



9 Eranskinak  
Taxuketa Geometrikoa eta Zuinketa

Galdakaon (Mercadillo-Irubide), N-634  
errepidean, 103+200 PK-tik 104+200Pk-ra  
sarbideen berrantolaketa.

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Anejo nº 9  
Trazado Geométrico y Replanteo

Reordenación de accesos en la carretera N-  
634 del P.K 103+200 al P.K 104+200  
(Mercadillo-Irubide) en Galdakao

Diciembre 2020



**Bizkaiko Foru  
Aldundia**  
**Diputación  
Foral de Bizkaia**



**UTE DAIR-INGEPLAN**

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## 1. INTRODUCCIÓN

El objeto del presente Anejo es recoger las características del trazado del tramo de la carretera N-634 comprendido entre el P.K. 103+200 y el P.K. 104+200, en Irubide y del tramo de la carretera BI-625 entre el P.K. 387+100 y el P.K. 387+300. El principal objetivo del proyecto es mejorar la seguridad vial de la carretera, para lo cual es importante conocer las características del trazado existente.

El trazado actual discurre a lo largo de la nacional N-634 a su paso por el municipio de Galdakao, con calzada doble con dos carriles para cada sentido de circulación de 3,50 m y arcones de aproximadamente 0,5 m separados por mediana con barrera de hormigón. Al llegar a la intersección con la carretera BI-625 en la calzada sentido Bilbao se duplican los carriles reservando los dos carriles de la izquierda para ejecutar el giro hacia la carretera BI-625.

Después de la salida existen tres carriles, el carril de la izquierda es el de incorporación para los vehículos procedentes de la BI-625, se va desvaneciendo en forma de cuña.

La carretera BI-625 en el tramo objeto del proyecto tiene también calzada doble con dos carriles por sentido de circulación de 3,50 metros de ancho y arcones e torno a los 2,00 metros. Las calzadas están separadas por una isleta central

Dentro del presente proyecto se prevé remodelar la intersección de la carretera N-634 con la carretera BI-625, que en la actualidad tiene regulado algunos movimientos mediante semaforización, implantando una nueva rotonda en el P.K. 103+800 facilitando además la posibilidad de cambio de sentido.

Además también está previsto remodelar la rotonda partida existente en el P.K. 103+200 convirtiéndola en una rotonda convencional.

El trazado ha sido definido de acuerdo con las especificaciones de la "Instrucción de Carreteras, Norma 3.1-IC. Trazado" de la Dirección General de Carreteras del Ministerio de Fomento, para una carretera con clasificación C-40 en la zona de las rotondas proyectadas.

La Norma establece para una velocidad de proyecto de 40 km/h los siguientes parámetros de diseño:

| Características Geométricas                          |        |
|------------------------------------------------------|--------|
| Radio mínimo absoluto                                | 50 m   |
| Pendiente y rampas máximas                           | 7,0 %  |
| Pendiente y rampa excepcional                        | 10,0 % |
| Parámetro mínimo de los acuerdos verticales convexos | 303 m  |
| Longitud mínima de los acuerdos verticales convexos  | 40 m   |
| Parámetro mínimo de los acuerdos verticales cóncavos | 568 m  |
| Longitud mínima de los acuerdos verticales cóncavos  | 40 m   |

En el resto de la carretera N-634 se ha ajustado el trazado proyectado a las alineaciones y rasantes existentes.

## 2. CARACTERÍSTICAS GENERALES DEL TRAZADO

### 2.1. ROTONDA CON BI-625

Las características geométricas de la nueva rotonda serán las siguientes:

- Los viales de accesos a la rotonda desde la N-634 mantendrán la geometría de carriles de 3,50 metros de anchura con arcén exterior de 1,00 metro y de 0,50 metros de arcén interior.
- El vial de acceso a la rotonda desde la carretera BI-625 mantendrá la geometría de carriles de 3,50 metros de anchura con arcén exterior de 1,00 metro.
- Rotonda de 9,00 metros de anchura de calzada con un radio de 35,00 metros, y un arcén interior y exterior de 1,00 metro de anchura.
- Los carriles directos tendrán entre 3,50 y 4 metros de ancho.

Se proyectan por tanto, diferentes ramales que acceden a la rotonda y le dan servicio resultando:

- Rotonda
  - 9,00 metros de anchura de calzada.
  - Isleta central de diámetro 50,00 metros.
  - Radio de 35,00 metros, y unos arcenes interior y exterior de 1,00 de anchura.
- Accesos N-634
  - Calzada doble de dos carriles de 3,50 metros de ancho.
  - Arcenes exteriores de 1,00 metros de ancho.
  - Arcenes interiores de 0,50 metros de ancho.
  - Mediana compuesta por barrera de hormigón, con isleta con bordillo montable al llegar a rotonda.
- Acceso BI-625
  - Calzada doble de dos carriles de 3,50 metros de ancho.
  - Arcenes exteriores de 0,50 y 1,00 metros de ancho.
- Carril directo en la N-634
  - Vial de 4,00 metros de ancho.
  - Arcenes de 1,00 m y 0,50 m exterior e interior respectivamente.

- Carril directo entre la BI-625 y la N-634.
- Vial de 4,00 metros de ancho.
- Arcenes de 0,50 m.

### 2.2. ROTONDA PARTIDA

A continuación se indican las características geométricas de la rotonda:

Rotonda

- 9,00 metros de anchura de calzada.
- Isleta central de diámetro 30,00 metros.
- Radio de 25 metros, y unos arcenes interior de 1 metro y 0,50 metros los exteriores.
- Accesos N-634
  - Calzada doble de dos carriles de 3,50 metros de ancho.
  - Mediana compuesta por barrera de hormigón, con isleta con bordillo montable al llegar a rotonda.
  - Se mantendrán la anchura de arcenes existente.

### **3. TRAZADO EN PLANTA**

Las condiciones geométricas por las que se ha regido la definición del trazado en planta de la rotonda, como ya se ha indicado, han sido las correspondientes a una velocidad asignada de cuarenta kilómetros por hora.

Para esta velocidad el radio mínimo absoluto, según la normativa, es de 50,00 metros y de 15,00 m en el caso de intersecciones. Según las recomendaciones de glorietas, el radio mínimo de entrada debe estar comprendido entre los 6 y 100 metros, siendo 20 m un valor recomendable. Para las salidas el valor mínimo absoluto es de 20,00 metros.

En la rotonda con la carretera BI-625 se han proyectado las entradas con un radio mínimo de 40 metros y máximo de 80 metros. Las salidas de la rotonda tienen un radio mínimo de 40 metros.

Los carriles directos proyectados tienen un radio mínimo de 50 metros.

En el caso de la nueva rotonda convencional situada en la antigua rotonda partida las entradas se han proyectado con un radio de 50 metros. Las salidas se ajustarán a las de la intersección existente.

### **4. TRAZADO EN ALZADO**

La inclinación máxima recomendada por la Instrucción 3.1-I.C. para una velocidad de 40 km/h es del 7,00% y en casos excepcionales puede llegar al 10,00%.

El hecho de tener que ajustarnos lo más posible a la traza actual obliga a reducir el parámetro Kv hasta valores por debajo de lo estipulado en la norma. Dichos acuerdos se encuentran en la zona de entrada a la rotonda, donde la velocidad es inferior a la velocidad proyectada de la carretera, y por tanto asumible por el conductor.

La rotonda tiene un alzado asimétrico con pendiente máxima longitudinal a lo largo de su recorrido de del 1.30.

Del mismo modo, esta necesidad de ajustar la rasante proyectada a la actual, obliga a reducir tanto las longitudes de los acuerdos como los parámetros Kv de los mismos, en especial en las zonas de confluencia de distintos ramales.

## 5. LISTADO DE ALINEACIONES

### 5.1. PLANTA

Para la definición analítica de los ejes en planta, se ha utilizado el sistema integrado de programas de ordenador CLIPIII, que proporciona los listados de los puntos singulares y coordenadas en planta del eje cada diez metros.

El listado recoge los “puntos principales” del trazado, es decir, aquellos en los que se produce un cambio de alineación, ya sean rectas, círculos o clotoides. Se dan el punto kilométrico y las coordenadas del comienzo y el final de cada alineación, la longitud de la misma, y los acimut inicial y final, en los círculos se dan además las coordenadas del centro y el radio, y en las clotoides las coordenadas del punto de inflexión y el parámetro.

Por último se incluye el listado de puntos cada diez metros, con el punto kilométrico correspondiente, las coordenadas y el acimut.

En el **Apéndice Nº 9.1: Listado de Alineaciones en Planta**, se incluyen los indicados listados de las alineaciones.

### 5.2. ALZADO

Para la definición analítica de los ejes en alzado, se ha utilizado el mismo sistema integrado de programas de ordenador citado para la planta, CLIPIII, que da los listados de los puntos singulares y cotas en alzado del eje cada diez metros.

El listado recoge los vértices entre los que se encuentran las curvas de acuerdo (parábolas) y los puntos de tangencia, definidos por su punto kilométrico, cota, pendiente de entrada y de salida, longitud, parámetro y flecha en el vértice del acuerdo.

Por último se incluye el listado de puntos cada diez metros, con el punto kilométrico correspondiente, la cota y la pendiente.

En el **Apéndice Nº 9.2: Listado de Alineaciones en Alzado**, se incluyen los listados de las alineaciones.

**APÉNDICE N° 9.1:**  
**LISTADO DE ALINEACIONES EN PLANTA**

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1. ROTONDA R=35

1.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 0+000,000 | 0,000    | 510.620,477 | 4.787.019,031 | 399,9991 | -35,000  |        | 510.585,477 | 4.787.019,031 |
| 0+139,999 | 139,999  | 510.562,599 | 4.786.992,543 | 145,3524 | -35,000  |        | 510.585,477 | 4.787.019,031 |
| 0+139,999 | 0,000    | 510.562,599 | 4.786.992,543 | 145,3524 | Infinito |        |             |               |
| 0+219,911 | 79,912   | 510.620,477 | 4.787.019,031 | 399,9991 | -35,000  |        | 510.585,477 | 4.787.019,031 |

1.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coord. X    | Coord. Y      | Acimut   | Radio   | Parám. |
|----|-----------|-------------|---------------|----------|---------|--------|
| PS | 0+000,000 | 510.620,477 | 4.787.019,031 | 399,9991 | -35,000 |        |
|    | 0+010     | 510.619,058 | 4.787.028,895 | 381,8100 |         |        |
|    | 0+020     | 510.614,916 | 4.787.037,960 | 363,6209 |         |        |
|    | 0+030     | 510.608,388 | 4.787.045,490 | 345,4317 |         |        |
|    | 0+040     | 510.600,001 | 4.787.050,875 | 327,2426 |         |        |
|    | 0+050     | 510.590,438 | 4.787.053,677 | 309,0535 |         |        |
|    | 0+060     | 510.580,472 | 4.787.053,671 | 290,8643 |         |        |
|    | 0+070     | 510.570,911 | 4.787.050,856 | 272,6752 |         |        |
|    | 0+080     | 510.562,532 | 4.787.045,460 | 254,4860 |         |        |
|    | 0+090     | 510.556,013 | 4.787.037,922 | 236,2969 |         |        |
|    | 0+100     | 510.551,883 | 4.787.028,852 | 218,1078 |         |        |
|    | 0+110     | 510.550,477 | 4.787.018,986 | 199,9186 |         |        |
|    | 0+120     | 510.551,909 | 4.787.009,123 | 181,7295 |         |        |
|    | 0+130     | 510.556,062 | 4.787.000,064 | 163,5404 |         |        |
| PS | 0+139,999 | 510.562,599 | 4.786.992,543 | 145,3524 | -35,000 |        |
| PS | 0+139,999 | 510.562,599 | 4.786.992,543 | 145,3524 | -35,000 |        |
|    | 0+140     | 510.562,599 | 4.786.992,543 | 145,3524 |         |        |
|    | 0+150     | 510.570,993 | 4.786.987,168 | 127,1621 |         |        |
|    | 0+160     | 510.580,560 | 4.786.984,378 | 108,9730 |         |        |
|    | 0+170     | 510.590,526 | 4.786.984,397 | 90,7838  |         |        |
|    | 0+180     | 510.600,083 | 4.786.987,224 | 72,5947  |         |        |
|    | 0+190     | 510.608,455 | 4.786.992,630 | 54,4055  |         |        |
|    | 0+200     | 510.614,965 | 4.787.000,176 | 36,2164  |         |        |
|    | 0+210     | 510.619,083 | 4.787.009,251 | 18,0273  |         |        |
|    | 0+190     | 510.608,455 | 4.786.992,630 | 54,4055  |         |        |
|    | 0+200     | 510.614,965 | 4.787.000,176 | 36,2164  |         |        |
|    | 0+210     | 510.619,083 | 4.787.009,251 | 18,0273  |         |        |
|    | 0+219,911 | 510.620,477 | 4.787.019,031 | 0,0000   |         |        |

## 2. EJE A

### 2.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.550,581 | 4.787.016,331 | 195,0843 | -35,000  |        | 510.585,477 | 4.787.019,031 |
| 1+034,128 | 34,127   | 510.541,846 | 4.786.984,022 | 238,5367 | 50,000   |        | 510.500,730 | 4.787.012,474 |
| 1+072,159 | 38,032   | 510.517,370 | 4.786.954,988 | 250,6426 | 200,000  |        | 510.377,383 | 4.787.097,829 |
| 1+112,159 | 40,000   | 510.488,802 | 4.786.926,990 | 250,6426 | Infinito |        |             |               |

### 2.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio   | Parám. |
|----|-----------|-------------|---------------|----------|---------|--------|
|    | 1+000     | 510.550,581 | 4.787.016,331 | 195,0845 |         |        |
| PS | 1+000,000 | 510.550,581 | 4.787.016,331 | 195,0843 | -35,000 |        |
|    | 1+020     | 510.548,148 | 4.786.996,613 | 220,5490 |         |        |
| PS | 1+034,128 | 510.541,846 | 4.786.984,022 | 238,5367 | 50,000  |        |
|    | 1+040     | 510.538,434 | 4.786.979,243 | 240,4060 |         |        |
|    | 1+060     | 510.525,790 | 4.786.963,757 | 246,7722 |         |        |
| PS | 1+072,159 | 510.517,370 | 4.786.954,988 | 250,6426 | 200,000 |        |
|    | 1+080     | 510.511,770 | 4.786.949,500 | 250,6426 |         |        |
|    | 1+100     | 510.497,486 | 4.786.935,501 | 250,6426 |         |        |
|    | 1+112,159 | 510.488,802 | 4.786.926,990 | 250,6426 |         |        |

## 3. EJE B

### 3.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio      | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|------------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.491,350 | 4.786.910,040 | 50,6815  | Infinito   |        |             |               |
| 1+009,500 | 9,500    | 510.498,139 | 4.786.916,685 | 50,6815  | Infinito   |        |             |               |
| 1+083,961 | 74,461   | 510.549,364 | 4.786.970,702 | 45,9412  | -1.000,000 |        | 509.798,643 | 4.787.631,321 |
| 1+121,175 | 37,215   | 510.582,638 | 4.786.984,146 | 105,1700 | 40,000     |        | 510.579,393 | 4.786.944,278 |

### 3.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio      | Parám. |
|----|-----------|-------------|---------------|----------|------------|--------|
| PS | 1+000,000 | 510.491,350 | 4.786.910,040 | 50,6815  | Infinito   |        |
| PS | 1+009,500 | 510.498,139 | 4.786.916,685 | 50,6815  | Infinito   |        |
|    | 1+010     | 510.498,496 | 4.786.917,035 | 50,6497  |            |        |
|    | 1+020     | 510.505,604 | 4.786.924,069 | 50,0131  |            |        |
|    | 1+030     | 510.512,641 | 4.786.931,174 | 49,3765  |            |        |
|    | 1+040     | 510.519,607 | 4.786.938,349 | 48,7399  |            |        |
|    | 1+050     | 510.526,500 | 4.786.945,593 | 48,1032  |            |        |
|    | 1+060     | 510.533,321 | 4.786.952,906 | 47,4666  |            |        |
|    | 1+070     | 510.540,068 | 4.786.960,286 | 46,8300  |            |        |
|    | 1+080     | 510.546,742 | 4.786.967,734 | 46,1934  |            |        |
| PS | 1+083,961 | 510.549,364 | 4.786.970,702 | 45,9412  | -1.000,000 |        |
|    | 1+090     | 510.553,680 | 4.786.974,918 | 55,5527  |            |        |
|    | 1+100     | 510.562,060 | 4.786.980,327 | 71,4682  |            |        |
|    | 1+110     | 510.571,518 | 4.786.983,495 | 87,3837  |            |        |
|    | 1+120     | 510.581,465 | 4.786.984,224 | 103,2992 |            |        |
|    | 1+121,175 | 510.582,637 | 4.786.984,146 | 105,1692 |            |        |
| PS | 1+000,000 | 510.491,350 | 4.786.910,040 | 50,6815  | Infinito   |        |

4. EJE C

4.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio     | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|-----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.582,646 | 4.786.984,145 | 105,1544 | -35,000   |        | 510.585,477 | 4.787.019,031 |
| 1+029,976 | 29,976   | 510.608,938 | 4.786.971,261 | 152,8625 | 40,000    |        | 510.579,411 | 4.786.944,276 |
| 1+131,089 | 101,113  | 510.681,679 | 4.786.901,125 | 144,8162 | -800,000  |        | 511.199,479 | 4.787.510,947 |
| 1+177,207 | 46,118   | 510.716,740 | 4.786.871,165 | 145,2154 | 7.353,169 |        | 505.922,345 | 4.781.295,964 |

4.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio     | Parám. |
|----|-----------|-------------|---------------|----------|-----------|--------|
| PS | 1+000     | 510.582,646 | 4.786.984,145 | 105,1544 | 40,000    |        |
|    | 1+020     | 510.601,365 | 4.786.977,714 | 136,9854 |           |        |
|    | 1+029,976 | 510.608,938 | 4.786.971,261 | 152,8625 |           |        |
|    | 1+040     | 510.615,747 | 4.786.963,904 | 152,0648 |           |        |
|    | 1+060     | 510.629,604 | 4.786.949,483 | 150,4733 |           |        |
|    | 1+080     | 510.643,817 | 4.786.935,413 | 148,8817 |           |        |
|    | 1+100     | 510.658,378 | 4.786.921,703 | 147,2902 |           |        |
| PS | 1+120     | 510.673,276 | 4.786.908,361 | 145,6986 | -800,000  |        |
|    | 1+131,089 | 510.681,679 | 4.786.901,125 | 144,8162 |           |        |
|    | 1+140     | 510.688,468 | 4.786.895,353 | 144,8933 |           |        |
| PS | 1+160     | 510.703,681 | 4.786.882,369 | 145,0665 | 7.353,169 |        |
|    | 1+177,207 | 510.716,740 | 4.786.871,165 | 145,2154 |           |        |
|    | 1+177,207 | 510.716,740 | 4.786.871,165 | 145,2154 |           |        |

5. EJE D

5.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio     | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|-----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.748,423 | 4.786.864,653 | 344,6981 | 3.257,282 |        | 512.852,087 | 4.789.351,515 |
| 1+100,254 | 100,254  | 510.672,890 | 4.786.930,568 | 346,6575 | 3.257,282 |        | 512.852,087 | 4.789.351,515 |
| 1+152,135 | 51,881   | 510.637,515 | 4.786.968,431 | 357,6669 | 300,000   |        | 510.873,597 | 4.787.153,541 |
| 1+206,193 | 54,058   | 510.620,475 | 4.787.018,654 | 0,6849   | 80,000    |        | 510.700,470 | 4.787.017,793 |

5.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio     | Parám. |
|----|-----------|-------------|---------------|----------|-----------|--------|
| PS | 1+000,000 | 510.748,423 | 4.786.864,653 | 344,6981 | 3.257,282 |        |
|    | 1+010     | 510.740,798 | 4.786.871,123 | 344,8935 |           |        |
|    | 1+020     | 510.733,193 | 4.786.877,616 | 345,0889 |           |        |
|    | 1+030     | 510.725,608 | 4.786.884,133 | 345,2844 |           |        |
|    | 1+040     | 510.718,043 | 4.786.890,673 | 345,4798 |           |        |
|    | 1+050     | 510.710,498 | 4.786.897,236 | 345,6753 |           |        |
|    | 1+060     | 510.702,974 | 4.786.903,823 | 345,8707 |           |        |
|    | 1+070     | 510.695,469 | 4.786.910,432 | 346,0662 |           |        |
|    | 1+080     | 510.687,985 | 4.786.917,065 | 346,2616 |           |        |
|    | 1+090     | 510.680,522 | 4.786.923,720 | 346,4571 |           |        |
| PS | 1+100     | 510.673,079 | 4.786.930,398 | 346,6525 | 3.257,282 |        |
|    | 1+100,254 | 510.672,890 | 4.786.930,568 | 346,6575 |           |        |
|    | 1+110     | 510.665,753 | 4.786.937,205 | 348,7256 |           |        |
|    | 1+120     | 510.658,659 | 4.786.944,252 | 350,8477 |           |        |
|    | 1+130     | 510.651,803 | 4.786.951,531 | 352,9697 |           |        |
|    | 1+140     | 510.645,194 | 4.786.959,035 | 355,0918 |           |        |
|    | 1+150     | 510.638,839 | 4.786.966,755 | 357,2139 |           |        |
|    | 1+152,135 | 510.637,515 | 4.786.968,431 | 357,6669 |           |        |
|    | 1+160     | 510.632,974 | 4.786.974,848 | 363,9258 |           |        |
|    | 1+170     | 510.628,147 | 4.786.983,599 | 371,8835 |           |        |
| PS | 1+180     | 510.624,448 | 4.786.992,882 | 379,8413 | 300,000   |        |
|    | 1+190     | 510.621,935 | 4.787.002,555 | 387,7990 |           |        |
|    | 1+200     | 510.620,648 | 4.787.012,465 | 395,7568 |           |        |
|    | 1+206,193 | 510.620,475 | 4.787.018,654 | 0,6849   |           |        |
|    | 1+206,193 | 510.620,475 | 4.787.018,654 | 0,6849   |           |        |
|    |           |             |               |          |           |        |
|    |           |             |               |          |           |        |

## 6. EJE E

### 6.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.591,622 | 4.787.053,487 | 311,2360 | -35,000  |        | 510.585,477 | 4.787.019,031 |
| 1+062,621 | 62,621   | 510.540,168 | 4.787.086,313 | 361,0679 | 80,000   |        | 510.605,669 | 4.787.132,244 |
| 1+174,306 | 111,686  | 510.476,045 | 4.787.177,758 | 361,0679 | Infinito |        |             |               |

### 6.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio   | Parám. |
|----|-----------|-------------|---------------|----------|---------|--------|
|    | 1+000     | 510.591,622 | 4.787.053,487 | 311,2362 |         |        |
| PS | 1+000,000 | 510.591,622 | 4.787.053,487 | 311,2360 | -35,000 |        |
|    | 1+010     | 510.581,913 | 4.787.055,853 | 319,1937 |         |        |
|    | 1+020     | 510.572,574 | 4.787.059,410 | 327,1515 |         |        |
|    | 1+030     | 510.563,752 | 4.787.064,105 | 335,1092 |         |        |
|    | 1+040     | 510.555,584 | 4.787.069,862 | 343,0670 |         |        |
|    | 1+050     | 510.548,197 | 4.787.076,593 | 351,0247 |         |        |
|    | 1+060     | 510.541,707 | 4.787.084,193 | 358,9825 |         |        |
| PS | 1+062,621 | 510.540,168 | 4.787.086,313 | 361,0679 | 80,000  |        |
|    | 1+070     | 510.535,931 | 4.787.092,355 | 361,0679 |         |        |
|    | 1+080     | 510.530,190 | 4.787.100,543 | 361,0679 |         |        |
|    | 1+090     | 510.524,448 | 4.787.108,731 | 361,0679 |         |        |
|    | 1+100     | 510.518,707 | 4.787.116,918 | 361,0679 |         |        |
|    | 1+110     | 510.512,966 | 4.787.125,106 | 361,0679 |         |        |
|    | 1+120     | 510.507,224 | 4.787.133,294 | 361,0679 |         |        |
|    | 1+130     | 510.501,483 | 4.787.141,481 | 361,0679 |         |        |
|    | 1+140     | 510.495,742 | 4.787.149,669 | 361,0679 |         |        |
|    | 1+150     | 510.490,000 | 4.787.157,856 | 361,0679 |         |        |
|    | 1+160     | 510.484,259 | 4.787.166,044 | 361,0679 |         |        |
|    | 1+170     | 510.478,518 | 4.787.174,232 | 361,0679 |         |        |
|    | 1+174,306 | 510.476,046 | 4.787.177,757 | 361,0679 |         |        |

## 7. EJE F

### 7.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio     | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|-----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.466,484 | 4.787.170,274 | 161,0575 | Infinito  |        |             |               |
| 1+024,381 | 24,381   | 510.480,485 | 4.787.150,314 | 161,0575 | Infinito  |        |             |               |
| 1+141,356 | 116,975  | 510.543,860 | 4.787.052,029 | 166,0220 | 1.500,000 |        | 509.252,483 | 4.786.288,914 |
| 1+172,496 | 31,140   | 510.550,616 | 4.787.022,144 | 205,6709 | 50,000    |        | 510.500,814 | 4.787.026,592 |

### 7.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio     | Parám. |
|----|-----------|-------------|---------------|----------|-----------|--------|
|    | 1+000     | 510.466,484 | 4.787.170,274 | 161,0575 |           |        |
| PS | 1+000,000 | 510.466,484 | 4.787.170,274 | 161,0575 | Infinito  |        |
|    | 1+010     | 510.472,227 | 4.787.162,087 | 161,0575 |           |        |
|    | 1+020     | 510.477,969 | 4.787.153,901 | 161,0575 |           |        |
| PS | 1+024,381 | 510.480,485 | 4.787.150,314 | 161,0575 | Infinito  |        |
|    | 1+030     | 510.483,703 | 4.787.145,708 | 161,2959 |           |        |
|    | 1+040     | 510.489,388 | 4.787.137,481 | 161,7204 |           |        |
|    | 1+050     | 510.495,018 | 4.787.129,216 | 162,1448 |           |        |
|    | 1+060     | 510.500,592 | 4.787.120,914 | 162,5692 |           |        |
|    | 1+070     | 510.506,111 | 4.787.112,575 | 162,9936 |           |        |
|    | 1+080     | 510.511,574 | 4.787.104,199 | 163,4180 |           |        |
|    | 1+090     | 510.516,981 | 4.787.095,787 | 163,8424 |           |        |
|    | 1+100     | 510.522,332 | 4.787.087,339 | 164,2668 |           |        |
|    | 1+110     | 510.527,627 | 4.787.078,856 | 164,6912 |           |        |
|    | 1+120     | 510.532,865 | 4.787.070,337 | 165,1157 |           |        |
|    | 1+130     | 510.538,046 | 4.787.061,784 | 165,5401 |           |        |
|    | 1+140     | 510.543,169 | 4.787.053,197 | 165,9645 |           |        |
| PS | 1+141,356 | 510.543,860 | 4.787.052,029 | 166,0220 | 1.500,000 |        |
|    | 1+150     | 510.547,594 | 4.787.044,245 | 177,0278 |           |        |
|    | 1+160     | 510.550,169 | 4.787.034,600 | 189,7602 |           |        |
|    | 1+170     | 510.550,776 | 4.787.024,635 | 202,4926 |           |        |
|    | 1+172,496 | 510.550,616 | 4.787.022,144 | 205,6706 |           |        |

## 8. EJE G

### 8.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio     | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|-----------|--------|-------------|---------------|
| 1+009,814 | 0,000    | 510.795,019 | 4.786.837,435 | 344,2757 | Infinito  |        |             |               |
| 1+031,540 | 21,726   | 510.778,339 | 4.786.851,356 | 344,2757 | Infinito  |        |             |               |
| 1+066,674 | 35,134   | 510.749,874 | 4.786.871,902 | 335,3289 | -250,000  |        | 510.618,150 | 4.786.659,420 |
| 1+106,817 | 40,143   | 510.717,597 | 4.786.895,696 | 345,5512 | 250,000   |        | 510.881,599 | 4.787.084,384 |
| 1+158,175 | 51,358   | 510.679,102 | 4.786.929,691 | 346,5560 | 3.253,782 |        | 512.852,101 | 4.789.351,503 |
| 1+195,433 | 37,259   | 510.653,111 | 4.786.956,303 | 358,7803 | 100,000   | 62,000 | 510.732,872 | 4.787.016,620 |
| 1+218,874 | 23,440   | 510.641,282 | 4.786.976,478 | 373,7028 | 100,000   |        | 510.732,872 | 4.787.016,620 |
| 1+257,314 | 38,440   | 510.630,495 | 4.787.013,307 | 385,9386 | Infinito  | 62,000 |             |               |
| 1+281,814 | 24,500   | 510.623,216 | 4.787.036,633 | 370,3415 | -50,000   | 35,000 | 510.578,545 | 4.787.014,172 |
| 1+303,838 | 22,024   | 510.609,376 | 4.787.053,535 | 342,2995 | -50,000   |        | 510.578,545 | 4.787.014,172 |
| 1+328,338 | 24,500   | 510.587,945 | 4.787.065,273 | 326,7023 | Infinito  | 35,000 |             |               |
| 1+364,338 | 36,000   | 510.556,049 | 4.787.081,855 | 338,1615 | 100,000   | 60,000 | 510.612,467 | 4.787.164,420 |
| 1+382,319 | 17,981   | 510.542,192 | 4.787.093,276 | 349,6087 | 100,000   |        | 510.612,467 | 4.787.164,420 |
| 1+418,319 | 36,000   | 510.519,826 | 4.787.121,419 | 361,0679 | Infinito  | 60,000 |             |               |
| 1+489,583 | 71,264   | 510.478,911 | 4.787.179,767 | 361,0679 | Infinito  |        |             |               |

### 8.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coord. X    | Coord. Y      | Acimut   | Radio     | Parám. |
|----|-----------|-------------|---------------|----------|-----------|--------|
|    | 1+009,814 | 510.795,019 | 4.786.837,435 | 344,2757 |           |        |
|    | 1+010     | 510.794,876 | 4.786.837,554 | 344,2757 |           |        |
|    | 1+020     | 510.787,199 | 4.786.843,962 | 344,2757 |           |        |
|    | 1+030     | 510.779,521 | 4.786.850,369 | 344,2757 |           |        |
| PS | 1+031,540 | 510.778,339 | 4.786.851,356 | 344,2757 | Infinito  |        |
|    | 1+040     | 510.771,753 | 4.786.856,666 | 342,1214 |           |        |
|    | 1+050     | 510.763,743 | 4.786.862,651 | 339,5749 |           |        |
|    | 1+060     | 510.755,499 | 4.786.868,310 | 337,0284 |           |        |
| PS | 1+066,674 | 510.749,874 | 4.786.871,902 | 335,3289 | -250,000  |        |
|    | 1+070     | 510.747,059 | 4.786.873,673 | 336,1759 |           |        |
|    | 1+080     | 510.738,741 | 4.786.879,222 | 338,7223 |           |        |
|    | 1+090     | 510.730,651 | 4.786.885,099 | 341,2688 |           |        |
|    | 1+100     | 510.722,802 | 4.786.891,294 | 343,8153 |           |        |
| PS | 1+106,817 | 510.717,597 | 4.786.895,696 | 345,5512 | 250,000   |        |
|    | 1+110     | 510.715,195 | 4.786.897,785 | 345,6135 |           |        |
|    | 1+120     | 510.707,664 | 4.786.904,364 | 345,8091 |           |        |
|    | 1+130     | 510.700,153 | 4.786.910,966 | 346,0048 |           |        |
|    | 1+140     | 510.692,663 | 4.786.917,591 | 346,2004 |           |        |
|    | 1+150     | 510.685,193 | 4.786.924,240 | 346,3961 |           |        |
| PS | 1+158,175 | 510.679,102 | 4.786.929,691 | 346,5560 | 3.253,782 |        |
|    | 1+160     | 510.677,744 | 4.786.930,911 | 346,6193 |           |        |
|    | 1+170     | 510.670,363 | 4.786.937,658 | 347,9453 |           |        |
|    | 1+180     | 510.663,215 | 4.786.944,650 | 350,9275 |           |        |
|    | 1+190     | 510.656,499 | 4.786.952,056 | 355,5658 |           |        |
| PS | 1+195,433 | 510.653,111 | 4.786.956,303 | 358,7803 | 100,000   | 62,000 |
|    | 1+200     | 510.650,440 | 4.786.960,007 | 361,6875 |           |        |
|    | 1+210     | 510.645,200 | 4.786.968,519 | 368,0537 |           |        |
| PS | 1+218,874 | 510.641,282 | 4.786.976,478 | 373,7028 | 100,000   |        |
|    | 1+220     | 510.640,836 | 4.786.977,512 | 374,4094 |           |        |
|    | 1+230     | 510.637,335 | 4.786.986,876 | 379,7610 |           |        |
|    | 1+240     | 510.634,507 | 4.786.996,466 | 383,4564 |           |        |
|    | 1+250     | 510.632,114 | 4.787.006,175 | 385,4957 |           |        |
| PS | 1+257,314 | 510.630,495 | 4.787.013,307 | 385,9386 | Infinito  | 62,000 |
|    | 1+260     | 510.629,904 | 4.787.015,928 | 385,7511 |           |        |
|    | 1+270     | 510.627,446 | 4.787.025,619 | 381,7565 |           |        |

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
|    | 1+280     | 510.624,002 | 4.787.034,998 | 372,5651 |          |        |
| PS | 1+281,814 | 510.623,216 | 4.787.036,633 | 370,3415 | -50,000  | 35,000 |
|    | 1+290     | 510.618,958 | 4.787.043,614 | 359,9181 |          |        |
|    | 1+300     | 510.612,303 | 4.787.051,056 | 347,1857 |          |        |
| PS | 1+303,838 | 510.609,376 | 4.787.053,535 | 342,2995 | -50,000  |        |
|    | 1+310     | 510.604,320 | 4.787.057,054 | 335,4401 |          |        |
|    | 1+320     | 510.595,527 | 4.787.061,806 | 328,5087 |          |        |
| PS | 1+328,338 | 510.587,945 | 4.787.065,273 | 326,7023 | Infinito | 35,000 |
|    | 1+330     | 510.586,426 | 4.787.065,950 | 326,7267 |          |        |
|    | 1+340     | 510.577,323 | 4.787.070,089 | 327,9049 |          |        |
|    | 1+350     | 510.568,360 | 4.787.074,521 | 330,8514 |          |        |
|    | 1+360     | 510.559,680 | 4.787.079,483 | 335,5664 |          |        |
| PS | 1+364,338 | 510.556,049 | 4.787.081,855 | 338,1615 | 100,000  | 60,000 |
|    | 1+370     | 510.551,467 | 4.787.085,180 | 341,7662 |          |        |
|    | 1+380     | 510.543,861 | 4.787.091,666 | 348,1324 |          |        |
| PS | 1+382,319 | 510.542,192 | 4.787.093,276 | 349,6087 | 100,000  |        |
|    | 1+390     | 510.536,925 | 4.787.098,864 | 353,9770 |          |        |
|    | 1+400     | 510.530,574 | 4.787.106,586 | 358,1007 |          |        |
|    | 1+410     | 510.524,624 | 4.787.114,623 | 360,4560 |          |        |
| PS | 1+418,319 | 510.519,826 | 4.787.121,419 | 361,0679 | Infinito | 60,000 |
|    | 1+420     | 510.518,861 | 4.787.122,795 | 361,0679 |          |        |
|    | 1+430     | 510.513,119 | 4.787.130,983 | 361,0679 |          |        |
|    | 1+440     | 510.507,378 | 4.787.139,170 | 361,0679 |          |        |
|    | 1+450     | 510.501,637 | 4.787.147,358 | 361,0679 |          |        |
|    | 1+460     | 510.495,896 | 4.787.155,546 | 361,0679 |          |        |
|    | 1+470     | 510.490,154 | 4.787.163,733 | 361,0679 |          |        |
|    | 1+480     | 510.484,413 | 4.787.171,921 | 361,0679 |          |        |
| PS | 1+489,583 | 510.478,911 | 4.787.179,767 | 361,0679 | Infinito |        |
|    | 1+489,583 | 510.478,911 | 4.787.179,767 | 361,0679 |          |        |

## 9. EJE H

### 9.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.466,484 | 4.787.170,274 | 161,0573 | Infinito |        |             |               |
| 1+005,329 | 5,329    | 510.469,544 | 4.787.165,911 | 161,0573 | Infinito |        |             |               |
| 1+041,542 | 36,213   | 510.489,249 | 4.787.135,538 | 165,6681 | 500,000  |        | 510.060,211 | 4.786.878,777 |
| 1+104,504 | 62,962   | 510.521,581 | 4.787.081,512 | 165,6681 | Infinito |        |             |               |
| 1+149,504 | 45,000   | 510.540,908 | 4.787.041,049 | 183,5730 | 80,000   | 60,000 | 510.463,557 | 4.787.020,634 |
| 1+211,284 | 61,781   | 510.533,211 | 4.786.981,286 | 232,7364 | 80,000   |        | 510.463,557 | 4.787.020,634 |
| 1+256,284 | 45,000   | 510.504,261 | 4.786.947,040 | 250,6413 | Infinito | 60,000 |             |               |
| 1+281,359 | 25,075   | 510.486,353 | 4.786.929,489 | 250,6413 | Infinito |        |             |               |

## 9.2. PUNTOS SUCESIVOS CADA 10 METROS

|    |                 |                |                |               |              |               | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio | Parám. |
|----|-----------------|----------------|----------------|---------------|--------------|---------------|-----------|-------------|---------------|----------|-------|--------|
|    |                 |                |                |               |              |               | 1+281,359 | 510.486,353 | 4.786.929,489 | 250,6413 |       |        |
|    | <b>Estación</b> | <b>Coor. X</b> | <b>Coor. Y</b> | <b>Acimut</b> | <b>Radio</b> | <b>Parám.</b> |           |             |               |          |       |        |
| PS | 1+000,000       | 510.466,484    | 4.787.170,274  | 161,0573      | Infinito     |               |           |             |               |          |       |        |
| PS | 1+005,329       | 510.469,544    | 4.787.165,911  | 161,0573      | Infinito     |               |           |             |               |          |       |        |
|    | 1+010           | 510.472,209    | 4.787.162,075  | 161,6520      |              |               |           |             |               |          |       |        |
|    | 1+020           | 510.477,792    | 4.787.153,779  | 162,9253      |              |               |           |             |               |          |       |        |
|    | 1+030           | 510.483,208    | 4.787.145,373  | 164,1985      |              |               |           |             |               |          |       |        |
|    | 1+040           | 510.488,455    | 4.787.136,860  | 165,4718      |              |               |           |             |               |          |       |        |
| PS | 1+041,542       | 510.489,249    | 4.787.135,538  | 165,6681      | 500,000      |               |           |             |               |          |       |        |
|    | 1+050           | 510.493,592    | 4.787.128,280  | 165,6681      |              |               |           |             |               |          |       |        |
|    | 1+060           | 510.498,728    | 4.787.119,700  | 165,6681      |              |               |           |             |               |          |       |        |
|    | 1+070           | 510.503,863    | 4.787.111,119  | 165,6681      |              |               |           |             |               |          |       |        |
|    | 1+080           | 510.508,998    | 4.787.102,538  | 165,6681      |              |               |           |             |               |          |       |        |
|    | 1+090           | 510.514,133    | 4.787.093,957  | 165,6681      |              |               |           |             |               |          |       |        |
|    | 1+100           | 510.519,268    | 4.787.085,377  | 165,6681      |              |               |           |             |               |          |       |        |
| PS | 1+104,504       | 510.521,581    | 4.787.081,512  | 165,6681      | Infinito     |               |           |             |               |          |       |        |
|    | 1+110           | 510.524,397    | 4.787.076,792  | 165,9352      |              |               |           |             |               |          |       |        |
|    | 1+120           | 510.529,390    | 4.787.068,128  | 167,7913      |              |               |           |             |               |          |       |        |
|    | 1+130           | 510.534,005    | 4.787.059,258  | 171,4158      |              |               |           |             |               |          |       |        |
|    | 1+140           | 510.537,981    | 4.787.050,086  | 176,8087      |              |               |           |             |               |          |       |        |
| PS | 1+149,504       | 510.540,908    | 4.787.041,049  | 183,5730      | 80,000       | 60,000        |           |             |               |          |       |        |
|    | 1+150           | 510.541,033    | 4.787.040,569  | 183,9678      |              |               |           |             |               |          |       |        |
|    | 1+160           | 510.542,914    | 4.787.030,754  | 191,9256      |              |               |           |             |               |          |       |        |
|    | 1+170           | 510.543,556    | 4.787.020,781  | 199,8833      |              |               |           |             |               |          |       |        |
|    | 1+180           | 510.542,951    | 4.787.010,806  | 207,8411      |              |               |           |             |               |          |       |        |
|    | 1+190           | 510.541,106    | 4.787.000,984  | 215,7988      |              |               |           |             |               |          |       |        |
|    | 1+200           | 510.538,051    | 4.786.991,469  | 223,7566      |              |               |           |             |               |          |       |        |
|    | 1+210           | 510.533,833    | 4.786.982,409  | 231,7143      |              |               |           |             |               |          |       |        |
| PS | 1+211,284       | 510.533,211    | 4.786.981,286  | 232,7364      | 80,000       |               |           |             |               |          |       |        |
|    | 1+220           | 510.528,545    | 4.786.973,928  | 239,0004      |              |               |           |             |               |          |       |        |
|    | 1+230           | 510.522,428    | 4.786.966,021  | 244,5327      |              |               |           |             |               |          |       |        |
|    | 1+240           | 510.515,750    | 4.786.958,580  | 248,2966      |              |               |           |             |               |          |       |        |
|    | 1+250           | 510.508,742    | 4.786.951,447  | 250,2921      |              |               |           |             |               |          |       |        |
| PS | 1+256,284       | 510.504,261    | 4.786.947,040  | 250,6413      | Infinito     | 60,000        |           |             |               |          |       |        |
|    | 1+260           | 510.501,608    | 4.786.944,439  | 250,6413      |              |               |           |             |               |          |       |        |
|    | 1+270           | 510.494,466    | 4.786.937,440  | 250,6413      |              |               |           |             |               |          |       |        |
|    | 1+280           | 510.487,324    | 4.786.930,441  | 250,6413      |              |               |           |             |               |          |       |        |

## 10. EJE AUXILIAR A

### 10.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio   | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|---------|--------|-------------|---------------|
| 0+973,080 | 0,000    | 510.574,657 | 4.787.042,672 | 272,6758 | -26,000 |        | 510.585,477 | 4.787.019,031 |
| 1+000,000 | 26,920   | 510.559,624 | 4.787.021,787 | 206,7615 | -26,000 |        | 510.585,477 | 4.787.019,031 |
| 1+042,078 | 42,078   | 510.545,196 | 4.786.982,716 | 238,2763 | 85,000  |        | 510.475,102 | 4.787.030,798 |
| 1+081,607 | 39,530   | 510.519,820 | 4.786.952,488 | 250,6426 | 203,500 |        | 510.377,383 | 4.787.097,829 |

### 10.2. PUNTOS SUCESIVOS CADA 10 METROS

| Estación     | Coord. X    | Coord. Y      | Acimut   | Radio   | Parám. |
|--------------|-------------|---------------|----------|---------|--------|
| 0+973,080    | 510.574,657 | 4.787.042,672 | 272,6758 |         |        |
| 0+980        | 510.568,820 | 4.787.038,994 | 255,7319 |         |        |
| 0+990        | 510.562,546 | 4.787.031,286 | 231,2465 |         |        |
| PS 1+000,000 | 510.559,624 | 4.787.021,787 | 206,7615 | -26,000 |        |
| 1+010        | 510.557,982 | 4.787.011,928 | 214,2513 |         |        |
| 1+020        | 510.555,194 | 4.787.002,331 | 221,7409 |         |        |
| 1+030        | 510.551,299 | 4.786.993,127 | 229,2306 |         |        |
| 1+040        | 510.546,351 | 4.786.984,443 | 236,7202 |         |        |
| PS 1+042,078 | 510.545,196 | 4.786.982,716 | 238,2763 | 85,000  |        |
| 1+050        | 510.540,589 | 4.786.976,272 | 240,7547 |         |        |
| 1+060        | 510.534,421 | 4.786.968,402 | 243,8830 |         |        |
| 1+070        | 510.527,874 | 4.786.960,844 | 247,0114 |         |        |
| 1+080        | 510.520,963 | 4.786.953,618 | 250,1397 |         |        |
| 1+081,607    | 510.519,820 | 4.786.952,488 | 250,6425 |         |        |

## 11. EJE AUXILIAR B

### 11.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 0+925,047 | 0,000    | 510.493,243 | 4.786.921,688 | 50,6815  | -993,000 |        | 509.798,643 | 4.787.631,321 |
| 1+000,000 | 74,953   | 510.544,778 | 4.786.976,088 | 45,8763  | -993,000 |        | 509.798,643 | 4.787.631,321 |
| 1+044,568 | 44,568   | 510.584,406 | 4.786.993,053 | 102,6221 | 50,000   |        | 510.582,348 | 4.786.943,095 |
| 1+086,480 | 41,912   | 510.611,477 | 4.787.019,031 | 399,9991 | -26,000  |        | 510.585,477 | 4.787.019,031 |

### 11.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
| PS | 0+925,047 | 510.493,243 | 4.786.921,688 | 50,6815  | -993,000 |        |
|    | 0+930     | 510.496,774 | 4.786.925,161 | 50,3640  |          |        |
|    | 0+940     | 510.503,849 | 4.786.932,227 | 49,7229  |          |        |
|    | 0+950     | 510.510,854 | 4.786.939,364 | 49,0818  |          |        |
|    | 0+960     | 510.517,786 | 4.786.946,572 | 48,4407  |          |        |
|    | 0+970     | 510.524,645 | 4.786.953,848 | 47,7996  |          |        |
|    | 0+980     | 510.531,431 | 4.786.961,194 | 47,1585  |          |        |
|    | 0+990     | 510.538,142 | 4.786.968,607 | 46,5174  |          |        |
| PS | 1+000,000 | 510.544,778 | 4.786.976,088 | 45,8763  | -993,000 |        |
|    | 1+010     | 510.552,082 | 4.786.982,894 | 58,6090  |          |        |
|    | 1+020     | 510.560,592 | 4.786.988,114 | 71,3414  |          |        |
|    | 1+030     | 510.569,969 | 4.786.991,539 | 84,0738  |          |        |
|    | 1+040     | 510.579,840 | 4.786.993,032 | 96,8062  |          |        |
| PS | 1+044,568 | 510.584,406 | 4.786.993,053 | 102,6221 | 50,000   |        |
|    | 1+050     | 510.589,818 | 4.786.993,395 | 89,3211  |          |        |
|    | 1+060     | 510.599,119 | 4.786.996,897 | 64,8357  |          |        |
|    | 1+070     | 510.606,427 | 4.787.003,633 | 40,3503  |          |        |
|    | 1+080     | 510.610,674 | 4.787.012,618 | 15,8649  |          |        |
| PS | 1+086,480 | 510.611,477 | 4.787.019,031 | 399,9991 | -26,000  |        |
|    | 1+086,480 | 510.611,477 | 4.787.019,031 | 399,9991 |          |        |

## 12. EJE AUXILIAR C

### 12.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 0+880,750 | 0,000    | 510.611,477 | 4.787.019,031 | 399,9991 | -26,000  |        | 510.585,477 | 4.787.019,031 |
| 1+000,000 | 119,250  | 510.582,214 | 4.786.993,236 | 108,0104 | -26,000  |        | 510.585,477 | 4.787.019,031 |
| 1+035,338 | 35,337   | 510.612,923 | 4.786.977,280 | 153,0034 | 50,000   |        | 510.575,939 | 4.786.943,631 |
| 1+137,322 | 101,984  | 510.686,210 | 4.786.906,461 | 144,8162 | -793,000 |        | 511.199,479 | 4.787.510,947 |

### 12.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
| PS | 0+880,750 | 510.611,477 | 4.787.019,031 | 399,9991 | -26,000  |        |
|    | 0+890     | 510.609,849 | 4.787.028,087 | 377,3502 |          |        |
|    | 0+900     | 510.604,670 | 4.787.036,570 | 352,8648 |          |        |
|    | 0+910     | 510.596,687 | 4.787.042,490 | 328,3794 |          |        |
|    | 0+920     | 510.587,066 | 4.787.044,982 | 303,8940 |          |        |
|    | 0+930     | 510.577,213 | 4.787.043,682 | 279,4087 |          |        |
|    | 0+940     | 510.568,568 | 4.787.038,781 | 254,9233 |          |        |
|    | 0+950     | 510.562,393 | 4.787.030,993 | 230,4379 |          |        |
|    | 0+960     | 510.559,591 | 4.787.021,458 | 205,9525 |          |        |
|    | 0+970     | 510.560,571 | 4.787.011,568 | 181,4672 |          |        |
|    | 0+980     | 510.565,190 | 4.787.002,768 | 156,9818 |          |        |
|    | 0+990     | 510.572,774 | 4.786.996,345 | 132,4964 |          |        |
|    | 1+000     | 510.582,214 | 4.786.993,236 | 108,0110 |          |        |
|    | 1+000,000 | 510.582,214 | 4.786.993,236 | 108,0104 | -26,000  |        |
|    | 1+010     | 510.591,944 | 4.786.991,001 | 120,7425 |          |        |
| PS | 1+020     | 510.601,036 | 4.786.986,877 | 133,4749 |          |        |
|    | 1+030     | 510.609,127 | 4.786.981,029 | 146,2073 |          |        |
|    | 1+035,338 | 510.612,923 | 4.786.977,280 | 153,0034 | 50,000   |        |
|    | 1+040     | 510.616,070 | 4.786.973,841 | 152,6292 |          |        |
|    | 1+050     | 510.622,890 | 4.786.966,527 | 151,8264 |          |        |
|    | 1+060     | 510.629,801 | 4.786.959,299 | 151,0236 |          |        |
|    | 1+070     | 510.636,802 | 4.786.952,159 | 150,2208 |          |        |
|    | 1+080     | 510.643,893 | 4.786.945,108 | 149,4180 |          |        |
|    | 1+090     | 510.651,073 | 4.786.938,147 | 148,6152 |          |        |
|    | 1+100     | 510.658,339 | 4.786.931,278 | 147,8124 |          |        |
|    | 1+110     | 510.665,692 | 4.786.924,500 | 147,0096 |          |        |
|    | 1+120     | 510.673,130 | 4.786.917,815 | 146,2068 |          |        |
|    | 1+130     | 510.680,651 | 4.786.911,225 | 145,4040 |          |        |
|    | 1+137,322 | 510.686,210 | 4.786.906,461 | 144,8162 | -793,000 |        |
|    | 1+137,322 | 510.686,210 | 4.786.906,461 | 144,8162 |          |        |

### 13. EJE AUXILIAR D

#### 13.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio   | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|---------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.668,206 | 4.786.925,366 | 346,6575 | 307,000 |        | 510.873,597 | 4.787.153,541 |
| 1+053,938 | 53,938   | 510.631,485 | 4.786.964,779 | 357,8426 | 307,000 |        | 510.873,597 | 4.787.153,541 |
| 1+113,581 | 59,643   | 510.611,462 | 4.787.019,924 | 397,8108 | 95,000  |        | 510.706,405 | 4.787.023,191 |
| 1+164,687 | 51,106   | 510.574,657 | 4.787.042,672 | 272,6758 | -26,000 |        | 510.585,477 | 4.787.019,031 |

#### 13.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio   | Parám. |
|----|-----------|-------------|---------------|----------|---------|--------|
| PS | 1+000,000 | 510.668,206 | 4.786.925,366 | 346,6575 | 307,000 |        |
|    | 1+010     | 510.660,884 | 4.786.932,176 | 348,7312 |         |        |
|    | 1+020     | 510.653,788 | 4.786.939,221 | 350,8048 |         |        |
|    | 1+030     | 510.646,924 | 4.786.946,493 | 352,8785 |         |        |
|    | 1+040     | 510.640,302 | 4.786.953,985 | 354,9522 |         |        |
|    | 1+050     | 510.633,926 | 4.786.961,689 | 357,0259 |         |        |
| PS | 1+053,938 | 510.631,485 | 4.786.964,779 | 357,8426 | 307,000 |        |
|    | 1+060     | 510.627,913 | 4.786.969,675 | 361,9046 |         |        |
|    | 1+070     | 510.622,725 | 4.786.978,218 | 368,6058 |         |        |
|    | 1+080     | 510.618,463 | 4.786.987,259 | 375,3071 |         |        |
|    | 1+090     | 510.615,174 | 4.786.996,698 | 382,0084 |         |        |
|    | 1+100     | 510.612,896 | 4.787.006,431 | 388,7096 |         |        |
| PS | 1+110     | 510.611,652 | 4.787.016,348 | 395,4109 | 95,000  |        |
|    | 1+113,581 | 510.611,462 | 4.787.019,924 | 397,8108 |         |        |
|    | 1+120     | 510.610,455 | 4.787.026,247 | 382,0946 |         |        |
|    | 1+130     | 510.605,923 | 4.787.035,092 | 357,6092 |         |        |
|    | 1+140     | 510.598,403 | 4.787.041,590 | 333,1238 |         |        |
|    | 1+150     | 510.588,994 | 4.787.044,792 | 308,6385 |         |        |
|    | 1+160     | 510.579,072 | 4.787.044,229 | 284,1531 |         |        |
|    | 1+164,687 | 510.574,657 | 4.787.042,672 | 272,6768 |         |        |

### 14. EJE AUXILIAR E

#### 14.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 0+966,439 | 0,000    | 510.611,477 | 4.787.019,031 | 399,9991 | -26,000  |        | 510.585,477 | 4.787.019,031 |
| 1+000,000 | 33,561   | 510.592,662 | 4.787.044,018 | 317,8241 | -26,000  |        | 510.585,477 | 4.787.019,031 |
| 1+067,927 | 67,927   | 510.538,419 | 4.787.082,711 | 361,0679 | 100,000  |        | 510.620,295 | 4.787.140,124 |
| 1+181,558 | 113,631  | 510.473,180 | 4.787.175,748 | 361,0679 | Infinito |        |             |               |

## 14.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio   | Parám. |
|----|-----------|-------------|---------------|----------|---------|--------|
|    | 0+966,439 | 510.611,477 | 4.787.019,031 | 399,9991 |         |        |
| PS | 0+966,439 | 510.611,477 | 4.787.019,031 | 399,9991 | -26,000 |        |
|    | 0+970     | 510.611,233 | 4.787.022,581 | 391,2799 |         |        |
|    | 0+980     | 510.608,020 | 4.787.031,985 | 366,7945 |         |        |
|    | 0+990     | 510.601,512 | 4.787.039,497 | 342,3091 |         |        |
| PS | 1+000,000 | 510.592,662 | 4.787.044,018 | 317,8241 | -26,000 |        |
|    | 1+010     | 510.583,205 | 4.787.047,257 | 324,1903 |         |        |
|    | 1+020     | 510.574,119 | 4.787.051,424 | 330,5565 |         |        |
|    | 1+030     | 510.565,495 | 4.787.056,477 | 336,9227 |         |        |
|    | 1+040     | 510.557,418 | 4.787.062,366 | 343,2889 |         |        |
|    | 1+050     | 510.549,969 | 4.787.069,032 | 349,6551 |         |        |
|    | 1+060     | 510.543,223 | 4.787.076,408 | 356,0213 |         |        |
| PS | 1+067,927 | 510.538,419 | 4.787.082,711 | 361,0679 | 100,000 |        |
|    | 1+070     | 510.537,229 | 4.787.084,408 | 361,0679 |         |        |
|    | 1+080     | 510.531,488 | 4.787.092,596 | 361,0679 |         |        |
|    | 1+090     | 510.525,746 | 4.787.100,783 | 361,0679 |         |        |
|    | 1+100     | 510.520,005 | 4.787.108,971 | 361,0679 |         |        |
|    | 1+110     | 510.514,264 | 4.787.117,159 | 361,0679 |         |        |
|    | 1+120     | 510.508,522 | 4.787.125,346 | 361,0679 |         |        |
|    | 1+130     | 510.502,781 | 4.787.133,534 | 361,0679 |         |        |
|    | 1+140     | 510.497,040 | 4.787.141,722 | 361,0679 |         |        |
|    | 1+150     | 510.491,298 | 4.787.149,909 | 361,0679 |         |        |
|    | 1+160     | 510.485,557 | 4.787.158,097 | 361,0679 |         |        |
|    | 1+170     | 510.479,816 | 4.787.166,284 | 361,0679 |         |        |
|    | 1+180     | 510.474,074 | 4.787.174,472 | 361,0679 |         |        |
|    | 1+181,558 | 510.473,180 | 4.787.175,748 | 361,0679 |         |        |
|    | 0+966,439 | 510.611,477 | 4.787.019,031 | 399,9991 |         |        |

## 15. EJE AUXILIAR F

### 15.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio     | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|-----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.486,216 | 4.787.154,334 | 161,0575 | 1.507,000 |        | 509.252,483 | 4.786.288,914 |
| 1+118,723 | 118,723  | 510.550,497 | 4.787.054,555 | 166,0728 | 1.507,000 |        | 509.252,483 | 4.786.288,914 |
| 1+155,150 | 36,427   | 510.559,487 | 4.787.019,745 | 201,7501 | 65,000    |        | 510.494,511 | 4.787.021,532 |
| 1+178,183 | 23,033   | 510.568,482 | 4.786.999,354 | 145,3524 | -26,000   |        | 510.585,477 | 4.787.019,031 |

### 15.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio     | Parám. |
|----|-----------|-------------|---------------|----------|-----------|--------|
| PS | 1+000,000 | 510.486,216 | 4.787.154,334 | 161,0575 | 1.507,000 |        |
|    | 1+010     | 510.491,931 | 4.787.146,128 | 161,4799 |           |        |
|    | 1+020     | 510.497,592 | 4.787.137,885 | 161,9023 |           |        |
|    | 1+030     | 510.503,198 | 4.787.129,604 | 162,3248 |           |        |
|    | 1+040     | 510.508,749 | 4.787.121,286 | 162,7472 |           |        |
|    | 1+050     | 510.514,245 | 4.787.112,932 | 163,1697 |           |        |
|    | 1+060     | 510.519,685 | 4.787.104,541 | 163,5921 |           |        |
|    | 1+070     | 510.525,069 | 4.787.096,114 | 164,0146 |           |        |
|    | 1+080     | 510.530,398 | 4.787.087,652 | 164,4370 |           |        |
|    | 1+090     | 510.535,670 | 4.787.079,155 | 164,8594 |           |        |
|    | 1+100     | 510.540,885 | 4.787.070,622 | 165,2819 |           |        |
|    | 1+110     | 510.546,044 | 4.787.062,056 | 165,7043 |           |        |
| PS | 1+118,723 | 510.550,497 | 4.787.054,555 | 166,0728 | 1.507,000 |        |
|    | 1+120     | 510.551,135 | 4.787.053,449 | 167,3236 |           |        |
|    | 1+130     | 510.555,358 | 4.787.044,395 | 177,1177 |           |        |
|    | 1+140     | 510.558,143 | 4.787.034,801 | 186,9119 |           |        |
|    | 1+150     | 510.559,424 | 4.787.024,893 | 196,7060 |           |        |
| PS | 1+155,150 | 510.559,487 | 4.787.019,745 | 201,7501 | 65,000    |        |
|    | 1+160     | 510.559,805 | 4.787.014,913 | 189,8748 |           |        |
|    | 1+170     | 510.563,226 | 4.787.005,581 | 165,3894 |           |        |
|    | 1+178,183 | 510.568,482 | 4.786.999,354 | 145,3530 |           |        |

## 16. ENTRADA GASOLINERA

### 16.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.618,473 | 4.786.961,009 | 151,7484 | -800,000 |        | 511.199,479 | 4.787.510,947 |
| 1+011,744 | 11,744   | 510.620,356 | 4.786.950,090 | 226,5109 | 10,000   |        | 510.611,210 | 4.786.954,135 |
| 1+023,198 | 11,455   | 510.610,758 | 4.786.948,146 | 348,0500 | 6,000    |        | 510.614,868 | 4.786.952,517 |
| 1+044,553 | 21,355   | 510.595,202 | 4.786.962,777 | 348,0500 | Infinito |        |             |               |

### 16.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
| PS | 1+000,000 | 510.618,473 | 4.786.961,009 | 151,7484 | -800,000 |        |
|    | 1+010     | 510.620,919 | 4.786.951,738 | 215,4104 |          |        |
| PS | 1+011,744 | 510.620,356 | 4.786.950,090 | 226,5109 | 10,000   |        |
|    | 1+020     | 510.613,549 | 4.786.946,664 | 314,1133 |          |        |
| PS | 1+023,198 | 510.610,758 | 4.786.948,146 | 348,0500 | 6,000    |        |
|    | 1+030     | 510.605,803 | 4.786.952,806 | 348,0500 |          |        |
|    | 1+040     | 510.598,519 | 4.786.959,658 | 348,0500 |          |        |
|    | 1+044,553 | 510.595,202 | 4.786.962,777 | 348,0500 |          |        |
| PS | 1+000,000 | 510.618,473 | 4.786.961,009 | 151,7484 | -800,000 |        |
|    | 1+010     | 510.620,919 | 4.786.951,738 | 215,4104 |          |        |
| PS | 1+011,744 | 510.620,356 | 4.786.950,090 | 226,5109 | 10,000   |        |
|    | 1+020     | 510.613,549 | 4.786.946,664 | 314,1133 |          |        |
| PS | 1+023,198 | 510.610,758 | 4.786.948,146 | 348,0500 | 6,000    |        |
|    | 1+030     | 510.605,803 | 4.786.952,806 | 348,0500 |          |        |
|    | 1+040     | 510.598,519 | 4.786.959,658 | 348,0500 |          |        |
|    | 1+044,553 | 510.595,202 | 4.786.962,777 | 348,0500 |          |        |

## 17. SALIDA GASOLINERA

### 17.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.600,180 | 4.786.967,703 | 148,3050 | 62,591   |        | 510.557,116 | 4.786.922,282 |
| 1+064,233 | 64,233   | 510.646,793 | 4.786.923,509 | 148,3050 | Infinito |        |             |               |

### 17.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+000     | 510.600,180 | 4.786.967,704 | 148,3046 |        |        |
|    | 1+000,000 | 510.600,180 | 4.786.967,703 | 148,3050 | 62,591 |        |
|    | 1+010     | 510.607,437 | 4.786.960,823 | 148,3050 |        |        |
|    | 1+020     | 510.614,694 | 4.786.953,943 | 148,3050 |        |        |
|    | 1+030     | 510.621,950 | 4.786.947,063 | 148,3050 |        |        |
|    | 1+040     | 510.629,207 | 4.786.940,182 | 148,3050 |        |        |
|    | 1+050     | 510.636,464 | 4.786.933,302 | 148,3050 |        |        |
|    | 1+060     | 510.643,721 | 4.786.926,422 | 148,3050 |        |        |
|    | 1+064,233 | 510.646,793 | 4.786.923,509 | 148,3050 |        |        |
|    |           |             |               |          |        |        |

## 18. AUXILIAR GASOLINERA

### 18.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.626,167 | 4.786.952,988 | 204,8787 | 15,000   |        | 510.611,211 | 4.786.954,136 |
| 1+006,749 | 6,749    | 510.624,179 | 4.786.946,598 | 233,5229 | 15,000   |        | 510.611,211 | 4.786.954,136 |
| 1+016,600 | 9,851    | 510.619,228 | 4.786.938,081 | 233,5229 | Infinito |        |             |               |

### 18.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+000,000 | 510.626,167 | 4.786.952,988 | 204,8787 | 15,000 |        |
| PS | 1+006,749 | 510.624,179 | 4.786.946,598 | 233,5229 | 15,000 |        |
|    | 1+010     | 510.622,545 | 4.786.943,787 | 233,5229 |        |        |
|    | 1+016,600 | 510.619,228 | 4.786.938,081 | 233,5229 |        |        |

## 19. VÍA SERVICIO 1

### 19.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.467,616 | 4.787.155,388 | 160,6176 | Infinito |        |             |               |
| 1+028,274 | 28,274   | 510.484,012 | 4.787.132,354 | 160,6176 | Infinito |        |             |               |
| 1+044,141 | 15,867   | 510.492,692 | 4.787.119,076 | 165,6682 | 200,000  |        | 510.321,076 | 4.787.016,372 |
| 1+088,499 | 44,358   | 510.515,470 | 4.787.081,014 | 165,6682 | Infinito |        |             |               |
| 1+134,912 | 46,413   | 510.534,998 | 4.787.039,125 | 185,3666 | 75,000   | 59,000 | 510.461,970 | 4.787.022,037 |
| 1+211,381 | 76,469   | 510.514,773 | 4.786.968,775 | 250,2755 | 75,000   |        | 510.461,970 | 4.787.022,037 |
| 1+213,888 | 2,507    | 510.512,977 | 4.786.967,026 | 251,4126 | 140,372  |        | 510.415,946 | 4.787.068,462 |

## 19.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
| PS | 1+000,000 | 510.467,616 | 4.787.155,388 | 160,6176 | Infinito |        |
|    | 1+010     | 510.473,415 | 4.787.147,241 | 160,6176 |          |        |
|    | 1+020     | 510.479,214 | 4.787.139,094 | 160,6176 |          |        |
| PS | 1+028,274 | 510.484,012 | 4.787.132,354 | 160,6176 | Infinito |        |
|    | 1+030     | 510.485,007 | 4.787.130,943 | 161,1669 |          |        |
|    | 1+040     | 510.490,529 | 4.787.122,607 | 164,3500 |          |        |
| PS | 1+044,141 | 510.492,692 | 4.787.119,076 | 165,6682 | 200,000  |        |
|    | 1+050     | 510.495,700 | 4.787.114,048 | 165,6682 |          |        |
|    | 1+060     | 510.500,836 | 4.787.105,468 | 165,6682 |          |        |
|    | 1+070     | 510.505,971 | 4.787.096,887 | 165,6682 |          |        |
|    | 1+080     | 510.511,106 | 4.787.088,306 | 165,6682 |          |        |
| PS | 1+088,499 | 510.515,470 | 4.787.081,014 | 165,6682 | Infinito |        |
|    | 1+090     | 510.516,241 | 4.787.079,725 | 165,6888 |          |        |
|    | 1+100     | 510.521,314 | 4.787.071,108 | 166,8778 |          |        |
|    | 1+110     | 510.526,098 | 4.787.062,328 | 169,8956 |          |        |
|    | 1+120     | 510.530,332 | 4.787.053,270 | 174,7422 |          |        |
|    | 1+130     | 510.533,728 | 4.787.043,870 | 181,4177 |          |        |
| PS | 1+134,912 | 510.534,998 | 4.787.039,125 | 185,3666 | 75,000   | 59,000 |
|    | 1+140     | 510.535,988 | 4.787.034,136 | 189,6853 |          |        |
|    | 1+150     | 510.536,939 | 4.787.024,189 | 198,1736 |          |        |
|    | 1+160     | 510.536,560 | 4.787.014,203 | 206,6619 |          |        |
|    | 1+170     | 510.534,856 | 4.787.004,357 | 215,1501 |          |        |
|    | 1+180     | 510.531,859 | 4.786.994,824 | 223,6384 |          |        |
|    | 1+190     | 510.527,621 | 4.786.985,775 | 232,1267 |          |        |
|    | 1+200     | 510.522,218 | 4.786.977,369 | 240,6149 |          |        |
|    | 1+210     | 510.515,745 | 4.786.969,757 | 249,1032 |          |        |
| PS | 1+211,381 | 510.514,773 | 4.786.968,775 | 250,2755 | 75,000   |        |
|    | 1+213,888 | 510.512,977 | 4.786.967,026 | 251,4124 |          |        |

## 20. VÍA SERVICIO 2

### 20.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio      | Parám.  | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|------------|---------|-------------|---------------|
| 1+000,000 | 0,000    | 510.626,089 | 4.786.953,073 | 150,8731 | -800,000   |         | 511.199,479 | 4.787.510,947 |
| 1+017,139 | 17,139   | 510.635,723 | 4.786.938,999 | 172,6949 | 50,000     |         | 510.590,252 | 4.786.918,205 |
| 1+038,375 | 21,236   | 510.648,332 | 4.786.922,110 | 145,6560 | -50,000    |         | 510.681,194 | 4.786.959,793 |
| 1+174,792 | 136,417  | 510.751,146 | 4.786.832,450 | 145,6560 | Infinito   |         |             |               |
| 1+246,992 | 72,200   | 510.804,391 | 4.786.783,712 | 150,2524 | 500,000    | 190,000 | 510.449,439 | 4.786.431,563 |
| 1+262,885 | 15,893   | 510.815,403 | 4.786.772,254 | 152,2759 | 500,000    |         | 510.449,439 | 4.786.431,563 |
| 1+335,085 | 72,200   | 510.861,988 | 4.786.717,116 | 156,8723 | Infinito   | 190,000 |             |               |
| 1+362,131 | 27,046   | 510.879,083 | 4.786.696,157 | 156,0113 | -2.000,000 |         | 512.420,337 | 4.787.970,730 |
| 1+390,289 | 28,158   | 510.899,001 | 4.786.676,400 | 137,6373 | -50,000    | 38,000  | 510.926,869 | 4.786.717,914 |
| 1+424,207 | 33,918   | 510.931,221 | 4.786.668,103 | 94,4521  | -50,000    |         | 510.926,869 | 4.786.717,914 |
| 1+453,087 | 28,880   | 510.958,875 | 4.786.676,048 | 76,0666  | Infinito   | 38,000  |             |               |
| 1+479,753 | 26,667   | 510.984,280 | 4.786.683,960 | 90,2137  | 60,000     | 40,000  | 510.993,467 | 4.786.624,667 |
| 1+489,769 | 10,015   | 510.994,259 | 4.786.684,662 | 100,8402 | 60,000     |         | 510.993,467 | 4.786.624,667 |
| 1+516,435 | 26,667   | 511.020,522 | 4.786.680,387 | 114,9873 | Infinito   | 40,000  |             |               |
| 1+545,436 | 29,001   | 511.048,897 | 4.786.674,416 | 111,4164 | -517,016   |         | 511.141,117 | 4.787.183,141 |
| 1+575,834 | 30,398   | 511.075,401 | 4.786.660,507 | 150,1205 | 50,000     |         | 511.039,979 | 4.786.625,218 |

## 20.2. PUNTOS SUCESIVOS CADA 10 METROS

|    |           |             |               |          |          |         | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio      | Parám.  |
|----|-----------|-------------|---------------|----------|----------|---------|-----------|-------------|---------------|----------|------------|---------|
|    |           |             |               |          |          |         | 1+300     | 510.839,842 | 4.786.744,327 | 155,7869 |            |         |
|    |           |             |               |          |          |         | 1+310     | 510.846,208 | 4.786.736,615 | 156,3174 |            |         |
|    |           |             |               |          |          |         | 1+320     | 510.852,521 | 4.786.728,859 | 156,6716 |            |         |
|    |           |             |               |          |          |         | 1+330     | 510.858,801 | 4.786.721,077 | 156,8495 |            |         |
| PS | 1+000,000 | 510.626,089 | 4.786.953,073 | 150,8731 | -800,000 |         | 1+335,085 | 510.861,988 | 4.786.717,116 | 156,8723 | Infinito   | 190,000 |
|    | 1+010     | 510.632,302 | 4.786.945,258 | 163,6055 |          |         | 1+340     | 510.865,074 | 4.786.713,289 | 156,7158 |            |         |
| PS | 1+017,139 | 510.635,723 | 4.786.938,999 | 172,6949 | 50,000   |         | 1+350     | 510.871,381 | 4.786.705,529 | 156,3975 |            |         |
|    | 1+020     | 510.636,987 | 4.786.936,433 | 169,0519 |          |         | 1+360     | 510.877,726 | 4.786.697,800 | 156,0792 |            |         |
|    | 1+030     | 510.642,509 | 4.786.928,116 | 156,3195 |          |         | 1+362,131 | 510.879,083 | 4.786.696,157 | 156,0113 | -2.000,000 |         |
| PS | 1+038,375 | 510.648,332 | 4.786.922,110 | 145,6560 | -50,000  |         | 1+370     | 510.884,153 | 4.786.690,139 | 154,3959 |            |         |
|    | 1+040     | 510.649,556 | 4.786.921,042 | 145,6560 |          |         | 1+380     | 510.891,022 | 4.786.682,877 | 148,4040 |            |         |
|    | 1+050     | 510.657,093 | 4.786.914,469 | 145,6560 |          |         | 1+390     | 510.898,762 | 4.786.676,562 | 138,0034 |            |         |
|    | 1+060     | 510.664,630 | 4.786.907,897 | 145,6560 |          |         | 1+390,289 | 510.899,001 | 4.786.676,400 | 137,6373 | -50,000    | 38,000  |
|    | 1+070     | 510.672,167 | 4.786.901,324 | 145,6560 |          |         | 1+400     | 510.907,537 | 4.786.671,802 | 125,2729 |            |         |
|    | 1+080     | 510.679,703 | 4.786.894,752 | 145,6560 |          |         | 1+410     | 510.917,083 | 4.786.668,881 | 112,5405 |            |         |
|    | 1+090     | 510.687,240 | 4.786.888,179 | 145,6560 |          |         | 1+420     | 510.927,020 | 4.786.667,914 | 99,8081  |            |         |
|    | 1+100     | 510.694,777 | 4.786.881,607 | 145,6560 |          |         | 1+424,207 | 510.931,221 | 4.786.668,103 | 94,4521  | -50,000    |         |
|    | 1+110     | 510.702,314 | 4.786.875,034 | 145,6560 |          |         | 1+430     | 510.936,954 | 4.786.668,918 | 87,8156  |            |         |
|    | 1+120     | 510.709,850 | 4.786.868,462 | 145,6560 |          |         | 1+440     | 510.946,612 | 4.786.671,485 | 79,8417  |            |         |
|    | 1+130     | 510.717,387 | 4.786.861,889 | 145,6560 |          |         | 1+450     | 510.956,003 | 4.786.674,918 | 76,2766  |            |         |
|    | 1+140     | 510.724,924 | 4.786.855,317 | 145,6560 |          |         | 1+453,087 | 510.958,875 | 4.786.676,048 | 76,0666  | Infinito   | 38,000  |
|    | 1+150     | 510.732,461 | 4.786.848,744 | 145,6560 |          |         | 1+460     | 510.965,319 | 4.786.678,554 | 77,0174  |            |         |
|    | 1+160     | 510.739,997 | 4.786.842,172 | 145,6560 |          |         | 1+470     | 510.974,780 | 4.786.681,784 | 81,7576  |            |         |
|    | 1+170     | 510.747,534 | 4.786.835,599 | 145,6560 |          |         | 1+479,753 | 510.984,280 | 4.786.683,960 | 90,2137  | 60,000     | 40,000  |
| PS | 1+174,792 | 510.751,146 | 4.786.832,450 | 145,6560 | Infinito |         | 1+480     | 510.984,524 | 4.786.683,997 | 90,4755  |            |         |
|    | 1+180     | 510.755,070 | 4.786.829,026 | 145,6799 |          |         | 1+489,769 | 510.994,259 | 4.786.684,662 | 100,8402 | 60,000     |         |
|    | 1+190     | 510.762,597 | 4.786.822,442 | 145,8599 |          |         | 1+490     | 510.994,491 | 4.786.684,658 | 101,0847 |            |         |
|    | 1+200     | 510.770,096 | 4.786.815,826 | 146,2163 |          |         | 1+500     | 511.004,443 | 4.786.683,768 | 109,6135 |            |         |
|    | 1+210     | 510.777,548 | 4.786.809,158 | 146,7490 |          |         | 1+510     | 511.014,258 | 4.786.681,861 | 114,1635 |            |         |
|    | 1+220     | 510.784,935 | 4.786.802,418 | 147,4580 |          |         | 1+516,435 | 511.020,522 | 4.786.680,387 | 114,9873 | Infinito   | 40,000  |
|    | 1+230     | 510.792,237 | 4.786.795,585 | 148,3435 |          |         | 1+520     | 511.023,991 | 4.786.679,567 | 114,5484 |            |         |
|    | 1+240     | 510.799,433 | 4.786.788,642 | 149,4052 |          |         | 1+530     | 511.033,752 | 4.786.677,396 | 113,3171 |            |         |
| PS | 1+246,992 | 510.804,391 | 4.786.783,712 | 150,2524 | 500,000  | 190,000 | 1+540     | 511.043,554 | 4.786.675,414 | 112,0857 |            |         |
|    | 1+250     | 510.806,503 | 4.786.781,570 | 150,6353 |          |         | 1+545,436 | 511.048,897 | 4.786.674,416 | 111,4164 | -517,016   |         |
|    | 1+260     | 510.813,431 | 4.786.774,359 | 151,9086 |          |         | 1+550     | 511.053,345 | 4.786.673,399 | 117,2278 |            |         |
| PS | 1+262,885 | 510.815,403 | 4.786.772,254 | 152,2759 | 500,000  |         | 1+560     | 511.062,650 | 4.786.669,783 | 129,9602 |            |         |
|    | 1+270     | 510.820,215 | 4.786.767,013 | 153,1372 |          |         | 1+570     | 511.071,052 | 4.786.664,390 | 142,6926 |            |         |
|    | 1+280     | 510.826,866 | 4.786.759,545 | 154,1968 |          |         |           |             |               |          |            |         |
|    | 1+290     | 510.833,401 | 4.786.751,976 | 155,0800 |          |         |           |             |               |          |            |         |

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+575,834 | 511.075,401 | 4.786.660,507 | 150,1205 | 50,000 |        |
|    | 1+575,834 | 511.075,401 | 4.786.660,507 | 150,1205 |        |        |

## 21. AUXILIAR 1 VÍA DE SERVICIO 2

### 21.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.659,796 | 4.786.912,112 | 145,6560 | Infinito |        |             |               |
| 1+037,706 | 37,706   | 510.662,105 | 4.786.878,245 | 245,6753 | 24,000   |        | 510.644,022 | 4.786.894,024 |
| 1+046,272 | 8,566    | 510.656,473 | 4.786.871,791 | 245,6753 | Infinito |        |             |               |

### 21.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+000     | 510.659,796 | 4.786.912,112 | 145,6560 | 24,000 |        |
|    | 1+010     | 510.665,767 | 4.786.904,181 | 172,1826 |        |        |
|    | 1+020     | 510.668,017 | 4.786.894,511 | 198,7084 |        |        |
|    | 1+030     | 510.666,161 | 4.786.884,758 | 225,2342 |        |        |
|    | 1+037,706 | 510.662,105 | 4.786.878,245 | 245,6753 |        |        |
|    | 1+040     | 510.660,597 | 4.786.876,516 | 245,6753 |        |        |
|    | 1+046,272 | 510.656,473 | 4.786.871,791 | 245,6753 |        |        |

## 22. AUXILIAR 2 VÍA DE SERVICIO 2

### 22.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.661,690 | 4.786.915,105 | 145,6560 | Infinito |        |             |               |
| 1+045,364 | 45,364   | 510.664,610 | 4.786.874,330 | 245,2417 | 29,000   |        | 510.642,630 | 4.786.893,248 |
| 1+054,034 | 8,670    | 510.658,954 | 4.786.867,759 | 245,2417 | Infinito |        |             |               |

### 22.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+000     | 510.661,690 | 4.786.915,105 | 145,6560 | 29,000 |        |
|    | 1+010     | 510.667,956 | 4.786.907,375 | 167,6091 |        |        |
|    | 1+020     | 510.671,241 | 4.786.897,982 | 189,5615 |        |        |
|    | 1+030     | 510.671,157 | 4.786.888,032 | 211,5139 |        |        |
|    | 1+040     | 510.667,714 | 4.786.878,696 | 233,4663 |        |        |
|    | 1+045,364 | 510.664,610 | 4.786.874,330 | 245,2417 |        |        |
|    | 1+050     | 510.661,586 | 4.786.870,817 | 245,2417 |        |        |
|    | 1+054,034 | 510.658,954 | 4.786.867,759 | 245,2417 |        |        |

23. AUXILIAR 3 VÍA DE SERVICIO 2

23.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.664,686 | 4.786.874,419 | 45,2449  | Infinito |        |             |               |
| 1+035,000 | 35,000   | 510.696,557 | 4.786.881,670 | 126,2693 | 27,500   |        | 510.685,529 | 4.786.856,479 |

23.2. PUNTOS SUCESIVOS CADA 10 METROS

| Estación | Coor. X     | Coor. Y       | Acimut   | Radio | Parám. |
|----------|-------------|---------------|----------|-------|--------|
| 1+000    | 510.664,686 | 4.786.874,419 | 45,2449  |       |        |
| 1+010    | 510.672,430 | 4.786.880,659 | 68,3948  |       |        |
| 1+020    | 510.681,887 | 4.786.883,736 | 91,5446  |       |        |
| 1+030    | 510.691,820 | 4.786.883,249 | 114,6944 |       |        |
| 1+035    | 510.696,557 | 4.786.881,670 | 126,2693 |       |        |

24. AUXILIAR 4 VÍA DE SERVICIO 2

24.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|-------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 511.029,268 | 4.786.678,369 | 113,8839 | 6,000 |        | 511.027,970 | 4.786.672,511 |
| 1+009,352 | 9,352    | 511.033,843 | 4.786.671,284 | 213,1127 | 6,000 |        | 511.027,970 | 4.786.672,511 |

24.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio | Parám. |
|----|-----------|-------------|---------------|----------|-------|--------|
| PS | 1+000,000 | 511.029,268 | 4.786.678,369 | 113,8839 | 6,000 |        |
|    | 1+009,352 | 511.033,843 | 4.786.671,284 | 213,1117 |       |        |

## 25. AUXILIAR 5 VÍA DE SERVICIO 2

### 25.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|-------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 511.037,544 | 4.786.670,559 | 13,1154  | 6,000 |        | 511.043,417 | 4.786.669,332 |
| 1+009,316 | 9,316    | 511.044,538 | 4.786.675,226 | 111,9632 | 6,000 |        | 511.043,417 | 4.786.669,332 |

### 25.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio | Parám. |
|----|-----------|-------------|---------------|----------|-------|--------|
| PS | 1+000,000 | 511.037,544 | 4.786.670,559 | 13,1154  | 6,000 |        |
|    | 1+009,316 | 511.044,538 | 4.786.675,226 | 111,9612 |       |        |

## 26. ROTONDA R=25

### 26.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 0+000,000 | 0,000    | 511.118,112 | 4.786.678,151 | 399,9993 | -25,000  |        | 511.093,112 | 4.786.678,151 |
| 0+100,000 | 100,000  | 511.076,771 | 4.786.659,230 | 145,3512 | -25,000  |        | 511.093,112 | 4.786.678,151 |
| 0+100,000 | 0,000    | 511.076,771 | 4.786.659,230 | 145,3512 | Infinito |        |             |               |
| 0+157,080 | 57,080   | 511.118,112 | 4.786.678,151 | 399,9993 | -25,000  |        | 511.093,112 | 4.786.678,151 |

### 26.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio   | Parám. |
|----|-----------|-------------|---------------|----------|---------|--------|
| PS | 0+000,000 | 511.118,112 | 4.786.678,151 | 399,9993 | -25,000 |        |
|    | 0+010     | 511.116,138 | 4.786.687,886 | 374,5345 |         |        |
|    | 0+020     | 511.110,529 | 4.786.696,085 | 349,0697 |         |        |
|    | 0+030     | 511.102,171 | 4.786.701,452 | 323,6049 |         |        |
|    | 0+040     | 511.092,382 | 4.786.703,140 | 298,1401 |         |        |
|    | 0+050     | 511.082,708 | 4.786.700,883 | 272,6753 |         |        |
|    | 0+060     | 511.074,677 | 4.786.695,037 | 247,2105 |         |        |
|    | 0+070     | 511.069,556 | 4.786.686,525 | 221,7457 |         |        |
|    | 0+080     | 511.068,155 | 4.786.676,691 | 196,2809 |         |        |
|    | 0+090     | 511.070,693 | 4.786.667,087 | 170,8162 |         |        |
|    | 0+100     | 511.076,771 | 4.786.659,230 | 145,3514 |         |        |
| PS | 0+100,000 | 511.076,771 | 4.786.659,230 | 145,3512 | -25,000 |        |
| PS | 0+100,000 | 511.076,771 | 4.786.659,230 | 145,3512 | -25,000 |        |
|    | 0+110     | 511.085,429 | 4.786.654,361 | 119,8866 |         |        |
|    | 0+120     | 511.095,300 | 4.786.653,247 | 94,4218  |         |        |
|    | 0+130     | 511.104,825 | 4.786.656,064 | 68,9570  |         |        |
|    | 0+140     | 511.112,501 | 4.786.662,369 | 43,4922  |         |        |
|    | 0+150     | 511.117,116 | 4.786.671,166 | 18,0274  |         |        |
| PS | 0+157,080 | 511.118,112 | 4.786.678,151 | 399,9993 | -25,000 |        |
|    | 0+157,080 | 511.118,112 | 4.786.678,151 | 399,9993 |         |        |

27. EJE I

27.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 511.180,689 | 4.786.671,487 | 310,5213 | Infinito |        |             |               |
| 1+039,729 | 39,729   | 511.141,501 | 4.786.678,023 | 310,5213 | Infinito |        |             |               |
| 1+074,238 | 34,509   | 511.111,984 | 4.786.694,548 | 354,4599 | 50,000   |        | 511.149,727 | 4.786.727,341 |

27.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
| PS | 1+000,000 | 511.180,689 | 4.786.671,487 | 310,5213 | Infinito |        |
|    | 1+010     | 511.170,825 | 4.786.673,132 | 310,5213 |          |        |
|    | 1+020     | 511.160,961 | 4.786.674,777 | 310,5213 |          |        |
|    | 1+030     | 511.151,097 | 4.786.676,422 | 310,5213 |          |        |
| PS | 1+039,729 | 511.141,501 | 4.786.678,023 | 310,5213 | Infinito |        |
|    | 1+040     | 511.141,234 | 4.786.678,068 | 310,8668 |          |        |
|    | 1+050     | 511.131,614 | 4.786.680,738 | 323,5992 |          |        |
|    | 1+060     | 511.122,716 | 4.786.685,265 | 336,3316 |          |        |
|    | 1+070     | 511.114,895 | 4.786.691,470 | 349,0640 |          |        |
| PS | 1+074,238 | 511.111,984 | 4.786.694,548 | 354,4599 | 50,000   |        |
|    | 1+074,238 | 511.111,984 | 4.786.694,548 | 354,4599 |          |        |

28. AUXILIAR 1 ROTONDA R=25

28.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 0+959,709 | 0,000    | 511.179,537 | 4.786.664,582 | 310,5213 | Infinito |        |             |               |
| 1+000,000 | 40,291   | 511.139,795 | 4.786.671,211 | 310,5213 | Infinito |        |             |               |
| 1+040,423 | 40,424   | 511.104,446 | 4.786.689,444 | 350,1128 | 65,000   |        | 511.150,489 | 4.786.735,325 |
| 1+059,885 | 19,462   | 511.086,453 | 4.786.692,699 | 272,6752 | -16,000  |        | 511.093,112 | 4.786.678,151 |

28.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación     | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám.   |
|----|--------------|-------------|---------------|----------|--------|----------|
|    | 0+959,709    | 511.179,537 | 4.786.664,582 | 310,5213 |        |          |
|    | 0+960        | 511.179,250 | 4.786.664,630 | 310,5213 |        |          |
|    | 0+970        | 511.169,386 | 4.786.666,275 | 310,5213 |        |          |
|    | 0+980        | 511.159,522 | 4.786.667,920 | 310,5213 |        |          |
|    | 0+990        | 511.149,659 | 4.786.669,565 | 310,5213 |        |          |
|    | PS 1+000,000 | 511.139,795 | 4.786.671,211 | 310,5213 |        | Infinito |
|    | 1+010        | 511.130,096 | 4.786.673,607 | 320,3159 |        |          |
|    | 1+020        | 511.120,880 | 4.786.677,460 | 330,1100 |        |          |
|    | 1+030        | 511.112,362 | 4.786.682,681 | 339,9042 |        |          |
|    | 1+040        | 511.104,745 | 4.786.689,146 | 349,6983 |        |          |
| PS | 1+040,423    | 511.104,446 | 4.786.689,444 | 350,1128 | 65,000 |          |
|    | 1+050        | 511.096,112 | 4.786.693,867 | 312,0077 |        |          |
|    | 1+059,885    | 511.086,454 | 4.786.692,700 | 272,6765 |        |          |

## 29. AUXILIAR 2 ROTONDA R=25

### 29.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 0+948,060 | 0,000    | 511.086,453 | 4.786.692,699 | 272,6752 | -16,000  |        | 511.093,112 | 4.786.678,151 |
| 1+000,000 | 51,940   | 511.101,254 | 4.786.664,377 | 66,0138  | -16,000  |        | 511.093,112 | 4.786.678,151 |
| 1+034,931 | 34,932   | 511.134,898 | 4.786.670,657 | 110,4901 | 50,000   |        | 511.126,696 | 4.786.621,334 |
| 1+081,259 | 46,327   | 511.180,598 | 4.786.663,058 | 110,4901 | Infinito |        |             |               |

### 29.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
| PS | 0+948,060 | 511.086,453 | 4.786.692,699 | 272,6752 | -16,000  |        |
|    | 0+950     | 511.084,743 | 4.786.691,787 | 264,9562 |          |        |
|    | 0+960     | 511.078,346 | 4.786.684,313 | 225,1675 |          |        |
|    | 0+970     | 511.077,532 | 4.786.674,508 | 185,3787 |          |        |
|    | 0+980     | 511.082,609 | 4.786.666,081 | 145,5900 |          |        |
|    | 0+990     | 511.091,656 | 4.786.662,217 | 105,8013 |          |        |
|    | 1+000,000 | 511.101,254 | 4.786.664,377 | 66,0138  |          |        |
| PS | 1+010     | 511.110,312 | 4.786.668,574 | 78,7466  | -16,000  |        |
|    | 1+020     | 511.120,024 | 4.786.670,887 | 91,4789  |          |        |
|    | 1+030     | 511.130,002 | 4.786.671,225 | 104,2113 |          |        |
|    | 1+034,931 | 511.134,898 | 4.786.670,657 | 110,4901 |          |        |
| PS | 1+040     | 511.139,898 | 4.786.669,826 | 110,4901 | 50,000   |        |
|    | 1+050     | 511.149,763 | 4.786.668,185 | 110,4901 |          |        |
|    | 1+060     | 511.159,627 | 4.786.666,545 | 110,4901 |          |        |
|    | 1+070     | 511.169,492 | 4.786.664,905 | 110,4901 |          |        |
|    | 1+080     | 511.179,356 | 4.786.663,264 | 110,4901 |          |        |
|    | 1+081,259 | 511.180,598 | 4.786.663,058 | 110,4901 |          |        |
| PS | 1+081,259 | 511.180,598 | 4.786.663,058 | 110,4901 | Infinito |        |

## 30. AUXILIAR 3 ROTONDA R=25

### 30.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio   | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|---------|--------|-------------|---------------|
| 0+965,465 | 0,000    | 511.109,112 | 4.786.678,151 | 399,9993 | -16,000 |        | 511.093,112 | 4.786.678,151 |
| 1+000,000 | 34,535   | 511.084,242 | 4.786.691,467 | 262,5900 | -16,000 |        | 511.093,112 | 4.786.678,151 |
| 1+029,915 | 29,915   | 511.055,683 | 4.786.685,269 | 310,2019 | 40,000  |        | 511.062,066 | 4.786.724,757 |
| 1+096,051 | 66,136   | 510.991,410 | 4.786.700,598 | 319,6067 | 447,680 |        | 511.127,118 | 4.787.127,213 |

### 30.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio   | Parám. |
|----|-----------|-------------|---------------|----------|---------|--------|
|    | 0+965,465 | 511.109,112 | 4.786.678,151 | 399,9993 |         |        |
|    | 0+970     | 511.108,474 | 4.786.682,625 | 381,9551 |         |        |
|    | 0+980     | 511.102,952 | 4.786.690,768 | 342,1663 |         |        |
|    | 0+990     | 511.093,709 | 4.786.694,140 | 302,3776 |         |        |
|    | 1+000,000 | 511.084,242 | 4.786.691,467 | 262,5900 |         |        |
| PS | 1+010     | 511.075,316 | 4.786.687,015 | 278,5059 | -16,000 |        |
|    | 1+020     | 511.065,567 | 4.786.684,910 | 294,4214 |         |        |
| PS | 1+029,915 | 511.055,683 | 4.786.685,269 | 310,2019 | 40,000  |        |
|    | 1+030     | 511.055,600 | 4.786.685,283 | 310,2140 |         |        |
|    | 1+040     | 511.045,747 | 4.786.686,991 | 311,6360 |         |        |
|    | 1+050     | 511.035,934 | 4.786.688,918 | 313,0581 |         |        |
|    | 1+060     | 511.026,167 | 4.786.691,064 | 314,4801 |         |        |
|    | 1+070     | 511.016,451 | 4.786.693,428 | 315,9022 |         |        |
|    | 1+080     | 511.006,790 | 4.786.696,008 | 317,3242 |         |        |
|    | 1+090     | 510.997,189 | 4.786.698,803 | 318,7462 |         |        |
|    | 1+096,051 | 510.991,410 | 4.786.700,598 | 319,6067 |         |        |

### 31. AUXILIAR 4 ROTONDA R=25

#### 31.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 510.980,090 | 4.786.702,903 | 120,5962 | -506,516 |        | 511.141,117 | 4.787.183,141 |
| 1+077,520 | 77,520   | 511.055,184 | 4.786.683,968 | 110,8530 | -506,516 |        | 511.141,117 | 4.787.183,141 |
| 1+092,520 | 15,000   | 511.069,502 | 4.786.679,626 | 126,6370 | 60,500   |        | 511.044,920 | 4.786.624,345 |

#### 31.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio    | Parám. |
|----|-----------|-------------|---------------|----------|----------|--------|
| PS | 1+000,000 | 510.980,090 | 4.786.702,903 | 120,5962 | -506,516 |        |
|    | 1+010     | 510.989,602 | 4.786.699,818 | 119,3394 |          |        |
|    | 1+020     | 510.999,173 | 4.786.696,921 | 118,0825 |          |        |
|    | 1+030     | 511.008,799 | 4.786.694,213 | 116,8256 |          |        |
|    | 1+040     | 511.018,477 | 4.786.691,697 | 115,5688 |          |        |
|    | 1+050     | 511.028,203 | 4.786.689,371 | 114,3119 |          |        |
|    | 1+060     | 511.037,973 | 4.786.687,238 | 113,0551 |          |        |
|    | 1+070     | 511.047,783 | 4.786.685,299 | 111,7982 |          |        |
| PS | 1+077,520 | 511.055,184 | 4.786.683,968 | 110,8530 | -506,516 |        |
|    | 1+080     | 511.057,619 | 4.786.683,497 | 113,4626 |          |        |
|    | 1+090     | 511.067,178 | 4.786.680,602 | 123,9852 |          |        |
|    | 1+092,520 | 511.069,502 | 4.786.679,626 | 126,6369 |          |        |

### 32. AUXILIAR 5 ROTONDA R=25

#### 32.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio    | Parám.  | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|----------|---------|-------------|---------------|
| 0+000,000 | 0,000    | 510.873,568 | 4.786.744,583 | 135,5183 | -442,142 |         | 511.107,648 | 4.787.119,678 |
| 0+052,112 | 52,112   | 510.919,300 | 4.786.719,660 | 128,0149 | -442,142 |         | 511.107,648 | 4.787.119,678 |
| 0+080,651 | 28,539   | 510.945,463 | 4.786.708,269 | 124,4462 | -600,000 | 219,000 | 511.170,242 | 4.787.264,573 |
| 0+104,958 | 24,306   | 510.968,178 | 4.786.699,622 | 121,8672 | -600,000 |         | 511.170,242 | 4.787.264,573 |
| 0+193,801 | 88,844   | 511.053,996 | 4.786.677,069 | 110,8530 | -513,516 |         | 511.141,117 | 4.787.183,141 |

#### 32.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio    | Parám.  |
|----|-----------|-------------|---------------|----------|----------|---------|
| PS | 0+000,000 | 510.873,568 | 4.786.744,583 | 135,5183 | -442,142 |         |
|    | 0+010     | 510.882,111 | 4.786.739,385 | 134,0784 |          |         |
|    | 0+020     | 510.890,769 | 4.786.734,382 | 132,6385 |          |         |
|    | 0+030     | 510.899,538 | 4.786.729,576 | 131,1987 |          |         |
|    | 0+040     | 510.908,413 | 4.786.724,969 | 129,7588 |          |         |
|    | 0+050     | 510.917,391 | 4.786.720,564 | 128,3190 |          |         |
| PS | 0+052,112 | 510.919,300 | 4.786.719,660 | 128,0149 | -442,142 |         |
|    | 0+060     | 510.926,465 | 4.786.716,362 | 126,9204 |          |         |
|    | 0+070     | 510.935,625 | 4.786.712,351 | 125,6516 |          |         |
|    | 0+080     | 510.944,859 | 4.786.708,514 | 124,5156 |          |         |
| PS | 0+080,651 | 510.945,463 | 4.786.708,269 | 124,4462 | -600,000 | 219,000 |
|    | 0+090     | 510.954,158 | 4.786.704,835 | 123,4543 |          |         |
|    | 0+100     | 510.963,516 | 4.786.701,311 | 122,3932 |          |         |
| PS | 0+104,958 | 510.968,178 | 4.786.699,622 | 121,8672 | -600,000 |         |
|    | 0+110     | 510.972,933 | 4.786.697,947 | 121,2421 |          |         |
|    | 0+120     | 510.982,413 | 4.786.694,765 | 120,0024 |          |         |
|    | 0+130     | 510.991,953 | 4.786.691,767 | 118,7627 |          |         |
|    | 0+140     | 511.001,550 | 4.786.688,955 | 117,5229 |          |         |
|    | 0+150     | 511.011,199 | 4.786.686,331 | 116,2832 |          |         |
|    | 0+160     | 511.020,898 | 4.786.683,896 | 115,0435 |          |         |
|    | 0+170     | 511.030,642 | 4.786.681,650 | 113,8037 |          |         |
|    | 0+180     | 511.040,428 | 4.786.679,593 | 112,5640 |          |         |
|    | 0+190     | 511.050,253 | 4.786.677,728 | 111,3243 |          |         |
|    | 0+193,801 | 511.053,996 | 4.786.677,070 | 110,8531 |          |         |

33. AUXILIAR 6 ROTONDA R=25

33.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio  | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|--------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 511.085,633 | 4.786.654,322 | 173,4045 | 26,000 |        | 511.061,869 | 4.786.643,773 |
| 1+007,268 | 7,268    | 511.087,621 | 4.786.647,356 | 191,1999 | 26,000 |        | 511.061,869 | 4.786.643,773 |

33.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+000,000 | 511.085,633 | 4.786.654,322 | 173,4045 | 26,000 |        |
| PS | 1+007,268 | 511.087,621 | 4.786.647,356 | 191,1999 | 26,000 |        |
|    | 1+007,268 | 511.087,621 | 4.786.647,356 | 191,1999 |        |        |

34. AUXILIAR 7 ROTONDA R=25

34.1. PUNTOS PRINCIPALES

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut  | Radio  | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|---------|--------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 511.090,227 | 4.786.645,995 | 31,7106 | 31,000 |        | 511.117,460 | 4.786.631,184 |
| 1+009,186 | 9,186    | 511.095,739 | 4.786.653,302 | 50,5759 | 31,000 |        | 511.117,460 | 4.786.631,184 |

34.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Coor. X     | Coor. Y       | Acimut  | Radio  | Parám. |
|----|-----------|-------------|---------------|---------|--------|--------|
| PS | 1+000,000 | 511.090,227 | 4.786.645,995 | 31,7106 | 31,000 |        |
|    | 1+009,186 | 511.095,739 | 4.786.653,302 | 50,5750 |        |        |

**35. AUXILIAR 8 ROTONDA R=25**

**35.1. PUNTOS PRINCIPALES**

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio  | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|--------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 511.104,830 | 4.786.700,223 | 395,1811 | 16,000 |        | 511.120,784 | 4.786.701,433 |
| 1+004,718 | 4,718    | 511.105,167 | 4.786.704,912 | 13,9541  | 16,000 |        | 511.120,784 | 4.786.701,433 |

**35.2. PUNTOS SUCESIVOS CADA 10 METROS**

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+000,000 | 511.104,830 | 4.786.700,223 | 395,1811 | 16,000 |        |
|    | 1+004,718 | 511.105,167 | 4.786.704,912 | 13,9534  |        |        |

**36. AUXILIAR 9 ROTONDA R=25**

**36.1. PUNTOS PRINCIPALES**

| Estación  | Longitud | Coord. X    | Coord. Y      | Acimut   | Radio  | Parám. | X Centro    | Y Centro      |
|-----------|----------|-------------|---------------|----------|--------|--------|-------------|---------------|
| 1+000,000 | 0,000    | 511.105,065 | 4.786.706,176 | 238,7892 | 15,000 |        | 511.092,764 | 4.786.714,760 |
| 1+006,154 | 6,154    | 511.100,620 | 4.786.701,982 | 264,9091 | 15,000 |        | 511.092,764 | 4.786.714,760 |

**36.2. PUNTOS SUCESIVOS CADA 10 METROS**

|    | Estación  | Coor. X     | Coor. Y       | Acimut   | Radio  | Parám. |
|----|-----------|-------------|---------------|----------|--------|--------|
| PS | 1+000,000 | 511.105,065 | 4.786.706,176 | 238,7892 | 15,000 |        |
|    | 1+006,154 | 511.100,620 | 4.786.701,982 | 264,9076 |        |        |

**APÉNDICE N° 9.2:**  
**LISTADO DE ALINEACIONES EN ALZADO**

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**1. ROTONDA R=35**

**1.1. LISTADO DE VÉRTICES**

| Nº | P.K.<br>Cota        | TE<br>TS               | Cota TE<br>Cota TS | pE(%)<br>pS(%)    | Longi.<br>Flecha | Kv                    |
|----|---------------------|------------------------|--------------------|-------------------|------------------|-----------------------|
| 1  | 0-075,397<br>40,720 | 0-075,397              | 40,720             | -1,3000           |                  |                       |
| 2  | 0+034,559<br>39,291 | 0+013,759<br>0+055,359 | 39,561<br>39,561   | -1,3000<br>1,3000 | 41,600<br>0,135  | 1.600,000<br>2,6000   |
| 3  | 0+144,514<br>40,720 | 0+123,714<br>0+165,314 | 40,450<br>40,450   | 1,3000<br>-1,3000 | 41,600<br>-0,135 | -1.600,000<br>-2,6000 |
| 4  | 0+254,470<br>39,291 | 0+233,670<br>0+275,270 | 39,561<br>39,561   | -1,3000<br>1,3000 | 41,600<br>0,135  | 1.600,000<br>2,6000   |
| 5  | 0+364,426<br>40,720 | 0+364,426              | 40,720             | 1,3000            |                  |                       |

**1.2. PUNTOS SUCESIVOS CADA 10 METROS**

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 0+000,000 | 39,740 | -1,3000   |           |          |            |        |          |
|    | 0+010,000 | 39,610 | -1,3000   |           |          |            |        |          |
| TE | 0+013,759 | 39,561 | -1,3000   |           |          |            |        |          |
|    | 0+020,000 | 39,492 | -0,9099   |           |          |            |        |          |
|    | 0+030,000 | 39,432 | -0,2849   |           |          |            |        |          |
| V  | 0+034,559 | 39,426 | 0,0000    | 39,291    | 41,600   | 1.600,000  | 0,135  | 2,6000   |
|    | 0+040,000 | 39,435 | 0,3401    |           |          |            |        |          |
|    | 0+050,000 | 39,500 | 0,9651    |           |          |            |        |          |
| TS | 0+055,359 | 39,561 | 1,3000    |           |          |            |        |          |
|    | 0+060,000 | 39,621 | 1,3000    |           |          |            |        |          |
|    | 0+070,000 | 39,751 | 1,3000    |           |          |            |        |          |
|    | 0+080,000 | 39,881 | 1,3000    |           |          |            |        |          |
|    | 0+090,000 | 40,011 | 1,3000    |           |          |            |        |          |
|    | 0+100,000 | 40,141 | 1,3000    |           |          |            |        |          |
|    | 0+110,000 | 40,271 | 1,3000    |           |          |            |        |          |
|    | 0+120,000 | 40,401 | 1,3000    |           |          |            |        |          |
| TE | 0+123,714 | 40,450 | 1,3000    |           |          |            |        |          |
|    | 0+130,000 | 40,519 | 0,9071    |           |          |            |        |          |
|    | 0+140,000 | 40,578 | 0,2821    |           |          |            |        |          |
| V  | 0+144,514 | 40,585 | 0,0000    | 40,720    | 41,600   | -1.600,000 | -0,135 | -2,6000  |
|    | 0+150,000 | 40,575 | -0,3429   |           |          |            |        |          |
|    | 0+160,000 | 40,510 | -0,9679   |           |          |            |        |          |
| TS | 0+165,314 | 40,450 | -1,3000   |           |          |            |        |          |
|    | 0+170,000 | 40,389 | -1,3000   |           |          |            |        |          |
|    | 0+180,000 | 40,259 | -1,3000   |           |          |            |        |          |
|    | 0+190,000 | 40,129 | -1,3000   |           |          |            |        |          |
|    | 0+200,000 | 39,999 | -1,3000   |           |          |            |        |          |
|    | 0+210,000 | 39,869 | -1,3000   |           |          |            |        |          |
|    | 0+219,911 | 39,740 | -1,3000   |           |          |            |        |          |

## 2. EJE A

### 2.1. LISTADO DE VÉRTICES

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv          |
|----|-----------|-----------|---------|---------|--------|-------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |             |
| 1  | 1+015,132 |           |         |         |        |             |
|    | 40,348    | 1+015,132 | 40,348  | -1,0410 |        |             |
| 2  | 1+022,000 | 1+015,586 | 40,343  | -1,0410 | 12,829 | 400,000     |
|    | 40,277    | 1+028,414 | 40,415  | 2,1662  | 0,051  | 3,2072      |
| 3  | 1+044,000 | 1+029,585 | 40,441  | 2,1662  | 28,831 | -10.000,000 |
|    | 40,753    | 1+058,415 | 41,024  | 1,8779  | -0,010 | -0,2883     |
| 4  | 1+112,159 | 1+112,159 | 42,033  | 1,8779  |        |             |
|    | 42,033    |           |         |         |        |             |
| 1  | 1+015,132 |           |         |         |        |             |
|    | 40,348    | 1+015,132 | 40,348  | -1,0410 |        |             |
| 2  | 1+022,000 | 1+015,586 | 40,343  | -1,0410 | 12,829 | 400,000     |
|    | 40,277    | 1+028,414 | 40,415  | 2,1662  | 0,051  | 3,2072      |
| 3  | 1+044,000 | 1+029,585 | 40,441  | 2,1662  | 28,831 | -10.000,000 |

### 2.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)   | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|-------------|--------|----------|
|    | 1+015,132 | 40,348 | -1,0410   |           |          |             |        |          |
| TE | 1+015,586 | 40,343 | -1,0410   |           |          |             |        |          |
|    | 1+020,000 | 40,322 | 0,0626    |           |          |             |        |          |
| V  | 1+022,000 | 40,328 | 0,5626    | 40,277    | 12,829   | 400,000     | 0,051  | 3,2072   |
| TS | 1+028,414 | 40,415 | 2,1662    |           |          |             |        |          |
| TE | 1+029,585 | 40,441 | 2,1662    |           |          |             |        |          |
|    | 1+030,000 | 40,450 | 2,1620    |           |          |             |        |          |
|    | 1+040,000 | 40,661 | 2,0620    |           |          |             |        |          |
| V  | 1+044,000 | 40,743 | 2,0220    | 40,753    | 28,831   | -10.000,000 | -0,010 | -0,2883  |
|    | 1+050,000 | 40,862 | 1,9620    |           |          |             |        |          |
| TS | 1+058,415 | 41,024 | 1,8779    |           |          |             |        |          |
|    | 1+060,000 | 41,054 | 1,8779    |           |          |             |        |          |
|    | 1+070,000 | 41,241 | 1,8779    |           |          |             |        |          |
|    | 1+080,000 | 41,429 | 1,8779    |           |          |             |        |          |
|    | 1+090,000 | 41,617 | 1,8779    |           |          |             |        |          |
|    | 1+100,000 | 41,805 | 1,8779    |           |          |             |        |          |
|    | 1+110,000 | 41,992 | 1,8779    |           |          |             |        |          |
|    | 1+112,159 | 42,033 | 1,8779    |           |          |             |        |          |

### 3. EJE B

#### 3.1. LISTADO DE VÉRTICES

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv         |
|----|-----------|-----------|---------|---------|--------|------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |            |
| 1  | 1+000,000 |           |         |         |        |            |
|    | 42,208    | 1+000,000 | 42,208  | -1,8508 |        |            |
| 2  | 1+058,283 | 1+036,949 | 41,524  | -1,8508 | 42,670 | 5.000,000  |
|    | 41,129    | 1+079,618 | 40,916  | -0,9974 | 0,046  | 0,8534     |
| 3  | 1+113,494 | 1+105,897 | 40,654  | -0,9974 | 15,194 | -7.500,000 |
|    | 40,579    | 1+121,091 | 40,487  | -1,2000 | -0,004 | -0,2026    |
| 4  | 1+121,175 | 1+121,175 | 40,486  | -1,2000 |        |            |
|    | 40,486    |           |         |         |        |            |

#### 3.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+000,000 | 42,208 | -1,8508   |           |          |            |        |          |
|    | 1+010,000 | 42,023 | -1,8508   |           |          |            |        |          |
|    | 1+020,000 | 41,838 | -1,8508   |           |          |            |        |          |
|    | 1+030,000 | 41,653 | -1,8508   |           |          |            |        |          |
| TE | 1+036,949 | 41,524 | -1,8508   |           |          |            |        |          |
|    | 1+040,000 | 41,469 | -1,7898   |           |          |            |        |          |
|    | 1+050,000 | 41,300 | -1,5898   |           |          |            |        |          |
| V  | 1+058,283 | 41,175 | -1,4241   | 41,129    | 42,670   | 5.000,000  | 0,046  | 0,8534   |
|    | 1+060,000 | 41,151 | -1,3898   |           |          |            |        |          |
|    | 1+070,000 | 41,022 | -1,1898   |           |          |            |        |          |
| TS | 1+079,618 | 40,916 | -0,9974   |           |          |            |        |          |
|    | 1+080,000 | 40,913 | -0,9974   |           |          |            |        |          |
|    | 1+090,000 | 40,813 | -0,9974   |           |          |            |        |          |
|    | 1+100,000 | 40,713 | -0,9974   |           |          |            |        |          |
| TE | 1+105,897 | 40,654 | -0,9974   |           |          |            |        |          |
|    | 1+110,000 | 40,612 | -1,0521   |           |          |            |        |          |
| V  | 1+113,494 | 40,575 | -1,0987   | 40,579    | 15,194   | -7.500,000 | -0,004 | -0,2026  |
|    | 1+120,000 | 40,500 | -1,1854   |           |          |            |        |          |
| TS | 1+121,091 | 40,487 | -1,2000   |           |          |            |        |          |
|    | 1+121,175 | 40,486 | -1,2000   |           |          |            |        |          |

#### 4. EJE C

##### 4.1. LISTADO DE VÉRTICES

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv         |
|----|-----------|-----------|---------|---------|--------|------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |            |
| 1  | 1+000,000 |           |         |         |        |            |
|    | 40,488    | 1+000,000 | 40,488  | -1,3000 |        |            |
| 2  | 1+006,600 | 1+000,180 | 40,486  | -1,3000 | 12,839 | -1.000,000 |
|    | 40,402    | 1+013,020 | 40,236  | -2,5839 | -0,021 | -1,2839    |
| 3  | 1+019,328 | 1+013,101 | 40,234  | -2,5839 | 12,454 | 600,000    |
|    | 40,073    | 1+025,555 | 40,042  | -0,5083 | 0,032  | 2,0756     |
| 4  | 1+044,111 | 1+034,994 | 39,994  | -0,5083 | 18,234 | 1.800,000  |
|    | 39,947    | 1+053,228 | 39,993  | 0,5047  | 0,023  | 1,0130     |
| 5  | 1+090,172 | 1+053,407 | 39,994  | 0,5047  | 73,531 | -4.500,000 |
|    | 40,180    | 1+126,938 | 39,765  | -1,1294 | -0,150 | -1,6340    |
| 6  | 1+144,419 | 1+132,154 | 39,706  | -1,1294 | 24,530 | 2.000,000  |
|    | 39,567    | 1+156,684 | 39,579  | 0,0971  | 0,038  | 1,2265     |
| 7  | 1+177,207 | 1+177,207 | 39,599  | 0,0971  |        |            |
|    | 39,599    |           |         |         |        |            |

##### 4.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+000,000 | 40,488 | -1,3000   |           |          |            |        |          |
| TE | 1+000,180 | 40,486 | -1,3000   |           |          |            |        |          |
| V  | 1+006,600 | 40,382 | -1,9420   | 40,402    | 12,839   | -1.000,000 | -0,021 | -1,2839  |
|    | 1+010,000 | 40,310 | -2,2820   |           |          |            |        |          |
| TS | 1+013,020 | 40,236 | -2,5839   |           |          |            |        |          |
| TE | 1+013,101 | 40,234 | -2,5839   |           |          |            |        |          |
| V  | 1+019,328 | 40,106 | -1,5461   | 40,073    | 12,454   | 600,000    | 0,032  | 2,0756   |
|    | 1+020,000 | 40,096 | -1,4341   |           |          |            |        |          |
| TS | 1+025,555 | 40,042 | -0,5083   |           |          |            |        |          |
|    | 1+030,000 | 40,019 | -0,5083   |           |          |            |        |          |
| TE | 1+034,994 | 39,994 | -0,5083   |           |          |            |        |          |
|    | 1+040,000 | 39,975 | -0,2302   |           |          |            |        |          |
| V  | 1+044,111 | 39,970 | -0,0018   | 39,947    | 18,234   | 1.800,000  | 0,023  | 1,0130   |
|    | 1+050,000 | 39,980 | 0,3253    |           |          |            |        |          |
| TS | 1+053,228 | 39,993 | 0,5047    |           |          |            |        |          |
| TE | 1+053,407 | 39,994 | 0,5047    |           |          |            |        |          |
|    | 1+060,000 | 40,023 | 0,3582    |           |          |            |        |          |
|    | 1+070,000 | 40,047 | 0,1359    |           |          |            |        |          |
|    | 1+080,000 | 40,050 | -0,0863   |           |          |            |        |          |
|    | 1+090,000 | 40,030 | -0,3085   |           |          |            |        |          |
| V  | 1+090,172 | 40,030 | -0,3123   | 40,180    | 73,531   | -4.500,000 | -0,150 | -1,6340  |
|    | 1+100,000 | 39,988 | -0,5307   |           |          |            |        |          |
|    | 1+110,000 | 39,924 | -0,7530   |           |          |            |        |          |
|    | 1+120,000 | 39,838 | -0,9752   |           |          |            |        |          |
| TS | 1+126,938 | 39,765 | -1,1294   |           |          |            |        |          |
|    | 1+130,000 | 39,730 | -1,1294   |           |          |            |        |          |
| TE | 1+132,154 | 39,706 | -1,1294   |           |          |            |        |          |
|    | 1+140,000 | 39,632 | -0,7371   |           |          |            |        |          |
| V  | 1+144,419 | 39,605 | -0,5161   | 39,567    | 24,530   | 2.000,000  | 0,038  | 1,2265   |
|    | 1+150,000 | 39,584 | -0,2371   |           |          |            |        |          |
| TS | 1+156,684 | 39,579 | 0,0971    |           |          |            |        |          |
|    | 1+160,000 | 39,582 | 0,0971    |           |          |            |        |          |
|    | 1+170,000 | 39,592 | 0,0971    |           |          |            |        |          |
|    | 1+177,207 | 39,599 | 0,0971    |           |          |            |        |          |

## 5. EJE D

### 5.1. LISTADO DE VÉRTICES

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv         |
|----|-----------|-----------|---------|---------|--------|------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |            |
| 1  | 1+000,000 |           |         |         |        |            |
|    | 39,638    | 1+000,000 | 39,638  | -0,1735 |        |            |
| 2  | 1+059,000 | 1+050,630 | 39,550  | -0,1735 | 16,740 | -5.000,000 |
|    | 39,536    | 1+067,370 | 39,493  | -0,5083 | -0,007 | -0,3348    |
| 3  | 1+083,000 | 1+067,706 | 39,491  | -0,5083 | 30,587 | 3.000,000  |
|    | 39,414    | 1+098,294 | 39,492  | 0,5113  | 0,039  | 1,0196     |
| 4  | 1+112,000 | 1+098,457 | 39,493  | 0,5113  | 27,085 | -2.000,000 |
|    | 39,562    | 1+125,543 | 39,448  | -0,8430 | -0,046 | -1,3543    |
| 5  | 1+155,000 | 1+144,009 | 39,292  | -0,8430 | 21,983 | 750,000    |
|    | 39,199    | 1+165,991 | 39,429  | 2,0880  | 0,081  | 2,9310     |
| 6  | 1+178,000 | 1+169,200 | 39,496  | 2,0880  | 17,600 | -2.000,000 |
|    | 39,680    | 1+186,800 | 39,786  | 1,2080  | -0,019 | -0,8800    |
| 7  | 1+186,886 | 1+186,886 | 39,787  | 1,2080  |        |            |
|    | 39,787    |           |         |         |        |            |

### 5.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+000,000 | 39,638 | -0,1735   |           |          |            |        |          |
|    | 1+010,000 | 39,621 | -0,1735   |           |          |            |        |          |
|    | 1+020,000 | 39,603 | -0,1735   |           |          |            |        |          |
|    | 1+030,000 | 39,586 | -0,1735   |           |          |            |        |          |
|    | 1+040,000 | 39,569 | -0,1735   |           |          |            |        |          |
|    | 1+050,000 | 39,551 | -0,1735   |           |          |            |        |          |
| TE | 1+050,630 | 39,550 | -0,1735   |           |          |            |        |          |
| V  | 1+059,000 | 39,529 | -0,3409   | 39,536    | 16,740   | -5.000,000 | -0,007 | -0,3348  |
|    | 1+060,000 | 39,525 | -0,3609   |           |          |            |        |          |
| TS | 1+067,370 | 39,493 | -0,5083   |           |          |            |        |          |
| TE | 1+067,706 | 39,491 | -0,5083   |           |          |            |        |          |
|    | 1+070,000 | 39,481 | -0,4318   |           |          |            |        |          |
|    | 1+080,000 | 39,454 | -0,0985   |           |          |            |        |          |
| V  | 1+083,000 | 39,453 | 0,0015    | 39,414    | 30,587   | 3.000,000  | 0,039  | 1,0196   |
|    | 1+090,000 | 39,461 | 0,2348    |           |          |            |        |          |
| TS | 1+098,294 | 39,492 | 0,5113    |           |          |            |        |          |
| TE | 1+098,457 | 39,493 | 0,5113    |           |          |            |        |          |
|    | 1+100,000 | 39,500 | 0,4341    |           |          |            |        |          |
|    | 1+110,000 | 39,518 | -0,0659   |           |          |            |        |          |
| V  | 1+112,000 | 39,516 | -0,1659   | 39,562    | 27,085   | -2.000,000 | -0,046 | -1,3543  |
|    | 1+120,000 | 39,487 | -0,5659   |           |          |            |        |          |
| TS | 1+125,543 | 39,448 | -0,8430   |           |          |            |        |          |
|    | 1+130,000 | 39,410 | -0,8430   |           |          |            |        |          |
|    | 1+140,000 | 39,326 | -0,8430   |           |          |            |        |          |
| TE | 1+144,009 | 39,292 | -0,8430   |           |          |            |        |          |
|    | 1+150,000 | 39,265 | -0,0442   |           |          |            |        |          |
| V  | 1+155,000 | 39,280 | 0,6225    | 39,199    | 21,983   | 750,000    | 0,081  | 2,9310   |
|    | 1+160,000 | 39,328 | 1,2892    |           |          |            |        |          |
| TS | 1+165,991 | 39,429 | 2,0880    |           |          |            |        |          |
| TE | 1+169,200 | 39,496 | 2,0880    |           |          |            |        |          |
|    | 1+170,000 | 39,512 | 2,0480    |           |          |            |        |          |
| V  | 1+178,000 | 39,660 | 1,6480    | 39,680    | 17,600   | -2.000,000 | -0,019 | -0,8800  |
|    | 1+180,000 | 39,692 | 1,5480    |           |          |            |        |          |
| TS | 1+186,800 | 39,786 | 1,2080    |           |          |            |        |          |
|    | 1+186,886 | 39,787 | 1,2080    |           |          |            |        |          |

## 6. EJE E

### 6.1. LISTADO DE VÉRTICES

| Nº | P.K.<br>Cota        | TE<br>TS               | Cota TE<br>Cota TS | pE(%)<br>pS(%)     | Longi.<br>Flecha | Kv                    |
|----|---------------------|------------------------|--------------------|--------------------|------------------|-----------------------|
| 1  | 1+018,117<br>39,527 | 1+018,117              | 39,527             | -1,0230            |                  |                       |
| 2  | 1+025,589<br>39,451 | 1+018,406<br>1+032,771 | 39,524<br>39,549   | -1,0230<br>1,3712  | 14,365<br>0,043  | 600,000<br>2,3942     |
| 3  | 1+049,228<br>39,775 | 1+032,841<br>1+065,615 | 39,550<br>39,683   | 1,3712<br>-0,5567  | 32,774<br>-0,079 | -1.700,000<br>-1,9279 |
| 4  | 1+087,700<br>39,561 | 1+066,389<br>1+109,011 | 39,679<br>39,669   | -0,5567<br>0,5088  | 42,622<br>0,057  | 4.000,000<br>1,0656   |
| 5  | 1+125,848<br>39,755 | 1+109,139<br>1+142,556 | 39,670<br>39,616   | 0,5088<br>-0,8278  | 33,416<br>-0,056 | -2.500,000<br>-1,3367 |
| 6  | 1+155,350<br>39,510 | 1+143,542<br>1+167,158 | 39,608<br>39,468   | -0,8278<br>-0,3555 | 23,615<br>0,014  | 5.000,000<br>0,4723   |
| 7  | 1+174,306<br>39,443 | 1+174,306              | 39,443             | -0,3555            |                  |                       |

### 6.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+018,117 | 39,527 | -1,0230   |           |          |            |        |          |
| TE | 1+018,406 | 39,524 | -1,0230   |           |          |            |        |          |
|    | 1+020,000 | 39,510 | -0,7574   |           |          |            |        |          |
| V  | 1+025,589 | 39,494 | 0,1741    | 39,451    | 14,365   | 600,000    | 0,043  | 2,3942   |
|    | 1+030,000 | 39,517 | 0,9093    |           |          |            |        |          |
| TS | 1+032,771 | 39,549 | 1,3712    |           |          |            |        |          |
| TE | 1+032,841 | 39,550 | 1,3712    |           |          |            |        |          |
|    | 1+040,000 | 39,633 | 0,9500    |           |          |            |        |          |
| V  | 1+049,228 | 39,696 | 0,4072    | 39,775    | 32,774   | -1.700,000 | -0,079 | -1,9279  |
|    | 1+050,000 | 39,699 | 0,3618    |           |          |            |        |          |
|    | 1+060,000 | 39,705 | -0,2264   |           |          |            |        |          |
| TS | 1+065,615 | 39,683 | -0,5567   |           |          |            |        |          |
| TE | 1+066,389 | 39,679 | -0,5567   |           |          |            |        |          |
|    | 1+070,000 | 39,661 | -0,4664   |           |          |            |        |          |
|    | 1+080,000 | 39,627 | -0,2164   |           |          |            |        |          |
| V  | 1+087,700 | 39,617 | -0,0239   | 39,561    | 42,622   | 4.000,000  | 0,057  | 1,0656   |
|    | 1+090,000 | 39,617 | 0,0336    |           |          |            |        |          |
|    | 1+100,000 | 39,633 | 0,2836    |           |          |            |        |          |
| TS | 1+109,011 | 39,669 | 0,5088    |           |          |            |        |          |
| TE | 1+109,139 | 39,670 | 0,5088    |           |          |            |        |          |
|    | 1+110,000 | 39,674 | 0,4744    |           |          |            |        |          |
|    | 1+120,000 | 39,701 | 0,0744    |           |          |            |        |          |
| V  | 1+125,848 | 39,699 | -0,1595   | 39,755    | 33,416   | -2.500,000 | -0,056 | -1,3367  |
|    | 1+130,000 | 39,689 | -0,3256   |           |          |            |        |          |
|    | 1+140,000 | 39,636 | -0,7256   |           |          |            |        |          |
| TS | 1+142,556 | 39,616 | -0,8278   |           |          |            |        |          |
| TE | 1+143,542 | 39,608 | -0,8278   |           |          |            |        |          |
|    | 1+150,000 | 39,559 | -0,6987   |           |          |            |        |          |
| V  | 1+155,350 | 39,524 | -0,5917   | 39,510    | 23,615   | 5.000,000  | 0,014  | 0,4723   |
|    | 1+160,000 | 39,499 | -0,4987   |           |          |            |        |          |
| TS | 1+167,158 | 39,468 | -0,3555   |           |          |            |        |          |
|    | 1+170,000 | 39,458 | -0,3555   |           |          |            |        |          |
|    | 1+174,306 | 39,443 | -0,3555   |           |          |            |        |          |

## 7. EJE F

### 7.1. LISTADO DE VÉRTICES

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv         |
|----|-----------|-----------|---------|---------|--------|------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |            |
| 1  | 1+000,000 |           |         |         |        |            |
|    | 39,390    | 1+000,000 | 39,390  | 0,2998  |        |            |
| 2  | 1+053,500 | 1+026,720 | 39,470  | 0,2998  | 53,561 | 25.000,000 |
|    | 39,550    | 1+080,280 | 39,688  | 0,5140  | 0,014  | 0,2142     |
| 3  | 1+110,900 | 1+082,254 | 39,698  | 0,5140  | 57,293 | -5.650,000 |
|    | 39,845    | 1+139,546 | 39,702  | -0,5000 | -0,073 | -1,0140    |
| 4  | 1+147,493 | 1+139,620 | 39,702  | -0,5000 | 15,745 | 500,000    |
|    | 39,662    | 1+155,365 | 39,871  | 2,6490  | 0,062  | 3,1490     |
| 5  | 1+155,425 | 1+155,425 | 39,873  | 2,6490  |        |            |
|    | 39,873    |           |         |         |        |            |

### 7.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+000,000 | 39,390 | 0,2998    |           |          |            |        |          |
|    | 1+010,000 | 39,420 | 0,2998    |           |          |            |        |          |
|    | 1+020,000 | 39,450 | 0,2998    |           |          |            |        |          |
| TE | 1+026,720 | 39,470 | 0,2998    |           |          |            |        |          |
|    | 1+030,000 | 39,480 | 0,3129    |           |          |            |        |          |
|    | 1+040,000 | 39,513 | 0,3529    |           |          |            |        |          |
|    | 1+050,000 | 39,551 | 0,3929    |           |          |            |        |          |
| V  | 1+053,500 | 39,565 | 0,4069    | 39,550    | 53,561   | 25.000,000 | 0,014  | 0,2142   |
|    | 1+060,000 | 39,592 | 0,4329    |           |          |            |        |          |
|    | 1+070,000 | 39,637 | 0,4729    |           |          |            |        |          |
|    | 1+080,000 | 39,687 | 0,5129    |           |          |            |        |          |
| TS | 1+080,280 | 39,688 | 0,5140    |           |          |            |        |          |
| TE | 1+082,254 | 39,698 | 0,5140    |           |          |            |        |          |
|    | 1+090,000 | 39,733 | 0,3769    |           |          |            |        |          |
|    | 1+100,000 | 39,762 | 0,1999    |           |          |            |        |          |
|    | 1+110,000 | 39,773 | 0,0229    |           |          |            |        |          |
| V  | 1+110,900 | 39,773 | 0,0070    | 39,845    | 57,293   | -5.650,000 | -0,073 | -1,0140  |
|    | 1+120,000 | 39,766 | -0,1540   |           |          |            |        |          |
|    | 1+130,000 | 39,742 | -0,3310   |           |          |            |        |          |
| TS | 1+139,546 | 39,702 | -0,5000   |           |          |            |        |          |
| TE | 1+139,620 | 39,702 | -0,5000   |           |          |            |        |          |
|    | 1+140,000 | 39,700 | -0,4240   |           |          |            |        |          |
| V  | 1+147,493 | 39,724 | 1,0745    | 39,662    | 15,745   | 500,000    | 0,062  | 3,1490   |
|    | 1+150,000 | 39,758 | 1,5760    |           |          |            |        |          |
| TS | 1+155,365 | 39,871 | 2,6490    |           |          |            |        |          |
|    | 1+155,425 | 39,873 | 2,6490    |           |          |            |        |          |

## 8. EJE G

### 8.1. LISTADO DE VÉRTICES

| Nº | P.K.<br>Cota        | TE<br>TS               | Cota TE<br>Cota TS | pE(%)<br>pS(%)     | Longi.<br>Flecha | Kv                     |
|----|---------------------|------------------------|--------------------|--------------------|------------------|------------------------|
| 1  | 1+009,814<br>40,360 | 1+009,814              | 40,360             | -2,4743            |                  |                        |
| 2  | 1+030,711<br>39,843 | 1+019,106<br>1+042,316 | 40,130<br>39,690   | -2,4743<br>-1,3138 | 23,211<br>0,034  | 2.000,000<br>1,1605    |
| 3  | 1+058,700<br>39,475 | 1+053,432<br>1+063,968 | 39,544<br>39,480   | -1,3138<br>0,0911  | 10,536<br>0,019  | 750,000<br>1,4048      |
| 4  | 1+101,000<br>39,514 | 1+079,169<br>1+122,831 | 39,494<br>39,438   | 0,0911<br>-0,3456  | 43,663<br>-0,024 | -10.000,000<br>-0,4366 |
| 5  | 1+150,000<br>39,344 | 1+139,562<br>1+160,438 | 39,380<br>39,396   | -0,3456<br>0,4895  | 20,875<br>0,022  | 2.500,000<br>0,8350    |
| 6  | 1+178,000<br>39,481 | 1+161,737<br>1+194,263 | 39,402<br>39,297   | 0,4895<br>-1,1368  | 32,525<br>-0,066 | -2.000,000<br>-1,6263  |
| 7  | 1+205,838<br>39,165 | 1+205,838<br>1+205,838 | 39,165<br>39,165   | -1,1368<br>-1,2200 | 0,000<br>0,000   | 0,000<br>-0,0832       |
| 8  | 1+219,198<br>39,002 | 1+206,199<br>1+232,197 | 39,161<br>39,326   | -1,2200<br>2,4940  | 25,998<br>0,121  | 700,000<br>3,7140      |
| 9  | 1+262,839<br>40,090 | 1+238,728<br>1+286,950 | 39,489<br>39,830   | 2,4940<br>-1,0780  | 48,222<br>-0,215 | -1.350,000<br>-3,5720  |
| 10 | 1+334,627<br>39,317 | 1+299,122<br>1+370,132 | 39,699<br>39,494   | -1,0780<br>0,5000  | 71,010<br>0,140  | 4.500,000<br>1,5780    |
| 11 | 1+376,786<br>39,527 | 1+370,307<br>1+383,265 | 39,495<br>39,533   | 0,5000<br>0,0820   | 12,958<br>-0,007 | -3.100,000<br>-0,4180  |

|    |           |           |        |         |        |             |
|----|-----------|-----------|--------|---------|--------|-------------|
| 12 | 1+383,707 | 1+383,707 | 39,533 | 0,0820  | 0,000  | 0,000       |
|    | 39,533    | 1+383,707 | 39,533 | 0,1149  | 0,000  | 0,0329      |
| 13 | 1+411,694 | 1+392,468 | 39,543 | 0,1149  | 38,452 | -10.000,000 |
|    | 39,565    | 1+430,921 | 39,513 | -0,2696 | -0,018 | -0,3845     |
| 14 | 1+490,000 | 1+490,000 | 39,354 | -0,2696 |        |             |
|    | 39,354    |           |        |         |        |             |

## 8.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+009,814 | 40,360 | -2,4743   |           |          |            |        |          |
|    | 1+010,000 | 40,355 | -2,4743   |           |          |            |        |          |
| TE | 1+019,106 | 40,130 | -2,4743   |           |          |            |        |          |
|    | 1+020,000 | 40,108 | -2,4296   |           |          |            |        |          |
|    | 1+030,000 | 39,890 | -1,9296   |           |          |            |        |          |
| V  | 1+030,711 | 39,877 | -1,8940   | 39,843    | 23,211   | 2.000,000  | 0,034  | 1,1605   |
|    | 1+040,000 | 39,722 | -1,4296   |           |          |            |        |          |
| TS | 1+042,316 | 39,690 | -1,3138   |           |          |            |        |          |
|    | 1+050,000 | 39,590 | -1,3138   |           |          |            |        |          |
| TE | 1+053,432 | 39,544 | -1,3138   |           |          |            |        |          |
| V  | 1+058,700 | 39,494 | -0,6114   | 39,475    | 10,536   | 750,000    | 0,019  | 1,4048   |
|    | 1+060,000 | 39,487 | -0,4380   |           |          |            |        |          |
| TS | 1+063,968 | 39,480 | 0,0911    |           |          |            |        |          |
|    | 1+064,015 | 39,480 | 0,0911    |           |          |            |        |          |
|    | 1+205,838 | 39,165 | -1,1368   |           |          |            |        |          |
| TE | 1+205,838 | 39,165 | -1,1368   |           |          |            |        |          |
| V  | 1+205,838 | 39,165 | -1,1368   | 39,165    | 0,000    | 0,000      | 0,000  | 0,0000   |
| TS | 1+205,838 | 39,165 | -1,1368   |           |          |            |        |          |
| TE | 1+206,199 | 39,161 | -1,2200   |           |          |            |        |          |
|    | 1+210,000 | 39,125 | -0,6770   |           |          |            |        |          |
| V  | 1+219,198 | 39,123 | 0,6370    | 39,002    | 25,998   | 700,000    | 0,121  | 3,7140   |
|    | 1+220,000 | 39,128 | 0,7515    |           |          |            |        |          |
|    | 1+230,000 | 39,275 | 2,1801    |           |          |            |        |          |
| TS | 1+232,197 | 39,326 | 2,4940    |           |          |            |        |          |
| TE | 1+238,728 | 39,489 | 2,4940    |           |          |            |        |          |
|    | 1+240,000 | 39,520 | 2,3998    |           |          |            |        |          |
|    | 1+250,000 | 39,723 | 1,6590    |           |          |            |        |          |
|    | 1+260,000 | 39,852 | 0,9183    |           |          |            |        |          |
| V  | 1+262,839 | 39,875 | 0,7080    | 40,090    | 48,222   | -1.350,000 | -0,215 | -3,5720  |
|    | 1+270,000 | 39,907 | 0,1775    |           |          |            |        |          |
|    | 1+280,000 | 39,888 | -0,5632   |           |          |            |        |          |
| TS | 1+286,950 | 39,830 | -1,0780   |           |          |            |        |          |
|    | 1+290,000 | 39,798 | -1,0780   |           |          |            |        |          |
| TE | 1+299,122 | 39,699 | -1,0780   |           |          |            |        |          |
|    | 1+300,000 | 39,690 | -1,0585   |           |          |            |        |          |

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+310,000 | 39,595 | -0,8363   |           |          |            |        |          |
|    | 1+320,000 | 39,523 | -0,6140   |           |          |            |        |          |
|    | 1+330,000 | 39,472 | -0,3918   |           |          |            |        |          |
| V  | 1+334,627 | 39,457 | -0,2890   | 39,317    | 71,010   | 4.500,000  | 0,140  | 1,5780   |
|    | 1+340,000 | 39,444 | -0,1696   |           |          |            |        |          |
|    | 1+350,000 | 39,438 | 0,0526    |           |          |            |        |          |
|    | 1+360,000 | 39,455 | 0,2748    |           |          |            |        |          |
|    | 1+370,000 | 39,493 | 0,4971    |           |          |            |        |          |
| TS | 1+370,132 | 39,494 | 0,5000    |           |          |            |        |          |
| TE | 1+370,307 | 39,495 | 0,5000    |           |          |            |        |          |
| V  | 1+376,786 | 39,521 | 0,2910    | 39,527    | 12,958   | -3.100,000 | -0,007 | -0,4180  |
|    | 1+380,000 | 39,528 | 0,1873    |           |          |            |        |          |
| TS | 1+383,265 | 39,533 | 0,0820    |           |          |            |        |          |
| TE | 1+383,707 | 39,533 | 0,0820    |           |          |            |        |          |
| V  | 1+383,707 | 39,533 | 0,0820    | 39,533    | 0,000    | 0,000      | 0,000  | 0,0000   |
| TS | 1+383,707 | 39,533 | 0,0820    |           |          |            |        |          |
|    | 1+383,707 | 39,533 | 0,0820    |           |          |            |        |          |

**9. EJE H**

**9.1. LISTADO DE VÉRTICES**

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv         |
|----|-----------|-----------|---------|---------|--------|------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |            |
| 1  | 1+134,937 |           |         |         |        |            |
|    | 39,590    | 1+134,937 | 39,590  | -0,7340 |        |            |
| 2  | 1+144,089 | 1+135,177 | 39,588  | -0,7340 | 17,824 | 600,000    |
|    | 39,523    | 1+153,001 | 39,722  | 2,2367  | 0,066  | 2,9707     |
| 3  | 1+168,000 | 1+153,238 | 39,727  | 2,2367  | 29,524 | -1.700,000 |
|    | 40,058    | 1+182,762 | 40,131  | 0,5000  | -0,064 | -1,7367    |
| 4  | 1+196,561 | 1+186,050 | 40,148  | 0,5000  | 21,021 | 1.100,000  |
|    | 40,200    | 1+207,071 | 40,454  | 2,4110  | 0,050  | 1,9110     |
| 5  | 1+210,893 | 1+210,893 | 40,546  | 2,4110  |        |            |
|    | 40,546    |           |         |         |        |            |

**9.2. PUNTOS SUCESIVOS CADA 10 METROS**

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+134,937 | 39,590 | -0,7340   |           |          |            |        |          |
| TE | 1+135,177 | 39,588 | -0,7340   |           |          |            |        |          |
|    | 1+140,000 | 39,572 | 0,0699    |           |          |            |        |          |
| V  | 1+144,089 | 39,589 | 0,7513    | 39,523    | 17,824   | 600,000    | 0,066  | 2,9707   |
|    | 1+150,000 | 39,663 | 1,7365    |           |          |            |        |          |
| TS | 1+153,001 | 39,722 | 2,2367    |           |          |            |        |          |
| TE | 1+153,238 | 39,727 | 2,2367    |           |          |            |        |          |
|    | 1+160,000 | 39,865 | 1,8389    |           |          |            |        |          |
| V  | 1+168,000 | 39,994 | 1,3683    | 40,058    | 29,524   | -1.700,000 | -0,064 | -1,7367  |
|    | 1+170,000 | 40,020 | 1,2507    |           |          |            |        |          |
|    | 1+180,000 | 40,115 | 0,6625    |           |          |            |        |          |
| TS | 1+182,762 | 40,131 | 0,5000    |           |          |            |        |          |
| TE | 1+186,050 | 40,148 | 0,5000    |           |          |            |        |          |
|    | 1+190,000 | 40,175 | 0,8591    |           |          |            |        |          |
| V  | 1+196,561 | 40,251 | 1,4555    | 40,200    | 21,021   | 1.100,000  | 0,050  | 1,9110   |
|    | 1+200,000 | 40,306 | 1,7682    |           |          |            |        |          |
| TS | 1+207,071 | 40,454 | 2,4110    |           |          |            |        |          |
|    | 1+210,000 | 40,524 | 2,4110    |           |          |            |        |          |
|    | 1+210,893 | 40,546 | 2,4110    |           |          |            |        |          |

## 10. VÍA DE SERVICIO 1

### 10.1. LISTADO DE VÉRTICES

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv         |
|----|-----------|-----------|---------|---------|--------|------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |            |
| 1  | 1+000,000 |           |         |         |        |            |
|    | 39,230    | 1+000,000 | 39,230  | 1,4195  |        |            |
| 2  | 1+009,986 | 1+001,092 | 39,246  | 1,4195  | 17,787 | -5.000,000 |
|    | 39,372    | 1+018,880 | 39,466  | 1,0638  | -0,008 | -0,3557    |
| 3  | 1+038,353 | 1+032,343 | 39,610  | 1,0638  | 12,019 | -500,000   |
|    | 39,674    | 1+044,362 | 39,593  | -1,3400 | -0,036 | -2,4038    |
| 4  | 1+049,794 | 1+045,194 | 39,582  | -1,3400 | 9,200  | 500,000    |
|    | 39,520    | 1+054,395 | 39,543  | 0,5000  | 0,021  | 1,8400     |
| 5  | 1+087,853 | 1+080,353 | 39,673  | 0,5000  | 15,000 | -1.500,000 |
|    | 39,710    | 1+095,353 | 39,673  | -0,5000 | -0,019 | -1,0000    |
| 6  | 1+102,532 | 1+096,192 | 39,669  | -0,5000 | 12,682 | 1.000,000  |
|    | 39,637    | 1+108,873 | 39,686  | 0,7682  | 0,020  | 1,2682     |
| 7  | 1+151,560 | 1+139,844 | 39,924  | 0,7682  | 23,432 | 1.500,000  |
|    | 40,014    | 1+163,276 | 40,287  | 2,3303  | 0,046  | 1,5621     |
| 8  | 1+171,339 | 1+166,291 | 40,357  | 2,3303  | 10,095 | -1.000,000 |
|    | 40,475    | 1+176,386 | 40,541  | 1,3208  | -0,013 | -1,0095    |
| 9  | 1+194,417 | 1+183,548 | 40,636  | 1,3208  | 21,737 | 1.500,000  |
|    | 40,779    | 1+205,285 | 41,080  | 2,7699  | 0,039  | 1,4492     |
| 10 | 1+213,893 | 1+213,893 | 41,319  | 2,7699  |        |            |
|    | 41,319    |           |         |         |        |            |

### 10.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+000,000 | 39,230 | 1,4195    |           |          |            |        |          |
| TE | 1+001,092 | 39,246 | 1,4195    |           |          |            |        |          |
| V  | 1+009,986 | 39,364 | 1,2416    | 39,372    | 17,787   | -5.000,000 | -0,008 | -0,3557  |
|    | 1+010,000 | 39,364 | 1,2414    |           |          |            |        |          |
| TS | 1+018,880 | 39,466 | 1,0638    |           |          |            |        |          |
|    | 1+020,000 | 39,478 | 1,0638    |           |          |            |        |          |
|    | 1+030,000 | 39,585 | 1,0638    |           |          |            |        |          |
| TE | 1+032,343 | 39,610 | 1,0638    |           |          |            |        |          |
| V  | 1+038,353 | 39,637 | -0,1381   | 39,674    | 12,019   | -500,000   | -0,036 | -2,4038  |
|    | 1+040,000 | 39,632 | -0,4676   |           |          |            |        |          |
| TS | 1+044,362 | 39,593 | -1,3400   |           |          |            |        |          |
| TE | 1+045,194 | 39,582 | -1,3400   |           |          |            |        |          |
| V  | 1+049,794 | 39,541 | -0,4200   | 39,520    | 9,200    | 500,000    | 0,021  | 1,8400   |
|    | 1+050,000 | 39,541 | -0,3789   |           |          |            |        |          |
| TS | 1+054,395 | 39,543 | 0,5000    |           |          |            |        |          |
|    | 1+060,000 | 39,571 | 0,5000    |           |          |            |        |          |
|    | 1+070,000 | 39,621 | 0,5000    |           |          |            |        |          |
|    | 1+080,000 | 39,671 | 0,5000    |           |          |            |        |          |
| TE | 1+080,353 | 39,673 | 0,5000    |           |          |            |        |          |
| V  | 1+087,853 | 39,692 | 0,0000    | 39,710    | 15,000   | -1.500,000 | -0,019 | -1,0000  |
|    | 1+090,000 | 39,690 | -0,1431   |           |          |            |        |          |
| TS | 1+095,353 | 39,673 | -0,5000   |           |          |            |        |          |
| TE | 1+096,192 | 39,669 | -0,5000   |           |          |            |        |          |
|    | 1+100,000 | 39,657 | -0,1192   |           |          |            |        |          |
| V  | 1+102,532 | 39,657 | 0,1341    | 39,637    | 12,682   | 1.000,000  | 0,020  | 1,2682   |
| TS | 1+108,873 | 39,686 | 0,7682    |           |          |            |        |          |
|    | 1+110,000 | 39,694 | 0,7682    |           |          |            |        |          |
|    | 1+120,000 | 39,771 | 0,7682    |           |          |            |        |          |
|    | 1+130,000 | 39,848 | 0,7682    |           |          |            |        |          |
| TE | 1+139,844 | 39,924 | 0,7682    |           |          |            |        |          |
|    | 1+140,000 | 39,925 | 0,7785    |           |          |            |        |          |
|    | 1+150,000 | 40,036 | 1,4452    |           |          |            |        |          |
| V  | 1+151,560 | 40,059 | 1,5492    | 40,014    | 23,432   | 1.500,000  | 0,046  | 1,5621   |
|    | 1+160,000 | 40,214 | 2,1119    |           |          |            |        |          |
| TS | 1+163,276 | 40,287 | 2,3303    |           |          |            |        |          |

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
| TE | 1+166,291 | 40,357 | 2,3303    |           |          |            |        |          |
|    | 1+170,000 | 40,437 | 1,9594    |           |          |            |        |          |
| V  | 1+171,339 | 40,462 | 1,8255    | 40,475    | 10,095   | -1.000,000 | -0,013 | -1,0095  |
| TS | 1+176,386 | 40,541 | 1,3208    |           |          |            |        |          |
|    | 1+180,000 | 40,589 | 1,3208    |           |          |            |        |          |
| TE | 1+183,548 | 40,636 | 1,3208    |           |          |            |        |          |
|    | 1+190,000 | 40,735 | 1,7509    |           |          |            |        |          |
| V  | 1+194,417 | 40,819 | 2,0454    | 40,779    | 21,737   | 1.500,000  | 0,039  | 1,4492   |
|    | 1+200,000 | 40,943 | 2,4176    |           |          |            |        |          |
| TS | 1+205,285 | 41,080 | 2,7699    |           |          |            |        |          |
|    | 1+210,000 | 41,211 | 2,7699    |           |          |            |        |          |
|    | 1+213,893 | 41,319 | 2,7699    |           |          |            |        |          |

## 11. ROTONDA R=25

### 11.1. LISTADO DE VÉRTICES

| Nº | P.K.<br>Cota        | TE<br>TS               | Cota TE<br>Cota TS | pE(%)<br>pS(%)     | Longi.<br>Flecha | Kv                  |
|----|---------------------|------------------------|--------------------|--------------------|------------------|---------------------|
| 1  | 0+000,000<br>39,360 | 0+000,000              | 39,360             | -2,0000            |                  |                     |
| 2  | 0+016,797<br>39,024 | 0+004,662<br>0+028,932 | 39,267<br>38,978   | -2,0000<br>-0,3820 | 24,270<br>0,049  | 1.500,000<br>1,6180 |
| 3  | 0+058,378<br>38,865 | 0+042,263<br>0+074,493 | 38,927<br>39,381   | -0,3820<br>3,1991  | 32,230<br>0,144  | 900,000<br>3,5811   |
| 4  | 0+082,500<br>39,637 | 0+075,012<br>0+089,988 | 39,397<br>39,503   | 3,1991<br>-1,7928  | 14,976<br>-0,093 | -300,000<br>-4,9920 |
| 5  | 0+099,479<br>39,333 | 0+092,821<br>0+106,136 | 39,452<br>39,390   | -1,7928<br>0,8701  | 13,314<br>0,044  | 500,000<br>2,6629   |
| 6  | 0+112,990<br>39,450 | 0+106,762<br>0+119,218 | 39,396<br>39,407   | 0,8701<br>-0,6869  | 12,456<br>-0,024 | -800,000<br>-1,5569 |
| 7  | 0+138,373<br>39,276 | 0+128,839<br>0+147,908 | 39,341<br>39,392   | -0,6869<br>1,2200  | 19,069<br>0,045  | 1.000,000<br>1,9069 |
| 8  | 0+152,610<br>39,449 | 0+148,585<br>0+156,635 | 39,400<br>39,369   | 1,2200<br>-2,0000  | 8,050<br>-0,032  | -250,000<br>-3,2200 |
| 9  | 0+157,080<br>39,360 | 0+157,080              | 39,360             | -2,0000            |                  |                     |

| Estación | Cota | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv) | Flecha | Theta(%) |
|----------|------|-----------|-----------|----------|-----------|--------|----------|
|----------|------|-----------|-----------|----------|-----------|--------|----------|

|    |           |        |         |        |       |          |        |         |
|----|-----------|--------|---------|--------|-------|----------|--------|---------|
| V  | 0+152,610 | 39,417 | -0,3900 | 39,449 | 8,050 | -250,000 | -0,032 | -3,2200 |
| TS | 0+156,635 | 39,369 | -2,0000 |        |       |          |        |         |
|    | 0+157,080 | 39,360 | -2,0000 |        |       |          |        |         |

## 12. EJE I

### 12.1. LISTADO DE VÉRTICES

| Nº | P.K.      | TE        | Cota TE | pE(%)   | Longi. | Kv         |
|----|-----------|-----------|---------|---------|--------|------------|
|    | Cota      | TS        | Cota TS | pS(%)   | Flecha |            |
| 1  | 1+000,000 |           |         |         |        |            |
|    | 39,475    | 1+000,000 | 39,475  | -0,5200 |        |            |
| 2  | 1+013,441 | 1+005,969 | 39,444  | -0,5200 | 14,944 | 5.000,000  |
|    | 39,405    | 1+020,913 | 39,389  | -0,2211 | 0,006  | 0,2989     |
| 3  | 1+047,000 | 1+035,010 | 39,357  | -0,2211 | 23,980 | -2.750,000 |
|    | 39,331    | 1+058,990 | 39,200  | -1,0931 | -0,026 | -0,8720    |
| 4  | 1+059,157 | 1+059,157 | 39,198  | -1,0931 |        |            |
|    | 39,198    |           |         |         |        |            |

### 12.2. PUNTOS SUCESIVOS CADA 10 METROS

|    | Estación  | Cota   | Pente.(%) | Cota Ver. | Long.(L) | Radio(kv)  | Flecha | Theta(%) |
|----|-----------|--------|-----------|-----------|----------|------------|--------|----------|
|    | 1+000,000 | 39,475 | -0,5200   |           |          |            |        |          |
| TE | 1+005,969 | 39,444 | -0,5200   |           |          |            |        |          |
|    | 1+010,000 | 39,425 | -0,4394   |           |          |            |        |          |
| V  | 1+013,441 | 39,411 | -0,3706   | 39,405    | 14,944   | 5.000,000  | 0,006  | 0,2989   |
|    | 1+020,000 | 39,391 | -0,2394   |           |          |            |        |          |
| TS | 1+020,913 | 39,389 | -0,2211   |           |          |            |        |          |
|    | 1+030,000 | 39,368 | -0,2211   |           |          |            |        |          |
| TE | 1+035,010 | 39,357 | -0,2211   |           |          |            |        |          |
|    | 1+040,000 | 39,342 | -0,4026   |           |          |            |        |          |
| V  | 1+047,000 | 39,305 | -0,6571   | 39,331    | 23,980   | -2.750,000 | -0,026 | -0,8720  |
|    | 1+050,000 | 39,283 | -0,7662   |           |          |            |        |          |
| TS | 1+058,990 | 39,200 | -1,0931   |           |          |            |        |          |
|    | 1+059,157 | 39,198 | -1,0931   |           |          |            |        |          |