

| System Information          |                                  |            |
|-----------------------------|----------------------------------|------------|
| Grid Report File Name       | MARLM228.HGR                     |            |
| Project Name                |                                  |            |
| CRU File Source             | Chevron Library                  |            |
| CAL II Version              | PC 9.50                          |            |
| Run Date                    | 11/29/10                         |            |
| General Information         |                                  |            |
| Crude Name                  | Marlim Lt/P-37 Fld(Petrobras)'03 |            |
| CrudeID                     | MARLM228                         |            |
| Country of Origin           | Brazil                           |            |
| State of Origin             | Rio de Janeiro                   |            |
| Geographical Region         | South America                    |            |
| User Defined Region         | Med/Sweet                        |            |
| Sulfur Type                 | Medium                           |            |
| Crude Type                  | Medium                           |            |
| Chemical Class              | Intermediate                     |            |
| Sample Year                 | 2003                             |            |
| Date of Assay               | 2006                             |            |
| Lab Data Quality            | Poor                             |            |
| Smoothed Data Confidence    | Excellent                        |            |
| Assay Library               | CVX                              |            |
| Laboratory                  | Petrobras                        |            |
| Whole Crude Properties      |                                  |            |
|                             | Entered                          | Calculated |
| API Gravity                 | 22,8                             | 23,5       |
| Specific Gravity @60/60 deg | 0,9170                           | 0,9131     |
| Crude Expansion (%)         |                                  | 0,44       |
| Sulfur                      | 0,72                             | 0,69       |
| Nitrogen                    | 3608,0                           | 3606,6     |
| Hydrogen                    | 12,20                            | 12,20      |
| Light Ends Properties       |                                  |            |
|                             | LV%                              | Wt%        |
| Ethane (C2)                 | 0,13                             | 0,05       |
| Propane (C3)                | 0,48                             | 0,27       |
| Isobutane (IC4)             | 0,14                             | 0,09       |
| Normal Butane (NC4)         | 0,27                             | 0,17       |
| Isopentane (IC5)            | 0,03                             | 0,02       |
| Normal Pentane (NC5)        | 0,02                             | 0,01       |
| Cyclopentane (CP)           | 0,08                             | 0,07       |
| Total                       | 1,15                             | 0,68       |

| Comments  |  |
|---|--|
| MARLIM P-37, is Marlim Light. DHA data are incomplete and go to c5 only. missing resid pours. |  |
| *** The GC Analysis Covers 8.0 LV% of crude up to a TBP of 130.2 deg. C.                      |  |
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| Generated from Haverly Systems Crude Assay Management System (H/CAMS)<br>www.haverly.com      |  |

Distillate & Resid Cuts

| <b>MARLM228 (Marlim Lt/P-37 Fld(Petrobras)'03)</b> | <b>Units</b> | <b>WC-Ent</b> | <b>WC-Calc</b> | <b>CUT1</b> | <b>CUT2</b> | <b>CUT3</b> |
|--|--------------|---------------|----------------|-------------|-------------|-------------|
| Initial Cut Point                                  | deg C        | n/a           | n/a            | 0,          | 85,         | 165,        |
| End Cut Point                                      | deg C        | n/a           | n/a            | 85,         | 165,        | 230,        |
| Vol. Yield   | LV%          | 100,00        | 100,00         | 2,58        | 8,30        | 8,30        |
| Cum. Vol. Yield at End of Cut                      | LV%          | 100,00        | 100,00         | 3,45        | 11,75       | 20,05       |
| Wt. Yield  | WT%          | 100,00        | 100,00         | 1,95        | 6,95        | 7,44        |
| Cum. Wt. Yield at End of Cut                       | WT%          | 100,00        | 100,00         | 2,43        | 9,39        | 16,83       |
| Unnormalized Volume Yield                          | LV%          |               | 100,44         | 2,59        | 8,34        | 8,33        |
| API Gravity  | API          | 22,80         | 23,47          | 73,21       | 53,59       | 41,29       |
| Specific Gravity @60/60 deg F                      |              | 0,9170        | 0,9131         | 0,6912      | 0,7645      | 0,8189      |
| Specific Gravity @20/4 deg C                       |              | 0,9132        | 0,9092         | 0,6863      | 0,7598      | 0,8149      |
| Density @15deg C                                   | kg/l         | 0,9165        | 0,9125         | 0,6911      | 0,7642      | 0,8185      |
| Density @20deg C                                   | kg/l         | 0,9132        | 0,9092         | 0,6863      | 0,7598      | 0,8149      |
| K-Factor (Watson)                                  |              |               | 11,75          | 12,26       | 11,70       | 11,53       |
| K-Factor (UOP)                                     |              | 11,70         | 11,76          | 12,27       | 11,72       | 11,56       |
| K-Factor (Vis K)                                   |              | 11,90         | 11,98          |             |             |             |
| Molecular Weight                                   |              |               | 321            | 85          | 123         | 161         |
| C/H Ratio (mass)                                   |              |               |                | 5,4         | 6,0         | 6,3         |
| Sulfur   | WT%          | 0,720         | 0,688          | 0,003       | 0,023       | 0,154       |
| Mercaptan Sulfur                                   | ppm          | 5             |                | 16          | 19          | 11          |
| Nitrogen   | ppm          | 3608,0        | 3606,6         | 0,1         | 0,1         | 0,6         |
| Basic Nitrogen                                     | ppm          | 978,0         | 1549,6         | 0,1         | 0,1         | 0,5         |
| Hydrogen   | WT%          | 12,2          | 12,2           | 15,6        | 14,3        | 13,6        |
| VL% TBP - Initial Boiling Pt                       | deg C        |               |                | 0,0         | 85,0        | 165,0       |
| VL% TBP - 5%                                       | deg C        |               |                | 19,5        | 89,5        | 168,6       |
| VL% TBP - 10%                                      | deg C        |               |                | 44,6        | 94,5        | 172,1       |
| VL% TBP - 20%                                      | deg C        |               |                | 59,0        | 104,3       | 179,1       |
| VL% TBP - 30%                                      | deg C        |               |                | 61,2        | 114,2       | 185,9       |
| VL% TBP - 50%                                      | deg C        |               |                | 66,0        | 126,8       | 199,0       |
| VL% TBP - 70%                                      | deg C        |               |                | 70,5        | 142,4       | 211,7       |
| VL% TBP - 80%                                      | deg C        |               |                | 80,6        | 150,0       | 217,9       |
| VL% TBP - 90%                                      | deg C        |               |                | 82,5        | 157,7       | 224,0       |
| VL% TBP - 95%                                      | deg C        |               |                | 83,8        | 161,4       | 227,0       |
| VL% TBP - End Boiling Pt                           | deg C        |               |                | 85,0        | 165,0       | 230,0       |
| <b>ASTM Distillation Method</b>                    |              |               |                | <b>D86</b>  | <b>D86</b>  | <b>D86</b>  |
| ASTM Initial Boiling Point                         | deg C        |               |                | 28,6        | 108,0       | 181,6       |
| ASTM 5% Point                                      | deg C        |               |                | 47,7        | 108,8       | 182,1       |
| ASTM 10% Point                                     | deg C        |               |                | 57,7        | 110,2       | 183,0       |
| ASTM 20% Point                                     | deg C        |               |                | 64,2        | 115,7       | 186,3       |
| ASTM 30% Point                                     | deg C        |               |                | 64,6        | 119,1       | 188,3       |
| ASTM 50% Point                                     | deg C        |               |                | 66,7        | 125,9       | 195,5       |
| ASTM 70% Point                                     | deg C        |               |                | 69,0        | 136,4       | 203,7       |
| ASTM 80% Point                                     | deg C        |               |                | 74,9        | 140,5       | 206,8       |
| ASTM 85% Point                                     | deg C        |               |                | 75,6        | 144,1       | 209,4       |
| ASTM 90% Point                                     | deg C        |               |                | 76,4        | 146,7       | 211,3       |
| ASTM 95% Point                                     | deg C        |               |                | 78,8        | 150,6       | 214,7       |
| ASTM End Boiling Pt                                | deg C        |               |                | 81,4        | 156,2       | 219,8       |
| Weighted Avg. Boiling Pt                           | deg C        |               |                | 67,5        | 128,6       | 196,9       |
| Molar Avg. Boiling Pt                              | deg C        |               |                | 64,3        | 123,6       | 193,4       |
| Cubic Avg. Boiling Pt                              | deg C        |               |                | 66,0        | 126,5       | 195,6       |
| Mean Avg. Boiling Pt                               | deg C        |               |                | 65,2        | 125,1       | 194,5       |
| Volumetric Avg. Boiling Pt                         | deg C        |               |                | 66,9        | 127,7       | 196,4       |
| E70 (%Evap. @ 70deg C)                             | LV%          |               |                | 74,8        | 0,0         | 0,0         |
| E82 (%Evap. @ 82deg C)                             | LV%          |               |                | 100,0       | 0,0         | 0,0         |
| E100 (%Evap. @100deg C)                            | LV%          |               |                | 100,0       | 0,0         | 0,0         |

Distillate & Resid Cuts

|                                 |         |       |       |        |        |        |
|---------------------------------|---------|-------|-------|--------|--------|--------|
| E135 (%Evap. @135deg C)         | LV%     |       |       | 100,0  | 67,4   | 0,0    |
| E180 (%Evap. @180deg C)         | LV%     |       |       | 100,0  | 100,0  | 0,0    |
| E280 (%Evap. @280deg C)         | LV%     |       |       | 100,0  | 100,0  | 100,0  |
| E300 (%Evap. @300deg C)         | LV%     |       |       | 100,0  | 100,0  | 100,0  |
| E340 (%Evap. @340deg C)         | LV%     |       |       | 100,0  | 100,0  | 100,0  |
| E345 (%Evap. @345deg C)         | LV%     |       |       | 100,0  | 100,0  | 100,0  |
| E350 (%Evap. @350deg C)         | LV%     |       |       | 100,0  | 100,0  | 100,0  |
| E360 (%Evap. @360deg C)         | LV%     |       |       | 100,0  | 100,0  | 100,0  |
| E370 (%Evap. @370deg C)         | LV%     |       |       | 100,0  | 100,0  | 100,0  |
| RON (clear)                     |         |       |       | 65,0   | 51,9   |        |
| MON (clear)                     |         |       |       | 62,3   | 49,4   |        |
| Reid Vapor Pressure             | kPa     | 17,24 | 18,15 | 61,68  | 7,65   | 0,27   |
| Driveability Index              |         |       |       | 829,3  | 1417,7 | 2106,2 |
| Luminometer Number              |         |       |       |        | 56,12  | 40,68  |
| Thiophenes                      | LV%     |       |       |        |        | 0,2    |
| Naphthalenes                    | WT%     |       |       |        |        | 1,7    |
| Paraffins (Total)               | LV%     |       |       | 70,2   | 44,1   | 30,5   |
| Paraffins (Iso)                 | LV%     |       |       | 33,05  |        |        |
| Paraffins (Normal)              | LV%     |       |       | 37,15  |        |        |
| Naphthenes                      | LV%     |       |       | 28,5   | 45,9   | 52,8   |
| Aromatics                       | LV%     |       |       | 1,3    | 10,0   | 16,7   |
| Asphaltenes                     | WT%     | 2,0   | 2,0   |        |        |        |
| N + 2A                          | LV%     |       |       | 31,11  | 65,96  | 86,25  |
| Wax                             | WT%     | 5,40  |       |        |        |        |
| Benzene Precursor Index         |         |       |       | 14,8   | 1,1    |        |
| Gross Heating Value             | GJ/m3   |       |       | 33,16  | 35,79  | 37,65  |
| Net Heating Value               | GJ/m3   |       |       | 30,87  | 33,47  | 35,29  |
| Flash Point (HSI/API)           | deg C   |       |       |        | 5      | 56     |
| Flash Point (Chevron)           | deg C   |       |       |        |        | 59     |
| Freeze Point                    | deg C   |       |       |        | -77    | -56    |
| Cloud Point                     | deg C   |       |       |        | -81    | -58    |
| Pour Point                      | deg C   | -45   |       |        | -83    | -59    |
| Softening Point                 | deg C   |       |       |        |        |        |
| Penetration                     | dmm     |       |       |        |        |        |
| Smoke Point                     | mm      |       |       | 49,21  | 24,77  | 18,73  |
| Aniline Point                   | deg C   |       |       | 61     | 50     | 51     |
| Neut or TAN No.                 | mgKOH/g | 0,74  |       | 0,01   | 0,03   | 0,07   |
| Cetane Index (D976)             |         |       |       |        |        | 35,0   |
| Cetane Index (D4737-A)          |         |       |       | 35,3   | 28,6   | 35,8   |
| Cetane Index (D4737-B)          |         |       |       | 50,0   | 39,4   | 40,8   |
| Diesel Index                    |         |       |       | 104,0  | 65,3   | 51,0   |
| Refractive Index @20deg C       |         |       |       | 1,3836 | 1,4284 | 1,4607 |
| Refractive Index @55deg C       |         |       |       | 1,3669 | 1,4125 | 1,4454 |
| Refractive Index @67deg C       |         |       |       | 1,3612 | 1,4070 | 1,4402 |
| Refractive Index @70deg C       |         |       |       | 1,3598 | 1,4056 | 1,4389 |
| Refractive Index @80deg C       |         |       |       | 1,3550 | 1,4011 | 1,4345 |
| Viscosity @ 60deg F (15.5deg C) | cSt     |       | 188,2 |        |        | 1,8    |
| Viscosity @ 68deg F ( 20deg C)  | cSt     |       | 150,4 |        |        | 1,7    |
| Viscosity @ 77deg F ( 25deg C)  | cSt     |       | 118,6 |        |        | 1,6    |
| Viscosity @100deg F ( 38deg C)  | cSt     |       | 68,9  |        |        | 1,3    |
| Viscosity @104deg F ( 40deg C)  | cSt     | 63,2  | 63,2  |        |        | 1,3    |
| Viscosity @122deg F ( 50deg C)  | cSt     | 44,1  | 44,1  |        |        | 1,1    |
| Viscosity @130deg F ( 54deg C)  | cSt     |       | 36,9  |        |        | 1,1    |
| Viscosity @140deg F ( 60deg C)  | cSt     |       |       |        |        | 1,0    |
| Viscosity @158deg F ( 70deg C)  | cSt     |       |       |        |        | 0,9    |

Distillate & Resid Cuts

|                                |      |        |        |    |    |       |
|--------------------------------|------|--------|--------|----|----|-------|
| Viscosity @176deg F ( 80deg C) | cSt  |        | 17,2   |    |    | 0,8   |
| Viscosity @180deg F ( 82deg C) | cSt  |        |        |    |    | 0,8   |
| Viscosity @200deg F ( 93deg C) | cSt  |        |        |    |    | 0,7   |
| Viscosity @210deg F ( 98deg C) | cSt  |        |        |    |    | 0,7   |
| Viscosity @212deg F (100deg C) | cSt  | 10,8   | 10,8   |    |    | 0,7   |
| Viscosity @250deg F (121deg C) | cSt  |        |        |    |    | 1     |
| Viscosity @275deg F (135deg C) | cSt  |        |        |    |    | 0,5   |
| Viscosity @300deg F (149deg C) | cSt  |        |        |    |    | 0,5   |
| Viscosity @325deg F (163deg C) | cSt  |        |        |    |    | 0,4   |
| Viscosity @375deg F (190deg C) | cSt  |        |        |    |    | 0,4   |
| Viscosity @425deg F (218deg C) | cSt  |        |        |    |    | 0,3   |
| Viscosity Index (D2270)        |      |        |        |    |    |       |
| Viscosity Slope (Chevron)      |      |        |        |    |    | 0,34  |
| Viscosity Slope (ASTM)         |      |        |        |    |    | -3,79 |
| Ramsbottom Carbon              | WT%  | 5,13   | 5,13   |    |    |       |
| Conradson Carbon               | WT%  |        | 5,39   |    |    |       |
| MCRT Carbon                    | WT%  | 5,7    | 5,4    |    |    |       |
| Sulfur in Ramsbottom Carbon    | WT%  |        |        |    |    |       |
| Iron                           | ppm  | 15,9   | 15,9   |    |    |       |
| Vanadium                       | ppm  | 22,130 | 22,123 |    |    |       |
| Nickel                         | ppm  | 15,420 | 15,413 |    |    |       |
| Aromatic Carbon Content        | WT%  |        |        | 13 | 16 | 20    |
| Salt Content                   | mg/l | 0,0000 |        |    |    |       |
| Filterable Solids              | mg/l | 0,00   |        |    |    |       |

Distillate & Resid Cuts

| CUT4         | CUT5         | CUT6         | CUT7         |
|--------------|--------------|--------------|--------------|
| 230,<br>350, | 350,<br>530, | 530+<br>n/a  | 350+<br>n/a  |
| 18,69        | 31,92        | 29,35        | 61,26        |
| 38,74        | 70,65        | 100,00       | 100,00       |
| 17,81        | 32,88        | 32,49        | 65,36        |
| 34,64        | 67,51        | 100,00       | 100,00       |
| 18,77        | 32,06        | 29,47        | 61,53        |
| 31,11        | 18,95        | 8,49         | 13,75        |
| 0,8702       | 0,9405       | 1,0108       | 0,9741       |
| 0,8662       | 0,9365       | 1,0068       | 0,9702       |
| 0,8697       | 0,9399       | 1,0101       | 0,9736       |
| 0,8662       | 0,9365       | 1,0068       | 0,9702       |
| 11,49        | 11,46        | 11,75        | 11,71        |
| 11,56        | 11,55        | 11,63        | 11,57        |
|              |              | 11,75        | 11,71        |
| 227          | 388          | 777          | 523          |
| 6,8          | 7,3          | 7,8          | 7,6          |
| 0,455        | 0,807        | 1,012        | 0,909        |
| 4            | 0            |              |              |
| 164,2        | 2163,8       | 8822,2       | 5473,1       |
| 109,5        | 906,9        | 2770,8       | 1926,3       |
| 12,8         | 11,9         | 11,1         | 11,5         |
| 230,0        | 350,0        | 530,0        | 350,0        |
| 236,7        | 359,4        | 538,8        | 367,9        |
| 243,2        | 368,6        | 547,7        | 385,4        |
| 256,1        | 386,9        | 566,2        | 419,8        |
| 268,6        | 404,9        | 585,8        | 453,6        |
| 292,9        | 440,3        | 630,3        | 522,4        |
| 316,3        | 475,5        | 688,3        | 601,3        |
| 327,7        | 493,3        | 728,8        | 651,9        |
| 338,9        | 511,4        | 790,3        | 724,7        |
| 344,5        | 520,6        | 844,7        | 786,8        |
| 350,0        | 530,0        | 1098,6       | 1098,6       |
| <b>D1160</b> | <b>D1160</b> | <b>D1160</b> | <b>D1160</b> |
| 244,7        | 368,4        | 548,0        | 372,9        |
| 247,4        | 372,0        | 551,3        | 380,0        |
| 251,4        | 377,9        | 557,0        | 392,0        |
| 262,0        | 393,7        | 572,8        | 424,3        |
| 272,7        | 409,5        | 590,5        | 456,9        |
| 292,9        | 440,3        | 630,3        | 522,4        |
| 316,3        | 475,5        | 688,3        | 601,3        |
| 327,6        | 493,4        | 729,0        | 652,3        |
| 333,3        | 502,4        | 757,1        | 685,9        |
| 338,9        | 511,4        | 790,3        | 724,7        |
| 344,5        | 520,6        | 898,7        | 855,7        |
| 350,0        | 530,0        | 1098,6       | 1098,6       |
| 287,7        | 429,5        | 634,0        | 539,2        |
| 280,9        | 418,6        | 604,4        | 470,7        |
| 285,4        | 426,3        | 626,4        | 520,6        |
| 283,1        | 422,3        | 615,4        | 496,2        |
| 286,7        | 428,1        | 631,0        | 531,7        |
| 0,0          | 0,0          | 0,0          | 0,0          |
| 0,0          | 0,0          | 0,0          | 0,0          |
| 0,0          | 0,0          | 0,0          | 0,0          |

Distillate & Resid Cuts

|        |        |         |         |
|--------|--------|---------|---------|
| 0,0    | 0,0    | 0,0     | 0,0     |
| 0,0    | 0,0    | 0,0     | 0,0     |
| 43,8   | 0,0    | 0,0     | 0,0     |
| 67,4   | 0,0    | 0,0     | 0,0     |
| 100,0  | 0,0    | 0,0     | 0,0     |
| 100,0  | 0,0    | 0,0     | 0,0     |
| 100,0  | 0,0    | 0,0     | 0,0     |
| 100,0  | 0,0    | 0,0     | 0,0     |
| 100,0  | 0,0    | 0,0     | 0,0     |
| 0,14   |        |         |         |
| 25,84  |        |         |         |
| 1,7    | 3,8    |         |         |
| 22,1   | 11,2   | 3,7     | 5,1     |
| 50,3   | 45,4   | 3,5     | 34,7    |
| 27,6   | 43,4   | 92,8    | 60,2    |
|        |        | 6,1     | 3,0     |
| 105,46 | 132,18 | 189,01  | 155,13  |
|        | 10,74  |         |         |
| 39,29  | 41,35  | 43,33   | 42,37   |
| 36,94  | 38,98  | 40,95   | 40,00   |
| 104    | 151    | 172     | 155     |
| 114    |        |         |         |
| -28    | 6      |         |         |
| -28    | 4      |         |         |
| -31    | 1      | 60      | 4       |
|        |        | 53      | 13      |
|        |        | 8,4     | 5451,3  |
| 13,19  |        |         |         |
| 60     | 70     |         |         |
| 0,40   | 1,22   |         |         |
| 44,3   |        |         |         |
| 45,4   |        |         |         |
| 46,8   |        |         |         |
| 43,6   | 30,1   |         |         |
| 1,4899 | 1,5299 | 1,5681  | 1,5482  |
| 1,4758 | 1,5174 | 1,5527  | 1,5359  |
| 1,4709 | 1,5132 | 1,5474  | 1,5316  |
| 1,4697 | 1,5121 | 1,5461  | 1,5306  |
| 1,4657 | 1,5085 | 1,5417  | 1,5270  |
| 7,9    | 1343,3 | 9,5E+08 | 1,0E+05 |
| 6,8    | 857,4  | 2,9E+08 | 5,3E+04 |
| 5,9    | 538,7  | 8,3E+07 | 2,7E+04 |
| 4,2    | 194,1  | 5,3E+06 | 5959,4  |
| 3,9    | 166,0  | 3,5E+06 | 4720,8  |
| 3,1    | 87,7   | 6,2E+05 | 1814,5  |
| 2,9    | 68,1   | 3,1E+05 | 1239,5  |
| 2,6    | 50,8   | 1,4E+05 | 796,0   |
| 2,2    | 31,8   | 3,8E+04 | 389,9   |

Distillate & Resid Cuts

|       |       |         |        |
|-------|-------|---------|--------|
| 1,8   | 21,1  | 1,3E+04 | 209,6  |
| 1,8   | 19,5  | 9965,3  | 184,6  |
| 1,5   | 13,3  | 3521,9  | 103,2  |
| 1,4   | 11,2  | 2212,8  | 79,5   |
| 1,4   | 10,8  | 2024,5  | 75,6   |
| 1     | 6     | 466     | 33     |
| 0,9   | 4,6   | 214,5   | 21,0   |
| 0,8   | 3,6   | 110,8   | 14,3   |
| 0,7   | 2,9   | 63,1    | 10,3   |
| 0,6   | 2,0   | 25,5    | 5,9    |
| 0,5   | 1,4   | 12,8    | 3,9    |
|       | 5     | -1      | 24     |
| 0,42  | 0,59  | 0,61    | 0,60   |
| -4,16 | -4,21 | -3,89   | -3,82  |
|       |       | 15,78   | 7,84   |
|       |       | 16,51   | 8,24   |
|       |       | 16,5    | 8,2    |
|       |       | 1,3     | 1,3    |
|       |       | 49,0    | 24,4   |
|       |       | 68,060  | 33,845 |
|       |       | 47,428  | 23,584 |
| 22    | 28    | 33      | 30     |
|       |       |         |        |
|       |       |         |        |

## GC Cuts (Vol%)

| MARLM228 (Marlim Lt/P-37 Fld(Petrobras)'03) |                                  | Units | WC-Ent       | CUT1          | CUT2          |
|---|----------------------------------|-------|--------------|---------------|---------------|
| Boiling Point                               |                                  | deg C | n/a          | 0-85          | 85-165        |
|   |                                  | deg F | n/a          | 32-185        | 185-329       |
| Yield                                       |                                  | Vol%  |              | 2,58g         | 8,30=         |
| Carbon#                                     | GC Components                    |       |              |               |               |
| C2  | Ethane                           | Vol%  | 0,131        |               |               |
| C3  | Propane                          | Vol%  | 0,479        | 0,055         |               |
| C4  | N-Butane                         | Vol%  | 0,267        | 4,986         | 0,000         |
|   | I-Butane                         | Vol%  | 0,142        | 0,909         | 0,000         |
| C5  | N-Pentane                        | Vol%  | 0,021        | 0,812         | 0,000         |
|   | I-Pentane                        | Vol%  | 0,031        | 1,182         | 0,000         |
|   | Cyclopentane                     | Vol%  | 0,083        | 3,181         | 0,007         |
| C6  | N-Hexane                         | Vol%  | 0,740        | 25,903        | 0,850         |
|   | <b>C6 Isomers (Total)</b>        | Vol%  | <b>0,690</b> | <b>25,728</b> | <b>0,303</b>  |
|   | 2-Methylpentane                  | Vol%  | 0,348        | 13,032        | 0,133         |
|   | 3-Methylpentane                  | Vol%  | 0,265        | 9,773         | 0,151         |
|   | 2,2-Dimethylbutane               | Vol%  | 0,016        | 0,608         | 0,001         |
|   | 2,3-Dimethylbutane               | Vol%  | 0,061        | 2,315         | 0,017         |
|   | <b>C6 Naphthenes (Total)</b>     | Vol%  | <b>0,613</b> | <b>18,444</b> | <b>1,642</b>  |
|   | Methylcyclopentane               | Vol%  | 0,378        | 12,599        | 0,635         |
|   | Cyclohexane                      | Vol%  | 0,235        | 5,846         | 1,007         |
|   | Benzene                          | Vol%  | 0,045        | 1,143         | 0,181         |
| C7  | N-Heptane                        | Vol%  | 0,564        | 2,947         | 5,871         |
|   | <b>C7 Isomers (Total)</b>        | Vol%  | <b>0,558</b> | <b>7,282</b>  | <b>4,456</b>  |
|   | 2-Methylhexane                   | Vol%  | 0,167        | 2,153         | 1,346         |
|   | 3-Methylhexane                   | Vol%  | 0,227        | 2,458         | 1,965         |
|   | 2,2-Dimethylpentane              | Vol%  | 0,013        | 0,350         | 0,049         |
|   | 2,3-Dimethylpentane              | Vol%  | 0,090        | 1,182         | 0,711         |
|   | 2,4-Dimethylpentane              | Vol%  | 0,031        | 0,769         | 0,128         |
|   | 3,3-Dimethylpentane              | Vol%  | 0,005        | 0,092         | 0,033         |
|   | 2,3,3-Trimethylbutane            | Vol%  | 0,003        | 0,066         | 0,012         |
|   | 3-Ethylpentane                   | Vol%  | 0,023        | 0,210         | 0,211         |
|   | <b>C7 Cyclopentanes (Total)</b>  | Vol%  | <b>0,465</b> | <b>4,710</b>  | <b>4,135</b>  |
|   | 1-1-Dimethylcyclopentane         | Vol%  | 0,038        | 0,587         | 0,270         |
|   | 1,Cis-2-Dimethylcyclopentane     | Vol%  | 0,006        | 0,028         | 0,065         |
|   | 1,Cis-3-Dimethylcyclopentane     | Vol%  | 0,098        | 1,071         | 0,843         |
|   | 1,Trans-2-Dimethylcyclopentane   | Vol%  | 0,164        | 1,773         | 1,428         |
|   | 1,Trans-3-Dimethylcyclopentane   | Vol%  | 0,087        | 1,050         | 0,725         |
|   | Ethylcyclopentane                | Vol%  | 0,072        | 0,202         | 0,805         |
|   | Methylcyclohexane                | Vol%  | 0,482        | 1,858         | 5,228         |
|   | Methylbenzene (Toluene)          | Vol%  | 0,148        | 0,161         | 1,727         |
| C8  | N-Octane                         | Vol%  | 0,374        | 0,052         | 4,482         |
|   | I-Octane                         | Vol%  | 0,891        | 0,342         | 10,628        |
|   | <b>C8 Naphthenes (Total)</b>     | Vol%  | <b>1,021</b> | <b>0,299</b>  | <b>12,195</b> |
|   | Methyl-Ethylcyclopentane         | Vol%  | 0,753        | 0,289         | 8,981         |
|   | Dimethylcyclohexane              | Vol%  | 0,267        | 0,010         | 3,214         |
|   | <b>C8 Aromatics (Total)</b>      | Vol%  | <b>0,228</b> | <b>0,005</b>  | <b>2,739</b>  |
|   | 1,4-Dimethylbenzene (P-Xylene)   | Vol%  | 0,027        | 0,001         | 0,328         |
|   | 1,3-Dimethylbenzene (M-Xylene)   | Vol%  | 0,109        | 0,002         | 1,313         |
|   | 1,2-Dimethylbenzene (O-Xylene)   | Vol%  | 0,025        | 0,000         | 0,306         |
|   | Ethylbenzene                     | Vol%  | 0,066        | 0,002         | 0,793         |
| C9  | N-Nonane                         | Vol%  |              |               |               |
|   | I-Nonane                         | Vol%  |              |               |               |
|   | Isobutylcyclopentane             | Vol%  |              |               |               |
|   | Isopropylcyclohexane             | Vol%  |              |               |               |
|   | <b>C9 Aromatics (Total)</b>      | Vol%  |              |               |               |
| C10   | N-Decane                         | Vol%  |              |               |               |
|   | I-Decane                         | Vol%  |              |               |               |
|   | Ethylpropylcyclopentane          | Vol%  |              |               |               |
|   | Isobutylcyclohexane              | Vol%  |              |               |               |
|   | <b>C10 Aromatics (Total)</b>     | Vol%  |              |               |               |
| C11   | N-Undecane                       | Vol%  |              |               |               |
|   | I-Undecane                       | Vol%  |              |               |               |
|   | <b>C11 Cyclopentanes (Total)</b> | Vol%  |              |               |               |
|   | <b>C11 Cyclohexanes (Total)</b>  | Vol%  |              |               |               |
|   | <b>C11 Aromatics (Total)</b>     | Vol%  |              |               |               |

## GC Cuts (Vol%)

|                             |                                       |      |        |         |        |
|-----------------------------|---------------------------------------|------|--------|---------|--------|
| <b>C12</b>                  | <b>N-Dodecane</b>                     | Vol% |        |         |        |
|                             | <b>I-Dodecane</b>                     | Vol% |        |         |        |
|                             | <b>C12 Cyclopentanes (Total)</b>      | Vol% |        |         |        |
|                             | <b>C12 Cyclohexanes (Total)</b>       | Vol% |        |         |        |
|                             | <b>C12 Aromatics (Total)</b>          | Vol% |        |         |        |
| <b>Class Summary (Vol%)</b> |                                       |      |        |         |        |
|                             | <b>N-Paraffins</b>                    | Vol% | 2,575  | 34,755  | 11,204 |
|                             | <b>Iso-Paraffins</b>                  | Vol% | 2,313  | 35,443  | 15,387 |
|                             | <b>Naphthenes</b>                     | Vol% | 2,663  | 28,492  | 23,207 |
|                             | <b>Aromatics</b>                      | Vol% | 0,420  | 1,310   | 4,648  |
|                             | <b>Total Identified GC Components</b> | Vol% | 7,970  | 100,000 | 54,445 |
|                             | <b>Unidentified GC Components</b>     | Vol% | 92,030 |         | 45,555 |

## GC Cuts (Wt%)

| MARLM228 (Marlim Lt/P-37 Fld(Petrobras)'03) |                                  | Units | WC-Ent       | CUT1          | CUT2          |
|---|----------------------------------|-------|--------------|---------------|---------------|
| Boiling Point                               |                                  | deg C | n/a          | 0-85          | 85-165        |
|   |                                  | deg F | n/a          | 32-185        | 185-329       |
| Yield                                       |                                  | WT%   |              | 1,95c         | 6,95c         |
| Carbon#                                     | GC Components                    |       |              |               |               |
| C2  | Ethane                           | WT%   | 0,051        |               |               |
| C3  | Propane                          | WT%   | 0,265        | 0,040         |               |
| C4  | N-Butane                         | WT%   | 0,170        | 4,216         | 0,000         |
|   | I-Butane                         | WT%   | 0,087        | 0,740         | 0,000         |
| C5  | N-Pentane                        | WT%   | 0,015        | 0,742         | 0,000         |
|   | I-Pentane                        | WT%   | 0,021        | 1,068         | 0,000         |
|   | Cyclopentane                     | WT%   | 0,068        | 3,454         | 0,007         |
| C6  | N-Hexane                         | WT%   | 0,535        | 24,879        | 0,738         |
|   | <b>C6 Isomers (Total)</b>        | WT%   | <b>0,498</b> | <b>24,667</b> | <b>0,263</b>  |
|   | 2-Methylpentane                  | WT%   | 0,249        | 12,402        | 0,115         |
|   | 3-Methylpentane                  | WT%   | 0,193        | 9,458         | 0,132         |
|   | 2,2-Dimethylbutane               | WT%   | 0,011        | 0,575         | 0,001         |
|   | 2,3-Dimethylbutane               | WT%   | 0,044        | 2,232         | 0,015         |
|   | <b>C6 Naphthenes (Total)</b>     | WT%   | <b>0,511</b> | <b>20,357</b> | <b>1,658</b>  |
|   | Methylcyclopentane               | WT%   | 0,311        | 13,732        | 0,626         |
|   | Cyclohexane                      | WT%   | 0,200        | 6,625         | 1,031         |
|   | Benzene                          | WT%   | 0,043        | 1,463         | 0,209         |
| C7  | N-Heptane                        | WT%   | 0,423        | 2,933         | 5,284         |
|   | <b>C7 Isomers (Total)</b>        | WT%   | <b>0,420</b> | <b>7,254</b>  | <b>4,023</b>  |
|   | 2-Methylhexane                   | WT%   | 0,125        | 2,128         | 1,203         |
|   | 3-Methylhexane                   | WT%   | 0,171        | 2,459         | 1,777         |
|   | 2,2-Dimethylpentane              | WT%   | 0,010        | 0,344         | 0,044         |
|   | 2,3-Dimethylpentane              | WT%   | 0,068        | 1,196         | 0,651         |
|   | 2,4-Dimethylpentane              | WT%   | 0,023        | 0,753         | 0,114         |
|   | 3,3-Dimethylpentane              | WT%   | 0,004        | 0,093         | 0,030         |
|   | 2,3,3-Trimethylbutane            | WT%   | 0,002        | 0,067         | 0,011         |
|   | 3-Ethylpentane                   | WT%   | 0,018        | 0,214         | 0,194         |
|   | <b>C7 Cyclopentanes (Total)</b>  | WT%   | <b>0,384</b> | <b>5,147</b>  | <b>4,099</b>  |
|   | 1-1-Dimethylcyclopentane         | WT%   | 0,031        | 0,644         | 0,268         |
|   | 1,Cis-2-Dimethylcyclopentane     | WT%   | 0,005        | 0,031         | 0,066         |
|   | 1,Cis-3-Dimethylcyclopentane     | WT%   | 0,080        | 1,167         | 0,830         |
|   | 1,Trans-2-Dimethylcyclopentane   | WT%   | 0,136        | 1,940         | 1,413         |
|   | 1,Trans-3-Dimethylcyclopentane   | WT%   | 0,071        | 1,138         | 0,711         |
|   | Ethylcyclopentane                | WT%   | 0,061        | 0,226         | 0,811         |
|   | Methylcyclohexane                | WT%   | 0,407        | 2,080         | 5,292         |
|   | Methylbenzene (Toluene)          | WT%   | 0,140        | 0,204         | 1,970         |
| C8  | N-Octane                         | WT%   | 0,288        | 0,054         | 4,144         |
|   | I-Octane                         | WT%   | 0,690        | 0,351         | 9,870         |
|   | <b>C8 Naphthenes (Total)</b>     | WT%   | <b>0,890</b> | <b>0,346</b>  | <b>12,761</b> |
|   | Methyl-Ethylcyclopentane         | WT%   | 0,657        | 0,334         | 9,398         |
|   | Dimethylcyclohexane              | WT%   | 0,233        | 0,012         | 3,364         |
|   | <b>C8 Aromatics (Total)</b>      | WT%   | <b>0,216</b> | <b>0,007</b>  | <b>3,121</b>  |
|   | 1,4-Dimethylbenzene (P-Xylene)   | WT%   | 0,026        | 0,001         | 0,371         |
|   | 1,3-Dimethylbenzene (M-Xylene)   | WT%   | 0,103        | 0,003         | 1,492         |
|   | 1,2-Dimethylbenzene (O-Xylene)   | WT%   | 0,025        | 0,000         | 0,355         |
|   | Ethylbenzene                     | WT%   | 0,063        | 0,003         | 0,904         |
| C9  | N-Nonane                         | WT%   |              |               |               |
|   | I-Nonane                         | WT%   |              |               |               |
|   | Isobutylcyclopentane             | WT%   |              |               |               |
|   | Isopropylcyclohexane             | WT%   |              |               |               |
|   | <b>C9 Aromatics (Total)</b>      | WT%   |              |               |               |
| C10   | N-Decane                         | WT%   |              |               |               |
|   | I-Decane                         | WT%   |              |               |               |
|   | Ethylpropylcyclopentane          | WT%   |              |               |               |
|   | Isobutylcyclohexane              | WT%   |              |               |               |
|   | <b>C10 Aromatics (Total)</b>     | WT%   |              |               |               |
| C11   | N-Undecane                       | WT%   |              |               |               |
|   | I-Undecane                       | WT%   |              |               |               |
|   | <b>C11 Cyclopentanes (Total)</b> | WT%   |              |               |               |
|   | <b>C11 Cyclohexanes (Total)</b>  | WT%   |              |               |               |
|   | <b>C11 Aromatics (Total)</b>     | WT%   |              |               |               |

## GC Cuts (Wt%)

|                            |                                       |     |        |         |        |
|----------------------------|---------------------------------------|-----|--------|---------|--------|
| <b>C12</b>                 | <b>N-Dodecane</b>                     | WT% |        |         |        |
|                            | <b>I-Dodecane</b>                     | WT% |        |         |        |
|                            | <b>C12 Cyclopentanes (Total)</b>      | WT% |        |         |        |
|                            | <b>C12 Cyclohexanes (Total)</b>       | WT% |        |         |        |
|                            | <b>C12 Aromatics (Total)</b>          | WT% |        |         |        |
| <b>Class Summary (WT%)</b> |                                       |     |        |         |        |
|                            | <b>N-Paraffins</b>                    | WT% | 1,747  | 32,864  | 10,166 |
|                            | <b>Iso-Paraffins</b>                  | WT% | 1,717  | 34,080  | 14,157 |
|                            | <b>Naphthenes</b>                     | WT% | 2,260  | 31,383  | 23,817 |
|                            | <b>Aromatics</b>                      | WT% | 0,400  | 1,673   | 5,300  |
|                            | <b>Total Identified GC Components</b> | WT% | 6,123  | 100,000 | 53,441 |
|                            | <b>Unidentified GC Components</b>     | WT% | 93,877 |         | 46,559 |