

0021 SITE REGRADING

1. General

1.1. Responsibilities

1.1.1. Objective

General: Provide design and documentation of site regrading works to meet the following requirements:

- Provide an efficient and economical design;
- Enhance the environment of the site whilst maintaining the site's natural features;
- Provide safe conditions for construction;
- Provide equal building conditions for all residential development allotments;
- Minimise impact on adjoining properties and other works;
- Minimise regrading in heavily treed areas;
- Maintain or improve drainage, overland flow paths, riparian zones and existing watercourses.

1.1.2. Performance

Requirements: As per Development Application consent conditions.

Authority requirements: As per Development Application consent conditions.

1.2. Cross References

1.2.1. General

Requirement: This is not a self-contained design document.

- 0010 Quality Requirements for Design;
- 0022 Control of Erosion and Sedimentation (Design);
- 0041 Geometric Road Design;
- 0074 Stormwater Drainage (Design).

1.3. Referenced Documents

1.3.1. Standards

General: Conform to the following worksection(s):

AS 3798-2007	Guidelines on earthworks for commercial and residential developments
AS 4970-2009	Protection of trees on development sites
Austrroads AGPT08-2019	Guide to Pavement Technology Part 8 – Pavement Construction
Austrroads AGRD01-2021	Guide to Road Design Part 1: Objectives of Road Design – Appendix B – Geotechnical Investigation and Design

1.4. Interpretation

1.4.1. Abbreviations

General: For the purposes of this worksection, the following abbreviations apply:

- ARI: Average Recurrence Interval;
- EPA: Environment Protection Authority;
- WAE: Work as Executed.

1.4.2. Definitions

General: For the purposes of this worksection, the following definitions apply:

- Advanced plants (species): Plant species containerised and established in 300 mm containers but less than 45 litre containers.

2. Pre-Design Planning

2.1. Planning

2.1.1. Site suitability for the proposed development

Improvement: The natural state of a site may not be suitable for the intended function. Site regrading may be required to:

- Alleviate flooding;
- Fill gullies or create emergency flow paths after installation of underground stormwater systems;
- Improve stormwater run-off;
- Reduce excessively steep slopes, to allow construction of economical foundation solutions;
- Allow effective recreational use or provide improved access;
- Fill local unwanted depressions;
- Improve ground conditions where existing soils have plastic/reactive properties.

Contours: Review the natural surface contours and design finished surface levels to confirm land will be suitably prepared for use.

2.1.2. Land use restrictions

Constraints: Identify all constraints, natural or otherwise, which may apply to the site.

2.2. Environmental Investigation and Planning

2.2.1. Development precinct investigation

Requirement: Prepare a survey and geotechnical report to establish locations of site features, levels and grade, and soil conditions.

Soil properties: Investigate the development precinct soil condition to determine the following:

- Chemical characteristics and compatibility of the soils when they are in contact with foundations of buildings, roads, sewers and services for the development and the appropriate precautions that can be taken;
- Acid sulfate soils;
- Climatic conditions, such as frost susceptibility, especially for road subgrade construction;
- Soil salinity: Evaluate existing soil conditions in known salt affected areas, or areas found to be salt affected by the geotechnical investigations.

Embankments: Determine the stability and base/top levels of embankment

2.2.2. Potential environmental impacts

Requirement: An Environmental Impact Statement (EIS) shall be prepared by suitably qualified persons for the development area/precinct which identifies potential environmental impacts by the development including the following:

- Heritage items;
- Items of Indigenous cultural significance;
- Effects on water quality and inundation;
- Endangered species requiring protection;
- Wildlife habitat;
- Vegetation requiring protection.

Details of potential impacts: If there are potential impacts, provide details of the issues and proposed control measures for minimising the impact and protecting the surrounding environment before starting design. This should be included in the Environmental Impact Statement (EIS), to be included in the preliminary design report.

2.3. Consultation

2.3.1. Council and other authorities

Requirement: Consult with the Council, TfNSW, NSW Department of Planning, Industry and Environment (Land and Water), NSW Department of Primary Industries (Fisheries) and other relevant authorities prior to commencement of design to identify any design requirements in addition to the requirements of this worksection. Also include any Environmental Impact Statement (EIS) required for approval.

Council consultation: Liaise with the Council's officer(s) before starting design to identify design requirements, including the following:

- Haul routes: Consult to define acceptable routes for haulage and applicable load limits;
- Tree protection: Consult with relevant Council and Government authorities to identify requirements and restrictions relating to tree protection and site clearing. This should be in addition to any recommendations outlined in the Environmental Impact Statement;
- Protection of culturally significant items: Consult with the relevant Government authorities and Council to identify requirements and restrictions relating to the protection and preservation of identified culturally significant items;
- Waste disposal: Consult and obtain approval for cleared/excavated material disposal facilities;
- Fill materials: Consult to establish restrictions, if any.

Other authorities: Consult with and seek approval for the development from the following state government authorities:

- NSW Government land and water resources departments: Consult the authority to identify areas requiring action to prevent salination;
- EPA: Consult the EPA on sedimentation, siltation, erosion and salination control requirements.

2.3.2. Utilities services plans

Existing services: Obtain service location plans (above and below ground) from all relevant public utility authorities and other organisations whose services exist within the site area. Plot these services on the relevant drawings, including the plan and cross-sectional views.

Utility services location: Contact DIAL BEFORE YOU DIG to identify location of underground utility services pipes and cables. Contact Council for underground council services and conduct on-site investigations to locate services where necessary.

2.3.3. Adjoining property owners

Protection of existing asset/infrastructure: Obtain drawings of existing infrastructure, including landscaping within and adjacent to the site. Consult with owners to identify protection requirements.

Property owner approval: After liaising with the EPA and obtaining approval from the Council for proposed sediment, siltation, erosion or salinity control measures and proposed drainage configuration, consult with and obtain written agreement from the adjoining property owners and incorporate into the design.

Agreement records: Submit all agreements to the Council.

3. Design

3.1. General

3.1.1. Considerations

Natural environment: Consider the implications of site regrading for the existing natural environment. Minimise site regrading in heavily treed areas.

Watercourses and riparian zones: Design site regrading works that preserve and do not degrade existing watercourses and riparian zones.

Haulage: Design areas for site regrading in conjunction with the roadworks design, with the objective of balancing cut to fill, achieving an economical works and minimising the haulage of imported fill or spoil. Bulk haulage has an adverse effect on adjacent development and infrastructure. Refer to the 0041 Geometric Road Design worksection and Austroads AGRD01 Appendix B.

3.1.2. Salinity prevention

Existing conditions: Evaluate existing soil salinity conditions in known salt affected areas, or areas found to be salt affected by the geotechnical investigations.

Groundwater table: Implement appropriate strategies aimed at lowering the groundwater table where necessary, together with primary measures to prevent extension of salinity problems.

3.1.3. Approval

Measures: Make enquiries with EPA and subsequently obtain Council approval for any proposed sediment, siltation, erosion or salinity control devices/measures. Submit all approvals to Council.

Agreement: Obtain written agreement from adjoining property owners prior to carrying out any construction work on their property. Submit all agreements to council.

3.2. Drainage and Run-Off

3.2.1. General

Underground drainage: Regrade areas to minimise the need for surface inlet pits and, where practical, allow surface water to flow naturally to roads or drainage reserves without excessive concentration.

Surface water drainage: Design site regrading so that surface water flows naturally to roads or drainage reserves without excessive concentration. Minimise the use of underground drainage systems with surface inlet pits.

Overland flow paths: Provide depressions for overland flow at low points and over major drainage lines to direct stormwater for storms of up to a 100-year ARI.

Inundation areas: In areas known to be affected by stormwater flows, assess the existing conditions in relation to the proposed development. Submit to the Council, data obtained, and recommendations of contour adjustments required.

3.2.2. Level Requirements

Areas abutting 100-year ARI flood levels: Design regrading to a minimum level of 0.5 m above the 100-year ARI flood levels. Do not cause flooding of other areas as a consequence of such regrading. Make sure other areas are not affected by flooding.

Building areas: Regrade in the direction of the catchment area drainage system as follows:

- Desirable surface grading: 1.5%;
- Minimum surface grading: 1.0%.

Steep building areas: For building areas with natural ground slopes greater than 15%, obtain confirmation from a geotechnical engineer of the site's suitability for the proposed development. Include specific requirements on the drawings.

Piped gullies or depressions: Design finished surface levels of piped gullies or depressions to provide adequate cover depth over pipelines (if piped) and direct surface stormwater flow to inlet pits.

3.2.3. Temporary diversion drains

Drawings: Identify the location of any temporary drains required to divert surface flows away from the regrading area, including any erosion or sedimentation control treatment. Size temporary drains to accommodate the volume of water to be diverted.

3.2.4. Erosion and sedimentation control

Objective: Minimise soil disturbance and material loss off site.

Control measures: Provide measures including, but not limited to the following:

- Trench stops at 30 m spacing along a trench with overtopping directed to the kerb;
- Blue metal bags placed along the kerb and gutter at maximum 30 m spacing;
- Blue metal bags placed around downstream drainage pits.

Additional requirements: Design to conform to the 0022 Control of Erosion and Sedimentation (Design) worksection.

3.2.5. Adjoining properties

Easements: If diverting or directing piped stormwater into adjoining properties is proposed, create drainage easement rights over adjoining lots to the 0074 Stormwater Drainage (Design) worksection.

3.3. Site Works

3.3.1. Clearing

Requirement: Clear the site of the following:

- Low scrub;
- Fallen timber;
- Debris;
- Stumps;
- Large rocks;
- All roots and loose timber which may contribute to drain blockage;
- Any trees which Council has deemed approaching the end of their functional life or dangerous/hazardous to normal use of site.

Special requirements: Dust control.

Document: Indicate special requirements of Council on the Drawings.

3.3.2. Slope stability

Stabilisation measures: Allow for stabilising measures, including retaining walls, as appropriate for the development site conditions. Consider future access and maintenance requirements.

Slope angle: Determine safe angles for slopes based on material properties under the worst site conditions possible and based on geotechnical testing and assessment by an appropriately qualified engineer.

3.3.3. Disposal

Requirement: Document the removal and legal disposal of all materials cleared from the site.

Spoil: Submit for approval all proposed locations for disposal of excavated material.

3.3.4. Trees

Overfilling: Do not fill over butts of trees in areas that require filling. Document clearing of all trees in such areas and relocate/replant with advanced species. Submit the number and type for approval by council.

Replanting: Allow for trees to be planted clear of probable future building locations, after filling is completed and graded. Include provisions for watering and maintenance during the contract period.

Relocating: Relocate clear of probable future building locations. Document future positions on drawings and note that replanting cannot commence until filling has been completed and graded. Include provisions for watering and maintenance during the contract period.

Preservation: Document approved preservation measures for selected trees, to prevent destruction caused by placement of fill or any other action within the tree drip zone. Refer to AS 4970 for further guidance.

3.3.5. Fill

Properties: Sound, clean material free from large rock, stumps, organic matter and other debris. Should only be virgin excavated natural material.

Material selection: Select suitable fill materials based on following considerations:

- Purpose of embankment;
- Availability of local material;
- Consolidation and settlement properties of the fill material;
- Wet weather working;
- Plant equipment required on site.

Placing of fill: Fill placement over prepared areas cannot start without Council's permission. Include in the development documentation, requirements for obtaining Council's approval before starting.

Quality and compaction: Conform to the recommendations of AS 3798 and Austroads AGPT08 Section 4.

Quantity: Design site regrading so that the balance between cut and fill is the most economical.

Commencement: Obtain approval from Council prior to commencement of fill placement over prepared areas. Document this requirement on relevant drawings.

Restricted fill: Submit for approval by Council a proposal for the use of restricted fill material comprising virgin excavated natural material or other EPA accepted products. Include details of the material type and its intended location for use.

3.3.6. Top Dressing

Landscaping: Document dressing of all areas where fill will be placed, with clean arable topsoil, fertilised and sown with suitable grasses.

Re-use: If possible, retain existing topsoil from the site and document its re-use in the same location.

Topsoil stockpile period: 3 months.

3.3.7. Retaining Walls

All retaining structures shall be designed in accordance with AS 4678 Earth Retaining Structures.

On Boundaries: Design retaining wall structures to sit fully inside the site when filling or cutting along the site boundary. Submit design to Council for approval.

Design: Use an appropriately qualified and experienced structural engineer to design and certify all retaining walls.

Adjacent services: Design retaining structures so that no imposed loads are applied to adjacent infrastructure and that any adjacent structures are outside of any zone of influence of the wall. The designer shall take reasonable measures to ensure the wall's stability can be self-maintained in the event of excavation of any nearby existing or proposed services.

4. Documentation

4.1. General

4.1.1. Actions and document content

Standard: Conform to the recommendations of AS 3798 Section 3 for details for documenting earthworks design.

4.2. Statutory Documentation Requirements

4.2.1. Approvals

Requirement: Document any prerequisite for approval of the development advised by the following authorities:

- Council for:
 - Haul routes;
 - Tree clearing or relocation;
 - Waste disposal;
 - Fill materials;
 - Stormwater drainage and erosion and sediment control;
 - Traffic control and management plan.
- Transport for New South Wales (TfNSW) for traffic control and management plan;
- NSW Department of Planning, Industry and Environment and NSW Department of Primary Industries for general land use and salination prevention measures;

- The EPA, NSW Department of Planning, Industry and Environment and NSW Department of Primary Industries for other general environmental impact requirements and in relation to works affecting waterways;
- Utilities authority for any public or private utility affected by the development.

4.3. Drawings

4.3.1. General

Requirement: Provide drawings defining the earthworks areas and specific treatments required.

Geotechnical testing stage: Provide drawings that show the location of site features in relation to the site boundaries, monuments, and other features for the purpose of testing.

4.3.2. Site regrading plan

Requirements: Provide design drawings to include the following:

- Define the location of features by distance to corner boundaries, monuments etc for the purpose of relocation at the geotechnical testing phase and for WAE drawings;
- Incorporate all geotechnical requirements and recommendations;
- Road longitudinal sections: With road construction details showing construction depths;
- Regrading layout: With finished levels as contours superimposed on existing ground contours. Include spot levels to clarify areas not covered by regrade contour and features associated with the regrading, such as retaining walls, banks or steps;
- Site cross section: Showing proposed and existing levels;
- Cut and fill areas: With cut areas clearly distinguished from the fill areas. Show the range of depth variations and earthwork quantities;
- EPA requirements: Incorporate sediment, siltation, erosion or salination control measures with references to the stage when measures will be provided;
- Haulage routes: Show details of haulage routes including the load limits for each route;
- Temporary diversion drains: Show the location of temporary drains required to divert surface flows away from the regrading area, including any erosion or sedimentation control treatment. Size drains to accommodate the volume of water to be diverted;
- Trees for preservation, removal, relocation and replanting.

4.3.3. Drawing presentation

Conform to the following worksection: 0010 Quality Requirements for Design

4.4. Supporting Design Documents

4.4.1. Design reports

Preliminary design report: Provide a report covering all geotechnical requirements, including the following:

- Site preparation and compaction requirements;
- Recommended minimum acceptable fill quality;
- Proposed regrading strategies.

Report guidelines: To Austroads AGRD01 Appendix B section B.2.5 for further guidelines on report content.

Environmental impact statement: Include details of potential impacts and measures adopted for minimising the impact.

4.4.2. Calculations

Requirements: Provide a design report incorporating calculations and references supporting the earthworks design.

4.4.3. Specifications

Construction documentation: Prepare technical specifications using the AUS-SPEC Construction worksection templates from the National Classification System workgroups 02, 03, 11 and 13.

4.4.4. Design certification

Certificate: Provide a signed and dated design certificate as evidence that a suitably qualified professional has reviewed all the design documents, including program and plans for the development, and can verify that the site regrading requirements for the development site meet the Council and statutory requirements.

4.4.5. Other documentation

Watercourses: Provide documentation necessary from the relevant authorities to support the filling of dams and watercourses.

4.5. Work as Executed

4.5.1. Work as Executed documents

Work as Executed drawings: Provide an additional set of final construction drawings for the purpose of recording the work completed by the Contractor.

Conform to the following worksection: 0010 Quality Requirements for Design.

4.5.2. Final certification of completed works

Requirement: State Council's requirements for final certification, e.g. inspections required by the designer.

4.5.3. Geotechnical report

Certification: Provide a geotechnical report certifying the development site with the proposed regrading works is suitable for the proposed development. Include any other supporting documents such as test results/certificates and survey data required to confirm this.

5. Annexure

5.1. Referenced documents

The following documents are incorporated into this work section by reference:

AS 3798	2007	Guidelines on earthworks for commercial and residential developments
AS 4970	2009	Protection of trees on development sites
Austrroads AGPT		Guide to Pavement Technology
Austrroads AGPT08	2019	Pavement Construction
Austrroads AGRD		Guide to Road Design
Austrroads AGRD01 Appendix B	2021	Geotechnical Investigations and Design