

# งานสำรวจวิศวกรรมฐานราก

บริษัท เนวรัตน์พัฒนาการ จำกัด (มหาชน)

โครงการ

ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด

เขต ทวีวัฒนา กรุงเทพมหานคร

2203-016

ดำเนินการโดย

บริษัท จีไอเทค อินเวสติเกชั่น จำกัด

81 ซอย ลาดพร้าว 71 ถนน ลาดพร้าว แขวงวังทองหลาง เขตวังทองหลาง กรุงเทพมหานคร 10310

โทร (081) 592-0039 โทรสาร (02)530-1495

## บทที่ 4

### ลักษณะสภาพชั้นดิน

จากการทดสอบในสนามโดยวิธีการทดสอบการทะลวงแบบมาตรฐาน (Standard Penetration Test, SPT) การวัดระดับน้ำใต้ดิน จากนั้นนำตัวอย่างที่ได้ไปทำการทดสอบในห้องปฏิบัติการเพื่อหาคุณสมบัติทางกายภาพและทางวิศวกรรมของดิน แล้วจึงนำมาทำการจำแนกชั้นดินตามคุณลักษณะ ซึ่งมีรายละเอียดดังตารางที่ 4.1 ถึงตารางที่ 4.12 สำหรับผลการทดสอบดินในห้องปฏิบัติการและกราฟแสดงลำดับชั้นของดินได้แสดงไว้ใน ภาคผนวก ก บทสรุปผลการทดสอบในห้องปฏิบัติการ ได้แสดงไว้ใน ภาคผนวก ข และภาพถ่ายแสดงการทำงานในสนามได้แสดงไว้ใน ภาคผนวก ค

ตารางที่ 4.1 แสดงการจำแนกชั้นดินตามคุณลักษณะหลุม TIH-1 (หลุมเจาะในน้ำ)

| Layer | Depth (m)   | USCS Group | Description                                                                       | N-value (Blows/Foot) | Su (t/m <sup>2</sup> ) |
|-------|-------------|------------|-----------------------------------------------------------------------------------|----------------------|------------------------|
| 1     | 0.00–5.00   |            | Top Soils and Backfill Materials                                                  |                      |                        |
| 2     | 5.00–12.00  | CH         | Medium stiff to Stiff CLAY; Dark Grey, High plasticity.                           |                      | 2.58 – 9.94            |
| 3     | 12.00–16.50 | CL         | Very stiff to Hard Silty CLAY; Brownish Grey, Low plasticity.                     | 20 - 42              |                        |
| 4     | 16.50–18.00 | SC         | Very dense Clayey Fine to Medium SAND; Brownish Grey, Low plasticity.             | 70                   |                        |
| 5     | 18.00–43.50 | SM         | Very dense Silty Fine to Coarse SAND trace Gravel; Brownish Grey, Non plasticity. | 54 – 50/4”           |                        |
| 6     | 43.50–45.00 | CL         | Hard Silty CLAY; Dark Brown, Low plasticity.                                      | 50/4”                |                        |
| 7     | 45.00–53.38 | SM         | Very dense Silty Fine to Coarse SAND; Brownish Grey, Non plasticity.              | 92 – 50/4”           |                        |

# GEOTECH INVESTIGATION CO., LTD.

## Boring Log

Project : ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด      Depth (m.) : 53.38  
 Location : เขต ทวีวัฒนา จังหวัด กรุงเทพมหานคร      Elev. (MSL) : -1.440

Hole No. : TIH-1      GWL (m.) : -3.00      Date Start : 01/03/2022  
 COORD. : N:1515485.066 E:648887.225      Driller : Yongyuth J.      Date Finish : 06/03/2022

| Description of Material                                                            | Depth (m.) | Sampling No. | Recovery | Graphic Log | xS <sub>u</sub> ( UC )<br>( t/m <sup>2</sup> ) |      |     |     | o NWC<br>+ PL<br>x LL |  |   |  | o Total<br>Unit<br>Weight<br>(t/m <sup>3</sup> ) |     |     |     |
|------------------------------------------------------------------------------------|------------|--------------|----------|-------------|------------------------------------------------|------|-----|-----|-----------------------|--|---|--|--------------------------------------------------|-----|-----|-----|
|                                                                                    |            |              |          |             | 2.0                                            | 4.0  | 6.0 | 8.0 |                       |  |   |  | 0.5                                              | 1.0 | 1.5 | 2.0 |
| Top Soils and<br>Backfill Materials                                                | 1.00       |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 2.00       |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 3.00       |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 4.00       |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 5.00 m.    |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
| Medium stiff to Stiff CLAY ;<br>Dark Grey.<br>( CH )                               | 6.00       | ST-1         |          |             | x                                              | 3.53 |     |     | +                     |  | x |  | 1.5                                              | 4   |     |     |
|                                                                                    | 7.00       | ST-2         |          |             | x                                              | 3.39 |     |     |                       |  |   |  | 1.5                                              | 8   |     |     |
|                                                                                    | 8.00       |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 9.00       | ST-3         |          |             | x                                              | 2.58 |     |     | +                     |  | x |  | 1.6                                              | 6   |     |     |
|                                                                                    | 10.00      | ST-4         |          |             |                                                |      |     |     |                       |  |   |  | 1.6                                              | 9   |     |     |
| Very stiff to Hard Silty<br>CLAY ; Brownish Grey.<br>( CL )                        | 11.00      |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 12.00 m.   | ST-5         |          |             |                                                |      |     |     | +                     |  | x |  | 1.6                                              | 7   |     |     |
|                                                                                    | 13.00      | SS-1         |          |             |                                                |      |     |     |                       |  | x |  | 1.8                                              | 8   |     |     |
|                                                                                    | 14.00      |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 15.00      | SS-2         |          |             |                                                |      |     |     |                       |  |   |  | 1.8                                              | 1   |     |     |
| Very dense Clayey Fine to<br>Medium SAND ; Brownish Grey.<br>( SC )                | 16.00      | SS-3         |          |             |                                                |      |     |     |                       |  | x |  | 1.9                                              | 6   |     |     |
|                                                                                    | 17.00      |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 18.00 m.   | SS-4         |          |             |                                                |      |     |     |                       |  | x |  | 2.0                                              | 2   |     |     |
|                                                                                    |            |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
|                                                                                    | 19.00      | SS-5         |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |
| Very dense Silty Fine to<br>Coarse SAND trace Gravel ;<br>Brownish Grey.<br>( SM ) | 20.00      |              |          |             |                                                |      |     |     |                       |  |   |  |                                                  |     |     |     |

PA=POWER AUGERING

WO = WASH OUT

SS=SPLIT SPOON

GEOLOGIST : Phaokamon T.

HA=HAND AUGERING

ST=SHELBY TUBE

MADE BY KETKANOK T.

**GEOTECH INVESTIGATION CO., LTD.**

## Boring Log

**Project** : ก่อสร้างอุโมงค์ระบายน้ำคลองทวิวัฒนาบริเวณคอขวด

**Depth (m.) : 53.38**

**Location :** เขต ทวีวัฒนา จังหวัด กรุงเทพมหานคร

**Elev. (MSL) : -1.440**

Hole No. :                      TIH-1

**GWL (m.): -3.00**

**Date Start : 01/03/2022**

**COORD. : N:1515485.066 E:648887.22**

**Driller :** Yongyuth J.

**Date Finish : 06/03/2022**

| Description of Material                                                          | Depth (m.) | Sampling No. | Recovery | Graphic Log | xS <sub>u</sub> ( UC )<br>( t/m <sup>2</sup> ) |     |       |        | o + NWC<br>x PL LL |                     |  |  | o Total Unit Weight  |     |                          |     |  |  |  |
|----------------------------------------------------------------------------------|------------|--------------|----------|-------------|------------------------------------------------|-----|-------|--------|--------------------|---------------------|--|--|----------------------|-----|--------------------------|-----|--|--|--|
|                                                                                  |            |              |          |             |                                                |     |       |        | ( % )              |                     |  |  | ( t/m <sup>3</sup> ) |     |                          |     |  |  |  |
|                                                                                  |            |              |          |             | 2.0                                            | 4.0 | 6.0   | 8.0    |                    |                     |  |  | 0.5                  | 1.0 | 1.5                      | 2.0 |  |  |  |
| Very dense Silty Fine to Coarse SAND trace Gravel ; Brownish Grey.<br><br>( SM ) | 21.00      | SS-6         |          |             |                                                |     |       | 54     |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 22.00      | SS-7         |          |             |                                                |     |       | 61     |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 23.00      |              |          |             |                                                |     |       |        |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 24.00      | SS-8         |          |             |                                                |     |       | 65     |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 25.00      | SS-9         |          |             |                                                |     |       | 86     |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 26.00      |              |          |             |                                                |     |       |        |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 27.00      | SS-10        |          |             |                                                |     |       | 80     |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 28.00      | SS-11        |          |             |                                                |     |       | 98/11" |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 29.00      |              |          |             |                                                |     |       |        |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 30.00      | SS-12        |          |             |                                                |     |       | 96/11" |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 31.00      | SS-13        |          |             |                                                |     |       | 97/11" |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 32.00      |              |          |             |                                                |     |       |        |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 33.00      | SS-14        |          |             |                                                |     |       | 98/10" |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 34.00      | SS-15        |          |             |                                                |     |       | 50/4"  |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 35.00      |              |          |             |                                                |     |       |        |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 36.00      | SS-16        |          |             |                                                |     |       | 95     |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 37.00      | SS-17        |          |             |                                                |     |       | 50/5"  |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 38.00      |              |          |             |                                                |     |       |        |                    |                     |  |  |                      |     |                          |     |  |  |  |
|                                                                                  | 39.00      | SS-18        |          |             |                                                |     |       | 50/4"  |                    |                     |  |  |                      |     |                          |     |  |  |  |
| 40.00                                                                            | SS-19      |              |          |             |                                                |     | 50/4" |        |                    |                     |  |  |                      |     |                          |     |  |  |  |
| PA=POWER AUGERING                                                                |            |              |          |             | WO = WASH OUT                                  |     |       |        |                    | SS=SPLIT SPOON      |  |  |                      |     | GEOLOGIST : Phaokamon T. |     |  |  |  |
| HA=HAND AUGERING                                                                 |            |              |          |             | ST=SHELBY TUBE                                 |     |       |        |                    | MADE BY KETKANOK T. |  |  |                      |     |                          |     |  |  |  |

GEOTECH INVESTIGATION CO., LTD.

Boring Log

Project : ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด      Depth (m.) : 53.38  
Location : เขต ทวีวัฒนา จังหวัด กรุงเทพมหานคร      Elev. (MSL) : -1.440

Hole No. : TIH-1      GWL (m.): -3.00      Date Start : 01/03/2022  
COORD. : N:1515485.066 E:648887.225      Driller : Yongyuth J.      Date Finish : 06/03/2022

| Description of Material                                                                  | Depth (m.) | Sampling No. | Recovery | Graphic Log | xS <sub>u</sub> ( UC )<br>( t/m <sup>2</sup> ) |     |     |     | o NWC<br>+ PL<br>x LL |    |    |    | o Total<br>Unit<br>Weight<br>(t/m <sup>3</sup> ) |     |     |     |
|------------------------------------------------------------------------------------------|------------|--------------|----------|-------------|------------------------------------------------|-----|-----|-----|-----------------------|----|----|----|--------------------------------------------------|-----|-----|-----|
|                                                                                          |            |              |          |             | 2.0                                            | 4.0 | 6.0 | 8.0 |                       |    |    |    |                                                  |     |     |     |
|                                                                                          |            |              |          |             | 0 SPT-N                                        |     |     |     | ( % )                 |    |    |    |                                                  |     |     |     |
|                                                                                          |            |              |          |             | 10                                             | 20  | 30  | 40  | 20                    | 40 | 60 | 80 | 0.5                                              | 1.0 | 1.5 | 2.0 |
| Very dense Silty Fine to Coarse SAND trace Gravel ; Brownish Grey.<br>( SM )<br>43.50 m. | 41.00      | SS-20        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 42.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 43.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
| Hard Silty CLAY ; Dark Brown<br>( CL ) 45.00 m.                                          | 44.00      | SS-22        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 45.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 46.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
| Very dense Silty Fine to Coarse SAND ; Brownish Grey.<br>( SM )<br>53.38 m.              | 47.00      | SS-23        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 48.00      | SS-24        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 49.00      | SS-25        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 50.00      | SS-26        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 51.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 52.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 53.00      | SS-27        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 54.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 55.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 56.00      | SS-28        |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
| End of Boring                                                                            | 57.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 58.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 59.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |
|                                                                                          | 60.00      |              |          |             |                                                |     |     |     |                       |    |    |    |                                                  |     |     |     |

PA=POWER AUGERING

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HA=HAND AUGERING

ST=SHELBY TUBE

MADE BY KETKANOK T.

GEOLOGIST : Phaokamon T.

# GEOTECH INVESTIGATION CO., LTD.

| SUMMARY OF TEST RESULTS                                  |                          |       |            |                         |       |       | Hole No.                      |     | TIH-1    |      | Tested By   |                                          | P.Jariya                    |                                       |      |                  |
|----------------------------------------------------------|--------------------------|-------|------------|-------------------------|-------|-------|-------------------------------|-----|----------|------|-------------|------------------------------------------|-----------------------------|---------------------------------------|------|------------------|
| Project   ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด |                          |       |            |                         |       |       | Total Depth (ม.)              |     | 53.38    |      | Tested Date |                                          | 13-18/04/2022               |                                       |      |                  |
|                                                          |                          |       |            |                         |       |       | GWL (ม.)                      |     | -3.00    |      | Checked By  |                                          | L.MANOCH                    |                                       |      |                  |
| Location   เขต ทวีวัฒนา   จังหวัด กรุงเทพมหานคร          |                          |       |            |                         |       |       | Project No.                   |     | 2203-016 |      | Check Date  |                                          | 19/04/2022                  |                                       |      |                  |
| Sample No.                                               | Interval of Depth ( m. ) |       | USCS Group | Atterberg's Limit ( % ) |       |       | Gradation ( % Passing Sieve ) |     |          |      |             | Total Unit Weight ( t / m <sup>3</sup> ) | Natural Water Content ( % ) | S <sub>u</sub> ( t / m <sup>2</sup> ) |      | SPT-N (blows/ft) |
|                                                          | From                     | To    |            | LL                      | PL    | PI    | #4                            | #10 | #40      | #100 | #200        |                                          |                             | PP                                    | UC   |                  |
|                                                          |                          |       |            |                         |       |       |                               |     |          |      |             |                                          |                             |                                       |      |                  |
| ST-1                                                     | 5.00                     | 5.50  | CH         | 93.10                   | 36.30 | 56.80 | 100                           | 100 | 99       | 98   | 96          | 1.54                                     | 90.63                       |                                       | 3.53 |                  |
| ST-2                                                     | 6.50                     | 7.00  | CH         |                         |       |       |                               |     |          |      |             | 1.58                                     | 77.14                       |                                       | 3.39 |                  |
| ST-3                                                     | 8.00                     | 8.50  | CH         | 74.30                   | 33.40 | 40.90 | 100                           | 100 | 99       | 96   | 92          | 1.66                                     | 66.77                       |                                       | 2.58 |                  |
| ST-4                                                     | 9.50                     | 10.00 | CH         |                         |       |       |                               |     |          |      |             | 1.69                                     | 55.81                       |                                       | 6.18 |                  |
| ST-5                                                     | 11.00                    | 11.50 | CH         | 84.90                   | 34.40 | 50.50 | 100                           | 100 | 99       | 97   | 96          | 1.67                                     | 57.45                       |                                       | 9.94 |                  |
| SS-1                                                     | 12.50                    | 12.95 | CL         | 39.90                   | 22.20 | 17.70 | 100                           | 100 | 99       | 93   | 90          | 1.88                                     | 19.80                       |                                       |      | 20               |
| SS-2                                                     | 14.00                    | 14.45 | CL         |                         |       |       |                               |     |          |      |             | 1.81                                     | 25.00                       |                                       |      | 23               |
| SS-3                                                     | 15.50                    | 15.95 | CL         | 38.50                   | 20.50 | 18.00 | 100                           | 100 | 99       | 96   | 91          | 1.96                                     | 23.53                       |                                       |      | 42               |
| SS-4                                                     | 17.00                    | 17.45 | SC         | 35.10                   | 17.30 | 17.80 | 100                           | 100 | 98       | 81   | 46          | 2.02                                     | 22.35                       |                                       |      | 70               |
| SS-5                                                     | 18.50                    | 18.75 | SM         | ---                     | NP    | ---   | 100                           | 98  | 83       | 44   | 15          |                                          | 13.33                       |                                       |      | 50/4"            |
| SS-6                                                     | 20.00                    | 20.45 | SM         | ---                     | NP    | ---   | 100                           | 98  | 88       | 43   | 16          |                                          | 20.69                       |                                       |      | 54               |
| SS-7                                                     | 21.50                    | 21.95 | SM         |                         |       |       |                               |     |          |      |             |                                          | 21.95                       |                                       |      | 61               |
| SS-8                                                     | 23.00                    | 23.45 | SM         | ---                     | NP    | ---   | 100                           | 97  | 72       | 39   | 18          |                                          | 21.25                       |                                       |      | 65               |
| SS-9                                                     | 24.50                    | 24.95 | SM         |                         |       |       |                               |     |          |      |             |                                          | 24.05                       |                                       |      | 86               |
| SS-10                                                    | 26.00                    | 26.45 | SM         | ---                     | NP    | ---   | 99                            | 92  | 61       | 35   | 17          |                                          | 24.36                       |                                       |      | 80               |

# GEOTECH INVESTIGATION CO., LTD.

| SUMMARY OF TEST RESULTS                                  |                                        |       |                   |                                       |       |       | Hole No.                                 |     | TIH-1    |      | Tested By   |                                                   | P.Jariya                                         |                                      |    |                             |
|----------------------------------------------------------|----------------------------------------|-------|-------------------|---------------------------------------|-------|-------|------------------------------------------|-----|----------|------|-------------|---------------------------------------------------|--------------------------------------------------|--------------------------------------|----|-----------------------------|
| Project   ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด |                                        |       |                   |                                       |       |       | Total Depth (m.)                         |     | 53.38    |      | Tested Date |                                                   | 13-18/04/2022                                    |                                      |    |                             |
|                                                          |                                        |       |                   |                                       |       |       | GWL (m.)                                 |     | -3.00    |      | Checked By  |                                                   | L.MANOCH                                         |                                      |    |                             |
| Location   เขต ทวีวัฒนา   จังหวัด กรุงเทพมหานคร          |                                        |       |                   |                                       |       |       | Project No.                              |     | 2203-016 |      | Check Date  |                                                   | 19/04/2022                                       |                                      |    |                             |
| Sample<br><br>No.                                        | Interval<br><br>of Depth<br><br>( m. ) |       | USCS<br><br>Group | Atterberg's<br><br>Limit<br><br>( % ) |       |       | Gradation<br><br><br>( % Passing Sieve ) |     |          |      |             | Total<br><br>Unit<br><br>Weight<br><br>( t / m³ ) | Natural<br><br>Water<br><br>Content<br><br>( % ) | S <sub>u</sub><br><br><br>( t / m² ) |    | SPT-N<br><br><br>(blows/ft) |
|                                                          | From                                   | To    |                   | LL                                    | PL    | PI    | #4                                       | #10 | #40      | #100 | #200        |                                                   |                                                  | PP                                   | UC |                             |
|                                                          |                                        |       |                   |                                       |       |       |                                          |     |          |      |             |                                                   |                                                  |                                      |    |                             |
| SS-11                                                    | 27.50                                  | 27.93 | SM                |                                       |       |       |                                          |     |          |      |             |                                                   | 19.10                                            |                                      |    | 98/11"                      |
| SS-12                                                    | 29.00                                  | 29.43 | SM                | ---                                   | NP    | ---   | 100                                      | 99  | 91       | 40   | 20          |                                                   | 23.46                                            |                                      |    | 96/11"                      |
| SS-13                                                    | 30.50                                  | 30.93 | SM                |                                       |       |       |                                          |     |          |      |             |                                                   | 22.97                                            |                                      |    | 97/11"                      |
| SS-14                                                    | 32.00                                  | 32.40 | SM                | ---                                   | NP    | ---   | 98                                       | 84  | 59       | 28   | 16          |                                                   | 15.19                                            |                                      |    | 98/10"                      |
| SS-15                                                    | 33.50                                  | 33.75 | SM                |                                       |       |       |                                          |     |          |      |             |                                                   | 11.34                                            |                                      |    | 50/4"                       |
| SS-16                                                    | 35.00                                  | 35.45 | SM                | ---                                   | NP    | ---   | 97                                       | 76  | 39       | 24   | 16          |                                                   | 17.71                                            |                                      |    | 95                          |
| SS-17                                                    | 36.50                                  | 36.78 | SM                | ---                                   | NP    | ---   | 98                                       | 86  | 50       | 29   | 16          |                                                   | 14.14                                            |                                      |    | 50/5"                       |
| SS-18                                                    | 38.00                                  | 38.25 | SM                |                                       |       |       |                                          |     |          |      |             |                                                   | 15.56                                            |                                      |    | 50/4"                       |
| SS-19                                                    | 39.50                                  | 39.75 | SM                | ---                                   | NP    | ---   | 100                                      | 96  | 54       | 34   | 16          |                                                   | 14.46                                            |                                      |    | 50/4"                       |
| SS-20                                                    | 41.00                                  | 41.38 | SM                |                                       |       |       |                                          |     |          |      |             |                                                   | 14.71                                            |                                      |    | 98/9"                       |
| SS-21                                                    | 42.50                                  | 42.78 | SM                | ---                                   | NP    | ---   | 100                                      | 93  | 58       | 33   | 19          |                                                   | 13.25                                            |                                      |    | 50/5"                       |
| SS-22                                                    | 44.00                                  | 44.25 | CL                | 37.40                                 | 19.30 | 18.10 | 100                                      | 100 | 99       | 92   | 87          | 1.91                                              | 23.71                                            |                                      |    | 50/4"                       |
| SS-23                                                    | 45.50                                  | 45.75 | SM                | ---                                   | NP    | ---   | 100                                      | 95  | 52       | 28   | 17          |                                                   | 9.78                                             |                                      |    | 50/4"                       |
| SS-24                                                    | 47.00                                  | 47.28 | SM                |                                       |       |       |                                          |     |          |      |             |                                                   | 18.18                                            |                                      |    | 50/5"                       |
| SS-25                                                    | 48.50                                  | 48.78 | SM                | ---                                   | NP    | ---   | 100                                      | 93  | 55       | 28   | 18          |                                                   | 17.20                                            |                                      |    | 50/5"                       |

**GEOTECH INVESTIGATION CO., LTD.**

## SUMMARY OF TEST RESULTS

Hole No. TIH-1

|           |          |
|-----------|----------|
| Tested By | P.Jariya |
|-----------|----------|

|                  |       |
|------------------|-------|
| Total Depth (m.) | 53.38 |
|------------------|-------|

|                    |                      |
|--------------------|----------------------|
| <b>Tested Date</b> | <b>13-18/04/2022</b> |
|--------------------|----------------------|

**GWL (m.) -3.00**

Checked By L.MANOCH

Project No. 2203-016

|            |            |
|------------|------------|
| Check Date | 19/04/2022 |
|------------|------------|

**Project**   ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด

**Location** เขต ทวีวัฒนา จังหวัด กรุงเทพมหานคร

[illegible]



# CONCLUSION OF LABORATORY TESTS

Project : ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด เขต ทวีวัฒนา จังหวัด กรุงเทพมหานคร

Boring No. : TIH-1

| Sample no. | Depth(m.)    |               | USCS Group | Sample diameter(cm.) | Sample height(cm.) | Sample volume(cm <sup>3</sup> .) | Wet soil+Container(gm.) | Dry Soil+Container(gm.) | Container (gm.) | Unit weight (t/m <sup>3</sup> .) | Natural water content (%) | Atterberg's   |                     |       | Natural Void Ratio | Degree of Saturation (%) | Grain Size Analysis |      |      |    |    |
|------------|--------------|---------------|------------|----------------------|--------------------|----------------------------------|-------------------------|-------------------------|-----------------|----------------------------------|---------------------------|---------------|---------------------|-------|--------------------|--------------------------|---------------------|------|------|----|----|
|            |              |               |            |                      |                    |                                  |                         |                         |                 |                                  |                           | Limit (%)     |                     |       |                    |                          |                     |      |      |    |    |
|            | Liquid limit | Plastic limit |            |                      |                    |                                  |                         |                         |                 |                                  |                           | Plastic index | ( % Passing Sieve ) |       |                    |                          |                     |      |      |    |    |
|            |              |               |            |                      |                    |                                  |                         |                         |                 |                                  |                           |               | #4                  | #10   |                    |                          | #40                 | #100 | #200 |    |    |
| ST-1       | 5.00         | 5.50          | CH         | 7.0                  | 16.5               | 634.67                           | 989.00                  | 524.05                  | 11.0            | 1.54                             | 90.63                     | 93.10         | 36.30               | 56.80 | 2.41               | 100.00                   | 100                 | 100  | 99   | 98 | 96 |
| ST-2       | 6.50         | 7.00          | CH         | 7.0                  | 16.5               | 634.67                           | 1015.00                 | 577.34                  | 10.0            | 1.58                             | 77.14                     |               |                     |       | 2.05               | 100.00                   |                     |      |      |    |    |
| ST-3       | 8.00         | 8.50          | CH         | 7.0                  | 16.4               | 630.83                           | 1059.00                 | 644.80                  | 12.0            | 1.66                             | 66.77                     | 74.30         | 33.40               | 40.90 | 1.74               | 100.00                   | 100                 | 100  | 99   | 96 | 92 |
| ST-4       | 9.50         | 10.00         | CH         | 7.0                  | 17.9               | 688.52                           | 1172.00                 | 755.76                  | 10.0            | 1.69                             | 55.81                     |               |                     |       | 1.48               | 100.00                   |                     |      |      |    |    |
| ST-5       | 11.00        | 11.50         | CH         | 7.0                  | 18.4               | 707.76                           | 1197.00                 | 764.27                  | 11.0            | 1.67                             | 57.45                     | 84.90         | 34.40               | 50.50 | 1.53               | 100.00                   | 100                 | 100  | 99   | 97 | 96 |
| SS-1       | 12.50        | 12.95         | CL         | 3.4                  | 15.6               | 141.56                           | 278.00                  | 234.03                  | 12.0            | 1.88                             | 19.80                     | 39.90         | 22.20               | 17.70 | 0.70               | 75.68                    | 100                 | 100  | 99   | 93 | 90 |
| SS-2       | 14.00        | 14.45         | CL         | 3.4                  | 10.3               | 93.47                            | 180.00                  | 146.20                  | 11.0            | 1.81                             | 25.00                     |               |                     |       | 0.84               | 79.27                    |                     |      |      |    |    |
| SS-3       | 15.50        | 15.95         | CL         | 3.4                  | 7.8                | 70.78                            | 152.00                  | 125.52                  | 13.0            | 1.96                             | 23.53                     | 38.50         | 20.50               | 18.00 | 0.67               | 92.97                    | 100                 | 100  | 99   | 96 | 91 |
| SS-4       | 17.00        | 17.45         | SC         | 3.4                  | 12.8               | 116.15                           | 246.00                  | 203.07                  | 11.0            | 2.02                             | 22.35                     | 35.10         | 17.30               | 17.80 | 0.61               | 97.69                    | 100                 | 100  | 98   | 81 | 46 |
| SS-5       | 18.50        | 18.75         | SM         | 3.4                  |                    |                                  | 113.00                  | 101.00                  | 11.0            |                                  | 13.33                     | ---           | NP                  | ---   |                    |                          | 100                 | 98   | 83   | 44 | 15 |
| SS-6       | 20.00        | 20.45         | SM         | 3.4                  |                    |                                  | 116.00                  | 98.00                   | 11.0            |                                  | 20.69                     | ---           | NP                  | ---   |                    |                          | 100                 | 98   | 88   | 43 | 16 |
| SS-7       | 21.50        | 21.95         | SM         | 3.4                  |                    |                                  | 110.00                  | 92.00                   | 10.0            |                                  | 21.95                     |               |                     |       |                    |                          |                     |      |      |    |    |
| SS-8       | 23.00        | 23.45         | SM         | 3.4                  |                    |                                  | 108.00                  | 91.00                   | 11.0            |                                  | 21.25                     | ---           | NP                  | ---   |                    |                          | 100                 | 97   | 72   | 39 | 18 |
| SS-9       | 24.50        | 24.95         | SM         | 3.4                  |                    |                                  | 108.00                  | 89.00                   | 10.0            |                                  | 24.05                     |               |                     |       |                    |                          |                     |      |      |    |    |
| SS-10      | 26.00        | 26.45         | SM         | 3.4                  |                    |                                  | 108.00                  | 89.00                   | 11.0            |                                  | 24.36                     | ---           | NP                  | ---   |                    |                          | 99                  | 92   | 61   | 35 | 17 |

| Sample no. | Depth(m.) |       | USCS Group | Sample diameter(cm.) | Sample height(cm.) | Sample volume(cm <sup>3</sup> .) | Wet soil+Container(gm.) | Dry Soil+Container(gm.) | Container (gm.) | Unit weight (t/m <sup>3</sup> .) | Natural water content (%) | Atterberg's  |               |               | Natural Void Ratio | Degree of Saturation (%) | Grain Size Analysis |     |     |      |      |  |
|------------|-----------|-------|------------|----------------------|--------------------|----------------------------------|-------------------------|-------------------------|-----------------|----------------------------------|---------------------------|--------------|---------------|---------------|--------------------|--------------------------|---------------------|-----|-----|------|------|--|
|            |           |       |            |                      |                    |                                  |                         |                         |                 |                                  |                           | Limit (%)    |               |               |                    |                          | ( % Passing Sieve ) |     |     |      |      |  |
|            | From      | To    |            |                      |                    |                                  |                         |                         |                 |                                  |                           | Liquid limit | Plastic limit | Plastic index |                    |                          | #4                  | #10 | #40 | #100 | #200 |  |
| SS-11      | 27.50     | 27.93 | SM         | 3.4                  | 11.7               | 106.17                           | 117.00                  | 100.00                  | 11.0            | 1.91                             | 19.10                     | ---          | NP            | ---           | 0.72               | 87.47                    | 100                 | 99  | 91  | 40   | 20   |  |
| SS-12      | 29.00     | 29.43 | SM         | 3.4                  |                    |                                  | 110.00                  | 91.00                   | 10.0            |                                  | 23.46                     |              |               |               |                    |                          | 98                  | 84  | 59  | 28   | 16   |  |
| SS-13      | 30.50     | 30.93 | SM         | 3.4                  |                    |                                  | 101.00                  | 84.00                   | 10.0            |                                  | 22.97                     |              |               |               |                    |                          | 97                  | 76  | 39  | 24   | 16   |  |
| SS-14      | 32.00     | 32.40 | SM         | 3.4                  |                    |                                  | 102.00                  | 90.00                   | 11.0            |                                  | 15.19                     |              |               |               |                    |                          | 98                  | 86  | 50  | 29   | 16   |  |
| SS-15      | 33.50     | 33.75 | SM         | 3.4                  |                    |                                  | 119.00                  | 108.00                  | 11.0            |                                  | 11.34                     |              |               |               |                    |                          | 100                 | 96  | 54  | 34   | 16   |  |
| SS-16      | 35.00     | 35.45 | SM         | 3.4                  |                    |                                  | 123.00                  | 106.00                  | 10.0            |                                  | 17.71                     |              |               |               |                    |                          | 100                 | 93  | 58  | 33   | 19   |  |
| SS-17      | 36.50     | 36.78 | SM         | 3.4                  |                    |                                  | 124.00                  | 110.00                  | 11.0            |                                  | 14.14                     |              |               |               |                    |                          | 100                 | 100 | 99  | 92   | 87   |  |
| SS-18      | 38.00     | 38.25 | SM         | 3.4                  |                    |                                  | 115.00                  | 101.00                  | 11.0            |                                  | 15.56                     |              |               |               |                    |                          | 100                 | 95  | 52  | 28   | 17   |  |
| SS-19      | 39.50     | 39.75 | SM         | 3.4                  |                    |                                  | 106.00                  | 94.00                   | 11.0            |                                  | 14.46                     |              |               |               |                    |                          | 100                 | 93  | 55  | 28   | 18   |  |
| SS-20      | 41.00     | 41.38 | SM         | 3.4                  |                    |                                  | 128.00                  | 113.00                  | 11.0            |                                  | 14.71                     |              |               |               |                    |                          | 100                 | 89  | 44  | 26   | 16   |  |
| SS-21      | 42.50     | 42.78 | SM         | 3.4                  |                    |                                  | 105.00                  | 94.00                   | 11.0            |                                  | 13.25                     |              | NP            | ---           |                    |                          | 100                 | 91  | 49  | 28   | 17   |  |
| SS-22      | 44.00     | 44.25 | CL         | 3.4                  |                    |                                  | 214.00                  | 175.09                  | 11.0            |                                  | 23.71                     |              |               |               |                    |                          |                     |     |     |      |      |  |
| SS-23      | 45.50     | 45.75 | SM         | 3.4                  |                    |                                  | 111.00                  | 102.00                  | 10.0            |                                  | 9.78                      |              |               |               |                    |                          |                     |     |     |      |      |  |
| SS-24      | 47.00     | 47.28 | SM         | 3.4                  |                    |                                  | 129.00                  | 111.00                  | 12.0            |                                  | 18.18                     |              |               |               |                    |                          |                     |     |     |      |      |  |
| SS-25      | 48.50     | 48.78 | SM         | 3.4                  |                    |                                  | 120.00                  | 104.00                  | 11.0            |                                  | 17.20                     |              |               |               |                    |                          |                     |     |     |      |      |  |
| SS-26      | 50.00     | 50.38 | SM         | 3.4                  |                    |                                  | 115.00                  | 98.00                   | 11.0            |                                  | 19.54                     |              |               |               |                    |                          |                     |     |     |      |      |  |
| SS-27      | 51.50     | 51.95 | SM         | 3.4                  |                    |                                  | 115.00                  | 99.00                   | 11.0            |                                  | 18.18                     |              |               |               |                    |                          |                     |     |     |      |      |  |
| SS-28      | 53.00     | 53.38 | SM         | 3.4                  |                    |                                  | 123.00                  | 103.00                  | 11.0            |                                  | 21.74                     |              |               |               |                    |                          |                     |     |     |      |      |  |

# GIn

GEOTECH INVESTIGATION CORPORATION LTD.

## UNCONFINED COMPRESSION TEST

Project : ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด

Boring No. : TIH-1

Location : เขต ทวีวัฒนา จังหวัด กรุงเทพมหานคร

Report No. : 2203-016

Soil type : CLAY

GWL. (m.) : -3.00

Test by : P.Jariya

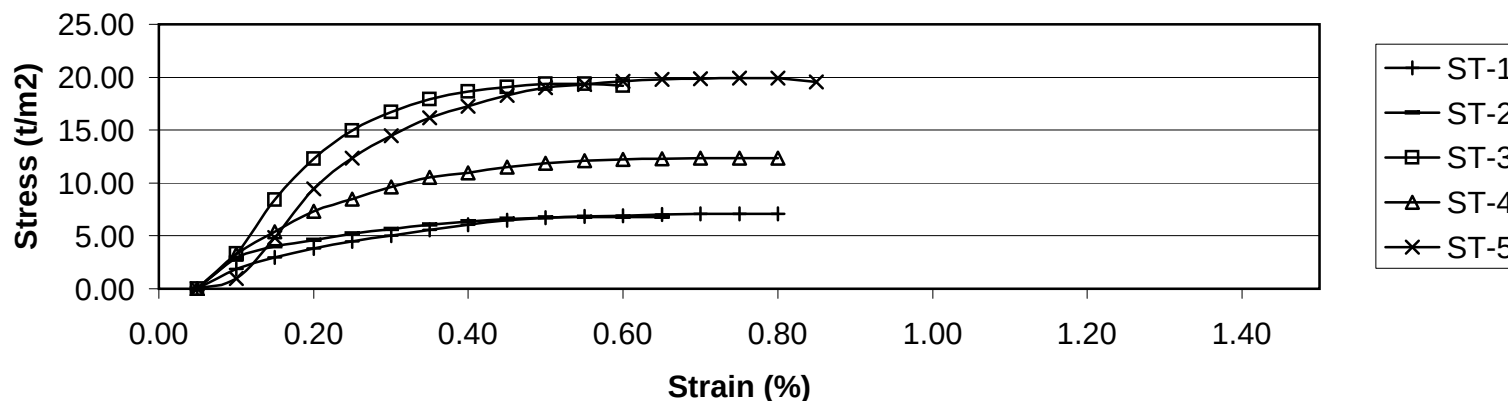
Date : 13-18/04/2022

Checked by : L.MANOCH

Load Scale, K : 0.0027 kN/div

| Sample depth (m.)                | 5.00-5.50 | 6.50-7.00 | 8.00-8.50 | 9.50-10.00 | 11.00-11.50 |  |  |  |  |
|----------------------------------|-----------|-----------|-----------|------------|-------------|--|--|--|--|
| Sample diamter(cm.)              | 3.90      | 3.90      | 3.90      | 3.90       | 3.90        |  |  |  |  |
| Sample height(cm.)               | 8.00      | 8.00      | 8.00      | 8.00       | 8.00        |  |  |  |  |
| Sample area(cm <sup>2</sup> .)   | 11.95     | 11.95     | 11.95     | 11.95      | 11.95       |  |  |  |  |
| Sample volume(cm <sup>3</sup> .) | 95.57     | 95.57     | 95.57     | 95.57      | 95.57       |  |  |  |  |
| Moisture Content (%)             | 90.63     | 77.14     | 66.77     | 55.81      | 57.45       |  |  |  |  |
| Unit weight (t/m <sup>3</sup> )  | 1.54      | 1.58      | 1.66      | 1.69       | 1.67        |  |  |  |  |
| Sample No.                       | ST-1      | ST-2      | ST-3      | ST-4       | ST-5        |  |  |  |  |
| qu (t/m <sup>2</sup> )           | 7.07      | 6.78      | 5.16      | 12.37      | 19.91       |  |  |  |  |

Stress - strain curve



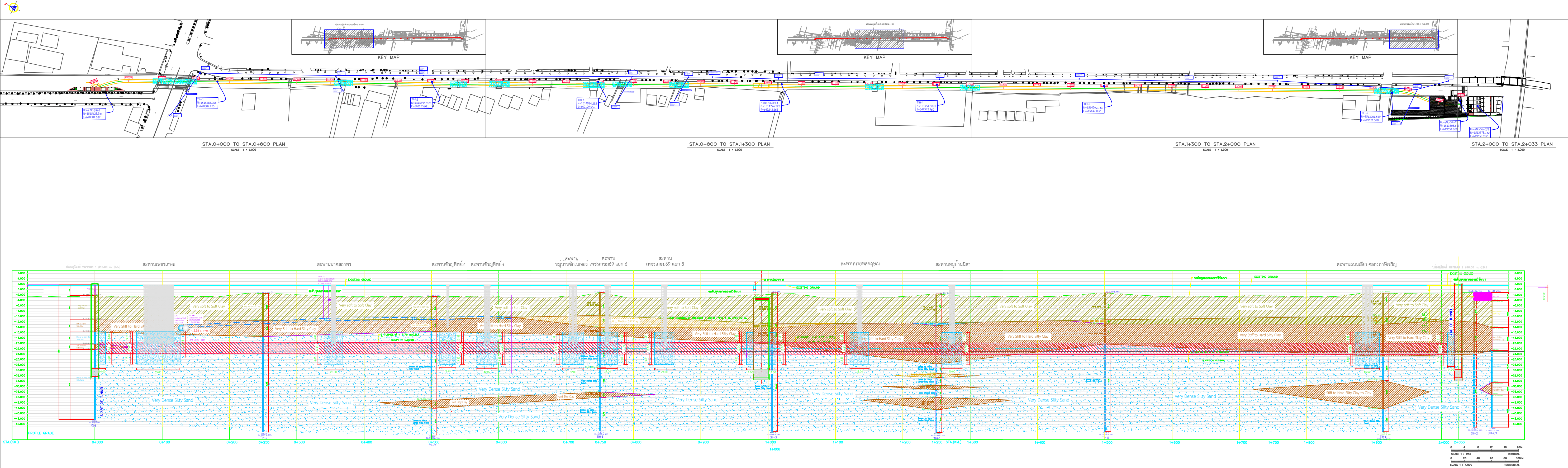


## ภาพถ่ายแสดงการเจาะสำรวจ หลุมเจาะ TIH-1

โครงการ ก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด

เขต ทวีวัฒนา จังหวัด กรุงเทพมหานคร

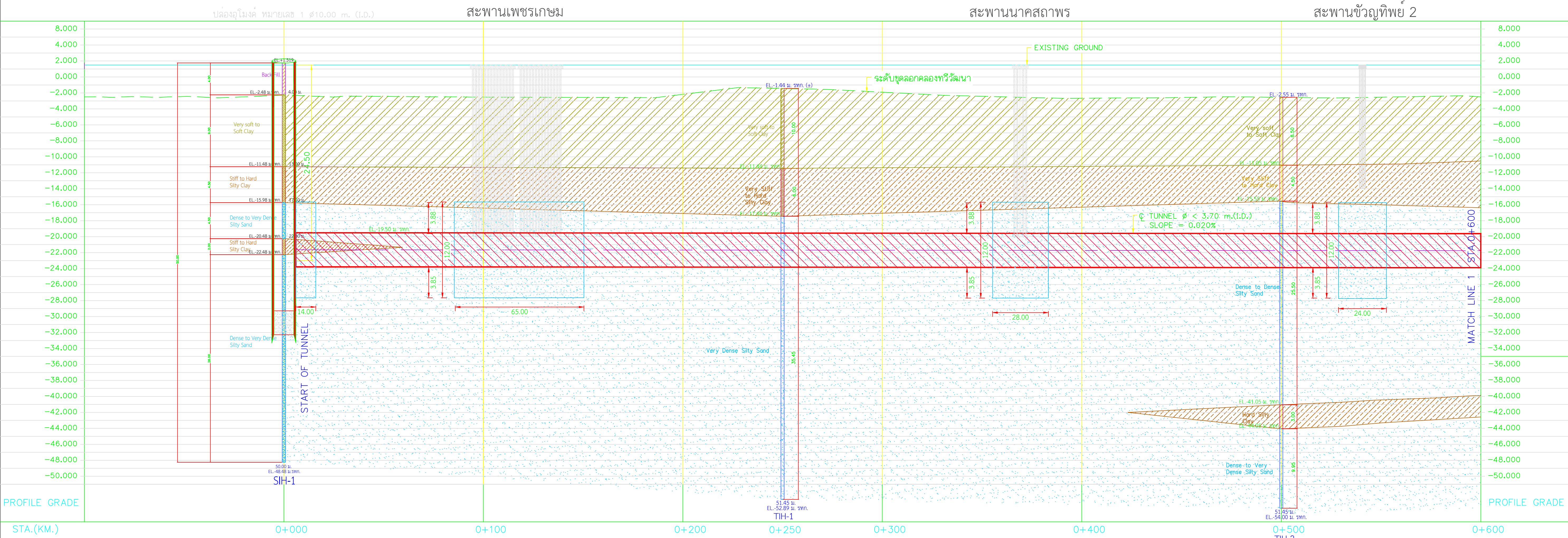
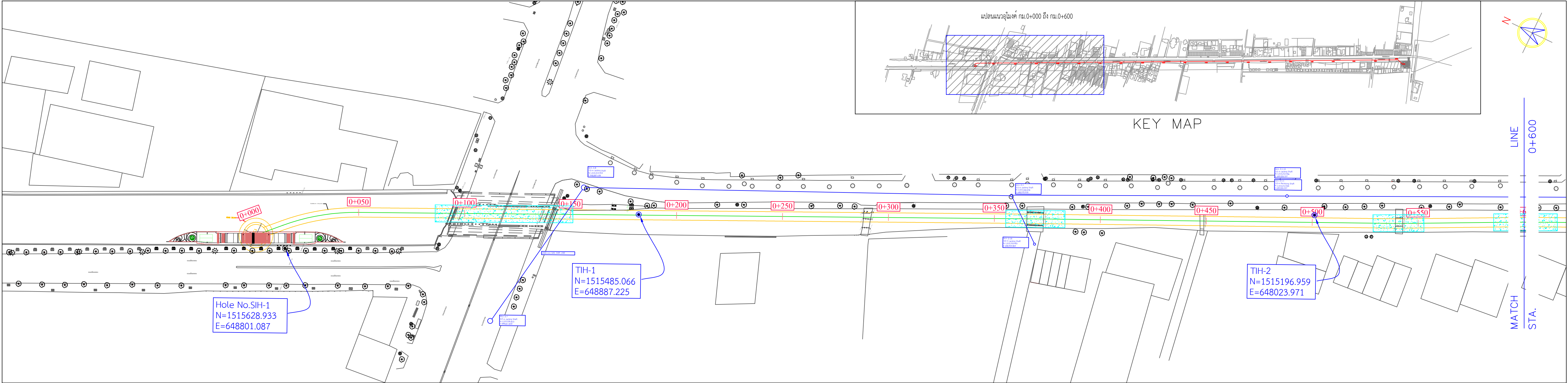




SOIL PROFILE ALONG TUNNEL ALIGNMENT (STA.0+000 TO STA.2+2033)  
แสดงระดับหลังคาอุโมงค์ระบายน้ำ ที่ระดับ -23.00 ม. รทก. & สะพาน 10 แห่ง + ขอบเขต Ground Improvment

|                                                                                                                       |                                                                                                                                                                                                                                       |                                                                                                |             |                             |          |        |                                                            |         |                                                       |                                     |             |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------|-----------------------------|----------|--------|------------------------------------------------------------|---------|-------------------------------------------------------|-------------------------------------|-------------|
| เจ้าของโครงการ :                                                                                                      | บริษัทที่ปรึกษา :                                                                                                                                                                                                                     | ผู้รับจ้าง:                                                                                    | ผู้เขียนแบบ | (สมิлян วงษ์ข่มภู)          | ครั้งที่ | วันที่ | รายการแก้ไข                                                | ตรวจสอบ | โครงการก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด |                                     |             |
| <br>สำนักงานระบายน้ำ กรุงเทพมหานคร | <br>PANYA CONSULTANTS<br>Create the Better<br><br>PC MANAGEMENT | <br>NAWARAT | ผู้ตรวจสอบ  | (ชลิิด กระเชิด)             |          |        | ย้ายระดับหลังคาอุโมงค์จาก -23.00 ม.รทก. เป็น -19.50 ม.รทก. |         | มาตราส่วน : 1:3000                                    | SOIL PROFILE ALONG TUNNEL ALIGNMENT |             |
|                                                                                                                       |                                                                                                                                                                                                                                       |                                                                                                | ผู้อนุมัติ  | (ชนพัฒน์ กิตติโชติเจริญกิจ) |          |        |                                                            |         | หน่วย : เมตร                                          |                                     |             |
|                                                                                                                       |                                                                                                                                                                                                                                       |                                                                                                |             |                             |          |        |                                                            |         | วันที่ : 23/05/2565                                   | แบบเลขที่ : TWN-301-02-2.3          | แผ่นที่ : 1 |





SCALE V = 1 : 250  
H = 1 : 1,000

|                                                                                                                       |                                                                                                                                                                                                                                       |                                                                                                |             |                             |          |            |                                                            |         |                                                       |                                     |             |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-------------|-----------------------------|----------|------------|------------------------------------------------------------|---------|-------------------------------------------------------|-------------------------------------|-------------|
| เจ้าของโครงการ :                                                                                                      | บริษัทที่ปรึกษา :                                                                                                                                                                                                                     | ผู้รับจ้าง :                                                                                   | ผู้เขียนแบบ | (สมิฉัน วงษ์ข่มขู)          | ครั้งที่ | วันที่     | รายการแก้ไข                                                | ตรวจสอบ | โครงการก่อสร้างอุโมงค์ระบายน้ำคลองทวีวัฒนาบริเวณคอขวด |                                     |             |
| <br>สำนักงานระบายน้ำ กรุงเทพมหานคร | <br>PANYA CONSULTANTS<br>Create the Better<br><br>PC MANAGEMENT | <br>NAWARAT | ผู้ตรวจสอบ  | (ชลิศ กระซิด)               | 1        | 27/04/2565 | ย้ายระดับหลังคาอุโมงค์จาก -23.00 ม.รทก. เป็น -19.50 ม.รทก. |         | มาตราส่วน : 1:1000                                    | SOIL PROFILE STA.0+000 TO STA.0+600 |             |
|                                                                                                                       |                                                                                                                                                                                                                                       |                                                                                                | ผู้อนุมัติ  | (ชนพัฒน์ กิตติโชติเจริญกิจ) |          |            |                                                            |         | หน่วย : เมตร                                          |                                     |             |
|                                                                                                                       |                                                                                                                                                                                                                                       |                                                                                                |             |                             |          |            |                                                            |         | วันที่ : 23/05/2565                                   | แบบเลขที่ : TWN-301-02-2.3          | แผ่นที่ : 2 |