

**Dixie Valley Well 28-33  
Well History Summary**

**28-33 Well History**

**Depth**

7/4/1990 Well Completed	9 5/8" liner from 5028' - 7882'
7/6/1990 Static Temperature survey	9300'
7/24/1990 Flowing Temperature survey	4100'
12/6/1990 Workover	
7/1/1993 Temperature survey	4000'
9/22/1993 Workover	
9/26/1993 Static Temperature survey	4970'
10/9/1993 Flowing PTS survey	9330'
4/18/1994 Workover	
5/4/1994 Flowing Pressure Temperature survey	4242'
11/2/1996 Flowing Temperature survey	4259'
Static Pressure survey	4259'
7/21/1998 Pull and reinstall cap tubing	
10/1/1998 Flowing Temperature survey	4300'
10/3/1998 Workover	
3/30/1999 Flowing Temperature survey	4500'
4/14/1999 Flowing Temperature survey	4474'
11/1/2001 7.5% HCL Acid (60,000 gals)	
10/23/2003 Flowing Temperature survey	4350'

**Summary**

0 gauge rings  
 12 wire line surveys  
 0 Sinker Bar  
 1 acid stimulation  
 4 Work-overs  
 Coil tubing clean-out  
 0 Nitrogen Lifts  
 1 capillary tubing strings

Cliff -  
Nalco -

You forwarded this message on 4/4/2007 12:17 PM.

**Jess McCulloch**

**From:** Jess McCulloch **Sent:** Wed 4/4/2007 12:15 PM  
**To:** Doug Brown  
**Cc:**  
**Subject:** Nalco history FYI  
**Attachments:**

Excerpts from some of Stu's stuff.

Summary:

Nalco 9354 = Bad

Nalco HP-1340 = Good

**Year 1999**

Considered as normal operation with plant output at 62.5 MW gross at the start of the year. In the previous fall of 1998, production well workovers, mainly consisting of hangdown string replacements and cap tubing replacements were conducted during the outage in October. Production wellbores were not limited by scale build-up. Scale inhibitor was changed from Nalco HP-1340 to Nalco 9354 as a cost saving measure.

A change in down-hole carbonate scale inhibitor in 1998 resulted in accelerated scaling in all production wells and caused production well downtime beginning in late 1999 and continued through 2000.

**Year 2000**

A coiled tubing clean-out of 73-7 was conducted in August. When pulling the hangdown string, the abnormally heavy scaling present was the first indication that the Nalco 9354 was not totally effective in inhibiting carbonate scaling in the Dixie Valley wells. Although CT operational problems prevented a total success, Well 73-7 could be placed back in service with a gain of 3.0 MW. The plant output of 61.0 MW was higher than the output at a comparable time in 1999 (59.5 MW).

During the months of September and October, the effects of high scaling rates began to show in other weak wells in Dixie Valley. Problems were noted with 82A-7, 63-7, and 76A-7 in terms of low well head pressure. Well 76A-7 was off-line during much of this time due to a scaled-in-place hangdown string (Note 3 MW loss in September). Wells 63-7 and 82A-7 were also off-line intermittently during this timeframe.

**Year 2001**

During the first quarter of 2001, production showed a slight decline of perhaps 0.25 MW. This decline is attributed to two factors:

1. Modest scaling due to continued use of Nalco 9354.

1. Reservoir pressure augmentation program was hampered by injection pump failures and plant trips that caused high-rates of brine loss.

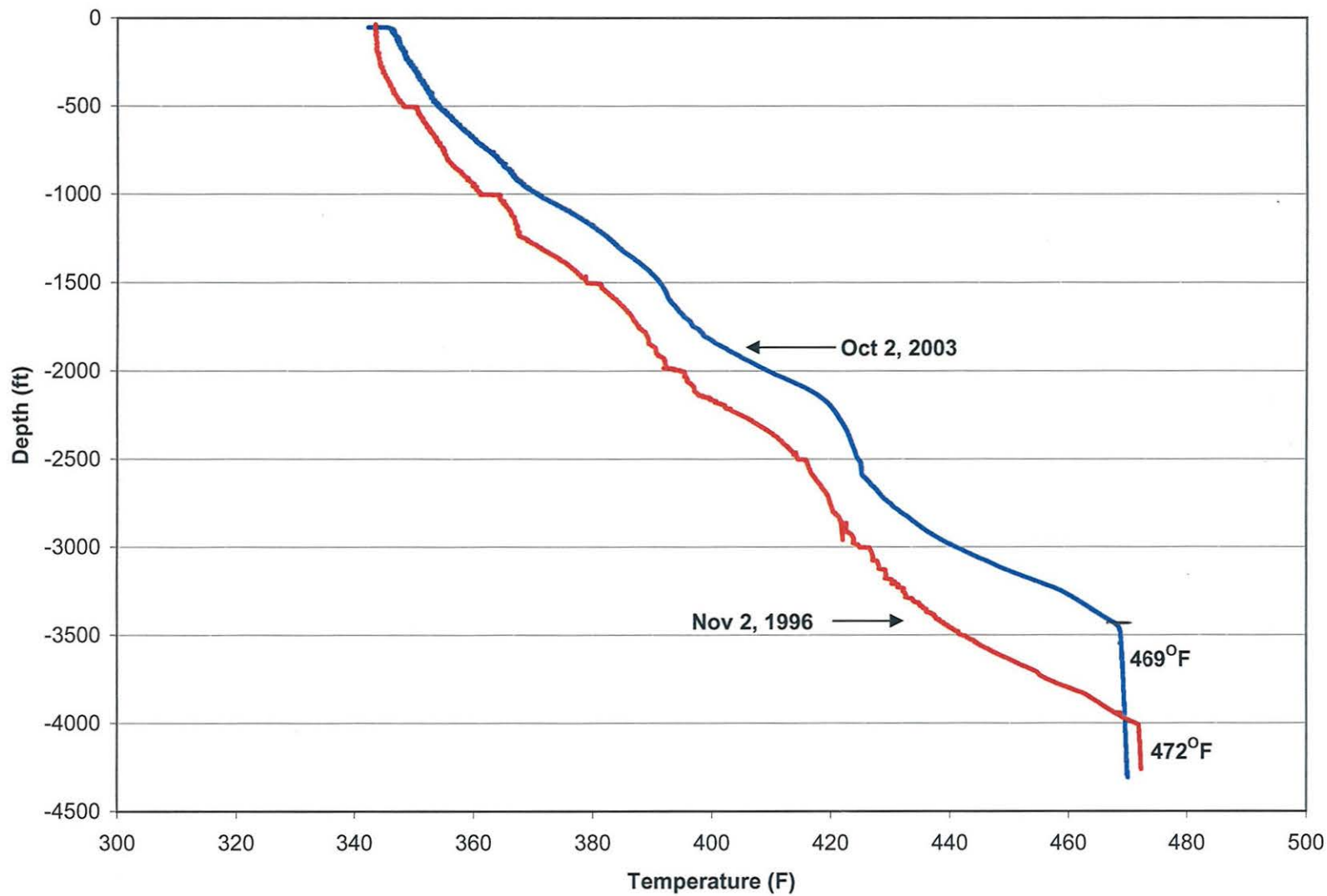
The May outage brought three improvements to the production field:

1. The Nalco 9354 was replaced by Nalco 1340 HP to reduce scaling rates in all production wells.
2. Well 63-7 was treated with acid to remove wellbore scale and scale at depth in the well.
3. Well 76A-7 was treated with acid to remove wellbore scale and scale at depth in the well.

### **Minimize wellbore scaling**

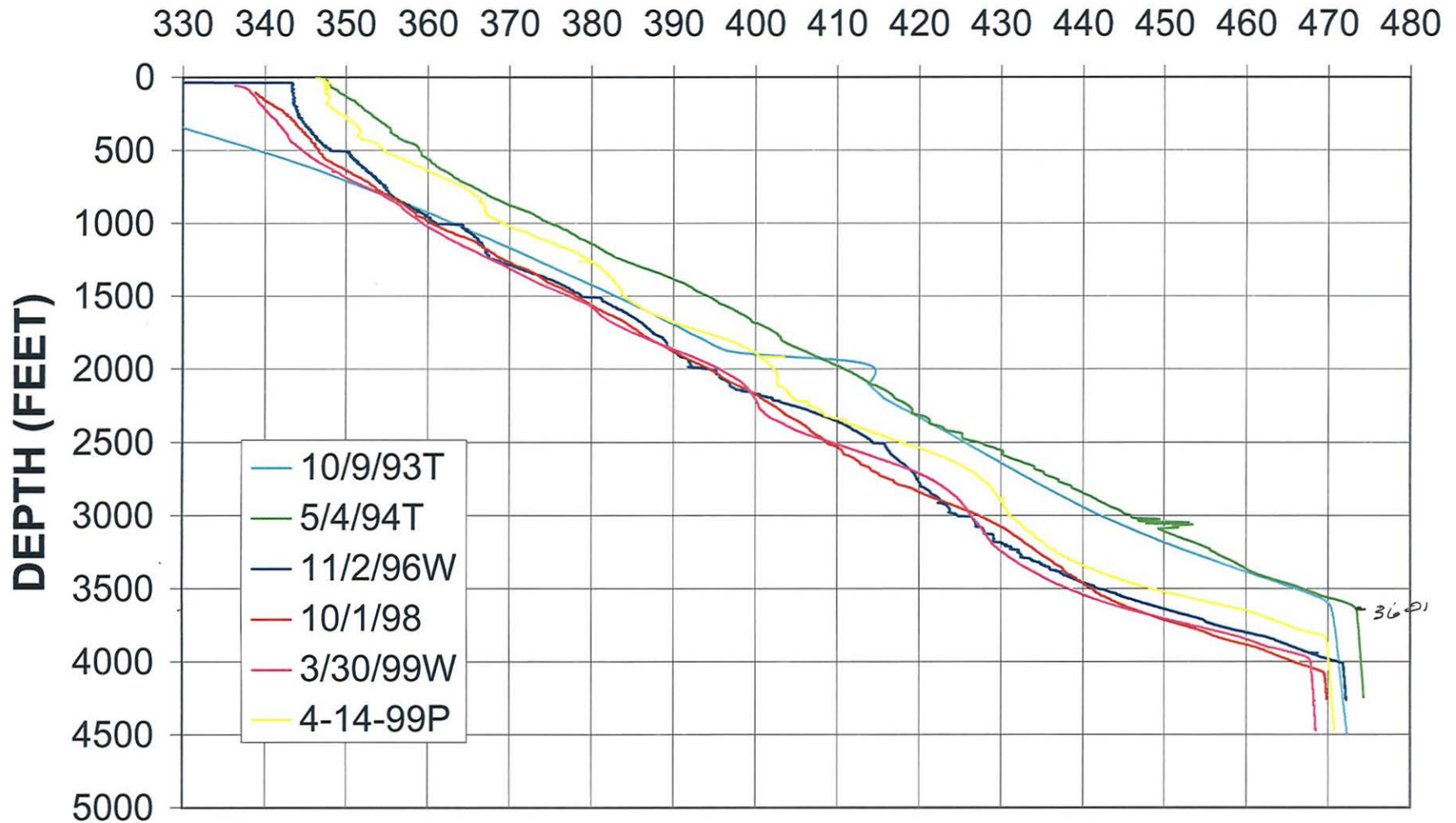
Prior to 1998, Nalco 1340 HP was used as a scale inhibitor in Dixie Valley Wells. The use of Nalco 9354 was shown to be ill-advised. Nine production wells were in service in 1998 and five of these wells required clean-outs during 2000-2001. The loss of well 82A-7 can largely be attributed to scale that developed through the use of Nalco 9354

### 28-33 Flowing Temperature



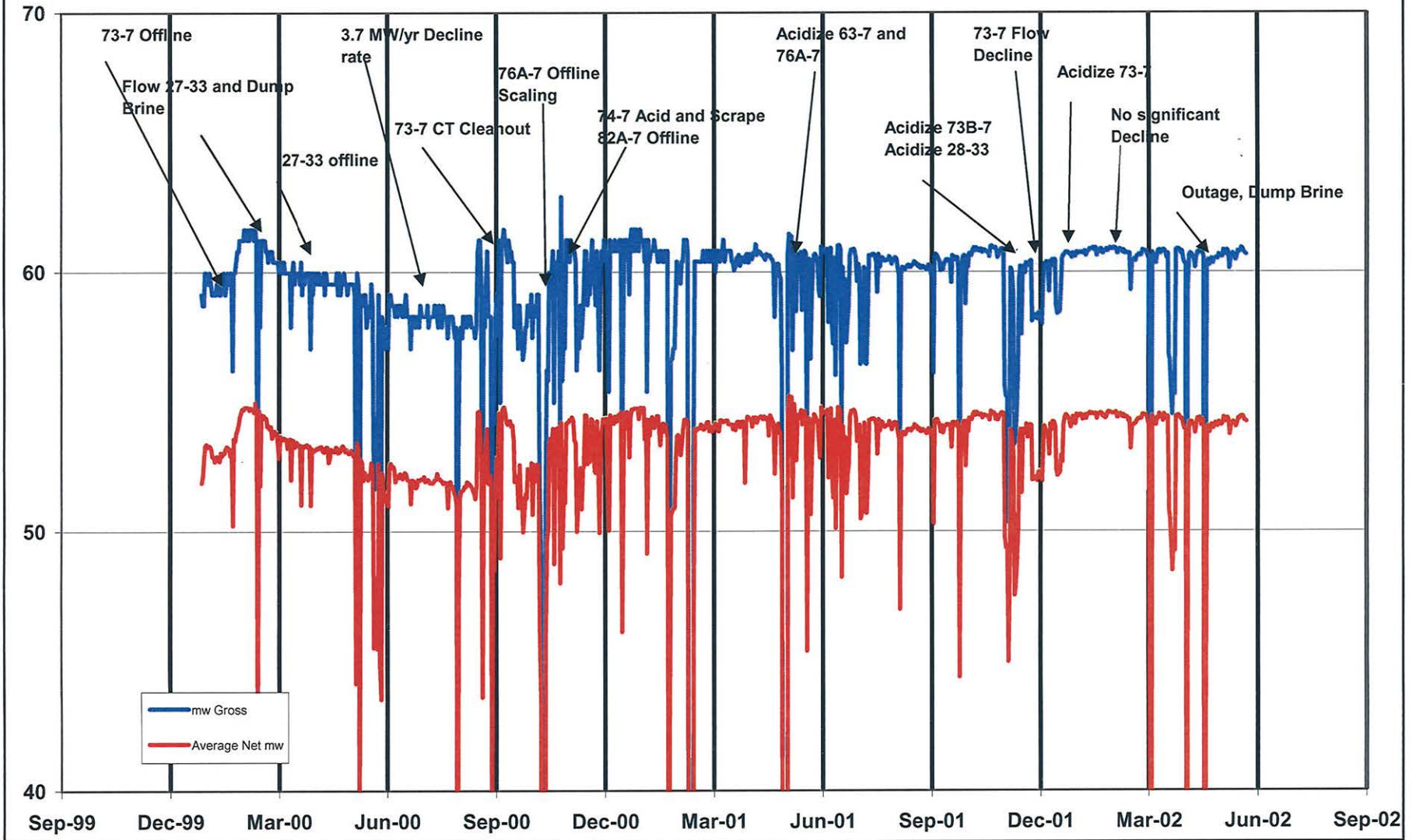
# 28-33 FLOWING TEMPERATURE LOGS

## TEMPERATURE (F)



# DIXIE VALLEY MW TRENDS

From 1 Jan 00 to 27 May 02



# Well Completion Diagram Well 28-33

Location: SW-SW-SW Section 33 T25N-R37E

Churchill County, Nevada

Datum: 3501' KB, 32' Above Ground Level

Drilled: 7/4/90 Veco Rig #10

13 3/8" Liner Hanger @ 1108'KB  
26" Hole @ 1330'KB

13 3/8" Tie Back  
13 3/8" 72# L80 BTC 0-1108'KB  
20" 94 & 106# K55 BTC @ 1318'KB

Casing Pinched To 11.5" @ 2967'KB

Flash Point at +/- 4100'KB  
HangDown String 4490' Below Tubing Hanger  
(137 Joints of 10 Round)  
Two 1/4" Cap Tubing Strings  
Banded To HangDown String

9 5/8" Liner Hanger @ 5028'KB  
17 1/2" Hole @ 5246'KB







13 3/8" 87.2# SS90 &  
72# L80 BTC 1108-5229'KB

12 1/4" Hole @ 7887'KB

9 5/8" 43.5, 47 & 53.5# L80 BTC  
5028-7882'KB

Fracture Below 9287'KB  
8 1/2" Hole @ 9507'KB

Inhibition Downhole Assembly and  
Cap Tubing Junk Below 9346'KB  
Bottom @ 9346'KB (10/8/93)

-  Alluvium @ Surface
-  Tuff & tuffaceous seds. @ 4870'KB
-  Tertiary basalt @ 6070'KB
-  Miocene sediments @ 7306'KB
-  Humboldt Lopolith @ 8648'KB
-  Jurassic quartzite @ 9106'KB

*NEED TO  
Get Hang down  
History*

**Dixie Valley Well 28-33  
Well History Summary**

**28-33 Well History**

**Depth**

7/4/1990 Well Completed	9 5/8" liner from 5028' - 7882'
7/6/1990 Static Temperature survey	9300'
7/24/1990 Flowing Temperature survey	4100'
12/6/1990 Workover	
7/1/1993 Temperature survey	4000'
9/22/1993 Workover	
9/26/1993 Static Temperature survey	4970'
10/9/1993 Flowing PTS survey	9330'
4/18/1994 Workover	
5/4/1994 Flowing Pressure Temperature survey	4242'
11/2/1996 Flowing Temperature survey	4259'
Static Pressure survey	4259'
7/21/1998 Pull and reinstall cap tubing	
10/1/1998 Flowing Temperature survey	4300'
10/3/1998 Workover	
3/30/1999 Flowing Temperature survey	4500'
4/14/1999 Flowing Temperature survey	4474'
11/1/2001 7.5% HCL Acid (60,000 gals)	

**Summary**

0 gauge rings  
 11 wire line surveys  
 0 Sinker Bar  
 1 acid stimulation  
 4 Work-overs  
 Coil tubing clean-out  
 0 Nitrogen Lifts  
 1 capillary tubing strings











Caithness Operating Compay LLC  
Wellfield Department  
Workover Report

To: Bobbi Gollan, John Gastineau, Stu Johnson, Don Wells

From: Greg Davidson

Field	WELL	WORK	AFE No.	Report No	Date	Supervisor
Dixie Valley	28-33	Acid Stim	A1F3	5	November 8, 2001	G Davidson/S Johnson

**Present Operation**

run 1.9" tubing - lift well

**Yest'day(Nov 7, 2001)**

Time	Operation Summary
0700	install 10" flow "t" - start water at 1 bpm from sump rig to and run 1.9" hang down tubing - (used)
1230	run total 137 joints - landed at 4483.03' below landing spool shut in water - shut in well
1800	Move in and rig up Halliburton N2 unit start N2 to lift well - rate 1000 scfm increase rate to 1200 scfm - well would not flow increase rate to 1400 scfm - returns evident - well would not flow
2200	shut down N2 - total pumped 245 000 scf allow well to heat over night shut in well
	Total water pumped to 2400 hrs: ~400 bbls Cummulative water pumped: ~4000 bbls

Service	Cost Summary	
	Hrs	Cost US\$
Company Supervision		
Colorand TBC		
Bills Power Tongs		10,417
Halliburton (acid)		
Bragg Crane		3,600
	Daily Cost	14,017
	Previous Cost	86,457
	Cost to Date	100,474

**Caithness Operating Compay LLC  
Wellfield Department  
Workover Report**

To: Bobbi Gollan, John Gastineau, Stu Johnson, Don Wells

From: Greg Davidson

Field	WELL	WORK	AFE No.	Report No	Date	Supervisor
Dixie Valley	28-33	Acid Stim	A1F3	6	November 9, 2001	G Davidson/S Johnson

**Present Operation**

well producing to plant

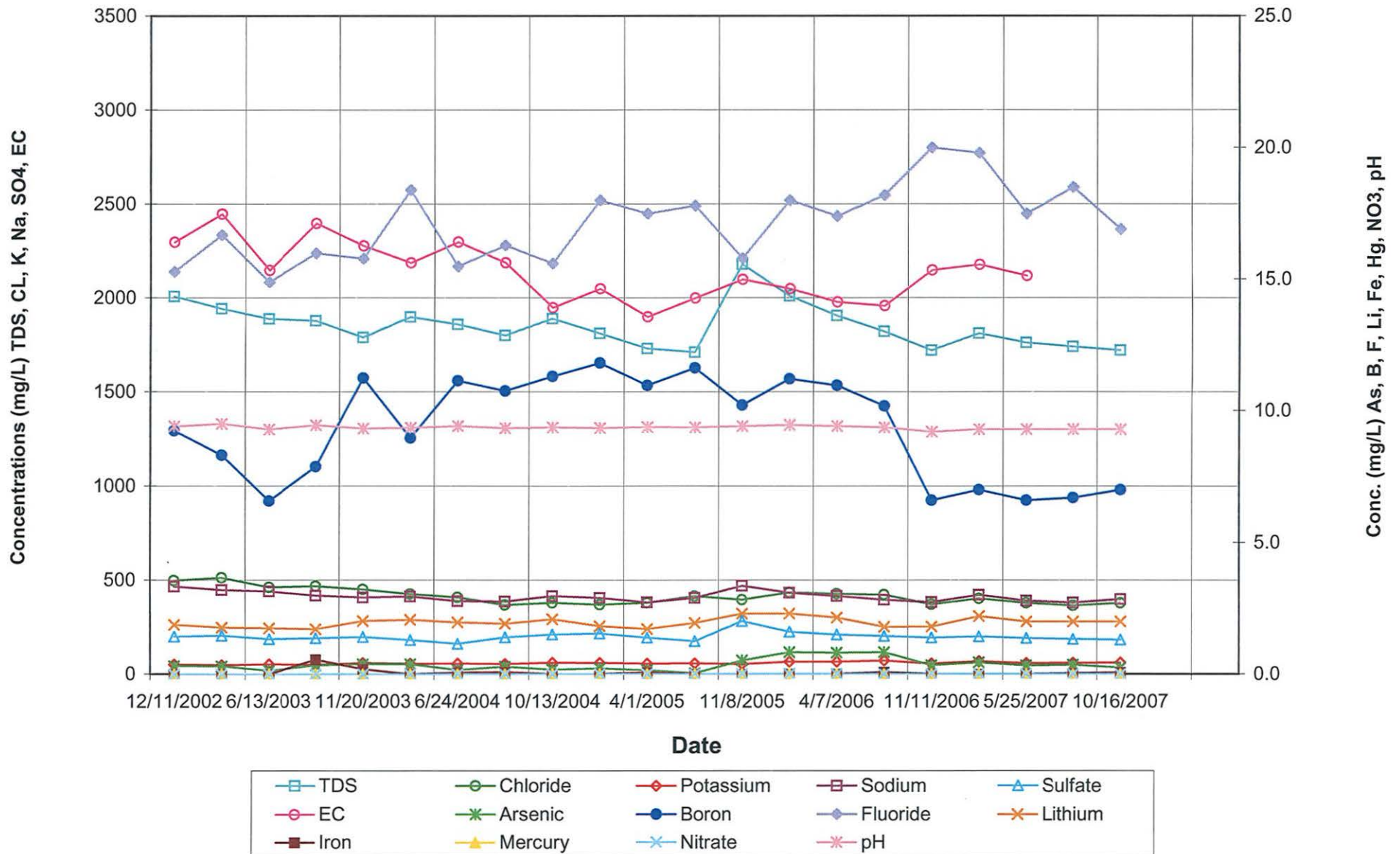
**Yest'day(Nov 8, 2001)**

Time	Operation Summary
0800	start N2 at 1000 scfm - increase to 1400 then to 2000 scfm
1110	well unloading water, spent acid with indication grey foam then to steam
1155	shut down N2 - total used (total job) 557 000 scf
	rig out Halliburton - leave well flowing to pond
1300	move in and rig up DV cap tubing unit and run 4507' 1/4" cap tubing
	start inhibitor
1500	perform productivity test - erroneous data - well continues to warm up
	tear out floor, water lines and related equipment - re-install permanent wellhead platform
	clean up location
	<p>AFE Estimated Cost: 114,008            Supplement (pull tubing) 14,000            Total AFE Budget 128,008            Actual Field Est.: 131,395</p>
	<b>Final Report</b>

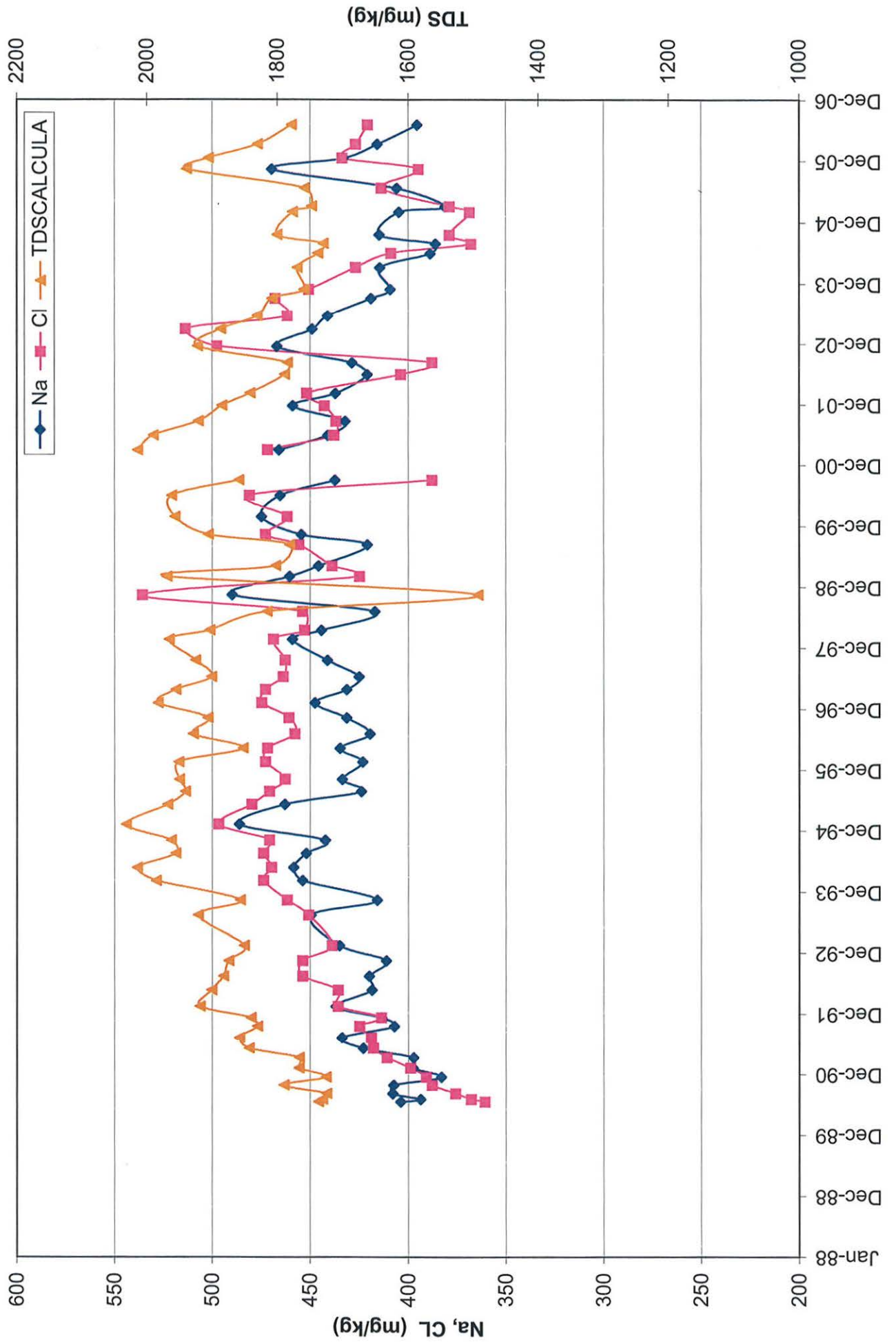
Service	Cost Summary	
	Hrs	Cost US\$
Company Supervision		1,000
Colorado TBC	pump	1,026
Colorado TBC	labor	1,951
Bills Power Tongs		
Halliburton (acid)		
Halliburton N2		25,444
	Vic Piping	1,500
	Daily Cost	30,921
	Previous Cost	100,474
	Cost to Date	131,395

# Caithness Dixie Valley, LLC

## Well 28-33 Water Analyses



Dixie Valley 28-33

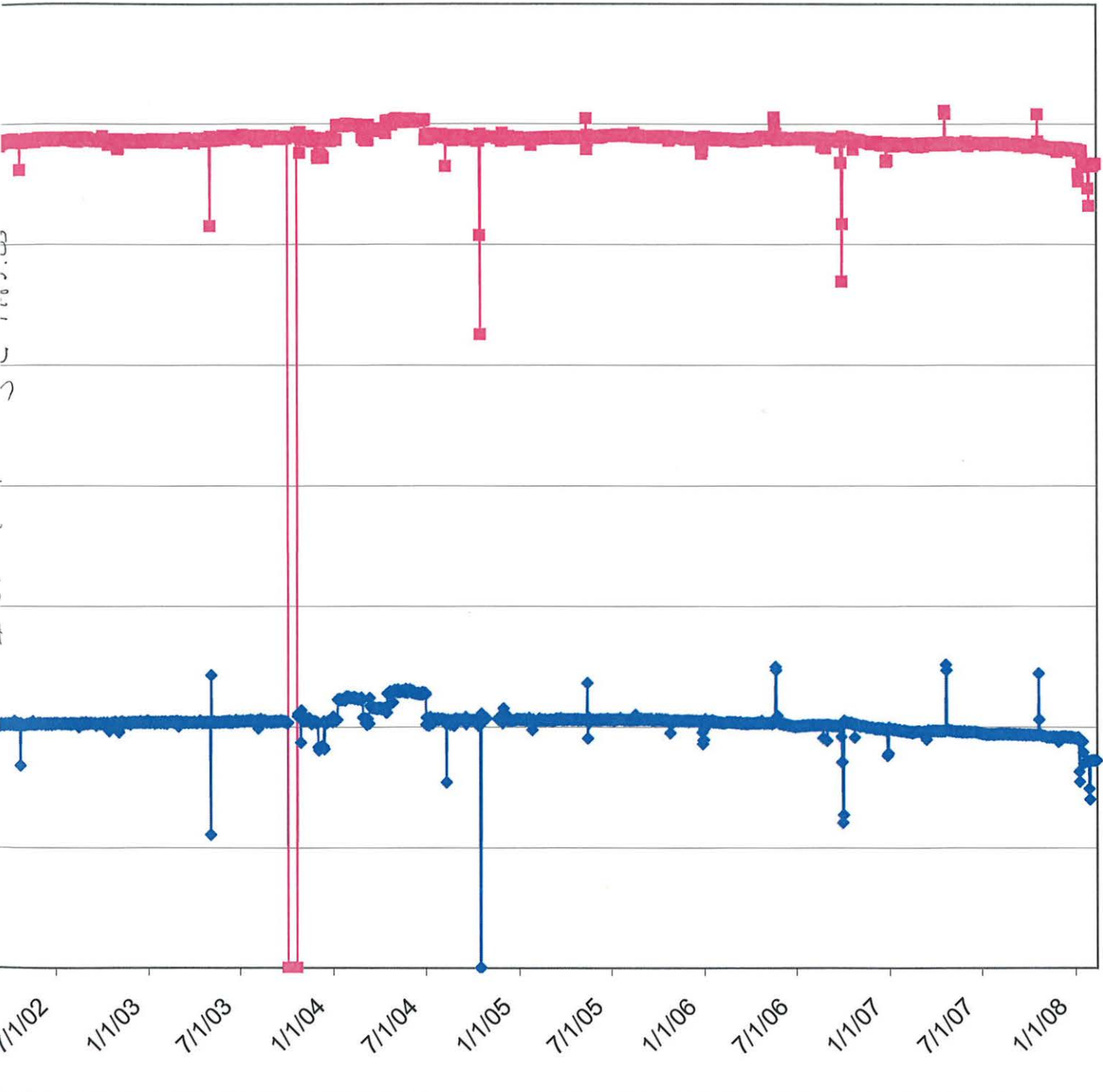


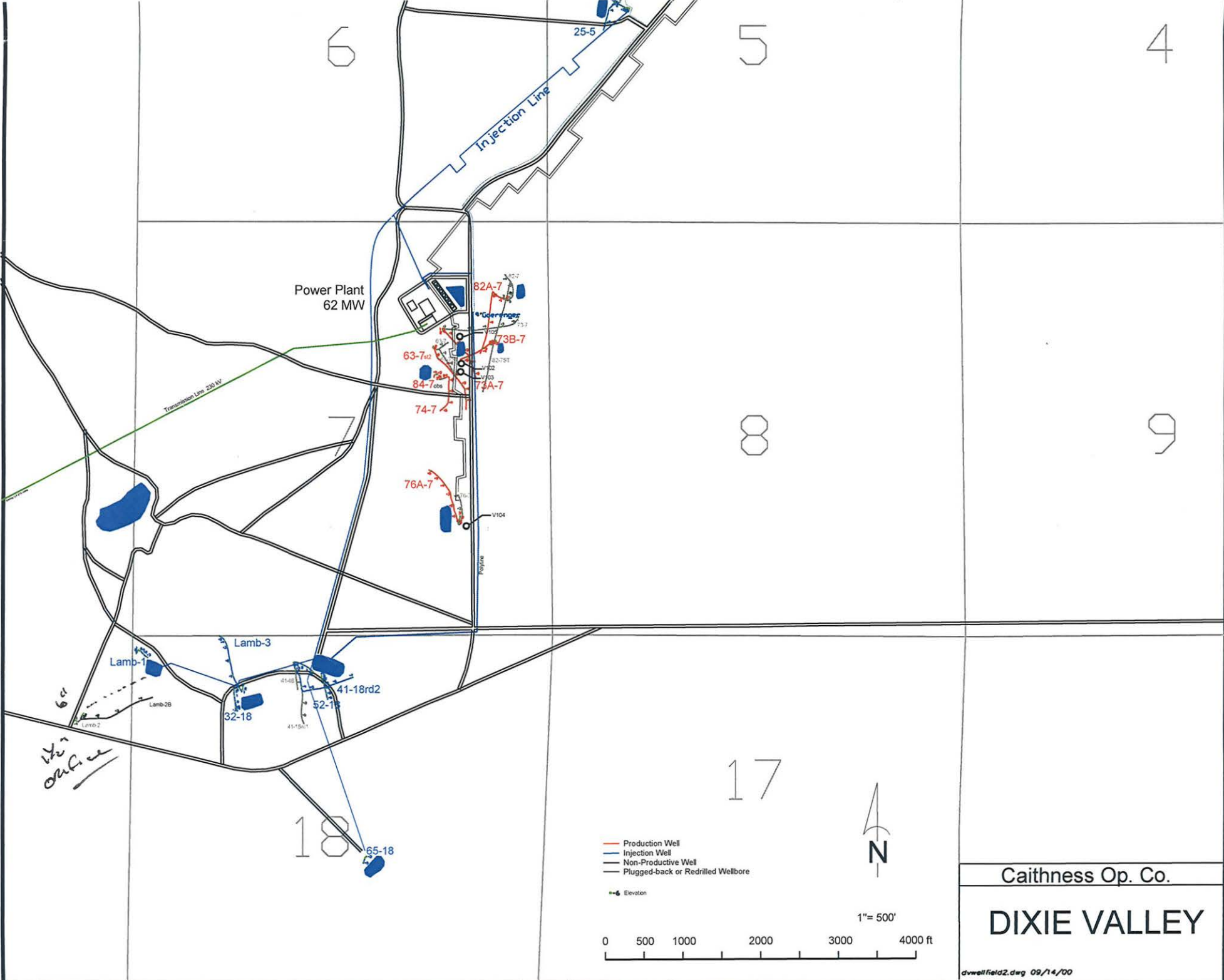




# ction History 1997-2008

TEMP2833





Power Plant  
62 MW

Transmission Line 230 KV

Injection Line

82A-7  
73B-7  
63-7  
84-7  
74-7  
76A-7  
84-7ob  
73A-7

Lamb-1

Lamb-2

Lamb-3

32-18

41-18rd2

52-18

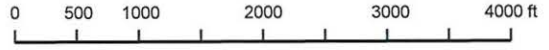
65-18

- Production Well
- Injection Well
- Non-Productive Well
- Plugged-back or Redrilled Wellbore

••• Elevation



1" = 500'



Caithness Op. Co.

**DIXIE VALLEY**

60'

the outline

28-33

spudded May 2, 1990  
completed July 4 TD = 9507

flowing temp ~ ~~472~~ <sup>472</sup> bottom

4-14-99 @ 4474 ft 470.7F  
11-02-96 @ 4259 472.2F

1993 Workover

scale 3/8" thick above 3120'  
clean below 3120' (no scale)

between  
3600 & 3800

Flash pt 3600 to 3800 ft  
Fluid entry 479°F

noted on log  
FLASH PT 10-9-93  
3660.4 - 3674.7  
@ 470.522°F  
to 470.573°F

Spinner shows main fracture between  
9133 and 9146

P @ 2618 psia @ 9330

in 1990 pressure was 2759 - 2766 psia

drilled - complete 4-July-90

TD<sub>mea</sub> = ~~1000~~ 9507

TD<sub>act</sub> = ~~9507~~ 9482

Flash  
pt 3200

prod 9390 - 9420 43%  
9450  
9370  
9350  
9290 - 9315 9100 - 9120

10/9/01

from request for acid  
cleanout

28-33 - strongest producer @ Dixie  
on line 7 years without scale cleanout  
longest of any well

Use N 9354 inhibitor (not fully effective)  
production declines 200 Kph since 1997

steam prod. 1.2 MW

1994 4/May/99 flow rate 956 Kph

lith log 0-5760 - alluvium ?  
5760-8650 - ~~albite~~ tuff + basalt  
8650-9050 - albite  
9050-9500 - Quartzite

8650 top of Jurassic

Flash pt at  
Injection pt

in 1990

output large approx 11 MW  
on stand alone basis

productivity 18 KPH/psi  
double open wells

measured T 477°F

	Western	4-27-09	1-31-02 4th quat 01	7-27-01	02-13-01	01-24-00
Na	414.5		459	441.06	448.3	454
K	56.26		.62.45	64.96	58.7	74.9
Ca	5.32		7.21	7.13	6.47	8.8
Mg	-		-	-		
Fe	-		.055	-		.1
Al	-		-	-		
SiO <sub>2</sub>	538		548	644.8	<del>587</del> 587	542
B	8.97		10	10.88	9.86	11.68
L	2.07		1.98	1.59	2.11	2.58
Total Alkalinity						
HCO <sub>3</sub>	156.90		167	188	199	153
CO <sub>3</sub>	39.20		21.5	31.2	23.9	28
Cl	427.00		443	438	463	473
F	18.4		16	16.9	15.8	15.2
SO <sub>4</sub>	182		234	242	238	221

+100%  
16.09%

	10-2-98	10-5-97	10-07-1996	12-12-95
N <sub>9</sub>	417.1	441.276	419.605	433.687
K	63.89	71.70	71.727	70.865
Ca	8.54	8.17	8.358	9.19
Mg	-	-	-	-
Fe	.02	.029	1.48	1.55
Al				
SiO <sub>2</sub>	533.5	609.05	622.857	628.565
B	10.65	10.202	10.523	10.456
Li	1.75			
Total Al <sub>2</sub> O <sub>3</sub>				
HCO <sub>3</sub>	140	148	126	132.
CO <sub>3</sub>	31	30.3	43	35.
Cl	454	463	458	463.
F	15	16.44	15	16.45
SO <sub>4</sub>	211	200	214	214

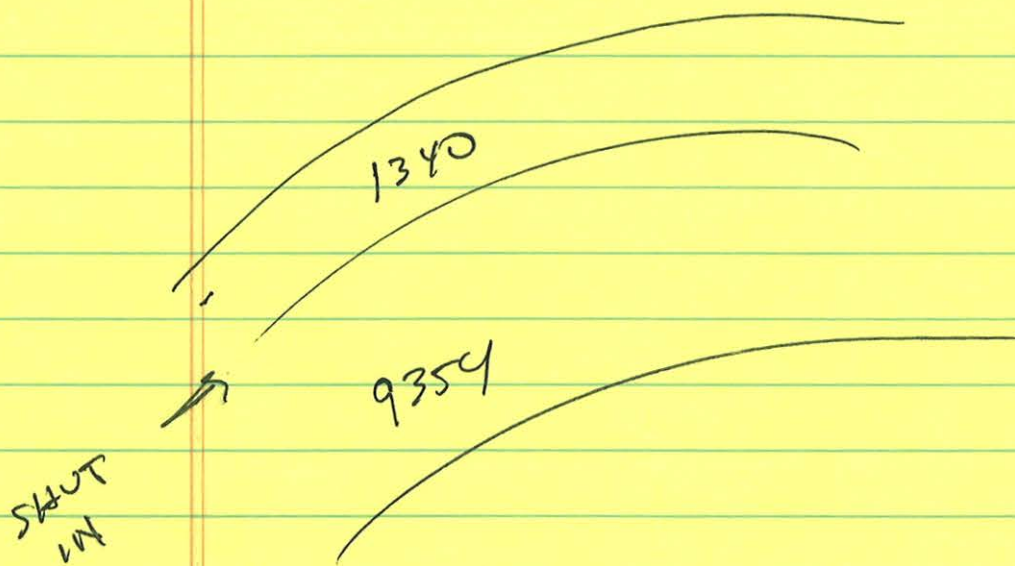


28-33

workover 1998- put in tubing  
pulled tubing 11/2001 pulled tubing

2 shut-ins or at near 01-  
last near end of 01

pass flushed with cold water during  
shut-ins - possible source of Mg



around 2000, all three wells  
28-33, 27-33, 27-33 were  
flushed, increased perme in 28-33