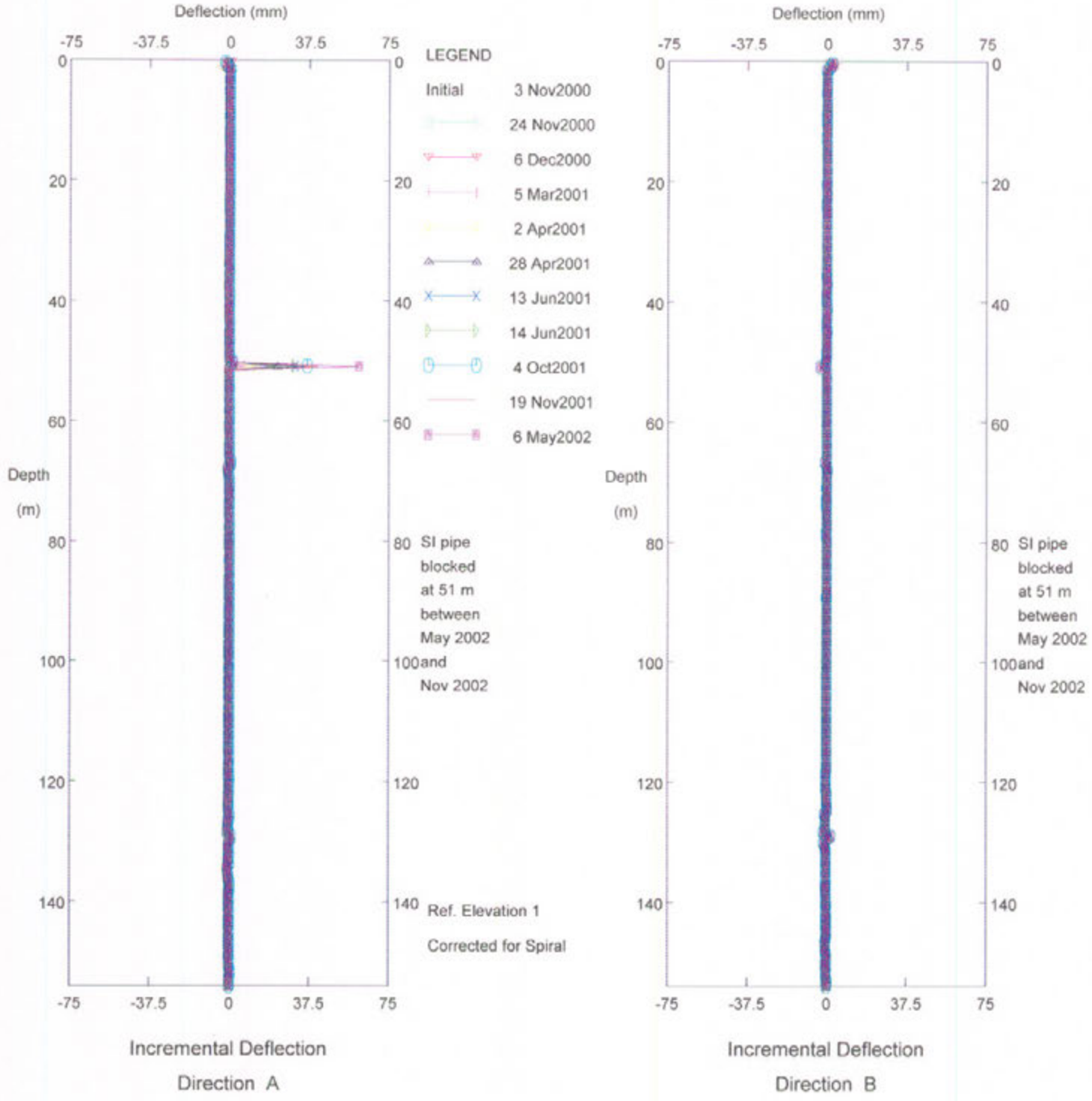
Abbott Drive near Bettcher

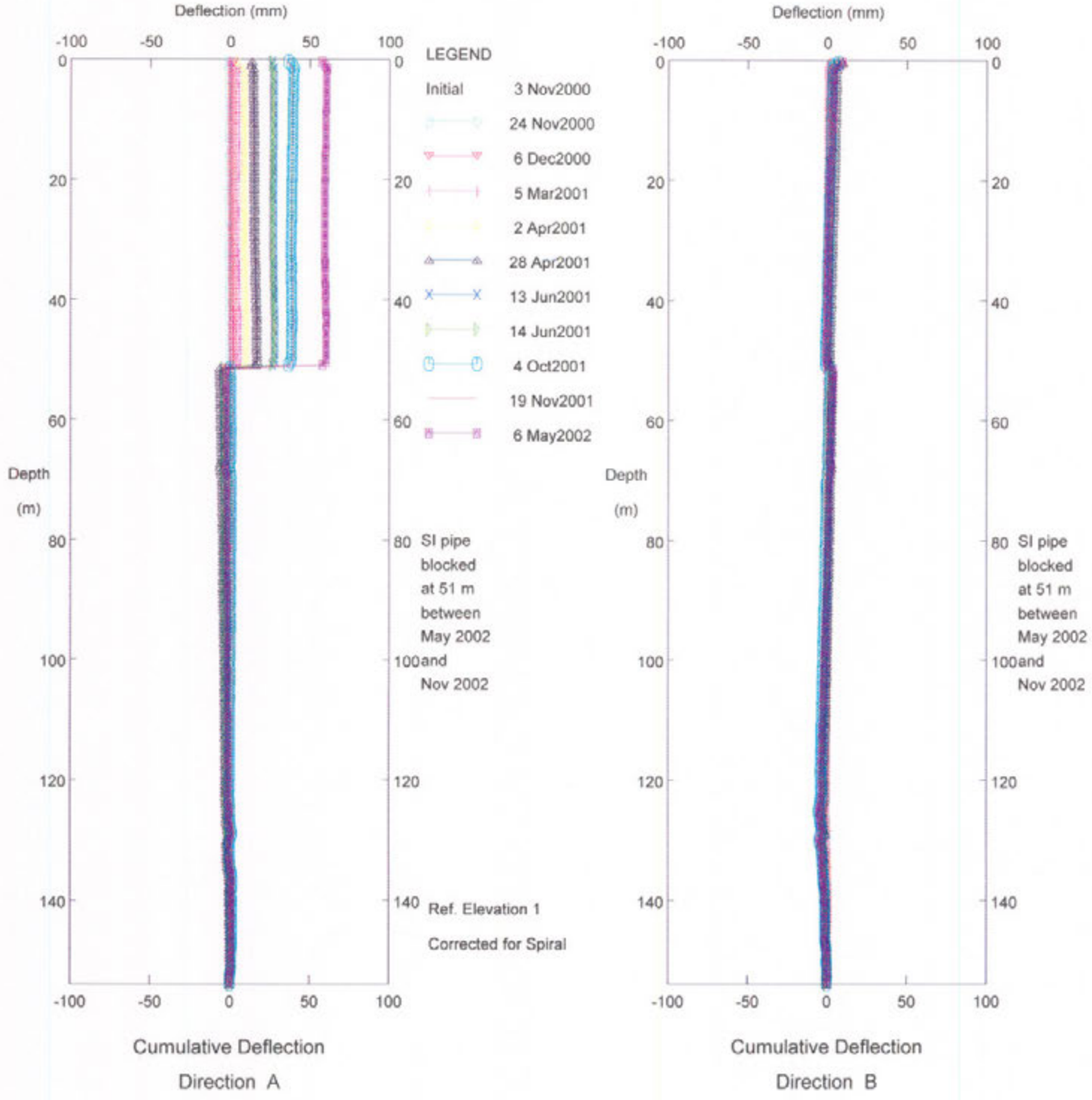
AMEC Earth and Environmental - Pr. George



KX03904 W.Quesnel Stability Study, Inclinometer SI-4 Corr.

Voyageur School

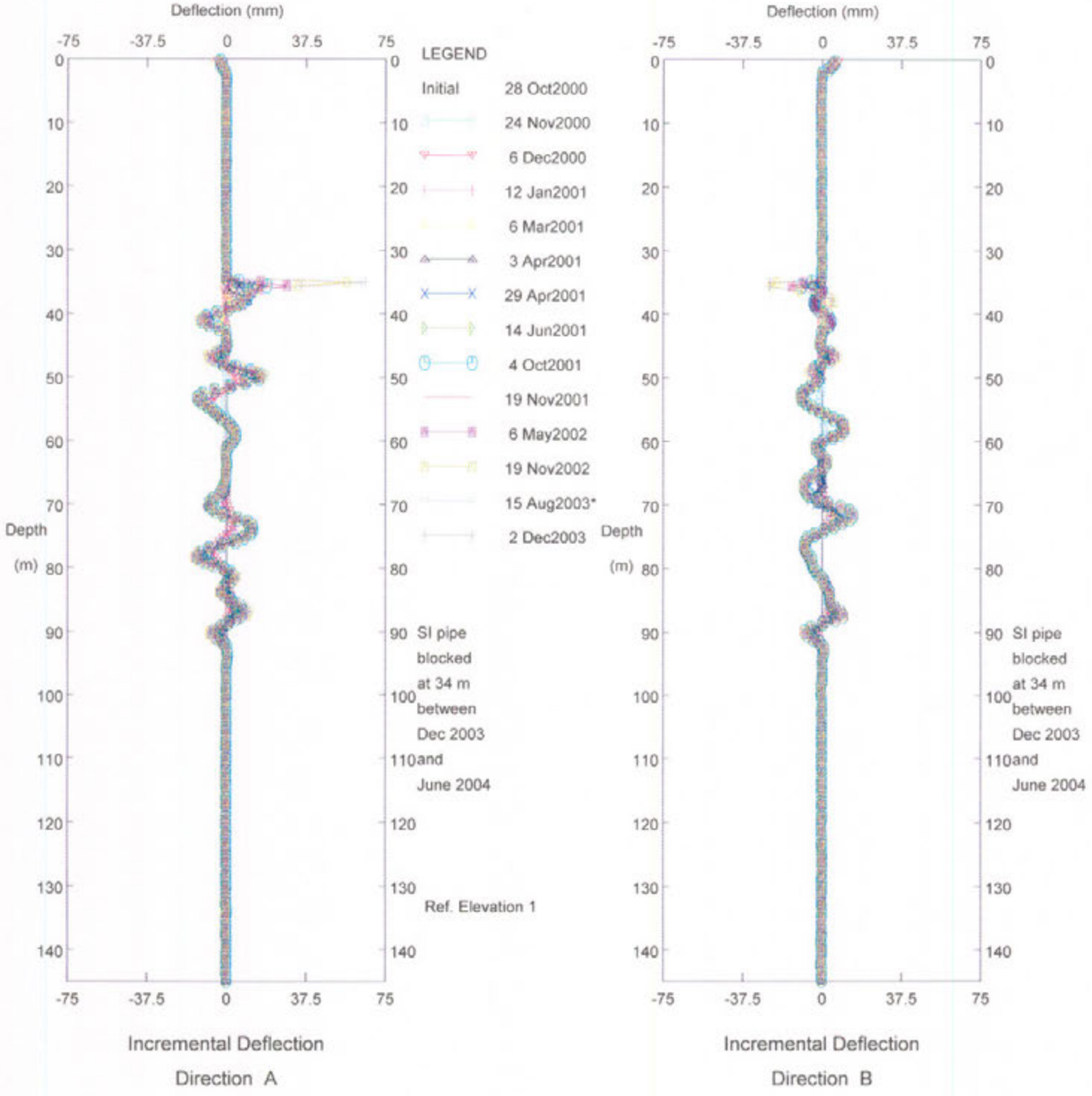
AMEC Earth and Environmental - Pr. George



KX03904 W.Quesnel Stability Study, Inclinometer SI-4 Corr.

Voyageur School

AMEC Earth and Environmental - Pr. George

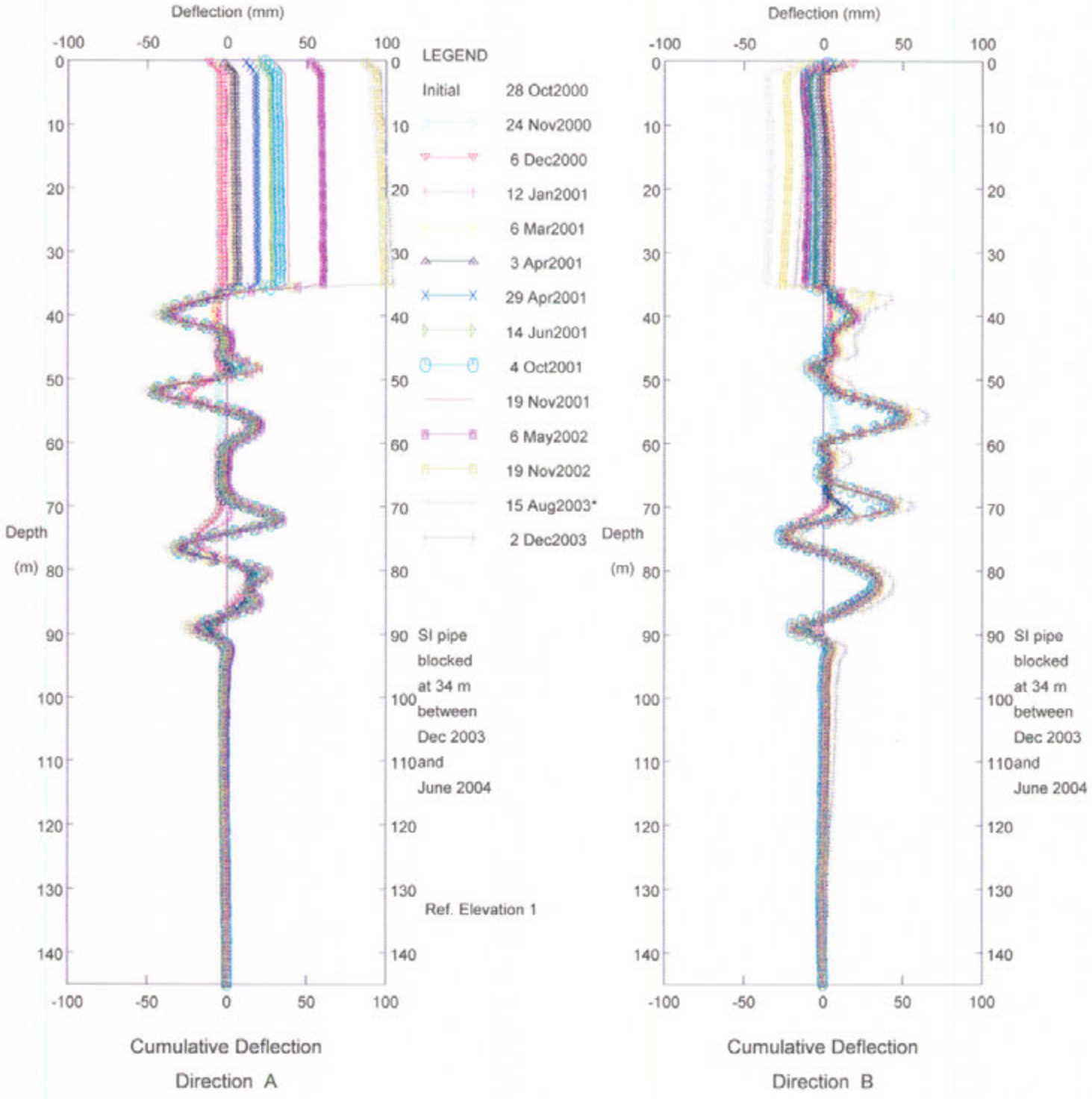


KX03904 W. Quesnel Stability Study, Inclinometer SI-5 Corr.

Abbott Drive

Sets marked * include zero shift and/or rotation corrections.

AMEC Earth and Environmental - Pr. George

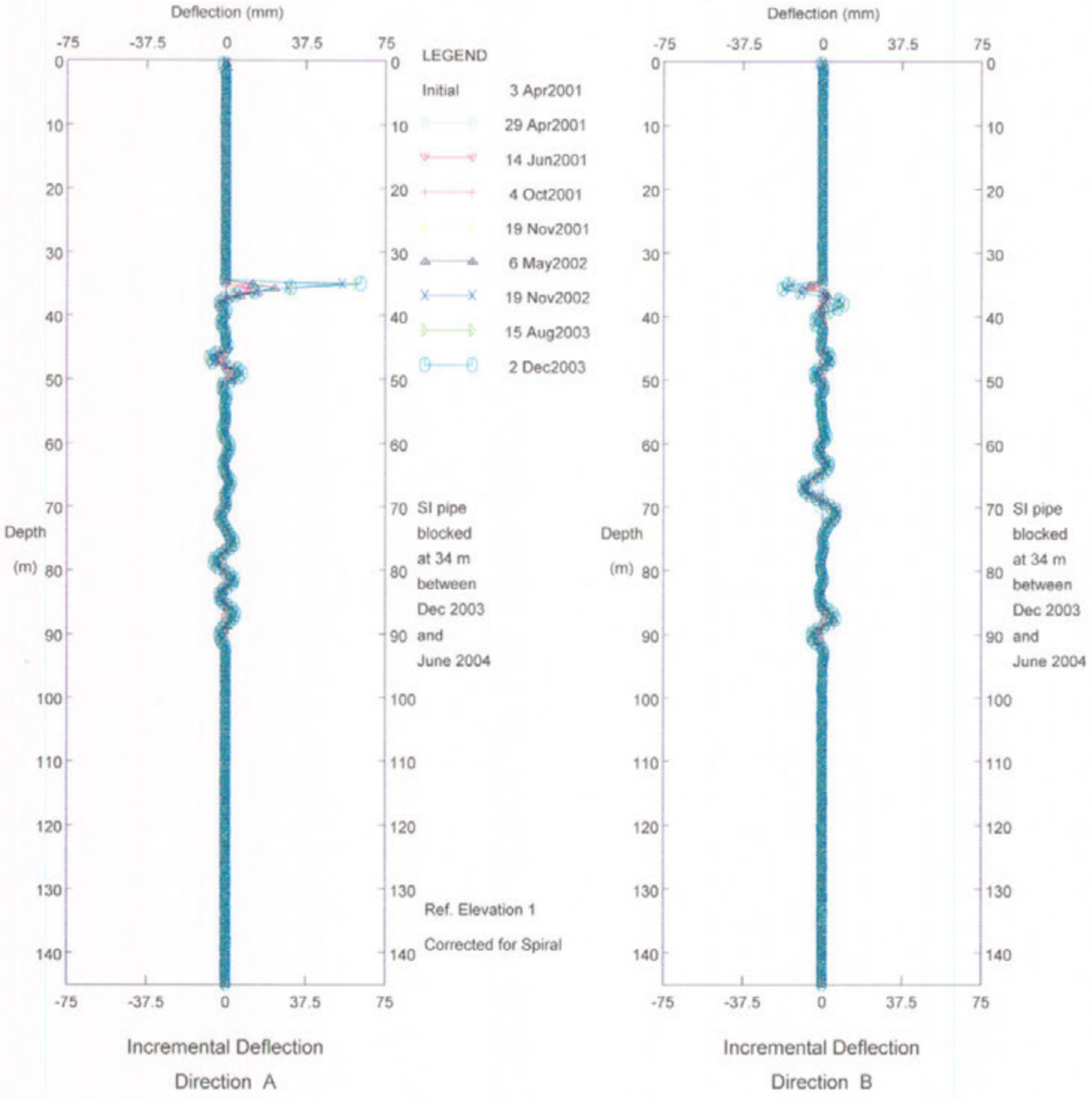


KX03904 W. Quesnel Stability Study, Inclinometer SI-5 Corr.

Abbott Drive

Sets marked * include zero shift and/or rotation corrections.

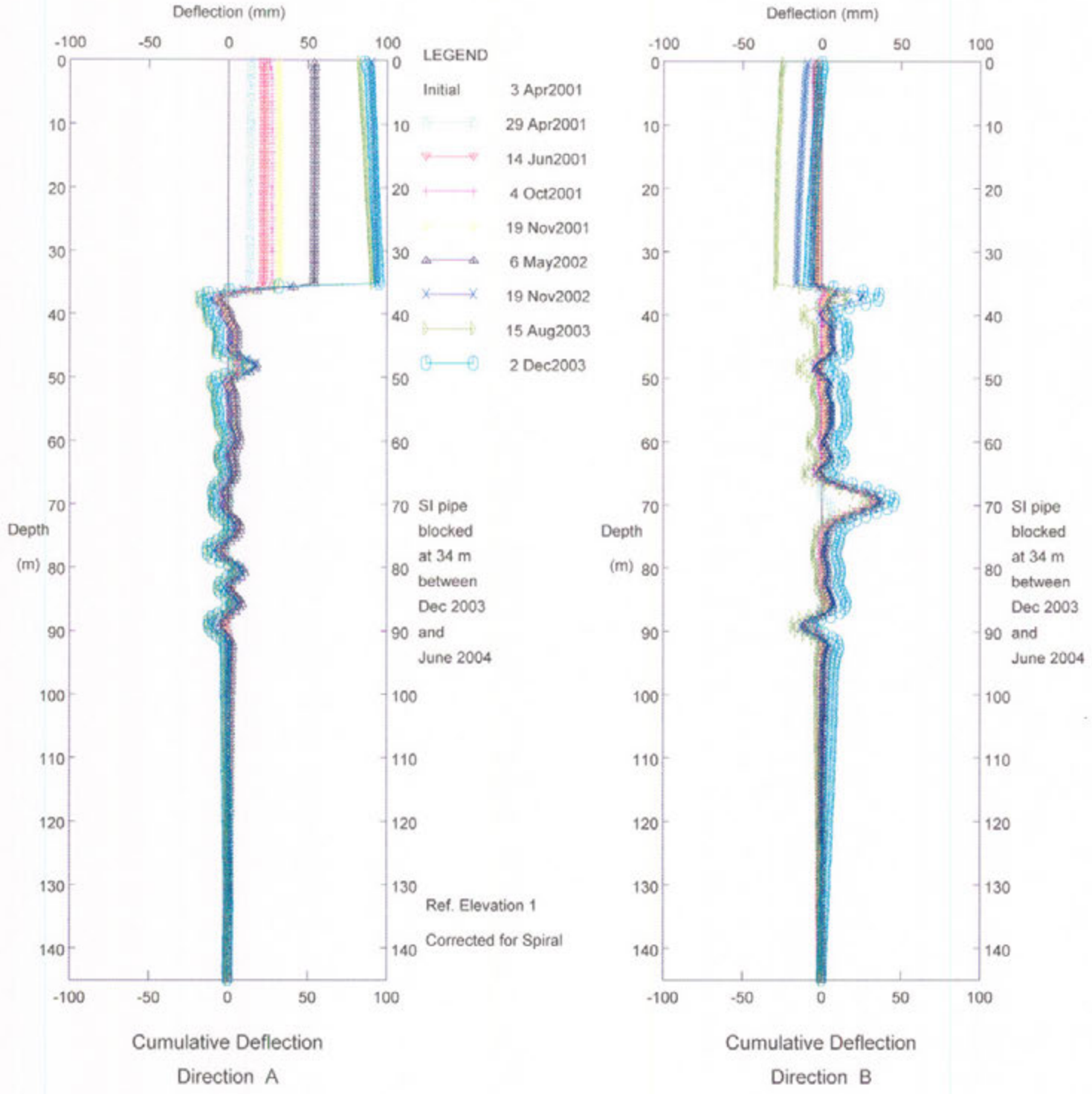
AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-5 Corr.

Abbott Drive

AMEC Earth and Environmental - Pr. George



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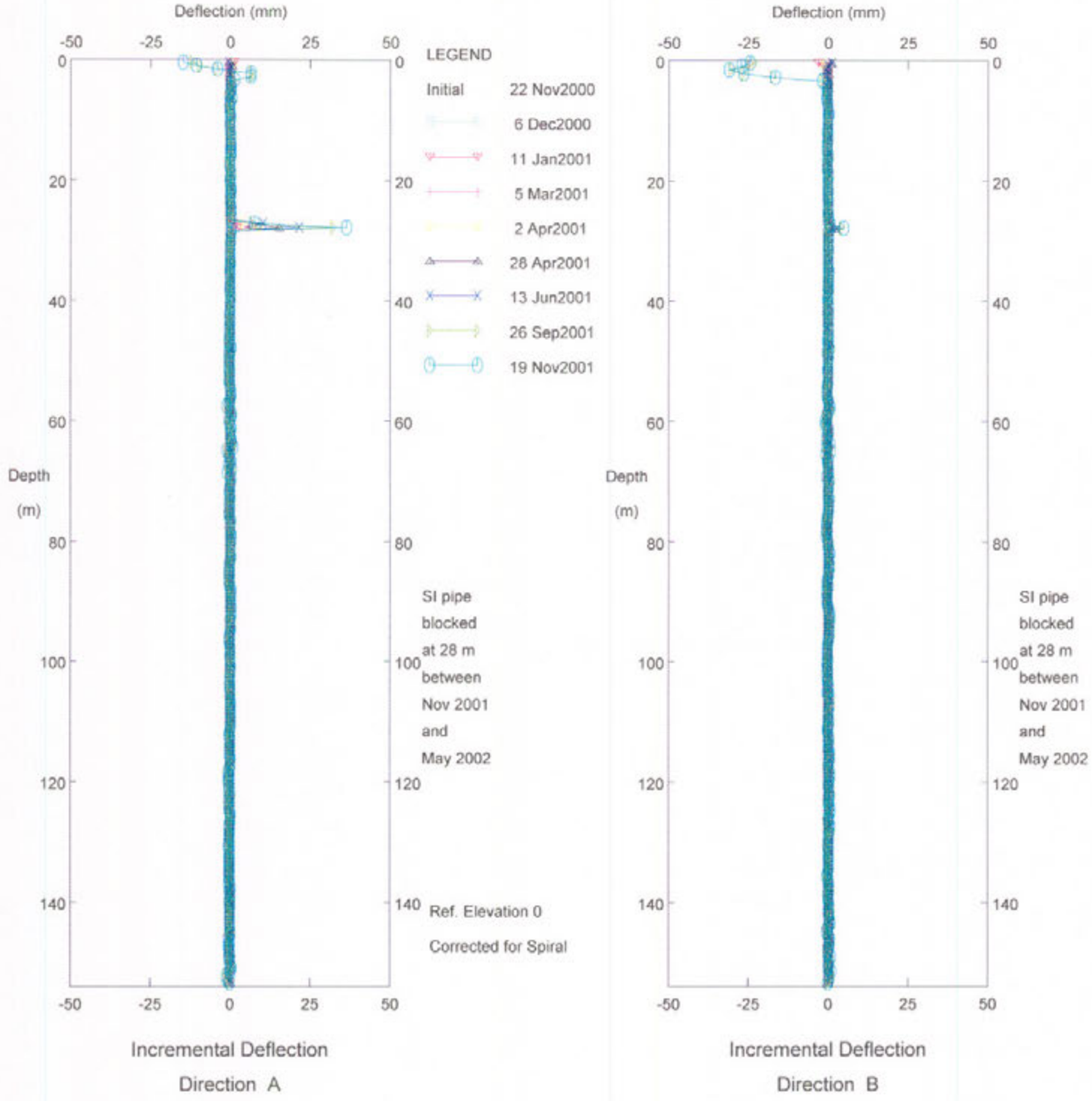
Abbott Drive

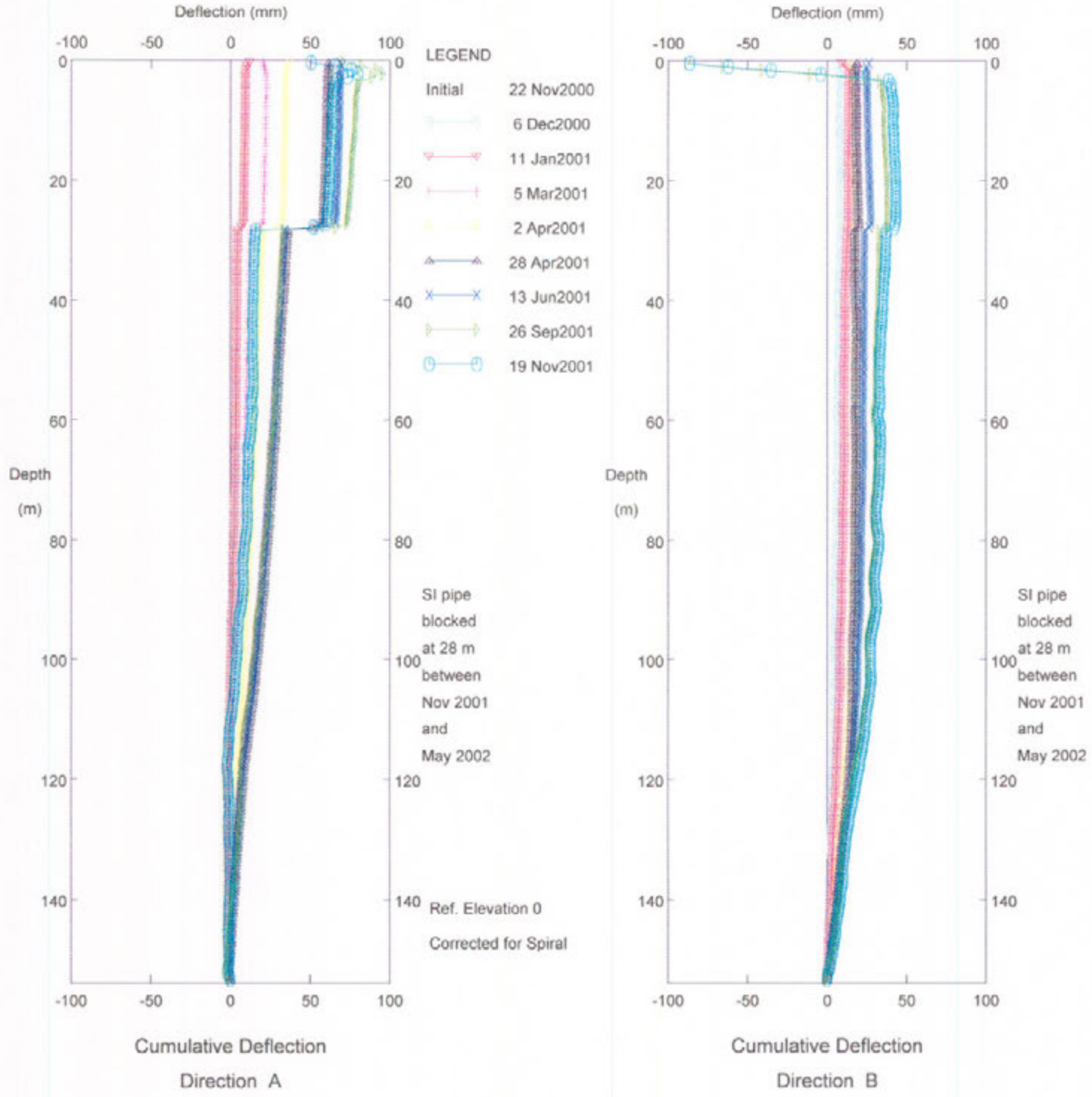
AMEC Earth and Environmental - Pr. George



KX03904 W.Quesnel Stability Study, Inclinometer SI-6 Corr.

End of Dixon Street

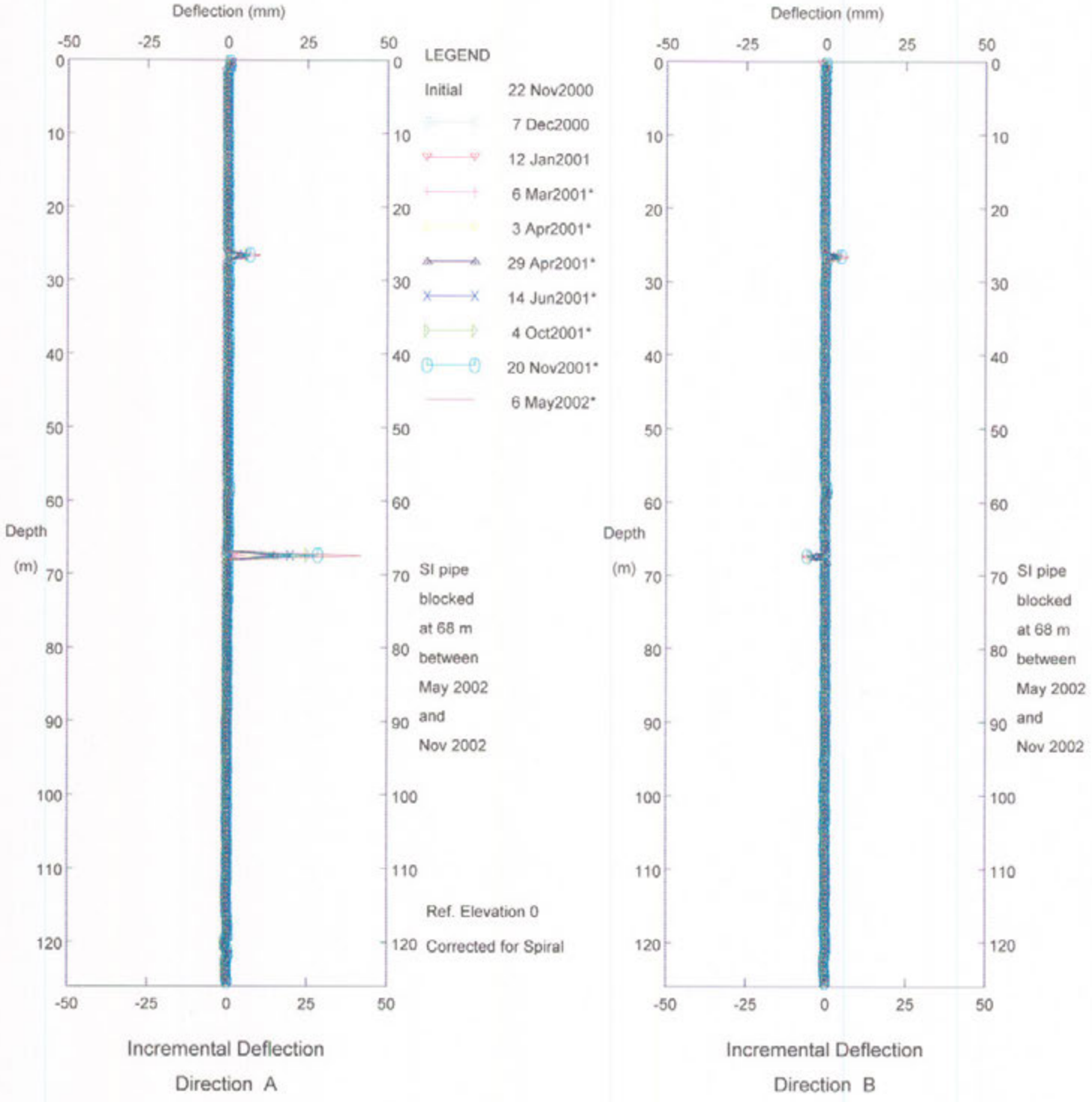
AMEC Earth and Environmental - Pr. George



KX03904 W.Quesnel Stability Study, Inclinometer SI-6 Corr.

End of Dixon Street

AMEC Earth and Environmental - Pr. George

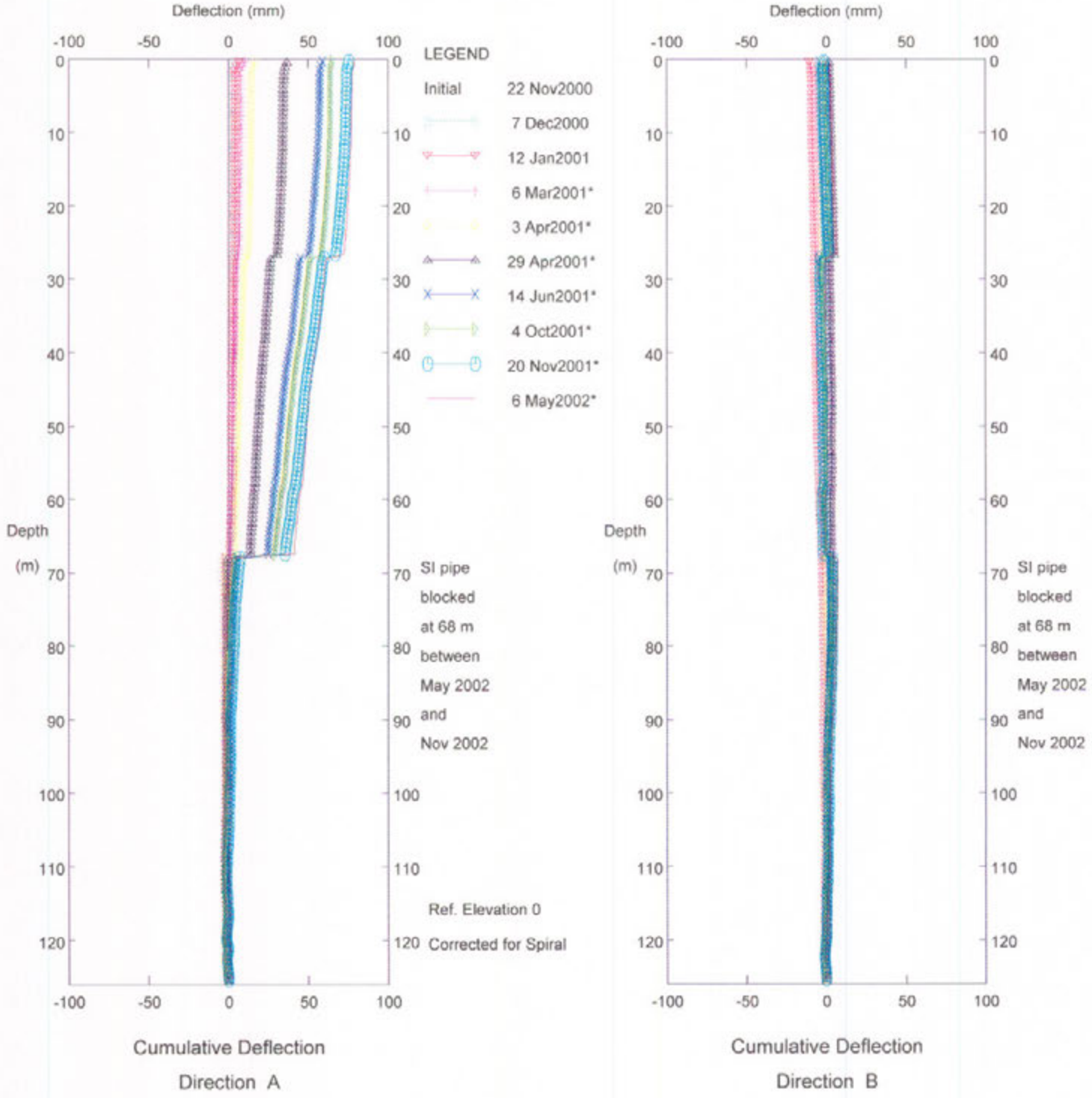


KX03904 W. Quesnel Stability Study, Inclinometer SI-7 Corr.

Pierce Crescent & Lewis Drive

Sets marked * include zero shift and/or rotation corrections.

AMEC Earth and Environmental - Pr. George

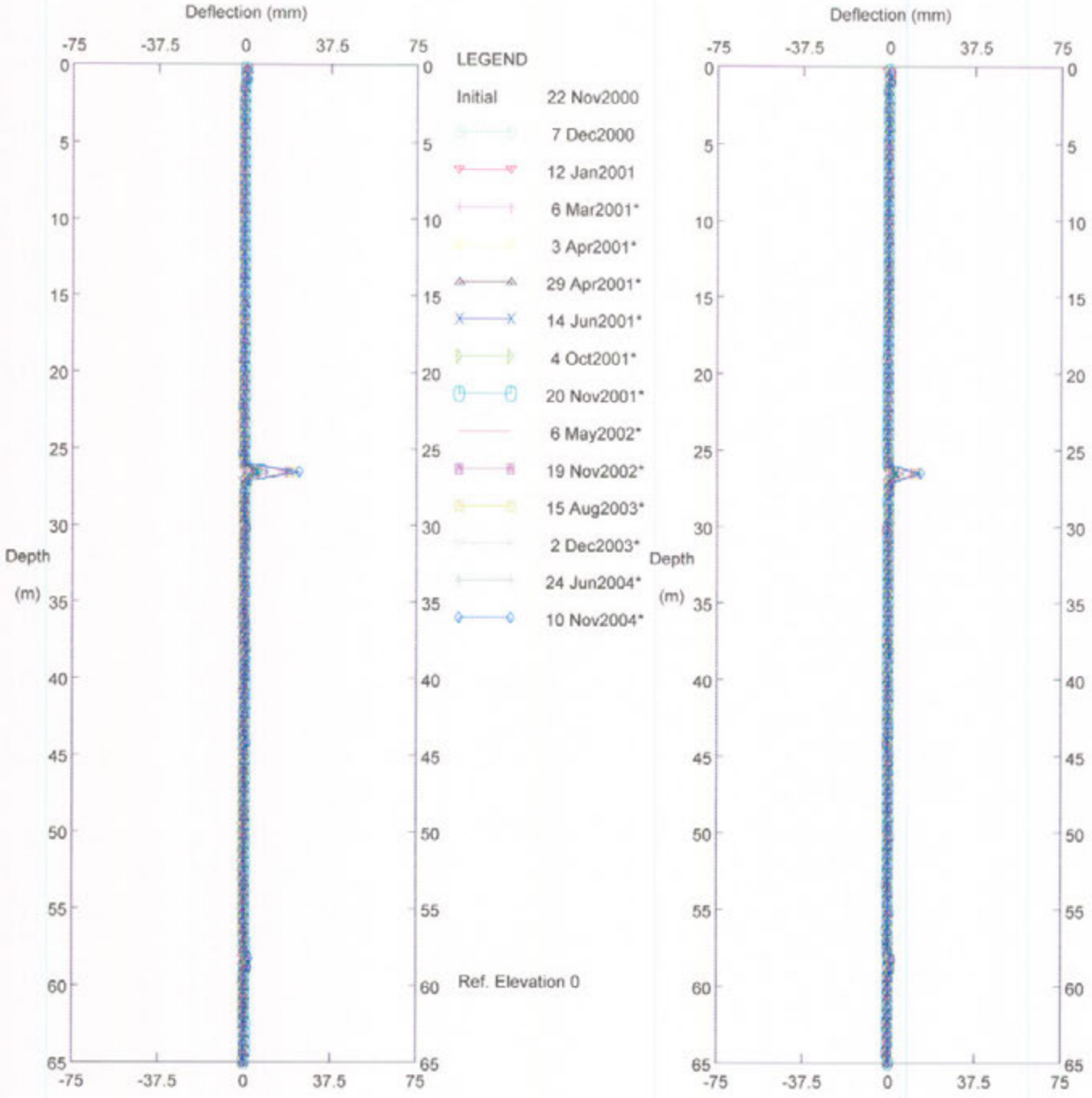


KX03904 W. Quesnel Stability Study, Inclinometer SI-7 Corr.

Pierce Crescent & Lewis Drive

Sets marked * include zero shift and/or rotation corrections.

AMEC Earth and Environmental - Pr. George

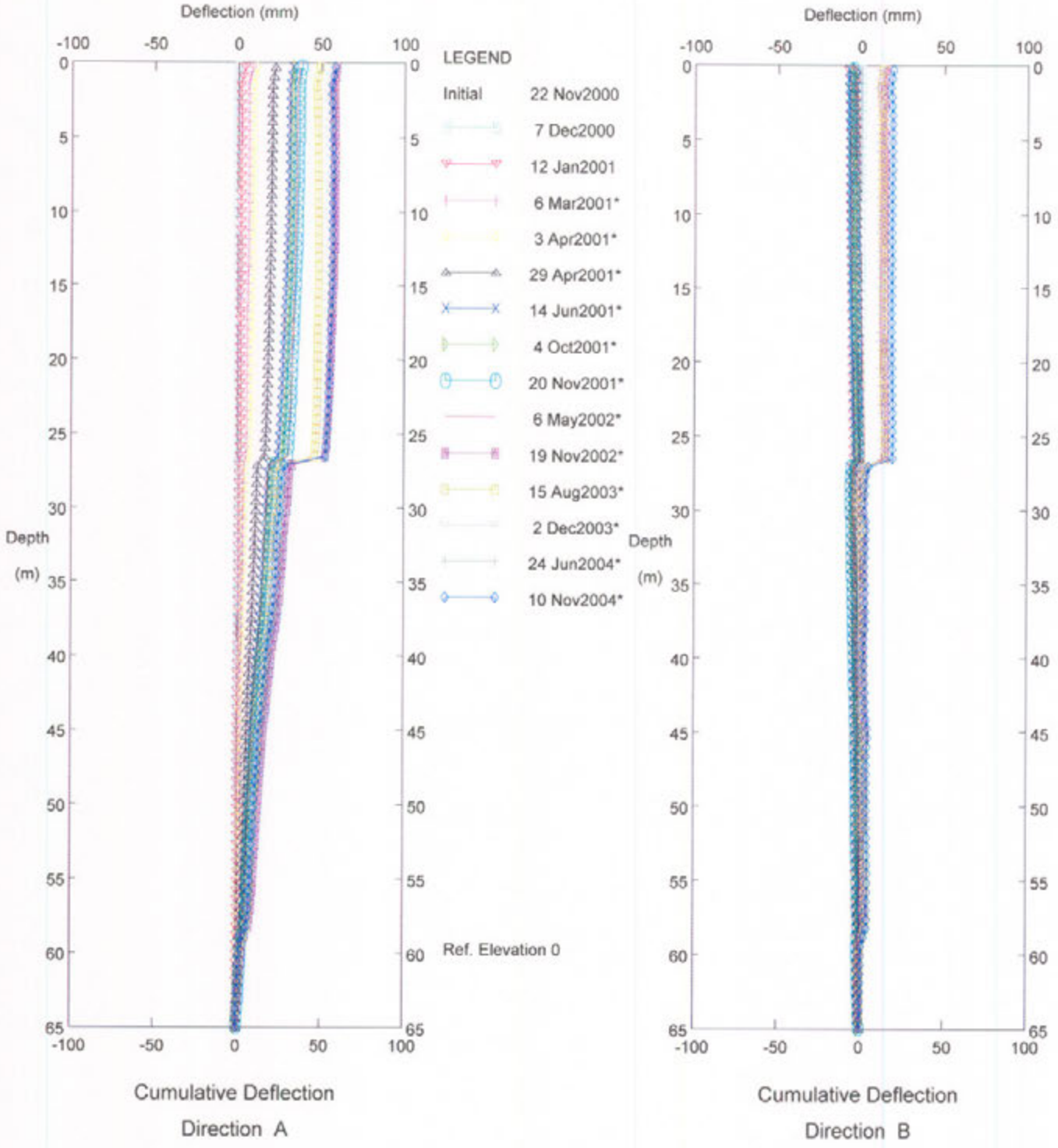


KX03904 W. Quesnel Stability Study, Inclinometer SI-7 Corr.

Pierce Crescent & Lewis Drive

Sets marked * include zero shift and/or rotation corrections.

AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-7 Corr.

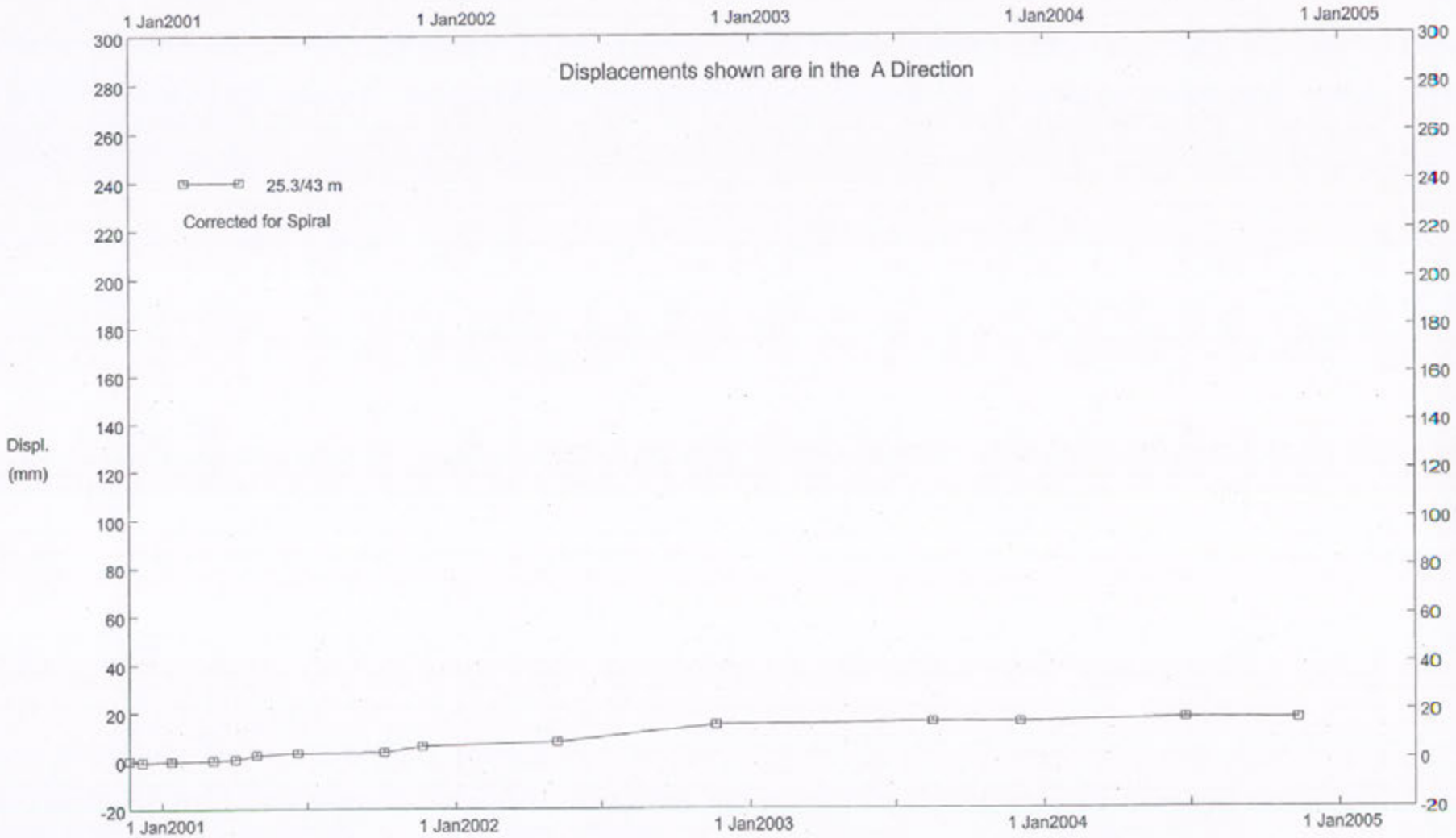
Pierce Crescent & Lewis Drive

Sets marked * include zero shift and/or rotation corrections.

APPENDIX B

Slope Inclinometer Velocity Plots

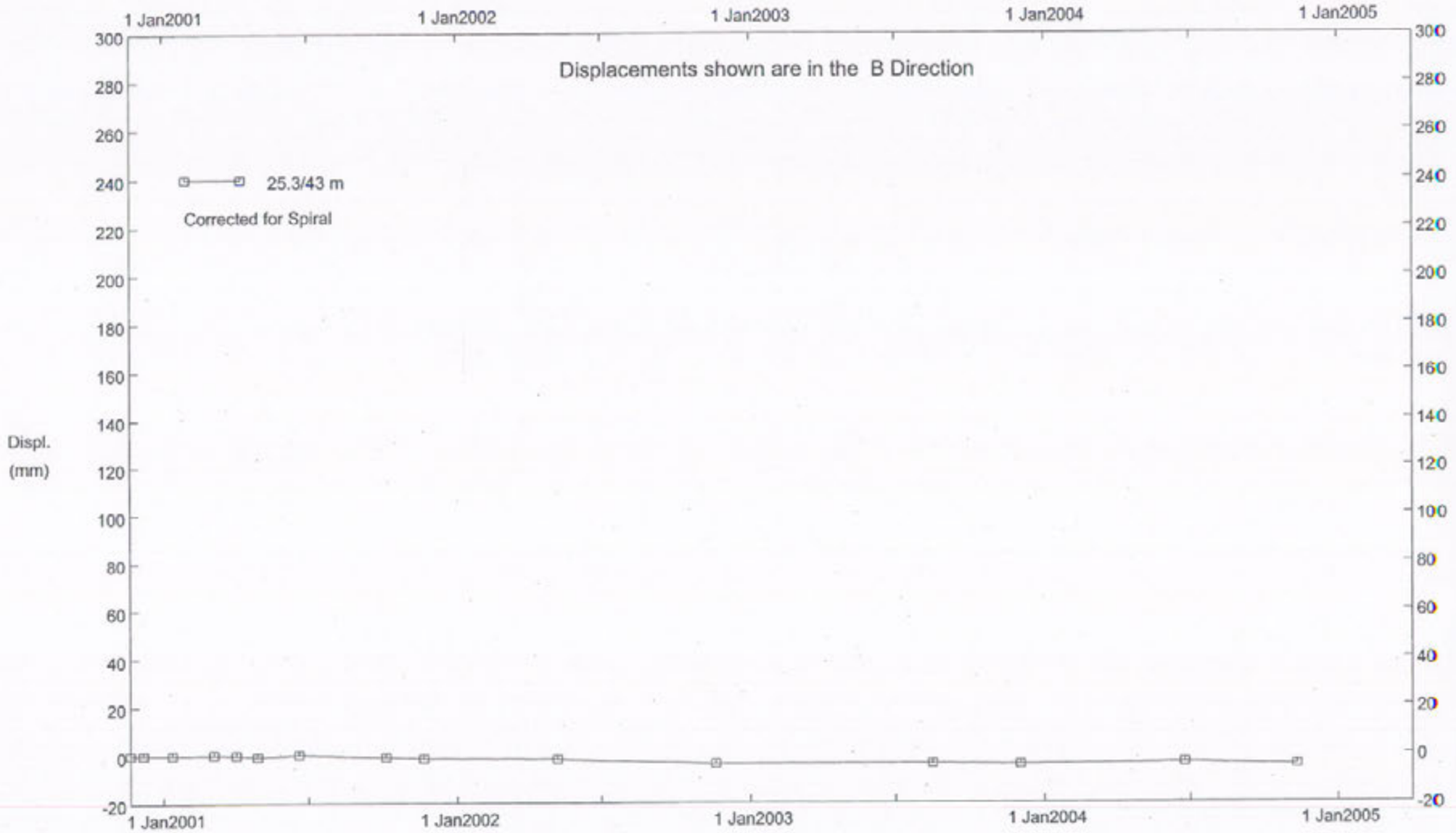
AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-1 Corr.

Lower Avery Lane

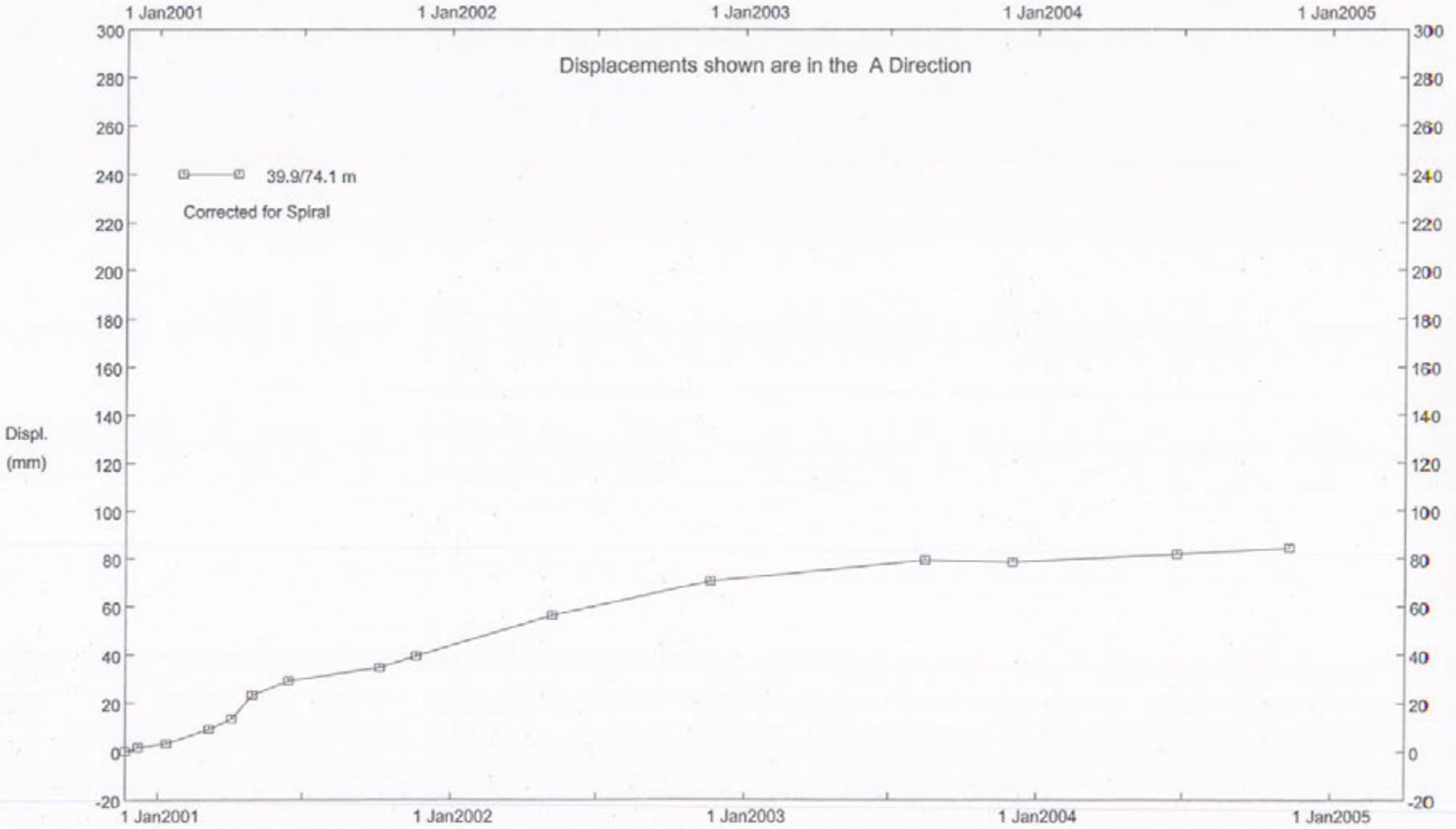
AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-1 Corr.

Lower Avery Lane

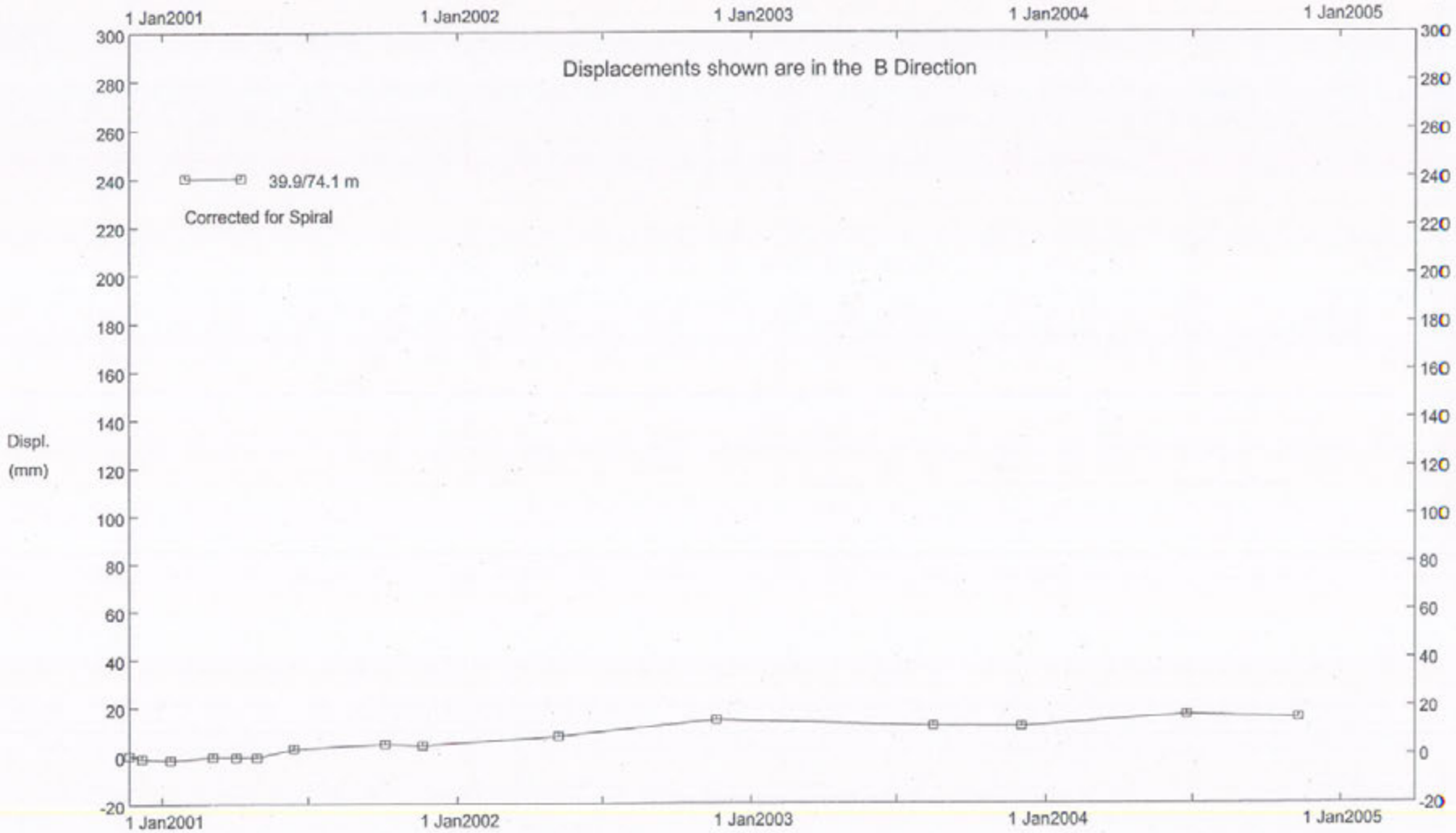
AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-2 Corr.

Upper Avery Lane

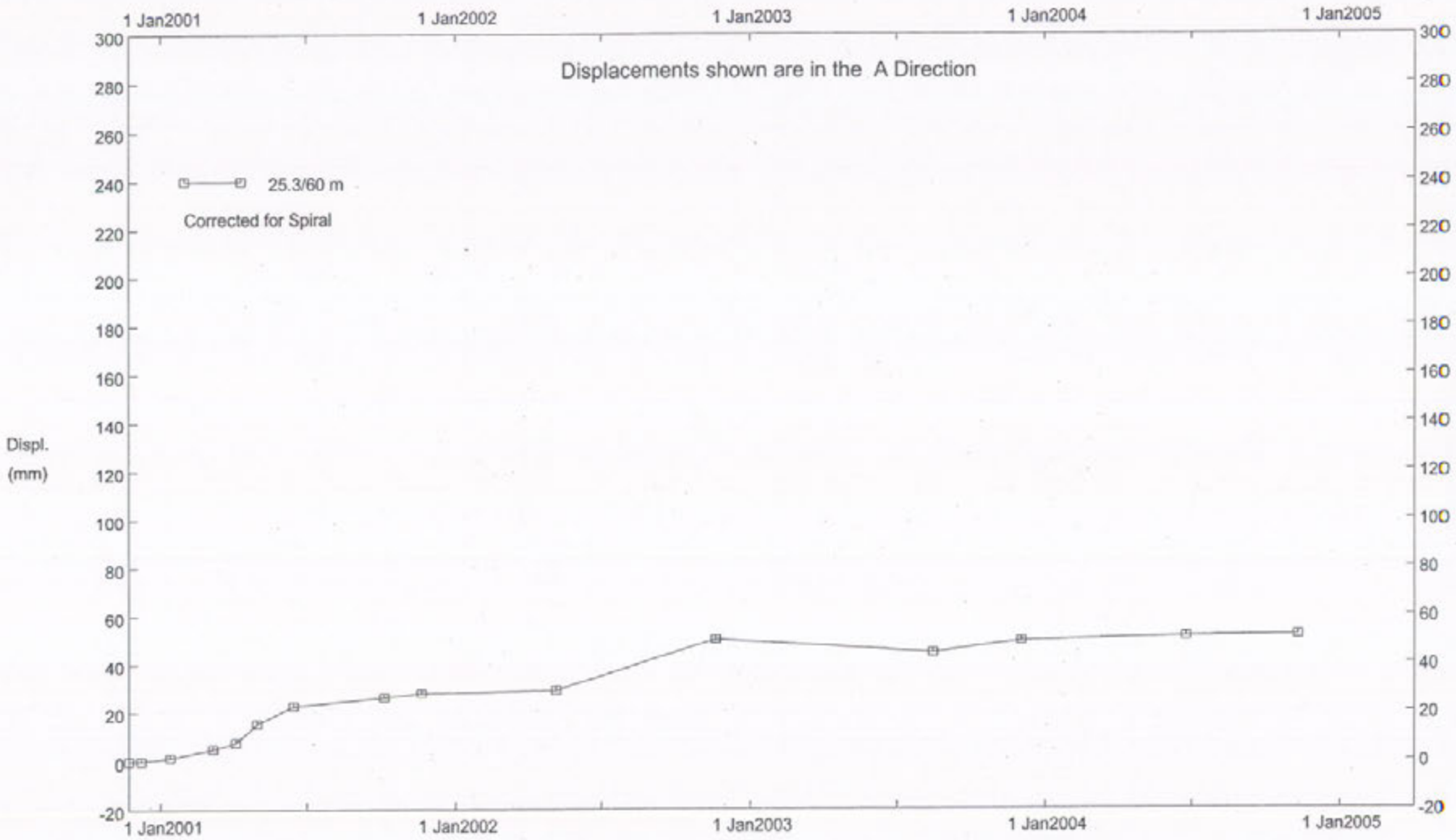
AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-2 Corr.

Upper Avery Lane

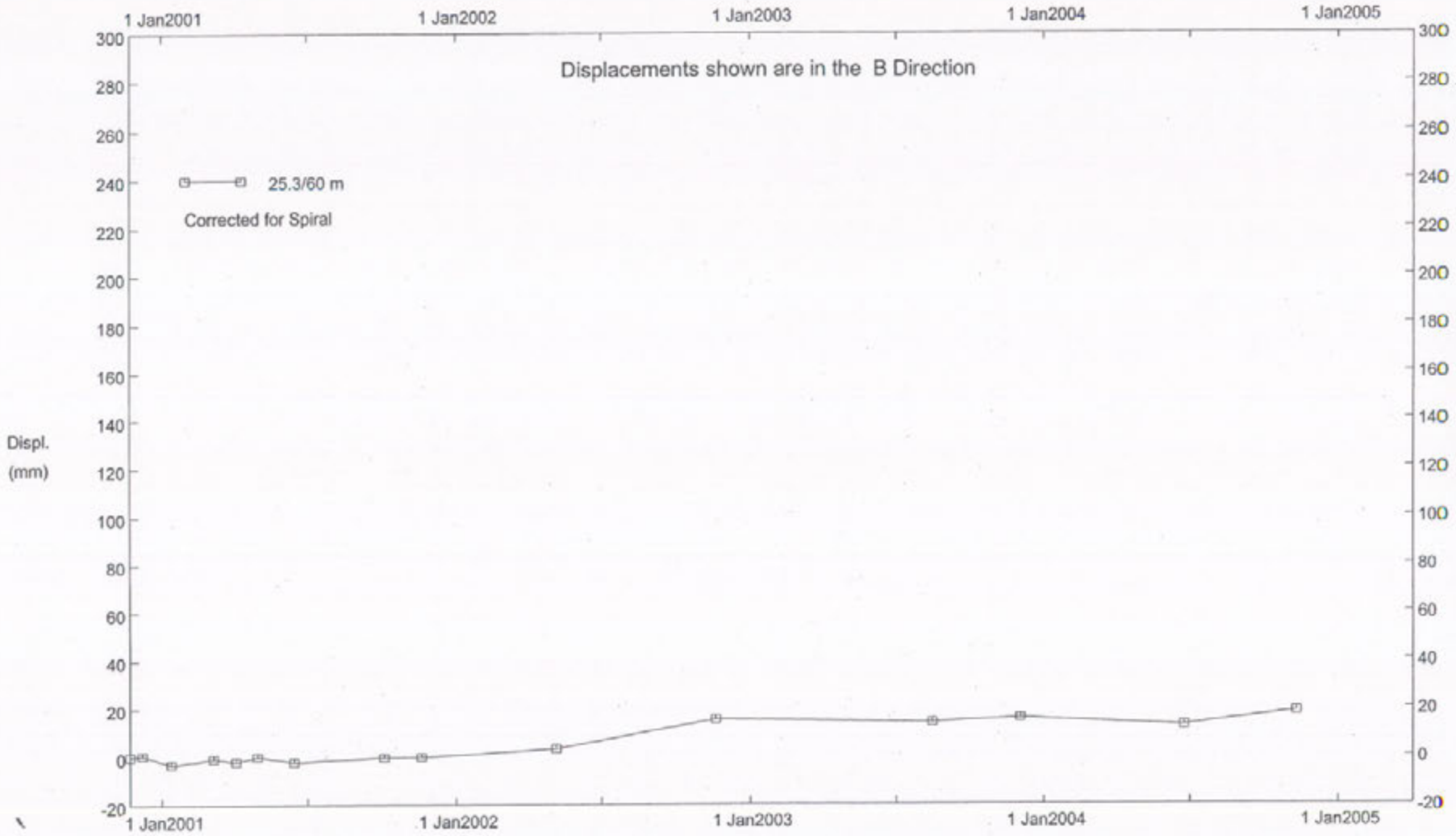
AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-7 Corr.

Pierce Crescent & Lewis Drive

AMEC Earth and Environmental - Pr. George



KX03904 W. Quesnel Stability Study, Inclinometer SI-7 Corr.

Pierce Crescent & Lewis Drive

APPENDIX C
Groundwater Level Plots

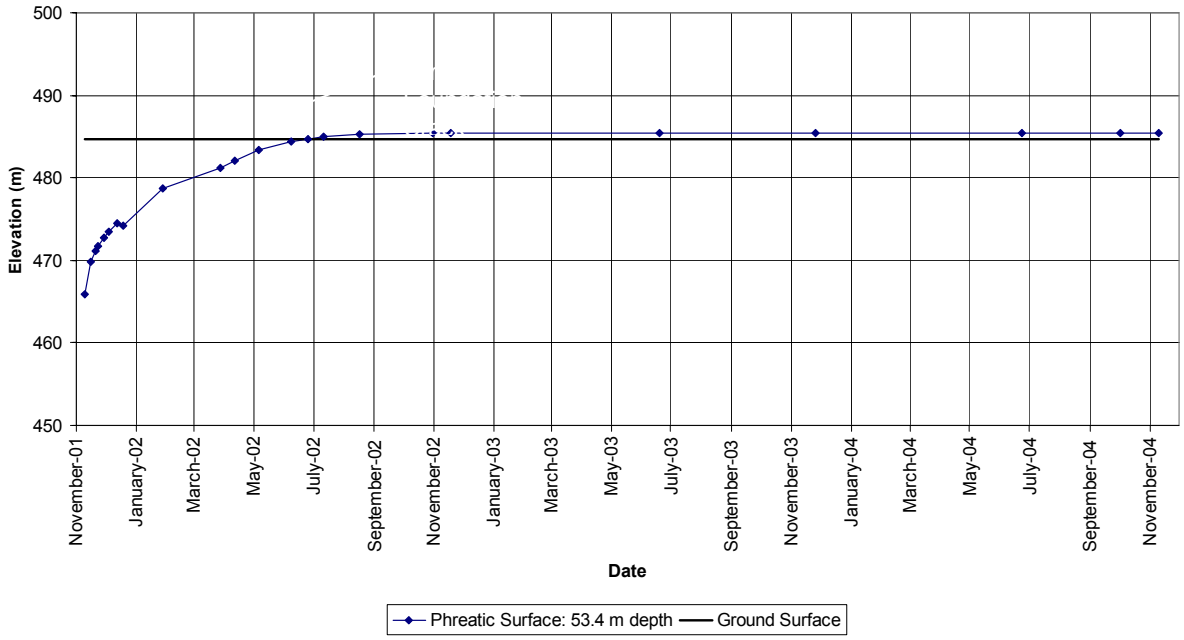


Chart 1: Piezometric data from BH-2A.

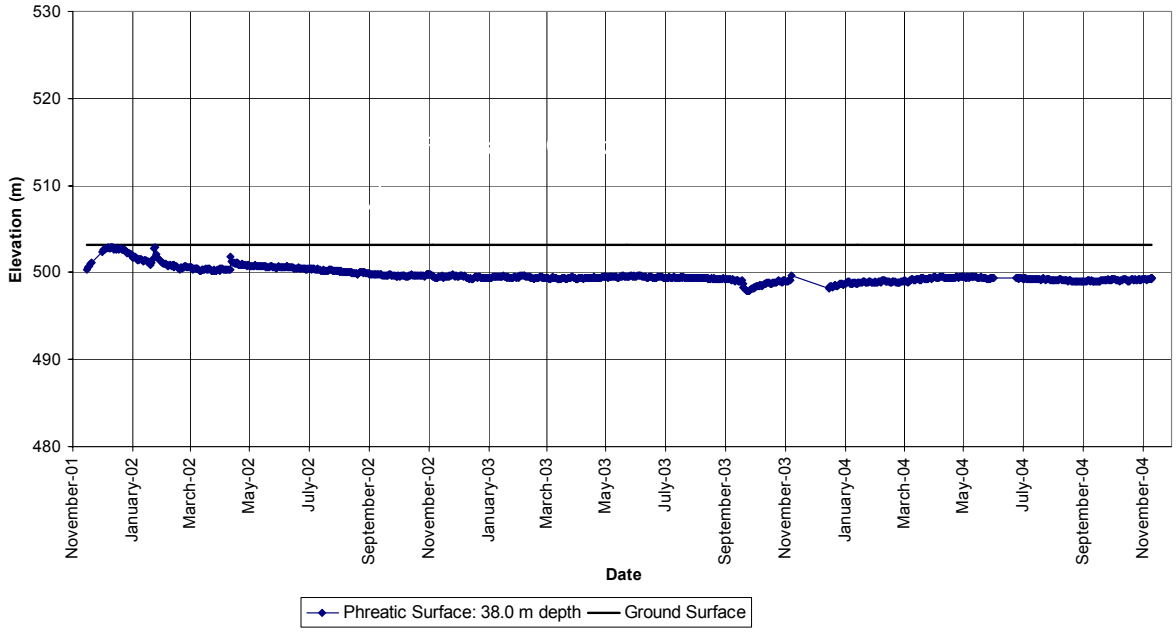


Chart 2: Piezometric data from BH-3A.

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City of Quesnel

On-Going Monitoring
West Quesnel Land Stability Study
Quesnel, BC

Chart C1 and C2

DATE:	SCALE:	DRAWN BY:	PROJECT No: KX04398
Apr 2005	NTS	SJ	

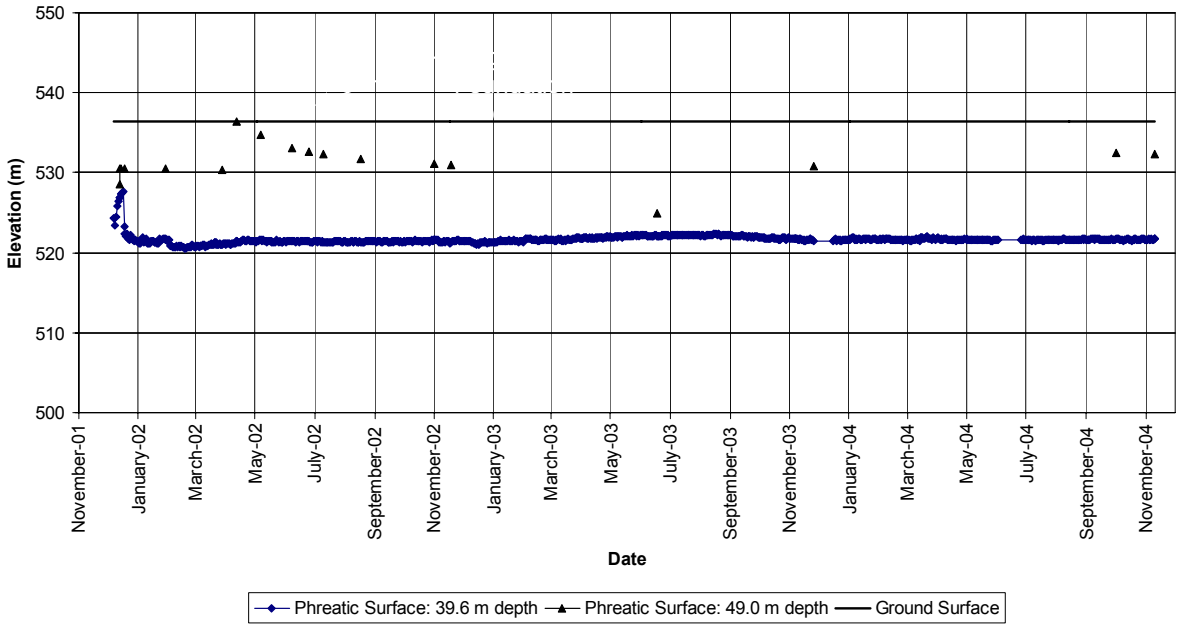

Chart 3: Piezometric data from BH-4A.

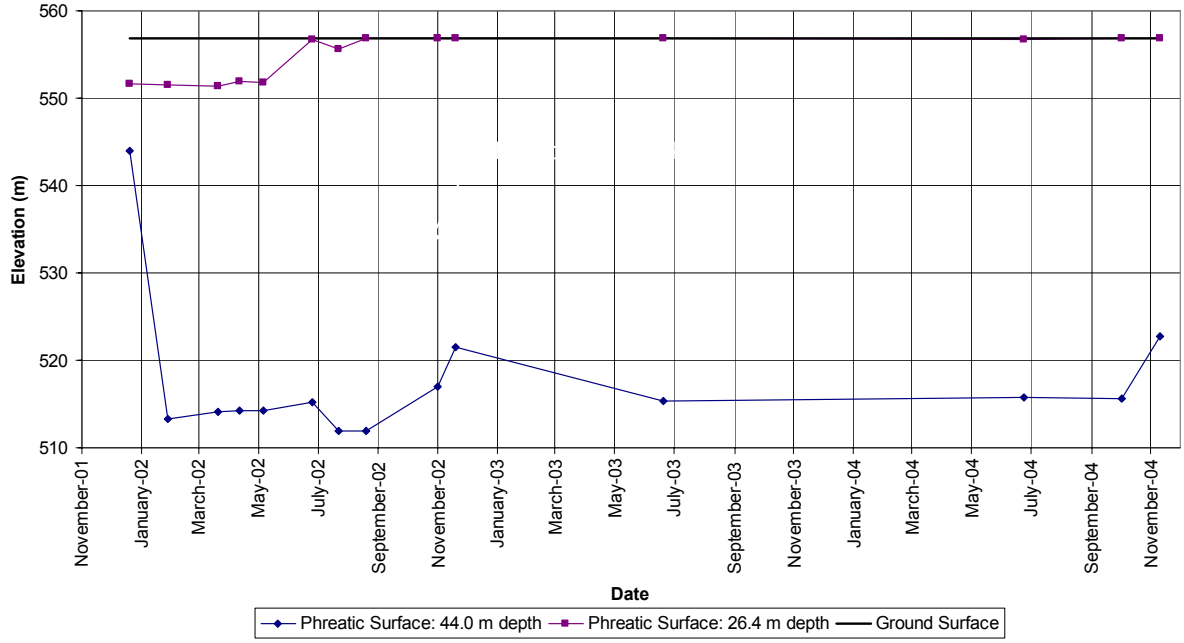

Chart 4: Piezometric data from BH-6A.

City of Quesnel

On-Going Monitoring
West Quesnel Land Stability Study
Quesnel, BC

Chart C3 and C4

DATE:	SCALE:	DRAWN BY:	PROJECT No: KX04398
Apr 2005	NTS	SJ	

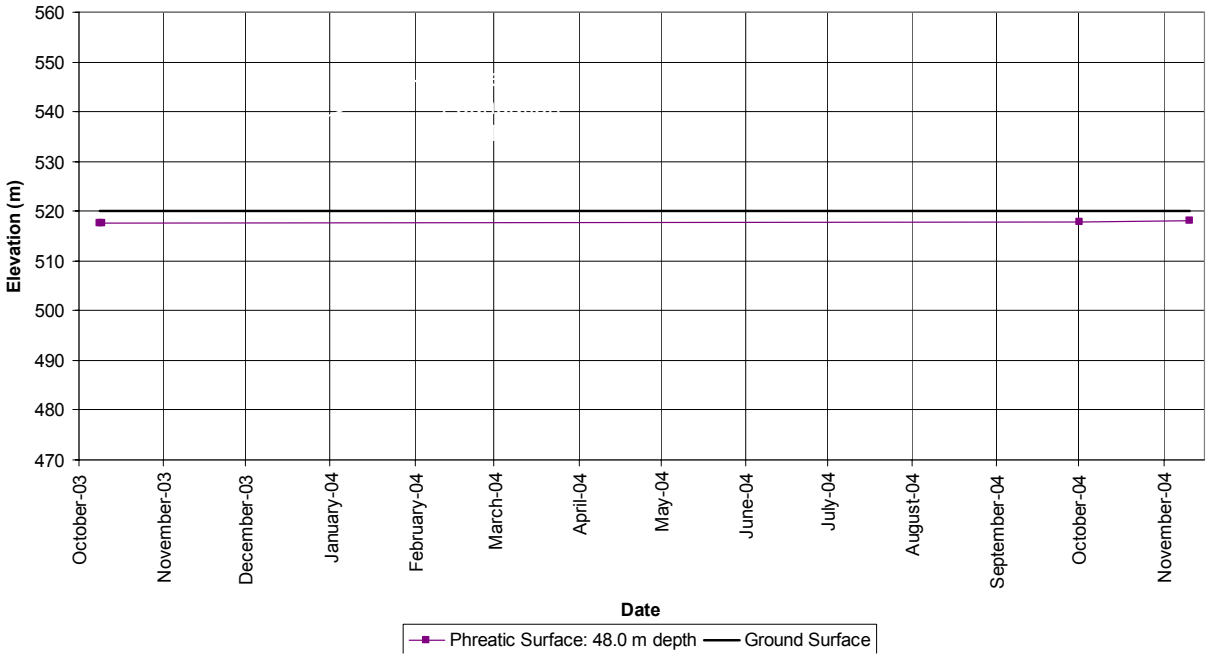

Chart 5: Piezometric data from PW03-01.

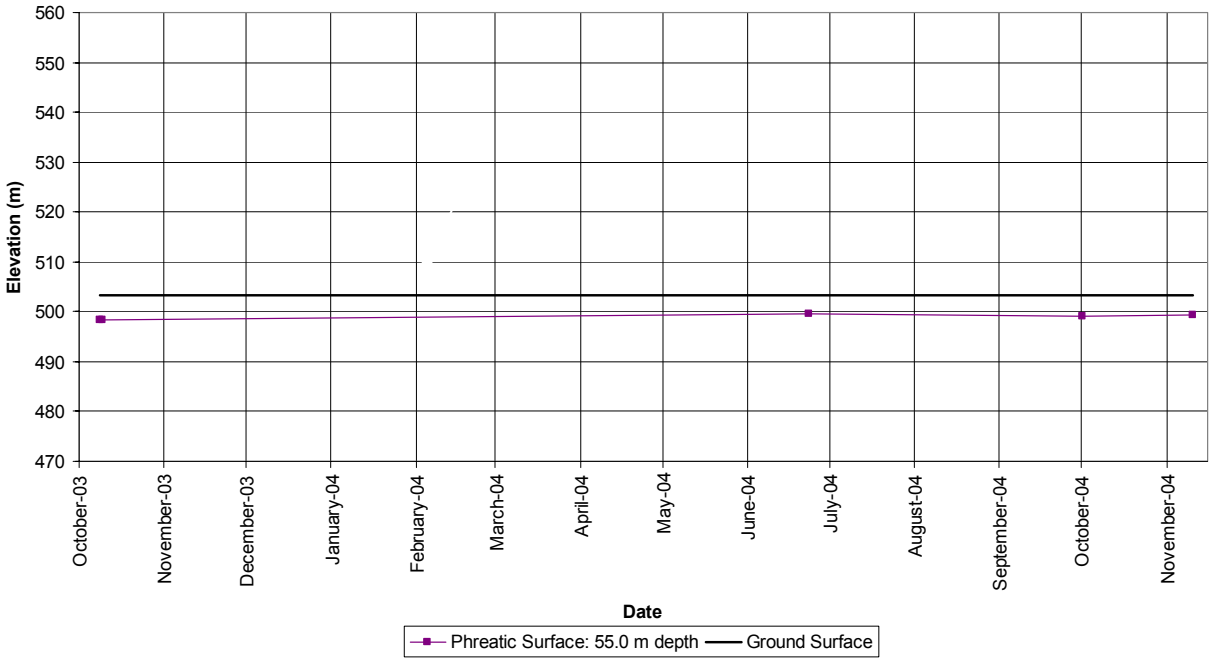

Chart 6: Piezometric data from PW03-02.

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On-Going Monitoring
West Quesnel Land Stability Study
Quesnel, BC

Chart C5 and C6

DATE:	SCALE:	DRAWN BY:	PROJECT No: KX04398
Apr 2005	NTS	SJ	

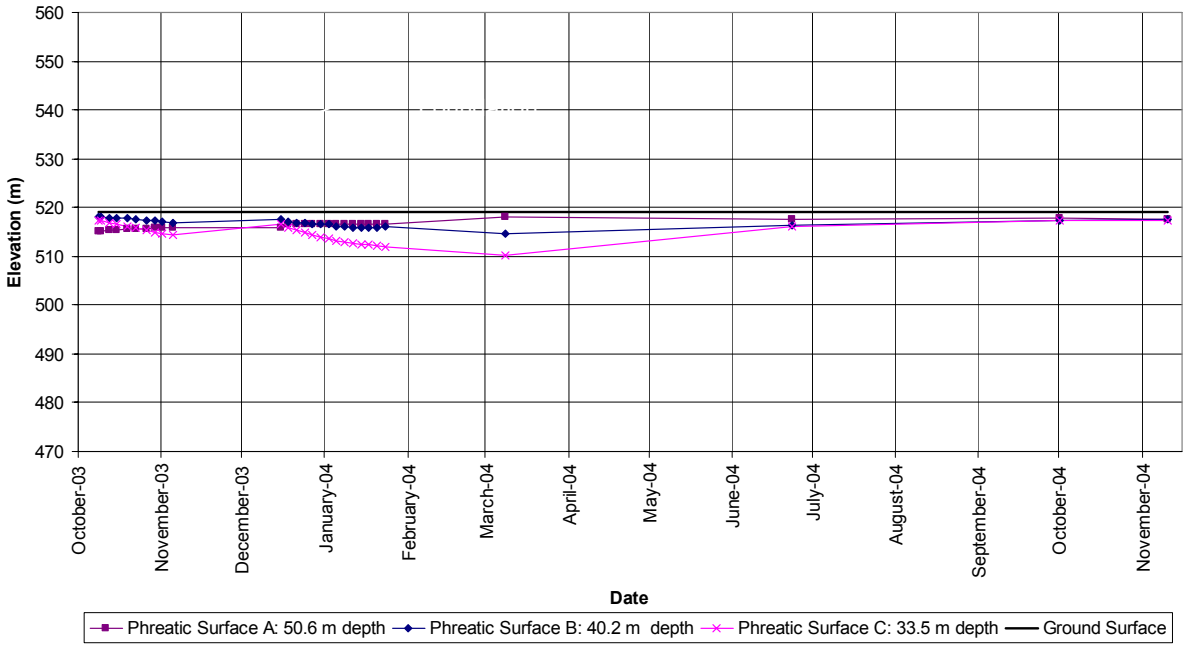

Chart 7: Piezometric data from BH03-03A, B, and C.

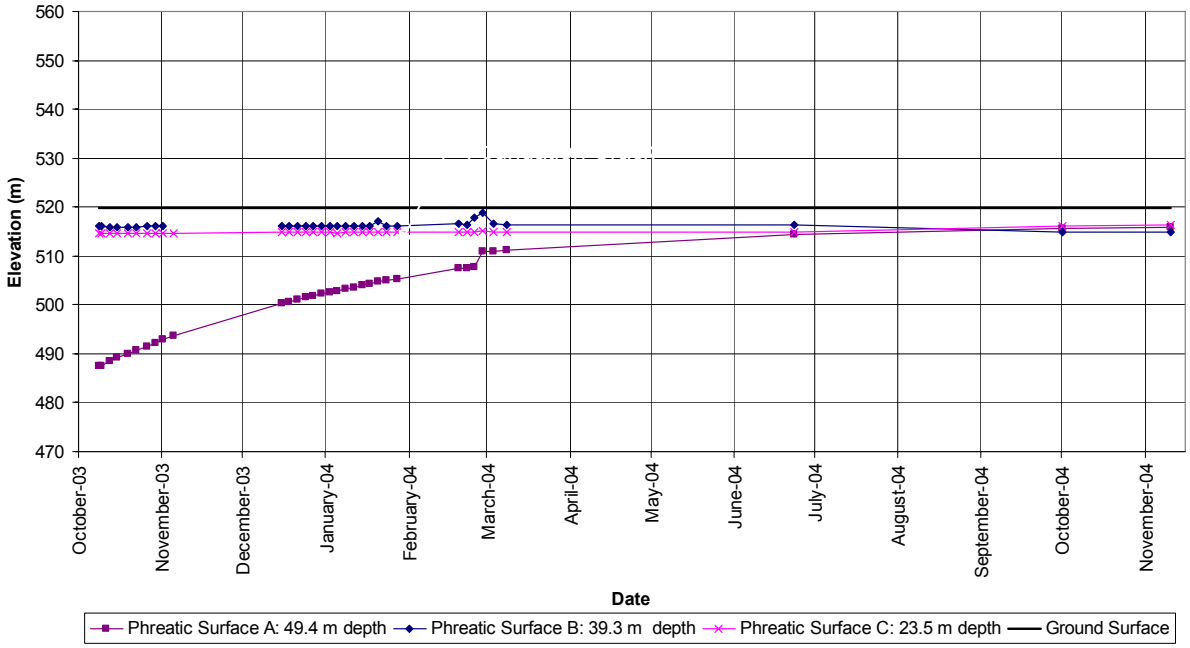

Chart 8: Piezometric data from BH03-04A, B and C.

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City of Quesnel

On-Going Monitoring
West Quesnel Land Stability Study
Quesnel, BC

Chart C7 and C8

DATE:	SCALE:	DRAWN BY:	PROJECT No: KX04398
Apr 2005	NTS	SJ	

APPENDIX D
Precipitation Data Plots

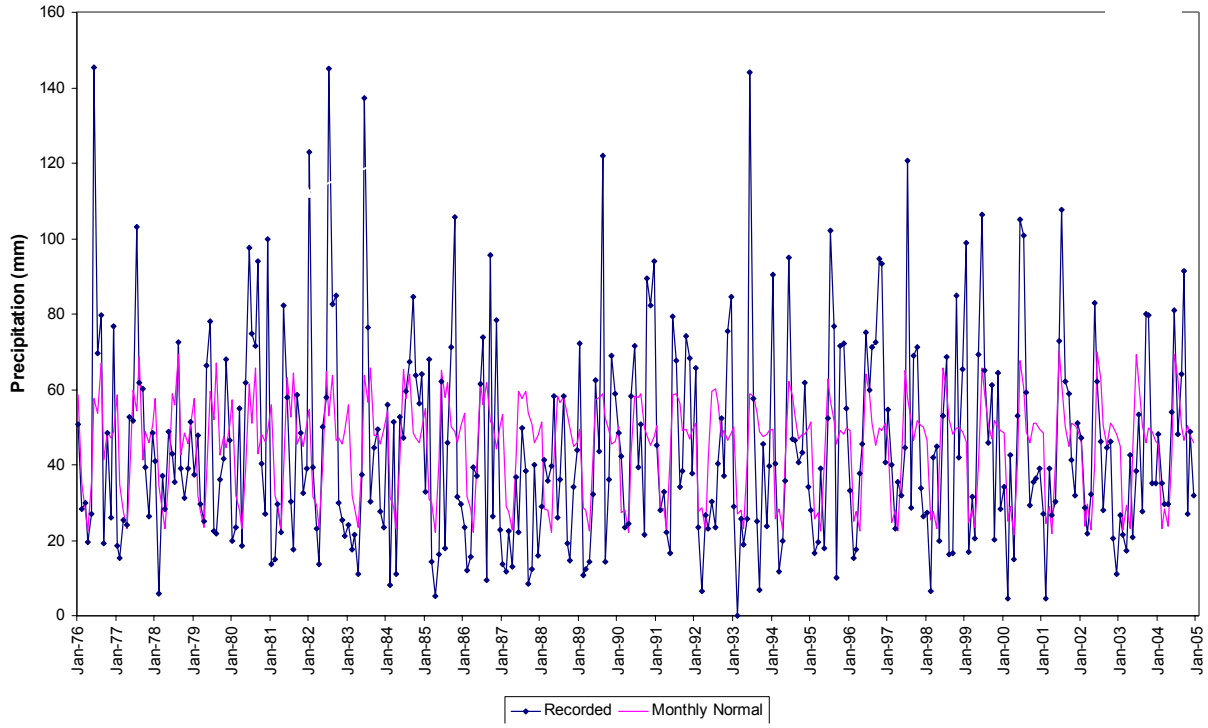


Chart 1: Monthly Precipitation from 1975 to 2005

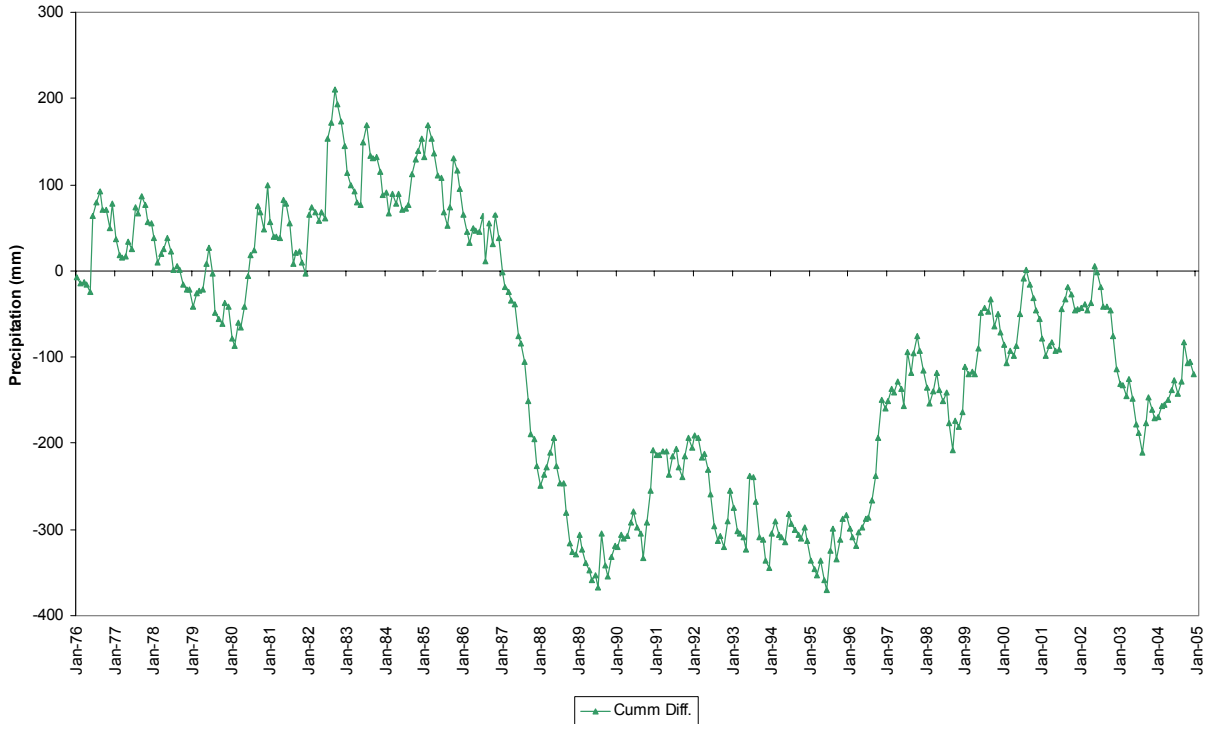


Chart 2: Cumulative Difference from 1975 to 2005

City of Quesnel

On-Going Monitoring
West Quesnel Land Stability Study
Quesnel, BC

Chart D1 and D2

DATE:	SCALE:	DRAWN BY:	PROJECT No: KX04398
Apr 2005	NTS	SJ	

APPENDIX E
Terasen GPS Movement Hub Survey Data and Plots

Table 1: Summary of Monitoring Data from September 1998 to December 1998

Station Number	Location (Landmark, Road)	September, 1998			December, 1998			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.871	531420.907	563.014	-0.007	0.005	-0.007	0.009	0.009	144.462
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870331.961	531626.828	557.163	0.012	-0.001	-0.008	0.012	0.012	355.236
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.445	531627.216	551.965	0.003	0.007	-0.013	0.008	0.008	66.801
6	Paley West	5870474.774	531664.168	539.628	5870474.771	531664.179	539.615	-0.003	0.011	-0.013	0.011	0.011	105.255
7	Paley East	5870427.297	531932.241	533.473	5870427.299	531932.249	533.467	0.002	0.008	-0.006	0.008	0.008	75.964
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.580	531909.287	536.905	0.000	-0.008	-0.038	0.008	0.008	270.000
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.588	531714.875	549.766	-0.011	0.012	-0.019	0.016	0.016	132.510
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.435	531986.023	531.210	-0.002	-0.004	-0.014	0.004	0.004	243.435
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.892	532052.515	524.393	0.004	0.002	0.008	0.004	0.004	26.565
16	Healy Road	5870413.504	532184.864	509.104	5870413.499	532184.859	509.086	-0.005	-0.005	-0.018	0.007	0.007	225.000
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.634	532237.872	519.599	-0.013	0.010	-0.011	0.016	0.016	142.431
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.929	531984.611	524.132	0.006	-0.006	-0.015	0.008	0.008	315.000
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.534	531978.063	517.219	0.002	0.002	-0.006	0.003	0.003	45.000
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.263	532199.109	504.333	0.004	0.004	-0.023	0.006	0.006	45.000
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869343.005	532493.492	485.459	0.009	0.009	-0.015	0.013	0.013	45.000
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.968	532631.095	478.920	0.000	0.009	0.000	0.009	0.009	90.000
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.061	532888.608	475.357	-0.003	0.001	-0.027	0.003	0.003	161.565
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609	5878341.373	531399.217	589.567	-0.026	0.007	-0.042	0.027	0.027	164.932
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.622	533765.361	545.406	-0.012	0.000	-0.023	0.012	0.012	180.000
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773	5870190.608	537039.418	595.773	0.000	0.000	0.000	0.000	0.000	0.000
29	Quesnel Hill	5870484.887	536304.120	575.014	5870484.893	536304.135	575.004	0.006	0.015	-0.010	0.016	0.016	68.199
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.947						

* Net Horizontal Displacement

Table 2: Summary of Monitoring Data from September 1998 to April 1999

Station Number	Location (Landmark, Road)	September, 1998			April, 1999			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.867	531420.931	563.007	-0.011	0.029	-0.014	0.031	0.031	110.772
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870331.956	531626.856	557.150	0.007	0.027	-0.021	0.028	0.028	75.466
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.438	531627.250	551.951	-0.004	0.041	-0.027	0.041	0.041	95.572
6	Paley West	5870474.774	531664.168	539.628	5870474.788	531664.208	539.613	0.014	0.040	-0.015	0.042	0.042	70.710
7	Paley East	5870427.297	531932.241	533.473	5870427.300	531932.279	533.462	0.003	0.038	-0.011	0.038	0.038	85.486
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.581	531909.314	536.909	0.001	0.019	-0.034	0.019	0.019	86.987
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.593	531714.910	549.753	-0.006	0.047	-0.032	0.047	0.047	97.275
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.428	531986.061	531.205	-0.009	0.034	-0.019	0.035	0.035	104.826
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.902	532052.557	524.361	0.014	0.044	-0.024	0.046	0.046	72.350
16	Healy Road	5870413.504	532184.864	509.104	5870413.501	532184.880	509.054	-0.003	0.016	-0.050	0.016	0.016	100.620
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.634	532237.910	519.610	-0.013	0.048	0.000	0.050	0.050	105.154
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.930	531984.639	524.126	0.007	0.022	-0.021	0.023	0.023	72.350
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.525	531978.098	517.218	-0.007	0.037	-0.007	0.038	0.038	100.713
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.256	532199.136	504.327	-0.003	0.031	-0.029	0.031	0.031	95.528
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869342.998	532493.516	485.473	0.002	0.033	-0.001	0.033	0.033	86.532
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.972	532631.109	478.920	0.004	0.023	0.000	0.023	0.023	80.134
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.068	532888.623	475.365	0.004	0.016	-0.019	0.016	0.016	75.964
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609	5878341.391	531399.224	589.587	-0.008	0.014	-0.022	0.016	0.016	119.745
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.631	533765.364	545.407	-0.003	0.003	-0.022	0.004	0.004	135.000
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773	5870190.608	537039.418	595.773	0.000	0.000	0.000	0.000	0.000	0.000
29	Quesnel Hill	5870484.887	536304.120	575.014	5870484.898	536304.133	574.998	0.011	0.013	-0.016	0.017	0.017	49.764
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.947						

* Net Horizontal Displacement

Table 3: Summary of Monitoring Data from September 1998 to December 1999

Station Number	Location(Landmark, Road)	September, 1998			December, 1999			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.879	531420.978	563.027	0.001	0.076	0.006	0.076	0.076	89.246
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870331.993	531626.885	557.160	0.044	0.056	-0.011	0.071	0.071	51.843
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.448	531627.288	551.953	0.006	0.079	-0.025	0.079	0.079	85.657
6	Paley West	5870474.774	531664.168	539.628	5870474.805	531664.239	539.608	0.031	0.071	-0.020	0.077	0.077	66.413
7	Paley East	5870427.297	531932.241	533.473	5870427.321	531932.307	533.461	0.024	0.066	-0.012	0.070	0.070	70.017
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.609	531909.354	536.909	0.029	0.059	-0.034	0.066	0.066	63.825
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.614	531714.965	549.774	0.015	0.102	-0.011	0.103	0.103	81.634
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.441	531986.116	531.199	0.004	0.089	-0.025	0.089	0.089	87.427
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.903	532052.589	524.376	0.015	0.076	-0.009	0.077	0.077	78.835
16	Healy Road	5870413.504	532184.864	509.104	5870413.509	532184.907	509.068	0.005	0.043	-0.036	0.043	0.043	83.367
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.644	532237.958	519.608	-0.003	0.096	-0.002	0.096	0.096	91.790
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.923	531984.695	524.127	0.000	0.078	-0.020	0.078	0.078	90.000
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.519	531978.134	517.213	-0.013	0.073	-0.012	0.074	0.074	100.098
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.259	532199.176	504.353	0.000	0.071	-0.003	0.071	0.071	90.000
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869342.998	532493.539	485.478	0.002	0.056	0.004	0.056	0.056	87.955
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.969	532631.117	478.922	0.001	0.031	0.002	0.031	0.031	88.152
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.069	532888.628	475.374	0.005	0.021	-0.010	0.022	0.022	76.608
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609	5878341.393	531399.221	589.596	-0.006	0.011	-0.013	0.013	0.013	118.610
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.630	533765.367	545.409	-0.004	0.006	-0.020	0.007	0.007	123.690
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773	5870190.608	537039.418	595.773	0.000	0.000	0.000	0.000	0.000	0.000
29	Quesnel Hill	5870484.887	536304.120	575.014	5870484.896	536304.133	575.002	0.009	0.013	-0.012	0.016	0.016	55.305
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.947						

* Net Horizontal Displacement

Table 4: Summary of Monitoring Data from September 1998 to February 2000

Station Number	Location (Landmark, Road)	September, 1998			February, 2000			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.874	531420.976	563.006	-0.004	0.074	-0.015	0.074	0.074	93.094
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870331.985	531626.884	557.159	0.036	0.055	-0.012	0.066	0.066	56.793
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.447	531627.289	551.948	0.005	0.080	-0.030	0.080	0.080	86.424
6	Paley West	5870474.774	531664.168	539.628	5870474.829	531664.236	539.608	0.055	0.068	-0.020	0.087	0.087	51.033
7	Paley East	5870427.297	531932.241	533.473	5870427.327	531932.311	533.457	0.030	0.070	-0.016	0.076	0.076	66.801
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.601	531909.349	536.907	0.021	0.054	-0.036	0.058	0.058	68.749
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.597	531714.959	549.773	-0.002	0.096	-0.012	0.096	0.096	91.193
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.437	531986.106	531.221	0.000	0.079	-0.003	0.079	0.079	90.000
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.906	532052.581	524.364	0.018	0.068	-0.021	0.070	0.070	75.174
16	Healy Road	5870413.504	532184.864	509.104	5870413.515	532184.912	509.064	0.011	0.048	-0.040	0.049	0.049	77.093
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.634	532237.962	519.603	-0.013	0.100	-0.007	0.101	0.101	97.407
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.919	531984.684	524.127	-0.004	0.067	-0.020	0.067	0.067	93.417
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.525	531978.140	517.238	-0.007	0.079	0.013	0.079	0.079	95.064
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.255	532199.171	504.340	-0.004	0.066	-0.016	0.066	0.066	93.468
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869342.994	532493.539	485.472	-0.002	0.056	-0.002	0.056	0.056	92.045
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.979	532631.117	478.918	0.011	0.031	-0.002	0.033	0.033	70.463
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.068	532888.624	475.373	0.004	0.017	-0.011	0.017	0.017	76.759
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609	5878341.378	531399.228	589.599	-0.021	0.018	-0.010	0.028	0.028	139.399
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.631	533765.367	545.417	-0.003	0.006	-0.012	0.007	0.007	116.565
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773	5870190.608	537039.418	595.773	0.000	0.000	0.000	0.000	0.000	0.000
29	Quesnel Hill	5870484.887	536304.120	575.014	5870484.896	536304.131	575.008	0.009	0.011	-0.006	0.014	0.014	50.711
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946						

* Net Horizontal Displacement

Table 5: Summary of Monitoring Data from September 1998 to May 2000

Station Number	Location (Landmark, Road)	September, 1998			May, 2000			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.860	531420.991	563.009	-0.018	0.089	-0.012	0.091	0.091	101.434
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870332.002	531626.898	557.136	0.053	0.069	-0.035	0.087	0.087	52.472
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.448	531627.297	551.936	0.006	0.088	-0.042	0.088	0.088	86.100
6	Paley West	5870474.774	531664.168	539.628	5870474.840	531664.240	539.586	0.066	0.072	-0.042	0.098	0.098	47.490
7	Paley East	5870427.297	531932.241	533.473	5870427.334	531932.321	533.449	0.037	0.080	-0.024	0.088	0.088	65.179
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.607	531909.363	536.886	0.027	0.068	-0.057	0.073	0.073	68.344
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.593	531714.979	549.763	-0.006	0.116	-0.022	0.116	0.116	92.961
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.432	531986.128	531.198	-0.005	0.101	-0.026	0.101	0.101	92.834
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.909	532052.594	524.343	0.021	0.081	-0.042	0.084	0.084	75.466
16	Healy Road	5870413.504	532184.864	509.104	5870413.516	532184.916	509.071	0.012	0.052	-0.033	0.053	0.053	77.005
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.626	532237.988	519.593	-0.021	0.126	-0.017	0.128	0.128	99.462
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.903	531984.719	524.125	-0.020	0.102	-0.022	0.104	0.104	101.094
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.502	531978.164	517.224	-0.030	0.103	-0.001	0.107	0.107	106.239
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.247	532199.193	504.330	-0.012	0.088	-0.026	0.089	0.089	97.765
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869342.985	532493.547	485.486	-0.011	0.064	0.012	0.065	0.065	99.752
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.964	532631.113	478.913	-0.004	0.027	-0.007	0.027	0.027	98.427
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.069	532888.617	475.376	0.005	0.010	-0.008	0.011	0.011	63.435
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609	5878341.380	531399.216	589.577	-0.019	0.006	-0.032	0.020	0.020	162.474
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.633	533765.368	545.406	-0.001	0.007	-0.023	0.007	0.007	98.130
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773	5870190.608	537039.418	595.773	0.000	0.000	0.000	0.000	0.000	0.000
29	Quesnel Hill	5870484.887	536304.120	575.014	5870484.892	536304.131	574.995	0.005	0.011	-0.019	0.012	0.012	65.556
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946						

* Net Horizontal Displacement

Table 6: Summary of Monitoring Data from September 1998 to December 2000

Station Number	Location (Landmark, Road)	September, 1998			Decemeber, 2000			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.847	531421.038	562.998	-0.031	0.136	-0.023	0.139	0.139	102.841
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870332.013	531626.939	557.146	0.064	0.110	-0.025	0.127	0.127	59.808
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.441	531627.341	551.947	-0.001	0.132	-0.031	0.132	0.132	90.434
6	Paley West	5870474.774	531664.168	539.628	5870474.883	531664.276	539.588	0.109	0.108	-0.040	0.153	0.153	44.736
7	Paley East	5870427.297	531932.241	533.473	5870427.348	531932.349	533.436	0.051	0.108	-0.037	0.119	0.119	64.722
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.636	531909.396	536.885	0.056	0.101	-0.058	0.115	0.115	60.994
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.603	531715.031	549.752	0.004	0.168	-0.033	0.168	0.168	88.636
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.429	531986.169	531.198	-0.008	0.142	-0.026	0.142	0.142	93.225
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.922	532052.628	524.353	0.034	0.115	-0.032	0.120	0.120	73.530
16	Healy Road	5870413.504	532184.864	509.104	5870413.524	532184.943	509.062	0.020	0.079	-0.042	0.081	0.081	75.793
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.618	532238.022	519.580	-0.029	0.160	-0.030	0.163	0.163	100.273
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.907	531984.751	524.107	-0.016	0.134	-0.040	0.135	0.135	96.809
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.531	531978.200	517.202	-0.001	0.139	-0.023	0.139	0.139	90.412
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.240	532199.240	504.315	-0.019	0.135	-0.041	0.136	0.136	98.011
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869343.007	532493.555	485.488	0.011	0.072	0.014	0.073	0.073	81.314
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.980	532631.118	478.908	0.012	0.032	-0.012	0.034	0.034	69.444
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.081	532888.636	475.383	0.017	0.029	-0.001	0.034	0.034	59.621
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609	5878341.379	531399.224	589.591	-0.020	0.014	-0.018	0.024	0.024	145.008
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.631	533765.368	545.412	-0.003	0.007	-0.017	0.008	0.008	113.199
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773	5870190.608	537039.418	595.773	0.000	0.000	0.000	0.000	0.000	0.000
29	Quesnel Hill	5870484.887	536304.120	575.014	5870484.890	536304.129	575.002	0.003	0.009	-0.012	0.009	0.009	71.565
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946						

* Net Horizontal Displacement

Table 7: Summary of Monitoring Data from September 1998 to May 2001

Station Number	Location (Landmark, Road)	September, 1998			May, 2001			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.846	531421.051	562.986	-0.032	0.149	-0.035	0.152	0.152	102.121
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870332.019	531626.936	557.100	0.070	0.107	-0.071	0.128	0.128	56.807
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.438	531627.349	551.923	-0.004	0.140	-0.055	0.140	0.140	91.637
6	Paley West	5870474.774	531664.168	539.628	5870474.886	531664.285	539.551	0.112	0.117	-0.077	0.162	0.162	46.251
7	Paley East	5870427.297	531932.241	533.473	5870427.359	531932.364	533.417	0.062	0.123	-0.056	0.138	0.138	63.249
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.636	531909.408	536.872	0.056	0.113	-0.071	0.126	0.126	63.638
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.598	531715.033	549.740	-0.001	0.170	-0.045	0.170	0.170	90.337
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.422	531986.189	531.193	-0.015	0.162	-0.031	0.163	0.163	95.290
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.914	532052.630	524.335	0.026	0.117	-0.050	0.120	0.120	77.471
16	Healy Road	5870413.504	532184.864	509.104	5870413.522	532184.942	509.052	0.018	0.078	-0.052	0.080	0.080	77.005
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.619	532238.054	519.581	-0.028	0.192	-0.029	0.194	0.194	98.297
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.892	531984.774	524.104	-0.031	0.157	-0.043	0.160	0.160	101.170
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.487	531978.205	517.207	-0.045	0.144	-0.018	0.151	0.151	107.354
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.221	532199.244	504.315	-0.038	0.139	-0.041	0.144	0.144	105.290
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869342.971	532493.555	485.475	-0.025	0.072	0.001	0.076	0.076	109.148
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.962	532631.106	478.908	-0.006	0.020	-0.012	0.021	0.021	106.699
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.053	532888.618	475.346	-0.011	0.011	-0.038	0.016	0.016	135.000
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609	5878341.388	531399.222	589.575	-0.011	0.012	-0.034	0.016	0.016	132.510
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.631	533765.369	545.407	-0.003	0.008	-0.022	0.009	0.009	110.556
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773	5870190.608	537039.418	595.773	0.000	0.000	0.000	0.000	0.000	0.000
29	Quesnel Hill	5870484.887	536304.120	575.014	5870484.884	536304.133	574.998	-0.003	0.013	-0.016	0.013	0.013	102.995
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946						

* Net Horizontal Displacement

Table 8: Summary of Monitoring Data from September 1998 to December 2001

Station Number	Location (Landmark, Road)	September, 1998			December, 2001			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021	5869992.844	531421.079	562.988	-0.034	0.177	-0.033	0.180	0.180	100.874
4	Picard Place (Lane)	5870331.949	531626.829	557.171	5870332.030	531626.959	557.116	0.081	0.130	-0.055	0.153	0.153	58.074
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978	5870180.449	531627.379	551.943	0.007	0.170	-0.035	0.170	0.170	87.642
6	Paley West	5870474.774	531664.168	539.628	5870474.904	531664.298	539.564	0.130	0.130	-0.064	0.184	0.184	45.000
7	Paley East	5870427.297	531932.241	533.473	5870427.363	531932.376	533.430	0.066	0.135	-0.043	0.150	0.150	63.947
8	Picard Avenue	5870328.580	531909.295	536.943	5870328.645	531909.423	536.882	0.065	0.128	-0.061	0.144	0.144	63.078
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785	5870063.587	531715.066	549.752	-0.012	0.203	-0.033	0.203	0.203	93.383
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224	5870067.419	531986.217	531.202	-0.018	0.190	-0.022	0.191	0.191	95.412
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385	5870275.910	532052.652	524.336	0.022	0.139	-0.049	0.141	0.141	81.006
16	Healy Road	5870413.504	532184.864	509.104	5870413.530	532184.984	509.054	0.026	0.120	-0.050	0.123	0.123	77.775
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610	5869847.610	532238.084	519.605	-0.037	0.222	-0.005	0.225	0.225	99.462
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147	5869826.906	531984.810	524.129	-0.017	0.193	-0.018	0.194	0.194	95.034
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225	5869596.493	531978.237	517.234	-0.039	0.176	0.009	0.180	0.180	102.494
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356	5869364.223	532199.265	504.332	-0.036	0.160	-0.024	0.164	0.164	102.680
21	Lane between Avery/Allison	5869342.996	532493.483	485.474	5869342.958	532493.562	485.490	-0.038	0.079	0.016	0.088	0.088	115.688
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920	5869628.967	532631.124	478.927	-0.001	0.038	0.007	0.038	0.038	91.507
23	Doherty Dr. - BM	5869134.064	532888.607	475.384	5869134.066	532888.633	475.373	0.002	0.026	-0.011	0.026	0.026	85.601
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609									
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429	5873887.635	533765.370	545.327	0.001	0.009	-0.102	0.009	0.009	83.660
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773									
29	Quesnel Hill	5870484.887	536304.120	575.014									
30	West End of Dodds Avenue at Finley Road				5869989.266	531217.807	575.401						
31	Blair Street				5869768.124	532338.411	508.144						
32	Lewis Drive/Beabien Avenue				5870079.631	532553.538	481.549						
33	South End of Allard Street				5869124.379	532245.960	495.342						
34	Abbott Road and Blair Street				5869581.862	532354.652	494.462						
35	Lewis Drive North of Couldwell Street				5869572.261	532863.710	473.090						
36	Anderson Drive at Abbott Drive				5869315.625	532692.784	476.837						
37	Dawson Street at Abbott Drive				5869644.821	531567.709	545.684						
38	Quesnel No. 1 Station - BM				5870193.015	537018.228	596.514						
39	Anderson Avenue at Wade Avenue				5869071.953	532473.937	476.875						
40	Lewis Drive East of Healy Street				5870303.346	532408.207	493.536						
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946						

* Net Horizontal Displacement

Table 10: Summary of Monitoring Data from September 1998 to Nov 2002

Station Number	Location (Landmark, Road)	September, 1998			December, 2001			October, 2002			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021				5869992.849	531421.127	562.960	-0.029	0.225	-0.061	0.227	0.227	97.344
4	Picard Place (Lane)	5870331.949	531626.829	557.171				5870332.088	531626.998	557.052	0.139	0.169	-0.119	0.219	0.219	50.563
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978				5870180.456	531627.415	551.896	0.014	0.206	-0.082	0.209	0.209	86.112
6	Paley West	5870474.774	531664.168	539.628				5870474.971	531664.345	539.518	0.197	0.177	-0.110	0.265	0.265	41.939
7	Paley East	5870427.297	531932.241	533.473				5870427.421	531932.432	533.390	0.124	0.191	-0.083	0.228	0.228	57.008
8	Picard Avenue	5870328.580	531909.295	536.943				5870328.687	531909.479	536.828	0.107	0.184	-0.115	0.213	0.213	59.821
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785				5870063.593	531715.120	549.734	-0.006	0.257	-0.051	0.257	0.257	91.337
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224				5870067.409	531986.267	531.172	-0.028	0.240	-0.052	0.242	0.242	96.654
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385				5870275.960	532052.698	542.298	0.072	0.185	17.913	0.199	0.199	68.735
16	Healy Road	5870413.504	532184.864	509.104				5870413.570	532184.994	509.024	0.066	0.130	-0.080	0.146	0.146	63.083
17	Bettcher/Lark Intersection	5869847.647	532237.862	519.610				5869847.618	532238.139	519.552	-0.031	0.277	-0.058	0.279	0.279	96.386
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147				5869826.897	531984.865	524.084	-0.026	0.248	-0.063	0.249	0.249	95.985
19	Abbott/Flamingo Intersection	5869599.532	531978.061	517.225				5869599.484	531978.276	517.200	-0.048	0.215	-0.025	0.220	0.220	102.585
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356				5869364.218	532199.317	545.313	-0.041	0.212	40.957	0.216	0.216	100.946
21	Lane between Avery/Allison	5869342.996	532493.483	485.474												
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920				5869628.966	532631.114	504.299	-0.002	0.028	25.379	0.028	0.028	94.086
23	Doherty Dr. - BM	5869134.064	532888.607	475.384												
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609												
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429				5873887.633	533765.364	545.313	-0.001	0.003	-0.116	0.003	0.003	108.435
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773												
29	Quesnel Hill	5870484.887	536304.120	575.014												
30	West End of Dodds Avenue at Finley Road				5869989.266	531217.807	575.401	5869989.264	531217.857	478.894	-0.002	0.050	-96.507	0.050	0.050	92.291
31	Blair Street				5869788.124	532338.411	508.144	5869788.143	532338.482	575.398	0.019	0.071	67.254	0.073	0.073	75.018
32	Lewis Drive/Beabien Avenue				5870079.631	532553.538	481.549	5870079.634	532553.543	508.117	0.003	0.005	26.568	0.006	0.006	59.036
33	South End of Allard Street				5869124.379	532245.960	495.342	5869124.378	532245.999	481.512	-0.001	0.039	-13.830	0.039	0.039	91.469
34	Abbott Road and Blair Street				5869581.862	532354.652	494.462	5869581.848	532354.695	495.304	-0.014	0.043	0.842	0.045	0.045	108.034
35	Lewis Drive North of Couldwell Street				5869572.261	532883.710	473.090	5869572.284	532883.719	494.407	0.023	0.009	21.317	0.025	0.025	21.371
36	Anderson Drive at Abbott Drive				5869315.625	532692.784	476.837	5869315.641	532692.787	473.019	0.016	0.003	-3.818	0.016	0.016	10.620
37	Dawson Street at Abbott Drive				5869644.821	531567.709	545.684	5869644.819	531567.765	476.793	-0.002	0.056	-68.891	0.056	0.056	92.045
38	Quesnel No. 1 Station - BM				5870193.015	537018.228	596.514									
39	Anderson Avenue at Wade Avenue				5869071.953	532473.937	476.875	5869071.948	532473.964	76.827	-0.005	0.027	-400.048	0.027	0.027	100.491
40	Lewis Drive East of Healy Street				5870303.345	532408.207	493.536	5870303.370	532408.233	493.514	0.024	0.026	-0.022	0.035	0.035	47.291
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946									

* Net Horizontal Displacement

Table 11: Summary of Monitoring Data from September 1998 to Nov 2002

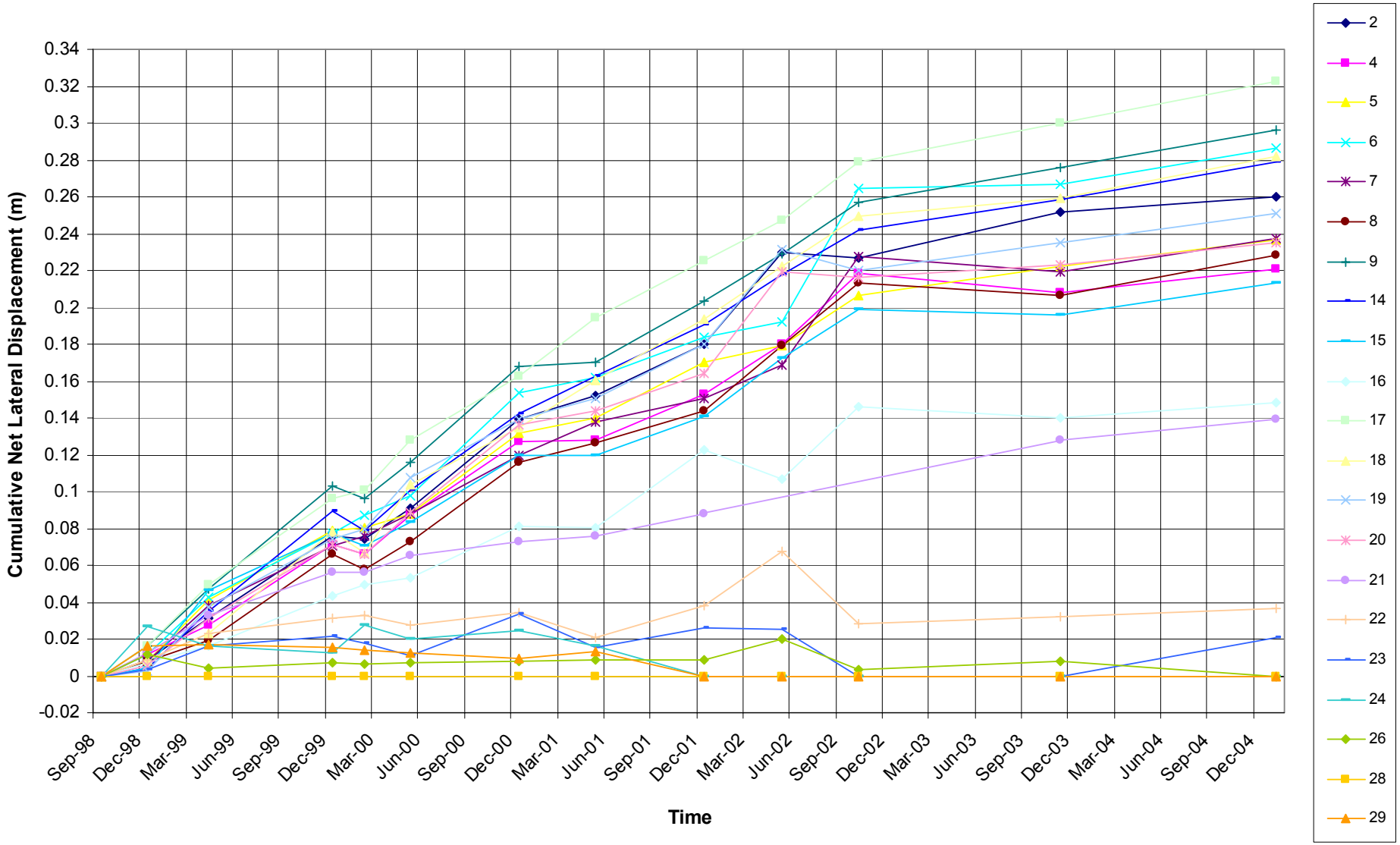
Station Number	Location (Landmark, Road)	September, 1998			December, 2001			November, 2003			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.678	531420.902	563.021				5869992.830	531421.149	562.984	-0.048	0.247	-0.037	0.251	0.251	100.894
4	Picard Place (Lane)	5870331.949	531628.829	557.171				5870332.061	531627.004	557.107	0.112	0.175	-0.064	0.208	0.208	57.358
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978				5870180.438	531627.431	551.910	-0.004	0.222	-0.068	0.222	0.222	90.998
6	Paley West	5870474.774	531664.168	539.628				5870474.963	531664.357	539.530	0.189	0.189	-0.098	0.267	0.267	45.027
7	Paley East	5870427.297	531932.241	533.473				5870427.392	531932.439	533.408	0.095	0.198	-0.065	0.219	0.219	64.323
8	Picard Avenue	5870328.580	531909.295	536.943				5870328.664	531909.484	536.879	0.084	0.189	-0.064	0.206	0.206	66.140
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785				5870063.592	531715.139	549.745	-0.007	0.276	-0.040	0.278	0.278	91.473
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224				5870067.414	531986.285	531.172	-0.023	0.258	-0.052	0.259	0.259	95.053
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385				5870275.932	532052.704	524.314	0.044	0.191	-0.071	0.196	0.196	77.027
16	Healy Road	5870413.504	532184.864	509.104				5870413.535	532185.001	509.048	0.031	0.137	-0.056	0.140	0.140	77.229
17	Bettcher/Lark Intersection	5869847.647	532237.882	519.610				5869847.601	532238.158	519.575	-0.046	0.296	-0.035	0.300	0.300	98.814
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147				5869826.883	531984.873	524.079	-0.040	0.256	-0.068	0.259	0.259	98.772
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225				5869596.467	531978.287	517.212	-0.065	0.226	-0.013	0.235	0.235	106.116
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356				5869364.193	532199.318	504.319	-0.066	0.213	-0.037	0.223	0.223	107.101
21	Lane between Avery/Allison	5869342.998	532493.483	485.474				5869342.951	532493.603	485.500	-0.045	0.120	0.026	0.128	0.128	110.746
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920				5869628.958	532631.116	478.922	-0.010	0.030	0.002	0.032	0.032	107.656
23	Doherty Dr. - BM	5869134.064	532888.607	475.384				5869134.065	532888.627	475.369						
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609												
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429				5873887.630	533765.368	545.325	-0.004	0.007	-0.104	0.008	0.008	121.157
28	Red Bluff Pump Station - BM	5870190.608	537039.418	595.773												
29	Quesnel Hill	5870484.887	536304.120	575.014				5870484.879	536304.132	574.983						
30	West End of Dodds Avenue at Finley Road				5869989.266	531217.807	575.401	5869989.248	531217.866	575.425	-0.018	0.059	0.024	0.061	0.061	107.395
31	Blair Street				5869768.124	532338.411	508.144	5869768.122	532338.497	508.122	-0.002	0.086	-0.022	0.086	0.086	91.566
32	Lewis Drive/Beablen Avenue				5870079.631	532553.536	481.549	5870079.614	532553.534	481.561	-0.017	-0.004	0.012	0.017	0.017	191.684
33	South End of Allard Street				5869124.379	532245.960	496.342	5869124.365	532246.002	496.322	-0.014	0.042	-0.020	0.044	0.044	107.968
34	Abbott Road and Blair Street				5869581.882	532354.652	494.462	5869581.840	532354.709	494.425	-0.022	0.057	-0.037	0.061	0.061	110.831
35	Lewis Drive North of Couldwell Street				5869572.261	532863.710	473.090	5869572.241	532863.717	473.076	-0.020	0.007	-0.014	0.021	0.021	160.785
36	Anderson Drive at Abbott Drive				5869315.625	532692.784	476.837	5869315.631	532692.792	476.822	0.006	0.008	-0.016	0.010	0.010	56.685
37	Dawson Street at Abbott Drive				5869644.821	531567.709	545.684	5869644.808	531567.776	545.704	-0.013	0.067	0.020	0.068	0.068	100.729
38	Quesnel No. 1 Station - BM				5870193.015	537018.228	596.514									
39	Anderson Avenue at Wade Avenue				5869071.953	532473.937	476.875	5869071.923	532473.967	476.852	-0.030	0.030	-0.023	0.042	0.042	135.048
40	Lewis Drive East of Healy Street				5870303.348	532408.207	493.536	5870303.345	532408.242	493.575	-0.001	0.035	0.039	0.035	0.035	91.959
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946	5875411.453	533109.702	542.946	0.000	0.000	0.000	0.000	0.000	0.000

* Net Horizontal Displacement

Table 12: Summary of Monitoring Data from September 1998 to January 2005

Station Number	Location (Landmark, Road)	September, 1998			Decmeber, 2001			January, 2005			Change				Horizontal Vector	
		Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Northing (m)	Easting (m)	Elevation (m ASL)	Total * (m)	Magnitude	Azimuth
2	Donnely/Dodds Intersection	5869992.878	531420.902	563.021				5869992.835	531421.159	562.997	-0.043	0.257	-0.024	0.260	0.260	99.466
4	Picard Place (Lane)	5870331.949	531626.829	557.171				5870332.075	531627.010	557.093	0.126	0.181	-0.078	0.221	0.221	55.251
5	East of Dawson/Lewis Intersection	5870180.442	531627.209	551.978				5870180.448	531627.446	551.906	0.006	0.237	-0.072	0.237	0.237	88.549
6	Paley West	5870474.774	531664.168	539.626				5870474.983	531664.364	539.544	0.209	0.196	-0.084	0.287	0.287	43.092
7	Paley East	5870427.297	531932.241	533.473				5870427.408	531932.451	533.424	0.111	0.210	-0.049	0.237	0.237	62.117
8	Picard Avenue	5870328.580	531909.295	536.943				5870328.674	531909.503	536.862	0.094	0.208	-0.081	0.228	0.228	65.558
9	Lane between Patchett/Pierce	5870063.599	531714.863	549.785				5870063.600	531715.159	549.753	0.001	0.296	-0.032	0.296	0.296	89.826
14	Pentland/Flamingo Intersection	5870067.437	531986.027	531.224				5870067.427	531986.306	531.192	-0.010	0.279	-0.032	0.279	0.279	92.136
15	Palmer/Lewis Intersection	5870275.888	532052.513	524.385				5870275.941	532052.719	524.317	0.053	0.206	-0.068	0.213	0.213	75.696
16	Healy Road	5870413.504	532184.864	509.104				5870413.550	532185.005	509.051	0.046	0.141	-0.053	0.148	0.148	71.858
17	Bettcher/Lark Intersection	5869847.647	532237.962	519.610				5869847.611	532238.182	519.582	-0.036	0.320	-0.028	0.322	0.322	96.342
18	Lark/Flamingo Intersection	5869826.923	531984.617	524.147				5869826.885	531984.896	524.112	-0.038	0.279	-0.035	0.282	0.282	97.791
19	Abbott/Flamingo Intersection	5869596.532	531978.061	517.225				5869596.480	531978.307	517.249	-0.052	0.246	0.024	0.251	0.251	101.977
20	Hawk Street @ Crane Ave.	5869364.259	532199.105	504.356				5869364.194	532199.331	504.332	-0.065	0.226	-0.024	0.235	0.235	106.113
21	Lane between Avery/Allison	5869342.996	532493.483	485.474				5869342.944	532493.612	485.502	-0.052	0.129	0.028	0.139	0.139	112.115
22	Lane between Beath/Bouchie	5869628.968	532631.086	478.920				5869628.965	532631.123	478.934	-0.003	0.037	0.014	0.037	0.037	95.124
23	Doherty Dr. - BM	5869134.064	532888.607	475.384				5869134.059	532888.627	475.375	-0.005	0.020	-0.009	0.021	0.021	104.036
24	Salton Road (Hixon Road)	5878341.399	531399.210	589.609												
26	Benchmark by Airport - BM	5873887.634	533765.361	545.429												
28	Red Bluff Pump Station - BM	5870190.606	537039.418	595.773												
29	Quesnel Hill	5870484.887	536304.120	575.014												
30	West End of Dodds Avenue at Finley Road				5869980.266	531217.807	575.401	5869989.254	531217.878	575.426	-0.012	0.0685	0.0253	0.069	0.069	99.611
31	Blair Street				5869768.124	532338.411	508.144	5869768.131	532338.519	508.128	0.0073	0.108	-0.017	0.108	0.108	86.140
32	Lewis Drive/Beablen Avenue				5870079.631	532553.538	481.549	5870079.619	532553.544	481.545	-0.0118	0.006	-0.004	0.013	0.013	154.217
33	South End of Allard Street				5869124.379	532245.960	495.342	5869124.368	532246.017	495.344	-0.011	0.057	0.002	0.058	0.058	100.923
34	Abbott Road and Blair Street				5869581.862	532354.652	494.462	5869581.838	532354.726	494.434	-0.0242	0.074	-0.028	0.078	0.078	108.109
35	Lewis Drive North of Couldwell Street				5869572.261	532863.710	473.090	5869572.256	532863.720	473.093	-0.0053	0.010	0.003	0.011	0.011	117.457
36	Anderson Drive at Abbott Drive				5869315.625	532692.784	476.837	5869315.625	532692.802	476.820	0.0004	0.017	-0.017	0.018	0.018	88.691
37	Dawson Street at Abbott Drive				5869644.821	531567.709	545.684	5869644.810	531567.789	545.704	-0.0106	0.080	0.020	0.081	0.081	97.566
38	Quesnel No. 1 Station - BM				5870193.015	537018.228	596.514	5870193.008	537018.239	596.526	-0.007	0.011	0.012	0.013	0.013	122.471
39	Anderson Avenue at Wade Avenue				5869071.953	532473.937	476.875	5869071.918	532473.970	476.859	-0.035	0.033	-0.016	0.048	0.048	136.685
40	Lewis Drive East of Healy Street				5870303.346	532408.207	493.536	5870303.349	532408.249	493.571	0.003	0.042	0.035	0.042	0.042	85.914
82C256	Government Benchmark at Airport				5875411.453	533109.702	542.946									

* Net Horizontal Displacement



City of Quesnel

On-Going Monitoring
West Quesnel Land Stability Study
Quesnel, BC

Chart 1: Cumulative net lateral displacement versus time from BC Gas movement hubs (September 1998 to January 2005)

Chart E1

DATE:	SCALE:	DRAWN BY:	PROJECT No: KX04398
Apr 2005	NTS	SJ	

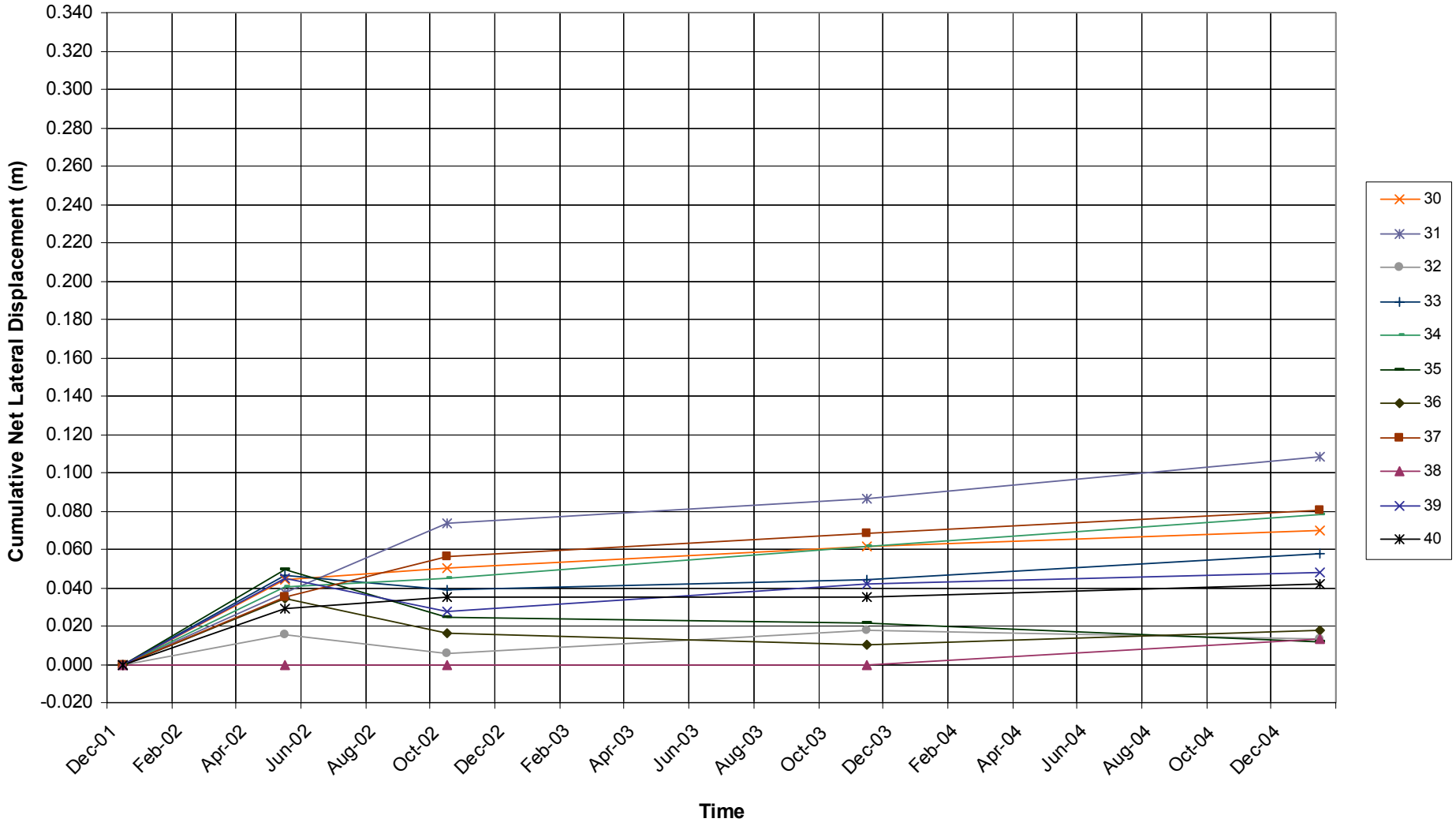


Chart E2

City of Quesnel

On-Going Monitoring
West Quesnel Land Stability Study
Quesnel, BC

Chart 2: Cumulative net lateral displacement versus time from BC Gas movement hubs (December 2001 to January 2005)

DATE:	SCALE:	DRAWN BY:	PROJECT No: KX04398
Apr 2005	NTS	SJ	