

# Directional Survey

With Listing

Using the following logs: FMS/FMI

A. Mark of Schlumberger

COMPANY:	NORTHWEST NATURAL GAS
WELL:	IW-24BH-23-65
FIELD:	MIST
COUNTY:	COLUMBIA
STATE:	OREGON
COUNTRY:	
Date Logged:	20-JUN-2000
Date Processed:	27-JUN-2000
Well Location:	976.5' NORTH, 1256.3' EAST FROM THE SW SECTION CORNOR
Elevations:	KB: DF: 923ft GL: 905ft
API Number:	36-009-00351 Job Number:

FOLD HERE The well name, location and borehole/reference data were furnished by the customer.

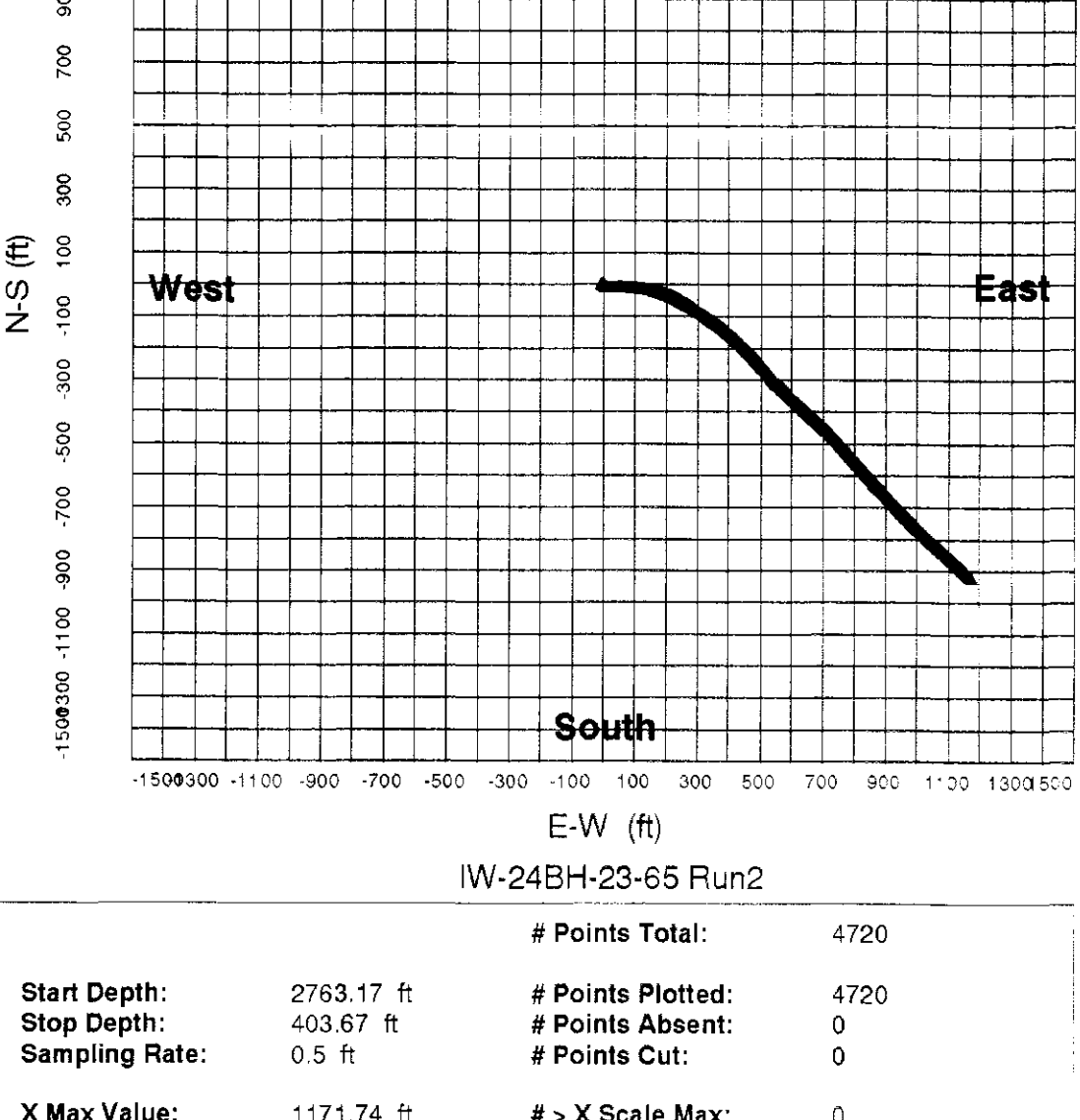
A. Interpretations are opinions based on references from electric or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation and we shall not be responsible in the case of gross or willful negligence on our part or responsible for any loss, costs, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

Field Recording:	Location: SACRAMENTO	Software Version: 9C1-303	Engineer: M KHAN
Office Recording:	ICS Center: Bakersfield ICS	Baseline:	Log Analyst: T Quinlan

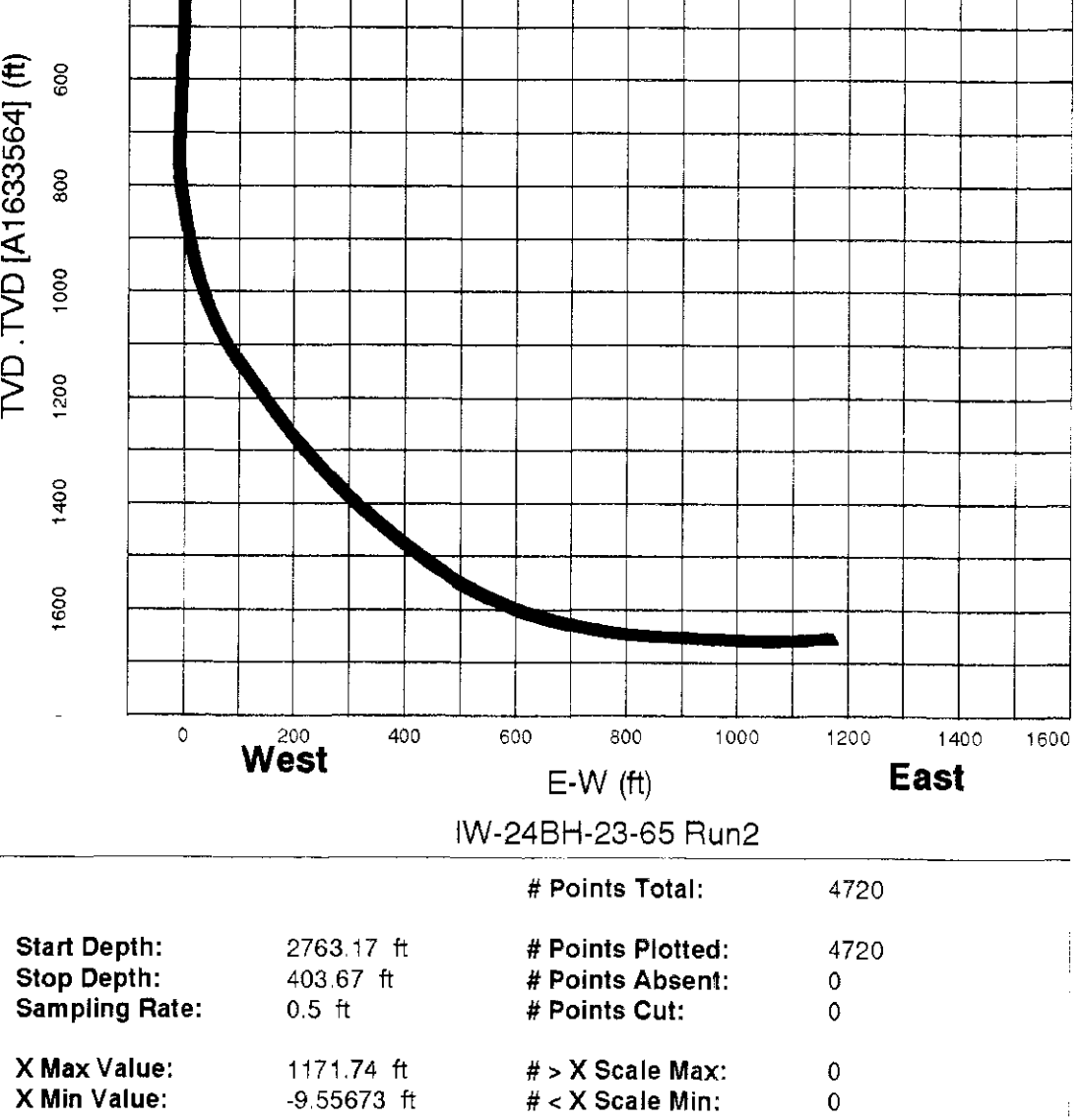
Mud and Borehole Measurements:	Rm @ Measured Temperature: 0.266ohm.m @ 58degF	BHT: 212degF	Bitsize: 7.875in.
	Rmf @ Measured Temperature: 0.281ohm.m @ 19degF	Type Fluid: n/a	XCD KCL
	Rmc @ Measured Temperature: 0.1454ohm.m @ 18degF	Mud Density: 8.6lb/mga.	

Remarks:  
MAXIMUM HOLE DEVIATION: 92 DEG  
LOGGED WITH TLC EQUIPMENT

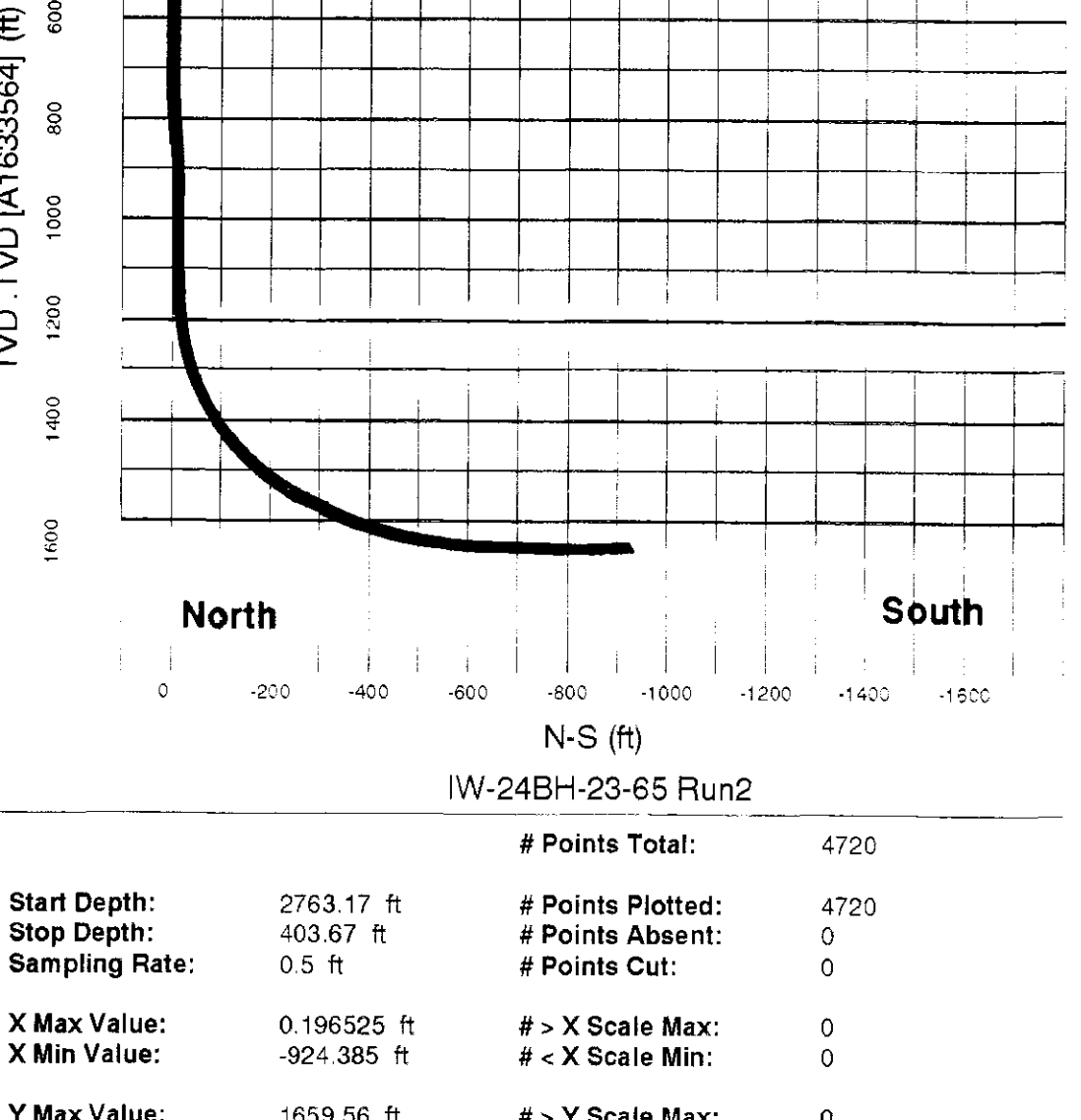
1561491



IW-24BH-23-65 Run2		# Points Total:	4720
Start Depth:	2763.17 ft	# Points Plotted:	4720
Stop Depth:	403.67 ft	# Points Absent:	0
Sampling Rate:	0.5 ft	# Points Cut:	0
X Max Value:	1171.74 ft	# > X Scale Max:	0
X Min Value:	-9.55673 ft	# < X Scale Min:	0
Y Max Value:	0.96525 ft	# > Y Scale Max:	0
Y Min Value:	-924.385 ft	# < Y Scale Min:	0



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X Min Value:	-9.55673 ft	# < X Scale Min:	0
Y Max Value:	1659.56 ft	# > Y Scale Max:	0
Y Min Value:	403.667 ft	# < Y Scale Min:	0



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## Northwest Natural Gas

IW-24BH-23-65  
Mist  
Columbia Oregon  
06/14/2000

Primary Index	TVD	DY (N-S)	DX (E-W)	AZIM	DEVI
ft	ft	ft	ft	deg	deg
410.0000	409.85001	0.17831	0.26658	128.83437	0.73730
430.0000	429.84167	-0.00246	-0.17786	22.55305	1.91992
450.0000	449.83334	-0.29889	-0.68020	252.10864	1.74101
470.0000	469.81668	-0.45134	-1.37501	269.10104	1.76693
490.0000	489.80002	-0.62996	-1.93159	242.25682	1.91043
510.0000	509.78336	-0.80378	-2.58964	264.49774	1.91658
530.0000	529.76670	-0.92057	-3.23531	255.40306	1.89573
550.0000	549.75004	-0.99228	-3.87227	275.31686	1.58752
570.0000	569.73338	-0.87001	-4.50923	282.85229	1.42293
590.0000	589.71672	-0.85235	-5.14619	285.40306	1.51888
610.0000	609.70006	-0.82195	-5.78315	273.43716	1.82036
630.0000	629.68340	-0.79008	-6.42011	272.86044	1.98055
650.0000	649.66674	-0.76507	-7.05703	271.05988	2.13419
670.0000	669.65008	-0.73046	-7.69395	274.42343	1.96807
690.0000	689.63342	-0.69756	-8.33087	270.48318	2.05881
710.0000	709.61676	-0.73530	-8.96779	264.86172	2.12192
730.0000	729.60010	-0.89444	-9.60471	201.07832	0.96944
750.0000	749.58344	-1.42796	-9.33032	142.86557	2.61397
770.0000	769.56678	-2.38957	-9.05593	133.74933	4.94606
790.0000	789.55012	-3.71284	-8.78154	128.69191	6.78440
810.0000	809.53346	-5.19371	-8.50715	120.05183	8.05961
830.0000	829.51680	-6.53810	-8.23276	114.66630	9.27740
850.0000	849.50014	-7.88484	-7.95837	112.77370	9.57559
870.0000	869.48348	-9.22438	-7.68398	111.20719	11.00149
890.0000	889.46682	-10.53930	-7.40959	106.17979	11.79951
910.0000	909.45016	-11.37969	-7.13520	96.75871	12.34309
930.0000	929.43350	-11.60118	-6.86081	88.84869	13.25430
950.0000	949.41684	-11.36922	-6.58642	86.63433	14.24209
970.0000	969.40018	-11.06390	-6.31203	86.73044	16.24412
990.0000	989.38352	-10.70433	-6.03764	86.52634	17.90527
1010.0000	1009.36686	-10.31925	-5.76325	86.88593	19.88444
1030.0000	1029.35020	-10.02424	-5.48886	88.32188	21.84786
1050.0000	1049.33354	-9.92902	-5.21447	90.86230	23.40203
1070.0000	1069.31688	-10.18770	-4.94008	92.44732	25.13631
1090.0000	1089.30022	-10.66711	-4.66569	93.68658	27.28997
1110.0000	1109.28356	-11.26078	-4.39130	93.82018	29.21719
1130.0000	1129.26690	-12.01818	-4.11691	94.68593	31.24774
1150.0000	1149.25024	-12.91840	-3.84252	94.82846	32.94712
1170.0000	1169.23358	-13.92565	-3.56813	96.09646	34.17394
1190.0000	1189.21692	-15.13744	-3.29374	96.42522	34.89487
1210.0000	1209.20026	-16.73372	-3.01935	98.88281	35.01025
1230.0000	1229.18360	-18.58690	-2.74496	100.02014	35.79984
1250.0000	1249.16694	-20.75655	-2.47057	102.26537	37.89065
1270.0000	1269.15028	-23.41226	-2.19618	104.23412	36.73391
1290.0000	1289.13362	-26.57651	-1.92179	106.84547	37.05693
1310.0000	1309.11696	-30.38431	-1.64740	109.26537	37.89065
1330.0000	1329.10030	-34.66492	-1.37301	110.79911	39.55746
1350.0000	1349.08364	-39.48374	-1.09862	113.34544	40.80518
1370.0000	1369.06698	-44.92334	-0.82423	115.15912	42.16990
1390.0000	1389.05032	-50.92834	-0.54984	117.19041	43.42246
1410.0000	1409.03366	-57.45545	-0.27545	118.77921	44.76567
1430.0000	1429.01700	-64.43513	0.00106	119.71095	46.31000
1450.0000	1449.00034	-71.82607	0.27667	120.79160	47.85123
1470.0000	1469.01668	-79.57927	0.55228	121.81281	48.84217
1490.0000	1489.03302	-87.48689	0.82789	122.77037	50.05480
1510.0000	1509.04936	-95.70640	1.10350	122.70237	51.17979
1530.0000	1529.06570	-104.25465	1.37911	123.60630	52.18697
1550.0000	1549.08204	-113.11301	1.65472	125.02782	54.04192
1570.0000	1569.09838	-122.22563	1.93033	126.07665	55.81581
1590.0000	1589.11472	-131.72258	2.20594	126.19682	57.52677
1610.0000	1609.13106	-141.56361	2.48155	127.17848	59.23772
1630.0000	1629.14740	-151.79778	2.75716	128.38449	56.25672
1650.0000	1649.16374	-162.48364	3.03277	129.67497	58.54557
1670.0000	1669.18008	-173.68591	3.30838	131.66806	59.85625
1690.0000	1689.19642	-185.33177	3.58399	133.10216	61.18498
1710.0000	1709.21276	-197.44185	3.85960	134.68417	60.54612
1730.0000	1729.22910	-210.03973	4.13521	136.29821	62.80338
1750.0000	1749.24544	-223.03178	4.41082	137.16470	63.68950
1770.0000	1769.26178	-236.40820	4.68643	138.49619	65.36709
1790.0000	1789.27812	-250.21986	4.96204	139.16357	67.46685
1810.0000	1809.29446	-264.37515	5.23765	139.72945	69.89096
1830.0000	1829.31080	-278.84219	5.51326	140.07237	71.76349
1850.0000	1849.32714	-293.47362	5.78887	140.70306	71.92540
1870.0000	1869.34348	-308.02762	6.06448	140.81818	71.13438
1890.0000	1889.35982	-322.55792	6.34009	128.42538	71.23243
1910.0000	1909.37616	-337.05276	6.61570	134.88982	70.99584
1930.0000	1929.39250	-341.98325	6.89131	135.44099	71.72926
1950.0000	1949.40884	-355.49033	7.16692	134.49120	73.94118
1970.0000	1969.42518	-368.97870	7.44253	134.31776	75.54283
1990.0000	1989.44152	-382.50549	7.71814	133.94272	77.10774
2010.0000	2009.45786	-396.06116	8.00000	134.06604	77.47729
2030.0000	2029.47420	-409.60068	8.28186	133.85272	77.66006
2050.0000	2049.49054	-423.11748	8.56372	133.92447	77.97645
2070.0000	2069.50688	-436.75900	8.84558	133.54538	79.51612
2090.0000	2089.52322	-450.27411	9.12744	133.30751	79.73696
2110.0000	2109.53956	-463.72711	9.40929	132.97945	80.58679
2130.0000	2129.55590	-477.34229	9.69115	132.33191	81.77193
2150.0000	2149.57224	-491.23108	9.97301	135.15251	82.18284
2170.0000	2169.58858	-505.47272	10.25487	136.10155	82.96724
2190.0000	2189.60492	-519.83844	10.53673	137.56186	83.88148
2210.0000	2209.62126	-534.35120	10.81859	137.64652	84.33968
2230.0000	2229.63760	-549.07178	11.10045	137.66672	85.35445
2250.0000	2249.65394	-563.86035	11.38231	137.94850	86.28956
2270.0000	2269.67028	-578.70593	11.66417	138.13533	86.44156
2290.0000	2289.68662	-593.53058	11.94603	137.90921	86.75581
2310.0000	2309.70296	-608.36664	12.22789	137.96637	86.70191
2330.0000	2329.71930	-623.18451	12.50975	137.75787	87.23207
2350.0000	2349.73564	-637.78973	12.79161	136.48012	89.27355
2370.0000	2369.75198	-652.37299	13.07347	136.97870	89.03146
2390.0000	2389.76832	-666.95013	13.35533	136.74510	89.15272
2410.0000	2409.78466	-681.54266	13.63719	137.03239	88.61176
2430.0000	2429.80100	-696.14899	13.91905	136.95041	88.47745
2450.0000	2449.81734	-710.76538	14.20091	136.98291	87.77024
2470.0000	2469.83368	-725.24158	14.48277	135.82014	89.28797
2490.0000	2489.85002	-739.48230	14.76463	134.81279	88.76807
2510.0000	2509.86636	-753.48869	15.04649	134.33818	88.26527
2530.0000	2529.88270	-767.44940	15.32835	134.37262	87.67403
2550.0000	2549.				