

INSPECTION & TEST PLAN

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| Inspection and Test Plan and Number | | OP06_f01 Inspection & Test Plan Workbook | | | |
| Project Name | | KiwiRail – North Auckland Line Recovery | | Version: | 2 draft |
| Date: | | 20/04/2024 | | Approved in RFI#: | TBC |
| Documents / Specifications Referenced: | | T+T North Auckland Line Remediation Works | | | |

| ITP# | Work Pack Element(s) | Drawing / Specification Ref. | Specification Detail Summary | Acceptance Criteria | Test Spec & Frequency | Control Type i.e. Checksheet / Records | Hold / Witness | External (Requested by PS4) // Internal (JFC Requirement) | PS3 Owner | Hold / Review / Witness | PS4 Owner Sign Off |
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| 1.0 PRE-CONSTRUCTION WORKS | | | | | | | | | | ENGINEER | |
| 1.01 | Check IFC Drawings | KiwiRail – North Auckland Line Recovery 136km Construction Issue (Rev A) | Ensure latest revision is being used | Correct drawings | Prior to works, updated accordingly based on formal correspondence | Controlled IFC drawings being used – Checkpoint on QA | HOLD | Internal | JFC | REVIEW | T&T |
| 2.0 BULK EARTHWORKS & LANDSCAPING | | | | | | | | | | | |
| 2.01 | Earthworks Tolerances | T+T NAL Recovery Specifications: 2.4.9 | All earthworks shall adhere to the lines, levels and grades shown on drawings or Engineer's instruction. Accuracy of surfaces under metal courses or concrete structures must preserve min. thicknesses of overlying layers. | Tolerances shall otherwise be as follows: <ul style="list-style-type: none">• Subgrade surfaces 0mm to - 30mm• Batters 0mm to +100mm• Rockfill surfaces ±200mm• Other surfaces 0mm to + 75mm | For every section of earthworks completed | Photos, QA Checksheet(s), As-built plans | Witness | Internal | JFC | REVIEW | T&T |
| 2.02 | Inspection of stripped surface | T+T NAL Recovery Specifications: 2.4.10 | <ul style="list-style-type: none">• The Engineer must be notified before any cut or fill begins.• The Engineer will inspect the stripped surface and decide if additional excavation, undercutting, backfilling, or other works such as drainage are needed.• No cut or fill can proceed in the area until the Engineer approves the commencement after necessary inspections and approvals have been completed. | The Engineer inspects and approves the stripped surface and any required works. No cut or fill is allowed until the Engineer gives approval. | <ul style="list-style-type: none">• Inspect prior to any cut or fill begins• Re-inspect after cut (prior to fill) | Written confirmation of Engineers approval | HOLD | External | JFC | HOLD | T&T |
| 2.03 | Standards and Testing - General | T+T NAL Recovery Specifications: 2.9 | General Testing – The locations and levels of all in-situ tests shall be recorded within 0.2m horizontally and 0.1m vertically All testing, both in-situ and laboratory, is to be carried out using an IANZ accredited testing organisation. Full details of the proposed testing organisation(s) shall be submitted to the Engineer for their approval. | General Testing – The locations and levels of all in-situ tests shall be recorded within 0.2m horizontally and 0.1m vertically All testing, both in-situ and laboratory, is to be carried out using an IANZ accredited testing organisation. Full details of the proposed testing organisation(s) shall be submitted to the Engineer for their approval. | For all compaction testing completed | Written confirmation of Engineers approval of the proposed testing organization | HOLD | External | JFC | REVIEW | T&T |
| 2.04 | General Undercutting (Outside the track formation area) | T+T NAL Recovery Specification v2s: 2.5.6 | The requirements for general undercutting outside the track formation area, i.e. within gullies, for the fill foundations and below areas of cut All organic materials, other unsuitables, and materials with an undrained shear strength less than the design minimum as stated on | <ul style="list-style-type: none">• <u>Shear Vane:</u> Target Criteria: No individual reading less than 75 kPaOr• <u>Scala Penetrometer:</u> Target Criteria: 3 blows/100mm to a depth of 1.5m | Shear vane and/or Scala testing Frequency not specified – Engineer to confirm on site | Photos, QA Checksheet(s), Written instruction by the Engineer. Test records with location plans | HOLD | External | JFC | HOLD | T&T |

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| | | | the drawings, or instructed by the Engineer, shall be undercut. The depth of the undercut in materials will be specified by the Engineer when the material at the subgrade level has been exposed and evaluated. | | | | | | | | |
| 2.05 | Conditioning and Spreading of Fill | T+T NAL Recovery Specifications v2: 2.8.2 | Before fill is placed in any area, the Contractor shall notify the Engineer that the fill foundation has been stripped, drained, including subsoil drains and prepared as required by the drawings and Specification and is ready for the Engineer's inspection and approval. | The fill foundation has been stripped, drained, including subsoil drains and prepared as required by the drawings and Specification. | Engineer to inspect and approve before fill is placed in any area | QA Checksheet(s), Photos, Written confirmation from the Engineer | HOLD | External | JFC | HOLD | T&T |
| 2.06 | Grassing | T+T NAL Recovery Specifications v2: 2.10.11 | The Contractor shall submit to the Principal for approval their proposed seed mixture fertiliser type and respective application rates prior to commencement of the grassing | Engineer to approve the proposed seed mixture fertiliser type and respective application rates | Prior to commencement of grassing | Specification for the seed mixture fertiliser type & application rate, Written confirmation from the Engineer | HOLD | External | JFC | HOLD | T&T |
| 3.0 Formation | | | | | | | | | | ENGINEER | |
| 3.01 | Laboratory material Testing | T+T NAL Recovery Specifications V1: 2.9.3 | Before placing any fill the Contractor shall carry out lab testing on any material to be used for testing to confirm the max dry density and optimum water content of each material type. | Test results shall be provided to the Geotech Engineer to confirm the grading, target dry densities and water contents for each material | Testing shall be undertaken by an IANZ accredited testing organization and undertaken according to the standards outline in Table 2.3 | IANZ test results, Written confirmation from the Engineer | HOLD | External | JFC | REVIEW | T&T |
| 3.02 | Source Selection Criteria - Ballast | T+T NAL Recovery Specifications: 2.3.1; Table 2.1 | Ballast shall comply with the requirements of KiwiRail C-ST-FO-4110 Formation, v.1 March 2019. If existing ballast material is proposed by the contractor to be stripped and re-used in construction, the ballast stockpile shall be inspected and approved by the Engineer prior to reinstatement. | KiwiRail supply Ballast material shall meet the requirements stated in document T SP MM 60140 Supply of Crushed and Screened Stone Ballast | Spec and frequency must comply with KiwiRail C-ST-FO-4110 | KiwiRail supply | N/A | N/A | N/A | N/A | N/A |
| 3.03 | Source Selection Criteria - Sub-ballast (GAP40) | T+T NAL Recovery Specifications v2: 2.3.2; Table 2.1 | The GAP40 shall comply with the NZTA M/4 specification for basecourse aggregate. Fill materials shall be sourced from areas of cut or from alternative sources. If the Contractor wishes to propose materials from alternative sources then they shall provide details of such sources for the Engineer's approval | Allowable Particle Size: < 40 mm • (1*) Percentage Fines (0.07mm): <7% • (2*) Weathering Quality Index: The aggregate shall have a quality index > or = to CA • (3*) Crushing Resistance Test: <10% fines passing 2.36 mm sieve under test load of 130 kN • (4*) Broken Face Content: 50% for >37.5 mm fraction and 19 mm – 37.5 mm fraction . For imported material, test results shall be supplied from the quarry and the similar rock within the quarry that are no older than 6 months. | Min. 2 tests per source subsequent every 5,000 m3 of imported fill material. 1* = Testing method NZS 4402:1986 Test 2.8.1 2* = Testing method NZS 4407:2015 Test 3.11 3* = Testing method NZS 4407:2015 Test 3.10 4* = Testing method NZS 4407:2015 Test 3.14 | Aggregate Test Reports | HOLD | External | JFC | HOLD | T&T |

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| 3.04 | Source Selection Criteria - Structural Fill/Hardfill GAP65 | T+T NAL Recovery Specifications: 2.3.5; Table 2.1 | <p>Defines a well graded aggregate, with slightly weathered to unweathered fragments of rock up to maximum 65 mm characteristic dimension and which is relatively free of fines and other mineral matter such that when compacted the rock fragments can achieve point-to-point contact.</p> <p>Fill materials shall be sourced from areas of cut or from alternative sources. If the Contractor wishes to propose materials from alternative sources then they shall provide details of such sources for the Engineer's approval</p> | <ul style="list-style-type: none"> • Allowable Particle Size: < 65 mm • (1*) Percentage Fines (0.07mm): <7% • (2*) Weathering Quality Index: The aggregate shall have a quality index > or = to CA • (3*) Crushing Resistance Test: <10% fines passing 2.36 mm sieve under test load of 130 kN • (4*) Broken Face Content: 50% for >37.5 mm fraction and 19 mm – 37.5 mm fraction.. For imported material, test results shall be supplied from the quarry and the similar rock within the quarry that are no older than 6 months. | <p>Min. 2 tests per source subsequent every 5,000 m3 of imported fill material.</p> <p>1* = Testing method NZS 4402:1986 Test 2.8.1 2* = Testing method NZS 4407:2015 Test 3.11 3* = Testing method NZS 4407:2015 Test 3.10 4* = Testing method NZS 4407:2015 Test 3.14</p> | Aggregate Test Reports | HOLD | External | JFC | HOLD | T&T |
| 3.05 | Source Selection Criteria – Rockfill (AP65, AP100, AP100/300) | T+T NAL Recovery Specification v2: 2.3.6; Table 2.1 | <p>Defines a well graded aggregate with slightly weathered to unweathered fragments of rock up to maximum 300 mm characteristic dimension and which is relatively free of fines and other mineral matter such that when compacted the rock fragments can achieve point-to-point contact.</p> <p>Fill materials shall be sourced from areas of cut or from alternative sources. If the Contractor wishes to propose materials from alternative sources then they shall provide details of such sources for the Engineer's approval</p> | <ul style="list-style-type: none"> • Allowable Particle Size: < or = 300mm • (1*) Percentage Fines: nil • (2*) Weathering Quality Index: The aggregate shall have a quality index > or = to CA • (3*) Crushing Resistance Test: <10% fines passing 2.36 mm sieve under test load of 130 kN • (4*) Broken Face Content: nil. For imported material, test results shall be supplied from the quarry and the similar rock within the quarry that are no older than 6 months. | <p>Min. 2 tests per source subsequent every 5,000 m3 of imported fill material.</p> <p>1* = Testing method NZS 4402:1986 Test 2.8.1 2* = Testing method NZS 4407:2015 Test 3.11 3* = Testing method NZS 4407:2015 Test 3.10 4* = Testing method NZS 4407:2015 Test 3.14</p> | Aggregate Test Reports | HOLD | External | JFC | REVIEW | T&T |
| 3.06 | Compaction Requirements – Buttress Fill | T+T NAL Recovery Specifications v2: 2.10.4, Table 2.5 | <p>Fill materials shall be compacted so as to achieve the minimum target criteria. Should any test result fail to meet the min. target criteria the Contractor shall propose remedial measures for the Engineer's approval</p> | <ul style="list-style-type: none"> • <u>Shear Vane: (if cohesive)</u> Target Criteria: Average reading over 10 consecutive readings shall not be less than 120 kPa with no individual readings less than 100 kPa. Scala (if granular material): Greater than 4 blows per 100mm • <u>In-situ Dry Density:</u> Target Criteria: ≥ 95% Maximum Dry Density. • <u>Air Voids:</u> Target Criteria: If cohesive material: Average reading over 10 consecutive readings shall not exceed 6%, with no single reading exceeding 8%. If granular material: Average reading over 10 consecutive readings shall not | <ul style="list-style-type: none"> • <u>Shear Vane & Scalar</u> Minimum Test Frequency: 1 set per 200 m3 of fill and 1 set per 0.5m lift. • <u>In-situ Dry Density:</u> Minimum Test Frequency: 1 set of NDM test per 250 m2 of fill lift • <u>Air Voids:</u> Minimum Test Frequency: 1 set of NDM test per 250 m2 of fill lift | QA Checksheet(s), IANZ test Results | HOLD | External | JFC | WITNESS | T&T |

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| | | | | exceed 8%, with no single reading exceeding 10% | | | | | | | |
| 3.07 | Formation Undercutting at 134.75km, 136km and 147.145km | T+T 'formation proposal' drawings emailed 3/4/24 (CH136), emailed 4/4/24 (CH134.7) shows depths and locations | <p>Undercuts are required if the foundation soils do not meet the minimum design requirements.</p> <p>Prior to the placement of any fill the foundation shall be inspected and approved by the Engineer.</p> <p>Two stages to expedite testing and decision making on extents of undercut:</p> <p>• 1) Initial testing using the Scala penetrometer probes to a minimum of 1.5 m depth below the base of the foundation.</p> <p>• 2) Further testing to be undertaken after excavation to the depth of the proposed undercut surface (where required) using local test pitting or full excavation of identified soft soil then undertake Scala penetrometer and shear vane testing to confirm strength of founding layers and extent/depth of any remaining softer material and/or depth to competent material.</p> | <p>Rail Embankments</p> <p>Shear vane — No individual reading less than 80 kPa and average reading >100 kPa.</p> <p>Scala — 3 blows/100mm (for cohesive soils); 5 blows/100mm (for granular soils)</p> <p>Formation for ballast and trackset</p> <p>Scala/Shear vane — equivalent CBR value as set out in C-ST-FO-4110.</p> | <p>Table 2.2:</p> <p>Rail Embankments:</p> <p>• <u>Shear Vane</u>: 1 test per 5m x 5m grid and minimum of 6 tests.</p> <p>• <u>Scala Penetrometer</u>: 1 test per 5m x 5m grid and minimum of 6 tests.</p> <p>Formation for ballast and track set:</p> <p>• <u>Shear Vane / Scala Penetrometer</u>: Three tests every 5m length of track</p> | QA Checksheet(s), Photos, Written confirmation from the Engineer. Test records with location plans | HOLD | External | JFC | HOLD | T&T |
| 3.08 | Compaction Requirements – Sub-ballast (GAP40) | T+T NAL Recovery Specifications v2: 2.10.4, Table 2.6 | Before placing any fill the Contractor shall carry out lab testing on any material to be used for testing to confirm the max dry density and optimum water content of each material type. | <p>• <u>In-situ Dry Density</u>: Target Criteria: ≥ 98% Maximum Dry Density.</p> <p>• <u>Clegg Hammer Test</u>: Target Criteria: Single test minimum clegg impact value ≥ 18. Average CIV ≥ 22 (over 5 consecutive tests)</p> | <p>• <u>In-situ Dry Density</u>: Minimum Test Frequency: 1 set of NDM test per 50 m2 of fill lift.</p> <p>• <u>Clegg Hammer Test</u>: Minimum Test Frequency: 1 test per 50 m2 of fill lift.</p> | QA Checksheet(s), IANZ test Results | HOLD | External | JFC | WITNESS | T&T |
| 3.09 | Compaction Requirements – Structural Fill / Hardfill (GAP65) / Rockfill | T+T NAL Recovery Specifications v2: 2.10.4, Table 2.7 | Fill materials shall be compacted so as to achieve the minimum target criteria. Should any test result fail to meet the min. target criteria the Contractor shall propose remedial measures for the Engineer's approval | <p>• <u>In-situ Dry Density</u>: Target Criteria: ≥ 95% Maximum Dry Density.</p> <p>• <u>Clegg Hammer Test</u>: Target Criteria: Single test minimum clegg impact value ≥ 18. Average CIV ≥ 22 (over 5 consecutive tests) (equivalent CBR of >15%).</p> | <p>• <u>In-situ Dry Density</u>: Minimum Test Frequency: 1 set of NDM test per 50 m2 of fill lift and every 1m lift. Minimum of 3 tests</p> <p>• <u>Clegg Hammer Test</u>: Minimum Test Frequency: 1 test per 50 m2 of fill lift.</p> | QA Checksheet(s), IANZ test Results | HOLD | External | JFC | WITNESS | T&T |
| 3.10 | Construction of formation (ballast) | 20190331 C-ST-FO-4110 Formation (Civil Standard), RFI 028 | Formation construction as per KiwiRail Standard C-ST-FO-4110 Formation and task instruction C-TI-FO-4207 | KiwiRail Standard C-ST-FO-4110 Formation and task instruction C-TI-FO-4207 for construction compliance. RFI 028- Ballast to be 390-410mm below top of rail | For every section of formation shown on the drawings | Survey, QA Checksheet(s), Photos | HOLD | Internal | JFC | WITNESS | T&T |

4.0 GEOSYNTHETICS SPECIFICATION

| ITP# | Work Pack Element(s) | Drawing / Specification Ref. | Specification Detail Summary | Acceptance Criteria | Test Spec & Frequency | Control Type i.e. Checksheet / Records | Hold / Witness | External (Requested by PS4) // Internal (JFC Requirement) | PS3 Owner | Hold / Review / Witness | PS4 Owner Sign Off |
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| 4.01 | Quality Assurance – information to be supplied | T+T NAL Recovery Specifications v2: 3.7, Table 3.1 RFI 017 Alternative GCL. | On delivery of geosynthetics, the Contractor is to provide the following information: <ul style="list-style-type: none"> Product name Name and address of producer/supplier Manufacturer's compliance certificate | <p>The following information to be supplied:</p> <p><u>Geosynthetics:</u></p> <ol style="list-style-type: none"> Product Name Name and Address of producer/supplier Manufacturer's compliance certificate <p><u>Separation Geotextile:</u></p> <ol style="list-style-type: none"> Checklist for directional placement, tensioning, laps, spacing, damage <p><u>Geogrid:</u></p> <p>Checklist for directional placement, tensioning, laps, spacing, damage</p> | <p>Min. frequency:</p> <ol style="list-style-type: none"> Check each lot (1 roll) Check each lot (1 roll) Check each lot (1 roll) 1 checklist per 100m² of geosynthetic installed 1 checklist per geosynthetic is installed | Dockets, Compliance Certificate | HOLD | External | JFC | REVIEW | T&T |
| 4.02 | Pre-commencement | T+T NAL Recovery Specifications: 3.3.1 | Before any geosynthetic installation is commenced, or fill is placed in any area, the Contractor shall advise the Engineer | <p>The Contractor shall be responsible for the correct setting out of the work and shall see that the specified locations, orientations, lengths, depths, spacings, and levels are strictly adhered to.</p> <p>Engineer to confirm requirements</p> | Before any geosynthetic installation is commenced, or fill is placed in any area, the Contractor shall advise the Engineer, with at least one working days' notice | Written confirmation from the Engineer | HOLD | External | JFC | WITNESS | T&T |
| 4.03 | Geogrid | T+T NAL Recovery Specifications: 3.4.1 | Specific geogrid reinforcement types are shown on the drawings. Alternative, equivalent geogrids may be approved by the Engineer. The alternative geogrids shall have similar performance characteristics equivalent to or better those of the specified materials. | <p>The following information shall be provided to the Engineer to allow approval of the proposed alternative geogrids:</p> <ul style="list-style-type: none"> Roll widths Minimum overlap width between rolls <ul style="list-style-type: none"> Characteristics initial strength Material reduction factor – creep rupture Creep limited strength based on creep rupture Material reduction factor – installation damage in sand and gravel <ul style="list-style-type: none"> Material reduction factor – environmental effects at 100 years design life Long term design strengths in sand and gravel (at 100 years design life) Coefficient of interaction for pullout <ul style="list-style-type: none"> Coefficient of direct sliding | Engineer to approve prior to use of alternative geogrid | Written Confirmation from the Engineer, Geogrid Spec | HOLD | External | JFC | REVIEW | T&T |
| 4.04 | Separation Geotextile | T+T NAL Recovery Specifications: 3.4.2 | Specific separation geotextile types are shown on the drawings. Alternative, equivalent geotextiles may be approved by the Engineer. Separation geotextile shall be non-woven, needle-punched geotextile that have similar performance characteristics equivalent to or better than those of the specified materials and shall meets the requirements of TNZ F/7:2003 | <p>Specification for Geotextile Wrapped Aggregate Subsoil Drain Construction as follows:</p> <ol style="list-style-type: none"> Filtration Class 2, Strength Class B for separation under or within embankments (including drainage blanket applications). Filtration Class 1, Strength Class C for separation behind the reinforced slope facing (e.g. Green Terramesh units or similar). | Engineer to approve prior to use of alternative geotextiles | Written Confirmation from the Engineer, Geogrid Spec | HOLD | External | JFC | REVIEW | T&T |

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| | | | | 3) Filtration Class 1, Strength Class D for separation under rockfill in embankments (including drainage blanket applications) | | | | | | | |
| 4.05 | Tolerances | T+T NAL Recovery Specifications: 3.5.5 | The front facing of the slope shall be aligned so that the front face varies not more than 100 mm from a 5 m straight edge held horizontally and vertically. Curved slopes shall be constructed with a uniform angular change so that the slope presents an evenly curved surface pleasing to the eye. The maximum horizontal gap between adjacent geogrids at the slope face shall be 10 mm. | Front face varies not more than 100 mm from a 5 m straight edge held horizontally and vertically. The maximum horizontal gap between adjacent geogrids at the slope face shall be 10 mm. | For every section of geosynthetic installed | Photos | HOLD | External | JFC | REVIEW | T&T |
| 5.0 SUBSOIL DRAINAGE – COUNTERFORT DRAINS | | | | | | | | | | | |
| 5.01 | Pre-commencement | T+T NAL Recovery Specifications: 4.3 | Before any subsoil or bored inclined drain installation is commenced or fill is placed in any area the Contractor shall advise the Engineer. | The Contractor shall be responsible for the correct setting out of the work and shall see that the specified locations, gradients, depths and levels are strictly adhered to. | Engineer to be given at least one working days' notice, so that they may inspect the area and confirm the requirements. | Written confirmation from the Engineer | HOLD | External | JFC | WITNESS | T&T |
| 5.02 | Materials – Drainage Pipe | T+T NAL Recovery Specifications v2: 4.4.1.1 | Drainage pipe material as per spec and or drawings or as instructed by the Engineer | Counterfort drainage pipes shall generally be 110 mm diameter Nexus hi-way grade pipe, or as shown on the drawings or as instructed by the Engineer. The pipes shall be slotted as specified on the drawings with the slots carefully formed to 2 mm width (+/- 0.2 mm) and clear of all debris and swarf. The drainpipes shall comply with the relevant specifications referred to in TNZ F/2. | Visual inspection and check pipe matches spec and or drawings prior to installation | Photos, QA Checksheet(s), Material Dockets | HOLD | External | JFC | REVIEW | T&T |
| 5.03 | Materials – Filter Material and Backfill | T+T NAL Recovery Specifications v2: 4.4.1.2 | The counterfort drain pipe shall be surrounded and immediately overlain by filter materials as defined in TNZ F/2 | Filter material shall be placed in the trench to the thickness shown on the drawings or as instructed by the Engineer. Backfill material for the remainder of the trench shall be either clean well graded 40/20 or 20/7 material; or filter defined in TNZ F/2 or as instructed by the Engineer | Visual inspection and check materials match spec and or drawings and or Engineers instruction | Photos, QA Checksheet(s), Material Dockets | HOLD | External | JFC | REVIEW | T&T |
| 5.04 | Trench Excavation | T+T NAL Recovery Specifications: 4.4.2.2 | Trench grade and depth as shown on the drawings or as instructed by the Engineer | Trench widths shall be a minimum of 300 mm increasing to a minimum of 600 mm for trenches greater than 1 m deep. Trenches shall be excavated to depth/grade as shown on drawings or as instructed by the Engineer | For every line of trench excavated (approximately 25m) | Photos, QA Checksheet(s) | HOLD | External | JFC | WITNESS | T&T |
| 5.05 | Bedding and Installation of Drainage Pipe | T+T NAL Recovery | Installation of pipe and bedding material as per spec and or drawings | The drainage pipe lengths shall be joined following the manufacturer's instructions or as approved by the | For every line of trench excavated (approximately 25m)) | Photos, QA Checksheet(s) | HOLD | External | JFC | WITNESS | T&T |

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| | | Specifications: 4.4.2.3 | | Engineer, with the pipe jointing such as to leave a smooth flush internal surface. Min. 75mm of filter material which completely surrounds the drainage pipe | | | | | | | |
| 5.06 | Backfilling | T+T NAL Recovery Specifications: 4.4.2.4 | Contractor to propose, for the Engineers approval, a method of compaction and testing procedures to demonstrate that relative density has been achieved. | The drain pipe installation shall be inspected and approved prior to backfilling. Backfill above the filter material shall be carefully placed in 300mm layers and compacted into a min Relative Density of 70% | Method of compaction and testing to be reviewed by the Engineer Each length of pipe installed to be inspected and approved by the Engineer | Photos, QA Checksheet(s), Compaction methodology | HOLD | External | JFC | HOLD | T&T |
| 6.0 SUBSOIL DRAINAGE - OUTLET STRUCTURES | | | | | | | | | | | |
| 6.01 | Materials & Construction | T+T NAL Recovery Specifications: 4.6 | Materials used and construction as per drawings or in other sections of this spec. | Materials to be used for the outlet structures shall be as specified on the drawings or in other sections of this Specification. Outlet structure shall be constructed in accordance with the drawings and relevant sections of this Specs. | For every section of outlet structure | Photos, Dockets, QA Checksheet(s) | HOLD | External | JFC | REVIEW | T&T |
| 7.0 SUBSOIL DRAINAGE - TRACKSIDE DRAINS | | | | | | | | | | | |
| 7.01 | Materials & Construction | T+T NAL Recovery Specifications: 4.7 | Materials used and construction as per drawings and in accordance with KiwiRail Standards. | Materials to be used for the trackside drain shall be as specified on the drawings and in accordance with KiwiRail Standards Corridor Drainage C-ST-CD-4102. Trackside drains shall be constructed in accordance with KiwiRail Standards Corridor Drainage C-ST-CD-4102. | For every section of trackside drain | Photos, Dockets, QA Checksheet(s) | HOLD | External | JFC | REVIEW | T&T |
| 10.0 PILE SPECIFICATIONS | | | | | | | | | | | |
| 10.01a | Material Supply | | Supply materials as shown on the drawings | Compliance with AS 1163/API 5L | All piles | Mill Certificates | HOLD | HOLD | JFC | HOLD | T&T |
| 10.01b | Preliminary, Site Datum, and Grid References | T+T NAL Recovery Specifications: 7.1.1 & 7.1.2 | The Auckland Structural Group's Piling Specification Rev G, dated 12 March 2002, is used for piling construction, with project-specific requirements modifying it. Drawings show levels in NZVD2016 Vertical Datum. | The Auckland Structural Group (ASG) Piling Specification Rev G, dated 12 March 2002, is to be used for piling construction, with project-specific requirements modifying it. All levels shown on the Drawings are in terms of NZVD2016 Vertical Datum. Pile locations are shown on the Drawings. | Prior to construction of piles | | HOLD | External | JFC | REVIEW | T&T |
| 10.02 | Method Statement | T+T NAL Recovery Specifications: 7.1.4 | The method statement shall describe all proposed equipment, and detail the construction sequence including but not limited to: • Programme of the works, detailing the timing and sequence of individual portions of the works; • Full details of the installation plant to be used, including manufacturer's information and proof of servicing/recent upkeep; • Full details of proposed plant set-up and loading throughout the works to inform on the local stability during the construction; | Acceptance of Method Statement by the Engineer | At least two weeks prior to construction of piles | Method Statement | HOLD | External | JFC | HOLD | T&T |

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| | | | <ul style="list-style-type: none"> Proposed phasing of excavation/filling operations such that the design stresses in the piles (and any supporting frames) are not exceeded; (Driven piles) Pile driving methodology and equipment for driving piles; A contingency plan to be adopted in the event of encountering obstructions, to minimise disruption and delay; and, Example Pile Construction Card. | | | | | | | | |
| 10.03 | Tolerances | T+T NAL Recovery Specifications: 7.1.5, RFI 011 | Tolerances specified shall apply for the construction of the piles unless otherwise specified on the drawings or agreed with the Engineer | <p>The following tolerances shall apply, unless otherwise:</p> <ul style="list-style-type: none"> Position of pile head (at underside of cap) shall not vary more than -25/+75 100mm horizontally (- towards rail / + away from rail) and +/- 25 mm vertically from the true position as specified on the drawings. The maximum permitted deviation of the piles from the vertical, at any depth, shall not be greater than 1H:75V deviation from the vertical. | Tolerances to be inspected during construction of each pile | QA Checksheet(s), As-built | HOLD | External | JFC | REVIEW | T&T |
| 10.04 | Inspections | T+T NAL Recovery Specifications: 7.1.7 | The Engineer is required to have the opportunity to observe all phases of piling operations and inspect specific items, including driving piles and required testing. They must have access to all parts of the works included in the contract and be given at least three working days' notice when work is ready for inspection or testing. The Contractor must arrange inspection facilities and replace or rectify defective or unsuitable parts or materials at their expense, as per the Principal's contract documents. | <p>Engineer must be given opportunity to observe all phases of the piling operation.</p> <p>The Engineer shall have at all reasonable times access to all parts of the works included in the Contract.</p> | Engineer given at least 3 working days' notice of when work is ready for inspection or testing | QA Checksheet(s), Written Confirmation of Engineers Approval | HOLD | External | JFC | WITNESS | T&T |
| 10.05 | Producer Statements | T+T NAL Recovery Specifications: 7.1.9 | Producer Statement – Construction (PS3) are required for each structure for the construction of the piles, with relevant construction records. | PS3 submission for each structure of the construction of the piles with relevant records | Post construction | Producer Statement (PS3) | HOLD | External | JFC | REVIEW | T&T |
| 10.06 | Pile Embedment | T+T NAL Recovery Specifications: 7.2.4 | Set cards (showing sets and rebound) shall be inspected by the Engineer and embedment depth agreed upon. | Pile embedment as per the IFC drawings | Agreed with Engineer prior to driving pile | Written Confirmation of Engineers Approval | HOLD | External | JFC | HOLD | T&T |
| 10.07 | Piling Records | T+T NAL Recovery Specifications: 7.2.6 | <p>The piling record must be submitted on professionally formatted, clearly typed documents and only accepted after verification by the Engineer or the nominated site representative:</p> <ul style="list-style-type: none"> The date and time of installation. Sequence of driving (if driving in groups) The level of the bed at the commencement of operations. The pile number or location. The type and size of the vibrator (if used) and piling hammer. | Review cards by the Engineer | Records provided to the Engineer within 24 hours of pile completion | Piling Records | HOLD | External | JFC | REVIEW | T&T |

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|---|----------------------|--|--|---|--|--|----------------|---|-----------|-------------------------|--------------------|
| | | | <ul style="list-style-type: none"> The type and condition of the piling helmet and packing. Details of any variations in the penetration resistance. Any apparent deviation from specified location and inclination The length of the complete pitched pile. The toe level of the pile before and after driving. The distance driven. The distance drilled. Set information (blows per metre and hammer drop height) as specified on the drawings, including. The final set and rebound (averaged over the last 10 blows). Details of any interruption to driving <ul style="list-style-type: none"> As specified on the drawings, the set at which top of rock is inferred will be calculated by the Engineer (defined as the "rock set") for the first pile installed at each site. Driving sets applicable for rock shall be inferred from set information from the first pile installed. The Contractor shall record the inferred level of the top of the rock based on the "rock set" for the remaining piles. | | | | | | | | |
| 10.08 | Pile splices | RFI 004 | <ul style="list-style-type: none"> Welds by qualified Welder to AS/NZS 1554.1 Full penetration butt welds required in accordance with NZGS/SESOC Construction specification for bored and driven piles 2.2.6 & 2.2.7 Weld testing in accordance with RFI004 attachment section 11.10 & 11.11 | Pass/Fail | Records provided to the Engineer | Piling Records | HOLD | External | JFC | REVIEW | T&T |
| 11.0 STRUCTURAL SPECIFICATION – CONCRETE WORKS | | | | | | | | | | | |
| 11.01 | Aggregates | T+T NAL Recovery Specifications: 9.1.3.2 | The Contractor shall provide the Engineer with details of the types and source of supply of the aggregates | <p>Fine and coarse aggregates shall comply with the requirements of NZS 3121 and NZS 3111. The maximum size of coarse aggregate shall be 19 mm.</p> <p>Proposed aggregates are non-reactive as defined in clause 6.1 of the CCANZ report no. TR3, Alkali Silica Reaction: Minimising the Risk of Damage to Concrete : Guidance Notes and Recommended Practice (2 no. edn) 2003.</p> <p>Once approval has been obtained for the aggregates to be used, neither the quality</p> | At least two weeks before work is to commence. | Mix Design (Aggregate source) | HOLD | External | JFC | HOLD | T&T |

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|-------|---|--|---|---|---|--|----------------|---|-----------|-------------------------|--------------------|
| | | | | nor source shall vary without the prior approval of the Engineer. | | | | | | | |
| 11.02 | Reinforcing Steel | T+T NAL Recovery Specifications: 9.1.3.8 | Reinforcing bars to comply with specifications | Reinforcing bars shall be higher ductility plain carbon steel grade 300E or 500E as shown on the drawings, and shall comply with AS/NZS 4671 Grade 250N or grade 500N reinforcement is permitted where specifically indicated on the drawings. Grade 250L or 500L is not permitted. | For every reinforcing bar(s) used | Dockets | HOLD | External | JFC | REVIEW | T&T |
| 11.03 | Concrete Mix Design (from a non-approved ready mix concrete producer) | T+T NAL Recovery Specifications: 9.1.4.1 | The Contractor shall supply to the Engineer details of the concrete mix design for approval. These shall include the following: a weights of aggregates and water b cement weight c water/cement ratio by weight d target slump e target compressive strength f admixtures g concrete grade h mix designation | Engineer to approve mix design prior to commencement of concrete works | At least two weeks notice | Mix Design | HOLD | External | JFC | HOLD | T&T |
| 11.04 | Concrete Mix Design (from an audited NZRMCA plant) | T+T NAL Recovery Specifications: 9.1.4.2 | The Contractor shall advise the Engineer of the mix details, concrete supplier and provide all supporting documentation if requested to do so to confirm the audit status of the ready mix plant. | Engineer to review and approve mix design if requested to do so | Upon request of the Engineer | Mix Design | HOLD | External | JFC | WITNESS | T&T |
| 11.05 | Delivery Records | T+T NAL Recovery Specifications: 9.1.4.2 | Records shall be kept at the batching plant for each batch incl the following: i Batch number and docket number which can be referred back to the batch plant ii Specified slump iii Mix designation (minimum strength, aggregate size and admixtures) iv Specified strength v Date and time of mixing vi Quantity delivered vii Actual weight and type of cement, fine and coarse aggregate, weight of free water and hence the free water / cement ratio. | Records must meet the approved Mix Design | Records for each batch of concrete ordered | Concrete Dockets | HOLD | External | JFC | REVIEW | T&T |
| 11.06 | Testing – Slump Test | T+T NAL Recovery Specifications: 9.1.6.2 | The results of slump tests taken on samples of concrete supervised by the Engineer at the point of delivery shall be the only basis for defining the slump of the mixes supplied. | Tolerances for slump shall be in accordance with Table 9.1 (Snippet below). | At least one slump test on each batch of concrete | In-situ Slump Test Results | HOLD | External | JFC | REVIEW | T&T |

| ITP# | Work Pack Element(s) | Drawing / Specification Ref. | Specification Detail Summary | Acceptance Criteria | | Test Spec & Frequency | | Control Type i.e. Checksheet / Records | Hold / Witness | External (Requested by PS4) // Internal (JFC Requirement) | PS3 Owner | Hold / Review / Witness | PS4 Owner Sign Off | | | | | | | | | | | | | | | | | | | | | |
|--|-------------------------------------|--|---|---|------------------|---|---|--|----------------|---|-----------|-------------------------|--------------------|-------------------|-----------------------------|--------------------------------------|---------------------|----------------------|------------------|-----------------|-----------------|----|----|-----|-----|----------------|--|-------------------|----|------|---------|-----|---------------|---------------------------|
| <div>Table 9.1: Concrete mixes</div> <table><thead><tr><th>Grade designation</th><th>Maximum aggregate size (mm)</th><th>Specified compressive strength (MPa)</th><th>Method of placement</th><th>Specified slump (mm)</th><th>General location</th><th>Additional data</th></tr></thead><tbody><tr><td>30 (normal mix)</td><td>19</td><td>30</td><td>NBC</td><td>100</td><td>Deadman anchor</td><td>++ Max shrinkage 750 microstrains at 56 days</td></tr><tr><td>17.5 (normal mix)</td><td>19</td><td>17.5</td><td>Gravity</td><td>100</td><td>Site concrete</td><td>Mix approval not required</td></tr></tbody></table> | | | | | | | | | | | | | | Grade designation | Maximum aggregate size (mm) | Specified compressive strength (MPa) | Method of placement | Specified slump (mm) | General location | Additional data | 30 (normal mix) | 19 | 30 | NBC | 100 | Deadman anchor | ++ Max shrinkage 750 microstrains at 56 days | 17.5 (normal mix) | 19 | 17.5 | Gravity | 100 | Site concrete | Mix approval not required |
| Grade designation | Maximum aggregate size (mm) | Specified compressive strength (MPa) | Method of placement | Specified slump (mm) | General location | Additional data | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 (normal mix) | 19 | 30 | NBC | 100 | Deadman anchor | ++ Max shrinkage 750 microstrains at 56 days | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17.5 (normal mix) | 19 | 17.5 | Gravity | 100 | Site concrete | Mix approval not required | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11.07 | Testing – Compressive Strength Test | T+T NAL Recovery Specifications: 9.1.6.2 | Compressive testing to be undertaken | Three specimens tested at 28 days and another at 7 days (if required). Test results must comply with the parameters set on the approved mix design | | Three compressive strength specimens shall be moulded for each 75m3 of concrete placed. | Compressive Strength Lab Test Results | HOLD | External | JFC | REVIEW | T&T | | | | | | | | | | | | | | | | | | | | | | |
| 11.08 | Testing – air entrainment | T+T NAL Recovery Specifications: 9.1.6.5 | Air entrainment tests shall be carried out in accordance with NZS 3104 clause 2.15.3.1 and percentage of air entrained determined in accordance with NZS 3112 Part 1 | . Air entrainment values for the work shall be between 3% and 6% for concrete with nominal aggregate size greater than 20 mm, and 4 to 8% for 10 to 20 mm nominal aggregate size. | | At least one test on each batch of concrete | Lab Test Results | HOLD | External | JFC | REVIEW | T&T | | | | | | | | | | | | | | | | | | | | | | |
| 11.09 | Testing - Reinforcement | T+T NAL Recovery Specifications: 9.1.6.5 | The contractor is required to provide a steel manufacturer's test certificate for each reinforcement material grade supplied. Independent testing shall also be carried out by the Contractor: One tensile and two bend tests shall be carried out on a random sample of every bar size, type and grade, for every 250 tonnes batch of reinforcing steel delivered to the site, with a minimum of one series of tests for each bars size, type and grade. The tests shall be carried out in accordance with AS/NZS 4671, by an independent TELARC registered testing laboratory and the samples shall be selected by the Engineer. | Reinforcing steel shall be deemed acceptable if it complies fully with the requirements of AS/NZS 4671 | | Prior to use of reinforcement | Test certificates, Tensile and Bend Tests Results | HOLD | External | JFC | HOLD | T&T | | | | | | | | | | | | | | | | | | | | | | |
| 11.10 | Concrete Placing | T+T NAL Recovery Specifications: 9.1.7.4 | Engineer or rep to be advised before any concrete is placed to inspect the formwork and reinforcement | Engineer or rep to approve pre-pour inspection | | At least 48 hours before concrete placement | QA Checksheet(s), Written Confirmation of Engineer’s/Rep Approval | HOLD | External | JFC | HOLD | T&T | | | | | | | | | | | | | | | | | | | | | | |
| 11.11 | Curing Compounds | T+T NAL Recovery Specifications: 9.1.7.8.4 | Curing compound details shall be approved in writing by the Engineer, such details shall be accompanied by test certificates to show that the compound will give satisfactory results for the proposed application | The compound shall be applied in strict accordance with the Manufacturer’s Specification and shall be applied as soon as the surface water has disappeared | | At least 6 days prior to use of curing compound | Curing Compound Spec Sheet, Confirmation of Engineer’s/Rep Approval | HOLD | External | JFC | HOLD | T&T | | | | | | | | | | | | | | | | | | | | | | |
| 11.12 | Cast-in items | T+T NAL Recovery Specifications: 9.1.8.1 | Holding down bolts and inserts shall be secured and fixed before the concrete is placed or, if shown on the drawings or if directed by the Engineer, recesses or blockouts shall be made in the concrete and the holding down bolts or inserts shall be grouted in place, or embedded in the second-stage concrete | The position tolerance on cast-in items shall be as follows: • bolts and inserts +/- 10 mm All cast-in items shall meet the durability requirements of the New Zealand Building Code. | | Visual check prior to concrete placement | Photos, QA Checksheet(s) | HOLD | External | JFC | REVIEW | T&T | | | | | | | | | | | | | | | | | | | | | | |

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|---|---------------------------------|--|---|---|---|--|----------------|---|-----------|-------------------------|--------------------|
| 11.13 | Construction Joint | T+T NAL Recovery Specifications: 9.1.9.1 | Construction joints shall be formed in the position shown on the drawings unless a change is approved by the Engineer | Construction joints shall be formed in the position shown on the drawings unless a change is approved by the Engineer | Contractor to confirm joint locations with Engineer prior to concrete pour | Photos, QA Checksheet(s) | HOLD | External | JFC | HOLD | T&T |
| 11.14 | Sealants | T+T NAL Recovery Specifications: 9.1.9.3 | Joints show on the drawings shall be sealed, with works undertaken in accordance with manufacturer's instructions and by an experienced applicator. Contractor shall submit details of the proposed sealant and applicator to the approval of the Engineer | Engineer to approve proposed sealant and applicator | Prior to sealant works | Joint material spec, Applicator's credentials, Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |
| 11.15 | Tolerances and Surface Finishes | T+T NAL Recovery Specifications: 9.1.10 | All concrete work shall be set out and constructed to achieve the structural tolerances specified in The Specs & drawings. | Surface finish as follows: Below Ground (surfaces not seen) Finish: F1 U1 Surfaces in contact with water Finish: F5 U4 All channels Finish: F4 U3 | For every concrete pour | Photos, QA Checksheet(s) | HOLD | External | JFC | REVIEW | T&T |
| 11.16 | Concrete Repair | T+T NAL Recovery Specifications: 9.1.11 | Contractor shall advise the Engineer of the presence of any defective concrete | Repair of imperfections to be completed within 7 days of removal of forms. Engineer to approve repair methods and materials used | For concrete works that require repair | Material Specs, Repair Methodology, Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |
| 11.17 | Slab on Grade | T+T NAL Recovery Specifications: 9.1.12 | The Contractor must adhere to minimum requirements before placing concrete ground slabs, compact the subgrade using a footpath roller or plate compactor, obtain Engineer's approval before hardfill is placed, and remove soft spots as directed. | Engineer to inspect and approve subgrade before hardfill is placed | Before placing concrete ground slabs | Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |
| 11.18 | Shop Drawings | T+T NAL Recovery Specifications: 9.1.14 | The Contractor is required to create shop drawings for precast units and concrete metal work, which must be submitted to the Engineer for approval before commencing operations. The Contractor is responsible for the accuracy of these drawings, ensuring competent tradesmen can fabricate structures to the dimensions and standards specified in the specifications. | Shop drawings reviewed and approved by Engineer | Prior to fabrication or pre-cast units and metal work cast into concrete | Shop Drawings, Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |
| 12.0 STRUCTURAL SPECIFICATION – STRUCTURAL STEELWORK & METALWORK | | | | | | | | | | | |
| 12.01 | Origin of Steel | T+T NAL Recovery Specifications: 9.2.5 | The Contractor shall submit steel source steel list as described in the SCNZ Report to the Design Engineer for review. | Evidence of conformity meeting the requirements of the SCNZ Report shall be submitted to the Construction Reviewer for review | Prior to procurement of steel | Steel Source List | HOLD | External | JFC | REVIEW | T&T |
| 12.02 | Inspections | T+T NAL Recovery Specifications: 9.2.7 | The contractor must inform the Engineer of shop work commencement in advance, offer necessary assistance for material observation, and ensure reasonable access to work locations. The contractor must cooperate with the Engineer in arranging inspections and keeping them informed about all stages of work. | Engineer to provide approval of inspection. | The following inspections are required by the Engineer: • Random inspection during the fabrication process; • After completion of fabrication and application of all protective coatings; and | Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |

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|--|--------------------------|--|---|---|---|---|----------------|---|-----------|-------------------------|--------------------|
| | | | | | • After erection in final location in the works. | | | | | | |
| 12.03 | Bolts, Nuts, and Washers | T+T NAL Recovery Specifications: 9.2.8.3 | The contractor must ensure the bolt, nut, and washer set have correct markings, and unmarked bolts should not be used. If no certification is provided, the Engineer may reject the bolts or request testing in accordance with AS/NZS 1252 Appendix A | If there is no certification provided the Engineer may reject the bolts and nuts or request them to be tested in accordance with AS/NZS 1252 App | Prior to use of bolts, nuts, and washers. | Certification for the bolts and nuts | HOLD | External | JFC | WITNESS | T&T |
| 12.04 | Fabrication | T+T NAL Recovery Specifications: 9.2.10.1 | The Engineer approves all quality control and checking procedures, and after a component's fabrication and erection, the Contractor must promptly provide the Engineer with the results of all quality control checks for that component. | Engineer to approve quality control and checking procedures | Prior to and during fabrication | QC and Checking Procedures, Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |
| 12.05 | Tolerances | T+T NAL Recovery Specifications: 9.2.10.2 | General Tolerances Straightness length/500 Structural dimensions + 3 mm Plan position of structural members + 5 mm Level of structural members + 5 mm. | Fabrication tolerances shall not be exceeded. If the assembled item's tolerance doesn't meet the clause, the Contractor and Engineer must agree on a method for achieving acceptable tolerances | For every section of steelwork and metalwork installed | QA Checksheet(s), Photos | HOLD | External | JFC | REVIEW | T&T |
| 12.06 | Welding | T+T NAL Recovery Specifications: 9.2.10.17 | Before any welding is commenced, the Contractor shall advise the Engineer so that they may have an opportunity to inspect any of the prepared surfaces. | Surfaces cleaned, prepared, and prepped for welding | Before any welding is commenced | Email trails | HOLD | External | JFC | WITNESS | T&T |
| 12.07 | Weld Quality Control | T+T NAL Recovery Specifications: 9.2.10.17 | An independent Welding Inspector will conduct all necessary inspections, tests, and reports, including NDT testing, for welding defects, and must be qualified to AS/NZS1554. The Welding Inspector must be approved by the Designer, and their details, including company, technical qualifications, and curriculum vitae | The Welding Inspector shall record all details of its inspections and shall submit a weekly written report covering progress, testing, rework and welding quality matters for that week. Welding procedure sheets shall be prepared by the fabricator and approved by the Welding Inspector. | Inspector details must be submitted two weeks before commencing structural steelwork fabrication. | Welding Procedure Sheets, Written Confirmation from Welding Inspector | HOLD | External | JFC | HOLD | T&T |
| 12.08 | Corrosion Protection | T+T NAL Recovery Specifications: 9.2.13.3 | Corrosion protection shall be fabricated and erected in accordance with a quality plan meeting the requirements of AS/NZS9002 Applicators shall have in place formal written quality assurance procedures appropriate to the scope of work, prior to commencing work on application of the corrosion protection system. | The Quality Plan shall allow for the engagement of an independent Corrosion Protection Inspector to carry out inspections and coating thickness measurements and provide corresponding reports in accordance section 11 of AS/NZS 2312. | Prior to fabrication of corrosion protection | Quality Plan, Written Confirmation from Corrosion Protection Inspector | HOLD | External | JFC | HOLD | T&T |
| 12.09 | Storage and Handling | T+T NAL Recovery Specifications: 9.2.14.2 | The Contractor shall lay down the steelwork on the site at the position agreed with the Engineer | Prior to erection all steelwork shall be cleaned as necessary to the satisfaction of the Engineer. | Prior to erection of steelwork | Photos, Written Confirmation from Engineer | HOLD | External | JFC | WITNESS | T&T |
| 12.10 | Erection Method | T+T NAL Recovery Specifications: 9.2.14.3 | A detailed method statement shall be prepared covering structural steel erection | Engineer to review and approve method statement prior to erection of steel on site | 2 weeks before commencing structural steel erection on site | Method Statement, Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |
| 13.0 CIVIL SPECIFICATION – PIPES & ASSOCIATED WORKS (GRAVITY DRAINAGE SYSTEM) | | | | | | | | | | | |
| 13.01a | Material Supply (CH136) | RFI 008, DWG 1090705-622rB | Supply materials as shown on the drawings | Material certificates | Each culvert | QA Checksheet(s), supplier dockets | HOLD | Internal | JFC | witness | T&T |

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|---|---|---|--|--|---|---|----------------|---|-----------|-------------------------|--------------------|
| 13.01b | Manhole Foundation | T+T NAL Recovery Specifications: 10.1.3.3.2 | The manhole structure shall be constructed or placed on a levelling course placed on top of the subgrade material. The levelling course shall comprise a 100 mm minimum layer of compacted approved AP20 granular material or concrete. | The suitability of the subgrade material shall be confirmed by the Engineer | Prior to placement of levelling course | QA Checksheet(s), Test Result(s), Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T |
| 13.02 | Manhole Testing | T+T NAL Recovery Specifications: 10.1.3.3.3 | The Engineer may require a watertightness test to be carried out at manholes. | The manhole shall be considered watertight if the drop does not exceed 0.2 litre per square metre of internal cross-section area per metre depth of the manhole. | Upon request | Test Result, Photos, Written Confirmation of Engineer's Approval | HOLD | External | JFC | WITNESS | T&T |
| 13.03 | Transport, Handling, and Storage of Materials | T+T NAL Recovery Specifications: 10.1.4.2 | Materials will be inspected by the Engineer, at their discretion, upon delivery to Site or as soon thereafter as practicable. | Damaged or unsatisfactory materials noted at that time will be marked and the Contractor shall either replace the item or if the Engineer permits, repair the defect in an approved manner. | At the Engineer's discretion | Written Confirmation of Engineer's Acceptance | HOLD | External | JFC | WITNESS | T&T |
| 13.04 | Tolerance | T+T NAL Recovery Specifications: 10.1.4.5 | For all culverts: <ul style="list-style-type: none"> An overall slope tolerance of + / - 0.5% is acceptable for installed culvert unless absolute maximum or minimum grades are stated on the Drawings (+/- 0.25% for CH136) Each separate pipe shall be individually set to line and within 10 mm of the invert levels shown on the Drawings provided that the deviation from a string line extending over two pipe lengths shall not exceed 10 mm. No sections of pipe shall be laid with an adverse (negative) grade unless shown otherwise on the Drawings | Tolerances are adhered to | For every section of pipe laid | QA Checksheet(s), Photos | HOLD | External | JFC | REVIEW | T&T |
| 13.04 | As built Culvert information | | Complete KiwiRail document M37c | Engineer's & KiwiRail acceptance | At completion | KR documents: M37c | Witness | Internal | JFC | HOLD | KiwiRail |
| 14.0 CIVIL SPECIFICATION – TRENCHING, BEDDING, AND BACKFILLING | | | | | | | | | | | |
| 14.01 | Trenching | T+T NAL Recovery Specifications: 10.2.5.1.1 | Trench excavation to be carried out in accordance with KiwiRail Civil Engineering Standard Culverts C-ST-CD-4103 Section 7.1.2. | Excavation in line with KiwiRail Civil Engineering Standard Culverts C-ST-CD-4103 Section 7.1.2.. | For every section of trench | QA Checksheet(s), Photos | HOLD | External | JFC | REVIEW | T&T |
| 14.01b | Trenchless method | T+T NAL Recovery Specifications v2: 10.3 | Trenchless methods of culvert installation to be carried out in accordance with KiwiRail Civil Engineering Standard Culverts C-ST-CD-4103 Section 7.1.4 | Trenchless methods of culvert installation to be carried out in accordance with KiwiRail Civil Engineering Standard Culverts C-ST-CD-4103 Section 7.1.4 | For every section of trench | QA Checksheet(s), Photos | HOLD | External | JFC | REVIEW | T&T |
| 14.02 | Unsuitable Foundation | T+T NAL Recovery Specifications: 10.2.5.1.4 | If trench bottom material isn't suitable for pipe foundation, Contractor must over-excavate upon receipt of order from the Engineer, and backfill with approved material. | Over excavation required if trench invert is less than the CBR values in Table 10.1 (snippet below). Replacement material tested for strength using Clegg Hammer or Scala and shall achieve equivalent CBR strength values given in Table 10.1. | <ul style="list-style-type: none"> For pipe diameters < 1,000 mm: testing at 10 m maximum centres for each placed layer. For pipe diameters 1,000 mm to 1500 mm: testing at 5 m maximum centres for each placed layer. For pipe diameters > 1,500 mm: testing at 2.5 | QA Checksheet(s), Clegg and or Scala Test Results, Photos | HOLD | External | JFC | REVIEW | T&T |

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|--|--|---|---|--|---|---|----------------|---|-----------|-------------------------|--------------------|------------------|--|-------------------|-----|---|---|---|-----|---|--|
| | | | | | m centres for each placed layer. | | | | | | | | | | | | | | | | |
| <div><div>Table 10.1: Trench invert strengths</div><table><tr><td>Trench situation</td><td>Minimum required CBR value at trench design invert level</td></tr><tr><td>In non-road areas</td><td>3.5</td></tr><tr><td>In permanent road areas with depth to trench invert less than 0.6 m</td><td>5</td></tr><tr><td>As in 2. but with depth to trench invert greater than 0.6 m</td><td>3.5</td></tr><tr><td>Beneath temporary construction haul roads</td><td>add 3 to the above permanent road case CBR's</td></tr></table></div> | | | | | | | | | | | | Trench situation | Minimum required CBR value at trench design invert level | In non-road areas | 3.5 | In permanent road areas with depth to trench invert less than 0.6 m | 5 | As in 2. but with depth to trench invert greater than 0.6 m | 3.5 | Beneath temporary construction haul roads | add 3 to the above permanent road case CBR's |
| Trench situation | Minimum required CBR value at trench design invert level | | | | | | | | | | | | | | | | | | | | |
| In non-road areas | 3.5 | | | | | | | | | | | | | | | | | | | | |
| In permanent road areas with depth to trench invert less than 0.6 m | 5 | | | | | | | | | | | | | | | | | | | | |
| As in 2. but with depth to trench invert greater than 0.6 m | 3.5 | | | | | | | | | | | | | | | | | | | | |
| Beneath temporary construction haul roads | add 3 to the above permanent road case CBR's | | | | | | | | | | | | | | | | | | | | |
| 14.03 | Pipe Bedding & Support | T+T NAL Recovery Specifications: 10.2.5.2 | Pipe bedding to be carried out in accordance with KiwiRail Civil Engineering Standard Culverts C-STCD-4103 Section 7.1.3. | Pipe bedding in line with KiwiRail Civil Engineering Standard Culverts C-STCD-4103 Section 7.1.3 | For every section of pipe bedding and support | QA Checksheets, Photos, Test Results | HOLD | External | JFC | REVIEW | T&T | | | | | | | | | | |
| 14.04 | Backfilling | T+T NAL Recovery Specifications: 10.2.5.2 | Backfilling to be carried out in accordance with KiwiRail Civil Engineering Standard Culverts C-ST-CD-4103 Section 7.1.3. | Backfilling in line with KiwiRail Civil Engineering Standard Culverts C-STCD-4103 Section 7.1.3 | For every section pipe backfilled | QA Checksheets, Photos, Test Results | HOLD | External | JFC | REVIEW | T&T | | | | | | | | | | |
| 15.0 CIVIL SPECIFICATION – ROCK ARMOUR | | | | | | | | | | | | | | | | | | | | | |
| 15.01 | Rock Armour Grading | T+T NAL Recovery Specifications: 10.4.3.1.1 | Rock armour material shall be well graded as indicated on the drawings. | Poorly graded or gap graded armour rock shall not be permitted except as approved by the Engineer. | For every section of rock armour | Rock Specifications | HOLD | External | JFC | REVIEW | T&T | | | | | | | | | | |
| 15.02 | Rock Armour - Placement | T+T NAL Recovery Specifications: 10.4.4.4 | The placement method of armour and underlayers directly on geotextile filter fabric shall be approved by the Engineer prior to placement | Engineer to approve methodology | Prior to rock armour placement | Method Statement, Written Confirmation of Engineer's Approval | HOLD | External | JFC | HOLD | T&T | | | | | | | | | | |
| 15.03 | Tolerances | T+T NAL Recovery Specifications: 10.4.5.2 | Rock materials must be placed according to the drawings' levels, dimensions, and slopes, and the surface profile must be measured using the specified tolerances: - Subgrade levels -0.1 m to +0.1 m - Armour underlayer thickness (average per profile): -0.1 m to +0.2 m - Armour rock thickness (average per profile): -0.1 m to +0.5 m | Tolerances are adhered to | For every section of rock material placed | QA Checksheet(s), Photos | HOLD | External | JFC | REVIEW | T&T | | | | | | | | | | |

Sub-contractor ITPs (Refer to OP06_f09 ITP Index for Subcontractors)

| ITP# | Work Pack Element(s) | Drawing / Specification Ref. | Specification Detail Summary | Acceptance Criteria | Test Spec & Frequency | Control Type i.e. Checksheet / IANZ Records | Hold / Witness | Internal / External | PS3 Owner | Hold / Witness | PS4 Owner |
|---|----------------------|------------------------------|------------------------------|---------------------|-----------------------|---|-----------------------|---------------------|-----------|----------------|-----------|
| Drainage (Directional Drilling) – Pipe Installation | | | | | | | (ENTER SUBCONTRACTOR) | | ENGINEER | | |
| 30 | | | | | | | | | | | |
| 31 | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| 33 | | | | | | | | | | | |
| 34 | | | | | | | | | | | |
| Sub Activity 2 (INSERT QA SHEET NAME) | | | | | | | (ENTER SUBCONTRACTOR) | | ENGINEER | | |
| 35 | | | | | | | | | | | |
| 36 | | | | | | | | | | | |
| 37 | | | | | | | | | | | |
| 38 | | | | | | | | | | | |
| 39 | | | | | | | | | | | |

ITP Induction Sign On

| ITP Induction Sign-on | | |
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