

May, 19, 1972

Memo: Thermal Gradient Survey in BORREGO VALLEY.

To: Mr. Fred Terry
From: G. Facca

- 1.- Mr. Dan McMillan instructed me (as a former consultant for Thermal Power Co.) to supply you the information on the gradient survey completed in the Thermal lease in Borrego Valley, California, around the Ocotillo wells.
- 2.- Please find enclosed:
 - a map showing the location of the wells
 - a copy of the temperature readings
 - gradient diagrams
- 3.- I have not lithological information and thus I can not offer a complete interpretation of the gradient survey. However, I believe that the general conclusions are reliable.
- 4.- Above 100 feet depth, the ground temperature is affected by the seasonal variations and the gradient is not reliable. I calculated the gradient between 100 feet and the bottom.
- 5.- You have a copy of my report on the gradient survey on the O'Neill property (Thermal) in Olene, Klamath Falls, Klamath County, Oregon. It discusses the general background of the geothermal gradient exploration method.
- 6.- You will note that:
 - a) one well, No. 7, has a gradient of 2.16 °C/10m, or seven times the "normal"
 - b) one well, No. 4, is below the "normal", and one, No. 3, is "normal"
 - c) all the other wells are over the "normal".

- 7.- Mr. Combs (U.C.Riverside) informed me that he made a temperature survey of the Ocotillo area and that the gradients are high.
- 8.- The area appears promising; however, additional temperature wells should be drilled. Moreover, other geophysical survey (gravimetry, perhaps some seismic profiles) should be discussed before locating an exploration well.

G. Facca

Giancarlo Facca

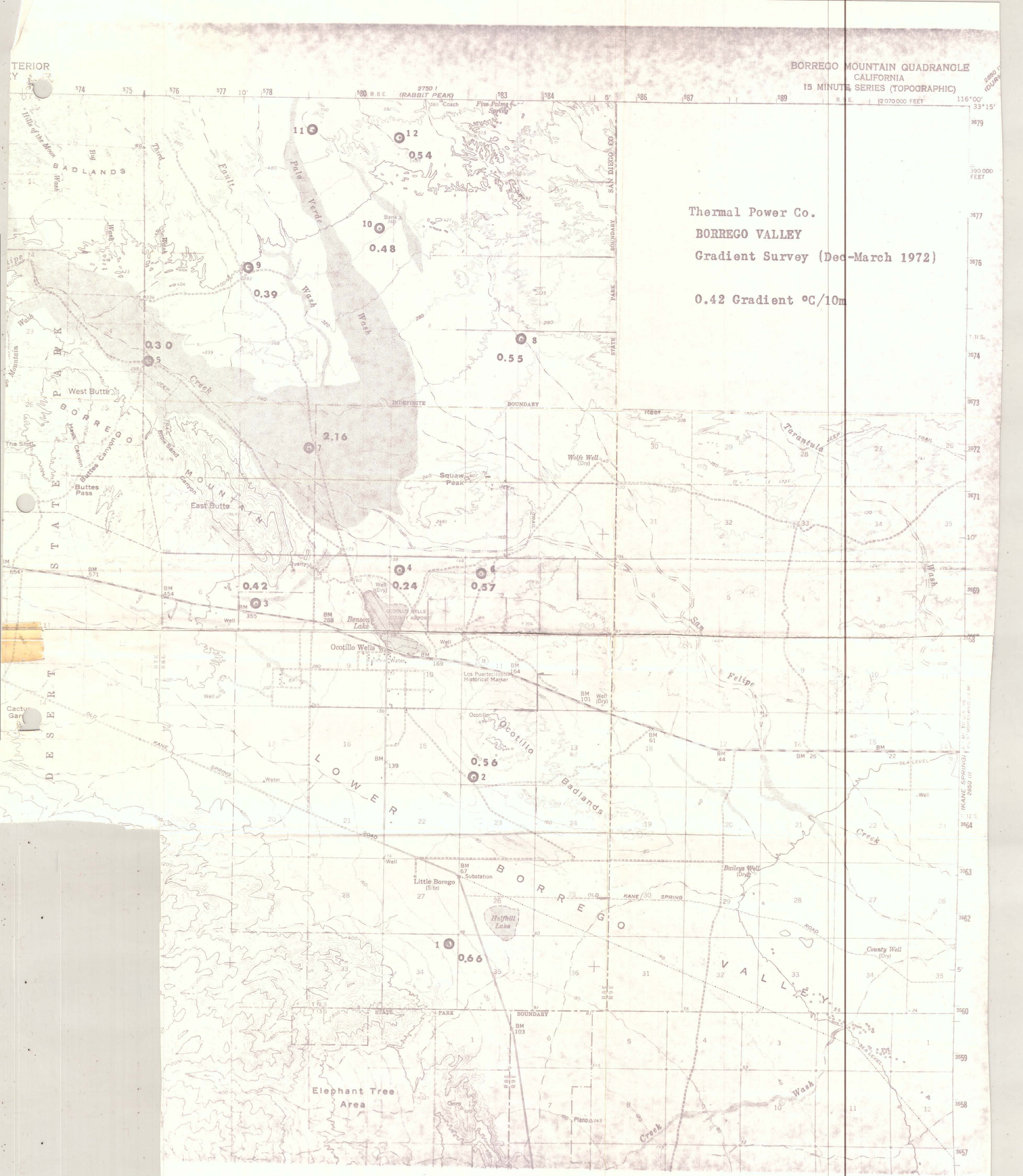
Thermal Power Co.

BORREGO VALLEY Geothermal Exploration Project

GRADIENT SURVEY

Well No.	Depth		Thickness m	Recorded temp. °C	Gradient, °C/10m
	Feet	Meters			
1	100	30.48	43.59	29.00	0.66
	243	74.07		31.87	
2	100	30.48	45.42	27.05	0.56
	249	75.90		29.60	
3	100	30.48	36.58	28.95	0.42
	220	67.06		30.48	
4	100	30.48	45.72	28.34	0.24
	250	76.20		29.46	
5	100	30.48	46.94	26.94	0.30
	254	77.42		28.41	
6	100	30.48	45.72	28.25	0.57
	250	76.20		30.86	
7	100	30.48	46.63	37.90	2.16
	253	77.11		48.00	
8	100	30.48	46.02	28.57	0.55
	251	76.50		31.09	
9	100	30.48	46.02	26.81	0.39
	251	76.50		28.60	
10	100	30.48	45.72	26.90	0.48
	250	76.20		29.11	
12	100	30.48	46.33	26.87	0.54
	252	76.81		29.33	

Thermal Power Co.
BORREGO VALLEY
Gradient Survey (Dec-March 1972)
0.42 Gradient °C/10m



TEMPERATURE READINGS

MAR 31 1972

March 31, 1972

Mr. Dan A. McMillan, President
Thermal Power Company
785 Market Street
San Francisco, Calif. 94103

Dear Mr. McMillan:

Enclosed are the thermal log data for 12 test holes in the Ocotillo Wells, California area. If you have any questions, I will be back in our office this coming Thursday or you can speak with my associate Joe Birman.

Yours very truly,

GEOHERMAL SURVEYS, INC.



J. B. Indreland

Encl:
Thermal logs for 12
wells

Date: MARCA 29, 1972

Project: COOTLAND WELLS

Probe No.: 381

Logged By:

Probe Correction: 0.17 ohms

Depth indicated when probe

SWL (ft.) 1 - 1/2 inch plastic pipe

returned to surface

(+ ft.) 0

WELL THERMAL LOG

Well Name/No.: 1

Location: T 12 S R 8 E SEC 34

NE COR. (PREVA)

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	1796.3	1726.6	24.09				
20	1815.1	1720.4	26.20				
40	1764.5	1639.8	27.49				
60	1726.0	1601.3	28.10				
80	1695.9	1570.7	28.61				
100	1672.9	1548.2	29.00	1672.8	1548.1	29.00	
120	1653.6	1528.9	29.34				
140	1631.9	1507.2	29.72				
160	1611.6	1486.9	30.10				
180	1589.6	1464.9	30.50				
200	1568.4	1443.7	30.90				
220	1544.6	1417.9	31.35				
240	1519.5	1394.8	31.84				
243	1517.8	1393.1	31.87				
BTH							

Date: MARCH 29, 1972

Project: CASTILLO WELLS

Probe No.: 701

Logged By: J. P. ...

Probe Correction: 127.7 ohms

Depth indicated when probe returned to surface

SWL (ft.) 2 1/2 inside plastic pipe

(± ft.) 0

WELL THERMAL LOG

Well Name/No.: 2

Location: T 11 S, R 8 E, SEC 2

SW COR. OF SW 1/4

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2020.5	1895.8	23.69				
20	1943.2	1815.5	24.76				
40	1844.1	1719.4	26.21				
60	1831.0	1706.3	26.42				
80	1811.4	1686.7	26.72				
100	1790.6	1665.9	27.05	1790.5	1665.8	27.05	
120	1766.2	1641.5	27.45				
140	1737.5	1607.8	27.96				
160	1702.1	1573.4	28.50				
180	1678.6	1553.9	28.91				
200	1663.8	1539.1	29.16	1663.8	1539.1	29.16	
220	1654.0	1530.2	29.32				
240	1644.6	1519.4	29.51				
249	1639.3	1514.6	29.60				
BTM							

Date: 11/24/73

Project: ...

Probe No.: 301

Logged By: A. B. ...

Probe Correction: 121.7 ohms

Depth indicated when probe

SWL (ft.) 3 inside plastic pipe

returned to surface (+ ft.) 0

WELL THERMAL LOG

Well Name/No.: 3

Location: T. 12 S., R. 8 E., S. 5 E. 5

150' N of Hwy 78,

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	1772.5	1847.6	29.34				
20	1850.4	1725.7	26.13				
40	1767.1	1642.4	27.43				
60	1735.1	1610.4	27.95				
80	1701.8	1577.1	28.50				
100	1676.4	1551.7	28.95	1676.5	1551.8	28.95	
120	1657.4	1532.7	29.29				
140	1641.6	1516.9	29.56				
160	1626.7	1502.0	29.81				
180	1612.7	1488.0	30.07				
200	1600.7	1476.0	30.29	1600.6	1475.9	30.30	
220	1590.8	1466.1	30.48				
BTM.							

Date: MAR 11 24 1973

Probe No.: 201

Probe Corrections: 1.27 ohms
SWL (ft.) 1/2 inside plastic pipe.

Project: WATER RESOURCES

Logged By: J. R. ...

Depth indicated when probe
returned to surface
(± ft.) 0

WELL THERMAL LOG

Well Name/No.: 7

Location: T/25 R. 86 S. 3

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2006.7	1882.0	23.87				
20	1831.7	1707.0	26.40				
40	1759.4	1634.7	27.55				
60	1736.6	1611.9	27.93				
80	1724.0	1599.3	28.14				
100	1712.2	1587.5	28.34	1712.1	1587.4	28.34	
120	1703.9	1579.2	28.47				
140	1694.0	1569.3	28.64				
160	1687.1	1562.4	28.78				
180	1681.0	1556.3	28.88				
200	1672.9	1548.2	29.00	1672.8	1548.1	29.00	
220	1664.0	1539.3	29.16				
240	1654.0	1529.3	29.34				
252	1647.2	1522.5	29.46				
Btm.							

Date: 11/22/73

Project: Oil Well

Probe No.: 151

Logged By: J. B. ...

Probe Correction: 124.7 ohms

Depth indicated when probe

SWL (ft.) 117 *twisted plastic pipe*

returned to surface

(+ ft.) 0

WELL THERMAL LOG

Well Name/No.: 5

Location: T118 R8E SEC 19
262 ft 773, success on well

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2010.8	1886.1	23.81				
20	1902.6	1777.9	25.35				
40	1843.0	1717.3	26.25				
60	1815.7	1690.7	26.66				
80	1805.7	1681.0	26.81				
100	1777.5	1672.8	26.94	1796.4	1671.7	26.96	
120	1782.6	1661.9	27.12				
140	1775.6	1650.9	27.30				
160	1764.7	1640.0	27.47				
180	1754.2	1628.5	27.65				
200	1743.0	1618.3	27.82	1743.1	1618.4	27.82	
220	1732.7	1606.0	28.01				
240	1716.1	1591.4	28.27				
254	1707.0	1582.3	28.41				
Stop							

Date: 10/20/77
 Probe No.: 251
 Probe Correction: 125.7 ohms
 SWL (ft.) 1/2 inside plastic pipe

Project: 100 ft. well
 Logged By: J. R. [unclear]
 Depth indicated when probe
 returned to surface
 (+ ft.) 0

WELL THERMAL LOG

Well Name/No.: 6

Location: T. 125. R. 5E. S. 22. NE cor. of 1/4

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2033.6	1908.9	23.51				
20	1834.6	1709.9	26.37				
40	1779.5	1654.8	27.23				
60	1755.9	1631.2	27.60				
80	1732.1	1612.4	27.91				
100	1717.1	1592.4	28.25	1717.2	1592.5	28.25	
120	1693.2	1568.5	28.66				
140	1669.6	1544.9	29.06				
160	1650.5	1526.1	29.39				
180	1633.6	1508.9	29.70				
200	1612.1	1489.4	30.05				
220	1595.3	1470.6	30.40				
240	1578.0	1453.3	30.71				
250	1570.1	1445.4	30.86				
Btm							

Date: 7/23/77

Project: ...

Probe No.: ...

Logged By: A. H. ...

Probe Correction: 124.7 ohms

Depth indicated when probe returned to surface (+ ft.) 0

SWL (ft.) 18.5 inside plastic pipe

WELL THERMAL LOG

Well Name/No.: 7

Location: T.H.S. R.S.L. SEC. 09

FARRE 19.50000 200' 11' 00" 1710000

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	1985.5	1860.8	24.16				
20	1759.7	1635.0	27.55				
40	1546.1	1421.4	31.32				
60	1412.3	1287.6	34.05				
80	1323.1	1198.4	36.09				
100	1247.8	1123.1	37.90	1250.7	1125.5	37.86	
120	1209.1	1079.4	39.09				
140	1163.1	1038.4	40.24				
160	1115.0	990.3	41.64				
180	1068.0	943.3	43.09				
200	1022.6	897.9	44.59	1023.5	898.8	44.53	
220	982.7	858.0	45.91				
240	946.8	822.1	47.24				
253	927.4	802.7	48.00				
Btm.							

Date: 10/29/78

Project: CCP Well 66113

Probe No.: 251

Logged By: A. R. ...

Probe Correction: 124.7 ohms
SWL (ft.) To ground level
in plastic pipe

Depth indicated when probe
returned to surface
(± ft.) 0

WELL THERMAL LOG

Well Name/No.: 5

Location: T 4 S. R. 8 E. SEC. 23

NEAR NE COR. OF NE 1/4

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2062.9	1938.2	23.11				
20	1893.6	1769.1	25.48				
40	1776.2	1651.5	27.28				
60	1743.3	1618.6	27.81				
80	1716.3	1591.6	28.27				
100	1695.0	1573.3	28.57	1698.1	1573.4	28.57	
120	1680.4	1555.7	28.89				
140	1659.9	1535.2	29.23				
160	1643.3	1518.6	29.53				
180	1626.6	1501.9	29.82				
200	1605.7	1481.0	30.20	1605.7	1481.0	30.20	
220	1580.3	1458.6	30.61				
240	1565.9	1441.2	30.94				
251	1557.7	1433.0	31.09				
Btm							

Date: APR 28 1972

Probe No.: 2

Probe Correction: 127.7 ohms

SWL (ft.) 1 inch plastic pipe

Project: ...

Logged By: ...

Depth indicated when probe returned to surface (+ ft.) 0

WELL THERMAL LOG

Well Name/No.: 9

Location: T 4 S R 4 E Sec. 17

at 33°12' 200 ft from East 1/4 Sec 17 Monument

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2050.8	1956.1	22.88				
20	1948.5	1823.8	24.68				
40	1842.0	1717.3	26.25				
60	1831.9	1707.2	26.40				
80	1818.1	1693.4	26.62				
100	1800.1	1681.4	26.81	1806.2	1681.5	26.81	
120	1792.5	1667.8	27.02				
140	1780.0	1655.3	27.21				
160	1766.1	1641.4	27.45				
180	1752.7	1628.0	27.66				
200	1736.0	1611.3	27.94	1736.2	1612.5	27.92	
220	1720.2	1595.5	28.20				
240	1706.7	1582.0	28.43				
251	1694.6	1571.9	28.60				
Bottom							

Date: April 12, 1972
 Probe No.: 517
 Probe Correction: 101.7 ohms
 SWL (ft.) 70 ground level inside plastic pipe

Project: ...
 Logged By: ...
 Depth indicated when probe returned to surface (+ ft.) +1

WELL THERMAL LOG

Well Name/No.: 10

Location: T.H.S. R.R. ROAD, SE 1/4 2750', 87°12' from back benchmark

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2121.3	2006.6	22.23				
20	1952.1	1822.4	24.63				
40	1851.1	1726.4	26.11				
60	1830.6	1705.9	26.43				
80	1813.6	1688.9	26.70				
100	1796.3	1671.6	26.96	1795.2	1670.5	26.98	
120	1777.7	1653.0	27.25				
140	1763.5	1638.8	27.49				
160	1741.9	1617.2	27.84				
180	1727.1	1602.4	28.09				
200	1712.2	1587.5	28.34	1712.2	1587.5	28.34	
220	1693.1	1567.4	28.69				
240	1674.4	1549.7	28.99				
250 Btm.	1666.8	1542.1	29.11				

Probe No.: 207
 Probe Correction: 175.7 ohms
 SWL (ft.) 4.5 *in. plastic pipe*

Project: U.S. Geological Survey
 Logged By: A. B. ...
 Depth indicated when probe returned to surface (+ ft.) 0

WELL THERMAL LOG

Well Name/No.: //

Location: T. 11 S., R. 2 E., S. 10 N., SE corner of No. 1/4

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2073.9	1969.2	22.70				
20	1881.5	1756.8	25.66				
40	1843.7	1719.0	26.23				
60	1823.0	1698.3	26.55				
80	1798.7	1674.0	26.93				
94	1786.9	1662.2	27.12				
Hole blocked at 94 ft. depth							

Date: April 23 1972
 Probe No.: 387
 Probe Correction: 131.7 ohms
 SWL (ft.) inside plastic pipe

Project: Geophysical
 Logged By: J.H. Miller
 Depth indicated when probe
 returned to surface
 (+ ft.) 0

WELL THERMAL LOG

Well Name/No.: 18
 Location: T4S, R8E, S3C, 3
2700' from creek BM at 230'

Depth (ft.)	Reading (ohms)	Corrected Reading	Temp. °C.	Withdrawal Check			Remarks
				Reading (ohms)	Corrected Reading	Temp. °C.	
10	2009.6	1889.9	23.83				
20	1889.6	1769.9	25.54				
40	1861.6	1736.9	25.96				
60	1840.0	1715.3	26.29				
80	1820.7	1696.0	26.58				
100	1801.9	1677.2	26.87	1801.6	1676.9	26.89	
120	1782.0	1657.3	27.19				
140	1762.6	1637.9	27.51				
160	1743.9	1619.2	27.80				
180	1724.0	1599.3	28.14				
200	1705.1	1580.4	28.45				
220	1684.7	1560.0	28.80	1708.3	1583.6	28.40	
240	1665.0	1540.3	29.14				
252	1659.5	1529.8	29.33				
BTM.							

GRADIENT DIAGRAMS

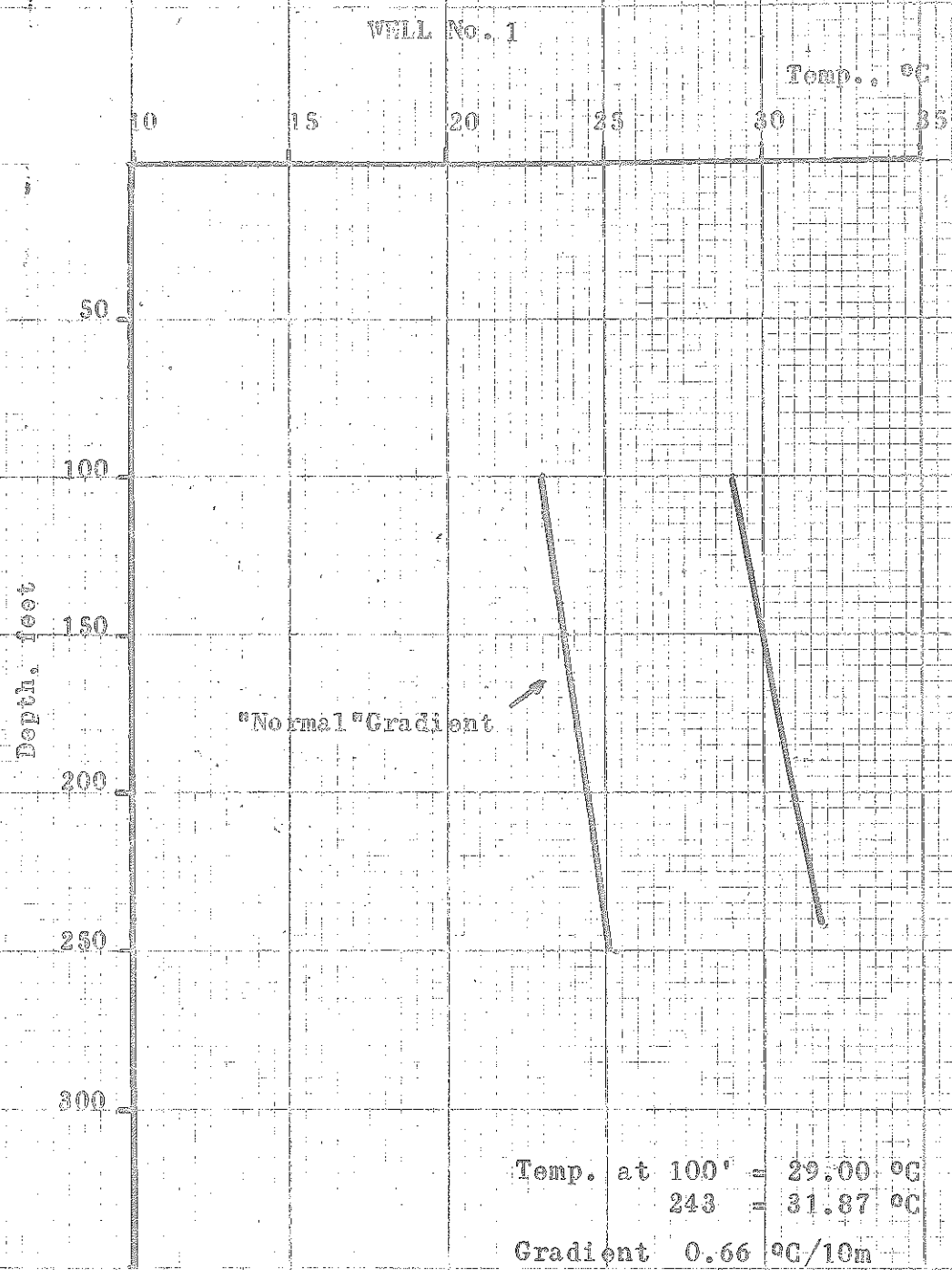
Thermal Power Co.

BOHNER VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: A. Hamill



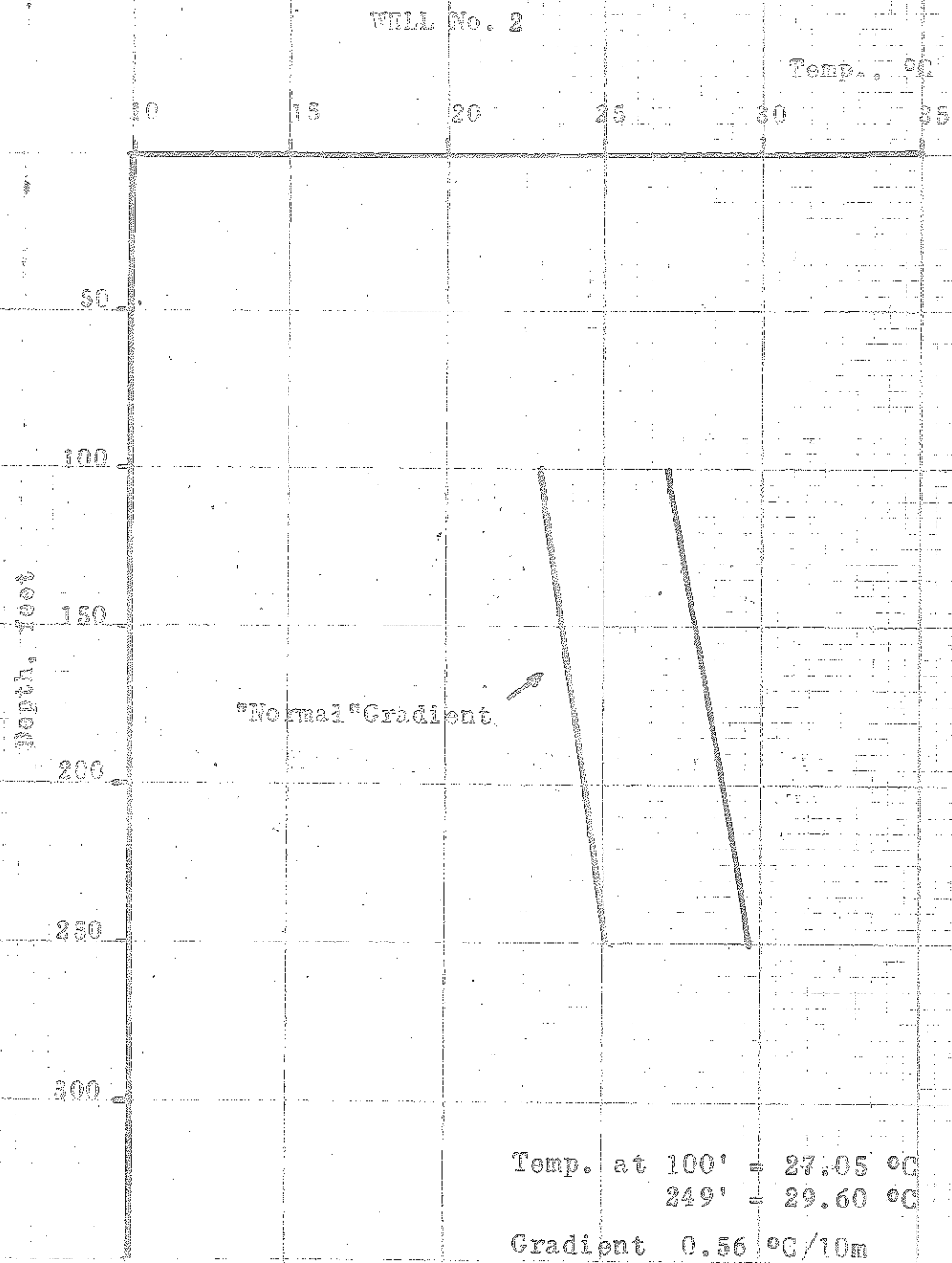
Florida Power Co.

LOHRAW VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operatoria, Emilia



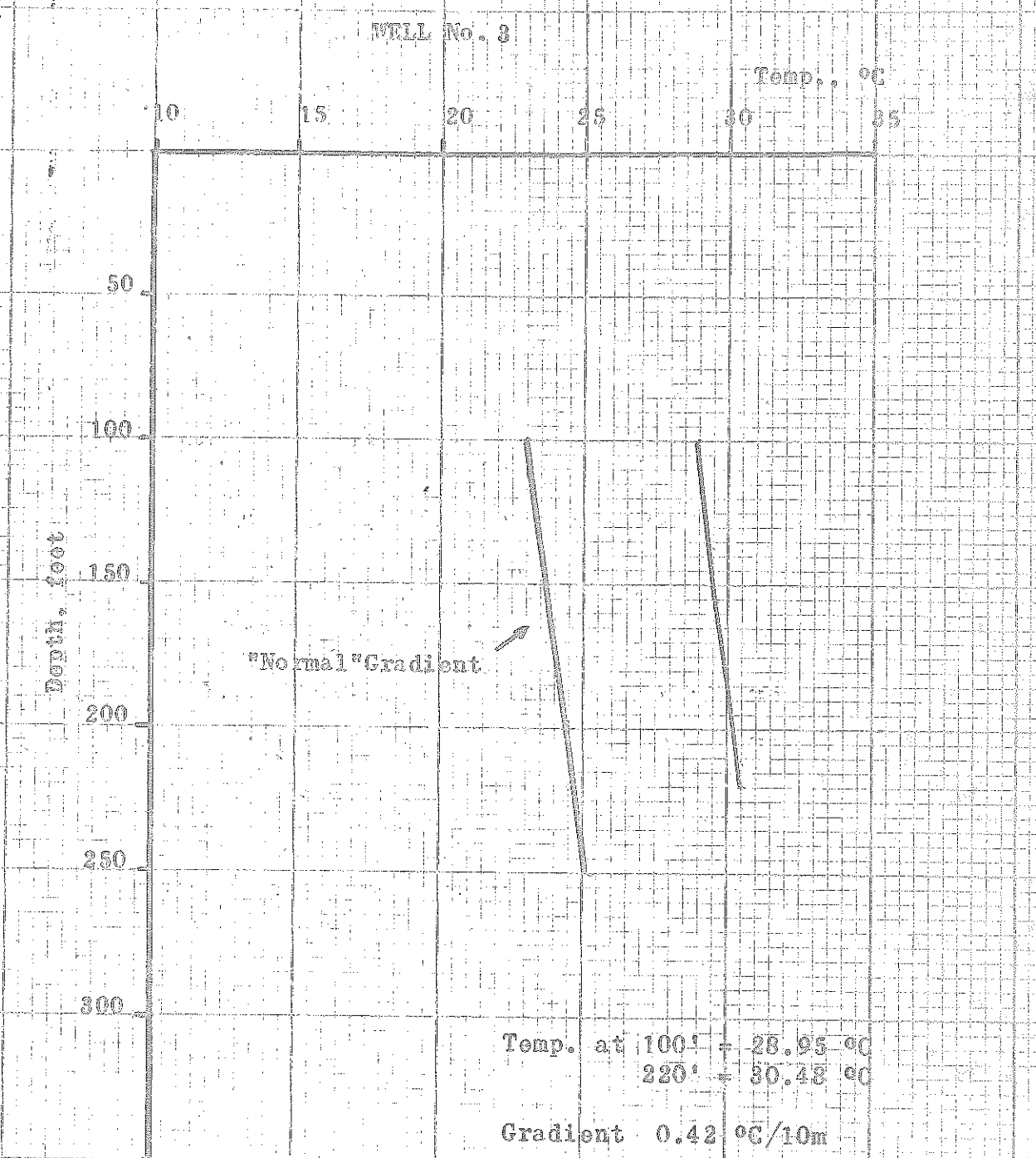
Thermal Power Co.

BORRERO VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: J. Romilla



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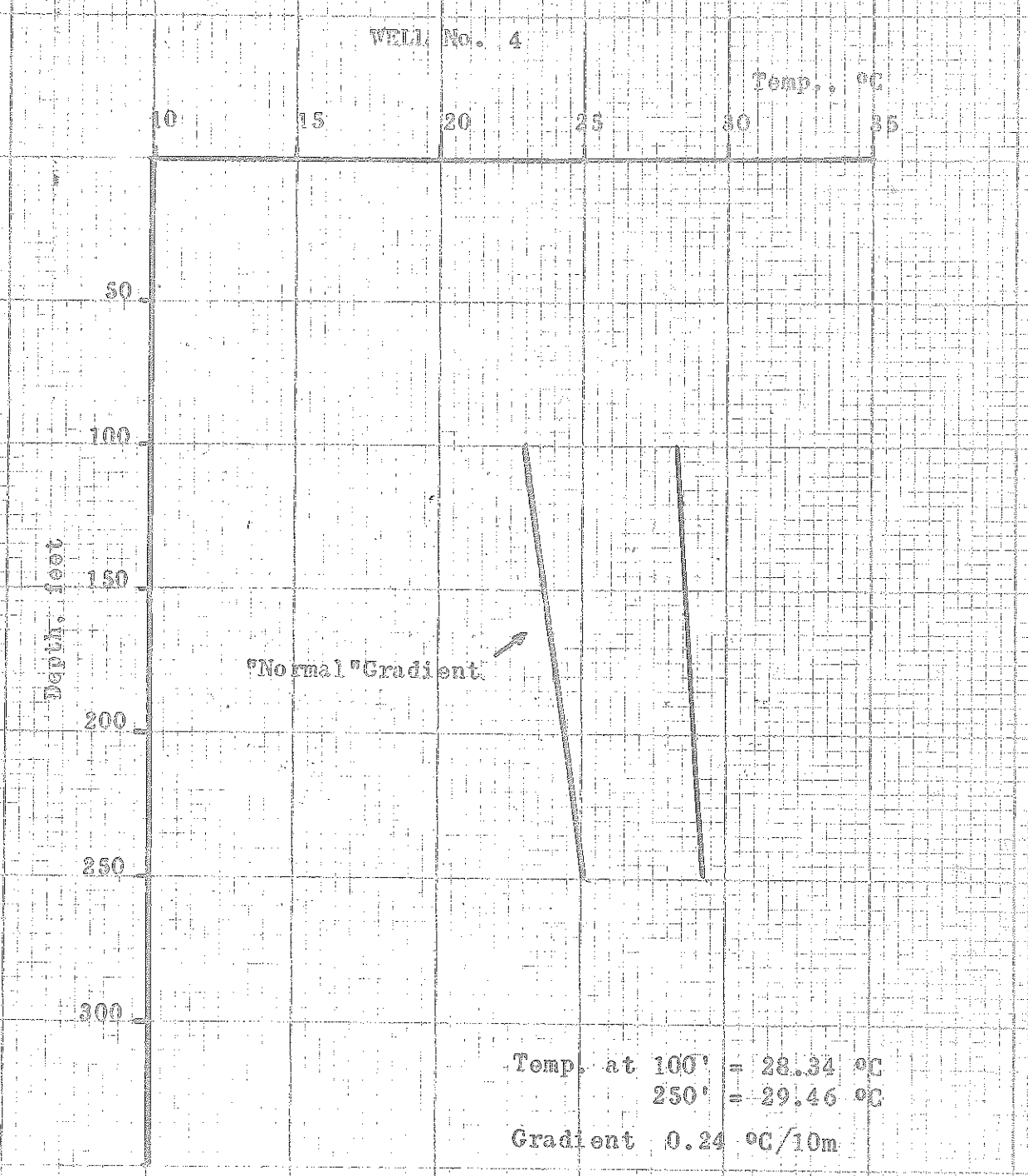
Thermal Power Co.

BOERTEG VALLEY Geothermal Exploration Project.

Gradient Survey (Drilling Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: A. Esquilla



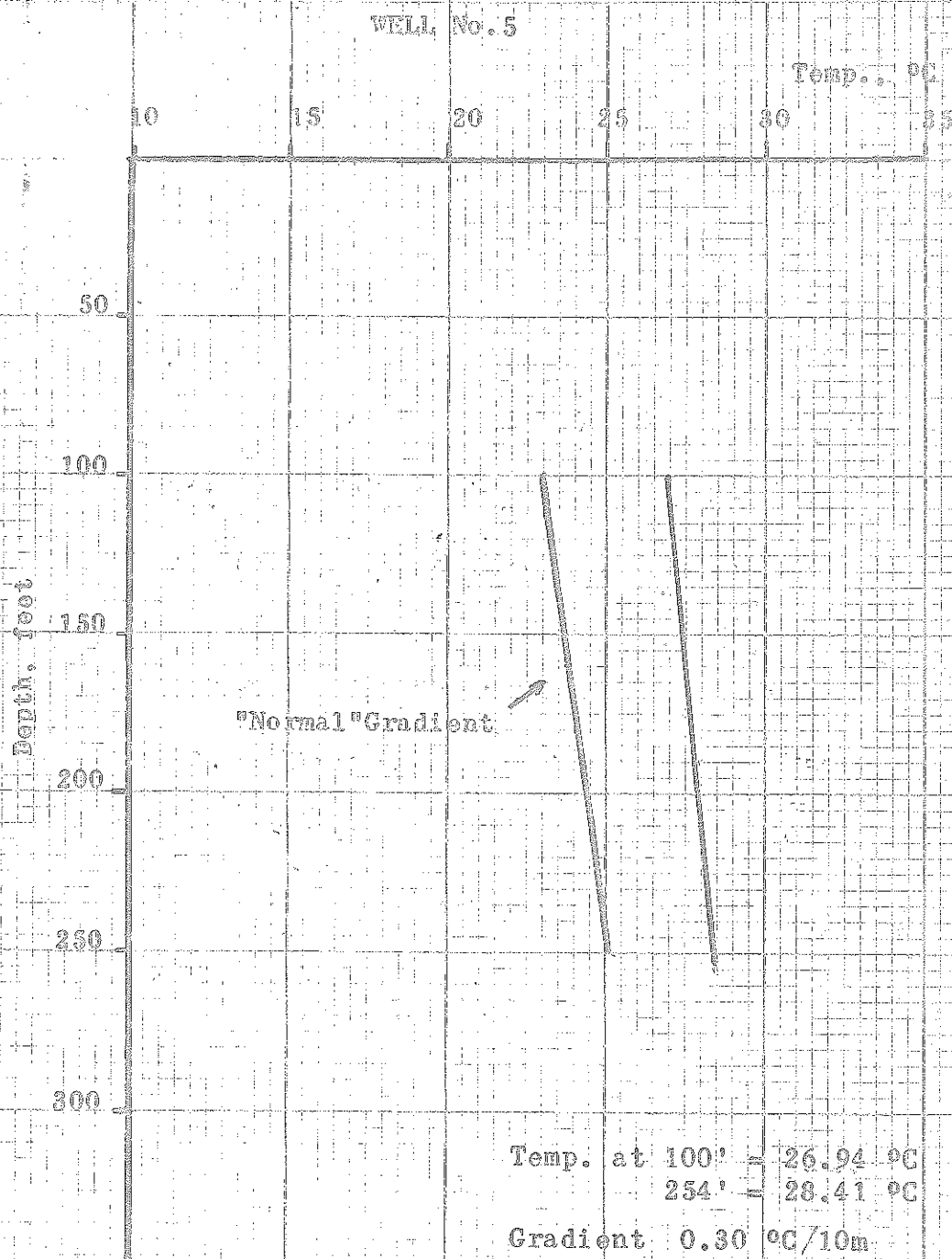
Thermal Power Co.

BORRERO VALLEY Geothermal Exploration Project

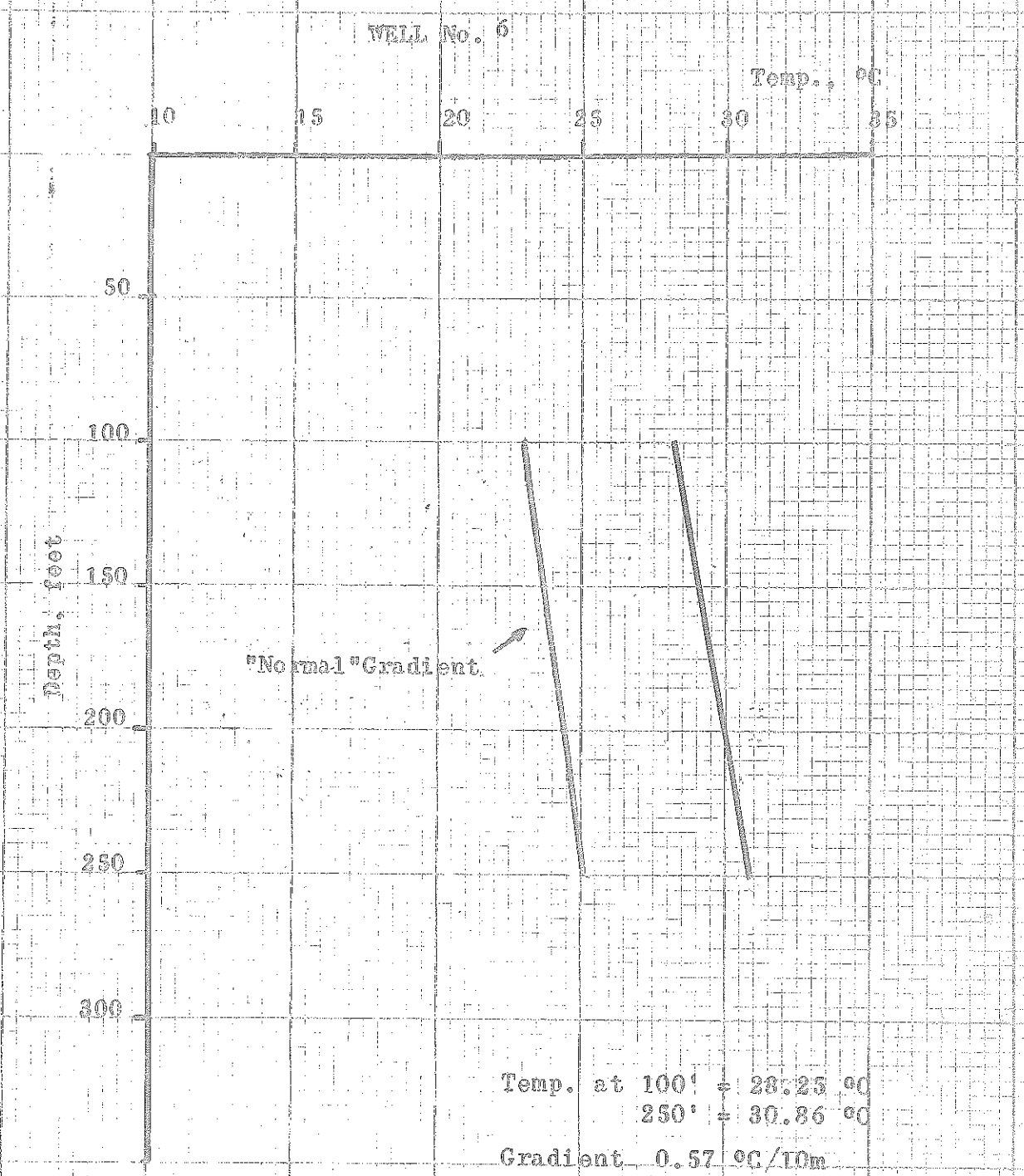
Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: A. Esilla



Thermal Power Co.
 BONNECO VALLEY Geothermal Exploration Project
 Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)
 Driller: United Geophysical Co.
 Temperature/measurement: Geothermal Survey, Inc. - Operator: A. Esquilla



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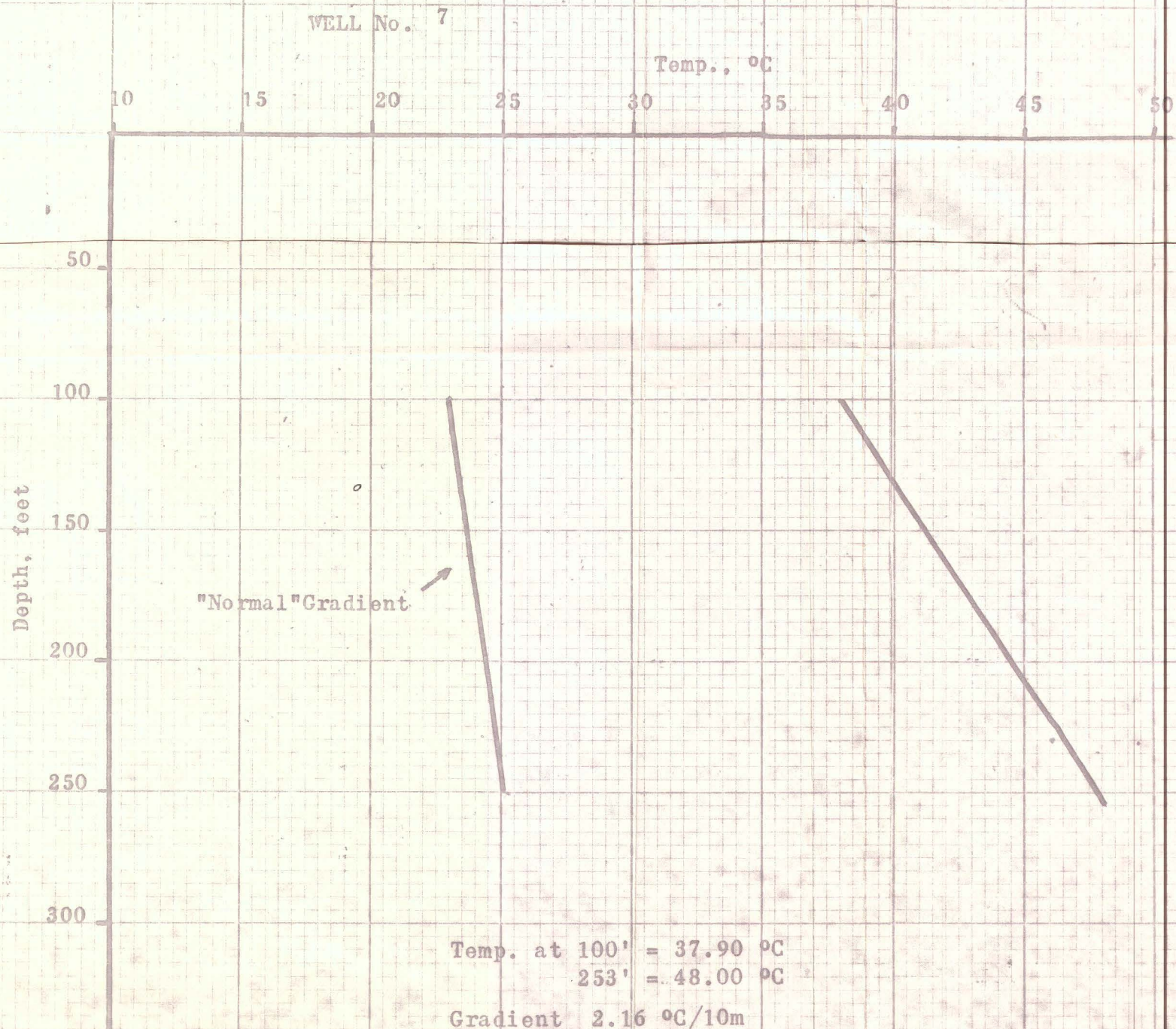
Thermal Power Co.

BORREGO VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: A. Esmilla



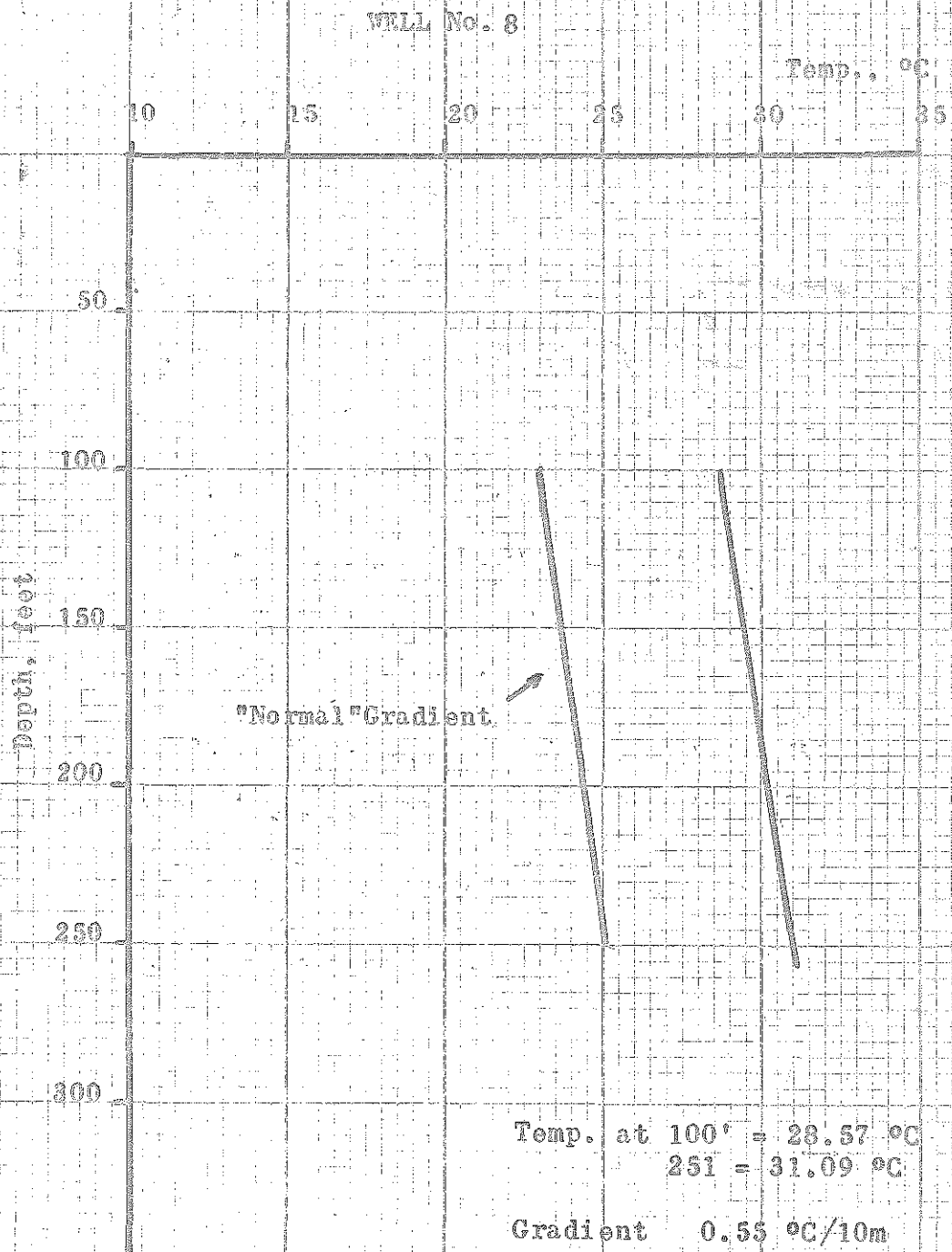
Thermal Power Co.

BORRECO VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: A. Esquilla



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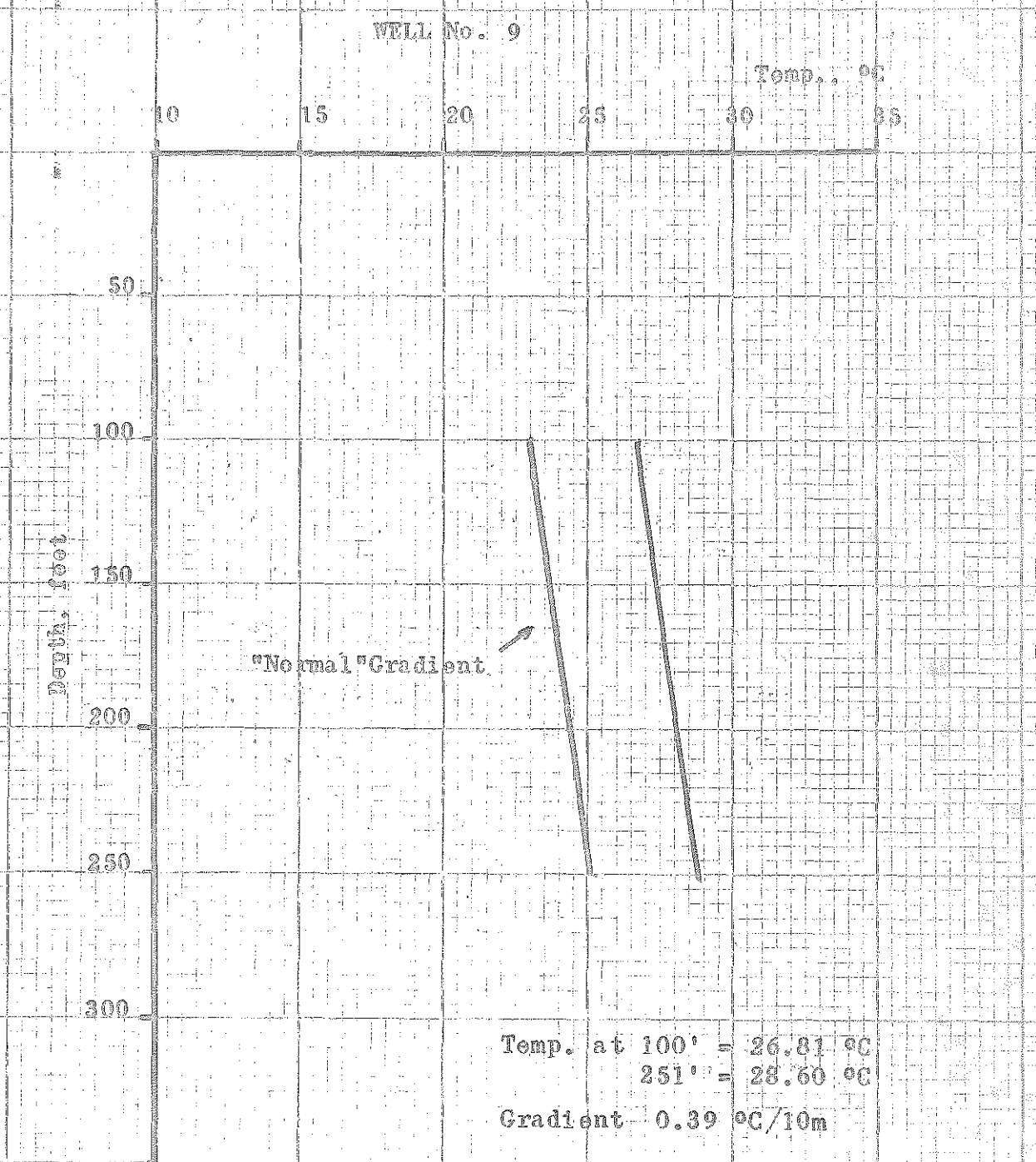
Thermal Power Co.

BORRERO VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: A. Esquilla



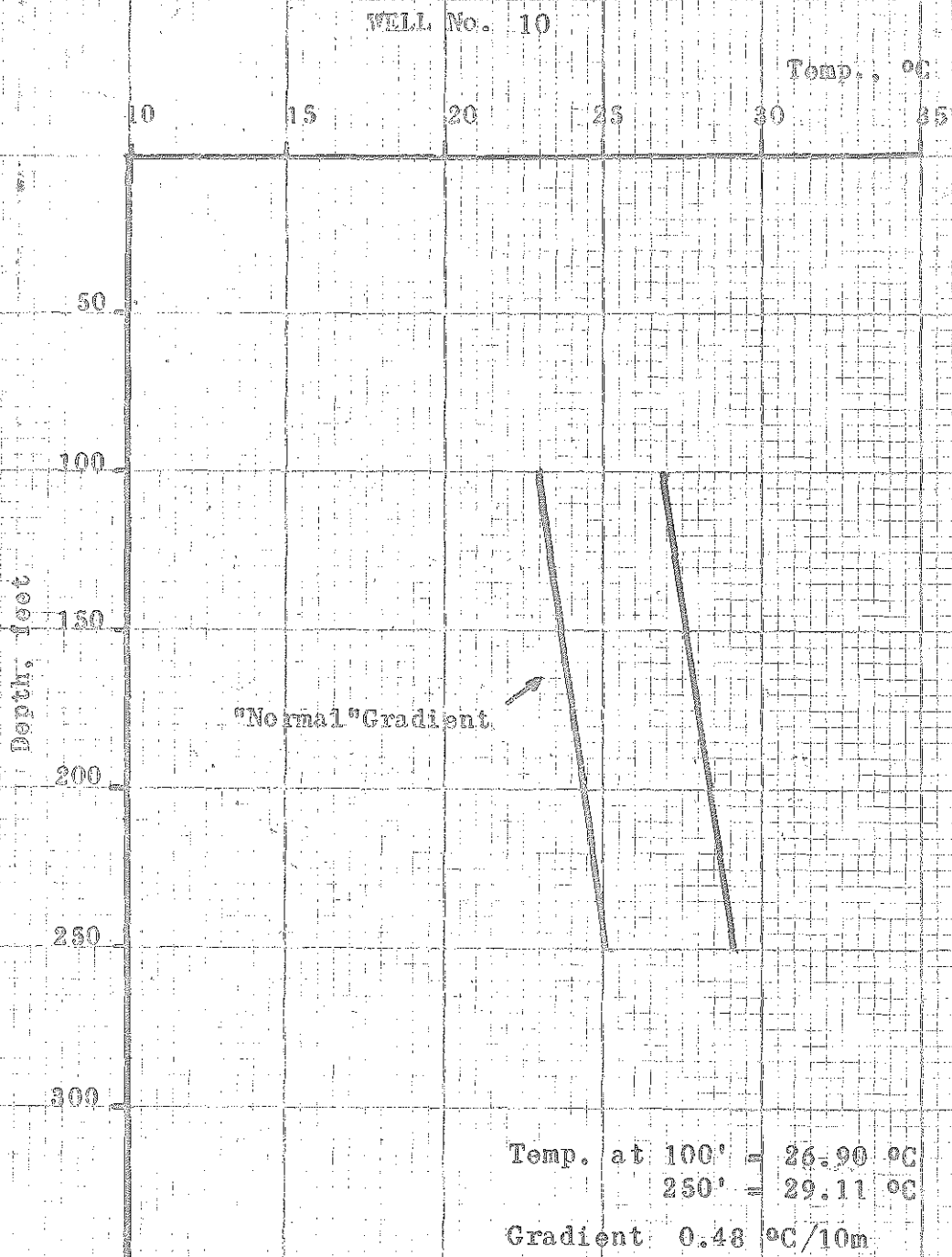
Thermal Power Co.

BORRERO VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: A. Eshilla



Thermal Power Co.

BORNEO VALLEY Geothermal Exploration Project

Gradient Survey (Drilling: Dec. 1971; Temp. measured March 1972)

Driller: United Geophysical Co.

Temperature measurement: Geothermal Survey, Inc. - Operator: H. Esquilla

