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CODE OF PRACTICE FOR SUBDIVISION AND DEVELOPMENT

Section 6 Stormwater and Land Drainage

6.1. SCOPE

6.1.1. This part of the Code of Practice sets out the engineering requirements for the stormwater drainage associated with subdivision and land development projects, including performance standards, methods for design and construction, and materials specifications. The criteria are to be used irrespective of whether the network created on a site is to be accepted as part of the public network or to remain under private ownership and control.

6.2. PERFORMANCE STANDARDS

6.2.1. General

6.2.1.1. A stormwater reticulation and disposal system shall be provided that can be economically maintained and is adequate to safeguard people from injury or illness and to protect property and the natural environment from damage caused by surface water shall be provided.

6.2.1.2. Council, with input from Community Boards, has developed and agreed on the Levels of Service to be provided for each stormwater scheme, which are within the Council's Areas of Benefit. All urban areas shall discharge as specified by the Levels of Service for each community (refer to Table 6.11).

6.2.1.3. Stormwater generated by a property is required to be disposed of within the boundary of that property unless there is sufficient capacity within the network and discharge to the network is specifically authorised by Council.

6.2.1.4. Stormwater disposal through soak pits is permitted provided the applicant can demonstrate that:

- a. They can be economically maintained
- b. The long-term soakage capacity is adequate
- c. Soak pits are assessed and designed as per NZ Building Code E1/VM1 or as otherwise consented by Council's Development Engineer.



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- 6.2.1.5. A stormwater disposal system which incorporates detention ponds to minimise the impact of surface water runoff is permissible where authorised in Ward Specific Requirements (refer Table 6.11), provided alternative arrangements do not satisfy the requirements, and that these details are included in the resource consent application.
- 6.2.1.6. Stormwater Detention Basins are to be self-draining without the use of pumping equipment and are not permitted to permanently hold water or be used as a water feature. Detention basins are to be adequately landscaped and constructed to be economically maintained unless specifically approved otherwise.
- 6.2.1.7. Stormwater Retention Basins are not permitted unless demonstrated to be deemed necessary and shall be constructed with a controlled engineering outflow. Retention basins are to be adequately landscaped and constructed to be economically maintained.
- 6.2.1.8. All stormwater reticulation and disposal systems are to be constructed to convey surface water to an approved outfall, by means of gravity flow wherever possible.
- 6.2.1.9. Where pipes or lined channels are used, the systems shall avoid the likelihood of blockages, leakage, erosion, and penetration by roots or the entry of groundwater and shall be located to avoid the likelihood of superimposed loads of normal ground movements.
- 6.2.1.10. Self-cleansing velocities (minimum of 0.65m/s) are to be maintained within reticulation systems.
- 6.2.1.11. Surface flows on carriageways are to be controlled in order to enable safe and comfortable vehicle and pedestrian access across and along road reserves.
- 6.2.1.12. Stormwater systems shall be designed and installed to cater for full development in the catchment upstream of the subject site. Downstream effects are to be fully addressed.



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6.2.1.13. Where any public main passes through privately owned residential, commercial or industrial complexes then the main should be installed outside the building envelope. An easement shall be provided in favour of the Council to allow access and repairs to the main at all times.

6.3. MEANS OF COMPLIANCE

6.3.1. General

6.3.1.1. All primary land drainage systems shall be piped (where required by the Specific Ward requirements) unless otherwise approved, or where the runoff constitutes an existing natural perennial stream.

6.3.1.2. The design events for which the stormwater systems shall be designed are specified in Table 6.11.

6.3.1.3. The stormwater system shall be constructed in accordance with Table 6.11, with the freeboard to habitable floor as in Table 6.1:

Table 6.1 Freeboard to Habitable Floor

| Catchment | Minimum Freeboard |
|--------------------------|-------------------|
| Less than 1 hectare | 150mm |
| 1 to 5 hectares | 200mm |
| 5 to 20 hectares | 300mm |
| Greater than 50 hectares | 500mm |

6.3.1.4. The design of the stormwater system shall generally be in accordance with the runoffs derived from the Rational Method for catchments less than 500 hectares and by the Modified Rational Method for catchments greater than 500 hectares. Other methods may be used to verify the results from the Modified Rational Method.



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- 6.3.1.5. Stormwater Management Plans for some areas have been prepared. Rainfall data and design parameters are to be consistent with these plans. Refer to Council's Water Services Manager for these Plans.
- 6.3.1.6. Systems shall be designed to cater for the peak design flow, without surcharge, based on a "Colebrook - White" pipe roughness coefficient $K_s = 1.50$ for pipes up to and including 1000mm diameter: and $K_s = 0.60$ for larger piped systems.
- 6.3.1.7. Lined channels shall be designed with the following Mannings 'n' as in Table 6.2:

Table 6.2 Lined channel/Mannings 'n'

| Lining Material | Mannings 'n' |
|------------------------------------|--------------------------------|
| Dressed timber, joints flush | 0.011 |
| Sawn timber, joints uneven | 0.014 |
| Cement plaster | 0.011 |
| Concrete, steel troweled | 0.012 |
| Concrete, timber forms, unfinished | 0.014 |
| Untreated gunite | 0.015 - 0.017 |
| Brickwork or dressed masonry | 0.014 |
| Rubble set in cement | 0.017 |
| Earth, smooth, no weeds | 0.020 |
| Earth, some stones and weeds | 0.025.025 - 0.0300.033 - 0.040 |
| Natural river channels: | 0.075 - 0.150 |
| Clean and straight | 0.075 |
| Winding, with pools and shoal | 0.090 - 0.120 |
| Very weedy, winding and overgrown | 0.150 |



6.3.2. Resource Consents

6.3.2.1. Resource consents may be required from Waikato Regional Council for the diversion and/or discharge of stormwater. The applicant is responsible for making the necessary application and obtaining such consents before TCDC will accept the completed works. The applicant shall consult with TCDC's Development Engineer prior to lodging such consent applications.

6.3.2.2. All developments within catchments where TCDC have discharge resource consents will need to comply with any of the conditions that may apply to the proposed drainage system. In addition, any Catchment Management Plans' recommendations must be adhered to.

6.3.3. Gravity Mains Reticulation Layout

6.3.3.1. The cover to all pipes from finished ground level shall be a minimum of 600mm or as per the pipe manufacturer's specifications, whichever is the greater. Where this minimum cover cannot be achieved an approved concrete cover slab or other approved measures may be authorised by Council.

6.3.3.2. All inlets (other than service connections) to the primary piped reticulation in urban areas where the pipe is greater than 450mm, shall be either through a sump, or a headwall with a vertical grating.

6.3.3.3. Outlets may be through a headwall with a hinged horizontal grating and appropriate energy dissipation for the outlet so that no soil erosion will take place. Outlet grates shall be hinged in urban areas where the pipe is greater than 450mm to allow flow pressures to open if the grates become blocked. Care is needed to ensure flows will not surcharge upstream of blocked grates.

6.3.3.4. Flood gates shall be provided on the downstream end of all pipes discharging into the ocean, tidal channels or natural waterways where backflow is a potential problem or where the discharge pipe is 600mm diameter or greater.



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6.3.3.5. Secondary overland flowpaths shall generally be aligned alongside the road network and reserve areas. Where such flowpaths are required to cross private property an appropriate easement in favour of the Council shall be provided to ensure its protection. It is preferred that secondary flowpaths on private property should be on accessways.

6.3.3.6. Primary stormwater shall be piped.

6.3.3.7. Building over public pipe systems is prohibited.

6.3.4. Open Drainage Systems

6.3.4.1. Where natural open stream systems or formed drainage channels are to be incorporated in the land drainage system, they shall be of sufficient width to contain the full design flood flow together with the freeboard given in Table 6.1 and to ensure protection from unacceptable scouring. Sufficient access for maintenance shall be provided.

6.3.4.2. Open drainage systems may be subject to Waikato Regional Council resource consents.

6.3.4.3. The flow characteristics of natural open stream systems shall be based on the likely long term stream condition. Consideration shall be given to the density and suitability of vegetation and due account shall be taken of blockages under peak flood conditions.

6.3.5. Manholes

6.3.5.1. Accessible inspection chambers are to be provided at all changes of grade, direction and pipe size, and shall not exceed 90m spacing for pipelines up to 1000mm diameter. For pipelines of 1000mm diameter or greater, the spacing of manholes may be extended up to 200m. Each branch line shall join a main line at a manhole junction.



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- 6.3.5.2. Manholes shall be located on all drainage lines and at the end of all terminal lines greater than 50m in length.
- 6.3.5.3. All stormwater manholes shall be constructed as detailed on the standard drawings.
- 6.3.5.4. Outlet pipes from manholes shall have a soffit level 20mm lower than that of the lowest incoming line, plus 5mm per 10 degrees of angle change between the two lines. Specific hydraulic design may be required for pipes where head losses are critical.
- 6.3.5.5. Manholes are to be pre-cast concrete conforming to NZS 4058 for concrete pipe construction minimum Class I with an internal diameter of 1050mm. These may be installed on pipelines up to 600mm diameter except for diameters over 500mm where the pipelines deviate more than 20° from the centre line of the outgoing pipeline. In those cases specific design of the benching may be required to ensure full efficiency of the outgoing pipeline. Alternatively, with pipelines with large angles of deviation, approval may be given for the manhole to be sited on a straight outlet with a series of factory-made mitred bends immediately downstream and are to be used on pipelines up to and including 600mm diameter.
- 6.3.5.6. All wall joints in manholes shall be epoxy mortared on both sides. A rubber/bitumen sealing strip shall be applied between the concrete faces. The joint between the wall and concrete lid shall be sealed with an epoxy mortar or as approved by the Engineer. The mixing and application of the epoxy mortar shall be in conformity with the manufacturer's directions to provide a watertight and root proof structure to the satisfaction of the Engineer.
- 6.3.5.7. Manholes up to 2400mm deep shall be constructed of a single riser where possible. A single 300mm riser may be used to make up final ground levels where necessary. Where manholes exceed 2400mm in depth, the base riser shall be a 2400mm riser topped with a single riser to final ground level. Where manholes exceed 5000mm in depth, they shall be built using two 2400mm risers topped with a single riser to final ground level.



6.3.5.8. Manholes shall be fitted with precast externally flanged bases. Where approved by the Engineer a cast in situ base using pre mixed 25 MPa concrete (with concrete support) may be used instead. The riser must penetrate a minimum of 75 mm into the wet concrete. The concrete is to be compacted using a mechanical insertion vibrator.

6.3.6. Deep Manholes

6.3.6.1. Any manhole in excess of 4000mm deep shall require specific approval of the Engineer. All such manholes shall be a minimum of 1200mm diameter, fitted with step irons, holding clamps and 600mm opening lid covers and frames. The benching shall be so arranged as to permit easy access of the bottom step by maintenance staff. Where the diameter of the outgoing pipeline exceeds 450mm diameter, steps and hand-holds may be required to be provided to access the invert of the pipe.

6.3.7. Stormwater Manholes on Larger Pipelines

6.3.7.1. Manholes on stormwater pipelines 600mm or greater shall be specifically designed. Particular care is to be paid to the issue of entry, outlet, and bend losses in the manhole.

6.3.8. Hydraulic Flow in Manholes

6.3.8.1. In addition to the normal pipeline gradient all manholes shall have a minimum drop of $20 + 5\text{mm per } 10^\circ$ of the angle of change of flow within the manhole. Manholes on pipelines greater than 1000mm diameter shall have the drop through the manhole designed to compensate for the energy lost due to the flow through the manhole at the design radius. Pipe inlets should at least match soffits with the outlet at manholes.

6.3.8.2. Drop connections on stormwater manholes up to and including 450mm diameter may have an open 'cascade' inside the manhole provided the height of drop does not exceed 1000mm and benching is hard finished 40 MPa concrete.



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- 6.3.8.3. Drops through stormwater manholes of more than 450mm diameter shall be avoided if possible, and if unavoidable shall be subject to specific design and approval. Cascade falls may be permitted subject to the benching being hard finished 40 MPa concrete rather than plaster, and flow into the manhole is directed through a deflector unit.
- 6.3.8.4. Specific design may be required for situations where pipe velocities are high, or downstream conditions will limit exit velocity from the manhole, and where manhole depths are relatively shallow.
- 6.3.9. Connections to Manholes**
- 6.3.9.1. Connections to manholes shall be effected by the use of power drills or saws. **The practice of smashing holes in the liner using hammers is prohibited.** All entry points shall be kept to a minimum diameter to accommodate the incoming manhole short. All holes shall be restored using epoxy mortar, not ordinary sand cement mortar.
- 6.3.9.2. Catchpits should be piped directly to a manhole, except that if the stormwater drain is greater diameter than 1200mm and a manhole is not conveniently located, the Catchpit leads may be saddled direct to that drain. A direct connection of the Catchpit lead to a stormwater drain with a diameter between 600mm and 1200mm diameter will only be permitted in exceptional circumstances, and at the Council's discretion.
- 6.3.9.3. Branch lines 300mm diameter and smaller may be saddled on to pipelines 1200mm diameter or larger, providing a manhole is supplied on the branching line within 5m of the main line.
- 6.3.9.4. The saddle shall be effected by use of drilling or power saw cutting of the principal pipe at a point no more than 30 degrees of arc below the soffit of the pipeline. An approved saddle with a root proof seal is to be carefully epoxied onto the main pipe and the inside bore of the principal pipe wiped smooth. No epoxy is to be dropped and allowed to remain on the invert of the principal pipeline.



6.3.10. Manhole Lids, Covers and Frames

- 6.3.10.1. Standard manhole covers and frames shall have a nominal 510mm opening, be heavy duty, manufactured from a strong and durable material and be of a design approved by the Engineer.
- 6.3.10.2. Grilled manholes, flat or domed, may be installed in low areas to catch surface water. Domed lids are preferred as they have fewer tendencies for blockage. Where a grilled cover is used, a sump with a minimum depth of 500mm is required to trap coarse sediment.
- 6.3.10.3. Heavy duty lids and frames are to be used in all instances.
- 6.3.10.4. The throats of all manholes shall be painted blue with a suitable paving paint. The covers can remain unpainted.

6.3.11. Manholes in Soft Ground

- 6.3.11.1. Where a manhole is to be constructed in soft ground, the area under the manhole shall be undercut down to solid and back-filled with suitable hardfill to provide an adequate foundation for the manhole base.

6.4. CATCH-PITS

- 6.4.1. Catch-pits (including back entry catch-pits) shall be constructed as on the standard drawings. Single and double catch-pits only shall be installed. Catch-pits shall be fitted with grates and frames.
- 6.4.2. The maximum capacity of a single sump shall be taken as 301/s and that of a double sump as 501/s.
- 6.4.3. Catch-pits shall be designed to take at least the 10% AEP design runoff.
- 6.4.4. Catch-pits shall generally be located as follows:



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- a. On roads having a carriageway width up to and including 10m, a maximum channel run of 125m. On all roads with a carriageway width greater than 10m, a maximum channel run of 90m.
- b. At all valley positions a double side entry sump is required.
- c. As required for catchment areas.

6.4.5. Catch-pits shall be connected to the primary stormwater system by a pipe of at least 225mm diameter to an adjacent manhole.

6.4.6. Super Modified Catchpits

6.4.6.1. Super Modified Catchpits shall be installed where the gradient exceeds 1 in 20 or where there is a high possibility that a double catchpit is unable to manage the inlet flows equivalent to a 10% AEP event (refer to the standard drawings).

6.4.7. Service Connections

6.4.7.1. Where service connections are approved, each residential lot shall include a lateral of at least 100mm diameter, which shall be extended from the main reticulation system to terminate at a minimum distance of 10m within the main body of the lot. Larger diameter service connections may be required for multi-unit for industrial.

6.4.7.2. Service connections shall be laid true to line and grade at right angles to the main line in a manner acceptable to Council.

6.4.7.3. The connection point of the laterals to each lot shall be sited, when possible, in a location that will not reduce the building area available.

6.4.7.4. The connection point of the laterals to each lot shall be sited, when possible, on the low side of proposed sites having a cross fall greater than 10m.



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6.4.7.5. Service connections shall be brought to between 0.6m and 1.2m of the final ground surface. Connections should be marked with stakes - either tied with detector tape or stakes in contact with the end caps, or with an identified concrete slab.

6.4.7.6. When the line is deeper than 4m, service connections will not permitted directly to the line.

6.4.8. Inlet and Outlet Structures

6.4.8.1. Approved structures shall be constructed at the inlets and outlets of pipelines. Structures shall be specifically designed to fit in with their natural surroundings.

6.4.8.2. Gabions and rock lined structures or driven or drilled piles and whalers may be acceptable provided that the structure has the necessary structural strength to meet long term durability.

6.4.8.3. Inlets shall be designed and constructed to provide efficient entry to the pipeline, minimise damage to surrounding ground and provide adequate and safe access for maintenance staff in the event of blockage. In particular instances, the Council may require pedestrian or even equipment access to the inlet to be provided and the installation of platforms across the inlet to permit cleaning under storm conditions.

6.4.8.4. Where a culvert is used across a watercourse to provide private vehicular access - driveway, private way or joint owned accessway - the whole structure shall remain a private asset.

6.4.8.5. Secondary overland flowpaths from all inlet structures shall be provided for flows greater than 200l/s.

6.4.8.6. All inlets to pipelines greater than 600mm diameter in urban areas require a galvanised steel safety grille with a maximum clear gap of 100mm. Inlet grilles shall be fitted at a flat grade to promote self-cleaning under high flow



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conditions. They shall have sufficient weight to prevent children lifting them aside. Where required by the Council, the grille shall be fitted with a lockable entry gate contained within the grille.

- 6.4.8.7. Inlet grilles shall be designed so that the grille bars are laid on the vertical plane and the exterior of the grille presents a smooth surface to permit easy cleaning either by hand or machine. Bar spacing shall not exceed 100mm. The supporting structure shall be contained on the inside of the grille to avoid it being damaged during cleaning. Web type grilles will not be permitted. Where required by the Council, the inlet shall be fitted with a secondary vertical inlet to facilitate operation of the inlet in the event of grille blockage.
- 6.4.8.8. In some cases, where the Council deems that the upstream flows may carry high loads, a tertiary and secondary screen may be required upstream to minimise debris loadings on the primary screen within the inlet structure. Such screens shall be specifically designed. Where the screens are to be located in a public reserve the screens are required to be designed and constructed to reflect safety, hydraulic and aesthetic considerations.
- 6.4.8.9. For outlets, provision must be made for energy dissipations unless it is demonstrated by the developer/applicant that outlet velocities and soil conditions are such as to make this unnecessary. The design shall achieve the minimal outlet velocity to preclude downstream scour of the channel and side banks, and address protection of the outlet around the outlet and the opposite bank.
- 6.4.8.10. Specific consideration must be given to provision for adequate fish passage where necessary.
- 6.4.8.11. The direction of the discharge shall be aligned with the natural downstream flow so as to prevent erosion of the opposite bank.



6.4.9. Bedding and Protection

6.4.9.1. The pipe bedding shall be in accordance with the Concrete Pipe Selection & Installation Guide by The Concrete Pipe Association of Australia and the manufactures guide to installation of PVC pipes.

6.4.9.2. All drainage lines shall be designed and constructed to withstand all the likely loads they will be subject to during the life of the system. The load carrying capacity in relation to their installation conditions shall be calculated in accordance with NZS/AS 3725:1989 Loads on Buried Concrete Pipes and AS 2566:1998 Buried Flexible Pipelines, where appropriate.

6.4.9.3. For drainage lines laid at grades steeper than 10% (including service connections) the bedding and surround material shall be of a low-grade (7MPa) weak concrete. For lines exceeding 20% in grade, anchor blocks shall be located at pipe joints, not exceeding 6m spacing.

6.4.9.4. Where public drains are located within rights of way or private access legs, all other utility services such as power, telephone and gas shall be located 300mm clear of the pipe.

6.4.10. Pipe Materials

6.4.10.1. Land drainage reticulation construction material shall be as defined in the Council's approved Materials Schedule.

6.4.10.2. All public stormwater pipes shall have a minimum diameter of 300mm with the exception of catch-pit leads which may be 225mm.

6.4.10.3. All joints on pipes and fittings less than 1050mm in diameter shall be factory made flexible type complying with the Council's approved Materials Schedule.



6.4.11. Connection to Council's System

6.4.11.1. Only an approved contractor under Council supervision may make connections to Council's system with the appropriate approvals in place.

6.4.12. Testing and Acceptance

6.4.12.1. Prior to acceptance of the completed stormwater system, the applicant's representative shall have supplied the Council with As-Built drawings as per the Section 1 requirements of this document, including any overland flowpaths and open channel systems together with certification.

6.4.12.2. The tests for stormwater systems shall be a visual inspection of manholes and lines, inspection of secondary flowpaths, and a check on open water courses at the upstream and downstream boundaries.

6.4.12.3. The Council may require each manhole structure to be tested in accordance with NZS 4452.

6.4.12.4. The effectiveness of the channels and sump shall be tested with flooding. Any ponding of water in the channel greater than 3mm under a 3m straight edge shall render the work unacceptable.

6.4.12.5. All pipelines 225mm and greater internal diameter shall be inspected internally with CCTV using pan and tilt cameras and the results recorded on DVD. This shall be done in accordance with the current version of the NZ Pipe Inspection Manual. A copy of the DVD is to be provided to Council along with the As-Builts in accordance with Council's requirements. Pipelines of 1200mm and greater internal diameter may be inspected manually, at the discretion of the Council.

6.4.12.6. Final testing will not be carried out until approved As-Builts have been received.



6.4.13. Counterfort and Bored Subsoil Drains

6.4.13.1. Counterfort and/or bored drains that are installed for stability reasons shall be constructed in such a manner as to provide satisfactory access for future maintenance purposes. Unless required otherwise at the time of Building Consent, these drains shall terminate at a manhole incorporating a sediment trap and be connected to and form an integral part of the reticulated public system. The drains shall be detailed on the As-Builts.

6.4.13.2. In the case of counterfort drains, the upper end of the perforated pipe shall be returned to the ground surface terminating in a removable screwed cap, and marked, to facilitate future flushing.

6.4.13.3. Where the Engineer determines that the counterfort and/or bored drains will have no effect beyond the immediate site in which they are installed, the future maintenance shall be the responsibility of the site owner, and this shall be recorded on the Title by a Memorandum Encumbrance.

6.4.13.4. All other subsoil drains and drains behind retaining structures shall terminate in a catchpit or approved cleanable sediment trap before connection to the public system.

6.4.14. Coastal and Cliff-top Discharges

6.4.14.1. Stormwater from roofs, driveways and any impermeable surfaces shall not be discharged over the top of cliffs. Discharge from impermeable surfaces on cliff top sections shall be disposed of by one of the following procedures:

- a. Discharging into a formal Council stormwater system where available.
- b. Discharging into an existing open channel system that does not discharge over a cliff face.
- c. Discharging through a lined inclined bore discharging to an energy dissipating structure at the base of the cliff.



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- d. An alternative method approved by Council.
- 6.4.14.2. Where piped/inclined bore discharges at coastal cliff faces are to be utilised, pipe liners shall be polyethylene SDR 17. The energy dissipater/outfall at the base of the cliff shall be constructed to blend in with the natural character of the coastline and shall be located on a low use area of foreshore where there is minimal risk of erosion from the discharge. The developer/applicant shall obtain any necessary consent from Waikato Regional Council.
- 6.4.14.3. Stormwater discharge onto or through all council-owned or controlled reserves shall be prohibited.
- 6.4.14.4. Construction of private discharge systems shall be subject to a Building Consent; the Building Consent application must include the following:
- a. Cross-sectional drawings extending at least 15m beyond the proposed pipe inlet and outlet positions
 - b. Confirmation from a Geotechnical Engineer that the site is suitable in relation to cliff and land stability, and also that the proposed outfall will not cause scour or instability in the vicinity of the outfall.
 - c. Design details and calculations for peak flows and pipe capacity, including any allowances for pipe inlet and outlet losses.
 - d. Written approval of the owner and any other land affected by the alignment of the pipeline and in the case of an Esplanade Reserve or other land vested in the Council, the written approval of Council's relevant Area Manager.
 - e. Sufficient details, including photographs, of the cliff face and shoreline at the outfall to show whether the outfall will have a visual or any other impact at and below the outfall.



6.4.15. Detention and Treatment Devices

6.4.15.1. General

- 6.4.15.1.1. Ponds, wetlands, rain gardens and riparian planting shall provide for public amenity and wildlife habitat as well as for stormwater detention and/or treatment. Stormwater treatment devices will not be treated as stand alone pieces of infrastructure but are considered as an integral part of the social and environmental community. Features such as irregular pond shapes, islands, bird perching logs, shorelines which have a natural appearance and recreation facilities such as boardwalks will all help in achieving this aim. It is essential that the matter of pond design be dealt with as early as possible in the development process. This is to ensure that provision is made for the appropriate size of utility reserve to incorporate a pond or other device complying with this document and Stormwater Treatment Devices (TP 10).
- 6.4.15.1.2. Stormwater detention and treatment devices shall be designed for minimum long-term maintenance requirements, including provision for forebays and sumps for coarse sediment settling and a separate gross pollutant trap for floatables.
- 6.4.15.1.3. The design shall generally be in accordance with the requirements of the Auckland Regional Council Technical Publication 10 - "Stormwater Treatment Devices" (TP 10) except as amended below.
- 6.4.15.1.4. Where the requirements of TP 10 and those detailed below are not practicable, application may be made to the Council to vary those requirements.
- 6.4.15.1.5. A complete set of stormwater device calculations and design drawings shall be submitted for approval prior to construction.
- 6.4.15.1.6. A geotechnical report addressing general ground stability of the device under all operational conditions, slope and necessity for lining to prevent piping may be required by the Council. When required it shall be carried out by an Engineer proficient in Geotechnical Engineering.



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- 6.4.15.1.7. Where ponds, wetlands and other devices are to be included by Council as part of the public network they shall be sited on separately titled utility lots vested in Council. In some cases these lots may be co-joined to recreation reserves but shall not be included as part of the reserve for any purpose.
- 6.4.15.2. **Ponds and Wetlands**
- 6.4.15.2.1. The use of retaining walls either above or below the normal operating level of the pond or wetland will not generally be approved by the Council, as the use of retaining walls outside the normal operating level of the pond is not considered consistent with the values set out above.
- 6.4.15.2.2. The maximum water level resulting from the operation of the pond or wetland must be contained completely within the drainage reserve area unless otherwise approved by the Council.
- 6.4.15.2.3. The external slopes of the pond shall be at a maximum gradient of one vertical to four horizontal (1:4).
- 6.4.15.2.4. The maximum permanent water depth shall be no more than 1500mm. The maximum depth of any pond shall not exceed 2000mm and no more than 10 percent of the pond area may exceed 1500mm in depth.
- 6.4.15.2.5. A planted shelf with a slope of one vertical to ten horizontal (1:10) shall be provided around the perimeter of the pond. The shelf shall be a minimum of two metres wide, extending for one metre above and one metre below the normal water level of the pond.
- 6.4.15.2.6. Internal pond slopes shall be at a maximum gradient of one vertical to three horizontal (1:3).
- 6.4.15.2.7. At least one sign shall be erected at all stormwater treatment devices, with the location, type and number of signs to be determined in consultation with the Council.



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6.4.15.3. **Inlet, Outlet and Manhole Details**

6.4.15.3.1. Treatment device inlets, outlets and manholes shall comply with the stormwater inlet, outlet and manhole details.

6.4.15.3.2. Low flow splitters shall generally comprise two manholes: the first to dissipate energy and the second to split the flow. Variations are required to be specifically approved by the Council.

6.4.15.3.3. Outlets shall be located to allow safe access from the bank of the pond without the need for boats. Access to the outlet manhole shall be by way of a secured grille dome of approved size and design.

6.4.15.3.4. Orifice outlets shall be designed with reverse slopes to protect the outlet from floatables.

6.4.15.3.5. Suitable measures for maintenance shall be installed to allow the pond to be de-watered using gravity through the outlet manholes. Manholes shall, as a minimum, have de-watering outlets at 600mm below the normal operating level and at the base of the pond.

6.4.15.3.6. De-watering pipes in the manhole shall comprise short lengths of SN 16 uPVC pipe with a puddle flange on the exterior of the manhole wall and a screwed cap on the inside of the manhole. The cap shall protrude no more than 150mm into the manhole.

6.4.15.4. **Manhole Safety Grille**

6.4.15.4.1. Council, at their discretion, may require the fitting of a Hynds Caliber safety grille (or a Council approved equivalent) within new and existing stormwater manholes.

6.4.16. **Planting**



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6.4.16.1. Site specific planting plans and specifications are to be submitted for approval, and planting carried out, in accordance with the requirements of Section 8 of this Code - Parks and Reserves.

6.4.17. Fencing and Maintenance Access

6.4.17.1. Access shall be provided for maintenance of any stormwater treatment device including the removal of sediment. This applies particularly to the forebay of a pond wetland which may require more frequent access by excavation equipment. Refer to standard drawings.

6.4.17.2. The width and gradient of the vehicle access routes shall be adequate for maintenance vehicles and machinery to reach the treatment device base and immediate environs.

6.4.17.3. Vehicle access routes shall have adequate measures against vehicle erosion of the surfaces. This may be achieved by the use of appropriate erosion matting below the surface of the grass or reinforced grass.

6.4.17.4. The engineer design plans shall detail the location of maintenance access points and routes.

6.4.17.5. Fencing shall be installed where required for health and safety reasons as directed by the Council. The criteria used in the determination shall include the following:

- a. proximity to dwellings
- b. proximity to schools, kindergartens, child care centres and similar
- c. proximity to walkways or roadways
- d. pond use
- e. pond depth



f. gradient of approach slopes

Council prefers to have complying unfenced ponds rather than non-complying fenced ponds.

6.4.17.6. Gates are to be provided for access to any fenced treatment device. The overall width of the gateway shall allow for access of maintenance vehicles and shall have a minimum opening width of three metres.

6.4.17.7. Fencing and gates shall be hot dipped galvanised.

6.4.17.8. Gates are to be fitted with hasp and latch and a standard padlock.

6.4.18. Maintenance Manuals

6.4.18.1. A specific maintenance manual is required for each stormwater device. A draft maintenance manual is to be submitted with the final design for approval. The maintenance manual shall include at least the following:

6.4.18.2. General Information:

- i. Location plan
- ii. Site plan
- iii. Construction plans
- iv. Planting plan
- v. Data and calculations summary
- vi. Resource consents
- vii. Geotechnical report from Engineer specialising in geotechnics
- viii. Fencing details
- ix. Bond information (terms and conditions) for maintenance
- x. Lists of any assets such as parks furniture and signs



6.4.18.3. Maintenance Requirements:

- i. Proposed frequency of maintenance
- ii. Maintenance log
- iii. Estimated O&M costs (dated) at the time of the manual being written
- iv. Pond de-watering method
- v. Planting maintenance - timing and methods
- vi. Weed maintenance and control
- vii. Sediment removal timing and methods
- viii. Structural maintenance
- ix. Inlet and outlet maintenance
- x. Pest inspections and control

6.4.18.4. The approved final maintenance manual is to be submitted on completion of the pond construction and shall include As-Built details in addition to those items listed above.

6.4.19. Approvals

6.4.19.1. On completion of the stormwater works an As-built plan conforming to the Council requirements is to be prepared.

6.4.19.2. The following checklist shall be used as part of the sign-off process for treatment devices:

- a. Inspection After Completion of Earthworks: - On completion of earthworks and prior to landscaping and the construction of any fences a site meeting shall be held between the Developer/Applicant's Representative and the Council's Representative. The purpose of this meeting is to confirm adherence to the submitted landscaping plans and to agree on any amendments.



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- b. On completion of construction the land/pond shall be vested in or have an easement in favour of the Council and the following shall be confirmed / provided:
- i. Device constructed in accordance with the construction plans and specifications.
 - ii. Planting carried out in accordance with plans and specifications, or where planting has not been affected, planting plans submitted and approved with proposed planting time and a performance bond covering the work lodged.
 - iii. Geotechnical certification in the form of producer statements (if required).
 - iv. As-Built plans and maintenance manual submitted and approved by Council.
 - v. Legal documentation of vesting completed where applicable.
- c. On completion of the maintenance period, which shall be 18 months for pond planting (unless otherwise approved by the Council) the following shall be confirmed/provided:
- i. Maintenance logs submitted for maintenance period.
 - ii. Planting established and maintained in accordance with planting plans.
 - iii. Details for consent sign-over confirmed where applicable.
 - iv. Waikato Regional Council final approval.



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6.4.20. Specific Ward Requirements

6.4.20.1. Specific Ward requirements for Stormwater & Land Drainage as shown in Table 6.3. These requirements are a minimum and may be increased at the Councils discretion.

Table 6.3

| Specific Ward requirements for Stormwater & Land Drainage | | |
|--|---|---|
| Community | Function | Requirement |
| All communities | Ward | |
| | Properties | Stormwater generated on a property will be disposed of in a managed manner and authorisation of disposal will be required in each case. The on-site system must be capable of carrying a 1 in 10 year rain event and must be maintainable. |
| All communities | Ward | |
| | Stormwater Retention Ponds | Permitted. Any pond used as a retention pond or water feature will be subject to Management Plan approval. |
| | Open Water Courses | Permitted. Subject to Design Constraints and Management Plan approval. |
| | Kerb Discharge | Not permitted. Unless otherwise specifically permitted. |
| | Existing stormwater reticulation | Conditional. On existing system's capacity and resource consent conditions. |
| | New Discharges | Subject to meeting Council's requirements relating to resource consent conditions. |



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| Specific Ward requirements for Stormwater & Land Drainage | | |
|---|-------------------------------------|--|
| Community | Function | Requirement |
| | Proposed Reticulation Design | <p>Primary piped system in all urban areas capable of carrying 5 year (20% AEP) rain event.</p> <p>Culvert in all areas capable of carrying a 20 year (5% AEP) rain event.</p> <p>Open channels and overland flow-path capable of carrying a 50 year (2% AEP) rain event to ensure that such surface water shall not enter buildings.</p> <p>Bridges capable of withstanding a 100 year (1% AEP) rain event.</p> |
| | Global Warming Factor | All stormwater calculation will be subject to a global warming factor of 20% |