

ADDENDUM

PROJECT: Baseline Assessment of Ecosystems Potentially Impacted by the well-field development at Steenbras:

Freshwater and Botanical Specialist Report (March 2019)

CLIENT: City of Cape Town

CONSULTANT: Aurecon South Africa (Pty) Ltd/ Zutari

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1 Background

Subsequent to the assessment of habitats potentially affected by the development of a wellfield at Steenbras, an additional pipeline route linking the Nuweberg Wellfield with the Water Treatment Plant in Steenbras was proposed. Freshwater Consulting, together with the project botanist, Charlie Boucher, were instructed to assess the ecological sensitivity of habitats along the proposed route through the Steenbras catchment.

The purpose of this addendum is to summarise the findings of the additional pipeline alignment through Steenbras associated with the Nuweberg Wellfield based on the approach described in section 1.4.

The pipeline alignment described in this assessment is referred to as Management Unit 19, in accordance with the Management Units identified in the main report.

2 General description and location of Management Unit 19.

MU 19 extends from the N2 highway in the east, towards the existing main offices of Steenbras Catchment Management to the north west (Figure A1). The alignment initially follows an existing, well developed laterite surfaced road perpendicular to the N2 that bisects an area that was cleared of pines in the last decade and is characterised by secondary vegetation on sandy soils. It then follows a forestry track through a recently felled pine plantation until it turns northwards and follows a firebreak between an Eskom powerline and a pine plantation. The alignment then turns westwards and follows the existing main road into Steenbras until it reaches the main office dwellings (Figure A1)

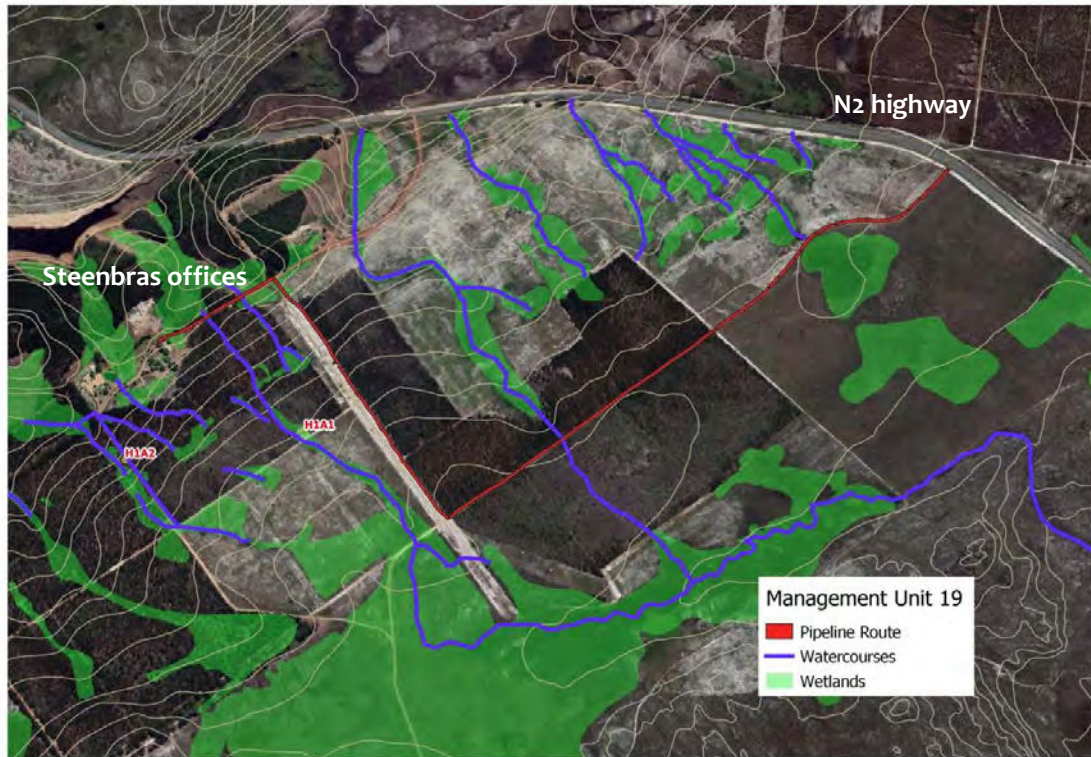


Figure A1 Management Unit 19: Pipeline alignment for the Nuweberg Wellfield between the N2 and the existing Steenbras Office Dwellings (i.e. the approximate location of the proposed Water Treatment Plant at Steenbras).

3 Ecological Condition, importance and sensitivity of habitats within Management Unit 19.

Habitat either side of the laterite road running perpendicular to the N2 is dominated by seasonally saturated or inundated *Berzelia lanuginosa* wetland habitat, separated by slightly raised areas of dryland (Figure A2a, Table A1a). Although previously under pine plantations, this habitat has recovered significantly since removal of trees and represents a threatened ecosystem type. Thus, it is largely considered of high Ecological Importance with moderate to high Ecological Sensitivity. A key feature of this section of the alignment is the presence of a large seasonally inundated, permanently saturated restioid pan to the south of the road with similar pan features north of the road but slightly beyond the road alignment (Figure A2a). These pans are dominated by the *Restio*, *Elegia nitida* with the wetland grass *Merxmuellera cincta* along the fringes. Whether or not these pans originate historically as excavations is unknown but they provide habitat that is now considered to be of high Ecological Importance and Sensitivity (Figure A3a, Table A1a).

West of this area, the pipe alignment follows the forestry road through an area of pine plantations that are currently being felled (Figure A3a). While the entire route through this area is described as seasonally saturated seep wetland, these features could not be mapped due to the presence of pines and current levels of disturbance associated with felling. Despite the poor condition of this habitat and the lack of plant indicators, saturation and soil features suggest that this area would support seep habitat in the absence of the pines and thus the area has high

rehabilitation potential and is considered of moderate to high Ecological Importance and Sensitivity (Table A1a, Figure A3a). Indeed recovery following recently removed pines along Track 322 has been rapid with clear wetland vegetation indicators to the south of the forestry road (Table A1a).

Tracks 323 to 326 represent the pipeline route through the firebreak adjacent to the existing plantation (Figure A3a). Due to constant ploughing and clearing below the Eskom pylons through this area, the habitat is completely altered. Changes in saturation of the sandy substrate suggest that this area is a mosaic of wetland and dry land, but severe disturbance rendered mapping of wetland impossible. Because of its poor condition and continued disturbance, the Ecological Sensitivity of this area is considered low (Table A1b and Figure A3b).

Despite disturbance to wetlands at the northern extent of the firebreak, this habitat still supports natural wetland habitat that attenuates runoff and discharges into relatively natural wetland north of the main road into Steenbras (Tracks 328 and 329). This area is considered to be of moderate to high Ecological importance with a high sensitivity to disturbance (Figure A3b and Table A1b).

The final portion of the Nuweberg pipeline route follows the main entrance road into Steenbras (Figure A2b). Despite the presence of wetlands, this area is generally of low Ecological Importance and Sensitivity due to the use of this area as a manicured garden along the road margin. Nevertheless, the streams that transverse through this area are still relatively sensitive to disturbance (Table A1c).

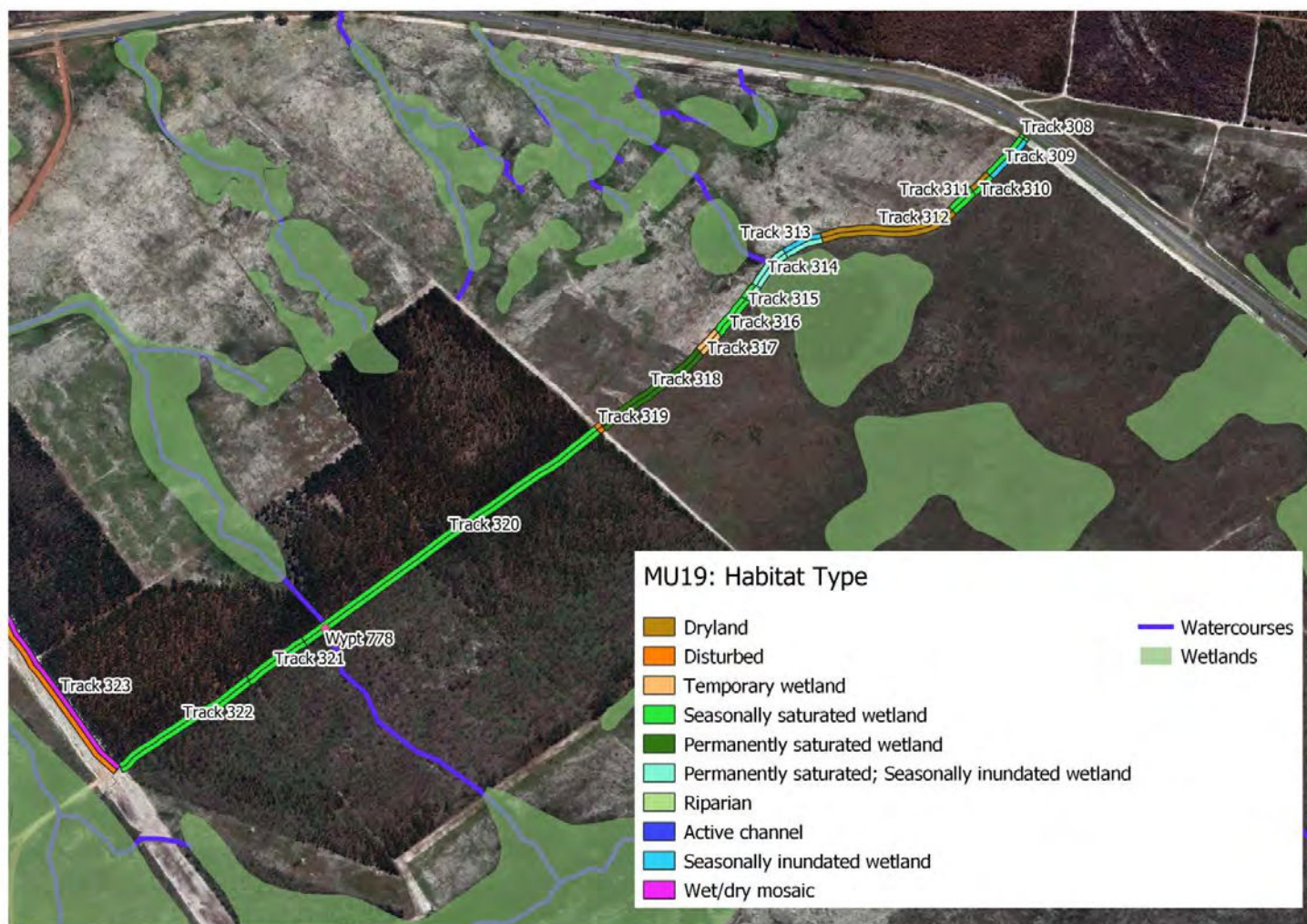


Figure A2a Management Unit 19: Spatial extent of Habitat Types between the N2 highway and firebreak

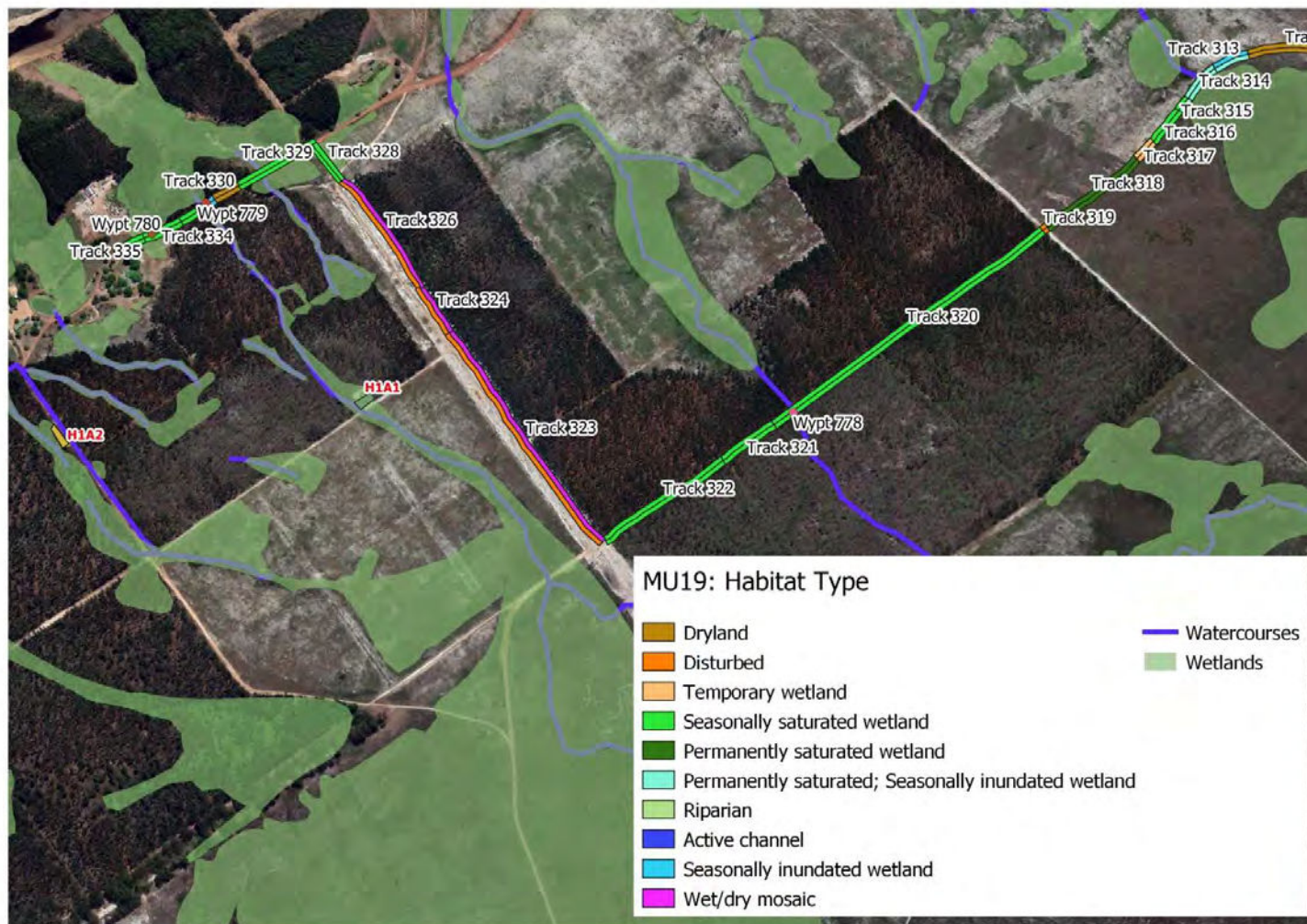


Figure A2b Management Unit 19: Spatial extent of Habitat Types between the firebreak and the Steenbras offices

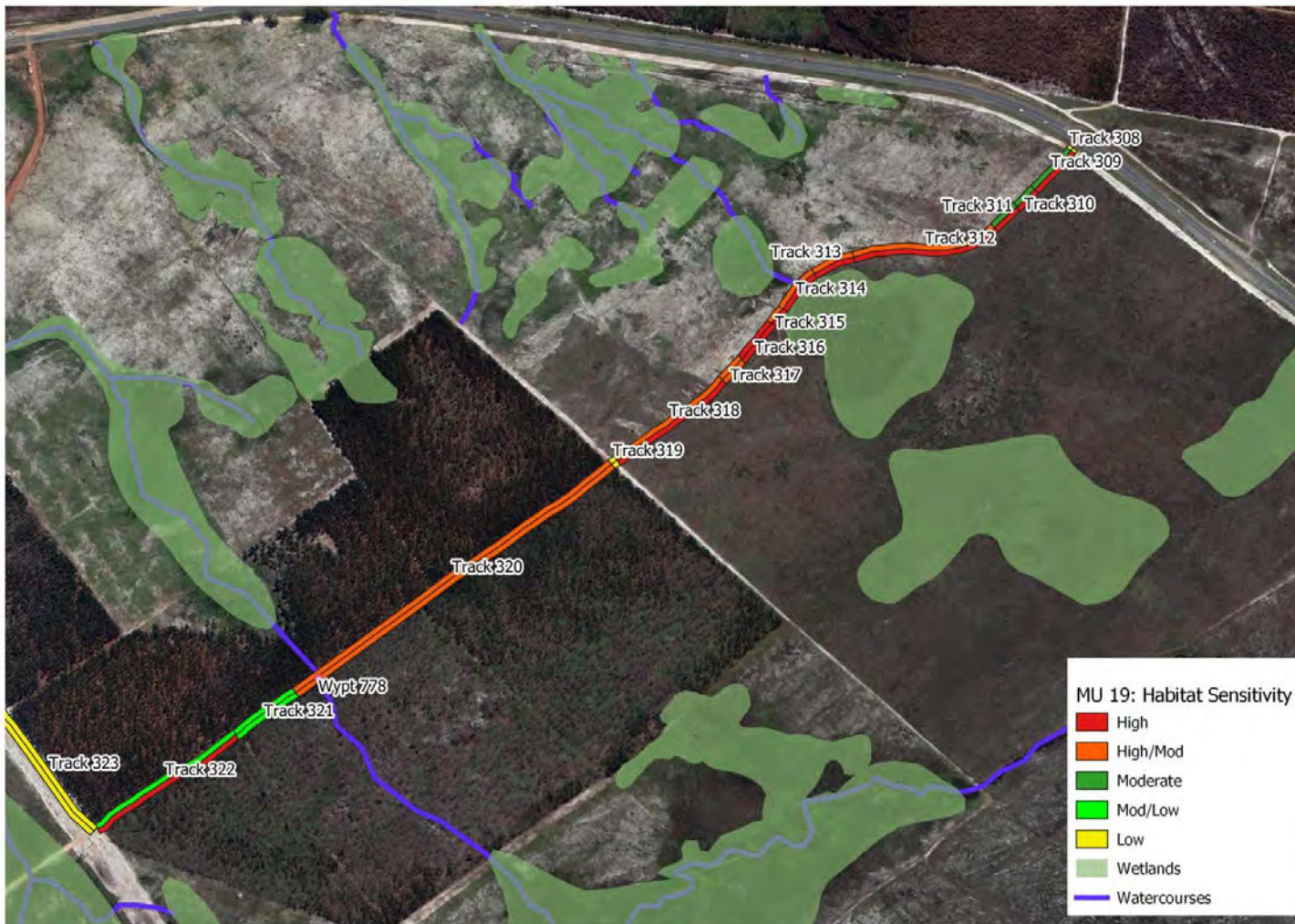


Figure A3a Management Unit 19: Habitat Sensitivity Types between the N2 highway and firebreak



Figure A3b Management Unit 19: Habitat Sensitivity between the firebreak and the Steenbras offices

Table A.1a MU 19 Characteristics of Habitat Types together with Ecological Condition (PES), Ecological Importance (EI) and Ecological Sensitivity (ES)

Track or waypoint	Setting	location	Affected habitat	Hydroperiod	General description	Dominant and conspicuous plants	Ecological Condition along route	EI	ES	Comment
Tr 308	Firebreak and track along N2 and previously pine plantation	US =	Wetland seep	Seasonally saturated	Sandy road through firebreak parallel to N2	<i>Rubus fruticosus</i> (invasive). Cleared of vegetation.	D/E	Low	Low	Receives runoff from wetland on the other side of the N2
		DS =	Wetland seep	Seasonally saturated	Laterite surfaced 9m track leads onto ploughed firebreak.	Cleared of vegetation. Seasonal recovery of wetland pioneers.	E	Mod Low	Low	Very disturbed due to laterite road
Tr 309	Recovered veld previously pine plantation	US =	Wetland seep	Seasonally inundated	<i>Berzelia lanuginosa</i> Seasonally Wet Medium-Tall Ericoid Fynbos with moderately deep sand	Moss on surface. <i>Berzelia lanuginosa</i> , <i>Cliffortia juniperifolia</i> , <i>Cliffortia tricuspidata</i> , <i>Erica hispidula</i> , <i>Passerina corymbosa</i> , <i>Stipagrostis cf ciliata</i> , <i>Stoebe cinerea</i> , <i>Stoebe spiralis</i>	A/B	High	High	The road through this area is about 9 m wide
		DS =	Wetland seep	Seasonally saturated	<i>Berzelia lanuginosa</i> Temporarily Wet Medium-Tall Ericoid Fynbos. Road edge is disturbed. Pebbles at surface from sugstate disturbance. Adjacent area with	<i>Athanasia trifurcata</i> , <i>Berzelia lanuginosa</i> , <i>Eragrostis curvula</i> , <i>Helichrysium crispum</i> , <i>Passerina corymbosa</i> , <i>Cliffortia tricuspidata</i> , <i>Stoebe cinerea</i> , <i>Pentameris patula</i>	C	High	Moderate	Downslope is dessicated due to effect of road through wetland habitat
Tr 310	Recovered veld previously pine plantation	US =	Wetland seep	Seasonally saturated	<i>Berzelia lanuginosa</i> Seasonally Wet Tall Ericoid Fynbos; Slightly domed topograpy with pebbles.	Taller than DS. Moss on surface. <i>Merxmullera cincta</i> , <i>Psoralea pinnata</i> , <i>Ursinia paleacea</i>	B	Mod. High	High	Remains of pine plantation evident
		DS =	Dryland	Dry	Rocky outcrop	<i>Athanasia trifurcata</i> , <i>Helichrysium crispum</i> , <i>Passerina corymbosa</i> , <i>Cliffortia tricuspidata</i> , <i>Stoebe cinerea</i>	B/C	Moderate	Moderate	Rocky outcrop
Tr 311	Recovered veld previously pine plantation	US =	Wetland seep	Seasonally saturated	<i>Berzelia lanuginosa</i> Seasonally Wet Tall Ericoid Fynbos; Slightly domed topography. Pebbles.	Moss on surface. <i>Erica cf curvirostris</i> , <i>Erica hispidula</i> , <i>Leptocarpus membranaceus</i> , <i>Merxmullera cincta</i> , <i>Passerina corymbosa</i> , <i>Restio bifarius</i> , <i>Stipagrostis cf ciliata</i> , <i>Syncarpha vestita</i>	B/C	High	High	Remains of pine plantation evident
		DS =	Wetland seep	Seasonally saturated	<i>Berzelia lanuginosa</i> Seasonally Wet Tall Ericoid Fynbos; Disturbed road edge. Pebbles at surface from substrate disturbance. Adjacent area with bedrock	Moss on surface. <i>Merxmullera cincta</i> , <i>Psoralea pinnata</i> , <i>Ursinia paleacea</i>	C	High	Moderate	Remains of pine plantation evident
Tr 312	Recovered veld previously pine plantation	US =	Dryland	N/A	Medium-tall ericoid-restioid Fynbos; Undulating topography. Pebbles on surface in coarse sand,	Moss on surface. <i>Erica cf curvirostris</i> , <i>Erica hispidula</i> , <i>Leptocarpus membranaceus</i> , <i>Merxmullera cincta</i> , <i>Passerina corymbosa</i> , <i>Restio bifarius</i> , <i>Stipagrostis cf ciliata</i> , <i>Syncarpha vestita</i>	B	Moderate	High	Remains of pine plantation evident
		DS =	Dryland	N/A	Medium-tall ericoid-restioid Fynbos; Slightly domed topography. Shallow coarse pebbly sand on rock sill.	Moss on surface. <i>Merxmullera cincta</i> , <i>Psoralea pinnata</i> , <i>Ursinia paleacea</i>	C	Moderate	Mod High	Remains of pine plantation evident
Tr 313	Recovered veld previously pine plantation	US =	Wetland seep	Permanently saturated, seasonally inundated	<i>Berzelia lanuginosa</i> Permanently saturated Tall ericoid-restioid Wetland Fynbos; Termites. Moss on surface. Sand on rock.	<i>Berzelia lanuginosa</i> , <i>Brunia alopecuroides</i> , <i>Erica hispidula</i> , <i>Leptocarpus impolitus</i> , <i>Stoebe cinerea</i> , <i>Tetraria capillacea</i> , <i>Ursinia paleacea</i>	B	High	High	
		DS =	Wetland seep	Seasonally inundated	<i>Berzelia lanuginosa</i> Permanently saturated Tall ericoid-restioid Wetland Fynbos; Sand on rock.	As for upslope but with <i>Psoralea pinnata</i>	B/C	High	Mod High	Remains of pine plantation evident; flows are impacted by the road through wetland i.e. DS is dessicated
Tr 314	Recovered veld previously pine plantation	US =	Pan	Permanently saturated, seasonally inundated	Restioid Pan Wetland Fynbos	Invasive swamp cypress (<i>Taxodium distichum</i>). <i>Elegia nitida</i> , <i>Brunia alopecuroides</i> and <i>Merxmullera cincta</i> ; with <i>Erica intervallaris</i> , <i>Gleichenia polypodioides</i> , <i>Lobelia jasionoides</i> , <i>Nevillea obtusissima</i>	A/B	High	High	Remains of pine plantation evident
		DS =	Pan	Permanently saturated, seasonally inundated	Restioid Wetland Fynbos fringe to pan; Shallow coarse pebbly sand on rock sill.	<i>Athanasia trifurcata</i> , <i>Erica hispidula</i> , <i>Merxmullera cincta</i>	B/C	Mod high	Mod High	Remains of pine plantation evident; Burnt about 5 yrs ago
Tr 315	Recovered veld previously pine plantation	US =	Wetland seep	Permanently saturated, seasonally inundated	<i>Berzelia lanuginosa</i> Seasonally Wet Tall Ericoid Fynbos; Slightly domed topography. Pebbles. Older vegetation	Moss on surface. <i>Erica cf curvirostris</i> , <i>Erica hispidula</i> , <i>Leptocarpus membranaceus</i> , <i>Merxmullera cincta</i> , <i>Passerina corymbosa</i> , <i>Restio bifarius</i> , <i>Stipagrostis cf ciliata</i> , <i>Syncarpha vestita</i>	B	High	High	Remains of pine plantation evident; Older vegetation.
		DS =	Wetland seep	Seasonally saturated	<i>Berzelia lanuginosa</i> Seasonally Wet Tall Ericoid Fynbos; Disturbed road edge. Pebbles at surface from substrate disturbance. Adjacent area with bedrock	<i>Merxmullera cincta</i> , <i>Psoralea pinnata</i> , <i>Ursinia paleacea</i>	B/C	Mod high	Mod High	Remains of pine plantation evident; Younger veg than upslope; burnt about 5 years ago; impacted by road
Tr 316	Recovered veld previously pine plantation	US =	Wetland seep	Seasonally saturated	Tall Proteoid-Ericoid-Restioid Fynbos; Slightly domed topography. Pebbles.	<i>Hakea sericea</i> (invader), <i>Erica hispidula</i> , <i>Hypodiscus aristatus</i> , <i>Leucadendron xanthoconus</i> , <i>Merxmullera cincta</i> , <i>Passerina corymbosa</i> , <i>Phyllica axillaris</i> , <i>Protea lepidocarpodendron</i> , <i>Restio purpurascens</i> , <i>Syncarpha vestita</i> , <i>Tetraria flexuosa</i> , <i>Ursinia paleacea</i>	B	High	High	Remains of pine plantation evident
		DS =	Wetland seep	Seasonally inundated	Tall Proteoid-Ericoid-Restioid Fynbos	<i>Merxmullera cincta</i> , <i>Psoralea pinnata</i> , <i>Ursinia paleacea</i>	B	High	High	Remains of pine plantation evident; Burnt about 5 yrs ago; Younger veg than upslope

Table A.2b MU 19 Characteristics of Habitat Types together with Ecological Condition (PES), Ecological Importance (EI) and Ecological Sensitivity (ES)

Track or waypoint	Setting	location	Affected habitat	Hydroperiod	General description	Dominant and conspicuous plants	Ecological Condition along route	EI	ES	Comment
Tr 317	Recovered veld previously pine plantation	US =	Wetland seep	Temporary	Medium-tall Ericoid-Restoid Fynbos; topsoil removed	Near fringe of <i>Pteridium aquilinum</i>	B/C	Mod High	Moderate	Remains of pine plantation evident; area adjacent to road has been scraped
		DS =	Wetland seep	Temporary	Medium-tall Ericoid-Restoid Fynbos; Disturbed by mud runoff from road.	<i>Erica hispidula</i> , <i>Passerina corymbosa</i> , <i>Pentameris patula</i> , <i>Ursinia paleacea</i>	B/C	Mod High	Moderate	Remains of pine plantation evident
Tr 318	Recovered veld previously pine plantation	US =	Wetland seep	Permanently saturated	Tall Ericoid-Restoid Wetland Fynbos	<i>Acacia melanoxylon</i> (invader), <i>Cliffortia juniperifolia</i> , <i>Ischyrolepis subverticillatus</i> , <i>Passerina corymbosa</i> , <i>Pentameris colorata</i> , <i>Restia bifarius</i> , <i>Stoebe cinerea</i> , <i>Stoebe spiralis</i> , <i>Syncarpha vestita</i> , <i>Ursinia paleacea</i>	A/B	High	High	Remains of pine plantation evident
		DS =	Wetland seep	Permanently saturated	Tall Ericoid-Restoid Wetland Fynbos but soils shallower than upslope	Veg more like 316 (DS)	A/B	High	Mod High	Remains of pine plantation evident; dryer than upslope because of road
Tr 319	Recovered veld previously pine plantation	US =	Disturbed	Dry	10 m wide laterite track at east edge along firebreak fringed by sandy track.	N/A	E	Low	Low	
		DS =	Disturbed	Dry	10 m wide laterite track at east edge along firebreak with rock pebbles and coarse sand	N/A	E	Low	Low	
Tr 320	Pine plantation being felled	US =	Wetland seep	Seasonally saturated	Upslope of road fringed by periodically cleared side drain with wetland.	Pines (currently being felled) - plantation A21	D	Mod High	Moderate	some natural vegetation below pines so not as impacted as downslope; road through pine plantation is 10 m wide
		DS =	Wetland seep	Seasonally saturated	Shallow sandy-pebbly soil	Standing healthy Pine plantation A3.	D/E	Mod High	Mod Low	No natural veg; dryer than upslope due to pines and road
Tr 321: WP 778 (cement piped culvert)	Pine plantation scheduled for felling	US =	Wetland seep	Seasonally saturated	Upslope of road fringed by periodically cleared side drain	Recent fire damaged standing Pine plantation A21. <i>Acacia longifolia</i> (invader), <i>Juncus capensis</i> , <i>Eragrostis curvula</i> , <i>Labelia jasinaoides</i> , <i>Labelia lutea</i> , <i>Paspalum urvillei</i> , <i>Pentameris thuarii</i> , <i>Tetralia capillacea</i>	D	Moderate	Mod High	Undulating topography
		DS =	Wetland seep	Seasonally saturated	Shallow sandy-pebbly soil	Standing healthy Pine plantation A3. <i>Acacia saligna</i> (invader), <i>Athanasia trifurcata</i> , <i>Carpobrotus edulis</i> , <i>Eragrostis curvula</i> , <i>Pentameris thuarii</i> , <i>Stoebe spiralis</i> , <i>Tribolium uniolae</i> , <i>Ursinia paleacea</i>	D/E	Moderate	Mod Low	Undulating topography
Tr 322	Recovered veld previously pine plantation	US =	Wetland seep	Seasonally inundated	Wet upslope side drain. Shallow sandy-pebbly soil.	Plantation clear-felled. <i>Acacia longifolia</i> (invader). Pioneer fynbos species. <i>Brachylaena neriifolia</i> , <i>Erica pulchella</i> , <i>Ischyrolepis subverticillatus</i> , <i>Labelia jasinaoides</i> , <i>Mimetes cuculatus</i> , <i>Pentameris thuarii</i> , <i>Stoebe spiralis</i> , <i>Senecio subcanescens</i> , <i>Syncarpha vestita</i> , <i>Tetralia capillacea</i> , <i>Thamnochortus fruticosus</i> , <i>Ursinia paleacea</i>	B/C	Mod High	High	Undulating topography; Remains of pine plantation evident
	Pine plantation scheduled for felling	DS =	Wetland seep	Seasonally saturated	Sandy soil with pebbles.	Standing healthy Pine plantation A3. <i>Acacia longifolia</i> (invader). <i>Erica curvirostris</i> , <i>Erica hispidula</i> , <i>Erica intervarialis</i> , <i>Pentameris thuarii</i>	C/D	Mod Low	Mod High	Undulating topography. Track ends at Eskom firebreak at west end of plantation

Table A.3c MU 19 Characteristics of Habitat Types together with Ecological Condition (PES), Ecological Importance (EI) and Ecological Sensitivity (ES)

Track or waypoint	Setting	location	Affected habitat	Hydroperiod	General description	Dominant and conspicuous plants	Ecological Condition along route	EI	ES	Comment
Tr 323	Ploughed Fire break	DS	Wet/dry mosaic	Wet to seasonally moist alternating with dry	Eskom pylons and Forestry Management 40m wide Firebreak with laterite track. Firebreak is ploughed (down slope ploughing should be changed to across slope). Sand. Undulating topography. Seasonally Moist depressions between dry dune ridges. Collars needed at intervals down trench located on trenching.	Pioneers not visible due to recent ploughing. Note that fringing vegetation on west side of firebreak has ridged accumulation of wind blown sand.	F	Mod to Low	Low	Collars needed at intervals down firebreak trench during and after trenching.
Tr 324	Ploughed Fire break	DS	Wet/dry mosaic	Wet to seasonally moist alternating with dry	Eskom pylons and Forestry Management 40m wide Firebreak with laterite track. Firebreak is ploughed . Sand. Steeper than previous track and prone to erosion	Pioneers not visible due to recent ploughing.	F	Mod	Low	Collars needed at intervals down firebreak trench during and after trenching.
Tr 325	Ploughed Fire break	DS	Dry land	Dry	Ridged rock outcrop with flowering gum.	Flowering gum tree. Pioneers not visible due to recent ploughing.	F	Mod	Low	Do not follow this route but continue pipeline along the eastern edge to the rocky outcrop. Collars needed at intervals down trench.
Tr 326	Ploughed Fire break	DS	Wet/dry mosaic	Wet to seasonally moist alternating with dry	Eskom pylons and Forestry Management 40m wide Firebreak with laterite track. Ploughed firebreak with rocky coarse sand. Undulating topography.	Pioneers not visible due to recent ploughing.	F	Mod	Low	Collars needed at intervals down trench and surface across slope ridging to contain erosion. Repair side drain along track.
Tr 327	Track in Ploughed Fire break	US & DS	Dry land	Dry	Sandstone rock valley side. Shallow (0-0.25m) Mispah	<i>Athanasia trifurcata</i> , <i>Diospyros glabra</i> , <i>Erica corifolia</i> , <i>Erica hispida</i> , <i>Erica pulchella</i> , <i>Lanaria lanata</i> , <i>Lobelia coronopifolia</i> , <i>Passerina corymbosa</i> , <i>Pentameris curvifolia</i> , <i>Pentameris thunbergii</i> , <i>Restio capensis</i> , <i>Restio gaudichaudianus</i> , <i>Roella ciliata</i> , <i>Stoebe spiralis</i> , <i>Ursinia paleacea</i>	B/C	Mod	Moderate	Trench upslope of track. Sort out drainage to prevent erosion. Collars needed at intervals down trench
Tr 328	Pine plantation	US & DS	Wetland seep	Seasonally saturated	Rocky valley side. Shallow soils on bedrock.	Plantation with some pines burnt.	D	Mod to high	High	Collars needed at intervals down trench. Consider decanalising flow and construction of wider "leaky" raised road. Good restoration potential
Tr 329	Pine plantation	US & DS	Wetland seep	Seasonally saturated	Rocky valley side. Shallow soils on bedrock.	<i>Gibbaria ilicifolia</i> , <i>Gleichenia polypodiodes</i> , <i>Lanaria lanata</i> , <i>Lobelia coronopifolia</i> , <i>Othonna quinqueidentata</i> , <i>Stoebe spiralis</i> , <i>Tetraria fasciata</i>	D	Mod to high	High	Disturbed footslope below plantation.
Tr 330	Pine plantation with manicured verge along entrance road	US =	Dry land	Dry	Manicured verge along Entrance road	<i>Gibbaria ilicifolia</i> , <i>Gleichenia polypodiodes</i> , <i>Lanaria lanata</i> , <i>Lobelia coronopifolia</i> , <i>Othonna quinqueidentata</i> , <i>Stoebe spiralis</i> , <i>Tetraria fasciata</i>	F	Low	Low	Take trench along upslope side; Disturbed footslope below plantation.
		DS =	Wetland seep	Seasonally saturated	Manicured verge along Entrance road	Wetland present adjacent to manicured road verge	F	Moderate	Mod High	No trenching here
Tr 331	Pine plantation with manicured verge along entrance road	US	Wetland seep	seasonally flowing	Channelled wetland seep	Remnant stands of <i>Prionium serratum</i> (palmiet) with other wetland plants among pines	C/D	Moderate	Mod High	Vegetation trashed. Reinstate .
WP 779	Pine plantation	US =	Seep Wetland	Seasonally saturated	Culvert with large concrete pipe		C/D	Moderate	Mod High	Vegetation trashed. Reinstate stream veg.
Tr 332	Pine plantation	DS =	Seep Wetland	Seasonally saturated	Disturbed wetland along Entrance road verge	<i>Eucalyptus</i> plantation. <i>Virgilia araboides</i> . <i>Pentameris macrantha</i> .	D	Moderate	Moderate	
Tr 333	Pine plantation	US =	Seep Wetland	Seasonally saturated	Disturbed wetland in side-drain along Entrance road verge		E	Low	Low	
	Pine plantation	DS =	Seep Wetland	Seasonally saturated	Disturbed wetland in side-drain along Entrance road verge		E	Low	Low	
Tr 334	Manicured garden	US =	Seep Wetland	Seasonally saturated	Manicured verge with side-drain wetland and garden	<i>Paspalum urvillei</i> lawn	E	Low	Low	
	Pine plantation	DS =	Seep Wetland	Seasonally saturated	Culvert with stone headwall		E	Low	Low	
WP 780	Manicured garden		Seep Wetland	Seasonally saturated	Manicured verge with side-drain wetland and garden		E	Low	Low	
Tr 335	Manicured garden	US =	Seep Wetland	Seasonally saturated	Fenced garden area around building	Manicured area	E	Low	Low	
	Manicured garden	DS =	Seep Wetland	Seasonally saturated		Manicured fenced area	E	Low	Low	

4 Construction activity and proposed maximum working widths

A summary of the current road width and associated development component for each track described in Table A1 is given in Table A2. This was used to inform the proposed maximum working widths, as given in Table A3, with specific recommendations for construction to minimise impacts as far as possible.

Table A2 The current road width and the proposed development component along the Nuweberg pipeline route through Steenbas.

Track or waypoint	Setting	Current Road width (m)	Development component
Tr 308	Firebreak and track along N2 and previously pine plantation	9.00 plus lateral firebreak	Pipeline & electricity downslope below ground after crossing the N2
Tr 309	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 310	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 311	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 312	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 313	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 314	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 315	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 316	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 317	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 318	Recovered veld previously pine plantation	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 319	Recovered veld previously pine plantation	9.00 plus 10 m side track	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 320	Pine plantation being felled	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 321; WP 778 (cement)	Pine plantation scheduled for felling	Culvert	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 322	Recovered veld previously pine plantation Pine plantation scheduled for felling	9.00	Pipeline & electricity downslope below ground for visual reasons (N2) and in Nature Reserve.
Tr 323	Ploughed Fire break	firebreak	Alongside existing powerlines so buried or on surface as dictated by Eskom requirements. Buried would not interfere with firebreak maintenance ploughing.
Tr 324	Ploughed Fire break	firebreak	
Tr 325	Ploughed Fire break	firebreak	
Tr 326	Ploughed Fire break	firebreak	
Tr 327	Track in Ploughed Fire break	3.00	
Tr 328	Pine plantation	3.00	Pipeline & electricity upslope below ground for visual reasons (main office access road) and in Nature Reserve.
Tr 329	Pine plantation	10.00	Pipeline & electricity upslope below ground for visual reasons (main office access road) and in Nature Reserve.
Tr 330	Pine plantation with manicured verge along entrance road	10.00	Pipeline & electricity upslope below ground for visual reasons (main office access road) and in Nature Reserve.
Tr 331; WP 779	Pine plantation with manicured verge along entrance road	10.00	Pipeline & electricity upslope above ground across stream.
Tr 332	Pine plantation	10.00	Pipeline & electricity upslope below ground for visual reasons (main office access road) and in Nature Reserve.
Tr 333	Pine plantation	10.00	Pipeline & electricity upslope below ground for visual reasons (main office access road) and in Nature Reserve.
Tr 334	Manicured garden Pine plantation	10.00	Location of pipeline and electricity determined by infrastructure
WP 780	Manicured garden	10.00	Location of pipeline and electricity determined by infrastructure
Tr 335	Manicured garden	10.00	Location of pipeline and electricity determined by infrastructure

Table A3: Working widths based on road or track width and extent of impact on natural environment (Firebreaks are treated separately)

Existing Road width (m)	Excavation into surfaced road	Traffic width	Stockpiling road & bed materials	Excavation into natural habitat	Total windrowed topsoil	Passing area or Bypass requirement	Total working width	Bypass requirements and comments
3.00	3	0	0	0	0	0	3.00	Tracks 327 & 328. Stockpiling topsoil and subsurface materials in designated area in firebreak or along main access road. Passing and bypassing by track to settlement from Eskom pylons eastward. Join pipes in firebreak area. Pull pipes and cables into trench.
9.00	3.00	4.00	2.00	0.00	0.00	0.00	9.00	rivercrossings and culverts are treated individually
9.00	3.00	4.00	2.00	0.00	0.00	3.00	12.00	Every 100m or as dictated by existing side tracks or by visual need
10.00	3.00	5.00	2.00	0.00	0.00	0.00	10.00	
Firebreak	0.00	0.00	2.00	3.00	2.00	0.00	7.00	Use existing track under E-pylons for general bypassing traffic. Excavator does not require transport support. Pipes laid and joined along E-track and rolled across firebreak into trench.

5 General Recommendations

In terms of the exact pipeline alignment, it is recommended that trenching take place downslope of the existing road that runs perpendicular to the N2 (this includes tracks 308 to 322). The construction footprint through the firebreak should be contained to within the disturbed ploughed habitat and avoid the area currently under pine plantation as this habitat has potential to recover naturally once the pines are removed. Trenching either side of the main entrance road will depend on the location of the existing electrical cabling in this area, although, if possible, trenching should be located downslope of the road to avoid damage to watercourses through this area.

Furthermore, it is recommended that prior to any excavation activities on site, the following specific issues be resolved on site:

- Continual road condition inspection and maintenance is to take place.
- Passing areas be demarcated, using existing side roads as far as possible;
- The working width for each section of pipeline be demarcated in situ such that areas beyond this are considered no-go areas;
- Regular collars be installed across the trenches to contain movement of water down the trenches to separate wetland and dryland habitats and to reduce downslope erosion.
- Search and rescue of appropriate plant material and the storage of natural materials be undertaken under guidance from the botanical ecologist;
- Top soil in the firebreak be windrowed under the guidance of the ecologist;
- If present, surface rocks and termite nests be stored face up and outside of the topsoil windrow;
- River and culvert crossings design requirements be detailed and approved by the freshwater ecologist in terms of working procedures.
- The disturbed areas that are not required for pipeline maintenance or access are returned to natural vegetation after disturbance is completed.
- Alternative access to Steenbras or requirements for bypassing be assessed and determined along the alignment that follows the main access route.

Lastly, recommended mitigation measures to address impacts associated with trenching and laying of the pipeline as given in Section 5.3.6 of the main report should be adhered to. Where

these measures cannot be implemented for practical reasons, alternative measures should be sought and approved by the ecologists prior to commencement of the construction.