NEVADA GEOTHERMAL POWER INC

DEEP BLUE NO.2 Geothermal Test Well
Phase III – Flow & Injection Testing Report

Blue Mountain, Humboldt County, Nevada, U.S.A

To: US Department of Energy
Golden Field Office
Office of Program Management
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Cooperative Agreement No. DE-FC04-2002AL68297
Geothermal Resource Exploration & Definition Program

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EXECUTIVE SUMMARY

The report documents the drilling of well Deep Blue No.2, the second deep geothermal test hole at the Blue Mountain Geothermal Area, Humboldt County, Nevada. The well was drilled by Noramex Corp, a Nevada company, with funding support from the US Department of Energy, under the DOE's GRED II Program.

Deep Blue No.2 was drilled as a 'step-out' hole from Deep Blue No.1, to further evaluate the commercial potential of the geothermal resource. Deep Blue No.2 was designed as a vertical, slim observation test hole to a nominal target depth of 1000 meters (nominal 3400 feet). The well tests an area of projected high temperatures at depth, from temperature gradients measured in a group of shallow drill holes located approximately one kilometer to the northeast of observation hole Deep Blue No.1. The well is not intended for, or designed as, a commercial well or a production well.

Deep Blue No.2 was spudded on March 25, 2004 and completed to a total depth of 1127.76m (3700 ft) on April 28, 2004. The well was drilled using conventional rotary drilling techniques to a depth of 201.17 m (660 ft), and continuously cored from 201.17m (660 ft) to 1127.76m (3700 ft). A brief rig-on flow-test was conducted at completion to determine basic reservoir parameters and obtain fluid samples. A permeable fracture zone with measured temperatures of 150 to 167°C (302 to 333°F) occurs between 500 to 750m (1640 to 2461ft). The well was left un-lined in anticipation of the Phase III - Flow and Injection Testing.

A further Kuster temperature survey was attempted after the well had been shut in for almost 3 weeks. The well appears to have bridged off at 439m (1440ft) as the Kuster tool was unable to descend past this point. Several attempts to dislodge the obstruction using tube jars were unsuccessful.

Deep Blue No.2 encountered variably fractured and veined, fine-grained rocks of the Singas Formation, and intruded by minor strongly altered fine-grained felsic dikes, and less altered fine- to medium-grained felsic to intermediate dikes.

Widespread open fractures and extensive of quartz veining in many intervals of the core indicate a high degree of fracturing and flow of silica-bearing fluids, almost certainly hotter than 200°C (392°F), at some time, but these fractures are now partially sealed. Intervals of soft shaly mudstone, common clay gouge, and rocks with generally low permeability (few veins and fractures) may also form a seal or 'cap' above the main high temperature reservoir at Blue Mountain.

The encouraging results from Deep Blue No.2 support further drilling at Blue Mountain. Higher temperature fluids can be expected where fractures providing channels for the circulation of hot water from depth have not been sealed extensively by silica deposition.

1.0 INTRODUCTION

1.1 Terms of Reference

Noramex Corp, a Nevada company, owns a 100% interest in geothermal leases, comprising 12 Sections, approximately 31km² (12mi²) at the Blue Mountain Geothermal Area in Humboldt County, Nevada.

In November 2000, Noramex was awarded a cost-share program under the U.S. Department of Energy's (DOE) Geothermal Resource Exploration and Definition I (GRED I) program to drill an intermediate depth geothermal test hole at the Blue Mountain Geothermal Area, (Solicitation No. DE-RP04-00AL66843; Cooperative Agreement No. DE-FC04-00AL66972).

The well, designated Deep Blue No.1, was drilled in the spring of 2002 and reached a total depth of 672m (2205ft) and recorded a maximum temperature of 145°C (293°F). The Phase II drilling provided significant new geologic information and subsurface temperature data about the geothermal resource at Blue Mountain ('Deep Blue No.1 Test Hole, Blue Mountain, Humboldt County, Nevada', October 2002).

Phase III - Flow Testing on Deep Blue No.1 was completed in the spring of 2004. Due to a hole in the liner the wellhead would not maintain pressure so an injection test was subsequently ruled out. The pitted and damaged liner was replaced and the well was shut in. The Phase II report on Deep Blue No.1 was filed with the DOE in July 2004.

Following the success of Deep Blue No.1, Noramex was awarded a cost-share program for a second geothermal slim well at Blue Mountain under the DOE's Geothermal Resource Exploration and Definition II (GRED II) Program, (Solicitation No. DE-SC04-02AL67912; Cooperative Agreement No. DE-FC04-2002AL68297) in September 2002.

The Phase I preliminary report outlining the program for drilling Deep Blue No.2 was completed in April 2003. The Phase II drilling part of the program including a short rig-on flow test was completed during the spring of 2004. Deep Blue No.2 was drilled to a total depth of 1128m (3700ft) and recorded a maximum temperature of 168°C (334°F). The well was left unlined in anticipation of further testing. Subsequent temperature surveys were unable to get past the bridge at 439m (1440ft). This required the well to be cleaned out before the Phase III – Flow and Injection Testing of the well could be undertaken.

This report describes Phase III of Cooperative Agreement No. DE-FC04-2002AL68297 of the GRED II program. It includes the details of the flow and injection testing, the down-hole temperature survey measurements, the geochemistry results and geothermometry of Deep Blue No.2. It also provides an update on the status of resource confirmation at the Blue Mountain Geothermal Area. The report has been prepared by Fairbank Engineering Ltd, on behalf of Noramex Corp, for the U.S Department of Energy, Golden Field Office, in compliance with the requirements of the cost share program.

1.2 Project History

The geothermal potential of the Blue Mountain area was first recognized during shallow exploratory drilling for gold mineralization on mineral claims staked by Nassau Ltd (Parr and Percival 1991).

A considerable amount of exploration work for precious-metals was carried out from 1984 to 1990 by Nassau and its joint venture partners and by other mining companies on adjacent private "railroad" land immediately to the south that included detail geologic mapping, soil and rock geochemistry, geophysical surveying (aeromagnetic and airborne VLF-EM, ground magnetic, IP-electrical resistivity, gravity, and reflection seismic), and more than one hundred and thirty mineral exploration drill holes, typically to depths of less than 152m (500ft). Mineral exploration work continued intermittently until 2001, with little work since then.

Many of the mineral exploration drill holes encountered warm to hot water, at temperatures of up to 81°C (178°F), and six holes reportedly encountered artesian flows of up to 1.3 – 1.9 L/sec (20 – 30 gpm), indicating the presence of a significant, shallow thermal anomaly at Blue Mountain (Parr and Percival, 1991).

Noramex Corp acquired geothermal leases to two Sections of land owned by Atchison Topeka and Santa Fe Railway (now Burlington Northern and Santa Fe Railway Company (BNSF), four sections of land owned by Nevada Land and Resource Council (NLRC) and six Sections of Bureau of Land Management (BLM) land. A geothermal evaluation was completed using the existing data augmented by new geologic mapping and analysis of aerial photographs. A self-potential (SP) survey indicated that the flow of geothermal fluid in the near surface might be controlled by north-trending faults.

In 1994 Noramex commissioned Geothermal Development Associates (GDA), of Reno, Nevada, to recommend a program of further geothermal work at Blue Mountain. GDA recommended a three-stage program of exploratory drilling, comprising thirteen shallow temperature gradient holes, three intermediate depth holes, and two small diameter (nominal 5 to 6") test holes to 914m (3,000ft), targeted to intersect the geothermal reservoir.

Noramex conducted further exploration work between 1996 and 1999 in collaboration with the Energy & Geoscience Institute (EGI), University of Utah and funding from the U.S. Department of Energy (DOE) Office of Geothermal Technology (DOE/OGT). Work included a self-potential (SP) survey, additional IP-electrical resistivity traversing, and detailed temperature measurements, to depths of 50 to 215m (164 to 705ft), in eleven new mineral exploration drill holes (Fairbank and Ross, 1999).

Several potential target areas for drilling were identified, to test coincident anomalies identified by the SP and the electrical resistivity surveys and areas of high temperature gradients. Geothermal consultants Nevin Sadlier-Brown Goodbrand Ltd (NSBG) of Vancouver, British Columbia, evaluated the results of the geothermal exploration program and recommended a 700 meter slim test well at Blue Mountain (Sadlier-Brown 1998).

In February 2000, Noramex was awarded a cost-share program to drill an intermediate depth 700 meter (2300 foot) geothermal observation well at Blue Mountain, under the U.S. Department of

Energy's (DOE) Geothermal Resource Exploration and Definition I (GRED I) program (Cooperative Agreement No. DE-FC04-00AL66972).

A Phase I summary report describing the technical status of the Blue Mountain Geothermal Area, Humboldt County, Nevada, was completed in October 2000 (Fairbank Engineering Ltd, on behalf of Noramex, October 2000).

Phase II provided funding to drill Deep Blue No.1, a geothermal slim well at Blue Mountain. Deep Blue No.1, completed to a total depth of 672m (2205ft) in June 2002, was drilled by Dynatec Drilling Inc, of Salt Lake City, Utah. A maximum temperature of 145°C (293°F) was recorded at 645m (2115ft).

A report on the drilling of Deep Blue No.1 was submitted to the DOE in October 2002; (Blue Mountain Geothermal Project; Deep Blue No.1 Test Hole, Blue Mountain, Humboldt County, USA, prepared by Fairbank Engineering Ltd on behalf of Noramex, October 2002).

The Phase III - Testing of Deep Blue No.1 was completed in May 2004 and a report was filed with the DOE July 2004.

In September 2002, Noramex was awarded a second slim geothermal observation test hole cost-share program, designated Deep Blue No.2, the Geothermal Exploration and Resource Definition II (GRED II) program, (Cooperative Agreement No. DE-FC04-2002AL68297).

Deep Blue No.2 was sited as a step out from Deep Blue No.1 in an area of known high geothermal gradients. The well was targeted to intersect fracture zones associated with the West and Central Faults, two prominent faults identified on the western flank of Blue Mountain, within the main thermal anomaly.

1.3 Location, Access and Physiography

The Blue Mountain Geothermal Project is located at the western base of Blue Mountain, on the southeastern margin of Desert Valley, approximately 32km (20miles) west of Winnemucca, in Humboldt County, northern Nevada (Figure 1.1). The project is centered at Latitude 41° 00'N, Longitude 118° 7' 30"W, at an elevation of about 1350m (4400ft) above sea level. Local relief is moderate to flat.

From Winnemucca the site is accessible year-round via Jungo Road, an improved gravel road that passes to the south of Blue Mountain. At a point just west of Blue Mountain, a dirt road off Jungo Road leads north, about 5.5km (3 ½ miles) to the site.

The climate is semi-arid with an average annual precipitation of 150 – 180mm (6 – 7"), and an annual temperature averaging 10.5°C (51°F). The area is also occasionally subjected to strong winds. Local vegetation consists of desert plants such as sagebrush, bunch grass and other small shrubs.

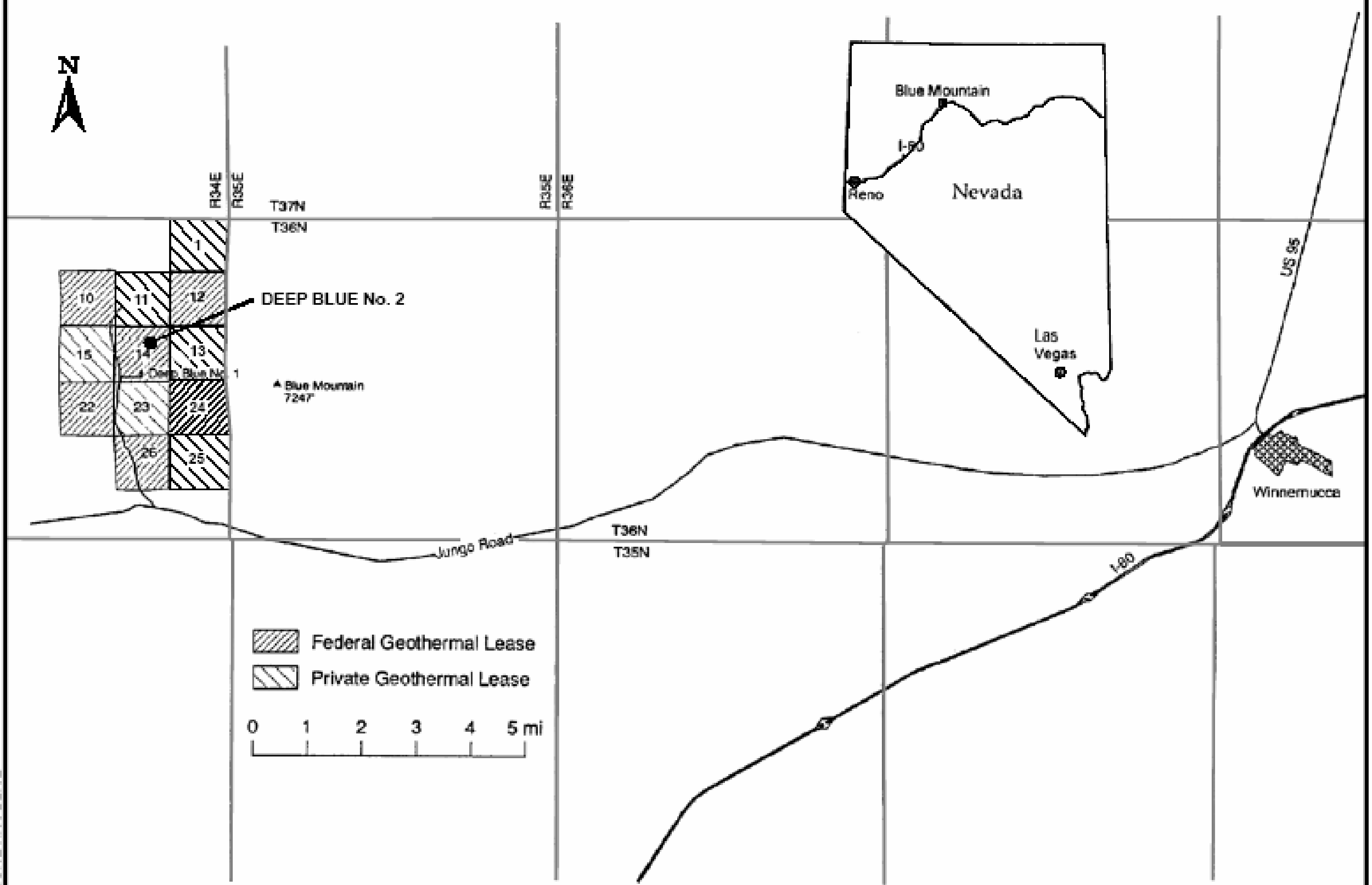
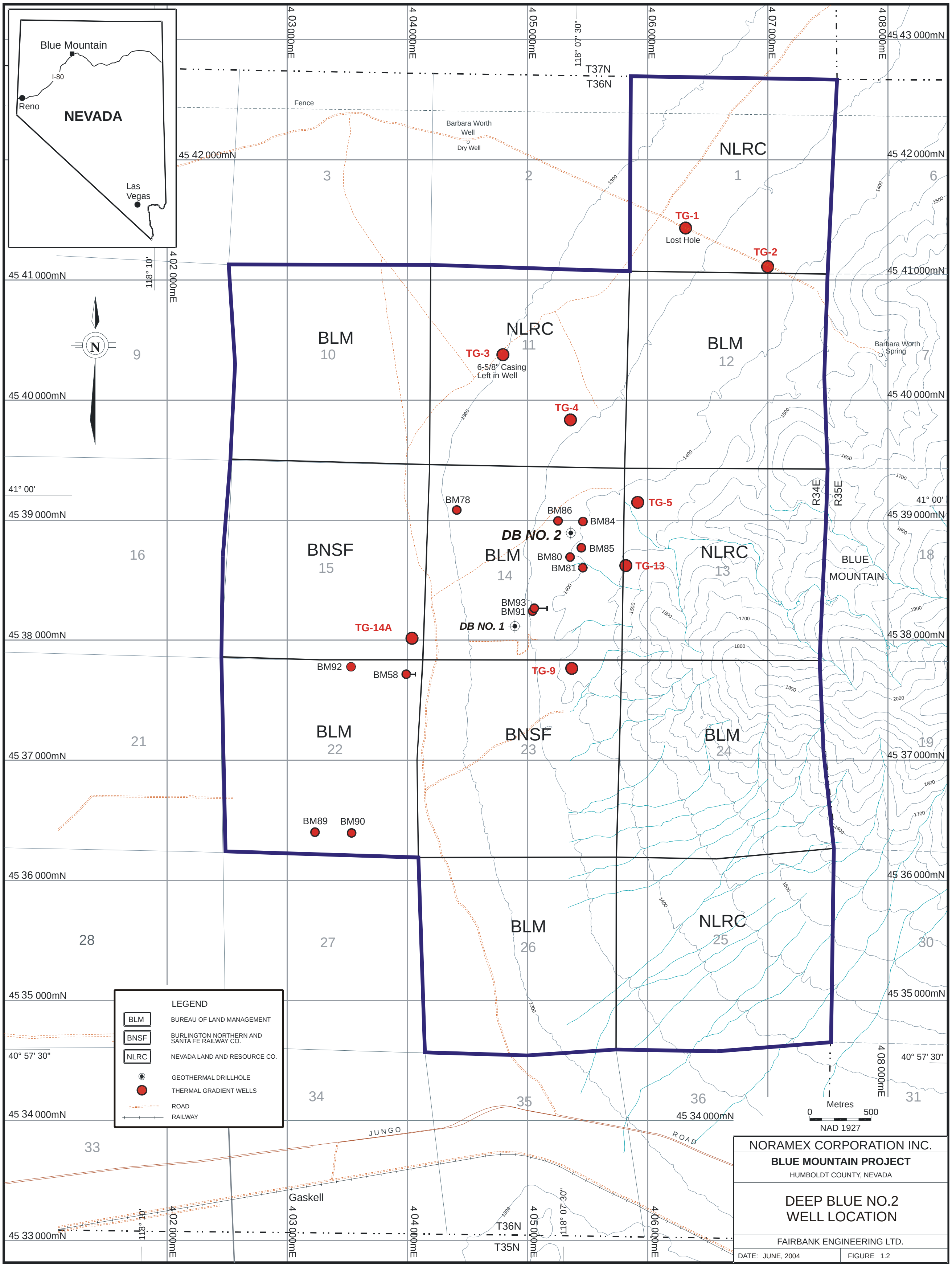


Figure 1.1 Blue Mountain Geothermal Area Project Location Map



Blue Mountain
Reno
NEVADA
Las Vegas
NLRC
1
BLM
10
NLRC
11
BLM
12
BNSF
15
BLM
14
NLRC
13
BLM
22
BNSF
23
BLM
24
BLM
26
NLRC
25
TG-1
Lost Hole
TG-2
TG-3
6-5/8" Casing Left in Well
TG-4
TG-5
TG-13
TG-14A
TG-9
BM78
BM86
BM84
BM85
BM80
BM81
BM93
BM91
BM92
BM58
BM89
BM90
DB NO. 2
DB NO. 1
BLUE MOUNTAIN
Barbara Worth Well
Dry Well
Barbara Worth Spring
Fence
T37N
T36N
T35N
R34E
R35E
JUNGO ROAD
Gaskell
LEGEND
BLM BUREAU OF LAND MANAGEMENT
BNSF BURLINGTON NORTHERN AND SANTA FE RAILWAY CO.
NLRC NEVADA LAND AND RESOURCE CO.
GEOTHERMAL DRILLHOLE
THERMAL GRADIENT WELLS
ROAD
RAILWAY
Metres
0 500
NAD 1927
NORAMEX CORPORATION INC.
BLUE MOUNTAIN PROJECT
HUMBOLDT COUNTY, NEVADA
DEEP BLUE NO.2
WELL LOCATION
FAIRBANK ENGINEERING LTD.
DATE: JUNE, 2004
FIGURE 1.2

The project is 25km (15mi) over relatively flat, undeveloped lands to the Rose Creek Substation, on a 120kV-transmission line owned by Sierra Pacific Power Company. The Blue Mountain geothermal leases are ideally situated for development, with no apparent environmental, cultural, social, or logistical impediments to drilling operations or future geothermal steam field and power plant development. The location of geothermal slim well Deep Blue No.2 is shown in Figure 1.2.

1.4 Scope of the Report

The Phase III report of Cooperative Agreement No. DE-FC04-2002AL68297 of the GRED II program includes a summary of the drilling operations, geology, and down-hole measurements obtained during the drilling of Deep Blue No.2. It provides an update on the status of resource confirmation at the Blue Mountain Geothermal Area. The report has been prepared by Fairbank Engineering Ltd, on behalf of Noramex Corp, for the US Department of Energy, Golden Field Office, in compliance with the requirements of the cost share program.

See below for the Deep Blue No.2 summary data.

SUMMARY DATA – DEEP BLUE NO.2

Well name:	DEEP BLUE NO.2
Location:	Humboldt County, Nevada, USA; T.36N R.34E, Section 14. Latitude N 40° 59.852'; Longitude W 118° 07.511 UTM Coordinates: 0405359mE; 4538892mN
Elevation:	1,407m (4,616ft)
Date spudded:	March 25, 2004
Date completed:	April 28, 2004
Date rig released:	April 30, 2004
Total days (spud/completion):	37 days
Total days (spud/rig release):	39 days
Maximum drilled depth:	1127.76m (3700ft)
Hole sizes:	
(a) Rotary drilling:	14 ¾" rotary hole; 0 to 18.29m (0 to 60ft) 9 ⅞" rotary hole; 18.29 to 201.17m (60 to 660ft)
(b) Continuous coring:	3.895" HQ core hole; 201.17 to 1127.76m TD (660 to 3700ft TD)
Casing sizes:	10" buttress thread casing cemented, with shoe @ 17.32m (56.83ft) 4½" flush joint casing cemented, with shoe @ 199.08m (653.16ft)

Liner:	NQ non-slotted liner installed to 640.08m (2100ft), slotted liner from 640.08m to 1124.10m TD (2100ft to 3688ft).
Maximum temperature:	
(a) During drilling:	Kuster: 167.5°C (333.5°F) @ 585.22m (1920ft) (no circulation for 3 hrs) MRT*: 151°C (303.8°F) @ 781.8m (2565ft)
(b) Post drilling:	159.29°C (318.73°F) @ 579.32m (1900.7ft); down-hole temperature log, (WELACO) April 29, 2004 (shut in for 18 hrs and prior to discharge attempt)
(c) Pre injection test:	Kuster: 159.94°C (319.89°F) @ 573.02m (1880ft); MRT*: 164°C (327.2°F) @ 1109.72m (3640ft)
(d) Post injection test:	Kuster: 157.08°C (317.74°F) @ 550m (1804.46ft); MRT*: 157°C (314.6°F) @ 1100m (3608.92ft) (* *Maximum Registering Thermometer*)
Well status:	Shut in April 30, 2004; heating. Attempted Kuster survey May 2004, well bridged off at 347.5m (1440ft). Well cleaned out Nov. 15, 2004, bridge removed. Flow and injection testing completed Nov. 2004.

2.0 GEOLOGY

2.1 Introduction

The Blue Mountain area is located within the Battle Mountain heat flow high and between two NE-SW trending geothermal/structural belts, the Humboldt structural zone and Black Rock Desert belt. Both these belts hosts numerous major geothermal fields, including Desert Peak-Brady, Steamboat, Soda Lake, Dixie Valley, and Beowawe (e.g. Blewitt et al., 2003; Faulds et al., 2003).

Geothermal systems in the Great Basin are linked to tectonic extension and high heat flow, probably resulting from the shallow depth of the Moho. The crust in northwestern Nevada is considered to be among the thinnest in the Basin and Range (Lerch et al., 2004). It has been concluded that, in the Great Basin, fault-normal extensional strain results from a favourable orientation of faults in a shear strain field, such as pull-apart grabens in the step-over of a dominant strike-slip structure (e.g. Blewitt et al. 2003).

The west-northwest extension in the northern Great Basin results from a transfer of dextral shear from the Walker Lane (Faulds et al., 2004), which is the main dextral fault system dividing the central part of Great Basin and the Sierra Nevada block. The Walker Lane starts to lose displacement in west-central Nevada, near the margin of the high heat flow region, and, in the northern segment of the lane, the dextral strike-slip faults splay into fans of normal faults within the Great Basin. Most recent extension along high-angle faults in the part of the Basin and Range that contains Blue Mountain postdates rhyolitic and basaltic magmatism and is restricted to the last 10-12Ma (Lerch et al., 2004).

2.2 Regional geology

Blue Mountain is located within the Luning-Fencemaker belt (LFTB) of Central Nevada (Speed, 1983; Oldow, 1984). This classic thrust-and-fault belt is related to a closure of Triassic back arc basin and contains folds and thrusts of diverse vergence that have deformed siliciclastic and calcareous back-arc flysch. The Fencemaker thrust forms the floor thrust to the LFTB and places the belt eastward above Triassic sediments of slope-and-shelf affinity. Most of the poly-phase deformation throughout the LFTB is attributed to displacement on this fault and resulted in several fold generations and imbrication of the strata (Elison, 1987).

The Blue Mountain range was mapped originally by Willden (1964), who recognized in the mountain two stratigraphic units divided by an east-verging thrust. Willden correlated the higher unit of grey to green, silty to sandy phyllitic mudstones with the Raspberry Formation, a package of rocks of the middle Norian age located in the shelf terrane east of the LFTB (Elison et al., 1982). Percival (1983) assigned the lower unit of thinly bedded, grey to black argillites with interbedded sandstone beds, and intruded by a larger body of diorite to the Grass Valley Formation, which is located within the carbonate platform strata east of the LFTB and interpreted to be of deltaic affinity (Silberling and Wallace, 1969). Consequently, both these correlations have been problematic.

In the past two decades, the Blue Mountain area has been the focus of much detailed gold deposit and geothermal exploration (e.g. Percival, 1983, 1993; Parr and Percival, 1991; Booth, 1994; Sadlier-Brown, 1996, 2003; Wendt, 2003). Until a short time ago, the Blue Mountain range was considered to have a simple overall structural geometry in the form of a moderately tilted, NW-facing succession, faulted by the Basin and Range tectonism. Recent structural and metamorphic studies in the Blue Mountain area by Wyld (2002) and Wyld et al. (2003) have demonstrated the presence of a more complex deformation history and have been followed by a re-evaluation of the existing stratigraphic model.

Work by Wyld (2002) and Wyld et al. (2003) resulted in recognition of three different lithostratigraphic units, which don't match the previously established formations. The three units defined in Blue Mountain are (from north to south): the O'Neill, the Singas, and the Andorno formations. There is a thrust contact between the Andorno and Singas formations, but the Singas and O'Neill are interpreted to be in gradational contact. Wyld has established that the diorite intrusion mapped by Willden (1964) relates in reality to an extensive, north-trending dyke swarm. In addition, she concluded that the newly defined units cut across the trace of the postulated, north-trending thrust of Willden (1964).

There are no fossils found in any of these units; the Norian age of the units, and the relationship, have been deduced by a correlation with similar dated units in nearby ranges (Santa Rosa Range and Eugene Mountains). This correlation prompted Wyld (2002) to propose that the units in Blue Mountain are overturned. Furthermore, Wyld (2002) concluded that strata of Blue Mountain are located in a footwall of a regional scale reverse fault situated to the northwest, and are folded by a megascopic, overturned fold. The bulk of this deformation Wyld et al. (2003) attributed to a single D1 event, which involved significant northwest-southeast shortening. $^{40}Ar/^{39}Ar$ whole-rock dating (slates and phyllites) indicates that D1 deformation occurred before 142–144 Ma (Late Jurassic), and potentially in the late Early and/or Middle Jurassic.

The subsequent D2 deformational event involved relatively minor northeast-southwest shortening and is correlated with similar event in the Santa Rosa Range (north-east of Blue Mountain), where it is shown to be middle Cretaceous (Wyld et. Al, 2001).

One of the youngest events is related to the intrusion of the Cenozoic mafic dykes and is reflected in the Ar age spectra of samples from Blue Mountain. The age of this event is not constrained precisely, but it appears to be about or less than 10 Ma.

The Triassic rocks within the Blue Mountain property are dissected by numerous late faults apparently related to Basin and Range faulting. Authors of previous reports on the property (e.g. Percival, 1983, 1993; Sadlier-Brown, 1996-2003, Wendt, 2003) recognized three distinct sets of such faults with trends that include: NE, NW, and N-S. All three trends are said to define range fronts. The northeastern set is associated with the hydrothermal alteration and elevated metal concentrations (Percival, 1993).

2.3 Detailed geology of the Blue Mountain project area

The 2004 detailed mapping by the Fairbank Engineering Ltd. Staff has established that, in general, the geology and sequence of the deformation events in the Blue Mountain project area and the approximate movement directions are similar to those worked out previously by Wyld (2002) and Wyld et al. (2003). This mapping has also added to a better understanding of the structure of the western Blue Mountain and allowed to make a geometrical subdivision of the area, see Figure 2.1.

It has been shown that the Blue Mountain area is dominated by a northeasterly striking, southeasterly-vergent fold and thrust belt with a regionally developed plunge in the northeasterly direction. At least two highly penetrative or locally penetrative deformations (D1 and D2) and two latter brittle deformations are now recognized. The northeast-trending D1 folds and thrusts, and north-northwest trending D2 folds in the western Blue Mountain suggest that a complex three-dimensional strain field has affected the region involving primarily shortening and lesser extension.

Sedimentary units of the Blue Mountain range occur in discontinuous, internally strained D1/D2 thrust panels surrounded by north-northwest dipping brittle shear zones. Strain within the panels varies from brittle fracturing and weak cleavage in sandstones to intense penetrative foliation in mudstones and siltstones. In addition, the strain has partitioned variably, leading to considerable difference in structural style both along and across strike.

Lithostratigraphy

The Blue Mountain geothermal project area is underlain almost entirely by rocks included by Wyld et al. (2003) in the Singas Formation. The formation is made up of a somewhat monotonous sequence of flysh rocks that have been folded into at least two generations of tight to isoclinal folds. The rocks include laminated mudstones to siltstones, interbedded locally with quartz-rich sandstones. In places, this sequence includes also some calcareous mudstones and sporadic limestone beds. Figure 2.2 models a 3D view of bedrock.

In general two lithostratigraphic units can be recognized in the map area within the Singas Formation. One of the units contains predominantly mudstones with smaller packages of argillites, and siltstones, and corresponds to the now discarded Raspberry Formation. The second unit, which contains interbedded mudstones, siltstones, and widespread quartz-rich sandstones, is an equivalent to the former Grass Valley Formation.

The way up of the strata is commonly ambiguous, and unquestionable bedding, together with primary sedimentary structures and top indicators, is scarce and has been recognized only in several outcrops. The locally intense and highly inhomogeneous deformation intensifies this problem. Reversals of lithological sequences appear to be common and many of the stratigraphic contacts are moderately to steeply northwest dipping ductile to brittle shear zones. In addition, in numerous outcrops S1 cleavage has been responsible for partial transposition of primary bedding.

The metamorphic assemblages range from greenschist to lower amphibolite facies, and locally, in the southern portion of the map area, on contacts with the mafic dykes, the mudstones are metamorphosed to biotite hornfelses.

2.4 Structure of the western Blue Mountain area

It has been possible to divide the deformation history of Blue Mountain into four distinct deformation events. The first order structure of Blue Mountain includes a regional scale fold. Superimposed on this fold is a duplex system, which consists of several major D1 and/or D2 thrust sheets. Internally, the thrust sheets include numerous macroscopic antiforms and synforms and a number of smaller duplexes that have developed in both the footwalls and hanging walls of the major thrusts.

The development of the Blue Mountain thrust system is related to progressive footwall collapse of the Blue Mountain units caused by the emplacement of the Black Rock Desert terrane, which acted as the dominant thrust sheet. The emplacement occurred at shallow crustal level, as indicated by the very low-grade regional metamorphism of the metasedimentary rocks in the footwall.

D1 deformation

In the western portion of the Blue Mountain range, metasedimenary rocks of the Singas Formation are folded by tight to isoclinal, locally intrafolial and reclined F1 folds, which are the oldest mesoscopic and macroscopic folds recognizable in the area. The folds are overturned to the SE and their axial planes dip steeply or moderately to the NW, whereas the axes plunge to the NE. In general the F1 folds have a well-developed axial planar fabric, which is nearly parallel to bedding on longer limbs of larger folds.

The first deformation, D1, was regionally penetrative and included folding and shearing/faulting on various scales, as well as development of numerous planar and linear fabrics. This event accounts for the bulk strain and present distribution of lithostratigraphic units, and controls the structural grain of the Blue Mountain area. The S1 fabric associated with isoclinal F1 folds is pervasive and closely spaced in mudstones and siltstones, but it is rarely developed in sandstones, which frequently appear to be unstrained. Where present in sandstones, a considerable refraction of S1 fabric is seen from mudstones to sandstones.

Commonly, zones of very strongly foliated mudstones and siltstones surround apparently unfoliated massive beds of sandstones, although some of the more competent lithologies are also locally represented by strongly silicified mudstones and siltstones (e.g. Main Zone). In places, the F1 folded and detached sandstones form imbricate stacks of fault-bounded limbs or isolated curved fold hinges.

D2 deformation

The D2 deformational event marks a significant change in the movement direction, and from predominantly ductile to more brittle character. The D2 structural elements (folds, lineations, etc.) are more limited spatially than the D1 structures, and mainly located in the southwestern portion of the Blue Mountain project area.

The vergence of the F2 folds and a number of other kinematic indicators suggest that the strike-slip component of the shear associated with these folds was dextral (i.e. top towards east). The

D2 deformation resulted largely in the NE-directed thrusting and locally intense imbrication of D1 structures. The thrusts cut the S0 and S1 planes at low angles. This event produced open to closed, asymmetric, mainly isolated folds, which are upright to somewhat overturned and display steep, mainly SW-dipping axial planes. They are associated with axial planar crenulation cleavage, which resulted in crenulation lineation on the S1 foliation, or less commonly in the S1/S2 intersection lineation.

Felsic sills

A number of felsic sills were found within the map area. Some display flow fabric, which parallels the S0/S1 fabric in the host rocks. Others have been boudinaged on limbs on F2 folds and are overprinted by scattered S2 cleavage, indicating that they are pre- to syn-kinematic with respect to the D2 event.

Wyld (2002) has suggested that these sills are of Late Cretaceous age on the basis of indirect evidence (Ar loss in whole rock analysis of the Blue Mountain host rocks) and correlation with similar, dated intrusive bodies in the Eugene Mountains.

D3 deformation – mafic dykes

The D3 deformation was a non-penetrative, brittle extension event associated with the intrusion of mainly north-south trending mafic dyke swarm. The dykes are mainly planar, up to several meters thick, variably magnetic, and show a wide range of lithologies (diabase-gabbro-diorite) and textures. They have a relatively even distribution across the map area, and account for a cumulative E-W extension of approximately 2-3%.

The mafic dykes clearly cut across the D1/D2 thrust faults and, in at least one outcrop, across the felsic dyke. The majority of the dykes are interpreted to be of Tertiary age and only few smaller dykes in the eastern portion of Blue Mountain were found to be of Cretaceous age (Wyld, 2002; Wyld et. Al, 2003).

A minor folding and buckling approximately perpendicular to the main D1/D2 structural grain of the area, as well as reactivation of the D1/D2 structural elements is linked to the D3 event.

D4 deformation – Basin and Range tectonism

The most recent deformation event affecting the area, reflected in numerous high angle normal faults that cut across the southwestern portion of Blue Mountain, is related to the Basin and Range tectonism.

In the mountain interior, extensional faulting is characterized by minor or negligible displacement, and can be essentially regarded as "noise" superimposed on the generally dominating the area, D1-D2 structural elements. But within the western portion of the map area, referred to as the "Main Zone" (the name is inherited from the gold exploration episode on this same property) these faults are responsible for the final overall geometry and distribution of pre-existing structural features. In the Main Zone, the sub-vertical Basin and Range faults and shear zones are superimposed on the D1/D2 structures and divide the outcrop into numerous, fault-bounded panels.

Similarly to the D3 event, the Basin and Range tectonism has reactivated the pre-existing structures in the project area.

2.5 Structure of the Main Zone area

The Main Zone is a trapezoid-shaped, locally uplifted area that occurs between three approximately north-trending faults and two cross-cutting, oblique faults. It has experienced more pervasive deformation than the interior of Blue Mountain. The overall fault pattern is suggestive of a restraining stepover. The north-trending faults and associated shear zones are oblique to the regional NE trend of lithological units and major D1 structures in the Singas Formation.

The Main Zone area displays numerous internal lithostratigraphic repetitions and evidently represents an imbricate system. The origin of this system is in part attributed to the NE-striking isoclinal D1 folds and superimposed D1/D2 thrusts and high-angle reverse faults. The extensive network of second and third order faults, shear zones, and fractures cut across the folded and stacked rocks and anastomoze around lenses of lower strain rocks. All structural elements within the zone form together a "honeycomb" mesh, a relatively broad damage zone, with individual structural features that display fairly small horizontal displacements. Resulting, numerous fault-bounded blocks within the zone have been the focus of extensive hydrothermal alteration.

The western side of the zone is marked by the obvious N-S breaks in the slope associated with two faults, the West fault and the Central fault. Both faults are tightly constrained by the outcrop patterns and display evidence for a dip-slip with some sinistral strike-slip component. At the southern end, the zone is delimited by the west-northwest-trending Southwest fault, and in the north the structure is cut by the North fault.

The sub-vertical Central fault is marked by a contiguous, complex shear zone, which locally contains an intensely foliated mélange-like siliceous rock with round fragments of quartz veins and silicified mudstones, as well as less deformed chalcedone-alunite vein. The fault originated probably as the D2, high-angle reverse fault. This interpretation is supported by the westerly vergence of the minor D2 folds and by the "drag" of the S1 planes in the hanging wall of the Central fault. This vergence is opposite to that of the D2 folds within and east of Main Zone. The fault has been subsequently reactivated as normal fault by the Basin and Range tectonics.

The eastern margin of the Main Zone, the East fault system, is less obvious. It shows up on aerial photographs as a distinct morphological lineament trending north-south. There is only sporadic outcrop nearby, yet the locally contrasting lithologies and structural elements exposed across the trace of the lineament indicate that it represents an important structure. Some of the D2 structural elements within the Main Zone, such as the S2 cleavage, D2 fold axes, and S1/S2 intersection lineation, show a clockwise rotation of up to 30^o with respect to these same elements in the interior of Blue Mountain. The rotation took place in all probability on the East fault and it denotes the East fault, at least in part, as a wrench fault.

The Main Zone is transected by a larger, ENE-striking thrust/high-angle fault, the Big fault. The fault continues east of the zone and is parallel to a prominent E-W trending valley in the western Blue Mountain. The immediate hanging wall of the Big fault is strongly altered and displays pervasive silicification, hydrothermal brecciation, quartz and calcite veining and stockworks. Locally, banded chalcedone silica is present in vugs.

The Big fault changes the dip orientation from ~40^o towards N in the interior of Blue Mountain to ~70^o towards NNW immediately east of the Main Zone area. Structurally, the Big fault is clearly linked to the Main Zone and to the zone's alteration system. Intersections of the late normal faults (West, Central, and East fault system), and of the Big fault appear to play an important role in localizing the discharge of the geothermal fluids.

A set of incipient, sub-parallel and predominantly WNW-striking, sinistral strike-slip faults and one dextral, probably conjugate fault, cut across the West and Central faults. They might represent transfer faults and signify the most recent deformation within the zone related to the Basin and Range tectonics.

The structures in the Main Zone provide both the sub-horizontal and near vertical permeability. Faults/shear zones with various, near perpendicular to each other strikes and dips appear to be equally effective at focusing fluid flow. Thus, connections between various faults, shear zones, and fractures in this zone, especially in three dimensions, are most likely complex.

2.6 Fractures, quartz veins, alteration and fluid flow

Throughout the Blue Mountain area, the dominant orientation of fractures is roughly parallel to the F1 and F2 fold axes, with other orientations (e.g. perpendicular or oblique to fold axes) being subordinate. The fractures are oriented at high angles to bedding and form two or three distinctive sets, but there is a considerable variability in the orientation of these sets. The highest fracture density occurs in sandstones and is related inversely to bed thickness. In mudstones, fractures are rare, though the packages of strongly silicified mudstones and argillites in the Main Zone are locally strongly fractured.

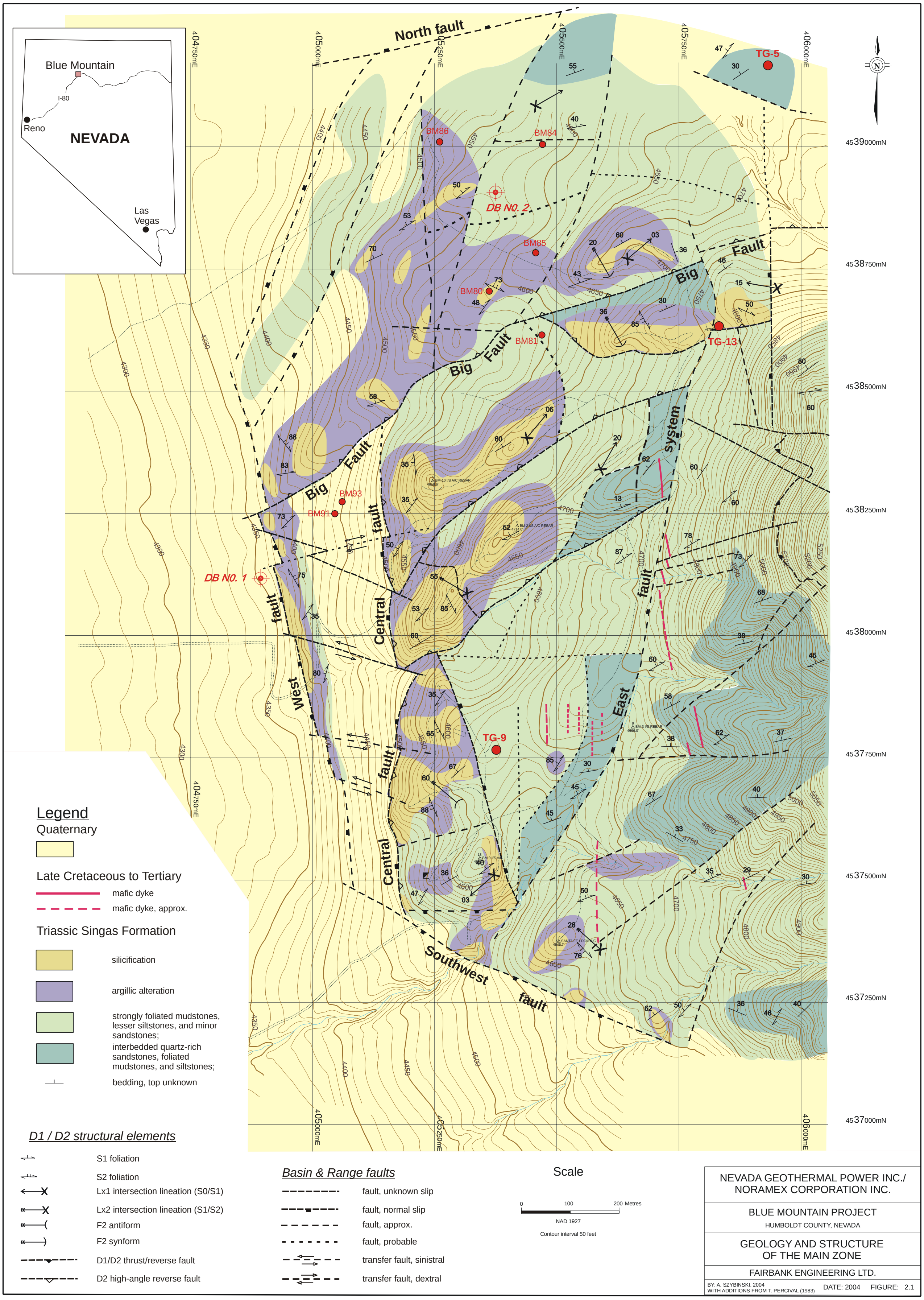
In the Main Zone, along the Central fault, brecciated quartz veins are associated with inhomogeneous brittle shearing and show many signs of transposition related to small scale folding and boudinage. The veins are associated with intense wall-rock alteration and silicification, which affect large volumes of rock in the immediate hanging wall of the fault. The overall pervasive shear fracturing, jointing and vein injection observed in the host rocks, as well as the silicified, mélange-like rock exposed along various segments of the Central fault, point to extensive brittle failure at high pore fluid pressures and seems to have taken place by hydro-fracturing.

The chalcedone-alunite veins associated with the Central and Southwest faults are clearly more recent and less deformed. The vein along the Central fault appears to be cut by the transfer faults only, but the resulting segments of the vein are rotated with respect to each other. The origin of these veins is uncertain; however, the lack of country rock enclaves in the veins favors a dilational origin. Alunite collected from within the Main Zone was dated by the K-Ar method and yielded an age of 3.9+/- 0.2 Ma (Garside et el., 1993; *in* Percival, 1993).

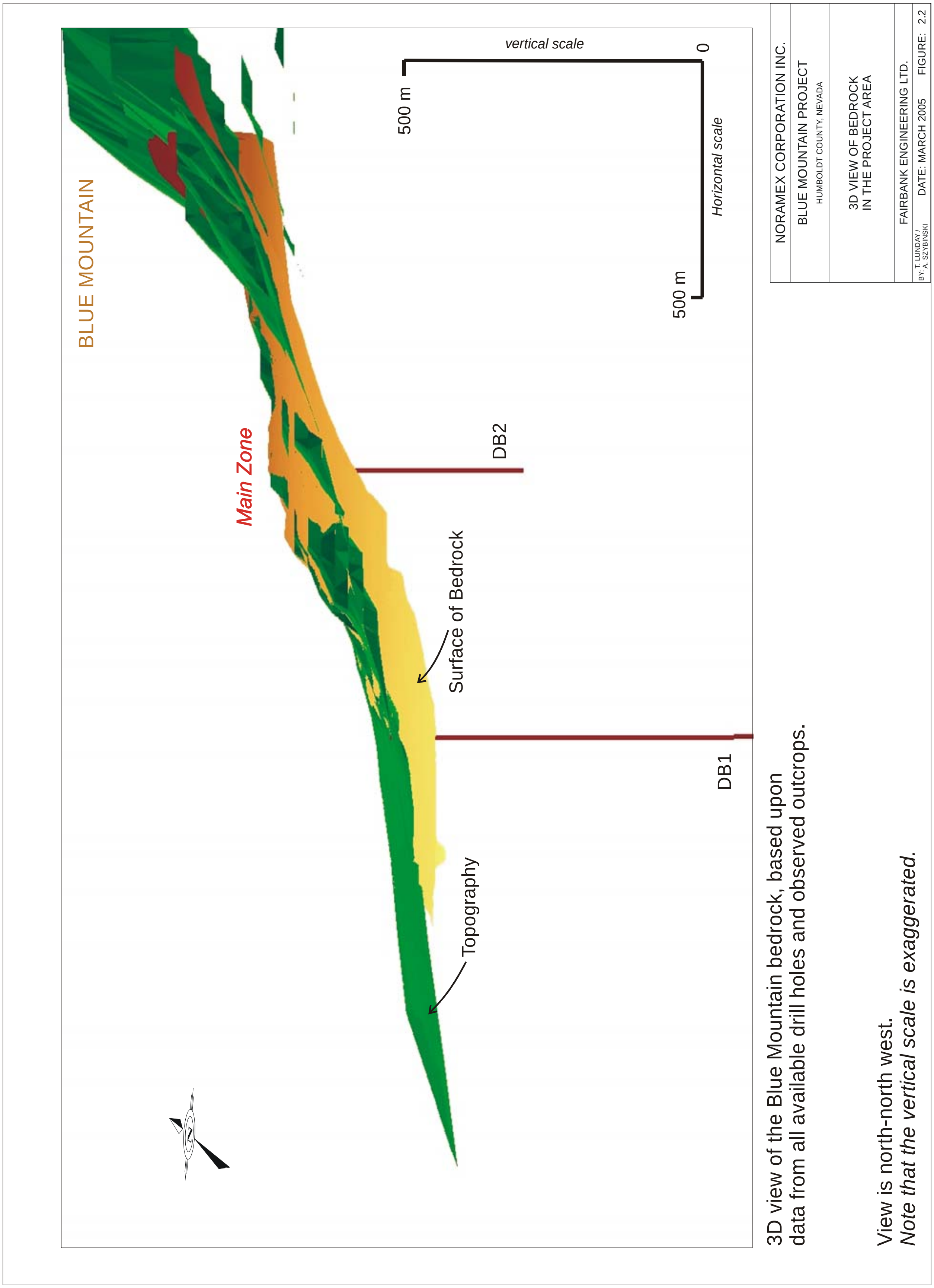
In the Main Zone, hydrothermal alteration envelopes hanging wall margins of the N-S trending West and Central faults and includes the fault zone rock. The western sections of NE-trending blocks within the zone are similarly altered. The alteration is mainly represented by argillic alteration and several stages of silicification. The silicified rocks are represented by distinct blackish, craggy outcrops, which stand in relief against weakly or non-altered host rocks. The argillic alteration forms a pronounced halo around areas affected by silicification. Both types of alteration are almost exclusively developed in mudstones and siltstones.

The alteration halos in the Main Zone are good indicators of recent fluid discharge. The distribution of the alteration is spotty, point-like, indicating that various segments of these structures might be connected individually to fluid reservoir(s). This suggests that fluid pathways are meandering and produce scattered distribution of high fluid fluxes along restricted segments of faults and shear zones.

The widespread hydration and metasomatism around the N-S trending West and Central faults, as well as sections of the NE-trending thrusts/high-angle reverse faults, indicates that the hydrothermal system is dominated by fluid discharge from both normally reactivated sub-vertical faults and pre-existing, but also reactivated, thrusts and high-angle reverse faults. The East fault system, which defines the eastern boundary of the Main Zone and represent a major break between the Blue Mountain interior and the Main Zone, most likely focuses the fluid up-flow.



North fault
Big Fault
Big Fault
Big Fault
Central fault
Central
West fault
East fault system
Southwest fault
BM86
BM84
BM85
BM80
BM81
BM93
BM91
DB NO. 2
DB NO. 1
TG-5
TG-13
TG-9
Blue Mountain
I-80
Reno
NEVADA
Las Vegas
404750mE
405000mE
405250mE
405500mE
405750mE
406000mE
4539000mN
4538750mN
4538500mN
4538250mN
4538000mN
4537750mN
4537500mN
4537250mN
4537000mN
Legend
Quaternary
Late Cretaceous to Tertiary
mafic dyke
mafic dyke, approx.
Triassic Singas Formation
silicification
argillic alteration
strongly foliated mudstones, lesser siltstones, and minor sandstones;
interbedded quartz-rich sandstones, foliated mudstones, and siltstones;
bedding, top unknown
D1 / D2 structural elements
S1 foliation
S2 foliation
Lx1 intersection lineation (S0/S1)
Lx2 intersection lineation (S1/S2)
F2 antiform
F2 synform
D1/D2 thrust/reverse fault
D2 high-angle reverse fault
Basin & Range faults
fault, unknown slip
fault, normal slip
fault, approx.
fault, probable
transfer fault, sinistral
transfer fault, dextral
Scale
0
100
200 Metres
NAD 1927
Contour interval 50 feet
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN PROJECT
HUMBOLDT COUNTY, NEVADA
GEOLOGY AND STRUCTURE
OF THE MAIN ZONE
FAIRBANK ENGINEERING LTD.
BY: A. SZYBINSKI, 2004
WITH ADDITIONS FROM T. PERCIVAL (1983)
DATE: 2004
FIGURE: 2.1



3D view of the Blue Mountain bedrock, based upon data from all available drill holes and observed outcrops.

View is north-north west.
Note that the vertical scale is exaggerated.

3.0 FLOW AND INJECTION TEST PLAN

Goals

- Determine equilibrated well temperature profile.
- Obtain more water samples for performing water quality analysis, getting geothermometer values and determining production related risks
- Establish well productivity, particularly for high temperature zones
- Determine well injectivity

Status of well at start of testing

- Well completed without tubing.
- Well bridged off at 439m (1440 ft) according to Kuster survey attempt.

DB-2 Test Plan

1. Move in drill rig and set up on hole with BOP, 4" flow T, flow line with pressure and temperature instrumentation and James tube with lip pressure tap.
2. Run in hole with core bit.
3. Drill out bridge. Kuster survey through drill rod.
4. No water circulation, use core bit to clean. If absolutely necessary use small pill of polymer to sweep cuttings and lubricate bit.
5. Pull out of hole. Run tubing. Finished on. Rig down wellhead to master valve.
6. Move rig off. Rig up flow line for test on.
7. Log with Welaco.
8. Rig up compressor.
9. Start flow test.
10. Attempt to flow for about 6-8 hrs.
11. Take water samples as soon as flow cleans up. Take samples every 2 hrs.
12. Continental Equipment delivered, rig up injection test with tank connected to pump to well.
13. Injection test. Water in tank by then, both water trucks on site full.
14. Welaco rigged up at start of injection test. Log running in hole.
15. Start injection with Welaco on bottom. Inject tank full of water at rate sufficient to show pressure build up. Fill tank with water trucks as injection goes on. Inject minimum of 1 tank and 2 water trucks full of water. More if possible, by filling tanks from water trucks.
16. Shut in well with logging tool in hole and observe pressure fall off.
17. Log coming out of hole
18. Wait 12 hours. Log again.
19. Wait 12 hours more. Log again. If temperature is equilibrated, test is done. If well is still heating, wait 24 hours and log again.
20. Release logging truck.

Refer to Figure 3.1 for the schematic Deep Blue No.2 well profile with lost circulation zones.

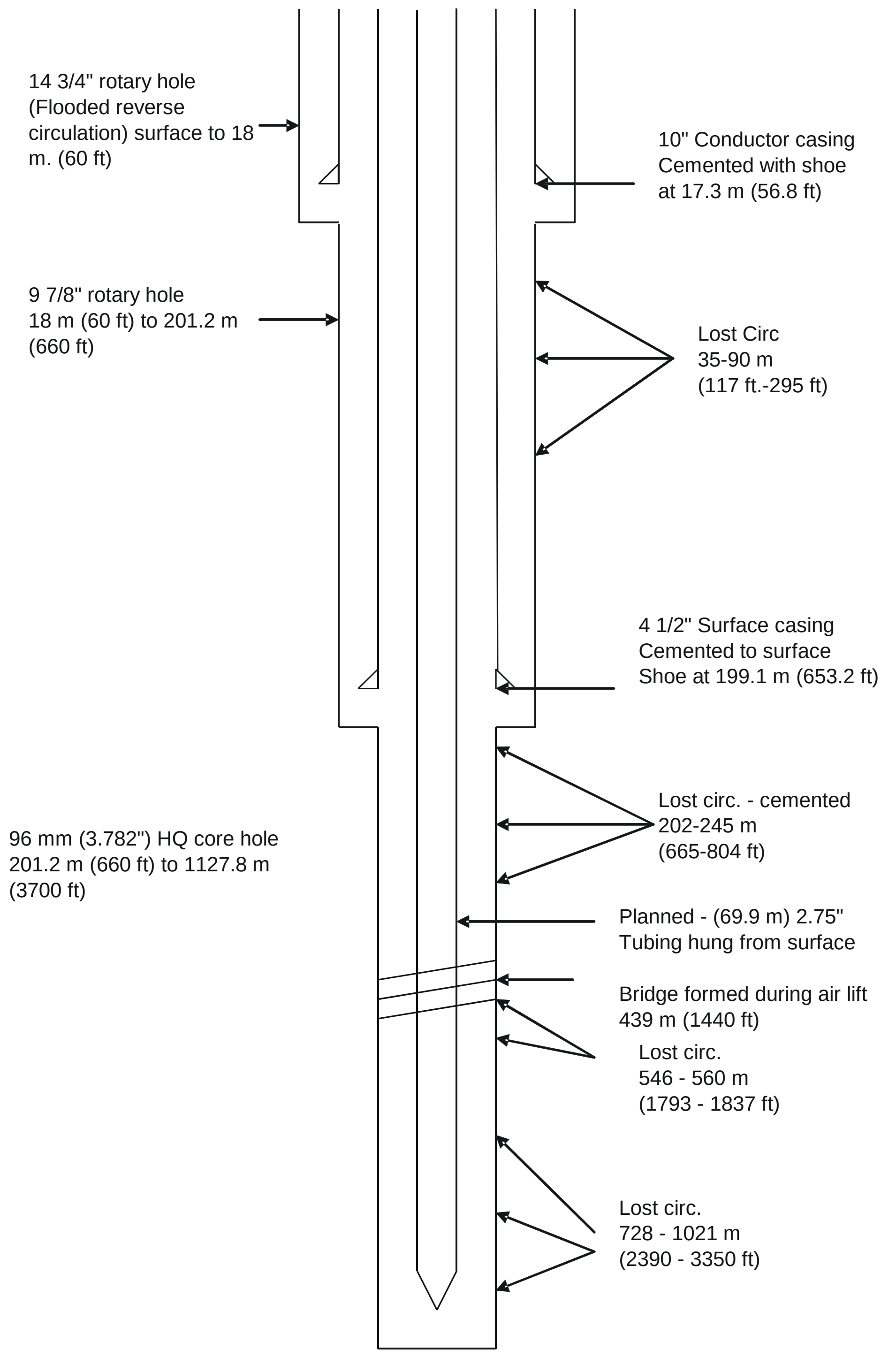


Figure 3.1 DB2 Well Profile with Loss Zones.

4.0 TEMPERATURE MEASUREMENTS WHILE DRILLING

Diamond coring has the advantage over rotary drilling in that bottom hole temperatures (BHT's) can be measured routinely through the bit during drilling breaks as the hole is put down. The drill hole itself interferes with the natural in-situ profile because of cross flows that commonly develop between different aquifers cut by the well. However, cross circulation effects are minimal at the hole bottom, thus, the temperature profile is comprised of a series of BHT's measured as the hole was put down is the closest approximation of the natural temperature profile in the absence of drilling.

In diamond drilling, much less drilling fluid is circulated and therefore the surrounding rock is less affected (cooled) by the drilling process. Fairbank Engineering's experience indicates that BHT's equilibrate to their undisturbed temperature after 10-12 hours. Most of the temperature rebound is in the first 4 hours after last circulation. Temperatures measured within 15 minutes of last circulation may be up to 25°C (77°F) lower than the undisturbed temperatures while temperatures obtained 3- 4 hours after last circulation are normally within 5°C (41°F) of the undisturbed temperatures. At Blue Mountain, massive losses of drill fluid to the formation may have had the effect of a higher degree of cooling for a larger area around the well bore which may mean that equilibration times are likewise longer.

Down-hole temperature data were collected during the drilling of Deep Blue No.2 using maximum registering thermometers (MRT), and a Kuster down-hole pressure temperature survey tool provided by E.S. Kyle Instrument Ltd. These instruments were used to obtain partially equilibrated temperature data while drilling, without significant interruption or disruption to the on-going drilling operations. The temperature data obtained are given in Appendix A.

4.1 Maximum Registering Thermometers (MRT)

Maximum registering thermometers (Kessler, 15.9cm (6.25")) were used to measure down-hole non-equilibrated temperatures at regular intervals during drilling. Thermometers with a range of 90 to 260°C (194 to 500°F) were used in pairs, for verification.

The thermometers were typically placed inside separate copper tube housings, and then attached to the overshot and run down-hole on the rig wire-line, immediately after completing a core run and before recovering the core tube. The thermometers were usually left down-hole for 15-30 minutes, with no fluid circulated down-hole. The thermometers were then recovered at surface (along with the core tube) and read immediately. The thermometers were reset using a centrifuge. MRT data were obtained roughly every 24.4m (80ft) throughout the core drilling of Deep Blue No.2, during rotary and core drilling operations.

The MRT data provided an indication of the subsurface temperatures as drilling was advanced; they do not represent stabilized temperatures. MRTs were run on other occasions, for example; after tripping the bit and immediately prior to resuming coring operations, with no fluid circulated down-hole for several hours, providing temperatures that more closely represented 'stabilized' conditions down-hole; and when the drilling was interrupted by other issues.

4.2 Kuster Down-hole Temperature / Pressure Surveys

E.S. Kyle Instrument Ltd. provided a Kuster tool and data chart reader for recording partially equilibrated down-hole temperatures and pressures during active coring. The tools provided were for measuring the temperature and pressure where the tool rested. The Kuster tools are composed of a mechanical device that rotates as the temperature or pressure increases as a result of rotation of a bourbon tube connected to a stylus. The stylus scribes a line .001" wide on a coated chart. This chart is read either by a 5x magifier or with the Kuster 2-way Chart Reader. The clocks and measuring devices are very resistant to vibration and temperature extremes, which offers quality data recording down-hole.

The procedure was to suspend drilling and circulation, pull up 30.5m (100ft), wait 2-3 hours then run the tool to the bottom of the survey interval, stopping at each preplanned interval and waiting 10-20 minutes. After the intervals were run and the tool retrieved it was disassembled and the chart read and the deviation data converted to temperature or pressure.

Four data sets were obtained with the Kuster survey tool. Noramex site personnel conducted three temperature-logging runs with the Kuster during active coring between 332 to 1127.8m (1088 to 3700ft) and one shortly after completion.

4.3 Down-hole Temperatures While Drilling

The down-hole temperatures recorded while drilling using the MRTs and the Kuster are plotted against depth in Figure 4.1, and against elevation in Figure 4.2. Figure 4.3 illustrates the down-hole temperatures of Deep Blue No.1 and No.2 along with temperatures from the thermal gradient wells.

Temperatures recorded at shallow depth were very encouraging, with non-equilibrated MRT temperatures of 81°C (178°F) at 201.2m (660ft), and 90°C (194°F) at 352m (1155ft). These temperatures imply thermal gradients similar to those recorded in previous holes drilled in the area, and indicate warm to hot water in the range faults.

Non-equilibrated MRT temperatures recorded during coring from 201.1 to 557.8m (660 to 1830ft) gave temperatures of 43.3°C (160°F) to 136°C (276.8°F) in relatively impermeable rocks. Below 557.8m (1830ft) substantial fracture permeability was encountered as indicated by partial and eventual loss of circulation (Appendix A.4) and in the core log. At 781.8m (2565ft) and 464.8m (1525ft) non-equilibrated temperatures of 151°C (303.8°F) and 148°C (298.4°F) were recorded by MRT (30 minutes) below and in this zone of permeability. MRT measurements at depths below the 557.8m (1830ft) indicate a reversal from the temperature curve from 201.2 to 557.8m (660-1830ft). It is probable that the large amount of drilling mud pumped down-hole depressed temperatures in and below the lost circulation zones and they will recover with time.

The partially equilibrated Kuster surveys were conducted in the core hole on four occasions. Of the four surveys the temperature ranged from 108.3°C (226.9°F) at 201.2m (660ft) to 167.5°C (333.5°F) at 585.2m (1920ft). The same reversal in the temperature curve was noted on the Kuster graphs as seen in the MRT graph as noted above.

A Kuster survey was attempted in May 2004, after the well had been shut in for almost 3 weeks. The well had bridged off at 439m (1440ft). A tube jar from E-Brace Tools Inc. was used in an effort to remove the obstruction, but the bridge could not be dislodged.

In October 2004, another attempt to dislodge the obstruction was made but the bridge could not be moved. The temperature recorded at 420m (1378ft) was 156.23°C (313.21°F). After the bridge was removed another Kuster survey was taken with a high of 159.94°C (313.89°F) recorded at 573m (1880ft).

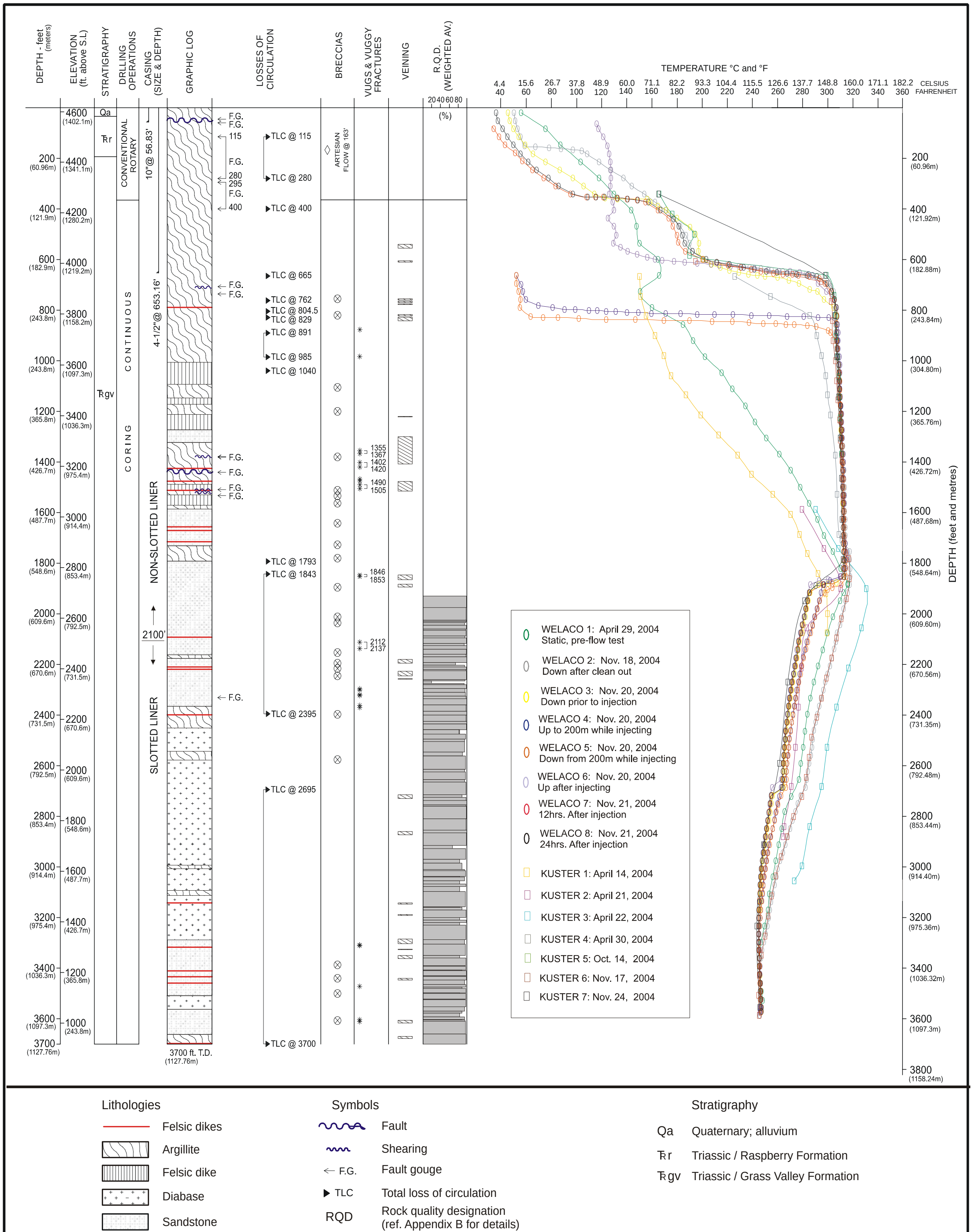
The final Kuster survey taken after the flow and injection test was completed, recorded a temperature of 157.08°C (314.74°F) at 550m (1804ft).

The summary graphic log, Figure 4.1, plots the down-hole geology and structures with temperatures. Figure 4.2 illustrates the temperatures recorded during drilling as well as pre and post-flow and injection testing. For comparison, Figure 4.3 illustrates the temperature profiles recorded for the slim wells DB-1 and DB-2, the Thermal Gradient TG and BM wells plotted against elevation. Figure 4.4 models isothermal temperature planes in a 3-dimensional image looking north. The detailed down-hole temperatures recorded are listed in Appendix A.

Temperature cross sections have been generated in the Target/ArcView software, using the temperature data from all available drill holes (Figures 4.5 to 4.13). The data are locally sparse, but they have been extrapolated at depth, using statistical properties of the software.

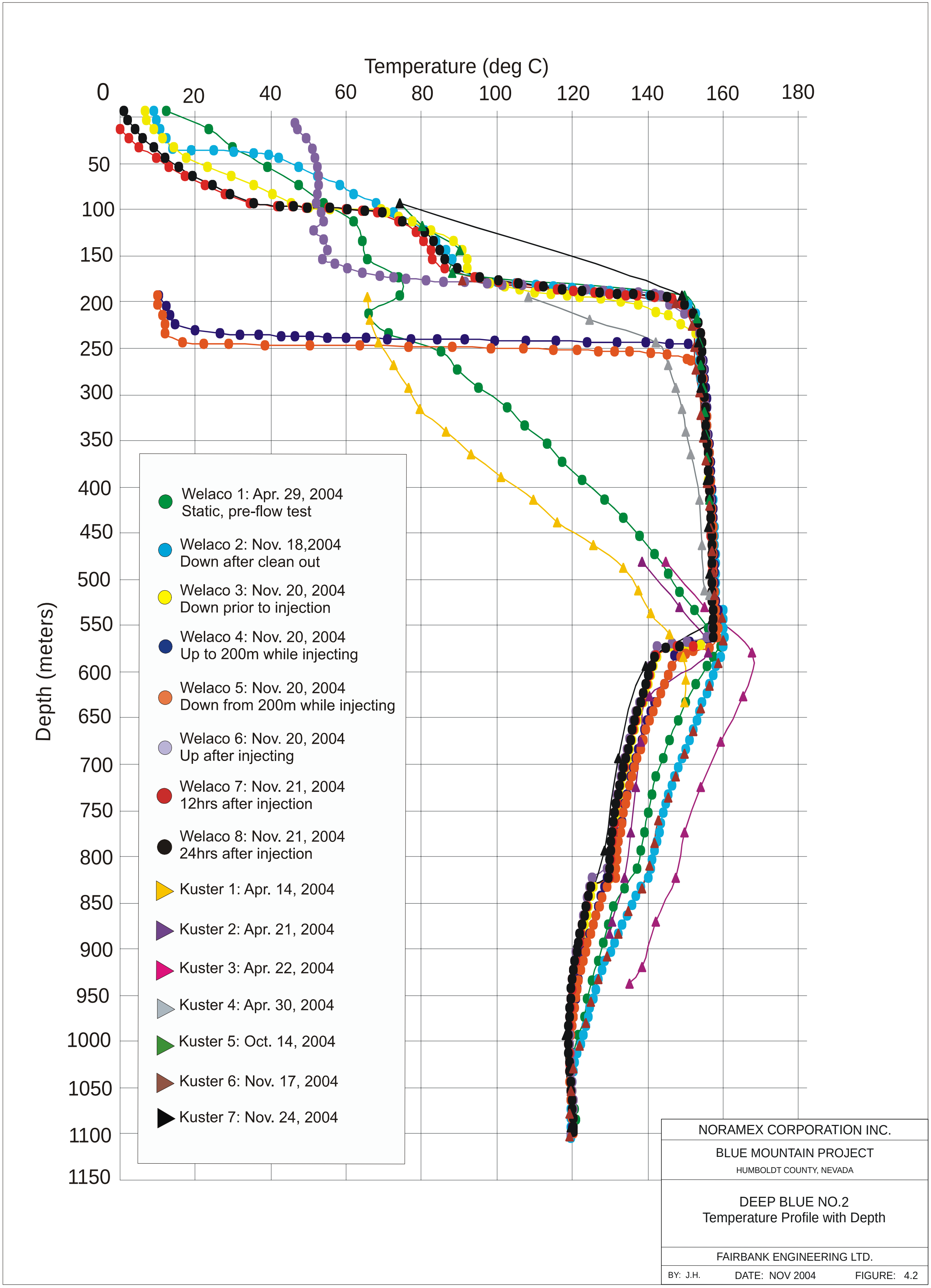
The contoured temperature data in the cross-sections show clearly a major geothermal system with a plume in the Blue Mountain project area. The plume is particularly well pictured in sections, A-A', D-D', F-F', and H-H', which indicate that the plume is centered on the Main Zone. The sections also show that the geothermal system is open to the south east and west, whereas outside the Main Zone, to the north and northwest, and possibly to the east, the isothermal planes drop off.

In the DB2 hole, temperatures become isothermal and show a reversal with depth, possibly indicating that the plume is divided into zones. The upper zone of the plume with the temperatures >141.23°C (286.21 °F) has been intersected in DB2. However, as revealed by the data and sections, it continues to the DB1 hole, where the zone is open at depth and its lower limit is, at present, unknown.

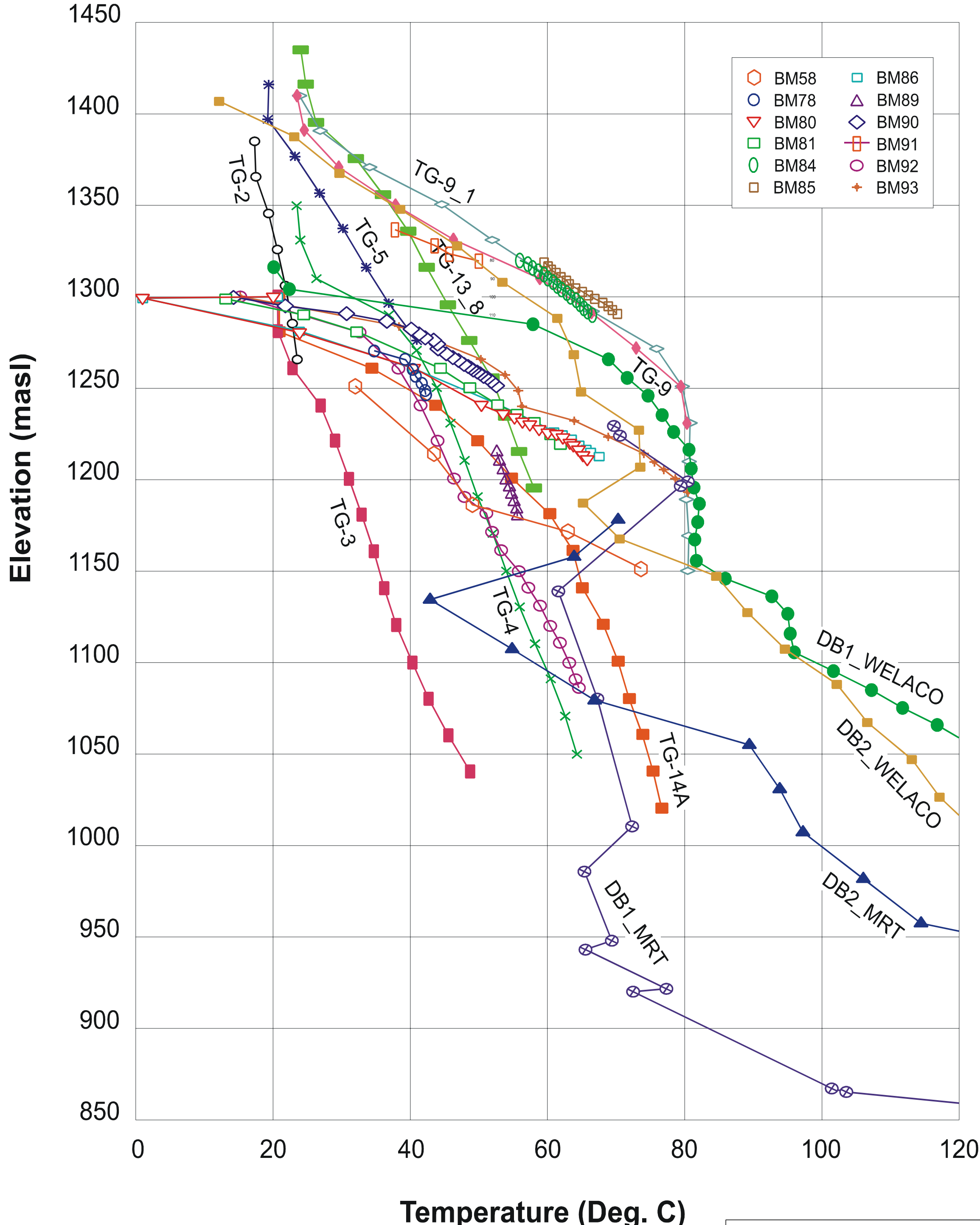


DEEP BLUE NO. 2 ~ Summary Graphic Log

Figure 4.1



Temperature (deg C)
0
20
40
60
80
100
120
140
160
180
Depth (meters)
50
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
1150
Welaco 1: Apr. 29, 2004
Static, pre-flow test
Welaco 2: Nov. 18,2004
Down after clean out
Welaco 3: Nov. 20, 2004
Down prior to injection
Welaco 4: Nov. 20, 2004
Up to 200m while injecting
Welaco 5: Nov. 20, 2004
Down from 200m while injecting
Welaco 6: Nov. 20, 2004
Up after injecting
Welaco 7: Nov. 21, 2004
12hrs after injection
Welaco 8: Nov. 21, 2004
24hrs after injection
Kuster 1: Apr. 14, 2004
Kuster 2: Apr. 21, 2004
Kuster 3: Apr. 22, 2004
Kuster 4: Apr. 30, 2004
Kuster 5: Oct. 14, 2004
Kuster 6: Nov. 17, 2004
Kuster 7: Nov. 24, 2004
NORAMEX CORPORATION INC.
BLUE MOUNTAIN PROJECT
HUMBOLDT COUNTY, NEVADA
DEEP BLUE NO.2
Temperature Profile with Depth
FAIRBANK ENGINEERING LTD.
BY: J.H.
DATE: NOV 2004
FIGURE: 4.2



NORAMEX CORPORATION INC.

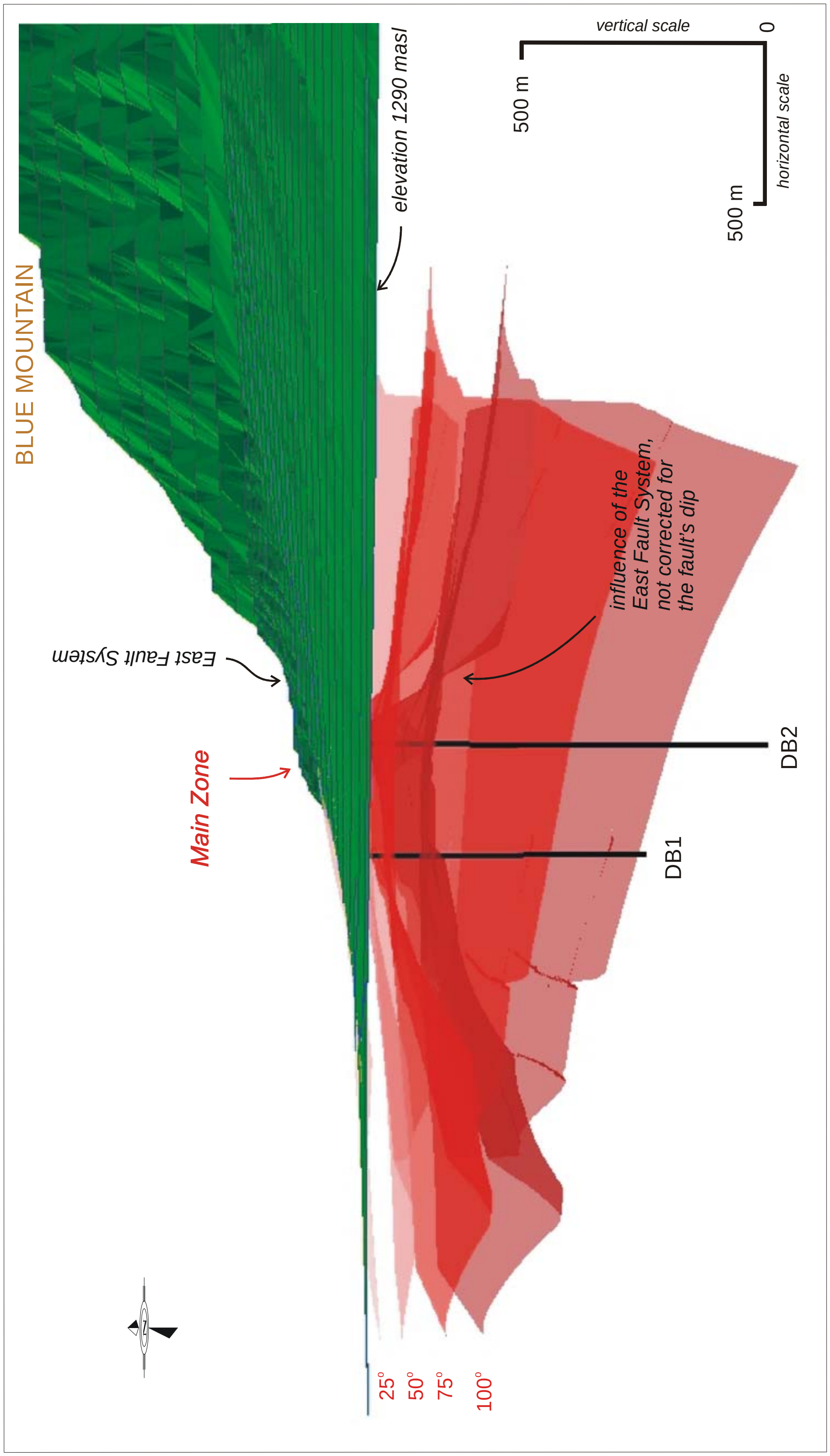
BLUE MOUNTAIN PROJECT

HUMBOLDT COUNTY, NEVADA

Temperature Profile
Comparison with Elevation

FAIRBANK ENGINEERING LTD.

DATE: NOV 2004 FIGURE: 4.3



3D view of the Blue Mountain geothermal field, based upon data from the DB1, DB2, and TG drill holes. The model shows a strong influence of the East Fault System on temperature distribution.

Looking north.

Note that the vertical scale is exaggerated.

NORAMEX CORPORATION INC.
BLUE MOUNTAIN PROJECT
HUMBOLDT COUNTY, NEVADA

3D VIEW OF
THE TEMPERATURE DISTRIBUTION
IN THE PROJECT AREA

FAIRBANK ENGINEERING LTD.

BY: T. LUNDAY / A. SZYBINSKI | DATE: MARCH 2005 | FIGURE: 4.4

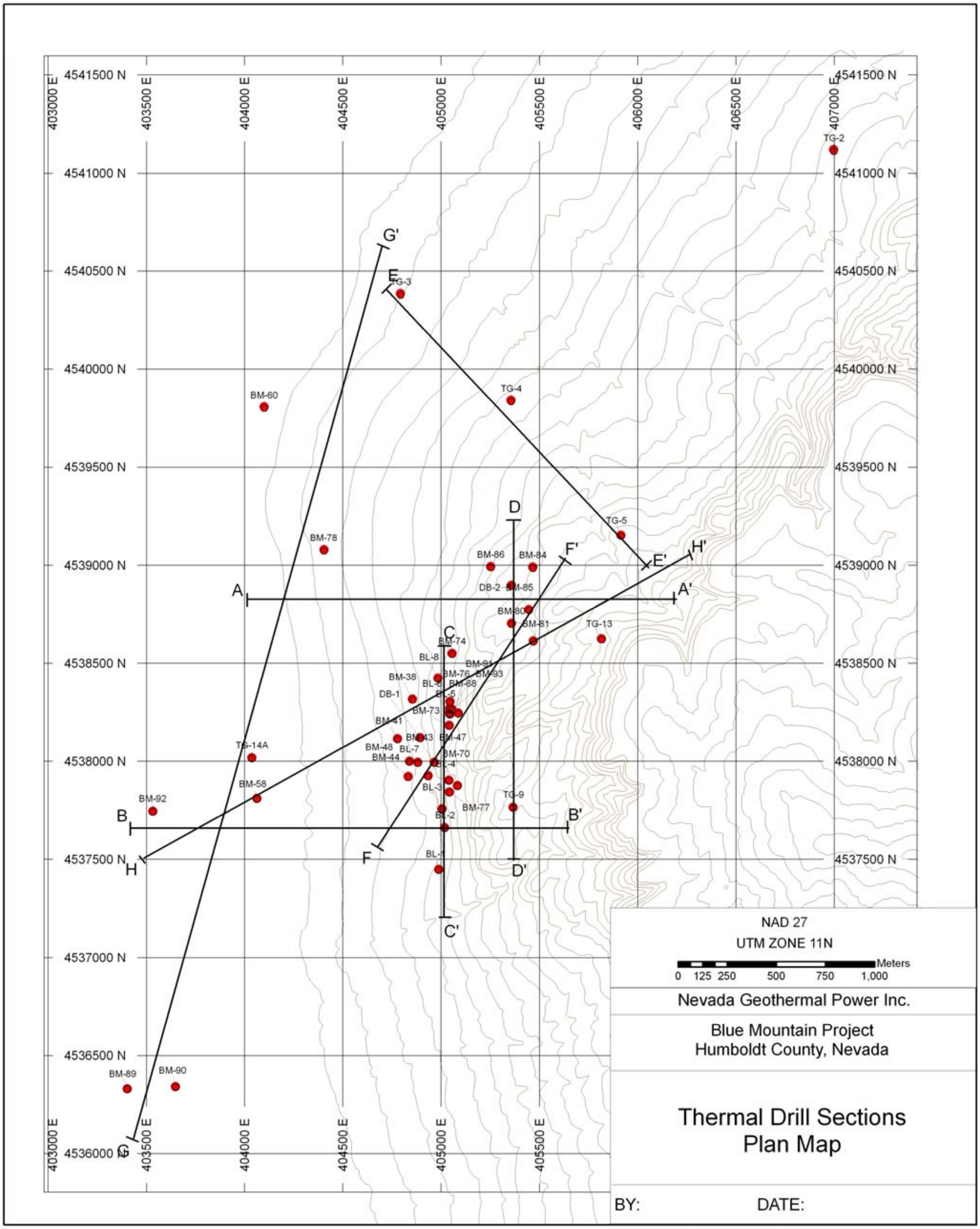
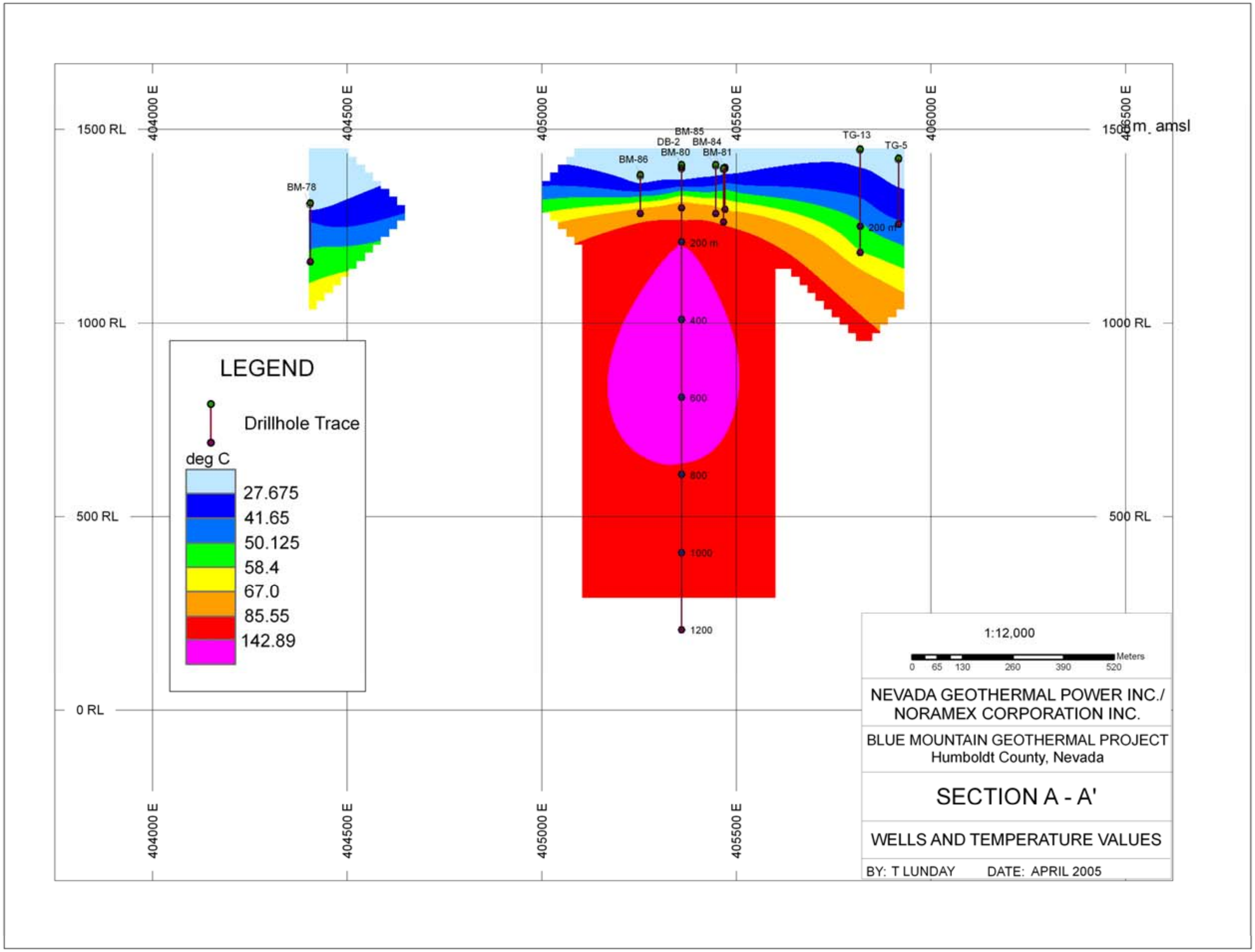

NAD 27
UTM ZONE 11N
Meters
0 125 250 500 750 1,000
Nevada Geothermal Power Inc.
Blue Mountain Project
Humboldt County, Nevada
Thermal Drill Sections
Plan Map
BY:
DATE:

Figure 4.5



1500 RL
1000 RL
500 RL
0 RL
1500 m, amsl
404000 E
404500 E
405000 E
405500 E
406000 E
406500 E
BM-78
BM-86
DB-2
BM-85
BM-80
BM-84
BM-81
TG-13
TG-5
200 m
400
600
800
1000
1200
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:12,000
Meters
0 65 130 260 390 520
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION A - A'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY
DATE: APRIL 2005

Figure 4.6

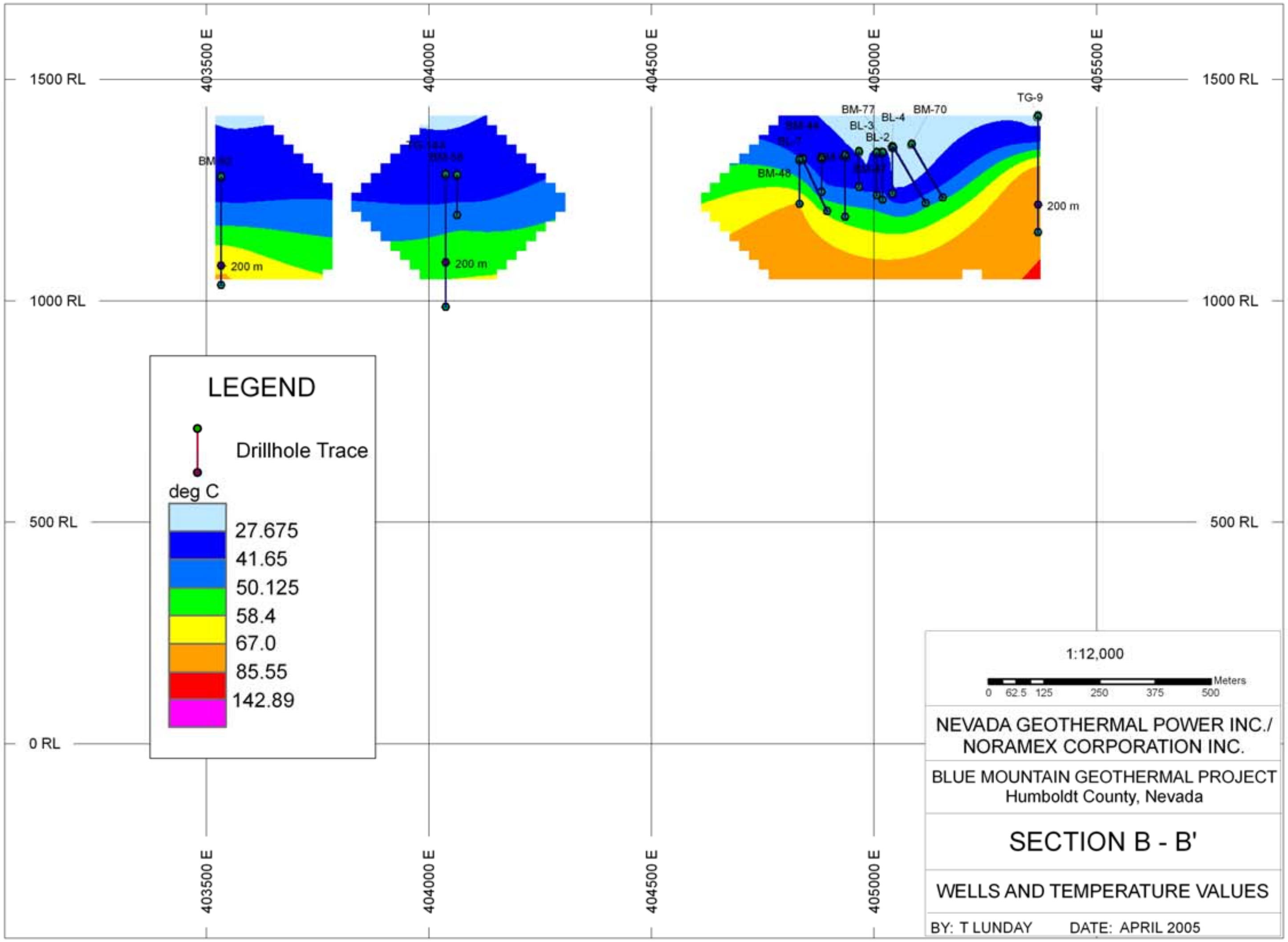

1500 RL
1000 RL
500 RL
0 RL
403500 E
404000 E
404500 E
405000 E
405500 E
BM-77
BL-3
BL-4
BL-2
BM-70
TG-9
BM-48
200 m
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:12,000
Meters
0 62.5 125 250 375 500
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION B - B'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY DATE: APRIL 2005

Figure 4.7

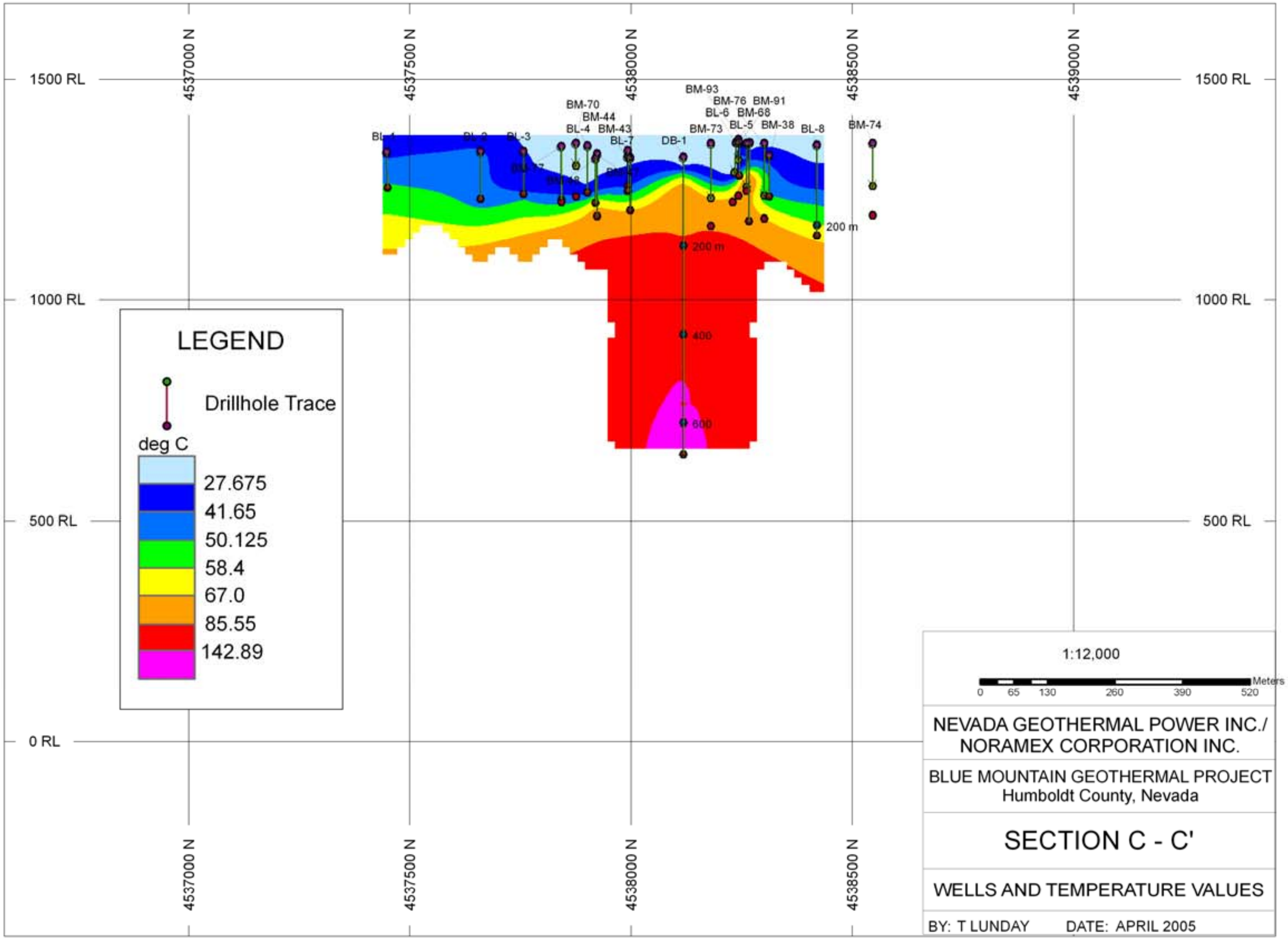

1500 RL
1000 RL
500 RL
0 RL
4537000 N
4537500 N
4538000 N
4538500 N
4539000 N
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:12,000
Meters
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION C - C'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY
DATE: APRIL 2005

Figure 4.8

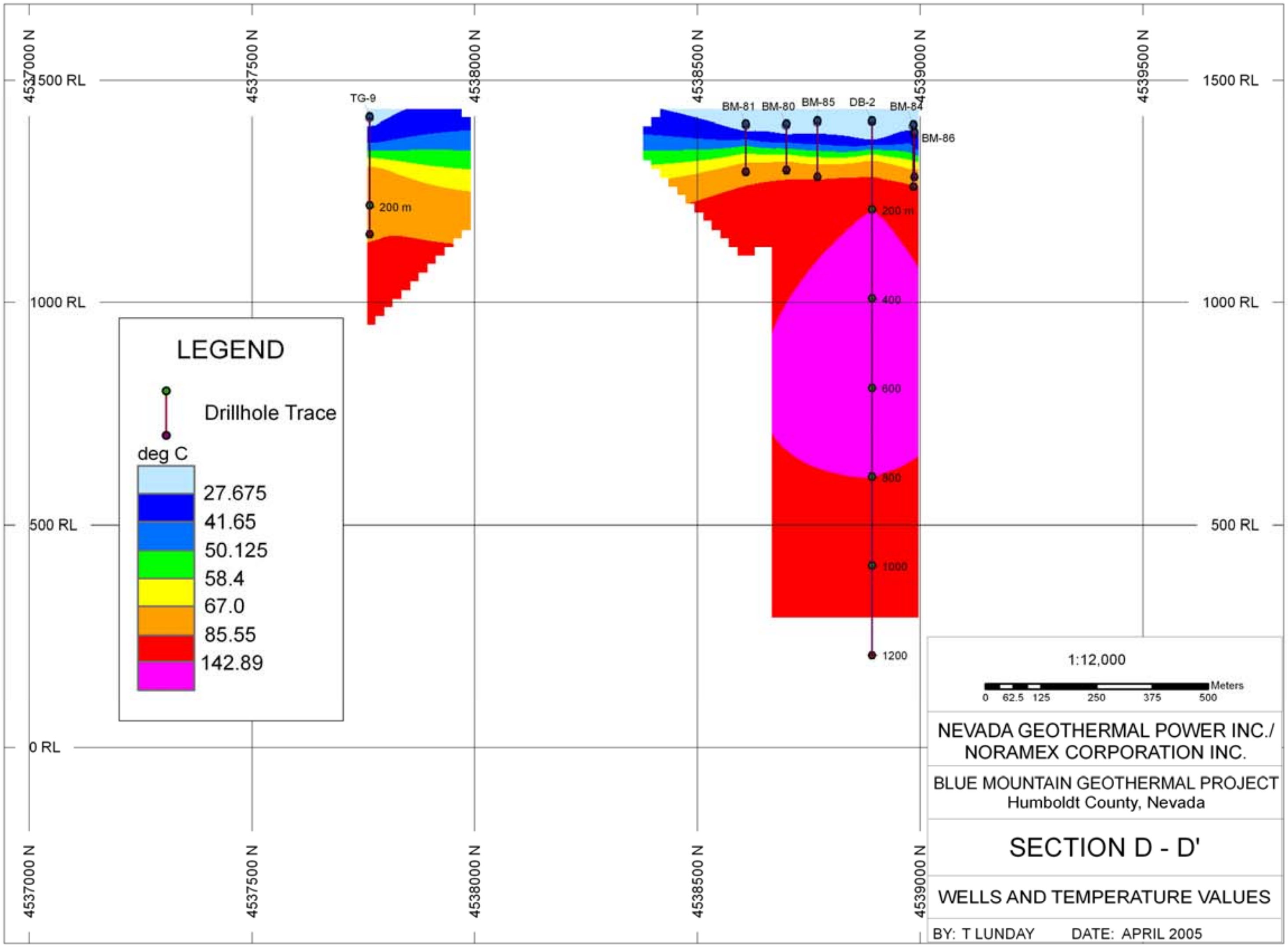

4537000 N
4537500 N
4538000 N
4538500 N
4539000 N
4539500 N
1500 RL
1000 RL
500 RL
0 RL
TG-9
200 m
BM-81
BM-80
BM-85
DB-2
BM-84
BM-86
200 m
400
600
800
1000
1200
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:12,000
0
62.5
125
250
375
500
Meters
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION D - D'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY
DATE: APRIL 2005

Figure 4.9

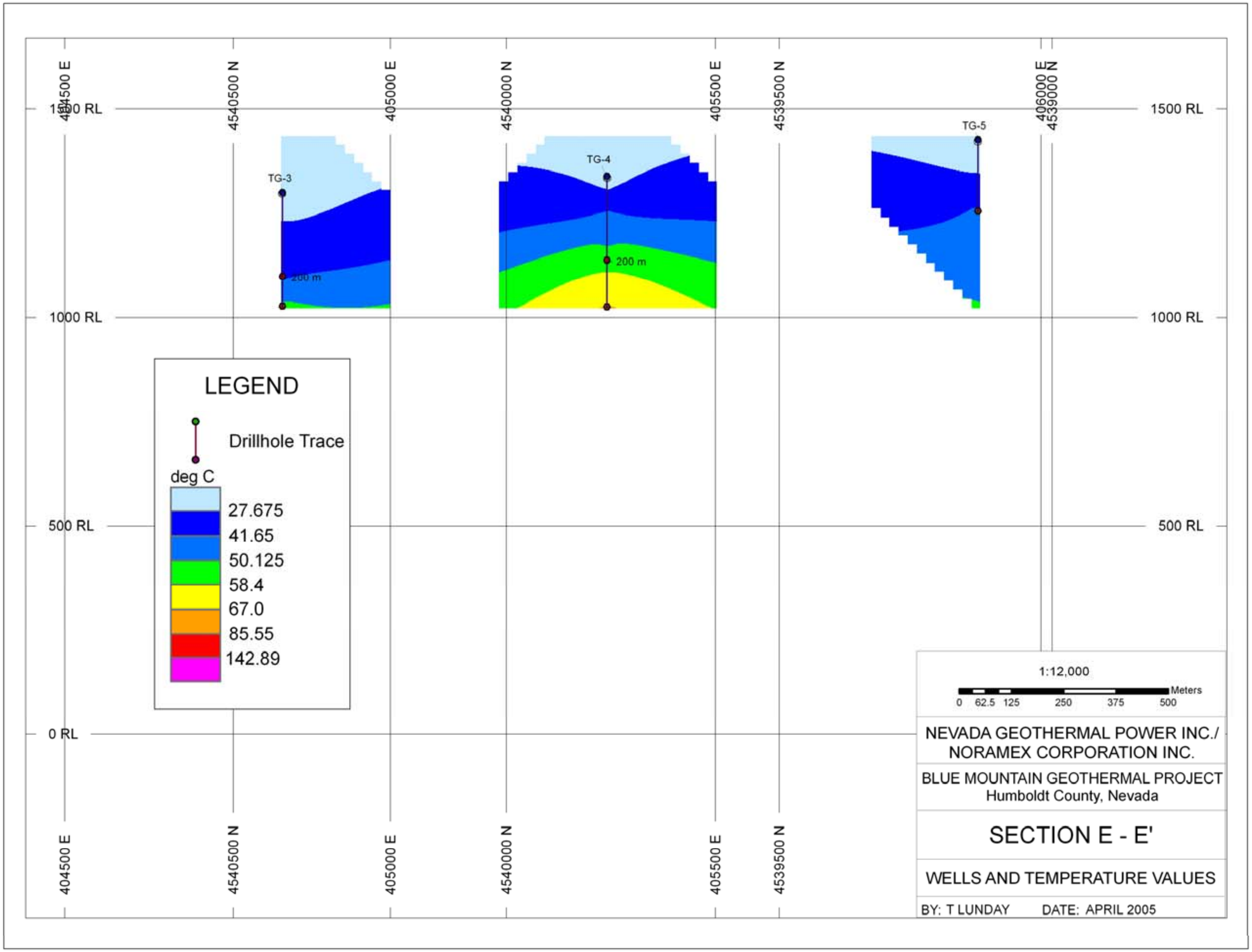

404500 E
4540500 N
405000 E
4540000 N
405500 E
4539500 N
406000 E
4539000 N
1500 RL
1000 RL
500 RL
0 RL
TG-3
TG-4
TG-5
200 m
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:12,000
Meters
0 62.5 125 250 375 500
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION E - E'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY
DATE: APRIL 2005

Figure 4.10

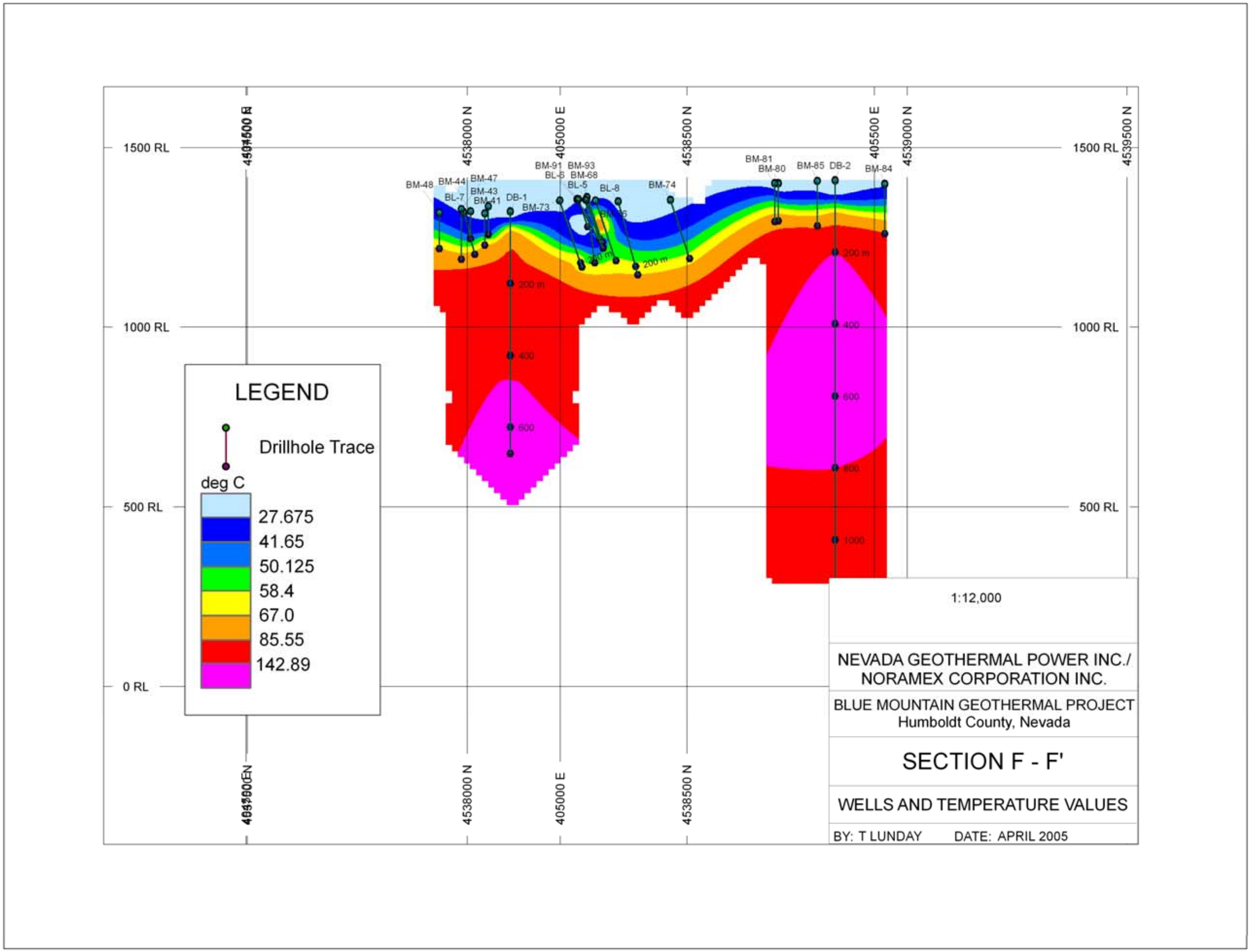
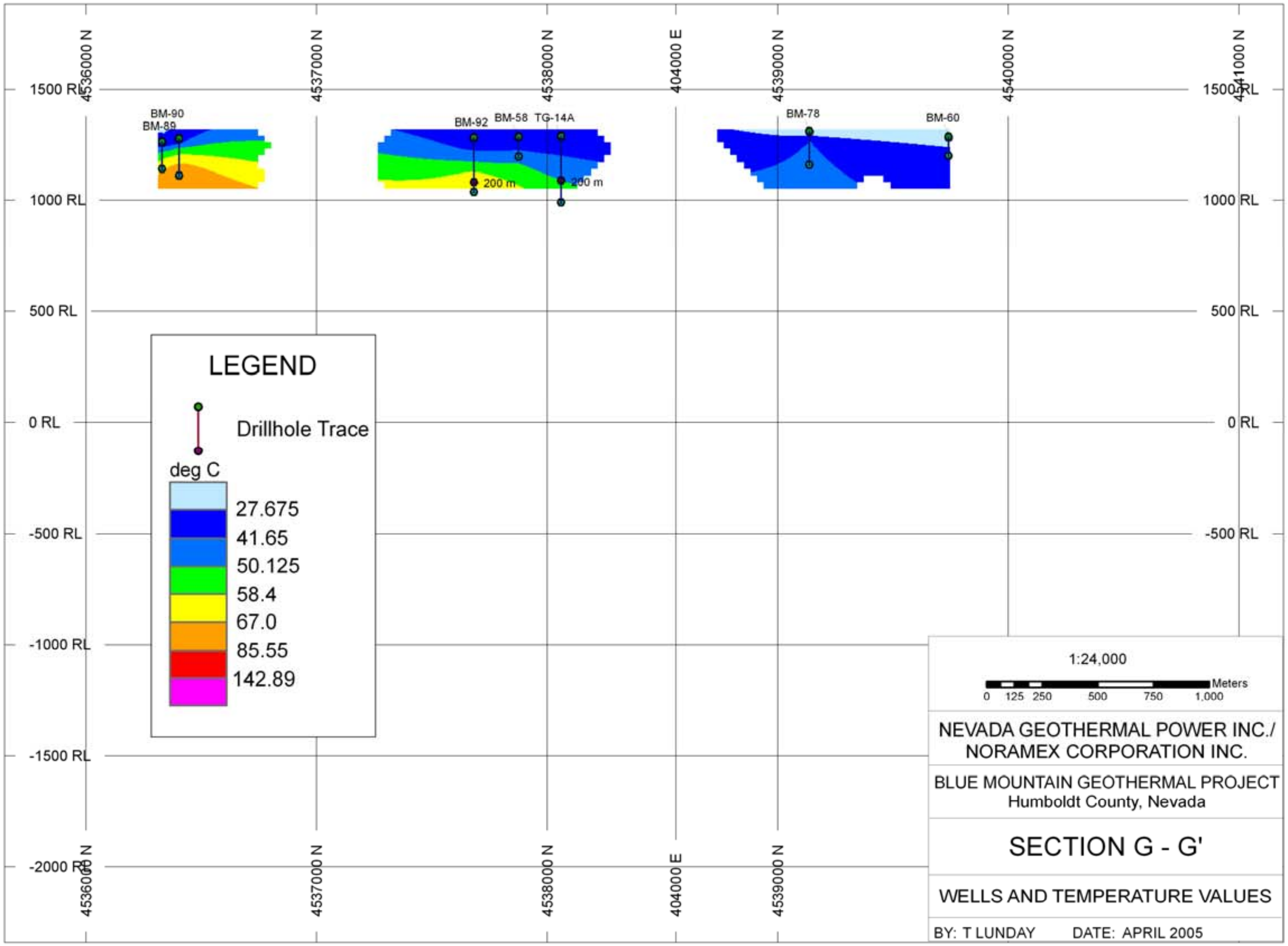
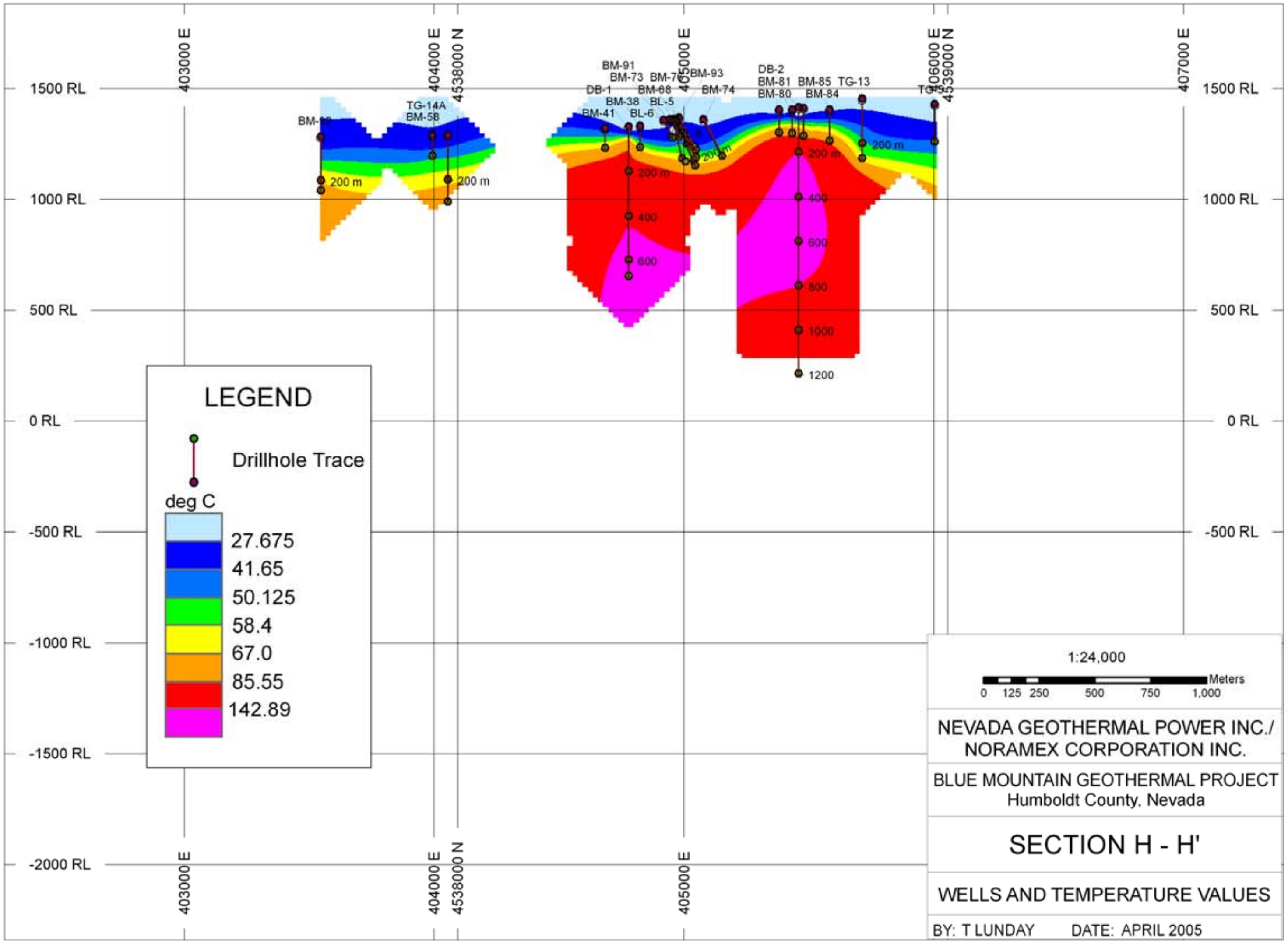

1500 RL
1000 RL
500 RL
0 RL
4538000 N
405000 E
4538500 N
405500 E
4539000 N
4539500 N
BM-48
BM-44
BM-47
BL-7
BM-43
BM-41
DB-1
BM-73
BM-91
BL-6
BM-93
BM-68
BL-5
BL-8
BM-74
BM-81
BM-80
BM-85
DB-2
BM-84
200 m
400
600
800
1000
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:12,000
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION F - F'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY
DATE: APRIL 2005

Figure 4.11



1500 RL
1000 RL
500 RL
0 RL
-500 RL
-1000 RL
-1500 RL
-2000 RL
4536000 N
4537000 N
4538000 N
404000 E
4539000 N
4540000 N
4541000 N
BM-90
BM-89
BM-92
BM-58
TG-14A
BM-78
BM-60
200 m
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:24,000
Meters
0 125 250 500 750 1,000
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION G - G'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY
DATE: APRIL 2005

Figure 4.12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1000 RL
500 RL
0 RL
-500 RL
-1000 RL
-1500 RL
-2000 RL
403000 E
404000 E
4538000 N
405000 E
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4539000 N
407000 E
BM-91
BM-73
DB-1
BM-68
BM-38
BL-5
BM-41
BL-6
BM-93
BM-74
DB-2
BM-81
BM-85
TG-13
BM-80
BM-84
TG-14A
BM-58
200 m
400
600
800
1000
1200
LEGEND
Drillhole Trace
deg C
27.675
41.65
50.125
58.4
67.0
85.55
142.89
1:24,000
Meters
0 125 250 500 750 1,000
NEVADA GEOTHERMAL POWER INC./
NORAMEX CORPORATION INC.
BLUE MOUNTAIN GEOTHERMAL PROJECT
Humboldt County, Nevada
SECTION H - H'
WELLS AND TEMPERATURE VALUES
BY: T LUNDAY
DATE: APRIL 2005

Figure 4.13

5.0 FLOW AND INECTION TEST DAILY REPORT

Monday November 8, 2004
A discussion was held in order to create a general guideline for the flow and injection test on DB-II. A general drawing of the flow line was defined and sent to Boart Longyear.

Tuesday November 9, 2004
Traveled from Vancouver to Winnemucca.

Wednesday November 10, 2004
Arrived in Winnemucca and began organizing the inventory for the flow test on site. Faxed information to Boart Longyear. Began discussing the flow line arrangement with the drilling superintendent, and realized that the spacer spool already on site wasn't compatible with the geothermal gate valve that would be installed on the wellhead. Measured the tank capacity on site; 8' x 27' 4" equivalent to 10,000 gallons. The water truck has a capacity of 4,000 gallons.

Thursday November 11, 2004
Checked the H2S on the wellhead and uninstalled the spacer spool to be reworked in Winnemucca. Steve Loughry was contacted by phone in order to reserve his water truck and caterpillar if work was needed. The work done on the spacer spool will take a maximum of 3 hours.

Friday November 12, 2004
The reduced spacer spool was installed on the DB2 wellhead. Details of the flow line test were sent to Boart Longyear to clarify the set up. Inventory of NQ pipe was made by Tyler Fairbank and will be double checked today. Steve Loughry was contacted to inform him that we needed the caterpillar on site by Saturday.

Saturday November 13, 2004
Began searching for a crane truck in Winnemucca, and booked one for Monday morning.
The caterpillar operator was supposed to be on site, however, he did not show up. Therefore Steve Loughry was contacted, and the work was re-scheduled for Sunday.

Sunday November 14, 2004
A caterpillar and water truck were brought on site in order to prepare the road, work commenced at 9:00 AM and finished at 2:00 PM approximately. A Kuster temperature survey was conducted on DB-1 to check the difference between the gauges.

Monday November 15, 2004
The drill rig arrived and began rigging up. Preparations on the water tank for the injection test commenced. The plan is to begin drilling tomorrow, Tuesday November 16, 2004 on DB2. The drill crew worked from 7AM to 7PM.

Tuesday November 16, 2004
Set up B.O.P on 4" tree without deflector. No circulation was used which necessitated rotating the drill string very carefully. The drill string was set up with an HQ USD bit type. The rework on drilling continued until it reached the bottom of the hole at 3698'arround midnight. The bottom was at the end of the previous drilling 3700'. Debris filled the bottom two feet. In order

to determine if the drill string was free they tripped out 100 feet and tripped back down 80 feet to make sure the drill string wasn't trapped in the hole.

Wednesday November 17, 2004

At 1:00 AM a wire line was used to run the Kuster temperature log and a tandem MRT. The survey was conducted from 600' to 2520'. At 9 AM the Kuster survey was finished. It took six hours to pull the HQ rods, finishing around 2 PM. They ran the NQ tubing (2 ¾" O.D.) down the hole tagging bottom at 3698', pulling back off the bottom 10', requiring approximately six hours until 8 PM. The non-slotted liner ended at 2100' with slotted liner from 2100' to 3688' TD. Rigging down completed by midnight.

Thursday November 18, 2004

The rigging for the flow line was set up and finished around 4 PM. Welaco commenced logging the temperature profiles during the evening.

Friday November 19, 2004

Key-Energy arrived on site at 7:00 AM and initiated a safety meeting. An H2S survey was conducted with the portable H2S detector, and no gas was detected. The flow test was conducted and water samples were taken. An H2S survey was conducted while the well was flowing, again no gas was detected. The well was flowed in two stages because the Key Energy compressor encountered problems with the clutch. Details of the two stages were recorded.

Saturday November 20, 2004

The injection test was conducted using Continental Equipment from Fallon Nevada. Water was injected at the rate of 150 GPM while Welaco logged the well. A total of 17,000 gallons of water were injected. A 3" flow meter was used in conjunction with a centrifugal pump.

Sunday November 21, 2004

Welaco logged the well twice after waiting 12 hours for it to equilibrate and then de-mobilized.

6.0 GEOCHEMISTRY ANALYSIS (Thermochem, Inc.)

6.1 Geochemistry Summary

The November 19, 2004 flowtest waters from Deep Blue #2 are similar to the waters collected April 30, 2004 but show higher total dissolved solids concentration and generally higher geothermometer temperatures. This appears to be due to the elimination of drilling contamination in the well, producing more pristine representatives of the parent reservoir water or from more water deeper in the well. The low temperature K-Mg geothermometer the November samples show ~205ºC versus ~180°C (401°F versus 356°F) for the April samples. Silica geothermometry appears to have switched from control by quartz to that of chalcedony, yielding a temperature of ~220ºC (428°F). The Na-K and Na-K-Ca geothermometers both show an approximate increase of 15ºC (59^{o}F) over the April samples (i.e. now 235ºC (455°F) and 255ºC (491°F), respectively). Anhydrite temperatures remains unchanged at 180-185ºC (356-365°F), seeming to reflect near-wellbore conditions. Near-wellbore control of calcium content by anhydrite suggests that the Na-K-Ca geothermometer is artificially depressed, and the Na/K geothermometer is more appropriate for the parent water. The geothermometry of the November samples points to a likely reservoir temperature of 250°C, ~10°C (482°F, ~50°F) hotter than indicated by the April flowtest samples.

The Thermochem Deep Blue No.2 geochemistry tables of results can be found in Appendix C.1. Full page, Thermochem figures containing the entire suite of geochemistry samples from the Blue Mountain geothermal wells are in Appendix C.2.

6.2 Key Points

1. Data quality for the November samples appears good (see Table 1). Charge balances (the difference between the sum of cations, or positively charged ions, and anions, or negatively charged ions) are all less than 10%. Conductivity's are close to the standard "100 times charge ([cations + anions]/2)", suggesting no important analytes are missing, although overall negative charge balances suggests a possible missing cation analyte. Some of the other Deep Blue waters are relatively enriched in iron and strontium, suggesting the missing cations may be heavy metals. The final DB-2 sample shows the worst charge balance (-9%) and conductivity well below "100 times charge", but shows geothermometer temperatures (other than silica) in line with the other samples. The conductivity analysis for this sample is likely in error. The conductivity for the final sample, analysis number 11121-7, is lower, most likely due to the fact that the pump was shut off at the time and the well was not being airlifted.

2. The November samples are richer in components attributable to geothermal reservoir fluids (Na, K, Li., SiO_2, B, Cl, and F), and poorer in components commonly enriched in low temperature waters peripheral to geothermal systems (Ca, Mg, HCO_3^-, SO_4^{-2} and NH_3), (see Table 2). This suggests that the November DB-2 samples are less diluted by peripheral water (drilling water?) that those in April. The different makeup of the November samples versus those in April is, to a certain extent, mirrored by the chemical evolution of the November samples as sampling progressed, suggesting that some of the contamination is due to wellbore processes. The variation of sulfate concentration with chloride (Figure 6.1) shows an increase in chloride and sulfate concentration for the November samples. This indicates that sulfate is a component of the reservoir water. The consistency of the anhydrite geothermometer between the

April and November samples suggests that anhydrite is present in the new wellbore reservoir and the well fluids have equilibrated with it at the measured wellbore temperature (~180ºC / 356ºF). The greater sulfate in the November samples suggests that the parent reservoir water is depleted in calcium and dissolves anhydrite, picking up sulfate, as it cools to the local reservoir.

3. A cross plot of fast-reacting (and therefore low temperature) geothermometers (Figure 6.2) shows a considerable increase in K-Mg temperature for the November DB-2 samples (from 180-200ºC / 356-392ºF), and an apparent switch of control of silica concentration from quartz to chalcedony. The change appears to be due to reduced contaminating water in the November 2004 samples. The waters in the April samples appear to have dissolved near-wellbore quartz to reach silica saturation, whereas those in the November samples were actively precipitating chalcedony, the expected silica phase under near-wellbore conditions (~180ºC / 356ºF).

4. A cross-plot of the Na-K and Ca-Mg geothermometers (Figure 6.3) shows that the November waters trend toward a Na-K temperature of 250°C, 10°C (482°F, 50°F) higher than indicated in the April samples. Although higher than the empirical Na-K-Ca and Na-K-Ca (magnesium corrected) geothermometers, the lower Na-K-Ca temperatures are consistent with pick-up of Ca and Mg as the fluids re-equilibrate to temperatures near the DB-2 wellbore.

<u>References</u>

Giggenbach W.F., 1991, Chemical Techniques in Geothermal Exploration; In UNITAR/UNDP Guidebook: Application of Geochemistry in Geothermal Reservoir Development, F. D'Amore Ed.

Sample Name	Analysis Number	Date	pH	conductivity uhoms/cm	sum cations	sum anions	Charge Balance (cat-ani) 0.5*(cat+ani)
Deep Blue 2	10885-1	04-30-04 6:00	8.675	6440	62.0	63.4	-2%
Deep Blue 2	10885-2	04-30-04 15:00	8.70	6570	64.0	64.5	-1%
Deep Blue 2	10885-3	04-30-04 16:00	8.59	6950	67.2	67.9	-1%
Deep Blue 2	11121 - 1	11-19-04 11:45	8.52	7300	70.8	72.1	-2%
Deep Blue 2	11121 - 2	11-19-04 02:15	8.42	7380	70.2	73.2	-4%
Deep Blue 2	11121 - 3	11-19-04 02:45	8.36	7400	70.8	73.3	-4%
Deep Blue 2	11121 - 4	11-19-04 03:15	8.44	7440	70.0	73.3	-5%
Deep Blue 2	11121 - 5	11-19-04 03:45	8.45	7420	70.5	72.9	-3%
Deep Blue 2	11121 - 6	11-19-04 04:15	8.39	7410	68.9	72.9	-6%
Deep Blue 2	11121 - 7	11-19-04 04:45	8.49	5390	67.0	73.7	-9%

Table 1: Data Quality indicators of DB-2 well waters.

Analysis Number	Sample Label	pH	Li	Na	K	Ca	Mg	SiO2	B	Cl	F	SO4	HCO3	CO3	NH4
10885-1	4/04-1	8.675	3.083	1280	142	41.4	1.63	154	11.7	1902	3.31	146	322	38.3	13.8
10885-2	4/04-2	8.7	3.209	1324	146	41.8	1.74	149	11.8	1950	3.51	143	283	49.5	13.0
10885-3	4/04-3	8.59	3.47	1398	156	36.7	1.06	138	13.0	2118	3.61	168	203	34.8	9.0
11121 – 1	11/04-1	8.52	3.43	1470	177	35.3	0.757	333	15.2	2310	4.24	154	211		5.56
11121 – 2	11/04-2	8.42	3.54	1460	181	29.1	0.630	350	16.1	2360	4.35	162	184		5.14
11121 – 3	11/04-3	8.36	3.47	1470	182	32.1	0.650	355	15.7	2360	4.45	165	186		4.99
11121 – 4	11/04-4	8.44	3.52	1450	186	31.8	0.595	375	15.6	2370	4.39	162	172		4.87
11121 – 5	11/04-5	8.45	3.40	1460	187	33.5	0.613	369	15.6	2350	4.38	166	176		4.82
11121 – 6	11/04-6	8.39	3.47	1420	187	36.0	0.598	385	15.7	2360	4.48	163	165		5.08
11121 – 7	11/04-7	8.49	3.49	1380	182	35.9	0.595	304	15.6	2380	4.53	173	163		4.95

Table 2: Major Element Chemistry of the DB-2 well waters.

Sample Name	Analysis Number	Amorphous Silica	Chalcedony conductive	Quartz conductive	Na-K-Ca	Na-K-Ca Mg corr	Na/K	K/Mg	Anhydrite
Deep Blue 2	10885-1	40	139	163	219	214	241	174	180
Deep Blue 2	10885-2	38	137	161	220	214	240	174	182
Deep Blue 2	10885-3	34	132	156	223	223	241	187	182
Deep Blue 2	11121 - 1	93	203	219	229	229	248	199	187
Deep Blue 2	11121 - 2	97	208	223	233	233	250	204	191
Deep Blue 2	11121 - 3	98	209	225	232	232	250	204	188
Deep Blue 2	11121 - 4	102	215	229	234	234	253	207	188
Deep Blue 2	11121 - 5	101	213	228	234	234	253	207	186
Deep Blue 2	11121 - 6	105	217	232	234	234	255	207	184
Deep Blue 2	11121 - 7	86	194	212	234	234	255	206	182

Table 3: Geothermometer temperatures of DB-2 well waters

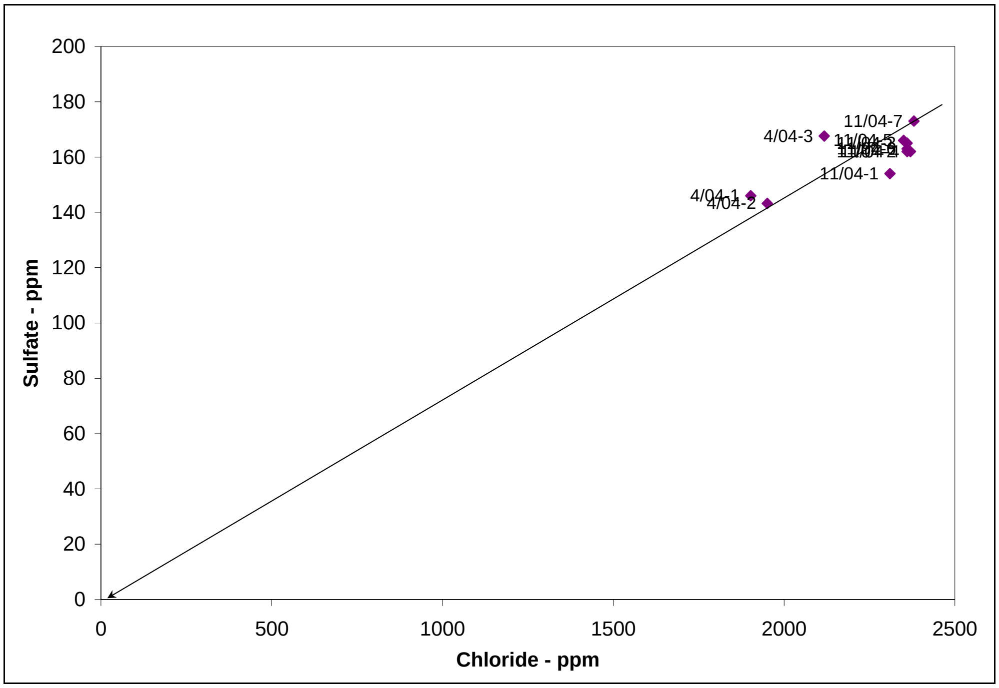


Figure 6.1: Cross-plot of chloride versus sulfate for DB-2 well waters. The arrow shows the trend of fresh water dilution.

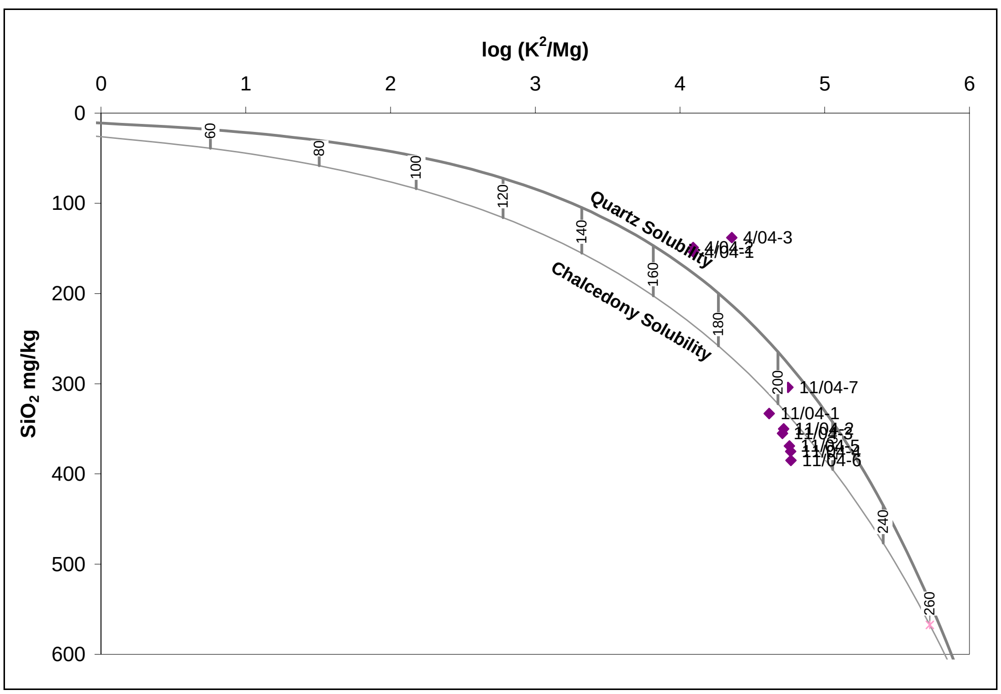


Figure 6.2: Cross-plot of K-Mg geothermometer versus silica geothermometers, after Giggenbach (1991).

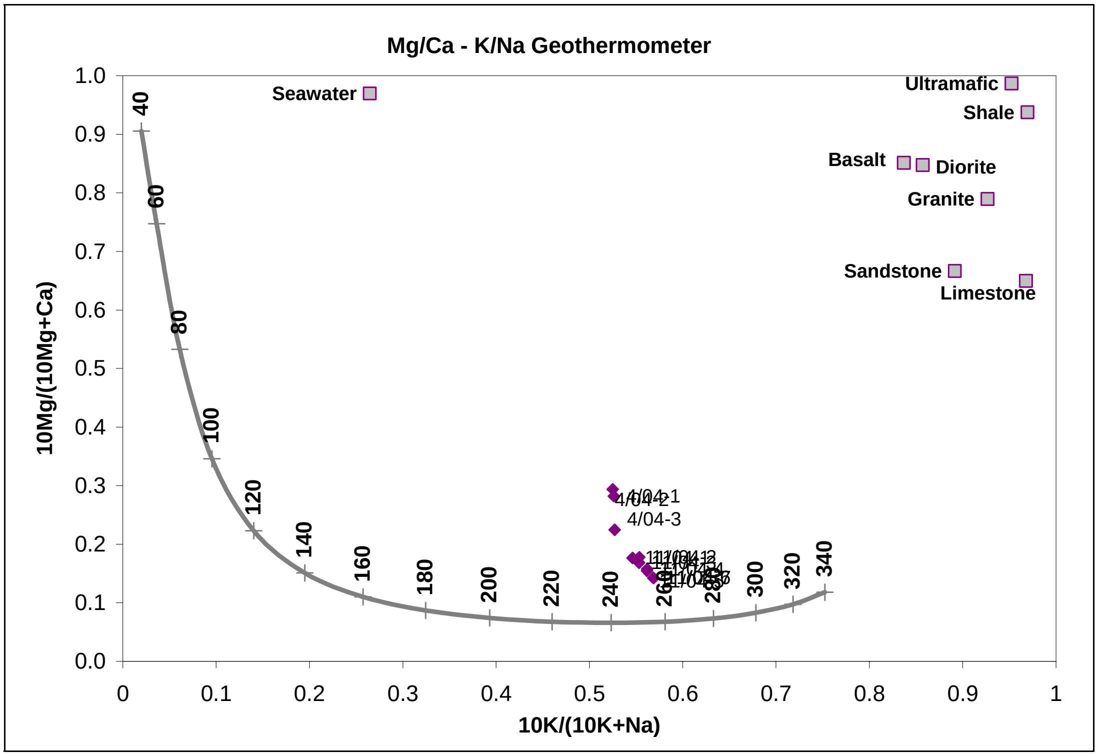


Figure 6.3: Na-K / Ca-Mg geothermometer cross-plot of the DB-2 well waters, after Giggenbach (1991). The trend from the April to November samples suggests cooling and re-equilibration from an equilibrated parent reservoir water of ~250ºC.

7.0 WELL TESTING (Susan Petty, Black Mountain Technology)

7.1 Well Test Summary

Two flow tests and one injection test of well Deep Blue No.2 were conducted following completion of the well. The first flow test on April 30, 2004, accomplished by air lifting the hole immediately after drilling, was done to clean the hole and to obtain water samples. Analysis of water samples showed decreasing mixing with cooler surface water during the test, with the silica geothermometers indicating temperatures between 170-185°C (338-365°F) and the Na-K geothermometers indicating temperatures around 220°C (428 °F). The well was flow tested again on November 19, 2004, following clean out of a bridge in the hole and running of a slotted liner. The well was air lifted to obtain water samples more representative of the formation fluids, then an injection test was performed to obtain some indication of reservoir permeability. Fluid samples taken during this flow test showed consistent temperatures around 220°C (428 °F), both for the silica geothermometers and the Na-K geothermometers. The injection test successfully demonstrated high permeability in a zone with temperatures around 155°C (311°F) from just below the casing shoe. The test results indicate that while there is a high permeability moderate temperature resource that can be developed in this area, this moderate temperature resource is fed by a higher temperature resource which is moving up or outward to the shallow DB-2 high permeability zone without mixing appreciably with any cool groundwater. Because the moderate temperature fluid in DB-2 has cooled through convection, not mixing, it is likely that this higher temperature resource can be developed in this area instead of developing the moderate temperature resource. See Figure 7.1 for the schematic of the testing well head for the rig-on test after clean-out.

For Figures in English units see Appendix D. The original Welaco flow and injection survey graphs are in Appendix E.

7.2 Well Logging

Description of Logging

One high resolution log using electronic tools which log pressure, temperature, spinner and linespeed, and four Kuster surveys were run in DB-2 during the course of drilling. Maximum registering thermometer readings were also run regularly to track temperatures during drilling. A high resolution survey run on 4/1/04 was completed just after the 4 1/2" casing was set and cemented. Another high resolution survey on 4/29/04 was conducted 18 hours after drilling was completed. A Kuster survey run on 5/19/04 encountered a blockage in the hole at a depth of 439m (1440 ft).

Since further testing was not possible without cleaning the hole, a rig was moved in on November 16. Clean out of the bridge at ~439 to 520m (1440 to 1706ft) was accomplished without the use of any water and with no trouble. Only two feet of fill were encountered at the bottom of the hole. The well was logged immediately after clean out with a Kuster tool through the drilling rods to obtain a survey before running the liner could disturb the temperatures. The NQ tubing was then run to a depth of 1123.5m (3686ft) without encountering any obstacles. The well was logged through the tubing using high accuracy digital temperature, pressure and spinner tools. A maximum temperature of 160°C (320°F) was observed from 546 to 587m (1791 to

1926ft). Both surveys also showed a long, nearly isothermal zone from just below the casing shoe at 199 to 587m (653 to 1926ft). Figure 7.2 shows all available temperature logs up to just prior to the injection test, including MRT's, Kuster surveys and continuous electrical surveys.

Following the air lift of DB-2 and just prior to injection testing, the well was logged running into the hole. With the tool on bottom, injection was started and stabilized at 150gpm of cold water (~20°C / 68°F) taken from a local well. The injection test continued for 2 hours at a constant rate of 150gpm with the tool on bottom to obtain a pressure build up. When it was clear that there was not much water left to continue injection, the hole was logged up and then down while still injection at a constant 150gpm. With the tool on bottom, the injection was shut-in and a pressure build-up obtained. After the pressure build-up had stabilized, about 3.5 hours after the start of injection, the well was logged up.

DB-2 was then logged after 12 hours of recovery from injection and again after 24 hours of recovery. Because there was little or no difference between the 12 and 24 hour recovery logs, further heat up was not necessary.

Log Interpretation

The high resolution log (Figure 7.3) run following clean out of the bridge showed a static water level at 40m (131ft) below ground surface (BGS). This log should be fairly close to the equilibrated temperature and pressure because no fluid was used during clean out of the bridge in the hole. The survey showed a nearly isothermal zone suggesting fluid circulation in the reservoir of 385m (1106ft) thickness. Below this zone the temperature reverses, extending from 585 to 835m (1919 to 2740ft) with an average temperature of 149°C (300°F), ranging from 158 to 140°C (316 to 284°F). This zone shows conductive cooling, and therefore lower permeability. Below this zone, the temperature drops further to 119°C (246°F). The last 60m (197ft) of the hole heat up very slightly suggesting another reversal to increasing thermal gradient. This bottom zone is relatively isothermal and took fluid during drilling, suggesting permeability as evidenced by the MRT temperatures and the Kuster surveys taken during drilling (Figure 7.2). During injection, however, the zone did not cool off (Figure 7.3). Sufficient cool fluid may not have been available to exit and cool off this part of the hole, or the low remaining flow of injectate may have heated to about the temperature of this zone on its way down.

A reversal below a very permeable zone is typical of outflow zones, common in the Basin and Range, where fluid flows upward along faults usually trending north-south or northeast-southwest, and then laterally in either permeable sediments out into the basin, or as is likely in this case, along east-west trending lower permeability faults. Below the permeable outflow zone, cooler fluids, typical of the thermal gradient for the area, control the temperature.

Figure 7.4 compares the high accuracy survey run immediately after drilling (Welaco 4/29/04) to the survey run immediately after clean-out (Welaco 11/18/04) and the surveys run during and after injection. In the 11/18/04 survey there is an isothermal zone from just below the casing shoe, 202 to 587m (663 to 1926ft), with the temperature around 157°C (314°F). This is evidence of circulating fluid in the fractured rock in this zone. During drilling, this entire zone had high lost circulation rates, with very large losses in the top 50m (164ft) of the zone (Figure 7.5), also a good indication of permeability.

Figure 7.4 indicates the permeable zones with lines of thickness varied by permeability. Those zones which cool off or heat up the most are considered the most permeable. However, some of the temperature variation in the deeper part of the hole following the air lift is related to pulling cooler water up from below. This is why the survey during injection (Figure 7.3) shows higher temperatures at the bottom part of the hole compared to the surveys run prior to injection than does the earlier survey run prior to injection. The cooler fluid from the bottom of the well has stopped moving up the borehole.

Although temperatures increase from the bottom of the casing shoe to a depth of 590m (1935 ft), the zone from 200 to 260m (656 to 853ft) is clearly the most permeable. Figure 7.5 shows the loss zones with the surveys taken immediately after drilling and following clean-out of the bridge. Because temperatures were not expected to be high in this zone, and because the hole was planned to explore temperatures in deeper zones, these loss zones were controlled with lost circulation materials down to around 550m (1804 ft). When the loss zone just below the shoe was not controlled with loss materials alone, it was cemented, but despite this, it still took fluid at a high rate during the injection test. This suggests very high permeability over this interval.

It is interesting that in Figure 7.4, which compares all the temperature surveys done during the entire November test, the survey done following the airlift just prior to injection shows cooling in the high temperature zone from 200 to 260m (656 to 853ft). This is most likely due to boiling in this zone caused by pressure drop during the air lift.

During injection, the zone just below the casing shoe took most of the fluid as indicated by the extreme cooling from 200 to 260m (656 to 853ft) (Figure 7.4). None of the zones at deeper depths took any of the injection fluid. This is typical of multiple entry geothermal wells. During injection, the first permeable zone will take all of the fluid with none reaching deeper permeable zones unless injection continues over very long time periods. This permeable zone heats up very rapidly following shut off of injection and is completely recovered in temperature at the time of the 12 hr survey.

Figure 7.6 compares DB-2 just prior to the flow test to the equilibrated temperature survey from DB-1. The shape of the two curves is similar. The top part of both holes shows an ~80°C (176^{o}F) about 100m (328ft) thick. Both wells have a long isothermal zone about 410m (1345ft) thick. There is no way to tell if the temperature in DB-1 would have reversed as it does in DB-2 below a depth of 590m (1935 ft). Temperature reversals such as that in DB-2 are common in active and or young geothermal systems where hot fluids flow up a permeable conduit from depth and then spread out, cooling by convection and mixing as they move away from the source water up-flow zone. The cool zone below the reversal in DB-2 does not appear to be very permeable as evidenced by the relatively small amount of increase in temperature between the 4/29/04 survey and the 11/18/04 survey in this cooler zone (Figure 7.3).

Figure 7.7 compares pressure surveys from water level in the well was observed in the 4/30/04 survey at a depth of 4.6m (15ft). This is very shallow compared to water wells in the area, but is similar to the water level of DB-1 prior to flow testing. The survey run after clean-out of the bridge showed a water level at 48m (158ft). Just prior to injection after the hole was air lifted the water level was observed at 104.65m (343ft). This water level increased during injection only 3 kPa to 105.8m (347ft). 12 hours after injection, the liquid level was found at 102.8m (337.3ft). 24 hours after injection the water level was almost unchanged at 102.7m (336.9 ft).

The large drop in static water level following the airlift flow test on 11/19/04 shown by comparing the pressure survey from 11/18 to that taken just before injection on 11/20 could be explained as unrecovered drawdown. However, when multiple zones with very different temperatures are all open to the wellbore, they may have very different pressures. Following a perturbation like a flow test, the well equilibrates to one of the lower pressure aquifers in connection with the well bore. This is very likely what happened to DB-2 since by the survey done 24 hours after the injection test, the fluid level remains at 102.8m (337.3 ft). Comparing bottom hole pressures from the first log run right after the clean out of the bridge, the pressure drops following the air lift and then increases slightly during the injection test, dropping again when injection is ended and then remaining constant for the next 24 hours.

7.3 Air Lift Flow Test

The Key Energy compressor was connected to the NQ tubing hung in DB-2 via a valve above the wellhead following completion of the clean out on November 19, 2004. Safety meetings were held and all non-essential personal were moved to a safe distance from the well. (Figure 7.1)

Flow was initiated at a tubing pressure of 785psi. The flow test continued for 4.5 hours. An attempt was made to flow the well without the airlift after about 3 hours of air pumping, but it died after about 30 minutes so air lift was restarted. Another attempt to flow the well without air was made near the end of the test, but again flow died after about 30 min. The small tubing diameter and moderate enthalpy made density gradient flow very unlikely, but there were signs during the testing that the well came close to sustaining flow.

Water samples were taken at 30 min intervals throughout the test with the final sample taken without the air flow. The results of chemical analysis of these fluids are discussed in the Geochemistry section.

7.4 Injection Test

Test Description

For the injection test, a water storage tank was connected to the 2 inch kill valves on the side of the well head with a pump to initiate injection. The water tank was filled with water pumped from a nearby water well and two water trucks traveled from the well to the storage tank to replenish the water as the test progressed. Because the trucks could not travel or pump water into the storage tank fast enough to keep up with the injection rate, the injection test could not continue beyond two hours.

The injection test started at 12:50pm on November 20. A total of 17,030 gallons of fluid at ~20°C (68°F) was injected at a constant rate of 150 gpm.. Excellent build up data was recorded with the high accuracy tool on bottom. An injecting survey was run with injection held constant at 150 gpm and then the tool was set at the same depth as before to acquire the end of the build-up. On the build-up/fall-off plot in Figure 7.8, there is a break in the data during the time that this injecting survey was run. The pressure fall off was then observed with the tool on bottom after the well was shut-in. When the pressure was observed to change only slightly, a static survey was run. The survey showed most of the fluid exiting the hole at a depth of 202 – 288m (663 – 945ft). This zone cooled to almost ambient temperature and then recovered rapidly suggesting very high permeability. Some fluid also exited the hole at 546 to 587m (1791 to 1926ft) in the high temperature zone.

Figure 7.7 compares pressure surveys during the entire test period. Water level in the well was observed in the 4/30/04 survey at a depth of 4.6m (15ft). This is very shallow compared to water wells in the area, but is similar to the water level of DB-1 prior to flow testing. The survey run after clean-out of the bridge showed a water level at 48m (158ft). Just prior to injection after the hole was air lifted the water level was observed at 104.65m (335.01ft). This water level increased during injection only 3 kPa to 105.8m (347ft). 12 hours after injection, the liquid level was found at 102.8m (337.3ft). 24 hours after injection the water level was almost unchanged at 102.7m (336.9ft).

The large drop in static water level following the airlift flow test on 11/19/04 shown by comparing the pressure survey from 11/18 to that taken just before injection on 11/20 could be explained as unrecovered drawdown. However, when multiple zones with very different temperatures are all open to the wellbore, they may have very different pressures. The bridge that formed at 439m (1440ft), would have separated the deeper cool zones from the shallower high temperature zones, perhaps preventing flow between them.

Following a perturbation like a flow test, the well equilibrates to one of the lower pressure aquifers in connection with the well bore. This is very likely what happened to DB-2 since by the survey done 24 hours after the injection test, the fluid level remains almost unchanged at 102.7m (336.9 ft). Comparing bottom hole pressures from the first log run right after the clean out of the bridge, the pressure drops following the air lift and then increases slightly during the injection test, dropping again when injection is ended and then remaining constant for the next 24 hours.

Test Data Analysis

Flow test data from small diameter wells usually can not be analyzed for reservoir parameters. Because the well usually will not flow on its own, or if it does, considerable phase separation of the liquid and vapor occur due to friction with the wellbore, it must be artificially flowed by air lifting. This makes obtaining any down-hole data almost impossible. In addition, most of the drawdown observed in small well-bores is due to frictional losses in the wellbore, wellbore storage, skin effect or boiling in the wellbore due to these other losses. As a result, the best chance to obtain reservoir parameters from small diameter wells comes from analyzing injection test data.

Even with injection data, the fact that very cold water is usually injected into hot, fractured rocks means that the fractures may open due to thermal effects and that the reservoir pressure may be impacted by changes in fluid density. The fall-off data after injection is shut-in has less of these effects since the injected water is heating back up reducing the amount of thermal impact.

Figure 7.9 shows the bottom hole pressure and temperature history of the injection test. The bottom hole temperature only varies 0.8°C (33.4°F) during the entire injection test. However, the primary production/injection zone drops from 157 to 12°C (314 to 54°F) during injection as shown in Figure 7.3. Although this could have some impact on the water level, Figure 7.8 suggests that this affect is minimal. As a result, the bottom hole pressure data from the injection test was not corrected for thermal effects.

The build-up data in Figure 7.8 is broken by the injecting survey run to determine which zone was receiving the injected fluid. After the tool again reached bottom, and further build-up data was obtained, it became clear that the two sections of bottom-hole data taken before and after the log was run would not match up and would be difficult to analyze. This is often true of data collected in small diameter boreholes in geothermal settings. The injection fall-off data look reasonably smooth and free of problems, so this data was relied on for determination of transmissivity and permeability.

The data was analyzed using the semi-log method and the Horner method. Figure 7.10 shows the semi-log plot of the injection fall off data from DB-2, while Figure 7.11 shows the Horner plot for the same data. The large pressure drop associated with the early fall off is due to wellbore storage and skin effects, or pressure drop due to friction in the wellbore and just outside of it. It is sometimes possible to calculate the skin effect, but this data did lend itself to this calculation, since wellbore storage affects are so large that they hide the skin effect.

The permeability thickness product, or transmissivity, a measure of how well the reservoir will produce, was calculated using both methods described above. For the semi-log method, the transmissivity was found to be 230,000 millidarcies (md). For the Horner method, the kh was even larger, 294,000 md. These values are quite large for oil and gas reservoirs, but typical for good geothermal reservoirs. For instance, the kh values for the Steamboat reservoir range from 350,000 md to over 1,000,000 md.

The calculated kh values were used to determine the maximum draw down to be expected from a properly completed production diameter well drilled and completed to develop the moderate temperature resource at the DB-2 location. With a production flow of 2000 gpm, a pumped well would have about 76 kPa (11 psi) of draw down. However, to keep the water being pumped from boiling, there would need to be sufficient head above the pump to maintain the saturation pressure of 551 kPa (80 psi) plus some added pressure to keep any dissolved gases from coming out of solution. The total set depth to pump at 2000 gpm would then be a minimum of 198m (650 ft.) Since a safety factor of about 61m (200ft) is generally needed to ensure the water does not boil in the pump, the pump would therefore need to be set below the production zone in the slotted liner at a depth of about 259m (850ft). The top of the production zone is at 202m (662ft). This would mean setting a large enough slotted liner through the production interval from 202m (662ft) to TD at 600 m (1969ft) to accommodate the large pump needed to produce this much fluid.

7.5 Geochemistry

Appendix B shows the results of these chemical analyses. This data was used to calculate geothermometers to assess the source temperature of the fluid. Table 1 shows the results of these geothermometer calculations.

The November 19, 2004 flow test samples from Deep Blue No.2 are similar to the waters collected April 30, 2004, during the rig-on flow test, but showed higher total dissolved solids concentration and generally higher geothermometer temperatures. This is most likely due to less contamination of the produced fluid by drilling fluids, producing fluids more representative of the parent reservoir water. The low temperature K-Mg geothermometer from the November samples show ~205ºC versus ~180°C (401°F versus 356°F) for the April samples. Silica geothermometry appears to have switched from control by quartz to that of chalcedony, yielding a temperature of ~220ºC (428°F). The Na-K and Na-K-Ca geothermometers both show an approximate increase of 15ºC (59°F) over the April samples (i.e. now 235ºC / 455°F and 255ºC / 491°F, respectively). Anhydrite temperatures remain unchanged at 180-185ºC (356-365°F), seeming to reflect near-wellbore conditions. Near-wellbore control of calcium content by anhydrite suggests that the Na-K-Ca geothermometer is artificially depressed, and the Na/K geothermometer is more appropriate for the parent water. The geothermometry of the November samples points to a likely parent reservoir temperature of 250°C, ~10°C (482°F, ~50°F) hotter than indicated by the April flow test samples.

The most noteworthy aspect of the geochemistry is the very high content, not only of chloride, but of other constituents indicative of geothermal reservoir fluids. The November samples are richer in components attributable to geothermal reservoir fluids (Na, K, Li, SiO_2, B, Cl, and F), and poorer in components commonly enriched in low temperature waters peripheral to geothermal systems (Ca, Mg, HCO_3^-, SO_4^{-2} and NH_4), (see Table 2). This suggests that the November DB-2 samples are less diluted by drilling water, than those in April. The different makeup of the November samples versus those in April is, to a certain extent, mirrored by the chemical evolution of the November samples as sampling progressed, suggesting that some of the contamination is due to wellbore processes. The variation of sulfate concentration with chloride (Table 1) shows an increase in chloride and sulfate concentration for the November samples. This indicates that sulfate is a component of the reservoir water. The consistency of the anhydrite geothermometer between the April and November samples suggests that anhydrite is present in the reservoir and the well fluids have equilibrated with it at the measured wellbore temperature (~180ºC / 356°F). The greater sulfate in the November samples suggests that the parent reservoir water is depleted in calcium and dissolves anhydrite, picking up sulfate, as it cools to the local reservoir temperature.

All of this leads to the conclusion that the cooling from the parent reservoir to the outflow zone in DB-2 is the result of conductive cooling, not mixing with cooler groundwater. The higher temperature reservoir could therefore be intersected at some deeper depth and be produced just as easily as the moderate temperature fluids are produced. Fairly simple numerical modeling can be done to determine the depth of the parent reservoir fluid.

DB-2 Drawing of Testing Wellhead for Rig-on Test After Clean-out

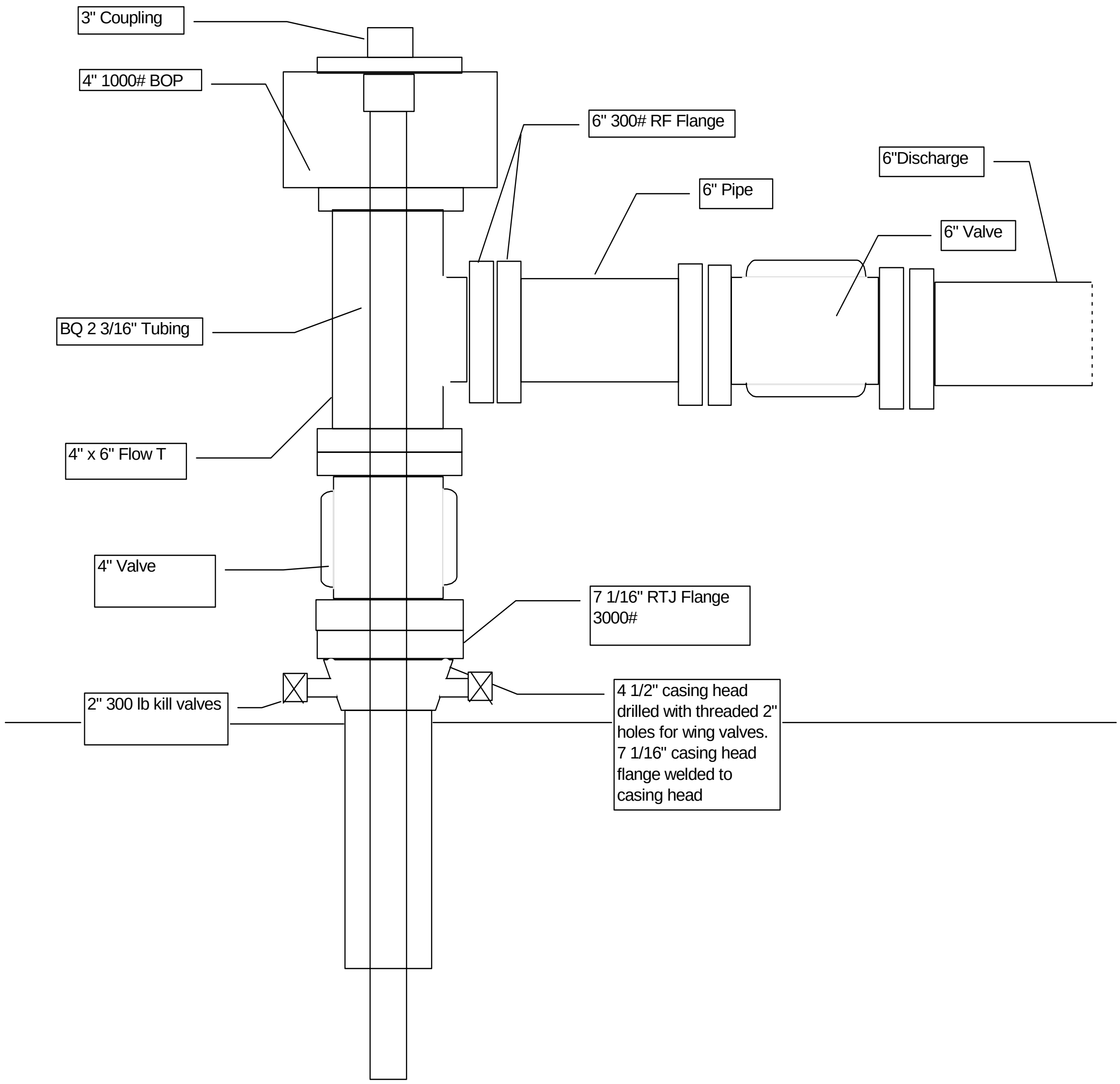


Figure 7.1

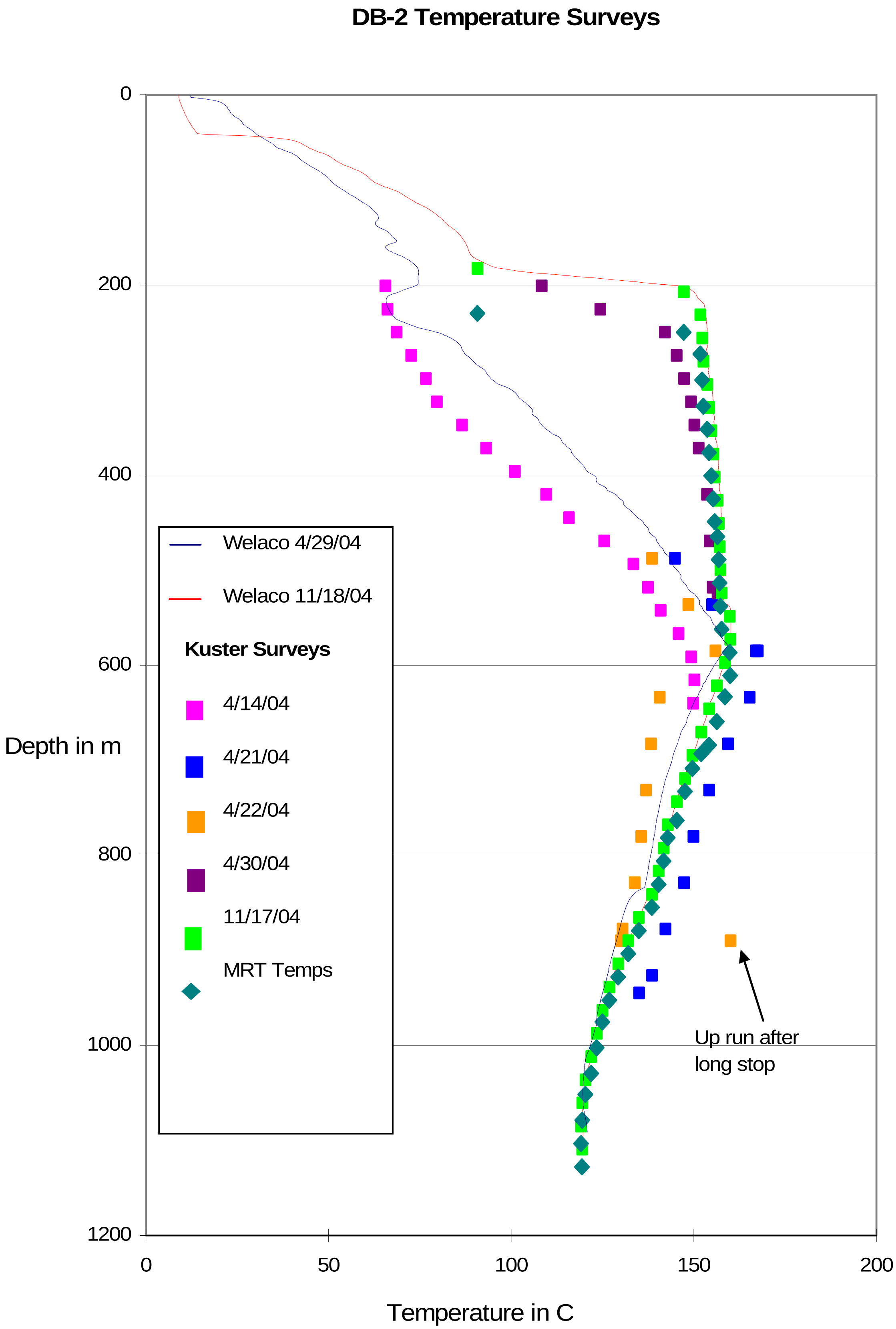
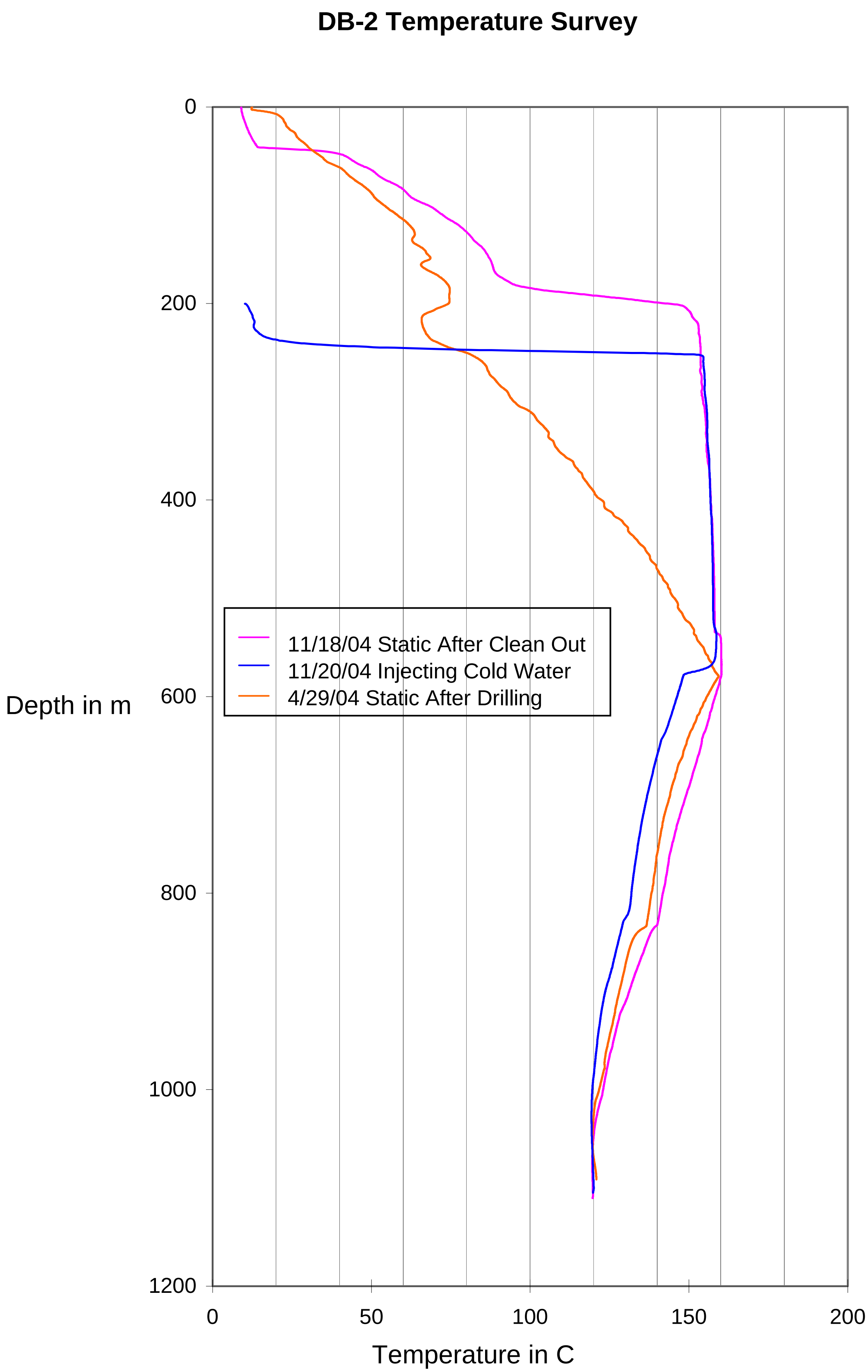

DB-2 Temperature Surveys
Depth in m
0
200
400
600
800
1000
1200
0
50
100
150
200
Temperature in C
Welaco 4/29/04
Welaco 11/18/04
Kuster Surveys
4/14/04
4/21/04
4/22/04
4/30/04
11/17/04
MRT Temps
Up run after
long stop

Figure 7.2

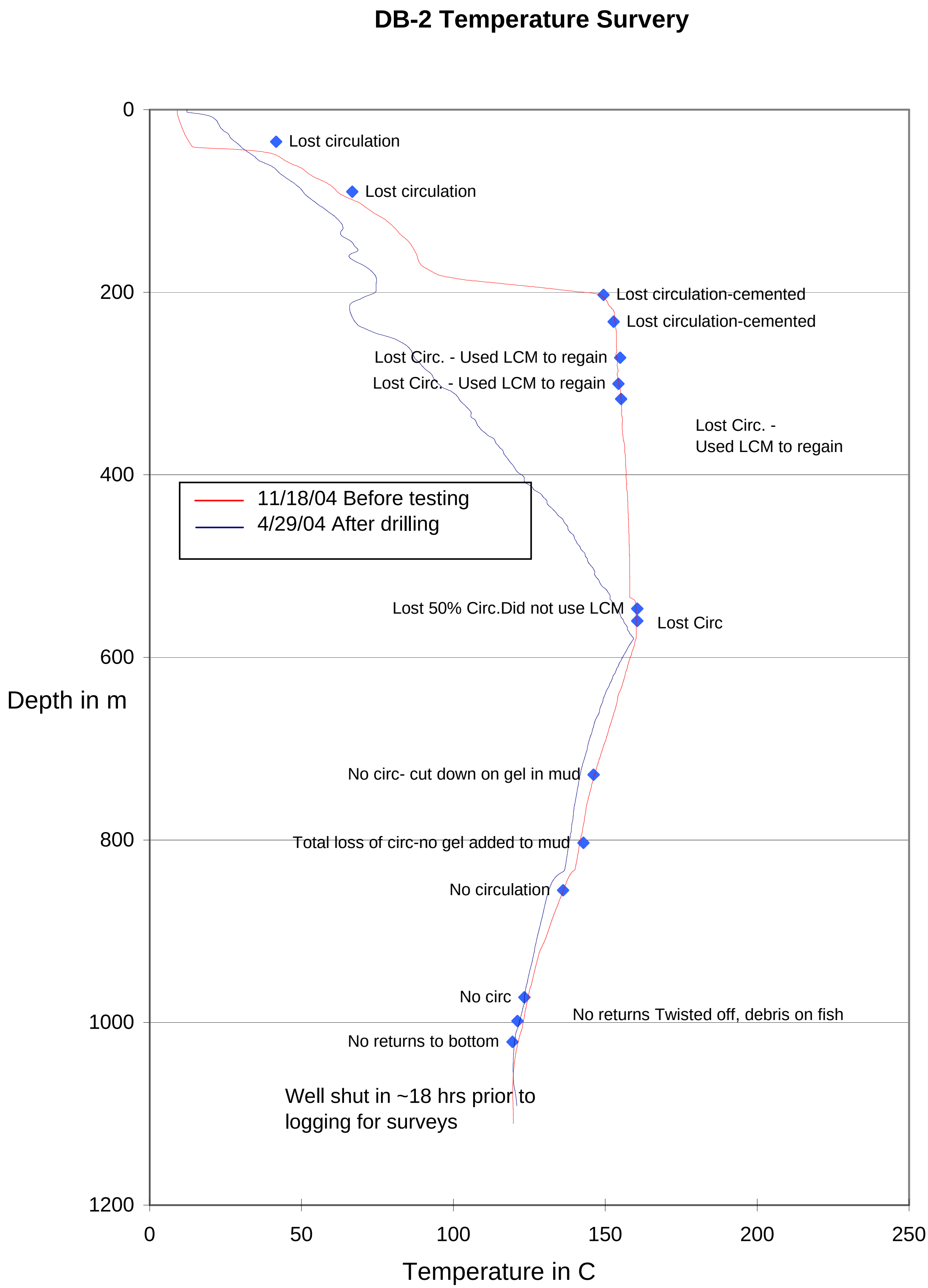


DB-2 Temperature Survey
Depth in m
0
200
400
600
800
1000
1200
0
50
100
150
200
Temperature in C
11/18/04 Static After Clean Out
11/20/04 Injecting Cold Water
4/29/04 Static After Drilling

Figure 7.3


DB-2 Logging During Test
11/18/04 - 11/21/04
Permeable zones
Depth in m
0
200
400
600
800
1000
1200
0
20
40
60
80
100
120
140
160
180
Temperature in C
Down After clean out 11/18
Down before injecting 11/20
Up log injecting 11/20
Up log after shut in 11/20
Down 12 hrs after injecting 11/20
Down 24 hrs after injecting 11/21

Figure 7.4



DB-2 Temperature Survery
Lost circulation
Lost circulation
Lost circulation-cemented
Lost circulation-cemented
Lost Circ. - Used LCM to regain
Lost Circ. - Used LCM to regain
Lost Circ. -
Used LCM to regain
11/18/04 Before testing
4/29/04 After drilling
Lost 50% Circ.Did not use LCM
Lost Circ
No circ- cut down on gel in mud
Total loss of circ-no gel added to mud
No circulation
No circ
No returns Twisted off, debris on fish
No returns to bottom
Well shut in ~18 hrs prior to
logging for surveys
0
200
400
600
800
1000
1200
Depth in m
0
50
100
150
200
250
Temperature in C

Figure 7.5

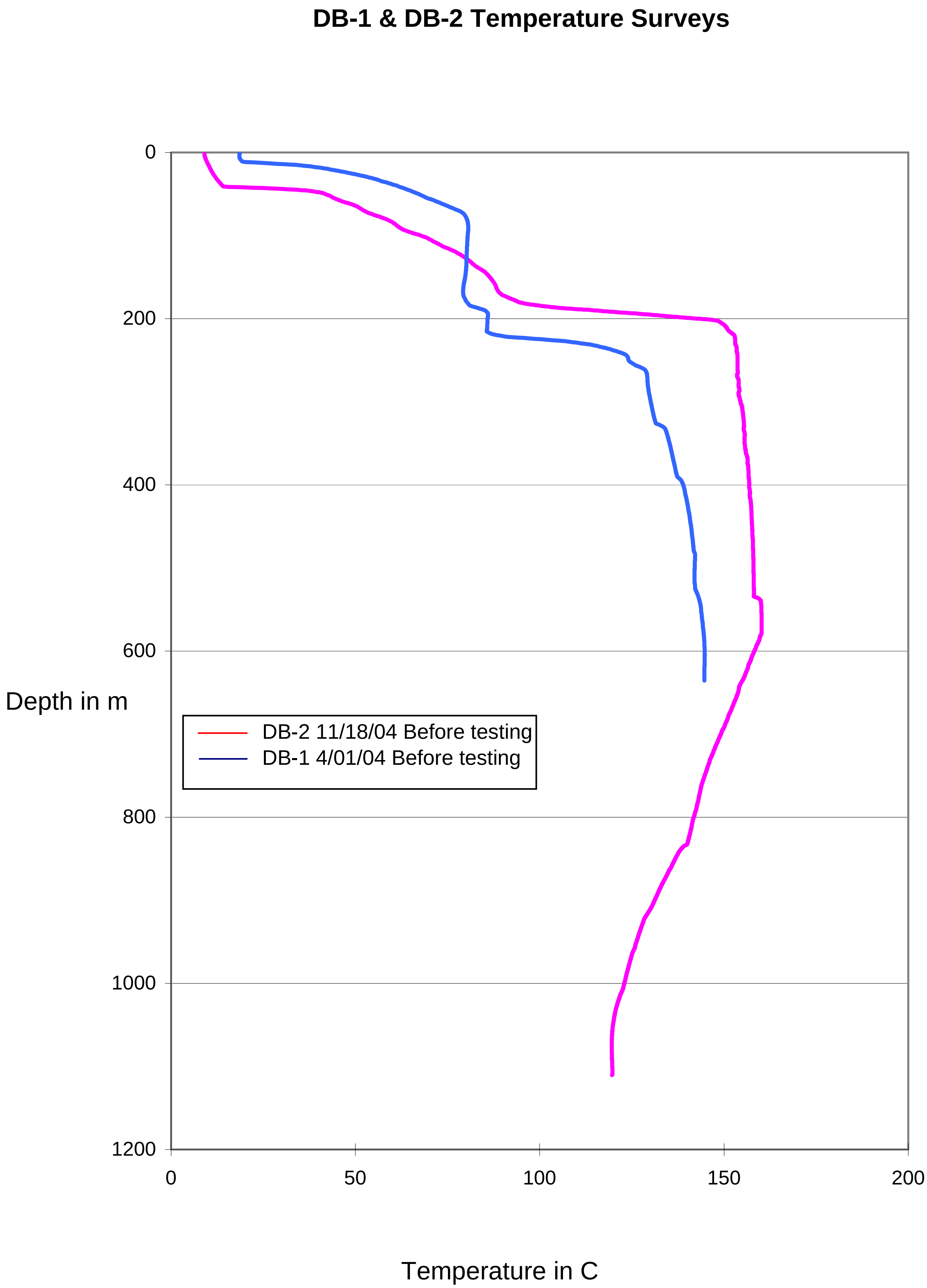

DB-1 & DB-2 Temperature Surveys
0
200
400
600
800
1000
1200
Depth in m
DB-2 11/18/04 Before testing
DB-1 4/01/04 Before testing
0
50
100
150
200
Temperature in C

Figure 7.6

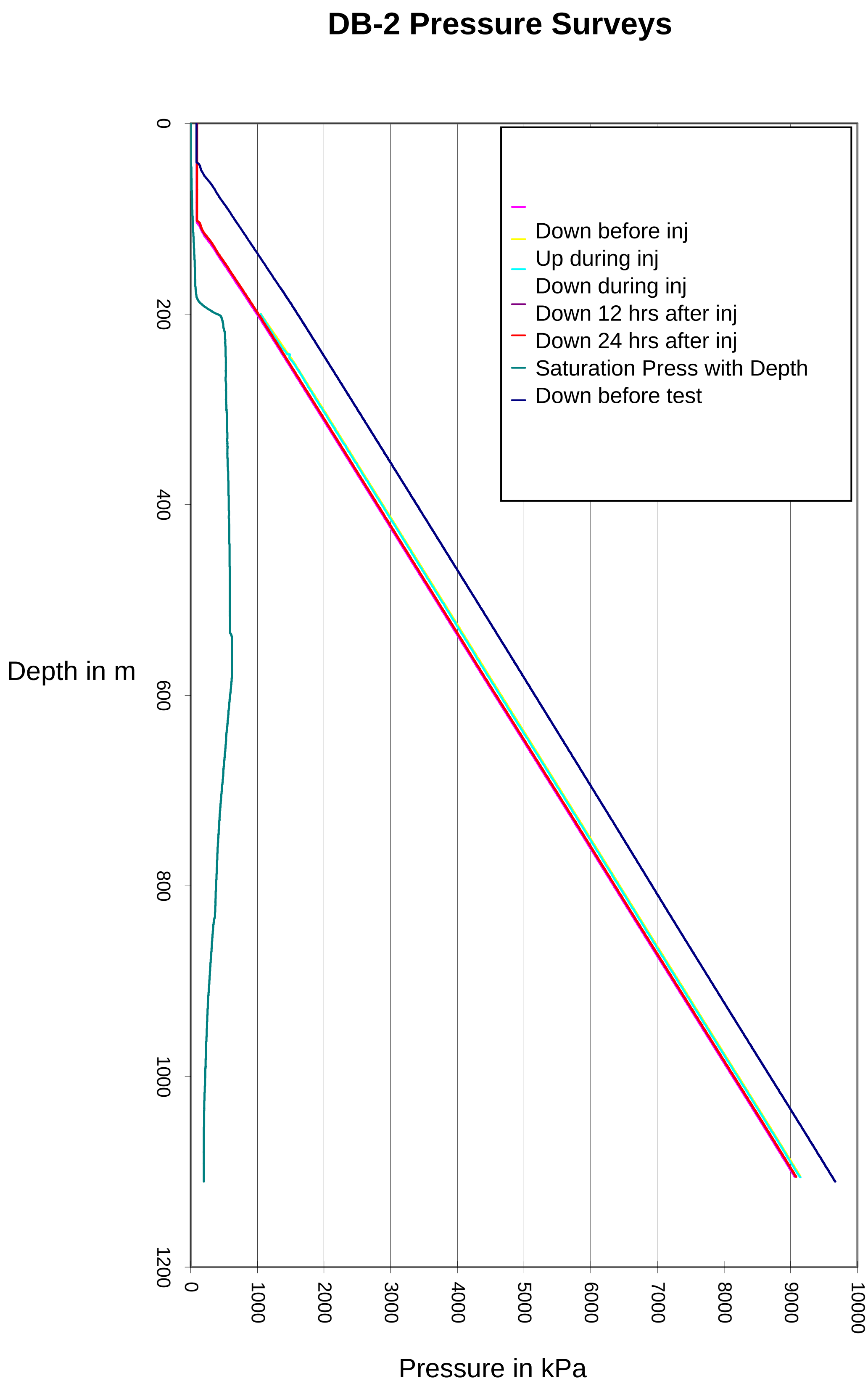

DB-2 Pressure Surveys
Depth in m
0
200
400
600
800
1000
1200
Pressure in kPa
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
Down before inj
Up during inj
Down during inj
Down 12 hrs after inj
Down 24 hrs after inj
Saturation Press with Depth
Down before test

Figure 7.7

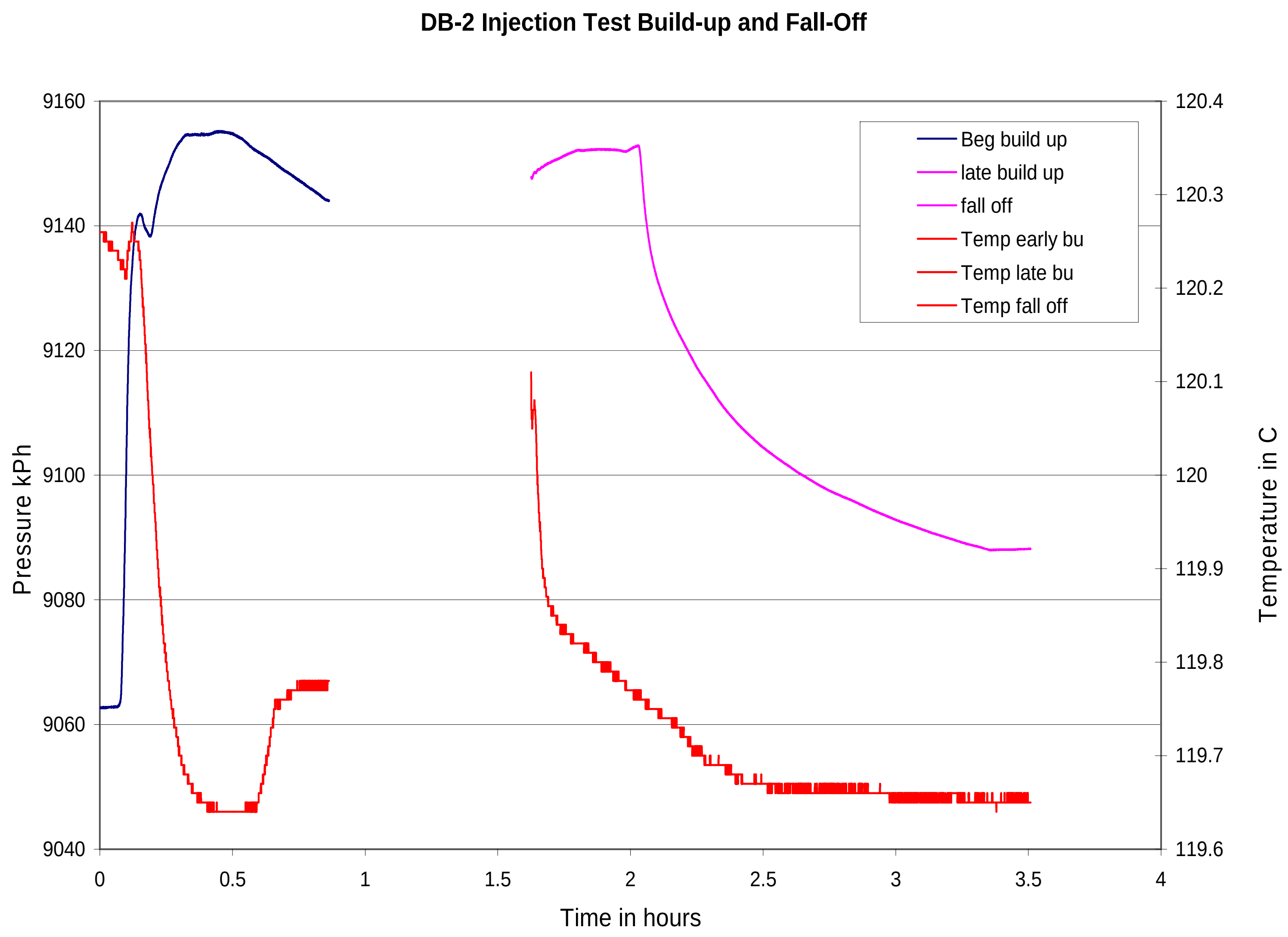

DB-2 Injection Test Build-up and Fall-Off
9160
9140
9120
9100
9080
9060
9040
Pressure kPh
120.4
120.3
120.2
120.1
120
119.9
119.8
119.7
119.6
Temperature in C
0
0.5
1
1.5
2
2.5
3
3.5
4
Time in hours
Beg build up
late build up
fall off
Temp early bu
Temp late bu
Temp fall off

Figure 7.8

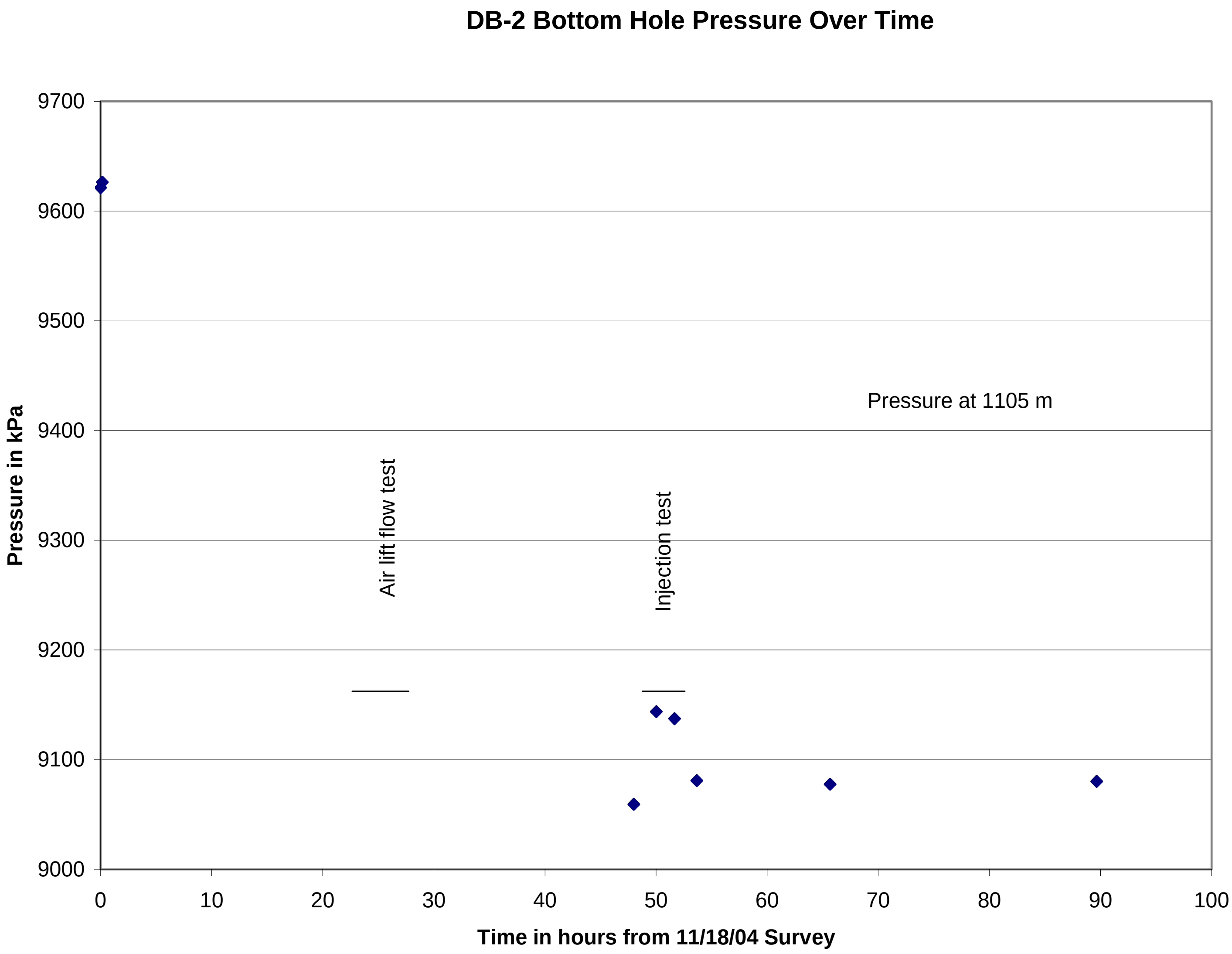

DB-2 Bottom Hole Pressure Over Time
9700
9600
9500
9400
9300
9200
9100
9000
Pressure in kPa
Pressure at 1105 m
Air lift flow test
Injection test
0
10
20
30
40
50
60
70
80
90
100
Time in hours from 11/18/04 Survey

Figure 7.9

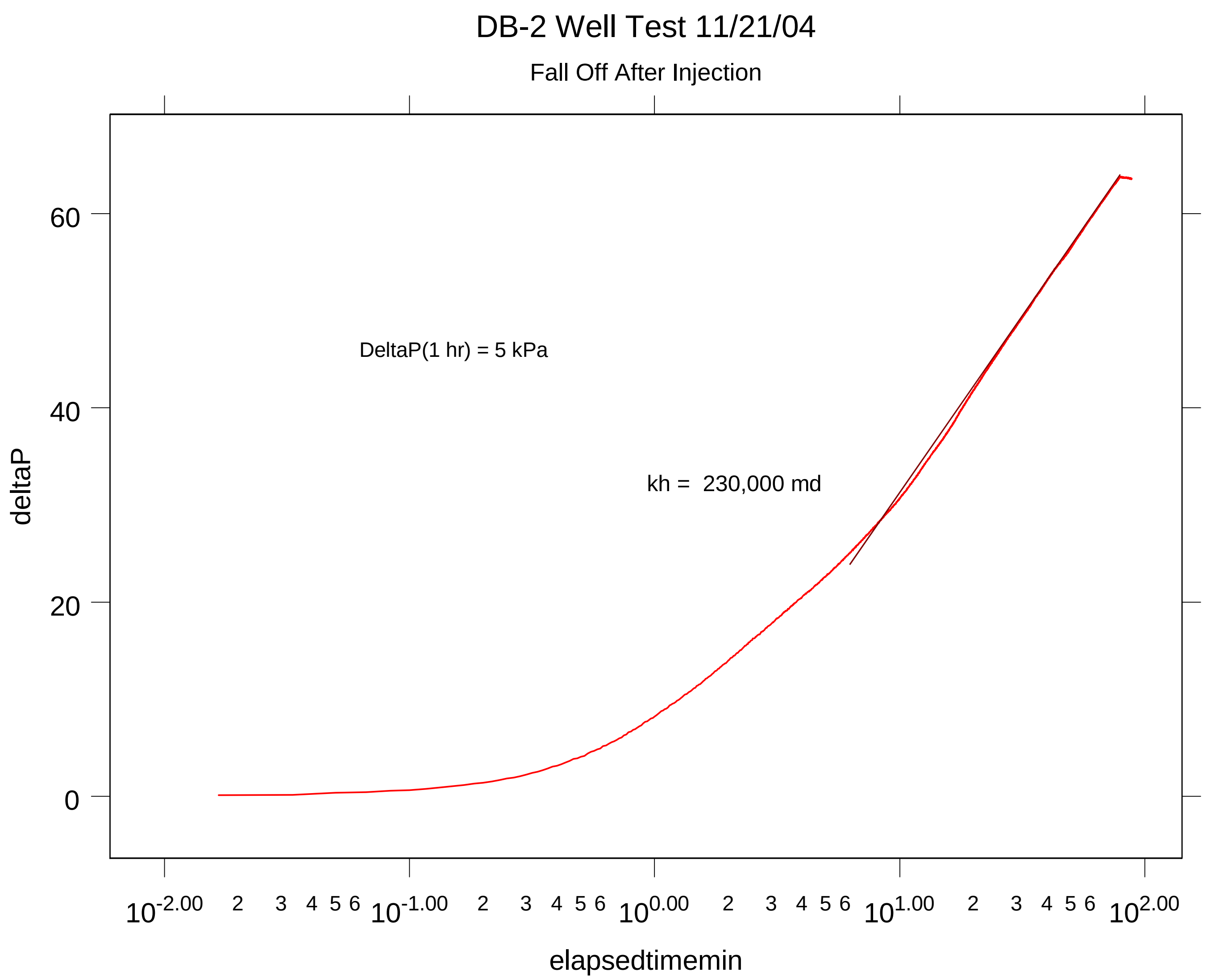
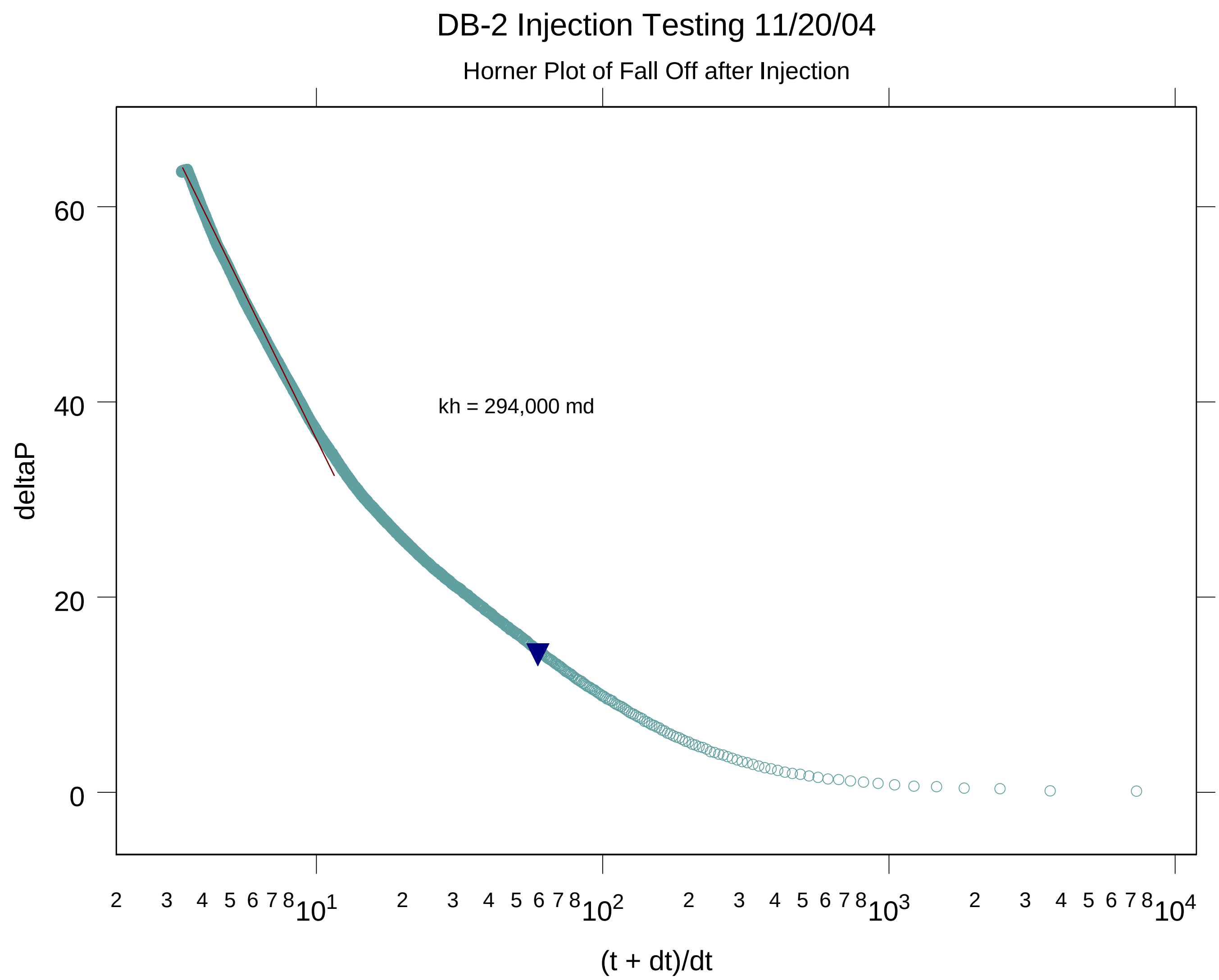

DB-2 Well Test 11/21/04
Fall Off After Injection
DeltaP(1 hr) = 5 kPa
kh = 230,000 md
deltaP
60
40
20
0
elapsedtimemin
$10^{-2.00}$ 2 3 4 5 6 $10^{-1.00}$ 2 3 4 5 6 $10^{0.00}$ 2 3 4 5 6 $10^{1.00}$ 2 3 4 5 6 $10^{2.00}$

Figure 7.10



DB-2 Injection Testing 11/20/04
Horner Plot of Fall Off after Injection
kh = 294,000 md
deltaP
0
20
40
60
(t + dt)/dt
2
3
4
5
6
7
8
10^1
10^2
10^3
10^4

Figure 7.11

8.0 CONCLUSIONS

The November test of DB-2 yielded much more representative fluid samples than did the earlier rig on test. According to Susan Petty, the injection testing indicated a high permeable moderate temperature resource just below the present casing shoe, with the production interval from about 200m (656ft) to 600m (1969ft).

GeothermEx (2004) has outlined an alternative model of a cross-flow, with geothermal fluids entering the well at 587m (1926ft) migrating up the well and re-entering the formation in a lower pressure permeable zone from 200 to 260m (656 to 853ft).

The fluid geothermometry results also showed consistent indication of high temperature (as high as 220-250°C / 428-482°F) parent reservoir temperature supplying the moderate temperature zone in DB-2 via a very direct connection with little mixing with other fluids.

Production of the moderate temperature reservoir discovered at DB-2 would require pumping and binary power generation equipment, both of which add cost and reduce conversion efficiency. However, this would be offset by the need to drill relatively shallow, 600m (<2000ft) wells. The well diameter would need to be big enough to accommodate a large volume pump, which would increase cost, although not as much as would be required for deep wells.

Preliminary estimates indicate a dual-flash power plant using deep wells producing higher temperature fluids from deep wells, possibly as deep as 2438m (8000ft), would cost less per installed kilowatt of capacity than would a binary plant producing from shallow wells. The cost of the well field is usually one quarter to one third of the total cost of the geothermal power project.

This makes it highly advantageous to discover the area of upwelling of the high temperature fluids, as it would increase the MW potential dramatically. The large area with warm water suggests that there is a fairly large volume of high temperature fluid flowing up along high angle fractures feeding the moderate temperature and low temperature zones. The potential for development of this high temperature resource is high.

Fairbank Engineering Ltd. recommends that it would be beneficial to test DB-2 to 1830m (6000ft) to determine the depth of the higher temperature resource, based on the 240°C (464°F) temperatures the geothermometry predicts. Drilling and temperature information is required down to 1830m (6000ft) to test for the inferred high temperature resource. Extending existing drill holes DB-2 or DB-1 as well as drilling new wells using coring equipment should be considered.

9.0 ACKNOWLEDGEMENTS

A geothermal slim well always presents challenges. The commitment, determination and professionalism of all parties involved in the Deep Blue No.2 drilling project, ensured that the program was conducted in a safe and controlled manner, on time and under budget, enabling the objectives of the program to be met.

Noramex Corp wishes to acknowledge the high level of commitment and support provided by the US DOE staff, in the Albuquerque Operations Office, and the Golden Field Office and senior management for the '*GRED'* program, throughout the drilling of Deep Blue No.2. The support of all of the US DOE personnel involved with the drilling program was instrumental in ensuring a successful deep geothermal test well and was greatly appreciated.

The hard work and cooperation demonstrated by the rig crew and supervisors of Boart Longyear, and the technical support provided for the rig-on flow test provided was also greatly appreciated.

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APPENDICIES

A: MRT & Kuster Temperature

B.1: Flow Test Observations

B.2: Water Sample Summary

C.1: Thermochem Results

C.2: Thermochem Figures

D: Section 7.0 Well Test English Unit Figures

E: Welaco Flow and Injection Test Graphs

APPENDIX A.

DB2 MRT Temperature Data – Min/Max

Date	Feet	Metres	Min. Temp °F	Max. Temp °F	Min. Temp °C	Max. Temp °C	Elapsed Time (min)
4/3/2004	755	230.1	160	160	71.1	71.1	15
4/5/2004	820	249.9	148	148	64.4	64.4	15
4/5/2004	895	272.8	110	110	43.3	43.3	15
4/6/2004	985	300.2	130	132	54.4	55.6	15
4/6/2004	1075	327.7	154	154	67.8	67.8	15
4/7/2004	1155	352.0	182	194	83.3	90	50
4/7/2004	1235	376.4	200	202	93.3	94.4	30
4/8/2004	1315	400.8	202	208	94.4	97.8	15
4/8/2004	1395	425.2	209	224	98.3	106.7	20
4/9/2004	1473	449.0	230	238	110	114.4	15
4/9/2004	1525	464.8	258	260	128	136	15
4/9/2004	1605	489.2	257	264.2	125	129	30
4/10/2004	1685	513.6	273.2	276.8	134	136	30
4/11/2004	1765	538.0	244.4	244.4	118	118	30
4/11/2004	1845	562.4	239	239	115	115	30
4/12/2004	1925	586.7	230	230	110	110	30
4/13/2004	2005	611.1	251.6	251.6	122	122	30
4/13/2004	2078	633.4	237.2	237.2	114	114	30
4/14/2004	2164	659.6	242.6	244.4	117	118	30
4/15/2004	2245	684.3	248	248	120	120	30
4/15/2004	2274	693.1	233.6	239	112	115	30
4/16/2004	2325	708.7	284	284	140	140	30
4/17/2004	2405	733.0	293	293	145	145	30
4/17/2004	2485	763.5	291.2	291.2	144	144	30
4/18/2004	2565	781.8	302.9	303.8	150	151	30
4/18/2004	2645	806.20	301.1	302	149	150	30
4/19/2004	2725	830.60	290.3	291	143	144	30
4/19/2004	2805	855.00	280.4	280.4	138	138	30
4/20/2004	2885	879.30	289.4	289.4	143	143	30
4/20/2004	2965	903.7	281.3	282	138	139	30
4/21/2004	3045	928.1	287.6	287.6	142	142	30
4/22/2004	3125	952.5	298.4	298.4	148	148	30
4/24/2004	3200	975.4	291.2	291.2	144	144	30
4/25/2004	3290	1002.8	285.8	287.6	141	142	30
4/25/2004	3378	1029.6	284	284	140	140	30
4/26/2004	3450	1051.6	282.2	282.2	139	139	30
4/26/2004	3540	1079.0	282.2	282.2	139	139	75
4/27/2004	3620	1103.4	282.2	282.2	139	139	30
4/28/2004	3700	1127.8	276.8	278.6	136	137	30

DB2 Kuster Data 1: Gauge #23540
Date: 14/04/2004

Feet	Metres	Temp °F	Temp °C	Press (Kpa)	Elapsed Time (min)	Elevation (m)
660	201.17	149.9	65.5	1861.7	20	1205.83
740	225.55	151	66.1	2096	10	1181.45
820	249.94	155.5	68.6	2341.2	10	1157.06
900	274.32	163.7	72.6	2575.5	10	1132.68
980	298.7	169.9	76.6	2820.6	10	1108.3
1060	323.09	175.3	79.6	3065.8	10	1083.91
1140	347.47	187.7	86.5	3289.3	10	1059.53
1220	371.86	199.9	93.1	3534.4	10	1035.14
1300	396.24	213.8	101	3768.9	10	1010.76
1380	420.62	229.3	109.6	4017.6	10	986.38
1460	445.01	239.9	115.8	4237.5	10	961.99
1540	469.39	257.7	125.4	4471.8	10	937.61
1620	493.78	272.1	133.4	4687.8	10	913.22
1700	518.16	279.3	137.4	4915.3	10	888.84
1780	542.54	285.6	140.9	5156.8	10	864.46
1860	566.93	294.4	145.8	5365.9	10	840.07
1940	591.31	300.7	149.3	5592.3	10	815.69
2020	615.7	302.2	150.1	5823.0	10	791.3
2100	640.08	301.6	149.8	6017.7	10	766.92

DB2 Kuster Data 2: Gauge #10551
Date: 21/04/2004

Feet	Metres	Temp °F	Temp °C	Press (Kpa)	Elapsed Time (min)	MRT °C	Elevation (m)
1600	487.68	281.30	138.50	4504.3	30		919.32
1760	536.49	299.30	148.50	4940.4	10		870.51
1920	585.22	312.60	155.90	5380.3	10		821.78
2080	633.98	285.10	140.60	5916.8	10		773.02
2240	682.75	280.90	138.30	6208.8	10		724.25
2400	731.52	278.40	136.90	6616.1	10		675.48
2560	780.29	276.10	135.60	7048.7	10		626.71
2720	829.06	272.80	133.80	7472.4	10		577.94
2880	877.82	266.90	130.50	7923.0	10		529.18
2920	890.02	266.00	130.00	8024.0	20	160/162	516.98

DB2 Kuster Data 3: Gauge #23540
Date: 22/04/2004

Feet	Metres	Temp °F	Temp °C	Press (Kpa)	Elapsed Time (min)	Elevation (m)
1600	487.68	292.6	144.8	4928.8	20	919.32
1760	536.49	311	155	4951.3	10	870.51
1920	585.22	333.5	167.5	5416.4	10	821.78
2080	633.98	329.5	165.3	5837.4	10	773.02
2240	682.75	318.9	159.4	6280.9	10	724.25
2400	731.52	309.6	154.2	6688.2	10	675.48
2560	780.29	301.8	149.9	7110.0	10	626.71
2720	829.06	297.1	147.3	7551.7	10	577.94
2880	877.82	288	142.2	7958.6	10	529.18
3040	926.59	281.3	138.5	8409.7	10	480.41
3100	944.88	275	135	8553.9	10	462.12
***1920	585.22	332.4	166.9	5434.4	10	821.78

*** Re-surveyed on the way out

DB2 Kuster Data 4: Gauge #10551
Date: 30/04/2004

Feet	Metres	Temp °F	Temp °C	Press (Kpa)	Elapsed Time (min)	Elevation (m)
660	201.2	226.9	108.3	919.8	10	1205.8
740	225.6	255.9	124.4	1182.9	10	1181.4
820	249.9	287.8	142.1	1442.5	10	1157.1
900	274.3	293.5	145.3	1680.4	10	1132.7
980	298.7	297.1	147.3	1883.3	10	1108.3
1060	323.1	300.6	149.2	2132.1	10	1083.9
1140	347.5	302.2	150.1	2359.2	10	1059.5
1220	371.9	304.3	151.3	2593.5	10	1035.1
1380	420.6	308.5	153.6	3047.8	10	986.4
1540	469.4	309.7	154.3	3289.3	10	937.6
1700	518.2	311.4	155.2	3538.0	10	888.8
1720	524.3	313.7	156.5	3981.6	10	882.7

DB2 Kuster Data 5: Gauge #10551
Date: 14/10/2004

Feet	Metres	Temp ^oF	Temp ^oC	Elapsed Time (min)	Elevation (m)
328.08	100	165.65	74.25	10	1307
410.10	125	176.38	80.21	10	1282
492.13	150	194.27	90.15	10	1257
574.15	175	190.49	88.05	10	1232
656.17	200	301.37	149.65	10	1207
738.19	225	307.53	153.07	10	1182
820.21	250	308.55	153.64	10	1157
902.23	275	309.09	153.94	10	1132
984.25	300	310.24	154.58	10	1107
1066.27	325	311.22	155.12	10	1082
1148.29	350	311.85	155.47	10	1057
1230.31	375	312.24	155.69	10	1032
1312.34	400	312.31	155.73	10	1007
1377.95	420	313.21	156.23	10	987

DB2 Kuster Data 6: Gauge #10551
Date: 17/11/2004

Feet	Metres	Temp ^oF	Temp ^oC	Press (Kpa)	MRT ^oC	Elevation (m)
600	182.88	195.368	90.76	1294.71		1224.12
680	207.264	297.104	147.28	1557.87		1199.736
760	231.648	305.132	151.74	1777.78		1175.352
840	256.032	306.158	152.31	1969.86		1150.968
920	280.416	306.716	152.62	2186.16		1126.584
1000	304.8	308.552	153.64	2424.09		1102.2
1080	329.184	309.56	154.20	2647.60		1077.816
1160	353.568	310.586	154.77	2856.69		1053.432
1240	377.952	311.612	155.34	3044.15		1029.048
1320	402.336	312.296	155.72	3289.29		1004.664
1400	426.72	313.664	156.48	3491.17		980.28
1480	451.104	314.222	156.79	3711.19		955.896
1560	475.488	314.69	157.05	3923.88		931.512
1640	499.872	315.086	157.27	4140.18		907.128
1720	524.256	315.662	157.59	4334.85		882.744
1800	548.64	319.64	159.80	4543.94		858.36
1880	573.024	319.892	159.94	4785.48		833.976
1960	597.408	317.354	158.53	4969.33		809.592
2040	621.792	313.376	156.32	5203.66		785.208
2120	646.176	309.56	154.20	5391.12		760.824
2200	670.56	305.636	152.02	5606.72		736.44
2280	694.944	301.298	149.61	5765.34		712.056
2360	719.328	297.59	147.55	6010.48		687.672

Continue from DB2 Kuster Data 6

2440	743.712	293.594	145.33	6221.20		663.288
2520	768.096	289.13	142.85	6432.65		638.904
2600	792.48	287.096	141.72	6684.62		614.52
2680	816.864	284.648	140.36	6854.05		590.136
2760	841.248	281.336	138.52	7110.01		565.752
2840	865.632	274.874	134.93	7339.02		541.368
2920	890.016	269.654	132.03	7512.06		516.984
3000	914.4	264.722	129.29	7713.94		492.6
3080	938.784	260.402	126.89	7937.45		468.216
3160	963.168	256.928	124.96	8200.62		443.832
3240	987.552	254.138	123.41	8370.05		419.448
3320	1011.936	251.402	121.89	8600.77		395.064
3400	1036.32	248.54	120.30	8867.54		370.68
3480	1060.704	246.974	119.43	9101.87		346.296
3560	1085.088	246.488	119.16	9325.17		321.912
3640	1109.472	246.884	119.38	9494.60	164/164	297.528

DB2 Kuster Data 7: Gauge #10551
Date: 24/11/2004

Feet	Metres	Temp ^{o}F	Temp ^{o}C	Press (Kpa)	MRT ^{o}C	Elevation (m)
328.084	100	165.488	74.16	29.35		1307
656.168	200	300.038	148.91	959.44		1207
820.21	250	308.138	153.41	1377.62		1157
984.252	300	309.398	154.11	1698.47		1107
1148.294	350	310.874	154.93	2063.52		1057
1312.336	400	312.08	155.60	2478.17		1007
1476.378	450	313.106	156.17	2917.98		957
1640.42	500	313.61	156.45	3339.76		907
1804.462	550	314.744	157.08	3786.89		857
1968.504	600	283.316	139.62	4262.75		807
2296.588	700	269.87	132.15	5167.61		707
2624.672	800	263.066	128.37	6060.95		607
2952.756	900	250.196	121.22	6991.04		507
3280.84	1000	244.922	118.29	7901.40		407
3608.924	1100	247.262	119.59	8687.29	156/157	307

APPENDIX B.1

DB2 Flow Test Observations
First Attempt, Date: 19/11/2004

Time Reading	**Gauge Line Pressure (PSI) 0-300**	**Line Temperature Celsius 0-260**	**Line Temperature Fahrenheit**	**Compressor PI Pressure (PSI)**	**Compressor P2 Pressure (PSI)**	**Lip Pressure (PSI) 0-30**	**Water Sample Taken pH levels OBS.**
10:45: AM	**Start 0**	0	32			0	
10:50: AM	0	0	32			0	
10:55: AM	0	0	32	795		0	Dirty
11:00: AM	0	35	95	"		0	Hot water Initial flow
11:05: AM	0	50	122	"		0	
11:10: AM	0	70	158	500		0	
11:20: AM	0	80	176	600		0	
11:25: AM	0	80	176	700		0	Water and steam
11:30:AM	0	80	176	"		0	Water starts to clear
11:40: AM	0	80	176	"		0	
11:45: AM	2	82	179.6	"		0	Water sample 7 to 7.5 pH
11:50: AM	2	88	190.4	"		0	Master valve partially closed
12:00: AM	2	88	190.4	"		0	
12:05: AM	12	90	194	"		0	Master valve 80% closed
12:10: AM	10	92	197.6	"		0	
12:15: AM	35	96	204.8	"		0	
12:16: AM	40	97	206.6	600		0	Well kicks up a bit
12:20: AM	10	98	208.4				
12:25: AM	0	85	185			0	
12:30: AM	0	80	176	0		0	Compressor not working
12:40: AM	**END 0**	0	32			0	Problem with clutch

DB2 Flow Test Observations
Second Attempt, Date: 19/11/2004

Time Reading	**Gauge Line Pressure (PSI) 0-300**	**Line Temperature Celsius 0-260**	**Line Temperature Fahrenheit**	**Compressor PI Pressure (PSI)**	**Compressor P2 Pressure (PSI)**	**Lip Pressure (PSI) 0-30**	**Water Sample Taken pH levels OBS.**
01:13: PM	**Start 2**	60	140			0	Master valve partially closed
01:20: PM	2	72	161.6	675		0	
01:30: PM	5	80	176	660		0	Master valve 80% closed
01:40: PM	10	85	185	650		0	Master valve 90% closed
01:50: PM	15	90	194	"		0	
02:00: PM	15	90	194	"		0	
02:10: PM	45/50	98	208.4	"		0	
02:20: PM	45/50	99	210.2	"		0	Water sample 6.5 to 7.0 pH
02:30: PM	45/50	99	210.2	620		0	
02:40: PM	45/50	99	210.2	"		0	
03:00: PM	35/40	99	210.2	"		0	
03:15: PM	30/45	100	212	600		0	Water sample 6.5 pH
03:30: PM	25/40	100	212	"		0	
03:45: PM	30/40	100	212	"		0	Water sample 7.5 to 8.0 pH
03:50: PM	30/40	100	212	"		0	
04:15: PM	2	99	210.2	"		0	Master valve 90% open
04:20: PM	5	95	203	"		0	Water sample 8 to 8.5 pH
04:30: PM	5	90	194	"		0	
04:40: PM	5	90	194	"		0	
04:42: PM	5	90	194	Compressor		0	
04:43: PM	5	90	194	Shut Down		0	
04:44: Pm	5	90	194	"		0	Water flow dropping
04:45: PM	2	85	185	"		0	Water flow dropping
04:47: PM	0	85	185	"		0	Water sample 8 to 8.5 pH
04:49: PM	0			"		0	Flow dropping dramatically

APPENDIX B.2

Flow Test Water Sample Summary
Date: 19/11/2004

Sample	PH	Alk	Hardness	Nitrite	Nitrate
1) 11:45 Am	7.0 to 7.5	120-180	0	1 to 3	0 to 20
2) 02:15: PM	6.5-7.0	180-300	0	0 to o.5	0
3) 02:45: PM	8 to 8.5	120-180	0	0	0
4) 3:15: PM	6.5	120-180	0	0	0
5) 03:45: PM	7.5 to 8.0	120-180	25 to 75	0	0
6) 04:15: PM	8 to 8.5	180-300	25 to 75	0	0
7) 04:47: PM	8 to 8.5	180- 300	25 to 75	0	0

APPENDIX C.1

THERMOCHEM RESULTS

December 29, 2004 11121 (1-7)

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Vancouver, B.C. V6C 1T2

Report of Analysis

Lab Number: 11121 - 1

Descriptor: Deep Blue 2 11-19-04 11:45

Analyte	mg/kg
Sodium	1470
Potassium	177
Calcium	35.3
Magnesium	0.757
Lithium	3.43
Strontium	1.14
Zinc	0.063
Barium	0.294
Iron	70.1
Boron	15.2
Silica	333
Aluminum	1.26
Antimony	0.011
Arsenic	0.045
Beryllium	<0.0010
Cadmium	<0.0010
Chromium	0.0025
Copper	0.0085
Lead	0.0020
Manganese	1.73
Mercury	<0.0013
Molybdenum	0.0034
Nickel	0.0069
Selenium	0.011
Silver	<0.0010
Thallium	0.0067
Chloride	2310

Fluoride	4.24
Sulfate	154
Carbonate Alkalinity (as CO3=)	<2.00
Bicarbonate Alkalinity (as HCO3-)	211
Ammonia	5.56
Hydrogen Sulfide	<0.500
Total Inorganic Carbon (as CO2)	79.7
Nitrate	<1.00
Nitrite	NA
Cyanide	<0.054
Total Phosphorus	2.39
Conductivity, umhos/cm	7300
Total Suspended Solids	NA
pH (units)	8.52
Gross Alpha, pCi/L	<20.0
Gross Beta, pCi/L	101+/-13

Note: Nitrite value not available due to Matrix problems interfering with analysis. Nitrite is not typically found in Geothermal systems due to the reducing environment

December 29, 2004 11121 (1-7)

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Report of Analysis

Lab Number: 11121 - 2

Descriptor: Deep Blue 2 11-19-04 02:15

Analyte	mg/kg
Sodium	1460
Potassium	181
Calcium	29.1
Magnesium	0.630
Lithium	3.54
Strontium	1.10
Zinc	0.028
Barium	0.290
Iron	53.5
Boron	16.1
Silica	350
Aluminum	0.490
Antimony	0.014
Arsenic	0.044
Beryllium	<0.0010
Cadmium	<0.0010
Chromium	0.0031
Copper	0.0065
Lead	0.0012
Manganese	1.27
Mercury	<0.0013
Molybdenum	0.0020
Nickel	0.0055
Selenium	0.011
Silver	<0.0010
Thallium	0.0060
Chloride	2360
Fluoride	4.35
Sulfate	162
Carbonate Alkalinity (as $CO_3^=$)	<2.00
Bicarbonate Alkalinity (as HCO_3^-)	184

Ammonia	5.14
Hydrogen Sulfide	<0.500
Total Inorganic Carbon (as CO2)	63.0
Nitrate	<1.00
Nitrite	NA
Cyanide	<0.054
Total Phosphorus	1.83
Conductivity, umhos/cm	7380
Total Suspended Solids	NA
pH (units)	8.42
Gross Alpha, pCi/L	<20.0
Gross Beta, pCi/L	98.8+/-13

Note: Nitrite value not available due to Matrix problems interfering with analysis. Nitrite is not typically found in Geothermal systems due to the reducing environment

December 29, 2004 11121 (1-7)

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Report of Analysis

Lab Number: 11121 - 3

Descriptor: Deep Blue 2 11-19-04 02:45

Analyte	mg/kg
Sodium	1470
Potassium	182
Calcium	32.1
Magnesium	0.650
Lithium	3.47
Strontium	1.23
Zinc	0.025
Barium	0.217
Iron	19.5
Boron	15.7
Silica	355
Aluminum	0.194
Antimony	0.016
Arsenic	0.032
Beryllium	<0.0010
Cadmium	<0.0010
Chromium	0.0033
Copper	0.0046
Lead	<0.0010
Manganese	0.531
Mercury	<0.0013
Molybdenum	0.0018
Nickel	0.0035
Selenium	0.013
Silver	<0.0010
Thallium	0.0055
Chloride	2360
Fluoride	4.45
Sulfate	165
Carbonate Alkalinity (as CO3=)	<2.00
Bicarbonate Alkalinity (as HCO3-)	186

Ammonia	4.99
Hydrogen Sulfide	<0.500
Total Inorganic Carbon (as CO2)	94.9
Nitrate	<1.00
Nitrite	NA
Cyanide	<0.054
Total Phosphorus	1.37
Conductivity, umhos/cm	7400
Total Suspended Solids	NA
pH (units)	8.36
Gross Alpha, pCi/L	<20.0
Gross Beta, pCi/L	109+/-14

Note: Nitrite value not available due to Matrix problems interfering with analysis. Nitrite is not typically found in Geothermal systems due to the reducing environment

December 29, 2004 11121 (1-7)

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Report of Analysis

Lab Number: 11121 - 4

Descriptor: Deep Blue 2 11-19-04 03:15

Analyte	mg/kg
Sodium	1450
Potassium	186
Calcium	31.8
Magnesium	0.595
Lithium	3.52
Strontium	1.25
Zinc	0.020
Barium	0.299
Iron	30.4
Boron	15.6
Silica	375
Aluminum	0.273
Antimony	0.021
Arsenic	0.050
Beryllium	<0.0010
Cadmium	<0.0010
Chromium	0.0037
Copper	0.0043
Lead	<0.0010
Manganese	0.779
Mercury	<0.0013
Molybdenum	0.0017
Nickel	0.0040
Selenium	0.014
Silver	<0.0010
Thallium	0.0061
Chloride	2370
Fluoride	4.39
Sulfate	162
Carbonate Alkalinity (as CO3=)	<2.00
Bicarbonate Alkalinity (as HCO3-)	172

Ammonia	4.87
Hydrogen Sulfide	<0.500
Total Inorganic Carbon (as CO2)	51.8
Nitrate	<1.00
Nitrite	NA
Cyanide	<0.054
Total Phosphorus	1.59
Conductivity, umhos/cm	7440
Total Suspended Solids	NA
pH (units)	8.44
Gross Alpha, pCi/L	<20.0
Gross Beta, pCi/L	97.5+/-13

Note: Nitrite value not available due to Matrix problems interfering with analysis. Nitrite is not typically found in Geothermal systems due to the reducing environment

December 29, 2004 11121 (1-7)

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Report of Analysis

Lab Number: 11121 - 5

Descriptor: Deep Blue 2 11-19-04 03:45

Analyte	mg/kg
Sodium	1460
Potassium	187
Calcium	33.5
Magnesium	0.613
Lithium	3.40
Strontium	1.30
Zinc	0.023
Barium	0.284
Iron	19.6
Boron	15.6
Silica	369
Aluminum	0.269
Antimony	0.025
Arsenic	0.041
Beryllium	<0.0010
Cadmium	<0.0010
Chromium	0.0036
Copper	0.0041
Lead	<0.0010
Manganese	0.504
Mercury	<0.0013
Molybdenum	0.0016
Nickel	0.0032
Selenium	0.013
Silver	<0.0010
Thallium	0.0061
Chloride	2350
Fluoride	4.38
Sulfate	166
Carbonate Alkalinity (as CO3=)	<2.00
Bicarbonate Alkalinity (as HCO3-)	176

Ammonia	4.82
Hydrogen Sulfide	<0.500
Total Inorganic Carbon (as CO2)	46.8
Nitrate	<1.00
Nitrite	NA
Cyanide	<0.054
Total Phosphorus	1.52
Conductivity, umhos/cm	7420
Total Suspended Solids	NA
pH (units)	8.45
Gross Alpha, pCi/L	<20.0
Gross Beta, pCi/L	38.9+/-11

Note: Nitrite value not available due to Matrix problems interfering with analysis. Nitrite is not typically found in Geothermal systems due to the reducing environment

December 29, 2004 11121 (1-7)

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Report of Analysis

Lab Number: 11121 - 6

Descriptor: Deep Blue 2 11-19-04 04:15

Analyte	mg/kg
Sodium	1420
Potassium	187
Calcium	36.0
Magnesium	0.598
Lithium	3.47
Strontium	1.34
Zinc	0.036
Barium	0.348
Iron	65.2
Boron	15.7
Silica	385
Aluminum	0.668
Antimony	0.029
Arsenic	0.071
Beryllium	<0.0010
Cadmium	<0.0010
Chromium	0.0040
Copper	0.0065
Lead	0.0011
Manganese	1.21
Mercury	<0.0013
Molybdenum	0.0025
Nickel	0.0053
Selenium	0.011
Silver	<0.0010
Thallium	0.0059
Chloride	2360
Fluoride	4.48
Sulfate	163
Carbonate Alkalinity (as CO3=)	<2.00
Bicarbonate Alkalinity (as HCO3-)	165

Ammonia	5.08
Hydrogen Sulfide	0.809
Total Inorganic Carbon (as CO2)	51.0
Nitrate	<1.00
Nitrite	NA
Cyanide	<0.054
Total Phosphorus	2.49
Conductivity, umhos/cm	7410
Total Suspended Solids	NA
pH (units)	8.39
Gross Alpha, pCi/L	<20.0
Gross Beta, pCi/L	120+/-14

Note: Nitrite value not available due to Matrix problems interfering with analysis. Nitrite is not typically found in Geothermal systems due to the reducing environment

December 29, 2004 11121 (1-7)

Kim Niggemann
Project Manager/Geologist
Nevada Geothermal/Noramex
Suite 900
409 Granville St.,
Vancouver, B.C. V6C 1T2

Report of Analysis

Lab Number: 11121 - 7

Descriptor: Deep Blue 2 11-19-04 04:45

Analyte	mg/kg
Sodium	1380
Potassium	182
Calcium	35.9
Magnesium	0.595
Lithium	3.49
Strontium	1.41
Zinc	0.103
Barium	0.316
Iron	33.0
Boron	15.6
Silica	304
Aluminum	2.01
Antimony	0.081
Arsenic	0.127
Beryllium	<0.0010
Cadmium	0.0027
Chromium	0.012
Copper	0.021
Lead	0.0098
Manganese	0.678
Mercury	<0.0013
Molybdenum	0.112
Nickel	0.0082
Selenium	0.018
Silver	0.0042
Thallium	0.020
Chloride	2380
Fluoride	4.53
Sulfate	173
Carbonate Alkalinity (as CO3=)	<2.00
Bicarbonate Alkalinity (as HCO3-)	163

Ammonia	4.95
Hydrogen Sulfide	<0.500
Total Inorganic Carbon (as CO2)	45.4
Nitrate	<1.00
Nitrite	NA
Cyanide	<0.054
Total Phosphorus	2.90
Conductivity, umhos/cm	5390
Total Suspended Solids	NA
pH (units)	8.49
Gross Alpha, pCi/L	<20.0
Gross Beta, pCi/L	148+/-11

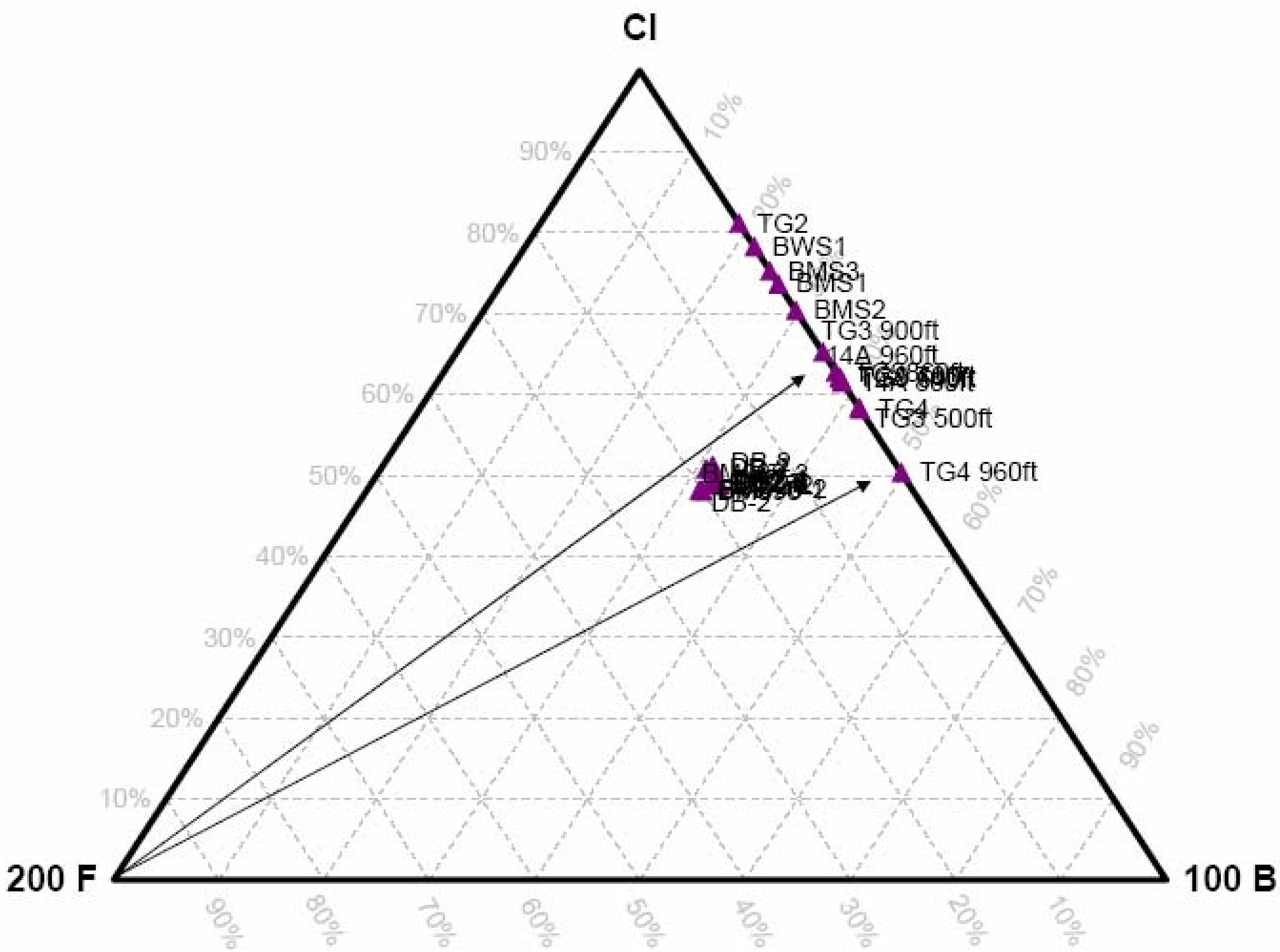
Note: Nitrite value not available due to Matrix problems interfering with analysis. Nitrite is not typically found in Geothermal systems due to the reducing environment

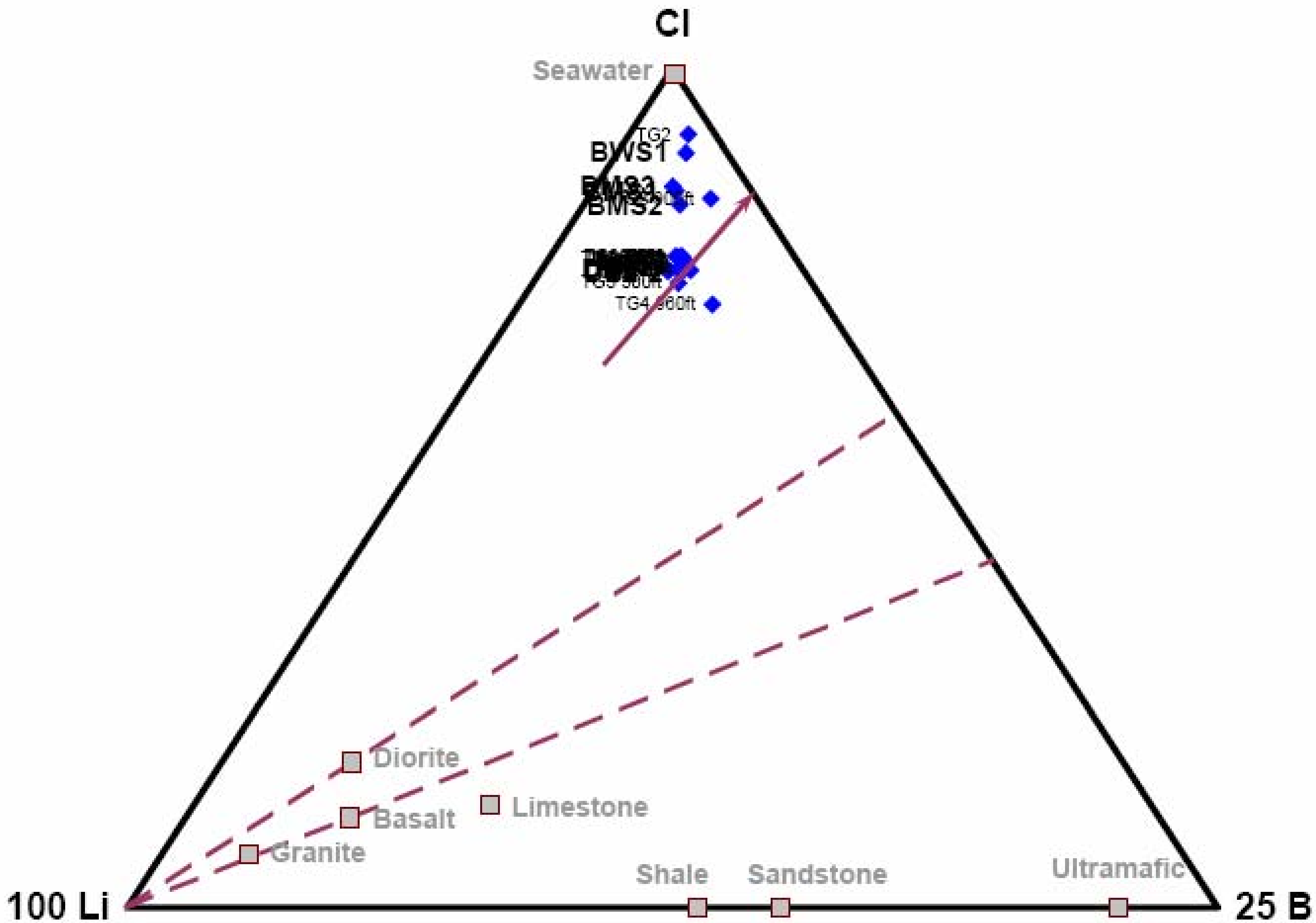
APPENDIX C.2

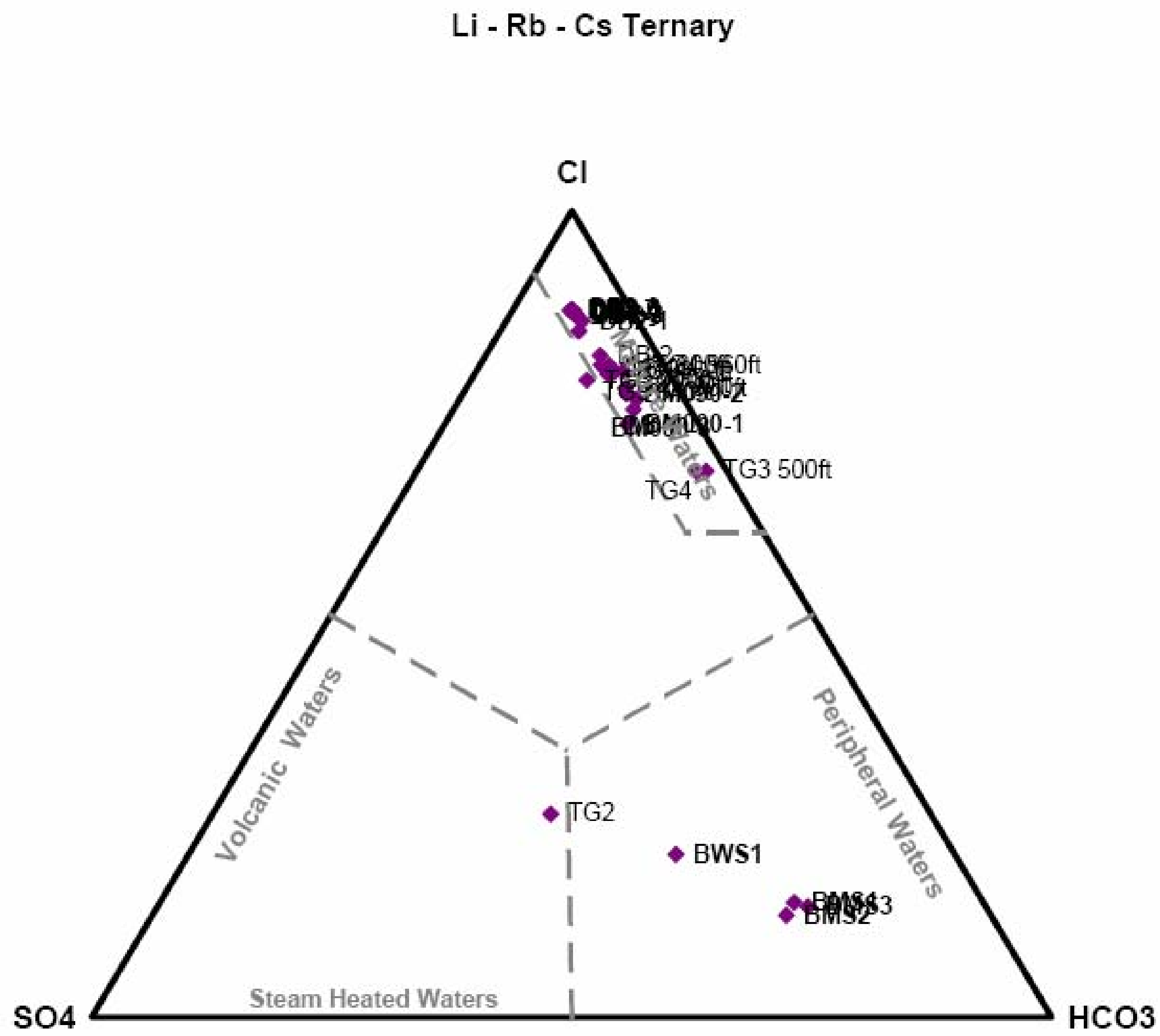
THERMOCHEM FIGURES.

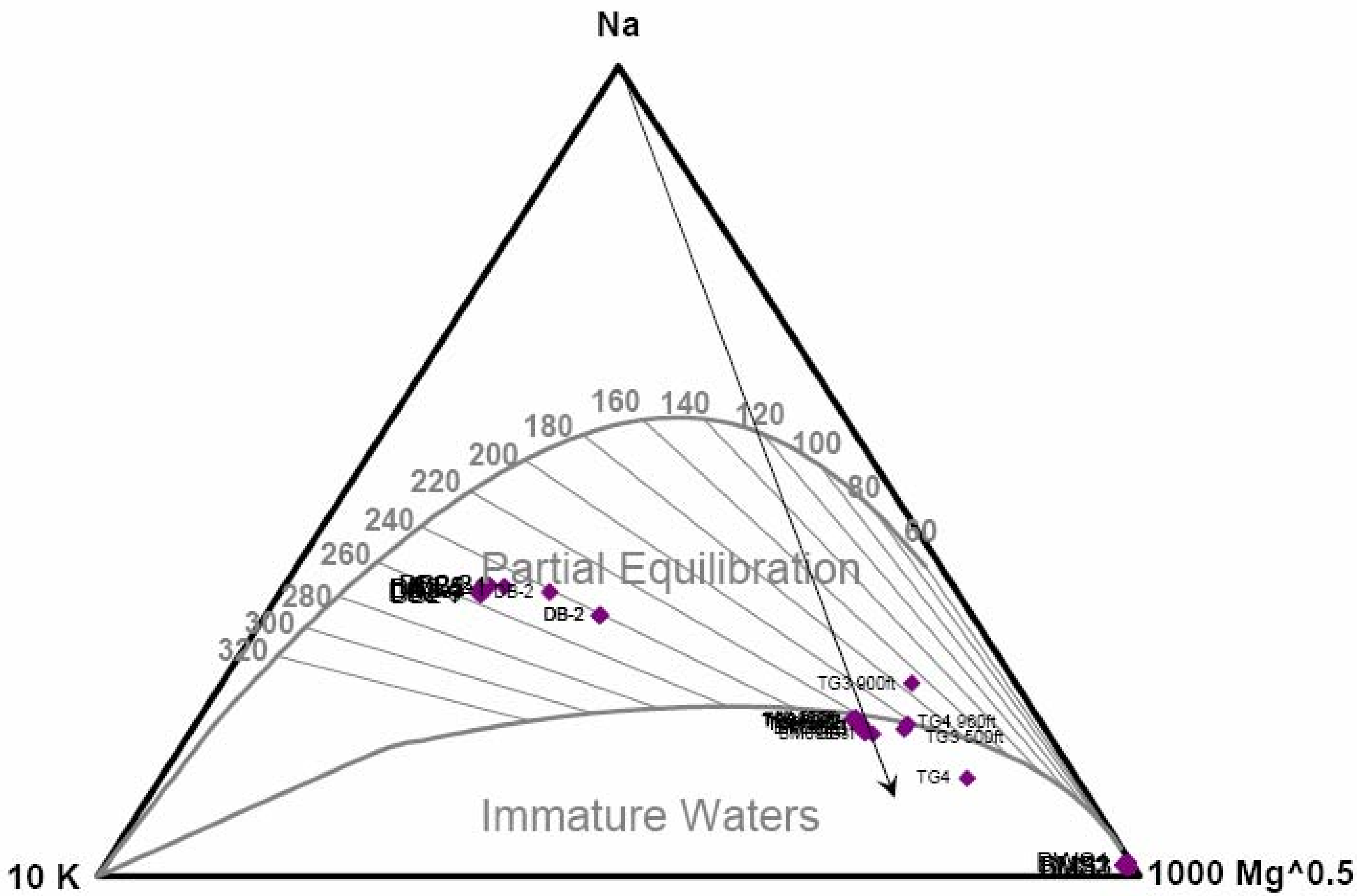
Sample Name	Amorphous Silica	Chalcedony cond	Quartz cond	Quartz max steam loss	Na-K-Ca	Na-K-Ca Mg corr	Na/K (Giggenbach)	K/Mg (Giggenbach)	Anhydrite
Deep Blue 2	40	139	163	154	219	214	241	174	180
Deep Blue 2	38	137	161	152	220	214	240	174	182
Deep Blue 2	34	132	156	148	223	223	241	187	182
Deep Blue 1	15	108	135	131	199	115	229	123	171
TG-14A	11	103	131	127	206	99	226	126	190
TG-14A	8	100	128	124	201	106	223	126	184
TG-2	-85	-18	9	25	144	17	207	43	134
TG-4	-67	4	35	45	196	36	222	104	192
TG-4	-38	41	73	77	186	94	210	115	172
TG-3	-15	70	101	101	192	54	204	114	217
TG-3	14	107	135	130	173	27	171	107	155
TG-9	-1	89	118	116	206	100	227	126	185
TG-9	3	94	122	120	212	80	226	125	202
TG-9	12	104	132	128	207	98	226	126	191
BM090	-21	63	94	96	198	119	228	125	155
BM090	-13	74	104	104	202	112	214	125	172
BM090	-6	82	111	110	201	116	216	125	162
BM-s1	-38	42	74	78	113	69	157	30	141
BM-s2	-38	42	74	78	127	68	180	37	138
BM-s3	-35	45	77	81	108	69	147	29	141
BWS-1	-45	33	65	70	85	69	103	21	124
Deep Blue 2	93	203	219	198	229	229	233	199	187
Deep Blue 2	97	208	223	202	233	233	236	204	191
Deep Blue 2	98	209	225	203	232	232	236	204	188
Deep Blue 2	102	215	229	206	234	234	239	207	188
Deep Blue 2	101	213	228	205	234	234	239	207	186
Deep Blue 2	105	217	232	208	234	234	242	207	184
Deep Blue 2	86	194	212	193	234	234	242	206	182

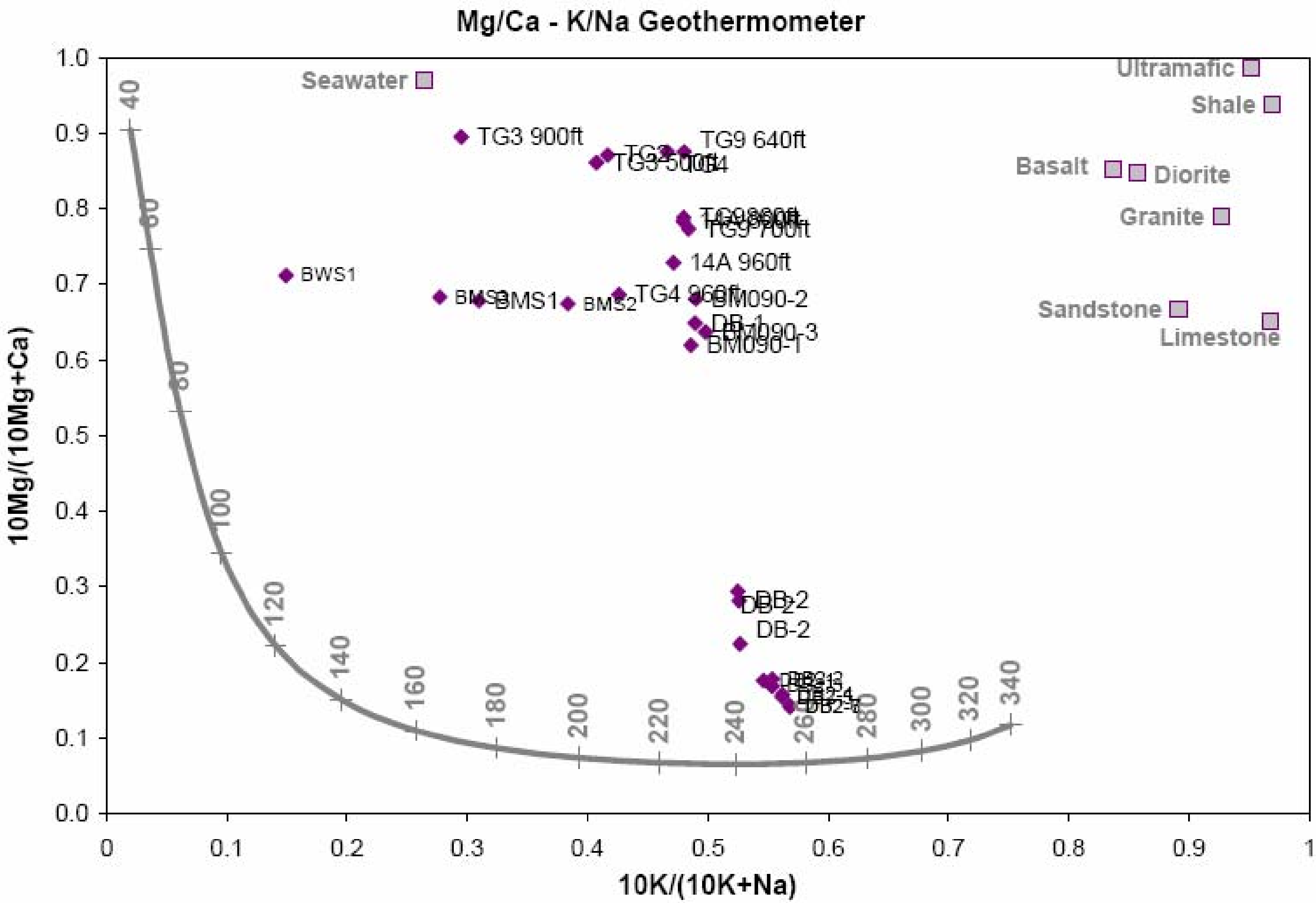
Sample Name	Source	Date	Temp C	pH	conductivity uhoms/cm	sum cations	sum anions	Charge Balance (cat-ani) 0.5*(cat+ani)
Deep Blue 2	10885-1	4/30/04		8.675	6440	62.0	63.4	-2%
Deep Blue 2	10885-2	4/30/04		8.7	6570	64.0	64.5	-1%
Deep Blue 2	10885-3	4/30/04		8.59	6950	67.2	67.9	-1%
Deep Blue 1	10859-1	4/3/04		8.58	6920	49.7	53.4	-7%
TG-14A	11062-1	8/23/04	54	8.47	5150	51.5	52.5	-2%
TG-14A	11062-2	8/25/04	63	8.04	5050	51.3	52.0	-2%
TG-2	11052-1	8/23/04		7.84	943	9.2	9.1	1%
TG-4	11052-2	9/1/04		7.6	5010	47.9	49.2	-3%
TG-4	11052-3	9/2/04		7.59	5625	53.9	56.0	-4%
TG-3	11052-4	9/8/04		7.5	6220	61.5	63.1	-3%
TG-3	11052-5	9/11/04		7.6	12090	127.7	130.2	-2%
TG-9	11052-6	9/14/04	52	8.13	5310	49.5	51.0	-3%
TG-9	11052-7	9/14/04		8.72	5440	52.4	53.2	-1%
TG-9	11052-8	9/15/04		8.58	5390	52.3	52.7	-1%
BM090	445 ft			7.52		55.1	55.3	0%
BM090	515 ft			7.93		52.5	52.4	0%
BM090	550 ft			8.06		55.4	54.3	2%
BM-s1	11078 - 1	10-25-04		7.30	752	7.5	8.2	-9%
BM-s2	11078 - 2	10-25-04		7.41	788	7.9	8.4	-7%
BM-s3	11078 - 3	10-25-04		7.40	793	8.0	8.5	-6%
BWS-1	11078 - 4	10-25-04		7.64	1130	12.1	11.9	1%
Deep Blue 2	11121 - 1	11-19-04		8.52	7300	70.8	72.1	-2%
Deep Blue 2	11121 - 2	11-19-04		8.42	7380	70.2	73.2	-4%
Deep Blue 2	11121 - 3	11-19-04		8.36	7400	70.8	73.3	-4%
Deep Blue 2	11121 - 4	11-19-04		8.44	7440	70.0	73.3	-5%
Deep Blue 2	11121 - 5	11-19-04		8.45	7420	70.5	72.9	-3%
Deep Blue 2	11121 - 6	11-19-04		8.39	7410	68.9	72.9	-6%
Deep Blue 2	11121 - 7	11-19-04		8.49	5390	67.0	73.7	-9%

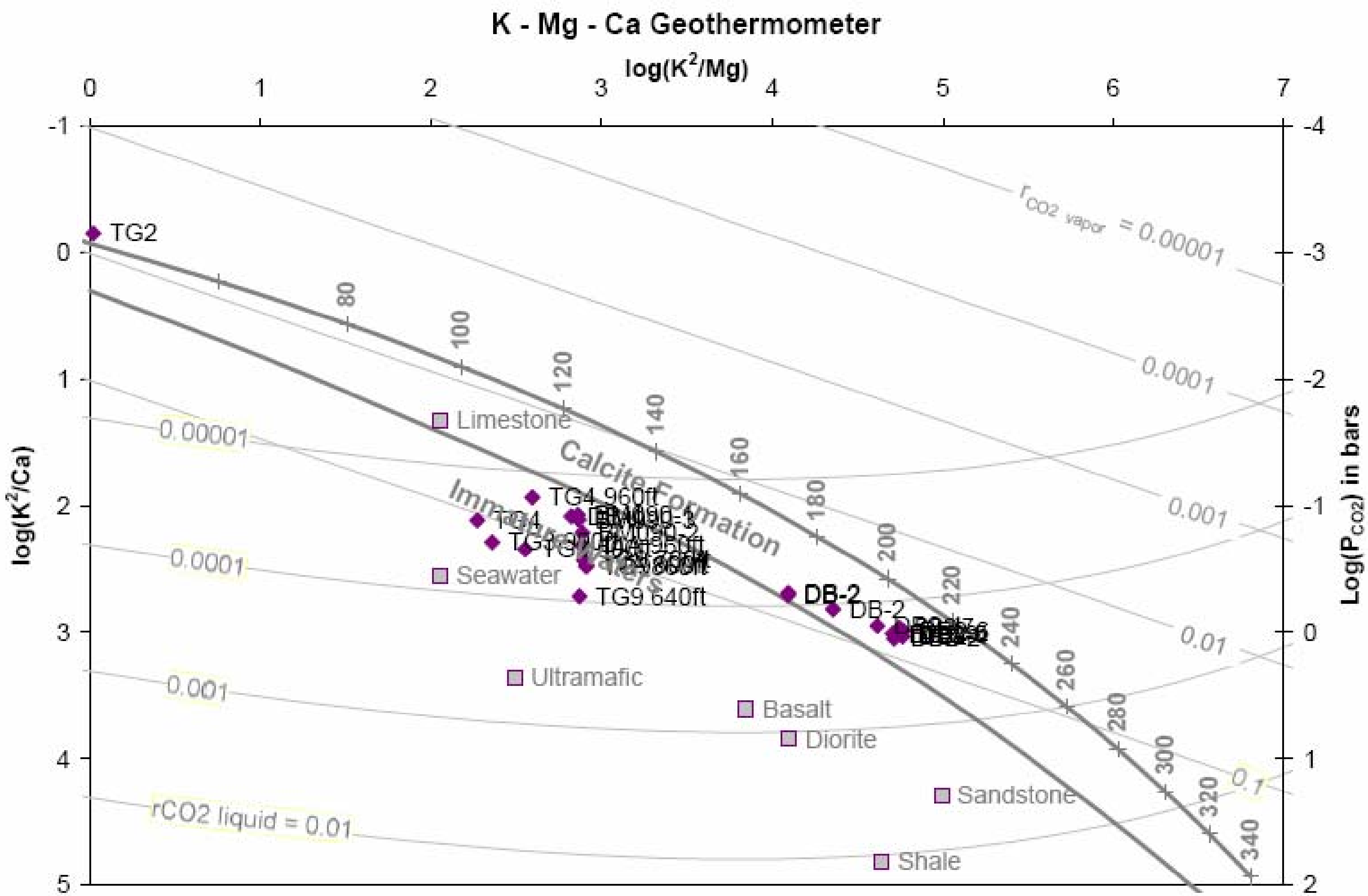

Cl
200 F
100 B
90%
80%
70%
60%
50%
40%
30%
20%
10%
TG2
BWS1
BMS3
BMS1
BMS2
TG3 900ft
14A 960ft
TG4
TG3 500ft
TG4 960ft
DB-8
DB-2


Cl
Seawater
TG2
BWS1
BMS3
BMS2
TG4 960ft
Diorite
Basalt
Limestone
Granite
Shale
Sandstone
Ultramafic
100 Li
25 B

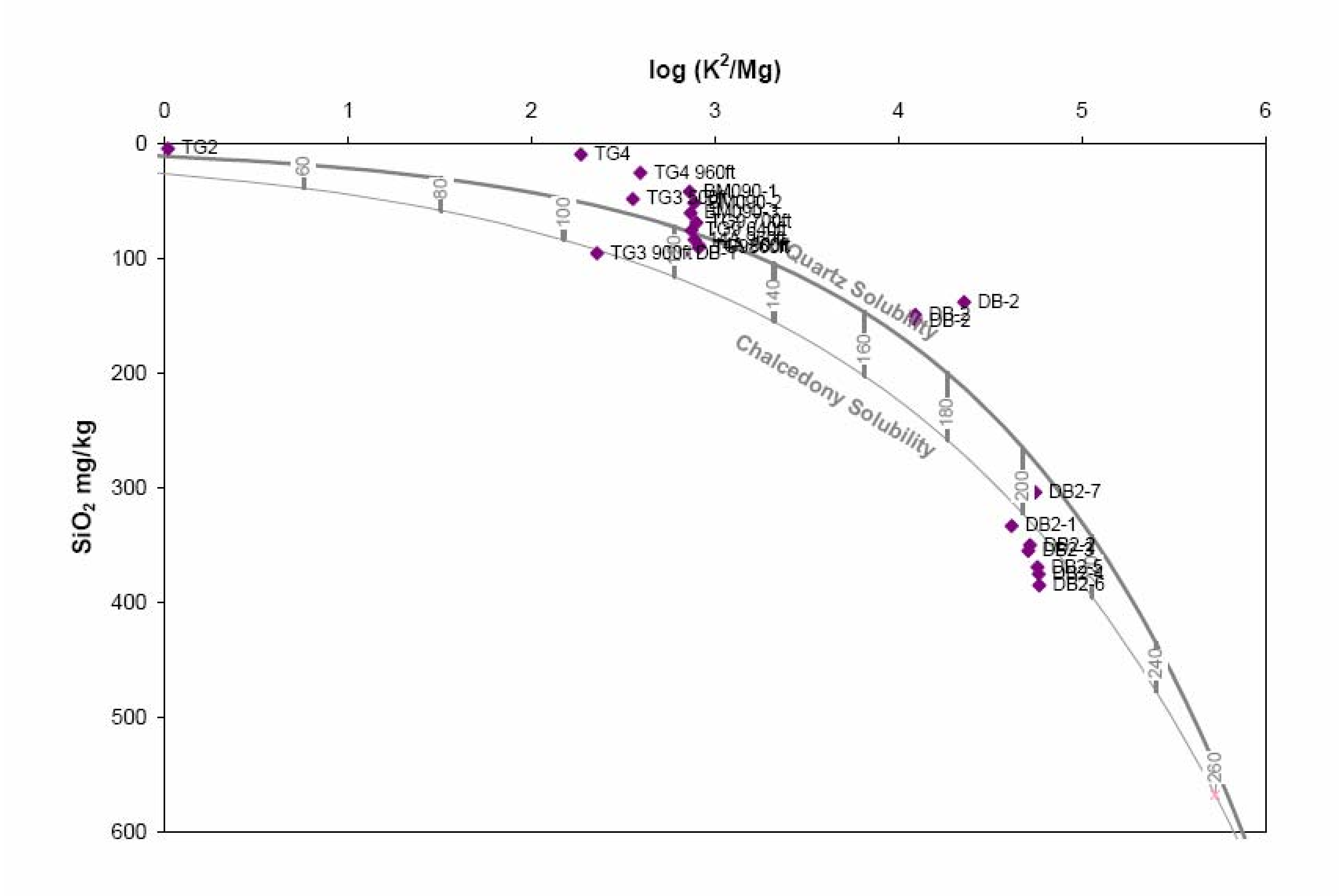

Li - Rb - Cs Ternary
Cl
SO4
HCO3
Volcanic Waters
Peripheral Waters
Steam Heated Waters
TG3 500ft
TG4
TG2
BWS1
BMS2


Na
10 K
1000 Mg^0.5
160
140
120
180
200
100
220
80
240
60
260
280
300
320
Partial Equilibration
Immature Waters
DB-2
DB-2
TG3 900ft
TG4 960ft
TG3 500ft
TG4

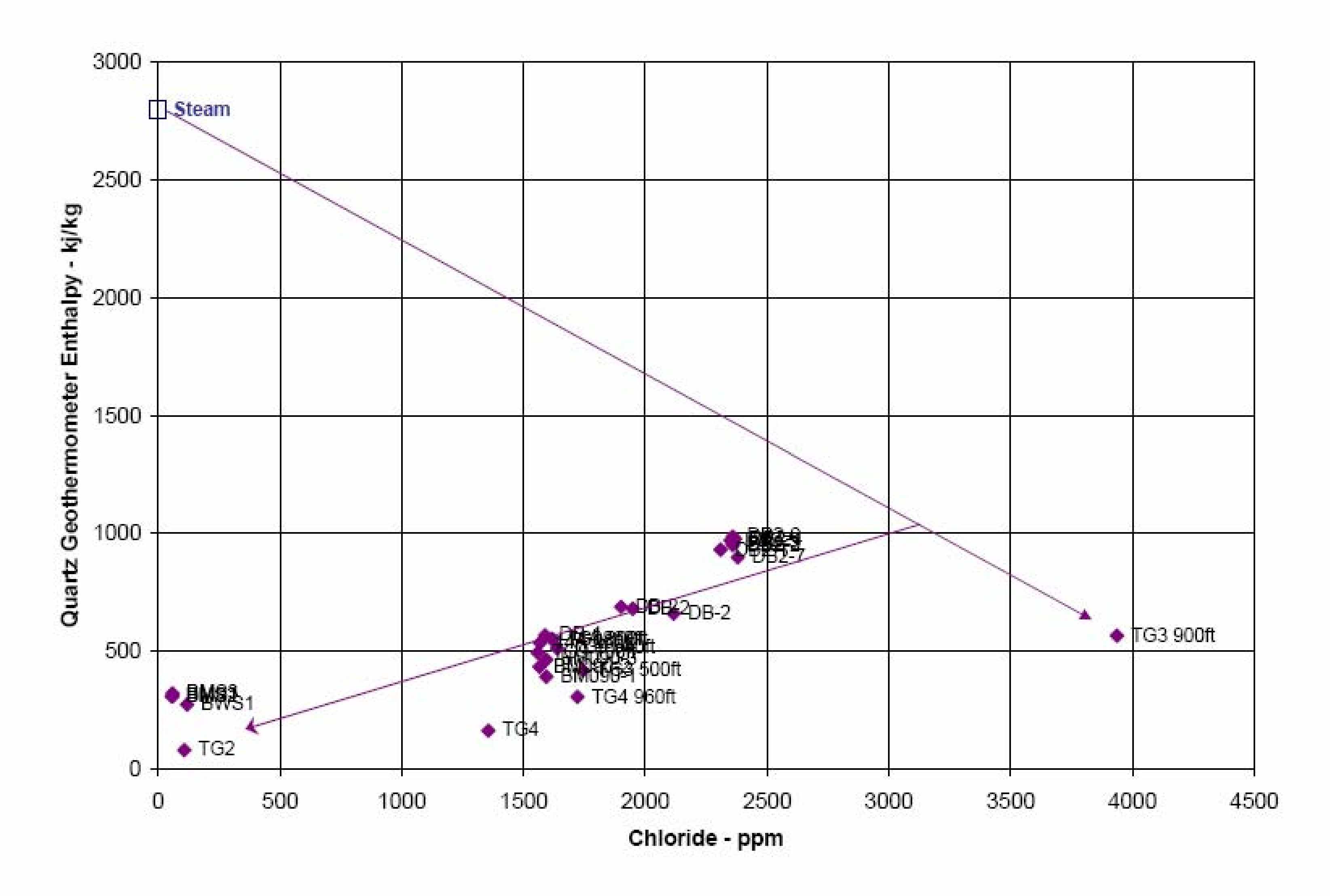

Mg/Ca - K/Na Geothermometer
10Mg/(10Mg+Ca)
10K/(10K+Na)
Seawater
Ultramafic
Shale
Basalt
Diorite
Granite
Sandstone
Limestone
TG3 900ft
TG9 640ft
14A 960ft
BWS1
BMS1
BMS2
BM090-2
BM090-3
BM090-1
DB-1
DB-2
TG9 700ft

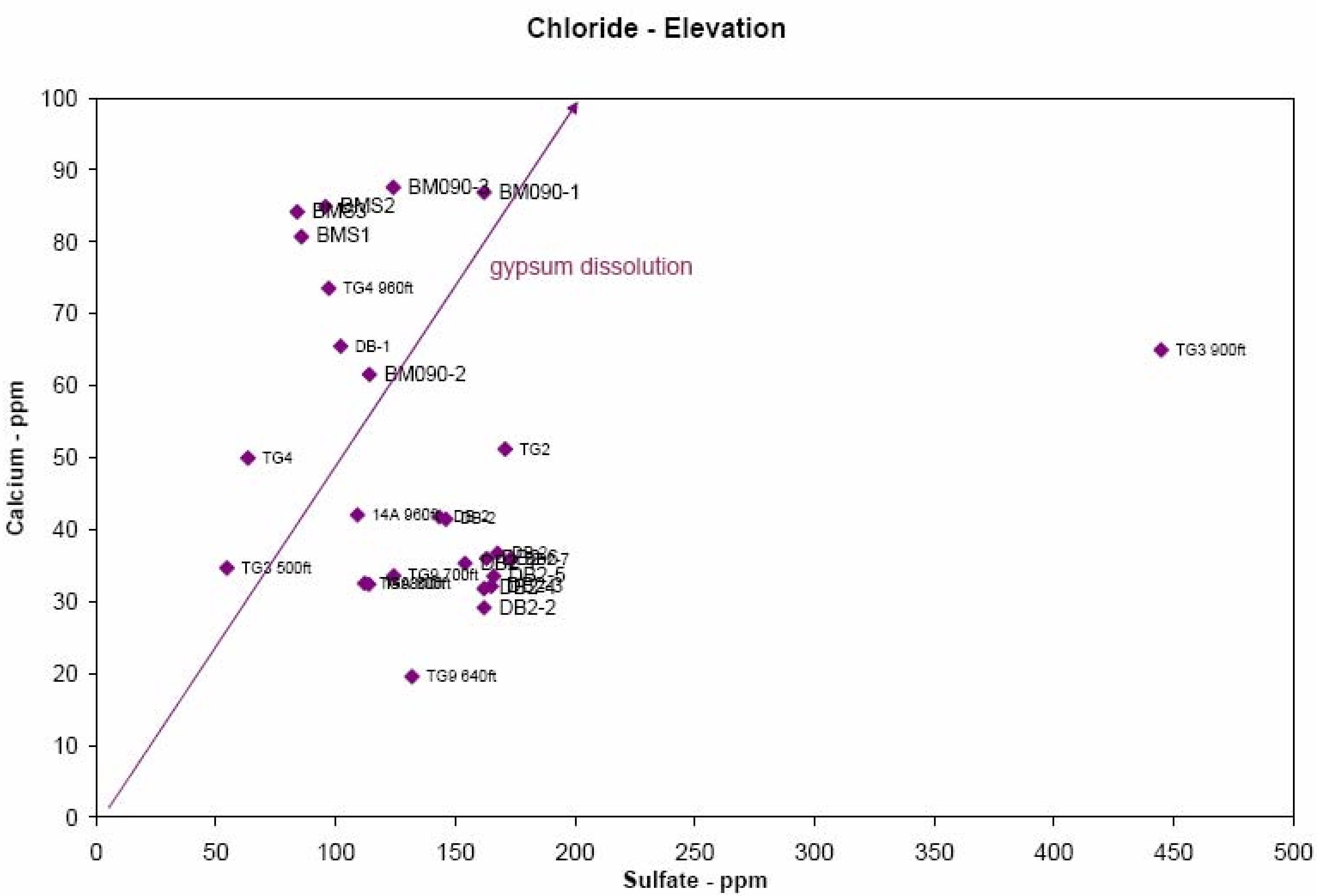


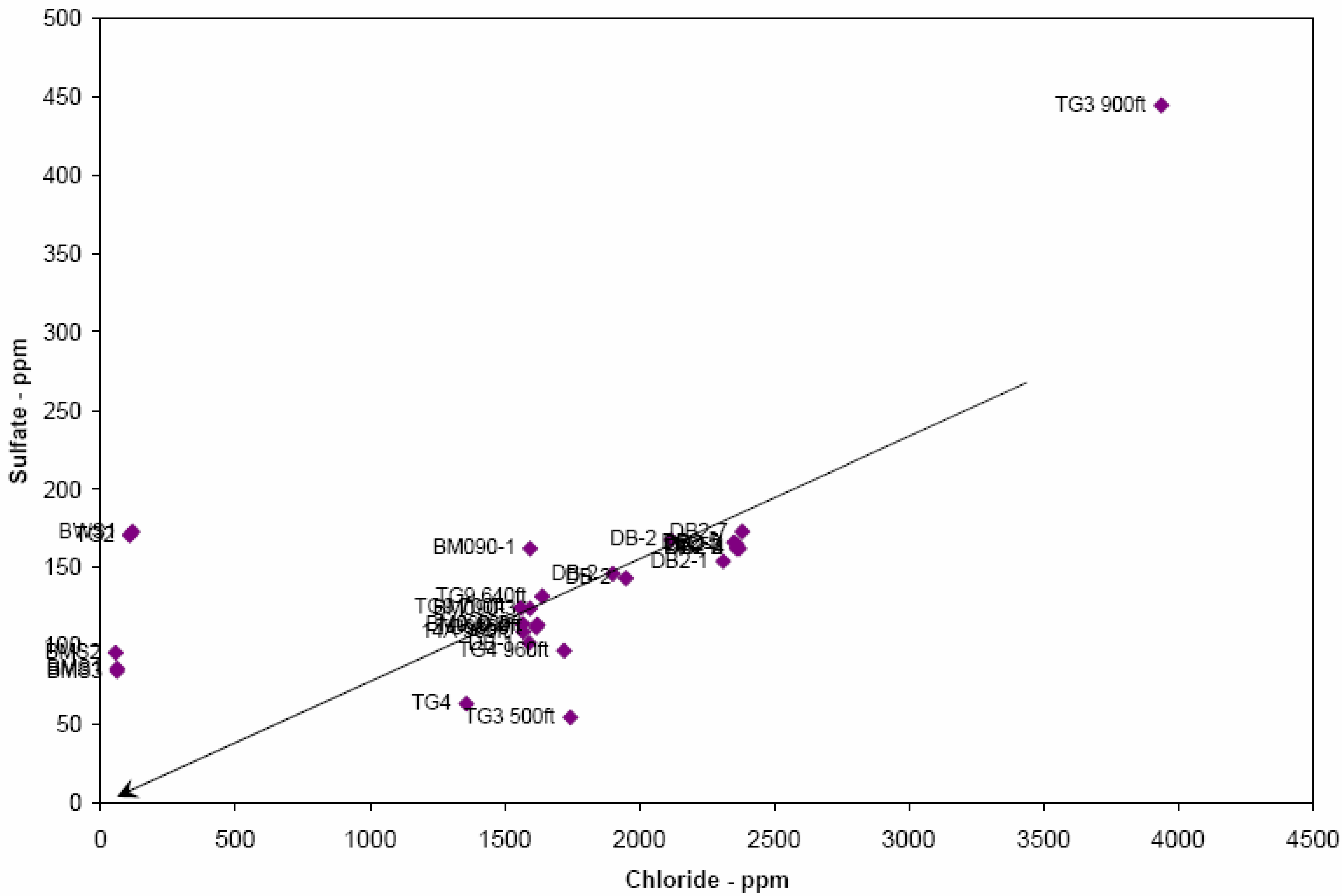
K - Mg - Ca Geothermometer
log(K2/Mg)
log(K2/Ca)
Log(PCO2) in bars
rCO2 vapor = 0.00001
0.0001
0.001
0.01
0.1
0.00001
0.0001
0.001
rCO2 liquid = 0.01
Calcite Formation
Immature Waters
Limestone
Seawater
Ultramafic
Basalt
Diorite
Sandstone
Shale
TG2
TG4 960ft
TG4
TG9 640ft
DB-2



log (K²/Mg)
SiO₂ mg/kg
0
1
2
3
4
5
6
100
200
300
400
500
600
Quartz Solubility
Chalcedony Solubility
60
80
100
140
160
180
200
240
260
TG2
TG4
TG4 960ft
TG3 900ft
BM090-1
DB-2
DB2-7
DB2-1
DB2-6


Quartz Geothermometer Enthalpy - kj/kg
Chloride - ppm
3000
2500
2000
1500
1000
500
0
0
500
1000
1500
2000
2500
3000
3500
4000
4500
Steam
TG3 900ft
DB-2
TG3 500ft
TG4 960ft
TG4
BWS1
TG2


Chloride - Elevation
Calcium - ppm
Sulfate - ppm
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
450
500
gypsum dissolution
BM090-3
BM090-1
BMS2
BMS1
TG4 960ft
DB-1
BM090-2
TG3 900ft
TG2
TG4
14A 960ft
TG3 500ft
TG9 700ft
DB2-5
DB2-2
TG9 640ft



Sulfate - ppm
Chloride - ppm
TG3 900ft
BM090-1
DB-2
DB2-1
TG4 960ft
TG4
TG3 500ft
TG9 640ft

APPENDIX D.

SECTION 7.0 WELL TEST ENGLISH UNIT FIGURES.

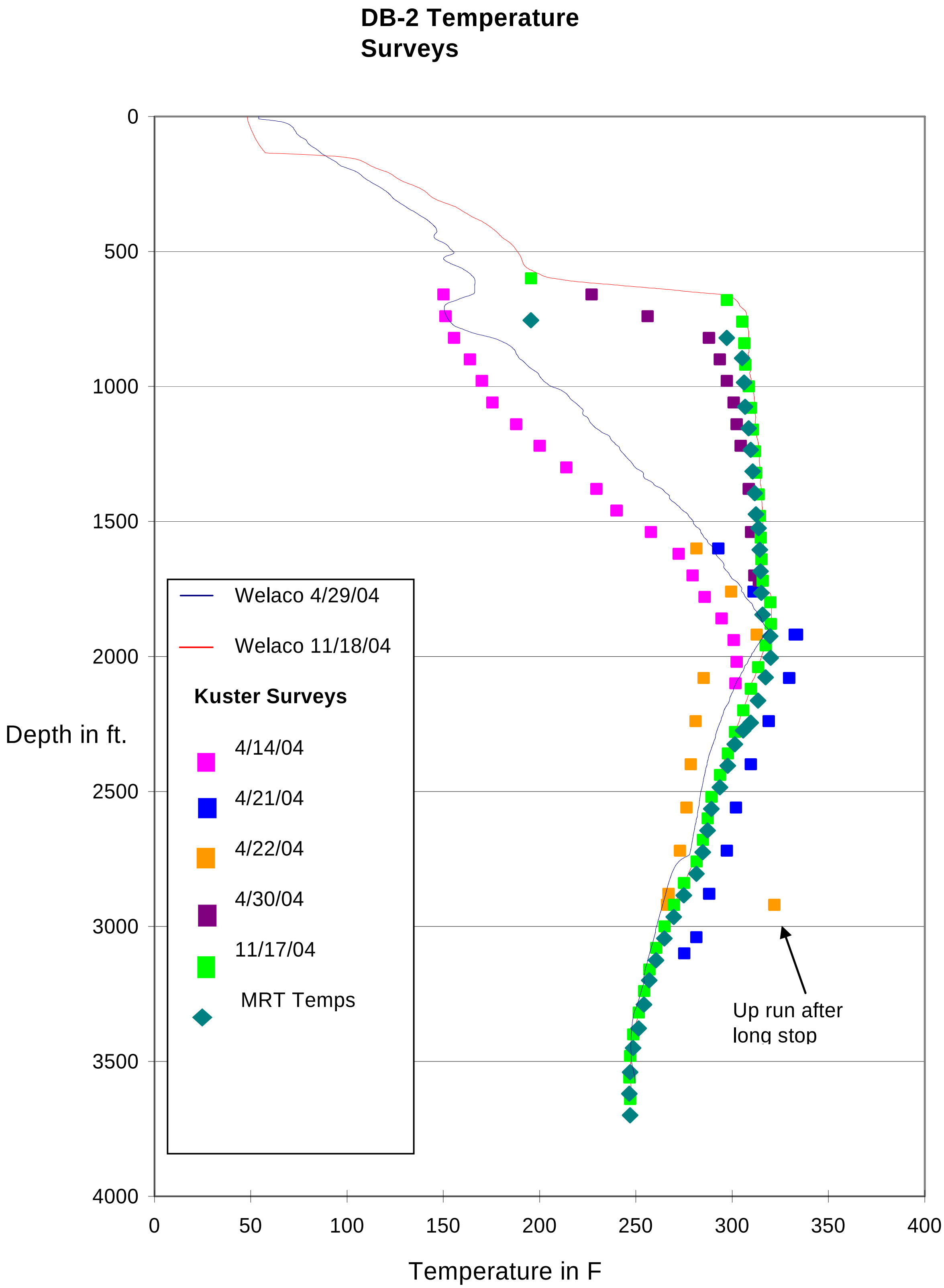

DB-2 Temperature Surveys
Depth in ft.
0
500
1000
1500
2000
2500
3000
3500
4000
0
50
100
150
200
250
300
350
400
Temperature in F
Welaco 4/29/04
Welaco 11/18/04
Kuster Surveys
4/14/04
4/21/04
4/22/04
4/30/04
11/17/04
MRT Temps
Up run after long stop

Figure 7.2

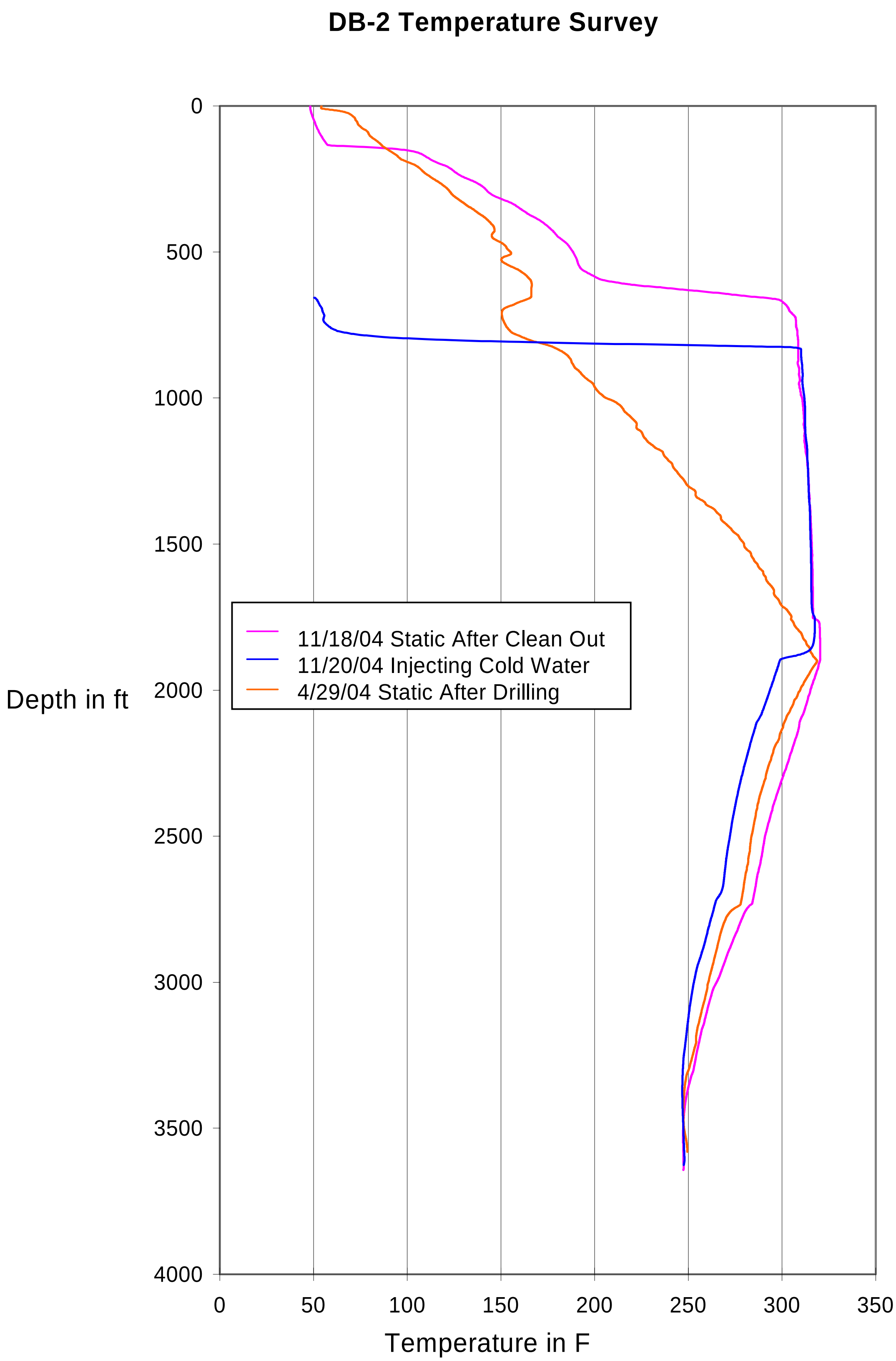

DB-2 Temperature Survey
Depth in ft
0
500
1000
1500
2000
2500
3000
3500
4000
0
50
100
150
200
250
300
350
Temperature in F
11/18/04 Static After Clean Out
11/20/04 Injecting Cold Water
4/29/04 Static After Drilling

Figure 7.3

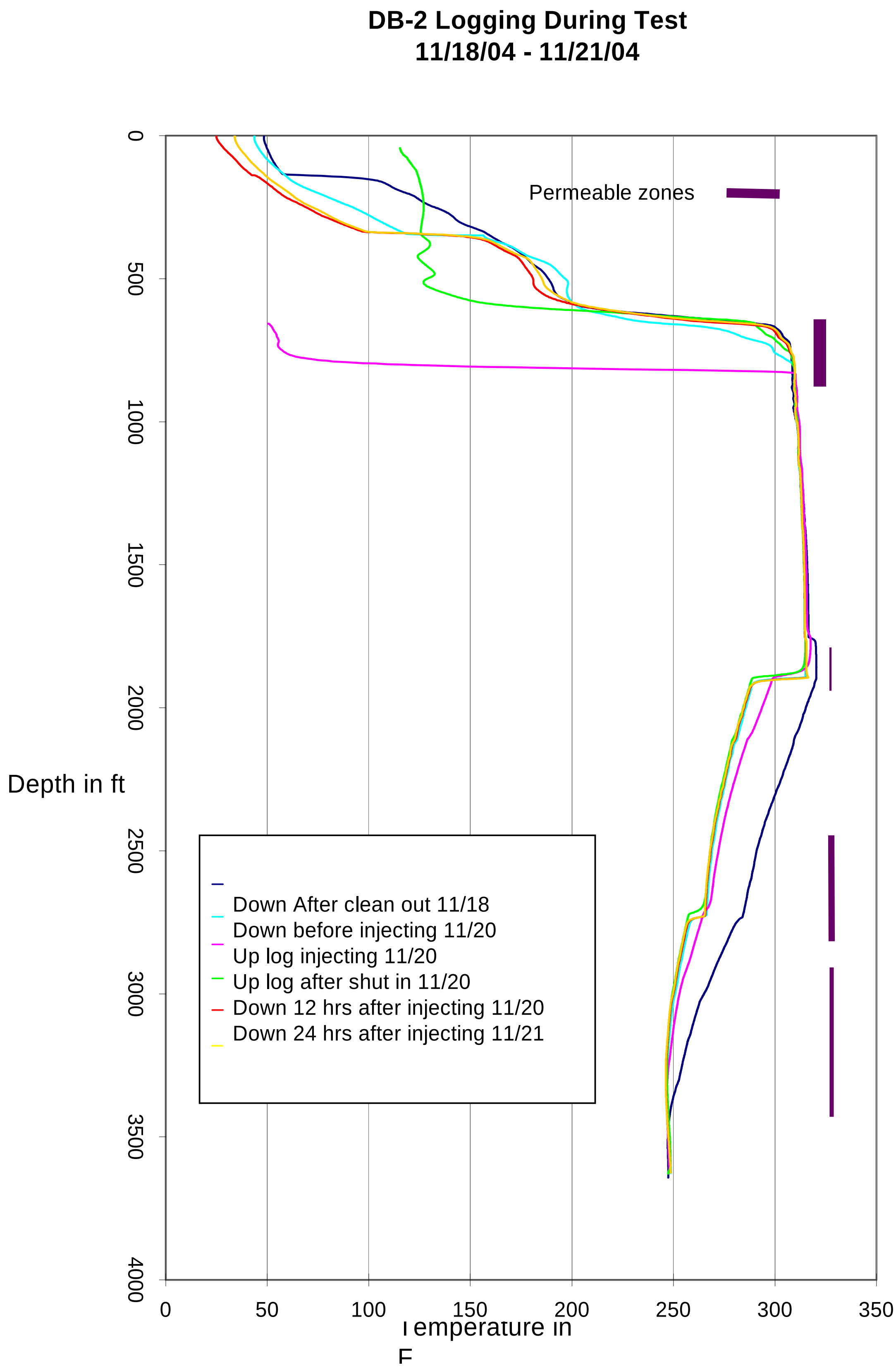

DB-2 Logging During Test
11/18/04 - 11/21/04
Permeable zones
Depth in ft
0
500
1000
1500
2000
2500
3000
3500
4000
0
50
100
150
200
250
300
350
Temperature in F
Down After clean out 11/18
Down before injecting 11/20
Up log injecting 11/20
Up log after shut in 11/20
Down 12 hrs after injecting 11/20
Down 24 hrs after injecting 11/21

Figure 7.4

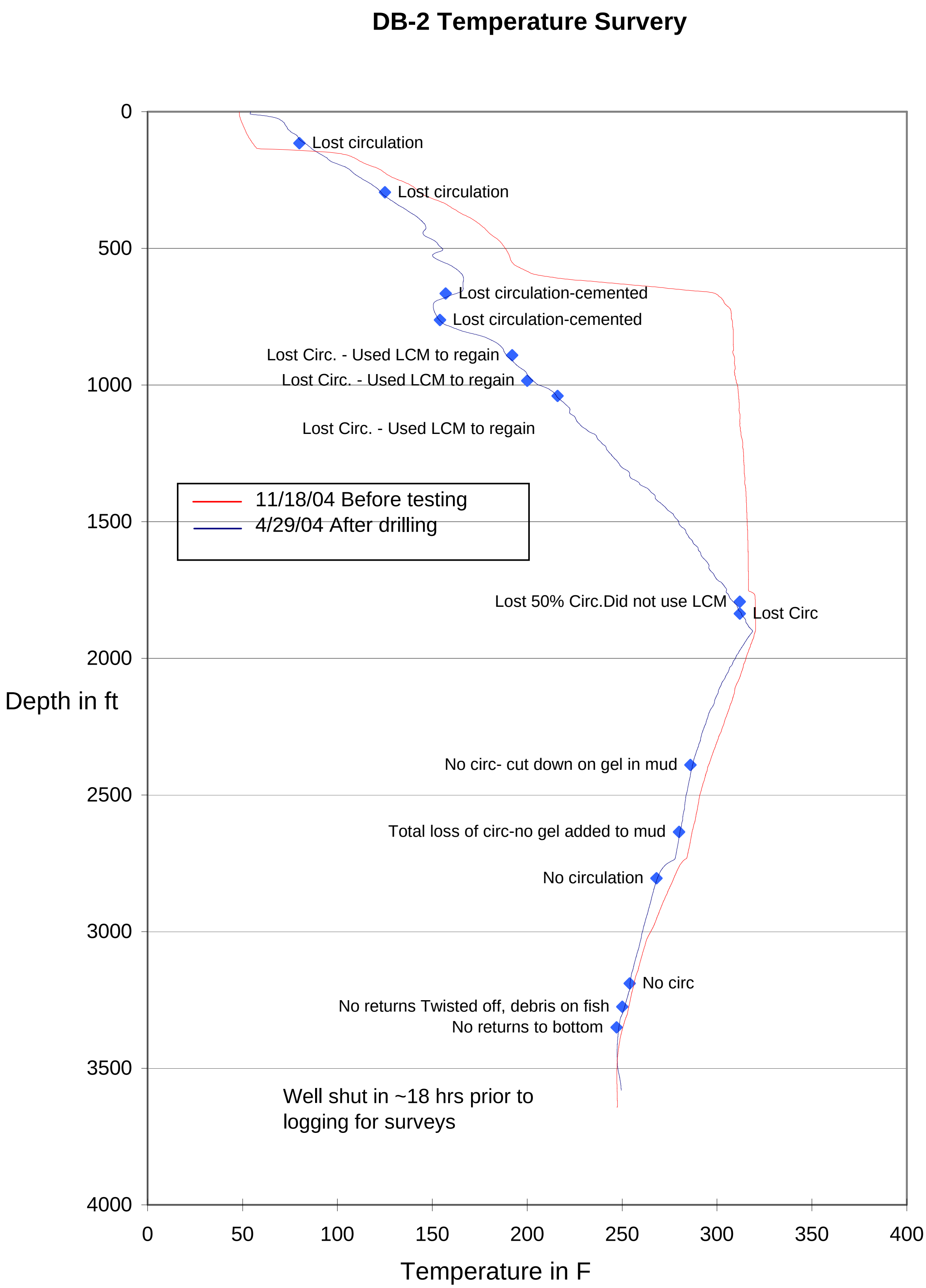

DB-2 Temperature Survery
0
500
1000
1500
2000
2500
3000
3500
4000
Depth in ft
0
50
100
150
200
250
300
350
400
Temperature in F
Lost circulation
Lost circulation
Lost circulation-cemented
Lost circulation-cemented
Lost Circ. - Used LCM to regain
Lost Circ. - Used LCM to regain
Lost Circ. - Used LCM to regain
11/18/04 Before testing
4/29/04 After drilling
Lost 50% Circ.Did not use LCM
Lost Circ
No circ- cut down on gel in mud
Total loss of circ-no gel added to mud
No circulation
No circ
No returns Twisted off, debris on fish
No returns to bottom
Well shut in ~18 hrs prior to
logging for surveys

Figure 7.5

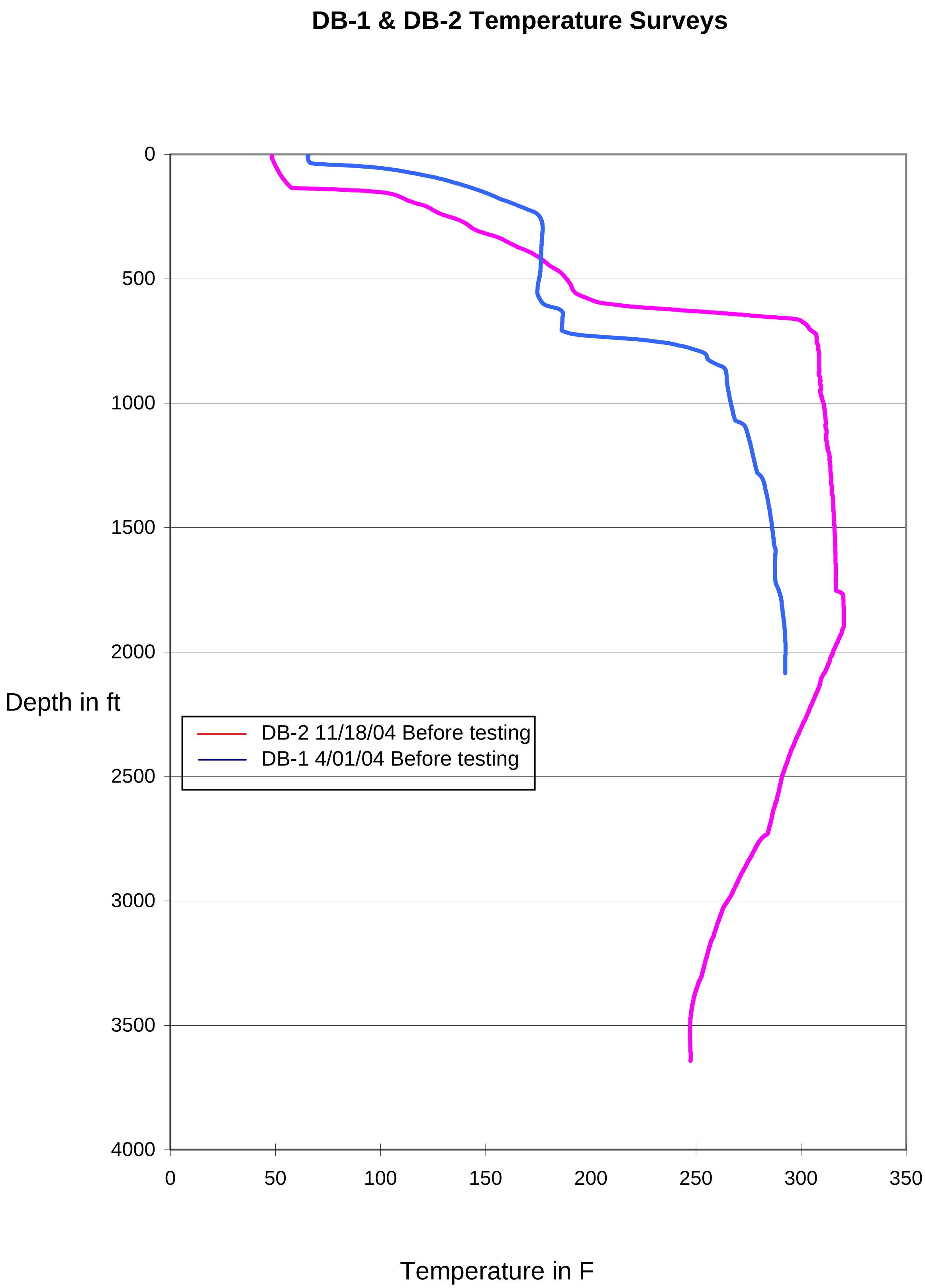

DB-1 & DB-2 Temperature Surveys
Depth in ft
0
500
1000
1500
2000
2500
3000
3500
4000
0
50
100
150
200
250
300
350
Temperature in F
DB-2 11/18/04 Before testing
DB-1 4/01/04 Before testing

Figure 7.6

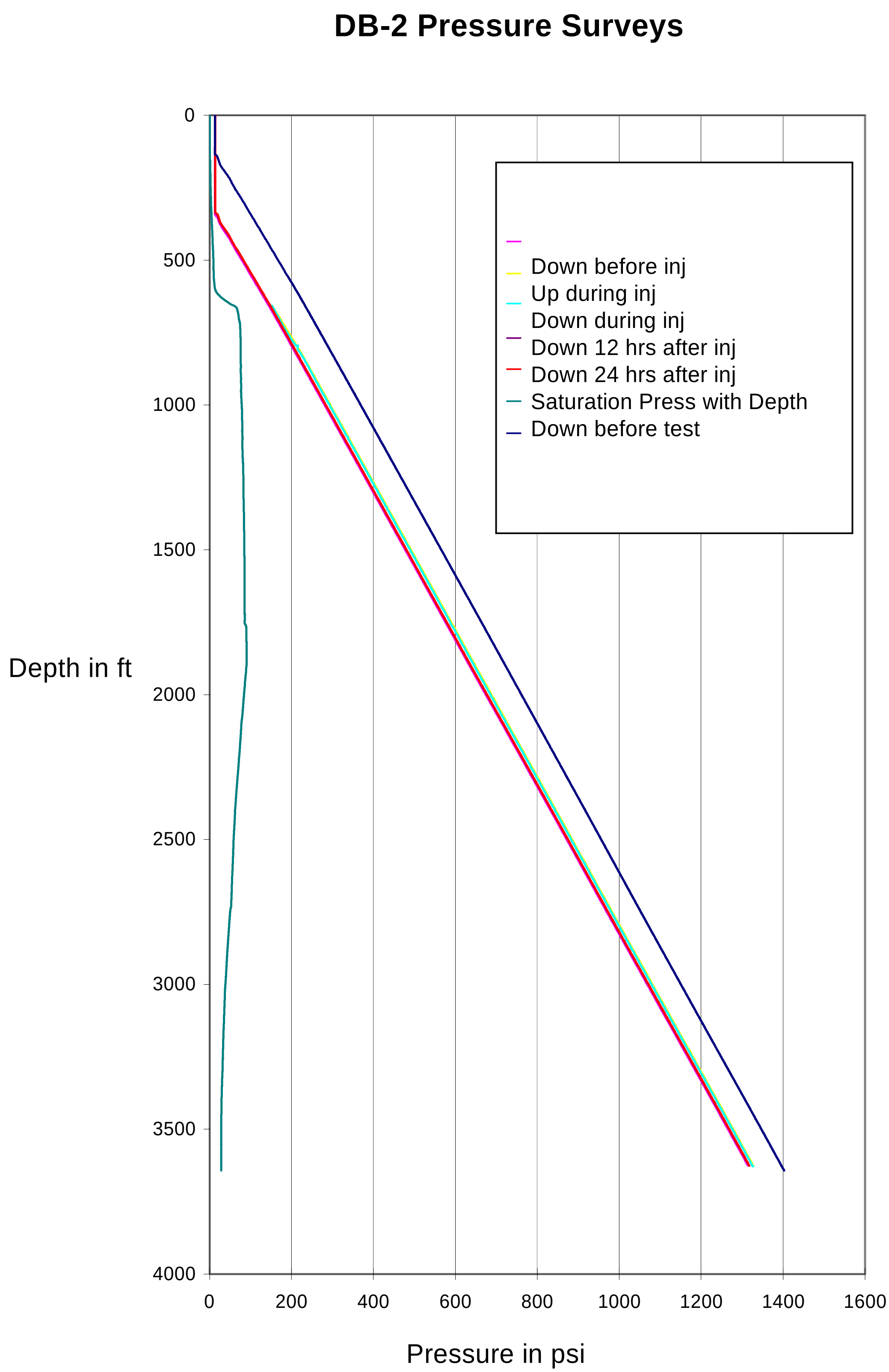
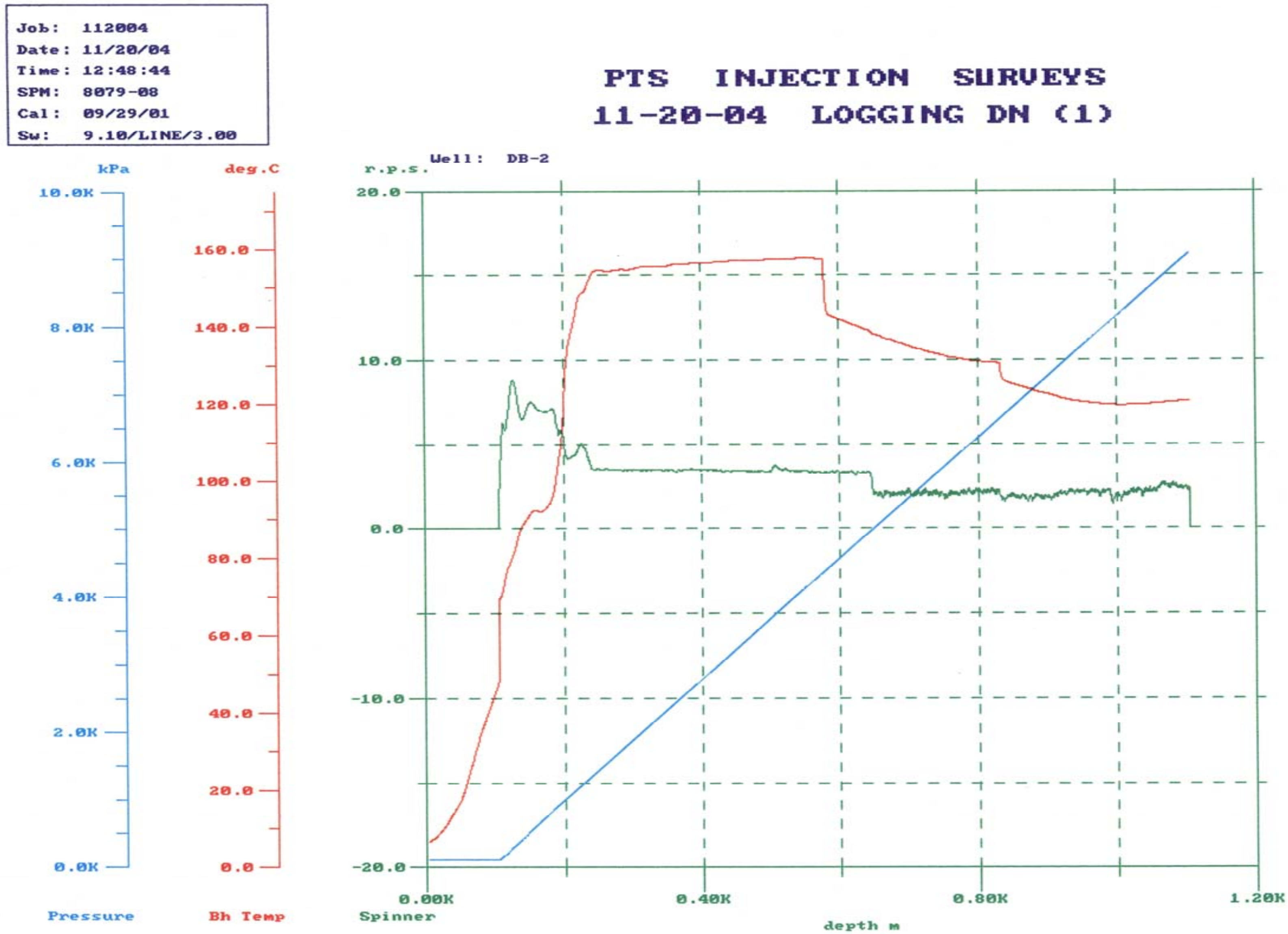
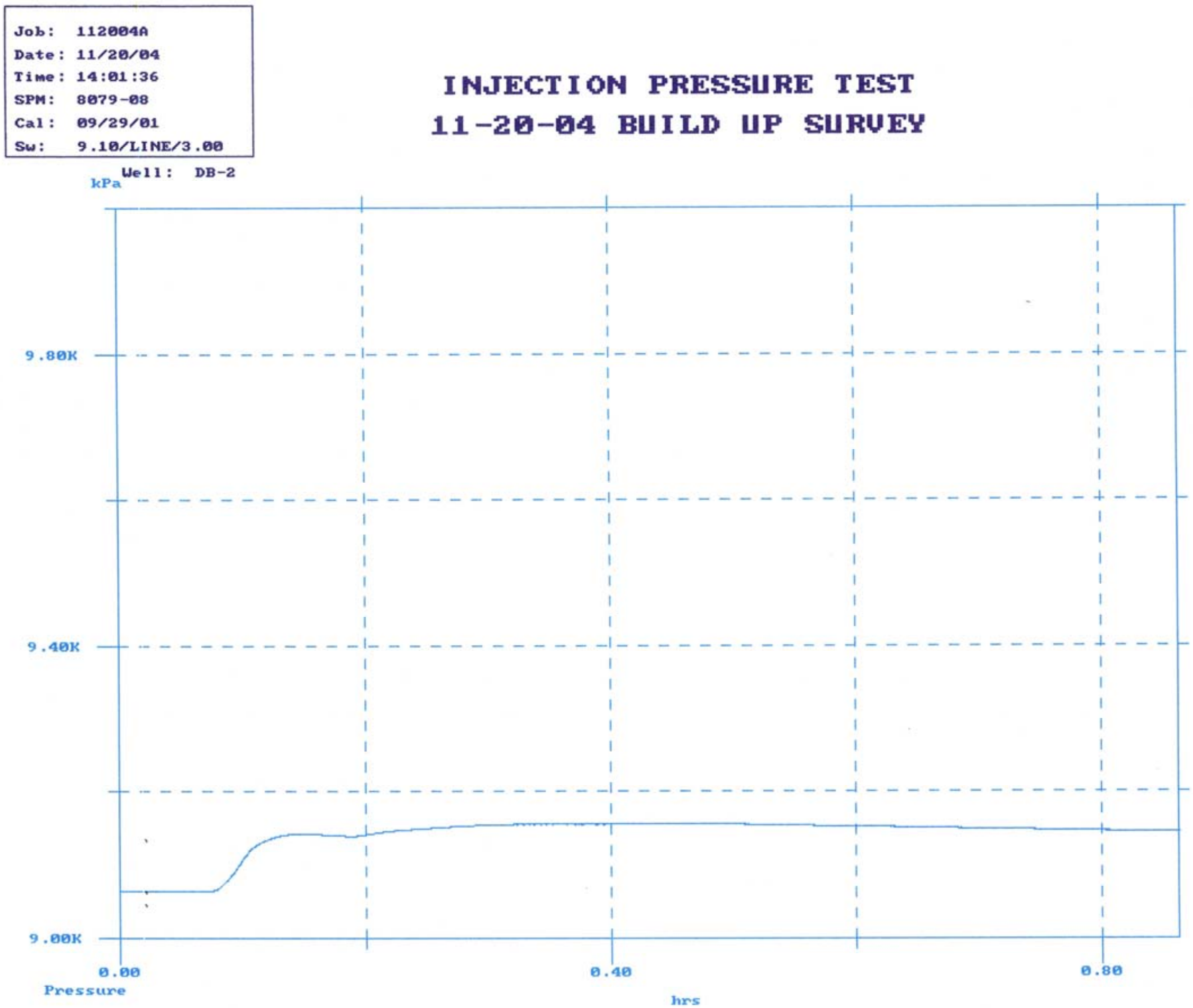

DB-2 Pressure Surveys
Depth in ft
Pressure in psi
0
500
1000
1500
2000
2500
3000
3500
4000
0
200
400
600
800
1000
1200
1400
1600
Down before inj
Up during inj
Down during inj
Down 12 hrs after inj
Down 24 hrs after inj
Saturation Press with Depth
Down before test

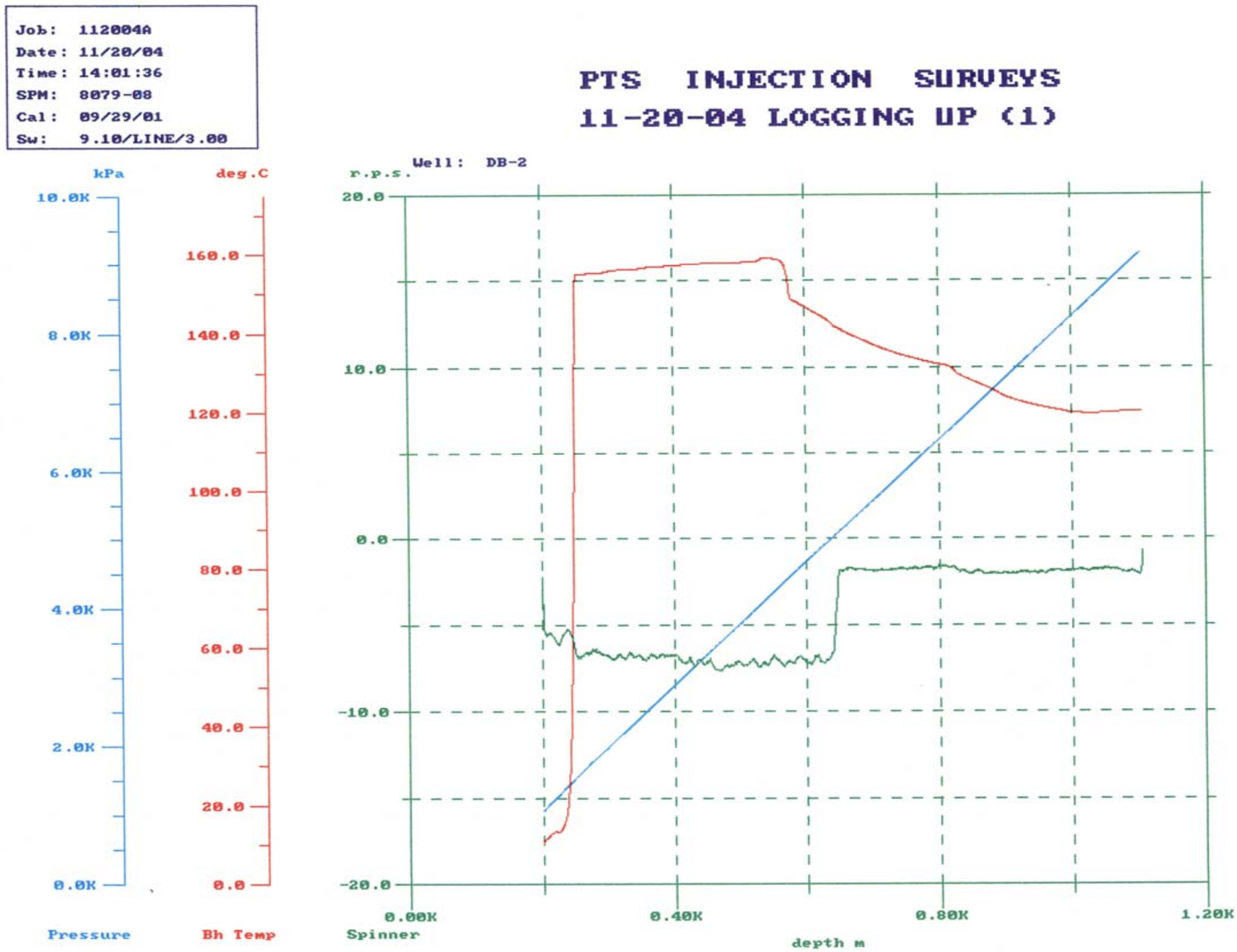
Figure 7.7

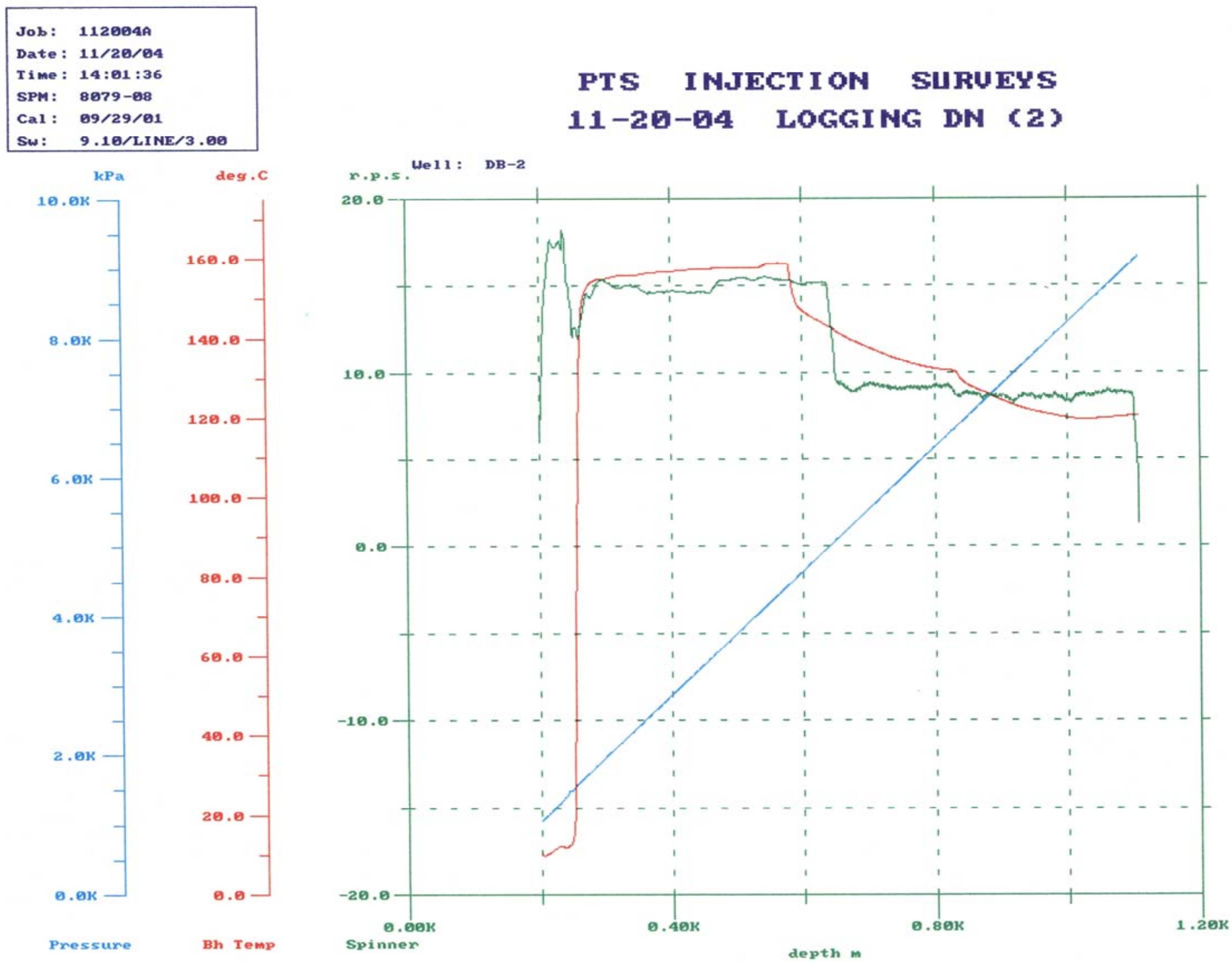
APPENDIX E.

WELACO FLOW AND INJECTION TEST GRAPHS.

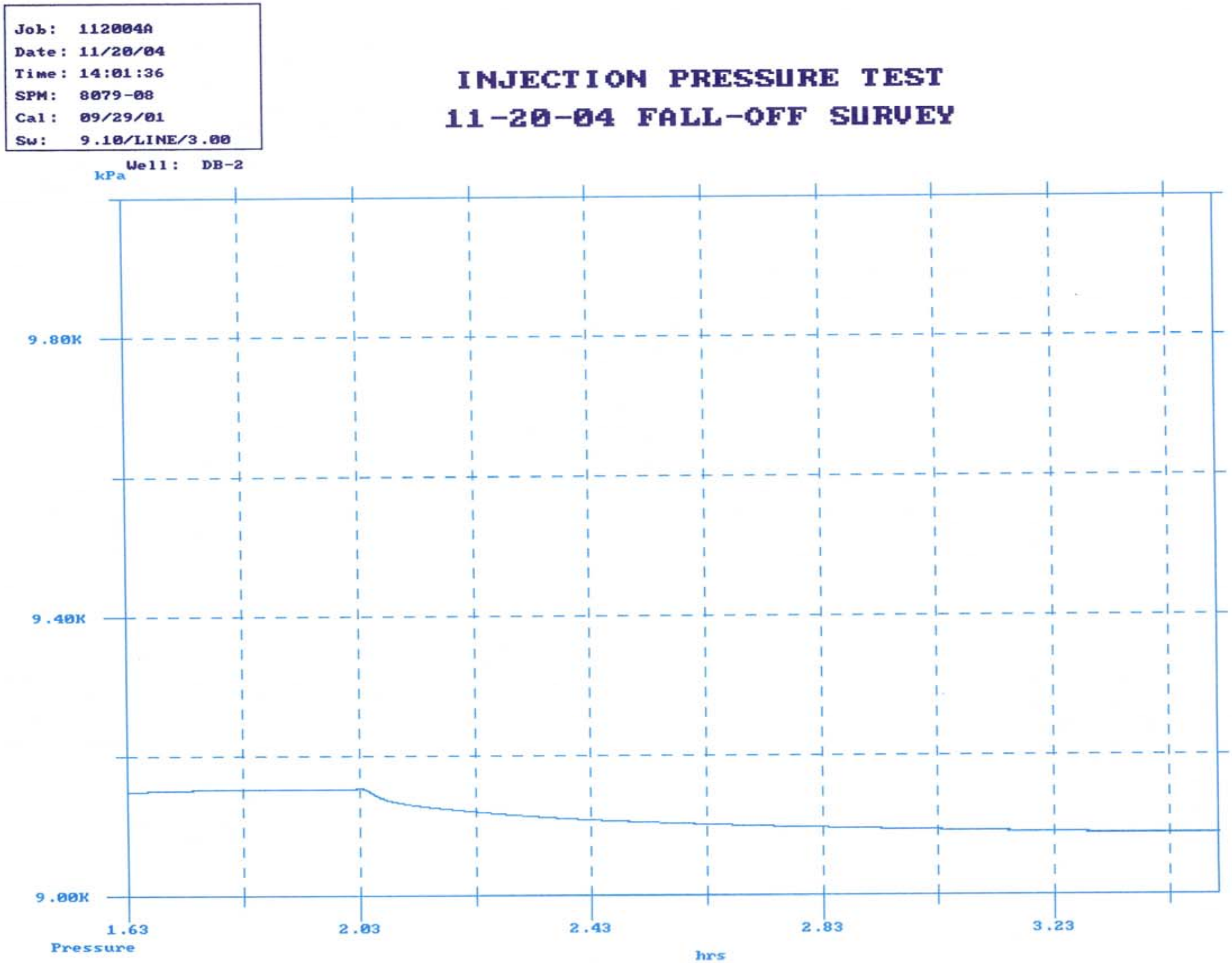

Job: 112004
Date: 11/20/04
Time: 12:48:44
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS INJECTION SURVEYS
11-20-04 LOGGING DN (1)
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m

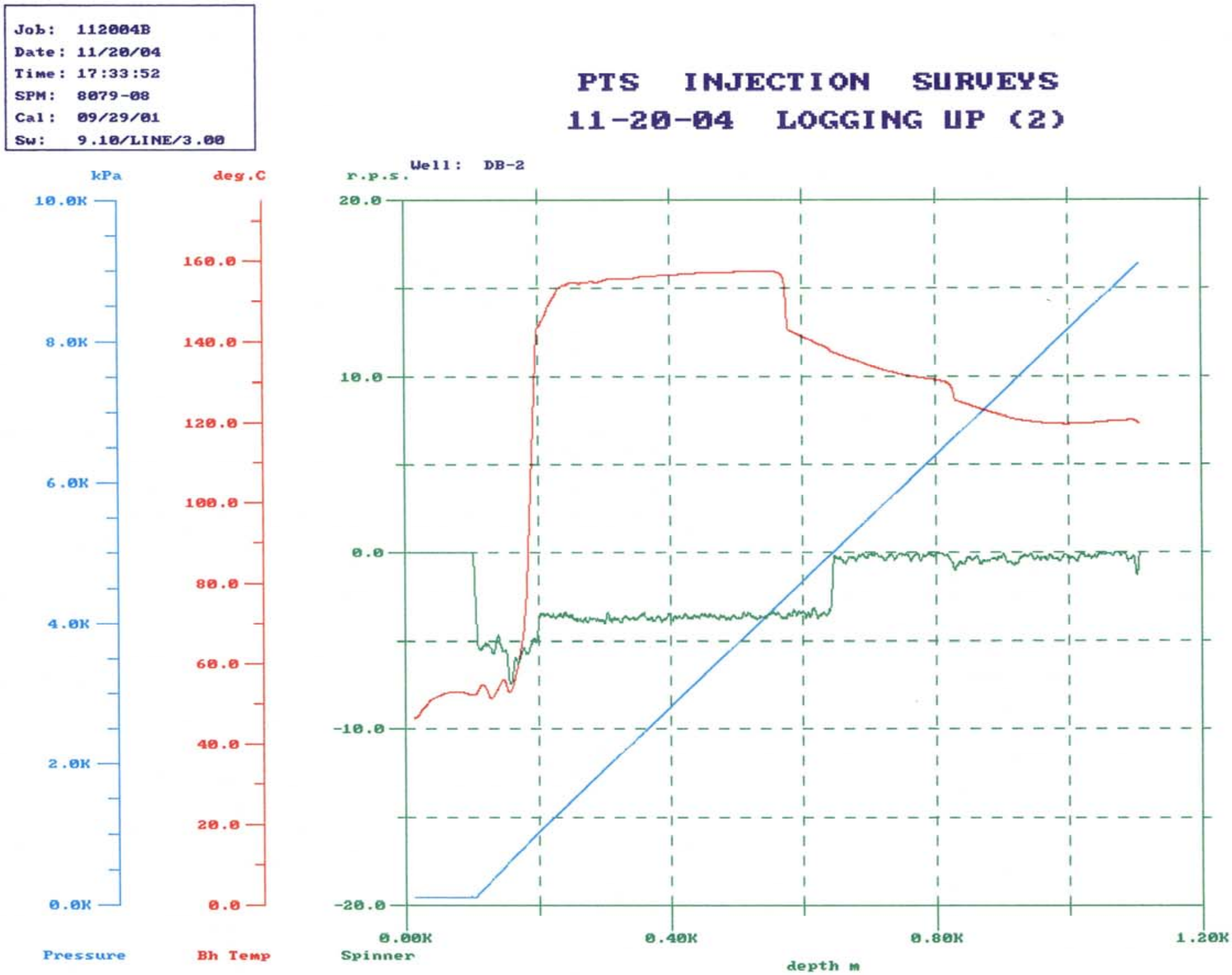

Job: 112004A
Date: 11/20/04
Time: 14:01:36
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
INJECTION PRESSURE TEST
11-20-04 BUILD UP SURVEY
Well: DB-2
kPa
9.80K
9.40K
9.00K
0.00
0.40
0.80
Pressure
hrs

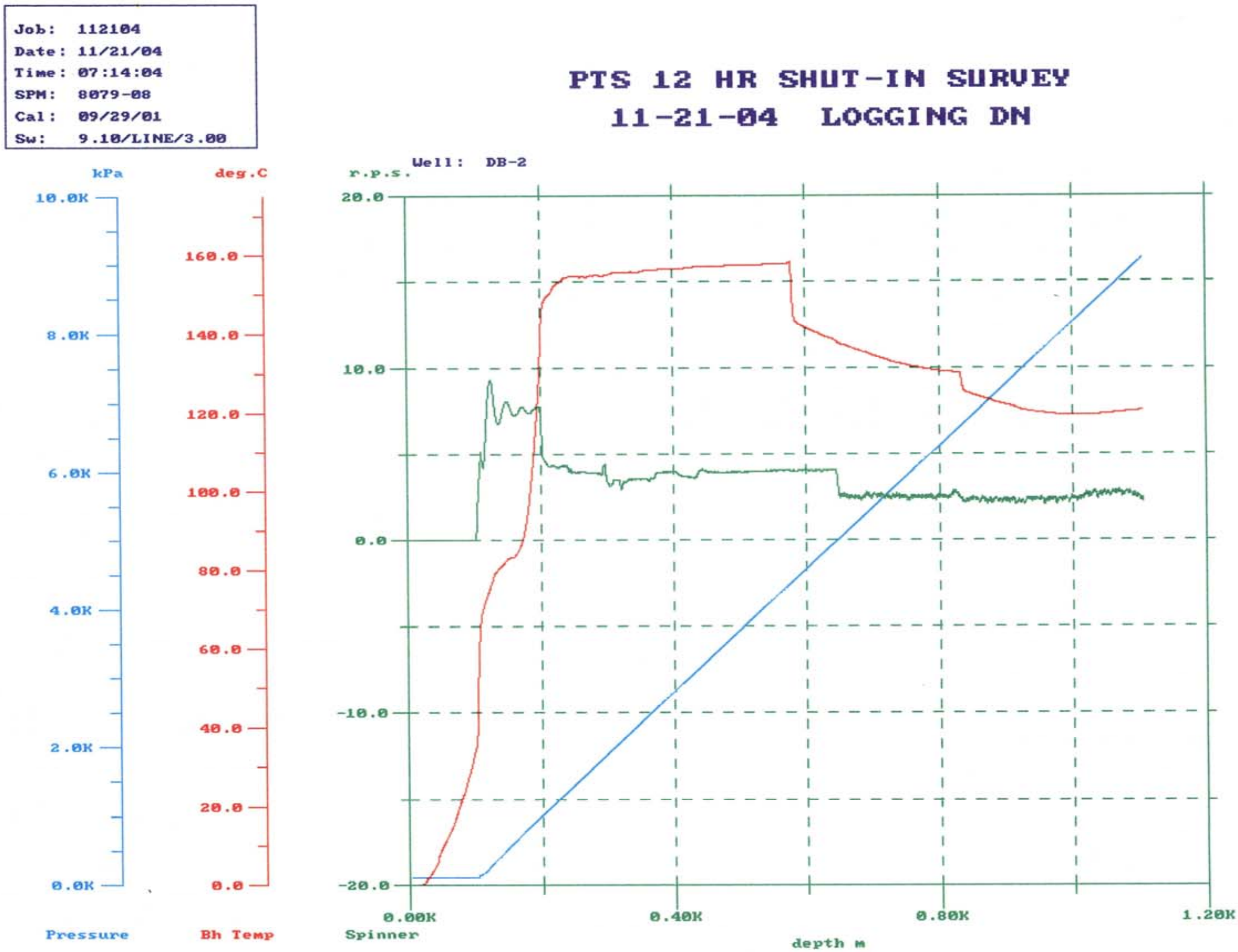

Job: 112004A
Date: 11/20/04
Time: 14:01:36
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS INJECTION SURVEYS
11-20-04 LOGGING UP (1)
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m



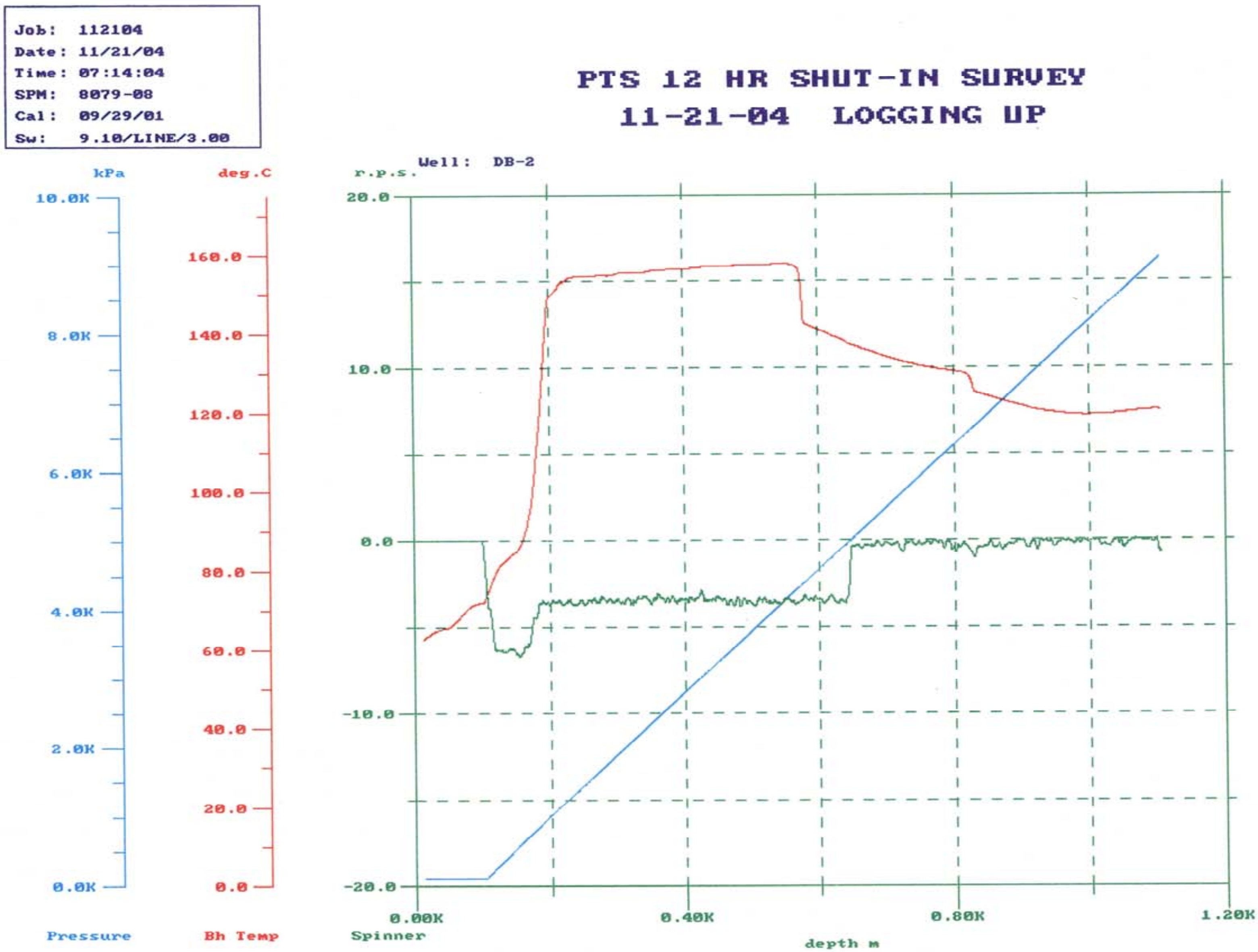
Job: 112004A
Date: 11/20/04
Time: 14:01:36
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS INJECTION SURVEYS
11-20-04 LOGGING DN (2)
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m


Job: 112004A
Date: 11/20/04
Time: 14:01:36
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
INJECTION PRESSURE TEST
11-20-04 FALL-OFF SURVEY
Well: DB-2
kPa
9.80K
9.40K
9.00K
1.63
2.03
2.43
2.83
3.23
Pressure
hrs


Job: 112004B
Date: 11/20/04
Time: 17:33:52
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS INJECTION SURVEYS
11-20-04 LOGGING UP (2)
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m



Job: 112104
Date: 11/21/04
Time: 07:14:04
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS 12 HR SHUT-IN SURVEY
11-21-04 LOGGING DN
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m



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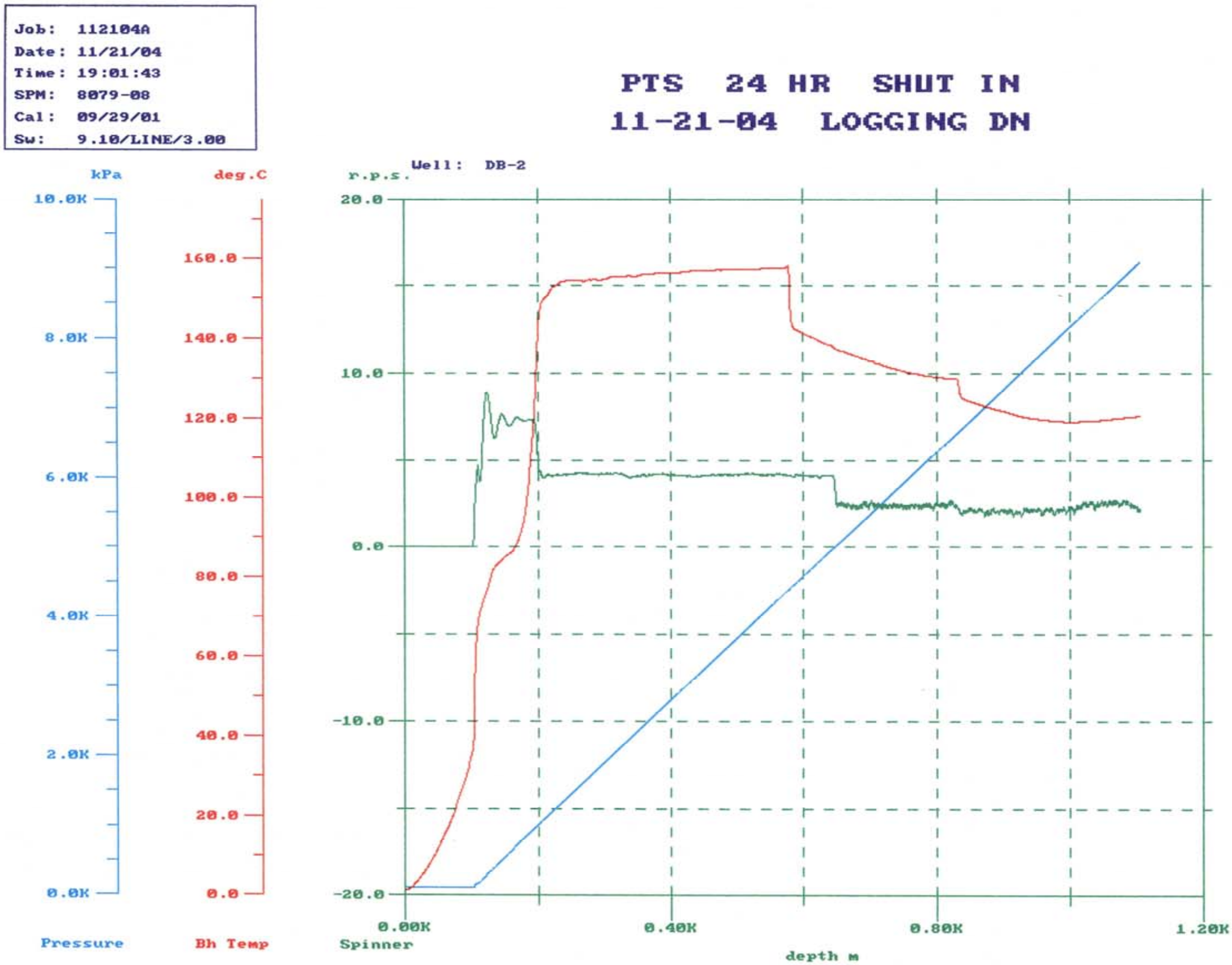
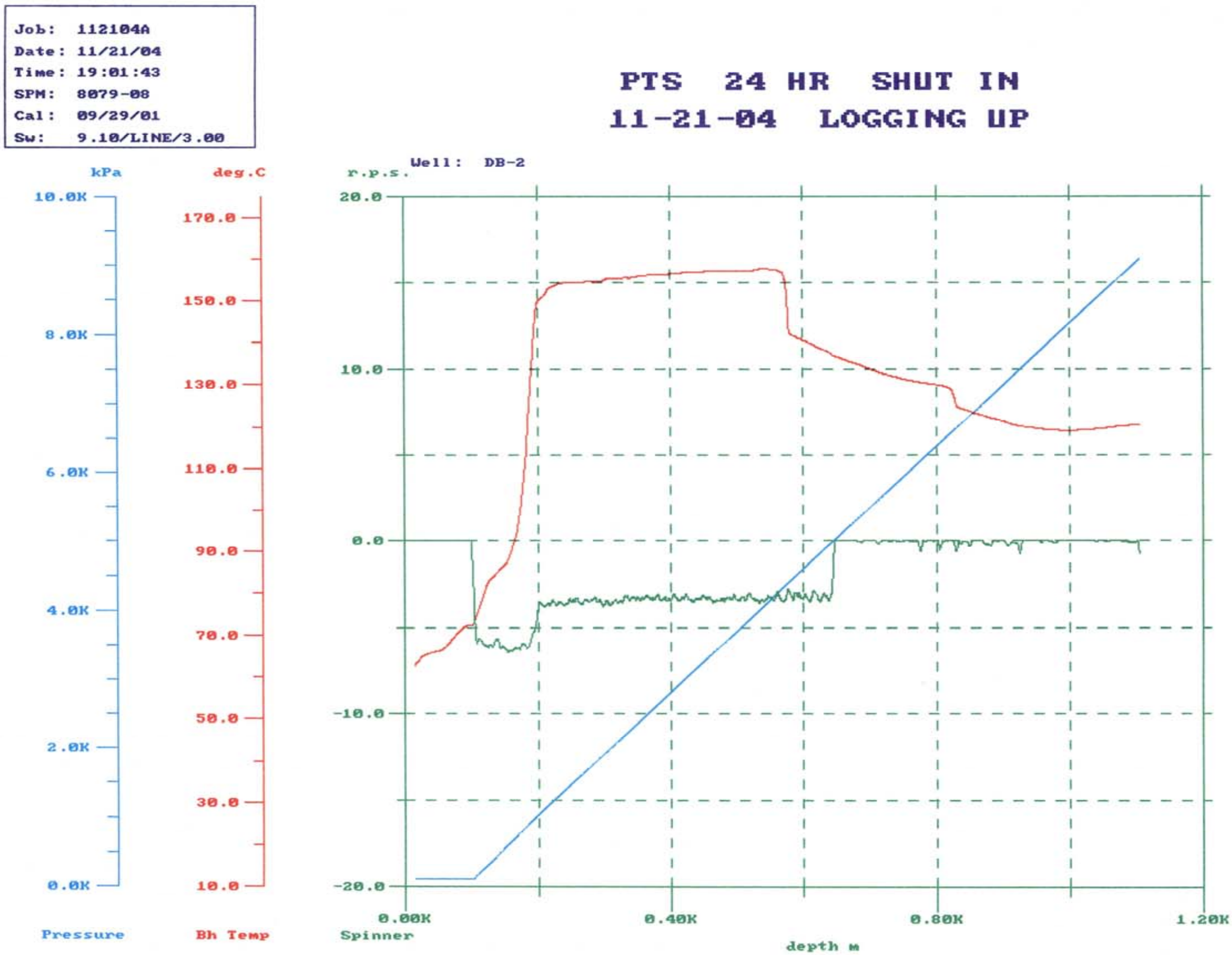
Date: 11/21/04
Time: 07:14:04
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS 12 HR SHUT-IN SURVEY
11-21-04 LOGGING UP
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m


Job: 112104A
Date: 11/21/04
Time: 19:01:43
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS 24 HR SHUT IN
11-21-04 LOGGING DN
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m



Job: 112104A
Date: 11/21/04
Time: 19:01:43
SPM: 8079-08
Cal: 09/29/01
Sw: 9.10/LINE/3.00
PTS 24 HR SHUT IN
11-21-04 LOGGING UP
Well: DB-2
kPa
deg.C
r.p.s.
10.0K
8.0K
6.0K
4.0K
2.0K
0.0K
170.0
150.0
130.0
110.0
90.0
70.0
50.0
30.0
10.0
20.0
10.0
0.0
-10.0
-20.0
0.00K
0.40K
0.80K
1.20K
Pressure
Bh Temp
Spinner
depth m