



# OFFSET INDUSTRIES

*Desktop aquatic ecology impact assessment for the proposed Mbewu-Inyaninga power line and substation deloyment*

14 September 2017

DESKTOP AQUATIC ECOLOGY

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# OFFSET INDUSTRIES

clean up your act

Author: Brett Reimers (Pr.Sci.Nat)



# EXECUTIVE SUMMARY

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The proposed project entails the construction of the Inyaninga 2 x 500 MVA 400/132 kV substation , ±100KM Inyaninga - Mbewu 400kV powerline and associated infrastructures.

The proposed project will traverse various farms within the jurisdiction of Ethekwini Metropolitan, Ilembe and Uthungulu Dis-trict Municipalities in the KwaZulu Natal Province, South Africa.

A fly over was conducted on the 24<sup>th</sup> of May 2017. With the data collected during this exercise as well as available desktop information this desktop aquatic ecology report was compiled. The proposed corridors encounter 17 quaternary catchments and 22 Sub Quaternary Reaches on their approximately 150 km route from just North of La Mercy to in land of Empangeni.

From the desktop impact assessment it was determined that on average the proposed project poses medium to low risks of erosion, sedimentation and pollution to the aquatic environments it encounters. If no mitigation measures are put in place there is a potentially high risk of impact from alien invasive plant species encroaching on cleared land. The majority of the risks are associated with the construction of the substations. Here, site selection is crucial and it is recommended that any site selected remain at least 60m away from the nearest watercourse measured from the outside edge of the riparian zone.

Inyaninga Site F is the least preferred for a substation in the south of the project due to its close proximity to the Tonagi River. Corridor 2 is the most preferred route as it crosses fewer FEPA rivers and tends to run along already disturbed land surfaces.

The project, if it complies with all recommended mitigation measures, does not pose undue risk to the aquatic environments it encounters.

However, once the final routes and substation positions have been selected it is recommended that any associated aquatic environments be subject to additional field studies to provide site specific mitigation measures.



# DECLARATION

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I Brett Reimers, declare that -

- I act as the independent aquatic ecologist in this matter;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- 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 National Environmental Management Act (Act 107 of 1998) (NEMA), regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the NEMA Act, regulations and all other applicable legislation;
- As a registered member of the South African Council for Natural Scientific Professions in terms of the Natural Scientific Professions Act, 2003 (Act No. 27 of 2003), I will undertake my professional duties in accordance with the Code of Conduct of the Council;
- 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 report are true and correct; and
- I am aware that a person is guilty of an offence in terms of Regulation 48 (1) of the EIA Regulations, 2014, if that person provides incorrect or misleading



information. A person who is convicted of an offence in terms of sub-regulation 48(1) (a)-(e) is liable to the penalties as contemplated in section 49B-(1) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the specialist:

Date: 14 September 2017

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## Abbreviations used within report

AIP	Alien Invasive Plants
DWS	Department of Water and Sanitation
NEMA	National Environmental Management Plan
NFEPA	National Freshwater priority Area
SQR	Sub Quaternary Reach
WWTW	Waste water treatment works



# AQUATIC ECOLOGY REPORT

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## 1. Introduction

### 1.1. Project description

The proposed project entails the construction of the Inyaninga 2 x 500 MVA 400/132 kV substation, ±100KM Inyaninga - Mbewu 400kV powerline and associated infrastructures.

The EThekweni Electricity Network has four 275kV Transmission in-feeds from Geogedale, Hector, Illovo and Avon substations.

- Avon Substation supplies Ottawa and Durban North Substations;
- Geogedale and Hector Substations supply Klaarwater Substation; and
- Illovo Substation Substations supplies Durban South and Lotus Park Substations.

The load forecast shows load demand doubling in the geographical area supplied by Ottawa and Durban North Substations in the next 20 years. The area supplied by Klaarwater is expected to grow by 20% and the area supplied by Durban South and Lotus Park Substations is expected to grow by 30% over the same period. Consequently, Eskom has proposed to construct the Inyaninga substation and the Inyaninga - Mbewu 400kV powerline in order to cater for future electricity needs.

### LEGAL REQUIREMENTS FOR BASIC ASSESSMENT

The proposed development triggers activities under the 2014 EIA Regulations. In accordance with the requirements of the NEMA, Eskom Holdings SOC Limited requires approval from the Competent Authority i.e. Department of Environmental Affairs in order to undertake the proposed project.

### LOCALITY

The proposed project will traverse various farms within the jurisdiction of EtheKweni Metropolitan, Ilembe and Uthungulu District Municipalities in the KwaZulu Natal Province, South Africa (Figure 1).

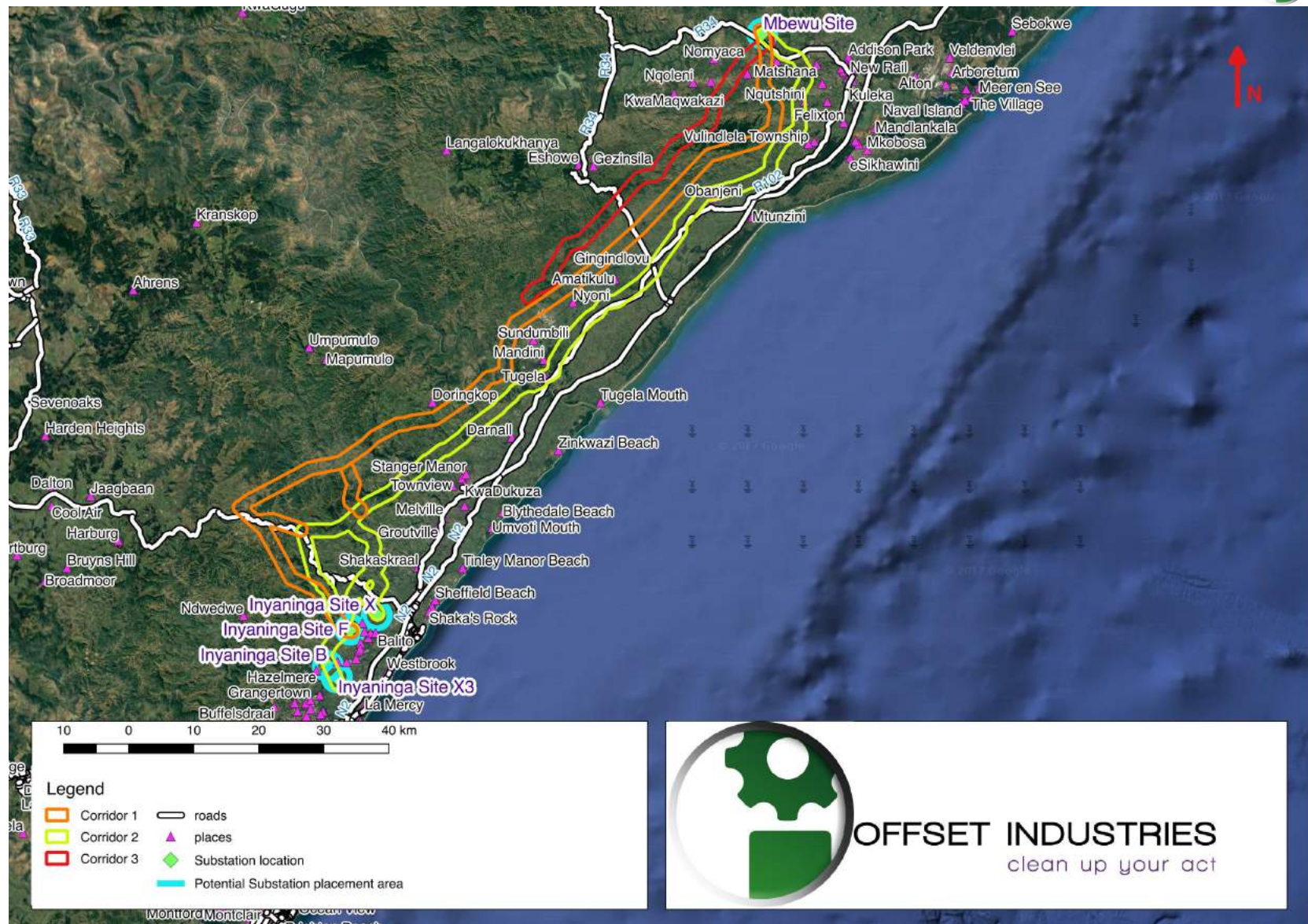


Figure 1: Locality



## 1.2. Desktop information

### 1.2.1. NFEPA

The National Freshwater Ecosystem Priority Areas (NFEPA) is a project that was developed to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and support for the sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs (Driver et al 2011).

The corridors cross multiple rivers some of which are FEPA rivers, these are illustrated below in a series of maps, moving northward from the four potential substation locations ,namely, Site X, X3, F and B (Figure 2, Figure 3, Figure 4, Figure 5, Figure 6).

FEPA rivers are ecosystems that have strategic importance with regard to water supply or aquatic ecosystem support. Functions include fish recruitment support migration as well as biodiversity management. These rivers are subject to greater scrutiny and developments in close proximity to them need to impliment extra measures to ensure that the present ecological status of these rivers is not deminished by their presence.

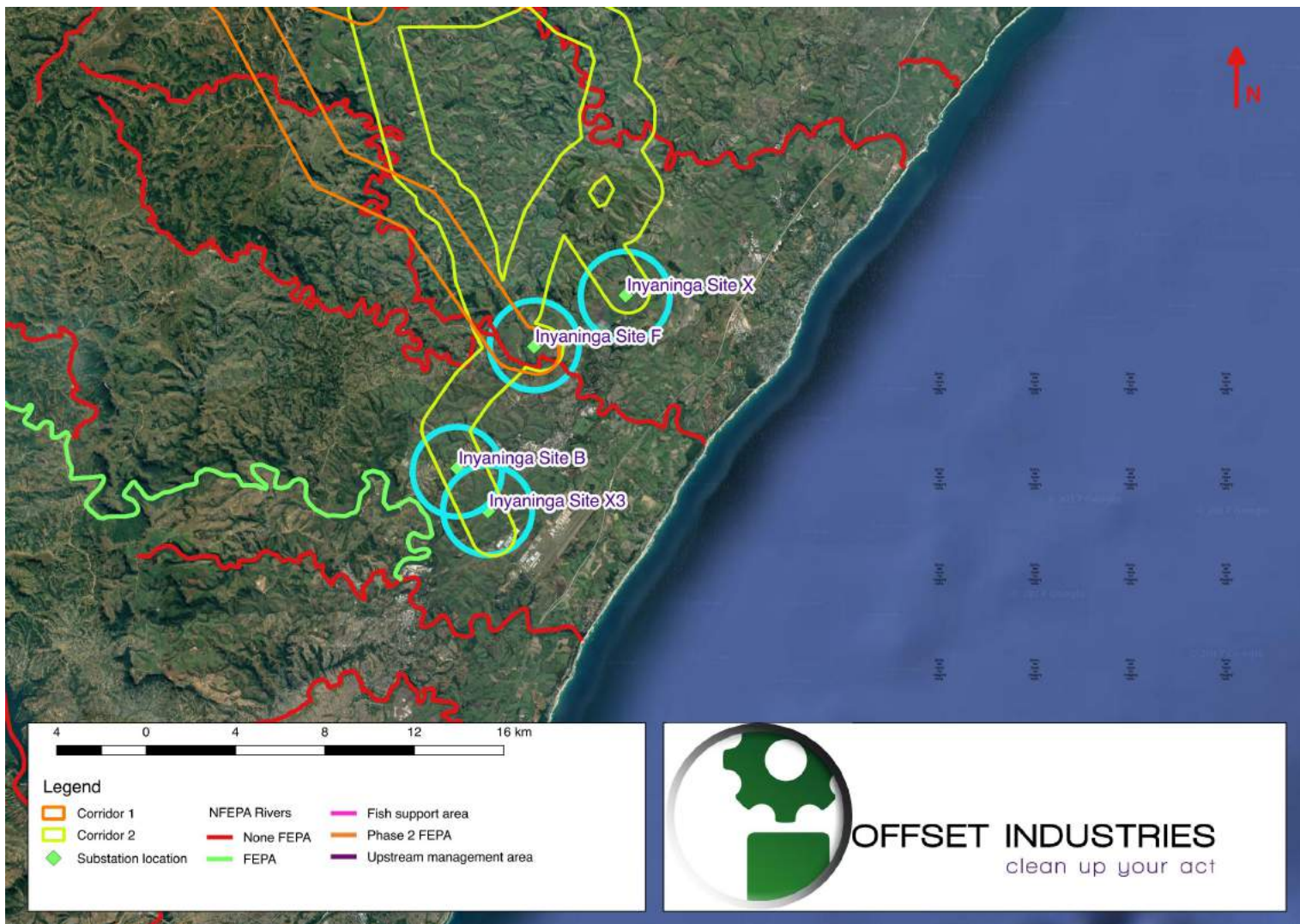


Figure 2: FEPA rivers map 1

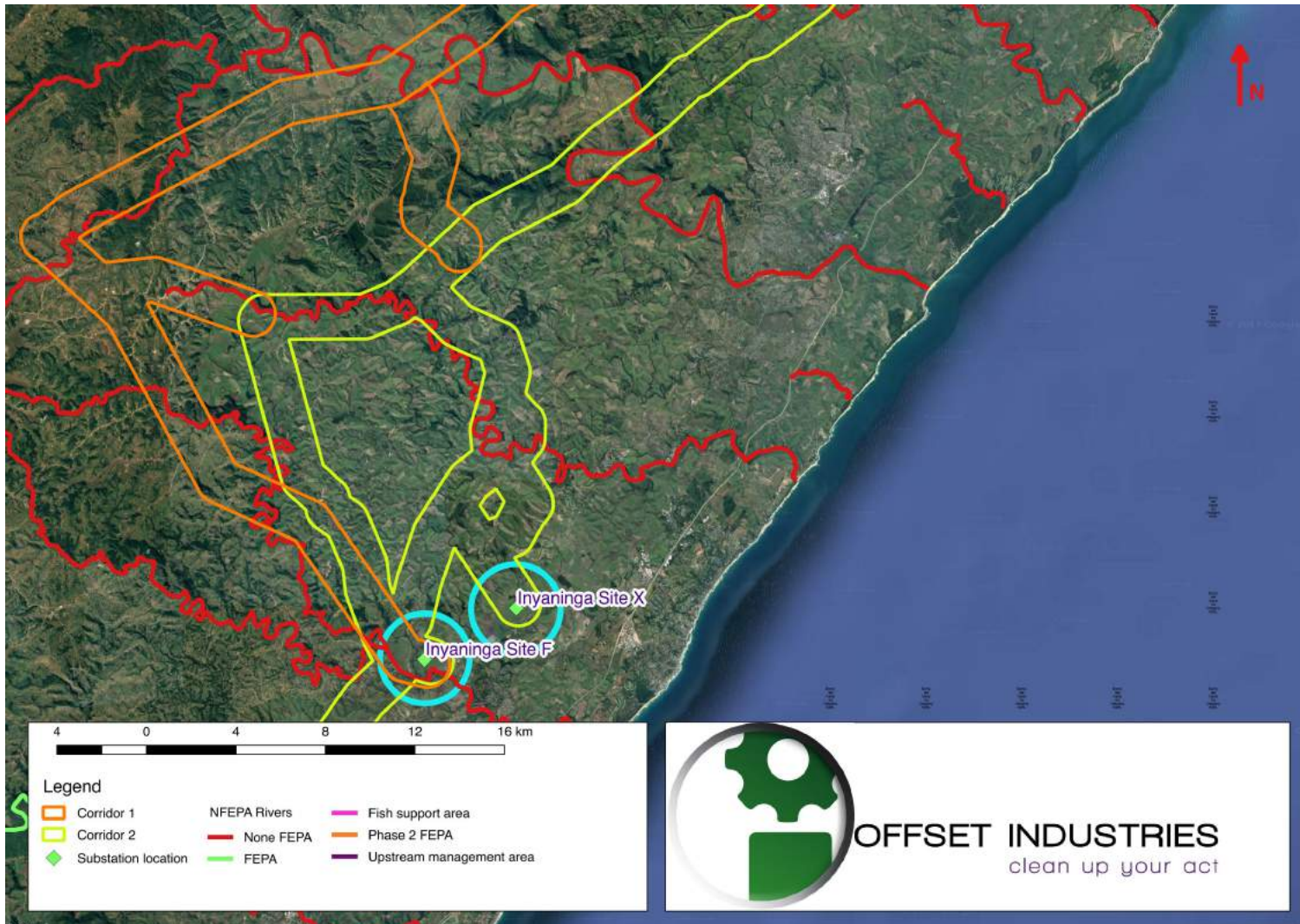


Figure 3: FEPA rivers map 2

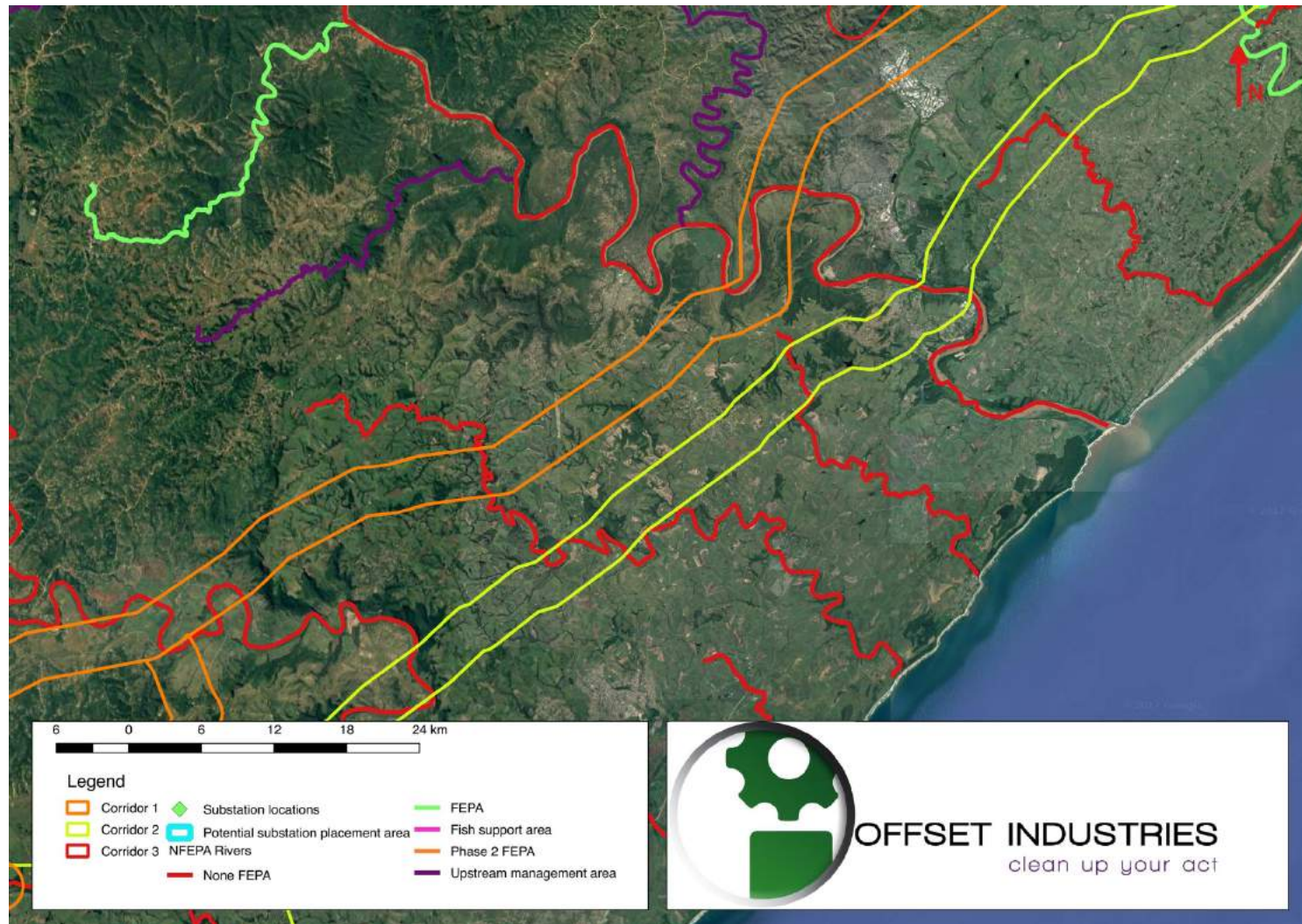


Figure 4:FEPA rivers map 3

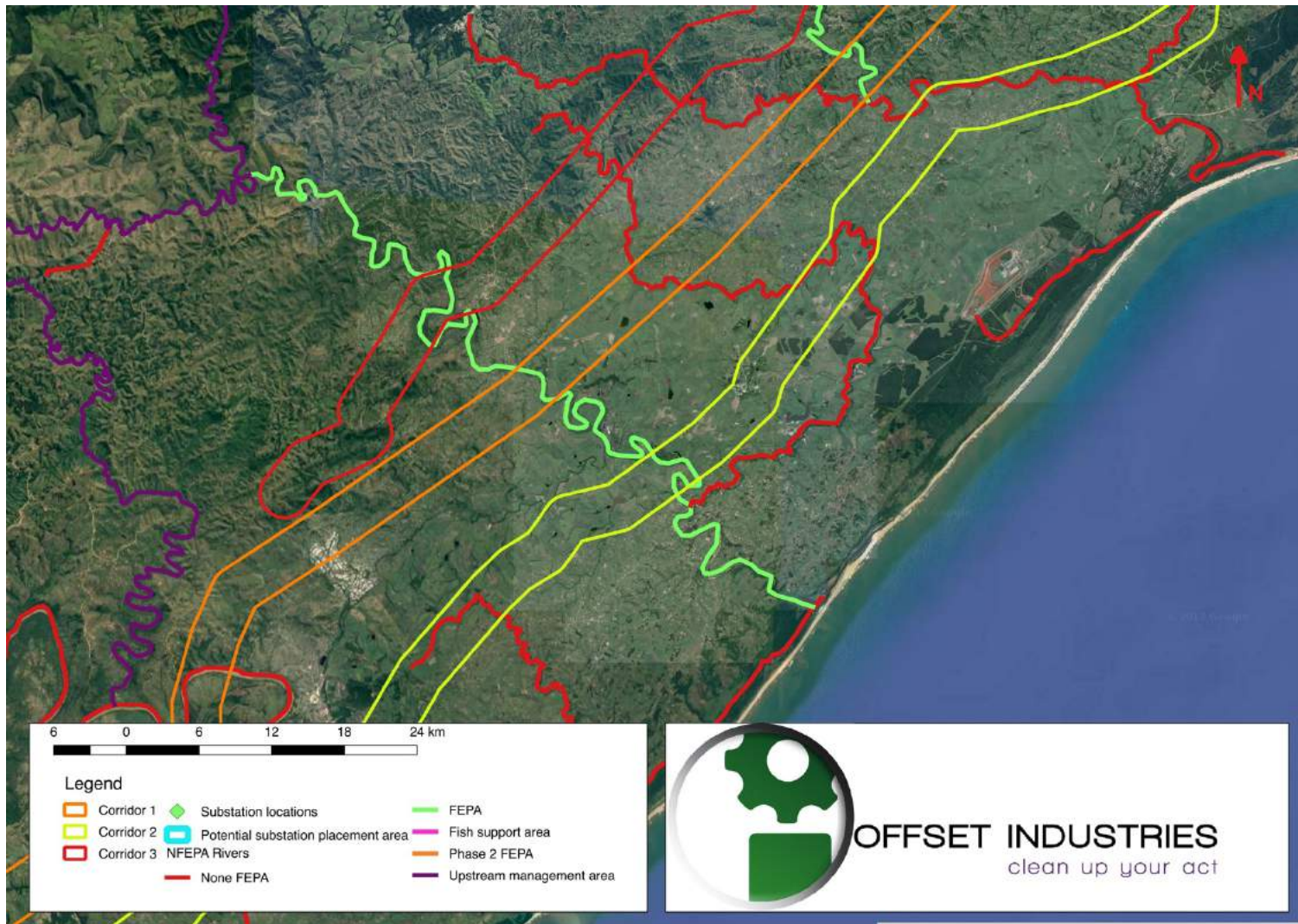


Figure 5: FEPA rivers map 4

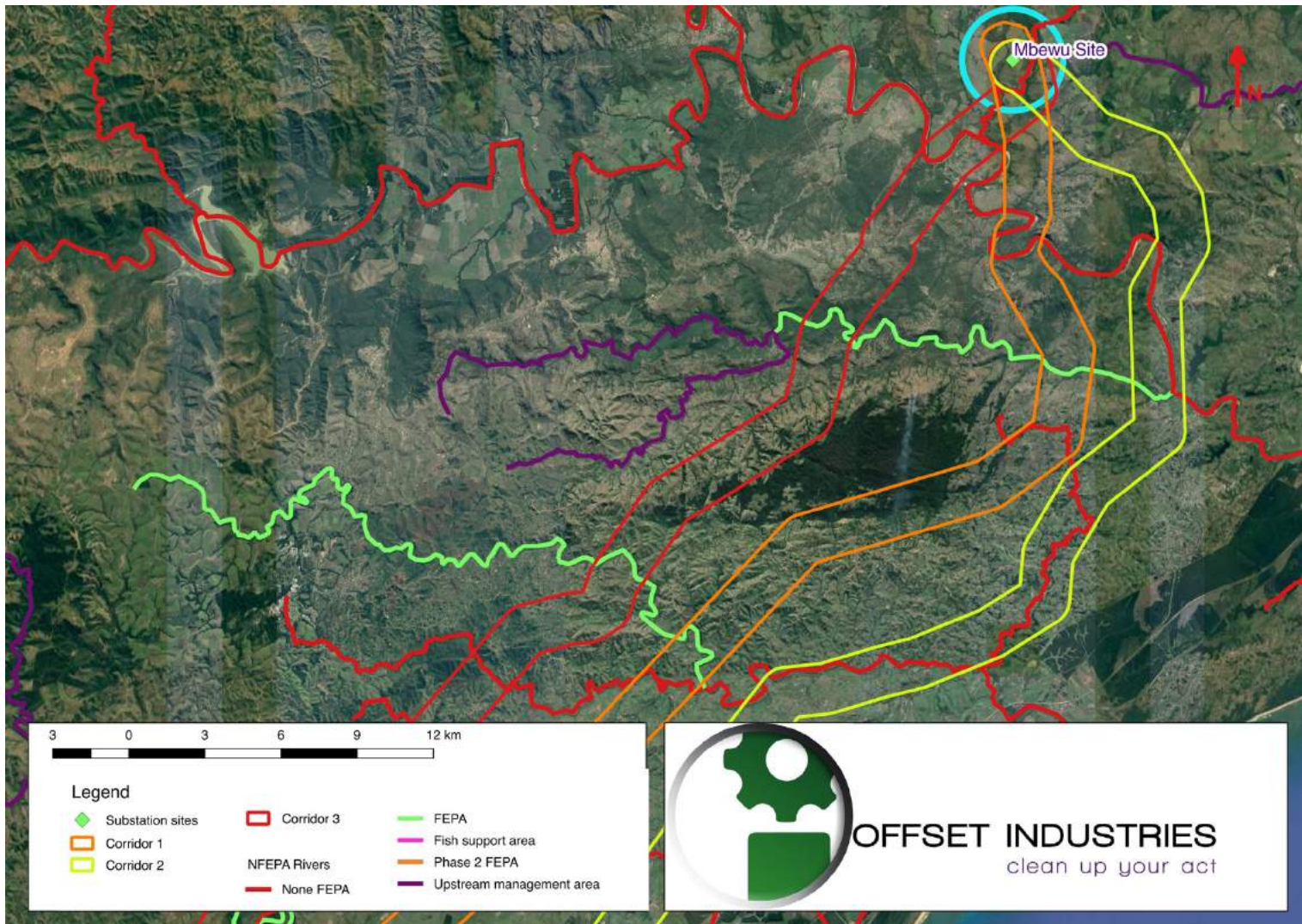


Figure 6: FEPA rivers map 5



As can be seen from the above figures, the proposed corridors cross up to three FEPA rivers and Corridor 3 borders on two upstream management areas. Corridor 2 crosses the least amount of FEPA rivers.

### 1.2.2. Quaternary data

The site falls over multiple quaternary catchments, these are again presented below in a series of maps (Figure 7, Figure 8, Figure 9, Figure 10, Figure 11). The corridors pass through three different primary ecoregions, these are:

- The North Eastern Coastal Belt
- The North Eastern Uplands; and
- The Natal Coastal Plain

The corridor and substations sites are associated with 17 quaternary catchments through which 22 Sub-Quaternary Reaches (SQRs) flow.

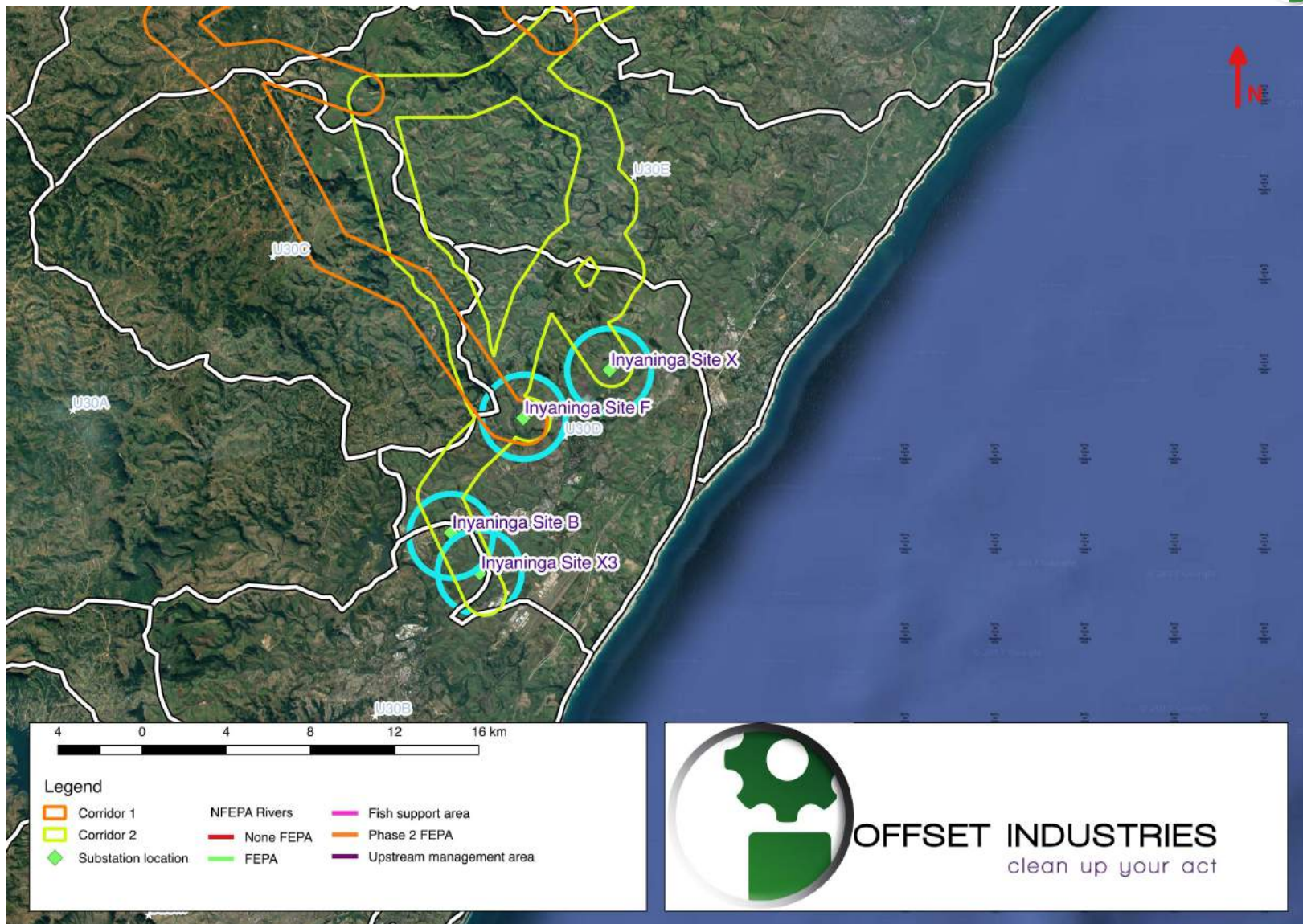


Figure 7: Quaternary catchment map 1

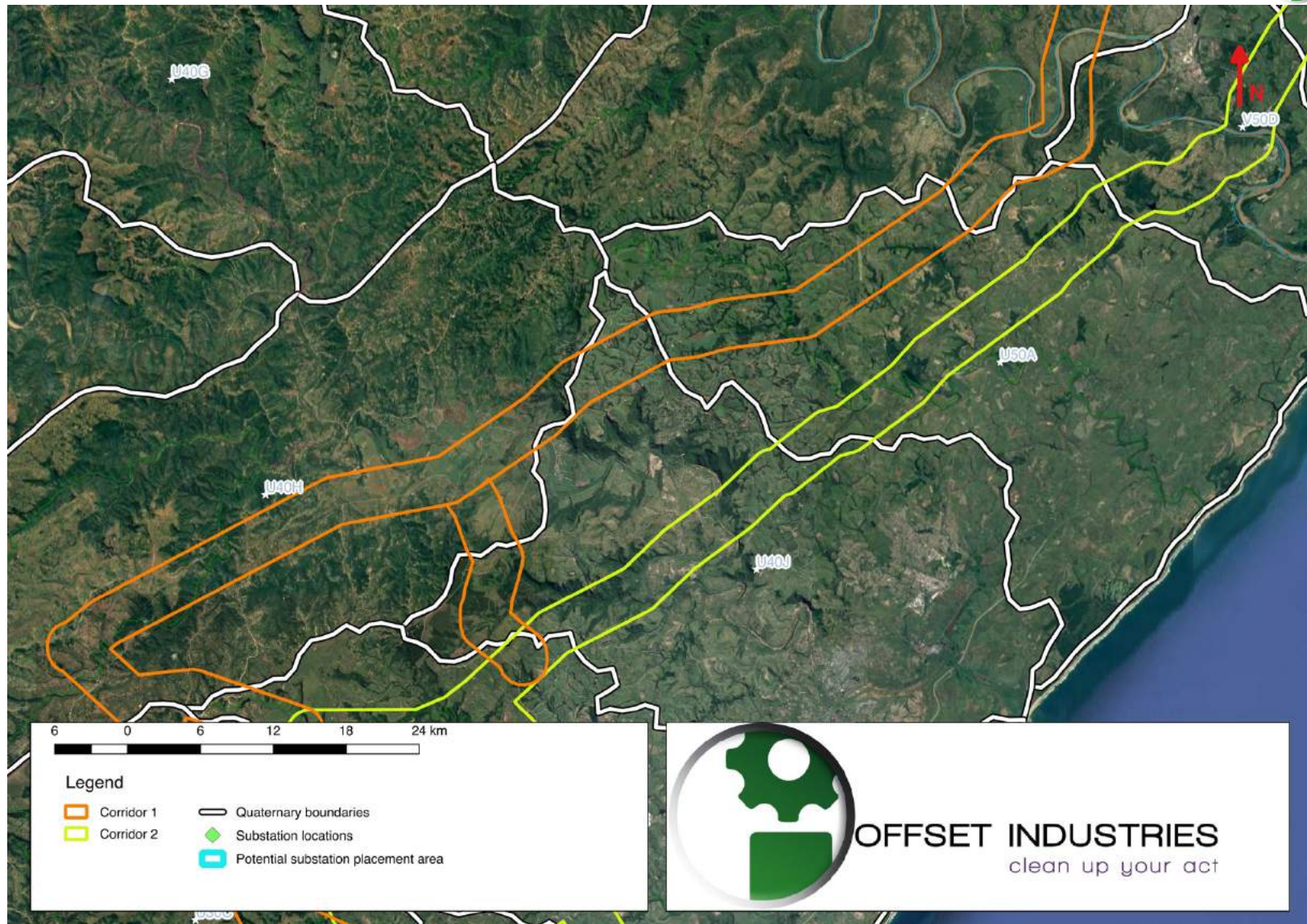


Figure 8: Quaternary catchment map 2

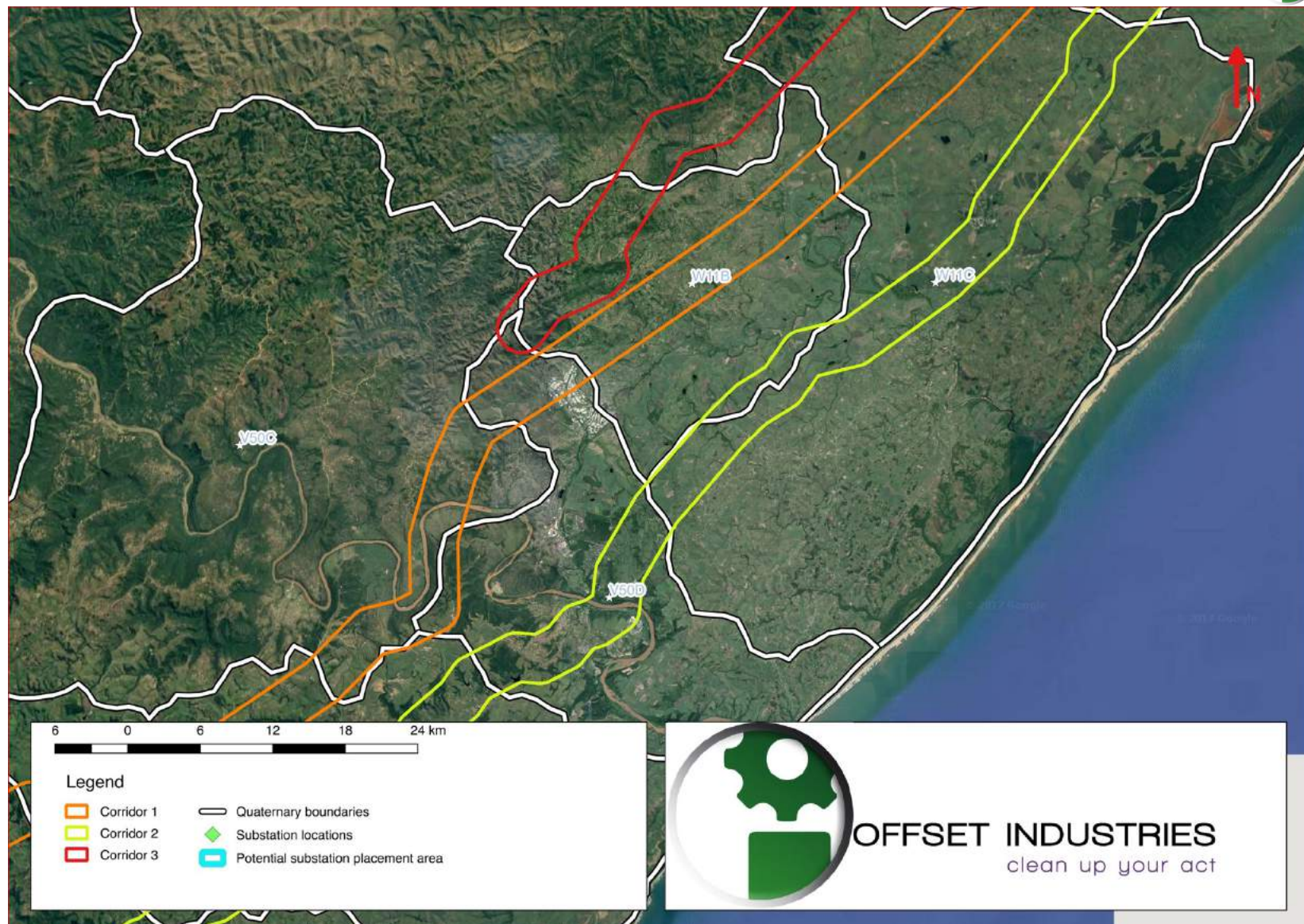


Figure 9: Quaternary catchment map 3

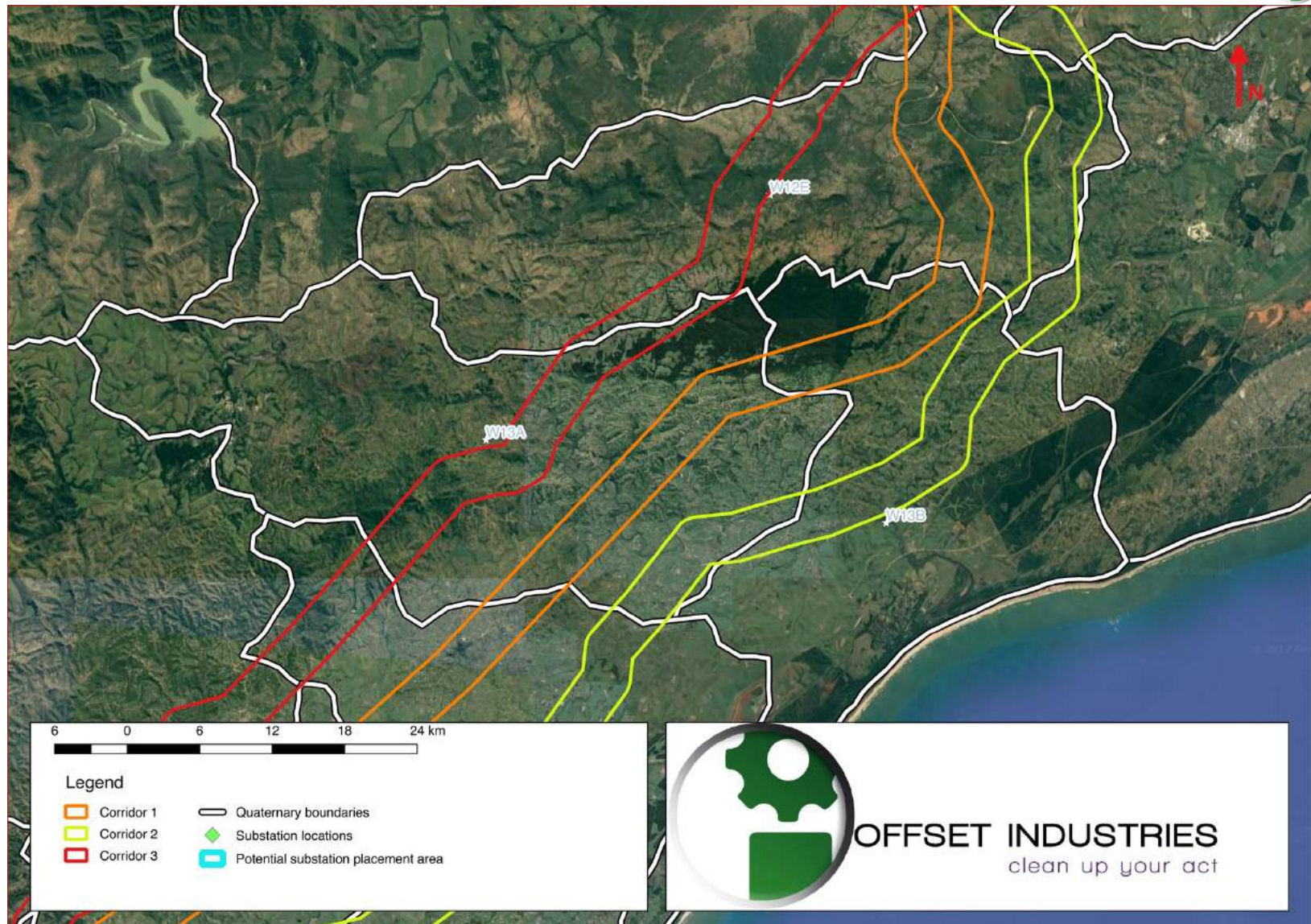


Figure 10: Quaternary catchment map 4

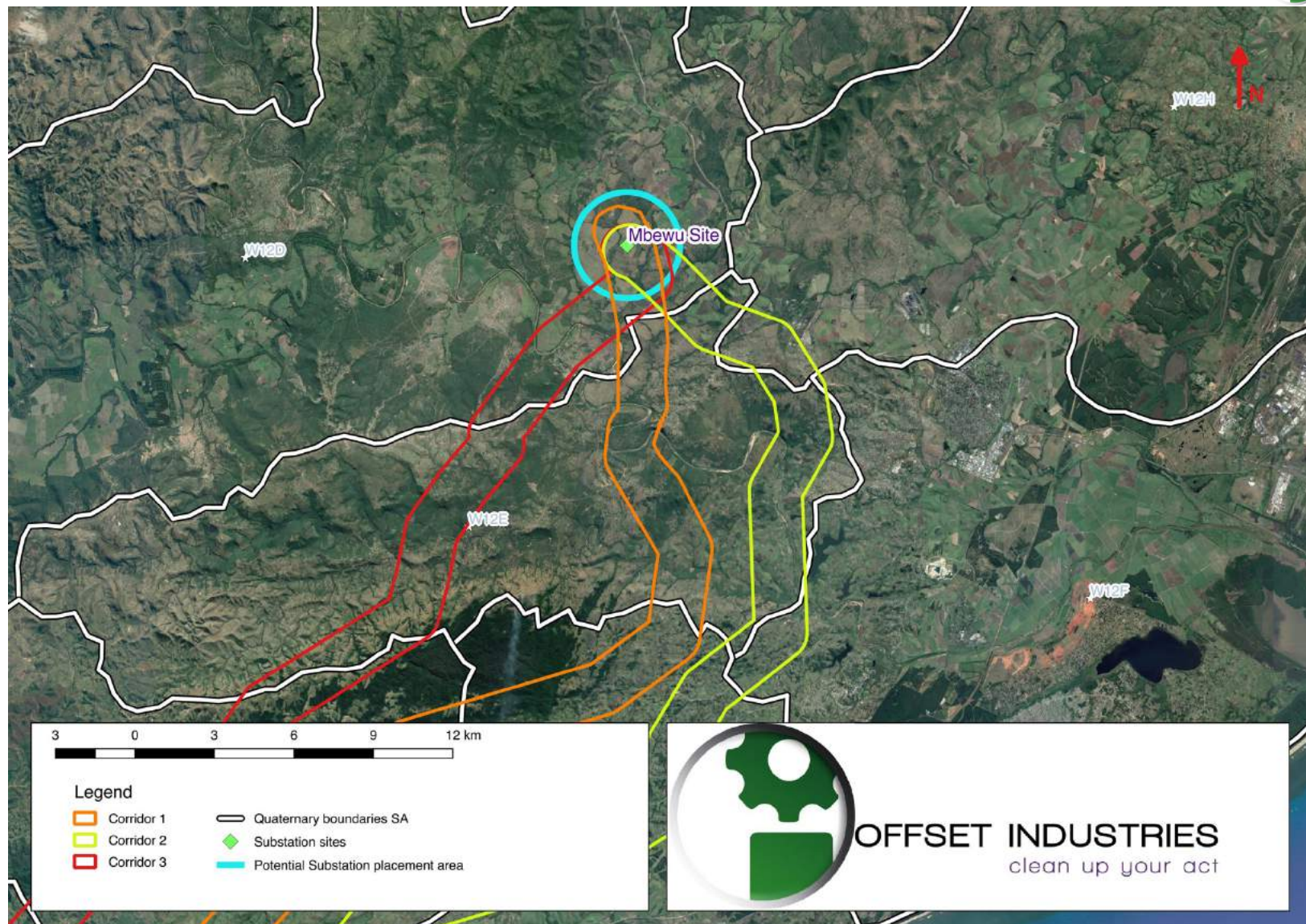


Figure 11: Quaternary catchment map 5



## 2. Scope of work and limitations

### 2.1. Scope of Work

The scope of work for the desktop aquatic ecology impact assessment investigating the proposed route options of Inyaninga substations to the Mbewu substation are:

A desktop assessment of the aquatic ecology associated with the proposed project will be focused on the sub-quaternary reaches (SQRs) associated with the powerline corridors, and will include the following:

- A description of the Present Ecological Status (PES).
- A description of the Ecological Important (EI) and Ecological Sensitivity (ES) of the reach.
- An expected macroinvertebrate assemblage.
- An expected fish species assemblage.
- A desktop based risk assessment for the proposed project, for the uMngeni River crossing. Mitigation measures will be prescribed for identified risks.

### 2.2. Limitations

The following limitations apply to this report:

- This is a desktop assessment no site visits were conducted,
- All information was sourced from online resources and information presented may be out of date and therefore inaccurate,
- The proposed corridors are as wide as 2 km with the longest being over 150km it is not possible to cover an area of this extent in exhaustive detail.
- Impact scores are based on desktop information and may be inaccurate when compared to field investigations.

## 3. Methodology

### 3.1. Desktop assessment methodology

As this is a desktop assessment, no field investigations were carried out. All information was sourced from internet resources such as the NFEPA Atlas project



and the Department of water and Sanitations, Desktop Present Ecological Status Assessments (Driver *et al.* 2011; Department of Water and Sanitation 2014). A flyover was undertaken on the 24<sup>th</sup> of May 2017. Data from the flyover is largely photographic and was used in conjunction with Google Earth Pro™ imagery to assess the landscape and rivers within the proposed corridors.

### 3.2. Assessment of Impact Significance

Significance scoring both assesses and predicts the significance of environmental impacts through evaluation of the following factors; probability of the impact; duration of the impact; extent of the impact; and magnitude of the impact. The significance of environmental impacts is then assessed considering any proposed mitigations. The significance of the impact “without mitigation” is the prime determinant of the nature and degree of mitigation required<sup>1</sup>. Each of the above impact factors have been used to assess each potential impact using ranking scales.

Unknown parameters are given the highest score (5) as significance scoring follows the Precautionary Principle. The Precautionary Principle is outlined in Box 1.

*‘When the information available to an evaluator is uncertain as to whether or not the impact of a proposed development on the environment will be adverse, the evaluator must accept as a matter of precaution, that the impact will be detrimental. It is a test to determine the acceptability of a proposed development. It enables the evaluator to determine whether enough information is available to ensure that a reliable decision can be made.’*

*Box 1: The precautionary principle*

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<sup>1</sup> Impact scores given “with mitigation” assume that the mitigation measures recommended in this assessment are implemented correctly and rehabilitation of the site is undertaken. Failure to implement mitigation measures during and after construction will keep the impact at an unacceptably high level.



Table 1: Significance scoring used for each potential impact

Probability	Duration
1 - very improbable	1 - very short duration (0-1years)
2 - improbable	2-short duration (2-5 years)
3 - probable	3 - medium term (5-15 years)
4 - highly probable	4 - long term (>15 years)
5 - definite	5 - permanent/unknown
Extent	Magnitude
1 - limited to the site	2 - minor
2 - limited to the local area	4 - low
3 - limited to the region	6 - moderate
4 - national	8 - high
5 - international	10 - very high

The following formula was used to calculate impact significance:

$$\text{Impact Significance: } (\text{Magnitude} + \text{Duration} + \text{Extent}) \times \text{Probability}$$

The formula gives a maximum value of 100 points which are translated into 1 of 3 impact significance categories; Low, Moderate and High as per Table 2.

Table 2: Impact significance ratings

Significance Points	Significance Rating
0-30 points	Low environmental significance
31-59 points	Moderate environmental significance
60-100 points	High environmental significance

The impact assessment is discussed in more detail in Section 5.

#### 4. Results and discussion

Desktop data from the Department of water and Sanitation is presented below in Table 3. certain catchments have more information available than others and impacts within the catchments may vary in detail. there are six classes within the River Eco-status and Monitoring Programme (REMP). These are:

Class A- Natural

Class B- Largely natural

Class C- Moderately modified



Class D- Largely modified

Class E- Seriously modified and

Class F- Critically modified





Table 3: Summary of desktop information

Quaternary catchment	SQR	River Name	EI	ES	PES	Impacts	Additional notes
U30B	U30A-04360	Mdloti	High	Very High	Largely Modified	Rural settlement, sand mining in upper and lower reaches, bass in system, bottom of reach in Hazelmere Dam. Brick works below dam, industries (Bayer chemicals). Abstraction (run-of-river/increased flows):SMALL:Inundation (dams):LARGE:Agricultural lands:SMALL:Bed modification:LARGE:Crossings (low water bridges/weirs):SMALL:Water quality - nutrients :SMALL:Water quality - other:SMALL/Erosion (banks, riparian zone), sedimentation:NONE/Exotic vegetation (Alien invasive plants, AIP):NONE/Forestry:NONE/Waste disposal:NONE	Sites X3 and B potentially fall within this catchment
U30D	U30D-04315-	Tongai	Moderate	Very High	Moderately Modified	Urban (Tongaat), WWTW return flows, road crossings, sand mining, quarry, dryland sugarcane, lower reach into estuary. .. Abstraction (run-of-river/increased flows):SMALL/Inundation (dams):NONE/Agricultural lands:SMALL/Bed modification:SMALL/Crossings (low water bridges/weirs):SMALL/Water quality - nutrients :MODERATE/Water quality - other:NONE/Erosion (banks, riparian zone), sedimentation:SMALL/Exotic vegetation (AIP):NONE/Forestry:NONE/Waste disposal:NONE	Substation sites X3, B, X and F all potentially fall within this quaternary catchment
U30C	U30C-04272	Mona	High	high	Moderately Modified	Rural settlements, AIP in riparian zone??, erosion, sand mining, dryland sugarcane. .. Abstraction (run-of-river/increased flows):SMALL/Inundation (dams):NONE/Agricultural lands:MODERATE/Bed modification:MODERATE/Crossings (low water bridges/weirs):SMALL/Water quality - nutrients :SMALL/Water quality - other:NONE/Erosion (banks, riparian zone), sedimentation:SMALL/Exotic vegetation (AIP):SMALL/Forestry:NONE/Waste disposal:NONE	
	U30C-04227	Tongati	High	High	Moderately Modified	Rural settlements, AIP in riparian zone??, erosion, sand mining, dryland sugarcane. .. Abstraction (run-of-river/increased flows):SMALL/Inundation (dams):NONE/Agricultural lands:MODERATE/Bed modification:MODERATE/Crossings (low water bridges/weirs):SMALL/Water quality - nutrients :SMALL/Water quality - other:NONE/Erosion (banks, riparian zone), sedimentation:SMALL/Exotic vegetation (AIP):SMALL/Forestry:NONE/Waste disposal:NONE	
U30E	U30E-04207	Mhlali	High	Very High	Moderately modified	Dryland sugarcane, erosion, extensive sand mining in lower reaches, quarry, WWTW discharges, hyacinths, AIP in riparian zone. .. Abstraction (run-of-river/increased flows):NONE/Inundation (dams):NONE/Agricultural lands:LARGE/Bed modification:MODERATE/Crossings (low water bridges/weirs):SMALL/Water quality - nutrients :SMALL/Water quality - other:SMALL/Erosion (banks, riparian zone), sedimentation:MODERATE/Exotic vegetation (AIP):SMALL/Forestry:NONE/Waste disposal:NONE	
U40J	U40J-03998	Mvoti	High	Very High	Moderately Modified	Subsistence farming, dryland sugarcane, road crossings, sand mining, residential in lower reach, into estuary. .. Abstraction (run-of-river/increased flows):MODERATE/Inundation (dams):NONE/Agricultural lands:MODERATE/Bed modification:MODERATE/Crossings (low water bridges/weirs):SMALL/Water quality - nutrients :SMALL/Water quality - other:NONE/Erosion (banks, riparian zone), sedimentation:SMALL/Exotic vegetation (AIP):NONE/Forestry:NONE/Waste disposal:NONE	



Quaternary catchment	SQR	River Name	EI	ES	PES	Impacts	Additional notes
U40H	U40H-04133	Nsuze	High	High	Largely natural	Low density rural, subsistence farming, some erosion. Abstraction (run-of-river/increased flows):NONE/Inundation (dams):NONE/Agricultural lands:SMALL/Bed modification:SMALL/Crossings (low water bridges/weirs):SMALL/Water quality - nutrients :NONE/Water quality - other:NONE/Erosion (banks, riparian zone), sedimentation:SMALL/Exotic vegetation (AIP):NONE/Forestry:NONE/Waste disposal:NONE	
U50A	U50A-04021	Nonoti	High	Very High	Largely natural	Dryland sugarcane, AIP, road crossings, instr dams. .. Abstraction (run-of-river/increased flows):1/Inundation (dams):1/Agricultural lands:4/Bed modification:2/Crossings (low water bridges/weirs):1/Water quality - nutrients :1/Water quality - other:0/Erosion (banks, riparian zone), sedimentation:0/Exotic vegetation (AIP):1/Forestry:0/Waste disposal:0	
	U50A-04018	Zinkwazi	High	Very High	Largely Natural	Dryland sugarcane, sml instr dam. .. Abstraction (run-of-river/increased flows):0/Inundation (dams):1/Agricultural lands:3/Bed modification:1/Crossings (low water bridges/weirs):1/Water quality - nutrients :1/Water quality - other:0/Erosion (banks, riparian zone), sedimentation:0/Exotic vegetation (AIP):0/Forestry:0/Waste disposal:0	
U50C	Not associated						
V50D	V50D-03903	Tugela	High	High	Moderately Modified	Irrigation in upper reach, gauging weir, semi-urban areas, Sappi abstraction weir, roads. Lower reach is estuarine	
W11B	Not associated						
W11A	W11A-03612	Matigulu	High	High	Moderately modified	Roads, rural, subs farming, cult in lower reaches, dams in tributaries, AIP, small amount of sand mining, sugarcane mill, est in lower reach	
W11C	W11C-03917	Nyoni	Moderate	High	Largely Modified	Extensive cultivation (dry land sugarcane), drained wetlands, plantations, roads, est in lower reach	
	W11C-03713	Nyezane	Moderate	High	Largely Modified	Roads, ext cult (dry land cane), dams in tribs, rural comm, AIP, small stretch of estuary in lower reach	
W13A	W13A-03641	Mkukuze	High	Very High	Moderately modified	Dlinza Forest Nature Reserve, urban (Eshowe), Waste Water Treatment Works, roads, cultivation, AIP, subs farming	
	W13A-03583	Mlalazi	High	Very High	Moderately modified	Dlinza Forest Nature Reserve, urban (Eshowe), WWTW, roads, cultivation, AIP, subs farming	
	W13A-03609	Mlalazi	High	Very High	Largey Modified	Rural, emerging farming, ext cultivation (sugarcane), sand mining, estuary in lower reach	
W13B	W13B-03593	KwaGugushe	High	Very High	Moderately modified	Rural, roads, over-grazing, subs farming in upper reaches, emerging farming (sugarcane) in lower reaches, AIP abstraction for Mtinzi Town, estuary in lower reach	
W12E	W12E-03526	Mhtatuzana	High	Very High	Largely Natural	Roads, rural, large papyrus swamp in lower third of reach, cultivation in lower reach	
	W12E-03475	Mhlathuze	High	Very High	Largely Modified	Cultivation, sand mining, comm, roads, blocked valley bottom wetland/water body - cultivation on the shores	
W12F	W12F-03494	Mhlathze	High	Very High	Serious Modification	Roads, erosion, cult (dryland sugarcane), sand mining, rural, mills with WWTW, heavy metal mining - slimes dam in floodplain, urban (Richard Bay), mining, blocked valley bottom wetland/water body, estuary in lower reach	
W12H	Not associated						



Quaternary catchment	SQR	River Name	EI	ES	PES	Impacts	Additional notes
W12D	W12D-03375	Mhlathze	Moderate	High	Largely Modified	Extensive irrigated cultivation, AIP, rural settlements	
	W12D-03346	Ntambanana	High	High	Moderately Modified	Roads, ext cultivation (dryland), AIP, dams in tributaries	Mbewu Substation located within quaternary catchment



#### 4.1. Expected fish species

The table below gives an indication of the expected fish species within the SQRs associated with the proposed project. The fish are recorded in the table below (Table 4) with abbreviations. A key to the table is provided in Appendix A.

Table 4: Expected fish species

SQR code	Fish code
U30A-04360	AAEN ALAB AMAR AMOS ANAT BGUR BNAT BPAL BPAU BVIV CGAR GAES MBRA MFLU OMOS PPHI TREN TSPA
U30D-04315-	AAEN ABER ALAB AMAR AMOS AMYA BGUR BNAT BPAL BPAU BVIV CGAR GAES GCAL GGIU LMCR LRIC MARG MCAP MCEP OMOS PPHI TREN TSPA
U30C-04272	AAEN ABER AMAR AMOS BGUR BNAT BPAL BPAU BVIV CGAR MCAP MCEP OMOS PPHI TREN TSPA
U30C-04227	AAEN ABER AMAR AMOS BGUR BNAT BPAL BPAU BVIV CGAR MCAP MCEP OMOS PPHI TREN TSPA
U30E-04207	AAEN ABER ABIC ALAB AMAR AMOS BGUR BNATBPAL BPAU BVIVCGAR GAES GCAL GGIU LMCRLRICMCAP MCEP OMOS PPHIRDEW TREN TSPA
U40J-03998	AAEN ABER ABIC ALAB AMAR AMOS BGUR BNAT BPAL BPAU BTRI BVIVCGAR GAES GCAL GGIU LMCR LRIC MCAP MCEP OMOS PPHI RDEW TSPA
U40H-04133	AAEN ABIC AMOS BGUR BNATBPAL BPAUBTRI BVIVCGAROMOS PPHI TSPA
U50A-04021	AAENABER ABIC ALAB AMAR AMOS ANAT BGUR BNAT BPAL BPAU BTRI BVIV CGAR GAES GCAL GGIU MCAP MCEP OMOS PPHI RDEW TSPA
U50A-04018	AAENABER ABIC ALAB AMAR AMOS ANAT BGUR BNATBPAL BPAU BTRI BVIV CGAR GAES GCAL GGIU LMCR LRIC MCAP MCEP OMOS PPHI RDEW SSIB TSPA
V50D-03903	AAEN ABER ABIC AMAR AMOS ANAT BGUR BNAT BPAU BTRI BVIV CGAR GAES GCAL GGIU LMCR LMOL LRUB MCAP MCEP OMOS PPHI RDEW TSPA
W11A-03612	AAEN ABER AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR CTHE GCAL GGIU LMOL MBRE MCAP MCEPMMAC OMOS PPHIRDEW TRENTSPA
W11C-03917	AAEN ABER ABIC AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR CTHE GAES GCAL GGIU LMCR LMOLMBRE MCAP MCEP MMAC OMOS PPHI RDEW TREN TSPA
W11C-03713	AAEN ABER ABIC AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR CTHE GAES GCAL GGIU LMCR LMOL MBRE MCAP MCEP MMAC OMOS PPHI RDEW TREN TSPA



W13A-03641	AAEN ABIC AJOH AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR GCAL GGIU LMCR LMOL MCAP MCEP MMAC OMOS PPHI TREN TSPA
W13A-03583	AAEN ABIC AJOH AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR CTHE GCAL GGIU LCYL LMCR LMOL MCAP MCEP MMAC OMOS PPHI TREN TSPA
W13A-03609	AAEN ABIC AJOH AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR GCAL GGIU LMCR LMOL MCAP MCEP MMAC OMOS PPHI TREN TSPA
W13B-03593	AAEN ABER ABIC AKAT AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR CMUL CTHE GCAL GGIU LCYL LMCR LMOL MCAP MCEP MMAC OMOS PPHI RDEW TREN TSPA
W12E-03526	AAEN ABIC AJOH AKAT AMAR AMOS AMYA BGUR BNAT BPAUBTRI BVIV CGAR CMUL CTHE GAES GCAL GGIU LCYL LMOL MMAC OMOS PPHI RDEW TREN TSPA
W12E-03475	AAEN ABIC AJOH AMAR AMOS AMYABGUR BNAT BPAU BTRI BVIV CGAR CMUL CTHE GAES GCAL GGIU LCYL LMOL MMAC OMOS PPHI RDEW TREN TSPA
W12F-03494	AAEN ABER ABIC AJOH AKAT ALAB AMAR AMOS AMYA BNAT BPAUBTRI BVIV CGAR CMUL CTHE GAES GCAL GGIU LCYL LMOL MCAPMCYP MMAC OMOS PPHI RDEW TREN TSPA
W12D-03375	AAEN ABER ABIC AJOH AKAT AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR GAES GCAL GGIU LCYL LMOL MMAC OMOS PPHI TREN TSPA
W12D-03346	AAEN ABER ABIC AJOH AMAR AMOS AMYA BGUR BNAT BPAU BTRI BVIV CGAR GAES GCAL GGIU LCYL LMOL MMAC OMOS PPHI TREN TSPA

#### 4.2. Current land use

The images below attempt to capture some of the land use within the proposed corridors.



*Figure 12: Large areas of land have been transformed for sugar farming, grazing and rural homesteads.*

From the above image, large scale land use change has occurred along large areas of the proposed corridor routes. Sugarcane farming appears to be the largest contributor. However, further North forestry does occur. Rural villages graze their cattle in the grasslands and water them in the rivers potentially creating increased erosion and bank trampling risks for the aquatic environment.

Fire is used to harvest large sections of sugar cane (Figure 13), this practise removes the wind buffer of the plant and reduces soil anchoring which allows for increased erosion from wind and rain. Replanting of sugarcane leaves soil exposed to the elements and allows for increased wind and water erosion.



*Figure 13: Fire is used to harvest sugar cane*

Farm dams interrupt river and wetland flows altering channels and preventing the migration of certain aquatic species (predominantly fish, however some invertebrates also migrate). Dams also tend to accumulate toxins from the surrounding environment, such as pesticides and herbicides. Deeper dams can stagnate resulting in the creation of anoxic waters (Figure 14).



*Figure 14: Farm dams are constructed to support agriculture and forestry but can prevent migration of aquatic species.*

Some natural or near natural landscapes do still exist usually protected formally within nature reserves or due to the effort required to reach them (Figure 15 and Figure 16).



*Figure 15: Relatively small areas remain untransformed*



*Figure 16: Grasslands persist at higher altitudes.*

#### **4.3. Potential new substation sites**

The current land use of the proposed area for the new substations is mapped and described in more detail below (Figure 17 and Figure 18).

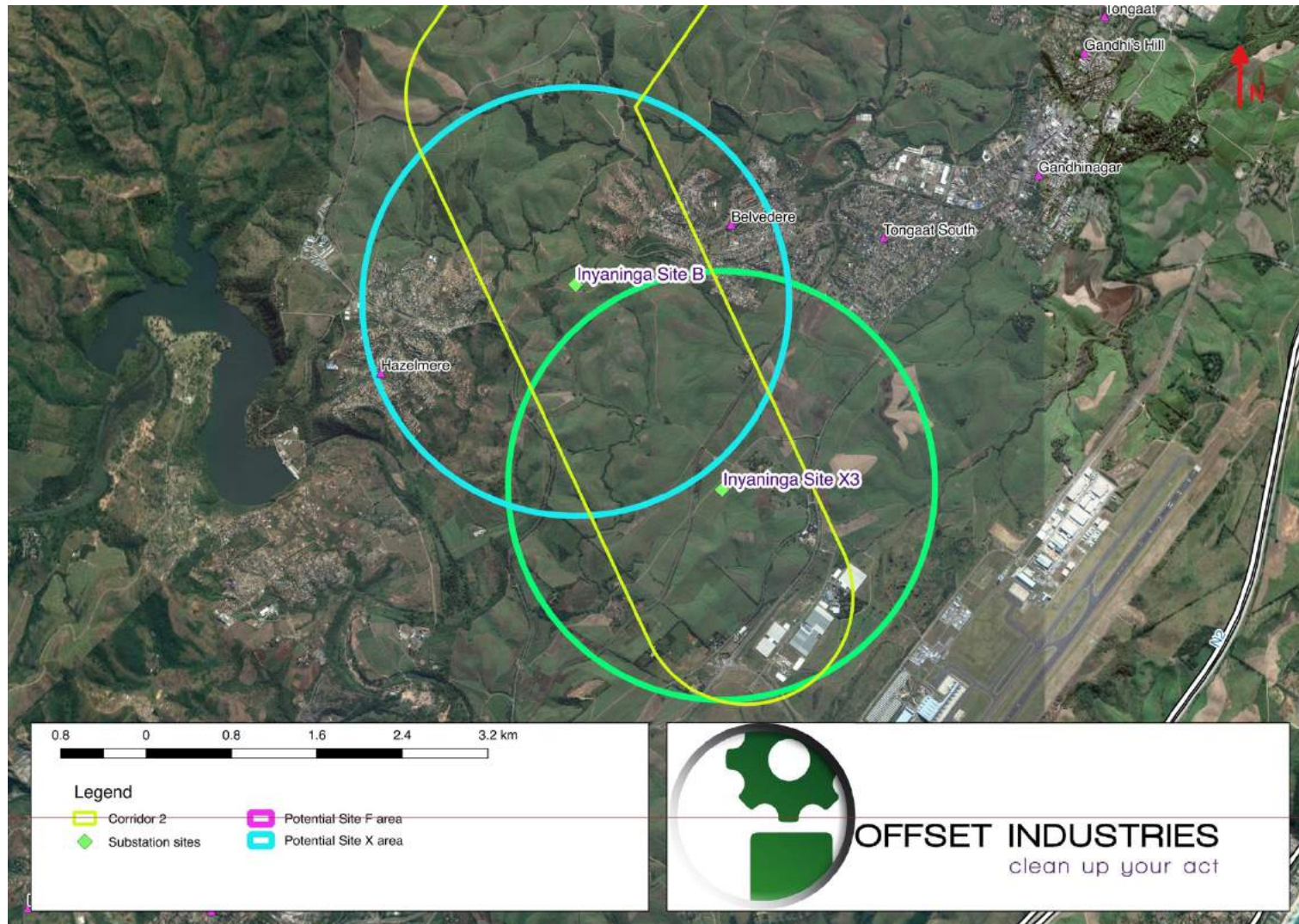


Figure 17: Proposed substation sites B and X3

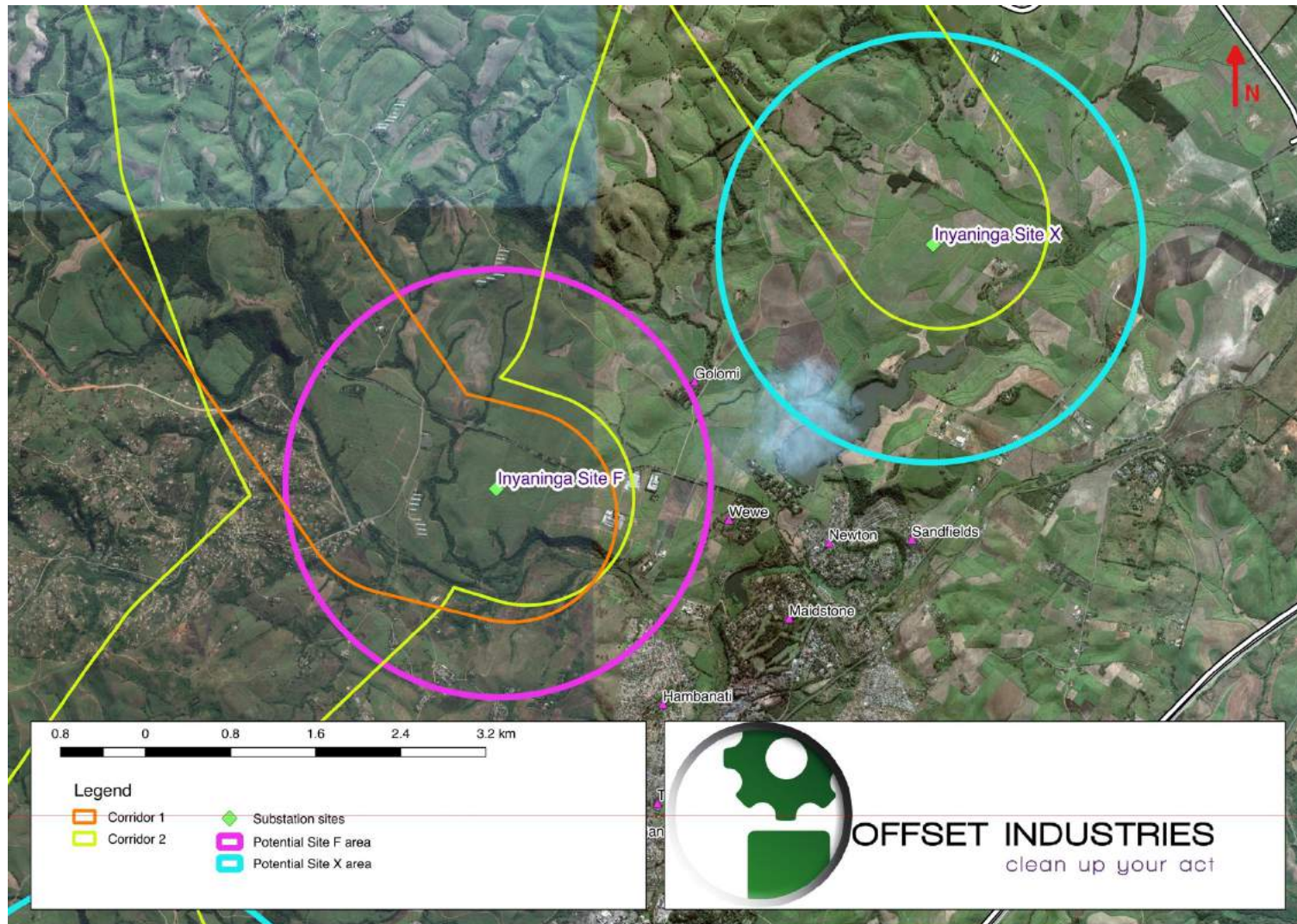


Figure 18: Proposed substation sites X and F



### Site B

Site B overlaps with Site X3 to a large degree (approximately 30% overlap). It has the least area dedicated to farming of the four potential sites the most urbanisation both formal and informal housing developments. However sugarcane farming is still the largest component of the proposed area.

### Site X3

Site X3 is largely dominated by sugarcane farming. However, to the South East a series of commercial scale greenhouses linked to the King Shaka International Airport complex are installed. Roads and rain routes also pass through Site X3.

### Site F

Site F is largely dominated by agriculture, sugarcane farming makes up the largest portion of the proposed area, however it appears there may also be other farming practises, likely subsistence as well as stock or poultry farming. There are also areas of urbanisation and human settlement with part of Ngedleni falling within the proposed area

### Site X

Site X is dominated by sugarcane farming with small pockets of forestry. Supporting these activities is Dudley Pringle dam.

## 5. Impact assessment

### 5.1. Construction Phase

During the construction phase, moderate to large scale earth moving will be required during excavations for the foundations of infrastructure such as pylons. Ground may become hardened via compaction effects from heavy vehicles, this compaction will enhance runoff, leading to an increased risk of erosion downslope.

Site clearing will remove vegetation and expose sediments to wind and waters erosive effects. Eroded sediments will be transported downslope and deposited within the aquatic environment. Increased sedimentation can alter available habitat availability and thereby alter the species compositions within rivers.



Vegetation clearing also poses the risk of allowing invasive plant species to colonise the corridors or substation site. These fast-growing weedy species out compete many native plants and can rapidly colonise an area if no management actions are put in place during the construction phase. Table 5 below details the impact assessment for the sites assessed, during the construction phase.



Table 5: Construction phase impacts

	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
1) Impacts associated with soil erosion, sedimentation										
Mbewu	4	1	2	1	2	1	6	4	40(Moderate)	6 (Low)
Site X	4	1	2	1	2	1	6	4	40(Moderate)	6 (Low)
Site X3	4	1	2	1	2	1	6	4	40(Moderate)	6 (Low)
Site B	4	1	2	1	2	1	6	4	40(Moderate)	6 (Low)
Site F	4	2	2	1	2	1	8	6	48 (Moderate)	16 (Low)
2) Impacts associated with Pollution										
Mbewu	3	1	3	2	2	1	6	4	33 (Moderate)	7 (Low)
Site X	3	1	3	2	2	1	6	4	33 (Moderate)	7 (Low)
Site X3	3	1	3	2	2	1	6	4	33 (Moderate)	7 (Low)
Site B	3	1	3	2	2	1	6	4	33 (Moderate)	7 (Low)
Site F	4	2	3	2	2	1	7	6	48 (Moderate)	18 (Low)
3) Impacts associated alien vegetation										
Mbewu	3	2	5	2	3	2	6	4	56 (High)	16 (Low)
Site X	3	2	5	2	3	2	6	4	56 (High)	16 (Low)
Site X3	3	2	5	2	3	2	6	4	56 (High)	16 (Low)
Site B	3	2	5	2	3	2	6	4	56 (High)	16 (Low)
Site F	4	2	5	2	3	2	8	4	64 (High)	14 (Low)



From Table 5, all impacts associated with the proposed substations can be lowered from high (alien invasive plants) or moderate significance to low significance if the correct mitigation is put in place. The Inyaninga site F was seen to have a higher risk profile as it is more closely associated with a large river system (Tongati River).

The importance of alien invasive plant control cannot be over stressed. With the correct management plan the colonization and spread of alien invasive plants can be greatly reduced. Alternatively, not putting measures in place can result in the transformation of the sites and further spread of seeds via water transport within the rivers.

### 6.2.1 Mitigation

All site camps must be kept at least 60 m outside of aquatic ecosystems. This distance is to be measured from the outside edge of the riparian zone. No washing of vehicles or personal is permitted within any river. Soils stock piles, concrete and building rubble must be kept at least 60m away from any river.

No vehicles or machinery are to be permitted within the aquatic environment. Maintenance roads may also not enter aquatic ecosystems.

Storm water controls within the substation facility are essential, a storm water management plan must be compiled to prevent the threat of high rainfall events leading to erosion and the deposition of sediments within aquatic ecosystems.

Water must not be abstracted from any river for any irrigation, construction or rehabilitation purposes unless a water use license has been granted allowing the specific activity.

Rehabilitation of the disturbed sediments needs to be conducted in a timely manner and the indigenous vegetation planted should be monitored and maintained to prevent die off and alien invasive plant encroachment.

It is recommended that in conjunction with an alien invasive plant management specialist that a control and eradication plan be compiled and implemented for the powerline routes.



If cables need to be placed over aquatic ecosystems the footprint of the exercise must be minimized as much as possible. Where possible, to avoid compaction within soft sediment areas hand stringing should be considered.

### *Alien Invasive Vegetation*

- An alien invasive management plan must be compiled for the alien invasive plant species on site and implemented during construction phase and followed up on and monitored as part of the operational phase.
- Protocols should be developed to prevent workers transporting alien invasive seeds from infested areas to as yet un-impacted locations
- If additional studies identify the presence of alien invasive aquatic faunal species these should be added to the invasive species control plan.

## **5.2. Operational Phase**

The operational phase of the project poses lower levels of risk to the aquatic environment. Monitoring and maintenance of the powerlines is likely to be sporadic. However, when maintenance is required vehicular movement within riparian zones in vehicles should be prohibited to prevent damaging vegetation and reduce the likelihood of river bank collapse.

Table 6 below details the risk assessment for the impacts posed during the operational phase.

Operational risks tend to be higher scoring due to the time frames involved. While construction impacts occur over a limited time they tend to be more significant in terms of impact to the system, the constructed system can be operational over decades; usually the risk profile is lower once the infrastructure has been placed.



Table 6: Operational phase impacts

	Probability		Duration		Extent		Magnitude		Significance scoring without mitigation	Significance scoring with mitigation
	Without	With	Without	With	Without	With	Without	With		
4) Impacts associated with soil erosion, sedimentation										
Mbewu	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site X	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site X3	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site B	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site F	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
5) Impacts associated with Pollution										
Mbewu	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site X	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site X3	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site B	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
Site F	2	1	2	1	2	1	4	2	16 (Low)	4 (low)
6) Impacts associated alien vegetation										
Mbewu	4	2	5	2	2	1	8	4	60 (High)	14 (low)
Site X	4	2	5	2	2	1	8	4	60 (High)	14 (low)
Site X3	4	2	5	2	2	1	8	4	60 (High)	14 (low)
Site B	4	2	5	2	2	1	8	4	60 (High)	14 (low)
Site F	4	2	5	2	2	1	8	4	60 (High)	14 (low)



Moderate and high impacts can be reduced to low impacts in all cases if appropriate mitigation measures are put in place. High impacts are again associated with alien vegetation, which if allowed to take hold can self-propagate and expand significantly by using the rivers as transportation for seeds. It is recommended that the alien invasive plant control begin along the river banks and work outwards up the catchment.

### 6.3.1 Mitigation

Maintenance vehicles are to be prohibited from driving within the riparian zone and must be constrained to established support roads at all times. No vehicles should be allowed within any river system. If significant work needs to be carried out within an aquatic ecosystem a risk assessment should be conducted with input from an aquatic ecologist.

Erosion monitoring at the bases of the pylons and at the substations must be carried out in order to identify issues early and implement remedial measures to reduce environmental degradation.

#### *Alien Invasive Vegetation*

- An alien invasive management plan must be compiled for both construction and operational phases. This must be implemented during construction phase and followed up on and monitored as part of the operational phase.
- If additional studies identify the presence of alien invasive aquatic faunal species these should be added to the invasive species control plan.

## 6. Recommendations

Inyaninga Site F is the least preferred site from an aquatic ecology perspective, it has the closest proximity to aquatic environments. However, this does not exclude Site F from selection, however field studies will be needed to determine the best possible placement within the given area.

It is recommended that any site chosen for construction of a substation be at least 60 meters away from the nearest aquatic ecosystem, this includes riparian zones. Due to the scale of the project it is highly recommended that once a site has been selected and the route confirmed that any aquatic ecosystems still



associated with the proposed substations be subject to field investigations to improve the mitigation measures mentioned in this document.

It is recommended that when the final route is selected that the pylon sites in association with rivers be approved by an aquatic ecologist. Pylons may not be constructed in aquatic environments including riparian zones. Large Rivers such as the Tugela should have the greatest possible span on either side free of the river from pylon construction.

It is difficult to recommend one corridor over the other options. If the pylons are constructed in a responsible manor all corridors may suffice in terms of aquatic ecology. It is recommended that in terms of the scope of this report that corridor two is the preferred option when considering the risk profile presented to the aquatic ecosystems, as it encounters fewer FEPA rivers and passes over more disturbed land than the other two route options.

Additional site specific investigations may be required up to and including the following:

- *In situ* water quality assessment;
- Invertebrate assessments including;
  - the South African Scoring System version 5,
  - Macroinvertebrate Assessment Index.
- Habitat assessments;
  - Invertebrate Habitat Assessment System,
  - Intermediate Habitat Integrity Assessment, and
- Vegetation assessments in the form of Vegetation Response Assessment Index (level 3).
- Fish response assessment index

Monitoring should assess the health of the river and provide mitigation and management options for the improvement of the affected system.



## 7. Conclusion

A fly over was conducted on the 24<sup>th</sup> of May 2017. With the data collected during this exercise and available desktop information this desktop aquatic ecology report was compiled. The proposed corridors encounter 17 quaternary catchments and 22 SQRs on their approximately 150 km route from just North of La Mercy to west of Empangeni (Mbewu Site).

From the assessment it was determined that on average the proposed project poses medium to low risks of erosion, sedimentation and pollution to the aquatic environments it encounters. The majority of the risks are associated with the construction of the substations. In these cases site selection is crucial and it is recommended that any site selected and designed allow for at least a 60m buffer from the nearest watercourse when measured from the outside edge of the riparian zone.

Inyaninga Site F is the least preferred for a substation in the south of the project and corridor 2 is the most preferred route from a desktop perspective as it crosses fewer FEPA rivers.

The project if it complies with all recommended mitigation measures does not pose undue risk to the various aquatic environments. However, once the final routes and substation positions have been selected it is recommended that any associated aquatic environments be subject to additional field studies to provide site specific mitigation measures.



## 8. References

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## Appendix A

Key to fish codes table extracted from Kleynhans 2007.

ABBREVIATION	SCIENTIFIC NAME	ENGLISH COMMON NAME
AAEN	<i>AWAOUS AENEOFUSCUS</i> (PETERS 1852)	FRESHWATER GOBY (M)
ABAR	<i>AUSTROGLANIS BARNARDI</i> (SKELTON, 1981)	BARNARD'S ROCK CATFISH
ABER	<i>ACANTHOPAGRUS BERDA</i> (FORSSKÅL, 1775)	RIVERBREAM (MS)
ABIC	<i>ANGUILLA BICOLOR BICOLOR</i> MCCLELLAND, 1844	SHORTFIN EEL
ABRE	<i>ATHERINA BREVICEPS</i> VALENCIENNES, 1835	CAPE SILVERSIDE
AGIL	<i>AUSTROGLANIS GILLI</i> (BARNARD, 1943)	CLANWILLIAM ROCK-CATFISH
AJOH	<i>APLOCHEILICHTHYS JOHNSTONI</i> (GÜNTHER, 1893)	JOHNSTON'S TOPMINNOW
AKAT	<i>APLOCHEILICHTHYS KATANGAE</i> (BOULENGER, 1912)	STRIPED TOPMINNOW
ALAB	<i>ANGUILLA BENGALENSIS LABIATA</i> PETERS, 1852	AFRICAN MOTTLED EEL
AMAR	<i>ANGUILLA MARMORATA</i> QUOY & GAIMARD 1824	GIANT MOTTLED EEL
AMOS	<i>ANGUILLA MOSSAMBICA</i> PETERS 1852	LONGFIN EEL
AMYA	<i>APLOCHEILICHTHYS MYAPOSAE</i> (BOULENGER, 1908)	NATAL TOPMINNOW
ANAT	<i>AMPHILIUS NATALENSIS</i> BOULENGER, 1917	NATAL MOUNTAIN CATFISH
ASCL	<i>AUSTROGLANIS SCLATERI</i> (BOULENGER, 1901)	ROCK-CATFISH
AURA	<i>AMPHILIUS URANOSCOPIUS</i> (PFEFFER, 1889)	STARGAZER (MOUNTAIN CATFISH)
BAEN	<i>LABEOBARBUS AENEUS</i> (BURCHELL, 1822)	SMALLMOUTH YELLOWFISH
BFRI	<i>BARBUS AFROHAMILTONI</i> CRASS, 1960	HAMILTON'S BARB
BAMA	<i>BARBUS AMATOLICUS</i> SKELTON, 1990	AMATOLA BARB
BAND	<i>BARBUS ANDREWII</i> BARNARD, 1937	WHITEFISH
BANN	<i>BARBUS ANNECTENS</i> GILCHRIST & THOMPSON, 1917	BROADSTRIPED BARB
BANO	<i>BARBUS ANOPLUS</i> WEBER, 1897	CHUBBYHEAD BARB



BARG	<i>BARBUS ARGENTEUS</i> GÜNTHER, 1868	ROSEFIN BARB
BBIF	<i>BARBUS BIFRENATUS</i> FOWLER, 1935	HYPHEN BARB
BBRI	<i>BARBUS BREVIPINNIS</i> JUBB, 1966	SHORTFIN BARB
BCAL	<i>BARBUS CALIDUS</i> BARNARD, 1938	CLANWILLIAM REDFIN
BCAP	<i>BARBUS CAPENSIS</i> SMITH, 1841	CLANWILLIAM YELLOWFISH
BERU	<i>BARBUS ERUBESCENS</i> SKELTON, 1974	TWEE RIVER REDFIN
BEUT	<i>BARBUS EUTAENIA</i> BOULENGER, 1904	ORANGEFIN BARB
BGUR	<i>BARBUS GURNEYI</i> GÜNTHER, 1868	REDTAIL BARB
BHOS	<i>BARBUS HOSPES</i> BARNARD, 1938	NAMAQUA BARB
BIMB	<i>BRYCINUS IMBERI</i> (PETERS, 1852)	IMBERI
BKIM	<i>LABEOBARBUS KIMBERLEYENSIS</i> GILCHRIST & THOMPSON, 1913	LARGEMOUTH YELLOWFISH
BLAT	<i>BRYCINUS LATERALIS</i> (BOULENGER, 1900)	STRIPED ROBBER
BLIN	<i>BARBUS LINEOMACULATUS</i> BOULENGER, 1903	LINE-SPOTTED BARB
BMAR	<i>LABEOBARBUS MAREQUENSIS</i> SMITH, 1841	LARGESCALE YELLOWFISH
BMAT	<i>BARBUS MATTOZI</i> GUIMARAES, 1884	PAPERMOUTH
BMOT	<i>BARBUS MOTESENSIS</i> STEINDACHNER, 1894	MARICO BARB
BNAT	<i>BARBUS NATALENSIS</i> CASTELNAU, 1861	SCALY
BNEE	<i>BARBUS NEEFI</i> GREENWOOD, 1962	SIDESPOT BARB
BPAL	<i>BARBUS PALLIDUS</i> SMITH, 1841	GOLDIE BARB
BPAU	<i>BARBUS PALUDINOSUS</i> PETERS, 1852	STRAIGHTFIN BARB
BPOL	<i>LABEOBARBUS POLYLEPIS</i> BOULENGER, 1907	SMALLSCALE YELLOWFISH
BRAD	<i>BARBUS RADIATUS</i> PETERS, 1853	BEIRA BARB
BSER	<i>BARBUS SERRA</i> PETERS, 1864	SAWFIN
BTOP	<i>BARBUS TOPPINI</i> BOULENGER, 1916	
BTRE	<i>BARBUS TREURENSIS</i> GROENEWALD, 1958	TREUR RIVER BARB
BTRI	<i>BARBUS TRIMACULATUS</i> PETERS, 1852	THREESpot BARB
BUNI	<i>BARBUS UNITAENIATUS</i> GÜNTHER, 1866	LONGBEARD BARB
BTRV	<i>BARBUS TREVELYANI</i> GÜNTHER, 1877	
BVIV	<i>BARBUS VIVIPARUS</i> WEBER, 1897	BOWSTRIPE BARB
CANO	<i>CHILOGLANIS ANOTERUS</i> CRASS, 1960	PENNANT TAIL SUCKERMOUTH (OR ROCK CATLET)



CAUR	<i>CARASSIUS AURATUS</i> (LINNAEUS, 1758)	GOLDFISH (EX)
CBIF	<i>CHILOGLANIS BIFURCUS</i> JUBB & LE ROUX, 1969	INCOMATI SUCKERMOUTH (OR ROCK CATLET)
CBRE	<i>CHETIA BREVIS</i> JUBB, 1968	ORANGE-FRINGED LARGEMOUTH
CCAR	<i>CYPRINUS CARPIO</i> LINNAEUS, 1758	CARP (EX)
CEMA	<i>CHILOGLANIS EMARGINATUS</i> JUBB & LE ROUX, 1969	PONGOLO SUCKERMOUTH (OR ROCK CATLET)
CFLA	<i>CHETIA FLAVIVENTRIS</i> TREWAVAS, 1961	CANARY KURPER
CGAR	<i>CLARIAS GARIEPINUS</i> (BURCHELL, 1822)	SHARPTOOTH CATFISH
CIDE	<i>CTENOPHARYNGODON IDELLA</i> (VALENCIENNES, 1844)	GRASS CARP (EX)
CMUL	<i>CTENOPOMA MULTISPINE</i> PETERS, 1844	MANYSPINED CLIMBING PERCH
CPAR	<i>CHILOGLANIS PARATUS</i> CRASS, 1960	SAWFIN SUCKERMOUTH (OR ROCK CATLET)
CPRE	<i>CHILOGLANIS PRETORIAE</i> VAN DER HORST, 1931	SHORTSPINE SUCKERMOUTH (OR ROCK CATLET)
CSWI	<i>CHILOGLANIS SWIERSTRAI</i> VAN DER HORST, 1931	LOWVELD SUCKERMOUTH (OR ROCK CATLET)
CTHE	<i>CLARIAS THEODORAE</i> WEBER, 1897	SNAKE CATFISH
GAES	<i>GILCHRISTELLA AESTUARIA</i> (GILCHRIST, 1913)	ESTUARINE ROUND-HERRING
GAFF	<i>GAMBUSIA AFFINIS</i> (BAIRD & GIRARD, 1853)	MOSQUITOFISH (EX)
GCAL	<i>GLOSSOGOBIUS CALLIDUS</i> SMITH, 1937	RIVER GOBY (M)
GGIU	<i>GLOSSOGOBIUS GIURIS</i> (HAMILTON-BUCHANAN, 1822)	TANK GOBY (M)
GZEB	<i>GALAXIAS ZEBRATUS</i> CASTELNAU, 1861	CAPE GALAXIAS
HANS	<i>HIPPOPOTAMYRUS ANSORGII</i> (BOULENGER, 1905)	SLENDER STONEBASHER
HCAP	<i>HYPORHAMPHUS CAPENSIS</i> (THOMINOT, 1886)	CAPE HALFBEAK (MS)



HMOL	<i>HYPOPHthalmichthys molitrix</i> (VALENCIENNES, 1844)	SILVER CARP (EX)
HVIT	<i>HYDROCYNUS VITTATUS</i> CASTELNAU, 1861	TIGERFISH
KAUR	<i>KNERIA AURICULATA</i> (PELLEGRIN, 1905)	SOUTHERN KNERIA
LCAP	<i>LABEO CAPENSIS</i> (SMITH, 1841)	ORANGE RIVER LABEO
LCON	<i>LABEO CONGORO</i> PETERS, 1852	PURPLE LABEO
LCYL	<i>LABEO CYLINDRICUS</i> PETERS, 1852	REDEYE LABEO
LMAC	<i>LEPOMIS MACROCHIRUS</i> RAFINESQUE, 1819	BLUEGILL SUNFISH (EX)
LMCR	<i>LIZA MACROLEPIS</i> (SMITH, 1846)	LARGE-SCALE MULLET (MS)
LMOL	<i>LABEO MOLYBDINUS</i> DU PLESSIS, 1963	LEADEN LABEO
LRIC	<i>LIZA RICHARDSONII</i> (SMITH, 1846)	SOUTHERN MULLET (MS)
LROS	<i>LABEO ROSAE</i> STEINDACHNER, 1894 ( <i>LABEO ALTEVILIS</i> )	REDNOSE LABEO
LRUB	<i>LABEO RUBROMACULATUS</i> GILCHRIST & THOMPSON, 1913	TUGELA LABEO
LRUD	<i>LABEO RUDDI</i> BOULENGER, 1907	SILVER LABEO
LSEE	<i>LABEO SEEBERI</i> GILCHRIST & THOMPSON, 1911	CLANWILLIAM SANDFISH
LUMB	<i>LABEO UMBRATUS</i> (SMITH, 1841)	MOGGEL
MACU	<i>MICRALESTES ACUTIDENS</i> (PETERS, 1852)	SILVER ROBBER
MARG	<i>MONODACTYLUS ARGENTEUS</i> (LINNAEUS, 1758)	NATAL MOONY (MS)
MBRA	<i>MICROPHIS BRACHYURUS</i> BLEEKER, 1853	OPOSSUM PIPEFISH (M)
MBRE	<i>MESOBOLA BREVIANALIS</i> (BOULENGER, 1908)	RIVER SARDINE
MCAP	<i>MYXUS CAPENSIS</i> (VALENCIENNES, 1836)	FRESHWATER MULLET (M)
MCEP	<i>MUGIL CEPHALUS</i> LINNAEUS, 1758	FLATHEAD MULLET (M)
MCYP	<i>MEGALOPS CYPRINOIDES</i> (BROUSSONET, 1782)	OXEYE TARPON
MDOL	<i>MICROPTERUS DOLOMIEU</i> LACEPÈDE, 1802	SMALLMOUTH BASS (EX)
MFAL	<i>MONODACTYLUS FALCIFORMIS</i> LACEPÈDE, 1801	CAPE MOONY (MS)



MFLU	<i>MICROPHIS FLUVIATILIS</i> (PETERS, 1852)	FRESHWATER PIPEFISH (M)
MMAC	<i>MARCUSENIUS MACROLEPIDOTUS</i> (PETERS, 1852)	BULLDOG
MPUN	<i>MICROPTERUS PUNCTULATUS</i> (RAFINESQUE, 1819)	SPOTTED BASS (EX)
MSAL	<i>MICROPTERUS SALMOIDES</i> (LACEPÈDE, 1802)	LARGEMOUTH BASS (EX)
NORT	<i>NOTHOBRANCHIUS ORTHONOTUS</i> (PETERS, 1844)	SPOTTED KILLIFISH
NRAC	<i>NOTHOBRANCHIUS RACHOVII</i> AHL, 1926	RAINBOW KILLIFISH
OAUR	<i>OREOCHROMIS AUREUS</i> (STEINDACHNER, 1864)	ISRAELI TILAPIA (EX)
OMAC	<i>OREOCHROMIS (NYASALAPIA) MACROCHIR</i> (BOULENGER, 1912)	GREENHEAD TILAPIA
OMOS	<i>OREOCHROMIS MOSSAMBICUS</i> (PETERS, 1852)	MOZAMBIQUE TILAPIA
OMYK	<i>ONCORHYNCHUS MYKISS</i> (WALBAUM, 1792)	RAINBOW TROUT (EX)
ONIL	<i>OREOCHROMIS NILOTICUS</i> (LINNAEUS, 1758)	NILE TILAPIA (EX)
OPER	<i>OP SARIDIUM PERINGUEYI</i> (GILCHRIST & THOMPSON, 1913)	SOUTHERN BARRED MINNOW
OPLA	<i>OREOCHROMIS PLACIDUS</i> (TREWAVAS, 1941)	BLACK TILAPIA
PAFE	<i>PSEUDOBARBUS AFER</i> (PETERS, 1864)	EASTERN CAPE REDFIN
PAMP	<i>PROTOPTERUS AMPHIBIUS</i> (PETERS, 1844)	EAST COAST LUNGFISH
PANN	<i>PROTOPTERUS ANNECTENS BRIENI</i> POLL, 1961	LUNGFISH
PASP	<i>PSEUDOBARBUS ASPER</i> (BOULENGER, 1911)	SMALLSCALE REDFIN
PBUG	<i>PSEUDOBARBUS BURGI</i> (BOULENGER, 1911)	BERG RIVER REDFIN
PBUR	<i>PSEUDOBARBUS BURCHELLI</i> SMITH, 1841	BURCHELL'S REDFIN
PCAT	<i>PETROCEPHALUS WESSELSI</i> KRAMER & VAN DER BANK, 2000	SOUTHERN CHURCHILL
PFLU	<i>PERCA FLUVIATILIS</i> LINNAEUS, 1758	EUROPEAN PERCH (EX)



PPHI	<i>PSEUDOCRENILABRUS PHILANDER</i> (WEBER, 1897)	SOUTHERN MOUTHBROODER
PPHL	<i>PSEUDOBARBUS PHLEGETHON</i> (BARNARD, 1938)	FIERY REDFIN
PQUA	<i>PSEUDOBARBUS QUATHLAMBAE</i> (BARNARD, 1938)	DRAKENSBERG MINNOW
PRET	<i>POECILIA RETICULATA</i> PETERS, 1859	GUPPY (EX)
PTEN	<i>PSEUDOBARBUS TENUIS</i> (BARNARD, 1938)	SLENDER REDFIN
RDEW	<i>REDIGOBIUS DEWAALI</i> (WEBER, 1897)	CHECKED GOBY (M)
SBAI	<i>SANDELIA BAINSII</i> CASTELNAU, 1861	EASTERN CAPE ROCKY
SCAP	<i>SANDELIA CAPENSIS</i> (CUVIER, 1831)	CAPE KURPER
SFON	<i>SALVELINUS FONTINALIS</i> (MITCHILL, 1815)	BROOK CHARR (EX)
SINT	<i>SCHILBE INTERMEDIUS</i> RÜPPELL, 1832	SILVER CATFISH
SMER	<i>SERRANOCHROMIS MERIDIANUS</i> JUBB, 1967	LOWVELD LARGEMOUTH
SSIB	<i>SILHOUETTEA SIBAYI</i> FARQUHARSON, 1970	SIBAYI GOBY (M)
STRU	<i>SALMO TRUTTA</i> LINNAEUS, 1758	BROWN TROUT (EX)
SZAM	<i>SYNODONTIS ZAMBEZENSIS</i> PETERS, 1852	BROWN SQUEAKER
TREN	<i>TILAPIA RENDALLI</i> (BOULENGER, 1896)	REDBREAST TILAPIA
TSPA	<i>TILAPIA SPARRMANII</i> SMITH, 1840	BANDED TILAPIA
TTIN	<i>TINCA TINCA</i> (LINNAEUS, 1758)	TENCH (EX)
VNEL	<i>VARICORHINUS NELSPRUITENSIS</i> GILCHRIST & THOMPSON, 1911	INCOMATI CHISELMOUTH
XHEL	<i>XIPHOPHORUS HELLERI</i> HECKEL, 1848	SWORDTAIL (EX)