

- REMARKS:**
- Proposition of Part Study of the Project of Extension and Improvement of the Sewer and Drainage System, San Agustín Hill and surrounding area.
 - Project of Sanitation Improvement of the Social Residential Area of Lima East Agreement P8/P10.
 - San Agustín Hill: Works of Water and Sewerage Sanitation Improvement, with 100% funding by the Executive Office Housing Administration Services.
 - Project of Sanitation Improvement of Socially Excluded Areas of Lima East Agreement P8/P10 and 7.
 - Proposition of the Part Study of the Project "Installation of the Water and Sewerage System for Hospital, Santa Rosa and Normal School sectors (C.C. 255 and 256)". This project includes Urban and Marginal drainage area.
 - Revision of General Works of Water and Sewerage that are executed by S.P.A. (S.P.A. General) Sector: Works of Water and Sewerage for Hospital, Santa Rosa and Normal School sectors (C.C. 255, 256 and 257) executed by "Santa Rosa" Joint Venture.
 - Contract of Work 020-2007-CV-11068588-0000/AL: Installation of Water and Sewerage Networks for Condominium Systems in Several Districts of South Area (Package 4).
 - PAE Works - Package 4: Central Corridor, Independence, District Puno.
 - Works for Networks Altiplano Villa Children District Trays.
 - PERU/USAID: Work for Urban Villa Children, Puno Area, Sector: Independent Urban Children Sector Scheme.
 - Works in Los Magallanes District Trays.

| SYMBOL | | DESCRIPTION |
|---------------------|--|------------------------------------|
| [Red line] | | Project boundary |
| [Black line] | | District boundary |
| [Dashed line] | | Drainage area boundary |
| [Thick black line] | | Sewerage primary network |
| [Thin black line] | | Foreseen Sewers |
| [Red line] | | EXISTING SEWERS: |
| [Blue line] | | Auxiliary Sewers |
| [Orange line] | | CARABAYLLO Sewers |
| [Purple line] | | COMAS Sewers |
| [Green line] | | COLECTOR COLLIQUE |
| [Light blue line] | | COMAS Sewers |
| [Pink line] | | GARAGAY Sewers |
| [Dark blue line] | | LOS ALISOS Sewers |
| [Light green line] | | EL MARMAL Sewers |
| [Yellow line] | | PUENTE PIEDRA Sewers |
| [Light purple line] | | PROLONGACION LMA Sewers |
| [Light blue line] | | RAMAL 11 Sewers |
| [Light green line] | | RAMAL 13 Y 17 Sewers |
| [Light purple line] | | SAN AGUSTIN Sewers |
| [Light blue line] | | TUNGASICA Sewers |
| [Circle with dot] | | Manhole |
| [Arrow] | | Flow direction |
| [Red square] | | Waste Water Treatment Plant (OTAP) |
| [Red square] | | Existing Sewerage Pumping Chamber |
| [Arrow] | | Discharging point |

| District Area (D.C.) | Sewers | San Coverage area | |
|----------------------|---------------------|-------------------|----------------|
| | | Quantity | Area |
| Other | Help Old Sewers | 06-21 | 100,000 |
| | | 06-22 | 100,000 |
| | Other Sewers | 06-23 | 40,000 |
| | | 06-24 | 80,000 |
| | Head 13 y 17 Sewers | 06-25 | 100,000 |
| | | 06-26 | 100,000 |
| | Rempl Sewers | 06-27 | 100,000 |
| | | 06-28 | 100,000 |
| | Los Olivos Sewers | 06-29 | 100,000 |
| | | 06-30 | 100,000 |
| | Comas Sewers | 06-31 | 100,000 |
| | | 06-32 | 100,000 |
| Other | Callao Sewers | 06-33 | 60,000 |
| | | 06-34 | 60,000 |
| | Callao Sewers | 06-35 | 60,000 |
| | | 06-36 | 60,000 |
| | San Agustín Sewers | 06-37 | 100,000 |
| | | 06-38 | 100,000 |
| | San Agustín Sewers | 06-39 | 100,000 |
| | | 06-40 | 100,000 |
| | Impugn Sewers | 06-41 | 100,000 |
| | | 06-42 | 100,000 |
| | Drainage Sewers | 06-43 | 40,000 |
| | | 06-44 | 40,000 |
| Punto Puno | Punto Puno Sewers | 06-45 | 100,000 |
| | | 06-46 | 100,000 |
| | | 06-47 | 100,000 |
| | | 06-48 | 100,000 |
| | | 06-49 | 100,000 |
| | | 06-50 | 100,000 |
| | | 06-51 | 100,000 |
| | | 06-52 | 100,000 |
| | | 06-53 | 100,000 |
| | | 06-54 | 100,000 |
| | | 06-55 | 100,000 |
| | | 06-56 | 100,000 |
| Migra | Migra Sewers | 06-57 | 20,000 |
| | | 06-58 | 20,000 |
| Total | | | 254,000 |

図2.5.9-5 : 調査対象地域内の工事と調査の進捗

表 2.5.9-10: 調査対象地域における、排水区分別・管材別延長

| 排水区 | 管材別延長 (Km) | | | | 合計 Km |
|-----------|--------------|---------------|--------------|---------------|----------------|
| | AC | CSN | FOFO | PVC | |
| A16 | | | | 7.52 | 7.52 |
| A18 | | 0.83 | | 10.70 | 11.53 |
| A19 | | | | 5.73 | 5.73 |
| AD-0 | | 0.97 | | 0.73 | 1.70 |
| AD-01B | | 0.00 | | 0.95 | 0.95 |
| AD-A1 | | 18.94 | | 11.37 | 30.31 |
| AD-A2 | | 19.61 | | 4.55 | 24.16 |
| AD-AG1 | | 1.92 | | 2.76 | 4.68 |
| AD-AG2 | | 26.52 | | 3.39 | 29.91 |
| AD-AG3 | | 12.00 | | 0.13 | 12.13 |
| AD-AG4 | | 24.10 | | 2.34 | 26.44 |
| ADC-1 | | 10.08 | | | 10.08 |
| ADC-2 | | 13.50 | | 0.02 | 13.52 |
| ADC-3 | | 4.97 | | | 4.97 |
| ADC-4 | | 6.91 | | | 6.91 |
| ADC-5 | | 13.66 | | 0.04 | 13.70 |
| ADC-6 | | 11.37 | 0.01 | | 11.38 |
| AD-CA1 | | | | 8.80 | 8.80 |
| AD-CA3 | | | | 0.82 | 0.82 |
| AD-CH1 | | 24.17 | | 7.86 | 32.03 |
| AD-CH2 | | 12.02 | | 0.56 | 12.58 |
| AD-CH3 | | 21.76 | | 0.12 | 21.88 |
| AD-CH4 | | 11.15 | | 19.72 | 30.87 |
| AD-CO1 | | 19.99 | | 0.85 | 20.84 |
| AD-CO2 | | 21.70 | | 5.13 | 26.83 |
| AD-M1 | 0.08 | 11.75 | | 1.49 | 13.32 |
| AD-N1 | | 19.04 | | 5.53 | 24.57 |
| AD-N2 | | 22.50 | | 1.03 | 23.53 |
| AD-P2 | | | | 0.46 | 0.46 |
| AD-PL1 | | 22.18 | | | 22.18 |
| AD-PL2 | | 20.15 | | 2.44 | 22.59 |
| AD-R1 | | 13.88 | | 0.93 | 14.81 |
| AD-R2 | | 16.43 | | 0.93 | 17.36 |
| AD-T1 | | 11.08 | | 3.46 | 14.54 |
| AD-T2 | | 2.33 | | 4.28 | 6.61 |
| AD-T3 | | 0.04 | | | 0.04 |
| AD-T4 | | 12.39 | | 0.15 | 12.54 |
| AD-T5 | | 10.06 | | | 10.06 |
| AD-T6 | | 2.61 | | | 2.61 |
| PT1 | | | | 22.99 | 22.99 |
| PT2 | | | | 6.59 | 6.59 |
| PT3 | | | | 13.00 | 13.00 |
| PT4 | | 0.02 | | 11.68 | 11.70 |
| PT5 | | 0.93 | | 7.85 | 8.78 |
| PT6 | | | | 25.44 | 25.44 |
| PT7 | | | | 7.54 | 7.54 |
| SA-57 | | 0.03 | | | 0.03 |
| 合計 | 0.08 | 441.59 | 0.01 | 209.88 | 651.56 |
| 割合 | 0.01% | 67.77% | 0.00% | 32.21% | 100.00% |

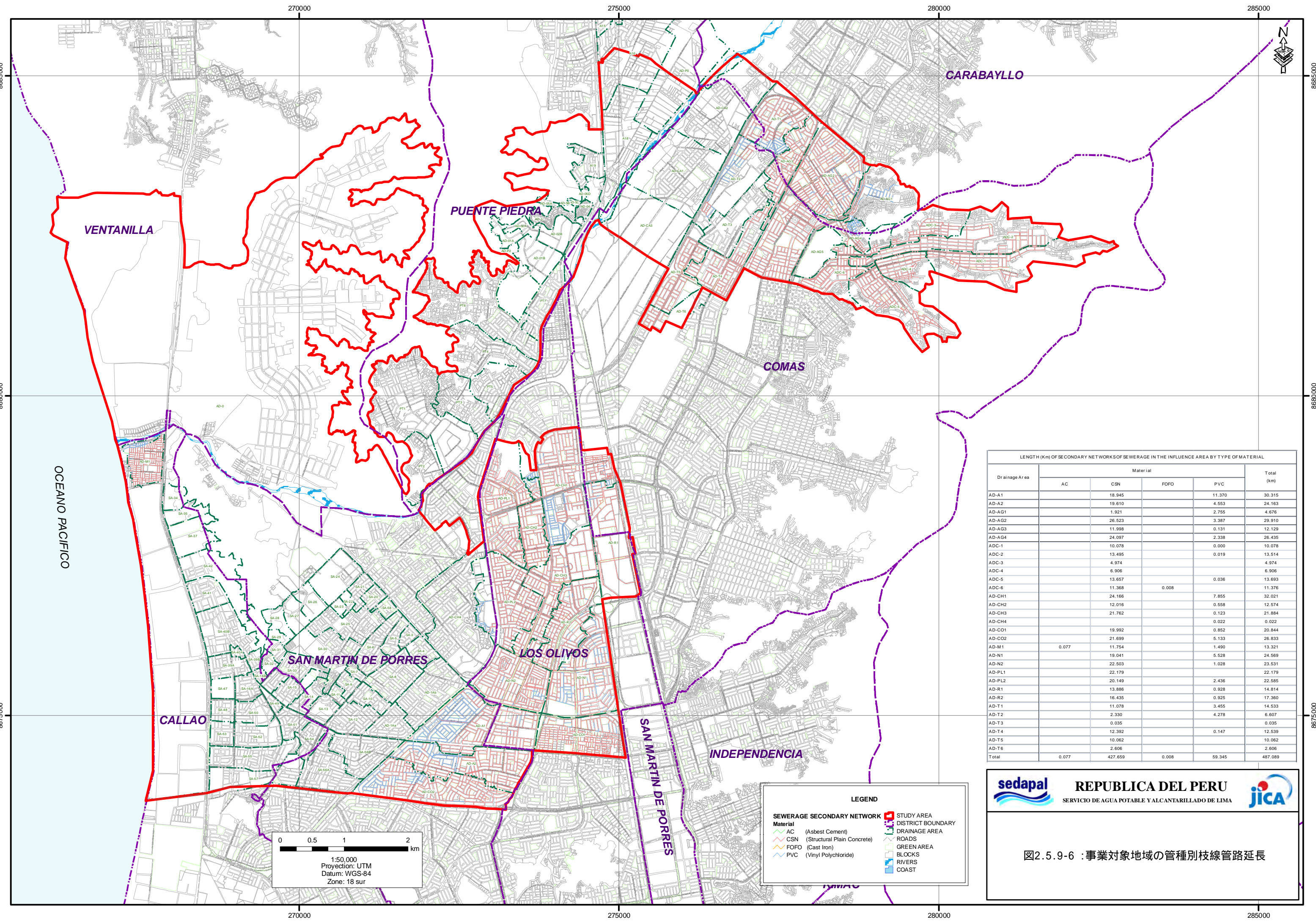
出典：JICA 調査団

図 2.5.9-6 は、調査対象地域の既存の枝線管路を管種別に整理したものである。また、表 2.5.9-11 は、事業対象地域の枝線を管種ごとに整理したものである。

表 2.5.9-11 事業対象地域の管種別枝線管長

| 排水区 | 管種別枝管延長 (Km) | | | | 合計 |
|-----------|--------------|---------------|-------------|--------------|---------------|
| | AC | CSN | FOFO | PVC | |
| AD-A1 | | 18.94 | | 11.37 | 30.31 |
| AD-A2 | | 19.61 | | 4.55 | 24.16 |
| AD-AG1 | | 1.92 | | 2.76 | 4.68 |
| AD-AG2 | | 26.52 | | 3.39 | 29.91 |
| AD-AG3 | | 12.00 | | 0.13 | 12.13 |
| AD-AG4 | | 24.10 | | 2.34 | 26.44 |
| ADC-1 | | 10.08 | | | 10.08 |
| ADC-2 | | 13.50 | | 0.02 | 13.52 |
| ADC-3 | | 4.97 | | | 4.97 |
| ADC-4 | | 6.91 | | | 6.91 |
| ADC-5 | | 13.66 | | 0.04 | 13.70 |
| ADC-6 | | 11.37 | 0.01 | | 11.38 |
| AD-CH1 | | 24.17 | | 7.86 | 32.03 |
| AD-CH2 | | 12.02 | | 0.56 | 12.58 |
| AD-CH3 | | 21.76 | | 0.12 | 21.88 |
| AD-CO1 | | 19.99 | | 0.85 | 20.84 |
| AD-CO2 | | 21.70 | | 5.13 | 26.83 |
| AD-M1 | 0.08 | 11.75 | | 1.49 | 13.32 |
| AD-N1 | | 19.04 | | 5.53 | 24.57 |
| AD-N2 | | 22.50 | | 1.03 | 23.53 |
| AD-PL1 | | 22.18 | | | 22.18 |
| AD-PL2 | | 20.15 | | 2.44 | 22.59 |
| AD-R1 | | 13.88 | | 0.93 | 14.81 |
| AD-R2 | | 16.43 | | 0.93 | 17.36 |
| AD-T1 | | 11.08 | | 3.46 | 14.54 |
| AD-T2 | | 2.33 | | 4.28 | 6.61 |
| AD-T3 | | 0.04 | | | 0.04 |
| AD-T4 | | 12.39 | | 0.15 | 12.54 |
| AD-T5 | | 10.06 | | | 10.06 |
| AD-T6 | | 2.61 | | | 2.61 |
| 合計 | 0.08 | 427.66 | 0.01 | 59.36 | 487.11 |

出典: JICA 調査団



LENGTH (km) OF SE CONDARY NETWORKS OF SEWERAGE IN THE INFLUENCE AREA BY TYPE OF MATERIAL

| Drainage Area | Material | | | | Total (km) |
|---------------|----------|---------|-------|--------|------------|
| | AC | CSN | FOFO | PVC | |
| AD-A1 | | 18.945 | | 11.370 | 30.315 |
| AD-A2 | | 19.610 | | 4.553 | 24.163 |
| AD-AG1 | | 1.921 | | 2.755 | 4.676 |
| AD-AG2 | | 26.523 | | 3.387 | 29.910 |
| AD-AG3 | | 11.998 | | 0.131 | 12.129 |
| AD-AG4 | | 24.097 | | 2.338 | 26.435 |
| ADC-1 | | 10.078 | | 0.000 | 10.078 |
| ADC-2 | | 13.495 | | 0.019 | 13.514 |
| ADC-3 | | 4.974 | | | 4.974 |
| ADC-4 | | 6.906 | | | 6.906 |
| ADC-5 | | 13.657 | | 0.036 | 13.693 |
| ADC-6 | | 11.368 | 0.008 | | 11.376 |
| AD-CH1 | | 24.166 | | 7.855 | 32.021 |
| AD-CH2 | | 12.016 | | 0.558 | 12.574 |
| AD-CH3 | | 21.762 | | 0.123 | 21.884 |
| AD-CH4 | | | | 0.022 | 0.022 |
| AD-CO1 | | 19.992 | | 0.852 | 20.844 |
| AD-CO2 | | 21.699 | | 5.133 | 26.833 |
| AD-M1 | 0.077 | 11.754 | | 1.490 | 13.321 |
| AD-N1 | | 19.041 | | 5.528 | 24.569 |
| AD-N2 | | 22.503 | | 1.028 | 23.531 |
| AD-PL1 | | 22.179 | | | 22.179 |
| AD-PL2 | | 20.149 | | 2.436 | 22.585 |
| AD-R1 | | 13.886 | | 0.928 | 14.814 |
| AD-R2 | | 16.435 | | 0.925 | 17.360 |
| AD-T1 | | 11.078 | | 3.455 | 14.533 |
| AD-T2 | | 2.330 | | 4.278 | 6.607 |
| AD-T3 | | 0.035 | | | 0.035 |
| AD-T4 | | 12.392 | | 0.147 | 12.539 |
| AD-T5 | | 10.062 | | | 10.062 |
| AD-T6 | | 2.606 | | | 2.606 |
| Total | 0.077 | 427.659 | 0.008 | 59.345 | 487.089 |

LEGEND

SEWERAGE SECONDARY NETWORK

Material

- AC (Asbest Cement)
- CSN (Structural Plain Concrete)
- FOFO (Cast Iron)
- PVC (Vinyl Polychloride)

STUDY AREA

- DISTRICT BOUNDARY
- DRAINAGE AREA
- ROADS
- GREEN AREA
- BLOCKS
- RIVERS
- COAST

0 0.5 1 2 km

1:50,000
Projection: UTM
Datum: WGS-84
Zone: 18 sur

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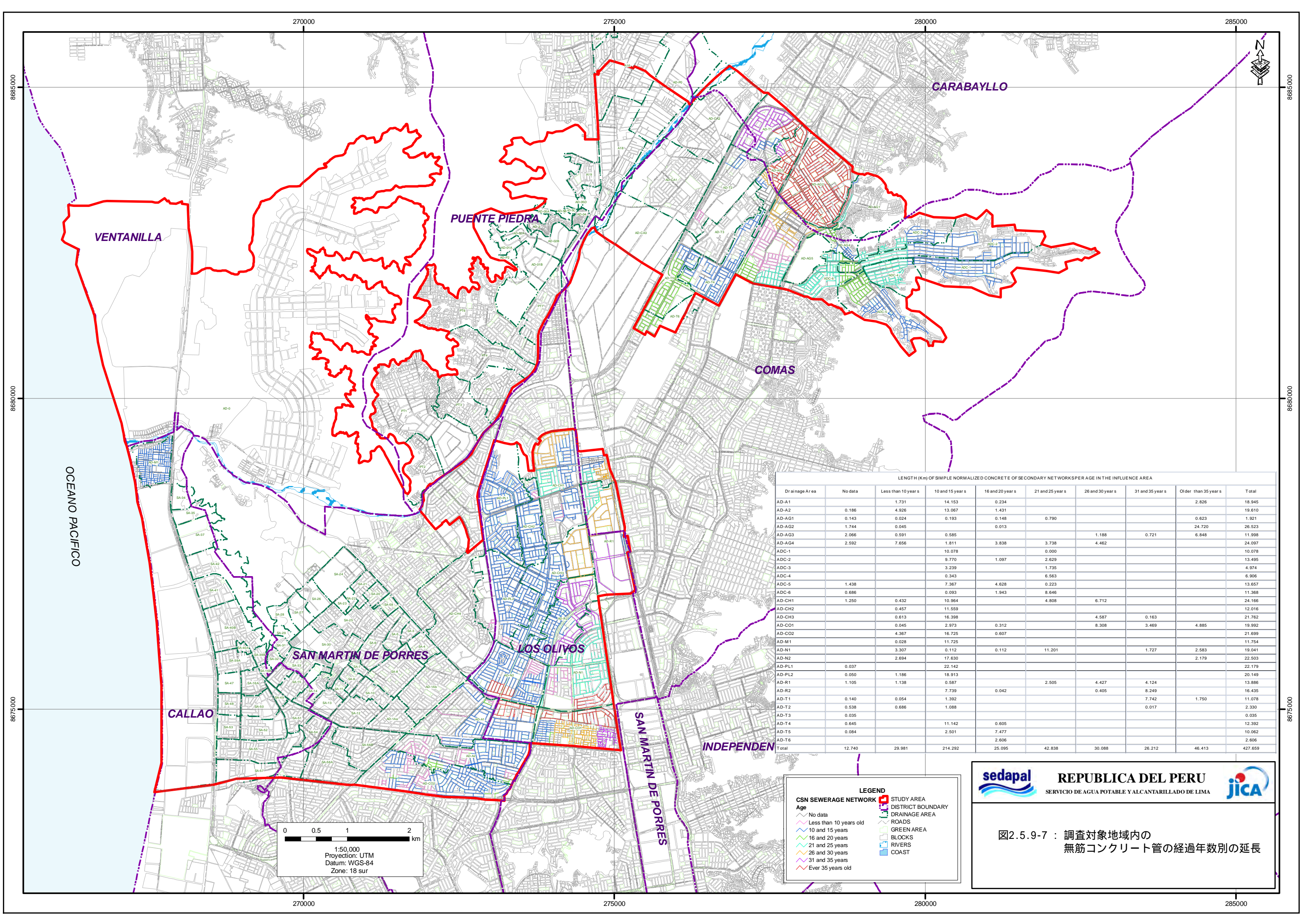
図2.5.9-6 : 事業対象地域の管種別枝線管路延長

PVC 管（塩化ビニル管）は、2000 年（材齢 10 年）に布設が始まったにすぎず、CSN 管（無筋コンクリート管）は、材齢 10～50 年に分布していることが読み取れる。多くの問題は、CSN 管で生じている。表 2.5.9-12 は、調査対象地域の CSN 管を 5 年ごとの材齢別に示したものである。

表 2.5.9-12: 事業対象地域における年数別枝線管長

| 年数別枝線管長 (Km) | | | | | | | | | |
|--------------|--------------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|---------------|
| 排水区 | データなし | 10 年以下 | 10～15 年 | 16～20 年 | 21～25 年 | 26～30 年 | 31～35 年 | 35 年以上 | 合計 |
| AD-A1 | | 1.730 | 14.150 | 0.230 | | | | 2.830 | 18.94 |
| AD-A2 | 0.19 | 4.930 | 13.070 | 1.430 | | | | | 19.61 |
| AD-AG1 | 0.14 | 0.020 | 0.190 | 0.150 | 0.790 | | | 0.620 | 1.92 |
| AD-AG2 | 1.74 | 0.050 | | 0.010 | | | | 24.720 | 26.52 |
| AD-AG3 | 2.07 | 0.590 | 0.580 | | | 1.190 | 0.720 | 6.850 | 12.00 |
| AD-AG4 | 2.59 | 7.660 | 1.810 | 3.840 | 3.740 | 4.460 | | | 24.10 |
| ADC-1 | | | 10.080 | | | | | | 10.08 |
| ADC-2 | | | 9.770 | 1.100 | 2.630 | | | | 13.50 |
| ADC-3 | | | 3.240 | | 1.740 | | | | 4.97 |
| ADC-4 | | | 0.340 | | 6.560 | | | | 6.91 |
| ADC-5 | 1.44 | | 7.370 | 4.630 | 0.220 | | | | 13.66 |
| ADC-6 | 0.69 | | 0.090 | 1.940 | 8.650 | | | | 11.37 |
| AD-CH1 | 1.25 | 0.430 | 10.960 | | 4.810 | 6.710 | | | 24.17 |
| AD-CH2 | | 0.460 | 11.560 | | | | | | 12.02 |
| AD-CH3 | | 0.610 | 16.400 | | | 4.590 | 0.160 | | 21.76 |
| AD-CO1 | | 0.04 | 2.97 | 0.31 | | 8.31 | 3.47 | 4.88 | 19.99 |
| AD-CO2 | | 4.370 | 16.720 | 0.610 | | | | | 21.70 |
| AD-M1 | | 0.030 | 11.730 | | | | | | 11.75 |
| AD-N1 | | 3.310 | 0.110 | 0.110 | 11.200 | | 1.730 | 2.580 | 19.04 |
| AD-N2 | | 2.690 | 17.630 | | | | | 2.180 | 22.50 |
| AD-PL1 | 0.04 | | 22.140 | | | | | | 22.18 |
| AD-PL2 | 0.05 | 1.190 | 18.910 | | | | | | 20.15 |
| AD-R1 | 1.11 | 1.140 | 0.590 | | 2.510 | 4.430 | 4.120 | | 13.88 |
| AD-R2 | | | 7.740 | 0.040 | | 0.410 | 8.250 | | 16.43 |
| AD-T1 | 0.14 | 0.050 | 1.390 | | | | 7.740 | 1.750 | 11.08 |
| AD-T2 | 0.54 | 0.690 | 1.090 | | | | 0.020 | | 2.33 |
| AD-T3 | 0.03 | | | | | | | | 0.04 |
| AD-T4 | 0.64 | | 11.140 | 0.600 | | | | | 12.39 |
| AD-T5 | 0.08 | | 2.500 | 7.480 | | | | | 10.06 |
| AD-T6 | | | | 2.610 | | | | | 2.61 |
| 合計 | 12.74 | 29.99 | 214.27 | 25.09 | 42.85 | 30.10 | 26.21 | 46.41 | 427.66 |

出典: JICA 調査団



LENGTH (km) OF SIMPLE NORMALIZED CONCRETE OF SECONDARY NETWORKS PER AGE IN THE INFLUENCE AREA

| Drainage Area | No data | Less than 10 years | 10 and 15 years | 16 and 20 years | 21 and 25 years | 26 and 30 years | 31 and 35 years | Older than 35 years | Total |
|---------------|---------|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------------------|---------|
| AD-A1 | | 1.731 | 14.153 | 0.234 | | | | 2.826 | 18.945 |
| AD-A2 | 0.186 | 4.926 | 13.067 | 1.431 | | | | | 19.610 |
| AD-AG1 | 0.143 | 0.024 | 0.193 | 0.148 | 0.790 | | | 0.623 | 1.921 |
| AD-AG2 | 1.744 | 0.045 | | 0.013 | | | | | 24.720 |
| AD-AG3 | 2.066 | 0.591 | 0.585 | | | 1.188 | 0.721 | 6.848 | 11.998 |
| AD-AG4 | 2.592 | 7.656 | 1.811 | 3.838 | 3.738 | 4.462 | | | 24.097 |
| ADC-1 | | | 10.078 | | 0.000 | | | | 10.078 |
| ADC-2 | | | 9.770 | 1.097 | 2.629 | | | | 13.495 |
| ADC-3 | | | 3.239 | | 1.735 | | | | 4.974 |
| ADC-4 | | | 0.343 | | 6.563 | | | | 6.906 |
| ADC-5 | 1.438 | | 7.367 | 4.628 | 0.223 | | | | 13.657 |
| ADC-6 | 0.686 | | 0.093 | 1.943 | 8.646 | | | | 11.368 |
| AD-CH1 | 1.250 | 0.432 | 10.964 | | 4.808 | 6.712 | | | 24.166 |
| AD-CH2 | | 0.457 | 11.559 | | | | | | 12.016 |
| AD-CH3 | | 0.613 | 16.398 | | | 4.587 | 0.163 | | 21.762 |
| AD-CO1 | | 0.045 | 2.973 | 0.312 | | 6.308 | 3.469 | 4.885 | 19.992 |
| AD-CO2 | | 4.367 | 16.725 | 0.607 | | | | | 21.699 |
| AD-M1 | | 0.028 | 11.725 | | | | | | 11.754 |
| AD-N1 | | 3.307 | 0.112 | 0.112 | 11.201 | | 1.727 | 2.583 | 19.041 |
| AD-N2 | | 2.694 | 17.630 | | | | | 2.179 | 22.503 |
| AD-PL1 | 0.037 | | 22.142 | | | | | | 22.179 |
| AD-PL2 | 0.050 | 1.186 | 18.913 | | | | | | 20.149 |
| AD-R1 | 1.105 | 1.138 | 0.587 | | 2.505 | 4.427 | 4.124 | | 13.886 |
| AD-R2 | | | 7.739 | 0.042 | | 0.405 | | | 16.435 |
| AD-T1 | 0.140 | 0.054 | 1.392 | | | | 7.742 | 1.750 | 11.078 |
| AD-T2 | 0.538 | 0.686 | 1.088 | | | | 0.017 | | 2.330 |
| AD-T3 | 0.035 | | | | | | | | 0.035 |
| AD-T4 | 0.645 | | 11.142 | 0.605 | | | | | 12.392 |
| AD-T5 | 0.084 | | 2.501 | 7.477 | | | | | 10.062 |
| AD-T6 | | | | 2.606 | | | | | 2.606 |
| Total | 12.740 | 29.981 | 214.292 | 25.095 | 42.838 | 30.088 | 26.212 | 46.413 | 427.659 |

LEGEND

CSN SEWERAGE NETWORK

- Age
- No data
- Less than 10 years old
- 10 and 15 years
- 16 and 20 years
- 21 and 25 years
- 26 and 30 years
- 31 and 35 years
- Ever 35 years old

STUDY AREA

- DISTRICT BOUNDARY
- DRAINAGE AREA
- ROADS
- GREEN AREA
- BLOCKS
- RIVERS
- COAST

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図2.5.9-7 : 調査対象地域内の無筋コンクリート管の経過年数別の延長