Part 5 Standards for Provision of Earthworks

5.1.1 General Standard

(1) The standards for the provision of Earthworks are to be in accordance with Australian Standard AS 3798-2007 - Guidelines on Earthworks for Commercial and Residential Developments, modified to suit local conditions and practices.

5.1.2 Materials for Filling

(1) The following materials are considered unsuitable as structural fill:
- a. organic soils;
- b. silts;
- c. materials prone to dissolving or which undergo physical or chemical changes on exposure to moisture; and
- d. contaminated soil.

Note:
- a. Structural fill is any filling which will, or may be required to support structures or pavements or for which it is intended time dependent settlement will be restricted.
- b. Most naturally occurring earth, soil and rock, with the exceptions noted in section 5.1.2(1), are capable of being compacted to form a homogeneous mass to support commercial and residential developments and associated infrastructure.
- c. Special measures will need to be undertaken if the following materials are proposed to be used for structural fill:
  - i. Natural Material:
    - A. clays of high plasticity which may be reactive and need to be selectively placed within the filling and under strict moisture and density control;
    - B. material which, after compaction, contains large particles and may lead to difficulties in the excavation of trenches for footings or services or driving of piles or drilling of piers if this is necessary;
    - C. overwet materials, as may be encountered in low lying areas;
    - D. single-sized or gap graded gravels or rock fill which will not break down upon compaction, leaving voids into which finer material may subsequently migrate;
    - E. saline, chemically aggressive, or polluted soils; and
    - F. carbonate soils where acid dispersal may occur.
  - ii. Waste Material:
    - i. waste material such as building and demolition material may be accepted as structural fill if the supply, placement and compaction is fully specified and supervised by the Consulting Engineer or Geotechnical Consultant; and
    - ii. level 1 supervision as set out in Appendix B of AS 3798 will be required if waste material is to be used as structural fill.

5.1.3 Compaction

(1) For areas of structural filling the minimum relative compaction values are to be those outlined below in Table 5.1.1.

Table 5.1.1 — Earthworks – Guidelines for Minimum Relative Compaction

Item	Project	Minimum relative compaction, percentage	
		Minimum dry density ratio (Cohesive Soils) (See Note 1)	Minimum Density index (Cohesionless soils) (See Note 2)
1	Residential Lot fill	95 (3)	65
2	Commercial, fills to support minor loadings	98 (4)	70
3	Roads embankments (a) > 0.3m below pavement subgrade (b) < 0.3m below pavement subgrade	 95 100	 65 80

Notes:
- a. The above table has been adapted from Table 5.1 – AS 3798-2007.
- b. All dry density ratios relate to AS 1289.E4.1 or AS 1289.E7.1 and standard compaction energy input (see AS 1289.E1.1 and AS 1289.E1.2).
- c. Density index as a means for control of achieved relative compaction may be difficult to use and interpret. Local correlations with other methods may

exist and can be used where these are well established.

d. Developments on this fill will be restricted to single and some double storey free standing houses with floor slab average loadings not exceeding 20 Kpa, and strip or pad footings not exceeding bearing pressures of 100 Kpa. Residential developments other than these are considered as commercial. A minimum dry density ratio of 98% or higher may need to be considered if collapse on saturation, excessive settlement, or dispersive soils are likely to occur. Not applicable where differential settlement is likely to occur.
e. Commercial developments are likely to impose loads on fills which will have a more severe effect than those of free-standing houses, even when contact pressures are limited. The engineer must assess the load carrying capacity and associated deformations associated with proposed filling to ensure the fill can perform its required function. Where highly loaded fills are proposed, the minimum relative compaction may need to be increased.

5.1.4 Construction

(1) Earthworks are to be carried out in accordance with AS 3798 Section 6.

Note: All fill over 500mm in depth is to be certified by an RPEQ that it has been placed in accordance with the level required under AS3798.

(2) For normal types of compaction equipment, the fill is to be compacted in layers not exceeding 300mm.

Dust managment —

a. Dust generated from the site and from earthworks is to be controlled so as not to adversely affect adjoining properties;
b. Water carts should also be provided on non-working days where it is necessary to control dust problems;
c. During and immediately following periods of rain, measures are to be undertaken to ensure that material from the development site is not deposited on to existing roads by construction traffic; and
d. Material deposited onto existing roads is to be removed immediately so as not to affect the safety of traffic.

5.1.5 Testing

(1) The frequency of testing fill for adequate compaction is to be in accordance with the requirements outlined in Table 5.1.2.

Table 5.1.2 — Earthworks – Guidelines to Frequency of Field Density Test

Scope of Earthworks	Minimum Frequency of Tests (See Note 2)
Large scale operations (e.g. subdivisions, large industrial lots, road embankments)	Greatest of— a. 1 test per 500m^3 distributed reasonably evenly throughout full depth and area; or b. 1 test per layer per material type per 2500m²; or c. 1 test per 200mm thickness per material type per 2500m²; d. 1 test per lot
Small scale operations (e.g. residential lots)	Greatest of— a. 1 test per 200m^3 distributed evenly through full depth and area; or b. 1 test per layer(c) per 1000m²; or c. 1 test per 200mm thickness (c) per 1000m²; or d. 1 test per lot.
Concentrated operations (e.g. filling of gullies, farm dams, etc)	Greatest of— a. 1 test per 100m^3 distributed reasonably evenly throughout full depth and area; or b. 1 test per layer (c) per 500m²; or c. 1 test per 200mm thickness (c) per 500m²
Confined operations filling behind structures (d)	1 test per 2 layers per 50m² ie test every second layer once per 50m²
Trenches under pavements and structures	1 test per 2 layers per 40 linear metre ie test every second layer once per 40m

Notes:

a. These guidelines refer to the determination of relative compaction using a direct method. However, where an indirect method is used, eg Perth sand penetrometer (AS 1289.F3.3), some interpretation of the guidelines may be required.
b. Tests in visually doubtful areas, and retests of failed areas should be carried out and are additional to the testing recommended in this table.
c. Where the geotechnical testing authority has been engaged at level 2 or level 3 as set out in Appendix B of AS 3798, it may be acceptable to test more than one layer per site visit by excavating to the test level.
d. Implies hand operated or small equipment.
e. All test locations are to be shown on a sketch plan.

5.1.6 Erosion and Sedimentation Control

(1) An Erosion and Sedimentation Control Program is prepared by a Certified Professional in Erosion and Sediment

Control (CPESC) or a Registered Professional Engineer of Queensland (RPEQ) in accordance with Soil Erosion and Sediment Control Engineering Guidelines for Queensland Construction Sites and IECA 2008, Best Practice Erosion and Sediment Control, and demonstrates that:

a. the environmental effects of sedimentation and erosion are controlled by best practice management measures;
b. sediments resulting from the development are contained within the site; and
c. development adjacent to the bank or the bed of a stream or watercourse, addresses environmental impact on waterbodies.

(2) Table 5.1.3. Land disturbance or exposure of soil involving an Issue listed in Column 1 is to include the information summarised in Column 2 at the time specified in Column 3.

Table 5.1.3 — Information required in support of a development application

Column 1 - Issue	Column 2 - Information Required	Column 3 - When Required
All applications	Submit a completed Erosion Hazard Assessment (EHA) form.	With development application
EHA low Risk	Best practice erosion and sediment control (ESC) must be implemented but no erosion and sediment control plans need to be submitted with the development application. Factsheets are available outlining best practice ESC.	Conditioned with Development Approval
EHA medium Risk	The applicant will need to engage a Registered Professional Engineer (RPEQ) or Certified Professional in Erosion and Sediment Control (CPESC) to prepare an ESC Program and Plan and supporting documentation — in accordance with the requirements of Table 1 - Assessable Development Requirements	Conditioned with Development Approval
EHA high risk	The applicant will need to engage a RPEQ and CPESC to prepare an ESC Program and Plan and supporting documentation — in accordance with the requirements of the Planning Scheme Policy 3 – General Works. The plans and program will need to be certified by a CPESC.	Conditioned with Development Approval
Where the development proposal involves any of the following issues as described below:		
Applications involving the endorsement of a staging plan	Submit an ESC Program and Plan and supporting documentation which demonstrate that the proposed staging will facilitate provision of effective ESC during construction.	With operational works application
Applications for which 1ha or greater external catchment area contributes stormwater run-off to the subject site	Submit an ESC Program and Plan and supporting documentation which demonstrates that clean stormwater from up-slope external catchment(s) can be diverted around or through the site without causing either an increase in sediment concentration of the flow, or erosion on site or off site. Alternatively, if it is not feasible to divert clean stormwater from up-slope external catchment(s) around or through the site, the ESC Program and Plan must demonstrate that there is sufficient land area available to install and operate a sediment basin which is sized to accommodate the stormwater run-off from the whole up-slope catchment.	With operational works application
Applications for which 1ha or greater of	Submit an ESC Program and Plan and	With operational works application

land disturbance will occur	supporting documentation which demonstrates that: a. there is sufficient land area available to install and operate an appropriately sized sediment basin; b. the run-off from all disturbed areas can be directed to a sediment basin throughout construction and until such time as the up-slope catchment is adequately stabilised against erosion.	
Applications proposing works on land having a slope of greater than 15%	Submit an ESC Program and Plan and supporting documentation which demonstrates that: a. there is sufficient land area available to install and operate an appropriately sized sediment basin; b. the run-off from all disturbed areas can be directed to a sediment basin: i. preliminary engineering sections of proposed sediment basins showing that they may be practically implemented on the slopes proposed; ii. preliminary earthworks plan showing proposed extent of land disturbance; iii. geotechnical report which assesses the probability of landslip instability as a result of the construction phase ESC measures.	With operational works application
All works subject to an Operational Works Development Approval with an EHA rating of 'medium'.	Erosion and sediment control program(s) and plan(s) – See section 5.1.6(3) Soil Testing as per 5.1.5 above Design Certificate as per 5.1.6(6)	As indicated in the condition timing of the development approval.
All works subject to an Operational Works Development Approval with an EHA rating of 'high'.	Erosion and sediment control program(s) and plan(s) – See section 5.1.6(3) Soil Testing as per 5.1.5 above Design Certificate as per 5.1.6(6) Inspection certificate - to be created	As indicated in the condition timing of the development approval.

(3) **Erosion and Sediment Control Plans**

The primary purpose of erosion and sediment control plans (ESC Plans) is to inform those persons constructing the development on what controls need to be implemented throughout all stages of the development from site establishment to project completion. Typically a separate ESC Plan is required for each phase of the development including the bulk earthworks, civil construction (typically roadworks and stormwater drainage), services installation, final stabilisation and the decommissioning of construction phase sediment basins. These plans could be considered an element of complying with the general environmental duty, that is, doing all that is reasonable and practicable to prevent or minimise environmental harm.

Erosion and sediment control plans must:

a. be prepared by a suitably qualified and experienced professional;
b. be consistent with this standard and a current best-practice document (such as the IECA 2008 Best Practice Erosion and Sediment Control). For issues where a document (i.e. manual or guideline) is not consistent with this standard, this standard prevails to the extent of the inconsistency;
c. be based on an assessment of the physical constraints and opportunities of the development site, including those for soil, landform type and gradient, and hydrology;
d. be supported by on-site soil testing;
e. provide a set of contour drawings showing existing and design contours, the real property description(s), north point, roads, site layout, boundaries and features. Contours on, and surrounding, the site should be shown so that catchment boundaries can be considered;
f. be at a suitable scale for the size of the project (as a guide around 1:1000 at A3 for a 2ha development and 1:500 at A3 for a 3,000m^2 development);
g. provide background information including site boundaries, existing vegetation, location of site access and other impervious areas and existing and proposed drainage pathways with discharge points also shown;
h. show the location of lots, stormwater drainage systems;
i. details on the nature and specific location of works and controls (revegetation, cut and fills, run-off diversions, stockpile management, access protection), timing of measures to be implemented and maintenance requirements (extent and frequency as defined in IECA 2008, Chapter 6.8);

j. show all areas of land disturbance, the way that works will modify the landscape and surface and sub-surface drainage patterns (adding new, or modifying existing constraints);
k. for each phase of the works (including clearing, earthworks, civil construction, services installation and landscaping) detail the type, location, sequence and timing of measures and actions to effectively minimise erosion, manage flows and capture sediment;
l. describe the scheduling of progressive and final rehabilitation as civil works progress, including the stabilisation of up-slope catchments prior to sediment basin removal;
m. identify the riparian buffers and areas of vegetation which are to be protected and fenced off to prevent vehicle access;
n. indicate the location and provide engineering details with supporting design calculations for all necessary sediment basins and ESC-related drainage structures;
o. indicate the location and diagrammatic representations of all other necessary erosion and sediment control measures;
p. identify the clean and disturbed catchments, and flow paths, showing:
    i. diversion of clean run-off;
    ii. collection drains and banks, batter chutes and waterway crossings;
    iii. location of discharge outlet points;
    iv. water quality monitoring locations;
q. show calculated flow velocities, flow rates and capacities, drain sizing and scour/lining protection, and velocity/energy checks required for all stormwater diversion and collection drains, banks, chutes, and outlets to waterways;
r. show waterways (perennial and non-perennial) and detail of stabilisation measures for all temporary waterway crossings;
s. locate topsoil and/or soil stockpiles;
t. prescribe non-structural controls where applicable, such as minimising the extent and duration of soil exposure, staging the works, identifying areas for protection, delaying clearing until construction works are imminent etc.;
u. include a maintenance schedule for ensuring ESC and stormwater infrastructure is maintained in effective working order (refer IECA 2008, Chapter 6 and Chapter 7);
v. include an adaptive management program to identify and rectify non-compliances and deficiencies in environmental performance (refer IECA 2008, Chapter 6 & Chapter 7);
w. provide details of chemical flocculation proposed, including equipment, chemical, dosing rates and procedures, quantities to be stored and storage location, and method of decanting any sediment basin; and
x. show how post-construction water sensitive urban design bioretention devices will be adequately protected against sediment ingress during land-disturbing activities, including where applicable the transition from construction-phase sediment basins to post-construction phase bioretention basins.

(4) **Erosion and Sediment Control Program**

A construction phase erosion and sediment control (ESC) program is a set of management strategies, supporting documents and ESC plans that describe what controls are required throughout all stages of the construction of the development, including the integration and protection of post-construction stormwater management infrastructure (e.g. water sensitive urban design bioretention devices).

In addition to providing Erosion and Sediment Control (ESC) plans, the Erosion and Sediment Control Program must also:
a. be consistent with this standard and a current best-practice document such as the IECA 2008, Best Practice Erosion and Sediment Control. For issues where a current best-practice document is not consistent with this standard, this standard prevails to the extent of the inconsistency;
b. be supported by on-site soil testing and analysis;
c. include contingency management measures for the site, for example to ensure ESC measures are effective at all times, particularly just prior to, during and after wet weather;
d. be consistent with current best-practice standards, taking into account all environmental constraints including erosion hazard, season, climate, soil characteristics, and proximity to waterways;
e. be prepared to a sufficient standard and level of detail such that compliance with this standard will be achieved if the construction phase ESC program is correctly implemented on site; and
f. include an effective monitoring and assessment program to identify, measure, record and report on the effectiveness of the erosion and sediment controls and the lawfulness of water releases (refer IECA 2008, Chapter 6 and Chapter 7).

(5) **Quality Assurance**

Certification
The certification requirements apply to any project assessed as having ‘medium’ or ‘high’ risk according to the Erosion Hazard Assessment form.

Certification must:
a. be on the approved form;
b. be undertaken by an RPEQ and/or CPESC;
c. be completed and lodged with Council at least 10 days prior to the prestart meeting or commencement of site works.

This requirement does not diminish the responsibility of any person involved in the development to do all that is reasonable and practicable to ensure effective environmental management is implemented on site at all times and in accordance with the requirements of the applicable development approval conditions, development approvals and the Environmental Protection Act 1994.

(6) **Erosion Control Standard**

The design and implementation of best-practice erosion control principles and practices will be based on monthly rainfall erosivity ratings as defined within IECA 2008 Table 4.4.1 and Table 4.4.4 unless noted otherwise in this standard.

Minimising soil exposure. Ensure non-essential exposure of soil is avoided by:

a. restricting the extent of clearing to that necessary for access to, and safe construction of the approved works;
b. protecting vegetation in all other areas of the site;
c. minimising the duration of soil exposure by:
    i. only clearing vegetation immediately prior to an area being actively worked;
    ii. staging the works to minimise the area of soil exposed at any one time;
    iii. effectively stabilising cleared areas if works are delayed or works are not intended to occur immediately;
    iv. effectively stabilising areas at finished level without delay and prior to rainfall; and
    v. effectively stabilising steep areas, such as stockpiles, batters and embankments, which are not being actively worked and prior to rainfall.

(7) **Drainage Control Standard**

The design and implementation of best-practice drainage control principles and practices will comply with IECA 2008 Table 4.3.1 unless noted otherwise in this standard.

Managing stormwater:

a. ensure clean stormwater is diverted or managed around or through the site without increasing the concentration of total suspended solids or other contaminants in the flow and without causing erosion (on site or off site). If it is not feasible to divert all areas discharging clean stormwater around or through the site, manage the clean stormwater as for contaminated stormwater, and ensure that sediment basins are sized to capture and accommodate the additional volume of run-off.
b. ensure sheet flows of stormwater are managed such that sheet and rill erosion is prevented or minimised; and
c. ensure that all concentrated stormwater flows including drainage lines, diversion drains, channels, spillway and batter chutes are managed onto, through, and at release points from the site in all rain events up to and including the average recurrence interval event defined within IECA 2008 Table 4.3.1 without causing:
    i. water contamination; or
    ii. sheet, rill or gully erosion; or
    iii. sedimentation; or
    iv. damage to structures or property.

(8) **Sediment Control Standard**

The design and implementation of best-practice sediment control principles and practices will be based on monthly rainfall erosivity ratings as defined within IECA 2008 Table 4.5.2 unless noted otherwise in this standard.

a. Sediment basins are to be provided in accordance with Best Practice Erosion and Sediment Control, Appendix B – Sediment basin design and operation, IECA (2008) in order to:
    i. ensure each sediment basin has the capacity to treat flows to current best-practice standards and as a minimum to contain all the stormwater run-off from the R(Y%, 5-day) rainfall depth equal to 40mm, unless a higher standard is prescribed in the development approval condition(s);
    ii. provide sediment storage volume in accordance with Table B8 (Appendix B, IECA 2008) or as a minimum store at least 2 months sediment from the receiving catchment, as determined using the Revised Universal Soil Loss Equation (RUSLE);
    iii. ensure sediment basins are maintained with sufficient storage capacity to capture and treat the run-off for the design rainfall depth. Where sediment basins are proposed to be oversized for storage of captured water for re-use, install survey markers in each such basin to clearly indicate the level that water within the basin must be lowered to, in order to meet the storage capacity specified in requirement (c) above;
    iv. ensure sediment basins are dewatered to the appropriate level as soon as practicable after each rainfall event and no longer than 5 days after a rainfall event (see also below);
    v. ensure stormwater captured in sediment basins is treated prior to discharge to minimise the concentration of contaminants released from the site, having due regard to forecast rainfall, and ensuring that releases are in accordance with the release limits within Table B40 and B41 specified in Appendix B, IECA 2008;
    vi. ensure sediment basins and associated structures such as inlets, outlets and spillways are effectively stabilised and structurally sound for ARI rainfall events defined within Table B12 (Appendix B, IECA 2008); and
    vii. ensure accumulated sediment from basins and other controls is removed and disposed of appropriately without causing water contamination.
b. Erosion and sediment controls (other than sediment basins):

i. ensure measures have been implemented such that the run-off from all disturbed areas flows to a sediment basin or basins. Where it is not feasible to divert run-off from small disturbed areas of the site to a sediment basin, implement compensatory erosion, drainage and sediment controls prior to rainfall to ensure that erosion of those of areas does not occur, including erosion caused by either splash (raindrop impact), sheet, rill or gully erosion processes;
ii. where it is not feasible to effectively stabilise cleared areas of exposed soil, such as areas being actively worked, implement a full suite of erosion and sediment controls, to maximise sediment capture in those areas and minimise erosion such that all forms of erosion, other than splash erosion (raindrop impact) and sheet erosion, do not occur;
iii. in areas of exposed soil where it is not feasible to either effectively stabilise the surface or implement a full suite of erosion and sediment controls, for example in the areas being actively worked and where the implementation of some erosion and sediment controls would impede construction activities, ensure contingency measures are available on site and are implemented, prior to rain, to maximise sediment capture in those areas and minimise erosion such that all forms of erosion, other than splash erosion (raindrop impact) and sheet erosion, do not occur; and
(Note: this does not apply to major erosion and sediment controls such as sediment basins. Major controls should be installed before other works commence); and
iv. effectively stabilise all stockpiles, batters and embankments without delay. Where it is not feasible to effectively stabilise a stockpile, batter or embankment, such as areas being actively worked, ensure that sediment controls are installed and surface stormwater flows are managed such that erosion of stockpiles, batters or embankments is not caused by concentrated stormwater flows.

5.1.7 Material Exportation

(1) Site access treatment measures must be implemented to prevent soil or mud being transported from the construction site and deposited on public roads.

5.1.8 Batters and Earth Retaining Structures

(1) No proposed fill or cut is to have a deleterious effect on the visual amenity of the adjoining property.

(2) Batters have a maximum gradient of 1:3 and are appropriately stabilized (including using appropriate planting).

(3) Gradients greater that 1:3 may be accepted where the design is supported and justified by a geotechnical analysis.

(4) Turf batters have a maximum gradient of 1:6. In public areas, batters are preferred over retaining walls.

(5) The toe of any fill batter or top of any cut batter is to be a minimum 300mm clear of the boundary line with an adjoining property.

(6) There is to be no ponding or nuisance from stormwater runoff on adjoining properties.

(7) All batters or walls abutting existing or proposed road reserves are to be contained within the proposed allotments and not encroach on the road reserve.

(8) Boulder type walls are required to be set back a minimum 0.3m from road reserves.

(9) Retaining structures greater than 1m in height shall have:
a. 60 year design life with an appropriate design certificate from a Registered Professional Engineer of Queensland (RPEQ);
b. a minimum 5kPa design surcharge load;
c. bridge footing where applicable so as to not impose any additional loading upon municipal underground services;
d. subsoil drainage, with connection to legal point of discharge;
e. approved backfill drainage material contained within a geo-fabric wrap;
f. moulded concrete V-drain; and
g. approved safety fence where located in public area and are 1.0m or greater in height.

Note: This is in accordance with Australian Standard Earth-retaining Structures AS4678-2002.

(10) Full depth coloured and textured concrete sleeper retaining walls are provided along or within public space areas.

(11) The use of timber sleepers for retaining purposes greater than 1m in height is not acceptable.

(12) Where on lot boundaries, retaining walls extend a minimum of 100mm below the nominated pad level of the adjacent downslope lot.

(13) Boulder wall height should be limited to a maximum of 1m for any contributed assets.

5.2 Dispersive Soil Management

(1) Background

Dispersive soils exist throughout Ipswich. They include large areas dominated by Sodosols that are known to be particularly vulnerable to dispersion and erosion. Other clay-rich soils such as Chromosols, Dermosols, Vertosols and some Hydrosols and Kandosols are also vulnerable to dispersive erosion.

Dispersion occurs when sodic soils (normally subsoils) are exposed to non-saline water including rainwater, resulting in the swelling of clay platelets and the collapse of clay aggregates. Dispersion is often seen as 'muddy' or 'milky' water in dams and surface water and dispersion can lead to tunnel erosion. Tunnel erosion can cause significant damage to physical infrastructure and buildings where undermining may occur and the surface may slump or collapse into voids and cavities that has been formed by soil dispersion.

In almost all cases, tunnel erosion results from the surface disturbance of soil allowing rainwater or stormwater to come into contact with dispersible subsoils.

Changes to hydrology, including concentrating flow in culverts, runoff from hardstand areas, ponding of rainfall and land contouring increases the risk of tunnel erosion.
Typical activities that increase the risk of exposing dispersive subsoils to rainfall and stormwater include:

a. the removal of topsoil;
b. soil excavation and ground profiling;
c. trenching and supply of services;
d. road and culvert construction; and
e. the construction of dams and detention basins.

Figure 5.2.1 Tunnel erosion and slumping along a drainage line

Development in areas containing dispersive soils has the potential to increase the incidence of infrastructure damage and environmental harm (eg adversely affect water quality) resulting from tunnel and surface erosion. The repair of tunnel erosion is also often expensive, difficult and prone to re-failure.

The management of dispersive soils therefore requires a focus on prevention rather than intervention, and a shift in standard construction techniques and development practices (refer to Section 5 below).

Figure 5.1.2 Large scale tunnel and gully erosion in highly dispersive soils, Centenary Highway

Figure 5.1.3 Erosion and dispersion along service trench

Figure 5.1.4 Batter erosion to dispersive subsoils

(2) **Identification of Dispersive Soils**

OV17 Dispersive Soils identifies the spatial distribution of the major dominant soil types in Ipswich based on the Australian Soil Classification Orders. The mapping has been produced to assist in broad scale soil identification focusing on the classification of dominant soil types only.

Those areas mapped as containing Sodosols are likely to contain dispersive soils or subsoils and development in these areas that meet or exceed the thresholds in Table 5.3.1 requires the development of a management plan unless it is demonstrated that dispersive soils / sub-soils are not present.

Field testing is able to be conducted to identify dispersive soils by observing the behaviour of air dried aggregates in distilled water or rainwater. The following steps should be followed, or the Emerson crumb test used as an initial test to identify soil susceptible to dispersion:
Step 1 *Collect soil aggregates (2 or 3 pea sized soil aggregates / 1-2cm in diameter) from each layer in the soil profile representative of the soil layers.*
Step 2 *If moist, dry the aggregates in the sun for a few hours until air-dried (Note: aggregates may not disperse when they*

should if they have not been sufficiently dried).
Step 3 *Gently place the selected aggregates in a shallow glass or jar of distilled water or rain water.*
Step 4 *Leave the soil aggregates on a stable surface without shaking or disturbing them for 2 hours.*
Step 5 *Record the results to determine the level of dispersion observed (refer to Figure 5.2.1 below).*

Where evidence of dispersion is recorded, additional management techniques and the preparation of a management plan may be required (refer to Section 3 below).

Further testing using approved Australian Standard techniques may also be required, particularly where results of the field testing is inconclusive, or where large areas are likely to be disturbed by development, including for the construction of infrastructure.

(3) **Thresholds and Dispersive Soil Management**

Development within areas containing dispersive soils (refer to Section 2 above) that meet or exceed the thresholds contained in Table 5.3.1 are required to provide a Dispersive Soil Management Plan (DSMP) as part of a comprehensive Erosion and Sediment Control Plan.

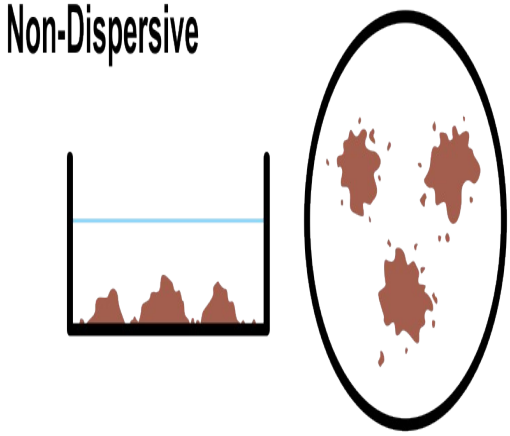
The DSMP is to be submitted to Council in a format that satisfies the requirements of Section 4 below. The DSMP must compliment and integrate with stormwater management undertaken in accordance with Parts 2 and 3 of this Planning Scheme Policy.

The DSMP should also address areas of difficult topography, with soil disturbance in areas of greater than 20% slope avoided.

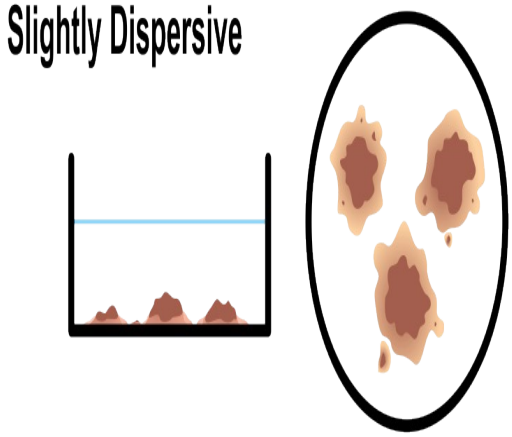
All other development undertaken in areas containing dispersive soils, including works such as landscaping and the installation of pools that would not normally require land use approval should ensure that adequate measures are taken to manage erosion and sediment control.

Ground disturbance and earthworks, particularly to sub-soils should be minimised and regard given to the management of dispersive soils as outlined in Section 5 below.

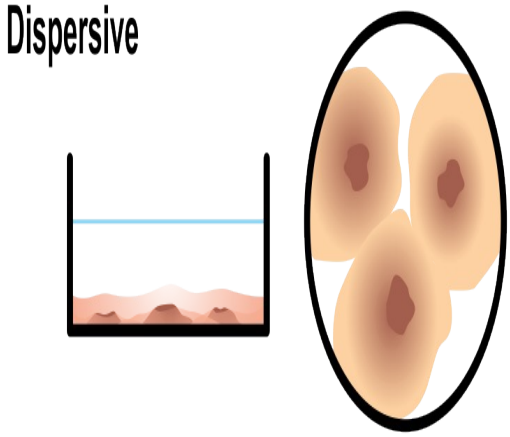
Figure 5.2.1 Aggregate dispersion results



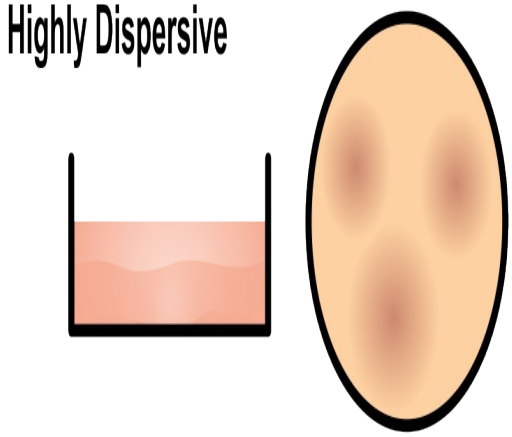
Water remains clear though particles may crumble. Boundary of aggregates clearly defined.



Discolouration surrounding particles or distinct cloudiness surrounding some. Boundary of aggregates vaguely defined.



Discolouration and cloudiness surround most or all particles. Boundary of aggregates not able to be defined.



Discolouration and cloudiness throughout, extending vertically through most or all water.

Table 5.2.1 — Thresholds for Dispersive Soil Management Plan

Development Type	Threshold
Material change of use within an area containing dispersive soils	a. Includes newly constructed road exceeding 30m in total length. b. 6 or more additional dwellings (attached or unattached). c. Disturbing greater than 2500m^2 of ground.
Reconfiguration of a lot within an area containing dispersive soils	a. Includes newly constructed road exceeding 30m in total length. b. Would result in 6 or more residential allotments or that provides for 6 or more dwellings. c. Disturbing greater than 2500m^2 of ground.
Operational works within an area containing dispersive soils	a. Disturbing greater than 2500m^2 of ground.

(4) **Dispersive Soil Management Plans**

This section outlines Council's expectations in relation to the reporting and presentation requirements for the preparation of a Dispersive Soil Management Plan (DSMP).

DSMP's are generally required to be submitted with the initial Material Change of Use and Reconfiguration of Lot application prior to Operational Works.

(4.1) ***Reporting Template***

Table 5.4.1 provides a recommended reporting template for a DSMP submitted to Council. This template is not prescriptive, but provides an indication of the type of information that Council will typically require for most developments. It should be noted however, that conformity with the template does not guarantee that all relevant issues have been addressed.

Table 5.2.2 — Recommended Reporting Template for DSMP's

Section	Contents
Cover Page	
Document Information Page	This page should outline information relevant to the authorship of the DSMP (ideally provided in tabular form), including document title (reference number, date and version tracking), document ownership (including names of personnel that have issued and checked the DSMP), RPEQ certification or suitably qualified and experienced professional (eg soil scientist) plus registration number, name of client and site address.
Summary	Concise summary of study methodology and findings.
Responses to Information Request	Details of how (if any) previous information request(s) from Council have been addressed.

Section	Contents
Table of Contents	
1. Introduction	General description of proposed development/works, existing site, scope of DSMP and names of the project team members.
2. Site Constraints	General description of site limitations that commonly affect on-site erosion and sediment control measures, grouped into five main categories: Soil; Topography; Water; Vegetation; and Ecology. Included should be a detailed site plan showing: i. location of site / property boundaries; ii. accurate location of boreholes (including reduced level) and proposed earthworks; iii. site contours and drainage paths (existing and final); iv. soils and associated risk mapping; v. difficult topography and associated hazard mapping; and vi. map scale suiting site area/features (maximum 1:2000).
3. Soil Data	Document soil sampling, testing and interpretation of test results, notably in terms of dispersion and erosion potential.
4. Erosion Risk Mapping	Aim to identify: zones of various erosion risk; areas where soil disturbance should be avoided; and well-defined links between assessed risks and the required construction practices and erosion and sediment control design standards.
5. Recommendations	Recommendations based on the assessment undertaken and requirements of Ipswich City Council (Planning Scheme Policy 3) and should include: i. any specific soil characteristics (eg fine grained and dispersive soils); ii. suggestion of alternative construction practices and top soil management to reduce present and future erosion (particularly tunnel) impacts; and iii. areas where disturbance of very high risk/dispersive soils is to be avoided.
6. Conclusions of the erosion assessment	Summary of site constraints, erosion hazards and recommended outcomes.
7. Appendices	Include bore logs and copies of all laboratory test results.

(5) Management of Dispersive Soils

The prevention and management of erosion may be achieved using a combination of the following:
a. identification and avoidance of dispersive soils;
b. soil re-compaction;

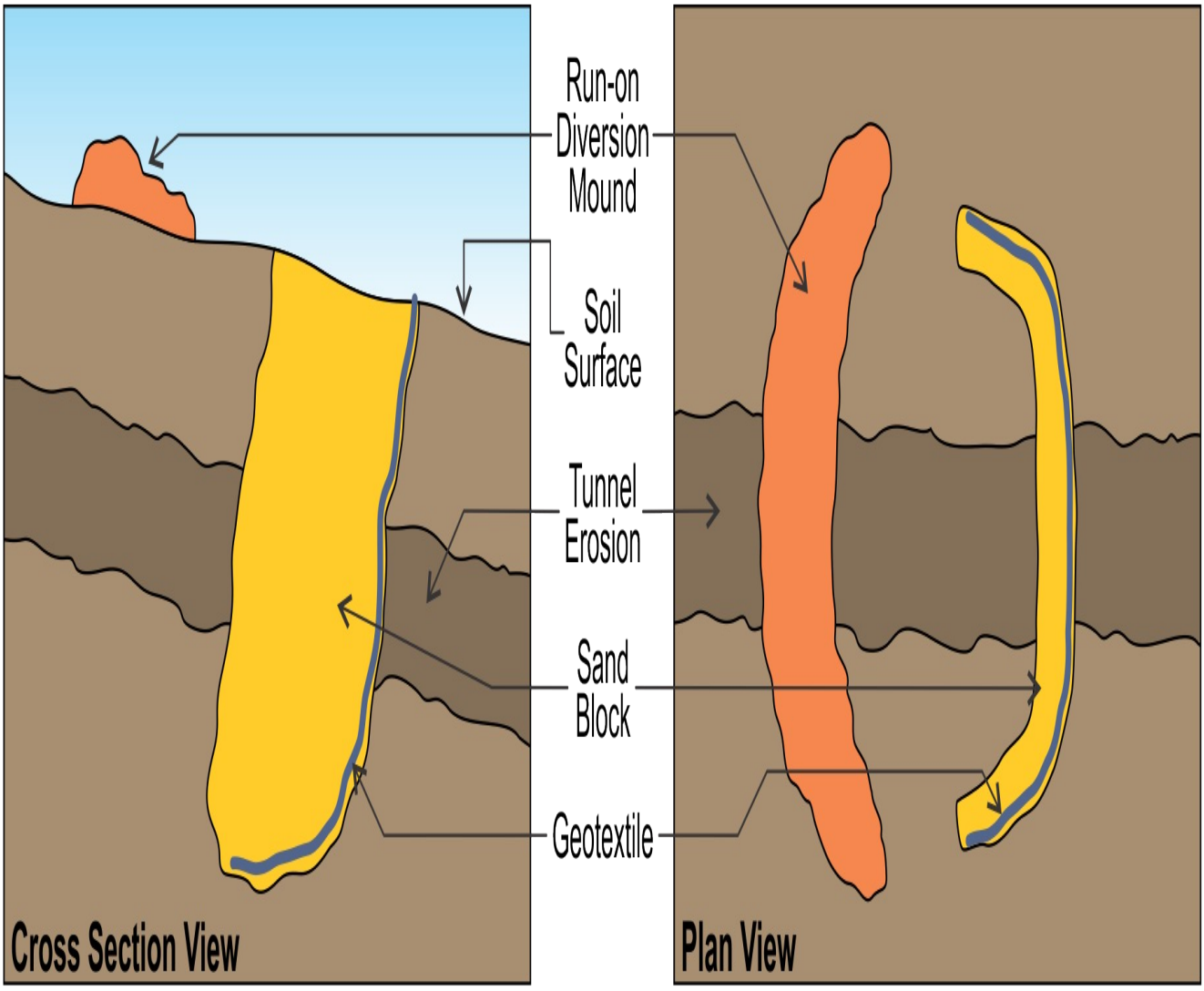
c. chemical amelioration;
d. use of sand blocks and barriers (refer to Figure 5.5.2); and
e. use of non-dispersive topsoil and revegetation.

The following checklist may be used to reduce the risk of soil dispersion:

- Apply gypsum to potentially dispersive soils. The application of chemical treatments including gypsum should avoid harmful changes to pH levels, particularly when in close proximity to waterways (eg 20m from top of bank). The mechanical application of chemical amelioration should also be avoided in areas intended for tree/vegetation retention.
- Minimise the amount of time land is exposed (eg by staging development).
- Discharge stormwater and runoff into relatively erosion resistant areas (eg garden beds mixed with gypsum, existing well vegetated areas with ample topsoil and stony elevated areas) away from dispersive soils. Stormwater discharge should not adversely impact on riparian an waterway corridors.
- Use rainwater tanks to capture runoff from roofs and buildings and pipe overflow to relatively erosion resistant areas.
- Cover exposed dispersive soils with topsoil (at least 150mm deep) and use geotextile barriers.
- Re-vegetate exposed areas, particularly areas of steep slopes.
- Captured runoff should be dissipated and spread over as wide an area as possible.

Figure 5.5.1 Revegetation of major servicing trench

Figure 5.5.2 Modified Sand Block Design



The depth of the sand block is determined by the depth of dispersive soils or tunnel erosion.
The span length of the structure is determined by the width of the tunnelling.

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