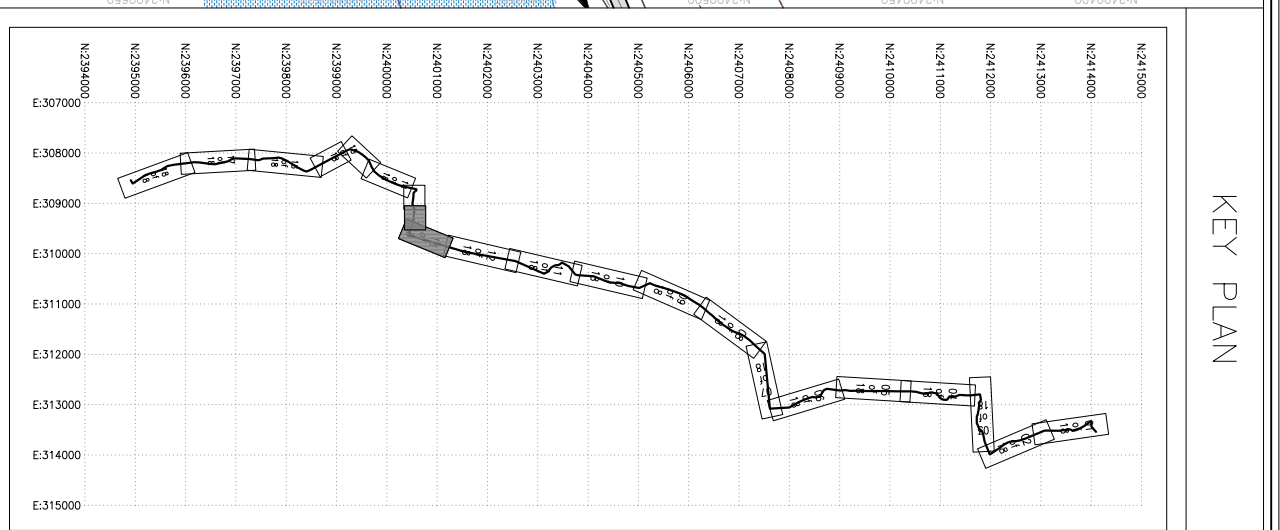
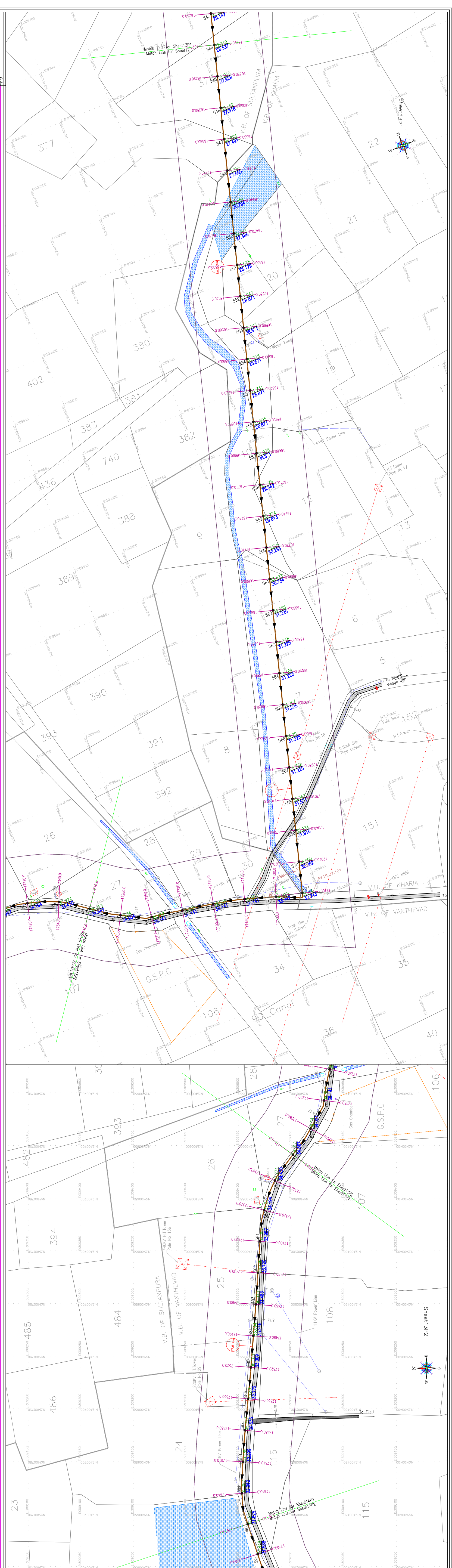




| SN  | DESCRIPTION | SMILE                                                                                 | SN  | DESCRIPTION | SMILE                                                                                 |
|-----|-------------|---------------------------------------------------------------------------------------|-----|-------------|---------------------------------------------------------------------------------------|
| 1   | Hand pump   |  | 21  | Hand pump   |  |
| 2   | Hand pump   |  | 22  | Hand pump   |  |
| 3   | Hand pump   |  | 23  | Hand pump   |  |
| 4   | Hand pump   |  | 24  | Hand pump   |  |
| 5   | Hand pump   |  | 25  | Hand pump   |  |
| 6   | Hand pump   |  | 26  | Hand pump   |  |
| 7   | Hand pump   |  | 27  | Hand pump   |  |
| 8   | Hand pump   |  | 28  | Hand pump   |  |
| 9   | Hand pump   |  | 29  | Hand pump   |  |
| 10  | Hand pump   |  | 30  | Hand pump   |  |
| 11  | Hand pump   |  | 31  | Hand pump   |  |
| 12  | Hand pump   |  | 32  | Hand pump   |  |
| 13  | Hand pump   |  | 33  | Hand pump   |  |
| 14  | Hand pump   |  | 34  | Hand pump   |  |
| 15  | Hand pump   |  | 35  | Hand pump   |  |
| 16  | Hand pump   |  | 36  | Hand pump   |  |
| 17  | Hand pump   |  | 37  | Hand pump   |  |
| 18  | Hand pump   |  | 38  | Hand pump   |  |
| 19  | Hand pump   |  | 39  | Hand pump   |  |
| 20  | Hand pump   |  | 40  | Hand pump   |  |
| 21  | Hand pump   |  | 41  | Hand pump   |  |
| 22  | Hand pump   |  | 42  | Hand pump   |  |
| 23  | Hand pump   |  | 43  | Hand pump   |  |
| 24  | Hand pump   |  | 44  | Hand pump   |  |
| 25  | Hand pump   |  | 45  | Hand pump   |  |
| 26  | Hand pump   |  | 46  | Hand pump   |  |
| 27  | Hand pump   |  | 47  | Hand pump   |  |
| 28  | Hand pump   |  | 48  | Hand pump   |  |
| 29  | Hand pump   |  | 49  | Hand pump   |  |
| 30  | Hand pump   |  | 50  | Hand pump   |  |
| 31  | Hand pump   |  | 51  | Hand pump   |  |
| 32  | Hand pump   |  | 52  | Hand pump   |  |
| 33  | Hand pump   |  | 53  | Hand pump   |  |
| 34  | Hand pump   |  | 54  | Hand pump   |  |
| 35  | Hand pump   |  | 55  | Hand pump   |  |
| 36  | Hand pump   |  | 56  | Hand pump   |  |
| 37  | Hand pump   |  | 57  | Hand pump   |  |
| 38  | Hand pump   |  | 58  | Hand pump   |  |
| 39  | Hand pump   |  | 59  | Hand pump   |  |
| 40  | Hand pump   |  | 60  | Hand pump   |  |
| 41  | Hand pump   |  | 61  | Hand pump   |  |
| 42  | Hand pump   |  | 62  | Hand pump   |  |
| 43  | Hand pump   |  | 63  | Hand pump   |  |
| 44  | Hand pump   |  | 64  | Hand pump   |  |
| 45  | Hand pump   |  | 65  | Hand pump   |  |
| 46  | Hand pump   |  | 66  | Hand pump   |  |
| 47  | Hand pump   |  | 67  | Hand pump   |  |
| 48  | Hand pump   |  | 68  | Hand pump   |  |
| 49  | Hand pump   |  | 69  | Hand pump   |  |
| 50  | Hand pump   |  | 70  | Hand pump   |  |
| 51  | Hand pump   |  | 71  | Hand pump   |  |
| 52  | Hand pump   |  | 72  | Hand pump   |  |
| 53  | Hand pump   |  | 73  | Hand pump   |  |
| 54  | Hand pump   |  | 74  | Hand pump   |  |
| 55  | Hand pump   |  | 75  | Hand pump   |  |
| 56  | Hand pump   |  | 76  | Hand pump   |  |
| 57  | Hand pump   |  | 77  | Hand pump   |  |
| 58  | Hand pump   |  | 78  | Hand pump   |  |
| 59  | Hand pump   |  | 79  | Hand pump   |  |
| 60  | Hand pump   |  | 80  | Hand pump   |  |
| 61  | Hand pump   |  | 81  | Hand pump   |  |
| 62  | Hand pump   |  | 82  | Hand pump   |  |
| 63  | Hand pump   |  | 83  | Hand pump   |  |
| 64  | Hand pump   |  | 84  | Hand pump   |  |
| 65  | Hand pump   |  | 85  | Hand pump   |  |
| 66  | Hand pump   |  | 86  | Hand pump   |  |
| 67  | Hand pump   |  | 87  | Hand pump   |  |
| 68  | Hand pump   |  | 88  | Hand pump   |  |
| 69  | Hand pump   |  | 89  | Hand pump   |  |
| 70  | Hand pump   |  | 90  | Hand pump   |  |
| 71  | Hand pump   |  | 91  | Hand pump   |  |
| 72  | Hand pump   |  | 92  | Hand pump   |  |
| 73  | Hand pump   |  | 93  | Hand pump   |  |
| 74  | Hand pump   |  | 94  | Hand pump   |  |
| 75  | Hand pump   |  | 95  | Hand pump   |  |
| 76  | Hand pump   |  | 96  | Hand pump   |  |
| 77  | Hand pump   |  | 97  | Hand pump   |  |
| 78  | Hand pump   |  | 98  | Hand pump   |  |
| 79  | Hand pump   |  | 99  | Hand pump   |  |
| 80  | Hand pump   |  | 100 | Hand pump   |  |
| 81  | Hand pump   |  | 101 | Hand pump   |  |
| 82  | Hand pump   |  | 102 | Hand pump   |  |
| 83  | Hand pump   |  | 103 | Hand pump   |  |
| 84  | Hand pump   |  | 104 | Hand pump   |  |
| 85  | Hand pump   |  | 105 | Hand pump   |  |
| 86  | Hand pump   |  | 106 | Hand pump   |  |
| 87  | Hand pump   |  | 107 | Hand pump   |  |
| 88  | Hand pump   |  | 108 | Hand pump   |  |
| 89  | Hand pump   |  | 109 | Hand pump   |  |
| 90  | Hand pump   |  | 110 | Hand pump   |  |
| 91  | Hand pump   |  | 111 | Hand pump   |  |
| 92  | Hand pump   |  | 112 | Hand pump   |  |
| 93  | Hand pump   |  | 113 | Hand pump   |  |
| 94  | Hand pump   |  | 114 | Hand pump   |  |
| 95  | Hand pump   |  | 115 | Hand pump   |  |
| 96  | Hand pump   |  | 116 | Hand pump   |  |
| 97  | Hand pump   |  | 117 | Hand pump   |  |
| 98  | Hand pump   |  | 118 | Hand pump   |  |
| 99  | Hand pump   |  | 119 | Hand pump   |  |
| 100 | Hand pump   |  | 120 | Hand pump   |  |
| 101 | Hand pump   |  | 121 | Hand pump   |  |
| 102 | Hand pump   |  | 122 | Hand pump   |  |
| 103 | Hand pump   |  | 123 | Hand pump   |  |
| 104 | Hand pump   |  | 124 | Hand pump   |  |
| 105 | Hand pump   |  | 125 | Hand pump   |  |
| 106 | Hand pump   |  | 126 | Hand pump   |  |
| 107 | Hand pump   |  | 127 | Hand pump   |  |
| 108 | Hand pump   |  | 128 | Hand pump   |  |
| 109 | Hand pump   |  | 129 | Hand pump   |  |
| 110 | Hand pump   |  | 130 | Hand pump   |  |
| 111 | Hand pump   |  | 131 | Hand pump   |  |
| 112 | Hand pump   |  | 132 | Hand pump   |  |
| 113 | Hand pump   |  | 133 | Hand pump   |  |
| 114 | Hand pump   |  | 134 | Hand pump   |  |
| 115 | Hand pump   |  | 135 | Hand pump   |  |
| 116 | Hand pump   |  | 136 | Hand pump   |  |
| 117 | Hand pump   |  | 137 | Hand pump   |  |
| 118 | Hand pump   |  | 138 | Hand pump   |  |
| 119 | Hand pump   |  | 139 | Hand pump   |  |
| 120 | Hand pump   |  | 140 | Hand pump   |  |
| 121 | Hand pump   |  | 141 | Hand pump   |  |
| 122 | Hand pump   |  | 142 | Hand pump   |  |
| 123 | Hand pump   |  | 143 | Hand pump   |  |
| 124 | Hand pump   |  | 144 | Hand pump   |  |
| 125 | Hand pump   |  | 145 | Hand pump   |  |
| 126 | Hand pump   |  | 146 | Hand pump   |  |
| 127 | Hand pump   |                                                                                       |     |             |                                                                                       |

| LEGEND                       |          |
|------------------------------|----------|
| NAME NO.                     | 00       |
| DATE                         | 00/00    |
| S. N.                        | 00.00    |
| Change                       | Ch. 0.00 |
| Thrust Block                 |          |
| Pipe Section                 |          |
| 1600 mm-1650 mm PCOP         |          |
| CL. 1 & 2                    |          |
| CL. 3 & 4                    |          |
| BRIDGE CROSSING              |          |
| ROAD CROSSING                |          |
| RAILWAY CROSSING             |          |
| RAILWAY CROSSING             |          |
| 102/104S                     |          |
| CORNER                       |          |
| Pipe with 300 mm S&B Bedding |          |
| Air Valve                    |          |
| SCOUR VALVE                  |          |
| NOTE DATE VALVE              |          |
| BATTERY VALVE                |          |
| NOTE RETURN VALVE            |          |
| PIPE REEFER VALVE            |          |
| FLOW METER                   |          |

[illegible]







| SN | DESCRIPTION      | START | END | DESCRIPTION | START | END |
|----|------------------|-------|-----|-------------|-------|-----|
| 1  | Grid             | 1     | 2   | Grid        | 1     | 2   |
| 2  | 1x4x4 Rod        | 2     | 3   | 1x4x4 Rod   | 3     | 4   |
| 3  | 1x4x4 Rod        | 3     | 4   | 50mm Dia    | 4     | 5   |
| 4  | Grid Centre      | 4     | 5   | 50mm Dia    | 5     | 6   |
| 5  | Grid Centre      | 5     | 6   | 50mm Dia    | 6     | 7   |
| 6  | Grid Tool Centre | 6     | 7   | 50mm Dia    | 7     | 8   |
| 7  | Grid Tool        | 7     | 8   | 50mm Dia    | 8     | 9   |
| 8  | Grid Tool        | 8     | 9   | 50mm Dia    | 9     | 10  |
| 9  | Grid Tool        | 9     | 10  | 50mm Dia    | 10    | 11  |
| 10 | Grid Tool        | 10    | 11  | 50mm Dia    | 11    | 12  |
| 11 | Grid Tool        | 11    | 12  | 50mm Dia    | 12    | 13  |
| 12 | Grid Tool        | 12    | 13  | 50mm Dia    | 13    | 14  |
| 13 | Grid Tool        | 13    | 14  | 50mm Dia    | 14    | 15  |
| 14 | Grid Tool        | 14    | 15  | 50mm Dia    | 15    | 16  |
| 15 | Grid Tool        | 15    | 16  | 50mm Dia    | 16    | 17  |
| 16 | Grid Tool        | 16    | 17  | 50mm Dia    | 17    | 18  |
| 17 | Grid Tool        | 17    | 18  | 50mm Dia    | 18    | 19  |
| 18 | Grid Tool        | 18    | 19  | 50mm Dia    | 19    | 20  |
| 19 | Grid Tool        | 19    | 20  | 50mm Dia    | 20    | 21  |
| 20 | Grid Tool        | 20    | 21  | 50mm Dia    | 21    | 22  |
| 21 | Grid Tool        | 21    | 22  | 50mm Dia    | 22    | 23  |
| 22 | Grid Tool        | 22    | 23  | 50mm Dia    | 23    | 24  |
| 23 | Grid Tool        | 23    | 24  | 50mm Dia    | 24    | 25  |
| 24 | Grid Tool        | 24    | 25  | 50mm Dia    | 25    | 26  |
| 25 | Grid Tool        | 25    | 26  | 50mm Dia    | 26    | 27  |
| 26 | Grid Tool        | 26    | 27  | 50mm Dia    | 27    | 28  |
| 27 | Grid Tool        | 27    | 28  | 50mm Dia    | 28    | 29  |
| 28 | Grid Tool        | 28    | 29  | 50mm Dia    | 29    | 30  |
| 29 | Grid Tool        | 29    | 30  | 50mm Dia    | 30    | 31  |
| 30 | Grid Tool        | 30    | 31  | 50mm Dia    | 31    | 32  |
| 31 | Grid Tool        | 31    | 32  | 50mm Dia    | 32    | 33  |
| 32 | Grid Tool        | 32    | 33  | 50mm Dia    | 33    | 34  |
| 33 | Grid Tool        | 33    | 34  | 50mm Dia    | 34    | 35  |
| 34 | Grid Tool        | 34    | 35  | 50mm Dia    | 35    | 36  |
| 35 | Grid Tool        | 35    | 36  | 50mm Dia    | 36    | 37  |
| 36 | Grid Tool        | 36    | 37  | 50mm Dia    | 37    | 38  |
| 37 | Grid Tool        | 37    | 38  | 50mm Dia    | 38    | 39  |
| 38 | Grid Tool        | 38    | 39  | 50mm Dia    | 39    | 40  |
| 39 | Grid Tool        | 39    | 40  | 50mm Dia    | 40    | 41  |
| 40 | Grid Tool        | 40    | 41  | 50mm Dia    | 41    | 42  |
| 41 | Grid Tool        | 41    | 42  | 50mm Dia    | 42    | 43  |
| 42 | Grid Tool        | 42    | 43  | 50mm Dia    | 43    | 44  |
| 43 | Grid Tool        | 43    | 44  | 50mm Dia    | 44    | 45  |
| 44 | Grid Tool        | 44    | 45  | 50mm Dia    | 45    | 46  |
| 45 | Grid Tool        | 45    | 46  | 50mm Dia    | 46    | 47  |
| 46 | Grid Tool        | 46    | 47  | 50mm Dia    | 47    | 48  |
| 47 | Grid Tool        | 47    | 48  | 50mm Dia    | 48    | 49  |
| 48 | Grid Tool        | 48    | 49  | 50mm Dia    | 49    | 50  |
| 49 | Grid Tool        | 49    | 50  | 50mm Dia    | 50    | 51  |
| 50 | Grid Tool        | 50    | 51  | 50mm Dia    | 51    | 52  |
| 51 | Grid Tool        | 51    | 52  | 50mm Dia    | 52    | 53  |
| 52 | Grid Tool        | 52    | 53  | 50mm Dia    | 53    | 54  |
| 53 | Grid Tool        | 53    | 54  | 50mm Dia    | 54    | 55  |
| 54 | Grid Tool        | 54    | 55  | 50mm Dia    | 55    | 56  |
| 55 | Grid Tool        | 55    | 56  | 50mm Dia    | 56    | 57  |
| 56 | Grid Tool        | 56    | 57  | 50mm Dia    | 57    | 58  |
| 57 | Grid Tool        | 57    | 58  | 50mm Dia    | 58    | 59  |
| 58 | Grid Tool        | 58    | 59  | 50mm Dia    | 59    | 60  |
| 59 | Grid Tool        | 59    | 60  | 50mm Dia    | 60    | 61  |
| 60 | Grid Tool        | 60    | 61  | 50mm Dia    | 61    | 62  |
| 61 | Grid Tool        | 61    | 62  | 50mm Dia    | 62    | 63  |
| 62 | Grid Tool        | 62    | 63  | 50mm Dia    | 63    | 64  |
| 63 | Grid Tool        | 63    | 64  | 50mm Dia    | 64    | 65  |
| 64 | Grid Tool        | 64    | 65  | 50mm Dia    | 65    | 66  |
| 65 | Grid Tool        | 65    | 66  | 50mm Dia    | 66    | 67  |
| 66 | Grid Tool        | 66    | 67  | 50mm Dia    | 67    | 68  |
| 67 | Grid Tool        | 67    | 68  | 50mm Dia    | 68    | 69  |
| 68 | Grid Tool        | 68    | 69  | 50mm Dia    | 69    | 70  |
| 69 | Grid Tool        | 69    | 70  | 50mm Dia    | 70    | 71  |
| 70 | Grid Tool        | 70    | 71  | 50mm Dia    | 71    | 72  |
| 71 | Grid Tool        | 71    | 72  | 50mm Dia    | 72    | 73  |
| 72 | Grid Tool        |       |     |             |       |     |

| LEGEND                           |          |
|----------------------------------|----------|
| Track No                         | 00       |
| Q. Alt.                          | 00.00    |
| R. Alt.                          | 00.00    |
| Change                           | 00.00    |
| Thrust Road                      | Ch 0.000 |
| True Direction                   | mm       |
| mm ROAD                          |          |
| CL. R. PROFILE                   |          |
| CL. L. PROFILE                   |          |
| LL. R.L. PROFILE                 |          |
| PROBE CROSSING                   |          |
| ROAD CROSSING                    |          |
| RAIL/RAIL CROSSING               |          |
| RAILWAY CROSSING                 |          |
| RAILWAY                          |          |
| CONCRETE                         |          |
| PIPE WITH JOINT AND SAND BEDDING |          |
| PIPE VALVE                       |          |
| SCORE VALVE                      |          |
| WASTE CATE VALVE                 |          |
| BATTERY VALVE                    |          |
| NON RETURN VALVE                 |          |
| PIPE REGULATOR VALVE             |          |
| FLOW METER                       |          |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |        |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------|
| 6.3 | 6.4 | 6.5 | 6.6 | 6.7 | 6.8 | 6.9 | 7.0 | 7.1 | 7.2 | 7.3 | 7.4 | 7.5 | 7.6 | 7.7 | 7.8 | 7.9 | 8.0 | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 8.9 | 9.0 | 9.1 | 9.2 | 9.3 | 9.4 | 9.5 | 9.6 | 9.7 | 9.8 | 9.9 | 10.0 | 10.1 | 10.2 | 10.3 | 10.4 | 10.5 | 10.6 | 10.7 | 10.8 | 10.9 | 11.0 | 11.1 | 11.2 | 11.3 | 11.4 | 11.5 | 11.6 | 11.7 | 11.8 | 11.9 | 12.0 | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 12.6 | 12.7 | 12.8 | 12.9 | 13.0 | 13.1 | 13.2 | 13.3 | 13.4 | 13.5 | 13.6 | 13.7 | 13.8 | 13.9 | 14.0 | 14.1 | 14.2 | 14.3 | 14.4 | 14.5 | 14.6 | 14.7 | 14.8 | 14.9 | 15.0 | 15.1 | 15.2 | 15.3 | 15.4 | 15.5 | 15.6 | 15.7 | 15.8 | 15.9 | 16.0 | 16.1 | 16.2 | 16.3 | 16.4 | 16.5 | 16.6 | 16.7 | 16.8 | 16.9 | 17.0 | 17.1 | 17.2 | 17.3 | 17.4 | 17.5 | 17.6 | 17.7 | 17.8 | 17.9 | 18.0 | 18.1 | 18.2 | 18.3 | 18.4 | 18.5 | 18.6 | 18.7 | 18.8 | 18.9 | 19.0 | 19.1 | 19.2 | 19.3 | 19.4 | 19.5 | 19.6 | 19.7 | 19.8 | 19.9 | 20.0 | 20.1 | 20.2 | 20.3 | 20.4 | 20.5 | 20.6 | 20.7 | 20.8 | 20.9 | 21.0 | 21.1 | 21.2 | 21.3 | 21.4 | 21.5 | 21.6 | 21.7 | 21.8 | 21.9 | 22.0 | 22.1 | 22.2 | 22.3 | 22.4 | 22.5 | 22.6 | 22.7 | 22.8 | 22.9 | 23.0 | 23.1 | 23.2 | 23.3 | 23.4 | 23.5 | 23.6 | 23.7 | 23.8 | 23.9 | 24.0 | 24.1 | 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.7 | 24.8 | 24.9 | 25.0 | 25.1 | 25.2 | 25.3 | 25.4 | 25.5 | 25.6 | 25.7 | 25.8 | 25.9 | 26.0 | 26.1 | 26.2 | 26.3 | 26.4 | 26.5 | 26.6 | 26.7 | 26.8 | 26.9 | 27.0 | 27.1 | 27.2 | 27.3 | 27.4 | 27.5 | 27.6 | 27.7 | 27.8 | 27.9 | 28.0 | 28.1 | 28.2 | 28.3 | 28.4 | 28.5 | 28.6 | 28.7 | 28.8 | 28.9 | 29.0 | 29.1 | 29.2 | 29.3 | 29.4 | 29.5 | 29.6 | 29.7 | 29.8 | 29.9 | 30.0 | 30.1 | 30.2 | 30.3 | 30.4 | 30.5 | 30.6 | 30.7 | 30.8 | 30.9 | 31.0 | 31.1 | 31.2 | 31.3 | 31.4 | 31.5 | 31.6 | 31.7 | 31.8 | 31.9 | 32.0 | 32.1 | 32.2 | 32.3 | 32.4 | 32.5 | 32.6 | 32.7 | 32.8 | 32.9 | 33.0 | 33.1 | 33.2 | 33.3 | 33.4 | 33.5 | 33.6 | 33.7 | 33.8 | 33.9 | 34.0 | 34.1 | 34.2 | 34.3 | 34.4 | 34.5 | 34.6 | 34.7 | 34.8 | 34.9 | 35.0 | 35.1 | 35.2 | 35.3 | 35.4 | 35.5 | 35.6 | 35.7 | 35.8 | 35.9 | 36.0 | 36.1 | 36.2 | 36.3 | 36.4 | 36.5 | 36.6 | 36.7 | 36.8 | 36.9 | 37.0 | 37.1 | 37.2 | 37.3 | 37.4 | 37.5 | 37.6 | 37.7 | 37.8 | 37.9 | 38.0 | 38.1 | 38.2 | 38.3 | 38.4 | 38.5 | 38.6 | 38.7 | 38.8 | 38.9 | 39.0 | 39.1 | 39.2 | 39.3 | 39.4 | 39.5 | 39.6 | 39.7 | 39.8 | 39.9 | 40.0 | 40.1 | 40.2 | 40.3 | 40.4 | 40.5 | 40.6 | 40.7 | 40.8 | 40.9 | 41.0 | 41.1 | 41.2 | 41.3 | 41.4 | 41.5 | 41.6 | 41.7 | 41.8 | 41.9 | 42.0 | 42.1 | 42.2 | 42.3 | 42.4 | 42.5 | 42.6 | 42.7 | 42.8 | 42.9 | 43.0 | 43.1 | 43.2 | 43.3 | 43.4 | 43.5 | 43.6 | 43.7 | 43.8 | 43.9 | 44.0 | 44.1 | 44.2 | 44.3 | 44.4 | 44.5 | 44.6 | 44.7 | 44.8 | 44.9 | 45.0 | 45.1 | 45.2 | 45.3 | 45.4 | 45.5 | 45.6 | 45.7 | 45.8 | 45.9 | 46.0 | 46.1 | 46.2 | 46.3 | 46.4 | 46.5 | 46.6 | 46.7 | 46.8 | 46.9 | 47.0 | 47.1 | 47.2 | 47.3 | 47.4 | 47.5 | 47.6 | 47.7 | 47.8 | 47.9 | 48.0 | 48.1 | 48.2 | 48.3 | 48.4 | 48.5 | 48.6 | 48.7 | 48.8 | 48.9 | 49.0 | 49.1 | 49.2 | 49.3 | 49.4 | 49.5 | 49.6 | 49.7 | 49.8 | 49.9 | 50.0 | 50.1 | 50.2 | 50.3 | 50.4 | 50.5 | 50.6 | 50.7 | 50.8 | 50.9 | 51.0 | 51.1 | 51.2 | 51.3 | 51.4 | 51.5 | 51.6 | 51.7 | 51.8 | 51.9 | 52.0 | 52.1</ |
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## GEOTECHNICAL INVESTIGATION REPORT

**Customer:** RAN-SOM Associates

**PMC:** -

**Design Consultant:** -

**Contractor:** -

**Project:** Geotechnical Investigation for Jhagadia Augmentation  
Water Supply Project (Rundh to Jhagadia)

**Project No.**  
2324068

**Riv.:**  
0

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Notes:

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| 0    | 12.07.2023 | -       | HP       |       | NHD      |       |
|      |            |         |          |       |          |       |
|      |            |         |          |       |          |       |
|      |            |         |          |       |          |       |
| Rev. | Date       | Details | Ini.     | Sign. | Ini.     | Sign. |
|      |            |         | Prepared |       | Approved |       |

 eSign

Signed by: Nehal Hiteshbhai Desai  
Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

## SUMMARY REPORT

| Topic                                  | Summary of Results                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project                                | Geotechnical Investigation for Jhagadia Augmentation Water Supply Project (Rundh to Jhagadia)                                                                                                                                                                                                                                      |
| Location                               | Jhagadiya, Dist. Bharuch                                                                                                                                                                                                                                                                                                           |
| Scope of Work                          | Ten (10) exploratory Boreholes                                                                                                                                                                                                                                                                                                     |
| Site Stratigraphy                      | Soil strata till termination is cohesive in nature with intermediate clayey sand layers in BH 01 to 05 & 07.<br>Strata in BH 06 & 08 is clayey sand till termination.<br>Strata in BH 09 is silty sand till termination.<br>In BH 10, soil strata is cohesive in nature till 9.0 m followed by clayey sand till termination level. |
| Water Table                            | Borehole water level was encountered at 5.0 m below ground level in BH 01 & 02.<br>In BH 07 & 10, it was 1.0 m below ground level while in other boreholes, no water was encountered till termination during the subsurface exploratory boreholes conducted in May/June 2023.                                                      |
| Liquefaction Susceptibility Assessment | Strata is non-liquefiable.                                                                                                                                                                                                                                                                                                         |
| Foundation Recommendation              | Shallow foundation (Isolated footing) is recommended.<br>Where isolated footings are planned, column ties shall be provided at foundation level for better rigidity and restrict differential settlement.<br>Allowable Bearing Capacity given in Table-2.                                                                          |

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### **Annexure:**

- ❖ Laboratory test results.
- ❖ Summary of Geotechnical Exploration.
- ❖ BH Location Details

## **ABSTRACT**

In the following pages, is presented the report with analysis, prepared from the thorough study of geotechnical investigation results.

The detailed scope of the work is decided as per the discussion with the customer. The test location detail is shown in layout plan submitted with the report.

A geotechnical investigation work was undertaken to obtain the required subsurface information to study and define the nature and behavior of soil. Such information was obtained through following steps:

- By making test boreholes and other field tests.
- By observing ground water table in boreholes
- By performing required in-situ tests
- By testing the samples in laboratory to classify it and to determine the engineering properties of soil/rock.

## **DISCLAIMER**

We have employed accepted geotechnical engineering procedures and our opinions and conclusions are made in accordance with generally accepted principles and practices of this profession. The contents of this report are valid as of the date of preparation. However, changes in the condition of the site can occur over time because of either natural processes or human activity. In addition, advancements in the practice of geotechnical engineering and changes in applicable practice codes may affect the validity of this report. Consequently, this report should not be relied upon after an elapsed period of twelve months without a review by us for verification of validity. Our investigation did not include the evaluation or assessment of any potential environmental hazards or groundwater contamination that may be present.

Every measurement has uncertainty. It is an established fact that no measuring instrument can determine the true value of any measurement. The cumulative effect of factors such as sensitivity of equipment, accuracy in calibration, human factors and environmental conditions will determine the overall uncertainty in the parameter determined from these measurements. Uncertainty is associated with reported results, which we have evaluated based on the above given criteria/s. Measurement uncertainty values will be provided on request.

*eSign*

Signed by: Nehal Hiteshbhai Desai  
Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

## **1.0 INTRODUCTION:**

M/s RAN-SOM Associates appointed M/s Unique Geocivil Services Pvt. Ltd. as Geotechnical Investigating Agency for above mentioned Project.

### **1.1 PROJECT DESCRIPTION:**

The proposed site is located near Jhagadiya, Dist. Bharuch. The project is for water supply distribution network.

## **2.0 SCOPE OF WORK:**

The principal objective of the exploration work was to determine the soil profile and to get recommendation regarding type of foundation and bearing capacity.

The entire field testing was carried out as per relevant IS codes and/or as per the instructions of the representatives of the customer. The samples collected from various test locations/depths, were sealed, labelled, and transported to our laboratory at Udhna, Surat. The required laboratory tests were conducted as per relevant IS codes.

This report has been prepared after careful study of the field and laboratory test results.

### **2.1 FIELD TESTS PERFORMED:**

- Drilling 10 nos. of 100 mm dia. bore hole with casing whenever required up to maximum depth of 15.0 m from ground level.
- Carry out Standard penetration Test (SPT) at every 2.0 m interval or continuous SPT at 1.0 m if strata is non-cohesive in nature.
- Collecting disturbed soil samples at every meter interval or as per the stratification of soil and recording depth at which soil changes.
- Collecting undisturbed samples (UDS) at 2.0 m interval alternate to S P Test.
- Observation of borehole water table using drilled holes.

## 2.2 LABORATORY TESTS PERFORMED:

- Natural moisture content.
- Field Density, Moisture content and Dry Density of undisturbed samples.
- Grain size Analysis.
- Liquid Limit and Plastic Limit.
- Specific gravity Test for Undisturbed samples.
- Diff. Free Swell Index.
- Test for shear properties of selected samples.
  - a) Unconfined compressive Strength on saturated cohesive soils.
  - b) Triaxial Shear (UU) Test.
  - c) Direct Shear Test (In case of non-cohesive soil).

## 2.3 DRILLING:

Drilling of 100/150 mm  $\phi$  borehole is carried out by manual shell & auger boring method / mechanical rotary drilling machine. Bore is cleaned properly before conducting S P Test or Collecting U D Samples. In weathered rock and hard rock drilling is performed with NX size core bit.

Casing is required to be lowered if the boreholes do not retain its shape. Care is taken that ground water level is maintained during the drilling and particularly before testing or sampling levels. In no case casing is allowed to advance below the bottom of borehole. Alternatively, Bentonite Slurry is also used to retain sides. The work was in general accordance with IS 1892-2021.

### **BH Locations Details**

| <b>BH No.</b> | <b>Chainage</b> | <b>N</b>    | <b>E</b>    |
|---------------|-----------------|-------------|-------------|
| 01            | CH - 0000       | 21°49'14.6" | 73°11'43.6" |
| 02            | CH - 0000       | 21°69'13.6" | 73°11'42.6" |
| 03            | CH - 4260       | 21°47'44.7" | 73°11'22.8" |
| 04            | CH - 7170       | 21°46'15.5" | 73°11'23.5" |
| 05            | CH - 11970      | 21°44'25.1" | 73°10'06.7" |

| BH No. | Chainage   | N           | E           |
|--------|------------|-------------|-------------|
| 06     | CH - 14880 | 21°42'54.6" | 73°10'12.4" |
| 07     | CH - 17100 | 21°41'50.1" | 73°09'34.4" |
| 08     | CH - 19200 | 21°41'23.7" | 73°08'46.3" |
| 09     | CH - 21120 | 21°40'25.4" | 73°08'42.8" |
| 10     | CH - 24373 | 21°38'49.3" | 73°08'57.6" |

#### 2.4 STANDARD PENETRATION TEST:

The Standard Penetration Tests are carried out as per IS 2131: 1981. In general, the tests are conducted at 2.0/3.0 m intervals. If soil strata is non-cohesive in nature, it is carried out at 1.0/1.5 m intervals.

Before testing, the borehole is cleaned properly, and Split Spoon Sampler is centrally seated in borehole. In the case of SPT to be conducted below water table care is taken that casing position is above the borehole depth. The water level in the borehole is maintained above or at least at the water table.

A standard hammer (Donut type) of 63.5 kg is dropped from a height of 75 cm. and the no. of blows for penetration of Split Spoon Sampler for 0-15, 15-30 and 30-45 cms are noted. The SPT 'N'-values are described as follows: -

1. The number of blows for each 15 cm penetration of the split spoon sampler is recorded.
2. The blows required to penetrate the initial 15 cm of the split spoon for seating the sampler is ignored due to the possible presence of loose materials or cuttings from the drilling operation.
3. The cumulative number of blows required to penetrate the balance 30 cm of the 45 cm split spoon sampler is termed the SPT value or the 'N' value. For example, a SPT value reported as "20" means that 20 blows were imparted to penetrate the split spoon sampler by the last 30 cm.
4. Where the number of blows required to penetrate the first 15 cm/ balance 30 cm of the split spoon sampler exceeds 50, the number of blows is presented along with the corresponding penetration. For example, an SPT value reported as "52/200 mm"

means that 52 blows were imparted to penetrate the split spoon sampler by 200 mm (beyond initial 150 mm).

Sample moisture content is collected in moisture cans. For non-plastic silts and fine Sands  $N_s$  value is corrected for effective overburden pressure and dilatancy Correction is added for tests conducted below water table.

## 2.5 DISTURBED AND UNDISTURBED SAMPLES:

Disturbed samples from shell or from Split Spoon Sampler is collected in polythene bags with proper labels.

Undisturbed samples in 70/100 mm  $\phi$  Shelby tubes are collected at 2.0/3.0 m intervals. The sampling tube is connected to the rod adopter with ball check valve. Before lowering the sampler, the bore is cleaned properly, and sampling tube is lightly oiled from inner and outer side.

Sampling tube is pushed into the borehole by pressure/hammering as per the soil stiffness. The sampling tube is immediately waxed.

In case of medium to coarse, non-cohesive, sand samples, where sampling is unsuccessful, Standard Penetration Test is carried out on cleaning the borehole.

## 2.6 GROUNDWATER:

The borehole water level was measured in the boreholes after drilling and sampling was completed. The measured water levels are presented in "Summary of Geotechnical Exploration". The time required for a Borehole water level to stabilize at or near the ground water level depends upon permeability of the formation and the initial head differential between borehole water level and ground water level. In fine grain soil (Silt & Clay), this stabilization time is in days (Ref. IS 6395). Therefore, borehole water level may be different than ground water table. It should be noted that groundwater levels might change and can vary with seasonal rainfall patterns, long-term climate fluctuations and with the influence of local site conditions.

## 2.7 LABORATORY TESTS:

The laboratory testing has been carried out in our NABL accredited laboratory. The quality procedure in our laboratory conforms to ISO/IEC-17025-2017 having Certificate No. TC-8053.

Disturbed, undisturbed and Standard Penetration Test samples from the field are brought to the laboratory with care and are grouped according to observations in the fields. On completion of shear, compressibility, permeability etc. tests on UD samples, these samples are placed in oven along with the S P Test samples and disturbed samples. Samples are selected such that each soil strata is adequately represented by the physical properties. The representative samples are dried in oven for 24 hours at  $110 \pm 5$  °C.

The following tests were conducted on selected samples recovered from the boreholes:

| Name of Test                    | Reference Standard   |
|---------------------------------|----------------------|
| Bulk Density                    | By Calculation       |
| Natural Moisture Content        | IS 2720-Part 2-1973  |
| Specific Gravity                | IS 2720-Part 3-1980  |
| Grain Size Analysis             | IS 2720-Part 4-1985  |
| Atterberg's Limit (LL, PL & PI) | IS 2720-Part 5-1985  |
| Unconfined Compression Test     | IS 2720-Part 10-1991 |
| Triaxial Shear Test (UU)        | IS 2720-Part 11-1993 |
| Free Swell Index                | IS 2720-Part 40-1977 |

### 2.7.1 PHYSICAL PROPERTIES:

The moisture cans collected from SPT samples from the field are weighed and placed in oven for drying to determine natural moisture content (NMC).

U D samples are extracted using an extractor and samples are prepared as per the required sizes of the test to be performed. Before extracting from tube, weight and volume of

sample are noted. Average bulk density is calculated in laboratory and samples are placed in oven to get the field moisture content for computing the dry density.

Specific gravity with specific gravity bottle / pycnometer is calculated as per IS 2720 (Part – 3, section 1&2): 1980. From the results of dry density and specific gravity the saturation of sample in % is calculated which is a useful data for deciding the condition of triaxial shear test

Grain size analysis is made by IS sieves. IS sieves commonly used are 4.75 mm, 2.00 mm, 1.00 mm 425 microns, 250 microns and 75 microns. For the coarse grain soil, a graph of partial size v/s cumulative % finer is plotted. For fine grain soil wet analysis is made and material fine than 75 micron is found out by hydrometer test. Mechanical digital single pan balance of 1 kg capacity with 0.1 gram least count is used.

Liquid limits and Plastic limits tests are carried out with distilled water as per IS 2720 (Part – 5): 1985. The samples are tested at a minimum of 24 hours after the addition of water. For liquid limit test cone penetration method is adopted but occasionally value is checked on Casagrande standard.

For the foundation soil sample showing high plasticity are checked for swelling and shrinkage. Firstly, for rough estimate, free swell test as per IS 2720 (Part – 40): 1977 is being carried out and getting positive indication of swelling. Shrinkage limit test is carried out as per IS 2720 (Part – 6): 1972.

#### 2.7.2 SHEAR PROPERTIES:

Shear tests are carried out by three methods.

- 1) Unconfined compressive strength as per IS 2720 (Part–10): 1973 for the saturated plastic soil undisturbed samples and cores of SPT samples.
- 2) Triaxial shear test is carried out on sample size of 38 mm  $\phi$  and 76 mm in height on motorized 30-speed load frame with digital display arrangements for load and pore-pressure. The confining pressure is applied to the cell by Air-water constant pressure system. The test is carried out for Unconsolidated Undrained (UU) test without pore-pressure measurement as per IS 2720 (Part–11): 1993.

- 3) Direct box shear test is carried out on non-plastic medium to coarse sand soil as per IS 2720 (Part – 13): 1986.

### 3.0 OBSERVATION & FOUNDATION RECOMMENDATION:

#### 3.1 Groundwater:

Borehole water level was encountered at 5.0 m below ground level in BH 01 & 02. In BH 07 & 10, it was 1.0 m below ground level while in other boreholes, no water was encountered till termination during the subsurface exploratory boreholes conducted in May/June 2023.

#### 3.2 Site Stratigraphy:

| BH No. | Stratigraphy |                                                           | Field SPT Values |
|--------|--------------|-----------------------------------------------------------|------------------|
|        | Depth (m)    | Soil Type/Classification                                  |                  |
| 01     | 0.0 to 3.0   | Black/yellow stiff plastic silty clay                     | 10               |
|        | 3.0 to 15.0  | Blackish yellow/yellow high plastic clay                  | 13 TO 25         |
| 02     | 0.0 to 1.0   | Black high plastic clay                                   | -                |
|        | 1.0 to 5.0   | Yellow stiff plastic silty clay with sand                 | 10 to 09         |
|        | 5.0 to 15.0  | Yellow very stiff plastic silty clay                      | 16 to 28         |
| 03     | 0.0 to 1.0   | Filling                                                   | -                |
|        | 1.0 to 2.0   | Black stiff plastic clayey fine sand                      | 12               |
|        | 2.0 to 5.0   | Yellow stiff plastic silty clay with fine sand            | 18               |
|        | 5.0 to 6.0   | Yellow very stiff plastic clayey fine sand                | 21               |
|        | 6.0 to 6.5   | Yellow stiff plastic silty clay with fine sand            | -                |
| 04     | 0.0 to 1.0   | Filling                                                   | -                |
|        | 1.0 to 3.0   | Blackish yellow stiff plastic clay with sand              | 15               |
|        | 3.0 to 4.0   | Blackish yellow stiff plastic clayey sand with gravel     | -                |
|        | 4.0 to 6.0   | Black very stiff high plastic clay                        | 19 to 22         |
| 05     | 0.0 to 2.0   | Yellow stiff plastic silty clay with sand                 | 15               |
|        | 2.0 to 3.0   | Blackish yellow high plastic clay with sand               | -                |
|        | 3.0 to 4.0   | Yellow very stiff plastic clayey medium to fine sand      | 27               |
|        | 4.0 to 8.0   | Black very stiff high plastic clay with sand              | 20 to 25         |
| 06     | 0.0 to 1.0   | Black high plastic clay with sand                         | -                |
|        | 1.0 to 4.0   | Yellow very stiff to hard plastic clayey sand with gravel | 27 to 57         |
|        | 4.0 to 4.5   | Yellow dense silty gravel with sand                       | Refusal          |

| BH No. | Stratigraphy |                                                          | Field SPT Values |
|--------|--------------|----------------------------------------------------------|------------------|
|        | Depth (m)    | Soil Type/Classification                                 |                  |
| 07     | 0.0 to 3.0   | Black stiff high plastic clay with sand                  | 10               |
|        | 3.0 to 6.0   | Yellow high plastic clay with sand                       | 13 to 20         |
| 08     | 0.0 to 5.7   | Yellow stiff plastic clayey medium to coarse sand        | 15 to 19         |
|        | 5.7 to 6.5   | Yellow stiff plastic silty clay with fine sand           | 20               |
| 09     | 0.0 to 6.0   | Black dense silty medium to fine sand                    | 28 to 33         |
| 10     | 0.0 to 1.0   | Filling                                                  | -                |
|        | 1.0 to 4.0   | Black stiff high plastic clay with sand                  | 10               |
|        | 4.0 to 9.0   | Yellow stiff plastic silty clay with fine to medium sand | 16 to 23         |
|        | 9.0 to 15.0  | Yellow hard plastic clayey medium to fine sand           | 26 to 36         |

Detail description of the soil profile is provided in “Summary of Geotechnical Exploration”.

### 3.3 Liquefaction Susceptibility Assessment:

As per IS: 1893 (Part 1) - 2016, liquefaction is likely in loose fine sand (SP) below the water table. In General, if  $N_{spt} > 30$ , soil strata are non-liquefiable. In this case, cohesive and non-cohesive layers is in stiff/dense state. Therefore, this layer is non liquifiable in nature.

Site location is in Zone-III as per Earthquake Zone given in IS: 1893 (Part 1) – 2016.

### 3.4 Foundation Recommendation:

- Isolated foundation may be selected as per the requirement of structural load of the building. Where isolated / individual foundations are planned, a beam connecting the columns at foundation level should be provided to give rigidity to the structure and to restrict differential settlements.
- The foundation can be placed at 2.0 m or below NGL.
- Allowable Bearing Capacity is given in Table-1 to Table-8 of this report.

### 3.5 Foundation Analysis concepts:

#### 3.5.1 Open Foundation:

Safe Net Bearing Capacity (for General Failure)  $q_d$   
 $= (c N_c s_c d_c i_c + q (N_q - 1) s_q d_q i_q + \frac{1}{2} B \gamma N_{\gamma} d_{\gamma} i_{\gamma}) / F$

Where,

F = Factor of Safety

c = Cohesion

q = Effective surcharge at base of fdn

B = Width of footing

$\gamma$  = Bulk unit weight of foundation soil

W' = Correction factor for location of water table

$\phi$  = Angle of shearing resistance of soil in degrees

$N_c, N_q, N_{\gamma}$  = Bearing Capacity Factor

$s_c, s_q, s_{\gamma}$  = Shape factor

$d_c, d_q, d_{\gamma}$  = Depth Factor

$i_c, i_q, i_{\gamma}$  = Inclination Factor

#### 3.5.2 Settlement in Cohesionless Soil:

Settlement of Foundations on Cohesionless Soil can be calculated from either of the following from IS 8009 (Part-1): 1976

- Method based on Standard Penetration Resistance Value N where Settlement of Foundations on Cohesionless Soil with known standard penetration resistance value N is obtained from Fig 9 of IS 8009 (Part-1): 1976.

#### 3.5.3 Settlement in Cohesive Soil:

**Settlement of Foundations on Cohesive Soil is calculated from:**

Total Settlement  $S_f = S_i + S_c$

Where,

$S_i$  = Immediate Settlement

$S_c$  = Primary Consolidation Settlement

- a) If the **Clay Layer is pre-compressed**, then the Settlement is calculated from:  
Case-2

Conso. Settlement for Precompressed Clay: ( $\sigma'_0 + \Delta\sigma' > \sigma'_c$ )

$$S_c = \frac{C_s H}{1 + e_0} \log\left(\frac{\sigma'_c}{\sigma'_0}\right) + \frac{C_c H}{1 + e_0} \log\left(\frac{\sigma'_0 + \Delta\sigma'}{\sigma'_c}\right) \text{ Case-2}$$

Case-3

Conso. Settlement for Precompressed Clay: ( $\sigma'_0 + \Delta\sigma' < \sigma'_c$ )

$$S_c = \frac{C_s H}{1 + e_0} \log\left(\frac{\sigma'_0 + \Delta\sigma'}{\sigma'_0}\right) \text{ Case-3}$$

- b) If the **Clay is not pre-compressed**, then the Settlement is calculated from Cast-1

Consolidation Settlement for Normally Consolidated Clay:

$$S_c = \frac{C_c H}{1 + e_0} \log\left(\frac{\sigma'_0 + \Delta\sigma'}{\sigma'_0}\right) \text{ Case-1}$$

Where,

$S_c$  = Consolidation Settlement

$\Delta\sigma'$  = Pressure increment in kg/cm<sup>2</sup>

$\sigma'_0$  = Initial effective pressure at mid-height of layer

$\sigma'_c$  = Pre-consolidation Pressure

$H_t$  = Thickness of soil layer

$e_0$  = Initial void ratio

$C_c$  = Compression Index

Bearing Capacity as per Shear Criteria as well as settlement criteria must be computed and the lower of the two values shall be considered as Allowable Bearing Capacity.

### 3.6 Recommended Allowable bearing capacity:

**For BH 01 & 02:**

**Table 1: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 75 mm settlement | Soil Subgrade Modulus (K) |
|----|-------|-------------------|------------|------------------------|---------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>      | kN/m <sup>2</sup> /m      |
| 1  | 2.0   | 203               | 14.6       | 203.0                  | 13904                     |
| 2  | 3.0   | 187               | 42.2       | 187.0                  | 4431                      |
| 3  | 4.0   | 179               | 61.6       | 179.0                  | 2906                      |

**For BH 03 & 07:**

**Table 2: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 75 mm<br>settlement | Soil Subgrade<br>Modulus (K) |
|----|-------|-------------------|------------|---------------------------|------------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>         | kN/m <sup>2</sup> /m         |
| 1  | 2.0   | 265               | 38.7       | 265.0                     | 6848                         |
| 2  | 3.0   | 276               | 49.0       | 276.0                     | 5633                         |

**For BH 04:**

**Table 3: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 75 mm<br>settlement | Soil Subgrade<br>Modulus (K) |
|----|-------|-------------------|------------|---------------------------|------------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>         | kN/m <sup>2</sup> /m         |
| 1  | 2.0   | 200               | 43.2       | 200.0                     | 4630                         |
| 2  | 3.0   | 189               | 67.8       | 189.0                     | 2788                         |

**For BH 05:**

**Table 4: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 75 mm<br>settlement | Soil Subgrade<br>Modulus (K) |
|----|-------|-------------------|------------|---------------------------|------------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>         | kN/m <sup>2</sup> /m         |
| 1  | 2.0   | 187               | 37.3       | 187.0                     | 5013                         |
| 2  | 3.0   | 177               | 59.3       | 177.0                     | 2985                         |

**For BH 06:**

**Table 5: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 75 mm<br>settlement | Soil Subgrade<br>Modulus (K) |
|----|-------|-------------------|------------|---------------------------|------------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>         | kN/m <sup>2</sup> /m         |
| 1  | 2.0   | 248               | 54.7       | 248.0                     | 4534                         |
| 2  | 3.0   | 236               | 86.7       | 204.2                     | 2355                         |

**For BH 08:**

**Table 6: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 75 mm<br>settlement | Soil Subgrade<br>Modulus (K) |
|----|-------|-------------------|------------|---------------------------|------------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>         | kN/m <sup>2</sup> /m         |
| 1  | 2.0   | 248               | 53.3       | 248.0                     | 4653                         |
| 2  | 3.0   | 235               | 83.8       | 210.3                     | 2510                         |

**For BH 09:**

**Table 7: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 50 mm<br>settlement | Soil Subgrade<br>Modulus (K) |
|----|-------|-------------------|------------|---------------------------|------------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>         | kN/m <sup>2</sup> /m         |
| 1  | 2.0   | 265               | 38.7       | 265.0                     | 6848                         |
| 2  | 3.0   | 276               | 49.0       | 276.0                     | 5633                         |

**For BH 10:**

**Table 8: Results of Bearing Capacity (Square Footings)**

| Sr | Width | SBC               | Settlement | ABC @ 75 mm<br>settlement | Soil Subgrade<br>Modulus (K) |
|----|-------|-------------------|------------|---------------------------|------------------------------|
| No | m     | kN/m <sup>2</sup> | mm         | kN/m <sup>2</sup>         | kN/m <sup>2</sup> /m         |
| 1  | 2.0   | 232               | 19.0       | 232.0                     | 12211                        |
| 2  | 3.0   | 214               | 43.5       | 214.0                     | 4920                         |
| 3  | 4.0   | 205               | 70.1       | 205.0                     | 2924                         |

**Note:**

1. Fill placed above EGL should be treated as surcharge load.
2. Backfilling shall be done with adequate compaction.
3. For open foundations, to restrict the influence of adjacent footings on each other, the lateral edge-to-edge spacing between the foundations should at least be equal to "B" where "B" is the width of the larger footing. In case this criterion cannot be satisfied, combined footings / RCC strip footings or raft foundations may be provided.
4. The suggested modulus of sub grade reaction (k) has been estimated as the ratio of the computed net bearing capacity/pressure and corresponding total settlement and is applicable at the center of the loaded area.
5. Bearing Capacity calculated for static & axial load only.

## Sample Calculation:

### DETERMINATION OF SAFE BEARING CAPACITY

Type of Shear Failure:

General

Footing Shape:

Square

Foundation Type:

Isolated

Net Ultimate Bearing Capacity :  $q_{ult} = C \cdot N_c \cdot S_c \cdot d_c + q \cdot (N_q - 1) \cdot S_q \cdot d_q + 0.5 \cdot B \cdot \gamma' \cdot N_\gamma \cdot S_\gamma \cdot d_\gamma \cdot w'$

$D_f = 2$  m  
 $c = 80$  kN/m<sup>2</sup>

$B = 3$  m  
 $\phi = 0$

$L/B = 1$   $L = 3$  m  
 $N_\phi = \tan^2 (\pi/4 + \phi/2) = 1$

Bearing Capacity factors :  $N_c = 5.14$

$N_q = 1.00$

$N_\gamma = 0.00$

Depth factors :  $D_c = 1.13$

$D_q = 1.00$

$D_\gamma = 1.00$

Shape factors :  $S_c = 1.30$

$S_q = 1.20$

$S_\gamma = 0.80$

Bulk Unit Wt. =  $18.15$  kN/m<sup>3</sup>

Water Table =  $2$  m

Effective Surcharge,  $q = 36.30$  kN/m<sup>2</sup>

Water Table Correction Factor,  $w' = 0.50$

$q_{ult} = 80 \times 5.14 \times 1.3 \times 1.13 + 36.3 \times 0 \times 1.2 \times 1 + 0.5 \times 3 \times 18.15 \times 0 \times 0.8 \times 1 \times 0.5$   
 $= 605.83$  kN/m<sup>2</sup>

Factor of Safety =  $3.00$

Net Safe Bearing Capacity =  $q_{ult} / FOS = 605.83 / 3 = 202$  kN/m<sup>2</sup>

### Immediate Settlement of Clay Layers:

Elastic Settlement:

$$S_{e(flexible)} = \Delta\sigma(\alpha B') \frac{1 - \mu_s^2}{E_s} I_s I_f$$

Reference: *Principles of Geotechnical Engineering by Das et al., (2014) eighth edition.*

| Layer | Thk. of Layer | Poisson's Ratio |             | Modulus of Elasticity of Soil |                   | Settlement Location | Location Factor | Factored Width | Effective Stress  | Shape Factor* | Fox's Depth Factor | Elastic Settlement, $S_e$ |      |
|-------|---------------|-----------------|-------------|-------------------------------|-------------------|---------------------|-----------------|----------------|-------------------|---------------|--------------------|---------------------------|------|
|       | H             | $\mu_s$         | Wt. $\mu_s$ | $E_s$                         | Wt. $E_s$         |                     | $\alpha$        | $B'$           | $\Delta\sigma$    | $I_s$         | $I_f$              | Flexible                  |      |
|       | m             |                 |             | kN/m <sup>2</sup>             | kN/m <sup>2</sup> |                     |                 | m              | kN/m <sup>2</sup> |               |                    | m                         | mm   |
| 1     | 5.0           | 0.50            | 0.50        | 8000                          | 8000              | Corner              | 1               | 3              | 202               | 0.257         | 0.805              | 0.0118                    | 11.8 |
| 2     |               |                 |             |                               |                   |                     |                 |                |                   |               |                    |                           |      |
| 3     |               |                 |             |                               |                   |                     |                 |                |                   |               |                    |                           |      |

\*Steinbrenner, 1934

|                                                                                                                                                                                                                                                                                           |                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Conso. Settlement for Precompressed Clay: (<math>\sigma'_0 + \Delta\sigma' &gt; \sigma'_c</math>)</b><br>$S_c = \frac{C_s H}{1 + e_0} \log\left(\frac{\sigma'_c}{\sigma'_0}\right) + \frac{C_c H}{1 + e_0} \log\left(\frac{\sigma'_0 + \Delta\sigma'}{\sigma'_c}\right)$ <b>Case-2</b> | <b>Consolidation Settlement for Normally Consolidated Clay:</b><br>$S_c = \frac{C_c H}{1 + e_0} \log\left(\frac{\sigma'_0 + \Delta\sigma'}{\sigma'_0}\right)$ <b>Case-1</b> |
| <b>Conso. Settlement for Precompressed Clay: (<math>\sigma'_0 + \Delta\sigma' &lt; \sigma'_c</math>)</b><br>$S_c = \frac{C_s H}{1 + e_0} \log\left(\frac{\sigma'_0 + \Delta\sigma'}{\sigma'_0}\right)$ <b>Case-3</b>                                                                      |                                                                                                                                                                             |

Reference: *Principles of Geotechnical Engineering by Das et al., (2014) eighth edition.*

Water Table =  m

| Layer | Depth to | Depth From | Bulk Unit Wt. of soil |                   | Spe. Gr. | $e_0$ | $C_c$ | $C_s$ |
|-------|----------|------------|-----------------------|-------------------|----------|-------|-------|-------|
| -     | m        | m          | g/cc                  | kN/m <sup>2</sup> | -        | -     | -     | -     |
| 1     | 0.0      | 2.0        | 1.85                  | 18.1              | 2.77     | 1.082 | 0.180 | 0.036 |
| 2     | 2.0      | 7.0        | 1.90                  | 18.6              | 2.77     | 0.967 | 0.162 | 0.032 |
|       |          |            |                       |                   |          |       |       |       |

| Layer | H   | Avg. Effective Stress @ Middle of the layer, $\sigma'_0$ | Pre-consolidation Pressure, $\sigma'_c$ | Change in Stress due to Foundation Pressure, $\Delta\sigma'$ | Type of Consolidation | Consolidation Settlement, $S_c$ |      |
|-------|-----|----------------------------------------------------------|-----------------------------------------|--------------------------------------------------------------|-----------------------|---------------------------------|------|
|       | m   | kN/m <sup>2</sup>                                        | kN/m <sup>2</sup>                       | kN/m <sup>2</sup>                                            |                       | m                               | mm   |
| 1     | 4.5 | 56                                                       | 100                                     | 90                                                           | Case-2                | 0.0792                          | 79.2 |
| 2     |     |                                                          |                                         |                                                              |                       |                                 |      |
|       |     |                                                          |                                         |                                                              |                       |                                 |      |
|       |     |                                                          |                                         |                                                              |                       |                                 | 79.2 |

| Total Settlement | Depth Factor | Rigidity Factor | Corrected Settlement |
|------------------|--------------|-----------------|----------------------|
| mm               |              |                 | mm                   |
| 90.9             | 0.81         | 1.0             | 73                   |

| Net SBC           | Settlement | Permissible Settlement | Allowable Bearing Capacity | Subgrade Modulus     |
|-------------------|------------|------------------------|----------------------------|----------------------|
| kN/m <sup>2</sup> | mm         | mm                     | kN/m <sup>2</sup>          | kN/m <sup>2</sup> /m |
| 202               | 73.4       | 75                     | 202                        | 2751                 |

### 3.7 Construction Related Recommendations:

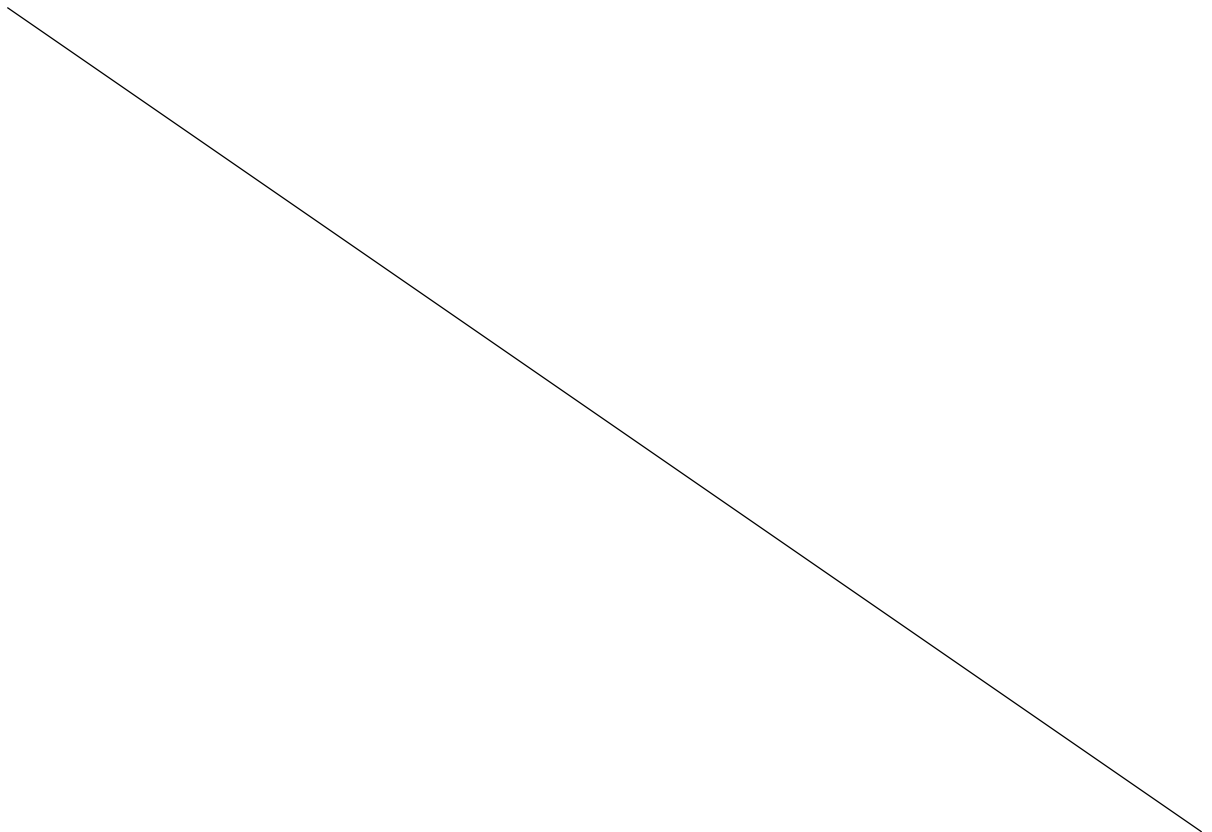
- Temporary excavations for foundation construction up to 3.0 m depth may be cut with side slopes of 1 vertical on 1 horizontal. Site In-charge should monitor the slopes on regular basis. If excessive spalling or caving occurs, the slopes may be flattened further to ensure stability. For deeper excavation, adequate arrangement must be made to

support the side by providing D-wall or any other suitable arrangement. IS 3764-1992 shall be followed as a Safety Code for excavation work.

- All loose/disturbed soils should be removed, and the exposed surface should be compacted properly using rammers / rollers. In case of expansive soil, PCC shall be laid immediately to prevent moisture loss.
- If excavator is used for excavation, excavation shall be carried out up to 0.15 m above the foundation level. Last 0.15 m depth shall be excavated manually.
- Top 2 to 3 m depth excavated soil cannot be used for back filling purposes without treatment. Backfill soil should be adequately compacted with roller/plate vibrator/rammer.
- It recommended to use PPC for sub-surface construction. OPC/PPC can be used for super structure.

For Unique Geocivil Services Pvt. Ltd.

Authorized Signatory



Project No.: 2324068

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*eSign*

Signed by: Nehal Hiteshbhai Desai  
Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

## I. S. CLASSIFICATION

**GW:** Well graded gravel, gravel-sand mixture, or no fines.

**GP:** Poorly graded gravels or gravel sand mixture, little or no fines.

**GM:** Silty gravels, poorly graded gravel-sand-silt mixtures.

**GC:** Clayey gravels, poorly graded gravel-sand-clay mixtures.

**SW:** Well-graded sands, gravelly sands; little or no fines.

**SP:** Poorly graded sands or gravelly sands, little or no fines.

**SM:** Silty sands, poorly graded sand-silt mixtures.

**SC:** Clayey sands, poorly graded sand-clay mixtures.

**ML:** Inorganic silt and very fine sands rock flour; silty or clayey fine sands or clayey silts with non-to low plasticity.

**CL:** Inorganic clays, gravelly clays, sandy clays, silty clays, lean clays of low plasticity.

**OL:** organic silts and organic silty clay of low plasticity.

**MI:** Inorganic silts, silty or clayey fine sands or clayey silts of medium plasticity.

**CI:** Inorganic clays, gravelly clays, sandy clays, silty clays, lean clays of medium plasticity.

**OI:** Organic silts and organic silty clays of medium plasticity.

**MH:** Inorganic silt of high compressibility, micaceous or diatomaceous fine sandy or silty soils, elastic silts.

**CH:** Inorganic clays of high plasticity, fat clays.

**OH:** Organic Clays of medium to high plasticity.

**Pt:** Peat and other highly organic soil with very high compressibility.

**TABLE - 3**  
**RESULTS OF STANDARD PENETRATION TEST**

Project No. : 2324068

Bore Hole No. : 1

| Depth<br>in mts. | No. of Blows for Penetration |              |              | Ns (Blows<br>/300 mm) | Nc(Corrected<br>value of Ns) | N. M. C.<br>(in %) |
|------------------|------------------------------|--------------|--------------|-----------------------|------------------------------|--------------------|
|                  | 0 - 150 mm                   | 150 - 300 mm | 300 - 450 mm |                       |                              |                    |
| 1.00             |                              |              |              |                       |                              | 25.95              |
| 2.00             | 02                           | 04           | 06           | 10                    | 10                           | 25.80              |
| 3.00             |                              |              |              |                       |                              | 25.52              |
| 4.00             | 03                           | 05           | 08           | 13                    | 13                           | 25.83              |
| 5.00             |                              |              |              |                       |                              | 26.84              |
| 6.00             | 04                           | 07           | 07           | 14                    | 14                           | 26.68              |
| 7.50             |                              |              |              |                       |                              | 26.53              |
| 9.00             | 05                           | 08           | 10           | 18                    | 18                           | 26.80              |
| 10.50            |                              |              |              |                       |                              | 26.45              |
| 12.00            | 07                           | 08           | 13           | 21                    | 21                           | 26.54              |
| 13.50            |                              |              |              |                       |                              | 26.29              |
| 15.00            | 08                           | 10           | 15           | 25                    | 25                           | 26.41              |

**TABLE - 3**  
**RESULTS OF STANDARD PENETRATION TEST**

Project No. : 2324068

Bore Hole No. : 10

| Depth<br>in mts. | No. of Blows for Penetration |              |              | Ns (Blows<br>/300 mm) | Nc(Corrected<br>value of Ns) | N. M. C.<br>(in %) |
|------------------|------------------------------|--------------|--------------|-----------------------|------------------------------|--------------------|
|                  | 0 - 150 mm                   | 150 - 300 mm | 300 - 450 mm |                       |                              |                    |
| 1.00             |                              |              |              |                       |                              | 28.58              |
| 2.00             | 03                           | 04           | 06           | 10                    | 10                           | 28.22              |
| 3.00             |                              |              |              |                       |                              | 26.64              |
| 4.00             | 05                           | 07           | 09           | 16                    | 16                           | 27.09              |
| 5.00             |                              |              |              |                       |                              | 26.16              |
| 6.00             | 08                           | 10           | 13           | 23                    | 23                           | 24.95              |
| 7.50             |                              |              |              |                       |                              | 25.65              |
| 9.00             | 08                           | 12           | 14           | 26                    | 26                           | 25.45              |
| 10.50            |                              |              |              |                       |                              | 25.41              |
| 12.00            | 09                           | 14           | 17           | 31                    | 31                           | 24.25              |
| 13.50            |                              |              |              |                       |                              | 25.05              |
| 15.00            | 10                           | 16           | 20           | 36                    | 36                           | 24.73              |

*eSign*

Signed by: Nehal Hiteshbhai Desai  
Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

**TABLE - 3**  
**RESULTS OF STANDARD PENETRATION TEST**

Project No. : 2324068

Bore Hole No. : 2

| Depth<br>in mts. | No. of Blows for Penetration |              |              | Ns (Blows<br>/300 mm) | Nc(Corrected<br>value of Ns) | N. M. C.<br>(in %) |
|------------------|------------------------------|--------------|--------------|-----------------------|------------------------------|--------------------|
|                  | 0 - 150 mm                   | 150 - 300 mm | 300 - 450 mm |                       |                              |                    |
| 1.00             | 02                           | 05           | 05           | 10                    | 10                           | 25.05              |
| 2.00             |                              |              |              |                       |                              | 24.41              |
| 3.00             | 03                           | 04           | 05           | 09                    | 09                           | 24.08              |
| 4.00             |                              |              |              |                       |                              | 25.49              |
| 5.00             | 05                           | 07           | 09           | 16                    | 16                           | 26.20              |
| 6.00             |                              |              |              |                       |                              | 27.09              |
| 7.50             | 07                           | 07           | 10           | 17                    | 17                           | 26.59              |
| 9.00             |                              |              |              |                       |                              | 26.53              |
| 10.50            | 09                           | 11           | 13           | 24                    | 24                           | 25.68              |
| 12.00            |                              |              |              |                       |                              | 26.22              |
| 13.50            | 10                           | 13           | 15           | 28                    | 28                           | 26.26              |
| 15.00            |                              |              |              |                       |                              | 26.03              |

*eSign*

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Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

### TABLE - 3

Bore Hole No. : 3

[illegible]

### TABLE - 3

Bore Hole No. : 4

[illegible]

### TABLE - 3

Bore Hole No. : 5

[illegible]

### TABLE - 3

Bore Hole No. : 6

[illegible]

### TABLE - 3

Bore Hole No.: 7

[illegible]

### TABLE - 3

Bore Hole No. : 8

[illegible]

### TABLE - 3

Bore Hole No. : 9

[illegible]

**TABLE - 5**  
**PARTICLE SIZE ANALYSIS**

Project No. : 2324068

Bore Hole No. : 1

| Soil Strata   | Depth<br>Sample Type | Gravel in %<br>(>4.75 mm) | Sand in %     |                    |                   | Silt in %<br>+<br>Clay in % |
|---------------|----------------------|---------------------------|---------------|--------------------|-------------------|-----------------------------|
|               |                      |                           | (4.75 - 2 mm) | (2mm - 425 $\mu$ ) | (425 - 75 $\mu$ ) |                             |
| 0.00 to 1.00  | 0.00/D               | 0                         | 1             | 2                  | 8                 | 89                          |
| 1.00 to 3.00  | 1.00/U               | 0                         | 0             | 1                  | 7                 | 92                          |
| 1.00 to 3.00  | 2.00/S               | 2                         | 0             | 0                  | 4                 | 94                          |
| 3.00 to 4.00  | 3.00/U               | 0                         | 0             | 1                  | 6                 | 93                          |
| 4.00 to 5.00  | 4.00/S               | 31                        | 0             | 1                  | 11                | 57                          |
| 5.00 to 15.50 | 5.00/U               | 0                         | 0             | 1                  | 6                 | 93                          |
| 5.00 to 15.50 | 6.00/S               | 0                         | 2             | 0                  | 8                 | 90                          |
| 5.00 to 15.50 | 7.50/U               | 0                         | 1             | 1                  | 8                 | 90                          |
| 5.00 to 15.50 | 9.00/S               | 1                         | 0             | 1                  | 6                 | 92                          |
| 5.00 to 15.50 | 10.50/U              | 0                         | 0             | 0                  | 6                 | 94                          |
| 5.00 to 15.50 | 12.00/S              | 0                         | 1             | 1                  | 3                 | 95                          |
| 5.00 to 15.50 | 13.50/U              | 0                         | 0             | 1                  | 5                 | 94                          |
| 5.00 to 15.50 | 15.00/S              | 0                         | 1             | 1                  | 3                 | 95                          |

 Signed by: Nehal Hiteshbhai Desai  
 Organization Unit: Authorized Signatory  
 Organization Name: UNIQUE  
 GEOCIVIL SERVICES PRIVATE  
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 Date: 12-Jul-2023 (02:05 PM)

**TABLE - 5**  
**PARTICLE SIZE ANALYSIS**

Project No. : 2324068

Bore Hole No. : 10

| Soil Strata   | Depth<br>Sample Type | Gravel in %<br>(>4.75 mm) | Sand in %     |                    |                   | Silt in %<br>+<br>Clay in % |
|---------------|----------------------|---------------------------|---------------|--------------------|-------------------|-----------------------------|
|               |                      |                           | (4.75 - 2 mm) | (2mm - 425 $\mu$ ) | (425 - 75 $\mu$ ) |                             |
| 0.00 to 1.00  | 0.00/D               | 42                        | 15            | 11                 | 6                 | 26                          |
| 1.00 to 2.00  | 1.00/U               | 4                         | 6             | 6                  | 14                | 70                          |
| 2.00 to 4.00  | 2.00/S               | 0                         | 4             | 7                  | 6                 | 83                          |
| 2.00 to 4.00  | 3.00/U               | 1                         | 4             | 6                  | 8                 | 81                          |
| 4.00 to 9.00  | 4.00/S               | 8                         | 10            | 11                 | 15                | 56                          |
| 4.00 to 9.00  | 5.00/U               | 7                         | 8             | 13                 | 21                | 51                          |
| 4.00 to 9.00  | 6.00/S               | 8                         | 8             | 12                 | 19                | 53                          |
| 4.00 to 9.00  | 7.50/U               | 2                         | 6             | 11                 | 22                | 59                          |
| 9.00 to 15.50 | 9.00/S               | 5                         | 10            | 18                 | 25                | 42                          |
| 9.00 to 15.50 | 10.50/U              | 4                         | 7             | 13                 | 30                | 46                          |
| 9.00 to 15.50 | 12.00/S              | 5                         | 9             | 22                 | 29                | 35                          |
| 9.00 to 15.50 | 13.50/U              | 6                         | 8             | 19                 | 19                | 48                          |
| 9.00 to 15.50 | 15.00/S              | 2                         | 8             | 22                 | 31                | 37                          |

**TABLE - 5**  
**PARTICLE SIZE ANALYSIS**

Project No. : 2324068

Bore Hole No. : 2

| Soil Strata    | Depth<br>Sample Type | Gravel in %<br>(>4.75 mm) | Sand in %     |                    |                   | Silt in %<br>+<br>Clay in % |
|----------------|----------------------|---------------------------|---------------|--------------------|-------------------|-----------------------------|
|                |                      |                           | (4.75 - 2 mm) | (2mm - 425 $\mu$ ) | (425 - 75 $\mu$ ) |                             |
| 0.00 to 1.00   | 0.00/D               | 0                         | 0             | 0                  | 7                 | 93                          |
| 1.00 to 5.00   | 1.00/S               | 2                         | 0             | 2                  | 9                 | 87                          |
| 1.00 to 5.00   | 2.00/U               | 2                         | 1             | 3                  | 12                | 82                          |
| 1.00 to 5.00   | 3.00/S               | 0                         | 0             | 3                  | 12                | 85                          |
| 1.00 to 5.00   | 4.00/U               | 3                         | 0             | 2                  | 10                | 85                          |
| 5.00 to 14.00  | 5.00/S               | 1                         | 3             | 2                  | 2                 | 92                          |
| 5.00 to 14.00  | 6.00/U               | 8                         | 0             | 1                  | 1                 | 90                          |
| 5.00 to 14.00  | 7.50/S               | 2                         | 2             | 2                  | 2                 | 92                          |
| 5.00 to 14.00  | 9.00/U               | 1                         | 0             | 1                  | 4                 | 94                          |
| 5.00 to 14.00  | 10.50/S              | 0                         | 2             | 3                  | 2                 | 93                          |
| 5.00 to 14.00  | 12.00/U              | 2                         | 0             | 2                  | 4                 | 92                          |
| 5.00 to 14.00  | 13.50/S              | 2                         | 0             | 0                  | 3                 | 95                          |
| 14.00 to 15.50 | 15.00/U              | 12                        | 0             | 2                  | 13                | 73                          |

## TABLE - 5

Bore Hole No. : 3

[illegible]

## TABLE - 5

Bore Hole No. : 4

[illegible]

## TABLE - 5

Bore Hole No. : 5

[illegible]

## TABLE - 5

Bore Hole No. : 6

[illegible]

## TABLE - 5

Bore Hole No. : 7

[illegible]

## TABLE - 5

Bore Hole No. : 8

[illegible]

## TABLE - 5

Bore Hole No. : 9

[illegible]

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 1

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 1.00                   | UD(Undisturbed)           | 0.88                     |                          |
| 3.00                   | UD(Undisturbed)           | 1.42                     |                          |
| 7.50                   | UD(Undisturbed)           | 2.17                     | 1.08                     |
| 10.50                  | UD(Undisturbed)           | 2.99                     | 1.50                     |

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 10

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 1.00                   | UD(Undisturbed)           | 1.25                     | 0.62                     |
| 5.00                   | UD(Undisturbed)           | 2.44                     | 1.22                     |

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 2

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 2.00                   | UD(Undisturbed)           | 0.93                     |                          |
| 4.00                   | UD(Undisturbed)           | 1.35                     |                          |
| 9.00                   | UD(Undisturbed)           | 2.23                     | 1.11                     |
| 15.00                  | UD(Undisturbed)           | 3.43                     | 1.71                     |

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 3

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 4.00                   | UD(Undisturbed)           | 2.17                     |                          |
| 6.00                   | UD(Undisturbed)           | 2.94                     |                          |

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 4

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 1.00                   | UD(Undisturbed)           | 1.56                     |                          |
| 5.00                   | UD(Undisturbed)           | 3.06                     |                          |

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 5

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 2.00                   | UD(Undisturbed)           | 1.46                     |                          |
| 6.00                   | UD(Undisturbed)           | 2.90                     |                          |
| 8.00                   | UD(Undisturbed)           | 3.97                     |                          |

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 7

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 4.00                   | UD(Undisturbed)           | 2.15                     | 1.07                     |
| 6.00                   | UD(Undisturbed)           | 3.20                     | 1.60                     |

**TABLE - 7A**  
**UNCONFINED COMPRESSION TEST TABLE**

Project No. 2324068

Bore Hole No. 8

| Depth<br>Sample (mts.) | Type of Sample<br>(UD/Rm) | Qu (Kg/cm <sup>2</sup> ) | Cu (Kg/cm <sup>2</sup> ) |
|------------------------|---------------------------|--------------------------|--------------------------|
| 1.00                   | UD(Undisturbed)           | 1.16                     |                          |
| 5.00                   | UD(Undisturbed)           | 2.28                     |                          |

**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 1

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 5.00         | Undisturbed         | 2.75                     | 0.50                                | 0.00                                | 0.83                      | 9.94      |
|              | Undisturbed         | 3.30                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 4.84                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

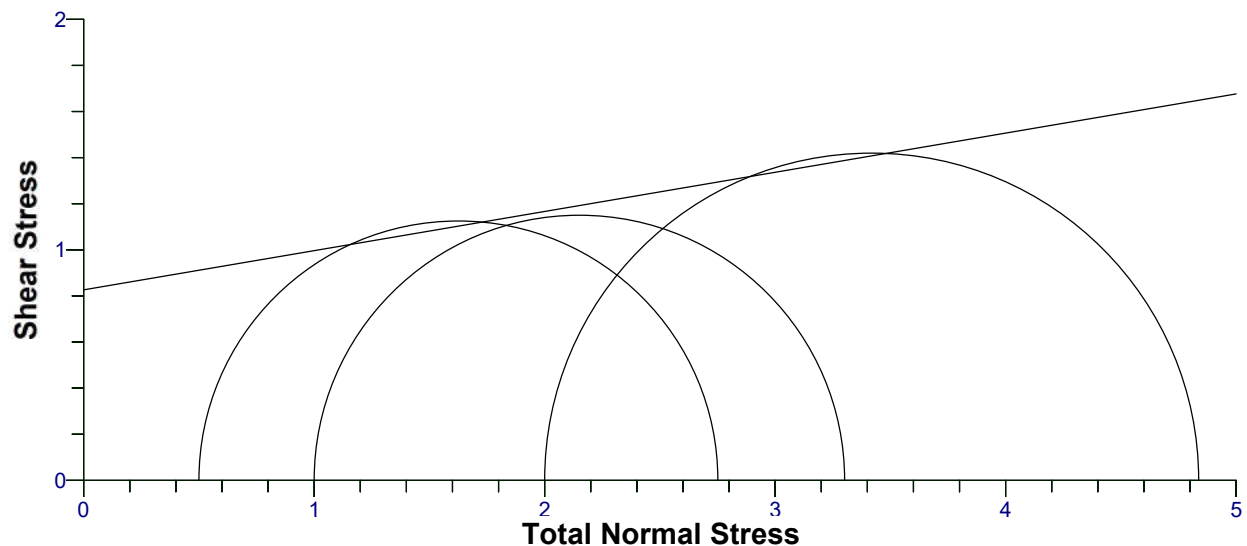


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 1

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 13.50        | Undisturbed         | 5.01                     | 1.00                                | 0.00                                | 1.54                      | 9.12      |
|              | Undisturbed         | 6.31                     | 2.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 9.13                     | 4.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

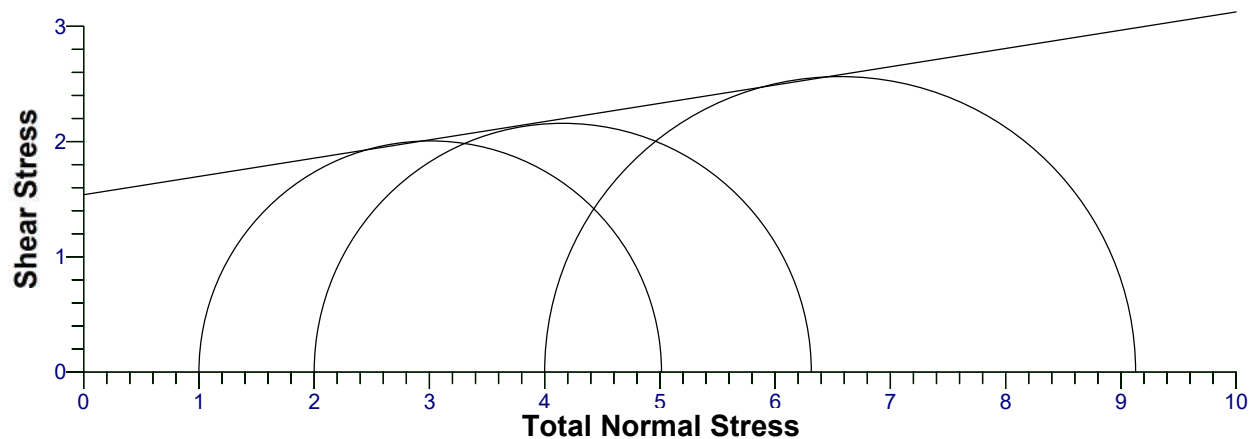


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 10

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 3.00         | Undisturbed         | 2.74                     | 0.50                                | 0.00                                | 0.81                      | 10.40     |
|              | Undisturbed         | 3.28                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 4.85                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

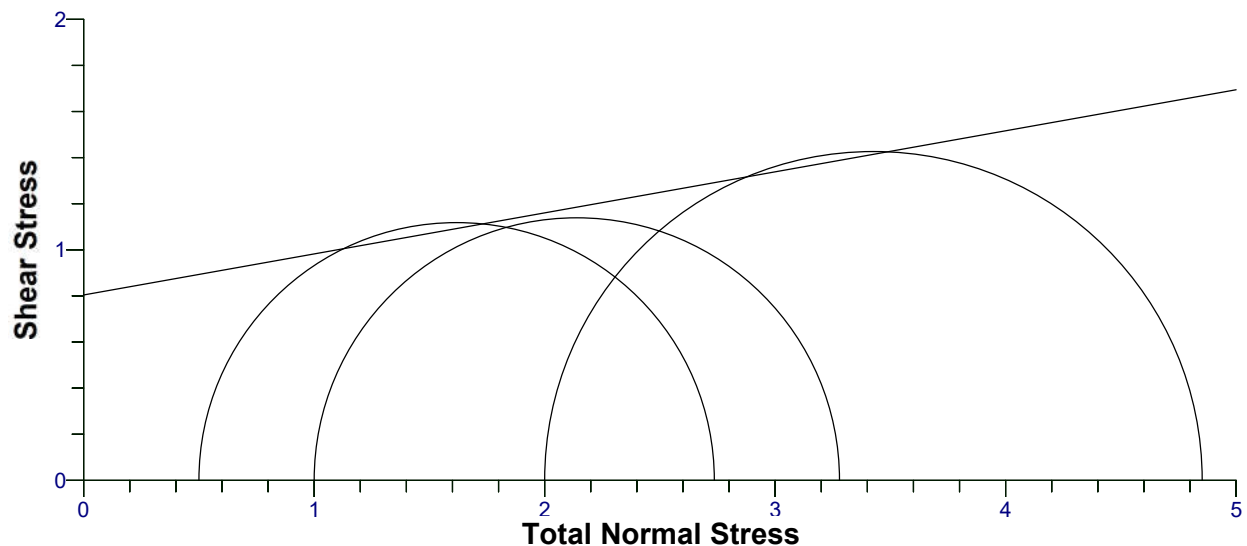


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 10

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 7.50         | Undisturbed         | 5.04                     | 1.00                                | 0.00                                | 1.42                      | 11.35     |
|              | Undisturbed         | 6.34                     | 2.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 9.46                     | 4.00                                | 0.00                                |                           |           |

### MOHR CIRCLE

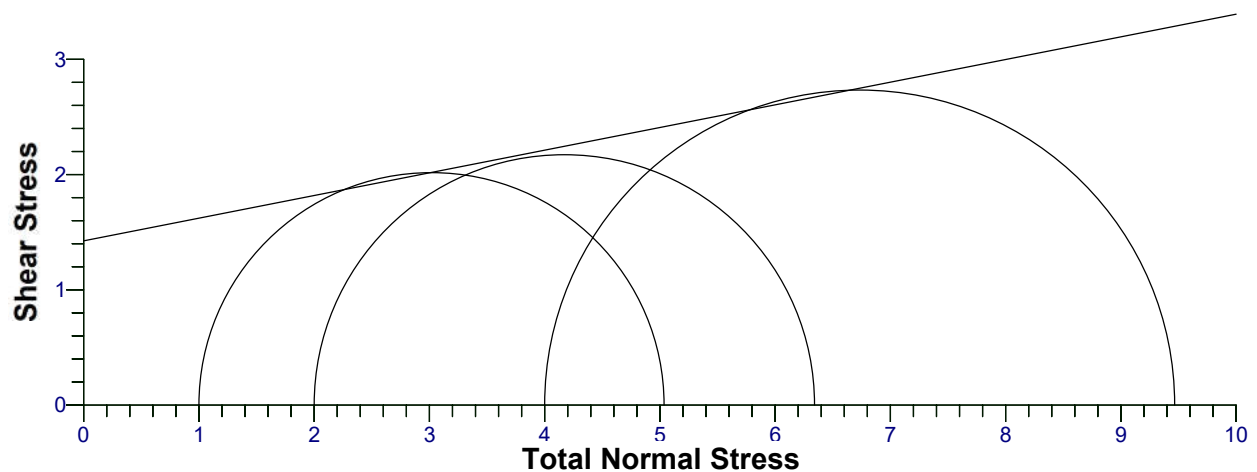


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 2

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 6.00         | Undisturbed         | 2.78                     | 0.50                                | 0.00                                | 0.89                      | 9.06      |
|              | Undisturbed         | 3.44                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 4.84                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

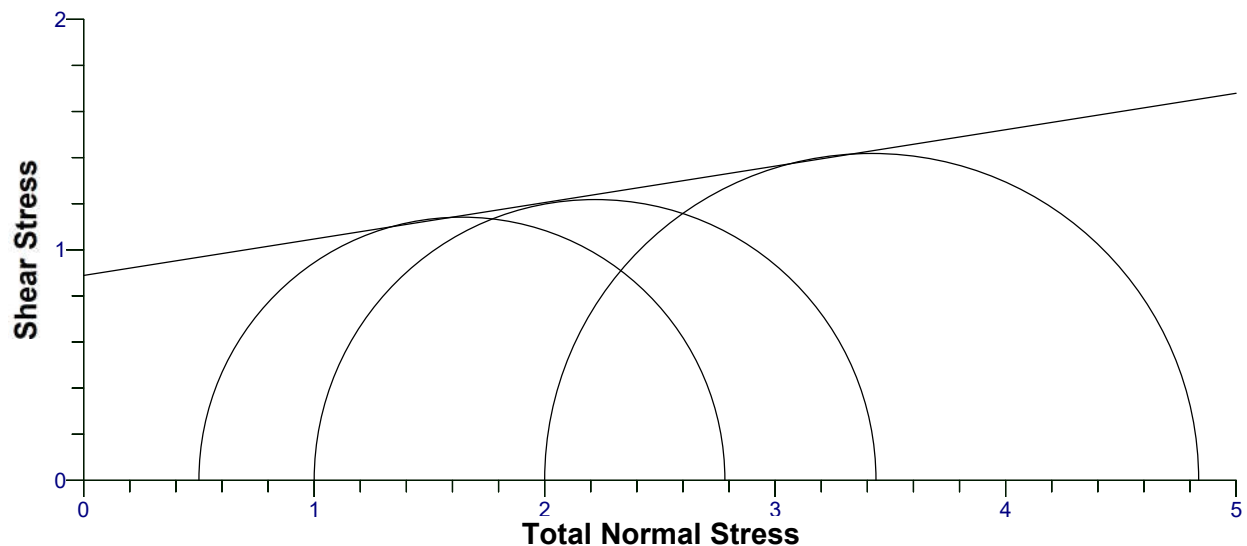


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 2

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 12.00        | Undisturbed         | 5.04                     | 1.00                                | 0.00                                | 1.53                      | 9.26      |
|              | Undisturbed         | 6.30                     | 2.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 9.17                     | 4.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

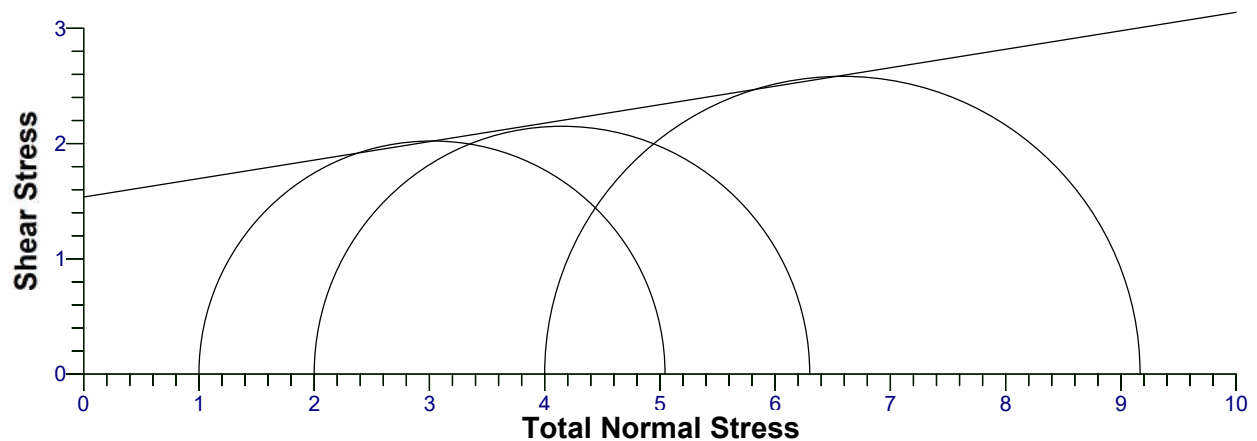


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 3

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 2.00         | Undisturbed         | 2.97                     | 0.50                                | 0.00                                | 0.83                      | 13.23     |
|              | Undisturbed         | 3.58                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 5.31                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

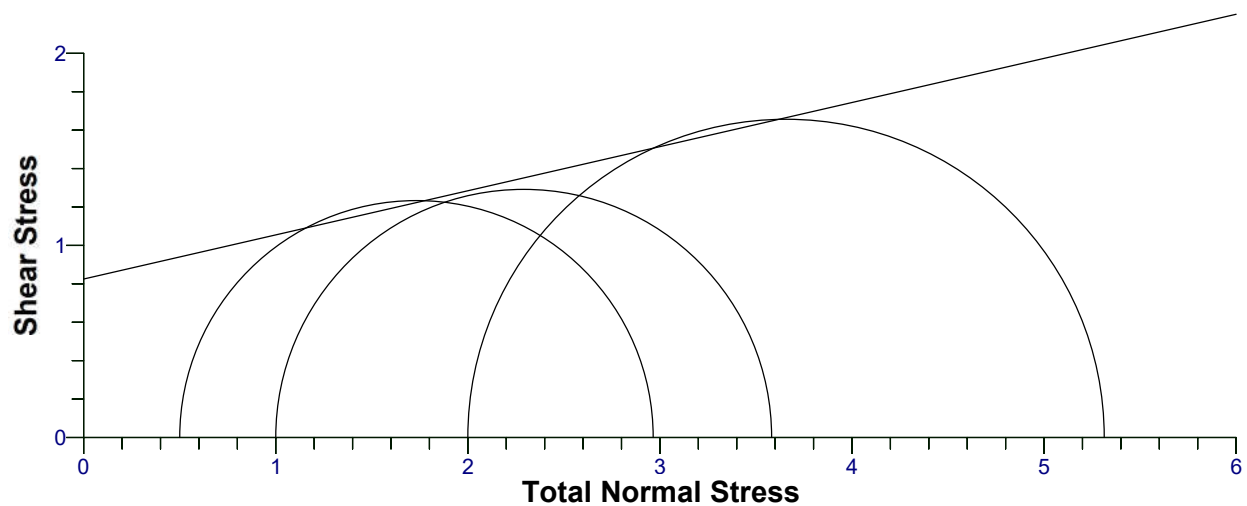


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 4

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 3.00         | Undisturbed         | 2.67                     | 0.50                                | 0.00                                | 0.66                      | 15.92     |
|              | Undisturbed         | 3.46                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 5.30                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

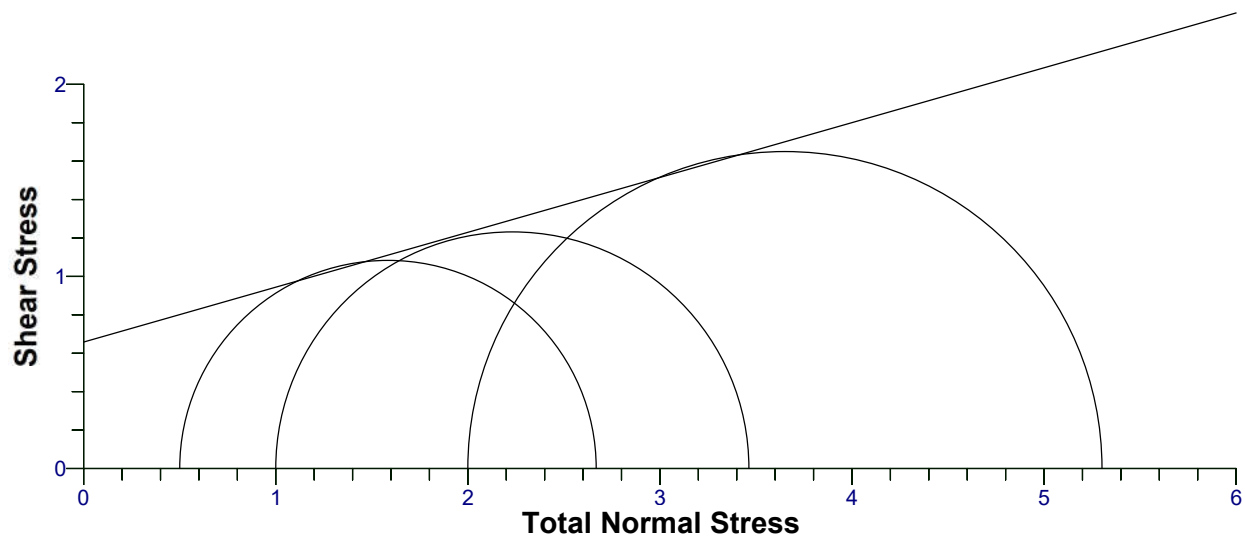


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 5

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 4.00         | Undisturbed         | 3.07                     | 0.50                                | 0.00                                | 0.93                      | 11.89     |
|              | Undisturbed         | 3.77                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 5.33                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

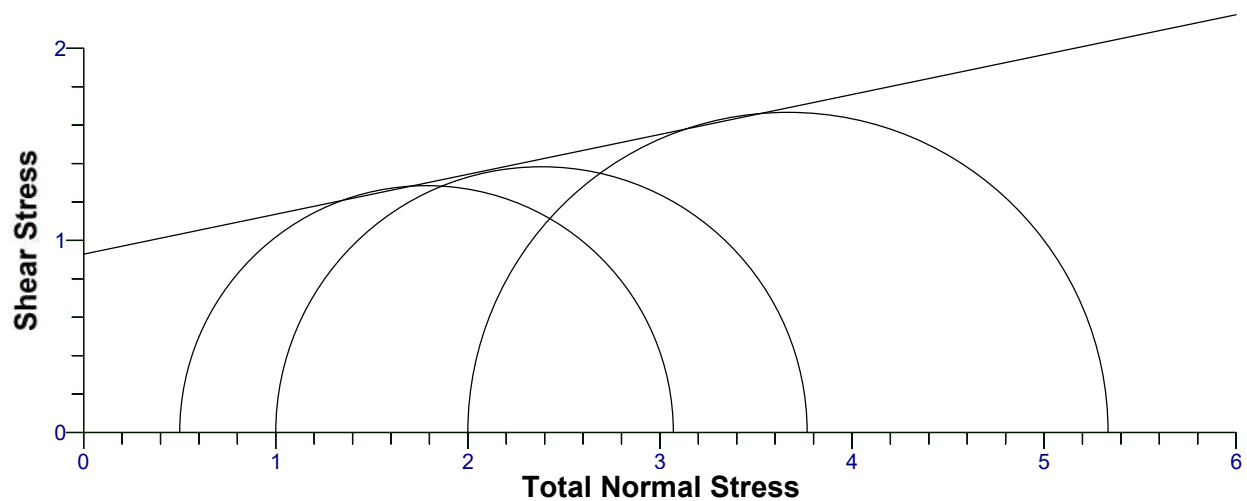


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 6

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 1.00         | Undisturbed         | 2.42                     | 0.50                                | 0.00                                | 0.63                      | 14.38     |
|              | Undisturbed         | 3.33                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 4.92                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

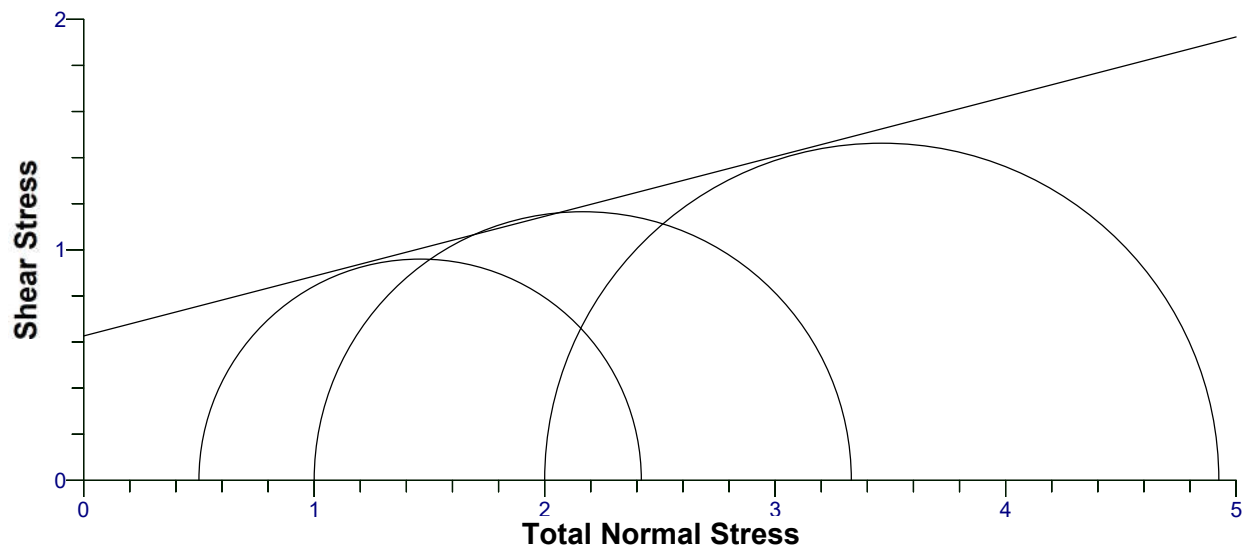


**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 7

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 2.00         | Undisturbed         | 2.56                     | 0.50                                | 0.00                                | 0.81                      | 8.78      |
|              | Undisturbed         | 3.24                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 4.60                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**

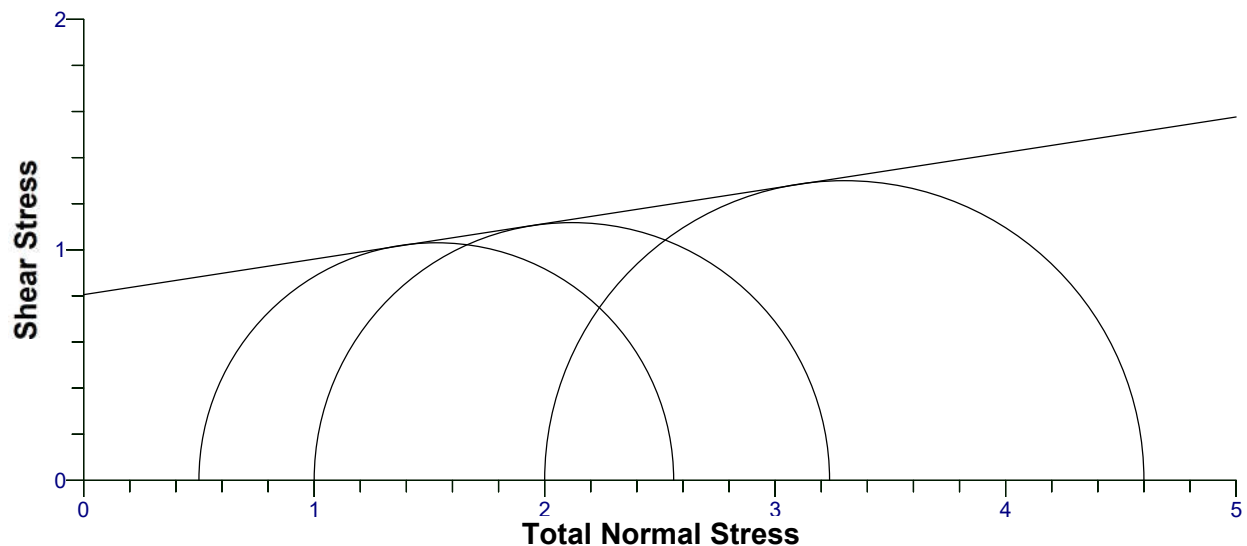


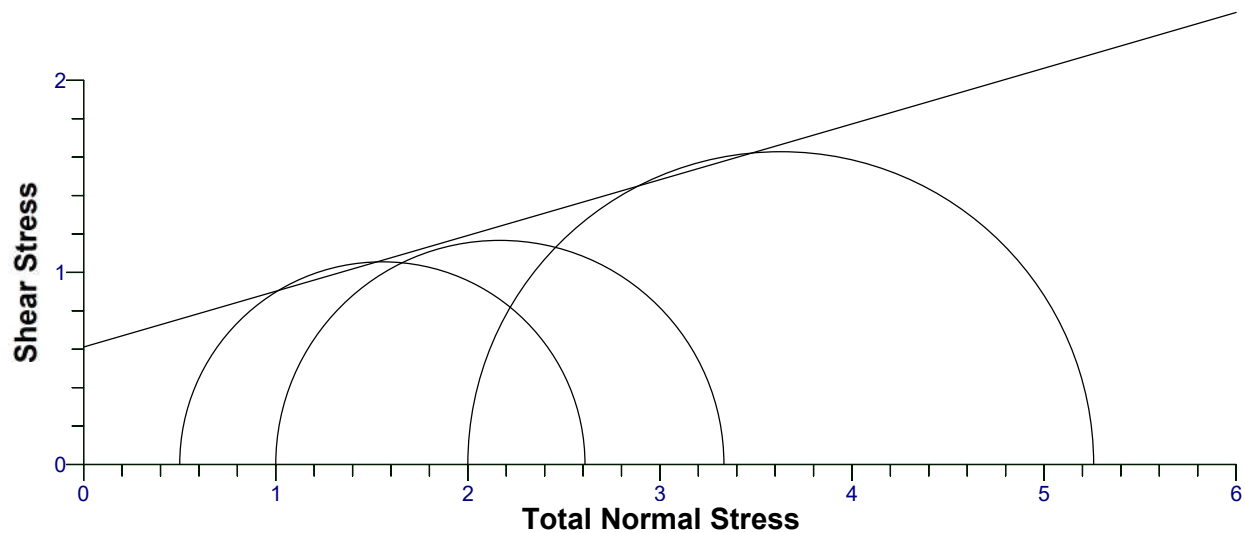
**TABLE - 7B**  
**TRIAXIAL SHEAR TEST**

Project No. : 2324068

Bore Hole No. : 8

| Depth Sample | Sample Type (UD/Rm) | Normal Stress at Failure | Cell Pressure (Kg/cm <sup>2</sup> ) | Pore Pressure (Kg/cm <sup>2</sup> ) | Shear Values from Graph   |           |
|--------------|---------------------|--------------------------|-------------------------------------|-------------------------------------|---------------------------|-----------|
|              |                     |                          |                                     |                                     | Cuu (Kg/cm <sup>2</sup> ) | Øuu (Phi) |
| 3.00         | Undisturbed         | 2.61                     | 0.50                                | 0.00                                | 0.61                      | 16.50     |
|              | Undisturbed         | 3.33                     | 1.00                                | 0.00                                |                           |           |
|              | Undisturbed         | 5.26                     | 2.00                                | 0.00                                |                           |           |

**MOHR CIRCLE**



## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068                |                      |                                                               |                     | Project : G.I.D.C. WATER WORKS, RUNDH                  |                            |                    |       |                          |                     |                              |                  |                        |                      | Depth of Water Table : 5.00 mts from Ground Level  |                  |                              |      |                  |                                |                  |            |                             |           |
|-------------------------------------|----------------------|---------------------------------------------------------------|---------------------|--------------------------------------------------------|----------------------------|--------------------|-------|--------------------------|---------------------|------------------------------|------------------|------------------------|----------------------|----------------------------------------------------|------------------|------------------------------|------|------------------|--------------------------------|------------------|------------|-----------------------------|-----------|
| Bore Hole No. :1                    |                      |                                                               |                     | Bore Hole Started on :27-05-23 Completed on : 28-05-23 |                            |                    |       |                          |                     |                              |                  |                        |                      | Location of Bore Hole :N 21°49'14.6" E 73°11'43.6" |                  |                              |      |                  |                                |                  |            |                             |           |
| Method of Drilling :ROTARY DRILLING |                      |                                                               |                     | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                            |                    |       |                          |                     |                              |                  |                        |                      |                                                    |                  |                              |      |                  |                                |                  |            |                             |           |
| Depth in metres                     | I. S. Classification | Visual Soil Description                                       | Field Test /Samples |                                                        | Ns No. of Blows per 300 mm | Rock Properties    |       | Natural Moist. Content % | Density (in gms/cc) |                              | Specific Gravity | Particle Size Analysis |                      |                                                    | Atterberg Limits |                              |      | Shrinkage Lim. % | Free swell Indx %              | Shear Properties |            | Additional Tests or Remarks |           |
|                                     |                      |                                                               | SPT VST             | UDS DS                                                 |                            | C.R. %             | RQD % |                          | Bulk                | Dry                          |                  | Gr. %                  | Sn %                 | Silt+ Clay                                         | LL %             | PL %                         | PI % |                  |                                | Test Type        | C (Kg/cm²) |                             | Ø in Deg. |
| 00.00                               | CH                   | BLACK HIGH PLASTIC CLAY                                       |                     | DS                                                     |                            |                    |       |                          |                     |                              |                  | 0                      | 11                   | 89                                                 | 50               | 26                           | 24   |                  | 55                             |                  |            |                             |           |
| 01.00                               |                      | YELLOW STIFF PLASTIC SILTY CLAY                               |                     | UDS                                                    |                            |                    |       | 25.95                    | 1.84                | 1.46                         | 2.77             | 0                      | 8                    | 92                                                 | 48               | 26                           | 22   |                  | 36                             | UCC              |            |                             |           |
| 02.00                               | CI                   |                                                               | SPT                 | DS                                                     | 10                         |                    |       | 25.80                    |                     |                              |                  | 2                      | 4                    | 94                                                 | 39               | 24                           | 15   |                  | 9                              |                  |            |                             |           |
| 03.00                               | CH                   | BLACKISH YELLOW HIGH PLASTIC CLAY                             |                     | UDS                                                    |                            |                    |       | 25.52                    | 1.87                | 1.49                         | 2.78             | 0                      | 7                    | 93                                                 | 51               | 26                           | 25   |                  | 36                             | UCC              |            |                             |           |
| 04.00                               | CH                   | BLACKISH YELLOW STIFF HIGH PLASSTIC CLAY WITH SAND AND GRAVEL | SPT                 | DS                                                     | 13                         |                    |       | 25.83                    |                     |                              |                  | 31                     | 12                   | 57                                                 | 53               | 27                           | 26   |                  |                                |                  |            |                             |           |
| 05.00                               |                      | YELLOW STIFF TO VERY STIFF HIGH PLASTIC CLAY                  |                     | UDS                                                    |                            |                    |       | 26.84                    | 1.92                | 1.51                         | 2.74             | 0                      | 7                    | 93                                                 | 52               | 27                           | 25   |                  |                                | Tuu              | 0.83       | 9.9°                        |           |
| 06.00                               |                      |                                                               | SPT                 | DS                                                     | 14                         |                    |       | 26.68                    |                     |                              |                  | 0                      | 10                   | 90                                                 | 53               | 27                           | 26   |                  |                                |                  |            |                             |           |
| 07.50                               |                      |                                                               |                     | UDS                                                    |                            |                    |       | 26.53                    | 1.93                | 1.53                         | 2.76             | 0                      | 10                   | 90                                                 | 52               | 26                           | 26   |                  |                                | UCC              | 1.08       |                             |           |
| 09.00                               |                      |                                                               | SPT                 | DS                                                     | 18                         |                    |       | 26.80                    |                     |                              |                  | 1                      | 7                    | 92                                                 | 51               | 26                           | 25   |                  |                                |                  |            |                             |           |
| 10.50                               | CH                   |                                                               |                     | UDS                                                    |                            |                    |       | 26.45                    | 1.95                | 1.54                         | 2.76             | 0                      | 6                    | 94                                                 | 50               | 26                           | 24   |                  |                                | UCC              | 1.50       |                             |           |
| 12.00                               |                      |                                                               | SPT                 | DS                                                     | 21                         |                    |       | 26.54                    |                     |                              |                  | 0                      | 5                    | 95                                                 | 59               | 29                           | 30   |                  |                                |                  |            |                             |           |
| 13.50                               |                      |                                                               |                     | UDS                                                    |                            |                    |       | 26.29                    | 1.97                | 1.56                         | 2.75             | 0                      | 6                    | 94                                                 | 55               | 27                           | 28   |                  |                                | Tuu              | 1.54       | 9.1°                        |           |
| 15.00                               |                      |                                                               | SPT                 | DS                                                     | 25                         |                    |       | 26.41                    |                     |                              |                  | 0                      | 5                    | 95                                                 | 51               | 26                           | 25   |                  |                                |                  |            |                             |           |
| 15.50                               |                      | TERMINATION                                                   |                     |                                                        |                            |                    |       |                          |                     |                              |                  |                        |                      |                                                    |                  |                              |      |                  |                                |                  |            |                             |           |
| SPT - Standard Penetration Test     |                      | DS - Disturbed Sample                                         |                     | Gr - Gravel                                            |                            | LL - Liquid Limit  |       | PI - Plasticity Index    |                     | Cv - Coeff. of Consolidation |                  |                        | C.R. - Core Recovery |                                                    |                  | Mv - Coeff. of Volume Change |      |                  | RQD - Rock Quality Designation |                  |            |                             |           |
| UDS - Undisturbed Sample            |                      | VST - Vane Shear Test                                         |                     | Sn - Sand                                              |                            | PL - Plastic Limit |       | C, Ø - Shear Parameters  |                     |                              |                  |                        |                      |                                                    |                  |                              |      |                  |                                |                  |            |                             |           |

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

B/216,Road No. 6-F,New Industrial Estate, Udhna,Surat-392001, Gujarat, India

Signed by: Nehal Hiteshbhai Desai  
 Organization Unit: Authorized Signatory  
 Organization Name: UNIQUE  
 GEOCIVIL SERVICES PRIVATE  
 LIMITED  
 Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068                                        |                      |                                                           |                                                   | Project : G.I.D.C. WATER WORKS, RUNDH                  |                            |                          |       |                          |                                         |      |                  |                                                  |      |                                                    |                                                              |      |      |                                                        |                   |                  |            |           |                             |
|-------------------------------------------------------------|----------------------|-----------------------------------------------------------|---------------------------------------------------|--------------------------------------------------------|----------------------------|--------------------------|-------|--------------------------|-----------------------------------------|------|------------------|--------------------------------------------------|------|----------------------------------------------------|--------------------------------------------------------------|------|------|--------------------------------------------------------|-------------------|------------------|------------|-----------|-----------------------------|
| Bore Hole No. :2                                            |                      |                                                           |                                                   | Bore Hole Started on 29-05-23 Completed on : 30-05-23  |                            |                          |       |                          |                                         |      |                  |                                                  |      | Depth of Water Table : 6.00 mts from Ground Level  |                                                              |      |      |                                                        |                   |                  |            |           |                             |
| Method of Drilling :ROTARY DRILLING                         |                      |                                                           |                                                   | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                            |                          |       |                          |                                         |      |                  |                                                  |      | Location of Bore Hole :N 21°69'13.6" E 73°11'42.6" |                                                              |      |      |                                                        |                   |                  |            |           |                             |
| Depth in metres                                             | I. S. Classification | Visual Soil Description                                   | Field Test /Samples                               |                                                        | Ns No. of Blows per 300 mm | Rock Properties          |       | Natural Moist. Content % | Density (in gms/cc)                     |      | Specific Gravity | Particle Size Analysis                           |      |                                                    | Atterberg Limits                                             |      |      | Shrinkage Lim. %                                       | Free swell Indx % | Shear Properties |            |           | Additional Tests or Remarks |
|                                                             |                      |                                                           | SPT VST                                           | UDS DS                                                 |                            | C.R. %                   | RQD % |                          | Bulk                                    | Dry  |                  | Gr. %                                            | Sn % | Silt+ Clay                                         | LL %                                                         | PL % | PI % |                                                        |                   | Test Type        | C (Kg/cm²) | Ø in Deg. |                             |
| 00.00                                                       | CH                   | BLACK HIGH PLASTIC CLAY                                   |                                                   | DS                                                     |                            |                          |       |                          |                                         |      |                  | 0                                                | 7    | 93                                                 | 52                                                           | 26   | 26   |                                                        | 70                |                  |            |           |                             |
| 01.00                                                       |                      |                                                           | YELLOW FIRM TO STIFF PLASTIC SILTY CLAY WITH SAND | SPT                                                    | DS                         | 10                       |       |                          | 25.05                                   |      |                  |                                                  | 2    | 11                                                 | 87                                                           | 48   | 26   | 22                                                     |                   | 27               |            |           |                             |
| 02.00                                                       | CI                   |                                                           |                                                   |                                                        | UDS                        |                          |       |                          | 24.41                                   | 1.84 | 1.48             | 2.81                                             | 2    | 16                                                 | 82                                                           | 40   | 25   | 15                                                     |                   | 18               | UCC        |           |                             |
| 03.00                                                       |                      |                                                           |                                                   | SPT                                                    | DS                         | 09                       |       |                          | 24.08                                   |      |                  |                                                  | 0    | 15                                                 | 85                                                           | 41   | 25   | 16                                                     |                   | 8                |            |           |                             |
| 04.00                                                       |                      |                                                           |                                                   | UDS                                                    |                            |                          |       | 25.49                    | 1.87                                    | 1.49 | 2.76             | 3                                                | 12   | 85                                                 | 48                                                           | 26   | 22   |                                                        |                   | UCC              |            |           |                             |
| 05.00                                                       |                      |                                                           | YELLOW VERY STIFF PLASTIC SILTY CLAY              | SPT                                                    | DS                         | 16                       |       |                          | 26.20                                   |      |                  |                                                  | 1    | 7                                                  | 92                                                           | 45   | 25   | 20                                                     |                   |                  |            |           |                             |
| 06.00                                                       |                      |                                                           |                                                   |                                                        | UDS                        |                          |       |                          | 27.09                                   | 1.92 | 1.51             | 2.74                                             | 8    | 2                                                  | 90                                                           | 38   | 23   | 15                                                     |                   |                  | Tuu        | 0.89      | 9.1°                        |
| 07.50                                                       |                      |                                                           |                                                   | SPT                                                    | DS                         | 17                       |       |                          | 26.59                                   |      |                  |                                                  | 2    | 6                                                  | 92                                                           | 45   | 25   | 20                                                     |                   |                  |            |           |                             |
| 09.00                                                       | CI                   |                                                           |                                                   | UDS                                                    |                            |                          |       | 26.53                    | 1.93                                    | 1.52 | 2.75             | 1                                                | 5    | 94                                                 | 39                                                           | 24   | 15   |                                                        |                   | UCC              | 1.11       |           |                             |
| 10.50                                                       |                      |                                                           |                                                   | SPT                                                    | DS                         | 24                       |       |                          | 25.68                                   |      |                  |                                                  | 0    | 7                                                  | 93                                                           | 40   | 25   | 15                                                     |                   |                  |            |           |                             |
| 12.00                                                       |                      |                                                           |                                                   | UDS                                                    |                            |                          |       | 26.22                    | 1.94                                    | 1.54 | 2.77             | 2                                                | 6    | 92                                                 | 37                                                           | 23   | 14   |                                                        |                   | Tuu              | 1.53       | 9.3°      |                             |
| 13.50                                                       |                      |                                                           |                                                   | SPT                                                    | DS                         | 28                       |       |                          | 26.26                                   |      |                  |                                                  | 2    | 3                                                  | 95                                                           | 39   | 24   | 15                                                     |                   |                  |            |           |                             |
| 14.00                                                       | CI                   | YELLOW VERY STIFF PLASTIC SILTY CLAY WITH SAND AND GRAVEL |                                                   |                                                        |                            |                          |       |                          |                                         |      |                  |                                                  |      |                                                    |                                                              |      |      |                                                        |                   |                  |            |           |                             |
| 15.00                                                       |                      |                                                           |                                                   |                                                        | UDS                        |                          |       |                          | 26.03                                   | 1.96 | 1.55             | 2.75                                             | 12   | 15                                                 | 73                                                           | 38   | 24   | 14                                                     |                   |                  | UCC        | 1.71      |                             |
| 15.50                                                       |                      | TERMINATION                                               |                                                   |                                                        |                            |                          |       |                          |                                         |      |                  |                                                  |      |                                                    |                                                              |      |      |                                                        |                   |                  |            |           |                             |
| SPT - Standard Penetration Test<br>UDS - Undisturbed Sample |                      |                                                           | DS - Disturbed Sample<br>VST - Vane Shear Test    |                                                        |                            | Gr - Gravel<br>Sn - Sand |       |                          | LL - Liquid Limit<br>PL - Plastic Limit |      |                  | PI - Plasticity Index<br>C, Ø - Shear Parameters |      |                                                    | Cv - Coeff. of Consolidation<br>Mv - Coeff. of Volume Change |      |      | C.R. - Core Recovery<br>RQD - Rock Quality Designation |                   |                  |            |           |                             |

SPT - Standard Penetration Test      DS - Disturbed Sample      Gr - Gravel      LL - Liquid Limit      PI - Plasticity Index      Cv - Coeff. of Consolidation      C.R. - Core Recovery  
 UDS - Undisturbed Sample      VST - Vane Shear Test      Sn - Sand      PL - Plastic Limit      C, Ø - Shear Parameters      Mv - Coeff. of Volume Change      RQD - Rock Quality Designation

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

B/216,Road No. 6-F,New Industrial Estate, Udhna,Surat-392022

Signed by: Nehal Hiteshbhai Desai,  
 Organization Unit: Authorized Signatory  
 Organization Name: UNIQUE  
 GEOCIVIL SERVICES PRIVATE  
 LIMITED  
 Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068                |                      |                                                     |                     | Project : G.I.D.C. WATER WORKS, RUNDH                  |                            |                 |                         |                          |                              |      |                  |                        |      |            |                              | Depth of Water Table : Below Termination Level |      |                                |                   |                  |            |           |                             |
|-------------------------------------|----------------------|-----------------------------------------------------|---------------------|--------------------------------------------------------|----------------------------|-----------------|-------------------------|--------------------------|------------------------------|------|------------------|------------------------|------|------------|------------------------------|------------------------------------------------|------|--------------------------------|-------------------|------------------|------------|-----------|-----------------------------|
| Bore Hole No. :3                    |                      |                                                     |                     | Bore Hole Started on :31-05-23 Completed on : 31-05-23 |                            |                 |                         |                          |                              |      |                  |                        |      |            |                              |                                                |      |                                |                   |                  |            |           |                             |
| Method of Drilling :ROTARY DRILLING |                      |                                                     |                     | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                            |                 |                         |                          |                              |      |                  |                        |      |            |                              |                                                |      |                                |                   |                  |            |           |                             |
|                                     |                      |                                                     |                     | Location of Bore Hole :N 21°47'44.7" E 73°11'22.8"     |                            |                 |                         |                          |                              |      |                  |                        |      |            |                              |                                                |      |                                |                   |                  |            |           |                             |
| Depth in metres                     | I. S. Classification | Visual Soil Description                             | Field Test /Samples |                                                        | Ns No. of Blows per 300 mm | Rock Properties |                         | Natural Moist. Content % | Density (in gms/cc)          |      | Specific Gravity | Particle Size Analysis |      |            | Atterberg Limits             |                                                |      | Shrinkage Lim. %               | Free swell Indx % | Shear Properties |            |           | Additional Tests or Remarks |
|                                     |                      |                                                     | SPT VST             | UDS DS                                                 |                            | C.R. %          | RQD %                   |                          | Bulk                         | Dry  |                  | Gr. %                  | Sn % | Silt+ Clay | LL %                         | PL %                                           | PI % |                                |                   | Test Type        | C (Kg/cm²) | Ø in Deg. |                             |
| 00.00                               | CI                   | FILLING                                             |                     | DS                                                     |                            |                 |                         |                          |                              |      |                  | 0                      | 24   | 76         | 41                           | 25                                             | 16   |                                | 27                |                  |            |           |                             |
| 01.00                               | SC                   | BLACK STIFF PLASTIC CLAYEY FINE SAND                | SPT                 | DS                                                     | 12                         |                 |                         | 21.89                    |                              |      |                  | 0                      | 65   | 35         | 36                           | 24                                             | 12   |                                | 20                |                  |            |           |                             |
| 02.00                               |                      | YELLOW VERY STIFF PLASTIC SILTY CLAY WITH FINE SAND |                     | UDS                                                    |                            |                 |                         | 23.97                    | 1.86                         | 1.50 | 2.78             | 0                      | 22   | 78         | 41                           | 24                                             | 17   |                                | 36                | Tuu              | 0.83       | 13.2°     |                             |
| 03.00                               | CI                   |                                                     | SPT                 | DS                                                     | 18                         |                 |                         | 25.37                    |                              |      |                  | 0                      | 27   | 73         | 44                           | 26                                             | 18   |                                | 25                |                  |            |           |                             |
| 04.00                               |                      |                                                     |                     | UDS                                                    |                            |                 |                         | 24.98                    | 1.89                         | 1.51 | 2.76             | 0                      | 21   | 79         | 46                           | 26                                             | 20   |                                |                   | UCC              |            |           |                             |
| 05.00                               | SC                   | YELLOW VERY STIFF PLASTIC CLAYEY FINE SAND          | SPT                 | DS                                                     | 21                         |                 |                         | 21.68                    |                              |      |                  | 0                      | 66   | 34         | 37                           | 23                                             | 14   |                                |                   |                  |            |           |                             |
| 06.00                               | CI                   | YELLOW VERY STIFF PLASTIC SILTY CLAY WITH FINE SAND |                     | UDS                                                    |                            |                 |                         | 24.90                    | 1.91                         | 1.53 | 2.77             | 0                      | 19   | 81         | 44                           | 25                                             | 19   |                                |                   | UCC              |            |           |                             |
| 06.50                               |                      | TERMINATION                                         |                     |                                                        |                            |                 |                         |                          |                              |      |                  |                        |      |            |                              |                                                |      |                                |                   |                  |            |           |                             |
| SPT - Standard Penetration Test     |                      | DS - Disturbed Sample                               | Gr - Gravel         |                                                        | LL - Liquid Limit          |                 | PI - Plasticity Index   |                          | Cv - Coeff. of Consolidation |      |                  | C.R. - Core Recovery   |      |            | Mv - Coeff. of Volume Change |                                                |      | RQD - Rock Quality Designation |                   |                  |            |           |                             |
| UDS - Undisturbed Sample            |                      | VST - Vane Shear Test                               | Sn - Sand           |                                                        | PL - Plastic Limit         |                 | C, Ø - Shear Parameters |                          |                              |      |                  |                        |      |            |                              |                                                |      |                                |                   |                  |            |           |                             |

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

B/216,Road No. 6-F,New Industrial Estate, Udhna,Surat-392 015, Gujarat

Signed by: Nehal Hiteshbhai Desai  
Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068              |                      |                                                            |                     | Project : G.I.D.C. WATER WORKS, RUNDH                  |                            |                    |       |                          |                     |                              |                  |                        |                      |            |                  |                                                    |      |                 |                                |                  |            |           |                             |  |  |
|-----------------------------------|----------------------|------------------------------------------------------------|---------------------|--------------------------------------------------------|----------------------------|--------------------|-------|--------------------------|---------------------|------------------------------|------------------|------------------------|----------------------|------------|------------------|----------------------------------------------------|------|-----------------|--------------------------------|------------------|------------|-----------|-----------------------------|--|--|
| Bore Hole No. :4                  |                      |                                                            |                     | Bore Hole Started on :02-06-23 Completed on : 02-06-23 |                            |                    |       |                          |                     |                              |                  |                        |                      |            |                  | Depth of Water Table : Below Termination Level     |      |                 |                                |                  |            |           |                             |  |  |
| Method of Drilling :SHELL & AUGER |                      |                                                            |                     | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                            |                    |       |                          |                     |                              |                  |                        |                      |            |                  | Location of Bore Hole :N 21°46'15.5" E 73°11'23.5" |      |                 |                                |                  |            |           |                             |  |  |
| Depth in metres                   | I. S. Classification | Visual Soil Description                                    | Field Test /Samples |                                                        | Ns No. of Blows per 300 mm | Rock Properties    |       | Natural Moist. Content % | Density (in gms/cc) |                              | Specific Gravity | Particle Size Analysis |                      |            | Atterberg Limits |                                                    |      | Shrinkge Lim. % | Free swell Indx %              | Shear Properties |            |           | Additional Tests or Remarks |  |  |
|                                   |                      |                                                            | SPT VST             | UDS DS                                                 |                            | C.R. %             | RQD % |                          | Bulk                | Dry                          |                  | Gr. %                  | Sn %                 | Silt+ Clay | LL %             | PL %                                               | PI % |                 |                                | Test Type        | C (Kg/cm²) | Ø in Deg. |                             |  |  |
| 00.00                             | CI                   | FILLING                                                    |                     | DS                                                     |                            |                    |       |                          |                     |                              |                  | 0                      | 3                    | 97         | 47               | 25                                                 | 22   |                 | 15                             |                  |            |           |                             |  |  |
| 01.00                             |                      | BLACKISH YELLOW STIFF HIGH PLASTIC CLAY WITH SAND          |                     | UDS                                                    |                            |                    |       | 19.37                    | 1.78                | 1.49                         | 2.78             | 1                      | 17                   | 82         | 62               | 31                                                 | 31   |                 | 33                             | UCC              |            |           |                             |  |  |
| 02.00                             | CH                   |                                                            | SPT                 | DS                                                     | 15                         |                    |       | 19.13                    |                     |                              |                  | 0                      | 13                   | 87         | 52               | 26                                                 | 26   |                 | 45                             |                  |            |           |                             |  |  |
| 03.00                             |                      | BLACKISH YELLOW VERY STIFF PLASTIC CLAYEY SAND WITH GRAVEL |                     | UDS                                                    |                            |                    |       | 18.41                    | 1.85                | 1.56                         | 2.78             | 13                     | 59                   | 28         | 58               | 29                                                 | 29   |                 | 33                             | Tuu              | 0.66       | 15.9°     |                             |  |  |
| 04.00                             | SC                   |                                                            |                     |                                                        |                            |                    |       |                          |                     |                              |                  |                        |                      |            |                  |                                                    |      |                 |                                |                  |            |           |                             |  |  |
| 05.00                             |                      | BLACK VERY STIFF HIGH PLASTIC CLAY                         | SPT                 | DS                                                     | 19                         |                    |       | 23.64                    |                     |                              |                  | 0                      | 10                   | 90         | 59               | 29                                                 | 30   |                 |                                |                  |            |           |                             |  |  |
| 06.00                             | CH                   |                                                            |                     |                                                        |                            |                    |       |                          |                     |                              |                  |                        |                      |            |                  |                                                    |      |                 |                                |                  |            |           |                             |  |  |
| 06.50                             |                      |                                                            |                     | UDS                                                    |                            |                    |       | 24.42                    | 1.90                | 1.53                         | 2.75             | 2                      | 11                   | 87         | 68               | 32                                                 | 36   |                 |                                | UCC              |            |           |                             |  |  |
|                                   |                      |                                                            | SPT                 | DS                                                     | 22                         |                    |       | 24.88                    |                     |                              |                  | 0                      | 11                   | 89         | 65               | 31                                                 | 34   |                 |                                |                  |            |           |                             |  |  |
|                                   |                      | TERMINATION                                                |                     |                                                        |                            |                    |       |                          |                     |                              |                  |                        |                      |            |                  |                                                    |      |                 |                                |                  |            |           |                             |  |  |
| SPT - Standard Penetration Test   |                      | DS - Disturbed Sample                                      |                     | Gr - Gravel                                            |                            | LL - Liquid Limit  |       | PI - Plasticity Index    |                     | Cv - Coeff. of Consolidation |                  |                        | C.R. - Core Recovery |            |                  | Mv - Coeff. of Volume Change                       |      |                 | RQD - Rock Quality Designation |                  |            |           |                             |  |  |
| UDS - Undisturbed Sample          |                      | VST - Vane Shear Test                                      |                     | Sn - Sand                                              |                            | PL - Plastic Limit |       | C, Ø - Shear Parameters  |                     |                              |                  |                        |                      |            |                  |                                                    |      |                 |                                |                  |            |           |                             |  |  |

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

B/216,Road No. 6-F,New Industrial Estate, Udhna,Surat-392 020, Gujarat, India

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Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068              |                      |                                                      |                     | Project : G.I.D.C. WATER WORKS, RUNDH                  |                            |                    |       |                          |                     |                              |                  |                                                   |                      |            |                  |                              |      |                  |                                |                 |            |           |                             |  |  |
|-----------------------------------|----------------------|------------------------------------------------------|---------------------|--------------------------------------------------------|----------------------------|--------------------|-------|--------------------------|---------------------|------------------------------|------------------|---------------------------------------------------|----------------------|------------|------------------|------------------------------|------|------------------|--------------------------------|-----------------|------------|-----------|-----------------------------|--|--|
| Bore Hole No. :5                  |                      |                                                      |                     | Bore Hole Started on :03-06-23 Completed on : 03-06-23 |                            |                    |       |                          |                     |                              |                  | Depth of Water Table : Below Termination Level    |                      |            |                  |                              |      |                  |                                |                 |            |           |                             |  |  |
| Method of Drilling :SHELL & AUGER |                      |                                                      |                     | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                            |                    |       |                          |                     |                              |                  | Location of Bore Hole :N 21°44'25.1" E73°10'06.7" |                      |            |                  |                              |      |                  |                                |                 |            |           |                             |  |  |
| Depth in metres                   | I. S. Classification | Visual Soil Description                              | Field Test /Samples |                                                        | Ns No. of Blows per 300 mm | Rock Properties    |       | Natural Moist. Content % | Density (in gms/cc) |                              | Specific Gravity | Particle Size Analysis                            |                      |            | Atterberg Limits |                              |      | Shrinkage Lim. % | Free swell Indx %              | Shear Test Type | Properties |           | Additional Tests or Remarks |  |  |
|                                   |                      |                                                      | SPT VST             | UDS DS                                                 |                            | C.R. %             | RQD % |                          | Bulk                | Dry                          |                  | Gr. %                                             | Sn %                 | Silt+ Clay | LL %             | PL %                         | PI % |                  |                                |                 | C (Kg/cm²) | Ø in Deg. |                             |  |  |
| 00.00                             | CI                   | YELLOW STIFF PLASTIC SILTY CLAY WITH SAND            |                     | DS                                                     |                            |                    |       |                          |                     |                              |                  | 2                                                 | 46                   | 52         | 40               | 25                           | 15   |                  | 35                             |                 |            |           |                             |  |  |
| 01.00                             |                      | SPT                                                  | DS                  | 15                                                     |                            |                    | 24.85 |                          |                     |                              |                  | 0                                                 | 48                   | 52         | 37               | 24                           | 13   |                  | 18                             |                 |            |           |                             |  |  |
| 02.00                             | CH                   | BLACKIS YELLOW STIFF HIGH PLASTIC CLAY WITH SAND     |                     | UDS                                                    |                            |                    | 23.54 | 1.83                     | 1.48                | 2.78                         | 1                | 19                                                | 80                   | 56         | 28               | 28                           |      | 36               | UCC                            |                 |            |           |                             |  |  |
| 03.00                             |                      | SPT                                                  | DS                  | 27                                                     |                            |                    | 18.49 |                          |                     |                              |                  | 1                                                 | 80                   | 19         | 34               | 22                           | 12   |                  | 40                             |                 |            |           |                             |  |  |
| 04.00                             | SC                   | YELLOW VERY STIFF PLASTIC CLAYEY MEDIUM TO FINE SAND |                     | UDS                                                    |                            |                    | 24.83 | 1.89                     | 1.51                | 2.77                         | 0                | 25                                                | 75                   | 55         | 28               | 27                           |      |                  | Tuu                            | 0.93            | 11.9°      |           |                             |  |  |
| 05.00                             |                      | SPT                                                  | DS                  | 20                                                     |                            |                    | 23.53 |                          |                     |                              |                  | 0                                                 | 18                   | 82         | 69               | 32                           | 37   |                  |                                |                 |            |           |                             |  |  |
| 06.00                             | CH                   | BLACK VERY STIFF HIGH PLASTIC CLAY WITH SAND         |                     | UDS                                                    |                            |                    | 25.34 | 1.91                     | 1.53                | 2.74                         | 0                | 18                                                | 82                   | 68         | 32               | 36                           |      |                  | UCC                            |                 |            |           |                             |  |  |
| 07.00                             |                      | SPT                                                  | DS                  | 25                                                     |                            |                    | 25.11 |                          |                     |                              |                  | 0                                                 | 10                   | 90         | 69               | 32                           | 37   |                  |                                |                 |            |           |                             |  |  |
| 08.00                             |                      |                                                      |                     | UDS                                                    |                            |                    | 25.31 | 1.93                     | 1.54                | 2.75                         | 1                | 12                                                | 87                   | 67         | 32               | 35                           |      |                  | UCC                            |                 |            |           |                             |  |  |
| 08.50                             |                      | TERMINATION                                          |                     |                                                        |                            |                    |       |                          |                     |                              |                  |                                                   |                      |            |                  |                              |      |                  |                                |                 |            |           |                             |  |  |
| SPT - Standard Penetration Test   |                      | DS - Disturbed Sample                                |                     | Gr - Gravel                                            |                            | LL - Liquid Limit  |       | PI - Plasticity Index    |                     | Cv - Coeff. of Consolidation |                  |                                                   | C.R. - Core Recovery |            |                  | Mv - Coeff. of Volume Change |      |                  | RQD - Rock Quality Designation |                 |            |           |                             |  |  |
| UDS - Undisturbed Sample          |                      | VST - Vane Shear Test                                |                     | Sn - Sand                                              |                            | PL - Plastic Limit |       | C, Ø - Shear Parameters  |                     |                              |                  |                                                   |                      |            |                  |                              |      |                  |                                |                 |            |           |                             |  |  |

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

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 Organization Name: UNIQUE  
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 Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068              |                      |                                                           |                     | Project : G.I.D.C. WATER WORKS, RUNDH                  |                                     |                    |       |                             |                     |                              |                  |                        |      | Depth of Water Table : Below Termination Level     |                  |                                |      |                  |                   |                 |            |           |                             |
|-----------------------------------|----------------------|-----------------------------------------------------------|---------------------|--------------------------------------------------------|-------------------------------------|--------------------|-------|-----------------------------|---------------------|------------------------------|------------------|------------------------|------|----------------------------------------------------|------------------|--------------------------------|------|------------------|-------------------|-----------------|------------|-----------|-----------------------------|
| Bore Hole No. :6                  |                      |                                                           |                     | Bore Hole Started on :04-06-23 Completed on : 04-06-23 |                                     |                    |       |                             |                     |                              |                  |                        |      | Location of Bore Hole :N 21°42'54.6" E 73°10'12.4" |                  |                                |      |                  |                   |                 |            |           |                             |
| Method of Drilling :SHELL & AUGER |                      |                                                           |                     | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                                     |                    |       |                             |                     |                              |                  |                        |      |                                                    |                  |                                |      |                  |                   |                 |            |           |                             |
| Depth in metres                   | I. S. Classification | Visual Soil Description                                   | Field Test /Samples |                                                        | Ns<br>No. of<br>Blows per<br>300 mm | Rock Properties    |       | Natural Moist.<br>Content % | Density (in gms/cc) |                              | Specific Gravity | Particle Size Analysis |      |                                                    | Atterberg Limits |                                |      | Shrinkage Lim. % | Free swell Indx % | Shear Test Type | Properties |           | Additional Tests or Remarks |
|                                   |                      |                                                           | SPT VST             | UDS DS                                                 |                                     | C.R. %             | RQD % |                             | Bulk                | Dry                          |                  | Gr. %                  | Sn % | Silt+ Clay                                         | LL %             | PL %                           | PI % |                  |                   |                 | C (Kg/cm²) | Ø in Deg. |                             |
| 00.00                             | CH                   | BLACK HIGH PLASTIC CLAY WITH SAND                         |                     | DS                                                     |                                     |                    |       |                             |                     |                              |                  | 2                      | 30   | 68                                                 | 60               | 29                             | 31   |                  | 80                |                 |            |           |                             |
| 01.00                             |                      | YELLOW VERY STIFF TO HARD PLASTIC CLAYEY SAND WITH GRAVEL |                     | UDS                                                    |                                     |                    |       | 21.80                       | 1.90                | 1.56                         | 2.79             | 18                     | 53   | 29                                                 | 56               | 27                             | 29   |                  | 42                | Tuu             | 0.63       | 14.4°     |                             |
| 02.00                             | SC                   |                                                           | SPT                 | DS                                                     | 27                                  |                    |       | 22.04                       |                     |                              |                  | 23                     | 45   | 32                                                 | 60               | 30                             | 30   |                  | 45                |                 |            |           |                             |
| 03.00                             |                      |                                                           | SPT                 | DS                                                     | 57                                  |                    |       | 20.80                       |                     |                              |                  | 21                     | 48   | 31                                                 | 57               | 27                             | 30   |                  | 55                |                 |            |           |                             |
| 04.00                             | GM                   | YELLOW DENSE SILTY GRAVEL WITH SAND                       | SPT                 | DS                                                     | 50/20                               |                    |       | 10.56                       |                     |                              |                  | 49                     | 36   | 15                                                 | 24               | -                              | -    |                  |                   |                 |            |           |                             |
| 04.30                             |                      | TERMINATION                                               |                     |                                                        |                                     |                    |       |                             |                     |                              |                  |                        |      |                                                    |                  |                                |      |                  |                   |                 |            |           |                             |
| SPT - Standard Penetration Test   |                      | DS - Disturbed Sample                                     |                     | Gr - Gravel                                            |                                     | LL - Liquid Limit  |       | PI - Plasticity Index       |                     | Cv - Coeff. of Consolidation |                  | C.R. - Core Recovery   |      | Mv - Coeff. of Volume Change                       |                  | RQD - Rock Quality Designation |      |                  |                   |                 |            |           |                             |
| UDS - Undisturbed Sample          |                      | VST - Vane Shear Test                                     |                     | Sn - Sand                                              |                                     | PL - Plastic Limit |       | C, Ø - Shear Parameters     |                     |                              |                  |                        |      |                                                    |                  |                                |      |                  |                   |                 |            |           |                             |

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

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 Organization Name: UNIQUE  
 GEOCIVIL SERVICES PRIVATE  
 LIMITED  
 Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068                |                      |                                                        |                     | Project : G.I.D.C. WATER WORKS, RUNDH                  |                                     |                 |                         |                          |                              |      |                      |                        |                              | Depth of Water Table : 1.00 mts from Ground Level  |                                |      |      |                  |                   |                  |            |                             |           |
|-------------------------------------|----------------------|--------------------------------------------------------|---------------------|--------------------------------------------------------|-------------------------------------|-----------------|-------------------------|--------------------------|------------------------------|------|----------------------|------------------------|------------------------------|----------------------------------------------------|--------------------------------|------|------|------------------|-------------------|------------------|------------|-----------------------------|-----------|
| Bore Hole No. :7                    |                      |                                                        |                     | Bore Hole Started on 21-06-23 Completed on : 21-06-23  |                                     |                 |                         |                          |                              |      |                      |                        |                              | Location of Bore Hole :N 21°41'50.1" E 73°09'34.4" |                                |      |      |                  |                   |                  |            |                             |           |
| Method of Drilling :ROTARY DRILLING |                      |                                                        |                     | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                                     |                 |                         |                          |                              |      |                      |                        |                              |                                                    |                                |      |      |                  |                   |                  |            |                             |           |
| Depth in metres                     | I. S. Classification | Visual Soil Description                                | Field Test /Samples |                                                        | Ns<br>No. of<br>Blows per<br>300 mm | Rock Properties |                         | Natural Moist. Content % | Density (in gms/cc)          |      | Specific Gravity     | Particle Size Analysis |                              |                                                    | Atterberg Limits               |      |      | Shrinkage Lim. % | Free swell Indx % | Shear Properties |            | Additional Tests or Remarks |           |
|                                     |                      |                                                        | SPT VST             | UDS DS                                                 |                                     | C.R. %          | RQD %                   |                          | Bulk                         | Dry  |                      | Gr. %                  | Sn %                         | Silt+ Clay                                         | LL %                           | PL % | PI % |                  |                   | Test Type        | C (Kg/cm²) |                             | Ø in Deg. |
| 00.00                               | CH                   | BLACK STIFF HIGH PLASTIC CLAY WITH SAND                |                     | DS                                                     |                                     |                 |                         |                          |                              |      |                      | 0                      | 21                           | 79                                                 | 52                             | 26   | 26   |                  | 40                |                  |            |                             |           |
| 01.00                               |                      | SPT                                                    | DS                  | 10                                                     |                                     |                 | 28.80                   |                          |                              |      | 0                    | 19                     | 81                           | 52                                                 | 26                             | 26   |      | 45               |                   |                  |            |                             |           |
| 02.00                               |                      |                                                        | UDS                 |                                                        |                                     |                 | 32.36                   | 1.86                     | 1.40                         | 2.76 | 3                    | 19                     | 78                           | 56                                                 | 27                             | 29   |      | 70               | Tuu               | 0.81             | 8.8°       |                             |           |
| 03.00                               | CH                   | YELLOW STIFF TO VERY STIFF HIGH PLASTIC CLAY WITH SAND | SPT                 | DS                                                     | 13                                  |                 |                         | 32.85                    |                              |      |                      | 7                      | 20                           | 73                                                 | 52                             | 26   | 26   |                  | 45                |                  |            |                             |           |
| 04.00                               |                      |                                                        | UDS                 |                                                        |                                     |                 | 30.61                   | 1.89                     | 1.44                         | 2.76 | 0                    | 16                     | 84                           | 53                                                 | 27                             | 26   |      |                  | UCC               | 1.07             |            |                             |           |
| 05.00                               |                      | SPT                                                    | DS                  | 20                                                     |                                     |                 | 28.29                   |                          |                              |      | 4                    | 14                     | 82                           | 56                                                 | 27                             | 29   |      |                  |                   |                  |            |                             |           |
| 06.00                               |                      |                                                        |                     | UDS                                                    |                                     |                 |                         | 28.53                    | 1.92                         | 1.50 | 2.74                 | 0                      | 44                           | 56                                                 | 65                             | 32   | 33   |                  |                   | UCC              | 1.60       |                             |           |
| 06.50                               |                      | TERMINATION                                            |                     |                                                        |                                     |                 |                         |                          |                              |      |                      |                        |                              |                                                    |                                |      |      |                  |                   |                  |            |                             |           |
| SPT - Standard Penetration Test     |                      | DS - Disturbed Sample                                  | Gr - Gravel         |                                                        | LL - Liquid Limit                   |                 | PI - Plasticity Index   |                          | Cv - Coeff. of Consolidation |      | C.R. - Core Recovery |                        | Mv - Coeff. of Volume Change |                                                    | RQD - Rock Quality Designation |      |      |                  |                   |                  |            |                             |           |
| UDS - Undisturbed Sample            |                      | VST - Vane Shear Test                                  | Sn - Sand           |                                                        | PL - Plastic Limit                  |                 | C, Ø - Shear Parameters |                          |                              |      |                      |                        |                              |                                                    |                                |      |      |                  |                   |                  |            |                             |           |

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

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Organization Name: UNIQUE  
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LIMITED  
Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068                |                      |                                                     |                     |             | Project : G.I.D.C. WATER WORKS, RUNDH                  |                    |       |                          |                     |                              |                  |                        |                      |            | Depth of Water Table : Below Termination Level     |                              |      |                 |                                |                  |            |           |                             |  |
|-------------------------------------|----------------------|-----------------------------------------------------|---------------------|-------------|--------------------------------------------------------|--------------------|-------|--------------------------|---------------------|------------------------------|------------------|------------------------|----------------------|------------|----------------------------------------------------|------------------------------|------|-----------------|--------------------------------|------------------|------------|-----------|-----------------------------|--|
| Bore Hole No. :8                    |                      |                                                     |                     |             | Bore Hole Started on 20-06-23 Completed on : 20-06-23  |                    |       |                          |                     |                              |                  |                        |                      |            | Location of Bore Hole :N 21°41'23.7" E 73°08'46.3" |                              |      |                 |                                |                  |            |           |                             |  |
| Method of Drilling :ROTARY DRILLING |                      |                                                     |                     |             | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                    |       |                          |                     |                              |                  |                        |                      |            |                                                    |                              |      |                 |                                |                  |            |           |                             |  |
| Depth in metres                     | I. S. Classification | Visual Soil Description                             | Field Test /Samples |             | Ns No. of Blows per 300 mm                             | Rock Properties    |       | Natural Moist. Content % | Density (in gms/cc) |                              | Specific Gravity | Particle Size Analysis |                      |            | Atterberg Limits                                   |                              |      | Shrinkge Lim. % | Free swell Indx %              | Shear Properties |            |           | Additional Tests or Remarks |  |
|                                     |                      |                                                     | SPT VST             | UDS DS      |                                                        | C.R. %             | RQD % |                          | Bulk                | Dry                          |                  | Gr. %                  | Sn %                 | Silt+ Clay | LL %                                               | PL %                         | PI % |                 |                                | Test Type        | C (Kg/cm²) | Ø in Deg. |                             |  |
| 00.00                               | SC                   | YELLOW STIFF PLASTIC CLAYEY MEDIUM TO COARSE SAND   |                     | DS          |                                                        |                    |       |                          |                     |                              |                  | 2                      | 73                   | 25         | 48                                                 | 24                           | 24   |                 | 40                             |                  |            |           |                             |  |
| 01.00                               |                      |                                                     |                     | UDS         |                                                        |                    |       | 21.53                    | 1.89                | 1.56                         | 2.77             | 2                      | 72                   | 26         | 49                                                 | 25                           | 24   |                 | 36                             | UCC              |            |           |                             |  |
| 02.00                               |                      | SPT                                                 | DS                  | 15          |                                                        |                    |       | 20.92                    |                     |                              |                  |                        | 2                    | 69         | 29                                                 | 48                           | 25   | 23              |                                | 10               |            |           |                             |  |
| 03.00                               | SC                   |                                                     |                     | UDS         |                                                        |                    |       | 22.42                    | 1.94                | 1.59                         | 2.75             | 4                      | 76                   | 20         | 49                                                 | 26                           | 23   |                 | 25                             | Tuu              | 0.61       | 16.5°     |                             |  |
| 04.00                               |                      | SPT                                                 | DS                  | 19          |                                                        |                    |       | 22.57                    |                     |                              |                  | 6                      | 60                   | 34         | 35                                                 | 21                           | 14   |                 |                                |                  |            |           |                             |  |
| 05.00                               |                      |                                                     | UDS                 |             |                                                        |                    |       | 22.58                    | 1.96                | 1.60                         | 2.76             | 8                      | 58                   | 34         | 34                                                 | 20                           | 14   |                 |                                | UCC              |            |           |                             |  |
| 05.70                               | CI                   | YELLOW VERY STIFF PLASTIC SILTY CLAY WITH FINE SAND |                     |             |                                                        |                    |       |                          |                     |                              |                  |                        |                      |            |                                                    |                              |      |                 |                                |                  |            |           |                             |  |
| 06.00                               |                      | SPT                                                 | DS                  | 20          |                                                        |                    |       | 25.34                    |                     |                              |                  |                        | 0                    | 36         | 64                                                 | 47                           | 26   | 21              |                                |                  |            |           |                             |  |
| 06.50                               |                      | TERMINATION                                         |                     |             |                                                        |                    |       |                          |                     |                              |                  |                        |                      |            |                                                    |                              |      |                 |                                |                  |            |           |                             |  |
| SPT - Standard Penetration Test     |                      | DS - Disturbed Sample                               |                     | Gr - Gravel |                                                        | LL - Liquid Limit  |       | PI - Plasticity Index    |                     | Cv - Coeff. of Consolidation |                  |                        | C.R. - Core Recovery |            |                                                    | Mv - Coeff. of Volume Change |      |                 | RQD - Rock Quality Designation |                  |            |           |                             |  |
| UDS - Undisturbed Sample            |                      | VST - Vane Shear Test                               |                     | Sn - Sand   |                                                        | PL - Plastic Limit |       | C, Ø - Shear Parameters  |                     |                              |                  |                        |                      |            |                                                    |                              |      |                 |                                |                  |            |           |                             |  |

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 Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068                |                      |                                       |                     | Project : G.I.D.C. WATER WORKS, RUNDH                 |                            |                    |       |                          |                     |                              |                  |                                                    |                      |                                                |                  |                              |      |                  |                                |                  |            |           |                             |
|-------------------------------------|----------------------|---------------------------------------|---------------------|-------------------------------------------------------|----------------------------|--------------------|-------|--------------------------|---------------------|------------------------------|------------------|----------------------------------------------------|----------------------|------------------------------------------------|------------------|------------------------------|------|------------------|--------------------------------|------------------|------------|-----------|-----------------------------|
| Bore Hole No. :9                    |                      |                                       |                     | Bore Hole Started on 20-06-23 Completed on : 20-06-23 |                            |                    |       |                          |                     |                              |                  |                                                    |                      | Depth of Water Table : Below Termination Level |                  |                              |      |                  |                                |                  |            |           |                             |
| Method of Drilling :ROTARY DRILLING |                      |                                       |                     | Diameter of Bore Hole : 150 mm                        |                            |                    |       | R. L. of Ground Level :  |                     |                              |                  | Location of Bore Hole :N 21°40'25.4" E 73°08'42.8" |                      |                                                |                  |                              |      |                  |                                |                  |            |           |                             |
| Depth in metres                     | I. S. Classification | Visual Soil Description               | Field Test /Samples |                                                       | Ns No. of Blows per 300 mm | Rock Properties    |       | Natural Moist. Content % | Density (in gms/cc) |                              | Specific Gravity | Particle Size Analysis                             |                      |                                                | Atterberg Limits |                              |      | Shrinkage Lim. % | Free swell Indx %              | Shear Properties |            |           | Additional Tests or Remarks |
|                                     |                      |                                       | SPT VST             | UDS DS                                                |                            | C.R. %             | RQD % |                          | Bulk                | Dry                          |                  | Gr. %                                              | Sn %                 | Silt+ Clay                                     | LL %             | PL %                         | PI % |                  |                                | Test Type        | C (Kg/cm²) | Ø in Deg. |                             |
| 00.00                               | SM                   | BLACK DENSE SILTY MEDIUM TO FINE SAND |                     | DS                                                    |                            |                    |       |                          |                     |                              |                  | 1                                                  | 75                   | 24                                             | 28               | -                            | -    |                  |                                |                  |            |           |                             |
| 01.00                               |                      |                                       | SPT                 | DS                                                    | 28                         |                    |       | 16.62                    |                     |                              |                  | 0                                                  | 85                   | 15                                             | 24               | -                            | -    |                  |                                |                  |            |           |                             |
| 02.00                               |                      |                                       |                     | UDS                                                   |                            |                    |       | 16.39                    | 1.97                | 1.69                         | 2.73             | 0                                                  | 86                   | 14                                             | 27               | -                            | -    |                  |                                | Buu              | 0.02       | 32.3°     |                             |
| 03.00                               |                      |                                       | SPT                 | DS                                                    | 26                         |                    |       | 18.01                    |                     |                              |                  | 0                                                  | 83                   | 17                                             | 25               | -                            | -    |                  |                                |                  |            |           |                             |
| 04.00                               |                      |                                       |                     | UDS                                                   |                            |                    |       | 17.80                    | 2.01                | 1.71                         | 2.74             | 0                                                  | 83                   | 17                                             | 28               | -                            | -    |                  |                                |                  |            |           |                             |
| 05.00                               |                      |                                       | SPT                 | DS                                                    | 33                         |                    |       | 17.48                    |                     |                              |                  | 1                                                  | 84                   | 15                                             | 27               | -                            | -    |                  |                                |                  |            |           |                             |
| 06.00                               |                      |                                       |                     | UDS                                                   |                            |                    | 17.74 | 2.04                     | 1.73                | 2.83                         | 0                | 84                                                 | 16                   | 27                                             | -                | -                            |      |                  |                                |                  |            |           |                             |
| 06.50                               |                      | TERMINATION                           |                     |                                                       |                            |                    |       |                          |                     |                              |                  |                                                    |                      |                                                |                  |                              |      |                  |                                |                  |            |           |                             |
| SPT - Standard Penetration Test     |                      | DS - Disturbed Sample                 |                     | Gr - Gravel                                           |                            | LL - Liquid Limit  |       | PI - Plasticity Index    |                     | Cv - Coeff. of Consolidation |                  |                                                    | C.R. - Core Recovery |                                                |                  | Mv - Coeff. of Volume Change |      |                  | RQD - Rock Quality Designation |                  |            |           |                             |
| UDS - Undisturbed Sample            |                      | VST - Vane Shear Test                 |                     | Sn - Sand                                             |                            | PL - Plastic Limit |       | C, Ø - Shear Parameters  |                     |                              |                  |                                                    |                      |                                                |                  |                              |      |                  |                                |                  |            |           |                             |

**UNIQUE GEOCIVIL SERVICES PVT. LTD.**

B/216,Road No. 6-F,New Industrial Estate, Udhna,Surat-392 010, Gujarat, India

Signed by: Nehal Hiteshbhai Desai  
Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
GEOCIVIL SERVICES PRIVATE  
LIMITED  
Date: 12-Jul-2023 (02:05 PM)

## SUMMARY OF GEOTECHNICAL EXPLORATIONS

| Project No. :2324068                |                      |                                                                        |                     | Project : G.I.D.C. WATER WORKS, RUNDH                  |                            |                    |       |                          |                     |                              |                  |                              |      | Depth of Water Table : 0.50 mts from Ground Level  |                  |                                |      |                  |                   |                 |            |           |                             |
|-------------------------------------|----------------------|------------------------------------------------------------------------|---------------------|--------------------------------------------------------|----------------------------|--------------------|-------|--------------------------|---------------------|------------------------------|------------------|------------------------------|------|----------------------------------------------------|------------------|--------------------------------|------|------------------|-------------------|-----------------|------------|-----------|-----------------------------|
| Bore Hole No. :10                   |                      |                                                                        |                     | Bore Hole Started on :19-06-23 Completed on : 20-06-23 |                            |                    |       |                          |                     |                              |                  |                              |      | Location of Bore Hole :N 21°38'49.3" E 73°08'57.6" |                  |                                |      |                  |                   |                 |            |           |                             |
| Method of Drilling :ROTARY DRILLING |                      |                                                                        |                     | Diameter of Bore Hole : 150 mm R. L. of Ground Level : |                            |                    |       |                          |                     |                              |                  |                              |      |                                                    |                  |                                |      |                  |                   |                 |            |           |                             |
| Depth in metres                     | I. S. Classification | Visual Soil Description                                                | Field Test /Samples |                                                        | Ns No. of Blows per 300 mm | Rock Properties    |       | Natural Moist. Content % | Density (in gms/cc) |                              | Specific Gravity | Particle Size Analysis       |      |                                                    | Atterberg Limits |                                |      | Shrinkage Lim. % | Free swell Indx % | Shear Test Type | Properties |           | Additional Tests or Remarks |
|                                     |                      |                                                                        | SPT VST             | UDS DS                                                 |                            | C.R. %             | RQD % |                          | Bulk                | Dry                          |                  | Gr. %                        | Sn % | Silt+ Clay                                         | LL %             | PL %                           | PI % |                  |                   |                 | C (Kg/cm²) | Ø in Deg. |                             |
| 00.00                               | GM                   | FILLING                                                                |                     | DS                                                     |                            |                    |       |                          |                     |                              |                  | 42                           | 32   | 26                                                 |                  | -                              | -    |                  |                   |                 |            |           |                             |
| 01.00                               | CI                   | BLACKISH YELLOW PLASTIC SILTY CLAY WITH SAND                           |                     | UDS                                                    |                            |                    |       | 28.58                    | 1.91                | 1.49                         | 2.75             | 4                            | 26   | 70                                                 | 45               | 22                             | 23   |                  | 36                | UCC             | 0.62       |           |                             |
| 02.00                               |                      | BLACK STIFF HIGH PLASTIC CLAY WITH SAND                                | SPT                 | DS                                                     | 10                         |                    |       | 28.22                    |                     |                              |                  | 0                            | 17   | 83                                                 | 68               | 31                             | 37   |                  | 60                |                 |            |           |                             |
| 03.00                               | CH                   |                                                                        |                     | UDS                                                    |                            |                    |       | 26.64                    | 1.95                | 1.54                         | 2.75             | 1                            | 18   | 81                                                 | 57               | 26                             | 31   |                  | 80                | Tuu             | 0.81       | 10.4°     |                             |
| 04.00                               |                      | YELLOW STIFF TO VERY STIFF PLASTIC SILTY CLAY WITH FINE TO MEDIUM SAND | SPT                 | DS                                                     | 16                         |                    |       | 27.09                    |                     |                              |                  | 8                            | 36   | 56                                                 | 49               | 25                             | 24   |                  |                   |                 |            |           |                             |
| 05.00                               |                      |                                                                        |                     | UDS                                                    |                            |                    |       | 26.16                    | 1.96                | 1.56                         | 2.75             | 7                            | 42   | 51                                                 | 39               | 23                             | 16   |                  |                   | UCC             | 1.22       |           |                             |
| 06.00                               | CI                   |                                                                        | SPT                 | DS                                                     | 23                         |                    |       | 24.95                    |                     |                              |                  | 8                            | 39   | 53                                                 | 47               | 25                             | 22   |                  |                   |                 |            |           |                             |
| 07.50                               |                      |                                                                        |                     | UDS                                                    |                            |                    |       | 25.65                    | 1.98                | 1.58                         | 2.74             | 2                            | 39   | 59                                                 | 40               | 22                             | 18   |                  |                   | Tuu             | 1.42       | 11.4°     |                             |
| 09.00                               |                      | YELLOW VERY STIFF TO HARD PLASTIC CLAYEY MEDIUM TO FINE SAND           | SPT                 | DS                                                     | 26                         |                    |       | 25.45                    |                     |                              |                  | 5                            | 53   | 42                                                 | 53               | 28                             | 25   |                  |                   |                 |            |           |                             |
| 10.50                               |                      |                                                                        |                     | UDS                                                    |                            |                    |       | 25.41                    | 1.99                | 1.59                         | 2.75             | 4                            | 50   | 46                                                 | 46               | 24                             | 22   |                  |                   |                 |            |           |                             |
| 12.00                               | SC                   |                                                                        | SPT                 | DS                                                     | 31                         |                    |       | 24.25                    |                     |                              |                  | 5                            | 60   | 35                                                 | 41               | 22                             | 19   |                  |                   |                 |            |           |                             |
| 13.50                               |                      |                                                                        |                     | UDS                                                    |                            |                    |       | 25.05                    | 2.00                | 1.60                         | 2.74             | 6                            | 46   | 48                                                 | 49               | 25                             | 24   |                  |                   |                 |            |           |                             |
| 15.00                               |                      |                                                                        | SPT                 | DS                                                     | 36                         |                    |       | 24.73                    |                     |                              |                  | 2                            | 61   | 37                                                 | 43               | 23                             | 20   |                  |                   |                 |            |           |                             |
| 15.50                               |                      | TERMINATION                                                            |                     |                                                        |                            |                    |       |                          |                     |                              |                  |                              |      |                                                    |                  |                                |      |                  |                   |                 |            |           |                             |
| SPT - Standard Penetration Test     |                      | DS - Disturbed Sample                                                  |                     | Gr - Gravel                                            |                            | LL - Liquid Limit  |       | PI - Plasticity Index    |                     | Cv - Coeff. of Consolidation |                  | Mv - Coeff. of Volume Change |      | C.R. - Core Recovery                               |                  | RQD - Rock Quality Designation |      |                  |                   |                 |            |           |                             |
| UDS - Undisturbed Sample            |                      | VST - Vane Shear Test                                                  |                     | Sn - Sand                                              |                            | PL - Plastic Limit |       | C, Ø - Shear Parameters  |                     |                              |                  |                              |      |                                                    |                  |                                |      |                  |                   |                 |            |           |                             |

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B/216,Road No. 6-F,New Industrial Estate, Udhna,Surat-392022

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2324068

BH Location Details

Legend

 Borehole

Google Earth

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8 km

*eSign*

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Organization Unit: Authorized Signatory  
Organization Name: UNIQUE  
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Date: 12-Jul-2023 (02:05 PM)