

PROPOSED STORMWATER MANAGEMENT PLAN

HUDDLE TOWNSHIP DEVELOPMENT (FINAL DRAFT)

Prepared for:

Huddle Investments (Pty) Ltd

100 Grayston Drive
Sandton
2196

Submitted to:

Gauteng Department of Agriculture and Rural Development

Diamond Corner Building
68 Eloff Street
Johannesburg
2000

Compiled by:



STRATEGIC ENVIRONMENTAL FOCUS

Strategic Environmental Focus (Pty) Ltd
P O Box 74785
Lynnwood Ridge
0040

Tel: 012-349-1307
Fax: 012-349-1229
Website: www.sefsa.co.za

Contact Person: Willie Howell

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PROJECT SUMMARY

Project Name	Huddle Township Development
Preferred Site	Proposed Portion 84 (a portion of the remainder) of the Farm Bedford 68 IR, Linksfield, City of Johannesburg Metropolitan Municipality (CJMM), Gauteng Province
Surveyor-General 21 Digit Code	T0IR00000000006800000
Development Footprint	Approximately 53 ha (excluding associated infrastructure).
Lay Down Area Dimensions	To be addressed within the Environmental Impact Report (EIR).
Site Photographs	Refer to Appendix 2
Confirmation of Supply:	
Water (Construction & Operational Phases)	Supplier: CJMM
Sewage (Construction & Operational Phases)	Supplier: CJMM
Electricity (Construction & Operational Phases)	Supplier: CJMM
Gas (Operational Phase)	Supplier: Egoli Gas (Pty) Ltd
Solid Waste (Construction & Operational Phases)	Estimated volumes and disposal methods will be discussed within the EIR

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Strategic Environmental Focus (Pty) Ltd (SEF) is a privately owned company and was formed in 1997 with the objective of providing **expert solutions to pressing environmental issues**. **SEF is one of Africa's largest multi-disciplinary consultancies**, offering sustainable environmental solutions to private and public sector clients. With our integrated services approach in the management of natural, built and social environments; and with over a decade of experience, we bring a wealth of knowledge and expertise to each project.

SEF's Vision

SEF offers holistic and innovative sustainable solutions in response to global challenges.

SEF's Mission

SEF is a national sustainability consultancy which provides integrated and innovative Social, Biophysical & Economic solutions while fostering strategic stakeholder relationships, underpinned by SEF's core values.

SEF has assembled a team of professionals, consisting of a core of environmental experts with extensive experience in dealing with Environmental Impact Assessments (EIAs), Public Participation Processes, Architectural and Landscape Architecture, Mining and Environmental Management. SEF also has a team of specialist practitioners such as specialists in Heritage Impact Assessments (HIA), Wetland Delineation and Functional Assessments; Wetland/ Riparian Rehabilitation, Aquatic Assessments; Ecological (Fauna, Avifauna and Flora) Assessment, Visual Impact Assessments (VIAs), Soils and Agricultural Potential Assessments, Socio-Economic Assessments, etc.

SEF is a Qualifying Small Enterprise and a **Level 2 contributor in terms of the Broad Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003)** and has a procurement recognition level of 135%.

SEF commits itself to comply with the requirements and the implementation of a Quality Management System. The Quality Management System will be reviewed and implemented to continually improve efficiency and effectiveness of the organisation.

SEF uses a "green" approach to anything we embark on. We believe in using technology to our and the environment's best advantage. We encourage the use of green alternatives such as telephone and video conferencing instead of travelling for workshops and meetings and CDs instead of printed material, where possible.

The following project team members are involved in this Stormwater Management Plan:

Table 1: Project Team Members

Name	Organization	Project Role
Willie Howell	SEF	Project Manager
John Sibanyoni	SEF	Hydrogeologist

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SECTION 1: INTRODUCTION

1.1 PREAMBLE

The purpose of this report sets out to determine the parameters and proposed infrastructure to be put in place for the management of stormwater run-off from off the development site for the proposed Huddle Township Development to be located on Portion 84 (a portion of the remainder) of the Farm Bedford 68 IR, Linksfield, City of Johannesburg Metropolitan Municipality (CJMM), Gauteng Province.

1.2 REQUIREMENTS

The management of stormwater run-off within the urban development of the City of Johannesburg falls under the jurisdiction of the Johannesburg Roads Agency.

The policy adopted by the JRA is aimed at mitigating the negative impact of densification on the environment associated with the water courses and riparian zones.

The policy applied to all new development sites amounts to the following:

- All developments taking place on land exceeding an area of 8 500 m² is subject to stormwater attenuation on the site being developed;
- The run-off associated with the development of the site is to be attenuated such that the predevelopment flows from off the site for a 1 in 5 year storm event is not exceeded up to and including a post-development storm event with a magnitude of a 1 in 25 year event;
- Discharge of stormwater from off the site or attenuation facility is subject to the approval of the landowner located downstream of the site;
- The Site Development Plan will only be approved if supported by an acceptable stormwater management strategy; and
- Clearance for the issuing of a Section 82 or Regulation 38 certificate will only be given once the stormwater management plan, as approved, is in place.

City of Johannesburg (CoJ) stormwater management by-laws (2009) have also been consulted in the preparation of this document for the purpose of compliance. The CoJ stormwater management by-law's purpose is to manage, control and regulate the quantity, quality, flow and velocity of stormwater runoff from any property which it is proposed to develop. It is also understood that the by-laws was developed to prevent or mitigate:

- (a) erosion and degradation of watercourses;
- (b) sedimentation in ponds and watercourses;
- (c) degradation of water quality and fish habitat; and
- (d) excess stormwater runoff onto a public road which may pose a danger to life or property or both.

This document does not cover all aspects of a detailed engineering stormwater management plan or design, but it does consider the current and likely future activities leading to stormwater impacts.

SECTION 2: SITE LOCATION

The proposed Huddle Township Development (approximately 53 ha in extent) will be situated on a portion of the existing Huddle Park Golf Course (Figure 1), i.e. on the proposed Portion 84 (a portion of the remainder) of the Farm Bedford 68 IR, Linksfield, City of Johannesburg Metropolitan Municipality (CJMM), Gauteng Province.

In general terms the site is located adjacent to and to the west of Club Street and at its intersection with Linksfield Road, to the west of Senderwood, to the east of the Royal Johannesburg Golf Course and to the south of the Sandringham High School (Figure 1 and Appendix 1).

The sites central co-ordinates are: 26° 08' 54.05" S and 28° 07' 19.64" E. The site is currently zoned as public open space. Access for the present Huddle Park Golf Course is obtained from Club Street.



Figure 1: Huddle Park proposed development locality map

SECTION 3: SITE DESCRIPTION

3.1 EXISTING SITE DESCRIPTION

To further place the site in context, the land uses within all four major compass directions that immediately surround the proposed development (or site) are described in the Table 22 below.

Table 2: Surrounding Land Use

Direction	Land Use	Distance (m)
North	Club Street (4 lane main road)	Boundary of the site
East	Club Street (4 lane main road)	Boundary of the site
South	Huddle Park Golf Course and Club House	Boundary of the site
	Club Street (2 lane main road)	Boundary of the site
West	Remainder of Huddle Park Golf Course	Boundary of the site

Some medium density residential developments, dwelling houses, the Saheti School and a filling station are located further to the east of and across that section of Club Street to the south of its intersection with Linksfild Road.

A plant nursery, a small shopping center and the Sizwe Tropical Disease Hospital on a large farm portion to the north east and across that section of Club Street to the north of its intersection with Linksfild Road. The site is located approximately 700 meters from the hospital.

Part of Huddle Park Golf Course, Sandringham High School and Sandringham residential area are located further to the north west of the site, while another part of the Huddle Park Golf Course, Royal Johannesburg Golf Course and the low density residential township of Linksfild North are located further to the west and south west of the site. Huddle Park Golf Course, sports fields and the business and high density residential developments of Linksfild Extension 3 Township are further located to the south west of the site.

3.2 PROPOSED FUTURE SITE DESCRIPTION

The proposed Huddle Township Development (approximately 53 ha in extent) provides for this portion of land to be developed for a residential estate, a small neighborhood node that will consist of retail facilities, some offices and a component of higher density residential apartments and a public and private road system (Table 3).

Table 3: Details of the Proposed Huddle Township Development

Residential Category	Approximate footprint area (ha)	Description (number of units, size, density, etc.)	Location within the proposed Huddle Township Development (estate)
Residential 1	24.7 ha	314 units (or erven) between $\approx 450\text{m}^2$ and 1000m^2 (average of 800m^2). 2 Storeys (provided that a storey that does not protrude above natural ground level at the highest point of the site on which the dwelling house is located, shall not be regarded as a storey). Coverage: Single storey = 60%; and Double storey = 50%.	Throughout the proposed estate – main feature of the estate.

Residential Category	Approximate footprint area (ha)	Description (number of units, size, density, etc.)	Location within the proposed Huddle Township Development (estate)
Residential 2	0.82 ha	Two small cluster developments. 2 storey's in height. Coverage = 60% Total of 33 units (density of 40 units/ ha). Access from the proposed 25m public road.	Interface between the existing Huddle Park Golf Course clubhouse (to the south) and the "Residential 1" component (to its north). Interface between the proposed Clubhouse and maintenance facilities and the "Residential 1" component.
Residential 3	1.38 ha	110 units (density of 80 units/ ha). 3 and 4 storey residential apartments. Coverage = 70%, remainder is parking. Access from the proposed 25m public road.	North of the proposed Neighbourhood Node. Just north of the intersection of Club Street with Linksfild Road.
Neighbourhood Node	4.80 ha	Maximum gross leasable area of 10 000m ² . Access from the proposed 25m public road. Provision is also made for the proposed retail/business node to obtain direct access from Club Street at one access point.	Located at the intersection between Club Street and Linksfild Road where the high activity land uses will have the least impact on existing lower density residential developments in the vicinity.
Public/ Private Road System		Road reserve widths vary between 16 – 30m to provide access to the various components within the proposed estate. Proposed estate access is a 25m wide public road that intersects at both ends with Club Street.	Throughout the proposed estate.
Open Space System		Clubhouse and maintenance facilities at one of the entrances to the proposed estate. Provides for pedestrian linkages within the proposed.	Throughout the proposed estate.



Figure 2: Proposed Huddle Development Layout Plan

SECTION 4: PROPOSED STORMWATER METHODOLOGY

It is proposed that full attenuation of stormwater will be facilitated within the proposed development footprint. A large number of attenuation facilities have been proposed throughout the development's open space system to limit the concentration of water and provide "waterways" (those ponds that may be lined to retain water for longer periods of time) which, during heavy and/or frequent rain events may allow for the use of this water for irrigation purposes. The "wet" ponds (some are proposed to be lined in order to retain water for longer periods of time) are estimated to cover approximately 13 000m² (refer to Figure 3 for the approximate sizing of each attenuation pond), thus the attenuation required can therefore be accommodated in a freeboard of between 400-500mm depending on the locality and routing of stormwater flows. Attenuated stormwater will then be discharged via a pipe from the last attenuation pond in each catchment into large dissipation areas within the adjacent Huddle Park Golf Course area (**Error! Reference source not found.**3).

Stormwater attenuation within the Neighborhood Node (retail/ business component) and Residential 2 and 3 components (i.e. cluster and apartment housing areas) will be provided by way of underground concrete tanks sized at 2 200m³ and 620m³, respectively.

The underground piped stormwater system (associated with the internal road network) will be designed to intercept the 1:5 year storm and routing of the 1:25 year storm will take place throughout the development and will be directed towards the attenuation facilities. The attenuation facilities will be designed to reduce the outflow from the entire development to the 1:5 year pre-development flow.



Figure 3: Stormwater Attenuation Pond Layout within the proposed Huddle Township Development

4.1 SURFACE WATER

Surface water forms the main component of the stormwater management plan as it is directly recharged by rainfall and impacts quickly as compared to groundwater which receives water through seepage/infiltration from surface water.

Surface water may in this case refer to both waters found in the stream, wetland and ponds with less distinction to stormwater. However, surface water considered as a receiving water body (receptor) needs to be protected from contact with untreated stormwater as it may bring degree of contamination such as greases or oil from parking or road areas.

It is with this reason design should include, but not be limited to the following:

- Effective conveyance channels;
- Impervious ponds;
- Treatment facility where necessary;
- Water re-use where feasible; and
- Stormwater retarders.

The overall storage capacity of ponds and the individual tanks on the commercial and medium density erven is estimated at approximately 8 000m³. The two proposed discharge points are:

a. South-west discharge

The area will have six ponds with estimated capacity of 6 200m³ and receiving an estimated stormwater volume of 3 000m³, which is a reasonable amount to handle provided maintenance is always taken care of. For example removal of deposited silt/soil will need to be done on a regular basis to keep the volume (capacity) of the attenuation facilities at design levels.

This is the discharge facility likely to have contaminated stormwater which will be coming from the Neighborhood Node with parking facilities likely to generate the contaminants such as hydrocarbons. To mitigate this possibility porous paving will be utilised within the parking area to filter surface water before it enters the underground conveyance systems.

b. North-west discharge

The aggregate capacity of the ponds in this catchment is 7 000m³ and receiving approximately 5 000m³.

The attached map illustrates the assumed catchment areas and shows the proposed attenuation facilities. This map will be subject to amendment depending on the final stormwater routing which will be carried out after approval of the township layout. A decision about which ponds would be lined and which will be left unlined will be made during the detailed calculation phase but it is proposed that at least some of the ponds be maintained as “wet ponds” both for aesthetic reasons and as a source of irrigation water.

4.2 CRITICAL ISSUES

Considerations of wetlands and down-gradient stream should be made during planning as it they can be regarded as major receptors. It should be noted that the development is fallen entirely outside the 1:100 year flood line. As a result the main aspect to consider is the prevention of spillage discharge of unattenuated stormwater from ponds direct to the stream/wetlands or direct discharge to the abovementioned receptors.

CoJ stormwater management by-laws (2009) with particular specific to, sub-section 3(a), requires that identified receptors within 500m downstream be assessed of any likely impact. The following receiving areas are relevant for the study area:

- Immediate wetland and stream;
- Bridge within 360m north-west; and
- The vicinity property of Rietfontein 61 IR, located 500m north and

It is therefore imperative that the above identified receptors are prevented protected from the effects of unattenuated stormwater arising from the subject development to be taken to prevent the impact in terms of both quantity and quality.

STORAGE FACILITIES

The study area indicates to have two sub-catchments as indicated earlier. Both sub-catchments should have at least two storage facilities each for the following measures:

- The first storage will capture stormwater as well as any siltation material.
- The second facility should be constructed in such a way that it will be in a position to capture and overflow/spillage during high rainfall.

The above proposed positioning of the storage facilities will assist to prevent any unattenuated flow into the wetlands. Furthermore the peak volumes of water to be released will be minimised in terms of impact into the wetlands and stream.

4.3 STORMWATER RUNOFF CONTROL

The surface runoff will need to be prevented or minimised by use of engineering designs such as:

- Flow retarders;
- Concrete lined channels (to be used only where flow velocities cannot be restricted)
- Rock lining;
- Well vegetated buffer strips;
- Unlined artificial channels for uncontaminated stormwater;
- Unlined sheetflow;
- Energy dissipaters;
- Planting; and
- Dry and/or wet ponds

All stormwater needs to be directed by channels, shaping or swales to the attenuation ponds lying along the drainage lines. The details need to be attended to during the detailed design stage Where surface flow is unavoidably at high velocity Stormwater retarders will need to be installed. .

4.4 STORMWATER EROSION CONTROL

Stormwater erosion is one of the most challenging factors of stormwater management as it happens quickly and destructively. With the slopes in the study area being fairly steeply, surface runoff on bare soil could have negative impact in terms of transportation of salt to the storage (attenuation close) ponds. Should erosion occur the eroded soil may need to be replaced and awareness is necessary not to use unsuitable soil which may have negative impact on the natural surrounds.

Sand bags/Straw bales may be used to prevent erosion during the construction phase before stabilising vegetation is established. Planting of rapidly growing grasses is recommended after construction to stabilise disturb soil and to retard sheet flow.

4.5 STORMWATER POLLUTION CONTROL

A possible source of gross pollution would be related to the existing major sewer outfall in the valley below the development. While responsibility for maintenance of this outfall sewer resides with Johannesburg Water the effect of the spillage on the wetlands needs full consideration. Sewer reticulation within the development must be designed in such a way as to obviate blockages and possible overtopping of manholes. The blockage or leakage of any sewer may pose considerable pollution threats to both surface and groundwater.

As noted elsewhere, where potentially high concentrations of hydrocarbons can be expected, such as parking areas, the introduction of porous paving to serve as a filter for surface water before it enters underground systems, will be encouraged.

SECTION 5: STORMWATER MANAGEMENT PLAN IMPLEMENTATION PROCEDURES

The implementation is a very crucial part of the entire management process and will only be effective if personnel who understand or have degree of experience of the methods and consequences of present to ensure that contractors follow the procedures proposed. Furthermore, knowledge of the related legislations in terms of water discharge is important. It is worthwhile to have procedures that are explicit and easy to follow during the implementation phase.

Procedures may include:

- Permission for construction to be obtained from the relevant authorities;
- Site survey and investigations;
- Design stage detailing of physical requirements;
- Construction phase monitoring procedures; and
- Occupational requirements.

5.1 DURING CONSTRUCTION

Soils will be affected during constructions. The CoJ stormwater by-laws (2009) provide guidelines for soil erosion management during construction. The following conditions need to be met or complied with:

- Minimise and use one transportation route where possible;
- Stormwater retardation to be employed either through the use of bunding, placement of straw bales or the use of sandbags;
- Exposed soil to be stabilised by utilising an appropriate best management practice and preferable stabilisation to take place within 12 hours;
- No soil to remain unstabilised for more than two days between 1 October and April; and
- No soil to remain unstabilised for more than seven days between 1 May and 30 September.

SECTION 6: CONCLUSIONS AND RECOMMENDATIONS

This document was compiled before any construction has commenced but with reference to the applicable and relevant legislation and bylaws. However, it should be noted that a revised engineering stormwater management plan may need to be undertaken after completing engineering design to provide for incorporation of the designs and changes made, if any.

Furthermore, inclusion of a monitoring plan will need to be included in contract documentation to supplement the standard operating procedures which form part of this document.

Surface erosion must be prevented by the introduction of energy dissipaters and the control of volumes and velocity of flow. On slopes greater than 2% (where alternate retardation measures not possible) use should be made of lined channels with outfall energy dissipaters before discharge into any receptor.

The Engineer that is appointed by the Developer to undertake and manage the detailed design and further development of this site must take into consideration matters raised in this report will win finalising the planning of any building, roadways and drainage structures on the site in order to achieve the proposed stormwater management proposals and in particular to comply with the storage conditions set out in this report