Conceptual Integrated Stormwater Management Plan for the Used Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station (Cape Farm No. 1552, Duynefontyn)

Report Prepared for

Eskom

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srk consulting

October 2016

Conceptual Integrated Stormwater Management Plan for the Used Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station (Cape Farm No.1552, Duynefontyn)

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SRK Project Number 478317/42D/2

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Disclaimer

The opinions expressed in this report have been based on the information supplied to SRK by Koeberg Operating Unit (Eskom). SRK has exercised all due care in reviewing the supplied information, but conclusions from the review are reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

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1 Introduction

A conceptual integrated stormwater management plan (ISWMP) was developed for the Used Fuel Transient Interim Storage Facility (TISF) at Koeberg Nuclear Power Station (KNPS) on Cape Farm No. 1552, Duynefontyn. This report documents that plan and was written as an Appendix to the EIA Report (Report No 478317/06). Hence, all background information not directly relevant was excluded and can instead be found in the EIA Report.

An external review of this ISWMP (also attached to the EIA Report) was conducted. It included a review of all documentation supporting the ISWMP. The conclusions of the external review were not addressed in this report but were instead addressed as follows:

- A meeting with the City of Cape Town, as recommended, is being arranged and the outcomes of that meeting will be included in the detailed design of the stormwater system;
- Details of the stormwater infrastructure, as recommended, will be developed and checked during detailed design to ensure that the system will operate appropriately.

The conceptual ISWMP was carried out via the following method:

- Review of relevant standards, guidelines and legislation;
- A site visit to inspect the two alternative sites included in the EIA;
- Review of previous relevant reports (SRK Consulting, 2016; SRK Consulting, 2015)
- Development of stormwater management measures based on the above information;

2 Data and analysis

2.1 Site Characteristics

2.1.1 General characteristics

KNPS is located on a sandy coastline of the West Coast, 1.5 km north of the residential area of Duynefontein, and within the City of Cape Town municipal boundary (City of Cape Town, 2016). The topography of the area is relatively flat, with an active dunefield extending north of KNPS. KNPS is located within the Koeberg Nature Reserve, a 3 000 ha reserve managed by the Koeberg Managing Authority. The TISF (on either site alternative) will be located within the Protected Area of KNPS, which has been disturbed by previous construction activities, and by current operational activities at KNPS.

2.1.2 Hydrology and stormwater

KNPS falls within quaternary catchment G21B, and within the Berg Water Management Area. No watercourses flow through KNPS or the surrounding Koeberg Nature Reserve. No wetland habitat occurs in the site and the closest lies 1.5 km away and is not hydrologically connected to the site (i.e. the site is not directly upgradient of the wetland and does not receive surface flows from the wetland) (SRK Consulting, 2016). It is therefore evident that neither of the alternative sites lies within any wetland catchment/s.

The hydrological characteristics of the area were noted during the Site visit and the following observations were noted at Alternative 1:

- The site has gentle slopes (a shallow gradient topography);

- There is evidence of some overland flow (possibly sheet flow) in the area (sediment transport and deposition can be seen);
- There is evidence of (sheet) flow across the dirt road. This road will apparently remain in place. The apparent drainage of the site and surrounds shows that a culvert will be needed under this road (or water re-directed to the existing stormwater system);
- Stormwater currently either infiltrates into the soil, or drains overland as sheet flow and exits the property by flowing under the boundary fence to the west;
- The site abuts the sea, and stormwater could be drained directly to the sea, or possibly connected to the existing main stormwater system (depending on capacity and available grades).

For alternative 2 the following was noted:

- Currently, no formal stormwater control exists at the TISF site, and stormwater will exit the area via the road system and erosion of the road edges could therefore be an issue;
- Stormwater is likely to pond in this area as it is a slight depression and at a lower elevation than the surrounding road;
- A culvert (or similar structure) would be required to allow stormwater to drain from the site under the road;
- Stormwater from this site would need to either be:
    - Directed via the existing stormwater system to the sea; or
    - Infrastructure would have to be built adjacent to the existing infrastructure to convey surface water away from the site.

2.2 Infrastructure

2.2.1 Planned project infrastructure

The following characteristics of the project infrastructure are relevant to stormwater:

- The TISF will comprise of concrete pad(s) over a footprint of approximately 12 800 m^2, and will be designed to accommodate storage of not more than 160 used nuclear fuel casks on concrete pads.
- The dry storage casks will be transferred from the spent fuel pools (SFP) to the TISF on the existing KNPS internal road network. A new site access road of approximately 100 m will be required for Alternative 1.
- The TISF design concept perused suggests that there is a very low to zero probability of there being a contaminated stormwater stream emanating from the TISF.

2.2.2 Existing Stormwater Infrastructure

The following information on stormwater infrastructure was relevant to the ISWMP:

- The general principle for stormwater management at the site is to remove stormwater from the site as quickly as possible. Discussions, emails and the preliminary stormwater management drawings indicate that no stormwater retention facilities currently exist on site;
- The stormwater infrastructure has the following main features:

- Two stormwater outlet pipes discharge all the stormwater from the site to the sea – one of the pipes has a nominal diameter of 1200 mm, and the other a nominal diameter of 1050 mm;
- Security infrastructure is necessary on the outfall pipes, and discussions indicated that additional stormwater outfalls were not desirable, but these were not ruled out;
- Staff at KNPS indicated that additional capacity sufficient to accept the storm flows from the TISF is available in the existing system;

- Operational aspects of the stormwater system:
  - Stormwater is sampled at the cooling water outfall, but the frequency is uncertain;
  - Significant and problematic build-up of silt occurs in the current system causing partial blockage of the pipes.

2.3 Clean and dirty areas

One of the steps in SWMP development is to delineate clean and dirty areas as this is a focus in the guidelines (DWAF, 2006). A dirty area is any area where there is a reasonable risk of contamination. The guidelines require these water streams to be treated differently. As concluded in Section 2.2.1., no dirty stormwater is likely to drain from the TISF. However, during construction, any stockpiles, areas where fuels and other chemicals are stored, and the laydown area will be considered as temporarily dirty.

2.4 Standards and regulations

Relevant legislation was reviewed including:

- Local: The City of Cape Town:
  - Floodplain and River Corridor Management Policy C58/05/09 (27 May 2009) enforceable via The City of Cape Town By-law Relating to Stormwater Management C35/08/05 (30 August 2005);
  - Management of Urban Stormwater Impacts Policy C58/05/09 (27 May 2009) enforceable via The City of Cape Town By-law Relating to Stormwater Management C35/08/05 (30 August 2005).
- National stormwater standards and guidelines:
  - National Water Act 36 of 1998 (NWA);
  - Storm Water Management Best Practice Guideline G1, Department of Water and Forestry, 2006;
  - Regulation 704 of the NWA of 1999 (This applies to mining and related activities).
- International standards which must be met:
  - IAEA SSR-2/1 (Rev. 1) Safety of Nuclear Power Plants: Design (2016);
  - IAEA SSR-2/2 (Rev. 1) Safety of Nuclear Power Plants: Commissioning and Operation (2016);
  - IAEA NS-R-5 (Rev.1) Safety of Nuclear Fuel Cycle Facilities (2014) which applies to predisposal management;
  - IAEA SSR-6 Regulations for the Safe Transport of Radioactive Material (2012 Edition).

- International guidelines which should be met to conform with international best practice:
    - IAEA SSG-18 Meteorological and Hydrological Hazards in Site Evaluation for Nuclear Installations (2011). This is a safety guide that provides guidance on how to comply with safety requirements, and presents international good practices;
    - IAEA WS-G-6.1 Storage of Radioactive Waste (2006);
    - IAEA NS-G-1.5 External Events Excluding Earthquakes in the Design of Nuclear Power Plants (2003).

3 Results: The ISWMP

3.1.1 Construction Phase ISWMP

Stormwater Management measures during construction:

1. Construct permanent stormwater management infrastructure such that:
    a. Any upgradient runoff is diverted around the facility;
    b. Stormwater flows are attenuated, if necessary (only if required by City of Cape Town regulators);
    c. The facility is drained of stormwater via channels that are connected to the existing stormwater system.
2. Before, or shortly after the beginning of construction:
    a. Build roads and road crossings before other infrastructure;
    b. Do not place laydown areas, stockpiles or any other materials or equipment in any area where natural surface flows might be expected;
    c. Develop a specific environmental specification for any construction including, but not limited to, the actions in this ISWMP.
3. Design temporary stormwater management works that:
    a. Separate clean and dirty stormwater by diverting any clean runoff around any potentially dirty areas such as laydown areas and stockpiles.
    b. Construct silt fences or berms to prevent the sediment transport around any stockpiles;
    c. Slope and size any unlined drains such that velocities do no exceed 1 m/s
    d. Where necessary, widen any channel where erosion might occur or use rip-rap protection to dissipate stormwater energy.
4. Dispose of general waste, hydrocarbon waste and other contaminants off site;
5. Supply and maintain chemical toilets if toilets are not available on the main site;
6. Construct temporary containment bunds for any hazardous chemicals, oils, fuels or greases stored on site. Bunds must have a containment capacity at least 100% of the volume of the storage container. If all containers are stored together, the bund must store at least 110% of the largest container or 25% of the total storage capacity, whichever is greater.
7. Do not disturb the natural topography or vegetation where possible;
8. To train construction staff, provide a short briefing on how to identify erosion, how to identify a leak (particularly from vehicles) and where to find contact details of the environmental officer/representative.
9. Conduct the following inspections:
    a. Inspect the site daily for leaks and for any breaches or evidence of spills or any other problems not in adherence to this SWMP. All cars should also be checked for oil leaks and any leaks found should be repaired immediately, the cause of the leak identified, the problem remediated such that no further leaks occur, and any contaminated soil or water is assessed and remediated.

b. Inspect the site for erosion after rain events. If erosion is evident, remediate and redesign the drainage in the area. If erosion is found in a natural drainage line, conduct an assessment to determine the cause, and develop a plan to prevent future erosion.
c. Inspect the site to ensure adherence to the stormwater management plan.
d. Before commissioning, conduct a formal walk-down by a team consisting of experts in external events, design of nuclear structures, component design, systems analysts and plant operators.

3.1.2 Operational Phase ISWMP

The following stormwater management measure will be carried out during operation:

1. Separate clean and dirty stormwater by diverting upgradient water around the TISF and sizing these diversions for the design basis flood event.
2. Road crossings shall be designed such that:
    a. Roads can be accessed in the event of the design basis flood.
    b. Erosion and sediment transport will not occur in the 1 in 100 year event.
3. Pollution on the site will be controlled by:
    a. Bunding of any hazardous chemical storage areas, including oils and greases, such that the bund is least 100% of the volume of the container. If a number of containers are stored together the bund will store at least 110% of the largest container, or 25% of the total storage capacity, whichever is greater;
    b. Placing oil and grease traps wherever oils and greases might be used, if relevant.
4. Erosion, sediment transport and total suspended solids (TSS) will be controlled by ensuring that:
    a. Any areas or drains which will experience altered flow, and where those flows exceed 1 m/s, are designed with materials able to resist that flow such as, but not limited to, gabions, reno-mattresses, rip-rap or concrete.
    b. Any water draining off the concrete slabs is conveyed such that no erosion occurs in any event up to and including a 1 in 100 flood year event by use of concrete drains or other suitable designs.
    c. Diversion drains diverting any water from the upstream catchment away from the site includes dissipaters at their outlet such that erosion is not caused in any flood up to and including a 1 in 100 year flood.
5. Capacity reduction in stormwater drains can be mitigated by:
    a. Design of all stormwater conveyances such that a self-cleaning velocity is likely at least once during the year.
    b. Designing any drains deeper than 1.5 mbgl such that no groundwater ingress occurs.
6. Management and training during operation shall include:
    a. Placing a visible sign/s that provides the name, telephone number and email address of the environmental manager and states: “If you notice any leaks or spills or erosion anywhere on the property please phone or email the environmental manager on…”
    b. Providing a brief training course once a year that guides construction staff on how to identify erosion, leaks (including leaks from vehicles) and how to contact the environmental manager.

c. Inspecting, before the wet season, after the wet season and after any rain event exceeding a 1 in 1 year rainfall (or more frequently if so prescribed by the engineer responsible for detailed design of the stormwater system), the following:

   i. All stormwater infrastructure, systems, inlets and outlets for blockages, silting, capacity reduction, groundwater ingress, erosion or malfunction;

   ii. The site for evidence of leaks or spills.

d. Stormwater from the TISF shall be sampled on a monthly basis for analysis of the presence of oils and greases, radioactivity indicators, phosphorus (only if required by City of Cape Town regulators) and TSS.

7. Continued improvement shall be achieved by:

   a. Updating the ISWMP two years after commissioning of the TISF and then reviews every five years thereafter.

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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional environmental practices.

4 References

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REVIEW REPORT FOR THE CONCEPTUAL INTEGRATED STORMWATER MANAGEMENT PLAN FOR THE USED FUEL TRANSIENT INTERIM STORAGE FACILITY AT KOEBERG NUCLEAR POWER STATION ON CAPE FARM No. 1552, DUYNEFONTYN

32827.00-REP-001 REV 2

REVIEW REPORT

OCTOBER 2016

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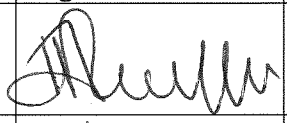
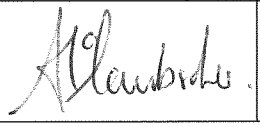
ISSUE & REVISION RECORD

QUALITY APPROVAL

	Capacity	Name	Signature	Date
	Project Leader	Francois Ricketts		29/09/2016
Approved by Design Centre Leader	Project Director	Sampie Laubscher		29/09/2016

This report has been prepared in accordance with BVi Consulting Engineers Quality Management System. BVi Consulting Engineers is ISO 9001: 2008 registered and certified by NQA Africa.

REVISION RECORD

Revision Number	Objective	Change	Date
0	Issued for comments	None	29/09/2016
1	Final	Comments incorporated	11/10/2016
2	Final	Amendments requested	12/10/2016

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1. TERM OF REFERENCE

Eskom has appointed SRK Consulting (South Africa) (Pty) Ltd (SRK) to prepare a conceptual Stormwater Management Plan (SWMP) for the proposed Transient Interim Storage Facility (TISF) at Koeberg Nuclear Power Station (Koeberg) ("the project") as part of the EIA process in terms of the 2014 EIA Regulations as per NEMA, 1998.

SRK subsequently appointed BVI Consulting Engineers to review the *Conceptual Integrated Stormwater Management Plan for the Used Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station on Cape Farm No. 1552, Duynefontyn* prepared by SRK Consulting (South Africa)(Pty) Ltd.

2. PURPOSE OF REPORT

This report will evaluate the conceptual SWMP in terms of the concepts developed to address legal, environmental and technical aspects associated with the proposed site and management of stormwater generated from the Used Fuel Transient Interim Storage Facility once it has been constructed.

The report will further identify aspects requiring further attention to ensure that the Environmental Authorisation obtained through the EIA process will cover the implementation of the SWMP in terms of its final footprint required for construction.

3. APPROACH FOLLOWED FOR REVIEW

The approach used to review the SWMP encompasses the following structure:

- Meeting with the SRK stormwater specialist to discuss scope and purpose of the study and obtain relevant documentation;
- Review the SRK specialist report and associated background information (Scoping Report and Comments and Responses Summary).

The above was then formalised in the Review Report under headings with the following approach:

- Clear identification of site characteristics, topography, hydrology of region and existing stormwater system;
- Data Analysis review;
- Review of technical requirements in relation with policies and standards;
- Review of recommendations and conclusion.

The Review Report, proposing aspects to be addressed by SRK Consulting (Pty) Ltd. within the original report, was circulated for comment.

Responses and comments were received from SRK and Eskom following a review of the BVi Review Report.

4. DATA AND ANALYSIS REVIEW

Clear identification has been made in the SWMP in terms of the locality, site characteristics, topography and hydrology.

Two alternative sites were identified for the establishment of the new Used Fuel Transient Interim Storage Facility (TISF). Neither of the TISF site alternatives have an existing stormwater system, therefore the stormwater could either drain directly to the sea or can be linked with the existing stormwater system on the site. According to ESKOM sufficient capacity exists in the existing stormwater system on site to cater for any additional stormwater volume generated by the TISF.

TISF Alternative 1 is the preferred site due to certain technical reasons and developing the SWMP for this option only is therefore acceptable.

An aspect that is not very clear from the drawings in the SWMP report is the extent of the footprint used for the EIA and whether this includes for the stormwater management facilities.

5. RELEVANCE OF INTERNATIONAL STANDARDS

The nature of the facility requires that International Atomic Energy Agency (IAEA) guidelines be followed for Nuclear Plant Designs where relevant.

The International Guidelines and Standards (IAEA) were used to test and develop technical design concept for the SWMP. This review confirms IAEA compliance with these referred clauses within the SWMP prepared by SRK.

In terms of risk assessment with respect to stormwater management, the SWMP addressed the issue of runoff from the upstream catchment for a major storm event by diverting flows around the TISF site. Stormwater runoff generated on site during a major storm event is dealt with conceptually.

6. LEGISLATION AND LOCAL AUTHORITY POLICY

The SWMP will support the EIA process as supporting document from a specialist and provides information at a conceptual level. It will therefore assist to formulate the Environmental Authorisation with its set of conditions.

The SWMP further refers to the Stormwater Policy of City of Cape Town and acknowledges that the TISF will have to comply with the policy's requirements. The impact of the policy's requirements in terms of infrastructure needed to comply is addressed at a conceptual level.

There is a risk that the information, being at a conceptual level, may not address issues of a technical nature adequately and that during detail design it is found that construction activities may trigger the need for further Environmental Authorisation in term of NEMA.

In light of above, it is felt that the additional information of a technical nature is required to eliminate the risk of requirements for environmental authorisation at a later stage.

A concept layout drawing indicating the TSIF linkage to the existing stormwater system should suffice. Detail is not required but the footprint needed to accommodate the facilities will be defined much clearer and also assist to eliminate the risk that it will fall outside the EIA footprint.

7. TECHNICAL ASPECTS OF EXISTING AND PROPOSED STORMWATER SYSTEM

The need for additional technical information to define certain aspects more fully was identified in Sections 6. It is felt that the following will assist to eliminate uncertainties and define the requirements of the SWMP to develop the footprint of the TISF clearly:

International Atomic Energy Agency Standards (IAEA Standards):

- The major and extreme storm event (Eskom Standards) should be used to assessed conceptually its potential impact on infrastructure requirements and on the downstream receiving system.

City of Cape Town Policies:

- Water quality volume (WQV) for treatment should be defined. The SWMP indicates that the international standards take precedence over Local Authority Policies. This is true within the context of the design of the facility but water quality has to be improved for lower order storm events.
- City of Cape Town policy requires that treatment have to be provided as a minimum for a 1/2 year, 24hr storm while post development 50-year Return Interval peak stormwater flow has to be reduced to pre development flows.
- The need for a detention facility to serve the TISF will in engagement with City of Cape Town, be confirmed whether applicable or not.
- The proposed system has to drain to an outfall and this should be clearly defined to which outfall it will drain, i.e. sea or the existing stormwater system.
- The location and depth of the existing system needs to be assessed to ensure that it can be used as an outfall system for the TISF. ESKOM's confirmation that sufficient capacity is available in the existing outfall pipe can be accepted.
- Overland stormwater drainage routes should be clearly defined for major or extreme events for the purpose to define the footprint for the EIA process.
- The City of Cape Town latest rainfall Intensity Duration Frequency (IDF) curves should be used to assess stormwater flows.

- The estimated detention volume is required for the preliminary sizing of detention/retention facilities.

The above aspects will form part of the conceptual identification of the TISF footprint, which form part of the EIA process and ultimately the Environmental Approval.

Presentation and Visual Aspects (Drawings)

The visual representation of the footprint of the proposed TISF should include the following aspects:

- Linking points to the existing stormwater system
- The overland drainage route from the spillway to deal with overflows.
- Erosion protection.
- Detention pond and outfall system to sea or existing pipeline.

8. CONCLUSIONS

The conceptual SWMP complies with the legal framework as set out in the International Atomic Energy Agency (IAEA) guidelines and addresses City of Cape Town's stormwater policy requirements at a conceptual level.

It is, however, felt that liaison with the City of Cape Town Stormwater Department be initiated to determine the extent of attenuation/detention pond and any other regulatory requirements that must be adhered to.

Furthermore, detail shall be requested from the Eskom Engineers regarding positioning of attenuation/detention ponds within the existing TISF site footprint and other associated stormwater infrastructure in the vicinity that will accept the stormwater from the proposed TSIF.

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEA/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2014; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 921, 2013

PROJECT TITLE

EIA for the Proposed Used Nuclear Fuel Transient Interim Storage Facility at Koeberg Nuclear Power Station

Specialist:	BVI CONSULTING ENGINEERS		
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4.2 The specialist appointed in terms of the Regulations_

I, Sampie Laubscher , declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

BVi CONSULTING ENGINEERS WESTERN CAPE (PTY) LTD.

Name of company (if applicable):

9 September 2016

Date: