

Datos topograficos

| Puntos | Norte      | Este       | Altura    |
|--------|------------|------------|-----------|
| 1      | 7610231.42 | 321232.744 | 1889.3683 |
| 2      | 7610239.05 | 321226.28  | 1889.2729 |
| 3      | 7610246.68 | 321219.816 | 1889.2123 |
| 4      | 7610251.68 | 321211.288 | 1889.4013 |
| 5      | 7610256.15 | 321202.342 | 1889.4820 |
| 6      | 7610260.62 | 321193.396 | 1889.3375 |
| 7      | 7610262.06 | 321183.761 | 1889.4011 |
| 8      | 7610261.07 | 321174.685 | 1889.5749 |
| 9      | 7610258.34 | 321164.099 | 1889.7385 |
| 10     | 7610259.69 | 321154.82  | 1889.8336 |
| 11     | 7610257.57 | 321146.166 | 1889.9418 |
| 12     | 7610256.48 | 321134.006 | 1890.1860 |
| 13     | 7610255.94 | 321124.217 | 1892.1709 |
| 14     | 7610253.55 | 321114.512 | 1892.8008 |
| 15     | 7610251.02 | 321104.836 | 1893.2771 |
| 16     | 7610248.50 | 321095.16  | 1893.9789 |
| 17     | 7610245.79 | 321086.999 | 1895.2228 |
| 18     | 7610243.44 | 321078.763 | 1896.4581 |
| 19     | 7610241.17 | 321066.07  | 1897.5893 |
| 20     | 7610238.95 | 321058.981 | 1898.1603 |
| 21     | 7610234.99 | 321050.444 | 1897.2782 |
| 22     | 7610232.75 | 321040.225 | 1896.7857 |
| 23     | 7610228.23 | 321031.991 | 1896.7785 |
| 24     | 7610224.85 | 321021.378 | 1896.7713 |
| 25     | 7610221.07 | 321016.025 | 1896.7641 |
| 26     | 7610216.73 | 321006.59  | 1896.7569 |
| 27     | 7610214.14 | 320997.587 | 1895.8988 |
| 28     | 7610209.23 | 320985.744 | 1895.2687 |
| 29     | 7610204.74 | 320976.352 | 1894.8515 |
| 30     | 7610199.83 | 320968.22  | 1894.9264 |
| 31     | 7610193.37 | 320960.772 | 1894.8010 |
| 32     | 7610193.74 | 320947.47  | 1894.776  |
| 33     | 7610190.72 | 320936.548 | 1895.2084 |
| 34     | 7610181.53 | 320924.169 | 1894.2900 |
| 35     | 7610174.77 | 320919.76  | 1895.072  |
| 36     | 7610176.40 | 320915.314 | 1895.0540 |
| 37     | 7610167.49 | 320902.292 | 1895.5131 |
| 38     | 7610166.33 | 320905.607 | 1895.511  |
| 39     | 7610160.75 | 320890.882 | 1895.509  |
| 40     | 7610153.66 | 320879.058 | 1895.9291 |
| 41     | 7610150.30 | 320865.612 | 1897.832  |

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| 42 | 7610137.37 | 320859.46  | 1895.9789 |
| 43 | 7610139.17 | 320855.406 | 1895.826  |
| 44 | 7610131.89 | 320842.867 | 1895.6764 |
| 45 | 7610125.91 | 320833.199 | 1895.6006 |
| 46 | 7610119.56 | 320826.374 | 1895.6908 |
| 47 | 7610118.26 | 320829.465 | 1895.781  |
| 48 | 7610110.09 | 320815.330 | 1895.8713 |
| 49 | 7610103.19 | 320805.672 | 1896.4724 |
| 50 | 7610094.05 | 320803.983 | 1898.769  |
| 51 | 7610082.87 | 320807.581 | 1900.2032 |
| 52 | 7610070.38 | 320794.519 | 1902.457  |
| 53 | 7610062.61 | 320786.692 | 1902.711  |
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| 55 | 7610044.68 | 320782.07  | 1909.1608 |
| 56 | 7610033.97 | 320781.666 | 1911.7603 |
| 57 | 7610026.28 | 320774.939 | 1914.0029 |
| 58 | 7610026.5  | 320782.185 | 1914.4458 |
| 59 | 7610016.49 | 320767.977 | 1914.8888 |
| 60 | 7610015.53 | 320771.406 | 1914.9567 |
| 61 | 7610000.84 | 320744.144 | 1915.1509 |
| 62 | 7609999.70 | 320749.94  | 1915.345  |
| 63 | 7609986.39 | 320715.085 | 1917.539  |
| 64 | 7609998.5  | 320754.046 | 1915.7333 |
| 65 | 7609980.71 | 320705.614 | 1916.1603 |
| 66 | 7609977.56 | 320714.128 | 1916.6238 |
| 67 | 7609964.94 | 320696.086 | 1917.2522 |
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| 69 | 7609952.37 | 320680.527 | 1919.8758 |
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| 74 | 7609931.85 | 320650.517 | 1922.4165 |
| 75 | 7609927.61 | 320626.663 | 1921.7062 |
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| 78 | 7609922.63 | 320597.079 | 1919.6408 |
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| 80 | 7609919.69 | 320576.252 | 1918.4392 |
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| 82 | 7609912.72 | 320558.652 | 1918.3616 |
| 83 | 7609908.49 | 320549.589 | 1918.6418 |
| 84 | 7609904.27 | 320540.525 | 1918.922  |
| 85 | 7609900.04 | 320531.462 | 1919.2021 |

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| 86  | 7609895.82 | 320522.396 | 1919.4802 |
| 87  | 7609891.65 | 320513.306 | 1919.7558 |
| 88  | 7609887.49 | 320504.216 | 1919.5211 |
| 89  | 7609883.32 | 320495.127 | 1919.2575 |
| 90  | 7609879.15 | 320486.037 | 1918.9939 |
| 91  | 7609874.68 | 320477.101 | 1918.8127 |
| 92  | 7609869.65 | 320468.462 | 1918.7896 |
| 93  | 7609864.61 | 320459.822 | 1918.7665 |
| 94  | 7609859.58 | 320451.182 | 1918.7434 |
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| 98  | 7609834.71 | 320419.954 | 1920.1053 |
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| 104 | 7609803.35 | 320368.955 | 1920.4031 |
| 105 | 7609796.94 | 320361.568 | 1921.0105 |
| 106 | 7609789.06 | 320355.412 | 1921.8627 |
| 107 | 7609781.18 | 320349.256 | 1922.6651 |
| 108 | 7609773.3  | 320343.099 | 1923.4706 |
| 109 | 7609765.91 | 320336.369 | 1924.0287 |
| 110 | 7609758.64 | 320329.507 | 1924.5297 |
| 111 | 7609751.36 | 320322.645 | 1924.7629 |
| 112 | 7609744.09 | 320315.783 | 1924.7225 |
| 113 | 7609736.81 | 320308.921 | 1924.6821 |
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| 115 | 7609722.27 | 320295.197 | 1924.8757 |
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| 121 | 7609679.98 | 320252.68  | 1924.5829 |
| 122 | 7609673.24 | 320245.3   | 1924.8817 |
| 123 | 7609666.5  | 320237.916 | 1925.2933 |
| 124 | 7609659.92 | 320230.393 | 1925.4948 |
| 125 | 7609653.97 | 320222.359 | 1925.4818 |
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| 127 | 7609642.06 | 320206.292 | 1925.4557 |
| 128 | 7609636.1  | 320198.258 | 1925.9026 |
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| 130 | 7609626.38 | 320180.794 | 1926.2953 |
| 131 | 7609621.59 | 320172.013 | 1926.5257 |
| 132 | 7609616.81 | 320163.232 | 1926.7561 |
| 133 | 7609613.18 | 320153.961 | 1926.6950 |
| 134 | 7609610.16 | 320144.427 | 1926.4782 |
| 135 | 7609607.14 | 320134.894 | 1926.2077 |
| 136 | 7609604.12 | 320125.361 | 1925.8983 |
| 137 | 7609601.10 | 320115.828 | 1925.6405 |
| 138 | 7609597.93 | 320106.344 | 1925.4525 |
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| 140 | 7609591.50 | 320087.403 | 1925.0966 |
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| 146 | 7609569.37 | 320031.804 | 1925.1592 |
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| 154 | 7609517.13 | 319971.767 | 1929.8125 |
| 155 | 7609509.87 | 319964.891 | 1929.8872 |
| 156 | 7609502.61 | 319958.016 | 1929.9620 |
| 157 | 7609495.11 | 319951.412 | 1930.1683 |
| 158 | 7609487.41 | 319945.025 | 1930.4060 |
| 159 | 7609479.72 | 319938.638 | 1930.0764 |
| 160 | 7609472.02 | 319932.251 | 1929.7928 |
| 161 | 7609463.75 | 319926.665 | 1929.789  |
| 162 | 7609455.27 | 319921.361 | 1929.8791 |
| 163 | 7609446.79 | 319916.057 | 1929.9692 |
| 164 | 7609438.61 | 319910.352 | 1930.0598 |
| 165 | 7609430.88 | 319904.008 | 1930.3665 |
| 166 | 7609423.15 | 319897.664 | 1930.6731 |
| 167 | 7609415.42 | 319891.319 | 1930.9798 |
| 168 | 7609407.69 | 319884.975 | 1931.2865 |
| 169 | 7609400.37 | 319878.161 | 1931.4292 |
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| 174 | 7609364.26 | 319843.579 | 1931.8528 |
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| 176 | 7609349.75 | 319829.812 | 1932.8171 |
| 177 | 7609342.38 | 319823.059 | 1933.5290 |
| 178 | 7609335.00 | 319816.305 | 1934.2409 |
| 179 | 7609327.63 | 319809.552 | 1934.9528 |
| 180 | 7609320.25 | 319802.798 | 1935.2006 |
| 181 | 7609313.35 | 319795.566 | 1935.224  |
| 182 | 7609306.51 | 319788.272 | 1935.2233 |
| 183 | 7609299.67 | 319780.978 | 1935.2226 |
| 184 | 7609292.83 | 319773.684 | 1935.2383 |
| 185 | 7609286.07 | 319766.319 | 1935.5216 |
| 186 | 7609279.85 | 319758.488 | 1935.6256 |
| 187 | 7609273.63 | 319750.657 | 1935.7296 |
| 188 | 7609267.41 | 319742.826 | 1935.8137 |
| 189 | 7609264.37 | 319733.600 | 1935.0432 |
| 190 | 7609262.82 | 319723.722 | 1933.8828 |
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| 192 | 7609259.71 | 319703.965 | 1932.167  |
| 193 | 7609258.15 | 319694.087 | 1931.5776 |
| 194 | 7609256.60 | 319684.208 | 1930.9881 |
| 195 | 7609255.04 | 319674.330 | 1930.8245 |
| 196 | 7609253.49 | 319664.451 | 1931.1046 |
| 197 | 7609251.53 | 319654.646 | 1931.4874 |
| 198 | 7609249.53 | 319644.849 | 1931.8824 |
| 199 | 7609247.52 | 319635.053 | 1932.2775 |
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| 201 | 7609243.50 | 319615.46  | 1933.0676 |
| 202 | 7609241.10 | 319605.790 | 1933.3642 |
| 203 | 7609236.99 | 319596.675 | 1933.7016 |
| 204 | 7609232.88 | 319587.56  | 1934.0198 |
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| 208 | 7609216.55 | 319551.047 | 1935.0574 |
| 209 | 7609212.52 | 319541.892 | 1935.0373 |
| 210 | 7609208.50 | 319532.737 | 1935.0172 |
| 211 | 7609204.48 | 319523.582 | 1934.9971 |
| 212 | 7609200.45 | 319514.427 | 1934.9771 |
| 213 | 7609196.43 | 319505.272 | 1934.9613 |
| 214 | 7609192.41 | 319496.117 | 1934.9465 |
| 215 | 7609188.38 | 319486.962 | 1934.9316 |
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| 217 | 7609179.01 | 319469.379 | 1935.2309 |

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| 218 | 7609173.47 | 319461.056 | 1935.5927 |
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| 221 | 7609156.84 | 319436.087 | 1936.6606 |
| 222 | 7609151.17 | 319427.849 | 1937.0481 |
| 223 | 7609145.36 | 319419.709 | 1937.4729 |
| 224 | 7609139.55 | 319411.569 | 1937.8977 |
| 225 | 7609133.74 | 319403.429 | 1938.0036 |
| 226 | 7609127.93 | 319395.289 | 1937.9281 |
| 227 | 7609121.74 | 319387.448 | 1938.0373 |
| 228 | 7609115.24 | 319379.855 | 1938.2782 |
| 229 | 7609108.73 | 319372.261 | 1938.5191 |
| 230 | 7609102.22 | 319364.667 | 1938.7599 |
| 231 | 7609095.79 | 319357.015 | 1938.9746 |
| 232 | 7609089.43 | 319349.293 | 1938.6419 |
| 233 | 7609081.59 | 319343.486 | 1938.4996 |
| 234 | 7609072.53 | 319339.254 | 1939.0420 |
| 235 | 7609063.47 | 319335.022 | 1938.7858 |
| 236 | 7609054.43 | 319330.753 | 1938.5146 |
| 237 | 7609045.39 | 319326.469 | 1938.2374 |
| 238 | 7609036.36 | 319322.185 | 1937.9602 |
| 239 | 7609027.32 | 319317.902 | 1937.8483 |
| 240 | 7609018.25 | 319313.700 | 1937.6663 |
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| 242 | 7609000.03 | 319305.441 | 1937.2752 |
| 243 | 7608990.93 | 319301.312 | 1937.0932 |
| 244 | 7608982.67 | 319295.680 | 1937.1145 |
| 245 | 7608974.43 | 319290.014 | 1937.1248 |
| 246 | 7608966.19 | 319284.349 | 1936.9418 |
| 247 | 7608957.51 | 319279.414 | 1936.9568 |
| 248 | 7608948.59 | 319274.897 | 1937.0850 |
| 249 | 7608939.67 | 319270.380 | 1937.2131 |
| 250 | 7608930.75 | 319265.863 | 1937.3413 |
| 251 | 7608922.29 | 319260.639 | 1937.2823 |
| 252 | 7608914.59 | 319254.258 | 1937.1039 |
| 253 | 7608906.98 | 319247.784 | 1936.9418 |
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| 255 | 7608893.08 | 319233.395 | 1936.9401 |
| 256 | 7608886.14 | 319226.201 | 1936.9392 |
| 257 | 7608878.97 | 319219.237 | 1936.9087 |
| 258 | 7608871.68 | 319212.386 | 1936.8021 |
| 259 | 7608864.40 | 319205.54  | 1936.6955 |
| 260 | 7608857.11 | 319198.68  | 1936.7873 |
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| 262 | 7608842.54 | 319184.991 | 1937.0552 |
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| 265 | 7608820.67 | 319164.456 | 1936.863  |
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| 267 | 7608806.12 | 319150.727 | 1936.7109 |
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| 271 | 7608778.08 | 319122.223 | 1935.9996 |
| 272 | 7608771.21 | 319114.957 | 1935.7027 |
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| 274 | 7608757.47 | 319100.426 | 1935.1087 |
| 275 | 7608750.40 | 319093.371 | 1934.8953 |
| 276 | 7608742.66 | 319087.045 | 1935.0357 |
| 277 | 7608734.91 | 319080.718 | 1935.1829 |
| 278 | 7608727.17 | 319074.392 | 1935.3301 |
| 279 | 7608719.42 | 319068.066 | 1935.4773 |
| 280 | 7608711.68 | 319061.740 | 1935.3904 |
| 281 | 7608703.93 | 319055.413 | 1935.2645 |
| 282 | 7608696.19 | 319049.087 | 1935.1387 |
| 283 | 7608688.53 | 319042.656 | 1934.9701 |
| 284 | 7608681.24 | 319035.819 | 1934.6353 |
| 285 | 7608673.94 | 319028.981 | 1934.2641 |
| 286 | 7608666.64 | 319022.143 | 1933.8798 |
| 287 | 7608659.35 | 319015.306 | 1933.4954 |
| 288 | 7608650.67 | 319011.693 | 1934.0991 |
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| 291 | 7608620.72 | 319010.057 | 1938.8104 |
| 292 | 7608611.38 | 319007.213 | 1939.6481 |
| 293 | 7608602.60 | 319002.433 | 1939.9742 |
| 294 | 7608593.82 | 318997.654 | 1940.4099 |
| 295 | 7608585.03 | 318992.875 | 1940.8549 |
| 296 | 7608576.50 | 318987.763 | 1941.1466 |
| 297 | 7608569.43 | 318980.689 | 1940.5351 |
| 298 | 7608562.36 | 318973.614 | 1939.9441 |
| 299 | 7608555.29 | 318966.540 | 1939.4961 |
| 300 | 7608548.23 | 318959.465 | 1939.5724 |
| 301 | 7608542.68 | 318951.175 | 1939.3044 |
| 302 | 7608537.33 | 318942.725 | 1938.9748 |
| 303 | 7608531.98 | 318934.274 | 1938.6453 |
| 304 | 7608526.64 | 318925.824 | 1938.3157 |
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| 326 | 7608397.32 | 318782.36 | 1939.35   |
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| 329 | 7608367.45 | 318779.64 | 1940.85   |
| 330 | 7608358.11 | 318777.16 | 1940.83   |
| 331 | 7608350.18 | 318771.06 | 1939.59   |
| 332 | 7608342.26 | 318764.95 | 1938.44   |
| 333 | 7608335.53 | 318757.93 | 1937.28   |
| 334 | 7608331.60 | 318748.73 | 1935.52   |
| 335 | 7608327.66 | 318739.54 | 1933.77   |
| 336 | 7608323.58 | 318730.43 | 1931.81   |
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| 350 | 7608218.83 | 318639.623 | 1921.6424 |
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| 2345 | 7608408.08 | 318758.796 | 1932.6775 |
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| 2783 | 7607539.63 | 317902.804 | 1909.1621 |
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| 2785 | 7607546.57 | 317969.874 | 1908.7243 |
| 2786 | 7607552.57 | 317993.060 | 1908.6127 |
| 2787 | 7607563.82 | 318014.036 | 1908.4819 |
| 2788 | 7607573.04 | 318043.008 | 1909.0072 |
| 2789 | 7608733.13 | 319045.554 | 1927.9629 |
| 2790 | 7608747.02 | 319065.312 | 1929.4689 |
| 2791 | 7608769.69 | 319086.533 | 1929.7763 |
| 2792 | 7608782.85 | 319083.606 | 1927.1969 |
| 2793 | 7608827.44 | 319134.097 | 1929.2836 |
| 2794 | 7608846.45 | 319158.246 | 1930.9121 |
| 2795 | 7608864.89 | 319174.414 | 1930.8594 |
| 2796 | 7608872.93 | 319183.927 | 1931.3378 |
| 2797 | 7608880.24 | 319194.904 | 1932.2035 |
| 2798 | 7608895.60 | 319205.148 | 1931.6523 |
| 2799 | 7608912.41 | 319219.052 | 1931.4761 |
| 2800 | 7608927.76 | 319237.346 | 1932.6048 |
| 2801 | 7608947.50 | 319248.322 | 1932.1324 |
| 2802 | 7608970.47 | 319260.092 | 1931.5475 |
| 2803 | 7609032.61 | 319295.217 | 1930.1060 |
| 2804 | 7609095.65 | 319335.869 | 1933.1792 |
| 2805 | 7609106.27 | 319344.777 | 1933.6231 |
| 2806 | 7609116.32 | 319360.870 | 1934.8302 |
| 2807 | 7609125.22 | 319370.353 | 1934.3485 |
| 2808 | 7609133.83 | 319384.722 | 1934.8289 |
| 2809 | 7609142.73 | 319399.952 | 1935.4097 |
| 2810 | 7609156.64 | 319410.948 | 1934.1593 |
| 2811 | 7609170.99 | 319428.478 | 1933.1733 |
| 2812 | 7609147.45 | 319389.683 | 1932.6250 |
| 2813 | 7609183.34 | 319448.307 | 1932.4916 |

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|------|------------|------------|-----------|
| 2814 | 7609192.53 | 319464.687 | 1932.1223 |
| 2815 | 7609200.09 | 319480.837 | 1932.0554 |
| 2816 | 7609209.28 | 319497.218 | 1931.6861 |
| 2817 | 7609219.04 | 319519.058 | 1931.6889 |
| 2818 | 7609225.64 | 319536.875 | 1931.9676 |
| 2819 | 7609229.41 | 319549.316 | 1932.1879 |
| 2820 | 7609237.45 | 319565.122 | 1931.4606 |
| 2821 | 7609246.93 | 319584.088 | 1930.6266 |
| 2822 | 7609254.11 | 319601.618 | 1930.2105 |
| 2823 | 7609257.29 | 319621.513 | 1929.8343 |
| 2824 | 7609263.32 | 319636.456 | 1928.7734 |
| 2825 | 7609271.36 | 319653.411 | 1927.3370 |
| 2826 | 7609273.08 | 319672.377 | 1927.5099 |
| 2827 | 7609275.45 | 319700.094 | 1928.6654 |
| 2828 | 7609277.46 | 319711.014 | 1929.3027 |
| 2829 | 7609282.06 | 319729.118 | 1930.8146 |
| 2830 | 7609274.59 | 319685.151 | 1927.8125 |
| 2831 | 7609291.53 | 319742.625 | 1930.8901 |
| 2832 | 7609303.30 | 319756.131 | 1930.4976 |
| 2833 | 7609318.23 | 319775.098 | 1930.3640 |
| 2834 | 7609326.27 | 319787.167 | 1930.6089 |
| 2835 | 7609334.03 | 319797.225 | 1930.4868 |
| 2836 | 7609346.80 | 319807.057 | 1929.1577 |
| 2837 | 7609358.86 | 319817.115 | 1928.1454 |
| 2838 | 7609367.47 | 319828.609 | 1928.1686 |
| 2839 | 7609374.08 | 319834.932 | 1927.9353 |
| 2840 | 7609384.41 | 319846.714 | 1928.2202 |
| 2841 | 7609396.76 | 319853.611 | 1927.2912 |
| 2842 | 7609404.51 | 319865.680 | 1928.0227 |
| 2843 | 7609417.82 | 319874.924 | 1926.8549 |
| 2844 | 7609429.87 | 319884.695 | 1926.4072 |
| 2845 | 7609439.64 | 319893.604 | 1926.2581 |
| 2846 | 7609449.68 | 319903.662 | 1926.7655 |
| 2847 | 7609460.88 | 319911.995 | 1926.9434 |
| 2848 | 7609476.17 | 319916.628 | 1925.7655 |
| 2849 | 7609494.26 | 319929.559 | 1926.2304 |
| 2850 | 7609508.04 | 319942.491 | 1926.7333 |
| 2851 | 7609529.78 | 319954.863 | 1925.2381 |
| 2852 | 7609554.71 | 319968.809 | 1923.1225 |
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| 2854 | 7607233.98 | 316826.483 | 1909.9240 |
| 2855 | 7607238.32 | 316814.458 | 1909.9643 |
| 2856 | 7607253.34 | 316816.963 | 1909.9872 |
| 2857 | 7607192.81 | 317023.474 | 1909.4394 |

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| 2858 | 7607153.00 | 317058.881 | 1906.8370 |
| 2859 | 7607123.46 | 317069.905 | 1909.6184 |
| 2860 | 7607094.92 | 317084.938 | 1909.6682 |
| 2861 | 7607063.88 | 317096.463 | 1909.6949 |
| 2862 | 7607033.11 | 317117.110 | 1909.7504 |
| 2863 | 7607020.59 | 317126.130 | 1909.7749 |
| 2864 | 7607002.57 | 317135.650 | 1909.8255 |
| 2865 | 7606976.04 | 317147.175 | 1909.8758 |
| 2866 | 7606870.62 | 317204.388 | 1913.9268 |
| 2867 | 7606856.60 | 317219.922 | 1915.3214 |
| 2868 | 7606822.06 | 317235.456 | 1918.2188 |
| 2869 | 7606770.17 | 317264.126 | 1919.2121 |
| 2870 | 7606738.62 | 317320.749 | 1919.3660 |
| 2871 | 7606729.11 | 317366.849 | 1919.9708 |
| 2872 | 7606726.11 | 317416.958 | 1923.4549 |
| 2873 | 7606742.13 | 317446.523 | 1924.9018 |
| 2874 | 7606790.35 | 317469.630 | 1922.0515 |
| 2875 | 7606825.39 | 317488.170 | 1922.6285 |
| 2876 | 7606854.43 | 317490.676 | 1924.4655 |
| 2877 | 7606878.86 | 317487.519 | 1924.6000 |
| 2878 | 7606910.55 | 317500.080 | 1926.3171 |
| 2879 | 7606945.59 | 317506.074 | 1927.0960 |
| 2880 | 7606970.06 | 317510.156 | 1927.6156 |
| 2881 | 7606991.71 | 317512.354 | 1927.1780 |
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| 2883 | 7607039.39 | 317521.461 | 1923.7801 |
| 2884 | 7607057.06 | 317521.572 | 1922.1599 |
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| 2887 | 7607111.82 | 317536.376 | 1920.3211 |
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| 2889 | 7607156.39 | 317545.212 | 1923.2127 |
| 2890 | 7607181.57 | 317555.922 | 1925.3235 |
| 2891 | 7607204.85 | 317562.851 | 1925.2804 |
| 2892 | 7607226.88 | 317567.261 | 1922.9133 |
| 2893 | 7607252.86 | 317568.226 | 1918.6200 |
| 2894 | 7607278.66 | 317575.470 | 1916.2451 |
| 2895 | 7607314.22 | 317588.069 | 1913.3306 |
| 2896 | 7607327.81 | 317611.406 | 1911.3239 |
| 2897 | 7607344.49 | 317632.824 | 1910.1774 |
| 2898 | 7607364.71 | 317655.548 | 1904.5890 |
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| 2900 | 7607400.33 | 317719.848 | 1917.3868 |
| 2901 | 7607409.77 | 317754.495 | 1921.0000 |

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|------|------------|------------|-----------|
| 2902 | 7607391.52 | 317708.193 | 1916.9710 |
| 2903 | 7607376.10 | 317673.546 | 1913.2479 |
| 2904 | 7607424.61 | 317773.473 | 1919.6753 |
| 2905 | 7607432.48 | 317796.466 | 1918.4698 |
| 2906 | 7607423.35 | 317810.325 | 1920.3074 |
| 2907 | 7607401.64 | 317813.790 | 1925.1228 |
| 2908 | 7607385.27 | 317817.885 | 1926.7326 |
| 2909 | 7607365.45 | 317827.964 | 1928.2809 |
| 2910 | 7607498.93 | 317922.038 | 1913.9411 |
| 2911 | 7607503.97 | 317947.790 | 1912.7481 |
| 2912 | 7607507.50 | 317976.066 | 1911.4156 |
| 2913 | 7607502.58 | 317994.408 | 1912.4362 |
| 2914 | 7607516.20 | 318037.832 | 1914.2220 |
| 2915 | 7607526.29 | 318064.089 | 1915.6115 |
| 2916 | 7607689.03 | 318238.739 | 1928.4206 |
| 2917 | 7607719.72 | 318226.616 | 1926.6154 |
| 2918 | 7607768.97 | 318211.259 | 1923.9316 |
| 2919 | 7607781.09 | 318225.807 | 1925.6630 |
| 2920 | 7607934.07 | 318434.563 | 1937.4144 |
| 2921 | 7607951.31 | 318454.854 | 1936.9167 |
| 2922 | 7607995.20 | 318504.273 | 1934.9666 |
| 2923 | 7607985.54 | 318493.588 | 1935.4840 |
| 2924 | 7608018.59 | 318528.696 | 1934.1556 |
| 2925 | 7608045.02 | 318551.083 | 1931.0702 |
| 2926 | 7608134.52 | 318616.872 | 1929.9492 |
| 2927 | 7608149.54 | 318624.228 | 1930.2423 |
| 2928 | 7608165.19 | 318632.224 | 1930.4055 |
| 2929 | 7608175.74 | 318637.022 | 1929.1674 |
| 2930 | 7608269.36 | 318711.116 | 1927.8800 |
| 2931 | 7608290.90 | 318717.873 | 1929.1156 |
| 2932 | 7608297.15 | 318664.133 | 1919.2738 |
| 2933 | 7608283.95 | 318662.844 | 1919.0941 |
| 2934 | 7608278.80 | 318711.509 | 1924.9500 |
| 2935 | 7608294.81 | 318729.291 | 1931.8098 |
| 2936 | 7608325.23 | 318783.254 | 1945.0987 |
| 2937 | 7608382.74 | 318802.989 | 1946.4320 |
| 2938 | 7608631.90 | 319029.871 | 1941.9406 |
| 2939 | 7608647.18 | 319034.425 | 1940.0301 |
| 2940 | 7608661.47 | 319046.134 | 1940.4878 |
| 2941 | 7608674.47 | 319057.193 | 1941.0287 |
| 2942 | 7608727.47 | 319104.830 | 1943.0040 |
| 2943 | 7608739.21 | 319110.702 | 1941.5483 |
| 2944 | 7608750.62 | 319123.752 | 1942.4110 |
| 2945 | 7608853.37 | 319228.219 | 1943.8266 |

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|------|------------|------------|-----------|
| 2946 | 7608803.73 | 319184.285 | 1945.2936 |
| 2947 | 7608990.58 | 319328.409 | 1947.6929 |
| 2948 | 7609011.55 | 319341.525 | 1949.5713 |
| 2949 | 7609030.42 | 319349.918 | 1949.8440 |
| 2950 | 7609047.71 | 319356.214 | 1948.7784 |
| 2951 | 7609062.61 | 319360.995 | 1947.5567 |
| 2952 | 7609081.48 | 319367.815 | 1945.1006 |
| 2953 | 7609130.94 | 319429.811 | 1942.1791 |
| 2954 | 7609140.82 | 319444.645 | 1941.0609 |
| 2955 | 7609150.55 | 319453.527 | 1939.4655 |
| 2956 | 7609218.43 | 319611.462 | 1938.7496 |
| 2957 | 7609227.39 | 319630.464 | 1937.0951 |
| 2958 | 7609232.66 | 319653.689 | 1936.2191 |
| 2959 | 7609235.83 | 319665.301 | 1935.6911 |
| 2960 | 7609241.10 | 319684.303 | 1934.8017 |
| 2961 | 7609246.38 | 319707.000 | 1935.6262 |
| 2962 | 7609469.50 | 319962.717 | 1938.5273 |
| 2963 | 7609484.43 | 319975.521 | 1938.0141 |
| 2964 | 7609502.02 | 319986.192 | 1936.3682 |
| 2965 | 7609564.01 | 320080.714 | 1931.0169 |
| 2966 | 7609605.42 | 320175.718 | 1930.5016 |
| 2967 | 7609611.83 | 320192.843 | 1930.7661 |
| 2968 | 7609615.58 | 320206.221 | 1931.7463 |
| 2969 | 7609653.54 | 320257.596 | 1931.8860 |
| 2970 | 7609672.79 | 320270.440 | 1929.6485 |
| 2971 | 7609789.11 | 320385.585 | 1927.6758 |
| 2972 | 7609797.70 | 320407.089 | 1929.0824 |
| 2973 | 7609808.45 | 320419.992 | 1928.2151 |
| 2974 | 7609841.21 | 320469.452 | 1927.3974 |
| 2975 | 7609857.33 | 320481.818 | 1924.6209 |
| 2976 | 7609892.86 | 320545.120 | 1923.6205 |

# COORDENADAS EJE DEL CAMINO

Nombre de alineación: Eje Sn Jacinto – Tolomosa

Descripción

Intervalo de P.K.: inicio: 0+000.00, fin: 6+303.52

Incremento de P.K.: 20.00

| P.K.     | Ordenada        | Abscisa       | Orientación de tangente |
|----------|-----------------|---------------|-------------------------|
| 0+000.00 | 7,610,253.3916m | 321,180.8578m | S83° 04' 27"O           |
| 0+020.00 | 7,610,250.9799m | 321,161.0037m | S83° 04' 27"O           |
| 0+040.00 | 7,610,248.5682m | 321,141.1497m | S83° 04' 27"O           |
| 0+060.00 | 7,610,245.7334m | 321,121.3554m | S79° 43' 27"O           |
| 0+080.00 | 7,610,241.3826m | 321,101.8398m | S75° 08' 25"O           |
| 0+100.00 | 7,610,235.8718m | 321,082.6145m | S73° 48' 48"O           |
| 0+120.00 | 7,610,230.2965m | 321,063.4073m | S73° 48' 48"O           |
| 0+140.00 | 7,610,224.7212m | 321,044.2001m | S73° 48' 48"O           |
| 0+160.00 | 7,610,218.5256m | 321,025.1892m | S69° 40' 47"O           |
| 0+180.00 | 7,610,210.8379m | 321,006.7316m | S65° 05' 46"O           |
| 0+200.00 | 7,610,201.9942m | 320,988.7939m | S63° 27' 56"O           |
| 0+220.00 | 7,610,193.0595m | 320,970.9006m | S63° 27' 56"O           |
| 0+240.00 | 7,610,184.1248m | 320,953.0072m | S63° 27' 56"O           |
| 0+260.00 | 7,610,175.1901m | 320,935.1139m | S63° 27' 56"O           |
| 0+280.00 | 7,610,166.2554m | 320,917.2206m | S63° 27' 56"O           |
| 0+300.00 | 7,610,157.3207m | 320,899.3273m | S63° 27' 56"O           |
| 0+320.00 | 7,610,148.3860m | 320,881.4339m | S63° 27' 56"O           |
| 0+340.00 | 7,610,139.4483m | 320,863.5421m | S62° 59' 51"O           |
| 0+360.00 | 7,610,128.6521m | 320,846.7460m | S51° 32' 18"O           |
| 0+380.00 | 7,610,115.0693m | 320,832.0805m | S45° 42' 59"O           |
| 0+400.00 | 7,610,101.1051m | 320,817.7627m | S45° 42' 59"O           |
| 0+420.00 | 7,610,085.4640m | 320,805.4785m | S27° 05' 05"O           |
| 0+440.00 | 7,610,066.8036m | 320,798.3175m | S19° 51' 17"O           |
| 0+460.00 | 7,610,048.1949m | 320,791.0391m | S28° 10' 07"O           |
| 0+480.00 | 7,610,031.6119m | 320,779.8778m | S34° 56' 37"O           |
| 0+500.00 | 7,610,015.5907m | 320,767.9285m | S41° 19' 11"O           |
| 0+520.00 | 7,610,001.9860m | 320,753.3141m | S52° 46' 44"O           |
| 0+540.00 | 7,609,990.0058m | 320,737.2993m | S53° 12' 33"O           |
| 0+560.00 | 7,609,978.0279m | 320,721.2827m | S53° 12' 33"O           |
| 0+580.00 | 7,609,966.0500m | 320,705.2662m | S53° 12' 33"O           |
| 0+600.00 | 7,609,954.0721m | 320,689.2496m | S53° 12' 33"O           |
| 0+620.00 | 7,609,942.0942m | 320,673.2331m | S53° 12' 33"O           |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 0+640.00 | 7,609,931.0589m | 320,656.5828m | S61° 50' 51"O |
| 0+660.00 | 7,609,923.4428m | 320,638.1258m | S73° 18' 24"O |
| 0+680.00 | 7,609,919.1681m | 320,618.5990m | S79° 07' 56"O |
| 0+700.00 | 7,609,915.3972m | 320,598.9577m | S79° 07' 56"O |
| 0+720.00 | 7,609,910.8594m | 320,579.4972m | S71° 56' 17"O |
| 0+740.00 | 7,609,903.1389m | 320,561.0627m | S65° 25' 31"O |
| 0+760.00 | 7,609,894.8212m | 320,542.8743m | S65° 25' 31"O |
| 0+780.00 | 7,609,886.5036m | 320,524.6860m | S65° 25' 31"O |
| 0+800.00 | 7,609,878.1860m | 320,506.4976m | S65° 25' 31"O |
| 0+820.00 | 7,609,869.3904m | 320,488.5405m | S61° 41' 26"O |
| 0+840.00 | 7,609,859.3197m | 320,471.2639m | S58° 55' 50"O |
| 0+860.00 | 7,609,848.9982m | 320,454.1331m | S58° 55' 50"O |
| 0+880.00 | 7,609,838.6766m | 320,437.0022m | S58° 55' 50"O |
| 0+900.00 | 7,609,828.3551m | 320,419.8713m | S58° 55' 50"O |
| 0+920.00 | 7,609,818.0336m | 320,402.7405m | S58° 55' 50"O |
| 0+940.00 | 7,609,807.5512m | 320,385.7103m | S56° 02' 54"O |
| 0+960.00 | 7,609,795.3100m | 320,369.9128m | S48° 24' 32"O |
| 0+980.00 | 7,609,781.1102m | 320,355.8461m | S42° 14' 16"O |
| 1+000.00 | 7,609,766.3029m | 320,342.4019m | S42° 14' 16"O |
| 1+020.00 | 7,609,751.4956m | 320,328.9578m | S42° 14' 16"O |
| 1+040.00 | 7,609,736.6884m | 320,315.5136m | S42° 14' 16"O |
| 1+060.00 | 7,609,721.8811m | 320,302.0695m | S42° 14' 16"O |
| 1+080.00 | 7,609,707.0743m | 320,288.6249m | S42° 21' 40"O |
| 1+100.00 | 7,609,692.8505m | 320,274.5724m | S46° 56' 42"O |
| 1+120.00 | 7,609,679.4381m | 320,259.7367m | S48° 00' 27"O |
| 1+140.00 | 7,609,666.0574m | 320,244.8721m | S48° 00' 27"O |
| 1+160.00 | 7,609,652.6768m | 320,230.0075m | S48° 00' 27"O |
| 1+180.00 | 7,609,639.2961m | 320,215.1428m | S48° 00' 27"O |
| 1+200.00 | 7,609,626.3760m | 320,199.8930m | S54° 17' 14"O |
| 1+220.00 | 7,609,616.2171m | 320,182.6894m | S62° 47' 19"O |
| 1+240.00 | 7,609,607.7924m | 320,164.5563m | S67° 22' 20"O |
| 1+260.00 | 7,609,600.7878m | 320,145.8270m | S70° 42' 36"O |
| 1+280.00 | 7,609,594.1808m | 320,126.9498m | S70° 42' 36"O |
| 1+300.00 | 7,609,587.5738m | 320,108.0726m | S70° 42' 36"O |
| 1+320.00 | 7,609,580.9668m | 320,089.1955m | S70° 42' 36"O |
| 1+340.00 | 7,609,574.3598m | 320,070.3183m | S70° 42' 36"O |
| 1+360.00 | 7,609,567.7528m | 320,051.4411m | S70° 42' 36"O |
| 1+380.00 | 7,609,560.2276m | 320,032.9405m | S61° 40' 55"O |
| 1+400.00 | 7,609,548.6556m | 320,016.6909m | S48° 11' 19"O |
| 1+420.00 | 7,609,535.3220m | 320,001.7841m | S48° 11' 19"O |
| 1+440.00 | 7,609,521.9884m | 319,986.8772m | S48° 11' 19"O |
| 1+460.00 | 7,609,508.6548m | 319,971.9703m | S48° 11' 19"O |
| 1+480.00 | 7,609,495.3211m | 319,957.0635m | S48° 11' 19"O |
| 1+500.00 | 7,609,481.2605m | 319,942.8803m | S39° 00' 35"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 1+520.00 | 7,609,464.8171m | 319,931.5091m | S33° 40' 14"O |
| 1+540.00 | 7,609,448.1724m | 319,920.4207m | S33° 40' 14"O |
| 1+560.00 | 7,609,431.5276m | 319,909.3324m | S33° 40' 14"O |
| 1+580.00 | 7,609,414.8902m | 319,898.2331m | S34° 42' 36"O |
| 1+600.00 | 7,609,399.9415m | 319,885.0072m | S45° 46' 14"O |
| 1+620.00 | 7,609,385.9909m | 319,870.6762m | S45° 46' 14"O |
| 1+640.00 | 7,609,372.0402m | 319,856.3451m | S45° 46' 14"O |
| 1+660.00 | 7,609,358.0896m | 319,842.0140m | S45° 46' 14"O |
| 1+680.00 | 7,609,344.1390m | 319,827.6829m | S45° 46' 14"O |
| 1+700.00 | 7,609,330.1883m | 319,813.3519m | S45° 46' 14"O |
| 1+720.00 | 7,609,316.2377m | 319,799.0208m | S45° 46' 14"O |
| 1+740.00 | 7,609,302.2871m | 319,784.6897m | S45° 46' 14"O |
| 1+760.00 | 7,609,288.3364m | 319,770.3586m | S45° 46' 14"O |
| 1+780.00 | 7,609,274.3873m | 319,756.0261m | S46° 11' 22"O |
| 1+800.00 | 7,609,262.4803m | 319,740.0216m | S60° 30' 48"O |
| 1+820.00 | 7,609,254.9029m | 319,721.5688m | S74° 50' 14"O |
| 1+840.00 | 7,609,251.3418m | 319,701.9003m | S81° 06' 38"O |
| 1+860.00 | 7,609,248.2512m | 319,682.1406m | S81° 06' 38"O |
| 1+880.00 | 7,609,245.1606m | 319,662.3808m | S81° 06' 38"O |
| 1+900.00 | 7,609,241.9726m | 319,642.6372m | S79° 30' 02"O |
| 1+920.00 | 7,609,237.5458m | 319,623.1388m | S74° 55' 01"O |
| 1+940.00 | 7,609,232.2906m | 319,603.8415m | S74° 45' 49"O |
| 1+960.00 | 7,609,226.7662m | 319,584.6257m | S69° 57' 59"O |
| 1+980.00 | 7,609,218.2829m | 319,566.5288m | S63° 21' 45"O |
| 2+000.00 | 7,609,209.3160m | 319,548.6516m | S63° 21' 45"O |
| 2+020.00 | 7,609,200.3491m | 319,530.7744m | S63° 21' 45"O |
| 2+040.00 | 7,609,191.3822m | 319,512.8971m | S63° 21' 45"O |
| 2+060.00 | 7,609,182.4153m | 319,495.0199m | S63° 21' 45"O |
| 2+080.00 | 7,609,173.4484m | 319,477.1427m | S63° 21' 45"O |
| 2+100.00 | 7,609,164.4815m | 319,459.2655m | S63° 21' 45"O |
| 2+120.00 | 7,609,155.2037m | 319,441.5532m | S59° 26' 15"O |
| 2+140.00 | 7,609,144.0249m | 319,424.9802m | S54° 12' 52"O |
| 2+160.00 | 7,609,132.3299m | 319,408.7559m | S54° 12' 52"O |
| 2+180.00 | 7,609,120.6349m | 319,392.5317m | S54° 12' 52"O |
| 2+200.00 | 7,609,108.9398m | 319,376.3074m | S54° 12' 52"O |
| 2+220.00 | 7,609,096.1685m | 319,360.9657m | S43° 31' 17"O |
| 2+240.00 | 7,609,080.1041m | 319,349.1395m | S29° 11' 51"O |
| 2+260.00 | 7,609,062.4291m | 319,339.7808m | S27° 50' 10"O |
| 2+280.00 | 7,609,044.7433m | 319,330.4420m | S27° 50' 10"O |
| 2+300.00 | 7,609,027.0576m | 319,321.1031m | S27° 50' 10"O |
| 2+320.00 | 7,609,009.3718m | 319,311.7643m | S27° 50' 10"O |
| 2+340.00 | 7,608,991.6861m | 319,302.4254m | S27° 50' 10"O |
| 2+360.00 | 7,608,974.0003m | 319,293.0866m | S27° 50' 10"O |
| 2+380.00 | 7,608,956.3146m | 319,283.7477m | S27° 50' 10"O |

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| 2+400.00 | 7,608,938.6288m | 319,274.4089m | S27° 50' 10"O |
| 2+420.00 | 7,608,921.2452m | 319,264.5504m | S34° 51' 40"O |
| 2+440.00 | 7,608,905.6924m | 319,251.9914m | S42° 27' 43"O |
| 2+460.00 | 7,608,891.3080m | 319,238.0963m | S44° 09' 35"O |
| 2+480.00 | 7,608,876.9601m | 319,224.1631m | S44° 09' 35"O |
| 2+500.00 | 7,608,862.6121m | 319,210.2299m | S44° 09' 35"O |
| 2+520.00 | 7,608,848.2641m | 319,196.2966m | S44° 09' 35"O |
| 2+540.00 | 7,608,833.9161m | 319,182.3634m | S44° 09' 35"O |
| 2+560.00 | 7,608,819.5681m | 319,168.4302m | S44° 09' 35"O |
| 2+580.00 | 7,608,805.2201m | 319,154.4969m | S44° 09' 35"O |
| 2+600.00 | 7,608,790.8721m | 319,140.5637m | S44° 09' 35"O |
| 2+620.00 | 7,608,776.5241m | 319,126.6304m | S44° 09' 35"O |
| 2+640.00 | 7,608,762.1761m | 319,112.6972m | S44° 09' 35"O |
| 2+660.00 | 7,608,747.8281m | 319,098.7640m | S44° 09' 35"O |
| 2+680.00 | 7,608,733.4801m | 319,084.8307m | S44° 09' 35"O |
| 2+700.00 | 7,608,719.1321m | 319,070.8975m | S44° 09' 35"O |
| 2+720.00 | 7,608,704.7841m | 319,056.9643m | S44° 09' 35"O |
| 2+740.00 | 7,608,690.4361m | 319,043.0310m | S44° 09' 35"O |
| 2+760.00 | 7,608,675.0129m | 319,030.3673m | S32° 28' 05"O |
| 2+780.00 | 7,608,657.3981m | 319,020.9104m | S27° 17' 50"O |
| 2+800.00 | 7,608,639.6253m | 319,011.7382m | S27° 17' 50"O |
| 2+820.00 | 7,608,621.1720m | 319,004.0972m | S19° 28' 13"O |
| 2+840.00 | 7,608,602.3157m | 318,997.4308m | S19° 28' 13"O |
| 2+860.00 | 7,608,583.4655m | 318,990.7475m | S20° 41' 03"O |
| 2+880.00 | 7,608,565.8275m | 318,981.4298m | S35° 00' 29"O |
| 2+900.00 | 7,608,551.0429m | 318,968.0381m | S49° 19' 56"O |
| 2+920.00 | 7,608,538.9578m | 318,952.1070m | S53° 23' 29"O |
| 2+940.00 | 7,608,527.0308m | 318,936.0525m | S53° 23' 29"O |
| 2+960.00 | 7,608,515.1039m | 318,919.9979m | S53° 23' 29"O |
| 2+980.00 | 7,608,503.6961m | 318,903.5870m | S59° 49' 19"O |
| 3+000.00 | 7,608,495.4324m | 318,885.4107m | S71° 16' 52"O |
| 3+020.00 | 7,608,490.5565m | 318,866.0279m | S77° 38' 53"O |
| 3+040.00 | 7,608,486.2781m | 318,846.4909m | S77° 38' 53"O |
| 3+060.00 | 7,608,481.7949m | 318,827.0053m | S72° 22' 49"O |
| 3+080.00 | 7,608,472.1393m | 318,809.6426m | S49° 27' 43"O |
| 3+100.00 | 7,608,456.4846m | 318,797.4105m | S26° 32' 37"O |
| 3+120.00 | 7,608,437.3476m | 318,791.9170m | S10° 10' 25"O |
| 3+140.00 | 7,608,417.6620m | 318,788.3844m | S10° 10' 25"O |
| 3+160.00 | 7,608,397.9765m | 318,784.8518m | S10° 10' 25"O |
| 3+180.00 | 7,608,378.2909m | 318,781.3192m | S10° 10' 25"O |
| 3+200.00 | 7,608,358.6348m | 318,777.6435m | S14° 33' 10"O |
| 3+220.00 | 7,608,340.7804m | 318,768.9307m | S37° 28' 16"O |
| 3+240.00 | 7,608,327.7283m | 318,753.9528m | S60° 23' 22"O |
| 3+260.00 | 7,608,319.1192m | 318,735.9045m | S64° 57' 11"O |

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| 3+280.00 | 7,608,310.6520m | 318,717.7852m | S64° 57' 11"O |
| 3+300.00 | 7,608,299.4635m | 318,701.3595m | S44° 24' 03"O |
| 3+320.00 | 7,608,283.5353m | 318,689.3028m | S35° 19' 47"O |
| 3+340.00 | 7,608,267.2185m | 318,677.7372m | S35° 19' 47"O |
| 3+360.00 | 7,608,250.9017m | 318,666.1717m | S35° 19' 47"O |
| 3+380.00 | 7,608,234.5850m | 318,654.6061m | S35° 19' 47"O |
| 3+400.00 | 7,608,218.2682m | 318,643.0405m | S35° 19' 47"O |
| 3+420.00 | 7,608,201.9514m | 318,631.4749m | S35° 19' 47"O |
| 3+440.00 | 7,608,185.6346m | 318,619.9093m | S35° 19' 47"O |
| 3+460.00 | 7,608,169.3179m | 318,608.3437m | S35° 19' 47"O |
| 3+480.00 | 7,608,153.0011m | 318,596.7781m | S35° 19' 47"O |
| 3+500.00 | 7,608,136.6843m | 318,585.2125m | S35° 19' 47"O |
| 3+520.00 | 7,608,120.3675m | 318,573.6469m | S35° 19' 47"O |
| 3+540.00 | 7,608,104.0508m | 318,562.0813m | S35° 19' 47"O |
| 3+560.00 | 7,608,087.7340m | 318,550.5157m | S35° 19' 47"O |
| 3+580.00 | 7,608,071.7586m | 318,538.4933m | S39° 39' 24"O |
| 3+600.00 | 7,608,057.0243m | 318,524.9816m | S45° 23' 11"O |
| 3+620.00 | 7,608,043.1601m | 318,510.5670m | S46° 10' 07"O |
| 3+640.00 | 7,608,029.3093m | 318,496.1394m | S46° 10' 07"O |
| 3+660.00 | 7,608,015.4585m | 318,481.7118m | S46° 10' 07"O |
| 3+680.00 | 7,608,001.6077m | 318,467.2842m | S46° 10' 07"O |
| 3+700.00 | 7,607,987.7570m | 318,452.8566m | S46° 10' 07"O |
| 3+720.00 | 7,607,973.9062m | 318,438.4290m | S46° 10' 07"O |
| 3+740.00 | 7,607,960.0554m | 318,424.0014m | S46° 10' 07"O |
| 3+760.00 | 7,607,946.2046m | 318,409.5738m | S46° 10' 07"O |
| 3+780.00 | 7,607,932.3538m | 318,395.1462m | S46° 10' 07"O |
| 3+800.00 | 7,607,918.3613m | 318,380.8605m | S42° 32' 25"O |
| 3+820.00 | 7,607,902.3756m | 318,368.8970m | S31° 04' 52"O |
| 3+840.00 | 7,607,884.3317m | 318,360.3479m | S19° 37' 19"O |
| 3+860.00 | 7,607,865.4400m | 318,353.7825m | S19° 09' 15"O |
| 3+880.00 | 7,607,846.6851m | 318,346.8704m | S26° 10' 58"O |
| 3+900.00 | 7,607,830.9536m | 318,334.7372m | S49° 06' 04"O |
| 3+920.00 | 7,607,821.1888m | 318,317.4356m | S72° 01' 10"O |
| 3+940.00 | 7,607,817.2247m | 318,297.8489m | S79° 55' 10"O |
| 3+960.00 | 7,607,813.7241m | 318,278.1577m | S79° 55' 10"O |
| 3+980.00 | 7,607,810.2235m | 318,258.4664m | S79° 55' 10"O |
| 4+000.00 | 7,607,806.7229m | 318,238.7751m | S79° 55' 10"O |
| 4+020.00 | 7,607,803.2223m | 318,219.0839m | S79° 55' 10"O |
| 4+040.00 | 7,607,799.6765m | 318,199.4013m | S77° 27' 40"O |
| 4+060.00 | 7,607,791.5965m | 318,181.2517m | S54° 32' 34"O |
| 4+080.00 | 7,607,777.0865m | 318,167.6813m | S31° 37' 28"O |
| 4+100.00 | 7,607,758.4374m | 318,160.8326m | S8° 42' 22"O  |
| 4+120.00 | 7,607,738.5836m | 318,161.7434m | S11° 47' 36"E |
| 4+140.00 | 7,607,719.7882m | 318,168.2540m | S30° 06' 15"E |

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| 4+160.00 | 7,607,702.9767m | 318,179.0861m | S32° 58' 28"E |
| 4+180.00 | 7,607,685.6783m | 318,189.0337m | S21° 06' 05"E |
| 4+200.00 | 7,607,666.0920m | 318,192.3614m | S1° 49' 01"O  |
| 4+220.00 | 7,607,646.7560m | 318,187.7990m | S24° 44' 07"O |
| 4+240.00 | 7,607,630.7230m | 318,176.0671m | S47° 39' 13"O |
| 4+260.00 | 7,607,620.2524m | 318,159.1364m | S64° 19' 44"O |
| 4+280.00 | 7,607,611.5883m | 318,141.1105m | S64° 19' 44"O |
| 4+300.00 | 7,607,601.2208m | 318,124.1106m | S48° 09' 07"O |
| 4+320.00 | 7,607,587.1430m | 318,109.9062m | S45° 02' 45"O |
| 4+340.00 | 7,607,573.3437m | 318,095.4501m | S52° 43' 31"O |
| 4+360.00 | 7,607,564.6921m | 318,077.5658m | S75° 38' 37"O |
| 4+380.00 | 7,607,560.2559m | 318,058.0642m | S77° 14' 25"O |
| 4+400.00 | 7,607,553.9814m | 318,039.1653m | S61° 12' 17"O |
| 4+420.00 | 7,607,543.4016m | 318,022.1945m | S57° 48' 31"O |
| 4+440.00 | 7,607,533.7268m | 318,004.7443m | S69° 53' 55"O |
| 4+460.00 | 7,607,530.2085m | 317,985.1287m | S84° 26' 36"O |
| 4+480.00 | 7,607,528.2719m | 317,965.2227m | S84° 26' 36"O |
| 4+500.00 | 7,607,526.3353m | 317,945.3167m | S84° 26' 36"O |
| 4+520.00 | 7,607,524.3987m | 317,925.4107m | S84° 26' 36"O |
| 4+540.00 | 7,607,522.4621m | 317,905.5047m | S84° 26' 36"O |
| 4+560.00 | 7,607,520.3973m | 317,885.6146m | S79° 50' 18"O |
| 4+580.00 | 7,607,512.1940m | 317,867.6023m | S51° 11' 25"O |
| 4+600.00 | 7,607,496.3595m | 317,855.7279m | S22° 32' 33"O |
| 4+620.00 | 7,607,476.7704m | 317,852.8986m | S6° 06' 20"E  |
| 4+640.00 | 7,607,457.3633m | 317,857.6477m | S15° 11' 22"E |
| 4+660.00 | 7,607,438.0620m | 317,862.8879m | S15° 11' 22"E |
| 4+680.00 | 7,607,418.7589m | 317,868.1216m | S14° 08' 27"E |
| 4+700.00 | 7,607,398.9017m | 317,868.4693m | S6° 14' 27"O  |
| 4+720.00 | 7,607,383.1191m | 317,857.6195m | S63° 36' 03"O |
| 4+740.00 | 7,607,384.0214m | 317,838.4896m | N58° 12' 00"O |
| 4+760.00 | 7,607,400.7437m | 317,829.0335m | N6° 53' 47"O  |
| 4+780.00 | 7,607,420.5990m | 317,826.6320m | N6° 53' 47"O  |
| 4+800.00 | 7,607,440.4346m | 317,824.1041m | N12° 41' 39"O |
| 4+820.00 | 7,607,456.2640m | 317,812.7662m | N58° 31' 51"O |
| 4+840.00 | 7,607,459.1590m | 317,793.5117m | S75° 37' 57"O |
| 4+860.00 | 7,607,450.8078m | 317,775.3717m | S63° 44' 24"O |
| 4+880.00 | 7,607,441.9589m | 317,757.4358m | S63° 44' 24"O |
| 4+900.00 | 7,607,433.1099m | 317,739.4999m | S63° 44' 24"O |
| 4+920.00 | 7,607,424.2610m | 317,721.5640m | S63° 44' 24"O |
| 4+940.00 | 7,607,415.4120m | 317,703.6281m | S63° 44' 24"O |
| 4+960.00 | 7,607,406.5631m | 317,685.6922m | S63° 44' 24"O |
| 4+980.00 | 7,607,397.7142m | 317,667.7563m | S63° 44' 24"O |
| 5+000.00 | 7,607,388.8652m | 317,649.8204m | S63° 44' 24"O |
| 5+020.00 | 7,607,380.0163m | 317,631.8845m | S63° 44' 24"O |

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| 5+040.00 | 7,607,369.8153m | 317,614.7304m | S52° 24' 44"O |
| 5+060.00 | 7,607,356.4039m | 317,599.9057m | S46° 44' 39"O |
| 5+080.00 | 7,607,342.6988m | 317,585.3397m | S46° 44' 39"O |
| 5+100.00 | 7,607,328.9936m | 317,570.7736m | S46° 44' 39"O |
| 5+120.00 | 7,607,314.6015m | 317,556.9256m | S37° 42' 37"O |
| 5+140.00 | 7,607,297.4223m | 317,546.7868m | S23° 23' 10"O |
| 5+160.00 | 7,607,278.2888m | 317,541.1103m | S11° 59' 56"O |
| 5+180.00 | 7,607,258.7258m | 317,536.9524m | S11° 59' 56"O |
| 5+200.00 | 7,607,239.1628m | 317,532.7945m | S11° 59' 56"O |
| 5+220.00 | 7,607,219.5998m | 317,528.6366m | S11° 59' 56"O |
| 5+240.00 | 7,607,200.0367m | 317,524.4787m | S11° 59' 56"O |
| 5+260.00 | 7,607,180.4737m | 317,520.3208m | S11° 59' 56"O |
| 5+280.00 | 7,607,160.9107m | 317,516.1630m | S11° 59' 56"O |
| 5+300.00 | 7,607,141.3477m | 317,512.0051m | S11° 59' 56"O |
| 5+320.00 | 7,607,121.7846m | 317,507.8472m | S11° 59' 56"O |
| 5+340.00 | 7,607,102.2216m | 317,503.6893m | S11° 59' 56"O |
| 5+360.00 | 7,607,082.6586m | 317,499.5314m | S11° 59' 56"O |
| 5+380.00 | 7,607,063.0956m | 317,495.3735m | S11° 59' 56"O |
| 5+400.00 | 7,607,043.5325m | 317,491.2156m | S11° 59' 56"O |
| 5+420.00 | 7,607,023.9695m | 317,487.0577m | S11° 59' 56"O |
| 5+440.00 | 7,607,004.4065m | 317,482.8998m | S11° 59' 56"O |
| 5+460.00 | 7,606,984.8435m | 317,478.7419m | S11° 59' 56"O |
| 5+480.00 | 7,606,965.2804m | 317,474.5840m | S11° 59' 56"O |
| 5+500.00 | 7,606,945.7174m | 317,470.4261m | S11° 59' 56"O |
| 5+520.00 | 7,606,926.1544m | 317,466.2683m | S11° 59' 56"O |
| 5+540.00 | 7,606,906.5914m | 317,462.1104m | S11° 59' 56"O |
| 5+560.00 | 7,606,887.0283m | 317,457.9525m | S11° 59' 56"O |
| 5+580.00 | 7,606,867.4653m | 317,453.7946m | S11° 59' 56"O |
| 5+600.00 | 7,606,847.9023m | 317,449.6367m | S11° 59' 56"O |
| 5+620.00 | 7,606,828.3393m | 317,445.4788m | S11° 59' 56"O |
| 5+640.00 | 7,606,808.7762m | 317,441.3209m | S11° 59' 56"O |
| 5+660.00 | 7,606,789.2132m | 317,437.1630m | S11° 59' 56"O |
| 5+680.00 | 7,606,769.9150m | 317,432.0675m | S23° 18' 58"O |
| 5+700.00 | 7,606,753.5964m | 317,420.7363m | S46° 14' 04"O |
| 5+720.00 | 7,606,742.9785m | 317,403.9447m | S69° 09' 09"O |
| 5+740.00 | 7,606,739.7377m | 317,384.3439m | N87° 55' 45"O |
| 5+760.00 | 7,606,743.3026m | 317,364.7001m | N77° 12' 34"O |
| 5+780.00 | 7,606,747.7303m | 317,345.1964m | N77° 12' 34"O |
| 5+800.00 | 7,606,752.1581m | 317,325.6927m | N77° 12' 34"O |
| 5+820.00 | 7,606,757.1058m | 317,306.3341m | N68° 47' 15"O |
| 5+840.00 | 7,606,767.8304m | 317,289.6106m | N45° 52' 09"O |
| 5+860.00 | 7,606,784.2085m | 317,278.3560m | N24° 56' 29"O |
| 5+880.00 | 7,606,802.3433m | 317,269.9222m | N24° 56' 29"O |
| 5+900.00 | 7,606,820.4781m | 317,261.4883m | N24° 56' 29"O |

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| 5+920.00 | 7,606,838.4891m | 317,252.8110m | N30° 55' 52"O |
| 5+940.00 | 7,606,854.8159m | 317,241.2669m | N35° 46' 28"O |
| 5+960.00 | 7,606,871.0553m | 317,229.5931m | N34° 47' 10"O |
| 5+980.00 | 7,606,888.1907m | 317,219.3075m | N27° 30' 01"O |
| 6+000.00 | 7,606,905.9308m | 317,210.0724m | N27° 30' 01"O |
| 6+020.00 | 7,606,923.6710m | 317,200.8373m | N27° 30' 01"O |
| 6+040.00 | 7,606,941.4112m | 317,191.6022m | N27° 30' 01"O |
| 6+060.00 | 7,606,959.1513m | 317,182.3672m | N27° 30' 01"O |
| 6+080.00 | 7,606,976.5218m | 317,172.4697m | N32° 29' 28"O |
| 6+100.00 | 7,606,993.1399m | 317,161.3422m | N34° 00' 24"O |
| 6+120.00 | 7,607,009.7193m | 317,150.1565m | N34° 00' 24"O |
| 6+140.00 | 7,607,026.2988m | 317,138.9707m | N34° 00' 24"O |
| 6+160.00 | 7,607,043.3538m | 317,128.5400m | N28° 35' 37"O |
| 6+180.00 | 7,607,061.0878m | 317,119.2936m | N27° 24' 59"O |
| 6+200.00 | 7,607,078.8415m | 317,110.0846m | N27° 24' 59"O |
| 6+220.00 | 7,607,096.5952m | 317,100.8755m | N27° 24' 59"O |
| 6+240.00 | 7,607,114.3489m | 317,091.6665m | N27° 24' 59"O |
| 6+260.00 | 7,607,132.1026m | 317,082.4574m | N27° 24' 59"O |
| 6+280.00 | 7,607,149.8562m | 317,073.2484m | N27° 24' 59"O |
| 6+300.00 | 7,607,167.6099m | 317,064.0393m | N27° 24' 59"O |
| 6+303.52 | 7,607,170.7346m | 317,062.4185m | N27° 24' 59"O |

Nombre de alineación: Eje Sn Jacinto - Tolomosa-Left-3.000

Descripción:

Intervalo de P.K.: inicio: 0+000.00, fin: 6+311.74

Incremento de P.K.: 20.00

| P.K.     | Ordenada        | Abscisa       | Orientación de tangente |
|----------|-----------------|---------------|-------------------------|
| 0+000.00 | 7,610,250.4135m | 321,181.2196m | S83° 04' 27"O           |
| 0+020.00 | 7,610,248.0018m | 321,161.3655m | S83° 04' 27"O           |
| 0+040.00 | 7,610,245.4529m | 321,141.5302m | S81° 21' 21"O           |
| 0+060.00 | 7,610,242.1562m | 321,121.8053m | S79° 40' 43"O           |
| 0+080.00 | 7,610,237.9104m | 321,102.2640m | S76° 42' 06"O           |
| 0+100.00 | 7,610,232.8369m | 321,082.9207m | S73° 48' 48"O           |
| 0+120.00 | 7,610,227.2616m | 321,063.7136m | S73° 48' 48"O           |
| 0+140.00 | 7,610,221.4400m | 321,044.5819m | S72° 05' 42"O           |
| 0+160.00 | 7,610,214.8718m | 321,025.6928m | S69° 29' 40"O           |
| 0+180.00 | 7,610,207.2199m | 321,007.2178m | S66° 21' 14"O           |
| 0+200.00 | 7,610,198.7866m | 320,989.0855m | S63° 27' 56"O           |
| 0+220.00 | 7,610,189.8519m | 320,971.1922m | S63° 27' 56"O           |
| 0+240.00 | 7,610,180.9172m | 320,953.2988m | S63° 27' 56"O           |
| 0+260.00 | 7,610,171.9825m | 320,935.4055m | S63° 27' 56"O           |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 0+280.00 | 7,610,163.0478m | 320,917.5122m | S63° 27' 56"O |
| 0+300.00 | 7,610,154.1131m | 320,899.6188m | S63° 27' 56"O |
| 0+320.00 | 7,610,145.1784m | 320,881.7255m | S63° 27' 56"O |
| 0+340.00 | 7,610,135.6308m | 320,864.1611m | S59° 14' 39"O |
| 0+360.00 | 7,610,124.2738m | 320,847.7126m | S53° 46' 12"O |
| 0+380.00 | 7,610,111.2973m | 320,832.5097m | S45° 42' 59"O |
| 0+400.00 | 7,610,096.9470m | 320,818.5936m | S41° 59' 50"O |
| 0+420.00 | 7,610,080.2145m | 320,807.8081m | S21° 45' 53"O |
| 0+440.00 | 7,610,061.4288m | 320,800.9484m | S19° 51' 17"O |
| 0+460.00 | 7,610,043.1028m | 320,793.0594m | S31° 54' 06"O |
| 0+480.00 | 7,610,026.7255m | 320,781.5825m | S35° 17' 29"O |
| 0+500.00 | 7,610,010.9746m | 320,769.2873m | S42° 44' 03"O |
| 0+520.00 | 7,609,998.1472m | 320,754.0233m | S56° 21' 26"O |
| 0+540.00 | 7,609,986.5748m | 320,737.7206m | S53° 12' 33"O |
| 0+560.00 | 7,609,974.5969m | 320,721.7040m | S53° 12' 33"O |
| 0+580.00 | 7,609,962.6189m | 320,705.6875m | S53° 12' 33"O |
| 0+600.00 | 7,609,950.6410m | 320,689.6710m | S53° 12' 33"O |
| 0+620.00 | 7,609,938.3705m | 320,673.8861m | S50° 03' 40"O |
| 0+640.00 | 7,609,926.9312m | 320,657.5468m | S62° 27' 06"O |
| 0+660.00 | 7,609,919.4431m | 320,639.0357m | S77° 23' 03"O |
| 0+680.00 | 7,609,916.2317m | 320,619.3058m | S82° 16' 49"O |
| 0+700.00 | 7,609,912.3480m | 320,599.6904m | S75° 59' 03"O |
| 0+720.00 | 7,609,906.8630m | 320,580.4682m | S71° 44' 57"O |
| 0+740.00 | 7,609,900.0769m | 320,561.6656m | S68° 34' 24"O |
| 0+760.00 | 7,609,891.7918m | 320,543.4634m | S65° 25' 31"O |
| 0+780.00 | 7,609,883.4742m | 320,525.2751m | S65° 25' 31"O |
| 0+800.00 | 7,609,874.9665m | 320,507.1771m | S63° 42' 24"O |
| 0+820.00 | 7,609,865.7718m | 320,489.4176m | S61° 28' 16"O |
| 0+840.00 | 7,609,856.1568m | 320,471.8822m | S60° 38' 56"O |
| 0+860.00 | 7,609,845.8597m | 320,454.7372m | S58° 55' 50"O |
| 0+880.00 | 7,609,835.5382m | 320,437.6063m | S58° 55' 50"O |
| 0+900.00 | 7,609,825.2167m | 320,420.4755m | S58° 55' 50"O |
| 0+920.00 | 7,609,814.8952m | 320,403.3446m | S58° 55' 50"O |
| 0+940.00 | 7,609,803.7195m | 320,386.7649m | S53° 23' 55"O |
| 0+960.00 | 7,609,791.2846m | 320,371.1181m | S47° 42' 54"O |
| 0+980.00 | 7,609,777.3913m | 320,356.7378m | S44° 31' 42"O |
| 1+000.00 | 7,609,762.6940m | 320,343.1773m | S42° 14' 16"O |
| 1+020.00 | 7,609,747.8867m | 320,329.7332m | S42° 14' 16"O |
| 1+040.00 | 7,609,733.0795m | 320,316.2890m | S42° 14' 16"O |
| 1+060.00 | 7,609,718.2722m | 320,302.8449m | S42° 14' 16"O |
| 1+080.00 | 7,609,703.2258m | 320,289.6719m | S40° 55' 26"O |
| 1+100.00 | 7,609,689.1215m | 320,275.5242m | S49° 19' 16"O |
| 1+120.00 | 7,609,676.0159m | 320,260.4191m | S48° 00' 27"O |
| 1+140.00 | 7,609,662.6352m | 320,245.5544m | S48° 00' 27"O |

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|----------|-----------------|---------------|---------------|
| 1+160.00 | 7,609,649.2545m | 320,230.6898m | S48° 00' 27"O |
| 1+180.00 | 7,609,635.7647m | 320,215.9290m | S44° 51' 34"O |
| 1+200.00 | 7,609,622.2768m | 320,201.2003m | S55° 01' 12"O |
| 1+220.00 | 7,609,612.5909m | 320,183.7261m | S64° 09' 03"O |
| 1+240.00 | 7,609,604.2983m | 320,165.5296m | S67° 28' 23"O |
| 1+260.00 | 7,609,597.7560m | 320,146.6388m | S72° 25' 42"O |
| 1+280.00 | 7,609,591.2722m | 320,127.7206m | S70° 42' 36"O |
| 1+300.00 | 7,609,584.6651m | 320,108.8434m | S70° 42' 36"O |
| 1+320.00 | 7,609,578.0581m | 320,089.9662m | S70° 42' 36"O |
| 1+340.00 | 7,609,571.4511m | 320,071.0891m | S70° 42' 36"O |
| 1+360.00 | 7,609,564.6853m | 320,052.2729m | S67° 16' 35"O |
| 1+380.00 | 7,609,556.1366m | 320,034.2118m | S61° 03' 40"O |
| 1+400.00 | 7,609,544.9360m | 320,017.6705m | S51° 37' 20"O |
| 1+420.00 | 7,609,531.9280m | 320,002.4895m | S48° 11' 19"O |
| 1+440.00 | 7,609,518.5944m | 319,987.5827m | S48° 11' 19"O |
| 1+460.00 | 7,609,505.2608m | 319,972.6758m | S48° 11' 19"O |
| 1+480.00 | 7,609,491.7294m | 319,957.9568m | S44° 45' 18"O |
| 1+500.00 | 7,609,476.9644m | 319,944.4871m | S40° 51' 37"O |
| 1+520.00 | 7,609,460.9454m | 319,932.5345m | S33° 40' 14"O |
| 1+540.00 | 7,609,444.3006m | 319,921.4462m | S33° 40' 14"O |
| 1+560.00 | 7,609,427.5256m | 319,910.5665m | S30° 14' 13"O |
| 1+580.00 | 7,609,410.4315m | 319,900.2072m | S36° 26' 22"O |
| 1+600.00 | 7,609,396.0024m | 319,886.4421m | S49° 12' 16"O |
| 1+620.00 | 7,609,382.6590m | 319,871.5543m | S45° 46' 14"O |
| 1+640.00 | 7,609,368.7084m | 319,857.2233m | S45° 46' 14"O |
| 1+660.00 | 7,609,354.7578m | 319,842.8922m | S45° 46' 14"O |
| 1+680.00 | 7,609,340.8071m | 319,828.5611m | S45° 46' 14"O |
| 1+700.00 | 7,609,326.8565m | 319,814.2300m | S45° 46' 14"O |
| 1+720.00 | 7,609,312.9058m | 319,799.8990m | S45° 46' 14"O |
| 1+740.00 | 7,609,298.9552m | 319,785.5679m | S45° 46' 14"O |
| 1+760.00 | 7,609,285.0046m | 319,771.2368m | S45° 46' 14"O |
| 1+780.00 | 7,609,270.5786m | 319,757.3957m | S43° 40' 58"O |
| 1+800.00 | 7,609,258.5224m | 319,741.5505m | S60° 56' 00"O |
| 1+820.00 | 7,609,251.0251m | 319,723.0698m | S78° 24' 30"O |
| 1+840.00 | 7,609,248.5153m | 319,703.2427m | S81° 06' 38"O |
| 1+860.00 | 7,609,245.4247m | 319,683.4830m | S81° 06' 38"O |
| 1+880.00 | 7,609,242.3341m | 319,663.7232m | S81° 06' 38"O |
| 1+900.00 | 7,609,238.6868m | 319,644.0610m | S78° 13' 20"O |
| 1+920.00 | 7,609,234.4557m | 319,624.5145m | S76° 53' 14"O |
| 1+940.00 | 7,609,229.1788m | 319,605.2402m | S71° 19' 48"O |
| 1+960.00 | 7,609,222.8903m | 319,586.2572m | S70° 07' 17"O |
| 1+980.00 | 7,609,215.0045m | 319,567.8831m | S66° 47' 46"O |
| 2+000.00 | 7,609,206.5254m | 319,549.7793m | S63° 21' 45"O |
| 2+020.00 | 7,609,197.5585m | 319,531.9020m | S63° 21' 45"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 2+040.00 | 7,609,188.5916m | 319,514.0248m | S63° 21' 45"O |
| 2+060.00 | 7,609,179.6247m | 319,496.1476m | S63° 21' 45"O |
| 2+080.00 | 7,609,170.6578m | 319,478.2704m | S63° 21' 45"O |
| 2+100.00 | 7,609,161.6726m | 319,460.4029m | S61° 04' 19"O |
| 2+120.00 | 7,609,151.6899m | 319,443.0776m | S59° 15' 06"O |
| 2+140.00 | 7,609,141.0338m | 319,426.1581m | S56° 30' 19"O |
| 2+160.00 | 7,609,129.4336m | 319,409.8683m | S54° 12' 52"O |
| 2+180.00 | 7,609,117.7386m | 319,393.6441m | S54° 12' 52"O |
| 2+200.00 | 7,609,105.7716m | 319,377.6286m | S50° 46' 51"O |
| 2+220.00 | 7,609,092.1774m | 319,362.9881m | S42° 23' 12"O |
| 2+240.00 | 7,609,076.1592m | 319,351.0550m | S31° 16' 11"O |
| 2+260.00 | 7,609,058.7490m | 319,341.2301m | S27° 50' 10"O |
| 2+280.00 | 7,609,041.0633m | 319,331.8913m | S27° 50' 10"O |
| 2+300.00 | 7,609,023.3775m | 319,322.5524m | S27° 50' 10"O |
| 2+320.00 | 7,609,005.6918m | 319,313.2136m | S27° 50' 10"O |
| 2+340.00 | 7,608,988.0060m | 319,303.8748m | S27° 50' 10"O |
| 2+360.00 | 7,608,970.3202m | 319,294.5359m | S27° 50' 10"O |
| 2+380.00 | 7,608,952.6345m | 319,285.1971m | S27° 50' 10"O |
| 2+400.00 | 7,608,934.6220m | 319,276.5246m | S24° 24' 08"O |
| 2+420.00 | 7,608,917.1958m | 319,266.8184m | S36° 14' 25"O |
| 2+440.00 | 7,608,901.9718m | 319,253.8612m | S43° 08' 51"O |
| 2+460.00 | 7,608,888.1812m | 319,239.3800m | S46° 44' 11"O |
| 2+480.00 | 7,608,873.9040m | 319,225.3771m | S44° 09' 35"O |
| 2+500.00 | 7,608,859.5560m | 319,211.4439m | S44° 09' 35"O |
| 2+520.00 | 7,608,845.2080m | 319,197.5106m | S44° 09' 35"O |
| 2+540.00 | 7,608,830.8600m | 319,183.5774m | S44° 09' 35"O |
| 2+560.00 | 7,608,816.5120m | 319,169.6442m | S44° 09' 35"O |
| 2+580.00 | 7,608,802.1640m | 319,155.7109m | S44° 09' 35"O |
| 2+600.00 | 7,608,787.8160m | 319,141.7777m | S44° 09' 35"O |
| 2+620.00 | 7,608,773.4680m | 319,127.8445m | S44° 09' 35"O |
| 2+640.00 | 7,608,759.1200m | 319,113.9112m | S44° 09' 35"O |
| 2+660.00 | 7,608,744.7720m | 319,099.9780m | S44° 09' 35"O |
| 2+680.00 | 7,608,730.4240m | 319,086.0448m | S44° 09' 35"O |
| 2+700.00 | 7,608,716.0760m | 319,072.1115m | S44° 09' 35"O |
| 2+720.00 | 7,608,701.7280m | 319,058.1783m | S44° 09' 35"O |
| 2+740.00 | 7,608,687.0698m | 319,044.5843m | S40° 43' 34"O |
| 2+760.00 | 7,608,671.1060m | 319,032.5580m | S34° 29' 13"O |
| 2+780.00 | 7,608,653.8536m | 319,022.4688m | S23° 51' 49"O |
| 2+800.00 | 7,608,635.5669m | 319,014.3702m | S27° 11' 34"O |
| 2+820.00 | 7,608,617.1808m | 319,006.5194m | S22° 54' 15"O |
| 2+840.00 | 7,608,598.5465m | 318,999.2802m | S19° 28' 13"O |
| 2+860.00 | 7,608,579.4690m | 318,993.3006m | S19° 46' 39"O |
| 2+880.00 | 7,608,561.9537m | 318,983.8208m | S36° 14' 02"O |
| 2+900.00 | 7,608,547.6154m | 318,969.9958m | S53° 05' 03"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 2+920.00 | 7,608,536.2771m | 318,953.5293m | S53° 23' 29"O |
| 2+940.00 | 7,608,524.3502m | 318,937.4747m | S53° 23' 29"O |
| 2+960.00 | 7,608,512.3507m | 318,921.4772m | S50° 14' 36"O |
| 2+980.00 | 7,608,500.1543m | 318,905.6523m | S59° 49' 10"O |
| 3+000.00 | 7,608,491.8171m | 318,887.5067m | S70° 49' 38"O |
| 3+020.00 | 7,608,487.7710m | 318,867.9468m | S80° 47' 46"O |
| 3+040.00 | 7,608,483.6219m | 318,848.3852m | S77° 38' 53"O |
| 3+060.00 | 7,608,478.3717m | 318,829.1025m | S67° 52' 51"O |
| 3+080.00 | 7,608,468.3953m | 318,811.8896m | S48° 33' 07"O |
| 3+100.00 | 7,608,452.3468m | 318,800.2233m | S23° 28' 38"O |
| 3+120.00 | 7,608,433.2969m | 318,794.2854m | S13° 53' 33"O |
| 3+140.00 | 7,608,413.6211m | 318,790.7072m | S10° 10' 25"O |
| 3+160.00 | 7,608,393.9356m | 318,787.1746m | S10° 10' 25"O |
| 3+180.00 | 7,608,374.2500m | 318,783.6419m | S10° 10' 25"O |
| 3+200.00 | 7,608,354.4871m | 318,780.6896m | S16° 17' 32"O |
| 3+220.00 | 7,608,336.9519m | 318,771.3863m | S39° 06' 04"O |
| 3+240.00 | 7,608,324.4212m | 318,756.0197m | S62° 40' 05"O |
| 3+260.00 | 7,608,316.6094m | 318,737.6197m | S64° 57' 11"O |
| 3+280.00 | 7,608,307.7113m | 318,719.7191m | S61° 14' 02"O |
| 3+300.00 | 7,608,295.9164m | 318,703.6447m | S48° 56' 08"O |
| 3+320.00 | 7,608,280.5626m | 318,690.8729m | S35° 19' 47"O |
| 3+340.00 | 7,608,264.2458m | 318,679.3074m | S35° 19' 47"O |
| 3+360.00 | 7,608,247.9291m | 318,667.7418m | S35° 19' 47"O |
| 3+380.00 | 7,608,231.6123m | 318,656.1762m | S35° 19' 47"O |
| 3+400.00 | 7,608,215.2955m | 318,644.6106m | S35° 19' 47"O |
| 3+420.00 | 7,608,198.9787m | 318,633.0450m | S35° 19' 47"O |
| 3+440.00 | 7,608,182.6620m | 318,621.4794m | S35° 19' 47"O |
| 3+460.00 | 7,608,166.3452m | 318,609.9138m | S35° 19' 47"O |
| 3+480.00 | 7,608,150.0284m | 318,598.3482m | S35° 19' 47"O |
| 3+500.00 | 7,608,133.7116m | 318,586.7826m | S35° 19' 47"O |
| 3+520.00 | 7,608,117.3949m | 318,575.2170m | S35° 19' 47"O |
| 3+540.00 | 7,608,101.0781m | 318,563.6514m | S35° 19' 47"O |
| 3+560.00 | 7,608,084.6489m | 318,552.2496m | S33° 36' 41"O |
| 3+580.00 | 7,608,068.5058m | 318,540.4680m | S40° 00' 25"O |
| 3+600.00 | 7,608,054.0208m | 318,526.7028m | S47° 22' 52"O |
| 3+620.00 | 7,608,040.4187m | 318,512.0432m | S46° 10' 07"O |
| 3+640.00 | 7,608,026.5679m | 318,497.6156m | S46° 10' 07"O |
| 3+660.00 | 7,608,012.7171m | 318,483.1880m | S46° 10' 07"O |
| 3+680.00 | 7,607,998.8663m | 318,468.7604m | S46° 10' 07"O |
| 3+700.00 | 7,607,985.0155m | 318,454.3328m | S46° 10' 07"O |
| 3+720.00 | 7,607,971.1647m | 318,439.9053m | S46° 10' 07"O |
| 3+740.00 | 7,607,957.3139m | 318,425.4777m | S46° 10' 07"O |
| 3+760.00 | 7,607,943.4631m | 318,411.0501m | S46° 10' 07"O |
| 3+780.00 | 7,607,929.6123m | 318,396.6225m | S46° 10' 07"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 3+800.00 | 7,607,914.9074m | 318,383.0833m | S38° 06' 54"O |
| 3+820.00 | 7,607,898.6608m | 318,371.4660m | S29° 58' 21"O |
| 3+840.00 | 7,607,880.6855m | 318,362.7284m | S22° 18' 08"O |
| 3+860.00 | 7,607,861.9515m | 318,355.7466m | S19° 09' 15"O |
| 3+880.00 | 7,607,842.9480m | 318,349.6075m | S25° 16' 22"O |
| 3+900.00 | 7,607,827.4232m | 318,337.2265m | S49° 33' 16"O |
| 3+920.00 | 7,607,817.6579m | 318,319.9367m | S73° 48' 04"O |
| 3+940.00 | 7,607,814.5960m | 318,300.2020m | S79° 55' 10"O |
| 3+960.00 | 7,607,811.0954m | 318,280.5108m | S79° 55' 10"O |
| 3+980.00 | 7,607,807.5948m | 318,260.8195m | S79° 55' 10"O |
| 4+000.00 | 7,607,804.0942m | 318,241.1283m | S79° 55' 10"O |
| 4+020.00 | 7,607,800.5936m | 318,221.4370m | S79° 55' 10"O |
| 4+040.00 | 7,607,796.4297m | 318,201.8865m | S73° 59' 27"O |
| 4+060.00 | 7,607,788.1284m | 318,183.7946m | S54° 37' 02"O |
| 4+080.00 | 7,607,773.4024m | 318,170.4980m | S29° 32' 33"O |
| 4+100.00 | 7,607,754.4290m | 318,164.6954m | S4° 28' 04"O  |
| 4+120.00 | 7,607,734.6475m | 318,166.9670m | S12° 55' 18"E |
| 4+140.00 | 7,607,716.6337m | 318,175.3514m | S32° 58' 28"E |
| 4+160.00 | 7,607,699.8554m | 318,186.2368m | S32° 58' 28"E |
| 4+180.00 | 7,607,681.8867m | 318,194.7943m | S15° 10' 12"E |
| 4+200.00 | 7,607,662.0642m | 318,196.3956m | S5° 56' 00"O  |
| 4+220.00 | 7,607,642.9945m | 318,190.7523m | S27° 02' 13"O |
| 4+240.00 | 7,607,627.2357m | 318,178.6214m | S48° 08' 25"O |
| 4+260.00 | 7,607,617.5638m | 318,161.2638m | S68° 02' 52"O |
| 4+280.00 | 7,607,608.4469m | 318,143.4992m | S60° 36' 35"O |
| 4+300.00 | 7,607,597.7441m | 318,126.6767m | S47° 38' 26"O |
| 4+320.00 | 7,607,584.4967m | 318,111.6956m | S48° 45' 54"O |
| 4+340.00 | 7,607,570.0637m | 318,097.8866m | S51° 09' 52"O |
| 4+360.00 | 7,607,560.9776m | 318,080.2396m | S75° 19' 49"O |
| 4+380.00 | 7,607,556.4572m | 318,060.7586m | S77° 14' 25"O |
| 4+400.00 | 7,607,550.4918m | 318,041.7513m | S61° 56' 19"O |
| 4+420.00 | 7,607,539.9388m | 318,024.7651m | S57° 48' 31"O |
| 4+440.00 | 7,607,530.1429m | 318,007.3713m | S67° 21' 28"O |
| 4+460.00 | 7,607,527.1220m | 317,987.7304m | S88° 09' 44"O |
| 4+480.00 | 7,607,525.5088m | 317,967.8035m | S84° 26' 36"O |
| 4+500.00 | 7,607,523.5722m | 317,947.8975m | S84° 26' 36"O |
| 4+520.00 | 7,607,521.6356m | 317,927.9914m | S84° 26' 36"O |
| 4+540.00 | 7,607,519.6990m | 317,908.0854m | S84° 26' 36"O |
| 4+560.00 | 7,607,517.0176m | 317,888.2788m | S77° 57' 18"O |
| 4+580.00 | 7,607,508.7985m | 317,870.2417m | S51° 04' 33"O |
| 4+600.00 | 7,607,492.6342m | 317,858.9121m | S18° 58' 38"O |
| 4+620.00 | 7,607,472.8754m | 317,857.3812m | S8° 42' 04"E  |
| 4+640.00 | 7,607,453.3915m | 317,861.8346m | S15° 11' 22"E |
| 4+660.00 | 7,607,434.1980m | 317,867.4261m | S18° 54' 30"E |

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| 4+680.00 | 7,607,415.0915m | 317,873.2110m | S7° 55' 16"E  |
| 4+700.00 | 7,607,395.2123m | 317,872.1371m | S11° 05' 27"O |
| 4+720.00 | 7,607,379.7359m | 317,860.4271m | S61° 11' 12"O |
| 4+740.00 | 7,607,378.0666m | 317,841.0731m | N71° 02' 46"O |
| 4+760.00 | 7,607,391.4393m | 317,827.1489m | N18° 21' 28"O |
| 4+780.00 | 7,607,411.2165m | 317,824.7449m | N6° 53' 47"O  |
| 4+800.00 | 7,607,431.0378m | 317,822.1227m | N10° 36' 55"O |
| 4+820.00 | 7,607,449.2244m | 317,814.6976m | N43° 37' 54"O |
| 4+840.00 | 7,607,455.5095m | 317,796.4702m | S87° 17' 50"O |
| 4+860.00 | 7,607,448.6572m | 317,777.7933m | S63° 44' 24"O |
| 4+880.00 | 7,607,439.8083m | 317,759.8574m | S63° 44' 24"O |
| 4+900.00 | 7,607,430.9594m | 317,741.9215m | S63° 44' 24"O |
| 4+920.00 | 7,607,422.1104m | 317,723.9856m | S63° 44' 24"O |
| 4+940.00 | 7,607,413.2615m | 317,706.0497m | S63° 44' 24"O |
| 4+960.00 | 7,607,404.4126m | 317,688.1138m | S63° 44' 24"O |
| 4+980.00 | 7,607,395.5636m | 317,670.1779m | S63° 44' 24"O |
| 5+000.00 | 7,607,386.7147m | 317,652.2420m | S63° 44' 24"O |
| 5+020.00 | 7,607,377.6226m | 317,634.4353m | S60° 18' 23"O |
| 5+040.00 | 7,607,366.8334m | 317,617.6148m | S56° 19' 50"O |
| 5+060.00 | 7,607,354.3024m | 317,602.0501m | S46° 44' 39"O |
| 5+080.00 | 7,607,340.5972m | 317,587.4840m | S46° 44' 39"O |
| 5+100.00 | 7,607,326.7865m | 317,573.0236m | S43° 18' 38"O |
| 5+120.00 | 7,607,311.6623m | 317,559.9639m | S37° 21' 26"O |
| 5+140.00 | 7,607,294.3570m | 317,550.0537m | S22° 14' 23"O |
| 5+160.00 | 7,607,275.3856m | 317,543.7820m | S15° 25' 57"O |
| 5+180.00 | 7,607,255.8740m | 317,539.4133m | S11° 59' 56"O |
| 5+200.00 | 7,607,236.3110m | 317,535.2554m | S11° 59' 56"O |
| 5+220.00 | 7,607,216.7479m | 317,531.0975m | S11° 59' 56"O |
| 5+240.00 | 7,607,197.1849m | 317,526.9396m | S11° 59' 56"O |
| 5+260.00 | 7,607,177.6219m | 317,522.7817m | S11° 59' 56"O |
| 5+280.00 | 7,607,158.0589m | 317,518.6238m | S11° 59' 56"O |
| 5+300.00 | 7,607,138.4958m | 317,514.4659m | S11° 59' 56"O |
| 5+320.00 | 7,607,118.9328m | 317,510.3081m | S11° 59' 56"O |
| 5+340.00 | 7,607,099.3698m | 317,506.1502m | S11° 59' 56"O |
| 5+360.00 | 7,607,079.8068m | 317,501.9923m | S11° 59' 56"O |
| 5+380.00 | 7,607,060.2437m | 317,497.8344m | S11° 59' 56"O |
| 5+400.00 | 7,607,040.6807m | 317,493.6765m | S11° 59' 56"O |
| 5+420.00 | 7,607,021.1177m | 317,489.5186m | S11° 59' 56"O |
| 5+440.00 | 7,607,001.5547m | 317,485.3607m | S11° 59' 56"O |
| 5+460.00 | 7,606,981.9916m | 317,481.2028m | S11° 59' 56"O |
| 5+480.00 | 7,606,962.4286m | 317,477.0449m | S11° 59' 56"O |
| 5+500.00 | 7,606,942.8656m | 317,472.8870m | S11° 59' 56"O |
| 5+520.00 | 7,606,923.3026m | 317,468.7291m | S11° 59' 56"O |
| 5+540.00 | 7,606,903.7395m | 317,464.5713m | S11° 59' 56"O |

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|----------|-----------------|---------------|---------------|
| 5+560.00 | 7,606,884.1765m | 317,460.4134m | S11° 59' 56"O |
| 5+580.00 | 7,606,864.6135m | 317,456.2555m | S11° 59' 56"O |
| 5+600.00 | 7,606,845.0505m | 317,452.0976m | S11° 59' 56"O |
| 5+620.00 | 7,606,825.4874m | 317,447.9397m | S11° 59' 56"O |
| 5+640.00 | 7,606,805.9244m | 317,443.7818m | S11° 59' 56"O |
| 5+660.00 | 7,606,786.3368m | 317,439.7615m | S8° 16' 48"O  |
| 5+680.00 | 7,606,766.8848m | 317,435.4227m | S24° 51' 04"O |
| 5+700.00 | 7,606,750.6748m | 317,423.9016m | S45° 57' 17"O |
| 5+720.00 | 7,606,739.7002m | 317,407.3168m | S67° 03' 29"O |
| 5+740.00 | 7,606,735.4330m | 317,387.8928m | S88° 09' 41"O |
| 5+760.00 | 7,606,739.1435m | 317,368.3449m | N73° 29' 25"O |
| 5+780.00 | 7,606,743.8122m | 317,348.9042m | N77° 12' 34"O |
| 5+800.00 | 7,606,748.2400m | 317,329.4005m | N77° 12' 34"O |
| 5+820.00 | 7,606,751.9540m | 317,309.7574m | N78° 45' 28"O |
| 5+840.00 | 7,606,760.3215m | 317,291.7876m | N53° 03' 14"O |
| 5+860.00 | 7,606,775.1273m | 317,278.5791m | N27° 13' 35"O |
| 5+880.00 | 7,606,793.5041m | 317,270.7244m | N24° 56' 29"O |
| 5+900.00 | 7,606,811.6389m | 317,262.2906m | N24° 56' 29"O |
| 5+920.00 | 7,606,829.2799m | 317,252.8793m | N28° 39' 37"O |
| 5+940.00 | 7,606,846.4470m | 317,242.6519m | N32° 03' 20"O |
| 5+960.00 | 7,606,862.9834m | 317,231.4396m | N38° 03' 55"O |
| 5+980.00 | 7,606,879.3254m | 317,219.9676m | N28° 26' 54"O |
| 6+000.00 | 7,606,897.2918m | 317,211.1875m | N27° 30' 01"O |
| 6+020.00 | 7,606,915.0319m | 317,201.9524m | N27° 30' 01"O |
| 6+040.00 | 7,606,932.7721m | 317,192.7174m | N27° 30' 01"O |
| 6+060.00 | 7,606,950.5123m | 317,183.4823m | N27° 30' 01"O |
| 6+080.00 | 7,606,967.7674m | 317,173.3764m | N32° 13' 18"O |
| 6+100.00 | 7,606,984.9304m | 317,163.1132m | N31° 42' 58"O |
| 6+120.00 | 7,607,001.5768m | 317,152.0311m | N34° 00' 24"O |
| 6+140.00 | 7,607,018.1375m | 317,140.8183m | N35° 43' 30"O |
| 6+160.00 | 7,607,034.5636m | 317,129.4165m | N30° 53' 03"O |
| 6+180.00 | 7,607,052.3829m | 317,120.3509m | N25° 41' 53"O |
| 6+200.00 | 7,607,070.1678m | 317,111.2042m | N27° 24' 59"O |
| 6+220.00 | 7,607,087.9214m | 317,101.9951m | N27° 24' 59"O |
| 6+240.00 | 7,607,105.6751m | 317,092.7861m | N27° 24' 59"O |
| 6+260.00 | 7,607,123.4288m | 317,083.5770m | N27° 24' 59"O |
| 6+280.00 | 7,607,141.1825m | 317,074.3680m | N27° 24' 59"O |
| 6+300.00 | 7,607,158.9362m | 317,065.1589m | N27° 24' 59"O |
| 6+311.74 | 7,607,169.3556m | 317,059.7542m | N27° 24' 59"O |

Nombre de alineación: Eje Sn Jacinto - Tolomosa-Right-3.000

Descripción:

Intervalo de P.K.: inicio: 0+000.00, fin: 6+300.36

Incremento de P.K.: 20.00

| P.K.     | Ordenada        | Abscisa       | Orientación de tangente |
|----------|-----------------|---------------|-------------------------|
| 0+000.00 | 7,610,256.3697m | 321,180.4961m | S83° 04' 27"O           |
| 0+020.00 | 7,610,253.9580m | 321,160.6420m | S83° 04' 27"O           |
| 0+040.00 | 7,610,251.6840m | 321,140.7733m | S84° 47' 33"O           |
| 0+060.00 | 7,610,249.3136m | 321,120.9232m | S79° 46' 20"O           |
| 0+080.00 | 7,610,244.8806m | 321,101.4311m | S73° 15' 52"O           |
| 0+100.00 | 7,610,238.9167m | 321,082.3425m | S73° 48' 48"O           |
| 0+120.00 | 7,610,233.3414m | 321,063.1353m | S73° 48' 48"O           |
| 0+140.00 | 7,610,227.9815m | 321,043.8691m | S75° 31' 54"O           |
| 0+160.00 | 7,610,222.1955m | 321,024.7368m | S69° 52' 18"O           |
| 0+180.00 | 7,610,214.5272m | 321,006.2741m | S63° 40' 52"O           |
| 0+200.00 | 7,610,205.2337m | 320,988.5662m | S63° 27' 56"O           |
| 0+220.00 | 7,610,196.2990m | 320,970.6729m | S63° 27' 56"O           |
| 0+240.00 | 7,610,187.3643m | 320,952.7795m | S63° 27' 56"O           |
| 0+260.00 | 7,610,178.4296m | 320,934.8862m | S63° 27' 56"O           |
| 0+280.00 | 7,610,169.4949m | 320,916.9929m | S63° 27' 56"O           |
| 0+300.00 | 7,610,160.5602m | 320,899.0996m | S63° 27' 56"O           |
| 0+320.00 | 7,610,151.6255m | 320,881.2062m | S63° 27' 56"O           |
| 0+340.00 | 7,610,143.1677m | 320,863.0909m | S66° 36' 49"O           |
| 0+360.00 | 7,610,133.1512m | 320,845.8522m | S52° 41' 36"O           |
| 0+380.00 | 7,610,119.0768m | 320,831.6822m | S42° 34' 06"O           |
| 0+400.00 | 7,610,105.1894m | 320,817.3061m | S49° 26' 07"O           |
| 0+420.00 | 7,610,090.8159m | 320,803.5464m | S29° 24' 15"O           |
| 0+440.00 | 7,610,072.4302m | 320,795.7775m | S19° 51' 17"O           |
| 0+460.00 | 7,610,053.6505m | 320,788.9032m | S23° 23' 51"O           |
| 0+480.00 | 7,610,036.7401m | 320,778.2953m | S34° 35' 46"O           |
| 0+500.00 | 7,610,020.4721m | 320,766.6726m | S39° 21' 21"O           |
| 0+520.00 | 7,610,006.2018m | 320,752.6867m | S48° 59' 16"O           |
| 0+540.00 | 7,609,993.6330m | 320,737.1403m | S53° 12' 33"O           |
| 0+560.00 | 7,609,981.6551m | 320,721.1238m | S53° 12' 33"O           |
| 0+580.00 | 7,609,969.6772m | 320,705.1072m | S53° 12' 33"O           |
| 0+600.00 | 7,609,957.6993m | 320,689.0907m | S53° 12' 33"O           |
| 0+620.00 | 7,609,945.8575m | 320,672.9781m | S56° 21' 26"O           |
| 0+640.00 | 7,609,935.3845m | 320,655.9520m | S60° 57' 38"O           |
| 0+660.00 | 7,609,927.5632m | 320,637.5841m | S72° 54' 34"O           |
| 0+680.00 | 7,609,922.1973m | 320,618.3281m | S75° 59' 03"O           |
| 0+700.00 | 7,609,918.5230m | 320,598.6724m | S82° 16' 49"O           |
| 0+720.00 | 7,609,915.0092m | 320,579.0088m | S72° 23' 26"O           |
| 0+740.00 | 7,609,906.5346m | 320,560.9239m | S62° 16' 37"O           |
| 0+760.00 | 7,609,898.0860m | 320,542.7999m | S65° 25' 31"O           |
| 0+780.00 | 7,609,889.7683m | 320,524.6115m | S65° 25' 31"O           |

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|----------|-----------------|---------------|---------------|
| 0+800.00 | 7,609,881.5881m | 320,506.3627m | S67° 08' 37"O |
| 0+820.00 | 7,609,873.2802m | 320,488.1802m | S62° 02' 09"O |
| 0+840.00 | 7,609,862.8640m | 320,471.1157m | S57° 12' 44"O |
| 0+860.00 | 7,609,852.4471m | 320,454.0442m | S58° 55' 50"O |
| 0+880.00 | 7,609,842.1256m | 320,436.9134m | S58° 55' 50"O |
| 0+900.00 | 7,609,831.8041m | 320,419.7825m | S58° 55' 50"O |
| 0+920.00 | 7,609,821.4825m | 320,402.6516m | S58° 55' 50"O |
| 0+940.00 | 7,609,811.6021m | 320,385.2660m | S59° 15' 28"O |
| 0+960.00 | 7,609,799.7337m | 320,369.2006m | S49° 18' 16"O |
| 0+980.00 | 7,609,785.4470m | 320,355.2473m | S39° 56' 49"O |
| 1+000.00 | 7,609,770.4040m | 320,342.0734m | S42° 14' 16"O |
| 1+020.00 | 7,609,755.5967m | 320,328.6293m | S42° 14' 16"O |
| 1+040.00 | 7,609,740.7895m | 320,315.1851m | S42° 14' 16"O |
| 1+060.00 | 7,609,725.9822m | 320,301.7410m | S42° 14' 16"O |
| 1+080.00 | 7,609,711.3332m | 320,288.1277m | S43° 57' 22"O |
| 1+100.00 | 7,609,697.1637m | 320,274.0147m | S44° 21' 16"O |
| 1+120.00 | 7,609,683.3289m | 320,259.5750m | S48° 00' 27"O |
| 1+140.00 | 7,609,669.9483m | 320,244.7104m | S48° 00' 27"O |
| 1+160.00 | 7,609,656.5676m | 320,229.8457m | S48° 00' 27"O |
| 1+180.00 | 7,609,643.1869m | 320,214.9811m | S48° 00' 27"O |
| 1+200.00 | 7,609,630.8997m | 320,199.2160m | S56° 03' 40"O |
| 1+220.00 | 7,609,620.2502m | 320,182.3062m | S60° 49' 57"O |
| 1+240.00 | 7,609,611.5859m | 320,164.2924m | S67° 05' 22"O |
| 1+260.00 | 7,609,604.1140m | 320,145.7422m | S68° 59' 30"O |
| 1+280.00 | 7,609,597.3498m | 320,126.9227m | S70° 42' 36"O |
| 1+300.00 | 7,609,590.7428m | 320,108.0455m | S70° 42' 36"O |
| 1+320.00 | 7,609,584.1358m | 320,089.1684m | S70° 42' 36"O |
| 1+340.00 | 7,609,577.5287m | 320,070.2912m | S70° 42' 36"O |
| 1+360.00 | 7,609,571.0122m | 320,051.3854m | S74° 08' 37"O |
| 1+380.00 | 7,609,564.7070m | 320,032.4350m | S62° 49' 30"O |
| 1+400.00 | 7,609,553.1440m | 320,016.2276m | S46° 06' 02"O |
| 1+420.00 | 7,609,539.3354m | 320,001.7710m | S48° 11' 19"O |
| 1+440.00 | 7,609,526.0017m | 319,986.8642m | S48° 11' 19"O |
| 1+460.00 | 7,609,512.6681m | 319,971.9573m | S48° 11' 19"O |
| 1+480.00 | 7,609,499.3414m | 319,957.0447m | S51° 37' 20"O |
| 1+500.00 | 7,609,486.4346m | 319,941.7876m | S45° 29' 11"O |
| 1+520.00 | 7,609,469.6170m | 319,931.0170m | S30° 14' 13"O |
| 1+540.00 | 7,609,452.9348m | 319,919.9886m | S33° 40' 14"O |
| 1+560.00 | 7,609,436.2900m | 319,908.9003m | S33° 40' 14"O |
| 1+580.00 | 7,609,420.2604m | 319,896.9460m | S37° 06' 15"O |
| 1+600.00 | 7,609,404.8848m | 319,884.2087m | S42° 20' 13"O |
| 1+620.00 | 7,609,390.1695m | 319,870.6679m | S45° 46' 14"O |
| 1+640.00 | 7,609,376.2189m | 319,856.3368m | S45° 46' 14"O |
| 1+660.00 | 7,609,362.2683m | 319,842.0058m | S45° 46' 14"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 1+680.00 | 7,609,348.3176m | 319,827.6747m | S45° 46' 14"O |
| 1+700.00 | 7,609,334.3670m | 319,813.3436m | S45° 46' 14"O |
| 1+720.00 | 7,609,320.4164m | 319,799.0125m | S45° 46' 14"O |
| 1+740.00 | 7,609,306.4657m | 319,784.6814m | S45° 46' 14"O |
| 1+760.00 | 7,609,292.5151m | 319,770.3504m | S45° 46' 14"O |
| 1+780.00 | 7,609,278.9035m | 319,755.7085m | S49° 12' 16"O |
| 1+800.00 | 7,609,267.0930m | 319,739.5978m | S59° 04' 33"O |
| 1+820.00 | 7,609,259.1704m | 319,721.2954m | S71° 31' 26"O |
| 1+840.00 | 7,609,254.3777m | 319,701.8968m | S81° 06' 38"O |
| 1+860.00 | 7,609,251.2871m | 319,682.1371m | S81° 06' 38"O |
| 1+880.00 | 7,609,248.1965m | 319,662.3773m | S81° 06' 38"O |
| 1+900.00 | 7,609,245.5097m | 319,642.5600m | S81° 39' 34"O |
| 1+920.00 | 7,609,240.9920m | 319,623.0969m | S73° 27' 00"O |
| 1+940.00 | 7,609,235.7533m | 319,603.8111m | S78° 11' 50"O |
| 1+960.00 | 7,609,231.1341m | 319,584.3718m | S70° 49' 21"O |
| 1+980.00 | 7,609,222.3416m | 319,566.4599m | S59° 55' 44"O |
| 2+000.00 | 7,609,212.7947m | 319,548.8957m | S63° 21' 45"O |
| 2+020.00 | 7,609,203.8278m | 319,531.0185m | S63° 21' 45"O |
| 2+040.00 | 7,609,194.8609m | 319,513.1413m | S63° 21' 45"O |
| 2+060.00 | 7,609,185.8940m | 319,495.2641m | S63° 21' 45"O |
| 2+080.00 | 7,609,176.9271m | 319,477.3869m | S63° 21' 45"O |
| 2+100.00 | 7,609,167.9602m | 319,459.5097m | S63° 21' 45"O |
| 2+120.00 | 7,609,159.4333m | 319,441.4225m | S62° 24' 51"O |
| 2+140.00 | 7,609,148.0493m | 319,425.0184m | S51° 55' 26"O |
| 2+160.00 | 7,609,136.1606m | 319,408.9398m | S54° 12' 52"O |
| 2+180.00 | 7,609,124.4656m | 319,392.7155m | S54° 12' 52"O |
| 2+200.00 | 7,609,112.8967m | 319,376.4060m | S57° 38' 53"O |
| 2+220.00 | 7,609,101.3176m | 319,360.1458m | S45° 40' 43"O |
| 2+240.00 | 7,609,085.6475m | 319,347.8426m | S28° 08' 35"O |
| 2+260.00 | 7,609,067.6470m | 319,339.1435m | S27° 50' 10"O |
| 2+280.00 | 7,609,049.9612m | 319,329.8047m | S27° 50' 10"O |
| 2+300.00 | 7,609,032.2754m | 319,320.4658m | S27° 50' 10"O |
| 2+320.00 | 7,609,014.5897m | 319,311.1270m | S27° 50' 10"O |
| 2+340.00 | 7,608,996.9039m | 319,301.7881m | S27° 50' 10"O |
| 2+360.00 | 7,608,979.2182m | 319,292.4493m | S27° 50' 10"O |
| 2+380.00 | 7,608,961.5324m | 319,283.1104m | S27° 50' 10"O |
| 2+400.00 | 7,608,944.0090m | 319,273.4853m | S31° 16' 11"O |
| 2+420.00 | 7,608,926.8489m | 319,263.2170m | S31° 57' 38"O |
| 2+440.00 | 7,608,910.7962m | 319,251.3116m | S40° 49' 48"O |
| 2+460.00 | 7,608,895.9090m | 319,237.9584m | S41° 35' 00"O |
| 2+480.00 | 7,608,881.3539m | 319,224.2482m | S44° 09' 35"O |
| 2+500.00 | 7,608,867.0059m | 319,210.3150m | S44° 09' 35"O |
| 2+520.00 | 7,608,852.6579m | 319,196.3817m | S44° 09' 35"O |
| 2+540.00 | 7,608,838.3099m | 319,182.4485m | S44° 09' 35"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 2+560.00 | 7,608,823.9620m | 319,168.5153m | S44° 09' 35"O |
| 2+580.00 | 7,608,809.6140m | 319,154.5820m | S44° 09' 35"O |
| 2+600.00 | 7,608,795.2660m | 319,140.6488m | S44° 09' 35"O |
| 2+620.00 | 7,608,780.9180m | 319,126.7155m | S44° 09' 35"O |
| 2+640.00 | 7,608,766.5700m | 319,112.7823m | S44° 09' 35"O |
| 2+660.00 | 7,608,752.2220m | 319,098.8491m | S44° 09' 35"O |
| 2+680.00 | 7,608,737.8740m | 319,084.9158m | S44° 09' 35"O |
| 2+700.00 | 7,608,723.5260m | 319,070.9826m | S44° 09' 35"O |
| 2+720.00 | 7,608,709.1780m | 319,057.0494m | S44° 09' 35"O |
| 2+740.00 | 7,608,694.9639m | 319,042.9863m | S47° 35' 36"O |
| 2+760.00 | 7,608,680.6435m | 319,029.0882m | S35° 14' 04"O |
| 2+780.00 | 7,608,662.7636m | 319,020.1915m | S23° 51' 49"O |
| 2+800.00 | 7,608,645.3343m | 319,010.4123m | S30° 43' 52"O |
| 2+820.00 | 7,608,627.3019m | 319,001.9214m | S16° 02' 12"O |
| 2+840.00 | 7,608,608.1117m | 318,996.2979m | S19° 28' 13"O |
| 2+860.00 | 7,608,589.3985m | 318,989.2624m | S22° 54' 15"O |
| 2+880.00 | 7,608,571.5907m | 318,980.2085m | S31° 58' 06"O |
| 2+900.00 | 7,608,556.1688m | 318,967.5562m | S43° 48' 18"O |
| 2+920.00 | 7,608,543.0046m | 318,952.5237m | S53° 23' 29"O |
| 2+940.00 | 7,608,531.0777m | 318,936.4691m | S53° 23' 29"O |
| 2+960.00 | 7,608,519.1507m | 318,920.4146m | S53° 23' 29"O |
| 2+980.00 | 7,608,508.3967m | 318,903.5663m | S61° 26' 42"O |
| 3+000.00 | 7,608,499.8166m | 318,885.5358m | S70° 22' 11"O |
| 3+020.00 | 7,608,493.8477m | 318,866.4582m | S74° 29' 59"O |
| 3+040.00 | 7,608,489.4499m | 318,846.9508m | S77° 38' 53"O |
| 3+060.00 | 7,608,485.9023m | 318,827.2766m | S79° 11' 47"O |
| 3+080.00 | 7,608,477.4243m | 318,809.3529m | S52° 51' 22"O |
| 3+100.00 | 7,608,462.7162m | 318,795.9675m | S31° 45' 10"O |
| 3+120.00 | 7,608,444.0157m | 318,789.3942m | S8° 37' 30"O  |
| 3+140.00 | 7,608,424.2343m | 318,786.5159m | S10° 10' 25"O |
| 3+160.00 | 7,608,404.5488m | 318,782.9833m | S10° 10' 25"O |
| 3+180.00 | 7,608,384.8633m | 318,779.4507m | S10° 10' 25"O |
| 3+200.00 | 7,608,365.2817m | 318,775.4304m | S13° 53' 33"O |
| 3+220.00 | 7,608,346.8403m | 318,767.9151m | S32° 12' 31"O |
| 3+240.00 | 7,608,332.5773m | 318,754.0747m | S51° 20' 49"O |
| 3+260.00 | 7,608,322.7865m | 318,736.6659m | S64° 57' 11"O |
| 3+280.00 | 7,608,314.6588m | 318,718.4012m | S68° 40' 19"O |
| 3+300.00 | 7,608,305.0642m | 318,701.0078m | S48° 22' 00"O |
| 3+320.00 | 7,608,288.9537m | 318,689.2811m | S31° 36' 38"O |
| 3+340.00 | 7,608,272.5536m | 318,677.8416m | S35° 19' 47"O |
| 3+360.00 | 7,608,256.2368m | 318,666.2760m | S35° 19' 47"O |
| 3+380.00 | 7,608,239.9200m | 318,654.7104m | S35° 19' 47"O |
| 3+400.00 | 7,608,223.6032m | 318,643.1448m | S35° 19' 47"O |
| 3+420.00 | 7,608,207.2865m | 318,631.5792m | S35° 19' 47"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 3+440.00 | 7,608,190.9697m | 318,620.0137m | S35° 19' 47"O |
| 3+460.00 | 7,608,174.6529m | 318,608.4481m | S35° 19' 47"O |
| 3+480.00 | 7,608,158.3361m | 318,596.8825m | S35° 19' 47"O |
| 3+500.00 | 7,608,142.0194m | 318,585.3169m | S35° 19' 47"O |
| 3+520.00 | 7,608,125.7026m | 318,573.7513m | S35° 19' 47"O |
| 3+540.00 | 7,608,109.3858m | 318,562.1857m | S35° 19' 47"O |
| 3+560.00 | 7,608,093.0813m | 318,550.6034m | S37° 02' 53"O |
| 3+580.00 | 7,608,077.2847m | 318,538.3409m | S38° 26' 38"O |
| 3+600.00 | 7,608,062.2109m | 318,525.2049m | S42° 59' 16"O |
| 3+620.00 | 7,608,047.9315m | 318,511.2052m | S46° 10' 07"O |
| 3+640.00 | 7,608,034.0807m | 318,496.7776m | S46° 10' 07"O |
| 3+660.00 | 7,608,020.2299m | 318,482.3500m | S46° 10' 07"O |
| 3+680.00 | 7,608,006.3792m | 318,467.9224m | S46° 10' 07"O |
| 3+700.00 | 7,607,992.5284m | 318,453.4948m | S46° 10' 07"O |
| 3+720.00 | 7,607,978.6776m | 318,439.0672m | S46° 10' 07"O |
| 3+740.00 | 7,607,964.8268m | 318,424.6396m | S46° 10' 07"O |
| 3+760.00 | 7,607,950.9760m | 318,410.2120m | S46° 10' 07"O |
| 3+780.00 | 7,607,937.1252m | 318,395.7844m | S46° 10' 07"O |
| 3+800.00 | 7,607,923.7497m | 318,380.9238m | S48° 15' 04"O |
| 3+820.00 | 7,607,908.5829m | 318,367.9831m | S33° 44' 54"O |
| 3+840.00 | 7,607,890.9110m | 318,358.7291m | S18° 59' 13"O |
| 3+860.00 | 7,607,871.8100m | 318,352.8193m | S19° 09' 15"O |
| 3+880.00 | 7,607,853.1665m | 318,345.6105m | S25° 04' 59"O |
| 3+900.00 | 7,607,836.6378m | 318,334.5200m | S44° 38' 11"O |
| 3+920.00 | 7,607,825.8376m | 318,317.8658m | S66° 18' 49"O |
| 3+940.00 | 7,607,820.4157m | 318,298.6584m | S79° 55' 10"O |
| 3+960.00 | 7,607,816.9151m | 318,278.9671m | S79° 55' 10"O |
| 3+980.00 | 7,607,813.4145m | 318,259.2759m | S79° 55' 10"O |
| 4+000.00 | 7,607,809.9139m | 318,239.5846m | S79° 55' 10"O |
| 4+020.00 | 7,607,806.4132m | 318,219.8933m | S79° 55' 10"O |
| 4+040.00 | 7,607,803.5768m | 318,200.1057m | S81° 28' 05"O |
| 4+060.00 | 7,607,796.8953m | 318,181.4455m | S57° 57' 17"O |
| 4+080.00 | 7,607,783.4350m | 318,166.8059m | S36° 51' 05"O |
| 4+100.00 | 7,607,765.6064m | 318,157.9946m | S15° 44' 52"O |
| 4+120.00 | 7,607,745.8027m | 318,156.2195m | S6° 03' 50"E  |
| 4+140.00 | 7,607,726.3031m | 318,160.4815m | S19° 59' 28"E |
| 4+160.00 | 7,607,708.8574m | 318,170.1451m | S32° 58' 28"E |
| 4+180.00 | 7,607,692.0692m | 318,181.0146m | S31° 03' 53"E |
| 4+200.00 | 7,607,673.4000m | 318,187.7268m | S7° 11' 37"E  |
| 4+220.00 | 7,607,653.6454m | 318,185.8790m | S17° 52' 52"O |
| 4+240.00 | 7,607,636.5357m | 318,175.8333m | S42° 57' 21"O |
| 4+260.00 | 7,607,624.4956m | 318,159.9681m | S60° 36' 35"O |
| 4+280.00 | 7,607,616.1033m | 318,141.8551m | S68° 02' 52"O |
| 4+300.00 | 7,607,606.8943m | 318,124.2055m | S52° 13' 26"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 4+320.00 | 7,607,592.4911m | 318,110.3884m | S41° 19' 37"O |
| 4+340.00 | 7,607,578.7269m | 318,095.9384m | S50° 58' 29"O |
| 4+360.00 | 7,607,569.3849m | 318,078.3707m | S71° 30' 38"O |
| 4+380.00 | 7,607,564.8526m | 318,058.8933m | S77° 14' 25"O |
| 4+400.00 | 7,607,559.1332m | 318,039.7862m | S64° 23' 56"O |
| 4+420.00 | 7,607,548.7892m | 318,022.6813m | S57° 48' 31"O |
| 4+440.00 | 7,607,538.6603m | 318,005.4639m | S67° 21' 28"O |
| 4+460.00 | 7,607,533.5916m | 317,986.1863m | S80° 43' 28"O |
| 4+480.00 | 7,607,531.3923m | 317,966.3145m | S84° 26' 36"O |
| 4+500.00 | 7,607,529.4557m | 317,946.4085m | S84° 26' 36"O |
| 4+520.00 | 7,607,527.5191m | 317,926.5025m | S84° 26' 36"O |
| 4+540.00 | 7,607,525.5825m | 317,906.5965m | S84° 26' 36"O |
| 4+560.00 | 7,607,524.3266m | 317,886.6457m | S85° 27' 16"O |
| 4+580.00 | 7,607,517.8189m | 317,868.0003m | S56° 09' 26"O |
| 4+600.00 | 7,607,503.3687m | 317,854.4194m | S30° 17' 24"O |
| 4+620.00 | 7,607,484.4410m | 317,848.5036m | S4° 25' 22"O  |
| 4+640.00 | 7,607,464.9510m | 317,852.1350m | S18° 54' 30"E |
| 4+660.00 | 7,607,445.7471m | 317,857.6928m | S15° 11' 22"E |
| 4+680.00 | 7,607,426.2670m | 317,862.1781m | S11° 28' 13"E |
| 4+700.00 | 7,607,406.5409m | 317,864.9498m | S3° 55' 42"O  |
| 4+720.00 | 7,607,388.4951m | 317,858.1668m | S52° 48' 47"O |
| 4+740.00 | 7,607,388.5091m | 317,839.5449m | N52° 43' 35"O |
| 4+760.00 | 7,607,406.2093m | 317,831.5584m | N10° 36' 55"O |
| 4+780.00 | 7,607,426.0398m | 317,828.9958m | N6° 53' 47"O  |
| 4+800.00 | 7,607,445.8429m | 317,826.6677m | N15° 09' 01"O |
| 4+820.00 | 7,607,460.6056m | 317,813.8508m | N61° 09' 17"O |
| 4+840.00 | 7,607,463.5555m | 317,794.5246m | S79° 39' 25"O |
| 4+860.00 | 7,607,454.7775m | 317,776.6374m | S63° 44' 24"O |
| 4+880.00 | 7,607,445.9285m | 317,758.7015m | S63° 44' 24"O |
| 4+900.00 | 7,607,437.0796m | 317,740.7656m | S63° 44' 24"O |
| 4+920.00 | 7,607,428.2307m | 317,722.8297m | S63° 44' 24"O |
| 4+940.00 | 7,607,419.3817m | 317,704.8938m | S63° 44' 24"O |
| 4+960.00 | 7,607,410.5328m | 317,686.9579m | S63° 44' 24"O |
| 4+980.00 | 7,607,401.6839m | 317,669.0220m | S63° 44' 24"O |
| 5+000.00 | 7,607,392.8349m | 317,651.0861m | S63° 44' 24"O |
| 5+020.00 | 7,607,384.1454m | 317,633.0774m | S67° 10' 25"O |
| 5+040.00 | 7,607,375.3460m | 317,615.1643m | S54° 56' 34"O |
| 5+060.00 | 7,607,361.5063m | 317,600.7719m | S43° 18' 38"O |
| 5+080.00 | 7,607,347.7144m | 317,586.2925m | S46° 44' 39"O |
| 5+100.00 | 7,607,334.0093m | 317,571.7265m | S46° 44' 39"O |
| 5+120.00 | 7,607,320.7848m | 317,556.7384m | S44° 02' 31"O |
| 5+140.00 | 7,607,304.3651m | 317,545.4339m | S27° 21' 37"O |
| 5+160.00 | 7,607,285.5633m | 317,538.8809m | S9° 54' 39"O  |
| 5+180.00 | 7,607,265.8754m | 317,535.4050m | S11° 59' 56"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 5+200.00 | 7,607,246.3124m | 317,531.2471m | S11° 59' 56"O |
| 5+220.00 | 7,607,226.7494m | 317,527.0892m | S11° 59' 56"O |
| 5+240.00 | 7,607,207.1863m | 317,522.9313m | S11° 59' 56"O |
| 5+260.00 | 7,607,187.6233m | 317,518.7734m | S11° 59' 56"O |
| 5+280.00 | 7,607,168.0603m | 317,514.6155m | S11° 59' 56"O |
| 5+300.00 | 7,607,148.4973m | 317,510.4576m | S11° 59' 56"O |
| 5+320.00 | 7,607,128.9342m | 317,506.2997m | S11° 59' 56"O |
| 5+340.00 | 7,607,109.3712m | 317,502.1418m | S11° 59' 56"O |
| 5+360.00 | 7,607,089.8082m | 317,497.9839m | S11° 59' 56"O |
| 5+380.00 | 7,607,070.2452m | 317,493.8260m | S11° 59' 56"O |
| 5+400.00 | 7,607,050.6821m | 317,489.6682m | S11° 59' 56"O |
| 5+420.00 | 7,607,031.1191m | 317,485.5103m | S11° 59' 56"O |
| 5+440.00 | 7,607,011.5561m | 317,481.3524m | S11° 59' 56"O |
| 5+460.00 | 7,606,991.9931m | 317,477.1945m | S11° 59' 56"O |
| 5+480.00 | 7,606,972.4300m | 317,473.0366m | S11° 59' 56"O |
| 5+500.00 | 7,606,952.8670m | 317,468.8787m | S11° 59' 56"O |
| 5+520.00 | 7,606,933.3040m | 317,464.7208m | S11° 59' 56"O |
| 5+540.00 | 7,606,913.7410m | 317,460.5629m | S11° 59' 56"O |
| 5+560.00 | 7,606,894.1779m | 317,456.4050m | S11° 59' 56"O |
| 5+580.00 | 7,606,874.6149m | 317,452.2471m | S11° 59' 56"O |
| 5+600.00 | 7,606,855.0519m | 317,448.0892m | S11° 59' 56"O |
| 5+620.00 | 7,606,835.4889m | 317,443.9314m | S11° 59' 56"O |
| 5+640.00 | 7,606,815.9258m | 317,439.7735m | S11° 59' 56"O |
| 5+660.00 | 7,606,796.3628m | 317,435.6156m | S11° 59' 56"O |
| 5+680.00 | 7,606,777.0427m | 317,430.5023m | S21° 45' 59"O |
| 5+700.00 | 7,606,759.7494m | 317,420.6637m | S40° 57' 23"O |
| 5+720.00 | 7,606,747.9459m | 317,404.7158m | S66° 01' 53"O |
| 5+740.00 | 7,606,744.0136m | 317,385.2686m | N88° 53' 38"O |
| 5+760.00 | 7,606,746.2121m | 317,365.4349m | N77° 12' 34"O |
| 5+780.00 | 7,606,750.6398m | 317,345.9312m | N77° 12' 34"O |
| 5+800.00 | 7,606,755.0676m | 317,326.4275m | N77° 12' 34"O |
| 5+820.00 | 7,606,761.1745m | 317,307.4207m | N63° 36' 12"O |
| 5+840.00 | 7,606,772.4658m | 317,291.0820m | N43° 08' 45"O |
| 5+860.00 | 7,606,788.9055m | 317,279.8111m | N28° 39' 37"O |
| 5+880.00 | 7,606,806.9049m | 317,271.1093m | N24° 56' 29"O |
| 5+900.00 | 7,606,825.2652m | 317,263.2046m | N21° 13' 21"O |
| 5+920.00 | 7,606,843.3479m | 317,254.8064m | N34° 14' 55"O |
| 5+940.00 | 7,606,858.8502m | 317,242.1766m | N39° 29' 37"O |
| 5+960.00 | 7,606,875.4253m | 317,231.0047m | N31° 31' 05"O |
| 5+980.00 | 7,606,892.5515m | 317,220.6829m | N29° 47' 27"O |
| 6+000.00 | 7,606,910.1796m | 317,211.2427m | N27° 30' 01"O |
| 6+020.00 | 7,606,927.9198m | 317,202.0077m | N27° 30' 01"O |
| 6+040.00 | 7,606,945.6600m | 317,192.7726m | N27° 30' 01"O |
| 6+060.00 | 7,606,963.5866m | 317,183.9138m | N25° 43' 34"O |

|          |                 |               |               |
|----------|-----------------|---------------|---------------|
| 6+080.00 | 7,606,980.8218m | 317,173.8476m | N35° 46' 51"O |
| 6+100.00 | 7,606,997.1267m | 317,162.2713m | N34° 00' 24"O |
| 6+120.00 | 7,607,013.7062m | 317,151.0856m | N34° 00' 24"O |
| 6+140.00 | 7,607,030.4850m | 317,140.2057m | N31° 46' 54"O |
| 6+160.00 | 7,607,047.6858m | 317,130.0039m | N29° 38' 29"O |
| 6+180.00 | 7,607,065.2800m | 317,120.4987m | N27° 24' 59"O |
| 6+200.00 | 7,607,083.0337m | 317,111.2896m | N27° 24' 59"O |
| 6+220.00 | 7,607,100.7874m | 317,102.0806m | N27° 24' 59"O |
| 6+240.00 | 7,607,118.5411m | 317,092.8715m | N27° 24' 59"O |
| 6+260.00 | 7,607,136.2948m | 317,083.6625m | N27° 24' 59"O |
| 6+280.00 | 7,607,154.0484m | 317,074.4534m | N27° 24' 59"O |
| 6+300.00 | 7,607,171.8021m | 317,065.2444m | N27° 24' 59"O |
| 6+300.36 | 7,607,172.1184m | 317,065.0803m | N27° 24' 59"O |

# Reporte de curva horizontal

## Tangent Data

Length: 45.383 Course: S 83° 04' 26.7974" W

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## Circular Curve Data

Delta: 09° 15'  
38.5272" Type: LEFT  
Radius: 250  
Length: 40.407 Tangent: 20.248  
Mid-Ord: 0.816 External: 0.819  
Chord: 40.363 Course: S 78° 26' 37.5338" W

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## Tangent Data

Length: 56.173 Course: S 73° 48' 48.2702" W

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## Circular Curve Data

Delta: 10° 20'  
52.0163" Type: LEFT  
Radius: 250  
Length: 45.151 Tangent: 22.637  
Mid-Ord: 1.019 External: 1.023  
Chord: 45.089 Course: S 68° 38' 22.2621" W

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## Tangent Data

Length: 152.069 Course: S 63° 27' 56.2539" W

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## Circular Curve Data

Delta: 17° 44'  
57.5060" Type: LEFT  
Radius: 100  
Length: 30.978 Tangent: 15.614  
Mid-Ord: 1.197 External: 1.212  
Chord: 30.855 Course: S 54° 35' 27.5009" W

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## Tangent Data

Length: 33.58 Course: S 45° 42' 58.7479" W

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## Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 25° 51'  |           |                      |
|          | 41.3488" | Type:     | LEFT                 |
| Radius:  | 50       |           |                      |
| Length:  | 22.568   | Tangent:  | 11.48                |
| Mid-Ord: | 1.268    | External: | 1.301                |
| Chord:   | 22.377   | Course:   | S 32° 47' 08.0735" W |

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Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 26.436 | Course: | S 19° 51' 17.3991" W |
|---------|--------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 15° 05'  |           |                      |
| Delta:   | 19.8111" | Type:     | RIGHT                |
| Radius:  | 50       |           |                      |
| Length:  | 13.167   | Tangent:  | 6.622                |
| Mid-Ord: | 0.433    | External: | 0.437                |
| Chord:   | 13.129   | Course:   | S 27° 23' 57.3046" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 22.96 | Course: | S 34° 56' 37.2102" W |
|---------|-------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 18° 15'  |           |                      |
| Delta:   | 55.8388" | Type:     | RIGHT                |
| Radius:  | 100      |           |                      |
| Length:  | 31.879   | Tangent:  | 16.076               |
| Mid-Ord: | 1.268    | External: | 1.284                |
| Chord:   | 31.745   | Course:   | S 44° 04' 35.1296" W |

---

Tangent Data

|         |         |         |                      |
|---------|---------|---------|----------------------|
| Length: | 104.172 | Course: | S 53° 12' 33.0490" W |
|---------|---------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 25° 55'  |           |                      |
| Delta:   | 22.7315" | Type:     | RIGHT                |
| Radius:  | 100      |           |                      |
| Length:  | 45.244   | Tangent:  | 23.016               |
| Mid-Ord: | 2.548    | External: | 2.615                |
| Chord:   | 44.859   | Course:   | S 66° 10' 14.4148" W |

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 37.277 | Course: | S 79° 07' 55.7806" W |
|---------|--------|---------|----------------------|

---

Circular Curve Data

Delta: 13° 42'  
25.1927" Type: LEFT  
Radius: 100  
Length: 23.923 Tangent: 12.019  
Mid-Ord: 0.715 External: 0.72  
Chord: 23.866 Course: S 72° 16' 43.1843" W

---

Tangent Data

Length: 72.338 Course: S 65° 25' 30.5879" W

---

Circular Curve Data

Delta: 06° 29'  
40.3488" Type: LEFT  
Radius: 250  
Length: 28.338 Tangent: 14.184  
Mid-Ord: 0.401 External: 0.402  
Chord: 28.323 Course: S 62° 10' 40.4135" W

---

Tangent Data

Length: 100.411 Course: S 58° 55' 50.2392" W

---

Circular Curve Data

Delta: 16° 41'  
34.6914" Type: LEFT  
Radius: 150  
Length: 43.702 Tangent: 22.007  
Mid-Ord: 1.589 External: 1.606  
Chord: 43.548 Course: S 50° 35' 02.8935" W

---

Tangent Data

Length: 103.305 Course: S 42° 14' 15.5478" W

---

Circular Curve Data

Delta: 05° 46'  
11.3776" Type: RIGHT

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Radius:  | 250    |           |                      |
| Length:  | 25.176 | Tangent:  | 12.598               |
| Mid-Ord: | 0.317  | External: | 0.317                |
| Chord:   | 25.165 | Course:   | S 45° 07' 21.2365" W |

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 84.404 | Course: | S 48° 00' 26.9253" W |
|---------|--------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 13° 44'  |           |                      |
| Delta:   | 21.5672" | Type:     | RIGHT                |
| Radius:  | 100      |           |                      |
| Length:  | 23.98    | Tangent:  | 12.048               |
| Mid-Ord: | 0.718    | External: | 0.723                |
| Chord:   | 23.922   | Course:   | S 54° 52' 37.7089" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 2.435 | Course: | S 61° 44' 48.4926" W |
|---------|-------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 08° 57'  |           |                      |
| Delta:   | 47.2695" | Type:     | RIGHT                |
| Radius:  | 250      |           |                      |
| Length:  | 39.109   | Tangent:  | 19.594               |
| Mid-Ord: | 0.764    | External: | 0.767                |
| Chord:   | 39.069   | Course:   | S 66° 13' 42.1273" W |

---

Tangent Data

|         |         |         |                      |
|---------|---------|---------|----------------------|
| Length: | 112.831 | Course: | S 70° 42' 35.7620" W |
|---------|---------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 22° 31'  |           |                      |
| Delta:   | 16.8790" | Type:     | LEFT                 |
| Radius:  | 80       |           |                      |
| Length:  | 31.446   | Tangent:  | 15.928               |
| Mid-Ord: | 1.54     | External: | 1.57                 |
| Chord:   | 31.244   | Course:   | S 59° 26' 57.3225" W |

---

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 88.344   | Course:   | S 48° 11' 18.8830" W |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 14° 31'  |           |                      |
| Delta:                     | 04.7828" | Type:     | LEFT                 |
| Radius:                    | 80       |           |                      |
| Length:                    | 20.271   | Tangent:  | 10.19                |
| Mid-Ord:                   | 0.641    | External: | 0.646                |
| Chord:                     | 20.217   | Course:   | S 40° 55' 46.4916" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 71.094   | Course:   | S 33° 40' 14.1001" W |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 12° 06'  |           |                      |
| Delta:                     | 00.3884" | Type:     | RIGHT                |
| Radius:                    | 80       |           |                      |
| Length:                    | 16.895   | Tangent:  | 8.479                |
| Mid-Ord:                   | 0.446    | External: | 0.448                |
| Chord:                     | 16.864   | Course:   | S 39° 43' 14.2943" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 183.972  | Course:   | S 45° 46' 14.4885" W |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 35° 20'  |           |                      |
| Delta:                     | 23.1039" | Type:     | RIGHT                |
| Radius:                    | 80       |           |                      |
| Length:                    | 49.344   | Tangent:  | 25.485               |
| Mid-Ord:                   | 3.774    | External: | 3.961                |
| Chord:                     | 48.565   | Course:   | S 63° 26' 26.0405" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 64.217   | Course:   | S 81° 06' 37.5925" W |

---

Circular Curve Data

Delta: 06° 20'  
48.9015" Type: LEFT  
Radius: 250  
Length: 27.694 Tangent: 13.861  
Mid-Ord: 0.383 External: 0.384  
Chord: 27.679 Course: S 77° 56' 13.1417" W

---

Tangent Data

Length: 32.633 Course: S 74° 45' 48.6910" W

---

Circular Curve Data

Delta: 11° 24'  
03.9402" Type: LEFT  
Radius: 80  
Length: 15.919 Tangent: 7.986  
Mid-Ord: 0.396 External: 0.398  
Chord: 15.893 Course: S 69° 03' 46.7209" W

---

Tangent Data

Length: 140.503 Course: S 63° 21' 44.7508" W

---

Circular Curve Data

Delta: 09° 08'  
52.3480" Type: LEFT  
Radius: 150  
Length: 23.949 Tangent: 12  
Mid-Ord: 0.478 External: 0.479  
Chord: 23.924 Course: S 58° 47' 18.5768" W

---

Tangent Data

Length: 71.396 Course: S 54° 12' 52.4027" W

---

Circular Curve Data

Delta: 26° 22'  
42.8378" Type: LEFT  
Radius: 80

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Length:  | 36.831 | Tangent:  | 18.748               |
| Mid-Ord: | 2.11   | External: | 2.167                |
| Chord:   | 36.507 | Course:   | S 41° 01' 30.9838" W |

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 168.29 | Course: | S 27° 50' 09.5649" W |
|---------|--------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 10° 50'  |           |                      |
| Delta:   | 51.3593" | Type:     | RIGHT                |
| Radius:  | 80       |           |                      |
| Length:  | 15.146   | Tangent:  | 7.596                |
| Mid-Ord: | 0.358    | External: | 0.36                 |
| Chord:   | 15.123   | Course:   | S 33° 15' 35.2446" W |

---

Tangent Data

|         |      |         |                      |
|---------|------|---------|----------------------|
| Length: | 6.75 | Course: | S 38° 41' 00.9242" W |
|---------|------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 05° 28'  |           |                      |
| Delta:   | 34.2983" | Type:     | RIGHT                |
| Radius:  | 120      |           |                      |
| Length:  | 11.469   | Tangent:  | 5.739                |
| Mid-Ord: | 0.137    | External: | 0.137                |
| Chord:   | 11.465   | Course:   | S 41° 25' 18.0733" W |

---

Tangent Data

|         |         |         |                      |
|---------|---------|---------|----------------------|
| Length: | 300.119 | Course: | S 44° 09' 35.2225" W |
|---------|---------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 16° 51'  |           |                      |
| Delta:   | 44.7511" | Type:     | LEFT                 |
| Radius:  | 80       |           |                      |
| Length:  | 23.544   | Tangent:  | 11.858               |
| Mid-Ord: | 0.865    | External: | 0.874                |
| Chord:   | 23.46    | Course:   | S 35° 43' 42.8470" W |

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| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 35.041 | Course: | S 27° 17' 50.4714" W |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 07° 49'  |           |                      |
| Delta:                     | 37.0211" | Type:     | LEFT                 |
| Radius:                    | 80       |           |                      |
| Length:                    | 10.928   | Tangent:  | 5.473                |
| Mid-Ord:                   | 0.187    | External: | 0.187                |
| Chord:                     | 10.92    | Course:   | S 23° 23' 01.9609" W |

---

| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 45.116 | Course: | S 19° 28' 13.4503" W |

---

| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 33° 55'  |           |                      |
| Delta:                     | 15.3945" | Type:     | RIGHT                |
| Radius:                    | 80       |           |                      |
| Length:                    | 47.363   | Tangent:  | 24.398               |
| Mid-Ord:                   | 3.48     | External: | 3.638                |
| Chord:                     | 46.674   | Course:   | S 36° 25' 51.1475" W |

---

| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 63.109 | Course: | S 53° 23' 28.8448" W |

---

| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 24° 15'  |           |                      |
| Delta:                     | 23.7880" | Type:     | RIGHT                |
| Radius:                    | 100      |           |                      |
| Length:                    | 42.336   | Tangent:  | 21.49                |
| Mid-Ord:                   | 2.232    | External: | 2.283                |
| Chord:                     | 42.02    | Course:   | S 65° 31' 10.7387" W |

---

| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 44.291 | Course: | S 77° 38' 52.6327" W |

---

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Circular Curve Data

Delta: 67° 28'  
27.7823" Type: LEFT  
Radius: 50  
Length: 58.883 Tangent: 33.393  
Mid-Ord: 8.42 External: 10.126  
Chord: 55.538 Course: S 43° 54' 38.7416" W

---

Tangent Data

Length: 81.893 Course: S 10° 10' 24.8504" W

---

Circular Curve Data

Delta: 54° 46'  
45.9279" Type: RIGHT  
Radius: 50  
Length: 47.804 Tangent: 25.906  
Mid-Ord: 5.605 External: 6.313  
Chord: 46.004 Course: S 37° 33' 47.8144" W

---

Tangent Data

Length: 38.083 Course: S 64° 57' 10.7784" W

---

Circular Curve Data

Delta: 29° 37'  
24.1194" Type: LEFT  
Radius: 50  
Length: 25.851 Tangent: 13.221  
Mid-Ord: 1.661 External: 1.719  
Chord: 25.564 Course: S 50° 08' 28.7187" W

---

Tangent Data

Length: 256.979 Course: S 35° 19' 46.6589" W

---

Circular Curve Data

Delta: 10° 50'  
19.9878" Type: RIGHT  
Radius: 200

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Length:  | 37.835 | Tangent:  | 18.974               |
| Mid-Ord: | 0.894  | External: | 0.898                |
| Chord:   | 37.778 | Course:   | S 40° 44' 56.6528" W |

---

Tangent Data

|         |         |         |                      |
|---------|---------|---------|----------------------|
| Length: | 190.937 | Course: | S 46° 10' 06.6467" W |
|---------|---------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 27° 00'  |           |                      |
| Delta:   | 51.3933" | Type:     | LEFT                 |
| Radius:  | 100      |           |                      |
| Length:  | 47.149   | Tangent:  | 24.021               |
| Mid-Ord: | 2.766    | External: | 2.845                |
| Chord:   | 46.713   | Course:   | S 32° 39' 40.9501" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 33.05 | Course: | S 19° 09' 15.2535" W |
|---------|-------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 60° 45'  |           |                      |
| Delta:   | 55.1892" | Type:     | RIGHT                |
| Radius:  | 50       |           |                      |
| Length:  | 53.028   | Tangent:  | 29.314               |
| Mid-Ord: | 6.867    | External: | 7.96                 |
| Chord:   | 50.577   | Course:   | S 49° 32' 12.8481" W |

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 110.96 | Course: | S 79° 55' 10.4427" W |
|---------|--------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 91° 42'  |           |                      |
| Delta:   | 46.7350" | Type:     | LEFT                 |
| Radius:  | 50       |           |                      |
| Length:  | 80.035   | Tangent:  | 51.518               |
| Mid-Ord: | 15.177   | External: | 21.792               |
| Chord:   | 71.76    | Course:   | S 34° 03' 47.0752" W |

---

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 6.132    | Course:   | S 11° 47' 36.2923" E |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 21° 10'  |           |                      |
| Delta:                     | 52.0564" | Type:     | LEFT                 |
| Radius:                    | 50       |           |                      |
| Length:                    | 18.484   | Tangent:  | 9.349                |
| Mid-Ord:                   | 0.852    | External: | 0.866                |
| Chord:                     | 18.379   | Course:   | S 22° 23' 02.3205" E |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 27.134   | Course:   | S 32° 58' 28.3487" E |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 97° 18'  |           |                      |
| Delta:                     | 11.9961" | Type:     | RIGHT                |
| Radius:                    | 50       |           |                      |
| Length:                    | 84.913   | Tangent:  | 56.817               |
| Mid-Ord:                   | 16.968   | External: | 25.685               |
| Chord:                     | 75.071   | Course:   | S 15° 40' 37.6493" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 31.331   | Course:   | S 64° 19' 43.6473" W |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 19° 16'  |           |                      |
| Delta:                     | 58.2749" | Type:     | LEFT                 |
| Radius:                    | 50       |           |                      |
| Length:                    | 16.827   | Tangent:  | 8.494                |
| Mid-Ord:                   | 0.706    | External: | 0.716                |
| Chord:                     | 16.748   | Course:   | S 54° 41' 14.5099" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 30.588   | Course:   | S 45° 02' 45.3724" W |

---

Circular Curve Data

Delta: 32° 11'  
39.2766" Type: RIGHT  
Radius: 50  
Length: 28.095 Tangent: 14.429  
Mid-Ord: 1.96 External: 2.04  
Chord: 27.727 Course: S 61° 08' 35.0107" W

---

Tangent Data

Length: 24.613 Course: S 77° 14' 24.6490" W

---

Circular Curve Data

Delta: 19° 25'  
53.9682" Type: LEFT  
Radius: 50  
Length: 16.957 Tangent: 8.561  
Mid-Ord: 0.717 External: 0.728  
Chord: 16.876 Course: S 67° 31' 27.6649" W

---

Tangent Data

Length: 26.486 Course: S 57° 48' 30.6808" W

---

Circular Curve Data

Delta: 26° 38'  
05.2848" Type: RIGHT  
Radius: 50  
Length: 23.243 Tangent: 11.836  
Mid-Ord: 1.345 External: 1.382  
Chord: 23.035 Course: S 71° 07' 33.3232" W

---

Tangent Data

Length: 104.092 Course: S 84° 26' 35.9656" W

---

Circular Curve Data

Delta: 99° 37'  
57.7102" Type: LEFT  
Radius: 40

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Length:  | 69.557 | Tangent:  | 47.361               |
| Mid-Ord: | 14.19  | External: | 21.992               |
| Chord:   | 61.118 | Course:   | S 34° 37' 37.1105" W |

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 52.926 | Course: | S 15° 11' 21.7446" E |
|---------|--------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 21° 25'  |           |                      |
| Delta:   | 49.1571" | Type:     | RIGHT                |
| Radius:  | 40       |           |                      |
| Length:  | 14.961   | Tangent:  | 7.569                |
| Mid-Ord: | 0.697    | External: | 0.71                 |
| Chord:   | 14.874   | Course:   | S 04° 28' 27.1660" E |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 6.059 | Course: | S 06° 14' 27.4125" W |
|---------|-------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 166° 51' |           |                      |
| Delta:   | 45.9383" | Type:     | RIGHT                |
| Radius:  | 19.69    |           |                      |
| Length:  | 57.342   | Tangent:  | 170.992              |
| Mid-Ord: | 17.437   | External: | 152.432              |
| Chord:   | 39.121   | Course:   | S 89° 40' 20.3817" W |

---

Tangent Data

|         |       |         |                    |
|---------|-------|---------|--------------------|
|         |       |         | N 06° 53' 46.6492" |
| Length: | 39.84 | Course: | W                  |

---

Circular Curve Data

|          |          |           |                    |
|----------|----------|-----------|--------------------|
|          | 109° 21' |           |                    |
| Delta:   | 49.6876" | Type:     | LEFT               |
| Radius:  | 25       |           |                    |
| Length:  | 47.719   | Tangent:  | 35.285             |
| Mid-Ord: | 10.547   | External: | 18.244             |
|          |          |           | N 61° 34' 41.4930" |
| Chord:   | 40.798   | Course:   | W                  |

---

| <u>Tangent Data</u> |         |                              |
|---------------------|---------|------------------------------|
| Length:             | 178.994 | Course: S 63° 44' 23.6632" W |

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| <u>Circular Curve Data</u> |          |                              |
|----------------------------|----------|------------------------------|
|                            | 16° 59'  |                              |
| Delta:                     | 44.4210" | Type: LEFT                   |
| Radius:                    | 80       |                              |
| Length:                    | 23.73    | Tangent: 11.953              |
| Mid-Ord:                   | 0.878    | External: 0.888              |
| Chord:                     | 23.644   | Course: S 55° 14' 31.4527" W |

---

| <u>Tangent Data</u> |        |                              |
|---------------------|--------|------------------------------|
| Length:             | 59.472 | Course: S 46° 44' 39.2422" W |

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| <u>Circular Curve Data</u> |          |                              |
|----------------------------|----------|------------------------------|
|                            | 34° 44'  |                              |
| Delta:                     | 42.8562" | Type: LEFT                   |
| Radius:                    | 80       |                              |
| Length:                    | 48.514   | Tangent: 25.029              |
| Mid-Ord:                   | 3.649    | External: 3.824              |
| Chord:                     | 47.774   | Course: S 29° 22' 17.8141" W |

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| <u>Tangent Data</u> |         |                              |
|---------------------|---------|------------------------------|
| Length:             | 514.225 | Course: S 11° 59' 56.3860" W |

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| <u>Circular Curve Data</u> |          |                              |
|----------------------------|----------|------------------------------|
|                            | 90° 47'  |                              |
| Delta:                     | 29.7529" | Type: RIGHT                  |
| Radius:                    | 50       |                              |
| Length:                    | 79.231   | Tangent: 50.696              |
| Mid-Ord:                   | 14.89    | External: 21.204             |
| Chord:                     | 71.197   | Course: S 57° 23' 41.2624" W |

---

| <u>Tangent Data</u> |        |                    |
|---------------------|--------|--------------------|
|                     |        | N 77° 12' 33.8611" |
| Length:             | 63.296 | Course: W          |

---

Circular Curve Data

Delta: 52° 16'  
04.7559" Type: RIGHT  
Radius: 50  
Length: 45.612 Tangent: 24.532  
Mid-Ord: 5.112 External: 5.694  
Chord: 44.047 Course: N 51° 04' 31.4832"  
W

---

Tangent Data

Length: 56.51 Course: N 24° 56' 29.1052"  
W

---

Circular Curve Data

Delta: 10° 49'  
59.3722" Type: LEFT  
Radius: 50  
Length: 9.454 Tangent: 4.741  
Mid-Ord: 0.223 External: 0.224  
Chord: 9.44 Course: N 30° 21' 28.7913"  
W

---

Tangent Data

Length: 33.186 Course: N 35° 46' 28.4774"  
W

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Circular Curve Data

Delta: 08° 16'  
27.3408" Type: RIGHT  
Radius: 150  
Length: 21.662 Tangent: 10.85  
Mid-Ord: 0.391 External: 0.392  
Chord: 21.643 Course: N 31° 38' 14.8070"  
W

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Tangent Data

Length: 83.504 Course: N 27° 30' 01.1366"  
W

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|                            |          |           |                    |
|----------------------------|----------|-----------|--------------------|
| <u>Circular Curve Data</u> |          |           |                    |
|                            | 06° 30'  |           |                    |
| Delta:                     | 22.6814" | Type:     | LEFT               |
| Radius:                    | 200      |           |                    |
| Length:                    | 22.711   | Tangent:  | 11.368             |
| Mid-Ord:                   | 0.322    | External: | 0.323              |
|                            |          |           | N 30° 45' 12.4773" |
| Chord:                     | 22.699   | Course:   | W                  |

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|                     |        |         |                    |
|---------------------|--------|---------|--------------------|
| <u>Tangent Data</u> |        |         |                    |
|                     |        |         | N 34° 00' 23.8180" |
| Length:             | 55.815 | Course: | W                  |

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|                            |          |           |                    |
|----------------------------|----------|-----------|--------------------|
| <u>Circular Curve Data</u> |          |           |                    |
|                            | 06° 35'  |           |                    |
| Delta:                     | 25.1260" | Type:     | RIGHT              |
| Radius:                    | 200      |           |                    |
| Length:                    | 23.005   | Tangent:  | 11.515             |
| Mid-Ord:                   | 0.331    | External: | 0.331              |
|                            |          |           | N 30° 42' 41.2551" |
| Chord:                     | 22.992   | Course:   | W                  |

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|                     |         |         |                    |
|---------------------|---------|---------|--------------------|
| <u>Tangent Data</u> |         |         |                    |
|                     |         |         | N 27° 24' 58.6921" |
| Length:             | 139.414 | Course: | W                  |

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## Alignment: Eje Sn Jacinto - Tolomosa-Left-3.000

### Description:

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|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 04° 40'  |           |                      |
| Delta:                     | 37.3427" | Type:     | LEFT                 |
| Radius:                    | 246.4    |           |                      |
| Length:                    | 20.114   | Tangent:  | 10.062               |
| Mid-Ord:                   | 0.205    | External: | 0.205                |
| Chord:                     | 20.108   | Course:   | S 78° 26' 37.5338" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 05° 45'  |           |                      |
| Delta:   | 50.8317" | Type:     | LEFT                 |
| Radius:  | 246.4    |           |                      |
| Length:  | 24.789   | Tangent:  | 12.405               |
| Mid-Ord: | 0.312    | External: | 0.312                |
| Chord:   | 24.778   | Course:   | S 68° 38' 22.2621" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 06° 17'  |           |                      |
| Delta:   | 24.5447" | Type:     | LEFT                 |
| Radius:  | 95.9     |           |                      |
| Length:  | 10.528   | Tangent:  | 5.269                |
| Mid-Ord: | 0.144    | External: | 0.145                |
| Chord:   | 10.523   | Course:   | S 54° 35' 27.5009" W |

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.205 | Course: | S 53° 46' 11.7641" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.211 | Course: | S 51° 51' 13.8177" W |
|---------|-------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 02° 56'  |           |                      |
| Delta:   | 35.4262" | Type:     | LEFT                 |
| Radius:  | 45.7     |           |                      |
| Length:  | 2.348    | Tangent:  | 1.174                |
| Mid-Ord: | 0.015    | External: | 0.015                |
| Chord:   | 2.347    | Course:   | S 32° 47' 08.0735" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 15° 05'  | Type:     | RIGHT                |
| Radius:  | 19.8111" |           |                      |
| Length:  | 54.3     | Tangent:  | 7.192                |
| Mid-Ord: | 14.3     | External: | 0.474                |
| Chord:   | 0.47     | Course:   | S 27° 23' 57.3046" W |
|          | 14.259   |           |                      |

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|         |      |         |                      |
|---------|------|---------|----------------------|
| Length: | 3.47 | Course: | S 40° 03' 08.0313" W |
|---------|------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 06° 48'  | Type:     | RIGHT                |
| Radius:  | 22.8775" |           |                      |
| Length:  | 104.1    | Tangent:  | 6.19                 |
| Mid-Ord: | 12.366   | External: | 0.184                |
| Chord:   | 0.184    | Course:   | S 44° 04' 35.1296" W |
|          | 12.359   |           |                      |

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.472 | Course: | S 51° 27' 40.5191" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.466 | Course: | S 53° 22' 35.2172" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.459 | Course: | S 55° 17' 29.9831" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 10.015 | Course: | S 56° 21' 26.1950" W |
|---------|--------|---------|----------------------|

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Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 84.172 | Course: | S 53° 12' 33.0490" W |
|---------|--------|---------|----------------------|

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Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 10.015 | Course: | S 50° 03' 39.9031" W |
|---------|--------|---------|----------------------|

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|                            |                     |           |                      |
|----------------------------|---------------------|-----------|----------------------|
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 3.459               | Course:   | S 51° 07' 36.1150" W |
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 3.466               | Course:   | S 53° 02' 30.8808" W |
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 3.472               | Course:   | S 54° 57' 25.5790" W |
| <u>Circular Curve Data</u> |                     |           |                      |
| Delta:                     | 14° 27'<br>49.7703" | Type:     | RIGHT                |
| Radius:                    | 104.1               |           |                      |
| Length:                    | 26.279              | Tangent:  | 13.21                |
| Mid-Ord:                   | 0.828               | External: | 0.835                |
| Chord:                     | 26.209              | Course:   | S 66° 10' 14.4148" W |
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 3.472               | Course:   | S 77° 23' 03.2506" W |
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 3.466               | Course:   | S 79° 17' 57.9488" W |
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 3.459               | Course:   | S 81° 12' 52.7147" W |
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 10.015              | Course:   | S 82° 16' 48.9265" W |
| <u>Tangent Data</u>        |                     |           |                      |
| Length:                    | 17.277              | Course:   | S 79° 07' 55.7806" W |
| <u>Tangent Data</u>        |                     |           |                      |

Length: 10.015 Course: S 75° 59' 02.6346" W

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Tangent Data

Length: 3.217 Course: S 74° 54' 38.5722" W

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Tangent Data

Length: 3.211 Course: S 72° 59' 40.7108" W

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Tangent Data

Length: 3.205 Course: S 71° 04' 42.7644" W

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Circular Curve Data

Delta: 02° 14' 52.2314" Type: LEFT  
Radius: 95.9  
Length: 3.762 Tangent: 1.881  
Mid-Ord: 0.018 External: 0.018  
Chord: 3.762 Course: S 72° 16' 43.1842" W

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Tangent Data

Length: 3.205 Course: S 73° 28' 43.6041" W

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Tangent Data

Length: 3.211 Course: S 71° 33' 45.6576" W

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Tangent Data

Length: 3.217 Course: S 69° 38' 47.7964" W

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Tangent Data

Length: 10.015 Course: S 68° 34' 23.7339" W

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Tangent Data

Length: 52.338 Course: S 65° 25' 30.5879" W

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|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.004   | Course:   | S 63° 42' 24.4991" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.29     | Course:   | S 63° 18' 05.5252" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.289    | Course:   | S 62° 32' 12.7863" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.287    | Course:   | S 61° 46' 20.0452" W |
| <u>Circular Curve Data</u> |          |           |                      |
| Delta:                     | 01° 54'  | Type:     | LEFT                 |
| Radius:                    | 39.1643" |           |                      |
| Length:                    | 246.4    |           |                      |
| Mid-Ord:                   | 8.218    | Tangent:  | 4.109                |
| Chord:                     | 0.034    | External: | 0.034                |
|                            | 8.217    | Course:   | S 62° 10' 40.4135" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.287    | Course:   | S 62° 35' 00.7818" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.289    | Course:   | S 61° 49' 08.0408" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.29     | Course:   | S 61° 03' 15.3019" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.004   | Course:   | S 60° 38' 56.3280" W |
| <u>Tangent Data</u>        |          |           |                      |

Length: 80.411 Course: S 58° 55' 50.2392" W

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Tangent Data

Length: 10.008 Course: S 56° 38' 24.0430" W

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Tangent Data

Length: 3.259 Course: S 55° 56' 57.6866" W

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Tangent Data

Length: 3.256 Course: S 54° 40' 26.3454" W

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Tangent Data

Length: 3.253 Course: S 53° 23' 54.9904" W

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 09° 03'  | Type:     | LEFT                 |
|          | 12.7172" |           |                      |
| Radius:  | 146.2    |           |                      |
| Length:  | 23.102   | Tangent:  | 11.575               |
| Mid-Ord: | 0.456    | External: | 0.457                |
| Chord:   | 23.078   | Course:   | S 50° 35' 02.8935" W |

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Tangent Data

Length: 3.253 Course: S 47° 46' 10.7965" W

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Tangent Data

Length: 3.256 Course: S 46° 29' 39.4415" W

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Tangent Data

Length: 3.259 Course: S 45° 13' 08.1003" W

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Tangent Data

Length: 10.008 Course: S 44° 31' 41.7439" W

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| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 83.305 | Course: | S 42° 14' 15.5478" W |

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| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 10.004 | Course: | S 40° 31' 09.4590" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 3.379 | Course: | S 40° 55' 26.3975" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 3.381 | Course: | S 41° 41' 19.0020" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 3.382 | Course: | S 42° 27' 11.6045" W |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 01° 11'  |           |                      |
| Delta:                     | 10.1930" | Type:     | RIGHT                |
| Radius:                    | 253.6    |           |                      |
| Length:                    | 5.25     | Tangent:  | 2.625                |
| Mid-Ord:                   | 0.014    | External: | 0.014                |
| Chord:                     | 5.25     | Course:   | S 45° 07' 21.2366" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 3.472 | Course: | S 49° 45' 19.4552" W |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 02° 16'  |           |                      |
| Delta:                     | 48.6059" | Type:     | RIGHT                |
| Radius:                    | 104.1    |           |                      |
| Length:                    | 4.143    | Tangent:  | 2.072                |
| Mid-Ord:                   | 0.021    | External: | 0.021                |
| Chord:                     | 4.143    | Course:   | S 54° 52' 37.7089" W |

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|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.469    | Course:   | S 58° 11' 56.1955" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.467    | Course:   | S 60° 06' 34.8432" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.464    | Course:   | S 62° 01' 13.4954" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 2.435    | Course:   | S 63° 01' 24.7301" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.385    | Course:   | S 63° 23' 11.2218" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.384    | Course:   | S 64° 09' 02.7445" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.383    | Course:   | S 64° 54' 54.2680" W |
| <hr/>                      |          |           |                      |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 04° 22'  |           |                      |
| Delta:                     | 46.0850" | Type:     | RIGHT                |
| Radius:                    | 253.6    |           |                      |
| Length:                    | 19.384   | Tangent:  | 9.697                |
| Mid-Ord:                   | 0.185    | External: | 0.185                |
| Chord:                     | 19.379   | Course:   | S 66° 13' 42.1273" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.382    | Course:   | S 70° 29' 39.7052" W |
| <hr/>                      |          |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.381    | Course:   | S 71° 15' 32.3079" W |

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.379    | Course:   | S 72° 01' 24.9123" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.004   | Course:   | S 72° 25' 41.8508" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 92.831   | Course:   | S 70° 42' 35.7620" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.018   | Course:   | S 67° 16' 34.6927" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.185    | Course:   | S 65° 55' 01.4963" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.177    | Course:   | S 63° 31' 13.1664" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.169    | Course:   | S 61° 07' 24.6583" W |
| <u>Circular Curve Data</u> |          |           |                      |
| Delta:                     | 08° 11'  | Type:     | LEFT                 |
| Radius:                    | 50.6775" |           |                      |
|                            | 75.8     |           |                      |
| Length:                    | 10.845   | Tangent:  | 5.432                |
| Mid-Ord:                   | 0.194    | External: | 0.194                |
| Chord:                     | 10.836   | Course:   | S 59° 26' 57.3225" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.169    | Course:   | S 57° 46' 29.9867" W |

|                            |                  |           |                      |
|----------------------------|------------------|-----------|----------------------|
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.177            | Course:   | S 55° 22' 41.4785" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.185            | Course:   | S 52° 58' 53.1488" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 10.018           | Course:   | S 51° 37' 19.9523" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 68.344           | Course:   | S 48° 11' 18.8830" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 10.018           | Course:   | S 44° 45' 17.8137" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.185            | Course:   | S 43° 23' 44.6173" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.177            | Course:   | S 40° 59' 56.2874" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.169            | Course:   | S 38° 36' 07.7793" W |
| <hr/>                      |                  |           |                      |
| <u>Circular Curve Data</u> |                  |           |                      |
| Delta:                     | 00° 11' 38.5800" | Type:     | LEFT                 |
| Radius:                    | 75.8             |           |                      |
| Length:                    | 0.257            | Tangent:  | 0.128                |
| Mid-Ord:                   | 0                | External: | 0                    |
| Chord:                     | 0.257            | Course:   | S 40° 55' 46.4915" W |
| <hr/>                      |                  |           |                      |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.169            | Course:   | S 43° 15' 25.2038" W |

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.177    | Course:   | S 40° 51' 36.6958" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.185    | Course:   | S 38° 27' 48.3659" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.018   | Course:   | S 37° 06' 15.1694" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 41.094   | Course:   | S 33° 40' 14.1001" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 20.036   | Course:   | S 30° 14' 13.0308" W |
| <u>Circular Curve Data</u> |          |           |                      |
| Delta:                     | 12° 06'  | Type:     | RIGHT                |
| Radius:                    | 00.3884" |           |                      |
| Length:                    | 84.2     | Tangent:  | 8.924                |
| Mid-Ord:                   | 17.782   | External: | 0.472                |
| Chord:                     | 0.469    | Course:   | S 39° 43' 14.2943" W |
|                            | 17.749   |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 20.036   | Course:   | S 49° 12' 15.5578" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 153.972  | Course:   | S 45° 46' 14.4885" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.018   | Course:   | S 42° 20' 13.4192" W |

Tangent Data

Length: 3.493 Course: S 43° 40' 57.5135" W

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Tangent Data

Length: 3.501 Course: S 46° 04' 39.9816" W

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Tangent Data

Length: 3.51 Course: S 48° 28' 22.3165" W

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 21° 00'  | Type:     | RIGHT                |
| Radius:  | 56.9024" |           |                      |
|          | 84.2     |           |                      |
| Length:  | 30.884   | Tangent:  | 15.618               |
| Mid-Ord: | 1.412    | External: | 1.436                |
| Chord:   | 30.711   | Course:   | S 63° 26' 26.0405" W |

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Tangent Data

Length: 3.51 Course: S 78° 24' 29.7645" W

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Tangent Data

Length: 3.501 Course: S 80° 48' 12.0994" W

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Tangent Data

Length: 3.493 Course: S 83° 11' 54.5675" W

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Tangent Data

Length: 10.018 Course: S 84° 32' 38.6618" W

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Tangent Data

Length: 44.217 Course: S 81° 06' 37.5925" W

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Tangent Data

Length: 10.004 Course: S 79° 23' 31.5037" W

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.29     | Course:   | S 78° 59' 12.5297" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.289    | Course:   | S 78° 13' 19.7909" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.287    | Course:   | S 77° 27' 27.0497" W |
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 01° 45'  |           |                      |
| Delta:                     | 47.7170" | Type:     | LEFT                 |
| Radius:                    | 246.4    |           |                      |
| Length:                    | 7.583    | Tangent:  | 3.792                |
| Mid-Ord:                   | 0.029    | External: | 0.029                |
| Chord:                     | 7.583    | Course:   | S 77° 56' 13.1417" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.287    | Course:   | S 78° 24' 59.2337" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.289    | Course:   | S 77° 39' 06.4926" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.29     | Course:   | S 76° 53' 13.7537" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.004   | Course:   | S 76° 28' 54.7798" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 2.633    | Course:   | S 74° 45' 48.6910" W |

Tangent Data

Length: 20.036 Course: S 71° 19' 47.6217" W

---

Circular Curve Data

Delta: 11° 24'  
03.9402" Type: LEFT  
Radius: 75.8  
Length: 15.083 Tangent: 7.567  
Mid-Ord: 0.375 External: 0.377  
Chord: 15.058 Course: S 69° 03' 46.7209" W

---

Tangent Data

Length: 20.036 Course: S 66° 47' 45.8201" W

---

Tangent Data

Length: 110.503 Course: S 63° 21' 44.7508" W

---

Tangent Data

Length: 10.008 Course: S 61° 04' 18.5546" W

---

Tangent Data

Length: 3.259 Course: S 60° 22' 52.1982" W

---

Tangent Data

Length: 3.256 Course: S 59° 06' 20.8571" W

---

Tangent Data

Length: 3.253 Course: S 57° 49' 49.5020" W

---

Circular Curve Data

Delta: 01° 30'  
30.3741" Type: LEFT  
Radius: 146.2  
Length: 3.849 Tangent: 1.925  
Mid-Ord: 0.013 External: 0.013

Chord: 3.849 Course: S 58° 47' 18.5767" W

---

Tangent Data

Length: 3.253 Course: S 59° 44' 47.6516" W

---

Tangent Data

Length: 3.256 Course: S 58° 28' 16.2964" W

---

Tangent Data

Length: 3.259 Course: S 57° 11' 44.9553" W

---

Tangent Data

Length: 10.008 Course: S 56° 30' 18.5989" W

---

Tangent Data

Length: 51.396 Course: S 54° 12' 52.4028" W

---

Tangent Data

Length: 10.018 Course: S 50° 46' 51.3334" W

---

Tangent Data

Length: 3.185 Course: S 49° 25' 18.1370" W

---

Tangent Data

Length: 3.177 Course: S 47° 01' 29.8072" W

---

Tangent Data

Length: 3.169 Course: S 44° 37' 41.2991" W

---

Circular Curve Data

Delta: 12° 03'  
16.6363" Type: LEFT  
Radius: 75.8

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Length:  | 15.948 | Tangent:  | 8.003                |
| Mid-Ord: | 0.419  | External: | 0.421                |
| Chord:   | 15.918 | Course:   | S 41° 01' 30.9838" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.169 | Course: | S 37° 25' 20.6686" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.177 | Course: | S 35° 01' 32.1605" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.185 | Course: | S 32° 37' 43.8307" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 10.018 | Course: | S 31° 16' 10.6342" W |
|---------|--------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 138.29 | Course: | S 27° 50' 09.5649" W |
|---------|--------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 20.036 | Course: | S 24° 24' 08.4956" W |
|---------|--------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 10° 50'  |           |                      |
| Delta:   | 51.3593" | Type:     | RIGHT                |
| Radius:  | 84.2     |           |                      |
| Length:  | 15.941   | Tangent:  | 7.995                |
| Mid-Ord: | 0.377    | External: | 0.379                |
| Chord:   | 15.917   | Course:   | S 33° 15' 35.2445" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 6.756 | Course: | S 41° 13' 42.7210" W |
|---------|-------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 05° 28'  | Type:     | RIGHT                |
| Radius:  | 34.2983" |           |                      |
| Length:  | 123.9    |           |                      |
| Length:  | 11.842   | Tangent:  | 5.926                |
| Mid-Ord: | 0.141    | External: | 0.142                |
| Chord:   | 11.838   | Course:   | S 41° 25' 18.0734" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 20.02 | Course: | S 46° 44' 10.8811" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |         |         |                      |
|---------|---------|---------|----------------------|
| Length: | 270.119 | Course: | S 44° 09' 35.2225" W |
|---------|---------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 10.018 | Course: | S 40° 43' 34.1532" W |
|---------|--------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.185 | Course: | S 39° 22' 00.9568" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.177 | Course: | S 36° 58' 12.6270" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.169 | Course: | S 34° 34' 24.1188" W |
|---------|-------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 02° 32'  | Type:     | LEFT                 |
| Radius:  | 18.5497" |           |                      |
| Length:  | 75.8     |           |                      |
| Length:  | 3.358    | Tangent:  | 1.679                |
| Mid-Ord: | 0.019    | External: | 0.019                |
| Chord:   | 3.358    | Course:   | S 35° 43' 42.8469" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.169 | Course: | S 36° 53' 01.5751" W |
|---------|-------|---------|----------------------|

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.177    | Course:   | S 34° 29' 13.0670" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.185    | Course:   | S 32° 05' 24.7372" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.018   | Course:   | S 30° 43' 51.5407" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 5.041    | Course:   | S 27° 17' 50.4714" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 20.036   | Course:   | S 23° 51' 49.4021" W |
| <u>Circular Curve Data</u> |          |           |                      |
| Delta:                     | 07° 49'  | Type:     | LEFT                 |
| Radius:                    | 37.0211" |           |                      |
| Length:                    | 75.8     | Tangent:  | 5.185                |
| Mid-Ord:                   | 10.355   | External: | 0.177                |
| Chord:                     | 0.177    | Course:   | S 23° 23' 01.9609" W |
|                            | 10.347   |           |                      |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 20.036   | Course:   | S 22° 54' 14.5196" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 15.116   | Course:   | S 19° 28' 13.4503" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.018   | Course:   | S 16° 02' 12.3810" W |

Tangent Data

Length: 3.493 Course: S 17° 22' 56.4753" W

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Tangent Data

Length: 3.501 Course: S 19° 46' 38.9433" W

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Tangent Data

Length: 3.51 Course: S 22° 10' 21.2782" W

---

Circular Curve Data

Delta: 19° 35'  
49.1929" Type: RIGHT  
Radius: 84.2  
Length: 28.799 Tangent: 14.542  
Mid-Ord: 1.228 External: 1.246  
Chord: 28.659 Course: S 36° 25' 51.1475" W

---

Tangent Data

Length: 3.472 Course: S 55° 08' 21.3747" W

---

Circular Curve Data

Delta: 12° 47'  
50.8268" Type: RIGHT  
Radius: 104.1  
Length: 23.252 Tangent: 11.674  
Mid-Ord: 0.649 External: 0.653  
Chord: 23.203 Course: S 65° 31' 10.7387" W

---

Tangent Data

Length: 3.061 Course: S 64° 02' 31.0063" W

---

Circular Curve Data

Delta: 44° 33'  
21.8598" Type: LEFT  
Radius: 45.7  
Length: 35.539 Tangent: 18.722

|          |       |           |                      |
|----------|-------|-----------|----------------------|
| Mid-Ord: | 3.411 | External: | 3.686                |
| Chord:   | 34.65 | Course:   | S 43° 54' 38.7416" W |

---

|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.061               | Course: | S 23° 46' 46.4769" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.075               | Course: | S 19° 56' 26.9675" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.09                | Course: | S 16° 06' 08.0969" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 10.021              | Course: | S 13° 53' 33.2287" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 61.893              | Course: | S 10° 10' 24.8504" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 10.021              | Course: | S 06° 27' 16.4721" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.59                | Course: | S 08° 37' 30.2126" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.604               | Course: | S 12° 27' 31.0565" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.619               | Course: | S 16° 17' 31.5032" W |

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|        |                            |       |       |
|--------|----------------------------|-------|-------|
|        | <u>Circular Curve Data</u> |       |       |
|        | 31° 51'                    |       |       |
| Delta: | 40.0055"                   | Type: | RIGHT |

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Radius:  | 54.3   |           |                      |
| Length:  | 30.195 | Tangent:  | 15.499               |
| Mid-Ord: | 2.085  | External: | 2.169                |
| Chord:   | 29.808 | Course:   | S 37° 33' 47.8144" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.619               | Course: | S 58° 50' 04.1256" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.604               | Course: | S 62° 40' 04.5723" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.59                | Course: | S 66° 30' 05.4162" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 10.021              | Course: | S 68° 40' 19.1567" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 18.083              | Course: | S 64° 57' 10.7784" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 10.021              | Course: | S 61° 14' 02.4001" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.09                | Course: | S 59° 01' 27.5319" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.075               | Course: | S 55° 11' 08.6613" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.061               | Course: | S 51° 20' 49.1519" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 06° 42'  | Type:     | LEFT                 |
| Radius:  | 18.1971" |           | 45.7                 |
| Length:  | 5.348    | Tangent:  | 2.677                |
| Mid-Ord: | 0.078    | External: | 0.078                |
| Chord:   | 5.345    | Course:   | S 50° 08' 28.7186" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.061 | Course: | S 48° 56' 08.2855" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.075 | Course: | S 45° 05' 48.7760" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |      |         |                      |
|---------|------|---------|----------------------|
| Length: | 3.09 | Course: | S 41° 15' 29.9054" W |
|---------|------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 10.021 | Course: | S 39° 02' 55.0373" W |
|---------|--------|---------|----------------------|

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Tangent Data

|         |         |         |                      |
|---------|---------|---------|----------------------|
| Length: | 236.979 | Course: | S 35° 19' 46.6589" W |
|---------|---------|---------|----------------------|

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Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 10.004 | Course: | S 33° 36' 40.5701" W |
|---------|--------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.391 | Course: | S 34° 07' 01.4347" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.392 | Course: | S 35° 04' 22.1702" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.394 | Course: | S 36° 01' 42.9027" W |
|---------|-------|---------|----------------------|

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 05° 06'  |           |                      |
| Delta:                     | 33.5072" | Type:     | RIGHT                |
| Radius:                    | 203.6    |           |                      |
| Length:                    | 18.156   | Tangent:  | 9.084                |
| Mid-Ord:                   | 0.202    | External: | 0.203                |
| Chord:                     | 18.15    | Course:   | S 40° 44' 56.6528" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.394    | Course:   | S 45° 28' 10.4030" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.392    | Course:   | S 46° 25' 31.1355" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.391    | Course:   | S 47° 22' 51.8710" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.004   | Course:   | S 47° 53' 12.7356" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 170.937  | Course:   | S 46° 10' 06.6467" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.015   | Course:   | S 43° 01' 13.5008" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.217    | Course:   | S 41° 56' 49.4383" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.211    | Course:   | S 40° 01' 51.5770" W |

Tangent Data

Length: 3.205 Course: S 38° 06' 53.6306" W

---

Circular Curve Data

Delta: 15° 33'  
18.4320" Type: LEFT  
Radius: 95.9  
Length: 26.036 Tangent: 13.098  
Mid-Ord: 0.882 External: 0.89  
Chord: 25.956 Course: S 32° 39' 40.9501" W

---

Tangent Data

Length: 3.205 Course: S 27° 12' 28.2697" W

---

Tangent Data

Length: 3.211 Course: S 25° 17' 30.3232" W

---

Tangent Data

Length: 3.217 Course: S 23° 22' 32.4619" W

---

Tangent Data

Length: 10.015 Course: S 22° 18' 08.3994" W

---

Tangent Data

Length: 13.05 Course: S 19° 09' 15.2535" W

---

Tangent Data

Length: 10.021 Course: S 15° 26' 06.8752" W

---

Tangent Data

Length: 3.59 Course: S 17° 36' 20.6157" W

---

Tangent Data

Length: 3.604 Course: S 21° 26' 21.4596" W

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.619    | Course:   | S 25° 16' 21.9062" W |
| <u>Circular Curve Data</u> |          |           |                      |
| Delta:                     | 37° 50'  | Type:     | RIGHT                |
| Radius:                    | 49.2667" |           |                      |
| Length:                    | 54.3     |           |                      |
| Length:                    | 35.868   | Tangent:  | 18.616               |
| Mid-Ord:                   | 2.935    | External: | 3.102                |
| Chord:                     | 35.22    | Course:   | S 49° 32' 12.8481" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.619    | Course:   | S 73° 48' 03.7900" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.604    | Course:   | S 77° 38' 04.2367" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.59     | Course:   | S 81° 28' 05.0805" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.021   | Course:   | S 83° 38' 18.8210" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 90.96    | Course:   | S 79° 55' 10.4427" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.021   | Course:   | S 76° 12' 02.0644" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.09     | Course:   | S 73° 59' 27.1962" W |

Tangent Data

Length: 3.075 Course: S 70° 09' 08.3257" W

---

Tangent Data

Length: 3.061 Course: S 66° 18' 48.8162" W

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 68° 47'  | Type:     | LEFT                 |
|          | 40.8125" |           |                      |
| Radius:  | 45.7     |           |                      |
| Length:  | 54.872   | Tangent:  | 31.288               |
| Mid-Ord: | 7.991    | External: | 9.685                |
| Chord:   | 51.634   | Course:   | S 34° 03' 47.0752" W |

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Tangent Data

Length: 3.046 Course: S 02° 14' 38.8246" E

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Tangent Data

Length: 3.046 Course: S 06° 03' 49.8117" E

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Tangent Data

Length: 3.046 Course: S 09° 53' 00.7987" E

---

Tangent Data

Length: 6.132 Course: S 11° 47' 36.2923" E

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 21° 10'  | Type:     | LEFT                 |
|          | 52.0564" |           |                      |
| Radius:  | 45.7     |           |                      |
| Length:  | 16.894   | Tangent:  | 8.545                |
| Mid-Ord: | 0.778    | External: | 0.792                |
| Chord:   | 16.798   | Course:   | S 22° 23' 02.3205" E |

---

Tangent Data

Length: 27.134 Course: S 32° 58' 28.3487" E

---

Tangent Data

Length: 3.619 Course: S 31° 03' 52.8552" E

---

Tangent Data

Length: 3.619 Course: S 27° 14' 41.8681" E

---

Tangent Data

Length: 3.619 Course: S 23° 25' 30.8810" E

---

Circular Curve Data

Delta: 74° 23' 06.0736" Type: RIGHT  
Radius: 54.3  
Length: 70.496 Tangent: 41.205  
Mid-Ord: 11.044 External: 13.864  
Chord: 65.648 Course: S 15° 40' 37.6493" W

---

Tangent Data

Length: 3.619 Course: S 58° 12' 36.9946" W

---

Tangent Data

Length: 3.604 Course: S 62° 02' 37.4413" W

---

Tangent Data

Length: 3.59 Course: S 65° 52' 38.2852" W

---

Tangent Data

Length: 10.021 Course: S 68° 02' 52.0256" W

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Tangent Data

Length: 1.331 Course: S 64° 19' 43.6474" W

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| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 20.042 | Course: | S 60° 36' 35.2690" W |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 19° 16'  |           |                      |
| Delta:                     | 58.2749" | Type:     | LEFT                 |
| Radius:                    | 45.7     |           |                      |
| Length:                    | 15.38    | Tangent:  | 7.764                |
| Mid-Ord:                   | 0.646    | External: | 0.655                |
| Chord:                     | 15.308   | Course:   | S 54° 41' 14.5099" W |

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| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 20.042 | Course: | S 48° 45' 53.7507" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 0.588 | Course: | S 45° 02' 45.3725" W |

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| <u>Tangent Data</u> |        |         |                      |
|---------------------|--------|---------|----------------------|
| Length:             | 10.021 | Course: | S 41° 19' 36.9941" W |

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| <u>Tangent Data</u> |      |         |                      |
|---------------------|------|---------|----------------------|
| Length:             | 3.59 | Course: | S 43° 29' 50.7346" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 3.604 | Course: | S 47° 19' 51.5785" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 3.619 | Course: | S 51° 09' 52.0251" W |

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| <u>Circular Curve Data</u> |          |          |       |
|----------------------------|----------|----------|-------|
|                            | 09° 16'  |          |       |
| Delta:                     | 33.3541" | Type:    | RIGHT |
| Radius:                    | 54.3     |          |       |
| Length:                    | 8.791    | Tangent: | 4.405 |

|          |       |           |                      |
|----------|-------|-----------|----------------------|
| Mid-Ord: | 0.178 | External: | 0.178                |
| Chord:   | 8.781 | Course:   | S 61° 08' 35.0107" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.619 | Course: | S 67° 41' 27.1814" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.619 | Course: | S 71° 30' 38.1684" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.619 | Course: | S 75° 19' 49.1555" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 24.613 | Course: | S 77° 14' 24.6490" W |
|---------|--------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 19° 25'  | Type:     | LEFT                 |
|          | 53.9682" |           |                      |
| Radius:  | 45.7     |           |                      |
| Length:  | 15.499   | Tangent:  | 7.825                |
| Mid-Ord: | 0.655    | External: | 0.665                |
| Chord:   | 15.425   | Course:   | S 67° 31' 27.6649" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 03° 42'  | Type:     | RIGHT                |
|          | 59.3624" |           |                      |
| Radius:  | 54.3     |           |                      |
| Length:  | 3.522    | Tangent:  | 1.762                |
| Mid-Ord: | 0.029    | External: | 0.029                |
| Chord:   | 3.522    | Course:   | S 71° 07' 33.3232" W |

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 2.991 | Course: | S 68° 21' 22.3504" W |
|---------|-------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 70° 59'  | Type:     | LEFT                 |
| Radius:  | 05.3071" |           |                      |
|          | 35.7     |           |                      |
| Length:  | 44.229   | Tangent:  | 25.457               |
| Mid-Ord: | 6.633    | External: | 8.147                |
| Chord:   | 41.454   | Course:   | S 34° 37' 37.1105" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 2.991 | Course: | S 00° 53' 51.8707" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.009 | Course: | S 03° 54' 06.4169" E |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.027 | Course: | S 08° 42' 03.6393" E |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 10.021 | Course: | S 11° 28' 13.3663" E |
|---------|--------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 22.926 | Course: | S 15° 11' 21.7446" E |
|---------|--------|---------|----------------------|

---

Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 20.042 | Course: | S 18° 54' 30.1229" E |
|---------|--------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
| Delta:   | 21° 25'  | Type:     | RIGHT                |
| Radius:  | 49.1571" |           |                      |
|          | 44.3     |           |                      |
| Length:  | 16.57    | Tangent:  | 8.383                |
| Mid-Ord: | 0.772    | External: | 0.786                |
| Chord:   | 16.473   | Course:   | S 04° 28' 27.1660" E |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 02° 40'  |           |                      |
| Delta:   | 18.2195" | Type:     | LEFT                 |
| Radius:  | 75.8     |           |                      |
| Length:  | 3.535    | Tangent:  | 1.768                |
| Mid-Ord: | 0.021    | External: | 0.021                |
| Chord:   | 3.534    | Course:   | S 55° 14' 31.4527" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 20° 25'  |           |                      |
| Delta:   | 16.6546" | Type:     | LEFT                 |
| Radius:  | 75.8     |           |                      |
| Length:  | 27.017   | Tangent:  | 13.653               |
| Mid-Ord: | 1.2      | External: | 1.22                 |
| Chord:   | 26.874   | Course:   | S 29° 22' 17.8141" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 67° 52'  |           |                      |
| Delta:   | 23.8304" | Type:     | RIGHT                |
| Radius:  | 54.3     |           |                      |
| Length:  | 64.324   | Tangent:  | 36.539               |
| Mid-Ord: | 9.25     | External: | 11.149               |
| Chord:   | 60.629   | Course:   | S 57° 23' 41.2624" W |

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Circular Curve Data

|          |          |           |                    |
|----------|----------|-----------|--------------------|
|          | 29° 20'  |           |                    |
| Delta:   | 58.8335" | Type:     | RIGHT              |
| Radius:  | 54.3     |           |                    |
| Length:  | 27.815   | Tangent:  | 14.22              |
| Mid-Ord: | 1.771    | External: | 1.831              |
|          |          |           | N 51° 04' 31.4832" |
| Chord:   | 27.512   | Course:   | W                  |

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|         |        |         |                    |
|---------|--------|---------|--------------------|
|         |        |         | N 28° 39' 37.4835" |
| Length: | 20.042 | Course: | W                  |

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Circular Curve Data

|          |          |           |                    |
|----------|----------|-----------|--------------------|
| Delta:   | 10° 49'  | Type:     | LEFT               |
| Radius:  | 59.3722" |           |                    |
| Length:  | 45.7     |           |                    |
| Mid-Ord: | 8.641    | Tangent:  | 4.333              |
|          | 0.204    | External: | 0.205              |
|          |          |           | N 30° 21' 28.7913" |
| Chord:   | 8.628    | Course:   | W                  |

---

Tangent Data

|         |        |         |                    |
|---------|--------|---------|--------------------|
| Length: | 20.042 | Course: | N 32° 03' 20.0991" |
|         |        |         | W                  |

---

Tangent Data

|         |       |         |                    |
|---------|-------|---------|--------------------|
| Length: | 3.186 | Course: | N 35° 46' 28.4774" |
|         |       |         | W                  |

---

Tangent Data

|         |        |         |                    |
|---------|--------|---------|--------------------|
| Length: | 10.008 | Course: | N 38° 03' 54.6735" |
|         |        |         | W                  |

---

Tangent Data

|         |       |         |                    |
|---------|-------|---------|--------------------|
| Length: | 3.413 | Course: | N 37° 22' 36.4290" |
|         |       |         | W                  |

---

Tangent Data

|         |       |         |                    |
|---------|-------|---------|--------------------|
| Length: | 3.416 | Course: | N 36° 06' 05.7774" |
|         |       |         | W                  |

---

Tangent Data

|         |       |         |                    |
|---------|-------|---------|--------------------|
| Length: | 3.419 | Course: | N 34° 49' 35.1379" |
|         |       |         | W                  |

---

Circular Curve Data

|          |          |           |       |
|----------|----------|-----------|-------|
| Delta:   | 00° 38'  | Type:     | RIGHT |
| Radius:  | 05.3666" |           |       |
| Length:  | 153.8    |           |       |
| Mid-Ord: | 1.704    | Tangent:  | 0.852 |
|          | 0.002    | External: | 0.002 |

Chord: 1.704 Course: N 31° 38' 14.8070"  
W

---

Tangent Data

Length: 3.419 Course: N 28° 26' 54.4761"  
W

---

Tangent Data

Length: 3.416 Course: N 27° 10' 23.8366"  
W

---

Tangent Data

Length: 3.413 Course: N 25° 53' 53.1850"  
W

---

Tangent Data

Length: 10.008 Course: N 25° 12' 34.9404"  
W

---

Tangent Data

Length: 63.504 Course: N 27° 30' 01.1366"  
W

---

Tangent Data

Length: 10.008 Course: N 29° 47' 27.3328"  
W

---

Tangent Data

Length: 3.278 Course: N 30° 18' 31.3084"  
W

---

Tangent Data

Length: 3.276 Course: N 31° 15' 54.7456"  
W

---

Tangent Data

Length: 3.274 Course: N 32° 13' 18.1905"  
W

---

Circular Curve Data

Delta: 00° 46'  
36.2008" Type: LEFT  
Radius: 196.2  
Length: 2.66 Tangent: 1.33  
Mid-Ord: 0.005 External: 0.005  
Chord: 2.66 Course: N 30° 45' 12.4773"  
W

---

Tangent Data

Length: 3.274 Course: N 29° 17' 06.7641"  
W

---

Tangent Data

Length: 3.276 Course: N 30° 14' 30.2091"  
W

---

Tangent Data

Length: 3.278 Course: N 31° 11' 53.6463"  
W

---

Tangent Data

Length: 10.008 Course: N 31° 42' 57.6219"  
W

---

Tangent Data

Length: 35.815 Course: N 34° 00' 23.8180"  
W

---

Tangent Data

Length: 10.004 Course: N 35° 43' 29.9069"  
W

---

Tangent Data

Length: 3.391 Course: N 35° 13' 09.0423"  
W

---

Tangent Data

Length: 3.392 Course: N 34° 15' 48.3068"  
W

---

Tangent Data

Length: 3.394 Course: N 33° 18' 27.5742"  
W

---

Circular Curve Data

Delta: 00° 51' 38.6452" Type: RIGHT  
Radius: 203.6  
Length: 3.059 Tangent: 1.529  
Mid-Ord: 0.006 External: 0.006  
Chord: 3.059 Course: N 30° 42' 41.2551"  
W

---

Tangent Data

Length: 3.394 Course: N 28° 06' 54.9359"  
W

---

Tangent Data

Length: 3.392 Course: N 27° 09' 34.2033"  
W

---

Tangent Data

Length: 3.391 Course: N 26° 12' 13.4678"  
W

---

Tangent Data

Length: 10.004 Course: N 25° 41' 52.6033"  
W

---

Tangent Data

|         |         |         |                    |
|---------|---------|---------|--------------------|
|         |         |         | N 27° 24' 58.6921" |
| Length: | 129.414 | Course: | W                  |

---

## Alignment: Eje Sn Jacinto - Tolomosa-Right-3.000

### Description:

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 35.383              | Course: | S 83° 04' 26.7974" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 10.004              | Course: | S 84° 47' 32.8862" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.379               | Course: | S 84° 23' 15.9476" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.381               | Course: | S 83° 37' 23.3431" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.382               | Course: | S 82° 51' 30.7406" W |

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|          |                            |           |                      |
|----------|----------------------------|-----------|----------------------|
|          | <u>Circular Curve Data</u> |           |                      |
|          | 04° 40'                    |           |                      |
| Delta:   | 37.3427"                   | Type:     | LEFT                 |
| Radius:  | 253.6                      |           |                      |
| Length:  | 20.701                     | Tangent:  | 10.356               |
| Mid-Ord: | 0.211                      | External: | 0.211                |
| Chord:   | 20.696                     | Course:   | S 78° 26' 37.5338" W |

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|         |                     |         |                      |
|---------|---------------------|---------|----------------------|
|         | <u>Tangent Data</u> |         |                      |
| Length: | 3.382               | Course: | S 74° 01' 44.3270" W |

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.381    | Course:   | S 73° 15' 51.7244" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.379    | Course:   | S 72° 29' 59.1199" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.004   | Course:   | S 72° 05' 42.1814" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 36.173   | Course:   | S 73° 48' 48.2702" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.004   | Course:   | S 75° 31' 54.3590" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.379    | Course:   | S 75° 07' 37.4204" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.381    | Course:   | S 74° 21' 44.8160" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.382    | Course:   | S 73° 35' 52.2134" W |
| <u>Circular Curve Data</u> |          |           |                      |
| Delta:                     | 05° 45'  | Type:     | LEFT                 |
| Radius:                    | 50.8318" |           |                      |
| Length:                    | 253.6    |           |                      |
| Length:                    | 25.513   | Tangent:  | 12.767               |
| Mid-Ord:                   | 0.321    | External: | 0.321                |
| Chord:                     | 25.502   | Course:   | S 68° 38' 22.2621" W |

Tangent Data

Length: 3.382 Course: S 63° 40' 52.3107" W

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Tangent Data

Length: 3.381 Course: S 62° 54' 59.7081" W

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Tangent Data

Length: 3.379 Course: S 62° 09' 07.1037" W

---

Tangent Data

Length: 10.004 Course: S 61° 44' 50.1651" W

---

Tangent Data

Length: 132.069 Course: S 63° 27' 56.2539" W

---

Tangent Data

Length: 10.015 Course: S 66° 36' 49.3999" W

---

Tangent Data

Length: 3.459 Course: S 65° 32' 53.1880" W

---

Tangent Data

Length: 3.466 Course: S 63° 37' 58.4221" W

---

Tangent Data

Length: 3.472 Course: S 61° 43' 03.7240" W

---

Circular Curve Data

Delta: 06° 17'  
24.5448" Type: LEFT  
Radius: 104.1  
Length: 11.428 Tangent: 5.72  
Mid-Ord: 0.157 External: 0.157  
Chord: 11.423 Course: S 54° 35' 27.5009" W

|                            |          |          |                      |
|----------------------------|----------|----------|----------------------|
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 3.472    | Course:  | S 47° 27' 51.2778" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 3.466    | Course:  | S 45° 32' 56.5797" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 3.459    | Course:  | S 43° 38' 01.8139" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 10.015   | Course:  | S 42° 34' 05.6020" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 13.58    | Course:  | S 45° 42' 58.7479" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 10.021   | Course:  | S 49° 26' 07.1262" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 3.59     | Course:  | S 47° 15' 53.3857" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 3.604    | Course:  | S 43° 25' 52.5418" W |
| <u>Tangent Data</u>        |          |          |                      |
| Length:                    | 3.619    | Course:  | S 39° 35' 52.0952" W |
| <u>Circular Curve Data</u> |          |          |                      |
| Delta:                     | 02° 56'  | Type:    | LEFT                 |
| Radius:                    | 35.4263" |          |                      |
| Length:                    | 54.3     |          |                      |
|                            | 2.789    | Tangent: | 1.395                |

|          |       |           |                      |
|----------|-------|-----------|----------------------|
| Mid-Ord: | 0.018 | External: | 0.018                |
| Chord:   | 2.789 | Course:   | S 32° 47' 08.0735" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.619 | Course: | S 29° 24' 14.8668" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.619 | Course: | S 25° 35' 03.8797" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.619 | Course: | S 21° 45' 52.8926" W |
|---------|-------|---------|----------------------|

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Tangent Data

|         |        |         |                      |
|---------|--------|---------|----------------------|
| Length: | 26.436 | Course: | S 19° 51' 17.3991" W |
|---------|--------|---------|----------------------|

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 15° 05'  |           |                      |
| Delta:   | 19.8112" | Type:     | RIGHT                |
| Radius:  | 45.7     |           |                      |
| Length:  | 12.035   | Tangent:  | 6.053                |
| Mid-Ord: | 0.396    | External: | 0.399                |
| Chord:   | 12       | Course:   | S 27° 23' 57.3046" W |

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 22.96 | Course: | S 34° 35' 45.6011" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.195 | Course: | S 35° 32' 09.2718" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.196 | Course: | S 37° 26' 45.0408" W |
|---------|-------|---------|----------------------|

---

Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.196 | Course: | S 39° 21' 20.8097" W |
|---------|-------|---------|----------------------|

|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Circular Curve Data</u> |          |           |                      |
| Delta:                     | 06° 48'  | Type:     | RIGHT                |
| Radius:                    | 22.8776" |           |                      |
|                            | 95.9     |           |                      |
| Length:                    | 11.392   | Tangent:  | 5.703                |
| Mid-Ord:                   | 0.169    | External: | 0.169                |
| Chord:                     | 11.386   | Course:   | S 44° 04' 35.1296" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.205    | Course:   | S 45° 09' 20.0329" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.211    | Course:   | S 47° 04' 17.9793" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.217    | Course:   | S 48° 59' 15.8407" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.015   | Course:   | S 50° 03' 39.9031" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 84.172   | Course:   | S 53° 12' 33.0490" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 10.015   | Course:   | S 56° 21' 26.1950" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.217    | Course:   | S 57° 25' 50.2575" W |
| <u>Tangent Data</u>        |          |           |                      |
| Length:                    | 3.211    | Course:   | S 59° 20' 48.1188" W |

Tangent Data

Length: 3.205 Course: S 61° 15' 46.0652" W

---

Circular Curve Data

Delta: 14° 27'  
49.7703" Type: RIGHT  
Radius: 95.9  
Length: 24.209 Tangent: 12.169  
Mid-Ord: 0.763 External: 0.769  
Chord: 24.145 Course: S 66° 10' 14.4148" W

---

Tangent Data

Length: 3.205 Course: S 71° 04' 42.7644" W

---

Tangent Data

Length: 3.211 Course: S 72° 59' 40.7108" W

---

Tangent Data

Length: 3.217 Course: S 74° 54' 38.5722" W

---

Tangent Data

Length: 10.015 Course: S 75° 59' 02.6346" W

---

Tangent Data

Length: 17.277 Course: S 79° 07' 55.7806" W

---

Tangent Data

Length: 10.015 Course: S 82° 16' 48.9265" W

---

Tangent Data

Length: 3.459 Course: S 81° 12' 52.7147" W

---

Tangent Data

Length: 3.466 Course: S 79° 17' 57.9488" W

|                            |                  |           |                      |
|----------------------------|------------------|-----------|----------------------|
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.472            | Course:   | S 77° 23' 03.2507" W |
| <u>Circular Curve Data</u> |                  |           |                      |
| Delta:                     | 02° 14' 52.2312" | Type:     | LEFT                 |
| Radius:                    | 104.1            |           |                      |
| Length:                    | 4.084            | Tangent:  | 2.042                |
| Mid-Ord:                   | 0.02             | External: | 0.02                 |
| Chord:                     | 4.084            | Course:   | S 72° 16' 43.1843" W |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.472            | Course:   | S 67° 10' 23.1177" W |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.466            | Course:   | S 65° 15' 28.4197" W |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.459            | Course:   | S 63° 20' 33.6539" W |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 10.015           | Course:   | S 62° 16' 37.4420" W |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 52.338           | Course:   | S 65° 25' 30.5879" W |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 10.004           | Course:   | S 67° 08' 36.6767" W |
| <u>Tangent Data</u>        |                  |           |                      |
| Length:                    | 3.379            | Course:   | S 66° 44' 19.7382" W |

Tangent Data

Length: 3.381 Course: S 65° 58' 27.1338" W

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Tangent Data

Length: 3.382 Course: S 65° 12' 34.5312" W

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Circular Curve Data

Delta: 01° 54'  
39.1642" Type: LEFT  
Radius: 253.6  
Length: 8.458 Tangent: 4.229  
Mid-Ord: 0.035 External: 0.035  
Chord: 8.457 Course: S 62° 10' 40.4135" W

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Tangent Data

Length: 3.419 Course: S 57° 58' 56.8997" W

---

Circular Curve Data

Delta: 09° 03'  
12.7172" Type: LEFT  
Radius: 153.8  
Length: 24.303 Tangent: 12.177  
Mid-Ord: 0.48 External: 0.481  
Chord: 24.277 Course: S 50° 35' 02.8935" W

---

Circular Curve Data

Delta: 01° 11'  
10.1931" Type: RIGHT  
Radius: 246.4  
Length: 5.101 Tangent: 2.551  
Mid-Ord: 0.013 External: 0.013  
Chord: 5.101 Course: S 45° 07' 21.2365" W

---

Circular Curve Data

Delta: 02° 16'  
48.6058" Type: RIGHT  
Radius: 95.9  
Length: 3.816 Tangent: 1.908  
Mid-Ord: 0.019 External: 0.019

Chord: 3.816 Course: S 54° 52' 37.7089" W

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Tangent Data

Length: 3.286 Course: S 62° 21' 39.9847" W

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Circular Curve Data

Delta: 04° 22' Type: RIGHT  
Radius: 46.0850"  
Length: 18.834 Tangent: 9.422  
Mid-Ord: 0.18 External: 0.18  
Chord: 18.829 Course: S 66° 13' 42.1273" W

---

Tangent Data

Length: 3.51 Course: S 68° 00' 27.9341" W

---

Circular Curve Data

Delta: 08° 11' Type: LEFT  
Radius: 50.6775"  
Length: 12.047 Tangent: 6.034  
Mid-Ord: 0.215 External: 0.216  
Chord: 12.036 Course: S 59° 26' 57.3225" W

---

Circular Curve Data

Delta: 00° 11' Type: LEFT  
Radius: 38.5830"  
Length: 0.285 Tangent: 0.143  
Mid-Ord: 0 External: 0  
Chord: 0.285 Course: S 40° 55' 46.4914" W

---

Circular Curve Data

Delta: 12° 06' Type: RIGHT  
Radius: 00.3884"  
75.8

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Length:  | 16.008 | Tangent:  | 8.034                |
| Mid-Ord: | 0.422  | External: | 0.425                |
| Chord:   | 15.978 | Course:   | S 39° 43' 14.2943" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 21° 00'  |           |                      |
| Delta:   | 56.9023" | Type:     | RIGHT                |
| Radius:  | 75.8     |           |                      |
| Length:  | 27.803   | Tangent:  | 14.06                |
| Mid-Ord: | 1.271    | External: | 1.293                |
| Chord:   | 27.647   | Course:   | S 63° 26' 26.0405" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 01° 45'  |           |                      |
| Delta:   | 47.7171" | Type:     | LEFT                 |
| Radius:  | 253.6    |           |                      |
| Length:  | 7.804    | Tangent:  | 3.903                |
| Mid-Ord: | 0.03     | External: | 0.03                 |
| Chord:   | 7.804    | Course:   | S 77° 56' 13.1417" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 11° 24'  |           |                      |
| Delta:   | 03.9403" | Type:     | LEFT                 |
| Radius:  | 84.2     |           |                      |
| Length:  | 16.755   | Tangent:  | 8.405                |
| Mid-Ord: | 0.416    | External: | 0.418                |
| Chord:   | 16.727   | Course:   | S 69° 03' 46.7209" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 12° 03'  |           |                      |
| Delta:   | 16.6363" | Type:     | LEFT                 |
| Radius:  | 84.2     |           |                      |
| Length:  | 17.715   | Tangent:  | 8.89                 |
| Mid-Ord: | 0.465    | External: | 0.468                |
| Chord:   | 17.682   | Course:   | S 41° 01' 30.9838" W |

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Tangent Data

Length: 20.036 Course: S 31° 16' 10.6342" W

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Circular Curve Data

Delta: 10° 50'  
51.3593" Type: RIGHT  
Radius: 75.8  
Length: 14.351 Tangent: 7.197  
Mid-Ord: 0.339 External: 0.341  
Chord: 14.33 Course: S 33° 15' 35.2446" W

---

Tangent Data

Length: 6.756 Course: S 36° 08' 19.1274" W

---

Circular Curve Data

Delta: 05° 28'  
34.2983" Type: RIGHT  
Radius: 116.1  
Length: 11.097 Tangent: 5.553  
Mid-Ord: 0.133 External: 0.133  
Chord: 11.092 Course: S 41° 25' 18.0733" W

---

Circular Curve Data

Delta: 02° 32'  
18.5494" Type: LEFT  
Radius: 84.2  
Length: 3.73 Tangent: 1.866  
Mid-Ord: 0.021 External: 0.021  
Chord: 3.73 Course: S 35° 43' 42.8470" W

---

Circular Curve Data

Delta: 07° 49'  
37.0211" Type: LEFT  
Radius: 84.2  
Length: 11.502 Tangent: 5.76  
Mid-Ord: 0.196 External: 0.197  
Chord: 11.493 Course: S 23° 23' 01.9608" W

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 12° 47'  |           |                      |
| Delta:   | 50.8268" | Type:     | RIGHT                |
| Radius:  | 95.9     |           |                      |
| Length:  | 21.42    | Tangent:  | 10.755               |
| Mid-Ord: | 0.597    | External: | 0.601                |
| Chord:   | 21.376   | Course:   | S 65° 31' 10.7387" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 44° 33'  |           |                      |
| Delta:   | 21.8598" | Type:     | LEFT                 |
| Radius:  | 54.3     |           |                      |
| Length:  | 42.226   | Tangent:  | 22.246               |
| Mid-Ord: | 4.053    | External: | 4.38                 |
| Chord:   | 41.17    | Course:   | S 43° 54' 38.7416" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 31° 51'  |           |                      |
| Delta:   | 40.0054" | Type:     | RIGHT                |
| Radius:  | 45.7     |           |                      |
| Length:  | 25.413   | Tangent:  | 13.044               |
| Mid-Ord: | 1.755    | External: | 1.825                |
| Chord:   | 25.087   | Course:   | S 37° 33' 47.8144" W |

---

Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 06° 42'  |           |                      |
| Delta:   | 18.1969" | Type:     | LEFT                 |
| Radius:  | 54.3     |           |                      |
| Length:  | 6.354    | Tangent:  | 3.181                |
| Mid-Ord: | 0.093    | External: | 0.093                |
| Chord:   | 6.351    | Course:   | S 50° 08' 28.7187" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 05° 06'  |           |                      |
| Delta:   | 33.5072" | Type:     | RIGHT                |
| Radius:  | 196.4    |           |                      |
| Length:  | 17.514   | Tangent:  | 8.763                |
| Mid-Ord: | 0.195    | External: | 0.195                |
| Chord:   | 17.508   | Course:   | S 40° 44' 56.6528" W |

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Circular Curve Data

|        |          |       |      |
|--------|----------|-------|------|
|        | 15° 33'  |       |      |
| Delta: | 18.4320" | Type: | LEFT |

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Radius:  | 104.1  |           |                      |
| Length:  | 28.262 | Tangent:  | 14.218               |
| Mid-Ord: | 0.958  | External: | 0.967                |
| Chord:   | 28.175 | Course:   | S 32° 39' 40.9501" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 37° 50'  |           |                      |
| Delta:   | 49.2667" | Type:     | RIGHT                |
| Radius:  | 45.7     |           |                      |
| Length:  | 30.187   | Tangent:  | 15.668               |
| Mid-Ord: | 2.47     | External: | 2.611                |
| Chord:   | 29.642   | Course:   | S 49° 32' 12.8481" W |

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Tangent Data

|         |       |         |                      |
|---------|-------|---------|----------------------|
| Length: | 3.619 | Course: | S 73° 48' 03.7900" W |
|---------|-------|---------|----------------------|

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 68° 47'  |           |                      |
| Delta:   | 40.8125" | Type:     | LEFT                 |
| Radius:  | 54.3     |           |                      |
| Length:  | 65.198   | Tangent:  | 37.176               |
| Mid-Ord: | 9.495    | External: | 11.507               |
| Chord:   | 61.351   | Course:   | S 34° 03' 47.0752" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 21° 10'  |           |                      |
| Delta:   | 52.0564" | Type:     | LEFT                 |
| Radius:  | 54.3     |           |                      |
| Length:  | 20.074   | Tangent:  | 10.153               |
| Mid-Ord: | 0.925    | External: | 0.941                |
| Chord:   | 19.96    | Course:   | S 22° 23' 02.3205" E |

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Tangent Data

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Circular Curve Data

|         |          |       |       |
|---------|----------|-------|-------|
|         | 74° 23'  |       |       |
| Delta:  | 06.0736" | Type: | RIGHT |
| Radius: | 45.7     |       |       |

|          |        |           |                      |
|----------|--------|-----------|----------------------|
| Length:  | 59.331 | Tangent:  | 34.679               |
| Mid-Ord: | 9.295  | External: | 11.668               |
| Chord:   | 55.251 | Course:   | S 15° 40' 37.6493" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 19° 16'  |           |                      |
| Delta:   | 58.2749" | Type:     | LEFT                 |
| Radius:  | 54.3     |           |                      |
| Length:  | 18.275   | Tangent:  | 9.225                |
| Mid-Ord: | 0.767    | External: | 0.778                |
| Chord:   | 18.189   | Course:   | S 54° 41' 14.5099" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 09° 16'  |           |                      |
| Delta:   | 33.3541" | Type:     | RIGHT                |
| Radius:  | 45.7     |           |                      |
| Length:  | 7.399    | Tangent:  | 3.707                |
| Mid-Ord: | 0.15     | External: | 0.15                 |
| Chord:   | 7.391    | Course:   | S 61° 08' 35.0107" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 19° 25'  |           |                      |
| Delta:   | 53.9682" | Type:     | LEFT                 |
| Radius:  | 54.3     |           |                      |
| Length:  | 18.416   | Tangent:  | 9.297                |
| Mid-Ord: | 0.779    | External: | 0.79                 |
| Chord:   | 18.328   | Course:   | S 67° 31' 27.6649" W |

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Circular Curve Data

|          |          |           |                      |
|----------|----------|-----------|----------------------|
|          | 03° 42'  |           |                      |
| Delta:   | 59.3626" | Type:     | RIGHT                |
| Radius:  | 45.7     |           |                      |
| Length:  | 2.964    | Tangent:  | 1.483                |
| Mid-Ord: | 0.024    | External: | 0.024                |
| Chord:   | 2.964    | Course:   | S 71° 07' 33.3233" W |

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| <u>Tangent Data</u> |       |         |                      |
|---------------------|-------|---------|----------------------|
| Length:             | 3.688 | Course: | S 75° 52' 18.6701" W |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 70° 59'  |           |                      |
| Delta:                     | 05.3071" | Type:     | LEFT                 |
| Radius:                    | 44.3     |           |                      |
| Length:                    | 54.884   | Tangent:  | 31.59                |
| Mid-Ord:                   | 8.231    | External: | 10.11                |
| Chord:                     | 51.441   | Course:   | S 34° 37' 37.1105" W |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 21° 25'  |           |                      |
| Delta:                     | 49.1571" | Type:     | RIGHT                |
| Radius:                    | 35.7     |           |                      |
| Length:                    | 13.353   | Tangent:  | 6.755                |
| Mid-Ord:                   | 0.622    | External: | 0.634                |
| Chord:                     | 13.275   | Course:   | S 04° 28' 27.1660" E |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 108° 39' |           |                      |
| Delta:                     | 49.0539" | Type:     | RIGHT                |
| Radius:                    | 15.39    |           |                      |
| Length:                    | 29.187   | Tangent:  | 21.442               |
| Mid-Ord:                   | 6.416    | External: | 11.004               |
| Chord:                     | 25.005   | Course:   | S 89° 40' 20.3817" W |

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| <u>Circular Curve Data</u> |          |           |                      |
|----------------------------|----------|-----------|----------------------|
|                            | 02° 40'  |           |                      |
| Delta:                     | 18.2195" | Type:     | LEFT                 |
| Radius:                    | 84.2     |           |                      |
| Length:                    | 3.926    | Tangent:  | 1.963                |
| Mid-Ord:                   | 0.023    | External: | 0.023                |
| Chord:                     | 3.926    | Course:   | S 55° 14' 31.4527" W |

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|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 20° 25'  |           |                      |
| Delta:                     | 16.6546" | Type:     | LEFT                 |
| Radius:                    | 84.2     |           |                      |
| Length:                    | 30.01    | Tangent:  | 15.166               |
| Mid-Ord:                   | 1.334    | External: | 1.355                |
| Chord:                     | 29.852   | Course:   | S 29° 22' 17.8141" W |

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|                            |          |           |                      |
|----------------------------|----------|-----------|----------------------|
| <u>Circular Curve Data</u> |          |           |                      |
|                            | 67° 52'  |           |                      |
| Delta:                     | 23.8304" | Type:     | RIGHT                |
| Radius:                    | 45.7     |           |                      |
| Length:                    | 54.137   | Tangent:  | 30.752               |
| Mid-Ord:                   | 7.785    | External: | 9.383                |
| Chord:                     | 51.026   | Course:   | S 57° 23' 41.2624" W |

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|                     |       |         |                      |
|---------------------|-------|---------|----------------------|
| <u>Tangent Data</u> |       |         |                      |
| Length:             | 3.061 | Course: | S 89° 11' 04.5124" W |

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|                            |          |           |                    |
|----------------------------|----------|-----------|--------------------|
| <u>Circular Curve Data</u> |          |           |                    |
|                            | 29° 20'  |           |                    |
| Delta:                     | 58.8334" | Type:     | RIGHT              |
| Radius:                    | 45.7     |           |                    |
| Length:                    | 23.41    | Tangent:  | 11.968             |
| Mid-Ord:                   | 1.491    | External: | 1.541              |
|                            |          |           | N 51° 04' 31.4832" |
| Chord:                     | 23.155   | Course:   | W                  |

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|                     |  |  |  |
|---------------------|--|--|--|
| <u>Tangent Data</u> |  |  |  |
|---------------------|--|--|--|

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|                            |          |       |      |
|----------------------------|----------|-------|------|
| <u>Circular Curve Data</u> |          |       |      |
|                            | 10° 49'  |       |      |
| Delta:                     | 59.3722" | Type: | LEFT |

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|          |        |           |                    |
|----------|--------|-----------|--------------------|
| Radius:  | 54.3   |           |                    |
| Length:  | 10.267 | Tangent:  | 5.149              |
| Mid-Ord: | 0.242  | External: | 0.244              |
|          |        |           | N 30° 21' 28.7913" |
| Chord:   | 10.251 | Course:   | W                  |

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Circular Curve Data

|          |          |           |                    |
|----------|----------|-----------|--------------------|
|          | 00° 38'  |           |                    |
| Delta:   | 05.3663" | Type:     | RIGHT              |
| Radius:  | 146.2    |           |                    |
| Length:  | 1.62     | Tangent:  | 0.81               |
| Mid-Ord: | 0.002    | External: | 0.002              |
|          |          |           | N 31° 38' 14.8070" |
| Chord:   | 1.62     | Course:   | W                  |

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Tangent Data

|         |       |         |                    |
|---------|-------|---------|--------------------|
|         |       |         | N 27° 38' 20.4463" |
| Length: | 3.398 | Course: | W                  |

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Circular Curve Data

|          |          |           |                    |
|----------|----------|-----------|--------------------|
|          | 00° 46'  |           |                    |
| Delta:   | 36.2008" | Type:     | LEFT               |
| Radius:  | 203.8    |           |                    |
| Length:  | 2.763    | Tangent:  | 1.381              |
| Mid-Ord: | 0.005    | External: | 0.005              |
|          |          |           | N 30° 45' 12.4773" |
| Chord:   | 2.763    | Course:   | W                  |

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Circular Curve Data

|          |          |           |                    |
|----------|----------|-----------|--------------------|
|          | 00° 51'  |           |                    |
| Delta:   | 38.6453" | Type:     | RIGHT              |
| Radius:  | 196.4    |           |                    |
| Length:  | 2.95     | Tangent:  | 1.475              |
| Mid-Ord: | 0.006    | External: | 0.006              |
|          |          |           | N 30° 42' 41.2551" |
| Chord:   | 2.95     | Course:   | W                  |

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## Reporte de curva vertical

Intervalo de P.K.: inicio: 0+000.00, fin: 6+303.52

| VAV | P.K.                                               | Inclinación de rasante T.S. | Longitud de curva            |             |
|-----|----------------------------------------------------|-----------------------------|------------------------------|-------------|
| 0   | 0+000.00                                           | 0.20%                       |                              |             |
| 1   | 0+264.91                                           | 6.75%                       | 150.000m                     |             |
|     | Información de acuerdo vertical: (acuerdo cóncavo) |                             |                              |             |
|     | -----                                              |                             |                              |             |
|     | P.K. de PAV:                                       | 0+189.91                    | Elevación:                   | 1,922.247m  |
|     | P.K. de VAV:                                       | 0+264.91                    | Elevación:                   | 1,922.397m  |
|     | P.K. de PTV:                                       | 0+339.91                    | Elevación:                   | 1,927.463m  |
|     | Punto bajo:                                        | 0+189.91                    | Elevación:                   | 1,922.247m  |
|     | Inclinación de rasante T.E.:                       | 0.20%                       | Inclinación de rasante T.S.: | 6.75%       |
|     | Cambiar:                                           | 6.55%                       | K:                           | 22.88432307 |
|     | Longitud de curva:                                 | 150.000m                    |                              |             |
|     | Distancia de iluminación:                          | 143.624m                    |                              |             |
| 2   | 0+634.05                                           | 1.10%                       | 150.000m                     |             |
|     | Información de acuerdo vertical: (acuerdo convexo) |                             |                              |             |
|     | -----                                              |                             |                              |             |
|     | P.K. de PAV:                                       | 0+559.05                    | Elevación:                   | 1,942.266m  |
|     | P.K. de VAV:                                       | 0+634.05                    | Elevación:                   | 1,947.332m  |
|     | P.K. de PTV:                                       | 0+709.05                    | Elevación:                   | 1,948.157m  |
|     | Punto alto:                                        | 0+709.05                    | Elevación:                   | 1,948.157m  |
|     | Inclinación de rasante T.E.:                       | 6.75%                       | Inclinación de rasante T.S.: | 1.10%       |
|     | Cambiar:                                           | 5.65%                       | K:                           | 26.52658004 |
|     | Longitud de curva:                                 | 150.000m                    |                              |             |
|     | Distancia de adelantamiento:                       | 348.465m                    | Distancia de parada:         | 192.526m    |
| 3   | 1+270.34                                           | -0.59%                      | 150.000m                     |             |
|     | Información de acuerdo vertical: (acuerdo convexo) |                             |                              |             |
|     | -----                                              |                             |                              |             |
|     | P.K. de PAV:                                       | 1+195.34                    | Elevación:                   | 1,953.506m  |
|     | P.K. de VAV:                                       | 1+270.34                    | Elevación:                   | 1,954.331m  |
|     | P.K. de PTV:                                       | 1+345.34                    | Elevación:                   | 1,953.885m  |
|     | Punto alto:                                        | 1+292.68                    | Elevación:                   | 1,954.042m  |
|     | Inclinación de rasante T.E.:                       | 1.10%                       | Inclinación de rasante T.S.: | -0.59%      |
|     | Cambiar:                                           | 1.69%                       | K:                           | 88.49655827 |
|     | Longitud de curva:                                 | 150.000m                    |                              |             |
|     | Distancia de adelantamiento:                       | 987.318m                    | Distancia de parada:         | 467.084m    |
| 4   | 1+560.36                                           | 2.91%                       | 150.000m                     |             |
|     | Información de acuerdo vertical: (acuerdo cóncavo) |                             |                              |             |

|   |                                                    |          |                              |             |
|---|----------------------------------------------------|----------|------------------------------|-------------|
|   | P.K. de PAV:                                       | 1+485.36 | Elevación:                   | 1,953.052m  |
|   | P.K. de VAV:                                       | 1+560.36 | Elevación:                   | 1,952.606m  |
|   | P.K. de PTV:                                       | 1+635.36 | Elevación:                   | 1,954.789m  |
|   | Punto bajo:                                        | 1+510.81 | Elevación:                   | 1,952.976m  |
|   | Inclinación de rasante T.E.:                       | -0.59%   | Inclinación de rasante T.S.: | 2.91%       |
|   | Cambiar:                                           | 3.51%    | K:                           | 42.77546539 |
|   | Longitud de curva:                                 | 150.000m |                              |             |
|   | Distancia de iluminación:                          | 262.893m |                              |             |
| 5 | 2+259.75                                           | -2.00%   | 150.000m                     |             |
|   | Información de acuerdo vertical: (acuerdo convexo) |          |                              |             |
|   | P.K. de PAV:                                       | 2+184.75 | Elevación:                   | 1,970.786m  |
|   | P.K. de VAV:                                       | 2+259.75 | Elevación:                   | 1,972.970m  |
|   | P.K. de PTV:                                       | 2+334.75 | Elevación:                   | 1,971.470m  |
|   | Punto alto:                                        | 2+273.67 | Elevación:                   | 1,972.081m  |
|   | Inclinación de rasante T.E.:                       | 2.91%    | Inclinación de rasante T.S.: | -2.00%      |
|   | Cambiar:                                           | 4.91%    | K:                           | 30.53931271 |
|   | Longitud de curva:                                 | 150.000m |                              |             |
|   | Distancia de adelantamiento:                       | 389.832m | Distancia de parada:         | 210.304m    |
| 6 | 2+721.47                                           | 5.02%    | 150.000m                     |             |
|   | Información de acuerdo vertical: (acuerdo cóncavo) |          |                              |             |
|   | P.K. de PAV:                                       | 2+646.47 | Elevación:                   | 1,965.235m  |
|   | P.K. de VAV:                                       | 2+721.47 | Elevación:                   | 1,963.735m  |
|   | P.K. de PTV:                                       | 2+796.47 | Elevación:                   | 1,967.503m  |
|   | Punto bajo:                                        | 2+689.18 | Elevación:                   | 1,964.808m  |
|   | Inclinación de rasante T.E.:                       | -2.00%   | Inclinación de rasante T.S.: | 5.02%       |
|   | Cambiar:                                           | 7.02%    | K:                           | 21.35665652 |
|   | Longitud de curva:                                 | 150.000m |                              |             |
|   | Distancia de iluminación:                          | 136.939m |                              |             |
| 7 | 2+967.41                                           | -5.81%   | 150.000m                     |             |
|   | Información de acuerdo vertical: (acuerdo convexo) |          |                              |             |
|   | P.K. de PAV:                                       | 2+892.41 | Elevación:                   | 1,972.322m  |
|   | P.K. de VAV:                                       | 2+967.41 | Elevación:                   | 1,976.090m  |
|   | P.K. de PTV:                                       | 3+042.41 | Elevación:                   | 1,971.732m  |
|   | Punto alto:                                        | 2+961.96 | Elevación:                   | 1,974.069m  |
|   | Inclinación de rasante T.E.:                       | 5.02%    | Inclinación de rasante T.S.: | -5.81%      |
|   | Cambiar:                                           | 10.83%   | K:                           | 13.84497608 |
|   | Longitud de curva:                                 | 150.000m |                              |             |
|   | Distancia de adelantamiento:                       | 217.729m | Distancia de parada:         | 135.654m    |

|                                                    |                              |          |                              |             |
|----------------------------------------------------|------------------------------|----------|------------------------------|-------------|
| 8                                                  | 3+430.00                     | 1.39%    | 150.000m                     |             |
| Información de acuerdo vertical: (acuerdo cóncavo) |                              |          |                              |             |
|                                                    | P.K. de PAV:                 | 3+355.00 | Elevación:                   | 1,953.568m  |
|                                                    | P.K. de VAV:                 | 3+430.00 | Elevación:                   | 1,949.210m  |
|                                                    | P.K. de PTV:                 | 3+505.00 | Elevación:                   | 1,950.250m  |
|                                                    | Punto bajo:                  | 3+476.10 | Elevación:                   | 1,950.050m  |
|                                                    | Inclinación de rasante T.E.: | -5.81%   | Inclinación de rasante T.S.: | 1.39%       |
|                                                    | Cambiar:                     | 7.20%    | K:                           | 20.84136774 |
|                                                    | Longitud de curva:           | 150.000m |                              |             |
|                                                    | Distancia de iluminación:    | 134.664m |                              |             |
| 9                                                  | 3+847.10                     | -3.85%   | 150.000m                     |             |
| Información de acuerdo vertical: (acuerdo convexo) |                              |          |                              |             |
|                                                    | P.K. de PAV:                 | 3+772.10 | Elevación:                   | 1,953.954m  |
|                                                    | P.K. de VAV:                 | 3+847.10 | Elevación:                   | 1,954.993m  |
|                                                    | P.K. de PTV:                 | 3+922.10 | Elevación:                   | 1,952.103m  |
|                                                    | Punto alto:                  | 3+811.79 | Elevación:                   | 1,954.229m  |
|                                                    | Inclinación de rasante T.E.: | 1.39%    | Inclinación de rasante T.S.: | -3.85%      |
|                                                    | Cambiar:                     | 5.24%    | K:                           | 28.62057806 |
|                                                    | Longitud de curva:           | 150.000m |                              |             |
|                                                    | Distancia de adelantamiento: | 370.052m | Distancia de parada:         | 201.803m    |
| 10                                                 | 4+378.16                     | 1.73%    | 150.000m                     |             |
| Información de acuerdo vertical: (acuerdo cóncavo) |                              |          |                              |             |
|                                                    | P.K. de PAV:                 | 4+303.16 | Elevación:                   | 1,937.415m  |
|                                                    | P.K. de VAV:                 | 4+378.16 | Elevación:                   | 1,934.524m  |
|                                                    | P.K. de PTV:                 | 4+453.16 | Elevación:                   | 1,935.824m  |
|                                                    | Punto bajo:                  | 4+406.64 | Elevación:                   | 1,935.421m  |
|                                                    | Inclinación de rasante T.E.: | -3.85%   | Inclinación de rasante T.S.: | 1.73%       |
|                                                    | Cambiar:                     | 5.59%    | K:                           | 26.84481639 |
|                                                    | Longitud de curva:           | 150.000m |                              |             |
|                                                    | Distancia de iluminación:    | 161.127m |                              |             |
| 11                                                 | 5+580.74                     | -1.03%   | 150.000m                     |             |
| Información de acuerdo vertical: (acuerdo convexo) |                              |          |                              |             |
|                                                    | P.K. de PAV:                 | 5+505.74 | Elevación:                   | 1,954.067m  |
|                                                    | P.K. de VAV:                 | 5+580.74 | Elevación:                   | 1,955.367m  |
|                                                    | P.K. de PTV:                 | 5+655.74 | Elevación:                   | 1,954.593m  |
|                                                    | Punto alto:                  | 5+599.75 | Elevación:                   | 1,954.882m  |
|                                                    | Inclinación de rasante T.E.: | 1.73%    | Inclinación de rasante T.S.: | -1.03%      |
|                                                    | Cambiar:                     | 2.77%    | K:                           | 54.24095425 |

|                                                    |                                                                                                       |            |                              |             |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------|------------|------------------------------|-------------|
|                                                    | Longitud de curva: 150.000m<br>Distancia de adelantamiento: 634.174m    Distancia de parada: 315.315m |            |                              |             |
| 12                                                 | 5+911.55                                                                                              | -2.15%     | 150.000m                     |             |
| Información de acuerdo vertical: (acuerdo convexo) |                                                                                                       |            |                              |             |
|                                                    | P.K. de PAV:                                                                                          | 5+836.55   | Elevación:                   | 1,952.727m  |
|                                                    | P.K. de VAV:                                                                                          | 5+911.55   | Elevación:                   | 1,951.953m  |
|                                                    | P.K. de PTV:                                                                                          | 5+986.55   | Elevación:                   | 1,950.340m  |
|                                                    | Punto alto:                                                                                           | 5+836.55   | Elevación:                   | 1,952.727m  |
|                                                    | Inclinación de rasante T.E.:                                                                          | -1.03%     | Inclinación de rasante T.S.: | -2.15%      |
|                                                    | Cambiar:                                                                                              | 1.12%      | K:                           | 134.2222842 |
|                                                    | Longitud de curva:                                                                                    | 150.000m   |                              |             |
|                                                    | Distancia de adelantamiento:                                                                          | 1,458.709m | Distancia de parada:         | 669.672m    |

# Informe de volumen

| P.K.     | Área de desmonte (m2) | Vol de desmonte (m3) | Vol reutilizable (m3) | Área de terraplén (m2) | Vol de terraplén (m3) |
|----------|-----------------------|----------------------|-----------------------|------------------------|-----------------------|
| 0+000.00 | 0                     | 0                    | 0                     | 0                      | 0                     |
| 0+020.00 | 8.2                   | 82                   | 82                    | 0.15                   | 1.46                  |
| 0+040.00 | 10.79                 | 189.9                | 189.9                 | 0                      | 1.46                  |
| 0+050.00 | 9.23                  | 99.47                | 99.47                 | 0                      | 0                     |
| 0+060.00 | 8.52                  | 87.35                | 87.35                 | 0.15                   | 0.74                  |
| 0+070.00 | 4.38                  | 63.36                | 63.36                 | 0.05                   | 0.99                  |
| 0+080.00 | 4.3                   | 42.51                | 42.51                 | 1.14                   | 6.02                  |
| 0+100.00 | 3.61                  | 78.68                | 78.68                 | 1.81                   | 29.57                 |
| 0+120.00 | 6.35                  | 99.62                | 99.62                 | 0                      | 18.11                 |
| 0+140.00 | 3.06                  | 94.07                | 94.07                 | 0.19                   | 1.89                  |
| 0+150.00 | 3.41                  | 31.82                | 31.82                 | 2.35                   | 12.73                 |
| 0+160.00 | 2.82                  | 30.49                | 30.49                 | 1.31                   | 18.35                 |
| 0+170.00 | 2.39                  | 25.46                | 25.46                 | 1.42                   | 13.69                 |
| 0+180.00 | 0.01                  | 11.73                | 11.73                 | 2.19                   | 18.16                 |
| 0+200.00 | 0                     | 0.1                  | 0.1                   | 3.35                   | 55.43                 |
| 0+220.00 | 0                     | 0                    | 0                     | 1.1                    | 44.46                 |
| 0+240.00 | 0                     | 0                    | 0                     | 3.94                   | 50.36                 |
| 0+260.00 | 0                     | 0                    | 0                     | 5.09                   | 90.27                 |
| 0+280.00 | 0                     | 0                    | 0                     | 3.03                   | 81.24                 |
| 0+300.00 | 1.43                  | 14.33                | 14.33                 | 0.17                   | 32.01                 |
| 0+320.00 | 4.17                  | 56.06                | 56.06                 | 2.8                    | 29.72                 |
| 0+340.00 | 6.33                  | 105                  | 105                   | 1.57                   | 43.73                 |
| 0+350.00 | 8.73                  | 71.51                | 71.51                 | 1.36                   | 15.38                 |
| 0+360.00 | 6.56                  | 72.16                | 72.16                 | 3.18                   | 23.5                  |
| 0+370.00 | 6.45                  | 61.5                 | 61.5                  | 3.19                   | 32.68                 |
| 0+380.00 | 3.95                  | 52                   | 52                    | 1.4                    | 22.97                 |
| 0+400.00 | 8.67                  | 126.2                | 126.2                 | 0.95                   | 23.46                 |
| 0+410.00 | 9.52                  | 85.03                | 85.03                 | 3.61                   | 23.58                 |
| 0+420.00 | 9.11                  | 82.69                | 82.69                 | 3.06                   | 35.55                 |
| 0+440.00 | 12.33                 | 208.25               | 208.25                | 0.07                   | 32.07                 |
| 0+460.00 | 5.75                  | 186.19               | 186.19                | 0.5                    | 5.49                  |
| 0+480.00 | 5.92                  | 119.71               | 119.71                | 0.87                   | 13.65                 |
| 0+490.00 | 4.66                  | 52.9                 | 52.9                  | 2.42                   | 16.44                 |
| 0+500.00 | 2.43                  | 37.51                | 37.51                 | 2.64                   | 25.2                  |
| 0+510.00 | 5.21                  | 40.35                | 40.35                 | 2.84                   | 26.72                 |
| 0+520.00 | 3.66                  | 46.77                | 46.77                 | 1.94                   | 22.84                 |
| 0+540.00 | 0.02                  | 36.8                 | 36.8                  | 1.99                   | 39.27                 |
| 0+560.00 | 3.74                  | 37.53                | 37.53                 | 0.32                   | 23.05                 |

|          |      |       |       |      |       |
|----------|------|-------|-------|------|-------|
| 0+580.00 | 3    | 67.42 | 67.42 | 2.38 | 26.97 |
| 0+600.00 | 4.04 | 70.4  | 70.4  | 0    | 23.8  |
| 0+620.00 | 0.45 | 44.86 | 44.86 | 2.27 | 22.72 |
| 0+630.00 | 4.67 | 25.62 | 25.62 | 0.02 | 11.3  |
| 0+640.00 | 7.7  | 62.18 | 62.18 | 0    | 0.11  |
| 0+650.00 | 5.19 | 64.62 | 64.62 | 0.32 | 1.66  |
| 0+660.00 | 5.28 | 52.52 | 52.52 | 0.54 | 4.44  |
| 0+670.00 | 4.56 | 49.67 | 49.67 | 0.11 | 3.33  |
| 0+680.00 | 1.31 | 29.36 | 29.36 | 0.21 | 1.57  |
| 0+700.00 | 0.01 | 13.23 | 13.23 | 0.73 | 9.35  |
| 0+710.00 | 1.26 | 6.25  | 6.25  | 2.62 | 16.84 |
| 0+720.00 | 2.94 | 19.83 | 19.83 | 3.15 | 29.91 |
| 0+730.00 | 1.14 | 19.3  | 19.3  | 6.77 | 52.16 |
| 0+740.00 | 0.8  | 9.72  | 9.72  | 0.96 | 38.63 |
| 0+760.00 | 0    | 8.07  | 8.07  | 1.75 | 27.09 |
| 0+780.00 | 0.96 | 9.67  | 9.67  | 0.67 | 24.2  |
| 0+800.00 | 0.36 | 13.27 | 13.27 | 0.06 | 7.34  |
| 0+810.00 | 2.09 | 12.17 | 12.17 | 1.15 | 6.08  |
| 0+820.00 | 3.69 | 28.39 | 28.39 | 4.64 | 29.46 |
| 0+830.00 | 1.47 | 25.3  | 25.3  | 4.19 | 45.06 |
| 0+840.00 | 1.19 | 13.3  | 13.3  | 0.69 | 24.42 |
| 0+860.00 | 5.97 | 71.66 | 71.66 | 1.87 | 25.58 |
| 0+880.00 | 2.27 | 82.45 | 82.45 | 1.19 | 30.62 |
| 0+900.00 | 0.05 | 23.21 | 23.21 | 1.01 | 22.07 |
| 0+920.00 | 0    | 0.49  | 0.49  | 4.82 | 58.37 |
| 0+940.00 | 3.26 | 32.19 | 32.19 | 0.98 | 58.32 |
| 0+950.00 | 5.24 | 41.06 | 41.06 | 1.41 | 12.19 |
| 0+960.00 | 2.49 | 37.28 | 37.28 | 1.78 | 16.15 |
| 0+970.00 | 4.65 | 34.71 | 34.71 | 0.3  | 10.48 |
| 0+980.00 | 1.71 | 31.33 | 31.33 | 0.34 | 3.23  |
| 1+000.00 | 0.71 | 24.2  | 24.2  | 0.44 | 7.86  |
| 1+020.00 | 0    | 7.15  | 7.15  | 1.23 | 16.75 |
| 1+040.00 | 0    | 0.04  | 0.04  | 1.89 | 31.21 |
| 1+060.00 | 3.1  | 31.03 | 31.03 | 0    | 18.89 |
| 1+080.00 | 1.29 | 43.92 | 43.92 | 1.65 | 16.5  |
| 1+090.00 | 0.01 | 6.65  | 6.65  | 4.08 | 28.56 |
| 1+100.00 | 0.02 | 0.15  | 0.15  | 2.07 | 30.73 |
| 1+120.00 | 0    | 0.16  | 0.16  | 3.45 | 55.19 |
| 1+140.00 | 0.1  | 0.96  | 0.96  | 0.45 | 39    |
| 1+160.00 | 1.01 | 11.06 | 11.06 | 0.27 | 7.23  |
| 1+180.00 | 0    | 10.1  | 10.1  | 3.06 | 33.34 |
| 1+190.00 | 0.14 | 0.68  | 0.68  | 1.12 | 20.92 |
| 1+200.00 | 2.18 | 12.21 | 12.21 | 4.47 | 28.13 |
| 1+210.00 | 0    | 11.56 | 11.56 | 4.37 | 44.48 |

|          |      |        |        |      |       |
|----------|------|--------|--------|------|-------|
| 1+220.00 | 0    | 0.01   | 0.01   | 3.07 | 37.29 |
| 1+230.00 | 0.96 | 4.77   | 4.77   | 1.19 | 21.29 |
| 1+240.00 | 2.19 | 15.9   | 15.9   | 1.66 | 14.13 |
| 1+250.00 | 1.39 | 18.03  | 18.03  | 0.75 | 11.88 |
| 1+260.00 | 1.93 | 16.64  | 16.64  | 0.01 | 3.78  |
| 1+280.00 | 1    | 29.33  | 29.33  | 0.25 | 2.63  |
| 1+300.00 | 0    | 9.99   | 9.99   | 1.59 | 18.43 |
| 1+320.00 | 2.05 | 20.52  | 20.52  | 0.67 | 22.6  |
| 1+340.00 | 1.67 | 37.22  | 37.22  | 0.07 | 7.41  |
| 1+360.00 | 0.01 | 16.77  | 16.77  | 1.21 | 12.81 |
| 1+370.00 | 2.35 | 11.58  | 11.58  | 0.65 | 9.38  |
| 1+380.00 | 5.09 | 35.17  | 35.17  | 2.77 | 18.18 |
| 1+390.00 | 3.25 | 39.24  | 39.24  | 3.32 | 32.23 |
| 1+400.00 | 1.69 | 24.05  | 24.05  | 0.56 | 20.16 |
| 1+420.00 | 2.31 | 40     | 40     | 0.05 | 6.11  |
| 1+440.00 | 8.86 | 111.7  | 111.7  | 0    | 0.53  |
| 1+460.00 | 9.5  | 183.66 | 183.66 | 0    | 0     |
| 1+480.00 | 4.19 | 136.92 | 136.92 | 0    | 0     |
| 1+490.00 | 7.06 | 56.17  | 56.17  | 0    | 0     |
| 1+500.00 | 5.26 | 60.52  | 60.52  | 0.01 | 0.04  |
| 1+520.00 | 5.96 | 111.16 | 111.16 | 0    | 0.07  |
| 1+540.00 | 3.53 | 94.86  | 94.86  | 0    | 0     |
| 1+560.00 | 0.04 | 35.72  | 35.72  | 0.42 | 4.24  |
| 1+580.00 | 4.41 | 44.65  | 44.65  | 2.79 | 32.17 |
| 1+590.00 | 5.46 | 52.05  | 52.05  | 3.36 | 31.18 |
| 1+600.00 | 4.04 | 48.88  | 48.88  | 0.06 | 17.26 |
| 1+620.00 | 0.84 | 48.8   | 48.8   | 0.02 | 0.87  |
| 1+640.00 | 3.39 | 42.31  | 42.31  | 1.36 | 13.81 |
| 1+660.00 | 2.65 | 60.38  | 60.38  | 0    | 13.57 |
| 1+680.00 | 2.13 | 47.73  | 47.73  | 0    | 0     |
| 1+700.00 | 0.93 | 30.55  | 30.55  | 0.51 | 5.13  |
| 1+720.00 | 1.97 | 29.01  | 29.01  | 0.57 | 10.84 |
| 1+740.00 | 4.7  | 66.73  | 66.73  | 0    | 5.7   |
| 1+760.00 | 2.33 | 70.34  | 70.34  | 0.12 | 1.2   |
| 1+780.00 | 1.43 | 37.64  | 37.64  | 0.14 | 2.57  |
| 1+790.00 | 3.92 | 27.53  | 27.53  | 1.35 | 7.19  |
| 1+800.00 | 2.49 | 32.61  | 32.61  | 0.13 | 7.13  |
| 1+810.00 | 6.7  | 45.68  | 45.68  | 0    | 0.66  |
| 1+820.00 | 6.53 | 67.12  | 67.12  | 0.26 | 1.36  |
| 1+840.00 | 5.19 | 118.78 | 118.78 | 0    | 2.67  |
| 1+860.00 | 4.16 | 93.51  | 93.51  | 0    | 0     |
| 1+880.00 | 0.24 | 44.01  | 44.01  | 0.15 | 1.46  |
| 1+900.00 | 1.68 | 19.14  | 19.14  | 2.71 | 28.77 |
| 1+910.00 | 2.69 | 21.41  | 21.41  | 8.67 | 58.05 |

|          |      |        |        |       |        |
|----------|------|--------|--------|-------|--------|
| 1+920.00 | 3.05 | 28.11  | 28.11  | 12.06 | 105.77 |
| 1+940.00 | 3.49 | 65.35  | 65.35  | 2.14  | 142.02 |
| 1+960.00 | 6.47 | 97.54  | 97.54  | 0.56  | 27.38  |
| 1+980.00 | 4.22 | 104.27 | 104.27 | 0.24  | 8.12   |
| 2+000.00 | 2.61 | 68.27  | 68.27  | 0.49  | 7.33   |
| 2+020.00 | 3.33 | 59.44  | 59.44  | 0.86  | 13.55  |
| 2+040.00 | 2.35 | 56.84  | 56.84  | 0.57  | 14.35  |
| 2+060.00 | 3.02 | 53.74  | 53.74  | 0.06  | 6.32   |
| 2+080.00 | 0.98 | 40.06  | 40.06  | 7.06  | 71.14  |
| 2+100.00 | 5.18 | 61.63  | 61.63  | 0     | 70.55  |
| 2+110.00 | 3.53 | 43.53  | 43.53  | 0.09  | 0.43   |
| 2+120.00 | 3.79 | 35.76  | 35.76  | 3.48  | 18.44  |
| 2+130.00 | 2.94 | 32.52  | 32.52  | 7.6   | 57.55  |
| 2+140.00 | 2.69 | 27.89  | 27.89  | 4.7   | 62.44  |
| 2+160.00 | 4.17 | 68.66  | 68.66  | 1.05  | 57.49  |
| 2+180.00 | 8.18 | 123.5  | 123.5  | 0.01  | 10.6   |
| 2+200.00 | 4.74 | 129.14 | 129.14 | 0.03  | 0.39   |
| 2+210.00 | 5.98 | 53.21  | 53.21  | 0.26  | 1.48   |
| 2+220.00 | 8.19 | 69.08  | 69.08  | 0.86  | 5.96   |
| 2+230.00 | 4.64 | 62.28  | 62.28  | 5.04  | 31.72  |
| 2+240.00 | 6.96 | 56.06  | 56.06  | 3.81  | 47.52  |
| 2+260.00 | 8.21 | 151.42 | 151.42 | 0     | 38.39  |
| 2+280.00 | 9.77 | 179.82 | 179.82 | 0     | 0      |
| 2+300.00 | 7.52 | 172.94 | 172.94 | 0.02  | 0.24   |
| 2+320.00 | 1.29 | 88.15  | 88.15  | 2.52  | 25.41  |
| 2+340.00 | 1.56 | 28.54  | 28.54  | 0.95  | 34.71  |
| 2+360.00 | 2.38 | 39.41  | 39.41  | 0.6   | 15.56  |
| 2+380.00 | 0.81 | 31.85  | 31.85  | 0     | 6.02   |
| 2+400.00 | 2.41 | 32.16  | 32.16  | 0.06  | 0.59   |
| 2+420.00 | 5.33 | 78.2   | 78.2   | 0.8   | 8.32   |
| 2+440.00 | 3.23 | 85.14  | 85.14  | 0.43  | 12.15  |
| 2+460.00 | 1.79 | 50.05  | 50.05  | 0     | 4.35   |
| 2+480.00 | 2.34 | 41.3   | 41.3   | 0     | 0      |
| 2+500.00 | 4.01 | 63.49  | 63.49  | 0.59  | 5.87   |
| 2+520.00 | 3.5  | 75.17  | 75.17  | 0.3   | 8.83   |
| 2+540.00 | 4    | 75     | 75     | 0.87  | 11.63  |
| 2+560.00 | 3.81 | 78.1   | 78.1   | 0     | 8.68   |
| 2+580.00 | 0.07 | 38.8   | 38.8   | 5.46  | 54.6   |
| 2+600.00 | 0.02 | 0.82   | 0.82   | 3.8   | 92.65  |
| 2+620.00 | 0    | 0.15   | 0.15   | 2.99  | 67.95  |
| 2+640.00 | 0.16 | 1.63   | 1.63   | 1.16  | 41.52  |
| 2+660.00 | 1.36 | 15.27  | 15.27  | 0.07  | 12.33  |
| 2+680.00 | 3.35 | 47.18  | 47.18  | 2.69  | 27.61  |
| 2+700.00 | 1.46 | 48.14  | 48.14  | 1.39  | 40.81  |

|          |       |        |        |       |        |
|----------|-------|--------|--------|-------|--------|
| 2+720.00 | 0     | 14.61  | 14.61  | 4.86  | 62.53  |
| 2+740.00 | 0.05  | 0.47   | 0.47   | 5.75  | 106.11 |
| 2+750.00 | 0.03  | 0.37   | 0.37   | 11.76 | 90.92  |
| 2+760.00 | 1.22  | 5.89   | 5.89   | 7.02  | 100.31 |
| 2+780.00 | 0.06  | 12.52  | 12.52  | 1.92  | 91.49  |
| 2+800.00 | 10.19 | 102.53 | 102.53 | 1.32  | 32.35  |
| 2+810.00 | 8.75  | 90.63  | 90.63  | 2.45  | 19.96  |
| 2+820.00 | 9.91  | 91.83  | 91.83  | 0.22  | 13.69  |
| 2+840.00 | 3.42  | 133.29 | 133.29 | 0.05  | 2.71   |
| 2+860.00 | 11.22 | 146.66 | 146.66 | 0     | 0.52   |
| 2+870.00 | 14.81 | 132.51 | 132.51 | 0     | 0      |
| 2+880.00 | 14.85 | 148.57 | 148.57 | 0     | 0      |
| 2+890.00 | 19.7  | 172.46 | 172.46 | 0     | 0      |
| 2+900.00 | 15.72 | 177.91 | 177.91 | 0     | 0      |
| 2+920.00 | 10.54 | 262.73 | 262.73 | 0     | 0      |
| 2+940.00 | 9.89  | 204.3  | 204.3  | 0     | 0      |
| 2+960.00 | 11.43 | 213.14 | 213.14 | 0     | 0      |
| 2+970.00 | 19.63 | 155.26 | 155.26 | 0     | 0      |
| 2+980.00 | 23.73 | 219.91 | 219.91 | 0     | 0      |
| 2+990.00 | 21.31 | 229.48 | 229.48 | 3.96  | 18.23  |
| 3+000.00 | 18.01 | 199.56 | 199.56 | 0     | 18.23  |
| 3+010.00 | 17.88 | 181.24 | 181.24 | 0     | 0      |
| 3+020.00 | 13.51 | 156.93 | 156.93 | 0     | 0      |
| 3+040.00 | 6.06  | 195.7  | 195.7  | 0     | 0      |
| 3+060.00 | 6.93  | 128.11 | 128.11 | 0     | 0.01   |
| 3+070.00 | 6.88  | 62.35  | 62.35  | 1.7   | 9.31   |
| 3+080.00 | 5.19  | 54.5   | 54.5   | 1.11  | 15.44  |
| 3+090.00 | 6.58  | 54.06  | 54.06  | 1.01  | 11.66  |
| 3+100.00 | 7.86  | 66.86  | 66.86  | 2.06  | 16.83  |
| 3+110.00 | 6.57  | 67.42  | 67.42  | 0.53  | 14.22  |
| 3+120.00 | 6.72  | 64.96  | 64.96  | 0.14  | 3.49   |
| 3+140.00 | 9.24  | 159.61 | 159.61 | 0     | 1.37   |
| 3+160.00 | 3.63  | 128.61 | 128.61 | 0     | 0      |
| 3+180.00 | 5.09  | 87.16  | 87.16  | 0     | 0      |
| 3+200.00 | 0.01  | 51.31  | 51.31  | 1.4   | 13.89  |
| 3+210.00 | 2.36  | 13.26  | 13.26  | 1.56  | 14.19  |
| 3+220.00 | 0.21  | 14.17  | 14.17  | 1.68  | 16.34  |
| 3+230.00 | 13.4  | 70.69  | 70.69  | 0.02  | 8.95   |
| 3+240.00 | 9.62  | 120.17 | 120.17 | 0     | 0.11   |
| 3+260.00 | 3.26  | 129.78 | 129.78 | 0     | 0      |
| 3+280.00 | 3.53  | 67.92  | 67.92  | 0     | 0      |
| 3+290.00 | 0.13  | 18.07  | 18.07  | 2.24  | 11.61  |
| 3+300.00 | 3.22  | 15.18  | 15.18  | 3.49  | 30.77  |
| 3+320.00 | 0     | 31.04  | 31.04  | 1.54  | 51.8   |

|          |      |        |        |      |        |
|----------|------|--------|--------|------|--------|
| 3+340.00 | 0.55 | 5.54   | 5.54   | 0.03 | 15.61  |
| 3+360.00 | 0    | 5.51   | 5.51   | 3.69 | 37.19  |
| 3+380.00 | 0    | 0      | 0      | 5.42 | 91.16  |
| 3+400.00 | 0    | 0      | 0      | 9.45 | 148.75 |
| 3+420.00 | 0    | 0.03   | 0.03   | 8.96 | 184.13 |
| 3+440.00 | 0.01 | 0.16   | 0.16   | 4.64 | 135.99 |
| 3+460.00 | 0    | 0.13   | 0.13   | 4.94 | 95.75  |
| 3+480.00 | 0    | 0.01   | 0.01   | 4.95 | 98.9   |
| 3+500.00 | 0.7  | 6.95   | 6.95   | 1.27 | 62.28  |
| 3+520.00 | 0    | 6.95   | 6.95   | 3.77 | 50.44  |
| 3+540.00 | 0    | 0      | 0      | 3.09 | 68.63  |
| 3+560.00 | 0    | 0      | 0      | 2.21 | 53.05  |
| 3+570.00 | 0.15 | 0.75   | 0.75   | 1.6  | 18.93  |
| 3+580.00 | 0.03 | 0.91   | 0.91   | 0.54 | 10.62  |
| 3+590.00 | 2.23 | 11.14  | 11.14  | 0.15 | 3.49   |
| 3+600.00 | 0.81 | 14.92  | 14.92  | 1.26 | 7.14   |
| 3+620.00 | 0.22 | 10.23  | 10.23  | 0.32 | 15.82  |
| 3+640.00 | 0.01 | 2.23   | 2.23   | 8.34 | 86.69  |
| 3+660.00 | 2.06 | 20.69  | 20.69  | 0.02 | 83.64  |
| 3+680.00 | 0.02 | 20.79  | 20.79  | 1.65 | 16.71  |
| 3+700.00 | 4.64 | 46.54  | 46.54  | 0    | 16.51  |
| 3+720.00 | 1.93 | 65.67  | 65.67  | 0.01 | 0.09   |
| 3+740.00 | 1.74 | 36.65  | 36.65  | 0.02 | 0.26   |
| 3+760.00 | 1.08 | 28.17  | 28.17  | 0    | 0.17   |
| 3+780.00 | 0    | 10.8   | 10.8   | 1.5  | 14.95  |
| 3+800.00 | 1.6  | 15.71  | 15.71  | 1.68 | 31.95  |
| 3+810.00 | 2.3  | 18.6   | 18.6   | 0.69 | 12.24  |
| 3+820.00 | 1.47 | 18     | 18     | 0.73 | 7.33   |
| 3+830.00 | 3.19 | 22.72  | 22.72  | 0    | 3.74   |
| 3+840.00 | 4.56 | 38.31  | 38.31  | 0    | 0      |
| 3+860.00 | 3.69 | 82.49  | 82.49  | 0    | 0      |
| 3+870.00 | 6.8  | 52.41  | 52.41  | 0    | 0      |
| 3+880.00 | 4.4  | 55.62  | 55.62  | 0    | 0      |
| 3+890.00 | 6.82 | 52.82  | 52.82  | 0.15 | 0.85   |
| 3+900.00 | 6.73 | 62.99  | 62.99  | 0.36 | 2.82   |
| 3+910.00 | 4.93 | 54.07  | 54.07  | 0.28 | 3.52   |
| 3+920.00 | 7.28 | 56.87  | 56.87  | 0.37 | 3.53   |
| 3+940.00 | 2.52 | 96.06  | 96.06  | 0    | 3.77   |
| 3+960.00 | 0.78 | 32.98  | 32.98  | 3.69 | 36.92  |
| 3+980.00 | 2.27 | 30.44  | 30.44  | 8.62 | 123.08 |
| 4+000.00 | 4.61 | 68.73  | 68.73  | 0.67 | 92.86  |
| 4+020.00 | 7.72 | 123.29 | 123.29 | 0    | 6.71   |
| 4+040.00 | 4.4  | 120.02 | 120.02 | 0.48 | 4.87   |
| 4+050.00 | 5.49 | 46.49  | 46.49  | 0    | 2.55   |

|          |       |        |        |       |        |
|----------|-------|--------|--------|-------|--------|
| 4+060.00 | 7.4   | 64.76  | 64.76  | 0     | 0      |
| 4+070.00 | 8.77  | 82.66  | 82.66  | 0     | 0      |
| 4+080.00 | 9.68  | 93.46  | 93.46  | 0     | 0      |
| 4+090.00 | 8.82  | 90.67  | 90.67  | 0     | 0      |
| 4+100.00 | 6.78  | 74.49  | 74.49  | 0     | 0      |
| 4+120.00 | 3.8   | 100.91 | 100.91 | 2.66  | 28.7   |
| 4+130.00 | 3.51  | 35.06  | 35.06  | 1.93  | 24.25  |
| 4+140.00 | 4.75  | 38.3   | 38.3   | 0     | 10.64  |
| 4+160.00 | 6.32  | 109.83 | 109.83 | 0.01  | 0.13   |
| 4+170.00 | 7.12  | 67.16  | 67.16  | 0     | 0.07   |
| 4+180.00 | 10.76 | 91.64  | 91.64  | 0.05  | 0.29   |
| 4+190.00 | 6.03  | 83.87  | 83.87  | 0     | 0.29   |
| 4+200.00 | 5.25  | 53.48  | 53.48  | 0.69  | 3.75   |
| 4+210.00 | 0.53  | 27.01  | 27.01  | 0.08  | 4.13   |
| 4+220.00 | 0     | 2.53   | 2.53   | 10.32 | 50.14  |
| 4+230.00 | 0     | 0      | 0      | 8.15  | 88.45  |
| 4+240.00 | 0.64  | 3.18   | 3.18   | 2.48  | 50.52  |
| 4+260.00 | 0.82  | 14.47  | 14.47  | 0.05  | 24.47  |
| 4+280.00 | 7.86  | 86.83  | 86.83  | 0.04  | 0.84   |
| 4+290.00 | 8.91  | 80.3   | 80.3   | 0.52  | 2.88   |
| 4+300.00 | 5.71  | 65.13  | 65.13  | 0.87  | 7.46   |
| 4+320.00 | 0.27  | 58.88  | 58.88  | 0.03  | 9.04   |
| 4+330.00 | 3.92  | 20.94  | 20.94  | 0.76  | 3.96   |
| 4+340.00 | 1.88  | 29     | 29     | 0.55  | 6.8    |
| 4+350.00 | 2.37  | 19.24  | 19.24  | 0.94  | 7.97   |
| 4+360.00 | 6.38  | 44.02  | 44.02  | 0.75  | 8.92   |
| 4+380.00 | 10.55 | 170.23 | 170.23 | 0     | 7.49   |
| 4+390.00 | 7.66  | 87.49  | 87.49  | 0.78  | 4      |
| 4+400.00 | 6.19  | 61.76  | 61.76  | 0.98  | 9.42   |
| 4+420.00 | 9.55  | 155.05 | 155.05 | 0     | 9.92   |
| 4+430.00 | 11.51 | 105.29 | 105.29 | 0     | 0      |
| 4+440.00 | 10.37 | 114.78 | 114.78 | 0.09  | 0.49   |
| 4+460.00 | 8.81  | 197.46 | 197.46 | 0     | 0.96   |
| 4+480.00 | 11.73 | 205.36 | 205.36 | 0     | 0      |
| 4+500.00 | 13.76 | 254.87 | 254.87 | 0     | 0      |
| 4+520.00 | 12.87 | 266.34 | 266.34 | 0     | 0      |
| 4+540.00 | 9.03  | 219.06 | 219.06 | 0     | 0      |
| 4+550.00 | 9.83  | 94.31  | 94.31  | 0     | 0      |
| 4+560.00 | 0.36  | 50.3   | 50.3   | 0.04  | 0.2    |
| 4+570.00 | 3.21  | 16.69  | 16.69  | 2.95  | 16.85  |
| 4+580.00 | 2.85  | 27.96  | 27.96  | 2.03  | 28.35  |
| 4+600.00 | 12.48 | 157.27 | 157.27 | 0     | 23.41  |
| 4+620.00 | 4.89  | 176.67 | 176.67 | 25.47 | 297.29 |
| 4+640.00 | 5.36  | 100.46 | 100.46 | 0.07  | 268.97 |

|          |       |        |        |       |        |
|----------|-------|--------|--------|-------|--------|
| 4+650.00 | 3.74  | 45.47  | 45.47  | 0.02  | 0.45   |
| 4+660.00 | 4.42  | 40.78  | 40.78  | 0     | 0.1    |
| 4+680.00 | 2.29  | 67.16  | 67.16  | 0.89  | 8.85   |
| 4+700.00 | 9.4   | 117.5  | 117.5  | 0     | 8.16   |
| 4+720.00 | 3.01  | 128.71 | 128.71 | 0.69  | 5.46   |
| 4+740.00 | 4.42  | 87.8   | 87.8   | 4.9   | 41.98  |
| 4+760.00 | 5.53  | 111.27 | 111.27 | 0.79  | 44.4   |
| 4+780.00 | 10.9  | 164.31 | 164.31 | 0.41  | 11.98  |
| 4+800.00 | 11.82 | 224.96 | 224.96 | 0.31  | 7.36   |
| 4+820.00 | 3.49  | 140.16 | 140.16 | 10.25 | 129.54 |
| 4+840.00 | 1.04  | 41.17  | 41.17  | 3.14  | 162.81 |
| 4+850.00 | 2.44  | 16.9   | 16.9   | 0.88  | 21.97  |
| 4+860.00 | 4.13  | 32.86  | 32.86  | 0.18  | 5.34   |
| 4+870.00 | 4.95  | 45.4   | 45.4   | 0.25  | 2.15   |
| 4+880.00 | 8.36  | 66.55  | 66.55  | 0.13  | 1.88   |
| 4+900.00 | 8.9   | 172.61 | 172.61 | 0.07  | 1.99   |
| 4+920.00 | 10.84 | 197.41 | 197.41 | 0.15  | 2.21   |
| 4+930.00 | 5.69  | 82.66  | 82.66  | 3.08  | 16.16  |
| 4+940.00 | 6.73  | 62.1   | 62.1   | 6.51  | 47.95  |
| 4+950.00 | 5.88  | 63.02  | 63.02  | 18.68 | 125.95 |
| 4+960.00 | 7.66  | 67.68  | 67.68  | 0     | 93.38  |
| 4+970.00 | 6.16  | 69.08  | 69.08  | 0.22  | 1.09   |
| 4+980.00 | 7.34  | 67.5   | 67.5   | 1.03  | 6.22   |
| 5+000.00 | 5.55  | 128.99 | 128.99 | 2.35  | 33.73  |
| 5+020.00 | 5.52  | 110.77 | 110.77 | 9.98  | 123.31 |
| 5+040.00 | 8.26  | 134.26 | 134.26 | 13.96 | 255.34 |
| 5+060.00 | 4.67  | 127.8  | 127.8  | 4.22  | 187.83 |
| 5+080.00 | 5.17  | 98.35  | 98.35  | 21.09 | 253.12 |
| 5+100.00 | 6.28  | 114.42 | 114.42 | 0.09  | 211.87 |
| 5+120.00 | 10.83 | 167.47 | 167.47 | 0     | 0.98   |
| 5+140.00 | 9.75  | 196.4  | 196.4  | 0.03  | 0.33   |
| 5+160.00 | 12.07 | 212.42 | 212.42 | 0     | 0.33   |
| 5+180.00 | 6.21  | 182.81 | 182.81 | 0     | 0      |
| 5+200.00 | 7.77  | 139.76 | 139.76 | 0     | 0      |
| 5+220.00 | 5.39  | 131.55 | 131.55 | 0.01  | 0.06   |
| 5+240.00 | 6.16  | 115.52 | 115.52 | 0.02  | 0.25   |
| 5+260.00 | 8.82  | 149.78 | 149.78 | 0     | 0.19   |
| 5+280.00 | 9.47  | 182.81 | 182.81 | 0     | 0      |
| 5+300.00 | 8.51  | 179.73 | 179.73 | 0     | 0      |
| 5+320.00 | 5.02  | 135.29 | 135.29 | 0.18  | 1.84   |
| 5+340.00 | 5.06  | 100.8  | 100.8  | 0     | 1.86   |
| 5+360.00 | 9.32  | 143.81 | 143.81 | 0     | 0.01   |
| 5+380.00 | 10.77 | 200.91 | 200.91 | 0     | 0      |
| 5+400.00 | 6.44  | 172.13 | 172.13 | 0     | 0      |

|          |       |        |        |       |        |
|----------|-------|--------|--------|-------|--------|
| 5+420.00 | 8.15  | 145.96 | 145.96 | 0     | 0      |
| 5+440.00 | 9.67  | 178.22 | 178.22 | 0.48  | 4.81   |
| 5+460.00 | 8.32  | 179.9  | 179.9  | 3.04  | 35.2   |
| 5+480.00 | 7.76  | 160.84 | 160.84 | 0     | 30.39  |
| 5+500.00 | 6.71  | 144.76 | 144.76 | 0     | 0      |
| 5+510.00 | 8.27  | 74.91  | 74.91  | 0     | 0      |
| 5+520.00 | 8.08  | 81.74  | 81.74  | 0     | 0      |
| 5+530.00 | 2.61  | 53.45  | 53.45  | 0.06  | 0.31   |
| 5+540.00 | 2.97  | 27.9   | 27.9   | 0.01  | 0.33   |
| 5+550.00 | 4.03  | 34.99  | 34.99  | 0     | 0.03   |
| 5+560.00 | 1.57  | 28     | 28     | 0.01  | 0.06   |
| 5+570.00 | 1.99  | 17.78  | 17.78  | 1.05  | 5.29   |
| 5+580.00 | 1.64  | 18.12  | 18.12  | 0.38  | 7.15   |
| 5+600.00 | 3.03  | 46.68  | 46.68  | 1.4   | 17.87  |
| 5+620.00 | 0     | 30.32  | 30.32  | 9.22  | 106.22 |
| 5+640.00 | 0     | 0      | 0      | 9.67  | 188.89 |
| 5+650.00 | 0     | 0      | 0      | 11.22 | 104.46 |
| 5+660.00 | 0     | 0      | 0      | 6.91  | 90.64  |
| 5+670.00 | 4.75  | 23.73  | 23.73  | 0.4   | 36.52  |
| 5+680.00 | 1.9   | 36.38  | 36.38  | 1.72  | 11.09  |
| 5+700.00 | 0.11  | 21.6   | 21.6   | 3.5   | 55.01  |
| 5+720.00 | 1.55  | 14.85  | 14.85  | 3.25  | 71.45  |
| 5+740.00 | 2.99  | 44.61  | 44.61  | 1.5   | 50.18  |
| 5+760.00 | 2.29  | 53.94  | 53.94  | 0.01  | 15.4   |
| 5+780.00 | 4.86  | 71.56  | 71.56  | 0     | 0.11   |
| 5+790.00 | 7.7   | 62.83  | 62.83  | 0     | 0      |
| 5+800.00 | 7     | 73.5   | 73.5   | 0     | 0      |
| 5+820.00 | 14.55 | 219.13 | 219.13 | 0     | 0      |
| 5+840.00 | 7.08  | 224    | 224    | 0.28  | 3.01   |
| 5+860.00 | 9.26  | 165.26 | 165.26 | 0     | 2.99   |
| 5+880.00 | 10.15 | 194.09 | 194.09 | 0     | 0      |
| 5+890.00 | 4.73  | 74.41  | 74.41  | 0     | 0      |
| 5+900.00 | 6.79  | 57.6   | 57.6   | 0     | 0      |
| 5+920.00 | 7.87  | 144.8  | 144.8  | 0     | 0      |
| 5+940.00 | 5.38  | 130.8  | 130.8  | 0     | 0      |
| 5+960.00 | 3.09  | 84.77  | 84.77  | 0.42  | 4.22   |
| 5+970.00 | 4.16  | 37.02  | 37.02  | 0.17  | 2.98   |
| 5+980.00 | 3.52  | 38.92  | 38.92  | 0.03  | 1.05   |
| 6+000.00 | 4.04  | 75.61  | 75.61  | 0     | 0.35   |
| 6+020.00 | 2.28  | 63.15  | 63.15  | 0.14  | 1.43   |
| 6+040.00 | 0.14  | 24.2   | 24.2   | 0.3   | 4.41   |
| 6+060.00 | 1.4   | 15.45  | 15.45  | 4.2   | 44.96  |
| 6+080.00 | 1.44  | 27.89  | 27.89  | 6.06  | 104.71 |
| 6+100.00 | 1.74  | 31.7   | 31.7   | 1.22  | 73.31  |

|          |      |       |       |      |       |
|----------|------|-------|-------|------|-------|
| 6+120.00 | 2.46 | 42.03 | 42.03 | 0.05 | 12.72 |
|----------|------|-------|-------|------|-------|

| P.K.     | Vol. desmonte<br>acumul. (m3) | Vol. reutilizable<br>acumul. (m3) | Vol. terrapien<br>acumul. (m3) | Vol. neto<br>acumul.(m3) |
|----------|-------------------------------|-----------------------------------|--------------------------------|--------------------------|
| 0+000.00 | 0                             | 0                                 | 0                              | 0                        |
| 0+020.00 | 82                            | 1.46                              | 1.46                           | 80.55                    |
| 0+040.00 | 271.91                        | 2.92                              | 2.92                           | 268.99                   |
| 0+050.00 | 371.38                        | 2.92                              | 2.92                           | 368.46                   |
| 0+060.00 | 458.73                        | 3.66                              | 3.66                           | 455.07                   |
| 0+070.00 | 522.09                        | 4.65                              | 4.65                           | 517.44                   |
| 0+080.00 | 564.6                         | 10.67                             | 10.67                          | 553.93                   |
| 0+100.00 | 643.28                        | 40.24                             | 40.24                          | 603.03                   |
| 0+120.00 | 742.89                        | 58.36                             | 58.36                          | 684.54                   |
| 0+140.00 | 836.96                        | 60.25                             | 60.25                          | 776.71                   |
| 0+150.00 | 868.78                        | 72.98                             | 72.98                          | 795.81                   |
| 0+160.00 | 899.28                        | 91.33                             | 91.33                          | 807.95                   |
| 0+170.00 | 924.74                        | 105.02                            | 105.02                         | 819.72                   |
| 0+180.00 | 936.47                        | 123.17                            | 123.17                         | 813.29                   |
| 0+200.00 | 936.57                        | 178.6                             | 178.6                          | 757.97                   |
| 0+220.00 | 936.57                        | 223.06                            | 223.06                         | 713.51                   |
| 0+240.00 | 936.57                        | 273.42                            | 273.42                         | 663.15                   |
| 0+260.00 | 936.57                        | 363.68                            | 363.68                         | 572.88                   |
| 0+280.00 | 936.57                        | 444.92                            | 444.92                         | 491.65                   |
| 0+300.00 | 950.9                         | 476.94                            | 476.94                         | 473.96                   |
| 0+320.00 | 1,006.96                      | 506.65                            | 506.65                         | 500.31                   |
| 0+340.00 | 1,111.96                      | 550.38                            | 550.38                         | 561.58                   |
| 0+350.00 | 1,183.47                      | 565.76                            | 565.76                         | 617.71                   |
| 0+360.00 | 1,255.63                      | 589.26                            | 589.26                         | 666.37                   |
| 0+370.00 | 1,317.13                      | 621.94                            | 621.94                         | 695.19                   |
| 0+380.00 | 1,369.13                      | 644.91                            | 644.91                         | 724.22                   |
| 0+400.00 | 1,495.34                      | 668.37                            | 668.37                         | 826.96                   |
| 0+410.00 | 1,580.37                      | 691.95                            | 691.95                         | 888.42                   |
| 0+420.00 | 1,663.06                      | 727.5                             | 727.5                          | 935.55                   |
| 0+440.00 | 1,871.31                      | 759.57                            | 759.57                         | 1,111.74                 |
| 0+460.00 | 2,057.50                      | 765.06                            | 765.06                         | 1,292.44                 |
| 0+480.00 | 2,177.22                      | 778.72                            | 778.72                         | 1,398.50                 |
| 0+490.00 | 2,230.12                      | 795.16                            | 795.16                         | 1,434.96                 |
| 0+500.00 | 2,267.63                      | 820.36                            | 820.36                         | 1,447.27                 |
| 0+510.00 | 2,307.98                      | 847.07                            | 847.07                         | 1,460.91                 |
| 0+520.00 | 2,354.75                      | 869.91                            | 869.91                         | 1,484.83                 |
| 0+540.00 | 2,391.55                      | 909.18                            | 909.18                         | 1,482.37                 |
| 0+560.00 | 2,429.08                      | 932.23                            | 932.23                         | 1,496.85                 |
| 0+580.00 | 2,496.50                      | 959.2                             | 959.2                          | 1,537.30                 |
| 0+600.00 | 2,566.90                      | 983                               | 983                            | 1,583.89                 |
| 0+620.00 | 2,611.76                      | 1,005.72                          | 1,005.72                       | 1,606.03                 |

|          |          |          |          |          |
|----------|----------|----------|----------|----------|
| 0+630.00 | 2,637.37 | 1,017.02 | 1,017.02 | 1,620.35 |
| 0+640.00 | 2,699.55 | 1,017.13 | 1,017.13 | 1,682.42 |
| 0+650.00 | 2,764.17 | 1,018.79 | 1,018.79 | 1,745.38 |
| 0+660.00 | 2,816.69 | 1,023.23 | 1,023.23 | 1,793.46 |
| 0+670.00 | 2,866.36 | 1,026.55 | 1,026.55 | 1,839.80 |
| 0+680.00 | 2,895.72 | 1,028.13 | 1,028.13 | 1,867.59 |
| 0+700.00 | 2,908.95 | 1,037.48 | 1,037.48 | 1,871.47 |
| 0+710.00 | 2,915.19 | 1,054.31 | 1,054.31 | 1,860.88 |
| 0+720.00 | 2,935.03 | 1,084.22 | 1,084.22 | 1,850.81 |
| 0+730.00 | 2,954.33 | 1,136.38 | 1,136.38 | 1,817.95 |
| 0+740.00 | 2,964.05 | 1,175.01 | 1,175.01 | 1,789.04 |
| 0+760.00 | 2,972.12 | 1,202.10 | 1,202.10 | 1,770.02 |
| 0+780.00 | 2,981.80 | 1,226.30 | 1,226.30 | 1,755.49 |
| 0+800.00 | 2,995.06 | 1,233.64 | 1,233.64 | 1,761.42 |
| 0+810.00 | 3,007.23 | 1,239.73 | 1,239.73 | 1,767.50 |
| 0+820.00 | 3,035.62 | 1,269.18 | 1,269.18 | 1,766.43 |
| 0+830.00 | 3,060.92 | 1,314.25 | 1,314.25 | 1,746.67 |
| 0+840.00 | 3,074.22 | 1,338.67 | 1,338.67 | 1,735.56 |
| 0+860.00 | 3,145.88 | 1,364.24 | 1,364.24 | 1,781.64 |
| 0+880.00 | 3,228.34 | 1,394.86 | 1,394.86 | 1,833.48 |
| 0+900.00 | 3,251.55 | 1,416.92 | 1,416.92 | 1,834.62 |
| 0+920.00 | 3,252.03 | 1,475.30 | 1,475.30 | 1,776.74 |
| 0+940.00 | 3,284.22 | 1,533.62 | 1,533.62 | 1,750.60 |
| 0+950.00 | 3,325.28 | 1,545.82 | 1,545.82 | 1,779.47 |
| 0+960.00 | 3,362.56 | 1,561.97 | 1,561.97 | 1,800.60 |
| 0+970.00 | 3,397.27 | 1,572.44 | 1,572.44 | 1,824.83 |
| 0+980.00 | 3,428.60 | 1,575.67 | 1,575.67 | 1,852.93 |
| 1+000.00 | 3,452.80 | 1,583.53 | 1,583.53 | 1,869.27 |
| 1+020.00 | 3,459.95 | 1,600.28 | 1,600.28 | 1,859.68 |
| 1+040.00 | 3,460.00 | 1,631.49 | 1,631.49 | 1,828.51 |
| 1+060.00 | 3,491.02 | 1,650.38 | 1,650.38 | 1,840.64 |
| 1+080.00 | 3,534.94 | 1,666.88 | 1,666.88 | 1,868.06 |
| 1+090.00 | 3,541.58 | 1,695.45 | 1,695.45 | 1,846.14 |
| 1+100.00 | 3,541.73 | 1,726.17 | 1,726.17 | 1,815.56 |
| 1+120.00 | 3,541.89 | 1,781.36 | 1,781.36 | 1,760.53 |
| 1+140.00 | 3,542.85 | 1,820.36 | 1,820.36 | 1,722.49 |
| 1+160.00 | 3,553.91 | 1,827.59 | 1,827.59 | 1,726.33 |
| 1+180.00 | 3,564.01 | 1,860.93 | 1,860.93 | 1,703.08 |
| 1+190.00 | 3,564.70 | 1,881.85 | 1,881.85 | 1,682.85 |
| 1+200.00 | 3,576.91 | 1,909.98 | 1,909.98 | 1,666.93 |
| 1+210.00 | 3,588.47 | 1,954.46 | 1,954.46 | 1,634.01 |
| 1+220.00 | 3,588.48 | 1,991.76 | 1,991.76 | 1,596.72 |
| 1+230.00 | 3,593.25 | 2,013.05 | 2,013.05 | 1,580.20 |
| 1+240.00 | 3,609.14 | 2,027.18 | 2,027.18 | 1,581.96 |

|          |          |          |          |          |
|----------|----------|----------|----------|----------|
| 1+250.00 | 3,627.18 | 2,039.06 | 2,039.06 | 1,588.12 |
| 1+260.00 | 3,643.82 | 2,042.84 | 2,042.84 | 1,600.98 |
| 1+280.00 | 3,673.15 | 2,045.47 | 2,045.47 | 1,627.68 |
| 1+300.00 | 3,683.14 | 2,063.90 | 2,063.90 | 1,619.24 |
| 1+320.00 | 3,703.67 | 2,086.49 | 2,086.49 | 1,617.17 |
| 1+340.00 | 3,740.89 | 2,093.90 | 2,093.90 | 1,646.99 |
| 1+360.00 | 3,757.66 | 2,106.72 | 2,106.72 | 1,650.94 |
| 1+370.00 | 3,769.24 | 2,116.09 | 2,116.09 | 1,653.14 |
| 1+380.00 | 3,804.41 | 2,134.28 | 2,134.28 | 1,670.13 |
| 1+390.00 | 3,843.65 | 2,166.50 | 2,166.50 | 1,677.15 |
| 1+400.00 | 3,867.70 | 2,186.67 | 2,186.67 | 1,681.04 |
| 1+420.00 | 3,907.71 | 2,192.78 | 2,192.78 | 1,714.93 |
| 1+440.00 | 4,019.40 | 2,193.31 | 2,193.31 | 1,826.10 |
| 1+460.00 | 4,203.07 | 2,193.31 | 2,193.31 | 2,009.76 |
| 1+480.00 | 4,339.99 | 2,193.31 | 2,193.31 | 2,146.68 |
| 1+490.00 | 4,396.16 | 2,193.31 | 2,193.31 | 2,202.85 |
| 1+500.00 | 4,456.68 | 2,193.34 | 2,193.34 | 2,263.34 |
| 1+520.00 | 4,567.84 | 2,193.41 | 2,193.41 | 2,374.43 |
| 1+540.00 | 4,662.70 | 2,193.41 | 2,193.41 | 2,469.29 |
| 1+560.00 | 4,698.42 | 2,197.64 | 2,197.64 | 2,500.77 |
| 1+580.00 | 4,743.07 | 2,229.81 | 2,229.81 | 2,513.26 |
| 1+590.00 | 4,795.12 | 2,260.99 | 2,260.99 | 2,534.13 |
| 1+600.00 | 4,844.00 | 2,278.25 | 2,278.25 | 2,565.75 |
| 1+620.00 | 4,892.79 | 2,279.12 | 2,279.12 | 2,613.67 |
| 1+640.00 | 4,935.10 | 2,292.93 | 2,292.93 | 2,642.18 |
| 1+660.00 | 4,995.48 | 2,306.49 | 2,306.49 | 2,688.99 |
| 1+680.00 | 5,043.21 | 2,306.49 | 2,306.49 | 2,736.72 |
| 1+700.00 | 5,073.76 | 2,311.62 | 2,311.62 | 2,762.14 |
| 1+720.00 | 5,102.77 | 2,322.46 | 2,322.46 | 2,780.31 |
| 1+740.00 | 5,169.50 | 2,328.16 | 2,328.16 | 2,841.33 |
| 1+760.00 | 5,239.84 | 2,329.37 | 2,329.37 | 2,910.47 |
| 1+780.00 | 5,277.48 | 2,331.94 | 2,331.94 | 2,945.54 |
| 1+790.00 | 5,305.01 | 2,339.13 | 2,339.13 | 2,965.87 |
| 1+800.00 | 5,337.61 | 2,346.26 | 2,346.26 | 2,991.35 |
| 1+810.00 | 5,383.30 | 2,346.92 | 2,346.92 | 3,036.37 |
| 1+820.00 | 5,450.41 | 2,348.28 | 2,348.28 | 3,102.13 |
| 1+840.00 | 5,569.20 | 2,350.95 | 2,350.95 | 3,218.24 |
| 1+860.00 | 5,662.70 | 2,350.95 | 2,350.95 | 3,311.75 |
| 1+880.00 | 5,706.72 | 2,352.41 | 2,352.41 | 3,354.31 |
| 1+900.00 | 5,725.86 | 2,381.18 | 2,381.18 | 3,344.68 |
| 1+910.00 | 5,747.27 | 2,439.23 | 2,439.23 | 3,308.04 |
| 1+920.00 | 5,775.38 | 2,545.00 | 2,545.00 | 3,230.38 |
| 1+940.00 | 5,840.73 | 2,687.02 | 2,687.02 | 3,153.71 |
| 1+960.00 | 5,938.28 | 2,714.41 | 2,714.41 | 3,223.87 |

|          |          |          |          |          |
|----------|----------|----------|----------|----------|
| 1+980.00 | 6,042.55 | 2,722.52 | 2,722.52 | 3,320.02 |
| 2+000.00 | 6,110.81 | 2,729.86 | 2,729.86 | 3,380.96 |
| 2+020.00 | 6,170.26 | 2,743.41 | 2,743.41 | 3,426.85 |
| 2+040.00 | 6,227.10 | 2,757.77 | 2,757.77 | 3,469.33 |
| 2+060.00 | 6,280.84 | 2,764.08 | 2,764.08 | 3,516.76 |
| 2+080.00 | 6,320.90 | 2,835.22 | 2,835.22 | 3,485.68 |
| 2+100.00 | 6,382.54 | 2,905.78 | 2,905.78 | 3,476.76 |
| 2+110.00 | 6,426.07 | 2,906.20 | 2,906.20 | 3,519.87 |
| 2+120.00 | 6,461.83 | 2,924.64 | 2,924.64 | 3,537.19 |
| 2+130.00 | 6,494.35 | 2,982.19 | 2,982.19 | 3,512.16 |
| 2+140.00 | 6,522.24 | 3,044.63 | 3,044.63 | 3,477.61 |
| 2+160.00 | 6,590.89 | 3,102.12 | 3,102.12 | 3,488.78 |
| 2+180.00 | 6,714.39 | 3,112.72 | 3,112.72 | 3,601.67 |
| 2+200.00 | 6,843.53 | 3,113.10 | 3,113.10 | 3,730.42 |
| 2+210.00 | 6,896.74 | 3,114.58 | 3,114.58 | 3,782.16 |
| 2+220.00 | 6,965.82 | 3,120.54 | 3,120.54 | 3,845.27 |
| 2+230.00 | 7,028.10 | 3,152.26 | 3,152.26 | 3,875.84 |
| 2+240.00 | 7,084.16 | 3,199.78 | 3,199.78 | 3,884.38 |
| 2+260.00 | 7,235.58 | 3,238.17 | 3,238.17 | 3,997.41 |
| 2+280.00 | 7,415.40 | 3,238.17 | 3,238.17 | 4,177.23 |
| 2+300.00 | 7,588.34 | 3,238.42 | 3,238.42 | 4,349.92 |
| 2+320.00 | 7,676.49 | 3,263.83 | 3,263.83 | 4,412.66 |
| 2+340.00 | 7,705.03 | 3,298.54 | 3,298.54 | 4,406.50 |
| 2+360.00 | 7,744.44 | 3,314.10 | 3,314.10 | 4,430.35 |
| 2+380.00 | 7,776.29 | 3,320.12 | 3,320.12 | 4,456.17 |
| 2+400.00 | 7,808.45 | 3,320.71 | 3,320.71 | 4,487.74 |
| 2+420.00 | 7,886.65 | 3,329.03 | 3,329.03 | 4,557.62 |
| 2+440.00 | 7,971.78 | 3,341.19 | 3,341.19 | 4,630.60 |
| 2+460.00 | 8,021.83 | 3,345.53 | 3,345.53 | 4,676.30 |
| 2+480.00 | 8,063.14 | 3,345.54 | 3,345.54 | 4,717.60 |
| 2+500.00 | 8,126.63 | 3,351.41 | 3,351.41 | 4,775.22 |
| 2+520.00 | 8,201.80 | 3,360.24 | 3,360.24 | 4,841.56 |
| 2+540.00 | 8,276.80 | 3,371.87 | 3,371.87 | 4,904.93 |
| 2+560.00 | 8,354.90 | 3,380.54 | 3,380.54 | 4,974.36 |
| 2+580.00 | 8,393.70 | 3,435.14 | 3,435.14 | 4,958.56 |
| 2+600.00 | 8,394.52 | 3,527.79 | 3,527.79 | 4,866.73 |
| 2+620.00 | 8,394.67 | 3,595.74 | 3,595.74 | 4,798.93 |
| 2+640.00 | 8,396.30 | 3,637.26 | 3,637.26 | 4,759.04 |
| 2+660.00 | 8,411.57 | 3,649.59 | 3,649.59 | 4,761.99 |
| 2+680.00 | 8,458.75 | 3,677.20 | 3,677.20 | 4,781.56 |
| 2+700.00 | 8,506.90 | 3,718.00 | 3,718.00 | 4,788.89 |
| 2+720.00 | 8,521.51 | 3,780.54 | 3,780.54 | 4,740.97 |
| 2+740.00 | 8,521.98 | 3,886.65 | 3,886.65 | 4,635.33 |
| 2+750.00 | 8,522.35 | 3,977.57 | 3,977.57 | 4,544.78 |

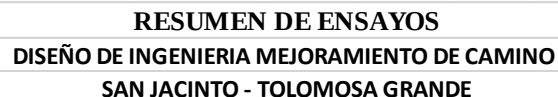
|          |           |          |          |          |
|----------|-----------|----------|----------|----------|
| 2+760.00 | 8,528.24  | 4,077.88 | 4,077.88 | 4,450.36 |
| 2+780.00 | 8,540.77  | 4,169.38 | 4,169.38 | 4,371.39 |
| 2+800.00 | 8,643.30  | 4,201.72 | 4,201.72 | 4,441.58 |
| 2+810.00 | 8,733.93  | 4,221.68 | 4,221.68 | 4,512.25 |
| 2+820.00 | 8,825.76  | 4,235.37 | 4,235.37 | 4,590.39 |
| 2+840.00 | 8,959.05  | 4,238.08 | 4,238.08 | 4,720.97 |
| 2+860.00 | 9,105.71  | 4,238.60 | 4,238.60 | 4,867.11 |
| 2+870.00 | 9,238.23  | 4,238.60 | 4,238.60 | 4,999.63 |
| 2+880.00 | 9,386.80  | 4,238.60 | 4,238.60 | 5,148.20 |
| 2+890.00 | 9,559.26  | 4,238.60 | 4,238.60 | 5,320.66 |
| 2+900.00 | 9,737.17  | 4,238.60 | 4,238.60 | 5,498.57 |
| 2+920.00 | 9,999.90  | 4,238.60 | 4,238.60 | 5,761.30 |
| 2+940.00 | 10,204.20 | 4,238.60 | 4,238.60 | 5,965.60 |
| 2+960.00 | 10,417.34 | 4,238.60 | 4,238.60 | 6,178.74 |
| 2+970.00 | 10,572.60 | 4,238.60 | 4,238.60 | 6,334.00 |
| 2+980.00 | 10,792.51 | 4,238.60 | 4,238.60 | 6,553.91 |
| 2+990.00 | 11,021.99 | 4,256.83 | 4,256.83 | 6,765.16 |
| 3+000.00 | 11,221.56 | 4,275.06 | 4,275.06 | 6,946.49 |
| 3+010.00 | 11,402.79 | 4,275.06 | 4,275.06 | 7,127.73 |
| 3+020.00 | 11,559.72 | 4,275.06 | 4,275.06 | 7,284.66 |
| 3+040.00 | 11,755.42 | 4,275.06 | 4,275.06 | 7,480.35 |
| 3+060.00 | 11,883.53 | 4,275.07 | 4,275.07 | 7,608.46 |
| 3+070.00 | 11,945.88 | 4,284.38 | 4,284.38 | 7,661.49 |
| 3+080.00 | 12,000.38 | 4,299.82 | 4,299.82 | 7,700.55 |
| 3+090.00 | 12,054.44 | 4,311.49 | 4,311.49 | 7,742.95 |
| 3+100.00 | 12,121.30 | 4,328.32 | 4,328.32 | 7,792.98 |
| 3+110.00 | 12,188.72 | 4,342.54 | 4,342.54 | 7,846.19 |
| 3+120.00 | 12,253.68 | 4,346.03 | 4,346.03 | 7,907.66 |
| 3+140.00 | 12,413.30 | 4,347.39 | 4,347.39 | 8,065.90 |
| 3+160.00 | 12,541.91 | 4,347.39 | 4,347.39 | 8,194.51 |
| 3+180.00 | 12,629.07 | 4,347.39 | 4,347.39 | 8,281.67 |
| 3+200.00 | 12,680.38 | 4,361.29 | 4,361.29 | 8,319.09 |
| 3+210.00 | 12,693.64 | 4,375.48 | 4,375.48 | 8,318.16 |
| 3+220.00 | 12,707.81 | 4,391.82 | 4,391.82 | 8,315.99 |
| 3+230.00 | 12,778.50 | 4,400.77 | 4,400.77 | 8,377.73 |
| 3+240.00 | 12,898.67 | 4,400.89 | 4,400.89 | 8,497.79 |
| 3+260.00 | 13,028.45 | 4,400.89 | 4,400.89 | 8,627.57 |
| 3+280.00 | 13,096.38 | 4,400.89 | 4,400.89 | 8,695.49 |
| 3+290.00 | 13,114.45 | 4,412.49 | 4,412.49 | 8,701.96 |
| 3+300.00 | 13,129.64 | 4,443.26 | 4,443.26 | 8,686.38 |
| 3+320.00 | 13,160.68 | 4,495.06 | 4,495.06 | 8,665.62 |
| 3+340.00 | 13,166.22 | 4,510.67 | 4,510.67 | 8,655.55 |
| 3+360.00 | 13,171.73 | 4,547.86 | 4,547.86 | 8,623.87 |
| 3+380.00 | 13,171.73 | 4,639.02 | 4,639.02 | 8,532.71 |

|          |           |          |          |          |
|----------|-----------|----------|----------|----------|
| 3+400.00 | 13,171.73 | 4,787.77 | 4,787.77 | 8,383.96 |
| 3+420.00 | 13,171.76 | 4,971.90 | 4,971.90 | 8,199.86 |
| 3+440.00 | 13,171.93 | 5,107.89 | 5,107.89 | 8,064.04 |
| 3+460.00 | 13,172.06 | 5,203.64 | 5,203.64 | 7,968.42 |
| 3+480.00 | 13,172.07 | 5,302.54 | 5,302.54 | 7,869.52 |
| 3+500.00 | 13,179.02 | 5,364.82 | 5,364.82 | 7,814.20 |
| 3+520.00 | 13,185.98 | 5,415.26 | 5,415.26 | 7,770.72 |
| 3+540.00 | 13,185.98 | 5,483.88 | 5,483.88 | 7,702.09 |
| 3+560.00 | 13,185.98 | 5,536.93 | 5,536.93 | 7,649.04 |
| 3+570.00 | 13,186.72 | 5,555.86 | 5,555.86 | 7,630.86 |
| 3+580.00 | 13,187.64 | 5,566.49 | 5,566.49 | 7,621.15 |
| 3+590.00 | 13,198.77 | 5,569.98 | 5,569.98 | 7,628.79 |
| 3+600.00 | 13,213.69 | 5,577.13 | 5,577.13 | 7,636.56 |
| 3+620.00 | 13,223.92 | 5,592.94 | 5,592.94 | 7,630.97 |
| 3+640.00 | 13,226.15 | 5,679.63 | 5,679.63 | 7,546.51 |
| 3+660.00 | 13,246.84 | 5,763.28 | 5,763.28 | 7,483.56 |
| 3+680.00 | 13,267.63 | 5,779.99 | 5,779.99 | 7,487.64 |
| 3+700.00 | 13,314.16 | 5,796.50 | 5,796.50 | 7,517.66 |
| 3+720.00 | 13,379.83 | 5,796.59 | 5,796.59 | 7,583.25 |
| 3+740.00 | 13,416.48 | 5,796.84 | 5,796.84 | 7,619.64 |
| 3+760.00 | 13,444.65 | 5,797.02 | 5,797.02 | 7,647.63 |
| 3+780.00 | 13,455.45 | 5,811.97 | 5,811.97 | 7,643.48 |
| 3+800.00 | 13,471.16 | 5,843.92 | 5,843.92 | 7,627.24 |
| 3+810.00 | 13,489.76 | 5,856.16 | 5,856.16 | 7,633.60 |
| 3+820.00 | 13,507.76 | 5,863.49 | 5,863.49 | 7,644.27 |
| 3+830.00 | 13,530.47 | 5,867.23 | 5,867.23 | 7,663.24 |
| 3+840.00 | 13,568.79 | 5,867.23 | 5,867.23 | 7,701.56 |
| 3+860.00 | 13,651.28 | 5,867.23 | 5,867.23 | 7,784.05 |
| 3+870.00 | 13,703.69 | 5,867.23 | 5,867.23 | 7,836.46 |
| 3+880.00 | 13,759.31 | 5,867.23 | 5,867.23 | 7,892.08 |
| 3+890.00 | 13,812.13 | 5,868.08 | 5,868.08 | 7,944.05 |
| 3+900.00 | 13,875.12 | 5,870.90 | 5,870.90 | 8,004.22 |
| 3+910.00 | 13,929.19 | 5,874.43 | 5,874.43 | 8,054.76 |
| 3+920.00 | 13,986.06 | 5,877.96 | 5,877.96 | 8,108.10 |
| 3+940.00 | 14,082.12 | 5,881.73 | 5,881.73 | 8,200.39 |
| 3+960.00 | 14,115.10 | 5,918.65 | 5,918.65 | 8,196.45 |
| 3+980.00 | 14,145.54 | 6,041.72 | 6,041.72 | 8,103.82 |
| 4+000.00 | 14,214.28 | 6,134.59 | 6,134.59 | 8,079.69 |
| 4+020.00 | 14,337.57 | 6,141.30 | 6,141.30 | 8,196.27 |
| 4+040.00 | 14,457.59 | 6,146.16 | 6,146.16 | 8,311.42 |
| 4+050.00 | 14,504.08 | 6,148.72 | 6,148.72 | 8,355.37 |
| 4+060.00 | 14,568.85 | 6,148.72 | 6,148.72 | 8,420.13 |
| 4+070.00 | 14,651.51 | 6,148.72 | 6,148.72 | 8,502.79 |
| 4+080.00 | 14,744.97 | 6,148.72 | 6,148.72 | 8,596.25 |

|          |           |          |          |           |
|----------|-----------|----------|----------|-----------|
| 4+090.00 | 14,835.64 | 6,148.72 | 6,148.72 | 8,686.92  |
| 4+100.00 | 14,910.13 | 6,148.72 | 6,148.72 | 8,761.41  |
| 4+120.00 | 15,011.04 | 6,177.42 | 6,177.42 | 8,833.62  |
| 4+130.00 | 15,046.09 | 6,201.67 | 6,201.67 | 8,844.42  |
| 4+140.00 | 15,084.39 | 6,212.31 | 6,212.31 | 8,872.07  |
| 4+160.00 | 15,194.22 | 6,212.45 | 6,212.45 | 8,981.77  |
| 4+170.00 | 15,261.38 | 6,212.51 | 6,212.51 | 9,048.87  |
| 4+180.00 | 15,353.02 | 6,212.80 | 6,212.80 | 9,140.22  |
| 4+190.00 | 15,436.89 | 6,213.08 | 6,213.08 | 9,223.81  |
| 4+200.00 | 15,490.37 | 6,216.84 | 6,216.84 | 9,273.53  |
| 4+210.00 | 15,517.38 | 6,220.97 | 6,220.97 | 9,296.41  |
| 4+220.00 | 15,519.91 | 6,271.11 | 6,271.11 | 9,248.80  |
| 4+230.00 | 15,519.91 | 6,359.56 | 6,359.56 | 9,160.34  |
| 4+240.00 | 15,523.08 | 6,410.08 | 6,410.08 | 9,113.00  |
| 4+260.00 | 15,537.55 | 6,434.55 | 6,434.55 | 9,103.01  |
| 4+280.00 | 15,624.39 | 6,435.39 | 6,435.39 | 9,189.00  |
| 4+290.00 | 15,704.69 | 6,438.27 | 6,438.27 | 9,266.42  |
| 4+300.00 | 15,769.82 | 6,445.74 | 6,445.74 | 9,324.08  |
| 4+320.00 | 15,828.70 | 6,454.78 | 6,454.78 | 9,373.92  |
| 4+330.00 | 15,849.64 | 6,458.74 | 6,458.74 | 9,390.90  |
| 4+340.00 | 15,878.64 | 6,465.54 | 6,465.54 | 9,413.10  |
| 4+350.00 | 15,897.88 | 6,473.51 | 6,473.51 | 9,424.37  |
| 4+360.00 | 15,941.90 | 6,482.43 | 6,482.43 | 9,459.47  |
| 4+380.00 | 16,112.13 | 6,489.92 | 6,489.92 | 9,622.21  |
| 4+390.00 | 16,199.62 | 6,493.92 | 6,493.92 | 9,705.70  |
| 4+400.00 | 16,261.37 | 6,503.33 | 6,503.33 | 9,758.04  |
| 4+420.00 | 16,416.42 | 6,513.25 | 6,513.25 | 9,903.17  |
| 4+430.00 | 16,521.71 | 6,513.25 | 6,513.25 | 10,008.46 |
| 4+440.00 | 16,636.49 | 6,513.74 | 6,513.74 | 10,122.75 |
| 4+460.00 | 16,833.95 | 6,514.70 | 6,514.70 | 10,319.24 |
| 4+480.00 | 17,039.31 | 6,514.70 | 6,514.70 | 10,524.61 |
| 4+500.00 | 17,294.18 | 6,514.70 | 6,514.70 | 10,779.48 |
| 4+520.00 | 17,560.52 | 6,514.70 | 6,514.70 | 11,045.82 |
| 4+540.00 | 17,779.58 | 6,514.70 | 6,514.70 | 11,264.88 |
| 4+550.00 | 17,873.89 | 6,514.70 | 6,514.70 | 11,359.18 |
| 4+560.00 | 17,924.19 | 6,514.91 | 6,514.91 | 11,409.28 |
| 4+570.00 | 17,940.88 | 6,531.75 | 6,531.75 | 11,409.13 |
| 4+580.00 | 17,968.84 | 6,560.10 | 6,560.10 | 11,408.74 |
| 4+600.00 | 18,126.10 | 6,583.51 | 6,583.51 | 11,542.59 |
| 4+620.00 | 18,302.77 | 6,880.80 | 6,880.80 | 11,421.97 |
| 4+640.00 | 18,403.24 | 7,149.77 | 7,149.77 | 11,253.47 |
| 4+650.00 | 18,448.71 | 7,150.22 | 7,150.22 | 11,298.49 |
| 4+660.00 | 18,489.49 | 7,150.32 | 7,150.32 | 11,339.17 |
| 4+680.00 | 18,556.64 | 7,159.17 | 7,159.17 | 11,397.48 |

|          |           |          |          |           |
|----------|-----------|----------|----------|-----------|
| 4+700.00 | 18,674.15 | 7,167.33 | 7,167.33 | 11,506.82 |
| 4+720.00 | 18,802.86 | 7,172.78 | 7,172.78 | 11,630.07 |
| 4+740.00 | 18,890.66 | 7,214.77 | 7,214.77 | 11,675.90 |
| 4+760.00 | 19,001.93 | 7,259.17 | 7,259.17 | 11,742.76 |
| 4+780.00 | 19,166.24 | 7,271.14 | 7,271.14 | 11,895.09 |
| 4+800.00 | 19,391.20 | 7,278.50 | 7,278.50 | 12,112.70 |
| 4+820.00 | 19,531.36 | 7,408.04 | 7,408.04 | 12,123.32 |
| 4+840.00 | 19,572.52 | 7,570.85 | 7,570.85 | 12,001.68 |
| 4+850.00 | 19,589.42 | 7,592.82 | 7,592.82 | 11,996.60 |
| 4+860.00 | 19,622.28 | 7,598.16 | 7,598.16 | 12,024.13 |
| 4+870.00 | 19,667.69 | 7,600.31 | 7,600.31 | 12,067.38 |
| 4+880.00 | 19,734.24 | 7,602.18 | 7,602.18 | 12,132.05 |
| 4+900.00 | 19,906.85 | 7,604.17 | 7,604.17 | 12,302.68 |
| 4+920.00 | 20,104.26 | 7,606.38 | 7,606.38 | 12,497.88 |
| 4+930.00 | 20,186.92 | 7,622.54 | 7,622.54 | 12,564.38 |
| 4+940.00 | 20,249.02 | 7,670.49 | 7,670.49 | 12,578.52 |
| 4+950.00 | 20,312.04 | 7,796.44 | 7,796.44 | 12,515.60 |
| 4+960.00 | 20,379.72 | 7,889.83 | 7,889.83 | 12,489.89 |
| 4+970.00 | 20,448.79 | 7,890.91 | 7,890.91 | 12,557.88 |
| 4+980.00 | 20,516.29 | 7,897.14 | 7,897.14 | 12,619.15 |
| 5+000.00 | 20,645.28 | 7,930.86 | 7,930.86 | 12,714.41 |
| 5+020.00 | 20,756.05 | 8,054.17 | 8,054.17 | 12,701.88 |
| 5+040.00 | 20,890.31 | 8,309.51 | 8,309.51 | 12,580.80 |
| 5+060.00 | 21,018.11 | 8,497.33 | 8,497.33 | 12,520.78 |
| 5+080.00 | 21,116.46 | 8,750.45 | 8,750.45 | 12,366.01 |
| 5+100.00 | 21,230.87 | 8,962.31 | 8,962.31 | 12,268.56 |
| 5+120.00 | 21,398.35 | 8,963.29 | 8,963.29 | 12,435.06 |
| 5+140.00 | 21,594.74 | 8,963.63 | 8,963.63 | 12,631.12 |
| 5+160.00 | 21,807.16 | 8,963.96 | 8,963.96 | 12,843.21 |
| 5+180.00 | 21,989.98 | 8,963.96 | 8,963.96 | 13,026.02 |
| 5+200.00 | 22,129.74 | 8,963.96 | 8,963.96 | 13,165.79 |
| 5+220.00 | 22,261.29 | 8,964.02 | 8,964.02 | 13,297.27 |
| 5+240.00 | 22,376.81 | 8,964.27 | 8,964.27 | 13,412.54 |
| 5+260.00 | 22,526.59 | 8,964.46 | 8,964.46 | 13,562.13 |
| 5+280.00 | 22,709.40 | 8,964.46 | 8,964.46 | 13,744.94 |
| 5+300.00 | 22,889.13 | 8,964.46 | 8,964.46 | 13,924.67 |
| 5+320.00 | 23,024.42 | 8,966.30 | 8,966.30 | 14,058.11 |
| 5+340.00 | 23,125.21 | 8,968.16 | 8,968.16 | 14,157.05 |
| 5+360.00 | 23,269.02 | 8,968.18 | 8,968.18 | 14,300.85 |
| 5+380.00 | 23,469.94 | 8,968.18 | 8,968.18 | 14,501.76 |
| 5+400.00 | 23,642.06 | 8,968.18 | 8,968.18 | 14,673.89 |
| 5+420.00 | 23,788.03 | 8,968.18 | 8,968.18 | 14,819.85 |
| 5+440.00 | 23,966.24 | 8,972.99 | 8,972.99 | 14,993.25 |
| 5+460.00 | 24,146.14 | 9,008.19 | 9,008.19 | 15,137.95 |

|          |           |           |           |           |
|----------|-----------|-----------|-----------|-----------|
| 5+480.00 | 24,306.98 | 9,038.59  | 9,038.59  | 15,268.40 |
| 5+500.00 | 24,451.74 | 9,038.59  | 9,038.59  | 15,413.15 |
| 5+510.00 | 24,526.65 | 9,038.59  | 9,038.59  | 15,488.07 |
| 5+520.00 | 24,608.39 | 9,038.59  | 9,038.59  | 15,569.80 |
| 5+530.00 | 24,661.84 | 9,038.90  | 9,038.90  | 15,622.94 |
| 5+540.00 | 24,689.74 | 9,039.23  | 9,039.23  | 15,650.51 |
| 5+550.00 | 24,724.73 | 9,039.25  | 9,039.25  | 15,685.48 |
| 5+560.00 | 24,752.73 | 9,039.31  | 9,039.31  | 15,713.41 |
| 5+570.00 | 24,770.51 | 9,044.60  | 9,044.60  | 15,725.91 |
| 5+580.00 | 24,788.62 | 9,051.75  | 9,051.75  | 15,736.88 |
| 5+600.00 | 24,835.30 | 9,069.62  | 9,069.62  | 15,765.68 |
| 5+620.00 | 24,865.63 | 9,175.84  | 9,175.84  | 15,689.78 |
| 5+640.00 | 24,865.63 | 9,364.73  | 9,364.73  | 15,500.89 |
| 5+650.00 | 24,865.63 | 9,469.19  | 9,469.19  | 15,396.44 |
| 5+660.00 | 24,865.63 | 9,559.83  | 9,559.83  | 15,305.79 |
| 5+670.00 | 24,889.35 | 9,596.35  | 9,596.35  | 15,293.00 |
| 5+680.00 | 24,925.73 | 9,607.44  | 9,607.44  | 15,318.29 |
| 5+700.00 | 24,947.33 | 9,662.45  | 9,662.45  | 15,284.88 |
| 5+720.00 | 24,962.18 | 9,733.90  | 9,733.90  | 15,228.29 |
| 5+740.00 | 25,006.79 | 9,784.08  | 9,784.08  | 15,222.72 |
| 5+760.00 | 25,060.73 | 9,799.47  | 9,799.47  | 15,261.25 |
| 5+780.00 | 25,132.29 | 9,799.58  | 9,799.58  | 15,332.71 |
| 5+790.00 | 25,195.12 | 9,799.58  | 9,799.58  | 15,395.54 |
| 5+800.00 | 25,268.62 | 9,799.58  | 9,799.58  | 15,469.04 |
| 5+820.00 | 25,487.75 | 9,799.58  | 9,799.58  | 15,688.17 |
| 5+840.00 | 25,711.75 | 9,802.59  | 9,802.59  | 15,909.16 |
| 5+860.00 | 25,877.00 | 9,805.58  | 9,805.58  | 16,071.43 |
| 5+880.00 | 26,071.09 | 9,805.58  | 9,805.58  | 16,265.52 |
| 5+890.00 | 26,145.51 | 9,805.58  | 9,805.58  | 16,339.93 |
| 5+900.00 | 26,203.11 | 9,805.58  | 9,805.58  | 16,397.53 |
| 5+920.00 | 26,347.91 | 9,805.58  | 9,805.58  | 16,542.33 |
| 5+940.00 | 26,478.71 | 9,805.58  | 9,805.58  | 16,673.13 |
| 5+960.00 | 26,563.48 | 9,809.80  | 9,809.80  | 16,753.68 |
| 5+970.00 | 26,600.50 | 9,812.78  | 9,812.78  | 16,787.72 |
| 5+980.00 | 26,639.42 | 9,813.83  | 9,813.83  | 16,825.59 |
| 6+000.00 | 26,715.04 | 9,814.17  | 9,814.17  | 16,900.86 |
| 6+020.00 | 26,778.19 | 9,815.60  | 9,815.60  | 16,962.59 |
| 6+040.00 | 26,802.39 | 9,820.01  | 9,820.01  | 16,982.37 |
| 6+060.00 | 26,817.84 | 9,864.98  | 9,864.98  | 16,952.86 |
| 6+080.00 | 26,845.73 | 9,969.68  | 9,969.68  | 16,876.05 |
| 6+100.00 | 26,877.43 | 10,042.99 | 10,042.99 | 16,834.44 |
| 6+120.00 | 26,919.46 | 10,055.71 | 10,055.71 | 16,863.75 |

[illegible]



UNIVERSIDAD AUTONOMA "JUAN MISAEL SARACHO"  
FACULTAD DE CIENCIAS Y TECNOLOGIA  
CARRERA DE INGENIERIA CIVIL  
LABORATORIO DE SUELOS

## GRANULOMETRÍA

### DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

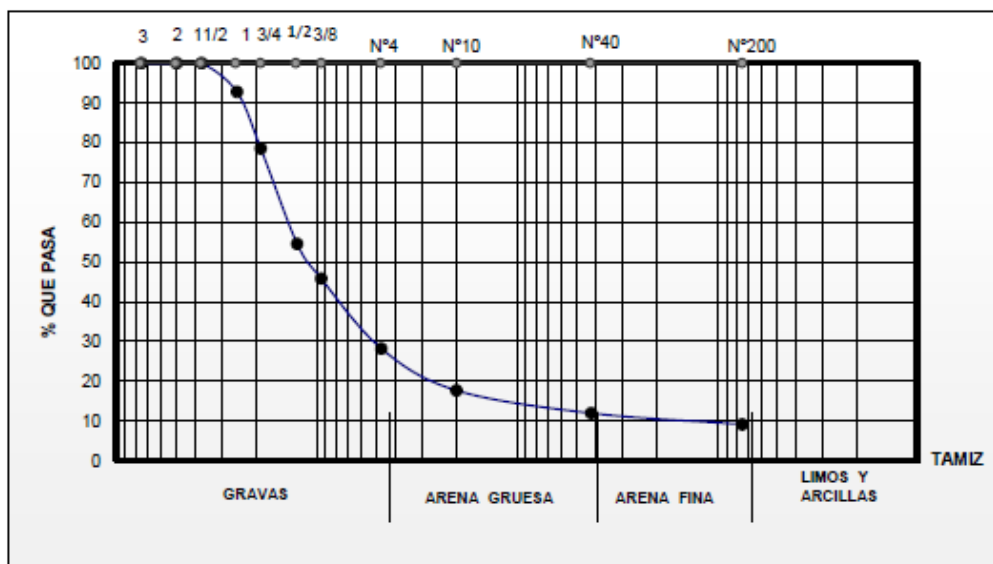
Laboratoristas: Omar Perez Aramayo

Identificación: Progresiva 0+000

Fecha: 12/11/2018

| Peso Total (gr.) |             |                | 1000           | A.S.T.M. |                      |
|------------------|-------------|----------------|----------------|----------|----------------------|
| Tamices          | Tamaño (mm) | Peso Ret. (gr) | Ret. Acum (gr) | % Ret    | % Que Pasa del Total |
| 3"               | 75          | 0.00           | 0.00           | 0.00     | 100.00               |
| 2"               | 50          | 0.00           | 0.00           | 0.00     | 100.00               |
| 1 1/2"           | 37.50       | 0.00           | 0.00           | 0.00     | 100.00               |
| 1"               | 25.00       | 72.40          | 72.40          | 7.24     | 92.76                |
| 3/4"             | 19.00       | 141.80         | 214.20         | 21.42    | 78.58                |
| 1/2"             | 12.50       | 240.40         | 454.60         | 45.46    | 54.54                |
| 3/8"             | 9.50        | 86.80          | 541.40         | 54.14    | 45.86                |
| Nº4              | 4.75        | 176.40         | 717.80         | 71.78    | 28.22                |
| Nº10             | 2.00        | 105.40         | 823.20         | 82.32    | 17.68                |
| Nº40             | 0.425       | 57.30          | 880.50         | 88.05    | 11.95                |
| Nº200            | 0.075       | 28.00          | 908.50         | 90.85    | 9.15                 |

TOTAL= 908.50



Est. Omar Perez Aramayo  
Carrera de Ing. Civil

Ing. Ricardo Arce Avendaño  
RESP. LAB. SUELOS



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## LIMITES DE ATTERBERG

EÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

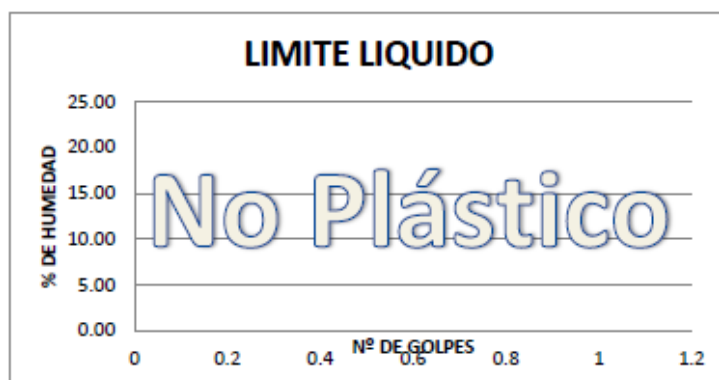
Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Omar Perez Aramayo

Identificación: Progresiva 0+000

Fecha: 12/11/2018

| Capsula N°             | 1 | 2 | 3 | 4 |
|------------------------|---|---|---|---|
| N° de golpes           |   |   |   |   |
| Suelo Húmedo + Cápsula |   |   |   |   |
| Suelo Seco + Cápsula   |   |   |   |   |
| Peso del agua          |   |   |   |   |
| Peso de la Cápsula     |   |   |   |   |
| Peso Suelo seco        |   |   |   |   |
| Porcentaje de Humedad  |   |   |   |   |



### Determinación de Limite Plástico

| Cápsula                        | 1 | 2 | 3 |
|--------------------------------|---|---|---|
| Peso de suelo húmedo + Cápsula |   |   |   |
| Peso de suelo seco + Cápsula   |   |   |   |
| Peso de cápsula                |   |   |   |
| Peso de suelo seco             |   |   |   |
| Peso del agua                  |   |   |   |
| Contenido de humedad           |   |   |   |

|                            |      |
|----------------------------|------|
| Limite Líquido (LL)        | 0.00 |
| Limite Plástico (LP)       | 0.00 |
| Índice de plasticidad (IP) | 0.00 |
| Índice de Grupo (IG)       | 0.00 |

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## HUMEDAD NATURAL Y CLASIFICACION

### DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Omar Perez Aramayo

Identificación: Progresiva 0+000

Fecha: 12/11/2018

| HUMEDAD NATURAL                |       |       |        |
|--------------------------------|-------|-------|--------|
| Cápsula                        | 1     | 2     | 3      |
| Peso de suelo húmedo + Cápsula | 101.9 | 102.3 | 102.00 |
| Peso de suelo seco + Cápsula   | 100.5 | 99    | 99.80  |
| Peso de cápsula                | 47    | 45    | 45.50  |
| Peso de suelo seco             | 53.5  | 54    | 54.3   |
| Peso del agua                  | 1.4   | 3.3   | 2.2    |
| Contenido de humedad           | 2.62  | 6.11  | 4.05   |
| PROMEDIO                       | 4.26  |       |        |

| CLASIFICACIÓN DEL SUELO |          | DESCRIPCIÓN                  |
|-------------------------|----------|------------------------------|
| SUCS:                   | GM       | Suelo gravoso con arena fina |
| AASHTO:                 | A-1-a(0) |                              |

Est. Omar Perez Aramayo  
Carrera de Ing. Civil

Ing Ricardo Arce Avendaño  
RESP. LAB. SUELOS



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LABORATORIO DE SUELOS

## COMPACTACION

### DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

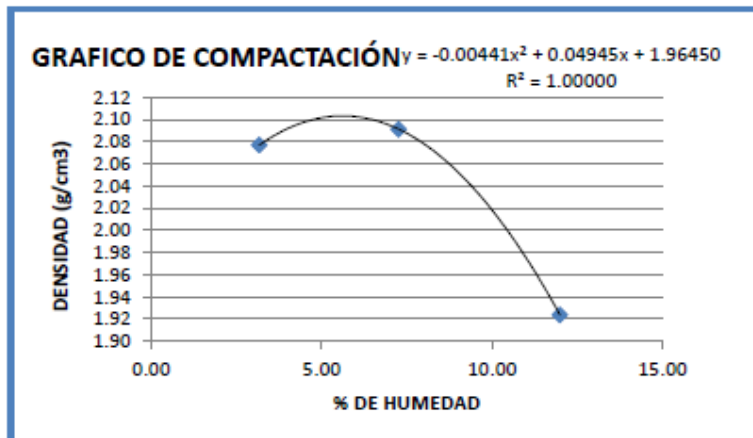
Laboratoristas: Omar Perez Aramayo

Identificación: Progresiva 0+000

Fecha: 12/11/2018

|                |          |        |                 |
|----------------|----------|--------|-----------------|
| Muestra: Única | Volumen: | 2335.0 | cm <sup>3</sup> |
|----------------|----------|--------|-----------------|

|                                             |        |         |        |
|---------------------------------------------|--------|---------|--------|
| N° de capas                                 | 5      | $\beta$ | 5      |
| N° de golpes por capa                       | 56     | 56      | 56     |
| Peso suelo húmedo + molde                   | 18886  | 19108   | 18910  |
| Peso del molde                              | 14140  | 14140   | 14138  |
| Peso suelo húmedo                           | 4746   | 4968    | 4772   |
| Volumén de la muestra                       | 2215.0 | 2215.0  | 2215.0 |
| Densidad suelo húmedo (gr/cm <sup>3</sup> ) | 2.14   | 2.24    | 2.15   |
| Cápsula N°                                  | 1      | 2       | 3      |
| Peso suelo húmedo + capsula                 | 162    | 218     | 319.9  |
| Peso suelo seco + cápsula                   | 158.50 | 206.50  | 290.80 |
| Peso del agua                               | 3.5    | 11.5    | 29.1   |
| Peso de la cápsula                          | 48     | 48      | 48     |
| Peso suelo seco                             | 110.5  | 158.5   | 242.8  |
| Contenido de humedad (%h)                   | 3.17   | 7.26    | 11.99  |
| Densidad suelo seco (gr/cm <sup>3</sup> )   | 2.08   | 2.09    | 1.92   |



|                 |                         |
|-----------------|-------------------------|
| Densidad Máxima | 2.10 gr/cm <sup>3</sup> |
| Humedad Optima  | 5.61 %                  |

Est. Omar Perez Aramayo  
Carrera de Ing. Civil

Ing Ricardo Arce Avendaño  
RESP. LAB. SUELOS



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LABORATORIO DE SUELOS

## GRANULOMETRÍA

### ISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

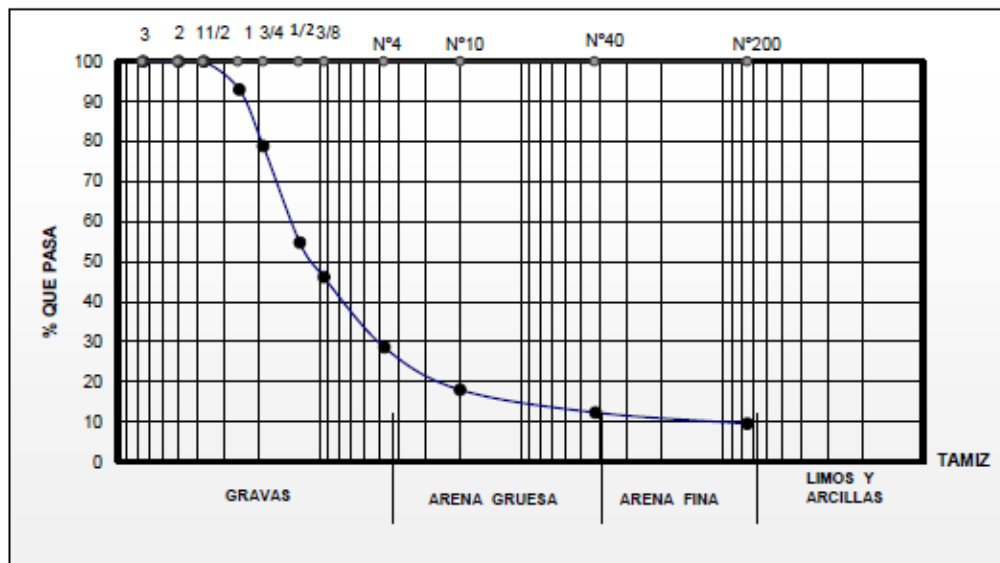
Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 0+500

Fecha: 12/11/2018

| Peso Total (gr.) |             |                | 1000           | A.S.T.M. |                      |
|------------------|-------------|----------------|----------------|----------|----------------------|
| Tamices          | Tamaño (mm) | Peso Ret. (gr) | Ret. Acum (gr) | % Ret    | % Que Pasa del Total |
| 3"               | 75          | 0.00           | 0.00           | 0.00     | 100.00               |
| 2"               | 50          | 0.00           | 0.00           | 0.00     | 100.00               |
| 1 1/2"           | 37.50       | 0.00           | 0.00           | 0.00     | 100.00               |
| 1"               | 25.00       | 70.40          | 70.40          | 7.04     | 92.96                |
| 3/4"             | 19.00       | 140.70         | 211.10         | 21.11    | 78.89                |
| 1/2"             | 12.50       | 241.30         | 452.40         | 45.24    | 54.76                |
| 3/8"             | 9.50        | 86.30          | 538.70         | 53.87    | 46.13                |
| Nº4              | 4.75        | 175.40         | 714.10         | 71.41    | 28.59                |
| Nº10             | 2.00        | 105.90         | 820.00         | 82.00    | 18.00                |
| Nº40             | 0.425       | 56.90          | 876.90         | 87.69    | 12.31                |
| Nº200            | 0.075       | 27.90          | 904.80         | 90.48    | 9.52                 |
| TOTAL=           |             | 904.80         |                |          |                      |



Est. Omar Perez Aramayo  
Carrera de Ing. Civil

Ing. Ricardo Arce Avendaño  
RESP. LAB. SUELOS



UNIVERSIDAD AUTÓNOMA "JUAN MISAEL SARACHO"  
FACULTAD DE CIENCIAS Y TECNOLOGÍA  
CARRERA DE INGENIERÍA CIVIL  
LABORATORIO DE SUELOS

## LIMITES DE ATTERBERG

### ENFOQUE DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

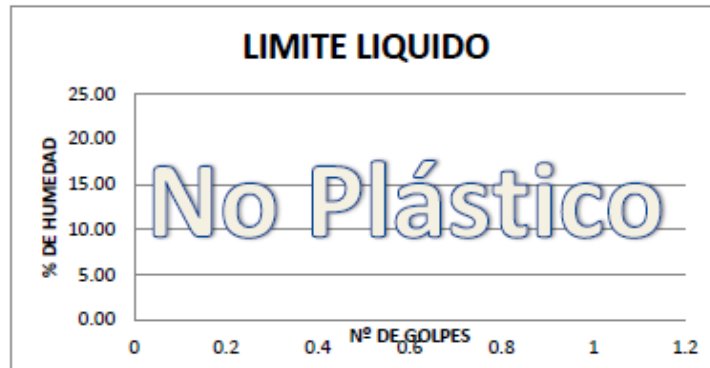
Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 0+500

Fecha: 12/11/2018

| Cápsula N°             | 1 | 2 | 3 | 4 |
|------------------------|---|---|---|---|
| N° de golpes           |   |   |   |   |
| Suelo Húmedo + Cápsula |   |   |   |   |
| Suelo Seco + Cápsula   |   |   |   |   |
| Peso del agua          |   |   |   |   |
| Peso de la Cápsula     |   |   |   |   |
| Peso Suelo seco        |   |   |   |   |
| Porcentaje de Humedad  |   |   |   |   |



#### Determinación de Límite Plástico

| Cápsula                        | 1 | 2 | 3 |
|--------------------------------|---|---|---|
| Peso de suelo húmedo + Cápsula |   |   |   |
| Peso de suelo seco + Cápsula   |   |   |   |
| Peso de cápsula                |   |   |   |
| Peso de suelo seco             |   |   |   |
| Peso del agua                  |   |   |   |
| Contenido de humedad           |   |   |   |

|                            |      |
|----------------------------|------|
| Límite Líquido (LL)        | 0.00 |
| Límite Plástico (LP)       | 0.00 |
| Índice de plasticidad (IP) | 0.00 |
| Índice de Grupo (IG)       | 0.00 |

Est. Omar Perez Aramayo  
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LABORATORIO DE SUELOS

## COMPACTACION

### DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

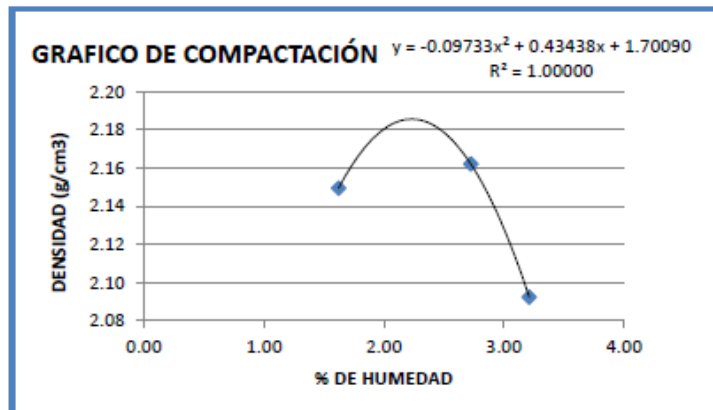
Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 0+500

Fecha: 12/11/2018

|                |                 |                 |
|----------------|-----------------|-----------------|
| Muestra: Única | Volumen: 2335.0 | cm <sup>3</sup> |
|----------------|-----------------|-----------------|

|                                             |        |        |        |
|---------------------------------------------|--------|--------|--------|
| N° de capas                                 | 5      | 5      | 5      |
| N° de golpes por capa                       | 56     | 56     | 56     |
| Peso suelo húmedo + molde                   | 19368  | 19498  | 19270  |
| Peso del molde                              | 14246  | 14290  | 14206  |
| Peso suelo húmedo                           | 5122   | 5208   | 5064   |
| Volumén de la muestra                       | 2345.0 | 2345.0 | 2345.0 |
| Densidad suelo húmedo (gr/cm <sup>3</sup> ) | 2.18   | 2.22   | 2.16   |
| Cápsula N°                                  | 1      | 2      | 3      |
| Peso suelo húmedo + capsula                 | 341.8  | 312    | 440.2  |
| Peso suelo seco + cápsula                   | 337.00 | 305.00 | 428.00 |
| Peso del agua                               | 4.8    | 7      | 12.2   |
| Peso de la cápsula                          | 41     | 48     | 48     |
| Peso suelo seco                             | 296    | 257    | 380    |
| Contenido de humedad (%h)                   | 1.62   | 2.72   | 3.21   |
| Densidad suelo seco (gr/cm <sup>3</sup> )   | 2.15   | 2.16   | 2.09   |



|                 |                         |
|-----------------|-------------------------|
| Densidad Máxima | 2.19 gr/cm <sup>3</sup> |
| Humedad Optima  | 2.23 %                  |

Est. Omar Perez Aramayo  
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## UNIVERSIDAD AUTÓNOMA "JUAN MISAEL SARACHO"

## FACULTAD DE CIENCIAS Y TECNOLOGÍA

## CARRERA DE INGENIERÍA CIVIL

## LABORATORIO DE SUELOS

## CALIFORNIA BEARING RATIO (CBR)

|                                                                                 |         |    |    |           |         |        |
|---------------------------------------------------------------------------------|---------|----|----|-----------|---------|--------|
| DISEÑO DE INGENIERÍA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE | Muestra | LL | IP | Clasific. | H. Opt. | D. Max |
| Laboratoristas: Est. Omar Perez Aramayo                                         | 1       | 33 | 10 | A-1-b(0)  | 2.23    | 2.19   |

## CONTENIDO DE HUMEDAD Y PESO UNITARIO

| Nº capas                 | 5              |         |         | 5              |         |         | 5              |         |          |
|--------------------------|----------------|---------|---------|----------------|---------|---------|----------------|---------|----------|
| Nº golpes por capa       | 12             |         |         | 25             |         |         | 56             |         |          |
| CONDICION DE MUESTRA     | Antes de mojar | D. de M |         | Antes de mojar | D. de M |         | Antes de mojar | D. de M |          |
| Peso muestra húm. +molde | 18568.0        | 18676.0 |         | 18516.0        | 18560.0 |         | 18534.0        | 18564.0 |          |
| Peso Molde               | 13906.0        | 13906.0 |         | 13646.0        | 13646.0 |         | 13628.0        | 13628.0 |          |
| Peso muestra húmeda      | 4662           | 4770    |         | 4870           | 4914    |         | 4906           | 4936    |          |
| Volumen de la muestra    | 2335           | 2335    |         | 2335           | 2535    |         | 2314           | 2314    |          |
| Peso Unit. Muestra Húm.  | 1.997          | 2.043   |         | 2.086          | 1.938   |         | 2.120          | 2.133   |          |
| MUESTRA DE HUMEDAD       | Fondo          | Superf. | 2º sup. | Fondo          | Superf. | 2º sup. | Fondo          | Superf. | 2º sup.  |
| Tara Nº                  | 1              | 2       | 3       | 1              | 2       | 3       | 1              | 2       | 3        |
| Peso muestra húm + tara  | 179.4          | 0       | 163.9   | 244.4          | 0       | 193.6   | 225.7          | 0       | 241      |
| Peso muestra seca + tara | 164            | 0       | 156.1   | 220            | 0       | 169.1   | 205            | 0       | 213.1    |
| Peso del agua            | 15.4           | 0       | 7.8     | 24.4           | 0       | 24.5    | 20.7           | 0       | 27.9     |
| Peso de tara             | 48.8           | 0       | 48.7    | 48.3           | 0       | 47.1    | 47.9           | 0       | 48.1     |
| Peso de la muestra seca  | 115.2          | 0       | 107.4   | 171.7          | 0       | 122     | 157.1          | 0       | 165      |
| Contenido humedad %      | 13.368         |         | 7.26257 | 14.2108        |         | 20.082  | 13.1763        |         | 16.90909 |
| Promedio cont. Humedad   | 13.37          |         | 7.26257 | 14.21          |         | 20.082  | 13.18          |         | 16.90909 |
| Peso Unit muestra seca   | 1.761          |         | 1.90451 | 1.826          |         | 1.614   | 1.873          |         | 1.824583 |

| Hum.<br>Opt.<br>% | Peso<br>Unit.<br>gr/cm3 |
|-------------------|-------------------------|
| 2.23              | 2.19                    |

## EXPANSION

| FECHA  | HORA  | TIEMPO<br>EN<br>DIAS | MOLDE Nº 12 |           |         | MOLDE Nº 25 |           |         | MOLDE Nº 56 |           |          |
|--------|-------|----------------------|-------------|-----------|---------|-------------|-----------|---------|-------------|-----------|----------|
|        |       |                      | LECT.       | EXPANSION |         | LECT.       | EXPANSION |         | LECT.       | EXPANSION |          |
|        |       |                      | EXTENS.     | CM.       | %       | EXTENS.     | CM.       | %       | EXTENS.     | CM.       | %        |
| 14-may | 10:50 | 1                    | 0           | 0         | 0       | 0           | 0         | 0       | 0           | 0         | 0        |
| 15-may | 10:30 | 2                    | 9           | 0.9       | 5.06187 | 12          | 1.2       | 6.74916 | 10          | 1         | 5.624297 |
| 16-may | 11:00 | 3                    | 15          | 1.5       | 8.43645 | 23          | 2.3       | 12.9359 | 19          | 1.9       | 10.68616 |
| 18-may | 08:00 | 4                    | 17          | 1.7       | 9.5613  | 32          | 3.2       | 17.9978 | 24          | 2.4       | 13.49831 |

| C.B.R.<br>% | Peso<br>Unit.<br>gr/cm3 |
|-------------|-------------------------|
| 13.8        | 1.761                   |
| 16.5        | 1.826                   |
| 20.3        | 1.873                   |

## C.B.R.

| PENETRACION |       | CARGA<br>NORMAL | MOLDE Nº 1   |        |               |      | MOLDE Nº 25  |        |               |      | MOLDE Nº 3   |        |               |      |
|-------------|-------|-----------------|--------------|--------|---------------|------|--------------|--------|---------------|------|--------------|--------|---------------|------|
|             |       |                 | CARGA ENSAYO |        | C.B.R. CORREG |      | CARGA ENSAYO |        | C.B.R. CORREG |      | CARGA ENSAYO |        | C.B.R. CORREG |      |
| Pulg.       | mm    | Kg              | Kg           | Kg/cm2 | Kg            | %    | Kg           | Kg/cm2 | Kg            | %    | Kg           | Kg/cm2 | Kg            | %    |
| 0           | 0     |                 | 15.7         | 0      |               |      | 15.7         | 0      |               |      | 15.7         | 0      |               |      |
| 0.025       | 0.63  |                 | 128.8        | 6.7    |               |      | 162.7        | 8.4    |               |      | 210.2        | 10.9   |               |      |
| 0.05        | 1.27  |                 | 151.4        | 7.8    |               |      | 187.6        | 9.7    |               |      | 237.4        | 12.3   |               |      |
| 0.075       | 1.9   |                 | 162.7        | 8.4    |               |      | 203.4        | 10.5   |               |      | 253.2        | 13.1   |               |      |
| 0.1         | 2.54  | 1360            | 187.6        | 9.7    |               | 13.8 | 223.8        | 11.6   |               | 16.5 | 275.8        | 14.3   |               | 20.3 |
| 0.2         | 5.08  | 2040            | 226.0        | 11.7   |               | 11.1 | 262.2        | 13.5   |               | 12.9 | 312.0        | 16.1   |               | 15.3 |
| 0.3         | 7.62  |                 | 214.7        | 11.1   |               |      | 257.7        | 13.3   |               |      | 307.5        | 15.9   |               |      |
| 0.4         | 10.16 |                 | 235.1        | 12.1   |               |      | 273.5        | 14.1   |               |      | 312.0        | 16.1   |               |      |
| 0.5         | 12.7  |                 | 250.9        | 13.0   |               |      | 284.9        | 14.7   |               |      | 336.9        | 17.4   |               |      |



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LABORATORIO DE SUELOS

## GRANULOMETRÍA

### ISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

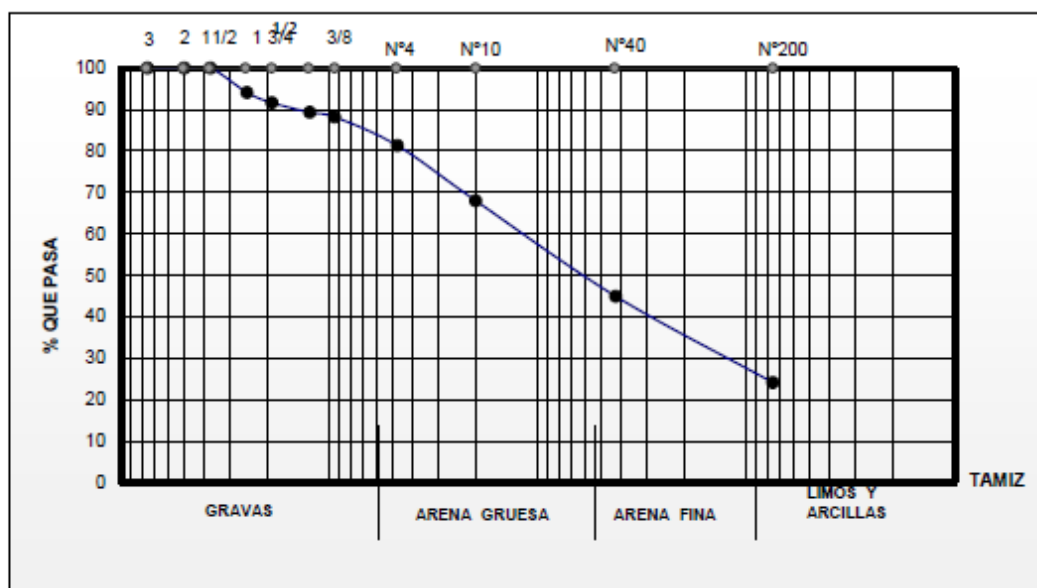
Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 3+000

Fecha: 12/11/2018

| Peso Total (gr.) |             |                | 500            | A.S.T.M. |                      |
|------------------|-------------|----------------|----------------|----------|----------------------|
| Tamices          | Tamaño (mm) | Peso Ret. (gr) | Ret. Acum (gr) | % Ret    | % Que Pasa del Total |
| 3"               | 75          | 0.00           | 0.00           | 0.00     | 100.00               |
| 2"               | 50          | 0.00           | 0.00           | 0.00     | 100.00               |
| 1 1/2"           | 37.50       | 0.00           | 0.00           | 0.00     | 100.00               |
| 1"               | 25.00       | 29.40          | 29.40          | 5.88     | 94.12                |
| 3/4"             | 19.00       | 12.40          | 41.80          | 8.36     | 91.64                |
| 1/2"             | 12.50       | 11.60          | 53.40          | 10.68    | 89.32                |
| 3/8"             | 9.50        | 5.60           | 59.00          | 11.80    | 88.20                |
| Nº4              | 4.75        | 34.50          | 93.50          | 18.70    | 81.30                |
| Nº10             | 2.00        | 66.40          | 159.90         | 31.98    | 68.02                |
| Nº40             | 0.425       | 115.50         | 275.40         | 55.08    | 44.92                |
| Nº200            | 0.075       | 104.00         | 379.40         | 75.88    | 24.12                |

TOTAL= 379.40



Est. Omar Perez Aramayo  
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Ing. Ricardo Arce Avendaño  
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CARRERA DE INGENIERIA CIVIL  
LABORATORIO DE SUELOS

## HUMEDAD NATURAL Y CLASIFICACION

### DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 3+000

Fecha: 12/11/2018

| HUMEDAD NATURAL                |      |       |        |
|--------------------------------|------|-------|--------|
| Cápsula                        | 1    | 2     | 3      |
| Peso de suelo húmedo + Cápsula | 102  | 102.5 | 102.40 |
| Peso de suelo seco + Cápsula   | 100  | 101   | 100.00 |
| Peso de cápsula                | 44.7 | 44.2  | 43.90  |
| Peso de suelo seco             | 55.3 | 56.8  | 56.1   |
| Peso del agua                  | 2    | 1.5   | 2.4    |
| Contenido de humedad           | 3.62 | 2.64  | 4.28   |
| PROMEDIO                       | 3.51 |       |        |

| CLASIFICACIÓN DEL SUELO |          | DESCRIPCIÓN                    |
|-------------------------|----------|--------------------------------|
| SUCS:                   | GC       | Suelo Gravoso con poca arcilla |
| AASHTO:                 | A-1-b(0) |                                |

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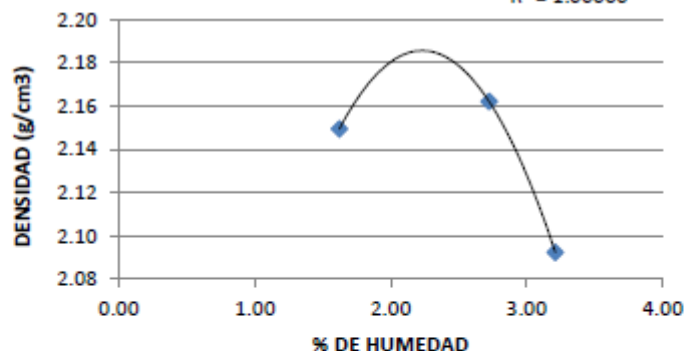
## COMPACTACION

|                                                                                        |                                         |
|----------------------------------------------------------------------------------------|-----------------------------------------|
| <b>DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE</b> |                                         |
| Procedencia: San Jacinto - Tolomosa Grande                                             | Laboratoristas: Est. Omar Perez Aramayo |
| Identificación: Progresiva 3+000                                                       | Fecha: 12/11/2018                       |

|                |          |        |                 |
|----------------|----------|--------|-----------------|
| Muestra: Única | Volumen: | 2335.0 | cm <sup>3</sup> |
|----------------|----------|--------|-----------------|

|                                             |        |        |        |
|---------------------------------------------|--------|--------|--------|
| Nº de capas                                 | 5      | 5      | 5      |
| Nº de golpes por capa                       | 56     | 56     | 56     |
| Peso suelo húmedo + molde                   | 19368  | 19498  | 19270  |
| Peso del molde                              | 14246  | 14290  | 14206  |
| Peso suelo húmedo                           | 5122   | 5208   | 5064   |
| Volumén de la muestra                       | 2345.0 | 2345.0 | 2345.0 |
| Densidad suelo húmedo (gr/cm <sup>3</sup> ) | 2.18   | 2.22   | 2.16   |
| Cápsula Nº                                  | 1      | 2      | 3      |
| Peso suelo húmedo + capsula                 | 341.8  | 312    | 440.2  |
| Peso suelo seco + cápsula                   | 337.00 | 305.00 | 428.00 |
| Peso del agua                               | 4.8    | 7      | 12.2   |
| Peso de la cápsula                          | 41     | 48     | 48     |
| Peso suelo seco                             | 296    | 257    | 380    |
| Contenido de humedad (%h)                   | 1.62   | 2.72   | 3.21   |
| Densidad suelo seco (gr/cm <sup>3</sup> )   | 2.15   | 2.16   | 2.09   |

**GRAFICO DE COMPACTACIÓN**  $y = -0.09733x^2 + 0.43438x + 1.70090$   
 $R^2 = 1.00000$



|                 |                         |
|-----------------|-------------------------|
| Densidad Máxima | 2.19 gr/cm <sup>3</sup> |
| Humedad Óptima  | 2.23 %                  |

Est. Omar Perez Aramayo  
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LABORATORIO DE SUELOS

## CALIFORNIA BEARING RATIO (CBR)

|                                                                                 |         |    |    |           |         |        |
|---------------------------------------------------------------------------------|---------|----|----|-----------|---------|--------|
| DISEÑO DE INGENIERÍA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE | Muestra | LL | IP | Clasific. | H. Opt. | D. Max |
| Laboratoristas: Est. Omar Perez Aramayo                                         | 1       | 33 | 10 | A-1-b(0)  | 2.23    | 2.19   |

### CONTENIDO DE HUMEDAD Y PESO UNITARIO

| Nº capas                 | 5              |         |         | 5              |         |         | 5              |         |          |
|--------------------------|----------------|---------|---------|----------------|---------|---------|----------------|---------|----------|
| Nº golpes por capa       | 12             |         |         | 25             |         |         | 56             |         |          |
| CONDICION DE MUESTRA     | Antes de mojar |         | D. de M | Antes de mojar |         | D. de M | Antes de mojar |         | D. de M  |
| Peso muestra hum.+molde  | 18568.0        | 18676.0 |         | 18516.0        | 18560.0 |         | 18534.0        | 18564.0 |          |
| Peso Molde               | 13906.0        | 13906.0 |         | 13646.0        | 13646.0 |         | 13628.0        | 13628.0 |          |
| Peso muestra húmeda      | 4662           | 4770    |         | 4870           | 4914    |         | 4906           | 4936    |          |
| Volumen de la muestra    | 2335           | 2335    |         | 2335           | 2535    |         | 2314           | 2314    |          |
| Peso Unit. Muestra Húm.  | 1.997          | 2.043   |         | 2.086          | 1.938   |         | 2.120          | 2.133   |          |
| MUESTRA DE HUMEDAD       | Fondo          | Superf. | 2º sup. | Fondo          | Superf. | 2º sup. | Fondo          | Superf. | 2º sup.  |
| Tara Nº                  | 1              | 2       | 3       | 1              | 2       | 3       | 1              | 2       | 3        |
| Peso muestra hum + tara  | 179.4          | 0       | 163.9   | 244.4          | 0       | 193.6   | 225.7          | 0       | 241      |
| Peso muestra seca + tara | 164            | 0       | 156.1   | 220            | 0       | 169.1   | 205            | 0       | 213.1    |
| Peso del agua            | 15.4           | 0       | 7.8     | 24.4           | 0       | 24.5    | 20.7           | 0       | 27.9     |
| Peso de tara             | 48.8           | 0       | 48.7    | 48.3           | 0       | 47.1    | 47.9           | 0       | 48.1     |
| Peso de la muestra seca  | 115.2          | 0       | 107.4   | 171.7          | 0       | 122     | 157.1          | 0       | 165      |
| Contenido humedad %      | 13.368         |         | 7.26257 | 14.2108        |         | 20.082  | 13.1763        |         | 16.90909 |
| Promedio cont. Humedad   | 13.37          |         | 7.26257 | 14.21          |         | 20.082  | 13.18          |         | 16.90909 |
| Peso Unit.muestra seca   | 1.761          |         | 1.90451 | 1.826          |         | 1.614   | 1.873          |         | 1.824583 |

| Hum. | Peso   |
|------|--------|
| Opt. | Unit.  |
| %    | gr/cm³ |
| 2.23 | 2.19   |

### EXPANSION

| FECHA  | HORA  | TIEMPO<br>EN<br>DIAS | MOLDE Nº 12 |     |                | MOLDE Nº 25 |     |                | MOLDE Nº 56 |     |                |
|--------|-------|----------------------|-------------|-----|----------------|-------------|-----|----------------|-------------|-----|----------------|
|        |       |                      | LECT.       |     | EXPANSION<br>% | LECT.       |     | EXPANSION<br>% | LECT.       |     | EXPANSION<br>% |
|        |       |                      | EXTENS.     | CM. |                | EXTENS.     | CM. |                | EXTENS.     | CM. |                |
| 14-may | 10:50 | 1                    | 0           | 0   | 0              | 0           | 0   | 0              | 0           | 0   | 0              |
| 15-may | 10:30 | 2                    | 9           | 0.9 | 5.06187        | 12          | 1.2 | 6.74916        | 10          | 1   | 5.624297       |
| 16-may | 11:00 | 3                    | 15          | 1.5 | 8.43645        | 23          | 2.3 | 12.9359        | 19          | 1.9 | 10.68616       |
| 18-may | 08:00 | 4                    | 17          | 1.7 | 9.5613         | 32          | 3.2 | 17.9978        | 24          | 2.4 | 13.49831       |

| C.B.R. | Peso   |
|--------|--------|
| %      | Unit.  |
|        | gr/cm³ |
| 13.8   | 1.761  |
| 16.5   | 1.826  |
| 20.3   | 1.873  |

### C.B.R.

| PENETRACION |       | CARGA<br>NORMAL | MOLDE Nº 1   |        |                |   | MOLDE Nº 25  |        |                |   | MOLDE Nº 3   |        |                |   |
|-------------|-------|-----------------|--------------|--------|----------------|---|--------------|--------|----------------|---|--------------|--------|----------------|---|
|             |       |                 | CARGA ENSAYO |        | C.B.R. CORREG. |   | CARGA ENSAYO |        | C.B.R. CORREG. |   | CARGA ENSAYO |        | C.B.R. CORREG. |   |
| Pulg.       | mm    | Kg              | Kg           | Kg/cm² | Kg             | % | Kg           | Kg/cm² | Kg             | % | Kg           | Kg/cm² | Kg             | % |
| 0           | 0     |                 | 15.7         | 0      |                |   | 15.7         | 0      |                |   | 15.7         | 0      |                |   |
| 0.025       | 0.63  |                 | 128.8        | 6.7    |                |   | 162.7        | 8.4    |                |   | 210.2        | 10.9   |                |   |
| 0.05        | 1.27  |                 | 151.4        | 7.8    |                |   | 187.6        | 9.7    |                |   | 237.4        | 12.3   |                |   |
| 0.075       | 1.9   |                 | 162.7        | 8.4    |                |   | 203.4        | 10.5   |                |   | 253.2        | 13.1   |                |   |
| 0.1         | 2.54  | 1360            | 187.6        | 9.7    | 13.8           |   | 223.8        | 11.6   | 16.5           |   | 275.8        | 14.3   | 20.3           |   |
| 0.2         | 5.08  | 2040            | 226.0        | 11.7   | 11.1           |   | 262.2        | 13.5   | 12.9           |   | 312.0        | 16.1   | 15.3           |   |
| 0.3         | 7.62  |                 | 214.7        | 11.1   |                |   | 257.7        | 13.3   |                |   | 307.5        | 15.9   |                |   |
| 0.4         | 10.16 |                 | 235.1        | 12.1   |                |   | 273.5        | 14.1   |                |   | 312.0        | 16.1   |                |   |
| 0.5         | 12.7  |                 | 250.9        | 13.0   |                |   | 284.9        | 14.7   |                |   | 336.9        | 17.4   |                |   |



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LABORATORIO DE SUELOS

## GRANULOMETRÍA

### DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

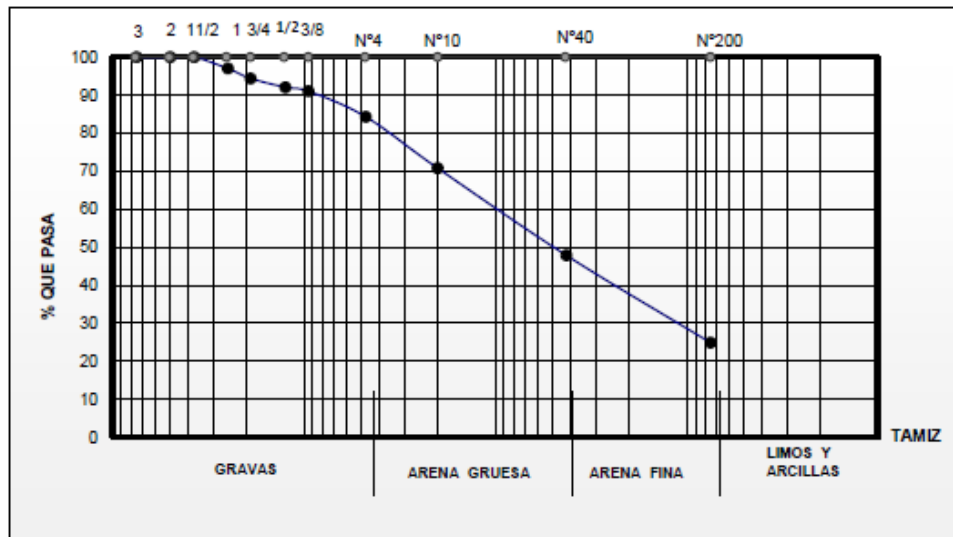
Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 6+114

Fecha: 12/11/2018

| Peso Total (gr.) |             |                | 500            | A.S.T.M. |                      |
|------------------|-------------|----------------|----------------|----------|----------------------|
| Tamices          | Tamaño (mm) | Peso Ret. (gr) | Ret. Acum (gr) | % Ret    | % Que Pasa del Total |
| 3"               | 75          | 0.00           | 0.00           | 0.00     | 100.00               |
| 2"               | 50          | 0.00           | 0.00           | 0.00     | 100.00               |
| 1 1/2"           | 37.50       | 0.00           | 0.00           | 0.00     | 100.00               |
| 1"               | 25.00       | 15.00          | 15.00          | 3.00     | 97.00                |
| 3/4"             | 19.00       | 13.00          | 28.00          | 5.60     | 94.40                |
| 1/2"             | 12.50       | 11.60          | 39.60          | 7.92     | 92.08                |
| 3/8"             | 9.50        | 5.10           | 44.70          | 8.94     | 91.06                |
| Nº4              | 4.75        | 33.80          | 78.50          | 15.70    | 84.30                |
| Nº10             | 2.00        | 67.50          | 146.00         | 29.20    | 70.80                |
| Nº40             | 0.425       | 114.70         | 260.70         | 52.14    | 47.86                |
| Nº200            | 0.075       | 114.80         | 375.50         | 75.10    | 24.90                |
| TOTAL=           |             | 375.50         |                |          |                      |



Est. Omar Perez Aramayo  
Carrera de Ing. Civil

Ing. Ricardo Arce Avendaño  
RESP. LAB. SUELOS



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## LIMITES DE ATTERBERG

### PROYECTO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

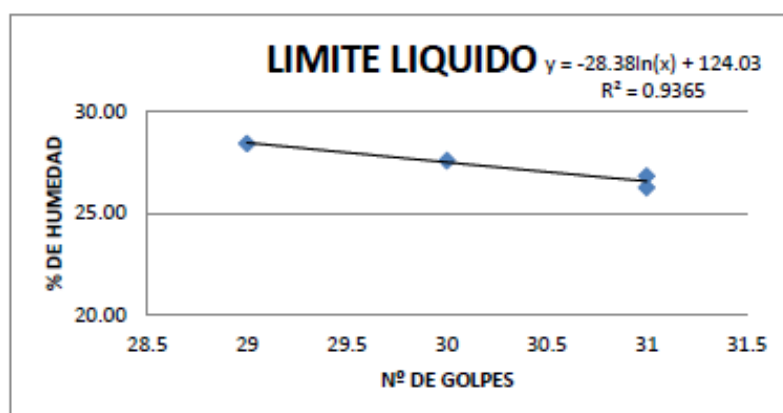
Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 6+114

Fecha: 12/11/2018

| Cápsula N°             | 1     | 2     | 3     | 4     |
|------------------------|-------|-------|-------|-------|
| N° de golpes           | 31    | 29    | 30    | 31    |
| Suelo Húmedo + Cápsula | 41.00 | 41.60 | 41.60 | 59.90 |
| Suelo Seco + Cápsula   | 37    | 37.3  | 37.4  | 56.8  |
| Peso del agua          | 4.00  | 4.30  | 4.20  | 3.10  |
| Peso de la Cápsula     | 22.09 | 22.17 | 22.18 | 45    |
| Peso Suelo seco        | 14.91 | 15.13 | 15.22 | 11.8  |
| Porcentaje de Humedad  | 26.83 | 28.42 | 27.60 | 26.27 |



### Determinación de Límite Plástico

| Cápsula                        | 1     | 2     | 3     |
|--------------------------------|-------|-------|-------|
| Peso de suelo húmedo + Cápsula | 48.00 | 47.80 | 48.00 |
| Peso de suelo seco + Cápsula   | 46.00 | 45.80 | 46.00 |
| Peso de cápsula                | 37.00 | 37.00 | 37.50 |
| Peso de suelo seco             | 9.00  | 8.80  | 8.50  |
| Peso del agua                  | 2.00  | 2.00  | 2.00  |
| Contenido de humedad           | 22.22 | 22.73 | 23.53 |

|                            |
|----------------------------|
| Límite Líquido (LL)        |
| 32.68                      |
| Límite Plástico (LP)       |
| 22.83                      |
| Índice de plasticidad (IP) |
| 9.85                       |
| Índice de Grupo (IG)       |
| 0.00                       |

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## HUMEDAD NATURAL Y CLASIFICACIÓN

### DISEÑO DE INGENIERÍA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Est. Omar Perez Aramayo

Identificación: Progresiva 6+114

Fecha: 12/11/2018

| HUMEDAD NATURAL                |       |       |        |
|--------------------------------|-------|-------|--------|
| Cápsula                        | 1     | 2     | 3      |
| Peso de suelo húmedo + Cápsula | 105.3 | 104.1 | 104.90 |
| Peso de suelo seco + Cápsula   | 102   | 102.5 | 103.00 |
| Peso de cápsula                | 44.7  | 44.2  | 43.90  |
| Peso de suelo seco             | 57.3  | 58.3  | 59.1   |
| Peso del agua                  | 3.3   | 1.6   | 1.9    |
| Contenido de humedad           | 5.76  | 2.74  | 3.21   |
| PROMEDIO                       | 3.91  |       |        |

| CLASIFICACIÓN DEL SUELO |          | DESCRIPCIÓN                    |
|-------------------------|----------|--------------------------------|
| SUCS:                   | GC       | Suelo gravoso con arena gruesa |
| AASHTO:                 | A-1-b(0) |                                |

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## COMPACTACION

### DISEÑO DE INGENIERIA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE

Procedencia: San Jacinto - Tolomosa Grande

Laboratoristas: Est. Omar Perez Aramayo

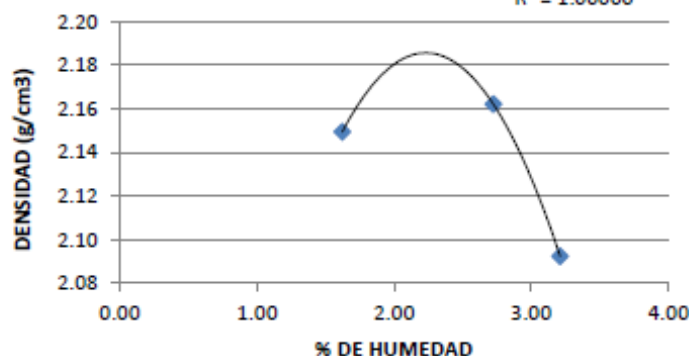
Identificación: Progresiva 6+114

Fecha: 12/11/2018

|                |          |        |                 |
|----------------|----------|--------|-----------------|
| Muestra: Única | Volumen: | 2335.0 | cm <sup>3</sup> |
|----------------|----------|--------|-----------------|

|                                             |        |        |        |
|---------------------------------------------|--------|--------|--------|
| N° de capas                                 | 5      | 5      | 5      |
| N° de golpes por capa                       | 56     | 56     | 56     |
| Peso suelo húmedo + molde                   | 19368  | 19498  | 19270  |
| Peso del molde                              | 14246  | 14290  | 14206  |
| Peso suelo húmedo                           | 5122   | 5208   | 5064   |
| Volumén de la muestra                       | 2345.0 | 2345.0 | 2345.0 |
| Densidad suelo húmedo (gr/cm <sup>3</sup> ) | 2.18   | 2.22   | 2.16   |
| Cápsula N°                                  | 1      | 2      | 3      |
| Peso suelo húmedo + capsula                 | 341.8  | 312    | 440.2  |
| Peso suelo seco + cápsula                   | 337.00 | 305.00 | 428.00 |
| Peso del agua                               | 4.8    | 7      | 12.2   |
| Peso de la cápsula                          | 41     | 48     | 48     |
| Peso suelo seco                             | 296    | 257    | 380    |
| Contenido de humedad (%h)                   | 1.62   | 2.72   | 3.21   |
| Densidad suelo seco (gr/cm <sup>3</sup> )   | 2.15   | 2.16   | 2.09   |

**GRAFICO DE COMPACTACIÓN**  $y = -0.09733x^2 + 0.43438x + 1.70090$   
 $R^2 = 1.00000$



|                 |                         |
|-----------------|-------------------------|
| Densidad Máxima | 2.19 gr/cm <sup>3</sup> |
| Humedad Optima  | 2.23 %                  |

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**LABORATORIO DE SUELOS**

## CALIFORNIA BEARING RATIO (CBR)

|                                                                                 |         |    |    |           |         |        |
|---------------------------------------------------------------------------------|---------|----|----|-----------|---------|--------|
| DISEÑO DE INGENIERÍA MEJORAMIENTO DE CAMINO TRAMO SAN JACINTO - TOLOMOSA GRANDE | Muestra | LL | IP | Clasific. | H. Opt. | D. Max |
| Laboratoristas: Est. Omar Perez Aramayo                                         | 1       | 33 | 10 | A-1-b(0)  | 2.23    | 2.19   |

### CONTENIDO DE HUMEDAD Y PESO UNITARIO

| Nº capas                 | 5                |         |         | 5                |         |         | 5                |         |          |
|--------------------------|------------------|---------|---------|------------------|---------|---------|------------------|---------|----------|
| Nº golpes por capa       | 12               |         |         | 25               |         |         | 56               |         |          |
| CONDICION DE MUESTRA     | Antes de mojarse |         | D. de M | Antes de mojarse |         | D. de M | Antes de mojarse |         | D. de M  |
| Peso muestra hum.+molde  | 18568.0          | 18676.0 |         | 18516.0          | 18560.0 |         | 18534.0          | 18564.0 |          |
| Peso Molde               | 13906.0          | 13906.0 |         | 13646.0          | 13646.0 |         | 13628.0          | 13628.0 |          |
| Peso muestra húmeda      | 4662             | 4770    |         | 4870             | 4914    |         | 4906             | 4936    |          |
| Volumen de la muestra    | 2335             | 2335    |         | 2335             | 2535    |         | 2314             | 2314    |          |
| Peso Unit. Muestra Húm.  | 1.997            | 2.043   |         | 2.086            | 1.938   |         | 2.120            | 2.133   |          |
| MUESTRA DE HUMEDAD       | Fondo            |         | Superf. | Fondo            |         | Superf. | Fondo            |         | Superf.  |
| Tara Nº                  | 1                | 2       | 3       | 1                | 2       | 3       | 1                | 2       | 3        |
| Peso muestra hum + tara  | 179.4            | 0       | 163.9   | 244.4            | 0       | 193.6   | 225.7            | 0       | 241      |
| Peso muestra seca + tara | 164              | 0       | 156.1   | 220              | 0       | 169.1   | 205              | 0       | 213.1    |
| Peso del agua            | 15.4             | 0       | 7.8     | 24.4             | 0       | 24.5    | 20.7             | 0       | 27.9     |
| Peso de tara             | 48.8             | 0       | 48.7    | 48.3             | 0       | 47.1    | 47.9             | 0       | 48.1     |
| Peso de la muestra seca  | 115.2            | 0       | 107.4   | 171.7            | 0       | 122     | 157.1            | 0       | 165      |
| Contenido humedad %      | 13.368           |         | 7.26257 | 14.2108          |         | 20.082  | 13.1763          |         | 16.90909 |
| Promedio cont. Humedad   | 13.37            |         | 7.26257 | 14.21            |         | 20.082  | 13.18            |         | 16.90909 |
| Peso Unit.muestra seca   | 1.761            |         | 1.90451 | 1.826            |         | 1.614   | 1.873            |         | 1.824583 |

| Hum. | Peso   |
|------|--------|
| Opt. | Unit.  |
| %    | gr/cm³ |
| 2.23 | 2.19   |

### EXPANSION

| FECHA  | HORA  | TIEMPO<br>EN<br>DIAS | MOLDE Nº 12 |     |           | MOLDE Nº 25 |     |           | MOLDE Nº 56 |     |           |
|--------|-------|----------------------|-------------|-----|-----------|-------------|-----|-----------|-------------|-----|-----------|
|        |       |                      | LECT.       |     | EXPANSION | LECT.       |     | EXPANSION | LECT.       |     | EXPANSION |
|        |       |                      | EXTENS.     | CM. | %         | EXTENS.     | CM. | %         | EXTENS.     | CM. | %         |
| 14-may | 10:50 | 1                    | 0           | 0   | 0         | 0           | 0   | 0         | 0           | 0   | 0         |
| 15-may | 10:30 | 2                    | 9           | 0.9 | 5.06187   | 12          | 1.2 | 6.74916   | 10          | 1   | 5.624297  |
| 16-may | 11:00 | 3                    | 15          | 1.5 | 8.43645   | 23          | 2.3 | 12.9359   | 19          | 1.9 | 10.68616  |
| 18-may | 08:00 | 4                    | 17          | 1.7 | 9.5613    | 32          | 3.2 | 17.9978   | 24          | 2.4 | 13.49831  |

| C.B.R. | Peso   |
|--------|--------|
| %      | Unit.  |
|        | gr/cm³ |
| 13.8   | 1.761  |
| 16.5   | 1.826  |
| 20.3   | 1.873  |

### C.B.R.

| PENETRACION |       | CARGA<br>NORMAL | MOLDE Nº 1   |        |                |   | MOLDE Nº 25  |        |                |   | MOLDE Nº 3   |        |                |   |
|-------------|-------|-----------------|--------------|--------|----------------|---|--------------|--------|----------------|---|--------------|--------|----------------|---|
|             |       |                 | CARGA ENSAYO |        | C.B.R. CORREG. |   | CARGA ENSAYO |        | C.B.R. CORREG. |   | CARGA ENSAYO |        | C.B.R. CORREG. |   |
| Pulg.       | mm    | Kg              | Kg           | Kg/cm² | Kg             | % | Kg           | Kg/cm² | Kg             | % | Kg           | Kg/cm² | Kg             | % |
| 0           | 0     |                 | 15.7         | 0      |                |   | 15.7         | 0      |                |   | 15.7         | 0      |                |   |
| 0.025       | 0.63  |                 | 128.8        | 6.7    |                |   | 162.7        | 8.4    |                |   | 210.2        | 10.9   |                |   |
| 0.05        | 1.27  |                 | 151.4        | 7.8    |                |   | 187.6        | 9.7    |                |   | 237.4        | 12.3   |                |   |
| 0.075       | 1.9   |                 | 162.7        | 8.4    |                |   | 203.4        | 10.5   |                |   | 253.2        | 13.1   |                |   |
| 0.1         | 2.54  | 1360            | 187.6        | 9.7    | 13.8           |   | 223.8        | 11.6   | 16.5           |   | 275.8        | 14.3   | 20.3           |   |
| 0.2         | 5.08  | 2040            | 226.0        | 11.7   | 11.1           |   | 262.2        | 13.5   | 12.9           |   | 312.0        | 16.1   | 15.3           |   |
| 0.3         | 7.62  |                 | 214.7        | 11.1   |                |   | 257.7        | 13.3   |                |   | 307.5        | 15.9   |                |   |
| 0.4         | 10.16 |                 | 235.1        | 12.1   |                |   | 273.5        | 14.1   |                |   | 312.0        | 16.1   |                |   |
| 0.5         | 12.7  |                 | 250.9        | 13.0   |                |   | 284.9        | 14.7   |                |   | 336.9        | 17.4   |                |   |

## ANÁLISIS DE TRÁFICO

### Trafico promedio horario

| Ubicación del aforo : camino San Jacinto – Tolomosa grande     |                  |            |          |            |           |          |           |
|----------------------------------------------------------------|------------------|------------|----------|------------|-----------|----------|-----------|
| dia : Martes 5 de Junio del 2018 inicio 4:00 am final 10:00 pm |                  |            |          |            |           |          |           |
| Hora                                                           | Tipo de vehículo | Cantidades |          | Totales    |           |          |           |
|                                                                |                  | Ingresando | Saliendo | Ingresando |           | Saliendo |           |
|                                                                |                  |            |          | %          | vehículos | %        | vehículos |
| 04: 00<br>05:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 05: 00<br>06:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 06: 00<br>07:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 07: 00<br>08:00                                                | Livianos         | 3          | 2        | 70.0       | 4         | 100.0    | 2         |
|                                                                | Medianos         | 1          | 0        | 30.0       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 08:00<br>09:00                                                 | Livianos         | 3          | 4        | 0.0        | 3         | 0.0      | 6         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 1        | 0.0        |           | 33.3     |           |
| 09:00<br>10:00                                                 | Livianos         | 4          | 3        | 0.0        | 4         | 66.7     | 4         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 10:00<br>11:00                                                 | Livianos         | 3          | 2        | 0.0        | 4         | 0.0      | 4         |
|                                                                | Medianos         | 1          | 2        | 100.0      |           | 100.0    |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 11:00<br>12:00                                                 | Livianos         | 4          | 0        | 100.0      | 4         | 33.3     | 1         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 12:00<br>13:00                                                 | Livianos         | 4          | 1        | 60.0       | 5         | 0.0      | 2         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 100.0    |           |
|                                                                | Pesados          | 1          | 0        | 20.0       |           | 0.0      |           |
| 13:00<br>14:00                                                 | Livianos         | 4          | 3        | 66.7       | 5         | 50.0     | 3         |
|                                                                | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 14:00<br>15:00                                                 | Livianos         | 3          | 2        | 100.0      | 3         | 100.0    | 2         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 15:00<br>16:00                                                 | Livianos         | 5          | 3        | 66.7       | 6         | 0.0      | 3         |
|                                                                | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 16:00<br>17:00                                                 | Livianos         | 3          | 4        | 100.0      | 3         | 60.0     | 5         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 1        | 0.0        |           | 20.0     |           |
| 17:00<br>18:00                                                 | Livianos         | 3          | 5        | 0.0        | 3         | 71.4     | 7         |
|                                                                | Medianos         | 0          | 2        | 0.0        |           | 28.6     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 18:00<br>19:00                                                 | Livianos         | 2          | 5        | 100.0      | 2         | 71.4     | 7         |
|                                                                | Medianos         | 0          | 2        | 0.0        |           | 28.6     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 19: 00<br>20:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 19: 00<br>20:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 20: 00<br>21:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |

|                 |          |    |    |     |   |     |   |
|-----------------|----------|----|----|-----|---|-----|---|
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| 21: 00<br>22:00 | Livianos | 0  | 0  | 0.0 | 0 | 0.0 | 0 |
|                 | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| Total           | Livianos | 41 | 34 | 75  |   |     |   |
|                 | Medianos | 4  | 10 | 14  |   |     |   |
|                 | Pesados  | 1  | 2  | 3   |   |     |   |

| Ubicación del aforo : camino San Jacinto – Tolomosa grande      |                     |            |          |            |           |          |           |
|-----------------------------------------------------------------|---------------------|------------|----------|------------|-----------|----------|-----------|
| dia : Viernes 8 de Junio del 2018 inicio 4:00 am final 10:00 pm |                     |            |          |            |           |          |           |
|                                                                 |                     | Cantidades |          | Totales    |           |          |           |
| Hora                                                            | Tipo de<br>vehículo | Ingresando | Saliendo | Ingresando |           | Saliendo |           |
|                                                                 |                     |            |          | %          | vehículos | %        | vehículos |
| 04: 00<br>05:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 05: 00<br>06:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 06: 00<br>07:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 07: 00<br>08:00                                                 | Livianos            | 3          | 2        | 70.0       | 4         | 100.0    | 2         |
|                                                                 | Medianos            | 1          | 0        | 30.0       |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 08:00<br>09:00                                                  | Livianos            | 3          | 4        | 0.0        | 3         | 0.0      | 5         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 33.3     |           |
|                                                                 | Pesados             | 0          | 1        | 0.0        |           | 33.3     |           |
| 09:00<br>10:00                                                  | Livianos            | 4          | 3        | 0.0        | 4         | 66.7     | 4         |
|                                                                 | Medianos            | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 10:00<br>11:00                                                  | Livianos            | 3          | 2        | 0.0        | 4         | 0.0      | 4         |
|                                                                 | Medianos            | 1          | 2        | 100.0      |           | 100.0    |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 11:00<br>12:00                                                  | Livianos            | 4          | 0        | 100.0      | 4         | 33.3     | 1         |
|                                                                 | Medianos            | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 12:00<br>13:00                                                  | Livianos            | 4          | 1        | 60.0       | 5         | 0.0      | 2         |
|                                                                 | Medianos            | 0          | 1        | 0.0        |           | 100.0    |           |
|                                                                 | Pesados             | 1          | 0        | 20.0       |           | 0.0      |           |
| 13:00<br>14:00                                                  | Livianos            | 4          | 3        | 66.7       | 5         | 50.0     | 3         |
|                                                                 | Medianos            | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 14:00<br>15:00                                                  | Livianos            | 3          | 2        | 100.0      | 3         | 100.0    | 2         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 15:00<br>16:00                                                  | Livianos            | 5          | 3        | 66.7       | 6         | 0.0      | 3         |
|                                                                 | Medianos            | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 16:00<br>17:00                                                  | Livianos            | 3          | 4        | 100.0      | 3         | 60.0     | 5         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 1        | 0.0        |           | 20.0     |           |
| 17:00<br>18:00                                                  | Livianos            | 3          | 5        | 0.0        | 3         | 71.4     | 7         |
|                                                                 | Medianos            | 0          | 2        | 0.0        |           | 28.6     |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 18:00<br>19:00                                                  | Livianos            | 2          | 5        | 100.0      | 2         | 71.4     | 7         |
|                                                                 | Medianos            | 0          | 2        | 0.0        |           | 28.6     |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 19: 00<br>20:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 19: 00<br>20:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 19: 00                                                          | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |

|                 |          |    |    |     |   |     |   |
|-----------------|----------|----|----|-----|---|-----|---|
| 20:00           | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| 20: 00<br>21:00 | Livianos | 0  | 0  | 0.0 | 0 | 0.0 | 0 |
|                 | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| 21: 00<br>22:00 | Livianos | 0  | 0  | 0.0 | 0 | 0.0 | 0 |
|                 | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| Total           | Livianos | 42 | 35 | 77  |   |     |   |
|                 | Medianos | 5  | 8  | 13  |   |     |   |
|                 | Pesados  | 2  | 3  | 5   |   |     |   |

| Ubicación del aforo : camino San Jacinto – Tolomosa grande     |                  |            |          |            |           |          |           |
|----------------------------------------------------------------|------------------|------------|----------|------------|-----------|----------|-----------|
| dia : Sabado 9 de Junio del 2018 inicio 4:00 am final 10:00 pm |                  |            |          |            |           |          |           |
|                                                                |                  | Cantidades |          | Totales    |           |          |           |
| Hora                                                           | Tipo de vehiculo | Ingresando | Saliendo | Ingresando |           | Saliendo |           |
|                                                                |                  |            |          | %          | vehículos | %        | vehículos |
| 04: 00<br>05:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 05: 00<br>06:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 06: 00<br>07:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 07: 00<br>08:00                                                | Livianos         | 3          | 2        | 70.0       | 4         | 100.0    | 2         |
|                                                                | Medianos         | 1          | 0        | 30.0       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 08:00<br>09:00                                                 | Livianos         | 3          | 4        | 0.0        | 3         | 0.0      | 5         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                |                  |            |          |            |           |          |           |
| 09:00<br>10:00                                                 | Livianos         | 4          | 3        | 0.0        | 4         | 66.7     | 4         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 10:00<br>11:00                                                 | Livianos         | 3          | 2        | 0.0        | 4         | 0.0      | 4         |
|                                                                | Medianos         | 1          | 2        | 100.0      |           | 100.0    |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 11:00<br>12:00                                                 | Livianos         | 4          | 0        | 100.0      | 4         | 33.3     | 1         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 12:00<br>13:00                                                 | Livianos         | 4          | 1        | 60.0       | 5         | 0.0      | 2         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 100.0    |           |
|                                                                | Pesados          | 1          | 0        | 20.0       |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 13:00<br>14:00                                                 | Livianos         | 4          | 3        | 66.7       | 5         | 50.0     | 3         |
|                                                                | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 14:00<br>15:00                                                 | Livianos         | 3          | 2        | 100.0      | 3         | 100.0    | 2         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 15:00<br>16:00                                                 | Livianos         | 5          | 3        | 66.7       | 6         | 0.0      | 3         |
|                                                                | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 16:00<br>17:00                                                 | Livianos         | 3          | 4        | 100.0      | 3         | 60.0     | 5         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 1        | 0.0        |           | 20.0     |           |
|                                                                |                  |            |          |            |           |          |           |
| 17:00<br>18:00                                                 | Livianos         | 3          | 5        | 0.0        | 3         | 71.4     | 7         |
|                                                                | Medianos         | 0          | 2        | 0.0        |           | 28.6     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 18:00<br>19:00                                                 | Livianos         | 2          | 5        | 100.0      | 2         | 71.4     | 7         |
|                                                                | Medianos         | 0          | 2        | 0.0        |           | 28.6     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |
| 19: 00<br>20:00                                                | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                |                  |            |          |            |           |          |           |

|                 |          |    |    |     |   |     |   |
|-----------------|----------|----|----|-----|---|-----|---|
| 19: 00<br>20:00 | Livianos | 0  | 0  | 0.0 | 0 | 0.0 | 0 |
|                 | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| 19: 00<br>20:00 | Livianos | 0  | 0  | 0.0 | 0 | 0.0 | 0 |
|                 | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| 20: 00<br>21:00 | Livianos | 0  | 0  | 0.0 | 0 | 0.0 | 0 |
|                 | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| 21: 00<br>22:00 | Livianos | 0  | 0  | 0.0 | 0 | 0.0 | 0 |
|                 | Medianos | 0  | 0  | 0.0 |   | 0.0 |   |
|                 | Pesados  | 0  | 0  | 0.0 |   | 0.0 |   |
| Total           | Livianos | 41 | 44 | 85  |   |     |   |
|                 | Medianos | 7  | 10 | 17  |   |     |   |
|                 | Pesados  | 0  | 2  | 2   |   |     |   |

| Ubicación del aforo : camino San Jacinto – Tolomosa grande         |                  |            |          |            |           |          |           |
|--------------------------------------------------------------------|------------------|------------|----------|------------|-----------|----------|-----------|
| día : miércoles 13 de Junio del 2018 inicio 4:00 am final 10:00 pm |                  |            |          |            |           |          |           |
| Hora                                                               | Tipo de vehículo | Cantidades |          | Totales    |           |          |           |
|                                                                    |                  | Ingresando | Saliendo | Ingresando |           | Saliendo |           |
|                                                                    |                  |            |          | %          | vehículos | %        | vehículos |
| 04: 00<br>05:00                                                    | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                    | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 05: 00<br>06:00                                                    | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                    | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 06: 00<br>07:00                                                    | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                    | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 07: 00<br>08:00                                                    | Livianos         | 3          | 2        | 70.0       | 4         | 100.0    | 2         |
|                                                                    | Medianos         | 1          | 0        | 30.0       |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 08:00<br>09:00                                                     | Livianos         | 3          | 4        | 0.0        | 3         | 0.0      | 5         |
|                                                                    | Medianos         | 0          | 0        | 0.0        |           | 33.3     |           |
|                                                                    | Pesados          | 0          | 1        | 0.0        |           | 33.3     |           |
| 09:00<br>10:00                                                     | Livianos         | 4          | 3        | 0.0        | 4         | 66.7     | 4         |
|                                                                    | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 10:00<br>11:00                                                     | Livianos         | 3          | 2        | 0.0        | 4         | 0.0      | 4         |
|                                                                    | Medianos         | 1          | 2        | 100.0      |           | 100.0    |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 11:00<br>12:00                                                     | Livianos         | 4          | 0        | 100.0      | 4         | 33.3     | 1         |
|                                                                    | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 12:00<br>13:00                                                     | Livianos         | 4          | 1        | 60.0       | 5         | 0.0      | 2         |
|                                                                    | Medianos         | 0          | 1        | 0.0        |           | 100.0    |           |
|                                                                    | Pesados          | 1          | 0        | 20.0       |           | 0.0      |           |
| 13:00<br>14:00                                                     | Livianos         | 4          | 3        | 66.7       | 5         | 50.0     | 3         |
|                                                                    | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 14:00<br>15:00                                                     | Livianos         | 3          | 2        | 100.0      | 3         | 100.0    | 2         |
|                                                                    | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 15:00<br>16:00                                                     | Livianos         | 5          | 3        | 66.7       | 6         | 0.0      | 3         |
|                                                                    | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 16:00<br>17:00                                                     | Livianos         | 3          | 4        | 100.0      | 3         | 60.0     | 5         |
|                                                                    | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                    | Pesados          | 0          | 1        | 0.0        |           | 20.0     |           |
| 17:00<br>18:00                                                     | Livianos         | 3          | 5        | 0.0        | 3         | 71.4     | 7         |
|                                                                    | Medianos         | 0          | 2        | 0.0        |           | 28.6     |           |
|                                                                    | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 18:00<br>19:00                                                     | Livianos         | 2          | 5        | 100.0      | 2         | 71.4     | 7         |
|                                                                    | Medianos         | 0          | 2        | 0.0        |           | 28.6     |           |

|                 |                 |           |           |           |   |     |   |
|-----------------|-----------------|-----------|-----------|-----------|---|-----|---|
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0 |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0 | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0 |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0 | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0 |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0 | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0 |   |
| 20: 00<br>21:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0 | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0 |   |
| 21: 00<br>22:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0 | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0 |   |
| <b>Total</b>    | <b>Livianos</b> | <b>41</b> | <b>38</b> | <b>73</b> |   |     |   |
|                 | <b>Medianos</b> | <b>4</b>  | <b>9</b>  | <b>13</b> |   |     |   |
|                 | <b>Pesados</b>  | <b>1</b>  | <b>2</b>  | <b>3</b>  |   |     |   |

| Ubicación del aforo : camino San Jacinto – Tolomosa grande    |                  |            |          |            |           |          |           |
|---------------------------------------------------------------|------------------|------------|----------|------------|-----------|----------|-----------|
| día : lunes 21 de enero de 2019 inicio 4:00 am final 10:00 pm |                  |            |          |            |           |          |           |
| Hora                                                          | Tipo de vehículo | Cantidades |          | Totales    |           |          |           |
|                                                               |                  | Ingresando | Saliendo | Ingresando |           | Saliendo |           |
|                                                               |                  |            |          | %          | vehículos | %        | vehículos |
| 04: 00<br>05:00                                               | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                               | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 05: 00<br>06:00                                               | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                               | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 06: 00<br>07:00                                               | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                               | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 07: 00<br>08:00                                               | Livianos         | 3          | 2        | 70.0       | 4         | 100.0    | 2         |
|                                                               | Medianos         | 1          | 0        | 30.0       |           | 0.0      |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 08:00<br>09:00                                                | Livianos         | 3          | 4        | 0.0        | 3         | 0.0      | 5         |
|                                                               | Medianos         | 0          | 0        | 0.0        |           | 33.3     |           |
|                                                               | Pesados          | 0          | 1        | 0.0        |           | 33.3     |           |
| 09:00<br>10:00                                                | Livianos         | 4          | 3        | 0.0        | 4         | 66.7     | 4         |
|                                                               | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 10:00<br>11:00                                                | Livianos         | 3          | 2        | 0.0        | 4         | 0.0      | 4         |
|                                                               | Medianos         | 1          | 2        | 100.0      |           | 100.0    |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 11:00<br>12:00                                                | Livianos         | 4          | 0        | 100.0      | 4         | 33.3     | 1         |
|                                                               | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 12:00<br>13:00                                                | Livianos         | 4          | 1        | 60.0       | 5         | 0.0      | 2         |
|                                                               | Medianos         | 0          | 1        | 0.0        |           | 100.0    |           |
|                                                               | Pesados          | 1          | 0        | 20.0       |           | 0.0      |           |
| 13:00<br>14:00                                                | Livianos         | 4          | 3        | 66.7       | 5         | 50.0     | 3         |
|                                                               | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 14:00<br>15:00                                                | Livianos         | 3          | 2        | 100.0      | 3         | 100.0    | 2         |
|                                                               | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 15:00<br>16:00                                                | Livianos         | 5          | 3        | 66.7       | 6         | 0.0      | 3         |
|                                                               | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                               | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 16:00<br>17:00                                                | Livianos         | 3          | 4        | 100.0      | 3         | 60.0     | 5         |
|                                                               | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                               | Pesados          | 0          | 1        | 0.0        |           | 20.0     |           |
| 17:00                                                         | Livianos         | 3          | 5        | 0.0        | 3         | 71.4     | 7         |

|                 |          |    |    |       |   |      |   |
|-----------------|----------|----|----|-------|---|------|---|
| 18:00           | Medianos | 0  | 2  | 0.0   |   | 28.6 |   |
|                 | Pesados  | 0  | 0  | 0.0   |   | 0.0  |   |
| 18:00<br>19:00  | Livianos | 2  | 5  | 100.0 | 2 | 71.4 | 7 |
|                 | Medianos | 0  | 2  | 0.0   |   | 28.6 |   |
|                 | Pesados  | 0  | 0  | 0.0   |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos | 0  | 0  | 0.0   | 0 | 0.0  | 0 |
|                 | Medianos | 0  | 0  | 0.0   |   | 0.0  |   |
|                 | Pesados  | 0  | 0  | 0.0   |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos | 0  | 0  | 0.0   | 0 | 0.0  | 0 |
|                 | Medianos | 0  | 0  | 0.0   |   | 0.0  |   |
|                 | Pesados  | 0  | 0  | 0.0   |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos | 0  | 0  | 0.0   | 0 | 0.0  | 0 |
|                 | Medianos | 0  | 0  | 0.0   |   | 0.0  |   |
|                 | Pesados  | 0  | 0  | 0.0   |   | 0.0  |   |
| 20: 00<br>21:00 | Livianos | 0  | 0  | 0.0   | 0 | 0.0  | 0 |
|                 | Medianos | 0  | 0  | 0.0   |   | 0.0  |   |
|                 | Pesados  | 0  | 0  | 0.0   |   | 0.0  |   |
| 21: 00<br>22:00 | Livianos | 0  | 0  | 0.0   | 0 | 0.0  | 0 |
|                 | Medianos | 0  | 0  | 0.0   |   | 0.0  |   |
|                 | Pesados  | 0  | 0  | 0.0   |   | 0.0  |   |
| Total           | Livianos | 50 | 40 | 90    |   |      |   |
|                 | Medianos | 4  | 10 | 14    |   |      |   |
|                 | Pesados  | 1  | 2  | 3     |   |      |   |

| Ubicación del aforo : camino San Jacinto – Tolomosa grande     |                  |            |          |            |           |          |           |
|----------------------------------------------------------------|------------------|------------|----------|------------|-----------|----------|-----------|
| día : jueves 24 de enero de 2019 inicio 4:00 am final 10:00 pm |                  |            |          |            |           |          |           |
| Hora                                                           | Tipo de vehículo | Cantidades |          | Totales    |           |          |           |
|                                                                |                  | Ingresando | Saliendo | Ingresando |           | Saliendo |           |
|                                                                |                  |            |          | %          | vehículos | %        | vehículos |
| 04:00<br>05:00                                                 | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 05:00<br>06:00                                                 | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 06:00<br>07:00                                                 | Livianos         | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                | Medianos         | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 07:00<br>08:00                                                 | Livianos         | 3          | 2        | 70.0       | 4         | 100.0    | 2         |
|                                                                | Medianos         | 1          | 0        | 30.0       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 08:00<br>09:00                                                 | Livianos         | 3          | 4        | 0.0        | 3         | 0.0      | 5         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 1        | 0.0        |           | 33.3     |           |
| 09:00<br>10:00                                                 | Livianos         | 4          | 3        | 0.0        | 4         | 66.7     | 4         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 10:00<br>11:00                                                 | Livianos         | 3          | 2        | 0.0        | 4         | 0.0      | 4         |
|                                                                | Medianos         | 1          | 2        | 100.0      |           | 100.0    |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 11:00<br>12:00                                                 | Livianos         | 4          | 0        | 100.0      | 4         | 33.3     | 1         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 12:00<br>13:00                                                 | Livianos         | 4          | 1        | 60.0       | 5         | 0.0      | 2         |
|                                                                | Medianos         | 0          | 1        | 0.0        |           | 100.0    |           |
|                                                                | Pesados          | 1          | 0        | 20.0       |           | 0.0      |           |
| 13:00<br>14:00                                                 | Livianos         | 4          | 3        | 66.7       | 5         | 50.0     | 3         |
|                                                                | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 14:00<br>15:00                                                 | Livianos         | 3          | 2        | 100.0      | 3         | 100.0    | 2         |
|                                                                | Medianos         | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |
| 15:00<br>16:00                                                 | Livianos         | 5          | 3        | 66.7       | 6         | 0.0      | 3         |
|                                                                | Medianos         | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                | Pesados          | 0          | 0        | 0.0        |           | 0.0      |           |

|                 |                 |           |           |           |   |      |   |
|-----------------|-----------------|-----------|-----------|-----------|---|------|---|
| 16:00<br>17:00  | Livianos        | 3         | 4         | 100.0     | 3 | 60.0 | 5 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 1         | 0.0       |   | 20.0 |   |
| 17:00<br>18:00  | Livianos        | 3         | 5         | 0.0       | 3 | 71.4 | 7 |
|                 | Medianos        | 0         | 2         | 0.0       |   | 28.6 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 18:00<br>19:00  | Livianos        | 2         | 5         | 100.0     | 2 | 71.4 | 7 |
|                 | Medianos        | 0         | 2         | 0.0       |   | 28.6 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 20: 00<br>21:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 21: 00<br>22:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| <b>Total</b>    | <b>Livianos</b> | <b>45</b> | <b>36</b> | <b>81</b> |   |      |   |
|                 | <b>Medianos</b> | <b>5</b>  | <b>10</b> | <b>15</b> |   |      |   |
|                 | <b>Pesados</b>  | <b>1</b>  | <b>2</b>  | <b>3</b>  |   |      |   |

| Ubicación del aforo : camino San Jacinto – Tolomosa grande      |                     |            |          |            |           |          |           |
|-----------------------------------------------------------------|---------------------|------------|----------|------------|-----------|----------|-----------|
| dia : domingo 27 de enero de 2019 inicio 4:00 am final 10:00 pm |                     |            |          |            |           |          |           |
| Hora                                                            | Tipo de<br>vehículo | Cantidades |          | Totales    |           |          |           |
|                                                                 |                     | Ingresando | Saliendo | Ingresando |           | Saliendo |           |
|                                                                 |                     |            |          | %          | vehículos | %        | vehículos |
| 04: 00<br>05:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 05: 00<br>06:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 06: 00<br>07:00                                                 | Livianos            | 0          | 0        | 0.0        | 0         | 0.0      | 0         |
|                                                                 | Medianos            | 0          | 0        | 100.0      |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 07: 00<br>08:00                                                 | Livianos            | 3          | 2        | 70.0       | 4         | 100.0    | 2         |
|                                                                 | Medianos            | 1          | 0        | 30.0       |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 08:00<br>09:00                                                  | Livianos            | 3          | 4        | 0.0        | 3         | 0.0      | 5         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 33.3     |           |
|                                                                 | Pesados             | 0          | 1        | 0.0        |           | 33.3     |           |
| 09:00<br>10:00                                                  | Livianos            | 4          | 3        | 0.0        | 4         | 66.7     | 4         |
|                                                                 | Medianos            | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 10:00<br>11:00                                                  | Livianos            | 3          | 2        | 0.0        | 4         | 0.0      | 4         |
|                                                                 | Medianos            | 1          | 2        | 100.0      |           | 100.0    |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 11:00<br>12:00                                                  | Livianos            | 4          | 0        | 100.0      | 4         | 33.3     | 1         |
|                                                                 | Medianos            | 0          | 1        | 0.0        |           | 33.3     |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 12:00<br>13:00                                                  | Livianos            | 4          | 1        | 60.0       | 5         | 0.0      | 2         |
|                                                                 | Medianos            | 0          | 1        | 0.0        |           | 100.0    |           |
|                                                                 | Pesados             | 1          | 0        | 20.0       |           | 0.0      |           |
| 13:00<br>14:00                                                  | Livianos            | 4          | 3        | 66.7       | 5         | 50.0     | 3         |
|                                                                 | Medianos            | 1          | 0        | 16.7       |           | 0.0      |           |
|                                                                 | Pesados             | 0          | 0        | 0.0        |           | 0.0      |           |
| 14:00<br>15:00                                                  | Livianos            | 3          | 2        | 100.0      | 3         | 100.0    | 2         |
|                                                                 | Medianos            | 0          | 0        | 0.0        |           | 0.0      |           |

|                 |                 |           |           |           |   |      |   |
|-----------------|-----------------|-----------|-----------|-----------|---|------|---|
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 15:00<br>16:00  | Livianos        | 5         | 3         | 66.7      | 6 | 0.0  | 3 |
|                 | Medianos        | 1         | 0         | 16.7      |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 16:00<br>17:00  | Livianos        | 3         | 4         | 100.0     | 3 | 60.0 | 5 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 1         | 0.0       |   | 20.0 |   |
| 17:00<br>18:00  | Livianos        | 3         | 5         | 0.0       | 3 | 71.4 | 7 |
|                 | Medianos        | 0         | 2         | 0.0       |   | 28.6 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 18:00<br>19:00  | Livianos        | 2         | 5         | 100.0     | 2 | 71.4 | 7 |
|                 | Medianos        | 0         | 2         | 0.0       |   | 28.6 |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 19: 00<br>20:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 20: 00<br>21:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| 21: 00<br>22:00 | Livianos        | 0         | 0         | 0.0       | 0 | 0.0  | 0 |
|                 | Medianos        | 0         | 0         | 0.0       |   | 0.0  |   |
|                 | Pesados         | 0         | 0         | 0.0       |   | 0.0  |   |
| <b>Total</b>    | <b>Livianos</b> | <b>41</b> | <b>38</b> | <b>79</b> |   |      |   |
|                 | <b>Medianos</b> | <b>4</b>  | <b>9</b>  | <b>13</b> |   |      |   |
|                 | <b>Pesados</b>  | <b>1</b>  | <b>2</b>  | <b>3</b>  |   |      |   |

## Trafico promedio

Realizando un resumen de los datos obtenidos en los aforos realizados obtenemos un valor para el transito promedio diario para el camino del cual es realizado el estudio correspondiente.

## Resumen de datos

| Descripción         | Vehiculo | Ingresando | Saliendo | Total |
|---------------------|----------|------------|----------|-------|
| 05 de junio de 2018 | Livianos | 41         | 34       | 75    |
|                     | Medianos | 4          | 10       | 14    |
|                     | Pesados  | 1          | 2        | 3     |
| 08 de junio de 2018 | Livianos | 42         | 35       | 77    |
|                     | Medianos | 5          | 8        | 13    |
|                     | Pesados  | 2          | 3        | 5     |
| 09 de junio de 2018 | Livianos | 41         | 44       | 85    |
|                     | Medianos | 7          | 10       | 17    |
|                     | Pesados  | 0          | 2        | 2     |
| 13 de junio de 2018 | Livianos | 41         | 38       | 79    |
|                     | Medianos | 4          | 9        | 13    |

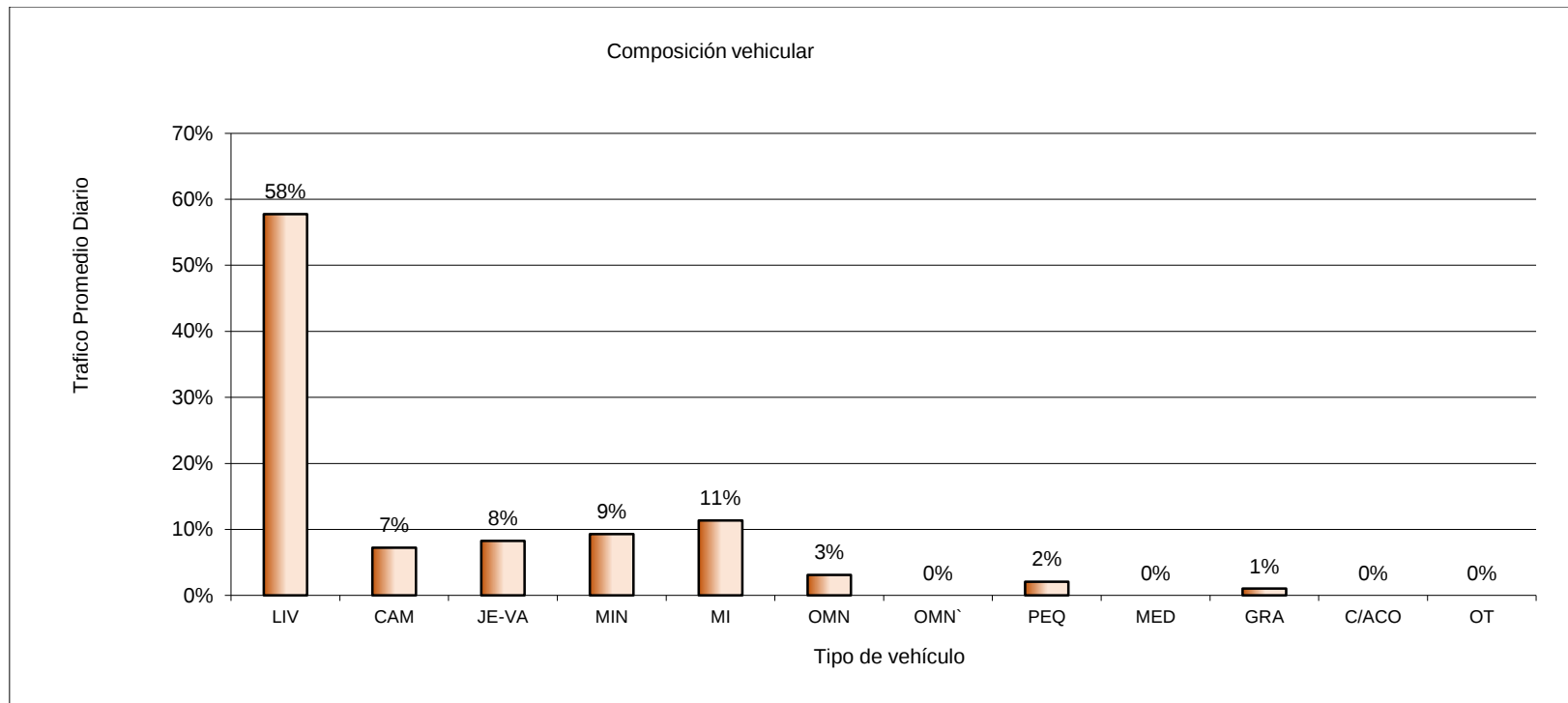
|                                        |                       |           |           |           |
|----------------------------------------|-----------------------|-----------|-----------|-----------|
|                                        | Pesados               | 1         | 2         | 3         |
| 21 de enero de 2019                    | Livianos              | 42        | 35        | 77        |
|                                        | Medianos              | 5         | 8         | 13        |
|                                        | Pesados               | 2         | 3         | 5         |
| 24 de enero de 2019                    | Livianos              | 41        | 44        | 85        |
|                                        | Medianos              | 7         | 10        | 17        |
|                                        | Pesados               | 0         | 2         | 2         |
| 27 de enero de 2019                    | Livianos              | 41        | 38        | 79        |
|                                        | Medianos              | 4         | 9         | 13        |
|                                        | Pesados               | 1         | 2         | 3         |
| <b>Promedio</b>                        | <b>Livianos</b>       | <b>41</b> | <b>38</b> | <b>80</b> |
|                                        | <b>Medianos</b>       | <b>5</b>  | <b>9</b>  | <b>14</b> |
|                                        | <b>Pesados</b>        | <b>1</b>  | <b>2</b>  | <b>3</b>  |
| <b>Transito promedio diario (tpd):</b> |                       |           |           | <b>96</b> |
| <b>Porcentajes</b>                     | Livianos (menor a 3t) |           |           | 82.29%    |
|                                        | Medianos (3T - 6T)    |           |           | 14.58%    |
|                                        | Pesados (6T - 8.2T)   |           |           | 3.12%     |

Tabla Nro.: Estudio de TPDA, Ambas direcciones

| Dia             | Mes | Hora  | Livianos    |            |               |         | Medianos |           |          | Pesados |             |        |            | Otros | Total |    |      |
|-----------------|-----|-------|-------------|------------|---------------|---------|----------|-----------|----------|---------|-------------|--------|------------|-------|-------|----|------|
|                 |     |       | Automóviles | Camionetas | Jeep-<br>Vag. | Minibus | Micro    | Omnibus   | Omnibus  | Peq     | Med         | Grande | C/acoplado |       |       |    |      |
|                 |     |       |             |            |               |         | 22 As.   | 23-35 As. | ≥ 36 As. | < 6 T   | 6T a < 10 T | ≥ 10 T |            |       |       |    |      |
| Promedio 7 Días |     | 4     | 0           | 0          | 0             | 0       | 0        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 0     |    |      |
|                 |     | 5     | 0           | 0          | 0             | 0       | 0        | 0         | 0        | 1       | 0           | 0      | 0          | 0     | 1     |    |      |
|                 |     | 6     | 2           | 2          | 0             | 0       | 1        | 0         | 0        | 0       | 0           | 1      | 0          | 0     | 6     |    |      |
|                 |     | 7     | 2           | 1          | 0             | 1       | 0        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 4     |    |      |
|                 |     | 8     | 3           | 0          | 2             | 0       | 1        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 6     |    |      |
|                 |     | 9     | 4           | 1          | 0             | 1       | 0        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 6     |    |      |
|                 |     | 10    | 4           | 0          | 1             | 1       | 1        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 7     |    |      |
|                 |     | 11    | 4           | 0          | 0             | 0       | 0        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 4     |    |      |
|                 |     | 12    | 3           | 0          | 1             | 1       | 2        | 1         | 0        | 0       | 0           | 0      | 0          | 0     | 8     |    |      |
|                 |     | 13    | 3           | 2          | 0             | 1       | 1        | 0         | 0        | 1       | 0           | 0      | 0          | 0     | 8     |    |      |
|                 |     | 14    | 4           | 0          | 1             | 0       | 0        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 5     |    |      |
|                 |     | 15    | 4           | 0          | 0             | 1       | 2        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 7     |    |      |
|                 |     | 16    | 4           | 0          | 2             | 0       | 0        | 1         | 0        | 0       | 0           | 0      | 0          | 0     | 7     |    |      |
|                 |     | 17    | 4           | 1          | 0             | 0       | 0        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 5     |    |      |
|                 |     | 18    | 4           | 0          | 1             | 1       | 1        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 7     |    |      |
|                 |     | 19    | 4           | 0          | 0             | 0       | 1        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 5     |    |      |
|                 |     | 20    | 4           | 0          | 0             | 0       | 0        | 1         | 0        | 0       | 0           | 0      | 0          | 0     | 5     |    |      |
|                 |     | 21    | 2           | 0          | 0             | 2       | 1        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 5     |    |      |
|                 |     | 22    | 1           | 0          | 0             | 0       | 0        | 0         | 0        | 0       | 0           | 0      | 0          | 0     | 1     |    |      |
|                 |     | Total |             |            | 56            | 7       | 8        | 9         | 11       | 3       | 0           | 2      | 0          | 1     | 0     | 0  | 97   |
|                 |     | %     |             |            | 58%           | 7%      | 8%       | 9%        | 11%      | 3%      | 0%          | 2%     | 0%         | 1%    | 0%    | 0% | 100% |

|        |         |        |       |
|--------|---------|--------|-------|
| 80     | 14      | 3      | 0     |
| 82.47% | 14.43%  | 3.09%  | 0.00% |
| 88.336 | 15.4588 | 3.3126 | 0     |

**Figura Nro. 1: Trafico promedio diario (%)**



Fuente: Elaboración propia

### **Factor de crecimiento por tipo de vehículo**

Para la obtención de índice de crecimiento (IC), se trabajó con datos proporcionados por el INE, como ser la tasa anual de crecimiento poblacional, el parque vehicular, y así promediando estos valores se obtuvo el índice de crecimiento para los vehículos livianos, medianos y pesados. A continuación, también obtenemos el factor de crecimiento y proyectamos los vehículos para los años correspondientes.

**Tabla Nro. 1: Índice de crecimiento (%)**

| <b>Tasa anual de crecimiento poblacional (%)</b> |       |
|--------------------------------------------------|-------|
| Tarija                                           | 10    |
| <b>Parque vehicular (%)</b>                      |       |
| Livianos                                         | 10,53 |
| Medianos                                         | -     |
| Pesados                                          | 7,34  |
| <b>Índice de crecimiento promedio (IC) (%)</b>   |       |
| Livianos                                         | 10.27 |
| Medianos                                         | 8.67  |
| Pesados                                          | 8.67  |

Fuente: INE 2012 y elaboración propia

#### **3.1.1. Periodo de diseño y tráfico generado**

El periodo de diseño del pavimento se tomó para una proyección de 12 años para pavimento flexible con concreto asfáltico (CA) tiempo de vida útil. Por otra parte para las proyecciones de tránsito en la vida útil del proyecto y según la evolución del estudio de tráfico, se consideró tasas de crecimiento tal como se muestra en la siguiente tabla.

**Tabla Nro. 2: Trafico promedio diario proyectado por el factor de crecimiento de cada vehículo tipo**

| Periodo       | Año  | Livianos    |            |           |         | Mediano         |                      |                     | Pesado       |                    |                  |            | Total |
|---------------|------|-------------|------------|-----------|---------|-----------------|----------------------|---------------------|--------------|--------------------|------------------|------------|-------|
|               |      | Automóviles | Camionetas | Jeep-Vag. | Minibus | Micro<br>22 As. | Omnibus<br>23-35 As. | Omnibus<br>≥ 36 As. | Peq<br>< 6 T | Med<br>6T a < 10 T | Grande<br>≥ 10 T | C/acoplado |       |
| 0             | 2018 | 56          | 7          | 8         | 9       | 11              | 3                    | 0                   | 2            | 0                  | 1                | 0          | 97    |
| 1             | 2019 | 62          | 8          | 9         | 10      | 12              | 3                    | 0                   | 2            | 0                  | 1                | 0          | 107   |
| 3             | 2021 | 75          | 9          | 11        | 12      | 14              | 4                    | 0                   | 3            | 0                  | 1                | 0          | 129   |
| 4             | 2022 | 83          | 10         | 12        | 13      | 15              | 4                    | 0                   | 3            | 0                  | 1                | 0          | 141   |
| 5             | 2023 | 91          | 11         | 13        | 15      | 17              | 5                    | 0                   | 3            | 0                  | 2                | 0          | 157   |
| 6             | 2024 | 101         | 13         | 14        | 16      | 18              | 5                    | 0                   | 3            | 0                  | 2                | 0          | 172   |
| 7             | 2025 | 111         | 14         | 16        | 18      | 20              | 5                    | 0                   | 4            | 0                  | 2                | 0          | 190   |
| 8             | 2026 | 122         | 15         | 17        | 20      | 21              | 6                    | 0                   | 4            | 0                  | 2                | 0          | 207   |
| 9             | 2027 | 135         | 17         | 19        | 22      | 23              | 6                    | 0                   | 4            | 0                  | 2                | 0          | 228   |
| 10            | 2028 | 149         | 19         | 21        | 24      | 25              | 7                    | 0                   | 5            | 0                  | 2                | 0          | 252   |
| 11            | 2029 | 164         | 21         | 23        | 26      | 27              | 7                    | 0                   | 5            | 0                  | 2                | 0          | 275   |
| 12            | 2030 | 181         | 23         | 26        | 29      | 30              | 8                    | 0                   | 5            | 0                  | 3                | 0          | 305   |
| 13            | 2031 | 199         | 25         | 28        | 32      | 32              | 9                    | 0                   | 6            | 0                  | 3                | 0          | 334   |
| 14            | 2032 | 220         | 27         | 31        | 35      | 35              | 10                   | 0                   | 6            | 0                  | 3                | 0          | 367   |
| 15            | 2033 | 243         | 30         | 35        | 39      | 38              | 10                   | 0                   | 7            | 0                  | 3                | 0          | 405   |
| 16            | 2034 | 267         | 33         | 38        | 43      | 42              | 11                   | 0                   | 8            | 0                  | 4                | 0          | 446   |
| 17            | 2035 | 295         | 37         | 42        | 47      | 45              | 12                   | 0                   | 8            | 0                  | 4                | 0          | 490   |
| 18            | 2036 | 325         | 41         | 46        | 52      | 49              | 13                   | 0                   | 9            | 0                  | 4                | 0          | 539   |
| 19            | 2037 | 359         | 45         | 51        | 58      | 53              | 15                   | 0                   | 10           | 0                  | 5                | 0          | 596   |
| 20            | 2038 | 395         | 49         | 56        | 64      | 58              | 16                   | 0                   | 11           | 0                  | 5                | 0          | 654   |
| 21            | 2039 | 436         | 54         | 62        | 70      | 63              | 17                   | 0                   | 11           | 0                  | 6                | 0          | 719   |
| 22            | 2040 | 481         | 60         | 69        | 77      | 69              | 19                   | 0                   | 12           | 0                  | 6                | 0          | 793   |
| Total periodo |      | 4618        | 577        | 657       | 742     | 730             | 199                  | 0                   | 133          | 0                  | 65               | 0          | 7721  |

Fuente: Elaboración propia

**Tabla Nro. 3: Tráfico generado al 20% TPD**

| Periodo       | Año  | 20%         | TPDg = Afectamos por un 20 % de trafico generado a cada tipo de vehiculo |           |         |                 |                      |                     |              |                    |                  |            | Total |
|---------------|------|-------------|--------------------------------------------------------------------------|-----------|---------|-----------------|----------------------|---------------------|--------------|--------------------|------------------|------------|-------|
|               |      | Automóviles | Camionetas                                                               | Jeep-Vag. | Minibus | Micro<br>22 As. | Omnibus<br>23-35 As. | Omnibus<br>≥ 36 As. | Peq<br>< 6 T | Med<br>6T a < 10 T | Grande<br>≥ 10 T | C/acoplado |       |
|               | 2018 | 0           | 0                                                                        | 0         | 0       | 0               | 0                    | 0                   | 0            | 0                  | 0                | 0          | 0     |
|               | 2019 | 0           | 0                                                                        | 0         | 0       | 0               | 0                    | 0                   | 0            | 0                  | 0                | 0          | 0     |
|               | 2020 | 0           | 0                                                                        | 0         | 0       | 0               | 0                    | 0                   | 0            | 0                  | 0                | 0          | 0     |
| 1             | 2021 | 15          | 2                                                                        | 2         | 2       | 3               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 26    |
| 2             | 2022 | 17          | 2                                                                        | 2         | 3       | 3               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 29    |
| 3             | 2023 | 18          | 2                                                                        | 3         | 3       | 3               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 31    |
| 4             | 2024 | 20          | 3                                                                        | 3         | 3       | 4               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 35    |
| 5             | 2025 | 22          | 3                                                                        | 3         | 4       | 4               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 38    |
| 6             | 2026 | 24          | 3                                                                        | 3         | 4       | 4               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 40    |
| 7             | 2027 | 27          | 3                                                                        | 4         | 4       | 5               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 45    |
| 8             | 2028 | 30          | 4                                                                        | 4         | 5       | 5               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 50    |
| 9             | 2029 | 33          | 4                                                                        | 5         | 5       | 5               | 1                    | 0                   | 1            | 0                  | 0                | 0          | 54    |
| 10            | 2030 | 36          | 5                                                                        | 5         | 6       | 6               | 2                    | 0                   | 1            | 0                  | 1                | 0          | 62    |
| 11            | 2031 | 40          | 5                                                                        | 6         | 6       | 6               | 2                    | 0                   | 1            | 0                  | 1                | 0          | 67    |
| 12            | 2032 | 44          | 5                                                                        | 6         | 7       | 7               | 2                    | 0                   | 1            | 0                  | 1                | 0          | 73    |
| 13            | 2033 | 49          | 6                                                                        | 7         | 8       | 8               | 2                    | 0                   | 1            | 0                  | 1                | 0          | 82    |
| 14            | 2034 | 53          | 7                                                                        | 8         | 9       | 8               | 2                    | 0                   | 2            | 0                  | 1                | 0          | 90    |
| 15            | 2035 | 59          | 7                                                                        | 8         | 9       | 9               | 2                    | 0                   | 2            | 0                  | 1                | 0          | 97    |
| 16            | 2036 | 65          | 8                                                                        | 9         | 10      | 10              | 3                    | 0                   | 2            | 0                  | 1                | 0          | 108   |
| 17            | 2037 | 72          | 9                                                                        | 10        | 12      | 11              | 3                    | 0                   | 2            | 0                  | 1                | 0          | 120   |
| 18            | 2038 | 79          | 10                                                                       | 11        | 13      | 12              | 3                    | 0                   | 2            | 0                  | 1                | 0          | 131   |
| 19            | 2039 | 87          | 11                                                                       | 12        | 14      | 13              | 3                    | 0                   | 2            | 0                  | 1                | 0          | 143   |
| 20            | 2040 | 96          | 12                                                                       | 14        | 15      | 14              | 4                    | 0                   | 2            | 0                  | 1                | 0          | 158   |
| Total periodo |      | 886         | 111                                                                      | 111       | 142     | 140             | 37                   | 0                   | 27           | 0                  | 11               | 0          | 1479  |

Fuente: Elaboración propia

**Tabla Nro. 4: Proyección del TPDA (tráfico total normal + generado) (veh/día), para 20 años**

| Periodo       | Año  | Livianos    |            |           |         | Mediano      |                   |                  | Pesado    |                 |               |            | Total |
|---------------|------|-------------|------------|-----------|---------|--------------|-------------------|------------------|-----------|-----------------|---------------|------------|-------|
|               |      | Automóviles | Camionetas | Jeep-Vag. | Minibus | Micro 22 As. | Omnibus 23-35 As. | Omnibus ≥ 36 As. | Peq < 6 T | Med 6T a < 10 T | Grande ≥ 10 T | C/acoplado |       |
|               | 2018 | 56          | 7          | 8         | 9       | 11           | 3                 | 0                | 2         | 0               | 1             | 0          | 97    |
|               | 2019 | 62          | 8          | 9         | 10      | 12           | 3                 | 0                | 2         | 0               | 1             | 0          | 107   |
|               | 2020 | 68          | 9          | 10        | 11      | 13           | 4                 | 0                | 2         | 0               | 1             | 0          | 118   |
| 1             | 2021 | 90          | 11         | 13        | 14      | 17           | 5                 | 0                | 4         | 0               | 1             | 0          | 155   |
| 2             | 2022 | 100         | 12         | 14        | 16      | 18           | 5                 | 0                | 4         | 0               | 1             | 0          | 170   |
| 3             | 2023 | 109         | 13         | 16        | 18      | 20           | 6                 | 0                | 4         | 0               | 2             | 0          | 188   |
| 4             | 2024 | 121         | 16         | 17        | 19      | 22           | 6                 | 0                | 4         | 0               | 2             | 0          | 207   |
| 5             | 2025 | 133         | 17         | 19        | 22      | 24           | 6                 | 0                | 5         | 0               | 2             | 0          | 228   |
| 6             | 2026 | 146         | 18         | 20        | 24      | 25           | 7                 | 0                | 5         | 0               | 2             | 0          | 247   |
| 7             | 2027 | 162         | 20         | 23        | 26      | 28           | 7                 | 0                | 5         | 0               | 2             | 0          | 273   |
| 8             | 2028 | 179         | 23         | 25        | 29      | 30           | 8                 | 0                | 6         | 0               | 2             | 0          | 302   |
| 9             | 2029 | 197         | 25         | 28        | 31      | 32           | 8                 | 0                | 6         | 0               | 2             | 0          | 329   |
| 10            | 2030 | 217         | 28         | 31        | 35      | 36           | 10                | 0                | 6         | 0               | 4             | 0          | 367   |
| 11            | 2031 | 239         | 30         | 34        | 38      | 38           | 11                | 0                | 7         | 0               | 4             | 0          | 401   |
| 12            | 2032 | 264         | 32         | 37        | 42      | 42           | 12                | 0                | 7         | 0               | 4             | 0          | 440   |
| 13            | 2033 | 292         | 36         | 42        | 47      | 46           | 12                | 0                | 8         | 0               | 4             | 0          | 487   |
| 14            | 2034 | 320         | 40         | 46        | 52      | 50           | 13                | 0                | 10        | 0               | 5             | 0          | 536   |
| 15            | 2035 | 354         | 44         | 50        | 56      | 54           | 14                | 0                | 10        | 0               | 5             | 0          | 587   |
| 16            | 2036 | 390         | 49         | 55        | 62      | 59           | 16                | 0                | 11        | 0               | 5             | 0          | 647   |
| 17            | 2037 | 431         | 54         | 61        | 70      | 64           | 18                | 0                | 12        | 0               | 6             | 0          | 716   |
| 18            | 2038 | 474         | 59         | 67        | 77      | 70           | 19                | 0                | 13        | 0               | 6             | 0          | 785   |
| 19            | 2039 | 523         | 65         | 74        | 84      | 76           | 20                | 0                | 13        | 0               | 7             | 0          | 862   |
| 20            | 2040 | 577         | 72         | 83        | 92      | 83           | 23                | 0                | 14        | 0               | 7             | 0          | 951   |
| Total periodo |      | 5318        | 664        | 755       | 854     | 834          | 226               | 0                | 154       | 0               | 73            | 0          | 8878  |

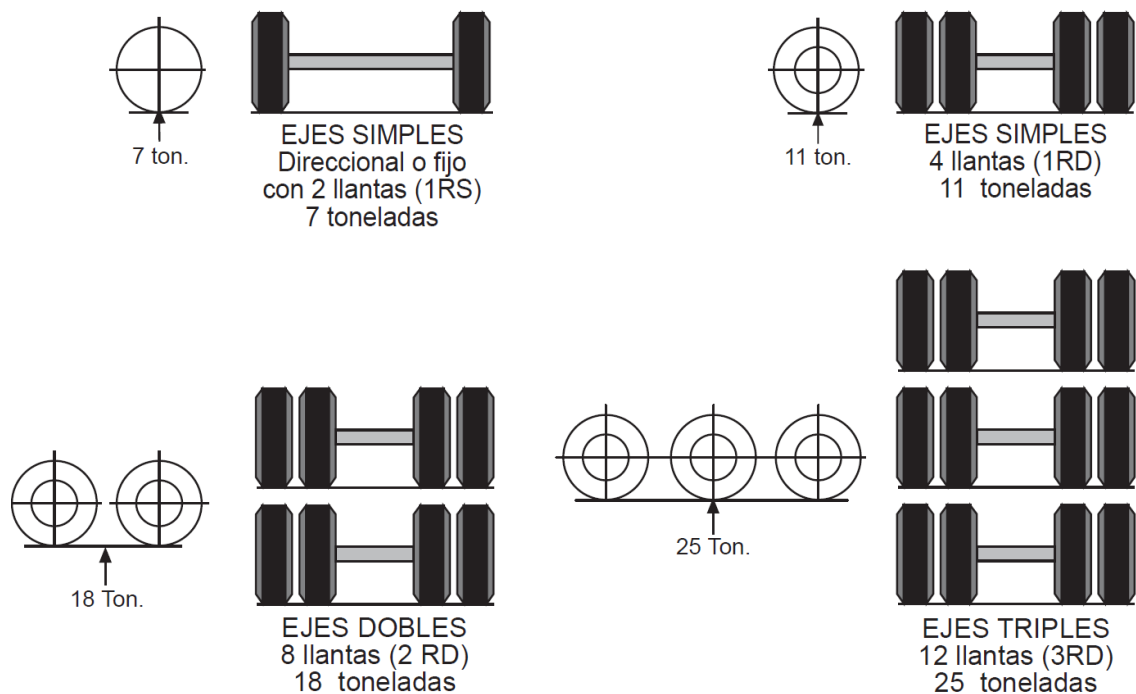
Fuente: Elaboración propi



## Calculo de ESALs

### Ejes equivalentes

**Figura Nro. 1: Límites de pesos permitidos por ejes (expresado en toneladas)**



Fuente: D.S. N° 25629 Ley de cargas

### Carga por eje

En este caso no se dispone de información del espectro de cargas vehicular, pero si tenemos la actividad de censos de carga que permite determinar los pesos promedio ponderados de acuerdo a la frecuencia de distribución de pesos.

**Tabla Nro. 1: Estaciones para la muestra de los pesos promedio. Años 2015 – 2016**

| Departamento | Carretera         | Estación  |
|--------------|-------------------|-----------|
| Chuquisaca   | Sucre - Yamparaez | Ckochis   |
| La Paz       | La Paz - Yungas   | Unduavi   |
| Tarija       | Padcaya - Bermejo | La Mamora |
| La Paz       | La Paz - Achacahi | Achacachi |

Fuente: Datos de pesajes estaciones Ckochis, Mamoré, Unduavi, Achacachi (2015-2016)

**Tabla Nro. 2: Pesos promedio por eje y tipo de vehículo**

|                 | TIPO VEHICULO                                      | CONFIG. EJES | UNIDAD  | PESOS POR EJE (Kg) |                 |                 |                 |
|-----------------|----------------------------------------------------|--------------|---------|--------------------|-----------------|-----------------|-----------------|
|                 |                                                    |              |         | EJE DELANTERO      | 1º EJE TRASERO  | 2do EJE TRASERO | 3er EJE TRASERO |
| 1               | AUTOMOVIL, VAGONETA                                | 11           | Kg<br>% | 1,365<br>50.6%     | 1,333<br>49.4%  |                 |                 |
| 2               | CAMIONETA                                          | 11           | Kg<br>% | 1,818<br>50.0%     | 1,818<br>50.0%  |                 |                 |
| 3               | MINIBUS                                            | 11           | Kg<br>% | 1,625<br>50.0%     | 1,625<br>50.0%  |                 |                 |
| 4               | MICROBUS                                           | 11           | Kg<br>% | 2,420<br>43.5%     | 3,140<br>56.5%  |                 |                 |
| 5               | BUS MEDIANO                                        | 11           | Kg<br>% | 4,027<br>39.0%     | 6,303<br>61.0%  |                 |                 |
| 6               | BUS GRANDE 2 EJES                                  | 11           | Kg<br>% | 5,128<br>40.2%     | 7,643<br>59.8%  |                 |                 |
| 7               | BUS GRANDE 3 EJES                                  | 12           | Kg<br>% | 7,125<br>39.5%     | 10,895<br>60.5% |                 |                 |
| 8               | CAMION MEDIANO                                     | 11           | Kg<br>% | 3,668<br>36.0%     | 6,529<br>64.0%  |                 |                 |
| 9               | C2 CAM. GRANDE 2 EJES                              | 11           | Kg<br>% | 5,101<br>34.9%     | 9,527<br>65.1%  |                 |                 |
| 10              | C3 CAM GRDE 3 EJES (TRASERO TANDEM)                | 12           | Kg<br>% | 6,947<br>31.6%     | 15,028<br>68.4% |                 |                 |
| 11              | C.SEMIREMOLQ. EJE2_TANDEM, EJE3_TANDEM             | 122          | Kg<br>% | 6,125<br>17.0%     | 15,000<br>41.7% | 14,875<br>41.3% |                 |
| 12              | C.SEMIREMOLQ. EJE2_TANDEM, EJE3_TRIDEM             | 123          | Kg<br>% | 6,576<br>13.5%     | 16,461<br>33.9% | 25,500<br>52.5% |                 |
| 13              | C.SEMIREMOLQ. EJE2_SIMPLE, EJE3_TRIDEM             | 113          | Kg<br>% | 6,142<br>12.9%     | 11,619<br>24.4% | 29,928<br>62.8% |                 |
| 14              | T-S CAMION C.SEMIREMOL (ULTIMO EJE TRASERO TANDEM) | 112          | Kg<br>% | 6,166<br>17.9%     | 10,333<br>30.0% | 18,000<br>52.2% |                 |
| 15              | C-R CAMION C_REMOLQUE                              | 1211         | Kg<br>% | 6,420<br>15.5%     | 16,700<br>40.4% | 9,260<br>22.4%  | 8,940<br>21.6%  |
| 16              | C-R CAMION C_REMOLQUE                              | 1112         | Kg<br>% | 5,975<br>12.1%     | 10,150<br>20.5% | 11,500<br>23.2% | 21,900<br>44.2% |
| TOTAL MUESTRA = |                                                    |              |         |                    |                 |                 |                 |

Fuente: Datos de pesajes estaciones Ckochis, Mamoré, Unduavi, Achacachi.(2015-2016)

Nota: Debo mencionar que para los automóviles, camionetas jeep – vagoneta, minibús, microbuses, buses medianos, buses grandes se usó los datos promedios antes mencionados, y para los camiones pequeños, camiones medianos, camiones grandes se usó la carga máxima por eje, para una mayor seguridad, suponiendo que estarán cargados a su máxima capacidad.

**Tabla Nro. 3: Determinación de los factores “LEF” y el factor de camión “TF”**

| Ítem                                   | Ejes                   | Automóviles                                       |      | Camionetas |      | Jeep - Vag. |      | Minibús |      | Microbuses |      | Buses medianos |      | Buses grandes |      | Camiones pequeños |      | Camiones medianos |      | Camiones grandes |      | Camiones c/acoplados |      | Otros   |      |
|----------------------------------------|------------------------|---------------------------------------------------|------|------------|------|-------------|------|---------|------|------------|------|----------------|------|---------------|------|-------------------|------|-------------------|------|------------------|------|----------------------|------|---------|------|
| <b>Configuración de ejes</b>           | <b>Eje delantero</b>   | 1                                                 |      | 1          |      | 1           |      | 1       |      | 1          |      | 1              |      | 1             |      | 1                 |      | 1                 |      | 1                |      | 1                    |      | 1       |      |
|                                        | <b>1er eje trasero</b> | 1                                                 |      | 1          |      | 1           |      | 1       |      | 1          |      | 1              |      | 2             |      | 1                 |      | 1                 |      | 2                |      | 2                    |      | 1       |      |
|                                        | <b>2do eje trasero</b> | 0                                                 |      | 0          |      | 0           |      | 0       |      | 0          |      | 0              |      | 0             |      | 0                 |      | 0                 |      | 0                |      | 3                    |      | 0       |      |
|                                        | <b>3er eje trasero</b> | 0                                                 |      | 0          |      | 0           |      | 0       |      | 0          |      | 0              |      | 0             |      | 0                 |      | 0                 |      | 0                |      | 0                    |      | 0       |      |
| <b>Unidades</b>                        |                        | Ton.                                              | kips | Ton.       | kips | Ton.        | kips | Ton.    | kips | Ton.       | kips | Ton.           | kips | Ton.          | kips | Ton.              | kips | Ton.              | kips | Ton.             | kips | Ton.                 | kips | Ton.    | kips |
| <b>Carga por eje</b>                   | <b>Eje delantero</b>   | 1,4                                               | 3,0  | 1,4        | 3,0  | 1,8         | 4,0  | 1,6     | 3,6  | 2,4        | 5,3  | 4,0            | 8,9  | 5,1           | 11,3 | 7,0               | 15,4 | 7,0               | 15,4 | 7,0              | 15,4 | 7,0                  | 15,4 | 1,0     | 2,2  |
|                                        | <b>1er eje trasero</b> | 1,3                                               | 2,9  | 1,3        | 2,9  | 1,8         | 4,0  | 1,6     | 3,6  | 3,1        | 6,9  | 6,3            | 13,9 | 7,6           | 16,8 | 7,0               | 15,4 | 11,0              | 24,3 | 18,0             | 39,7 | 18,0                 | 39,7 | 2,0     | 4,4  |
|                                        | <b>2do eje trasero</b> | 0                                                 | 0    | 0          | 0    | 0           | 0    | 0       | 0    | 0          | 0    | 0              | 0    | 0             | 0    | 0                 | 0    | 0                 | 0    | 0                | 0    | 25                   | 55,1 | 0       | 0    |
|                                        | <b>3er eje trasero</b> | 0                                                 | 0    | 0          | 0    | 0           | 0    | 0       | 0    | 0          | 0    | 0              | 0    | 0             | 0    | 0                 | 0    | 0                 | 0    | 0                | 0    | 0                    | 0    | 0       | 0    |
| <b>NE = 2 plg (76,2 mm)</b>            |                        | <b>Pt = 2,0 (para carreteras de bajo volumen)</b> |      |            |      |             |      |         |      |            |      |                |      |               |      |                   |      |                   |      |                  |      |                      |      |         |      |
| <b>Factor equivalente de carga LEF</b> | <b>Eje delantero</b>   | 0,00160                                           |      | 0,00160    |      | 0,00300     |      | 0,00244 |      | 0,00885    |      | 0,05750        |      | 0,14480       |      | 0,52000           |      | 0,52000           |      | 0,52000          |      | 0,52000              |      | 0,00048 |      |
|                                        | <b>1er eje trasero</b> | 0,00146                                           |      | 0,00146    |      | 0,00300     |      | 0,00244 |      | 0,02235    |      | 0,32995        |      | 0,05960       |      | 0,52000           |      | 3,25250           |      | 2,12400          |      | 2,12400              |      | 0,00480 |      |
|                                        | <b>2do eje trasero</b> | 0                                                 |      | 0          |      | 0           |      | 0       |      | 0          |      | 0              |      | 0             |      | 0                 |      | 0                 |      | 0                |      | 1,81950              |      | 0       |      |
|                                        | <b>3er eje trasero</b> | 0                                                 |      | 0          |      | 0           |      | 0       |      | 0          |      | 0              |      | 0             |      | 0                 |      | 0                 |      | 0                |      | 0                    |      | 0       |      |
| <b>Factor camión (TF) =</b>            |                        | 0,0031                                            |      | 0,0031     |      | 0,0060      |      | 0,0049  |      | 0,0312     |      | 0,3875         |      | 0,2044        |      | 1,0400            |      | 3,7725            |      | 2,6440           |      | 4,4635               |      | 0,0053  |      |

Fuente: Elaboración propia

Nota: Se trabajó con un número estructural (SN) de 2 plg o 76,2 mm para un serviciabilidad final (Pt) de 2,0.

**Tabla Nro. 4: Cálculo de ESALs para un periodo de diseño de 20 años**

|                                                                                 | Auto<br>móviles | Camionetas  | Jeep<br>-<br>Vag. | Minibús      | Microbuses   | Buses<br>medios | Buses<br>grandes | Camiones<br>pequeños | Camiones<br>medianos | Camiones<br>grandes | Camiones<br>c/accoplado | Otros       |
|---------------------------------------------------------------------------------|-----------------|-------------|-------------------|--------------|--------------|-----------------|------------------|----------------------|----------------------|---------------------|-------------------------|-------------|
| <b>Proyección del TPDA<br/>(tráfico total normal +<br/>generado) (veh/día).</b> | 5318            | 664         | 755               | 854          | 834          | 226             | 0                | 154                  | 0                    | 73                  | 0                       | 0           |
| <b>Total vehículo del<br/>periodo (1 año = 365<br/>días)</b>                    | 19410<br>70     | 2423<br>60  | 2755<br>75        | 31171<br>0.0 | 30441<br>0.0 | 8249<br>0.0     | 0.00             | 56210.<br>00         | 0.00                 | 26645.<br>00        | 0.00                    | 0.00        |
| <b>Factor de camión</b>                                                         | 0.0030<br>6     | 0.003<br>06 | 0.00<br>6         | 0.0048<br>8  | 0.0312       | 0.387<br>45     | 0.204<br>4       | 1.04                 | 3.7725               | 2.644               | 4.463<br>5              | 0.005<br>28 |
| <b>ESALs</b>                                                                    | 5939.6<br>74    | 741.6<br>22 | 1653<br>.4        | 1521.1<br>45 | 9497.5<br>92 | 3196<br>0.7     | 0.000            | 58458.<br>40         | 0.000                | 70449.<br>38        | 0.000                   | 0.000       |
| <b>Total ESALs (20 años)<br/>(50%)</b>                                          | <b>90111.01</b> |             |                   |              |              |                 |                  |                      |                      |                     |                         |             |

Fuente: Elaboración propia

**Tabla Nro. 5: Cálculo de ESALs para un periodo de diseño de 12 años, para pavimento flexible**

|                                                                                 | Automóviles     | Camionetas   | Jeep<br>-<br>Vag. | Minibús      | Microbuses   | Buses<br>medios | Buses<br>grandes | Camiones<br>pequeños | Camiones<br>medianos | Camiones<br>grandes | Camiones<br>c/accoplado | Otros       |
|---------------------------------------------------------------------------------|-----------------|--------------|-------------------|--------------|--------------|-----------------|------------------|----------------------|----------------------|---------------------|-------------------------|-------------|
| <b>Proyección del TPDA<br/>(tráfico total normal +<br/>generado) (veh/día).</b> | 1957            | 245          | 277               | 314          | 332          | 91              | 0                | 63                   | 0                    | 28                  | 0                       | 0           |
| <b>Total vehículo del<br/>periodo (1 año = 365<br/>días)</b>                    | 71430<br>5.0    | 89425.<br>00 | 101<br>10         | 11461<br>0.0 | 12118<br>0.0 | 3321<br>5.0     | 0.00             | 22995.<br>00         | 0.00                 | 10220.<br>00        | 0.00                    | 0.00        |
| <b>Factor de camión</b>                                                         | 0.0030<br>6     | 0.0030<br>6  | 0.0<br>06         | 0.0048<br>8  | 0.0312       | 0.387<br>45     | 0.204<br>4       | 1.04                 | 3.7725               | 2.644               | 4.463<br>5              | 0.005<br>28 |
| <b>ESALs</b>                                                                    | 2185.7<br>73    | 273.64<br>1  | 606<br>.6         | 559.29<br>7  | 3780.8<br>16 | 1286<br>9.1     | 0.000            | 23914.<br>80         | 0.000                | 27021.<br>68        | 0.000                   | 0.000       |
| <b>Total ESALs (12 años)<br/>(50%)</b>                                          | <b>35605.89</b> |              |                   |              |              |                 |                  |                      |                      |                     |                         |             |

Fuente: Elaboración propia

## CÁLCULO DE CAUDALES PARA ALCANTARILLAS

Para el dimensionamiento de las alcantarillas de paso se debe determinar una función para determinar los caudales de diseño, para ello se utiliza el método racional modificado, el cual como dato de ingreso requiere la intensidad de la precipitación para un tiempo igual al tiempo de concentración. La obtención de este valor se realiza mediante la fórmula de Grunsky.

$$i_t = i_{24} \sqrt{\frac{24}{t}} \qquad i_{24} = \frac{P_d}{24}$$

### Intensidad Máxima de la Cuenca N°10

Para éste cálculo se precisa saber algunos parámetros característicos de la cuenca, como para este caso el Tiempo de Concentración. Las siguientes fórmulas empíricas serán las que nos aproximen aneste valor.

#### Alcantarilla de paso Prog: 0+170

|                                           |          |                 |
|-------------------------------------------|----------|-----------------|
| A: Área de la cuenca en Km <sup>2</sup>   | 0.500    | Km <sup>2</sup> |
| L: Longitud del río principal Km.         | 0.300    | Km              |
| J: Pendiente media del río principal m/m. | 0.084    | m/m             |
| H: Desnivel Máximo, se expresa en m.      | 25.220   | m               |
| C: Coeficiente de escorrentia.            | 0.600    | Norma ABC       |
| Punto mas alto                            | 1947.140 | m.s.n.m.        |
| Punto más bajo                            | 1921.920 | m.s.n.m.        |
| Tc: Tiempo de Concentración en hr.        |          |                 |

### Cálculo del Tiempo de Concentración

| Autor             | Ecuación                                                | Tc (Hrs) |
|-------------------|---------------------------------------------------------|----------|
| Kirpich           | $T_c = 0,0195 \left( \frac{L^3}{H} \right)^{0,385}$     | 0.068    |
| Pasini            | $T_c = 0,023 \left( \frac{AL}{S} \right)^{0,5}$         | 0.031    |
| Temez             | $T_c = 0,3 \left( \frac{L}{S^{1/4}} \right)^{0,76}$     | 0.192    |
| California        | $T_c = 0,066 * \left( \frac{L}{J^{1/2}} \right)^{0,77}$ | 0.068    |
| Ventura<br>Herbas | $T_c = 0,05 * \left( \frac{A}{J} \right)^{0,5}$         | 0.122    |
| Gandotti          | $T_c = \frac{4\sqrt{A} + 1,5L}{25.3 * J * L}$           | 5.138    |

Promedio:  $T_c = 0.936 \text{ hrs}$

Utilizando la formula de Grunsky se obtiene lo siguiente:

| Periodo de Retorno T en años | Tiempo de Concentración (horas) | Intensidad horaria $i_{24}$ (mm/h) | Intensidad de Diseño (mm/h) |
|------------------------------|---------------------------------|------------------------------------|-----------------------------|
| 50                           | 0.936                           | 38.155                             | 193.15                      |

### Caudal de Diseño para Alcantarillas

#### Fórmula Racional

El método de la fórmula racional, nos permitió hacer estimaciones de los caudales máximos de escorrentía usando las intensidades máximas de precipitación.

$$Q = C * i * A$$

Dónde:

C = Coeficiente de Escorrentía.

i = Intensidad máxima de la lluvia para un periodo de duración igual al periodo de concentración.

A = Área de la Cuenca.

El coeficiente de Uniformidad CU toma en cuenta la falta de uniformidad en la precipitación y su fórmula es:

$$CU = 1 + \frac{t_c^{1.25}}{t_c^{1.25} + 14}$$

$$CU = 1.061741025$$

Si i está en mm/h y A en Km<sup>2</sup> entonces Q en m<sup>3</sup>/s. Viene dado por:

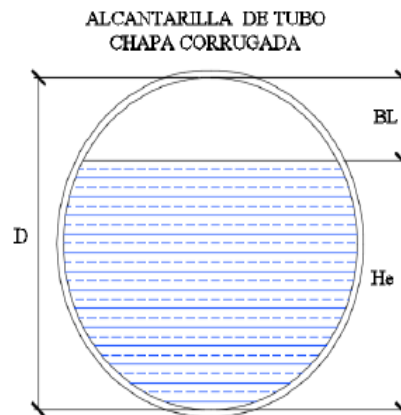
$$Q = CU * \frac{C * i * A}{3.6}$$

$$Q = 17.090 \quad \text{m}^3/\text{s}$$

### Alcantarilla de chapa metálica sección circular

#### Datos :

|      |                  |                     |
|------|------------------|---------------------|
| Q =  | 17.090           | m <sup>3</sup> /s   |
| n =  | 0.024            | tub. metálica ARMCO |
| S =  | 1.00%            | 0,001 m/m           |
| R =  | Radio Hidráulico |                     |
| A =  | Área Hidráulica  |                     |
| BL = | 0.4 D            | m                   |
| D =  | 0.437            | m iterando          |



### Fórmula de Manning

$$Q = \frac{A * R^{\frac{2}{3}} * S^{\frac{1}{2}}}{n}$$

$$Q = \frac{\left[ \left( \frac{\pi * D^2}{4} \right) - \left( \frac{\pi * D^2}{4 * 180} \cos^{-1}(1 - 2bl) \right) + \left( \frac{D}{2} - bl * D \right)^2 * \tan(\cos^{-1}(1 - 2bl)) \right]^{\frac{5}{2}} * \frac{1}{S^{\frac{1}{2}}}}{\left[ \left( \pi - \frac{\pi}{180} \cos^{-1}(1 - 2bl) \right) * D \right]^{\frac{2}{3}}}}$$

$$_{0,20} = \frac{\left[ \left( \frac{\pi * D^2}{4} \right) - \left( \frac{\pi * D^2}{4 * 180} \cos^{-1}(1 - 0.8D) \right) + (0.5D - 0.4D^2)^2 * \tan(\cos^{-1}(1 - 0.8D)) \right]^{\frac{5}{2}} * \frac{0,01^{\frac{1}{2}}}{0,024}}{\left[ \left( \pi - \frac{\pi}{180} \cos^{-1}(1 - 0.8D) \right) * D \right]^{\frac{2}{3}}}}$$

Iterando :

**D** = 0.437 m.

**D (adop.)** = 0.80 m. seguridad

## CÁLCULO DE CAUDALES PARA ALCANTARILLAS

Para el dimensionamiento de las alcantarillas de paso se debe determinar una función para determinar los caudales de diseño, para ello se utiliza el método racional modificado, el cual como dato de ingreso requiere la intensidad de la precipitación para un tiempo igual al tiempo de concentración. La obtención de este valor se realiza mediante la fórmula de Grunsky.

$$i_t = i_{24} \sqrt{\frac{24}{t}} \qquad i_{24} = \frac{P_d}{24}$$

### Intensidad Máxima de la Cuenca N°8

Para éste cálculo se precisa saber algunos parámetros característicos de la cuenca, como para este caso el Tiempo de Concentración. Las siguientes fórmulas empíricas serán las que nos aproximen aneste valor.

Alcantarilla de paso Prog: 4+393.57

|                                           |          |                 |
|-------------------------------------------|----------|-----------------|
| A: Área de la cuenca en Km <sup>2</sup> . | 1.000    | Km <sup>2</sup> |
| L: Longitud del río principal Km.         | 1.217    | Km              |
| J: Pendiente media del río principal m/m. | 0.116    | m/m             |
| H: Desnivel Máximo, se expresa en m.      | 141.194  | m               |
| C: Coeficiente de escorrentia.            | 0.600    | Norma ABC       |
| Punto mas alto                            | 1051.000 | m.s.n.m.        |
| Punto más bajo                            | 909.806  | m.s.n.m.        |
| Tc: Tiempo de Concentración en hr.        |          |                 |

### Cálculo del Tiempo de Concentración

| Autor      | Ecuación                                               | Tc (Hrs) |
|------------|--------------------------------------------------------|----------|
| Kirpich    | $Tc = 0,0195 \left( \frac{L^3}{H} \right)^{0,385}$     | 0.177    |
| Pasini     | $Tc = 0,023 \left( \frac{AL}{S} \right)^{0,5}$         | 0.075    |
| Temez      | $Tc = 0,3 \left( \frac{L}{S^{1/4}} \right)^{0,76}$     | 0.525    |
| California | $Tc = 0,066 * \left( \frac{L}{J^{1/2}} \right)^{0,77}$ | 0.176    |

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|                   |                                               |       |
|-------------------|-----------------------------------------------|-------|
| Ventura<br>Herbas | $T_c = 0,05 * \left(\frac{A}{J}\right)^{0,5}$ | 0.147 |
| Giandotti         | $T_c = \frac{4\sqrt{A} + 1,5L}{25,3 * J * L}$ | 1.631 |

Promedio:  $T_c = 0.455 \text{ hrs}$

Utilizando la formula de Grunsky se obtiene lo siguiente:

| Periodo de Retorno T en años | Tiempo de Concentración (horas) | Intensidad horaria $i_{24}$ (mm/h) | Intensidad de Diseño (mm/h) |
|------------------------------|---------------------------------|------------------------------------|-----------------------------|
| 50                           | 0.455                           | 38.155                             | 277.12                      |

Caudal de Diseño para Alcantarillas

#### Fórmula Racional

El método de la fórmula racional, nos permitio hacer estimaciones de los caudales máximos de escorrentia usando las intensidades máximas de precipitación.

$$Q = C * i * A$$

Dónde:

C = Coeficiente de Escorrentia.

i = Intensidad máxima de la lluvia para un periodo de duración igual al periodo de concentración.

A = Área de la Cuenca.

El coeficiente de Uniformidad CU toma en cuenta la falta de unifromidad en la precipitación y su fórmula es:

$$CU = 1 + \frac{t_c^{1.25}}{t_c^{1.25} + 14}$$

$$CU = 1.025996205$$

Si i está en mm/h y A en  $Km^2$  entonces Q en  $m^3/s$ . Viene dado por:

$$Q = CU * \frac{C * i * A}{3.6}$$

$$Q = 47.387 \text{ m}^3/s$$

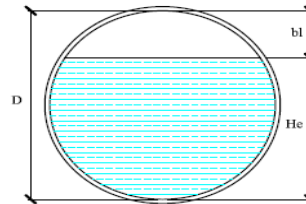
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# ALCANTARILLA DE CHAPA METÁLICA SECCIÓN CIRCULAR

Datos :

Q m3/s = 47.387  
n = 0.022 Chapa metálica  
S = 2.00%  
R = Radio Hidráulico  
A = Área Hidráulica  
bl = 0.4 D

ALCANTARILLA DE TUBO  
CHAPA CORRUGADA



Fórmula de Manning

$$Q = \frac{A * R^{\frac{2}{3}} * S^{\frac{1}{2}}}{n}$$

$$Q = \frac{\left[ \left( \frac{\pi * D^2}{4} \right) - \left( \frac{\pi * D^2}{4 * 180} \cos^{-1}(1 - 2bl) \right) + \left( \frac{D}{2} - bl * D \right)^2 * \tan(\cos^{-1}(1 - 2bl)) \right]^{\frac{5}{2}} * \frac{1}{n} S^{\frac{1}{2}}}{\left[ \left( \pi - \frac{\pi}{180} \cos^{-1}(1 - 2bl) \right) * D \right]^{\frac{2}{3}}}$$

$$3.836 = \frac{\left[ \left( \frac{\pi * D^2}{4} \right) - \left( \frac{\pi * D^2}{4 * 180} \cos^{-1}(1 - 0.8D) \right) + (0.5D - 0.4D^2)^2 * \tan(\cos^{-1}(1 - 0.8D)) \right]^{\frac{5}{2}} * \frac{1}{0.022} S^{\frac{1}{2}}}{\left[ \left( \pi - \frac{\pi}{180} \cos^{-1}(1 - 0.8D) \right) * D \right]^{\frac{2}{3}}}$$

Iterando :

D = 1.485 m.  
D (adop.) = 1.50 m.

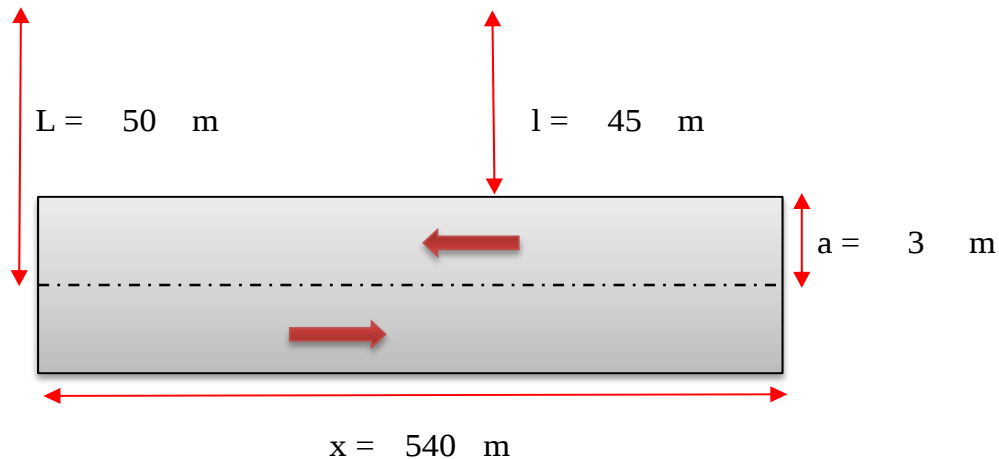
### Diseño de cunetas.

Progresiva: 0+280 - 0+820

Lados: Izq.

Datos:

|                  |        |                                                              |
|------------------|--------|--------------------------------------------------------------|
| a =              | 3,00   | Ancho de carril (m).                                         |
| C <sub>1</sub> = | 0,95   | Coeficiente de escorrentia de la calzada.                    |
| C <sub>2</sub> = | 0,40   | Coeficiente de escorrentia del terreno.                      |
| I =              | 63,90  | Intensidad de la lluvia (mm/h) para tc= 10 min T= 20 años.   |
| n =              | 0,015  | Coeficiente de Manning cunetas revestidas de H° 0,013-0,017. |
| S =              | 0,0500 | Pendiente de la cuneta (m/m).                                |
| L =              | 50,00  | Derecho de via (m).                                          |



**Cálculo del area de calzada:**  $A_1 = 1620,00 \text{ m}^2$

**Cálculo del area del terreno natural:**  $A_2 = 24300,00 \text{ m}^2$

**Cálculo del coeficiente de escorrentia ponderada:**  $C_{pd} = 0,43$

$$C_{ponderado} = \frac{C_1 \cdot A_1 + C_2 \cdot A_2}{A_1 + A_2}$$

**Cálculo de caudal máximo:**  $Q = 0,20 \text{ m}^3/\text{s}$

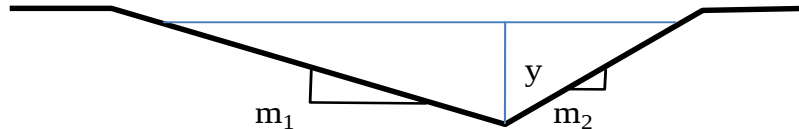
Formula racional:

$$Q = \frac{C \cdot I \cdot A}{3,6}$$

Q = Caudal maximo ( $\text{m}^3/\text{s}$ ).  
I = Intensidad maxima (mm/h).  
A = Area de calzada mas terreno ( $\text{km}^2$ ).  
C = Coeficiente de escorrentía (adim).

### Cálculo del tirante normal de la seccion triangular de la cuneta.

|                        |                |                               |
|------------------------|----------------|-------------------------------|
| Q =                    | 0,200          | m <sup>3</sup> /s             |
| y =                    | 0,24606        | Tirante normal (m).           |
| n =                    | 0,022          | Coeficiente de rugosidad.     |
| s =                    | <b>0,0500</b>  | Pendiente longitudinal.       |
| <b>m<sub>1</sub></b> = | <b>2:1 H:V</b> | Talud 1 seccion triangular. 2 |
| <b>m<sub>2</sub></b> = | <b>1:1 H:V</b> | Talud 2 seccion triangular. 1 |
| <b>T</b> =             | <b>0,98</b>    | Espejo de agua (m).           |



### Area mojada:

$$A = \left( \frac{m_1 + m_2}{2} \right) * y^2 \quad A = 0,09 \text{ m}^2$$

### Perimetro mojado:

$$P = \left( \sqrt{1 + m_1^2} + \sqrt{1 + m_2^2} \right) * y \quad P = 0,90 \text{ m}$$

### Radio hidráulico:

$$R_h = \frac{A}{P} \quad R_h = 0,10 \text{ m}$$

### Cálculo del tirante normal en funcion del caudal, según Manning.

$$Q = \frac{1}{n} \cdot A \cdot R_h^{\frac{2}{3}} \cdot S^{\frac{1}{2}} \quad Q = 0,2004 \text{ m}^3/\text{s} \text{ ok!}$$

Iterando:  $y = 0,25 \text{ m}$

Bordo libre:  $BL = 0,082 \text{ m}$   $y_t = \mathbf{0,33 \text{ m}}$

$$BL = \frac{1}{3} \cdot y \quad y_t = y + BL$$

Nota: Se tomo el area de aporte mas grande en todo el diseño, y como la pendiente era menor a la normada de 5%, se trabajo con dicha pendiente, y podemos concluir que la seccion triangular de cuneta calculada sera para todo el diseño la misma.