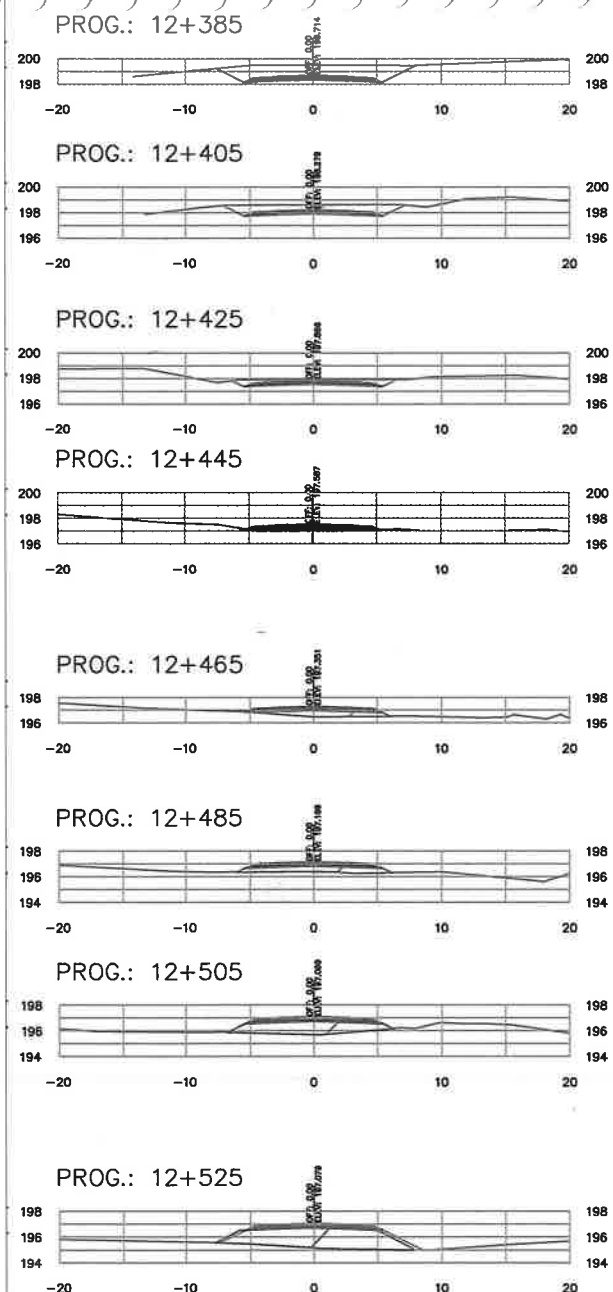
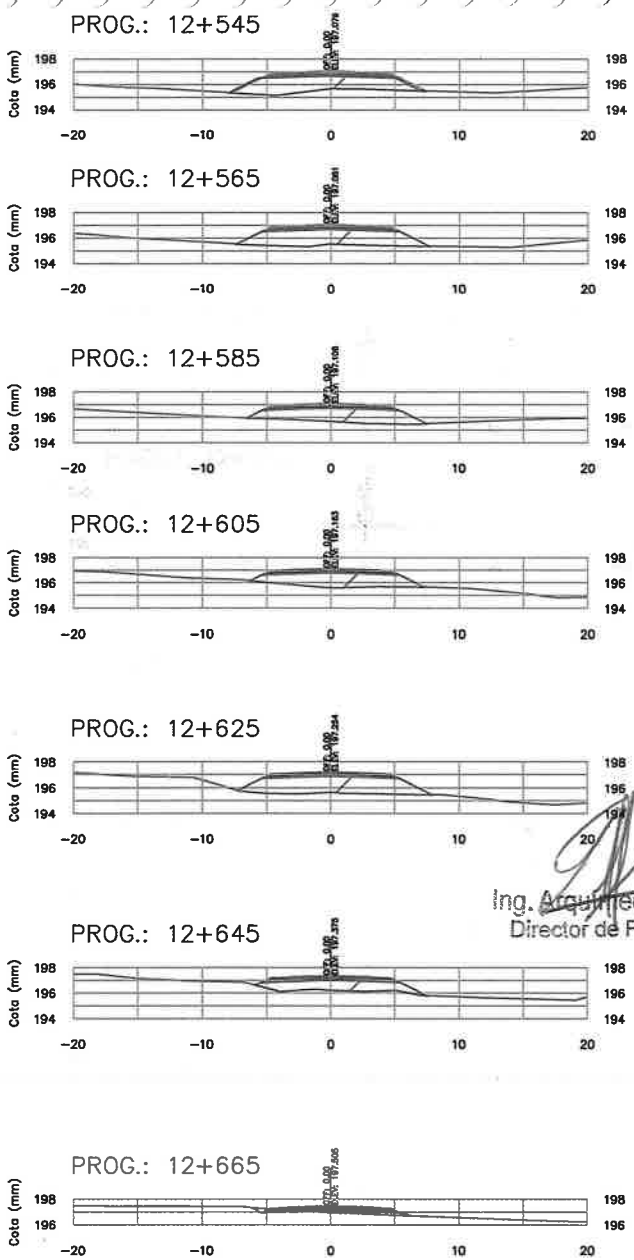
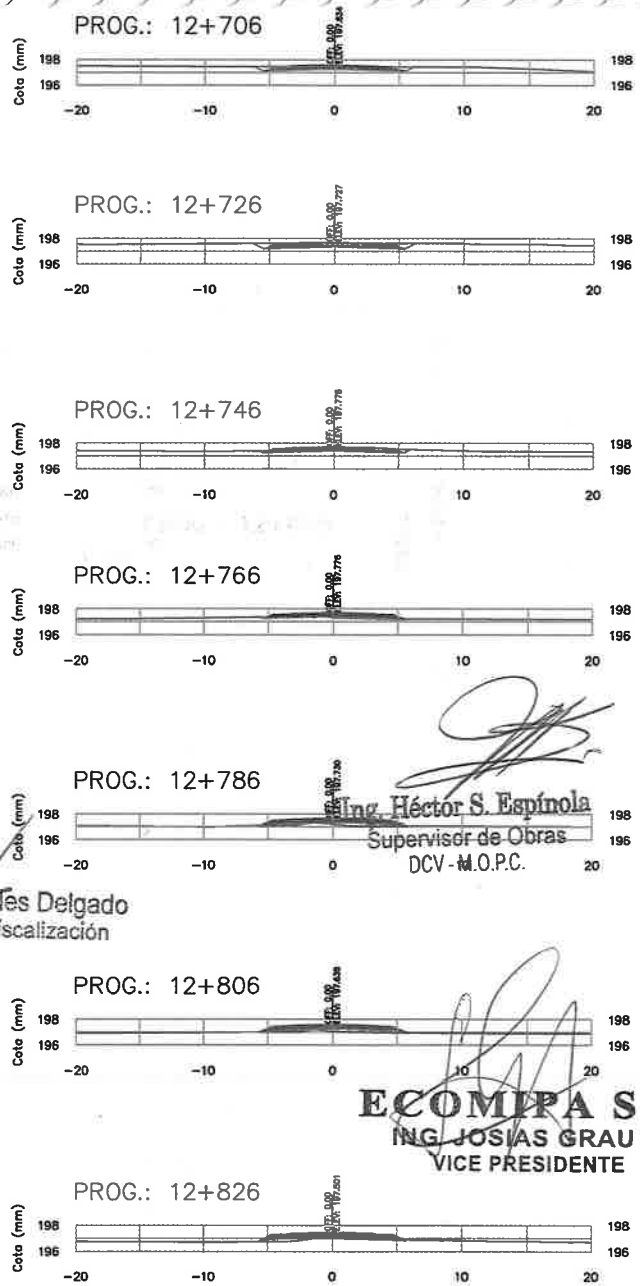




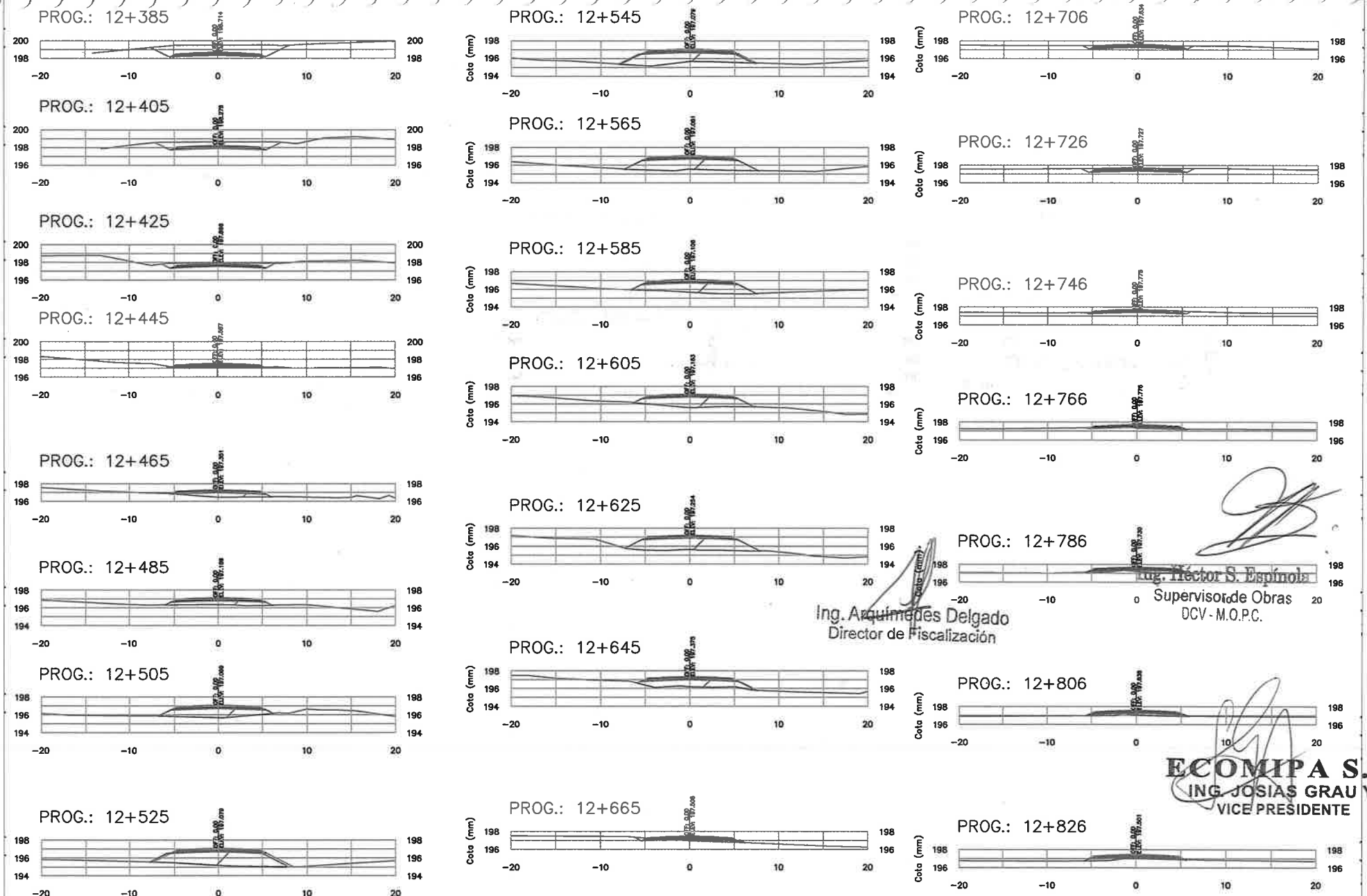


Ing. Héctor S. Espínola
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY ÁREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARÁ DISEÑO GEOMETRICO · ESCALA · ST-31-R1



Ing. Arquímedes Delgado
Director de Fiscalización

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Supervisor de Obras
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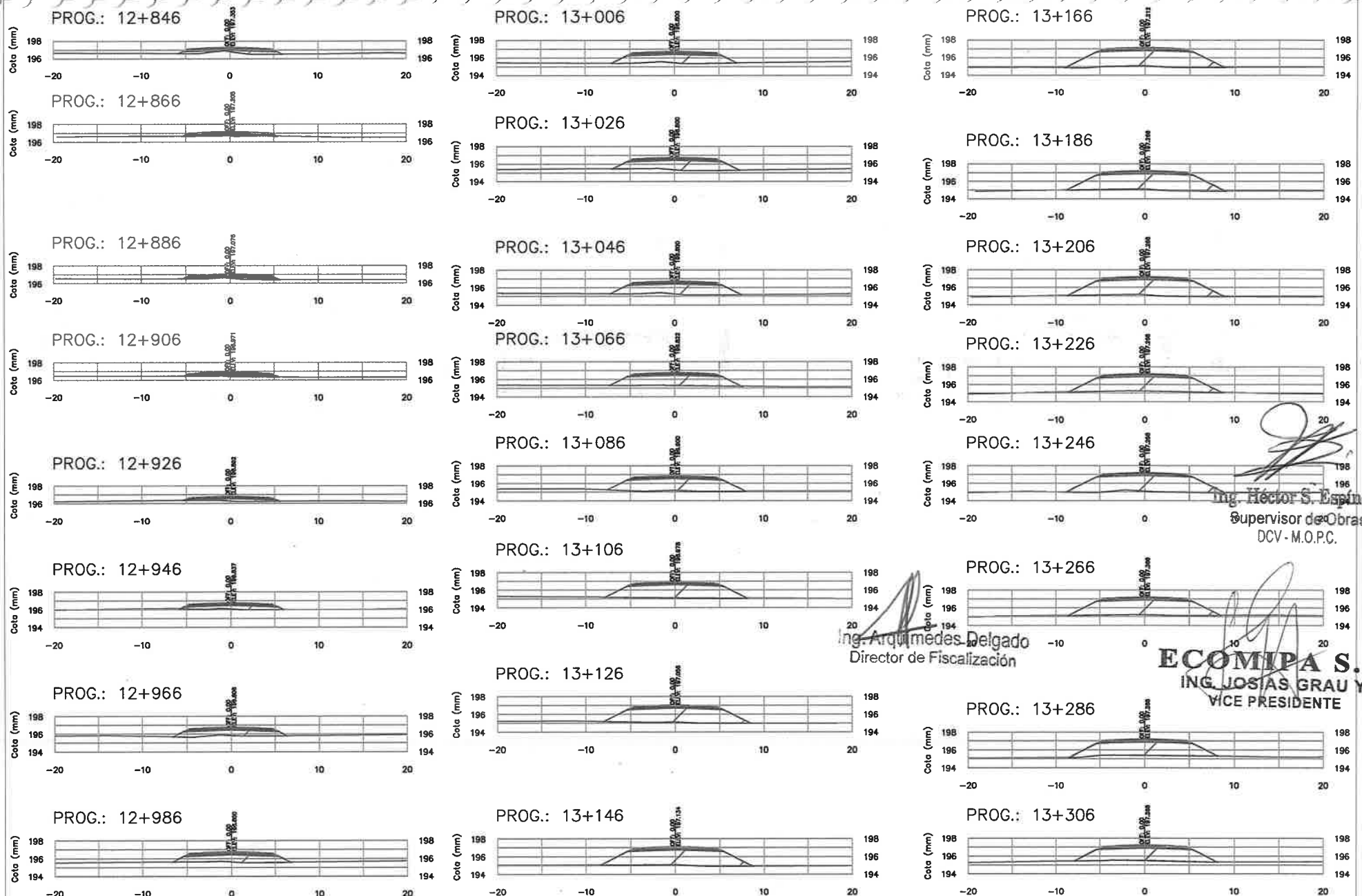
ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY AREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARA DISEÑO GEOMETRICO · ESCALA · ST-32-R1

101- Ciento uno



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Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
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VICE PRESIDENTE

Ing. Gustavo Cuevas
Coordinador del Servicio

CONSORCIO L&C

Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2
Tramo: San Vicente - Itanará

REPÚBLICA DEL PARAGUAY
MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES
DIRECCION DE CAMINOS VECINALES (DCV)

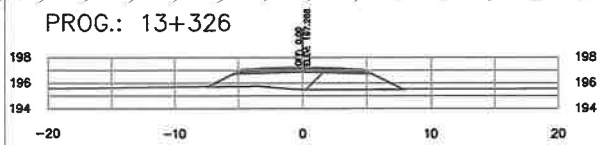
MAPA DEL PARAGUAY
AREA DEL PROYECTO

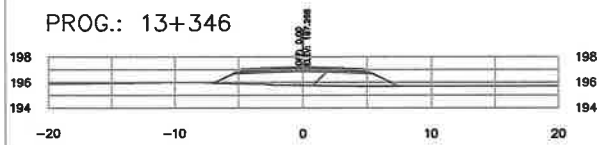
REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA
TRAMO 2: SAN VICENTE - A° ITANARÁ

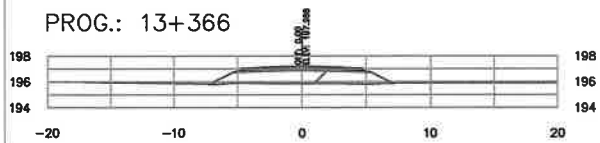
SECCIONES TRANSVERSALES
Tramo 2: SAN VICENTE - ARROYO ITANARA

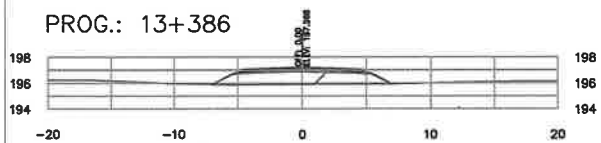
DISEÑO GEOMETRICO	ESCALA	ST-33-R1

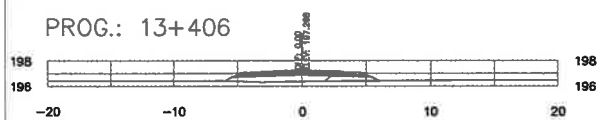
100- Ciento

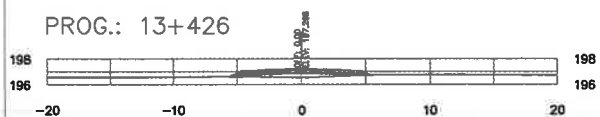


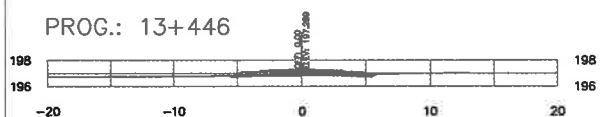


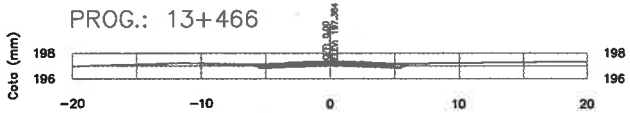


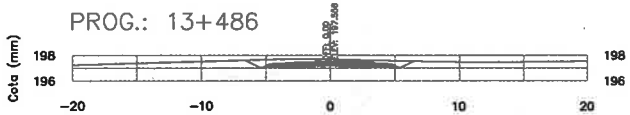


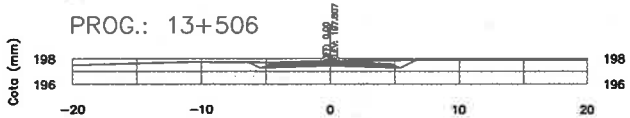


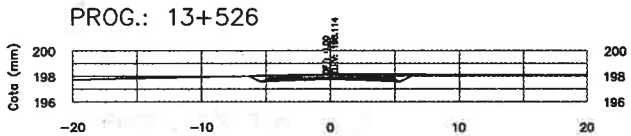


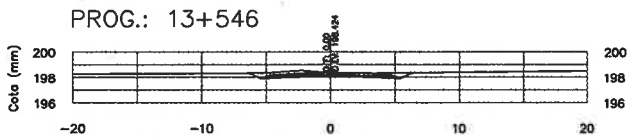


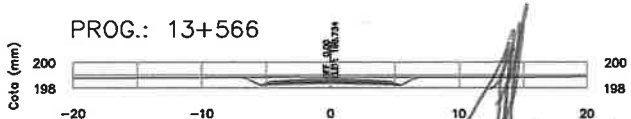


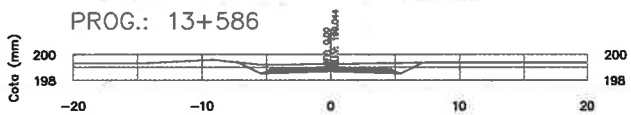


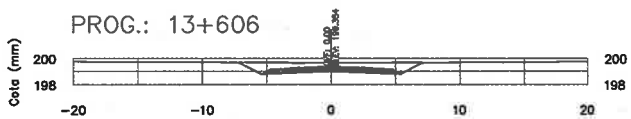


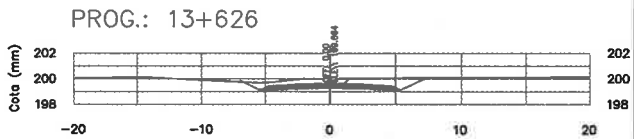


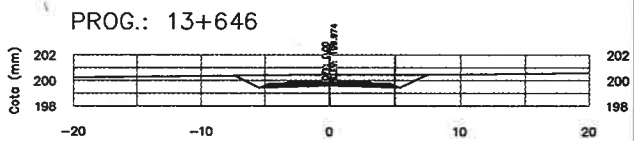


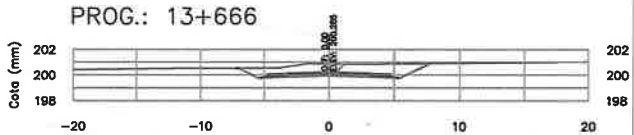


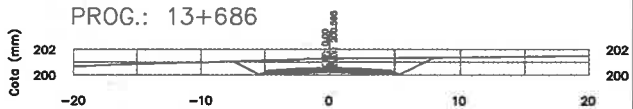


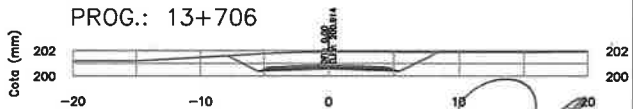


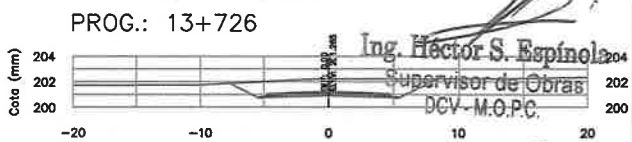


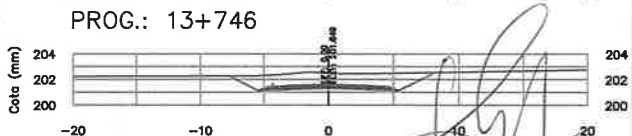


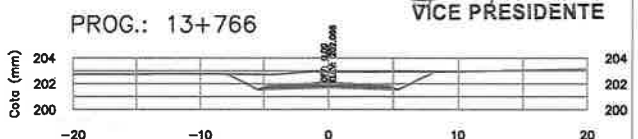










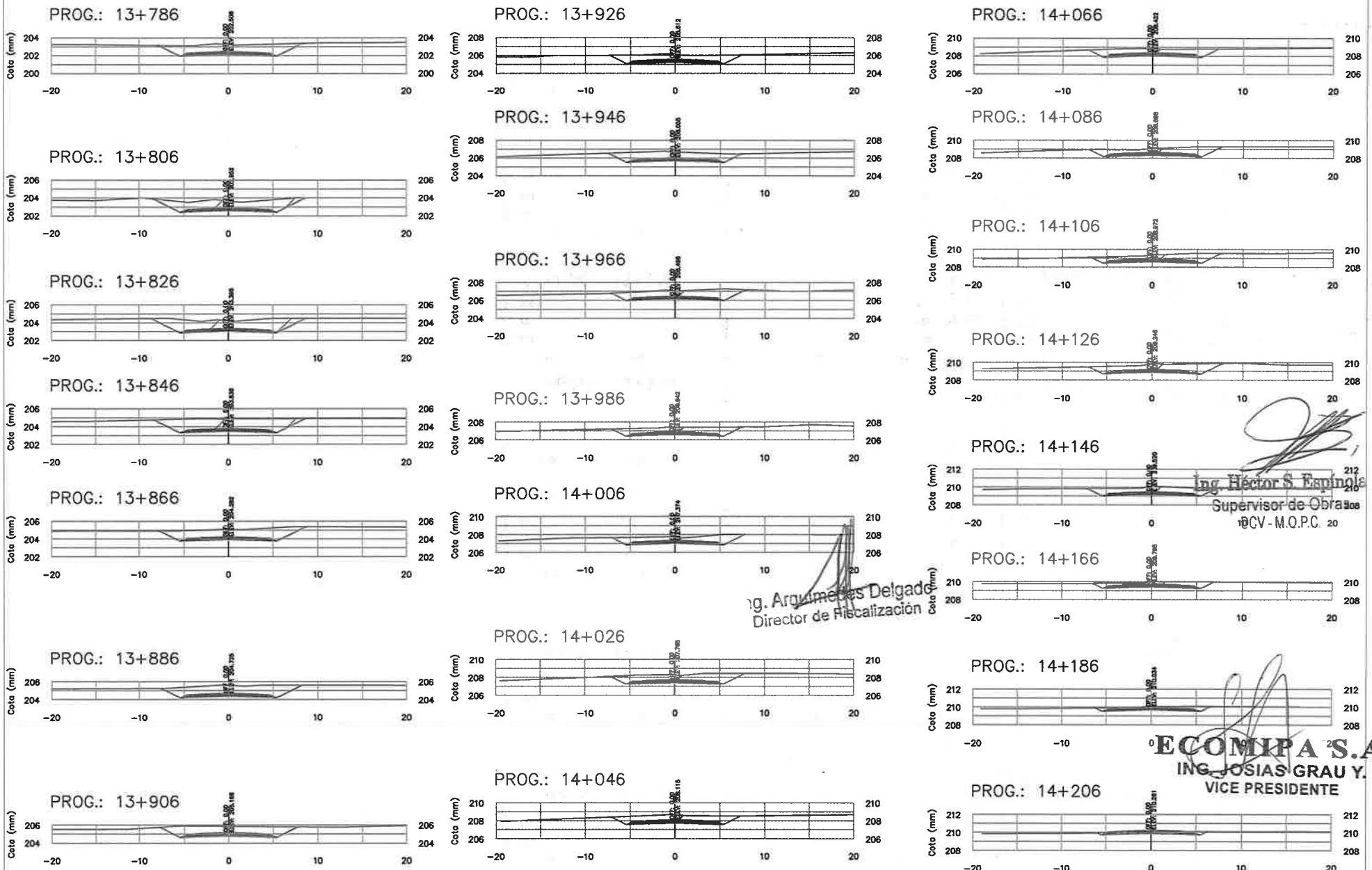


Ing. Héctor S. Espínola
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARÁ DISEÑO GEOMETRICO · ESCALA · ST-34-R1



Ing. Héctor S. Espinola
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
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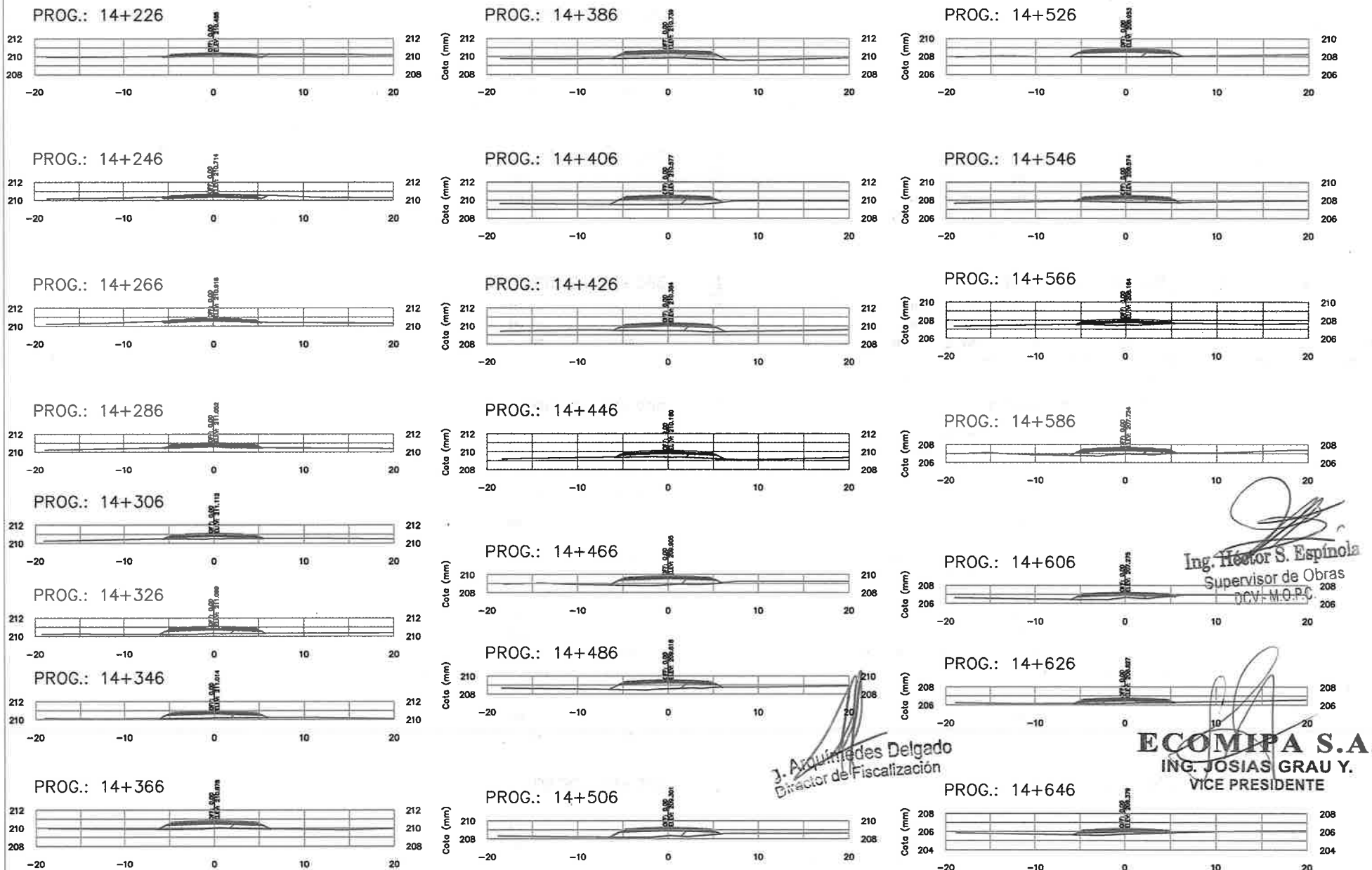
VICE PRESIDENTE

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY ÁREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARA DISEÑO GEOMETRICO · ESCALA · ST-35-R1



Ing. Héctor S. Espínola
Supervisor de Obras
DCV - M.O.P.C.

J. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
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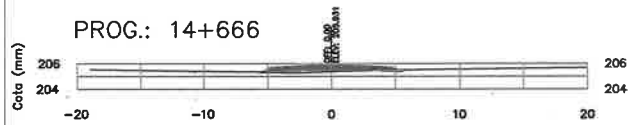

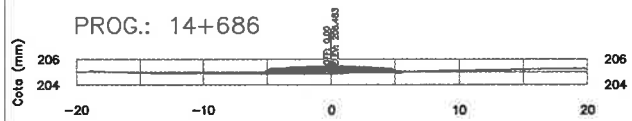

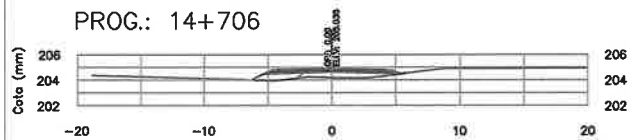

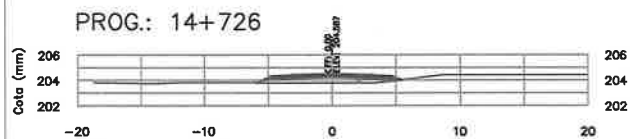

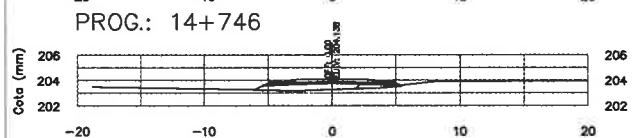

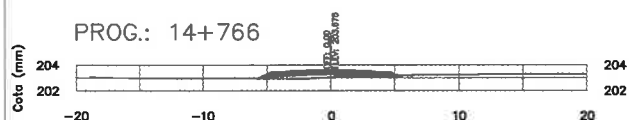

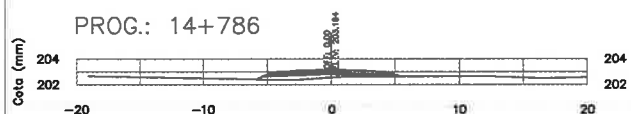

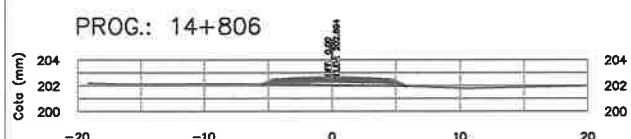

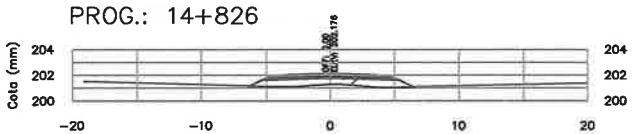

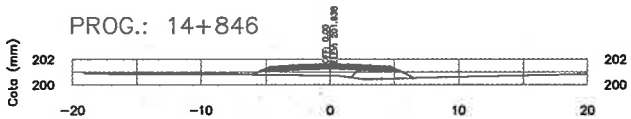

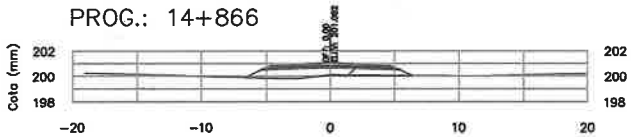

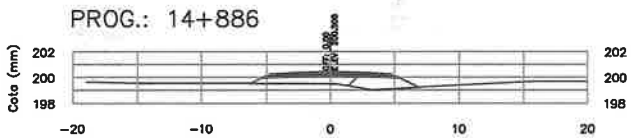

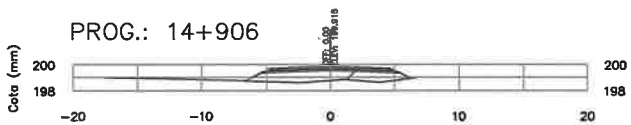

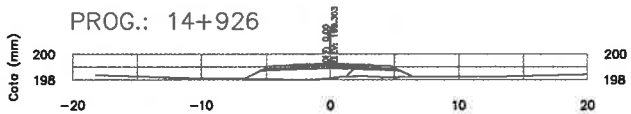

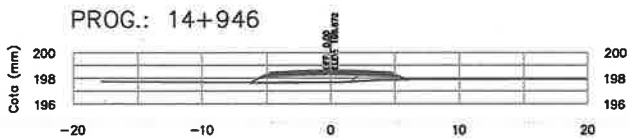

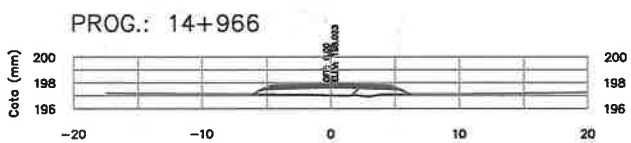

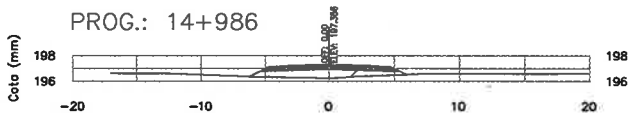

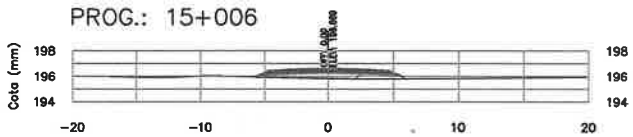

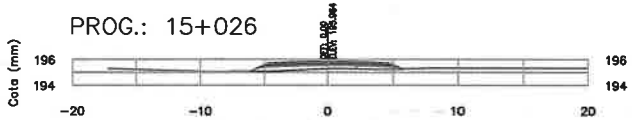

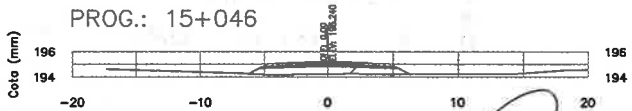

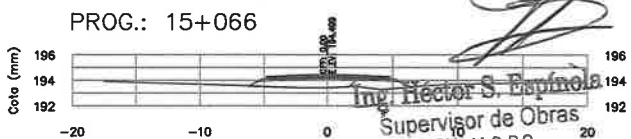

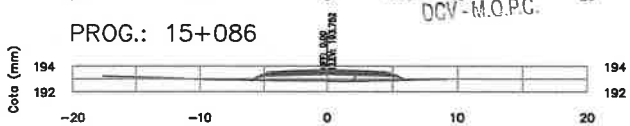

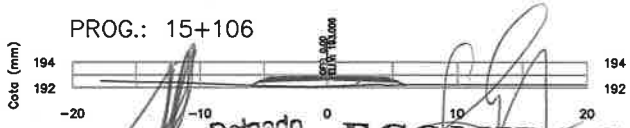

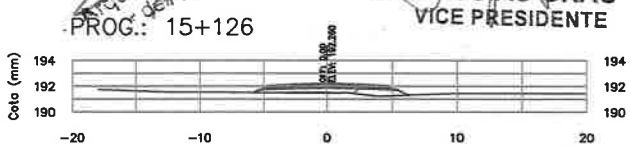

Ing. Héctor S. Espínola
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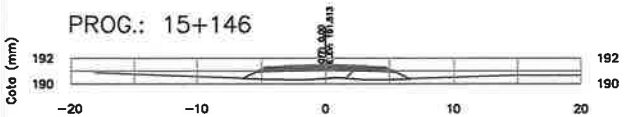
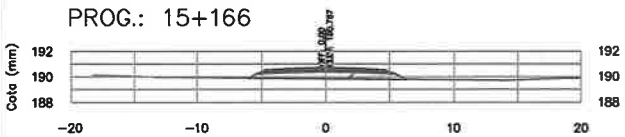
DCV - M.O.P.C.

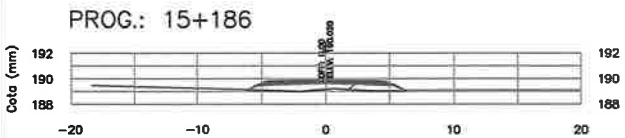
Ing. Jorge Delgado
Jefe de Fiscalización

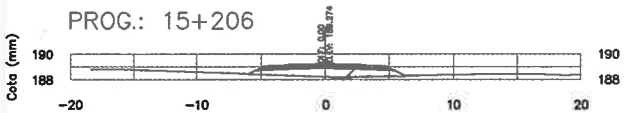
ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

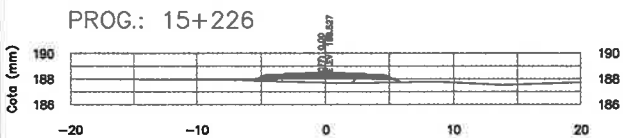
Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY ÁREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARA DISEÑO GEOMETRICO · ESCALA · ST-37-R1

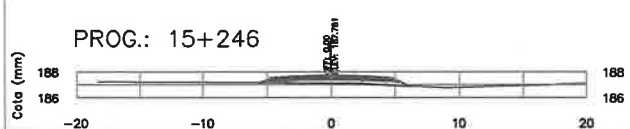


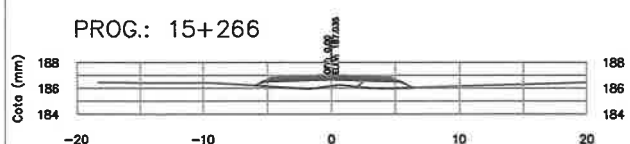


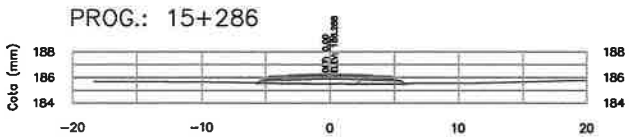


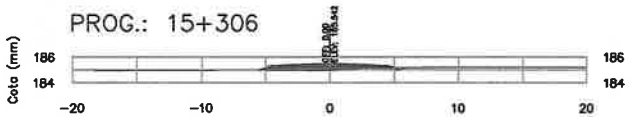


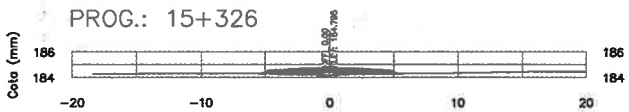


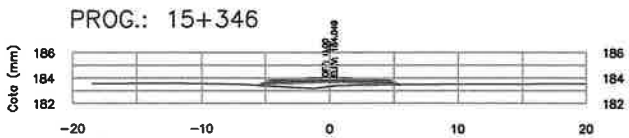


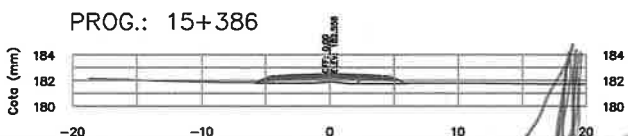


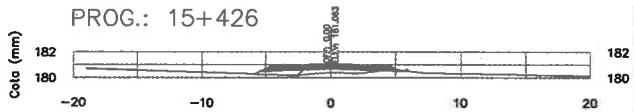


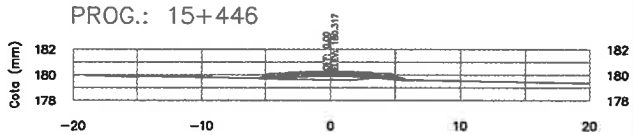


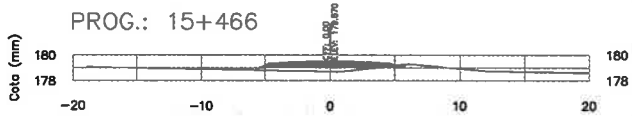


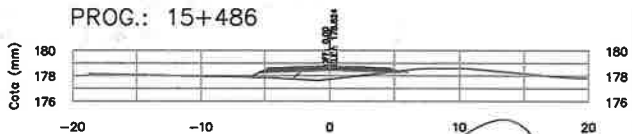


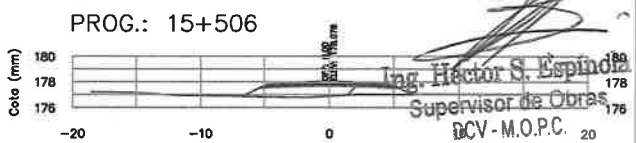


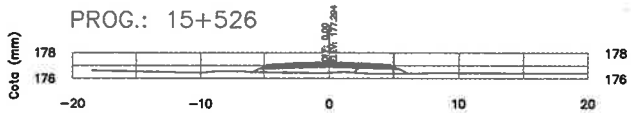


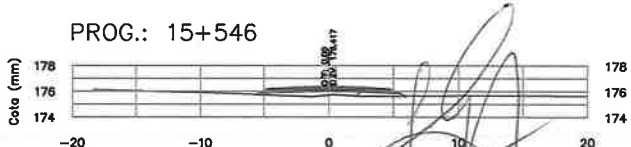


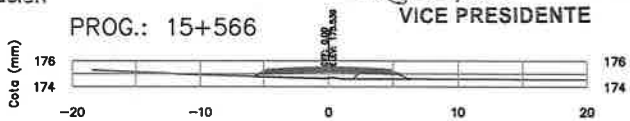










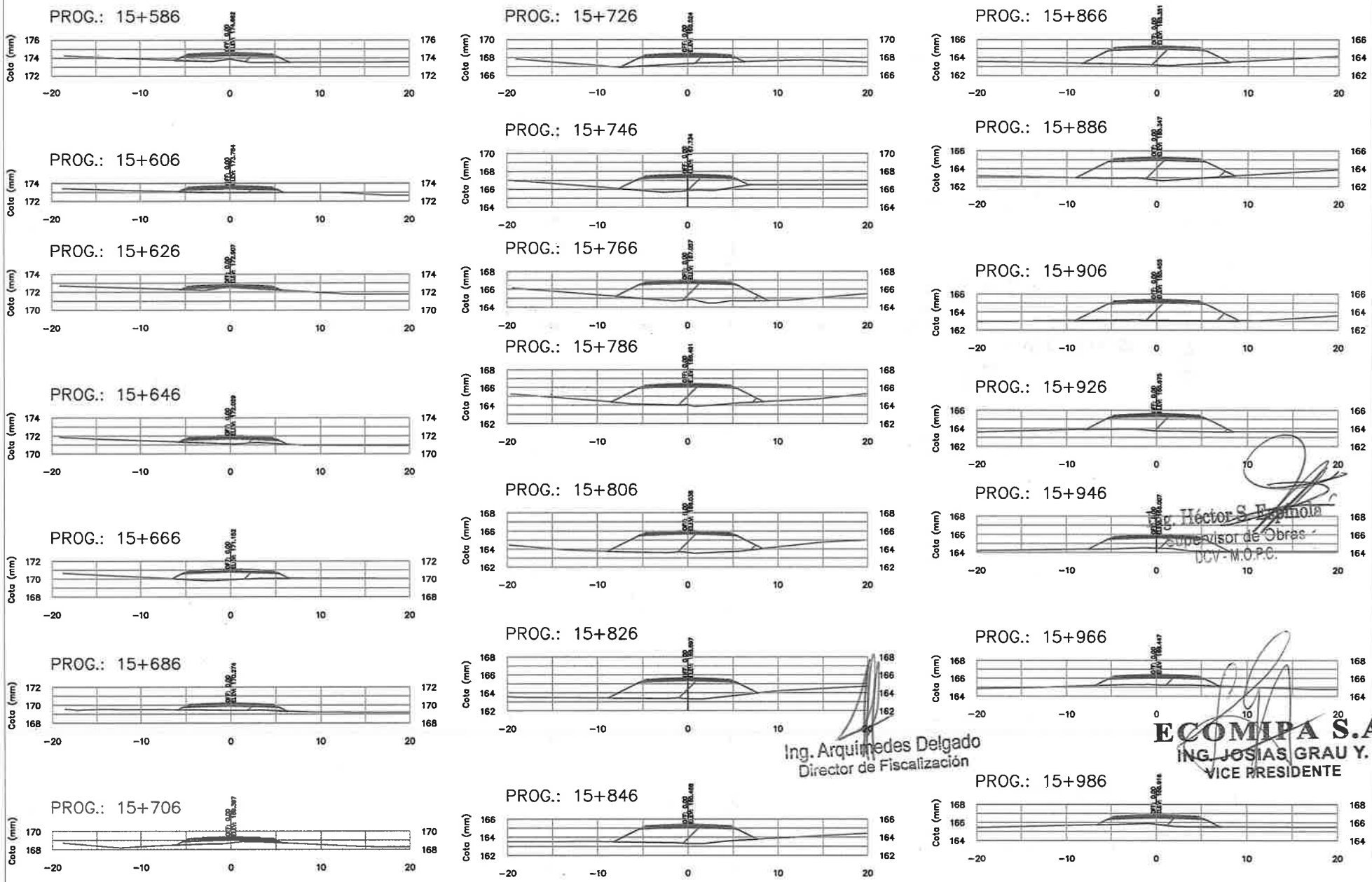


Ing. Héctor S. Espindola
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY ÁREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARA DISEÑO GEOMETRICO · ESCALA · ST-38-R1



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Ing. Arquimedes Delgado
Director de Fiscalización

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VICE PRESIDENTE

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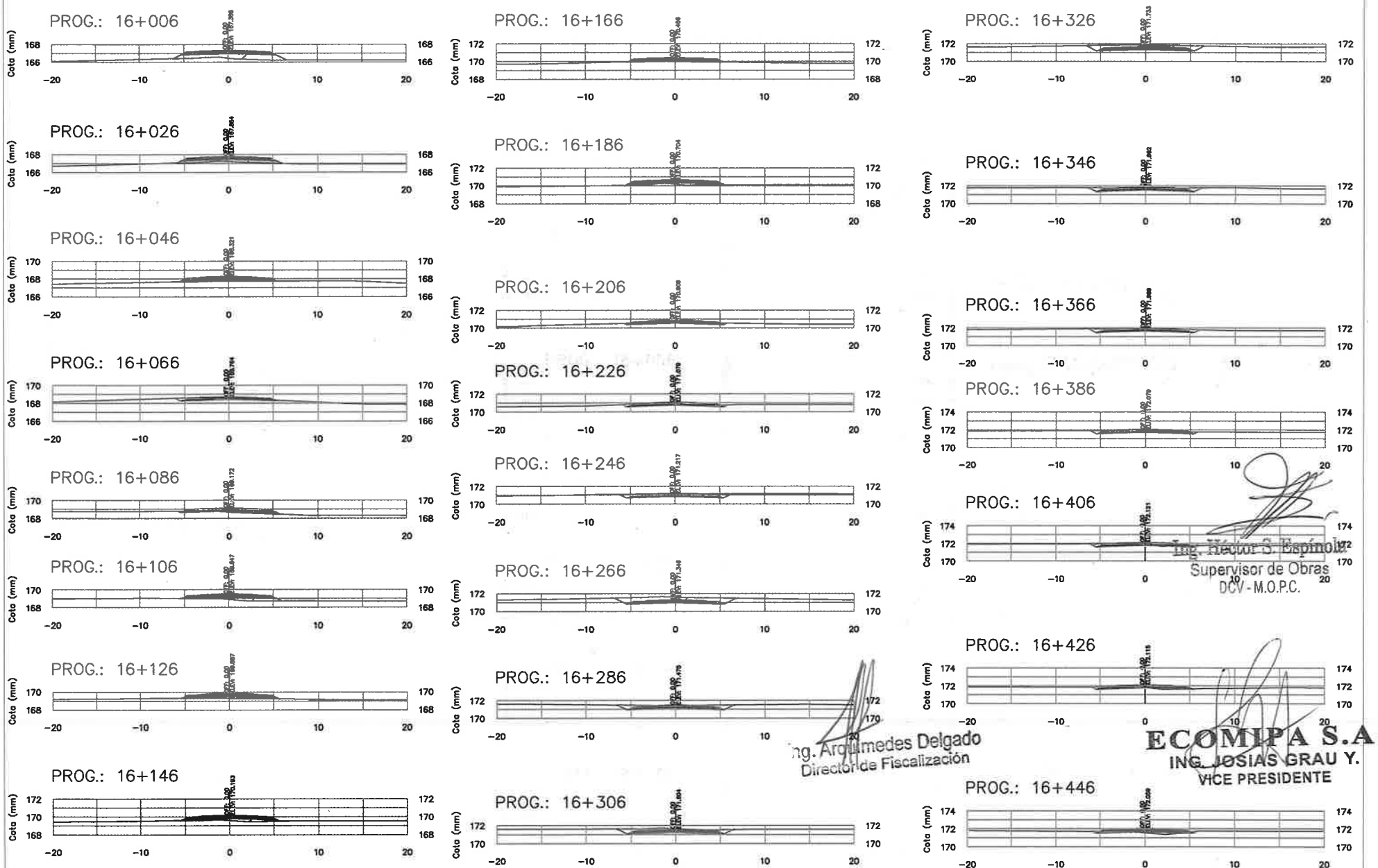

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Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

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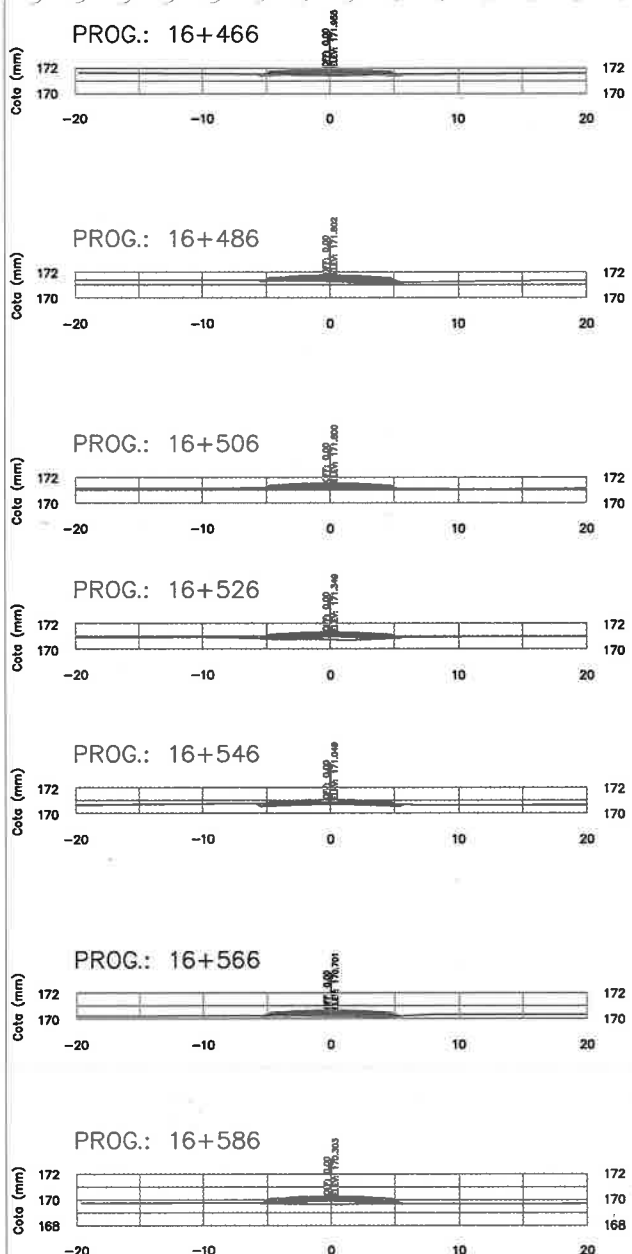
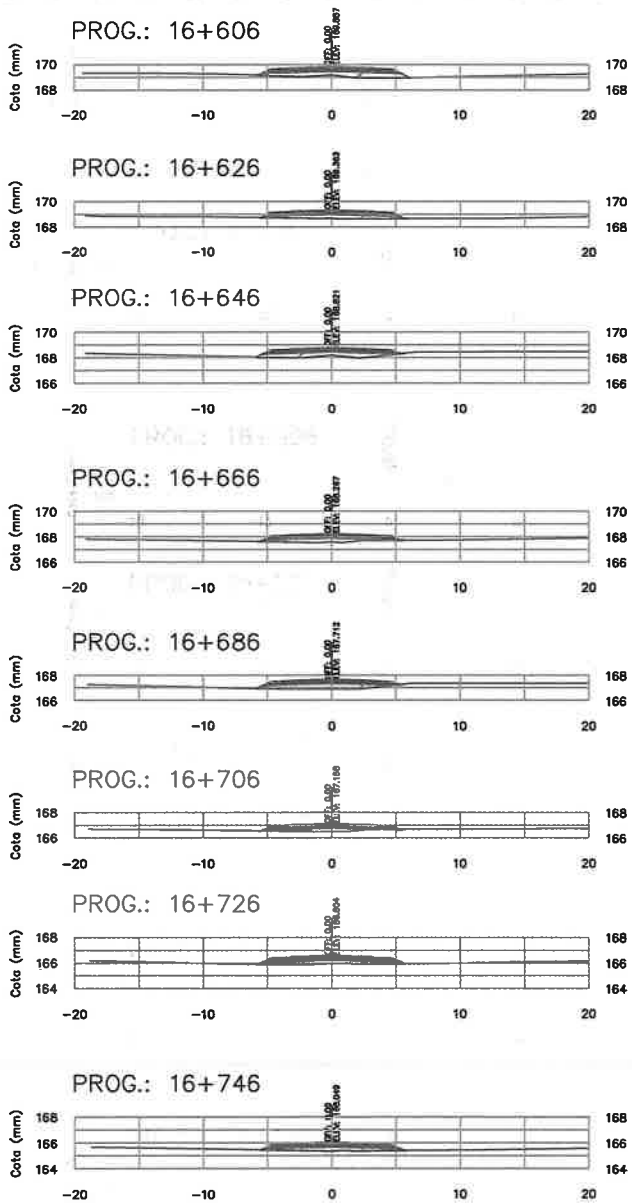
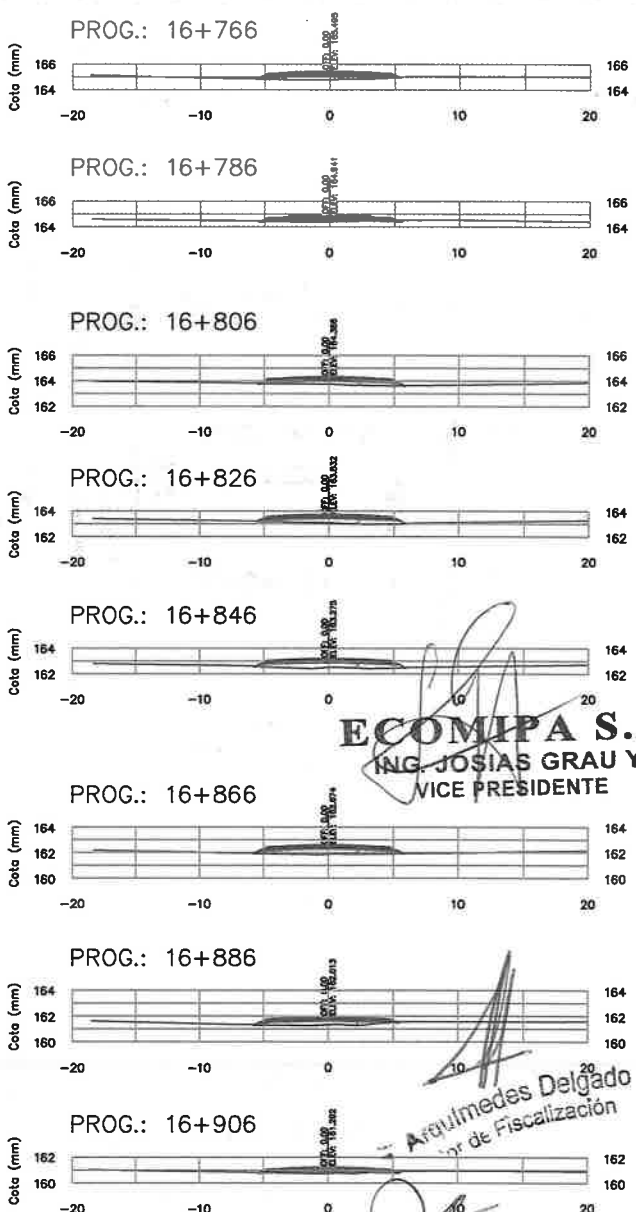




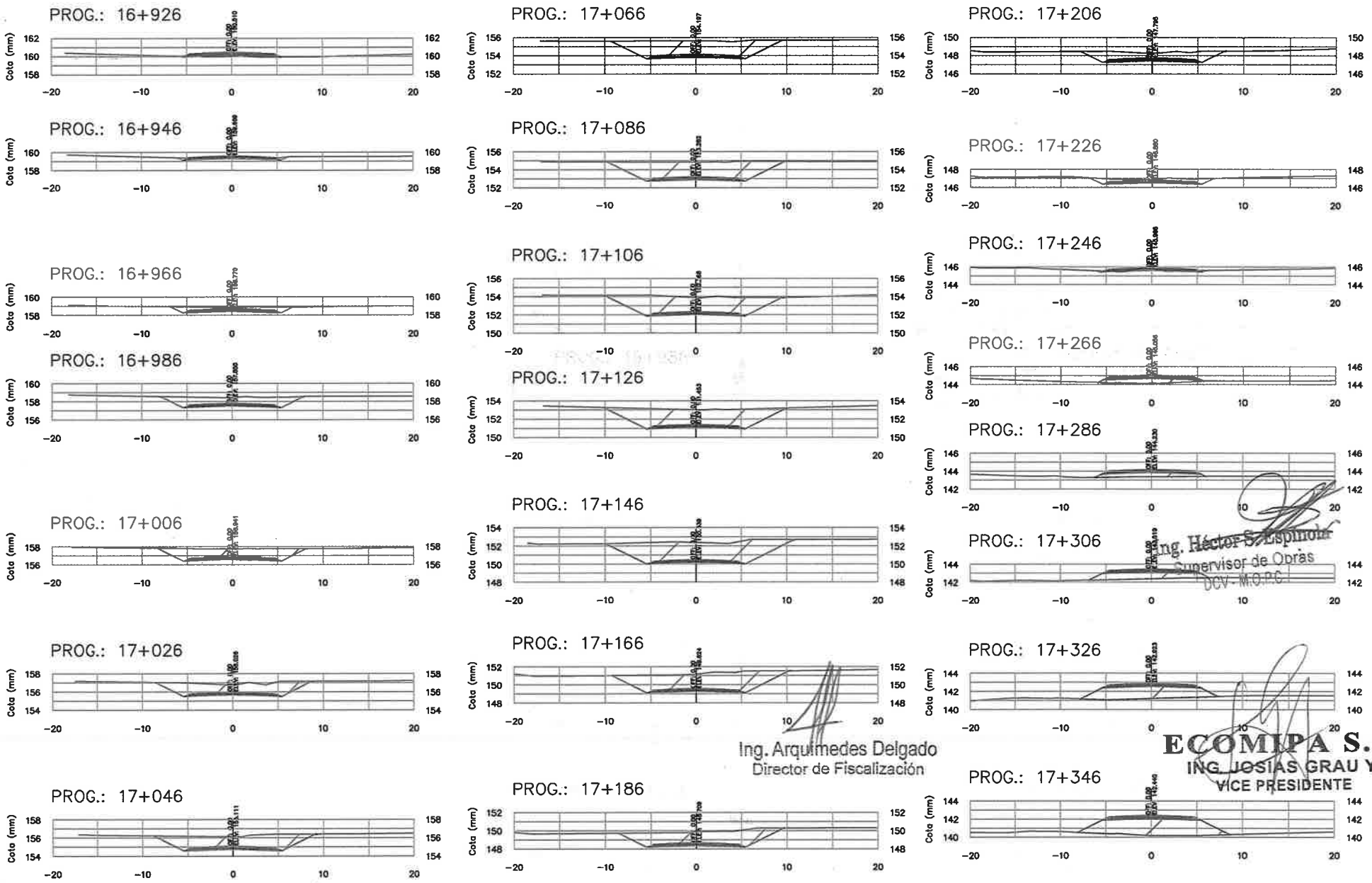


ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

Arquimedes Delgado
...or de Fiscalización

Ing. Héctor S. Espinola
Supervisor de Obras
DCV - TRANSVERSALES
Tramo 2: SAN VICENTE - ARROYO ITANARÁ

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY ÁREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	DISEÑO GEOMETRICO | ESCALA | ST-41-R1



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Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquimedes Delgado
Director de Fiscalización

ECOMIPA S.A.
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VICE PRESIDENTE

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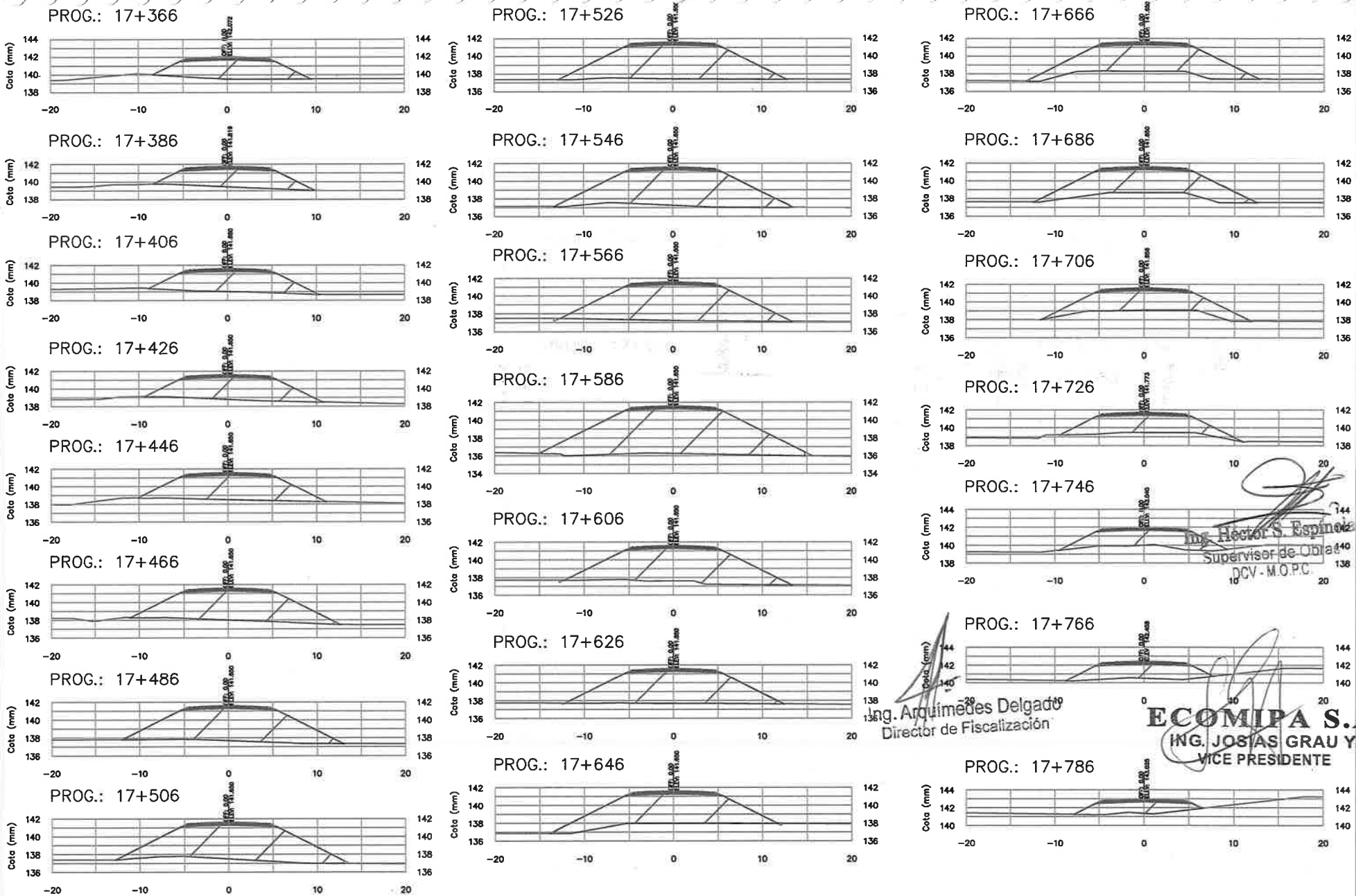

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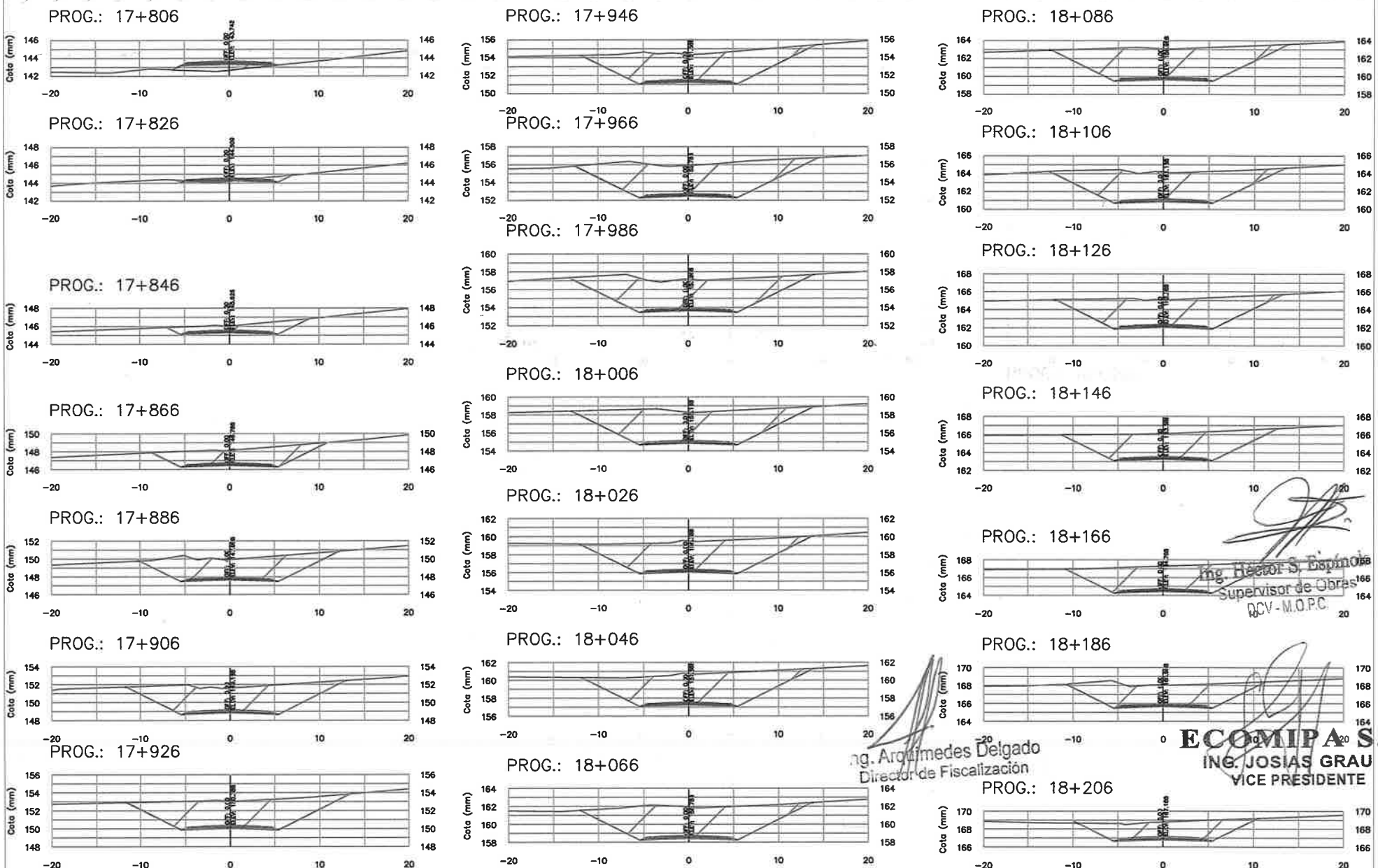
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY ÁREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARA DISEÑO GEOMETRICO · ESCALA · ST-43-R1



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DCV - M.O.P.C.

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Director de Fiscalización

ECOMIPA S.A.
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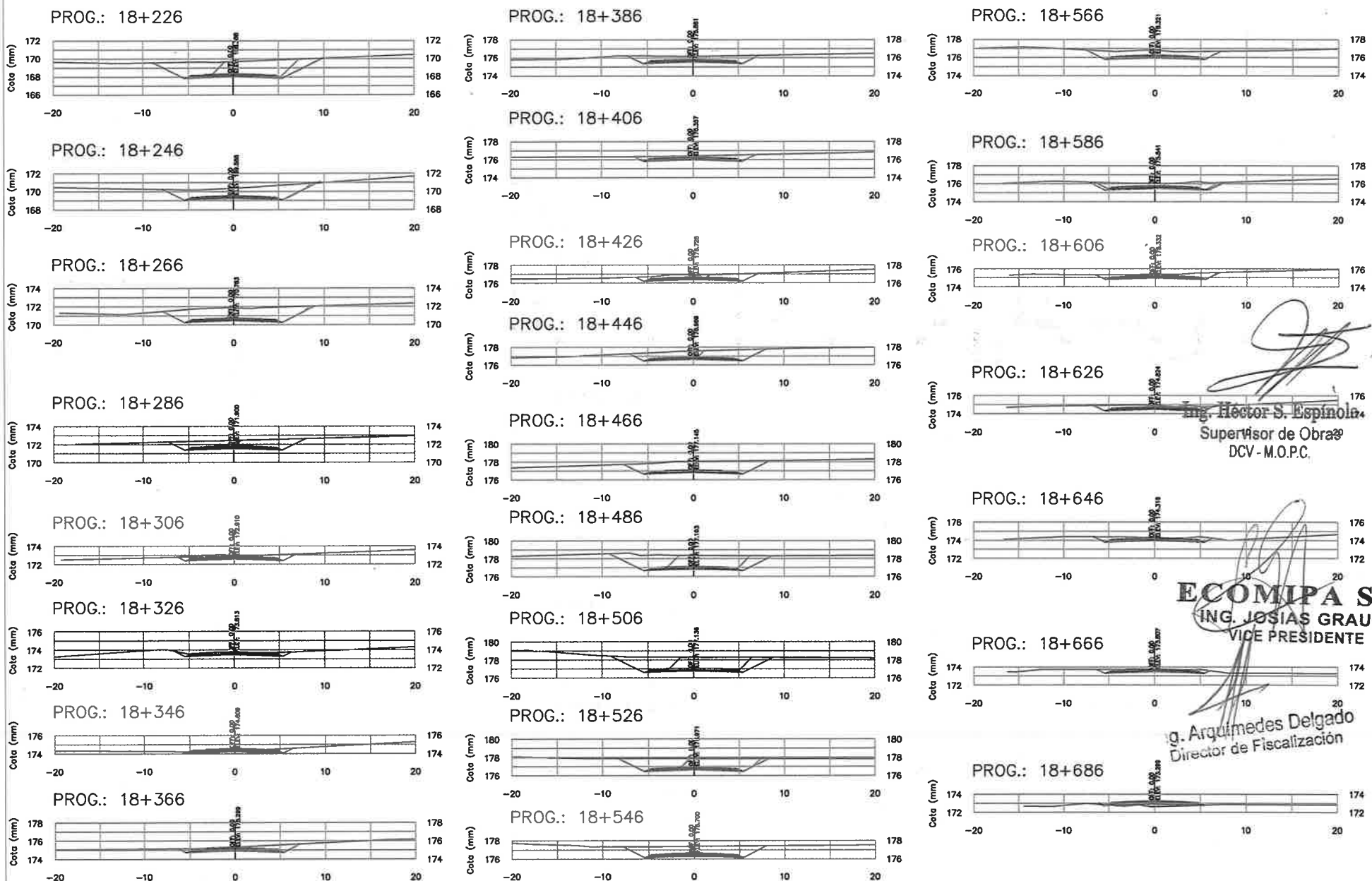
VICE PRESIDENTE

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARA DISEÑO GEOMETRICO · ESCALA · ST-44-R1



Ing. Héctor S. Espínola
Supervisor de Obras
DCV - M.O.P.C.

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

Ing. Arquímedes Delgado
Director de Fiscalización

Ing. Gustavo Cuevas Coordinador del Servicio	CONSORCIO L&C	Fiscalización de la Rehabilitación de Caminos Vecinales, en el marco del Programa PR-L 1092-Grupo N° 2 Tramo: San Vicente - Itanará	REPÚBLICA DEL PARAGUAY MINISTERIO DE OBRAS PÚBLICAS Y COMUNICACIONES DIRECCION DE CAMINOS VECINALES (DCV)	MAPA DEL PARAGUAY ÁREA DEL PROYECTO	REVISIÓN DEL DISEÑO FINAL DE INGENIERIA PARA LA PAVIMENTACIÓN ASFÁLTICA TRAMO 2: SAN VICENTE - A° ITANARÁ	SECCIONES TRANSVERSALES Tramo 2: SAN VICENTE - ARROYO ITANARÁ DISEÑO GEOMETRICO · ESCALA · ST-45-R1

88- Ochenta y ocho

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
0+000.00	0.00	3.19	0.00	0.00	0.00	0.00
0+020.00	2.24	0.00	22.43	31.89	22.43	31.89
0+040.00	5.36	0.00	76.07	0.00	98.50	31.89
0+060.00	8.93	0.00	142.93	0.00	241.42	31.89
0+080.00	16.14	0.00	250.69	0.00	492.11	31.89
0+100.00	23.04	0.00	391.81	0.00	883.92	31.89
0+120.00	27.12	0.00	501.57	0.00	1385.49	31.89
0+140.00	30.00	0.00	571.17	0.00	1956.66	31.89
0+160.00	32.26	0.00	622.58	0.00	2579.24	31.89
0+180.00	36.90	0.00	691.57	0.00	3270.81	31.89
0+200.00	36.87	0.00	737.74	0.00	4008.55	31.89
0+220.00	36.40	0.00	732.70	0.00	4741.25	31.89
0+240.00	29.20	0.00	656.64	0.00	5397.89	31.89
0+260.00	34.27	0.00	635.51	0.00	6033.40	31.89
0+280.00	24.46	0.00	586.73	0.00	6620.13	31.89
0+300.00	34.51	0.00	589.67	0.00	7209.80	31.89
0+320.00	30.88	0.00	654.70	0.00	7864.50	31.89
0+340.00	35.85	0.00	667.79	0.00	8532.30	31.89
0+360.00	35.70	0.00	715.84	0.00	9248.14	31.89
0+380.00	34.06	0.00	697.81	0.00	9945.94	31.89
0+400.00	29.57	0.00	636.27	0.00	10582.21	31.89
0+420.00	26.91	0.00	564.85	0.00	11147.06	31.89
0+440.00	25.29	0.00	522.08	0.00	11669.14	31.89
0+460.00	22.18	0.00	474.74	0.00	12143.89	31.89
0+480.00	19.97	0.00	421.54	0.00	12565.43	31.89
0+500.00	16.52	0.00	364.94	0.00	12930.38	31.89
0+520.00	14.70	0.00	312.18	0.00	13242.55	31.89
0+540.00	12.04	0.00	267.36	0.00	13509.91	31.89
0+560.00	9.95	0.00	219.87	0.00	13729.78	31.89
0+580.00	7.84	0.00	177.84	0.00	13907.61	31.89
0+600.00	6.19	0.00	140.28	0.00	14047.89	31.89
0+620.00	3.93	0.00	101.20	0.00	14149.09	31.89
0+640.00	2.99	0.00	69.14	0.00	14218.23	31.89
0+660.00	2.67	0.02	56.57	0.16	14274.80	32.05
0+680.00	2.26	0.00	49.27	0.16	14324.07	32.20
0+700.00	2.23	0.00	44.91	0.00	14368.98	32.20
0+720.00	1.77	0.03	40.01	0.25	14408.99	32.46
0+740.00	1.26	0.18	30.22	2.01	14439.20	34.47
0+760.00	0.66	0.34	19.14	5.13	14458.34	39.60
0+780.00	1.27	0.11	19.30	4.47	14477.65	44.07
0+800.00	2.75	0.00	40.23	1.09	14517.88	45.16
0+820.00	4.11	0.00	68.65	0.00	14586.53	45.16

Ing. Héctor S. Espinola
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquimedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
0+840.00	5.26	0.00	93.71	0.00	14680.24	45.16
0+860.00	6.14	0.00	113.95	0.00	14794.20	45.16
0+880.00	7.34	0.00	134.77	0.00	14928.97	45.16
0+900.00	9.03	0.00	163.69	0.00	15092.66	45.16
0+920.00	9.99	0.00	190.19	0.00	15282.86	45.16
0+940.00	11.52	0.00	215.11	0.00	15497.97	45.16
0+960.00	12.33	0.00	238.55	0.00	15736.52	45.16
0+980.00	13.90	0.00	262.32	0.00	15998.84	45.16
1+000.00	14.29	0.00	281.90	0.00	16280.74	45.16
1+020.00	15.38	0.00	296.75	0.00	16577.48	45.16
1+040.00	15.89	0.00	312.72	0.00	16890.20	45.16
1+060.00	16.69	0.00	325.72	0.00	17215.92	45.16
1+080.00	15.57	0.00	322.38	0.00	17538.30	45.16
1+100.00	15.34	0.00	309.04	0.00	17847.34	45.16
1+120.00	16.73	0.00	320.68	0.00	18168.02	45.16
1+140.00	16.70	0.00	334.31	0.00	18502.33	45.16
1+160.00	14.38	0.00	310.79	0.00	18813.12	45.16
1+180.00	13.69	0.00	280.71	0.00	19093.83	45.16
1+200.00	13.70	0.00	274.05	0.00	19367.88	45.16
1+220.00	12.26	0.00	259.59	0.00	19627.47	45.16
1+240.00	10.75	0.00	230.03	0.00	19857.50	45.16
1+260.00	10.19	0.00	209.34	0.00	20066.84	45.16
1+280.00	9.93	0.00	201.22	0.00	20268.05	45.16
1+300.00	8.26	0.00	181.92	0.00	20449.97	45.16
1+320.00	6.88	0.00	151.34	0.00	20601.31	45.16
1+340.00	5.56	0.00	124.36	0.00	20725.67	45.16
1+360.00	4.09	0.00	96.52	0.00	20822.19	45.16
1+380.00	2.51	0.00	66.01	0.00	20888.20	45.16
1+400.00	0.72	0.30	32.25	2.96	20920.45	48.13
1+420.00	0.07	0.91	7.83	12.02	20928.28	60.15
1+440.00	0.00	2.46	0.67	33.64	20928.95	93.79
1+460.00	0.00	4.77	0.00	72.30	20928.95	166.09
1+480.00	0.00	6.57	0.00	113.39	20928.95	279.48
1+500.00	0.00	6.97	0.00	135.35	20928.95	414.83
1+520.00	0.00	7.43	0.00	144.03	20928.95	558.86
1+540.00	0.00	7.59	0.00	150.26	20928.95	709.12
1+560.00	0.00	5.48	0.00	130.75	20928.95	859.87
1+580.00	0.00	5.67	0.00	111.48	20928.95	951.35
1+600.00	0.00	9.98	0.00	156.45	20928.95	1107.80
1+620.00	0.00	8.24	0.00	182.16	20928.95	1289.96
1+640.00	0.00	6.88	0.00	151.19	20928.95	1441.14
1+660.00	0.00	8.04	0.00	149.20	20928.95	1590.35

Ing. Arquímedes Delgado
Director de Fiscalización

Ing. Héctor G. Espinola
Supervisor de Obras
DCV - M.O.P.C.

EXCOMIPA S.A.
NICOLÁS GRAU Y
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
1+680.00	0.00	10.79	0.00	188.24	20928.95	1778.59
1+700.00	0.00	9.58	0.00	203.68	20928.95	1982.27
1+720.00	0.00	7.81	0.00	173.89	20928.95	2156.16
1+740.00	0.00	7.17	0.00	149.74	20928.95	2305.90
1+760.00	0.00	5.79	0.00	129.54	20928.95	2435.44
1+780.00	0.00	6.53	0.00	123.13	20928.95	2558.57
1+800.00	0.00	4.05	0.02	105.74	20928.97	2664.31
1+820.00	0.00	2.08	0.02	61.33	20928.99	2725.64
1+840.00	0.00	2.78	0.00	48.60	20928.99	2774.24
1+860.00	0.00	2.61	0.00	53.89	20928.99	2828.14
1+880.00	0.00	1.96	0.00	45.78	20928.99	2873.91
1+900.00	0.06	0.99	0.60	29.53	20929.58	2903.44
1+920.00	0.62	0.35	6.80	13.39	20936.38	2916.83
1+940.00	0.79	0.23	14.07	5.79	20950.45	2922.61
1+960.00	1.63	0.02	24.13	2.45	20974.58	2925.06
1+980.00	2.36	0.00	39.91	0.17	21014.48	2925.23
2+000.00	3.21	0.00	55.73	0.00	21070.21	2925.23
2+020.00	5.00	0.00	82.11	0.00	21152.32	2925.23
2+040.00	6.07	0.00	110.71	0.00	21263.04	2925.23
2+060.00	6.16	0.00	122.32	0.00	21385.35	2925.23
2+080.00	5.73	0.00	118.97	0.00	21504.32	2925.23
2+100.00	3.48	0.02	92.16	0.23	21596.48	2925.46
2+120.00	2.55	0.00	60.33	0.28	21656.81	2925.73
2+140.00	2.03	0.00	45.83	0.04	21702.64	2925.78
2+160.00	0.96	0.00	29.90	0.00	21732.54	2925.78
2+180.00	0.64	0.01	15.96	0.06	21748.50	2925.84
2+200.00	0.90	0.00	15.36	0.06	21763.87	2925.90
2+220.00	1.49	0.00	23.90	0.00	21787.77	2925.90
2+240.00	2.24	0.00	37.37	0.00	21825.14	2925.90
2+260.00	1.49	0.00	37.37	0.00	21862.51	2925.90
2+280.00	2.01	0.00	35.00	0.00	21897.52	2925.90
2+300.00	2.78	0.00	47.89	0.00	21945.40	2925.90
2+320.00	3.84	0.02	66.22	0.24	22011.63	2926.14
2+340.00	5.31	0.00	91.55	0.24	22103.18	2926.39
2+360.00	6.62	0.00	119.36	0.00	22222.54	2926.39
2+380.00	6.94	0.00	135.57	0.00	22358.12	2926.39
2+400.00	8.11	0.00	150.45	0.00	22508.57	2926.39
2+420.00	9.95	0.00	180.64	0.00	22689.20	2926.39
2+440.00	10.79	0.00	207.47	0.00	22896.67	2926.39
2+460.00	11.10	0.00	218.98	0.00	23115.65	2926.39
2+480.00	11.02	0.00	221.26	0.00	23336.91	2926.39
2+500.00	11.31	0.00	223.33	0.00	23560.24	2926.39

Ing. Héctor S. Espínola
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU V.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
2+520.00	13.55	0.00	248.63	0.00	23808.86	2926.39
2+540.00	13.15	0.00	267.05	0.00	24075.92	2926.39
2+560.00	10.81	0.00	239.69	0.00	24315.60	2926.39
2+580.00	10.11	0.00	209.25	0.00	24524.85	2926.39
2+600.00	11.34	0.00	214.50	0.00	24739.36	2926.39
2+620.00	10.30	0.00	216.35	0.00	24955.71	2926.39
2+640.00	10.24	0.00	205.31	0.00	25161.02	2926.39
2+660.00	10.60	0.00	208.36	0.00	25369.37	2926.39
2+680.00	10.86	0.00	214.62	0.00	25584.00	2926.39
2+700.00	10.43	0.00	212.94	0.00	25796.93	2926.39
2+720.00	11.32	0.00	217.54	0.00	26014.47	2926.39
2+740.00	12.50	0.00	238.18	0.00	26252.65	2926.39
2+760.00	12.43	0.00	249.26	0.00	26501.92	2926.39
2+780.00	12.69	0.00	251.22	0.00	26753.14	2926.39
2+800.00	12.91	0.00	256.05	0.00	27009.19	2926.39
2+820.00	10.60	0.00	235.11	0.00	27244.30	2926.39
2+840.00	10.04	0.00	206.38	0.00	27450.69	2926.39
2+860.00	7.69	0.00	177.29	0.00	27627.97	2926.39
2+880.00	7.60	0.00	152.91	0.00	27780.88	2926.39
2+900.00	6.43	0.00	140.27	0.00	27921.15	2926.39
2+920.00	8.84	0.00	152.61	0.00	28073.76	2926.39
2+940.00	10.80	0.00	196.40	0.00	28270.16	2926.39
2+960.00	10.99	0.00	217.91	0.00	28488.07	2926.39
2+980.00	11.64	0.00	226.28	0.00	28714.35	2926.39
3+000.00	11.20	0.00	228.35	0.00	28942.70	2926.39
3+020.00	9.98	0.00	211.71	0.00	29154.41	2926.39
3+040.00	9.22	0.00	191.94	0.00	29346.35	2926.39
3+060.00	7.90	0.00	171.21	0.00	29517.56	2926.39
3+080.00	4.41	0.00	123.10	0.00	29640.66	2926.39
3+100.00	2.08	0.04	64.83	0.37	29705.48	2926.76
3+120.00	0.29	0.35	23.61	3.90	29729.10	2930.66
3+140.00	0.00	3.37	2.85	37.20	29731.95	2967.86
3+160.00	0.00	3.20	0.00	65.65	29731.95	3033.52
3+180.00	0.00	3.28	0.00	64.80	29731.95	3098.32
3+200.00	0.00	4.10	0.00	73.85	29731.95	3172.17
3+220.00	0.00	2.99	0.00	70.97	29731.95	3243.14
3+240.00	0.00	2.45	0.00	54.48	29731.95	3297.63
3+260.00	0.00	1.22	0.00	36.76	29731.95	3334.38
3+280.00	0.42	0.43	4.18	16.48	29736.13	3350.86
3+300.00	0.65	0.26	10.72	6.80	29746.85	3357.65
3+320.00	1.14	0.00	17.96	2.56	29764.81	3360.22
3+340.00	1.93	0.00	30.77	0.00	29795.58	3360.22

Ing. Héctor S. Espinola
Supervisor de Obras
DCV - M.O.P.C.

Ing. Arquímedes Delgado
Director de Fiscalización

ECOMIPA S.A.
ING. JOSIAS GRAU V.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
3+360.00	4.71	0.00	66.38	0.00	29861.96	3360.22
3+380.00	8.08	0.00	127.87	0.00	29989.82	3360.22
3+400.00	7.86	0.00	159.36	0.00	30149.18	3360.22
3+420.00	7.34	0.00	151.95	0.00	30301.13	3360.22
3+440.00	9.41	0.00	167.48	0.00	30468.61	3360.22
3+460.00	7.34	0.00	167.66	0.00	30636.28	3360.22
3+480.00	9.32	0.00	167.32	0.00	30803.59	3360.22
3+500.00	10.59	0.00	200.45	0.00	31004.04	3360.22
3+520.00	11.71	0.00	224.20	0.00	31228.25	3360.22
3+540.00	11.66	0.00	233.61	0.00	31461.86	3360.22
3+560.00	11.05	0.00	227.02	0.00	31688.88	3360.22
3+580.00	8.82	0.00	198.66	0.00	31887.54	3360.22
3+600.00	5.98	0.00	147.96	0.00	32035.50	3360.22
3+620.00	0.45	1.32	64.29	13.18	32099.78	3373.39
3+640.00	0.00	3.01	4.53	43.27	32104.31	3416.67
3+660.00	0.00	5.94	0.00	89.48	32104.31	3506.15
3+680.00	0.00	9.41	0.00	153.48	32104.31	3659.64
3+700.00	0.00	15.31	0.00	247.17	32104.31	3906.81
3+720.00	0.00	14.70	0.00	300.10	32104.31	4206.90
3+740.00	0.00	17.36	0.00	320.62	32104.31	4527.52
3+760.00	0.00	21.52	0.00	388.77	32104.31	4916.29
3+780.00	0.00	26.13	0.00	476.48	32104.31	5392.78
3+800.00	0.00	27.19	0.00	533.23	32104.31	5926.01
3+820.00	0.00	23.19	0.00	503.80	32104.31	6429.81
3+840.00	0.00	25.28	0.00	484.71	32104.31	6914.53
3+860.00	0.00	15.83	0.00	411.08	32104.31	7325.61
3+880.00	0.00	9.48	0.00	253.06	32104.31	7578.67
3+900.00	0.00	6.05	0.00	155.31	32104.31	7733.98
3+920.00	0.00	2.53	0.00	85.81	32104.31	7819.78
3+940.00	3.67	0.00	36.70	25.31	32141.01	7845.09
3+960.00	11.75	0.00	154.23	0.00	32295.24	7845.09
3+980.00	16.76	0.00	285.13	0.00	32580.36	7845.09
4+000.00	16.88	0.00	336.42	0.00	32916.78	7845.09
4+020.00	13.81	0.00	306.97	0.00	33223.75	7845.09
4+040.00	15.84	0.00	296.54	0.00	33520.29	7845.09
4+060.00	16.55	0.00	323.87	0.00	33844.16	7845.09
4+080.00	16.42	0.00	329.64	0.00	34173.80	7845.09
4+100.00	16.78	0.00	331.99	0.00	34505.79	7845.09
4+120.00	19.13	0.00	359.09	0.00	34864.88	7845.09
4+140.00	15.52	0.00	346.45	0.00	35211.33	7845.09
4+160.00	16.56	0.00	320.37	0.00	35532.70	7845.09
4+180.00	21.71	0.00	383.11	0.00	35915.81	7845.09

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ECOMIPA S.A.
ING. JAIME GRAU Y.
VICE PRESIDENTE

Ing. Héctor S. Espinola
Supervisor de Obras
DCV - M.O.P.C.

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
4+200.00	22.54	0.00	441.15	0.00	36356.96	7845.09
4+220.00	22.85	0.00	451.82	0.00	36808.78	7845.09
4+240.00	19.91	0.00	425.84	0.00	37234.62	7845.09
4+260.00	20.43	0.00	397.88	0.00	37632.50	7845.09
4+280.00	14.85	0.00	352.14	0.00	37984.64	7845.09
4+300.00	8.46	0.00	233.03	0.00	38217.68	7845.09
4+320.00	1.09	0.62	95.46	6.19	38313.13	7851.28
4+340.00	0.00	8.93	10.90	95.45	38324.03	7946.73
4+360.00	0.00	17.22	0.00	261.49	38324.03	8208.22
4+380.00	0.00	16.50	0.00	337.21	38324.03	8545.42
4+400.00	0.00	17.79	0.00	342.88	38324.03	8888.30
4+420.00	0.00	25.62	0.00	434.12	38324.03	9322.43
4+440.00	0.00	20.06	0.00	456.81	38324.03	9779.23
4+460.00	0.00	14.33	0.00	343.87	38324.03	10123.10
4+480.00	0.00	11.44	0.00	257.68	38324.03	10380.78
4+500.00	0.00	6.12	0.00	175.58	38324.03	10556.36
4+520.00	0.00	2.59	0.00	87.07	38324.03	10643.42
4+540.00	1.28	0.01	12.81	25.99	38336.84	10669.41
4+560.00	2.36	0.00	36.39	0.11	38373.23	10669.52
4+580.00	3.60	0.00	59.61	0.00	38432.84	10669.52
4+600.00	3.41	0.00	70.14	0.00	38502.99	10669.52
4+620.00	3.84	0.00	72.55	0.00	38575.54	10669.52
4+640.00	3.81	0.00	76.53	0.00	38652.07	10669.52
4+660.00	3.32	0.00	71.25	0.00	38723.32	10669.52
4+680.00	2.69	0.03	60.05	0.32	38783.37	10669.84
4+700.00	2.73	0.01	54.17	0.43	38837.54	10670.27
4+720.00	1.93	0.22	46.56	2.35	38884.09	10672.63
4+740.00	2.17	0.21	40.96	4.38	38925.05	10677.00
4+760.00	1.98	0.30	41.50	5.10	38966.56	10682.11
4+780.00	2.21	0.26	41.95	5.55	39008.51	10687.66
4+800.00	1.63	0.26	38.42	5.15	39046.93	10692.81
4+820.00	0.77	0.34	24.00	5.93	39070.93	10698.74
4+840.00	0.01	0.90	7.82	12.36	39078.75	10711.10
4+860.00	1.88	0.26	18.87	11.65	39097.61	10722.75
4+880.00	1.61	0.13	34.89	3.91	39132.50	10726.66
4+900.00	2.97	0.03	45.86	1.61	39178.36	10728.27
4+920.00	3.79	0.00	67.59	0.34	39245.96	10728.61
4+940.00	4.88	0.00	86.68	0.00	39332.63	10728.61
4+960.00	6.76	0.00	116.43	0.00	39449.06	10728.61
4+980.00	5.44	0.00	122.06	0.00	39571.12	10728.61
5+000.00	5.31	0.00	107.50	0.00	39678.62	10728.61
5+020.00	5.75	0.00	110.55	0.00	39789.17	10728.61

Ing. Arquimedes Delgado
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VICE PRESIDENTE

Ing. Héctor A. Espínola
Supervisor de Obras
DCV - M.O.P.C.

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
5+040.00	5.51	0.00	112.56	0.00	39901.73	10728.61
5+060.00	5.05	0.00	105.58	0.00	40007.30	10728.61
5+080.00	4.68	0.00	97.28	0.00	40104.58	10728.61
5+100.00	5.11	0.00	97.90	0.00	40202.48	10728.61
5+120.00	4.15	0.00	92.66	0.00	40295.13	10728.61
5+140.00	5.07	0.00	92.23	0.00	40387.36	10728.61
5+160.00	4.10	0.00	91.71	0.00	40479.07	10728.61
5+180.00	5.94	0.00	100.44	0.00	40579.52	10728.61
5+200.00	3.91	0.00	98.52	0.00	40678.03	10728.61
5+220.00	3.70	0.00	76.05	0.00	40754.08	10728.61
5+240.00	3.00	0.00	66.94	0.00	40821.03	10728.61
5+260.00	2.40	0.00	53.94	0.00	40874.97	10728.61
5+280.00	2.41	0.00	48.09	0.00	40923.06	10728.61
5+300.00	4.40	0.00	68.15	0.00	40991.21	10728.61
5+320.00	4.43	0.00	88.35	0.00	41079.56	10728.61
5+340.00	3.35	0.04	77.88	0.40	41157.45	10729.01
5+360.00	4.80	0.00	81.54	0.40	41238.98	10729.41
5+380.00	5.75	0.00	105.49	0.00	41344.47	10729.41
5+400.00	4.72	0.00	104.73	0.00	41449.20	10729.41
5+420.00	4.97	0.00	96.96	0.00	41546.16	10729.41
5+440.00	7.58	0.00	125.49	0.00	41671.64	10729.41
5+460.00	10.98	0.00	185.57	0.00	41857.22	10729.41
5+480.00	11.20	0.00	221.80	0.00	42079.02	10729.41
5+500.00	12.13	0.00	233.26	0.00	42312.28	10729.41
5+520.00	16.48	0.00	286.05	0.00	42598.34	10729.41
5+540.00	22.79	0.00	392.73	0.00	42991.07	10729.41
5+560.00	25.72	0.00	485.50	0.00	43476.56	10729.41
5+580.00	21.29	0.00	471.56	0.00	43948.12	10729.41
5+600.00	20.86	0.00	423.11	0.00	44371.23	10729.41
5+620.00	21.77	0.00	428.87	0.00	44800.10	10729.41
5+640.00	19.01	0.00	408.40	0.00	45208.51	10729.41
5+660.00	14.51	0.00	334.38	0.00	45542.88	10729.41
5+680.00	15.28	0.00	297.86	0.00	45840.74	10729.41
5+700.00	15.38	0.00	306.57	0.00	46147.30	10729.41
5+720.00	12.16	0.00	275.37	0.00	46422.68	10729.41
5+740.00	7.50	0.52	196.65	5.19	46619.33	10734.61
5+760.00	6.29	0.79	137.92	13.10	46757.25	10747.71
5+780.00	7.23	0.03	135.23	8.26	46892.48	10755.97
5+800.00	7.47	0.02	147.05	0.59	47039.53	10756.56
5+820.00	6.67	0.05	141.42	0.73	47180.95	10757.28
5+840.00	5.43	0.18	121.02	2.26	47301.96	10759.54
5+860.00	5.74	0.20	111.66	3.74	47413.62	10763.28

Ing. Arquímedes Delgado
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ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
5+880.00	5.40	0.11	111.19	3.05	47524.81	10766.32
5+900.00	2.58	0.18	79.82	2.90	47604.63	10769.22
5+920.00	3.46	0.03	60.43	2.08	47665.05	10771.31
5+940.00	4.28	0.04	77.38	0.65	47742.43	10771.96
5+960.00	3.56	0.00	78.34	0.43	47820.77	10772.38
5+980.00	3.33	0.00	68.92	0.03	47889.69	10772.42
6+000.00	3.20	0.00	65.34	0.00	47955.03	10772.42
6+020.00	2.59	0.23	57.93	2.33	48012.97	10774.75
6+040.00	1.80	0.53	43.94	7.64	48056.90	10782.39
6+060.00	2.01	0.01	38.10	5.38	48095.00	10787.76
6+080.00	1.18	0.23	31.89	2.33	48126.90	10790.09
6+100.00	0.68	0.37	18.58	5.96	48145.48	10796.06
6+120.00	1.01	0.18	16.92	5.48	48162.40	10801.54
6+140.00	1.09	0.09	21.09	2.66	48183.49	10804.20
6+160.00	0.17	0.83	12.67	9.13	48196.16	10813.33
6+180.00	1.16	0.15	13.31	9.77	48209.48	10823.11
6+200.00	0.76	0.90	19.19	10.51	48228.66	10833.61
6+220.00	1.26	0.32	20.24	12.19	48248.91	10845.80
6+240.00	1.12	0.02	23.86	3.37	48272.77	10849.17
6+260.00	2.12	0.00	32.42	0.18	48305.18	10849.35
6+280.00	1.64	0.30	37.58	3.03	48342.76	10852.38
6+300.00	1.18	0.31	28.17	6.15	48370.93	10858.53
6+320.00	2.31	0.11	34.88	4.26	48405.81	10862.79
6+340.00	3.30	0.08	56.15	1.91	48461.96	10864.70
6+360.00	2.94	0.12	62.46	1.96	48524.42	10866.65
6+380.00	3.06	0.27	59.98	3.91	48584.39	10870.57
6+400.00	2.01	0.27	50.64	5.38	48635.03	10875.95
6+420.00	1.52	0.00	35.26	2.68	48670.29	10878.63
6+440.00	0.14	1.64	16.56	16.45	48686.85	10895.08
6+460.00	0.02	2.95	1.52	45.95	48688.37	10941.04
6+480.00	0.00	4.98	0.15	79.32	48688.52	11020.35
6+500.00	0.00	10.53	0.00	155.12	48688.52	11175.47
6+520.00	0.00	8.43	0.00	190.22	48688.53	11365.69
6+540.00	0.02	8.95	0.16	173.87	48688.69	11539.56
6+560.00	0.00	10.17	0.16	191.23	48688.84	11730.80
6+580.00	0.00	11.47	0.00	216.46	48688.84	11947.25
6+600.00	0.00	12.45	0.00	239.25	48688.84	12186.50
6+620.00	0.73	0.21	7.34	126.58	48688.18	12313.08
6+640.00	9.29	0.00	100.20	2.07	48790.38	12315.15
6+660.00	13.73	0.00	230.17	0.00	49026.55	12315.15
6+680.00	17.33	0.00	310.60	0.00	49337.15	12315.15
6+700.00	19.57	0.00	369.00	0.00	49706.15	12315.15

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VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
6+720.00	22.05	0.00	416.19	0.00	50122.34	12315.15
6+740.00	24.47	0.00	465.21	0.00	50587.56	12315.15
6+760.00	24.40	0.00	488.70	0.00	51076.26	12315.15
6+780.00	21.92	0.00	463.15	0.00	51539.41	12315.15
6+800.00	21.43	0.00	433.45	0.00	51972.86	12315.15
6+820.00	18.83	0.00	402.60	0.00	52375.46	12315.15
6+840.00	10.19	0.00	290.27	0.00	52665.74	12315.15
6+860.00	3.52	0.00	137.11	0.00	52802.85	12315.15
6+880.00	1.22	0.44	47.41	4.36	52850.26	12319.52
6+900.00	0.12	2.13	13.41	25.64	52863.67	12345.16
6+920.00	0.00	5.82	1.18	79.64	52864.84	12424.79
6+940.00	0.07	7.66	0.69	134.82	52865.53	12559.62
6+960.00	0.00	8.81	0.69	164.76	52866.22	12724.37
6+980.00	0.00	7.55	0.00	163.64	52866.22	12888.02
7+000.00	0.00	6.97	0.00	145.19	52866.22	13033.20
7+020.00	0.00	6.75	0.00	137.20	52866.22	13170.40
7+040.00	0.00	6.03	0.04	127.81	52866.25	13298.21
7+060.00	0.00	5.67	0.04	117.00	52866.29	13415.21
7+080.00	0.00	4.86	0.01	105.26	52866.30	13520.47
7+100.00	0.00	4.54	0.01	93.94	52866.31	13614.41
7+120.00	0.00	2.71	0.02	72.51	52866.32	13686.92
7+140.00	0.00	2.47	0.04	51.88	52866.36	13738.79
7+160.00	0.09	5.09	0.89	75.61	52867.25	13814.40
7+180.00	0.05	4.94	1.41	100.26	52868.67	13914.66
7+200.00	0.00	4.41	0.54	93.53	52869.20	14008.19
7+220.00	0.00	2.66	0.00	70.74	52869.20	14078.93
7+240.00	0.24	1.26	2.42	39.20	52871.63	14118.13
7+260.00	0.48	0.71	7.19	19.70	52878.82	14137.82
7+280.00	2.46	0.00	29.33	7.10	52908.15	14144.93
7+300.00	3.86	0.00	63.14	0.00	52971.29	14144.93
7+320.00	3.30	0.00	71.54	0.00	53042.83	14144.93
7+340.00	3.83	0.00	71.23	0.00	53114.06	14144.93
7+360.00	5.24	0.00	90.66	0.00	53204.71	14144.93
7+380.00	5.57	0.00	108.09	0.00	53312.80	14144.93
7+400.00	5.25	0.00	108.22	0.00	53421.02	14144.93
7+420.00	4.94	0.00	101.94	0.00	53522.96	14144.93
7+440.00	4.38	0.00	93.23	0.00	53616.22	14144.93
7+460.00	3.67	0.00	80.58	0.00	53696.80	14144.93
7+480.00	2.40	0.06	60.76	0.56	53757.56	14145.49
7+500.00	1.97	0.20	43.71	2.53	53801.27	14148.01
7+520.00	0.35	0.33	23.17	5.31	53824.44	14153.32
7+540.00	0.02	0.88	3.71	12.10	53828.15	14165.42

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TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
7+560.00	0.52	0.30	5.39	11.78	53833.54	14177.20
7+580.00	0.47	0.10	9.85	4.05	53843.39	14181.25
7+600.00	0.13	0.64	6.05	7.42	53849.44	14188.67
7+620.00	0.08	0.48	2.12	11.14	53851.56	14199.81
7+640.00	0.11	0.70	1.86	11.74	53853.42	14211.55
7+660.00	0.15	0.87	2.60	15.73	53856.02	14227.29
7+680.00	0.00	0.90	1.55	17.72	53857.57	14245.00
7+700.00	0.08	0.29	0.88	11.83	53858.45	14256.83
7+720.00	0.20	0.12	2.88	4.08	53861.33	14260.91
7+740.00	1.51	0.09	17.10	2.12	53878.43	14263.04
7+760.00	4.24	0.00	57.51	0.90	53935.94	14263.93
7+780.00	5.67	0.00	99.18	0.00	54035.12	14263.93
7+800.00	6.97	0.00	126.42	0.00	54161.54	14263.93
7+820.00	7.87	0.00	148.43	0.00	54309.97	14263.93
7+840.00	9.12	0.00	169.94	0.00	54479.91	14263.93
7+860.00	9.97	0.00	190.95	0.00	54670.86	14263.93
7+880.00	9.60	0.00	195.73	0.00	54866.59	14263.93
7+900.00	10.67	0.00	202.68	0.00	55069.27	14263.93
7+920.00	9.75	0.00	204.22	0.00	55273.49	14263.93
7+940.00	9.46	0.00	192.13	0.00	55465.62	14263.93
7+960.00	9.07	0.00	185.31	0.00	55650.93	14263.93
7+980.00	10.71	0.00	197.83	0.00	55848.75	14263.93
8+000.00	9.75	0.00	204.59	0.00	56053.35	14263.93
8+020.00	9.26	0.00	190.04	0.01	56243.38	14263.95
8+040.00	9.64	0.00	188.99	0.02	56432.37	14263.97
8+060.00	8.95	0.00	185.95	0.01	56618.32	14263.97
8+080.00	8.08	0.00	170.36	0.01	56788.67	14263.98
8+100.00	7.30	0.00	153.81	0.05	56942.48	14264.03
8+120.00	7.28	0.00	145.79	0.04	57088.27	14264.06
8+140.00	7.96	0.00	152.43	0.01	57240.70	14264.08
8+160.00	7.62	0.00	155.83	0.01	57396.53	14264.09
8+180.00	6.37	0.00	139.90	0.00	57536.42	14264.09
8+200.00	5.57	0.00	119.37	0.00	57655.80	14264.09
8+220.00	3.34	0.00	89.04	0.04	57744.84	14264.13
8+240.00	4.83	0.00	81.61	0.04	57826.45	14264.17
8+260.00	4.63	0.00	94.55	0.00	57921.00	14264.17
8+280.00	4.09	0.00	87.15	0.00	58008.15	14264.17
8+300.00	4.21	0.00	82.98	0.00	58091.13	14264.17
8+320.00	4.35	0.00	85.66	0.00	58176.79	14264.17
8+340.00	4.35	0.00	87.07	0.00	58263.86	14264.18
8+360.00	4.60	0.00	89.49	0.00	58353.35	14264.18
8+380.00	5.54	0.00	101.35	0.00	58454.70	14264.18

Ing. Arquimedes Delgado
Director de Fiscal

ECOMPA S.A.
ING. JUAN CARLOS GRAU Y.
VICE PRESIDENTE

Ing. Héctor S. Espinola
Supervisor de Obras
DGV - M.O.P.C.

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
8+400.00	4.88	0.00	104.16	0.00	58558.85	14264.18
8+420.00	4.98	0.00	98.53	0.01	58657.38	14264.19
8+440.00	5.61	0.00	105.85	0.00	58763.23	14264.19
8+460.00	6.60	0.00	122.09	0.00	58885.33	14264.20
8+480.00	6.93	0.00	135.32	0.00	59020.65	14264.20
8+500.00	7.12	0.00	140.51	0.00	59161.16	14264.20
8+520.00	7.58	0.00	146.95	0.00	59308.11	14264.20
8+540.00	8.71	0.00	162.86	0.01	59470.97	14264.21
8+560.00	9.18	0.00	178.90	0.01	59649.88	14264.22
8+580.00	9.15	0.00	183.31	0.00	59833.19	14264.22
8+600.00	8.82	0.09	179.72	0.94	60012.91	14265.16
8+620.00	10.55	0.00	193.66	0.94	60206.56	14266.10
8+640.00	13.15	0.00	236.93	0.01	60443.50	14266.11
8+660.00	13.91	0.00	270.56	0.01	60714.05	14266.12
8+680.00	14.59	0.00	284.96	0.00	60999.01	14266.12
8+700.00	13.11	0.09	277.02	0.94	61276.03	14267.06
8+720.00	16.61	0.00	297.27	0.94	61573.30	14268.00
8+740.00	17.04	0.00	336.54	0.00	61909.84	14268.00
8+760.00	17.13	0.00	341.67	0.00	62251.51	14268.00
8+780.00	16.04	0.00	331.62	0.00	62583.13	14268.00
8+800.00	14.28	0.00	303.20	0.00	62886.34	14268.00
8+820.00	12.18	0.00	264.63	0.00	63150.97	14268.00
8+840.00	12.76	0.00	249.43	0.04	63400.39	14268.04
8+860.00	12.28	0.00	250.46	0.05	63650.85	14268.09
8+880.00	10.94	0.00	232.23	0.00	63883.08	14268.10
8+900.00	9.47	0.00	204.16	0.00	64087.24	14268.10
8+920.00	8.05	0.00	175.27	0.00	64262.51	14268.10
8+940.00	6.78	0.00	148.34	0.00	64410.85	14268.10
8+960.00	6.84	0.00	136.21	0.02	64547.06	14268.11
8+980.00	6.38	0.00	132.16	0.02	64679.22	14268.13
9+000.00	6.26	0.01	126.40	0.11	64805.62	14268.24
9+020.00	5.82	0.01	120.79	0.18	64926.41	14268.43
9+040.00	5.84	0.04	116.54	0.47	65042.96	14268.89
9+060.00	5.90	0.00	117.38	0.40	65160.34	14269.29
9+080.00	5.03	0.00	109.27	0.00	65269.61	14269.30
9+100.00	6.61	0.01	116.38	0.11	65386.00	14269.41
9+120.00	5.38	0.04	119.90	0.56	65505.91	14269.97
9+140.00	6.29	0.00	116.73	0.44	65622.64	14270.41
9+160.00	5.87	0.00	121.64	0.00	65744.28	14270.41
9+180.00	6.37	0.00	122.39	0.00	65866.67	14270.41
9+200.00	6.69	0.00	130.61	0.00	65997.28	14270.41
9+220.00	6.04	0.00	127.33	0.00	66124.61	14270.41

Ing. Arquimedes Delgado
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Supervisor de Obras
DCV - M.O.P.C.

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
9+240.00	5.62	0.00	116.60	0.00	66241.22	14270.41
9+260.00	2.33	0.50	79.48	4.97	66320.70	14275.38
9+280.00	4.24	0.05	65.68	5.50	66386.38	14280.88
9+300.00	3.42	0.12	76.63	1.70	66463.01	14282.58
9+320.00	3.16	0.03	65.87	1.42	66528.88	14284.00
9+340.00	1.99	0.00	51.55	0.26	66580.43	14284.26
9+360.00	1.31	0.38	33.03	3.85	66613.46	14288.11
9+380.00	1.79	0.00	31.03	3.85	66644.49	14291.96
9+400.00	0.71	0.03	25.04	0.29	66669.53	14292.26
9+420.00	0.31	0.31	10.20	3.43	66679.73	14295.69
9+440.00	0.88	0.01	11.82	3.21	66691.55	14298.90
9+460.00	4.18	0.00	50.52	0.07	66742.08	14298.98
9+480.00	4.37	0.00	85.43	0.00	66827.51	14298.98
9+500.00	3.76	0.00	81.22	0.00	66908.73	14298.98
9+520.00	3.82	0.00	75.77	0.00	66984.50	14298.98
9+540.00	3.22	0.00	70.45	0.00	67054.95	14298.98
9+560.00	3.03	0.00	62.58	0.00	67117.53	14298.98
9+580.00	2.85	0.00	58.81	0.00	67176.35	14298.98
9+600.00	2.61	0.00	54.54	0.00	67230.88	14298.98
9+620.00	2.88	0.00	54.91	0.01	67285.80	14298.99
9+640.00	3.03	0.00	59.11	0.01	67344.91	14299.00
9+660.00	4.56	0.00	75.87	0.00	67420.78	14299.00
9+680.00	5.81	0.00	103.67	0.00	67524.46	14299.00
9+700.00	7.25	0.00	130.59	0.00	67655.04	14299.00
9+720.00	8.56	0.00	158.14	0.00	67813.18	14299.00
9+740.00	12.35	0.00	209.16	0.01	68022.34	14299.01
9+760.00	14.00	0.04	263.57	0.42	68285.91	14299.43
9+780.00	15.83	0.00	298.34	0.43	68584.25	14299.86
9+800.00	17.31	0.00	331.39	0.01	68915.64	14299.87
9+820.00	19.34	0.00	366.43	0.00	69282.07	14299.87
9+840.00	20.82	0.00	401.53	0.00	69683.60	14299.87
9+860.00	21.87	0.00	426.84	0.00	70110.44	14299.87
9+880.00	23.21	0.00	450.77	0.00	70561.21	14299.87
9+900.00	22.03	0.00	452.40	0.00	71013.61	14299.87
9+920.00	25.50	0.00	475.25	0.00	71488.86	14299.87
9+940.00	26.92	0.00	524.12	0.00	72012.98	14299.87
9+960.00	29.62	0.00	565.40	0.00	72578.37	14299.87
9+980.00	27.58	0.00	572.00	0.00	73150.37	14299.87
10+000.00	27.66	0.00	552.38	0.00	73702.75	14299.87
10+020.00	26.33	0.00	539.96	0.03	74242.71	14299.90
10+040.00	19.86	0.06	461.99	0.66	74704.69	14300.56
10+060.00	20.41	0.00	402.75	0.63	75107.44	14301.19

Ing. Arquímedes Delgado
Director de Fiscalización

Ing. Héctor S. Espinola
Supervisor de Obras
DCV - M.O.P.C.

ECOMIPA S.A.
ING. JOSIAS GRAU Y.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
10+080.00	23.81	0.00	442.17	0.00	75549.61	14301.19
10+100.00	22.38	0.00	461.86	0.01	76011.47	14301.20
10+120.00	20.96	0.00	433.40	0.01	76444.87	14301.21
10+140.00	18.39	0.00	393.47	0.00	76838.34	14301.21
10+160.00	16.07	0.00	344.54	0.00	77182.88	14301.21
10+180.00	9.79	0.00	258.52	0.00	77441.40	14301.21
10+200.00	8.52	0.00	183.05	0.00	77624.44	14301.21
10+220.00	7.49	0.00	160.09	0.00	77784.53	14301.21
10+240.00	6.14	0.00	136.30	0.00	77920.84	14301.21
10+260.00	3.63	0.00	97.74	0.00	78018.58	14301.21
10+280.00	1.15	0.60	47.82	6.04	78066.39	14307.25
10+300.00	1.78	0.01	29.26	6.14	78095.65	14313.40
10+320.00	0.88	0.65	26.55	6.57	78122.20	14319.96
10+340.00	0.05	2.20	9.24	28.51	78131.44	14348.47
10+360.00	0.91	1.83	9.59	40.35	78141.03	14388.82
10+380.00	0.42	0.55	13.30	23.82	78154.33	14412.64
10+400.00	1.22	0.01	16.41	5.56	78170.74	14418.20
10+420.00	1.01	0.13	22.36	1.36	78193.10	14419.56
10+440.00	0.43	0.18	14.47	3.05	78207.57	14422.61
10+460.00	1.11	0.03	15.43	2.08	78223.01	14424.69
10+480.00	0.21	0.06	13.18	0.96	78236.18	14425.66
10+500.00	1.62	0.01	18.24	0.74	78254.43	14426.40
10+520.00	4.08	0.00	56.92	0.10	78311.35	14426.50
10+540.00	5.63	0.00	97.01	0.00	78408.36	14426.50
10+560.00	5.65	0.00	112.72	0.00	78521.08	14426.50
10+580.00	5.14	0.00	107.85	0.00	78628.93	14426.50
10+600.00	2.35	0.00	74.92	0.00	78703.85	14426.50
10+620.00	2.22	0.00	45.69	0.00	78749.55	14426.50
10+640.00	2.81	0.00	50.26	0.00	78799.81	14426.50
10+660.00	3.73	0.00	65.42	0.00	78865.22	14426.50
10+680.00	3.65	0.00	73.86	0.00	78939.09	14426.50
10+700.00	4.01	0.00	76.69	0.00	79015.77	14426.50
10+720.00	3.39	0.00	74.06	0.01	79089.83	14426.50
10+740.00	2.46	0.00	58.48	0.01	79148.31	14426.51
10+760.00	2.52	0.00	49.78	0.01	79198.09	14426.53
10+780.00	0.21	0.49	27.37	4.88	79225.46	14431.41
10+800.00	0.14	2.45	3.52	29.36	79228.98	14460.76
10+820.00	2.92	0.73	30.57	31.82	79259.55	14492.58
10+840.00	2.09	0.06	50.12	7.94	79309.67	14500.52
10+860.00	2.19	0.00	42.77	0.62	79352.44	14501.13
10+880.00	5.48	0.00	76.68	0.02	79429.12	14501.15
10+900.00	8.45	0.00	139.30	0.01	79568.41	14501.16

Ing. Arquímedes Delgado
Director de Fiscalización

Ing. Héctor S. Espinola
Supervisor de Obras
DCV - M.O.P.C.

ECOMIPA S.A.
ING. JUSTAS GRAU Y.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
10+920.00	8.14	0.00	165.91	0.00	79734.32	14501.16
10+940.00	6.87	0.01	150.13	0.13	79884.45	14501.30
10+960.00	9.64	0.01	165.04	0.19	80049.49	14501.48
10+980.00	11.32	0.00	209.58	0.06	80259.07	14501.54
11+000.00	10.60	0.00	219.24	0.00	80478.32	14501.54
11+020.00	7.40	0.00	180.03	0.01	80658.35	14501.55
11+040.00	10.07	0.02	174.76	0.21	80833.11	14501.76
11+060.00	13.18	0.01	232.58	0.26	81065.68	14502.02
11+080.00	13.43	0.00	266.16	0.07	81331.84	14502.10
11+100.00	14.21	0.00	275.05	0.00	81606.90	14502.10
11+120.00	13.23	0.00	273.45	0.03	81880.35	14502.12
11+140.00	13.50	0.00	266.79	0.03	82147.13	14502.15
11+160.00	10.81	0.01	242.30	0.06	82389.43	14502.22
11+180.00	10.57	0.00	212.71	0.06	82602.14	14502.28
11+200.00	8.66	0.00	191.38	0.03	82793.52	14502.32
11+220.00	8.02	0.01	166.88	0.11	82960.40	14502.43
11+240.00	7.83	0.00	158.44	0.09	83118.84	14502.52
11+260.00	7.22	0.00	150.48	0.01	83269.32	14502.53
11+280.00	6.06	0.01	132.82	0.12	83402.15	14502.64
11+300.00	5.40	0.00	114.55	0.15	83516.70	14502.79
11+320.00	5.41	0.00	108.07	0.03	83624.77	14502.82
11+340.00	4.48	0.00	98.86	0.01	83723.64	14502.82
11+360.00	2.18	0.00	66.60	0.03	83790.23	14502.86
11+380.00	0.34	0.17	25.25	1.74	83815.49	14504.59
11+400.00	0.39	1.44	7.28	16.06	83822.77	14520.66
11+420.00	2.40	0.00	27.85	14.35	83850.62	14535.01
11+440.00	1.05	0.03	34.46	0.28	83885.07	14535.29
11+460.00	0.09	0.57	11.40	5.98	83896.47	14541.27
11+480.00	0.00	1.47	0.92	20.42	83897.39	14561.69
11+500.00	0.03	0.84	0.30	23.10	83897.69	14584.79
11+520.00	0.00	1.88	0.33	27.20	83898.02	14611.99
11+540.00	0.00	5.04	0.04	69.24	83898.07	14681.23
11+560.00	0.00	6.38	0.01	114.19	83898.08	14795.43
11+580.00	0.00	6.43	0.00	128.04	83898.08	14923.47
11+600.00	0.00	2.87	0.01	92.98	83898.09	15016.45
11+620.00	0.00	2.27	0.02	51.39	83898.11	15067.84
11+640.00	0.00	1.61	0.01	38.82	83898.12	15106.66
11+660.00	0.00	3.30	0.00	49.14	83898.12	15155.80
11+680.00	0.00	3.34	0.00	66.41	83898.12	15222.21
11+700.00	0.01	1.51	0.06	48.52	83898.18	15270.73
11+720.00	0.00	3.37	0.06	48.82	83898.24	15319.55
11+740.00	0.00	4.01	0.01	73.82	83898.25	15393.37

Ing. Arquímedes Delgado
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ING. GUSTAVO GRAU Y.
VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
11+780.00	0.00	7.42	0.00	109.16	83898.26	15577.57
11+800.00	0.00	1.56	0.00	89.82	83898.26	15667.39
11+820.00	0.00	3.02	0.00	45.77	83898.26	15713.17
11+840.00	0.00	5.54	0.00	85.56	83898.26	15798.73
11+860.00	0.00	4.06	0.00	95.99	83898.26	15894.72
11+880.00	0.00	4.20	0.00	82.58	83898.26	15977.30
11+900.00	0.44	0.51	4.38	47.04	83902.64	16024.34
11+920.00	2.72	0.09	31.53	5.92	83934.17	16030.26
11+940.00	5.93	0.00	86.47	0.85	84020.64	16031.11
11+960.00	1.96	0.09	78.90	0.94	84099.55	16032.04
11+980.00	1.16	0.08	31.24	1.77	84130.78	16033.81
12+000.00	2.23	1.85	33.95	19.34	84164.73	16053.15
12+020.00	4.44	0.00	66.73	18.51	84231.45	16071.66
12+040.00	11.38	0.00	158.22	0.00	84389.68	16071.66
12+060.00	11.19	0.00	225.68	0.00	84615.36	16071.66
12+080.00	10.25	0.00	214.39	0.00	84829.75	16071.66
12+100.00	9.52	0.00	197.75	0.00	85027.51	16071.66
12+120.00	9.42	0.00	189.47	0.00	85216.98	16071.66
12+140.00	8.99	0.00	184.12	0.01	85401.10	16071.67
12+160.00	5.49	0.00	144.79	0.01	85545.88	16071.67
12+180.00	0.63	0.00	61.18	0.03	85607.07	16071.70
12+200.00	0.12	0.66	7.49	6.59	85614.56	16078.30
12+220.00	0.00	4.66	1.20	53.15	85615.76	16131.45
12+240.00	0.00	10.94	0.00	156.02	85615.76	16287.47
12+260.00	0.00	17.04	0.00	279.83	85615.76	16567.30
12+280.00	0.00	17.71	0.00	347.48	85615.76	16914.78
12+300.00	0.00	18.65	0.00	363.58	85615.77	17278.36
12+320.00	0.07	17.28	0.66	359.30	85616.43	17637.65
12+340.00	0.00	23.85	0.66	411.30	85617.10	18048.95
12+360.00	0.00	16.28	0.00	401.32	85617.10	18450.27
12+380.00	0.00	10.18	0.00	264.59	85617.10	18714.86
12+400.00	0.00	5.40	0.00	155.81	85617.10	18870.67
12+420.00	0.94	0.07	9.45	54.79	85626.54	18925.46
12+440.00	3.53	0.03	44.74	1.04	85671.29	18926.50
12+460.00	4.48	0.00	80.56	0.28	85751.85	18926.78
12+480.00	9.60	0.00	140.57	0.00	85892.42	18926.78
12+500.00	17.98	0.00	275.97	0.00	86168.39	18926.78
12+520.00	14.42	0.01	323.15	0.13	86491.55	18926.91
12+540.00	14.93	0.00	292.26	0.13	86783.81	18927.04
12+560.00	11.80	0.00	268.48	0.00	87052.29	18927.04
12+580.00	11.31	0.00	232.91	0.00	87285.19	18927.04
12+600.00	15.94	0.00	273.61	0.00	87558.81	18927.04

Ing. Arquímedes Delgado
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PRESIDENTE

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Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
12+620.00	8.67	0.00	246.81	0.00	87805.61	18927.05
12+640.00	1.25	0.47	99.22	4.73	87904.83	18931.78
12+660.00	0.00	3.42	12.53	38.93	87917.36	18970.71
12+680.00	0.00	4.20	0.00	76.25	87917.36	19046.96
12+700.00	0.00	2.16	0.00	63.60	87917.36	19110.56
12+720.00	0.35	0.51	3.49	26.69	87920.84	19137.25
12+740.00	1.51	0.01	18.58	5.19	87939.42	19142.43
12+760.00	1.72	0.00	32.27	0.05	87971.69	19142.49
12+780.00	1.28	0.01	29.94	0.08	88001.63	19142.57
12+800.00	2.63	0.00	39.03	0.08	88040.67	19142.65
12+820.00	0.96	0.00	35.88	0.00	88076.55	19142.65
12+840.00	1.34	0.00	23.00	0.00	88099.55	19142.65
12+860.00	1.16	0.01	24.96	0.05	88124.51	19142.70
12+880.00	1.50	0.00	26.55	0.09	88151.06	19142.79
12+900.00	3.74	0.00	52.42	0.04	88203.48	19142.83
12+920.00	6.93	0.00	106.75	0.00	88310.23	19142.83
12+940.00	8.50	0.01	154.34	0.06	88464.57	19142.89
12+960.00	10.92	0.00	194.27	0.06	88658.84	19142.94
12+980.00	11.91	0.00	228.36	0.03	88887.20	19142.97
13+000.00	13.43	0.00	253.43	0.03	89140.63	19143.00
13+020.00	13.54	0.00	269.68	0.02	89410.31	19143.02
13+040.00	17.32	0.00	308.54	0.02	89718.85	19143.04
13+060.00	18.50	0.00	358.14	0.00	90076.99	19143.04
13+080.00	20.67	0.00	391.70	0.01	90468.69	19143.05
13+100.00	22.45	0.00	431.27	0.01	90899.96	19143.06
13+120.00	25.06	0.00	475.11	0.00	91375.07	19143.06
13+140.00	24.90	0.00	499.55	0.00	91874.62	19143.06
13+160.00	24.09	0.00	489.85	0.00	92364.47	19143.06
13+180.00	22.02	0.00	461.10	0.05	92825.56	19143.11
13+200.00	25.13	0.00	471.53	0.05	93297.09	19143.16
13+220.00	22.39	0.00	475.21	0.00	93772.30	19143.16
13+240.00	19.36	0.00	417.49	0.01	94189.79	19143.17
13+260.00	17.50	0.00	368.61	0.01	94558.41	19143.18
13+280.00	15.67	0.00	331.69	0.01	94890.10	19143.19
13+300.00	12.66	0.00	283.28	0.00	95173.37	19143.19
13+320.00	11.88	0.00	245.43	0.00	95418.80	19143.19
13+340.00	10.74	0.00	226.24	0.00	95645.04	19143.19
13+360.00	4.94	0.00	156.78	0.03	95801.83	19143.22
13+380.00	2.00	0.00	69.36	0.07	95871.19	19143.29
13+400.00	0.19	0.56	21.89	5.63	95893.07	19148.92
13+420.00	0.00	2.04	1.89	25.95	95894.97	19174.88
13+440.00	0.00	6.45	0.00	84.88	95894.97	19259.76

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VICE PRESIDENTE

Ing. Héctor S. Espinola
Supervisor de Obras
DCV - M.O.P.C.

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
13+460.00	0.00	5.17	0.00	116.26	95894.97	19376.01
13+480.00	0.00	5.21	0.00	103.88	95894.97	19479.89
13+500.00	0.00	4.58	0.02	97.94	95894.99	19577.84
13+520.00	0.00	6.63	0.04	112.06	95895.03	19689.89
13+540.00	0.00	8.44	0.06	150.61	95895.10	19840.51
13+560.00	0.00	9.54	0.05	179.80	95895.15	20020.31
13+580.00	0.01	9.38	0.16	189.20	95895.30	20209.51
13+600.00	0.00	12.00	0.15	213.80	95895.45	20423.31
13+620.00	0.01	12.09	0.06	240.98	95895.52	20664.29
13+640.00	0.00	14.75	0.06	268.44	95895.58	20932.73
13+660.00	0.00	19.11	0.00	338.58	95895.58	21271.31
13+680.00	0.00	18.00	0.00	371.03	95895.58	21642.34
13+700.00	0.00	16.62	0.00	346.17	95895.58	21988.51
13+720.00	0.00	16.95	0.00	335.68	95895.58	22324.19
13+740.00	0.00	16.28	0.04	332.25	95895.62	22656.44
13+760.00	0.00	16.38	0.04	326.63	95895.67	22983.07
13+780.00	0.00	19.64	0.00	360.28	95895.67	23343.36
13+800.00	0.00	20.66	0.00	403.06	95895.67	23746.41
13+820.00	0.00	17.14	0.00	378.00	95895.67	24124.42
13+840.00	0.00	16.48	0.02	336.17	95895.69	24460.58
13+860.00	0.00	15.10	0.02	315.73	95895.71	24776.31
13+880.00	0.00	11.64	0.03	267.31	95895.74	25043.62
13+900.00	0.00	13.34	0.06	249.76	95895.80	25293.38
13+920.00	0.00	13.58	0.06	269.24	95895.86	25562.62
13+940.00	0.00	10.98	0.04	245.63	95895.90	25808.25
13+960.00	0.00	11.02	0.01	219.96	95895.91	26028.21
13+980.00	0.00	12.85	0.00	238.63	95895.91	26266.84
14+000.00	0.00	11.47	0.00	243.20	95895.91	26510.03
14+020.00	0.00	11.01	0.00	224.86	95895.91	26734.89
14+040.00	0.00	10.86	0.00	218.73	95895.91	26953.63
14+060.00	0.01	10.48	0.06	213.43	95895.96	27167.06
14+080.00	0.00	12.22	0.06	227.02	95896.02	27394.08
14+100.00	0.00	10.90	0.00	231.16	95896.02	27625.23
14+120.00	0.00	7.17	0.00	180.66	95896.03	27805.89
14+140.00	0.00	4.74	0.00	119.09	95896.03	27924.98
14+160.00	0.00	2.65	0.01	73.87	95896.03	27998.85
14+180.00	0.00	1.87	0.01	45.16	95896.04	28044.00
14+200.00	0.00	2.48	0.00	43.49	95896.04	28087.50
14+220.00	0.00	1.21	0.00	36.87	95896.04	28124.37
14+240.00	0.78	0.00	7.77	12.08	95903.80	28136.45
14+260.00	1.86	0.00	26.34	0.00	95930.15	28136.45
14+280.00	3.94	0.00	57.98	0.00	95988.12	28136.45

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Supervisor de Obras
DCV - M.O.P.C.

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
14+300.00	4.26	0.00	81.97	0.00	96070.10	28136.45
14+320.00	5.54	0.00	98.00	0.00	96168.10	28136.45
14+340.00	5.59	0.00	111.34	0.00	96279.44	28136.45
14+360.00	6.72	0.00	123.05	0.00	96402.50	28136.45
14+380.00	5.35	0.00	120.67	0.00	96523.17	28136.45
14+400.00	3.79	0.00	91.43	0.00	96614.60	28136.45
14+420.00	6.69	0.00	104.78	0.00	96719.37	28136.45
14+440.00	6.75	0.00	134.35	0.00	96853.72	28136.45
14+460.00	6.49	0.00	132.35	0.00	96986.08	28136.45
14+480.00	5.43	0.00	119.19	0.00	97105.27	28136.45
14+500.00	3.46	0.00	88.90	0.00	97194.17	28136.45
14+520.00	1.86	0.02	53.17	0.22	97247.34	28136.67
14+540.00	4.21	0.00	60.70	0.23	97308.04	28136.90
14+560.00	3.01	0.06	72.20	0.59	97380.24	28137.50
14+580.00	1.88	0.00	48.87	0.58	97429.11	28138.08
14+600.00	2.06	0.03	39.36	0.30	97468.46	28138.38
14+620.00	1.01	0.17	30.66	2.01	97499.12	28140.38
14+640.00	1.23	0.06	22.43	2.34	97521.55	28142.73
14+660.00	4.33	0.00	55.66	0.64	97577.21	28143.37
14+680.00	3.45	0.00	77.85	0.03	97655.05	28143.40
14+700.00	4.28	0.00	77.30	0.02	97732.36	28143.42
14+720.00	1.83	0.04	61.09	0.37	97793.45	28143.80
14+740.00	2.32	0.00	41.48	0.37	97834.93	28144.17
14+760.00	2.25	0.00	45.64	0.00	97880.57	28144.17
14+780.00	6.50	0.00	87.44	0.00	97968.02	28144.17
14+800.00	6.34	0.00	128.35	0.00	98096.37	28144.17
14+820.00	7.41	0.00	137.51	0.00	98233.88	28144.17
14+840.00	8.17	0.00	155.85	0.00	98389.73	28144.17
14+860.00	8.84	0.00	170.10	0.00	98559.83	28144.17
14+880.00	8.30	0.00	171.36	0.00	98731.19	28144.17
14+900.00	5.54	0.00	138.35	0.00	98869.53	28144.17
14+920.00	5.81	0.00	113.42	0.00	98982.96	28144.17
14+940.00	6.08	0.00	118.89	0.00	99101.85	28144.17
14+960.00	3.97	0.00	100.55	0.00	99202.40	28144.17
14+980.00	3.14	0.00	71.13	0.00	99273.53	28144.17
15+000.00	6.36	0.00	95.05	0.00	99368.58	28144.17
15+020.00	6.97	0.00	133.34	0.02	99501.92	28144.19
15+040.00	4.62	0.00	115.90	0.03	99617.82	28144.22
15+060.00	4.61	0.00	92.28	0.01	99710.10	28144.23
15+080.00	4.23	0.00	88.35	0.00	99798.45	28144.24
15+100.00	8.05	0.00	122.78	0.00	99921.23	28144.24
15+120.00	5.37	0.00	134.21	0.02	100055.44	28144.26

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Supervisor de Obras
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ECOSERPA S.A.
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VICE PRESIDENTE

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
15+140.00	5.34	0.00	107.10	0.02	100162.54	28144.28
15+160.00	6.18	0.00	115.18	0.00	100277.72	28144.29
15+180.00	3.55	0.00	97.26	0.02	100374.98	28144.31
15+200.00	2.62	0.00	61.67	0.02	100436.65	28144.33
15+220.00	5.88	0.00	84.98	0.00	100521.63	28144.33
15+240.00	3.44	0.00	93.18	0.02	100614.81	28144.35
15+260.00	0.62	0.38	40.59	3.86	100655.40	28148.21
15+280.00	1.04	0.03	16.60	4.16	100672.01	28152.37
15+300.00	2.53	0.00	35.66	0.34	100707.67	28152.71
15+320.00	2.86	0.00	53.86	0.04	100761.53	28152.75
15+340.00	3.43	0.00	62.90	0.03	100824.43	28152.78
15+360.00	2.51	0.51	59.43	5.05	100883.86	28157.84
15+380.00	2.89	0.10	54.03	6.09	100937.88	28163.93
15+400.00	2.14	0.00	50.30	1.04	100988.18	28164.97
15+420.00	3.18	0.16	53.25	1.56	101041.43	28166.52
15+440.00	5.04	0.08	82.21	2.33	101123.64	28168.85
15+460.00	8.36	0.00	133.97	0.77	101257.61	28169.62
15+480.00	4.50	0.01	128.62	0.06	101386.23	28169.68
15+500.00	3.31	0.00	78.10	0.07	101464.33	28169.75
15+520.00	4.85	0.00	81.52	0.02	101545.85	28169.76
15+540.00	6.39	0.00	112.39	0.01	101658.24	28169.77
15+560.00	3.71	0.00	101.03	0.00	101759.27	28169.77
15+580.00	0.94	0.02	46.53	0.19	101805.79	28169.96
15+600.00	4.34	0.00	52.80	0.21	101858.60	28170.18
15+620.00	8.49	0.00	128.24	0.02	101986.83	28170.19
15+640.00	4.34	0.01	128.30	0.06	102115.13	28170.26
15+660.00	2.75	0.01	70.92	0.15	102186.05	28170.41
15+680.00	9.28	0.00	120.28	0.09	102306.33	28170.50
15+700.00	17.36	0.00	266.39	0.00	102572.72	28170.50
15+720.00	25.24	0.00	426.02	0.00	102998.74	28170.50
15+740.00	26.50	0.00	517.40	0.00	103516.14	28170.50
15+760.00	26.83	0.00	533.28	0.00	104049.42	28170.50
15+780.00	24.44	0.00	512.69	0.00	104562.11	28170.50
15+800.00	20.71	0.00	451.48	0.00	105013.59	28170.50
15+820.00	21.92	0.00	426.28	0.00	105439.87	28170.50
15+840.00	27.90	0.00	498.17	0.00	105938.04	28170.50
15+860.00	27.08	0.00	549.77	0.00	106487.81	28170.50
15+880.00	19.46	0.00	465.45	0.00	106953.27	28170.50
15+900.00	15.49	0.00	349.56	0.00	107302.82	28170.50
15+920.00	8.97	0.02	244.61	0.16	107547.44	28170.66
15+940.00	8.97	0.00	179.37	0.16	107726.81	28170.82
15+960.00	5.92	0.00	148.86	0.00	107875.67	28170.82

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DCV- M.O.P.C.

TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
15+980.00	2.50	0.00	84.23	0.01	107959.90	28170.83
16+000.00	1.41	0.00	39.18	0.01	107999.08	28170.84
16+020.00	0.00	1.98	14.14	19.75	108013.22	28190.59
16+040.00	0.96	0.31	9.62	22.84	108022.84	28213.43
16+060.00	2.37	0.00	33.31	3.13	108056.15	28216.57
16+080.00	1.47	0.00	38.42	0.05	108094.56	28216.61
16+100.00	1.85	0.00	33.22	0.00	108127.78	28216.61
16+120.00	0.34	0.03	21.88	0.27	108149.66	28216.88
16+140.00	1.60	0.00	19.40	0.27	108169.06	28217.15
16+160.00	0.00	1.33	16.01	13.32	108185.08	28230.47
16+180.00	0.00	2.06	0.00	33.93	108185.08	28264.40
16+200.00	0.00	4.14	0.00	62.00	108185.08	28326.40
16+220.00	0.00	8.34	0.00	124.81	108185.08	28451.21
16+240.00	0.00	4.97	0.03	133.10	108185.10	28584.31
16+260.00	0.00	5.20	0.06	101.64	108185.16	28685.95
16+280.00	0.00	6.73	0.03	119.32	108185.20	28805.27
16+300.00	0.00	3.82	0.00	105.54	108185.20	28910.81
16+320.00	0.00	3.80	0.00	76.14	108185.20	28986.95
16+340.00	0.00	2.51	0.00	63.01	108185.20	29049.96
16+360.00	0.00	1.97	0.04	44.80	108185.25	29094.76
16+380.00	0.13	1.40	1.30	33.73	108186.55	29128.49
16+400.00	0.57	0.65	6.96	20.46	108193.50	29148.95
16+420.00	0.38	0.30	9.49	9.42	108203.00	29158.37
16+440.00	0.96	0.12	13.39	4.19	108216.39	29162.56
16+460.00	0.47	0.09	14.34	2.14	108230.73	29164.70
16+480.00	1.57	0.02	20.44	1.12	108251.17	29165.82
16+500.00	0.00	1.31	15.70	13.28	108266.87	29179.10
16+520.00	0.71	0.06	7.07	13.64	108273.94	29192.73
16+540.00	1.65	0.00	23.58	0.57	108297.52	29193.30
16+560.00	3.93	0.00	55.78	0.00	108353.31	29193.30
16+580.00	2.42	0.00	63.43	0.00	108416.74	29193.30
16+600.00	3.09	0.01	55.04	0.09	108471.78	29193.39
16+620.00	2.12	0.00	52.06	0.13	108523.83	29193.52
16+640.00	3.18	0.04	52.99	0.44	108576.82	29193.96
16+660.00	1.55	0.08	47.36	1.20	108624.18	29195.16
16+680.00	2.53	0.00	40.85	0.80	108665.04	29195.96
16+700.00	2.27	0.00	48.05	0.02	108713.09	29195.97
16+720.00	2.24	0.01	45.16	0.11	108758.24	29196.08
16+740.00	0.63	0.25	28.72	2.62	108786.96	29198.71
16+760.00	2.26	0.00	28.88	2.54	108815.84	29201.24
16+780.00	3.18	0.00	54.42	0.00	108870.26	29201.24
16+800.00	3.83	0.00	70.16	0.00	108940.42	29201.24

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TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
16+820.00	3.40	0.00	72.33	0.00	109012.75	29201.24
16+840.00	2.43	0.05	58.35	0.50	109071.10	29201.75
16+860.00	0.66	0.41	30.92	4.62	109102.02	29206.37
16+880.00	0.40	0.10	10.52	5.16	109112.54	29211.53
16+900.00	0.00	1.60	3.95	17.08	109116.50	29228.61
16+920.00	0.00	6.77	0.00	83.77	109116.50	29312.38
16+940.00	0.00	14.29	0.00	210.61	109116.50	29523.00
16+960.00	0.00	17.56	0.02	318.48	109116.52	29841.47
16+980.00	0.00	19.29	0.02	368.46	109116.54	30209.94
17+000.00	0.00	22.87	0.03	421.55	109116.57	30631.48
17+020.00	0.00	28.33	0.03	511.98	109116.60	31143.46
17+040.00	0.00	31.19	0.00	595.15	109116.61	31738.61
17+060.00	0.00	31.69	0.04	628.72	109116.64	32367.34
17+080.00	0.00	32.23	0.04	639.20	109116.68	33006.54
17+100.00	0.00	37.50	0.00	697.39	109116.68	33703.93
17+120.00	0.01	31.35	0.06	688.57	109116.74	34392.50
17+140.00	0.00	24.03	0.05	553.86	109116.79	34946.36
17+160.00	0.00	14.32	0.04	383.53	109116.83	35329.89
17+180.00	0.00	6.17	0.04	204.88	109116.88	35534.77
17+200.00	0.05	0.80	0.46	69.66	109117.34	35604.44
17+220.00	4.36	0.00	44.11	7.99	109161.44	35612.42
17+240.00	4.69	0.00	90.53	0.00	109251.97	35612.42
17+260.00	8.24	0.00	129.31	0.00	109381.28	35612.42
17+280.00	16.19	0.00	244.35	0.00	109625.63	35612.42
17+300.00	23.39	0.00	395.85	0.00	110021.48	35612.42
17+320.00	28.34	0.00	517.37	0.00	110538.85	35612.42
17+340.00	27.06	0.00	554.03	0.00	111092.88	35612.42
17+360.00	32.58	0.00	596.35	0.00	111689.24	35612.42
17+380.00	36.52	0.00	690.98	0.00	112380.22	35612.43
17+400.00	42.16	0.00	786.86	0.04	113167.08	35612.47
17+420.00	54.05	0.00	962.13	0.04	114129.21	35612.51
17+440.00	62.61	0.01	1166.55	0.08	115295.75	35612.59
17+460.00	67.46	0.00	1300.62	0.08	116596.37	35612.68
17+480.00	66.92	0.00	1343.72	0.00	117940.09	35612.68
17+500.00	72.72	0.00	1396.33	0.00	119336.41	35612.68
17+520.00	71.76	0.13	1444.73	1.26	120781.14	35613.93
17+540.00	103.11	0.00	1748.66	1.26	122528.80	35615.19
17+560.00	66.40	0.08	1695.08	0.77	124224.87	35615.96
17+580.00	61.46	0.02	1278.56	0.93	125503.43	35616.89
17+600.00	59.24	0.04	1207.02	0.61	126710.45	35617.51
17+620.00	55.03	0.00	1142.73	0.45	127853.18	35617.96
17+640.00	48.24	0.00	1032.69	0.00	128885.87	35617.96

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TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
17+660.00	36.80	0.00	850.37	0.00	129736.25	35617.96
17+680.00	29.20	0.00	659.97	0.00	130396.22	35617.96
17+700.00	26.05	0.00	552.56	0.00	130948.78	35617.96
17+720.00	21.40	0.00	474.55	0.00	131423.33	35617.96
17+740.00	14.31	0.00	357.09	0.00	131780.42	35617.96
17+760.00	5.66	0.01	199.64	0.09	131980.06	35618.04
17+780.00	0.19	2.53	58.44	25.42	132038.50	35643.47
17+800.00	0.00	13.40	1.87	159.38	132040.37	35802.85
17+820.00	0.00	29.21	0.00	426.17	132040.37	36229.02
17+840.00	0.01	43.59	0.13	728.01	132040.50	36957.03
17+860.00	0.01	54.74	0.20	983.27	132040.70	37940.30
17+880.00	0.00	57.35	0.07	1120.33	132040.76	39060.64
17+900.00	0.00	63.77	0.00	1211.22	132040.77	40271.86
17+920.00	0.00	72.94	0.00	1367.08	132040.77	41638.94
17+940.00	0.00	71.22	0.00	1441.64	132040.77	43080.58
17+960.00	0.00	71.59	0.00	1428.13	132040.78	44508.71
17+980.00	0.00	64.60	0.02	1361.90	132040.80	45870.61
18+000.00	0.00	64.46	0.02	1290.55	132040.82	47161.16
18+020.00	0.00	67.11	0.01	1315.69	132040.83	48476.85
18+040.00	0.02	67.74	0.16	1348.52	132040.99	49825.37
18+060.00	0.00	65.04	0.15	1327.81	132041.14	51153.18
18+080.00	0.01	59.34	0.08	1243.78	132041.22	52396.96
18+100.00	0.00	52.72	0.08	1121.59	132041.29	53517.55
18+120.00	0.00	50.63	0.01	1033.55	132041.30	54551.10
18+140.00	0.00	43.18	0.01	938.16	132041.31	55489.27
18+160.00	0.06	31.97	0.59	751.59	132041.90	56240.85
18+180.00	0.00	26.89	0.60	588.68	132042.51	56829.54
18+200.00	0.03	17.88	0.30	447.79	132042.80	57277.33
18+220.00	0.00	20.63	0.29	385.15	132043.09	57662.47
18+240.00	0.00	12.99	0.00	336.17	132043.09	57998.64
18+260.00	0.00	5.87	0.00	188.56	132043.09	58187.20
18+280.00	0.00	3.17	0.00	90.36	132043.09	58277.56
18+300.00	0.00	2.52	0.00	56.88	132043.09	58334.44
18+320.00	0.00	6.18	0.00	86.95	132043.09	58421.39
18+340.00	0.00	9.81	0.00	159.88	132043.09	58581.27
18+360.00	0.00	6.21	0.00	160.25	132043.09	58741.52
18+380.00	0.00	7.58	0.00	137.44	132043.09	58878.96
18+400.00	0.00	12.98	0.00	205.16	132043.09	59084.12
18+420.00	0.00	17.68	0.00	306.64	132043.09	59390.76
18+440.00	0.00	23.80	0.00	414.54	132043.09	59805.30
18+460.00	0.00	23.44	0.00	473.63	132043.09	60278.93
18+480.00	0.00	18.57	0.00	420.57	132043.09	60699.50

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TABLA DE VOLUMEN DE TERRAPLÉN

Progresiva	Area Terraplen m2	Area Corte m2	Terraplen Volumen m3	Corte Volumen m3	Terraplen Acumulado Volumen m3	Corte Acumulado Volumen m3
18+500.00	0.00	15.11	0.00	336.68	132043.09	61036.19
18+520.00	0.00	10.94	0.00	260.55	132043.09	61296.74
18+540.00	0.00	8.59	0.00	194.79	132043.09	61491.53
18+560.00	0.00	6.35	0.01	148.48	132043.10	61640.01
18+580.00	0.01	6.21	0.08	125.59	132043.18	61765.59
18+600.00	0.00	5.00	0.09	112.09	132043.27	61877.69
18+620.00	0.00	3.12	0.01	81.24	132043.28	61958.93
18+640.00	1.34	0.08	13.43	32.06	132056.71	61990.99

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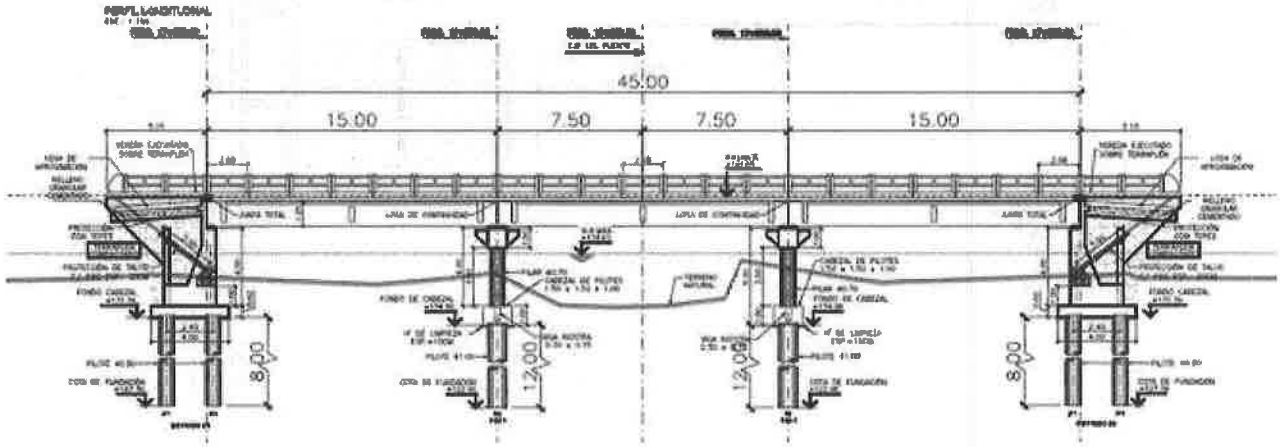
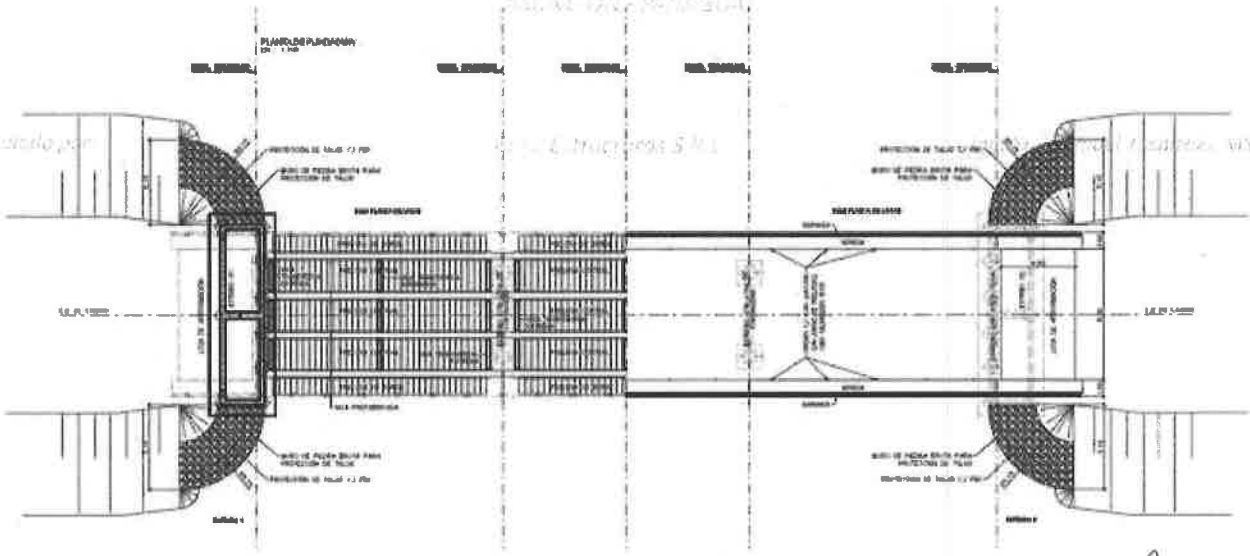
MEMORIA DE CÁLCULO ESTRUCTURAL

PUENTE L=3X15.00M=45.00M

TRAMO: ARROYO DE ORO
PROGR.: 17+582.50





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Mayo - 2021
ASUNCIÓN - PARAGUAY

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Director de Fiscalización

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Calculado por: ***Crea*** *Estructuras S.R.L.* *Ing..Yuji Samuel Yoshizaki, MSc*

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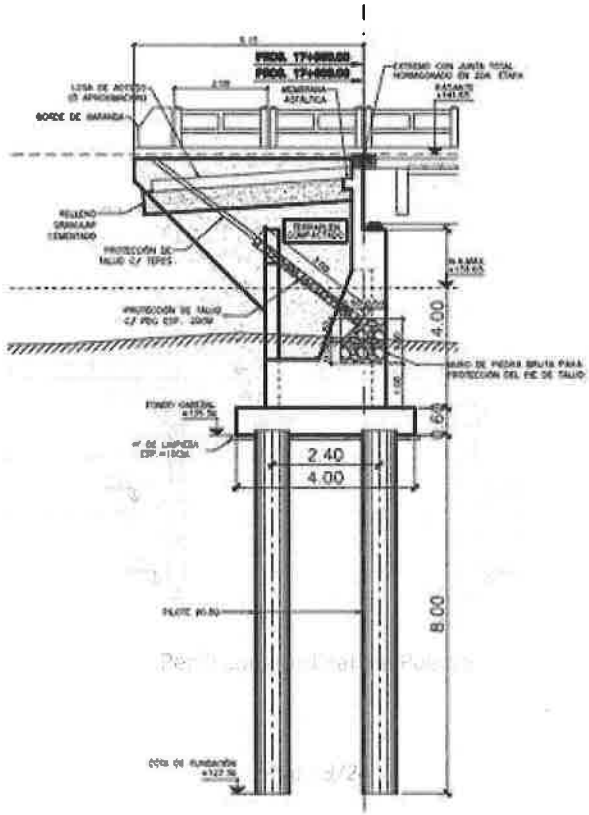
1. Objeto

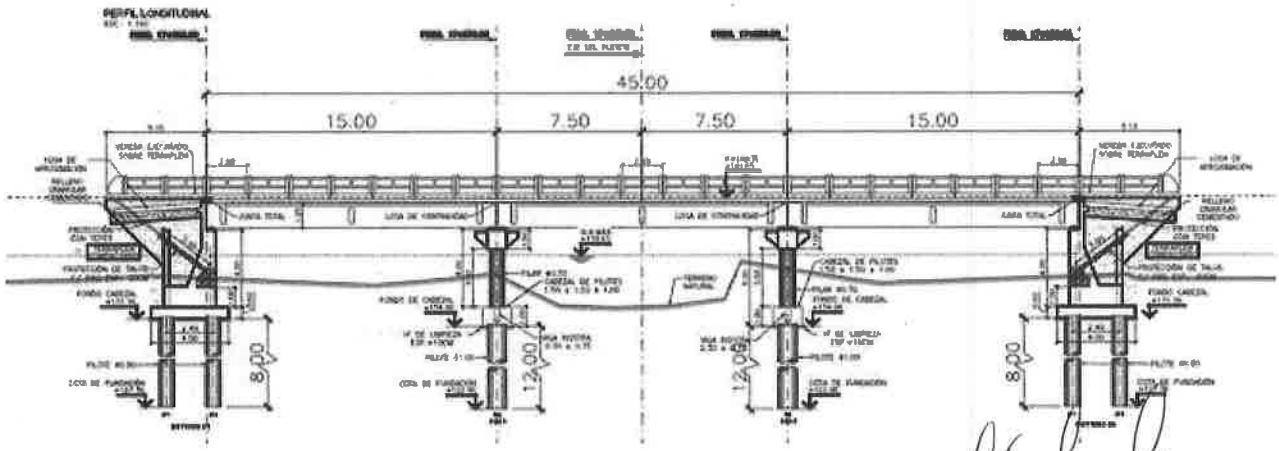
La presente memoria tiene por objeto presentar los resultados del diseño y cálculo estructural correspondiente al las pilas y estribos del puente ubicado en la progresiva 17+582.50, sobre el Arroyo de Oro.

2. Descripción del Puente

El puente consiste en una estructura de tres tramos de 15m de longitud cada una. Posee juntas de dilatación en ambas cabeceras del puente. La sección transversal está compuesta por 4 vigas prefabricadas con losa tablero de 22cm de espesor, hormigonado in situ con la utilización de prelosas que contienen las armaduras principales del tablero. Ambos estribos se encuentran fundados sobre pilotes de Ø80cm. Las pilas a su vez poseen fundación sobre pilotes Ø100cm .



Vista Lateral del Estribo



Perfil Longitudinal del Puente

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3. Normas utilizadas

La norma utilizada para el diseño del presente puente, es la Norma AASHTO LRFD 2013

3.1 Factores de Carga y Combinaciones de Carga

La solicitación mayorada total se tomará como:

$Q = \Sigma \eta i \cdot \gamma i \cdot Qi$

ηi = modificador de las cargas especificado en el Artículo1.3.2
Qi = solicitaciones de las cargas aquí especificadas
γi = factores de carga especificados en las Tablas 1 y 2

Tabla 3.4.1-1 – Combinaciones de Cargas y Factores de Carga (Tabla 1)

Combinación de Cargas / Estado Límite	DC DD DW EH EV ES EL	LL IM CE BR PL LS	WA	WS	WL	FR	TU CR SH	TG	SE	Usar sólo uno por vez EQ	IC	CT	CV
RESISTENCIA I (a menos que se especifique lo contrario)	γ_p	1.75	1.00	-	-	1.00	0.50/1.20	γ_{TG}	γ_{SE}	-	-	-	-
RESISTENCIA II	γ_p	1.35	1.00	-	-	1.00	0.50/1.20	γ_{TG}	γ_{SE}	-	-	-	-
RESISTENCIA III	γ_p	-	1.00	1.40	-	1.00	0.50/1.20	γ_{TG}	γ_{SE}	-	-	-	-
RESISTENCIA IV – Sólo *EH, EV, ES, DW, DC*	γ_p 1.5	-	1.00	-	-	1.00	0.50/1.20	-	-	-	-	-	-
RESISTENCIA V	γ_p	1.35	1.00	0.40	1.0	1.00	0.50/1.20	γ_{TG}	γ_{SE}	-	-	-	-
EVENTO EXTREMO I	γ_p	γ_{EQ}	1.00	-	-	1.00	-	-	-	1.00	-	-	-
EVENTO EXTREMO II	γ_p	0.50	1.00	-	-	1.00	-	-	-	-	1.00	1.00	1.00
SERVICIO I	1.00	1.00	1.00	0.30	1.0	1.00	1.00/1.20	γ_{TG}	γ_{SE}	-	-	-	-
SERVICIO II	1.00	1.30	1.00	-	-	1.00	1.00/1.20	-	-	-	-	-	-
SERVICIO III	1.00	0.80	1.00	-	-	1.00	1.00/1.20	γ_{TG}	γ_{SE}	-	-	-	-
SERVICIO IV	1.00	-	1.00	0.70	-	1.00	1.00/1.20	-	1.0	-	-	-	-
FATIGA - Sólo *LL, IM* y *CE*	-	0.75	-	-	-	-	-	-	-	-	-	-	-

Tabla 3.4.1-2 – Factores de carga para cargas permanentes, γ_p (Tabla 2)

Tipo de carga	Factor de Carga Máximo	Mínimo
DC: Elemento y accesorios	1.25	0.90
DD: Fricción negativa (downdrag)	1.80	0.45
DW: Superficies de rodamiento e instalaciones para servicios públicos	1.50	0.65
EH: Empuje horizontal del suelo		
• Activo	1.50	0.90
• En reposo	1.35	0.90
EL: Tensiones residuales de montaje	1.00	1.00
EV: Empuje vertical del suelo		
• Estabilidad global	1.00	N/A
• Muros de sostenimiento y estribos	1.35	1.00
• Estructura rígida enterrada	1.30	0.90
• Marcos rígidos	1.35	0.90
• Estructuras flexibles enterradas u otras, excepto alcantarillas metálicas rectangulares	1.95	0.90
• Alcantarillas metálicas rectangulares flexibles	1.50	0.90
ES: Sobrecarga de suelo	1.50	0.75

3.2 Sobrecarga Vehicular de Diseño

Sobre la carga móvil, la Norma establece lo siguiente:
"La sobrecarga vehicular sobre las calzadas de puentes o estructuras incidentales, designadas como HL-93, deberá consistir en una combinación de:

- Camión de diseño o Tandem de diseño, y
- Carga de carril de diseño.

3.6.1.2.2 Camión de Diseño

Los pesos y las separaciones entre los ejes y las ruedas del camión de diseño serán como se especifica en la Figura 1. Se deberá considerar un incremento por carga dinámica como se especifica en el Artículo 3.6.2.

A excepción de lo especificado en los Artículos 3.6.1.3.1 y 3.6.1.4.1. la separación entre los dos ejes de 145.000 N se deberá variar entre 4300 y 9000 mm para producir las solicitaciones extremas.

Figura 3.6.1.2.2-1 – Características del camión de diseño

3.6.1.2.3 Tandem de Diseño

El tandem de diseño consistirá en un par de ejes de 110.000 N con una separación de 1200 mm. La separación transversal de las ruedas se deberá tomar como 1800 mm. Se deberá considerar un incremento por carga dinámica según lo especificado en el Artículo 3.6.2

3.6.1.2.4 Carga del Carril de Diseño

La carga del carril de diseño consistirá en una carga de 9.3 N/mm. uniformemente distribuida en dirección longitudinal. Transversalmente la carga del carril de diseño se supondrá uniformemente distribuida en un ancho de 3000 mm. Las solicitaciones debidas a la carga del carril de diseño no estarán sujetas a un incremento por carga dinámica.

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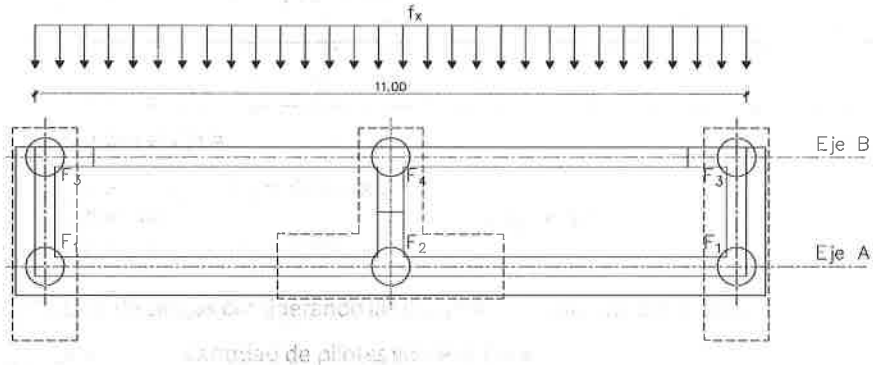
4. Fundación del Estribo

4.1. Determinación de la carga de servicio

Solicitaciones en la fundación del estribo para altura del estribo H_e=5.0m y Puente viga de longitud igual a L=15.00m, según Manual de Puentes del MOPC.



$F_1 := 1140 \cdot kN$

$F_2 := 2610 \cdot kN$

$F_3 := 550 \cdot kN$

$F_4 := 600 \cdot kN$

$f_x := 125 \cdot \frac{kN}{m}$

VANO: 15 m

H_e (m)	B (m)	F_1 (kN)	F_2 (kN)	F_3 (kN)	F_4 (kN)	f_x (kN/m)
7	4.00	1830	5180	700	1800	260
6	3.50	1600	4780	650	1300	210
5	3.20	1390	3180	600	1050	165
4	2.70	1140	2610	550	600	125
3	2.00	1030	2120	500	500	90

Carga total sobre el Eje A

$\Sigma F_{Eje.A} := F_1 + F_2 + F_1 = 4890 \cdot kN$

$\Sigma F_{Eje.B} := F_3 + F_4 + F_3 = 1700 \cdot kN$

Redistribución de cargas considerando las siguientes cantidades de pilotes:

$n_{eje.A} := 6$ cantidad de pilotes sobre el Eje A

$n_{eje.B} := 3$ cantidad de pilotes sobre el Eje B

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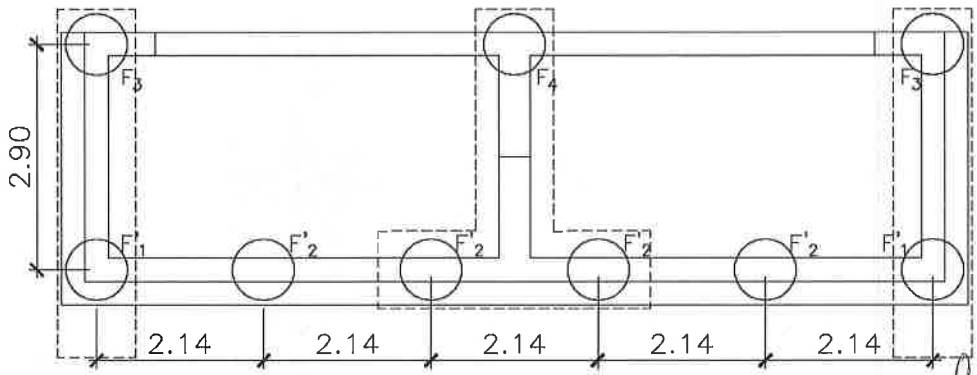

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$tf := 1000kgf$

$F'_1 := \frac{\Sigma F_{Eje.A}}{(n_{eje.A} - 1) \cdot 2} = 489 \cdot kN$ $Q_{Servicio}$ de los pilotes esquineros ubicados sobre el Eje A

$F'_2 := \left[\frac{\Sigma F_{Eje.A}}{(n_{eje.A} - 1)}\right] = 978 \cdot kN$ $Q_{Servicio}$ de los pilotes intermedios ubicados sobre el Eje A

$\text{Verificación}_{\Sigma F.Eje.A} := 2 \cdot F'_1 + 4 \cdot F'_2 = 4890 \cdot kN$ Ok!

4.2. Cálculo de Pilotes a cargas verticales
(Método de Decourt-Quaresma para Pilotes Perforados)

4.2.1 Cálculo de la capacidad portante del pilote (Cargas Verticales)

Datos generales del terreno y del pilote

$L_p := 8.00m$ longitud total del pilote

$h_o := 0.00 \cdot m$ longitud del pilote de la zona no enterrada

$h_s := 1.00 \cdot m$ altura de socavación estimada

$L_{ef} := 5.00m$ longitud efectiva del pilote que colabora a la fricción lateral

$D_p := 0.80 \cdot m$ diámetro del pilote

$A_p := \pi \cdot \frac{D_p^2}{4} = 0.5027 \cdot m^2$ área de punta

$\psi := \pi \cdot D_p = 2.51m$ perímetro del pilote

$W_p := 2.5 \cdot \frac{tf}{m^3} \cdot A_p \cdot L_p = 98.59 \cdot kN$ peso del pilote

$Q_{servicio} := \max(F'_1, F'_2, F_3, F_4) + W_p = 1076.59 \cdot kN$ carga máxima de servicio

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