



Iarnród Éireann
Cork Line Level Crossings
XC211 (19-135-2)

| | |
|-----------|-----------------------|
| | T.PIT1 |
| | Trial Pit Photographs |
| Client: | Iarnród Éireann |
| Engineer: | Jacob's |
| Date: | February 2020 |



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| | T.PIT2 |
| | Trial Pit Photographs |
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| | Trial Pit Photographs |
| Client: | Iarnród Éireann |
| Engineer: | Jacob's |
| Date: | February 2020 |



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| | Trial Pit Photographs |
| Client: | Iarnród Éireann |
| Engineer: | Jacob's |
| Date: | February 2020 |



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| | T.PIT3 |
| | Trial Pit Photographs |
| Client: | Iarnród Éireann |
| Engineer: | Jacob's |
| Date: | February 2020 |

Appendix E

Indirect CBR Test Results

Cork Line Level Crossings - Irish Rail

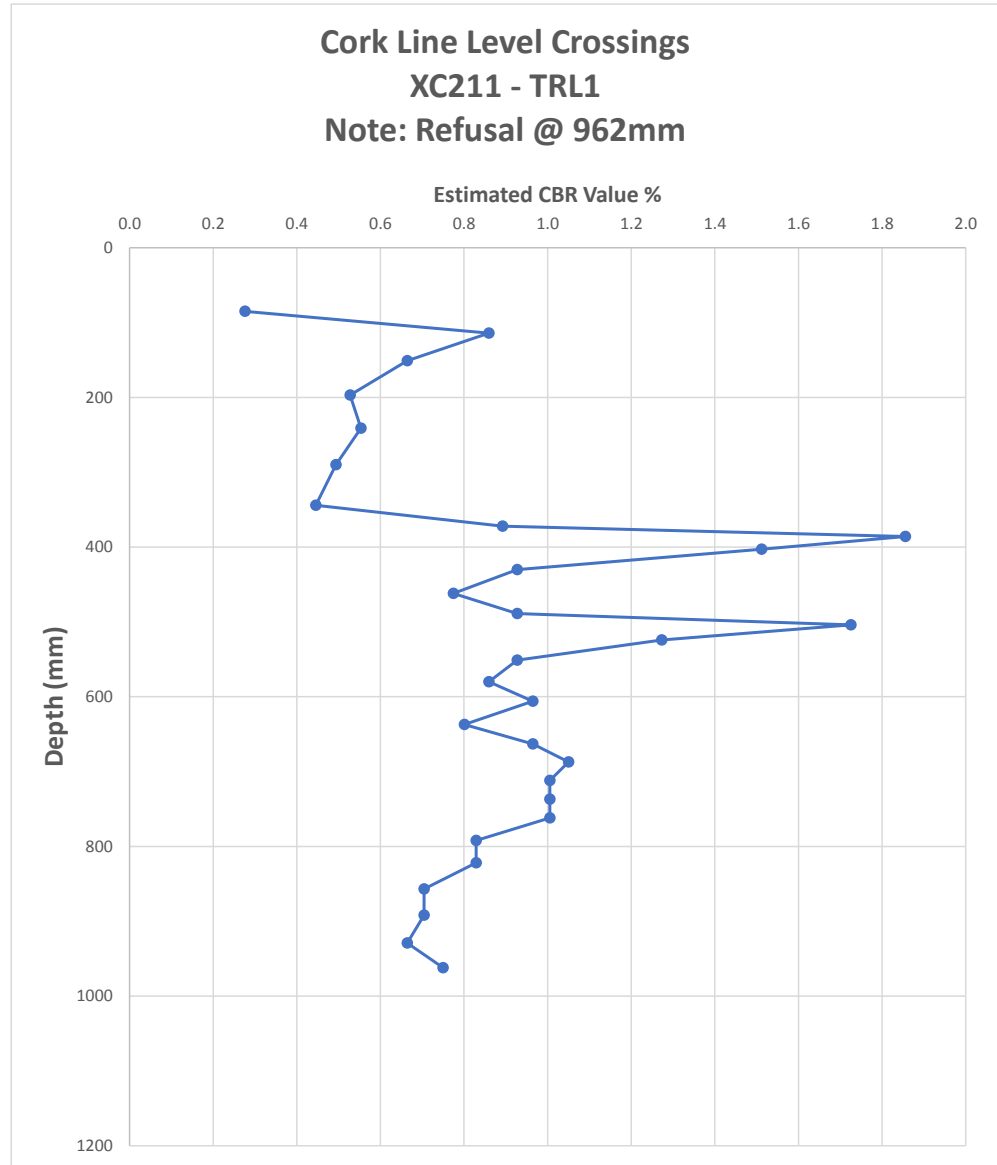
Transport Research Laboratory - Dynamic Cone Penetrometer Data

| | | | |
|----------|---------------------|--------|--------|
| Location | XC211 - TRL1 | Job No | 19-135 |
|----------|---------------------|--------|--------|

| | | |
|------------|------------|-----------|
| Easting | Northing | Elevation |
| 554814.846 | 617962.459 | 98.149 |

| | | | |
|------------------|------|--------|------------|
| Test Start Depth | 0 | mm/bgl | DATE |
| Start Reading: | 1007 | mm | 09/03/2020 |

| No. of Blows | READING (mm) | Penetration/blow (mm) | DEPTH | CBR % |
|--------------|--------------|-----------------------|-------|-------|
| 1 | 922 | 85 | 85 | 0.3 |
| 2 | 893 | 29 | 114 | 0.9 |
| 3 | 856 | 37 | 151 | 0.7 |
| 4 | 810 | 46 | 197 | 0.5 |
| 5 | 766 | 44 | 241 | 0.6 |
| 6 | 717 | 49 | 290 | 0.5 |
| 7 | 663 | 54 | 344 | 0.4 |
| 8 | 635 | 28 | 372 | 0.9 |
| 9 | 621 | 14 | 386 | 1.9 |
| 10 | 604 | 17 | 403 | 1.5 |
| 11 | 577 | 27 | 430 | 0.9 |
| 12 | 545 | 32 | 462 | 0.8 |
| 13 | 518 | 27 | 489 | 0.9 |
| 14 | 503 | 15 | 504 | 1.7 |
| 15 | 483 | 20 | 524 | 1.3 |
| 16 | 456 | 27 | 551 | 0.9 |
| 17 | 427 | 29 | 580 | 0.9 |
| 18 | 401 | 26 | 606 | 1.0 |
| 19 | 370 | 31 | 637 | 0.8 |
| 20 | 344 | 26 | 663 | 1.0 |
| 21 | 320 | 24 | 687 | 1.0 |
| 22 | 295 | 25 | 712 | 1.0 |
| 23 | 270 | 25 | 737 | 1.0 |
| 24 | 245 | 25 | 762 | 1.0 |
| 25 | 215 | 30 | 792 | 0.8 |
| 26 | 185 | 30 | 822 | 0.8 |
| 27 | 150 | 35 | 857 | 0.7 |
| 28 | 115 | 35 | 892 | 0.7 |
| 29 | 78 | 37 | 929 | 0.7 |
| 30 | 45 | 33 | 962 | 0.7 |
| 31 | | | | |



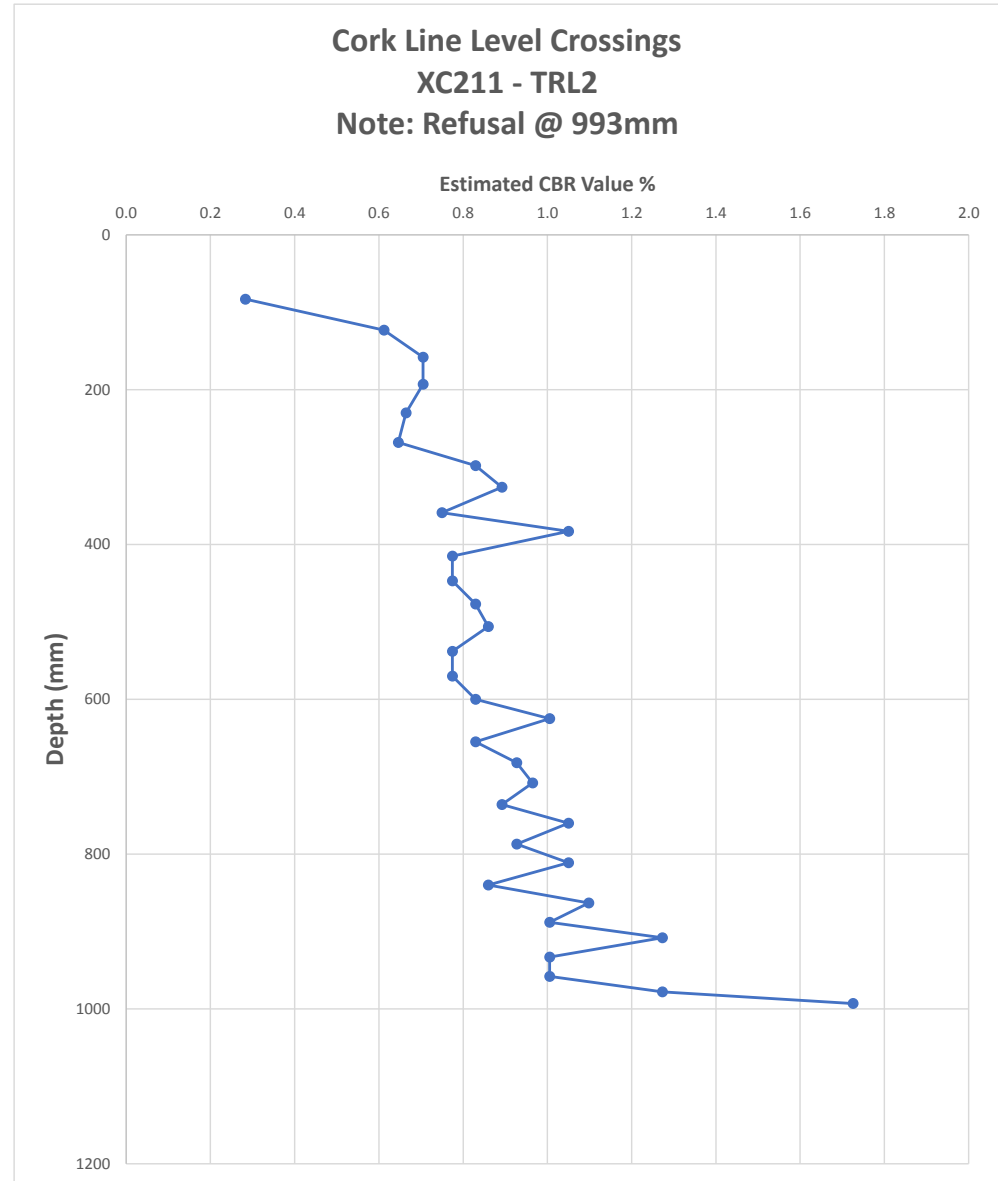
Cork Line Level Crossings - Irish Rail
Transport Research Laboratory - Dynamic Cone Penetrometer Data

| | | | |
|----------|---------------------|--------|--------|
| Location | XC211 - TRL2 | Job No | 19-135 |
|----------|---------------------|--------|--------|

| | | |
|------------|------------|-----------|
| Easting | Northing | Elevation |
| 554820.522 | 617964.969 | 97.873 |

| | | | |
|------------------|------|--------|------------|
| Test Start Depth | 0 | mm/bgl | DATE |
| Start Reading: | 1053 | mm | 09/03/2020 |

| No. of Blows | READING (mm) | Penetration/blow (mm) | DEPTH | CBR % |
|--------------|--------------|-----------------------|-------|-------|
| 1 | 970 | 83 | 83 | 0.3 |
| 2 | 930 | 40 | 123 | 0.6 |
| 3 | 895 | 35 | 158 | 0.7 |
| 4 | 860 | 35 | 193 | 0.7 |
| 5 | 823 | 37 | 230 | 0.7 |
| 6 | 785 | 38 | 268 | 0.6 |
| 7 | 755 | 30 | 298 | 0.8 |
| 8 | 727 | 28 | 326 | 0.9 |
| 9 | 694 | 33 | 359 | 0.7 |
| 10 | 670 | 24 | 383 | 1.0 |
| 11 | 638 | 32 | 415 | 0.8 |
| 12 | 606 | 32 | 447 | 0.8 |
| 13 | 576 | 30 | 477 | 0.8 |
| 14 | 547 | 29 | 506 | 0.9 |
| 15 | 515 | 32 | 538 | 0.8 |
| 16 | 483 | 32 | 570 | 0.8 |
| 17 | 453 | 30 | 600 | 0.8 |
| 18 | 428 | 25 | 625 | 1.0 |
| 19 | 398 | 30 | 655 | 0.8 |
| 20 | 371 | 27 | 682 | 0.9 |
| 21 | 345 | 26 | 708 | 1.0 |
| 22 | 317 | 28 | 736 | 0.9 |
| 23 | 293 | 24 | 760 | 1.0 |
| 24 | 266 | 27 | 787 | 0.9 |
| 25 | 242 | 24 | 811 | 1.0 |
| 26 | 213 | 29 | 840 | 0.9 |
| 27 | 190 | 23 | 863 | 1.1 |
| 28 | 165 | 25 | 888 | 1.0 |
| 29 | 145 | 20 | 908 | 1.3 |
| 30 | 120 | 25 | 933 | 1.0 |
| 31 | 95 | 25 | 958 | 1.0 |
| 32 | 75 | 20 | 978 | 1.3 |
| 33 | 60 | 15 | 993 | 1.7 |
| 34 | | | | |



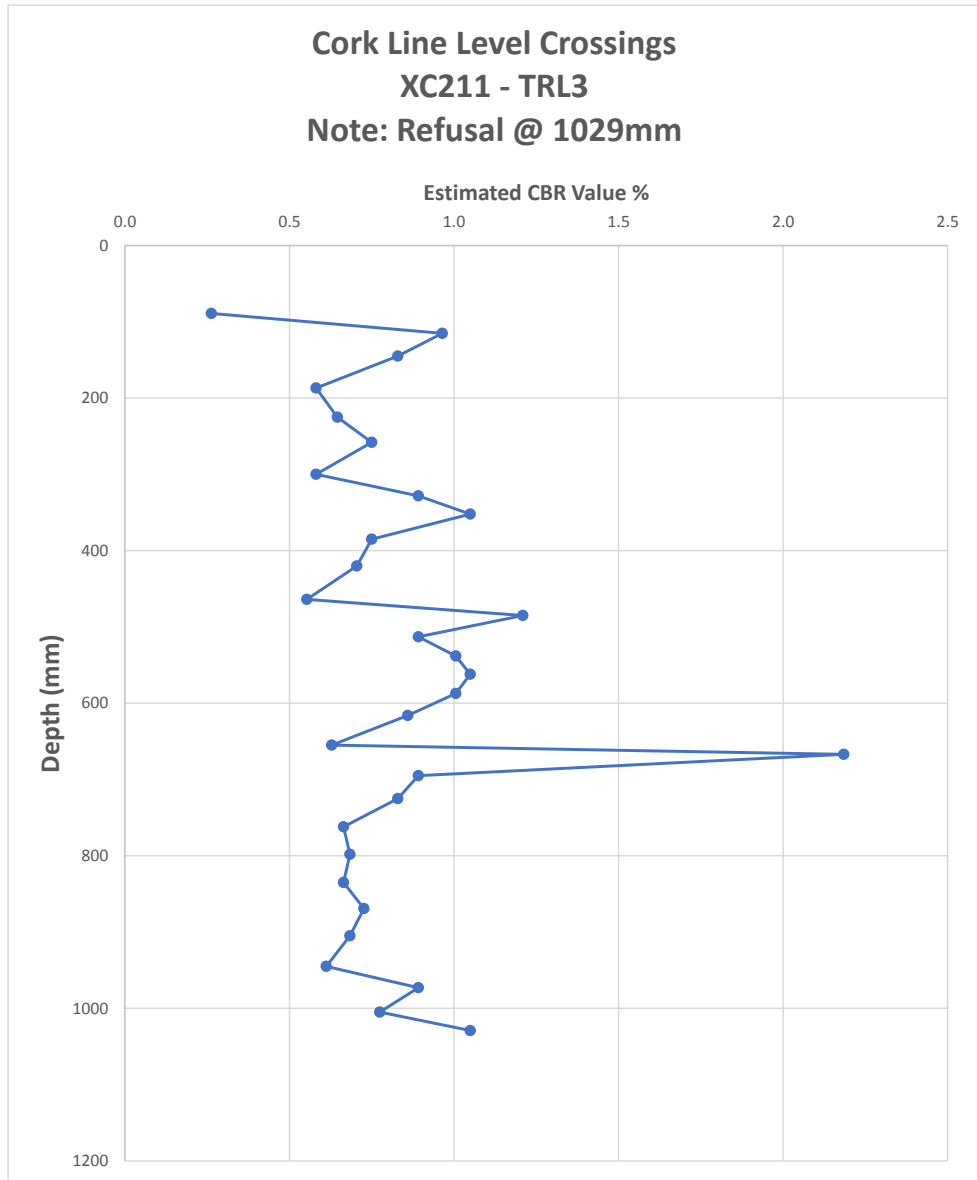
Cork Line Level Crossings - Irish Rail
Transport Research Laboratory - Dynamic Cone Penetrometer Data

| | | | |
|----------|---------------------|--------|--------|
| Location | XC211 - TRL3 | Job No | 19-135 |
|----------|---------------------|--------|--------|

| | | |
|------------|------------|-----------|
| Easting | Northing | Elevation |
| 554882.414 | 618087.375 | 101.182 |

| | | | |
|------------------|------|--------|------------|
| Test Start Depth | 0 | mm/bgl | DATE |
| Start Reading: | 1090 | mm | 09/03/2020 |

| No. of Blows | READING (mm) | Penetration/blow (mm) | DEPTH | CBR % |
|--------------|--------------|-----------------------|-------|-------|
| 1 | 1001 | 89 | 89 | 0.3 |
| 2 | 975 | 26 | 115 | 1.0 |
| 3 | 945 | 30 | 145 | 0.8 |
| 4 | 903 | 42 | 187 | 0.6 |
| 5 | 865 | 38 | 225 | 0.6 |
| 6 | 832 | 33 | 258 | 0.7 |
| 7 | 790 | 42 | 300 | 0.6 |
| 8 | 762 | 28 | 328 | 0.9 |
| 9 | 738 | 24 | 352 | 1.0 |
| 10 | 705 | 33 | 385 | 0.7 |
| 11 | 670 | 35 | 420 | 0.7 |
| 12 | 626 | 44 | 464 | 0.6 |
| 13 | 605 | 21 | 485 | 1.2 |
| 14 | 577 | 28 | 513 | 0.9 |
| 15 | 552 | 25 | 538 | 1.0 |
| 16 | 528 | 24 | 562 | 1.0 |
| 17 | 503 | 25 | 587 | 1.0 |
| 18 | 474 | 29 | 616 | 0.9 |
| 19 | 435 | 39 | 655 | 0.6 |
| 20 | 423 | 12 | 667 | 2.2 |
| 21 | 395 | 28 | 695 | 0.9 |
| 22 | 365 | 30 | 725 | 0.8 |
| 23 | 328 | 37 | 762 | 0.7 |
| 24 | 292 | 36 | 798 | 0.7 |
| 25 | 255 | 37 | 835 | 0.7 |
| 26 | 221 | 34 | 869 | 0.7 |
| 27 | 185 | 36 | 905 | 0.7 |
| 28 | 145 | 40 | 945 | 0.6 |
| 29 | 117 | 28 | 973 | 0.9 |
| 30 | 85 | 32 | 1005 | 0.8 |
| 31 | 61 | 24 | 1029 | 1.0 |
| 32 | | | | |



Cork Line Level Crossings - Irish Rail

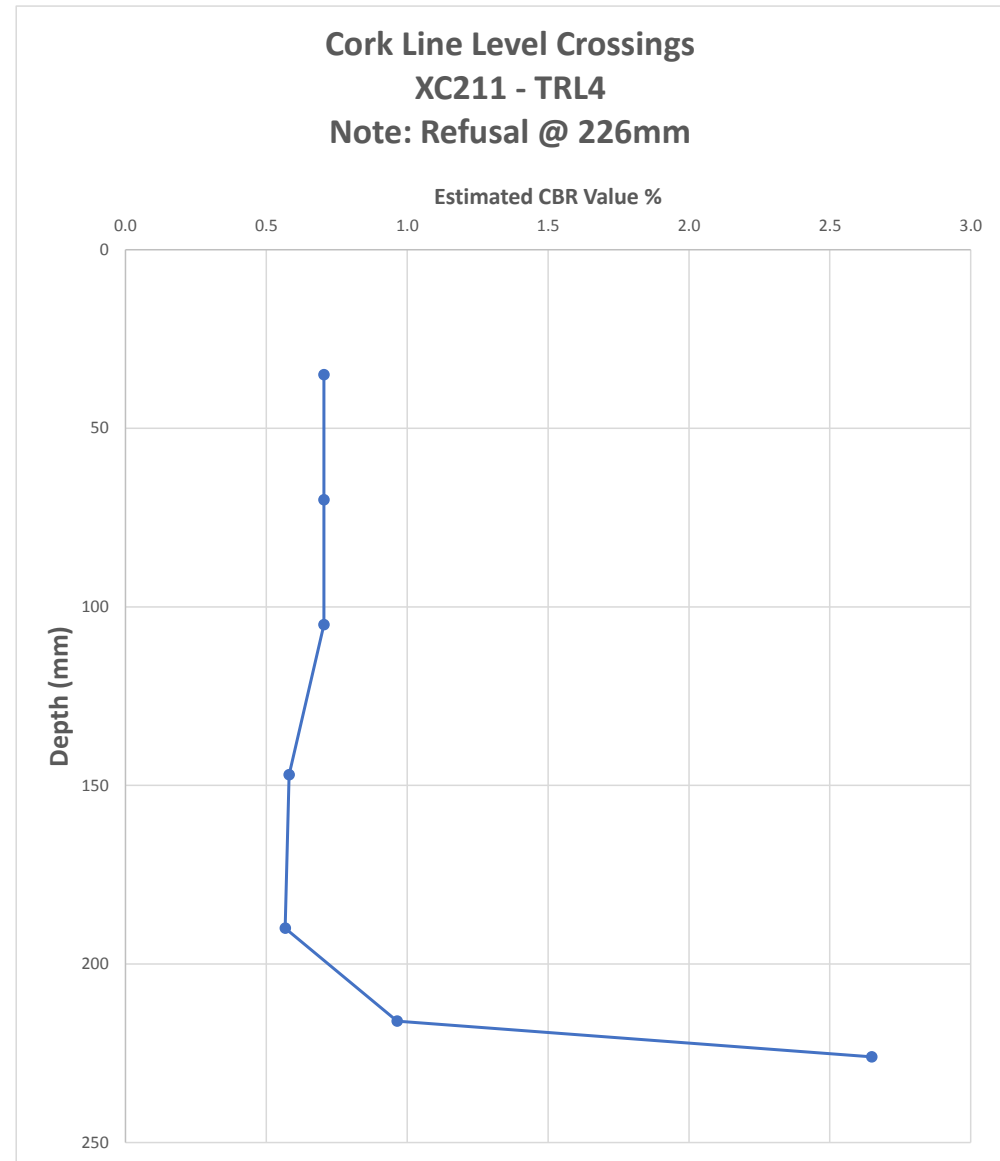
Transport Research Laboratory - Dynamic Cone Penetrometer Data

| | | | |
|----------|---------------------|--------|--------|
| Location | XC211 - TRL4 | Job No | 19-135 |
|----------|---------------------|--------|--------|

| | | |
|------------|------------|-----------|
| Easting | Northing | Elevation |
| 554886.268 | 618091.178 | 101.803 |

| | | | |
|------------------|------|--------|------------|
| Test Start Depth | 0 | mm/bgl | DATE |
| Start Reading: | 1045 | mm | 09/03/2020 |

| No. of Blows | READING (mm) | Penetration/blow (mm) | DEPTH | CBR % |
|--------------|--------------|-----------------------|-------|-------|
| 1 | 1010 | 35 | 35 | 0.7 |
| 2 | 975 | 35 | 70 | 0.7 |
| 3 | 940 | 35 | 105 | 0.7 |
| 4 | 898 | 42 | 147 | 0.6 |
| 5 | 855 | 43 | 190 | 0.6 |
| 6 | 829 | 26 | 216 | 1.0 |
| 7 | 819 | 10 | 226 | 2.6 |
| 8 | 819 | 0 | 226 | |
| 9 | 819 | 0 | 226 | |
| 10 | | | | |



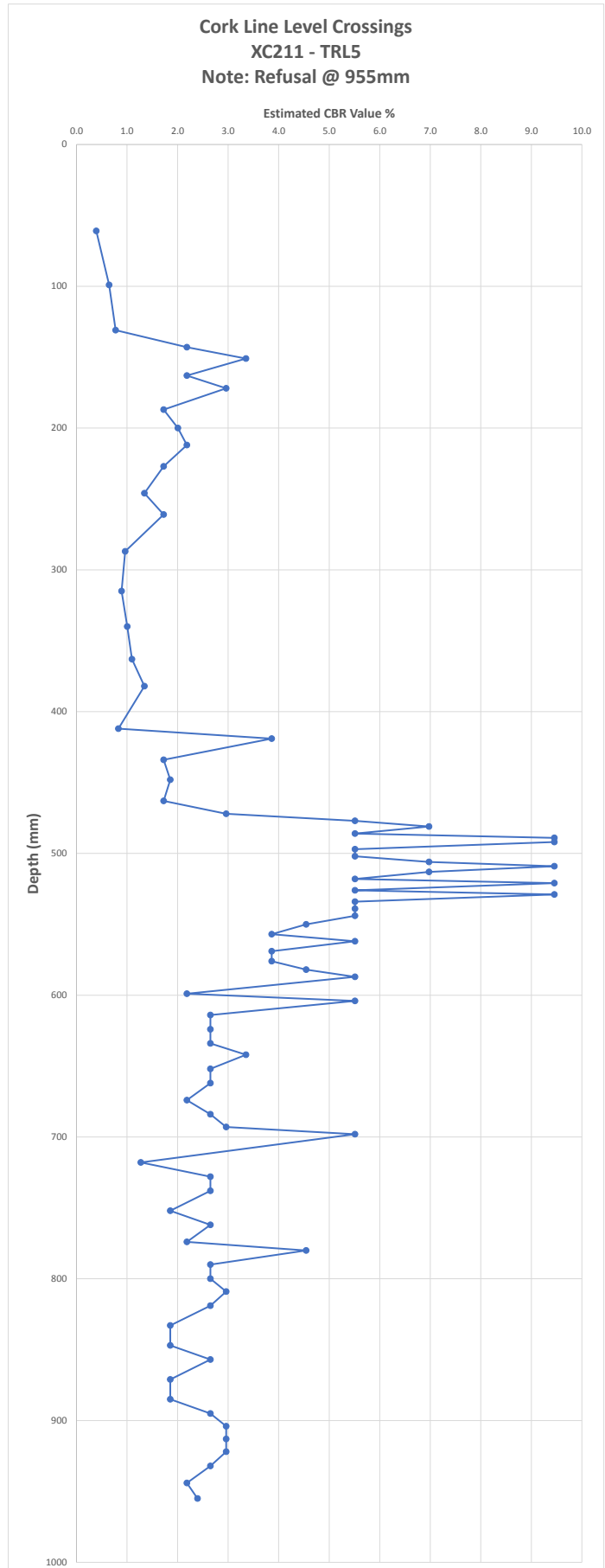
Cork Line Level Crossings - Irish Rail
 Transport Research Laboratory - Dynamic Cone Penetrometer Data

| | | | |
|----------|--------------|--------|--------|
| Location | XC211 - TRL5 | Job No | 19-135 |
|----------|--------------|--------|--------|

| | | |
|------------|-----------|-----------|
| Easting | Northing | Elevation |
| 554936.035 | 618184.51 | 111.629 |

| | | | |
|------------------|------|--------|------------|
| Test Start Depth | 0 | mm/bgl | DATE |
| Start Reading: | 1042 | mm | 09/03/2020 |

| No. of Blows | READING (mm) | Penetration/blow (mm) | DEPTH | CBR % |
|--------------|--------------|-----------------------|-------|-------|
| 1 | 981 | 61 | 61 | 0.4 |
| 2 | 943 | 38 | 99 | 0.6 |
| 3 | 911 | 32 | 131 | 0.8 |
| 4 | 899 | 12 | 143 | 2.2 |
| 5 | 891 | 8 | 151 | 3.4 |
| 6 | 879 | 12 | 163 | 2.2 |
| 7 | 870 | 9 | 172 | 3.0 |
| 8 | 855 | 15 | 187 | 1.7 |
| 9 | 842 | 13 | 200 | 2.0 |
| 10 | 830 | 12 | 212 | 2.2 |
| 11 | 815 | 15 | 227 | 1.7 |
| 12 | 796 | 19 | 246 | 1.3 |
| 13 | 781 | 15 | 261 | 1.7 |
| 14 | 755 | 26 | 287 | 1.0 |
| 15 | 727 | 28 | 315 | 0.9 |
| 16 | 702 | 25 | 340 | 1.0 |
| 17 | 679 | 23 | 363 | 1.1 |
| 18 | 660 | 19 | 382 | 1.3 |
| 19 | 630 | 30 | 412 | 0.8 |
| 20 | 623 | 7 | 419 | 3.9 |
| 21 | 608 | 15 | 434 | 1.7 |
| 22 | 594 | 14 | 448 | 1.9 |
| 23 | 579 | 15 | 463 | 1.7 |
| 24 | 570 | 9 | 472 | 3.0 |
| 25 | 565 | 5 | 477 | 5.5 |
| 26 | 561 | 4 | 481 | 7.0 |
| 27 | 556 | 5 | 486 | 5.5 |
| 28 | 553 | 3 | 489 | 9.5 |
| 29 | 550 | 3 | 492 | 9.5 |
| 30 | 545 | 5 | 497 | 5.5 |
| 31 | 540 | 5 | 502 | 5.5 |
| 32 | 536 | 4 | 506 | 7.0 |
| 33 | 533 | 3 | 509 | 9.5 |
| 34 | 529 | 4 | 513 | 7.0 |
| 35 | 524 | 5 | 518 | 5.5 |
| 36 | 521 | 3 | 521 | 9.5 |
| 37 | 516 | 5 | 526 | 5.5 |
| 38 | 513 | 3 | 529 | 9.5 |
| 39 | 508 | 5 | 534 | 5.5 |
| 40 | 503 | 5 | 539 | 5.5 |
| 41 | 498 | 5 | 544 | 5.5 |
| 42 | 492 | 6 | 550 | 4.5 |
| 43 | 485 | 7 | 557 | 3.9 |
| 44 | 480 | 5 | 562 | 5.5 |
| 45 | 473 | 7 | 569 | 3.9 |
| 46 | 466 | 7 | 576 | 3.9 |
| 47 | 460 | 6 | 582 | 4.5 |
| 48 | 455 | 5 | 587 | 5.5 |
| 49 | 443 | 12 | 599 | 2.2 |
| 50 | 438 | 5 | 604 | 5.5 |
| 51 | 428 | 10 | 614 | 2.6 |
| 52 | 418 | 10 | 624 | 2.6 |
| 53 | 408 | 10 | 634 | 2.6 |
| 54 | 400 | 8 | 642 | 3.4 |
| 55 | 390 | 10 | 652 | 2.6 |
| 56 | 380 | 10 | 662 | 2.6 |
| 57 | 368 | 12 | 674 | 2.2 |
| 58 | 358 | 10 | 684 | 2.6 |
| 59 | 349 | 9 | 693 | 3.0 |
| 60 | 344 | 5 | 698 | 5.5 |
| 61 | 324 | 20 | 718 | 1.3 |
| 62 | 314 | 10 | 728 | 2.6 |
| 63 | 304 | 10 | 738 | 2.6 |
| 64 | 290 | 14 | 752 | 1.9 |
| 65 | 280 | 10 | 762 | 2.6 |
| 66 | 268 | 12 | 774 | 2.2 |
| 67 | 262 | 6 | 780 | 4.5 |
| 68 | 252 | 10 | 790 | 2.6 |
| 69 | 242 | 10 | 800 | 2.6 |
| 70 | 233 | 9 | 809 | 3.0 |
| 71 | 223 | 10 | 819 | 2.6 |
| 72 | 209 | 14 | 833 | 1.9 |
| 73 | 195 | 14 | 847 | 1.9 |
| 74 | 185 | 10 | 857 | 2.6 |
| 75 | 171 | 14 | 871 | 1.9 |
| 76 | 157 | 14 | 885 | 1.9 |
| 77 | 147 | 10 | 895 | 2.6 |
| 78 | 138 | 9 | 904 | 3.0 |
| 79 | 129 | 9 | 913 | 3.0 |
| 80 | 120 | 9 | 922 | 3.0 |
| 81 | 110 | 10 | 932 | 2.6 |
| 82 | 98 | 12 | 944 | 2.2 |
| 83 | 87 | 11 | 955 | 2.4 |
| 84 | | | | |



Cork Line Level Crossings - Irish Rail

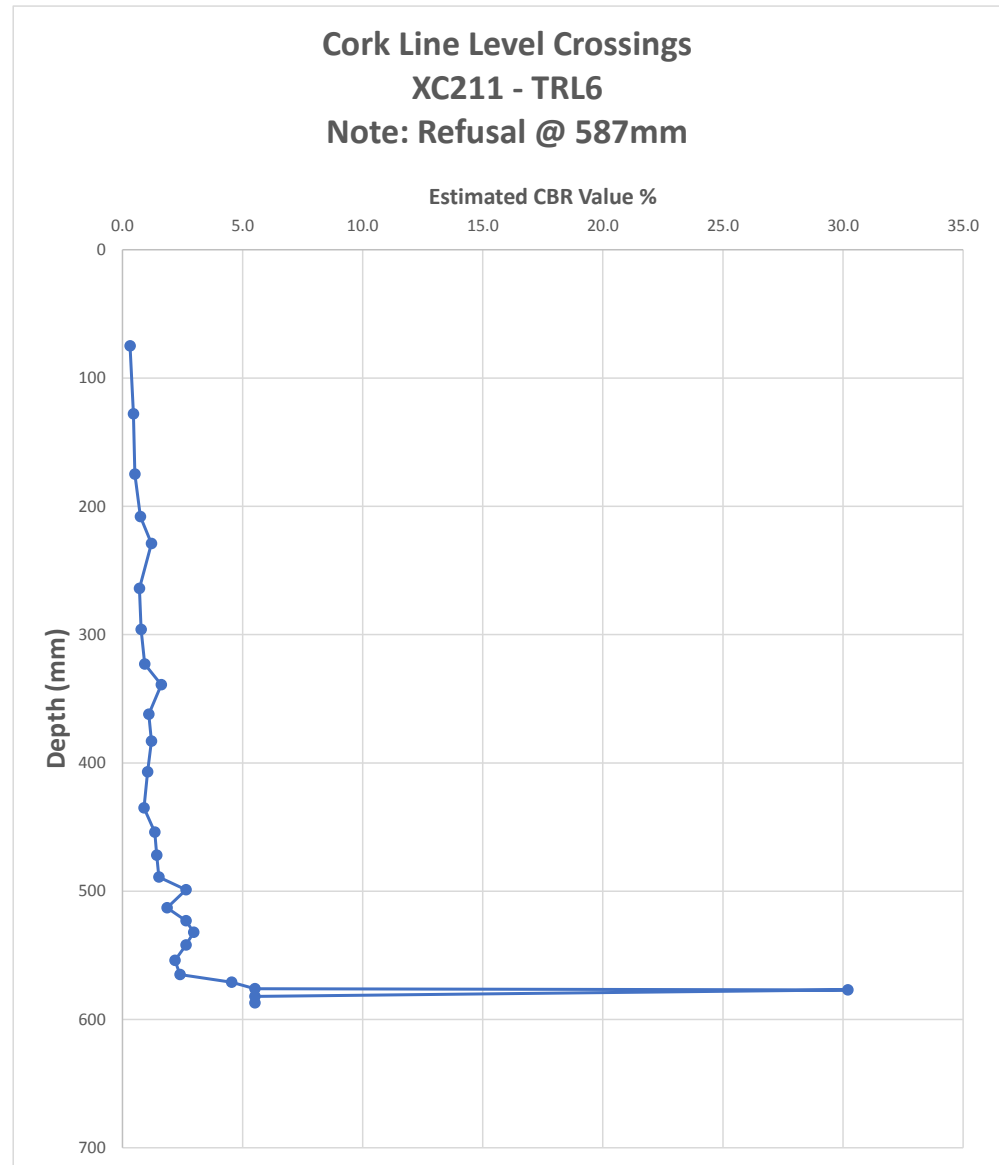
Transport Research Laboratory - Dynamic Cone Penetrometer Data

| | | | |
|----------|---------------------|--------|--------|
| Location | XC211 - TRL6 | Job No | 19-135 |
|----------|---------------------|--------|--------|

| | | |
|------------|------------|-----------|
| Easting | Northing | Elevation |
| 554941.786 | 618184.849 | 112.108 |

| | | | |
|------------------|------|--------|------------|
| Test Start Depth | 0 | mm/bgl | DATE |
| Start Reading: | 1092 | mm | 09/03/2020 |

| No. of Blows | READING (mm) | Penetration/blow (mm) | DEPTH | CBR % |
|--------------|--------------|-----------------------|-------|-------|
| 1 | 1017 | 75 | 75 | 0.3 |
| 2 | 964 | 53 | 128 | 0.5 |
| 3 | 917 | 47 | 175 | 0.5 |
| 4 | 884 | 33 | 208 | 0.7 |
| 5 | 863 | 21 | 229 | 1.2 |
| 6 | 828 | 35 | 264 | 0.7 |
| 7 | 796 | 32 | 296 | 0.8 |
| 8 | 769 | 27 | 323 | 0.9 |
| 9 | 753 | 16 | 339 | 1.6 |
| 10 | 730 | 23 | 362 | 1.1 |
| 11 | 709 | 21 | 383 | 1.2 |
| 12 | 685 | 24 | 407 | 1.0 |
| 13 | 657 | 28 | 435 | 0.9 |
| 14 | 638 | 19 | 454 | 1.3 |
| 15 | 620 | 18 | 472 | 1.4 |
| 16 | 603 | 17 | 489 | 1.5 |
| 17 | 593 | 10 | 499 | 2.6 |
| 18 | 579 | 14 | 513 | 1.9 |
| 19 | 569 | 10 | 523 | 2.6 |
| 20 | 560 | 9 | 532 | 3.0 |
| 21 | 550 | 10 | 542 | 2.6 |
| 22 | 538 | 12 | 554 | 2.2 |
| 23 | 527 | 11 | 565 | 2.4 |
| 24 | 521 | 6 | 571 | 4.5 |
| 25 | 516 | 5 | 576 | 5.5 |
| 26 | 515 | 1 | 577 | 30.2 |
| 27 | 510 | 5 | 582 | 5.5 |
| 28 | 505 | 5 | 587 | 5.5 |
| 29 | 505 | 0 | 587 | |
| 30 | 505 | 0 | 587 | |
| 31 | | | | |



Appendix F

Water Purging Data & Logs

Appendix G Geotechnical Soil Laboratory Test Results



LABORATORY TEST REPORT

MOISTURE CONTENT BS 1377 : Part 2 : 1990 Oven Drying Method cl 3.2

| | | | |
|--------------------|---|-----------------------|------------|
| Site: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93346 |
| Order No: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Tested: | 31/03/2020 |
| | | Date Reported: | 03/04/2020 |
| | | Specification: | Client |

Sampled Ref: XC211-TP01 Type D Sample 3

Sample Type: Bulk **Location:** XC211-TP01 Type D Sample 3

Date Sampled: Client Info **Sample by:** Client

Depth: 0.4-0.9m **Material Type:** Soil

Moisture Content (%): 11

Tested in accordance with BS 1377: Part 2: 1990
Sample preparation by cone and quarter

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature

James Fisher Testing Services (Ireland) Ltd
James Ward, Operations Manager





LABORATORY TEST REPORT

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP - BS 1377: Part 4: 1990

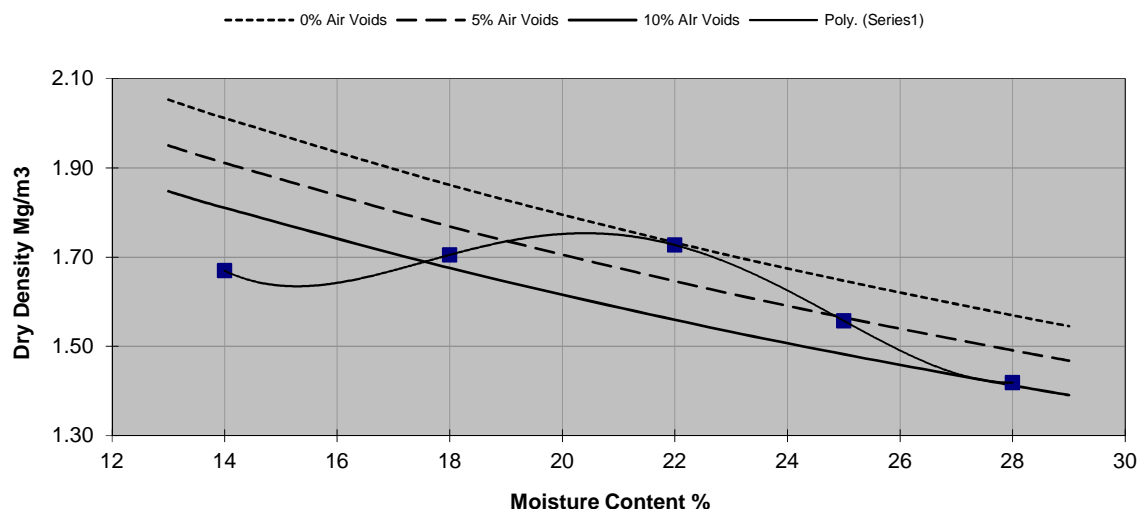
| | |
|---|----------------------------------|
| Project: Cork Line Level Crossings | Job No: 19-135 |
| Client: OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: ST 93345 |
| Order No: 2003-104 | Date Received: 09/03/2020 |
| Originator: Ian Holley | Date Tested: 06/04/2020 |
| | Date Reported: 07/04/2020 |
| | Material: Soil |
| | Specification: Client |

| | |
|---|---------------------------|
| Client Sample Ref : XC211-TP01 Type B Sample 2 | Sample Type : Bulk |
| Supplier: Client Info | Description : Soil |
| Location: 0.4-0.9m | |

Date sampled : Client Info **Comments :** None
Sampling Cert : No

| | | | |
|----------------------------|-----|-----------------------------------|-----|
| Rammer used : | 4.5 | No of layers: | 3 |
| No of sub samples : | 5 | % retained on 37.5mm sieve | 0.6 |
| Mould Size: | CBR | % retained on 20mm sieve | 4.4 |

| | | | | | |
|---------------------------------------|------|------|------|------|------|
| Bulk Density: Mg/m³ | 1.90 | 2.01 | 2.11 | 1.95 | 1.82 |
| Moisture Content: % | 14 | 18 | 22 | 25 | 28 |
| Dry Density: Mg/m³ | 1.67 | 1.71 | 1.73 | 1.56 | 1.42 |



Maximum Dry Density (Mg/m³)
Optimum Moisture Content (%)

| |
|-------------|
| 1.75 |
| 20 |

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with BS 1377: Part 4:1990
 Particle Density (Mg/m³) - 2.8 (Assumed)

Approved Signature
 James Fisher Testing Services Limited
 Phil Thorp, Laboratory Manager

James Fisher Testing Services Limited, a company registered in England and Wales with registration number: 01182561

Registered office: Fisher House, PO Box 4, Barrow-in-Furness, Cumbria, LA14 1HR

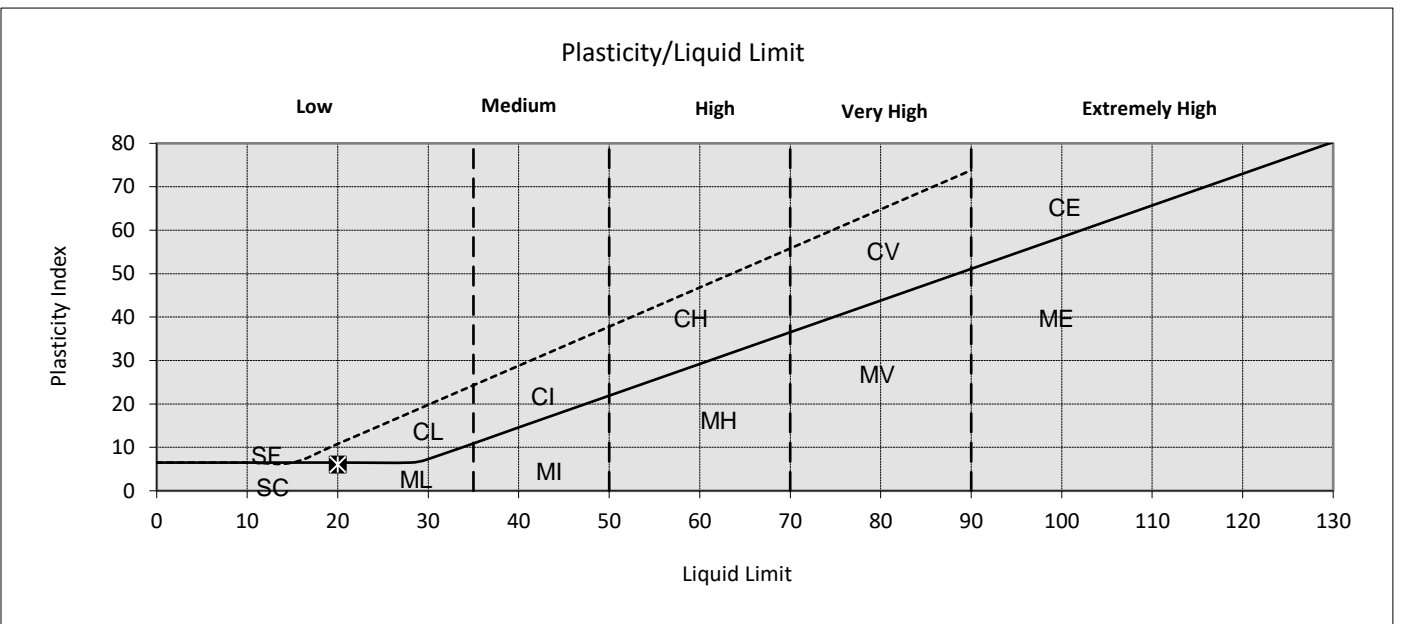




LABORATORY TEST REPORT
LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 CI 4.4,5.3

| | | | |
|--------------------|--|-----------------------|-----------------------------------|
| Site Ref.: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: | ST 93347 |
| Order No: | 2003-104 | Sample Ref.: | XC211-TP01 0.4-0.9m Type D Samp 3 |
| Originator: | Ian Holley | Date Sampled: | Client Info |
| | | Date Received: | 09/03/2020 |
| | | Date Tested: | 03/04/2020 |
| | | Date Reported: | 03/04/2020 |

| | |
|--------------------------------|--------|
| Sampling Certificate | No |
| Sampled By | Client |
| Sample Type | Bulk |
| Sample Preparation Method | Washed |
| MATERIAL | Soil |
| Retained 425 micron (%) | 24 |
| Natural Moisture Content (%) | 13 |
| Liquid Limit (single point)(%) | 20 |
| Plastic Limit (%) | 14 |
| Plasticity Index | 6 |



The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature
James Fisher Testing Services Ltd
Phil Thorp, Laboratory Manager

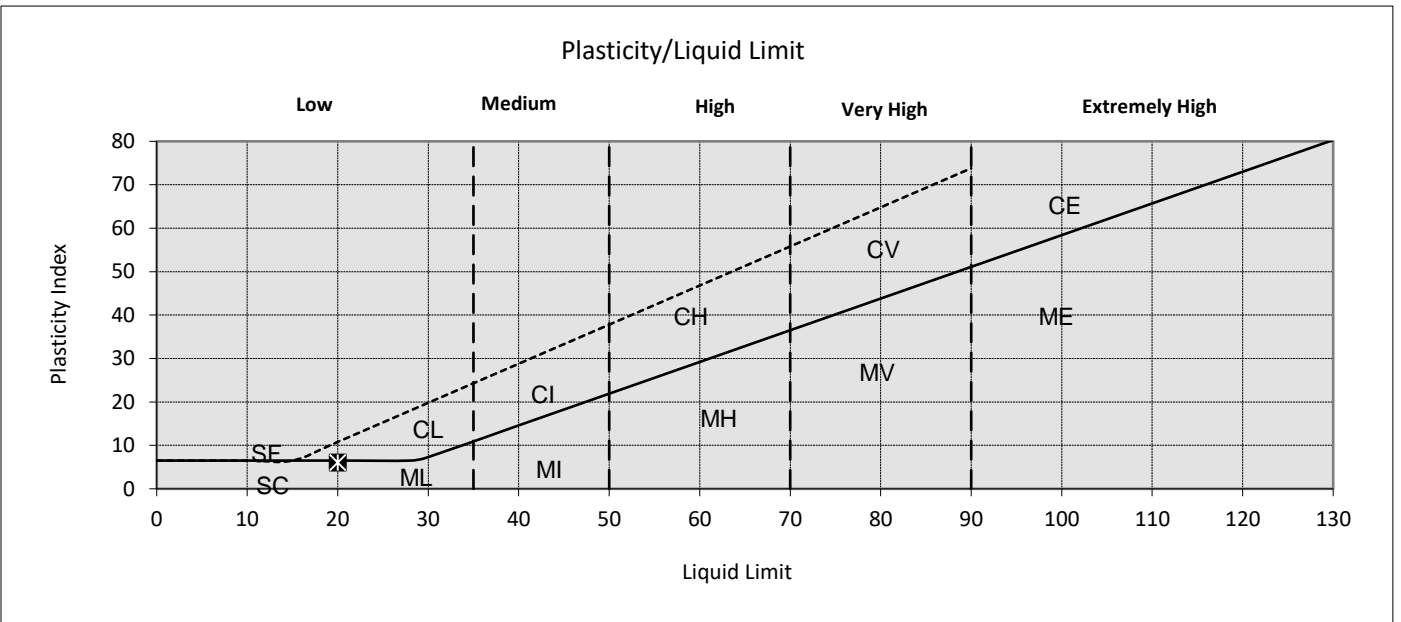




LABORATORY TEST REPORT
LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 CI 4.4,5.3

| | | | |
|--------------------|--|-----------------------|-----------------------------------|
| Site Ref.: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: | ST 93347 |
| Order No: | 2003-104 | Sample Ref.: | XC211-TP01 0.4-0.9m Type D Samp 3 |
| Originator: | Ian Holley | Date Sampled: | Client Info |
| | | Date Received: | 09/03/2020 |
| | | Date Tested: | 03/04/2020 |
| | | Date Reported: | 03/04/2020 |

| | |
|--------------------------------|--------|
| Sampling Certificate | No |
| Sampled By | Client |
| Sample Type | Bulk |
| Sample Preparation Method | Washed |
| MATERIAL | Soil |
| Retained 425 micron (%) | 24 |
| Natural Moisture Content (%) | 13 |
| Liquid Limit (single point)(%) | 20 |
| Plastic Limit (%) | 14 |
| Plasticity Index | 6 |



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 Phil Thorp, Laboratory Manager



LABORATORY TEST REPORT

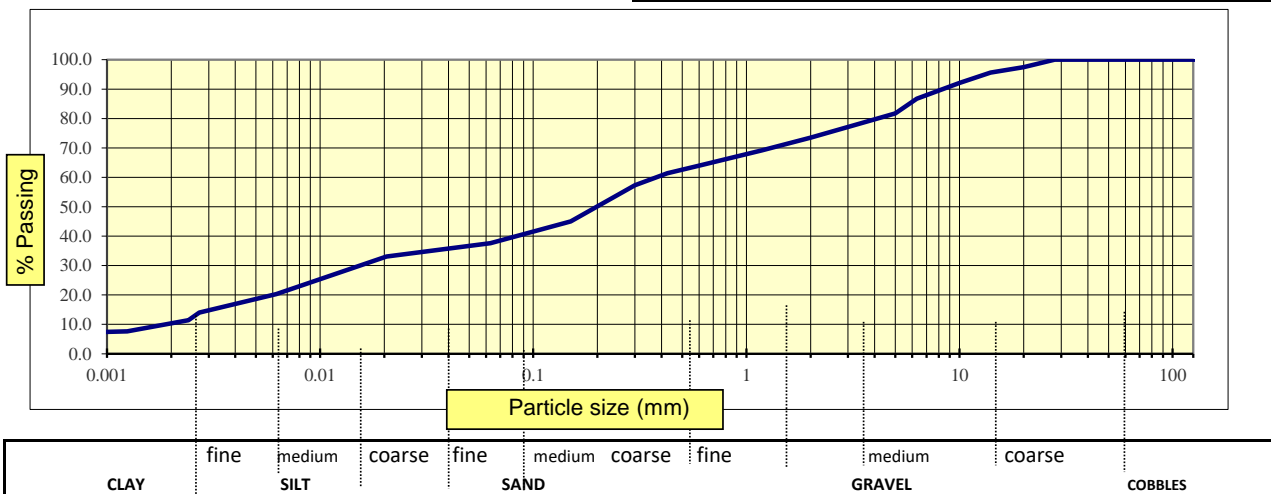
Determination of Particle Size Distribution - BS 1377 : Part 2 : 1990

Determination of Particle Size Distribution (Hydrometer Sedimentation) - BS 1377 : Part 2 : 1990 Cl. 9.5

| | | | |
|--------------------|---|---------------------------|---------------------|
| Project: | Cork Line Level Crossings | Job No: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93344 |
| | | Date Received: | 09/03/2020 |
| | | Date Reported: | 02/04/2020 |
| | | Date Tested: | 01/04/2020 |
| Order No: | 2003-104 | Material: | Soil |
| Originator: | Ian Holley | Visual Description | Light Gravel, Sandy |

| | |
|----------------------------|--------------------------------|
| Client Ref. | XC211-TP01 Type B Sample 2 |
| Location: | XC211-TP01 Type B Sample 2 |
| Supplier: | Bulk |
| Source: | Client Info. |
| Depth (m): | 0.4-0.9m |
| Sampling Reason: | Client Request |
| Sampled By: | Client |
| Specification: | Client |
| Preparation Method: | Without Organics Preparation |
| Notes: | Disturbed sample from cleanout |

| BS Sieve Size | % Passing | Specification |
|---------------|-----------|---------------|
| 300 mm | 100 | |
| 125 mm | 100 | |
| 100 mm | 100 | |
| 75 mm | 100 | |
| 63 mm | 100 | |
| 50 mm | 100 | |
| 37.5 mm | 100 | |
| 28 mm | 100 | |
| 20 mm | 97 | |
| 14 mm | 96 | |
| 10 mm | 92 | |
| 6.3 mm | 87 | |
| 5 mm | 82 | |
| 3.35 mm | 78 | |
| 2 mm | 74 | |
| 1.18 mm | 69 | |
| 0.6 mm | 64 | |
| 0.425 mm | 61 | |
| 0.3 mm | 57 | |
| 0.15 mm | 45 | |
| 0.063 mm | 38 | |
| 0.020 mm | 33 | |
| 0.006 mm | 20 | |
| 0.003 mm | 14 | |
| 0.002 mm | 11 | |
| 0.001 mm | 8 | |



Tested in accordance with BS 1377: Part 2 : 1990 Clause 9.2 and 9.5

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.
 Sedimentation by Hydrometer - Not UKAS


 Approved Signature

JAMES FISHER TESTING SERVICES (IRELAND) LTD.

James Ward, Operations Manager





Laboratory Test Report
Determination of shear Strength by Direct Shear (Small Shearbox)
 in accordance with BS :1377: Part 7 : 1990 Clause 4

| | | |
|--|----------------------------|----------------|
| Project: Cork Line Level Crossing | Job No.: | 19-135 |
| Client: OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref. No.: | ST 93350 |
| | Date Received: | 09/03/2020 |
| | Date Reported: | 05/05/2020 |
| | Material: | Earthworks |
| Order No.: 2003-104 | Visual Description: | Brown SAND |
| Originator: Ian Holley | Specification: | TII Series 600 |

Client Ref:

| |
|----------|
| ST 93350 |
|----------|

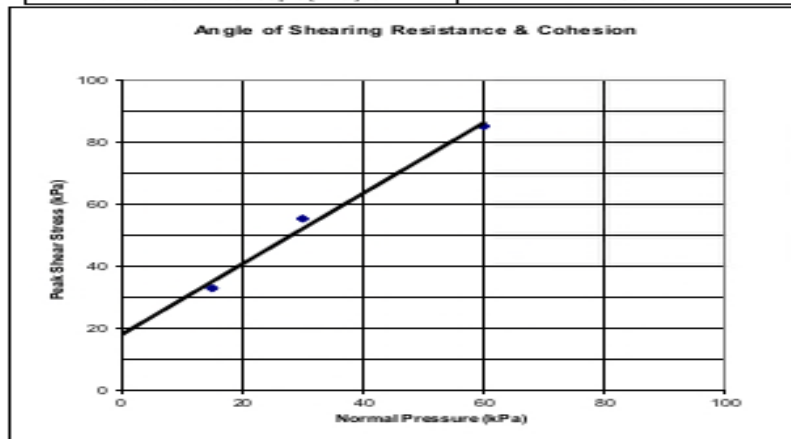
| | | | |
|--|------------------------------|---------------------------------|---------------------------------------|
| Certificate of sampling | Yes | Date Of Sampling: | Client info |
| Lab Reference No. | XC211-TP01 1.0-1.5m Sample 6 | Sampled By: | OCB |
| Sample Source & Ticket No. | Site Won | Sample Preparation: | Bulk sample sieved through 20mm sieve |
| Sample Location / Orientation : | Cork Line Level Crossings | Tested Dry or Submerged: | Dry |

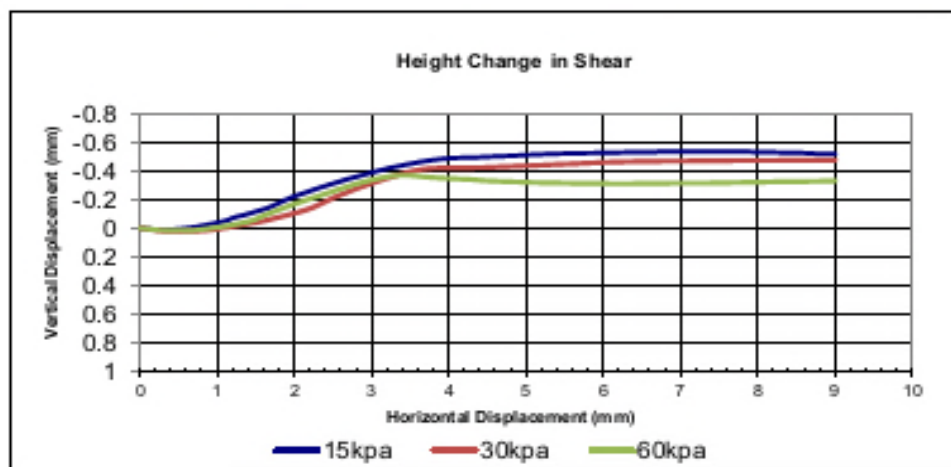
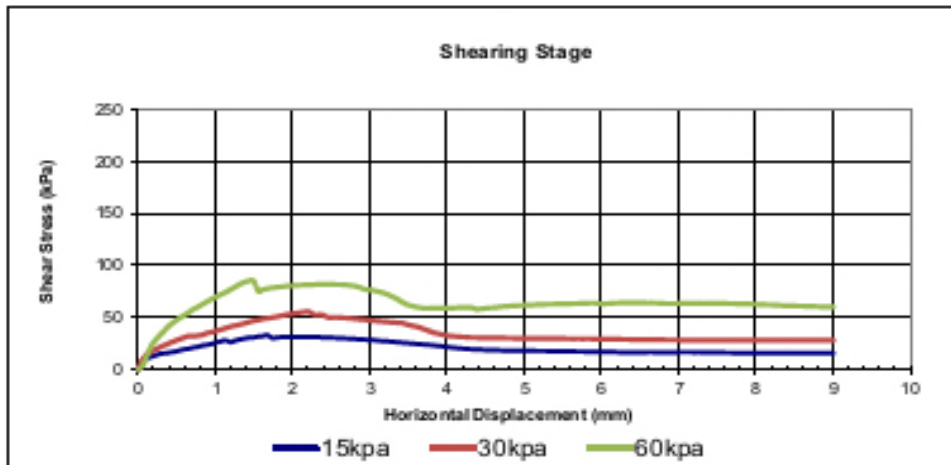
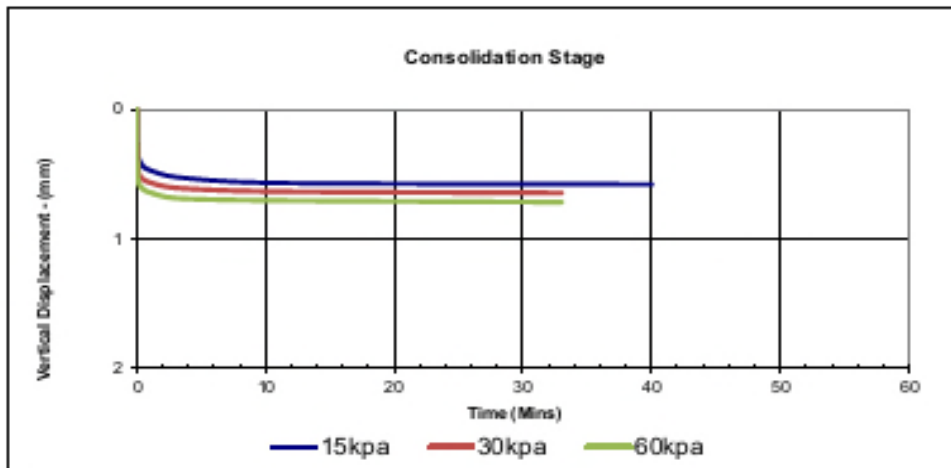
Results

| SUMMARY OF TEST RESULTS: | |
|--|------|
| Angle of Shearing Resistance (°) ϕ' | 48.5 |
| Cohesion Intercept (kPa) c' | 18.0 |

Sample Condition: Submerged
 Particle Density: 2.65 (Mg/m³) Assumed
 Sample Preparation: Remoulded (Hand Tamped)
 Material tested passing 2mm sieve

| Initial Condition | | | |
|--|-------|-------|-------|
| | Stage | | |
| | 1 | 2 | 3 |
| Normal Pressure (kPa) | 15 | 30 | 60 |
| Height (mm) | 19.47 | 19.23 | 19.41 |
| Width (mm) | 59.9 | 59.9 | 59.9 |
| Bulk Density (Mg/m ³) | 2.08 | 2.10 | 2.08 |
| Dry Density (Mg/m ³) | 1.84 | 1.86 | 1.84 |
| Moisture Content (%) | 13 | 13 | 13 |
| Voids Ratio | 0.443 | 0.425 | 0.438 |
| Degree of Saturation | 77.8 | 81.1 | 78.6 |
| Shearing Stage | | | |
| Rate of Displacement (mm/min) | 0.8 | 0.8 | 0.8 |
| Peak Shear Stress (kPa) | 32.9 | 55.4 | 85.2 |
| Displacement at Peak Stress (mm) | 1.7 | 2.2 | 1.5 |
| Final Condition | | | |
| Bulk Density (Mg/m ³) | 2.10 | 2.12 | 2.14 |
| Dry Density (Mg/m ³) | 1.84 | 1.88 | 1.88 |
| Moisture Content (%) | 14 | 13 | 14 |
| Angle of Shearing Resistance (°) ϕ' | 48.5 | | |
| Cohesion Intercept (kPa) c' | 18.0 | | |





Subcontracted to a Laboratory Accredited in this Testing

Approved Signature

James Fisher Testing Services Limited

James Ward, Operations Manager



LABORATORY TEST REPORT

BRE Test Suite B - Greenfield Site

| | | | |
|--------------------|---|-----------------------|------------|
| Project: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co. Cork | Lab Ref. No.: | ST 93349 |
| Order No.: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Reported: | 08/04/2020 |
| | | Material: | Soil |
| | | Date Tested: | 07/04/2020 |
| | | Specification: | Client |

Sample Details

XC211-TP01 Type B Sample 6

| | | | |
|-------------------------|-------------|--------------------------|--------------|
| Supplier: | Client Info | Date of Sampling: | Client Info. |
| Source: | Client Info | Sampled By: | Client |
| Sample Location: | 1.0-1.5m | Sampling Reason: | Request |

| Parameter | RESULT |
|---------------------------------------|--------|
| pH | 7.3 |
| Sulphate Aqueous Extract (SO4) (mg/l) | <10 |
| Sulphur as S, Total (%) | <0.01 |
| Sulphate as SO4, Total (%) | <0.01 |

Comments:

None

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with the above specifications

Subcontracted to a laboratory UKAS accredited for this testing

Approved Signature

JAMES FISHER TESTING SERVICES (IRELAND) LTD.

James Ward, Operations Manager





LABORATORY TEST REPORT

To determine the Organic Content of Soil
in accordance with BS 1377

| | | | |
|--------------------|---|-----------------------|------------|
| Project: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co. Cork | Lab Ref. No.: | ST 93349 |
| Order No.: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Reported: | 08/04/2020 |
| | | Material: | Soil |
| | | Date Tested: | 07/04/2020 |
| | | Specification: | Client |

Sample Details

XC211-TP01 Type B Sample 6

| | | | |
|-------------------------|-------------|--------------------------|-------------|
| Supplier: | Client Info | Date of Sampling: | Client Info |
| Source: | Client Info | Sampled By: | Client |
| Sample Location: | 1.0-1.5m | Sampling Reason: | Request |

Result:

| | |
|---------------------------|------------|
| Organic Matter (%) | 0.3 |
|---------------------------|------------|

Comments:

None

Tested in accordance with the above specifications
Subcontracted to a laboratory UKAS accredited for this testing

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

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James Ward, Operations Manager



LABORATORY TEST REPORT

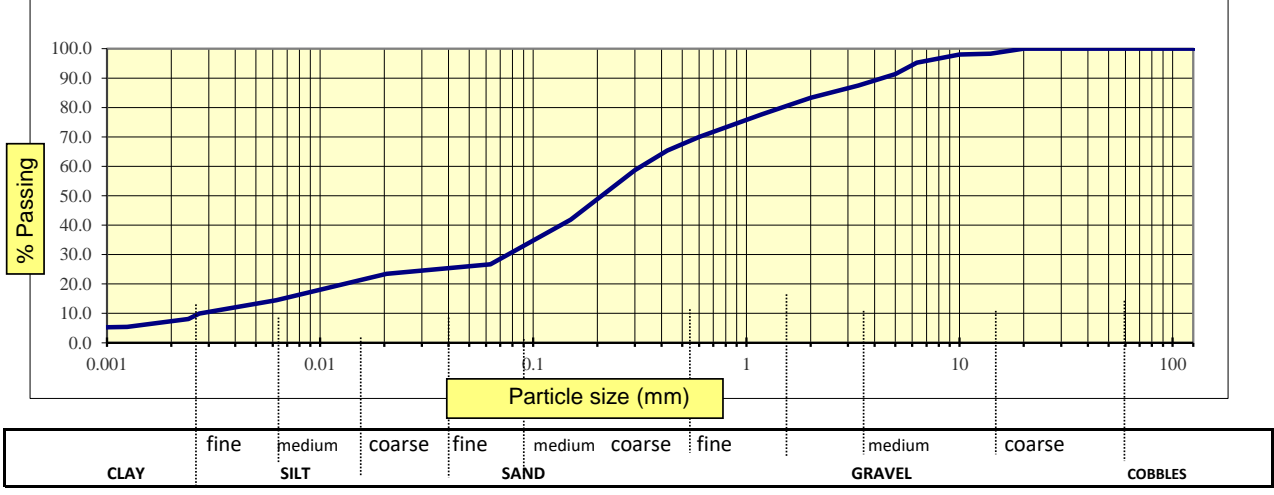
Determination of Particle Size Distribution - BS 1377 : Part 2 : 1990

Determination of Particle Size Distribution (Hydrometer Sedimentation) - BS 1377 : Part 2 : 1990 Cl. 9.5

| | | | |
|--------------------|---|---------------------------|------------------|
| Project: | Cork Line Level Crossings | Job No: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93348 |
| | | Date Received: | 09/03/2020 |
| | | Date Reported: | 02/04/2020 |
| | | Date Tested: | 01/04/2020 |
| Order No: | 2003-104 | Material: | Soil |
| Originator: | Ian Holley | Visual Description | Grey Clay, Sandy |

| | |
|----------------------------|--------------------------------|
| Client Ref. | XC211-TP01 Type B Sample 6 |
| Location: | XC211-TP01 Type B Sample 6 |
| Supplier: | Bulk |
| Source: | Client Info. |
| Depth (m): | 1.0-1.5m |
| Sampling Reason: | Client Request |
| Sampled By: | Client |
| Specification: | Client |
| Preparation Method: | Without Organics Preparation |
| Notes: | Disturbed sample from cleanout |

| BS Sieve Size | % Passing | Specification |
|---------------|-----------|---------------|
| 300 mm | 100 | |
| 125 mm | 100 | |
| 100 mm | 100 | |
| 75 mm | 100 | |
| 63 mm | 100 | |
| 50 mm | 100 | |
| 37.5 mm | 100 | |
| 28 mm | 100 | |
| 20 mm | 100 | |
| 14 mm | 98 | |
| 10 mm | 98 | |
| 6.3 mm | 95 | |
| 5 mm | 91 | |
| 3.35 mm | 87 | |
| 2 mm | 83 | |
| 1.18 mm | 78 | |
| 0.6 mm | 70 | |
| 0.425 mm | 65 | |
| 0.3 mm | 59 | |
| 0.15 mm | 42 | |
| 0.063 mm | 27 | |
| 0.020 mm | 23 | |
| 0.006 mm | 14 | |
| 0.003 mm | 10 | |
| 0.002 mm | 8 | |
| 0.001 mm | 5 | |



Tested in accordance with BS 1377: Part 2 : 1990 Clause 9.2 and 9.5

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.
 Sedimentation by Hydrometer - Not UKAS


 Approved Signature

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 James Ward, Operations Manager

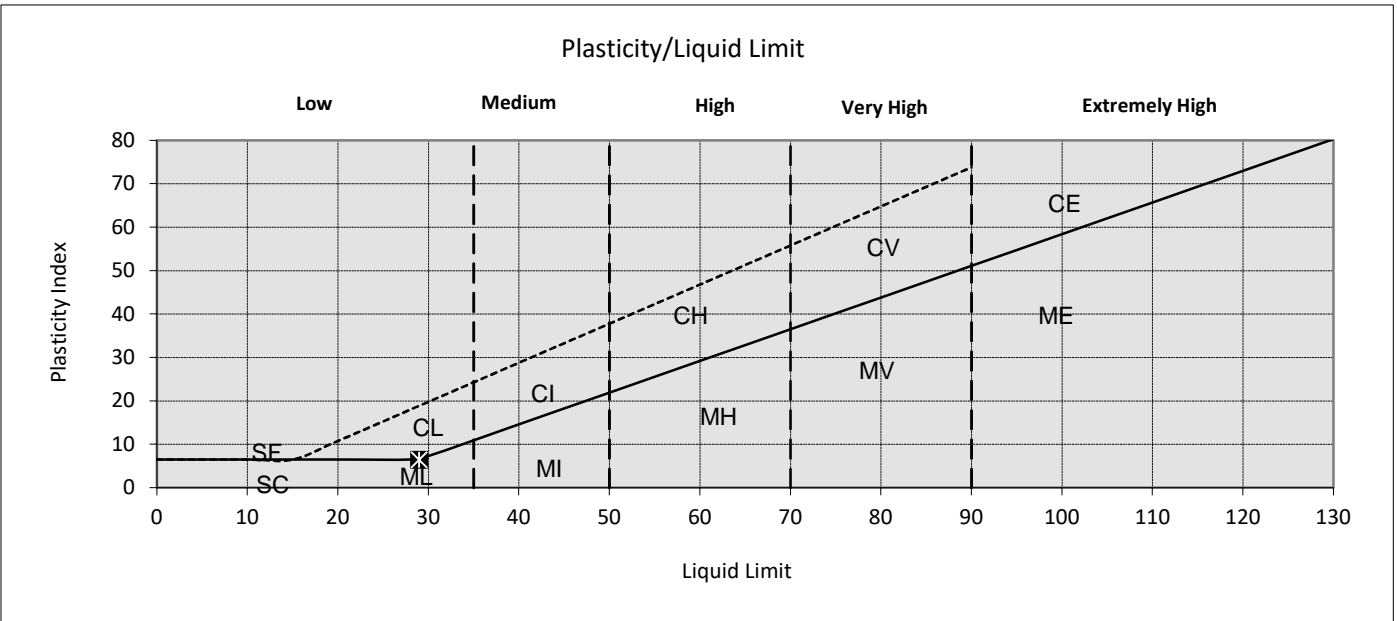




LABORATORY TEST REPORT
LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 CI 4.4,5.3

| | | | |
|--------------------|--|-----------------------|---------------------|
| Site Ref.: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: | ST 93352 |
| Order No: | 2003-104 | Sample Ref.: | XC211-TP01 2.3-3.0m |
| Originator: | Ian Holley | Date Sampled: | Client Info |
| | | Date Received: | 09/03/2020 |
| | | Date Tested: | 02/04/2020 |
| | | Date Reported: | 21/04/2020 |

| | |
|--------------------------------|--------|
| Sampling Certificate | No |
| Sampled By | Client |
| Sample Type | Bulk |
| Sample Preparation Method | Washed |
| MATERIAL | Soil |
| Retained 425 micron (%) | 25 |
| Natural Moisture Content (%) | 24 |
| Liquid Limit (single point)(%) | 29 |
| Plastic Limit (%) | 22 |
| Plasticity Index | 6 |



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Approved Signature
James Fisher Testing Services Ltd
Phil Thorp, Laboratory Manager





LABORATORY TEST REPORT

MOISTURE CONTENT BS 1377 : Part 2 : 1990 Oven Drying Method cl 3.2

| | | | |
|--------------------|---|-----------------------|------------|
| Site: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93351 |
| Order No: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Tested: | 26/03/2020 |
| | | Date Reported: | 03/04/2020 |
| | | Specification: | Client |

Sampled Ref: XC211-TP01 Type D Sample 9

Sample Type: Bulk **Location:** XC211-TP01 Type D Sample 9

Date Sampled: Client Info **Sample by:** Client

Depth: 2.5-3.0m **Material Type:** Soil

Moisture Content (%): 20

Tested in accordance with BS 1377: Part 2: 1990
Sample preparation by cone and quarter

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

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James Fisher Testing Services (Ireland) Ltd
James Ward, Operations Manager





Laboratory Test Report
Determination of shear Strength by Direct Shear (Small Shearbox)
 in accordance with BS :1377: Part 7 : 1990 Clause 4

| | |
|---|---|
| Project: Cork Line Level Crossing | Job No.: 19-135 |
| Client: OCB Geotechnical Unit 1 Carrigogna Middleton | Lab Ref. No.: ST 93354 |
| Order No.: 2003-104 | Date Received: 09/03/2020 |
| Originator: Ian Holley | Date Reported: 22/05/2020 |
| | Material: Earthworks |
| | Visual Description: Brown silty SAND |
| | Specification: TII Series 600 |

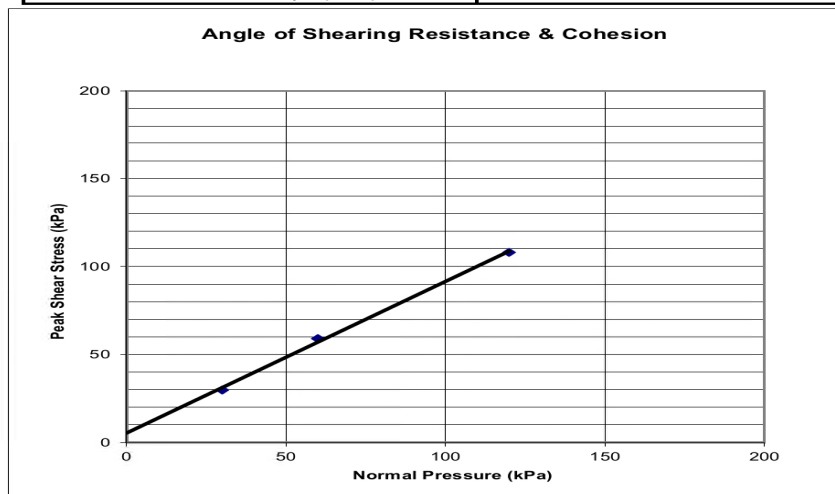
| | | |
|--|-------------------------------|--|
| Client Ref: | ST 93354 | |
| Certificate of sampling | Yes | Date Of Sampling: Client info |
| Lab Reference No. | XC211-TP01 3.0-3.4m Sample 10 | Sampled By: OCB |
| Sample Source & Ticket No. | Site Won | Sample Preparation: Bulk sample sieved through 20mm sieve |
| Sample Location / Orientation : | Cork Line Level Crossings | Tested Dry or Submerged: Dry |

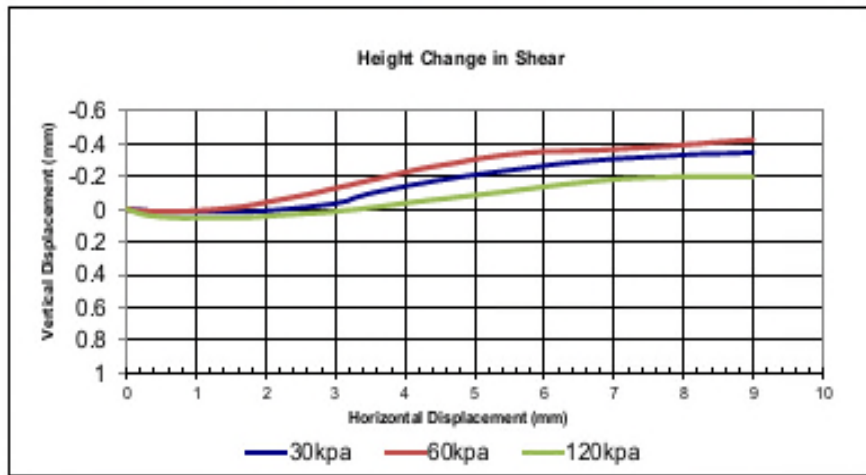
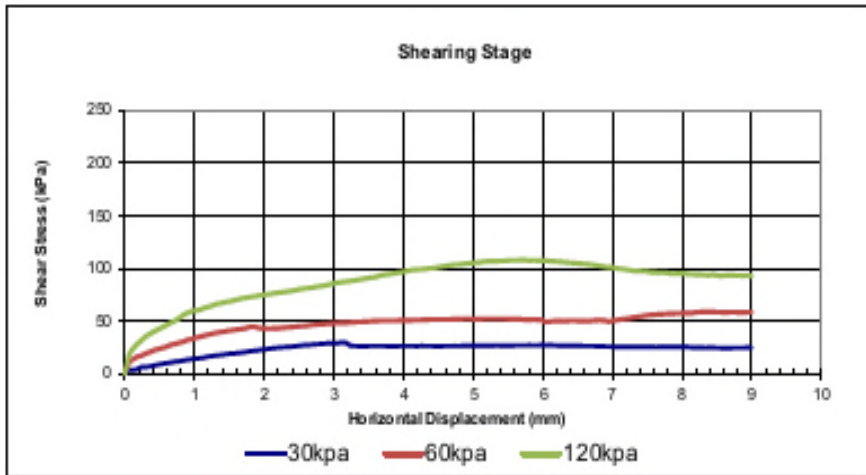
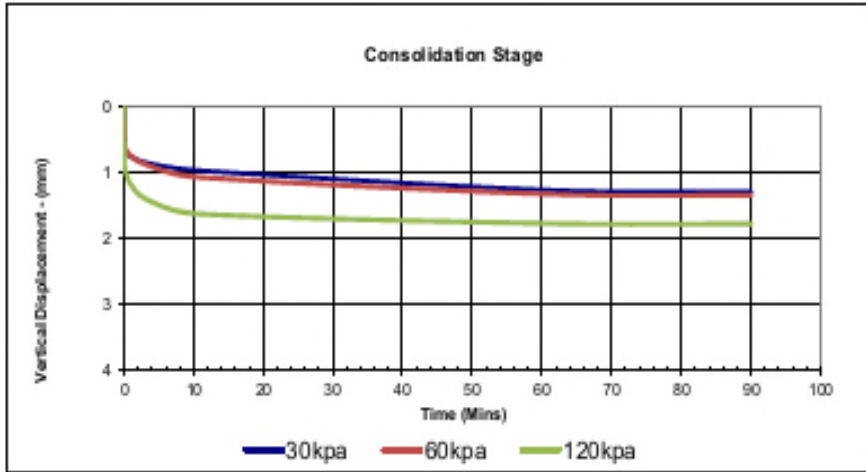
Results

| SUMMARY OF TEST RESULTS: | |
|--|------|
| Angle of Shearing Resistance (°) ϕ' | 40.5 |
| Cohesion Intercept (kPa) c' | 5.3 |

Sample Condition: Submerged
 Particle Density: 2.70(Mg/m³) Assumed
 Sample Preparation: Remoulded (Hand Tamped)
 Material tested passing 2mm sieve

| Initial Condition | | | |
|--|-------|-------|-------|
| | Stage | | |
| | 1 | 2 | 3 |
| Normal Pressure (kPa) | 30 | 60 | 120 |
| Height (mm) | 18.80 | 18.81 | 18.48 |
| Width (mm) | 59.9 | 59.9 | 59.9 |
| Bulk Density (Mg/m ³) | 2.08 | 2.07 | 2.11 |
| Dry Density (Mg/m ³) | 1.72 | 1.71 | 1.74 |
| Moisture Content (%) | 21 | 21 | 21 |
| Voids Ratio | 0.574 | 0.575 | 0.547 |
| Degree of Saturation | 98.8 | 98.6 | 103.6 |
| Shearing Stage | | | |
| Rate of Displacement (mm/min) | 0.8 | 0.8 | 0.8 |
| Peak Shear Stress (kPa) | 29.8 | 59.1 | 108.0 |
| Displacement at Peak Stress (mm) | 3.1 | 8.3 | 5.7 |
| Final Condition | | | |
| Bulk Density (Mg/m ³) | 2.20 | 2.16 | 2.27 |
| Dry Density (Mg/m ³) | 1.81 | 1.80 | 1.91 |
| Moisture Content (%) | 22 | 20 | 19 |
| Angle of Shearing Resistance (°) ϕ' | 40.5 | | |
| Cohesion Intercept (kPa) c' | 5.3 | | |





Subcontracted to a Laboratory Accredited in this Testing

Approved Signature
 James Fisher Testing Services Limited
 James Ward, Operations Manager

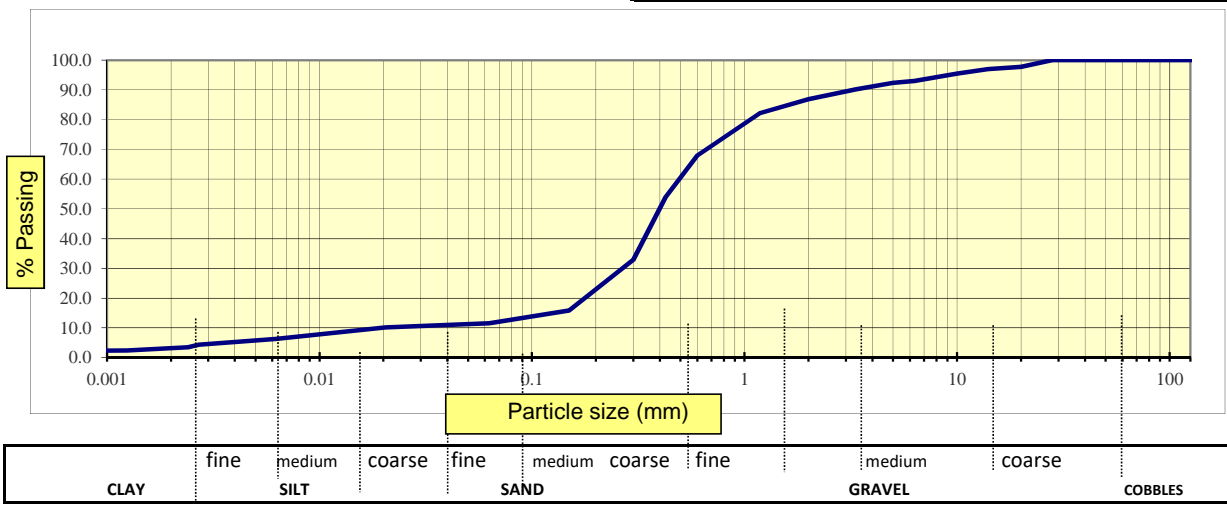
LABORATORY TEST REPORT

Determination of Particle Size Distribution - BS 1377 : Part 2 : 1990

| | | | |
|--------------------|---|---------------------------|------------|
| Project: | Cork Line Level Crossings | Job No: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93353 |
| Order No: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Reported: | 25/03/2020 |
| | | Date Tested: | 23/03/2020 |
| | | Material: | Soil |
| | | Visual Description | Sandy Clay |

| | |
|----------------------------|--------------------------------|
| Client Ref. | XC211-TP01 Type B Sample 10 |
| Location: | XC211-TP01 Type B Sample 10 |
| Supplier: | Bulk |
| Source: | Client Info. |
| Depth (m): | 3.0-3.4m |
| Sampling Reason: | Client Request |
| Sampled By: | Client |
| Specification: | Client |
| Preparation Method: | Without Organics Preparation |
| Notes: | Disturbed sample from cleanout |

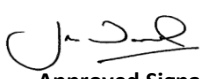
| BS Sieve Size | % Passing | Specification |
|---------------|-----------|---------------|
| 300 mm | 100 | |
| 125 mm | 100 | |
| 100 mm | 100 | |
| 75 mm | 100 | |
| 63 mm | 100 | |
| 50 mm | 100 | |
| 37.5 mm | 100 | |
| 28 mm | 100 | |
| 20 mm | 98 | |
| 14 mm | 97 | |
| 10 mm | 96 | |
| 6.3 mm | 93 | |
| 5 mm | 92 | |
| 3.35 mm | 90 | |
| 2 mm | 87 | |
| 1.18 mm | 82 | |
| 0.6 mm | 68 | |
| 0.425 mm | 54 | |
| 0.3 mm | 33 | |
| 0.15 mm | 16 | |
| 0.063 mm | 12 | |
| 0.020 mm | 10 | |
| 0.006 mm | 6 | |
| 0.003 mm | 4 | |
| 0.002 mm | 4 | |
| 0.001 mm | 2 | |



Tested in accordance with BS 1377: Part 2 : 1990 Clause 3.2, 9.2 and 9.5

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Sedimentation by Hydrometer - Not UKAS



Approved Signature
JAMES FISHER TESTING SERVICES (IRELAND) LTD.
 James Ward, Operations Manager





LABORATORY TEST REPORT

MOISTURE CONTENT BS 1377 : Part 2 : 1990 Oven Drying Method cl 3.2

| | | | |
|--------------------|---|-----------------------|------------|
| Site: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93357 |
| Order No: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Tested: | 13/03/2020 |
| | | Date Reported: | 25/03/2020 |
| | | Specification: | Client |

Sampled Ref: XC211-TP02 Type D Sample 3

Sample Type: Bulk **Location:** XC211-TP02 Type D Sample 3

Date Sampled: Client Info **Sample by:** Client

Depth: 0.3-0.8m **Material Type:** Soil

Moisture Content (%): 21

Tested in accordance with BS 1377: Part 2: 1990
Sample preparation by cone and quarter

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature

James Fisher Testing Services (Ireland) Ltd
James Ward, Operations Manager





LABORATORY TEST REPORT

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP - BS 1377: Part 4: 1990

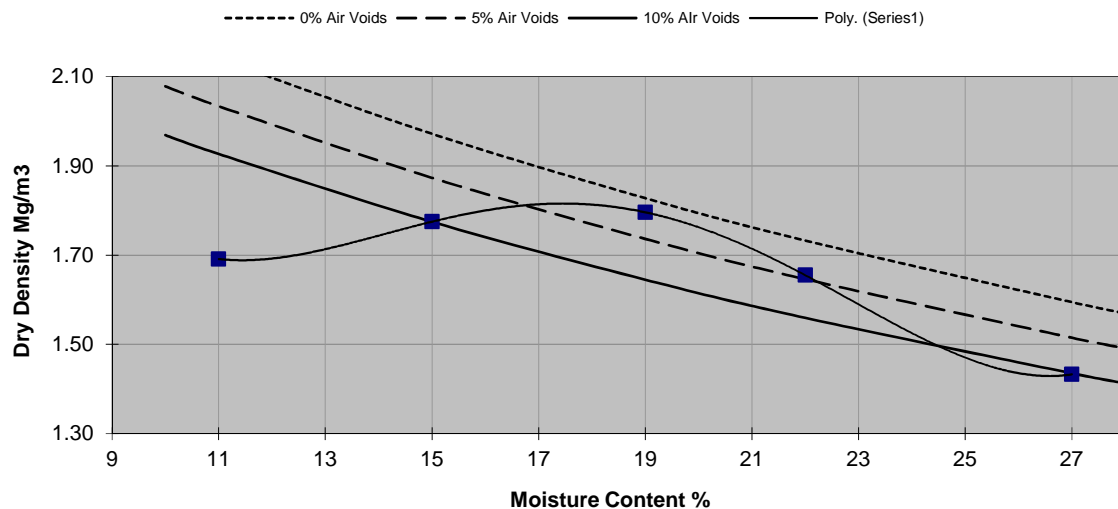
| | |
|---|----------------------------------|
| Project: Cork Line Level Crossings | Job No: 19-135 |
| Client: OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: ST 93356 |
| Order No: 2003-104 | Date Received: 09/03/2020 |
| Originator: Ian Holley | Date Tested: 03/04/2020 |
| | Date Reported: 06/04/2020 |
| | Material: Soil |
| | Specification: Client |

| | |
|---|---------------------------|
| Client Sample Ref : XC211-TP02 Type B Sample 2 | Sample Type : Bulk |
| Supplier: Client Info | Description : Soil |
| Location: 0.3-0.8m | |

Date sampled : Client Info **Comments :** None
Sampling Cert : No

| | | | |
|----------------------------|-----|-----------------------------------|-----|
| Rammer used : | 4.5 | No of layers: | 3 |
| No of sub samples : | 5 | % retained on 37.5mm sieve | 0.3 |
| Mould Size: | CBR | % retained on 20mm sieve | 4.6 |

| | | | | | |
|---------------------------------------|------|------|------|------|------|
| Bulk Density: Mg/m³ | 1.88 | 2.04 | 2.13 | 2.03 | 1.81 |
| Moisture Content: % | 11 | 15 | 19 | 22 | 27 |
| Dry Density: Mg/m³ | 1.69 | 1.77 | 1.80 | 1.65 | 1.43 |



| | |
|---|-------------|
| Maximum Dry Density (Mg/m³) | 1.82 |
| Optimum Moisture Content (%) | 18 |

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with BS 1377: Part 4:1990
 Particle Density (Mg/m³) - 2.8 (Assumed)

Approved Signature
 James Fisher Testing Services Limited
 Phil Thorp, Laboratory Manager

James Fisher Testing Services Limited, a company registered in England and Wales with registration number: 01182561

Registered office: Fisher House, PO Box 4, Barrow-in-Furness, Cumbria, LA14 1HR

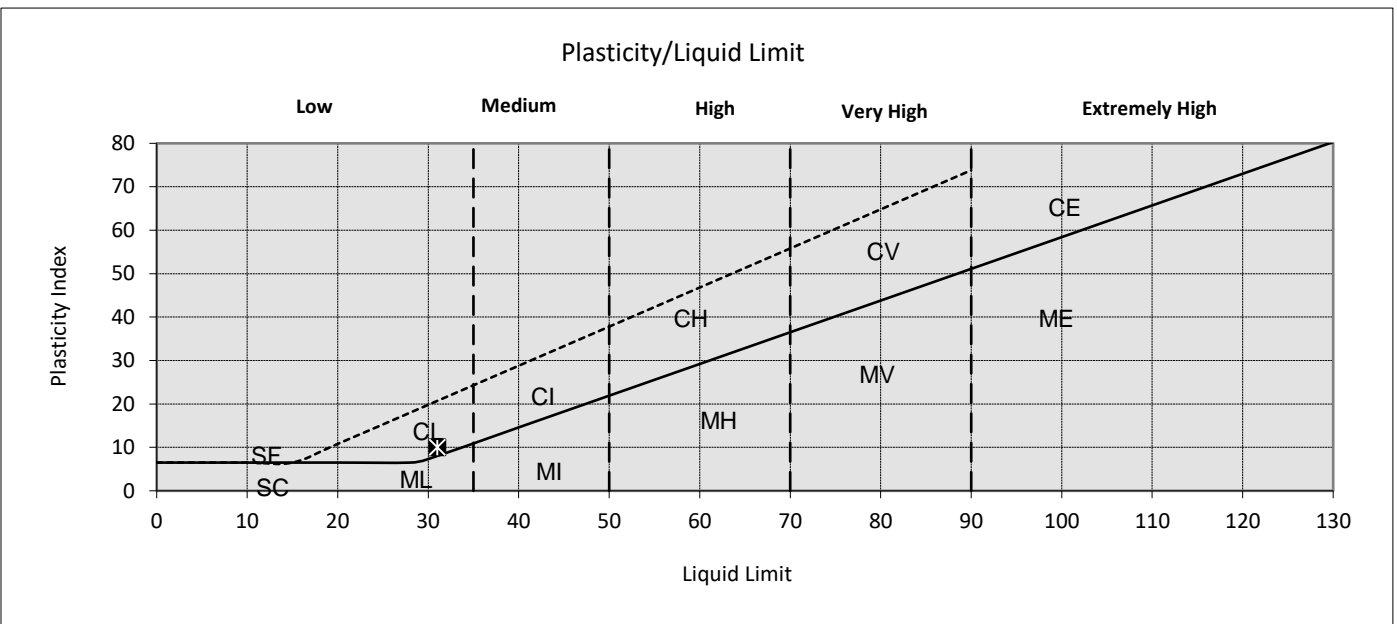




LABORATORY TEST REPORT
LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 CI 4.4,5.3

| | | | |
|--------------------|--|-----------------------|-------------------------------------|
| Site Ref.: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: | ST 93358 |
| Order No: | 2003-104 | Sample Ref.: | XC211-TP02 0.3-0.8m Type D Sample 3 |
| Originator: | Ian Holley | Date Sampled: | Client Info |
| | | Date Received: | 09/03/2020 |
| | | Date Tested: | 20/03/2020 |
| | | Date Reported: | 31/03/2020 |

| | |
|--------------------------------|--------|
| Sampling Certificate | No |
| Sampled By | Client |
| Sample Type | Bulk |
| Sample Preparation Method | Washed |
| MATERIAL | Soil |
| Retained 425 micron (%) | 26 |
| Natural Moisture Content (%) | 25 |
| Liquid Limit (single point)(%) | 31 |
| Plastic Limit (%) | 21 |
| Plasticity Index | 10 |



The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature
 James Fisher Testing Services Ltd
 Phil Thorp, Laboratory Manager





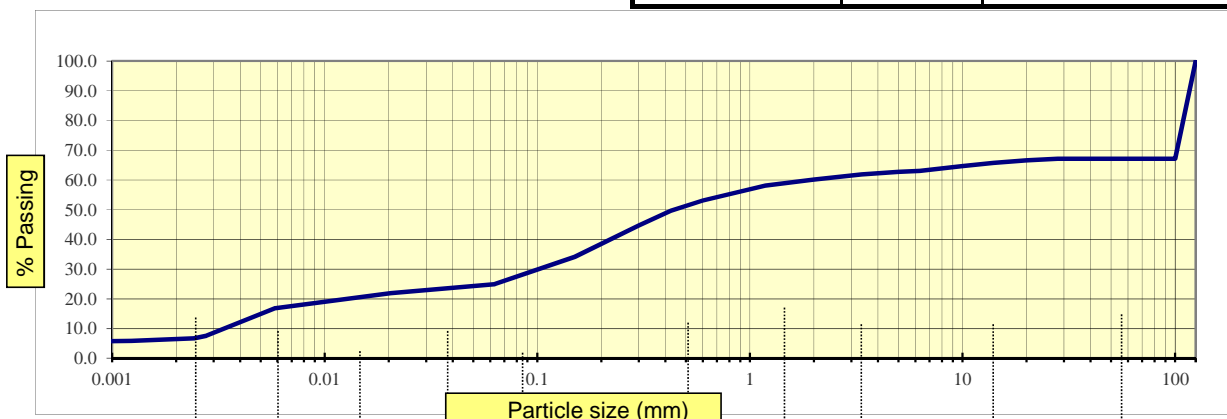
LABORATORY TEST REPORT

Determination of Particle Size Distribution - BS 1377 : Part 2 : 1990

| | | | |
|--------------------|---|---------------------------|-------------------------------|
| Project: | Cork Line Level Crossings | Job No: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93355 |
| | | Date Received: | 09/03/2020 |
| | | Date Reported: | 25/03/2020 |
| | | Date Tested: | 23/03/2020 |
| Order No: | 2003-104 | Material: | Soil |
| Originator: | Ian Holley | Visual Description | Large Cobble, Dark Sandy Clay |

| | |
|----------------------------|--------------------------------|
| Client Ref. | XC211-TP02 Type B Sample 2 |
| Location: | XC211-TP02 Type B Sample 2 |
| Supplier: | Bulk |
| Source: | Client Info. |
| Depth (m): | 0.3-0.8m |
| Sampling Reason: | Client Request |
| Sampled By: | Client |
| Specification: | Client |
| Preparation Method: | Without Organics Preparation |
| Notes: | Disturbed sample from cleanout |

| BS Sieve Size | % Passing | Specification |
|---------------|-----------|---------------|
| 300 mm | 100 | |
| 125 mm | 100 | |
| 100 mm | 67 | |
| 75 mm | 67 | |
| 63 mm | 67 | |
| 50 mm | 67 | |
| 37.5 mm | 67 | |
| 28 mm | 67 | |
| 20 mm | 67 | |
| 14 mm | 66 | |
| 10 mm | 65 | |
| 6.3 mm | 63 | |
| 5 mm | 63 | |
| 3.35 mm | 62 | |
| 2 mm | 60 | |
| 1.18 mm | 58 | |
| 0.6 mm | 53 | |
| 0.425 mm | 50 | |
| 0.3 mm | 45 | |
| 0.15 mm | 34 | |
| 0.063 mm | 25 | |
| 0.0205 mm | 22 | |
| 0.0059 mm | 17 | |
| 0.0028 mm | 7.6 | |
| 0.0024 mm | 6.7 | |
| 0.0012 mm | 5.9 | |



| | | | | | | | | | | |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|
| CLAY | fine | medium | coarse | fine | medium | coarse | fine | medium | coarse | COBBLES |
|------|------|--------|--------|------|--------|--------|------|--------|--------|---------|

Tested in accordance with BS 1377: Part 2 : 1990 Clause 3.2, 9.2 and 9.5

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Sedimentation by Hydrometer - Not UKAS

J. Ward

Approved Signature
JAMES FISHER TESTING SERVICES (IRELAND) LTD.
 James Ward, Operations Manager





LABORATORY TEST REPORT

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP - BS 1377: Part 4: 1990

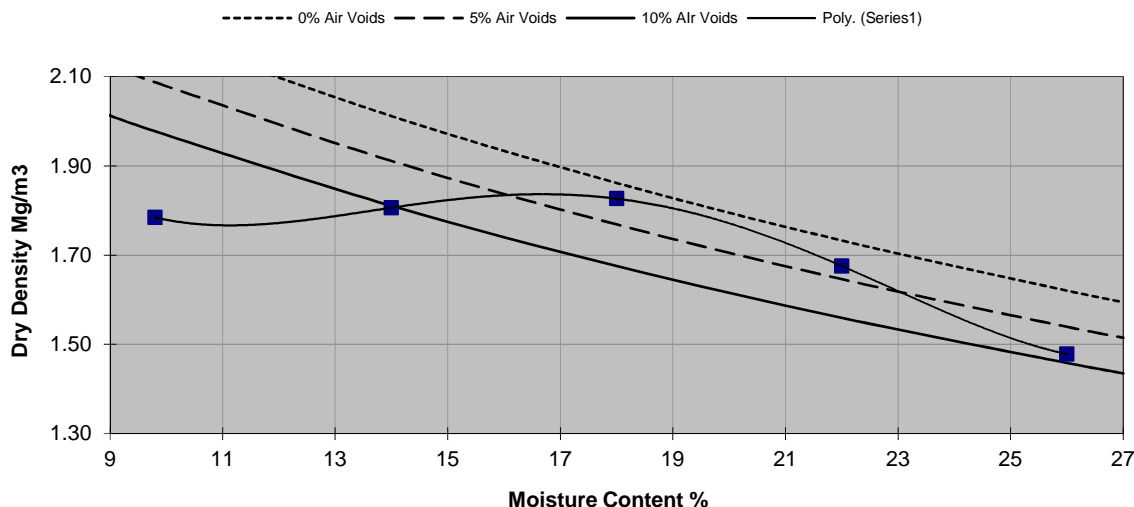
| | |
|---|----------------------------------|
| Project: Cork Line Level Crossings | Job No: 19-135 |
| Client: OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: ST 93360 |
| Order No: 2003-104 | Date Received: 09/03/2020 |
| Originator: Ian Holley | Date Tested: 03/04/2020 |
| | Date Reported: 06/04/2020 |
| | Material: Soil |
| | Specification: Client |

| | |
|---|---------------------------|
| Client Sample Ref : XC211-TP02 Type B Sample 6 | Sample Type : Bulk |
| Supplier: Client Info | Description : Soil |
| Location: 1.6-2.1m | |

Date sampled : Client Info **Comments :** None
Sampling Cert : No

| | | | |
|----------------------------|-----|-----------------------------------|-----|
| Rammer used : | 4.5 | No of layers: | 3 |
| No of sub samples : | 5 | % retained on 37.5mm sieve | 0.5 |
| Mould Size: | CBR | % retained on 20mm sieve | 5.5 |

| | | | | | |
|---------------------------------------|------|------|------|------|------|
| Bulk Density: Mg/m³ | 1.96 | 2.07 | 2.16 | 2.04 | 1.86 |
| Moisture Content: % | 9.8 | 14 | 18 | 22 | 26 |
| Dry Density: Mg/m³ | 1.78 | 1.81 | 1.83 | 1.68 | 1.48 |



| | |
|---|-------------|
| Maximum Dry Density (Mg/m³) | 1.84 |
| Optimum Moisture Content (%) | 17 |

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with BS 1377: Part 4:1990
 Particle Density (Mg/m³) - 2.8 (Assumed)

Approved Signature
 James Fisher Testing Services Limited
 Phil Thorp, Laboratory Manager

James Fisher Testing Services Limited, a company registered in England and Wales with registration number: 01182561

Registered office: Fisher House, PO Box 4, Barrow-in-Furness, Cumbria, LA14 1HR



LABORATORY TEST REPORT

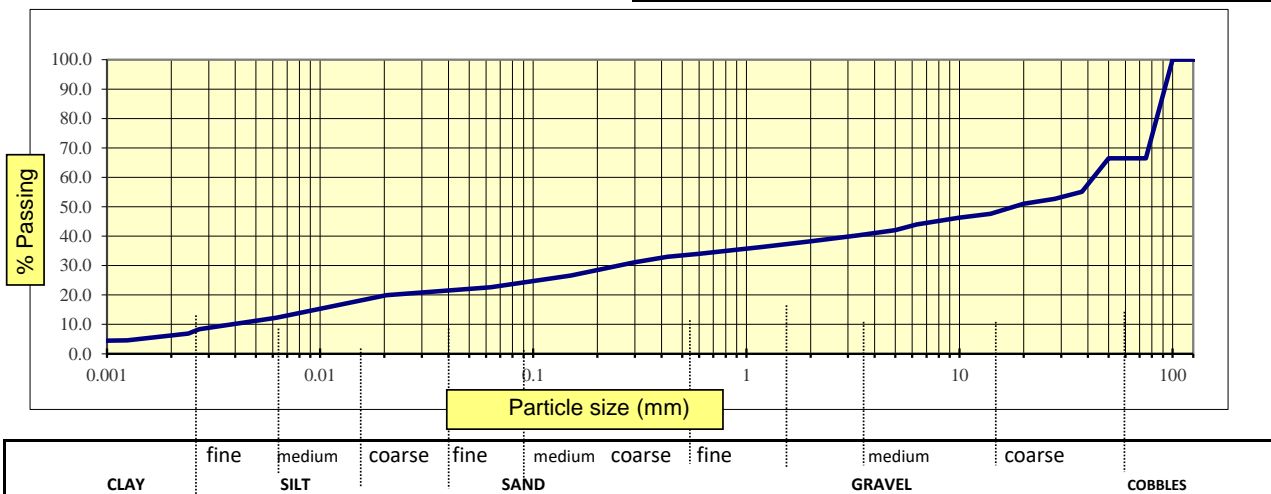
Determination of Particle Size Distribution - BS 1377 : Part 2 : 1990

Determination of Particle Size Distribution (Hydrometer Sedimentation) - BS 1377 : Part 2 : 1990 Cl. 9.5

| | | | |
|--------------------|---|---------------------------|--------------------------|
| Project: | Cork Line Level Crossings | Job No: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93359 |
| | | Date Received: | 09/03/2020 |
| | | Date Reported: | 02/04/2020 |
| | | Date Tested: | 31/03/2020 |
| Order No: | 2003-104 | Material: | Soil |
| Originator: | Ian Holley | Visual Description | Cobbly Light Clay, Sandy |

| | |
|----------------------------|--------------------------------|
| Client Ref. | XC211-TP02 Type B Sample 6 |
| Location: | XC211-TP02 Type B Sample 6 |
| Supplier: | Bulk |
| Source: | Client Info. |
| Depth (m): | 1.6-2.1m |
| Sampling Reason: | Client Request |
| Sampled By: | Client |
| Specification: | Client |
| Preparation Method: | Without Organics Preparation |
| Notes: | Disturbed sample from cleanout |

| BS Sieve Size | % Passing | Specification |
|---------------|-----------|---------------|
| 300 mm | 100 | |
| 125 mm | 100 | |
| 100 mm | 100 | |
| 75 mm | 66 | |
| 63 mm | 66 | |
| 50 mm | 66 | |
| 37.5 mm | 55 | |
| 28 mm | 53 | |
| 20 mm | 51 | |
| 14 mm | 48 | |
| 10 mm | 46 | |
| 6.3 mm | 44 | |
| 5 mm | 42 | |
| 3.35 mm | 40 | |
| 2 mm | 38 | |
| 1.18 mm | 36 | |
| 0.6 mm | 34 | |
| 0.425 mm | 33 | |
| 0.3 mm | 31 | |
| 0.15 mm | 27 | |
| 0.063 mm | 23 | |
| 0.020 mm | 20 | |
| 0.006 mm | 12 | |
| 0.003 mm | 8 | |
| 0.002 mm | 7 | |
| 0.001 mm | 5 | |



Tested in accordance with BS 1377: Part 2 : 1990 Clause 9.2 and 9.5

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.
 Sedimentation by Hydrometer - Not UKAS


 Approved Signature

JAMES FISHER TESTING SERVICES (IRELAND) LTD.
 James Ward, Operations Manager





LABORATORY TEST REPORT

BRE Test Suite B - Greenfield Site

| | | | |
|--------------------|---|-----------------------|------------|
| Project: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co. Cork | Lab Ref. No.: | ST 93363 |
| Order No.: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Reported: | 08/04/2020 |
| | | Material: | Soil |
| | | Date Tested: | 07/04/2020 |
| | | Specification: | Client |

Sample Details

XC211-TP02 Type D Sample 9

| | | | |
|-------------------------|-------------|--------------------------|--------------|
| Supplier: | Client Info | Date of Sampling: | Client Info. |
| Source: | Client Info | Sampled By: | Client |
| Sample Location: | 2.7-3.2m | Sampling Reason: | Request |

| Parameter | RESULT |
|---------------------------------------|--------|
| pH | 8.4 |
| Sulphate Aqueous Extract (SO4) (mg/l) | <10 |
| Sulphur as S, Total (%) | 0.01 |
| Sulphate as SO4, Total (%) | 0.02 |

Comments:

None

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with the above specifications

Subcontracted to a laboratory UKAS accredited for this testing

Approved Signature

JAMES FISHER TESTING SERVICES (IRELAND) LTD.

James Ward, Operations Manager





LABORATORY TEST REPORT

MOISTURE CONTENT BS 1377 : Part 2 : 1990 Oven Drying Method cl 3.2

| | | | |
|--------------------|---|-----------------------|------------|
| Site: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93361 |
| Order No: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Tested: | 26/03/2020 |
| | | Date Reported: | 03/04/2020 |
| | | Specification: | Client |

Sampled Ref: XC211-TP02 Type D Sample 9

Sample Type: Bulk **Location:** XC211-TP02 Type D Sample 9

Date Sampled: Client Info **Sample by:** Client

Depth: 2.7-3.2m **Material Type:** Soil

Moisture Content (%): 12

Tested in accordance with BS 1377: Part 2: 1990
Sample preparation by cone and quarter

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature

James Fisher Testing Services (Ireland) Ltd
James Ward, Operations Manager

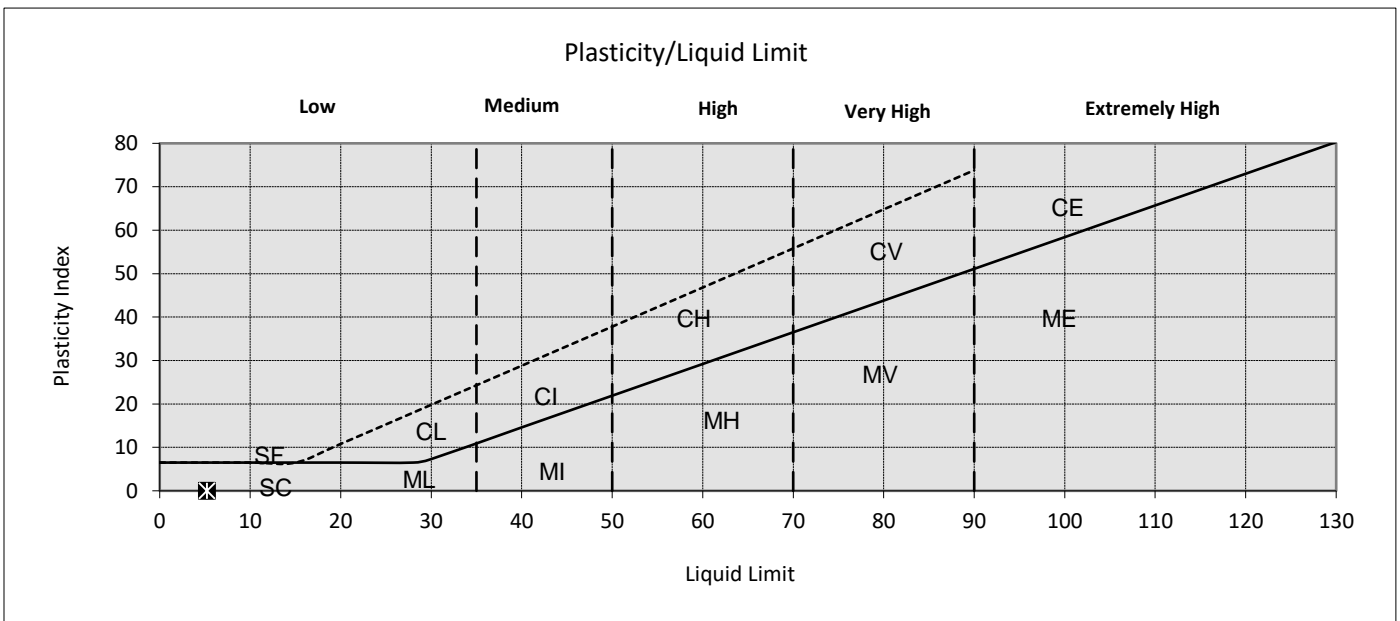




LABORATORY TEST REPORT
LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 CI 4.4,5.3

| | | | |
|--------------------|--|-----------------------|-------------------------------------|
| Site Ref.: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: | ST 93362 |
| Order No: | 2003-104 | Sample Ref.: | XC211-TP02 2.7-3.2m Type D Sample 9 |
| Originator: | Ian Holley | Date Sampled: | Client Info |
| | | Date Received: | 09/03/2020 |
| | | Date Tested: | 26/03/2020 |
| | | Date Reported: | 31/03/2020 |

| | |
|--------------------------------|-------------|
| Sampling Certificate | No |
| Sampled By | Client |
| Sample Type | Bulk |
| Sample Preparation Method | Washed |
| MATERIAL | Soil |
| Retained 425 micron (%) | 70 |
| Natural Moisture Content (%) | 11 |
| Liquid Limit (single point)(%) | 5 |
| Plastic Limit (%) | Non-Plastic |
| Plasticity Index | N/A |



The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature
 James Fisher Testing Services Ltd
 Phil Thorp, Laboratory Manager



LABORATORY TEST REPORT

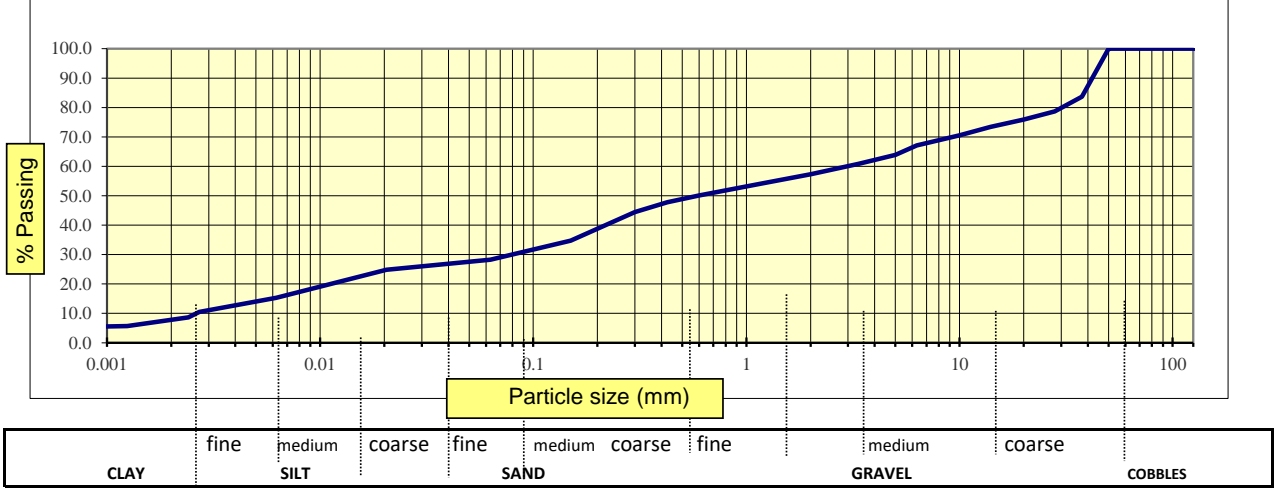
Determination of Particle Size Distribution - BS 1377 : Part 2 : 1990

Determination of Particle Size Distribution (Hydrometer Sedimentation) - BS 1377 : Part 2 : 1990 Cl. 9.5

| | | | |
|--------------------|---|---------------------------|-------------------|
| Project: | Cork Line Level Crossings | Job No: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93364 |
| | | Date Received: | 09/03/2020 |
| | | Date Reported: | 02/04/2020 |
| | | Date Tested: | 01/04/2020 |
| Order No: | 2003-104 | Material: | Soil |
| Originator: | Ian Holley | Visual Description | Light Clay, Sandy |

| | |
|----------------------------|--------------------------------|
| Client Ref. | XC211-TP03 Type B Sample 2 |
| Location: | XC211-TP03 Type B Sample 2 |
| Supplier: | Bulk |
| Source: | Client Info. |
| Depth (m): | 0.3-0.8m |
| Sampling Reason: | Client Request |
| Sampled By: | Client |
| Specification: | Client |
| Preparation Method: | Without Organics Preparation |
| Notes: | Disturbed sample from cleanout |

| BS Sieve Size | % Passing | Specification |
|---------------|-----------|---------------|
| 300 mm | 100 | |
| 125 mm | 100 | |
| 100 mm | 100 | |
| 75 mm | 100 | |
| 63 mm | 100 | |
| 50 mm | 100 | |
| 37.5 mm | 84 | |
| 28 mm | 79 | |
| 20 mm | 76 | |
| 14 mm | 73 | |
| 10 mm | 71 | |
| 6.3 mm | 67 | |
| 5 mm | 64 | |
| 3.35 mm | 61 | |
| 2 mm | 57 | |
| 1.18 mm | 54 | |
| 0.6 mm | 50 | |
| 0.425 mm | 48 | |
| 0.3 mm | 44 | |
| 0.15 mm | 35 | |
| 0.063 mm | 28 | |
| 0.020 mm | 25 | |
| 0.006 mm | 15 | |
| 0.003 mm | 11 | |
| 0.002 mm | 9 | |
| 0.001 mm | 6 | |



Tested in accordance with BS 1377: Part 2 : 1990 Clause 9.2 and 9.5

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.
 Sedimentation by Hydrometer - Not UKAS


 Approved Signature

JAMES FISHER TESTING SERVICES (IRELAND) LTD.
 James Ward, Operations Manager





LABORATORY TEST REPORT

BRE Test Suite B - Greenfield Site

| | | | |
|--------------------|---|-----------------------|------------|
| Project: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co. Cork | Lab Ref. No.: | ST 93367 |
| Order No.: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Reported: | 06/04/2020 |
| | | Material: | Soil |
| | | Date Tested: | 31/03/2020 |
| | | Specification: | Client |

Sample Details

XC211-TP03 Type D Sample 7

| | | | |
|-------------------------|-------------|--------------------------|--------------|
| Supplier: | Client Info | Date of Sampling: | Client Info. |
| Source: | Client Info | Sampled By: | Client |
| Sample Location: | 1.3-1.8m | Sampling Reason: | Request |

| Parameter | RESULT |
|--|--------|
| pH | 7.8 |
| Sulphate Aqueous Extract as (SO4) (mg/l) | 11 |
| Sulphur as S, Total (%) | 0.01 |
| Sulphate as SO4, Total (%) | 0.02 |

Comments:

None

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Tested in accordance with the above specifications

Subcontracted to a laboratory UKAS accredited for this testing

Approved Signature
JAMES FISHER TESTING SERVICES (IRELAND) LTD.

James Ward, Operations Manager





LABORATORY TEST REPORT

MOISTURE CONTENT BS 1377 : Part 2 : 1990 Oven Drying Method cl 3.2

| | | | |
|--------------------|---|-----------------------|------------|
| Site: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93465 |
| Order No: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Tested: | 13/03/2020 |
| | | Date Reported: | 25/03/2020 |
| | | Specification: | Client |

Sampled Ref: XC211-TP03 Type D Sample 7

Sample Type: Bulk **Location:** XC211-TP03 Type D Sample 7

Date Sampled: Client Info **Sample by:** Client

Depth: 1.3-1.8m **Material Type:** Soil

Moisture Content (%): 18

Tested in accordance with BS 1377: Part 2: 1990
Sample preparation by cone and quarter

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

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James Fisher Testing Services (Ireland) Ltd
James Ward, Operations Manager

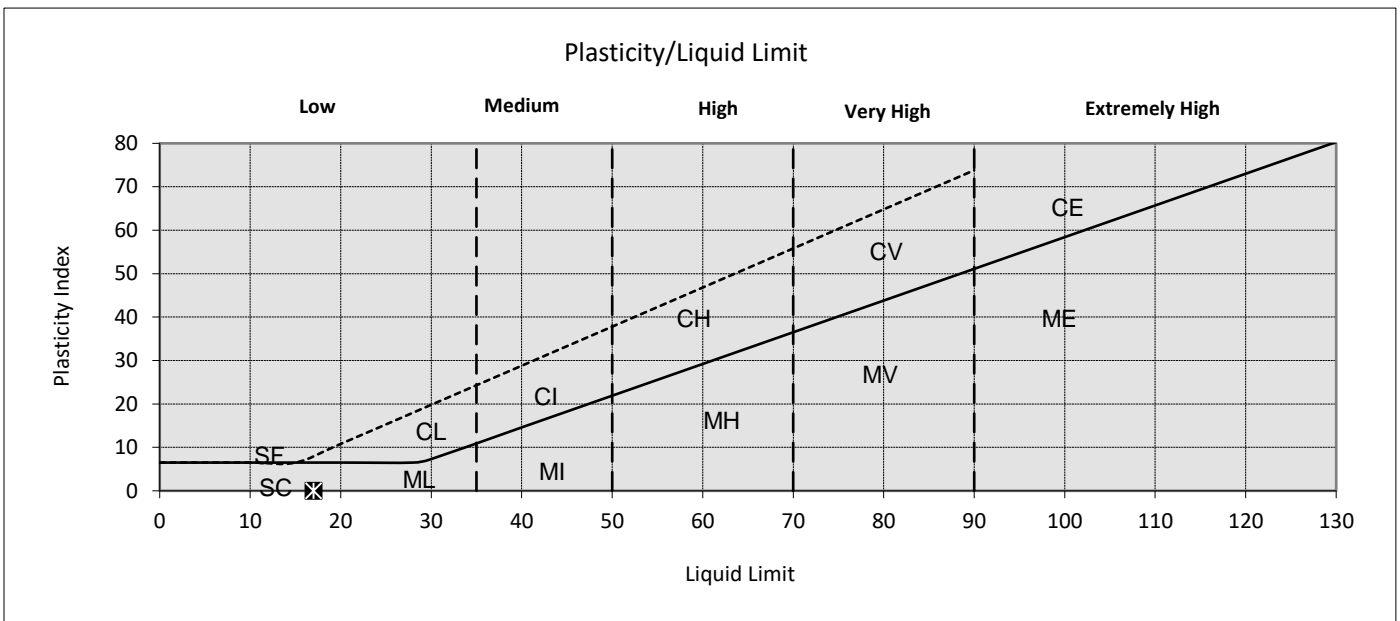




LABORATORY TEST REPORT
LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 CI 4.4,5.3

| | | | |
|--------------------|--|-----------------------|-------------------------------------|
| Site Ref.: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: | ST 93366 |
| Order No: | 2003-104 | Sample Ref.: | XC211-TP03 1.3-1.8m Type D Sample 7 |
| Originator: | Ian Holley | Date Sampled: | Client Info |
| | | Date Received: | 09/03/2020 |
| | | Date Tested: | 18/03/2020 |
| | | Date Reported: | 31/03/2020 |

| | |
|--------------------------------|-------------|
| Sampling Certificate | No |
| Sampled By | Client |
| Sample Type | Bulk |
| Sample Preparation Method | Washed |
| MATERIAL | Soil |
| Retained 425 micron (%) | 56 |
| Natural Moisture Content (%) | 12 |
| Liquid Limit (single point)(%) | 17 |
| Plastic Limit (%) | Non-Plastic |
| Plasticity Index | N/A |



The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature
 James Fisher Testing Services Ltd
 Phil Thorp, Laboratory Manager





LABORATORY TEST REPORT

MOISTURE CONTENT BS 1377 : Part 2 : 1990 Oven Drying Method cl 3.2

| | | | |
|--------------------|---|-----------------------|------------|
| Site: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93368 |
| Order No: | 2003-104 | Date Received: | 09/03/2020 |
| Originator: | Ian Holley | Date Tested: | 26/03/2020 |
| | | Date Reported: | 03/04/2020 |
| | | Specification: | Client |

Sampled Ref: XC211-TP03 Type D Sample 9

Sample Type: Bulk **Location:** XC211-TP03 Type D Sample 9

Date Sampled: Client Info **Sample by:** Client

Depth: 2.5-3.0m **Material Type:** Soil

Moisture Content (%): 11

Tested in accordance with BS 1377: Part 2: 1990
Sample preparation by cone and quarter

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature

James Fisher Testing Services (Ireland) Ltd
James Ward, Operations Manager

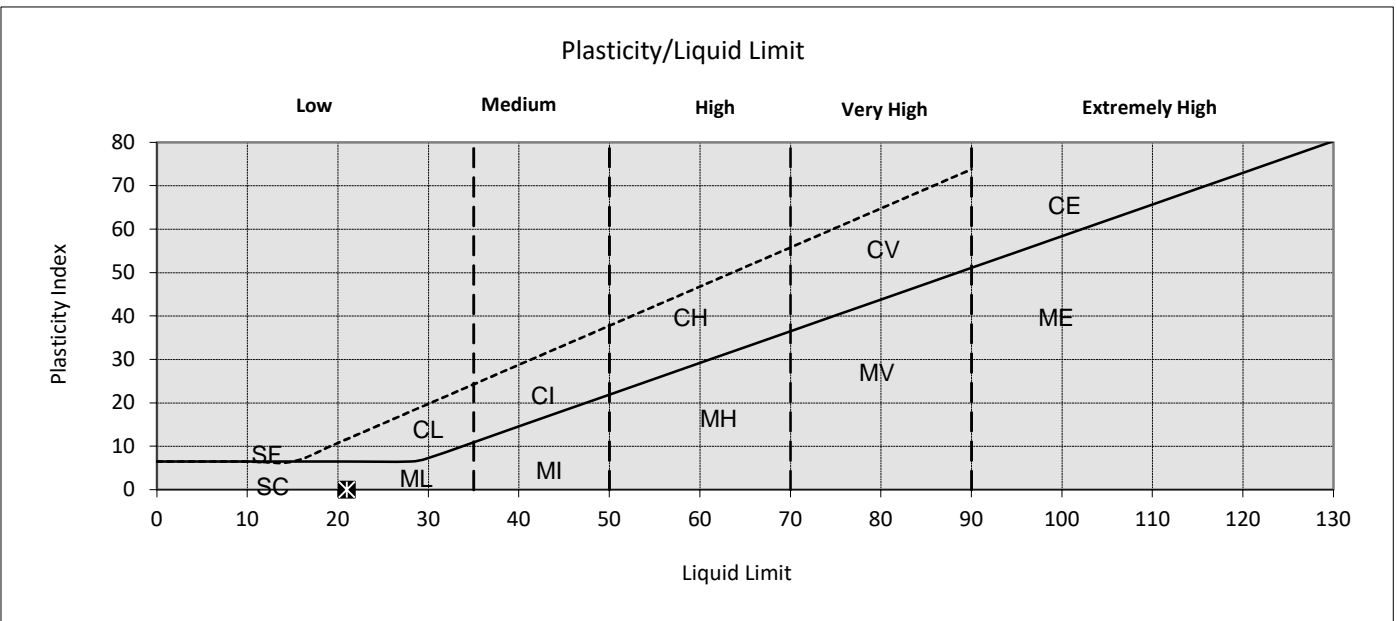




LABORATORY TEST REPORT
LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 CI 4.4,5.3

| | | | |
|--------------------|--|-----------------------|--------------------------------|
| Site Ref.: | Cork Line Level Crossings | Job No.: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton Co Cork | Lab Ref No.: | ST 93369 |
| Order No: | 2003-104 | Sample Ref.: | XC211-TP03 2.5-3.0m Type D S.9 |
| Originator: | Ian Holley | Date Sampled: | Client Info |
| | | Date Received: | 09/03/2020 |
| | | Date Tested: | 28/03/2020 |
| | | Date Reported: | 21/04/2020 |

| | |
|--------------------------------|-------------|
| Sampling Certificate | No |
| Sampled By | Client |
| Sample Type | Bulk |
| Sample Preparation Method | Washed |
| MATERIAL | Soil |
| Retained 425 micron (%) | 25 |
| Natural Moisture Content (%) | 10 |
| Liquid Limit (single point)(%) | 21 |
| Plastic Limit (%) | Non-Plastic |
| Plasticity Index | N/A |



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Approved Signature
 James Fisher Testing Services Ltd
 Phil Thorp, Laboratory Manager



LABORATORY TEST REPORT

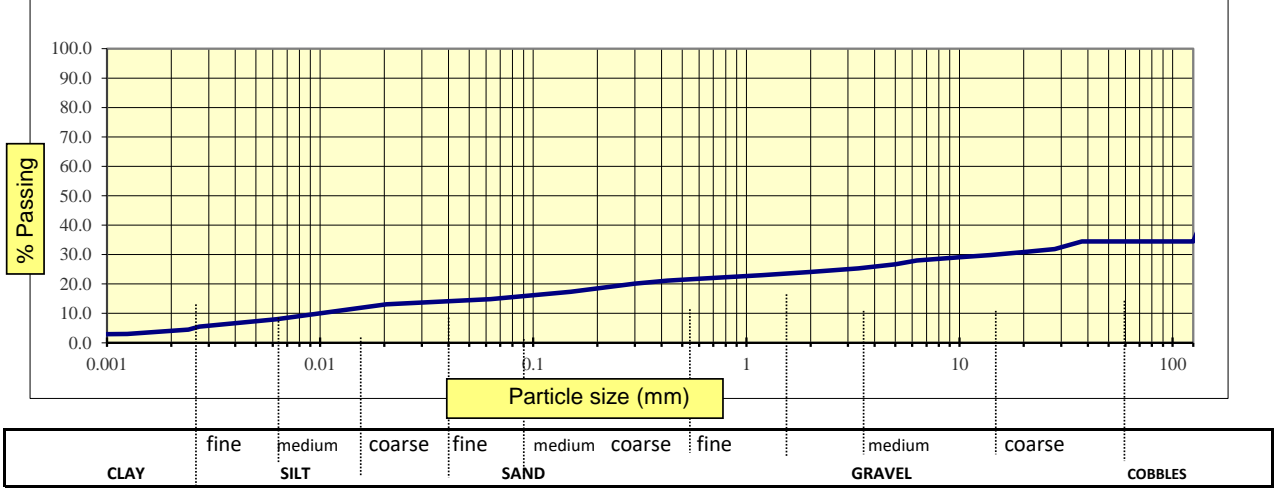
Determination of Particle Size Distribution - BS 1377 : Part 2 : 1990

Determination of Particle Size Distribution (Hydrometer Sedimentation) - BS 1377 : Part 2 : 1990 Cl. 9.5

| | | | |
|--------------------|---|---------------------------|---------------------------------|
| Project: | Cork Line Level Crossings | Job No: | 19-135 |
| Client: | OCB Geotechnical Unit 1 Carrigogna Midleton | Lab Ref No.: | ST 93370 |
| | | Date Received: | 09/03/2020 |
| | | Date Reported: | 02/04/2020 |
| | | Date Tested: | 31/03/2020 |
| Order No: | 2003-104 | Material: | Soil |
| Originator: | Ian Holley | Visual Description | Large Cobble, Light Clay, Sandy |

| | |
|----------------------------|--------------------------------|
| Client Ref. | XC211-TP03 Type B Sample 11 |
| Location: | XC211-TP03 Type B Sample 11 |
| Supplier: | Bulk |
| Source: | Client Info. |
| Depth (m): | 3.7-4.2m |
| Sampling Reason: | Client Request |
| Sampled By: | Client |
| Specification: | Client |
| Preparation Method: | Without Organics Preparation |
| Notes: | Disturbed sample from cleanout |

| BS Sieve Size | % Passing | Specification |
|---------------|-----------|---------------|
| 300 mm | 100 | |
| 125 mm | 34 | |
| 100 mm | 34 | |
| 75 mm | 34 | |
| 63 mm | 34 | |
| 50 mm | 34 | |
| 37.5 mm | 34 | |
| 28 mm | 32 | |
| 20 mm | 31 | |
| 14 mm | 30 | |
| 10 mm | 29 | |
| 6.3 mm | 28 | |
| 5 mm | 27 | |
| 3.35 mm | 25 | |
| 2 mm | 24 | |
| 1.18 mm | 23 | |
| 0.6 mm | 22 | |
| 0.425 mm | 21 | |
| 0.3 mm | 20 | |
| 0.15 mm | 17 | |
| 0.063 mm | 15 | |
| 0.020 mm | 13 | |
| 0.006 mm | 8 | |
| 0.003 mm | 6 | |
| 0.002 mm | 5 | |
| 0.001 mm | 3 | |



Tested in accordance with BS 1377: Part 2 : 1990 Clause 9.2 and 9.5

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.
 Sedimentation by Hydrometer - Not UKAS


 Approved Signature

JAMES FISHER TESTING SERVICES (IRELAND) LTD.
 James Ward, Operations Manager



INDEX PROPERTIES - SUMMARY OF RESULTS

| Hole No. | Sample | | | Soil Description | ρ | ρ_d | W | < 425 μm sieve | W_L | W_P | I_P | ρ_s | Remarks | |
|------------|--------|-----------|-------|------------------|--|----------|-----|---------------------------|-------|-------|-------------------|----------|---------|------|
| | No. | Depth (m) | | | | | | | | | | | | type |
| | | from | to | | | | | | | | | | | |
| | | | | | Mg/m ³ | % | % | % | % | | Mg/m ³ | | | |
| XC211-CP01 | 6 | 0.70 | 1.90 | D | Brown slightly gravelly sandy CLAY | | 9.6 | 49 s | 19 b | 14 | 5 | | | |
| XC211-CP01 | 9 | 1.90 | 2.50 | D | Brown slightly sandy slightly gravelly CLAY | | 4.1 | 58 s | 27 b | 15 | 12 | | | |
| XC211-CP01 | 14 | 3.50 | 4.50 | D | Brown sandy slightly gravelly silty CLAY | | 9.7 | 61 s | 20 a | 13 | 7 | | | |
| XC211-CP01 | 18 | 5.50 | 6.50 | D | Brown slightly sandy gravelly CLAY. | | 2.1 | 41 s | 23 b | 13 | 10 | | | |
| XC211-CP01 | 22 | 7.20 | 8.00 | D | Brown slightly sandy slightly gravelly CLAY | | 12 | 57 s | 27 b | 15 | 12 | | | |
| XC211-CP01 | 27 | 9.00 | 10.00 | D | Brown slightly sandy slightly gravelly CLAY | | 14 | 62 s | 30 a | 15 | 15 | | | |
| XC211-CP02 | 6 | 1.20 | 2.00 | D | Brown slightly sandy slightly gravelly CLAY. | | 12 | 60 s | 26 b | 14 | 12 | | | |
| XC211-CP02 | 12 | 3.00 | 4.00 | D | Brown slightly sandy slightly gravelly CLAY | | 9.8 | 62 s | 31 b | 17 | 14 | | | |
| XC211-CP02 | 16 | 5.00 | 6.00 | D | Brown slightly sandy slightly gravelly CLAY | | 9.8 | 62 s | 29 b | 16 | 13 | | | |
| XC211-CP02 | 21 | 7.00 | 8.00 | D | Brown slightly sandy slightly gravelly CLAY. | | 12 | 74 s | 30 a | 16 | 14 | | | |
| XC211-CP02 | 25 | 9.00 | 10.00 | D | Brown sandy slightly gravelly CLAY | | 15 | 61 s | 26 a | 14 | 12 | | | |
| XC211-CP02 | 29 | 11.00 | 12.00 | D | Brown slightly sandy slightly gravelly CLAY | | 36 | 58 s | 30 a | 16 | 14 | | | |

General notes:

All above tests carried out to BS1377 : 1990 unless annotated otherwise. See Remarks for further details

Key : ρ bulk density, linear

W_L Liquid limit

W_P Plastic limit

<425 μm preparation

ρ_s particle density

ρ_d dry density

a 4 point cone test

NP non - plastic

n from natural soil

-g = gas jar

w moisture content

b 1 point cone test

IP Plasticity Index

s sieved specimen

-p = small pycnometer

* test carried out to BS EN ISO 17892

h removed by hand

QA Ref
SLR 1
Rev 2.95
Mar 17



Project No N9426-20
Project Name Cork Line Level Crossings

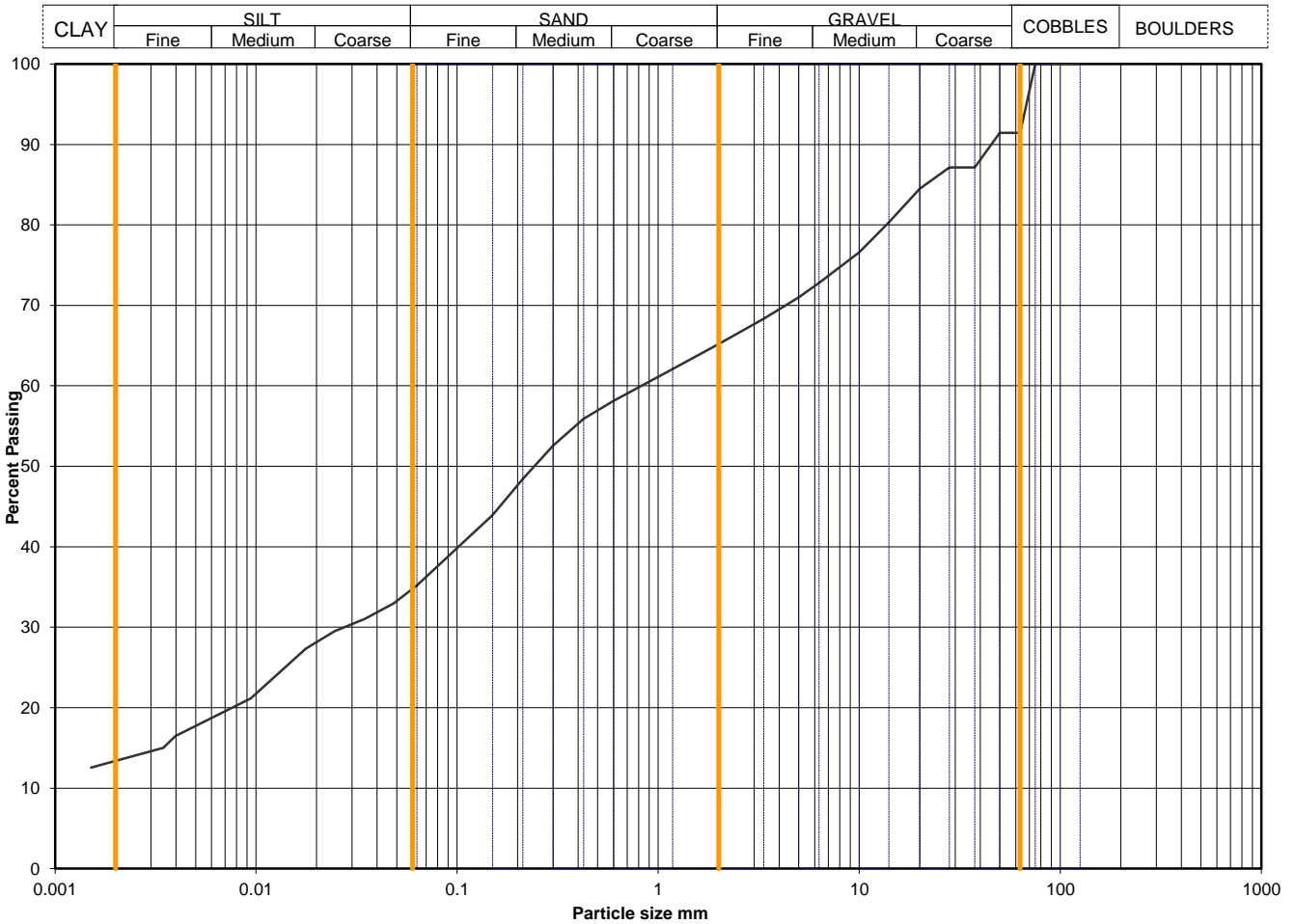
Figure
INDX

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Particle Size Distribution Analysis

| | | | |
|------------------------|----------------|----------------------|-------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP01 |
| | SOCO2020100629 | Sample Depth (m BGL) | 1.90 - 2.50 |
| | | Sample Type and No | B8 |
| | | Specimen Ref | |



| Sieving | | Sedimentation | |
|------------------|-----------|-------------------------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 35 |
| 90 | 100 | 0.0484 | 33 |
| 75 | 100 | 0.0346 | 31 |
| 63 | 91 | 0.0246 | 30 |
| 50 | 91 | 0.0176 | 27 |
| 37.5 | 87 | 0.0094 | 21 |
| 28 | 87 | 0.0040 | 16 |
| 20 | 84 | 0.0034 | 15 |
| 14 | 80 | 0.0015 | 13 |
| 10 | 77 | | |
| 6.3 | 73 | | |
| 5.0 | 71 | | |
| 3.35 | 68 | | |
| 2.00 | 65 | | |
| 1.18 | 62 | | |
| 0.600 | 58 | Particle density, Mg/m ³ | |
| 0.425 | 56 | 2.65 | assumed |
| 0.300 | 53 | Dry mass of sample, kg | |
| 0.212 | 48 | 4.5 | |
| 0.150 | 44 | | |
| 0.063 | 35 | | |

| | |
|----------------------------|--|
| Soil description | Brown slightly sandy slightly gravelly CLAY with one cobble. |
| Preparation / Pretreatment | Sieve: pre dried, Hydro: as BS1377 |
| Remarks | |

| Sample Proportions | Cobbles / boulders | Whole | *<60mm |
|--------------------|--------------------|--------|--------|
| | | Gravel | 8.6 |
| | Sand | 26.2 | 28.7 |
| | Silt | 30.0 | 32.8 |
| | Clay | 21.8 | 23.9 |
| | | 13.4 | 14.7 |

*<60mm values to aid description only

| | | |
|-------------------------------|------------------|----------------|
| Uniformity Coefficient | D60 / D10 | Not applicable |
|-------------------------------|------------------|----------------|

| | | |
|--------------------|-------------------------|----------------|
| Test Method | BS 1377 : Part 2 : 1990 | |
| | Sieving | 9.2 wet sieve |
| | Sedimentation | 9.5 hydrometer |

QA Ref
SLR 2,9
Rev 2.22
Jul 17



0001



Project No N9426-20
Project Name Cork Line Level Crossings

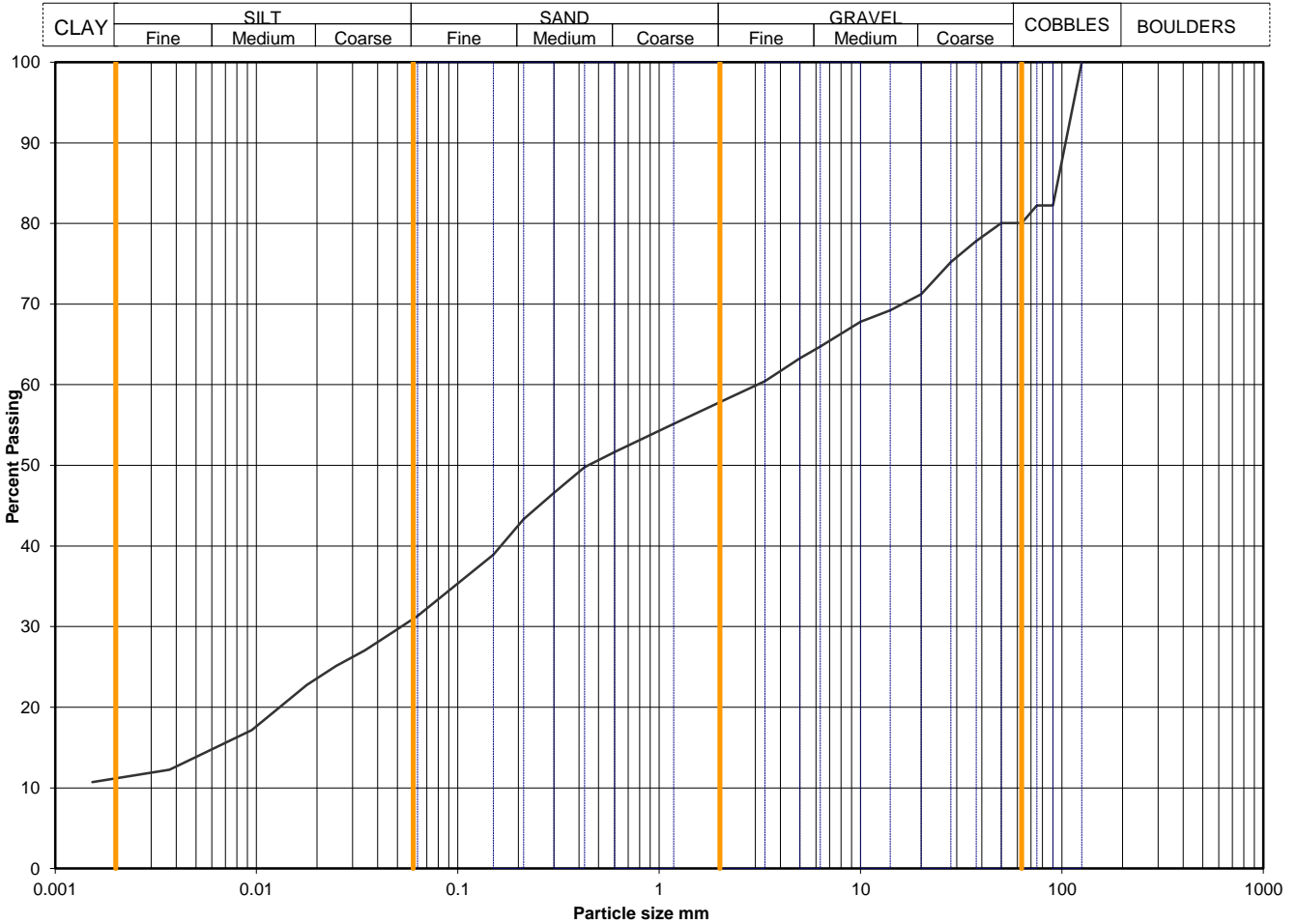
Figure
PSD

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Particle Size Distribution Analysis

| | | | |
|------------------------|----------------|----------------------|-------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP01 |
| | SOCO2020100635 | Sample Depth (m BGL) | 4.50 - 5.50 |
| | | Sample Type and No | B15 |
| | | Specimen Ref | |



| Sieving | | Sedimentation | |
|------------------|-----------|-------------------------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 31 |
| 90 | 82 | 0.0482 | 29 |
| 75 | 82 | 0.0346 | 27 |
| 63 | 80 | 0.0247 | 25 |
| 50 | 80 | 0.0177 | 23 |
| 37.5 | 78 | 0.0095 | 17 |
| 28 | 75 | 0.0044 | 13 |
| 20 | 71 | 0.0037 | 12 |
| 14 | 69 | 0.0015 | 11 |
| 10 | 68 | | |
| 6.3 | 65 | | |
| 5.0 | 63 | | |
| 3.35 | 60 | | |
| 2.00 | 58 | | |
| 1.18 | 55 | | |
| 0.600 | 52 | Particle density, Mg/m ³ | |
| 0.425 | 50 | 2.65 | assumed |
| 0.300 | 47 | Dry mass of sample, kg | |
| 0.212 | 43 | 20.0 | |
| 0.150 | 39 | | |
| 0.063 | 31 | | |

| | |
|----------------------------|---|
| Soil description | Brown slightly sandy slightly gravelly CLAY with two cobbles. |
| Preparation / Pretreatment | Sieve: pre dried, Hydro: as BS1377 |
| Remarks | |

| Sample Proportions | Cobbles / boulders Gravel Sand Silt Clay | Whole | *<60mm |
|--------------------|--|-------|--------|
| | | 20.0 | 0.0 |
| | 22.2 | 27.8 | |
| | 26.5 | 33.1 | |
| | 20.1 | 25.1 | |
| | 11.2 | 14.0 | |

*<60mm values to aid description only

| | | |
|-------------------------------|------------------|----------------|
| Uniformity Coefficient | D60 / D10 | Not applicable |
|-------------------------------|------------------|----------------|

| | | |
|--------------------|-------------------------|----------------|
| Test Method | BS 1377 : Part 2 : 1990 | |
| | Sieving | 9.2 wet sieve |
| | Sedimentation | 9.5 hydrometer |

QA Ref
SLR 2,9
Rev 2.22
Jul 17



Project No N9426-20
Project Name Cork Line Level Crossings

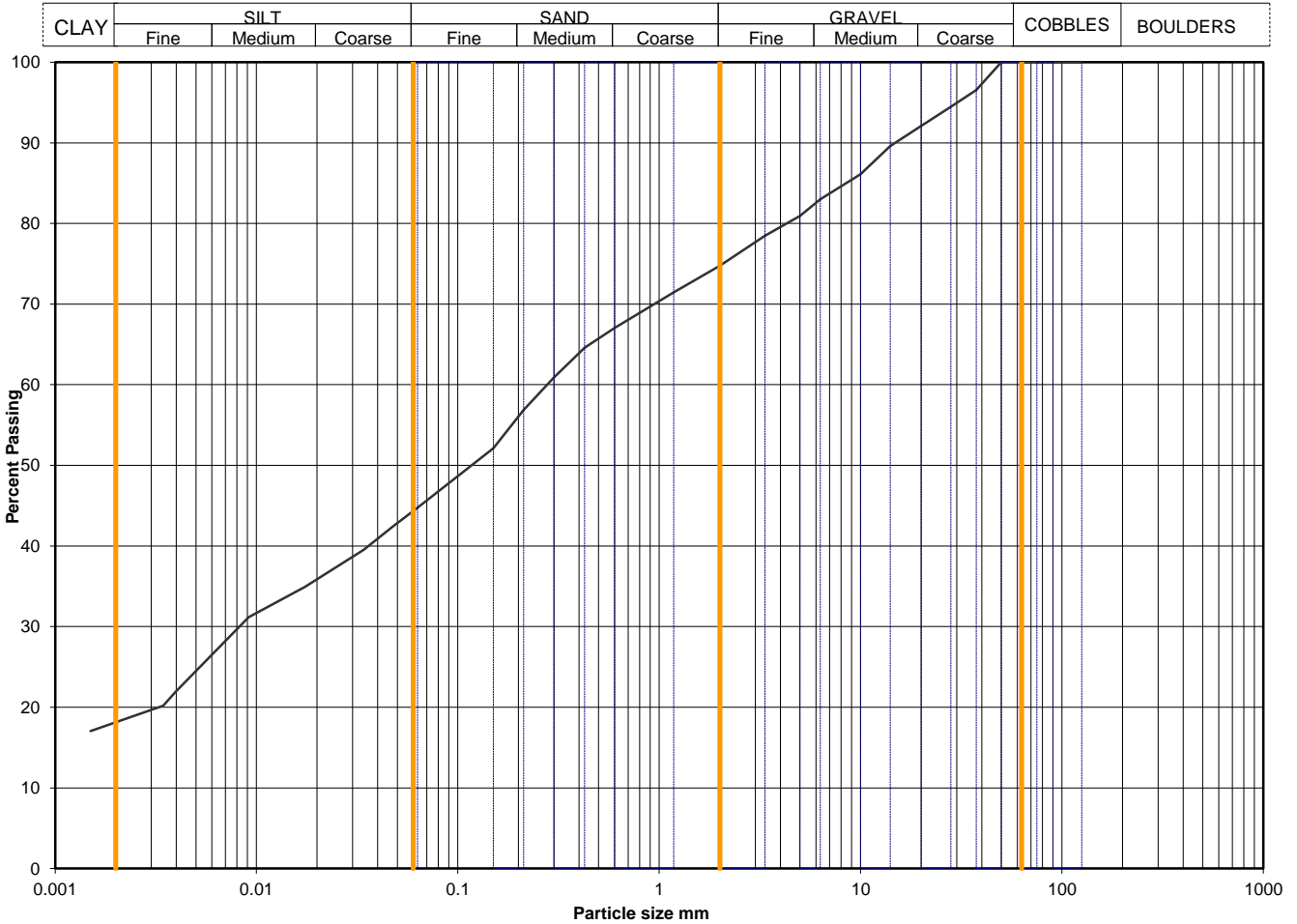
Figure
PSD

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Particle Size Distribution Analysis

| | | | |
|------------------------|----------------|----------------------|--------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP01 |
| | SOCO2020100646 | Sample Depth (m BGL) | 9.00 - 10.00 |
| | | Sample Type and No | B26 |
| | | Specimen Ref | |



| Sieving | | Sedimentation | |
|------------------|-----------|-------------------------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 45 |
| 90 | 100 | 0.0475 | 42 |
| 75 | 100 | 0.0341 | 40 |
| 63 | 100 | 0.0243 | 37 |
| 50 | 100 | 0.0174 | 35 |
| 37.5 | 97 | 0.0091 | 31 |
| 28 | 94 | 0.0040 | 22 |
| 20 | 92 | 0.0034 | 20 |
| 14 | 90 | 0.0015 | 17 |
| 10 | 86 | | |
| 6.3 | 83 | | |
| 5.0 | 81 | | |
| 3.35 | 78 | | |
| 2.00 | 75 | | |
| 1.18 | 71 | | |
| 0.600 | 67 | | |
| 0.425 | 65 | | |
| 0.300 | 61 | | |
| 0.212 | 57 | | |
| 0.150 | 52 | | |
| 0.063 | 45 | | |
| | | Particle density, Mg/m ³ | |
| | | 2.65 | assumed |
| | | Dry mass of sample, kg | |
| | | 2.8 | |

| | |
|----------------------------|--|
| Soil description | Brown slightly sandy slightly gravelly CLAY. |
| Preparation / Pretreatment | Sieve: pre dried, Hydro: as BS1377 |
| Remarks | |

| Sample Proportions | Cobbles / boulders | Whole | * <60mm |
|--------------------|--------------------|--------|---------|
| | | Gravel | 0.0 |
| | Sand | 25.3 | 25.3 |
| | Silt | 30.0 | 30.0 |
| | Clay | 26.6 | 26.6 |
| | | 18.1 | 18.1 |

* <60mm values to aid description only

| | | |
|-------------------------------|------------------|----------------|
| Uniformity Coefficient | D60 / D10 | Not applicable |
|-------------------------------|------------------|----------------|

| | | |
|--------------------|-------------------------|----------------|
| Test Method | BS 1377 : Part 2 : 1990 | |
| | Sieving | 9.2 wet sieve |
| | Sedimentation | 9.5 hydrometer |

QA Ref
SLR 2,9
Rev 2.22
Jul 17



Project No N9426-20
Project Name Cork Line Level Crossings

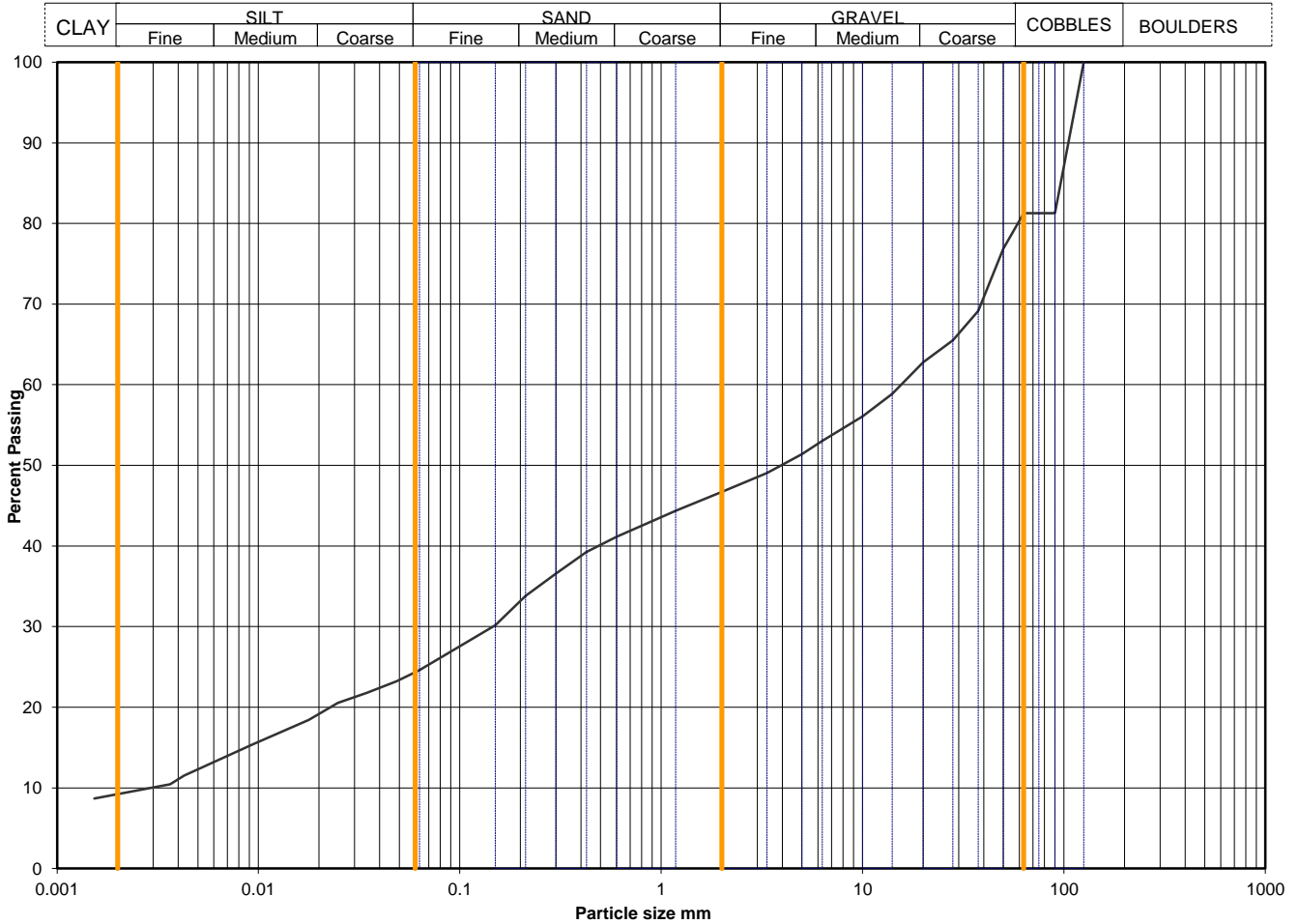
Figure
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Particle Size Distribution Analysis

| | | | |
|------------------------|----------------|----------------------|-------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP02 |
| | SOCO2020100650 | Sample Depth (m BGL) | 1.20 - 2.00 |
| | | Sample Type and No | B5 |
| | | Specimen Ref | |



| Sieving | | Sedimentation | |
|------------------|-----------|-------------------------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 25 |
| 90 | 81 | 0.0486 | 23 |
| 75 | 81 | 0.0347 | 22 |
| 63 | 81 | 0.0248 | 21 |
| 50 | 77 | 0.0178 | 18 |
| 37.5 | 69 | 0.0094 | 15 |
| 28 | 66 | 0.0043 | 12 |
| 20 | 63 | 0.0036 | 10 |
| 14 | 59 | 0.0015 | 9 |
| 10 | 56 | | |
| 6.3 | 53 | | |
| 5.0 | 51 | | |
| 3.35 | 49 | | |
| 2.00 | 47 | | |
| 1.18 | 44 | | |
| 0.600 | 41 | | |
| 0.425 | 39 | | |
| 0.300 | 37 | | |
| 0.212 | 34 | | |
| 0.150 | 30 | | |
| 0.063 | 25 | | |
| | | Particle density, Mg/m ³ | |
| | | 2.65 | assumed |
| | | Dry mass of sample, kg | |
| | | 8.4 | |

| | |
|----------------------------|---|
| Soil description | Brown slightly sandy gravelly CLAY with one cobble. |
| Preparation / Pretreatment | Sieve: pre dried, Hydro: as BS1377 |
| Remarks | |

| Sample Proportions | Cobbles / boulders | Whole | *<60mm |
|--------------------|--------------------|--------|--------|
| | | Gravel | 18.7 |
| | Sand | 34.6 | 42.6 |
| | Silt | 22.1 | 27.2 |
| | Clay | 15.4 | 18.9 |
| | | 9.2 | 11.3 |

*<60mm values to aid description only

| | | |
|-------------------------------|------------------|------|
| Uniformity Coefficient | D60 / D10 | 4858 |
|-------------------------------|------------------|------|

| | | |
|--------------------|-------------------------|----------------|
| Test Method | BS 1377 : Part 2 : 1990 | |
| | Sieving | 9.2 wet sieve |
| | Sedimentation | 9.5 hydrometer |

QA Ref
SLR 2,9
Rev 2.22
Jul 17



Project No N9426-20
Project Name Cork Line Level Crossings

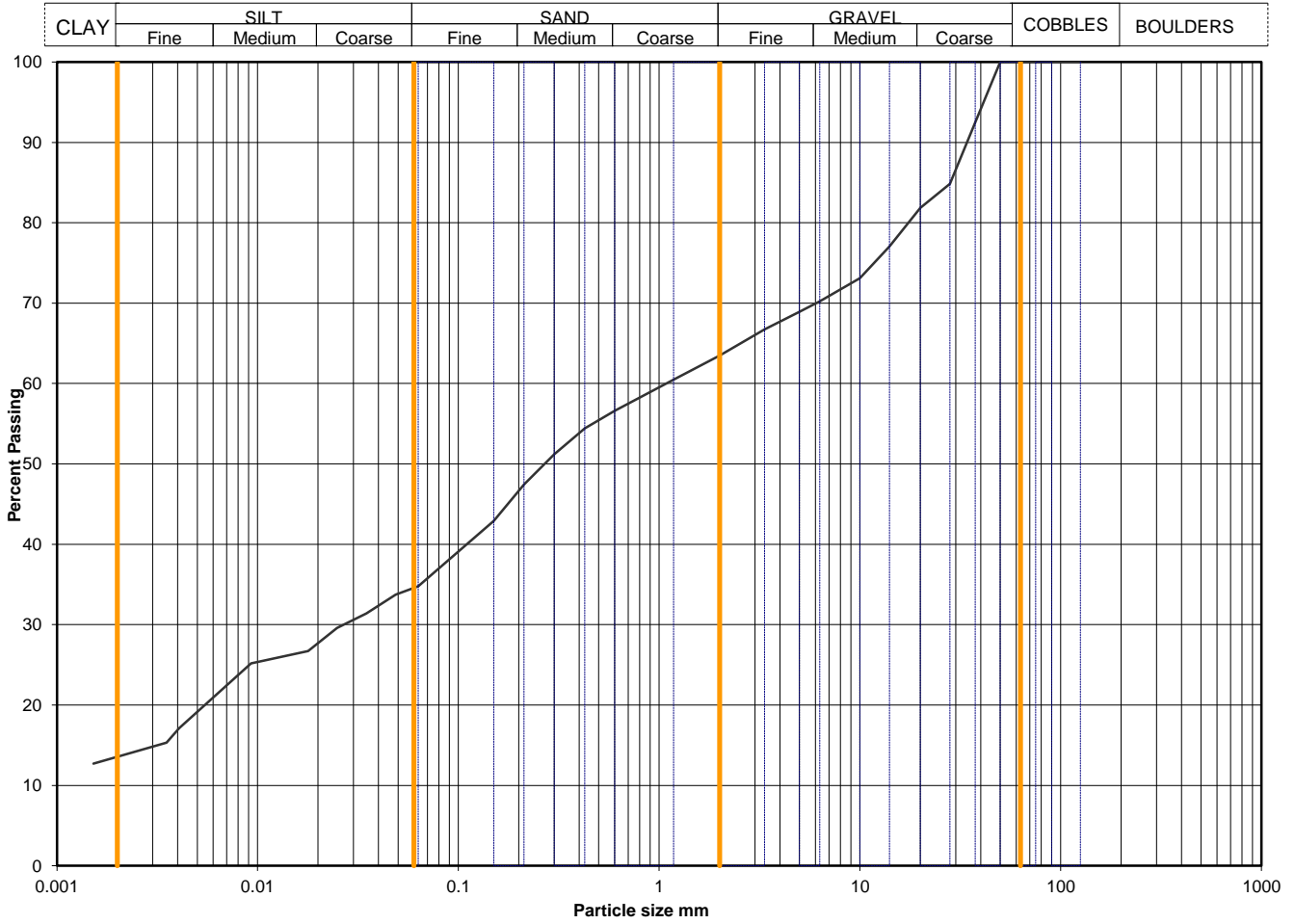
Figure
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Particle Size Distribution Analysis

| | | | |
|------------------------|----------------|----------------------|-------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP02 |
| | SOCO2020100652 | Sample Depth (m BGL) | 2.00 - 3.00 |
| | | Sample Type and No | B8 |
| | | Specimen Ref | |



| Sieving | | Sedimentation | |
|------------------|-----------|-------------------------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 35 |
| 90 | 100 | 0.0486 | 34 |
| 75 | 100 | 0.0348 | 31 |
| 63 | 100 | 0.0248 | 30 |
| 50 | 100 | 0.0178 | 27 |
| 37.5 | 92 | 0.0093 | 25 |
| 28 | 85 | 0.0041 | 17 |
| 20 | 82 | 0.0035 | 15 |
| 14 | 77 | 0.0015 | 13 |
| 10 | 73 | | |
| 6.3 | 70 | | |
| 5.0 | 69 | | |
| 3.35 | 67 | | |
| 2.00 | 63 | | |
| 1.18 | 60 | | |
| 0.600 | 57 | Particle density, Mg/m ³ | |
| 0.425 | 54 | 2.65 assumed | |
| 0.300 | 51 | Dry mass of sample, kg | |
| 0.212 | 47 | 2.3 | |
| 0.150 | 43 | | |
| 0.063 | 35 | | |

| | |
|----------------------------|-------------------------------------|
| Soil description | Brown slightly sandy gravelly CLAY. |
| Preparation / Pretreatment | Sieve: pre dried, Hydro: as BS1377 |
| Remarks | |

| Sample Proportions | Cobbles / boulders | Whole | *<60mm |
|--------------------|--------------------|--------|--------|
| | | Gravel | 0.0 |
| | Sand | 36.5 | 36.5 |
| | Silt | 28.7 | 28.7 |
| | Clay | 21.2 | 21.2 |
| | | 13.6 | 13.6 |

*<60mm values to aid description only

| | | |
|-------------------------------|------------------|----------------|
| Uniformity Coefficient | D60 / D10 | Not applicable |
|-------------------------------|------------------|----------------|

| | | |
|--------------------|-------------------------|----------------|
| Test Method | BS 1377 : Part 2 : 1990 | |
| | Sieving | 9.2 wet sieve |
| | Sedimentation | 9.5 hydrometer |

QA Ref
SLR 2,9
Rev 2.22
Jul 17



Project No N9426-20
Project Name Cork Line Level Crossings

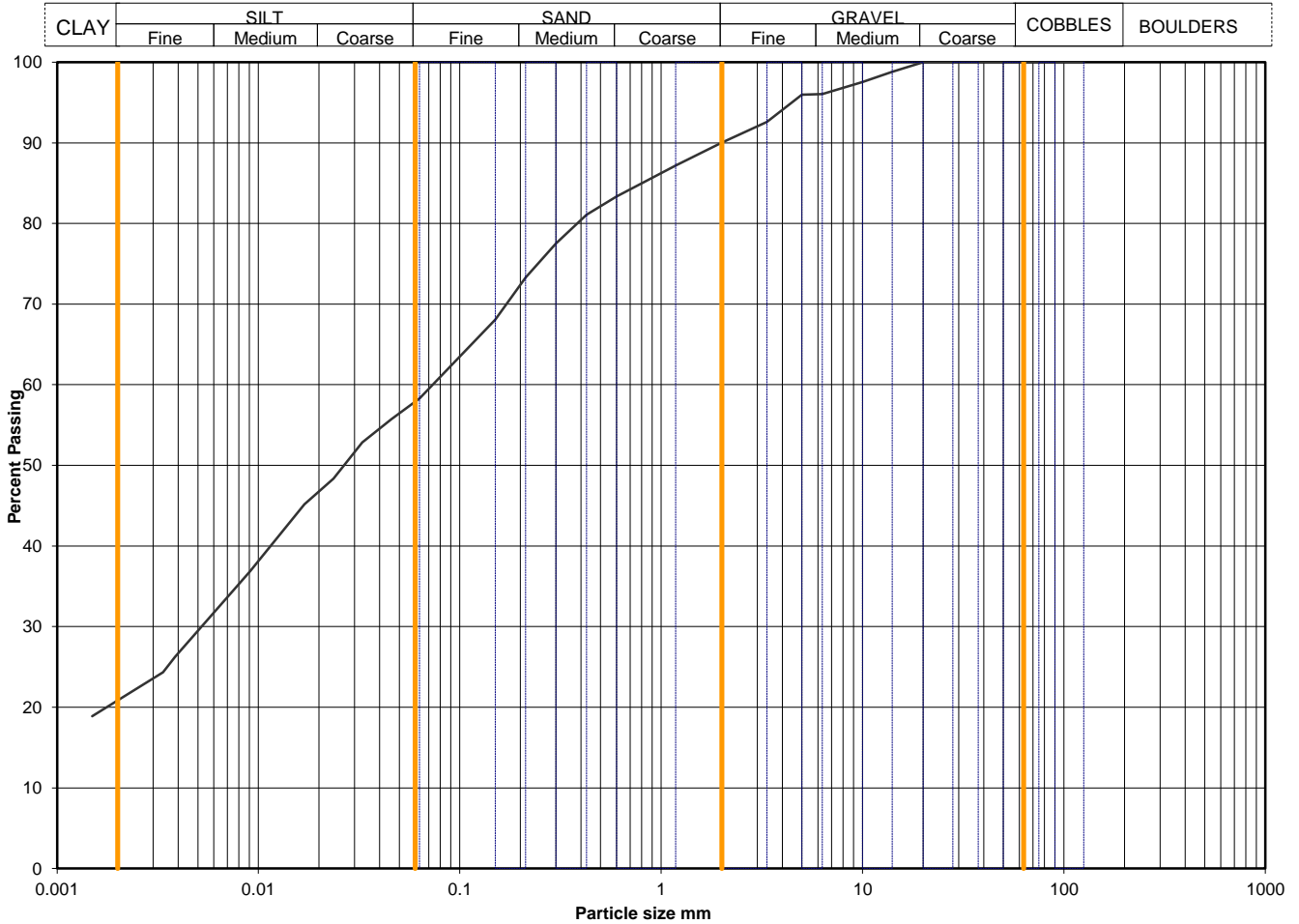
Figure
PSD

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Particle Size Distribution Analysis

| | | | |
|-----------------|----------------|----------------------|-------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP02 |
| | SOCO2020100661 | Sample Depth (m BGL) | 6.00 - 7.00 |
| | | Sample Type and No | D18 |
| | | Specimen Ref | |



| Sieving | | Sedimentation | |
|------------------|-----------|-------------------------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 58 |
| 90 | 100 | 0.0456 | 56 |
| 75 | 100 | 0.0327 | 53 |
| 63 | 100 | 0.0236 | 48 |
| 50 | 100 | 0.0169 | 45 |
| 37.5 | 100 | 0.0091 | 37 |
| 28 | 100 | 0.0039 | 26 |
| 20 | 100 | 0.0034 | 24 |
| 14 | 99 | 0.0015 | 19 |
| 10 | 98 | | |
| 6.3 | 96 | | |
| 5.0 | 96 | | |
| 3.35 | 93 | | |
| 2.00 | 90 | | |
| 1.18 | 87 | | |
| 0.600 | 83 | | |
| 0.425 | 81 | | |
| 0.300 | 78 | | |
| 0.212 | 73 | | |
| 0.150 | 68 | | |
| 0.063 | 58 | | |
| | | Particle density, Mg/m ³ | |
| | | 2.65 assumed | |
| | | Dry mass of sample, kg | |
| | | 1.0 | |

| | |
|----------------------------|--|
| Soil description | Brown slightly sandy slightly gravelly CLAY. |
| Preparation / Pretreatment | Sieve: pre dried, Hydro: as BS1377 |
| Remarks | |

| Sample Proportions | Cobbles / boulders Gravel Sand Silt Clay | Whole | *<60mm |
|--------------------|--|-------|--------|
| | | 0.0 | 0.0 |
| | 10.0 | 10.0 | |
| | 31.7 | 31.7 | |
| | 37.4 | 37.4 | |
| | 20.9 | 20.9 | |

*<60mm values to aid description only

| | | |
|-------------------------------|------------------|----------------|
| Uniformity Coefficient | D60 / D10 | Not applicable |
|-------------------------------|------------------|----------------|

| | | |
|--------------------|-------------------------|----------------|
| Test Method | BS 1377 : Part 2 : 1990 | |
| | Sieving | 9.2 wet sieve |
| | Sedimentation | 9.5 hydrometer |

QA Ref
SLR 2,9
Rev 2.22
Jul 17



0001



Project No N9426-20
Project Name Cork Line Level Crossings

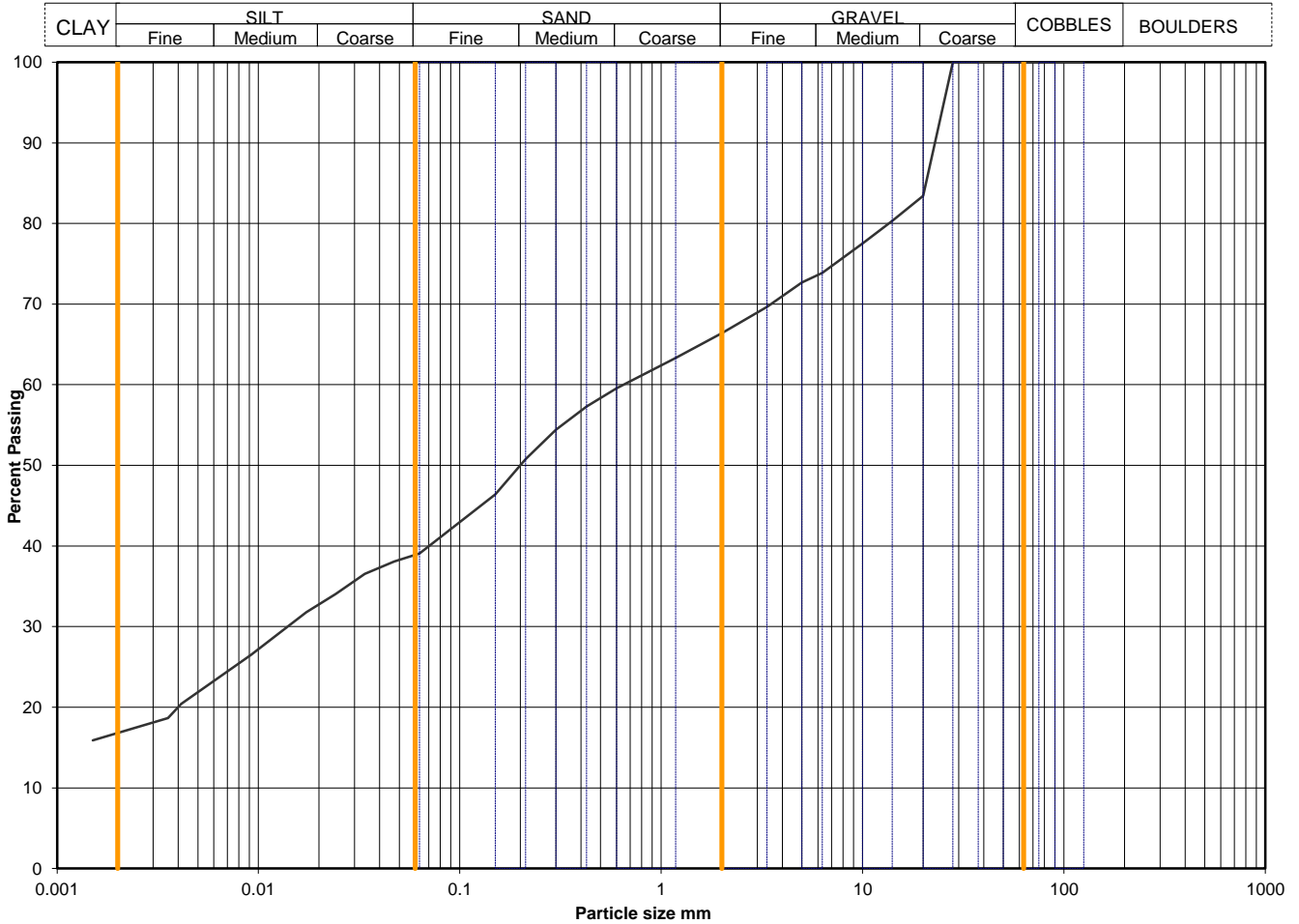
Figure
PSD

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Particle Size Distribution Analysis

| | | | |
|------------------------|----------------|----------------------|---------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP02 |
| | SOCO2020100669 | Sample Depth (m BGL) | 10.00 - 11.00 |
| | | Sample Type and No | B26 |
| | | Specimen Ref | |



| Sieving | | Sedimentation | |
|------------------|-----------|-------------------------------------|-----------|
| Particle Size mm | % Passing | Particle Size mm | % Passing |
| 125 | 100 | 0.0630 | 39 |
| 90 | 100 | 0.0472 | 38 |
| 75 | 100 | 0.0337 | 37 |
| 63 | 100 | 0.0242 | 34 |
| 50 | 100 | 0.0173 | 32 |
| 37.5 | 100 | 0.0092 | 26 |
| 28 | 100 | 0.0041 | 20 |
| 20 | 83 | 0.0036 | 19 |
| 14 | 80 | 0.0015 | 16 |
| 10 | 78 | | |
| 6.3 | 74 | | |
| 5.0 | 73 | | |
| 3.35 | 70 | | |
| 2.00 | 66 | | |
| 1.18 | 63 | | |
| 0.600 | 60 | Particle density, Mg/m ³ | |
| 0.425 | 57 | 2.65 | assumed |
| 0.300 | 54 | Dry mass of sample, kg | |
| 0.212 | 51 | 3.5 | |
| 0.150 | 46 | | |
| 0.063 | 39 | | |

| | |
|----------------------------|--|
| Soil description | Brown slightly sandy slightly gravelly CLAY. |
| Preparation / Pretreatment | Sieve: pre dried, Hydro: as BS1377 |
| Remarks | |

| Sample Proportions | Cobbles / boulders | Whole | *<60mm |
|--------------------|--------------------|--------|--------|
| | | Gravel | 0.0 |
| | Sand | 33.6 | 33.6 |
| | Silt | 27.3 | 27.3 |
| | Clay | 22.3 | 22.3 |
| | | 16.8 | 16.8 |

*<60mm values to aid description only

| | | |
|-------------------------------|------------------|----------------|
| Uniformity Coefficient | D60 / D10 | Not applicable |
|-------------------------------|------------------|----------------|

| | | |
|--------------------|-------------------------|----------------|
| Test Method | BS 1377 : Part 2 : 1990 | |
| | Sieving | 9.2 wet sieve |
| | Sedimentation | 9.5 hydrometer |

QA Ref
SLR 2,9
Rev 2.22
Jul 17



Project No N9426-20
Project Name Cork Line Level Crossings

Figure
PSD

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UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TESTS WITHOUT MEASUREMENT OF PORE PRESSURE - SUMMARY OF RESULTS

| Hole No. | Sample | | | Soil Description | Density | | w | Test type | Dia. | ø3 | At failure / end of stage | | | | | Membrane Thickness | Remarks | | |
|------------|--------|-----------|----|------------------|---|------|------|-----------|------|-------|---------------------------|--------------|---------------------------------|----------------|----------------|--------------------|---------|---------------------------------|------|
| | No. | Depth (m) | | | type | bulk | | | | | dry | Axial strain | σ ₁ - σ ₃ | σ ₃ | σ ₁ | | | σ ₁ - σ ₃ | MODE |
| | | from | to | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| XC211-CP02 | 19 | 7.50 | | U | Firm light brown slightly sandy slightly gravelly CLAY. | 2.27 | 2.02 | 12 | UUM | 103.7 | 75 | 3.0 | 34 | 17 | P | 0.3 | | | |
| | | | | | | | | | | | | | | | | | | | |
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General notes: Tests carried out in accordance with BS1377: Part 7: 1990, clause 8 for single stage, clause 9 for multistage tests. Specimens nominally 2:1 height diameter ratio and tested at a rate of strain of 2%/minute, unless annotated otherwise. Latex rubber membrane used and membrane correction applied in accordance with BS1377-7 8.5.1.4 unless stated. Tested from base depth and in a vertical orientation unless stated otherwise.

Legend UU - single stage test (may be in sets of specimens) σ₃ cell pressure Mode of failure P plastic UUM - multistage test on a single specimen σ₁ - σ₃ deviator stress B brittle suffix R - remoulded or recompacted CU undrained shear strength C compound

QA Ref
SLR 2
Rev 2.8
Apr 19



0001



SOCOTEC

Project No N9426-20
Project Name Cork Line Level Crossings

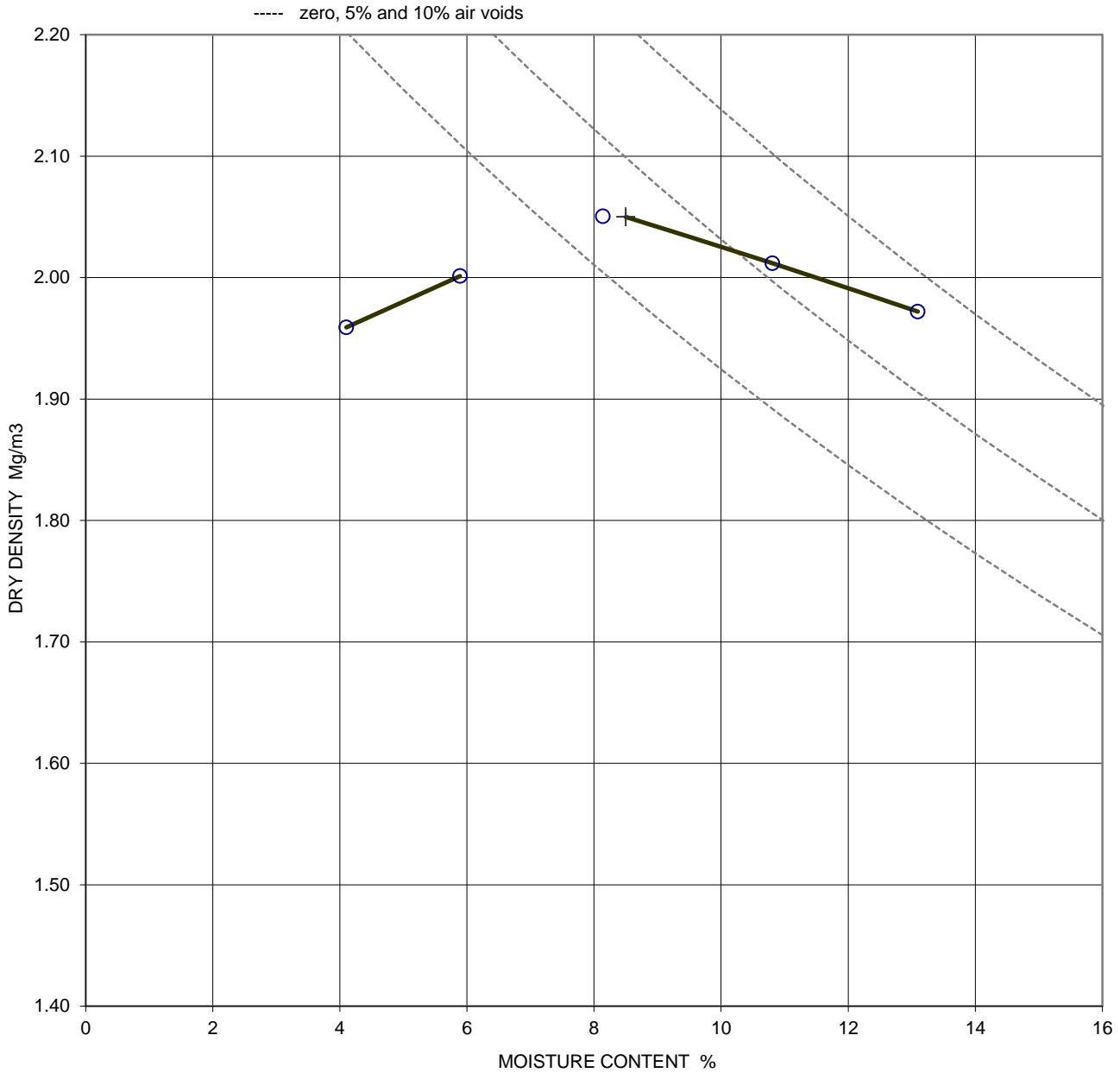
Figure
UUSUM

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Printed: 20/11/2020 10:02

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

| | | | |
|-----------------|----------------|----------------------|-------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP02 |
| | SOCO2020100654 | Sample Depth (m BGL) | 3.00 - 4.00 |
| | | Sample Type and No | B11 |
| | | Specimen Ref | |

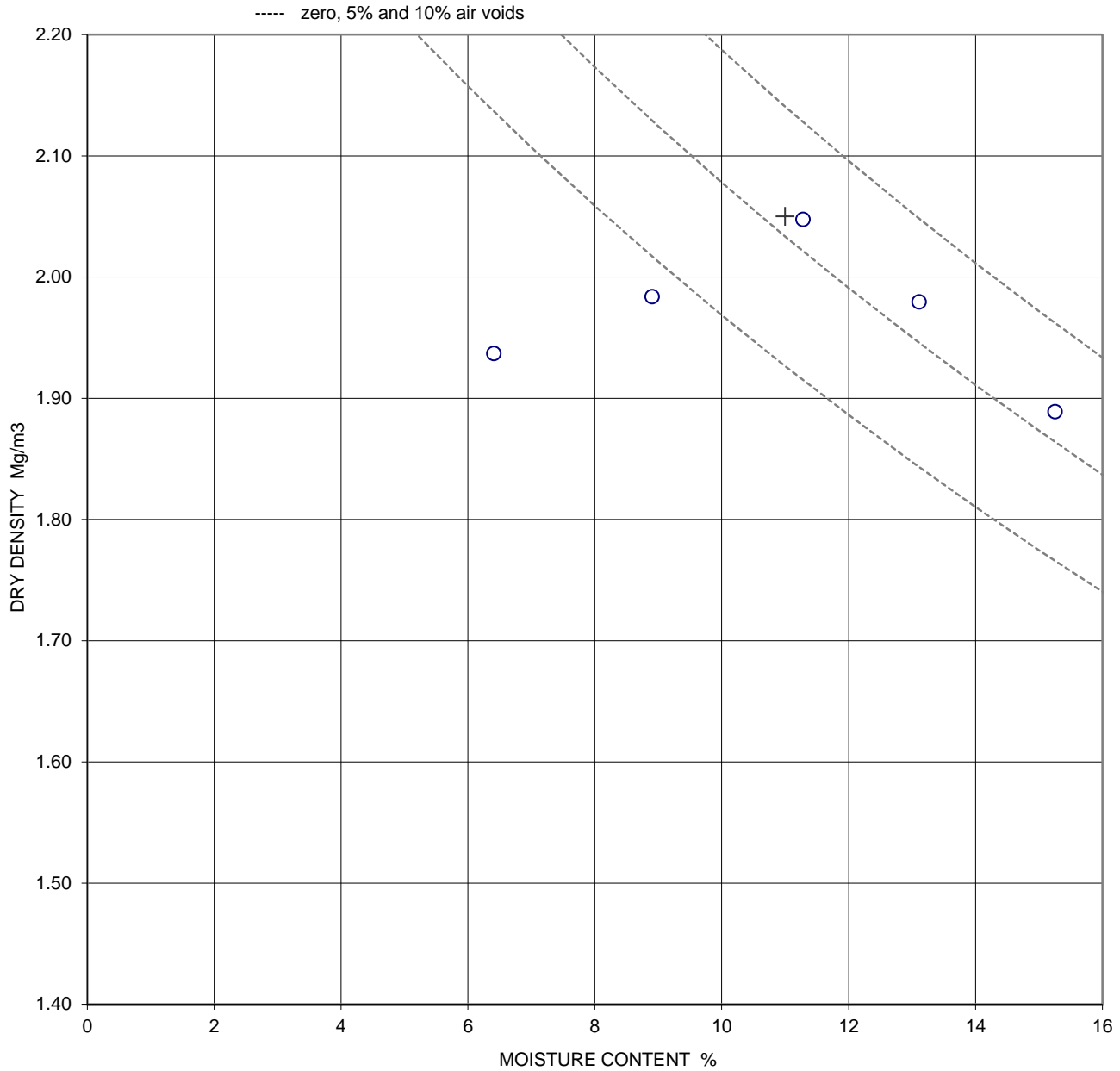


| | | |
|--------------------------|---|--|
| Soil description | Brown slightly sandy slightly gravelly CLAY. | Derived Parameters + |
| Test method | BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould | Maximum dry density, Mg/m ³ |
| Preparation | Original material was natural, single sample tested | 2.05 |
| Material > 37.5mm | 0 % | Optimum moisture content, % |
| Material < 37.5mm > 20mm | 3 % | 8.5 |
| Particle density | 2.72 assumed | |
| Remarks | | |



| | | | | | |
|---|---|---|--|---------------------------|-----------------------------------|
| QA Ref SLD 4, 3.5/6 Rev 2.8 Sep 17 |  0001 |  | Project No | N9426-20 | Figure COMPH |
| | | | Project Name | Cork Line Level Crossings | |
| | | | The results reported relate only to the samples tested; opinions and interpretations expressed herein are outside the scope of UKAS accreditation. © Copyright 2017 SOCOTEC UK Limited | | Printed: 20/11/2020 09:58 |

DRY DENSITY / MOISTURE CONTENT RELATIONSHIP
BS1377 : PART 4 : 1990 : HEAVY COMPACTION, 4.5 kg rammer

| | | | |
|------------------------|----------------|----------------------|-------------|
| Sample Details: | SAMPLE ID: | Hole No | XC211-CP02 |
| | SOCO2020100656 | Sample Depth (m BGL) | 4.00 - 5.00 |
| | | Sample Type and No | B13 |
| | | Specimen Ref | |



| | | |
|--------------------------|---|--|
| Soil description | Brown slightly sandy slightly gravelly CLAY. | Derived Parameters + |
| Test method | BS 1377:part 4:1990: clause 3.5, 4.5 kg rammer in a 1 litre mould | Maximum dry density, Mg/m ³ |
| Preparation | Original material was natural, single sample tested | 2.05 |
| Material > 37.5mm | 0 % | Optimum moisture content, % |
| Material < 37.5mm > 20mm | 4 % | 11 |
| Particle density | 2.80 assumed | |
| Remarks | | |

| | | | | | |
|--|---|---|--------------|---------------------------|---------------------------------|
| QA Ref SLD 4, 3.5/6 Rev 2.8 Sep 17 |  0001 |  | Project No | N9426-20 | Figure |
| | | | Project Name | Cork Line Level Crossings | |
| The results reported relate only to the samples tested; opinions and interpretations expressed herein are outside the scope of UKAS accreditation. © Copyright 2017 SOCOTEC UK Limited | | | | | Printed: 20/11/2020 09:58 |

Appendix H Environmental Laboratory Test Results



Final Report

Report No.: 20-07165-1

Initial Date of Issue: 12-Mar-2020

Client: Environmental Laboratory Services Ltd

Client Address: Acorn Business Campus
Mahon Industrial Park
Blackrock
Cork
Ireland

Contact(s): Emer Kearney
Results

Project: Soil Samples

Quotation No.: Q20-19728

Date Received: 05-Mar-2020

Order No.: 6897

Date Instructed: 05-Mar-2020

No. of Samples: 2

Turnaround (Wkdays): 5

Results Due: 11-Mar-2020

Date Approved: 12-Mar-2020

Approved By:

Details: Darrell Hall, Director

Project: Soil Samples

| Client: Environmental Laboratory Services Ltd | | Chemtest Job No.: | | | | | 20-07165 | 20-07165 | | |
|---|---------|----------------------|------|-------|-------|--|-------------|-------------|--|--|
| Quotation No.: Q20-19728 Order No.: 6897 | | Chemtest Sample ID.: | | | | | 981122 | 981123 | | |
| | | Client Sample Ref.: | | | | | 176540/003 | 176540/004 | | |
| | | Client Sample ID.: | | | | | 3 | 4 | | |
| | | Sample Location: | | | | | XC211-TP01 | XC211-TP01 | | |
| | | Sample Type: | | | | | SOIL | SOIL | | |
| | | Top Depth (m): | | | | | 0.05 | 3.00 | | |
| | | Date Sampled: | | | | | 20-Feb-2020 | 20-Feb-2020 | | |
| Determinand | Accred. | SOP | Type | Units | LOD | | | | | |
| pH | U | 1010 | 10:1 | | N/A | | 10.0 | 8.6 | | |
| Cyanide (Free) | U | 1300 | 10:1 | mg/l | 0.050 | | < 0.050 | < 0.050 | | |
| Arsenic (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | 1.2 | 2.2 | | |
| Boron (Dissolved) | U | 1450 | 10:1 | µg/l | 20 | | < 20 | < 20 | | |
| Barium (Dissolved) | U | 1450 | 10:1 | µg/l | 5.0 | | < 5.0 | 7.4 | | |
| Beryllium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 | | |
| Cadmium (Dissolved) | U | 1450 | 10:1 | µg/l | 0.080 | | < 0.080 | < 0.080 | | |
| Chromium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | 1.8 | 5.1 | | |
| Copper (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | 1.8 | 2.4 | | |
| Mercury (Dissolved) | U | 1450 | 10:1 | µg/l | 0.50 | | < 0.50 | < 0.50 | | |
| Nickel (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 | | |
| Lead (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | 2.3 | 6.4 | | |
| Selenium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 | | |
| Vanadium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | 1.9 | 8.6 | | |
| Zinc (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | 3.5 | 16 | | |
| Aliphatic TPH >C5-C6 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aliphatic TPH >C6-C8 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aliphatic TPH >C8-C10 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aliphatic TPH >C10-C12 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aliphatic TPH >C12-C16 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aliphatic TPH >C16-C21 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aliphatic TPH >C21-C35 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aliphatic TPH >C35-C44 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Total Aliphatic Hydrocarbons | N | 1675 | 10:1 | µg/l | 5.0 | | < 5.0 | < 5.0 | | |
| Aromatic TPH >C5-C7 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aromatic TPH >C7-C8 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aromatic TPH >C8-C10 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aromatic TPH >C10-C12 | N | 1675 | 10:1 | µg/l | 0.10 | | 36 | < 0.10 | | |
| Aromatic TPH >C12-C16 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aromatic TPH >C16-C21 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aromatic TPH >C21-C35 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 | | |
| Aromatic TPH >C35-C44 | N | 1680 | 10:1 | µg/l | 50.00 | | < 50 | < 50 | | |
| Total Aromatic Hydrocarbons | N | 1675 | 10:1 | µg/l | 5.0 | | 36 | < 5.0 | | |
| Total Petroleum Hydrocarbons | N | 1675 | 10:1 | µg/l | 10 | | 36 | < 10 | | |
| Benzene | U | 1760 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 | | |
| Toluene | U | 1760 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 | | |
| Ethylbenzene | U | 1760 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 | | |

Project: Soil Samples

| Client: Environmental Laboratory Services Ltd | | Chemtest Job No.: | | | | 20-07165 | 20-07165 | |
|---|---------|----------------------|------|-------|------|-------------|-------------|--|
| Quotation No.: Q20-19728 Order No.: 6897 | | Chemtest Sample ID.: | | | | 981122 | 981123 | |
| | | Client Sample Ref.: | | | | 176540/003 | 176540/004 | |
| | | Client Sample ID.: | | | | 3 | 4 | |
| | | Sample Type: | | | | XC211-TP01 | XC211-TP01 | |
| | | Top Depth (m): | | | | SOIL | SOIL | |
| | | Date Sampled: | | | | 0.05 | 3.00 | |
| | | | | | | 20-Feb-2020 | 20-Feb-2020 | |
| Determinand | Accred. | SOP | Type | Units | LOD | | | |
| m & p-Xylene | U | 1760 | 10:1 | µg/l | 1.0 | < 1.0 | < 1.0 | |
| o-Xylene | U | 1760 | 10:1 | µg/l | 1.0 | < 1.0 | < 1.0 | |
| Methyl Tert-Butyl Ether | N | 1760 | 10:1 | µg/l | 1.0 | < 1.0 | < 1.0 | |
| Naphthalene | U | 1800 | 10:1 | µg/l | 0.10 | 32 | < 0.10 | |
| Acenaphthylene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Acenaphthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Fluorene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Phenanthrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[a]anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Chrysene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[b]fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[k]fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[a]pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Indeno(1,2,3-c,d)Pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Dibenz(a,h)Anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[g,h,i]perylene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Total Of 16 PAH's | U | 1800 | 10:1 | µg/l | 2.0 | 32 | < 2.0 | |

| SOP | Title | Parameters included | Method summary |
|------|---|--|--|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44 Aromatics: >C5–C7, >C7–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44 | Pentane extraction / GCxGC FID detection |
| 1680 | Extractable Petroleum Hydrocarbons | Aliphatics: >C5–C6, >C6–C8, >C8–C10*, >C10–C12*, >C12–C16*, >C16–C21*, >C21–C35*, >C35–C44 Aromatics: >C5–C7, >C7–C8, >C8–C10*, >C10–C12*, >C12–C16*, >C16–C21*, >C21–C35*, >C35–C44 | Dichloromethane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Pentane extraction / GCMS detection |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 640 | Characterisation of Waste (Leaching C10) | Waste material including soil, sludges and granular waste | Compliance Test for Leaching of Granular Waste Material and Sludge |

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



Final Report

Report No.: 20-07190-1
Initial Date of Issue: 11-Mar-2020
Client: Environmental Laboratory Services Ltd
Client Address: Acorn Business Campus
Mahon Industrial Park
Blackrock
Cork
Ireland
Contact(s): Emer Kearney
Results
Project: Soil Testing
Quotation No.: Q20-19728
Date Received: 05-Mar-2020
Order No.: 6881
Date Instructed: 05-Mar-2020
No. of Samples: 2
Turnaround (Wkdays): 5
Results Due: 11-Mar-2020
Date Approved: 11-Mar-2020

Approved By:

Details: Darrell Hall, Director

Project: Soil Testing

| Client: Environmental Laboratory Services Ltd | | Chemtest Job No.: | | | | | 20-07190 | 20-07190 |
|---|---------|----------------------|------|-------|-------|--|-------------|-------------|
| Quotation No.: Q20-19728 Order No.: 6881 | | Chemtest Sample ID.: | | | | | 981249 | 981250 |
| | | Client Sample Ref.: | | | | | 176306/003 | 176306/004 |
| | | Client Sample ID.: | | | | | 3.0m | 0.05m |
| | | Sample Location: | | | | | TP02 | TP02 |
| | | Sample Type: | | | | | SOIL | SOIL |
| | | Date Sampled: | | | | | 20-Feb-2020 | 20-Feb-2020 |
| Determinand | Accred. | SOP | Type | Units | LOD | | | |
| pH | U | 1010 | 10:1 | | N/A | | 8.6 | 7.9 |
| Cyanide (Free) | U | 1300 | 10:1 | mg/l | 0.050 | | < 0.050 | < 0.050 |
| Arsenic (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Boron (Dissolved) | U | 1450 | 10:1 | µg/l | 20 | | < 20 | < 20 |
| Barium (Dissolved) | U | 1450 | 10:1 | µg/l | 5.0 | | < 5.0 | < 5.0 |
| Beryllium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Cadmium (Dissolved) | U | 1450 | 10:1 | µg/l | 0.080 | | < 0.080 | < 0.080 |
| Chromium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Copper (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Mercury (Dissolved) | U | 1450 | 10:1 | µg/l | 0.50 | | < 0.50 | < 0.50 |
| Nickel (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Lead (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | 56 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Zinc (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | | < 1.0 | 1.9 |
| Aliphatic TPH >C5-C6 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | 10:1 | µg/l | 5.0 | | < 5.0 | < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | 10:1 | µg/l | 0.10 | | 240 | < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | 10:1 | µg/l | 0.10 | | 220 | 30 |
| Aromatic TPH >C16-C21 | N | 1675 | 10:1 | µg/l | 0.10 | | 72 | < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | 10:1 | µg/l | 0.10 | | < 0.10 | < 0.10 |
| Aromatic TPH >C35-C44 | N | 1680 | 10:1 | µg/l | 50.00 | | < 50 | < 50 |
| Total Aromatic Hydrocarbons | N | 1675 | 10:1 | µg/l | 5.0 | | 540 | 31 |
| Total Petroleum Hydrocarbons | N | 1675 | 10:1 | µg/l | 10 | | 540 | 30 |
| Benzene | U | 1760 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Toluene | U | 1760 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| Ethylbenzene | U | 1760 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |
| m & p-Xylene | U | 1760 | 10:1 | µg/l | 1.0 | | < 1.0 | < 1.0 |

Project: Soil Testing

| Client: Environmental Laboratory Services Ltd | | Chemtest Job No.: | | | | | 20-07190 | 20-07190 |
|---|---------|----------------------|------|-------|------|--------|-------------|-------------|
| Quotation No.: Q20-19728 Order No.: 6881 | | Chemtest Sample ID.: | | | | | 981249 | 981250 |
| | | Client Sample Ref.: | | | | | 176306/003 | 176306/004 |
| | | Client Sample ID.: | | | | | 3.0m | 0.05m |
| | | Sample Location: | | | | | TP02 | TP02 |
| | | Sample Type: | | | | | SOIL | SOIL |
| | | Date Sampled: | | | | | 20-Feb-2020 | 20-Feb-2020 |
| Determinand | Accred. | SOP | Type | Units | LOD | | | |
| o-Xylene | U | 1760 | 10:1 | µg/l | 1.0 | < 1.0 | < 1.0 | |
| Methyl Tert-Butyl Ether | N | 1760 | 10:1 | µg/l | 1.0 | < 1.0 | < 1.0 | |
| Naphthalene | U | 1800 | 10:1 | µg/l | 0.10 | 180 | < 0.10 | |
| Acenaphthylene | U | 1800 | 10:1 | µg/l | 0.10 | 3.7 | < 0.10 | |
| Acenaphthene | U | 1800 | 10:1 | µg/l | 0.10 | 28 | < 0.10 | |
| Fluorene | U | 1800 | 10:1 | µg/l | 0.10 | 16 | < 0.10 | |
| Phenanthrene | U | 1800 | 10:1 | µg/l | 0.10 | 22 | < 0.10 | |
| Anthracene | U | 1800 | 10:1 | µg/l | 0.10 | 3.2 | < 0.10 | |
| Fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[a]anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Chrysene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[b]fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[k]fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[a]pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Indeno(1,2,3-c,d)Pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Dibenz(a,h)Anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[g,h,i]perylene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Total Of 16 PAH's | U | 1800 | 10:1 | µg/l | 2.0 | 250 | < 2.0 | |

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample: | Sample Ref: | Sample ID: | Sample Location: | Sampled Date: | Deviation Code(s): | Containers Received: |
|---------|-------------|------------|------------------|---------------|--------------------|----------------------|
| 981248 | 176306/002 | 2 | TP02 | 17-Feb-2020 | B | Amber Glass 250ml |
| 981248 | 176306/002 | 2 | TP02 | 17-Feb-2020 | B | Plastic Tub 500g |

| SOP | Title | Parameters included | Method summary |
|------|---|--|--|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5–C6, >C6–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44 Aromatics: >C5–C7, >C7–C8, >C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35–C44 | Pentane extraction / GCxGC FID detection |
| 1680 | Extractable Petroleum Hydrocarbons | Aliphatics: >C5–C6, >C6–C8, >C8–C10*, >C10–C12*, >C12–C16*, >C16–C21*, >C21–C35*, >C35–C44 Aromatics: >C5–C7, >C7–C8, >C8–C10*, >C10–C12*, >C12–C16*, >C16–C21*, >C21–C35*, >C35–C44 | Dichloromethane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Pentane extraction / GCMS detection |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 640 | Characterisation of Waste (Leaching C10) | Waste material including soil, sludges and granular waste | Compliance Test for Leaching of Granular Waste Material and Sludge |

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com



Final Report

Report No.: 20-16827-1

Initial Date of Issue: 08-Jul-2020

Client: Environmental Laboratory Services Ltd

Client Address: Acorn Business Campus
Mahon Industrial Park
Blackrock
Cork
Ireland

Contact(s): Emer Kearney
Results

Project: Soil Samples

| | |
|---------------------------------|-------------------------------------|
| Quotation No.: Q20-19728 | Date Received: 02-Jul-2020 |
| Order No.: 7423 | Date Instructed: 02-Jul-2020 |
| No. of Samples: 2 | |
| Turnaround (Wkdays): 5 | Results Due: 08-Jul-2020 |

Date Approved: 08-Jul-2020

Approved By:


Details: Glynn Harvey, Technical Manager

Results - Leachate

Project: Soil Samples

| Client: Environmental Laboratory Services Ltd | | Chemtest Job No.: | | 20-16827 | 20-16827 | | |
|---|---------|----------------------|------|------------|------------|------------|------------|
| Quotation No.: Q20-19728 | | Chemtest Sample ID.: | | 1025420 | 1025421 | | |
| Order No.: 7423 | | Client Sample Ref.: | | 183057/001 | 183057/002 | | |
| | | Client Sample ID.: | | 1 | 2 | | |
| | | Sample Type: | | SOIL | SOIL | | |
| Determinand | Accred. | SOP | Type | Units | LOD | | |
| pH | U | 1010 | 10:1 | | N/A | 10.3 | 9.2 |
| Cyanide (Free) | U | 1300 | 10:1 | mg/l | 0.050 | < 0.050 | < 0.050 |
| Arsenic (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | 3.2 | < 1.0 |
| Boron (Dissolved) | U | 1450 | 10:1 | µg/l | 20 | 45 | 33 |
| Barium (Dissolved) | U | 1450 | 10:1 | µg/l | 5.0 | 6.0 | 5.4 |
| Beryllium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Cadmium (Dissolved) | U | 1450 | 10:1 | µg/l | 0.080 | < 0.080 | < 0.080 |
| Chromium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | 4.7 | 2.1 |
| Copper (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | 2.4 | 1.4 |
| Mercury (Dissolved) | U | 1450 | 10:1 | µg/l | 0.50 | < 0.50 | < 0.50 |
| Nickel (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | 4.3 | < 1.0 |
| Lead (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | 3.0 | < 1.0 |
| Selenium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | < 1.0 | < 1.0 |
| Vanadium (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | 5.7 | < 1.0 |
| Zinc (Dissolved) | U | 1450 | 10:1 | µg/l | 1.0 | 10 | 2.9 |
| Aliphatic TPH >C5-C6 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aliphatic TPH >C6-C8 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aliphatic TPH >C8-C10 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aliphatic TPH >C10-C12 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aliphatic TPH >C12-C16 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aliphatic TPH >C16-C21 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aliphatic TPH >C21-C35 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aliphatic TPH >C35-C44 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Total Aliphatic Hydrocarbons | N | 1675 | 10:1 | µg/l | 5.0 | [A] < 5.0 | [A] < 5.0 |
| Aromatic TPH >C5-C7 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aromatic TPH >C7-C8 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aromatic TPH >C8-C10 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aromatic TPH >C10-C12 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aromatic TPH >C12-C16 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aromatic TPH >C16-C21 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aromatic TPH >C21-C35 | N | 1675 | 10:1 | µg/l | 0.10 | [A] < 0.10 | [A] < 0.10 |
| Aromatic TPH >C35-C44 | N | 1680 | 10:1 | µg/l | 50.00 | [A] < 50 | [A] < 50 |
| Total Aromatic Hydrocarbons | N | 1675 | 10:1 | µg/l | 5.0 | [A] < 5.0 | [A] < 5.0 |
| Total Petroleum Hydrocarbons | N | 1675 | 10:1 | µg/l | 10 | [A] < 10 | [A] < 10 |
| Benzene | U | 1760 | 10:1 | µg/l | 1.0 | [A] < 1.0 | [A] < 1.0 |
| Toluene | U | 1760 | 10:1 | µg/l | 1.0 | [A] < 1.0 | [A] < 1.0 |
| Ethylbenzene | U | 1760 | 10:1 | µg/l | 1.0 | [A] < 1.0 | [A] < 1.0 |
| m & p-Xylene | U | 1760 | 10:1 | µg/l | 1.0 | [A] < 1.0 | [A] < 1.0 |
| o-Xylene | U | 1760 | 10:1 | µg/l | 1.0 | [A] < 1.0 | [A] < 1.0 |
| Methyl Tert-Butyl Ether | N | 1760 | 10:1 | µg/l | 1.0 | [A] < 1.0 | [A] < 1.0 |

Results - Leachate

Project: Soil Samples

| | | | | | | | | |
|--|-----------------------------|------------|-------------|--------------|------------|--------|------------|------------|
| Client: Environmental Laboratory Services Ltd | Chemtest Job No.: | | | | | | 20-16827 | 20-16827 |
| Quotation No.: Q20-19728 | Chemtest Sample ID.: | | | | | | 1025420 | 1025421 |
| Order No.: 7423 | Client Sample Ref.: | | | | | | 183057/001 | 183057/002 |
| | Client Sample ID.: | | | | | | 1 | 2 |
| | Sample Type: | | | | | | SOIL | SOIL |
| Determinand | Accred. | SOP | Type | Units | LOD | | | |
| Naphthalene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Acenaphthylene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Acenaphthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Fluorene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Phenanthrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[a]anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Chrysene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[b]fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[k]fluoranthene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[a]pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Indeno(1,2,3-c,d)Pyrene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Dibenz(a,h)Anthracene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Benzo[g,h,i]perylene | U | 1800 | 10:1 | µg/l | 0.10 | < 0.10 | < 0.10 | |
| Total Of 16 PAH's | U | 1800 | 10:1 | µg/l | 2.0 | < 2.0 | < 2.0 | |

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Eurofins Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

| Sample: | Sample Ref: | Sample ID: | Sample Location: | Sampled Date: | Deviation Code(s): | Containers Received: |
|----------------|--------------------|-------------------|-------------------------|----------------------|---------------------------|-----------------------------|
| 1025420 | 183057/001 | 1 | | | A | Amber Glass 250ml |
| 1025420 | 183057/001 | 1 | | | A | Plastic Tub 500g |
| 1025421 | 183057/002 | 2 | | | A | Amber Glass 250ml |
| 1025421 | 183057/002 | 2 | | | A | Plastic Tub 500g |

Test Methods

| SOP | Title | Parameters included | Method summary |
|------|---|--|--|
| 1010 | pH Value of Waters | pH | pH Meter |
| 1300 | Cyanides & Thiocyanate in Waters | Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate | Continuous Flow Analysis. |
| 1450 | Metals in Waters by ICP-MS | Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc | Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS). |
| 1675 | TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG) | Aliphatics: >C5-C6, >C6-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44 Aromatics: >C5-C7, >C7-C8, >C8-C10, >C10-C12, >C12-C16, >C16-C21, >C21-C35, >C35-C44 | Pentane extraction / GCxGC FID detection |
| 1680 | Extractable Petroleum Hydrocarbons | Aliphatics: >C5-C6, >C6-C8, >C8-C10*, >C10-C12*, >C12-C16*, >C16-C21*, >C21-C35*, >C35-C44 Aromatics: >C5-C7, >C7-C8, >C8-C10*, >C10-C12*, >C12-C16*, >C16-C21*, >C21-C35*, >C35-C44 | Dichloromethane extraction / GCxGC FID detection |
| 1760 | Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS | Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260) | Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds. |
| 1800 | Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS | Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene | Pentane extraction / GCMS detection |
| 2030 | Moisture and Stone Content of Soils(Requirement of MCERTS) | Moisture content | Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C. |
| 2040 | Soil Description(Requirement of MCERTS) | Soil description | As received soil is described based upon BS5930 |
| 640 | Characterisation of Waste (Leaching C10) | Waste material including soil, sludges and granular waste | Compliance Test for Leaching of Granular Waste Material and Sludge |

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
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- > "greater than"

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Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

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Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

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- A - Date of sampling not supplied
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Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

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Appendix I Pre & Post Site Condition Photographs



Iarnród Éireann
 Cork Line Level Crossings
 XC211 (19-135-2)

| | |
|-----------|----------------------------|
| | XC211 |
| | Pre Works Site Photographs |
| Client: | Iarnród Éireann |
| Engineer: | Jacob's |
| Date: | 2020 |