**Inspection and test plan – Fill Earthworks (Bridge Embankments)**

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| **Project no.** | | CC0374 | **Project name** | Pakenham Roads Upgrade | | **Date** |  | | **Approved by** | Damian Hagebols |
| **ITP no.** | 16300-P200-SYM-QAC-ITP-0008 | | **Revision date** | 12/09/2023 | **Plant and equipment used** | | |  | | |
| **Lot no.** |  | | **Location (chainages, detailed description or marked-up plan)** | | | | |  | | |

Attach Dockets, Certificates and QA Documents to ITP

|  |  |  |  |  | **Verification of acceptance by** | | | | | **Remarks/record (eg. Test frequency reports, certificates, checklist etc)** |
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|  |  |  |  |  | **Symal** | | | **Superintendent** | |
| **Item no.** | **Activity** | **Ref docs** | **Acceptance criteria** | **Freq** | **Key** | **Resp** | **Initial/ date** | **Key** | **Sign/ date** |
| **1.0 Pre-start activities** | | | | | | | | | | |
| **1.1** | Define Work Lot | 173.02  204.03 (h)  Table 204.142  Quality Management Plan  Lot Diagram  1630-P200-SYM-GEO-DPK-0001  5.2.1.4  (Table 43a) | Survey boundaries clearly define the Earthworks Type B Construction works.  Lot diagram to be provided clearly marking up extents of lot area.  Work Lot open on Teambinder.  Lot size with no more than one day’s production or a maximum of 10,000m² for Type B Material.  Lot size with no more than one days production or a maximum of 5000m2 for Type A1 & A2 Material.  In case of Random level assessments of the surface measurements, the lot size shall be a maximum of 4000m².  **Has all of the above been completed and approved?**  **Yes □ No □** | Prior to start of works | R | SE |  |  |  | Lot Map □ |
| **1.2** | Fill at Structures | 1630-P200-SYM-GEO-DRG-1103 to 1105 | Material type is determined by reviewing the proximity of the fill layer to the future bridge abutment. As per the relevant drawings, fill may be Type B, A1 or A2 materials.  **Material type determined:**  **Type B □ Type A1 □ Type A2 □** | Each Lot | H | SE |  |  |  |  |
| **2.0 Set Out** | | | | | | | | | | |
| **2.1** | Set Out Survey Completed | VR Clause 204.03 (a)  IFC Drawings | Set out pegs in place and clearly mark out limits of works as per IFC drawings.  **Has all of the above been completed and approved?**  **Yes □ No □** | Each Lot | R | SE |  |  |  |  |
| **3.0 Placement of Type B Material** | | | | | | | | | | |
| **3.1** | **Initial Testing** | 1630-P200-SYM-GEO-DRG-1004  VR Clause 204.04(c) | Type B:  The material is to be meet the following requirements:  **CBR ≥ 3%**  **Swell < 2.5%**  **Friction Angle ≥ 28°**  **Drained Cohesion ≥ 4kPa**  **Liquid Limit < 50%**  If swell exceeds 2.5%, material shall be classified as expansive. Raise RFI and request approval from Superintendent to use material.  Type B fill need to be tested to confirm they are able to meet the adopted shear strength parameters. | Each Lot | R | SE |  |  |  | NATA Test Report: CBR and Swell  **Yes □ No □** |
| **3.2** | Underlying Layer Conformance | VR Clause 204.10(b)  Construction Document | No fill to be placed until the area has been reviewed by the Superintendent.  Areas upon which fills are to be constructed shall be prepared for test rolling by the Contractor, Any unstable areas detected by test rolling shall be rectified.  Note for 1st layer:  After subgrade cut to the depths (or after in-situ stabilisation) nominated in Drawing Nos. 1630-P200-SYM-GEO-1102 to 1105 in Appendix A, or as required by DoT document Section 204, perform subgrade proof roll to assess stability. Results of proof roll to be provided to the Superintendent for review and approval in accordance with the requirements of DoT Section 204.  **Approval to proceed granted?**  **Yes □ No □** | Each Lot | **H** | SE |  | **H** |  |  |
| **3.3** | Placing Geotextiles  (if applicable) | VR Clause 210.05  IFC Drawing | The placement of geotextile is not permitted without the written approval of the Superintendent.  Geotextile shall be placed to the limits as shown on drawings or specified. The geotextile shall be placed without punctures or tears and, if these occur, they shall be rectified or the entire roll of geotextile replaced prior to covering. Any rolls with imperfections shall not be used.  All joints shall be overlapped or sewn in accordance with the Geotextile Record.  Geotextiles shall be covered by filling within 48 hours of placement.  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Each Lot | **H** | SE |  | **H** |  |  |
| **3.4** | Placing of Fill | VR Clause 204.10(d)  1630-P200-SYM-GEO-DPK-0001  5.4.2.2.4 | Spread and compact in layers not exceeding a compacted thickness of 200 mm.  No more than 20% of total volume of each fill layer may exceed 37.5mm particle size  **Where Type B material contains 25% or more of rock by volume, which will not break down during compaction to meet the maximum particle dimension required for a 200 mm thick layer**, the loose thickness of each layer may equal 125% of the typical maximum particle dimension of the rock up to a maximum layer thickness of 500 mm. Any rock with a maximum particle dimension greater than 80% of the loose thickness of the layer shall be removed. The material shall be placed and compacted such that voids are completely filled with fine material.  Type B material containing rock with a particle dimension greater than 150 mm after compaction shall not be placed within 400 mm of the top of Type B and/or Type C material zones.  Placement of fill to full embankment height in lifts of no more than 2.6m per week where monitoring remains within acceptable limits. Hold filling while monitoring settlement and increase in pore pressures. Commence next lift of filling if the measured settlement and excess pore pressures are within acceptable limits.  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Once  Each Lot | W | SE |  |  |  | Verification Records: Layer Thickness at least every three layers  **Yes □ No □** |
| **3.5** | Keyed Fill Layers | VR Clause 204.10(c)  204.10(d) | Placement surface textured to ensure layers keyed into each other.  Where a fill is to be constructed on steep sideling ground or against an existing embankment with side slope steeper than 4 horizontally to 1 vertically, benches shall be progressively cut over the full area to be covered by new fill. The width of each bench shall be such as to permit safe and effective operation of plant but shall be not less than 1 m.  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Once  Each Lot | W | SE |  |  |  |  |
| **3.6** | Test Roll of Type B fill layer | VR Clause 204.12  173.03  Construction Document  (Test roll Procedure in specification 173.03)  1630-P200-SYM-GEO-DPK-0001  Table 43 | Test Roll in accordance with Section 173.  Surface shall withstand test rolling without visible deformation or springing.  Test roll to be completed using at least a fully loaded water cart with 8 tonne axle load or 20 tonne gross vehicle mass.  Where unstable areas exceed 20% of the area being considered by proof roll the whole area should be ripped and recompacted.  **The Contractor shall provide for the Superintendent to be present during all test rolling.**  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Each Lot | **H** | SE |  | **H** |  |  |
| **3.7** | Compaction Testing | VR Clause Table 204.131  Table 204.141  Table 204.142  173.04(d)  1630-P200-SYM-GEO-DRG-0004 (table 3). | Type B:  Type B material placed within 400 mm of top of Type B material: **99% (Scale A)**  Type B Material placed more than 400 mm below top of Type B Material: **97% (Scale A)**  **All areas of the job will be considered as scale A.**  Type B material is to be tested as per 1630-P200-SYM-GEO-DRG-0004 (table 3). And should meet the moisture content requirements as per VR204.  >70% for any material within 150mm of subgrade.  >80% for all material below cut floor level.  For testing small areas, which can be for lots where surface area < 500m2. The test requirements are based on the mean of 3 individual tests where the results must exceed 2% or more than would be required for a 6 lot test.  **Have the results been achieved?**  **Yes □ No □** | Each Lot | R | SE |  |  |  | NATA Test Report: Compaction  **Yes □ No □** |
| **3.8** | Monitoring of Settlement | 1630-P200-SYM-GEO-DPK-0001  5.4.2.2.10 Table 33  5.4.2.2.10 Table 34b | The rate of filling lifts and effect on settlement, lateral displacement and excess pore water pressure to be monitored.  The ratio of change in maximum lateral movement to change in maximum settlement should be calculate at the competition of each lift.  A minimum of two readings are to be taken immediately post installation and immediately prior to the commencement of embankment construction from the settlement plates, extensometers, survey prisms on culverts, inclinometers, and standpipes. During the construction phase measurements are to be taken when the fill height reaches 1.0m and then every 1m of fill after. During the hold period measurements are to be taken twice weekly and monthly until practical completion is reached.  Vibrating Wire Piezometers readings are to be taken for at least one week prior to commencement of construction. Continuous readings are to be taken during the construction stages with data sent to the logger on 6 hourly intervals.  Survey prisms installed on bridge abutments are to have baseline readings taken immediately post installation. Following that readings are to be taken weekly for two months, two weekly for the following six months and monthly following that until practical completion is reached.  Are monitoring results within the allowable limits stipulated in Table 34b (where applicable for this lot)?  **Approval to proceed granted?**  **Yes □ No □** | Each Lot | R | SE |  | **H** |  | Monitoring Checklist  **Yes □ No □** |
| **4.0 Placement of Type A material (Type A1 and A2)** | | | | | | | | | | |
| **4.1** | **Initial Testing** | 1630-P200-SYM-GEO-DRG-1004  VR Clause 204.04(c) | Type A1:  The material is to be meet the following requirements:  **CBR ≥ 6%**  **Swell < 1.5% (1.0% for verge material)**  **Friction Angle ≥ 37°**  **Permeability < 5 x 10^-9 (capping/verge material only)**  Type A2:  The material is to be meet the following requirements:  **CBR ≥6% - Assigned CBR testing for new material.**  **Swell < 1.5% (1.0% for verge material) – Assigned swell testing for new material**  **Friction Angle ≥ 32°**  **Drained Cohesion ≥ 6KPA**  Type A structural fill and Type B fill need to be tested to confirm they are able to meet the adopted shear strength parameters. | Each Lot | R | SE |  |  |  | NATA Test Report: CBR and Swell  **Yes □ No □** |
| **4.2** | Underlying Layer Conformance | VR Clause 204.10(b)  Construction Work Pack  (Placement of fill material) | No fill to be placed until the area has been reviewed by the Superintendent.  Areas upon which fills are to be constructed shall be prepared for test rolling by the Contractor, Any unstable areas detected by test rolling shall be rectified.  Note for 1st layer:  After subgrade cut to the depths (or after in-situ stabilisation) nominated in Drawing Nos. 1630-P200-SYM-GEO-1102 to 1105 in Appendix A, or as required by DoT document Section 204 dated December 2015, perform subgrade proof roll to assess stability. Results of proof roll to be provided to the Superintendent for review and approval in accordance with the requirements of DoT Section 204. | Each lot | **H** | SE |  | **H** |  |  |
| **4.3** | Placing Subsurface Drainage | 1630-P200-SYM-GEO-DRG-1102 | Have specified drainage materials been placed at the base of excavation as per drawing 1630-P200-SYM-GEO-1102?  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Each Lot | **H** | SE |  | **H** |  |  |
| **4.4** | Placing of Geotextiles  (If applicable) | VR Clause 210.05  IFC Drawing | The placement of geotextile is not permitted without the written approval from the relevant Surveillance Officer.  Geotextile shall be placed to the limits as shown on IFC Drawings without punctures or tears. If these occur, they shall be rectified, or the entire roll of geotextile replaced prior to covering.  Geotextiles in subsurface drains shall be placed to conform to the approximate shape of the excavation and fully envelop the drainage material.  All joints shall be overlapped or sewn in accordance with the Geotextile Record. Geotextiles shall be covered by filling within 48 hours of placement.  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Each lot | H | SE |  |  |  |  |
| **4.6** | Placing of Fill | VR Clause 204.10(d)  1630-P200-SYM-GEO-RPT-0001  5.2.1.3.1  Table 43 | Spread and compact in layers not exceeding a compacted thickness of 200 mm.  Visual Inspection for maximum particle dimension  Where a fill is to be constructed on steep sideling ground or against an existing embankment with side slope steeper than H3:1V, benches shall be progressively cut over the full area to be covered by new fill. The width of each bench shall be not less than 1 m.  Placement of fill to full embankment height in lifts of no more than 2.6m per week where monitoring remains within acceptable limits. Hold filling while monitoring settlement and increase in pore pressures. Commence next lift of filling if the measured settlement and excess pore pressures are within acceptable limits.  **Has all the above been completed per standard and approved?**  **Yes □ No □** | Each lot | R | SE |  |  |  | Verification Records: Layer Thickness at least every three layers  **Yes □ No □** |
| **4.7** | Keyed Fill Layers | VR Clause 204.10(c)  204.10(d) | Placement surface textured to ensure layers keyed into each other.  Where a fill is to be constructed on steep sideling ground or against an existing embankment with side slope steeper than 4 horizontally to 1 vertically, benches shall be progressively cut over the full area to be covered by new fill. The width of each bench shall be such as to permit safe and effective operation of plant but shall be not less than 1 m.  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Once  Each Lot | W | SE |  |  |  |  |
| **4.8** | Test Roll of Type A fill layer | VR Clause 204.12  173.03  Construction Document  (Test roll Procedure in specification 173.03)  1630-P200-SYM-GEO-DPK-0001  Table 43 | Test Roll in accordance with Section 173.  Surface shall withstand test rolling without visible deformation or springing.  Test roll to be completed using at least a fully loaded water cart with 8 tonne axle load or 20 tonne gross vehicle mass.  Where unstable areas exceed 20% of the area being considered by proof roll the whole area should be ripped and recompacted.  **The Contractor shall provide for the Superintendent to be present during all test rolling.**  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Each lot | **H** | SE |  | **H** |  |  |
| **4.9** | Compaction Testing | VR Clause Table 204.131  Table 204.141  Table 204.142  173.04(d)  1630-P200-SYM-GEO-DRG-0004 (table 3). | Type A1:  All Type A material: **99% (Scale A)**  **All areas of the job will be considered as scale A**  Type A1 material is to be tested as per 1630-P200-SYM-GEO-DRG-0004 (table 3). And should meet the moisture content requirements as per VR204.  Type A2:  All Type A material: **99% (Scale A)**  **All areas of the job will be considered as scale A**  Type A2 material is to be tested as per 1630-P200-SYM-GEO-DRG-0004 (table 3). And should meet the moisture content requirements as per VR204.  For testing small areas, which can be for lots where surface area < 500m2. The test requirements are based on the mean of 3 individual tests where the results must exceed 2% or more than would be required for a 6-lot test. | Each Lot | R | SE |  |  |  | NATA Test Report: Compaction  **Yes □ No □** |
| **4.10** | Fill at Structures (if applicable) | VR Clause 204.11 (b)  Table 204.111  Construction Work Pack | No Fill to be placed within 3 m of structure until the foundation is reviewed by the relevant Surveillance Officer.  Culverts with an opening height greater than 1200 mm, shall be material of at least Type A material quality.  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Each Lot | H | SE |  | **H** |  |  |
| **4.11** | Fill within 300 mm of structures (if applicable) | VR Clause 204.11  Construction Work Pack | Use of geo-composite drainage material or Permeable Fill in accordance with 204.04(f).  Compaction plant shall not be operated within the minimum distances from structures shown in Table 204.111.  The difference in level of any fill being placed on opposite sides of a structure or structural component shall not exceed H/4 or 500 mm, whichever is the lesser, where H is the height of the structure.  **Has all of the above been completed per standard and approved?**  **Yes □ No □** | Each Lot | R | SE |  |  |  |  |
| **4.12** | Fill Material against Concrete Structures (if applicable) | VR Clause 204.11  Construction Work Pack | No material shall be placed against concrete within 14 days of casting.  **Has all of the above been completed per standard?**  **Yes □ No □** | Each Lot | R | SE |  |  |  | Concrete Pour Recorded  **Yes □ No □**  NATA Test Reports: Compressive Strength  **Yes □ No □** |
| **4.13** | Monitoring of Settlement | 1630-P200-SYM-GEO-DPK-0001  5.4.2.2.10 Table 33  5.4.2.2.10 Table 34b | The rate of filling lifts and effect on settlement, lateral displacement and excess pore water pressure to be monitored.  The ratio of change in maximum lateral movement to change in maximum settlement should be calculate at the competition of each lift.  A minimum of two readings are to be taken immediately post installation and immediately prior to the commencement of embankment construction from the settlement plates, extensometers, survey prisms on culverts, inclinometers, and standpipes. During the construction phase measurements are to be taken when the fill height reaches 1.0m and then every 1m of fill after. During the hold period measurements are to be taken twice weekly and monthly until practical completion is reached.  Vibrating Wire Piezometers readings are to be taken for at least one week prior to commencement of construction. Continuous readings are to be taken during the construction stages with data sent to the logger on 6 hourly intervals.  Survey prisms installed on bridge abutments are to have baseline readings taken immediately post installation. Following that readings are to be taken weekly for two months, two weekly for the following six months and monthly following that until practical completion is reached.  Are monitoring results within the allowable limits stipulated in Table 34b (where applicable for this lot)?  **Approval to proceed granted?**  **Yes □ No □** | Each Lot | R | SE |  | **H** |  | Monitoring Checklist  **Yes □ No □** |
| **5.0 Geotechnical Analysis (and Material Testing)** | | | | | | | | | | |
| **5.1** | Post Compaction Grading/Maximum Particle Dimension | VR Clause Table 204.041  PS3020.05 (b), (c) | Type A:  Sieve 75.0mm – **100% passing by mass,**  Sieve 4.75mm – **40 - 80% passing by mass,**  Sieve 0.075mm – **10 - 40% passing by mass.**  Type B:  No more than 20% of total volume of each fill layer may exceed 37.5mm particle size  Maximum Particle Dimension (MPD) ≤ 150 mm within 400 mm of Top of Type B.  or  MPD ≤ 400mm at depths greater than 400 mm below the top of Type B material.  **Have the results been achieved?**  **Yes □ No □** | Each Lot | R | SE |  |  |  | NATA Test Report: Grading  Visual Inspections for Maximum Particle Dimension |
| **5.2** | LL and PI Testing | VR Clause Table 204.131  Table 204.141  Table 204.142  173.04(d) | Type A: **□**  PI: **6 - 25**,  PI x % Passing 0.425mm: **1000 Max.**  LL and comparison of PI against LL, (identification of silt) is required for Type A2 Material.  s  Type B: **□**  LL and comparison of PI against LL, (identification of silt) is required for Type B Material.  Initial testing is 1 Test per 2 lots. | Each Lot | R | SE |  |  |  | NATA Test Report: LL, PI **□** |
| **5.3** | Reduced Frequency  Post compaction testing of initial lots. | VR Clause 204.14 – Table 204.141  RC 500.20 | Test initial lot for assigned CBR/Swell.  Test initial 3 lots for compaction.  Once material and work have achieved the specified requirements in the first test. And;  Established a compaction procedure to the satisfaction of the Superintendent’s. Symal can reduce the frequency of testing of subsequent lots to the minimum requirements specified in Table 204.142.  **If Reduced frequency has been granted, the testing can be conducted at the following frequency.**  1 test per every 8 lots for CBR/Swell  1 every 2 lots OR every 3rd lot if placed >400 mm below top of type B for Compaction Testing.  1 test per 4 lots of LL and comparison of PI against LL.  **Has the criteria been achieved?**  **Yes □ No □** | Each Lot | R | SE |  | R |  |  |
| **6.0 Completion** | | | | | | | | | | |
| **6.1** | Conformity with IFC Drawings and Construction Tolerances | VR Clause 204.03  Table 204.031 | Earthworks shall be finished to conform to the levels, lines, grades and cross-sectional specified or shown on the drawings with the following requirements.  Scale A: 80 measurements per lot  Mean +5 / -15 mm Max Std Dev. 12 mm | Each Lot | R | SE |  |  |  |  |
| **6.2** | Preparation of Final Surface.  (For Underside of Pavement Layers and the surface of the Cut Floor). | VR Clause 204.15 | Surface is Smooth, Hard, Tightly Bound and Free from Depressions Capable of Holding Water.  Material within 150 mm of subgrade shall be maintained such that its moisture content is not less than 70% of OMC prior to the placement of any pavement layers.  **Does the final product conform to the above criterial?**  **Yes □ No □** | Each Lot | R | SE |  |  |  |  |
| **7.0 Work Lot Close Out** | | | | | | | | | | |
| **7.1** | Test Reports | DoT Specs | All Test reports received and reviewed | Each Lot | R | PE |  |  |  | NATA Endorsed Test Reports |
| **7.2** | Product Non-Conformance | QMP | All Product Non-Conformance(s) recorded and closed (if applicable) | Each Lot | R | PE |  |  |  | NCR reports |

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| **Works complete (signer SE/SS)** | |  | | | **Date works complete** | |  | | | |
| **Lot conforms (signer PE)** |  | | **Date lot closed** |  | | **NCR/s no. raised** | |  | **Date NCR closed for this lot** |  |

**Responsibility (Resp.) Key**: **PM**-Project Manager, **PE**-Project Engineer, **SE**- Site Engineer, **CS**-Civil Superintendent, **SS**-Site Supervisor, **SV**-Surveyor, **CR**-Client Representative

**SI** – Superintendent

**Inspection Key: W –** Witness, **H –** Hold Point, **S –** Surveillance**, I** – Inspection, **R**  – Review