# Appendix 2-3

## Extraction & Injection Well Drilling Logs

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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-1

| | | |
|---|---|---|
| Borehole Location: JPL-EW-1<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: S. DeSilva<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4”<br>Drilling Method: Mud Rotory<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 02/27/04 - 03/02/04<br>Total Depth: 268.0’ bgs | Coordinates (NAD 83/NAVD 88) Northing: 1895846.62<br>Surface Elevation: 1189.60 Easting: 6509909.30<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8” Low Carbon Steel<br>6 5/8” Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | 4" Asphalt Surface. | | | | | | | |
| | GM | SAND with GRAVEL and COBBLES: fine- to coarse-grained sand, poorly sorted. | | | | | | | Surface seal: 0-3’ Concrete |
| 5 | GM | SAND: brown and gray, loose, small to medium granitic cobbles, poorly sorted. | | | | | | | |
| 10 | SM | Clayey Silty SAND: brown, fine-grained sand, some clay, some silt, some medium cobbles and fine gravel, poorly sorted. | Sand and Silt at 7’ bgs. | | | | | | Bentonite/Grout seal: 3’ - 203’ |
| 15 | | Medium-grained sand, no clay. | | | | | | | |
| 20 | | Fine- to medium-grained sand, 60% fines, 40% cobbles and fine gravel. | Switch to mud rotary. | | | | | | 6 5/8” Low Carbon Steel Casing |
| 25 | | As above. | | | | | | | |
| 30 | | At 28’ bgs., Slight increase in coarse-grained sand and increase in cobbles, 50% sand, and 50% cobbles.<br>10YR 5/3. | | | | | | | |
| 35 | | As above. | | | | | | | |
| 40 | | As above. | | | | | | | |
| 45 | | Increase in larger granitic cobbles, sub-angular. | Viscosity: 47s (1L/min) | | | | | | |
| 50 | | Silty SAND with cobbles and fine gravel: 55% fine sand, 45% cobblesf/fine gravel, angular to sub-angular, increase in fine gravel in cuttings. | | | | | | | |
| 55 | SM/ GM | Medium to coarse-grained sand is brown; fine sand/ silt is dark brownish gray. | | | | | | | |
| 60 | | | | | | | | | |

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| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 60 | SM/ GM | As above. | | | | | | | |
| 65 | ML | Sandy SILT: brown and gray brown, fine to medium-grained sand, some coarse, moderately sorted. | | | | | | | |
| 70 | SM/ GM | Silty SAND with gravel and cobbles: light brown to dark gray brown, medium to coarse-grained sand, some fine-grained sand, sub-angular to angular grains, moderate sorting. | | | | | | | Bentonite/Grout seal: 3’ - 203’ |
| 75 | | | | | | | | | |
| 80 | | | | | | | | | 6 5/8” Low Carbon Steel Casing |
| 85 | | Increase in fine gravel and silt | | | | | | | |
| 90 | SP/ GP | SAND with Cobbles: 60% medium to coarse-grained sand, light tannish brown; 40% fine-grained sand, dark grayish brown.<br>Slight increase in fine sand. | | | | | | | |
| 95 | ML | Sandy SILT with cobbles: light brown - medium to coarse-grained sand, dark grayish brown, some fine gravel. | | | | | | | |
| 100 | | Less fine gravel. | | | | | | | |
| 105 | | As above. | | | | | | | |
| 110 | GM/ SM | Silty SAND with COBBLES: light tannish brown, medium to coarse-grained sand; dark grayish brown, fine-grained sand with silt, sub-angular to angular, poorly sorted. | | | | | | | |
| 115 | | As above, more silt | | | | | | | |
| 120 | | | | | | | | | |

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| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 120 | GM/SM | As above. | | | | | | | |
| 125 | | As above. | | | | | | | |
| 130 | GM/SM | Silty COBBLES/BOULDERS with SAND: brown, medium to coarse-grained sand, some fine-grained sand. | Rig chatter; more difficult drilling. | | | | | | Bentonite/Grout seal: 3' - 203' |
| 135 | | As above. | | | | | | | |
| | ML | Sandy SILT: brown,some fine to medium-grained sand. | | | | | | | |
| 140 | SP | SAND with cobbles/boulders: fine to coarse-grained sand, with some silt, sub-angular to angular, some cobbles. | | | | | | | 6 5/8" Low Carbon Steel Casing |
| 145 | | | Moderate rig chatter. | | | | | | |
| 150 | CL | Sandy CLAY: some fine-grained sand | | | | | | | |
| 155 | SP | SAND with cobbles/boulders: fine to coarse-grained sand, with some silt, sub-angular to angular, some cobbles. | | | | | | | |
| 160 | SM | Silty SAND: fine-grained sand and silt dark olive brown; coarse sand orange brown. | Hard drilling, heavy rig chatter. | | | | | | |
| 165 | | Fine gravel up to 3/4", subangular. | | | | | | | |
| 170 | | As above, less gravels. | Moderate to hard drilling, very heavy rig chatter. | | | | | | |
| 175 | | More granitic gravel up to ½". | | | | | | | |
| 180 | | | | | | | | | |

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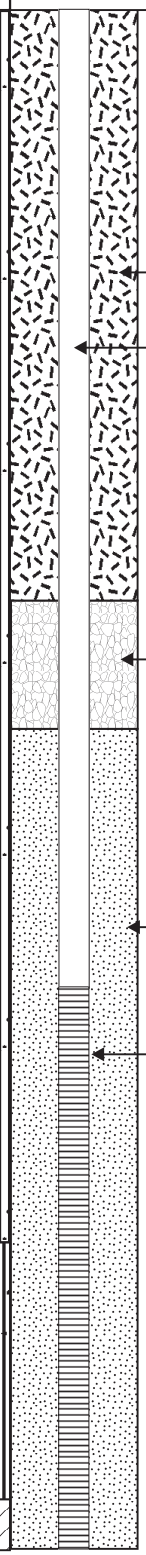
| Depth (feet bgs) | USCS symbols | Sample description | Comments |
|---|---|---|---|
| 180 | | Decrease in gravel content, increase in fine-grained sand. | Easier drilling. |
| | | COBBLES and BOULDERS at 183’bgs. | |
| 185 | | | |
| 190 | SM | As above. | Heavy rig chatter. |
| 195 | | As above. | |
| 200 | | Less gravels, more silt. | Hard drilling. |
| 205 | | As above. | Hard drilling.<br>Mud viscosity: 35<br>Mud weight: 9.2 |
| 210 | | As above. | |
| 215 | | As above. | |
| | | COBBLES with Sandy SILT matrix: fine to coarse-grained sand. | |
| 220 | | | |
| 225 | | As above. | |
| 230 | GM | COBBLES/BOULDERS: brown, fine to coarse-grained sand, angular to subangular, poorly sorted. | Heavy rig chatter. |
| 235 | | As above. | |
| 240 | CL | CLAY: some fine-grained sand | |

Grading: % Gravel, % Sand, % Fines, Max. Size

Lithology

Well Completion

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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-1

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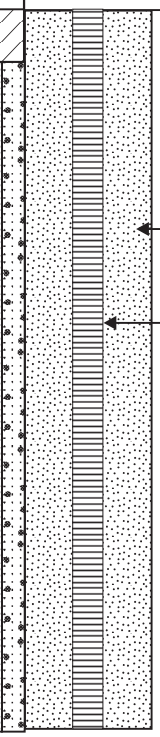
| Borehole Location: JPL-EW-1<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: S. DeSilva<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotory<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 02/27/04 - 03/02/04<br>Total Depth: 268.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1895846.62<br>Surface Elevation: 1189.60 Easting: 6509909.30<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 240 | CL | CLAY: some fine-grained sand | | | | | | | |
| 245 | SP/GP | Gravelly SAND with cobbles: fine to coarse-grained sand, fine gravel up to 3/4" in length, poorly sorted. | | | | | | | |
| 250 | | No fine gravel in cuttings, some silt. | | | | | | | Filter pack: RMC #8 Mesh sand 208' - 268'<br>6 5/8" Stainless steel screen 0.40-inch slot size 218' - 268' |
| 255 | | As above. | Heavy rig chatter. | | | | | | |
| 260 | | As above. | Moderate rig chatter. | | | | | | |
| 265 | | As above. | | | | | | | |
| 268 | | | | | | | | | |

TD: 268'bgs.



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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/03/04 - 03/08/04<br>Total Depth: 320.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1895844.00<br>Surface Elevation: 1189.32 Easting: 6509922.81<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | 4" Asphalt Surface. | | | | | | | |
| 5 | GM | Gravelly SAND: fine to coarse-grained sand with silt, some cobbles, poorly sorted. | | | | | | | Surface seal: 0-3' Concrete |
| 10 | SM/GM | Silty SAND with COBBLES: brown, loose, fine to medium-grained sand, some cobbles (granitic composition), poorly sorted. | | | | | | | Bentonite/Grout seal: 3' - 250' |
| 15 | | Medium-grained sand. | | | | | | | |
| 20 | | Fine to medium-grained sand, some cobbles and fine gravel, 60% fines and 40% cobbles/fine gravel. | | | | | | | 6 5/8" Low Carbon Steel Casing |
| 25 | GM | Gravelly SAND: fine to coarse-grained sand with silt, cobbles, fine gravel, poorly sorted. | | | | | | | |
| 30 | | Increase in cobbles. | More difficult drilling, rig chatter. | | | | | | |
| 35 | | As above. | Heavy rig chatter. | | | | | | |
| 40 | SM/GM | Silty SAND with cobbles and fine gravel: 55% fine sand, 45% cobblesf/fine gravel, angular to sub-angular, increase in fine gravel in cuttings. | | | | | | | |
| 45 | | Angular. | | | | | | | |
| 50 | | 50% fine sand, 50% cobbles/fine gravel. | | | | | | | |
| 55 | | Medium to coarse-grained sand is brown; fine sand/ silt is dark brownish gray. | | | | | | | |
| 60 | | 59' bgs: granitic boulder. | Heavy rig chatter. | | | | | | |

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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/03/04 - 03/08/04<br>Total Depth: 320.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1895844.00<br>Surface Elevation: 1189.32 Easting: 6509922.81<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 60 | SM/ GM | As above. | | | | | | | |
| 65 | ML | Sandy SILT: brown and gray brown, fine to medium-grained sand, some coarse, moderately sorted. | | | | | | | |
| 70 | SM/ GM | Silty SAND with gravel and cobbles: light brown to dark gray brown, medium to coarse-grained sand, some fine-grained sand, sub-angular to angular grains, moderate sorting. | | | | | | | |
| 75 | | | | | | | | | |
| 80 | | | | | | | | | 6 5/8" Low Carbon Steel Casing |
| 85 | | Increase in fine gravel and silt | | | | | | | |
| 90 | SP/ GP | SAND with Cobbles: 60% medium to coarse-grained sand, light tannish brown; 40% fine-grained sand, dark grayish brown.<br>Slight increase in fine sand. | | | | | | | |
| 95 | ML | Sandy SILT with cobbles: light brown - medium to coarse-grained sand, dark grayish brown, some fine gravel. | | | | | | | |
| 100 | | Less fine gravel. | | | | | | | |
| 105 | | As above. | | | | | | | |
| 110 | GM/ SM | Silty SAND with COBBLES: light tannish brown, medium to coarse-grained sand; dark grayish brown, fine-grained sand with silt, sub-angular to angular, poorly sorted. | | | | | | | |
| 115 | | As above, more silt | | | | | | | |
| 120 | | | | | | | | | |

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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/03/04 - 03/08/04<br>Total Depth: 320.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1895844.00<br>Surface Elevation: 1189.32 Easting: 6509922.81<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 120 | GM/SM | As above. | | | | | | | |
| 125 | | As above. | | | | | | | |
| 130 | GM/SM | Silty COBBLES/BOULDERS with SAND: brown, medium to coarse-grained sand, some fine-grained sand. | Rig chatter; more difficult drilling. | | | | | | |
| 135 | | As above. | | | | | | | |
| | ML | Sandy SILT: brown,some fine to medium-grained sand. | | | | | | | |
| 140 | SP | SAND with cobbles/boulders: fine to coarse-grained sand, with some silt, sub-angular to angular, some cobbles. | | | | | | | 6 5/8" Low Carbon Steel Casing |
| 145 | | | Moderate rig chatter. | | | | | | |
| 150 | CL | Sandy CLAY: some fine-grained sand | | | | | | | |
| 155 | SP | SAND with cobbles/boulders: fine to coarse-grained sand, with some silt, sub-angular to angular, some cobbles. | | | | | | | |
| 160 | SM | Silty SAND: fine-grained sand and silt dark olive brown; coarse sand orange brown. | Hard drilling, heavy rig chatter. | | | | | | |
| 165 | | Fine gravel up to 3/4", subangular. | | | | | | | |
| 170 | | As above, less gravels. | Moderate to hard drilling, very heavy rig chatter. | | | | | | |
| 175 | | More granitic gravel up to ½". | | | | | | | |
| 180 | | | | | | | | | |

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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-2

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| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 180 | SM | Decrease in gravel content, increase in fine-grained sand. | Easier drilling. | | | | | | |
| | | COBBLES and BOULDERS at 183'bgs. | | | | | | | |
| 185 | | | | | | | | | |
| 190 | | As above. | Heavy rig chatter. | | | | | | |
| | | | | | | | | | |
| 195 | | As above. | | | | | | | |
| 200 | | Less gravels, more silt. | Hard drilling. | | | | | | 6 5/8" Low Carbon Steel Casing |
| 205 | | As above. | Hard drilling.<br>Mud viscosity: 35<br>Mud weight: 9.2 | | | | | | |
| 210 | | As above. | | | | | | | |
| 215 | | As above. | | | | | | | |
| | | COBBLES with Sandy SILT matrix: fine to coarse-grained sand. | | | | | | | |
| 220 | | | | | | | | | |
| 225 | | As above. | | | | | | | |
| 230 | GM | COBBLES/BOULDERS: brown, fine to coarse-grained sand, angular to subangular, poorly sorted. | Heavy rig chatter. | | | | | | |
| 235 | | As above. | | | | | | | |
| 240 | CL | CLAY: some fine-grained sand | | | | | | | |

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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-2

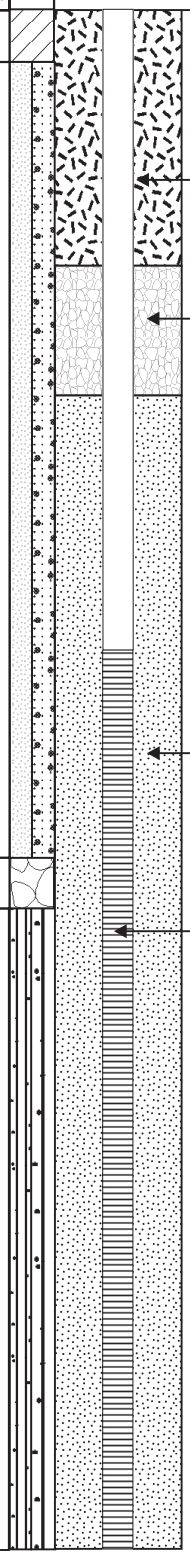
| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4”<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/03/04 - 03/08/04<br>Total Depth: 320.0’ bgs | Coordinates (NAD 83/NAVD 88) Northing: 1895844.00<br>Surface Elevation: 1189.32 Easting: 6509922.81<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8” Low Carbon Steel<br>6 5/8” Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments |
|---|---|---|---|
| 240 | CL | CLAY: some fine-grained sand | |
| 245 | SP/GP | Gravelly SAND with cobbles: fine to coarse-grained sand, fine gravel up to 3/4” in length, poorly sorted. | |
| 250 | | No fine gravel in cuttings, some silt. | |
| 255 | | As above. | Heavy rig chatter. |
| 260 | | As above. | Moderate rig chatter. |
| 265 | | As above. | |
| 270 | | As above, orange brown to dark olive gray, fine to coarse-grained sand with silt, sub-angular to angular, poorly sorted. | Less rig chatter. |
| | | COBBLE Layer. | |
| 275 | SM/GM | Silty SAND with gravel: orange brown to dark olive gray, fine to coarse-grained sand with silt, sub-angular to angular, poorly sorted. | |
| 280 | | | |
| 285 | | As above, less silt | Rig chatter. |
| 290 | | As above, more silt. | |
| 295 | | Gravel with SAND: less silt, light brown, 70% fine to coarse-grained, angular to sub-rounded gravel, 25% fine to coarse-grained, sub-angular to sub-rounded SAND, 5% non-plastic fines, poorly sorted, micaceous. | |
| 300 | | | |

Grading: % Gravel, % Sand, % Fines, Max. Size

Lithology

Well Completion




JPL-EW-2.CDR

NASA/JPL

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# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-EW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4”<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/03/04 - 03/08/04<br>Total Depth: 320.0’ bgs | Coordinates (NAD 83/NAVD 88) Northing: 1895844.00<br>Surface Elevation: 1189.32 Easting: 6509922.81<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8” Low Carbon Steel<br>6 5/8” Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 300 | SM/ GP | Silty SAND with gravel: 70% angular fine to coarse-grained sand, 20% sub-rounded fine to coarse-grained, sub-angular to sub-rounded gravel, 10% non-plastic fines, poorly sorted. | | | | | | | Filter pack: RMC #8 mesh sand 255’ - 320’ |
| 305 | ML | Sandy SILT: gray brown, 75% non-plastic fines, 25% fine to coarse-grained sand, sub-angular to sub-rounded, micaceous. | | | | | | | 6 5/8” Stainless steel screen 0.40-inch slot size 265’ - 315’ |
| 310 | SM | Silty SAND: orange brown, 85% angular fine to coarse-grained sand, 10% sub-rounded fine to coarse-grained sand, 5% non-plastic fines. | | | | | | | |
| 315 | | As above, less silt. | | | | | | | |
| 320 | | | | | | | | | |

TD: 320’bgs.

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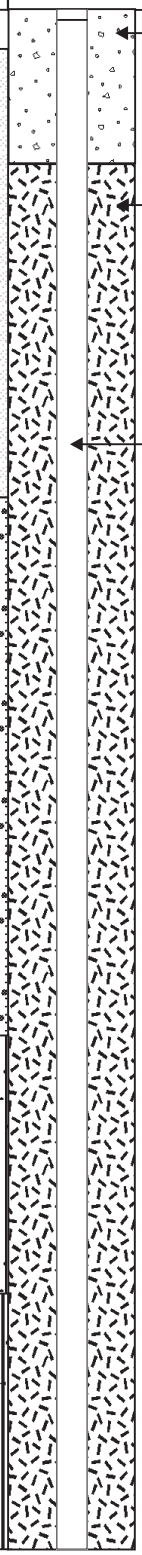
# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-1

| | | |
|---|---|---|
| Borehole Location: JPL-IW-1<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G. | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 02/19/04 - 02/26/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896169.10<br>Surface Elevation: 1234.10 Easting: 6510059.62<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology |
|---|---|---|---|---|---|---|---|---|
| 0 | | Asphalt Surface (4 inches thick).<br>Gravel base for pavement. | | | | | | |
| 5 | SP | SAND (Fill): orange brown, medium dense, slightly moist, fine to coarse sand with trace silt, micacceous. | | | | | | |
| 10 | | Gravelly. | | | | | | |
| | | Fine to coarse sand with some silt. | | | | | | |
| 15 | | Cobbles at 16' bgs. | | | | | | |
| | | Occasional fine to coarse gravel. | | | | | | |
| 20 | GP | Sandy GRAVEL: fine to coarse sand, fine to coarse gravel with trace silt, slightly moist, very dense. | | | | | | |
| 25 | | Cobbles from 28' to 32' bgs. | | | | | | |
| 30 | | Granitic and dioritic rock fragments with some orange-brown sand matrix, slightly moist, very dense. | | | | | | |
| 35 | | Cobbles/Boulders: olive (5Y4/3), 40% fine to medium-grained and 60% coarse-grained sand, angular to subangular, trace gravel. | | | | | | |
| 40 | SM | Silty SAND: coarse to very coarse-grained, some fine to medium-grained, some silt, angular to subangular, trace gravel. | | | | | | |
| 45 | | | | | | | | |
| 50 | GM | Cobbles/silty SAND: Brown (10YR 5/3), coarse- to very coarse-grained, some silt, angular to subangular, slight increase in fine-grained sand. | | | | | | |
| 55 | | | | | | | | |
| 60 | | | | | | | | |

Well Completion




JPL-IW-1.CDR

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# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-1

| | | |
|---|---|---|
| Borehole Location: JPL-IW-1<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G. | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4”<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 02/19/04 - 02/26/04<br>Total Depth: 315.0’ bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896169.10<br>Surface Elevation: 1234.10 Easting: 6510059.62<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8” Low Carbon Steel<br>6 5/8” Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 60 | ML | Sandy SILT: brown, very fine- to fine-grained sand, trace coarse gravel | | | | | | | |
| 65 | | Yellowish brown (10YR 5/4) increase in fines. | | | | | | | Bentonite/Grout seal: 3’ - 200’ |
| | | As above, with more gravels | | | | | | | |
| 70 | ML/SM | Silty SAND: brown, fine-grained sand, gravel 5-20 mm in length, angular to subangular. | | | | | | | |
| 75 | | | | | | | | | 6 5/8” Low Carbon Steel Casing |
| 80 | | As above. | | | | | | | |
| 85 | SM/GM | Silty SAND: brown, fine to medium grained, occasional coarse gravels and cobbles | | | | | | | |
| 90 | | Brown (10YR 5/3). | | | | | | | |
| 95 | | Decrease in gravel content in cuttings. | | | | | | | |
| 100 | | Silty sandy GRAVEL: very fine- to coarse-grained granitic gravels and cobbles | | | | | | | |
| 105 | | | | | | | | | |
| 110 | | Increase in fine content, 70% fine to medium-grained sand, 30% medium to coarse-grained sand, some silt, no gravel. | | | | | | | |
| 115 | | As above. | | | | | | | |
| 120 | | | | | | | | | |

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# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-1

| | | |
|---|---|---|
| Borehole Location: JPL-IW-1<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G. | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 02/19/04 - 02/26/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896169.10<br>Surface Elevation: 1234.10 Easting: 6510059.62<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel 6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 120–125 | SM/GM | Dark grayish brown (10YR 4/2).<br>Medium to coarse-grained, some fine to medium-grained. | | | | | | | Bentonite/Grout seal: 3' - 200' |
| 130–145 | GM | Silty GRAVEL: fine to coarse-grained sand, some fine gravel.<br>Increased fine gravel in cuttings.<br>Less gravel. | Rig chatter.<br>Easier drilling. | | | | | | 6 5/8" Low Carbon Steel Casing |
| 145–150 | SP | SAND: medium to coarse-grained, some fine to medium-grained sand, some fine gravel, poorly graded. | | | | | | | |
| 150–175 | SM/GM | Interbedded COBBLES/BOULDERS w/ Silty Sandy Matrix: fine to coarse-grained sand, some fine gravel, some silt.<br>As above.<br>Brown, medium to coarse-grained sand, angular to subangular.<br>As above.<br>As above. | Increased rig chatter.<br>156' bgs increased rig chatter, bit binding. Medium to difficult drilling. | | | | | | |
| 175–180 | SM | Silty SAND: dark brown, very fine- to medium-grained, trace gravels | Easier drilling. | | | | | | |
| 180 | SM/GM | Silty SAND with COBBLES: medium to coarse-grained, some fine-grained, some silt, some fine gravel. | | | | | | | |

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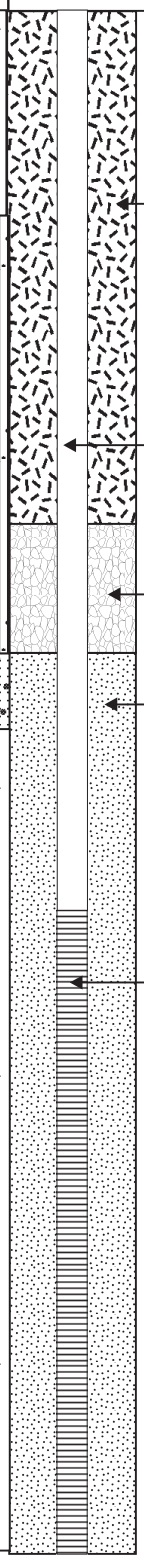
# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-1

| | | |
|---|---|---|
| Borehole Location: JPL-IW-1<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G. | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 02/19/04 - 02/26/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896169.10<br>Surface Elevation: 1234.10 Easting: 6510059.62<br>Borehole Abandoned: Monitoring Device Installed:<br>Yes No X Yes X No<br>Method: NA Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology |
|---|---|---|---|---|---|---|---|---|
| 180 | SM/GM | As above. | | | | | | |
| 185 | | As above. | | | | | | |
| 190 | SM | Silty SAND with gravel; very fine to medium grained, trace coarse sand | Rig chatter; moderate drilling. | | | | | |
| 195 | | As above. | As above. | | | | | |
| 200 | | As above. | | | | | | |
| 205 | GP | BOULDERS/COBBLES with little or no matrix: gravel angular to subangular. | Viscosity: 33 | | | | | |
| 210 | SM/GM | Silty SAND w/BOULDERS and COBBLES: fine to very coarse-grained sand, some fine gravel, subangular to angular. | | | | | | |
| 215 | | Decrease in fine gravel content. | | | | | | |
| 220 | | As above. | | | | | | |
| | | 220'-240'bgs granite or dioritc bedrock: cuttings 60-70% fine to medium-grained sand with silt, 30-40% coarse to very coarse-grained sand, trace fine gravel. | Very slow drilling. | | | | | |
| 225 | | | | | | | | |
| 230 | SM/GM | As above, less cobbles. | | | | | | |
| 235 | | As above, increasing fines | | | | | | |
| 240 | | | | | | | | |

Well Completion

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# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-1

| | | |
|---|---|---|
| Borehole Location: JPL-IW-1<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G. | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 02/19/04 -02/26/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896169.10<br>Surface Elevation: 1234.10 Easting: 6510059.62<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 240 | ML | Silty SAND with trace clay: brown, 60% fine- to medium-grained sand, trace fine gravel. | Drilling easier than above. | | | | | | |
| 245 | | As above. | | | | | | | |
| 250 | GM/SM | COBBLES with Silty Sandy Matrix: brown, fine to medium-grained sand, some silt, coarse to very coarse-grained sand, trace fine gravel, angular to subangular. | | | | | | | |
| 255 | | | | | | | | | |
| 260 | | As above. | | | | | | | |
| 265 | | As above. | Rig chatter. | | | | | | Filter pack: medium aquarium sand 205' - 315' |
| 270 | SM/SC | Silty clayey SAND: brown, 60% fine to medium-grained sand, 40%, coarse to very coarse-grained sand, angular to subangular, trace gravels | | | | | | | |
| 275 | | As above. | Increased rig chatter. | | | | | | 6 5/8" Stainless steel screen 0.50-inch slot size 215' - 315' |
| 280 | | As above. | | | | | | | |
| | ML/GM | Sandy gravelly SILT with trace clay: fine- to coarse-grained sand, some fine gravel | | | | | | | |
| 285 | | As above. | | | | | | | |
| 290 | GM | COBBLES/BOULDERS: fine gravel angular to subangular. | Rig chatter. | | | | | | |
| 295 | | As above. | | | | | | | |
| 300 | | As above. | | | | | | | |

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# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-1

Borehole Location: JPL-IW-1
Project Location: NASA Jet Propulsion Lab.
Project #: G486009
Geologist: D. Conner
Drilling Contractor: WDC Exploration & Wells
Driller: Alberto Vega
Reviewed by: D. Clexton R.G.

Sampler Type: Grab Sample from Shaker Screen
Boring Diameter: 12 1/4"
Drilling Method: Mud Rotary
Drill Rig: Speedstar 30K
Hammer Type: Casing Hammer
Date: 02/19/04 - 02/26/04
Total Depth: 315.0' bgs

Coordinates (NAD 83/NAVD 88) Northing: 1896169.10
Surface Elevation: 1234.10 Easting: 6510059.62
Borehole Abandoned:
Yes No X
Method: NA

Monitoring Device Installed:
Yes X No
Type: 6 5/8" Low Carbon Steel
6 5/8" Stainless Steel Screen

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | Grading: % Sand | Grading: % Fines | Grading: Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 300 | GM | As above. | Increased rig chatter. | | | | | | Filter pack: medium aquarium sand 205' - 315' |
| 305 | | | Bit binding at 308'bgs. | | | | | | 6 5/8" Stainless steel screen 0.50-inch slot size 215' - 315' |
| 310 | | | Slow drilling. | | | | | | |
| 315 | | Very fine gravel. | | | | | | | TD: 315'bgs. |

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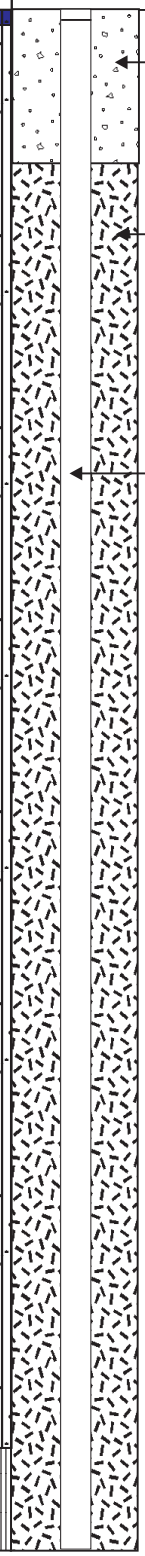
# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/09/04 - 03/15/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896177.56<br>Surface Elevation: 1241.23 Easting: 6509864.21<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology |
|---|---|---|---|---|---|---|---|---|
| 0 | | 4" Asphalt Surface. | | | | | | |
| | SM | Silty SAND: brown, very fine to coarse grained, silt and clay, sub-angular, poorly sorted, common gravel. | Air percussion. | | | | | |
| 5 | | | | | | | | |
| 10 | | As above. | | | | | | |
| | | Cobbles. | | | | | | |
| 15 | | Very fine to medium grained, abundant cobbles of granitic composition. | | | | | | |
| 20 | | As above. | Switch to mud rotary drilling at 20' bgs. | | | | | |
| 25 | | As above. | | | | | | |
| 30 | | As above. | | | | | | |
| 35 | | As above. | | | | | | |
| 40 | | No cobbles. | | | | | | |
| 45 | | Abundant fine gravel. | | | | | | |
| 50 | | Common silt. | | | | | | |
| 55 | | As above. | | | | | | |
| | SM/ ML | Sandy SILT: brown, very fine- to coarse-grained sand, trace coarse gravel | | | | | | |
| 60 | | | | | | | | |




JPL-IW-2.CDR

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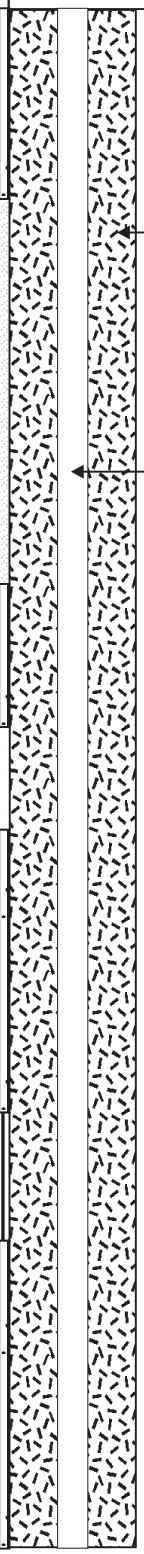
# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/09/04 - 03/15/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896177.56<br>Surface Elevation: 1241.23 Easting: 6509864.21<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology |
|---|---|---|---|---|---|---|---|---|
| 60–65 | SM | SILTY SAND: brown, fine to coarse grained, abundant finegravel and cobbles. | | | | | | |
| 65–80 | SP | SAND: grayish brown to tan brown: fine to coarse-grained, sub-rounded to sub-angular, trace fine gravel.<br>As above, some silt.<br>Slight increase in fine gravel. | | | | | | |
| 80–85 | SM | SILTY SAND: grayish brown to tan brown, 50% fine-grained sand with silt, 25% medium-grained and 25% fine-grained sand, sub-rounded to angular, poorly sorted. | | | | | | |
| 85–90 | SM/GM | Silty SAND and GRAVEL: very fine- to coarse-grained granitic gravels and cobbles | | | | | | |
| 90–100 | SM | SILTY SAND: grayish brown to tan brown, 50% fine-grained sand with silt, 25% medium-grained and 25% fine-grained sand, sub-rounded to angular, poorly sorted.<br>As above. | | | | | | |
| 100–105 | GM | Silty sandy GRAVEL: very fine- to coarse-grained granitic gravels and cobbles | | | | | | |
| 105–120 | SM | Silty SAND: light brown, 60% fine-grained sand with silt, 30% coarse-grained sand, 10% medium-grained sand, poorly sorted.<br>As above. | | | | | | |

Well Completion




JPL-IW-2.CDR

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# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/09/04 - 03/15/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896177.56<br>Surface Elevation: 1241.23 Easting: 6509864.21<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 120 | SM | SILTY SAND: grayish brown to tan brown, 60% fine-grained sand with silt, 30% coarse-grained sand, 10% medium-grained sand, poorly sorted. | | | | | | | |
| 125 | | Increase in fine-grained sand and silt. | | | | | | | |
| 130 | | SILTY SAND: 60% fine-grained sand with silt, 30% coarse-grained sand, 10% medium-grained sand, maximum size 4mm. | | | | | | | Bentonite/Grout seal: 3' - 189' |
| 135 | | As above. | | | | | | | 6 5/8" Low Carbon Steel Casing |
| 140 | ML/SM | SAND with SILT: brown, very fine sand | | | | | | | |
| 145 | | As above. | | | | | | | |
| 150 | SM/GM | Silty SAND and gravel: brown, fine to coarse sand, cobbles and boulders | | | | | | | |
| 155 | | As above. | | | | | | | |
| 160 | ML/SM | SAND with SILT: brown, very fine sand<br>As above. | | | | | | | |
| 165 | | Yellowish brown, 60% fine-grained sand with silt, 40% medium to coarse-grained sand, poorly sorted. | | | | | | | |
| 170 | SM | Silty SAND: grayish brown to tan, fine-grained sand content; 70% fine-grained, 30% medium to coarse-grained. | | | | | | | |
| 175 | | 70% fine-grained sand, 15% medium-grained, 15% coarse-grained, 3-5% of grains 4-6mm in length. | | | | | | | |
| 180 | GM | SAND with COBBLES (Description on next page.) | Rig chatter. | | | | | | |

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# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-2

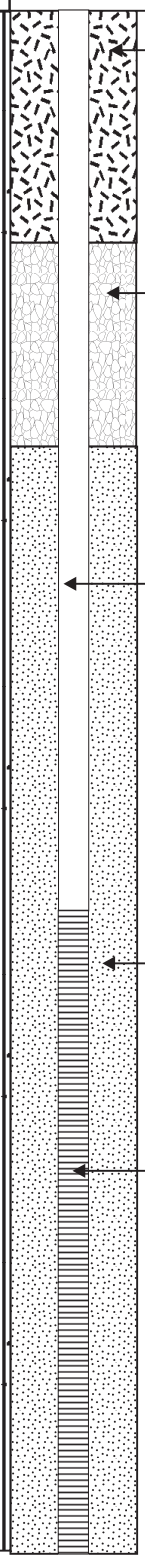
| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/09/04 - 03/15/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896177.56<br>Surface Elevation: 1241.23 Easting: 6509864.21<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments |
|---|---|---|---|
| 180 | | SAND with COBBLES: yellowish brown, 50% fine-grained sand with silt, 30% medium to coarse-grained sand, 20% fine gravel, angular to sub-angular, gravel and cobbles granitic to dioritic in composition. | |
| 185 | | As above. | Rig chatter and bit binding. |
| 190 | | As above. | |
| 195 | | Fine gravel in cuttings up to 19mm in length. | |
| 200 | | Gravelly SAND: grayish brown to yellowish brown, 60% fine-grained sand, 25% medium to coarse-grained sand, 15% fine gravel, up to 20mm in length, angular to sub-angular. | Moderate to heavy rig chatter. |
| 205 | | Gravelly SAND with COBBLES: grayish brown to yellowish brown, fine to coarse-grained sand, and fine gravel. | |
| 210 | GM | Decrease in COBBLES 208'-215' bgs. | |
| 215 | | Increase in COBBLES, cuttings grayish brown to brown, 60% fine-grained sand, 25% medium to coarse-grained sand, 15% fine gravel, up to 18mm in length, angular to subangular. | |
| 220 | | Grayish brown, fine gravel 15-20mm in length. | |
| 225 | | Increase in COBBLES. | |
| 230 | | COBBLES/BOULDERS with SAND: grayish brown to tan brown, 70% fine-grained sand, 20% medium-grained sand, 10% coarse-grained sand, trace fine gravel, angular to sub-angular, gravel dioritic in composition. | Heavy rig chatter.<br>Bit binding. |
| 235 | | As above. | |
| 240 | | | |

Grading: % Gravel, % Sand, % Fines, Max. Size

Lithology

Well Completion




JPL-IW-2.CDR

Battelle
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# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/09/04 - 03/15/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896177.56<br>Surface Elevation: 1241.23 Easting: 6509864.21<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 240–245 | GM | COBBLES/BOULDERS with SAND: grayish brown to tan brown, 70% fine-grained sand, 20% medium-grained sand, 10% coarse-grained sand, trace fine gravel, angular to sub-angular, gravel dioritic in composition.<br>60% fine-grained sand, 25% medium-grained sand, 15% coarse-grained sand, maximum grain size 10mm, angular to sub-angular. | | | | | | | Filter pack: medium aquarium sand 205' - 315' |
| 250–265 | GM/ SM | Cobbles with Silty SAND: brown, fine to medium sand, trace angular to subangular fine gravels<br>As above.<br>As above. | | | | | | | 6 5/8" Stainless steel screen 0.50-inch slot size 215' - 315' |
| 265–275 | SC/ SM | Silty clayey SAND: brown, fine to coarse sand, trace angular to subangular fine gravels<br>As above. | Continued moderate to difficult drilling. | | | | | | |
| 275–285 | ML/ GM | Sandy gravelly SILT: fine to coarse sand, fine gravel, trace clay<br>As above.<br>As above. | Moderate to difficult drilling. | | | | | | |
| 290–300 | GM | COBBLES/BOOULDERS: fine gravel<br>As above. | | | | | | | |

JPL-IW-2.CDR

Battelle
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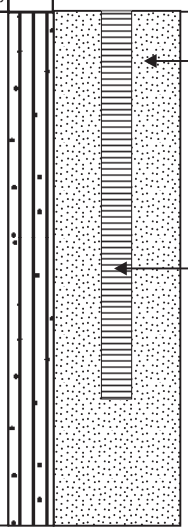
# NASA/JPL
# BORING LOG AND WELL COMPLETION DIAGRAM – JPL-IW-2

| | | |
|---|---|---|
| Borehole Location: JPL-EW-2<br>Project Location: NASA Jet Propulsion Lab.<br>Project #: G486009<br>Geologist: D. Conner<br>Drilling Contractor: WDC Exploration & Wells<br>Driller: Alberto Vega<br>Reviewed by: D. Clexton R.G., | Sampler Type: Grab Sample from Shaker Screen<br>Boring Diameter: 12 1/4"<br>Drilling Method: Mud Rotary<br>Drill Rig: Speedstar 30K<br>Hammer Type: Casing Hammer<br>Date: 03/09/04 - 03/15/04<br>Total Depth: 315.0' bgs | Coordinates (NAD 83/NAVD 88) Northing: 1896177.56<br>Surface Elevation: 1241.23 Easting: 6509864.21<br>Borehole Abandoned: Yes No X<br>Method: NA<br>Monitoring Device Installed: Yes X No<br>Type: 6 5/8" Low Carbon Steel<br>6 5/8" Stainless Steel Screen |

| Depth (feet bgs) | USCS symbols | Sample description | Comments | Grading: % Gravel | % Sand | % Fines | Max. Size | Lithology | Well Completion |
|---|---|---|---|---|---|---|---|---|---|
| 300 | GM | COBBLES/BOULDERS with SAND: grayish brown to tan brown, 60% fine-grained sand, 25% medium-grained sand, 15% coarse-grained sand, maximum grain size 10mm, angular to sub-angular. | | | | | | | Filter pack: medium aquarium sand 205' - 315' |
| 305 | | As above. | | | | | | | |
| 310 | | As above. | | | | | | | 6 5/8" Stainless steel screen 0.50-inch slot size 215' - 315' |
| 315 | | As above. | | | | | | | |
| 320 | | | | | | | | | |



TD: 320' bgs.

JPL-IW-2.CDR

ATTACHMENT 2

**PACIFIC SURVEYS**

# LATEROLOG 3
# GAMMA-RAY

| Job No. | | |
|---|---|---|
| 11266 | Company | WDC EXPLORATION & WELLS |
| | Well | EW-1 |
| | Field | JPL |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| MARS YARD<br>Sec. Twp. Rge. | SONIC/VDL<br>ELOG |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation above perm. datum | Elevation |
| Log Measured From | G.L. | 0 | | K.B. |
| Drilling Measured From | G.L. | | | D.F.<br>G.L. |

| | | | |
|---|---|---|---|
| Date | 03-01-04 | | |
| Run Number | ONE | | |
| Depth Driller | 268' | | |
| Depth Logger | 268' | | |
| Bottom Logged Interval | 268' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.4 @ 77F | | |
| Rmf @ Meas. Temp | 8.0 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 09:45 | | |
| Time Logger on Bottom | 10:51 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | B. HEADINGTON | | |

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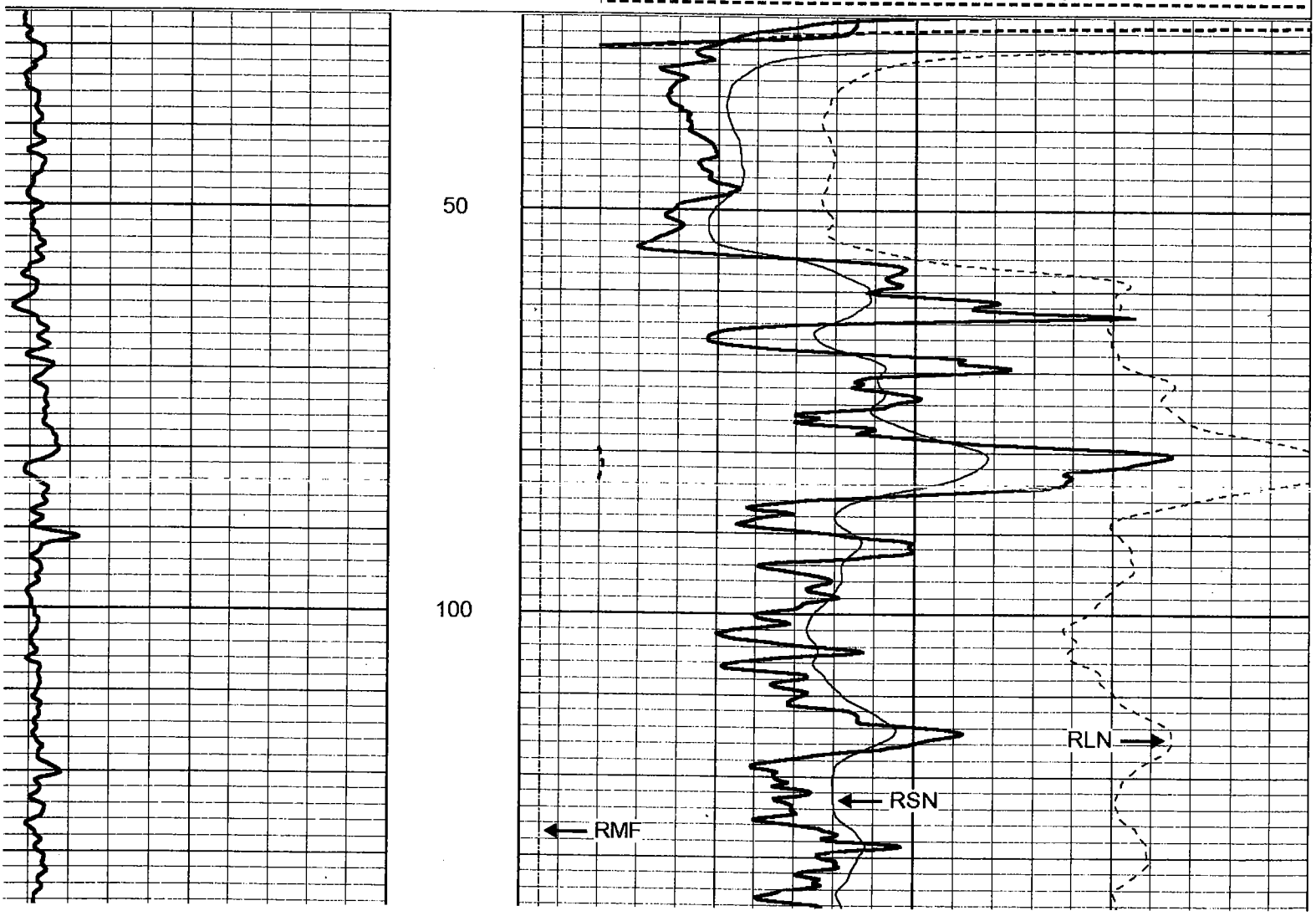
Comments

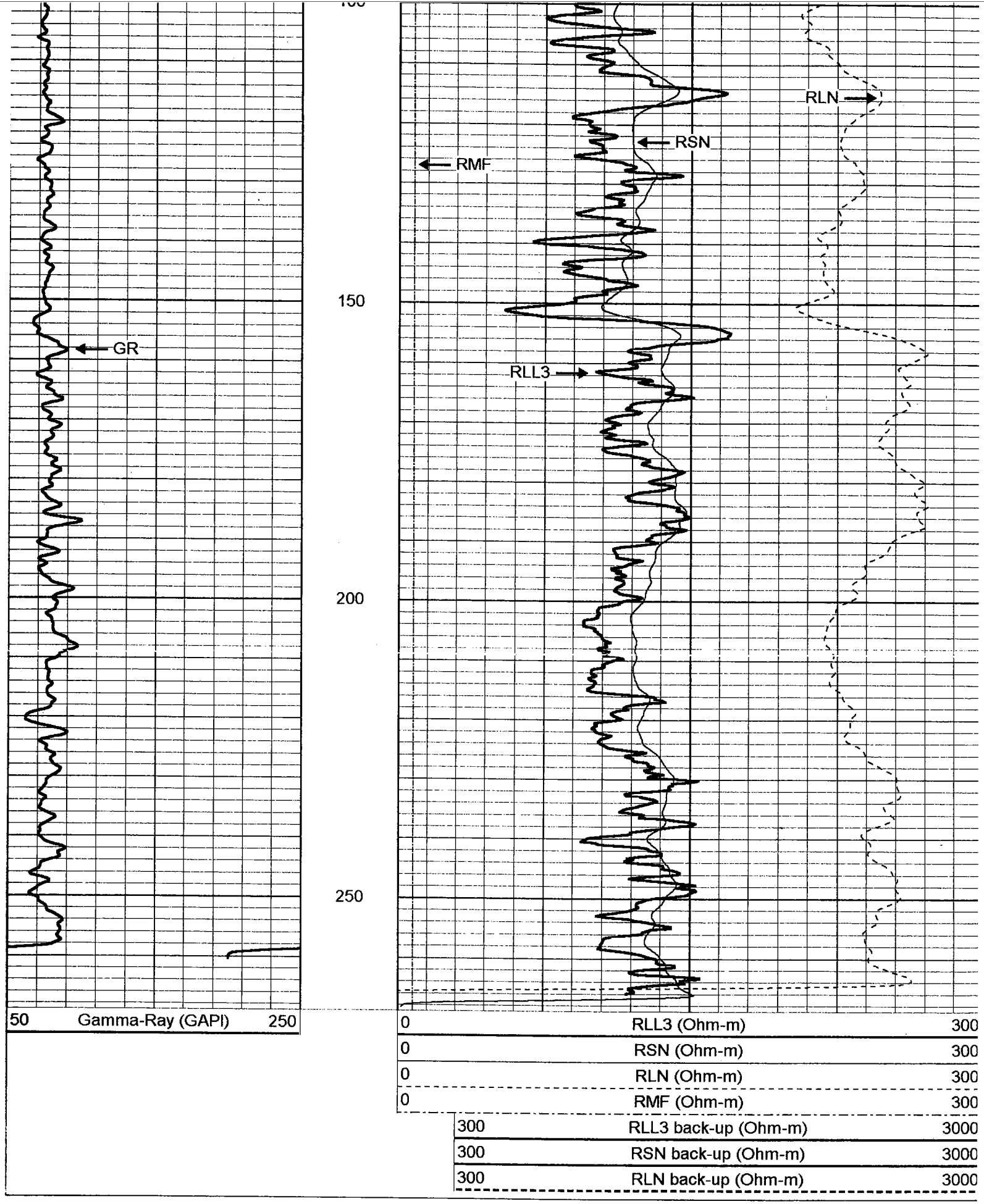
## Gamma Ray Calibration Report

| | | |
|---|---|---|
| Serial Number: | 12 | |
| Tool Model: | GROH | |
| Performed: | Thu Feb 12 09:06:37 2004 | |
| Calibrator Value: | 162.0 | GAPI |
| Background Reading: | 46.0 | |
| Calibrator Reading: | 174.5 | |
| Sensitivity: | 1.2612 | GAPI/ |

| | |
|---|---|
| Database File: | 11266.db |
| Dataset Pathname: | WDC/EW1/run1/LL3A |
| Presentation Format: | guard |
| Dataset Creation: | Mon Mar 01 19:32:19 2004 by Log Warrior 7.0 Standar |
| Charted by: | Depth in Feet scaled 1:240 |

| | | |
|---|---|---|
| 0 | Gamma-Ray (GAPI) | 250 |
| 0 | RLL3 (Ohm-m) | 300 |
| 0 | RSN (Ohm-m) | 300 |
| 0 | RLN (Ohm-m) | 300 |
| 0 | RMF (Ohm-m) | 300 |
| 300 | RLL3 back-up (Ohm-m) | 3000 |
| 300 | RSN back-up (Ohm-m) | 3000 |
| 300 | RLN back-up (Ohm-m) | 3000 |




GR
RMF
RSN
RLN
RLL3
150
200
250
50 Gamma-Ray (GAPI) 250
0 RLL3 (Ohm-m) 300
0 RSN (Ohm-m) 300
0 RLN (Ohm-m) 300
0 RMF (Ohm-m) 300
300 RLL3 back-up (Ohm-m) 3000
300 RSN back-up (Ohm-m) 3000
300 RLN back-up (Ohm-m) 3000

**PACIFIC SURVEYS**

# SONIC VELOCITY VARIABLE DENSITY

| Job No. | | |
|---|---|---|
| 11266 | Company | WDC EXPLORATION & WELLS |
| | Well | EW-1 |
| | Field | JPL |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| MARS YARD | LL3/GR<br>ELOG |
| Sec. Twp. Rge. | |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation | Elevation |
| Log Measured From | G.L. | 0 | above perm. datum | K.B. |
| Drilling Measured From | G.L. | | | D.F.<br>G.L. |

| | | | |
|---|---|---|---|
| Date | 03-01-04 | | |
| Run Number | ONE | | |
| Depth Driller | 268' | | |
| Depth Logger | 268' | | |
| Bottom Logged Interval | 268' | | |
| Top Log Interval | 0' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.4 @ 77F | | |
| Rmf @ Meas. Temp | 8.0 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 09:45 | | |
| Time Logger on Bottom | 10:51 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | B. HEADINGTON | | |

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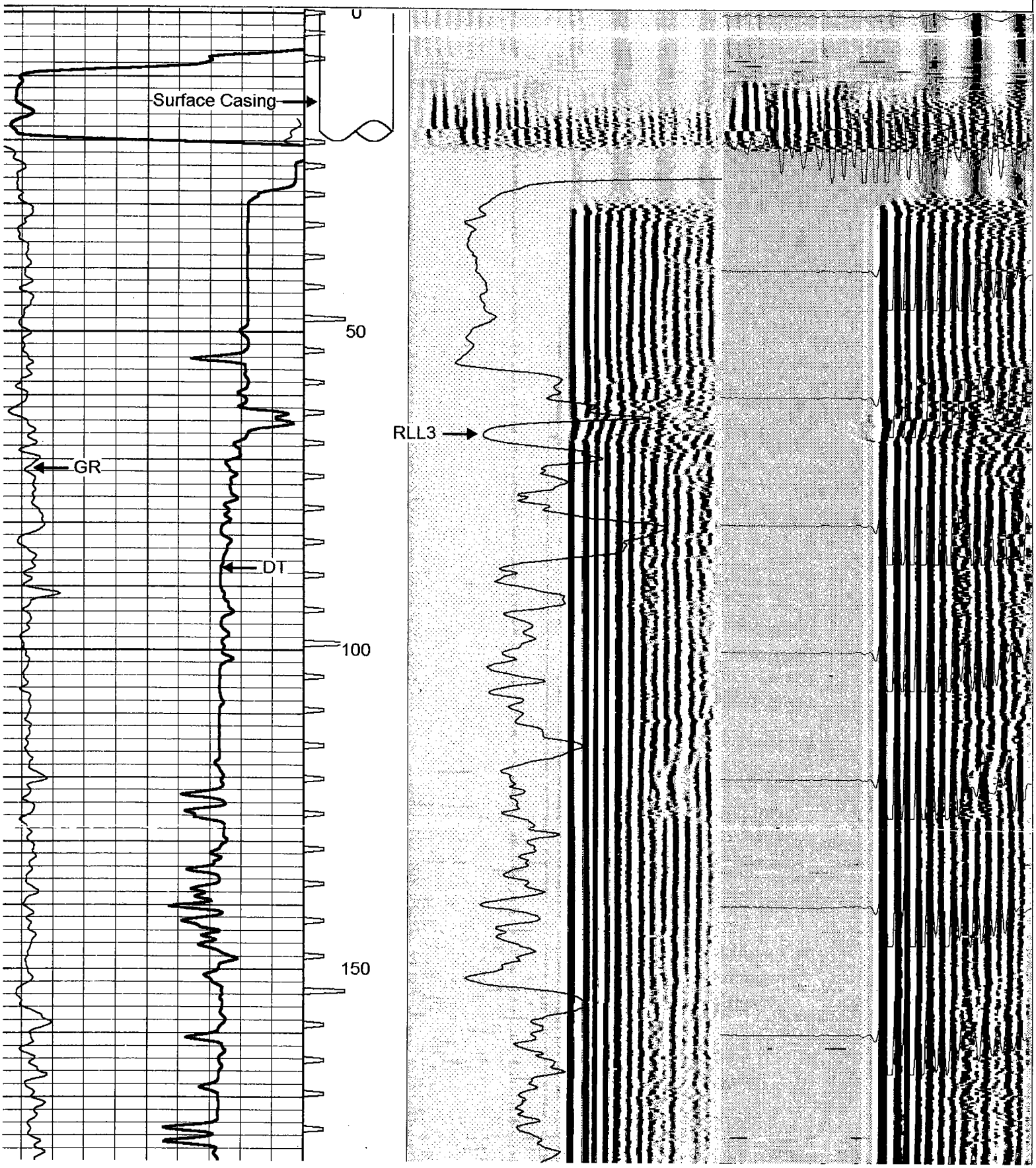
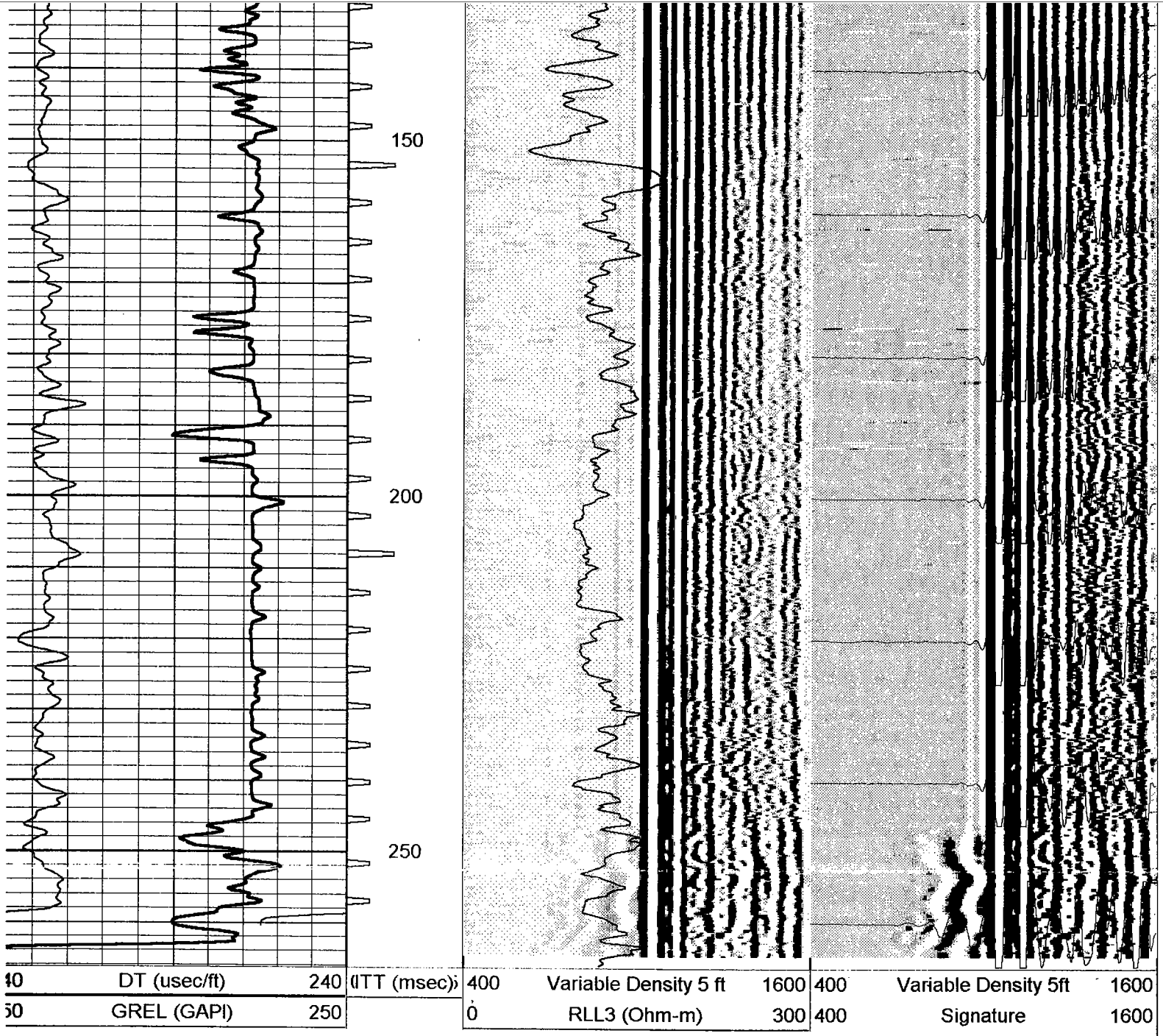
Comments

| | |
|---|---|
| Database File: | 11266.db |
| Dataset Pathname: | WDC/EW1/run1/SONIC |
| Presentation Format: | slt |
| Dataset Creation: | Mon Mar 01 19:57:35 2004 by Log Warrior 7.0 Standar |
| Charted by: | Depth in Feet scaled 1:240 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | DT (usec/ft) | 240 | ITT (msec) | 400 | Variable Density 5 ft | 1600 | 400 | Variable Density 5ft | 1600 |
| 0 | GREL (GAPI) | 250 | | 0 | RLL3 (Ohm-m) | 300 | 400 | Signature | 1600 |




150
200
250
40
DT (usec/ft)
240
ITT (msec)
400
Variable Density 5 ft
1600
400
Variable Density 5ft
1600
50
GREL (GAPI)
250
0
RLL3 (Ohm-m)
300
400
Signature
1600

**PACIFIC SURVEYS**

# ELECTRIC LOG
# LATEROLOG 3
# GAMMA-RAY

Job No. 11266

Company: WDC EXPLORATION & WELLS
Well: EW-1
Field: JPL
County: LOS ANGELES State: CA

Location:
MARS YARD
Sec. Twp. Rge.

Other Services:
SONIC/VDL
LL3/GR

| | | | |
|---|---|---|---|
| Permanent Datum | G.L. | Elevation above perm. datum | Elevation |
| Log Measured From | G.L. | 0 | K.B. |
| Drilling Measured From | G.L. | | D.F. |
| | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 03-01-04 | | |
| Run Number | ONE | | |
| Depth Driller | 268' | | |
| Depth Logger | 268' | | |
| Bottom Logged Interval | 268' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.4 @ 77F | | |
| Rmf @ Meas. Temp | 8.0 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 09:45 | | |
| Time Logger on Bottom | 10:51 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | B. HEADINGTON | | |

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Comments

## ELOG Calibration Report

| | |
|---|---|
| Serial: | D4 |
| Model: | DTQ |
| Shop Calibration Performed: | Wed Feb 25 09:18:39 2004 |
| Before Survey Verification Performed: | Fri Feb 20 12:30:51 2004 |
| After Survey Verification Performed: | Fri Feb 20 12:31:33 2004 |

### Shop Calibration

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 8.138 | 99.809 | | 10.200 | 102.200 | Ohm-m | 1.004 | 2.033 |
| Long | 3.548 | 93.177 | | 10.200 | 102.200 | Ohm-m | 1.026 | -17.000 |
| IEE | 211.000 | 7071.540 | counts | 0.231 | 7.739 | A | | |
| VSN | 96.020 | 8040.740 | counts | 1.831 | 153.367 | V | | |
| VLN | 85.100 | 2043.000 | counts | 1.623 | 38.968 | V | | |

### Before Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.249 | 101.201 | | 40.505 | 101.206 | Ohm-m | 0.996 | 0.422 |
| Long | 142.638 | 102.842 | | 102.858 | 102.858 | Ohm-m | 1.024 | -2.408 |
| IEE | 212.960 | 7070.960 | counts | 0.233 | 7.738 | A | | |
| VSN | 96.300 | 8039.720 | counts | 1.837 | 153.348 | V | | |
| VLN | 85.320 | 2042.520 | counts | 1.627 | 38.959 | V | | |

### After Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.270 | 101.200 | | 40.249 | 101.201 | Ohm-m | 1.000 | -0.035 |
| Long | 142.491 | 102.843 | | 102.842 | 102.842 | Ohm-m | 1.004 | -0.383 |
| IEE | 213.380 | 7077.580 | counts | 0.234 | 7.746 | A | | |
| VSN | 96.540 | 8047.160 | counts | 1.841 | 153.490 | V | | |
| VLN | 85.400 | 2044.440 | counts | 1.629 | 38.995 | V | | |

### After Survey Verification compared to Before Survey Calibration

| | Zero | | | Cal | | |
|---|---|---|---|---|---|---|
| | Before | After | | Before | After | |
| Short | 40.505 | 40.249 | Ohm-m | 101.206 | 101.201 | Ohm-m |
| Long | 143.592 | 142.638 | Ohm-m | 102.858 | 102.842 | Ohm-m |

## Gamma Ray Calibration Report

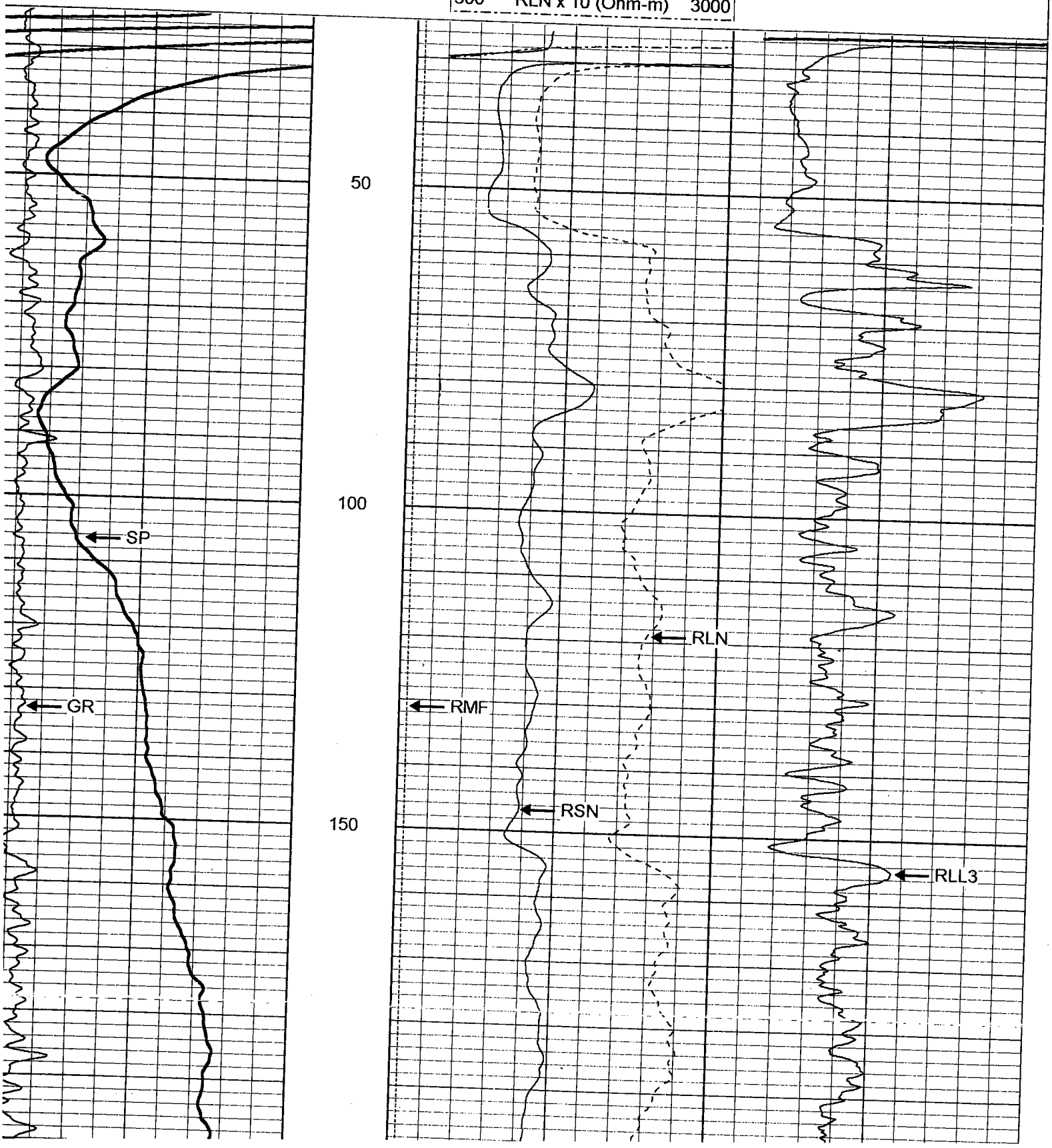
| | | |
|---|---|---|
| Serial Number: | D4 | |
| Tool Model: | ELOG | |
| Performed: | Thu Feb 12 15:16:57 2004 | |
| Calibrator Value: | 162.0 | GAPI |
| Background Reading: | 172.5 | cps |
| Calibrator Reading: | 717.9 | cps |
| Sensitivity: | 0.2970 | GAPI/cps |

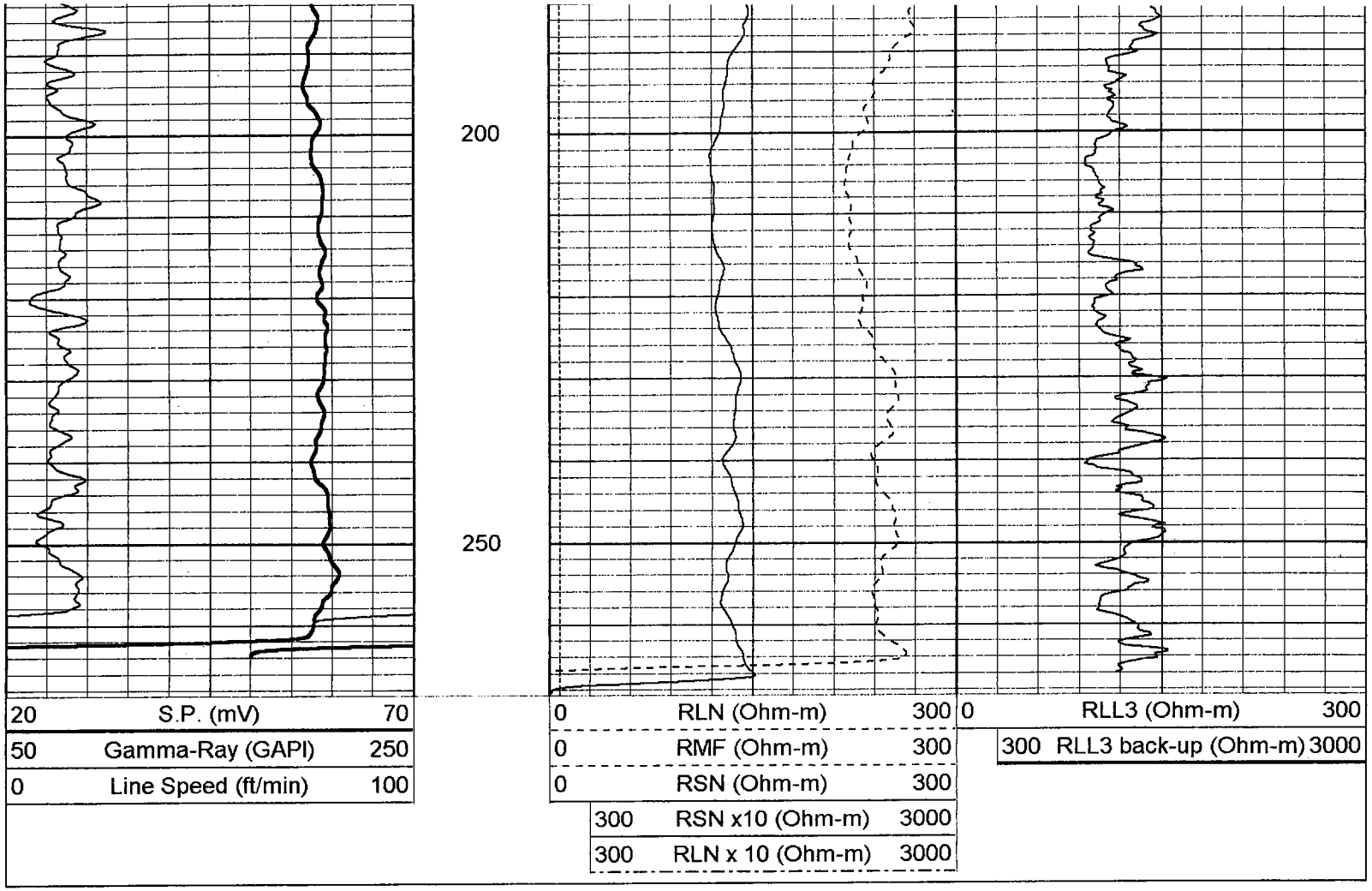
Database File: 11266.db
Dataset Pathname: WDC/EW1/run1/ELOG
Presentation Format: elog2
Dataset Creation: Mon Mar 01 19:09:35 2004 by Log Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240

| | | |
|---|---|---|
| 20 | S.P. (mV) | 70 |
| 50 | Gamma-Ray (GAPI) | 250 |
| 0 | Line Speed (ft/min) | 100 |

| | | |
|---|---|---|
| 0 | RLN (Ohm-m) | 300 |
| 0 | RMF (Ohm-m) | 300 |
| 0 | RSN (Ohm-m) | 300 |
| 300 | RSN x10 (Ohm-m) | 3000 |
| 300 | RLN x 10 (Ohm-m) | 3000 |

| | | |
|---|---|---|
| 0 | RLL3 (Ohm-m) | 300 |
| 300 | RLL3 back-up (Ohm-m) | 3000 |




200
250
20 S.P. (mV) 70
50 Gamma-Ray (GAPI) 250
0 Line Speed (ft/min) 100
0 RLN (Ohm-m) 300
0 RMF (Ohm-m) 300
0 RSN (Ohm-m) 300
300 RSN x10 (Ohm-m) 3000
300 RLN x 10 (Ohm-m) 3000
0 RLL3 (Ohm-m) 300
300 RLL3 back-up (Ohm-m) 3000

[redacted]

**PACIFIC SURVEYS**

# SONIC VELOCITY VARIABLE DENSITY

| Job No. | | |
|---|---|---|
| 11269 | Company | WDC EXPLORATION & WELLS |
| | Well | EW-2 |
| | Field | JPL |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| MARS YARD | LL3/GR<br>ELOG |
| Sec. Twp. Rge. | |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation | Elevation |
| Log Measured From | G.L. | 0 | above perm. datum | K.B.<br>D.F.<br>G.L. |
| Drilling Measured From | G.L. | | | |

| | | | |
|---|---|---|---|
| Date | 03-05-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 320' | | |
| Bottom Logged Interval | 320' | | |
| Top Log Interval | 0' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.8 @ 77F | | |
| Rmf @ Meas. Temp | 8.1 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 1100 | | |
| Time Logger on Bottom | 1220 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | B. HEADINGTON | | |

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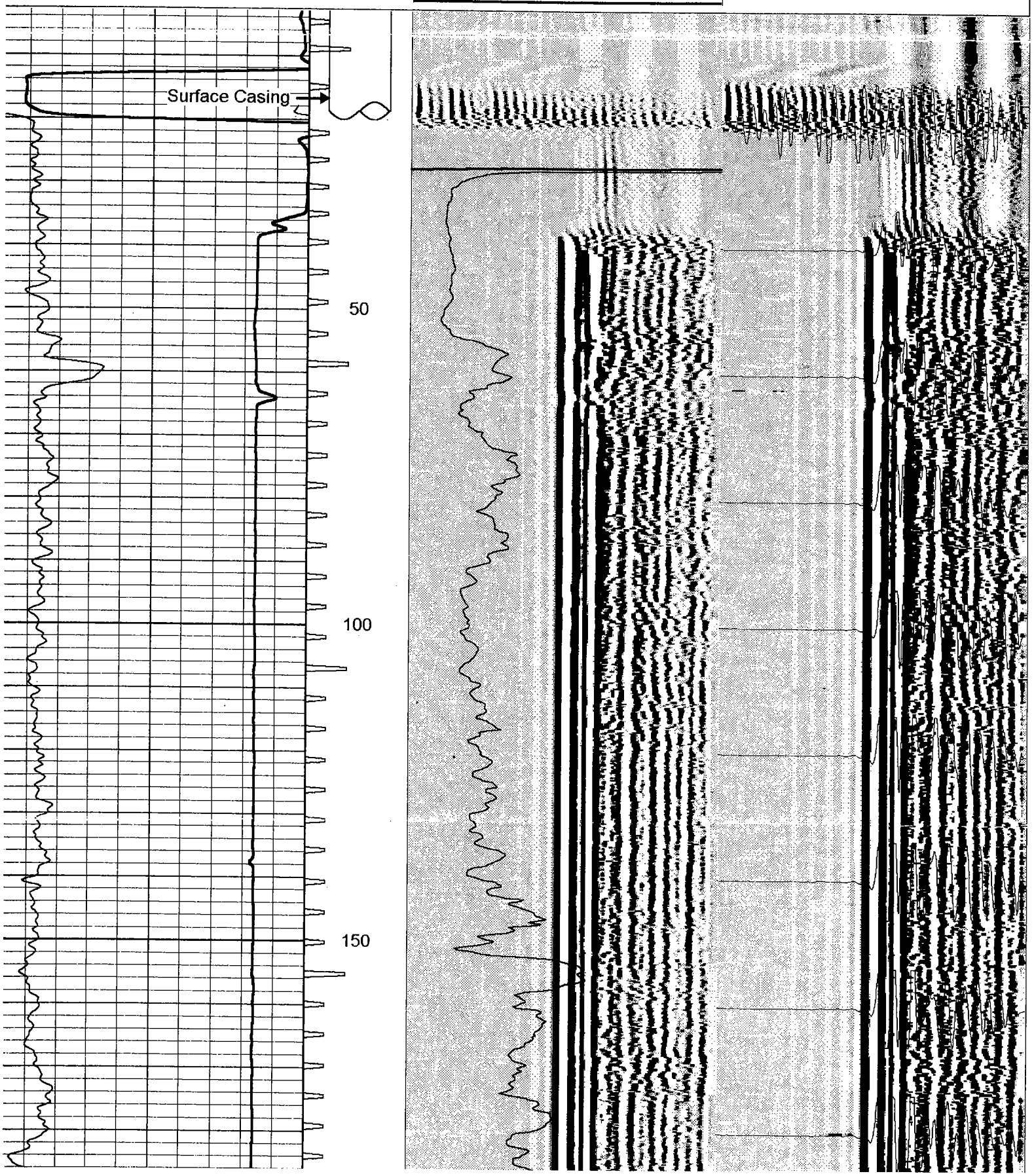
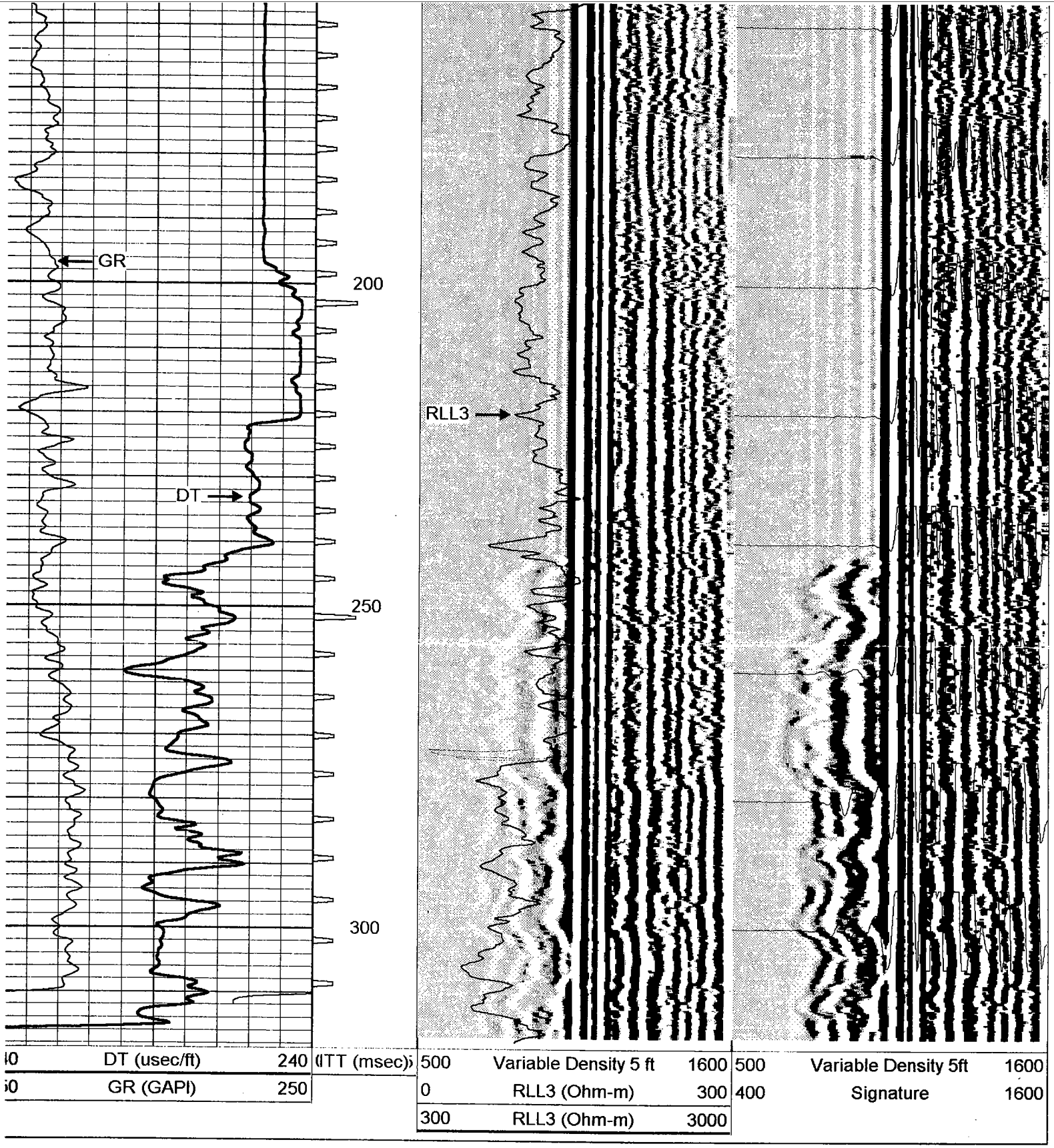
Comments

Database File: 11269.db
Dataset Pathname: WDC/EW2/run1/SONIC.1
Presentation Format: slt
Dataset Creation: Fri Mar 05 17:12:58 2004 by Calc Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40 | DT (usec/ft) | 240 | ITT (msec) | 500 | Variable Density 5 ft | 1600 | 500 | Variable Density 5ft | 1600 |
| 50 | GR (GAPI) | 250 | | 0 | RLL3 (Ohm-m) | 300 | 400 | Signature | 1600 |
| | | | | 300 | RLL3 (Ohm-m) | 3000 | | | |




GR
DT
RLL3
200
250
300
0 DT (usec/ft) 240
0 GR (GAPI) 250
ITT (msec)
500 Variable Density 5 ft 1600
0 RLL3 (Ohm-m) 300
300 RLL3 (Ohm-m) 3000
500 Variable Density 5ft 1600
400 Signature 1600

**PACIFIC SURVEYS**

# LATEROLOG 3
# GAMMA-RAY

Job No.
11269

| | |
|---|---|
| Company | WDC EXPLORATION & WELLS |
| Well | EW-2 |
| Field | JPL |
| County | LOS ANGELES State CA |

Location:

MARS YARD

Sec. Twp. Rge.

Other Services:

SONIC/VDL
ELOG

| | | | |
|---|---|---|---|
| Permanent Datum | G.L. | Elevation above perm. datum | Elevation |
| Log Measured From | G.L. 0 | | K.B. |
| Drilling Measured From | G.L. | | D.F. |
| | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 03-05-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 320' | | |
| Bottom Logged Interval | 320' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.8 @ 77F | | |
| Rmf @ Meas. Temp | 8.1 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 1100 | | |
| Time Logger on Bottom | 1220 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | B. HEADINGTON | | |

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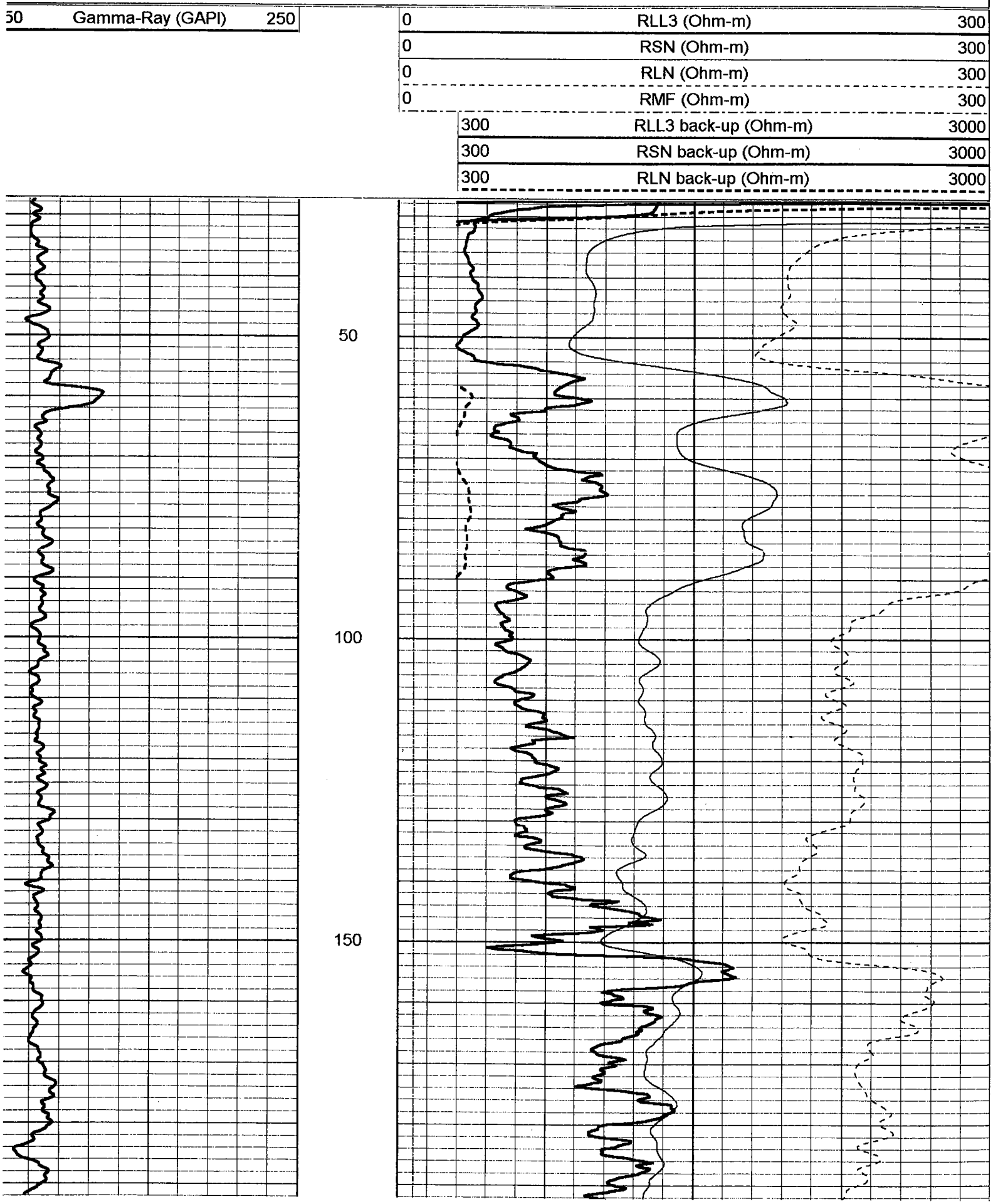
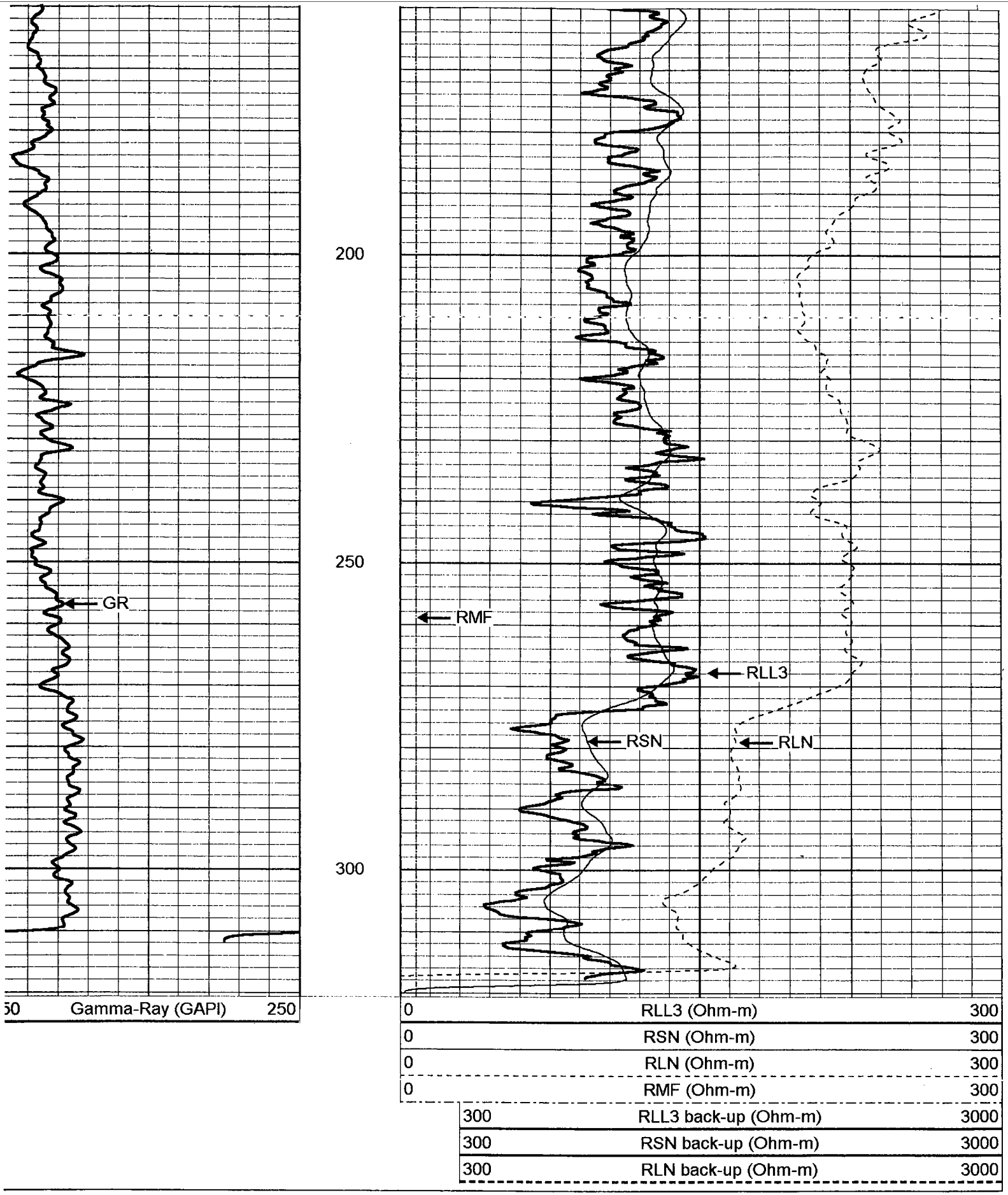
All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, 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 our general terms and conditions set out in our current Price Schedule.

Comments

Database File: 11269.db
Dataset Pathname: WDC/EW2/run1/LL3
Presentation Format: guard
Dataset Creation: Fri Mar 05 16:01:32 2004 by Log Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240




200
250
300
GR
RMF
RLL3
RSN
RLN
50
Gamma-Ray (GAPI)
250
0
RLL3 (Ohm-m)
300
0
RSN (Ohm-m)
300
0
RLN (Ohm-m)
300
0
RMF (Ohm-m)
300
300
RLL3 back-up (Ohm-m)
3000
300
RSN back-up (Ohm-m)
3000
300
RLN back-up (Ohm-m)
3000

**PACIFIC SURVEYS**

# ELECTRIC LOG
# LATEROLOG 3
# GAMMA-RAY

Job No. 11269

| | |
|---|---|
| Company | WDC EXPLORATION & WELLS |
| Well | EW-2 |
| Field | JPL |
| County | LOS ANGELES State CA |

Location:

MARS YARD

Sec. Twp. Rge.

Other Services:

SONIC/VDL
LL3/GR

| | | | |
|---|---|---|---|
| Permanent Datum | G.L. | Elevation above perm. datum | Elevation |
| Log Measured From | G.L. 0 | | K.B. |
| Drilling Measured From | G.L. | | D.F. |
| | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 03-05-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 320' | | |
| Bottom Logged Interval | 320' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.8 @ 77F | | |
| Rmf @ Meas. Temp | 8.1 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 1100 | | |
| Time Logger on Bottom | 1220 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | B. HEADINGTON | | |

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Comments

## ELOG Calibration Report

| | |
|---|---|
| Serial: | D4 |
| Model: | DTQ |
| Shop Calibration Performed: | Fri Mar 05 12:34:20 2004 |
| Before Survey Verification Performed: | Fri Feb 20 12:30:51 2004 |
| After Survey Verification Performed: | Fri Feb 20 12:31:33 2004 |

### Shop Calibration

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 8.145 | 99.832 | | 10.200 | 102.200 | Ohm-m | 1.003 | 2.027 |
| Long | 3.682 | 92.993 | | 10.200 | 102.200 | Ohm-m | 1.030 | -17.407 |
| IEE | 198.160 | 7003.960 | counts | 0.217 | 7.665 | A | | |
| VSN | 75.060 | 7966.720 | counts | 1.432 | 151.955 | V | | |
| VLN | 83.860 | 2024.120 | counts | 1.600 | 38.608 | V | | |

### Before Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.249 | 101.201 | | 40.505 | 101.206 | Ohm-m | 0.996 | 0.422 |
| Long | 142.638 | 102.842 | | 102.858 | 102.858 | Ohm-m | 1.024 | -2.408 |
| IEE | 212.960 | 7070.960 | counts | 0.233 | 7.738 | A | | |
| VSN | 96.300 | 8039.720 | counts | 1.837 | 153.348 | V | | |
| VLN | 85.320 | 2042.520 | counts | 1.627 | 38.959 | V | | |

### After Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.270 | 101.200 | | 40.249 | 101.201 | Ohm-m | 1.000 | -0.035 |
| Long | 142.491 | 102.843 | | 102.842 | 102.842 | Ohm-m | 1.004 | -0.383 |
| IEE | 213.380 | 7077.580 | counts | 0.234 | 7.746 | A | | |
| VSN | 96.540 | 8047.160 | counts | 1.841 | 153.490 | V | | |
| VLN | 85.400 | 2044.440 | counts | 1.629 | 38.995 | V | | |

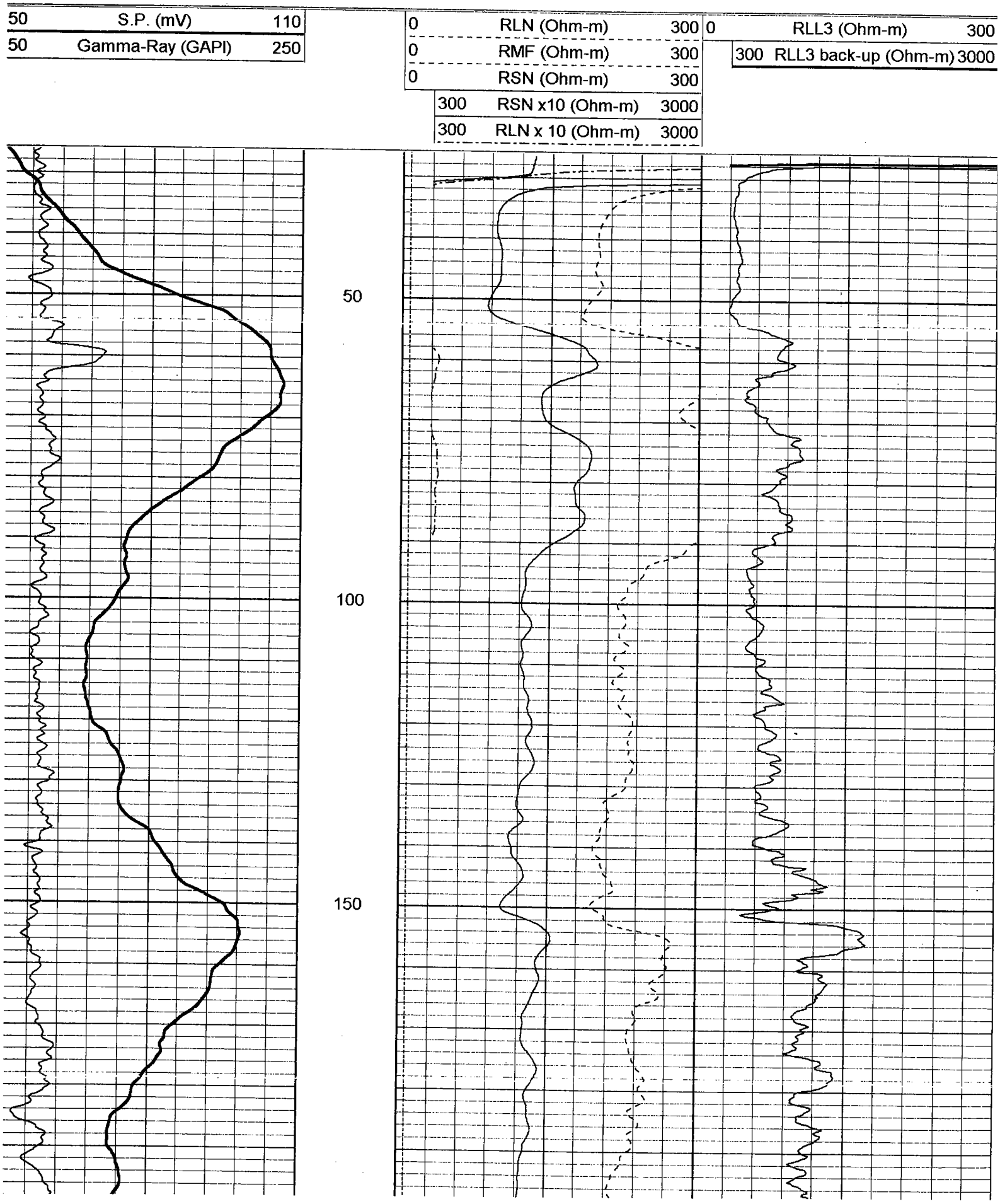
### After Survey Verification compared to Before Survey Calibration

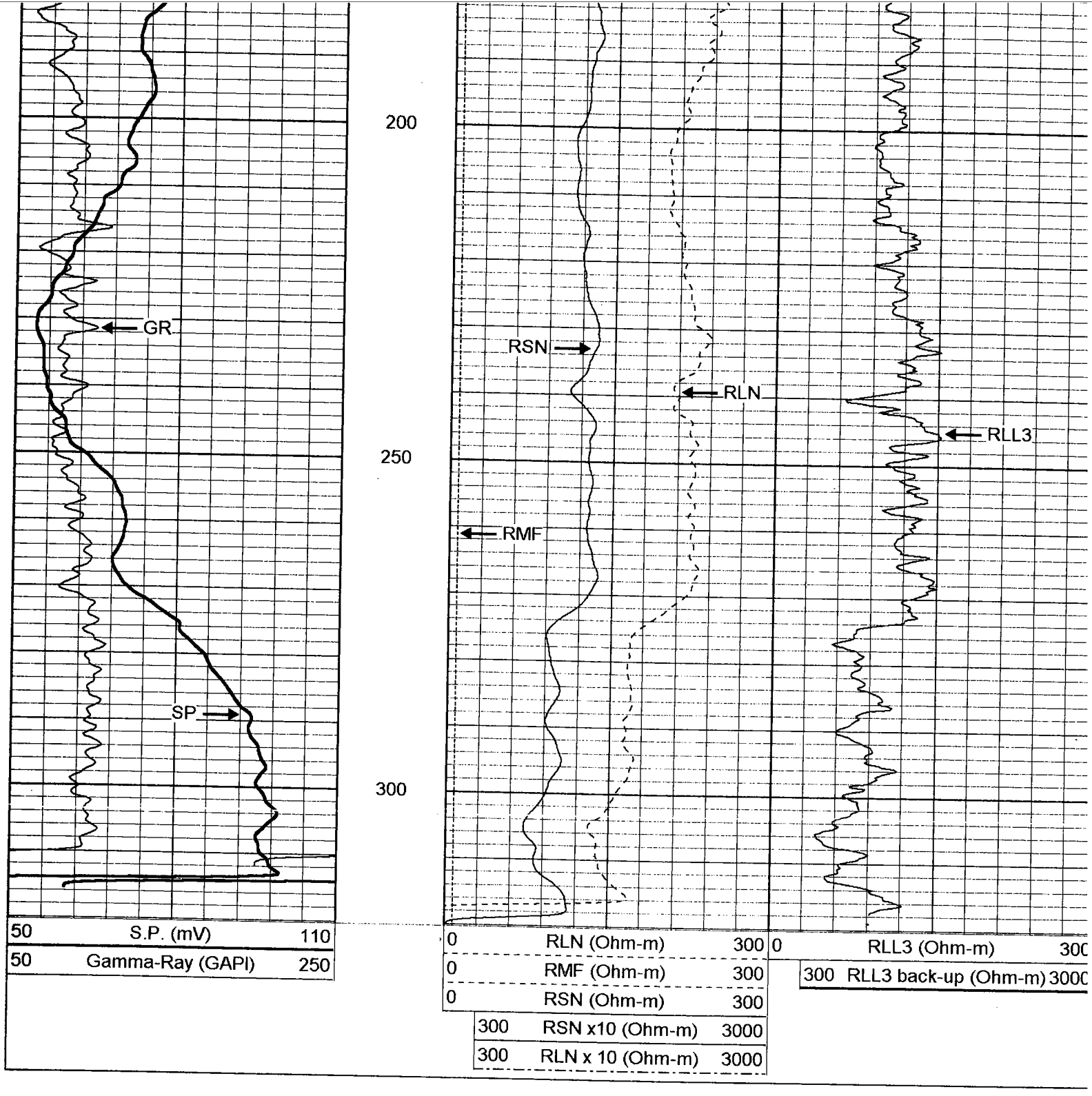
| | Zero | | | Cal | | |
|---|---|---|---|---|---|---|
| | Before | After | | Before | After | |
| Short | 40.505 | 40.249 | Ohm-m | 101.206 | 101.201 | Ohm-m |
| Long | 143.592 | 142.638 | Ohm-m | 102.858 | 102.842 | Ohm-m |

## Gamma Ray Calibration Report

| | | |
|---|---|---|
| Serial Number: | D4 | |
| Tool Model: | ELOG | |
| Performed: | Thu Feb 12 15:16:57 2004 | |
| Calibrator Value: | 162.0 | GAPI |
| Background Reading: | 172.5 | cps |
| Calibrator Reading: | 717.9 | cps |
| Sensitivity: | 0.2970 | GAPI/cps |

Database File: 11269.db
Dataset Pathname: WDC/EW2/run1/ELOG2.1
Presentation Format: elog2
Dataset Creation: Fri Mar 05 16:04:38 2004 by Calc Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240




200
250
300
GR
SP
RSN
RLN
RLL3
RMF
50 S.P. (mV) 110
50 Gamma-Ray (GAPI) 250
0 RLN (Ohm-m) 300
0 RMF (Ohm-m) 300
0 RSN (Ohm-m) 300
300 RSN x10 (Ohm-m) 3000
300 RLN x 10 (Ohm-m) 3000
0 RLL3 (Ohm-m) 300
300 RLL3 back-up (Ohm-m) 3000

**PACIFIC SURVEYS**

# ELECTRIC LOG
# GAMMA-RAY

| Job No. | | |
|---|---|---|
| 11250 | Company | WDC EXPLORATION & WELLS |
| | Well | INJECTION WELL No.1 |
| | Field | JPL |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| MARS YARD<br>Sec. Twp. Rge. | SONIC/VDL |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation above perm. datum | Elevation |
| Log Measured From | G.L. | 0 | | K.B. |
| Drilling Measured From | G.L. | | | D.F.<br>G.L. |

| | | | |
|---|---|---|---|
| Date | 02-25-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 320' | | |
| Bottom Logged Interval | 320' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.07 @ 77F | | |
| Rmf @ Meas. Temp | 5.89 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 09:45 | | |
| Time Logger on Bottom | 10:51 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | RIDDER | | |
| Witnessed By | B. HEADINGTON | | |

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Comments

## ELOG Calibration Report

| | |
|---|---|
| Serial: | D4 |
| Model: | DTQ |
| Shop Calibration Performed: | Wed Feb 25 09:18:39 2004 |
| Before Survey Verification Performed: | Fri Feb 20 12:30:51 2004 |
| After Survey Verification Performed: | Fri Feb 20 12:31:33 2004 |

### Shop Calibration

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 8.138 | 99.809 | | 10.200 | 102.200 | Ohm-m | 1.004 | 2.033 |
| Long | 3.548 | 93.177 | | 10.200 | 102.200 | Ohm-m | 1.026 | -17.000 |
| IEE | 211.000 | 7071.540 | counts | 0.231 | 7.739 | A | | |
| VSN | 96.020 | 8040.740 | counts | 1.831 | 153.367 | V | | |
| VLN | 85.100 | 2043.000 | counts | 1.623 | 38.968 | V | | |

### Before Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.249 | 101.201 | | 40.505 | 101.206 | Ohm-m | 0.996 | 0.422 |
| Long | 142.638 | 102.842 | | 102.858 | 102.858 | Ohm-m | 1.024 | -2.408 |
| IEE | 212.960 | 7070.960 | counts | 0.233 | 7.738 | A | | |
| VSN | 96.300 | 8039.720 | counts | 1.837 | 153.348 | V | | |
| VLN | 85.320 | 2042.520 | counts | 1.627 | 38.959 | V | | |

### After Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.270 | 101.200 | | 40.249 | 101.201 | Ohm-m | 1.000 | -0.035 |
| Long | 142.491 | 102.843 | | 102.842 | 102.842 | Ohm-m | 1.004 | -0.383 |
| IEE | 213.380 | 7077.580 | counts | 0.234 | 7.746 | A | | |
| VSN | 96.540 | 8047.160 | counts | 1.841 | 153.490 | V | | |
| VLN | 85.400 | 2044.440 | counts | 1.629 | 38.995 | V | | |

### After Survey Verification compared to Before Survey Calibration

| | Zero | | | Cal | | |
|---|---|---|---|---|---|---|
| | Before | After | | Before | After | |
| Short | 40.505 | 40.249 | Ohm-m | 101.206 | 101.201 | Ohm-m |
| Long | 143.592 | 142.638 | Ohm-m | 102.858 | 102.842 | Ohm-m |

## Gamma Ray Calibration Report

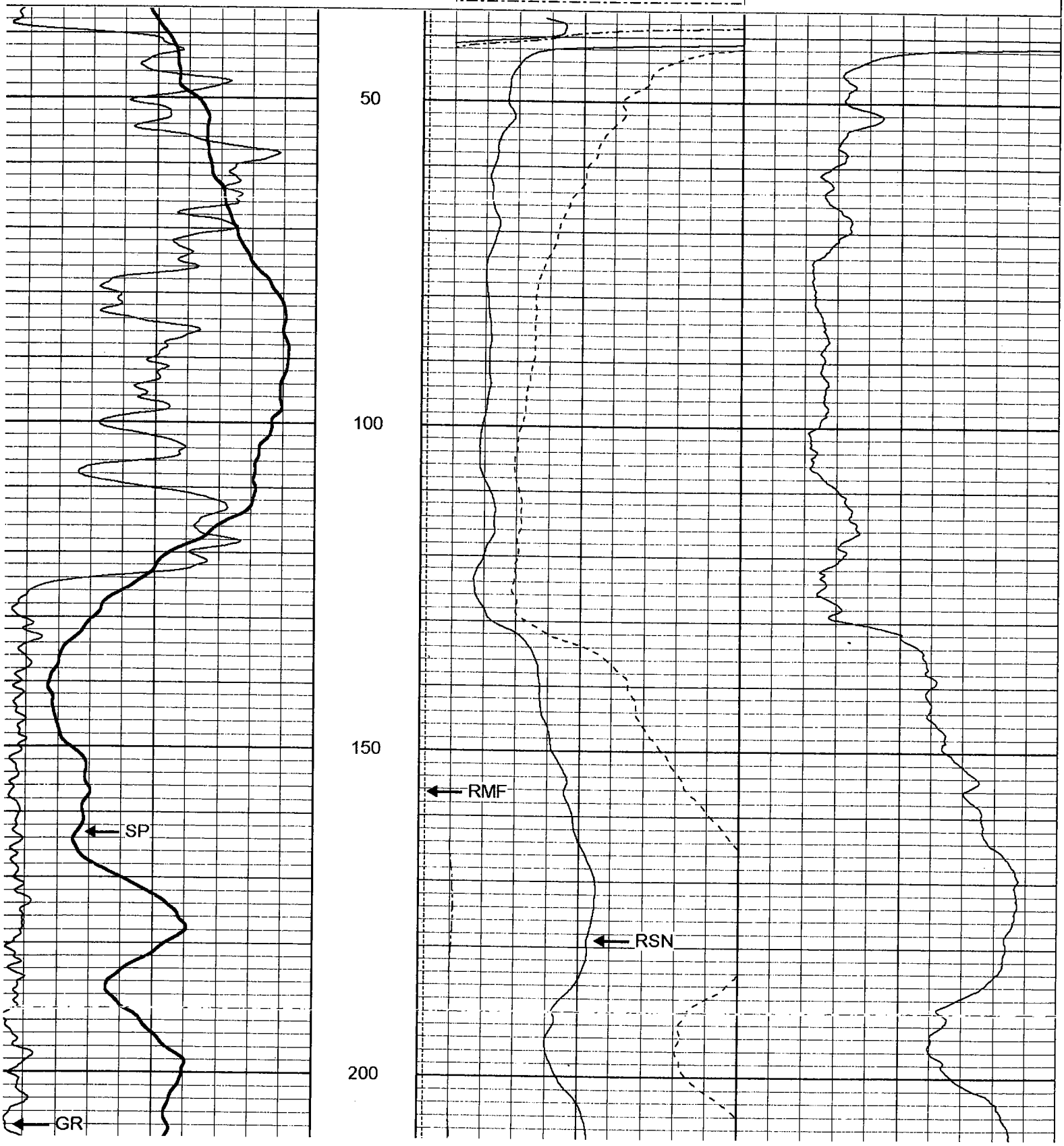
| | | |
|---|---|---|
| Serial Number: | D4 | |
| Tool Model: | ELOG | |
| Performed: | Thu Feb 12 15:16:57 2004 | |
| Calibrator Value: | 162.0 | GAPI |
| Background Reading: | 172.5 | cps |
| Calibrator Reading: | 717.9 | cps |
| Sensitivity: | 0.2970 | GAPI/cps |

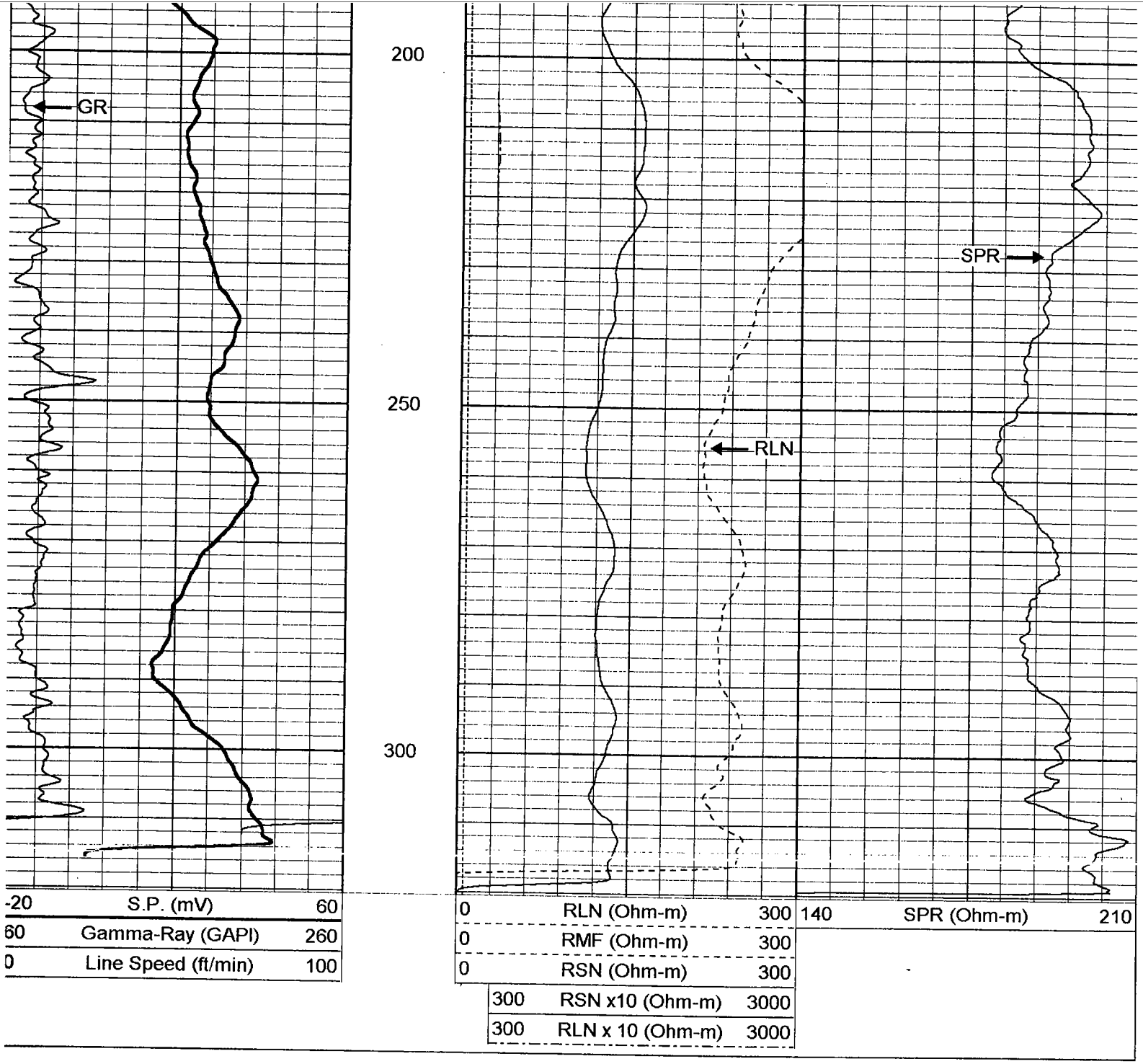
Database File: 11250.db
Dataset Pathname: WDC/well/run1/Elog
Presentation Format: elog2
Dataset Creation: Wed Feb 25 13:47:47 2004 by Log Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240

| | | |
|---|---|---|
| -20 | S.P. (mV) | 60 |
| 60 | Gamma-Ray (GAPI) | 260 |
| 0 | Line Speed (ft/min) | 100 |

| | | |
|---|---|---|
| 0 | RLN (Ohm-m) | 300 |
| 0 | RMF (Ohm-m) | 300 |
| 0 | RSN (Ohm-m) | 300 |
| 300 | RSN x10 (Ohm-m) | 3000 |
| 300 | RLN x 10 (Ohm-m) | 3000 |

| | | |
|---|---|---|
| 140 | SPR (Ohm-m) | 210 |




GR
200
250
300
RLN
SPR
-20 S.P. (mV) 60
60 Gamma-Ray (GAPI) 260
0 Line Speed (ft/min) 100
0 RLN (Ohm-m) 300
0 RMF (Ohm-m) 300
0 RSN (Ohm-m) 300
300 RSN x10 (Ohm-m) 3000
300 RLN x 10 (Ohm-m) 3000
140 SPR (Ohm-m) 210

**PACIFIC SURVEYS**

# SONIC VELOCITY VARIABLE DENSITY

| Job No. | | |
|---|---|---|
| 11250 | Company | WDC EXPLORATION & WELLS |
| | Well | INJECTION WELL No.1 |
| | Field | JPL |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| MARS YARD | ELOG<br>GAMMA-RAY |
| Sec. Twp. Rge. | |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation | Elevation |
| Log Measured From | G.L. | 0 | above perm. datum | K.B. |
| Drilling Measured From | G.L. | | | D.F.<br>G.L. |

| | | | |
|---|---|---|---|
| Date | 02-25-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 320' | | |
| Bottom Logged Interval | 320' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.07 @ 77F | | |
| Rmf @ Meas. Temp | 5.89 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 09:45 | | |
| Time Logger on Bottom | 10:51 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | RIDDER | | |
| Witnessed By | B. HEADINGTON | | |

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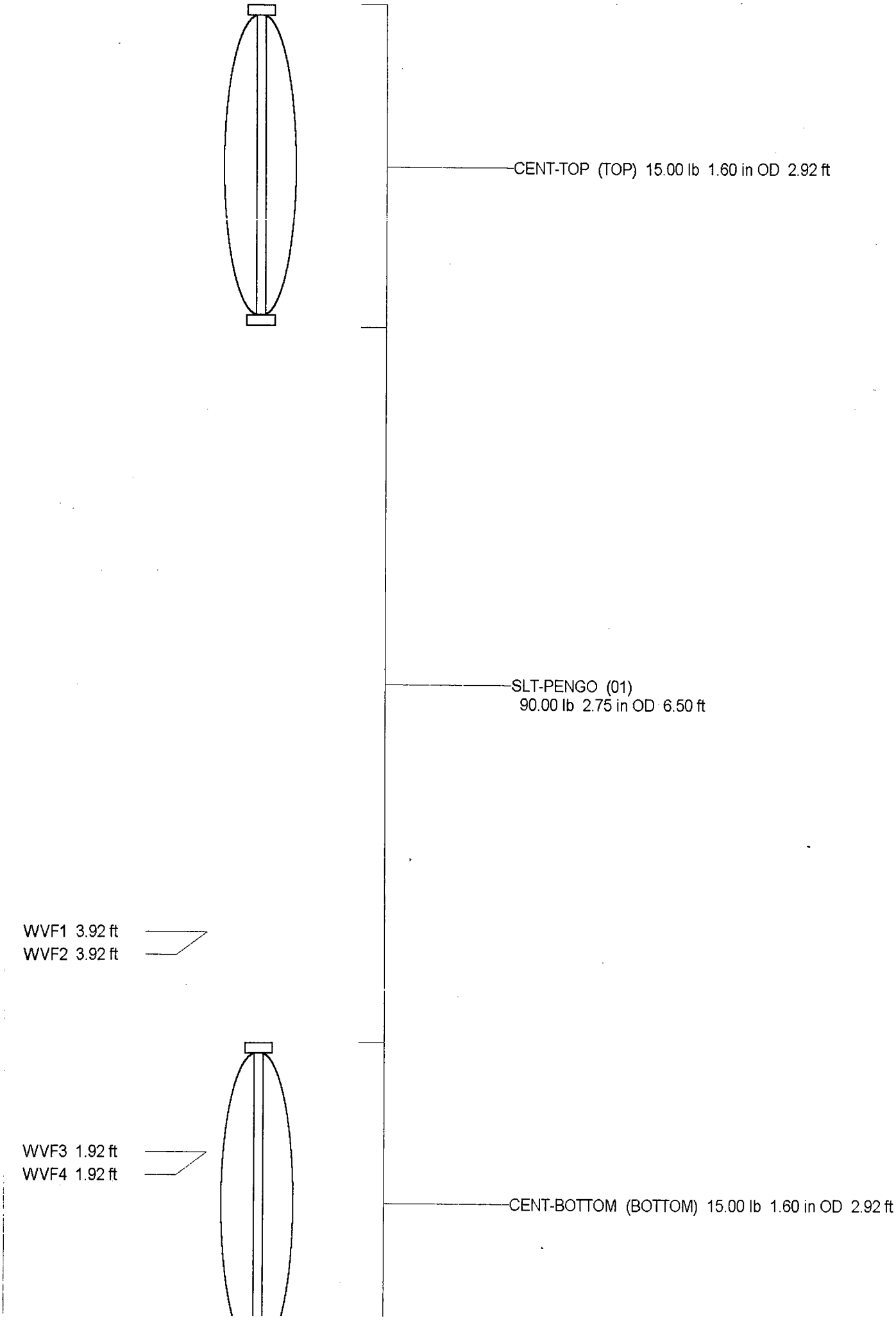
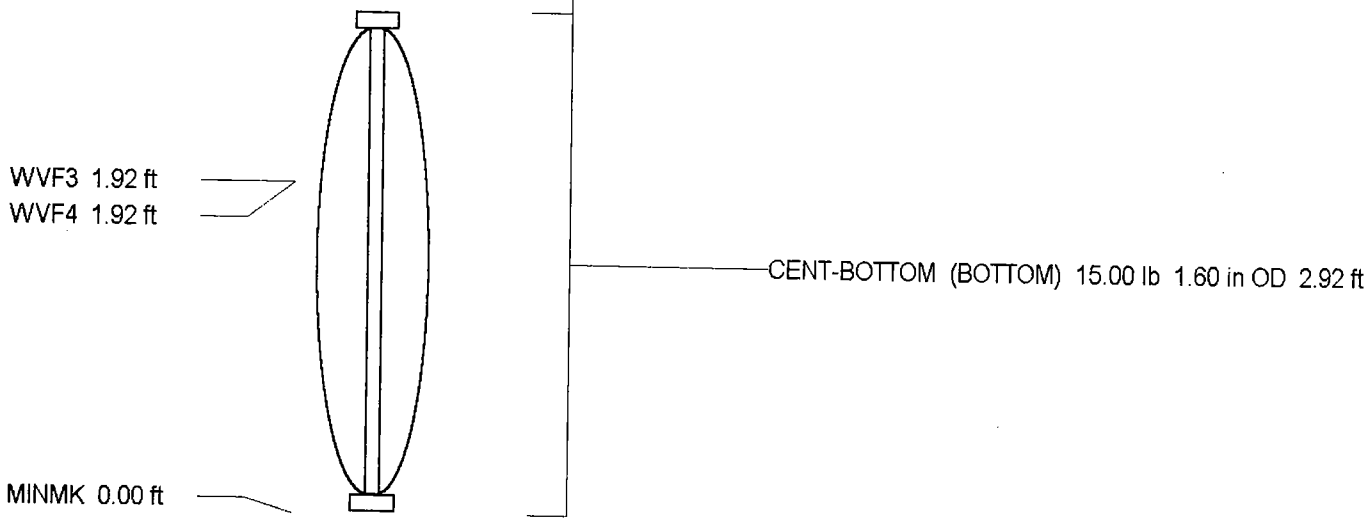
Comments

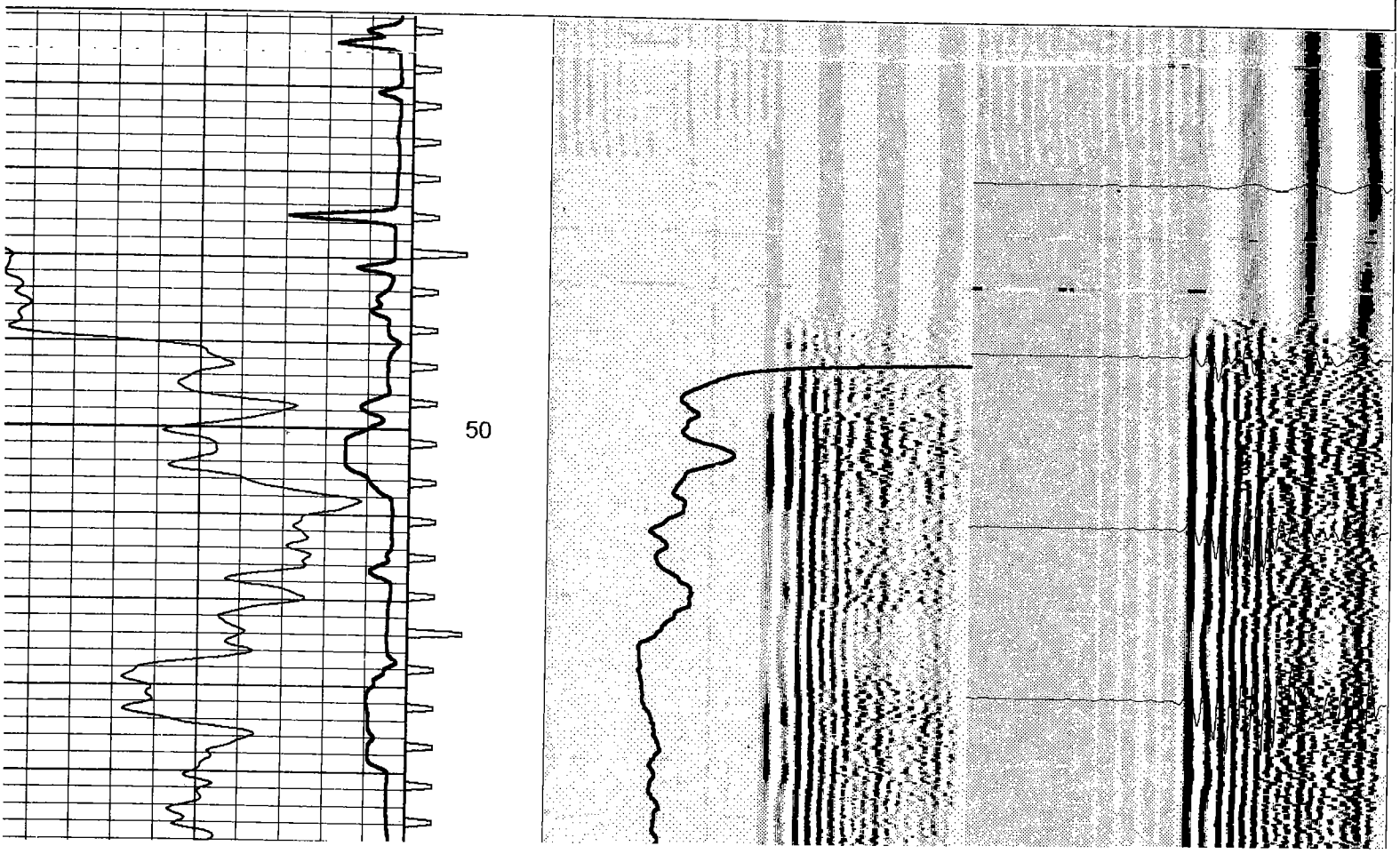

CENT-TOP (TOP) 15.00 lb 1.60 in OD 2.92 ft
SLT-PENGO (01)
90.00 lb 2.75 in OD 6.50 ft
WVF1 3.92 ft
WVF2 3.92 ft
WVF3 1.92 ft
WVF4 1.92 ft
CENT-BOTTOM (BOTTOM) 15.00 lb 1.60 in OD 2.92 ft




| | |
|---|---|
| Dataset: | WDC/well/run1/SONIC |
| Total Length: | 12.33 ft |
| Total Weight: | 120.00 lb |
| O.D. | 2.75 in |

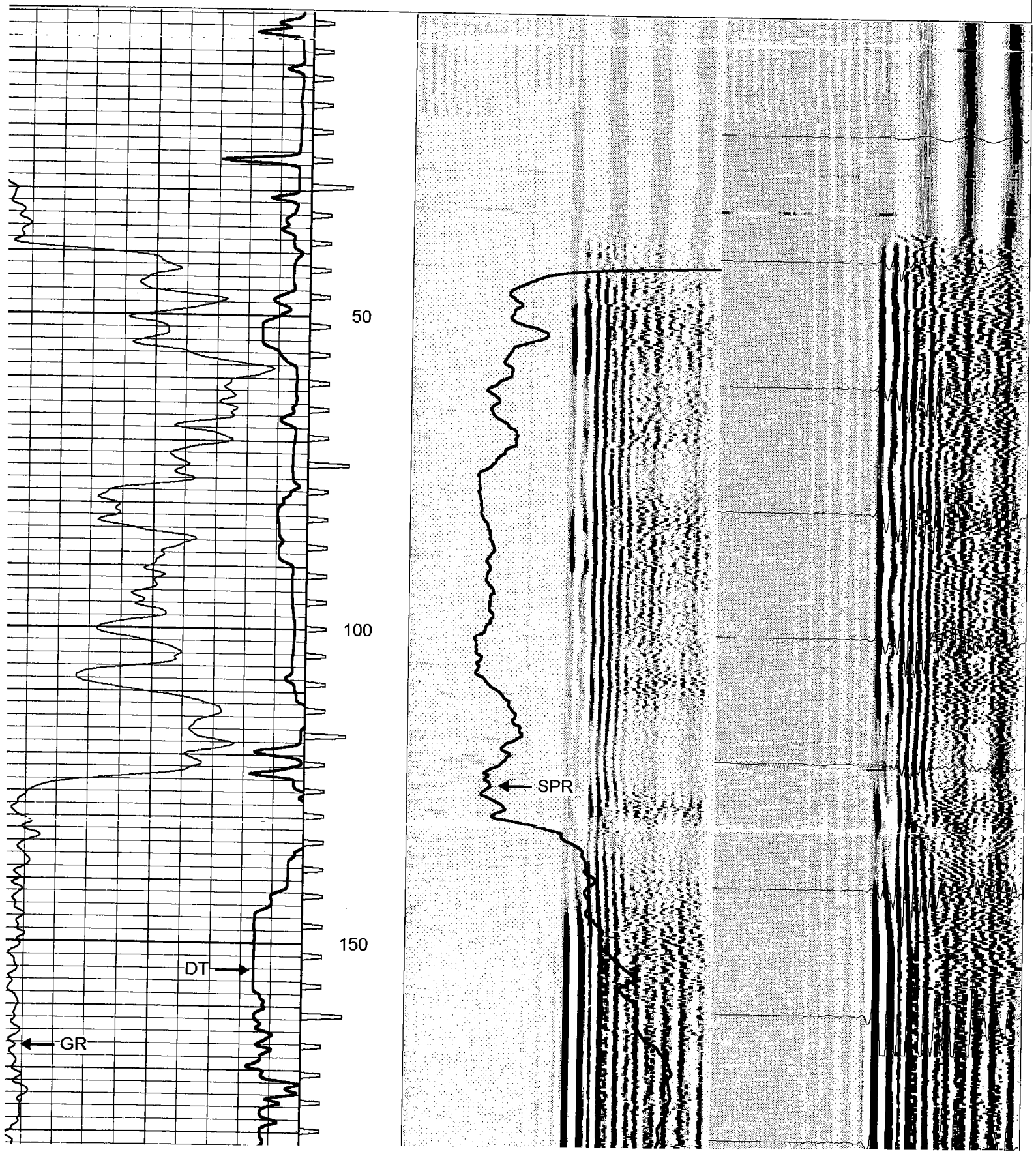
| | |
|---|---|
| Database File: | 11250.db |
| Dataset Pathname: | WDC/well/run1/SONIC |
| Presentation Format: | slt |
| Dataset Creation: | Wed Feb 25 14:18:59 2004 by Log Warrior 7.0 Standar |
| Charted by: | Depth in Feet scaled 1:240 |

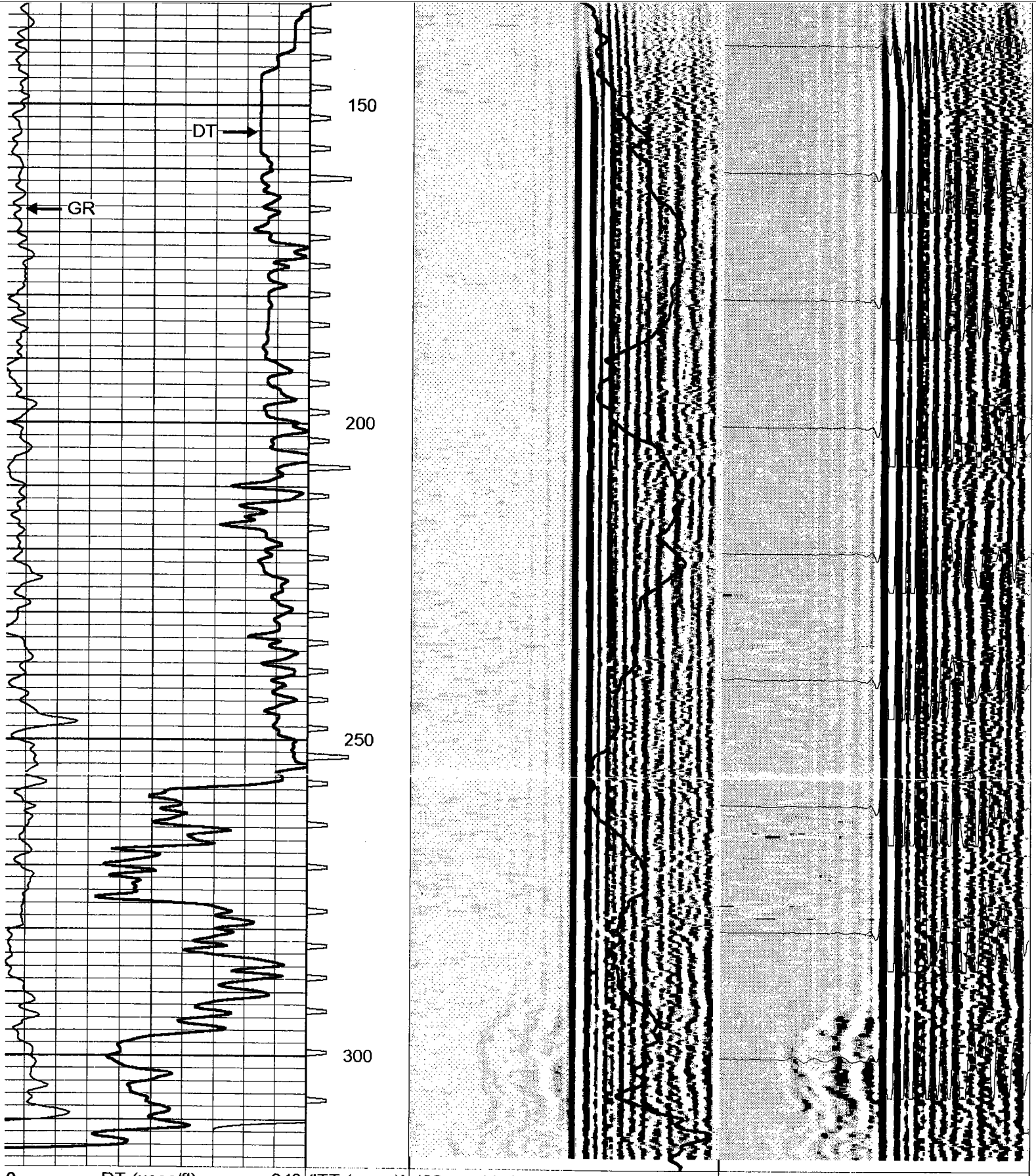
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | DT (usec/ft) | 240 | (ITT (msec)) | 400 | Variable Density 5 ft | 1600 | 400 | Variable Density 5ft | 1600 |
| 60 | GR (GAPI) | 260 | | 140 | SPR (Ohm-m) | 210 | 400 | Signature | 1600 |



Database File: 11250.db
Dataset Pathname: WDC/well/run1/SONIC
Presentation Format: slt
Dataset Creation: Wed Feb 25 14:18:59 2004 by Log Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | DT (usec/ft) | 240 | ITT (msec) | 400 | Variable Density 5 ft | 1600 | 400 | Variable Density 5ft | 1600 |
| 60 | GR (GAPI) | 260 | | 140 | SPR (Ohm-m) | 210 | 400 | Signature | 1600 |




150
DT
GR
200
250
300
0
DT (usec/ft)
240
(ITT (msec))
400
Variable Density 5 ft
1600
400
Variable Density 5ft
1600
0
GR (GAPI)
260
140
SPR (Ohm-m)
210
400
Signature
1600

**PACIFIC SURVEYS**

# SONIC VELOCITY VARIABLE DENSITY

| Job No. | | |
|---|---|---|
| 11278 | Company | WDC EXPLORATION & WELLS |
| | Well | INJECTION WELL No. 2 |
| | Field | JPL |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| MARS YARD | LL3/GR<br>ELOG |
| Sec. Twp. Rge. | |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation above perm. datum | Elevation |
| Log Measured From | G.L. | 0 | | K.B. |
| Drilling Measured From | G.L. | | | D.F.<br>G.L. |

| | | | |
|---|---|---|---|
| Date | 03-11-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 319' | | |
| Bottom Logged Interval | 319' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.4 @ 77F | | |
| Rmf @ Meas. Temp | 7.9 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 13:45 | | |
| Time Logger on Bottom | 15:00 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | RIDDER | | |
| Witnessed By | B. HEADINGTON | | |

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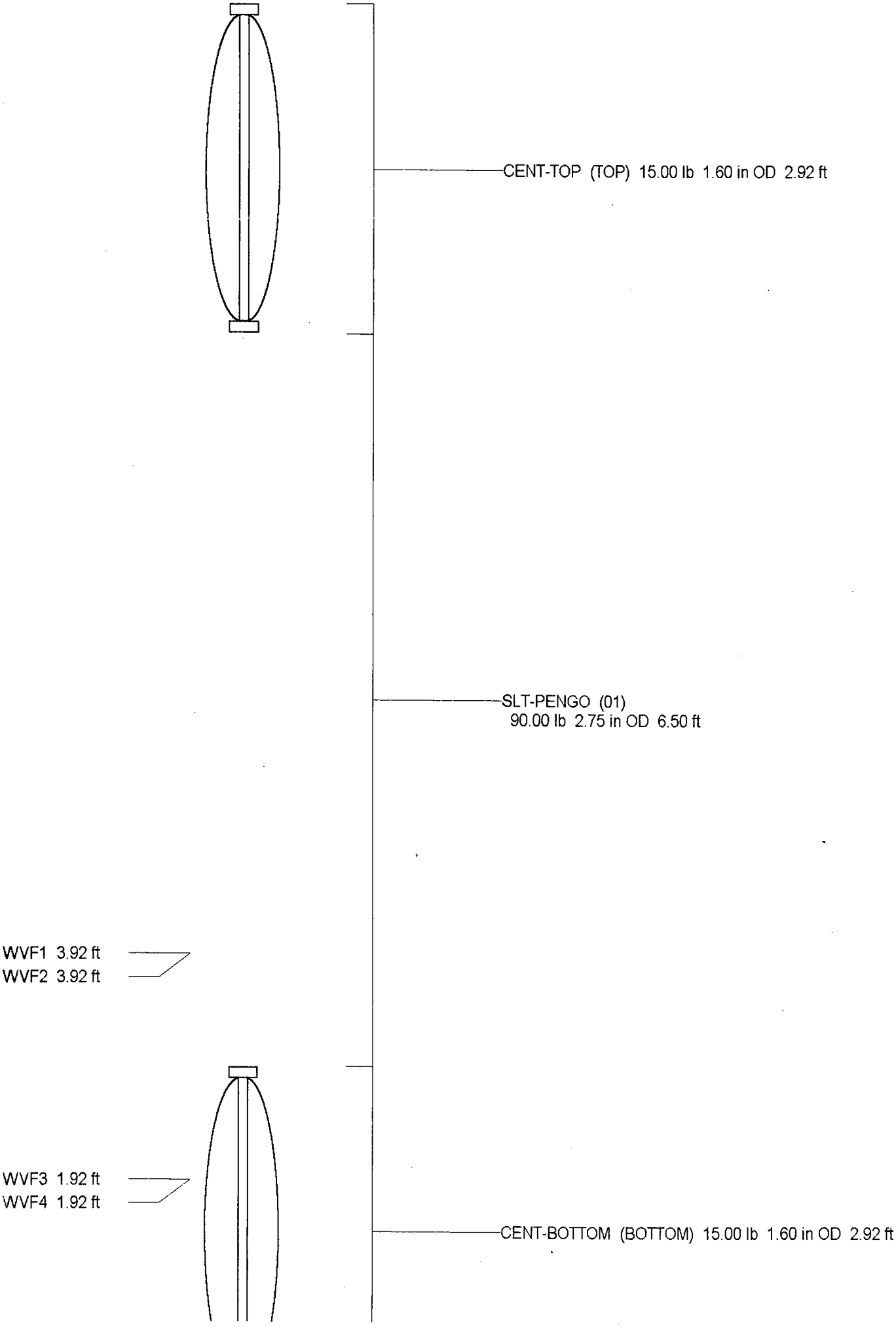
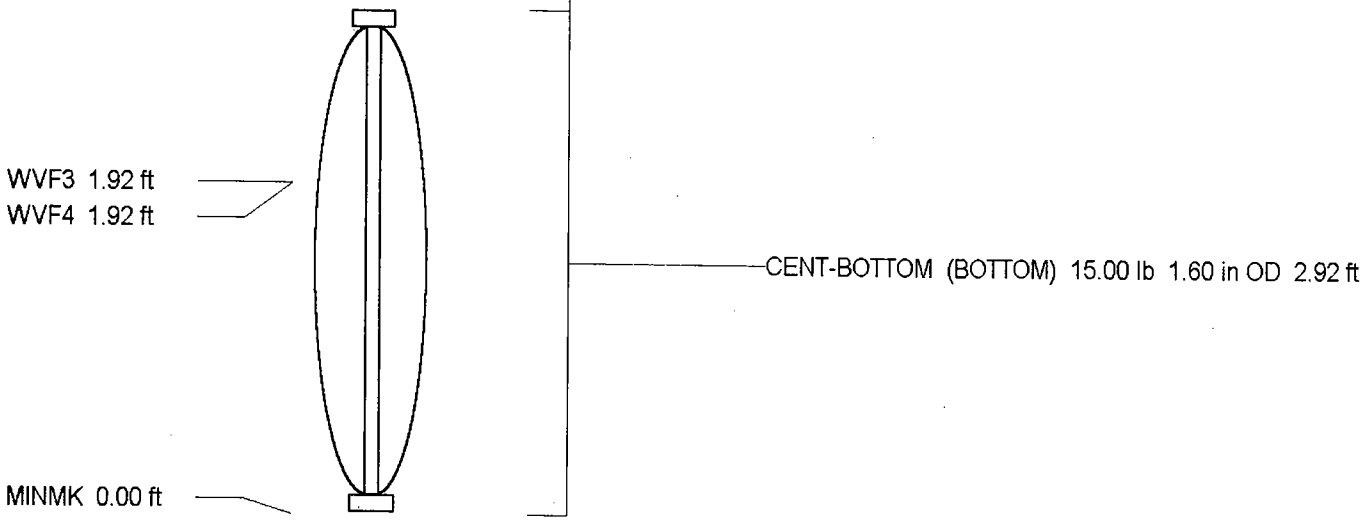
All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, 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 our general terms and conditions set out in our current Price Schedule.

Comments

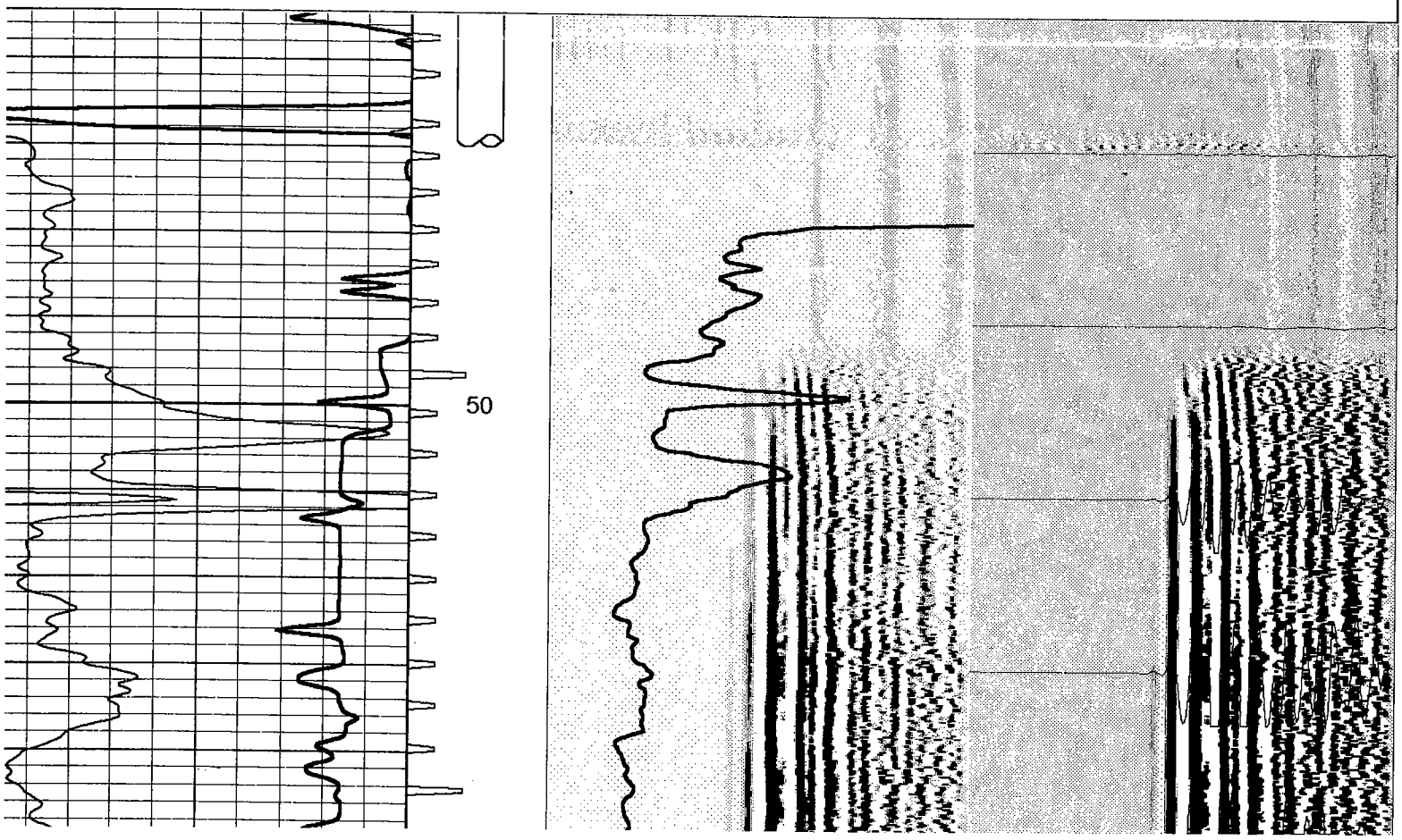

CENT-TOP (TOP) 15.00 lb 1.60 in OD 2.92 ft
SLT-PENGO (01)
90.00 lb 2.75 in OD 6.50 ft
WVF1 3.92 ft
WVF2 3.92 ft
WVF3 1.92 ft
WVF4 1.92 ft
CENT-BOTTOM (BOTTOM) 15.00 lb 1.60 in OD 2.92 ft




| | |
|---|---|
| Dataset: | WDC/well/run1/SONIC |
| Total Length: | 12.33 ft |
| Total Weight: | 120.00 lb |
| O.D. | 2.75 in |

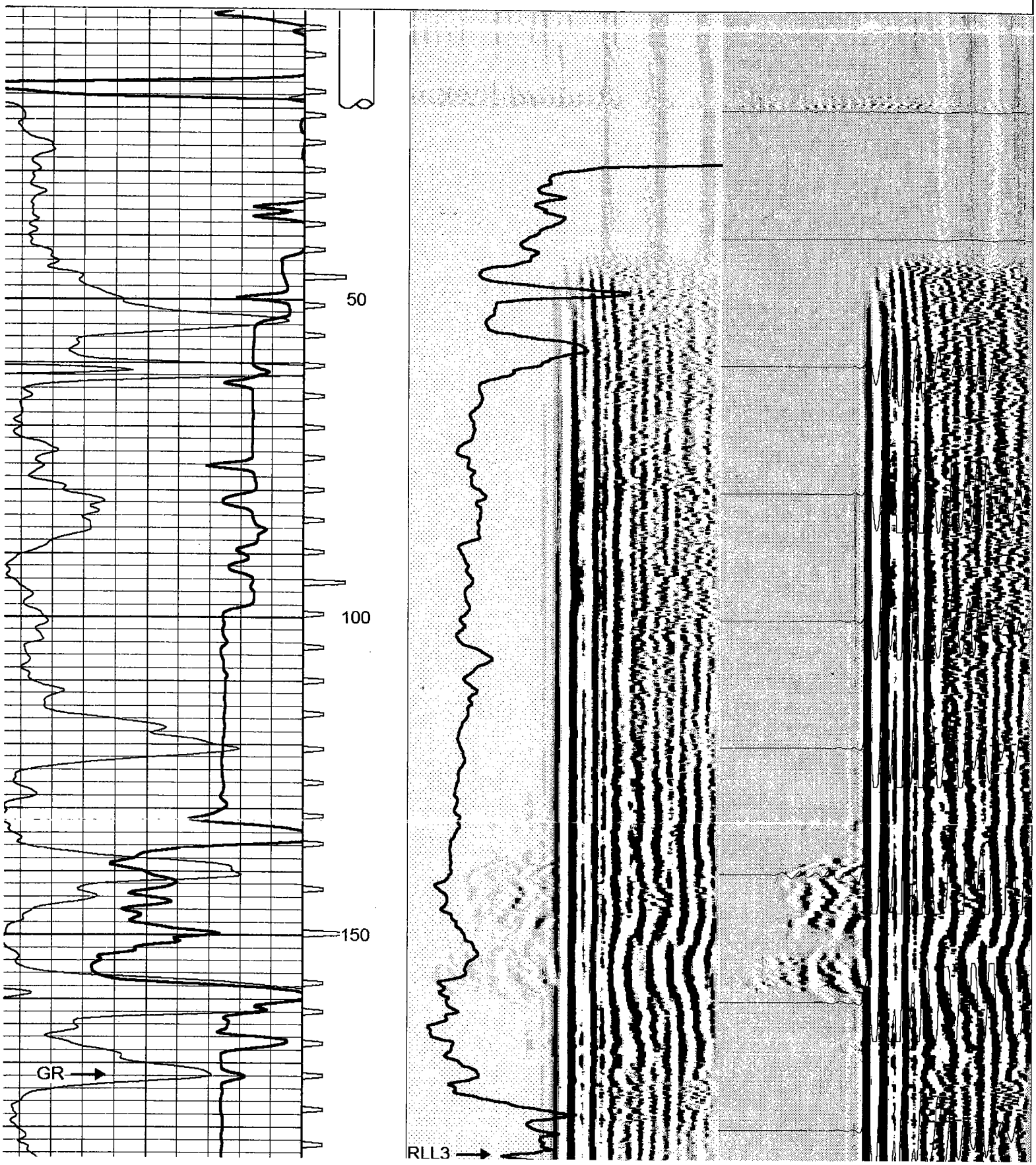
| | |
|---|---|
| Database File: | 11278.db |
| Dataset Pathname: | WDC/well/run1/SONIC |
| Presentation Format: | slt |
| Dataset Creation: | Thu Mar 11 18:52:25 2004 by Log Warrior 7.0 Standar |
| Charted by: | Depth in Feet scaled 1:240 |

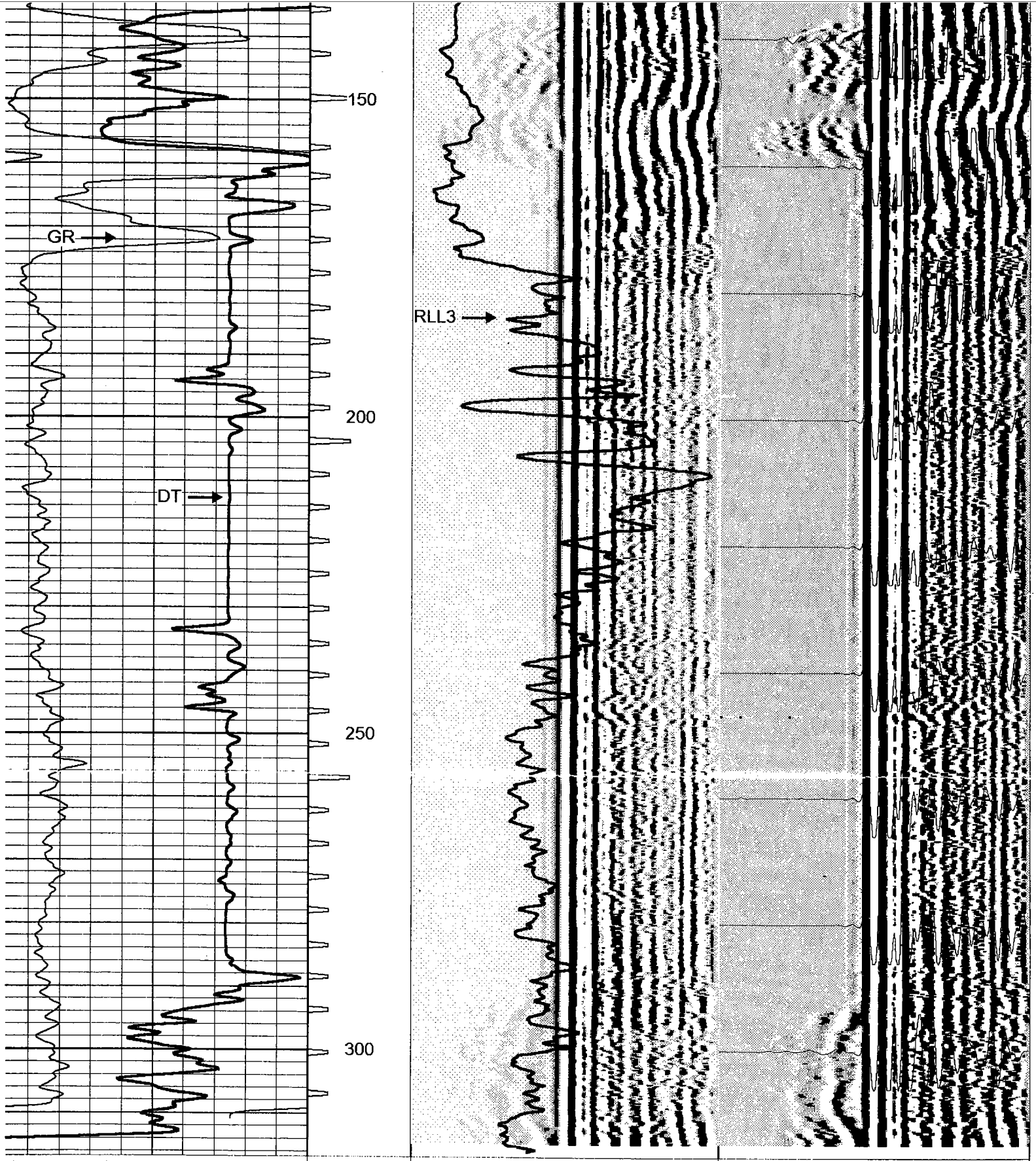
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | DT (usec/ft) | 240 | ITT (msec) | 500 | Variable Density 5 ft | 1600 | 500 | Variable Density 5ft | 1600 |
| 0 | Gamma-Ray (GAPI) | 250 | | 0 | RLL3 (Ohm-m) | 300 | 500 | Signature | 1600 |



| | |
|---|---|
| Database File: | 11278.db |
| Dataset Pathname: | WDC/well/run1/SONIC |
| Presentation Format: | slt |
| Dataset Creation: | Thu Mar 11 18:52:25 2004 by Log Warrior 7.0 Standar |
| Charted by: | Depth in Feet scaled 1:240 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | DT (usec/ft) | 240 | (ITT (msec)) | 500 | Variable Density 5 ft | 1600 | 500 | Variable Density 5ft | 1600 |
| 0 | Gamma-Ray (GAPI) | 250 | | 0 | RLL3 (Ohm-m) | 300 | 500 | Signature | 1600 |




150
GR
200
DT
250
300
RLL3
40
DT (usec/ft)
240
ITT (msec)
500
Variable Density 5 ft
1600
500
Variable Density 5ft
1600
50
Gamma-Ray (GAPI)
250
0
RLL3 (Ohm-m)
300
500
Signature
1600

**PACIFIC SURVEYS**

# ELECTRIC LOG
# LATEROLOG 3
# GAMMA-RAY

Job No. 11278

| | |
|---|---|
| Company | WDC EXPLORATION & WELLS |
| Well | INJECTION WELL No. 2 |
| Field | JPL |
| County | LOS ANGELES State CA |

Location:

MARS YARD

Sec. Twp. Rge.

Other Services:

SONIC/VDL
LL3/GR

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation above perm. datum | Elevation |
| Log Measured From | G.L. | 0 | | K.B. |
| Drilling Measured From | G.L. | | | D.F. |
| | | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 03-11-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 319' | | |
| Bottom Logged Interval | 319' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.4 @ 77F | | |
| Rmf @ Meas. Temp | 7.9 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 13:45 | | |
| Time Logger on Bottom | 15:00 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | RIDDER | | |
| Witnessed By | B. HEADINGTON | | |

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Comments

## ELOG Calibration Report

| | |
|---|---|
| Serial: | D4 |
| Model: | DTQ |
| Shop Calibration Performed: | Fri Mar 05 12:34:20 2004 |
| Before Survey Verification Performed: | Fri Feb 20 12:30:51 2004 |
| After Survey Verification Performed: | Fri Feb 20 12:31:33 2004 |

### Shop Calibration

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 8.145 | 99.832 | | 10.200 | 102.200 | Ohm-m | 1.003 | 2.027 |
| Long | 3.682 | 92.993 | | 10.200 | 102.200 | Ohm-m | 1.030 | -17.407 |
| IEE | 198.160 | 7003.960 | counts | 0.217 | 7.665 | A | | |
| VSN | 75.060 | 7966.720 | counts | 1.432 | 151.955 | V | | |
| VLN | 83.860 | 2024.120 | counts | 1.600 | 38.608 | V | | |

### Before Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.249 | 101.201 | | 40.505 | 101.206 | Ohm-m | 0.996 | 0.422 |
| Long | 142.638 | 102.842 | | 102.858 | 102.858 | Ohm-m | 1.024 | -2.408 |
| IEE | 212.960 | 7070.960 | counts | 0.233 | 7.738 | A | | |
| VSN | 96.300 | 8039.720 | counts | 1.837 | 153.348 | V | | |
| VLN | 85.320 | 2042.520 | counts | 1.627 | 38.959 | V | | |

### After Survey Verification

| | Readings | | | References | | | Results | |
|---|---|---|---|---|---|---|---|---|
| | Zero | Cal | | Zero | Cal | | Gain | Offset |
| Short | 40.270 | 101.200 | | 40.249 | 101.201 | Ohm-m | 1.000 | -0.035 |
| Long | 142.491 | 102.843 | | 102.842 | 102.842 | Ohm-m | 1.004 | -0.383 |
| IEE | 213.380 | 7077.580 | counts | 0.234 | 7.746 | A | | |
| VSN | 96.540 | 8047.160 | counts | 1.841 | 153.490 | V | | |
| VLN | 85.400 | 2044.440 | counts | 1.629 | 38.995 | V | | |

### After Survey Verification compared to Before Survey Calibration

| | Zero | | | Cal | | |
|---|---|---|---|---|---|---|
| | Before | After | | Before | After | |
| Short | 40.505 | 40.249 | Ohm-m | 101.206 | 101.201 | Ohm-m |
| Long | 143.592 | 142.638 | Ohm-m | 102.858 | 102.842 | Ohm-m |

## Gamma Ray Calibration Report

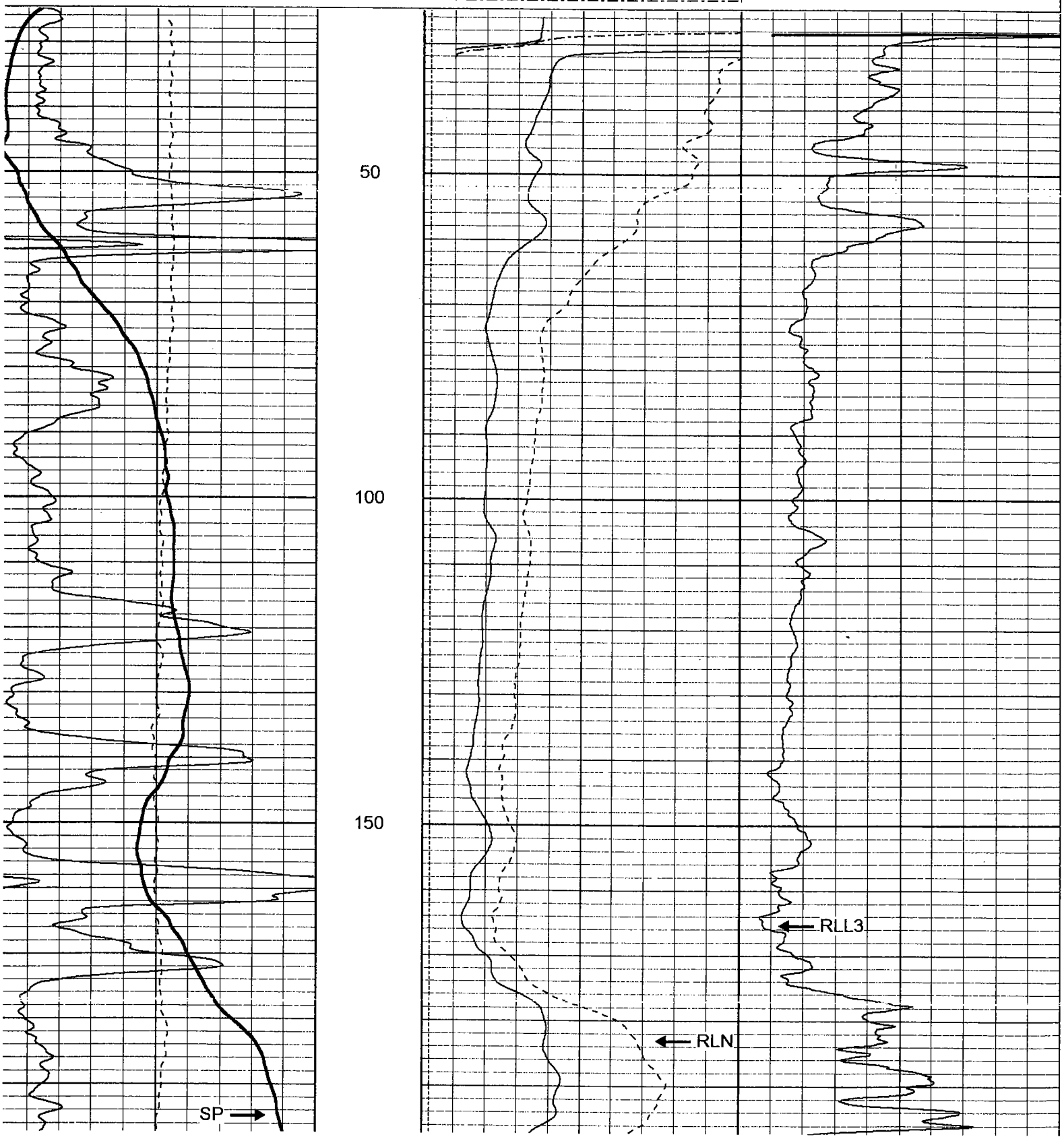
| | | |
|---|---|---|
| Serial Number: | D4 | |
| Tool Model: | ELOG | |
| Performed: | Thu Feb 12 15:16:57 2004 | |
| Calibrator Value: | 162.0 | GAPI |
| Background Reading: | 172.5 | cps |
| Calibrator Reading: | 717.9 | cps |
| Sensitivity: | 0.2970 | GAPI/cps |

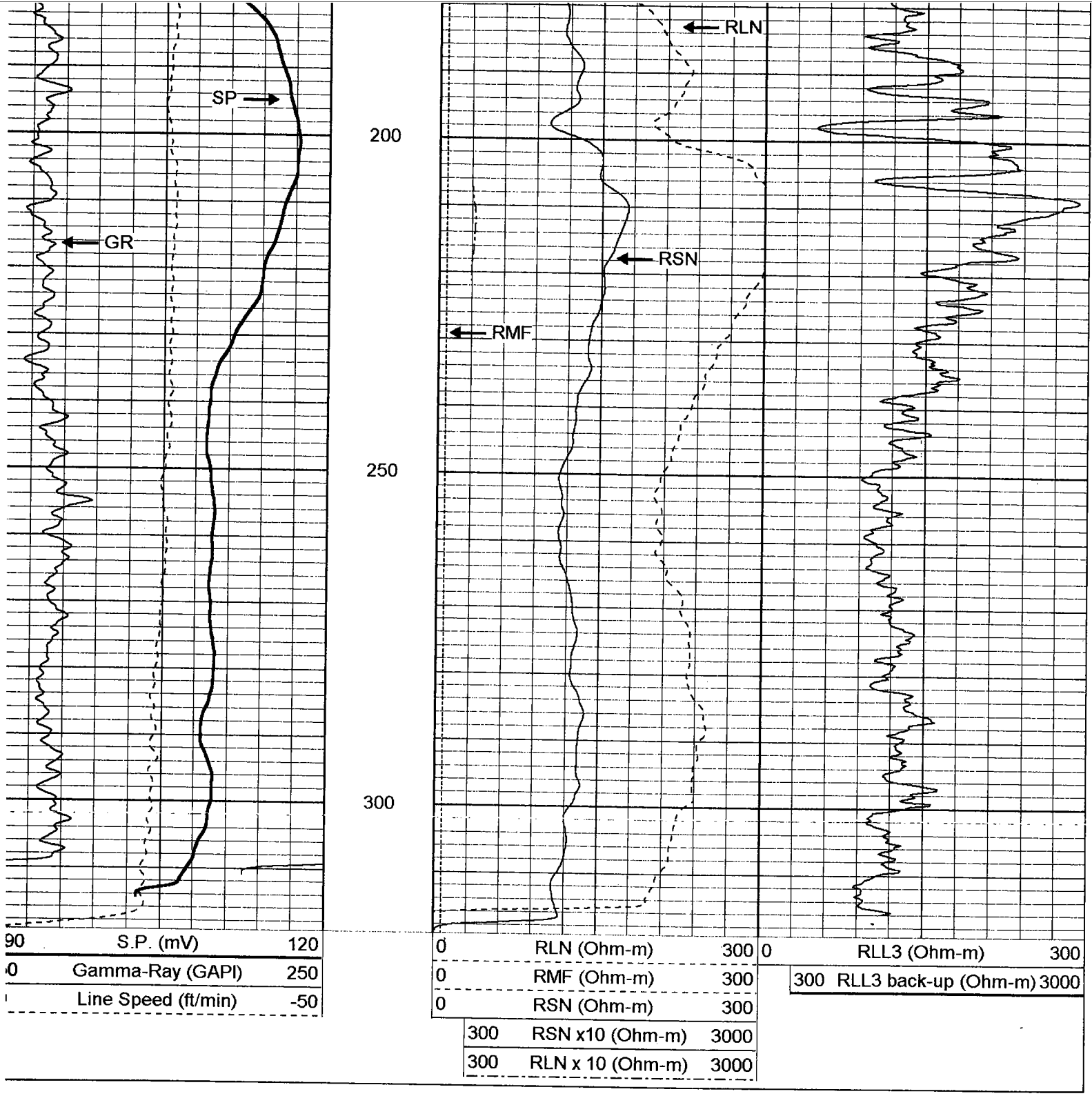
Database File: 11278.db
Dataset Pathname: WDC/well/run1/ELOG
Presentation Format: elog2
Dataset Creation: Thu Mar 11 18:01:41 2004 by Log Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240

| | | |
|---|---|---|
| -90 | S.P. (mV) | 120 |
| 50 | Gamma-Ray (GAPI) | 250 |
| 0 | Line Speed (ft/min) | -50 |

| | | |
|---|---|---|
| 0 | RLN (Ohm-m) | 300 |
| 0 | RMF (Ohm-m) | 300 |
| 0 | RSN (Ohm-m) | 300 |
| 300 | RSN x10 (Ohm-m) | 3000 |
| 300 | RLN x 10 (Ohm-m) | 3000 |

| | | |
|---|---|---|
| 0 | RLL3 (Ohm-m) | 300 |
| 300 | RLL3 back-up (Ohm-m) | 3000 |




SP
GR
RLN
RSN
RMF
200
250
300
90 S.P. (mV) 120
0 Gamma-Ray (GAPI) 250
Line Speed (ft/min) -50
0 RLN (Ohm-m) 300
0 RMF (Ohm-m) 300
0 RSN (Ohm-m) 300
300 RSN x10 (Ohm-m) 3000
300 RLN x 10 (Ohm-m) 3000
0 RLL3 (Ohm-m) 300
300 RLL3 back-up (Ohm-m) 3000

**PACIFIC SURVEYS**

# LATEROLOG 3
# GAMMA-RAY

| Job No. | | |
|---|---|---|
| 11278 | Company | WDC EXPLORATION & WELLS |
| | Well | INJECTION WELL No. 2 |
| | Field | JPL |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| MARS YARD<br>Sec. Twp. Rge. | SONIC/VDL<br>ELOG |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | G.L. | | Elevation | Elevation |
| Log Measured From | G.L. | 0 | above perm. datum | K.B.<br>D.F.<br>G.L. |
| Drilling Measured From | G.L. | | | |

| | | | |
|---|---|---|---|
| Date | 03-11-04 | | |
| Run Number | ONE | | |
| Depth Driller | 320' | | |
| Depth Logger | 319' | | |
| Bottom Logged Interval | 319' | | |
| Top Log Interval | 30' | | |
| Casing Driller | 12 3/8" @ 20' | | |
| Casing Logger | 20' | | |
| Bit Size | 12.25" | | |
| Type Fluid in Hole | BENTONITE | | |
| Density / Viscosity | N/A | | |
| pH / Fluid Loss | N/A | | |
| Source of Sample | CIRCULATED | | |
| Rm @ Meas. Temp | 6.4 @ 77F | | |
| Rmf @ Meas. Temp | 7.9 @ 77F | | |
| Rmc @ Meas. Temp | N/A | | |
| Source of Rmf / Rmc | MEAS | | |
| Rm @ BHT | N/A | | |
| Time Circulation Stopped | 13:45 | | |
| Time Logger on Bottom | 15:00 | | |
| Max. Recorded Temperature | N/A | | |
| Equipment Number | PS-3 | | |
| Location | L.A. | | |
| Recorded By | RIDDER | | |
| Witnessed By | B. HEADINGTON | | |

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Comments

## Gamma Ray Calibration Report

| | | |
|---|---|---|
| Serial Number: | 12 | |
| Tool Model: | GROH | |
| Performed: | Thu Feb 12 09:06:37 2004 | |
| Calibrator Value: | 162.0 | GAPI |
| Background Reading: | 46.0 | |
| Calibrator Reading: | 174.5 | |
| Sensitivity: | 1.2612 | GAPI/ |

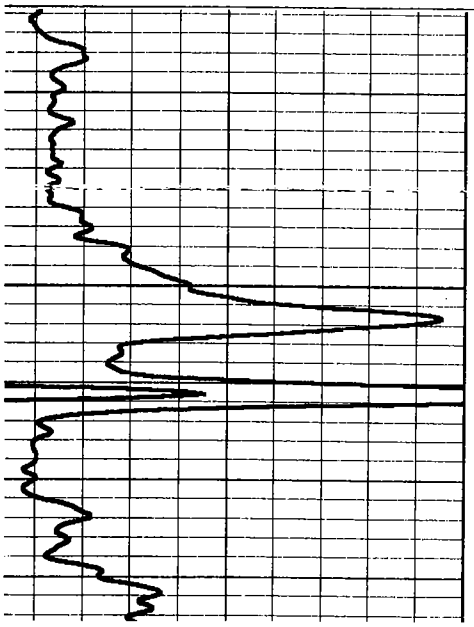
## Simplec RLL3 Calibration Report

| | |
|---|---|
| Serial Number: | 294 |
| Tool Model: | M&W |
| Performed: | Thu Feb 12 09:24:52 2004 |

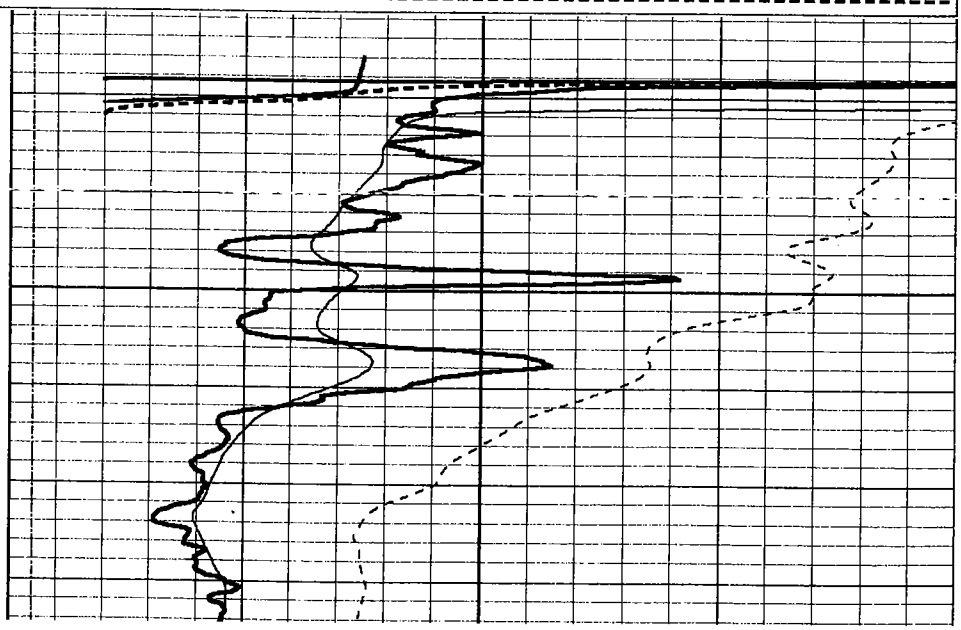
| System Reading | Calibration Reference | |
|---|---|---|
| 0.016 | 2.500 | Ohm-m |
| 0.033 | 5.000 | |
| 0.351 | 50.000 | |
| 1.804 | 250.000 | |
| 3.862 | 500.000 | |

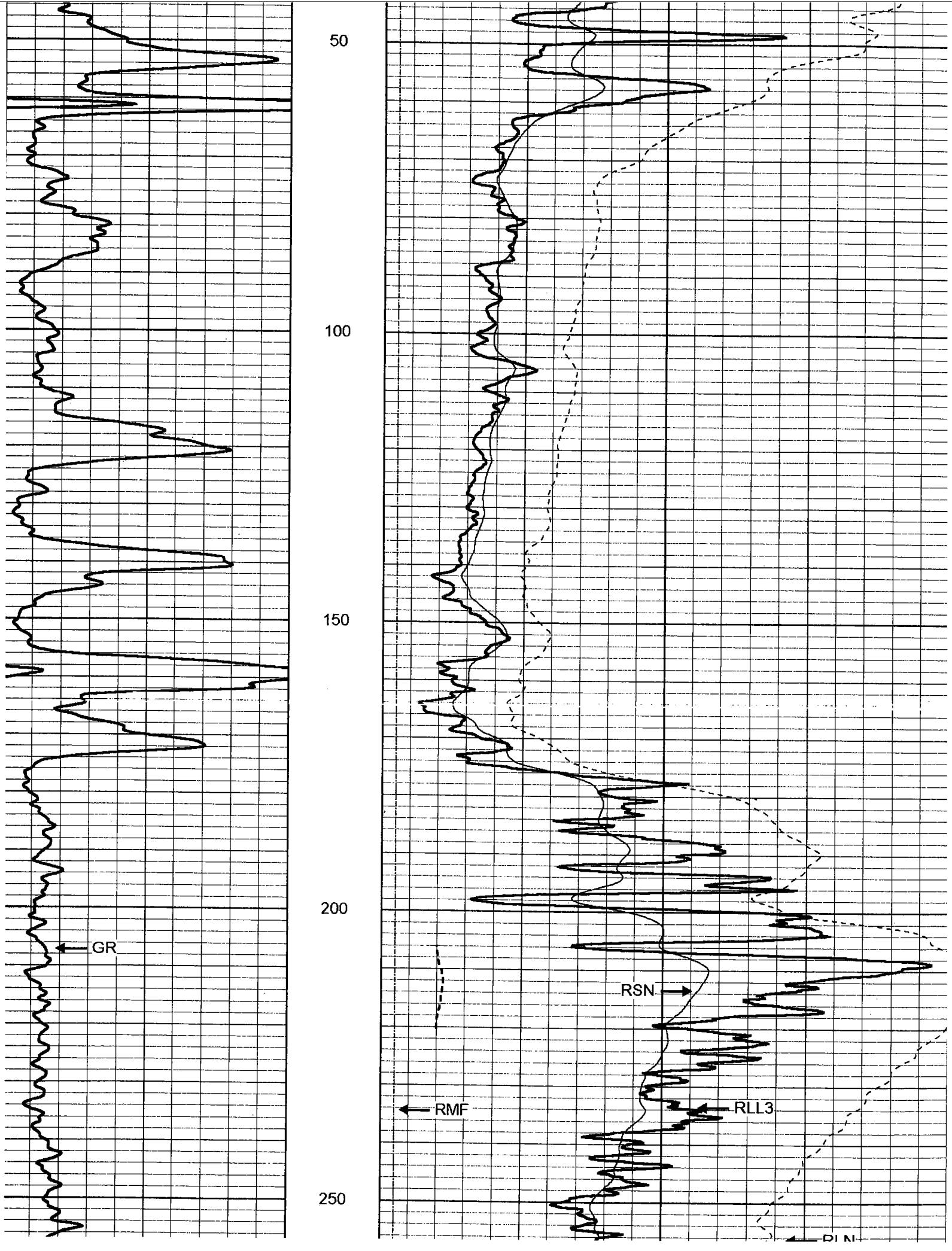
| | |
|---|---|
| Database File: | 11278.db |
| Dataset Pathname: | WDC/well/run1/LL3 |
| Presentation Format: | guard |
| Dataset Creation: | Thu Mar 11 18:27:31 2004 by Log Warrior 7.0 Standar |
| Charted by: | Depth in Feet scaled 1:240 |

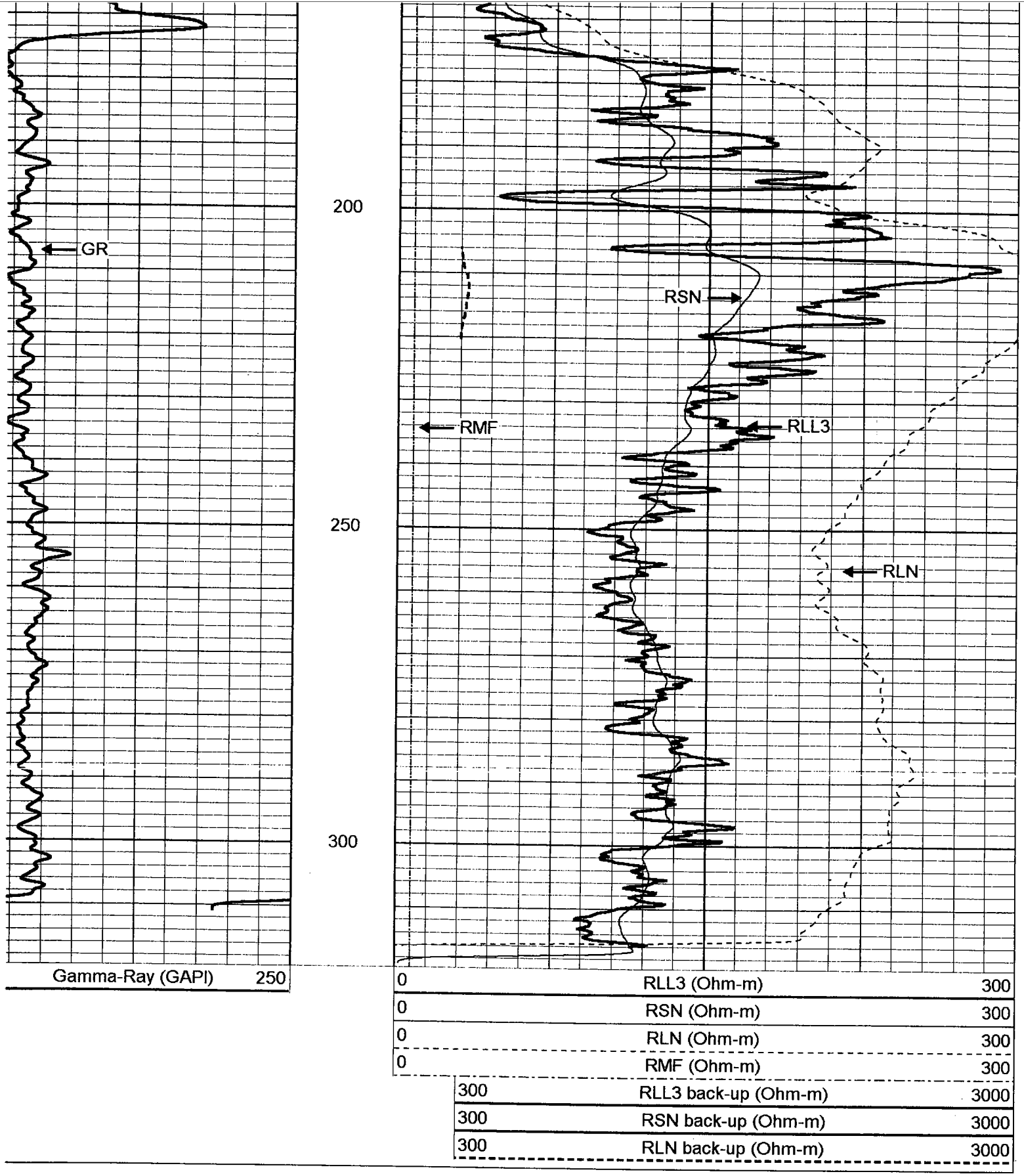
| | | |
|---|---|---|
| 50 | Gamma-Ray (GAPI) | 250 |
| 0 | RLL3 (Ohm-m) | 300 |
| 0 | RSN (Ohm-m) | 300 |
| 0 | RLN (Ohm-m) | 300 |
| 0 | RMF (Ohm-m) | 300 |
| 300 | RLL3 back-up (Ohm-m) | 3000 |
| 300 | RSN back-up (Ohm-m) | 3000 |
| 300 | RLN back-up (Ohm-m) | 3000 |



50




50
100
150
200
250
GR
RSN
RMF
RLL3


GR
200
250
300
RSN
RMF
RLL3
RLN
Gamma-Ray (GAPI) 250
0 RLL3 (Ohm-m) 300
0 RSN (Ohm-m) 300
0 RLN (Ohm-m) 300
0 RMF (Ohm-m) 300
300 RLL3 back-up (Ohm-m) 3000
300 RSN back-up (Ohm-m) 3000
300 RLN back-up (Ohm-m) 3000

ATTACHMENT 3

PACIFIC SURVEYS

# SPINNER LOG
# NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | EW-1 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

Location:

JPL; MARS YARD

Sec. Twp. Rge:

Other Services:

TEMP/FLRES

| | | | | |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | Elevation |
| Log Measured From | T.O.C. | 0' | above perm. datum | K.B. |
| Drilling Measured From | T.O.C. | | | D.F. |
| | | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 265' | | |
| Depth Logger | 263' | | |
| Bottom Logged Interval | 263' | | |
| Top Log Interval | 140' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 64.9 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 315' |
| Liner | | | | |
| | | | | |

Fold Here

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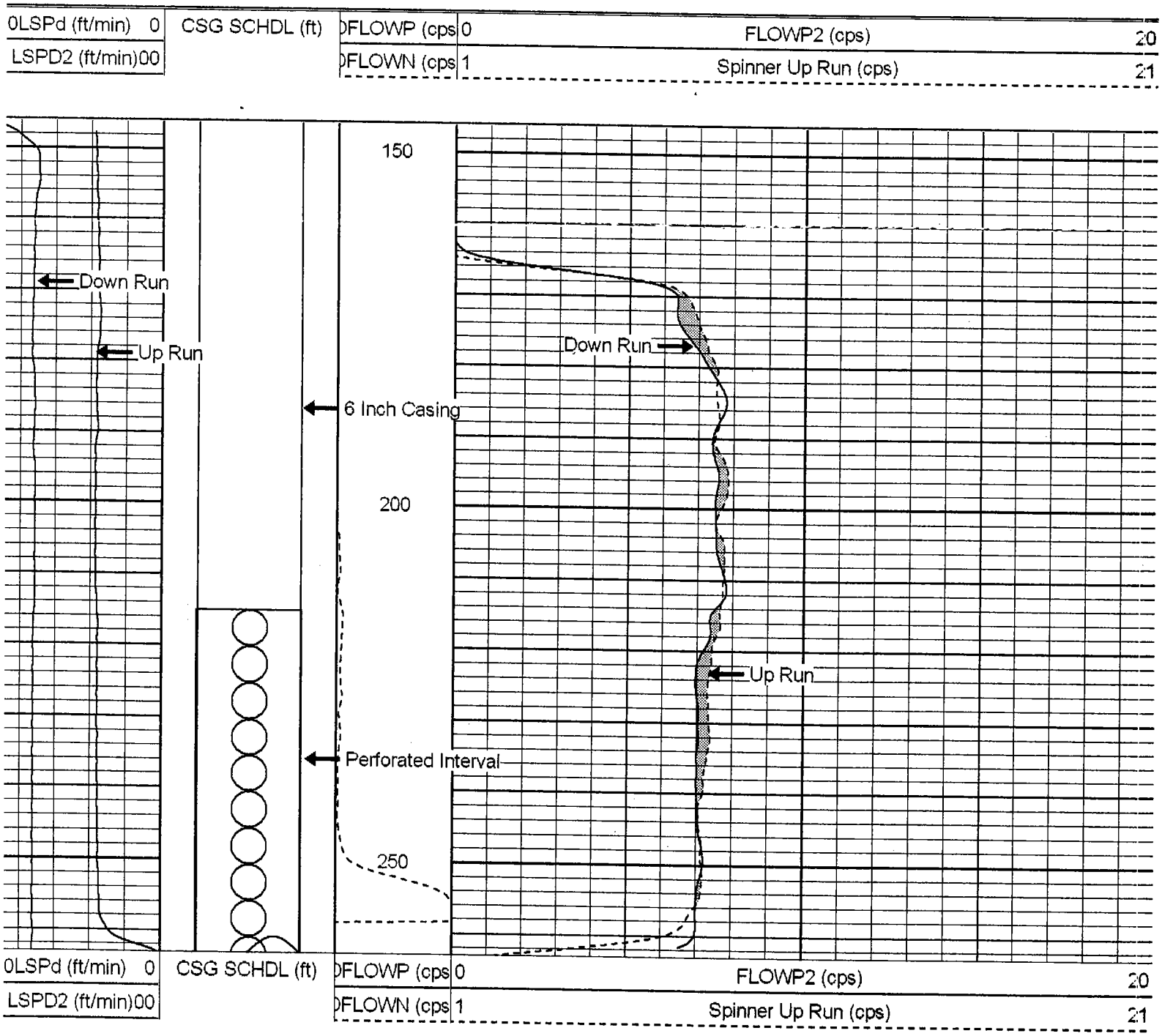
Comments

Database File: 11341.db
Dataset Pathname: WDC/EW1/run1/SPIN2UP.2
Presentation Format: spin
Dataset Creation: Tue Apr 20 11:13:55 2004 by Calc Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240



PACIFIC SURVEYS

# TEMPERATURE FLUID RESISTIVITY NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | EW-1 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| JPL; MARS YARD | SPINNER |
| Sec. Twp. Rge. | |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | Elevation |
| Log Measured From | T.O.C. | 0' | above perm. datum | K.B. |
| Drilling Measured From | T.O.C. | | | D.F. |
| | | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 265' | | |
| Depth Logger | 265' | | |
| Bottom Logged Interval | 263' | | |
| Top Log Interval | 130' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 64.9 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

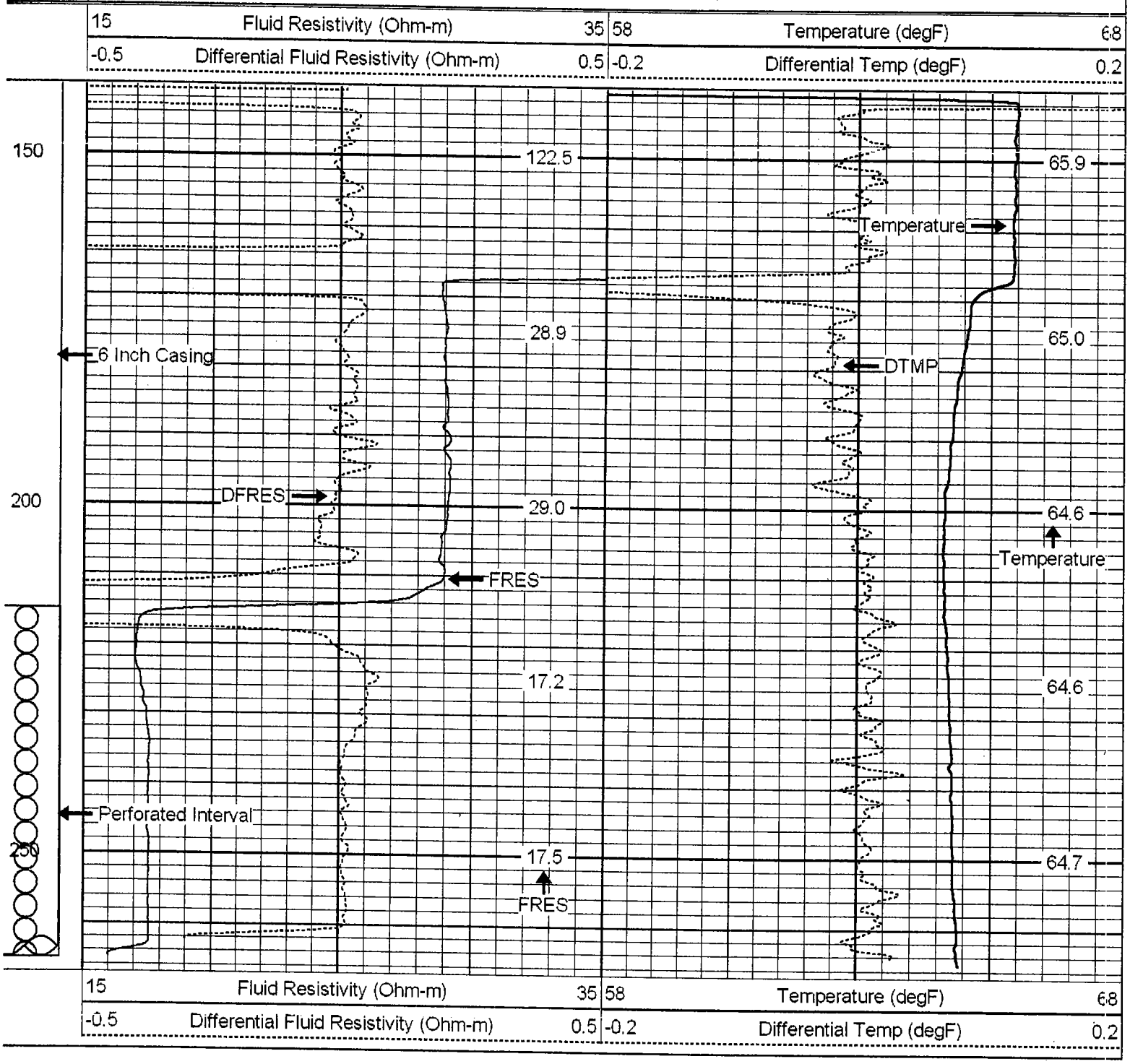
| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 265' |
| Liner | | | | |
| | | | | |

Differential Temp (degF) 0.2 -0.2

Differential Fluid Resistivity (Ohm-m) 0.5 -0.5

<< Fold Here >>

atabase File: 11341.db
ataset Pathname: WDC/EW1/run1/TEMP
resentation Format: frttemp2
ataset Creation: Tue Apr 20 10:21:28 2004 by Log Warrior 7.0 Standar
harted by: Depth in Feet scaled 1:240



**PACIFIC SURVEYS**

# SPINNER LOG
# NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | EW-2 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| JPL; MARS YARD | TEMP/FLRES |
| Sec. Twp. Rge. | |

| | | | | Elevation |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | K.B. |
| Log Measured From | T.O.C. | 0' | above perm. datum | D.F. |
| Drilling Measured From | T.O.C. | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 315' | | |
| Depth Logger | 315' | | |
| Bottom Logged Interval | 313' | | |
| Top Log Interval | 130' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 65.3 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

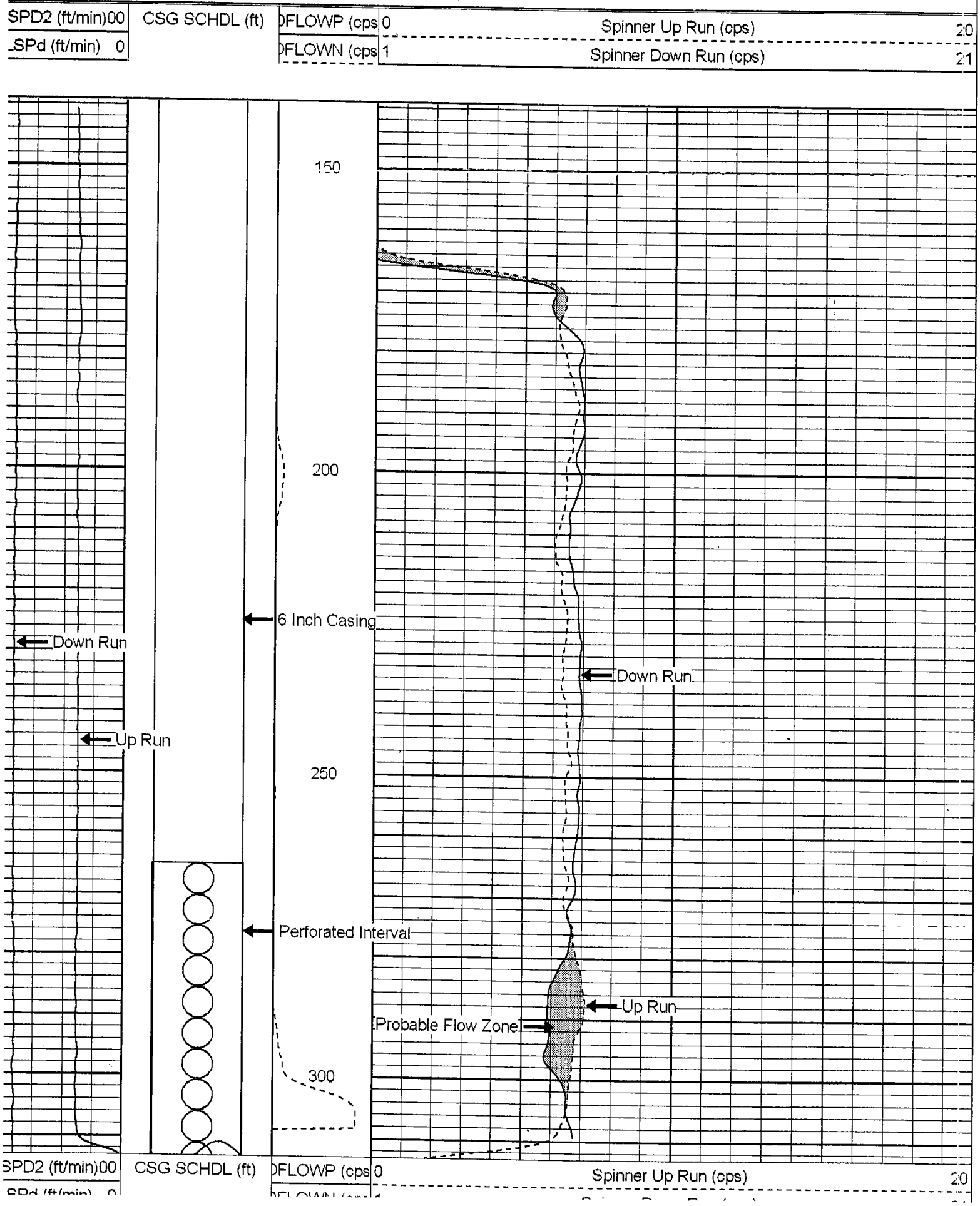
| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 315' |
| Liner | | | | |
| | | | | |

Perforated Interval

>>>> Fold Here <<<<

atabase File: 11341.db
ataset Pathname: WDC/EW2/run1/SPIN1UP.1
resentation Format: spin
ataset Creation: Tue Apr 20 09:10:30 2004 by Calc Warrior 7.0 Standar
harted by: Depth in Feet scaled 1:240



**PACIFIC SURVEYS**

# TEMPERATURE FLUID RESISTIVITY NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | EW-2 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| JPL; MARS YARD | SPINNER |
| Sec. Twp. Rge. | |

| | | | | Elevation |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | K.B. |
| Log Measured From | T.O.C. | 0' | above perm. datum | D.F. |
| Drilling Measured From | T.O.C. | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 315' | | |
| Depth Logger | 315' | | |
| Bottom Logged Interval | 313' | | |
| Top Log Interval | 130' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 65.3 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 315' |
| Liner | | | | |
| | | | | |

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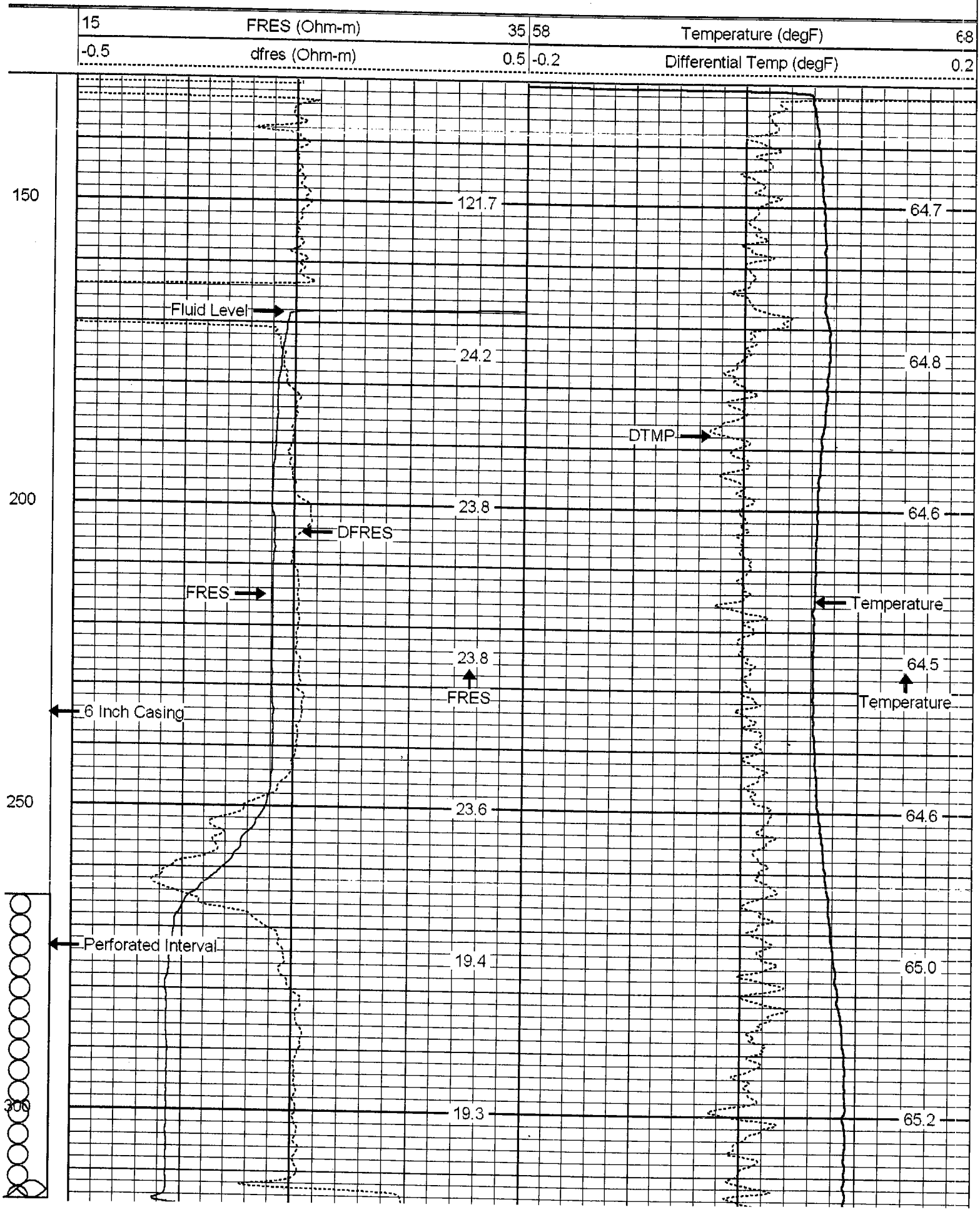
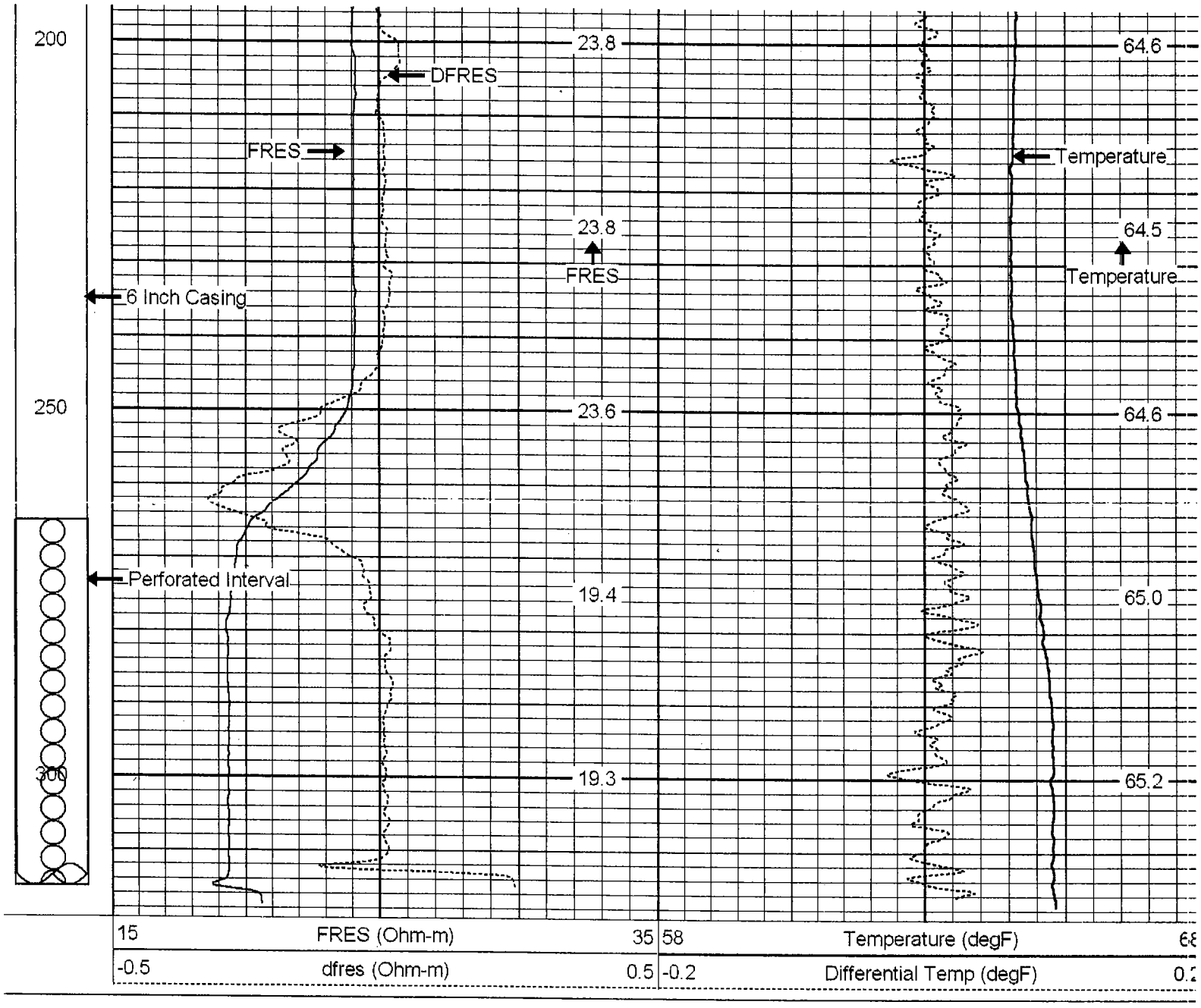
All interpretations are opinions based on inferences from electrical or other measurements and Pacific Surveys cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or wilful negligence on our part, be liable or responsible for any loss costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These

atabase File: 11341.db
ataset Pathname: WDC/EW2/run1/TEMP
resentation Format: frttemp2
ataset Creation: Tue Apr 20 09:50:23 2004 by Log Warrior 7.0 Standar
harted by: Depth in Feet scaled 1:240




200
250
300
23.8
DFRES
FRES
23.8
FRES
6 Inch Casing
23.6
Perforated Interval
19.4
19.3
64.6
Temperature
64.5
Temperature
64.6
65.0
65.2
15
FRES (Ohm-m)
35
-0.5
dfres (Ohm-m)
0.5
58
Temperature (degF)
-0.2
Differential Temp (degF)

PACIFIC SURVEYS

# SPINNER LOG
# NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | IW-1 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| JPL; MARS YARD | TEMP/FLRES |
| Sec. Twp. Rge. | |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | Elevation |
| Log Measured From | T.O.C. | 0' | above perm. datum | K.B. |
| Drilling Measured From | T.O.C. | | | D.F. |
| | | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 315' | | |
| Depth Logger | 307' | | |
| Bottom Logged Interval | 306' | | |
| Top Log Interval | 180' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 64.7 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 315' |
| Liner | | | | |
| | | | | |

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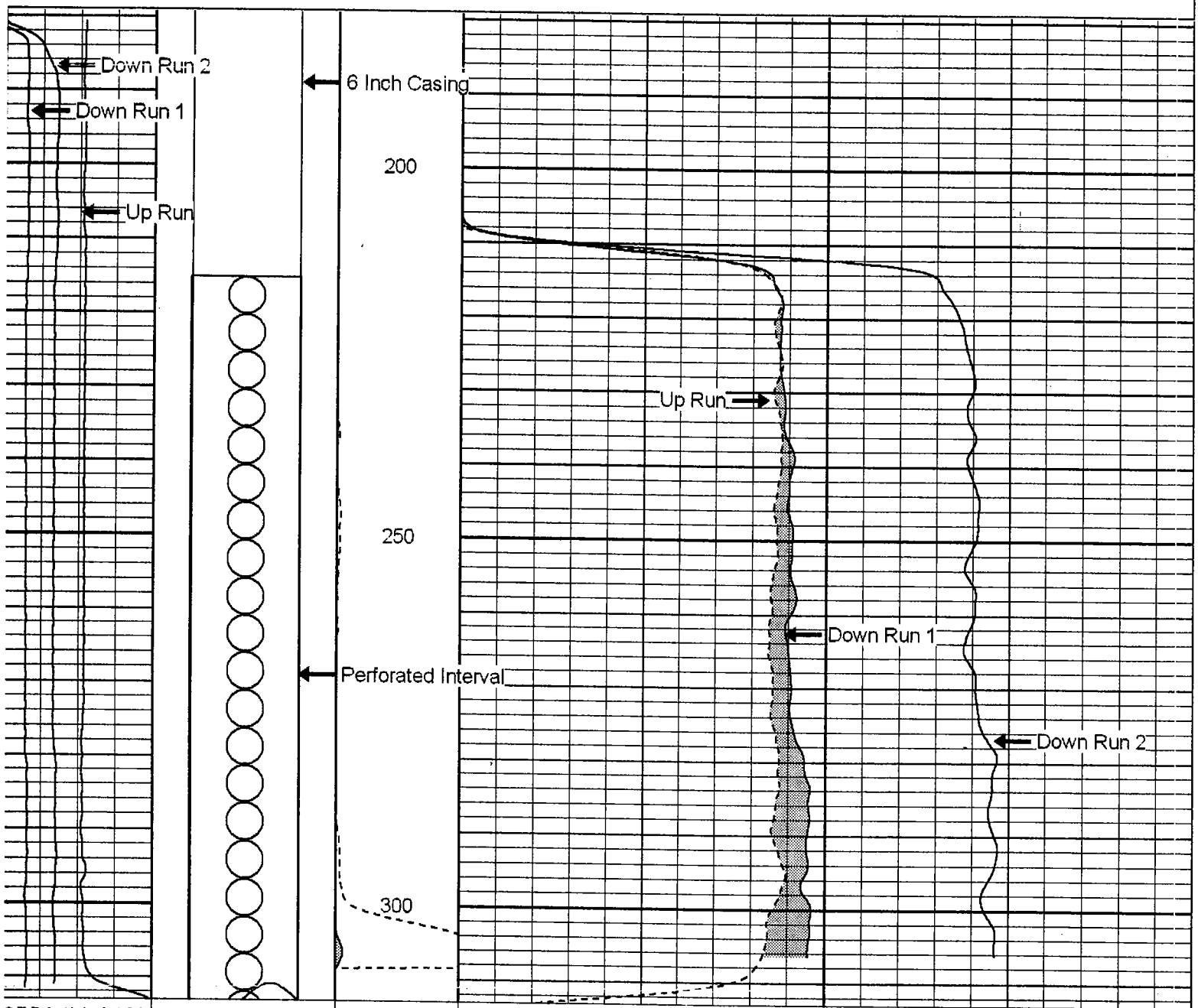
Comments

atabase File: 11341.db
ataset Pathname: WDC/IW1/run1/SPINUP.1
resentation Format: spin
ataset Creation: Tue Apr 20 13:54:05 2004 by Calc Warrior 7.0 Standar
harted by: Depth in Feet scaled 1:240

| | | | | | |
|---|---|---|---|---|---|
| SPD3 (ft/min)00 | CSG SCHDL (ft) | DFLOWP (cps | 0 | Spinner Down Run (cps) | 20 |
| SPd (ft/min) 0 | | DFLOWN (cps | 0 | Spinner Down Run (cps) | 20 |
| SPD2 (ft/min)00 | | | 0.5 | Spinner Up Run (cps) | 20.5 |





| | | | | | |
|---|---|---|---|---|---|
| SPD3 (ft/min)00 | CSG SCHDL (ft) | DFLOWP (cps | 0 | Spinner Down Run (cps) | 20 |
| SPd (ft/min) 0 | | DFLOWN (cps | 0 | Spinner Down Run (cps) | 20 |
| SPD2 (ft/min)00 | | | 0.5 | Spinner Up Run (cps) | 20.5 |

**PACIFIC SURVEYS**

# TEMPERATURE FLUID RESISTIVITY NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | IW-1 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

Location:

JPL; MARS YARD

Sec. Twp. Rge.

Other Services:

SPINNER

| | | | | Elevation |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | K.B. |
| Log Measured From | T.O.C. | 0' | above perm. datum | D.F. |
| Drilling Measured From | T.O.C. | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 315' | | |
| Depth Logger | 313' | | |
| Bottom Logged Interval | 313' | | |
| Top Log Interval | 180' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 66.1 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 315' |
| Liner | | | | |
| | | | | |

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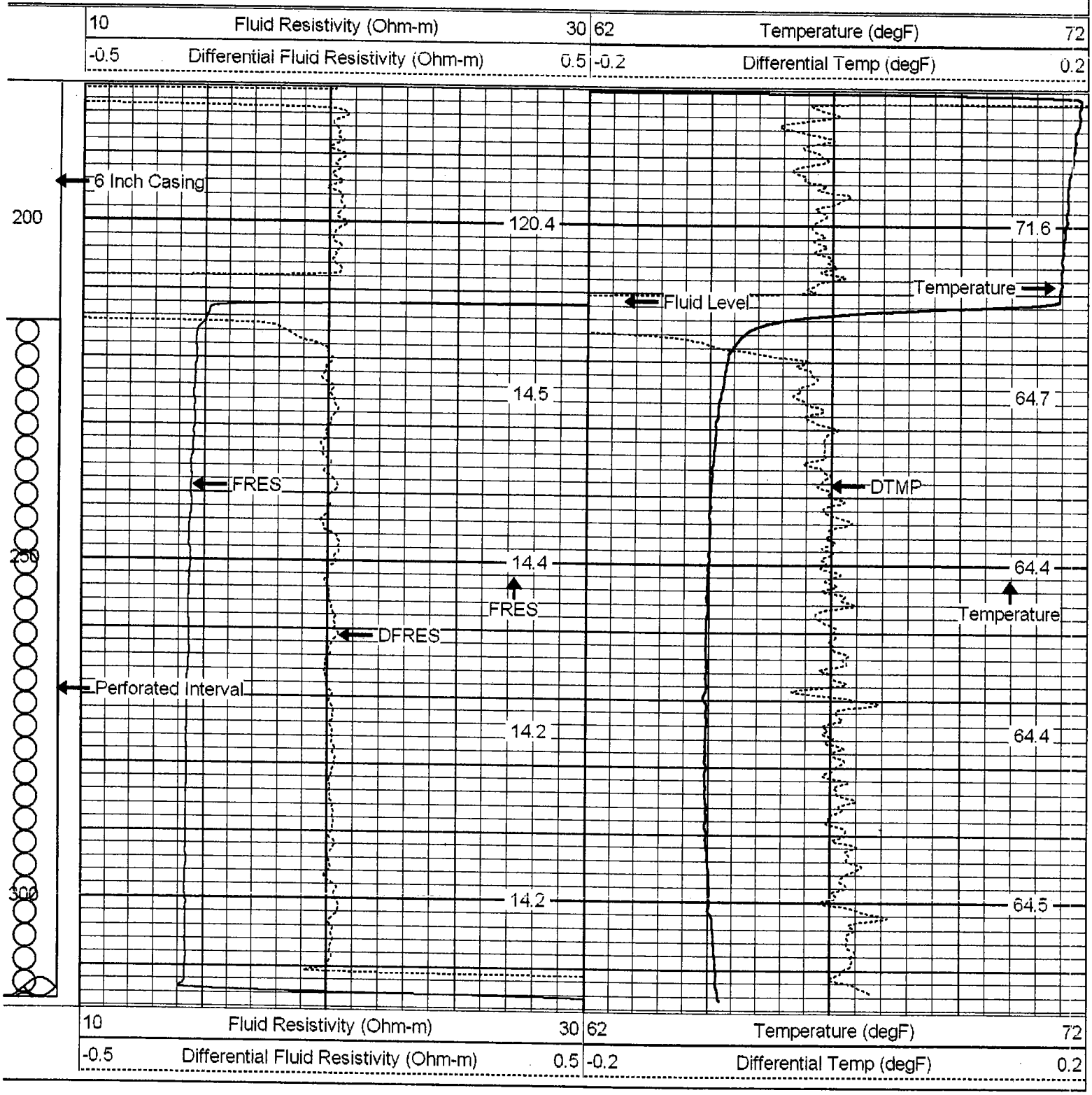
atabase File: 11341.db
ataset Pathname: WDC/IW1/run1/TEMP
resentation Format: frttemp2
ataset Creation: Tue Apr 20 13:23:40 2004 by Log Warrior 7.0 Standar
harted by: Depth in Feet scaled 1:240



**PACIFIC SURVEYS**

# SPINNER LOG
# NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | IW-2 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| JPL; MARS YARD | TEMP/FLRES |
| Sec. Twp. Rge. | |

| | | | | Elevation |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | |
| Log Measured From | T.O.C. | 0' | above perm. datum | K.B. |
| Drilling Measured From | T.O.C. | | | D.F. |
| | | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 315' | | |
| Depth Logger | 305' | | |
| Bottom Logged Interval | 303' | | |
| Top Log Interval | 180' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 66.1 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 315' |
| Liner | | | | |
| | | | | |

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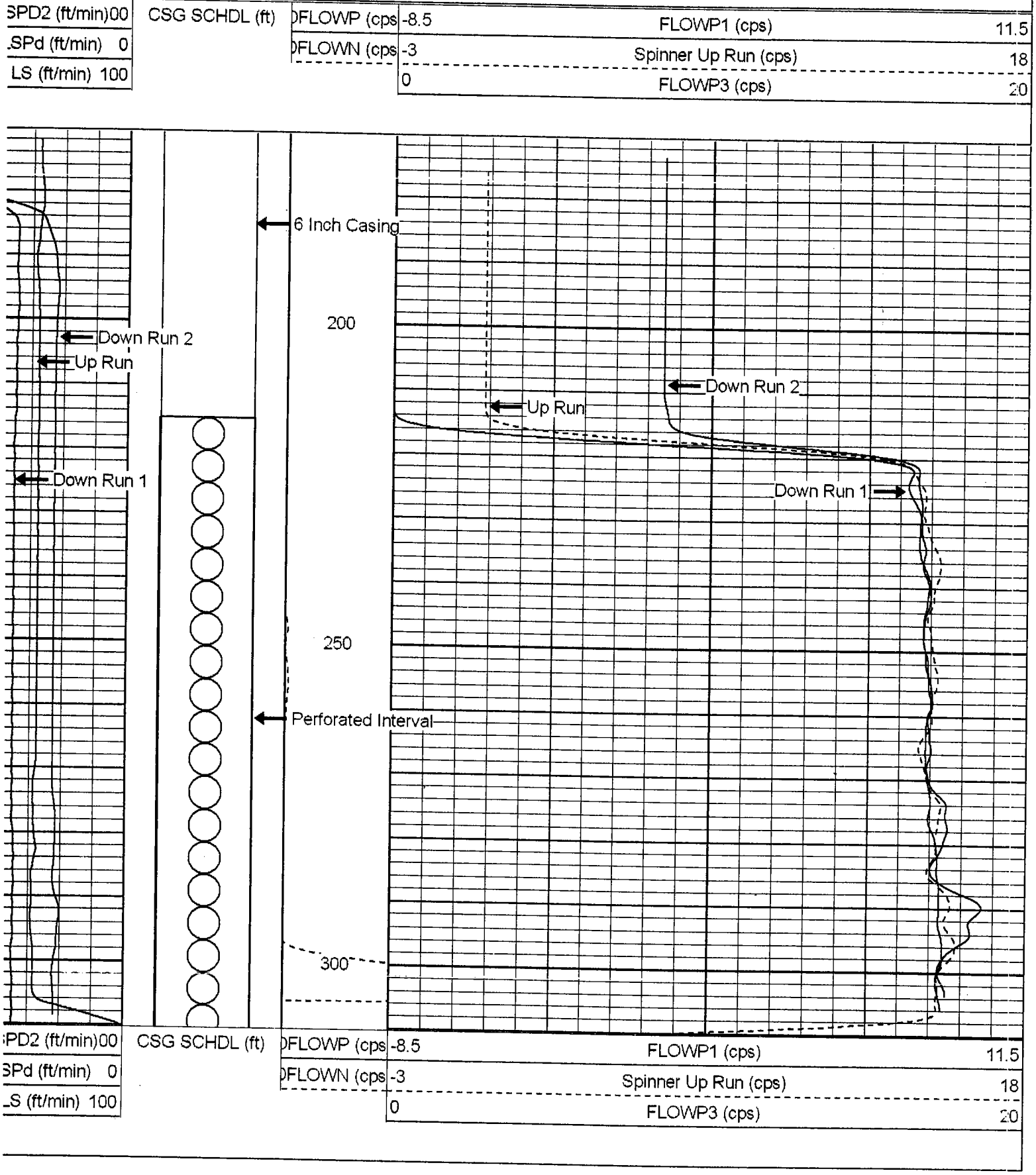
ataset Pathname: WDC/IW2/run1/SPIN4UP.1
esentation Format: spin
ataset Creation: Tue Apr 20 12:33:17 2004 by Calc Warrior 7.0 Standar
narted by: Depth in Feet scaled 1:240



**PACIFIC SURVEYS**

# TEMPERATURE FLUID RESISTIVITY NON-PUMPING CONDITIONS

| Job No. | | |
|---|---|---|
| 11341 | Company | WATER DEVELOPMENT CORPORATION |
| | Well | IW-2 |
| | Field | PASADENA |
| | County | LOS ANGELES State CA |

| Location: | Other Services: |
|---|---|
| JPL; MARS YARD | SPINNER |
| Sec. Twp. Rge. | |

| | | | | |
|---|---|---|---|---|
| Permanent Datum | T.O.C. | | Elevation | Elevation |
| Log Measured From | T.O.C. | 0' | above perm. datum | K.B. |
| Drilling Measured From | T.O.C. | | | D.F. |
| | | | | G.L. |

| | | | |
|---|---|---|---|
| Date | 4-20-04 | | |
| Run Number | ONE | | |
| Depth Driller | 315' | | |
| Depth Logger | 315' | | |
| Bottom Logged Interval | 312' | | |
| Top Log Interval | 140' | | |
| Pump Set @ | N/A | | |
| Time Pumping Prior to Survey | N/A | | |
| Density / Viscosity | N/A | | |
| Max. Recorded Temp. | 66.1 F | | |
| Pump Rate (GPM) | N/A | | |
| Time Well Ready | 0800 | | |
| Time Logger on Bottom | 0830 | | |
| Equipment Number | PS-3 | | |
| Location | LA | | |
| Recorded By | D. JACOVITCH | | |
| Witnessed By | D. CLEXTON | | |

| Borehole Record | | | | Tubing Record | | | |
|---|---|---|---|---|---|---|---|
| Run Number | Bit | From | To | Size | Weight | From | To |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

| Casing Record | Size | Wgt/Ft | Top | Bottom |
|---|---|---|---|---|
| Surface String | | | | |
| Prot. String | | | | |
| Production String | 6" | STEEL | 0' | 315' |
| Liner | | | | |
| | | | | |

Fold Here >>>>>>

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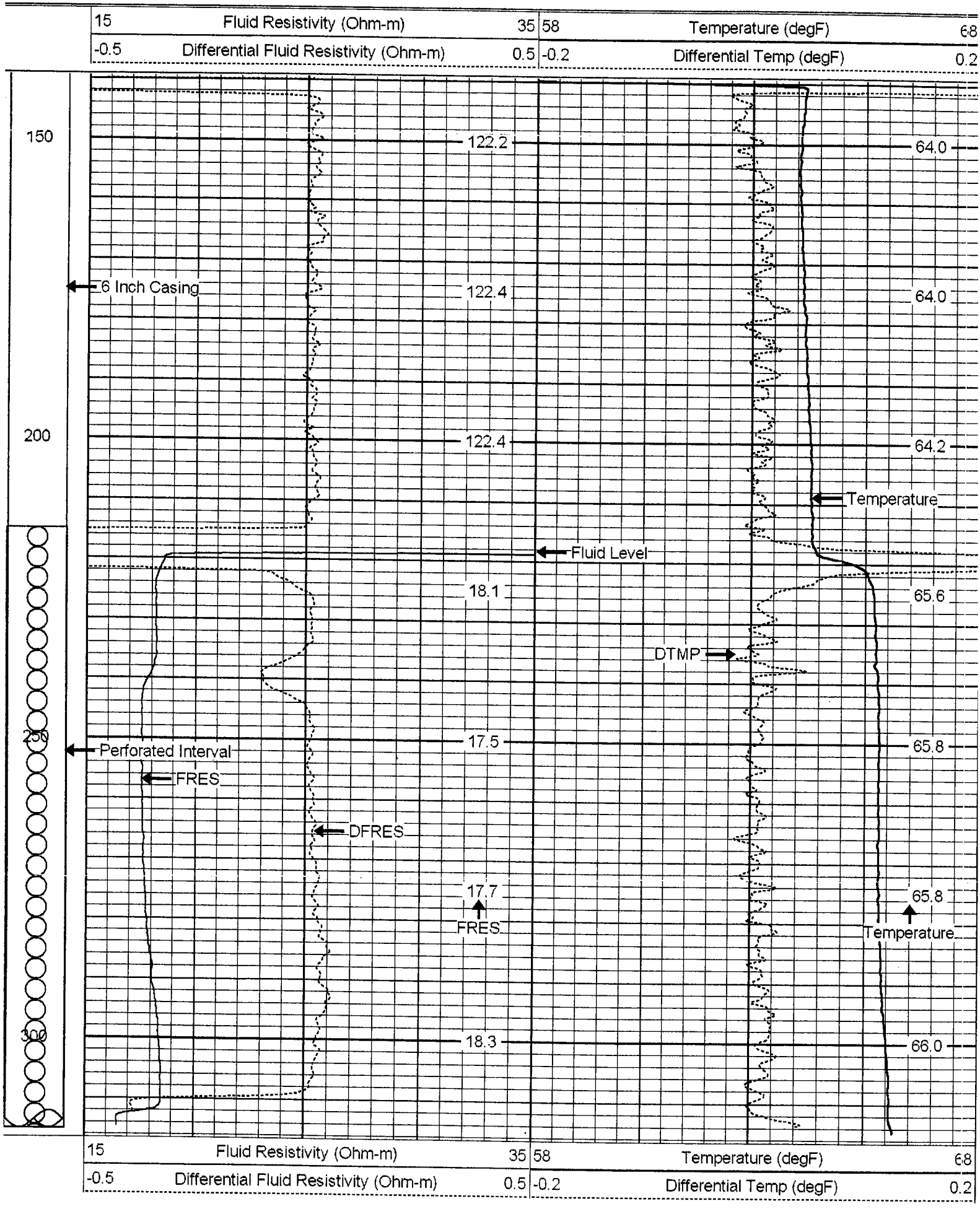
Comments

Dataset Pathname: WDC/IW2/run1/TEMP
Presentation Format: frttemp2
Dataset Creation: Tue Apr 20 11:54:30 2004 by Log Warrior 7.0 Standar
Charted by: Depth in Feet scaled 1:240