



Section 2: Earthworks

Sutherland Shire Public Domain Technical Manual
Part D: Specification

SUTHERLANDSHIRE

**Sutherland Shire Public Domain Technical Manual
Part D: Specification**

Issue 1.1 December 2018

This document is periodically reviewed and new versions are published. Document currency is not guaranteed when printed. For the current version always refer to sutherlandshire.nsw.gov.au



4-20 Eton St, Sutherland NSW 2232
Locked Bag 17, Sutherland NSW 1499
P. 9710 0333 sutherlandshire.nsw.gov.au

Section 2: Earthworks

Contents

2.1	Scope	2-1
2.2	Standards.....	2-1
2.3	Erosion and sediment control	2-2
2.4	Clearing and vegetation protection	2-4
2.4.1	General	2-4
2.5	Protection of earthworks against saturation	2-6
2.5.1	General	2-6
2.5.2	Stormwater diversion.....	2-6
2.5.3	De-watering.....	2-7
2.5.4	Stockpiles.....	2-7
2.5.5	Reinstatement	2-7
2.6	Excavation	2-8
2.6.1	General	2-8
2.6.2	Excavation in rock	2-8
2.6.3	Excavation for pavements	2-8
2.6.4	Excavation for trenches.....	2-8
2.6.5	Excavation for structures	2-9
2.6.6	Excavation around trees.....	2-9
2.6.7	Excavation around services.....	2-9
2.6.8	Hazardous materials	2-10
2.6.9	Support of excavations.....	2-10
2.6.10	Sawcutting	2-11
2.6.11	Ground water	2-11
2.6.12	Excavated materials.....	2-11
2.7	Preparation of subgrade	2-12
2.7.1	General	2-12
2.7.2	Preparation of subgrades before placing fill.....	2-12
2.7.3	Unsuitable material	2-12

Section 2: Earthworks

2.8	Placing and compaction of fill material	2-13
2.8.1	Material for filling.....	2-13
2.8.2	Moisture content of filling materials	2-13
2.8.3	Placing and compacting fill	2-14
2.8.4	Placing and compacting fill near structures	2-14
2.8.5	Placing and compacting trench backfill.....	2-15
2.8.6	Finished surface of earthworks in areas to be vegetated.....	2-15
2.9	Quality management.....	2-15
2.9.1	Testing	2-15
2.9.2	Frequency of testing.....	2-16
2.9.3	Schedule of hold points and check points – earthworks.....	2-18

2 Earthworks

2.1 Scope

This section details requirements for earthworks including the following:

- protection of earthworks against soil erosion and wetting;
- clearing the site and protection of vegetation;
- detailed excavation works including pole and furniture footings, tree pits, retaining walls, stormwater drainage works, kerb and guttering and trenching for utility service;
- excavation of footpath and road pavement as required;
- disposal, and preferably recycling of surplus excavated material;
- compaction and trimming of subgrade;
- placing and compaction of fill material; and
- ground preparation necessary to bring the site to the correct shape and level.

2.2 Standards

Unless stated otherwise in the project specific specification, the *approved design drawings* or elsewhere in the construction documents, work shall comply with the current *SSC standard drawings*, relevant Australian Standards and / or RMS Standards.

The following table indicates the Australian Standards, RMS Standards or other relevant standards applicable to this section. This table is not exhaustive and may not include all standards that may apply to the work to be undertaken. It is the responsibility of the *contractor* to ensure that all relevant standards are met.

AS 4970	<i>Protection of trees on development sites</i>
AS 1289	<i>Methods of testing soils for engineering purposes (inc. supplements & amendments)</i>
AS 1348	<i>Road and traffic engineering, glossary of terms. Part 1 - Road design & construction</i>
AS 1726	<i>Geotechnical site investigation code (inc. amendments)</i>
AS 2436	<i>Guide to noise control on construction, maintenance and demolition sites</i>

Section 2: Earthworks

AS 2601	<i>Demolition of structures</i>
AS 3798	<i>Guidelines on earthworks for commercial and residential development</i>
AS/NZS 2865	<i>Safe working in a confined place</i>
Landcom	<i>Managing Urban Stormwater: Soils & Construction – Volume 1 (the ‘Blue Book’)</i>
WorkCover Authority of NSW	<i>Code of Practice – Excavations</i>
WorkCover Authority of NSW	<i>Code of Practice – Moving Plant on Construction Sites</i>
WorkSafe Australia	<i>Asbestos: Code of Practice and Guidance Notes</i>

Please note that the requirements of all public utility service providers such as Telstra, Optus, NBNCo, Sydney Water, Ausgrid and Jemena must also be met.

2.3 Erosion and sediment control

The *contractor* shall generally plan and manage the works to minimise erosion and the transfer of sediment to areas downstream of the worksite by:

- Diverting clean surface flows arriving at the site from upslope around disturbed areas or collect and carry surface flows through the disturbed areas in closed pipelines.
- Paving or stabilising by revegetation all disturbed surfaces immediately following disturbance.
- Diverting surface flows from disturbed areas to pass through sediment capture devices such as silt fencing, filter dams, check dams and settling basins before discharge to bushland, downstream properties, road gutters, natural watercourses and piped drainage systems.

All erosion and sediment controls must be designed and installed in accordance with the following:

- *Council’s* Sutherland Shire Environmental Specification 2007 - Environmental Site Management;
- Managing Urban Stormwater – Soils & Construction published by Landcom; and

- the Environmental Site Management Plan (ESMP) where an ESMP is required (refer to Section 1 : Preliminaries).

These controls are to be constructed and maintained in satisfactory working order throughout the duration of construction, or until stabilisation works have been carried out to the satisfaction of *Council's representative*.

Attention is drawn to the fact that regardless of how remote construction sites may be from natural waterways, all water discharged to from construction sites is directed to natural waterways by landforms and piped drainage systems. Measures must be taken to comply with the provisions of the Clean Waters Act with regard to the potential deposition of sediments into natural waterways. Those responsible for breaches of the Clean Waters Act are subject to penalties prescribed by the Act.

Sediment control devices

The *contractor* shall provide sediment controls to protect downstream and disturbed areas.

Sediment Control Devices include but are not limited to:

- Filter dams - to be constructed at all drainage outlets within the site. These dams shall be constructed as detailed in the approved drawings. The storage capacity of these structures shall be determined at 240 m³/ha of upstream catchment.
- Filter surround - to be provided to any inlet to the piped drainage system during the course of construction of the pipeline or associated earthworks
- Permanent silt traps - where shown on the approved drawings are to be constructed and maintained to the Engineers' satisfaction at all times.
- Silt fences - shall be constructed around all disturbed areas, stockpiles and as directed by *Council's representative*.

Revegetation

The following measures are to be implemented as standard procedures:

- exposed Cut and Fill Batters and all Denuded Areas;
- application of 50 mm thickness of topsoil;
- seeding and fertilising;
- hay mulching at 0.5 kg/m²;

Section 2: Earthworks

- application of bitumen emulsion spray, on a 50% water 50% slow breaking anionic emulsion mixture, applied at a rate of 0.25 litres/m²; and
- regular watering of the areas until growth is well established.

Should revegetation not be successful, further treatment will be required as directed by *Council's representative*.

The operation of plant and equipment, and storage of any materials including spoil outside the approved works area is prohibited, in order to ensure the retention of natural vegetation which is the most effective mechanism for the control of soil erosion.

2.4 Clearing and vegetation protection

2.4.1 General

In advance of all clearing and grubbing operations, effective erosion and sedimentation control measures shall be implemented in accordance with this Specification.

During the clearing, care shall be taken not to disturb any bench mark, survey or level peg. Should any of these marks be disturbed or removed, they shall be reinstated by a registered surveyor at no cost to *Council*.

Grub holes remaining following the removal of trees, shall be squared before filling with approved material, compacted in layers to achieve 100% Standard Maximum Dry Density under kerbs and road carriageways and 95% Standard Maximum Dry Density outside road carriageways and tested by a NATA accredited laboratory (or SSC laboratory) prior to the completion of further works that will restrict access for testing.

Attention is drawn to the Rivers and Foreshores Improvement Act which requires a permit (3A Permit) to be obtained from the NSW Public Works for *works* within 40 metres of a watercourse or body of water.

Limits of Clearing

Unless otherwise specified, the limits of clearing and grubbing shall be not more than the area required for completion of the approved *work*.

Prior to the commencement of any clearing and grubbing, the *contractor* shall peg the extent of the area to be cleared and conduct a joint inspection *Council's*

representative to identify vegetation to be retained and protected. No clearing *work* or any type of disturbance outside this area shall be carried out without the prior approval of *Council's representative*.

Unless otherwise specified, remove all vegetation, logs, stumps, boulders, roots, scrub, debris and dumped material and items within the limits of clearing. Demolish and dispose of any minor built structures, all rubbish and other materials that are unsuitable for use in the *Works*. Grass and topsoil shall not be removed as part of this initial clearing.

Protection of existing vegetation

Protective measures including, but not limited to Tree Protection Fencing and Tree Armour shall be provided in accordance with this specification. Refer Section 1: Preliminaries for protection of existing vegetation.

Salvage of vegetation

The *contractor* shall give *Council's Representative* a minimum of 10 days notice prior to the scheduled clearing of areas of native vegetation and provide access to the site for the collection of seeds and cuttings.

Stripping and stockpiling of topsoil

Immediately prior to the commencement of earthworks for any item of *works*, topsoil is to be stripped in the area to be excavated and stockpiled for later use. In particular topsoil is to be stripped from any areas to be covered by paving, structures or fill. Also strip topsoil within the limits of clearing for underground services beyond the limit of earthworks. Grass shall be stripped together with topsoil in the grass root zone. Avoid contamination by any other material. Topsoil shall not be stripped from around existing trees closer than a distance equal to twice the radius of the tree's crown measured from the trunk other than where engineering *works* are shown in the approved drawings.

The *contractor* shall obtain the written consent of *Council's representative* for the use of any stockpile site which is not shown on the drawings. Proposals in this regard shall be submitted at least three working days before stockpiling is due to commence and shall specify the maximum dimensions of the proposed stockpile.

2.5 Protection of earthworks against saturation

2.5.1 General

The *contractor's* responsibility for the *Works* shall include the protection of earthworks against saturation prior to, during and following earthworks operations.

2.5.2 Stormwater diversion

The *contractor* shall collect surface and seepage flows from upstream of disturbed areas and provide drainage pipelines to convey the water collected through or around the site. Pipelines are to discharge to the road kerb or a piped drainage system as approved by *Council's representative*.

The *contractor* shall grade earthworks, in particular subgrades, to drain at all stages without ponding. Where run-off must cross the formation as surface flow, the *contractor* shall ensure that it does so as a broad sheet flow which crosses roughly at right angles to the alignment and minimises the likelihood of subgrade softening. Effective pumping plant shall be provided where required for keeping all excavations free from water while construction is in progress. All pumped water from excavations must be filtered and where necessary must be flocculated to remove turbidity.

When rain is likely or when work is not proposed to continue in a working area on the following day, precautions shall be taken to avoid saturation of granular material. Ripped material remaining in cuttings and material placed on embankments shall be sealed by compaction to provide a smooth tight surface.

Should in-situ or stockpiled material become over wet, the *contractor* shall be responsible for drying out or replacing the material and for any subsequent delays to the operations.

Works must be planned and constructed so that stormwater runoff is directed away from the buildings/adjacent properties at all times. This may involve all temporary means to directly drain or to store and then discharge the water using pumps and the like. All stormwater drainage diversions shall be of sufficient capacity to prevent flooding of the *works* and adjacent properties, pavements and buildings *Council's representative* during storms of 100% AEP (once in one year average recurrence interval).

2.5.3 De-watering

Turbid water shall not be pumped from excavations and discharged to either the public road or an existing drainage system. Clear water can be discharged to the public road or drainage systems only with the written approval by *Council's representative*.

The *contractor* shall allow for the removal and appropriate disposal of all mud and debris, which may collect in the excavations.

If water enters excavations which are meant to receive concrete, the water shall be pumped out, any soft material unsuitable for receiving concrete taken out and replaced with either clean compacted sand or approved selected material as separately defined in this Specification.

2.5.4 Stockpiles

Where locations are not nominated in the design documents, place stockpiles to minimise effects on site and adjacent areas. Keep clear of tops of slopes to avoid causing instability.

Locate stockpiles clear of natural drainage lines and to minimise surface flows from upstream. Provide temporary drainage as necessary to avoid erosion of the toe of the stockpile.

Stockpile material is to be placed to avoid damage to existing trees and vegetation.

Stockpiles shall have a maximum batter slope shall not exceed 2:1 and shall be covered using geofabric or similar material to prevent wind erosion. The lower half of the stockpile shall be surrounded by silt fencing located such that all runoff from the stockpile is filtered before draining to lower land.

If to remain unused for more than four (4) weeks, topsoil stockpiles shall be sown as specified for "Temporary Grassing" in section 2.3 above. Restoration of stockpile sites following completion of the work shall be carried out in accordance with Section 8 : Landscape *Works*.

2.5.5 Reinstatement

Fill temporary drains and remove structures when no longer required. Filling shall be placed and compacted as specified later in this Section. Reinstatement surfaces (including areas formerly occupied by stockpiles) as follows:

- within the area of the permanent *works* finish as specified;
- areas outside the permanent *works* shall be reinstated to their condition at commencement of the Contract

2.6 Excavation

2.6.1 General

Description and classification of soils shall be in accordance with AS1726.

Excavation shall be carried out to the depths and dimensions shown in the approved plans and construction documents, or to such greater depths and dimensions as will ensure sound, permanent foundations. The subgrade at the final excavated level shall be tested to establish its bearing capacity before any materials or structures are placed on the excavated surfaces (check point). The *PDC* may order the removal and replacement of unsuitable material.

2.6.2 Excavation in rock

Where the *contractor* is required to excavate in bedrock noise levels and vibrations to adjacent buildings must be limited to those allowed under legislation. The use of any pneumatic breaking or hammering device is NOT permitted for the excavation of bedrock material within 10 metres of existing dwellings or structures. Explosives are not permitted.

A dilapidation survey and report of surrounding properties is to be undertaken by the *contractor* to document defects in existence prior to the commencement of *works*. In the absence of defect documentation, it will be assumed that defects did not exist prior to the commencement of *works*.

2.6.3 Excavation for pavements

Excavation for pavements shall be carried out to form the boxing in which the pavement is to be constructed.

Any excavation in existing pavements shall have neat vertical edges. Boxing shall extend over a sufficient width to allow construction of the pavement below and behind kerbing and edging.

2.6.4 Excavation for trenches

Trenches for pipelines shall be excavated so as to provide adequate cover clearance between the outside of the pipe and the trench wall or sheeting in

accordance with AS 3725. Trenches for utility service conduits shall conform to the Utility service provider's specifications.

Trench excavations shall be carried below the pipe invert grade to accommodate bedding as specified and/or shown. All loose unexcavated material and projections of hard materials or rock protruding above plan grade shall be removed prior to placement of bedding.

Additional excavation shall be provided under sockets or flanges of pipes and ducts to allow for jointing and to give the pipe or duct uniform bearing.

2.6.5 Excavation for structures

Excavations for structures shall extend a sufficient distance from the structure so as to permit placing and removing forms, installing drainage facilities where required, cleaning and inspection.

Except where specified, excavations for footings shall not be over-excavated to allow for forming and backfilling.

Excavations for footings, which have been carried beyond the lines and levels authorised, shall be backfilled with concrete or stabilised sand at the *contractor's* expense.

All rock above the levels specified and/or shown and all rock shattered, disturbed or loosened by the process of excavation shall be removed and the foundation surface shall be cleaned by air jets and by brooming until it is clear of loose material.

All cracks, fissures, holes and soft spots in rock foundations shall be cleaned out and filled with concrete, grout or mortar, as directed by the *PDC*.

2.6.6 Excavation around trees

All *works* within tree protection zones and root structural zones shall be in accordance with AS4970. The *contractor* must dig using hand tools whenever digging in the structural root zone or the designated tree protection zone. All care must be taken to ensure that no tree roots are damaged during all excavation activities.

2.6.7 Excavation around services

The *contractor* must dig using hand tools within 0.3m of a utility service.

Dial Before You Dig plans may note transmission cables such as high voltage gas or water mains that need a Utility service provider representative present when excavating near their service. The *contractor* is responsible for coordinating any Utility service provider supervision.

2.6.8 Hazardous materials

The *contractor* shall give notice immediately to *Council's representative* of any hazardous materials or conditions found, including but not limited to the following:

- asbestos or material containing asbestos;
- flammable or explosive liquids / gases;
- toxic, infective or contaminated materials;
- radiation or radio-active materials;
- noxious or explosive chemicals; and
- tanks or containers that have been used for storage of explosive, toxic, infective or contaminated substances.

Refer to Section 1: Preliminaries regarding removal of hazardous materials and remediation of the site.

2.6.9 Support of excavations

The *contractor* shall provide all shoring, planking, propping, progressive backfilling and strutting necessary to retain the sides of the excavations, and to ensure safe working, including safety covers over holes. The *contractor* has sole responsibility for the sufficient support of the excavations on site (including any design and approvals required for such supports).

Any collapse of the sides of excavations due to the *contractor's* failure to shore, brace and/or sheet such excavations shall be rectified and any materials, equipment, structures, services etc. damaged by such collapses shall be repaired or replaced at the *contractor's* expense.

Such shoring, bracing and/or sheeting shall be satisfactorily maintained during the whole of the excavation and construction operations and shall be removed in a manner that prevents bank collapse as the excavations are concreted and/or backfilled.

Where temporary supports are to be left in place, they shall be appropriately de-stressed and all cavities behind the supports shall be located, backfilled and compacted as specified elsewhere herein.

Any voids formed outside sheeting, sheet piling, shoring, etc, shall be filled and compacted to the approval of the *PDC*.

The *contractor* shall remove shoring and timbering progressively as the work proceeds unless otherwise instructed.

2.6.10 Sawcutting

Should excavation be required in an area of concrete or asphalt, sawcuts of nominal 75mm depth shall be made in the surface prior to excavation to ensure a smooth joint is maintained in the existing surface.

In the case of excavations for drainage *works*, sawcuts shall be provided on both sides of the trench. For kerb and/or gutter *works*, sawcuts shall be provided around the perimeter of the area of pavement to be reinstated. Medians shall be sawcut on the face of new median kerb alignment.

2.6.11 Ground water

If ground water is encountered, such sections of the site shall be dewatered as necessary to permit work to proceed as required.

2.6.12 Excavated materials

All materials cleared and excavated shall be removed from site and recycled appropriately or disposed of legally by adhering to the provisions of the *Protection of the Environment Operations Act 1997* unless approved by *council's representative* to be re-used on site.

If an appropriate area exists on the site, suitable approved material may be stockpiled for use as backfilling, provided that excess stockpiled material is disposed of when all backfilling is completed.

2.7 Preparation of subgrade

2.7.1 General

After the site has been cleared, and excavation has been completed to the underside of the proposed pavement, the natural ground surfaces on which fill or pavements are to be placed shall be compacted to the specified density.

Heavy steel drum rollers (applied load intensity greater than or equal to 4t/m width of drum) shall not be used within 1.5m of an existing buried service unless permitted by the relevant utility service authority. Care should be taken with the use of vibrating rollers in close proximity to existing utility services. Contact should be made with utility service providers for advice.

2.7.2 Preparation of subgrades before placing fill

The sub-grade shall be excavated, trimmed and consolidated to levels ready to receive the first pavement course over the entire area to be surfaced. Low areas shall be filled with approved selected material and compacted to the following densities when tested in accordance with AS

1289. Areas shall be re-trimmed if necessary after compaction:

- 95% of standard maximum dry density (all subgrades except under roads, and kerbs and gutters); and
- 100% of standard maximum dry density (under roads, kerbs and gutters, and building platforms).

2.7.3 Unsuitable material

Unsuitable material for the *works* includes any areas of the earthworks foundation or any layer with the earthworks formation that rut excessively, yield or show signs of distress or instability, ground containing cavities, faults or fissures or ground contaminated by harmful substances including oil and chemicals.

Unsuitable material such as silt, mud, roots, organic matter, rubbish, areas of very soft clay or high moisture content and any other deleterious substances shall be replaced with selected material as specified.

The *contractor* shall rework or replace any material that has become unsuitable because of inappropriate construction activities. Inappropriate construction activities include poor surface drainage, restricted or inoperative subsurface

drains, contamination, excessive sized plant where the imposed local load exceeds the material strength, poorly maintained plant allowing leakage of oils and water onto the formation and leaving the surface open to wet weather allowing moisture ingress.

Where, any underlying material is deemed to be unsound, the whole of that material shall be removed so as to provide a sound subgrade for the roadworks.

Where the site is composed of geologically unstable materials, a full geotechnical investigation and report will be required. The *PDC* is to ensure that the area is stabilised and certification is provided by a NATA accredited laboratory (or SSC laboratory) that the area is stable.

2.8 Placing and compaction of fill material

2.8.1 Material for filling

Material used for filling shall be uniform in classification, well graded, coarse, granular and free draining. Filling material can be crushed rock, natural soil, gravel and sand, or other approved granular material consisting of clean, sound, durable fragments, free from organic material in accordance with *AS 1289. 3.6.1*.

The *contractor* shall obtain a copy of the supplier's grading tests that is indicative of the material supplied. A copy of this test certificate shall be provided to the *PDC* for inclusion in documentation required to support certification of the *works* at the conclusion of construction.

Council encourages use of recycled materials where possible. Recycled material shall comply with *RMS QA Specification 3071* when used as select material and the grade limits above.

2.8.2 Moisture content of filling materials

Fill is to be compacted at a moisture content of approximately +/- 2% of Standard Optimum Moisture Content. Strict adherence to this range is required.

Soils with moisture content greater than the specified compaction range shall be removed and replaced with complying material.

Soils with moisture content less than the specified compaction range must have water added prior to and during the compaction process.

Section 2: Earthworks

At the time of compaction of each layer, the moisture content of the material shall be +/-2% of Standard Optimum Moisture Content.

2.8.3 Placing and compacting fill

The material shall be spread and compacted in maximum 150 mm layers to obtain 95% of the optimum dry density established by Australian Standard AS 1289. The degree of compaction shall be determined and certified by a NATA accredited laboratory (or SSC laboratory).

Equipment shall be adequately weighted and sufficient passes shall be made to attain the compaction specified. In areas which are not suitable for rolling with power equipment the *contractor* shall use mechanical hand tampers / plate compactors.

If, at any time during the progress of the work, tests show that the specified degree of compaction is not being obtained, the *contractor's* equipment and/or methods shall be replaced or modified, as required, to obtain the specified results.

The *contractor* may vary the scarifying and compacting methods adopted provided that the material can still be compacted to the specified density.

At the completion of each day's work and at any time during a shift when a delay to work appears imminent on account of rain, all fill deposited shall be spread, graded and lightly rolled to form a surface sufficiently dense and shaped to shed the runoff to drains. Upon resumption of work those areas which have not been fully compacted shall be ripped for their full depth, cut to shape and processed as newly deposited fill. Material which has been moisture softened following rainfall shall be removed prior to placing additional fill over.

Acceptance of each layer is conditional upon the application of uniform and sufficient compaction effort by appropriate equipment over the whole of the layer.

2.8.4 Placing and compacting fill near structures

Placing of fill must be undertaken in layers so that any adjacent structures are not overloaded or damaged during compaction.

The placing of fill against brickwork or concrete work shall only be done where shown on approved construction documents.

The placing of fill on both sides of foundation walls shall be equalised as far as possible and the difference in elevation between the two surfaces shall not exceed 600mm.

Fill shall be placed in layers not exceeding 150mm in compacted thickness allowing due care to avoid damage to any structures within the fill area and shall be compacted by rolling, tamping, vibration or other approved means.

2.8.5 Placing and compacting trench backfill

Trench backfill shall be placed and compacted in accordance with AS 3725 and/or the relevant utility service provider's specifications.

Backfilling shall proceed as rapidly as construction. Backfill shall be placed in layers not exceeding 150mm in compacted thickness allowing due care to avoid damage to any services within the trench area and shall be compacted as specified.

For drainage trench backfill refer to Section 3: Stormwater drainage.

2.8.6 Finished surface of earthworks in areas to be vegetated

The area within the limit of *works* shall be graded, within the limits specified, to the required elevations and cross sections.

The finished surfaces shall be smooth, compacted as specified, and free from irregular surface changes.

Allowance for the effects of consolidation including the settlement of fill shall be made by placing extra material at the time of construction or additional material shall be placed after consolidation has taken place.

The levels of the finished surface shall be in accordance with the approved drawings and shall not pond surface water.

2.9 Quality management

2.9.1 Testing

Testing shall be carried out to determine whether the fill has been compacted to the specified density.

All testing must be performed by a NATA accredited laboratory (or SSC laboratory).

The cost of all testing shall be paid by the *contractor* and the original of all laboratory reports shall be provided to the *PDC* for inclusion in documentation required to support certification of the *works* at the conclusion of construction.

2.9.2 Frequency of testing

The following testing frequencies relate to acceptance on a 'not one to fail' basis.

The testing shall be carried out in locations chosen by the NATA accredited laboratory (or SSC laboratory) technician and at the frequencies as given below, however, it may be appropriate to undertake testing in specific locations based on visual appearance or past experience (e.g. compaction may be more difficult to achieve adjacent to manholes, kerbs or over backfilled service trenches).

Where a test, or group of tests, is carried out on an area that has been subjected to essentially the same preparation and compaction procedures, and where the area is free from items that would affect compaction results (see examples in the above paragraph) the whole of this area is considered to be represented by this test or group of tests. The uniform area is generally known as a work lot.

On this basis, if one or more tests indicate that compliance with the specification has not been achieved, the whole of the area which has been submitted for testing is deemed not to comply, unless it can be demonstrated that the area in which the non-complying test result(s) can reasonably be separated from the whole. It should not be assumed a test result applies only to the area immediately surrounding it.

Required frequency of testing is as follows: Not less than:

- 1 test per 50m² distributed reasonably evenly throughout full depth and area; or
- 1 test per layer of 150 mm thickness per material type per 200m² of surface area (but per 100m² for roads) whichever requires the most tests.

The testing frequency may be reassessed by the NATA accredited laboratory (or SSC laboratory), if a high degree of uniformity becomes evident during construction.

For trench filling, 1 test per 20 linear metres per layer of 150mm thickness per material type is required.

2.9.3 Schedule of hold points and check points – earthworks

1. Work process:	Grub holes
Hold point or check point:	<i>Check point</i>
Notice:	N/A
Action:	Test certificate for compaction
2. Work process:	Stormwater management, erosion & sediment control
<i>Hold point or check point:</i>	Hold point – <i>Council's representative</i>
Notice:	At least five (5) working days notice
Action:	<i>Council's representative</i> will inspect the sediment control prior to authorising the release of the <i>hold point</i> .
3. Work Process:	Excavation to required levels
<i>Hold Point or check point:</i>	<i>Hold point – PDC</i>
Notice:	N/A
Action:	The <i>PDC</i> shall confirm that the design subgrade surface levels have been achieved. Where insufficient known levels and survey marks exist, land survey may need to be completed to confirm that the required levels have been achieved.
4. Work Process:	Compaction of subgrade
<i>Hold point or check point:</i>	<i>Check point</i>
Notice:	N/A

Action:	Density testing by a NATA accredited laboratory (or SSC laboratory) is to be completed or test samples are to be taken as appropriate prior to proceeding with works that will reduce access to the subgrade. Works may progress at the <i>contractor's</i> risk following sampling. Test results are to be provided to the PCA for inclusion in documentation supporting certification.
5. Work Process:	Supply of fill material
<i>Hold point or check point:</i>	<i>Check point</i>
Required Notice	N/A
Action:	Supplier's grading test is to be supplied for the material supplied. Works may progress at the <i>contractor's</i> risk following sampling. Test results are to be provided to the PCA for inclusion in documentation supporting certification.
6. Work Process:	Compaction Testing
<i>Hold point or check point:</i>	<i>Check point</i>
Notice:	N/A
Action:	Density testing is to be completed by a NATA accredited laboratory (or SSC laboratory) before works that will restrict access to the trench backfill are completed. Works may progress at the <i>contractor's</i> risk following sampling. Test results are to be provided to the PCA for inclusion in documentation supporting certification.