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Report

Post Closure Residual Risk Assessment

NEW ZEALAND

Golden Cross Mine

12 August 2016
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TABLE OF CONTENTS

EXECUTIVE SUMMARY V
RESIDUAL RISK ASSESSMENT VI
WATER TREATMENT COST VALUATION VII
SUMMARY VIII
1 INTRODUCTION 1
1.1 Purpose 1
1.2 Site Background 1
1.3 Statement of Methodology 2
1.4 Report Organisation 2
2 LANDSLIDE MOVEMENT 4
2.1 Introduction 4
2.2 Rainfall 4
2.3 Historic Landslide and Mitigation 4
2.4 Landslide Movement Monitoring 5
3 GROUNDWATER/LANDSLIDE MODEL REVIEW 10
3.1 Introduction 10
3.2 Groundwater Management 10
3.3 Groundwater Monitoring 10
4 UNDERGROUND COLLAPSE AND SINKHOLE FORMATION 15
4.1 Introduction 15
4.2 Initial Site Observations 15
4.3 URS 2014 Inspection Observations 17
4.4 2015 Status 18
4.5 Conditions That Influence Sinkhole Development 22
4.6 Collapse Mechanism 23
4.7 Remediation and Public Safety 23
5 ENGINEERING ISSUES 24
5.1 Introduction 24
5.2 Continued slide movement resulting in the release of tailings 24
5.2.1 Regulations and Design Standards 24
5.2.2 Consolidation 24
5.3 Capping failures 25
5.4 Slope Failures 26
5.5 Caving Potential 26
5.6 Seepage and Dewatering 27
5.7 Erosion 27
5.8 Surface Water Management System Failure 27

URS

6 WATER MANAGEMENT AND TREATMENT 28
6.1 Introduction 28
6.2 Water Quality trends 28
6.3 LONG TERM ENVIRONMENTAL MONITORING 31
7 SOCIAL VALUE BENEFITS 32
8 RESIDUAL RISK ASSESSMENT 33
8.1 Introduction 33
8.2 Risk Assessment Approach 33
8.3 Events 35
8.3.1 Uncontrolled Tailings Release 35
8.3.2 Discharge from the USD and SYSD 36
8.3.3 Tailings Acid Rock Drainage 38
8.3.4 Waste Rock Stack Acid Rock Drainage 38
8.3.5 Open Pit ARD 39
8.3.6 Mine Water Treatment 40
8.4 RISK REGISTER 43
9 RESIDUAL RISK PROBABILITIES 49
9.1 Introduction 49
10 VALUATION 56
10.1 Introduction 56
10.2 Inflation Discount Rates 56
10.3 Valuation Period 56
10.4 Residual Risk Costs 56
10.4.1 Release of Contaminants from Underground Mine 57
10.4.2 Capping Leads to ARD 57
10.5 Development of Probabilistic Costs 57
10.6 Residual Risk Costs 58
11 CONTINUED SLIDE MOVEMENT RESULTING IN THE RELEASE OF TAILINGS 59
11.1 Introduction 59
11.2 Dam Breach 59
11.2.1 Dam Breach Parameters 59
11.2.2 Dam Breach Parameters 59
11.2.3 Embankment and Downstream Erosion 59
11.3 REMEDIAL COSTS 60
12 ANNUAL CARE AND MAINTENANCE COSTS 61
12.1 Introduction 61
13 REFERENCES 62
14 LIMITATIONS 64

URS

TABLES

Table 2-1 Summary of displacement monitoring of six regular survey monuments. 8
Table 2-2 Summary of displacement monitoring of three additional survey monuments 9
Table 3-1 Summary of key changes in monitored piezometer for the period. 11
Table 5-1 Capping Design Detail 26
Table 6-1 Water Quality Compliance and Probabilities 31
Table 8-1 Qualitative Measure of Likelihood 34
Table 8-2 Qualitative Measures of Consequence 34
Table 8-3 Risk Screening For Qualitative Assessment 35
Table 8-4 Risk Register 45
Table 9-1 Guide to Assigning Subjective Probabilities 49
Table 9-2 Risk Model Results 49
Table 10-1 Residual Risk Cost – 80 Percent Confidence 57
Table 10-2 100-Year Net Present Value Analysis of Residual Risks 58
Table 11-1 Summary of Estimated Remedial Costs (From Table 1 Tonkin & Taylor 2011) 60
Table 12-1 Estimated Annual Site Income and Care and Maintenance Costs (from J Voyles February 2015) 61
Table 12-2 100-Year Net Present Value Analysis (not including Residual Risks) 61

FIGURES

Figure 1-1 Existing Site Features 3
Figure 2-1 Location of monitoring network 6
Figure 3-1 Piezometers PW25, N7 and N9. 12
Figure 3-2 Piezometers N45 and N142 12
Figure 3-3 Piezometers N132/1, N132/2 and N132/3 13
Figure 4-1 Aerial view of sinkhole 14 June 2013 15
Figure 4-2 View from Helicopter into sinkhole 14 June 2013 (taken from Tonkin &Taylor video footage) 16
Figure 4-3 Debris filled sinkhole 26 July 2013 16
Figure 4-4 Open Pit Sinkhole development as of July 2014 17
Figure 4-5 Enlarged view of sink hole July 2014 17
Figure 4-6 Sinkhole ground profile measurements (from T&T, 2015) 19
Figure 4-7 2015 Sinkhole Cross Sections (from T&T, 2015) 20
Figure 4-8 June 2015 sinkhole images from aerial survey drone. 21
Figure 5-1 Tailings consolidation from 1998 to 2009 (from Tonkin and Taylor, 2013) 25
Figure 6-1 Manganese Trend (Best Fit) 29
Figure 6-2 Iron Trend (Best Fit) 29

Figure 6-3 Hardness Trend 30
Figure 9-1 Event tree for Continuing Movement of Landslide and uncontrolled release of tailings (part 1) 51
Figure 9-2 Event tree for Continuing Movement of Landslide and uncontrolled release of tailings (part 2) 52
Figure 9-3 Event tree for WRS capping failure 53
Figure 9-4 Event tree for mine water release (part 1) 54
Figure 9-5 Event tree for mine water release (part 2) 55

APPENDICES

Appendix A IncLinometer and GPS Data
Appendix B Water Chemistry
Appendix C Sink Hole Evaluation
Appendix D Costs and valuation
Appendix E Dam Breach Evaluation

EXECUTIVE SUMMARY

This residual risk assessment updates the 2011 post closure risk assessment developed for the Golden Cross Mine Site (URS, 2008, 2011). The update is based on evaluation of the current site conditions (as of January 2016). The risk assessment will be used to provide information to develop the long-term site management plan and financial assurance.

The update included reviewing data associated with the landslide movement, groundwater levels, water treatment facilities, the recently developed sinkhole and the general condition of the site. An historic landslide was identified on site in the mid 1990's. Stabilization works were implemented at this time and site monitoring continues. Unusual vertical and horizontal movements recorded in 2008 have since proven to be errors in the analysis software, which has been rectified. Monitoring results indicate annual displacement remains well below the action (intervention) threshold of 75 mm per year with rates less than 5 mm per year being reported over the past seventeen years.

Groundwater and landslide models were originally developed as part of the 2003 and 2008 risk assessments (URS, 2003 and 2008). The models were sensitive to groundwater level inputs which have been reviewed as part of this risk assessment. While water pressures in the lower slide have recovered to historic levels and the upper slide beneath the tailings dam is still depressurized by about 50 meters, the small number of functional piezometers indicate some changes in in groundwater pressures since 2003 when the stability models were developed. These changes do not appear to have impacted the rate of slide movement. We therefore conclude that the stability models remain a viable representation of landslide behaviour which has remained relatively quiescent for over sixteen years and reached a relatively stable equilibrium condition comparable to background conditions.

In June 2013 a sinkhole developed on the eastern wall of the open pit. Between June 2013 and January 2015 the sinkhole developed in size to approximately 40m in diameter and approximately 20m in depth. The Tonkin & Taylor (2013) evaluation of the sinkhole documents the coincidence of a relatively complex set of geological conditions with the underground workings which have given rise to the development of the sinkhole. The debris from the formation of the sinkhole initially self-choked the hole giving rise to water ponding on the debris surface. Over time the debris has softened and been washed into the underground workings. The upslope regression of the sinkhole brings its outer eastern margin close to the upslope rim of the adjacent swale drain (as at January 2015). At this time the drain is not at risk. The sinkhole has not been backfilled or remediated. A permanent safety fence has been installed. Consideration is currently being given to the selection of the most appropriate remedial option for the sinkhole.

All of the site water meets the discharge standards, with the exception of the underground mine water. Underground mine water is currently pumped from a well within the historic mine workings at a rate of approximately 2,000 cubic meters per day (m^3/d) (80 cubic meters per hour (m^3/hr)). The underground mine water continues to be treated to remove iron and manganese.

A trend analysis was completed for both the iron and manganese. The trend analysis indicated that manganese should meet the consent limits by2022, with a 95 percent confidence level. Iron is estimated to achieve compliance limits by 2051 . This assessment assumed that active treatment would be maintained for the period of consent (2035). At this time manganese will be below compliance limits but iron will still be in excess of the compliance limits. Passive treatment, such as aeration cascades and settling ponds, could be used to achieve compliance limits.

Rehabilitation of the Golden Cross Mine has returned the site to a condition similar to the adjoining farm lands with cattle and sheep grazing. The Waitekauri River continues to be a recognised trout fishery.

RESIDUAL RISK ASSESSMENT

The risk assessment identified potential modes of failure that have been evaluated over the years for the site. The identified failure modes are dependent on various engineering issues that will be used to estimate the residual risk at the site. These engineering considerations include engineering design redundancy of the tailings impoundment and consolidation (settlement) of tailings, and the condition of reclamation features including capping, embankment, open pit and constructed drainage channels.

The risk assessment was performed for the identified residual risks that included the following steps:

- Review of a variety of inherent risks including those previously identified;
- Screening issues utilizing a qualitative risk assessment;
- Developing event trees for the significant issues identified; and
- Developing a quantitative risk model of the significant issues.

Based on the qualitative risk assessment the following residual risks were assessed for the associated financial risk at the site:

- Continued growth of the sink hole giving rise to a breach in the surface swale drain and risk associated with failure of engineering works to control surface runoff resulting in surface water inflow into underground; and
- Continued Slide Movement resulting in the release of tailings; and
- Capping failure of Waste Rock Stack (WRS) leading to acid drainage; and
- Underground release of contaminants - incorporating water treatment system failure.

The probability of events occurring was derived from analysis, site data, historical precedent, or engineering judgment. The event trees are presented on Figures 9-1 through 9-5. Probabilities for each event, branch and tree are provided. The probabilities for each branch were summed to provide an overall probability of the occurrence of each scenario. Table ES-1 presents the estimated probabilities for each of the residual risk events.

Table ES 1 Risk Model Results

Risk Issue	Probability
Continuing slide movement resulting in the release of tailings	2.77×10^{-7}
Capping failure of WRS leading to acid drainage	4.08×10^{-6}
Underground release of contaminants	2.86×10^{-3}

A valuation period of 100-years was used for purposes of risk-based financial assurance estimation. Costs were estimated for the residual risk associated with a capping failure and the underground release of contaminants since these are the residual risks that may occur during the 100-year valuation period.

Table ES 2 Residual Risk Cost – 80 Percent Confidence

Risk Issue	80% CL Cost ($NZ, in millions)
Capping failure leading to acid drainage	$0.57
Underground release of contaminants	$0.40

A probabilistic evaluation was completed to estimate the residual risks at the site as summarised in Table ES-3.

Table ES 3 Cost Valuation Summary

Scenario	NPV (NZ$ in Millions)
Residual Risk Cost (80% Confidence Level)	$0.25

Due to the extremely low probability of occurrence for release of tailings it was not included in the quantitative assessment above. However, the consequences and costs of a single event release of tailings were included for purposes of potential financial assurance calculations.

A dam breach analysis was completed by Tonkin & Taylor (Tonkin & Taylor, 2011) to estimate the amount of discharge that would occur from the tailings dam following a tailings dam failure initiated by landslide movement. The peak discharge (lake water) resulting from a failure was estimated at 260 m^3/s. This resulted in a total material movement in the saddle embankment of 25,000 m^3; 15,000 m^3 of embankment and 10,000 m^3 of tailing. The cost to repair any damage and re-instate to pre-breach status resulting from this movement of material and discharge of water was estimated at approximately $1.45 million. This estimate has been escalated by inflation to a 2015 value of $1.527 million.

WATER TREATMENT COST VALUATION

Costs were also developed for water treatment plant operations. Annual operating costs were evaluated for a 20-year period of continued water treatment with site management for an additional 80 years. Annual operating costs were developed by Water Engineering Technologies (WET) both with and without potential tree harvest income (WET, 2010). Table ES-4 provides a summary of the NPV developed for annual site operation.

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Table ES 4 Cost Valuation – Operating Costs

Scenario	NPV (NZ$ in Millions)
Active Water Treatment for 20 Years, Continued Site Management for Additional 80 years (Includes Tree Harvest Income)	$2,798,000
Active Water Treatment for 20 Years, Continued Site Management for Additional 80 years (No Tree Harvest Income)	$7,080,000

SUMMARY

In summary, rehabilitation at the Golden Cross Site has returned the site to land uses similar to the surrounding catchments and to that pre-dating mining. Residual risks of potential acid rock drainage and release of contaminants from the site are very low. The consequence cost for such events was estimated to be approximately $1,210,000 with a resulting annual risk-based NPV cost of $250,000. Landslide movements continue to be well below the target range. A release of tailings from continued slide movement is difficult to envision. Nevertheless, the potential financial implications of a landslide-induced failure of the tailings dam has been estimated at approximately $1.527 million. Treatment of underground water continues and has been conservatively estimated for an additional 20 year duration. The total cost for water treatment ranges from $2.8 to $7.1 million depending on whether or not expected future timber sale income is used to offset these costs.

1 INTRODUCTION

1.1 Purpose

This residual risk assessment updates the 2011 revised post closure risk assessment originally developed for the Golden Cross Mine Site (URS, 2008, 2011). The update is based on evaluation of the site through to December 2015. Coeur Gold NZ Limited and Viking Mining Co. Limited (together known as the "Golden Cross Joint Venture" GCJV) requested that URS update the 2011 risk assessment to account for the observed post-closure behaviour, performance of the water treatment process and site conditions, and the development of a sinkhole in the open pit. The report defines the residual risk for the site, including the remaining natural processes that could conceivably result in the release of contaminants from the site that may exceed established water quality criteria.

From the updated residual risk assessment, an estimate of costs was developed for each of the identified residual risks. In addition, potential costs are also provided from a very low probability release of tailings, as well as for continued site water treatment.

1.2 Site Background

The Golden Cross Mine operated between 1991 and 1998, and the original owners were Cyprus Gold New Zealand Limited and Viking Mining Limited. In 1993, GCJV purchased the site and became the operator.

During its operational life, the Golden Cross Mine included both an open pit and underground mining operation. The mine produced gold and silver, contained within quartz veins, with the underground mine extracting ore from the main Empire quartz vein. The open pit extracted from an overlying quartz vein stock. The combined annual average production was 850,000 tons of processed ore.

The ore was milled on site and the gold and silver extracted using conventional cyanide leach/carbon in pulp (CIP) methods. The process involves crushing and grinding the ore into slurry before cyanide extraction. Following extraction, the fine-grained tailings were treated to recover the cyanide using an acidification –volatilisation - re-neutralization process (AVR). The AVR process recovered the cyanide prior to disposal of the tailings, which was pumped as slurry to the tailing storage facility. Minute amounts of cyanide remained in the tailings when they were pumped into the impoundment, rapidly decomposed into non-toxic constituent components (carbon and nitrogen) and the consolidated tailings are now a benign "rock flour." This is similar to the fine sediment/ground-up rock carried by glacial melt water.

The open pit mine also produced waste rock. The waste rock was either stored in engineered waste rock stockpiles at the mine site, or used in construction of the tailings dam embankment. This depended on the extent of the mineralization in the waste rock and the potential to form acid rock drainage (ARD). Waste containing potential acid generating material was encapsulated within low permeability, non-acid forming material as a means of preventing acid generation.

During closure, the site was rehabilitated by regrading and capping areas that contained potentially acid generating material. This included removing engineered platforms and roadways, and capping waste rock storage areas. Covered areas have now been returned to pasture.

The open pit was partially backfilled and capped. The capping was extended up the walls of the pit to reduce exposure of the surface slopes in the pit thereby preventing the potential for acid generation from the pit walls. A well and pump system were installed to provide water level control in the underground mine workings. The surface drainage system was completed to provide long-term protection of the primary control capping layer (PCL). Figure 1-1 presents the existing site features.

Site monitoring is completed on a periodic basis including water quality sampling, aquatic biology sampling and monitoring, sediment sampling, vegetative success monitoring, erosion control and geotechnical monitoring. A water treatment system is currently used to treat the underground mine water before discharging into the Waitekauri River. Treatment involves the addition of lime, followed by clarification to remove trace metals.

On 12 June 2013 a sub vertical sided surface collapse (sinkhole) was observed on the eastern side of the remediated open pit. Tonkin & Taylor were engaged to assess the likely failure mechanism, undertake a risk assessment and provide remedial options (Tonkin & Taylor, 2013). The open void of the sinkhole has continued to enlarge upslope towards the surface drain on the pit wall. Safety fencing was installed around the sinkhole and GCJV is currently considering longer term management options for the sinkhole.

1.3 Statement of Methodology

This residual risk assessment supersedes the 2011 risk assessment. The update is based on evaluation of site conditions through to December 2015. No updates were necessary to the previous engineering analysis contained in the original 2008 assessment. The updated data has been used to modify previously established risk scenarios, and to identify and evaluate other residual environmental risks.

1.4 Report Organisation

The report is organised as follows:

- Section One – Introduction.
- Section Two – Landslide Movement Review.
- Section Three – Groundwater/Landslide Model Review.
- Section Four – Underground Collapse.
- Section Five – Engineering Issues.
- Section Six – Water Management and Treatment.
- Section Seven – Social Value Benefits.
- Section Eight – Residual Risk Assessment.
- Section Nine – Residual Risk Probabilities.
- Section Ten –Valuation.
- Section Eleven – Continued Slide Movement Resulting in the Release of Tailings.
- Section Twelve – Annual Care and Maintenance Costs.
- Section Thirteen – Limitations.
- Section Fourteen– References.

Data reviewed for this update is presented in Appendices A and B. Appendix A provides inclinometer and Global Positioning System (GPS) data. Appendix B provides the water chemistry trends completed for the mine water. Appendix C includes the Tonkin & Taylor (T&T) 2013 assessment of the sink hole, the January 2015 status report and an independent review by Dick Beetham (GHD, 23 October 2015). Appendix D provides estimated costs and a valuation. Appendix E includes the T&T tailings dam breach evaluation.

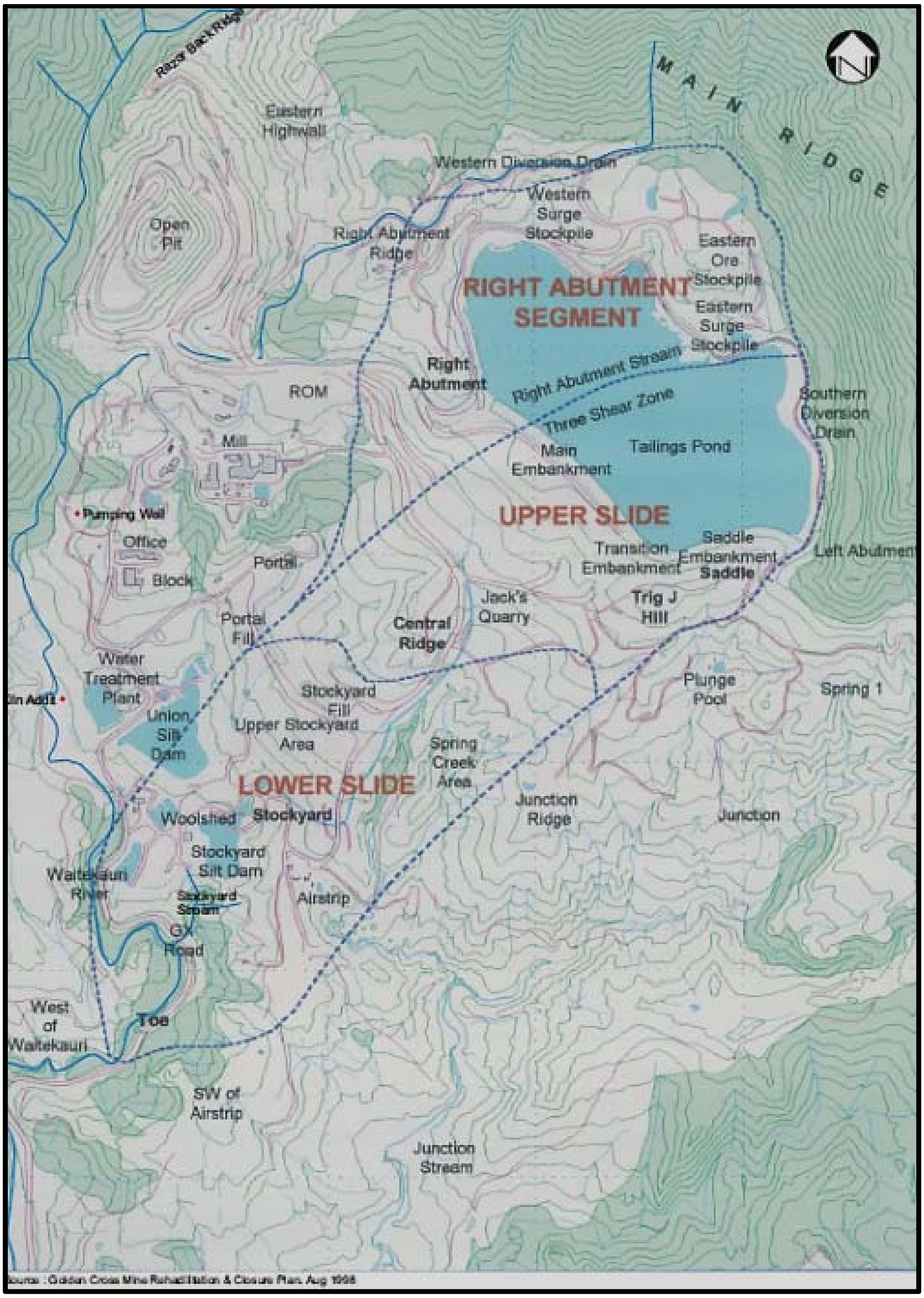


Figure 1-1 Existing Site Features

2 LANDSLIDE MOVEMENT

2.1 Introduction

Landslide movement is monitored using inclinometers and GPS monuments. The most recent landslide monitoring reports were prepared by T&T to cover the period between June 2010 to October 2012 (T&T, June 2013), and between October 2012 to December 2015 (T&T, July 2014; and email data from GCJV). These reports were used for this risk assessment update and are provided in Appendix A.

This section summarises the rainfall characteristics, the monitored piezometric levels and the deformations measured by GPS at the surveyed monuments. This section also compares the measured groundwater levels with the groundwater assumptions embedded in the numerical modelling of the slide carried out by URS in 2003.

2.2 Rainfall

The average annual rainfall for the site is reported by T&T (July 2014) is 2787mm. Rainfall recorded by the rainfall gauge at the site Water Treatment Plant (WTP) from 2010 to 2013 shows annual rainfall between 1925mm and 2605mms. This extends the run of below-average annual rainfall readings back to 2008. Rainfall during the period year 2000 to year 2007 was above average.

Rainfall was typically characterised by long periods of low rainfall punctuated by large rainfall events. Nine significant rainfall events were reported by T&T during this monitoring period (June 2010 to August 2015). The magnitude of these events ranged from 111mm over 2 days to 267mm over 4 days. These events occasionally lasted several days.

2.3 Historic Landslide and Mitigation

In 1995 a historic landslide was triggered by construction of the tailings dam. GCJV commissioned Woodward Clyde, Legacy Company of URS, to guide the monitoring and remediation of the slide. The landslide was effectively stabilised and the site successfully remediated by the following:

- Constructing a filter buttress for the tailings dam embankment.
- Building surface water diversions.
- Adding a filter buttress to the Union Silt Dam.
- Dewatering of the weak stratum to stabilize the landslide with horizontal drains and an underground drainage adit.
- Removing some waste rock from the surface of the slide to reduce the driving mechanisms.

Movement of the landslide is monitored to ensure movement rates remain below the target limit of 75 mm per year. This threshold was established by URS and reviewed by the geotechnical peer review panel as the amount of movement that may signal a change in the condition of the landslide triggering additional monitoring and possible site actions.

The possibility of landslide movement leading to a breach of the tailings dam and significant release of tailings has been evaluated since closure. Investigations indicate that the tailings have consolidated around the impoundment perimeter. The resulting increase in tailings density had by 2002 diminished the tailings' ability to flow (SKM, 2002). Tailings consolidation was further evaluated in the 2003 and 2011 risk assessments (URS, 2003 and 2011). The reports showed an increase in density confirming that the tailings are not likely to flow in the event of a breach. The probability of landslide movement initiating a breach in the tailings dam with significant release of tailings was inconceivable.

2.4 Landslide Movement Monitoring

Landslide movement has been monitored in the past using a combination of inclinometers and GPS measurement of survey monuments across the site. The last two remaining inclinometers, N131 and N136 became too constricted in 2008 and inclinometer readings ceased. The Landslide Committee concluded that they had served their primary role of identifying the depth and location of the failure surface and the instruments have not been replaced.

Since 2008 landslide movement has continued to be monitored by GPS measurement of the following six survey monuments:

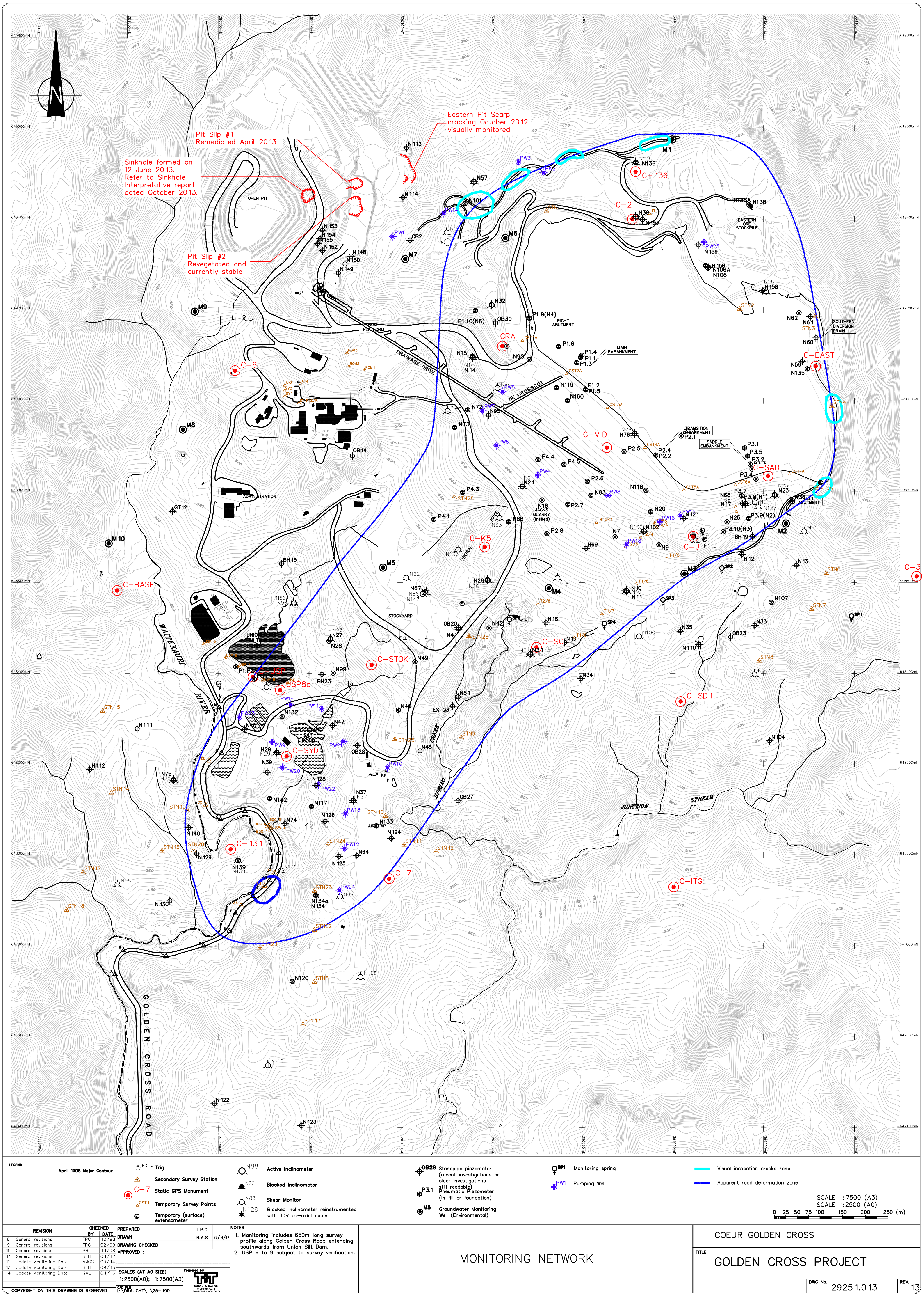
1. C-2.
2. C-SAD.
3. C-Mid.
4. C-K5.
5. C-SYD.
6. USP-8.

GPS survey readings during the 2008 monitoring period showed surprising vertical movements and lateral movement of C-K5. Following review of the unusual readings monitoring of the following three monuments re-commenced:

1. C-RA.
2. C-STOK.
3. C-USP.

The location of the nine monuments is shown in Figure 2-1.

Figure 2-1 Location of monitoring network



The movements in 2009 initiated a site inspection by Richard Davidson of URS accompanied by Grant Loney of T&T. The tailings embankment appeared to be in good condition without indication of movement or cracking, but minor cracking of shotcrete in the Western and Southern Diversion Drains was attributed to possible movement. Crack meters showed no movement during the 2009 to 2010 monitoring period and subsequent rebound of survey monument readings was difficult to understand.

The inconsistent readings during 2008 and 2009 instigated a review of the data described in T&T's Monitoring report (June 2013). The review concluded that a new release of the data processing software (TGO v1.63) introduced to the project in 2008 was producing variable results. The variable data was subsequently re-processed using the previous version (TGA v1.60). In October 2012, Topcon Tools data processing software was introduced to the project after comparing the results with the aging TGA v1.60 package.

The monitoring data through to September 2015 is summarised in Appendix A and shown in Table 2-1 and 2-2.

Table 2-1 Summary of displacement monitoring of six regular survey monuments

Location	ID	November 2009 to September 2015		
		Lateral displacement (mm)	Vertical displacement (mm)	Direction (°)
Rear of Tailings Pond, Upper Slide	C-2	15.2 (2.6) [3.41]	-3.0 (-0.5) [-0.5]	203
Saddle, Upper Slide	C-SAD	16.4 (2.80) [2.65]	-36.0 (-6.1) [-9.0]	232
Main Embankment, Mid Slide	C-Mid	8.1 (1.40) [3.67]	-40.0 (-6.9) [-12.5]	263
Central Ridge, Mid Slide	CK5	17.8 (3.09) [3.10]	-8.0 (-1.4) [0.1]	232
Stockyard Lower Slide	C-SYD	6.0 (1.04) [1.11]	3.00 (0.5) [-0.2]	90
Stockyard Lower Slide	USP-8	16.1 (2.80) [2.44]	-11.0 (-1.9) [0.6]	187

Notes:-

Theoretical instrument error for static GPS is 3mm to 5mm.

Numbers in round brackets () are annual movement during the monitoring period.

Numbers in square brackets[] are annual movement since Jan 2001.

Negative numbers indicate downwards movement.

Table 2-2 Summary of displacement monitoring of three additional survey monuments

Location	ID	November 2009 to September 2015		
		Lateral displacement (mm)	Vertical displacement (mm)	Direction (°)
Right Abutment, Upper Slide	C-RA	5.8	-3.0	121
		(1.01)	(-1.2)	
		[2.44]	[-0.1]	
Stockyard Fill	C-STOK	6.0	-3.0	180
		(1.05)	(-0.5)	
		[1.29]	[-0.1]	
Union Silt Pond, Off Slide	C-USP	13.0	-36	212
		(2.26)	(-6.3)	
		[1.89]	[-2.4]	

Notes:

Theoretical instrument error for static GPS is 3mm to 5mm.

Numbers in round brackets () are annual movement during the monitoring period.

Numbers in square brackets [] are annual movement since Jan 2001.

Negative numbers indicate downwards movement.

Table 2-1 and Table 2-2 show the lateral and vertical displacements measured during this period as well as the annual displacements for the period (in round brackets) and the annual displacements since January 2001 (square brackets) when the landslide was considered stable. The data includes the re-processed 2008 and 2009 data.

The data indicates continued small lateral movements ranging between 1.01mm/year and 3.09mm/yr for the period, comparing well with annualised movements since January 2001 ranging between 1.0mm/yr and 3.6mm/yr.

Vertical deformations range from -6.9mm/year to 0.5mm/yr for the period, compared with annualised movements since January 2001 ranging from -12.5 mm/yr to 0.62 mm/yr. The large negative values are generally associated with monuments on the upper or middle slide which may be subject to ongoing settlement induced by the tailings embankment.

The monitoring results indicate that the landslide continues to move predictably at an extremely slow rate significantly below the 75mm/yr target for reviewing the monitoring requirements. The direction of the movement vectors for the period generally agree with the movement vectors for the period from January 2001 although there is some variability, particularly for small movements which are at the lower limits of the GPS system accuracy.

3 GROUNDWATER/LANDSLIDE MODEL REVIEW

3.1 Introduction

Landslide models comprising 2D and 3D limit equilibrium models developed in 1997 indicated that the slide was sensitive to the ground surface profile and groundwater pressures at the base of the slide. The ground profile has been “fixed” by the remediation works and has remained unchanged since closure.

In 2003 numerical models were developed to estimate the deformations under existing and potential groundwater regimes. The assumed piezometric surface on the base of the landslide was updated in 2003 based on piezometer readings and various scenarios of groundwater regime were modelled.

We have compared the currently monitored piezometer readings since 2003 with the assumed 2003 groundwater profile and find that there have been no significant changes in piezometric levels which could change the results of the numerical modelling or the subsequent conclusions.

The following sections summarise our review.

3.2 Groundwater Management

Groundwater levels at the site continue to be maintained by more than 195 horizontal drains. These are installed on the surface of the slide, as well as pumping from a single well intercepting groundwater within the mine workings. The underground mine water is pumped to the on-site water treatment plant.

The surface drains are still effective and pumping continues at a rate of approximately 2000m^3/day. The nearest piezometer, M8, has fluctuated between Relative Level (RL) 285m and RL 302m over the last 10 years, and recorded RL 294.1m on 21 August 2015

3.3 Groundwater Monitoring

Groundwater levels have been monitored since closure, utilising standpipe and pneumatic piezometers. In the two most recent monitoring reports (June 2010 to October 2012, and October 2012 to January 2014) T&T tabulated nine and eight functional piezometers respectively (refer Table 3-1 below). The location of the piezometer network is presented in Figure 2-1.

Table 3-1 summarises the key changes in monitored piezometer levels for 2008, through to August 2015.

Table 3-1 Summary of key changes in monitored piezometer for the period

Piezometer ID	Location	Geological Unit	Type	Comment
PW25	Rear of Tailings Pond	Union Volcanics	Standpipe	Last read in August 2015
N7	Trig J	Lower Omahia A	Pneumatic	Not functional. Last read in Jan 2014
N9	Trig J	Lower Omahia A	Pneumatic	Not functional. Last read in Jan 2014
N45	Spring Creek	Lower Omahia A	Standpipe	Functional. Last read in Aug 2015
N132/1	Stockyard	Basement	Standpipe	Functional. Last read in Aug 2015
N132/2	Stockyard	Lower Omahia A	Pneumatic	Not functional. Last read in Jan 2014
N132/3	Stockyard	Lower Omahia A	Pneumatic	Not functional. Last read in Jan 2014
N142	Stockyard	Union Volcanics/Slide Base	Pneumatic	Not functional. Last read in Nov 07
M8	Upper Waitekauri	Coromandel Group/ Empire Vein	Standpipe	Last read in Aug 2015

We have plotted the historical behaviour of the above piezometers with the exception of M8 which is outside the slide. The piezometer plots, shown in Figures 3-1 to 3-3, indicate that there have been some changes in water levels since 2003 when the stability model was updated to incorporate the measured piezometric levels.

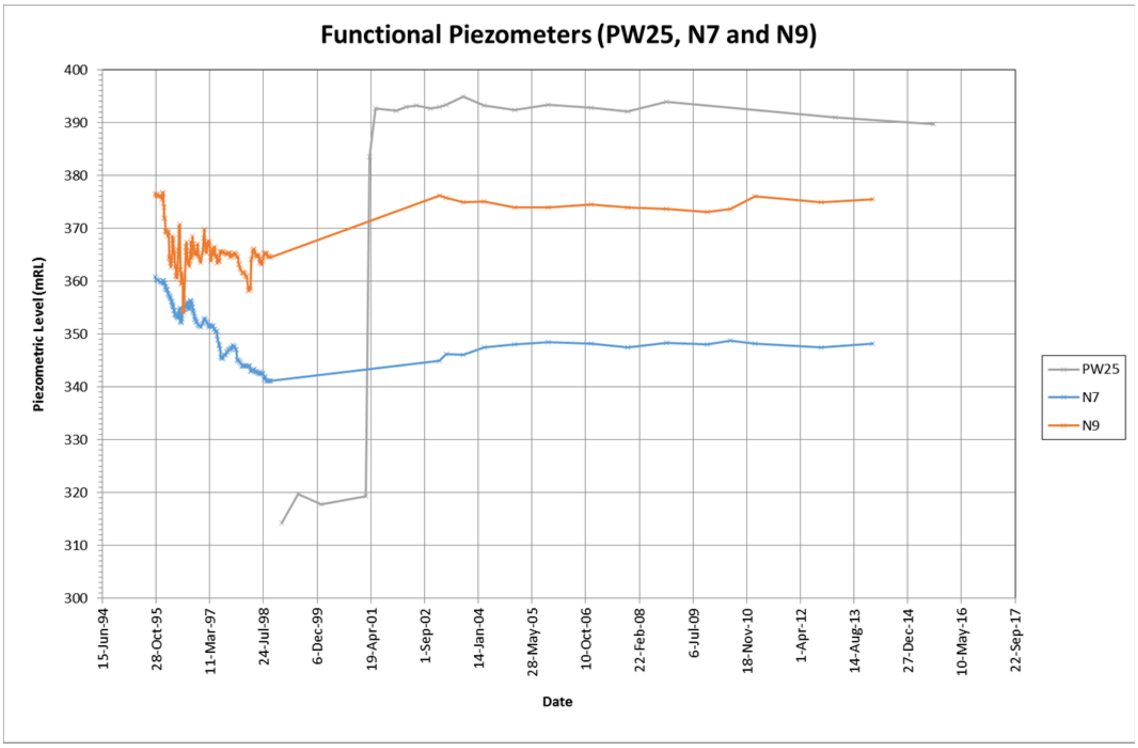


Figure 3-1 Piezometers PW25, N7 and N9

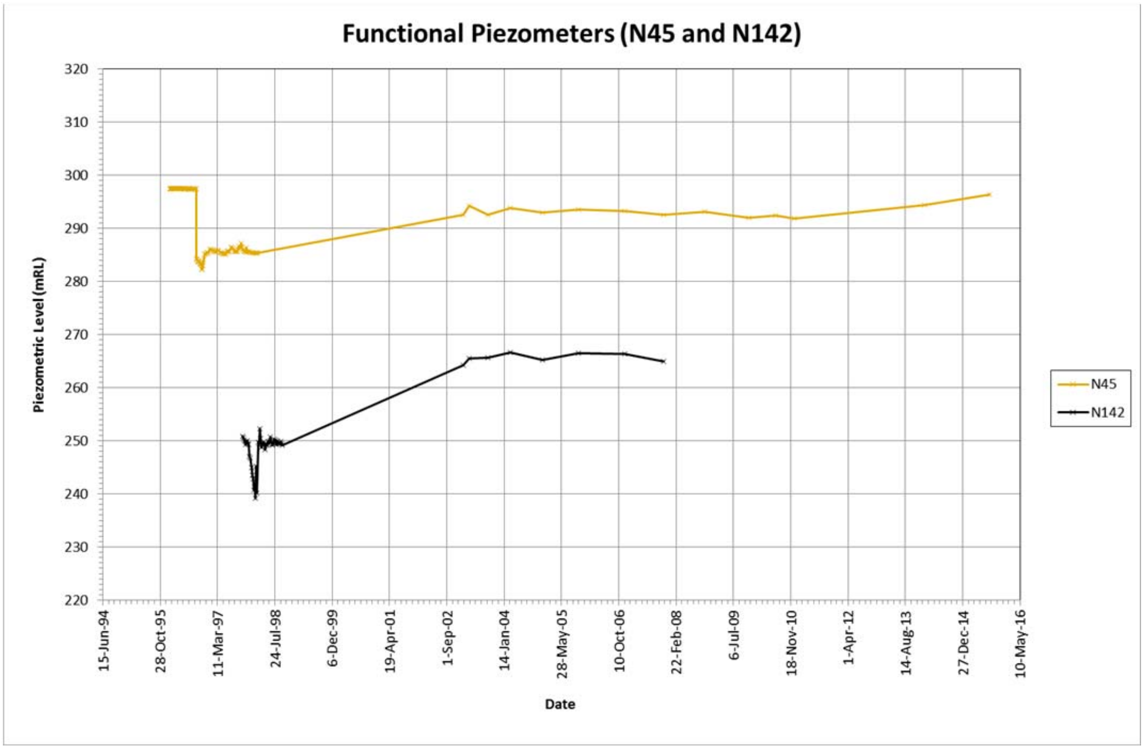


Figure 3-2 Piezometers N45 and N142

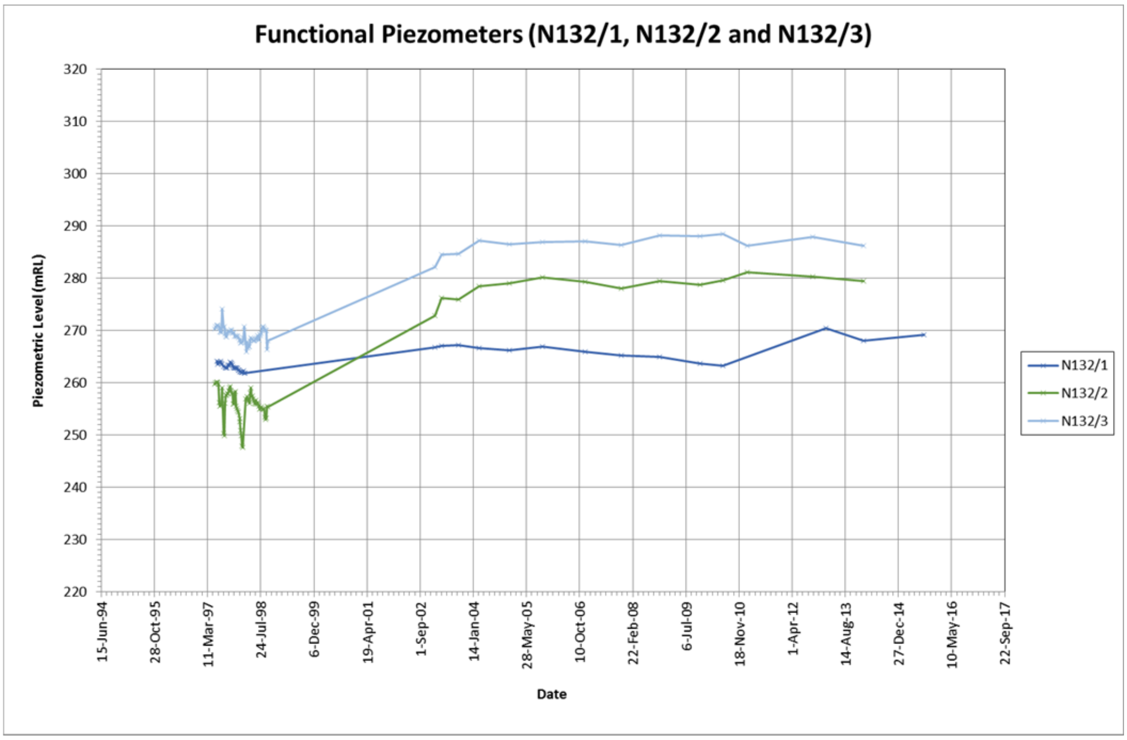


Figure 3-3 Piezometers N132/1, N132/2 and N132/3

The plots indicate that groundwater levels reached equilibrium by approximately mid-2013, although N132/2 and N132/3 rose an additional three metres reaching equilibrium in 2014. The plots show variability of the piezometer readings in the order of several metres. Since 2010 both N45 and N131/1 have risen by 4.54m and 5.98m respectively. N45 is showing a steady increase in water level whilst N131/1 rose during 2010-2013 and has shown steady results since 2013. These changes in water levels do not appear to be impacting landslide movement rates.

A 2D and 3D analysis of stability by limit equilibrium methods was performed in 1997 and presented in the Definitive Stabilization Report (Woodward Clyde, 1997). The analysis provided factors of safety for various ground profiles and groundwater assumptions. In 2003, URS carried out numerical modelling to estimate deformations under various groundwater regimes. The history of groundwater levels and deformations were used to calibrate the model and worst-case scenarios of groundwater were modelled to then predict the potential slope movement. The results were presented in the 2003 risk assessment (URS, 2003).

Two failure mechanisms were evaluated to estimate the slope stability of the landslide, including:

- Increased groundwater levels in the Lower Slide.
- Increased groundwater levels in the Upper Slide.

The first case was considered to be the more likely case while the second would be the worst case scenario. Additionally, the effect of horizontal drain failure was examined during the worst case scenario.

For both scenarios the rate of predicted movement was less than the target value of 75mm/year which would trigger additional monitoring and there was no indication of catastrophic failure. Equilibrium would re-establish and movements would cease upon stabilization of groundwater levels.

Given the predictable and small landslide movements to date, and the variability in a few piezometric readings since 2003, we believe the 2003 stability model and results remain valid and there is no justification for revision. Our assessment of risk incorporates the estimates of deformations from the 2003 analysis.

4 UNDERGROUND COLLAPSE AND SINKHOLE FORMATION

4.1 Introduction

On 12 June 2013 a sub vertical sided surface collapse (here-after referred to as the sinkhole) was observed on the eastern side of the remediated open pit by a helicopter pilot. Upon reporting of the feature, T&T together with Waikato Regional Council and Hauraki District Council undertook further observation and a flyover.

T&T were subsequently engaged by the GCJV to assess the likely failure mechanism, undertake a risk assessment and provide remedial options.

In 2015, Dick Beetham of GHD was engaged to provide independent review of the sink hole (see Appendix C).

This section summarises the site and geological conditions, failure mechanisms and observations presented in the T&T 2013 and 2015 reports. The full reports are presented in Appendix C.

4.2 Initial Site Observations

The sinkhole was initially described as approximately 20 m in diameter and 20 m deep. T&T staff visited the site on 14 and 20 June, and again on 26 July 2013 (see Figures 4-1 and 4-2). Over the course of these visits T&T observed that the sinkhole opening at the surface had enlarged in an upslope direction by 11.5m. Material from the upslope regression was backfilling the sinkhole and water was ponding on the top of the debris backfill (Figure 4-3). Reference pegs were installed around the sinkhole which were used for visual observation of changes and a safety fence was installed.

Figure 4-1 Aerial view of sinkhole 14 June 2013

Figure 4-2 View from Helicopter into sinkhole 14 June 2013 (taken from Tonkin &Taylor video footage)

Figure 4-3 Debris filled sinkhole 26 July 2013

The fencing contractor reported a “soft zone” in the north- west corner of the fenced area. The 2013 T&T report considered this to be related to a shallow landslip feature and soft soil mantle.

During the July 2013 inspection, shallow tension cracks within 2m of the edges of the sinkhole were observed. This is indicative of continued regression of the sinkhole sides. However, T&T commented that the extent of the sink hole had effectively stabilised.

4.3 URS 2014 Inspection Observations

The scope of work for the revision of this risk assessment included a URS inspection of the site to view site conditions, including the sinkhole. This was undertaken on 24 July 2014. At this time the sinkhole was estimated to be about 40m in diameter and 20m deep and it was clear that the sinkhole had regressed further upslope. (See Figures 4-4 and 4-5). Comparison of 2013 and 2014 photography shows that the sinkhole has enlarged on the north, east and southern sides, however, the western margin appeared to be the same.

Figure 4-4 Open Pit Sinkhole development as of July 2014

Figure 4-5 Enlarged view of sink hole July 2014

Comments from the Golden Cross Mine Water Treatment Plant Operator, Jeff Sanderson, indicated that the sinkhole had enlarged since June 2013 and that it does not, to date, permanently self-choke with debris. Regression debris collects in the sinkhole and forms a blockage that then ponds surface run off and rain. This is clear from the July 2013 T&T observations. The Water Treatment Plant Operator also noted that once the volume of water accumulated on the debris in the sinkhole reaches some threshold, the ponded water appears to flush the debris into the underground workings leaving an open chimney. This appeared to have occurred prior to the URS visit as there was no ponded water or accumulated debris observed in the sink hole. These observations support the low (0-10%) postulated bulking factor.

URS noted, in 2014 that the sink hole had regressed upslope.

4.4 2015 Status

A sinkhole status report was prepared by T&T in February 2015, and GHD completed a site visit and associated reporting in October 2015. These are based on observations made on 13 January 2015 and 27 August 2015 respectively. In January 2015 two sections were re-measured by handheld laser and a walkover of the ground along the strike of the fault for approximately 100m either side of the sinkhole was completed. No ground cracking was observed. Some ponded water was present at the base of the sinkhole. The main changes observed to the sinkhole geometry were enlargements to the east and north. The sinkhole perimeter and ground profiles recorded during the three surveys are shown on Figures 4-6 and 4-7. There has been little change to the southern and western sides of the sinkhole perimeter.

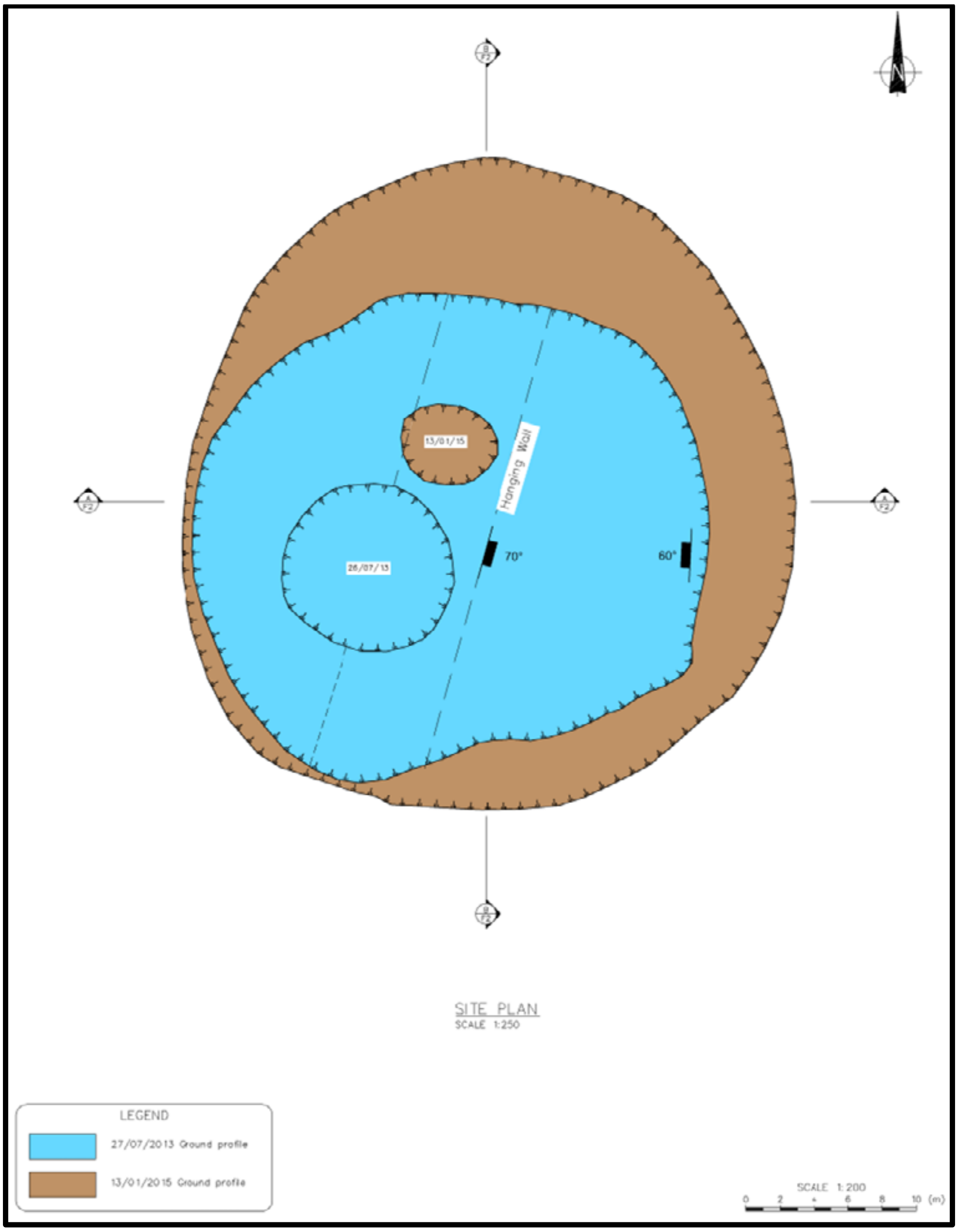


Figure 4-6 Sinkhole ground profile measurements (from T&T, 2015)

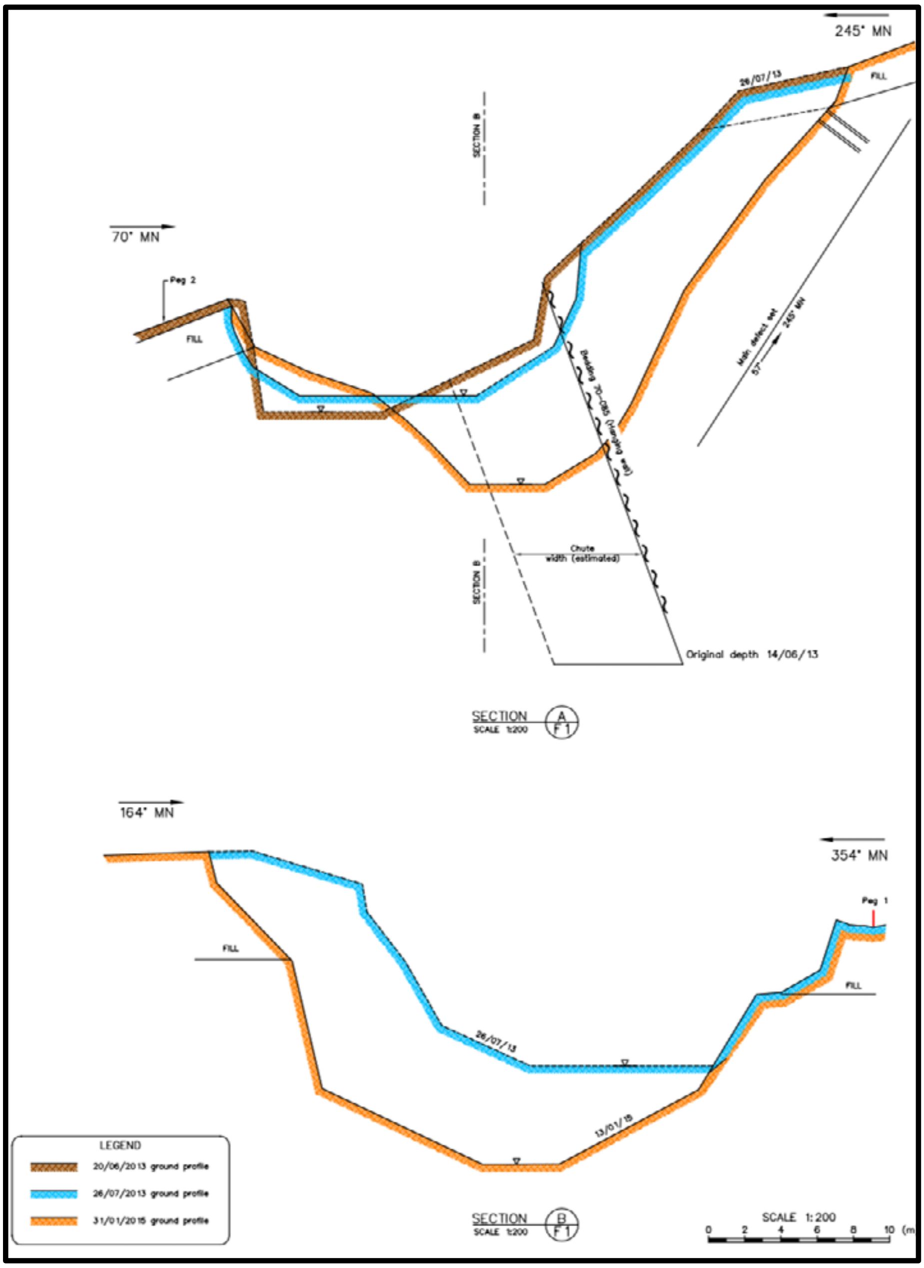


Figure 4-7 2015 Sinkhole Cross Sections (from T&T, 2015)

In August 2015, GHD observed a north trending subsidence crack on the northern side of the sinkhole and a recent slope failure from the eastern side of the sinkhole. At the time of this visit there was no water ponding in the base of the sinkhole despite heavy rainfall. GHD noted that the acid generating rock is exposed in the sides of the crater and any run off reports to the underground. The sinkhole development does not appear to have had a significant impact on the water quality from the underground workings. GHD also considered that public health concerns were covered off with the construction of a 2m high deep fence with warning signs.

GCJV have amended the monitoring of the sinkhole size with the implementation of drone surveys from December 2015. Figure 4-8 presents the June 2016 aerial photograph of the sinkhole.

Figure 4-8 June 2015 sinkhole images from aerial survey drone

From the available photography and the 2015 T&T report shows regression of the northern and eastern margins of the sinkhole since inception. Using the data in the T&T 2015 report this equates to approximate regression rate of 612mm/year to the north and 408mm/year to the east at the ground surface. Based on comparison of aerial photography the regression rate appears to have slowed.

4.5 Conditions That Influence Sinkhole Development

The T&T (2013) evaluation of the sinkhole documents the coincidence of a relatively complex set of geological conditions which have given rise to the development of the sinkhole. These conditions are:

1. The Empire Fault and the associated ore vein which trends NNE to SSW and dips steeply to the west. This fault is only observed in the underground workings.

2. The Beefeater Fault (or an associated splay) which trends NNE to SSW and dips 60 to 70° to the east and transects the open pit. It splays from the Empire Fault at approximately RL 270m.

3. A consistent carbonaceous layer between 30cm to 2m thick within the Tuff Marker Horizon which dips sub parallel to the Beefeater Fault. This carbonaceous horizon has a lateral extent of about 1km and can be observed in the underground to about RL 250m along the strike of the Empire vein.

4. A shear zone associated with the Beefeater Fault and the carbonaceous layer. As observed at the surface in the open pit, the shear zone is 7m wide and it may be deeper at depth. It comprises a well-developed foot wall and hanging wall with a orthogonal defect which has slickensided surfaces coated with smectite with a known friction angle of 9°. This is a significantly weaker zone than the surrounding rock.

5. Groundwater in the underground workings fluctuates between RL 290 to 300m.

6. Surface infiltration of water through the rock mass and fault zones into the unfilled stopes

7. About 120m of overburden between the remediated open pit surface and RL 260 underground drives.

8. Extensive underground mining of the Empire Vein was undertaken from several drives between RL90m and RL 260m. Ore was extracted by stoping three panels, the top of which are approximately RL 135m, RL 245m, and RL 315m. The stoped panels were backfilled with waste rock except for the top 4m of each panel which remained unfilled. In addition, a 7 to 10m high vertical excavation was undertaken from the top of the panel i.e. above RL 315m. This excavation also remained unfilled. Inclined excavations to the east of each panel were also undertaken using an inclined room and pillar method. Upon retreat 50% of each pillar was robbed. It appears that the room and pillar workings were not backfilled.

9. Specifically, it appears the main stope of influence in the failure is an unbackfilled 7 to 10m tall stope (stope 1) above RL 300m. This stope falls towards the north as cover depth increase in this direction.

4.6 Collapse Mechanism

The collapse mechanism is postulated to result from the coincidence of the open void associated with the non-backfilled room (stope 2) and pillar workings and stope 1 intersecting the Empire vein at approximately RL 300m (T&T, 2013). It is likely that sheared rock of the Beefeater fault collapsed in a rectangular prism into the unfilled Stopes 1 to 2 and propagated up dip to the surface (c. 80m above the unfilled stope) following the weak carbonaceous beds within the Tuff Marker Horizon. This collapse has given rise to the sinkhole development.

Water infiltration into the faulted zone may have contributed to sinkhole initiation.

The original volume of the sinkhole is estimated to be approximately 2000 to 3000 m^3. With the minimal suggested bulking factor of the collapse debris, it is likely that the material collapsed into stope 1 and spread into the adjacent stope 2. The more recent rough volume estimate is around 7,000m^3 (T&T, 2015).

Further enlargement of the sinkhole by sliding failures along the dominant west dipping defect set on the eastern side sinkhole wall appears possible as the chute empties and leaves the toe of the slope unsupported above the hanging wall of the chute. Similarly, further enlargement on the northern side of the sinkhole may occur. This is most likely controlled by the strike of the bedding plane sheared zones.

4.7 Remediation and Public Safety

Following sinkhole stabilization, future sinkhole management options will be determined to identify the most appropriate course of action based on site specific conditions and risk. Visual monitoring of the sink hole continues monthly as well as the ongoing monitoring of the water quality. Quarterly aerial drone surveys are being undertaken which allow safer observation and evaluation of changes to the sinkhole over time.

At this time, the sinkhole does not impact water quality for surface runoff in the open pit or in the underground. In the event that the adjacent surface swale drain is breached by further sinkhole development, the swale can be diverted within the open pit.

The sinkhole is recognised as a public safety hazard. As a result, a 2m high fence and warning signs have been erected at distance from the sinkhole which includes predicted future sinkhole enlargement.

5 ENGINEERING ISSUES

5.1 Introduction

Potential failure modes were identified for the mine site including the following:

- Continued slide movement resulting in the release of tailings.
- Development of ARD.
- Decrease of underground mine water quality.
- Failure of water treatment plant.

The identified modes of failure were related to engineering issues that will be used to estimate the residual risk at the site. These engineering considerations include consolidation (settlement) of tailings, the condition of reclamation features including capping, embankment, open pit and constructed drainage channels, and caving in the underground mine. No additional engineering analysis was completed for this risk assessment update.

5.2 Continued slide movement resulting in the release of tailings

5.2.1 Regulations and Design Standards

Proposed new dam safety regulations for New Zealand which would have provided regulations controlling dams were revoked in June 2015. At this stage, a replacement to these regulations has not been proposed. Accordingly, the current best practice for New Zealand Dam safety is the newly revised New Zealand Dam Safety Guidelines (NZSOLD, 2015).

The tailings dam has a High Potential Impact Classification (PIC) in terms of the New Zealand Dam Safety Guidelines, estimated based on the potential impact on life, the environment and the economy. Based on this classification, there are several key design standards for the tailings dam that relate to this risk assessment.

The design standards which have been considered for the tailings dam classification include the Inflow Design Flood (IDF) and potential for uncontrolled release during an earthquake loading case. The IDF for a high potential impact dam is between a 1 in 10, 000 annual exceedance probability (AEP) and the Probable Maximum Flood (PMF) (NZSOLD, 2015). The spillways for the tailings dam were designed to convey three times the PMF. Additionally, stability during earthquake conditions were evaluated within the 2003 risk assessment (URS, 2003), and the tailings dam was assessed to meet these requirements.

5.2.2 Consolidation

The extent of tailings consolidation and the resulting relative density determines the ability for the tailings to liquefy and flow through a breach within the embankment. Flow through a breach could result in the discharge of tailings from the site.

A review of the 2000 and 1998 analysis (Woodward Clyde, 2000) was undertaken as part of this risk assessment in 2011. The evaluations indicated that liquefaction of the tailings was unlikely to occur at the measured densities (Woodward Clyde, 1998). Following the 2000 study (Woodward Clyde, 2000), the tailings have continued to drain and consolidate, increasing the tailings strength (SKM, 2002). The most recent settlement survey was completed in 2009. Assessment of the settlement surveys has shown that the average settlement rate has reduced from 1.03 meters per year (m/yr) at the cessation of tailings deposition to approximately 0.08 m/yr in 2009 (T&T, 2013). The 2013 T&T report indicated that the tailings are still undergoing secondary consolidation beneath the cap.

Figure 5-1 below shows the results of the surveys including the 2009 survey.

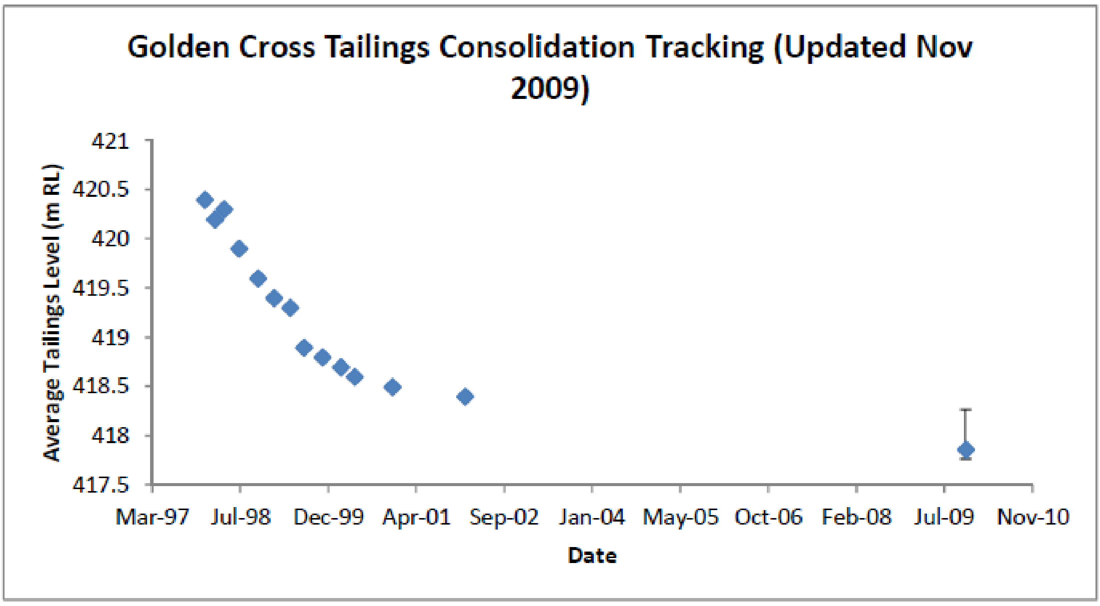


Figure 5-1 Tailings consolidation from 1998 to 2009 (from Tonkin and Taylor, 2013)

Tailings consolidation data collected since the 2009 report shows that the rate of secondary consolidation continues to decrease, the tailings density is continuing to increase, which indicates a continuing increase in tailings strength over time.

All the previous reports show an increase in density and confirm that the tailings will not flow in the event of a breach. Considering that the tailings embankment was not likely to breach during landslide induced movement, the likelihood of tailings release from a dam failure is considered to be rare.

5.3 Capping failures

The waste rock stacks and the tailings impoundment were capped as part of closure of the site. This capping was described as a primary control layer (PCL), which serves to restrict the movement of oxygen and water into the potentially acid generating materials. The cap, from bottom to top, is summarised within Table 5-1 below.

Table 5-1 Capping Design Detail

Layer	Description
Primary Control Layer	The PCL is comprised of a minimum 1 m thick layer of compacted low permeability [<10^{-8} centimetre per sec (cm/sec)], low air void (<5%) nonacid forming rock (Type X) placed over the controlled mine waste fill. It was considered that at less than 5% air voids, the material would retain > 95% saturation.
Subsoil	This comprises a 600 mm layer of ash and/or Omahia subsoil over the Primary Control Layer.
Topsoil	Topsoil is comprised of 150 mm growth media layer over the subsoil.

The cap was designed to have a thickness of 1.75 m, however as-built construction (T&T, 2001) indicated an average thickness of 2 m for the capping layer on the top surface and greater thicknesses on the steeper slopes. Beneath the cap, waste rock was compacted to a low permeability to reduce the potential for the material to become unsaturated, resulting in oxygen ingress and cracking. There are no reported capping failures on the waste rock stack and tailings impoundment. The only exposures have been minor slips, which occur typically in the surrounding catchment. Whilst the development of the sinkhole in the open pit is a breach in the capping, it does not expose greater than 1 ha of soils with the potential for ARD. Hence it is not considered as an increased risk in this regard.

5.4 Slope Failures

As a result of a potential slope failure, there is potential for exposure of waste rock that could result in an increase of ARD that could exceed water quality criteria. Based on previous evaluations prepared at consenting, an area of approximately 1.0 hectare (ha) or larger would have to be exposed to exceed this criteria.

An evaluation was completed as part of the 2003 risk assessment (URS, 2003) identifying the slope angle necessary for failure. The Factor of Safety (FS) was evaluated for all potential failure surfaces, resulting in a FS well above the 1.5 necessary to meet stability design criteria. Analysis indicated that the only potential for slope failure was in the presence of significant flood event (i.e. between 1:100 and 1:10,000) and a 500-year earthquake.

As it is unlikely that an area of this size would be exposed and no significant slope failures have been observed in 10 years since closure, this was not considered a viable mode of failure. An open pit slip was observed in 2008, however, the area involved was less than 1 ha and the area was repaired and re-contoured as part of the regular site maintenance. It no longer contributes to ARD.

5.5 Caving Potential

The potential for caving or collapse within the historic and more recent underground mine workings was examined. Caving up to the surface could result in ARD and an increase of Iron and Manganese from underground. The previous residual risk assessments (URS, 2003, 2008 and 2011) indicated at the time that any form of caving (block cave and progressive chimney collapse) was not likely and that, if caving were to occur, potential for upward progress of the collapse reaching the surface at the surface was considered very unlikely.

However, given that caving to the ground surface, with sinkhole development, has now occurred, caving needs to be re-assessed in this risk assessment.

We have considered caving only as a risk to uncontrolled release of mine water from the underground in the event that excessive surface water from the open pit reports to the underground through the sinkhole. This is further discussed in Section 8.

5.6 Seepage and Dewatering

Mine water levels are currently maintained via pumping. Water levels are maintained about 18 meters below the borehole collar (290 to 300mRL). The existing pumps are 40 to 50 meters below the ground surface. Water is extracted at a rate of 80 cubic meters per hour (m^3/hr) and piped to a water treatment plant for treatment. The extracted water has a pH of around 6.1 (ranges from 6 to 6.6). These levels are consistent with background levels for the area.

5.7 Erosion

In 2007 an area of erosion was noted in the main site drain (MSD), close to the access road near the confluence with the Waitekauri River. Remedial works were implemented and have remained stable since.

5.8 Surface Water Management System Failure

Following closure, the existing surface water drainage system was upgraded to control runoff from larger storm events and to reduce potential damage to drains and facilities. This included the following:

- Diverting of catchments previously contributing runoff to the Western Diversion Drain.
- Lining the Southern Diversion Drain with riprap and diverting the drain to the tailings pond.
- Constructing a riser pipe within the tailings pond to act as the primary spillway.
- Constructing a rock-lined and shotcrete channel above the riser pipe to act as the secondary/emergency spillway.
- Constructing a fence to prevent debris flow from inhibiting discharge through the spillway and riser pipes.
- Increasing the capacity of the drains to convey runoff from the 1:1000 year storm event.
- Lining the drains with geofabric prior to placing riprap.
- Improving the main site drain to further protect from potential erosion and/or undercutting.

These improvements have further reduced the probability of a failure of the surface water management system to a low level outside of regular maintenance of the system. The channels are currently in a good state of repair.

6 WATER MANAGEMENT AND TREATMENT

6.1 Introduction

Water sources include surface water runoff from the tailings pond, waste rock piles, open pit, embankment underdrain facilities, and underground mine water. All of the water meets the discharge standards, with the exception of the underground mine water. Underground mine water is currently pumped from a well within the historic mine workings at a rate of approximately 2,000 cubic meters per day (m^3/d) or 80 m^3/hr. The underground mine water continues to be treated to remove iron and manganese.

A water treatment system is currently operated to treat the underground mine water before discharging into the Waitekauri River. Treatment involves the addition of lime, followed by removal of the precipitated sludge (containing trace metals) via clarifiers. Post-closure discharges from the mine are regulated by Resource Consents 119658, 119659, 103088, 119660, 119661 and 103087 issued by Waikato Regional Council. The current effluent discharge for the entire system meets the Consent Limits. The key Consent Limits allow for surface water discharge from the mine include the following:

- Iron (total): 2 milligrams per litre (g/m^3) – 12 month average and no single value over 2.5 g/m^3.
- Manganese (total): 2.5g/m^3 for hardness greater than 200g/m^3 as $CaCO_3$.

The compliance limits for the site are instream after reasonable mixing. In addition the limits apply for the total site with treated mine water making up a component of the water at the compliance point. For the purposes of this assessment a dilution of 50% of treated mine water has been adopted based on previous assessment (Golders, 2008).

6.2 Water Quality trends

Water quality is monitored at the mine on a quarterly basis. The data indicates that the concentration of iron and manganese is decreasing over time. Appendix B presents a summary of the completed analysis.

Trends were evaluated using a least squares-fit analysis for manganese, exponential decay was found to provide a better fit than linear regression. The best fit (for all data) trend shows that the manganese concentrations without treatment will fall below 5g/m^3 for the first time in 2018. Figure 6-1 below presents the best fit trend for manganese and the upper confidence limit of the mean (95%UCL) and upper bound (95%UTL) lines which are calculated for each year of data. The calculation of statistical limits (95%UCL and 95%UTL) requires data sets be grouped by year and minimises any bias due to differing sampling frequencies over time.

Trends were evaluated using a least squares-fit analysis for iron, exponential decay was found to provide a better fit than linear regression. The results show that the iron trend line will fall below 2 g/m^3 for the first time during or before 2021. Figure 6-2 below presents the best fitting trend for the iron, which is the decay trend.

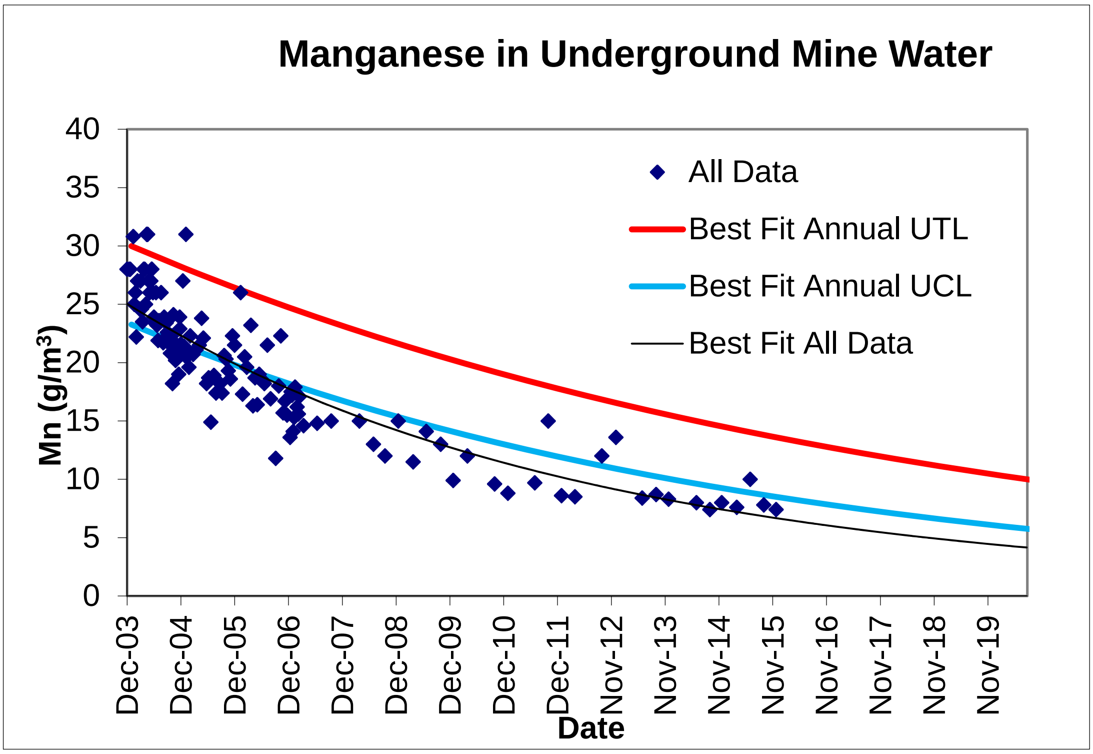


Figure 6-1 Manganese Trend (Best Fit)

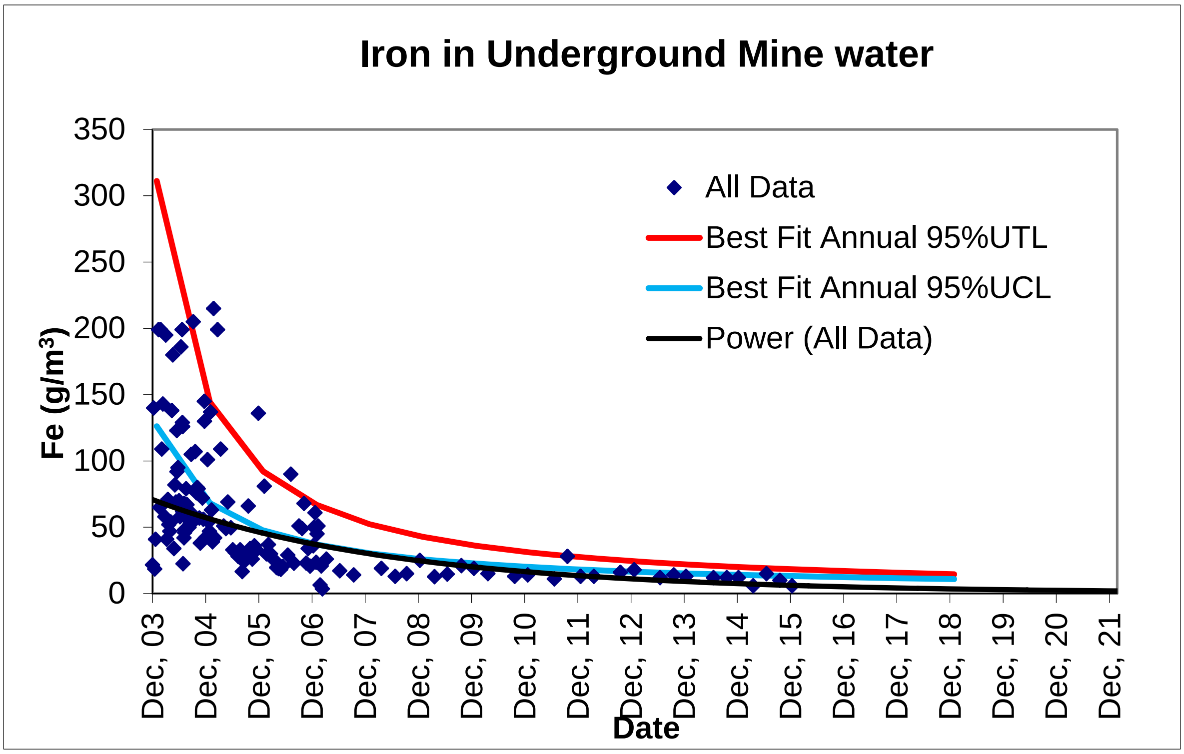


Figure 6-2 Iron Trend (Best Fit)

The current plan for the mine is to cease the use of the water treatment plant when the water quality from the underground mine water meets the Consent Limits without treatment. Two scenarios were evaluated for this risk assessment:

- The probability that water treatment is required beyond 2035 when the consent expires.
- The assessment is based on forecasted water quality being in compliance with a 95 percent confidence level, based on the following criteria:
  - Manganese criteria are dependent on the level of hardness. An extrapolation of hardness data (refer Figure 6-3) suggested that the average hardness would be above 200g/m^3 until 2059 The compliance limit of 2.5 g/m^3 instream for manganese is therefore used.
  - Iron compliance limit of 2g/m^3 in stream is used.

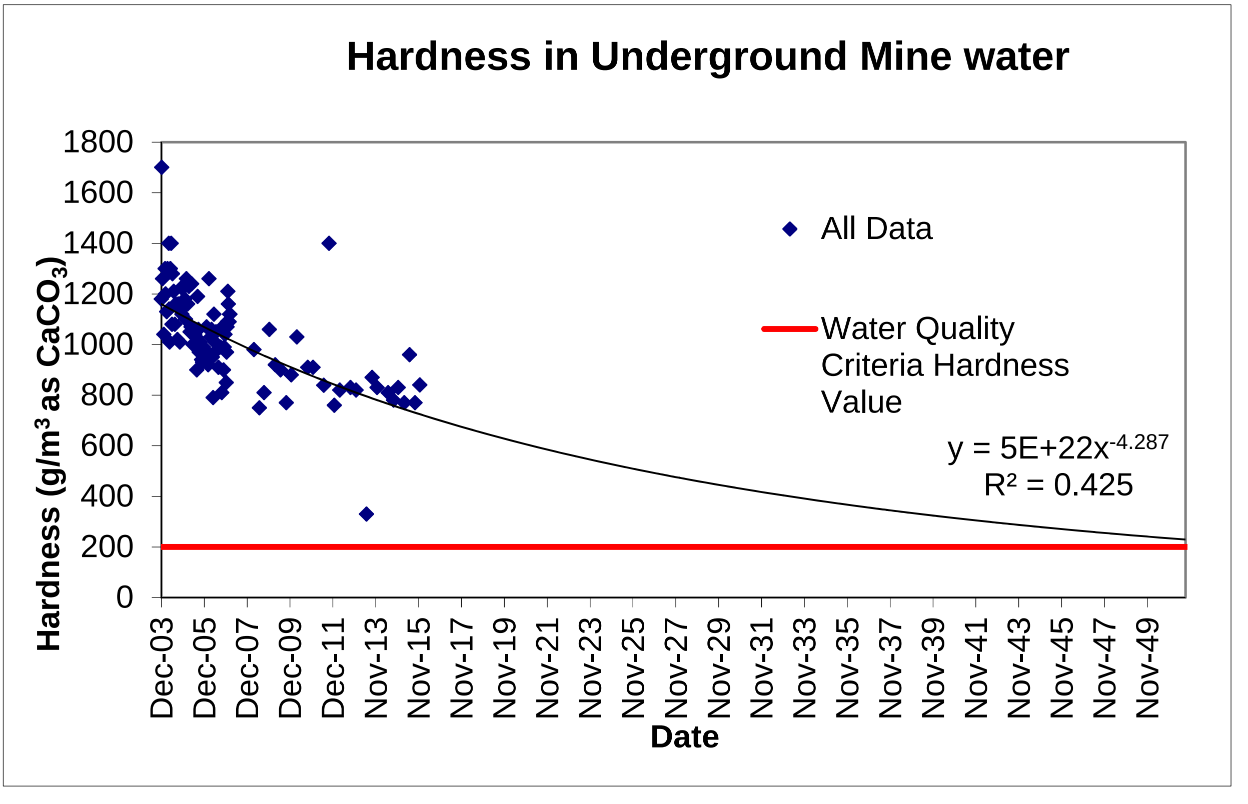


Figure 6-3 Hardness Trend

Table 6-1 below provides the dates at which water quality limits are achieved both instream (with dilution) and at discharge (no dilution in stream). Detailed discussion of the data and these water quality conclusions is presented in Appendix B.

Table 6-1 Water Quality Compliance and Probabilities

Parameter	Mean Confidence Limit (UCL)[1] 95th percentile meets Compliance Limits	Upper Confidence Limit (UTL)[2] 95th percentile meets Compliance Limits
Manganese (in stream, with dilution)	2022	2031
Manganese (at discharge, undiluted)	2030	2041
Iron (in stream, with dilution)	2051	2076
Iron (at discharge, undiluted)	2109	2150

Notes: [1]UCL is the concentration that the mean of the data will be below with 95% confidence.
[2]UTL is the concentration that 95% of the data set will be below with 95% confidence.

The table indicates that iron is estimated to take until 2051 (a period of 35 years) for the upper confidence limit of the mean concentration (mean UCL) to achieve compliance limits in stream, while manganese is estimated to achieve compliance limits by 2022 (a period of 7 years). For this risk assessment it was assumed that active treatment would be maintained for another 20 years (2035) at which time the average (UCL 95%) concentration of manganese would be below the compliance limit (2.5g/m^3) and the upper tolerance limit (UTL) would be below the compliance limit after reasonable mixing (5g/m^3). While iron is likely to remain in excess of the compliance limits in 2035 this would not necessitate active water treatment. Passive treatment for iron could achieve compliance limits, unlike manganese, post 2035 if required.

Passive treatment of iron typically consists of some form of aeration and settling to capture “iron floc” that readily precipitates in an environment exposed to the atmosphere. This can be as straight forward as a series of cascades and a settling pond coupled with regular removal for iron floc from the ponds.

6.3 LONG TERM ENVIRONMENTAL MONITORING

An evaluation was completed in 2008 by Golder & Associates (Golder, 2008) to review the water quality, aquatic biology and terrestrial ecology at the Golden Cross mine site based on the environmental monitoring data for the past 10 years (Golder, 2008). The trend analysis completed in the study indicated similar results to the risk analysis.

The analysis referenced a Kingett and Associates baseline study (1986) of groundwater that was completed within the area. The study found that there were elevated concentrations of iron and manganese in the groundwater in the surrounding aquifers. This indicates that the background concentrations of elements such as iron and manganese in the Waitekauri catchment surface waters are elevated compared to waters in other local catchments that do not pass through mineralized rock zones.

7 SOCIAL VALUE BENEFITS

Rehabilitation of the Golden Cross Mine has returned the site to a condition similar to the adjoining farm lands. Cattle and sheep grazing are conducted on the rehabilitated site and reclamation works have also created productive wildlife habitat and recreational uses. Thus, the site has achieved long-term post-mining beneficial uses.

The social and recreational values of the Golden Cross site derive from its physical setting as well as the heritage values principally associated with past mining. The mine is located at the southern end of the Forest Park which is managed by the Department of Conservation (DOC). The Forest Park abuts the northeast corner of the Golden Cross mine property with other native forest adjoining the Mine on its eastern, northern, and western sides. A range of pursuits are accommodated throughout the Forest Park including, but not limited to, fishing, walking (with heritage trails), rock hounding, picnicking and hunting. In the vicinity of the mine walking tracks were extended as part of site rehabilitation to facilitate access to the adjacent DOC managed lands. Thus, the rehabilitated Golden Cross site offers extensions to the DOC lands as well as mining interpretative recreational use.

The general area in and around the mine retains a number of heritage values, predominately associated with past mining activity. Given these values a heritage trail is located in the far north of the mine site.

In addition, the Waitekauri River catchment is recognised as a trout fishery which brings fisherman to the area.

The Golden Cross site also includes approximately 194 hectares which have been planted to commercial Radiata pine timber production. Trees were planted in late 1990s and the anticipated harvest is 2024-2028 with an expected stumpage revenue of $6.7 million. In addition, these plantings also offer potential carbon sequestration credits (P F Olsen, 2014).

8 RESIDUAL RISK ASSESSMENT

8.1 Introduction

The general site risk is typical of the surrounding area with minor surface slumping and vegetation management along the lines of a typical farm or other land use in the region. The residual risks associated with the site due to the potential for natural processes to result in environmental consequences were presented in Section 5. The potential modes of failure at Golden Cross associated with these risks include:

- Continued slide movement resulting in the release of tailings.
- Continued slide movement resulting in discharge from the Union Silt Dam (USD) or Stockyard Dam (SYSD).
- Development of ARD.
- Decrease of underground mine water quality.
- Failure of water treatment plant.

The underground collapse and formation of the sinkhole in the open pit is considered to influence the risk of decreasing underground mine water quality (see section 8.3.6.4). Minor variations in mine water quality have been observed that could have resulted from the sinkhole formation.

This Section discusses the risk assessment approach and the evaluation of these risks.

8.2 Risk Assessment Approach

A risk assessment was performed for the identified residual risks. This included following steps:

- Review of a variety of inherent risks including those previously identified.
- Screening issues utilizing a qualitative risk assessment.
- Developing event trees for the significant issues identified as requiring assessment.
- Developing a qualitative risk model of the significant issues.

The qualitative measures of the likelihood of an event were previously identified and will be utilised again for this risk assessment as presented in Table 8-1.

Table 8-1 Qualitative Measure of Likelihood

Descriptor	Description
Likely	High. May arise about once per year or more.
Moderate	Possible. May arise at least once in a one to ten year period.
Unlikely	Not impossible. May occur in the next 100 years.
Rare	Very low. May occur in the next 1000 years.
Inconceivable	Unlikely to occur.

The qualitative measures of consequence are presented in Table 8-2.

Table 8-2 Qualitative Measures of Consequence

Descriptor	Definition of Consequence ($NZ)
Catastrophic	>$10 M
Major	$1M to $10 M
Moderate	$50,000 to $1M
Minor	$10,000 to $50,000
Negligible	<$10,000

Screening of the risk issues was previously conducted on the basis of assessed risk. Table 8-3 below presents the screening matrix. For this level of the risk assessment, “avoid” means that the risk can be avoided, “assess” means there is an evaluation of the scenario and “no action” is recognition that the risk potential is extremely low and no action may be necessary.

Any risk with an “assess” will be further discussed below.

Table 8-3 Risk Screening For Qualitative Assessment

		Consequence				
		Catastrophic	Major	Moderate	Minor	Negligible
Likelihood	Likely	*Avoid*	*Avoid*	*Assess*	*Assess*	*Assess*
	Moderate	*Avoid*	*Assess*	*Assess*	*No Action*	*No Action*
	Unlikely	*Avoid*	*Assess*	*Assess*	*No Action*	*No Action*
	Rare	*Assess*	*Assess*	*No Action*	*No Action*	*No Action*
	Inconceivable	*No Action*	*No Action*	*No Action*	*No Action*	*No Action*

8.3 Events

The following identified events were evaluated within the risk register and are summarised within the sections below. All the events were reviewed and updated in the 2008 risk assessment (URS, 2008) and again have been reviewed and updated for this risk assessment. No new events have been added. The updates are summarised below.

8.3.1 Uncontrolled Tailings Release

This event is related to the breach of the tailings dam and the uncontrolled release of tailings downstream into the Waitekauri River. Four failure modes were evaluated in the risk assessment, which included:

- Landslide induced failure.
- Flood event induced failure.
- Earthquake induced failure.
- Underdrainage failure.

These failure modes were further assessed, based on the current site conditions, as summarised below. A tailing runout analysis was completed in 1996 and an assessment of the impact for a breach at the Saddle dam was undertaken in 2011 (URS, 1996 and T&T, 2011). These evaluated the extent of tailing that would be released in the unlikely event that failure of the tailings dam was to occur. These values from the 2011 study were used, with escalation, to estimate the cost related to the release of tailings.

The current site conditions have not undergone sufficient change to warrant any change in the assessment of failure modes or risk.

8.3.1.1 Landslide Induced Failure Movement

The current landslide plane movement rate is an average of less than 5mm/year and the piezometric levels remain stable. This rate is typical of long-term background deformation in a dry year, and would not cause distress to the tailings impoundment. The rate of movement is significantly lower than the 75mm/year identified trigger level for initiating review.

Tailings consolidation was initially evaluated in the 2003 risk assessment (URS, 2003) using data from the SKM 2002 report and was reviewed for this analysis. Both the SKM 2002, and subsequent T&T 2013 reports showed an increase in density confirming that the tailings will not flow in the event of a breach, and considering that the tailings embankment was not likely to breach during landslide induced movement, the risk of a dam failure is considered rare.

8.3.1.2 Flood Event Induced Failure Movement

For tailings embankments, there is a potential failure mode where flood events could overtop the crest, erode the downstream area, result in a tailings breach and potentially release tailings downstream. The tailings impoundment spillways were constructed to pass the equivalent of three consecutive PMF storm events. In previous analysis it has been shown that there is limited movement of the landslide following significant rainfall events. Due to the capacity of the embankment and spillway along with the limited movement of the slide, there is not a perceived risk for flood induced failure.

8.3.1.3 Earthquake Induced Failure Movement

During an earthquake, a typical failure mode for an active upstream method tailings dam is that the impoundment and tailings liquefy, resulting in a breach of the embankment that could potentially discharge downstream. The tailings dam at Golden Cross is a downstream method dam, built out of engineered fill derived from the open pit, rather than tailings material. Therefore, this type of failure is not probable. Additionally, a previous analysis (Woodward Clyde, 1998) indicated that post earthquake instability of the tailings embankment was inconceivable. The same study indicated that massive cracking, larger movements and major slumping would be required to breach the embankment. Furthermore, the study indicated that seismic activity would not significantly increase the landslide movement.

Therefore, even in the event of an extreme earthquake, it is not expected that the tailings dam will breach or overtop, that the tailings will liquefy or generate large deformations. Thus this event was not evaluated in the quantitative risk assessment.

8.3.1.4 Underdrainage failure

Previous analyses (Montgomery Watson Americas, 1998 and Woodward–Clyde New Zealand Limited, 1998b) evaluated whether the underdrain systems would no longer be functioning over time due to underdrain failure. However, since closure of the Golden Cross Mine in 1998, the existing underdrains continue to function and maintain the stability of the embankment. The risk of embankment failure or blocked underdrains was considered to be insignificant.

8.3.2 Discharge from the USD and SYSD

This event is related to discharge from the USD and SYSD downstream into the Waitekauri River. The potential for landslide movement resulting in failure of each of the dams was evaluated in the risk assessment.

As described above, the current landslide plane movement rate is an average of less than 5 millimetres per year (mm/year). This rate is typical of long-term background deformation in a dry year, and would not cause distress to the tailings impoundment. The rate of movement is significantly lower than the 75mm/year identified trigger level for initiating review.

8.3.2.1 Union Silt Dam

USD is located approximately 900m south west of the Tailings Dam, across the road from the Water Treatment Plant. The facility is classified as a Stage 2 dam and does not require annual inspections. In November 2009 T&T conducted depth soundings of the USD (Appendix E).

At the time of the survey, the water level in the pond was controlled by a discharge pipe approximately 0.5m below the spillway crest. Subsequent to the survey being undertaken, the discharge pipe and spillway were lowered by approximately 0.55m – i.e. the November 2009 water level was approximately equal to the level of the current spillway. The new operating water level is at approximately RL 282.0 m and the new spillway crest is at approximately RL 282.5 m giving the dam impoundment a maximum depth of about 3.2 m, and a volume of approximately 12,000m^3.

The USD is located at the south-west limit of the Golden Cross Landslide. During the period of highest movement rates of the Golden Cross Landslide (1995-1997), it was discovered that the USD was intersected by the landslide boundary. This created a shear zone within the dam between the stationary (western) part of the dam outside the landslide and the eastern part of the dam located on the landslide. Distortion of up to 1.4m occurred at this point without any apparent effect on the dam's stability, significant water retention ability (some seepage observed) or underdrain flows. This is thought to be due to the high plasticity of the clay rich argillic material used for the central low permeability core. This material is a highly weathered, hydrothermally altered Coromandel Group andesite that was specially selected for its plasticity and non-brittle behaviour.

Notwithstanding the confidence in the ability of the central core material to behave plastically (i.e. to avoid brittle cracking), in 1996-1997 the dam was significantly strengthened with regard to stability and filter capacity. This was achieved by constructing a 5 m thick graded filter buttress (the USD Filter Buttress) with additional subsoil and collector drains. The works, coupled with the wider scale landslide stabilisation works, appear to have been successful, with the dam having shown no subsequent signs of distress. At current landslide movement rates, the dam is estimated to have more than 400 years of life before the filter protection is at all compromised. Thus it is considered highly unlikely to fail.

8.3.2.2 Stockyard Silt Dam

The SYSD is located approximately 250 m south east of the USD. The facility is classified as a Stage 2 dam and does not require annual inspections. Depth soundings were also undertaken for this dam in November 2009 to determine the volume of the pond (Appendix E). At the time of the survey, the water level in the pond was marginally higher than the lowest point of the dam crest/spillway (i.e. the pond was just spilling water at RL 271.6 m). The water level in the pond is controlled by a spillway discharge over the shotcrete lined embankment crest. At this level the dam impoundment had a maximum depth of about 3.4 meter and a volume of approximately 9,500 m^3. Note that these figures refer to the water depth/volume above the silt.

The SYSD is located within the lower slide segment of the Golden Cross Landslide and has moved with the slide since its construction. It is remote from the slide boundaries (greater than 200 m to the closest boundary) and its performance has been unaffected by landslide movement. The downstream shoulder comprises large rockfill (average particle size of approximately 500 mm) which is designed to resist flood flows, so such a failure would be extremely unlikely even with a significant dam overtopping flood event.

8.3.3 Tailings Acid Rock Drainage

ARD results from the exposure and subsequent oxidation of tailings in the presence of moisture. Currently the opportunity for oxidation is low due to the capping of the tailings during closure and the constant pond level. Based on the above review there have been no identified landslide movements or erosion that would expose tailings to potential generation of ARD.

8.3.4 Waste Rock Stack Acid Rock Drainage

Four failure modes were previously evaluated for generating ARD within the waste rock storages, including:

- Slumping or erosion of the capping material;
- Surface cracking leading to a PCL breach;
- Deep-seated slope failure; and
- Failure of the underdrain system.

8.3.4.1 Slumping or Erosion of the Capping Material

Two scenarios were evaluated for the potential generation of ARD from slumping of the capping layer (1) over steepened slope and saturated soils and (2) capping erosion. The waste rock was constructed to slopes of 4H:1V (Horizontal to Vertical). This slope angle is considered stable, making it unlikely that significant slumping failures would occur. Localised areas have been identified that have steeper slopes which may result in a higher potential for failure. Areas in which past failures have occurred (identified as Areas 17 and 18 (URS, 2003)) have been monitored as part of the regular operation and maintenance and no slope movement has been identified, with the exception of a minor slip in 2008. The exposure from the minor slip was less than 1ha and the area was repaired and recapped as part of the regular site maintenance.

As part of other studies (EGI, 1998) an oxidation rate of 10 kilograms sulphate per hectare per day for exposed material was evaluated, resulting in the required exposure of an area greater than 1.0ha) for the potential exceedance of water quality criteria.

Soil erosion was also considered as a potential failure mode. A proper drainage system and vegetative cover play a critical role in reduction of erosion potential. Surface water is currently controlled on the site through a series of constructed drainages and the area has been well revegetated. The rate of erosion of the existing soil was evaluated in previous studies (Montgomery Watson Americas, 1998) at 0.075mm/year to 3.5mm/year. This indicated that the cover could be compromised after 171 to 9,000 years utilizing the above rates respectively. However, the study noted that well vegetated slopes, which are the case at Golden Cross, will have limited erosion.

8.3.4.2 Surface Cracking Leading to Primary Control Layer Breach

The repeat visual inspections have identified cracking in the Western Diversion Drain (WDD)and Southern Diversion Drain (SDD) shotcrete in various locations. As a result, during the 2009 monitoring period, crack meters and pins were installed. In 2010 the monitoring indicated no additional movement had been detected.

The 2012 and 2014 visual inspection reports indicated that the number and extent of cracks in the WDD shotcrete lining identified in 2009 appear to have increased as detailed in the Golden Cross Crack Meter Report (T&T, 2011). Some seepage of water into the cracks was evident.

Review of rainfall records indicates that the changes in cracking number and extent are consistent with periods of lower than average rainfall.

Previous evaluation of the movement rates indicated that there was a compression of slide blocks. A similar pattern of compression was observed within the recent monitoring period, thus it is unlikely that any new subsurface cracking will lead to a PCL breach.

8.3.4.3 Underdrain Failure

This blockage may result in elevated water levels and seepage through potentially acid generating waste rock. However, if this scenario were to occur, the volume of seepage would be low, resulting in limited effects. Therefore, this failure mode is considered to be low risk.

8.3.5 Open Pit ARD

Four modes of failure were identified for the production of ARD within the open pit including:

- Pit Floor Seepage.
- Capping Failure.
- Drain Blockage.
- High Wall Failure.

8.3.5.1 Pit Floor Failure

Water moving through the pit infill has the potential to come into contact with mineralized rock and enter the historic mine workings beneath the pit. Underground mine water is pumped through a vertical well within the historic mine workings and routed to the water treatment plant prior to discharge. During closure, the pit floor was sealed with compacted waste rock having low voids and permeability. Additionally, shotcrete was added on selected steeper areas of the pit wall, further encapsulating waste. The encapsulated material was treated with lime and the reconstructed pit floor was drained through a notch cut in the pit wall, discharging surface stormwater to the river.

These treatments have resulted in minimal floor seepage. Low ponding capacity and the low overall hydraulic gradient seepage through the area have resulted in a seepage rate of less than $0.2m^3$/day (previously measured by site personnel).

The underground discharge is pumped through a well from the historic workings at a rate of approximately $2000m^3$/day. Considering the low rate of pit seepage, there is minimal contribution to site outflow from the pit floor.

8.3.5.2 Capping Failure

The open pit backfill is capped with a 1m thick Primary Control Layer (PCL), 600mm subsoil layer and 150mm topsoil. The PCL was constructed to restrict oxygen and water movement into Potential Acid Generating (PAG) materials and therefore the contamination of surface water runoff.

Sinkhole development with localised failure of the capping layer has occurred which creates the potential for exposure of PAG and subsequent increase of ARD.

Previous mechanisms for capping failure in the open pit were either slope failure or erosion. T&T (2013) estimate the sinkhole has removed approximately 650m^2 area of PCL and exposed approximately 1600m^2 of PAG. This is less, by a factor of 6, than the 1ha PAG exposure that is estimated to result in water quality criteria exceedances. On this basis, T&T (2013) consider that revision of the capping failure qualitative risk assessment is not necessary provided all significant PCL breaches are repaired.

Since the previous risk assessment (URS, 2011) two small slips (approx. 20m x 30m in size) occurred in the eastern pit wall following a heavy rainfall event in July 2012. Slip 1 was remediated by buttressing and drainage. Slip 2 was considered to be self-stabilising and no further work was undertaken on this. The Eastern Pit scarp also reactivated during the July 2012 rainfall event. The movement was expressed at the ground surface as a 300mm head scarp with a 1m deep crack. The crack was infilled with compacted clay.

The consequence of these capping failures is potential infiltration into the capped waste rock resulting in ARD and potential release of metals. Similar to the tailings, exposure of approximately 1 ha of waste rock is required to exceed water quality criteria.

8.3.5.3 Drain Blockage

Previously, minor slips and slumps of the landslide resulted in the partial infill of the primary interception drain onto the eastern side of the pit. Subsequently, additional diversions have been installed to drain water down slope to a lower drain. These diversions were lined with erosion resistant rock.

8.3.5.4 High Wall Failure

The potential for failure of the open pit high wall was considered as a mode of failure. The high wall was cut back to reduce its slope and no failures have been observed since 1998. The volume of material movement resulting from a high wall failure could be significant, however the consequence of failure is not considered to be an issue, because the majority of the material would remain in the pit. The only foreseen consequence would be a short term and minimal increase in suspended sediment load to the Waitekauri River, with a low ARD potential.

8.3.6 Mine Water Treatment

Currently, underground mine water requires treatment prior to discharge from the site. Underground mine water is pumped through a vertical well within the historic mine workings, and routed to the water treatment plant prior to discharge.

Several potential failure modes were evaluated which could change water quality into or out of the water treatment plant, including the following:

- Mine water release.
- Treatment system failure.
- Underground water exceeds treatment capacity.
- Underground collapse.
- Automation system failure.

8.3.6.1 Mine water release

Several failure scenarios that could result in the potential release of underground water were previously identified. They include the following:

- Failure of the existing blockages between the abstraction well and Kiln Adit following pump failure, allowing the discharge of mine water with increased concentrations of contaminants.
- Uncontrolled release of contaminated mine water via workings up to about 320 mRL (elevation of the Portal), following pump failure.

Failure of the blockages is considered unlikely, given the current water surface elevation in the mine workings. Additionally, the volume of water released would be small and the consequences minor. However, blockage failure following a failure of the pump was considered possible. An uncontrolled release of mine water could have a potentially significant environmental consequence.

8.3.6.2 Treatment System Failure

Several modes of failure were identified for the release of untreated water from the treatment system failure, including the following:

- Treatment plant failure.
- A change in mine water flow, exceeding the treatment capabilities of the treatment plant.
- A change in mine water quality exceeding the treatment capabilities of the treatment plant.

The treatment plant treats and discharges mine water directly into the Waitekauri River. Water treatment is facilitated through the precipitation and clarification of trace metals. It is planned that the treatment plant will remain fully active and maintained until the mine water no longer requires treatment.

Even with the consideration of maintenance there is potential for an interim failure to occur at the plant. However, consequences would not be significant as several weeks of water retention exist in the underground workings which would allow plant repairs to be made without a discharge from the underground workings into the Waitekauri River.

8.3.6.3 *Underground Water Quality Exceeds Treatment Capability*

A significant change in the existing water quality would be necessary to overload the treatment capability. Currently, the primary source of elevated constituents is within the unsaturated portion of the mine, where the release of contaminants is controlled by the amount of oxygen available for sulphide oxidation and the degree of contact between the oxidation products and seepage through these zones.

Given the rapid rate of recharge due to rainfall within the system, it is considered unlikely that ARD will occur within the unsaturated zone. The only scenario for this to occur is the increase in water level, or a collapse in the mine workings. The treatment system is reliant on the existing water quality conditions for the amount of additive. With an abrupt change in water chemistry, the additive may not be adequate for the sufficient removal of these metals. This has not been observed in over 15 years of post-closure operations.

Currently on-site personnel monitor the water chemistry routinely. It is unlikely that this type of abrupt change in water chemistry would occur, due to the large volume of water and subsequent buffering in the underground workings. The most likely change in water chemistry would result from changes in water level. Gradual changes would be detected within the monitoring data, and the water treatment plant operation could be modified for the change in water chemistry.

8.3.6.4 *Underground collapse*

The URS (2004) risk assessment defined caving as an isolated collapse within the underground mine and/or propagation of an underground collapse to the surface. It indicated that such an event was inconceivable.

However, the development of a single large sinkhole in the last 18 years since underground mining of the Empire Vein ceased confirms that it is possible for unfilled stopes to collapse and propagate to the surface when sheared carbonaceous beds within a fault zone intersect the underground workings. It is apparent that the current sinkhole has not completely filled the underground void and as a result there is a risk of further subsidence or sinkhole development. The T&T (2013) report considers the ground surface footprint of the site that is at risk from subsidence and the probability of serious injury or loss of life due to any future subsidence. The report focused on the subsidence risk due to the intersection of previously mapped faults and the underground workings.

Based on the location of sheared carbonaceous beds intersecting the upper unfilled workings for a 200m length, T&T (2013) considered that there is a 10,000m^2 surface footprint risk area associated with the Beefeater Fault. This is a rectangular area approximately 200m long by 50m wide trending NNE to SSW across the eastern wall of the remediated open pit. This risk area includes a section of the primary surface water interception drain on the eastern side of the pit.

The risk is that excessive surface water flow into the underground could cause the unengineered blockage in the old workings to be compromised and untreated mine water discharge is released into the Waitekauri River. The sinkhole has not, to date, resulted in stormwater from the surface swale entering the underground but the potential exists for this to occur. Such an event can be mitigated by engineered controls within the open pit, e.g. swale diversion, thus the likelihood of drain failure is considered rare.

Given that an underground collapse has occurred and formed a sinkhole at the ground surface the probability of this initiating event is 1. We have used 99.9% in the related event tree. Based on the T&T assessment of the geological conditions and the relative position of the mine stopes there is a lesser probability of future events occurring. he probability of a new unrelated event occurring is assumed to be 0.02 (1:50 years).

The worst case consequence to the public as a result of a sinkhole within the open pit is loss of life which has been estimated as 1 in 514,800 (T&T, 2013). his would rate as having a likelihood of "inconceivable".

Based on the location and volume of the unfilled stopes T&T (2013) consider it "unlikely" that stope collapse will propagate downwards to other unfilled stopes and result in large collapse volume and surface risk footprint.

It is noted by T&T (2013) that the West Mine Fault could potentially intersect with the unfilled underground mine workings at about RL 190m and also the unfilled RL 260m Hanging Wall Exploratory Drive. However, they consider that collapse associated with these features unlikely as there are no weak carbonaceous layers and the intersection is below the groundwater level.

The potential for unmapped faults to intersect the underground workings remains but is considered unlikely.

The T&T (2013) report presents a suggested cost for back filling the sink hole. It does not present any other remedial options and associated costs for consideration and neither does it present the ongoing costs associated with monitoring. GCJV is currently monitoring the sink hole and considering a range of options for remediation. For this report, we have allowed for an estimated remedial cost of NZ$500,000.

8.4 RISK REGISTER

A risk register was then established from the qualitative risk assessment. The previous risk register was reviewed and updates were made, as necessary. The risk register is shown in Table 8-4.

Screening of risk issues is conducted on the basis of assessed risk. Items (scenarios) that are identified as "assess" are those that will be further evaluated within the quantitative risk assessment. Items identified as "avoid" means that the risk can be mitigated or avoided through measures. Items identified as "no action" are identified as items where the risk potential is extremely low and no action is necessary.

The risk register is modified from the 2011 risk assessment. The following changes were made:

- Amendment of the basis for likelihood wording for uncontrolled tailings release due to landslide.
- Change of the likelihood of uncontrolled tailings release due to earthquake from rare to inconceivable and amendment of the likelihood basis wording.
- Change in the qualitative risk description for the uncontrolled release of tailings to Low.

- Change of the likelihood of waste rock stack ARD due to cap slumping or erosion from moderate to unlikely and amendment of the likelihood basis wording accordingly. And the resultant decrease in the qualitative risk from high to moderate.
- Amendment of the event description (event 5.4 underground collapse), basis for likelihood and consequence description for underground water quality or flows exceeds treatment capacity due to underground collapse, with sinkhole development.

Table 8-4 Risk Register

Id	Event	Description of Event	Likelihood	Basis for Likelihood	Consequence	Description of Consequence	Qualitative Risk	Action
1.0	**Uncontrolled Tailings Release**							
1.1	Landslide	Landslide movement results in breach of impoundment and loss of tailings.	Rare	For a landslide to result in a breach the embankment would have to crack significantly .The behaviour of the piezometers and movement rate of the slide makes this a rare event. The consolidation and strength of the tailings make the possibility of scouring a breach very unlikely.	Major	Release of tailings beyond site constraints requiring clean up action.	High	Assess
1.2	Flood Event	A flood event leads to scour and breach of the tailings impoundment.	Inconceivable	If a flood event occurred, the flooding would be controlled by the pond outlet and spillway, which are capable of storing the 1,000 year flood without overtopping and of passing 3 times the PMF.	Moderate	Release of tailings to Union Silt Dam (USD) with minor release to Waitekauri River.	Low	No Action
1.3	Earthquake	Seismic event results in breach of tailings impoundment and loss of tailings.	Inconceivable		Moderate	Release of tailings to USD with minor release to Waitekauri River.	Low	No Action

Id	Event	Description of Event	Likelihood	Basis for Likelihood	Consequence	Description of Consequence	Qualitative Risk	Action
1.4	Underdrain Failure -1	Filter media around the underdrain is compromised, leading to piping failure and loss of some tailings.	Rare	The strength and consolidation of the tailings are not amenable to piping.	Minor	Release of tailings to USD with minor release to Waitekauri River.	Low	No Action
1.5	Underdrain Failure -2	Underdrain failure allows increase in pore pressure within tailings impoundment.	Rare	Increase pore pressure could result in changes in the material properties; however the strength and the consolidation of the tailings are not amenable to piping.	Minor	Release of tailings to USD with minor release to Waitekauri River.	Low	No Action
2.0 Uncontrolled Discharge from the USD and SYSD								
2.1	Landslide	Landslide movement results in discharge from the USD and SYSD.	Rare	A filter buttress was constructed on the USD to stabilize the dam. The dam is estimated to have more than 400-years of life before the filter protection is compromised. The stability of the embankment will not result in a failure. The SYSD has a downstream embankment that is comprised of a large rockfill. This area is resistant to flood flows and its performance has been unaffected by landslide movement.	Minor	Discharge of water to the Waitekauri River.	Low	No Action

Id	Event	Description of Event	Likelihood	Basis for Likelihood	Consequence	Description of Consequence	Qualitative Risk	Action
3.0	**Waste Rock Stack ARD**							
3.1	Cap slumping or erosion	Slumping or erosion of the cap results in a capping breach and localized ARD (>1 ha PAG exposed)	Unlikely	Based on no events since 1998 closure (17yrs).	Moderate	Localized ARD requiring cover repair, erosion to expose 1 ha.	Moderate	Assess
3.2	Cap cracking leads to breach	Slope movement leads to an extensive capping breach enabling sufficient ARD material to influence water quality in waste rock stack underdrains, and Terminal Well 2, (TW2).	Unlikely	Based on landslide movement rates.	Minor	TW2 Contaminated and directed to WTP, reducing life of treatment system.	Moderate	No Action
3.3	Deep seated Slope failure	A large scale slope failure exposes a significant area of waste rock to oxidation.	Inconceivable	Stability Analysis	Major	PAG rock exposed, surface water contamination and repair of cover.	Low	No Action
3.4	Underdrain Failure.	Terminal Well 2 discharge ceases and spring discharges occur.	Rare	Based on landslide movement rates.	Minor	Discharge of slightly contaminated water to Spring Creek, requiring treatment.	Low	No Action
4.0	**Open Pit ARD**							
4.1	Pit Floor Seepage	Seepage through the base of the open pit and underlying PAG rock into the underground.	Unlikely	Based on limited seepage rates	Negligible	Continued treatment at the WTP.	Low	No Action
4.2	Capping Failure	Slumping or caving of cap leads to exposure of PAG rock in pit walls (>1ha PAG exposed).	Unlikely	Based on observations onsite present and past.	Minor	Discharge of ARD water to Waitekauri River necessitates cover repair	Moderate	No action
4.3	Drain Blockage	Slumping blocks drains and initiates further slope movement.	Unlikely	Based on observed failures to date	Minor	Discharge of ARD water to Waitekauri River necessitates cover repair	Moderate	No action

Id	Event	Description of Event	Likelihood	Basis for Likelihood	Consequence	Description of Consequence	Qualitative Risk	Action
4.4	High Wall Failure	Major collapse of the High Wall Omahia Andesite into the open pit.	Rare	Based on observed localized slips and slumps.	Minor	Release of sediment to Waitekauri necessitates short-term water treatment and revegetation.	Low	No Action
5.0	**Underground (UG) Discharge and Treatment System**							
5.1	Mine water Release	The pump or wells fail preventing the abstraction of underground water.	Moderate	Well Reliability	Moderate	Pump fails or well is damaged, preventing water abstraction. Head increases leading to uncontrolled release of underground mine water.	Unlikely	Assess
5.2	Treatment System Failure	Treatment system fails.	Unlikely	Age of plant and ongoing maintenance	Moderate	Treatment system fails and mine water is released directly into Waitekauri River.	Moderate	Assess
5.3	UG Water Quality or Flow Exceeds Treatment Capacity	Excessive surface water flow into the underground from an underground collapse which develops to the open pit surface that coincides with surface drains	Unlikely	Based on one event already occurred with potential for impact on the adjacent surface drain with failure of engineering works to control surface runoff	Moderate	Unengineered blockage in the old workings is compromised and untreated mine water discharges to the Waitekauri Stream.	Moderate	Assess
5.4	Underground Collapse	A collapse within the underground E46 drainage drive prevents water from draining to the Golden Cross workings.	Rare	Observation of Golden Cross Workings and static piezometric levels.	Moderate	Collapse within underground workings creates blockage and prevents E46 from draining landslide. Landslide is remobilized and alternative drainage is required.	Moderate	Assess

9 RESIDUAL RISK PROBABILITIES

9.1 Introduction

Based on the qualitative risk assessment the following identified residual risks were considered for the associated financial risk at the site:

- Continued slide movement resulting in the release of tailings.
- Capping failure leading to acid drainage- incorporating waste rock storage capping.
- Underground release of contaminants-incorporating water treatment system failure.

The probability of events occurring was derived, based on analysis, site data or engineering judgment. Where data was limited, probabilities were assigned, based on the definitions provided within Table 9-1.

Table 9-1 Guide to Assigning Subjective Probabilities

Description	Annual Probability
Occurrence is virtually certain.	1
Occurrence of the condition or event is observed in the available database.	10^{-1}
The occurrence of the condition or event is not observed, or is observed in one instance, in the available database; several potential failure scenarios can be identified.	10^{-2}
The occurrence of the condition or event is not observed in the available database. It is difficult to think about any plausible failure scenario; however, a single scenario could be identified after considerable effort.	10^{-3}
The condition or event has not been observed, and no plausible scenario could be identified, even after considerable effort.	10^{-4}

(Reference: Barneich J, Majors D, Moriwaki Y, Kulkarni R and Davidson R, 1996)

The event trees are presented on Figures 9-1 to 9-5. Probabilities for each event, branch and tree are provided. The probabilities for each positive branch of the event tree were summed to provide an overall probability of the occurrence of each scenario. Table 9-2 presents the estimated probabilities for each of the residual risk events.

Table 9-2 Risk Model Results

Risk Issue	Probability
Continuing slide movement resulting in the release of tailings	2.77×10^{-7}
Capping failure of WRS leading to acid drainage	4.08×10^{-6}
Underground release of contaminants	2.86×10^{-3}

A valuation period of 100 years is used to estimate a financial risk recommendation for the site. Due to the extremely low probability of occurrence, the release of tailings was not included in the quantitative assessment to establish a financial risk estimate. However, the consequence and potential costs of this very low probability event has been included in Section 11 for purposes of further financial assurance consideration.

Figure 9-1 Event tree for Continuing Movement of Landslide and uncontrolled release of tailings (part 1)

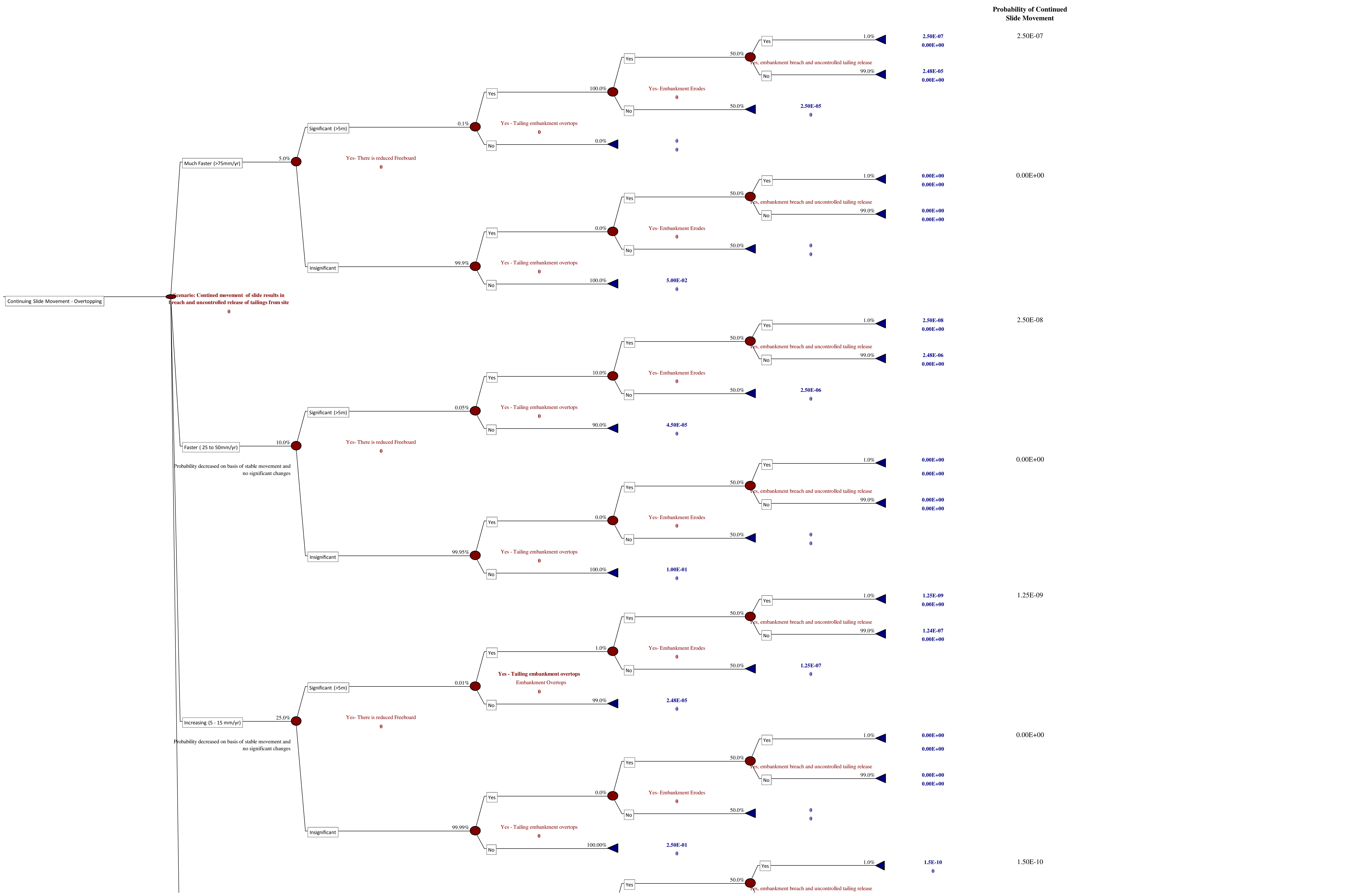


Figure 9-2 Event tree for Continuing Movement of Landslide and uncontrolled release of tailings (part 2)

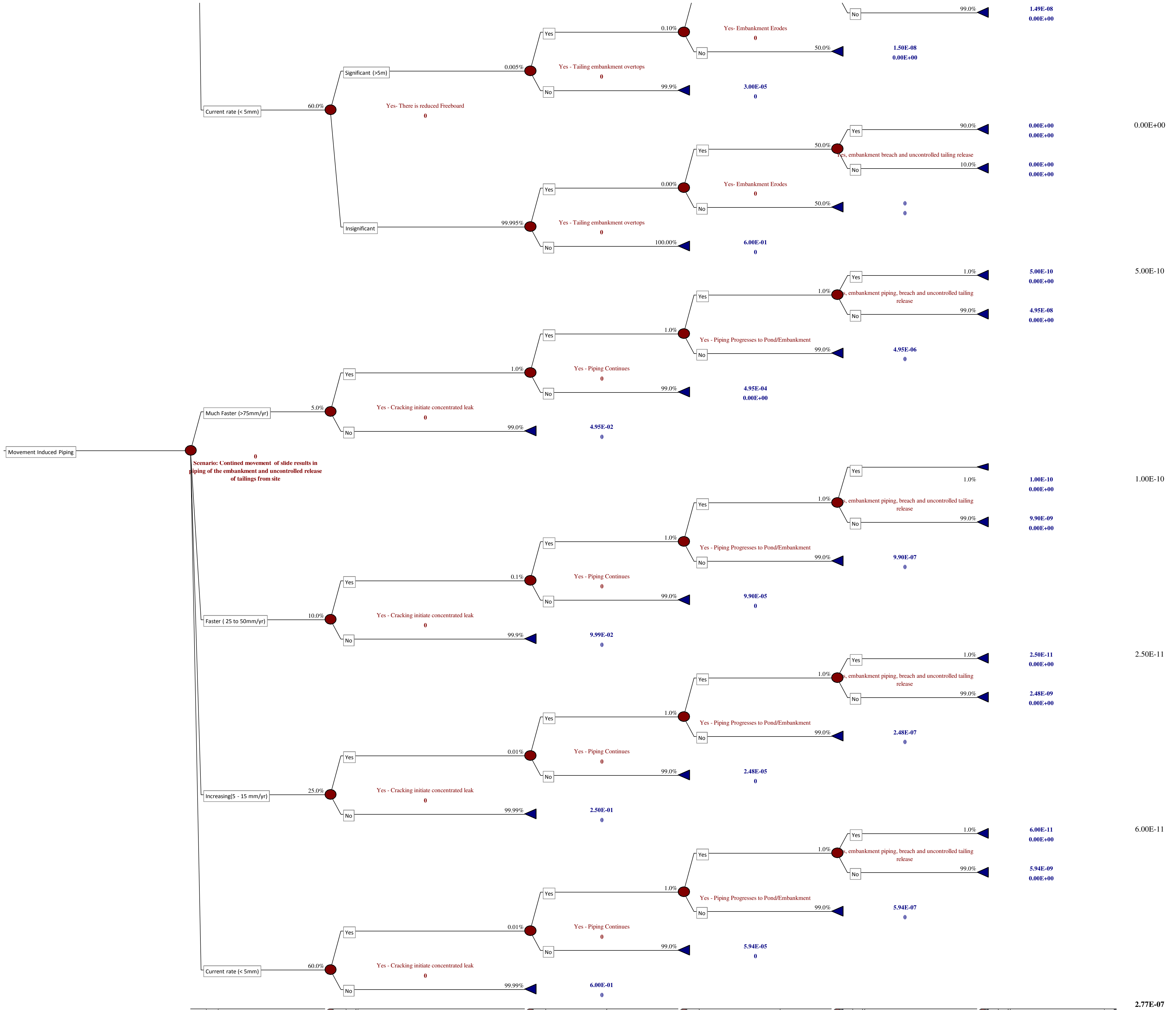


Figure 9-3 Event tree for WRS capping failure

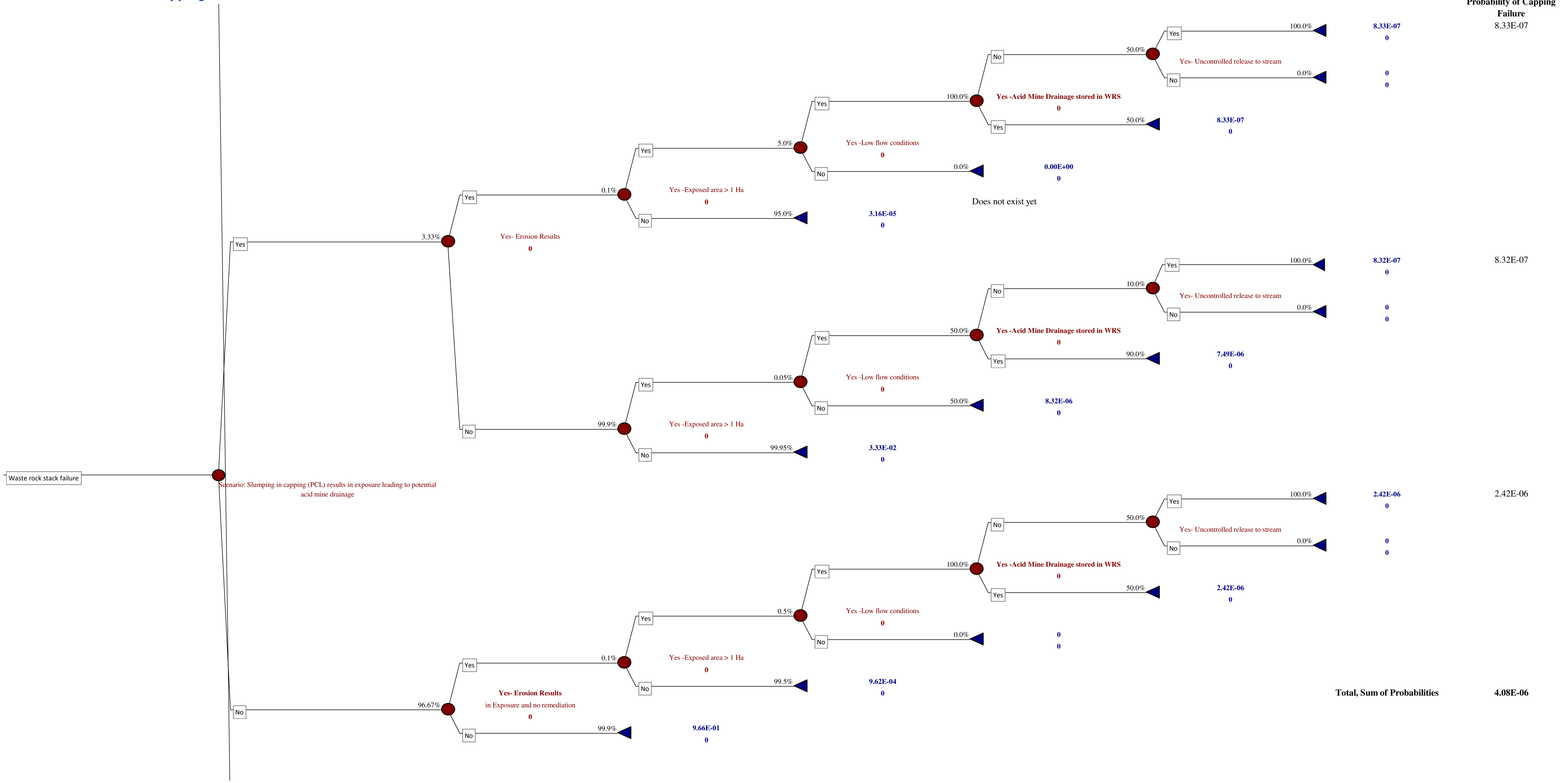


Figure 9-4 Event tree for mine water release (part 1)

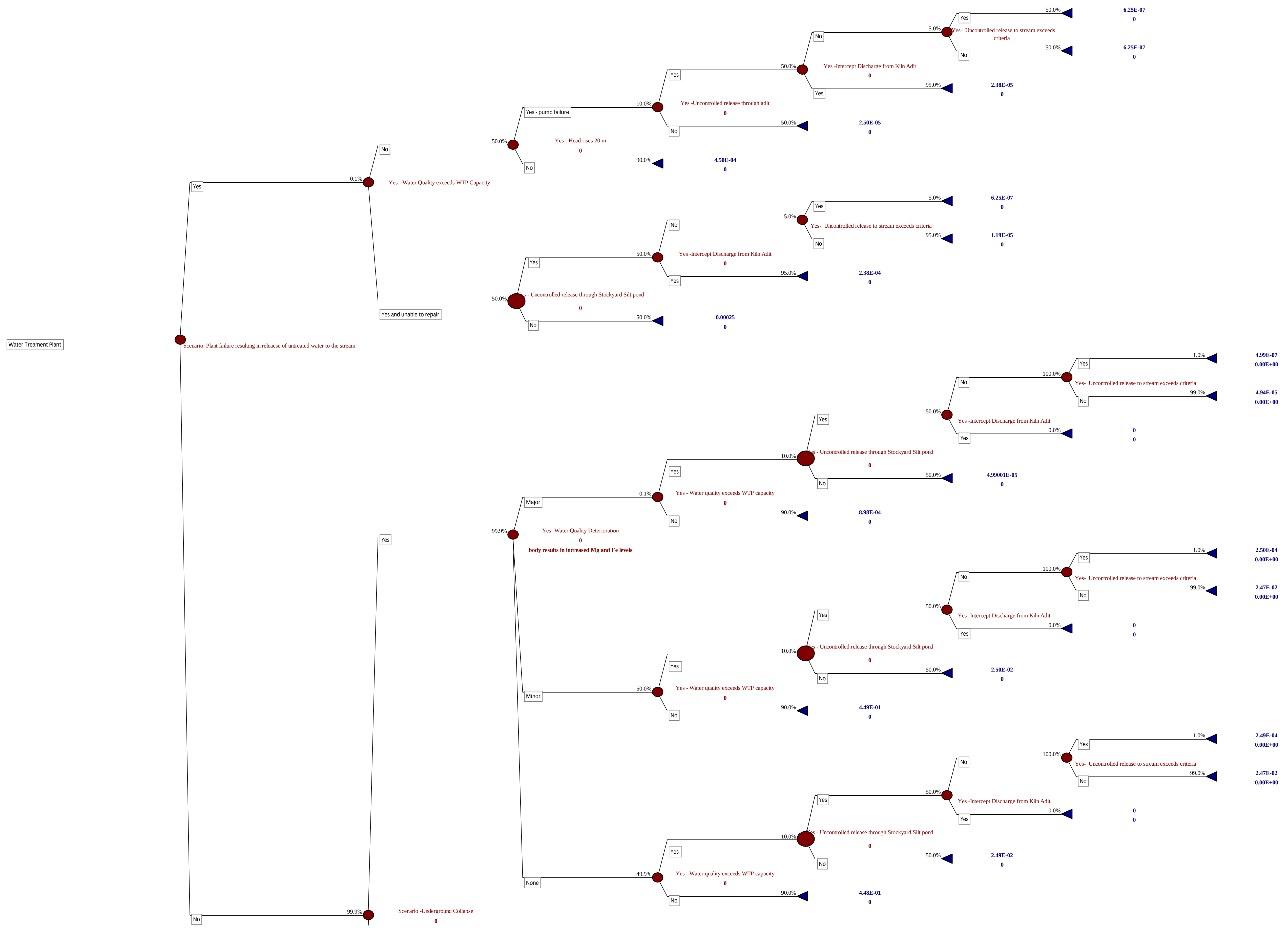
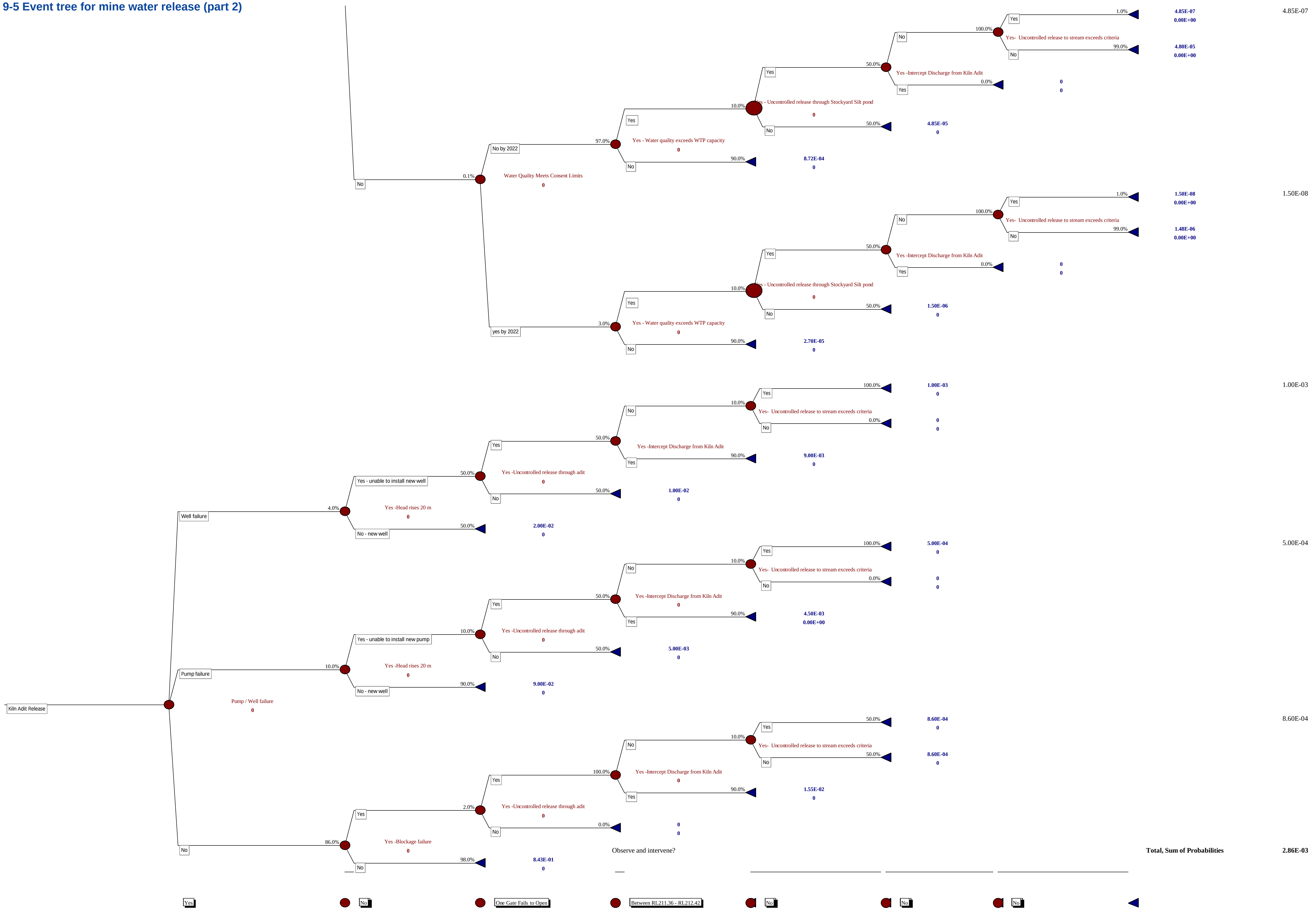


Figure 9-5 Event tree for mine water release (part 2)



10 VALUATION

10.1 Introduction

This section describes the development of residual risk costs for capping failure and underground release of contaminants developed for the risk assessment. Cost components for the activities were estimated from a variety of sources:

- Previous Cost Estimates (URS, 2003, 2008 and 2011).
- Industry References:
  - New Zealand Reserve Bank, Discount Rates and CPI http://www.rbnz.govt.nz/inflation.
  - Discount Rates and CPI assumption.
  - http://www.treasurey.govt.nz/publications/guidance/reporting/accounting/discount rate.
  - The cost basis is December 2015, in New Zealand dollars. Costs were estimated for annual care and maintenance and residual risks. Cost estimate details are provided in Appendix D.

10.2 Inflation Discount Rates

Inflation and discount rates were estimated using the Reserve Bank of New Zealand. The reserve bank is the central bank of New Zealand, and is constituted under the Reserve Bank of New Zealand Act of 1989. The Governor of the Reserve Bank is responsible for New Zealand's currency and operating monetary policy. Liabilities were assessed using a long term discount rate of 3.5% percent.

10.3 Valuation Period

A valuation period of 100 years was utilized for this analysis. The results do not include any tax benefits arising from reclamation expenditures, and no revenue streams were included.

10.4 Residual Risk Costs

Costs were estimated for the residual risks with a probability of occurring within the valuation period of 100-years, this included underground release of contaminants and capping breach leading to ARD. The residual risk associated with continued water treatment uses the annual care and maintenance cost estimated for operating the water treatment plant and associated monitoring as shown in the annual operating costs described in the WET analysis (WET, 2010). Residual risk costs include general items, compliance with health and safety requirements and earthworks. Unit costs are based on historic maintenance activities, movement of material developed as part of the run-out analysis and professional judgment. Costs are broken down into the following categories:

- Water Treatment Plant:
  - Maintenance.
  - Continued Operation.

- Capping (PCL) Failure:
  - Repair of exposed waste rock.
  - Placing of Capping Material.
  - Revegetation.

10.4.1 Release of Contaminants from Underground Mine

The costs associated with the underground release of contaminants are directly related to the continued operation of the water treatment plant. These costs are based on the annual operating, monitoring and reporting costs associated with the treatment plant as identified in the WET valuation study (WET, 2010).

10.4.2 Capping Leads to ARD

The costs associated with capping failure were evaluated for preliminary and general items, and earthwork. Preliminary and general items were associated with health and safety requirements and general operation and maintenance. These costs were based on actual historical costs at the site. Earthwork quantities were based on the assumption that the exposure is approximately 1 ha and will need to be removed with capping and vegetation restored. Unit costs were based on engineering judgment. Costs associated with monitoring and reporting were based on the WET valuation study (WET, 2010).

The unit costs and quantities are provided in detail in Appendix C. Average costs for each residual risk were developed. Then based using engineering judgment a low (10 percent) and high (90 percent) cost were estimated for each of the residual risks. The low and high costs were then used to develop a cost distribution for each of the residual risks.

Table 10-1 Residual Risk Cost – 80 Percent Confidence

Risk Issue	80% CL Cost ($NZ, in millions)
Capping failure leading to acid drainage	$0.57
Release of contaminants from underground mine	$0.40

The 80 percent confidence values were established from the developed cost distributions and are presented in Table 10-1. The 80% confidence level (CL80%) for a cost range or distribution is that amount which should not be exceeded in 80% of occurrences. This measure is generally considered to reflect a reasonable level of conservatism with respect to cost (and adopting here as the value to be used for planning purposes - planning cost estimate).

10.5 Development of Probabilistic Costs

The overall residual risk for the site was estimated using At Risk (Version 7.0.1 an excel add on developed by Pallisade Corporation). This software allows discrete or continuous probability distribution to be defined for key variables and the static cost model to be iterated many times to simulate a range of possible outcomes.

For each residual risk a Weibull probability distribution was developed. The Weibull distribution uses an average and 90 percent cost. As described above the costs estimated for each of the residual risks were used to develop this distribution.

A simulation using 10,000 iterations was performed using a Latin Hypercube At Risk (Version 7.0.1) sampling method. This simulation accounted for the probabilities estimated for each of the residual risks and the developed cost distribution. The model evaluates a distribution of Net Present Value for the combined residual risks based on confidence level from 10 to 100 percent.

10.6 Residual Risk Costs

The estimate of the combined residual risk liability for the site is summarised in Table 10-2. The value presented is for the 80% confidence level. Further detail of the estimate of costs and the probabilistic evaluation is provided in Appendix D.

Table 10-2 100-Year Net Present Value Analysis of Residual Risks

	80% Confidence Level ($NZ Millions)
Residual Risk Cost	0.25

Note: 1) Annual operating costs are provided separately.

11 CONTINUED SLIDE MOVEMENT RESULTING IN THE RELEASE OF TAILINGS

11.1 Introduction

T&T completed a report (T&T, 2011) to evaluate the possible mechanisms of a hypothetical dam failure that could occur following continued slide movement. This report is included as Appendix E to this report. This section summarises the results of this report including the potential cost associated with the tailings dam breach.

11.2 Dam Breach

The purpose of the tailings dam breach analysis (T&T, 2011) is to estimate the downstream impact of the failure during a postulated "sunny day" dam breach during a piping inducted failure under the normal reservoir water level. The dam breach analysis is based on the following assumptions:

- The service spillway crest is at an elevation of 420m.
- The quantity of water stored within the tailings dam reservoir behind the service spillway (normal reservoir water level) is approximately 730,000m^3 with a maximum depth of approximately 5.5m.
- Normal reservoir water level at elevation of 420m.

11.2.1 Dam Breach Parameters

Several methodologies were compared to estimate dam breach parameters. These included Von Thun and Gillette (Von Thun et al, 1990) and Froehlich (Froelich et. al, 1996) were used to estimate breach width and slope and failure time based on the reservoir volume and failure height. The results of the analysis indicated an average breach width of 20 m with side-slopes of 0.5H:1V with a failure time of 50 minutes.

11.2.2 Dam Breach Parameters

The outflow from the dam breach was estimated using a storage-elevation curve of the reservoir and a broad-crested weir discharge relationship. The peak discharge was estimated as approximately 260m^3/s.

11.2.3 Embankment and Downstream Erosion

During a hypothetical dam breach with a width of 20m it was estimated that 15,000m^3 of embankment material would be eroded and that 10,000m^3 of tailing would be released. The volume of material is approximately 3 percent of the total volume of water released from the tailings dam reservoir. Due to the high level of dilution of the eroded embankment and tailing material the release is not expected to create any appreciable deposition of material onsite.

Following the hypothetical dam breach the released water could pass through the saddle embankment would be directed downstream in a southerly direction toward the Junction Stream. Water would flow into and through the rock-lined stilling basin/plunge pool that the Southern Diversion Drainage formerly discharged into, down an approximately 300 m length of channel lined with concrete and into the natural channel tributary to the Junction Stream. Discharge would then be directed downstream toward the Waitekauri River.

The peak discharge in the Waitekauri River during the 100-year storm event is estimated as approximately 240m^3/s. Because the peak discharge during the tailing dam failure is similar to the peak discharge in the Waitekauri River during the 100-year storm event it was considered that there will be minimal damage to the larger bridges along the river, with some damage to the smaller bridge crossing and associated erosion/scour damage.

11.3 REMEDIAL COSTS

The T&T (T&T, 2011) report estimates the likely costs associated with cleaning up the downstream environment and remediating the damage on the tailing dam embankment associated with the hypothetical dam failure. A summary of costs is provided in Table 11-1.

Table 11-1 Summary of Estimated Remedial Costs (From Table 1 Tonkin & Taylor 2011)

Type of Damage	Description	Cost ($NZ)
Flood Damage	Significant damage to up to four low level bridge crossings	$ 400,000
	Minor damage to the Campbell Road and SH2 bridge crossings	$ 200,000
	Damage to fences, etc. at Golden Cross and on properties within the Waitekauri River flood plain	$ 100,000
	Damage to the Stockyard Silt dam embankment	$ 50,000
	Erosion damage to Junction Stream	$ 200,000
Tailings Release	Return of any areas of deposited tailings to the tailings dam	$ 50,000
	Chemical/ecological testing of receiving waters to quantify effects on environment	$ 50,000
Embankment	Reconstruct zoned saddle embankment and tailings cap	$ 400,000
	Total	**$1,450,000**

For insurance premium purposes an estimate was also developed for the single event occurrence of continued slide movement resulting in a tailing dam failure. The probability of a tailing dam failure occurring is $2.77x10^{-7}$. The evaluation completed by T&T (2011) estimated that the cost associated with dam failure was approximately $1.45 million. This has been escalated to a 2015 estimate of $1.527million. The escalation used the NZ Treasury inflation calculator from Q1 2011 to Q4 2015 with an overall change of 4.5%.

12 ANNUAL CARE AND MAINTENANCE COSTS

12.1 Introduction

The annual care and maintenance items for the Golden Cross Mine site were identified by Couer Gold (J Voyles February 2015). The items are based on internal property management documentation, historic costs, estimated future costs and professional judgment associated with each cost item.

Two categories of care and maintenance that have a finite lifespan were identified. These include the length of time of treatment for the WTP and costs associated with forestry management. For this evaluation, water treatment was carried out for a further 20 year period (2035). The time period is the estimated period that water treatment will be necessary to achieve a 95 percent confidence level that water is suitable to discharge directly into the receiving stream to remain compliant with the discharge permit.

Annual site operating costs are summarised in Table 12-1. The costs are divided into three periods : (1) Active Water Treatment Pre-Tree Harvest, (2) Active Water Treatment Post-Tree Harvest, and (3) Water Treatment Post Tree Harvest. These costs include information provided by PF Olsen for tree crop maintenance (PF Olsen December 2014).

Table 12-1 Estimated Annual Site Income and Care and Maintenance Costs (from J Voyles February 2015)

Active Water Treatment (11 Years) Pre-Tree Harvest (NZ$)	Active Water Treatment (9 Years) Post-Tree Harvest (NZ$)	Water Treatment (80 Years) Post-Tree Harvest (NZ$)
$369,000	$349,000	$105,000

Note: 1) Costs rounded to the nearest thousand dollars.

The Net Present Value (NPV) of Active Water Treatment for 20 years with Continued Site management for an additional 80 years with and without tree harvest income is summarised in Table 12-2.

Table 12-2 100-Year Net Present Value Analysis (not including Residual Risks)

Scenario	NPV (NZ$)
Active Water Treatment for 20 Years (2035), Continued Site Management for Additional 80 years (Tree Harvest Income)	$2,798,000
Active Water Treatment for 20 Years (2035), Continued Site Management for Additional 80 years (No Tree Harvest Income)	$7,080,000

Note: 1) Costs rounded to the nearest thousand dollars.

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14 LIMITATIONS

URS New Zealand Limited (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Coeur Gold (NZ) Limited and Viking Mining Limited and only those third parties who have been authorised in writing by URS to rely on this Report.

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It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

Any estimates of potential costs which have been provided are presented as estimates only as at the date of the Report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.

APPENDIX A INCLINOMETER AND GPS DATA

Tonkin & Taylor, 2012. Golden Cross Landslide Monitoring Report for June 2010 to October 2012 Monitoring Period, June 2013.

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2014 and 2015 monitoring Data supplied by Tonkin and Taylor.

REPORT

Coeur d'Alene Mines Corporation

Golden Cross Landslide Monitoring Report
October 2012 to January 2014 Monitoring Period

Report prepared for:

COEUR D'ALENE MINES CORPORATION

Report prepared by:

Tonkin & Taylor Ltd

Distribution:

COEUR D'ALENE MINES CORPORATION	2 copies
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Table of contents

1 Introduction 1
- 1.1 General 1
- 1.2 GPS data processing software status 1

2 Rainfall 1

3 Groundwater 2

4 Mass movement monitoring 3
- 4.1 Inclinometers 3
- 4.2 GPS 3
  - 4.2.1 Regular stations 3
  - 4.2.2 Additional stations from November/December 2009 4
  - 4.2.3 Additional stations from February 2011 5

5 Visual inspection 6

6 Small scale pit instability 6

7 Golden Cross sink hole 7

8 Summary 7

9 Applicability 9

Appendix A: Monitoring Network

Appendix B: Rainfall

Appendix C: GPS Data

Appendix D: Visual Inspection Records

1 Introduction

1.1 General

This report presents a summary of the monitoring data gathered from selected monitoring locations at the Golden Cross Mine for the period from October 2012 to January 2014. Monitoring data was collected in October 2012 (the end of the previous monitoring period) and February 2014 (the end of the current monitoring period) and is presented and discussed in this report.

Monitoring is carried out by Geotechnics Ltd in a format agreed by all interested parties (i.e. representatives of Coeur Gold NZ Ltd, Viking Mining Ltd, Tonkin & Taylor Ltd (T&T), URS Corp and Environment Waikato) at a Landslide Review Meeting in October 2002.

This report is intended to summarise the period's rainfall characteristics, significant changes to monitored piezometric levels and any significant changes identified within the GPS. In addition, this report outlines visual inspection data collected on site with photographic records. Attached to this report are:

- Appendix A - Monitoring Network;
- Appendix B – Rainfall/Piezometric Data;
- Appendix C - GPS Data;
- Appendix D - Visual Inspection Records.

1.2 GPS data processing software status

The data from October 2012 and January 2014 has been processed using the new Topcon Tools package. Because of the difficulties with data processing in the previous monitoring period (June 2010 to October 2012), the validity of the Topcon package was checked by also processing the data with the previously adopted and now recently expired TGOV1.60 software. This check confirmed the accuracy of the Topcon Tools system and so the Topcon – processed data has been adopted for this report. The data for October 2012 to February 2014, together with the historic monitoring data is presented in Appendix C of this report.

2 Rainfall

The annual rainfall for 2012 and 2013 was 2605 mm and 2007 mm respectively. The rainfall for 2012 and, in particular, 2013 was well below the average annual rainfall of 2787 mm, as recorded by the rainfall gauge at the Water Treatment Plant (WTP). The annual rainfall recorded during the last six years (2008-2013) was below the average annual rainfall while the rainfall for the years 2000 to 2007 were each above the average of 2787 mm.

There have been multiple large rainfall events and long periods of low rainfall during the monitoring period. Rainfall events of note were as follows:

- 185 mm occurred in the period 24th to 26th December 2012 with a peak of 90 mm on the 24th of December 2012;
- 210 mm occurred on the 16th and 17th of April 2013 with a peak of 150 mm on the 16th of April 2013;
- 248 mm occurred in the period 17th to 22th of August 2013 with a peak of 110 mm on the 22nd of August 2013 and a total rainfall of 405 mm for August 2013;
- 135 mm occurred on the 24th of September 2013.

Rainfall in the monitoring period was below average during 10 of the 16 months in the monitoring period. Long spells of relatively dry weather comprising no daily rainfall exceeding 50 mm was observed during the periods; 1 October to 23 December 2012 and 27 December 2012 to 15 April 2013.

3 Groundwater

Groundwater monitoring data is presented in Table 1 below. Four of the seven remaining piezometers monitored showed decreases in groundwater levels from the previous period with the exceptions being N7 (+0.6 m), N9 (+0.6m) and N45 (+8.4 m).

The average change in groundwater level was a drop of 0.13 m, perhaps due to relatively dry weather and increased pumping effort in the underground mine (i.e. M8 level fell 5.6 m during the monitoring period).

During the previous monitoring period (June 2010 to October 2012), five of the eight monitored piezometers showed increases in groundwater from the previous period (October 2008 to June 2010) with the exception of PW25 (-2.9 m), N7 (-1.2 m) and N45 (-5.9 m).

Historically, the groundwater level at N45 has been subject to relatively minor fluctuations since recording recommenced in 2002 but the groundwater level rose 8.4 m in this monitoring period and a 5.9 m drop was recorded in the previous monitoring period (June 2010 to October 2012). This could be due to a relatively long dry period before the 15 of February 2013 groundwater level monitoring date.

Table **1** – Significant changes in monitored piezometers levels (June 2010 to October 2012 / February 2013)

Piezometer I.D.	Location	Geological Unit	Type	Change (m)
PW25	Rear of Tailings Pond	Union Volcanics	Standpipe	-
N7	Trig J	Lower Omahia A	Pneumatic	+0.6
N9	Trig J	Lower Omahia A	Pneumatic	+0.6
N45	Spring Creek	Lower Omahia A	Standpipe	+8.4
N132/1	Stockyard	Basement	Standpipe	-2.3
N132/2	Stockyard	Lower Omahia A	Pneumatic	-0.9
N132/3	Stockyard	Lower Omahia A	Pneumatic	-1.7
M8	Upper Waitekauri	Coromandel Group/ Empire Vein	Standpipe	-5.6
			Average	-0.13

4 Mass movement monitoring

4.1 Inclinometers

No inclinometers are currently read.

4.2 GPS

4.2.1 Regular stations

GPS data for the regularly monitored monuments for the subject monitoring period October 2012 to January 2014 is presented in Table 2 below, together with the data from the previous two monitoring periods for comparison.

Table 2 – Summary of GPS data

Location	ID	June 2010 to October 2012 (28 months)		October 2012 to January 2014 (15 months)		
		Plan Movement[1] (mm)	Vertical Movement [1&2] (mm)	Plan Movement[3] (mm)	Net Movement Direction[3] (°)	Vertical Movement[2] (mm)
Rear of Tailings Pond, Upper Slide	C-2	11 (4.7 mm/yr) *(2)*	+1 *(-2)*	5.1 (4.1 mm/yr) [3.2]	349 [203]	+8
Saddle, Upper Slide	C-Sad	16 (6.9 mm/yr) *(3)*	-2 *(-12)*	7.3 (5.8 mm/yr) [2.3]	74 [267]	-8
Main Embankment, Mid Slide	C-Mid	4 (1.7 mm/yr) *(2)*	-13 *(-12)*	5 (4.0 mm/yr) [4.0]	307 [283]	-12
Central Ridge, Mid Slide	C-K5	10 (4.3 mm/yr) *(1)*	-13 *(+7)*	3.2 (2.6 mm/yr) [3.2]	162 [225]	+8
Stockyard, Lower Slide	C-SYD	2 (0.9 mm/yr) *(3)*	-3 *(+2)*	2.2 (1.8 mm/yr) [1.1]	27 [184]	-1
Union Silt Pond	USP-8	3 (1.3 mm/year) *(11)*	+3 *(+10)*	4 (3.2 mm/yr) [1.6]	270 [211]	-4
Average		7.7 (3.3 mm/yr) *(3.7 mm) (2.2 mm/yr)*		4.5 (3.6 mm/yr) [2.6mm] (13 year ave. ann. rate)		

Notes:

Theoretical Instrument error for static GPS is 3 to 5mm for the period

1 Italic brackets (x) indicate corresponding October 2008-June 2010 period.

2 Positive numbers indicate upwards movement and negative numbers indicate downwards movement for the 15 month monitoring period.

3 Square brackets [x] indicate average plan movement per year and direction for 13 year period 2001 – 2014.

The monitored monuments recorded plan movements during the subject 15 month monitoring period range from 7.3 mm (C-Sad) to 2.2 mm (C-SYD) with an average of 4.5 mm and an annual average of 3.6 mm/year. The plan average annual movement rate of 3.6 mm/year is 38% higher than the 2.6 mm/year average movement rate from 2001 to2014. However, all of the readings are significantly lower than the emergency threshold of 75 mm per year (Landslide Review Meeting, October 2002).

The orientation of the recent plan movement for C-Mid, CK5 and USP-8 is reasonably consistent with historic movement indicating the movement is likely to be valid. However, the recent recorded plan movement directions of C-2, C-SAD, and C-SYD is inconsistent with historical data; accordingly is possible that the movement of these monuments is within or near to the GPS error tolerance.

The vertical movements recorded are relatively small, ranging between -12 mm (i.e. downward movement) for C-Mid and +8 mm (upward movement) for C-2 and C-K5.

4.2.2 Additional stations from November/December 2009

As a result of the unusual vertical readings on some of the monuments between October 2008 and July 2009, it was agreed (during the annual Landslide Review Panel meeting of 4/9/09) to recommence monitoring six previously monitored monuments. However, only monuments C-RA, C-Stok (Lower Slide) and C-USP (replaced USP-6 as it was impossible to read) yielded reliable results. Results, including average annual plan movement for each station for the last 13 years, are presented in Table 3 below.

Table **3** – Extra GPS monument monitoring

Location	ID	June 2010 to October 2012 (28 months)		October 2012 to February 2014 (16 months)		
		Plan Movement[1] (mm)	Vertical Movement[2] (mm)	Plan Movement[3] (mm)	Net Movement Direction[3] (°)	Vertical Movement[2] (mm)
Right Abutment, Upper Slide	C-RA	3 (1.3 mm/yr) *(1)*	+4 *(+3)*	2.2 (1.7 mm/yr) [2.4]	63 [132]	0
Stockyard Fill, Mid Slide	C-Stok	4 (1.7 mm/yr) *(1)*	-5 *(+4)*	2.2 (1.7 mm/yr) [1.2]	117 [158]	+2
Union Silt Pond, Off Slide	C-USP	5 (2.1 mm/yr) *(7)*	+1 *(-11)*	3.0 (2.3 mm/yr) [2.0]	180 [148]	-7
Average		4 (1.7 mm/yr) *(3.0)* *(5.1 mm/yr)*		2.5 (1.9 mm/yr) [1.9] *(13 year ave. ann. Rate)*		

Notes:
Theoretical Instrument error for static GPS is 3 to 5 mm for the period.
1 Italic brackets (x) indicate corresponding November 2009-June 2010 period.
2 Positive numbers indicate upwards movement and negative numbers indicate downwards movement.
3 Square brackets [x] indicate average plan movement per year and direction for 13 year period 2001 – 2014.

All of these monuments have shown relatively small plan movements for the monitoring period ranging from 2.2 mm (C-RA and C-Stok)) to 3.0 mm (C-USP) with an average of 2.5 mm and an annual rate of 1.9 mm/year, to the same as the 13 year annualised rate of 1.9 mm/year. With the exception of C-RA, these plan movement directions are reasonably consistent with the historic movement directions and are likely to be valid. However, all of the recent movements are within the range of accuracy of the GPS equipment.

The vertical movements range between -7 mm (downward movement) for C-USP and +2 mm (upward movement) for C-Stok.

4.2.3 Additional stations from February 2011

To further increase the coverage of the monitoring network it was agreed (during the annual Landslide Review Panel meeting of November 11, 2010) to convert two previously monitored on-slide inclinometers to GPS monuments. This has been carried out and initial base readings were taken in February 2011 with subsequent readings taken in October 2012 and January 2014. Results are presented in Table 4 below.

Table 4 – New GPS monument monitoring

Location	ID	February 2011 to October 2012 (20 months)		October 2012 to January 2014 (15 months)		
		Plan Movement (mm)	Vertical Movement[1] (mm)	Plan Movement (mm)	Net Movement Direction (°)	Vertical Movement[1] (mm)
Toe of Access road	C-131	3 (1.8 mm/yr)	-30	9.8 (7.8 mm/yr)	156	-10
Rear of Tailings Dam and below WDD	C-136	6 (3.6 mm/yr)	+1	1.4 (1.1 mm/yr)	315	-5
Average		4.5 (2.7 mm/yr)		5.6 (4.5 mm/yr)		

Notes:

Theoretical Instrument error for static GPS is 3 to 5 mm for the period

1 Positive numbers indicate upwards movement and negative numbers indicate downwards movement.

The two GPS monitoring monuments have plan movements for the monitoring period ranging from 1.4 mm (C-136) to 9.8 mm (C-131).

C-131 has an apparent vertical movement for the period of -10 mm (downward movement), in addition to the -30 mm (downward movement) for the previous monitoring period. Given the generally upward historic movement of C-131, this vertical reading may be anomalous. Similarly the 9.8 mm of plan movement for C-31 during the period is surprising given that C-131 has only moved 7.3 mm in plan since February 2011.

C-136 has an apparent uphill plan movement for the period of 1.4 mm. This movement is within the GPS instrument error, is not in a landslide consistent direction and is therefore considered anomalous.

Once more monitoring data is available and longer term movement trends can be established, more reliable interpretation of the results of these stations will be possible.

5 Visual inspection

Formal visual inspections were carried out on site by Paul Burton during the instrument monitoring rounds on the 9th of October 2012 and the 31st of January 2014. Results are summarised as follows:

1. 9/10/2012 Inspection

   Two small scale shallow landslips (Pit Slip 1 and Pit Slip 2) which occurred following heavy rainfall in July 2012 on the eastern side of the backfilled Open Pit were observed. Reactivation of relatively small scale deep seated historic instability (Eastern Pit Scarp) towards the pit also occurred following the July 2012 rainfall event.

   The number and extent of cracks in the Western Diversion Drain (WDD) shotcrete lining identified in 2009 appear to have increased since the previous crack monitoring survey was completed in February 2011 as detailed in the report titled *Golden Cross Crack Meter Report* (ref: 613625 – DFB. 150410). Some seepage of water into the cracks was evident.

2. 31/01/2014 Inspection

   Remediated Pit Slip 1 appeared to be stable and performing well. There has been no obvious change to Pit Slip 2 or the Eastern Pit Scarp.

   The cracks in the Western Diversion Drain (WDD) shotcrete lining first identified in 2009 appeared to have moved again. The relatively dry weather may have caused shrinkage cracking of the lining which is difficult to distinguish from tension cracks in the lining.

   A 375 mm diameter reinforced concrete culvert was installed in a sump in the WDD to divert the continuous seepage and horizontal drain flows from the steep vegetated catchment to the north from the WDD to the Tailings Dam. This was undertaken to prevent continuous saturation of the potentially unstable ground below the WDD cracks.

   The diameter of the Golden Cross Sink Hole (refer to T&T report titled *Golden Cross Sink Hole Report Formal Interpretative Report v2* dated October 2013) which first formed in June 2013 appeared to have widened and the base of the hole had deepened.

Visual inspection sheets for the two visits are included in Appendix D. Pit Slip 1, Pit Slip 2 and the Eastern Pit Scarp are discussed further in Section 6 and the Golden Cross Sink Hole is discussed further in Section 7.

6 Small scale pit instability

As mentioned in Section 5, two landslips (Pit Slip 1 and Pit Slip 2) on the eastern side of the open pit were identified following the heavy rainfall event of July 2012. Reactivation of historic instability (Eastern Pit Scarp) was also observed above the eastern side of the open pit.

Pit Slip 1 was approximately 1.5 m deep and 20 m wide and extended downslope approximately 30 m. The landslip debris inundated land downslope, including the rock lined drain below. It was considered likely that the headscarp of the landslip would continue to regress upslope during heavy rainfall and therefore remediation comprising placement of imported fill and installation of longitudinal buttress drains was undertaken along with the surface being re-grassed. The remediation of this landslip was completed in April 2013 and appears to have been successful.

Pit Slip 2 comprises an approximately 35 m wide shallow (less than 1 m deep) slump. The land has not fully evacuated and the vegetation had minor disturbance only and accordingly, no remediation was undertaken. Pit Slip 2 currently appears to be stable and vegetation has re-established.

The Eastern Pit Scarp is considered to be a reactivation of a landslip towards the Open Pit identified in 2007. The reactivation occurred during an extremely wet period in July 2012. It is estimated to be approximately 70 m wide and the ground surface expression at the head comprised an approximately 300 mm high scarp with an approximately 1 m deep crack at the scarp base. The crack was filled with compacted cohesive fill and does not appear to have moved further since July 2012.

The locations of Pit Slip 1, Pit Slip 2 and the Eastern Pit Scarp is shown on the Monitoring Network Figure included in Appendix A.

7 Golden Cross sink hole

The Golden Cross Sink Hole on the eastern side of the open pit occurred on 12 June 2013. A semi-permanent 2 m high safety fence with "keep out" signs was erected around the sink hole in early July 2013 to remove public access within the vicinity of the sink hole.

The sink hole was considered a result of a NNE to SSW striking structurally controlled geological feature (probably the Beefeater Fault) which created a sub-vertical walled collapse shaft into what appears to be an unfilled underground working at approximately RL 300 m. A detailed description of the sink hole mechanism, inspections, risk assessment and remediation options are included in the T&T report titled *Golden Cross Sink Hole Report Formal Interpretative Report v2* dated October 2013.

Based on three engineer inspections and regular photographs taken by JV staff it appeared the sink hole had self-stabilised by late July 2013. This was based on collapse of the sink hole sides effectively backfilling the base of the hole to a point where the sides were no longer over steepened and water was ponding at the base of the hole.

Inspection of the sink hole in February 2014 revealed that instability at the base was still ongoing. The sink hole was in excess of 30m in surface diameter and 15 to 18m deep at the upslope end. The Golden Cross Joint Venture therefore reached a verbal agreement with Waikato Regional Council and Hauraki District Council in February 2014 that it would remediate the sink hole when it is stable and safe to do so.

The sink hole will be regularly monitored to assess when it has stabilised further and what remedial works can be undertaken. The location of the sink hole is shown on the monitoring network figure included in Appendix A.

8 Summary

Four of the seven monitored piezometers show minor piezometric falls during the monitoring period; this is likely to be due to a dry monitoring period and an increased pumping effort in the underground mine (i.e. M8).

GPS movement rates for "on slide" GPS stations from October 2012 to January 2014 (the period of this monitoring report) range from 1.1 to 7.8 mm/year with an average of 3.4 mm/year, which is similar to the corresponding average annual rate of 2.4 mm/year for the last 13 years. However, the monitoring data indicates a number of the higher movement GPS stations are in a non-landslide consistent direction and therefore this annualised rate for this monitoring period is not considered to be a true reflection of the “real” movement that has occurred.

Pit Slip 1 was remediated with placement of imported fill and installation of longitudinal buttress drains in April 2013 and this appears to have performed well. No obvious change to Pit Slip 2 or the Eastern Pit Scarp has occurred during the monitoring period.

The Golden Cross Sink Hole on the eastern side of the open pit occurred on the 12 June 2013 and a safety fence was erected around the sink hole to remove public access shortly after. Inspection of the sink hole in February 2014 revealed that instability at the base was still ongoing. The Golden Cross Joint Venture therefore reached a verbal agreement with Waikato Regional Council and Hauraki District Council in February 2014 that it would remediate the sink hole when it is stable and safe to do so. The sink hole will be regularly monitored to assess when it has stabilised further and what remedial works can be undertaken.

9 Applicability

This report has been prepared for the benefit of Coeur d'Alene Mines Corporation with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
....	....
Ben Harrison	Grant Loney
Geotechnical Engineer	Project Director

BTH

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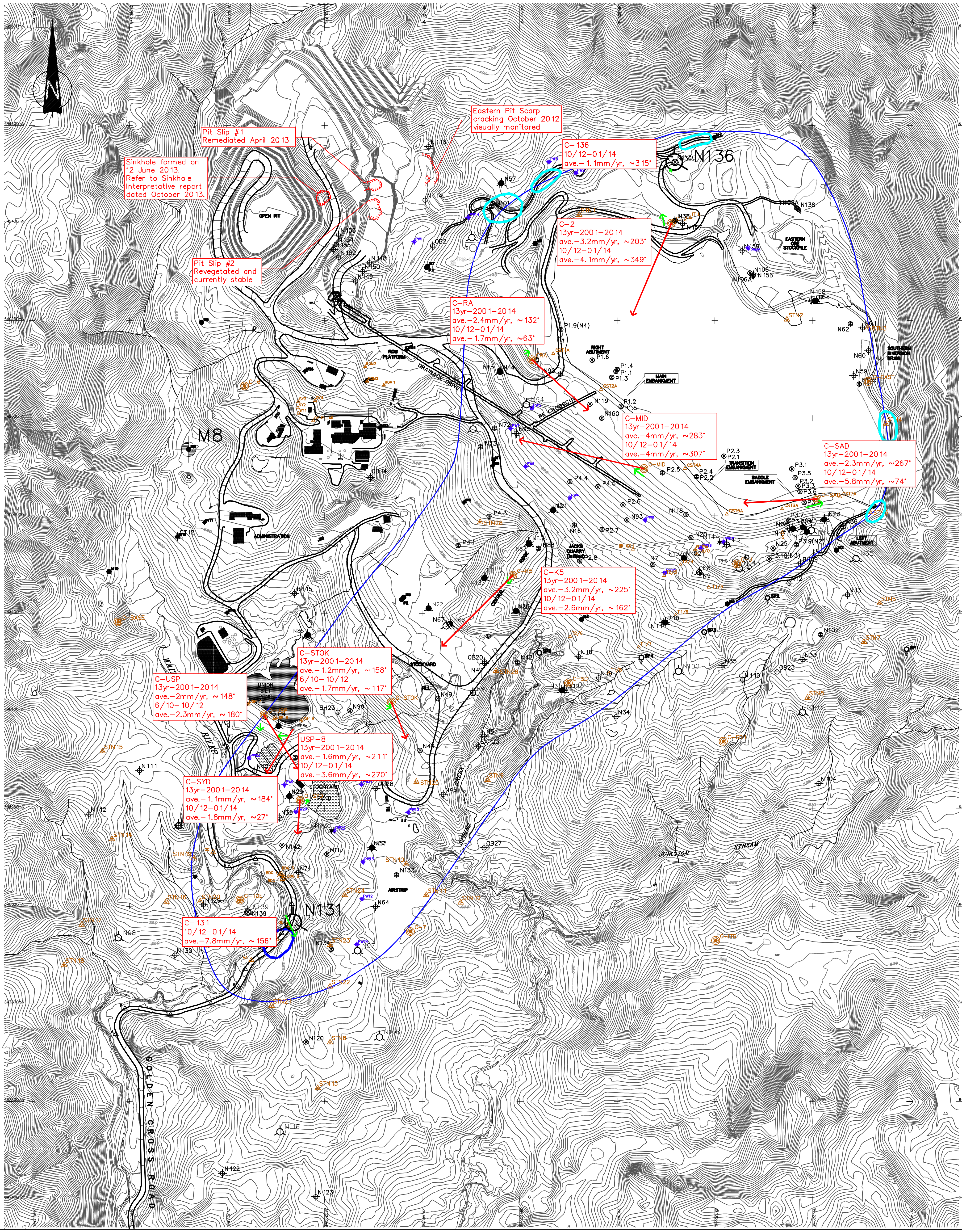
Appendix A: Monitoring Network



LEGEND

————	April 1998 Major Contour
TRIG J	Trig
	Secondary Survey Station
C-7	Static GPS Monument
CST1	Temporary Survey Points
	Temporary (surface) extensometer
N88	Active Inclinometer
N22	Blocked Inclinometer
N88	Shear Monitor
N128	Blocked inclinometer reinstrumented with TDR co-axial cable
OB28	Standpipe piezometer (recent investigations or older investigations still readable)
P3.1	Pneumatic Piezometer (in fill or foundation)
M5	Groundwater Monitoring Well (Environmental)
SP1	Monitoring spring
PW1	Pumping Well
red arrow	Plan movement 2001-2014
cyan	Visual inspection cracks zone
blue	Apparent road deformation zone
green arrow	Plan movement in last monitoring period

(Plan movement arrows proportional to length 1mm=5m)

SCALE 1:7100 (A3)
SCALE 1:2500 (A0)
0 25 50 75 100 150 200 250 (m)

REVISION		CHECKED BY	DATE
8	General revisions	TPC	10/98
9	General revisions	TPC	02/99
10	General revisions	PB	11/08
11	General revisions	BTH	01/12
12	Update Monitoring Data	MJCC	03/14

PREPARED	T.P.C.	
DRAWN	B.A.S	22/4/97
DRAWING CHECKED		
APPROVED :		

SCALES (AT A0 SIZE) 1:2500(A0); 1:7100(A3)

Prepared by: TONKIN & TAYLOR ENVIRONMENTAL & ENGINEERING CONSULTANTS

CAD FILE L:\DRAUGHT\..\25-190

NOTES
1. Monitoring includes 650m long survey profile along Golden Cross Road extending southwards from Union Silt Dam.
2. USP 6 to 9 subject to survey verification.

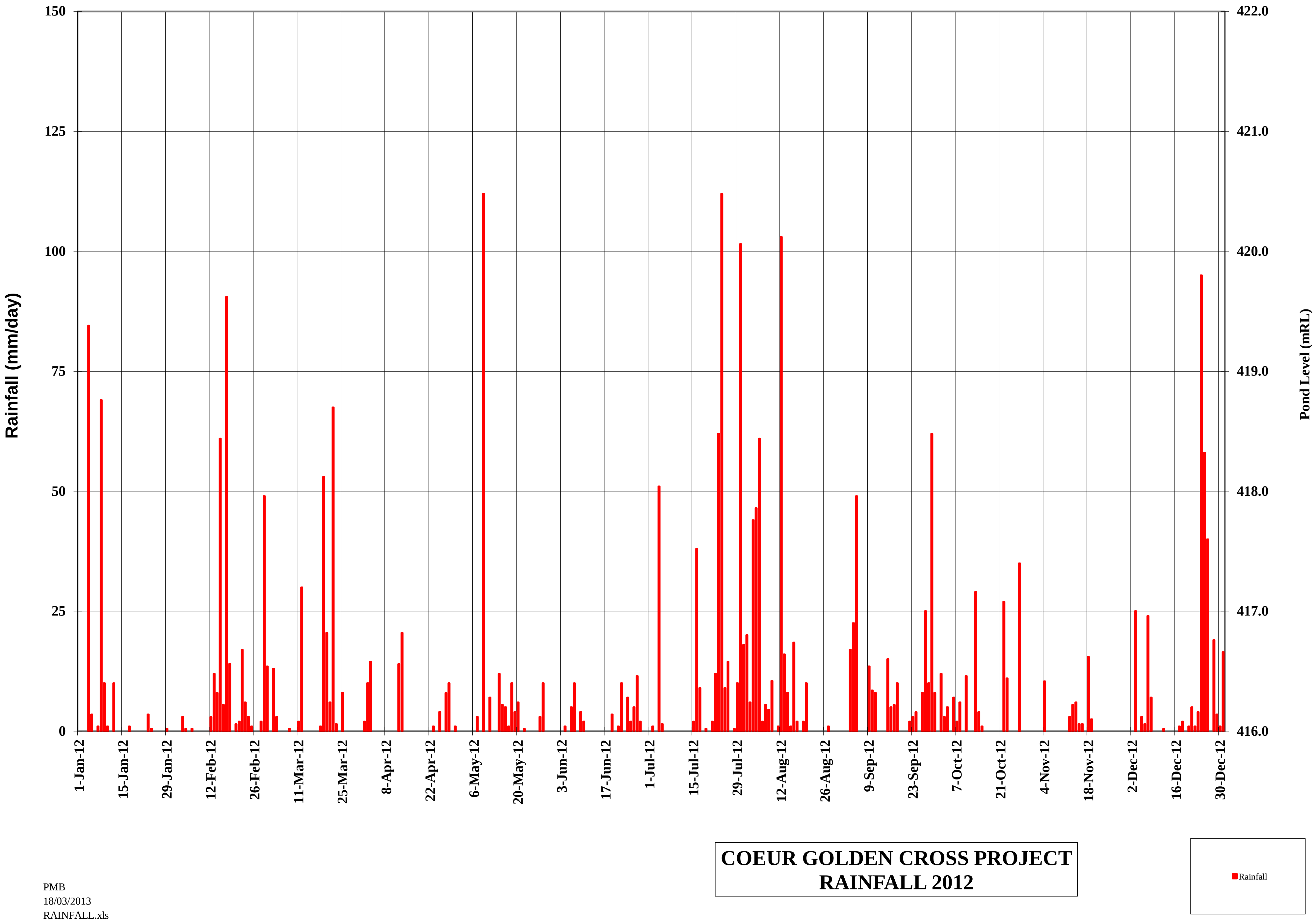
MONITORING NETWORK
GPS — OCT 2012 — JAN 2014

COEUR GOLDEN CROSS

TITLE
GOLDEN CROSS PROJECT

DWG No. 29251.013
REV. 12

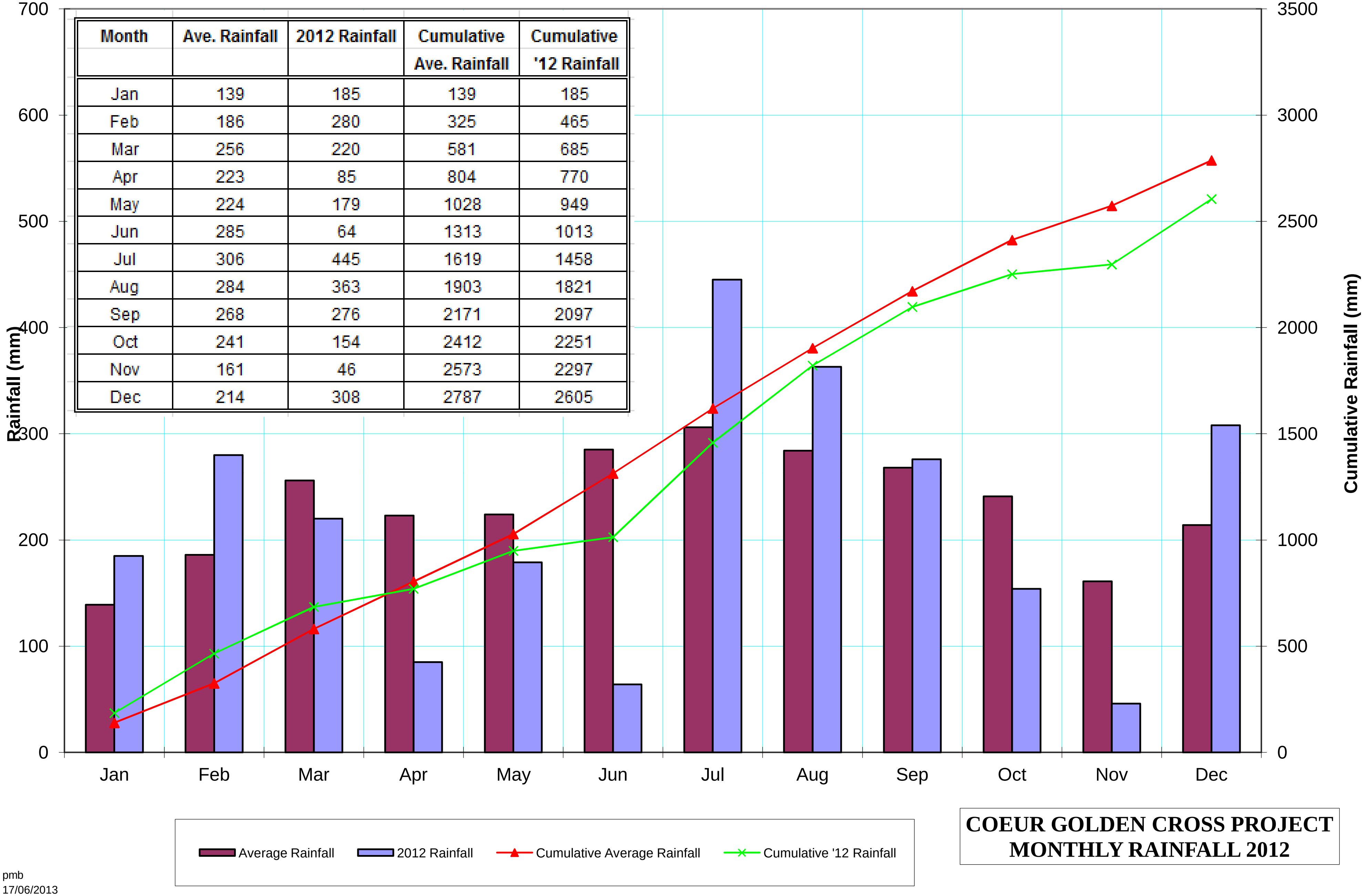
Appendix B: Rainfall



COEUR GOLDEN CROSS PROJECT
RAINFALL 2012

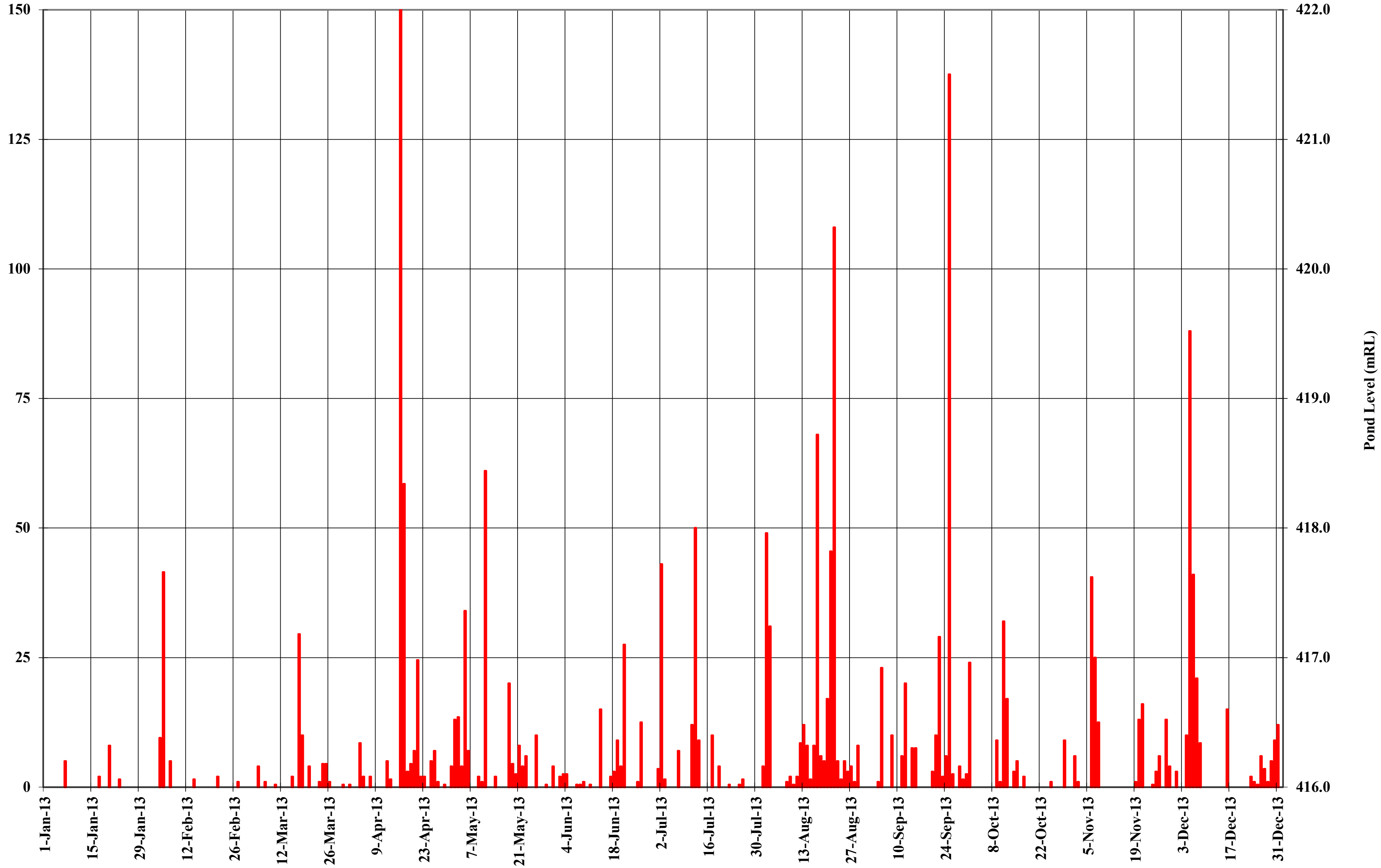
PMB
18/03/2013
RAINFALL.xls
Rainfall 2012

COEUR GOLDEN CROSS PROJECT
MONTHLY RAINFALL 2012



Month	Ave. Rainfall	2012 Rainfall	Cumulative Ave. Rainfall	Cumulative '12 Rainfall
Jan	139	185	139	185
Feb	186	280	325	465
Mar	256	220	581	685
Apr	223	85	804	770
May	224	179	1028	949
Jun	285	64	1313	1013
Jul	306	445	1619	1458
Aug	284	363	1903	1821
Sep	268	276	2171	2097
Oct	241	154	2412	2251
Nov	161	46	2573	2297
Dec	214	308	2787	2605

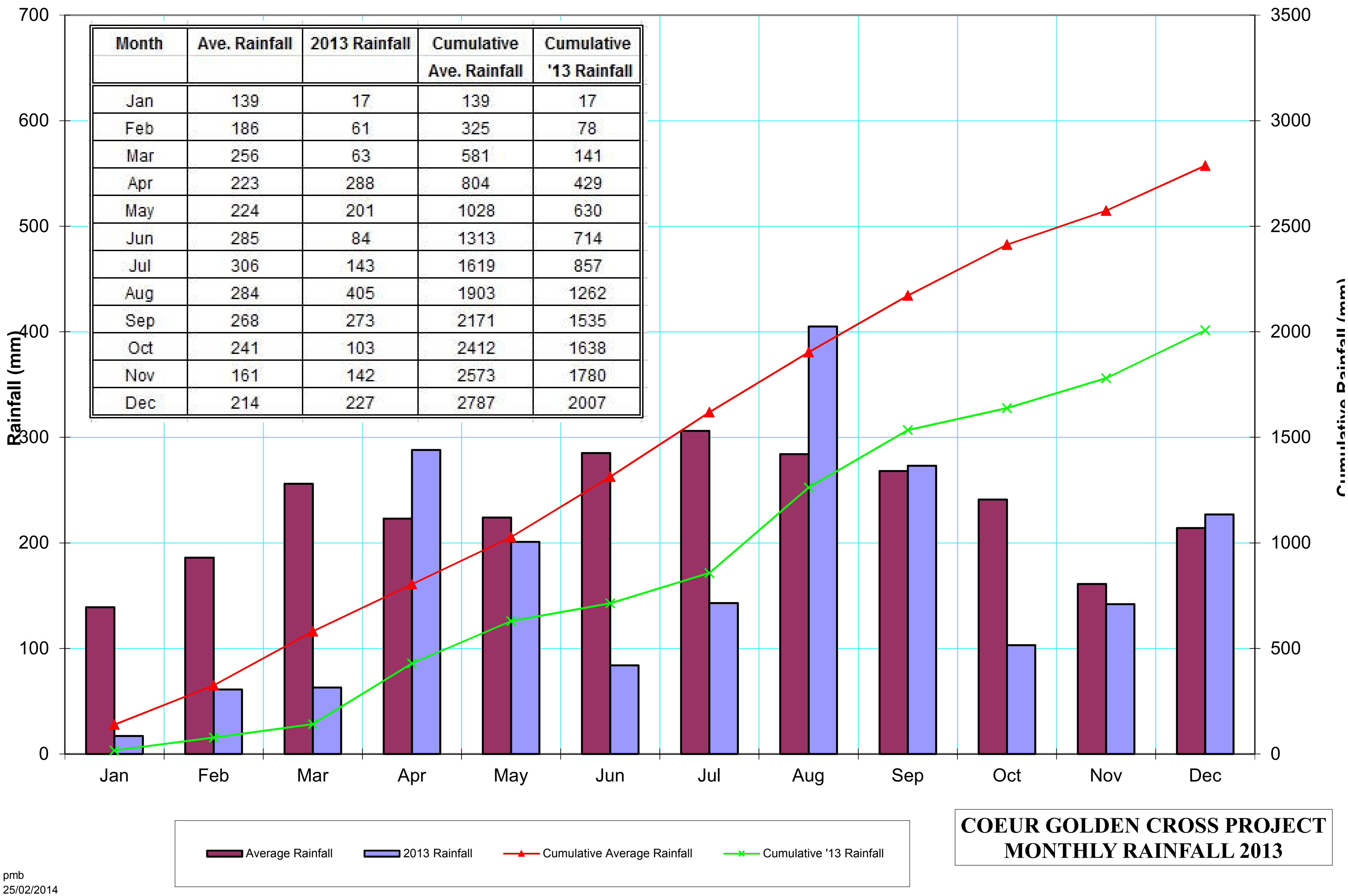
pmb
17/06/2013
RCHART.XLS
RainChart 12



COEUR GOLDEN CROSS PROJECT
RAINFALL 2013

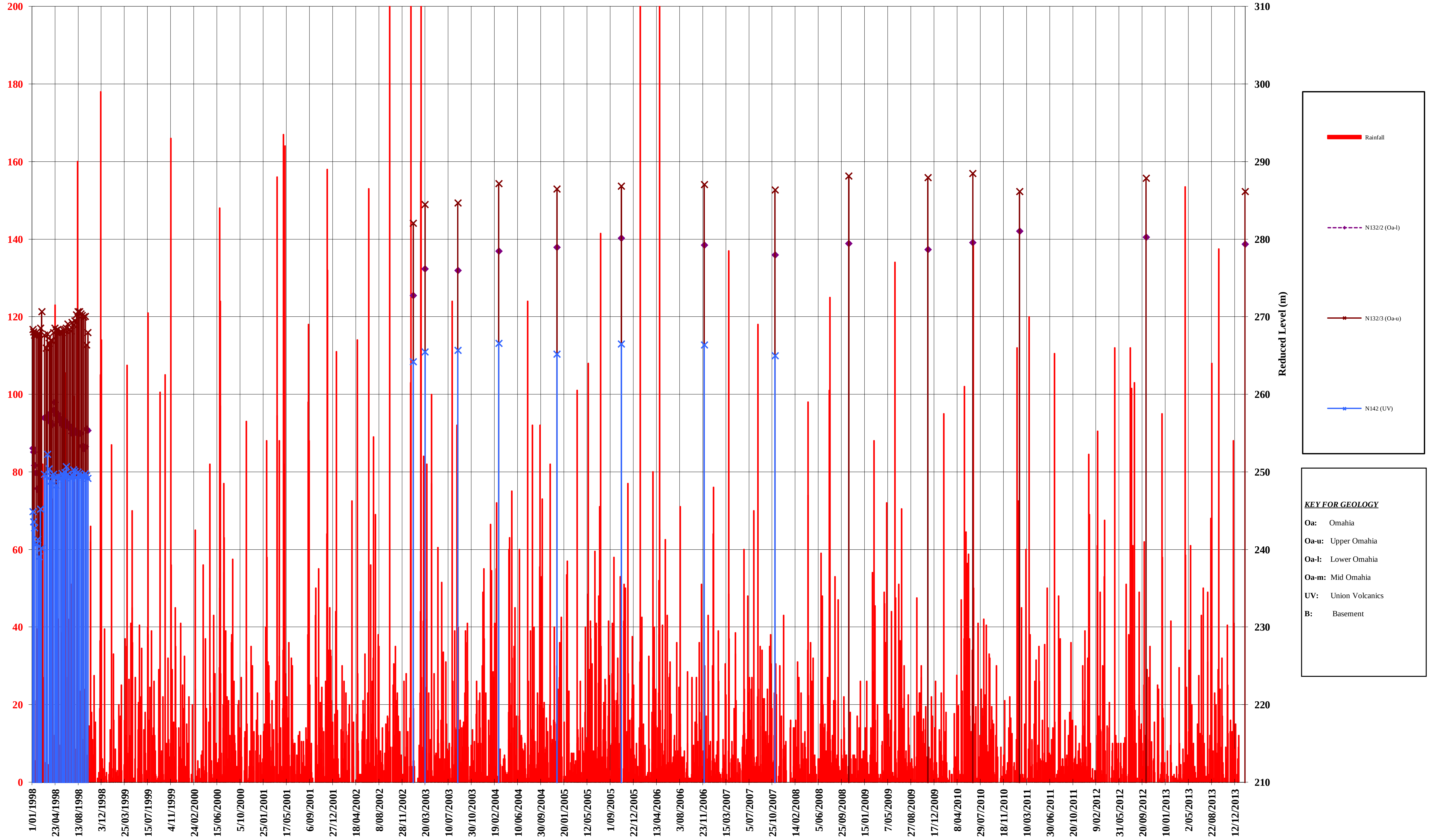
PMB
25/02/2014
RAINFALL.xls
Rainfall 2013

COEUR GOLDEN CROSS PROJECT
MONTHLY RAINFALL 2013



Month	Ave. Rainfall	2013 Rainfall	Cumulative Ave. Rainfall	Cumulative '13 Rainfall
Jan	139	17	139	17
Feb	186	61	325	78
Mar	256	63	581	141
Apr	223	288	804	429
May	224	201	1028	630
Jun	285	84	1313	714
Jul	306	143	1619	857
Aug	284	405	1903	1262
Sep	268	273	2171	1535
Oct	241	103	2412	1638
Nov	161	142	2573	1780
Dec	214	227	2787	2007

pmb
25/02/2014
RCHART.XLS
RainChart 13



COEUR GOLDEN CROSS PROJECT
N-Series Holes - ***STOCKYARD*** - Pneumatic Piezos

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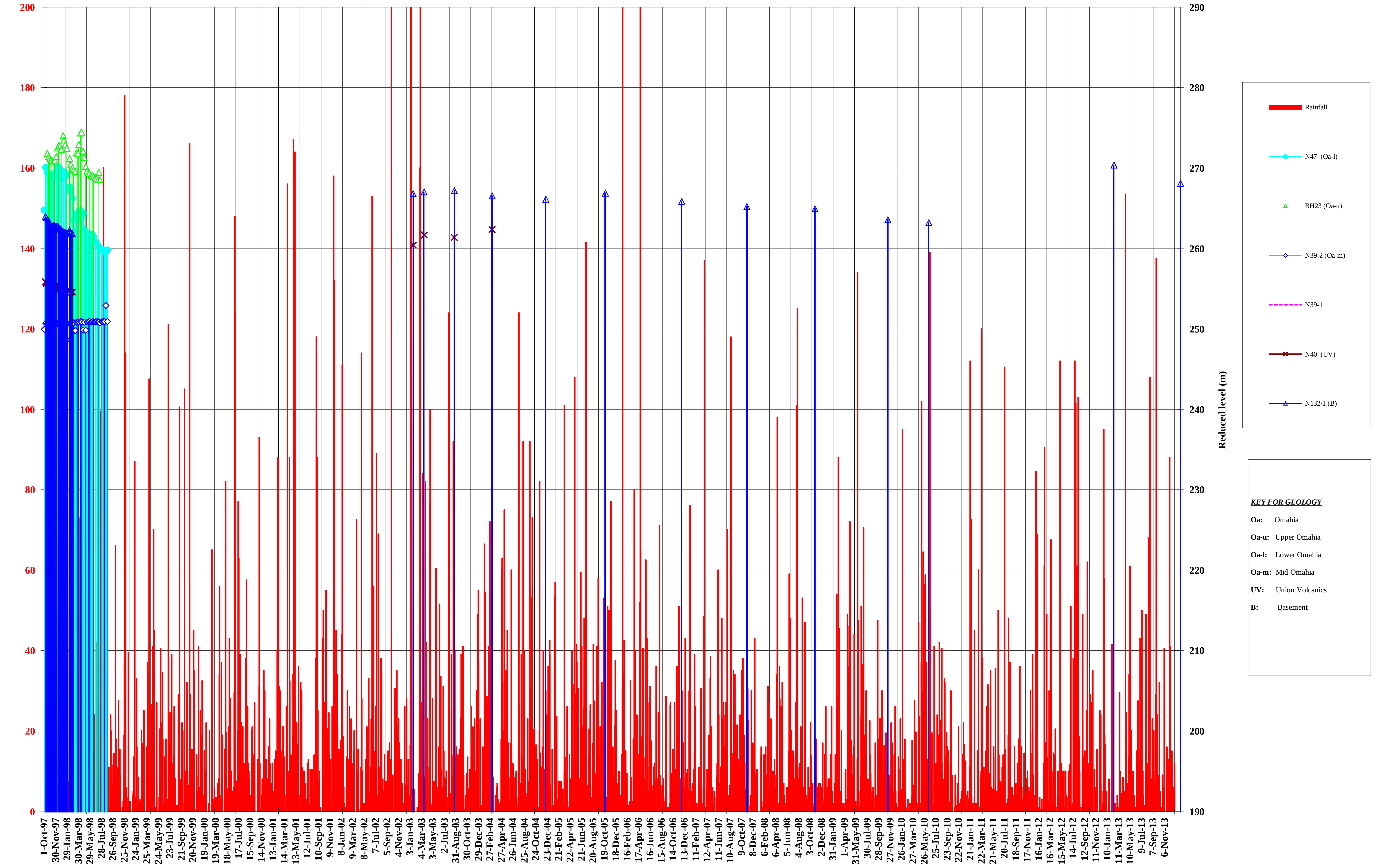
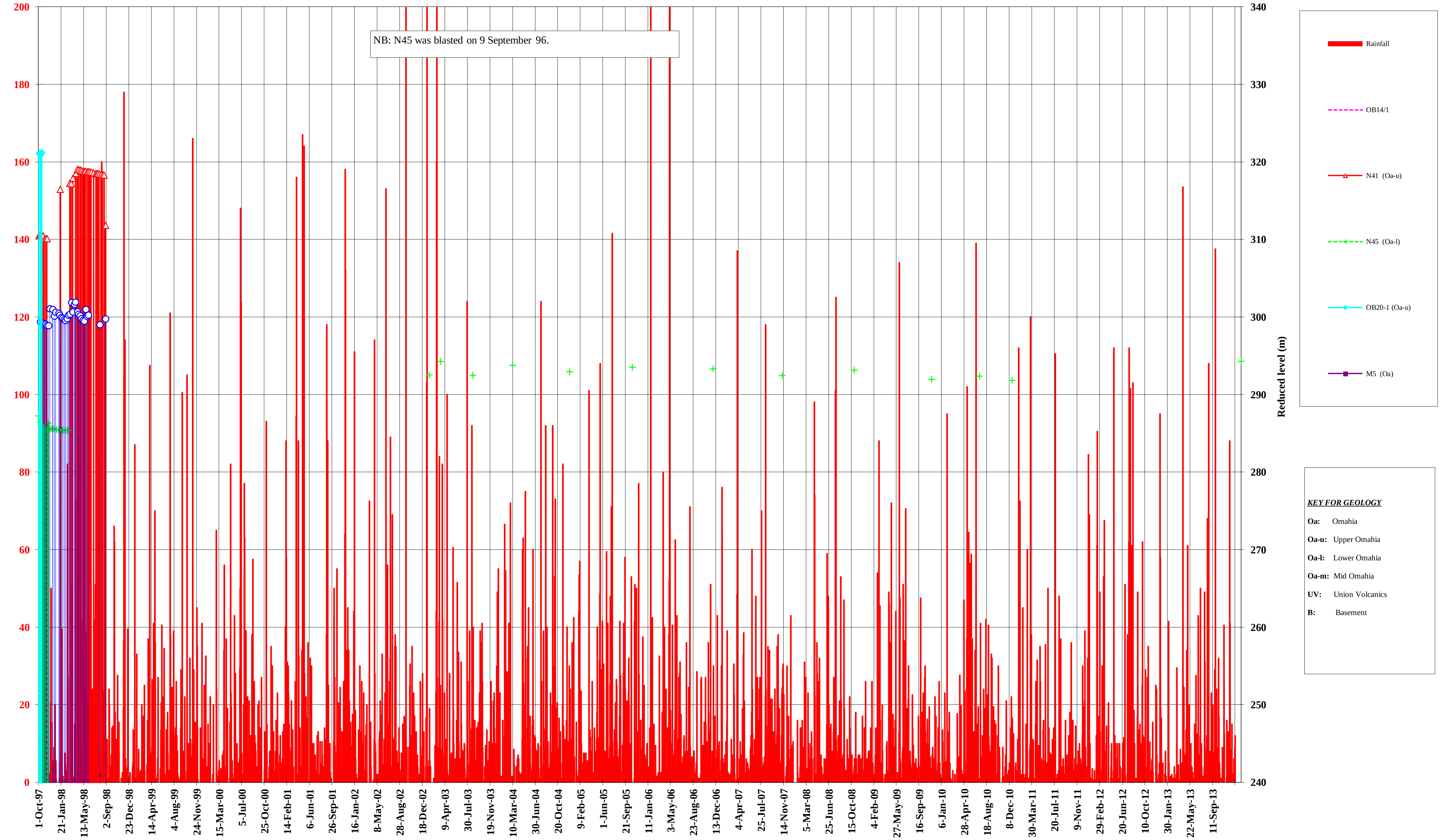
17/03/2014
pmb091012.recentN-PIEZO.xls
7 - Stockyard N132



COEUR GOLDEN CROSS PROJECT
STOCKYARD - Standpipe Piezometers

JPW
17/03/2014
pmb091012.recentSP-PIEZO V2.xls
9 - Stockyard-rpt



COEUR GOLDEN CROSS PROJECT

LOWER CENTRAL RIDGE/STOCKYARD DUMP - Standpipe Piezometers

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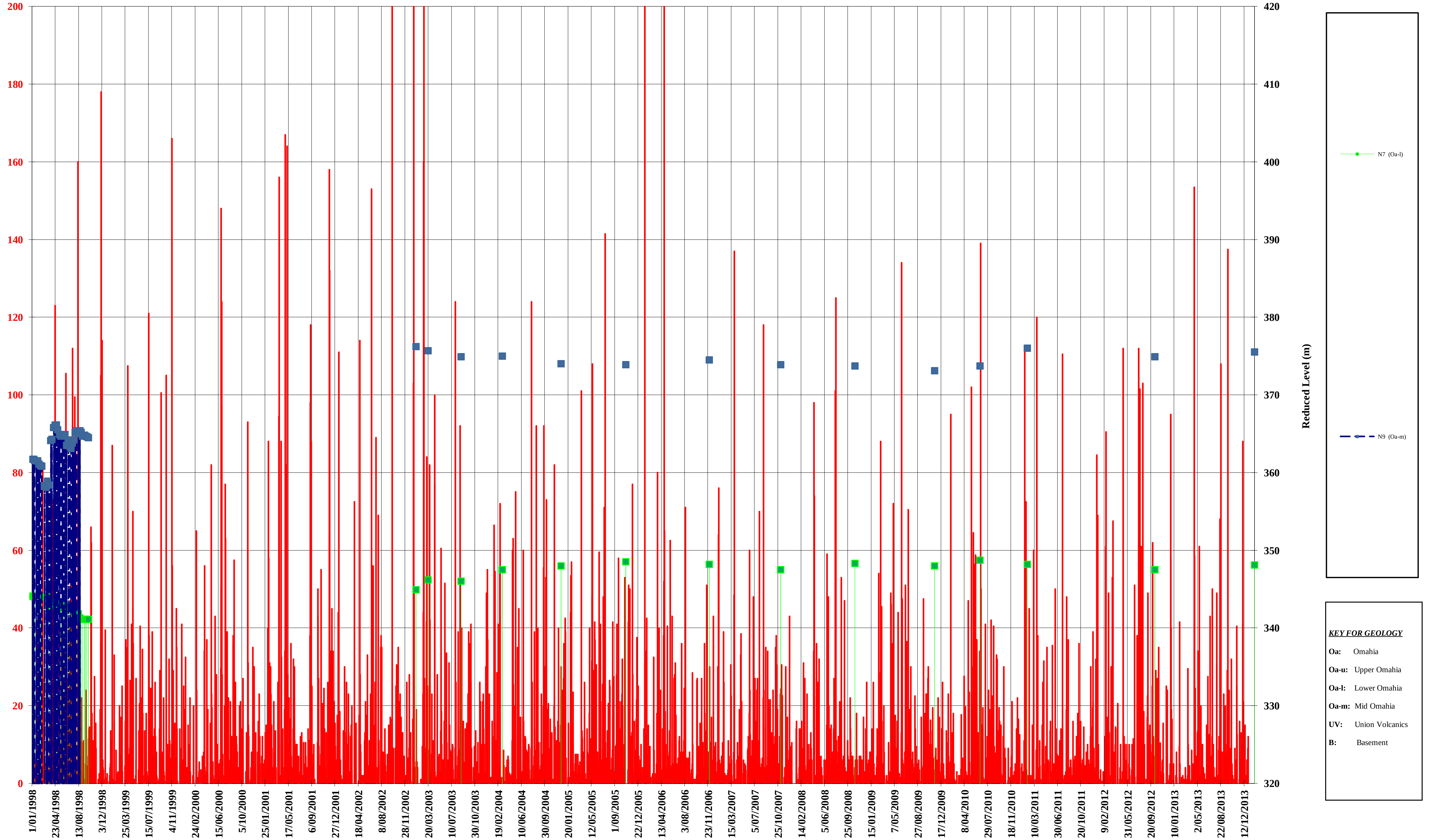
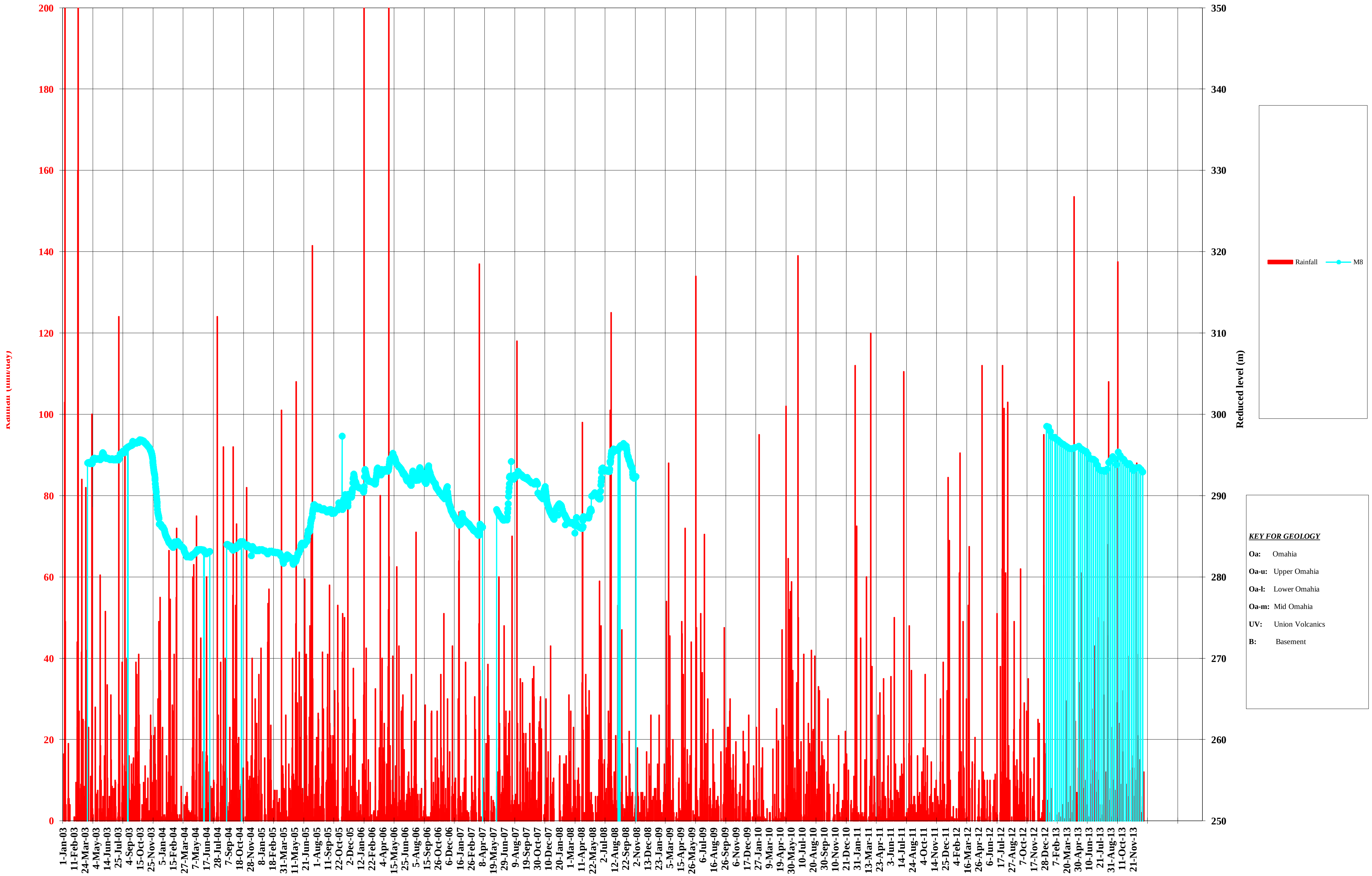
17/03/2014
pmb091012.recentSP-PIEZO V2.xls
7 - LowCenRdg-StkyardDump-rpt



COEUR GOLDEN CROSS PROJECT
N-Series Holes - ***TRIG J & LEFT ABUTMENT*** - Pneumatic Piezos

PMB
17/03/2014
pmb091012.recentN-PIEZO.xls
4 - Left Abutment N7 and N9



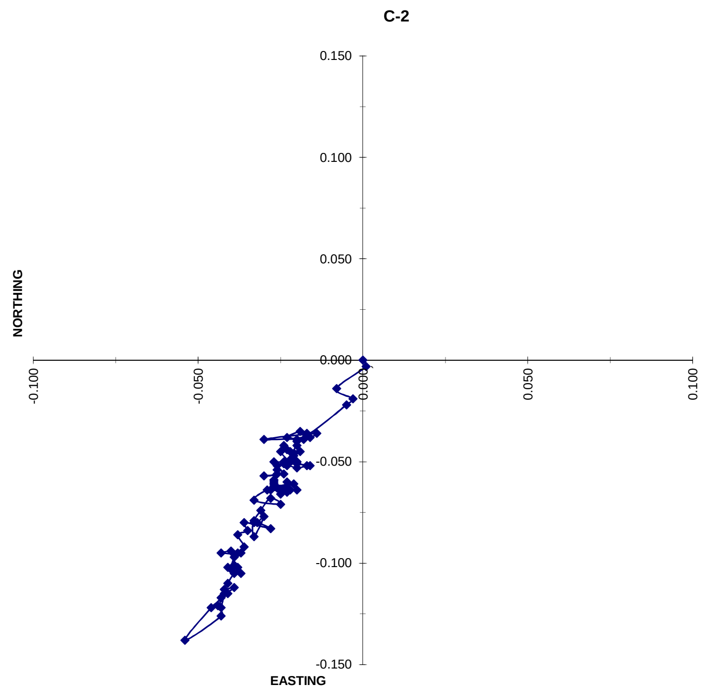
COEUR GOLDEN CROSS PROJECT

WAITEKAURI - Standpipe Piezometers

JPW
4/04/2014
pmb040414.recentSP-PIEZO V2.xls
11 - Waitekauri-rpt

Appendix C: GPS Data

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C - 2	18/8/97	649399.454	390911.046	436.666	0.000	0.000	0.000	0.000	0.7	0.6	1.3
Static	1/9/97	649399.451	390911.047	436.665	-0.003	0.001	-0.001	0.003	0.6	0.4	2.0
	29/9/97	649399.440	390911.038	436.672	-0.014	-0.008	0.006	0.017	0.9	0.6	1.8
	13/10/97	649399.435	390911.043	436.665	-0.019	-0.003	-0.001	0.019	0.5	0.4	1.0
	28/10/97	649399.432	390911.041	436.657	-0.022	-0.005	-0.009	0.024	0.4	0.5	1.2
	1/4/98	649399.417	390911.029	436.650	-0.037	-0.017	-0.016	0.044	0.5	0.4	1.1
	8/4/98	649399.416	390911.023	436.651	-0.038	-0.023	-0.015	0.047	0.7	0.5	1.6
	15/4/98	649399.419	390911.027	436.645	-0.035	-0.019	-0.021	0.045	0.6	0.5	1.6
	22/4/98	649399.418	390911.029	436.644	-0.036	-0.017	-0.022	0.045	0.6	0.4	1.5
	29/4/98	649399.416	390911.030	436.634	-0.038	-0.016	-0.032	0.052	2.2	3.7	3.2
	6/5/98	649399.415	390911.028	436.651	-0.039	-0.018	-0.015	0.045	0.3	0.2	0.7
	13/5/98	649399.418	390911.032	436.648	-0.036	-0.014	-0.018	0.043	0.5	0.3	0.9
	20/5/98	649399.415	390911.016	436.637	-0.039	-0.030	-0.029	0.057	0.7	0.5	0.9
	27/5/98	649399.415	390911.026	436.645	-0.039	-0.020	-0.021	0.049	0.6	0.3	1.1
	3/6/98	649399.412	390911.026	436.650	-0.042	-0.020	-0.016	0.049	0.6	0.3	0.9
	10/6/98	649399.414	390911.026	436.649	-0.040	-0.020	-0.017	0.048	0.4	0.3	0.8
	17/6/98	649399.408	390911.025	436.644	-0.046	-0.021	-0.022	0.055	0.6	0.4	1.2
	24/6/98	649399.409	390911.027	436.649	-0.045	-0.019	-0.017	0.052	0.4	0.3	0.8
	1/7/98	649399.410	390911.023	436.641	-0.044	-0.023	-0.025	0.056	0.5	0.4	1.1
	8/7/98	649399.412	390911.022	436.661	-0.042	-0.024	-0.005	0.049	0.5	0.4	0.9
	15/7/98	649399.409	390911.021	436.644	-0.045	-0.025	-0.022	0.056	0.4	0.3	0.8
	22/7/98	649399.404	390911.024	436.648	-0.050	-0.022	-0.018	0.058	0.5	0.3	1.0
	29/7/98	649399.407	390911.025	436.650	-0.047	-0.021	-0.016	0.054	0.4	0.3	0.8
	5/8/98	649399.404	390911.026	436.651	-0.050	-0.020	-0.015	0.056	0.6	0.4	1.2
	12/8/98	649399.409	390911.024	436.645	-0.045	-0.022	-0.021	0.054	0.6	0.4	1.2
	19/8/98	649399.405	390911.024	436.651	-0.049	-0.022	-0.015	0.056	0.5	0.3	0.9
	26/8/98	649399.404	390911.022	436.645	-0.050	-0.024	-0.021	0.059	0.9	0.6	2.5
	9/9/98	649399.403	390911.026	436.644	-0.051	-0.020	-0.022	0.059	0.8	0.4	1.4
	16/9/98	649399.404	390911.024	436.649	-0.050	-0.022	-0.017	0.057	0.5	0.3	0.9
	23/9/98	649399.404	390911.026	436.652	-0.050	-0.020	-0.014	0.056	0.4	0.2	0.7
	30/9/98	649399.402	390911.023	436.650	-0.052	-0.023	-0.016	0.059	0.6	0.3	1.0
	7/10/98	649399.403	390911.022	436.651	-0.051	-0.024	-0.015	0.058	0.5	0.3	0.9
	21/10/98	649399.401	390911.026	436.649	-0.053	-0.020	-0.017	0.059	0.5	0.3	1.1
	28/10/98	649399.402	390911.029	436.635	-0.052	-0.017	-0.031	0.063	0.5	0.4	1.1
	4/11/98	649399.402	390911.030	436.637	-0.052	-0.016	-0.029	0.062	0.7	0.5	1.5
	18/11/98	649399.404	390911.019	436.640	-0.050	-0.027	-0.026	0.062	0.6	0.5	1.2
	16/12/98	649399.402	390911.020	436.640	-0.052	-0.026	-0.026	0.064	1.1	0.6	2.0
	28/12/98	649399.398	390911.020	436.629	-0.056	-0.026	-0.037	0.072	0.6	0.4	1.1
	13/1/99	649399.397	390911.016	436.620	-0.057	-0.030	-0.046	0.079	0.5	0.3	1.0
	27/1/99	649399.398	390911.022	436.631	-0.056	-0.024	-0.035	0.070	0.6	0.3	1.0
	10/2/99	649399.400	390911.020	436.628	-0.054	-0.026	-0.038	0.071	0.6	0.4	1.1
	24/2/99	649399.395	390911.019	436.633	-0.059	-0.027	-0.033	0.073	0.5	0.3	1.0
	11/3/99	649399.395	390911.019	436.633	-0.059	-0.027	-0.033	0.073	0.6	0.5	1.3
	24/3/99	649399.393	390911.019	436.628	-0.061	-0.027	-0.038	0.077	0.7	0.5	1.5
	7/4/99	649399.394	390911.019	436.627	-0.060	-0.027	-0.039	0.076	1.1	0.5	0.8
	21/4/99	649399.390	390911.022	436.632	-0.064	-0.024	-0.034	0.076	0.7	0.3	0.8
	5/5/99	649399.391	390911.020	436.631	-0.063	-0.026	-0.035	0.077	1.0	0.3	0.7
	19/5/99	649399.393	390911.025	436.638	-0.061	-0.021	-0.028	0.070	0.7	0.3	0.6
	2/6/99	649399.392	390911.019	436.633	-0.062	-0.027	-0.033	0.075	0.5	0.3	0.9
	16/6/99	649399.393	390911.019	436.632	-0.061	-0.027	-0.034	0.075	0.5	0.5	1.0
	29/6/99	649399.391	390911.023	436.635	-0.063	-0.023	-0.031	0.074	0.4	0.3	0.7
	14/7/99	649399.394	390911.023	436.633	-0.060	-0.023	-0.033	0.072	0.7	0.2	1.3
	28/7/99	649399.389	390911.023	436.629	-0.065	-0.023	-0.037	0.078	0.5	0.4	2.0
	26/8/99	649399.390	390911.024	436.632	-0.064	-0.022	-0.034	0.076	0.6	0.4	1.9
	27/9/99	649399.388	390911.021	436.625	-0.066	-0.025	-0.041	0.082	0.6	0.5	1.5
	27/10/99	649399.390	390911.022	436.627	-0.064	-0.024	-0.039	0.079	0.4	0.4	0.9
	24/11/99	649399.390	390911.026	436.637	-0.064	-0.020	-0.029	0.073	0.4	0.4	0.8
	14/12/99	649399.390	390911.021	436.625	-0.064	-0.025	-0.041	0.080	0.6	0.4	1.4
	13/1/00	649399.390	390911.018	436.624	-0.064	-0.028	-0.042	0.082	0.9	0.7	1.9
	9/2/00	649399.391	390911.023	436.623	-0.063	-0.023	-0.043	0.080	0.8	0.5	1.7
	1/3/00	649399.390	390911.017	436.622	-0.064	-0.029	-0.044	0.083	0.5	0.4	1.0
	4/4/00	649399.385	390911.013	436.606	-0.069	-0.033	-0.060	0.097	0.5	0.4	1.1
	3/5/00	649399.383	390911.021	436.621	-0.071	-0.025	-0.045	0.088	0.7	0.9	0.9
	1/6/00	649399.386	390911.018	436.63	-0.068	-0.028	-0.036	0.082	1.3	1.3	1.3
	4/7/00	649399.380	390911.015	436.626	-0.074	-0.031	-0.040	0.090	0.4	0.3	1.0
	7/8/00	649399.375	390911.013	436.636	-0.079	-0.033	-0.030	0.091	0.3	0.2	0.6
	5/9/00	649399.374	390911.014	436.625	-0.080	-0.032	-0.041	0.095	0.4	0.3	1.0
	4/10/00	649399.377	390911.016	436.62	-0.077	-0.030	-0.046	0.095	0.7	0.8	1.4
	2/11/00	649399.367	390911.013	436.627	-0.087	-0.033	-0.039	0.101	0.1	0.8	1.1
	4/12/00	649399.374	390911.013	436.623	-0.080	-0.033	-0.043	0.097	0.4	0.3	0.8
	9/1/01	649399.371	390911.018	436.625	-0.083	-0.028	-0.041	0.097	0.9	0.6	2.0
	7/2/01	649399.374	390911.010	436.627	-0.080	-0.036	-0.039	0.096	0.5	0.4	1.4
	5/3/01	649399.370	390911.011	436.62	-0.084	-0.035	-0.046	0.102	0.4	0.3	1.0
	17/4/01	649399.368	390911.008	436.628	-0.086	-0.038	-0.038	0.101	0.4	0.3	0.8
	10/9/01	649399.362	390911.010	436.633	-0.092	-0.036	-0.033	0.104	1.0	0.0	1.0
	10/12/01	649399.359	390911.008	436.626	-0.095	-0.038	-0.040	0.110	1.0	0.0	1.0
	13/03/02	649399.359	390911.003	436.618	-0.095	-0.043	-0.048	0.115	1.0	0.0	1.0
	18/6/02	649399.360	390911.006	436.628	-0.094	-0.040	-0.038	0.109	1.0	1.0	1.0
	29/10/02	649399.359	390911.009	436.631	-0.095	-0.037	-0.035	0.108	1.0	1.0	1.0
	21/01/03	649399.357	390911.007	436.619	-0.097	-0.039	-0.047	0.115	1.0	0.0	1.0
	18/3/03	649399.351	390911.006	436.623	-0.103	-0.040	-0.043	0.119	1.0	0.0	1.0
	9/01/2003	649399.352	390911.008	436.618	-0.102	-0.038	-0.048	0.119	1.0	0.0	1.0
	10/03/2004	649399.353	390911.007	436.627	-0.101	-0.039	-0.039	0.115	1.0	0.0	1.0
	15/12/04	649399.352	390911.005	436.630	-0.102	-0.041	-0.036	0.116	1.0	0.0	0.0
	25/10/05	649399.349	390911.009	436.630	-0.105	-0.037	-0.036	0.117	2.0	1.0	1.0
	30/11/06	649399.349	390911.007	436.625	-0.105	-0.039	-0.041	0.119	1.0	0.0	1.0
	16/01/08	649399.344	390911.005	436.624	-0.110	-0.041	-0.042	0.125	0.0	0.0	0.0
	29/10/08	649399.341	390911.004	436.624	-0.113	-0.042	-0.042	0.128	0.0	0.0	1.0
	21/11/08	649399.342	390911.007	436.624	-0.112	-0.039	-0.042	0.126	1.0	0.0	1.0
	09/03/09	649399.337	390911.003	436.628	-0.117	-0.043	-0.038	0.130	1.0	1.0	2.0
	30/07/09	649399.332	390911.003	436.619	-0.122	-0.043	-0.047	0.138	1.0	0.0	1.0
	17/11/2009	649399.339	390911.004	436.621	-0.115	-0.042	-0.045	0.130	0.0	0.0	1.0
	17/06/2010	649399.339	390911.005	436.622	-0.115	-0.041	-0.044	0.130	0.0	0.0	1.0
	04/02/11	649399.332	390911	436.611	-0.122	-0.046	-0.055	0.142	1.0	1.0	3.0
	17/01/2012	649399.316	390910.992	436.606	-0.138	-0.054	-0.060	0.160			
	9/10/2012	649399.328	390911.003	436.623	-0.126	-0.043	-0.043	0.140	2	1	2
	30/01/14	649399.333	390911.002	436.631	-0.121	-0.044	-0.035	0.133	1.0	2.0	4.0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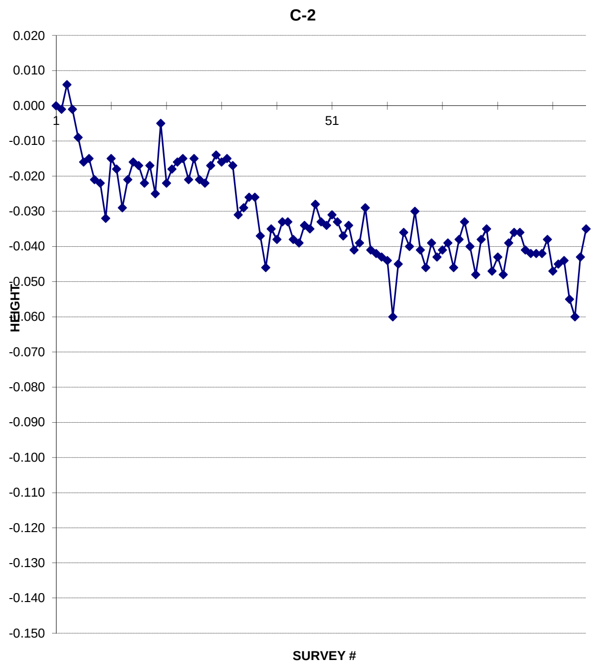
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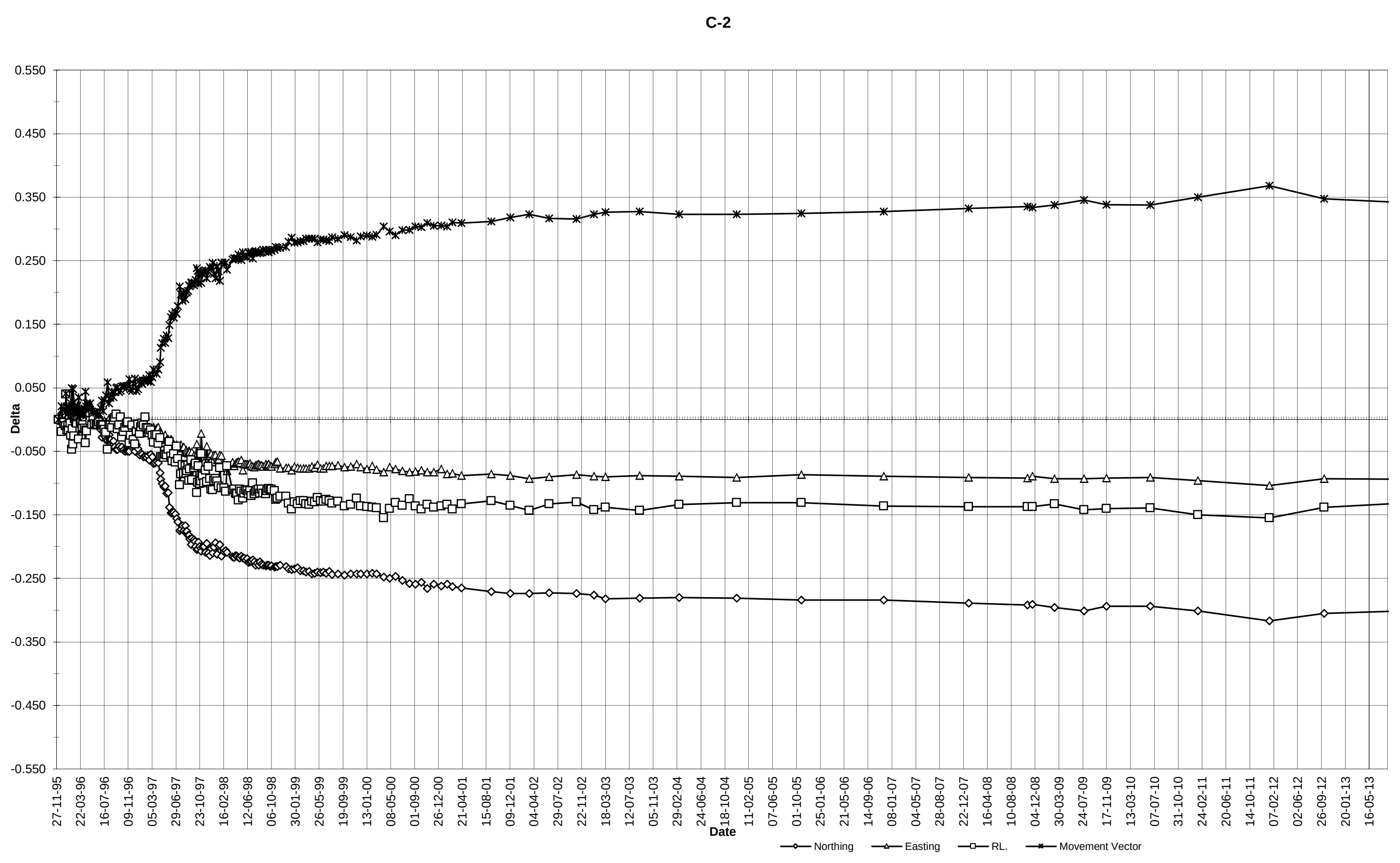
51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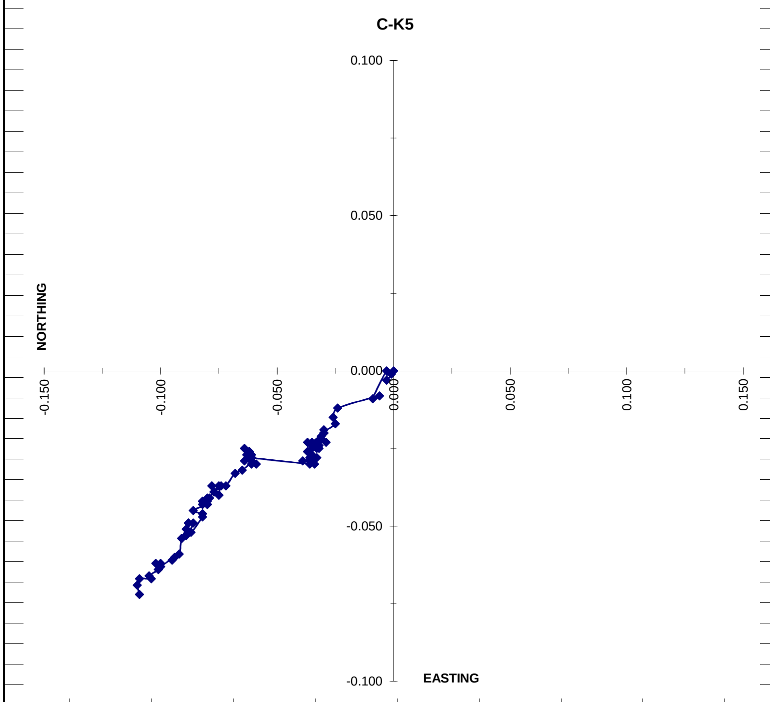
24-02-11
20-06-11
14-10-11
07-02-12
02-06-12
26-09-12
20-01-13
16-05-13
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C - K5	18/8/97	648677.984	390585.702	371.338	0.000	0.000	0.000	0.000	0.6	0.5	1.2
STATIC	1/9/97	648677.983	390585.701	371.339	-0.001	-0.001	0.001	0.002	0.3	0.4	0.7
	15/9/97	648677.981	390585.699	371.340	-0.003	-0.003	0.002	0.005	0.6	0.7	1.3
	29/9/97	648677.984	390585.699	371.343	0.000	-0.003	0.005	0.006	0.6	0.8	1.3
	13/10/97	648677.975	390585.693	371.337	-0.009	-0.009	-0.001	0.013	0.4	0.5	0.9
	28/10/97	648677.976	390585.696	371.334	-0.008	-0.006	-0.004	0.011	0.3	0.2	0.7
	25/2/98	648677.972	390585.678	371.333	-0.012	-0.024	-0.005	0.027	0.3	0.2	0.7
	4/3/98	648677.969	390585.676	371.337	-0.015	-0.026	-0.001	0.030	0.2	0.2	0.5
	11/3/98	648677.967	390585.677	371.333	-0.017	-0.025	-0.005	0.031	0.4	0.3	0.9
	1/4/98	648677.964	390585.672	371.336	-0.020	-0.030	-0.002	0.036	0.3	0.3	0.7
	8/4/98	648677.960	390585.670	371.330	-0.024	-0.032	-0.008	0.041	0.5	0.4	1.0
	15/4/98	648677.964	390585.672	371.331	-0.020	-0.030	-0.007	0.037	0.3	0.2	0.6
	22/4/98	648677.964	390585.672	371.333	-0.020	-0.030	-0.005	0.036	0.5	0.4	0.9
	29/4/98	648677.965	390585.672	371.329	-0.019	-0.030	-0.009	0.037	0.4	0.2	0.8
	6/5/98	648677.962	390585.671	371.332	-0.022	-0.031	-0.006	0.038	0.3	0.2	0.5
	13/5/98	648677.961	390585.673	371.336	-0.023	-0.029	-0.002	0.037	0.3	0.2	0.6
	20/5/98	648677.963	390585.671	371.335	-0.021	-0.031	-0.003	0.038	0.3	0.2	0.6
	27/5/98	648677.961	390585.667	371.334	-0.023	-0.035	-0.004	0.042	0.4	0.3	0.7
	3/6/98	648677.961	390585.669	371.330	-0.023	-0.033	-0.008	0.041	0.3	0.3	0.7
	10/6/98	648677.959	390585.670	371.333	-0.025	-0.032	-0.005	0.041	0.5	0.3	0.7
	17/6/98	648677.961	390585.669	371.333	-0.023	-0.033	-0.005	0.041	0.3	0.2	0.7
	24/6/98	648677.959	390585.669	371.332	-0.025	-0.033	-0.006	0.042	0.3	0.3	0.6
	1/7/98	648677.960	390585.667	371.333	-0.024	-0.035	-0.005	0.043	0.5	0.4	1.0
	8/7/98	648677.960	390585.668	371.334	-0.024	-0.034	-0.004	0.042	0.5	0.3	1.1
	15/7/98	648677.961	390585.665	371.326	-0.023	-0.037	-0.012	0.045	0.6	0.3	0.5
	22/7/98	648677.960	390585.667	371.331	-0.024	-0.035	-0.007	0.043	0.3	0.2	0.6
	29/7/98	648677.959	390585.667	371.330	-0.025	-0.035	-0.008	0.044	0.2	0.2	0.6
	5/8/98	648677.957	390585.667	371.332	-0.027	-0.035	-0.006	0.045	0.3	0.2	0.7
	12/8/98	648677.955	390585.666	371.326	-0.029	-0.036	-0.012	0.048	0.6	0.4	1.6
	19/8/98	648677.956	390585.667	371.330	-0.028	-0.035	-0.008	0.046	0.4	0.3	1.2
	26/8/98	648677.956	390585.666	371.332	-0.028	-0.036	-0.006	0.046	0.6	0.4	2.0
	9/9/98	648677.956	390585.667	371.329	-0.028	-0.035	-0.009	0.046	0.3	0.2	0.9
	16/9/98	648677.956	390585.667	371.328	-0.028	-0.035	-0.010	0.046	0.4	0.2	0.8
	23/9/98	648677.958	390585.665	371.327	-0.026	-0.037	-0.011	0.047	0.4	0.3	0.8
	30/9/98	648677.955	390585.666	371.331	-0.029	-0.036	-0.007	0.047	0.3	0.3	0.7
	7/10/98	648677.955	390585.663	371.332	-0.029	-0.039	-0.006	0.049	0.3	0.2	0.6
	21/10/98	648677.956	390585.669	371.334	-0.028	-0.033	-0.004	0.043	0.4	0.3	0.9
	28/10/98	648677.954	390585.668	371.330	-0.030	-0.034	-0.008	0.046	0.4	0.3	0.7
	4/11/98	648677.954	390585.666	371.329	-0.030	-0.036	-0.009	0.048	0.4	0.5	1.0
	18/11/98	648677.956	390585.641	371.327	-0.028	-0.061	-0.011	0.068	0.4	0.3	0.9
New	24/2/99	648665.170	390575.128	359.760	-0.028	-0.061	-0.011	0.068	0.5	0.4	1.1
	11/3/99	648665.172	390575.127	359.760	-0.026	-0.062	-0.011	0.068	0.4	0.3	0.8
	24/3/99	648665.169	390575.125	359.760	-0.029	-0.064	-0.011	0.071	0.6	0.5	1.1
	7/4/99	648665.172	390575.127	359.759	-0.026	-0.062	-0.012	0.068	0.3	0.2	0.8
	21/4/99	648665.168	390575.128	359.759	-0.030	-0.061	-0.012	0.069	0.8	0.3	0.8
	5/5/99	648665.170	390575.127	359.757	-0.028	-0.062	-0.014	0.069	0.8	0.3	0.8
	19/5/99	648665.171	390575.128	359.756	-0.027	-0.061	-0.015	0.068	0.6	0.3	0.7
	2/6/99	648665.173	390575.125	359.759	-0.025	-0.064	-0.012	0.070	0.3	0.3	0.7
	16/6/99	648665.169	390575.128	359.757	-0.029	-0.061	-0.014	0.069	0.9	0.5	1.7
	29/6/99	648665.168	390575.130	359.761	-0.030	-0.059	-0.010	0.067	0.5	0.3	0.9
	14/7/99	648665.171	390575.127	359.759	-0.027	-0.062	-0.012	0.069	0.5	0.3	1.5
	28/7/99	648665.171	390575.126	359.754	-0.027	-0.063	-0.017	0.071	0.4	0.3	0.9
	27/8/99	648665.169	390575.128	359.757	-0.029	-0.061	-0.014	0.069	0.5	0.3	1.0
	28/9/99	648665.166	390575.124	359.760	-0.032	-0.065	-0.011	0.073	0.4	0.3	0.7
	28/10/99	648665.165	390575.121	359.764	-0.033	-0.068	-0.007	0.076	0.4	0.4	0.8
	25/11/99	648665.161	390575.117	359.761	-0.037	-0.072	-0.010	0.082	0.4	0.2	0.8
	15/12/99	648665.161	390575.115	359.761	-0.037	-0.074	-0.010	0.083	0.7	0.4	0.9
	13/1/00	648665.159	390575.112	359.757	-0.039	-0.077	-0.014	0.087	0.5	0.4	1.1
	10/2/00	648665.161	390575.114	359.759	-0.037	-0.075	-0.012	0.084	0.5	0.4	1.0
	2/3/00	648665.158	390575.114	359.761	-0.040	-0.075	-0.010	0.086	0.5	0.4	1.0
	5/4/00	648665.161	390575.111	359.761	-0.037	-0.078	-0.010	0.087	0.4	0.3	0.7
	4/5/00	648665.158	390575.114	359.759	-0.040	-0.075	-0.012	0.086	0.7	0.9	0.9
	2/6/00	648665.159	390575.112	359.757	-0.039	-0.077	-0.014	0.087	2.0	2.5	2.5
	5/7/00	648665.157	390575.110	359.757	-0.041	-0.079	-0.014	0.090	0.3	0.2	0.6
	4/8/00	648665.156	390575.109	359.761	-0.042	-0.080	-0.010	0.091	0.4	0.2	0.8
	11/9/00	648665.156	390575.107	359.76	-0.042	-0.082	-0.011	0.093	0.5	0.6	1.0
	5/10/00	648665.157	390575.109	359.759	-0.041	-0.080	-0.012	0.091	0.4	0.4	0.9
	3/11/00	648665.155	390575.107	359.762	-0.043	-0.082	-0.009	0.093	0.3	0.2	0.7
	5/12/00	648665.156	390575.107	359.761	-0.042	-0.082	-0.010	0.093	0.4	0.3	0.8
	10/1/01	648665.155	390575.109	359.76	-0.043	-0.080	-0.011	0.091	0.5	0.4	1.1
	6/3/01	648665.155	390575.109	359.762	-0.043	-0.080	-0.009	0.091	0.4	0.3	0.7
	18/4/01	648665.153	390575.103	359.760	-0.045	-0.086	-0.011	0.098	0.4	0.3	0.8
	31/5/01	648665.152	390575.107	359.762	-0.046	-0.082	-0.009	0.094	0.3	0.2	0.7
	17/9/01	648665.151	390575.107	359.764	-0.047	-0.082	-0.007	0.095	1.0	0.0	1.0
	12/12/2001	648665.146	390575.102	359.773	-0.052	-0.087	0.002	0.101	1.0	0.0	1.0
	13/03/02	648665.149	390575.101	359.768	-0.049	-0.088	-0.003	0.101	1.0	0.0	1.0
	18/6/02	648665.149	390575.103	359.766	-0.049	-0.086	-0.005	0.099	2.0	0.0	1.0
	30/10/02	648665.146	390575.101	359.765	-0.052	-0.088	-0.006	0.102	1.0	0.0	1.0
	24/1/03	648665.144	390575.098	359.763	-0.054	-0.091	-0.008	0.106	1.0	0.0	1.0
	19/03/03	648665.147	390575.100	359.761	-0.051	-0.089	-0.010	0.103	1.0	0.0	1.0
	25/08/03	648665.149	390575.101	359.763	-0.049	-0.088	-0.008	0.101	1.0	0.0	1.0
	10/03/2004	648665.145	390575.100	359.770	-0.053	-0.089	-0.001	0.104	1.0	0.0	1.0
	15/12/2004	648665.144	390575.098	359.768	-0.054	-0.091	-0.003	0.106	0.0	0.0	0.0
	25/10/2005	648665.139	390575.097	359.765	-0.059	-0.092	-0.006	0.109	1.0	0.0	0.0
	30/11/06	648665.137	390575.094	359.762	-0.061	-0.095	-0.009	0.113	1.0	0.0	1.0
	16/1/08	648665.138	390575.095	359.766	-0.060	-0.094	-0.005	0.112	1.0	0.0	0.0
	29/10/08	648665.135	390575.089	359.771	-0.063	-0.100	0.000	0.118	1.0	1.0	1.0
	21/11/2008	648665.135	390575.089	359.771	-0.063	-0.100	0.000	0.118	1.0	1.0	2.0
	9/03/2009	648665.136	390575.087	359.767	-0.062	-0.102	-0.004	0.119	0.0	0.0	1.0
	30/07/2009	648665.134	390575.088	359.764	-0.064	-0.101	-0.007	0.120	0.0	0.0	1.0
	17/11/2009	648665.136	390575.089	359.77	-0.062	-0.100	-0.001	0.118	1.0	1.0	2.0
	17/06/2010	648665.134	390575.088	359.778	-0.064	-0.101	0.007	0.120	0.0	0.0	1.0
	4/2/11	648665.132	390575.084	359.768	-0.066	-0.105	-0.003	0.124	0.0	0.0	1.0
	18/10/11	648665.131	390575.085	359.771	-0.067	-0.104	0.000	0.124	1.0	1.0	2.0
	17/01/2012	648665.131	390575.080	359.767	-0.067	-0.109	-0.004	0.128			
	2/11/2012	648665.129	390575.079	359.765	-0.069	-0.110	-0.006	0.130	1	0	1
	3/02/2014	648665.126	390575.08	359.773	-0.072	-0.109	0.002	0.131	1	2	1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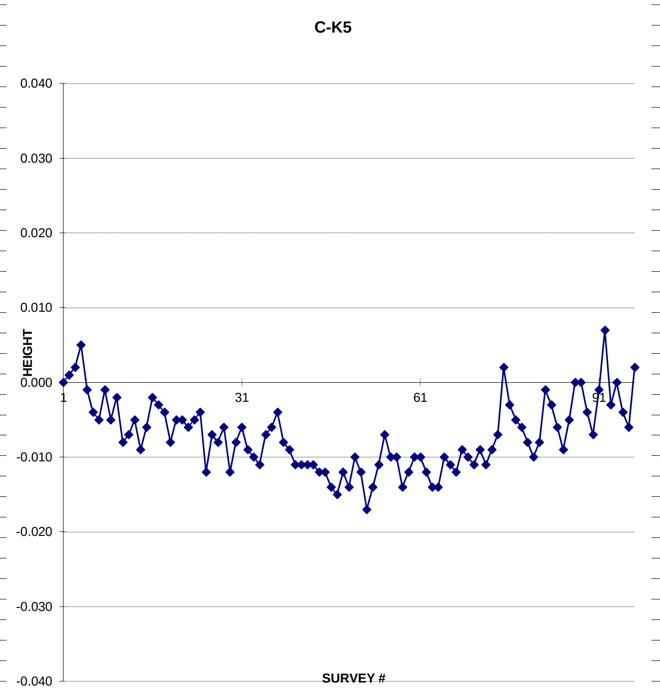
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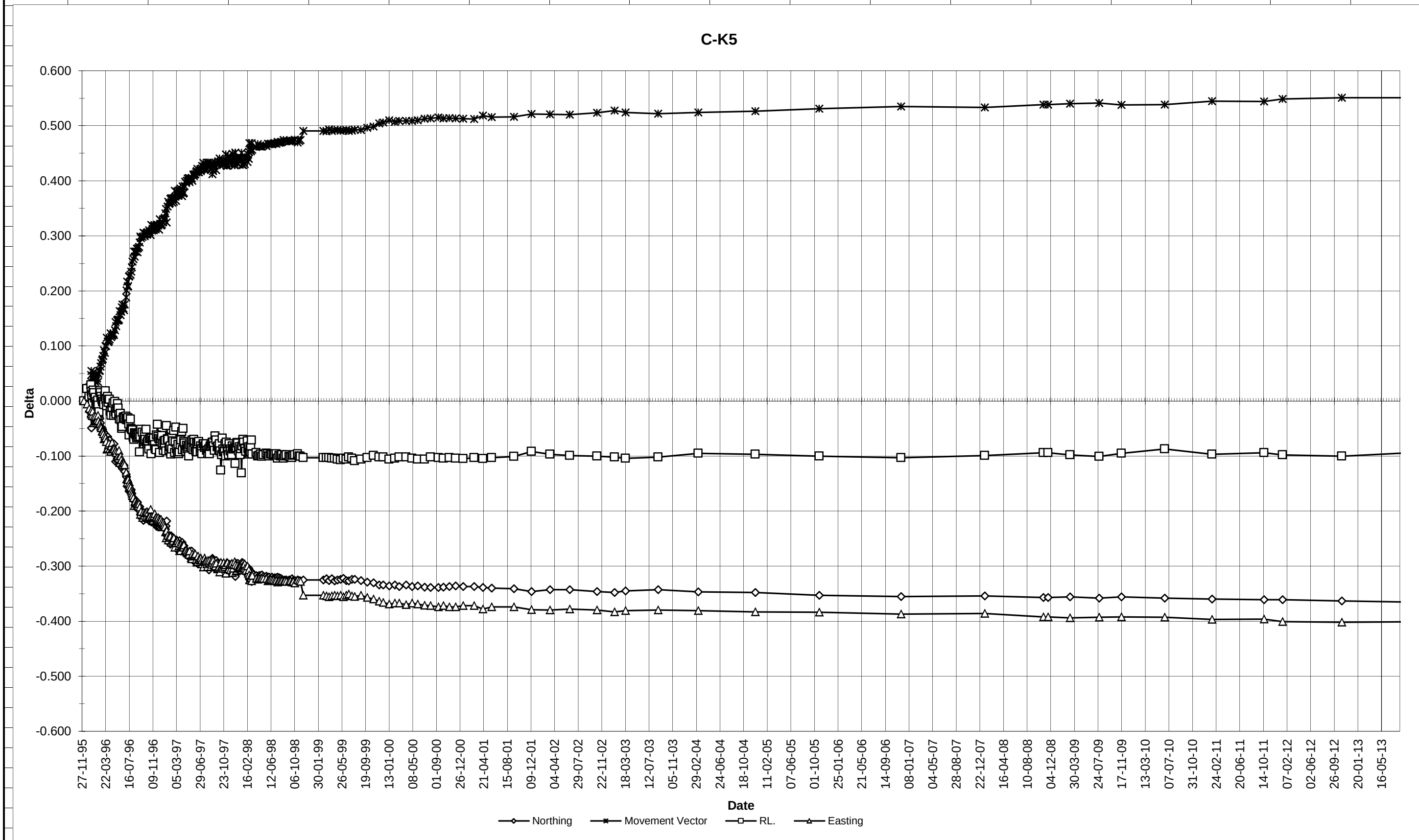
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Delta
Date
Northing
Movement Vector
RL.
Easting

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C - J	18/8/97	648701.267	391044.764	419.797	0.000	0.000	0.000	0.000	0.5	0.4	1.1
STATIC	15/9/97	648701.264	391044.760	419.801	-0.003	-0.004	0.004	0.006	0.7	0.6	1.5
	29/9/97	648701.262	391044.756	419.804	-0.005	-0.008	0.007	0.012	0.7	0.8	1.6
	13/10/97	648701.254	391044.753	419.792	-0.013	-0.011	-0.005	0.018	0.6	0.7	1.3
	28/10/97	648701.249	391044.757	419.798	-0.018	-0.007	0.001	0.019	0.4	0.4	0.9
	26/2/98	648701.258	391044.748	419.786	-0.009	-0.016	-0.011	0.021	0.6	0.5	1.3
	5/3/98	648701.255	391044.750	419.791	-0.012	-0.014	-0.006	0.019	0.6	0.5	1.4
	12/3/98	648701.256	391044.749	419.784	-0.011	-0.015	-0.013	0.023	0.7	0.6	1.4
	2/4/98	648701.254	391044.748	419.781	-0.013	-0.016	-0.016	0.026	0.7	0.5	1.4
	16/4/98	648701.256	391044.752	419.789	-0.011	-0.012	-0.008	0.018	0.5	0.4	1.0
	23/4/98	648701.257	391044.750	419.789	-0.010	-0.014	-0.008	0.019	0.4	0.3	0.7
	30/4/98	648701.259	391044.752	419.787	-0.008	-0.012	-0.010	0.018	0.3	0.2	0.6
	7/5/98	648701.255	391044.746	419.790	-0.012	-0.018	-0.007	0.023	0.3	0.3	0.7
	28/5/98	648701.255	391044.749	419.794	-0.012	-0.015	-0.003	0.019	0.4	0.3	0.8
	4/6/98	648701.256	391044.749	419.789	-0.011	-0.015	-0.008	0.020	0.4	0.3	0.9
	11/6/98	648701.257	391044.748	419.789	-0.010	-0.016	-0.008	0.020	0.5	0.3	0.9
	18/6/98	648701.254	391044.746	419.789	-0.013	-0.018	-0.008	0.024	0.4	0.4	0.9
	25/6/98	648701.253	391044.743	419.793	-0.014	-0.021	-0.004	0.026	0.3	0.2	0.6
	2/7/98	648701.255	391044.744	419.788	-0.012	-0.020	-0.009	0.025	0.5	0.4	1.0
	9/7/98	648701.254	391044.745	419.789	-0.013	-0.019	-0.008	0.024	0.4	0.3	1.2
	16/7/98	648701.255	391044.744	419.789	-0.012	-0.020	-0.008	0.025	0.5	0.3	1.0
	23/7/98	648701.252	391044.742	419.787	-0.015	-0.022	-0.010	0.028	0.5	0.4	1.1
	30/7/98	648701.253	391044.744	419.791	-0.014	-0.020	-0.006	0.025	1.1	0.6	2.0
	6/8/98	648701.251	391044.741	419.793	-0.016	-0.023	-0.004	0.028	0.5	0.3	1.0
	13/8/98	648701.249	391044.739	419.798	-0.018	-0.025	0.001	0.031	0.8	0.5	1.6
	20/8/98	648701.252	391044.741	419.789	-0.015	-0.023	-0.008	0.029	0.4	0.3	0.9
	27/8/98	648701.252	391044.744	419.788	-0.015	-0.020	-0.009	0.027	0.5	0.4	1.3
	10/9/98	648701.253	391044.743	419.783	-0.014	-0.021	-0.014	0.029	0.3	0.2	1.1
	17/9/98	648701.251	391044.742	419.786	-0.016	-0.022	-0.011	0.029	0.6	0.4	1.7
	24/9/98	648701.252	391044.740	419.794	-0.015	-0.024	-0.003	0.028	0.7	0.5	1.4
	1/10/98	648701.254	391044.740	419.789	-0.013	-0.024	-0.008	0.028	0.5	0.3	0.9
	8/10/98	648701.256	391044.728	419.806	-0.011	-0.036	0.009	0.039	0.9	0.6	1.7
	22/10/98	648701.254	391044.745	419.794	-0.013	-0.019	-0.003	0.023	0.3	0.3	0.7
	29/10/98	648701.253	391044.745	419.791	-0.014	-0.019	-0.006	0.024	0.5	0.3	0.9
	5/11/98	648701.252	391044.743	419.791	-0.015	-0.021	-0.006	0.026	0.4	0.3	0.9
	19/11/98	648701.254	391044.746	419.788	-0.013	-0.018	-0.009	0.024	0.5	0.8	1.3
	17/12/98	648701.250	391044.738	419.777	-0.017	-0.026	-0.020	0.037	0.7	1.2	1.7
	28/12/98	648701.255	391044.742	419.778	-0.012	-0.022	-0.019	0.031	0.5	0.4	1.1
	14/1/99	648701.261	391044.721	419.778	-0.006	-0.043	-0.019	0.047	1.8	1.0	3.1
	28/1/99	648701.255	391044.740	419.793	-0.012	-0.024	-0.004	0.027	0.8	0.5	1.5
	11/2/99	648701.260	391044.738	419.783	-0.007	-0.026	-0.014	0.030	0.5	0.4	1.1
	25/2/99	648701.252	391044.745	419.789	-0.015	-0.019	-0.008	0.025	0.7	0.5	1.4
	12/3/99	648701.251	391044.746	419.788	-0.016	-0.018	-0.009	0.026	0.7	0.4	1.4
	25/3/99	648701.258	391044.741	419.786	-0.009	-0.023	-0.011	0.027	0.5	0.4	1.1
	8/4/99	648701.252	391044.738	419.780	-0.015	-0.026	-0.017	0.034	0.7	0.5	1.5
	22/4/99	648701.254	391044.741	419.785	-0.013	-0.023	-0.012	0.029	0.6	0.3	0.4
	6/5/99	648701.254	391044.742	419.784	-0.013	-0.022	-0.013	0.029	0.9	0.3	0.6
	20/5/99	648701.253	391044.743	419.786	-0.014	-0.021	-0.011	0.028	0.7	0.3	0.7
	3/6/99	648701.253	391044.743	419.788	-0.014	-0.021	-0.009	0.027	0.6	0.3	1.1
	17/6/99	648701.255	391044.744	419.782	-0.012	-0.020	-0.015	0.028	0.3	0.3	0.8
	2/7/99	648701.255	391044.743	419.789	-0.012	-0.021	-0.008	0.025	0.5	0.4	0.9
	15/7/99	648701.251	391044.744	419.787	-0.016	-0.020	-0.010	0.027	0.6	0.4	0.6
	29/7/99	648701.251	391044.745	419.787	-0.016	-0.019	-0.010	0.027	0.7	0.3	1.4
	27/8/99	648701.254	391044.741	419.789	-0.013	-0.023	-0.008	0.028	0.4	0.3	1.5
	28/9/99	648701.257	391044.742	419.793	-0.010	-0.022	-0.004	0.024	0.4	0.3	1.0
	28/10/99	648701.254	391044.740	419.780	-0.013	-0.024	-0.017	0.032	0.3	0.2	0.6
	25/11/99	648701.250	391044.734	419.785	-0.017	-0.030	-0.012	0.037	0.4	0.4	0.8
	15/12/99	648701.254	391044.734	419.786	-0.013	-0.030	-0.011	0.034	0.6	0.4	1.3
	13/1/00	648701.249	391044.733	419.788	-0.018	-0.031	-0.009	0.037	0.3	0.3	0.8
	10/2/00	648701.251	391044.738	419.773	-0.016	-0.026	-0.024	0.039	0.6	0.4	1.4
	2/3/00	648701.250	391044.736	419.778	-0.017	-0.028	-0.019	0.038	0.4	0.3	0.9
	5/4/00	648701.250	391044.728	419.774	-0.017	-0.036	-0.023	0.046	0.4	0.3	0.9
	4/5/00	648701.253	391044.730	419.779	-0.014	-0.034	-0.018	0.041	0.5	0.7	0.7
	2/6/00	648701.249	391044.731	419.784	-0.018	-0.033	-0.013	0.040	0.8	1.2	1.2
	5/7/00	648701.247	391044.729	419.786	-0.020	-0.035	-0.011	0.042	0.4	0.2	0.6
	25/7/00	648701.245	391044.727	419.780	-0.022	-0.037	-0.017	0.046	0.4	0.3	0.8
	4/8/00	648701.242	391044.727	419.783	-0.025	-0.037	-0.014	0.047	0.3	0.2	0.6
	11/9/00	648701.241	391044.727	419.783	-0.026	-0.037	-0.014	0.047	0.7	0.6	1.6
	5/10/00	648701.244	391044.727	419.78	-0.023	-0.037	-0.017	0.047	0.5	0.4	1.0
	3/11/00	648701.243	391044.716	419.786	-0.024	-0.048	-0.011	0.055	0.7	0.7	1.3
	7/12/00	648701.241	391044.726	419.781	-0.026	-0.038	-0.016	0.049	0.7	0.5	1.5
	10/1/01	648701.243	391044.724	419.772	-0.024	-0.040	-0.025	0.053	0.7	0.4	1.5
	6/3/01	648701.240	391044.726	419.778	-0.027	-0.038	-0.019	0.050	0.3	0.2	0.7
	18/4/01	648701.239	391044.721	419.779	-0.028	-0.043	-0.018	0.054	0.6	0.4	1.0
	31/5/01	648701.235	391044.722	419.785	-0.032	-0.042	-0.012	0.054	0.3	0.2	0.7
	11/9/01	648701.230	391044.718	419.784	-0.037	-0.046	-0.013	0.060	1.0	0.0	1.0
	5/12/01	648701.230	391044.716	419.780	-0.037	-0.048	-0.017	0.063	1.0	1.0	1.0
	13/03/02	648701.226	391044.714	419.778	-0.041	-0.050	-0.019	0.067	1.0	0.0	1.0
	18/6/02	648701.228	391044.719	419.778	-0.039	-0.045	-0.019	0.063	1.0	1.0	1.0
	29/10/02	648701.231	391044.716	419.788	-0.036	-0.048	-0.009	0.061	2.0	1.0	1.0
	21/01/03	648701.207	391044.709	419.792	-0.060	-0.055	-0.005	0.082	3.0	1.0	2.0
	19/03/03	648701.225	391044.711	419.788	-0.042	-0.053	-0.009	0.068	2.0	1.0	2.0
	25/08//03	648701.226	391044.715	419.785	-0.041	-0.049	-0.012	0.065	1.0	1.0	1.0
	10/03/2004	648701.226	391044.722	419.785	-0.041	-0.042	-0.012	0.060	1.0	1.0	1.0
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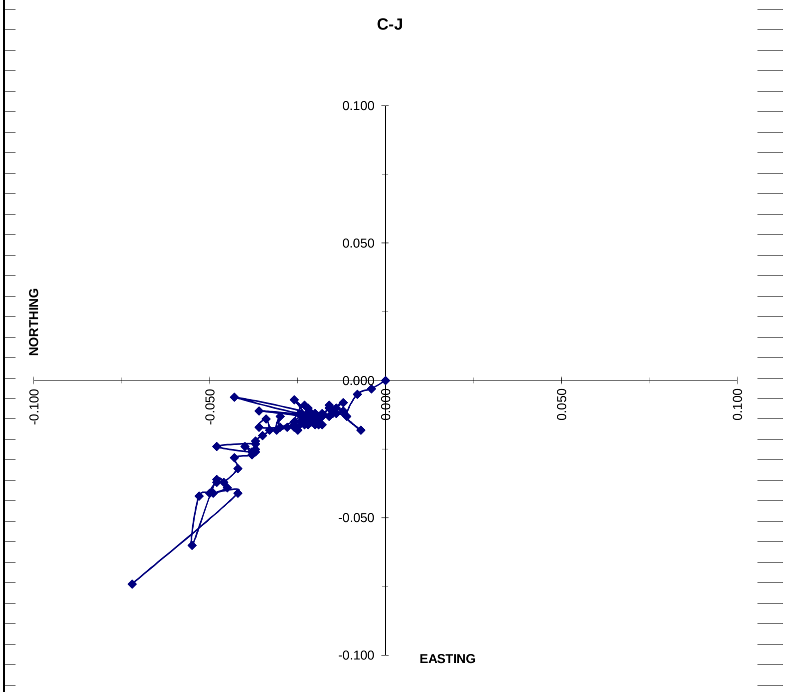
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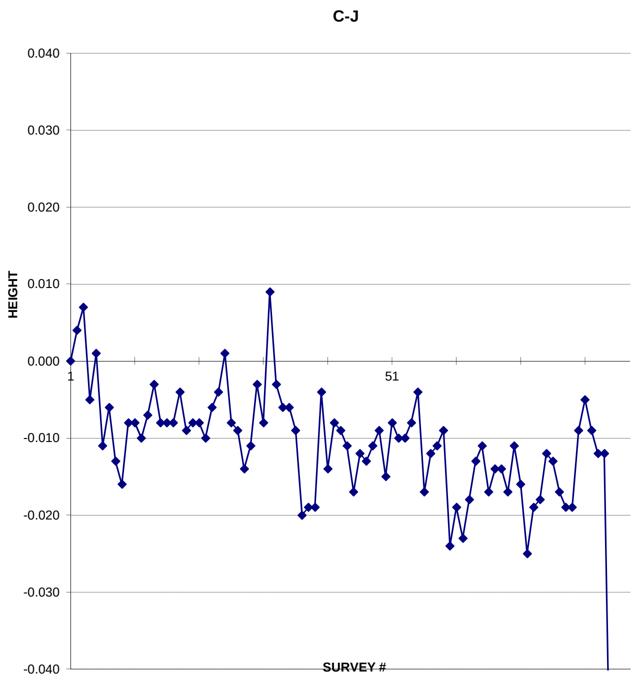
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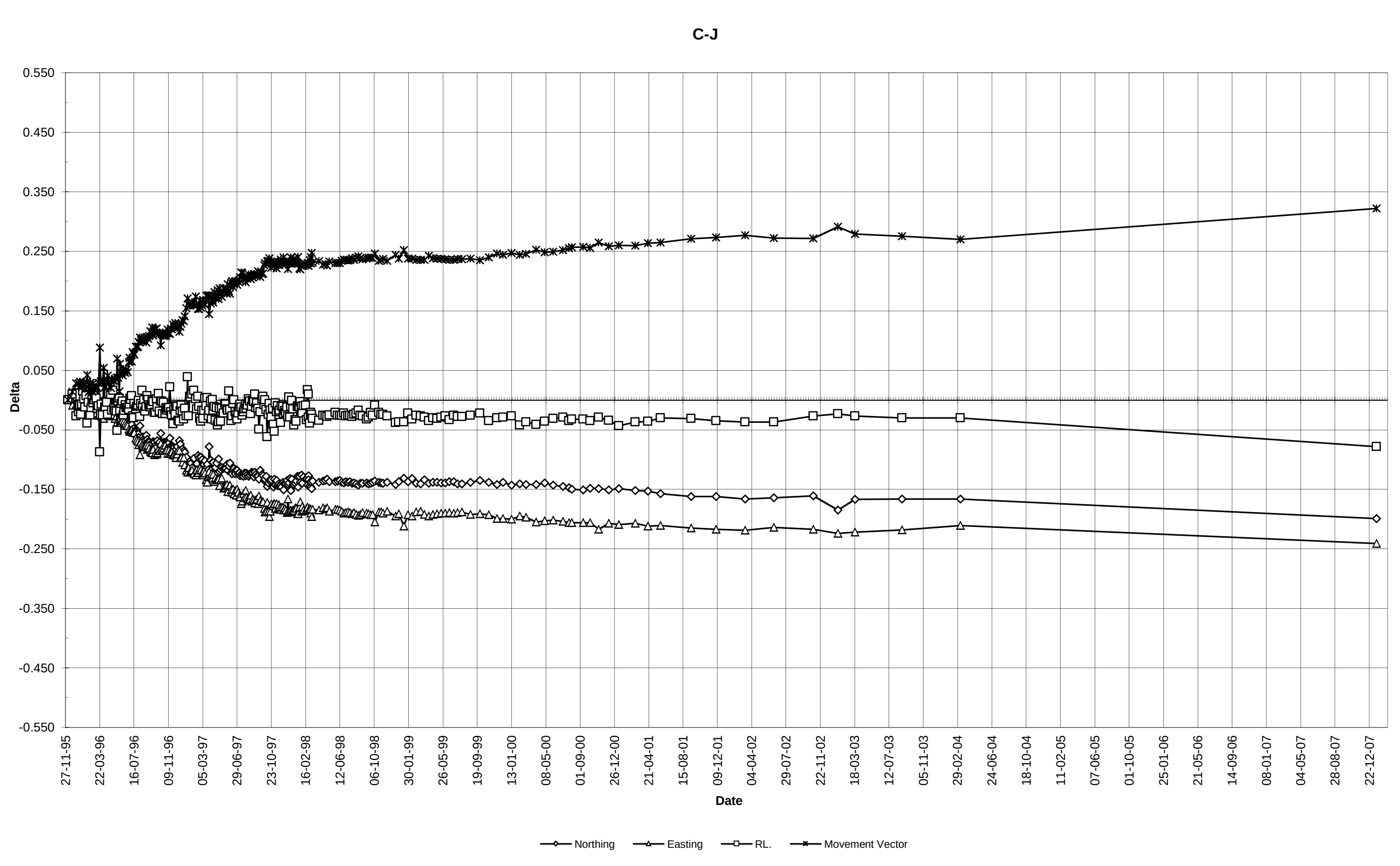
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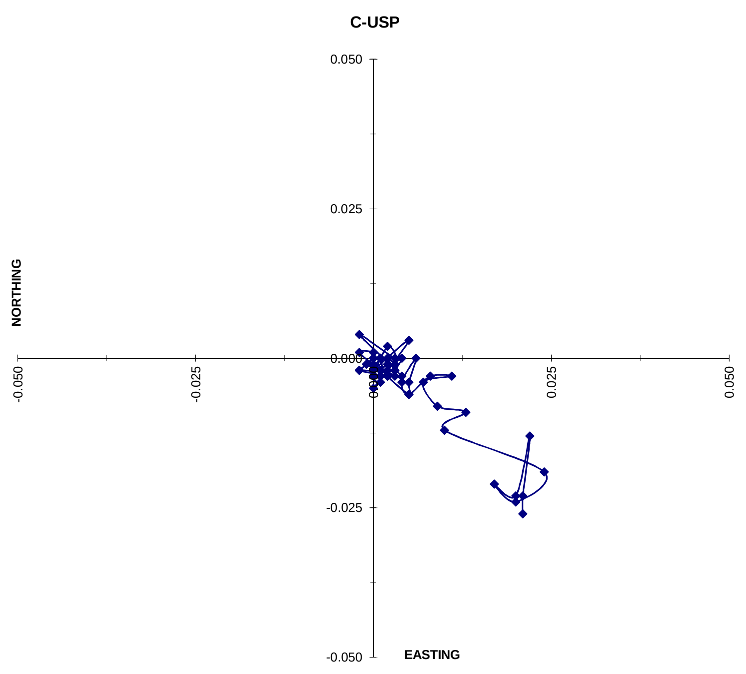
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-USP	24/2/98	648392.116	390075.868	286.240	0.000	0.000	0.000	0.000	0.4	0.3	0.8
Static	10/3/98	648392.114	390075.866	286.239	-0.002	-0.002	-0.001	0.003	0.5	0.3	0.9
	17/3/98	648392.116	390075.868	286.238	0.000	0.000	-0.002	0.002	0.3	0.3	0.6
	7/4/98	648392.117	390075.868	286.240	0.001	0.000	0.000	0.001	0.4	0.4	1.0
	14/4/98	648392.117	390075.866	286.244	0.001	-0.002	0.004	0.005	0.3	0.3	0.7
	21/4/98	648392.114	390075.869	286.232	-0.002	0.001	-0.008	0.008	0.4	0.2	0.9
	28/4/98	648392.114	390075.868	286.243	-0.002	0.000	0.003	0.004	0.3	0.2	0.8
	5/5/98	648392.114	390075.868	286.235	-0.002	0.000	-0.005	0.005	0.2	0.2	0.5
	12/5/98	648392.119	390075.873	286.241	0.003	0.005	0.001	0.006	0.5	0.3	1.0
	19/5/98	648392.111	390075.868	286.239	-0.005	0.000	-0.001	0.005	0.5	0.3	0.8
	26/5/98	648392.113	390075.869	286.237	-0.003	0.001	-0.003	0.004	0.4	0.3	0.7
	2/6/98	648392.114	390075.866	286.239	-0.002	-0.002	-0.001	0.003	0.4	0.2	0.8
	9/6/98	648392.114	390075.869	286.243	-0.002	0.001	0.003	0.004	0.4	0.3	0.7
	16/6/98	648392.116	390075.869	286.238	0.000	0.001	-0.002	0.002	0.3	0.2	0.6
	23/6/98	648392.115	390075.870	286.240	-0.001	0.002	0.000	0.002	0.3	0.2	0.7
	30/6/98	648392.114	390075.868	286.234	-0.002	0.000	-0.006	0.006	0.3	0.2	0.6
	7/7/98	648392.116	390075.869	286.237	0.000	0.001	-0.003	0.003	0.3	0.2	0.6
	14/7/98	648392.114	390075.869	286.237	-0.002	0.001	-0.003	0.004	0.3	0.3	0.6
	21/7/98	648392.115	390075.867	286.236	-0.001	-0.001	-0.004	0.004	0.3	0.2	0.7
	28/7/98	648392.114	390075.869	286.233	-0.002	0.001	-0.007	0.007	0.4	0.3	0.8
	4/8/98	648392.114	390075.870	286.236	-0.002	0.002	-0.004	0.005	0.3	0.2	0.8
	11/8/98	648392.113	390075.870	286.241	-0.003	0.002	0.001	0.004	0.3	0.2	0.9
	18/8/98	648392.113	390075.869	286.232	-0.003	0.001	-0.008	0.009	0.4	0.3	1.0
	25/8/98	648392.113	390075.870	286.239	-0.003	0.002	-0.001	0.004	0.3	0.2	0.7
	1/9/98	648392.115	390075.868	286.234	-0.001	0.000	-0.006	0.006	0.5	0.8	1.2
	8/9/98	648392.114	390075.868	286.236	-0.002	0.000	-0.004	0.004	0.4	0.3	0.7
	15/9/98	648392.113	390075.868	286.237	-0.003	0.000	-0.003	0.004	0.3	0.2	0.6
	23/9/98	648392.113	390075.870	286.239	-0.003	0.002	-0.001	0.004	0.6	0.3	1.2
	29/9/98	648392.113	390075.869	286.235	-0.003	0.001	-0.005	0.006	0.4	0.3	0.7
	6/10/98	648392.113	390075.868	286.235	-0.003	0.000	-0.005	0.006	0.3	0.3	0.7
	13/10/98	648392.113	390075.868	286.236	-0.003	0.000	-0.004	0.005	0.5	0.4	1.1
	27/10/98	648392.113	390075.870	286.239	-0.003	0.002	-0.001	0.004	0.5	0.7	1.1
	3/11/98	648392.113	390075.870	286.241	-0.003	0.002	0.001	0.004	0.6	0.5	1.3
	10/11/98	648392.114	390075.869	286.241	-0.002	0.001	0.001	0.002	0.3	0.5	0.8
	24/11/98	648392.112	390075.869	286.241	-0.004	0.001	0.001	0.004	0.4	0.5	0.9
	22/12/98	648392.113	390075.868	286.236	-0.003	0.000	-0.004	0.005	0.7	0.3	0.8
	6/1/99	648392.118	390075.870	286.236	0.002	0.002	-0.004	0.005	0.5	0.3	1.0
	19/1/99	648392.116	390075.871	286.245	0.000	0.003	0.005	0.006	0.4	0.3	0.8
	16/2/99	648392.120	390075.866	286.239	0.004	-0.002	-0.001	0.005	0.4	0.3	1.0
	2/3/99	648392.113	390075.872	286.239	-0.003	0.004	-0.001	0.005	0.4	0.3	0.7
	16/3/99	648392.114	390075.870	286.237	-0.002	0.002	-0.003	0.004	0.6	0.5	1.4
	22/3/99	648392.116	390075.872	286.239	0.000	0.004	-0.001	0.004	0.5	0.3	1.0
	30/3/99	648392.114	390075.871	286.235	-0.002	0.003	-0.005	0.006	0.7	0.6	1.4
	9/4/99	648392.115	390075.871	286.234	-0.001	0.003	-0.006	0.007	0.6	0.5	1.2
	13/4/99	648392.116	390075.870	286.234	0.000	0.002	-0.006	0.006	0.4	0.3	1.0
	27/4/99	648392.114	390075.871	286.231	-0.002	0.003	-0.009	0.010	0.8	0.3	0.9
	12/5/99	648392.113	390075.871	286.235	-0.003	0.003	-0.005	0.007	0.5	0.2	0.4
	25/5/99	648392.113	390075.870	286.236	-0.003	0.002	-0.004	0.005	0.6	0.3	0.6
	9/6/99	648392.110	390075.873	286.240	-0.006	0.005	0.000	0.008	0.9	0.5	0.7
	22/6/99	648392.112	390075.873	286.229	-0.004	0.005	-0.011	0.013	0.4	0.4	0.8
	6/7/99	648392.116	390075.874	286.228	0.000	0.006	-0.012	0.013	1.1	0.3	1.9
	20/7/99	648392.112	390075.872	286.239	-0.004	0.004	-0.001	0.006	0.5	0.3	1.1
	14/1/00	648392.110	390075.873	286.237	-0.006	0.005	-0.003	0.008	0.3	0.3	0.7
	11/7/00	648392.113	390075.876	286.232	-0.003	0.008	-0.008	0.012	0.5	0.3	0.9
	2/11/2000	648392.113	390075.879	286.226	-0.003	0.011	-0.014	0.018	0.7	0.6	1.4
	5/12/2000	648392.112	390075.875	286.233	-0.004	0.007	-0.007	0.011	0.4	0.3	0.9
	1/06/2001	648392.108	390075.877	286.23	-0.008	0.009	-0.010	0.016	0.3	0.2	0.7
	27/08/03	648392.107	390075.881	286.262	-0.009	0.013	0.022	0.027	1.0	0.0	1.0
	24/03/2004	648392.104	390075.878	286.236	-0.012	0.010	-0.004	0.016	1.0	0.0	1.0
	17/11/09	648392.097	390075.892	286.234	-0.019	0.024	-0.006	0.031	1.0	2.0	3.0
	4/12/2009	648392.092	390075.888	286.226	-0.024	0.020	-0.014	0.034	1.0	1.0	1.0
	22/6/10	648392.095	390075.885	286.223	-0.021	0.017	-0.017	0.032	1.0	0.0	1.0
	9/02/2011	648392.093	390075.888	286.224	-0.023	0.020	-0.016	0.034	1.0	0.0	1.0
	17/01/2012	648392.103	390075.890	286.219	-0.013	0.022	-0.021	0.033			
	22/10/12	648392.093	390075.889	286.224	-0.023	0.021	-0.016	0.035	1	1	2
	3/2/14	648392.090	390075.889	286.217	-0.026	0.021	-0.023	0.041	1.0	2.0	5.0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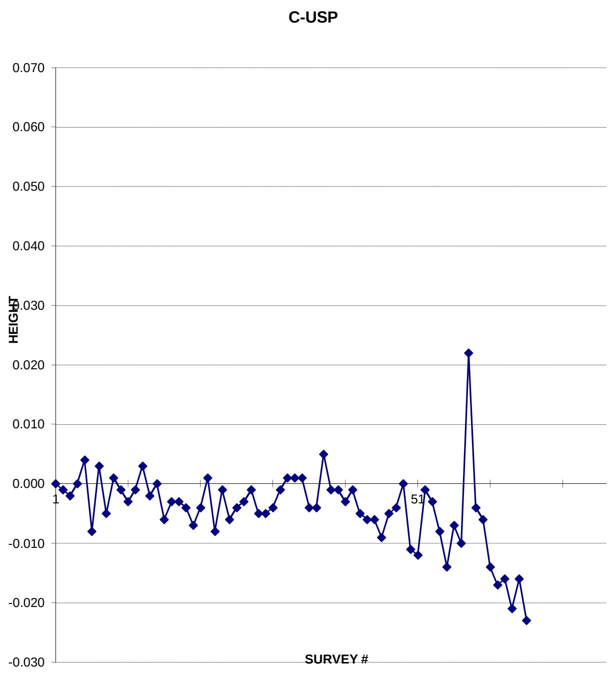
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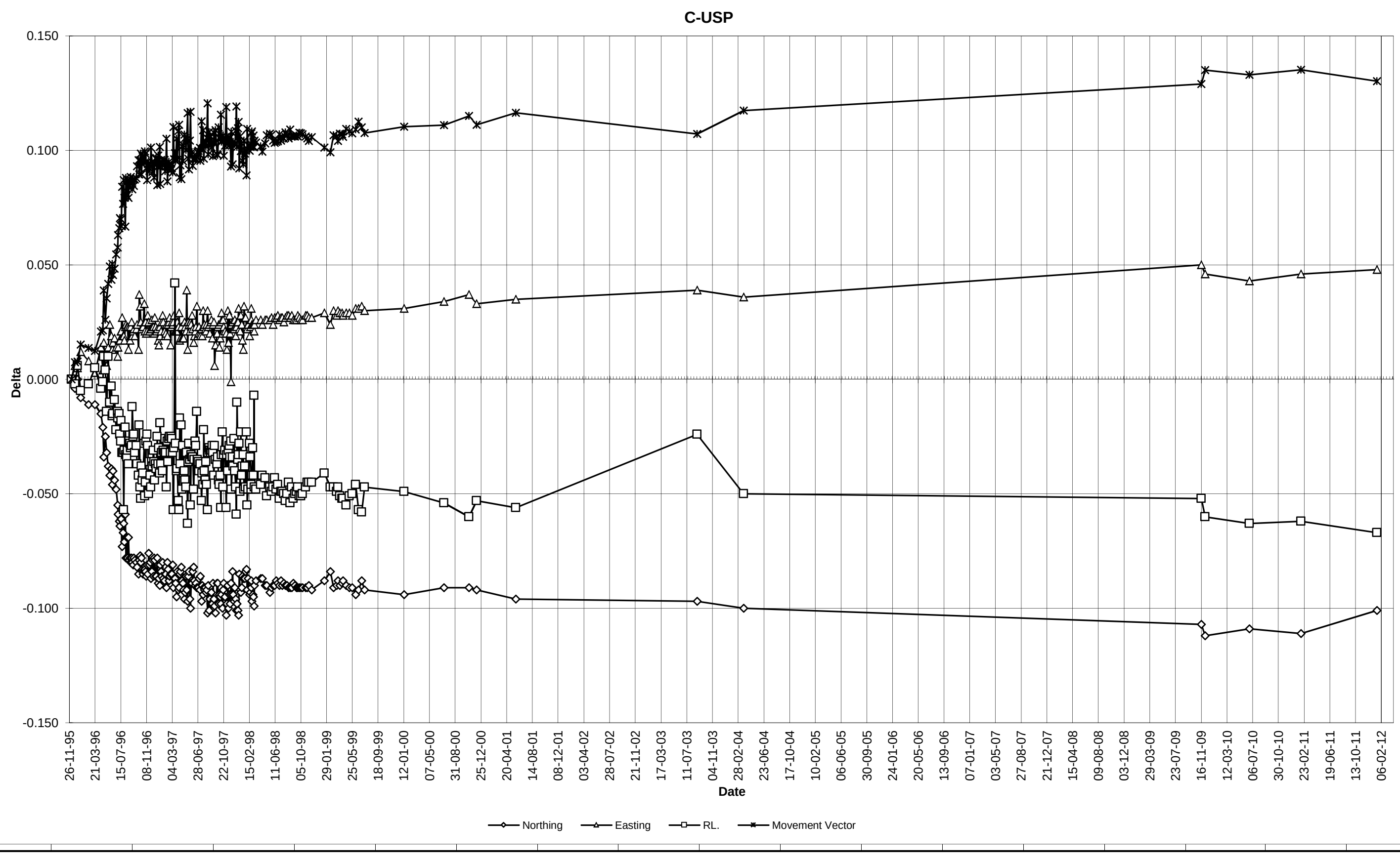
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Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
CRA	20/2/98	649119.919	390624.749	428.910	0.000	0.000	0.000	0.000	0.2	0.2	0.5
Static	27/2/98	649119.923	390624.747	428.908	0.004	-0.002	-0.002	0.005	0.4	0.3	0.8
	6/3/98	649119.922	390624.746	428.913	0.003	-0.003	0.003	0.005	0.5	0.4	1.1
	13/3/98	649119.918	390624.746	428.904	-0.001	-0.003	-0.006	0.007	0.5	0.3	1.0
	3/4/98	649119.919	390624.747	428.911	0.000	-0.002	0.001	0.002	0.3	0.2	0.7
	9/4/98	649119.919	390624.747	428.908	0.000	-0.002	-0.002	0.003	0.3	0.3	0.8
	17/4/98	649119.920	390624.746	428.918	0.001	-0.003	0.008	0.009	0.6	0.5	1.4
	24/4/98	649119.919	390624.747	428.902	0.000	-0.002	-0.008	0.008	0.4	0.3	0.9
	1/5/98	649119.916	390624.748	428.910	-0.003	-0.001	0.000	0.003	0.4	0.3	0.7
	8/5/98	649119.917	390624.747	428.912	-0.002	-0.002	0.002	0.003	0.4	0.3	0.9
	15/5/98	649119.920	390624.752	428.917	0.001	0.003	0.007	0.008	0.6	0.4	1.0
	22/5/98	649119.918	390624.746	428.909	-0.001	-0.003	-0.001	0.003	0.9	0.8	1.9
	29/5/98	649119.918	390624.746	428.910	-0.001	-0.003	0.000	0.003	0.3	0.2	0.4
	5/6/98	649119.918	390624.749	428.917	-0.001	0.000	0.007	0.007	0.3	0.2	0.6
	12/6/98	649119.917	390624.747	428.912	-0.002	-0.002	0.002	0.003	0.4	0.3	0.8
	19/6/98	649119.916	390624.747	428.913	-0.003	-0.002	0.003	0.005	0.3	0.2	0.7
	26/6/98	649119.917	390624.747	428.910	-0.002	-0.002	0.000	0.003	0.4	0.2	0.7
	3/7/98	649119.916	390624.748	428.916	-0.003	-0.001	0.006	0.007	0.4	0.3	0.8
	10/7/98	649119.917	390624.747	428.914	-0.002	-0.002	0.004	0.005	0.4	0.3	0.9
	17/7/98	649119.913	390624.747	428.912	-0.006	-0.002	0.002	0.007	0.3	0.3	0.6
	24/7/98	649119.914	390624.747	428.914	-0.005	-0.002	0.004	0.007	0.3	0.2	0.6
	31/7/98	649119.911	390624.747	428.912	-0.008	-0.002	0.002	0.008	0.4	0.3	0.8
	7/8/98	649119.914	390624.745	428.916	-0.005	-0.004	0.006	0.009	0.5	0.3	0.9
	14/8/98	649119.911	390624.746	428.916	-0.008	-0.003	0.006	0.010	0.5	0.3	1.0
	21/8/98	649119.913	390624.747	428.918	-0.006	-0.002	0.008	0.010	0.3	0.2	0.8
	28/8/98	649119.913	390624.748	428.912	-0.006	-0.001	0.002	0.006	0.4	0.3	0.9
	11/9/98	649119.914	390624.747	428.913	-0.005	-0.002	0.003	0.006	0.4	0.3	0.8
	18/9/98	649119.915	390624.747	428.910	-0.004	-0.002	0.000	0.004	0.6	0.4	1.1
	2/10/98	649119.915	390624.747	428.911	-0.004	-0.002	0.001	0.005	0.4	0.3	0.8
	9/10/98	649119.914	390624.745	428.915	-0.005	-0.004	0.005	0.008	0.6	0.3	1.1
	23/10/98	649119.912	390624.751	428.918	-0.007	0.002	0.008	0.011	0.3	0.3	0.7
	30/10/98	649119.919	390624.754	428.916	0.000	0.005	0.006	0.008	0.5	0.4	1.1
	4/11/98	649119.914	390624.754	428.913	-0.005	0.005	0.003	0.008	0.4	0.3	0.8
	18/11/98	649119.917	390624.749	428.912	-0.002	0.000	0.002	0.003	0.3	0.5	0.8
	16/12/98	649119.916	390624.754	428.916	-0.003	0.005	0.006	0.008	0.5	0.4	1.1
	28/12/98	649119.913	390624.753	428.913	-0.006	0.004	0.003	0.008	0.4	0.3	1.1
	13/1/99	649119.913	390624.750	428.900	-0.006	0.001	-0.010	0.012	0.4	0.3	0.8
	27/1/99	649119.917	390624.750	428.907	-0.002	0.001	-0.003	0.004	0.5	0.4	1.0
	10/2/99	649119.920	390624.753	428.910	0.001	0.004	0.000	0.004	0.4	0.3	0.8
	24/2/99	649119.917	390624.756	428.912	-0.002	0.007	0.002	0.008	0.4	0.3	0.8
	11/3/99	649119.916	390624.755	428.908	-0.003	0.006	-0.002	0.007	0.4	0.3	1.0
	24/3/99	649119.913	390624.760	428.894	-0.006	0.011	-0.016	0.020	0.6	0.6	3.0
	7/4/99	649119.917	390624.755	428.906	-0.002	0.006	-0.004	0.007	0.6	0.5	0.6
	21/4/99	649119.916	390624.757	428.913	-0.003	0.008	0.003	0.009	0.8	0.3	0.8
	5/5/99	649119.914	390624.754	428.911	-0.005	0.005	0.001	0.007	0.8	0.3	0.7
	19/5/99	649119.915	390624.756	428.913	-0.004	0.007	0.003	0.009	0.8	0.3	0.8
	2/6/99	649119.916	390624.754	428.913	-0.003	0.005	0.003	0.007	0.5	0.4	1.1
	16/6/99	649119.916	390624.756	428.912	-0.003	0.007	0.002	0.008	0.6	0.6	1.5
	29/6/99	649119.913	390624.756	428.915	-0.006	0.007	0.005	0.010	0.3	0.4	0.7
	14/7/99	649119.914	390624.757	428.910	-0.005	0.008	0.000	0.009	0.5	0.4	0.8
	28/7/99	649119.910	390624.758	428.915	-0.009	0.009	0.005	0.014	0.4	0.2	0.8
	26/8/99	649119.913	390624.758	428.908	-0.006	0.009	-0.002	0.011	0.4	0.3	0.8
	27/9/99	649119.916	390624.758	428.908	-0.003	0.009	-0.002	0.010	0.5	0.3	0.9
	27/10/99	649119.913	390624.757	428.910	-0.006	0.008	0.000	0.010	0.4	0.7	0.9
	24/11/99	649119.914	390624.760	428.912	-0.005	0.011	0.002	0.012	0.3	0.2	0.7
	14/12/99	649119.912	390624.756	428.908	-0.007	0.007	-0.002	0.010	0.6	0.5	1.1
	12/1/00	649119.915	390624.760	428.905	-0.004	0.011	-0.005	0.013	0.4	0.3	0.9
	1/3/00	649119.916	390624.757	428.901	-0.003	0.008	-0.009	0.012	0.6	0.5	1.4
	4/4/00	649119.916	390624.756	428.904	-0.003	0.007	-0.006	0.010	0.4	0.4	0.8
	3/5/00	649119.912	390624.759	428.901	-0.007	0.010	-0.009	0.015	0.7	0.8	0.8
	1/6/00	649119.916	390624.758	428.912	-0.003	0.009	0.002	0.010	0.5	0.8	0.8
	4/7/00	649119.911	390624.756	428.907	-0.008	0.007	-0.003	0.011	0.4	0.3	0.8
	7/8/00	649119.908	390624.759	428.917	-0.011	0.010	0.007	0.016	0.3	0.2	0.5
	8/9/00	649119.908	390624.758	428.906	-0.011	0.009	-0.004	0.015	0.4	0.3	0.9
	4/10/00	649119.911	390624.758	428.909	-0.008	0.009	-0.001	0.012	0.4	0.5	1.0
New posn	11/12/00	649154.262	390626.443	423.829	-0.008	0.009	-0.001	0.012	0.7	0.5	1.1
	09/01/01	649154.257	390626.463	423.820	-0.013	0.029	-0.010	0.033	1.0	0.7	2.3
	08/02/01	649154.252	390626.462	423.825	-0.018	0.028	-0.005	0.034	0.4	0.3	1.0
	05/03/01	649154.247	390626.465	423.828	-0.023	0.031	-0.002	0.039	0.4	0.3	0.8
	17/4/01	649154.250	390626.464	423.831	-0.020	0.030	0.001	0.036	0.3	0.2	0.7
	11/09/01	649154.245	390626.471	423.830	-0.025	0.037	0.000	0.045	1.0	0.0	1.0
	10/12/01	649154.241	390626.471	423.823	-0.029	0.037	-0.007	0.048	1.0	0.0	1.0
	14/03/02	649154.242	390626.470	423.830	-0.028	0.036	0.000	0.046	1.0	1.0	1.0
	19/6/02	649154.242	390626.470	423.827	-0.028	0.036	-0.003	0.046	1.0	0.0	1.0
	30/10/2002	649154.242	390626.473	423.826	-0.028	0.039	-0.004	0.048	1.0	0.0	1.0
	21/2/03	649154.245	390626.473	423.824	-0.025	0.039	-0.006	0.047	1.0	0.0	1.0
	18/3/03	649154.241	390626.475	423.834	-0.029	0.041	0.004	0.050	1.0	0.0	1.0
	9/01/2003	649154.240	390626.480	423.827	-0.030	0.046	-0.003	0.055	1.0	0.0	1.0
	11/03/2004	649154.242	390626.478	423.828	-0.028	0.044	-0.002	0.052	1.0	0.0	1.0
	18/11/2009	649154.234	390626.48	423.826	-0.036	0.046	-0.004	0.059	1.0	0.0	1.0
	22/06/2010	649154.234	390626.481	423.829	-0.036	0.047	-0.001	0.059	0.0	0.0	1.0
	4/02/2011	649154.236	390626.478	423.816	-0.034	0.044	-0.014	0.057	0.0	0.0	1.0
	18/10/2011	649154.23	390626.475	423.815	-0.040	0.041	-0.015	0.059	1.0	1.0	2.0
	17/01/2012	649154.226	390626.478	423.830	-0.044	0.044	0.000	0.062			
	9/10/12	649154.235	390626.484	423.833	-0.035	0.050	0.003	0.061	1	1	1
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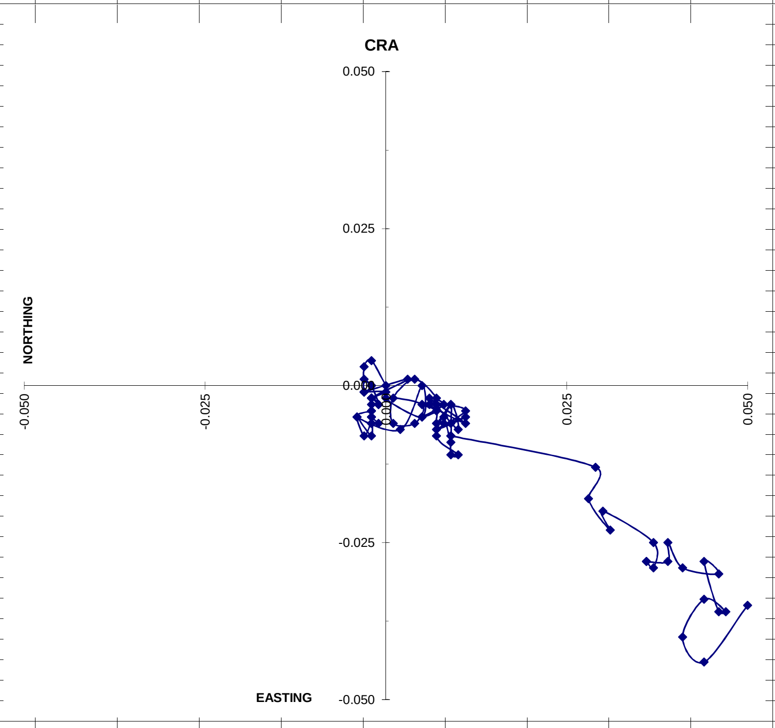
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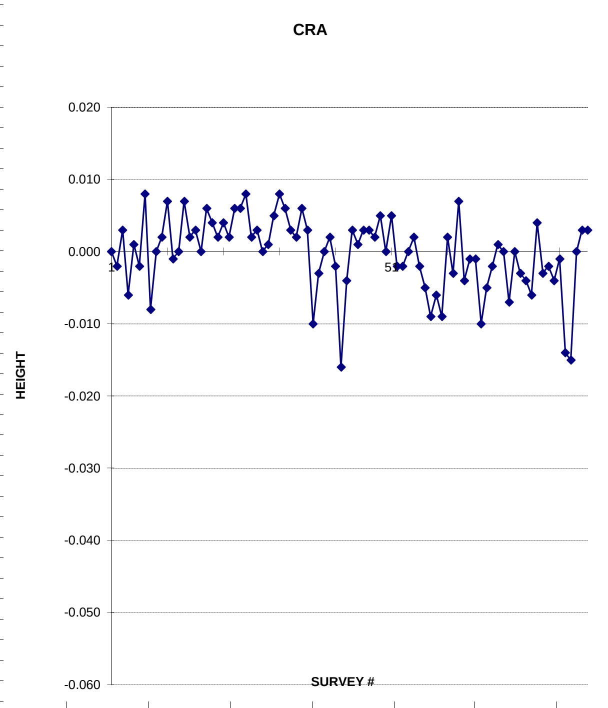
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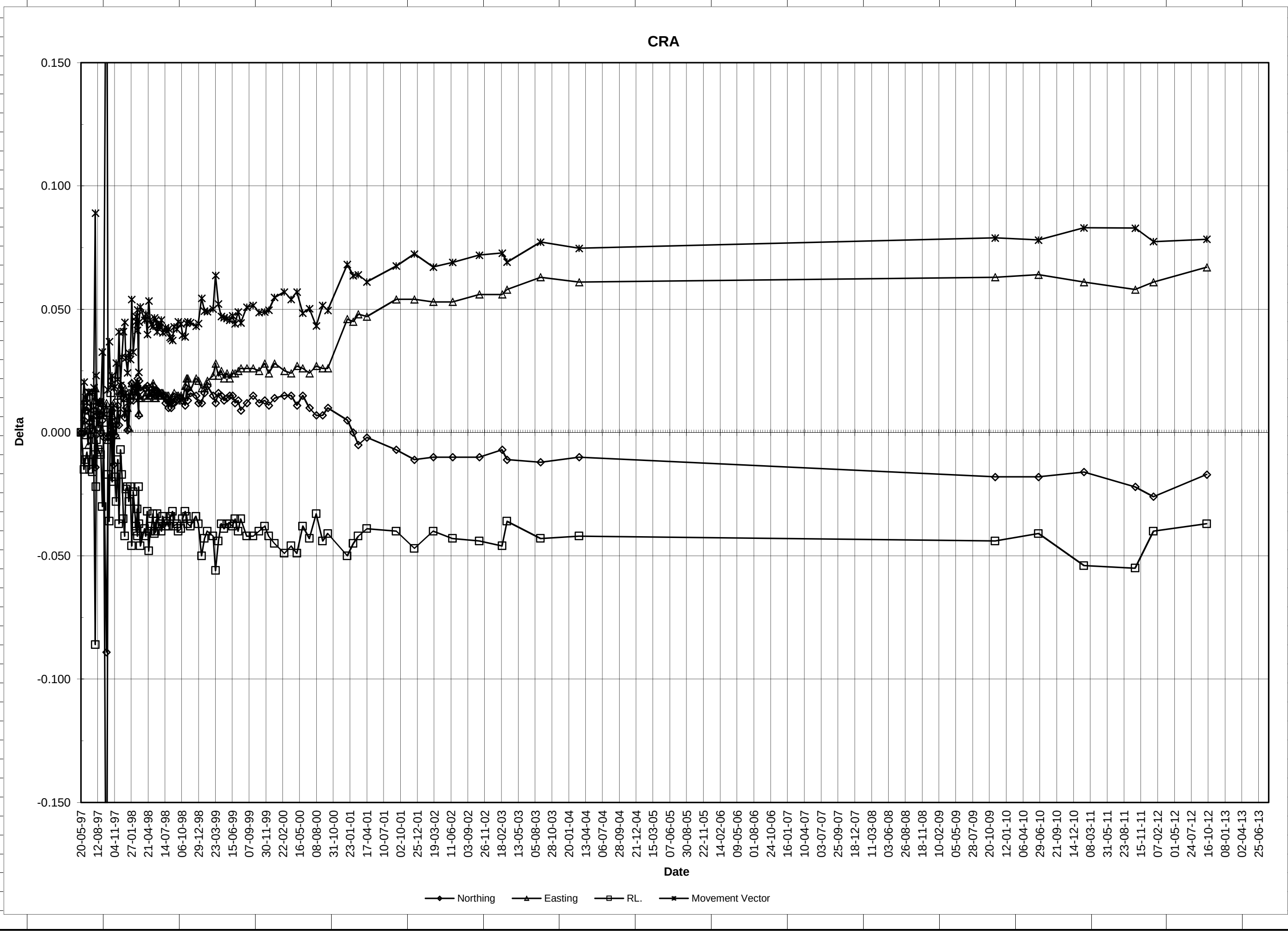
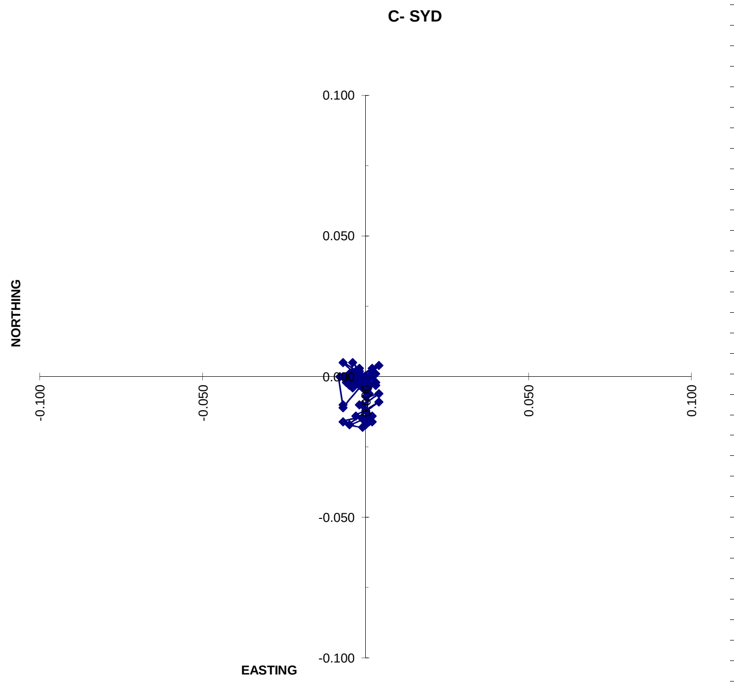

CRA
Delta
Date
0.150
0.100
0.050
0.000
-0.050
-0.100
-0.150
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-SYD	18/8/97	648216.979	390149.360	280.610	0.000	0.000	0.000	0.000	0.5	0.5	1.1
Static	1/9/97	648216.980	390149.362	280.611	0.001	0.002	0.001	0.002	0.5	0.4	1.0
	15/9/97	648216.979	390149.358	280.614	0.000	-0.002	0.004	0.004	0.3	0.3	0.7
	29/9/97	648216.981	390149.362	280.614	0.002	0.002	0.004	0.005	0.4	0.3	0.8
	13/10/97	648216.968	390149.353	280.613	-0.011	-0.007	0.003	0.013	0.4	0.3	0.9
	28/10/97	648216.969	390149.353	280.615	-0.010	-0.007	0.005	0.013	0.4	0.3	0.7
	9/3/98	648216.979	390149.352	280.605	0.000	-0.008	-0.005	0.009	0.8	0.5	1.6
	16/3/98	648216.979	390149.356	280.605	0.000	-0.004	-0.005	0.006	0.6	0.2	0.4
	6/4/98	648216.979	390149.357	280.606	0.000	-0.003	-0.004	0.005	0.4	0.3	0.8
	20/4/98	648216.980	390149.355	280.602	0.001	-0.005	-0.008	0.009	0.3	0.3	0.8
	27/4/98	648216.979	390149.356	280.609	0.000	-0.004	-0.001	0.004	0.4	0.3	0.7
	4/5/98	648216.977	390149.354	280.606	-0.002	-0.006	-0.004	0.007	0.2	0.2	0.6
	11/5/98	648216.979	390149.355	280.604	0.000	-0.005	-0.006	0.008	0.3	0.2	0.8
	18/5/98	648216.976	390149.355	280.604	-0.003	-0.005	-0.006	0.008	0.3	0.2	0.5
	25/5/98	648216.980	390149.356	280.608	0.001	-0.004	-0.002	0.005	0.5	0.4	1.1
	1/6/98	648216.978	390149.357	280.601	-0.001	-0.003	-0.009	0.010	0.4	0.4	0.9
	8/6/98	648216.980	390149.355	280.612	0.001	-0.005	0.002	0.005	0.4	0.3	0.9
	15/6/98	648216.978	390149.356	280.606	-0.001	-0.004	-0.004	0.006	0.2	0.2	0.5
	22/6/98	648216.979	390149.354	280.607	0.000	-0.006	-0.003	0.007	0.3	0.2	0.6
	29/6/98	648216.979	390149.354	280.606	0.000	-0.006	-0.004	0.007	0.2	0.2	0.4
	6/7/98	648216.979	390149.353	280.610	0.000	-0.007	0.000	0.007	0.3	0.2	0.6
	13/7/98	648216.979	390149.354	280.606	0.000	-0.006	-0.004	0.007	0.3	0.2	0.6
	20/7/98	648216.980	390149.356	280.610	0.001	-0.004	0.000	0.004	0.3	0.2	0.7
	27/7/98	648216.980	390149.357	280.605	0.001	-0.003	-0.005	0.006	0.5	0.4	1.2
	3/8/98	648216.980	390149.356	280.605	0.001	-0.004	-0.005	0.006	0.5	0.4	1.2
	10/8/98	648216.981	390149.358	280.608	0.002	-0.002	-0.002	0.003	0.4	0.3	1.3
	17/8/98	648216.979	390149.357	280.602	0.000	-0.003	-0.008	0.009	0.3	0.3	1.2
	24/8/98	648216.979	390149.355	280.604	0.000	-0.005	-0.006	0.008	0.3	0.2	0.7
	7/9/98	648216.981	390149.357	280.602	0.002	-0.003	-0.008	0.009	0.3	0.3	0.7
	14/9/98	648216.980	390149.356	280.603	0.001	-0.004	-0.007	0.008	0.5	0.3	1.0
	21/9/98	648216.980	390149.357	280.609	0.001	-0.003	-0.001	0.003	0.6	0.4	1.2
	28/9/98	648216.978	390149.356	280.606	-0.001	-0.004	-0.004	0.006	0.3	0.2	0.6
	5/10/98	648216.980	390149.356	280.603	0.001	-0.004	-0.007	0.008	0.8	1.3	1.9
	12/10/98	648216.978	390149.356	280.604	-0.001	-0.004	-0.006	0.007	0.5	0.3	1.0
	27/10/98	648216.979	390149.358	280.607	0.000	-0.002	-0.003	0.004	0.6	0.4	1.2
	2/11/98	648216.977	390149.357	280.607	-0.002	-0.003	-0.003	0.005	0.5	0.3	0.9
	9/11/98	648216.982	390149.358	280.611	0.003	-0.002	0.001	0.004	0.6	0.4	1.2
	23/11/98	648216.976	390149.356	280.609	-0.003	-0.004	-0.001	0.005	0.5	0.6	1.2
	21/12/98	648216.984	390149.356	280.614	0.005	-0.004	0.004	0.008	0.6	0.5	1.2
	5/1/99	648216.979	390149.358	280.595	0.000	-0.002	-0.015	0.015	0.7	0.6	1.6
	18/1/99	648216.977	390149.355	280.611	-0.002	-0.005	0.001	0.005	0.5	0.3	0.9
	29/1/99	648216.978	390149.357	280.609	-0.001	-0.003	-0.001	0.003	0.4	0.3	0.8
	12/2/99	648216.983	390149.364	280.611	0.004	0.004	0.001	0.006	0.6	0.5	1.7
	26/2/99	648216.976	390149.358	280.610	-0.003	-0.002	0.000	0.004	0.5	0.4	1.1
	15/3/99	648216.976	390149.358	280.607	-0.003	-0.002	-0.003	0.005	0.3	0.3	0.7
	29/3/99	648216.975	390149.356	280.598	-0.004	-0.004	-0.012	0.013	0.6	0.4	1.1
	12/4/99	648216.976	390149.359	280.603	-0.003	-0.001	-0.007	0.008	0.4	0.3	0.9
	26/4/99	648216.976	390149.361	280.608	-0.003	0.001	-0.002	0.004	1.4	0.5	0.9
	10/5/99	648216.978	390149.357	280.608	-0.001	-0.003	-0.002	0.004	0.9	0.4	1.0
	24/5/99	648216.975	390149.359	280.607	-0.004	-0.001	-0.003	0.005	0.6	0.3	0.7
	8/6/99	648216.979	390149.358	280.606	0.000	-0.002	-0.004	0.004	0.3	0.2	0.6
	21/6/99	648216.976	390149.363	280.598	-0.003	0.003	-0.012	0.013	0.4	0.3	0.8
	5/7/99	648216.976	390149.363	280.605	-0.003	0.003	-0.005	0.007	0.6	0.4	1.2
	19/7/99	648216.978	390149.360	280.611	-0.001	0.000	0.001	0.001	0.5	0.3	1.1
	27/8/99	648216.973	390149.361	280.615	-0.006	0.001	0.005	0.008	0.6	0.5	1.6
	28/9/99	648216.980	390149.363	280.604	0.001	0.003	-0.006	0.007	0.4	0.4	0.8
	6/10/99	648216.979	390149.362	280.612	0.000	0.002	0.002	0.003	0.5	0.3	1.1
	28/10/99	648216.982	390149.362	280.615	0.003	0.002	0.005	0.006	0.4	0.5	0.7
	25/11/99	648216.977	390149.363	280.610	-0.002	0.003	0.000	0.004	0.6	0.3	1.0
	15/12/99	648216.977	390149.359	280.602	-0.002	-0.001	-0.008	0.008	1.0	0.5	1.8
	14/1/00	648216.981	390149.357	280.610	0.002	-0.003	0.000	0.004	0.6	0.4	1.3
	10/2/00	648216.984	390149.353	280.629	0.005	-0.007	0.019	0.021	0.7	0.6	1.6
	2/3/00	648216.978	390149.359	280.611	-0.001	-0.001	0.001	0.002	0.4	0.3	1.0
	5/4/00	648216.980	390149.358	280.608	0.001	-0.002	-0.002	0.003	0.5	0.3	1.0
	4/5/00	648216.977	390149.360	280.609	-0.002	0.000	-0.001	0.002	0.6	1.1	1.1
	2/6/00	648216.979	390149.358	280.606	0.000	-0.002	-0.004	0.004	0.8	1.0	1.0
	5/7/00	648216.979	390149.360	280.604	0.000	0.000	-0.006	0.006	0.3	0.3	0.7
	7/8/00	648216.979	390149.360	280.603	0.000	0.000	-0.007	0.007	0.4	0.3	0.9
	8/9/00	648216.980	390149.362	280.617	0.001	0.002	0.007	0.007	0.5	0.5	0.9
	5/10/00	648216.978	390149.359	280.609	-0.001	-0.001	-0.001	0.002	0.4	0.5	0.9
	3/11/00	648216.979	390149.361	280.602	0.000	0.001	-0.008	0.008	0.5	0.4	1.0
	6/12/00	648216.977	390149.359	280.607	-0.002	-0.001	-0.003	0.004	0.4	0.3	0.7
	10/1/01	648216.979	390149.362	280.598	0.000	0.002	-0.012	0.012	0.6	0.6	1.3
	6/3/01	648216.975	390149.360	280.607	-0.004	0.000	-0.003	0.005	0.4	0.3	0.8
	18/4/01	648216.977	390149.359	280.610	-0.002	-0.001	0.000	0.002	0.6	0.5	1.4
	31/5/01	648216.974	390149.36	280.603	-0.005	0.000	-0.007	0.009	0.3	0.3	0.7
	9/10/01	648216.977	390149.363	280.600	-0.002	0.003	-0.010	0.011	1.0	0.0	1.0
	12/12/01	648216.976	390149.361	280.606	-0.003	0.001	-0.004	0.005	1.0	0.0	1.0
	14/03/02	648216.979	390149.361	280.613	0.000	0.001	0.003	0.003	1.0	0.0	1.0
	19/6/02	648216.972	390149.360	280.604	-0.007	0.000	-0.006	0.009	1.0	0.0	1.0
	29/10/02	648216.973	390149.364	280.603	-0.006	0.004	-0.007	0.010	1.0	0.0	1.0
	21/2/03	648216.969	390149.359	280.609	-0.010	-0.001	-0.001	0.010	1.0	0.0	1.0
	19/03/03	648216.969	390149.358	280.607	-0.010	-0.002	-0.003	0.011	1.0	0.0	1.0
	27/08/03	648216.963	390149.362	280.603	-0.016	0.002	-0.007	0.018	1.0	1.0	1.0
	24/03/2004	648216.965	390149.357	280.605	-0.014	-0.003	-0.005	0.015	1.0	1.0	1.0
	15/12/2004	648216.967	390149.360	280.606	-0.012	0.000	-0.004	0.013	1.0	0.0	1.0
	26/10/2005	648216.970	390149.364	280.611	-0.009	0.004	0.001	0.010	2.0	1.0	1.0
	16/01/2008	648216.962	390149.355	280.6	-0.017	-0.005	-0.010	0.020	2.0	1.0	1.0
	29/10/2008	648216.964	390149.36	280.603	-0.015	0.000	-0.007	0.017	1.0	0.0	1.0
	21/11/2008	648216.962	390149.36	280.603	-0.017	0.000	-0.007	0.018	1.0	0.0	1.0
	9/03/2008	648216.963	390149.361	280.605	-0.016	0.001	-0.005	0.017	1.0	1.0	2.0
	30/07/2009	648216.965	390149.362	280.61	-0.014	0.002	0.000	0.014	1.0	1.0	2.0
	17/11/09	648216.963	390149.353	280.592	-0.016	-0.007	-0.018	0.025	1.0	1.0	2.0
	17/06/2010	648216.961	390149.359	280.605	-0.018	-0.001	-0.005	0.019	1.0	1.0	1.0
	9/02/2011	648216.964	390149.359	280.600	-0.015	-0.001	-0.010	0.018	1.0	0.0	2.0
	17/01/2012	648216.973	390149.361	280.598	-0.006	0.001	-0.012	0.013			
	22/10/12	648216.963	390149.36	280.602	-0.016	0.000	-0.008	0.018	1	1	3
	3/2/14	648216.965	390149.361	280.601	-0.014	0.001	-0.009	0.017	1.0	2.0	5.0


C- SYD
NORTHING
EASTING
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0.000
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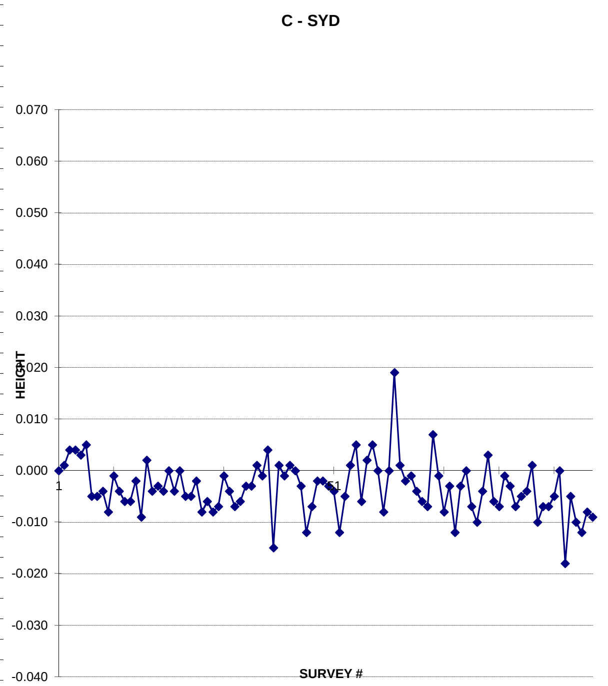
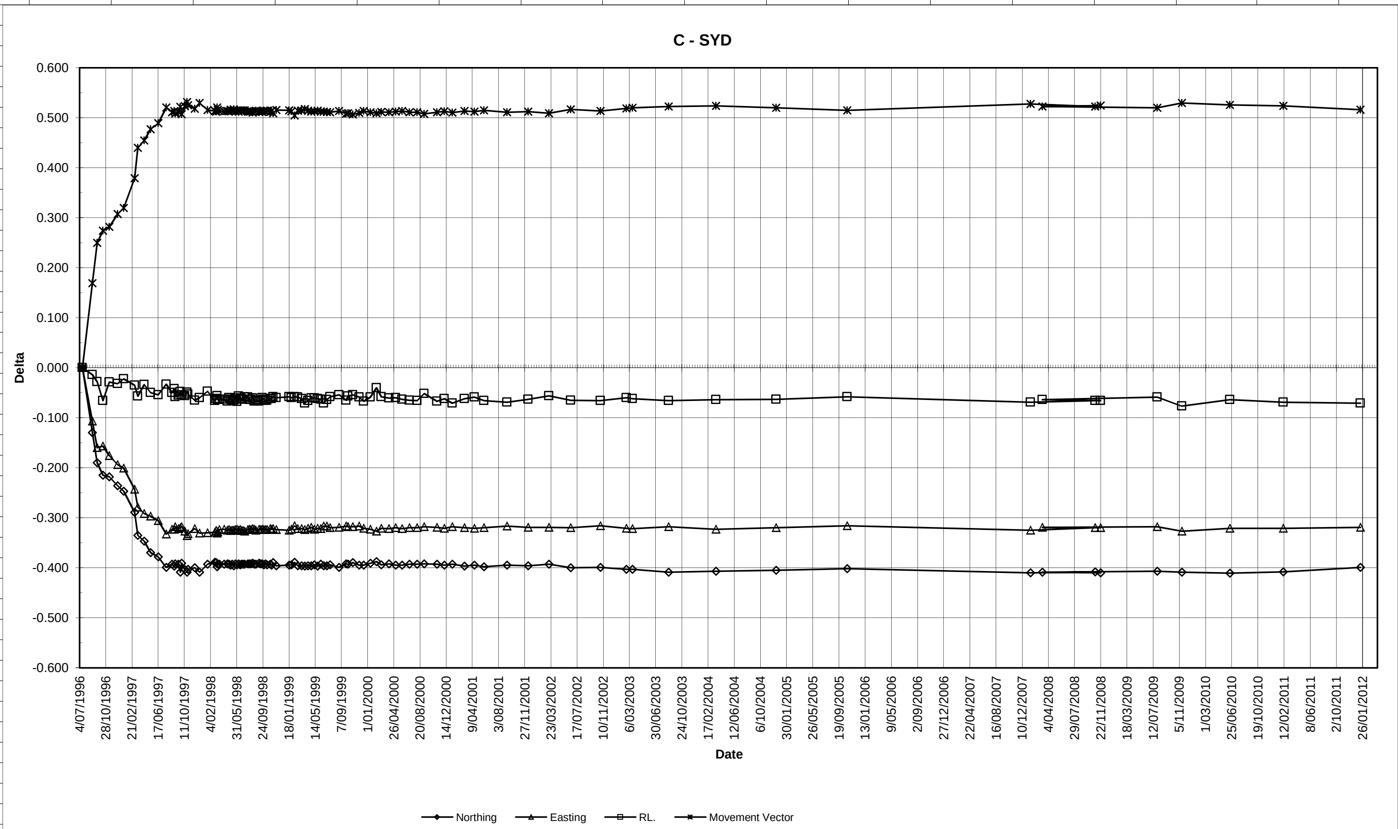
-0.100
-0.100
-0.050
0.050
0.100


C - SYD
HEIGHT
SURVEY #
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
-0.010
-0.020
-0.030
-0.040
1
51


C - SYD
Delta
Date
0.600
0.500
0.400
0.300
0.200
0.100
0.000
-0.100
-0.200
-0.300
-0.400
-0.500
-0.600
4/07/1996
28/10/1996
21/02/1997
17/06/1997
11/10/1997
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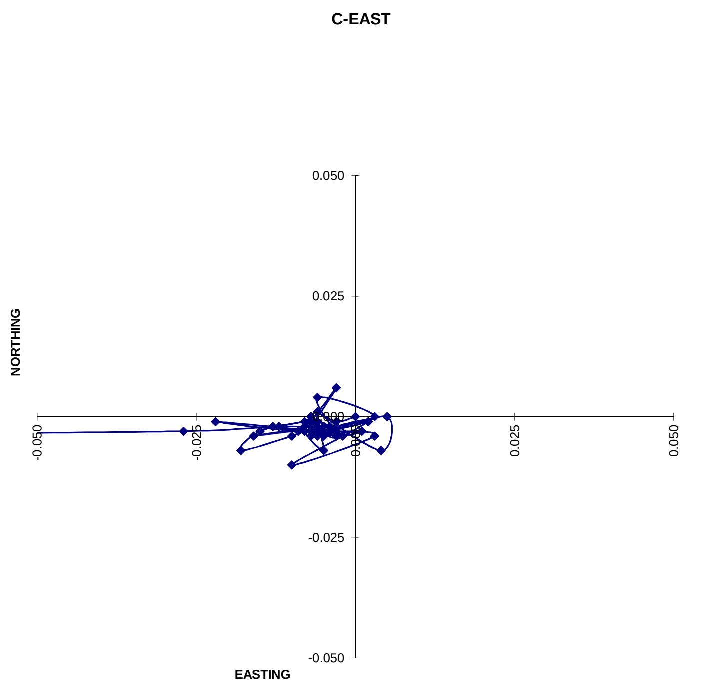
18/03/2009
12/07/2009
5/11/2009
1/03/2010
25/06/2010
19/10/2010
12/02/2011
8/06/2011
2/10/2011
26/01/2012
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-EAST	12/2/98	649075.719	391314.461	425.462				Not Used in Data Set			
Static	16/2/98	649075.694	391314.471	425.443							
	26/2/98	649075.714	391314.470	425.397	0.000	0.000	0.000	0.000	0.3	0.3	0.9
	5/3/98	649075.713	391314.467	425.403	-0.001	-0.003	0.006	0.007	0.6	0.6	1.5
	12/3/98	649075.715	391314.464	425.398	0.001	-0.006	0.001	0.006	0.9	3.6	1.4
	19/3/98	649075.707	391314.474	425.380	-0.007	0.004	-0.017	0.019			
	26/3/98	649075.714	391314.475	425.405	0.000	0.005	0.008	0.009	0.4	0.4	1.1
	2/4/98	649075.711	391314.466	425.396	-0.003	-0.004	-0.001	0.005	0.8	0.7	2.1
	16/4/98	649075.713	391314.472	425.400	-0.001	0.002	0.003	0.004	0.4	0.3	0.8
	23/4/98	649075.712	391314.467	425.401	-0.002	-0.003	0.004	0.005	0.5	0.3	0.9
	30/4/98	649075.713	391314.472	425.401	-0.001	0.002	0.004	0.005	0.3	0.2	0.7
	7/5/98	649075.704	391314.460	425.397	-0.010	-0.010	0.000	0.014	1.4	0.9	3.1
	14/5/98	649075.710	391314.473	425.394	-0.004	0.003	-0.003	0.006	0.6	0.4	1.2
	21/5/98	649075.711	391314.467	425.404	-0.003	-0.003	0.007	0.008	0.8	0.5	1.0
	28/5/98	649075.710	391314.468	425.406	-0.004	-0.002	0.009	0.010	0.8	0.4	1.3
	4/6/98	649075.711	391314.471	425.407	-0.003	0.001	0.010	0.010	0.4	0.3	0.9
	11/6/98	649075.710	391314.464	425.411	-0.004	-0.006	0.014	0.016	0.4	0.4	1.0
	18/6/98	649075.710	391314.465	425.402	-0.004	-0.005	0.005	0.008	0.4	0.4	0.9
	25/6/98	649075.711	391314.464	425.401	-0.003	-0.006	0.004	0.008	0.4	0.4	1.1
	2/7/98	649075.712	391314.465	425.405	-0.002	-0.005	0.008	0.010	0.4	0.4	1.1
	9/7/98	649075.710	391314.463	425.404	-0.004	-0.007	0.007	0.011	0.4	0.4	1.0
	16/7/98	649075.711	391314.465	425.406	-0.003	-0.005	0.009	0.011	0.5	0.4	1.2
	23/7/98	649075.714	391314.463	425.409	0.000	-0.007	0.012	0.014	0.6	0.6	1.7
	30/7/98	649075.710	391314.465	425.394	-0.004	-0.005	-0.003	0.007	0.9	0.8	3.0
	6/8/98	649075.712	391314.466	425.402	-0.002	-0.004	0.005	0.007	0.4	0.4	1.2
	13/8/98	649075.713	391314.463	425.392	-0.001	-0.007	-0.005	0.009	0.9	0.6	1.8
	20/8/98	649075.711	391314.464	425.406	-0.003	-0.006	0.009	0.011	0.5	0.4	1.0
	27/8/98	649075.711	391314.464	425.406	-0.003	-0.006	0.009	0.011	0.6	0.5	1.4
	10/9/98	649075.710	391314.467	425.392	-0.004	-0.003	-0.005	0.007	0.5	0.4	1.1
	17/9/98	649075.718	391314.464	425.397	0.004	-0.006	0.000	0.007	0.7	0.6	1.6
	24/9/98	649075.714	391314.473	425.397	0.000	0.003	0.000	0.003	0.4	0.4	0.9
	1/10/98	649075.711	391314.463	425.400	-0.003	-0.007	0.003	0.008	0.7	0.6	1.5
	8/10/98	649075.713	391314.448	425.408	-0.001	-0.022	0.011	0.025	0.7	0.7	1.5
	22/10/98	649075.711	391314.464	425.406	-0.003	-0.006	0.009	0.011	0.5	0.6	1.1
	29/10/98	649075.710	391314.467	425.398	-0.004	-0.003	0.001	0.005	0.7	1.6	2.4
	5/11/98	649075.711	391314.461	425.400	-0.003	-0.009	0.003	0.010	0.4	0.5	0.9
	19/11/98	649075.710	391314.454	425.423	-0.004	-0.016	0.026	0.031	2.7	2.7	6.7
	17/12/98	649075.712	391314.463	425.399	-0.002	-0.007	0.002	0.008	0.6	0.6	1.4
	28/12/98	649075.713	391314.463	425.404	-0.001	-0.007	0.007	0.010	0.8	0.5	1.0
	14/1/99	649075.712	391314.463	425.397	-0.002	-0.007	0.000	0.007	0.7	0.6	2.1
	28/1/99	649075.720	391314.467	425.406	0.006	-0.003	0.009	0.011	0.7	0.7	1.9
	11/2/99	649075.712	391314.462	425.405	-0.002	-0.008	0.008	0.011	0.5	0.5	1.3
	25/2/99	649075.712	391314.458	425.404	-0.002	-0.012	0.007	0.014	1.0	0.9	2.8
	12/3/99	649075.712	391314.465	425.386	-0.002	-0.005	-0.011	0.012	0.5	0.5	1.4
	25/3/99	649075.713	391314.464	425.388	-0.001	-0.006	-0.009	0.011	0.8	0.6	1.6
	8/4/99	649075.707	391314.465	425.382	-0.007	-0.005	-0.015	0.017	1.2	1.0	3.2
	22/4/99	649075.711	391314.462	425.391	-0.003	-0.008	-0.006	0.010	1.0	0.4	1.2
	6/5/99	649075.714	391314.463	425.397	0.000	-0.007	0.000	0.007	1.0	0.4	0.7
	20/5/99	649075.712	391314.464	425.388	-0.002	-0.006	-0.009	0.011	0.7	0.4	0.8
	3/6/99	649075.711	391314.462	425.380	-0.003	-0.008	-0.017	0.019	0.7	0.3	0.8
	17/6/99	649075.710	391314.460	425.382	-0.004	-0.010	-0.015	0.018	1.0	0.5	2.1
	2/7/99	649075.707	391314.452	425.391	-0.007	-0.018	-0.006	0.020	0.9	0.9	3.0
	15/7/99	649075.711	391314.455	425.382	-0.003	-0.015	-0.015	0.021	0.6	0.6	2.0
	29/7/99	649075.713	391314.462	425.379	-0.001	-0.008	-0.018	0.020	0.5	0.5	1.3
	13/1/00	649075.712	391314.457	425.360	-0.002	-0.013	-0.037	0.039	0.6	0.6	1.5
	5/12/2000	649075.711	391314.443	425.365	-0.003	-0.027	-0.032	0.042	0.3	0.4	0.8
	8/09/2003	649075.710	391314.359	425.360	-0.004	-0.111	-0.037	0.117	2.0	1.0	1.0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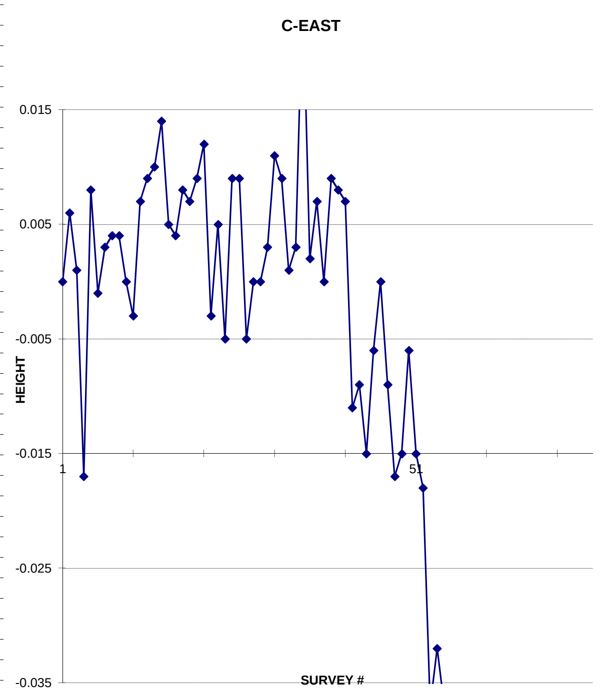
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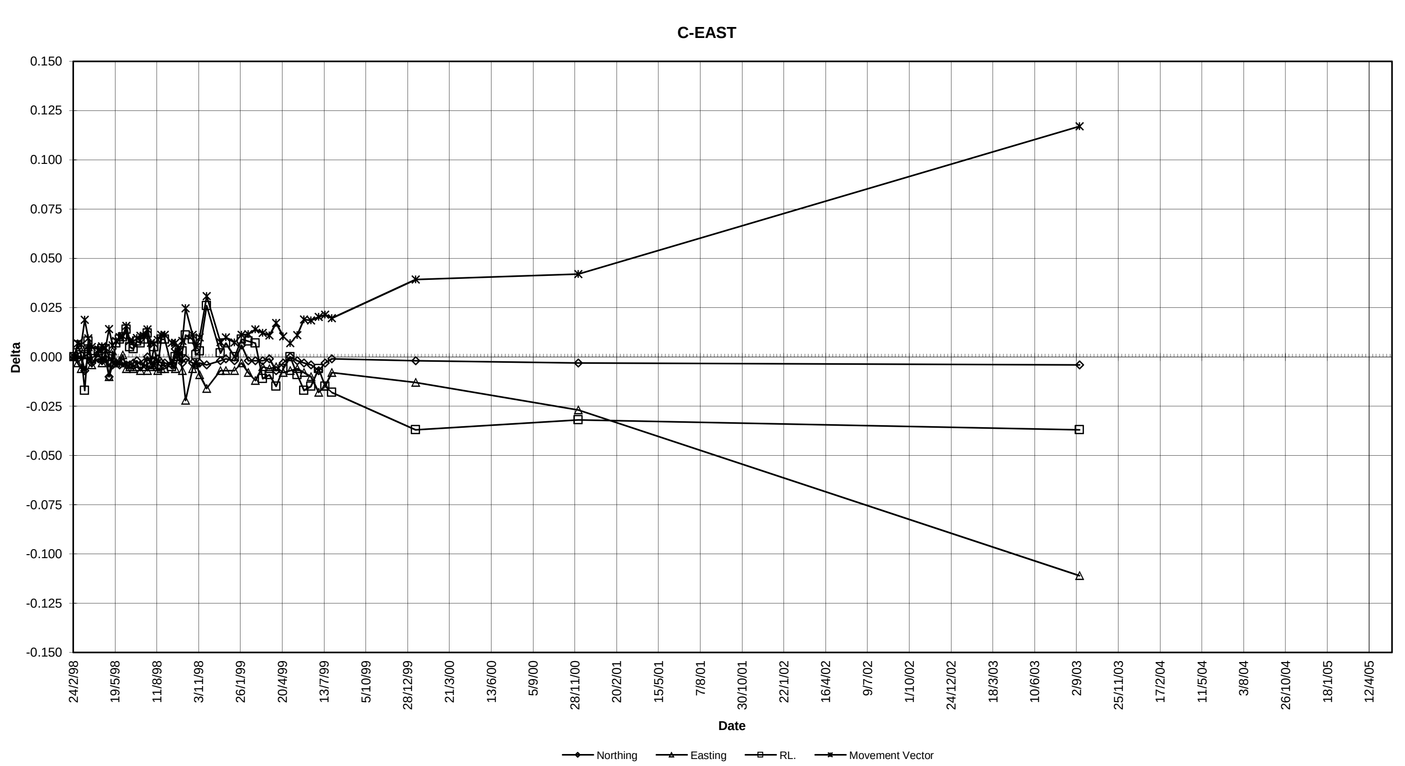
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19/5/98
11/8/98
3/11/98
26/1/99
20/4/99
13/7/99
5/10/99
28/12/99
21/3/00
13/6/00
5/9/00
28/11/00
20/2/01
15/5/01
7/8/01
30/10/01
22/1/02
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9/7/02
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18/3/03
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2/9/03
25/11/03
17/2/04
11/5/04
3/8/04
26/10/04
18/1/05
12/4/05
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-MID	8/5/98	648896.674	390854.853	419.343	0.000	0.000	0.000	0.000	0.8	0.5	1.4
Static	15/5/98	648896.672	390854.853	419.341	-0.002	0.000	-0.002	0.003	0.5	0.3	1.1
	22/5/98	648896.670	390854.850	419.336	-0.004	-0.003	-0.007	0.009	1.4	1.0	2.5
	29/5/98	648896.673	390854.847	419.326	-0.001	-0.006	-0.017	0.018	0.3	0.2	0.6
	5/6/98	648896.669	390854.850	419.326	-0.005	-0.003	-0.017	0.018	0.2	0.2	0.5
	12/6/98	648896.671	390854.847	419.316	-0.003	-0.006	-0.027	0.028	0.4	0.3	0.9
	19/6/98	648896.672	390854.846	419.309	-0.002	-0.007	-0.034	0.035	0.3	0.3	0.8
	26/6/98	648896.673	390854.846	419.308	-0.001	-0.007	-0.035	0.036	0.4	0.3	1.0
	3/7/98	648896.671	390854.847	419.308	-0.003	-0.006	-0.035	0.036	0.4	0.3	0.8
	10/7/98	648896.673	390854.846	419.296	-0.001	-0.007	-0.047	0.048	0.5	0.4	0.7
	24/7/98	648896.672	390854.847	419.288	-0.002	-0.006	-0.055	0.055	0.5	0.4	1.0
	31/7/98	648896.673	390854.847	419.276	-0.001	-0.006	-0.067	0.067	0.4	0.3	0.8
	7/8/98	648896.671	390854.847	419.281	-0.003	-0.006	-0.062	0.062	0.5	0.3	1.0
	14/8/98	648896.673	390854.846	419.269	-0.001	-0.007	-0.074	0.074	0.4	0.3	0.8
	21/8/98	648896.674	390854.848	419.270	0.000	-0.005	-0.073	0.073	0.3	0.3	0.7
	28/8/98	648896.674	390854.847	419.261	0.000	-0.006	-0.082	0.082	0.5	0.4	1.9
	11/9/98	648896.673	390854.846	419.259	-0.001	-0.007	-0.084	0.084	0.5	0.4	1.0
	18/9/98	648896.673	390854.846	419.255	-0.001	-0.007	-0.088	0.088	1.0	0.4	1.1
	2/10/98	648896.675	390854.844	419.250	0.001	-0.009	-0.093	0.093	0.5	0.3	0.9
	9/10/98	648896.671	390854.844	419.248	-0.003	-0.009	-0.095	0.095	0.5	0.4	1.1
	30/10/98	648896.677	390854.845	419.237	0.003	-0.008	-0.106	0.106	0.6	0.5	1.2
	5/11/98	648896.678	390854.847	419.241	0.004	-0.006	-0.102	0.102	0.5	0.3	0.9
	19/11/98	648896.678	390854.846	419.231	0.004	-0.007	-0.112	0.112	0.5	0.4	1.0
	28/12/98	648896.683	390854.842	419.223	0.009	-0.011	-0.120	0.121	0.6	0.4	1.3
	14/1/99	648896.681	390854.847	419.222	0.007	-0.006	-0.121	0.121	0.6	0.4	1.5
	11/2/99	648896.679	390854.848	419.209	0.005	-0.005	-0.134	0.134	0.6	0.5	1.5
	25/2/99	648896.680	390854.844	419.211	0.006	-0.009	-0.132	0.132	0.5	0.4	1.2
	12/3/99	648896.680	390854.847	419.204	0.006	-0.006	-0.139	0.139	0.6	0.4	1.4
	25/3/99	648896.683	390854.843	419.211	0.009	-0.010	-0.132	0.133	0.9	0.5	1.9
	8/4/99	648896.680	390854.843	419.194	0.006	-0.010	-0.149	0.149	0.4	0.3	0.8
	22/4/99	648896.680	390854.843	419.188	0.006	-0.010	-0.155	0.155	1.4	0.4	1.2
	6/5/99	648896.681	390854.841	419.195	0.007	-0.012	-0.148	0.149	0.8	0.4	0.9
	20/5/99	648896.683	390854.846	419.195	0.009	-0.007	-0.148	0.148	0.8	0.3	1.1
	3/6/99	648896.682	390854.845	419.190	0.008	-0.008	-0.153	0.153	0.9	0.3	1.1
	17/6/99	648896.682	390854.846	419.186	0.008	-0.007	-0.157	0.157	0.5	0.4	1.7
	2/7/99	648896.683	390854.844	419.182	0.009	-0.009	-0.161	0.162	0.4	0.4	1.1
	15/7/99	648896.685	390854.843	419.176	0.011	-0.010	-0.167	0.168	0.6	0.4	1.1
	29/7/99	648896.682	390854.847	419.180	0.008	-0.006	-0.163	0.163	0.3	0.5	1.1
	26/8/99	648896.683	390854.846	419.174	0.009	-0.007	-0.169	0.169	0.4	0.3	0.8
	27/9/99	648896.676	390854.828	419.143	0.002	-0.025	-0.200	0.202	0.7	0.6	1.2
	6/10/99	648896.677	390854.825	419.144	0.003	-0.028	-0.199	0.201	0.5	0.4	1.0
	27/10/99	648896.674	390854.823	419.130	0.000	-0.030	-0.213	0.215	0.4	0.3	0.7
	24/11/99	648896.676	390854.822	419.128	0.002	-0.031	-0.215	0.217	0.5	0.3	0.8
	14/12/99	648896.671	390854.818	419.119	-0.003	-0.035	-0.224	0.227	0.4	0.4	1.0
	12/1/00	648896.676	390854.819	419.115	0.002	-0.034	-0.228	0.231	0.6	0.4	1.0
	9/2/00	648896.672	390854.819	419.104	-0.002	-0.034	-0.239	0.241	1.1	0.5	1.4
	1/3/00	648896.672	390854.815	419.103	-0.002	-0.038	-0.240	0.243	1.0	0.8	2.0
	4/4/00	648896.673	390854.811	419.101	-0.001	-0.042	-0.242	0.246	0.4	0.3	0.8
	3/5/00	648896.671	390854.814	419.085	-0.003	-0.039	-0.258	0.261	0.7	1.0	1.0
	1/6/00	648896.674	390854.814	419.098	0.000	-0.039	-0.245	0.248	0.6	0.9	0.9
	4/7/00	648896.674	390854.814	419.093	0.000	-0.039	-0.250	0.253	0.6	0.4	1.1
	7/8/00	648896.672	390854.813	419.094	-0.002	-0.040	-0.249	0.252	0.4	0.2	0.7
	8/9/00	648896.673	390854.813	419.087	-0.001	-0.040	-0.256	0.259	0.5	0.8	1.3
	4/10/00	648896.674	390854.810	419.086	0.000	-0.043	-0.257	0.261	0.8	0.6	1.8
	2/11/00	648896.672	390854.807	419.083	-0.002	-0.046	-0.260	0.264	0.6	0.5	1.3
	4/12/00	648896.675	390854.811	419.076	0.001	-0.042	-0.267	0.270	0.4	0.3	1.0
	9/1/01	648896.669	390854.812	419.079	-0.005	-0.041	-0.264	0.267	0.8	0.6	1.8
	8/2/01	648896.676	390854.812	419.074	0.002	-0.041	-0.269	0.272	0.4	0.3	0.9
	5/3/01	648896.672	390854.812	419.072	-0.002	-0.041	-0.271	0.274	0.4	0.3	0.7
	17/4/01	648896.678	390854.805	419.071	0.004	-0.048	-0.272	0.276	0.5	0.3	1.0
	11/9/01	648896.674	390854.806	419.061	0.000	-0.047	-0.282	0.286	1.0	0.0	1.0
	10/12/01	648896.676	390854.803	419.059	0.002	-0.050	-0.284	0.288	2.0	1.0	1.0
	14/3/02	648896.670	390854.796	419.039	-0.004	-0.057	-0.304	0.309	1.0	0.0	1.0
	19/6/02	648896.676	390854.801	419.043	0.002	-0.052	-0.300	0.304	1.0	0.0	0.0
	29/10/02	648896.675	390854.801	419.039	0.001	-0.052	-0.304	0.308	1.0	0.0	1.0
	21/1/03	648896.677	390854.797	419.022	0.003	-0.056	-0.321	0.326	1.0	0.0	0.0
	18/3/03	648896.675	390854.797	419.029	0.001	-0.056	-0.314	0.319	1.0	0.0	0.0
	8/9/03	648896.677	390854.793	419.020	0.003	-0.060	-0.323	0.329	1.0	0.0	1.0
	11/3/04	648896.676	390854.79	419.012	0.002	-0.063	-0.331	0.337	1.0	1.0	1.0
	17/12/04	648896.677	390854.787	418.997	0.003	-0.066	-0.346	0.352	1.0	0.0	1.0
	25/10/05	648896.679	390854.788	418.980	0.005	-0.065	-0.363	0.369	1.0	1.0	1.0
	30/11/06	648896.679	390854.781	418.971	0.005	-0.072	-0.372	0.379	1.0	0.0	1.0
	16/1/08	648896.678	390854.779	418.963	0.004	-0.074	-0.380	0.387	1.0	0.0	0.0
	29/10/08	648896.678	390854.771	418.947	0.004	-0.082	-0.396	0.404	1.0	1.0	1.0
	9/3/09	648896.677	390854.769	418.95	0.003	-0.084	-0.393	0.402	0.0	0.0	1.0
	30/7/09	648896.68	390854.772	418.943	0.006	-0.081	-0.400	0.408	1.0	0.0	1.0
	17/11/2009	648896.678	390854.767	418.936	0.004	-0.086	-0.407	0.416	1.0	0.0	1.0
	17/6/10	648896.678	390854.769	418.935	0.004	-0.084	-0.408	0.417	1.0	0.0	1.0
	4/2/11	648896.679	390854.763	418.923	0.005	-0.090	-0.420	0.430	0.0	0.0	1.0
	18/10/11	648896.679	390854.768	418.933	0.005	-0.085	-0.410	0.419	1.0	1.0	**3.0**
	17/01/2012	648896.677	390854.754	418.924	0.003	-0.099	-0.419	0.431			
	19/10/12	648896.678	390854.765	418.922	0.004	-0.088	-0.421	0.430	1	0	1
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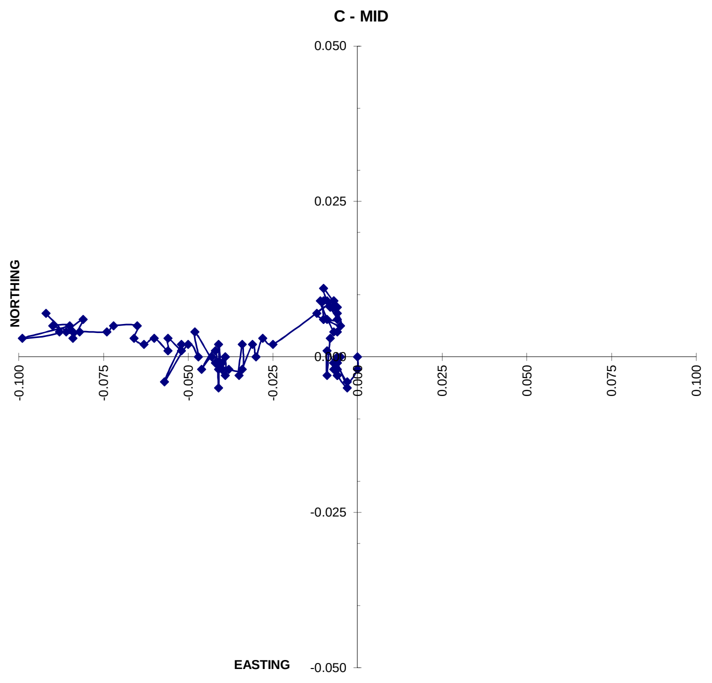
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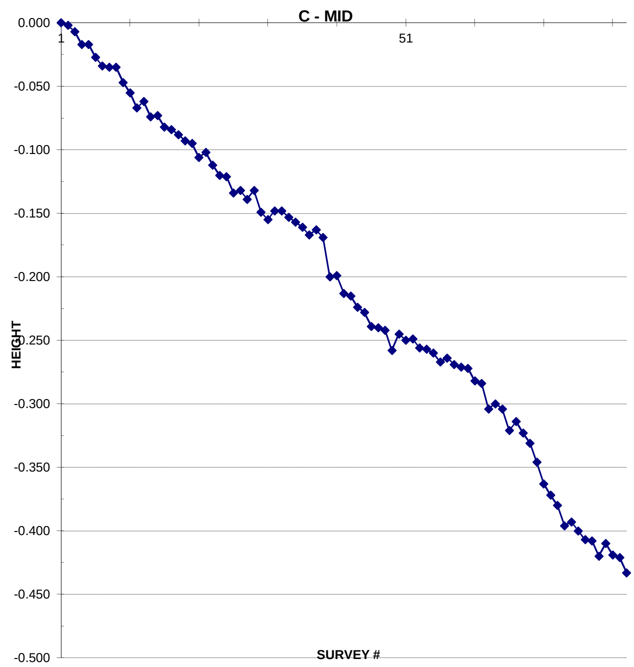
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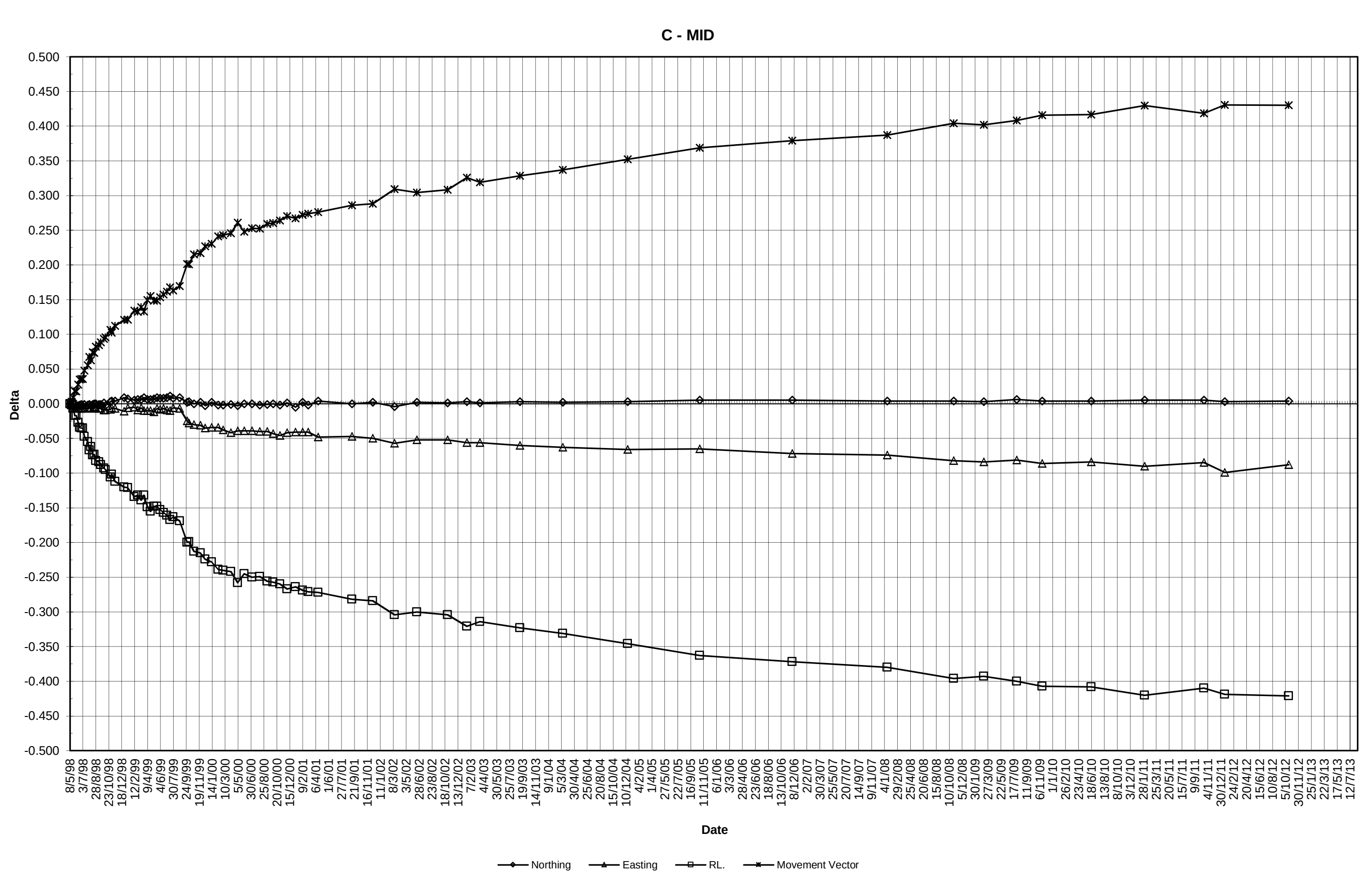
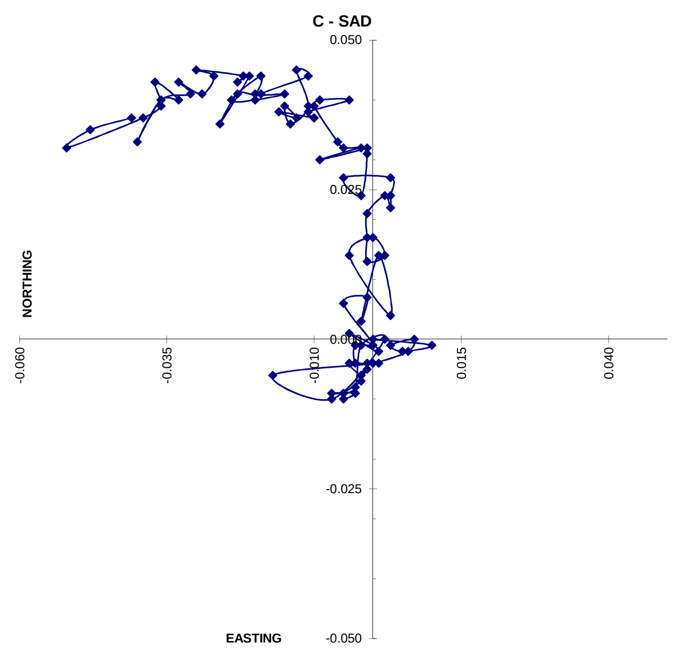

C - MID
Delta
Date
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-SAD	7/5/98	648834.284	391209.624	426.528	0.000	0.000	0.000	0.000	0.3	0.2	0.7
	14/5/98	648834.283	391209.634	426.517	-0.001	0.010	-0.011	0.015	0.4	0.3	0.9
	21/5/98	648834.282	391209.629	426.509	-0.002	0.005	-0.019	0.020	0.6	0.3	0.5
	28/5/98	648834.283	391209.627	426.502	-0.001	0.003	-0.026	0.026	0.3	0.2	0.6
	4/6/98	648834.284	391209.631	426.492	0.000	0.007	-0.036	0.037	0.3	0.2	0.5
	11/6/98	648834.282	391209.630	426.492	-0.002	0.006	-0.036	0.037	0.6	0.4	1.2
	18/6/98	648834.280	391209.624	426.481	-0.004	0.000	-0.047	0.047	0.3	0.3	0.7
	25/6/98	648834.280	391209.620	426.477	-0.004	-0.004	-0.051	0.051	0.5	0.3	1.0
	2/7/98	648834.278	391209.622	426.476	-0.006	-0.002	-0.052	0.052	0.3	0.3	0.8
	9/7/98	648834.279	391209.623	426.470	-0.005	-0.001	-0.058	0.058	0.5	0.3	1.0
	16/7/98	648834.278	391209.622	426.472	-0.006	-0.002	-0.056	0.056	0.8	0.3	0.6
	23/7/98	648834.277	391209.622	426.461	-0.007	-0.002	-0.067	0.067	0.5	0.4	1.5
	30/7/98	648834.275	391209.619	426.455	-0.009	-0.005	-0.073	0.074	0.8	0.5	1.4
	6/8/98	648834.274	391209.619	426.464	-0.010	-0.005	-0.064	0.065	0.5	0.3	0.9
	13/8/98	648834.275	391209.621	426.445	-0.009	-0.003	-0.083	0.084	0.7	0.5	2.5
	20/8/98	648834.275	391209.617	426.459	-0.009	-0.007	-0.069	0.070	0.4	0.3	1.1
	27/8/98	648834.275	391209.619	426.454	-0.009	-0.005	-0.074	0.075	0.4	0.3	1.0
	10/9/98	648834.276	391209.621	426.439	-0.008	-0.003	-0.089	0.089	0.4	0.3	0.8
	17/9/98	648834.283	391209.622	426.452	-0.001	-0.002	-0.076	0.076	1.0	0.5	1.8
	24/9/98	648834.284	391209.626	426.442	0.000	0.002	-0.086	0.086	0.6	0.4	1.2
	1/10/98	648834.274	391209.617	426.441	-0.010	-0.007	-0.087	0.088	0.6	0.4	1.2
	8/10/98	648834.278	391209.607	426.433	-0.006	-0.017	-0.095	0.097	0.6	0.4	1.1
	22/10/98	648834.280	391209.625	426.428	-0.004	0.001	-0.100	0.100	0.5	0.4	1.0
	29/10/98	648834.280	391209.623	426.420	-0.004	-0.001	-0.108	0.108	0.6	0.7	1.4
	5/11/98	648834.280	391209.621	426.411	-0.004	-0.003	-0.117	0.117	0.8	0.5	1.6
	19/11/98	648834.283	391209.621	426.405	-0.001	-0.003	-0.123	0.123	0.5	0.4	1.0
	17/12/98	648834.283	391209.624	426.387	-0.001	0.000	-0.141	0.141	0.5	0.6	1.1
	28/12/98	648834.285	391209.620	426.391	0.001	-0.004	-0.137	0.137	0.7	0.4	1.3
	14/1/99	648834.282	391209.625	426.392	-0.002	0.001	-0.136	0.136	0.8	0.6	2.0
	28/1/99	648834.290	391209.619	426.376	0.006	-0.005	-0.152	0.152	0.6	0.5	1.3
	11/2/99	648834.291	391209.623	426.371	0.007	-0.001	-0.157	0.157	0.7	0.4	1.5
	25/2/99	648834.287	391209.622	426.377	0.003	-0.002	-0.151	0.151	0.7	0.5	1.6
	12/3/99	648834.298	391209.625	426.376	0.014	0.001	-0.152	0.153	0.7	0.5	1.4
	25/3/99	648834.288	391209.627	426.356	0.004	0.003	-0.172	0.172	0.8	0.7	2.0
	8/4/99	648834.298	391209.620	426.350	0.014	-0.004	-0.178	0.179	0.6	0.4	1.2
	22/4/99	648834.301	391209.624	426.342	0.017	0.000	-0.186	0.187	0.9	0.3	0.7
	6/5/99	648834.298	391209.626	426.347	0.014	0.002	-0.181	0.182	0.8	0.3	0.5
	20/5/99	648834.297	391209.623	426.340	0.013	-0.001	-0.188	0.188	0.7	0.3	0.7
	3/6/99	648834.301	391209.623	426.338	0.017	-0.001	-0.190	0.191	0.8	0.8	1.7
	17/6/99	648834.305	391209.623	426.332	0.021	-0.001	-0.196	0.197	0.4	0.4	0.9
	2/7/99	648834.308	391209.626	426.326	0.024	0.002	-0.202	0.203	1.0	0.3	2.1
	15/7/99	648834.306	391209.627	426.330	0.022	0.003	-0.198	0.199	0.7	0.2	1.3
	29/7/99	648834.308	391209.627	426.328	0.024	0.003	-0.200	0.201	0.3	0.3	1.3
	26/8/99	648834.311	391209.627	426.316	0.027	0.003	-0.212	0.214	0.6	0.4	1.3
	27/9/99	648834.311	391209.619	426.304	0.027	-0.005	-0.224	0.226	0.5	0.9	1.1
	6/10/99	648834.308	391209.622	426.308	0.024	-0.002	-0.220	0.221	0.6	0.4	1.2
	27/10/99	648834.315	391209.623	426.306	0.031	-0.001	-0.222	0.224	0.4	0.2	0.8
	24/11/99	648834.316	391209.622	426.300	0.032	-0.002	-0.228	0.230	0.5	0.4	1.0
	14/12/99	648834.314	391209.615	426.303	0.030	-0.009	-0.225	0.227	0.4	0.3	1.0
	12/1/00	648834.316	391209.623	426.297	0.032	-0.001	-0.231	0.233	0.5	0.4	1.2
	9/2/00	648834.316	391209.619	426.297	0.032	-0.005	-0.231	0.233	0.8	0.5	1.4
	1/3/00	648834.317	391209.618	426.293	0.033	-0.006	-0.235	0.237	0.5	0.4	1.2
	4/4/00	648834.323	391209.614	426.275	0.039	-0.010	-0.253	0.256	0.5	0.3	1.0
	3/5/00	648834.324	391209.615	426.248	0.040	-0.009	-0.280	0.283	1.2	1.8	1.8
	1/6/00	648834.324	391209.620	426.264	0.040	-0.004	-0.264	0.267	0.7	0.9	0.9
	4/7/00	648834.322	391209.613	426.266	0.038	-0.011	-0.262	0.265	0.4	0.3	0.8
	25/7/00	648834.321	391209.614	426.262	0.037	-0.010	-0.266	0.269	0.6	0.4	1.0
	4/8/00	648834.321	391209.614	426.27	0.037	-0.010	-0.258	0.261	0.3	0.2	0.6
	11/9/00	648834.322	391209.608	426.258	0.038	-0.016	-0.270	0.273	0.7	1.0	1.9
	4/10/00	648834.321	391209.611	426.255	0.037	-0.013	-0.273	0.276	0.6	0.5	1.4
	2/11/00	648834.323	391209.609	426.248	0.039	-0.015	-0.280	0.283	0.6	0.5	1.3
	7/12/00	648834.320	391209.610	426.242	0.036	-0.014	-0.286	0.289	0.9	0.8	2.5
	9/1/01	648834.323	391209.613	426.237	0.039	-0.011	-0.291	0.294	1.2	0.8	2.5
	8/2/01	648834.329	391209.611	426.241	0.045	-0.013	-0.287	0.291	0.5	0.4	1.2
	5/3/01	648834.328	391209.613	426.239	0.044	-0.011	-0.289	0.293	0.7	0.4	1.2
	17/4/01	648834.325	391209.605	426.240	0.041	-0.019	-0.288	0.292	0.5	0.5	1.5
	11/9/01	648834.325	391209.609	426.244	0.041	-0.015	-0.284	0.287	1.0	1.0	1.0
	5/12/01	648834.324	391209.604	426.223	0.040	-0.020	-0.305	0.308	2.0	1.0	1.0
	13/3/02	648834.324	391209.600	426.222	0.040	-0.024	-0.306	0.310	1.0	1.0	1.0
	18/6/02	648834.328	391209.605	426.217	0.044	-0.019	-0.311	0.315	1.0	1.0	1.0
	29/10/02	648834.325	391209.604	426.211	0.041	-0.020	-0.317	0.320	1.0	0.0	1.0
	21/1/03	648834.325	391209.601	426.185	0.041	-0.023	-0.343	0.346	1.0	0.0	0.0
	18/3/03	648834.320	391209.598	426.210	0.036	-0.026	-0.318	0.321	1.0	0.0	1.0
	27/8/03	648834.328	391209.603	426.203	0.044	-0.021	-0.325	0.329	2.0	1.0	1.0
	10/3/04	648834.327	391209.601	426.192	0.043	-0.023	-0.336	0.340	1.0	0.0	1.0
	15/12/04	648834.328	391209.602	426.190	0.044	-0.022	-0.338	0.342	1.0	0.0	1.0
	25/10/05	648834.329	391209.594	426.184	0.045	-0.030	-0.344	0.348	2.0	1.0	2.0
	30/11/06	648834.328	391209.597	426.165	0.044	-0.027	-0.363	0.367	1.0	0.0	1.0
	16/1/08	648834.325	391209.595	426.157	0.041	-0.029	-0.371	0.374	1.0	0.0	0.0
	29/10/08	648834.327	391209.591	426.144	0.043	-0.033	-0.384	0.388	0.0	0.0	1.0
	21/11/08	648834.325	391209.593	426.145	0.041	-0.031	-0.383	0.386	1.0	1.0	1.0
	9/3/09	648834.324	391209.588	426.146	0.040	-0.036	-0.382	0.386	1.0	1.0	2.0
	30/7/09	648834.317	391209.584	426.113	0.033	-0.040	-0.415	0.418	1.0	1.0	3.0
	17/11/2009	648834.324	391209.588	426.14	0.040	-0.036	-0.388	0.392	1.0	0.0	1.0
	17/6/10	648834.324	391209.591	426.132	0.040	-0.033	-0.396	0.399	1.0	0.0	1.0
	4/2/11	648834.327	391209.587	426.123	0.043	-0.037	-0.405	0.409	1.0	0.0	1.0
	9/2/11	648834.323	391209.588	426.129	0.039	-0.036	-0.399	0.403	1.0	1.0	2.0
	18/10/11	648834.321	391209.585	426.130	0.037	-0.039	-0.398	0.402	1.0	1.0	2.0
	17/01/2012	648834.316	391209.572	426.130	0.032	-0.052	-0.398	0.403			
	9/10/12	648834.319	391209.576	426.13	0.035	-0.048	-0.398	0.402	2	1	2
	30/1/14	648834.321	391209.583	426.122	0.037	-0.041	-0.406	0.410	1	1	1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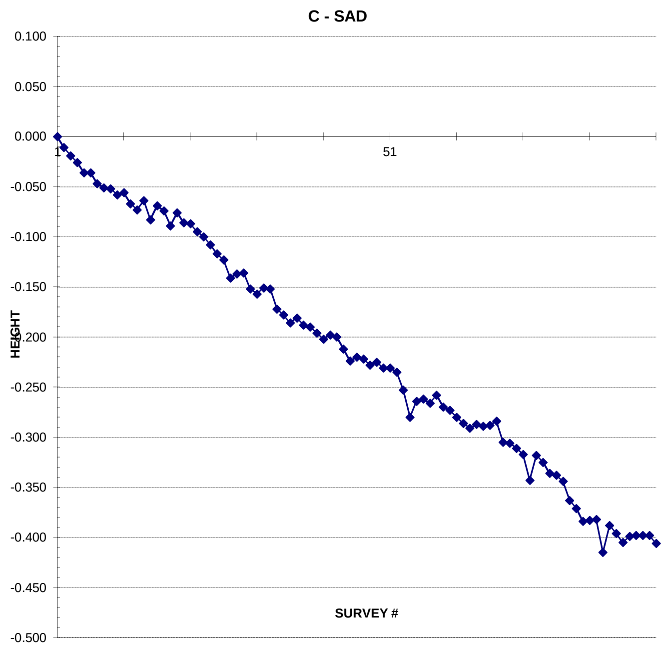
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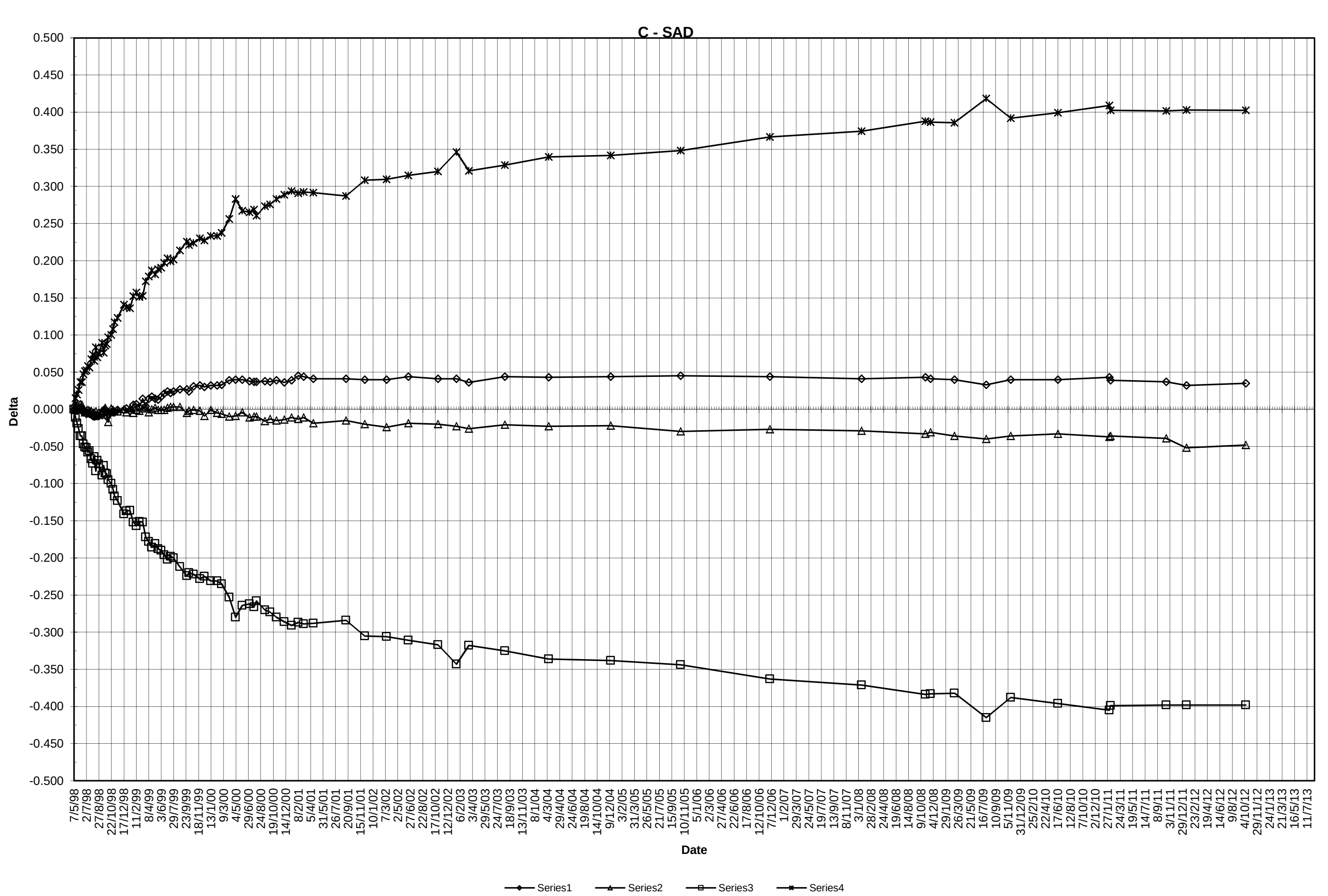
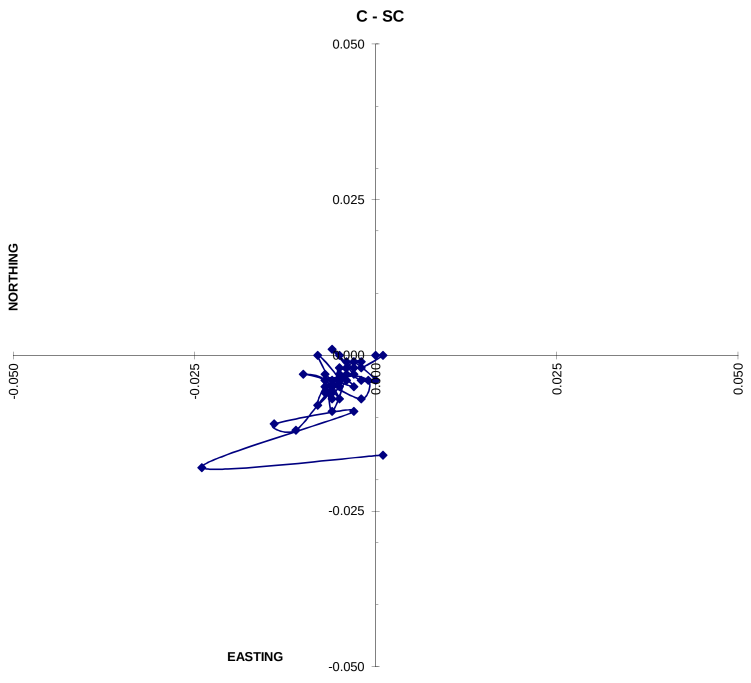
51


C - SAD
Delta
Date
Series1
Series2
Series3
Series4

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-SC	20/2/98	648457.397	390699.900	332.244	0.000	0.000	0.000	0.000	0.4	0.3	0.9
Static	27/2/98	648457.397	390699.901	332.240	0.000	0.001	-0.004	0.004	0.4	0.3	0.9
	6/3/98	648457.395	390699.898	332.247	-0.002	-0.002	0.003	0.004	0.5	0.4	1.1
	3/4/98	648457.396	390699.898	332.241	-0.001	-0.002	-0.003	0.004	0.5	0.4	1.3
	9/4/98	648457.396	390699.897	332.249	-0.001	-0.003	0.005	0.006	0.4	0.2	0.7
	17/4/98	648457.395	390699.896	332.244	-0.002	-0.004	0.000	0.004	0.3	0.2	0.7
	24/4/98	648457.395	390699.897	332.238	-0.002	-0.003	-0.006	0.007	0.5	0.3	1.0
	1/5/98	648457.395	390699.897	332.241	-0.002	-0.003	-0.003	0.005	0.4	0.3	0.9
	8/5/98	648457.396	390699.897	332.240	-0.001	-0.003	-0.004	0.005	0.5	0.3	1.3
	15/5/98	648457.393	390699.900	332.242	-0.004	0.000	-0.002	0.004	0.4	0.3	0.9
	22/5/98	648457.393	390699.898	332.244	-0.004	-0.002	0.000	0.004	1.3	0.8	2.6
	29/5/98	648457.395	390699.895	332.239	-0.002	-0.005	-0.005	0.007	0.3	0.2	0.6
	5/6/98	648457.393	390699.895	332.240	-0.004	-0.005	-0.004	0.008	0.5	0.2	0.9
	12/6/98	648457.395	390699.896	332.244	-0.002	-0.004	0.000	0.004	0.3	0.2	0.6
	19/6/98	648457.397	390699.895	332.239	0.000	-0.005	-0.005	0.007	0.5	0.3	1.0
	26/6/98	648457.398	390699.894	332.246	0.001	-0.006	0.002	0.006	0.4	0.3	0.7
	3/7/98	648457.394	390699.897	332.239	-0.003	-0.003	-0.005	0.007	0.2	0.2	0.6
	10/7/98	648457.396	390699.896	332.242	-0.001	-0.004	-0.002	0.005	0.7	0.5	1.3
	24/7/98	648457.393	390699.896	332.245	-0.004	-0.004	0.001	0.006	0.4	0.3	0.9
	31/7/98	648457.394	390699.895	332.247	-0.003	-0.005	0.003	0.007	0.5	0.3	1.6
	7/8/98	648457.392	390699.897	332.240	-0.005	-0.003	-0.004	0.007	0.5	0.4	1.6
	14/8/98	648457.393	390699.894	332.239	-0.004	-0.006	-0.005	0.009	0.4	0.3	0.8
	21/8/98	648457.392	390699.894	332.240	-0.005	-0.006	-0.004	0.009	0.4	0.3	0.8
	28/8/98	648457.393	390699.894	332.245	-0.004	-0.006	0.001	0.007	0.4	0.3	0.9
	4/9/98	648457.391	390699.894	332.244	-0.006	-0.006	0.000	0.008	0.6	0.4	1.2
	11/9/98	648457.390	390699.894	332.240	-0.007	-0.006	-0.004	0.010	0.5	0.3	1.0
	18/9/98	648457.392	390699.893	332.243	-0.005	-0.007	-0.001	0.009	0.5	0.4	0.9
	2/10/98	648457.394	390699.893	332.247	-0.003	-0.007	0.003	0.008	0.5	0.4	1.1
	9/10/98	648457.391	390699.893	332.244	-0.006	-0.007	0.000	0.009	1.1	0.4	1.1
	30/10/98	648457.394	390699.895	332.240	-0.003	-0.005	-0.004	0.007	0.6	0.5	1.4
	9/11/98	648457.395	390699.895	332.247	-0.002	-0.005	0.003	0.006	0.5	0.4	1.0
	23/11/98	648457.391	390699.894	332.246	-0.006	-0.006	0.002	0.009	0.3	0.3	0.7
	21/12/98	648457.392	390699.895	332.248	-0.005	-0.005	0.004	0.008	0.4	0.3	0.8
	5/1/99	648457.394	390699.896	332.238	-0.003	-0.004	-0.006	0.008	0.4	0.3	0.9
	18/1/99	648457.388	390699.894	332.246	-0.009	-0.006	0.002	0.011	0.3	0.2	0.6
	29/1/99	648457.393	390699.893	332.245	-0.004	-0.007	0.001	0.008	0.5	0.3	0.9
	12/2/99	648457.394	390699.890	332.241	-0.003	-0.010	-0.003	0.011	0.7	0.5	1.9
	26/2/99	648457.393	390699.893	332.247	-0.004	-0.007	0.003	0.009	0.4	0.3	0.8
	15/3/99	648457.390	390699.895	332.242	-0.007	-0.005	-0.002	0.009	0.5	0.4	0.9
	29/3/99	648457.397	390699.892	332.257	0.000	-0.008	0.013	0.015	0.9	0.6	2.1
	12/4/99	648457.393	390699.895	332.241	-0.004	-0.005	-0.003	0.007	0.4	0.3	0.9
	26/4/99	648457.392	390699.893	332.245	-0.005	-0.007	0.001	0.009	1.3	0.5	1.0
	10/5/99	648457.389	390699.892	332.233	-0.008	-0.008	-0.011	0.016	1.0	0.4	1.1
	24/5/99	648457.393	390699.895	332.246	-0.004	-0.005	0.002	0.007	0.5	0.2	0.4
	8/6/99	648457.393	390699.893	332.239	-0.004	-0.007	-0.005	0.009	0.3	0.3	0.6
	21/6/99	648457.390	390699.898	332.247	-0.007	-0.002	0.003	0.008	0.2	0.3	0.6
	5/7/99	648457.393	390699.899	332.241	-0.004	-0.001	-0.003	0.005	0.5	0.2	1.1
	19/7/99	648457.393	390699.895	332.241	-0.004	-0.005	-0.003	0.007	0.1	0.4	2.1
	19/1/00	648457.385	390699.889	332.238	-0.012	-0.011	-0.006	0.017	0.9	0.5	1.8
	7/7/00	648457.386	390699.886	332.242	-0.011	-0.014	-0.002	0.018	0.5	0.4	1.0
	7/12/00	648457.388	390699.897	332.261	-0.009	-0.003	0.017	0.019	1.2	0.8	2.5
	27/8/03	648457.379	390699.876	332.246	-0.018	-0.024	0.002	0.030	2.0	1.0	1.0
	11/3/04	648457.381	390699.901	332.268	-0.016	0.001	0.024	0.029	3.0	1.0	3.0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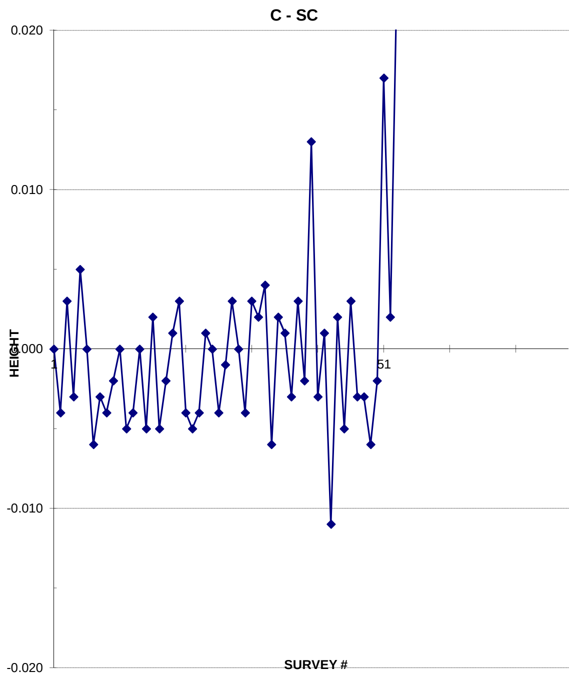
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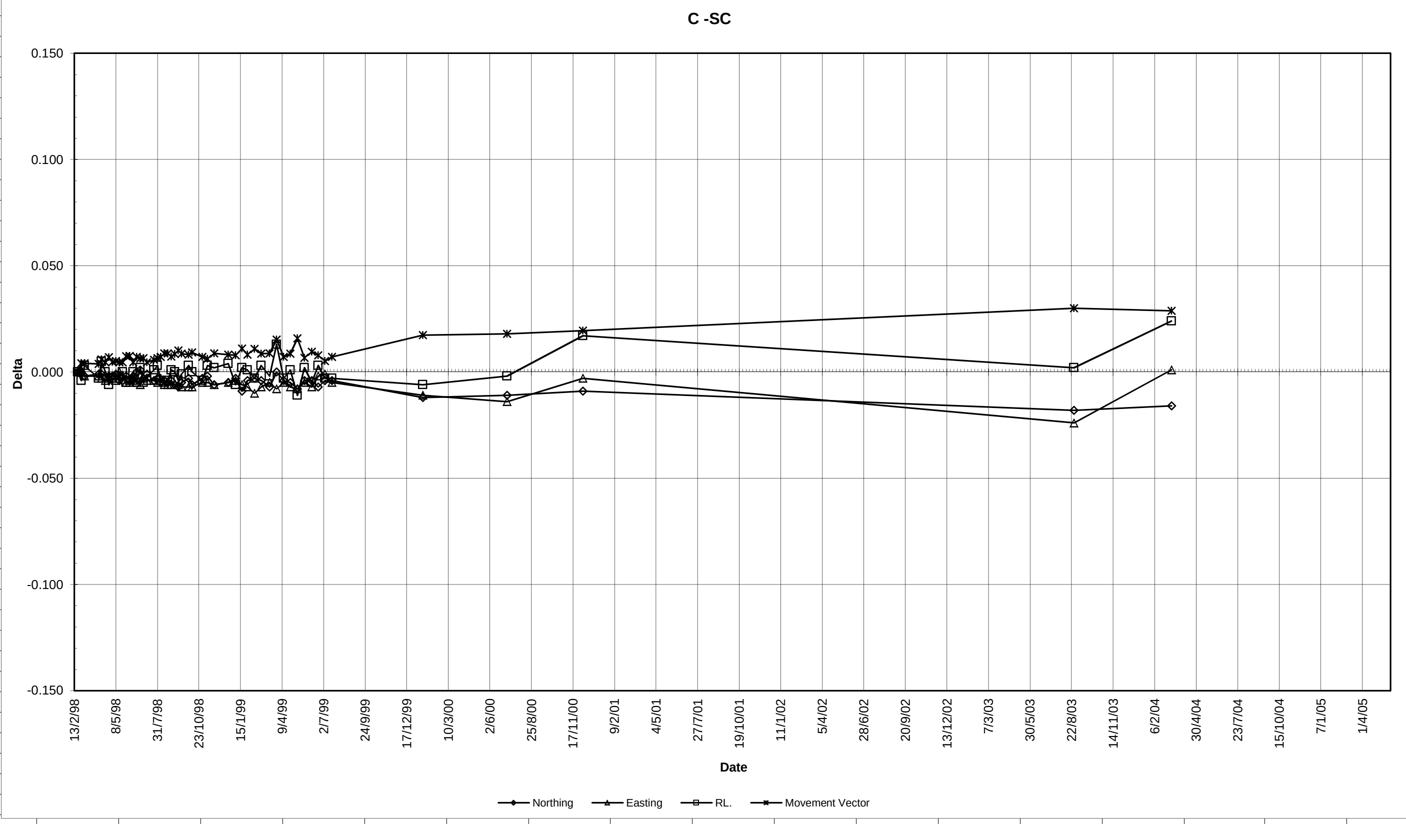
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31/7/98
23/10/98
15/1/99
9/4/99
2/7/99
24/9/99
17/12/99
10/3/00
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25/8/00
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4/5/01
27/7/01
19/10/01
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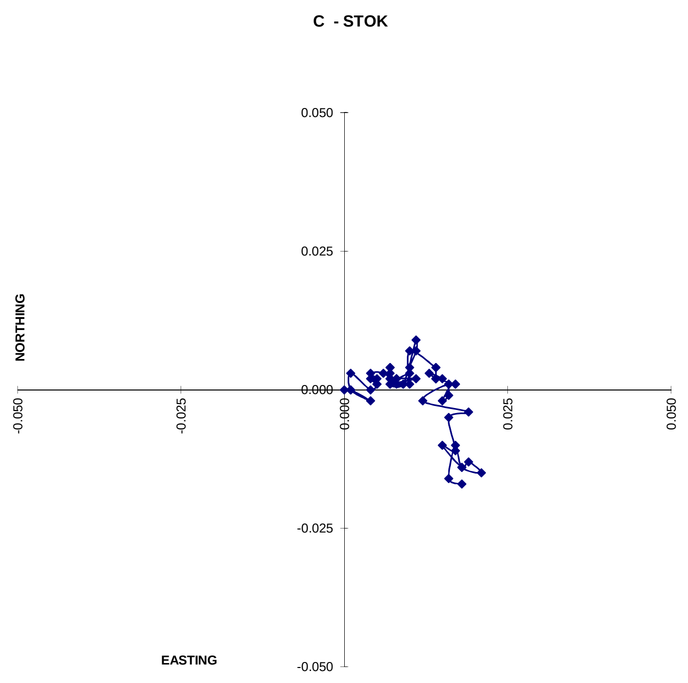
1/4/05
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-STOK	4/5/98	648418.611	390336.821	301.415	0.000	0.000	0.000	0.000	0.3	0.2	0.6
Static	11/5/98	648418.611	390336.822	301.414	0.000	0.001	-0.001	0.001	0.3	0.2	0.5
	18/5/98	648418.609	390336.825	301.416	-0.002	0.004	0.001	0.005	0.6	0.2	0.7
	25/5/98	648418.611	390336.822	301.414	0.000	0.001	-0.001	0.001	0.4	0.3	0.7
	1/6/98	648418.614	390336.822	301.412	0.003	0.001	-0.003	0.004	0.5	0.3	0.9
	8/6/98	648418.611	390336.825	301.419	0.000	0.004	0.004	0.006	0.5	0.4	1.1
	15/6/98	648418.612	390336.826	301.415	0.001	0.005	0.000	0.005	0.3	0.3	0.7
	22/6/98	648418.613	390336.825	301.416	0.002	0.004	0.001	0.005	0.3	0.2	0.7
	29/6/98	648418.612	390336.826	301.421	0.001	0.005	0.006	0.008	0.4	0.3	0.8
	6/7/98	648418.613	390336.826	301.418	0.002	0.005	0.003	0.006	0.4	0.3	0.8
	13/7/98	648418.614	390336.825	301.418	0.003	0.004	0.003	0.006	0.4	0.3	0.8
	20/7/98	648418.614	390336.827	301.414	0.003	0.006	-0.001	0.007	0.4	0.3	0.8
	27/7/98	648418.612	390336.829	301.420	0.001	0.008	0.005	0.009	0.6	0.4	1.2
	3/8/98	648418.614	390336.828	301.417	0.003	0.007	0.002	0.008	0.4	0.3	0.8
	10/8/98	648418.615	390336.828	301.423	0.004	0.007	0.008	0.011	0.6	0.4	1.1
	17/8/98	648418.615	390336.828	301.416	0.004	0.007	0.001	0.008	0.4	0.3	0.8
	24/8/98	648418.613	390336.828	301.418	0.002	0.007	0.003	0.008	0.3	0.3	0.9
	7/9/98	648418.613	390336.829	301.419	0.002	0.008	0.004	0.009	0.5	0.3	1.7
	14/9/98	648418.613	390336.828	301.422	0.002	0.007	0.007	0.010	0.4	0.3	1.3
	21/9/98	648418.613	390336.828	301.425	0.002	0.007	0.010	0.012	0.2	0.1	0.5
	28/9/98	648418.613	390336.829	301.425	0.002	0.008	0.010	0.013	0.6	0.3	1.2
	5/10/98	648418.613	390336.832	301.417	0.002	0.011	0.002	0.011	0.8	0.7	1.6
	12/10/98	648418.612	390336.828	301.424	0.001	0.007	0.009	0.011	0.8	0.4	1.7
	27/10/98	648418.612	390336.830	301.425	0.001	0.009	0.010	0.013	0.6	0.4	1.1
	2/11/98	648418.614	390336.831	301.421	0.003	0.010	0.006	0.012	0.5	0.4	1.1
	9/11/98	648418.612	390336.828	301.422	0.001	0.007	0.007	0.010	0.6	0.9	1.4
	23/11/98	648418.612	390336.830	301.425	0.001	0.009	0.010	0.013	0.4	0.3	0.9
	21/12/98	648418.620	390336.832	301.425	0.009	0.011	0.010	0.017	0.7	0.5	1.5
	5/1/99	648418.618	390336.832	301.417	0.007	0.011	0.002	0.013	0.6	0.4	1.2
	18/1/99	648418.615	390336.831	301.426	0.004	0.010	0.011	0.015	0.4	0.3	1.0
	29/1/99	648418.612	390336.831	301.428	0.001	0.010	0.013	0.016	0.4	0.3	0.9
	12/2/99	648418.618	390336.831	301.418	0.007	0.010	0.003	0.013	0.6	0.4	1.3
	26/2/99	648418.615	390336.835	301.415	0.004	0.014	0.000	0.015	0.8	0.6	1.8
	15/3/99	648418.615	390336.835	301.424	0.004	0.014	0.009	0.017	0.5	0.4	1.3
	29/3/99	648418.613	390336.835	301.419	0.002	0.014	0.004	0.015	0.5	0.3	1.2
	12/4/99	648418.613	390336.835	301.414	0.002	0.014	-0.001	0.014	0.4	0.4	0.9
	26/4/99	648418.614	390336.834	301.424	0.003	0.013	0.009	0.016	0.9	0.4	0.9
	10/5/99	648418.613	390336.836	301.418	0.002	0.015	0.003	0.015	1.1	0.5	1.3
	24/5/99	648418.613	390336.835	301.423	0.002	0.014	0.008	0.016	0.6	0.2	0.6
	8/6/99	648418.613	390336.835	301.419	0.002	0.014	0.004	0.015	0.5	0.3	0.9
	21/6/99	648418.612	390336.838	301.415	0.001	0.017	0.000	0.017	0.7	0.3	1.2
	5/7/99	648418.612	390336.838	301.415	0.001	0.017	0.000	0.017	0.5	0.3	1.7
	19/7/99	648418.612	390336.837	301.423	0.001	0.016	0.008	0.018	0.6	0.4	2.2
	24/11/99	648418.610	390336.837	301.428	-0.001	0.016	0.013	0.021	0.4	0.3	1.0
	18/1/00	648418.609	390336.836	301.430	-0.002	0.015	0.015	0.021	0.7	0.6	1.5
	11/7/00	648418.612	390336.837	301.426	0.001	0.016	0.011	0.019	0.4	0.4	1.1
	6/12/00	648418.609	390336.833	301.434	-0.002	0.012	0.019	0.023	0.5	0.3	1.1
	1/6/01	648418.607	390336.84	301.431	-0.004	0.019	0.016	0.025	0.7	0.6	1.5
	30/10/02	648418.606	390336.837	301.437	-0.005	0.016	0.022	0.028	1.0	1.0	1.0
	8/9/03	648418.600	390336.838	301.422	-0.011	0.017	0.007	0.021	1.0	0.0	1.0
	24/3/04	648418.601	390336.836	301.430	-0.010	0.015	0.015	0.023	1.0	0.0	2.0
	4/12/2009	648418.597	390336.839	301.436	-0.014	0.018	0.021	0.031	0.0	0.0	1.0
	22/06/2010	648418.598	390336.84	301.44	-0.013	0.019	0.025	0.034	0.0	0.0	1.0
	11/03/2011	648418.596	390336.842	301.438	-0.015	0.021	0.023	0.035	0.0	0.0	1.0
	18/10/11	648418.597	390336.839	301.438	-0.014	0.018	0.023	0.032	1.0	1.0	2.0
	17/01/2012	648418.601	390336.838	301.435	-0.010	0.017	0.020	0.028			
	2/11/12	648418.595	390336.837	301.435	-0.016	0.016	0.020	0.030	1.0	1.0	1.0
	3/2/14	648418.594	390336.839	301.437	-0.017	0.018	0.022	0.033	1.0	2.0	2.0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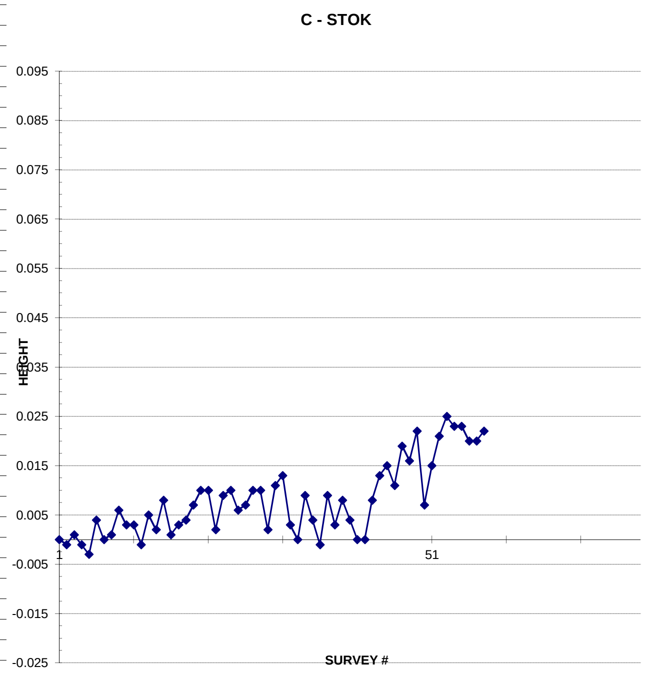
-0.025
0.000
0.025
0.050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SURVEY #
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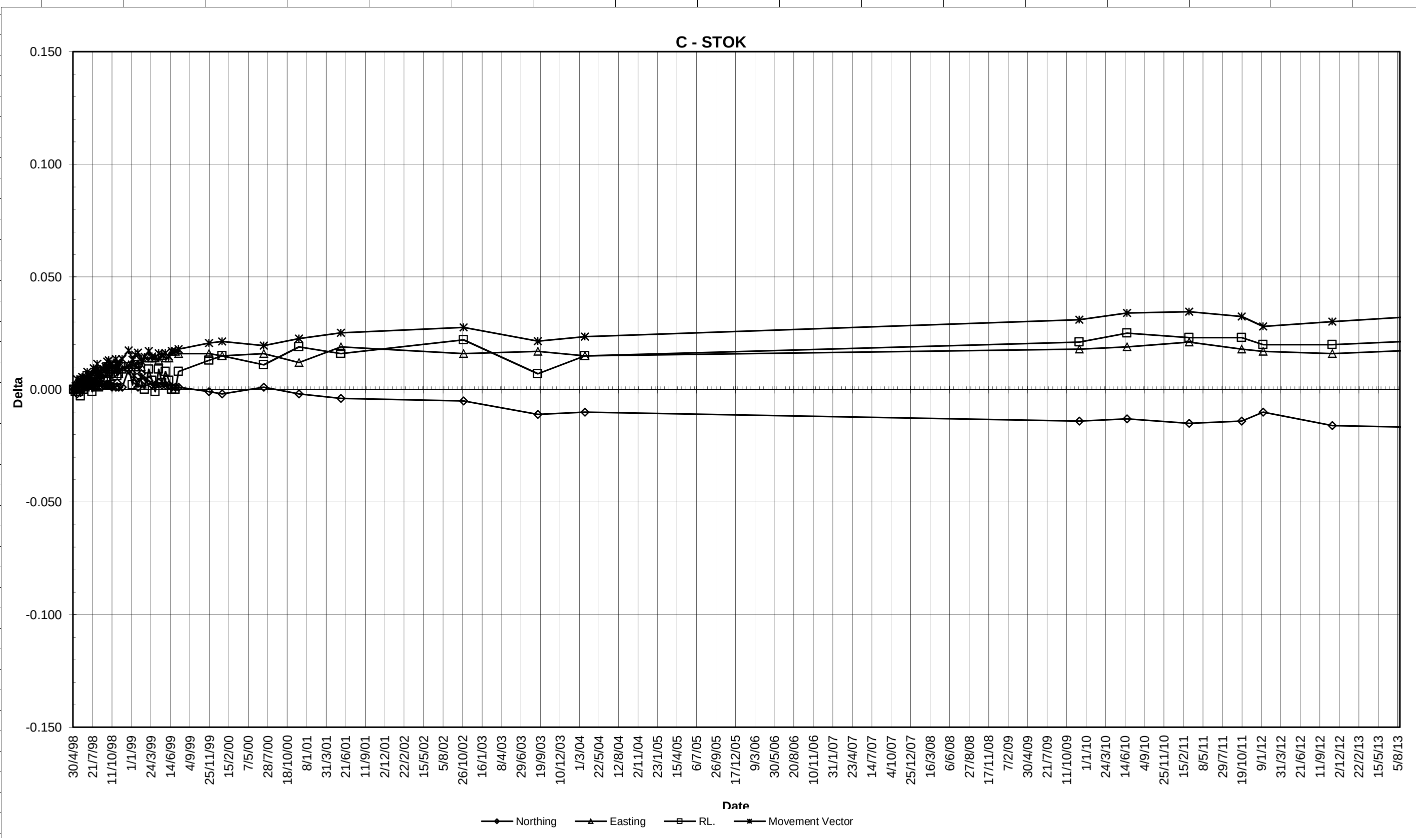
51


C - STOK
Delta
Date
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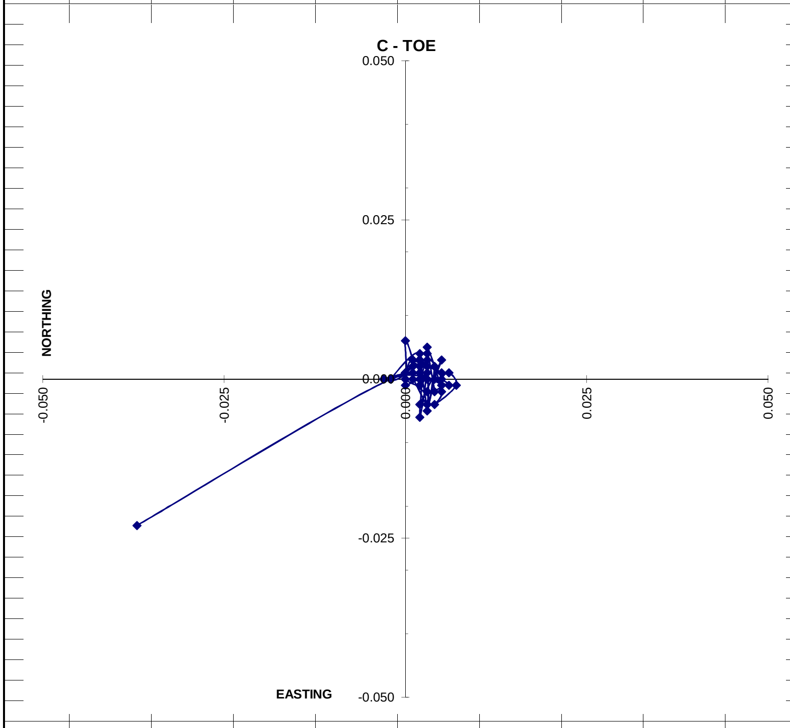
0.050
0.000
-0.050
-0.100
-0.150
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-TOE	12/2/98	648012.640	390026.430	262.330					Not Used In Data Set		
RTK	16/2/98	648012.664	390026.438	262.239							
STATIC	24/2/98	648012.647	390026.428	262.190	0.000	0.000	0.000	0.000			
RTK	3/3/98	648012.650	390026.429	262.204	0.003	0.001	0.014	0.014			
RTK	10/3/98	648012.648	390026.433	262.213	0.001	0.005	0.023	0.024			
	17/3/98	648012.650	390026.429	262.199	0.003	0.001	0.009	0.010	0.5	0.3	0.9
	7/4/98	648012.649	390026.430	262.197	0.002	0.002	0.007	0.008	0.6	0.4	1.2
	14/4/98	648012.650	390026.430	262.202	0.003	0.002	0.012	0.013	0.3	0.3	0.8
	21/4/98	648012.649	390026.431	262.184	0.002	0.003	-0.006	0.007	0.4	0.2	0.9
	28/4/98	648012.649	390026.429	262.207	0.002	0.001	0.017	0.017	0.6	0.4	1.1
	5/5/98	648012.648	390026.428	262.192	0.001	0.000	0.002	0.002	0.2	0.2	0.4
	12/5/98	648012.651	390026.431	262.198	0.004	0.003	0.008	0.009	0.4	0.3	0.7
	19/5/98	648012.641	390026.430	262.192	-0.006	0.002	0.002	0.007	0.5	0.4	0.9
	26/5/98	648012.651	390026.430	262.200	0.004	0.002	0.010	0.011	0.4	0.3	0.9
	2/6/98	648012.647	390026.426	262.197	0.000	-0.002	0.007	0.007	0.4	0.3	0.9
	9/6/98	648012.648	390026.428	262.206	0.001	0.000	0.016	0.016	0.3	0.2	0.6
	16/6/98	648012.653	390026.428	262.197	0.006	0.000	0.007	0.009	0.3	0.3	0.7
	23/6/98	648012.650	390026.429	262.200	0.003	0.001	0.010	0.010	0.3	0.3	0.7
	30/6/98	648012.648	390026.429	262.197	0.001	0.001	0.007	0.007	0.3	0.2	0.5
	7/7/98	648012.649	390026.429	262.198	0.002	0.001	0.008	0.008	0.3	0.2	0.6
	14/7/98	648012.648	390026.428	262.193	0.001	0.000	0.003	0.003	0.5	0.3	1.1
	21/7/98	648012.647	390026.425	262.198	0.000	-0.003	0.008	0.009	0.9	0.5	0.9
	28/7/98	648012.648	390026.430	262.193	0.001	0.002	0.003	0.004	0.3	0.2	0.6
	4/8/98	648012.647	390026.430	262.196	0.000	0.002	0.006	0.006	0.4	0.3	0.7
	11/8/98	648012.647	390026.428	262.201	0.000	0.000	0.011	0.011	1.0	0.6	2.1
	18/8/98	648012.646	390026.430	262.189	-0.001	0.002	-0.001	0.002	0.6	0.4	1.2
	25/8/98	648012.648	390026.431	262.192	0.001	0.003	0.002	0.004	0.6	0.4	1.3
	1/9/98	648012.647	390026.430	262.195	0.000	0.002	0.005	0.005	0.4	0.4	0.9
	8/9/98	648012.647	390026.430	262.205	0.000	0.002	0.015	0.015	0.7	0.5	2.3
	15/9/98	648012.647	390026.431	262.203	0.000	0.003	0.013	0.013	0.6	0.4	1.3
	22/9/98	648012.643	390026.431	262.212	-0.004	0.003	0.022	0.023	1.0	0.7	2.4
	29/9/98	648012.647	390026.429	262.186	0.000	0.001	-0.004	0.004	0.6	0.3	1.2
	6/10/98	648012.646	390026.428	262.194	-0.001	0.000	0.004	0.004	0.5	0.4	1.1
	13/10/98	648012.647	390026.431	262.205	0.000	0.003	0.015	0.015	0.6	0.4	1.1
	27/10/98	648012.642	390026.431	262.192	-0.005	0.003	0.002	0.006	0.6	0.5	1.4
	3/11/98	648012.649	390026.432	262.201	0.002	0.004	0.011	0.012	0.4	0.3	0.8
	10/11/98	648012.650	390026.431	262.201	0.003	0.003	0.011	0.012	0.5	0.4	1.1
	24/11/98	648012.646	390026.430	262.202	-0.001	0.002	0.012	0.012	0.3	0.3	0.7
	22/12/98	648012.645	390026.431	262.203	-0.002	0.003	0.013	0.013	0.3	0.4	0.7
	6/1/99	648012.646	390026.433	262.202	-0.001	0.005	0.012	0.013	0.6	0.5	1.3
	19/1/99	648012.648	390026.430	262.202	0.001	0.002	0.012	0.012	0.6	0.4	1.1
	16/2/99	648012.650	390026.430	262.201	0.003	0.002	0.011	0.012	0.4	0.3	0.9
	2/3/99	648012.643	390026.431	262.206	-0.004	0.003	0.016	0.017	0.6	0.4	1.5
	16/3/99	648012.647	390026.432	262.208	0.000	0.004	0.018	0.018	0.5	0.4	1.2
	30/3/99	648012.650	390026.433	262.203	0.003	0.005	0.013	0.014	0.7	0.4	1.6
	13/4/99	648012.643	390026.430	262.192	-0.004	0.002	0.002	0.005	0.5	0.4	1.1
	27/4/99	648012.645	390026.431	262.191	-0.002	0.003	0.001	0.004	0.7	0.3	0.8
	12/5/99	648012.645	390026.432	262.198	-0.002	0.004	0.008	0.009	0.5	0.2	0.6
	25/5/99	648012.652	390026.431	262.200	0.005	0.003	0.010	0.012	0.9	0.4	1.2
	9/6/99	648012.645	390026.433	262.201	-0.002	0.005	0.011	0.012	1.0	0.3	1.8
	22/6/99	648012.643	390026.432	262.182	-0.004	0.004	-0.008	0.010	0.5	0.3	0.9
	6/7/99	648012.646	390026.435	262.202	-0.001	0.007	0.012	0.014	0.7	0.5	2.0
	20/7/99	648012.648	390026.434	262.204	0.001	0.006	0.014	0.015	0.7	0.5	1.3
	18/1/00	648012.647	390026.433	262.201	0.000	0.005	0.011	0.012	0.6	0.4	1.2
	11/7/00	648012.646	390026.434	262.188	-0.001	0.006	-0.002	0.006	0.3	0.3	0.8
	6/12/00	648012.647	390026.426	262.207	0.000	-0.002	0.017	0.017	0.6	0.5	1.5
	1/6/01	648012.624	390026.391	262.277	-0.023	-0.037	0.087	0.097	1.6	1.1	3.3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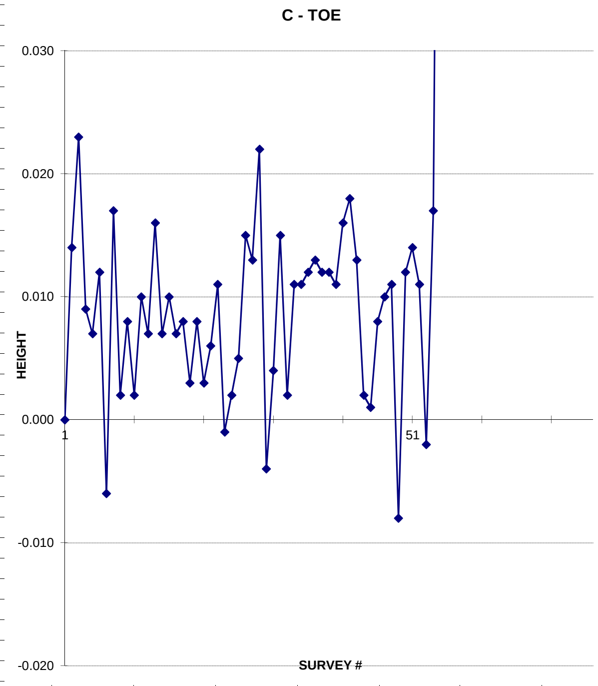
0.050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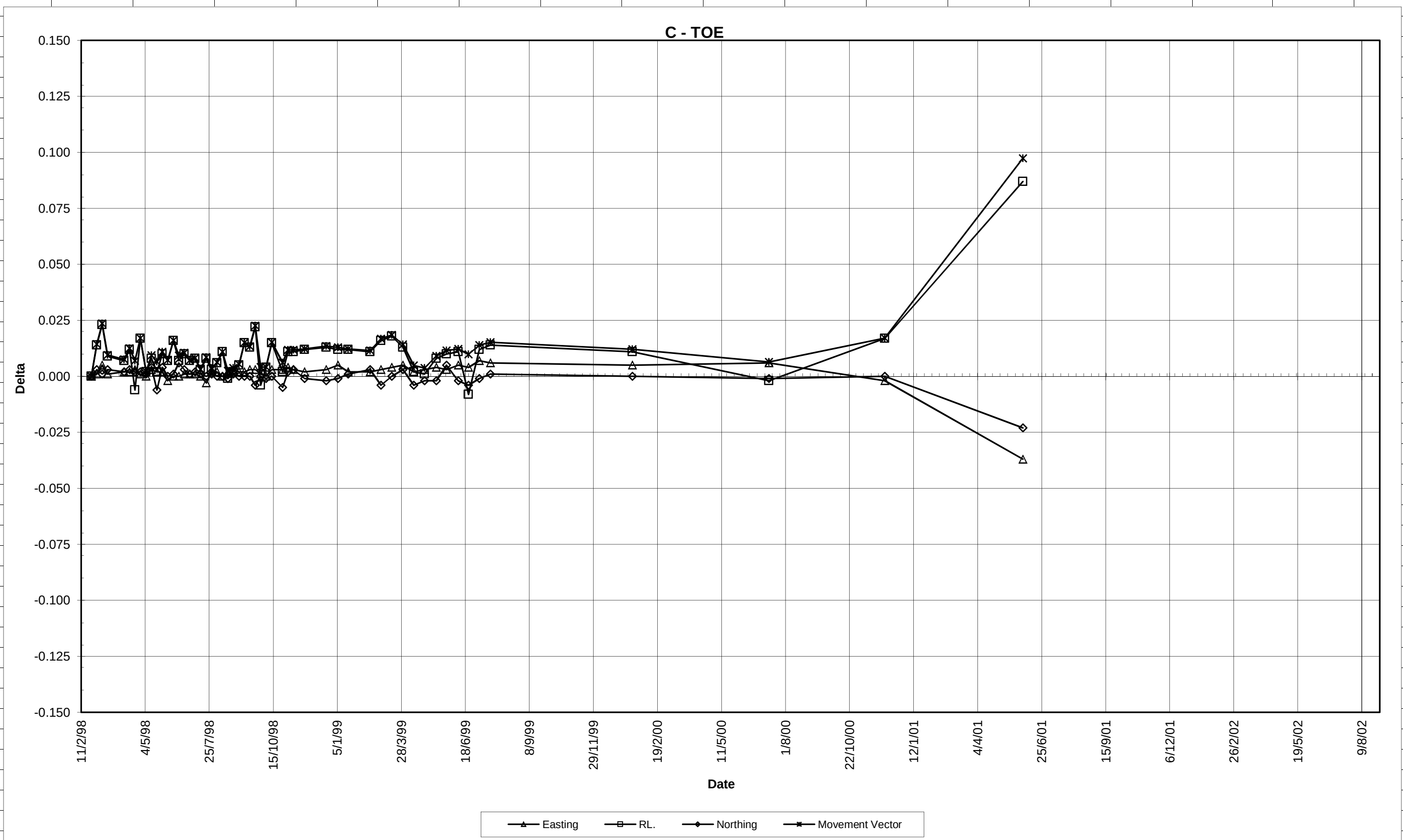
51


C - TOE
Delta
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0.025
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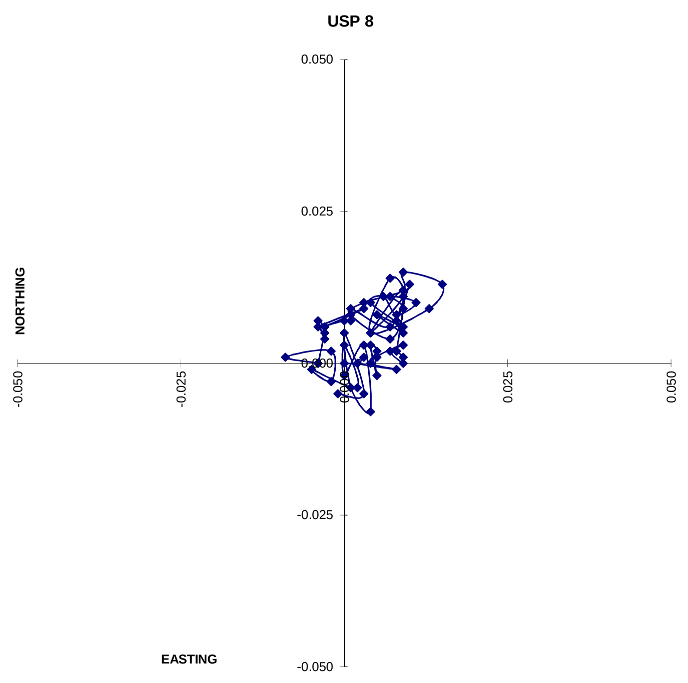
-0.100
-0.125
-0.150
11/2/98
4/5/98
25/7/98
15/10/98
5/1/99
28/3/99
18/6/99
8/9/99
29/11/99
19/2/00
11/5/00
1/8/00
22/10/00
12/1/01
4/4/01
25/6/01
15/9/01
6/12/01
26/2/02
19/5/02
9/8/02
Easting
RL.
Northing
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
USP 8	27/10/98	648363.076	390135.657	286.117	0.000	0.000	0.000	0.000	0.9	0.7	1.7
Static	3/11/98	648363.076	390135.659	286.122	0.000	0.002	0.005	0.005	0.6	0.6	1.2
	10/11/98	648363.077	390135.660	286.121	0.001	0.003	0.004	0.005	0.5	0.4	1.0
	24/11/98	648363.076	390135.659	286.122	0.000	0.002	0.005	0.005	0.5	0.4	1.0
	22/12/98	648363.075	390135.665	286.117	-0.001	0.008	0.000	0.008	0.4	0.3	1.0
	6/1/99	648363.076	390135.661	286.120	0.000	0.004	0.003	0.005	0.6	0.4	1.1
	19/1/99	648363.078	390135.662	286.125	0.002	0.005	0.008	0.010	0.4	0.3	0.8
	16/2/99	648363.079	390135.661	286.120	0.003	0.004	0.003	0.006	0.3	0.2	0.6
	2/3/99	648363.074	390135.662	286.122	-0.002	0.005	0.005	0.007	0.4	0.3	0.9
	16/3/99	648363.077	390135.662	286.113	0.001	0.005	-0.004	0.006	0.9	0.5	2.3
	22/3/99	648363.079	390135.666	286.124	0.003	0.009	0.007	0.012	0.4	0.4	0.9
	30/3/99	648363.078	390135.664	286.120	0.002	0.007	0.003	0.008	0.6	0.4	1.3
	9/4/99	648363.076	390135.666	286.124	0.000	0.009	0.007	0.011	0.5	0.4	1.1
	13/4/99	648363.077	390135.666	286.122	0.001	0.009	0.005	0.010	0.6	0.4	1.5
	27/4/99	648363.078	390135.665	286.119	0.002	0.008	0.002	0.008	0.7	0.3	0.7
NEW	25/5/99	648363.093	390135.644	286.167	0.002	0.008	0.002	0.008	0.9	0.4	1.1
	9/6/99	648363.103	390135.645	286.165	0.012	0.009	0.000	0.015	0.6	0.5	1.1
	22/6/99	648363.096	390135.640	286.153	0.005	0.004	-0.012	0.014	0.5	0.3	1.0
	6/7/99	648363.102	390135.645	286.163	0.011	0.009	-0.002	0.014	0.4	0.3	1.2
	20/7/99	648363.105	390135.643	286.169	0.014	0.007	0.004	0.016	0.6	0.4	2.1
	27/8/99	648363.096	390135.640	286.170	0.005	0.004	0.005	0.008	0.6	0.3	1.5
	28/9/99	648363.100	390135.649	286.172	0.009	0.013	0.007	0.017	0.4	0.6	1.0
	6/10/99	648363.104	390135.651	286.173	0.013	0.015	0.008	0.021	0.4	0.4	0.9
	28/10/99	648363.106	390135.645	286.176	0.015	0.009	0.011	0.021	0.3	0.2	0.6
	25/11/99	648363.103	390135.645	286.169	0.012	0.009	0.004	0.016	0.4	0.4	0.9
	15/12/99	648363.101	390135.639	286.161	0.010	0.003	-0.004	0.011	1.2	0.7	0.4
	14/1/00	648363.099	390135.637	286.166	0.008	0.001	0.001	0.008	0.4	0.2	0.8
	10/2/00	648363.095	390135.643	286.171	0.004	0.007	0.006	0.010	0.6	0.4	1.2
	2/3/00	648363.100	390135.645	286.171	0.009	0.009	0.006	0.014	0.4	0.3	0.8
	5/4/00	648363.102	390135.643	286.167	0.011	0.007	0.002	0.013	0.7	0.4	1.4
	4/5/00	648363.101	390135.647	286.167	0.010	0.011	0.002	0.015	1.1	1.5	1.5
	2/6/00	648363.099	390135.644	286.164	0.008	0.008	-0.001	0.011	0.6	1.1	1.1
	5/7/00	648363.102	390135.642	286.164	0.011	0.006	-0.001	0.013	0.4	0.2	0.7
	4/8/00	648363.101	390135.640	286.166	0.010	0.004	0.001	0.011	0.4	0.2	1.1
	11/9/00	648363.097	390135.645	286.166	0.006	0.009	0.001	0.011	0.8	0.5	1.5
	5/10/00	648363.099	390135.641	286.165	0.008	0.005	0.000	0.009	0.5	0.4	1.0
	3/11/00	648363.096	390135.645	286.161	0.005	0.009	-0.004	0.011	0.4	0.4	0.9
	4/12/00	648363.098	390135.644	286.167	0.007	0.008	0.002	0.011	0.4	0.3	0.8
	10/1/01	648363.104	390135.646	286.166	0.013	0.010	0.001	0.016	0.5	0.4	1.1
	6/3/01	648363.097	390135.643	286.170	0.006	0.007	0.005	0.010	0.4	0.3	0.8
	18/4/01	648363.100	390135.637	286.164	0.009	0.001	-0.001	0.009	0.4	0.4	1.1
	31/5/01	648363.098	390135.637	286.168	0.007	0.001	0.003	0.008	0.2	0.2	0.4
	17/9/01	648363.098	390135.636	286.173	0.007	0.000	0.008	0.011	1.0	0.0	1.0
	12/12/2001	648363.097	390135.632	286.172	0.006	-0.004	0.007	0.010	2.0	1.0	1.0
	14/3/02	648363.100	390135.639	286.176	0.009	0.003	0.011	0.015	1.0	0.0	1.0
	19/6/02	648363.097	390135.633	286.174	0.006	-0.003	0.009	0.011	1.0	0.0	0.0
	29/10/02	648363.097	390135.633	286.172	0.006	-0.003	0.007	0.010	1.0	0.0	1.0
	21/2/03	648363.098	390135.632	286.175	0.007	-0.004	0.010	0.013	1.0	0.0	1.0
	19/3/03	648363.095	390135.633	286.177	0.004	-0.003	0.012	0.013	1.0	0.0	1.0
	25/8/03	648363.096	390135.633	286.169	0.005	-0.003	0.004	0.007	1.0	1.0	1.0
	11/3/04	648363.091	390135.632	286.170	0.000	-0.004	0.005	0.006	1.0	1.0	1.0
	15/12/2004	648363.091	390135.632	286.180	0.000	-0.004	0.015	0.016	1.0	0.0	0.0
	26/10/2005	648363.092	390135.627	286.178	0.001	-0.009	0.013	0.016	1.0	1.0	1.0
	30/11/2006	648363.093	390135.634	286.177	0.002	-0.002	0.012	0.012	1.0	0.0	0.0
	16/01/2008	648363.088	390135.634	286.168	-0.003	-0.002	0.003	0.005	1.0	0.0	0.0
	29/10/2008	648363.09	390135.631	286.173	-0.001	-0.005	0.008	0.009	1.0	0.0	1.0
	9/03/2009	648363.087	390135.638	286.179	-0.004	0.002	0.014	0.015	1.0	0.0	1.0
	30/07/2009	648363.094	390135.636	286.188	0.003	0.000	0.023	0.023	1.0	0.0	2.0
	17/11/09	648363.089	390135.636	286.186	-0.002	0.000	0.021	0.021	1.0	1.0	3.0
	4/12/2009	648363.094	390135.639	286.191	0.003	0.003	0.026	0.026	1.0	1.0	2.0
	17/06/2010	648363.083	390135.64	286.183	-0.008	0.004	0.018	0.020	1.0	1.0	2.0
	4/02/2011	648363.087	390135.637	286.196	-0.004	0.001	0.031	0.031	0.0	0.0	1.0
	17/01/2012	648363.096	390135.636	286.185	0.005	0.000	0.020	0.021			
	22/10/2012	648363.086	390135.639	286.185	-0.005	0.003	0.020	0.021	1	1	2
	3/02/2014	648363.086	390135.635	286.181	-0.005	-0.001	0.016	0.017	1.0	1.0	4.0


USP 8
NORTHING
EASTING
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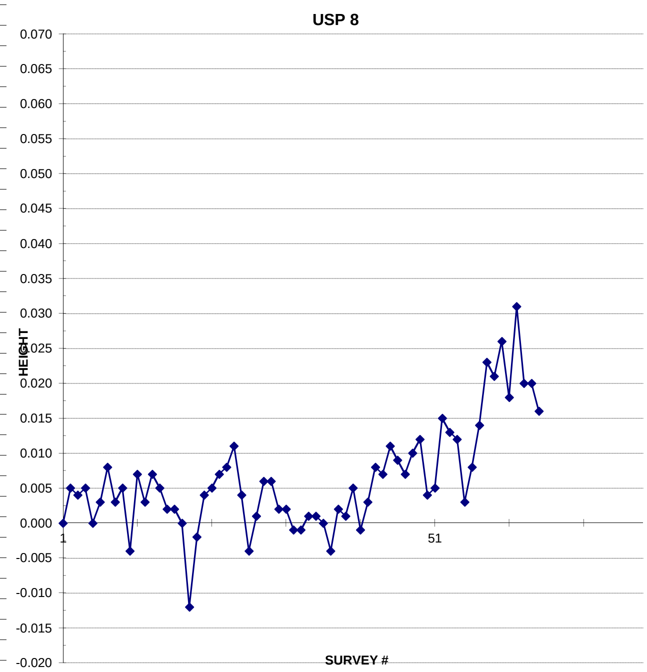
0.025
0.000
-0.025
-0.050
-0.050
-0.025
0.025
0.050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HEIGHT
SURVEY #
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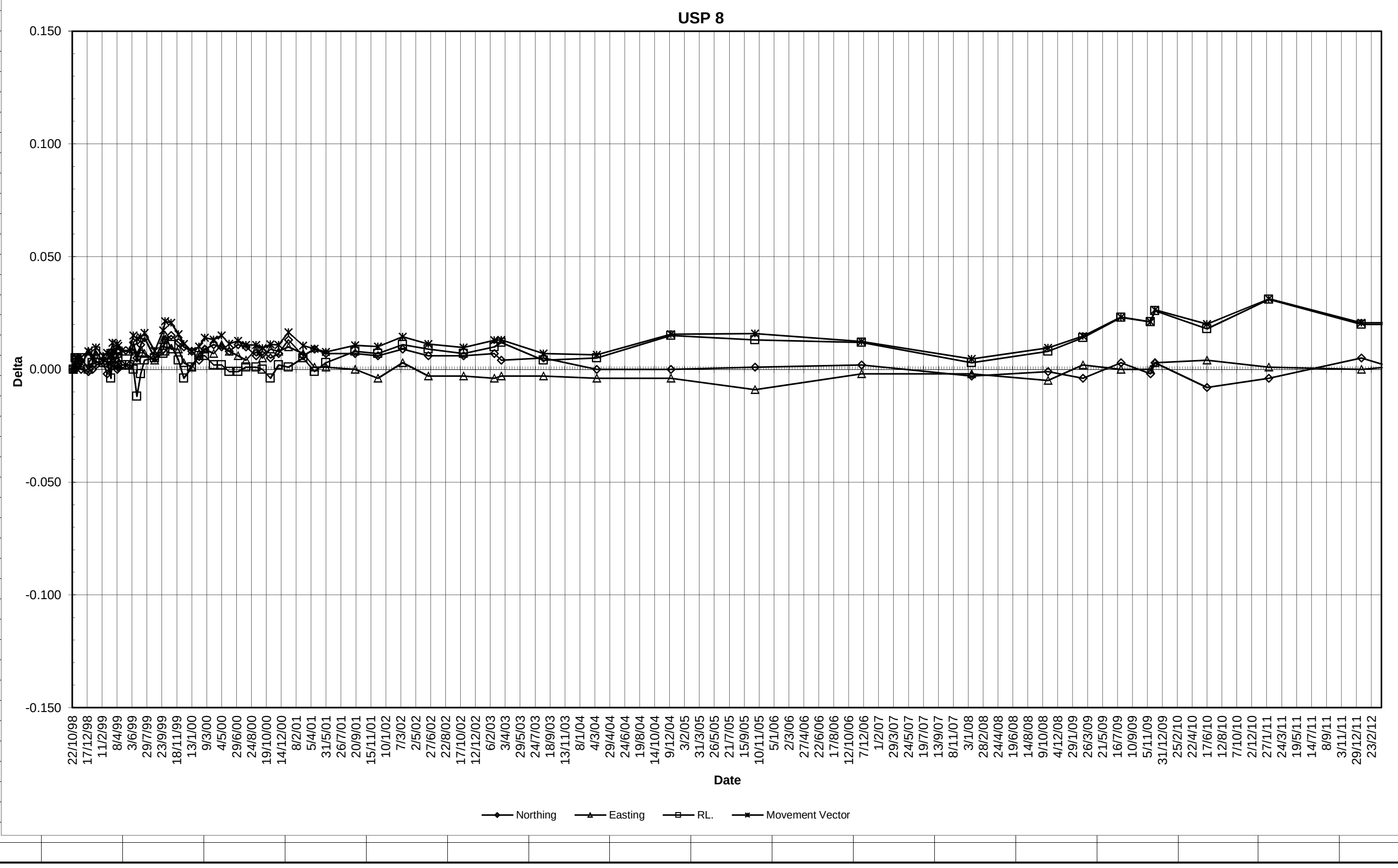
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
-0.005
-0.010
-0.015
-0.020
1
51


USP 8
Delta
Date
0.150
0.100
0.050
0.000
-0.050
-0.100
-0.150
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C 131	11/03/2011	647965.926	390136.902	250.733					2	1	5
C 131	18/10/2011	647965.920	390136.905	250.705	-0.006	0.003	-0.028	0.029	5	2	12
	17/01/2012	647965.939	390136.903	250.677	0.013	0.001	-0.056	0.057			
	2/11/12	647965.928	390136.900	250.703	0.002	-0.002	-0.030	0.030	2.0	1.0	1.0
	21/2/14	647965.919	390136.904	250.693	-0.007	0.002	-0.040	0.041	1.0	3.0	8.0

C 136	11/03/2011	649524.281	390918.386	445.767					0	1	1
C136	18/10/2011	649524.280	390918.386	445.771	-0.001	0.000	0.004	0.004	1	1	2
	17/01/2012	649524.256	390918.358	445.732	-0.025	-0.028	-0.035	0.051			
	9/10/2012	649524.275	390918.384	445.768	-0.006	-0.002	0.001	0.006	2	1	1
	30/01/2014	649524.276	390918.383	445.763	-0.005	-0.003	-0.004	0.007	1	1	5

Appendix D: Visual Inspection Records

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Quarterly visual inspection of Golden Cross mine site

Inspection Date: 9-10-12 **Time:** All day **Pond RL:** na

Weather: Overcast with breaks - windy **Inspected by:** PB

Item		Concern					General Observations			Comments	Action required (U = urgent) (R = routine)
		Movement/ slips	Seeps	Erosion	Cracks	Sink holes	Surface Drainage (1)	Instrument Intact (3)	Horiz drain Flows (2)		
Dam Embankment	Upstream Shoulder and crest	✓	✓	✓	✓	✓	✓	✓	✓		
	Right Abutment	✓	✓	✓	✓	✓	✓	✓	✓		
	Left Abutment	✓	✓	✓	✓	✓	✓	✓	✓		
	Saddle Embankment	✓	X	✓	✓	✓	✓	✓	✓	flows on road at base of slope.	
	Main Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
	Spring Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
	Portal Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
	Stockyard Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
Trig J Ridge		✓	✓	✓	✓	✓	✓	✓	✓		
Landslide Toe		✓	✓	✓	✓	✓	✓	✓	✓		
Air Strip											
Upper Waitekauri (Piezometer M8)											
Tailing Pond Margin											
Rear of Tailings Pond		✓	X	X	X	X	X	✓	✓	Significant drainage issues with WOD, reported to client.	
USD Wetland											
SYSD Wetland		✓	✓	✓	✓	✓	✓	✓	✓		
Open Pit		X	X	X	X	✓	X	✓	✓	number of slips on East pit wall - client notified	
Pond Outlet and Channel		✓	✓	✓	✓	✓	✓	✓	✓		

√ = No Problem
X = Problem

1.Check surface drainage for flow, erosion, obstructions and instability
2. Check horiz drains for visual normality ie. Flow rate and turbidity
3. Check outlet and channel for damage, corrosion and blockage.

COEUR
THE PRECIOUS METALS COMPANY

Quarterly visual inspection of Golden Cross mine site

Inspection Date: 31-1-14 **Time:** **Pond RL:**

Weather: Clear, sunny, warm, prolonged dry period **Inspected by:** RB

Item		Concern					General Observations			Comments	Action required (U = urgent) (R = routine)
		Movement/ slips	Seeps	Erosion	Cracks	Sink holes	Surface Drainage (1)	Instrument Intact (3)	Horiz drain Flows (2)		
Dam Embankment	Upstream Shoulder and crest	✓	✓	✓	✓	✓	✓	✓	✓		
	Right Abutment	✓	✓	✓	✓	✓	✓	✓	✓		
	Left Abutment	✓	✓	✓	✓	✓	✓	✓	✓		
	Saddle Embankment	✓	✓	✓	✓	✓	✓	✓	✓	no spring on access road.	
	Main Embankment	✓	✓	✓	✓	✓	✓	✓	✓	very dry.	
	Spring Embankment	✓	✓	✓	✓	✓	✓	✓	✓	Q series HD v. low → no flow.	
	Portal Embankment										
	Stockyard Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
Trig J Ridge		✓	✓	✓	✓	✓	✓	✓	✓		
Landslide Toe		✓	✓	✓	✓	✓	✓	✓	✓		
Air Strip		✓	✓	✓	✓	✓	✓	✓	✓		
Upper Waitekauri (Piezometer M8)		✓	✓	✓	✓	✓	✓	✓	✓		
Tailing Pond Margin		✓	✓	✓	✓	✓	✓	✓	✓		
Rear of Tailings Pond		X	✓	✓	X	✓	✓	✓	✓	* notebook.	
USD Wetland		✓	✓	✓	✓	✓	✓	✓	✓		
SYSD Wetland		✓	✓	✓	✓	✓	✓	✓	✓	SYD WL very low.	approx 3-400mm below crest.
Open Pit		X	✓	X	X	X	✓	✓	✓	Further perimeter slumping of feature.	
Pond Outlet and Channel		✓	✓	✓	✓	✓	✓	✓	✓	v. low flow through outlet.	

√ = No Problem
X = Problem

1.Check surface drainage for flow, erosion, obstructions and instability
2. Check horiz drains for visual normality ie. Flow rate and turbidity
3. Check outlet and channel for damage, corrosion and blockage.

REPORT

Coeur d'Alene Mines Corporation

Golden Cross Landslide Monitoring Report
June 2010 to October 2012 Monitoring Period

Report prepared for:

COEUR D'ALENE MINES CORPORATION

Report prepared by:

Tonkin & Taylor Ltd

Distribution:

COEUR D'ALENE MINES CORPORATION	2 copies
Viking Mining Ltd	1 copy
Tonkin & Taylor Ltd (FILE)	1 copy

June 2013

T&T Ref: 613625.001

Table of contents

1 Introduction 1
- 1.1 General 1
- 1.2 GPS data processing software status 1

2 Rainfall 2

3 Groundwater 2

4 Mass movement monitoring 3
- 4.1 General 3
- 4.2 Inclinometers 3
- 4.3 GPS 3
  - 4.3.1 Regular stations 3
  - 4.3.2 Additional stations from November/December 2009 5
  - 4.3.3 Additional stations from February 2011 6

5 Visual inspection 6

6 Small scale pit instability 7

7 Technical memorandum 7

8 Summary 7

9 Applicability 8

Appendix A: Monitoring Network

Appendix B: Rainfall

Appendix C: GPS Data

Appendix D: Visual Inspection Records

Appendix E: Technical Memorandum

1 Introduction

1.1 General

This report presents a summary of the monitoring data gathered from selected monitoring locations at the Golden Cross Mine for the period from June 2010 to October 2012. Monitoring data was collected in March 2011, October 2011, January 2012 and October 2012 and is presented and discussed in this report.

Monitoring is carried out by Geotechnics Ltd in a format agreed by all interested parties (i.e. representatives of Coeur Gold NZ Ltd, Viking Mining Ltd, Tonkin & Taylor Ltd (T&T), URS Corp and Environment Waikato) at a Landslide Review Meeting in October 2002.

This report is intended to summarise the period's rainfall characteristics, significant changes to monitored piezometric levels and any significant changes identified within the GPS and crackmeter data. In addition, this report outlines visual inspection data collected on site with photographic records. Attached to this report are:

- Appendix A – Monitoring Network;
- Appendix B - Rainfall Data;
- Appendix C - GPS Data;
- Appendix D - Visual Inspection Records;
- Appendix E - Technical Memorandum.

1.2 GPS data processing software status

There has been inconsistency and sometimes anomalous GPS data produced by the data processing data software, TGO V1.63 which was introduced in 2008. This data suggested apparent significant vertical movements and unusually high variability in plan readings.

A review of both the data processing software and monitoring equipment and process was undertaken by an independent registered surveyor, Errol Balks of Earthbrooke Views Ltd in June 2012. Mr Balks was previously an employee of CKL Surveys Ltd (CKL), the historic GPS data processor, and was familiar with the systems used. He processed the October 2008 to January 2012 data using both the more recent TGO V1.63 version of the data reduction programme (which had been exclusively used during the period by CKL) and the older version TGO V1.60, used by CKL for data processing prior to October 2008.

The review identified that the data processing using TGO V1.60 showed much less variation in the graphs and movement vectors were consistent with previous trends observed prior to 2008. The TGO V1.63 was considered to be the reason for the data variability and it was therefore recommended that the TGO V1.60 processed data be adopted for the period.

The TGO data processing package has now legally expired and new data processing software, Topcon Tools has been adopted for future processing.

Accordingly, all TGO V1.63 processed data has since has been discarded and re-processed with TGO V1.60 for October 2008 to January 2012. The October 2012 monitoring data has been processed using the new Topcon Tools package and its validity confirmed by also processing with the TGOV1.60 software. The re-processed data for October 2008 to October 2012, together with the historic monitoring data is presented in Appendix C of this report.

2 Rainfall

The annual rainfall for 2010 and 2011 were 2189 mm and 1928 mm respectively. The 2012 rainfall prior to 31 October 2012 was 2251 mm and the 2012 annual rainfall was 2605 mm. The rainfall for 2010, 2011 and 2012 are well below the average annual rainfall of 2787 mm, as recorded by the rainfall gauge at the Water Treatment Plant (WTP). The annual rainfall recorded during the last five years has been below the average annual rainfall and the rainfall for the years 2000 to 2007 were all above the average of 2787 mm.

There have been multiple large rainfall events and long periods of low rainfall during the monitoring period. Rainfall events of note were as follows:

- 267 mm occurred in the period 18th to 30th June 2010 with a peak of 139 mm on 25th June 2010;
- Cyclone Wilma battered the Coromandel Peninsula in late January 2011 and during the period between 23rd and 29th of January 2011, 230 mm of rainfall was recorded with a peak of 112 mm on 23 January 2011;
- 119 mm was recorded on 23 March 2011;
- 111 mm was recorded on 24 July 2011;
- 111 mm was recorded on 10 May 2012;
- 485 mm was recorded in July 2012, with three days exceeding a daily rainfall of 100 mm and a maximum daily rainfall of 111 mm. The Waikato Regional Council (WRC) Golden Cross rainfall gauge (located north and elevated approximately 200 m above WTP gauge) recorded 760 mm of rain in July 2012, including 400 mm on 23 July 2012.

Rainfall in the monitoring period was below average during 19 of the 28 months in the monitoring period. Long spells of relatively dry weather comprising no daily rainfall exceeding 50 mm was observed during the periods; 27 June 2010 to 22 January 2011, 24 March 2011 to 23 July 2011 and 25 July 2011 to 2 January 2012.

3 Groundwater

Groundwater monitoring data is presented in Table 1 below. Five of the eight remaining piezometers monitored showed increases in groundwater levels from the previous period with the exceptions being PW25 (-2.9 m), N7 (-1.2 m) and N45 (-5.9 m).

Stockyard Union Volcanics piezo N142 is no longer readable due to tube constriction. N45 and N132/1 were thought to be blocked but the groundwater level was able to be measured with a smaller dipping probe in February 2013.

The average change in water level was +0.33 m increase in groundwater levels, perhaps due to the October 2012 reading having been preceded by a relatively wet July to September period.

Table 1 – Significant changes in monitored piezometers levels (June 2010 to October 2012 / February 2013)

Piezometer I.D.	Location	Geological Unit	Type	Change (m)
PW25	Rear of Tailings Pond	Union Volcanics	Standpipe	-2.9[1]
N7	Trig J	Lower Omahia A	Pneumatic	-1.2
N9	Trig J	Lower Omahia A	Pneumatic	+1.2
N45	Spring Creek	Lower Omahia A	Standpipe	-5.9
N132/1	Stockyard	Basement	Standpipe	+7.2
N132/2	Stockyard	Lower Omahia A	Pneumatic	+0.7
N132/3	Stockyard	Lower Omahia A	Pneumatic	+0.6
N142	Stockyard	Union Volcanics/ Slide base	Pneumatic	No return
M8	Upper Waitekauri	Coromandel Group/ Empire Vein	Standpipe	+2.8 m[1]
			Average	+0.33[1]

Notes:

1 PW25, N45, N132/1, N132/2 and M8 were measured in early 2013 and therefore this change has not been included in determining the average change during the June 2010 to October 2012 period.

4 Mass movement monitoring

4.1 General

As mentioned in Section 1.2, GPS monitoring data presented in this report supersedes the GPS monitoring data included in previously issued monitoring reports for the periods October 2008 to November 2009 and November 2009 to June 2010 due to the GPS software variability.

4.2 Inclinometers

No inclinometers are currently read.

4.3 GPS

4.3.1 Regular stations

GPS data for the regularly monitored monuments for the subject monitoring period June 2010 to October 2012 is presented in Table 2 below, together with the data from the previous two years for comparison. The previously reported data for the October 2008 to June 2010 has been superseded by the data reprocessed with TGO V1.60 and is included in Table 2.

Table 2 – Summary of GPS data

Location	ID	October 2008 to June 2010 (20 months)		June 2010 to October 2012 (28 months)		
		Plan Movement[1] (mm)	Vertical Movement [1&2] (mm)	Plan Movement[3] (mm)	Net Movement Direction[3] (°)	Vertical Movement[2] (mm)
Rear of Tailings Pond, Upper Slide	C-2	2 *(3)*	-2 *(0)*	11 (4.7 mm/yr) [3.8]	190 [200]	+1
Saddle, Upper Slide	C-Sad	3 *(5)*	-12 *(-13)*	16 (6.9 mm/yr) [3.1]	252 [264]	-2
Main Embankment, Mid Slide	C-Mid	2 *(8)*	-12 *(-16)*	4 (1.7 mm/yr) [4.0]	270 [281]	-13
Central Ridge, Mid Slide	C-K5	1 *(7)*	+7 *(+5)*	10 (4.3 mm/yr) [3.3]	241 [229]	-13
Stockyard, Lower Slide	C-SYD	3 *(5)*	+2 *(+3)*	2 (0.9 mm/yr) [1.3]	27 [187]	-3
Union Silt Pond	USP-8	11 *(4)*	+10 *(+5)*	3 (1.3 mm/yr) [1.6]	342 [201]	+3
Average		3.7 (2.2 mm/yr) *(6.4)* *(10 month ann. rate)*		7.7 (3.3 mm/yr) [2.9] (12 year ave. ann. rate)		

Notes:

Theoretical Instrument error for static GPS is 3 to 5mm for the period

1 Italic brackets (x) indicate corresponding January 2008-October 2008 period.

2 Positive numbers indicate upwards movement and negative numbers indicate downwards movement for the 28 month monitoring period.

3 Square brackets [x] indicate average plan movement per year and direction for 12 year period 2001 – 2012.

All monitored monuments recorded plan movements during the subject 28 months monitoring period range from 16 mm (C-Sad) to 2 mm (C-SYD) with an average of 7.7 mm and an annual average of 3.3 mm/year. The plan average annual movement rate of 3.3 mm/year is relatively consistent (14% higher) with the 2.9 mm/year average movement rate from 2001 to 2012 but all of the readings are significantly lower than the emergency threshold of 75 mm per year. The orientation of the recent plan movement for C-2, C-Sad, C-Mid and CK5 is consistent with historic movement indicating the movement is likely to be valid. However, the recent recorded plan movement of C-SYD and USP-8 is inconsistent with historical data; therefore it is likely the recorded very small movement of these monuments is within GPS error tolerance and actual plan movement is minimal.

The vertical movements recorded are relatively small, ranging between -13 mm (i.e. downward movement) for C-Mid and C-K5 and +3 mm (upward movement) for USP-8.

4.3.2 Additional stations from November/December 2009

As a result of the unusual vertical readings on some of the monuments between October 2008 and July 2009, it was agreed (during the annual Landslide Review Panel meeting of 4/9/09) to commence monitoring six previously monitored monuments. These were C-RA, C-J (Upper Slide), C-Stok (Lower Slide), C-Base, C-8, USP-6 (Off Slide). The results for C-8, C-J and C-Base were not considered reliable due to the large number of nearby pine trees and these have not been presented. In addition, monument C-USP was installed to replace USP-6 as it was impossible to read. Results are presented in Table 3 below. Note that Table 3 also presents the average annual plan movement for each station for the last 12 years.

Table 3 – Extra GPS monument monitoring

Location	ID	November/December 2009 to June 2010 (7 months)		June 2010 to October 2012 (28 months)		
		Plan Movement (mm)	Vertical Movement[1] (mm)	Plan Movement[2] (mm)	Net Movement Direction[2] (°)	Vertical Movement[1] (mm)
Right Abutment, Upper Slide	C-RA	1	+3	3 (1.3 mm/yr) [2.5]	72 [136]	+4
Stockyard Fill, Mid Slide	C-Stok	1	+4	4 (1.7 mm/yr) [1.2]	225 [164]	-5
Union Silt Pond, Off Slide	C-USP	7	-11	5 (2.1 mm/yr) [2.0]	117 [144]	+1
Average		3 (5.1mm/yr)		4 (1.7 mm/yr) [1.9] (12 year ave. ann. Rate)		

Notes:

Theoretical Instrument error for static GPS is 3 to 5 mm for the period

1 Positive numbers indicate upwards movement and negative numbers indicate downwards movement.

2 Square brackets [x] indicate average plan movement per year and direction for 12 year period 2001 – 2012.

All of these monuments have shown relatively small plan movements for the monitoring period ranging from 3 mm (C-RA) to 5 mm (C-USP) with an average of 4 mm giving an annual rate of 1.7 mm/year, similar to the 12 year annualised rate of 1.9 mm/year. These rates are within the range of accuracy of the equipment and may be considered to be negligible.

The vertical movements range between -5 mm (downward movement) for C-Stok and +4 mm (upward movement) for C-RA.

4.3.3 Additional stations from February 2011

To further increase the coverage of the monitoring network it was also agreed (during the annual Landslide Review Panel meeting of November 11, 2010) to convert two previously monitored on-slide inclinometers to GPS monuments. This has been carried out and initial base readings were taken in February 2011 with the last reading taken in October 2012.

Table 4 – New GPS monument monitoring

Location	ID	February 2011 to October 2012 (20 months)		
		Plan Movement (mm)	Net Movement Direction (°)	Vertical Movement[1] (mm)
Toe of Access road	C-131	3 (1.8mm/yr)	315	-30
Rear of Tailings Dam and below WDD	C-136	6 (3.3mm/yr)	198	+1

Notes:

Theoretical Instrument error for static GPS is 3 to 5 mm for the period

1 Positive numbers indicate upwards movement and negative numbers indicate downwards movement.

The two new GPS monitoring monuments have plan movements for the monitoring period ranging from 3 mm (C-131) to 6 mm (C-136).

C-131 has an apparent vertical movement for the period of -30 mm (downward movement). Given the small plan movement and generally upward historic movement of C-131, this vertical reading is considered anomalous. Once more monitoring data is available and movement trends can be established, reliable interpretation of results will be possible.

5 Visual inspection

Formal visual inspections were carried out on site by Paul Burton on the 9th of February 2011 and the 9th of October 2012. Results are summarised as follows:

1. 9/2/2011 Inspection

   The slip near the portal embankment had re-vegetated. It was also noted there was no increase in the number of small erosional landslips in the Open Pit. There was no evidence of distortion of the road surface near N131 at the toe of the lower slide.

2. 9/10/2012 Inspection

   Two small scale shallow landslips (Pit Slip 1 and Pit Slip 2) which occurred following heavy rainfall in July 2012 on the eastern side of the backfilled Open Pit were observed. Reactivation of a relatively small scale deep seated historic instability (Eastern Pit Scarp) towards the pit also occurred following the July 2012 rainfall event. The two slips and the Eastern Pit Slip are discussed further in Sections 6 and 7 below.

   The number and extent of cracks in the Western Diversion Drain (WDD) shotcrete lining identified in 2009 appear to have increased since the previous crack monitoring survey was completed in February 2011 as detailed in the Golden Cross Crack Meter Report (ref: 613625 – DFB. 150410). Some seepage of water into the cracks was evident.

Visual inspection sheets for the two visits are included in Appendix D.

6 Small scale pit instability

As mentioned in Section 5, two landslips (Pit Slip 1 and Pit Slip 2) on the eastern side of the open pit were identified following the heavy rainfall event of July 2012. Reactivation of a historic instability (Eastern Pit Scarp) was also observed above the eastern side of the open pit.

Pit Slip 1 is approximately 1.5 m deep and 20 m wide and extends downslope approximately 30 m. The landslip debris has inundated land downslope, including the rock lined drain below. It was considered likely that the headscarp of the landslip would continue to regress upslope during heavy rainfall and therefore remediation was recommended. This was designed by T&T and required placement of imported fill and longitudinal buttress drains. The remediation of this landslip was completed in April 2013.

Pit Slip 2 comprises an approximately 35 m wide shallow (less than 1 m deep) slump. The land has not fully evacuated and the vegetation has had minor disturbance only. Similarly to adjacent historic surface slumps observed within the open pit, it is considered likely that the slip will self stabilise and therefore no remediation is required.

The Eastern Pit Scarp is considered to be a reactivation of a landslip towards the Open Pit identified in 2007. The reactivation occurred during an extremely wet period in July 2012. It was approximately 70 m wide and the ground surface expression at the head comprised an approximately 300 mm high scarp with an approximately 1 m deep crack at the scarp base. The crack has since been filled with compacted cohesive fill and the scarp smoothed to permit vehicle access. It is more than 180 m from the “main” Golden Cross Landslide and accordingly, no further remediation is proposed; the scarp will continue to be visually monitored regularly.

The locations of Pit Slip 1, Pit Slip 2 and the Eastern Pit Scarp is shown on the Monitoring Network Figure included in Appendix A.

7 Technical memorandum

The Technical Memorandum (Tech Memo) appended to this document is an interpretative review of the monitoring results for the Golden Cross Landslide for the period June 2010 to October 2012 and of selected monitoring data dating back to 2001. It includes further historic data relating to the Landslide and drainage works and provides a summary of the current Landslide movement within a historic context.

The Tech Memo has been included in Appendix E and should be read in conjunction with this Landslide Monitoring Report.

8 Summary

In summary, the reprocessed GPS data for October 2008 to January 2012 has been found to provide reliable plan and vertical movements consistent with previous trends. The January 2012 to October 2012 data (the latest data) has also been found to be consistent with historic data.

Five of the eight monitored piezometers show minor piezometric rises during the monitoring period; this is likely to be due to a very wet July to September period preceding the October 2012 monitoring.

GPS movement rates for “on slide” GPS stations from June 2010 to October 2012 (the period of this monitoring report) range from 0.9 to 6.9 mm/year with an average of around 3 mm/year, consistent with the average annual rate for the last 12 years.

Two small scale landslips (Pit Slip 1 and Pit Slip 2) and a reactivation of a historic instability (Eastern Pit Scarp) on the eastern side of the open pit were identified following heavy rainfall in July 2012. The landslips and historic instability are considered unrelated to the main Landslide. Remediation comprising placement of imported fill and longitudinal buttress drains to repair Pit Slip 1 was completed in April 2013. Pit Slip 2 is expected to self stabilise and the Eastern Pit Scarp will continue to be visually monitored regularly.

9 Applicability

This report has been prepared for the benefit of Coeur d'Alene Mines Corporation with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

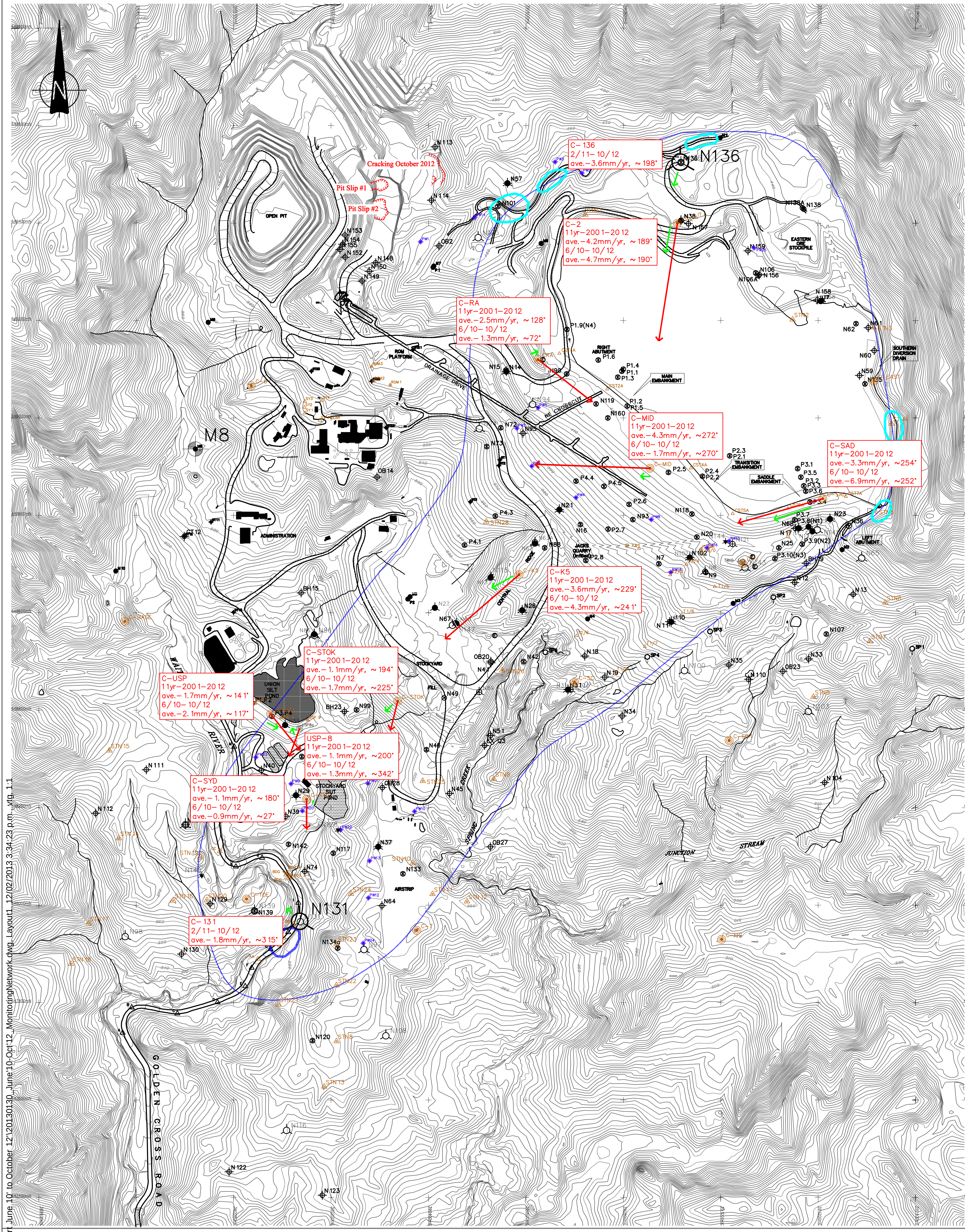
Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
B Harrison	G Loney ....
Ben Harrison	Grant Loney
Geotechnical Engineer	Project Director

BTH:rmt

P:\613625\613625.001\Monitoring report June 10' to October 12'\Reports final\Monitoring report\bth10062013.rep.docx

Appendix A: Monitoring Network



LEGEND

April 1998 Major Contour

TRIG. J Trig
Secondary Survey Station
C-7 Static GPS Monument
CST1 Temporary Survey Points
Temporary (surface) extensometer

N88 Active Inclinometer
N22 Blocked Inclinometer
N88 Shear Monitor
N128 Blocked Inclinometer reinstrumented with TDR co-axial cable

OB28 Standpipe piezometer (recent investigations or older investigations still readable)
P3.1 Pneumatic Piezometer (in fill or foundation)
M5 Groundwater Monitoring Well (Environmental)

SP1 Monitoring spring
PW1 Pumping Well
Plan movement 2001-2012
Plan movement in last monitoring period
(Plan movement arrows proportional to length 1mm=5m)

Visual inspection cracks zone
Apparent road deformation zone

SCALE 1:7100 (A3)
SCALE 1:2500 (A0)
0 25 50 75 100 150 200 250 (m)

REVISION	CHECKED BY	DATE
General revisions	TPC	10/98
General revisions	TPC	02/99
General revisions	PB	11/08
General revisions	BTH	01/12

PREPARED	T.P.C.	
DRAWN	B.A.S	22/4/97
DRAWING CHECKED		
APPROVED :		

SCALES (AT A0 SIZE) 1:2500(A0); 1:7100(A3)

CAD FILE L:\DRAUGHT\..\25-190

Prepared by: T+T TONKIN & TAYLOR ENVIRONMENTAL & ENGINEERING CONSULTANTS

NOTES
1. Monitoring includes 650m long survey profile along Golden Cross Road extending southwards from Union Silt Dam.
2. USP 6 to 9 subject to survey verification.

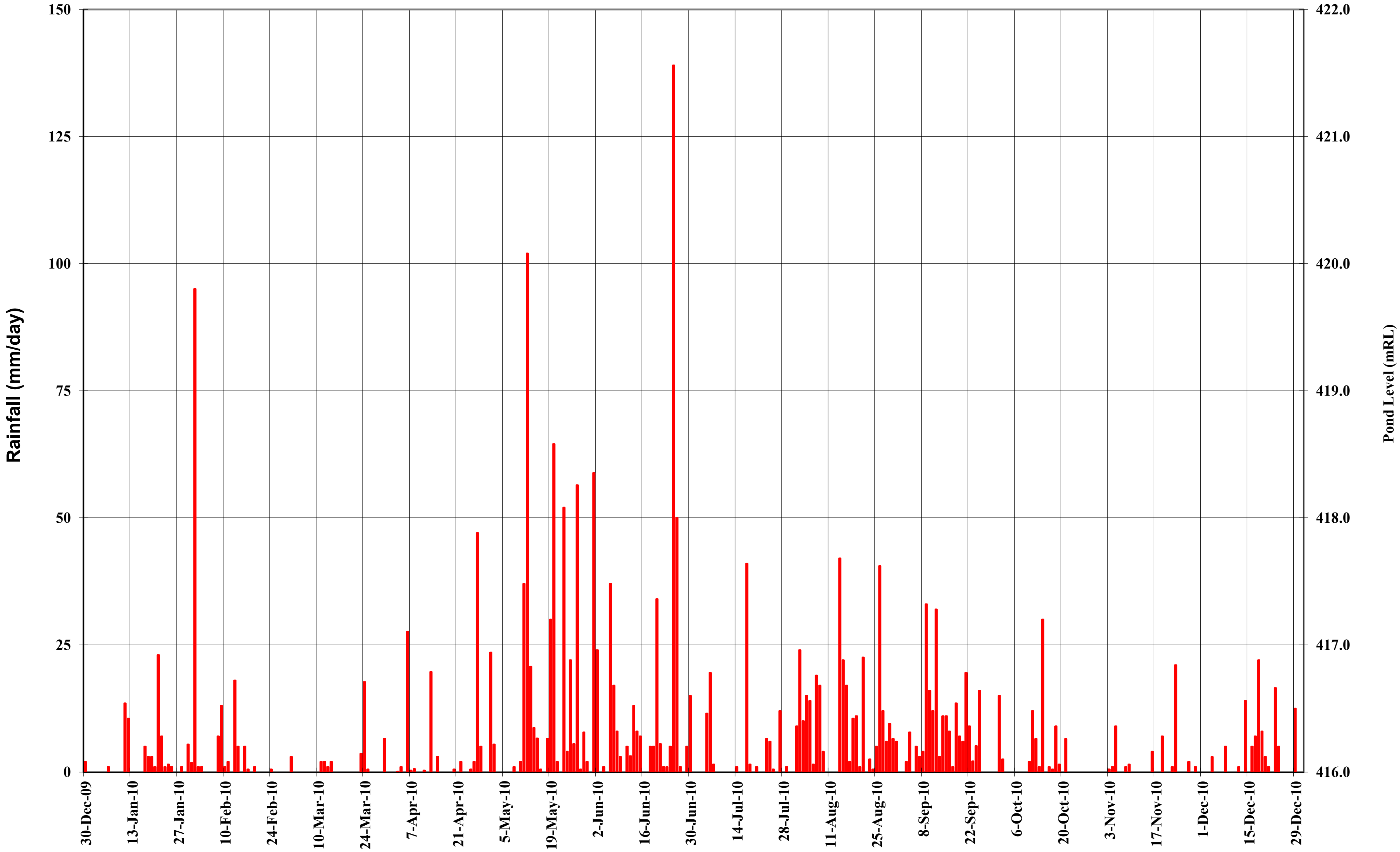
MONITORING NETWORK
GPS - JUNE 2010 - OCT 2012

COEUR GOLDEN CROSS

TITLE
GOLDEN CROSS PROJECT

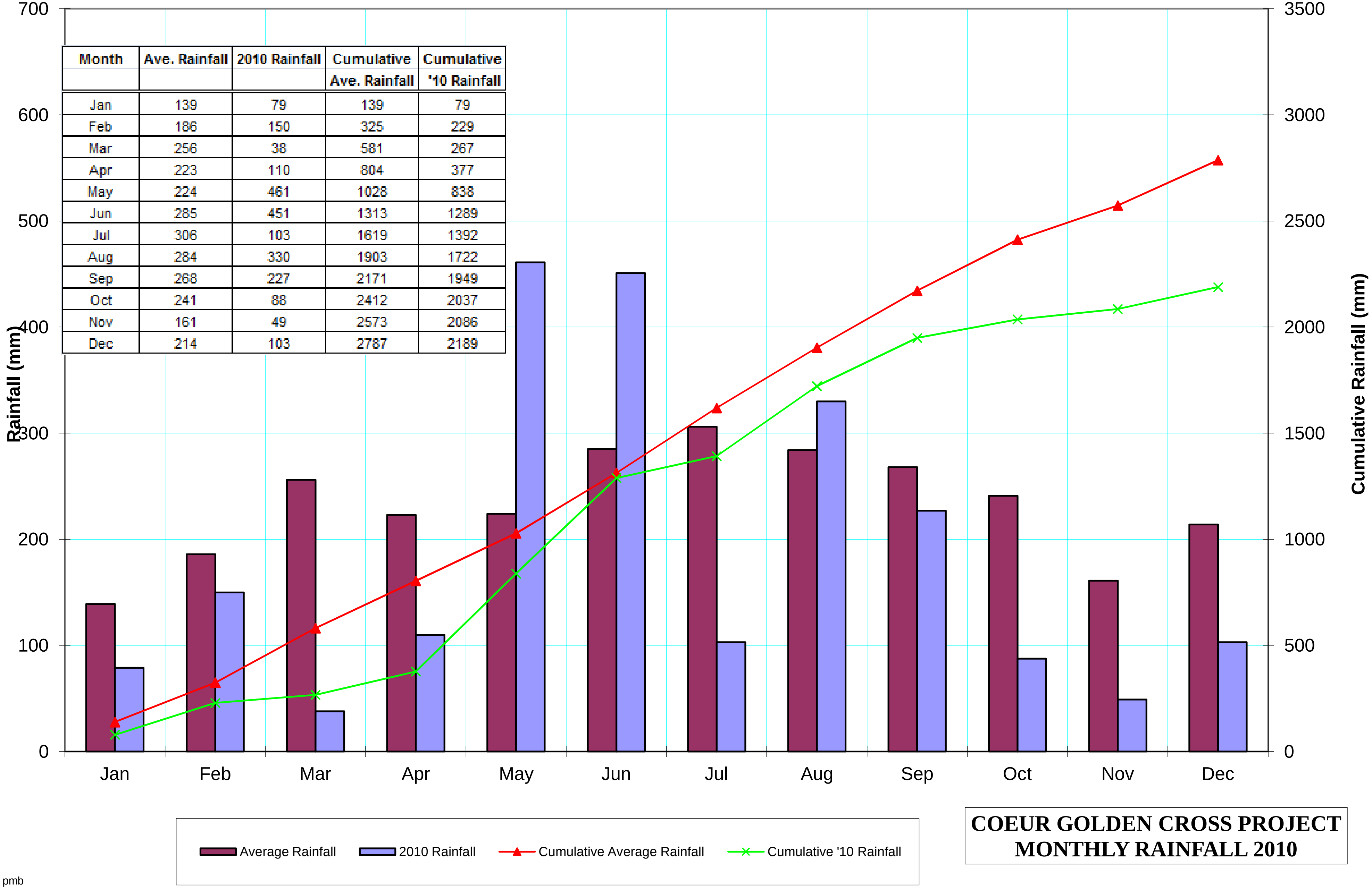
DWG No. 12520-190 REV. 9

Appendix B: Rainfall



COEUR GOLDEN CROSS PROJECT
RAINFALL 2010

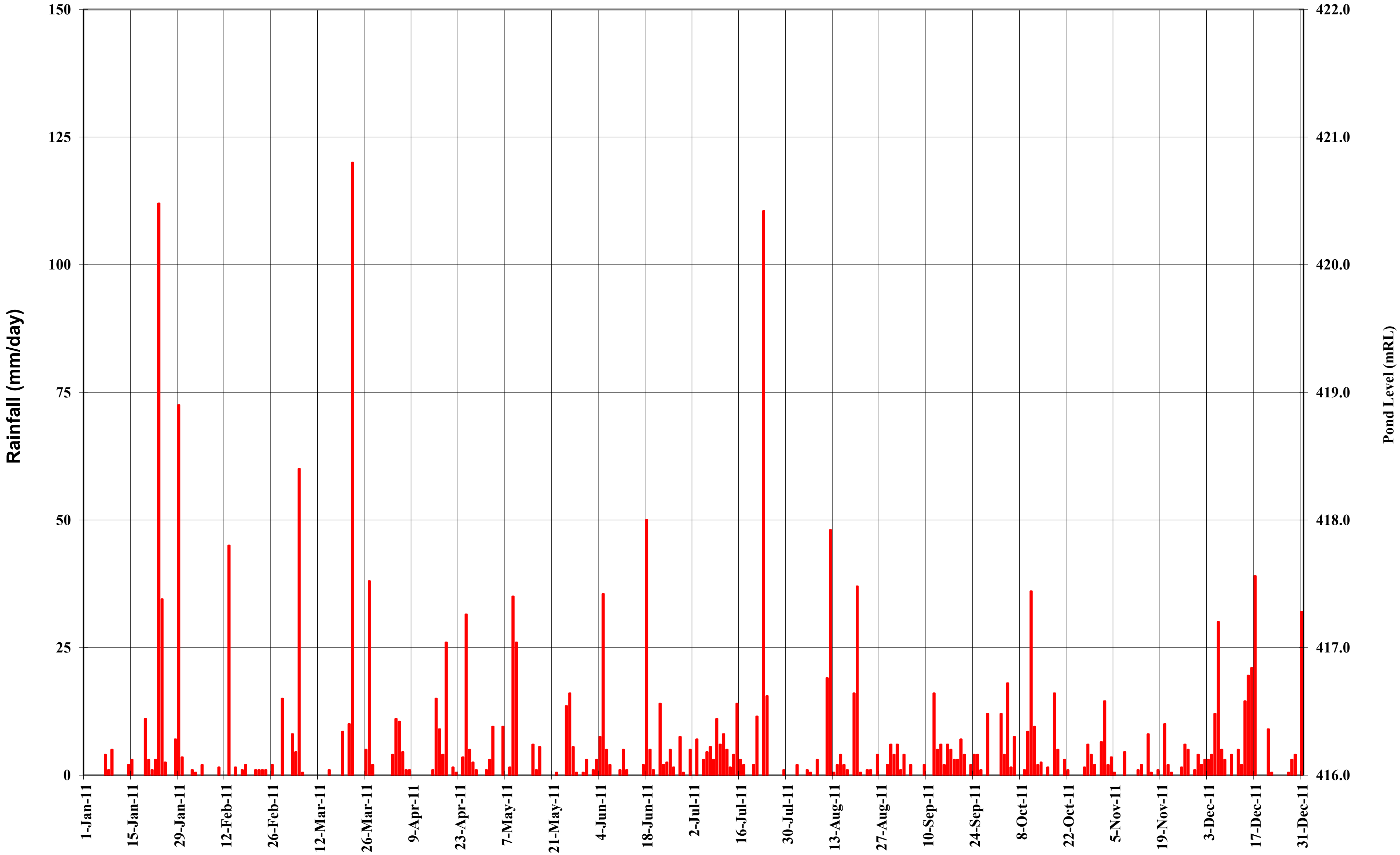
PMB
18/12/2012
RAINFALL.xls
Rainfall 2010



Month	Ave. Rainfall	2010 Rainfall	Cumulative Ave. Rainfall	Cumulative '10 Rainfall
Jan	139	79	139	79
Feb	186	150	325	229
Mar	256	38	581	267
Apr	223	110	804	377
May	224	461	1028	838
Jun	285	451	1313	1289
Jul	306	103	1619	1392
Aug	284	330	1903	1722
Sep	268	227	2171	1949
Oct	241	88	2412	2037
Nov	161	49	2573	2086
Dec	214	103	2787	2189

COEUR GOLDEN CROSS PROJECT
MONTHLY RAINFALL 2010

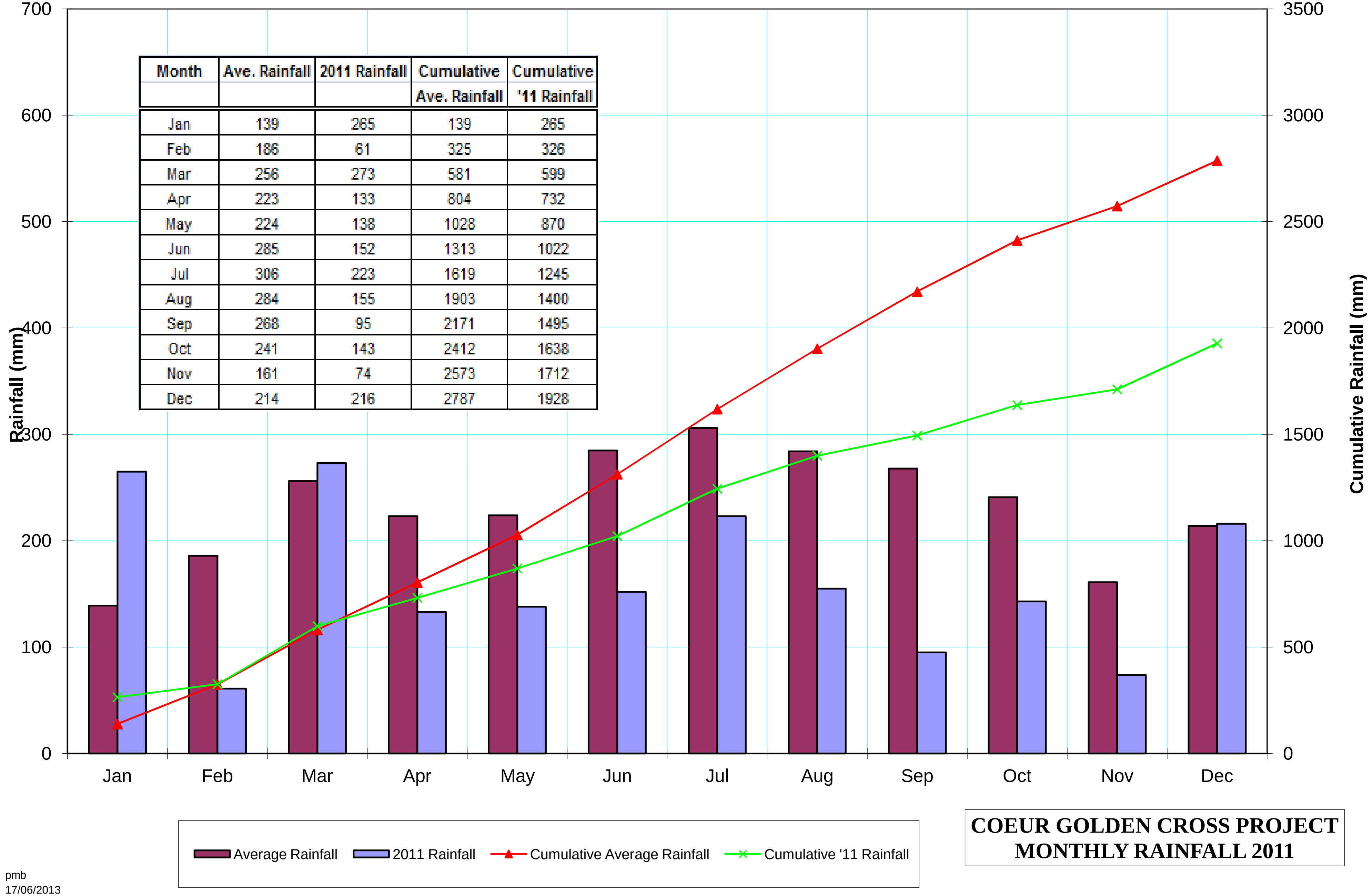
pmb
1/07/2013
RCHART.XLS
RainChart 10



COEUR GOLDEN CROSS PROJECT
RAINFALL 2011

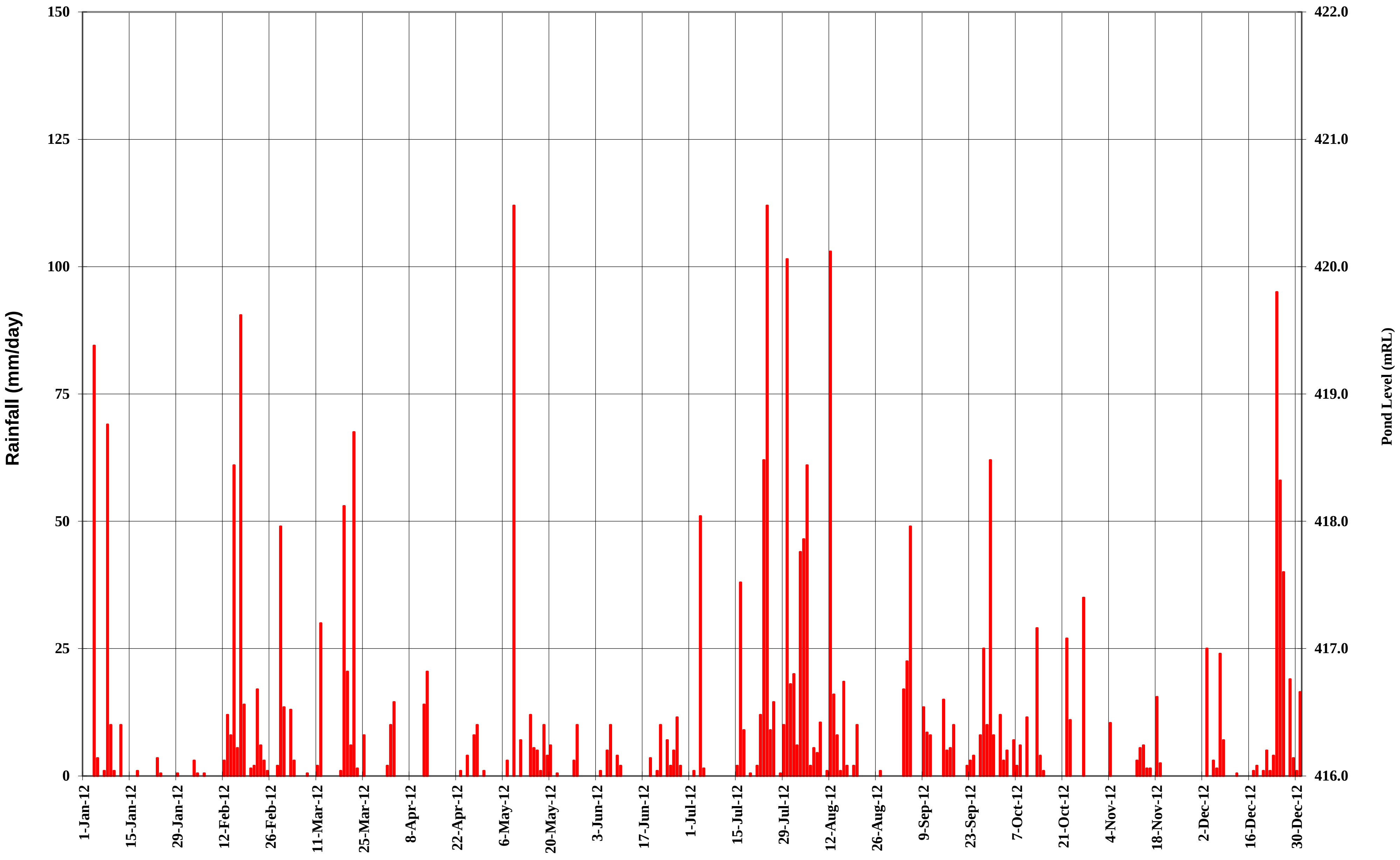
PMB
7/02/2012
RAINFALL.xls
Rainfall 2011

COEUR GOLDEN CROSS PROJECT
MONTHLY RAINFALL 2011



Month	Ave. Rainfall	2011 Rainfall	Cumulative Ave. Rainfall	Cumulative '11 Rainfall
Jan	139	265	139	265
Feb	186	61	325	326
Mar	256	273	581	599
Apr	223	133	804	732
May	224	138	1028	870
Jun	285	152	1313	1022
Jul	306	223	1619	1245
Aug	284	155	1903	1400
Sep	268	95	2171	1495
Oct	241	143	2412	1638
Nov	161	74	2573	1712
Dec	214	216	2787	1928

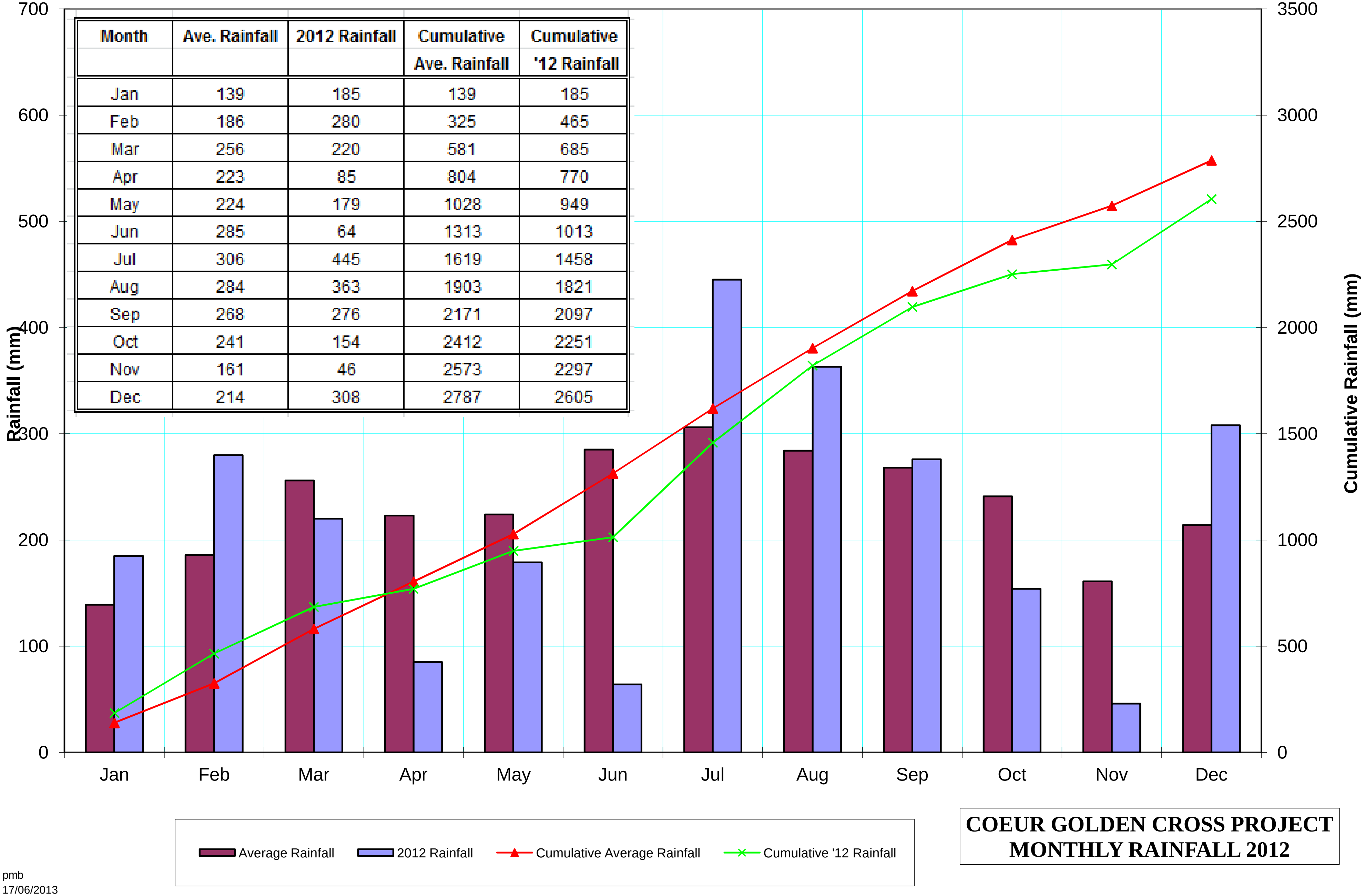
pmb
17/06/2013
RCHART.XLS
RainChart 11



COEUR GOLDEN CROSS PROJECT
RAINFALL 2012

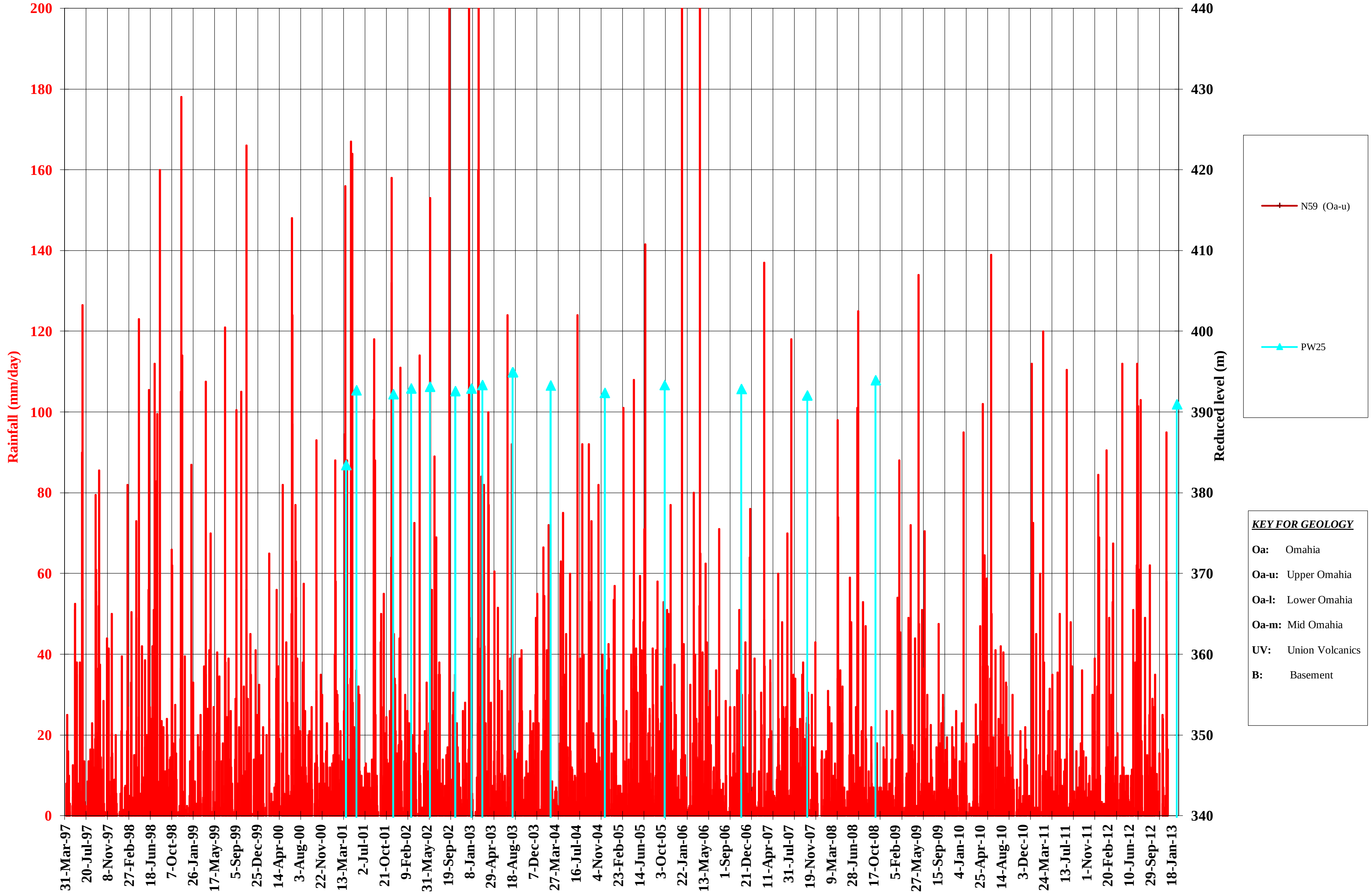
PMB
18/03/2013
RAINFALL.xls
Rainfall 2012

COEUR GOLDEN CROSS PROJECT
MONTHLY RAINFALL 2012



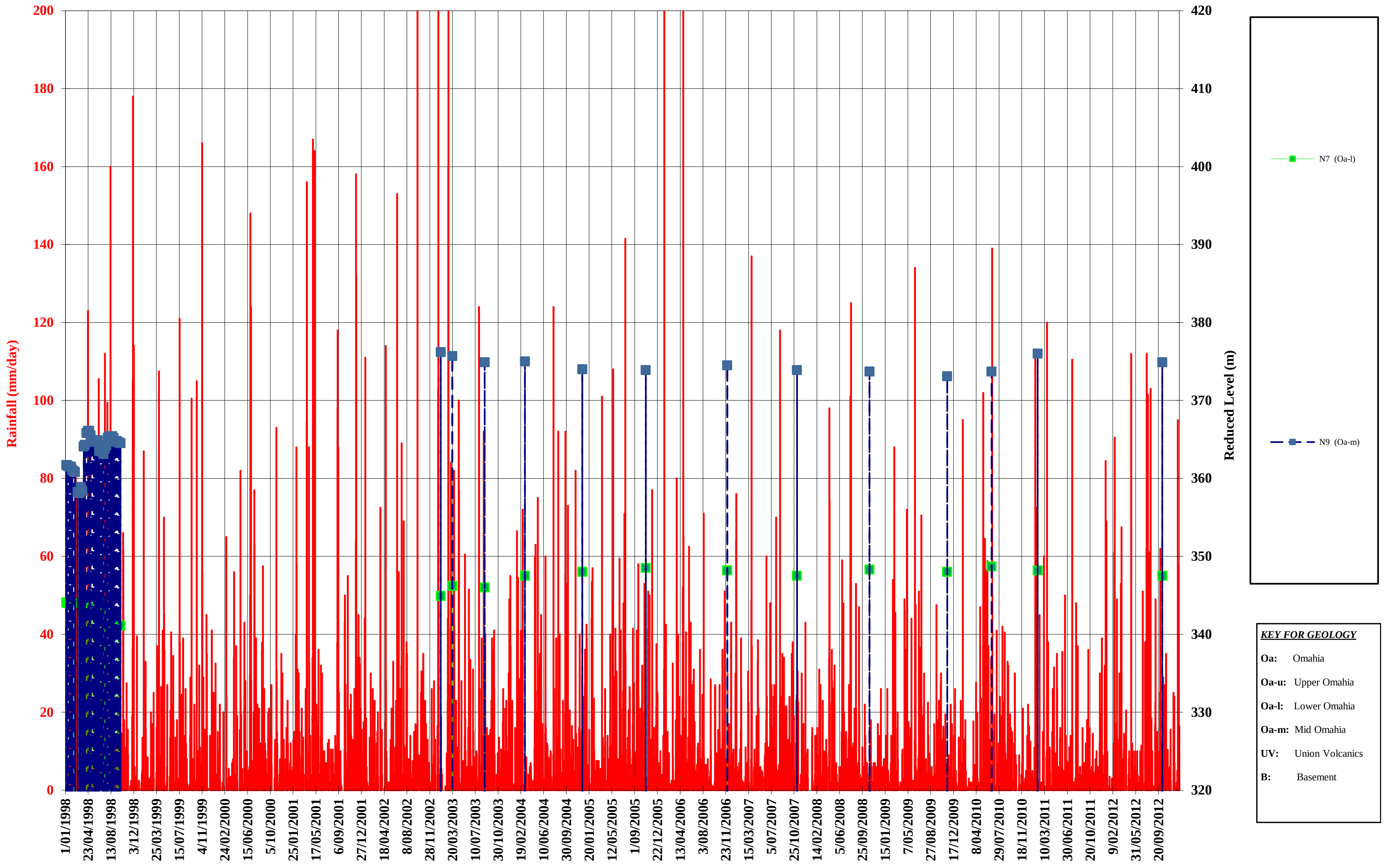
Month	Ave. Rainfall	2012 Rainfall	Cumulative Ave. Rainfall	Cumulative '12 Rainfall
Jan	139	185	139	185
Feb	186	280	325	465
Mar	256	220	581	685
Apr	223	85	804	770
May	224	179	1028	949
Jun	285	64	1313	1013
Jul	306	445	1619	1458
Aug	284	363	1903	1821
Sep	268	276	2171	2097
Oct	241	154	2412	2251
Nov	161	46	2573	2297
Dec	214	308	2787	2605

pmb
17/06/2013
RCHART.XLS
RainChart 12



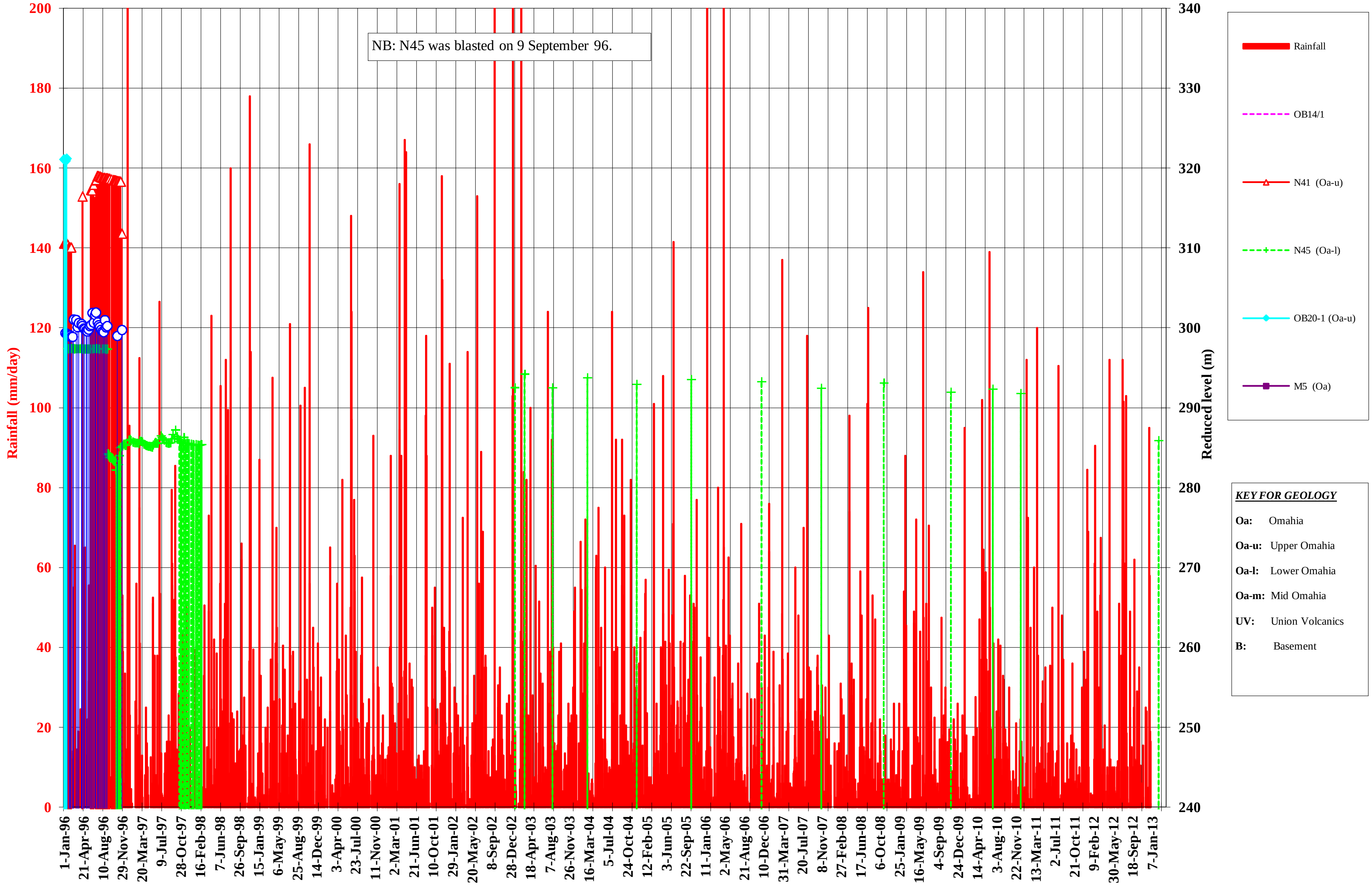
JPW
26/02/2013
pmb091012.recentSP-PIEZO V2.xls
2 - RearOfTailings-rpt

COEUR GOLDEN CROSS PROJECT
REAR OF TAILINGS - Standpipe piezometers



COEUR GOLDEN CROSS PROJECT
N-Series Holes - ***TRIG J & LEFT ABUTMENT*** - Pneumatic Piezos

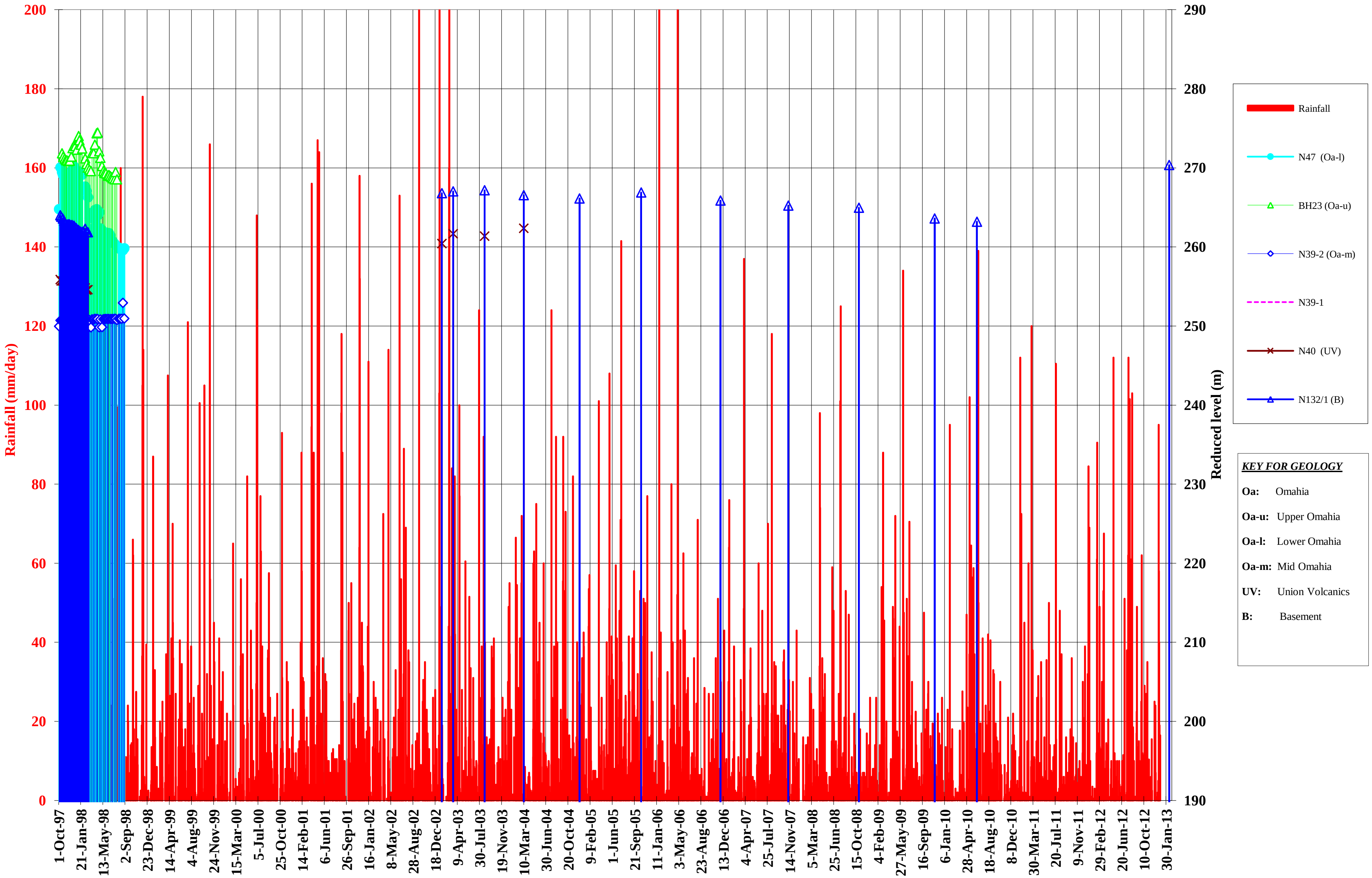
PMB
18/03/2013
pmb091012.recentN-PIEZO.xls
4 - Left Abutment N7 and N9



COEUR GOLDEN CROSS PROJECT

LOWER CENTRAL RIDGE/STOCKYARD DUMP - Standpipe Piezometers

JPW
26/02/2013
pmb091012.recentSP-PIEZO V2.xls
7 - LowCenRdg-StkyardDump-rpt



COEUR GOLDEN CROSS PROJECT
STOCKYARD - Standpipe Piezometers

JPW
18/03/2013
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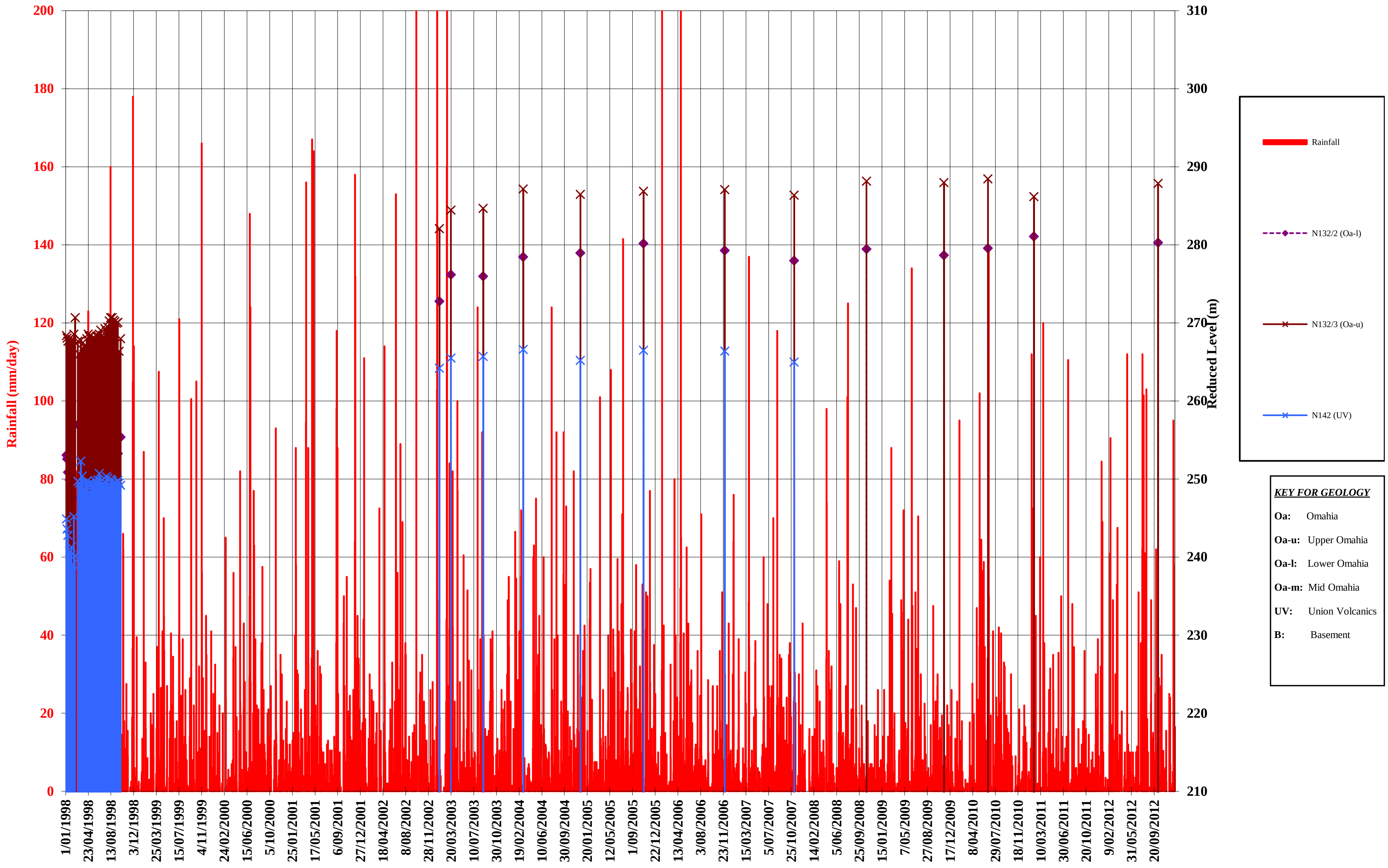
9 - Stockyard-rpt

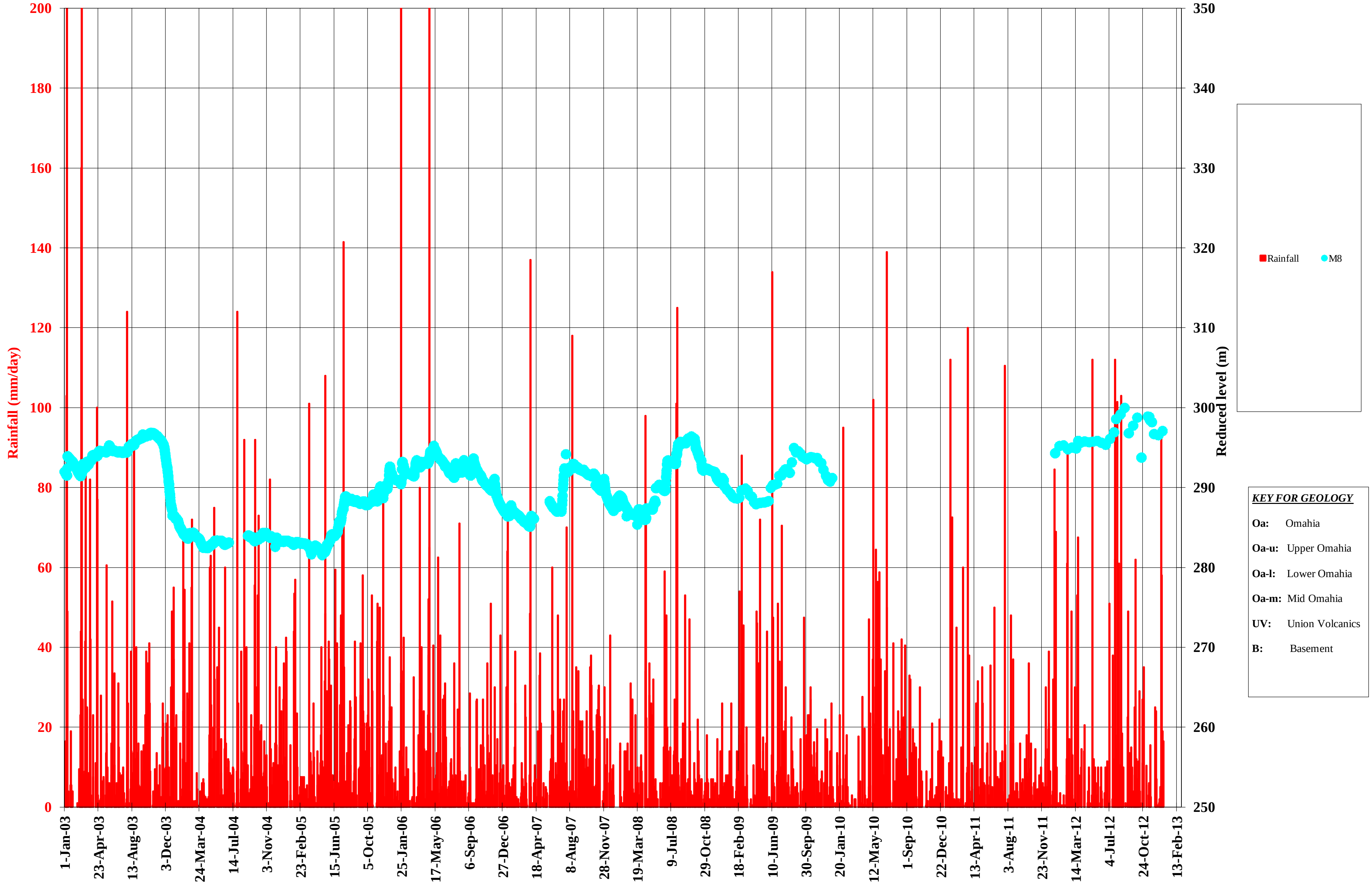


KEY FOR GEOLOGY

Oa: Omahia
Oa-u: Upper Omahia
Oa-l: Lower Omahia
Oa-m: Mid Omahia
UV: Union Volcanics
B: Basement

COEUR GOLDEN CROSS PROJECT
N-Series Holes - ***STOCKYARD*** - Pneumatic Piezos

PMB
18/03/2013
pmb091012.recentN-PIEZO.xls
7 - Stockyard N132



KEY FOR GEOLOGY

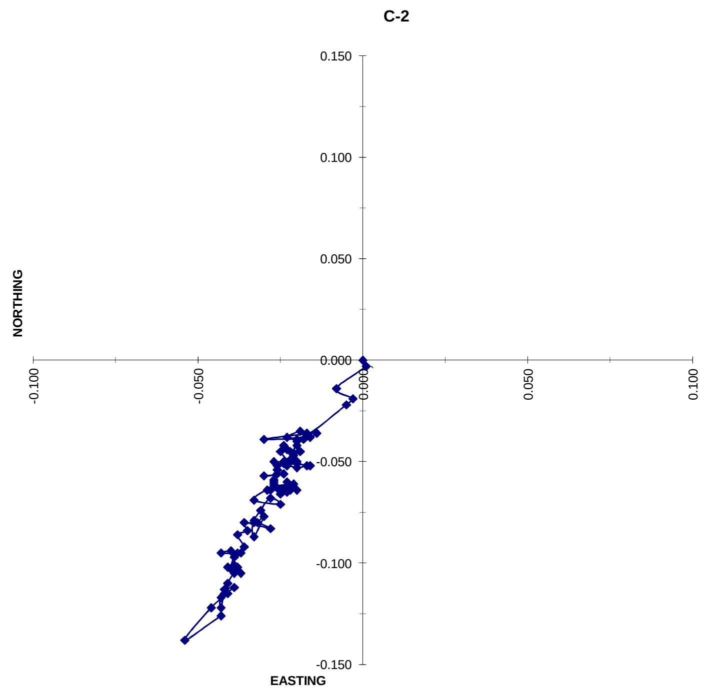
Oa: Omahia
Oa-u: Upper Omahia
Oa-l: Lower Omahia
Oa-m: Mid Omahia
UV: Union Volcanics
B: Basement

COEUR GOLDEN CROSS PROJECT
WAITEKAURI - Standpipe Piezometers

JPW
18/03/2013
pmb091012.recentSP-PIEZO V2.xls
11 - Waitekauri-rpt

Appendix C: GPS Data

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C - 2	18/8/97	649399.454	390911.046	436.666	0.000	0.000	0.000	0.000	0.7	0.6	1.3
Static	1/9/97	649399.451	390911.047	436.665	-0.003	0.001	-0.001	0.003	0.6	0.4	2.0
	29/9/97	649399.440	390911.038	436.672	-0.014	-0.008	0.006	0.017	0.9	0.6	1.8
	13/10/97	649399.435	390911.043	436.665	-0.019	-0.003	-0.001	0.019	0.5	0.4	1.0
	28/10/97	649399.432	390911.041	436.657	-0.022	-0.005	-0.009	0.024	0.4	0.5	1.2
	1/4/98	649399.417	390911.029	436.650	-0.037	-0.017	-0.016	0.044	0.5	0.4	1.1
	8/4/98	649399.416	390911.023	436.651	-0.038	-0.023	-0.015	0.047	0.7	0.5	1.6
	15/4/98	649399.419	390911.027	436.645	-0.035	-0.019	-0.021	0.045	0.6	0.5	1.6
	22/4/98	649399.418	390911.029	436.644	-0.036	-0.017	-0.022	0.045	0.6	0.4	1.5
	29/4/98	649399.416	390911.030	436.634	-0.038	-0.016	-0.032	0.052	2.2	3.7	3.2
	6/5/98	649399.415	390911.028	436.651	-0.039	-0.018	-0.015	0.045	0.3	0.2	0.7
	13/5/98	649399.418	390911.032	436.648	-0.036	-0.014	-0.018	0.043	0.5	0.3	0.9
	20/5/98	649399.415	390911.016	436.637	-0.039	-0.030	-0.029	0.057	0.7	0.5	0.9
	27/5/98	649399.415	390911.026	436.645	-0.039	-0.020	-0.021	0.049	0.6	0.3	1.1
	3/6/98	649399.412	390911.026	436.650	-0.042	-0.020	-0.016	0.049	0.6	0.3	0.9
	10/6/98	649399.414	390911.026	436.649	-0.040	-0.020	-0.017	0.048	0.4	0.3	0.8
	17/6/98	649399.408	390911.025	436.644	-0.046	-0.021	-0.022	0.055	0.6	0.4	1.2
	24/6/98	649399.409	390911.027	436.649	-0.045	-0.019	-0.017	0.052	0.4	0.3	0.8
	1/7/98	649399.410	390911.023	436.641	-0.044	-0.023	-0.025	0.056	0.5	0.4	1.1
	8/7/98	649399.412	390911.022	436.661	-0.042	-0.024	-0.005	0.049	0.5	0.4	0.9
	15/7/98	649399.409	390911.021	436.644	-0.045	-0.025	-0.022	0.056	0.4	0.3	0.8
	22/7/98	649399.404	390911.024	436.648	-0.050	-0.022	-0.018	0.058	0.5	0.3	1.0
	29/7/98	649399.407	390911.025	436.650	-0.047	-0.021	-0.016	0.054	0.4	0.3	0.8
	5/8/98	649399.404	390911.026	436.651	-0.050	-0.020	-0.015	0.056	0.6	0.4	1.2
	12/8/98	649399.409	390911.024	436.645	-0.045	-0.022	-0.021	0.054	0.6	0.4	1.2
	19/8/98	649399.405	390911.024	436.651	-0.049	-0.022	-0.015	0.056	0.5	0.3	0.9
	26/8/98	649399.404	390911.022	436.645	-0.050	-0.024	-0.021	0.059	0.9	0.6	2.5
	9/9/98	649399.403	390911.026	436.644	-0.051	-0.020	-0.022	0.059	0.8	0.4	1.4
	16/9/98	649399.404	390911.024	436.649	-0.050	-0.022	-0.017	0.057	0.5	0.3	0.9
	23/9/98	649399.404	390911.026	436.652	-0.050	-0.020	-0.014	0.056	0.4	0.2	0.7
	30/9/98	649399.402	390911.023	436.650	-0.052	-0.023	-0.016	0.059	0.6	0.3	1.0
	7/10/98	649399.403	390911.022	436.651	-0.051	-0.024	-0.015	0.058	0.5	0.3	0.9
	21/10/98	649399.401	390911.026	436.649	-0.053	-0.020	-0.017	0.059	0.5	0.3	1.1
	28/10/98	649399.402	390911.029	436.635	-0.052	-0.017	-0.031	0.063	0.5	0.4	1.1
	4/11/98	649399.402	390911.030	436.637	-0.052	-0.016	-0.029	0.062	0.7	0.5	1.5
	18/11/98	649399.404	390911.019	436.640	-0.050	-0.027	-0.026	0.062	0.6	0.5	1.2
	16/12/98	649399.402	390911.020	436.640	-0.052	-0.026	-0.026	0.064	1.1	0.6	2.0
	28/12/98	649399.398	390911.020	436.629	-0.056	-0.026	-0.037	0.072	0.6	0.4	1.1
	13/1/99	649399.397	390911.016	436.620	-0.057	-0.030	-0.046	0.079	0.5	0.3	1.0
	27/1/99	649399.398	390911.022	436.631	-0.056	-0.024	-0.035	0.070	0.6	0.3	1.0
	10/2/99	649399.400	390911.020	436.628	-0.054	-0.026	-0.038	0.071	0.6	0.4	1.1
	24/2/99	649399.395	390911.019	436.633	-0.059	-0.027	-0.033	0.073	0.5	0.3	1.0
	11/3/99	649399.395	390911.019	436.633	-0.059	-0.027	-0.033	0.073	0.6	0.5	1.3
	24/3/99	649399.393	390911.019	436.628	-0.061	-0.027	-0.038	0.077	0.7	0.5	1.5
	7/4/99	649399.394	390911.019	436.627	-0.060	-0.027	-0.039	0.076	1.1	0.5	0.8
	21/4/99	649399.390	390911.022	436.632	-0.064	-0.024	-0.034	0.076	0.7	0.3	0.8
	5/5/99	649399.391	390911.020	436.631	-0.063	-0.026	-0.035	0.077	1.0	0.3	0.7
	19/5/99	649399.393	390911.025	436.638	-0.061	-0.021	-0.028	0.070	0.7	0.3	0.6
	2/6/99	649399.392	390911.019	436.633	-0.062	-0.027	-0.033	0.075	0.5	0.3	0.9
	16/6/99	649399.393	390911.019	436.632	-0.061	-0.027	-0.034	0.075	0.5	0.5	1.0
	29/6/99	649399.391	390911.023	436.635	-0.063	-0.023	-0.031	0.074	0.4	0.3	0.7
	14/7/99	649399.394	390911.023	436.633	-0.060	-0.023	-0.033	0.072	0.7	0.2	1.3
	28/7/99	649399.389	390911.023	436.629	-0.065	-0.023	-0.037	0.078	0.5	0.4	2.0
	26/8/99	649399.390	390911.024	436.632	-0.064	-0.022	-0.034	0.076	0.6	0.4	1.9
	27/9/99	649399.388	390911.021	436.625	-0.066	-0.025	-0.041	0.082	0.6	0.5	1.5
	27/10/99	649399.390	390911.022	436.627	-0.064	-0.024	-0.039	0.079	0.4	0.4	0.9
	24/11/99	649399.390	390911.026	436.637	-0.064	-0.020	-0.029	0.073	0.4	0.4	0.8
	14/12/99	649399.390	390911.021	436.625	-0.064	-0.025	-0.041	0.080	0.6	0.4	1.4
	13/1/00	649399.390	390911.018	436.624	-0.064	-0.028	-0.042	0.082	0.9	0.7	1.9
	9/2/00	649399.391	390911.023	436.623	-0.063	-0.023	-0.043	0.080	0.8	0.5	1.7
	1/3/00	649399.390	390911.017	436.622	-0.064	-0.029	-0.044	0.083	0.5	0.4	1.0
	4/4/00	649399.385	390911.013	436.606	-0.069	-0.033	-0.060	0.097	0.5	0.4	1.1
	3/5/00	649399.383	390911.021	436.621	-0.071	-0.025	-0.045	0.088	0.7	0.9	0.9
	1/6/00	649399.386	390911.018	436.63	-0.068	-0.028	-0.036	0.082	1.3	1.3	1.3
	4/7/00	649399.380	390911.015	436.626	-0.074	-0.031	-0.040	0.090	0.4	0.3	1.0
	7/8/00	649399.375	390911.013	436.636	-0.079	-0.033	-0.030	0.091	0.3	0.2	0.6
	5/9/00	649399.374	390911.014	436.625	-0.080	-0.032	-0.041	0.095	0.4	0.3	1.0
	4/10/00	649399.377	390911.016	436.62	-0.077	-0.030	-0.046	0.095	0.7	0.8	1.4
	2/11/00	649399.367	390911.013	436.627	-0.087	-0.033	-0.039	0.101	0.1	0.8	1.1
	4/12/00	649399.374	390911.013	436.623	-0.080	-0.033	-0.043	0.097	0.4	0.3	0.8
	9/1/01	649399.371	390911.018	436.625	-0.083	-0.028	-0.041	0.097	0.9	0.6	2.0
	7/2/01	649399.374	390911.010	436.627	-0.080	-0.036	-0.039	0.096	0.5	0.4	1.4
	5/3/01	649399.370	390911.011	436.62	-0.084	-0.035	-0.046	0.102	0.4	0.3	1.0
	17/4/01	649399.368	390911.008	436.628	-0.086	-0.038	-0.038	0.101	0.4	0.3	0.8
	10/9/01	649399.362	390911.010	436.633	-0.092	-0.036	-0.033	0.104	1.0	0.0	1.0
	10/12/01	649399.359	390911.008	436.626	-0.095	-0.038	-0.040	0.110	1.0	0.0	1.0
	13/03/02	649399.359	390911.003	436.618	-0.095	-0.043	-0.048	0.115	1.0	0.0	1.0
	18/6/02	649399.360	390911.006	436.628	-0.094	-0.040	-0.038	0.109	1.0	1.0	1.0
	29/10/02	649399.359	390911.009	436.631	-0.095	-0.037	-0.035	0.108	1.0	1.0	1.0
	21/01/03	649399.357	390911.007	436.619	-0.097	-0.039	-0.047	0.115	1.0	0.0	1.0
	18/3/03	649399.351	390911.006	436.623	-0.103	-0.040	-0.043	0.119	1.0	0.0	1.0
	9/01/2003	649399.352	390911.008	436.618	-0.102	-0.038	-0.048	0.119	1.0	0.0	1.0
	10/03/2004	649399.353	390911.007	436.627	-0.101	-0.039	-0.039	0.115	1.0	0.0	1.0
	15/12/04	649399.352	390911.005	436.630	-0.102	-0.041	-0.036	0.116	1.0	0.0	0.0
	25/10/05	649399.349	390911.009	436.630	-0.105	-0.037	-0.036	0.117	2.0	1.0	1.0
	30/11/06	649399.349	390911.007	436.625	-0.105	-0.039	-0.041	0.119	1.0	0.0	1.0
	16/01/08	649399.344	390911.005	436.624	-0.110	-0.041	-0.042	0.125	0.0	0.0	0.0
	29/10/08	649399.341	390911.004	436.624	-0.113	-0.042	-0.042	0.128	0.0	0.0	1.0
	21/11/08	649399.342	390911.007	436.624	-0.112	-0.039	-0.042	0.126	1.0	0.0	1.0
	09/03/09	649399.337	390911.003	436.628	-0.117	-0.043	-0.038	0.130	1.0	1.0	2.0
	30/07/09	649399.332	390911.003	436.619	-0.122	-0.043	-0.047	0.138	1.0	0.0	1.0
	17/11/2009	649399.339	390911.004	436.621	-0.115	-0.042	-0.045	0.130	0.0	0.0	1.0
	17/06/2010	649399.339	390911.005	436.622	-0.115	-0.041	-0.044	0.130	0.0	0.0	1.0
	04/02/11	649399.332	390911	436.611	-0.122	-0.046	-0.055	0.142	1.0	1.0	3.0
	17/01/2012	649399.316	390910.992	436.606	-0.138	-0.054	-0.060	0.160			
	9/10/2012	649399.328	390911.003	436.623	-0.126	-0.043	-0.043	0.140	2	1	2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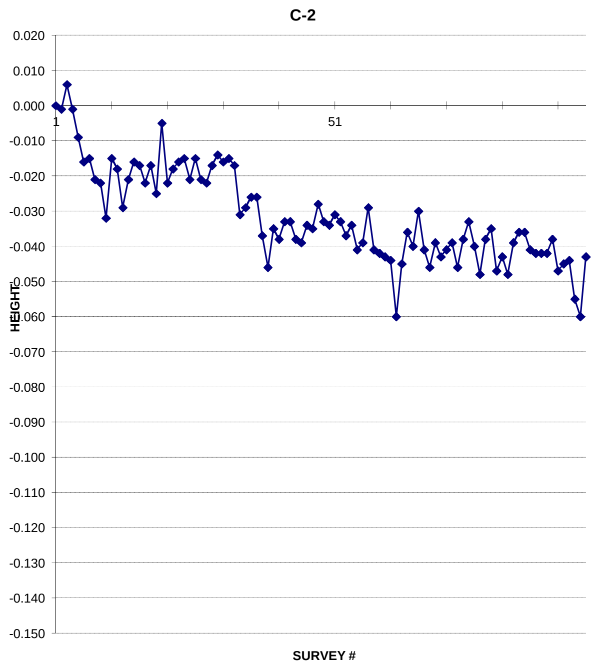
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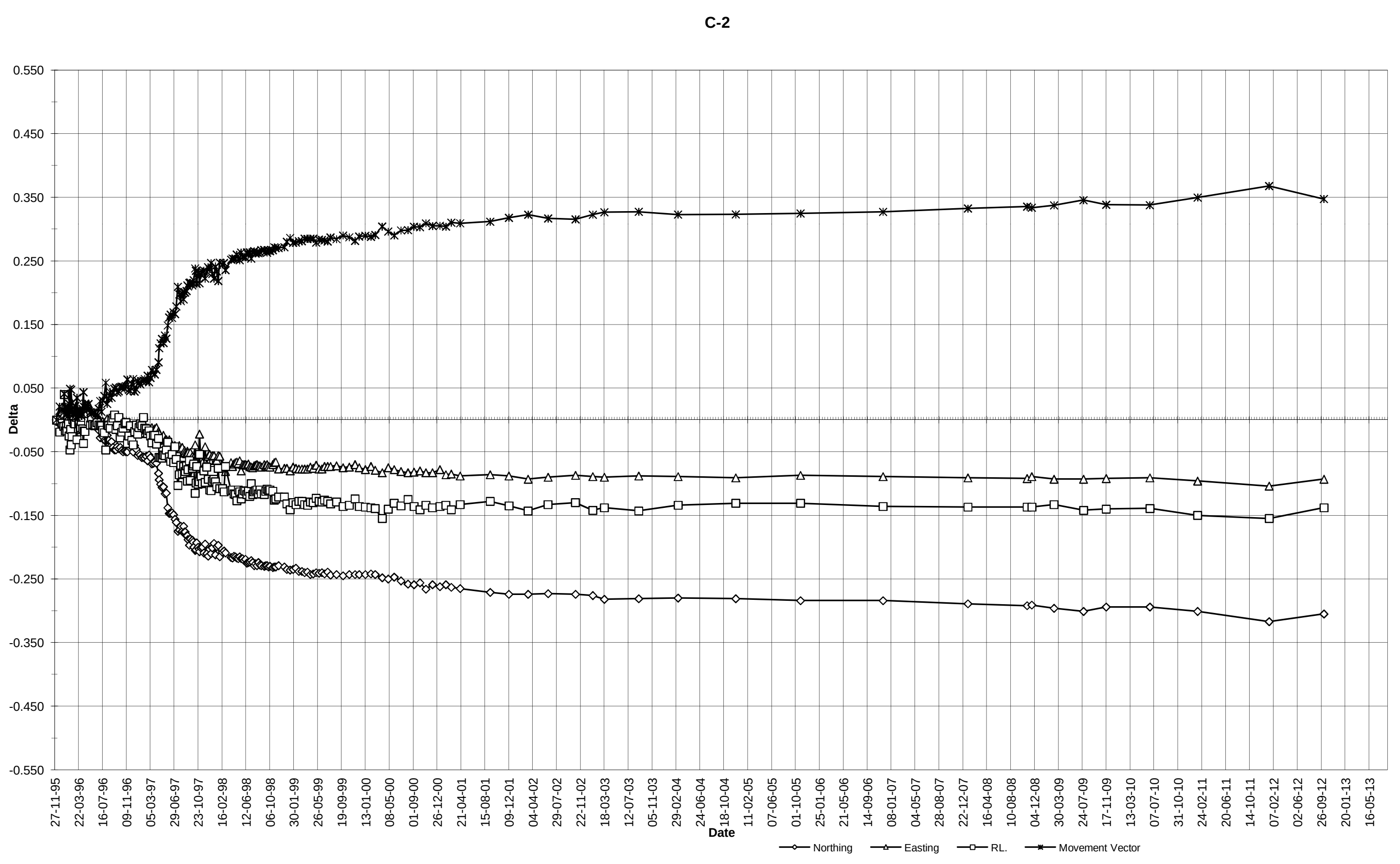
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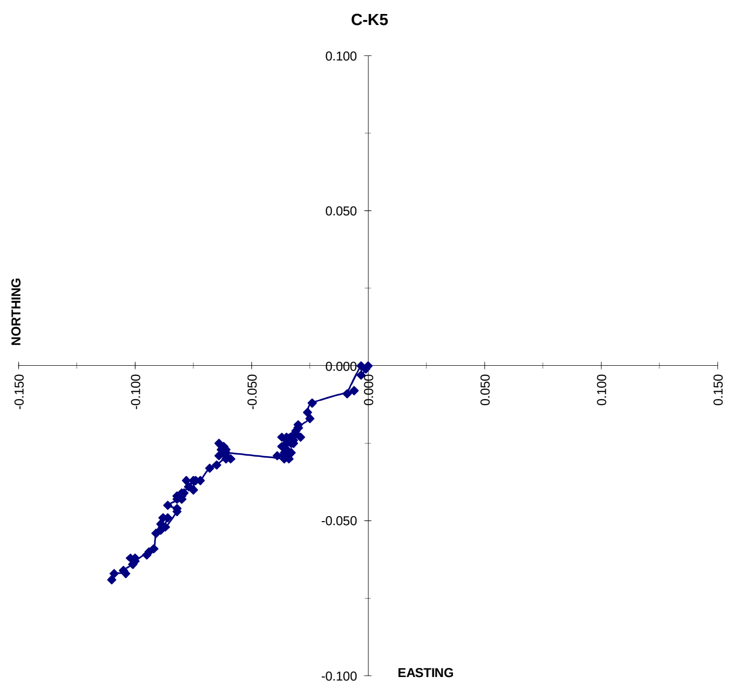
-0.250
-0.350
-0.450
-0.550
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C - K5	18/8/97	648677.984	390585.702	371.338	0.000	0.000	0.000	0.000	0.6	0.5	1.2
STATIC	1/9/97	648677.983	390585.701	371.339	-0.001	-0.001	0.001	0.002	0.3	0.4	0.7
	15/9/97	648677.981	390585.699	371.340	-0.003	-0.003	0.002	0.005	0.6	0.7	1.3
	29/9/97	648677.984	390585.699	371.343	0.000	-0.003	0.005	0.006	0.6	0.8	1.3
	13/10/97	648677.975	390585.693	371.337	-0.009	-0.009	-0.001	0.013	0.4	0.5	0.9
	28/10/97	648677.976	390585.696	371.334	-0.008	-0.006	-0.004	0.011	0.3	0.2	0.7
	25/2/98	648677.972	390585.678	371.333	-0.012	-0.024	-0.005	0.027	0.3	0.2	0.7
	4/3/98	648677.969	390585.676	371.337	-0.015	-0.026	-0.001	0.030	0.2	0.2	0.5
	11/3/98	648677.967	390585.677	371.333	-0.017	-0.025	-0.005	0.031	0.4	0.3	0.9
	1/4/98	648677.964	390585.672	371.336	-0.020	-0.030	-0.002	0.036	0.3	0.3	0.7
	8/4/98	648677.960	390585.670	371.330	-0.024	-0.032	-0.008	0.041	0.5	0.4	1.0
	15/4/98	648677.964	390585.672	371.331	-0.020	-0.030	-0.007	0.037	0.3	0.2	0.6
	22/4/98	648677.964	390585.672	371.333	-0.020	-0.030	-0.005	0.036	0.5	0.4	0.9
	29/4/98	648677.965	390585.672	371.329	-0.019	-0.030	-0.009	0.037	0.4	0.2	0.8
	6/5/98	648677.962	390585.671	371.332	-0.022	-0.031	-0.006	0.038	0.3	0.2	0.5
	13/5/98	648677.961	390585.673	371.336	-0.023	-0.029	-0.002	0.037	0.3	0.2	0.6
	20/5/98	648677.963	390585.671	371.335	-0.021	-0.031	-0.003	0.038	0.3	0.2	0.6
	27/5/98	648677.961	390585.667	371.334	-0.023	-0.035	-0.004	0.042	0.4	0.3	0.7
	3/6/98	648677.961	390585.669	371.330	-0.023	-0.033	-0.008	0.041	0.3	0.3	0.7
	10/6/98	648677.959	390585.670	371.333	-0.025	-0.032	-0.005	0.041	0.5	0.3	0.7
	17/6/98	648677.961	390585.669	371.333	-0.023	-0.033	-0.005	0.041	0.3	0.2	0.7
	24/6/98	648677.959	390585.669	371.332	-0.025	-0.033	-0.006	0.042	0.3	0.3	0.6
	1/7/98	648677.960	390585.667	371.333	-0.024	-0.035	-0.005	0.043	0.5	0.4	1.0
	8/7/98	648677.960	390585.668	371.334	-0.024	-0.034	-0.004	0.042	0.5	0.3	1.1
	15/7/98	648677.961	390585.665	371.326	-0.023	-0.037	-0.012	0.045	0.6	0.3	0.5
	22/7/98	648677.960	390585.667	371.331	-0.024	-0.035	-0.007	0.043	0.3	0.2	0.6
	29/7/98	648677.959	390585.667	371.330	-0.025	-0.035	-0.008	0.044	0.2	0.2	0.6
	5/8/98	648677.957	390585.667	371.332	-0.027	-0.035	-0.006	0.045	0.3	0.2	0.7
	12/8/98	648677.955	390585.666	371.326	-0.029	-0.036	-0.012	0.048	0.6	0.4	1.6
	19/8/98	648677.956	390585.667	371.330	-0.028	-0.035	-0.008	0.046	0.4	0.3	1.2
	26/8/98	648677.956	390585.666	371.332	-0.028	-0.036	-0.006	0.046	0.6	0.4	2.0
	9/9/98	648677.956	390585.667	371.329	-0.028	-0.035	-0.009	0.046	0.3	0.2	0.9
	16/9/98	648677.956	390585.667	371.328	-0.028	-0.035	-0.010	0.046	0.4	0.2	0.8
	23/9/98	648677.958	390585.665	371.327	-0.026	-0.037	-0.011	0.047	0.4	0.3	0.8
	30/9/98	648677.955	390585.666	371.331	-0.029	-0.036	-0.007	0.047	0.3	0.3	0.7
	7/10/98	648677.955	390585.663	371.332	-0.029	-0.039	-0.006	0.049	0.3	0.2	0.6
	21/10/98	648677.956	390585.669	371.334	-0.028	-0.033	-0.004	0.043	0.4	0.3	0.9
	28/10/98	648677.954	390585.668	371.330	-0.030	-0.034	-0.008	0.046	0.4	0.3	0.7
	4/11/98	648677.954	390585.666	371.329	-0.030	-0.036	-0.009	0.048	0.4	0.5	1.0
	18/11/98	648677.956	390585.641	371.327	-0.028	-0.061	-0.011	0.068	0.4	0.3	0.9
New	24/2/99	648665.170	390575.128	359.760	-0.028	-0.061	-0.011	0.068	0.5	0.4	1.1
	11/3/99	648665.172	390575.127	359.760	-0.026	-0.062	-0.011	0.068	0.4	0.3	0.8
	24/3/99	648665.169	390575.125	359.760	-0.029	-0.064	-0.011	0.071	0.6	0.5	1.1
	7/4/99	648665.172	390575.127	359.759	-0.026	-0.062	-0.012	0.068	0.3	0.2	0.8
	21/4/99	648665.168	390575.128	359.759	-0.030	-0.061	-0.012	0.069	0.8	0.3	0.8
	5/5/99	648665.170	390575.127	359.757	-0.028	-0.062	-0.014	0.069	0.8	0.3	0.8
	19/5/99	648665.171	390575.128	359.756	-0.027	-0.061	-0.015	0.068	0.6	0.3	0.7
	2/6/99	648665.173	390575.125	359.759	-0.025	-0.064	-0.012	0.070	0.3	0.3	0.7
	16/6/99	648665.169	390575.128	359.757	-0.029	-0.061	-0.014	0.069	0.9	0.5	1.7
	29/6/99	648665.168	390575.130	359.761	-0.030	-0.059	-0.010	0.067	0.5	0.3	0.9
	14/7/99	648665.171	390575.127	359.759	-0.027	-0.062	-0.012	0.069	0.5	0.3	1.5
	28/7/99	648665.171	390575.126	359.754	-0.027	-0.063	-0.017	0.071	0.4	0.3	0.9
	27/8/99	648665.169	390575.128	359.757	-0.029	-0.061	-0.014	0.069	0.5	0.3	1.0
	28/9/99	648665.166	390575.124	359.760	-0.032	-0.065	-0.011	0.073	0.4	0.3	0.7
	28/10/99	648665.165	390575.121	359.764	-0.033	-0.068	-0.007	0.076	0.4	0.4	0.8
	25/11/99	648665.161	390575.117	359.761	-0.037	-0.072	-0.010	0.082	0.4	0.2	0.8
	15/12/99	648665.161	390575.115	359.761	-0.037	-0.074	-0.010	0.083	0.7	0.4	0.9
	13/1/00	648665.159	390575.112	359.757	-0.039	-0.077	-0.014	0.087	0.5	0.4	1.1
	10/2/00	648665.161	390575.114	359.759	-0.037	-0.075	-0.012	0.084	0.5	0.4	1.0
	2/3/00	648665.158	390575.114	359.761	-0.040	-0.075	-0.010	0.086	0.5	0.4	1.0
	5/4/00	648665.161	390575.111	359.761	-0.037	-0.078	-0.010	0.087	0.4	0.3	0.7
	4/5/00	648665.158	390575.114	359.759	-0.040	-0.075	-0.012	0.086	0.7	0.9	0.9
	2/6/00	648665.159	390575.112	359.757	-0.039	-0.077	-0.014	0.087	2.0	2.5	2.5
	5/7/00	648665.157	390575.110	359.757	-0.041	-0.079	-0.014	0.090	0.3	0.2	0.6
	4/8/00	648665.156	390575.109	359.761	-0.042	-0.080	-0.010	0.091	0.4	0.2	0.8
	11/9/00	648665.156	390575.107	359.76	-0.042	-0.082	-0.011	0.093	0.5	0.6	1.0
	5/10/00	648665.157	390575.109	359.759	-0.041	-0.080	-0.012	0.091	0.4	0.4	0.9
	3/11/00	648665.155	390575.107	359.762	-0.043	-0.082	-0.009	0.093	0.3	0.2	0.7
	5/12/00	648665.156	390575.107	359.761	-0.042	-0.082	-0.010	0.093	0.4	0.3	0.8
	10/1/01	648665.155	390575.109	359.76	-0.043	-0.080	-0.011	0.091	0.5	0.4	1.1
	6/3/01	648665.155	390575.109	359.762	-0.043	-0.080	-0.009	0.091	0.4	0.3	0.7
	18/4/01	648665.153	390575.103	359.760	-0.045	-0.086	-0.011	0.098	0.4	0.3	0.8
	31/5/01	648665.152	390575.107	359.762	-0.046	-0.082	-0.009	0.094	0.3	0.2	0.7
	17/9/01	648665.151	390575.107	359.764	-0.047	-0.082	-0.007	0.095	1.0	0.0	1.0
	12/12/2001	648665.146	390575.102	359.773	-0.052	-0.087	0.002	0.101	1.0	0.0	1.0
	13/03/02	648665.149	390575.101	359.768	-0.049	-0.088	-0.003	0.101	1.0	0.0	1.0
	18/6/02	648665.149	390575.103	359.766	-0.049	-0.086	-0.005	0.099	2.0	0.0	1.0
	30/10/02	648665.146	390575.101	359.765	-0.052	-0.088	-0.006	0.102	1.0	0.0	1.0
	24/1/03	648665.144	390575.098	359.763	-0.054	-0.091	-0.008	0.106	1.0	0.0	1.0
	19/03/03	648665.147	390575.100	359.761	-0.051	-0.089	-0.010	0.103	1.0	0.0	1.0
	25/08/03	648665.149	390575.101	359.763	-0.049	-0.088	-0.008	0.101	1.0	0.0	1.0
	10/03/2004	648665.145	390575.100	359.770	-0.053	-0.089	-0.001	0.104	1.0	0.0	1.0
	15/12/2004	648665.144	390575.098	359.768	-0.054	-0.091	-0.003	0.106	0.0	0.0	0.0
	25/10/2005	648665.139	390575.097	359.765	-0.059	-0.092	-0.006	0.109	1.0	0.0	0.0
	30/11/06	648665.137	390575.094	359.762	-0.061	-0.095	-0.009	0.113	1.0	0.0	1.0
	16/1/08	648665.138	390575.095	359.766	-0.060	-0.094	-0.005	0.112	1.0	0.0	0.0
	29/10/08	648665.135	390575.089	359.771	-0.063	-0.100	0.000	0.118	1.0	1.0	1.0
	21/11/2008	648665.135	390575.089	359.771	-0.063	-0.100	0.000	0.118	1.0	1.0	2.0
	9/03/2009	648665.136	390575.087	359.767	-0.062	-0.102	-0.004	0.119	0.0	0.0	1.0
	30/07/2009	648665.134	390575.088	359.764	-0.064	-0.101	-0.007	0.120	0.0	0.0	1.0
	17/11/2009	648665.136	390575.089	359.77	-0.062	-0.100	-0.001	0.118	1.0	1.0	2.0
	17/06/2010	648665.134	390575.088	359.778	-0.064	-0.101	0.007	0.120	0.0	0.0	1.0
	4/2/11	648665.132	390575.084	359.768	-0.066	-0.105	-0.003	0.124	0.0	0.0	1.0
	18/10/11	648665.131	390575.085	359.771	-0.067	-0.104	0.000	0.124	1.0	1.0	2.0
	17/01/2012	648665.131	390575.080	359.767	-0.067	-0.109	-0.004	0.128			
	2/11/2012	648665.129	390575.079	359.765	-0.069	-0.110	-0.006	0.130	1	0	1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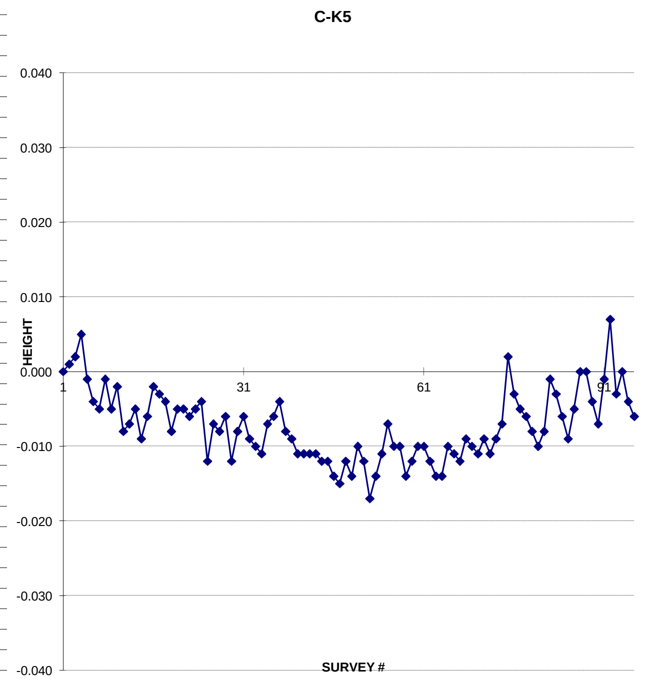
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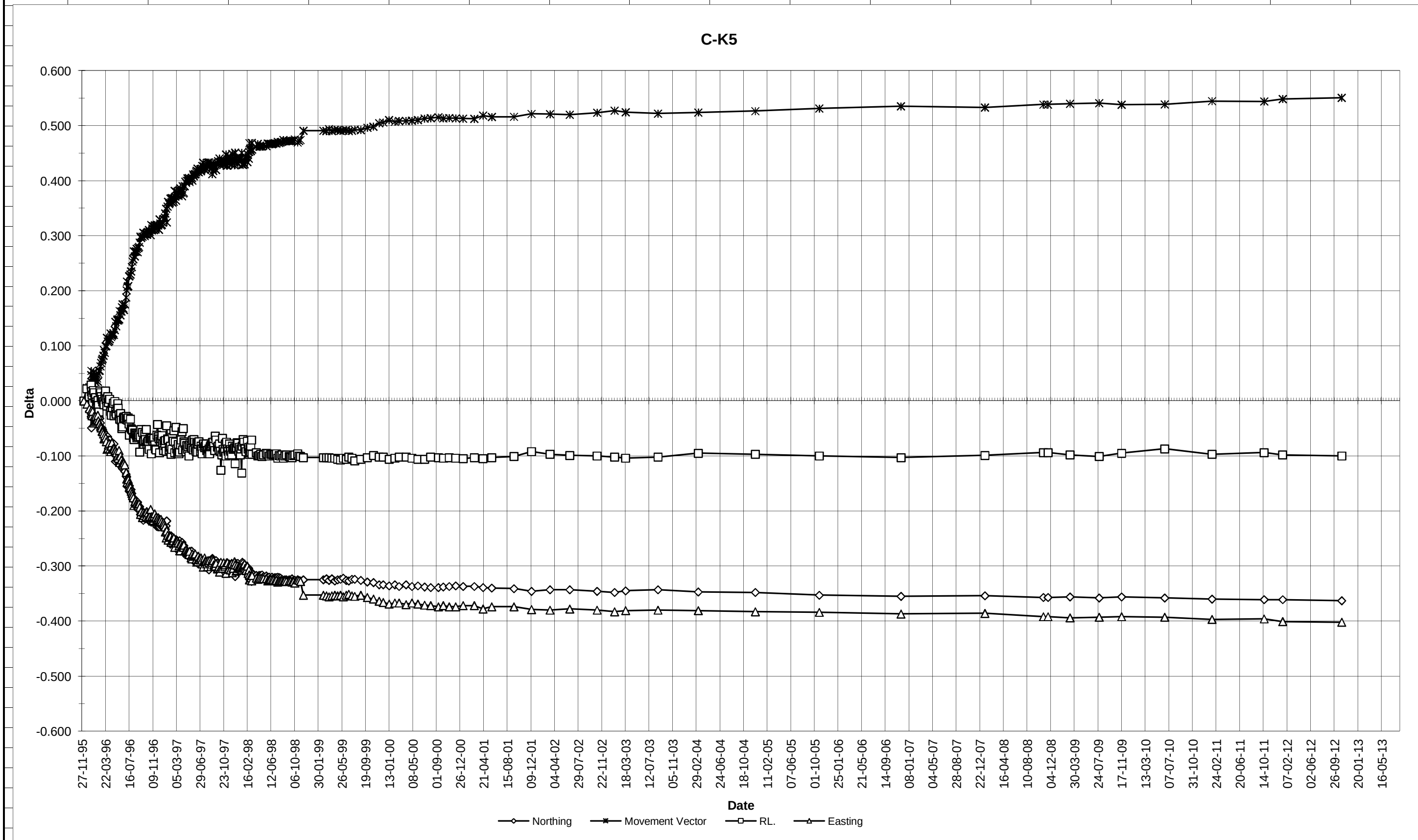
C-K5
Delta
Date
Northing
Movement Vector
RL.
Easting

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C - J	18/8/97	648701.267	391044.764	419.797	0.000	0.000	0.000	0.000	0.5	0.4	1.1
STATIC	15/9/97	648701.264	391044.760	419.801	-0.003	-0.004	0.004	0.006	0.7	0.6	1.5
	29/9/97	648701.262	391044.756	419.804	-0.005	-0.008	0.007	0.012	0.7	0.8	1.6
	13/10/97	648701.254	391044.753	419.792	-0.013	-0.011	-0.005	0.018	0.6	0.7	1.3
	28/10/97	648701.249	391044.757	419.798	-0.018	-0.007	0.001	0.019	0.4	0.4	0.9
	26/2/98	648701.258	391044.748	419.786	-0.009	-0.016	-0.011	0.021	0.6	0.5	1.3
	5/3/98	648701.255	391044.750	419.791	-0.012	-0.014	-0.006	0.019	0.6	0.5	1.4
	12/3/98	648701.256	391044.749	419.784	-0.011	-0.015	-0.013	0.023	0.7	0.6	1.4
	2/4/98	648701.254	391044.748	419.781	-0.013	-0.016	-0.016	0.026	0.7	0.5	1.4
	16/4/98	648701.256	391044.752	419.789	-0.011	-0.012	-0.008	0.018	0.5	0.4	1.0
	23/4/98	648701.257	391044.750	419.789	-0.010	-0.014	-0.008	0.019	0.4	0.3	0.7
	30/4/98	648701.259	391044.752	419.787	-0.008	-0.012	-0.010	0.018	0.3	0.2	0.6
	7/5/98	648701.255	391044.746	419.790	-0.012	-0.018	-0.007	0.023	0.3	0.3	0.7
	28/5/98	648701.255	391044.749	419.794	-0.012	-0.015	-0.003	0.019	0.4	0.3	0.8
	4/6/98	648701.256	391044.749	419.789	-0.011	-0.015	-0.008	0.020	0.4	0.3	0.9
	11/6/98	648701.257	391044.748	419.789	-0.010	-0.016	-0.008	0.020	0.5	0.3	0.9
	18/6/98	648701.254	391044.746	419.789	-0.013	-0.018	-0.008	0.024	0.4	0.4	0.9
	25/6/98	648701.253	391044.743	419.793	-0.014	-0.021	-0.004	0.026	0.3	0.2	0.6
	2/7/98	648701.255	391044.744	419.788	-0.012	-0.020	-0.009	0.025	0.5	0.4	1.0
	9/7/98	648701.254	391044.745	419.789	-0.013	-0.019	-0.008	0.024	0.4	0.3	1.2
	16/7/98	648701.255	391044.744	419.789	-0.012	-0.020	-0.008	0.025	0.5	0.3	1.0
	23/7/98	648701.252	391044.742	419.787	-0.015	-0.022	-0.010	0.028	0.5	0.4	1.1
	30/7/98	648701.253	391044.744	419.791	-0.014	-0.020	-0.006	0.025	1.1	0.6	2.0
	6/8/98	648701.251	391044.741	419.793	-0.016	-0.023	-0.004	0.028	0.5	0.3	1.0
	13/8/98	648701.249	391044.739	419.798	-0.018	-0.025	0.001	0.031	0.8	0.5	1.6
	20/8/98	648701.252	391044.741	419.789	-0.015	-0.023	-0.008	0.029	0.4	0.3	0.9
	27/8/98	648701.252	391044.744	419.788	-0.015	-0.020	-0.009	0.027	0.5	0.4	1.3
	10/9/98	648701.253	391044.743	419.783	-0.014	-0.021	-0.014	0.029	0.3	0.2	1.1
	17/9/98	648701.251	391044.742	419.786	-0.016	-0.022	-0.011	0.029	0.6	0.4	1.7
	24/9/98	648701.252	391044.740	419.794	-0.015	-0.024	-0.003	0.028	0.7	0.5	1.4
	1/10/98	648701.254	391044.740	419.789	-0.013	-0.024	-0.008	0.028	0.5	0.3	0.9
	8/10/98	648701.256	391044.728	419.806	-0.011	-0.036	0.009	0.039	0.9	0.6	1.7
	22/10/98	648701.254	391044.745	419.794	-0.013	-0.019	-0.003	0.023	0.3	0.3	0.7
	29/10/98	648701.253	391044.745	419.791	-0.014	-0.019	-0.006	0.024	0.5	0.3	0.9
	5/11/98	648701.252	391044.743	419.791	-0.015	-0.021	-0.006	0.026	0.4	0.3	0.9
	19/11/98	648701.254	391044.746	419.788	-0.013	-0.018	-0.009	0.024	0.5	0.8	1.3
	17/12/98	648701.250	391044.738	419.777	-0.017	-0.026	-0.020	0.037	0.7	1.2	1.7
	28/12/98	648701.255	391044.742	419.778	-0.012	-0.022	-0.019	0.031	0.5	0.4	1.1
	14/1/99	648701.261	391044.721	419.778	-0.006	-0.043	-0.019	0.047	1.8	1.0	3.1
	28/1/99	648701.255	391044.740	419.793	-0.012	-0.024	-0.004	0.027	0.8	0.5	1.5
	11/2/99	648701.260	391044.738	419.783	-0.007	-0.026	-0.014	0.030	0.5	0.4	1.1
	25/2/99	648701.252	391044.745	419.789	-0.015	-0.019	-0.008	0.025	0.7	0.5	1.4
	12/3/99	648701.251	391044.746	419.788	-0.016	-0.018	-0.009	0.026	0.7	0.4	1.4
	25/3/99	648701.258	391044.741	419.786	-0.009	-0.023	-0.011	0.027	0.5	0.4	1.1
	8/4/99	648701.252	391044.738	419.780	-0.015	-0.026	-0.017	0.034	0.7	0.5	1.5
	22/4/99	648701.254	391044.741	419.785	-0.013	-0.023	-0.012	0.029	0.6	0.3	0.4
	6/5/99	648701.254	391044.742	419.784	-0.013	-0.022	-0.013	0.029	0.9	0.3	0.6
	20/5/99	648701.253	391044.743	419.786	-0.014	-0.021	-0.011	0.028	0.7	0.3	0.7
	3/6/99	648701.253	391044.743	419.788	-0.014	-0.021	-0.009	0.027	0.6	0.3	1.1
	17/6/99	648701.255	391044.744	419.782	-0.012	-0.020	-0.015	0.028	0.3	0.3	0.8
	2/7/99	648701.255	391044.743	419.789	-0.012	-0.021	-0.008	0.025	0.5	0.4	0.9
	15/7/99	648701.251	391044.744	419.787	-0.016	-0.020	-0.010	0.027	0.6	0.4	0.6
	29/7/99	648701.251	391044.745	419.787	-0.016	-0.019	-0.010	0.027	0.7	0.3	1.4
	27/8/99	648701.254	391044.741	419.789	-0.013	-0.023	-0.008	0.028	0.4	0.3	1.5
	28/9/99	648701.257	391044.742	419.793	-0.010	-0.022	-0.004	0.024	0.4	0.3	1.0
	28/10/99	648701.254	391044.740	419.780	-0.013	-0.024	-0.017	0.032	0.3	0.2	0.6
	25/11/99	648701.250	391044.734	419.785	-0.017	-0.030	-0.012	0.037	0.4	0.4	0.8
	15/12/99	648701.254	391044.734	419.786	-0.013	-0.030	-0.011	0.034	0.6	0.4	1.3
	13/1/00	648701.249	391044.733	419.788	-0.018	-0.031	-0.009	0.037	0.3	0.3	0.8
	10/2/00	648701.251	391044.738	419.773	-0.016	-0.026	-0.024	0.039	0.6	0.4	1.4
	2/3/00	648701.250	391044.736	419.778	-0.017	-0.028	-0.019	0.038	0.4	0.3	0.9
	5/4/00	648701.250	391044.728	419.774	-0.017	-0.036	-0.023	0.046	0.4	0.3	0.9
	4/5/00	648701.253	391044.730	419.779	-0.014	-0.034	-0.018	0.041	0.5	0.7	0.7
	2/6/00	648701.249	391044.731	419.784	-0.018	-0.033	-0.013	0.040	0.8	1.2	1.2
	5/7/00	648701.247	391044.729	419.786	-0.020	-0.035	-0.011	0.042	0.4	0.2	0.6
	25/7/00	648701.245	391044.727	419.780	-0.022	-0.037	-0.017	0.046	0.4	0.3	0.8
	4/8/00	648701.242	391044.727	419.783	-0.025	-0.037	-0.014	0.047	0.3	0.2	0.6
	11/9/00	648701.241	391044.727	419.783	-0.026	-0.037	-0.014	0.047	0.7	0.6	1.6
	5/10/00	648701.244	391044.727	419.78	-0.023	-0.037	-0.017	0.047	0.5	0.4	1.0
	3/11/00	648701.243	391044.716	419.786	-0.024	-0.048	-0.011	0.055	0.7	0.7	1.3
	7/12/00	648701.241	391044.726	419.781	-0.026	-0.038	-0.016	0.049	0.7	0.5	1.5
	10/1/01	648701.243	391044.724	419.772	-0.024	-0.040	-0.025	0.053	0.7	0.4	1.5
	6/3/01	648701.240	391044.726	419.778	-0.027	-0.038	-0.019	0.050	0.3	0.2	0.7
	18/4/01	648701.239	391044.721	419.779	-0.028	-0.043	-0.018	0.054	0.6	0.4	1.0
	31/5/01	648701.235	391044.722	419.785	-0.032	-0.042	-0.012	0.054	0.3	0.2	0.7
	11/9/01	648701.230	391044.718	419.784	-0.037	-0.046	-0.013	0.060	1.0	0.0	1.0
	5/12/01	648701.230	391044.716	419.780	-0.037	-0.048	-0.017	0.063	1.0	1.0	1.0
	13/03/02	648701.226	391044.714	419.778	-0.041	-0.050	-0.019	0.067	1.0	0.0	1.0
	18/6/02	648701.228	391044.719	419.778	-0.039	-0.045	-0.019	0.063	1.0	1.0	1.0
	29/10/02	648701.231	391044.716	419.788	-0.036	-0.048	-0.009	0.061	2.0	1.0	1.0
	21/01/03	648701.207	391044.709	419.792	-0.060	-0.055	-0.005	0.082	3.0	1.0	2.0
	19/03/03	648701.225	391044.711	419.788	-0.042	-0.053	-0.009	0.068	2.0	1.0	2.0
	25/08//03	648701.226	391044.715	419.785	-0.041	-0.049	-0.012	0.065	1.0	1.0	1.0
	10/03/2004	648701.226	391044.722	419.785	-0.041	-0.042	-0.012	0.060	1.0	1.0	1.0
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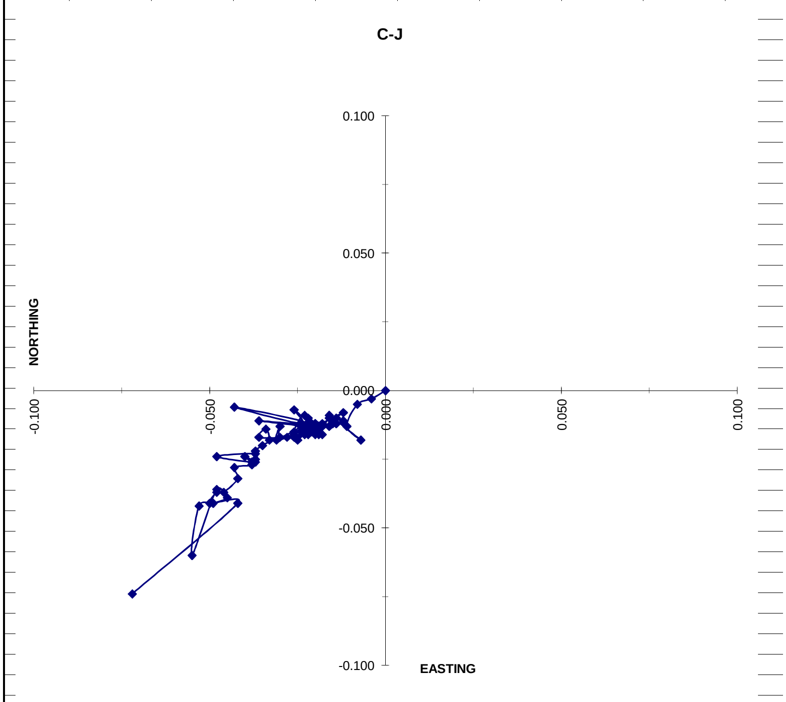
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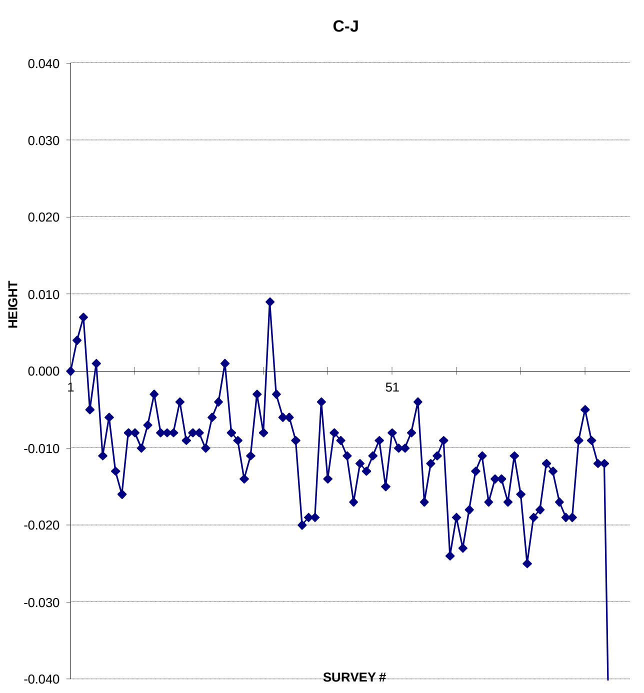
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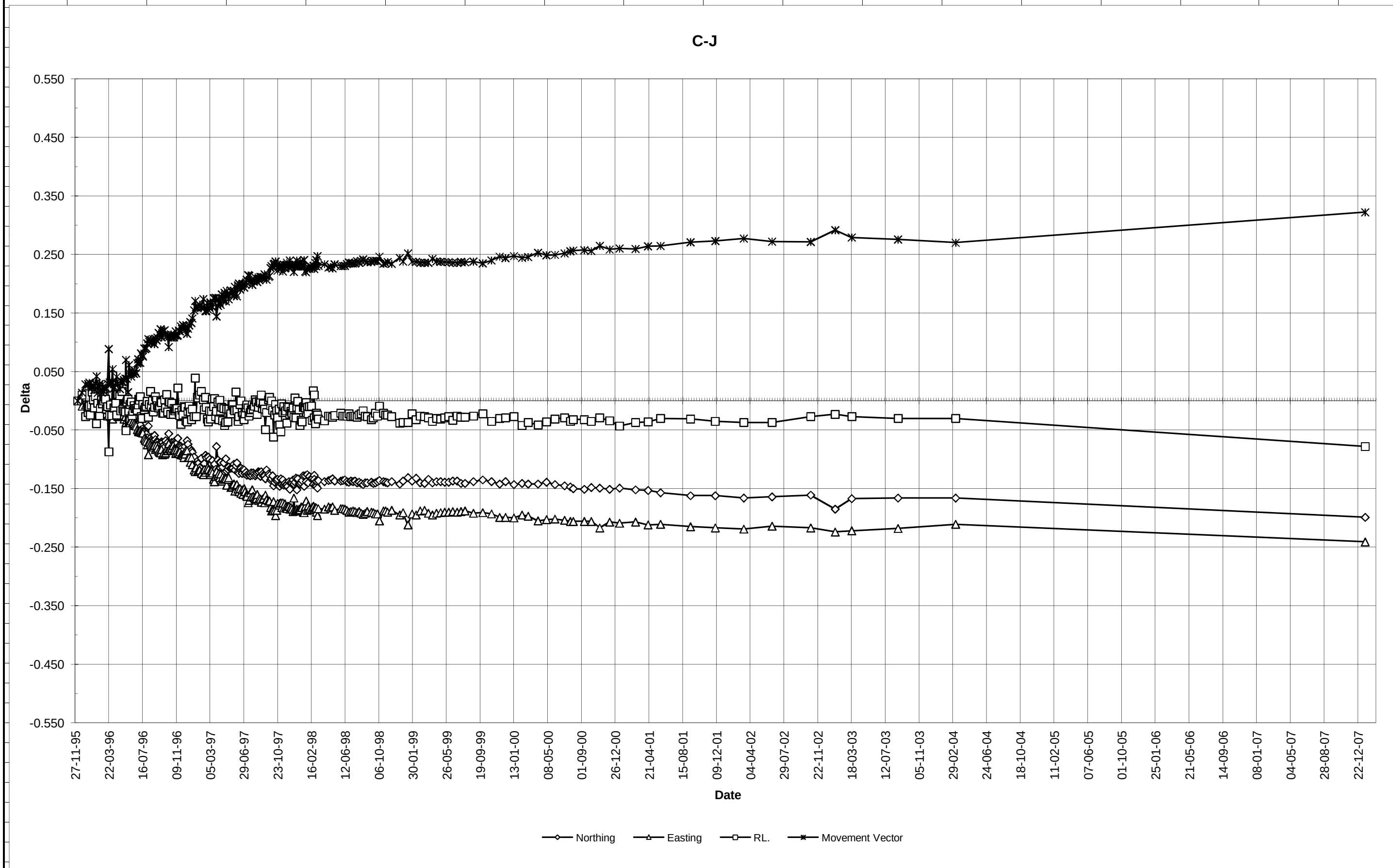
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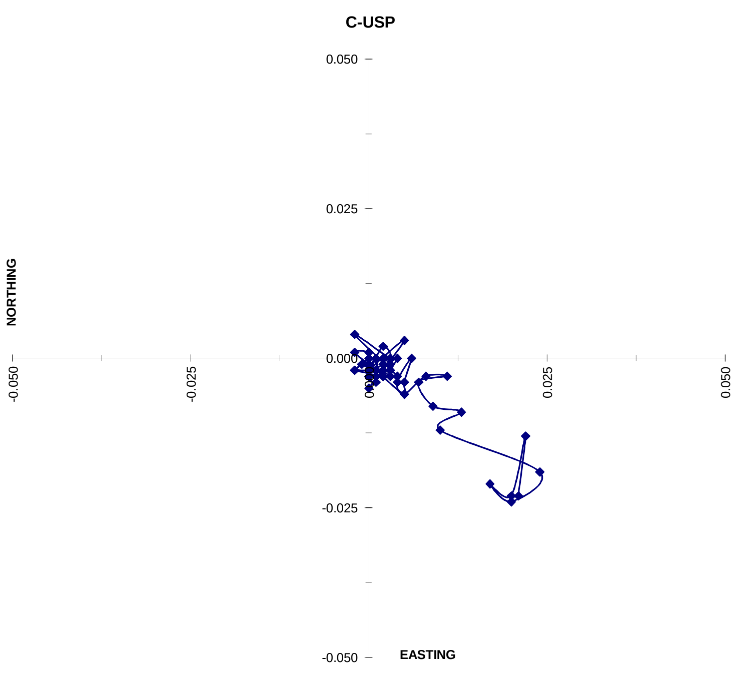
21-05-06
14-09-06
08-01-07
04-05-07
28-08-07
22-12-07
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-USP	24/2/98	648392.116	390075.868	286.240	0.000	0.000	0.000	0.000	0.4	0.3	0.8
Static	10/3/98	648392.114	390075.866	286.239	-0.002	-0.002	-0.001	0.003	0.5	0.3	0.9
	17/3/98	648392.116	390075.868	286.238	0.000	0.000	-0.002	0.002	0.3	0.3	0.6
	7/4/98	648392.117	390075.868	286.240	0.001	0.000	0.000	0.001	0.4	0.4	1.0
	14/4/98	648392.117	390075.866	286.244	0.001	-0.002	0.004	0.005	0.3	0.3	0.7
	21/4/98	648392.114	390075.869	286.232	-0.002	0.001	-0.008	0.008	0.4	0.2	0.9
	28/4/98	648392.114	390075.868	286.243	-0.002	0.000	0.003	0.004	0.3	0.2	0.8
	5/5/98	648392.114	390075.868	286.235	-0.002	0.000	-0.005	0.005	0.2	0.2	0.5
	12/5/98	648392.119	390075.873	286.241	0.003	0.005	0.001	0.006	0.5	0.3	1.0
	19/5/98	648392.111	390075.868	286.239	-0.005	0.000	-0.001	0.005	0.5	0.3	0.8
	26/5/98	648392.113	390075.869	286.237	-0.003	0.001	-0.003	0.004	0.4	0.3	0.7
	2/6/98	648392.114	390075.866	286.239	-0.002	-0.002	-0.001	0.003	0.4	0.2	0.8
	9/6/98	648392.114	390075.869	286.243	-0.002	0.001	0.003	0.004	0.4	0.3	0.7
	16/6/98	648392.116	390075.869	286.238	0.000	0.001	-0.002	0.002	0.3	0.2	0.6
	23/6/98	648392.115	390075.870	286.240	-0.001	0.002	0.000	0.002	0.3	0.2	0.7
	30/6/98	648392.114	390075.868	286.234	-0.002	0.000	-0.006	0.006	0.3	0.2	0.6
	7/7/98	648392.116	390075.869	286.237	0.000	0.001	-0.003	0.003	0.3	0.2	0.6
	14/7/98	648392.114	390075.869	286.237	-0.002	0.001	-0.003	0.004	0.3	0.3	0.6
	21/7/98	648392.115	390075.867	286.236	-0.001	-0.001	-0.004	0.004	0.3	0.2	0.7
	28/7/98	648392.114	390075.869	286.233	-0.002	0.001	-0.007	0.007	0.4	0.3	0.8
	4/8/98	648392.114	390075.870	286.236	-0.002	0.002	-0.004	0.005	0.3	0.2	0.8
	11/8/98	648392.113	390075.870	286.241	-0.003	0.002	0.001	0.004	0.3	0.2	0.9
	18/8/98	648392.113	390075.869	286.232	-0.003	0.001	-0.008	0.009	0.4	0.3	1.0
	25/8/98	648392.113	390075.870	286.239	-0.003	0.002	-0.001	0.004	0.3	0.2	0.7
	1/9/98	648392.115	390075.868	286.234	-0.001	0.000	-0.006	0.006	0.5	0.8	1.2
	8/9/98	648392.114	390075.868	286.236	-0.002	0.000	-0.004	0.004	0.4	0.3	0.7
	15/9/98	648392.113	390075.868	286.237	-0.003	0.000	-0.003	0.004	0.3	0.2	0.6
	23/9/98	648392.113	390075.870	286.239	-0.003	0.002	-0.001	0.004	0.6	0.3	1.2
	29/9/98	648392.113	390075.869	286.235	-0.003	0.001	-0.005	0.006	0.4	0.3	0.7
	6/10/98	648392.113	390075.868	286.235	-0.003	0.000	-0.005	0.006	0.3	0.3	0.7
	13/10/98	648392.113	390075.868	286.236	-0.003	0.000	-0.004	0.005	0.5	0.4	1.1
	27/10/98	648392.113	390075.870	286.239	-0.003	0.002	-0.001	0.004	0.5	0.7	1.1
	3/11/98	648392.113	390075.870	286.241	-0.003	0.002	0.001	0.004	0.6	0.5	1.3
	10/11/98	648392.114	390075.869	286.241	-0.002	0.001	0.001	0.002	0.3	0.5	0.8
	24/11/98	648392.112	390075.869	286.241	-0.004	0.001	0.001	0.004	0.4	0.5	0.9
	22/12/98	648392.113	390075.868	286.236	-0.003	0.000	-0.004	0.005	0.7	0.3	0.8
	6/1/99	648392.118	390075.870	286.236	0.002	0.002	-0.004	0.005	0.5	0.3	1.0
	19/1/99	648392.116	390075.871	286.245	0.000	0.003	0.005	0.006	0.4	0.3	0.8
	16/2/99	648392.120	390075.866	286.239	0.004	-0.002	-0.001	0.005	0.4	0.3	1.0
	2/3/99	648392.113	390075.872	286.239	-0.003	0.004	-0.001	0.005	0.4	0.3	0.7
	16/3/99	648392.114	390075.870	286.237	-0.002	0.002	-0.003	0.004	0.6	0.5	1.4
	22/3/99	648392.116	390075.872	286.239	0.000	0.004	-0.001	0.004	0.5	0.3	1.0
	30/3/99	648392.114	390075.871	286.235	-0.002	0.003	-0.005	0.006	0.7	0.6	1.4
	9/4/99	648392.115	390075.871	286.234	-0.001	0.003	-0.006	0.007	0.6	0.5	1.2
	13/4/99	648392.116	390075.870	286.234	0.000	0.002	-0.006	0.006	0.4	0.3	1.0
	27/4/99	648392.114	390075.871	286.231	-0.002	0.003	-0.009	0.010	0.8	0.3	0.9
	12/5/99	648392.113	390075.871	286.235	-0.003	0.003	-0.005	0.007	0.5	0.2	0.4
	25/5/99	648392.113	390075.870	286.236	-0.003	0.002	-0.004	0.005	0.6	0.3	0.6
	9/6/99	648392.110	390075.873	286.240	-0.006	0.005	0.000	0.008	0.9	0.5	0.7
	22/6/99	648392.112	390075.873	286.229	-0.004	0.005	-0.011	0.013	0.4	0.4	0.8
	6/7/99	648392.116	390075.874	286.228	0.000	0.006	-0.012	0.013	1.1	0.3	1.9
	20/7/99	648392.112	390075.872	286.239	-0.004	0.004	-0.001	0.006	0.5	0.3	1.1
	14/1/00	648392.110	390075.873	286.237	-0.006	0.005	-0.003	0.008	0.3	0.3	0.7
	11/7/00	648392.113	390075.876	286.232	-0.003	0.008	-0.008	0.012	0.5	0.3	0.9
	2/11/2000	648392.113	390075.879	286.226	-0.003	0.011	-0.014	0.018	0.7	0.6	1.4
	5/12/2000	648392.112	390075.875	286.233	-0.004	0.007	-0.007	0.011	0.4	0.3	0.9
	1/06/2001	648392.108	390075.877	286.23	-0.008	0.009	-0.010	0.016	0.3	0.2	0.7
	27/08/03	648392.107	390075.881	286.262	-0.009	0.013	0.022	0.027	1.0	0.0	1.0
	24/03/2004	648392.104	390075.878	286.236	-0.012	0.010	-0.004	0.016	1.0	0.0	1.0
	17/11/09	648392.097	390075.892	286.234	-0.019	0.024	-0.006	0.031	1.0	2.0	3.0
	4/12/2009	648392.092	390075.888	286.226	-0.024	0.020	-0.014	0.034	1.0	1.0	1.0
	22/6/10	648392.095	390075.885	286.223	-0.021	0.017	-0.017	0.032	1.0	0.0	1.0
	9/02/2011	648392.093	390075.888	286.224	-0.023	0.020	-0.016	0.034	1.0	0.0	1.0
	17/01/2012	648392.103	390075.890	286.219	-0.013	0.022	-0.021	0.033			
	22/10/12	648392.093	390075.889	286.224	-0.023	0.021	-0.016	0.035	1	1	2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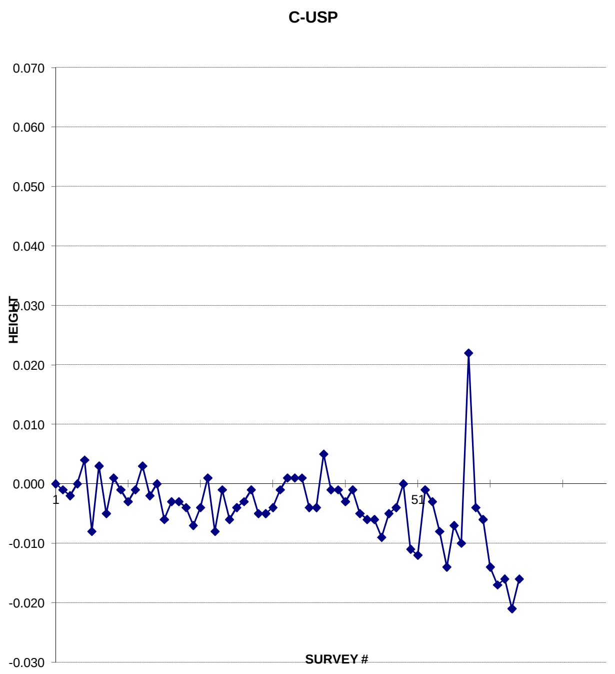
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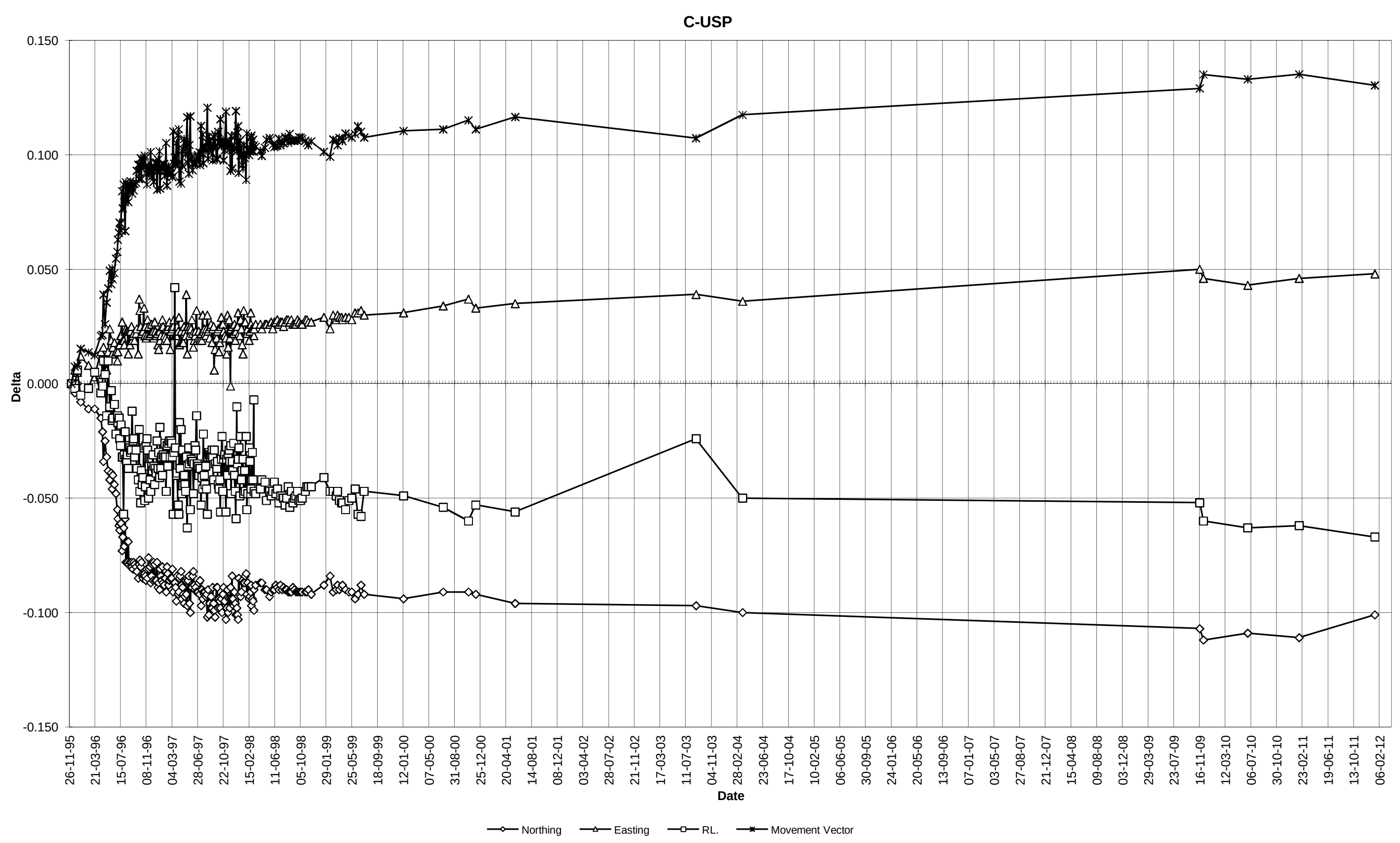
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Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
CRA	20/2/98	649119.919	390624.749	428.910	0.000	0.000	0.000	0.000	0.2	0.2	0.5
Static	27/2/98	649119.923	390624.747	428.908	0.004	-0.002	-0.002	0.005	0.4	0.3	0.8
	6/3/98	649119.922	390624.746	428.913	0.003	-0.003	0.003	0.005	0.5	0.4	1.1
	13/3/98	649119.918	390624.746	428.904	-0.001	-0.003	-0.006	0.007	0.5	0.3	1.0
	3/4/98	649119.919	390624.747	428.911	0.000	-0.002	0.001	0.002	0.3	0.2	0.7
	9/4/98	649119.919	390624.747	428.908	0.000	-0.002	-0.002	0.003	0.3	0.3	0.8
	17/4/98	649119.920	390624.746	428.918	0.001	-0.003	0.008	0.009	0.6	0.5	1.4
	24/4/98	649119.919	390624.747	428.902	0.000	-0.002	-0.008	0.008	0.4	0.3	0.9
	1/5/98	649119.916	390624.748	428.910	-0.003	-0.001	0.000	0.003	0.4	0.3	0.7
	8/5/98	649119.917	390624.747	428.912	-0.002	-0.002	0.002	0.003	0.4	0.3	0.9
	15/5/98	649119.920	390624.752	428.917	0.001	0.003	0.007	0.008	0.6	0.4	1.0
	22/5/98	649119.918	390624.746	428.909	-0.001	-0.003	-0.001	0.003	0.9	0.8	1.9
	29/5/98	649119.918	390624.746	428.910	-0.001	-0.003	0.000	0.003	0.3	0.2	0.4
	5/6/98	649119.918	390624.749	428.917	-0.001	0.000	0.007	0.007	0.3	0.2	0.6
	12/6/98	649119.917	390624.747	428.912	-0.002	-0.002	0.002	0.003	0.4	0.3	0.8
	19/6/98	649119.916	390624.747	428.913	-0.003	-0.002	0.003	0.005	0.3	0.2	0.7
	26/6/98	649119.917	390624.747	428.910	-0.002	-0.002	0.000	0.003	0.4	0.2	0.7
	3/7/98	649119.916	390624.748	428.916	-0.003	-0.001	0.006	0.007	0.4	0.3	0.8
	10/7/98	649119.917	390624.747	428.914	-0.002	-0.002	0.004	0.005	0.4	0.3	0.9
	17/7/98	649119.913	390624.747	428.912	-0.006	-0.002	0.002	0.007	0.3	0.3	0.6
	24/7/98	649119.914	390624.747	428.914	-0.005	-0.002	0.004	0.007	0.3	0.2	0.6
	31/7/98	649119.911	390624.747	428.912	-0.008	-0.002	0.002	0.008	0.4	0.3	0.8
	7/8/98	649119.914	390624.745	428.916	-0.005	-0.004	0.006	0.009	0.5	0.3	0.9
	14/8/98	649119.911	390624.746	428.916	-0.008	-0.003	0.006	0.010	0.5	0.3	1.0
	21/8/98	649119.913	390624.747	428.918	-0.006	-0.002	0.008	0.010	0.3	0.2	0.8
	28/8/98	649119.913	390624.748	428.912	-0.006	-0.001	0.002	0.006	0.4	0.3	0.9
	11/9/98	649119.914	390624.747	428.913	-0.005	-0.002	0.003	0.006	0.4	0.3	0.8
	18/9/98	649119.915	390624.747	428.910	-0.004	-0.002	0.000	0.004	0.6	0.4	1.1
	2/10/98	649119.915	390624.747	428.911	-0.004	-0.002	0.001	0.005	0.4	0.3	0.8
	9/10/98	649119.914	390624.745	428.915	-0.005	-0.004	0.005	0.008	0.6	0.3	1.1
	23/10/98	649119.912	390624.751	428.918	-0.007	0.002	0.008	0.011	0.3	0.3	0.7
	30/10/98	649119.919	390624.754	428.916	0.000	0.005	0.006	0.008	0.5	0.4	1.1
	4/11/98	649119.914	390624.754	428.913	-0.005	0.005	0.003	0.008	0.4	0.3	0.8
	18/11/98	649119.917	390624.749	428.912	-0.002	0.000	0.002	0.003	0.3	0.5	0.8
	16/12/98	649119.916	390624.754	428.916	-0.003	0.005	0.006	0.008	0.5	0.4	1.1
	28/12/98	649119.913	390624.753	428.913	-0.006	0.004	0.003	0.008	0.4	0.3	1.1
	13/1/99	649119.913	390624.750	428.900	-0.006	0.001	-0.010	0.012	0.4	0.3	0.8
	27/1/99	649119.917	390624.750	428.907	-0.002	0.001	-0.003	0.004	0.5	0.4	1.0
	10/2/99	649119.920	390624.753	428.910	0.001	0.004	0.000	0.004	0.4	0.3	0.8
	24/2/99	649119.917	390624.756	428.912	-0.002	0.007	0.002	0.008	0.4	0.3	0.8
	11/3/99	649119.916	390624.755	428.908	-0.003	0.006	-0.002	0.007	0.4	0.3	1.0
	24/3/99	649119.913	390624.760	428.894	-0.006	0.011	-0.016	0.020	0.6	0.6	3.0
	7/4/99	649119.917	390624.755	428.906	-0.002	0.006	-0.004	0.007	0.6	0.5	0.6
	21/4/99	649119.916	390624.757	428.913	-0.003	0.008	0.003	0.009	0.8	0.3	0.8
	5/5/99	649119.914	390624.754	428.911	-0.005	0.005	0.001	0.007	0.8	0.3	0.7
	19/5/99	649119.915	390624.756	428.913	-0.004	0.007	0.003	0.009	0.8	0.3	0.8
	2/6/99	649119.916	390624.754	428.913	-0.003	0.005	0.003	0.007	0.5	0.4	1.1
	16/6/99	649119.916	390624.756	428.912	-0.003	0.007	0.002	0.008	0.6	0.6	1.5
	29/6/99	649119.913	390624.756	428.915	-0.006	0.007	0.005	0.010	0.3	0.4	0.7
	14/7/99	649119.914	390624.757	428.910	-0.005	0.008	0.000	0.009	0.5	0.4	0.8
	28/7/99	649119.910	390624.758	428.915	-0.009	0.009	0.005	0.014	0.4	0.2	0.8
	26/8/99	649119.913	390624.758	428.908	-0.006	0.009	-0.002	0.011	0.4	0.3	0.8
	27/9/99	649119.916	390624.758	428.908	-0.003	0.009	-0.002	0.010	0.5	0.3	0.9
	27/10/99	649119.913	390624.757	428.910	-0.006	0.008	0.000	0.010	0.4	0.7	0.9
	24/11/99	649119.914	390624.760	428.912	-0.005	0.011	0.002	0.012	0.3	0.2	0.7
	14/12/99	649119.912	390624.756	428.908	-0.007	0.007	-0.002	0.010	0.6	0.5	1.1
	12/1/00	649119.915	390624.760	428.905	-0.004	0.011	-0.005	0.013	0.4	0.3	0.9
	1/3/00	649119.916	390624.757	428.901	-0.003	0.008	-0.009	0.012	0.6	0.5	1.4
	4/4/00	649119.916	390624.756	428.904	-0.003	0.007	-0.006	0.010	0.4	0.4	0.8
	3/5/00	649119.912	390624.759	428.901	-0.007	0.010	-0.009	0.015	0.7	0.8	0.8
	1/6/00	649119.916	390624.758	428.912	-0.003	0.009	0.002	0.010	0.5	0.8	0.8
	4/7/00	649119.911	390624.756	428.907	-0.008	0.007	-0.003	0.011	0.4	0.3	0.8
	7/8/00	649119.908	390624.759	428.917	-0.011	0.010	0.007	0.016	0.3	0.2	0.5
	8/9/00	649119.908	390624.758	428.906	-0.011	0.009	-0.004	0.015	0.4	0.3	0.9
	4/10/00	649119.911	390624.758	428.909	-0.008	0.009	-0.001	0.012	0.4	0.5	1.0
New posn	11/12/00	649154.262	390626.443	423.829	-0.008	0.009	-0.001	0.012	0.7	0.5	1.1
	09/01/01	649154.257	390626.463	423.820	-0.013	0.029	-0.010	0.033	1.0	0.7	2.3
	08/02/01	649154.252	390626.462	423.825	-0.018	0.028	-0.005	0.034	0.4	0.3	1.0
	05/03/01	649154.247	390626.465	423.828	-0.023	0.031	-0.002	0.039	0.4	0.3	0.8
	17/4/01	649154.250	390626.464	423.831	-0.020	0.030	0.001	0.036	0.3	0.2	0.7
	11/09/01	649154.245	390626.471	423.830	-0.025	0.037	0.000	0.045	1.0	0.0	1.0
	10/12/01	649154.241	390626.471	423.823	-0.029	0.037	-0.007	0.048	1.0	0.0	1.0
	14/03/02	649154.242	390626.470	423.830	-0.028	0.036	0.000	0.046	1.0	1.0	1.0
	19/6/02	649154.242	390626.470	423.827	-0.028	0.036	-0.003	0.046	1.0	0.0	1.0
	30/10/2002	649154.242	390626.473	423.826	-0.028	0.039	-0.004	0.048	1.0	0.0	1.0
	21/2/03	649154.245	390626.473	423.824	-0.025	0.039	-0.006	0.047	1.0	0.0	1.0
	18/3/03	649154.241	390626.475	423.834	-0.029	0.041	0.004	0.050	1.0	0.0	1.0
	9/01/2003	649154.240	390626.480	423.827	-0.030	0.046	-0.003	0.055	1.0	0.0	1.0
	11/03/2004	649154.242	390626.478	423.828	-0.028	0.044	-0.002	0.052	1.0	0.0	1.0
	18/11/2009	649154.234	390626.48	423.826	-0.036	0.046	-0.004	0.059	1.0	0.0	1.0
	22/06/2010	649154.234	390626.481	423.829	-0.036	0.047	-0.001	0.059	0.0	0.0	1.0
	4/02/2011	649154.236	390626.478	423.816	-0.034	0.044	-0.014	0.057	0.0	0.0	1.0
	18/10/2011	649154.23	390626.475	423.815	-0.040	0.041	-0.015	0.059	1.0	1.0	2.0
	17/01/2012	649154.226	390626.478	423.830	-0.044	0.044	0.000	0.062			
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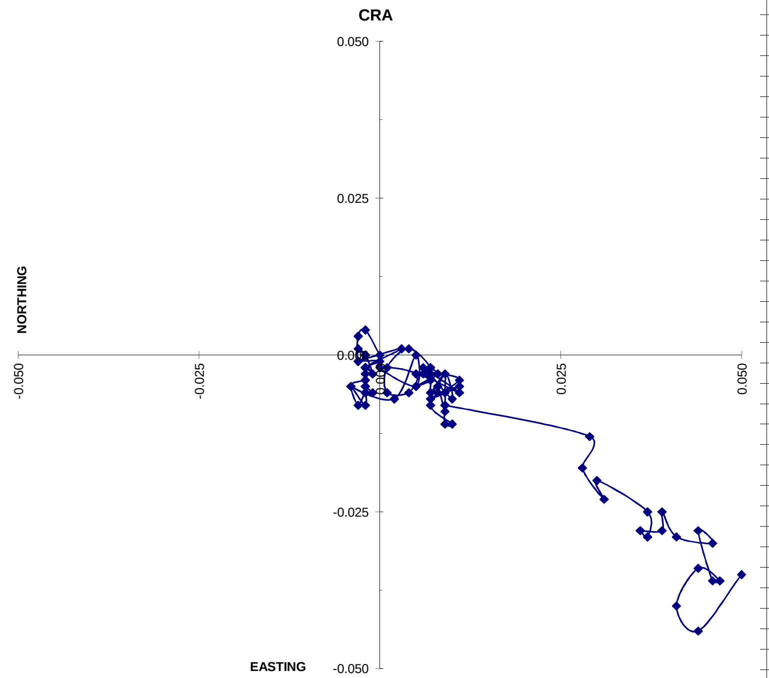
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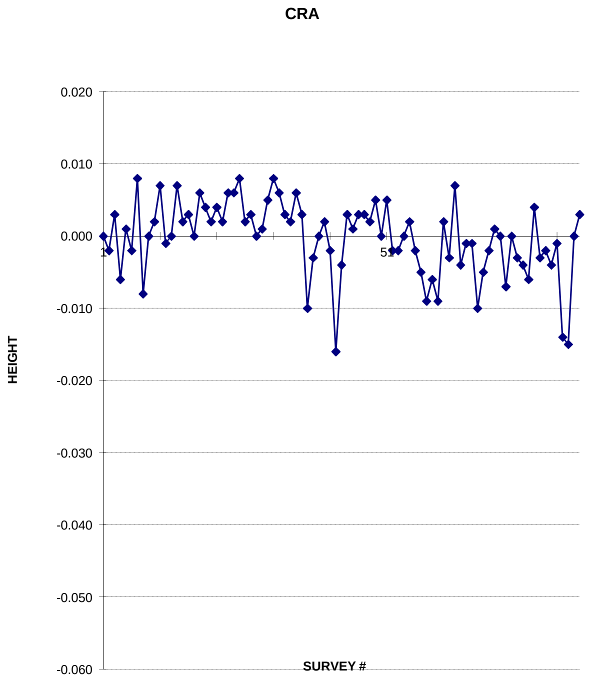
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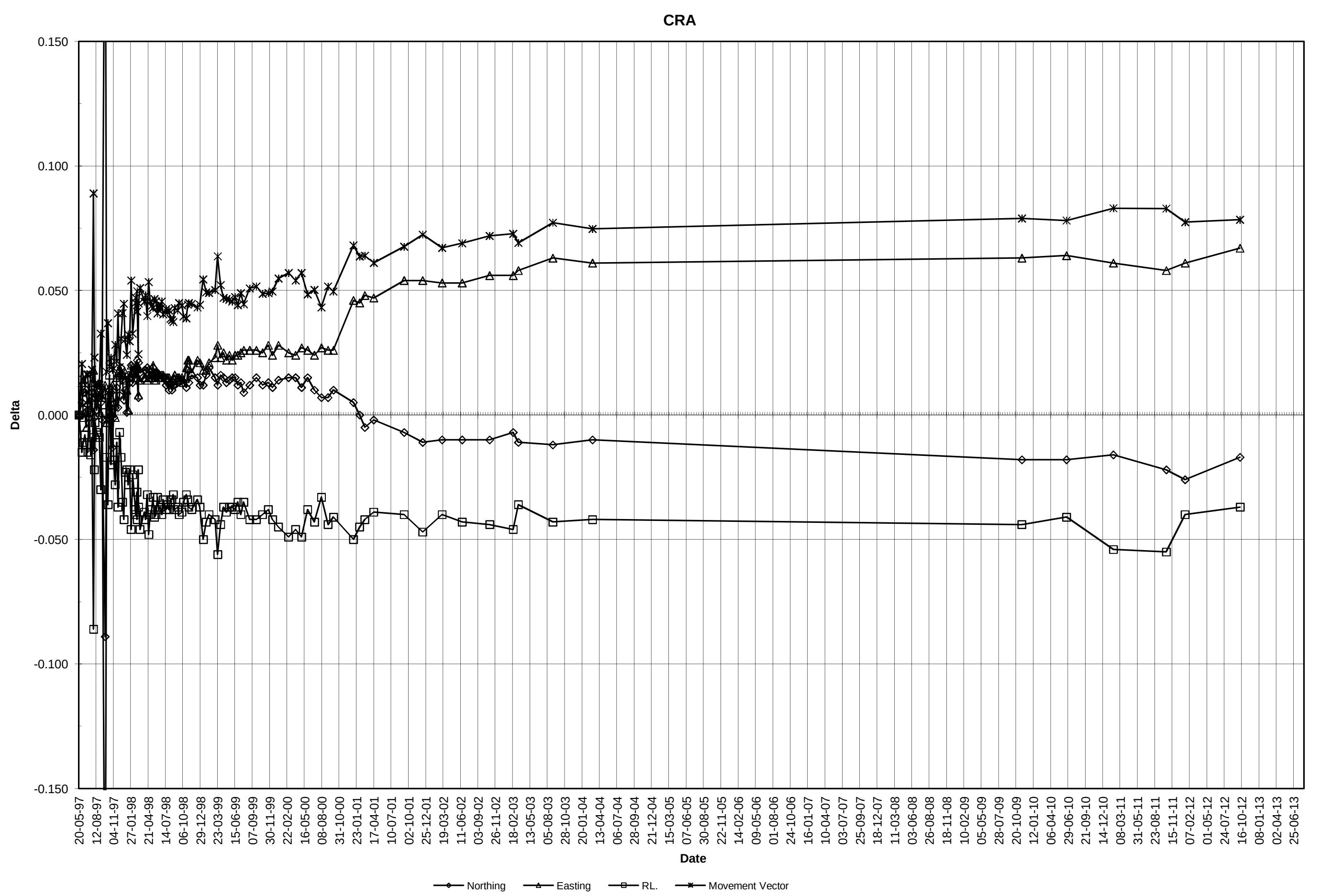
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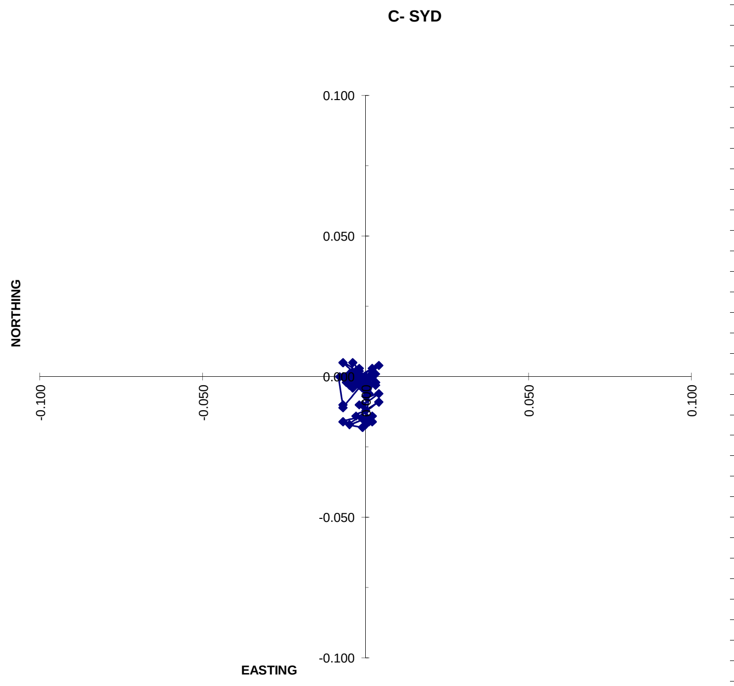
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-SYD	18/8/97	648216.979	390149.360	280.610	0.000	0.000	0.000	0.000	0.5	0.5	1.1
Static	1/9/97	648216.980	390149.362	280.611	0.001	0.002	0.001	0.002	0.5	0.4	1.0
	15/9/97	648216.979	390149.358	280.614	0.000	-0.002	0.004	0.004	0.3	0.3	0.7
	29/9/97	648216.981	390149.362	280.614	0.002	0.002	0.004	0.005	0.4	0.3	0.8
	13/10/97	648216.968	390149.353	280.613	-0.011	-0.007	0.003	0.013	0.4	0.3	0.9
	28/10/97	648216.969	390149.353	280.615	-0.010	-0.007	0.005	0.013	0.4	0.3	0.7
	9/3/98	648216.979	390149.352	280.605	0.000	-0.008	-0.005	0.009	0.8	0.5	1.6
	16/3/98	648216.979	390149.356	280.605	0.000	-0.004	-0.005	0.006	0.6	0.2	0.4
	6/4/98	648216.979	390149.357	280.606	0.000	-0.003	-0.004	0.005	0.4	0.3	0.8
	20/4/98	648216.980	390149.355	280.602	0.001	-0.005	-0.008	0.009	0.3	0.3	0.8
	27/4/98	648216.979	390149.356	280.609	0.000	-0.004	-0.001	0.004	0.4	0.3	0.7
	4/5/98	648216.977	390149.354	280.606	-0.002	-0.006	-0.004	0.007	0.2	0.2	0.6
	11/5/98	648216.979	390149.355	280.604	0.000	-0.005	-0.006	0.008	0.3	0.2	0.8
	18/5/98	648216.976	390149.355	280.604	-0.003	-0.005	-0.006	0.008	0.3	0.2	0.5
	25/5/98	648216.980	390149.356	280.608	0.001	-0.004	-0.002	0.005	0.5	0.4	1.1
	1/6/98	648216.978	390149.357	280.601	-0.001	-0.003	-0.009	0.010	0.4	0.4	0.9
	8/6/98	648216.980	390149.355	280.612	0.001	-0.005	0.002	0.005	0.4	0.3	0.9
	15/6/98	648216.978	390149.356	280.606	-0.001	-0.004	-0.004	0.006	0.2	0.2	0.5
	22/6/98	648216.979	390149.354	280.607	0.000	-0.006	-0.003	0.007	0.3	0.2	0.6
	29/6/98	648216.979	390149.354	280.606	0.000	-0.006	-0.004	0.007	0.2	0.2	0.4
	6/7/98	648216.979	390149.353	280.610	0.000	-0.007	0.000	0.007	0.3	0.2	0.6
	13/7/98	648216.979	390149.354	280.606	0.000	-0.006	-0.004	0.007	0.3	0.2	0.6
	20/7/98	648216.980	390149.356	280.610	0.001	-0.004	0.000	0.004	0.3	0.2	0.7
	27/7/98	648216.980	390149.357	280.605	0.001	-0.003	-0.005	0.006	0.5	0.4	1.2
	3/8/98	648216.980	390149.356	280.605	0.001	-0.004	-0.005	0.006	0.5	0.4	1.2
	10/8/98	648216.981	390149.358	280.608	0.002	-0.002	-0.002	0.003	0.4	0.3	1.3
	17/8/98	648216.979	390149.357	280.602	0.000	-0.003	-0.008	0.009	0.3	0.3	1.2
	24/8/98	648216.979	390149.355	280.604	0.000	-0.005	-0.006	0.008	0.3	0.2	0.7
	7/9/98	648216.981	390149.357	280.602	0.002	-0.003	-0.008	0.009	0.3	0.3	0.7
	14/9/98	648216.980	390149.356	280.603	0.001	-0.004	-0.007	0.008	0.5	0.3	1.0
	21/9/98	648216.980	390149.357	280.609	0.001	-0.003	-0.001	0.003	0.6	0.4	1.2
	28/9/98	648216.978	390149.356	280.606	-0.001	-0.004	-0.004	0.006	0.3	0.2	0.6
	5/10/98	648216.980	390149.356	280.603	0.001	-0.004	-0.007	0.008	0.8	1.3	1.9
	12/10/98	648216.978	390149.356	280.604	-0.001	-0.004	-0.006	0.007	0.5	0.3	1.0
	27/10/98	648216.979	390149.358	280.607	0.000	-0.002	-0.003	0.004	0.6	0.4	1.2
	2/11/98	648216.977	390149.357	280.607	-0.002	-0.003	-0.003	0.005	0.5	0.3	0.9
	9/11/98	648216.982	390149.358	280.611	0.003	-0.002	0.001	0.004	0.6	0.4	1.2
	23/11/98	648216.976	390149.356	280.609	-0.003	-0.004	-0.001	0.005	0.5	0.6	1.2
	21/12/98	648216.984	390149.356	280.614	0.005	-0.004	0.004	0.008	0.6	0.5	1.2
	5/1/99	648216.979	390149.358	280.595	0.000	-0.002	-0.015	0.015	0.7	0.6	1.6
	18/1/99	648216.977	390149.355	280.611	-0.002	-0.005	0.001	0.005	0.5	0.3	0.9
	29/1/99	648216.978	390149.357	280.609	-0.001	-0.003	-0.001	0.003	0.4	0.3	0.8
	12/2/99	648216.983	390149.364	280.611	0.004	0.004	0.001	0.006	0.6	0.5	1.7
	26/2/99	648216.976	390149.358	280.610	-0.003	-0.002	0.000	0.004	0.5	0.4	1.1
	15/3/99	648216.976	390149.358	280.607	-0.003	-0.002	-0.003	0.005	0.3	0.3	0.7
	29/3/99	648216.975	390149.356	280.598	-0.004	-0.004	-0.012	0.013	0.6	0.4	1.1
	12/4/99	648216.976	390149.359	280.603	-0.003	-0.001	-0.007	0.008	0.4	0.3	0.9
	26/4/99	648216.976	390149.361	280.608	-0.003	0.001	-0.002	0.004	1.4	0.5	0.9
	10/5/99	648216.978	390149.357	280.608	-0.001	-0.003	-0.002	0.004	0.9	0.4	1.0
	24/5/99	648216.975	390149.359	280.607	-0.004	-0.001	-0.003	0.005	0.6	0.3	0.7
	8/6/99	648216.979	390149.358	280.606	0.000	-0.002	-0.004	0.004	0.3	0.2	0.6
	21/6/99	648216.976	390149.363	280.598	-0.003	0.003	-0.012	0.013	0.4	0.3	0.8
	5/7/99	648216.976	390149.363	280.605	-0.003	0.003	-0.005	0.007	0.6	0.4	1.2
	19/7/99	648216.978	390149.360	280.611	-0.001	0.000	0.001	0.001	0.5	0.3	1.1
	27/8/99	648216.973	390149.361	280.615	-0.006	0.001	0.005	0.008	0.6	0.5	1.6
	28/9/99	648216.980	390149.363	280.604	0.001	0.003	-0.006	0.007	0.4	0.4	0.8
	6/10/99	648216.979	390149.362	280.612	0.000	0.002	0.002	0.003	0.5	0.3	1.1
	28/10/99	648216.982	390149.362	280.615	0.003	0.002	0.005	0.006	0.4	0.5	0.7
	25/11/99	648216.977	390149.363	280.610	-0.002	0.003	0.000	0.004	0.6	0.3	1.0
	15/12/99	648216.977	390149.359	280.602	-0.002	-0.001	-0.008	0.008	1.0	0.5	1.8
	14/1/00	648216.981	390149.357	280.610	0.002	-0.003	0.000	0.004	0.6	0.4	1.3
	10/2/00	648216.984	390149.353	280.629	0.005	-0.007	0.019	0.021	0.7	0.6	1.6
	2/3/00	648216.978	390149.359	280.611	-0.001	-0.001	0.001	0.002	0.4	0.3	1.0
	5/4/00	648216.980	390149.358	280.608	0.001	-0.002	-0.002	0.003	0.5	0.3	1.0
	4/5/00	648216.977	390149.360	280.609	-0.002	0.000	-0.001	0.002	0.6	1.1	1.1
	2/6/00	648216.979	390149.358	280.606	0.000	-0.002	-0.004	0.004	0.8	1.0	1.0
	5/7/00	648216.979	390149.360	280.604	0.000	0.000	-0.006	0.006	0.3	0.3	0.7
	7/8/00	648216.979	390149.360	280.603	0.000	0.000	-0.007	0.007	0.4	0.3	0.9
	8/9/00	648216.980	390149.362	280.617	0.001	0.002	0.007	0.007	0.5	0.5	0.9
	5/10/00	648216.978	390149.359	280.609	-0.001	-0.001	-0.001	0.002	0.4	0.5	0.9
	3/11/00	648216.979	390149.361	280.602	0.000	0.001	-0.008	0.008	0.5	0.4	1.0
	6/12/00	648216.977	390149.359	280.607	-0.002	-0.001	-0.003	0.004	0.4	0.3	0.7
	10/1/01	648216.979	390149.362	280.598	0.000	0.002	-0.012	0.012	0.6	0.6	1.3
	6/3/01	648216.975	390149.360	280.607	-0.004	0.000	-0.003	0.005	0.4	0.3	0.8
	18/4/01	648216.977	390149.359	280.610	-0.002	-0.001	0.000	0.002	0.6	0.5	1.4
	31/5/01	648216.974	390149.36	280.603	-0.005	0.000	-0.007	0.009	0.3	0.3	0.7
	9/10/01	648216.977	390149.363	280.600	-0.002	0.003	-0.010	0.011	1.0	0.0	1.0
	12/12/01	648216.976	390149.361	280.606	-0.003	0.001	-0.004	0.005	1.0	0.0	1.0
	14/03/02	648216.979	390149.361	280.613	0.000	0.001	0.003	0.003	1.0	0.0	1.0
	19/6/02	648216.972	390149.360	280.604	-0.007	0.000	-0.006	0.009	1.0	0.0	1.0
	29/10/02	648216.973	390149.364	280.603	-0.006	0.004	-0.007	0.010	1.0	0.0	1.0
	21/2/03	648216.969	390149.359	280.609	-0.010	-0.001	-0.001	0.010	1.0	0.0	1.0
	19/03/03	648216.969	390149.358	280.607	-0.010	-0.002	-0.003	0.011	1.0	0.0	1.0
	27/08/03	648216.963	390149.362	280.603	-0.016	0.002	-0.007	0.018	1.0	1.0	1.0
	24/03/2004	648216.965	390149.357	280.605	-0.014	-0.003	-0.005	0.015	1.0	1.0	1.0
	15/12/2004	648216.967	390149.360	280.606	-0.012	0.000	-0.004	0.013	1.0	0.0	1.0
	26/10/2005	648216.970	390149.364	280.611	-0.009	0.004	0.001	0.010	2.0	1.0	1.0
	16/01/2008	648216.962	390149.355	280.6	-0.017	-0.005	-0.010	0.020	2.0	1.0	1.0
	29/10/2008	648216.964	390149.36	280.603	-0.015	0.000	-0.007	0.017	1.0	0.0	1.0
	21/11/2008	648216.962	390149.36	280.603	-0.017	0.000	-0.007	0.018	1.0	0.0	1.0
	9/03/2008	648216.963	390149.361	280.605	-0.016	0.001	-0.005	0.017	1.0	1.0	2.0
	30/07/2009	648216.965	390149.362	280.61	-0.014	0.002	0.000	0.014	1.0	1.0	2.0
	17/11/09	648216.963	390149.353	280.592	-0.016	-0.007	-0.018	0.025	1.0	1.0	2.0
	17/06/2010	648216.961	390149.359	280.605	-0.018	-0.001	-0.005	0.019	1.0	1.0	1.0
	9/02/2011	648216.964	390149.359	280.600	-0.015	-0.001	-0.010	0.018	1.0	0.0	2.0
	17/01/2012	648216.973	390149.361	280.598	-0.006	0.001	-0.012	0.013			
	22/10/12	648216.963	390149.36	280.602	-0.016	0.000	-0.008	0.018	1	1	3


C- SYD
NORTHING
EASTING
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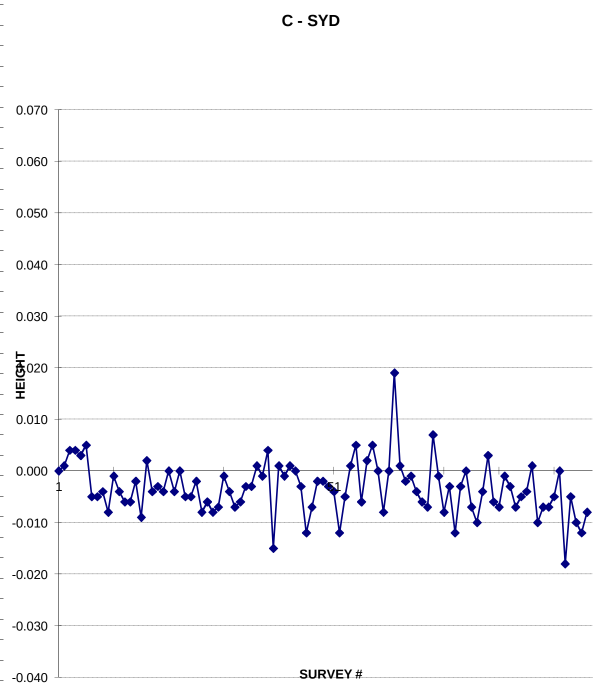
-0.050
-0.100
0.000


C - SYD
HEIGHT
SURVEY #
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0.030
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0.000
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-0.020
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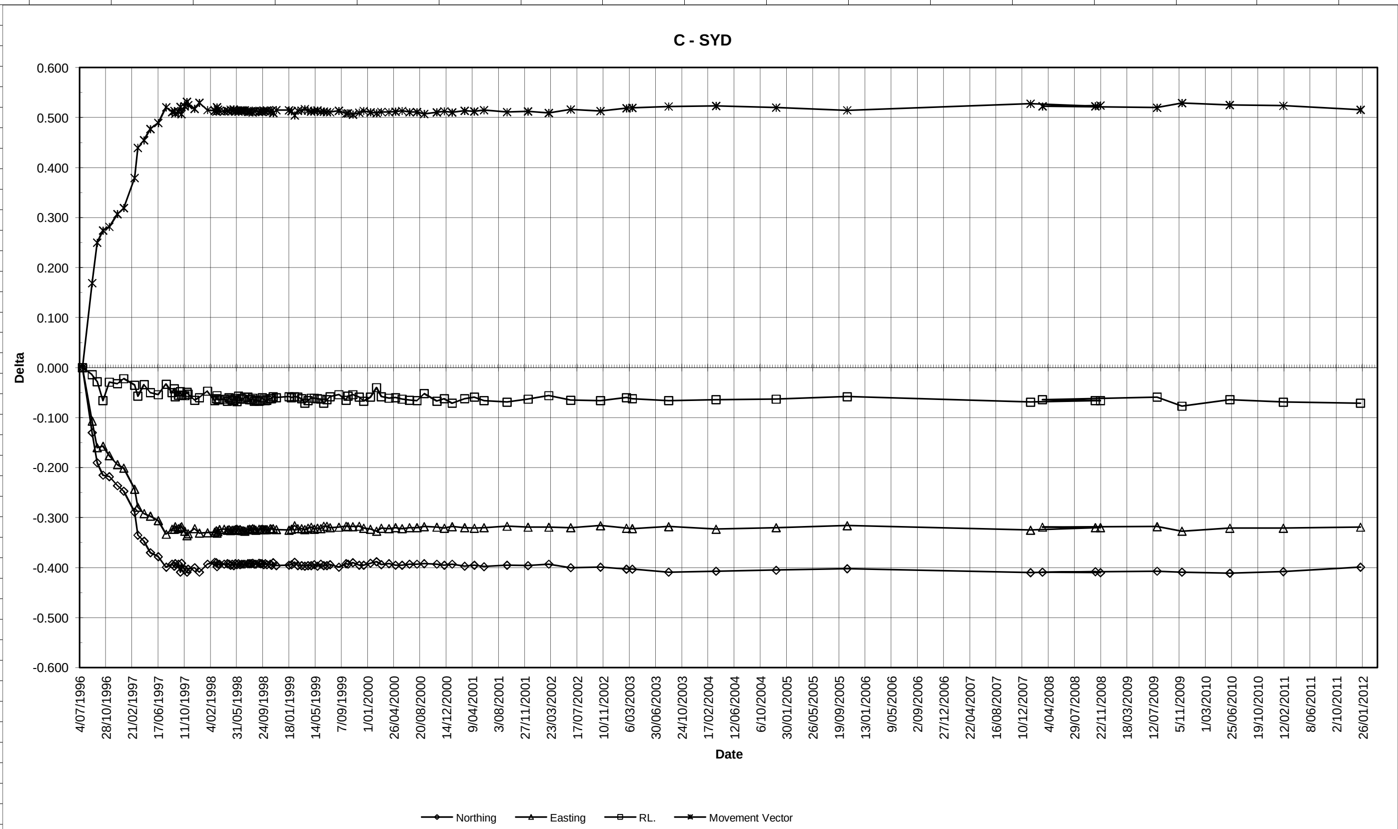
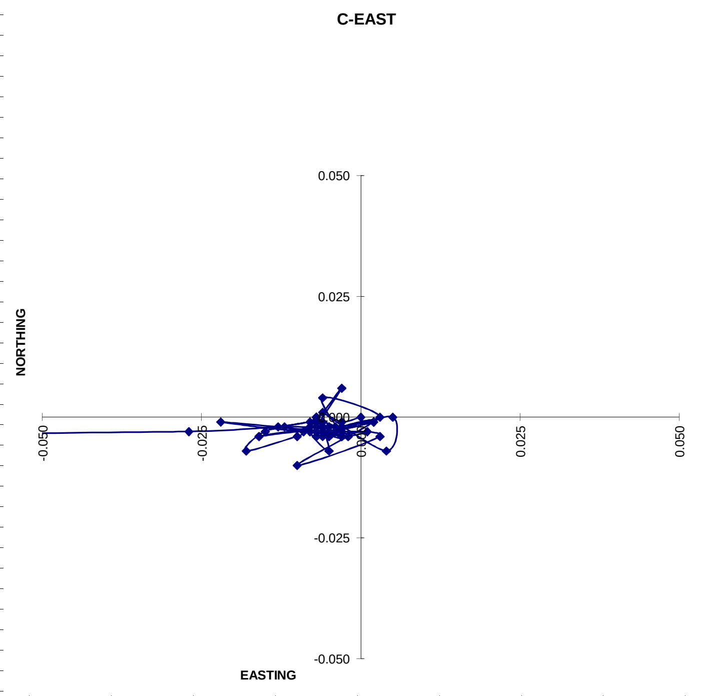
-0.040


C - SYD
Delta
Date
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-EAST	12/2/98	649075.719	391314.461	425.462				Not Used in Data Set			
Static	16/2/98	649075.694	391314.471	425.443							
	26/2/98	649075.714	391314.470	425.397	0.000	0.000	0.000	0.000	0.3	0.3	0.9
	5/3/98	649075.713	391314.467	425.403	-0.001	-0.003	0.006	0.007	0.6	0.6	1.5
	12/3/98	649075.715	391314.464	425.398	0.001	-0.006	0.001	0.006	0.9	3.6	1.4
	19/3/98	649075.707	391314.474	425.380	-0.007	0.004	-0.017	0.019			
	26/3/98	649075.714	391314.475	425.405	0.000	0.005	0.008	0.009	0.4	0.4	1.1
	2/4/98	649075.711	391314.466	425.396	-0.003	-0.004	-0.001	0.005	0.8	0.7	2.1
	16/4/98	649075.713	391314.472	425.400	-0.001	0.002	0.003	0.004	0.4	0.3	0.8
	23/4/98	649075.712	391314.467	425.401	-0.002	-0.003	0.004	0.005	0.5	0.3	0.9
	30/4/98	649075.713	391314.472	425.401	-0.001	0.002	0.004	0.005	0.3	0.2	0.7
	7/5/98	649075.704	391314.460	425.397	-0.010	-0.010	0.000	0.014	1.4	0.9	3.1
	14/5/98	649075.710	391314.473	425.394	-0.004	0.003	-0.003	0.006	0.6	0.4	1.2
	21/5/98	649075.711	391314.467	425.404	-0.003	-0.003	0.007	0.008	0.8	0.5	1.0
	28/5/98	649075.710	391314.468	425.406	-0.004	-0.002	0.009	0.010	0.8	0.4	1.3
	4/6/98	649075.711	391314.471	425.407	-0.003	0.001	0.010	0.010	0.4	0.3	0.9
	11/6/98	649075.710	391314.464	425.411	-0.004	-0.006	0.014	0.016	0.4	0.4	1.0
	18/6/98	649075.710	391314.465	425.402	-0.004	-0.005	0.005	0.008	0.4	0.4	0.9
	25/6/98	649075.711	391314.464	425.401	-0.003	-0.006	0.004	0.008	0.4	0.4	1.1
	2/7/98	649075.712	391314.465	425.405	-0.002	-0.005	0.008	0.010	0.4	0.4	1.1
	9/7/98	649075.710	391314.463	425.404	-0.004	-0.007	0.007	0.011	0.4	0.4	1.0
	16/7/98	649075.711	391314.465	425.406	-0.003	-0.005	0.009	0.011	0.5	0.4	1.2
	23/7/98	649075.714	391314.463	425.409	0.000	-0.007	0.012	0.014	0.6	0.6	1.7
	30/7/98	649075.710	391314.465	425.394	-0.004	-0.005	-0.003	0.007	0.9	0.8	3.0
	6/8/98	649075.712	391314.466	425.402	-0.002	-0.004	0.005	0.007	0.4	0.4	1.2
	13/8/98	649075.713	391314.463	425.392	-0.001	-0.007	-0.005	0.009	0.9	0.6	1.8
	20/8/98	649075.711	391314.464	425.406	-0.003	-0.006	0.009	0.011	0.5	0.4	1.0
	27/8/98	649075.711	391314.464	425.406	-0.003	-0.006	0.009	0.011	0.6	0.5	1.4
	10/9/98	649075.710	391314.467	425.392	-0.004	-0.003	-0.005	0.007	0.5	0.4	1.1
	17/9/98	649075.718	391314.464	425.397	0.004	-0.006	0.000	0.007	0.7	0.6	1.6
	24/9/98	649075.714	391314.473	425.397	0.000	0.003	0.000	0.003	0.4	0.4	0.9
	1/10/98	649075.711	391314.463	425.400	-0.003	-0.007	0.003	0.008	0.7	0.6	1.5
	8/10/98	649075.713	391314.448	425.408	-0.001	-0.022	0.011	0.025	0.7	0.7	1.5
	22/10/98	649075.711	391314.464	425.406	-0.003	-0.006	0.009	0.011	0.5	0.6	1.1
	29/10/98	649075.710	391314.467	425.398	-0.004	-0.003	0.001	0.005	0.7	1.6	2.4
	5/11/98	649075.711	391314.461	425.400	-0.003	-0.009	0.003	0.010	0.4	0.5	0.9
	19/11/98	649075.710	391314.454	425.423	-0.004	-0.016	0.026	0.031	2.7	2.7	6.7
	17/12/98	649075.712	391314.463	425.399	-0.002	-0.007	0.002	0.008	0.6	0.6	1.4
	28/12/98	649075.713	391314.463	425.404	-0.001	-0.007	0.007	0.010	0.8	0.5	1.0
	14/1/99	649075.712	391314.463	425.397	-0.002	-0.007	0.000	0.007	0.7	0.6	2.1
	28/1/99	649075.720	391314.467	425.406	0.006	-0.003	0.009	0.011	0.7	0.7	1.9
	11/2/99	649075.712	391314.462	425.405	-0.002	-0.008	0.008	0.011	0.5	0.5	1.3
	25/2/99	649075.712	391314.458	425.404	-0.002	-0.012	0.007	0.014	1.0	0.9	2.8
	12/3/99	649075.712	391314.465	425.386	-0.002	-0.005	-0.011	0.012	0.5	0.5	1.4
	25/3/99	649075.713	391314.464	425.388	-0.001	-0.006	-0.009	0.011	0.8	0.6	1.6
	8/4/99	649075.707	391314.465	425.382	-0.007	-0.005	-0.015	0.017	1.2	1.0	3.2
	22/4/99	649075.711	391314.462	425.391	-0.003	-0.008	-0.006	0.010	1.0	0.4	1.2
	6/5/99	649075.714	391314.463	425.397	0.000	-0.007	0.000	0.007	1.0	0.4	0.7
	20/5/99	649075.712	391314.464	425.388	-0.002	-0.006	-0.009	0.011	0.7	0.4	0.8
	3/6/99	649075.711	391314.462	425.380	-0.003	-0.008	-0.017	0.019	0.7	0.3	0.8
	17/6/99	649075.710	391314.460	425.382	-0.004	-0.010	-0.015	0.018	1.0	0.5	2.1
	2/7/99	649075.707	391314.452	425.391	-0.007	-0.018	-0.006	0.020	0.9	0.9	3.0
	15/7/99	649075.711	391314.455	425.382	-0.003	-0.015	-0.015	0.021	0.6	0.6	2.0
	29/7/99	649075.713	391314.462	425.379	-0.001	-0.008	-0.018	0.020	0.5	0.5	1.3
	13/1/00	649075.712	391314.457	425.360	-0.002	-0.013	-0.037	0.039	0.6	0.6	1.5
	5/12/2000	649075.711	391314.443	425.365	-0.003	-0.027	-0.032	0.042	0.3	0.4	0.8
	8/09/2003	649075.710	391314.359	425.360	-0.004	-0.111	-0.037	0.117	2.0	1.0	1.0


C-EAST
NORTHING
EASTING
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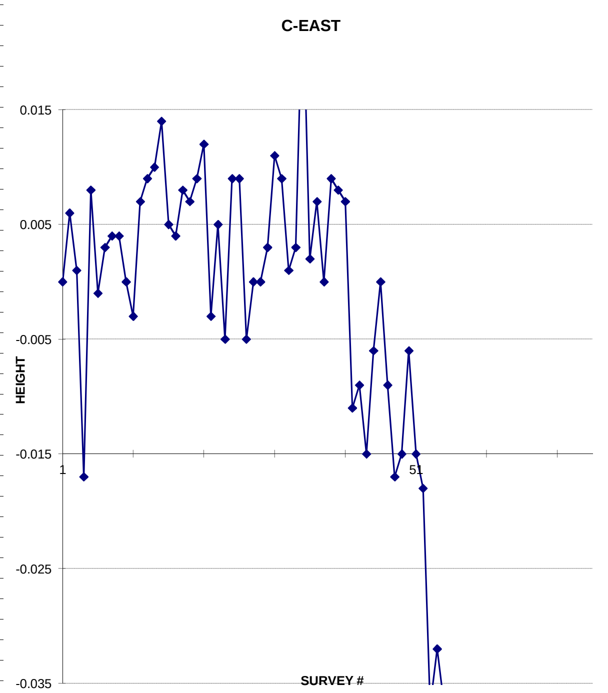
0.000
-0.025
-0.050
-0.050
-0.025
0.000
0.025
0.050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HEIGHT
SURVEY #
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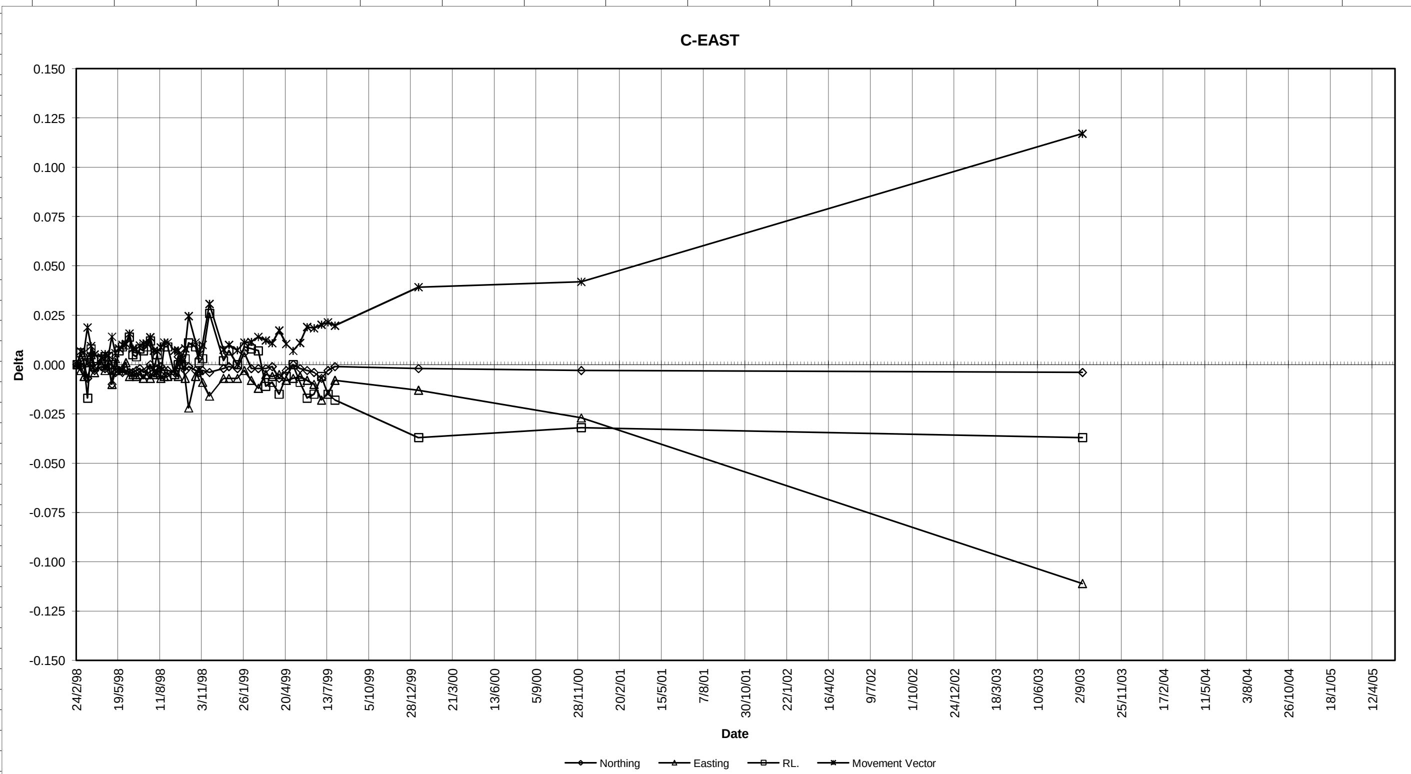
1
51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0.050
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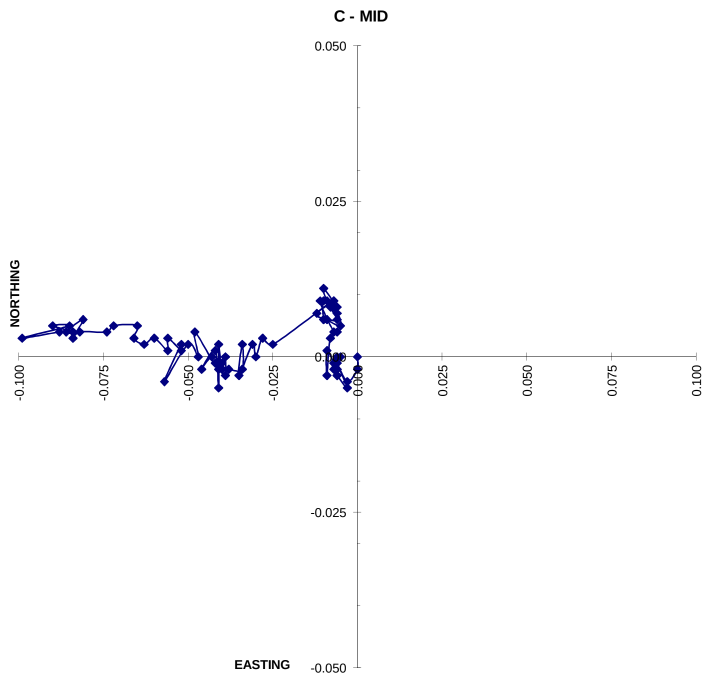
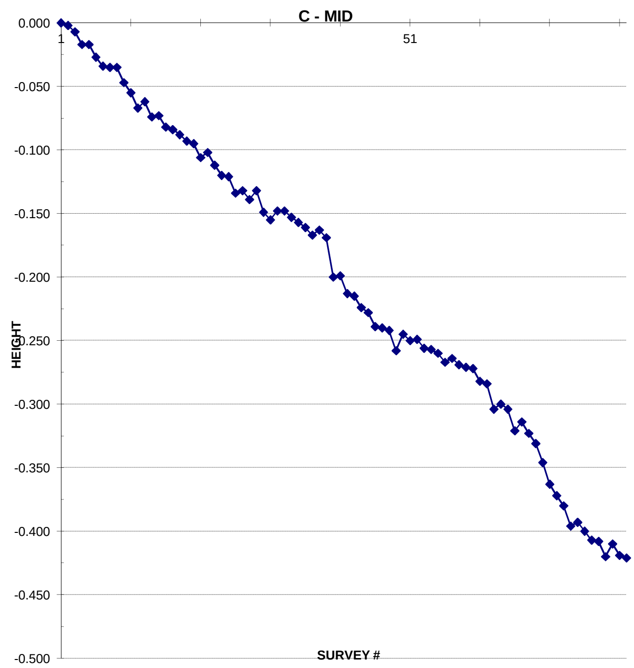
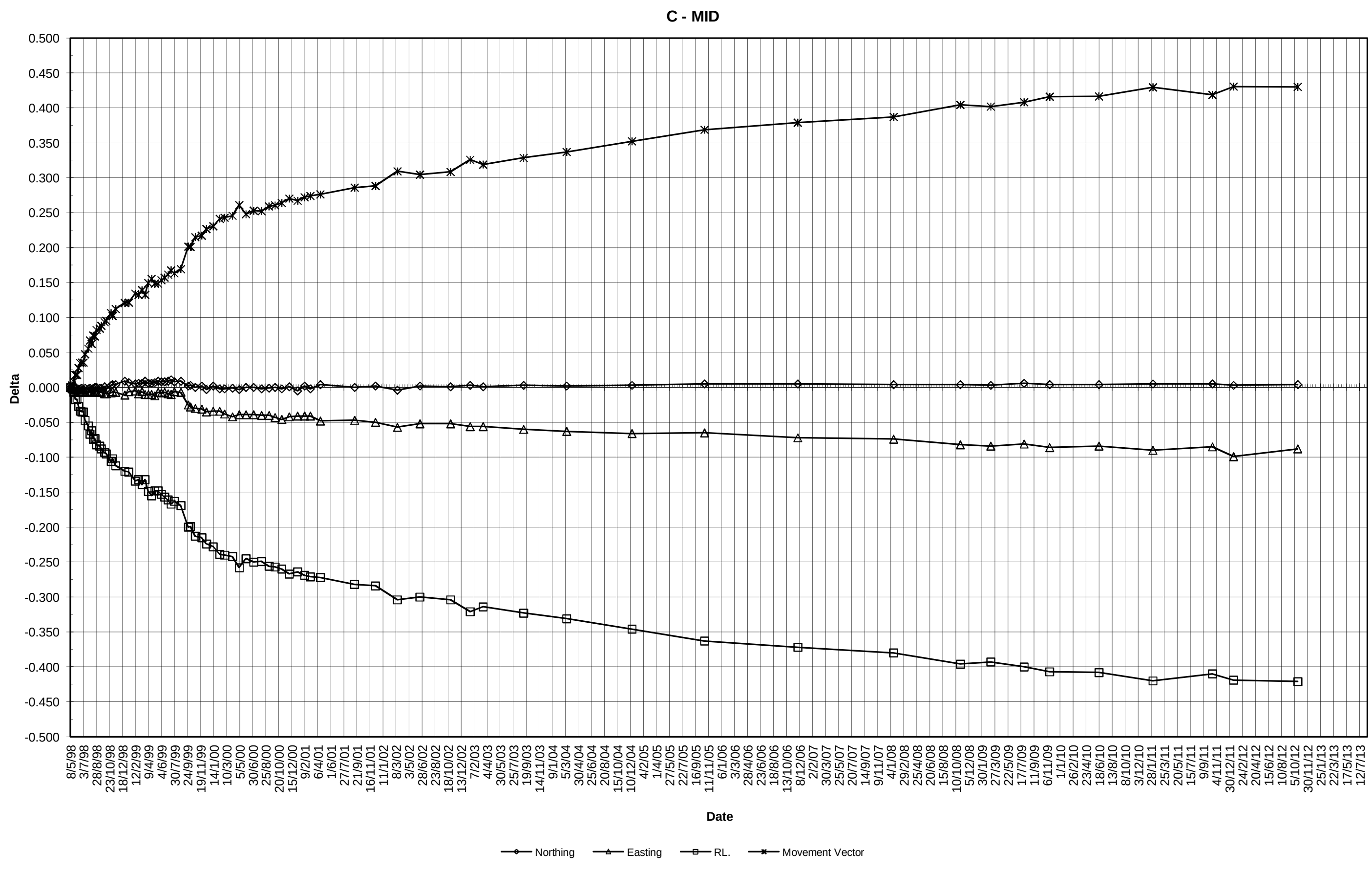
-0.100
-0.125
-0.150
24/2/98
19/5/98
11/8/98
3/11/98
26/1/99
20/4/99
13/7/99
5/10/99
28/12/99
21/3/00
13/6/00
5/9/00
28/11/00
20/2/01
15/5/01
7/8/01
30/10/01
22/1/02
16/4/02
9/7/02
1/10/02
24/12/02
18/3/03
10/6/03
2/9/03
25/11/03
17/2/04
11/5/04
3/8/04
26/10/04
18/1/05
12/4/05
Northing
Easting
RL.
Movement Vector

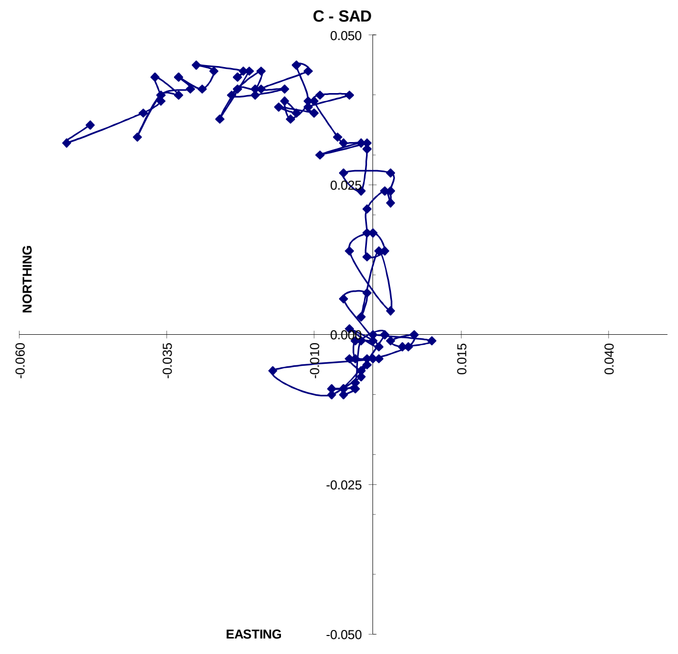
	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-MID	8/5/98	648896.674	390854.853	419.343	0.000	0.000	0.000	0.000	0.8	0.5	1.4
Static	15/5/98	648896.672	390854.853	419.341	-0.002	0.000	-0.002	0.003	0.5	0.3	1.1
	22/5/98	648896.670	390854.850	419.336	-0.004	-0.003	-0.007	0.009	1.4	1.0	2.5
	29/5/98	648896.673	390854.847	419.326	-0.001	-0.006	-0.017	0.018	0.3	0.2	0.6
	5/6/98	648896.669	390854.850	419.326	-0.005	-0.003	-0.017	0.018	0.2	0.2	0.5
	12/6/98	648896.671	390854.847	419.316	-0.003	-0.006	-0.027	0.028	0.4	0.3	0.9
	19/6/98	648896.672	390854.846	419.309	-0.002	-0.007	-0.034	0.035	0.3	0.3	0.8
	26/6/98	648896.673	390854.846	419.308	-0.001	-0.007	-0.035	0.036	0.4	0.3	1.0
	3/7/98	648896.671	390854.847	419.308	-0.003	-0.006	-0.035	0.036	0.4	0.3	0.8
	10/7/98	648896.673	390854.846	419.296	-0.001	-0.007	-0.047	0.048	0.5	0.4	0.7
	24/7/98	648896.672	390854.847	419.288	-0.002	-0.006	-0.055	0.055	0.5	0.4	1.0
	31/7/98	648896.673	390854.847	419.276	-0.001	-0.006	-0.067	0.067	0.4	0.3	0.8
	7/8/98	648896.671	390854.847	419.281	-0.003	-0.006	-0.062	0.062	0.5	0.3	1.0
	14/8/98	648896.673	390854.846	419.269	-0.001	-0.007	-0.074	0.074	0.4	0.3	0.8
	21/8/98	648896.674	390854.848	419.270	0.000	-0.005	-0.073	0.073	0.3	0.3	0.7
	28/8/98	648896.674	390854.847	419.261	0.000	-0.006	-0.082	0.082	0.5	0.4	1.9
	11/9/98	648896.673	390854.846	419.259	-0.001	-0.007	-0.084	0.084	0.5	0.4	1.0
	18/9/98	648896.673	390854.846	419.255	-0.001	-0.007	-0.088	0.088	1.0	0.4	1.1
	2/10/98	648896.675	390854.844	419.250	0.001	-0.009	-0.093	0.093	0.5	0.3	0.9
	9/10/98	648896.671	390854.844	419.248	-0.003	-0.009	-0.095	0.095	0.5	0.4	1.1
	30/10/98	648896.677	390854.845	419.237	0.003	-0.008	-0.106	0.106	0.6	0.5	1.2
	5/11/98	648896.678	390854.847	419.241	0.004	-0.006	-0.102	0.102	0.5	0.3	0.9
	19/11/98	648896.678	390854.846	419.231	0.004	-0.007	-0.112	0.112	0.5	0.4	1.0
	28/12/98	648896.683	390854.842	419.223	0.009	-0.011	-0.120	0.121	0.6	0.4	1.3
	14/1/99	648896.681	390854.847	419.222	0.007	-0.006	-0.121	0.121	0.6	0.4	1.5
	11/2/99	648896.679	390854.848	419.209	0.005	-0.005	-0.134	0.134	0.6	0.5	1.5
	25/2/99	648896.680	390854.844	419.211	0.006	-0.009	-0.132	0.132	0.5	0.4	1.2
	12/3/99	648896.680	390854.847	419.204	0.006	-0.006	-0.139	0.139	0.6	0.4	1.4
	25/3/99	648896.683	390854.843	419.211	0.009	-0.010	-0.132	0.133	0.9	0.5	1.9
	8/4/99	648896.680	390854.843	419.194	0.006	-0.010	-0.149	0.149	0.4	0.3	0.8
	22/4/99	648896.680	390854.843	419.188	0.006	-0.010	-0.155	0.155	1.4	0.4	1.2
	6/5/99	648896.681	390854.841	419.195	0.007	-0.012	-0.148	0.149	0.8	0.4	0.9
	20/5/99	648896.683	390854.846	419.195	0.009	-0.007	-0.148	0.148	0.8	0.3	1.1
	3/6/99	648896.682	390854.845	419.190	0.008	-0.008	-0.153	0.153	0.9	0.3	1.1
	17/6/99	648896.682	390854.846	419.186	0.008	-0.007	-0.157	0.157	0.5	0.4	1.7
	2/7/99	648896.683	390854.844	419.182	0.009	-0.009	-0.161	0.162	0.4	0.4	1.1
	15/7/99	648896.685	390854.843	419.176	0.011	-0.010	-0.167	0.168	0.6	0.4	1.1
	29/7/99	648896.682	390854.847	419.180	0.008	-0.006	-0.163	0.163	0.3	0.5	1.1
	26/8/99	648896.683	390854.846	419.174	0.009	-0.007	-0.169	0.169	0.4	0.3	0.8
	27/9/99	648896.676	390854.828	419.143	0.002	-0.025	-0.200	0.202	0.7	0.6	1.2
	6/10/99	648896.677	390854.825	419.144	0.003	-0.028	-0.199	0.201	0.5	0.4	1.0
	27/10/99	648896.674	390854.823	419.130	0.000	-0.030	-0.213	0.215	0.4	0.3	0.7
	24/11/99	648896.676	390854.822	419.128	0.002	-0.031	-0.215	0.217	0.5	0.3	0.8
	14/12/99	648896.671	390854.818	419.119	-0.003	-0.035	-0.224	0.227	0.4	0.4	1.0
	12/1/00	648896.676	390854.819	419.115	0.002	-0.034	-0.228	0.231	0.6	0.4	1.0
	9/2/00	648896.672	390854.819	419.104	-0.002	-0.034	-0.239	0.241	1.1	0.5	1.4
	1/3/00	648896.672	390854.815	419.103	-0.002	-0.038	-0.240	0.243	1.0	0.8	2.0
	4/4/00	648896.673	390854.811	419.101	-0.001	-0.042	-0.242	0.246	0.4	0.3	0.8
	3/5/00	648896.671	390854.814	419.085	-0.003	-0.039	-0.258	0.261	0.7	1.0	1.0
	1/6/00	648896.674	390854.814	419.098	0.000	-0.039	-0.245	0.248	0.6	0.9	0.9
	4/7/00	648896.674	390854.814	419.093	0.000	-0.039	-0.250	0.253	0.6	0.4	1.1
	7/8/00	648896.672	390854.813	419.094	-0.002	-0.040	-0.249	0.252	0.4	0.2	0.7
	8/9/00	648896.673	390854.813	419.087	-0.001	-0.040	-0.256	0.259	0.5	0.8	1.3
	4/10/00	648896.674	390854.810	419.086	0.000	-0.043	-0.257	0.261	0.8	0.6	1.8
	2/11/00	648896.672	390854.807	419.083	-0.002	-0.046	-0.260	0.264	0.6	0.5	1.3
	4/12/00	648896.675	390854.811	419.076	0.001	-0.042	-0.267	0.270	0.4	0.3	1.0
	9/1/01	648896.669	390854.812	419.079	-0.005	-0.041	-0.264	0.267	0.8	0.6	1.8
	8/2/01	648896.676	390854.812	419.074	0.002	-0.041	-0.269	0.272	0.4	0.3	0.9
	5/3/01	648896.672	390854.812	419.072	-0.002	-0.041	-0.271	0.274	0.4	0.3	0.7
	17/4/01	648896.678	390854.805	419.071	0.004	-0.048	-0.272	0.276	0.5	0.3	1.0
	11/9/01	648896.674	390854.806	419.061	0.000	-0.047	-0.282	0.286	1.0	0.0	1.0
	10/12/01	648896.676	390854.803	419.059	0.002	-0.050	-0.284	0.288	2.0	1.0	1.0
	14/3/02	648896.670	390854.796	419.039	-0.004	-0.057	-0.304	0.309	1.0	0.0	1.0
	19/6/02	648896.676	390854.801	419.043	0.002	-0.052	-0.300	0.304	1.0	0.0	0.0
	29/10/02	648896.675	390854.801	419.039	0.001	-0.052	-0.304	0.308	1.0	0.0	1.0
	21/1/03	648896.677	390854.797	419.022	0.003	-0.056	-0.321	0.326	1.0	0.0	0.0
	18/3/03	648896.675	390854.797	419.029	0.001	-0.056	-0.314	0.319	1.0	0.0	0.0
	8/9/03	648896.677	390854.793	419.020	0.003	-0.060	-0.323	0.329	1.0	0.0	1.0
	11/3/04	648896.676	390854.79	419.012	0.002	-0.063	-0.331	0.337	1.0	1.0	1.0
	17/12/04	648896.677	390854.787	418.997	0.003	-0.066	-0.346	0.352	1.0	0.0	1.0
	25/10/05	648896.679	390854.788	418.980	0.005	-0.065	-0.363	0.369	1.0	1.0	1.0
	30/11/06	648896.679	390854.781	418.971	0.005	-0.072	-0.372	0.379	1.0	0.0	1.0
	16/1/08	648896.678	390854.779	418.963	0.004	-0.074	-0.380	0.387	1.0	0.0	0.0
	29/10/08	648896.678	390854.771	418.947	0.004	-0.082	-0.396	0.404	1.0	1.0	1.0
	9/3/09	648896.677	390854.769	418.95	0.003	-0.084	-0.393	0.402	0.0	0.0	1.0
	30/7/09	648896.68	390854.772	418.943	0.006	-0.081	-0.400	0.408	1.0	0.0	1.0
	17/11/2009	648896.678	390854.767	418.936	0.004	-0.086	-0.407	0.416	1.0	0.0	1.0
	17/6/10	648896.678	390854.769	418.935	0.004	-0.084	-0.408	0.417	1.0	0.0	1.0
	4/2/11	648896.679	390854.763	418.923	0.005	-0.090	-0.420	0.430	0.0	0.0	1.0
	18/10/11	648896.679	390854.768	418.933	0.005	-0.085	-0.410	0.419	1.0	1.0	3.0
	17/01/2012	648896.677	390854.754	418.924	0.003	-0.099	-0.419	0.431			
	19/10/12	648896.678	390854.765	418.922	0.004	-0.088	-0.421	0.430	1	0	1


C - MID
NORTHING
EASTING


C - MID
HEIGHT
SURVEY #


C - MID
Delta
Date
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-SAD	7/5/98	648834.284	391209.624	426.528	0.000	0.000	0.000	0.000	0.3	0.2	0.7
	14/5/98	648834.283	391209.634	426.517	-0.001	0.010	-0.011	0.015	0.4	0.3	0.9
	21/5/98	648834.282	391209.629	426.509	-0.002	0.005	-0.019	0.020	0.6	0.3	0.5
	28/5/98	648834.283	391209.627	426.502	-0.001	0.003	-0.026	0.026	0.3	0.2	0.6
	4/6/98	648834.284	391209.631	426.492	0.000	0.007	-0.036	0.037	0.3	0.2	0.5
	11/6/98	648834.282	391209.630	426.492	-0.002	0.006	-0.036	0.037	0.6	0.4	1.2
	18/6/98	648834.280	391209.624	426.481	-0.004	0.000	-0.047	0.047	0.3	0.3	0.7
	25/6/98	648834.280	391209.620	426.477	-0.004	-0.004	-0.051	0.051	0.5	0.3	1.0
	2/7/98	648834.278	391209.622	426.476	-0.006	-0.002	-0.052	0.052	0.3	0.3	0.8
	9/7/98	648834.279	391209.623	426.470	-0.005	-0.001	-0.058	0.058	0.5	0.3	1.0
	16/7/98	648834.278	391209.622	426.472	-0.006	-0.002	-0.056	0.056	0.8	0.3	0.6
	23/7/98	648834.277	391209.622	426.461	-0.007	-0.002	-0.067	0.067	0.5	0.4	1.5
	30/7/98	648834.275	391209.619	426.455	-0.009	-0.005	-0.073	0.074	0.8	0.5	1.4
	6/8/98	648834.274	391209.619	426.464	-0.010	-0.005	-0.064	0.065	0.5	0.3	0.9
	13/8/98	648834.275	391209.621	426.445	-0.009	-0.003	-0.083	0.084	0.7	0.5	2.5
	20/8/98	648834.275	391209.617	426.459	-0.009	-0.007	-0.069	0.070	0.4	0.3	1.1
	27/8/98	648834.275	391209.619	426.454	-0.009	-0.005	-0.074	0.075	0.4	0.3	1.0
	10/9/98	648834.276	391209.621	426.439	-0.008	-0.003	-0.089	0.089	0.4	0.3	0.8
	17/9/98	648834.283	391209.622	426.452	-0.001	-0.002	-0.076	0.076	1.0	0.5	1.8
	24/9/98	648834.284	391209.626	426.442	0.000	0.002	-0.086	0.086	0.6	0.4	1.2
	1/10/98	648834.274	391209.617	426.441	-0.010	-0.007	-0.087	0.088	0.6	0.4	1.2
	8/10/98	648834.278	391209.607	426.433	-0.006	-0.017	-0.095	0.097	0.6	0.4	1.1
	22/10/98	648834.280	391209.625	426.428	-0.004	0.001	-0.100	0.100	0.5	0.4	1.0
	29/10/98	648834.280	391209.623	426.420	-0.004	-0.001	-0.108	0.108	0.6	0.7	1.4
	5/11/98	648834.280	391209.621	426.411	-0.004	-0.003	-0.117	0.117	0.8	0.5	1.6
	19/11/98	648834.283	391209.621	426.405	-0.001	-0.003	-0.123	0.123	0.5	0.4	1.0
	17/12/98	648834.283	391209.624	426.387	-0.001	0.000	-0.141	0.141	0.5	0.6	1.1
	28/12/98	648834.285	391209.620	426.391	0.001	-0.004	-0.137	0.137	0.7	0.4	1.3
	14/1/99	648834.282	391209.625	426.392	-0.002	0.001	-0.136	0.136	0.8	0.6	2.0
	28/1/99	648834.290	391209.619	426.376	0.006	-0.005	-0.152	0.152	0.6	0.5	1.3
	11/2/99	648834.291	391209.623	426.371	0.007	-0.001	-0.157	0.157	0.7	0.4	1.5
	25/2/99	648834.287	391209.622	426.377	0.003	-0.002	-0.151	0.151	0.7	0.5	1.6
	12/3/99	648834.298	391209.625	426.376	0.014	0.001	-0.152	0.153	0.7	0.5	1.4
	25/3/99	648834.288	391209.627	426.356	0.004	0.003	-0.172	0.172	0.8	0.7	2.0
	8/4/99	648834.298	391209.620	426.350	0.014	-0.004	-0.178	0.179	0.6	0.4	1.2
	22/4/99	648834.301	391209.624	426.342	0.017	0.000	-0.186	0.187	0.9	0.3	0.7
	6/5/99	648834.298	391209.626	426.347	0.014	0.002	-0.181	0.182	0.8	0.3	0.5
	20/5/99	648834.297	391209.623	426.340	0.013	-0.001	-0.188	0.188	0.7	0.3	0.7
	3/6/99	648834.301	391209.623	426.338	0.017	-0.001	-0.190	0.191	0.8	0.8	1.7
	17/6/99	648834.305	391209.623	426.332	0.021	-0.001	-0.196	0.197	0.4	0.4	0.9
	2/7/99	648834.308	391209.626	426.326	0.024	0.002	-0.202	0.203	1.0	0.3	2.1
	15/7/99	648834.306	391209.627	426.330	0.022	0.003	-0.198	0.199	0.7	0.2	1.3
	29/7/99	648834.308	391209.627	426.328	0.024	0.003	-0.200	0.201	0.3	0.3	1.3
	26/8/99	648834.311	391209.627	426.316	0.027	0.003	-0.212	0.214	0.6	0.4	1.3
	27/9/99	648834.311	391209.619	426.304	0.027	-0.005	-0.224	0.226	0.5	0.9	1.1
	6/10/99	648834.308	391209.622	426.308	0.024	-0.002	-0.220	0.221	0.6	0.4	1.2
	27/10/99	648834.315	391209.623	426.306	0.031	-0.001	-0.222	0.224	0.4	0.2	0.8
	24/11/99	648834.316	391209.622	426.300	0.032	-0.002	-0.228	0.230	0.5	0.4	1.0
	14/12/99	648834.314	391209.615	426.303	0.030	-0.009	-0.225	0.227	0.4	0.3	1.0
	12/1/00	648834.316	391209.623	426.297	0.032	-0.001	-0.231	0.233	0.5	0.4	1.2
	9/2/00	648834.316	391209.619	426.297	0.032	-0.005	-0.231	0.233	0.8	0.5	1.4
	1/3/00	648834.317	391209.618	426.293	0.033	-0.006	-0.235	0.237	0.5	0.4	1.2
	4/4/00	648834.323	391209.614	426.275	0.039	-0.010	-0.253	0.256	0.5	0.3	1.0
	3/5/00	648834.324	391209.615	426.248	0.040	-0.009	-0.280	0.283	1.2	1.8	1.8
	1/6/00	648834.324	391209.620	426.264	0.040	-0.004	-0.264	0.267	0.7	0.9	0.9
	4/7/00	648834.322	391209.613	426.266	0.038	-0.011	-0.262	0.265	0.4	0.3	0.8
	25/7/00	648834.321	391209.614	426.262	0.037	-0.010	-0.266	0.269	0.6	0.4	1.0
	4/8/00	648834.321	391209.614	426.27	0.037	-0.010	-0.258	0.261	0.3	0.2	0.6
	11/9/00	648834.322	391209.608	426.258	0.038	-0.016	-0.270	0.273	0.7	1.0	1.9
	4/10/00	648834.321	391209.611	426.255	0.037	-0.013	-0.273	0.276	0.6	0.5	1.4
	2/11/00	648834.323	391209.609	426.248	0.039	-0.015	-0.280	0.283	0.6	0.5	1.3
	7/12/00	648834.320	391209.610	426.242	0.036	-0.014	-0.286	0.289	0.9	0.8	2.5
	9/1/01	648834.323	391209.613	426.237	0.039	-0.011	-0.291	0.294	1.2	0.8	2.5
	8/2/01	648834.329	391209.611	426.241	0.045	-0.013	-0.287	0.291	0.5	0.4	1.2
	5/3/01	648834.328	391209.613	426.239	0.044	-0.011	-0.289	0.293	0.7	0.4	1.2
	17/4/01	648834.325	391209.605	426.240	0.041	-0.019	-0.288	0.292	0.5	0.5	1.5
	11/9/01	648834.325	391209.609	426.244	0.041	-0.015	-0.284	0.287	1.0	1.0	1.0
	5/12/01	648834.324	391209.604	426.223	0.040	-0.020	-0.305	0.308	2.0	1.0	1.0
	13/3/02	648834.324	391209.600	426.222	0.040	-0.024	-0.306	0.310	1.0	1.0	1.0
	18/6/02	648834.328	391209.605	426.217	0.044	-0.019	-0.311	0.315	1.0	1.0	1.0
	29/10/02	648834.325	391209.604	426.211	0.041	-0.020	-0.317	0.320	1.0	0.0	1.0
	21/1/03	648834.325	391209.601	426.185	0.041	-0.023	-0.343	0.346	1.0	0.0	0.0
	18/3/03	648834.320	391209.598	426.210	0.036	-0.026	-0.318	0.321	1.0	0.0	1.0
	27/8/03	648834.328	391209.603	426.203	0.044	-0.021	-0.325	0.329	2.0	1.0	1.0
	10/3/04	648834.327	391209.601	426.192	0.043	-0.023	-0.336	0.340	1.0	0.0	1.0
	15/12/04	648834.328	391209.602	426.190	0.044	-0.022	-0.338	0.342	1.0	0.0	1.0
	25/10/05	648834.329	391209.594	426.184	0.045	-0.030	-0.344	0.348	2.0	1.0	2.0
	30/11/06	648834.328	391209.597	426.165	0.044	-0.027	-0.363	0.367	1.0	0.0	1.0
	16/1/08	648834.325	391209.595	426.157	0.041	-0.029	-0.371	0.374	1.0	0.0	0.0
	29/10/08	648834.327	391209.591	426.144	0.043	-0.033	-0.384	0.388	0.0	0.0	1.0
	21/11/08	648834.325	391209.593	426.145	0.041	-0.031	-0.383	0.386	1.0	1.0	1.0
	9/3/09	648834.324	391209.588	426.146	0.040	-0.036	-0.382	0.386	1.0	1.0	2.0
	30/7/09	648834.317	391209.584	426.113	0.033	-0.040	-0.415	0.418	1.0	1.0	3.0
	17/11/2009	648834.324	391209.588	426.14	0.040	-0.036	-0.388	0.392	1.0	0.0	1.0
	17/6/10	648834.324	391209.591	426.132	0.040	-0.033	-0.396	0.399	1.0	0.0	1.0
	4/2/11	648834.327	391209.587	426.123	0.043	-0.037	-0.405	0.409	1.0	0.0	1.0
	9/2/11	648834.323	391209.588	426.129	0.039	-0.036	-0.399	0.403	1.0	1.0	2.0
	18/10/11	648834.321	391209.585	426.130	0.037	-0.039	-0.398	0.402	1.0	1.0	2.0
	17/01/2012	648834.316	391209.572	426.130	0.032	-0.052	-0.398	0.403			
	9/10/12	648834.319	391209.576	426.13	0.035	-0.048	-0.398	0.402	2	1	2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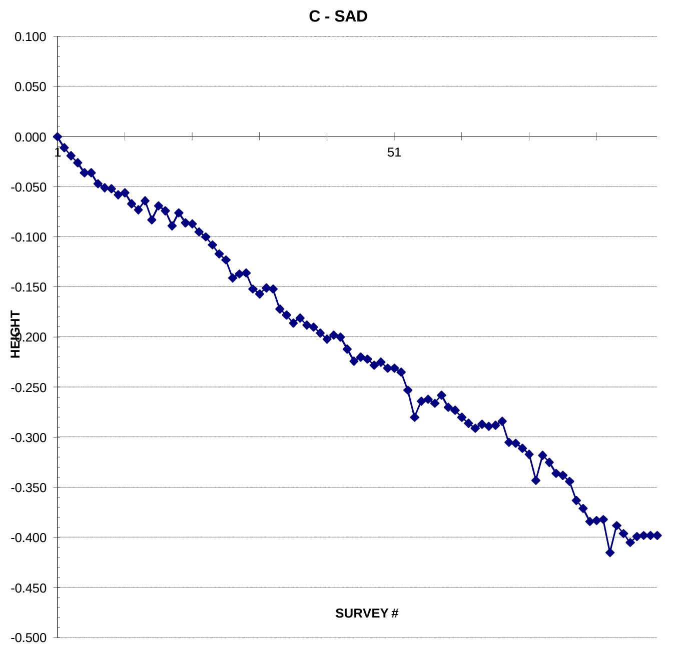
EASTING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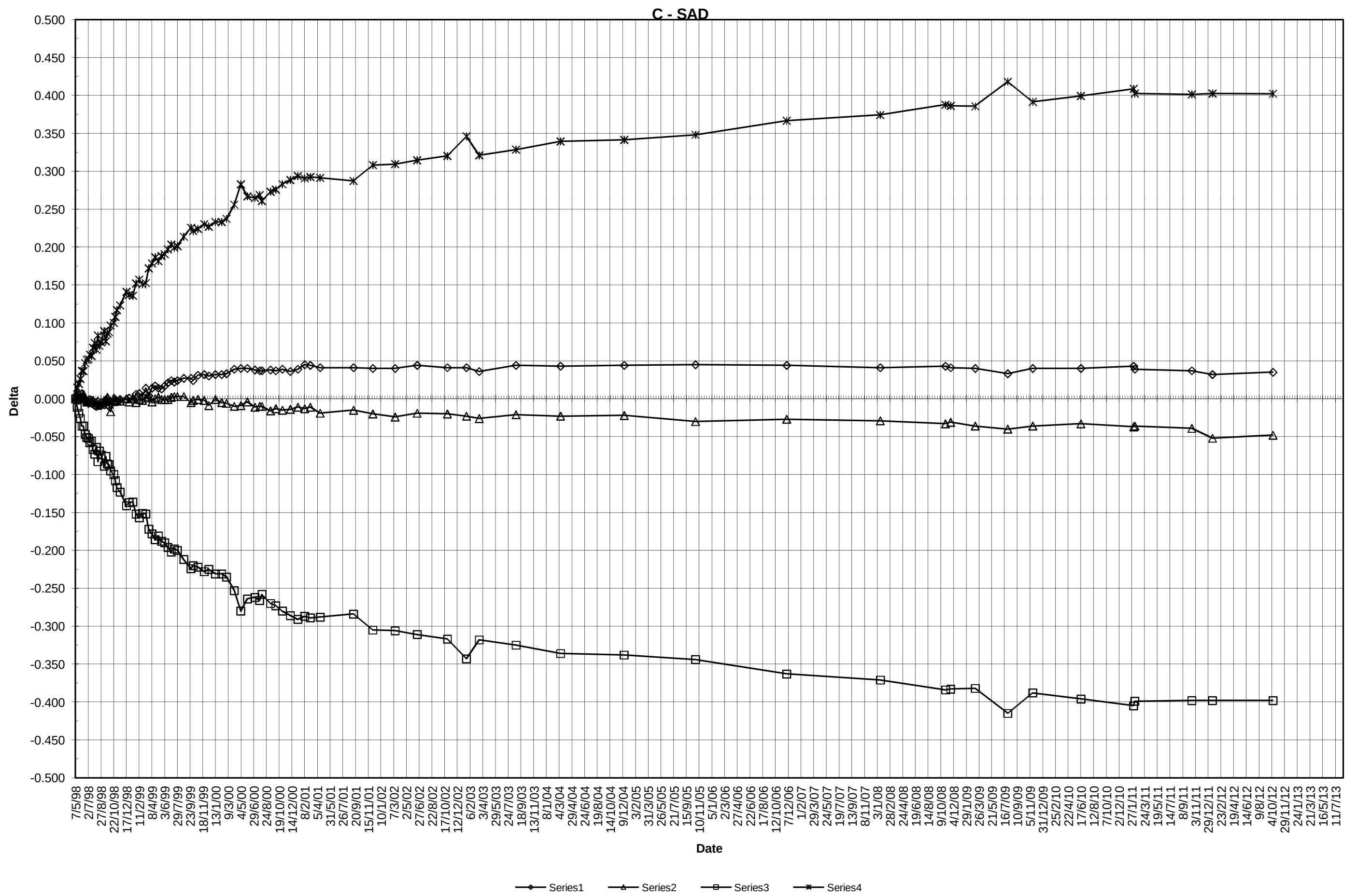
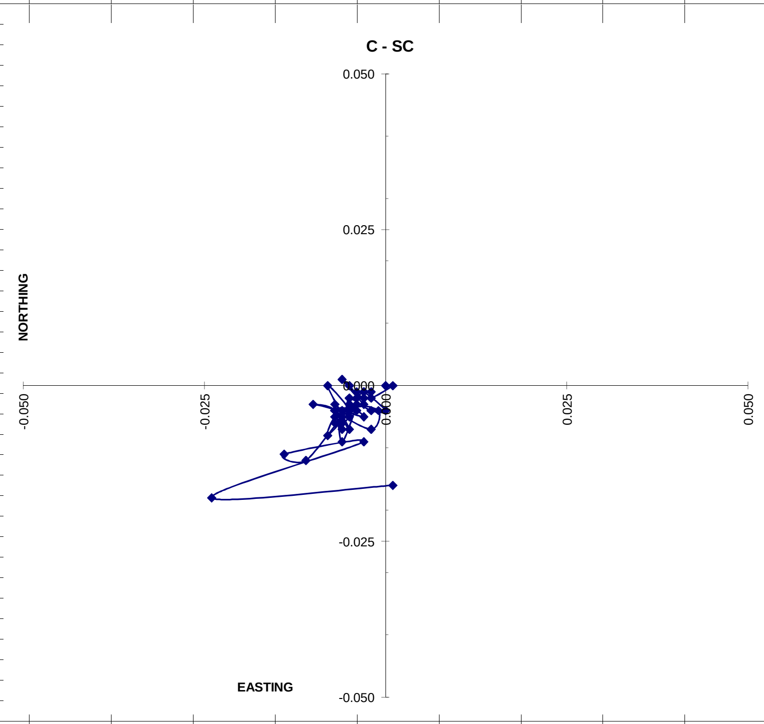
HEIGHT
SURVEY #


C - SAD
Delta
Date
Series1
Series2
Series3
Series4

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-SC	20/2/98	648457.397	390699.900	332.244	0.000	0.000	0.000	0.000	0.4	0.3	0.9
Static	27/2/98	648457.397	390699.901	332.240	0.000	0.001	-0.004	0.004	0.4	0.3	0.9
	6/3/98	648457.395	390699.898	332.247	-0.002	-0.002	0.003	0.004	0.5	0.4	1.1
	3/4/98	648457.396	390699.898	332.241	-0.001	-0.002	-0.003	0.004	0.5	0.4	1.3
	9/4/98	648457.396	390699.897	332.249	-0.001	-0.003	0.005	0.006	0.4	0.2	0.7
	17/4/98	648457.395	390699.896	332.244	-0.002	-0.004	0.000	0.004	0.3	0.2	0.7
	24/4/98	648457.395	390699.897	332.238	-0.002	-0.003	-0.006	0.007	0.5	0.3	1.0
	1/5/98	648457.395	390699.897	332.241	-0.002	-0.003	-0.003	0.005	0.4	0.3	0.9
	8/5/98	648457.396	390699.897	332.240	-0.001	-0.003	-0.004	0.005	0.5	0.3	1.3
	15/5/98	648457.393	390699.900	332.242	-0.004	0.000	-0.002	0.004	0.4	0.3	0.9
	22/5/98	648457.393	390699.898	332.244	-0.004	-0.002	0.000	0.004	1.3	0.8	2.6
	29/5/98	648457.395	390699.895	332.239	-0.002	-0.005	-0.005	0.007	0.3	0.2	0.6
	5/6/98	648457.393	390699.895	332.240	-0.004	-0.005	-0.004	0.008	0.5	0.2	0.9
	12/6/98	648457.395	390699.896	332.244	-0.002	-0.004	0.000	0.004	0.3	0.2	0.6
	19/6/98	648457.397	390699.895	332.239	0.000	-0.005	-0.005	0.007	0.5	0.3	1.0
	26/6/98	648457.398	390699.894	332.246	0.001	-0.006	0.002	0.006	0.4	0.3	0.7
	3/7/98	648457.394	390699.897	332.239	-0.003	-0.003	-0.005	0.007	0.2	0.2	0.6
	10/7/98	648457.396	390699.896	332.242	-0.001	-0.004	-0.002	0.005	0.7	0.5	1.3
	24/7/98	648457.393	390699.896	332.245	-0.004	-0.004	0.001	0.006	0.4	0.3	0.9
	31/7/98	648457.394	390699.895	332.247	-0.003	-0.005	0.003	0.007	0.5	0.3	1.6
	7/8/98	648457.392	390699.897	332.240	-0.005	-0.003	-0.004	0.007	0.5	0.4	1.6
	14/8/98	648457.393	390699.894	332.239	-0.004	-0.006	-0.005	0.009	0.4	0.3	0.8
	21/8/98	648457.392	390699.894	332.240	-0.005	-0.006	-0.004	0.009	0.4	0.3	0.8
	28/8/98	648457.393	390699.894	332.245	-0.004	-0.006	0.001	0.007	0.4	0.3	0.9
	4/9/98	648457.391	390699.894	332.244	-0.006	-0.006	0.000	0.008	0.6	0.4	1.2
	11/9/98	648457.390	390699.894	332.240	-0.007	-0.006	-0.004	0.010	0.5	0.3	1.0
	18/9/98	648457.392	390699.893	332.243	-0.005	-0.007	-0.001	0.009	0.5	0.4	0.9
	2/10/98	648457.394	390699.893	332.247	-0.003	-0.007	0.003	0.008	0.5	0.4	1.1
	9/10/98	648457.391	390699.893	332.244	-0.006	-0.007	0.000	0.009	1.1	0.4	1.1
	30/10/98	648457.394	390699.895	332.240	-0.003	-0.005	-0.004	0.007	0.6	0.5	1.4
	9/11/98	648457.395	390699.895	332.247	-0.002	-0.005	0.003	0.006	0.5	0.4	1.0
	23/11/98	648457.391	390699.894	332.246	-0.006	-0.006	0.002	0.009	0.3	0.3	0.7
	21/12/98	648457.392	390699.895	332.248	-0.005	-0.005	0.004	0.008	0.4	0.3	0.8
	5/1/99	648457.394	390699.896	332.238	-0.003	-0.004	-0.006	0.008	0.4	0.3	0.9
	18/1/99	648457.388	390699.894	332.246	-0.009	-0.006	0.002	0.011	0.3	0.2	0.6
	29/1/99	648457.393	390699.893	332.245	-0.004	-0.007	0.001	0.008	0.5	0.3	0.9
	12/2/99	648457.394	390699.890	332.241	-0.003	-0.010	-0.003	0.011	0.7	0.5	1.9
	26/2/99	648457.393	390699.893	332.247	-0.004	-0.007	0.003	0.009	0.4	0.3	0.8
	15/3/99	648457.390	390699.895	332.242	-0.007	-0.005	-0.002	0.009	0.5	0.4	0.9
	29/3/99	648457.397	390699.892	332.257	0.000	-0.008	0.013	0.015	0.9	0.6	2.1
	12/4/99	648457.393	390699.895	332.241	-0.004	-0.005	-0.003	0.007	0.4	0.3	0.9
	26/4/99	648457.392	390699.893	332.245	-0.005	-0.007	0.001	0.009	1.3	0.5	1.0
	10/5/99	648457.389	390699.892	332.233	-0.008	-0.008	-0.011	0.016	1.0	0.4	1.1
	24/5/99	648457.393	390699.895	332.246	-0.004	-0.005	0.002	0.007	0.5	0.2	0.4
	8/6/99	648457.393	390699.893	332.239	-0.004	-0.007	-0.005	0.009	0.3	0.3	0.6
	21/6/99	648457.390	390699.898	332.247	-0.007	-0.002	0.003	0.008	0.2	0.3	0.6
	5/7/99	648457.393	390699.899	332.241	-0.004	-0.001	-0.003	0.005	0.5	0.2	1.1
	19/7/99	648457.393	390699.895	332.241	-0.004	-0.005	-0.003	0.007	0.1	0.4	2.1
	19/1/00	648457.385	390699.889	332.238	-0.012	-0.011	-0.006	0.017	0.9	0.5	1.8
	7/7/00	648457.386	390699.886	332.242	-0.011	-0.014	-0.002	0.018	0.5	0.4	1.0
	7/12/00	648457.388	390699.897	332.261	-0.009	-0.003	0.017	0.019	1.2	0.8	2.5
	27/8/03	648457.379	390699.876	332.246	-0.018	-0.024	0.002	0.030	2.0	1.0	1.0
	11/3/04	648457.381	390699.901	332.268	-0.016	0.001	0.024	0.029	3.0	1.0	3.0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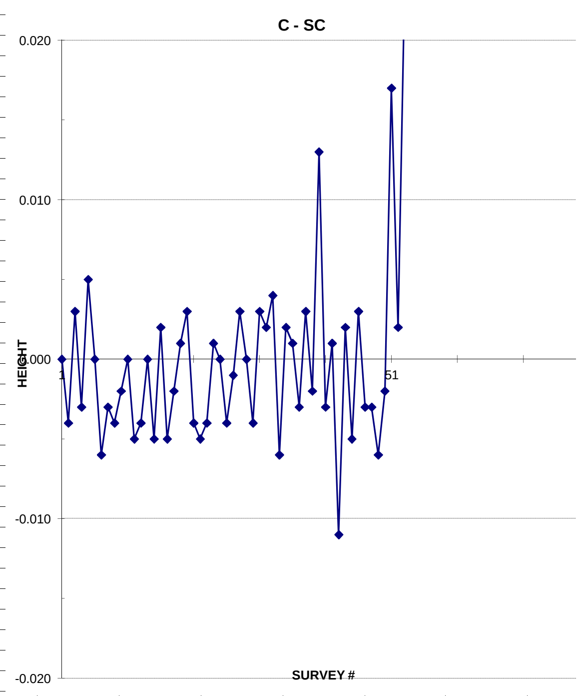
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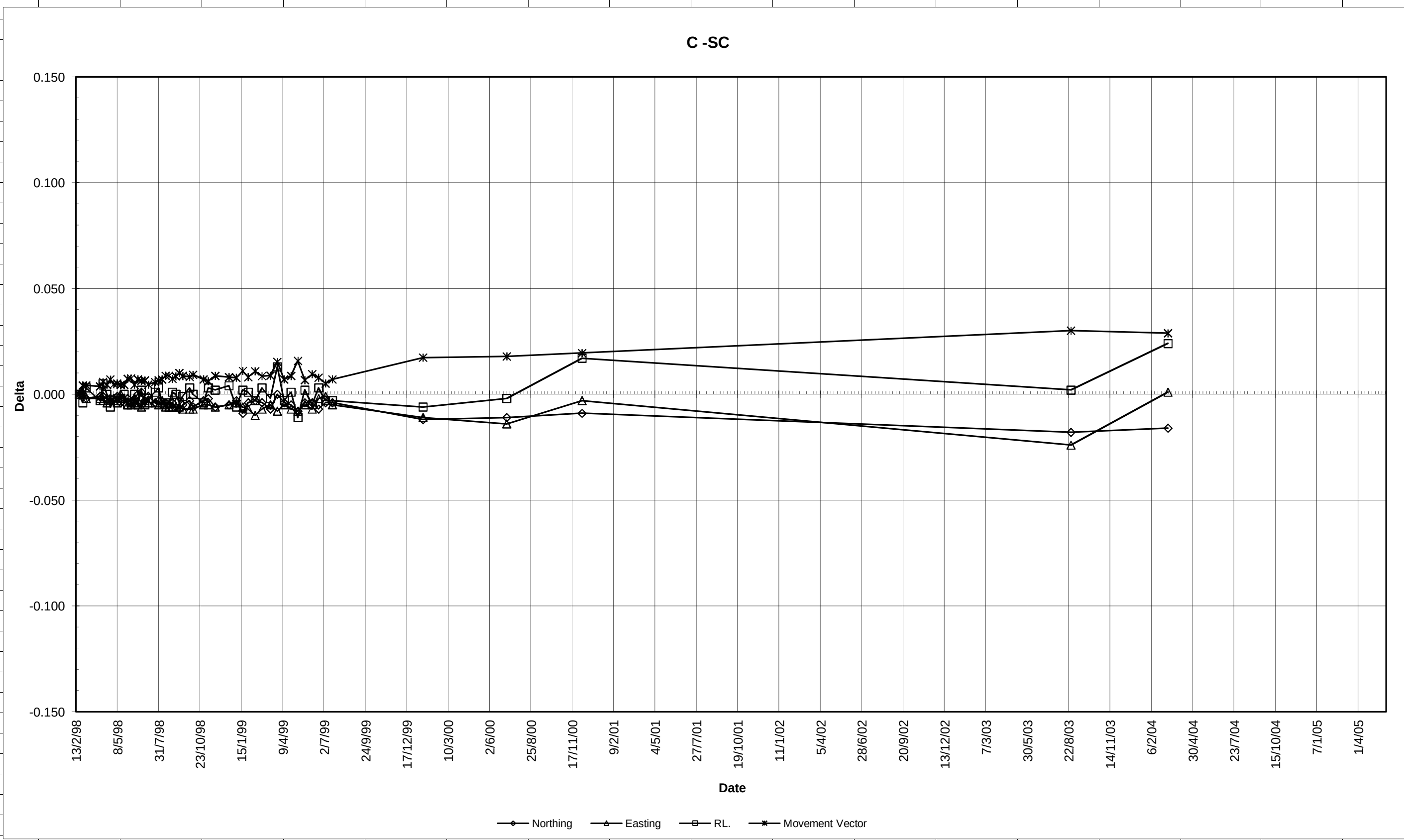
51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31/7/98
23/10/98
15/1/99
9/4/99
2/7/99
24/9/99
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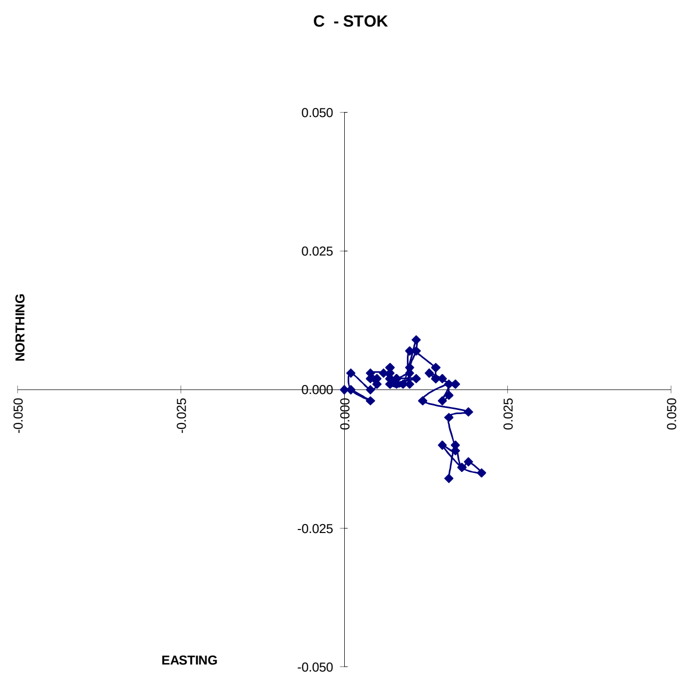
14/11/03
6/2/04
30/4/04
23/7/04
15/10/04
7/1/05
1/4/05
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-STOK	4/5/98	648418.611	390336.821	301.415	0.000	0.000	0.000	0.000	0.3	0.2	0.6
Static	11/5/98	648418.611	390336.822	301.414	0.000	0.001	-0.001	0.001	0.3	0.2	0.5
	18/5/98	648418.609	390336.825	301.416	-0.002	0.004	0.001	0.005	0.6	0.2	0.7
	25/5/98	648418.611	390336.822	301.414	0.000	0.001	-0.001	0.001	0.4	0.3	0.7
	1/6/98	648418.614	390336.822	301.412	0.003	0.001	-0.003	0.004	0.5	0.3	0.9
	8/6/98	648418.611	390336.825	301.419	0.000	0.004	0.004	0.006	0.5	0.4	1.1
	15/6/98	648418.612	390336.826	301.415	0.001	0.005	0.000	0.005	0.3	0.3	0.7
	22/6/98	648418.613	390336.825	301.416	0.002	0.004	0.001	0.005	0.3	0.2	0.7
	29/6/98	648418.612	390336.826	301.421	0.001	0.005	0.006	0.008	0.4	0.3	0.8
	6/7/98	648418.613	390336.826	301.418	0.002	0.005	0.003	0.006	0.4	0.3	0.8
	13/7/98	648418.614	390336.825	301.418	0.003	0.004	0.003	0.006	0.4	0.3	0.8
	20/7/98	648418.614	390336.827	301.414	0.003	0.006	-0.001	0.007	0.4	0.3	0.8
	27/7/98	648418.612	390336.829	301.420	0.001	0.008	0.005	0.009	0.6	0.4	1.2
	3/8/98	648418.614	390336.828	301.417	0.003	0.007	0.002	0.008	0.4	0.3	0.8
	10/8/98	648418.615	390336.828	301.423	0.004	0.007	0.008	0.011	0.6	0.4	1.1
	17/8/98	648418.615	390336.828	301.416	0.004	0.007	0.001	0.008	0.4	0.3	0.8
	24/8/98	648418.613	390336.828	301.418	0.002	0.007	0.003	0.008	0.3	0.3	0.9
	7/9/98	648418.613	390336.829	301.419	0.002	0.008	0.004	0.009	0.5	0.3	1.7
	14/9/98	648418.613	390336.828	301.422	0.002	0.007	0.007	0.010	0.4	0.3	1.3
	21/9/98	648418.613	390336.828	301.425	0.002	0.007	0.010	0.012	0.2	0.1	0.5
	28/9/98	648418.613	390336.829	301.425	0.002	0.008	0.010	0.013	0.6	0.3	1.2
	5/10/98	648418.613	390336.832	301.417	0.002	0.011	0.002	0.011	0.8	0.7	1.6
	12/10/98	648418.612	390336.828	301.424	0.001	0.007	0.009	0.011	0.8	0.4	1.7
	27/10/98	648418.612	390336.830	301.425	0.001	0.009	0.010	0.013	0.6	0.4	1.1
	2/11/98	648418.614	390336.831	301.421	0.003	0.010	0.006	0.012	0.5	0.4	1.1
	9/11/98	648418.612	390336.828	301.422	0.001	0.007	0.007	0.010	0.6	0.9	1.4
	23/11/98	648418.612	390336.830	301.425	0.001	0.009	0.010	0.013	0.4	0.3	0.9
	21/12/98	648418.620	390336.832	301.425	0.009	0.011	0.010	0.017	0.7	0.5	1.5
	5/1/99	648418.618	390336.832	301.417	0.007	0.011	0.002	0.013	0.6	0.4	1.2
	18/1/99	648418.615	390336.831	301.426	0.004	0.010	0.011	0.015	0.4	0.3	1.0
	29/1/99	648418.612	390336.831	301.428	0.001	0.010	0.013	0.016	0.4	0.3	0.9
	12/2/99	648418.618	390336.831	301.418	0.007	0.010	0.003	0.013	0.6	0.4	1.3
	26/2/99	648418.615	390336.835	301.415	0.004	0.014	0.000	0.015	0.8	0.6	1.8
	15/3/99	648418.615	390336.835	301.424	0.004	0.014	0.009	0.017	0.5	0.4	1.3
	29/3/99	648418.613	390336.835	301.419	0.002	0.014	0.004	0.015	0.5	0.3	1.2
	12/4/99	648418.613	390336.835	301.414	0.002	0.014	-0.001	0.014	0.4	0.4	0.9
	26/4/99	648418.614	390336.834	301.424	0.003	0.013	0.009	0.016	0.9	0.4	0.9
	10/5/99	648418.613	390336.836	301.418	0.002	0.015	0.003	0.015	1.1	0.5	1.3
	24/5/99	648418.613	390336.835	301.423	0.002	0.014	0.008	0.016	0.6	0.2	0.6
	8/6/99	648418.613	390336.835	301.419	0.002	0.014	0.004	0.015	0.5	0.3	0.9
	21/6/99	648418.612	390336.838	301.415	0.001	0.017	0.000	0.017	0.7	0.3	1.2
	5/7/99	648418.612	390336.838	301.415	0.001	0.017	0.000	0.017	0.5	0.3	1.7
	19/7/99	648418.612	390336.837	301.423	0.001	0.016	0.008	0.018	0.6	0.4	2.2
	24/11/99	648418.610	390336.837	301.428	-0.001	0.016	0.013	0.021	0.4	0.3	1.0
	18/1/00	648418.609	390336.836	301.430	-0.002	0.015	0.015	0.021	0.7	0.6	1.5
	11/7/00	648418.612	390336.837	301.426	0.001	0.016	0.011	0.019	0.4	0.4	1.1
	6/12/00	648418.609	390336.833	301.434	-0.002	0.012	0.019	0.023	0.5	0.3	1.1
	1/6/01	648418.607	390336.84	301.431	-0.004	0.019	0.016	0.025	0.7	0.6	1.5
	30/10/02	648418.606	390336.837	301.437	-0.005	0.016	0.022	0.028	1.0	1.0	1.0
	8/9/03	648418.600	390336.838	301.422	-0.011	0.017	0.007	0.021	1.0	0.0	1.0
	24/3/04	648418.601	390336.836	301.430	-0.010	0.015	0.015	0.023	1.0	0.0	2.0
	4/12/2009	648418.597	390336.839	301.436	-0.014	0.018	0.021	0.031	0.0	0.0	1.0
	22/06/2010	648418.598	390336.84	301.44	-0.013	0.019	0.025	0.034	0.0	0.0	1.0
	11/03/2011	648418.596	390336.842	301.438	-0.015	0.021	0.023	0.035	0.0	0.0	1.0
	18/10/11	648418.597	390336.839	301.438	-0.014	0.018	0.023	0.032	1.0	1.0	2.0
	17/01/2012	648418.601	390336.838	301.435	-0.010	0.017	0.020	0.028			
	2/11/12	648418.595	390336.837	301.435	-0.016	0.016	0.020	0.030	1.0	1.0	1.0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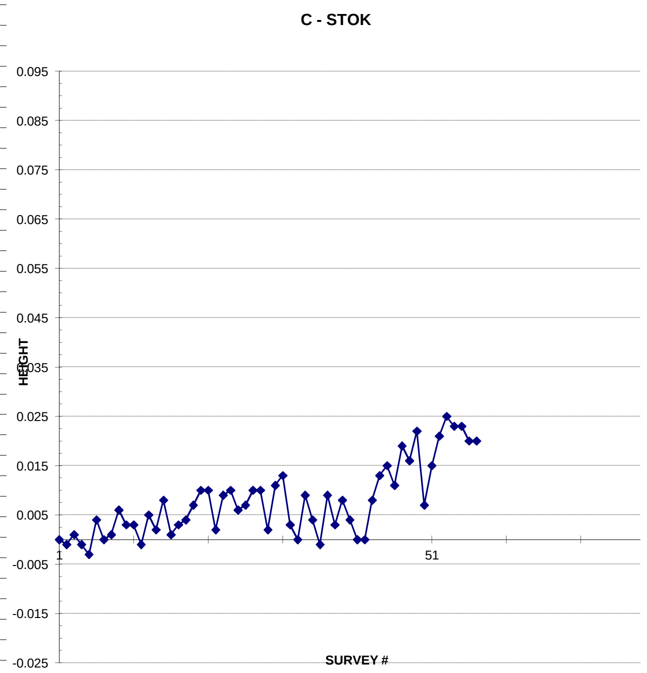
0.050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SURVEY #
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0.035
0.025
0.015
0.005
-0.005
-0.015
-0.025
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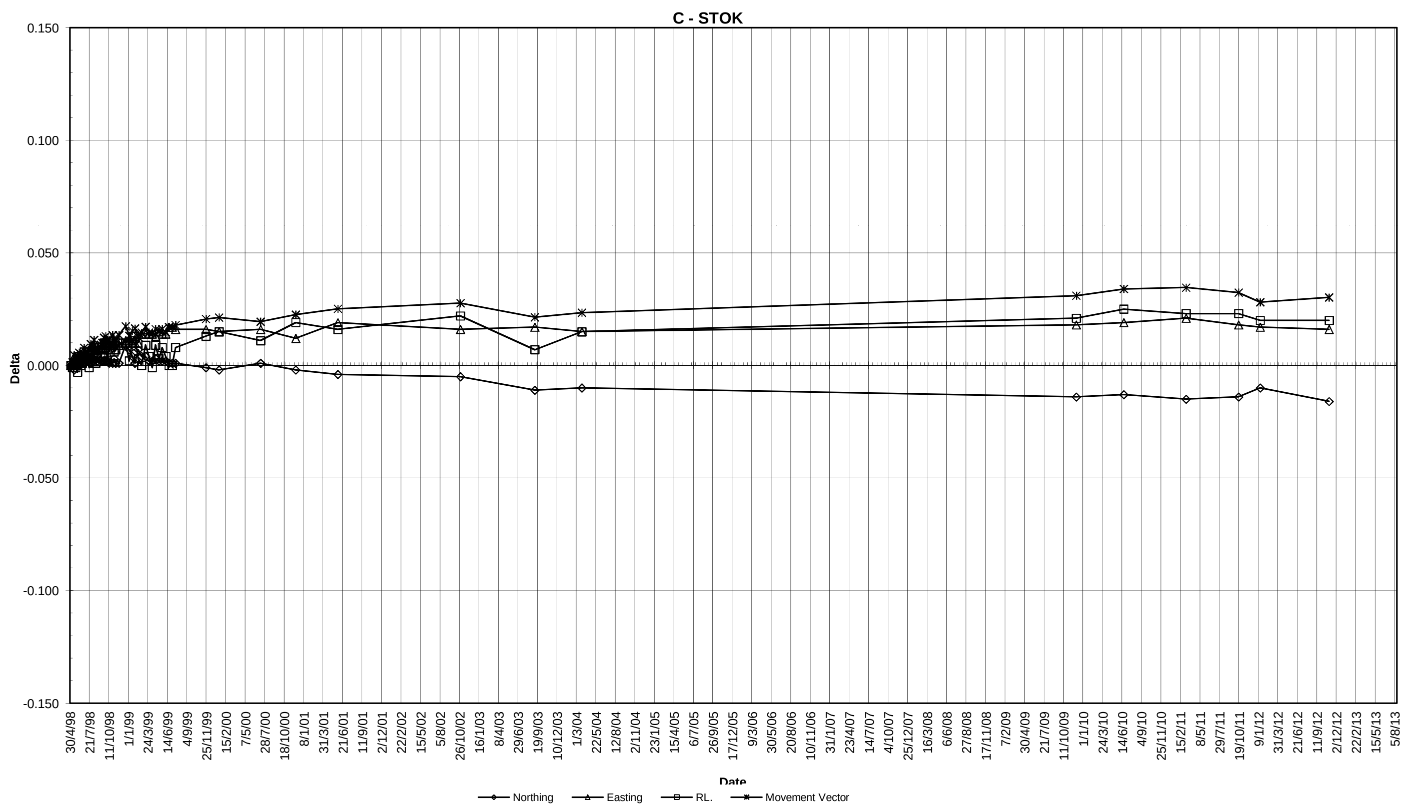
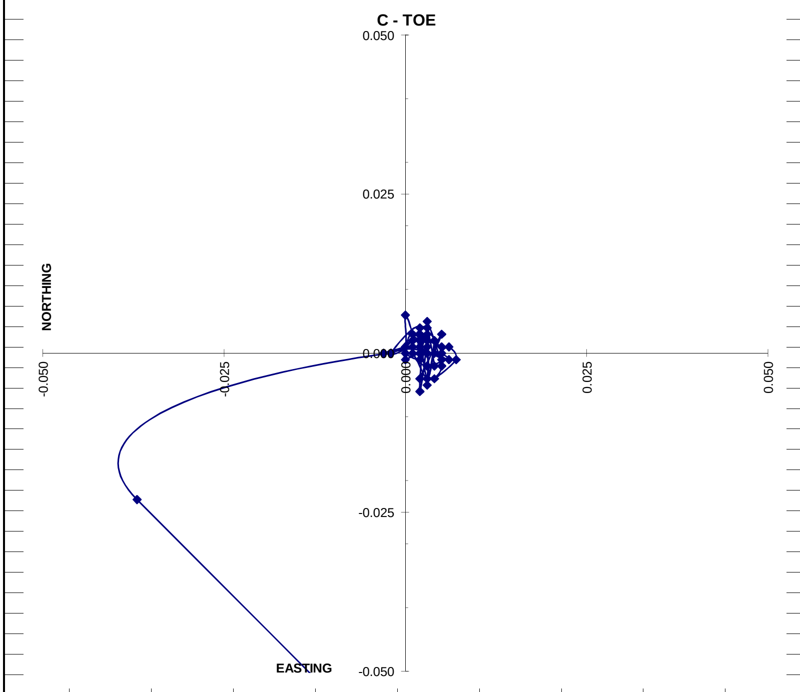
51


C - STOK
Delta
Date
0.150
0.100
0.050
0.000
-0.050
-0.100
-0.150
Northing
Easting
RL.
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
C-TOE	12/2/98	648012.640	390026.430	262.330					Not Used In Data Set		
RTK	16/2/98	648012.664	390026.438	262.239							
STATIC	24/2/98	648012.647	390026.428	262.190	0.000	0.000	0.000	0.000			
RTK	3/3/98	648012.650	390026.429	262.204	0.003	0.001	0.014	0.014			
RTK	10/3/98	648012.648	390026.433	262.213	0.001	0.005	0.023	0.024			
	17/3/98	648012.650	390026.429	262.199	0.003	0.001	0.009	0.010	0.5	0.3	0.9
	7/4/98	648012.649	390026.430	262.197	0.002	0.002	0.007	0.008	0.6	0.4	1.2
	14/4/98	648012.650	390026.430	262.202	0.003	0.002	0.012	0.013	0.3	0.3	0.8
	21/4/98	648012.649	390026.431	262.184	0.002	0.003	-0.006	0.007	0.4	0.2	0.9
	28/4/98	648012.649	390026.429	262.207	0.002	0.001	0.017	0.017	0.6	0.4	1.1
	5/5/98	648012.648	390026.428	262.192	0.001	0.000	0.002	0.002	0.2	0.2	0.4
	12/5/98	648012.651	390026.431	262.198	0.004	0.003	0.008	0.009	0.4	0.3	0.7
	19/5/98	648012.641	390026.430	262.192	-0.006	0.002	0.002	0.007	0.5	0.4	0.9
	26/5/98	648012.651	390026.430	262.200	0.004	0.002	0.010	0.011	0.4	0.3	0.9
	2/6/98	648012.647	390026.426	262.197	0.000	-0.002	0.007	0.007	0.4	0.3	0.9
	9/6/98	648012.648	390026.428	262.206	0.001	0.000	0.016	0.016	0.3	0.2	0.6
	16/6/98	648012.653	390026.428	262.197	0.006	0.000	0.007	0.009	0.3	0.3	0.7
	23/6/98	648012.650	390026.429	262.200	0.003	0.001	0.010	0.010	0.3	0.3	0.7
	30/6/98	648012.648	390026.429	262.197	0.001	0.001	0.007	0.007	0.3	0.2	0.5
	7/7/98	648012.649	390026.429	262.198	0.002	0.001	0.008	0.008	0.3	0.2	0.6
	14/7/98	648012.648	390026.428	262.193	0.001	0.000	0.003	0.003	0.5	0.3	1.1
	21/7/98	648012.647	390026.425	262.198	0.000	-0.003	0.008	0.009	0.9	0.5	0.9
	28/7/98	648012.648	390026.430	262.193	0.001	0.002	0.003	0.004	0.3	0.2	0.6
	4/8/98	648012.647	390026.430	262.196	0.000	0.002	0.006	0.006	0.4	0.3	0.7
	11/8/98	648012.647	390026.428	262.201	0.000	0.000	0.011	0.011	1.0	0.6	2.1
	18/8/98	648012.646	390026.430	262.189	-0.001	0.002	-0.001	0.002	0.6	0.4	1.2
	25/8/98	648012.648	390026.431	262.192	0.001	0.003	0.002	0.004	0.6	0.4	1.3
	1/9/98	648012.647	390026.430	262.195	0.000	0.002	0.005	0.005	0.4	0.4	0.9
	8/9/98	648012.647	390026.430	262.205	0.000	0.002	0.015	0.015	0.7	0.5	2.3
	15/9/98	648012.647	390026.431	262.203	0.000	0.003	0.013	0.013	0.6	0.4	1.3
	22/9/98	648012.643	390026.431	262.212	-0.004	0.003	0.022	0.023	1.0	0.7	2.4
	29/9/98	648012.647	390026.429	262.186	0.000	0.001	-0.004	0.004	0.6	0.3	1.2
	6/10/98	648012.646	390026.428	262.194	-0.001	0.000	0.004	0.004	0.5	0.4	1.1
	13/10/98	648012.647	390026.431	262.205	0.000	0.003	0.015	0.015	0.6	0.4	1.1
	27/10/98	648012.642	390026.431	262.192	-0.005	0.003	0.002	0.006	0.6	0.5	1.4
	3/11/98	648012.649	390026.432	262.201	0.002	0.004	0.011	0.012	0.4	0.3	0.8
	10/11/98	648012.650	390026.431	262.201	0.003	0.003	0.011	0.012	0.5	0.4	1.1
	24/11/98	648012.646	390026.430	262.202	-0.001	0.002	0.012	0.012	0.3	0.3	0.7
	22/12/98	648012.645	390026.431	262.203	-0.002	0.003	0.013	0.013	0.3	0.4	0.7
	6/1/99	648012.646	390026.433	262.202	-0.001	0.005	0.012	0.013	0.6	0.5	1.3
	19/1/99	648012.648	390026.430	262.202	0.001	0.002	0.012	0.012	0.6	0.4	1.1
	16/2/99	648012.650	390026.430	262.201	0.003	0.002	0.011	0.012	0.4	0.3	0.9
	2/3/99	648012.643	390026.431	262.206	-0.004	0.003	0.016	0.017	0.6	0.4	1.5
	16/3/99	648012.647	390026.432	262.208	0.000	0.004	0.018	0.018	0.5	0.4	1.2
	30/3/99	648012.650	390026.433	262.203	0.003	0.005	0.013	0.014	0.7	0.4	1.6
	13/4/99	648012.643	390026.430	262.192	-0.004	0.002	0.002	0.005	0.5	0.4	1.1
	27/4/99	648012.645	390026.431	262.191	-0.002	0.003	0.001	0.004	0.7	0.3	0.8
	12/5/99	648012.645	390026.432	262.198	-0.002	0.004	0.008	0.009	0.5	0.2	0.6
	25/5/99	648012.652	390026.431	262.200	0.005	0.003	0.010	0.012	0.9	0.4	1.2
	9/6/99	648012.645	390026.433	262.201	-0.002	0.005	0.011	0.012	1.0	0.3	1.8
	22/6/99	648012.643	390026.432	262.182	-0.004	0.004	-0.008	0.010	0.5	0.3	0.9
	6/7/99	648012.646	390026.435	262.202	-0.001	0.007	0.012	0.014	0.7	0.5	2.0
	20/7/99	648012.648	390026.434	262.204	0.001	0.006	0.014	0.015	0.7	0.5	1.3
	18/1/00	648012.647	390026.433	262.201	0.000	0.005	0.011	0.012	0.6	0.4	1.2
	11/7/00	648012.646	390026.434	262.188	-0.001	0.006	-0.002	0.006	0.3	0.3	0.8
	6/12/00	648012.647	390026.426	262.207	0.000	-0.002	0.017	0.017	0.6	0.5	1.5
	1/6/01	648012.624	390026.391	262.277	-0.023	-0.037	0.087	0.097	1.6	1.1	3.3
	2/11/12	647965.928	390136.9	250.703	-46.719	110.472	-11.487	120.493	2.0	1.0	1.0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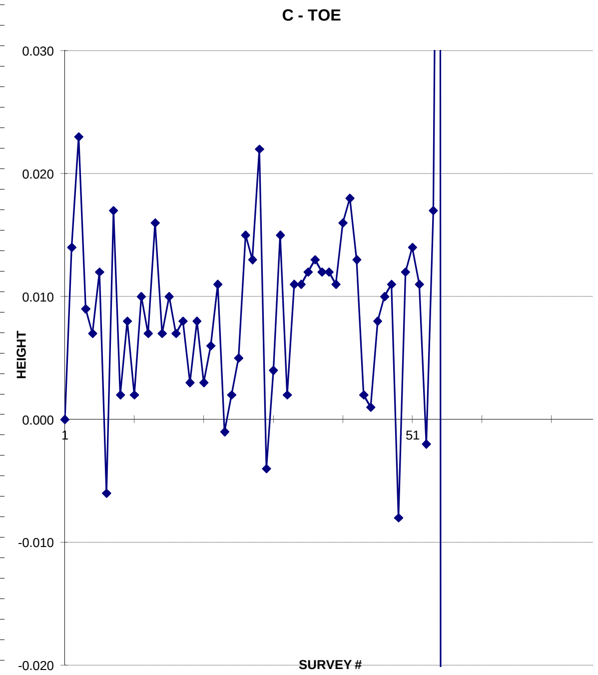
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SURVEY #
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0.000
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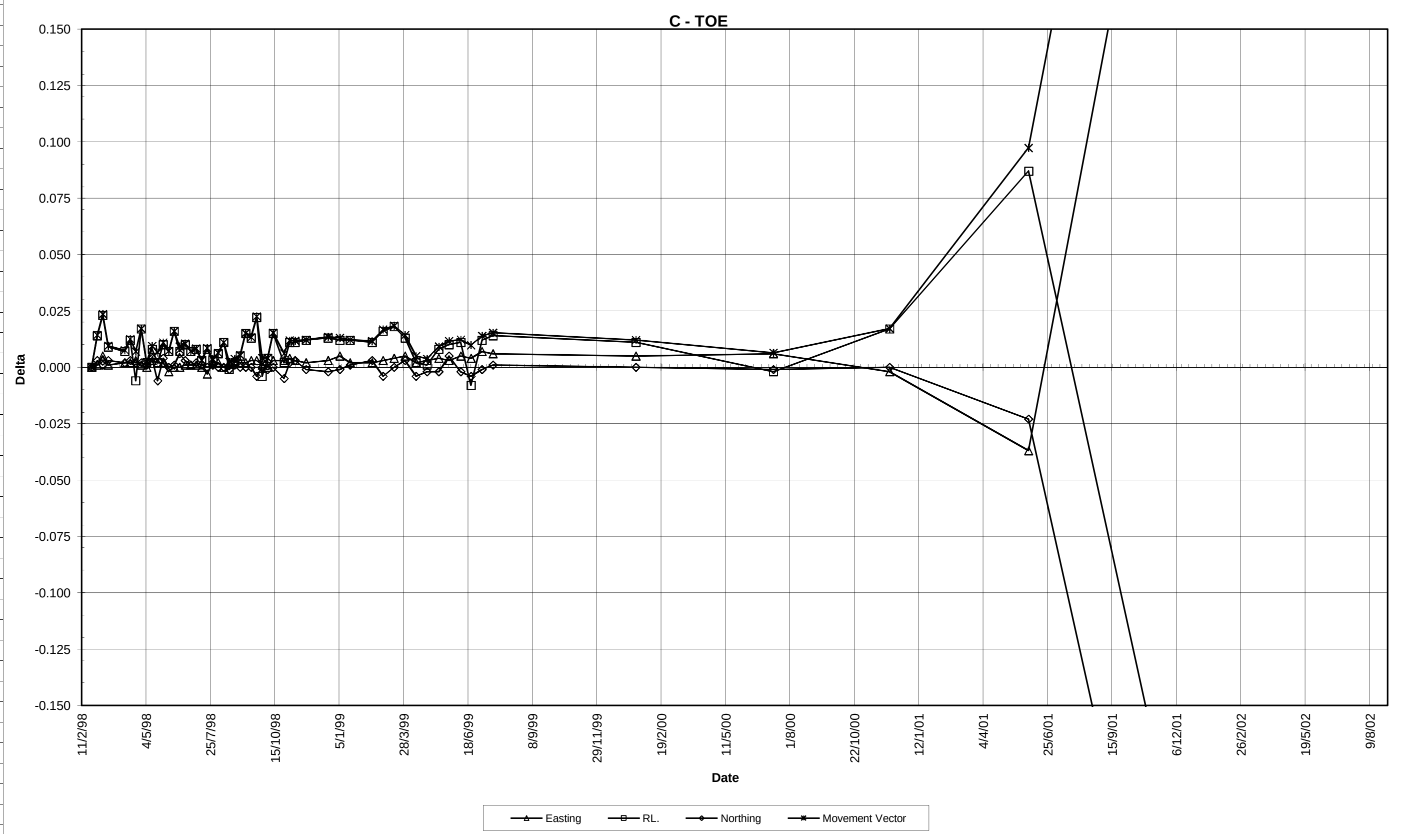
-0.020
1
51


C - TOE
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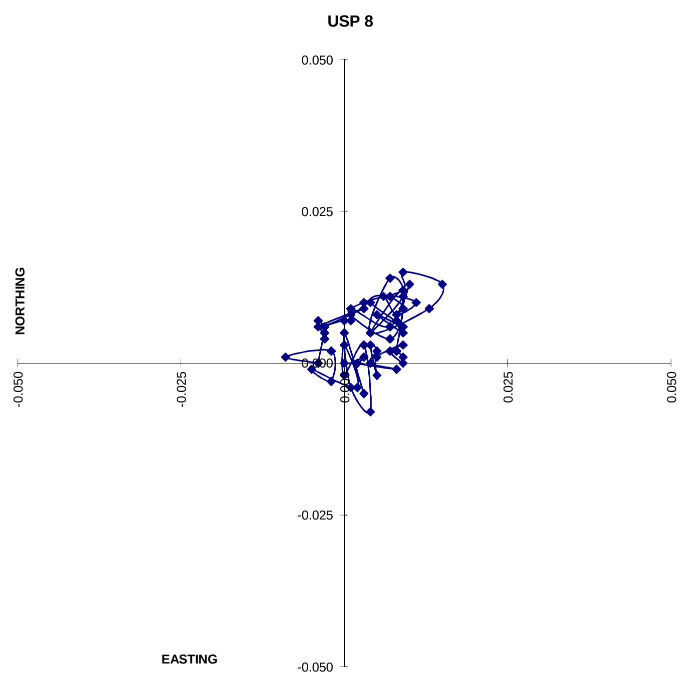
-0.025
-0.050
-0.075
-0.100
-0.125
-0.150
11/2/98
4/5/98
25/7/98
15/10/98
5/1/99
28/3/99
18/6/99
8/9/99
29/11/99
19/2/00
11/5/00
1/8/00
22/10/00
12/1/01
4/4/01
25/6/01
15/9/01
6/12/01
26/2/02
19/5/02
9/8/02
Easting
RL.
Northing
Movement Vector

	Date	Northing	Easting	Height	dN	dE	dH	dTotal	pN	pE	pH
USP 8	27/10/98	648363.076	390135.657	286.117	0.000	0.000	0.000	0.000	0.9	0.7	1.7
Static	3/11/98	648363.076	390135.659	286.122	0.000	0.002	0.005	0.005	0.6	0.6	1.2
	10/11/98	648363.077	390135.660	286.121	0.001	0.003	0.004	0.005	0.5	0.4	1.0
	24/11/98	648363.076	390135.659	286.122	0.000	0.002	0.005	0.005	0.5	0.4	1.0
	22/12/98	648363.075	390135.665	286.117	-0.001	0.008	0.000	0.008	0.4	0.3	1.0
	6/1/99	648363.076	390135.661	286.120	0.000	0.004	0.003	0.005	0.6	0.4	1.1
	19/1/99	648363.078	390135.662	286.125	0.002	0.005	0.008	0.010	0.4	0.3	0.8
	16/2/99	648363.079	390135.661	286.120	0.003	0.004	0.003	0.006	0.3	0.2	0.6
	2/3/99	648363.074	390135.662	286.122	-0.002	0.005	0.005	0.007	0.4	0.3	0.9
	16/3/99	648363.077	390135.662	286.113	0.001	0.005	-0.004	0.006	0.9	0.5	2.3
	22/3/99	648363.079	390135.666	286.124	0.003	0.009	0.007	0.012	0.4	0.4	0.9
	30/3/99	648363.078	390135.664	286.120	0.002	0.007	0.003	0.008	0.6	0.4	1.3
	9/4/99	648363.076	390135.666	286.124	0.000	0.009	0.007	0.011	0.5	0.4	1.1
	13/4/99	648363.077	390135.666	286.122	0.001	0.009	0.005	0.010	0.6	0.4	1.5
	27/4/99	648363.078	390135.665	286.119	0.002	0.008	0.002	0.008	0.7	0.3	0.7
NEW	25/5/99	648363.093	390135.644	286.167	0.002	0.008	0.002	0.008	0.9	0.4	1.1
	9/6/99	648363.103	390135.645	286.165	0.012	0.009	0.000	0.015	0.6	0.5	1.1
	22/6/99	648363.096	390135.640	286.153	0.005	0.004	-0.012	0.014	0.5	0.3	1.0
	6/7/99	648363.102	390135.645	286.163	0.011	0.009	-0.002	0.014	0.4	0.3	1.2
	20/7/99	648363.105	390135.643	286.169	0.014	0.007	0.004	0.016	0.6	0.4	2.1
	27/8/99	648363.096	390135.640	286.170	0.005	0.004	0.005	0.008	0.6	0.3	1.5
	28/9/99	648363.100	390135.649	286.172	0.009	0.013	0.007	0.017	0.4	0.6	1.0
	6/10/99	648363.104	390135.651	286.173	0.013	0.015	0.008	0.021	0.4	0.4	0.9
	28/10/99	648363.106	390135.645	286.176	0.015	0.009	0.011	0.021	0.3	0.2	0.6
	25/11/99	648363.103	390135.645	286.169	0.012	0.009	0.004	0.016	0.4	0.4	0.9
	15/12/99	648363.101	390135.639	286.161	0.010	0.003	-0.004	0.011	1.2	0.7	0.4
	14/1/00	648363.099	390135.637	286.166	0.008	0.001	0.001	0.008	0.4	0.2	0.8
	10/2/00	648363.095	390135.643	286.171	0.004	0.007	0.006	0.010	0.6	0.4	1.2
	2/3/00	648363.100	390135.645	286.171	0.009	0.009	0.006	0.014	0.4	0.3	0.8
	5/4/00	648363.102	390135.643	286.167	0.011	0.007	0.002	0.013	0.7	0.4	1.4
	4/5/00	648363.101	390135.647	286.167	0.010	0.011	0.002	0.015	1.1	1.5	1.5
	2/6/00	648363.099	390135.644	286.164	0.008	0.008	-0.001	0.011	0.6	1.1	1.1
	5/7/00	648363.102	390135.642	286.164	0.011	0.006	-0.001	0.013	0.4	0.2	0.7
	4/8/00	648363.101	390135.640	286.166	0.010	0.004	0.001	0.011	0.4	0.2	1.1
	11/9/00	648363.097	390135.645	286.166	0.006	0.009	0.001	0.011	0.8	0.5	1.5
	5/10/00	648363.099	390135.641	286.165	0.008	0.005	0.000	0.009	0.5	0.4	1.0
	3/11/00	648363.096	390135.645	286.161	0.005	0.009	-0.004	0.011	0.4	0.4	0.9
	4/12/00	648363.098	390135.644	286.167	0.007	0.008	0.002	0.011	0.4	0.3	0.8
	10/1/01	648363.104	390135.646	286.166	0.013	0.010	0.001	0.016	0.5	0.4	1.1
	6/3/01	648363.097	390135.643	286.170	0.006	0.007	0.005	0.010	0.4	0.3	0.8
	18/4/01	648363.100	390135.637	286.164	0.009	0.001	-0.001	0.009	0.4	0.4	1.1
	31/5/01	648363.098	390135.637	286.168	0.007	0.001	0.003	0.008	0.2	0.2	0.4
	17/9/01	648363.098	390135.636	286.173	0.007	0.000	0.008	0.011	1.0	0.0	1.0
	12/12/2001	648363.097	390135.632	286.172	0.006	-0.004	0.007	0.010	2.0	1.0	1.0
	14/3/02	648363.100	390135.639	286.176	0.009	0.003	0.011	0.015	1.0	0.0	1.0
	19/6/02	648363.097	390135.633	286.174	0.006	-0.003	0.009	0.011	1.0	0.0	0.0
	29/10/02	648363.097	390135.633	286.172	0.006	-0.003	0.007	0.010	1.0	0.0	1.0
	21/2/03	648363.098	390135.632	286.175	0.007	-0.004	0.010	0.013	1.0	0.0	1.0
	19/3/03	648363.095	390135.633	286.177	0.004	-0.003	0.012	0.013	1.0	0.0	1.0
	25/8/03	648363.096	390135.633	286.169	0.005	-0.003	0.004	0.007	1.0	1.0	1.0
	11/3/04	648363.091	390135.632	286.170	0.000	-0.004	0.005	0.006	1.0	1.0	1.0
	15/12/2004	648363.091	390135.632	286.180	0.000	-0.004	0.015	0.016	1.0	0.0	0.0
	26/10/2005	648363.092	390135.627	286.178	0.001	-0.009	0.013	0.016	1.0	1.0	1.0
	30/11/2006	648363.093	390135.634	286.177	0.002	-0.002	0.012	0.012	1.0	0.0	0.0
	16/01/2008	648363.088	390135.634	286.168	-0.003	-0.002	0.003	0.005	1.0	0.0	0.0
	29/10/2008	648363.09	390135.631	286.173	-0.001	-0.005	0.008	0.009	1.0	0.0	1.0
	9/03/2009	648363.087	390135.638	286.179	-0.004	0.002	0.014	0.015	1.0	0.0	1.0
	30/07/2009	648363.094	390135.636	286.188	0.003	0.000	0.023	0.023	1.0	0.0	2.0
	17/11/09	648363.089	390135.636	286.186	-0.002	0.000	0.021	0.021	1.0	1.0	3.0
	4/12/2009	648363.094	390135.639	286.191	0.003	0.003	0.026	0.026	1.0	1.0	2.0
	17/06/2010	648363.083	390135.64	286.183	-0.008	0.004	0.018	0.020	1.0	1.0	2.0
	4/02/2011	648363.087	390135.637	286.196	-0.004	0.001	0.031	0.031	0.0	0.0	1.0
	17/01/2012	648363.096	390135.636	286.185	0.005	0.000	0.020	0.021			
	22/10/2012	648363.086	390135.639	286.185	-0.005	0.003	0.020	0.021	1	1	2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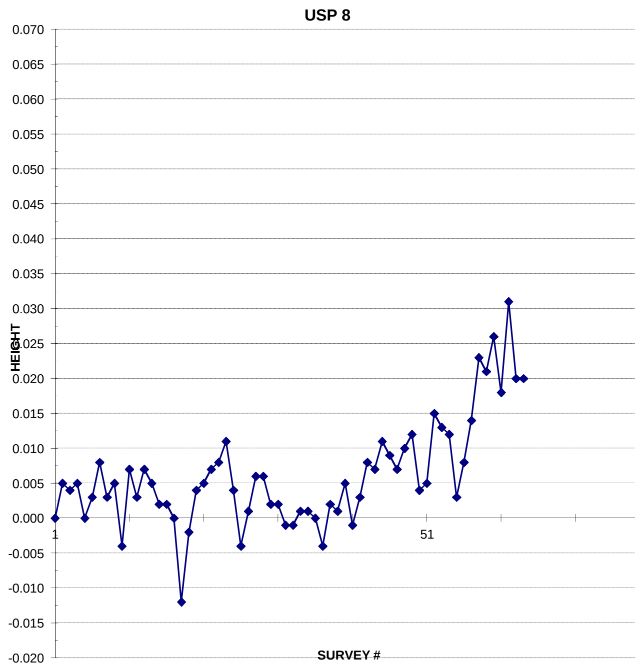
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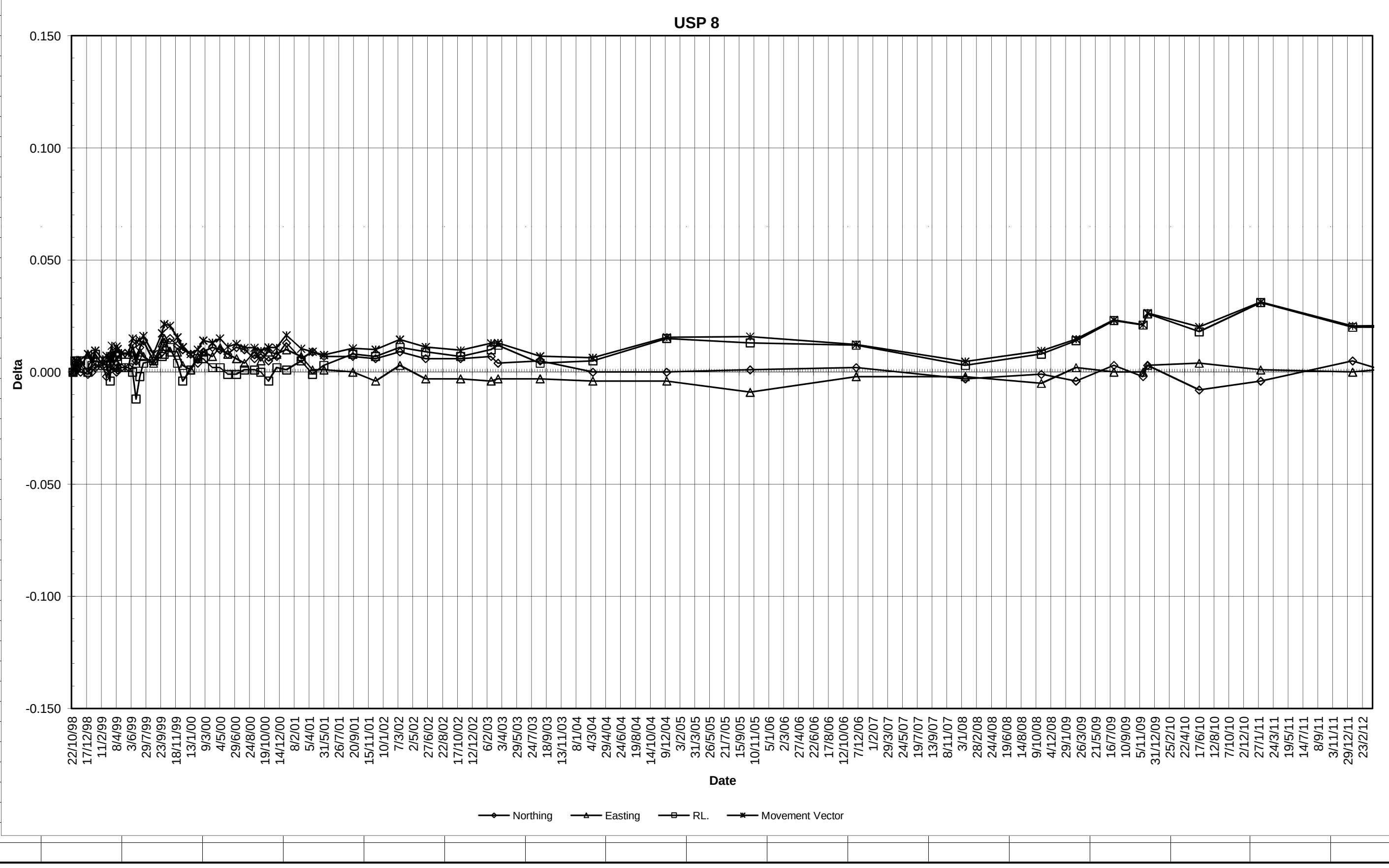
51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-0.150
Northing
Easting
RL.
Movement Vector

Appendix D: Visual Inspection Records

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Quarterly visual inspection of Golden Cross mine site

Inspection Date: 9-2-11 **Time:** am **Pond RL:** ✓

Weather: Overcast. **Inspected by:** PB

Item		Concern: Movement/ slips	Concern: Seeps	Concern: Erosion	Concern: Cracks	Concern: Sink holes	General Observations: Surface Drainage (1)	General Observations: Instrument Intact (3)	General Observations: Horiz drain Flows (2)	Comments	Action required (U = urgent) (R = routine)
Dam Embankment	Upstream Shoulder and crest	√	X	√	√	√	√	√	√	Ground wet	
	Right Abutment	√	√	√	√	√	√	√	√		
	Left Abutment	X	√	X	X	√	√	√	√	minor cracking in shotcrete.	
	Saddle Embankment	√	X	X	√	√	X	√	√	seep erosion continues near N145.	
	Main Embankment	√	X	√	√	√	X	√	√		
	Spring Embankment	X	X	X	√	√	√	√	√		
	Portal Embankment	X	X	X	√	√	√	√	√	previous slide re-vegetating.	
	Stockyard Embankment	√	X	√	√	√	√	√	√		
Trig J Ridge											
Landslide Toe		√	√	√	X	√	√	√	√	distortion in road not increasing.	
Air Strip											
Upper Waitekauri (Piezometer M8)											
Tailing Pond Margin		√	√	√	√	√	√	√	√		
Rear of Tailings Pond		√	√	√	X	√	√	√	√	minor shotcrete cracks - new GPS at N136.	
USD Wetland											
SYSD Wetland											
Open Pit		X	X	X	X	√	√	√	√	no increase in surficial slips.	
Pond Outlet and Channel											

√ = No Problem
X = Problem

1.Check surface drainage for flow, erosion, obstructions and instability
2. Check horiz drains for visual normality ie. Flow rate and turbidity
3. Check outlet and channel for damage, corrosion and blockage.

COEUR
THE PRECIOUS METALS COMPANY

Quarterly visual inspection of Golden Cross mine site

Inspection Date: 9-10-12 **Time:** All day **Pond RL:** na

Weather: Overcast with breaks - windy **Inspected by:** PR

Item		Concern					General Observations			Comments	Action required (U = urgent) (R = routine)
		Movement/ slips	Seeps	Erosion	Cracks	Sink holes	Surface Drainage (1)	Instrument Intact (3)	Horiz drain Flows (2)		
Dam Embankment	Upstream Shoulder and crest	✓	✓	✓	✓	✓	✓	✓	✓		
	Right Abutment	✓	✓	✓	✓	✓	✓	✓	✓		
	Left Abutment	✓	✓	✓	✓	✓	✓	✓	✓		
	Saddle Embankment	✓	X	✓	✓	✓	✓	✓	✓	Flows on road at base of slope.	
	Main Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
	Spring Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
	Portal Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
	Stockyard Embankment	✓	✓	✓	✓	✓	✓	✓	✓		
Trig J Ridge		✓	✓	✓	✓	✓	✓	✓	✓		
Landslide Toe		✓	✓	✓	✓	✓	✓	✓	✓		
Air Strip											
Upper Waitekauri (Piezometer M8)											
Tailing Pond Margin											
Rear of Tailings Pond		✓	X	X	X	X	X	✓	✓	Significant drainage issues with WDD, reported to client.	
USD Wetland											
SYSD Wetland		✓	✓	✓	✓	✓	✓	✓	✓		
Open Pit		X	X	X	X	✓	X	✓	✓	number of slips on East pit wall - client notified	
Pond Outlet and Channel		✓	✓	✓	✓	✓	✓	✓	✓		

√ = No Problem X = Problem	1.Check surface drainage for flow, erosion, obstructions and instability		
	2. Check horiz drains for visual normality ie. Flow rate and turbidity		
	3. Check outlet and channel for damage, corrosion and blockage.		

Appendix E: Technical Memorandum

REPORT

COEUR D'ALENE MINES CORP

Golden Cross Landslide Review Technical Memorandum: June 2010 to October 2012

Report prepared for:

COEUR D'ALENE MINES CORP

Report prepared by:

Tonkin & Taylor Ltd

Distribution:

COEUR D'ALENE MINES CORP	2 copies
Viking Mining	1 copy
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June 2013

T&T Ref: 613625.001

Table of contents

1 Introduction 1
1.1 Brief 1
1.2 Background 1
2 Monitoring data 2
2.1 Rainfall 2
2.2 Mass movement monitoring 2
2.2.1 Inclinometers 3
2.2.2 GPS Data 3
2.3 Groundwater monitoring 5
2.3.1 General 5
2.3.2 Upper Slide Piezometers 5
2.3.3 Lower Slide piezometers 5
2.3.4 M8 off-slide underground mine water level 5
2.3.5 Horizontal drains 6
2.3.6 Underdrains 6
2.4 Visual inspection 6
2.4.1 February 2011 6
2.4.2 October 2012 6
2.4.3 February 2013 7
3 Interpretative discussion 7
3.1 Mass movement 7
3.2 Rainfall and groundwater 8
4 Recommendations 9
5 Applicability 10

Appendix 1: Attachments

Executive summary

This report presents an interpretive review of monitoring results for the Golden Cross Landslide for the period June 2010 to October 2012 and selected monitoring data dating back to 1999.

Plan movement data for the monitoring period (range 0.9 to 6.9 mm/year, average 3.3 mm/year) did not exceed the criteria for increased monitoring (60 to 75 mm/year).

Discussion of observed plan movement and groundwater trends for the monitoring period is presented and recommendations made for future monitoring.

1 Introduction

1.1 Brief

This report presents an interpretive review of monitoring results for the Golden Cross Landslide for the period June 2010 to October 2012 and selected monitoring data dating back to 1999. This report is included as Appendix E of the Golden Cross Landslide Monitoring Report for June 2010 to October 2012 (T&T Ref. 613625.001 dated April 2013), referred to as the "Monitoring Report," and should be read in conjunction with it. The monitoring data is not presented in detail in this report.

The locations of the various mass movement and groundwater monitoring observation points are shown on the Monitoring Network Plan presented in Appendix 1 of this report.

1.2 Background

The Golden Cross Landslide is a large scale deep seated translational reactivated earth-rock slide underlying the Golden Cross Mine site, Waihi. It is some 2,100 m long, 500 to 1,000 m wide, up to 145 m deep, and occupies some 135 hectares of land.

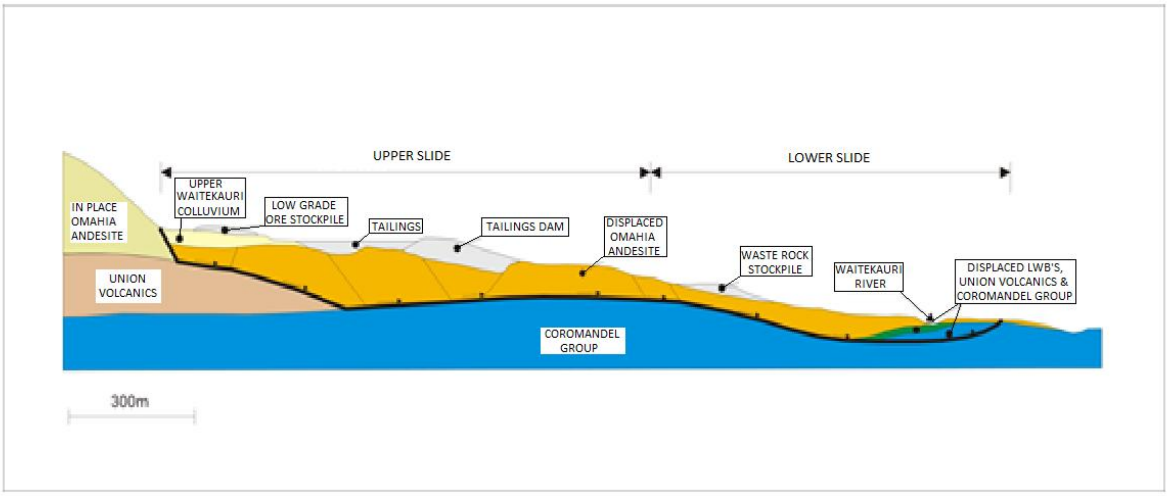

Figure 1: Golden Cross Landslide geological model

The landslide can be divided into upper and lower slides as demarcated on Figure 1 above. GPS monument C-K5 is located near the toe of the Upper Slide and C-Stok is located near the head of the Lower Slide.

Figure 2 below presents a contour model of the Golden Cross Landslide basal slide failure surface based on subsurface investigation and historic mass movement (inclinometer) monitoring data. The indicative slide movement vectors are based on surface monitoring data (GPS).

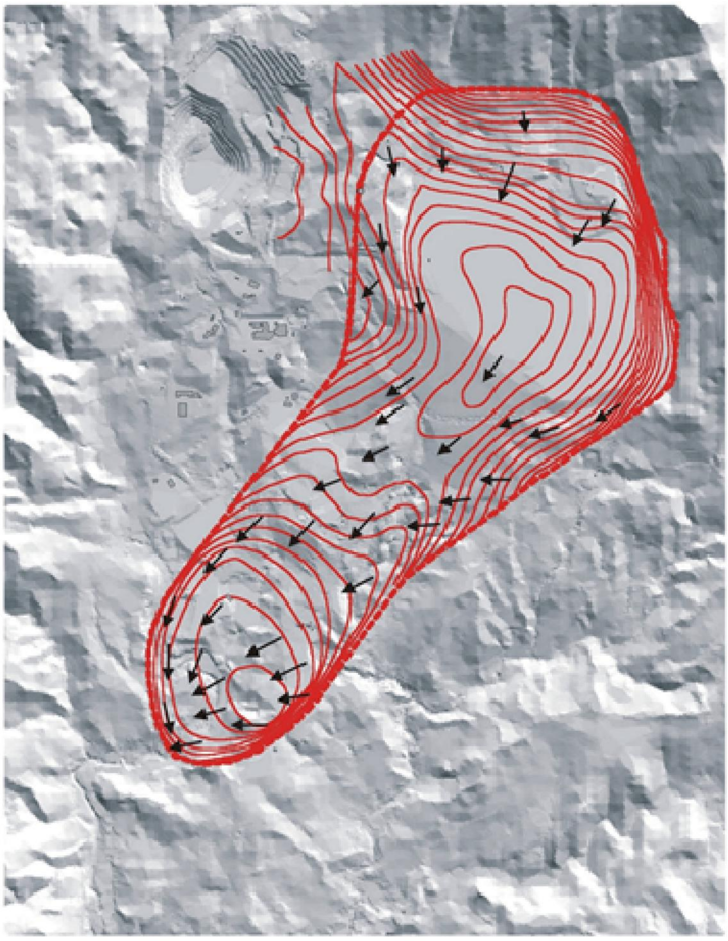

Figure 2: Golden Cross Landslide slide failure surface contours (10m intervals) and movement vectors)

2 Monitoring data

2.1 Rainfall

Below average rainfall was recorded during 19 of the 28 months in the monitoring period and the period was characterised by long periods of relatively dry weather. Periodic significant rainfall events also occurred during the monitoring period as normally expected for this location and details for these events are presented in Section 2 of the Monitoring Report.

Below average rainfall has been recorded at the site for each of the last five years (2008 to 2012) whereas the rainfall for each of the years 2000 to 2007 was above the average of 2787 mm.

2.2 Mass movement monitoring

Summary mass movement monitoring data dating back to 1998 are presented on the M8, Rainfall, GPS cumulative movement and inclinometer plot (presented in Appendix 1 of this report). This plot presents cumulative movement versus rainfall. The plot does not show the movement direction for any of the plotted monitoring instruments and whether the movement is in a direction consistent with expected landslide movement. The plot legend has been annotated to show movement direction for the GPS monuments for the current monitoring period (June 2010 to October 2012) and whether the recorded movement direction is consistent with expected landslide movement at that location.

2.2.1 Inclinometers

Four landslide inclinometers were monitored during the period September 1999 through to late 2005 (refer to the M8, Rainfall, GPS cumulative movement and inclinometer plot, Appendix 1). Saddle inclinometer N145 and Central Ridge inclinometer N147 became unreadable (blocked at the basal slide sheared zone) in 2006. Accordingly, there have been no serviceable inclinometers within the landslide since Lower Slide (Road) inclinometer N131 and Upper Slide (Rear of Tailings Pond) inclinometer N136 became blocked in 2008.

Lower Slide (Road) inclinometer N131 and Upper Slide (Rear of Tailings Pond) inclinometer N136 have since been converted to surface GPS monitoring points (refer section 2.2.2 below).

2.2.2 GPS Data

2.2.2.1 General

Plan movement direction arrows for the various GPS markers are shown on the Monitoring Network Plan (Appendix 1). A summary of cumulative GPS movement dating back to 1998 is presented on the M8, Rainfall, GPS cumulative movement and inclinometer plot (Appendix 1). Movement direction is annotated in the plot legend. The summary plot presented in Appendix 1 of this report should be read in conjunction with the graphs presented in Appendix C of the Monitoring Report.

Table 1 below presents a comparison of total yearly plan (horizontal) displacement recorded between 1999 and 2012 (mm/year).

Table 1: Net GPS plan (horizontal) displacement data (mm). *These data are* graphed on *M8, Rainfall, GPS cumulative movement and inclinometer plot* presented in *Appendix 1.*

GPS	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
C-2	14.1	15.7	12.6	3.2	7.1	2.2	5.0	2.0	5.4	3.2	2.0	1.0	8.6	5.0
C-Sad	27.9	15.6	3.2	5.0	3.2	1.4	8.1	3.2	3.6	4.5	4.2	3.0	6.7	9.0
C-Mid	18.2	15.3	7.1	5.1	8.2	3.2	2.2	7.0	2.2	8.0	4.0	2.0	1.4	3.2
C-K5	5.7	19.7	5.0	7.8	3.0	2.2	5.1	3.6	1.4	6.7	1.0	2.2	4.2	6.3
C-SYD	6.1	3.2	4.1	4.1	10.2	3.6	5.0			5.4	7.1	6.3	3.0	1.4
USP-8	8.6	5.0	9.1	3.2	6.1	5.1	5.1	7.1	5.0	3.6	5.1	7.2	5.0	2.2
Ave	13.4	12.4	6.9	4.7	6.3	3.0	5.1	4.6	3.5	5.2	3.9	3.6	4.8	4.5

Since 1999 the average GPS movement rates have ranged between 3.0 and 13.4 mm/year with an overall average of 5.9 mm/year.

Anomalous GPS data described and assessed in the previous Technical Memorandum dated June 2010 (T&T Ref. 613625.001) appears to have been the result of a change in data processing software (TGO V1.63 - refer Section 1.2 of the June 2013 Monitoring Report). Data processing using the previous software (TGO V1.60) yielded more consistent and reliable results. The reprocessed data are presented in the monitoring report and have been assessed in preparing this report.

The theoretical instrument error for each static GPS recording is estimated to be 3 to 5mm.

2.2.2.2 Upper slide

GPS mass movement monitoring data for the Upper Slide indicate that there has been extremely slow landslide movement within the monitoring period from June 2010 to October 2012.

Upper Slide monuments C-2 (Rear of tailings), C-Sad (Saddle) and CK5 (Central Ridge) recorded movement in a general direction consistent with expected slide movement vectors (compare Monitoring Network Plan, Appendix 1 and Figure 2 above). C-Sad recorded the highest movement rate during the monitoring period of 6.9 mm/year with C-2 and C-K5 recording 4.7 mm/year and 4.3 mm/year respectively.

Upper Slide monument C-Mid, located in the middle of the tailings dam main embankment has recorded movement in a due west direction (281º) since 2001, which is over 45 degrees west of the expected slide movement azimuth. This is difficult to explain given that all the surrounding Upper Slide monuments including C-2, C-Sad and C-K5 have generally recorded movement in a "landslide consistent" direction.

The average rate of movement recorded by C-Sad of 6.9 mm/year for the current monitoring period is approximately double the 3.1 mm/year average for the previous 12 years. The average movement rates recorded by C-Sad, C-2 and CK-5 during the current monitoring period are still in the extremely slow (<16mm/year) rate of movement range (Cruden & Varnes 1996).

We note that for the final GPS reading during the monitoring period, taken on 19 October 2012, the direction of movement reversed for monuments C-Sad, C-2 and C-Mid. This is a typical fluctuation within the overall movement trend of these Upper Slide monuments. The vertical movement signatures for embankment monuments C-Mid and C-Sad are generally consistent with long term settlement.

Additional and new GPS monuments monitored in the Upper Slide area include C-RA (Right Abutment) and C-136 (Rear of tailings). Right Abutment monument C-RA has displayed movement upslope toward the tailings impoundment in the monitoring period and over the last 12 years in a direction toward the middle of the Main Embankment. These movement directions are difficult to explain but are generally oriented in a down dip direction of the landslide lateral basal failure surface below (Figure 2).

Rear of tailings monument C-136 has recorded movement of 3.3 mm/year in a southerly direction consistent with a real slide movement vector and similar in magnitude and direction to rear of tailings monument C-2.

2.2.2.3 Lower slide

GPS mass movement monitoring data for the Lower Slide indicate that there has been negligible movement within the monitoring period from June 2010 to October 2012. The Lower Slide appears to be 'locked up'.

Lower slide monuments C-SYD (Stockyard) and USP-8 (Union Silt Pond) recorded average movement rates of 0.9 mm/year and 1.3 mm/year respectively, but not in a direction consistent with historic slide movement vectors (Figure 2).

Additional Lower slide monument C-Stok recorded an average movement rate of 1.7 mm/year during the monitoring period that is consistent with historic slide vector movement. This compares well with an average rate of 1.2 mm/year over the previous 12 years.

New Lower Slide GPS monument C-131 (Road) recorded 3 mm of movement (1.8 mm/year) in a north-west direction from February 2011 to October 2012 that is not consistent with historic slide vector movement (Figure 2).

2.3 Groundwater monitoring

2.3.1 General

Groundwater monitoring instruments were read twice during the monitoring period in March 2011 and October 2012. Lower Slide Spring Creek standpipe piezometer N45 (Lower Omahia) and Stockyard standpipe piezometer N132/1 (Basement) initially could not be read due to blockage within the standpipes. They were, however, read at a later date with a smaller dipping probe. There are eight functional piezometers monitoring groundwater levels within the total upper and lower landslide areas.

In general we note that:

- Response fluctuations to low frequency rainfall events are not observed on the graphs due to the widely spaced monitoring frequency.
- The existing instruments may have become unresponsive over the last ten years.

2.3.2 Upper Slide Piezometers

A groundwater level rise of 1.2 m was recorded by Trig J piezometer N9 and a fall of 1.2 m recorded by Trig J piezometer N7, both of which are monitoring water levels in the Omahia Andesite aquifer. These continue to fluctuate within a narrow range and have not shown a distinct rising or falling trend over the last 10 years.

Rear of tailings piezometer PW25 recorded a water level at RL391m, approximately 3 m lower than the previous reading in October 2008.

2.3.3 Lower Slide piezometers

Stockyard standpipe piezometer N45 (Omahia) recorded a drop of approximately 6 m between November 2010 and January 2013 while nearby Stockyard standpipe piezometer N132/1 (Basement) recorded a 7 m rise between June 2010 and January 2013.

Lower Slide (Stockyard) piezometers N132/2 and N132/3 recorded rises of 0.7m and 0.6m respectively. These piezometers monitor the Omahia aquifer in the Stockyard area and have recorded gradually rising groundwater levels of approximately 5 m to 10 m over the last 10 years. This is further to a rise of approximately 10 m to 15 m recorded between 1998 and 2002 after the Lower Slide pumping wells were decommissioned in this area.

2.3.4 M8 off-slide underground mine water level

Piezometer M8 is located in the upper Waitekauri River catchment approximately 150 m north-west of the now removed Administration building (refer Monitoring Network Plan, Appendix 1). M8 was installed to monitor the groundwater level and groundwater chemistry in the underground mine constructed within the Coromandel Group rock formation (Basement). Pumping wells PW26 and PW27 operate to control the groundwater levels in the underground mine which are monitored by M8. M8 and pumping wells PW26 and PW27 are located approximately 500 m from the Landslide. The M8 water level generally has a minor response to rainfall as observed by the minor fluctuations on the plot but the major water level fluctuations are related to pumping effort from PW26 and PW27.

Groundwater level data for M8 peaked at just over RL 300 m (July 2012) during the monitoring period. The monitoring period levels between RL 295 m and RL 300 m are the highest recorded readings since January 2003 (refer to the M8, Rainfall, GPS cumulative movement and inclinometer plot, Appendix 1).

There is an apparent correlation between the high M8 groundwater level and increased movement rates recorded during the monitoring period by Upper Slide monitoring stations C-2, C-Sad and CK-5. We assess that this correlation is likely to be coincidental given the large distance (500m) between M8 and the Upper Slide. The relationship between Upper Slide movement and groundwater pressure within the sub-slide Coromandel Group rock aquifer could be better understood if there were more groundwater monitoring data points within the Coromandel Group formation beneath the Upper Slide.

2.3.5 Horizontal drains

The network of surface collared sub-horizontal drain networks are the only current groundwater depressurisation instruments following decommissioning of the underground E46 drainage drive and surface pumping wells.

Drain flows from the Lower Slide H3 (Road) and SY2 (Stockyard) sites and the Upper Slide – Trig J J3 and J4 sites were monitored in October 2011 and drain flow data are held on file. The individual drains at each site need to be carefully labelled for accurate comparison with future monitoring at these sites.

2.3.6 Underdrains

Sustained flows continue from the tailings impoundment (Terminal 1) and embankment (Terminal 2) underdrains. The Terminal 1 flow point is easily accessible and can be readily monitored but the Terminal 2 flows are not easily accessible and cannot be reliably monitored.

A flow rate of 400 litres per minute was recorded for the Terminal 1 underdrains in February 2013 during a sustained dry period (the 2012/2013 summer period was officially declared a “drought” by the NZ Government). This compares well with flows ranging between 250 and 500+ litres per minute that were recorded during March and April 2010.

These underdrain flow data and characteristics are generally consistent with historical flow trends from the underdrains although the volume appears to have decreased in the past 15 years. The inferred approximate range of Terminal 1 flows historically was in the order of 500 to 1,000 litres per minute. The decreased flow volume is probably related to consolidation of the tailings and siltation.

2.4 Visual inspection

Visual inspections of the Golden Cross mine site were carried out on 9 February 2011, 9 October 2012 and 26 February 2013. A brief discussion of each follows.

2.4.1 February 2011

The February 2011 inspection (by Paul Burton) noted minor seeps and some erosion features around the various dam embankments including the Saddle embankment area near N145. Cracks and holes in the shotcrete lining of the Western Diversion Drain (WDD) were observed and some appeared to have worsened.

2.4.2 October 2012

During the October 2012 inspection (by Paul Burton) seepage was noted in the Saddle embankment area only with flows on the access way at the base of the slope. The condition of the WDD had worsened with various types of deformation recorded including erosion, cracks and sinkholes.

2.4.3 February 2013

Inspection of the Golden Cross Landslide and environs was carried out on 26 February 2013 by T&T staff Grant Loney, Tim Coote and Paul Burton, all of whom have experience of the site dating back a minimum of 15 years. The inspection was carried out to assess the overall site condition and inspect areas of seepage, erosion and deformation noted in previous visual inspections in the key Landslide areas such as the Saddle Embankment and Trig J.

No ground cracks were observed in any natural ground or fill within the footprint of the Golden Cross Landslide. This includes all the tailings embankment fills, Trig J, Left and Right Abutments, Central Ridge and Stockyard areas. During previous significant Landslide movement episodes, ground cracking was one of the key indicators of movement.

The condition of the WDD appeared similar to previous inspections during the current monitoring period. A crack within a shotcreted cut face near the Left Abutment appeared to be localised and not related to landslide movement.

Of note were previously identified areas of concentrated seepage and erosion on the south-east facing slope of the Saddle Embankment. These areas are delineated by pockets of reeds ("Yorkshire fog grass") that prefer damp soil conditions. It was noted that the seepage areas were not currently active (dry), which suggest they are the result of prevailing weather conditions and poor drying due to the slope aspect as opposed to seepage from the tailings pond.

Photo 1: View of Saddle Embankment from Trig J. Note seepage and erosion areas defined by reed grass

3 Interpretative discussion

3.1 Mass movement

Mass movement monitoring data for the period indicate that the Upper Slide continues to move at an extremely low rate while the Lower Slide has recorded negligible movement. The Upper Slide probably continues to move as a stick-slip response to large rainfall events and associated elevated groundwater pressure on the slide mass. The Lower Slide moving at a negligible rate is likely to be having a buttressing effect on the Upper Slide.

Monitoring data for the period June 2010 to October 2012 recorded within-slide movement rates of up to 6.9 mm/year (C-Sad) with an average rate of 3.3 mm/year. Of the six regular GPS regular monitoring stations, Upper Slide monuments C-2 (Rear of tailings), C-Sad (Saddle) and CK5

(Central Ridge) recorded movement in a general direction consistent with expected slide movement vectors. New GPS monuments C-136 (Upper Slide) and C-Stok (Lower Slide) also presented data consistent with minor landslide movement.

Landslide movement rates of less than 16 mm/year are classified as 'extremely slow' (Cruden & Varnes, 1996, Appendix 1) and the movement rates recorded in the last monitoring period and previous 12 years are less than movement rates recorded after June 1997 when the landslide was considered to have been "stabilised." It appears that only ongoing minor "stick-slip" movement in response to large rainfall events (refer to Figures 4.1 and 4.2 from the October 1997 Interpretive Report T&T Ref: 12520/R20, presented in Appendix 1) has occurred from 1999 to the present day.

Saddle Embankment monument C-Sad recorded the highest "landslide consistent" movement rate of 6.9 mm/year during the 28 month monitoring period, although the final monitoring reading from January to October 2012 showed a reversal (upslope movement). The Saddle Embankment is a key area with respect to the landslide and risk assessment. The significance of any trend changes recorded by the on-going slope movement (GPS), groundwater and surface observation monitoring data should be closely scrutinised. Areas of groundwater seepage and deformation within embankment and drain structures surrounding the tailings impoundment may be related to the on-going extremely slow movement of the Upper Slide although this is considered to be unlikely.

Deformation of the rigid WDD shotcrete lining appears to be localised and probably associated with seasonal shrink and swell of surficial soils. Seepage within the embankment structures, and in particular the Saddle Embankment, appears to be related to seasonal moisture conditions (rainfall) on and within the fill structures and not related to seepage through them from the tailings pond.

3.2 Rainfall and groundwater

A mixture of groundwater level rises and falls have been recorded within the monitoring period with more falls (N7 and PW25) than rises in the Upper Slide and more rises (N132/1 to 3) in the Lower Slide.

Given the relatively dry previous five years it also may be expected that the groundwater levels would be relatively static or showing a downward trend.

In general, the Upper Slide piezometers do not show an overall raising or lowering trend. There are very limited data points to quantify and define the piezometric surface in the Upper Slide area. The currently monitored groundwater level in rear of tailings pond standpipe PW25, at about RL 390 m, is similar to the level recorded in rear of tailings piezometer N38 following groundwater drawdown achieved by the Northeast Crosscut in 1997 (refer to Figure 6.2 from October 1997 Interpretive Report T&T Ref: 12520/R20, presented in Appendix 1). This indicates that the Omahia Andesite aquifer beneath the tailings impoundment area (important for Landslide stability) is still significantly depressurised. Without additional groundwater monitoring data points it is difficult to assess if this apparent depressurisation is due to the on-going effect of the E46 Drainage Drive, surface horizontal drains or other factors.

The Lower Slide Stockyard piezometers show a minor overall trend (N132/1 to N132/3) of rising groundwater level over the last ten years. It is possible that gradually rising piezometric levels in the Lower Slide area may reflect some landslide aquifer re-pressurisation due to the declining capacity of the horizontal drainage network as the drain holes become clogged over time. Based on the negligible GPS movements rates this trend does not appear to be having a negative impact on the stability of the Lower Slide block.

This relationship between groundwater piezometric levels and drain flows could be better assessed if the key horizontal drain networks are monitored at the same time and frequency as the piezometer water levels. The key drain networks to be monitored include the Upper Slide J3 and J4 drains below Trig J and Lower Slide SY2 (Stockyard) and H3 (Road). Synchronised monitoring of the tailings and embankment underdrain flows would also enhance the data set for modelling the hydrogeology of the Upper Slide.

4 Recommendations

We make the following recommendations for on-going monitoring and assessment of the Golden Cross Landslide:

- Continue monitoring groundwater (piezometers) and mass movement monitoring stations (GPS monuments) on a yearly basis;
- Continue monitoring the extended GPS network;
- Synchronise the monitoring and reporting period to beginning and end of year dates to correlate better with annual rainfall;
- Monitor on a quarterly basis the horizontal drain flows at the J3, J4, H3 and SY2 sites and the tailings impoundment underdrain (Terminal 1) outlet. If possible, reconfigure the embankment underdrain (Terminal 2) outlet for ease of future monitoring. Monitor the horizontal drain and terminal well flows at the same time as the annual piezometer monitoring for more relevant information;
- More accurately locate, describe and monitor areas of seepage and erosion within the Saddle dam embankment

5 Applicability

This report has been prepared for the benefit of Coeur D 'Alene Mines Corp with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor LTD

Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
....	....
Tim Coote	Grant Loney
Senior Engineering Geologist	Project Director

TIMC

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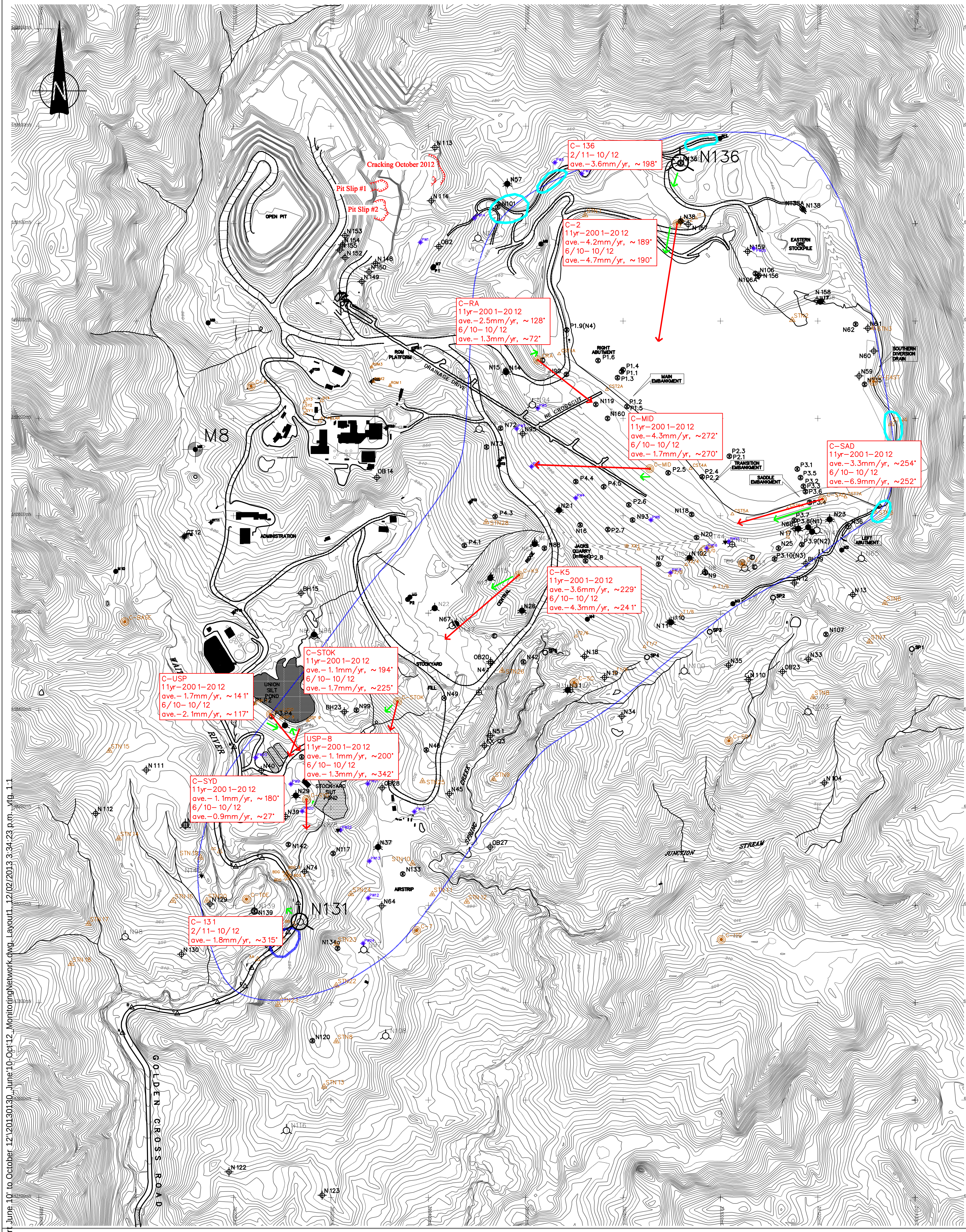
Appendix 1: Attachments

- Monitoring network plan;
- M8, Rainfall, GPS cumulative movement and inclinometer plot;
- Landslide movement rate classification (Cruden & Varnes 1996);
- Figures 4.1, 4.2 & 6.2 from October 1997 Interpretive Report T&T Ref: 12520/R20.



LEGEND

April 1998 Major Contour

TRIG	Trig
	Secondary Survey Station
C-7	Static GPS Monument
CST1	Temporary Survey Points
	Temporary (surface) extensometer
N88	Active Inclinometer
N22	Blocked Inclinometer
N88	Shear Monitor
N128	Blocked Inclinometer reinstrumented with TDR co-axial cable
OB28	Standpipe piezometer (recent investigations or older investigations still readable)
P3.1	Pneumatic Piezometer (in fill or foundation)
M5	Groundwater Monitoring Well (Environmental)
SP1	Monitoring spring
PW1	Pumping Well
	Plan movement 2001-2012
	Visual inspection cracks zone
	Apparent road deformation zone
	Plan movement in last monitoring period

(Plan movement arrows proportional to length 1mm=5m)

SCALE 1:7100 (A3)
SCALE 1:2500 (A0)
0 25 50 75 100 150 200 250 (m)

REVISION	BY	DATE
General revisions	TPC	10/98
General revisions	TPC	02/99
General revisions	PB	11/08
General revisions	BTH	01/12

PREPARED T.P.C.
DRAWN B.A.S 22/4/97
DRAWING CHECKED
APPROVED :

SCALES (AT A0 SIZE) 1:2500(A0); 1:7100(A3)

CAD FILE L:\DRAUGHT\..\25-190

Prepared by: T&T TONKIN & TAYLOR ENVIRONMENTAL & ENGINEERING CONSULTANTS

NOTES
1. Monitoring includes 650m long survey profile along Golden Cross Road extending southwards from Union Silt Dam.
2. USP 6 to 9 subject to survey verification.

MONITORING NETWORK
GPS - JUNE 2010 - OCT 2012

COEUR GOLDEN CROSS

TITLE GOLDEN CROSS PROJECT

DWG No. 12520-190 REV. 9

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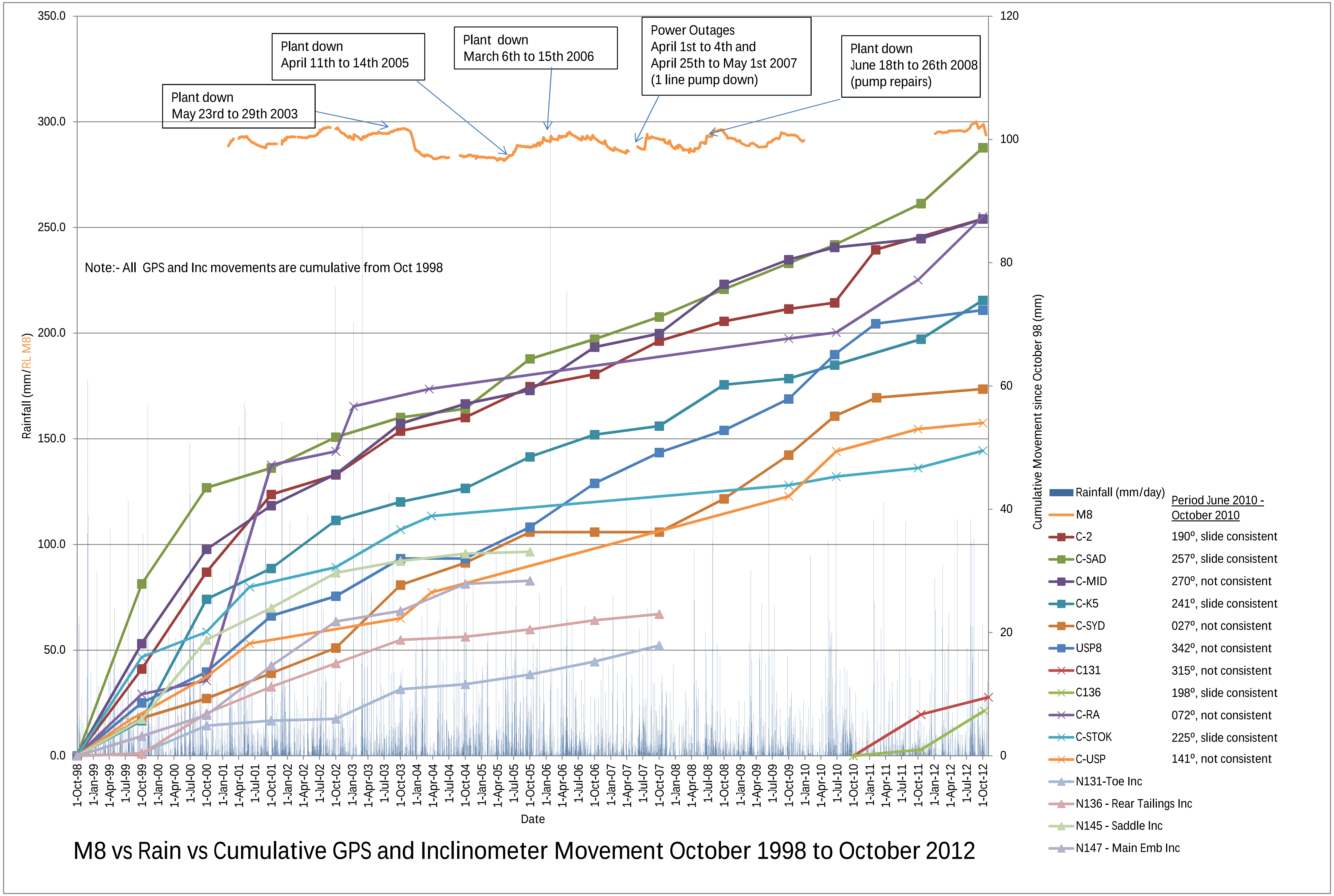

M8 vs Rain vs Cumulative GPS and Inclinometer Movement October 1998 to October 2012

Velocity Class	Description	Velocity (mm/sec)	Typical Velocity
7	Extremely Rapid		
		$5x10^{3}$	5 m/sec
6	Very Rapid		
		$5x10^{1}$	3 m/min
5	Rapid		
		$5x10^{-1}$	1.8 m/hr
4	Moderate		
		$5x10^{-3}$	13 m/month
3	Slow		
		$5x10^{-5}$	1.6 m/year
2	Very Slow		
		$5x10^{-7}$	16 mm/year
1	Extremely Slow		

Landslide movement rate scale (Cruden & Varnes, 1996)

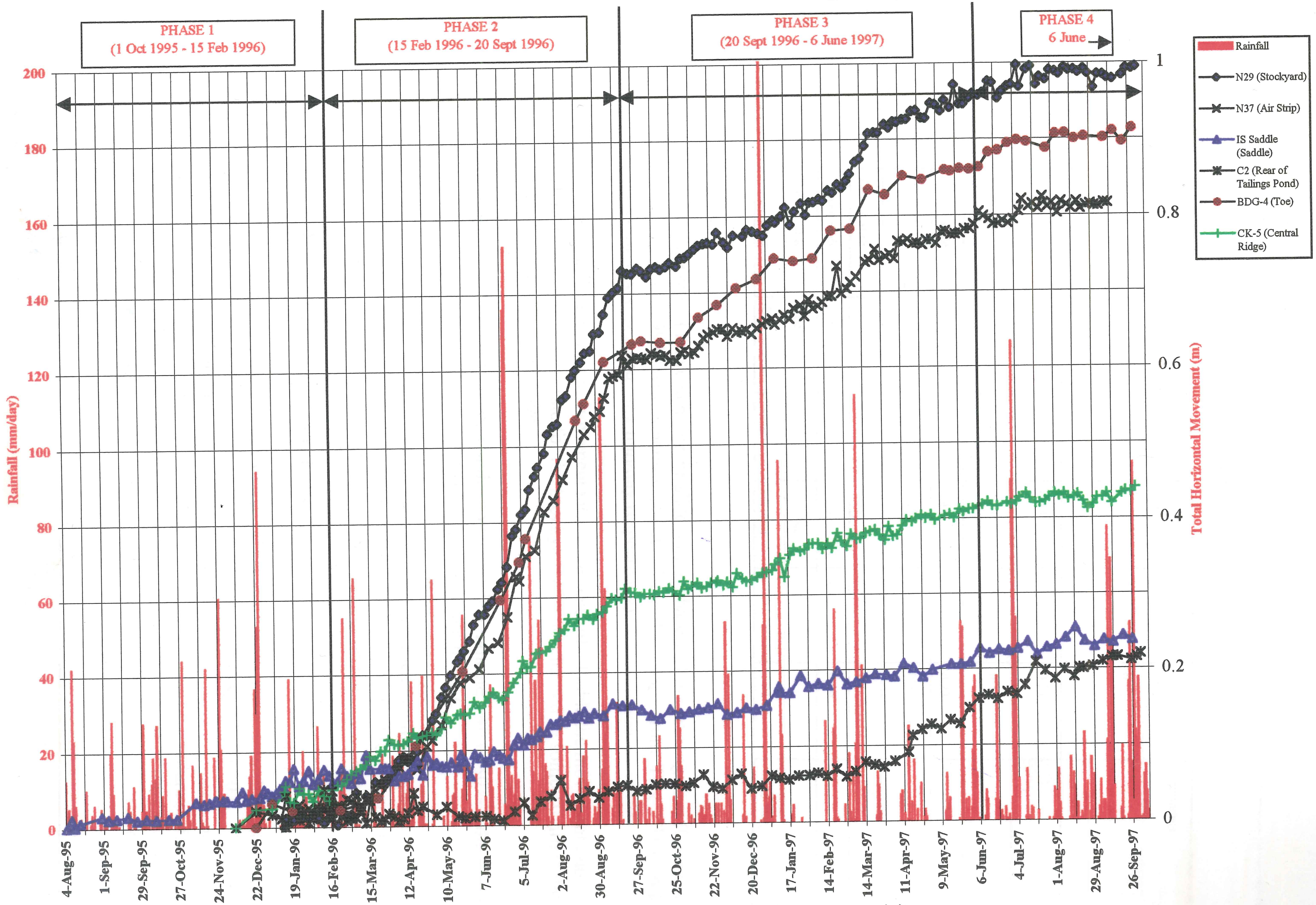

Figure 4.1 : GPS Total horizontal movement of the slide surface showing four main phases of movement activity.

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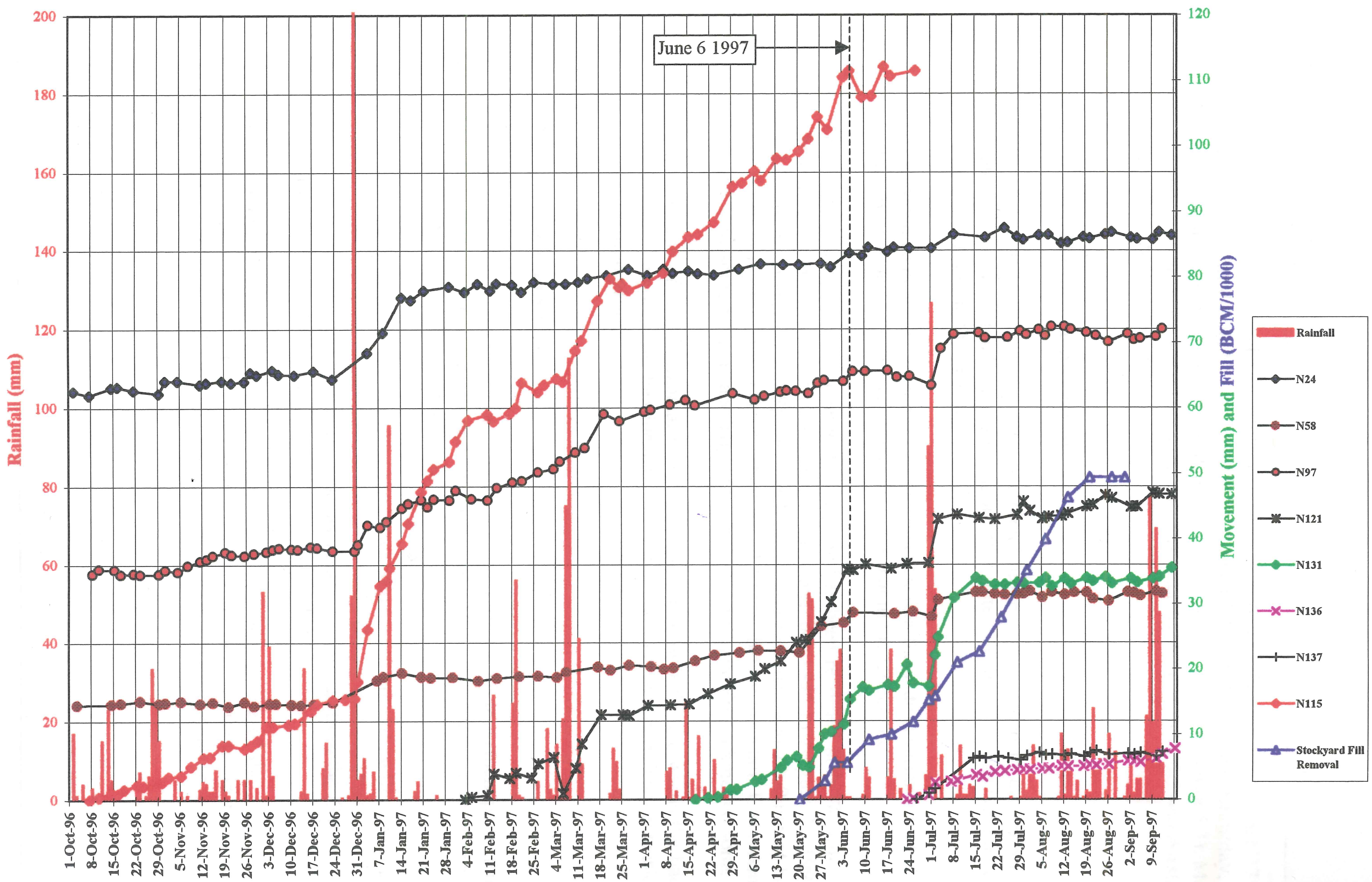

Figure 4.2: Inclinometer data showing change at June 6 1997 from continuous movement to "stick-slip" movement and to relative stability of the landslide. Note relative stabilisation is coincident with relocation of fill from the Stockyard Buttress to the Eastern Ore Stockpile.

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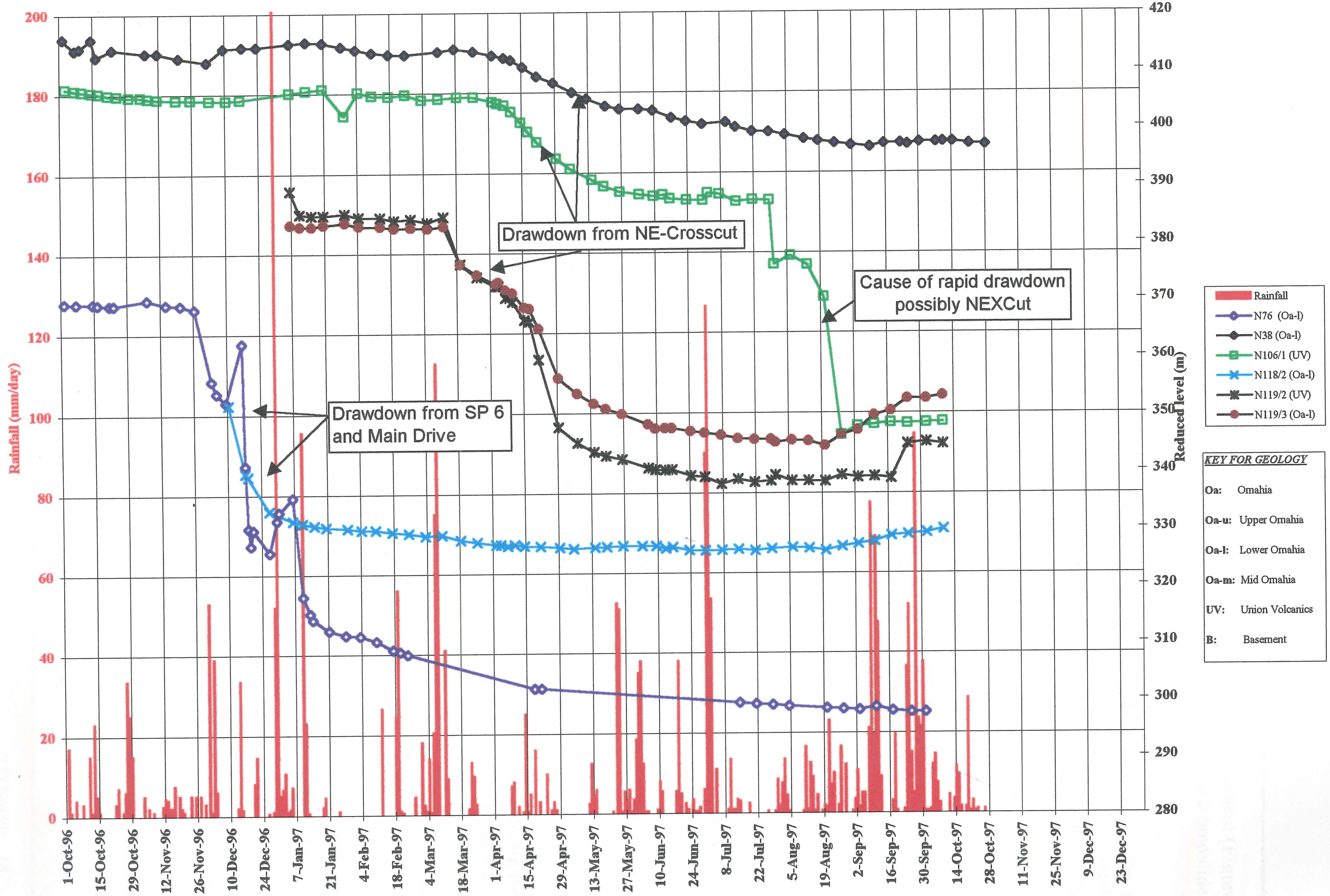

Figure 6.2: Piezometric drawdown recorded in response to drainage drilling from E46 Drainage Drive. Note rapid drawdown recorded by N76 and N118 (drilled into a large andesite block), and the NE-Crosscut induced drawdown recorded by N38 and N106 >350m to the NE.

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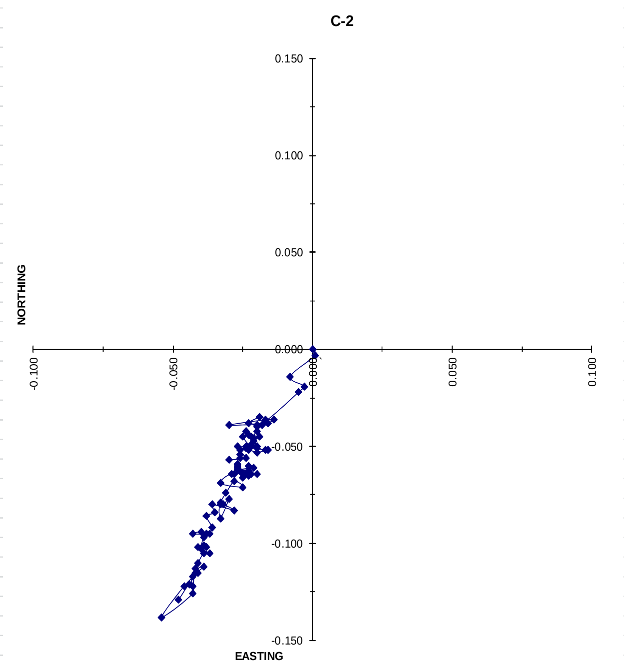
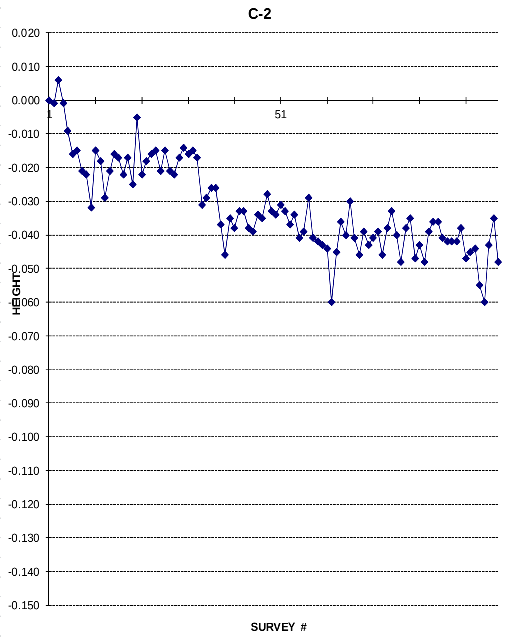
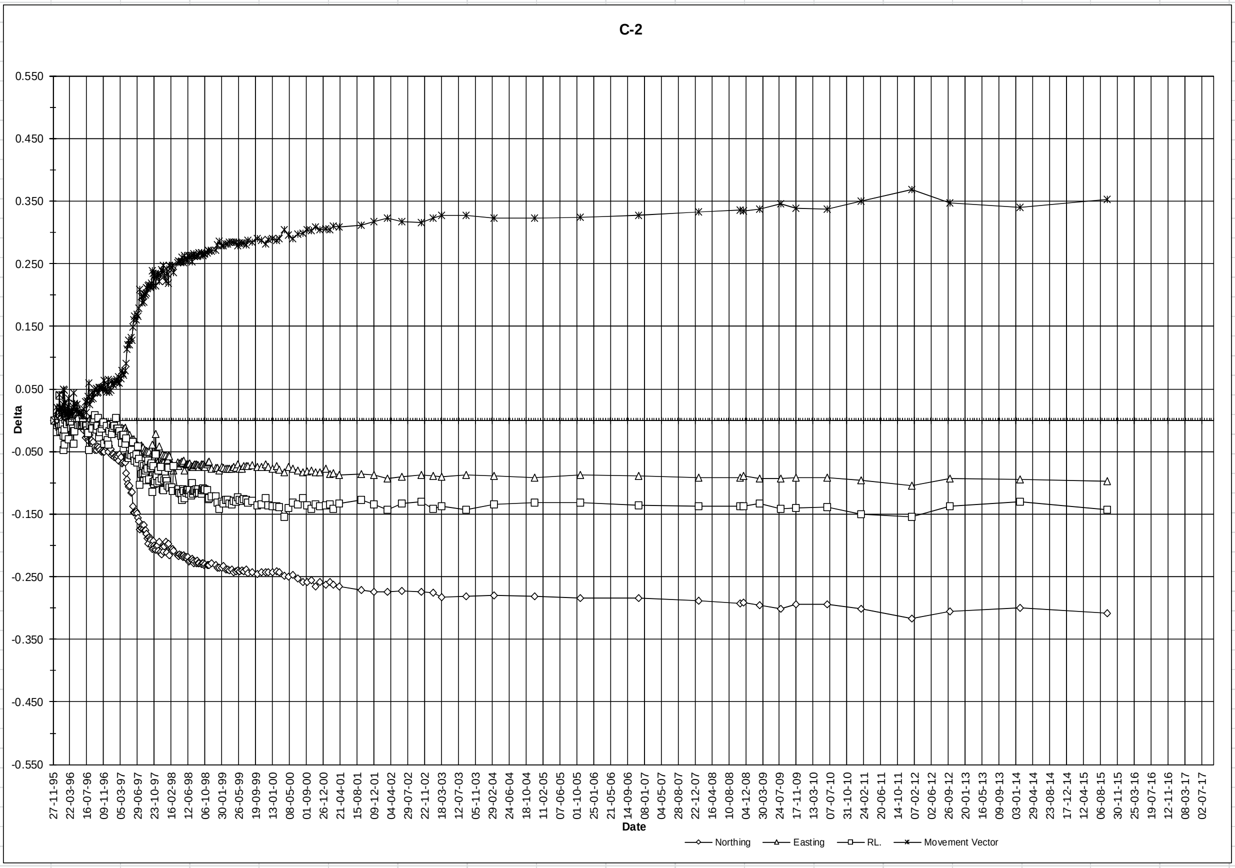
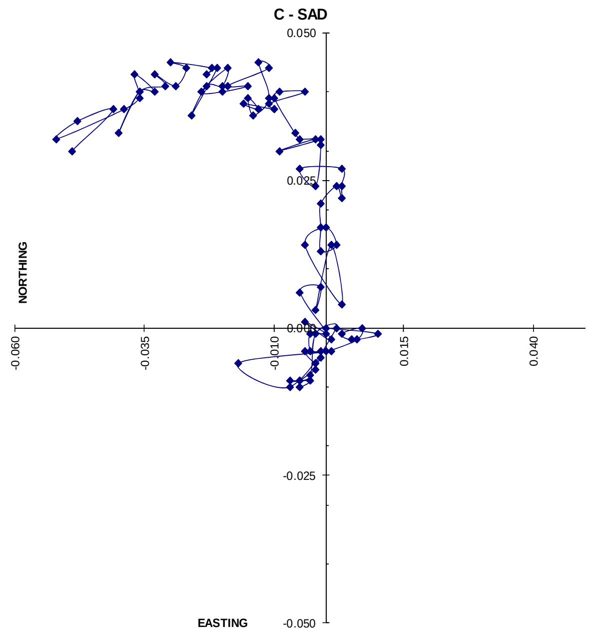
2014 and 2015 Landslide Monitoring Results





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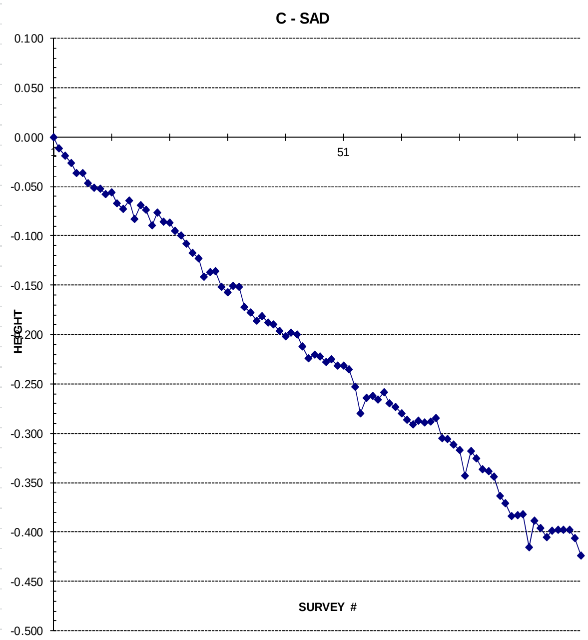
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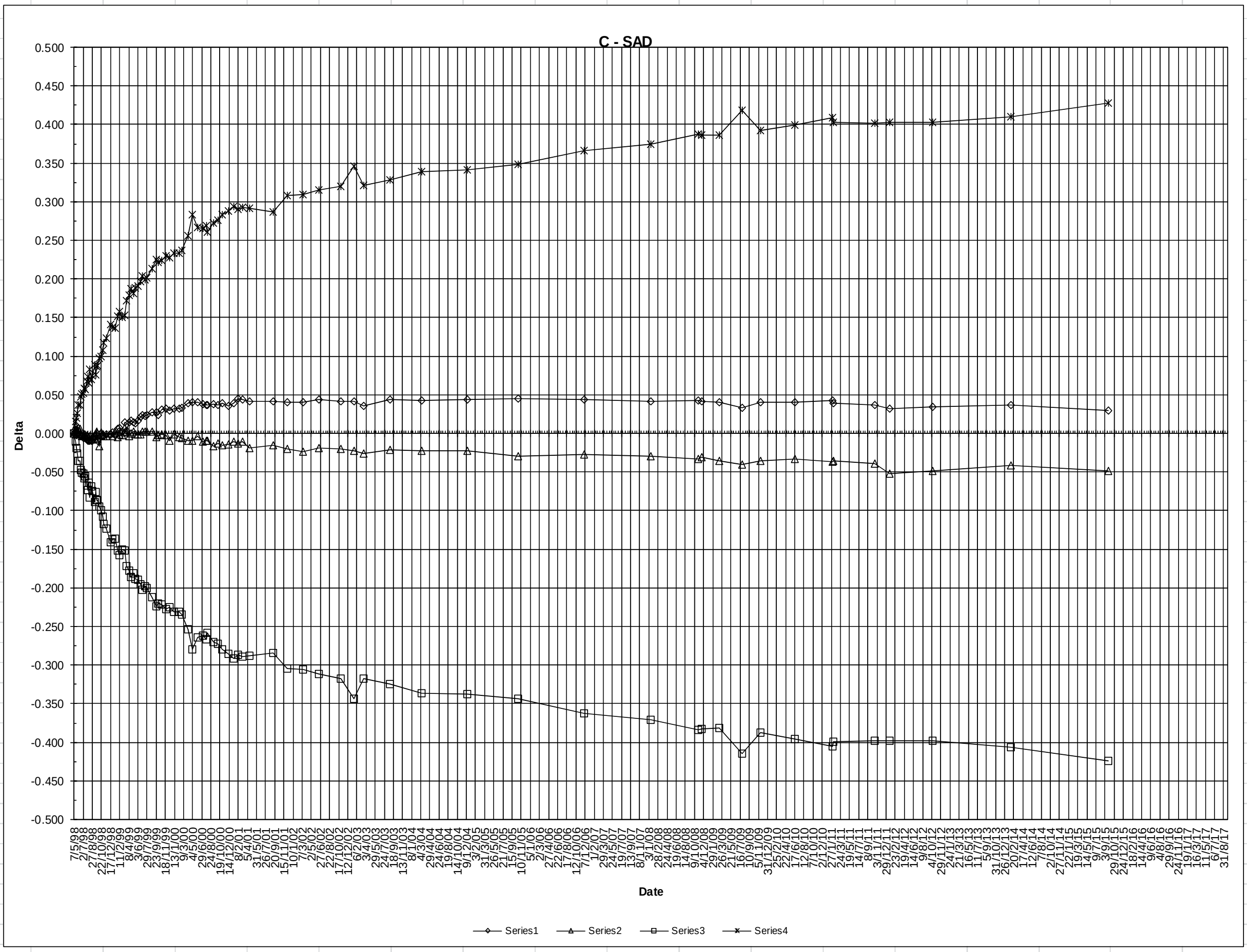
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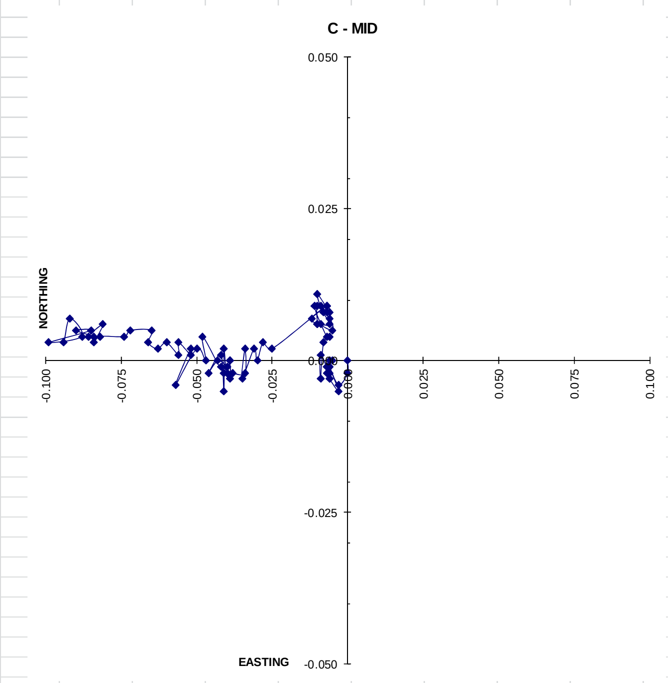
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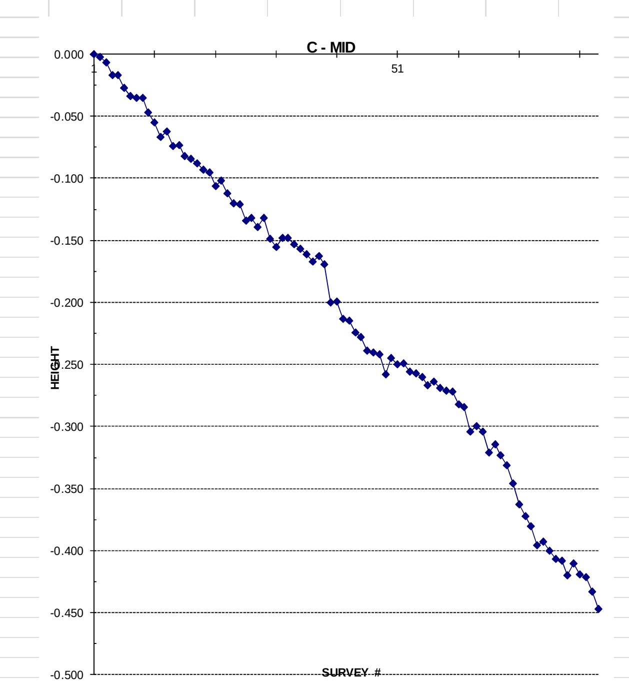
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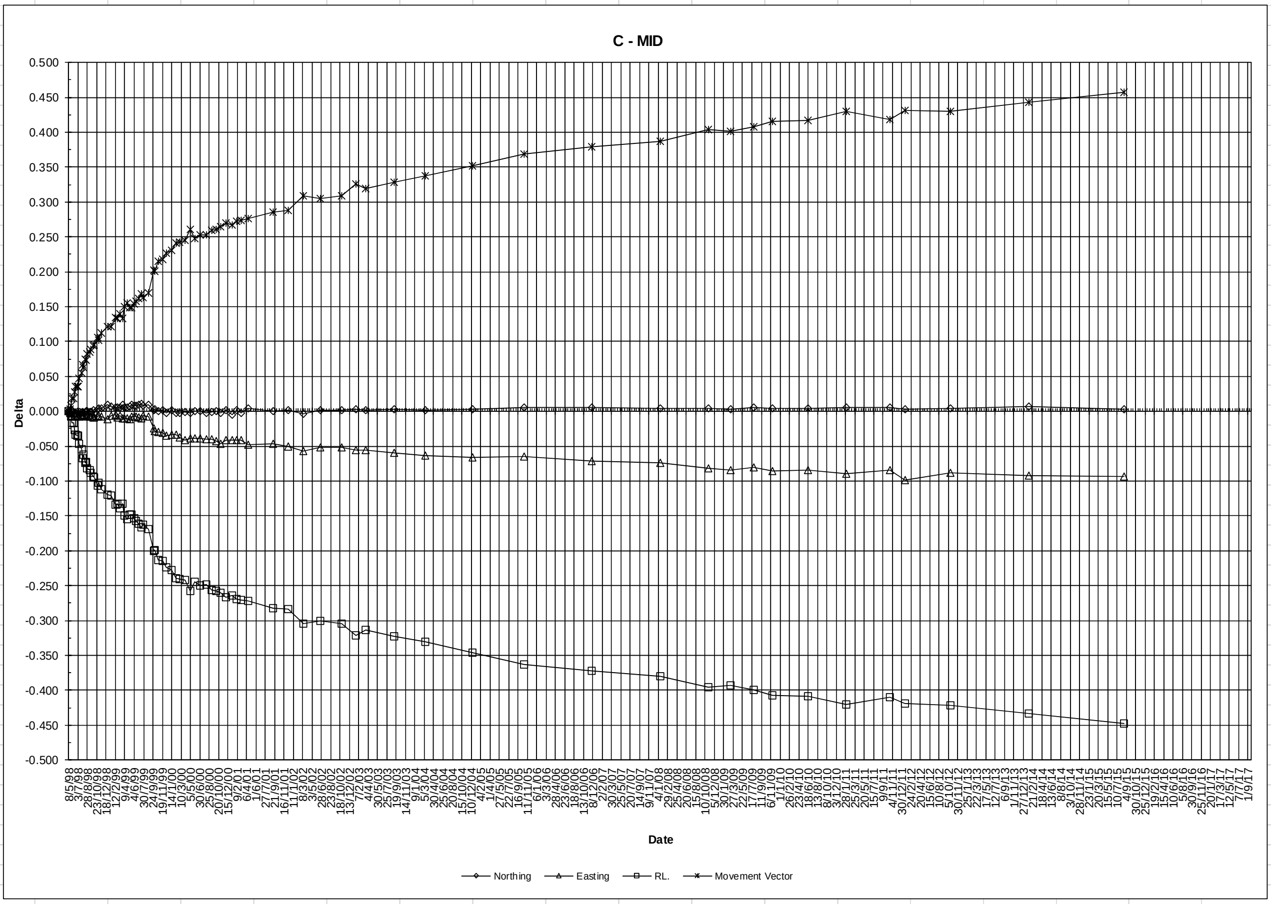
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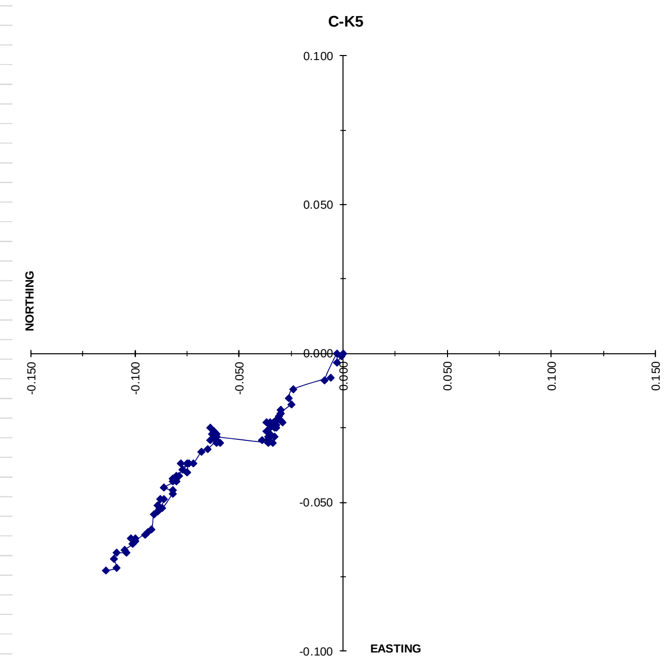
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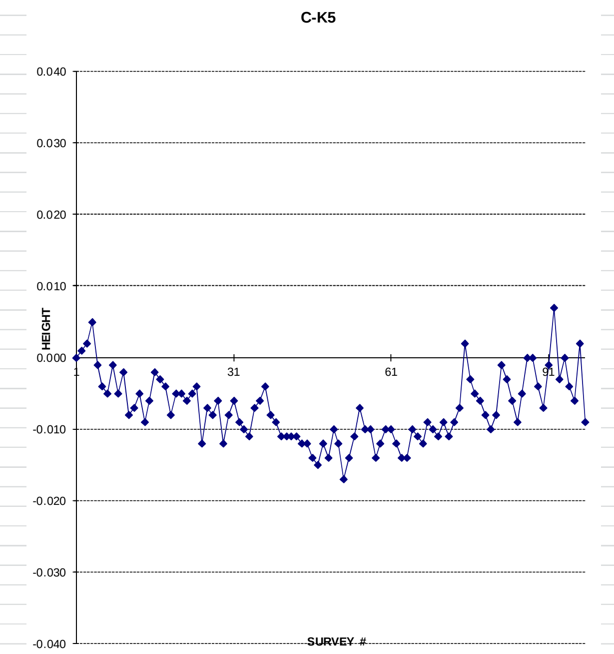
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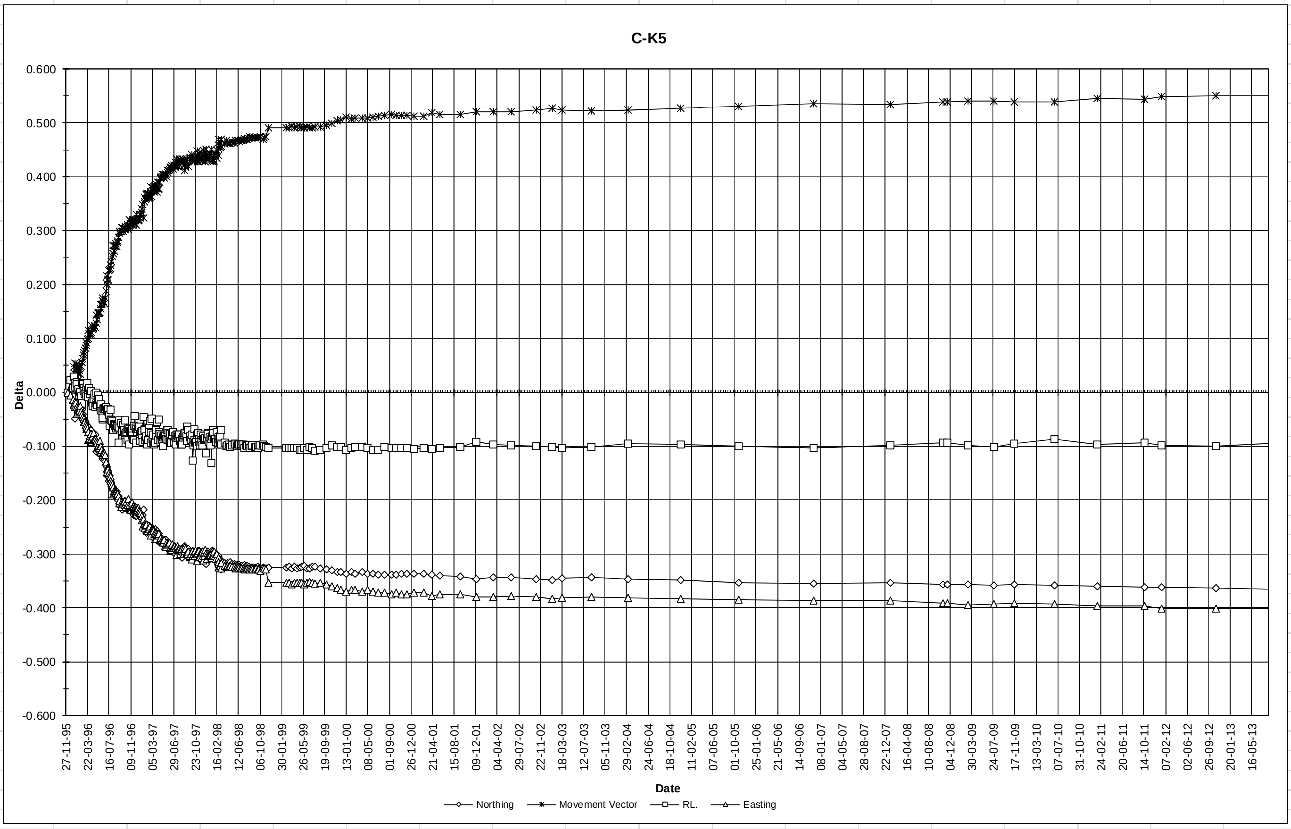
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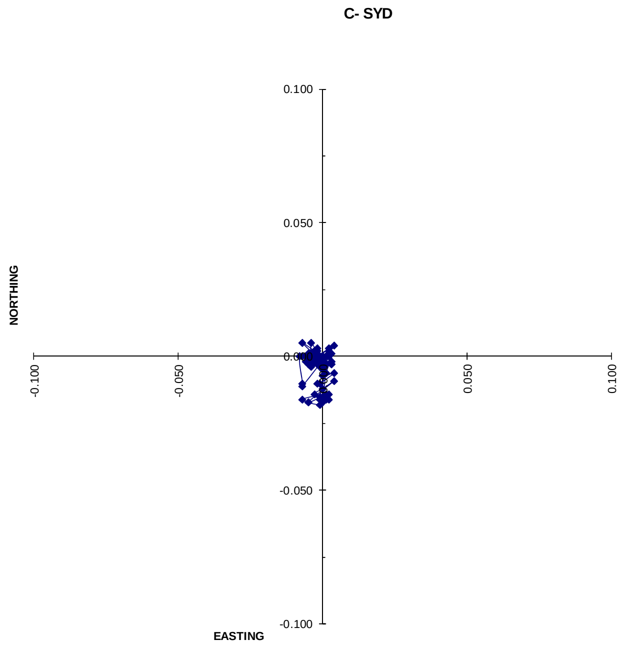
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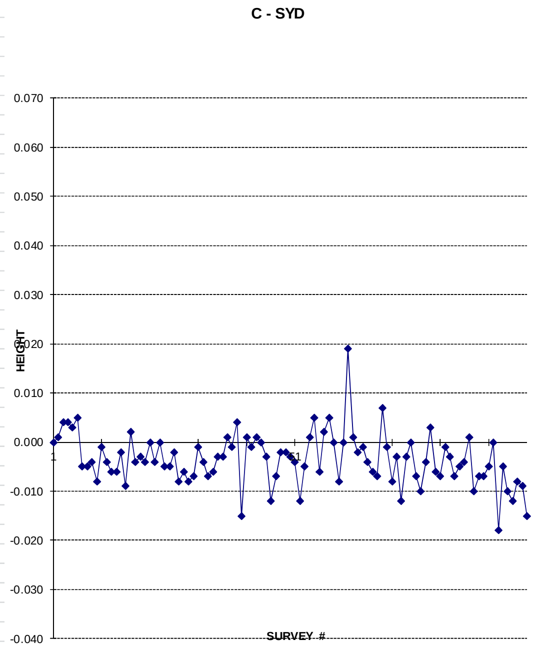
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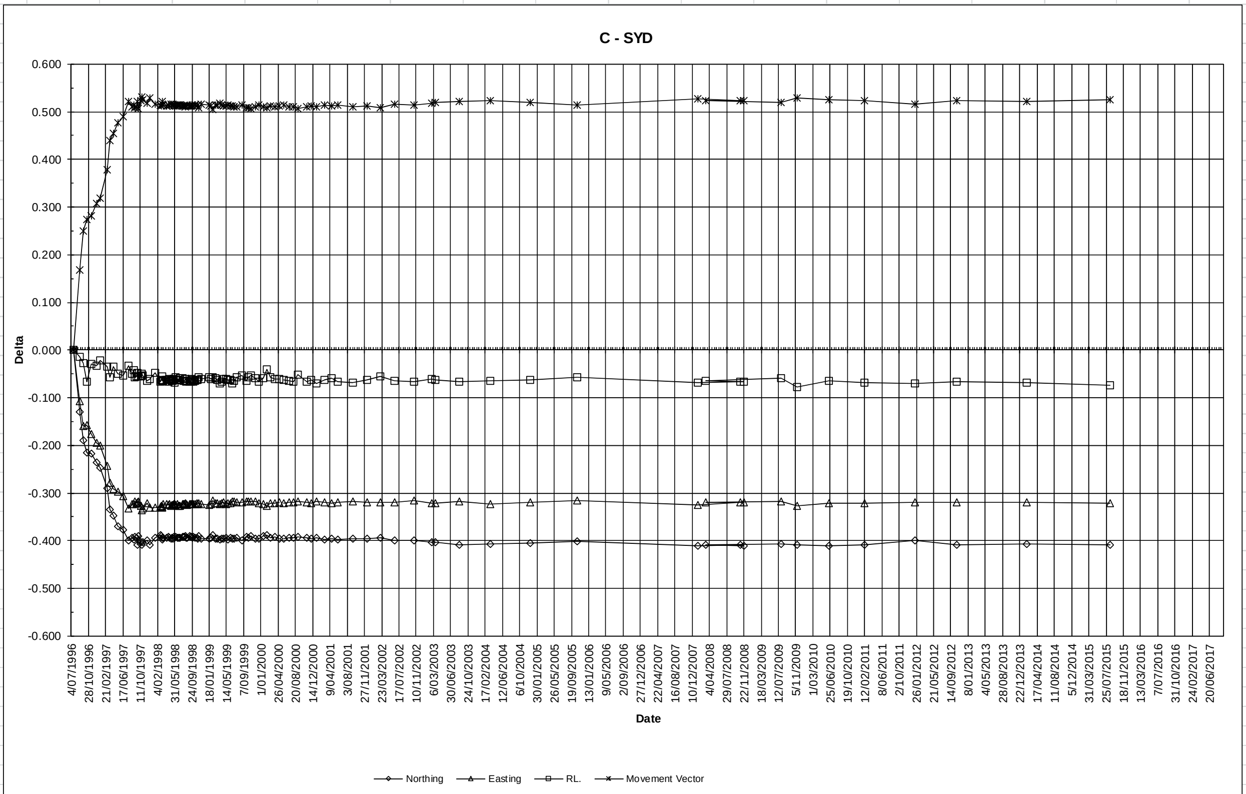
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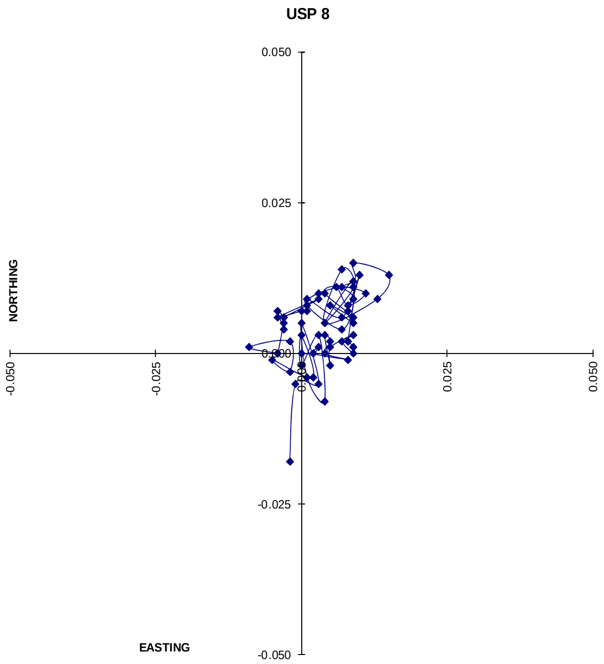
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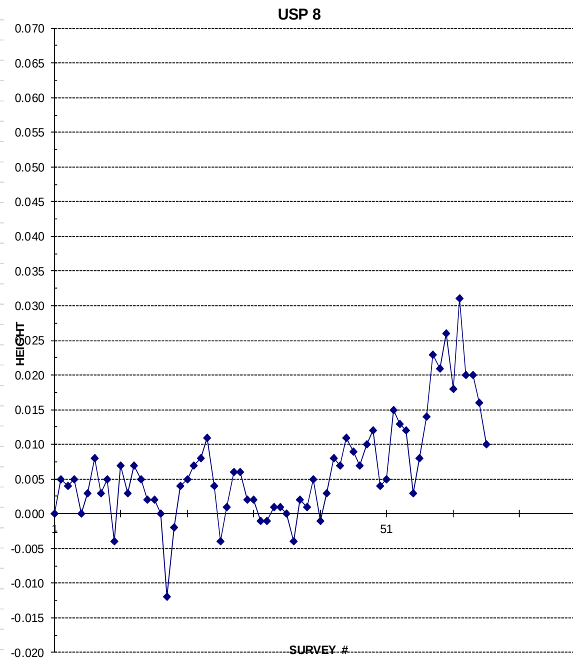
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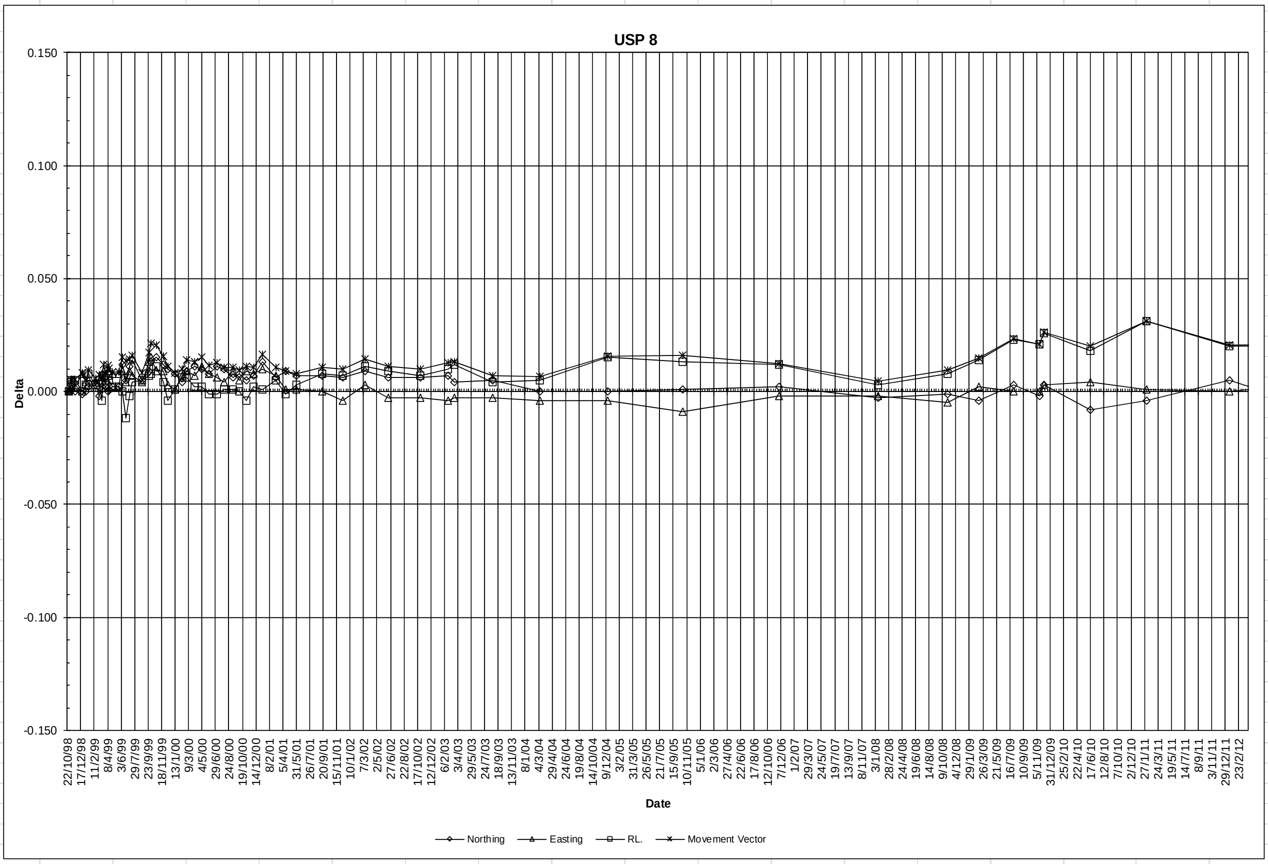
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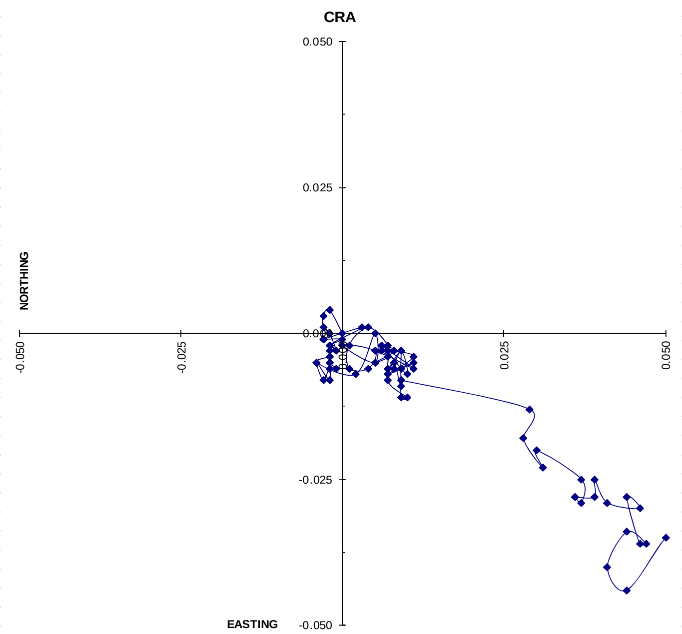
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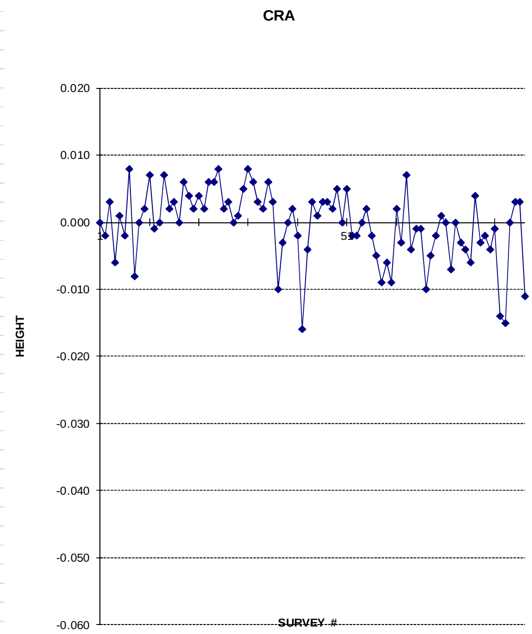
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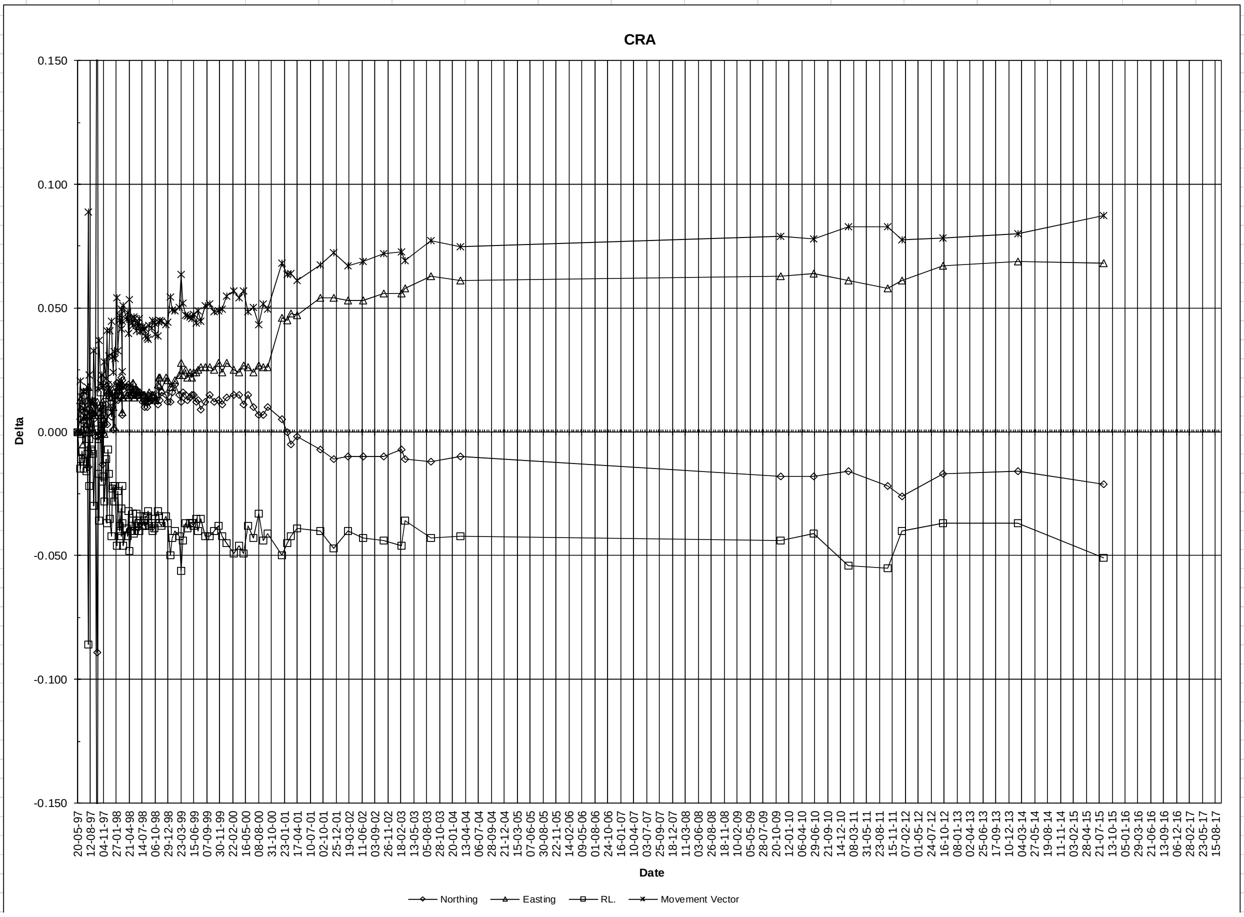
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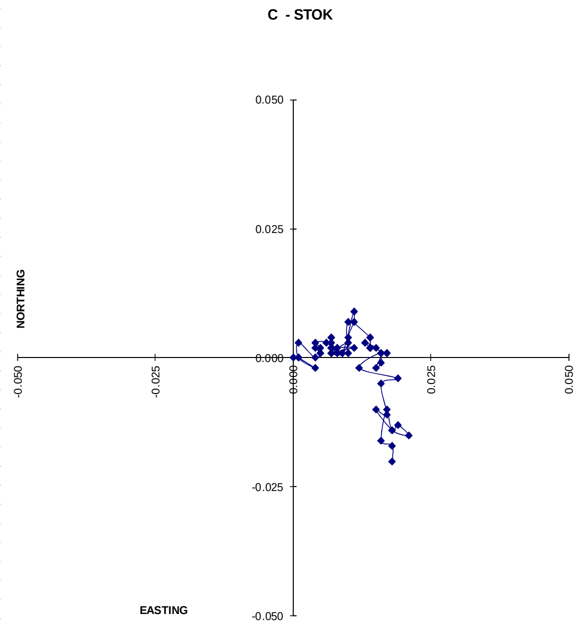
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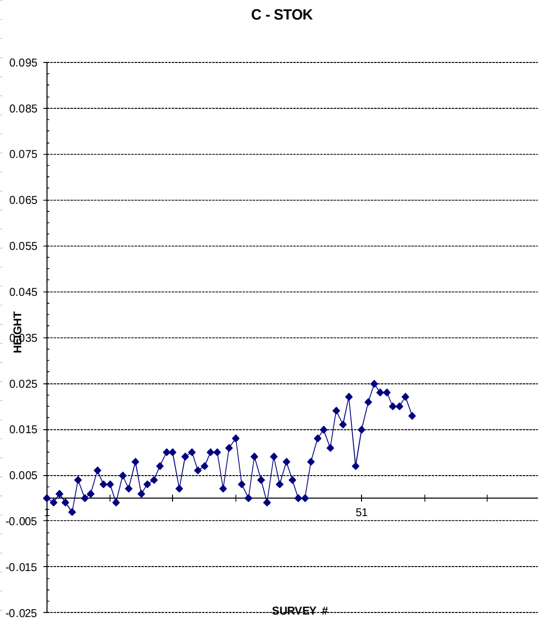
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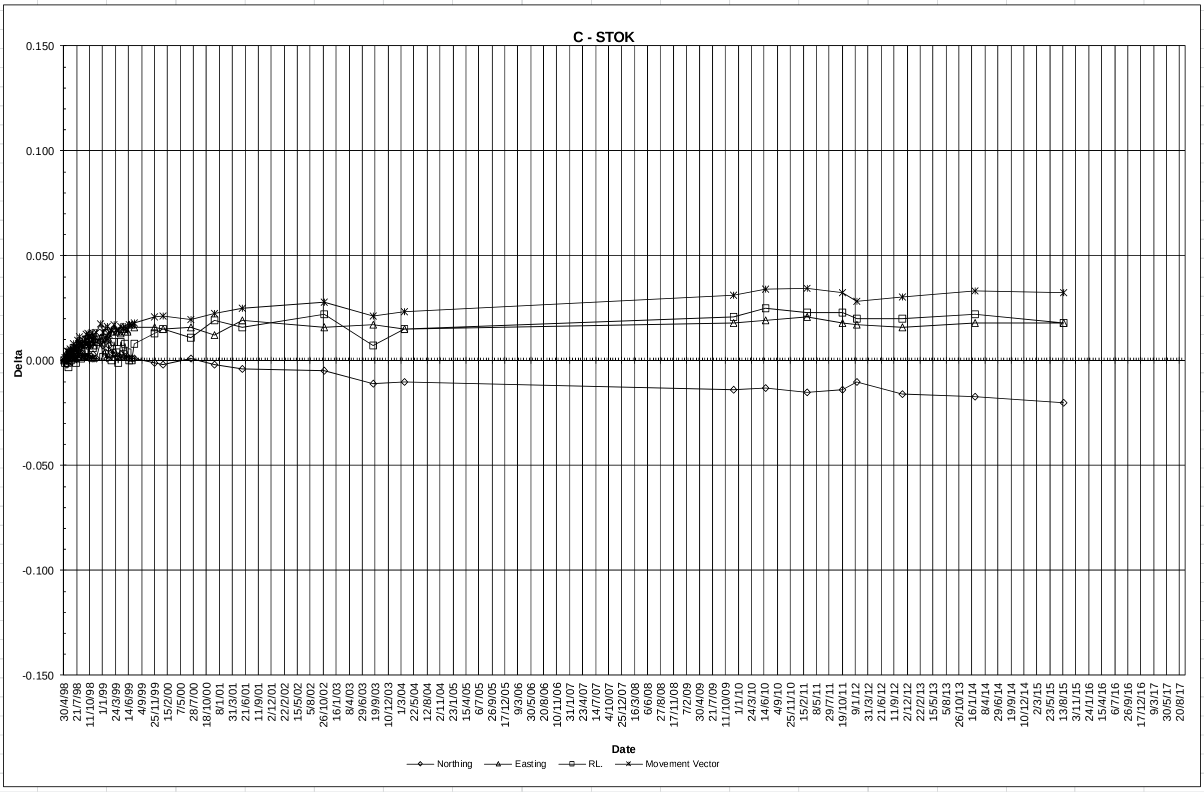
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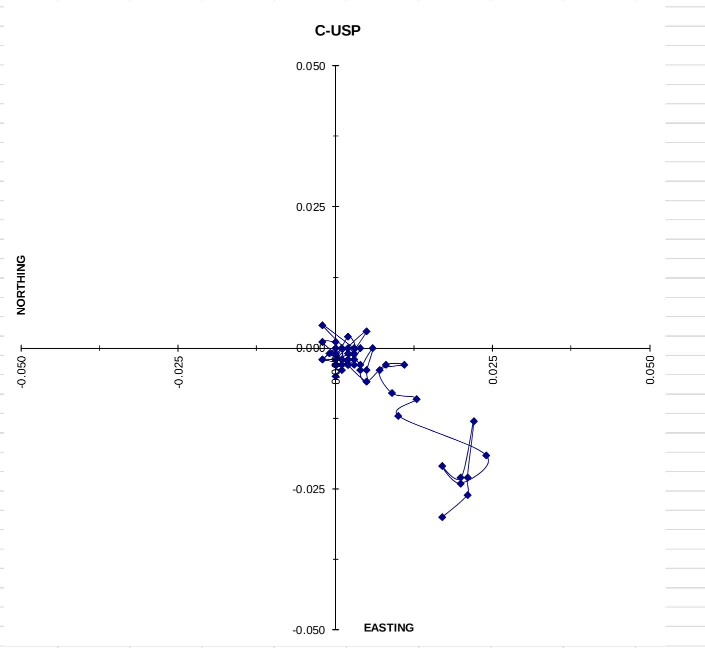
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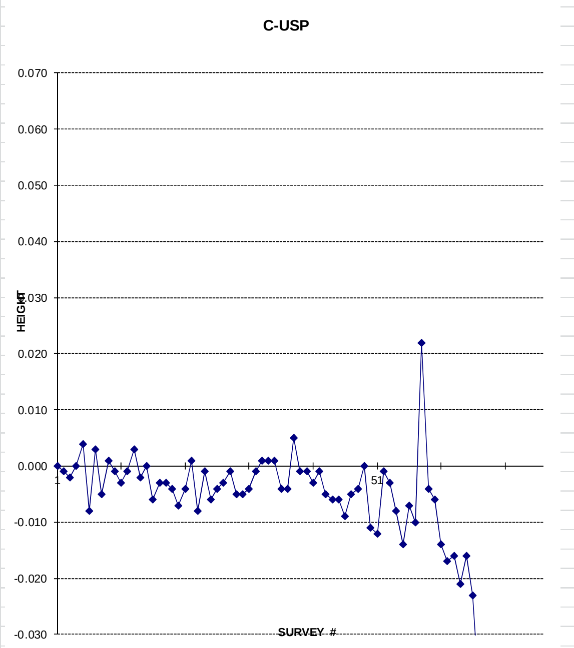
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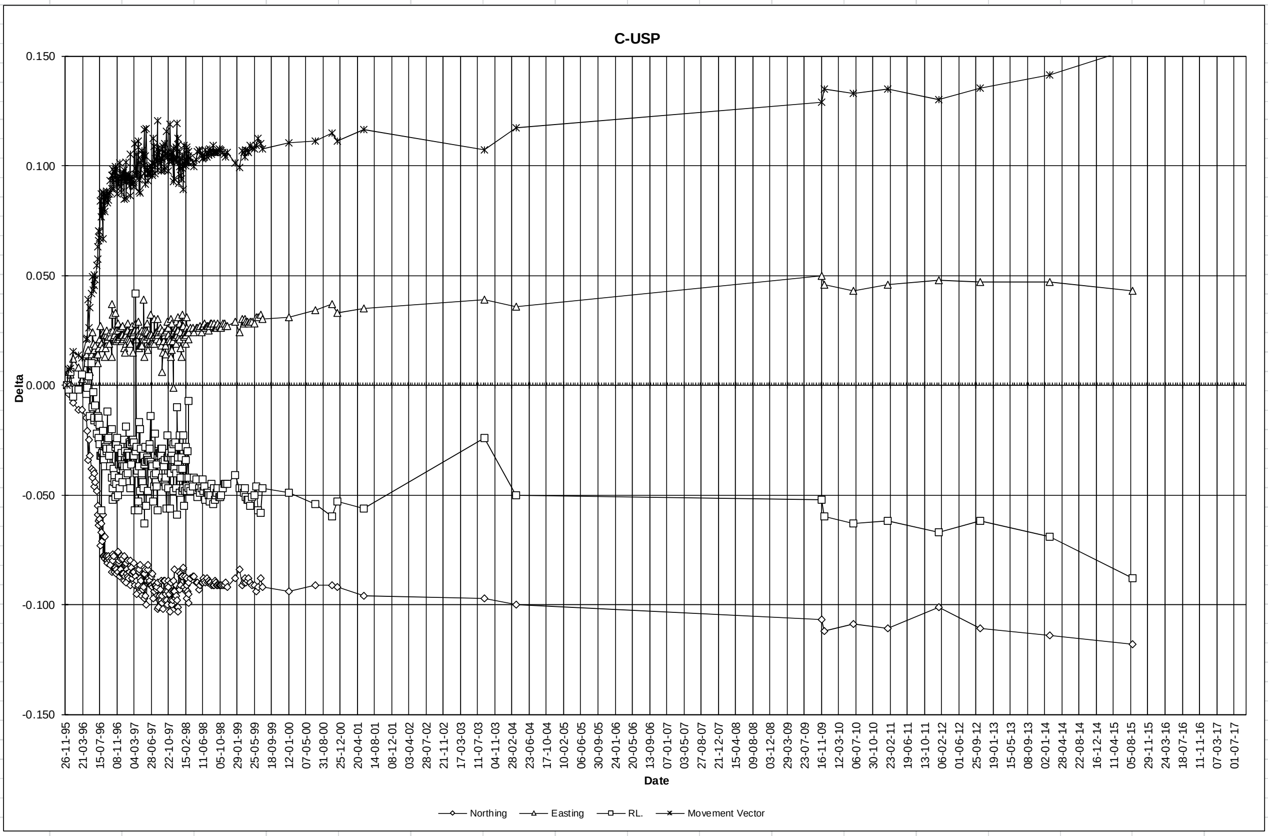
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APPENDIX B WATER CHEMISTRY

Introduction

The risk assessment has been developed to provide probabilities for the following scenarios:-

1. The probability that water treatment is required beyond the current consent term 20 years (2035). The 20 years consent terms is also the timeframe beyond which full refurbishment of the water treatment plant would likely be required.

2. The probability that water treatment is required in perpetuity (>100 year for risk assessment purposes).

In addition, an approximation of the timeline to achieve water quality compliance with the current consent criteria is provided.

The water quality parameters manganese, iron and sulphate have been considered in determining these probabilities on the following basis:-

- Iron and manganese have specific compliance criteria that must be achieved.
- Sulphate is an indicator of rate of trace element release from sulphide oxidation.

Water Treatment in 20 Years

In the URS 2008 assessment the data trend was based on mean yearly data. This approach provided for the high variability in early results.

The least squares method was used to evaluate to fit curves to the water quality trends and the goodness of fit (R squared value) was used to select the regression curve for extrapolation of the data.

The following table shows the trends regression curves selected based on the highest R squared value.

Parameter	Mean All data	UCL Annualised data	UTL Annualised data
Manganese	Power (moderate)	Exponential (moderate)	Exponential (poor)
Iron	Exponential (poor)	Power (strong)[1]	Power (moderate)[1]
Sulphate	Power (poor)	Linear (strong)	Linear (poor)
Hardness	Power (poor)	Not Applicable	Not Applicable

Note: Strong = R^2 >=0.9, Moderate = R^2 >=0.7 & <0.9, Poor = R^2 <0.7
[1] Data from 2008 analysed as two yearly blocks.

The variability around the mean data was allowed for by calculating upper confidence limits (UCL95) on the mean and standard deviations for each year of data. The 2003 data, was removed as it only covers one month of the year. Trend analysis of these yearly values and extrapolation shows a poorer correlation for the current data set (2004 to 2015) than when assessed in 2008. This is mainly due to the greater variability in the 2011, 2012 and 2015 data as shown by the higher standard deviations for these years.

This assessment is based on forecast water quality being in compliance 95% (UTL) of the time (with a 95% confidence) with the following criteria:-

- Manganese criteria are hardness dependent up to a maximum concentration of 2.5 mg/l which has a corresponding hardness of approximately 200 mg/l. Extrapolation of the hardness data suggests that the average hardness would be above 400 mg/l (allowing for dilution) until after 2035. The compliance limit of 2.5 mg/l for manganese is therefore used.

- Iron of less than 2 mg/l.
- Sulphate of less than 200 mg/l.

The compliance limits for the site are instream after reasonable mixing. In addition the limits apply for the total site with treated mine-water making up a component of the water at the compliance point. For the purposes of this assessment a dilution of 50% of treated mine-water has been adopted based on previous assessments (Golders 2008).

While the analysis suggests a general decrease in the standard deviation over the first 7 years of monitoring (2004 to 2010), the standard deviation in the 2011 and 2012 data is considerably greater increasing the UTL values derived for these years. This significantly increases the timeframe required for water quality to meet compliance criteria without treatment compared to the 2008 assessment.

Notably the iron has shown no variance for the 2014 data (3 results are the same value) and a higher UTL value for iron in the 2015 data due to higher variability. This is a limitation of the sample size for this statistical method. To enable a meaningful regression curve to be fitted to this data it is necessary to analyse post 2008 data as two yearly data blocks to increase the sample size.

The following table summarises the forecast of water quality compliance and probabilities.

	Concentration @ PW26 ($g.m^{-3}$)	Mean Meets Compliance Limit	Mean Upper Confidence Limit (UCL)[1] 95%tile meets Compliance Limit	Upper Tolerance Limit (UTL)[2] 95%tile meets Compliance Limit	Probability of Water Quality Not Complying in 2035	Probability of Water Quality Not Complying in 2115
Manganese - in stream	5	2018[3]	2022[3]	2031[3]	<0.01[3]	<0.01
Manganese - @ discharge (no dilution)	2.5	2025[3]	2030[3]	2041[3]	<0.01[3]	<0.01
Iron in stream	4	2037	2051	2076	0.52	0.01
Iron - @ discharge (no dilution)	2	2076	2109	2150	0.73	0.29
Sulphate in stream	400	2023	2024	2026	<0.01	<0.01
Sulphate @ discharge (no dilution)	200	2028	2029	2029	<0.01	<0.01

Note: 1 UCL is the concentration that the mean of the data will be below with 95% confidence
2 UTL is the concentration that 95% of the data set will be below with 95% confidence
3 Mn meets criteria for hardness above 200mg/l

Water Treatment in Perpetuity

The probability that water treatment from the underground working could be required in perpetuity is evaluated qualitatively as “rare” and assigned an annual probability of 10^{-3}. The accepted baseline, pre modern mining, is a background level influenced by historic mining. This background level was present approximately 100 years post the historic mining. Looking at examples internationally there are instances where historic mine discharges have had adverse changes in water quality that has required water treatment. As such this possibility cannot reasonably be considered “inconceivable” and an event tree has been prepared.

Conceptual Model of the Underground Mine

The underground mine has a series of interconnected open voids from modern mining which intercept older workings.   For the current water level condition in PW26 there will be a zone of mineralised potentially acid generating andesite exposed in the tunnels above the water level that will condition to oxidised and release ARD products. While the tunnels remain stable this rate of ARD will decrease gradually as the materials oxidise and weather.

When areas of tunnel collapse occur and expose fresher less weathered sulphide material, rates of oxidation will increase briefly while these fresher materials weather. This would potentially explain the fluctuations that were observed and in 2011 and 2012 and this could be associated with the sinkhole that surfaced within the open pit in 2013. The potential fluctuations in water quality that could result from these events in the future are therefore conservatively provided for by the current predictions of water quality improvement assuming the current operating conditions are maintained.

For the above predictions to remain valid the reinstatement of areas of collapse would be necessary to ensure that significant changes in underground mine water level do not occur as a result of surface water runoff entering the mine. Increased water flow through underground mine collapses is expected to result in deteriorating water quality at PW26 as an increased mass load of ARD products are mobilised.

APPENDIX C SINK HOLE EVALUATION

Tonkin & Taylor, 2013. Golden Cross Sinkhole. Formal Interpretative Report V 2. Prepared for Coeur d'Alene Mines Corporation.

Tonkin & Taylor, 2015. Golden Cross Sinkhole January 2015 Status Report. Letter report dated 23 February 2015. Ref 29251.1304.

GHD Limited 2015. Coeur Golden Cross Mine Sinkhole Subsidence Assessment. Letter Report date 23 October 2015, ref 51/33408.

REPORT

Coeur d'Alene Mines Corporation

Golden Cross Sink Hole
Formal Interpretative Report v2

Report prepared for:

COEUR D'ALENE MINES CORPORATION

Report prepared by:

Tonkin & Taylor Ltd

Distribution:

COEUR D'ALENE MINES CORPORATION	2 copies
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October 2013

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Table of contents

Executive summary i

1 Introduction 1
- 1.1 Background to the Subsidence 1
- 1.2 Previous Reporting 1
- 1.3 Objectives and Scope of Works 1

2 Geology, Geomorphology and Mining 2
- 2.1 Geological setting 2
- 2.2 Groundwater 2
- 2.3 Mining Activity 2
  - 2.3.1 Historical Operations 2
  - 2.3.2 Recent Operations 2
- 2.4 Open Pit 3
- 2.5 Underground Workings 3
  - 2.5.1 General 3
  - 2.5.2 Historical Mining 3
  - 2.5.3 Recent Mining 3
- 2.6 Mine Grid Coordinates 4

3 2013 Sink Hole 5
- 3.1 Initial surface collapse description 5
- 3.2 Site Observations 5
  - 3.2.1 14 June 2013 5
  - 3.2.2 20 June 2013 5
  - 3.2.3 26 July 2013 6
- 3.3 Surface Monitoring 7

4 Sink Hole Mechanism 8
- 4.1 Introduction 8
  - 4.1.1 Shallow Ground Conditions 8
  - 4.1.2 Faulting 8
- 4.2 Bulking Factor 10
- 4.3 Water infiltration 10
- 4.4 Unfilled underground Workings Extent 10
- 4.5 Collapse Mechanism Interpretation 11
  - 4.5.1 Collapse into underground workings 11
  - 4.5.2 Fill collapse 12
- 4.6 Sink Hole Extent 13

5 Public Safety 14

6 Consent Compliance 15

7 Risk Assessment 16
- 7.1 Introduction 16
- 7.2 Waihi town Failures 16
- 7.3 Previous Subsidence Risk Assessment at Golden Cross 16
  - 7.3.1 Introduction 16
  - 7.3.2 Caving potential 16
  - 7.3.3 Capping failure 17
- 7.4 Risk Assessment 18

7.4.1 Surface Footprint Risk 18
7.4.2 Other Faults 20
7.4.3 Revised Risk Assessment for Caving Potential 20
7.5 Open Pit fill instability 22
8 Remedial Options/Monitoring 22
8.1 Introduction 22
8.2 Initial works 23
8.3 Observation / Monitoring 23
8.4 Backfill sink hole 23
8.5 Fill Stopes 23
8.6 Ongoing monitoring 24
9 Conclusions 25
10 Applicability 26
11 References 27

Appendix A: Sink Hole Figures

Appendix B: Probabilistic Likelihood Assessment

Probabilistic Likelihood Assessment

Appendix C: Subsidence Risk Footprint

Executive summary

Introduction:
A sub-vertical sided surface collapse occurred on the eastern side of the rehabilitated open pit on 12 June 2013. The surface collapse has since been named the Golden Cross sink hole. The sink hole was initially 20m in diameter and appears to have stabilised at approximately 27m in diameter. Public access to Golden Cross Mine site has been closed and a 2m high fence was erected around the sink hole.

Tonkin & Taylor (T&T) was engaged by the Golden Cross Joint Venture (JV), 80% Coeur d'Alene Mines Corporation (Coeur) and 20% Viking Mining Ltd (Viking) to assess the most likely collapse mechanism, undertake a risk assessment and provide remedial options.

Sink hole mechanism:
T&T first inspected the sink hole on 14 June 2013 and it appeared that the collapse was a result of a NNE to SSW striking structurally controlled geological feature which created a sub-vertical walled collapse shaft into what appears to be an unfilled stope at approximately RL 300m. The collapse shaft was interpreted to lie between the footwall and hanging wall of a steeply easterly dipping faulted zone in the rock mass which intersected the ground surface on the sloping eastern side of the open pit. Accordingly, the angle of draw (10 to 30 degrees to the vertical) to the west of the underground workings is structurally controlled.

Stuart Rabone, in a geological interpretation report (1993) on the underground workings, describes the Pillar, Beefeater and Calliope faults as splinters of an NNE to SSW trending east dipping fault zone. Rabone was confident that they could be projected up-dip, sub parallel with the strike and dip of the sheared carbonaceous horizons within the conspicuous Tuff Marker Horizon to their surface exposure in the eastern wall of the open pit. The main fault zone, probably the Beefeater Fault appears to preferentially follow these carbonaceous zones of bedding plane shears where the zone is 7m wide at the base of the sink hole which is approximately 10m below the open pit surface.

The carbonaceous zone associated with the Beefeater Fault, or a splay of the Beefeater Fault, were mapped by Rabone as being close to the recent upper unfilled underground workings (stopes) along the Empire Vein based on a 1996 Minesight model of the underground workings supplied by the JV. Therefore, we consider it likely the carbonaceous zone within the tuff marker horizon has collapsed in a rectangular prism-like shape into the unfilled stopes with the collapse void migrating within the weak carbonaceous beds to the surface (approximately 80m above the unfilled stopes).

T&T undertook two subsequent inspections on 20 June 2013 and 26 July 2013 to monitor the stability of the sink hole and it was considered partially stabilised in late June 2013 and fully stabilised by late July 2013. This judgement was made because water was ponding in the base of the sink hole on 20 June 2013 and upslope regression of the sink hole appeared to have effectively stopped in July 2013.

Risk assessment:

The intersection length of the faulted zone and upper unfilled workings is estimated to be approximately 200m and based on an angle of draw to the west of the underground workings of 10 to 30 degrees, a 50m width perpendicular to the upper unfilled workings is considered at risk. Accordingly, the surface subsidence risk footprint has been assessed as 200m long by 50m wide.

URS Corporation (URS) carried out a residual risk assessment as part of the Golden Cross post closure assessments in 2004 and 2011. The previously identified residual risks considered relevant to the sink hole were caving (or surface subsidence) and capping failure and have been reviewed in accordance with URS risk assessment methodology. URS assessed the qualitative risk of capping failure was moderate and the qualitative risk for caving failure was not included as the qualitative likelihood was considered unlikely to occur.

In accordance with URS risk assessment methodology, a quantitative risk assessment is required to better assess the caving risk for a 100 year valuation period. The quantitative likelihood is considered 1 event in 20 years and therefore five events could be expected during the 100 year valuation period.

The quantitative financial consequence per event is estimated to be in the order of NZD$200,000 (with typical September 2013 rates) based on backfilling a sink hole with similar quantities to the one that has occurred, including design costs. This gives a financial consequence for a 100 year valuation period of NZD$1,000,000, or a net present value (NPV) of approximately NZD$200,000 based on 3.4% real discount rate.

A probabilistic likelihood assessment has been undertaken to assess the quantitative likelihood of serious injury/loss of life as a result of a future subsidence caused at the Golden Cross site indicates serious injury/loss of life could occur once in approximately 500,000 years which is significantly less than normally tolerated levels. As the valuation period previously used by URS was only 100 years and the calculated likelihood is significantly lower than a number of tolerable limits for loss of life, a quantitative financial consequence assessment has not been undertaken.

The sink hole has exposed approximately 0.16 ha of PAG and future sink holes are likely to be similar. This is significantly less than the 1.0 ha area of Potentially Acid Generating Rock (PAG) that URS estimated would be needed to exceed water quality criteria. Therefore the qualitative risk assessment for capping failure does not need to be revised. This assessment is further confirmed by recent measurements which indicate there has been no change to water chemistry since the sink hole occurred.

Sink hole remediation:
Remedial options, such as observation/monitoring, backfilling the sink hole and filling the stopes to repair the sink hole and allow public access to be reinstated have been considered.

Observation and monitoring the sink hole could comprise leaving the sink hole open inside the fenced zone with regular monitoring undertaken by JV staff. An engineer inspection could also be undertaken as part of the annual Golden Cross Landslide inspections.

Backfilling the hole would comprise benching the steep edges of the sink hole and carefully and progressively pushing pit fill and placing imported fill into the sink hole until it is at the same level as the surrounding open pit surface.

Filling the stopes comprises pumping a sand slurry fill from boreholes on the open pit surface into the unfilled stopes to reduce the future risk of stope collapse. The existing sink hole would then need to be backfilled. This option is considered expensive and impractical and is therefore not recommended.

Surface water from above the feature and from a small mid-slope open pit channel is able to drain into the sink hole at the present time. Remedial works to divert surface water from entering the sink hole and the subsidence risk footprint should also be undertaken as soon as possible irrespective of the selected remedial option.

1 Introduction

1.1 Background to the Subsidence

The Golden Cross Mine is located in the Hauraki District at the northern end of Golden Cross Road approximately 8km NW of Waihi. The Mine is currently owned by the Golden Cross Joint Venture (JV), 80% Coeur d'Alene Mines Corporation (Coeur) and 20% Viking Mining Ltd (Viking).

A sub-vertical sided surface collapse was observed on the eastern side of the rehabilitated open pit on 12 June 2013 by a helicopter pilot. The surface collapse has since been named the Golden Cross sink hole. The sink hole is approximately 25m in diameter. Public access to Golden Cross Mine site has been closed and a 2m high fence was erected approximately 20m from the sink hole. Various plans and cross sections are presented in Appendix A and a detailed discussion of the feature, history, likely mechanisms and possible remedial options is presented in the following sections.

1.2 Previous Reporting

Tonkin & Taylor Ltd (T&T) geologists visited the site on June 14 2013 to observe the sink hole and met Environment Waikato and Hauraki District Council representatives. During this visit a helicopter fly-over of the feature was undertaken and a video recording made.

1.3 Objectives and Scope of Works

Tonkin & Taylor Ltd (T&T) was engaged by the JV to assess the likely failure mechanism, undertake a risk assessment and provide remedial options. T&T have carried out the following tasks:

1. Undertaken three site inspections to locate and observe near surface ground conditions at the sink hole site;
2. Gathered information on underground mine working history;
3. Assessed the most likely collapse mechanism;
4. Undertaken a review of the relevant risks included in a previous risk assessment completed as part of the Golden Cross Mine Post Closure report;
5. Considered possible remedial options;
6. Prepared this interpretative report.

2 Geology, Geomorphology and Mining

2.1 Geological setting

The site is located within a NNW trending belt of predominantly Miocene to Pliocene age andesitic and rhyolitic volcanics deposited 4 to 11 million years ago which form much of the Coromandel Ranges. At Golden Cross, three main geological formations are present. These are the Coromandel Group, Union Volcanics (Whitianga Group) and Omahia Andesite (Ref 1).

In more detail Rabone (Ref. 9) describes the open pit geology as a sequence of andesitic/rhyolitic volcanics that appear crudely conformable and are steeply tilted east or southeast. The lower part of the sequence in the far west comprises massive to coarsely autobrecciated andesite lava. Overlying this and exposed along the western edge of the open pit is an andesitic pyroclastic unit (Monroe Tuff) which has a steep easterly dip. This tuff is overlain to the east by a relatively massive uniform fine grained porphyritic andesitic lava flow (Empire Flow) which cropped out in the central part of the open pit. Overlying the Empire Flow and exposed in the east wall of the open pit is a thick epiclastic tuff sequence (Tuff Marker Horizon; TMH1). This unit includes a distinctive carbonaceous to silty crystal-lithic tuff about 10m above the base of the unit. The carbonaceous horizon varies from less than 30cm up to 2m thick and strikes north to northeast, dips east at 45° to 60° and can be traced down dip to its intersection with the hanging wall of the Empire Lode in the underground section of the mine. Correlation of this unit with the underground workings and drill holes indicates a strike extent of over 1000m and a consistent steep easterly dip to about RL250m along the strike of the Empire Lode.

Rabone describes the Tuff Marker Horizon as being significantly affected by faulting with the carbonaceous unit, in particular being strongly sheared sub parallel to bedding in the open pit. This faulting trends NNE to SSW and dips east at 60° in the open pit and correlates with the Pillar, Beefeater, and Calliope faults underground.

2.2 Groundwater

The groundwater within the vicinity of the underground workings is currently maintained by pumping. The nearest operational piezometer M8 has fluctuated between RL 290m and RL 300m over the last 10 years and was recorded at RL 294.5m on 14 June 2013.

2.3 Mining Activity

2.3.1 Historical Operations

The original Golden Cross Mine was continuously mined by underground methods between 1892 and 1905 with sporadic mining until 1917. These workings were located south of and within the open pit with the closest of these underground workings being approximately 60m from the sink hole location.

The Golden Cross site and township then reverted to farmland until the early 1980s.

2.3.2 Recent Operations

Significant amounts of previously unknown gold and silver mineralisation was identified in the shallow Empire Stockwork zone and deeper Empire Vein in the early 1980s. Subsequently a mining licence was applied for and granted in April 1990.

The recent mining operations were undertaken from 1991 to 1998. These comprised a 100m deep and 500m by 350m wide open pit excavation (shallow Empire Stockwork zone) at the west of the property with underground mine workings (Empire Vein) beneath the eastern side of the open pit.

The mining operations ceased in December 1997 (processing of the ore was completed in June 1998).

2.4 Open Pit

Rehabilitation of the open pit commenced in 1998 following closure of the mine and open pit was backfilled. This comprised placement of compacted bulk fill in the base and on the sides of the open pit with a 1.75m thick layer of zoned fill as a rehabilitation capping. The filled pit was grassed and is currently used for grazing stock.

2.5 Underground Workings

2.5.1 General

A plan (Figure 3) and cross section (Figure 5) have been prepared from the digital copy of the 1996 Vulcan Model (Ref. 6) which records the extents of the recent underground workings, the proposed workings/reserves and the known extents of the old underground workings. These plans are presented in Appendix A.

2.5.2 Early Underground Mining

The original underground workings are located both south of and within the present open pit. These workings comprised mining from relatively small (1.8m by 1m) drives (Ref. 7). While some of the exploratory drives were intersected and removed by the open pit excavation, a number of drives to the south of the pit and west of the Waste Water Treatment plant are still present.

The extent of the backfilling of these old drives in unknown, but is likely to be limited. However, the size of these drives is small by comparison with the more modern underground mining, thus limiting their potential for collapse.

2.5.3 Recent Mining

The recent underground mining was undertaken below the eastern side of the open pit and along the Empire vein (approximately within a corridor between the 3000mE to 3200mE Mine Grid). The ore within the Empire vein was accessed via a series of underground drives between RL 90m and RL 260m. The groundwater level was suppressed below the underground workings during operations by pumping.

The extraction of the ore included stoping of three panels along the Empire vein. The top of each panel was approximately at RL 135m, RL 245m and RL 315m respectively, refer to Figure 4 in Appendix A. The panels were backfilled with waste rock except for the top 4m of each panel, which was not backfilled. A 7 to 10m high vertical excavation was also undertaken above the top panel. It appears that this stope was not backfilled.

Additional inclined excavations to the east of each panel were undertaken using an inclined room and pillar method. This comprised excavating a zone (room) while retaining some rock pillars to support the roof during operations. When retreating from the inclined room at least 50% of each pillar was removed as they were no longer required to support the roof for mining purposes. However, the excavations were not purposely collapsed during retreat.

2.6 Mine Grid Coordinates

All survey at Golden Cross during the investigation and mining operations was to a local mine grid which was skewed to align with the NNE to SSW trending Empire Vein.

The location of the surface collapse was surveyed by GPS on 14 June 2013 and 20 June 2013 in NZMG coordinates and this was converted to mine grid coordinates using the GNS transformation (Ref. 5). All figures included in this report are shown in mine grid coordinates for consistency with the older information. Similarly, all discussion in this report is based on mine grid coordinates.

3 2013 Sink Hole

3.1 Initial surface collapse description

The sink hole was first observed on the morning of Wednesday 12 June 2013. It is likely that the sink hole developed during the night of 11 June 2013 as a helicopter operator, flying across the open pit daily throughout that week on unrelated business did not notice the hole until Wednesday morning.

The sink hole was initially described as being up to 20m in diameter and at least 20m deep, based on photographs taken from the helicopter and observations from the nearby elevated ridge to the south of the Open Pit.

3.2 Site Observations

3.2.1 14 June 2013

T&T senior engineering geologists visited the site on 14 June 2013 to inspect the sink hole from both a helicopter and the adjacent ground to observe the geology exposed in the sink hole and determine the likelihood of enlargement of the collapse area.

Study of a video made during the helicopter flight and photographs taken from the ground clearly showed that the sub-vertical walled collapse shaft (at the base of the sink hole) was a structurally controlled geological feature. The shaft had a rectangular shape which was somewhat elongated in a NNE to SSW direction and appeared to have been formed by rock mass defects dipping steeply to the east. The initial impression was that the collapse shaft lay between the footwall and hanging wall of a faulted zone in the rock mass which intersected the ground surface on the sloping eastern side of the open pit. A number of unfavourably orientated defects were noted on the eastern (upslope) side of the sink hole and further regression of the shaft upslope (to the east) was anticipated. The depth of the (visible) sink hole was measured by handheld laser from the helicopter as 20m below ground surface on the downslope side.

T&T staff installed four pegs more or less equally spaced around the sink hole as reference markers. These pegs were surveyed in using a hand held GPS and then used as reference markers to measure the dimensions of the sink hole. The location of the sink hole and a cross section through the hole are presented on Figures 1, 2 and 4 respectively in Appendix A.

While on site, a meeting was held with Hauraki District Council (HDC) and Environment Waikato (EW) representatives where preliminary interpretations of the event were discussed along with how public health and safety would be managed.

3.2.2 20 June 2013

T&T staff revisited the site with JV staff on 20 June 2013.

The following observations were made on the second inspection:

- The sink hole opening had regressed approximately 10m upslope since the initial June 14 visit.
- The material from the upslope regression was backfilling the sink hole and water was now ponding at the base of the sink hole (refer to Photograph 1). The height of the exposed face from the downslope edge of the sink hole to the surface water was now just 6m.
- The faulted zone was no longer clearly visible.
- There was approximately 6m depth of oversteepened open pit backfill below the upslope edge of the sink hole and associated concern that more of the fill might slide on the in situ

rock contact into the opening. This possibility was considered in the set out of the semi-permanent safety fence which was constructed in early July 2013.
- Minor surface cracking was present on the southern and western edges of the sink hole.

3.2.3 26 July 2013

T&T revisited the site to investigate a soft zone reported by the contractor installing the safety fence and to reassess the size of the sink hole at ground level. A summary of the observations is set out below:

1. Soft Zone:

- The soft zone reported by the fencing contractor was located at the SE corner of the fenced off area (lower right hand corner looking downslope) where the fence line crosses a shallow landslip feature and the soil mantle has slipped on the underlying mine fill. The location of this feature is shown on Figure 2 in Appendix A.
- The soft zone (landslip debris) comprises disturbed material/debris and was wet.
- The soft zone is considered unrelated to the sink hole and is similar in nature to other shallow landslip features on the sloping ground within the open pit.

2. Sink hole:

- The sink hole had regressed upslope 1.5m since the June 2013 visit. See Photograph 1 below.
- The fault zone was clearer than previous visits (due to material having been washed off the face) and the fault zone width was measured by hand held laser at 7m.
- Water was still ponded within the base of the sink hole, indicating that the top of the collapse shaft had been sealed off.
- There was shallow tension cracking within 2m of the edges of the sink hole opening indicating that that further small scale regression of the sides may be expected.
- An additional 5 monitoring pegs were installed and surveyed in by hand held GPS along the strike of the fault zone to assist with future monitoring as required.

Photograph 1: View of sink hole on 26 July 2013 from the upslope (east) side

3.3 Surface Monitoring

Photographs taken from the same location (elevated ridge to the south of the open pit) daily until early July 2013 were used to identify any macro changes to the size of the opening.

Upslope regression of the sink hole to the northeast was evident in each of the daily photographs until 18 June 2013, six days after the initial event, at which time a degree of self stabilisation appeared to have occurred.

By the end of June 2013, it was not possible to discern any macro changes to the sink hole dimensions from the photographs and therefore the frequency of the photographs was reduced to two per week in early July 2013. The 26 July 2013 visit indicated that the extent of the sink hole had effectively stabilised.

4 Sink Hole Mechanism

4.1 Introduction

The assumed ground conditions and our interpretation of the subsidence mechanism is based on three inspections of the collapse shaft, our experience at the Golden Cross site, discussions with current and previous JV staff and available underground workings and geological information. It must be appreciated that the actual ground and mining conditions may vary from the assumed model.

4.1.1 Shallow Ground Conditions

The inferred near surface ground conditions in the eastern highwall of the open pit comprise a mantle of open pit backfill (up to 6m thick) placed on the previous benched open pit surface, overlain by an approximately 1.75m thick zoned rehabilitation fill layer. A typical cross section is shown in Figure 4 in Appendix A.

4.1.2 Faulting

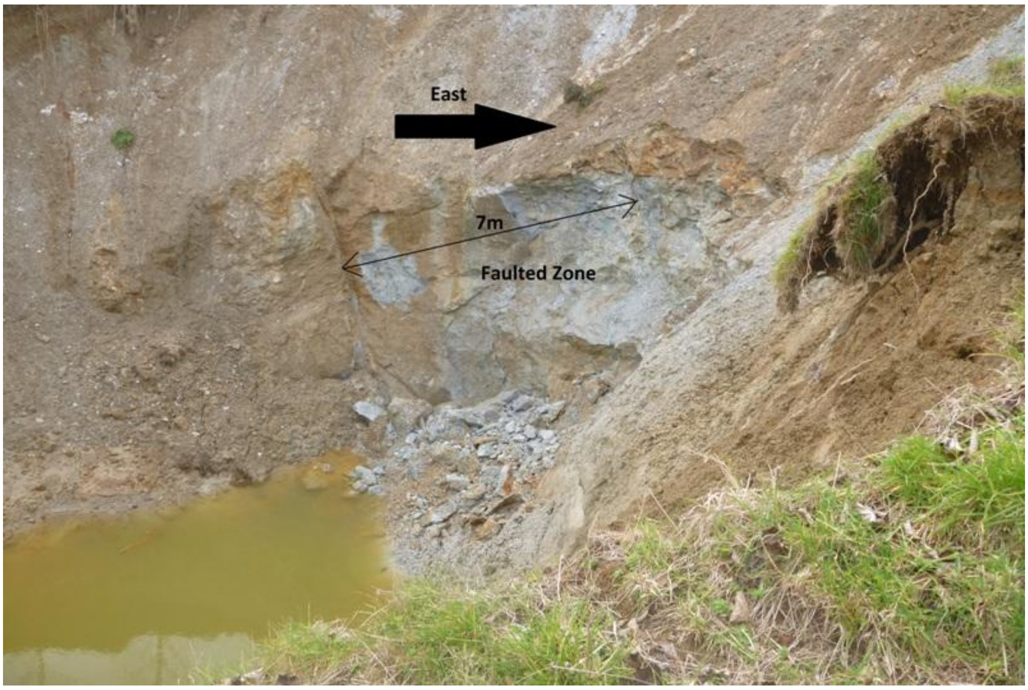
A series of NNE to SSW trending faults cross the open pit and extend down to the Empire vein. The majority of these faults (Beefeater Fault, Pillar Fault, West Mine Fault and the Western Boundary Fault) dip steeply east while the Empire Fault, associated with hydrothermally altered Coromandel Group and the Empire Vein, strikes NNE to SSW, dips steeply to the west and was extensively mined underground.

Rabone (Ref. 9), in a report on the underground workings, describes the Pillar, Beefeater and Calliope faults as splinters of an overall NNE to SSW trending east dipping fault zone. All three faults can be identified at RL 260m level in the underground workings and in the hanging wall. They can be confidently projected up-dip, subparallel with the strike and dip of the carbonaceous horizons within the Tuff Marker Horizon to their surface exposure in the eastern wall of the open pit. In the open pit the tuff unit is sheared and argillised over a broad zone, particularly in the carbonaceous bed and Rabone found it difficult to separate the faults. Rabone was clear however, that the main faulting, probably the Beefeater Fault, preferentially followed the carbonaceous seam as a zone of bedding plane shear.

Photograph 2 below shows the fault zone dipping at approximately 70 degrees to the east as observed at the 14 June 2013 inspection. The dark lines close to the fault dip in Photograph 2 are identical to those shown on Figure 5 of the Rabone underground report (Ref.9) where they are described as carbonaceous horizons within the Tuff Marker Horizon.

Photograph 2(left): A photograph taken on 14 June 2013 indicating the faulted zone (includes the dark carbonaceous horizons) within the sink hole. Photograph 3 (right): Figure 5 from Rabone 1993 underground report which also includes the dark carbonaceous horizons.

The sheared carbonaceous zone near the surface is likely to be at least 7m wide as shown in Photograph 4 below and may become wider with depth. Based on a geological cross section by Rabone (Ref. 9), the location of the highest level open stope workings on the Empire Vein and the position of the collapse, we consider that this fault is either the Beefeater Fault or a splay from the Beefeater Fault.



Photograph 4: View of the fault zone

The failure zone comprises a well-developed foot and hanging wall with an orthogonal defect set with slickensided surfaces which appear to be very weak and could be coated with smectite (swelling clays such as montmorillonite) which, from previous investigations at Golden Cross, are known to have a friction angle as low as 9°.

The West Mine Fault intersects the Empire Fault at approximately RL 270m which is below the upper stope workings. The Western Boundary Fault may intersect the Empire Fault but it appears to dip below the underground workings (i.e. below RL 100m). The Beefeater Fault association with the sheared carbonaceous beds in the Tuff Marker Horizon is unique and differs from the characteristics of The West Mine and Western Boundary faults.

4.2 Bulking Factor

The bulking (or swelling) factor is defined as the increase in volume of the excavated material above the original in situ volume before excavation. With hard rock and when the rock breaks up into angular fragments the bulking factor may be high. However with soft weak rock angular fragments do not develop and the bulking factor is relatively small. In underground mining, a material's bulking factor is usually known reasonably accurately as non-ore grade rock is used to backfill the stopes. The bulking factor, where known, may also be used to determine the likely upward progression of a roof collapse from the underground workings towards the ground surface before it self supports.

There is no readily available bulking factor information for the hydrothermally altered andesite (Coromandel Group) at Golden Cross. However, former JV staff advised a roof collapse formed above one of the old underground drives at Golden Cross during the 1990s and it was inferred the collapsed material (also likely to be material from an extremely weak fault zone) had a very low bulking factor, likely less than 10%.

The URS Post Closure Risk Report (Ref.10) noted that the generally accepted bulking factor for a rock mass is generally 40% to 80% and used a bulking factor of 41% for the mineralised andesite rock mass in their assessment of the likely upward progression of a collapse in to the underground workings. This was the same bulking factor used for the mineralised andersite rock mass in the evaluation of the 2001 collapse above the nearby Waihi Township workings.

As the sink hole feature is considered to be within the weak sheared rock associated with a fault zone, 0 to 10% is judged to be a realistic assumption and has been adopted for this assessment.

4.3 Water infiltration

Surface stormwater from rainfall within the catchment is primarily directed to the Waitekauri Stream via large rock lined channels. Some infiltration through the rock mass (particularly faults and joints) to the permanent water table (maintained between RL 290 to 300m) is also likely. The unfilled zones within the stopes in the upper levels of the Empire Vein are above the groundwater level and therefore will act as drainage tunnels at atmospheric pressure. The NNE to SSW fault systems that cross the open pit eastern highwall are likely to act as both horizontal aquicludes and vertical conduits allowing the infiltrating groundwater to track down the hanging wall of the faults into the open underground workings.

4.4 Unfilled Underground Workings Extent

Discussions with former JV staff (Ref. 7) regarding the nature and backfilling of the upper underground workings in the vicinity of the collapse shaft established that the following stopes were not backfilled (refer to Figure 5 in Appendix A):

Stope 1: A 7m to 10m tall blind long hole stope above approximately RL 300m which is at the top of the highest panel.
Stope 2: A room and pillar excavation inclined at approximately 30 degrees that extended from the Empire Vein at approximately RL 305m.
Stope 3: A room and pillar excavation inclined at approximately 20 degrees that extended from the Empire Vein at approximately RL 260m (now flooded).
Stope 4: Top 4m of central panel at RL 245m (now flooded).
Stope 5: Top 4m of bottom panel RL 135m (now flooded).

It should be noted that the elevations above are approximate.

As the groundwater table is maintained between RL 290m and RL300m, collapse of non-backfilled stopes below the groundwater level (Stopes 3, 4 and 5) is considered relatively unlikely. The underground groundwater level does fluctuate and cyclic wetting and drying of the weak carbonaceous zone at the stope intersection may have exacerbated or contributed to initiation of the sink hole.

Non-backfilled stopes 1 and 2 fall towards the north and therefore the crown pillar or cover depth over the stopes increases to the north.

The Beefeater Fault has a similar strike to the underground workings, i.e. the fault is essentially parallel with the underground workings. Based on a plan by Rabone (Ref. 9), the Beefeater Fault and underground workings (above RL 280m) are parallel over an approximate length of 200m.

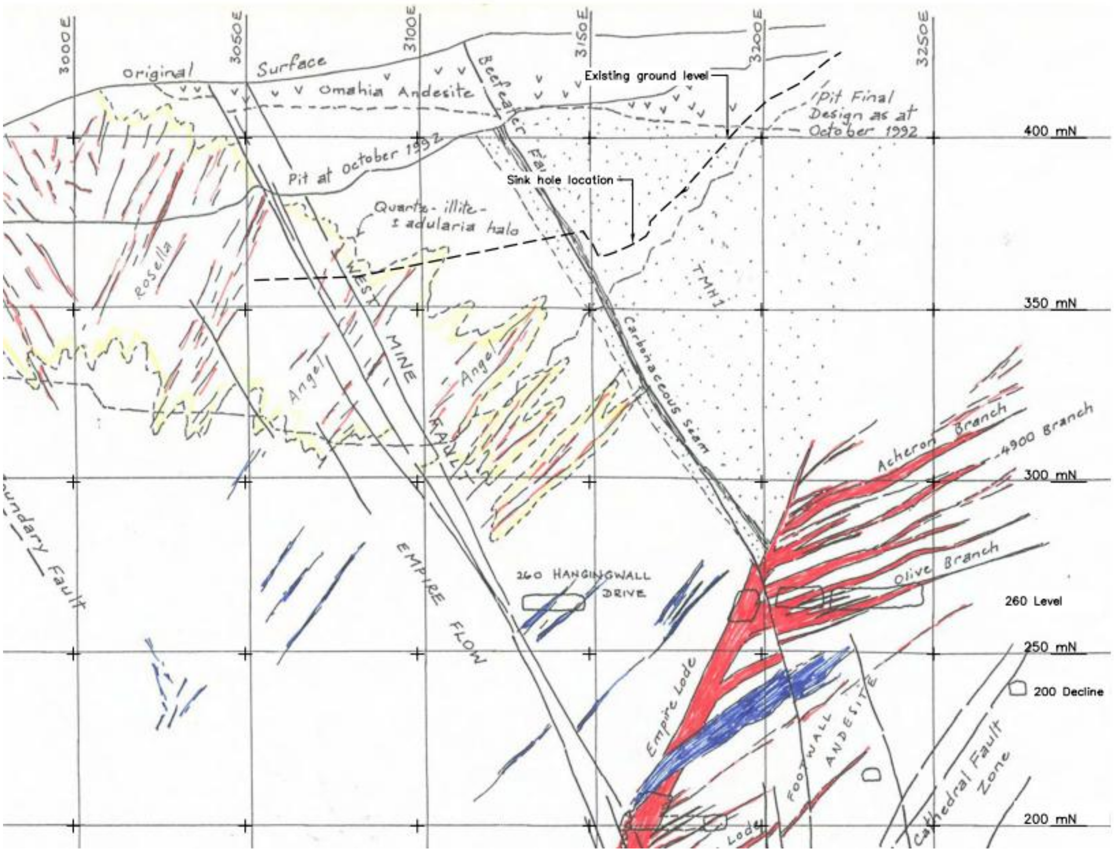
The old underground workings (1893 to 1902), which were mostly not backfilled, are located well to the south of the sink hole and are therefore interpreted to be unrelated to the sink hole feature.

4.5 Collapse Mechanism Interpretation

4.5.1 Collapse into underground workings

A projection of the steeply dipping faulted zone (Beefeater fault described by Rabone as a bedding plane shear along carbonaceous tuff horizons within the Tuff Marker Horizon) observed in the sink hole at the surface intersects with the blind long hole stope near the top of the upper panel above RL 300m (Stope 1) and the inclined non-backfilled room and pillar excavation from the Empire Vein at approximately RL 305m (Stope 2). All these stopes are above the current groundwater level. Therefore we consider it likely the bedding plane fault (Beefeater Fault) within the Tuff Marker Horizon has collapsed in a rectangular prism-like shape into the unfilled Stopes 1 to 2 and propagated all the way up to the surface (approximately 80m above the unfilled stopes) following the weak carbonaceous beds within the Tuff Marker Horizon. Accordingly, the angle of draw (10 to 30 degrees to the vertical) to the west of the upper unfilled workings is structurally controlled.

Geological Section 1 below is a cross section from Rabone (Ref. 9) which shows the Beefeater Fault within the Tuff Marker Horizon intersecting the Empire vein, which is close to the subsequently excavated unfilled Stopes 1 to 2. The 26 July 2013 sink hole profile is also shown and it is also close to the mapped Beefeater Fault.



Geological Section 1: Figure 3-Generalised Geological Section 4850N in Rabone 1993

The volume of the sink hole measured as an inverted truncated cone is between 2000 and 3000m^3 based on the most recent measurements taken onsite. Therefore, based on a relatively low to nil bulking factor, approximately 2000m^3 to 3000m^3 of material could be present in the unfilled stope(s) below. Stopes 1 and 2 comprise the following volumes based on the approximate average plan area (from the Minesight Model) and typical stope height (Ref.7):

1. Stope 1– 4,500m^3 (it is unknown if the ore reserve indicated on Figure 5 in Appendix A was also excavated)
2. Stope 2– 2,200m^3

Therefore, based on the above volumes any one of the three stopes could contain the material volume in the surface depression. However, it is considered most likely the collapse has occurred in Stope 1 (tall blind long hole stope) with collapse material spreading in to interconnected stope 2.

Deeper seated collapse into the inclined unfilled room and pillar excavation (Stope 3) is considered unlikely as the stope elevation falls to the north and it appears to drop below the Beefeater Fault. JV staff (Ref. 7) also described the rock above the Stope 3 as being relatively competent.

4.5.2 Fill collapse

It was evident during the three inspections of the surface collapse that the pit fill is relatively thin (less than 6m thick at this location) and competent (estimated shear strength exceeding 80kPa).

Accordingly, it is considered extremely unlikely the sink hole was caused by a deep failure of poorly compacted fill and this mechanism can be discounted. However, water infiltration in to the faulted zone may have exacerbated or contributed to the initiation of the sink hole.

4.6 Sink Hole Extent

As of 26 July 2013 the sink hole is conical in nature and was approximately 28m in diameter, compared with about 20m in diameter when the sink hole was first identified. In early October, JV staff indicated the sink hole sides have regressed back slightly (less than 1.5m) since our 26 July inspection and the base is not currently ponding water (no rain for at least 1 week) which indicates water could be slowly infiltrating down the collapse shaft.

A series of slickensided defects (dipping 30 degrees to the west) in the upper Coromandel Group rock underlie the waste rock and has resulted in approximately 10m of upslope (east) regression (i.e. expansion) of the sink hole since it was first identified.

The overlying and relatively thin fill layer is likely to periodically collapse locally into the sink hole. Tension cracking of this fill material was observed less than 5m to the south and west of the sink hole on 20 June 2013 and 26 July 2013.

5 Public Safety

T&T undertook a preliminary risk assessment to determine the surface footprint that could be at imminent risk of subsidence. A location plan for a proposed semi-permanent safety fence was issued in an email dated 28 June 2013 (Ref. 8). The proposed fence location was based on the assumptions that the low strength fault zone identified within the sink hole (magnetic N-S strike, 70 degree dip to east) is sufficiently buttressed by the collapsed ground and the fractured Coromandel Group rock and pit fill regresses back at 30 degrees upslope (east). The fence was constructed in early July.

During the meeting with HDC on 14 June 2013, there was agreement that all practical steps had been taken to ensure public safety but further risk assessment should be carried out prior to removing the public access constraints. The results of that assessment are presented in Section 7.4.

6 Consent Compliance

JV staff have been monitoring the water quality and water chemistry of the water discharged for many years in accordance with Environment Waikato discharge consents. As of October 2013, water quality monitoring indicated no change in the sediment content or chemistry since the sink hole was first noted on 12 June 2013. This is further assurance the sink hole has occurred in upper unfilled stopes above the water table (RL 295m).

7 Risk Assessment

7.1 Introduction

The purpose of this risk assessment is to determine the ground surface footprint at the site that is potentially at risk of subsidence and the probability of serious injury/loss of life due to any future subsidence. This primarily focuses on the subsidence risk due to the intersection of the previously mapped faults and the underground workings.

This risk assessment includes reference to previous subsidence risk assessments undertaken at Waihi town and at Golden Cross.

7.2 Waihi town Failures

Given that a probabilistic risk assessment was undertaken and accepted for a public reserve/road reserve (1961 and 1999 sink holes) in Waihi town, it is considered appropriate to use a similar risk assessment method for the Golden Cross situation which is on privately owned land where only a very limited number of people (e.g. trampers) could be at risk during a future sink hole. We note the Waihi town risk assessments were in an urban environment and therefore a probabilistic risk approach for the Golden Cross site is likely to be suitable.

7.3 Previous Subsidence Risk Assessment at Golden Cross

7.3.1 Introduction

URS Corporation prepared the Golden Cross Mine Post Closure report in 2004 (Ref. 10) and an updated report in 2011 (Ref. 11) and this included a residual risk assessment. URS used a risk assessment approach that comprised a qualitative measure of likelihood (inconceivable to likely) and consequence (less than $10,000 to greater than $10 M) to produce a qualitative risk register. The qualitative measure of likelihood, consequence and the resultant risk register is shown in Table 7.1 to Table 7.3 of the URS (2011) report respectively. If the assessed qualitative risk was high or there was a significant financial consequence, further evaluation in the form of a quantitative risk assessment was undertaken to determine the residual risk cost over a 100 year period.

The risks relevant to a sink hole are considered to be:

- Caving potential;
- Capping failure.

The likelihood and consequences of these items within the risk register have been reviewed.

7.3.2 Caving potential

Caving is defined by URS as isolated collapse within the underground mine and / or propagation of an underground collapse to the surface (i.e. sink hole). The risks associated with a collapse were considered to be Acid Rock Drainage (ARD) and release of contaminants from the underground. This is described further in sections 4.4 and 7.2.6 the 2011 URS report.

URS (2004) used the following methods which are based on experience from civil and mining projects to assess the qualitative likelihood of a sink hole occurring:

1. Stability Graph Method (Potvin, 1989, expanded by Diederichs, et.al., 1996)
2. Surface Crown Pillar Design (Carter, 1992)
3. Bell and Stacey Relationship (1992)

URS considered the likelihood of collapse of 4m high unfilled stopes in accordance with the Stability Graph Method (SGM). The Surface Crown Pillar Design (SCPD) method was used as a check to determine the minimum crown pillar thickness required to prevent collapse into the underground workings. URS finally considered if a failure into the underground working did in fact occur and used the Bell and Stacey (BS) relationship to calculate the height of upward progression of the collapse due to bulking of rubble generated from the collapse.

The rock quality, including reference to joint sets (unknown which fault these relate to) was considered in the SGM and was described as "very poor to poor." URS calculated that an infinite stope length will be stable without reinforcement in accordance with the SGM.

The minimum required crown pillar thickness to avoid collapse was calculated as 25m in accordance with the SCPD method and, given the actual crown pillar thickness was at least 80m, surface subsidence was considered unlikely to occur in accordance with the qualitative measure of likelihood.

In the event of a collapse, an upward progression of 17m (conical failure) was estimated using the BS relationship. A bulking factor of 41% (per the evaluation of the Waihi Chimney collapse, 2001) for the mineralised andesite rock mass was assumed.

Based on the results calculated in accordance with the three methods, URS considered the likelihood of surface subsidence as "unlikely to occur" as a result of underground collapse in accordance with the qualitative measure of likelihood shown in Table 7.2 (2011 URS report). As such, surface subsidence as a result of underground caving was not included in the Risk Register (Table 7.3 in 2011 URS report).

URS did include the risk of degradation of water quality as a result of underground collapse in the residual risk register (Table 7.3 in 2011 URS report). Given that there has been no change to the water quality or water chemistry, it is likely the collapse has occurred above the water table which, as mentioned in Section 4, is consistent with our collapse mechanism assessment.

As a sink hole has occurred and resulted in health and safety provisions being implemented, an additional item within the residual risk register (Table 7.3 in 2011 URS report) is required. See Section 7.4.3 below.

7.3.3 Capping failure

The open pit backfill was capped with a 1m thick Primary Control Layer (PCL), 600mm subsoil layer and 150mm of topsoil as part of the closure measures for the site. The PCL was constructed to restrict the movement of oxygen and water into the Potential Acid Generating (PAG) materials (e.g. waste rock and mineralised Coromandel Group rock) and therefore prevent contamination of surface water runoff.

As a result of sink hole development, localised failure of the capping layer has occurred creating potential for exposure of PAG and a subsequent increase of Acid Rock Drainage (ARD) that could potentially exceed water quality.

The capping failure mechanism within the open pit considered by URS was slope failure and erosion. The qualitative risk assessment by URS (Ref. 11) indicated slope failure, resulting in exposure of PAG in pit walls (greater than 1.0 ha) was considered a moderate risk based on a likelihood of "unlikely" and a "moderate" consequence.

The sink hole has removed an approximately 650m^2 area of PCL and exposed approximately 1600m^2 (0.16 ha) of PAG. This is significantly less than the 1.0 ha PAG exposure that could exceed water quality criteria (Ref. 11) and therefore a revision of the capping failure qualitative risk assessment is not required (provided repair of all significant PCL breaches is undertaken).

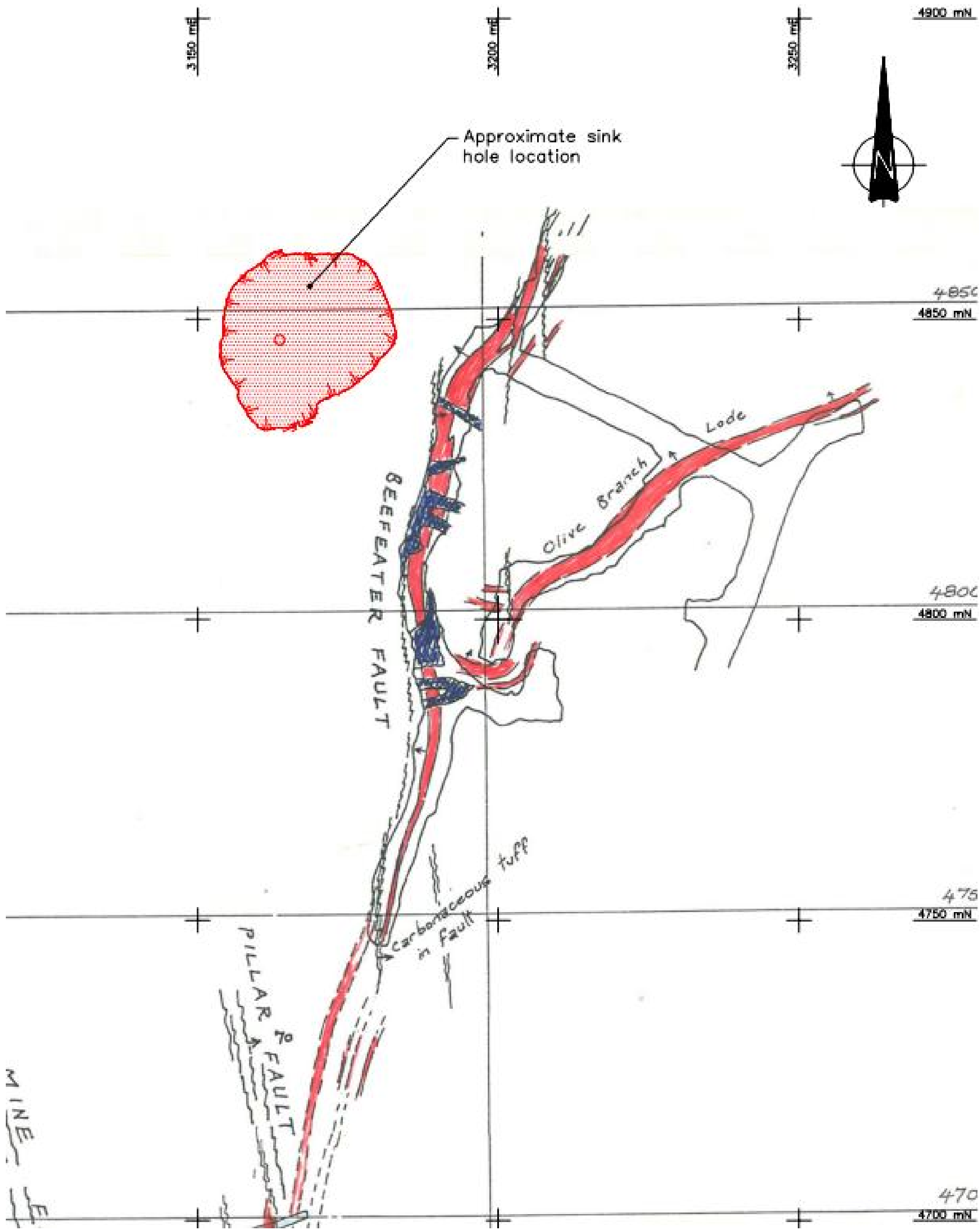
7.4 Risk Assessment

7.4.1 Surface Footprint Risk

The sink hole that has developed confirms that it is possible that unfilled stopes can collapse where sheared carbonaceous beds within a fault zone intersect the underground workings. One such collapse (this one) has propagated to the surface over the last 20 years.

It is unlikely the sink hole has completely filled the unfilled stopes and therefore the ground surface above sheared carbonaceous beds (i.e. faulted zone) that intersects unfilled underground workings is at risk of further subsidence or sink holes.

Geological Plan 1 below is a plan of the approximate location and orientation of the known sheared carbonaceous beds and the Empire Vein (location of underground workings) at RL 280m. RL 280m is the closest horizontal section produced by Rabone to the known upper unfilled stopes. The plan has been used to determine the intersection length of the faults and unfilled underground workings.



Geological Plan 1: Figure 1 - Simplified Geology at RL 280m in Rabone 1993. *Note the Empire vein, and branch veins are shown in red.*

The underground workings above RL 297m extend over a length of approximately 200m (1996 Minesight Model). Based on an essentially parallel strike of the Empire Vein (i.e. underground workings) and sheared carbonaceous beds, we have conservatively assumed the known sheared carbonaceous beds intersect the upper unfilled workings over this entire 200m length. Based on an angle of draw of 10 to 30 degrees to the west of the upper unfilled workings, a 50m width perpendicular to the underground workings is considered at risk. This equates to a 10,000m^2 (1.0 ha) surface footprint risk area.

Based on the location and volume of the unfilled stopes and the assessment by URS (Ref. 10) that an infinite unfilled stope with suitable cover (that is not intersected by faults) will be stable without reinforcement, it is considered unlikely that a stope collapse will propagate downwards to other unfilled stopes and result in a larger collapse volume and surface risk footprint.

The surface footprint risk area is defined as the surface area at risk to subsidence and is indicated on Figure 6 in Appendix B.

Surface subsidence (or caving potential) was assessed in the URS Post Closure Risk report and can be referred to when considering surface subsidence in areas beyond the assessed surface risk footprint.

7.4.2 Other Faults

Of the remaining known faults, the limited geological data available indicates the West Mine Fault could also potentially intersect the unfilled underground workings at approximately RL 190m and could also intersect the unfilled RL 260m Hanging Wall Exploratory Drive.

As the West Mine Fault does not comprise the unique sheared carbonaceous beds associated with Beefeater Fault (or splays of the Beefeater Fault) and the potential intersection level is below the suppressed groundwater level we consider surface collapse associated with the West Mine Fault into the underground workings is unlikely.

The majority of the historic mine workings along the western side of the property, which may have intersected the Western Boundary Fault and West Mine Fault, were removed by the open pit excavation, significantly reducing the risk of other collapse mechanisms.

It is possible that additional faults that were previously unknown or were not mapped also intersect the underground workings, but, given the quality of the geological mapping and interpretation work carried out at Golden Cross both pre-mining and during mining, this is also considered relatively unlikely.

7.4.3 Revised Risk Assessment for Caving Potential

The sink hole, caused as a result of an underground caving failure which has propagated to the surface has occurred approximately 22 years after the recent underground mining commenced and therefore the qualitative likelihood is considered “unlikely to moderate” in accordance with Table 7.1 in the 2011 URS report. The qualitative measure of consequence is considered “moderate” ($50,000 to $1M) in accordance with Table 7.2 in the 2011 URS report.

The unlikely to moderate qualitative likelihood and moderate qualitative measure of consequence for a surface subsidence equates to a moderate to high qualitative risk in accordance with the URS methodology. Accordingly an additional item to update to URS risk register is shown in Table 1 below.

Table 1: Additional residual risk to be included in Table 7.3: Risk Register in 2011 URS report

ID	Event	Description of event	Likelihood	Basis for Likelihood	Consequence	Description of consequence	Qualitative risk	Action
6.0 Surface Collapse within Open Pit								
6.1	Sink hole	Underground caving failure propagates to the surface	Unlikely to Moderate	1 event in 22 years	Moderate	Provisions to reinstate public safety	Moderate to High	Assess

The action required for a moderate to high risk is further assessment, such as a probabilistic risk assessment in accordance with Table 7 in the 2004 URS report.

The quantitative risk of a sink hole is estimated as 1 event in 20 years based on the one event since underground mining commenced in 1991. Therefore five events in a 100 year valuation period (used by URS) could be expected.

The average cost per event to backfill the sink hole, including associated professional fees could be in the order of NZD$200,000 and therefore the total cost to repair five sink holes over a 100 year valuation period could be in the order of NZD$1,000,000. For the URS assumption of a 3.4% real discount rate, this equates to a net present value (NPV) of approximately $200,000. URS used a lognormal distribution to estimate a residual risk cost with an 80% confidence level, as opposed to estimating an average cost as we have done.

The worst case consequence to the public as a result of a sink hole within the open pit is loss of life. Accordingly, a probabilistic likelihood assessment, similar to the one undertaken following the 1999 Waihi town sink hole has been undertaken to determine the likelihood of loss of life.

The probabilistic likelihood of a sink hole occurring on the open pit surface resulting in loss of life is estimated to have a likelihood of 1 loss of life in 512,800 years. Based on Table 7.1 in the 2011 URS report, this would rate as having a likelihood of “inconceivable” (unlikely to occur). Details of the assessment method, assumptions and calculations are presented in Appendix B.

7.5 Open Pit fill instability

The pit backfill upslope of the sink hole overlying the Coromandel Group rock has effectively locally lost its downslope buttress. The interface strength between the two layers is unknown but it is likely significant seepage occurs along this interface due to the permeability contrast. Therefore there is considered to be a risk of upslope instability of the waste rock.

The surface slope is inclined at approximately 25 degrees above the sink hole but, due to the benched nature of the Open Pit, the slope of the interface varies between very steep (pre-existing cuts at approximately 60 degrees) and relatively flat (pre-existing benches at less than 10 degrees). The instability is only likely to occur on the steep cuts and therefore, if failure of the waste rock occurs, it is likely to extend to the nearest flat bench only.

The nearest bench, based on limited survey data is estimated to be approximately 20m upslope of the shaft eastern scarp (26 July 2013 location) and therefore instability of the waste rock is considered to be the likely upper limit of associated instability. This entire area is contained within the safety fence and therefore there is no risk to persons due to upslope instability provided people do not climb the fence.

8 Remedial Options/Monitoring

8.1 Introduction

The purpose of this section is to provide preliminary remedial recommendations including three possible options for consideration. Following review and selection of the preferred conceptual remedial solution a design report/specification will be required to assist the contractor undertaking the works.

A comprehensive design report comprising design sketches, proposed staging of works, benching requirements, and consent requirements (if any) for the selected option will be required prior to commencing works. This will help contractor(s) prepare a price estimate to carry out the works.

8.2 Initial works

Surface water from above the feature and from a small mid-slope open pit channel is able to drain into the sink hole at the present time. Remedial works to divert surface water from entering the collapse shaft and the subsidence risk footprint shown on Figure 6 (Appendix B) should be undertaken as soon as possible.

These works could be completed with a small excavator when the site dries out in late spring or early summer.

8.3 Observation / Monitoring

This option comprises leaving the sink hole open inside the fenced zone with the drainage measures set out in the previous section. Regular monitoring could be undertaken by JV staff, with an engineer inspection undertaken as part of the annual Golden Cross Landslide Inspections.

This option, while the cheapest, does not completely remove the risk of someone falling in the sink hole as curious persons may still climb over the fence for a closer look at the feature.

8.4 Backfill sink hole

This option comprises backfilling the sink hole up to the level of the surrounding ground surface. This will eliminate the risk of someone falling in to the hole and allow the reinstatement of public access.

Backfilling the hole will need to be carefully managed as the hole is currently 6m deep at the downslope (western) end. The most practical option with regard to safety may be to push the sides (waste rock and cover fill) in to the sink hole to reduce the depth to the base of the sink hole, and to create an access ramp. The oversteepened hole perimeter will also need to be adequately benched from the downslope side to improve stability and progressively push the material into the sink hole. Then imported material can be placed with a long reach or similar to back fill the remainder of the sink hole.

As the integrity of the faulted zone is unknown, there may be a risk of the backfill material collapsing into the faulted zone again. An option to reduce this risk is to place a number of high tensile geogrid and geoxtextile layers above the faulted zone to effectively bridge the highly fractured material and potential voids below.

8.5 Fill Stopes

This comprises pumping a sand slurry (or similar) from the surface (e.g. from drill holes within the open pit) into the unfilled stopes to reduce the risk of surface subsidence by effectively eliminating the risk of stope collapse or reducing the possible upward progression of a collapse.

This method is very expensive with significant uncertainties and has only been done previously on highly populated or highly valued land (Steed et al 1991 and Karfarkis 1993). We do not recommend this option.

8.6 Ongoing monitoring

JV staff are regularly monitoring the sink hole extent, including taking regular photographs from an elevated area to the south of the open pit. This indicates minimal change has occurred since early July 2013 as detailed in Section 3.3. A GPS baseline reading has also been recorded on a number of pegs along the strike of the faulted zone to monitor any movement.

As noted in Section 6, JV staff will continue water quality monitoring as per Resource Consents held with Environment Waikato.

JV staff are to advise if any significant changes to the ground surface in or around the sink hole are observed and if significant changes to water quality are observed.

Additional monitoring and investigation options such as Ground Penetrating Radar (GPR) scanning, inclined boreholes, acoustic monitoring and surveying have been considered and are considered unlikely to yield accurate information on the extent of the feature.

9 Conclusions

The primary conclusions and recommendations are listed below:

- A sink hole approximately 20m in diameter and 20m deep developed on the eastern side of the open pit on 13 June 2013.
- The sink hole appeared to have stabilised at approximately 27m in diameter and 6m deep (downslope edge) by late July 2013. The base of the hole was ponding water which indicates the collapse shaft within the sink hole has been reasonably well sealed by debris.
- Based on available subsoil information, it is considered that the surface collapse is probably due to intersection of weak carbonaceous material associated with the Beefeater Fault (or splays of the Beefeater Fault) and high level unfilled underground mine workings (stopes) above the suppressed ground water level.
- The strike of the Beefeater Fault and the upper unfilled workings and the angle of draw (10 to 30 degrees to the vertical) to the west of the upper unfilled workings indicate there is a potential future subsidence risk footprint area of approximately 200m by 50m.
- The updated qualitative risk of caving (or surface subsidence) is considered moderate to high in accordance with the method previously implemented by URS.
- The quantitative likelihood of surface subsidence is considered to be 1 event per 20 years and the quantitative financial consequence is estimated to be NZD$1,000,000 (based on 2013 average prices) for a 100 year valuation period. This gives a net present value (NPV) of approximately NZD$200,000 based on a 3.4% real discount rate.
- A quantitative likelihood assessment indicates the annual probability of serious injury/loss of life due to a future sink hole is significantly less than normally tolerated levels.
- The previous qualitative risk assessment by URS (2011) for capping failure is still considered valid.
- It is recommended the existing security fence be left in place until a decision on remedial works is made.

10 Applicability

This report has been prepared for the benefit of Coeur d'Alene Mines Corporation with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement. It has been prepared based on site observations by ourselves and from analysis of significant amounts of information provided by others on which we have relied.

While every effort has been made to determine an accurate subsoil model, such work has inherent uncertainties and inferences about the nature of the subsoil features are made but cannot be guaranteed.

Tonkin & Taylor LTD

Environmental and Engineering Consultants

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Authorised for Tonkin & Taylor Ltd by:

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Grant Loney

Project Director

BTH

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Appendix A: Sink Hole Figures

- Figure 1 – Site Location Plan
- Figure 2 – Site Contour Plan
- Figure 3 – Underground Working Plan
- Figure 4 – Sink Hole Cross Section
- Figure 5 - Underground Workings Cross Section

NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Aerial photo sourced from Google Earth(Copyright: 2012). Imagery taken April 2010.

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0 50 100 150 200 250 (m)

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GOLDEN CROSS SINK HOLE

Site and Sink Hole Location Plan

FIG. No. Figure 1

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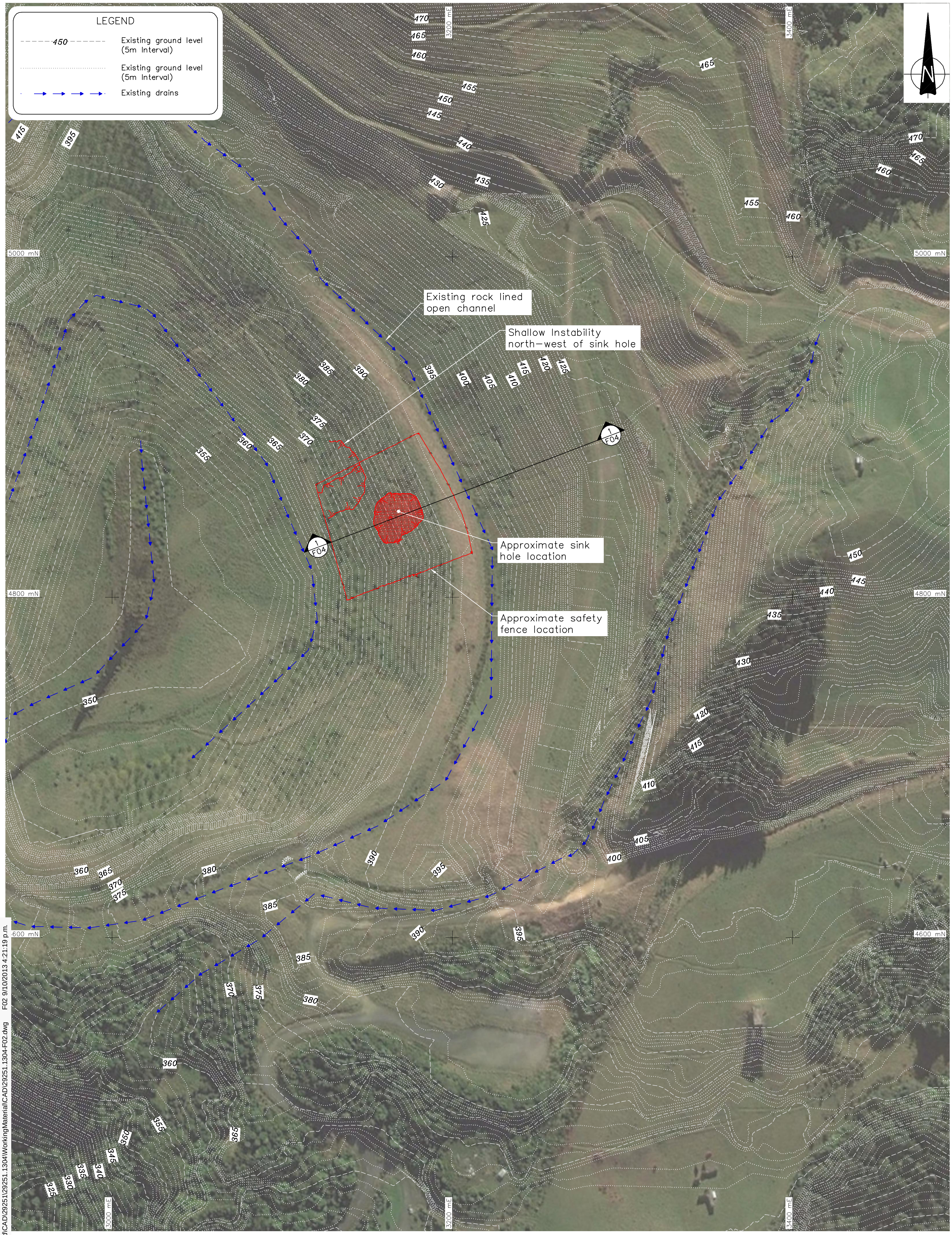

NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Aerial photo sourced from Google Earth(Copyright: 2012). Imagery taken April 2010.
3. Base contour taken from 1996 JV Mineshaft Model.
4. Coordinate and Level Datum are in terms of GX Mine Grid.

SCALE 1:2000

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GOLDEN CROSS SINK HOLE
Site Contour Plan

FIG. No. Figure 2

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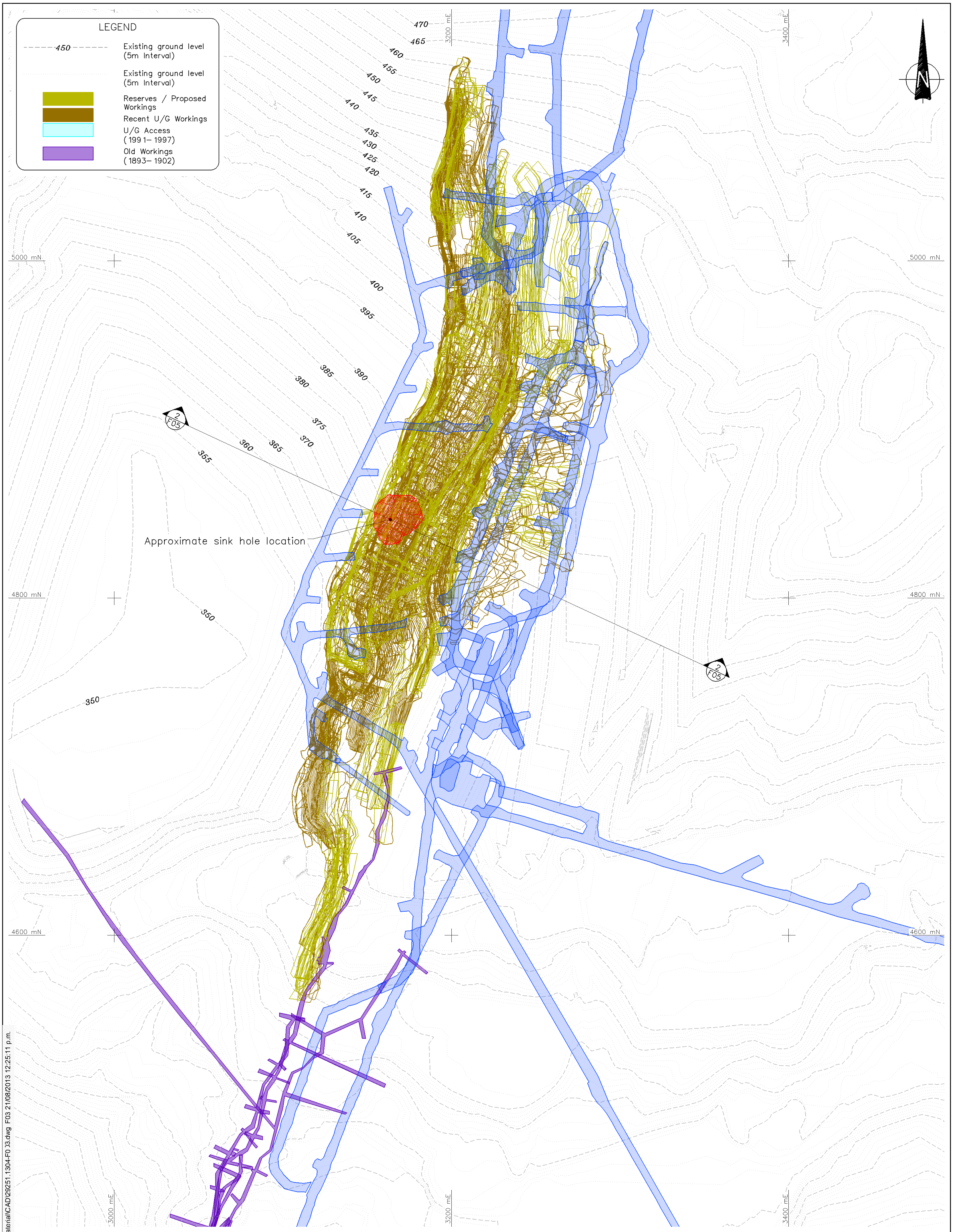

NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Underground working based on a copy of 1996 JV Vulcan Model
3. Coordinate and Level Datum are in terms of GX Mine Grid.

SCALE 1:2000
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COEUR D'ALENE MINES CORPORATION
GOLDEN CROSS SINK HOLE
Underground Working Plan
FIG. No. Figure 3
REV. 0

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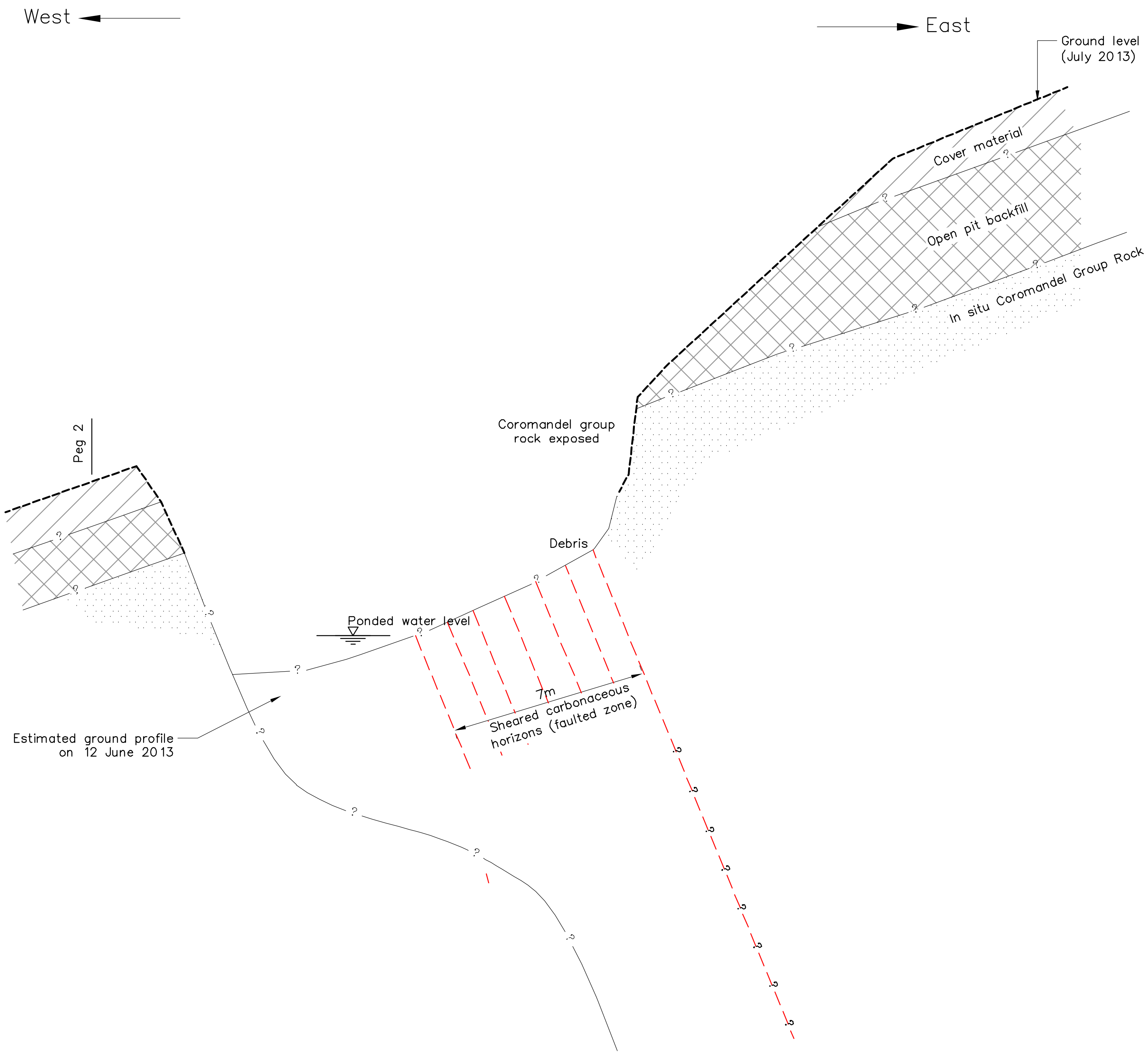

SECTION 2 F02 SINK HOLE CROSS SECTION

SCALE 1:200

SCALE 1: 200

0 2 4 6 8 10 (m)

NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Cross section based on observations on 20 June 2013 and 26 July 2013.

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105 Carlton Gore Road, Newmarket, Auckland
www.tonkin.co.nz

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COEUR D'ALENE MINES CORPORATION
GOLDEN CROSS SINK HOLE

Sink Hole Cross Section

FIG. No. Figure 4

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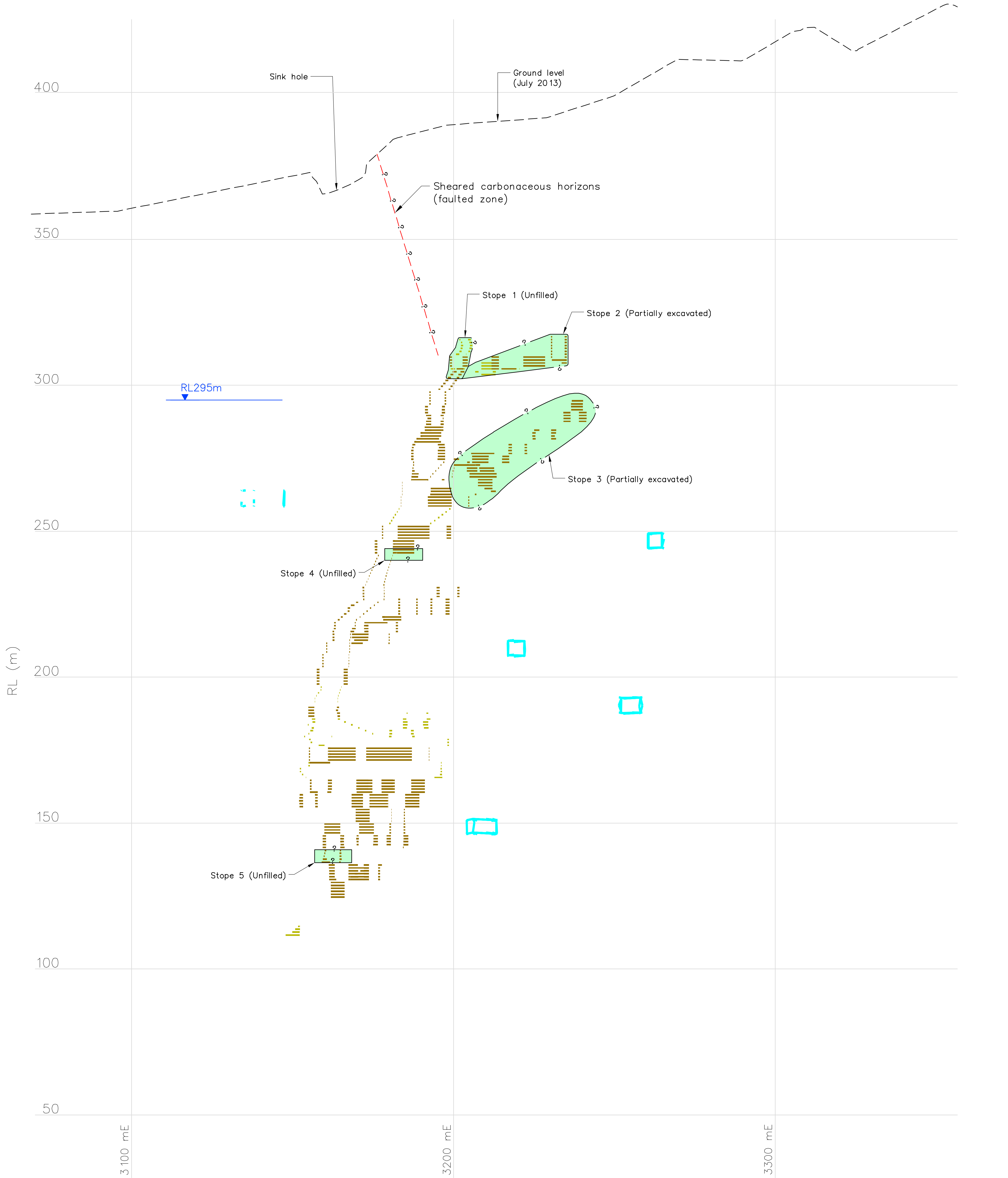

SECTION 2/F3
SCALE 1: 1250

LEGEND

- Unfilled Stope
- Approx. M8 Water Level
- Reserves/Proposed Workings
- Recent U/G Workings
- U/G Access (1991 – 1997)

NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Underground working based on a copy of 1996 JV Minesight Model.
3. Coordinate and Level Datum are in terms of GX Mine Grid.

SCALE 1: 1,250
0 10 20 30 40 50 60 70 80 (m)

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GOLDEN CROSS SINK HOLE

Undeground Workings Cross Section

FIG. No. Figure 5

REV. 0

Appendix B: Probabilistic Likelihood Assessment

Probabilistic Likelihood Assessment

A probabilistic likelihood assessment, similar to the assessment undertaken following the 1999 Waihi town sink hole, has been undertaken to assess the quantitative likelihood of serious injury/loss of life as a result of a future subsidence caused at the Golden Cross Site.

The recent sink hole that has occurred is the only known surface subsidence event in the history of the Golden Cross Mine.

The probabilities considered are defined below:

1. P (Event) – The probability of an event occurring within the subsidence risk footprint (200m by 50m as defined in Section 7.4.1).
2. P (Event/Area) – The probability of an event in the area that would affect persons walking off the track (average speed estimated to be 5km/hr) above the eastern side of the open pit (500m long) and on to the eastern side of the open pit. This assessment includes the following assumptions:
    a. The number of public persons entering the Golden Cross site is estimated as 10 people per day during the summer and 5 people per week during the winter.
    b. The majority of people keep to the track and only a small proportion of people walk off the track (say 10 %) and on to the eastern side of the open pit (400m by 180m).
    c. The area at risk of subsidence is 40m (20m subsidence diameter) which includes a 10m safe stopping distance.
    d. There is an equal probability of a person walking at any location within the eastern side of the open pit.
3. P (Loss of life) – The probability of loss of life if the event occurred at the same location as the person.
4. P (D) – The probability of death at the Golden Cross site due to a subsidence.

Table 1 below shows the resultant probability due to subsidence into the historical or recent underground workings as defined above.

Table B1: Probability of Loss of life resulting from subsidence

Probability P	Calculate probability P	Recent Underground Workings
1. P (Event)	No. events/No. years	1 event/22 years = 0.05
2. P (Event/Area)	No. Persons/year x track length adjacent to open pit/walking speed x likelihood of people walking off this track x sink hole diameter /area of eastern side of pit	(10 people/day +5 people/week) x 0.5 x 0.5km/5km per hour x 10% x $Area_{sink\ hole}/Area_{open\ pit}$ x 1 day/24 hours = 3.90e-05
3. P (Death)	Probability of death considered certain.	1.0
P(D)	1 x 2 x 3 x 4	0.0000020 = 0.00020% or 1 event in 512,800 years

The probabilities in Table B1 need to be evaluated in terms of their acceptability to society. See Table B2 below.

As noted in a review (ref. 14) of the Waihi Mine underground collapse evaluation report (ref.13), there tends to be an incubation period before mine collapses occur, and then, over a period of several decades most of the settlement occurs. So after 100 years or so, the likelihood of collapse is greatly reduced. It was suggested the Waihi Mine was in the period where most collapses occur as two occurred in two years (1999 and 2001). Therefore, the assumption that stope collapse frequency is linear (based on one collapse in to the Golden Cross recent underground workings) may not be conservative and the estimated probabilities could be somewhat higher.

Acceptable probabilities

The acceptable probability as defined by various countries and agencies is indicated in Table B2 below for comparison with the estimated probability of loss of life due to a surface collapse into underground workings at Golden Cross Mine.

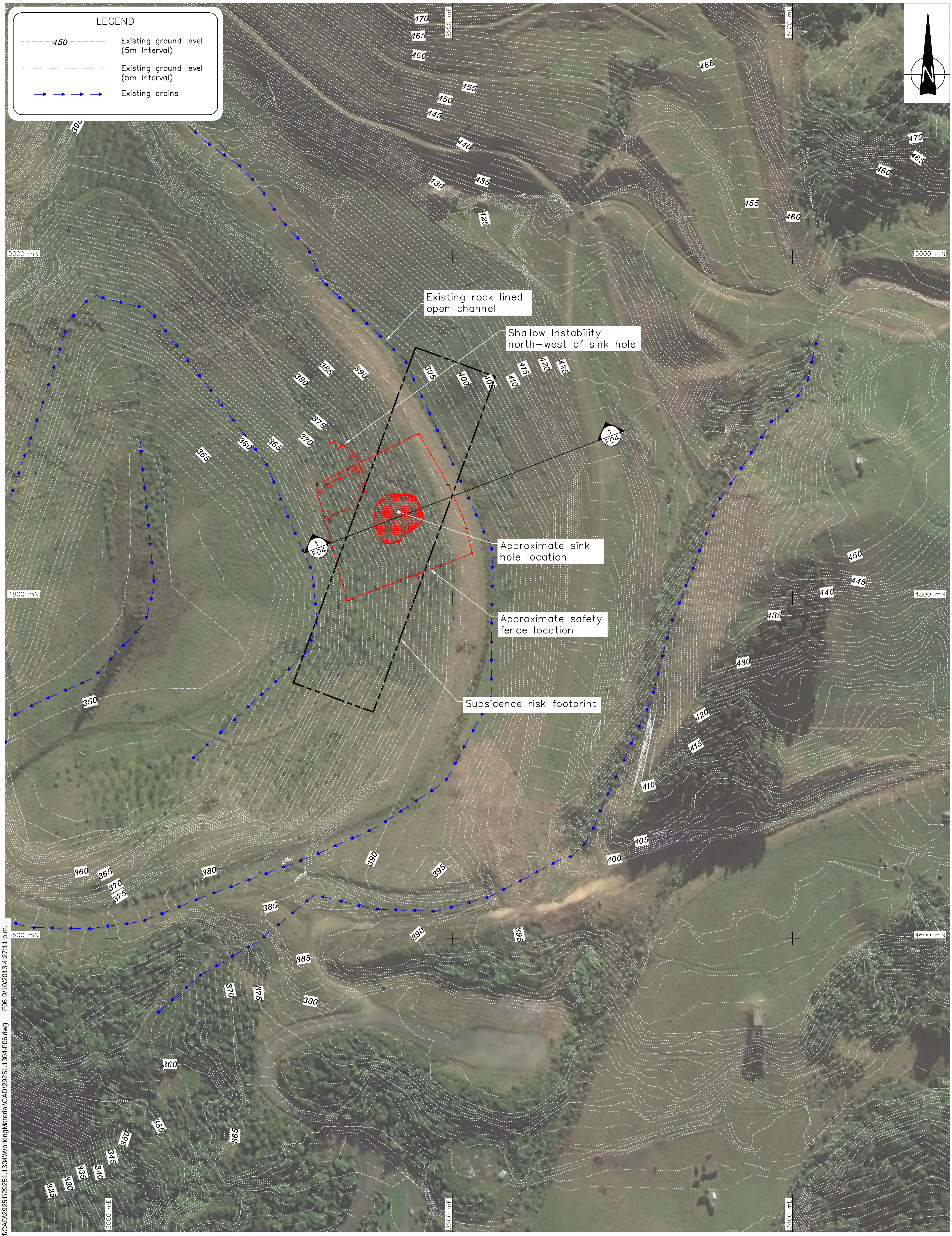
Table B2: Acceptable probabilities

Country / Agency	Annual probability of occurrence of loss of life– upper tolerable limit	
UK Health and Safety Executive	10^{-4}	1 in 10,000
British Columbia Hydro for dams	10^{-4}	1 in 10,000
Hong Kong Government Planning	10^{-5}	1 in 100,000
NSW Department of Planning	10^{-5}	1 in 100,000

It can be seen that our assessment of the probability of loss of life caused by surface collapse into underground workings is significantly lower than the lowest tolerable limit. Therefore, in accordance with the URS Post Closure reports (Ref 10 and Ref 11), a quantitative financial consequence assessment is not required.

Appendix C: Subsidence Risk Footprint

- Figure 6 – Subsidence Risk Footprint



NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Aerial photo sourced from Google Earth(Copyright: 2012). Imagery taken April 2010.
3. Base contour taken from 1996 JV Minesight Model.
4. Coordinate and Level Datum are in terms of GX Mine Grid.

SCALE 1:2000
0 20 40 60 80 100 (m)

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PROJECT No. 29251.1304

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GOLDEN CROSS SINK HOLE
Subsidence Risk Footprint

FIG. No. Figure 6
REV. 0

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Tonkin & Taylor

T&T Ref: 29251.1304
23 February 2015

Coeur d'Alene Mines Corporation
104 S. Michigan Ave
Suite 900
Chicago
IL 60603, USA

Attention: Jim Voyles

Dear Jim

Golden Cross Sinkhole
January 2015 Status Report

1. Introduction

A sub-vertical collapse feature, known as the Golden Cross Sinkhole, is located on the eastern side of the rehabilitated open pit. The sinkhole was first observed on the 12th of June 2013. Tonkin & Taylor was engaged by the Coeur d'Alene Mines JV to observe the sinkhole and assess the most likely failure mechanism, the associated risks and possible remedial options. The results of this work are contained in the October 2013 T&T report[1]. The sinkhole has been further observed by T&T representatives on a number of occasions, most recently the 13th January 2015. This letter report updates the status of the sinkhole by summarising the observations of the feature on the 13th of January 2015 and provides comments on the changes that have occurred since it was initially observed.

2. Background/ Previous interpretation

A sub-vertical sided surface collapse was observed on the eastern side of the rehabilitated open pit on 12 June 2013 by a helicopter pilot. The surface collapse has since been named the Golden Cross Sinkhole. The sink hole when initially observed was approximately 20m in diameter (it is currently 35m to 40m in diameter). The sinkhole has the appearance of a steep sided crater at the surface. An open collapse shaft at the base of the crater was observed during the first of the site inspections by T&T, but was subsequently blocked and has not been visible on subsequent inspections.

T&T (2013) concluded that the sinkhole was likely a result of a structurally controlled geological feature which created a sub-vertical walled collapse shaft into unfilled underground mine workings at approximately RL 300m. The collapse shaft was interpreted to lie between the footwall and

[1] T&T (2013) "Golden Cross Sink Hole Formal Interpretive Report v2" Report prepared for Coeur D'Alene Mines Corporation. T&T Ref: 29251.1304

hanging wall of a steeply easterly dipping faulted zone in the rock mass (probably the Beefeater Fault) which intersected the ground surface at the location of the sinkhole.

3. Previous Sinkhole site visit observations

The sinkhole has been inspected in detail on 4 occasions prior to the most recent site visit and the observations from each visit are summarised below.

3.1 14th of June 2013

The sinkhole was first visited by T&T on the 14th of June 2013 and was photographed from the ground and during a helicopter fly-by. The sinkhole was open to a depth of at least 20m below ground level on the lower (western) side with no ponded water. During this initial visit the bedding attitude and bedding plane sheared zones (faults) that appear to have structurally controlled the collapse shaft were clearly observed. These features are described in detail in T&T (2013)[1].

3.2 20th of June 2013

A more detailed ground survey was made on the 20th of June 2013 with the perimeter of the feature mapped by handheld GPS and two sections, east to west (upslope-downslope) and north to south (across slope) were surveyed by handheld Laser. Four pegs were also installed around the perimeter of the sinkhole to use as reference markers for future surveys. During this survey the sinkhole condition was observed to have changed in the 6 days since the first visit and a pond of water had formed on the floor of the sinkhole approximately 6m below the lower (western) side of the feature. The ponding likely occurred because the throat of the collapse shaft was blocked with low permeability debris that had slid off the sides of the sinkhole.

3.3 26th of July 2013

A further survey was completed on the 26th of July 2013, where the two sections were again re-measured and a detailed walk-over made over the land surrounding the sinkhole to observe signs of any ground cracking that might indicate that the sinkhole was extending along the strike of the fault that formed the hanging wall of the sinkhole. No evidence of cracking was sighted. Water was observed to be ponding on the floor of the sinkhole at 5m below the lower (western) side of the sinkhole. The surveyed cross sectional size and shape of the sinkhole had undergone minor changes since the 20th of June survey.

3.4 25th of February 2014

The sinkhole was observed on the 25th of February 2014 and a visual inspection carried out. During this visit the sinkhole was visually observed to have deepened and no water was ponded at the time. Details of the 13th of January 2015 visit are presented in the following sections.

4. 13th January 2015 site visit observations

During the site visit made on 13/01/15 the two sections were remeasured by handheld Laser and a walkover of the ground along the strike of the fault for approximately 100m either side of the sinkhole was completed. No ground cracking was observed. Some ponded water was present at the base of the sinkhole. The main changes observed to the sinkhole geometry were enlargements to the east and north. The sinkhole perimeter and ground profiles recorded during the three surveys are shown plotted on Figures 01 and 02 attached.

5. Commentary

The most significant changes have occurred on the high (east) side, and the north side.

On the high (east) side, the surface crater of the sinkhole has enlarged by 5m depth and width over the full height of the side. This retreat appears to have been caused by two factors including:

- Slope instability of the steep face of the sinkhole crater. This instability appears to be controlled by continuous rock mass defects dipping at 60° West into the sinkhole chute.
- A deepening of the sinkhole crater related to the loss of additional material down the sinkhole, including the material that has slipped into the sinkhole.

On the north side, the surface crater has also enlarged in width and depth by around 5 to 6m. The retreat on the north side of the sinkhole has also been caused by slope instability and by the loss of material into the sinkhole chute. The widening to the north appears to have followed along strike of the sheared zones that are controlling the sinkhole chute.

A rough calculation of the volume of material lost down the sinkhole chute between the 20th of June 2013 and the beginning of 2015 is in the order of 4,500 m^3. This volume is additional to the original loss estimated at between 2,000m^3 and 3,000 m^3 in June 2013 (i.e. around 7,000m^3 in total has been lost) No bulking factors have been applied to these estimates.

Further enlargement of the sinkhole by sliding failures along the dominant west dipping defect set on the eastern side sinkhole wall appears possible as the chute empties and leaves the toe of the slope unsupported above the hanging wall of the chute. Similarly, further enlargement on the northern side of the sinkhole may occur. This is most likely controlled by the strike of the bedding plane sheared zones.

There has been little change to the southern and western sides of the sinkhole perimeter.

6. Conclusions

Overall the most recent observations from the 13th of January 2015 are consistent with the most likely identified failure mechanism (of a collapse shaft down a faulted zone into unfilled mine workings) identified in the T&T (2013)[1] report.

The ongoing enlargement and retreat of the sinkhole on the north and east sides indicates the sinkhole remains in an active and unstable state. In particular the eastern (high) side may continue to retreat upslope due to further instability of the face.

The enlargement of the sinkhole to the north may be associated with a collapse shaft that has lengthened to the north along the strike of the fault, however this cannot be confirmed based on the observations undertaken.

Material from the sinkhole has continued to be lost down the collapse shaft with an estimated around 7,000m^3 lost to date. This indicates the collapse shaft is capable of receiving significant volumes of material. It was previously estimated in T&T (2013) that the stopes most likely to have initiated the collapse had the following approximate volumes directly beneath the plan area of the collapse shaft:

- Stope 1 – 4,500m^3
- Stope 2 – 2,200m^3

Given the volume of each stope is less than the lost material volume (with no bulking factors), it is possible that either the stopes are larger than previously estimated, or that material from the collapse shaft is mobile when it enters the stope and is able to be conveyed along the length of each stope.

On the basis of the above conclusions the sinkhole is considered to be active and it is not possible to predict when stabilisation of the sinkhole will occur. The estimated maximum likely extents of the sinkhole given in T&T (2013)[1] is, however, considered likely to remain appropriate.

T&T are currently undertaking a scoping of potential remedial works options for the sinkhole. It should be noted however that these options are only proposals at this stage and the feasibility and efficacy of such options has not yet been established.

7. Applicability

This report has been prepared for the benefit of Coeur d'Alene Mines Corporation with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

....

pp Bernard Hegan — Senior Engineering Geologist

Matthew Wansbone — Geotechnical Engineer

Authorised for Tonkin & Taylor by:

....

pp Grant Loney

Project Director

23-Feb-15

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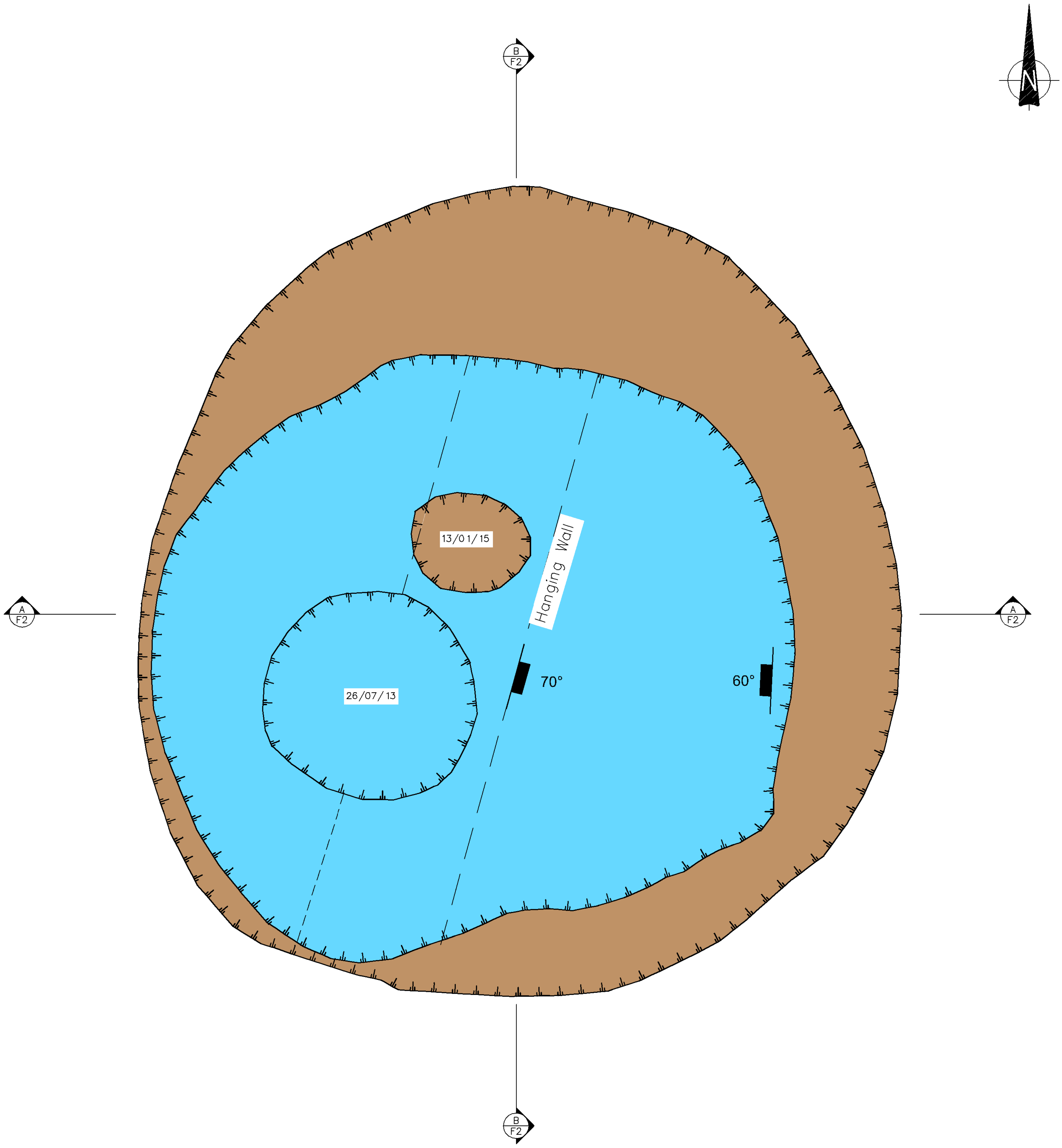
Appendix A: Figures 01 and 02



SITE PLAN

SCALE 1:250

LEGEND

27/07/2013 Ground profile

13/01/2015 Ground profile

SCALE 1:200

0 2 4 6 8 10 (m)

NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Cross section based on observations on 20 June 2013, 26 July 2013 and 13 January 2015.

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PROJECT No. 29251.1304		

COEUR D'ALENE MINES CORPORATION

GOLDEN CROSS SINK HOLE

SITE PLAN

FIG. No. Figure 01

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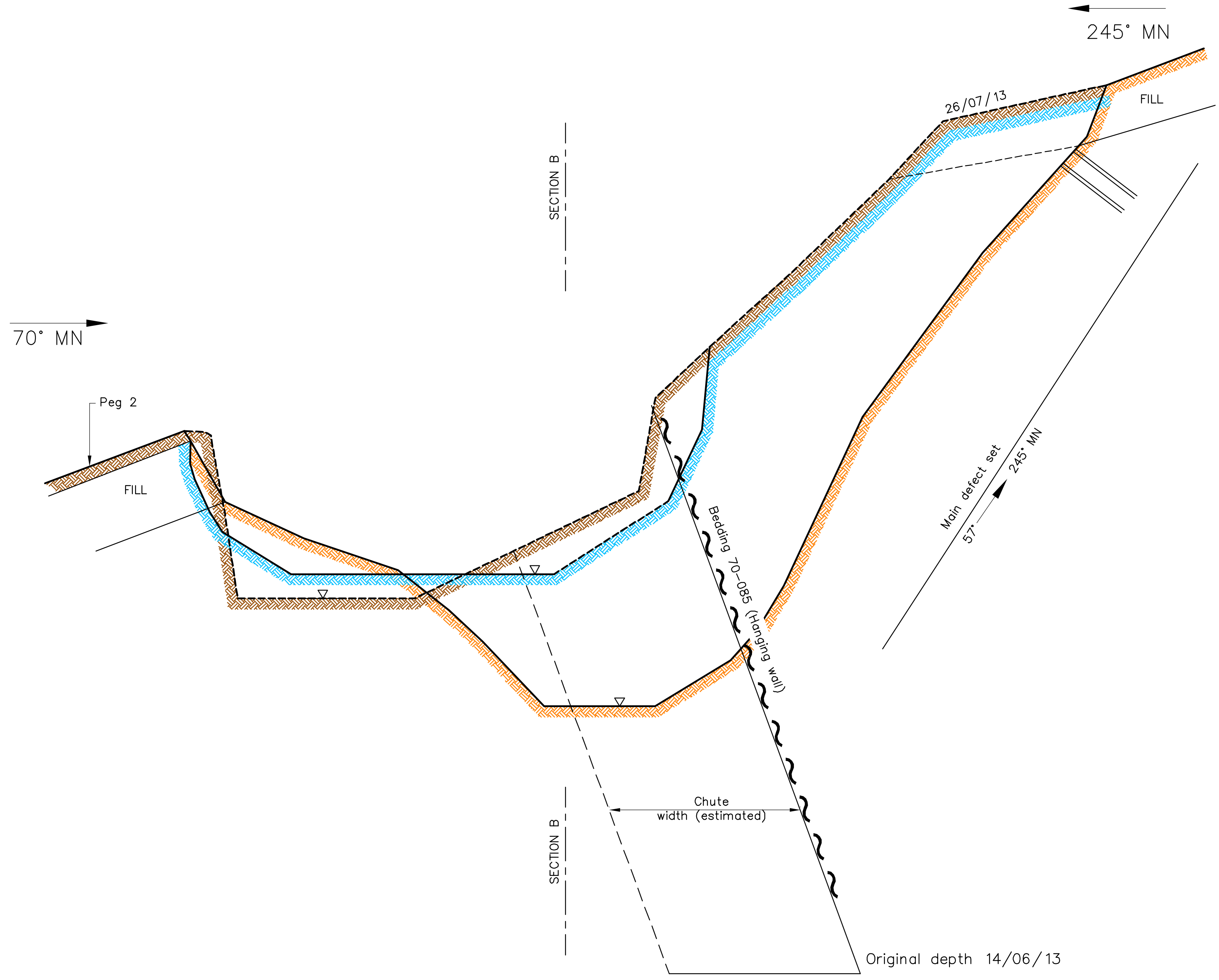
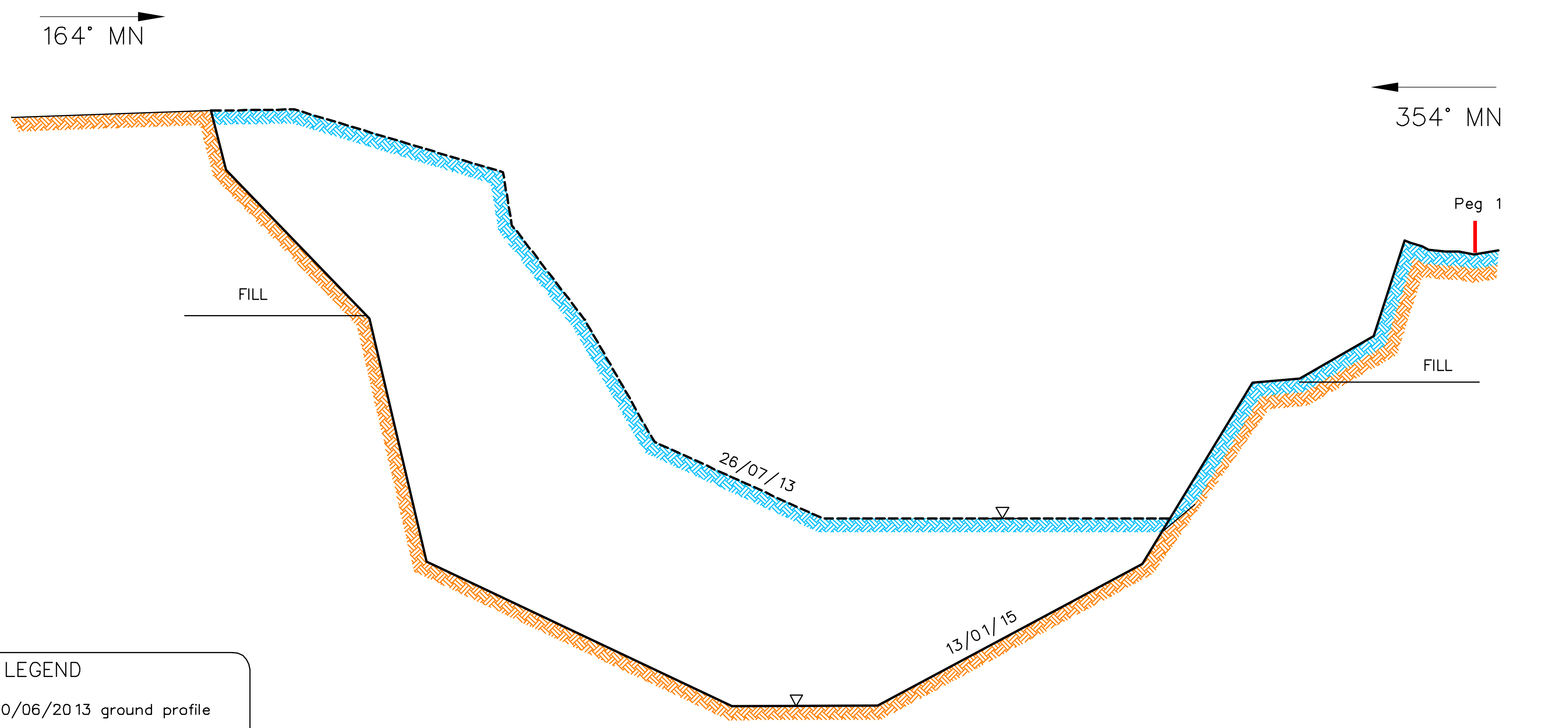


SECTION A
SCALE 1:200
A
F1



SECTION B
SCALE 1:200
B
F1

SCALE 1:200
0 2 4 6 8 10 (m)

LEGEND

- 20/06/2013 ground profile
- 26/07/2013 ground profile
- 31/01/2015 ground profile

NOTE:
1. All dimensions in millimetres unless noted otherwise.
2. Cross section based on observations on 20 June 2013 and 26 July 2013.

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GOLDEN CROSS SINK HOLE
Cross Section A & B

FIG. No. Figure 02
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23 October 2015

Peter Riley & Jay Gear
Coeur Mining Inc
104 Mitchigan Ave, Suite 900,
Chicago, IL USA 60603

Our ref: 51/33408/DocNumber
Your ref:

Dear Peter & Jay

Coeur Golden Cross Mine
Sink-hole Subsidence Assessment

Thank you for the opportunity to revisit Golden Cross Mine and to be involved in this assessment. After some years since my last visit, the parts of the site we visited on this occasion, were as I recall them.

Background

A sub-vertical sided sink-hole was noticed on 12 June 2013, on the eastern side of the closed and rehabilitated open-cast mine pit at Golden Cross Mine. The sink-hole was initially some 20 m in diameter, and has now enlarged to be some 40 m in diameter.

Photo 1. *View of the sink-hole “crater” in early September 2015 (courtesy of Paul Burton, T&T)*

The sink-hole area has been closed off with a 2 m high “deer” fence, and has been regularly monitored by inspection. The monitoring shows that the initially deep sink-hole is generally choked off with debris about 10 - 12 m below the surface. However, during intense rain it has apparently temporarily unblocked itself and swallowed the additional debris provided from the natural enlargement of the crater.

The sink-hole currently appears to be relatively stable. As it is located in a privately owned, remote rural area, and has been fenced off with warning signs, it does not represent a public hazard. It is mainly of interest to the mine rehabilitation monitoring program, which is still current. In addition it is a notable and interesting feature relating to historical mining in the area.

Three similar sink-holes have occurred in 1966, 1999 and 2001 in nearby Waihi, where sudden collapses into large unfilled stopes of the historic Martha underground mine have migrated slowly to the surface. The sink-hole crater in Barrys Road in 2001 occurred without warning beneath a house. Luckily the residents were rescued without injury. These sink-holes have all subsequently been back-filled so that no trace of them remains today. The filling has apparently been done to reduce residual risk in a populated urban area, and also to provide a “post-disaster” reassurance to the local populace of a return to normality. In my experience in many earthquake, tsunami, landslide and volcanic natural disaster zones around the world, there is a strong post-disaster local need for a demonstrated return to normalcy, and this generally takes the form of removing all evidence that a disaster has occurred. Whereas there is a growing awareness that retaining evidence of what has occurred is a vital reminder for future generations of what can happen. In my assessment the sink-hole that has occurred at rural Golden Cross provides a low risk opportunity for retaining an example of a sink-hole.

I was part of a small team who studied the risk of sink-hole formation in Waihi. The Martha mine operated for 70 years and closed in 1952. It was a deep underground mine extending to some 600 m depth on 16 mine levels, and 1.6 km laterally. Overall the Martha underground mine became established as one of the great gold mines of the world producing 1,217 tonnes of gold-silver bullion from processing 12.2 million tonnes of ore mined during its long life. From 1914 the sub-vertical stopes were generally not backfilled. Our risk assessment showed that the risk of sink-hole formation was unacceptable along some of the major stopes beneath small areas of Waihi township, and these areas have subsequently been permanently evacuated. According to Trevor Maton, there is currently evidence of a new sink-hole forming in an evacuated area of Waihi. This urban environment where sink-holes have occurred in Waihi is quite different to the remote, rural, privately owned environment at Golden Cross.

At the instigation of Mr Peter Riley of Viking and Coeur Mining, partners in the Golden Cross Mine Joint Venture (JV), I have been engaged to review Tonkin & Taylor (T&T) reports relating to the sink-hole, to evaluate the likely cause of the sink-hole and the corrective action plans.

Provided Documents

The following documents have been provided for review:

1. “*Golden Cross Sink Hole Formal Interpretative Report v2*” by T&T dated October 2013
2. “*Golden Cross Sink Hole January 2015 Status Report*” by T&T dated 23 February 2015
3. “*Golden Cross Sinkhole Remediation: Investigation and Design*” by T&T dated 23 February 2015

Site Visit

A visit was made to the Golden Cross mine site to see the sink-hole on 27 August 2015, on what was a memorable, sunny, early spring day. The visit was made in the company of Peter Riley, Trevor Maton, (former mining engineer at Golden Cross and now with Newmont Waihi Gold), and Jeff Sanderson, water plant operator and maintenance supervisor at Golden Cross.

We walked around the perimeter of the crater inside the fenced-off enclosure. We noticed a north-trending subsidence crack on the northern side of the crated and a recent slope failure from the eastern side of the crater into its base (Photos 2 & 3). There was no water ponding in the floor of the crater, even though Jeff told us, there had been recent heavy rain (Photo 3).

Photo 2. *View of the sink-hole crater showing a fan of slope failure debris from the eastern side resting on the crater floor.*

Relevant photos taken during the site visit are included in this review.

A Pre and post Golden Cross Mine site visit was made by Peter Riley and Dick Beetham to the T&T Auckland office to discuss the sink-hole with Grant Loney, Bernard Hegan, Matt Wansbone and Paul Burton. All these people have a history of working at times on the Golden Cross mine site, before, during mining, and during subsequent monitoring.

Photo 3. *The crater floor at the toe of the debris fan has deposits of fine grained material that indicate (temporary) ponding of rain water.*

Report Assessment

1. *Golden Cross Sink Hole Formal Interpretative Report v2* by T&T dated October 2013

This is a comprehensive and thorough report that considers and covers the following items:

- Site inspections
- Available information on the underground and open pit mining history
- Assessment of the sink-hole collapse mechanism
- A review of sink-hole risks
- Possible remedial options

Early helicopter footage of the sink-hole (not part of the report, but viewed at T&T office) showed a sub-vertical, rectangular-shaped “shaft” extending to depth beneath the surface collapse. This “shaft” has subsequently quickly filled with debris from higher side-wall failure and enlargement of the surface collapse crater. To me the clear view of the “shaft” feature illustrated rock structural control of the collapse that was underlying the formation of the sink-hole. In addition it emphasised the requirement of a void (open stope) to accommodate the debris from the collapse.

These aspects are neatly covered by T&T in their report. They have linked together the geology and faulting mapped in the open pit with that mapped underground, and have tied these data into the 3D mine model that was fortunately available via the co-operation and support of Trevor Maton. It is inferred with good evidence that a steeply dipping, highly sheared fault zone several metres wide associated with the Beefeater and other faults, intersects one or two partially unfilled stopes of the 1990’s underground mine workings that were carried out along the Empire vein mineralisation. The collapse has migrated upwards, a height of some 80 m along the fault shear zone, from the stope void(s), over a period of ~20 years since work in that part of the underground mine stopped. The migration continued upwards to form the sink-hole seen in 2013, and has continued to swallow the additional debris provided by crater enlargement, at least up until present.

I note with interest that in my assessment of the formation of the sink-holes in Waihi in 2002, I postulated that upward migration of that collapse was more likely to occur where a fault zone of poor quality sheared rock intersected an unfilled stope. There is good evidence for this occurring with the sink-hole here.

Another feature of this sink-hole, as noted by T&T, is that the volume of failed material, up to present, appears to be about the same as the available volume in the unfilled stope(s). In this case the “expected” rock mass bulking, or increase in volume, has not occurred during collapse. It is generally considered that bulking from an in situ rock mass into a collapsed pile may be as much as a 40% increase in volume because of the voids in the rock pile. With this situation “chimney” collapses underground are often regarded as “self-healing”, or they choke off due to the increase in volume of the collapsed material.

For zero or small bulking to occur, in my view the collapse material will need to have soil-like properties – which may be consistent with the described highly sheared, carbonaceous fault zone. As well, to fill the available stope volume, it appears the collapsed material would have to migrate laterally some distance along the unfilled stope(s). To me this invokes a flow mechanism that is compatible with a saturated material having soil-like properties, rather than rock debris.

The T&T report updates the sink-hole risk assessment for the site. In 2011, a site-wide Mine Closure Risk Assessment performed by URS Corporation, using a variety of accepted methodologies, assessed sink-hole formation as unlikely. To me, this illustrates the difficulties of making predictions of events and risks when there is no reliable calibration method available. I understand that URS are currently undertaking a review of the 2011 Risk Assessment, and that in performing this review, URS are using the most recent sinkhole evaluation and monitoring results.

The T&T report also provides a scoping of potential remedial measures but does not evaluate the feasibility of efficacy of implementing these potential remedial measures.

In my assessment this report by T&T is complete and comprehensive in the range of aspects the JV may wish to consider for the future control and monitoring of the closed mine site in relation to the sink-hole, should future remediation be necessary. It makes very good use of available geological information and interprets this well. In my view it reflects the value of accumulated IP (Intellectual Property) and the acquired knowledge that T&T have at Golden Cross Mine, due to being involved at the mine throughout its design, operational mining, and closure monitoring life. I doubt whether the collection of available (geological) data and its interpretation in this report can be improved.

2. *Golden Cross Sink Hole January 2015 Status Report* by T&T dated 23 February 2015, updates the geomorphology of the sink-hole mapped in the earlier report. It outlines the enlargement of the sink-hole crater at the surface from 20 to 40 m diameter, and updates the estimate of failed volume.

The report describes the enlargement of the sink-hole to the north and east and the deepening of the base. It finds that the additional failed material that has been “lost” down the sink-hole is some 4,500 m^3, which when added to the original lost volume of 2,000 to 3,000 m^3 gives a total lost volume of ~7,000 m^3. 7,000 m^3 is the estimated available volume below the collapse in unfilled stopes 1 and 2, and it suggests that the void available to receive collapse debris may be greater than previously estimated, and/or the failed debris is mobile and moving laterally along the stopes, and that the bulking is minimal.

3 *Golden Cross Sinkhole Remediation: Investigation and Design* by T&T dated 23 February 2015, is a proposal to the JV for investigation and design of remedial options.

This report presents methodology and cost estimates for two options to regrade and backfill the sink-hole. In my view backfilling may not be required, and in any event should not be attempted until it has been shown clearly that the sink-hole has stopped periodically swallowing the debris that falls into it. This may become apparent over the next year or so, as most recent volume estimates provided by T&T suggest that the available underground void space is now approximately equivalent to the collapse debris.

If the JV decides that some form of backfill of the sink-hole is (eventually) warranted, then in my view there would be no need to carry out benching earthworks of the sink-hole slope batters. Backfill materials could be stockpiled on the flat area upslope of the sink-hole, then simply pushed into the crater until it is filled to the required level. If the backfill is concrete demolition clean fill material and/or locally sourced rock, in my assessment this fill method would provide a satisfactory fill that would choke the stabilised sink-hole shaft, as well as providing support to the sink-hole batters.

If an impermeable plug is required in the base of the sink-hole to prevent ingress of surface water into the underground mine, then access to the crater floor could be gained by cutting a notch into the more stable down-slope side of the crater. This notch would also allow for drainage to occur from the crater base. The impermeable plug may then be compacted soil materials from the notch excavation, and/or imported fine grained fill. Once the plug is in place the crater could be filled to the required level with blocky demolition concrete and rock as described above.

The walls of the crater have acid generating potential. However, their area is relatively small, and runoff draining through the provided notch would migrate overland through vegetation and the fenced off wetland in the floor of the rehabilitated open pit, over a long, well vegetated path before entry to the Waitekauri Stream.

Sink-hole Assessment

The sink-hole is a reminder that the unexpected can occur, despite sophisticated analyses. However given its remote, rural location, the impact of the sink-hole appears to be minimal in all regards. In my view appropriate steps have been taken by the JV to make the site safe, and to assess and monitor the progression of the sink-hole.

Ongoing monitoring shows that water pumped from the underground mine to the water treatment plant has reportedly shown no increase in acidity, manganese, or iron content. It can therefore be shown clearly that the sink-hole subsidence has caused no adverse changes to water quality or to the on-going water treatment requirements.

The sink-hole has exposed a small area of potentially acid generating rock within its crater. However, the area of potentially acid generating rock is limited and run-off from the sink-hole walls presently drains underground, where its impact through water treatment monitoring is shown to be negligible.

Photo 4. *View of the sink-hole looking NW. The public access walking track is arrowed red. The crater rim would have to enlarge eastwards some 20 m before it would capture the drain on the right (east) arrowed yellow. In summer the surrounding trees will obscure the view of the sink-hole, and hide it.*

In my view the public safety concerns caused by the sink-hole have been covered off with construction of the 2 m high deer fence with warning signs that surround it. The sink-hole is on private land in a remote rural area. A public access marked tramping track (Photo 4) is located some 100 m to the east. In their probabilistic risk assessment, T&T (1) estimate that 10 people per day may use this track in summer and 5 people per week in winter. Trampers would have little reason to, and are unlikely to stray from the marked track. If they did, they would have to scale the 2 m high fence with warning signs in order to get close to sink-hole crater, which is a steep-sided depression some 12 m deep. In practical terms it is similar to banks and bluffs one encounters directly next to many tramping tracks in NZ, natural features that are unfenced.

In their probabilistic risk assessment, T&T estimate using conservative parameters, that the present public risk is acceptable.

Monitoring and Possible Remedial Options

In my assessment the monitoring of the sink-hole has been very good, both in terms of site visits, reporting and photo records at the surface, and with the ability to monitor water from the underground mine via the water treatment plant.

Photo 6. *View of the sink-hole enclosure fence and the sink-hole – just visible (arrowed), looking north.*

I am reassured that nothing untoward will occur at the sink-hole without it being well recorded, provided the monitoring continues. Jeff Sanderson has stated that he is making regular monthly site visits to record the sink-hole crater. In my view monthly visits are sufficient, given the minimal changes to the sink hole that have occurred in the last 6 months – since the T&T (2) update report was compiled on I Feb 2015.

I do not see a need to back-fill the sink-hole at this stage. Rather, I think there are advantages to be gained in observing and understanding the development of the sink-hole over time. It will be useful to know if the sink-hole continues to swallow the debris that fall into it. If and when this stabilises, presumably depends on when the receiving void below is full. Also it will be useful to see if the crater rim continues to enlarge, and when "stable" batter slopes form inside the crater. It appears to me from the debris fan currently remaining on the sink-hole crater floor after recent heavy rain (Photos 2 & 3), and with the volume of swallowed debris being estimated to be similar to void available underground to receive the debris, that stabilisation of the sink-hole may have now occurred. In addition enlargement of the crater now appears to be occurring at a very slow rate.

In my assessment a no-backfill option is available at this site because of its remote location and very low risk. In addition, there would be little point attempting to bench and backfill the sink-hole crater before it has stabilised and stopped swallowing debris. I suggest there would be valuable lessons to be learnt by observing and monitoring what happens to the sink-hole, at least in the medium term.

I also suggest that in the long-term, an unfilled sink-hole that has stabilised would be a notable and interesting feature relating to historical mining in the area. With signage on this and other features at the Golden Cross Mine, it could possibly become an attraction for visitors, similar to the "Woodstock Windows" walk in the Waitewheta / Karangahake Gorge. In my view Golden Cross has a remarkable history, which includes two periods of old and modern mining involving both underground and open pit, their rehabilitation, and all the other activities associated with that mining.

If the situation arises where the sink-hole crater enlarges eastwards to the point where it is threatening to capture the large drain on that side (Photos 4 & 5), then consideration would need to be given to diverting the upslope part of the drain so that it by-passes the sink-hole, as well as perhaps, filling the sink-hole to some extent. However, I expect on current evidence, that well before enlargement of the sink-hole crater to the point where upslope drain capture occurs, the sink-hole would have stopped swallowing debris, and the natural batter slopes in the sink-hole crater would have stabilised to their natural angle of stability.

Please contact me if you have questions regarding this assessment.

Sincerely
GHD Limited

Dick Beetham
Engineering Geologist and Principal Geotechnical Engineer
027 221 8853

Samantha Webb
Principal Engineering Geologist

Photo 7. *View of the sink-hole from the northern side.*

Scope and Limitations

This review presents the results of a best endeavour geotechnical appraisal prepared for the purpose of the commission received. The advice provided relates to the project and structures described, and must be reviewed by a competent geo-professional before being used for another purpose. GHD accepts no responsibility for other use of the advice.

The advice tendered in this review is based on experience, on the best practice assessment of evidence provided by others, and on a visual "geotechnical" appraisal. No subsurface investigations have been conducted. An assessment of the local land features has been made based on this information. It is emphasised that geotechnical conditions vary substantially across the site from where observations have been made. Subsurface conditions, including groundwater levels, can change in a limited distance or time. In evaluation of this report, recognition should be made of the limitations involved.

An understanding of the geotechnical site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experienced based. Hence this review should not be altered, amended or abbreviated, issued in part or issued incomplete without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances, which arise from the issue of the review which has been modified in any way.

APPENDIX D COSTS AND VALUATION

GOLDEN CROSS RISK ASSESSMENT UPDATE					
Estimated Residual Risk Cost – Median Costs					
	Total				
Description	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**	
Dam Breach (from T+T 2011)					
Embankment					
Reconstruction of zoned saddled embankment including tails cap and filter and buttress	LS	1	$ 600,000	$ 600,000	
Subtotal Preliminary and General				*$ 600,000*	
Flood damage					
Restore low level bridge, culverts and reinstate washouts	LS	1	$ 400,000	$ 400,000	
Restore High level damage - road and bridge repairs	LS	1	$ 200,000	$ 200,000	
Repair fences and sheds, replace selected fill and grass near dam	LS	1	$ 200,000	$ 200,000	
Subtotal Restore failed embankment				*$ 800,000*	
Tailings Release					
Capture 10,000m3 of tailings and return to dam	LS	1	$ 50,000	$ 50,000	
Chemical and ecological testing	LS	1	$ 50,000	$ 50,000	
Subtotal Repair damage to tributary channel				*$ 100,000*	
Escalation from Q1 2011 to Q4 2015				$ 77,000	
Total Dam Breach Costs- Capital Costs				**$1,515,794**	
Regulatory Costs					
Additional monitoring and reporting	LS	1	$ 63,745	$ 63,700	
Subtotal Annual Costs				***$ 63,700***	
Total Dam Breach Costs - 10 yr NPV					
Total Dam Breach - 10 yr NPV and Annual Cost				**$2,088,831**	
	Total				
Underground Release of Contaminants					
Treatment Plant Operation					
Operation Costs	LS	1	$ 244,900	$ 244,900	
Subtotal Treatment Plant Operation				*$ 244,900*	
Total Underground Release of Contaminants				**$ 244,900**	

Description	Unit	Quality	Unit Cost	Total	
Regulatory Costs					
Additional monitoring and reporting	LS	1	$ 26,125	$ 26,100	
Subtotal Annual Costs				***$ 26,100***	
Total Underground Release of Contaminants - 3 yr NPV					
Total Underground Release of Contaminants - 3 yr NPV and Annual Cost				**$ 323,210**	
	Total				
Capping Leads to ARD					
Preliminary and General					
General Items and Costs	LS	1	$ 2,613	$ 2,600	
Comply with all H& S Requirements	LS	1	$ 2,613	$ 2,600	
Subtotal Preliminary and General				$ 5,200	
Earthwork					
Replace PAG Waste Rock					
Excavate spilled waste rock and compact	CM	5,000	$ 16	$ 78,400	
Restore failed PCL capping					
Clean-up failed material	CM	8,000	$ 16	$ 125,400	
Import and place topsoil	CM	1,500	$ 42	$ 62,700	
Prepare, seed and fertilize topsoil	SM	10,000	$ 5	$ 52,300	
Subtotal Earthwork				$ 318,800	
Total Capping Leads to ARD				**$ 324,000**	
Regulatory Costs					
Additional monitoring and reporting	LS	1	$ 26,125	$ 26,100	
Subtotal Annual Costs				**$ 26,100**	
Total Capping Failure - 3 yr NPV					
Total Capping Failure - 3 yr NPV and Annual Cost				**$ 402,316**	

GOLDEN CROSS RISK ASSESSMENT UPDATE					
ESTIMATED RESIDUAL RISK COST - P10 (MAX)					
	Total				
Description	**Unit**	**Quantity**	**Unit Cost**	**Total Cost**	
Dam Breach (trom T+T 2011)					
Embankment					
Reconstruction of zoned saddled embankment including tails cap and filter and buttress	LS	1	$720,000	$ 720,000	
Subtotal Preliminary and General				$ 720,000	
Flood damage					
Restore low level bridge, culverts and reinstate washouts.	LS	1	$ 600,000	$ 600,000	
Restore High level damage - road and bridge repairs.	LS	1	$ 300,000	$ 300,000	
Repair fences and sheds, replace selected fill and grass near dam.	LS	1	$ 220,000	$ 220,000	
Subtotal Restore failed embankment.				$1,120,000	
Tailings Release					
Capture 10,000m3 of tailings and return to dam	LS	1	$ 100,000	$ 100,000	
Chemical and ecological testing	LS	1	$ 100,000	$ 100,000	
Subtotal Repair damage to tributary channel				$ 200,000	
Escalation from 2011 to Q4 2015				$ 654,330	
Total Dam Breach Costs- Capital Costs				**$2,129,330**	
Regulatory Costs					
Additional monitoring and reporting	LS	1	$ 79,681	$ 79,700	
Subtotal Annual Costs				**$ 79,700**	
Total Dam Breach Costs - 10 yr NPV					
Total Dam Breach - 10 yr NPV and Annual Cost				**$2,767,226**	
	Total				
Underground Release of Contaminants					
Treatment Plant Operation					
Operation Costs	LS	1	$ 367,350	$ 367,400	
Subtotal Treatment Plant Operation				$ 367,400	
Total Underground Release of Contaminants				**$ 367,400**	

Description	Unit	Quantity	Unit Cost	Total Cost	
Regulatory Costs					
Additional monitoring and reporting	LS	1	$ 32,656	$ 32,700	
Subtotal Annual Costs				**$ 32,700**	
Total Underground Release of Contaminants - 3 yr NPV					
Total Underground Release of Contaminants - 3 yr NPV and Annual Cost				**$ 465,520**	
	Total				
Capping Leads to ARD					
Preliminary and General					
General Items and Costs	LS	1	$ 3,919	$ 3,900	
Comply with all H& S Requirements	LS	1	$ 3,919	$ 3,900	
Subtotal Preliminary and General				$ 7,800	
Earthwork					
Replace PAG Waste Rock					
Excavate spilled waste rock and compact	CM	8,750	$ 27	$ 240,000	
Restore failed PCL capping					
Clean-up failed material	CM	14,000	$ 27	$ 384,000	
Import and place topsoil	CM	2,625	$ 73	$ 192,000	
Prepare, seed and fertilize topsoil	SM	17,500	$ 9	$ 160,000	
Subtotal Earthwork				$ 976,000	
Total Capping Leads to ARD				**$ 983,800**	
Regulatory Costs					
Additional monitoring and reporting	LS	1	$ 32,656	$ 32,700	
Subtotal Annual Costs				**$ 32,700**	
Total Capping Failure - 3 yr NPV					
Total Capping Failure - 3 yr NPV and Annual Cost				**$1,081,920**	

APPENDIX E DAM BREACH EVALUATION

REPORT

Coeur D'Alene Mines Corporation

Assessment of potential impact of failure of Golden Cross Dams Technical Memorandum

Report prepared for:

COEUR D'ALENE MINES CORPORATION

Report prepared by:

Tonkin & Taylor Ltd

Distribution:

COEUR D'ALENE MINES CORPORATION	1 copy
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March 2011

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Contents

1 Introduction 1

2 Possible Tailings Dam failure mechanisms 2

2.1 Overtopping in flood 2
2.2 Large scale landslip induced failure 2
2.3 Localised embankment movement 3
2.4 Liquefaction of tailings 3
2.5 "Least unlikely" Tailings Dam failure mechanism 3

3 Potential consequences of a Tailings Dam failure 4

3.1 Dam breach discharge 4
3.2 Effects of water discharge 6
3.2.1 Immediately downstream of Saddle Embankment 6
3.2.2 Wider receiving environment 8
3.3 Effects of embankment erosion 10
3.4 Effects of tailings discharge 11

4 Estimated remedial costs following a failure of the Tailings Dam 11

5 Union Silt Dam 13

5.1 Description 13
5.2 Landslide context and dam strengthening 15

6 Stockyard Silt Dam 15

6.1 Description 15
6.2 Landslide context 17

7 Conclusions 17

7.1 Tailings Dam 17
7.2 Union Silt Dam 18
7.3 Stockyard Silt Dam 18

8 Applicability 18

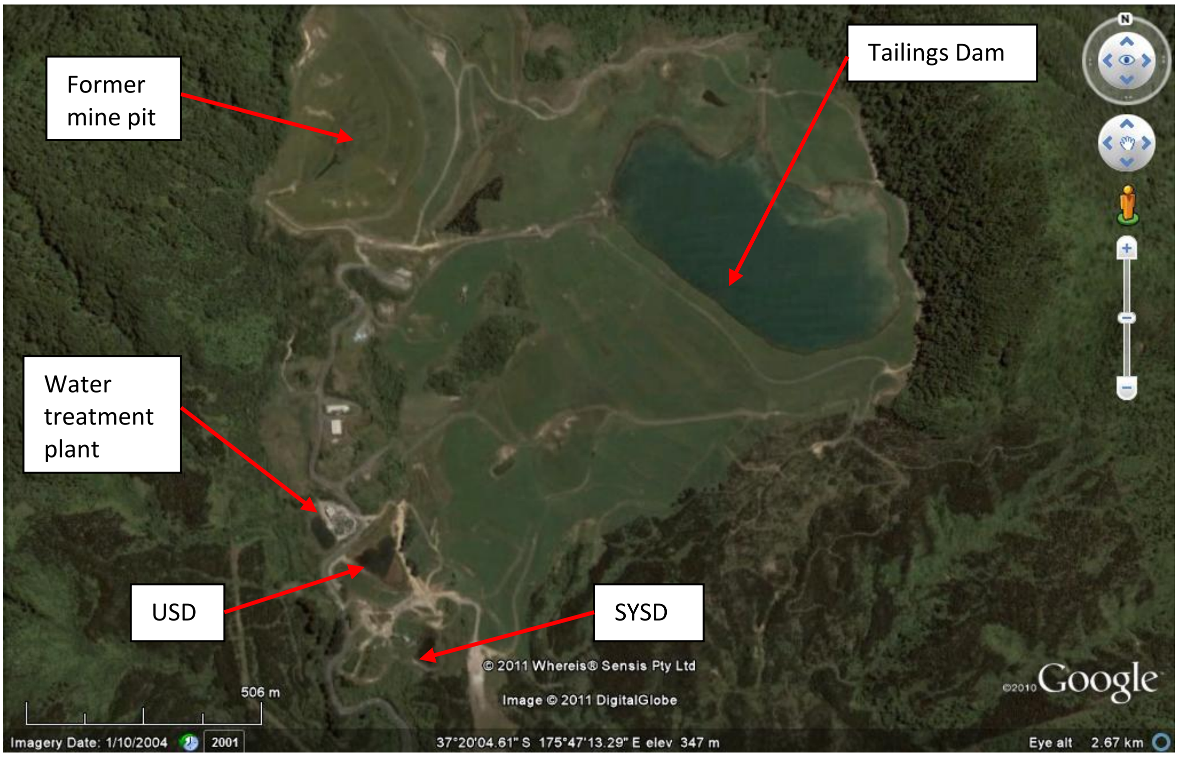
Appendix A: Figures 1 to 7

Appendix B: Cost estimate for Tailings Dam remedial works

Appendix C: USD strengthening works

1 Introduction

The site of the former Golden Cross gold mine contains three dams; the Tailings Dam, the Union Silt Dam (USD) and the Stockyard Silt Dam (SYSD), as shown in Map 1. The USD and SYSD are relative minor structures in the rehabilitated landscape as compared to the Tailings Dam.



Map 1. Location of the three Golden Cross dams (Aerial photo sourced from GoogleEarth)

Several reports have been written by various authors over the last decade relating to the likelihood and potential consequences of a failure of the Tailings Dam. Coeur d'Alene Mines Corporation (Coeur) has engaged Tonkin & Taylor Ltd (T&T) to review those reports and summarise the issues relevant to a potential dam failure.

This report outlines the possible mechanisms by which a failure of the Tailings Dam could occur and the associated probability of such an event occurring (Section 2). It then assesses the possible consequences if the "least unlikely" of these failure mechanisms was to occur (i.e. most likely) (Section 3) and the associated remedial costs (Section 4).

In addition, an assessment is also made of the USD and SYSD in Sections 5 and 6 respectively.

This report has not been prepared as part of a dam PIC assessment as soon to be required under the New Zealand Building Act Dam Safety Regulations, although should provide useful inputs into that process when it is undertaken.

2 Possible Tailings Dam failure mechanisms

2.1 Overtopping in flood

The outlet arrangement for the Tailings Dam comprises a service spillway (1.8 m diameter manhole riser) at RL 420 m and an emergency spillway (12 m wide trapezoidal channel) at RL 422 m.[1] The emergency spillway is only designed to operate in events exceeding a 1000 year return period and the water level during the Probable Maximum Flood (PMF) is RL 423 m[2]. This gives a freeboard from the current embankment crest (RL 424.75 m) of 2.75 m in a 1000 year return period and 1.75 m in a PMF – i.e. a very large amount of freeboard.

The spillway system is also a very robust one. The service spillway is protected by a substantial debris screen so blockage is considered to be very unlikely. We understand, and it is noteworthy that, no debris of any significant size has accumulated in the approximately 10 years since installation of the outlet works. The emergency spillway is a 12 m wide open channel that transitions down to 2 m width over 20 m downstream of the spillway crest. Complete blockage of the channel due to channel side instability is improbable at or near the crest and, while more likely where the channel narrows, the gradient of the channel in this reach is such that released water would be able to overtop and scour any debris without affecting discharge rates from the reservoir.

URS concluded that there “is not a perceived risk for flood induced failure” and have not attempted to calculate a probability of flood overtopping.[3]

2.2 Large scale landslip induced failure

The stability of the landslip on which the Tailings Dam is located is well documented. The extensive remedial works undertaken in the late 1990’s have successfully stabilised the landslip, with a long-term average of less than 5 mm/year of movement in the landslide corridor of movement (SW to SSW) recorded in annual GPS monitoring. This is compared with the threshold movement of 75 mm/year that is required to trigger review by the landslide monitoring committee. 75 mm/year is based on the design details for the saddle filter buttress construction being sized to provide filter protection for a shear movement of 3 m, giving a 40 year period for tailings consolidation to occur and render the tailings immobile. Current movement rates imply that at least a few hundred years of filter protection is theoretically available.

The GPS monitoring has shown that the landslide movement shows no significant response to heavy rainfall events.[4] In addition, the landslide is not expected to be significantly displaced by large earthquakes as the failure surface is already considered to be residual strength.[5] That is, a brittle first-time failure of peak strength soil inducing a large discrete displacement of the landslip is not possible.

Recently the number of GPS stations being monitored has been significantly increased to improve the understanding of the long-term landslide behaviour. Also, a programme of flushing key horizontal drain clusters and re-measuring flow rates is currently underway. Monitoring and reporting of the data is continuing on a 6-monthly basis at this stage.

[1] T&T Drawings 12520 – P93, P94 – Coeur Gold, Golden Cross Project, As-Builts, July 2001.
[2] T&T Completion Report “Union Embankment Tailings Storage – Designer Report for January 1999 to July 2001”, pp.6-7.
[3] URS, Golden Cross Mine Post Closure Risk Assessment Update – Draft Final Report, October 2010, p. 7.3.
[4] URS, Golden Cross Mine Post Closure Risk Assessment Update – Draft Final Report, October 2010, p. 7.3.
[5] Woodward Clyde, Tailings Inundation Potential – Draft Report, May 2000, p. 2.2.

2.3 Localised embankment movement

Distinct from movement associated with the deep seated landslip, a further potential failure mechanism is localised (i.e. relatively shallow) movement of the embankment itself. Stability analyses undertaken following the completion of site works show that the minimum static factor of safety (FoS) for significant embankment failures is greater than 2.2 (against a design FoS of 1.5).[6] A Maximum Credible Earthquake (MCE) with a return period of approximately 1,500 years is expected to result in less than 100 mm downslope movement to the embankment[7], which would not result in a loss of reservoir contents due to the very large freeboard available. The embankment itself is not susceptible to earthquake induced liquefaction.[8]

2.4 Liquefaction of tailings

In situ testing has been undertaken on the tailings retained behind the embankment at various times. The strength and density of the tailings has continued to improve over time, although the rate of improvement has slowed from the initial peak following the deposition of the tailings cap. Woodward-Clyde/URS undertook a liquefaction assessment and concluded that, even though there is likely to be a loss of strength and some deformation, there is no risk of the tailings liquefying in the MCE. [9]

While we have not carried out specific liquefaction studies of the tailings, we note that the dam embankment has been designed as if it were a water retention structure. Accordingly, it does not appear to matter if the tailings liquefy during seismic shaking, provided there is no escape of the liquefied tailings.

2.5 "Least unlikely" Tailings Dam failure mechanism

As described in the above discussion, none of the possible failure mechanisms are considered to be likely to occur. However, to enable us to identify the potential effects of a dam failure, we have made an assessment of the "least unlikely" failure mechanism.

We consider that the Saddle Embankment is the most vulnerable location within the dam embankment. This was the location where the most significant tension cracking and seepage was observed in 1995-96 during the saddle filter buttress foundation excavations, and is where the boundary of the landslide intersects the embankment and the left abutment causing extension (tension) of the saddle embankment. The damage observed in the Saddle Embankment vicinity in 1995/1996 is shown on the attached Figure 1[10] in Appendix A, together with the location of our inferred "least unlikely" dam failure.

When the Saddle Embankment was raised from RL 418 m to RL 424.75 m, a substantial drainage and filter buttress blanket was constructed on the downstream shoulder of the original embankment profile[11] (Figure 4, Appendix A). Besides controlling the phreatic surface within the embankment, the purpose of the filter buttress is to provide a filter to prevent the development of pipes (i.e. erosion tunnels) within the embankment. The filter provides compatibility both with the embankment materials and with the tailings. The composition of the filter buttress also acts

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[6] T&T, Tailings Storage Design Report January 1998 to July 2001 Completion Report, August 2001, p. 16.
[7] Woodward Clyde, Tailings Inundation Potential – Draft Report, May 2000, p. 2.2.
[8] URS, Golden Cross Mine Post Closure Risk Assessment Update – Draft Final Report, October 2010, p. 7-3.
[9] Woodward Clyde, Tailings Inundation Potential – Draft Report, May 2000, p. 3.3 and URS, Risk Report for Golden Cross, 2004, p. 5.3.1.
[10] Based on T&T Drawing 14947 – Fig 1 – Coeur Gold (NZ) Ltd, Golden Cross Project, Left Abutment/Trig J Areas – Observed Damage, June 1996.
[11] T&T Drawings 12520 – P41 – Coeur Gold, Golden Cross Project, As-Builts, July 2001.

as a “crack stopper”, designed to collapse into cracks that could possibly develop so that there would always be filter-compatible granular material to impede direct flows.

As mentioned above, the filter is expected to tolerate up to 3 m of landslide movement without loss of function.[12] However, if greater displacements were to occur and the filter was to be dislocated, it is conceivable that seepage could occur along the resulting cracks and propagate from the reservoir through to the downstream shoulder of the embankment. If the hydraulic gradient was high enough, “pipes” could form along this weakness, which would have the potential to erode and develop into an open channel through the embankment.

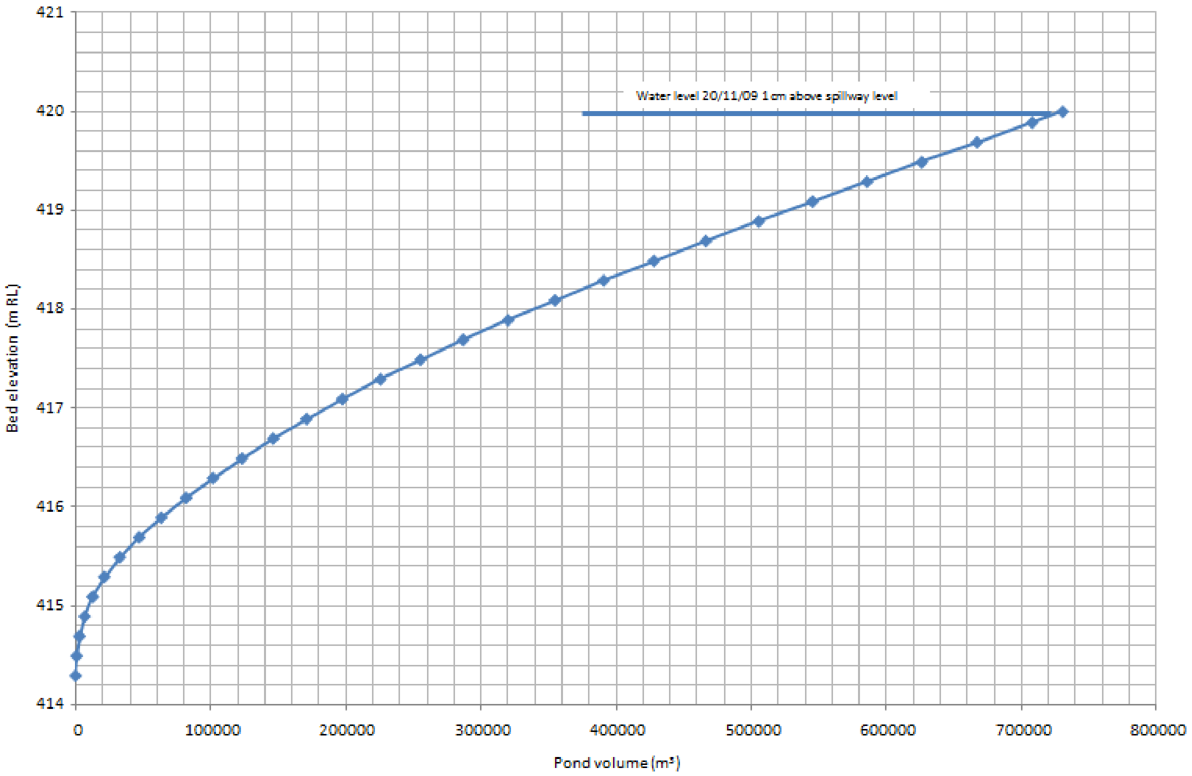
URS put the probability of such a landslip induced piping failure occurring at 1E-09, in comparison to the probability of a landslide induced overtopping failure of 5.53E-07.[13] However, we consider qualitatively that a piping-type failure is “less unlikely” than an overtopping-type failure. The following sections discuss the likely consequences of such a failure.

3 Potential consequences of a Tailings Dam failure

3.1 Dam breach discharge

The quantity of water stored within the Tailings Dam reservoir beneath the level of the service spillway is approximately 730,000 m^3 at up to 5.5 m depth[14] (Graph 1 and Figure 5 in Appendix A). This was determined by measuring the depth below water level where a heavy plate was just supported by the tailings. These soundings were carried out from a boat in November 2009 and GPS readings were taken for each sounding. Given the capacity of the spillway system, the recent apparent lack of rapid response of the landslide to rainfall and the assessed “least unlikely” failure mechanism, we consider that it is reasonable to assume that the reservoir level would be about RL 420 m at the time of a (highly unlikely) dam failure.

[12] Minutes of Landslide Review Meeting, January 2001, p. 4.
[13] URS, Golden Cross Mine Post Closure Risk Assessment Update – Draft Final Report, October 2010, Fig 8-3.
[14] T&T depth soundings within the Tailings Dam, November 2009.

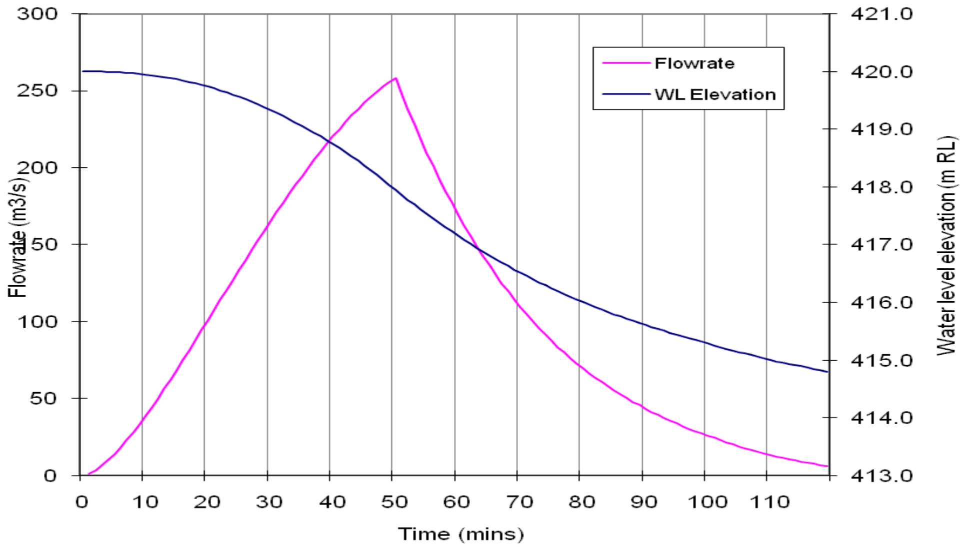


Graph 1. Tailings Dam storage-elevation curve as measured in November 2009

As part of this study, we have undertaken our own dam breach analysis. Dam breach parameters have been assessed using a variety of different methodologies, including Von Thun and Gillette (1990), Froelich (1995), Reclamation (1988) and Froelich and Fread (1996). Based on the results of these analyses, we estimate that an average 20 m wide breach with side slopes of 0.5H:1V may develop through the embankment over a period of 50 minutes.

For a piping-type failure, this breach may start as a small seepage hole through the embankment which would work its way back to the reservoir as fine material from the embankment is eroded by the flowing water. As the size of the hole increases, more water would flow through it, resulting in progressively more erosion of embankment material and increased flows. Eventually the roof of the "pipe" might collapse and an open channel with an average width of 20 m might develop through the embankment crest.

A peak dam discharge of approximately 260 m^3/s has been calculated for this breach scenario using a spreadsheet based on the storage-elevation curve of the reservoir and a broad-crested weir discharge relationship (Graph 2).



Graph 2. Computed dam break hydrograph resulting from 20 m wide breach developing over 50 minutes

As detailed in Section 2, we consider that any dam breach is "least unlikely" to occur through the Saddle Embankment in the vicinity of the worst tension cracking and seepage observed in 1995/1996 (Figure 1).

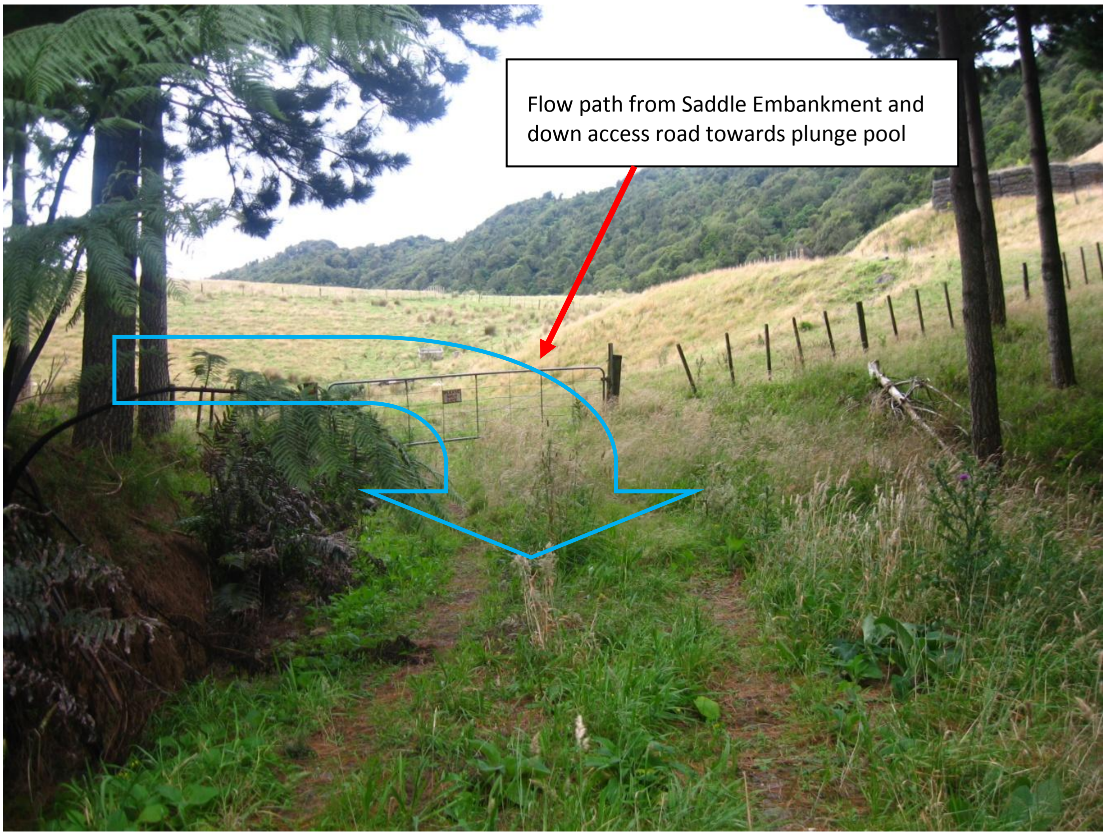
3.2 Effects of water discharge

3.2.1 Immediately downstream of Saddle Embankment

A walk-over of the expected discharge flow path was carried out in January 2011 to confirm the theoretical discharge course indicated by contour information. The assessed approximate flow path of an impoundment discharge is shown on Figures 1 to 3 in Appendix A and on Photographs 1 to 3 below. After breaching the Saddle Embankment, water would flow in an easterly direction for about 50 m before draining in a southerly direction towards the Junction Stream. Water would flow into and through the rock-lined stilling basin/plunge pool that the Southern Diversion Drain formerly discharged into, down an approximately 300 m length of channel lined with concrete (pumped inside an inflatable geotextile) and into the natural channel of a tributary of the Junction Stream.

While some erosion damage is likely to the plunge pool and the concrete-lined channel, there is no other mining infrastructure located within the inferred flow path. An unquantified level of erosion would also occur on the ground between the breach location and the stilling basin but, as this is all natural ground, we would not expect this to be very significant and readily able to be repaired if that was considered necessary.

Photograph 1. Inferred flow path of possible dam breach release



Photograph 2. Looking up along potential dam breach flood path towards Saddle Embankment (breach to left of photograph)

Photograph 3. Looking upstream along concrete-lined channel towards plunge pool

3.2.2 Wider receiving environment

To assess the effects of a possible dam breach discharge, the peak discharge has been compared with the 1 in 100 year flows in the Ohinemuri and Waitekauri rivers . A flow gauge has measured flows in the Ohinemuri River at Karangahake since 1956. The highest flow of 1,048 m^3/s was recorded on April 13 1981, and was considered to be approximately equivalent to a 1 in 100 year flow[15]. Scaling the 287 km^2 Ohinemuri catchment at Karangahake, a 1 in 100 year flow of approximately 240 m^3/s is estimated for the 45 km^2 catchment of the Waitekauri River at the SH2 Bridge/Ohinemuri confluence. It is noteworthy, however, that the finite volume of water in the Tailings Dam makes for a much shorter hydrograph peak than would normally be experienced in a natural flood, thereby reducing the magnitude of any flooding/erosion effects on the downstream channel.

Because the calculated unattenuated peak tailings dam discharge is similar (less than 10% difference) to the 1 in 100 year flow in the downstream reaches of the Waitekauri River, we consider that no more than minor damage would occur to the SH2 and Campbell Road bridges if these structures had been designed for a 1 in 100 year event (we have not verified the design standards for the bridges). However, we consider that the two smaller bridge and culvert crossings on Golden Cross Road, beginning at the confluence of the Junction Stream (Photograph 4) and Waitekauri River, are likely to experience significant damage in the event of a dam failure. Erosion of the Waitekauri River channel may also result in localised washouts affecting the Golden Cross Road where the channel is close to the road.

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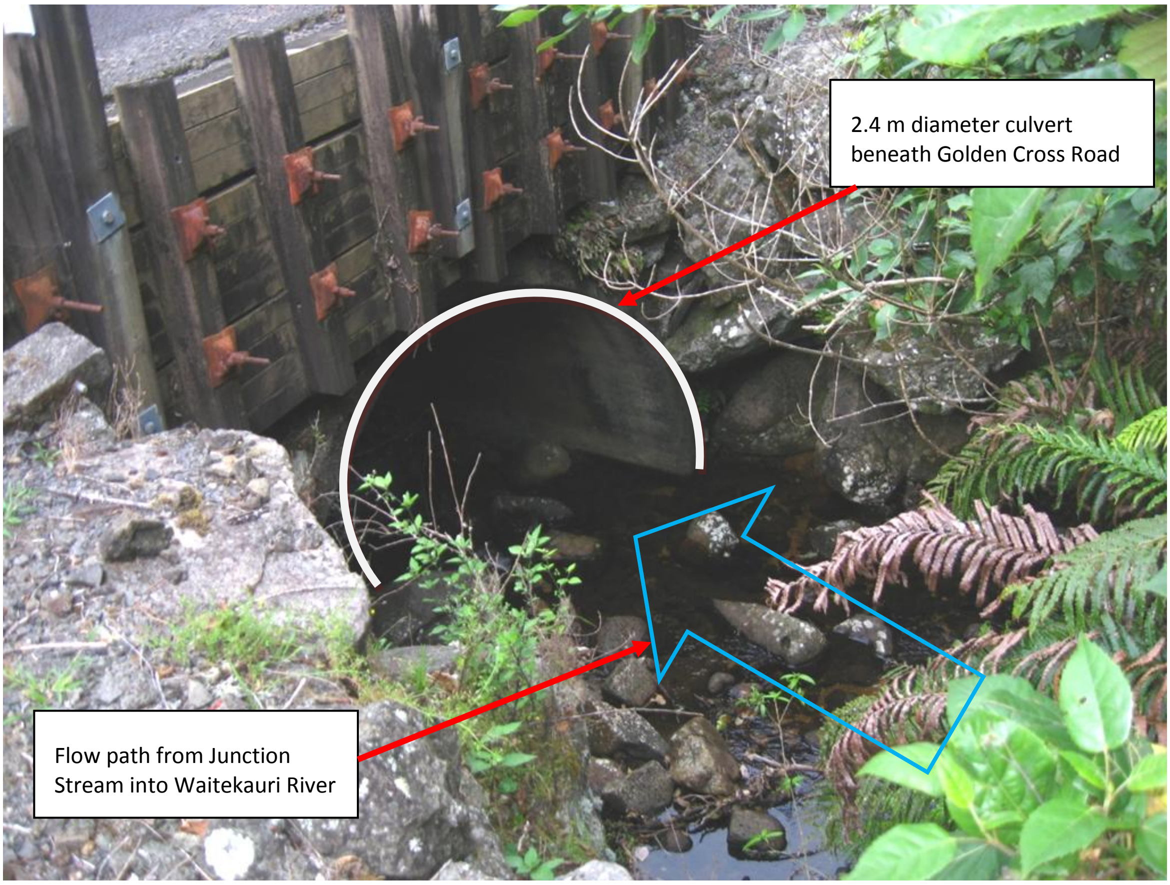
[15] Environment Waikato website accessed 20 December 2010: http://www.ew.govt.nz/riverlevelsandrainfall/cgi-bin/hydwebserver.cgi/points/details?point=244&catchment=17



Photograph 4. 2.4 m diameter culvert beneath Golden Cross Road through which the Junction Stream discharges into the Waitekauri River

Some erosion/scour damage to the Junction Stream and the upper reaches of the Waitekauri River could also be expected, although the Waitekauri River channel is relatively stable with large-sized boulders (up to 2.5 m diameter) lining the bed and banks. We have not quantified the amount of erosion damage that may occur, although we note that the high flow volumes/rates would be partially offset by the short duration of any dam break discharge. It is noteworthy that significant erosion damage within the Junction Stream channel shown on an aerial photograph taken in February 1998 shortly after Cyclone Fergus is not visible in an aerial photograph taken in 2007 and, indeed, significant vegetation growth (grass and pine trees) has occurred adjacent to the stream up to the present day (Photograph 5).

Photograph 5. Typical Junction Stream valley (rocky stream not visible in base of valley due to vegetation growth)

Residential dwellings adjacent to the Waitekauri River are all considered to be sufficiently elevated that they will not be affected by dam breach flows.

Given the relative magnitude of the dam breach discharge (i.e. an approximately 1 in 100 year flow in the Waitekauri River), the minor nature (i.e. relatively small culverts and bridges on a low volume dead end rural road) of the bridges that are considered likely to suffer significant damage and the fact that there are no at-risk dwellings, we do not consider it is highly likely that there would be a loss of life if the dam were to fail by piping of the Saddle Embankment.

3.3 Effects of embankment erosion

If a 20 m wide (average) breach were to develop through the Saddle Embankment to the level of the reservoir invert (as outlined in Section 3.1) , we estimate that approximately 15,000 m^3 of embankment material (including filter material) and tailings cap would be eroded away (Figure 4). With the exception of some of the granular filter materials, most of this is relatively fine grained soil which we expect would be entrained in the released water and conveyed into the Waitekauri/Ohinemuri river system. It is unlikely that this sediment would deposit in such a manner that it could be effectively cleaned up. However, the concentration of embankment material (15,000 m^3 in 730,000 m^3 of water or approximately 2% by volume) is such that the effect on the downstream environment would be expected to be fairly minor.

It is noteworthy that **no soil/rock with acid-producing potential was used** within the construction of the Saddle Embankment[16], which significantly reduces the potential impact of embankment erosion.

3.4 Effects of tailings discharge

Because the tailings have consolidated and are not judged to be readily flowable, a large scale release of tailings from the dam is considered to be unlikely. URS concluded that any tailings "flow" would not cross the property boundary, although some tailings fines are likely to be entrained and transported by the escaping water.[17]

We estimate that approximately 10,000 m^3 of tailings (in 730,000 m^3 of water or approximately 1.5% by volume) may be released in a dam breach scenario if the 20 m wide (average) breach through the embankment was to continue to the deepest point of the reservoir (approximately 150 m beyond the tailings cap) (Figure 4, Appendix A). As with the eroded embankment material, the eroded tailings are expected to be entrained in suspension in the released water and conveyed into the Waitekauri/Ohinemuri river system. Due to the diluted nature of the tailings it is unlikely that this sediment would deposit in such a manner that it could be effectively cleaned up.

URS have assessed the effects of such a discharge on the receiving environment and concluded that, due to the low volumes of tailings and the high degree of dilution, the environmental effects of this release are expected to be minimal.[18] We have not undertaken an independent assessment of the likely effects of a tailings release of this magnitude on the downstream aquatic environment.

4 Estimated remedial costs following a failure of the Tailings Dam

Section 3 outlines the possible damage that could occur in the highly unlikely event of a breach of the Saddle Embankment of the magnitude described in Section 3.1. Table 1 summarises the likely costs (in present value NZ$ excluding GST) of cleaning up the downstream environment, remediating any damage and repairing the dam embankment (further detail provided in Appendix B).

We note that the cost of repairing the dam embankment and nearby natural ground erosion may be estimated with a reasonable degree of accuracy (± 20%) as the volume of embankment erosion is prescribed by the empirical dam breach equations – i.e. the magnitude of damage is "known" [this assessment of ± 20% accuracy ignores the inherent uncertainty in the use of empirical equations to develop breach parameters].

However, the cost of some of the repairs downstream of the embankment is more difficult to estimate with accuracy as the magnitude of damage due to the breach flow is harder to quantify. We have estimated damage levels based on a number of assumptions (e.g. design standards of existing bridges, extent of erosion, etc) and have then endeavoured to assign sensible costs to repair this damage. Accordingly, Table 1 presents an assessment of the expected accuracy of the cost estimate (confidence level) for each of the respective items along with an indication of the accuracy of the total cost calculated as a weighted average.

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[16] T&T, 10183 Golden Cross Project: Union Embankment, Tailings Storage and Related Works – Design Report, December 1989, p.6.
[17] URS, Risk Report for Golden Cross, 2004, p. 7.5.
[18] URS, Risk Report for Golden Cross, 2004, p. 7.6.

Table 1. Summary of estimated remedial costs from failure of Tailings Dam

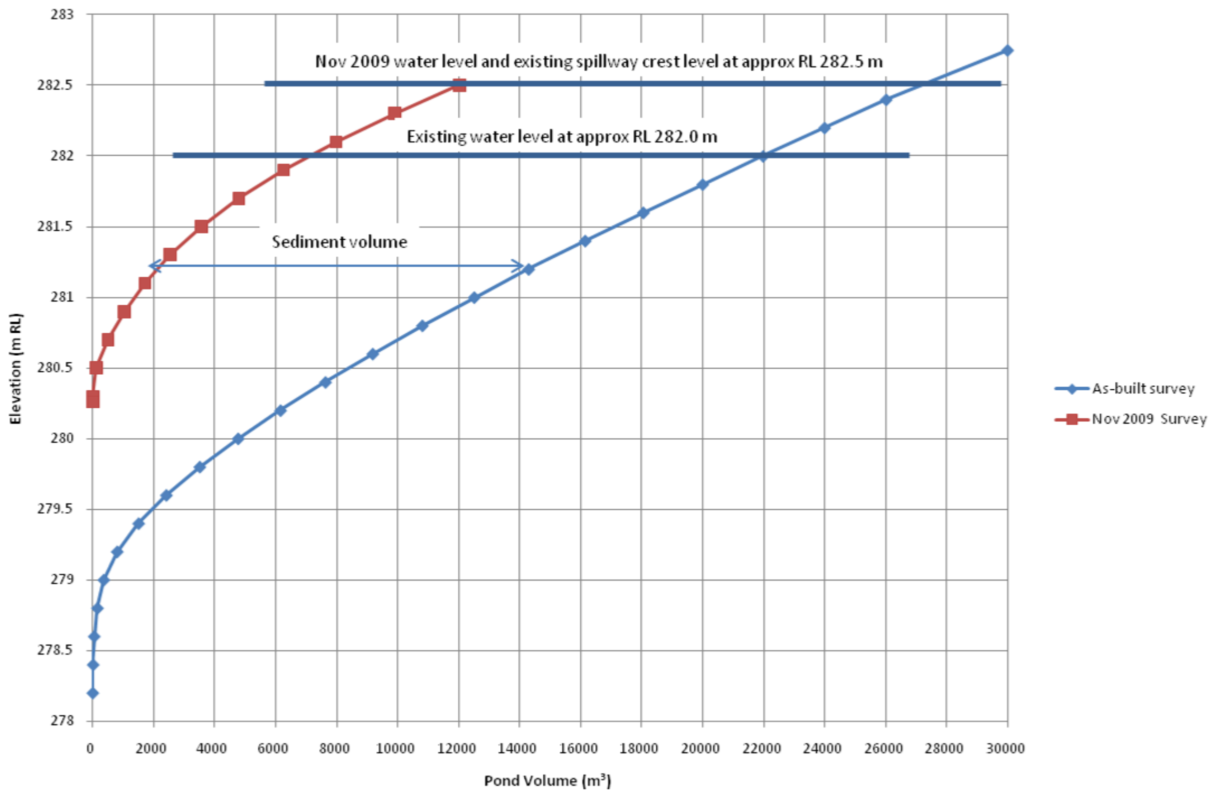
Type of damage	Description of damage / likely repairs or testing required	Estimated cost to remediate (2011 NZ$ excluding GST) with indicative accuracy
Embankment	(i) Damage: Erosion of 15,000 m^3 of embankment material (ii) Remedial works: Reconstruct zoned saddle embankment (including a thickened filter buttress) and tailings cap	$600,000 (± 20%)
Flood damage	**A. Low Level Infrastructure** (i) Damage: Significant damage to low level bridge and culvert crossings over the Waitekauri River and localised washouts on Golden Cross Road (ii) Remedial works: Repair bridge damage, replace culverts and reinstate washouts	$400,000 (± 50%)
	B. Higher Level Infrastructure (i) Damage: Minor damage to the Campbell Road and SH2 bridge crossings over the Waitekauri River (ii) Remedial works: Repair road and bridge damage	$200,000 (± 50%)
	C. Ancillary Damage (i) Damage: Damage to fences, sheds etc at Golden Cross and on properties within the Waitekauri River flood plain (ii) Remedial works: Repair fences and sheds	$100,000 (± 50%)
	D. Near- Dam Erosion (i) Damage: 5,000 m^2 of erosion damage immediately downstream of the Saddle Embankment in the area of the left abutment (ii) Remedial works: Replace with selected compacted fill and grass	$100,000 (± 20%)
Tailings release	**A. Tailings Erosion** (i) Damage: Erosion of 10,000 m^3 of tailings and deposition downstream (ii) Remedial works: Return of any areas of deposited tailings to the tailings dam (unlikely given expected dilution and dispersion)	$50,000 (± 100%)
	B. Testing Chemical/ecological testing of receiving waters to quantify effects on environment (noting that URS expects environmental damage to be minimal[19])	$50,000 (± 50%)
TOTAL		$1,500,000 (± 40% weighted average)

5 Union Silt Dam

5.1 Description

The USD is located approximately 900 m south west of the Tailings Dam, across the road from the Water Treatment Plant. As with the Tailings Dam, depth soundings were undertaken in November 2009 to determine the volume of the pond. A contour plan is attached as Figure 6 in Appendix A and a storage-elevation curve is shown in Graph 3 below.

At the time of the survey, the water level in the pond was controlled by a discharge pipe approximately 0.5 m below the spillway crest. Typical details are shown in Photographs 6 and 7. Subsequent to the survey being undertaken, the discharge pipe and spillway were lowered by approximately 0.55 m – i.e. the November 2009 water level was approximately equal to the level of the current spillway. The new operating water level is at approximately RL 282.0 m and the new spillway crest is at approximately RL 282.5 m giving the dam impoundment a maximum water depth of about 2.3 m and a water volume of approximately 12,000 m^3.



Graph 3. USD storage-elevation curve as measured in November 2009

Photograph 6. Lowered USD overland spillway (pipe discharge approximately 0.5 m below spillway level)

Photograph 7. Looking along USD embankment (left) towards spillway

5.2 Landslide context and dam strengthening

The USD is located at the south-west extent of the Golden Cross Landslide (Figure 2, Appendix A). During the period of highest movement rates of the Golden Cross Landslide (1995-1997), it was discovered that the USD was intersected by the landslide boundary. This created a shear zone within the dam between the stationary (western) part of the dam outside the landslide and the eastern part of the dam located on the landslide. Distortion of up to 1.4 m occurred at this point without any apparent effect on the dam's stability, water retention ability or underdrain flows. This is thought to be due to the high plasticity of the clay rich argillic material used for the central low permeability core. This material is a highly weathered, hydrothermally altered Coromandel Group andesite that was specially selected for its plasticity and non-brittle behaviour.

Notwithstanding the confidence in the ability of the central core material to behave plastically (i.e. to avoid brittle cracking), it was decided to significantly strengthen the dam with regard to stability and filter capacity. This was achieved by constructing a 5 m thick graded filter buttress (the USD Filter Buttress) with additional subsoil and collector drains. Details are shown on Drawing 13732-01 (Appendix C) and construction was carried out in 1996-1997.

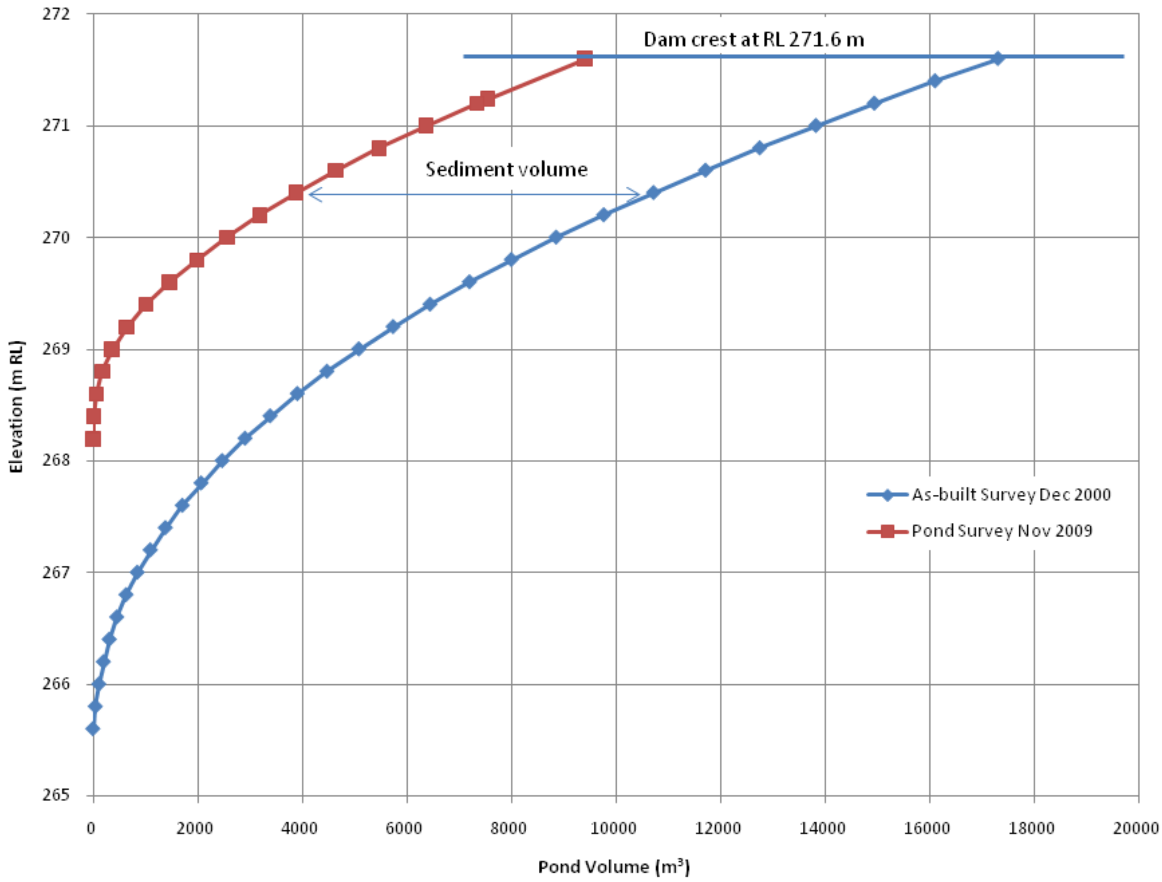
The works, coupled with the wider scale landslide stabilisation works, appear to have been successful, with the dam having shown no subsequent signs of distress. At current landslide movement rates, the dam is estimated to have more than 400 years of life before the filter protection is at all compromised. Thus, it is considered that this structure is highly unlikely to fail.

6 Stockyard Silt Dam

6.1 Description

The SYSD is located approximately 250 m south east of the USD. Depth soundings were also undertaken for this dam in November 2009 to determine the volume of the pond. A contour plan is attached at Figure 7 in Appendix A and a storage-elevation curve is shown in Graph 4 below.

The water level in the pond is controlled by a spillway discharge over the shotcrete lined embankment crest (Photograph 8). At this level the dam impoundment has a maximum water depth of about 3.5 m and a water volume of approximately 9,500 m^3.



Graph 4. SYSD storage-elevation curve as measured in November 2009

Photograph 8. SYSD crest/spillway looking from left abutment, with low point in crest at the far end

6.2 Landslide context

The SYSD is located wholly within the lower slide segment of the Golden Cross Landslide (Figure 2, Appendix A) and has moved with the slide since its construction. It is remote from the slide boundaries (greater than 200 m to the closest boundary) and its performance has been unaffected by landslide movement. We note that the downstream shoulder comprises large rockfill (average particle size of approximately 500 mm) which is designed to resist flood flows, so a failure is considered to be extremely unlikely even with a significant dam overtopping flood event.

7 Conclusions

7.1 Tailings Dam

Given the robust design of the Golden Cross Tailings Dam spillway system, the strength and relatively low shoulder slopes of the dam embankments and the low rates of landslide movement recorded over the last decade, a failure of the Tailings Dam is considered to be highly unlikely. Nonetheless, we consider that the “least unlikely” failure scenario is a landslip induced piping failure of the Saddle Embankment on the landslide margin in the vicinity of the most significant tension cracking and seepage observed during construction of the stabilising Saddle filter buttress in 1995/1996. If such a failure were to occur, it is considered that the following damage and effects may eventuate:

- Formation of an average 20 m wide breach developing through the Saddle Embankment, tailings cap and tailings to the deepest point of the reservoir, requiring the erosion of approximately 15,000 m^3 of embankment/cap material (with no acid producing potential) and 10,000 m^3 of tailings.
- Release of 730,000 m^3 of water at a peak flow of 260 m^3/s (roughly equivalent to a 1 in 100 year flow in the downstream reaches of the Waitekauri River).
- Relatively minor erosion damage to the former Southern Diversion Drain Stilling Basin and 300 m of concrete-lined channel, as well as to the natural ground between the Saddle Embankment and the stilling basin.
- Relatively minor erosion damage to the Junction Stream and upper reaches of the Waitekauri River.
- Significant damage to two bridge/culvert crossings and localised washouts on Golden Cross Road.
- Minor damage to the Campbell Road and SH2 bridges.
- Damage to fences, etc on the Waitekauri River flood plain.
- No dwellings are expected to be affected.
- The environmental effects of sediment and tailings release are expected to be minor due to their dilution by 730,000 m^3 of water.

Repairing the damage caused is estimated to cost in the order of NZ$1,500,000 (plus GST) as at 31 March 2011.

7.2 Union Silt Dam

A failure of the USD in considered to be highly unlikely given the strengthening works that were undertaken, the current movement rate of the Golden Cross Landslide and the small contributory catchment.

7.3 Stockyard Silt Dam

A failure of the SYSD in considered to be highly unlikely given the location of the dam within the body of the Golden Cross Landslide and the large rockfill construction of the downstream shoulder of the dam.

8 Applicability

This report has been prepared for the benefit of Coeur D'Alene Mines Corporation with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor LTD

Environmental and Engineering Consultants

Report prepared by:	Authorised for Tonkin & Taylor Ltd by:
....	....
Paul Hayes	Grant Loney
Geotechnical Engineer	Project Director

PJH

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Appendix A: Figures 1 to 7

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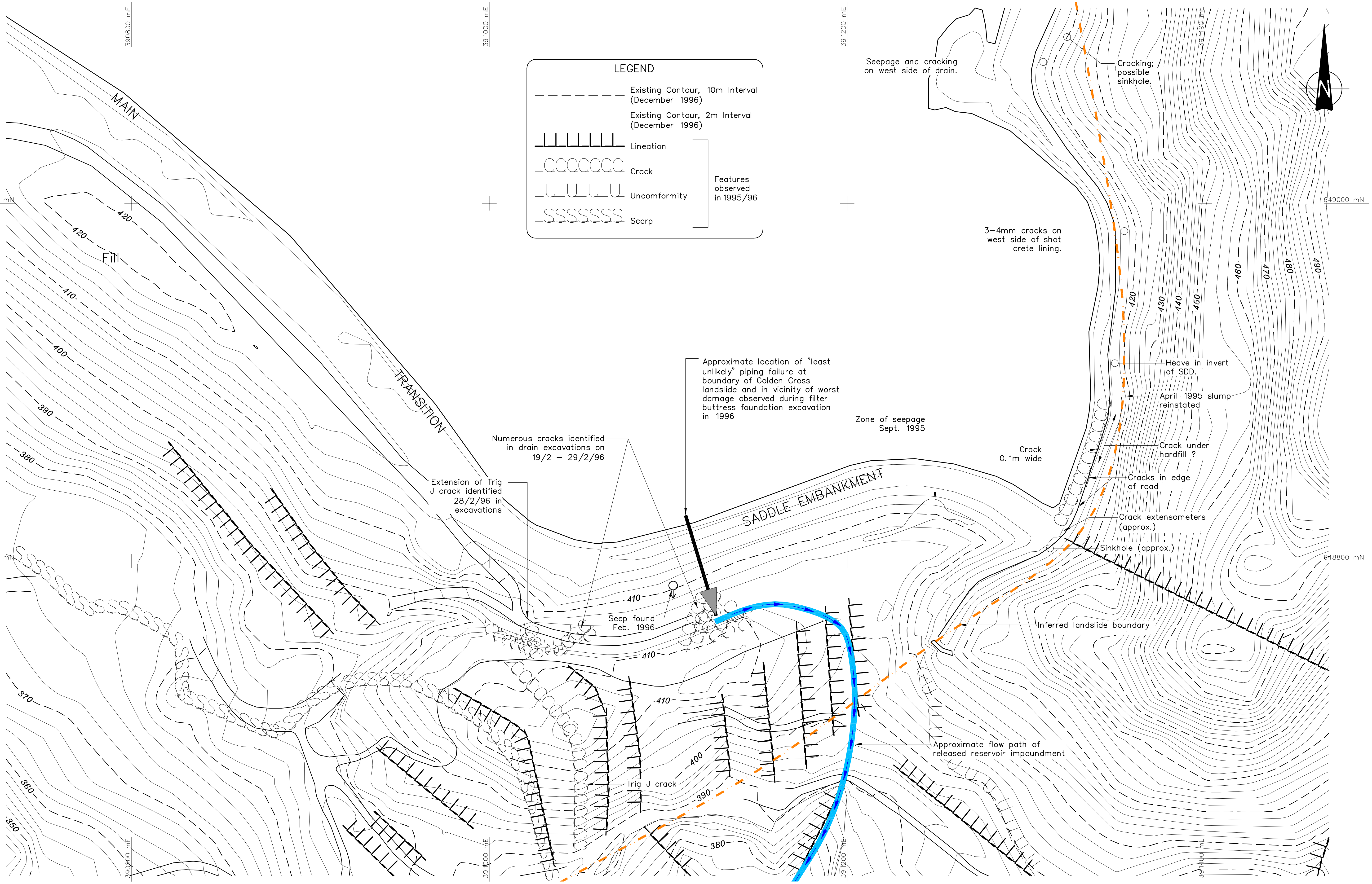

NOTES:

1. Based drawing are sourced from T&T 14947–F01 drawing dated June 1996.
2. Coordinate Datum: NZ Geodetic 1949 Mt Eden Circuit Coordinates
   Origin: Mt Eden 16 700,000 mN 300,000 mE
   Level Datum: LINZ (MSL) Moturiki Vertical Datum 1953

SCALE 1:2000

0 20 40 60 80 100 (m)

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GOLDEN CROSS TAILINGS DAM

"Least Unlikely" Location of Piping Failure

FIG. No. Figure 1

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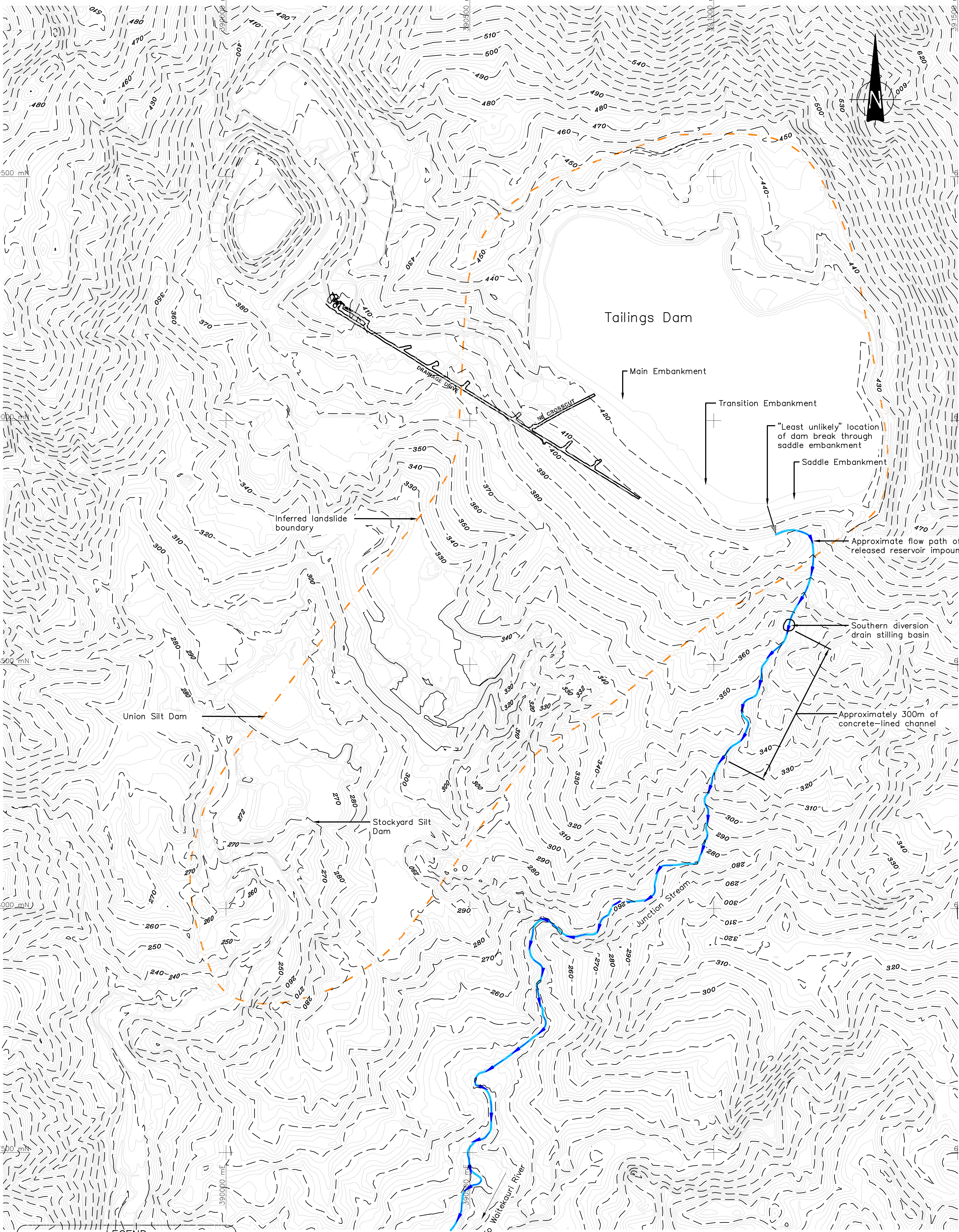

LEGEND

Existing Contour 10m Interval (April 1998)

Existing Contour 2m Interval (April 1998)

Approximate Flow Path

SCALE 1: 7500

0 100 200 300 400 500 (m)

NOTES:

1. Based drawing are sourced from T&T 12– 190 drawing dated April 1997.

2. Coordinate Datum: NZ Geodetic 1949 Mt Eden Circuit Coordinates
Origin: Mt Eden 16 700,000 mN 300,000 mE
Level Datum: LINZ (MSL) Moturiki Vertical Datum 1953

391000 mE 391500 mE

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GOLDEN CROSS TAILINGS DAM

Likely Flow Path of Resevoir Contents

FIG. No. Figure 2

REV. 0

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NOTES:

1. Topomap sourced from Terralink International (Copyright 2002–2005 Terralink International Limited and its licensors).

SCALE 1: 30000

0 300 600 900 1200 1500 (m)

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GOLDEN CROSS TAILINGS DAM

Downstream of Tailings Dam

FIG. No. Figure 3

REV. 0

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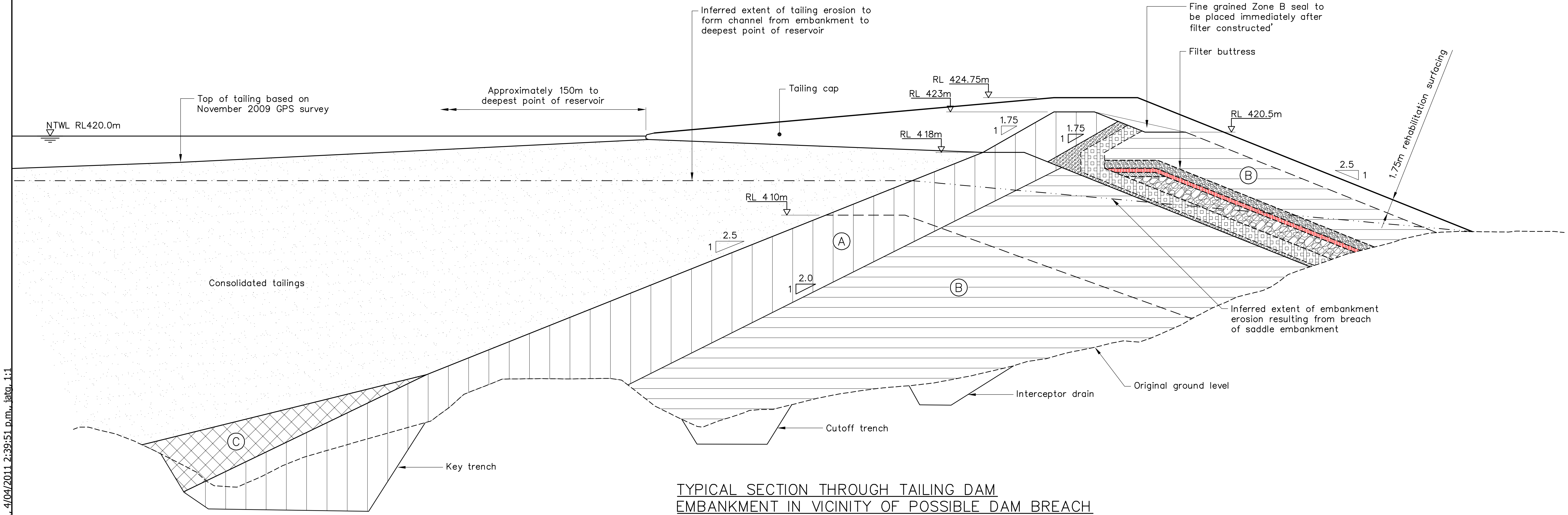

TYPICAL SECTION THROUGH TAILING DAM
EMBANKMENT IN VICINITY OF POSSIBLE DAM BREACH
SCALE 1:500

NOTE:
1. Drawing collated from following sources:
- T&T 1061–35–TD–48–2 – Golden Cross Project Mining & Waste Disposal Works – Saddle Embankment Foundation Details (Oct. 1990)
- T&T 1061–35–TD–48–3 – Golden Cross Project Mining & Waste Disposal Works – Interim Profiles & Transition/Saddle Zoning (Oct. 1990)
- T&T 12520–P41–S1 – Golden Cross Project Asbuilt September 1999 – RL423m Crest Saddle Embankment – Typical Cross Section (Aug. 2001)
- Coeur Memorandum, Andrew Sands, Re: Tailings Capping Trials (10 June 1998)

A3 SCALE 1:500
0 5 10 15 20 25 (m)

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GOLDEN CROSS TAILINGS DAM

Saddle Embankment Cross Section

FIG. No. Figure 4

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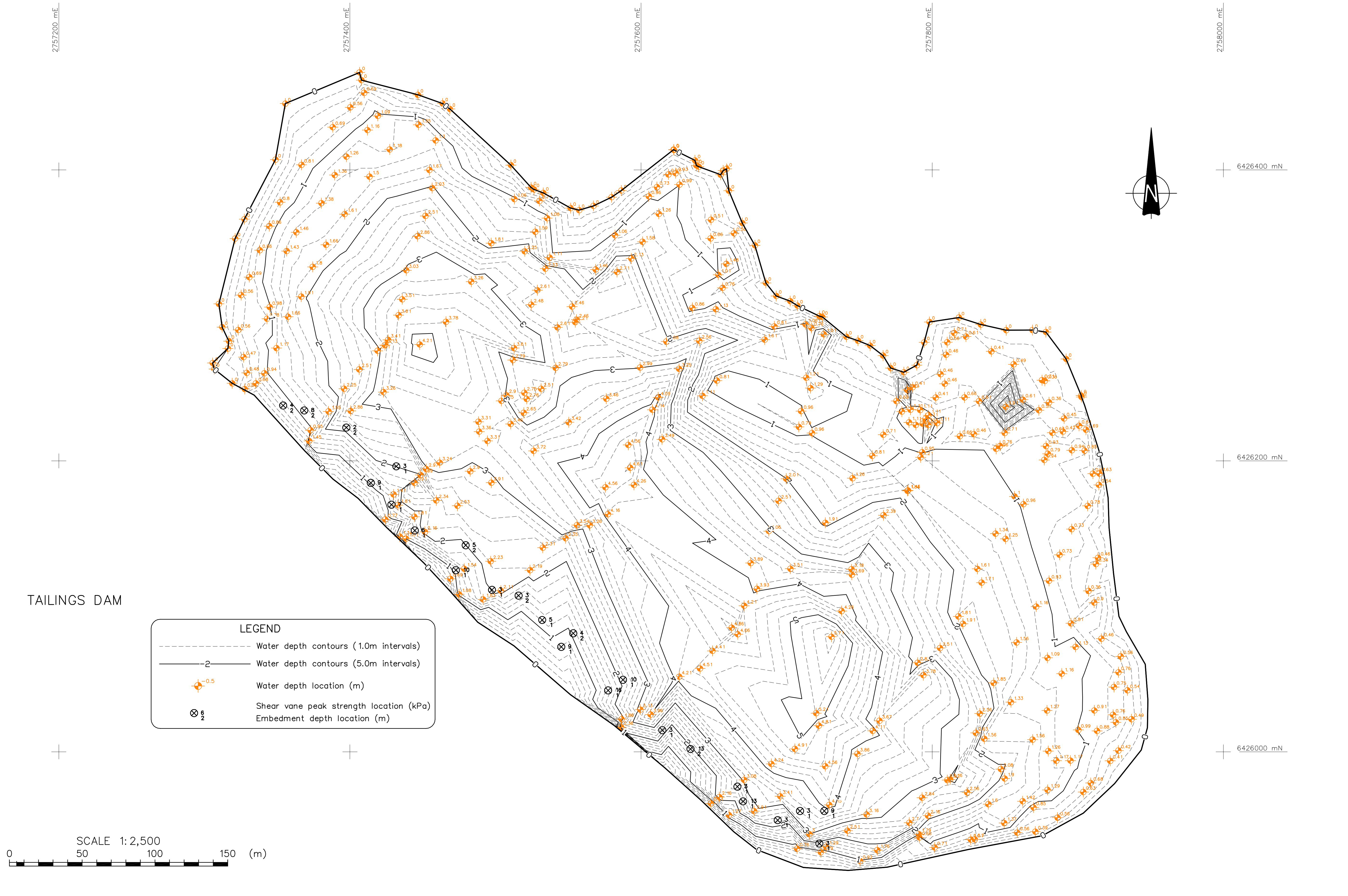

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GOLDEN CROSS TAILINGS DAM
Tailings Dam Depth Soundings

FIG. No. Figure 5

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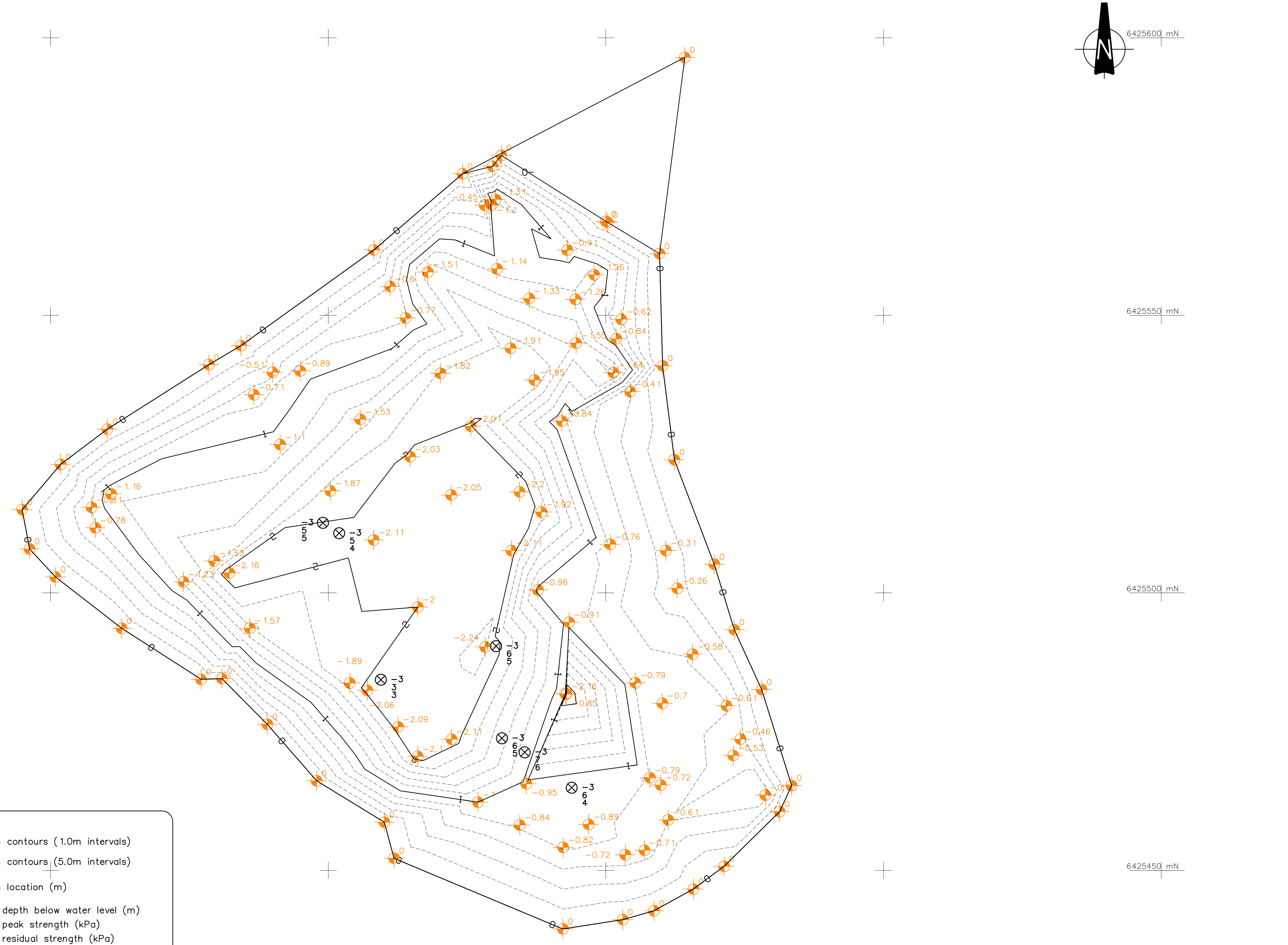

LEGEND

- - - - -	Water depth contours (1.0m intervals)
——2——	Water depth contours (5.0m intervals)
(location symbol) 0	Water depth location (m)
⊗ −3 / 6 / 5	Shear vane depth below water level (m) Shear vane peak strength (kPa) Shear vane residual strength (kPa)

NOTES:
1. All dimensions are in millimetres unless noted otherwise.
2. Coordinates datum: NZ Geodetic 1949 New Zealand Map Grid.

SCALE 1: 750

0 10 20 30 40 50 (m)

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GOLDEN CROSS TAILINGS DAM

Union Silt Dam Depth Soundings

FIG. No. Figure 6

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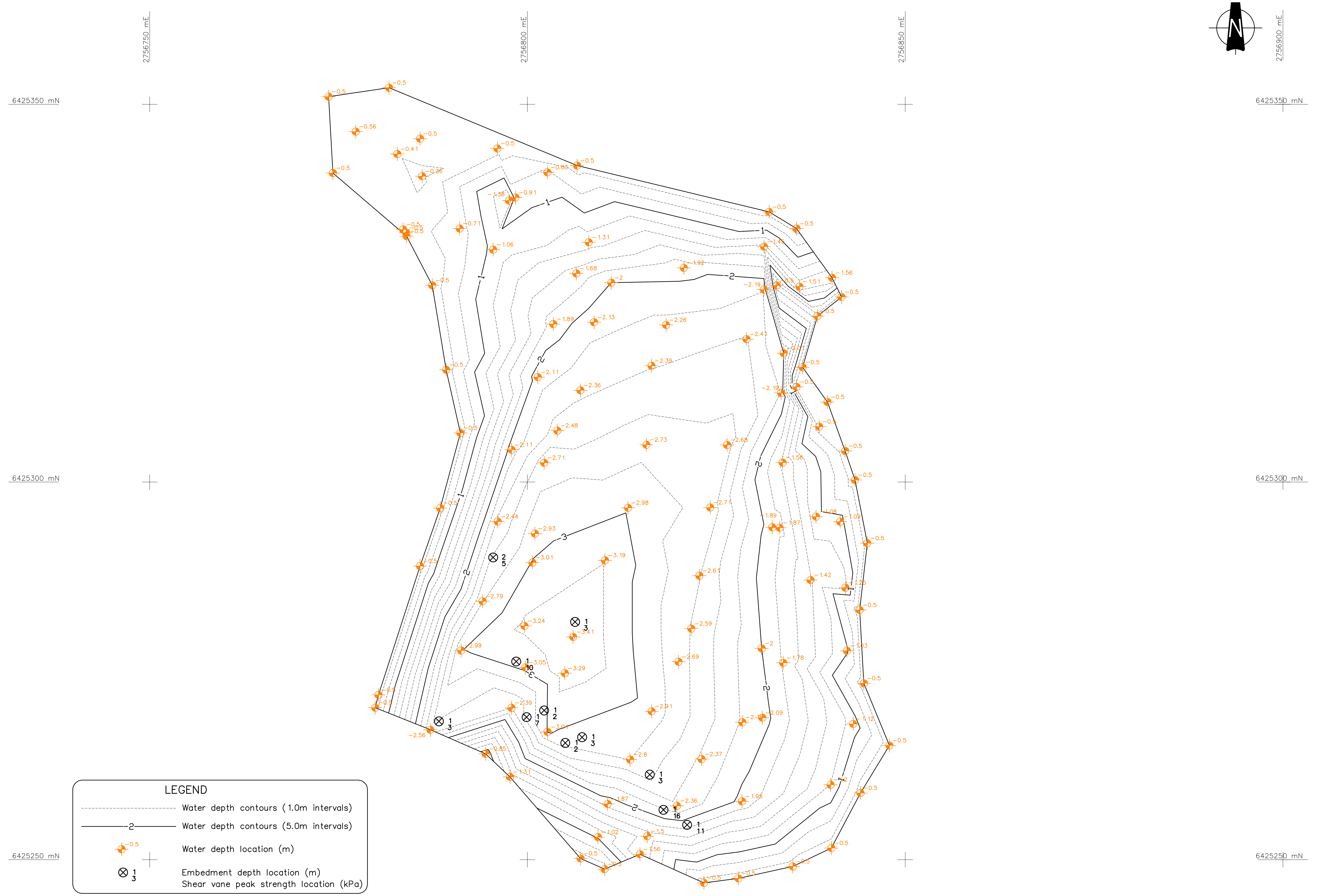

LEGEND

- Water depth contours (1.0m intervals)
- Water depth contours (5.0m intervals)
- Water depth location (m)
- Embedment depth location (m) / Shear vane peak strength location (kPa)

NOTES:
1. All dimensions are in millimetres unless noted otherwise.
2. Coordinates datum: NZ Geodetic 1949 New Zealand Map Grid.

SCALE 1:500

0 5 10 15 20 25 (m)

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GOLDEN CROSS TAILINGS DAM

Stockyard Silt Dam Depth Soundings

FIG. No. Figure 7

REV. 0

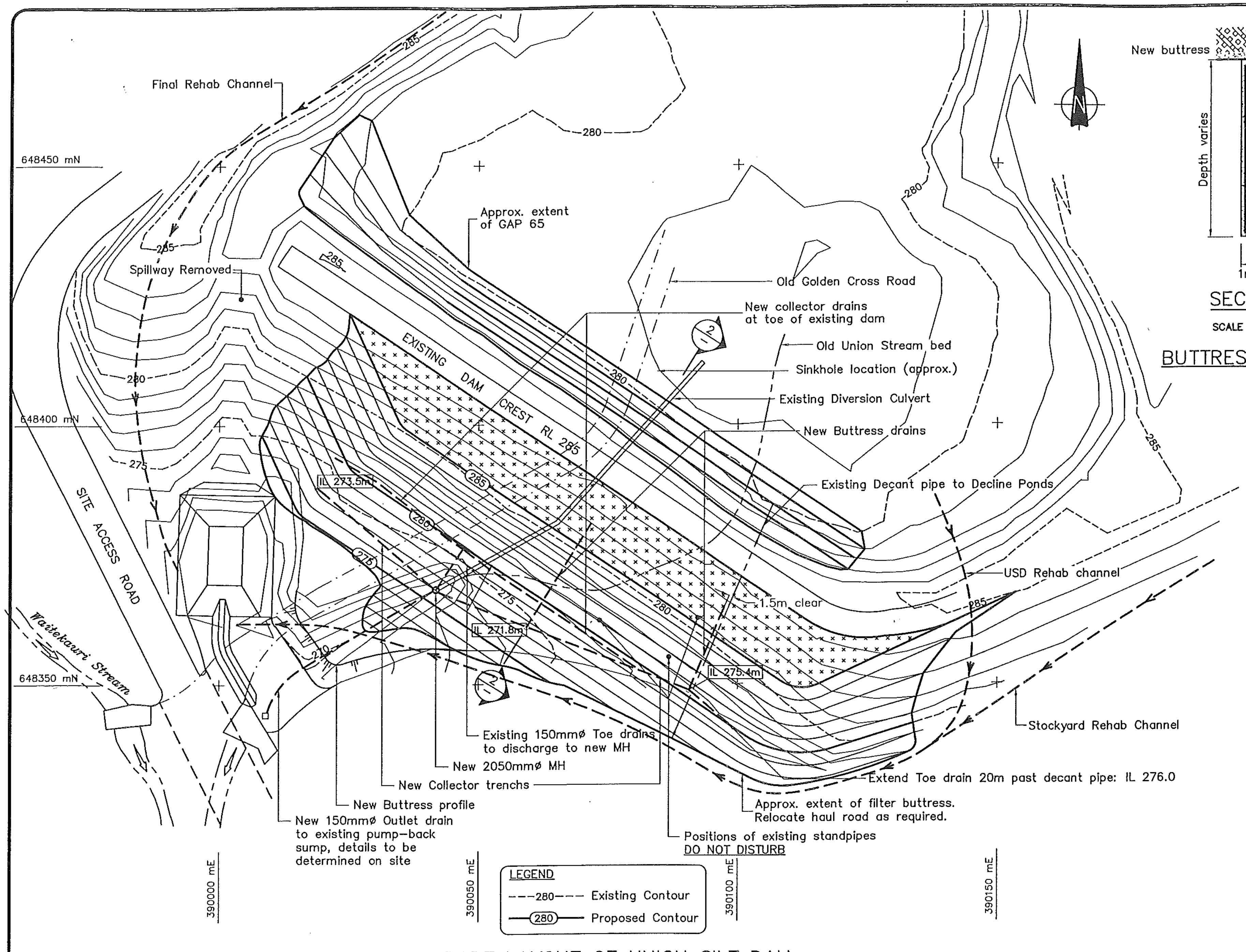
Appendix B: Cost estimate for Tailings Dam remedial works

Job Name: Golden Cross
Job Number: 613625.001
Client: Coeur d'Alene Mines Corporation

Title: Estimated remedial costs in the event of a piping-induced breach of the Tailings Dam Saddle Embankment

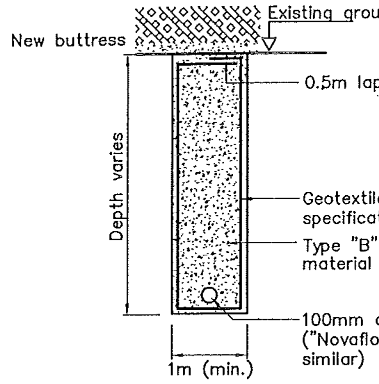
Type of damage	Description of damage	Item	Unit	Quantity	Rate	Estimated cost	Total estimated cost
Flood damage	Significant damage to low level bridge and culvert crossings over the Waitekauri River and localised washouts on Golden Cross Road	Design and consenting for culverts/bridges	PS	2	$10,000	$20,000	
		Culvert repairs - replace 8 m of 2.4 m diameter culvert and headwalls, backfill and 40 m2 of seal	PS	1	$80,000	$80,000	
		Bridge repairs - repairs to single land bridge abutments, piers and deck, but not complete replacement	PS	1	$150,000	$150,000	
		Washout repairs to northbound shoulder of Golden Cross Road	PS	6	$25,000	$150,000	**$400,000**
	Minor damage to the Campbell Road and SH2 bridge crossings over the Waitekauri River	Design and consenting for bridges	PS	2	$10,000	$20,000	
		Repairs to bridge abutments and erosion protection	PS	2	$90,000	$180,000	**$200,000**
	Damage to fences, sheds etc at Golden Cross and on properties within the Waitekauri River flood plain	Repair farm sheds	PS	3	$15,000	$45,000	
		Repair fords on farm tracks	PS	5	$6,000	$30,000	
		Repair farm fences	m	500	$50	$25,000	**$100,000**
	Erosion damage immediately downstream of the Saddle Embankment in the area of the left abutment	Place and compact suitable fill to repair eroded zones, particularly at toe of Saddle Embankment	cu.m	3000	$20	$60,000	
		Regrass exposed areas	sq.m	5000	$4	$20,000	
		Reinstate access tracks, fences and gates	PS	1	$20,000	$20,000	**$100,000**
Tailings release	Return of any areas of deposited tailings to the tailings dam (unlikely given expected dilution and dispersion)	Excavator and truck and trailer hire to pick up any accessible deposits and return to Golden Cross	days	10	$5,000	$50,000	**$50,000**
	Chemical/ecological testing of receiving waters to quantify effects on environment (noting that URS expects environmental damage to be minimal)	Site sampling and laboratory testing	PS	1	$50,000	$50,000	**$50,000**
Embankment	Reconstruct zoned saddle embankment (including perhaps a thickened filter buttress) and tailings cap	Place and compact Type A fill	cu.m	2400	$20	$48,000	
		Place and compact Type B fill	cu.m	4100	$20	$82,000	
		Place and compact filter material (increase overall width from 5.5 m to 8 m)	cu.m	2800	$60	$168,000	
		Place and compact rehabilitation surfacing	cu.m	2000	$35	$70,000	
		Place and compact tailings cap	cu.m	3700	$50	$185,000	
		Regrass exposed areas	sq.m	4250	$4	$17,000	
		Design, supervision and earthworks testing	PS	1	$30,000	$30,000	**$600,000**
Total estimated remedial cost in event of breach of Tailings Dam Saddle Embankment (Jan 31 2011 NZ$ excluding GST)							**$1,500,000**

Appendix C: USD strengthening works



PART LAYOUT OF UNION SILT DAM

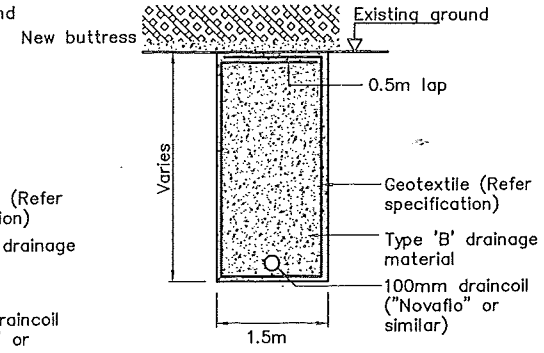
SCALE 1:500



SECTION 1

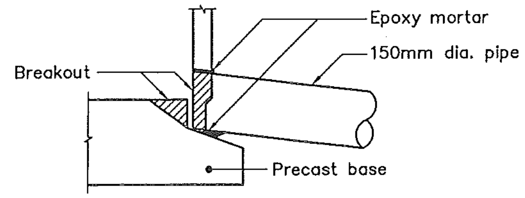
SCALE 1 : 50

BUTTRESS DRAIN DETAIL



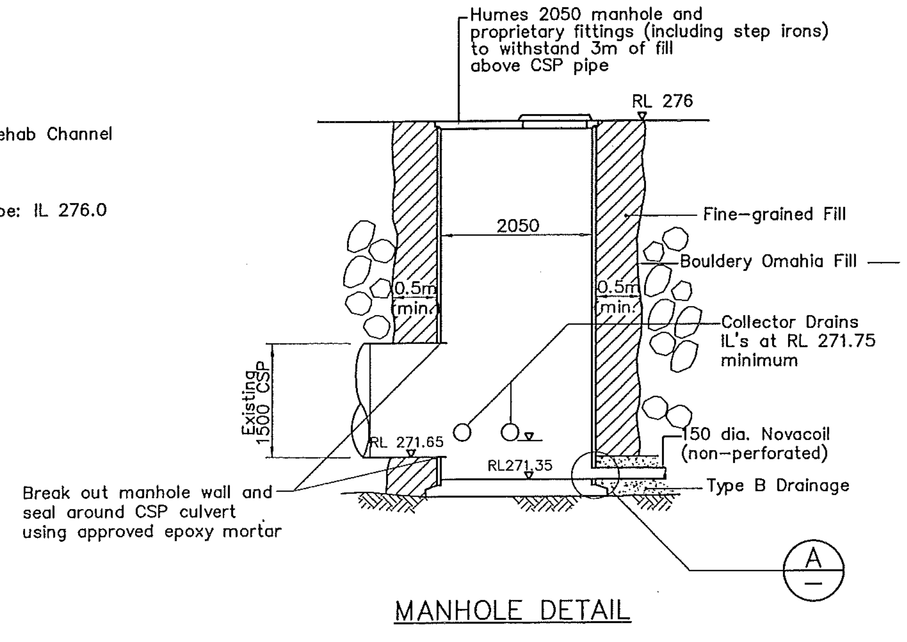
COLLECTOR TRENCH DETAIL

SCALE 1 : 50



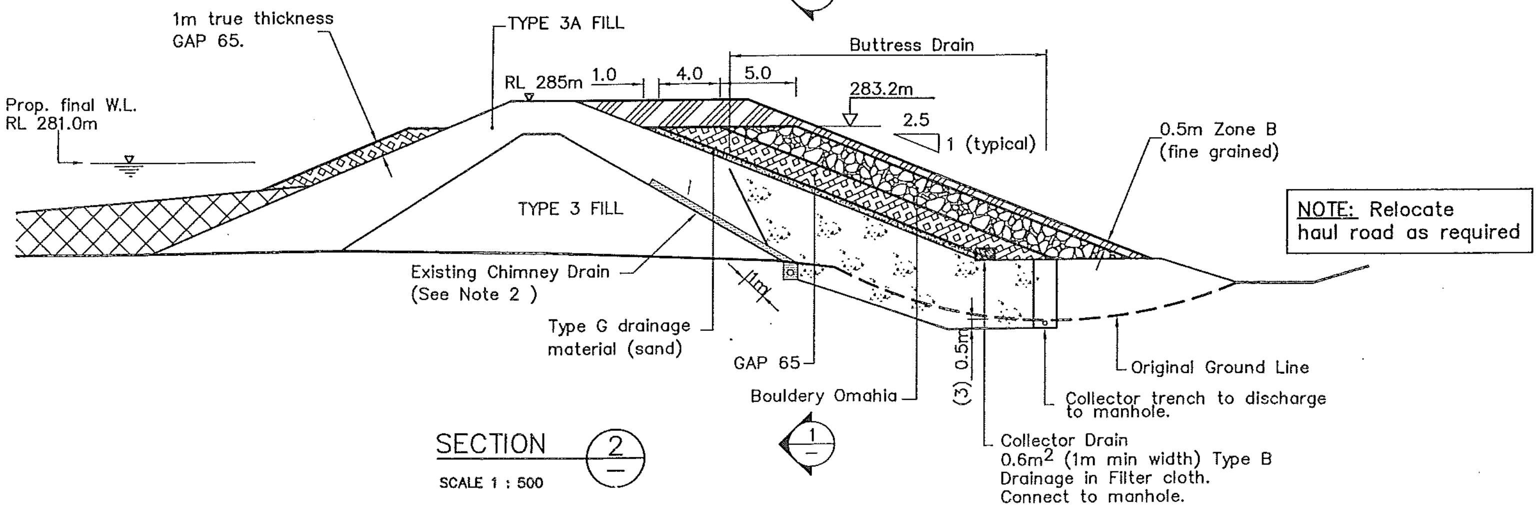
DETAIL A

N.T.S.



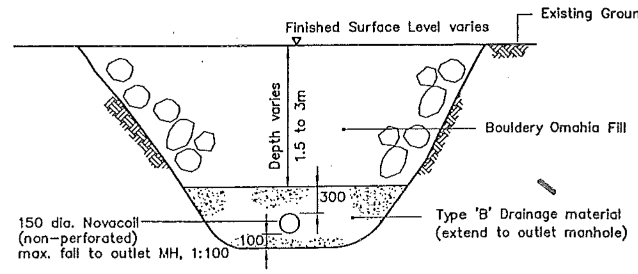
MANHOLE DETAIL

SCALE 1:50



SECTION 2

SCALE 1 : 500



OUTLET DRAIN DETAIL

N.T.S.

SCALE 1:500

0 2.5 5 7.5 10 15 20 25 (m)

NOTES:
1. The buttress drain shall extend and lap the existing chimney drain by not less than 1m (slope length). The exposed chimney drain shall be inspected by the Engineer prior to backfilling.
2. The existing 150 dia. "Novaflo" draincoil shall be diverted into the collector trench. The Engineer shall confirm any requirements for diverting the chimney drain collector into the collector trench following inspection.
3. The buttress drain trench invert shall extend not less than 0.5m below original ground level. The invert shall grade towards the collector trench at steeper than 1 in 100.
4. Where the buttress drain is adjacent to the existing decant pipe, the Contractor shall manually probe ahead of the excavator and carefully locate the pipe. All excavation work within 1m of the pipe shall be carried out manually.
5. The new buttress fill profile shall be developed using bouldery Omahia fill.
6. Drain positions and lengths to be confirmed on site by Engineer.
7. All invert levels and grades to be confirmed on site by Engineer.
8. All works to be in accordance with Contract Specification and Health and Safety requirements.
9. Sinkholes on U/S shoulder repaired March 1996.
10. Contours are As-built surveyed by S. Kusabs at 1m intervals.

	REVISION DESCRIPTION	BY	DATE
S	As-Built Issue	GAL	08/01
A	Construction Issue	G.A.L.	26/3/96

DESIGNED	G.A.L.	3/96
DRAWN	R.B.S.	NOV.95
DRAWING CHECKED		
APPROVED :		

This drawing is not to be used for construction purposes unless signed as approved

REFERENCE

CAD FILE : 13732001

TONKIN & TAYLOR LTD.
ENVIRONMENTAL & ENGINEERING CONSULTANTS
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GOLDEN CROSS MINE

UNION SILT DAM AS BUILT Supplementary Drainage / Buttress Work

SCALES (AT A1 SIZE) AS SHOWN

DWG. No. 13732-01 REV. S

GOVERNMENT OIL & GAS INFRASTRUCTURE POWER INDUSTRIAL

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