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9. WATER RACES

This Part includes:

- The assessment of required infrastructure
- Technical design requirements
- Material requirements
- Completion Documentation requirements for vested asset acceptance

The Resource Management Act (RMA) and Local Government Act (LGA) are the principal statutes that controls land development, including water race aspects.

The Selwyn District Council has formed the Water Race Bylaw 2008 pursuant to section 146 (b)(i) of the Local Government Act 2002.

Unless stated in SDC's Engineering Code of Practice (ECOP) Part 7: Water Races and Part 5: Stormwater and Land Drainage, please refer to CCC's Waterways, Wetlands and Drainage Guide and CCC's Construction Standard Specification for further guidance.

9.1 REFERENCED DOCUMENTS AND LEGISLATION

The following documents are referenced in addition to those referred to in Part 5: 5.1 'Stormwater and Land Drainage - Referenced documents:

- Selwyn District Council Water Race Bylaw 2008
- Selwyn water race guidelines (Including standard drawings)
- Selwyn District Council Water Races Activity Management Plan
- Canterbury Regional Stormwater Forum
- Selwyn District Council Policy manual
- Folder: SDC_Public (selwyn.govt.nz) – Live GIS Asset data for existing services
- Christchurch City Council Waterways, Wetlands and Drainage Guide (WWDG)
- Selwyn District Council - 5Waters Activity Mgt Plan

9.2 OVERVIEW OF SELWYN DISTRICTS WATER RACE NETWORKS

The water race network extends across the plains of the Selwyn District and is made of three schemes:

- Paparua
- Malvern
- Ellesmere

The primary objective of the water race network is to supply drinking water to stock animals. The secondary objectives of the water race network are to:

- Provide water for firefighting services
- Provide water for commercial and non-commercial irrigation
- The enhancement of amenity and ecological values of the Selwyn district

The Water Race network in Selwyn began operations in the 1800's, over 130 years ago. Council manages approximately 1,700kms of water race network that runs across the district. The water races provide significant

character and amenity values to the district. This needs to be considered and valued when considering works to the Stock Water Race Scheme

Please contact Council Water Services directly to discuss a particular water races, operational status or existing property water race irrigation rights or any proposed work modifications etc.

9.2.1 Effects of Development on the Water Race Network

Any development reliant on the municipal supply will be required to contribute to the infrastructure necessary to connect. The developer is responsible for the cost (or part cost) of any system extension.

Any changes or alterations to a water race proposed by a new development will need to ensure the existing user's level of service is not negatively affected.

9.2.2 Water Race Resource Constraints and Consents

New water race systems including diversions require approval from the Council. Any alterations to a stock water race including new water race systems, diversions, closures, require approval from the Council. Approval shall be sought from the Selwyn District Council Water Services Department, or via engineering approval with an associated SDC Resource consent.

There are separate subdivision and land use resource consent procedures in which stock water race issues may arise. The input of appropriate Selwyn District Council staff is required. Early discussion, particularly pre-application meetings between the District Council and the applicant, can be an effective way of moving a proposal forward.

Note that the information given in WWDG Part B chapter 17, although useful may not be directly transferable to the Selwyn District.

Applicants should also consult with Canterbury Regional Council (Environment Canterbury) staff to determine any other approvals required.

Consult with authorising officers from both Councils prior to consent application. It is good practice for the Council and the Canterbury Regional Council to process subdivision and water-related resource consents simultaneously and deal with land and water issues at a joint hearing pursuant to section 102 of the RMA.

Consultation with Environment Canterbury staff should be sought to clarify if consent is required for:

- Piping of water races
- Diverting of water races
- Closure of water races
- Installation of structures, ponds, or enhancements
- Spraying of water races
- Fish Salvage and relocation

Council staff may aid with a water race proposal to Environment Canterbury made by an applicant.

Consents for water race would need to be applied for an exercised in conjunction with wider development consents for a project (i.e., stormwater, earthworks, and general consents).

Discharge of stormwater directly to water races is always prohibited.

Any alteration, culvert pipeline or structure must be inspected by Council prior to acceptance into the network/scheme or vested with Council's ownership.

Only contractors suitably qualified and experienced are permitted to perform works on Selwyn District Council water race network for:

- Install pipework or relocate races that will be vested into the Council
- Install pipework that is located within legal roads.

9.3 INFORMATION TO BE PROVIDED AT RESOURCE CONSENT

Specific information to be provided for water races with any concept drawings or Resource Consent plans must include:

- The location of existing water race and any existing water race structures e.g., weirs and gates
- Any proposal to move, pipe or close the water race
- The location of any archaeological and historical features
- Representative pre-existing and post development cross-sections through any water race
- The proposed proximity of buildings to the water's edge and/or shoulder of the banks. Note: Any setback <5m from water race requires Council approval
- Identification of any natural or artificially created basins/ponds/wetlands
- The impact of any proposed filling or excavation on existing water races
- Existing services and easements
- Details of any contaminated ground or historical filling
- Protected trees, other significant vegetation, and other features to be protected and retained (e.g., natural landforms, ecological protection areas)
- Details of any investigations such as ground water levels, profiles, infiltration testing and effects on the environment and geological or water quality assessments
- Concept plans for site stormwater design to minimise interaction between stormwater and water races
- Proposal for easement over water race. This includes allowance for heavy machinery to access the water race from the roadside and to access all parts of water race for cleaning and maintenance purposes
- Whether the water race within the site boundary will be privately maintained or SDC maintained

9.4 WATER RACE DESIGN CONSIDERATIONS

The water race network is the total system required to convey water for the purpose of supplying farms with water for stock. It consists of a system of open channels, pipes, and culverts.

When designing alterations to a water race for Council to review please consider the following and provide supporting evidence in the Design Report:

- Width, depth, and gradient of race
- Size (or sizes) of the pipework throughout the proposed system
- Selection of appropriate pipeline material type(s) and class
- Lining material for the race
- Layout and alignment including route selection, topographical and environmental aspects, easements, foundation aspects, and clearances
- Hydraulic adequacy including acceptable flow velocities and other requirements where applicable to satisfy WWDG Part B chapter 22
- The race shall be design in such a way as to minimise scouring due to high velocities
- Geotechnical investigations - consider any geotechnical requirements determined under Part 3: Geotechnical Requirements
- Major reticulation and its potential for significant traffic disruption. Discuss at an early stage with Council
- Proposed alignment of new water races including description how system will operate.
- Stormwater design to minimise interaction between stormwater and water races

- Allowance for heavy machinery to access the water race from the roadside and to access all parts of water race for cleaning and maintenance purposes. Water races within private residential lots must be avoided as far as practical.
- Confirmation of whether the water race within the site boundary will be privately maintained or SDC maintained

9.4.1 Design Life

All water race network systems are expected to last for an asset life of 100 years (depending upon asset type) with appropriate maintenance and must be designed accordingly to minimise life cycle costs for the whole period.

All products must be fit for their respective purpose and comply in all respects with the Council's current specification for the supply of that material and the standards referenced.

9.4.2 Material Specification

Council approval is required to confirm and accept proposed materials for any water race construction. All materials must be included in the design report and be approved as part of engineering approval process.

Full quality records (as per the manufacturer's Quality Assurance manual) must be available on request for evaluation by the Council and be kept for a minimum period of 10 years.

Both the developer and the contractor are responsible for ensuring the appropriate handling, storage, transportation and installation of pipes and fittings to avoid damage and to preserve their dimensions and physical properties. The total exposed storage period from the date of manufacture to the date of installation for all PVC and Concrete pipe must not exceed 12 months. Store fittings under cover at all times.

Specific details for race construction is detailed in the Race Geometry section, and should races should be lined with clay or Bentonite mixed with natural material /gravel. Council may consider geotextile lining (matting) along the banks of water races, approval will be given on a case-by-case basis as required.

The Council reserves the right to require full details of the manufacturer's means for demonstrating compliance. Irrespective of the means of demonstrating compliance and the supplier's and manufacturer's quality assurance systems, responsibility remains with the developer to ensure the installation of products that conform with the requirements of the ECOP and the appropriate standards.

Positive verification inspections or testing results obtained by the Council shall not limit the supplier's responsibility to provide an acceptable product, nor shall it preclude subsequent claims made under warranty due to manufacturing defects, faulty design, formulation, or processing.

9.4.3 Minimum Protection Standards for New Developments

For the protection of buildings, design and build the water race system so that every new building platform is at least 400mm above top of water race banks. Note that the top of bank may include the drain tailings on the banks of the drain. Please consult appropriate Selwyn District Council staff to confirm normal flow levels for the water race. Note that other criteria such as stormwater flood levels may govern the minimum height of building platforms. Council may require building platforms to be elevated more than 400mm above normal water race flow levels if other risks are deemed to impact on the building platform minimum height.

Building setbacks are defined in the Water Race Bylaw and the SDC District Plan.

These are utilised in conjunction with the setting of building levels to ensure that buildings remain free of inundation up to the minimum protection standard. Protection standards are set by the RMA, the District Plan and the Building Act and are discussed in WWDG Part B chapter 20.

9.4.4 Spoil Cleaning Prior to Works

Prior to commencing any approved physical alterations to a water race all previous historic race cleaning spoil which has been deposited along the race banks shall be removed by the contractor completing the works. The bank of the water race will be formed to the height that was specified at Engineering Approval or Councils discretion.

Any water race spoil removal by contractor/developer requires approval from the Council.

When planning to undertake water race spoil cleaning Designers/Contractors are to consider the following concerns in the proposal for works/design report:

- Water race banks shall not be excavated lower than the highest expected water level or existing ground level
- Water race banks shall not be weakened in anyway such that bank failure or overtopping occurs
- A water test is required post cleaning
- Re-instatement of banks – including of prevention of sediment run off into the water race

The water loss test should be done when the water race is cleaned or modified in any way (including realignment or piping). The water loss test will involve flow gauging on the existing water race/waterway upstream and downstream of the modified/cleaned water race.

9.4.5 Contaminated Sites

Avoid contaminated sites wherever possible. If a contaminated site cannot be avoided, provide details about the following issues with the Design Report:

- Compliance with statutory requirements – NECS consent requirements
- Options for decontaminating the area
- Selection of materials and jointing techniques to maintain the water quality
- Safety of construction and maintenance personnel
- Any special pipeline maintenance considerations
- How any issues and concerns raised in the PSI report have been mitigated

9.5 DESIGN PARAMETERS

Designers are encouraged also to refer to Part 5 ‘Stormwater’ for reference to criteria for structures such as culverts and bridges etc.

For subdivision developments where water races are encountered the following hierarchy shall be incorporated into design of systems and development layout:

1. Retaining the water race as is, design development around
2. Keeping the water race within road reserve
3. Realignment of water race
4. Piping of water race
5. Closure of stock water race

Council may consider proposals for a water race to be converted into a reticulated pipeline. This must be considered against option of retaining as an open race. Council approval must be obtained before a pipeline system may proceed.

Water races within private residential lots must be avoided as far as practical. Consultation with Council prior to final design submission is essential to ensure the best solution for water race is selected.

9.5.1 Water Race Formation and Geometry

Designers must demonstrate they meet the following requirements in the design report:

- Water race formation and geometry shall be in accordance with standard drawing **WR 8.0**
- The water race is designed to have minimal water loss through infiltration (specify the types of backfill used for approval)
- The water race is incorporated cleanly into the existing landscape or new landscape
- An additional layer of granular gravel material (e.g., AP20 or AP40) shall overlay the liner for protection and reduce suspension of fine particles
- The side slope of any new/diverted water race shall be no steeper than 1(V):1(H). The base width shall tie-in with the race up and downstream. Base widths are typically 1.0 – 1.5m.
- There should not be any sharp bends in the water race when tying-in with the existing water race or drainage network
- New and relocated water races are required to be lined with a minimum of 300mm of approved lining material
- Races should be lined with clay or Bentonite mixed with natural material /gravel. A mix of Bentonite and 85% gravel mix could be used
- Lime stabillisation may be required for mixed clay liners of 2-4% by weight
- A maximum particle size of 20% of the liner thickness should be used
- Liners should be well mixed on site to achieve uniform cay/bentonite distribution
- If used, pure Bentonite liners should be 20-50mm thick and covered with a compacted layer of topsoil/gravel
- Channel dimensions and batters should be agreed with Council Engineer for all new channels, Access to clean water races must be provided for in all new and relocated races
- Demonstrate that grade of the race will not cause issues to supply of water or cause excessive flow velocity leading to scour and erosion.
- Large rocks/boulders should not be present within the water race channel, as these impede mechanical cleaning of the water races
- Ensure that the piped water race network has appropriate clearances to other services and utilities (refer to Section 11 for more guidance)

Any deviation from these standards must be approved by Council's Development Engineering Manager or Council's Project Manager.

Note - The water loss test should be done when the water race is cleaned or modified in any way (including realignment or piping). The water loss test will involve flow gauging on the existing water race/waterway upstream and downstream of the modified/cleaned water race.

9.5.2 Open Channel Gradients and Acceptable Flow Velocities

Grade envelope criteria for open water races channels are as follows:

- Maximum gradient: 1%

- Minimum gradient: 0.2%

Exceptions may be permitted with Council approval only – but will require rigorous analysis to demonstrate acceptable performance over the asset life. If water race design is likely to result in high velocities, then:

- Ensure velocities are non-scouring
- Acceptable velocities will depend on soil conditions but should not exceed the velocities given in WWDG Part B Clause 22.7 Table 22-5

9.5.3 Piped Water Races

Refer also to Part 4 'Stormwater' for guidance on design of reticulation layout.

When a project is approved to pipe a water race, designers must use the following hierarchy to determine where to position pipelines:

- Within the road formation (refer WWDG Part B clause 14.2.1)
- Within public land with the approval the Council
- Within drainage reserves
- Within private property (if unavoidable) adjacent to, and if possible parallel to, boundaries, with a minimum offset to the pipe centreline of one metre

Consideration must be made to allow for access for construction and maintenance activities.

Designers must also adhere to the following factors when designing a piped water race network:

- Cross other asset types (e.g., road, railway line, creek, drain or underground service) perpendicular to the other asset type as far as is practicable
- Pipelines that require road crossings must have a minimum cover of 0.75m (the requirement to concrete cap must be identified in the design report and approved by Council)
- Proposed pipes and concrete structures that are likely to lie within Aggressive Groundwater Map will need additional protection such as an external plastic wrapping membrane.
- Waterstops must be installed on all pipelines with gradients steeper than 1:3 and where required by WWDG Part B clause 14.2.3 and WWDG Part B Table 14.2
- Detail design of all proposed waterstops must be included in design report for approval
- Allow for possible future building plans when locating proposed pipes
- Avoid putting maintenance structures within the property
- Specify physical protection of any pipelines necessary when they are located within or adjacent to the normal building areas or any engineering features (existing or likely) on the site e.g., retaining walls
- All pipelines must be laid in straight lines with a consistent gradient between manholes or inlet/outlet
- Provide manholes in accordance with WWDG Part B clause 14.4 and 14.5 and CSS: Part 3. Consult the Council before embarking on any part of the piped water race system design.
- Manholes that are part of a pipeline system shall be designed with sumps to capture silt travelling through the pipeline (contact Council for standard drawings)
- No feature should impede flow through a manhole, unless required for operation of a pipeline system
- The flow deviation angle between the inlet and outlet pipes must not be greater than 90 degrees (see Section 5)
- Locate and space manholes for easy maintenance (including cleaning)
- Manholes that will be benched need to be identified in the design report for approval
- Ensure that the effects of turbulence and/or hydraulic grade are considered for the pressure within manholes
- Ensure that manholes are secured against uplift in accordance with WWDG Part B clause 14.4
- Where a special manhole cannot be constructed with a standard riser the lid must:
    - Meet the WWDG Part B clause 14.4 requirements for structural design, confirmed by a Design Certificate

    - Have minimum concrete strength and cover of 40 MPa and 50mm respectively
    - Conform to the geometric requirements of SD 302 or SD 303, whichever is relevant
    - Manholes shall normally be provided on all water race pipelines as follows:
        - At each change of direction, pipe size or gradient
        - At each branching line or intersection
        - At the end of all terminal lines other than those with headwalls
        - At a spacing of not more than 90m (50m if critical line) for pipes of diameter 1500mm or less
        - At a spacing of not more than 120m for pipes of diameter more than 1500mm, with the approval of the Asset Engineer
- Details designs of any concrete structures that are not prefabricated will need to be included in the design report and approved by council

9.5.4 Minimum Pipe Sizes

Pipe diameter must be approved by council for any piped water race design and culvert. Sizing must allow for maximum possible flows for water races.

The minimum diameter water race culvert/pipe is

- Within the carriageway – 300mm
- Outside of the carriage – 225mm

Council does expect designers to calculate pipe loadings and specify pipe sizes in accordance with good practice.

9.5.5 Minimum Pipe Class and Fitting Class

When designing piped water race reticulation systems, the following minimum pipe classes are acceptable for use in the Selwyn district:

- PVC pipes:
    - Good ground conditions – SN 8
    - Poor ground conditions – SN 16
- All PE pipes – PN 12.5

Note that the minimum preferred grade is PE 100.

All Council vested PVC infrastructure (including individual laterals to the point of supply) shall be pressure tested to 30 kPa for 2 minutes with an allowable pressure drop of 2 kPa.

All PE infrastructure shall be designed, and pressure tested to the pressure rating of the lowest rated pipework or fitting. See CCC CSS Section 14.3.2, 14.3.3, and 14.3.4 for testing requirements.

9.5.6 Bridges and Culverts

When designing a bridge or culvert crossing proposed designs must meet the following requirements:

- All culverts within the stock water race network require standard precast concrete headwalls
- Culverts must be designed and constructed in accordance with standard drawing WR 10.0
- Council approval is required prior to construction of any bridge or culvert
- Provide proposed invert levels and details of the culvert/bridge for approval by Council

- Refer to Part 8: Roading and Transport for vehicle crossing design and the Bridge Manual and WWDG Part B chapter 13 for waterway design at bridges and culverts
- Where pipes are laid with shallow cover less than manufacturer's recommendations, concrete capping is required to protect the pipe and road pavement

9.5.7 Inlet and Outlet Structures

Design inlets and outlets in accordance with WWDG Part B clauses 14.6 and 14.7. The design report shall include but not be limited to the following:

- Management of the existing water level and effect of the design discharge on the network
- The effects of inlet and tailwater controls when designing culverts, as set out in WWDG Part B clause 22.9
- Consideration of back flow and any back flow prevention devices require
- Acceptable outlet velocities will depend on soil conditions, but should not exceed:
    - 0.5m/s where the substrate is cohesive
    - Velocities given in WWDG Part B Clause 22.7 Table 22-5.
- Requirements and appropriate design (including calculations) of energy dissipation devices in situations where non-scouring velocities at the point of discharge cannot be achieved for approval

9.5.8 Termination of Water Races

The end of a water race must dispose of excess water in ways that comply with SDC network consents for water races. A water race termination can either be the end point of an existing water race, or a new termination point for an approved race closure.

When designing a termination point for a water race consider the following in the design report:

- Justification of method of termination (to ground or by approved outfall) and evidence of compliance with standards and consent requirements
- The need to obtain additional ECan discharge consents when discharging to ground. Note that these consents must align with any existing SDC consents already in place
- Requirements for water race closures (extent and timeframes)
- The termination point must allow for expected race flows, and the possible flows that may be encountered during extreme rainfall events
- Design and locate soakpit systems to allow easy access for maintenance and where failure will not affect private properties
- Soakpits may be constructed to convey water to ground, soakpits must be constructed in accordance with standard drawing WR 13.0
- Detailed design of any soakpit must be included in the design report for approval and meet the requirements set out in WWDG Part B 6.5
- Carry out a geotechnical assessment including soakage tests when considering the large-scale use of infiltration systems
- If terminating into a natural waterway, details of the outfall structure must be supplied in the design report (including any dissipating structures necessary to ensure minimal erosion of the natural waterway occurs
- No obstruction which will impede the natural flow may be placed in the channel (including sharp bends)

Council staff must be consulted when proposing a termination method.

9.5.9 Clearances from other Services or Structures

Open water races will require a larger offset that specified in Section 12 and designers will be required to provide evidence that all practicable measures have been undertaken to prevent structural issues arising within the water race (such as bank collapse) in the design report.

The water race assets will be classed as 'Stormwater' for the purposes of utility clearance in Part 9 of the COP. Confirm these clearances with the network utility operators, before deciding on any utility layout or trench detail.

Locate race and associated pipe work that are adjacent to existing buildings and structures clear of the 'zone of influence' of the building foundations. Refer to Part 5 'Stormwater' for guidance on building over or near pipelines. If this is not possible, undertake a specific design covering the following:

- Protection of the pipe work
- Long term maintenance access for the race and pipe work
- Protection of the existing structure or building

Specify the protection mechanism used on the drawings submitted for Engineering Approval.

9.5.10 Water Race Easements

Water race systems shall generally be located within a reserve, easement, or road reserve. Using easements or road reserves in Residential or Business zones is subject to approval by the Asset Engineer.

The piped easement width is the greater of:

2 x (depth to invert) + OD

3.0 m

Where OD = Outside Diameter of the pipe laid in easement

The open channel easement width is the greater of:

1.5 x width of race + 6m
8m

Note: Width of race is measured between tops of bank

To be complaint with the water race bylaw, designers must consider the following:

- The easement registration **must** provide the Council with rights of occupation and access and ensure suitable conditions for operation and maintenance
- The easement should include allowance for heavy machinery to access the water race from the roadside and to access all parts of water race for cleaning and maintenance purposes
- **Provide access of 6m width** along at least one side of any race for maintenance, considering the 'reach' of cleaning machinery and the width/depth of the race. Vegetate berms and banks and construct at slopes that are stable, not prone to scour in flood flows and maintainable.
- Fencing over a race is permitted subject to Council approval and conditions. Fences must be constructed in a way the flow is not impeded and to prevent blockages of debris and material.
- No fence posts are permitted within water race channel.
- Gates must be provided for access along a water race, which may include machinery for cleaning.
- Fences must not significantly impede flood flows up to the minimum protection standards (Refer WWDG Part B clause 13.9)

9.6 CONSTRUCTION

Construction must be carried out in accordance with CSS: Part 3.

Wherever works are installed within existing legal roads, the developer must obtain a Corridor Access Request (CAR) for that work. The works must comply with requirements as set out in CSS: Part 1 for this type of work.

9.6.1 PE Pipeline Construction

All PE pipe joins are to be Butt Welds and Electrofusion couplers. The following weld test requirements must be met during construction:

- One pre-construction test for each weld
- One construction test weld for any number of welds up to 20 and then 1 test weld for every 20 welds completed

Note: the pre-construction and construction weld test results are required to be submitted with the completion documents supply to Council for review and acceptance.

Pre-construction welds must be done on site and with the same personnel and equipment that will be used to complete the whole job. If at any time throughout the course of construction either of the following changes:

- The personnel
- The welding equipment
- The welded material changes

Pre-construction weld tests will need to be redone.

9.6.2 CCTV Inspection

All new piped water races shall be inspected with CCTV in accordance with the NZ Pipe Inspection Manual (link here) to confirm construction has been completed in accordance with the approved engineering drawings.

Pipes shall be flushed prior to CCTV inspections.

The CCTV footage and operator analysis (CCTV logs) shall be collated on an indexed USB Drive or sharepoint link supplied to Selwyn District Council with the completion document package for review and acceptance. The CCTV inspection is to be carried out once construction is completed. If requested, a second inspection shall be done at the end of the defect liability period.

9.6.3 Bedding, haunching and backfill

Design bedding, haunching and backfill to conform with WWDG Part B clause 14.2.3.

Bedding and haunching materials must comply with CCC CSS: Part 1, and the pipe manufacturers' specifications or relevant NZS laying standard.

Specify backfill materials individually. The material used must be capable of achieving the backfill compaction requirements set out in CCC CSS.

Specify wrapping of the joints in all rubber ring jointed pipes and laterals with a geotextile that complies with TNZ F/7 strength class C. Select a geotextile that will prevent the infiltration of backfill or natural material into the stormwater system where pipes break under seismic loading.

Specify wrapping of the haunching for plastic pipes and laterals in liquefaction prone areas with a geotextile that complies with TNZ F/7 strength class C. This may improve the longitudinal strength of the pipeline, reducing potential alterations in grade.

9.7 COMPLETION DOCUMENTS (QUALITY ASSURANCE)

Provide the information below as part of your completion documentation package:

- Environment Canterbury compliance monitoring reports
- All performance test results (including pressure test results)
- CCTV inspection footage and logs of all pipelines 225mm diameter and greater
- Material specification compliance test results
- Compaction test results
- Subgrade test results
- Infiltration test results
- Operations and Maintenance manuals
- Commissioning Report and supporting information
- As-builts
- Easement documents

Provide the Council with a certificate for each pipeline tested including the date, time and pressure of the test. Provide details of the pipes in a form complying with the requirements of this ECOP, including manufacturer, diameter, type, class, jointing and contractor who laid the pipe.

Water races that have been realigned must also show records of the material used and conformance with the design criteria.

APPENDIX 1: STANDARD DRAWINGS

Drawing number			Name/description
WR	2.0		Stock water race connection requirements
WR	2.0A		Stock water race connection requirements for on farm reticulation
WR	2.0B		Stock water race connection requirements for garden use & shelter belts
WR	3.0		Standard control gate (main water race)
WR	3.1		Bearing block for control gate
WR	4.0		Typical Small control gate design for lateral races
WR	4.1		Typical control gate for lateral race weirs 1/3
WR	4.2		Control gate for lateral race weirs 2/3
WR	4.3		Control gate dimensions for lateral race weirs 3/3
WR	4.4A		Water race weir and gate concrete and reinforcement detail
WR	4.4B		Weir control for water races
WR	4.4C		Control gate design for water race pipe ID 110-220mm
WR	7.0		Water race requirements for ponds
WR	8.0		Relocation and new water race requirements
WR	9.0		Water race watering bay requirements
WR	10.0		Typical Water race road crossing cross-section
WR	11.0		Standard water race weir with bypass
WR	12.0		Standard weir configuration and construction details
WR	13.0		Water race syphon