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PROJECT NUMBER 11159

**Development Kingsburgh Extension
9 (Erf 2954, 2955 And 2956)**

GUIDELINE DOCUMENT:

MANAGEMENT OF STORMWATER

RUN-OFF AND EROSION DURING

CONSTRUCTION

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GUIDELINE DOCUMENT: MANAGEMENT OF STORMWATER RUN-OFF AND EROSION DURING CONSTRUCTION

1. GENERAL

1.1 This document sets out guidelines to be followed, as appropriate to specific sites, in order to comply with:

- The Water Act (No 36 of 1998)
- eThekweni Municipality stormwater management policy
- Documented best management practice
- Guidelines for Human Settlement Planning and Design ("Red Book")

1.2 Proper consideration of drainage during construction can frequently prevent costly delays and future failures. Delays can occur not only because of damaged or washed-out facilities, but because of shut-down resulting from environmental considerations.

1.3 Installation of the stormwater management system shall commence immediately on completion of clearing and commencement of earthworks.

2. OBJECTIVES

2.1 Implementation of mitigation measures to minimize negative environmental impacts resulting from uncontrolled run-off from the construction site.

2.2 Retention / detention / attenuation of run-off in order to prevent soil erosion on-site and increased sediment loads on downstream watercourses resulting therefrom.

2.3 Minimize pollutant loads e.g., cement, oil, diesel, paper, plastic, etc.

2.4 Prevent inundation of or damage to adjacent or downstream properties or natural environments.

2.5 Protect downstream water courses against erosion.

2.6 Groundwater recharge

3. PLANNING

3.1 Efforts to control delays or damages arising from construction drainage must begin in the planning stage and carry through to design and construction. This document has been developed to provide a guide, but it is impractical to prescribe fixed rules to cover all eventualities

3.2 The recommendations and procedural approaches outlined herein need be adopted as they pertain to the requirements of and conditions on a specific site, in order for the Contractor to formulate an effective plan for management of stormwater runoff during construction activities. Protective measures are the Contractor's responsibility, but cannot generally be reduced to biddable contract items.

- 3.3 Adequate and constant supervision and monitoring of the stormwater management plan shall be provided by the Contractor

4. SITE TOPOGRAPHY AND GEOLOGY

- 4.1 A geotechnical evaluation of the site will inform the degree of management required eg,. greater protective measures will be necessary on steep sites underlain by cohesionless sands.

The internal road system will be designed to adequately provide for the nature of a residential area.

The design of the road structural layers will be based on a 20year design life and a detailed Pavement Design Report will be produced for Municipal approval during the detailed design stage.

5. NATURAL ENVIRONMENT ADJOINING OR ON SITE

- 5.1 The boundary of any natural conservancy areas adjacent to or on the construction site (including non-user servitudes) shall be accurately demarcated and fenced so as to prevent any access from the construction area.
- 5.2 Temporary fences shall consist of gum-pole support posts (1,5m above ground), with stays as necessary, to which shall be secured three straining wires (top, middle and bottom of posts) forfixing of hessian or shade-cloth, which shall be buried 300mm into ground at the base.

6. POTENTIAL POLLUTANT SOURCES

The following areas and activities require particular attention with regard to the potential negativeimpacts of uncontrolled stormwater runoff therefrom.

6.1 Construction Camp

- The area allocated should be level and away from watercourses.
- An impervious hardened surface should be constructed on which equipment or hazardous materials (e.g., cement, lime, oil and fuel) can be stored / handled / used.The surface should be graded to the centre. So that any spillage may be collected and satisfactorily disposed of.

Spillage from taps and possible pollution around ablution facilities shall be controlled.

6.2 Stockpile / Spoil Area

The Contractor shall control the erosion of stockpiles.

- Exposed material in temporary stockpiles should, wherever possible be stored in flat-topped mounds with sides not exceeding 1:2 slope.
- Stockpiling of soil or any other materials shall not be allowed near a watercourse.

- Any surplus or material unsuitable for backfill which is to remain on site for landscaping shall as early as practicable be placed in its permanent position and be topsoiled and vegetated.

6.3 Trench Excavation

- Trenches shall be backfilled as soon as practicable and trenching shall not proceed unreasonably far ahead of pipe laying, especially on steeper gradients.
- Temporary mounds or sandbags shall be placed along the route of backfilled trenches to prevent wash-out.

6.4 Dust

- Precautions shall be taken to prevent contamination of areas exposed to runoff from any form of easily transported material e.g. cement, lime, brick- and saw-dust.
- Soil to be stored on stockpiles for lengthy periods shall be covered to prevent wind erosion and resultant

6.5 Mixing of Concrete and Mortar

- Cement mixing should take place on impermeable liners.
- Cleaning of cement mixing and handling equipment shall only be done using proper cleaning trays.

7. PREVENTATIVE MEASURES - MANAGEMENT TOOLS

7.1 General

- Run-off. Control of runoff problems during construction can be costly. Consideration of the following items will aid in maintaining satisfactory drainage during the construction period.
- Natural drainage. Maximum use shall be made of existing ditches and drainage features. Where possible, grading operations should proceed downhill, both for economic grading and to use natural drainage to the greatest extent
- Temporary drainage. Temporary provisions will be required to facilitate construction drainage. A particular effort should be made to drain pavement subgrade excavations and base-courses to prevent detrimental saturation. Careful consideration needs be given to the drainage of all construction roads, equipment areas, borrow pits, and waste areas, where open excavation can lead to excessive erosion or discharge of turbid water to local streams.

7.2 Soil Erosion Control Measures

7.2.1 General

- The intent at each stage of site earthworks, as individually considered hereunder, is to prevent accumulation of runoff, reduce flow depths and velocities, promote

deposition of silt in stilling basins and dissipate energy at discharge points.

- Wherever possible, permanent features of a stormwater management system should be installed early and be available to assist in control during construction.

7.2.2 Site Clearance

- Vegetation should not be stripped over the entire site at commencement, if the construction programme could accommodate phased clearance.
- If levels are not to be altered over portions of a site, those areas should remain uncleared of in-situ vegetation until closer to the time of final landscaping or provision of alternative vegetal cover.

7.2.3 Topsoil Strip

- This exercise should be carried out over limited areas on extensive sites and only commence as work progresses to new areas.
- Consideration should be given to using cleared vegetation as a temporary brush mattress for erosion control or chipping it for use in mulching or being wrapped in shade-cloth to form "roll" berms.

7.2.4 Earthworks

i) Cut Faces

- I. Where significant catchments occur above cut faces temporary or permanent berms or channels (depending on final provisions) should be constructed at the top of these proposed slopes to intercept flows and divert them to managed discharge points.
- II. Should such cut faces be permanent features they should shortly after excavation be mulched or topsoiled and vegetated with the intended future ground cover.
- III. Temporary cut faces should be left with a "ripped" finish and protected by mulching or mulch "roll" berms pegged to the slope.

ii) Fill Embankments

- I. As soon as practical after the final height has been reached, any "overfill" should be removed and the embankment shaped to final design slope with a "face" compacted to the specified density.
- II. Embankments are generally permanent features and should, therefore, as soon as practicable be covered with the finally intended vegetation.
- III. Where grassing is specified an option may be to strip-turf at 1,0m intervals with hand-planting between the filter and scour prevention barriers provided by the established turf.
- IV. Such slopes are very often covered in builders rubble / waste during construction and this practice should be strictly avoided as surface runoff between such hard material encourages runnels and resultant erosion.
- V. Toes of extensive fill embankments should be "fenced" with 75 dia. gumpoles, protruding 0,5m above ground at 2,0m centres with hessian, shade cloth or geofabric attached and buried 300mm below ground surface, to act as silt-traps.

iii) Cut / Fill Terraces

I. Major damage very often results from accumulation of runoff on extensive terraced areas discharging in an uncontrolled manner, particularly down fill embankments.

II. Recommended measures to prevent such occurrence include the following:

- a) No cut or fill slopes of a temporary necessity during construction, should be directed to the crest of fills.
- b) Cut material should be moved continuously from a "level" platform to "level" compacted fill layers, such layer always being $\pm 0,5\text{m}$ high CV $2,5\text{m}$ wide at the fill edge of the terrace. A berm which is continually being raised during construction will thus be achieved.
- c) On completion of terraces the surfaces should be temporarily shaped to fall toward the cut side for narrow terraces and be dished to central points on more extensive and wider platforms.
- d) Stilling basins / sumps should temporarily be constructed $\pm 3,0\text{m} \times 3,0\text{m} \times 1,0\text{m}$ deep at the centre, with sloping reno-matress sides laid on geofabric. 150dia. uPVC piping (with a vertical section of pipe extending $0,5\text{m}$ above the centre of the sump) should drain inflow to the toe of embankments to controlled discharge points, or where possible into a component of the final drainage measure which it has previously been possible to construct.
- e) Where a temporary berm has unavoidably to be provided at the top of completed embankments of height greater than $4,0\text{m}$ a temporary continuous berm at the top of the embankment, formed of bales of straw placed on geofabric turned up and secured with wire to the outer-face of the bale, may be considered. Suitable outlet provisions (refer 7.2.4.3.d) should be provided at intervals along the inner (impoundment) face of the berm.

iv) Stockpiles

Protection against water erosion and wind-blown dust needs to be considered:

I. Keep surface of smaller piles of cohesionless material watered during periods of strong wind.

II. Cover surface with a brush matress derived from cleared vegetation.

III. Form flat topped mounds with sides sloping at 1:2 which should be temporarily protected (refer 7.2.4.1).

IV. For stockpiles that are to remain unused for lengthy periods peg hessian covering to banked edges.

v) Reinstatement of Vegetation

Areas of site that are to be permanently landscaped and receive vegetal covering, should be reinstated as soon as possible, wherever practical and be protected during the balance of the construction period.

vi) Gutters and Downpipes

These provisions should be completed as soon as possible after completion of roofs (especially pitched) and be linked to the permanent stormwater drainage installation.

vii) Attenuation Basins

Generally such provision should, if possible, be completed ahead of building completion to allow for usage as a stilling basin and silt trap. A temporary outlet pipe at a higher level than the final should be investigated. Removal and

satisfactory disposal of silt will have to be undertaken prior to final commissioning.

viii) Controlled Discharge

- I. Accumulated stormwater flows will have to be directed to municipal drains or adjacent natural water-courses at one or more points and at a rate not to exceed that approved in the stormwater management plan for the completed development (generally 1:10 year pre-development runoff).
- II. During construction silt loads will be unavoidably higher than finally anticipated and all reasonable attempts need be made to reduce such load prior to discharge.
- III. Routing flows through the final attenuation reservoir will assist, but if that is impractical, impoundment may be necessary in temporary stilling basins, prior to discharge to municipal stormwater drains.
- IV. Where discharge is to a watercourse the final design for such facility should be constructed prior to commencement of earthworks on site and all possible temporary stormwater runoff provisions (collecting flows from terraces or the edge of embankments) linked thereto.
- V. Final discharge points will have been designed to dissipate water energy before release to natural watercourses. Substantial berms of coarse river-sand around such points could assist in removing silt from during-construction runoff.





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