APPENDIX 39B

ANNEXURES TO THE ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE EXPANSION OF THE CAPE WINELANDS AIRPORT.

ANNEXURE

ANNEXURE 1: CURRICULUM VITAE

CURRICULUM VITAE of PAUL HENDRIK SLABBERT

ENVIRONMENTAL & HERITAGE IMPACT PRACTITIONER

EAPASA Reg 2020 • Ref: 2019/1036 & APHP Professional Heritage Practitioner

1. PERSONAL DETAILS

Born:	23 May 1973
Nationality:	South African
Drivers License:	Code EB
Languages:	Proficient in English and Afrikaans

2. KEY COMPETENCIES

I've completed my BACCALAUREUS ARTIUM ET SCIENTIAE Honors degree at the Potchefstroom University for CHO in 1995. The degree is primarily focused on qualifying Town and Regional Planners, but due to the SCIENTIAE (Science) component it equipped and stimulated my passion for environmental planning. Geography & Environmental studies, Sociology, Statistics and Mathematics in the first year and Geography & Environmental studies, Sociology in the second year formed the bases of my environmental education and interest. Economics up to 3rd year level and Statistics, Project Management and Planning Legislation at 4th year level provided me with an advance understanding of the development industry. The Town and Regional Planning curriculum from 1st to 4th year covered the entire spectrum of the built, people, heritage, natural and aesthetic environment in relation to the potential impacts on the socio, economic and bio-physical environment.

I started my Environmental Assessment Practitioner (EAP) career in 1998 as a professional practicing initially in the eco-tourism development industry. My passion for environmental, heritage & land-use planning with associated management strategies enable me to facilitate with all role players to find workable solutions in order to implement sustainable development in Greenfield areas. Due to the ECA (Act No. 73 of 1989) Section 21 Activities identified in 1997/8 the projects I was involved with required authorisation ito the ECA. As a result I started to practice as an EAP obtaining authorisations for triggered developments. I gained experience in rural and urban development with the emphasis on environmental impact assessments and management. This enabled me to have various publications in leading eco-tourism magazines. I've been witness to the evolution of the EIA industry from ECA to NEMA up to the current EIA Regulations. I've been operating as a Principal EAP and Environmental Practice owner for over 20 years.

During my career to date I have accumulated experience in the following key areas:

Impact Practitioner & Environmental Planner:

- Environmental Impact Assessments [legislative & process],
- Heritage & Visual Impact Assessments [legislative & process],
- Mining; Processing & Industrial [legislative & process],

- Environmental Management [environmental control, management plans, Environmental & Social Management Systems],
- Conservation [management strategies, funding & alien vegetation],
- Power Generation [generation, distribution and powerline alignment]
- Land-Use [forward planning, feasibility study, business plan],
- Eco-tourism [trails, birding, recreation, construction, lodging],
- Community [facilitating, public participation, education],
- Water use authorisation [WULA's, GA's pollution prevention management plans and ELU's];
- Waste Management Licences [legislative & process];
- Air Emission Licences [legislative & process],
- Coastal Water Discharge Permits [legislative & process],
- Organizers [events, strategic, project management].

<u>Business & Corporate Reasonability:</u>

- Information on my Environmental Practice, PHS Consulting please view at www.phsconsulting.co.za
- For overview of my social and community engagement programme visit www.africanvisionfoundation.co.za

<u>Advanced Legislative Knowledge:</u>

Providing specialist services and managing and driving projects related to the following legislation:

- National Environmental Management Act (Act No. 107 of 1998) and 2017 Regulations;
- Environmental Conservation Act (Act No. 73 of 1989);
- National Heritage Resources Act (Act No. 25 of 1999);
- Land Use Planning Ordinance (Ordinance 15 of 1985);
- National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008);
- National Environmental Management: Waste Act (Act No. 59 of 2008);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004);

- Mineral and Petroleum Resources Development Act (Act No. 28 of 2002);
- National Water Act (Act 36 of 1998);
- National Water Services Act (Act 108 of 1997).
- National Environmental Management Act (Act No. 107 of 1998); Public Participation Guideline (10 October 2012)

3. TERTIARY EDUCATION

3.1 Honors Degree in B Art Et Scien (Planning)

Year/s of study:	1992 – 1995 (received 96/03/04)
Institution:	University of Potchefstroom (PU for CHO)
Course Modules:	Geography and Environmental Studies Industrial Sociology Town & Regional Planning Economics Mathematics Philosophy Sociology Statistics Planning Legislation
Honors Thesis:	Sustainable Development of Ikageng Township

4. REGISTRATIONS AND AFFILIATIONS

- Certified Member of the Environmental Assessment Practitioners Assocoation of South Africa – Reg 2019/1036
- Professional Certified Member of Association of Professional Heritage Practitioners (APHP)
- Professional Member of the International Association for Impact Assessment (IAIA)

5. EMPLOYMENT RECORD

4.1 Current

Designation:	Self-Employed Principal Environmental Assessment Practitioner Heritage Assessment Practitioner Environmental Planner
Period:	1998 to current
Key responsibilities:	Environmental Practice (PHS Consulting) Owner that conduct, manage and review EIA's, Basic Assessments, Coastal Water Discharge Permit, Air Quality Licenses, Waste Management Licenses, Setback Line applications,

Water Use Authorizations, General Authorizations, NEMA S24G Applications, Mining Permit and License applications. Authorisation and License compliance audits, EMP's, ECO work, Social and Labour plan compilations, Alien Eradication Management Plans, Fire Management Plans, Maintenance Management Plans, Wild Life Management Plans. Environmental feasibility planning, event organizing and Corporate Social Investment programmes.

PHS Consulting: As sole Member of the Close Corporation I currently employ two fulltime EAP's namely Amanda Fritz-Whyte and Nadine Duncan. We make use of various freelance EAP's and specialist consultants depending on the project type.

4.2 Pre PHS Consulting

Designation: Employed by OmniPlan
Period: 1997 to 1998
Key responsibilities: Planning Administration, Town Planning Applications, Constraint Analysis, Layout and Design, Community Presentations.

6. COURSE / CONFERENCE PARTICIPATION

5.1 Short courses completed

I attended various DEA&DP, APHP, IAIA, Fynbos & SANBI forum workshops, training programmes and conferences since 1999 to date.

7. LIST OF EIA PROJECTS TO DATE

Please note over the years in practice I conducted many projects and it's impossible to list them all. He is a summary of the most relevant EAP projects that illustrate my competence, knowledge and experience. **Please note that all projects listed below required the need to conduct Public and Authority Participation, the result is 25 years of consultation experience.**

Major project	Tasks	Employer/client	Responsibility
Namaqualand Casino Development **1998**	Evaluate and assess various site alternatives for the development of a casino in Namaqualand. Assess bio-physical & socio-economic environments from Garies to Vioolsdrif to Pella inland environments. Assessment of the entire coastal environment from Groenrivier mouth to Alexander bay. Presented preferred site alternative to be included in national bid for license allocations	Namaqualand District Council	Act as researcher, public participation liaison and site assessment consultant
Barolong Archaeological Eco-tourism Assessment **1999 - 2000**	Investigate the feasibility to develop eco-tourism activities amongst the Barolong Tribe kraal systems on the highlands of the North West Province. After survey and mapping, proposed a feasible site close to Hartebeesfontein (NW). Planned hiking and mountain bike trails system in terms of bio-	Hartebeesfontein Farmers Association	Site Analysis, layout development, Heritage Practitioner (HP) and environmental management and ECO work

	physical and heritage constraints. Drafted a management plan for trail system and developed the trail system and product. Launched and operated initial phase until handover to landowners.		
EIA's on 4x4 trails and overnight huts, **2000 - 2001**	Completed 3 x EIA's on 4x4 trails in the Du Toit Kloof and Hexriver mountains. Worked according to DECAS guidelines and ECA process at the time.	Private Landowners and conservancies	EAP
Anglo Gold Game Reserves – North West, Gauteng, Free State Provinces **2001**	Contracted as Environmental Management Officer for Anglo Gold mining group in Vaal Reefs. I drafted EMP's for all three of the Nature Reserves and Interpretation Centres. This was followed by ecotourism master plans to focus on sustainable use of the Reserves. I acted as ECO, for the building projects (Lodges) in the reserves and on most of the adjacent mining areas. Water Management and monitoring of water samples were part of the duties	Anglo Gold Ashanti	ECO, HP and IEM officer
Contracted by Uluntu Environments for trail planning and assessments **2002**	Status quo assessments on all trails and tracks conditions in the Rhodes Memorial, Devils Peak, Sandy Bay , Buffels Bay, Table Mountain and Cape Point areas of the Cape Peninsula National Park. Proposed rehabilitation plans, construction plans and new routes. Assess potential impact on new and disturbed areas. Construction implementation and ECO.	City of Cape Town, Cape Nature	Planning, Environmental Assessment & ECO
Kronendal Estate Residential Development – Houtbay, **2003** Community Centre site selection – Pringle Bay **2003**	Environmental Impact Assessment and EMP's Site Analyses in coastal zone, with comprehensive public participation. This was to determine a feasible site form both an environmental and community perspective	Dormacorp Pty Ltd & First Plan town and regional Planners Hangklip Kleinmond Municipality	EAP Site Assessor and Public participation Liaison
Mosaic Farm, Walkerbay Fynbos Conservancy, Stanford, Western Cape **2003 – 2005** Chairman Birdlife Walke Bay **2003 - 2005**	Project and Conservation Management contract, responsible for drafting and implementing a major, building restoration and alien clearance program. Planning and implementing the Walkerbay Fynbos Conservancy Hiking trail alignments and management plans. Responsible for assessing development footprints for overnight camps. Implementation of a fire management plan and action plan. Established bird club and birding project in the Overberg and the Stanford Bird fair	Hermanus Riviera Estates Birdlife South Africa	Environmental Planner, HP, Implementing Agent and Assessor Chairman (WB), Event Organiser and Community Liaison
Hoopjiesrivier, Free Range Chicken Farm (Farm 541 Caledon)–	Basic Assessment and EMP's	ITAKANE	EAP

Karwyderskraal, **2006** Heritage Heights (Portion 81 of the Farm 229) residential development – VanWyksdorp, **2006**	Visual Impact Assessment (VIA) and Heritage Impact Assessment (HIA)	Andre Snyman	VIA and HP
Kleinberg residential and retirement village development (erf 459) – Riviersonderend **2007** Gansbaai Industrial extension (erf 210) – Gansbaai **2007** Kleinbaai harbour dredging – Gansbaai **2007**	Basic Assessment, EMP's and Landscape Planning Basic Assessment, EMP's Basic Assessment, EMP's	Jacob du Toit Overstrand Municipality Overstrand Municipality	EAP EAP EAP & ECO
Langeberg Cheese factory (Portion 69 of Farm no.159) – Buffelsjag **2008** Industrial development (erf 931)- Struisbaai **2008** Shopping Centre Development – Livingstone Zambia **2008** Billboard development (erf 35270) – Milnerton **2008** Fick's Pool Restuarant – Hermanus **2008**	Basic Assessment, EMP's Basic Assessment, EMP's, Landscape Planning EIA and EMP's Basic Assessment, EMP's Basic Assessment, VIA and HIA	Langeberg Kaas Pty Ltd Louis Greeff Shoprite Checkers CK Outdoor Advertising Pty Ltd Overstrand Municipality	EAP EAP EAP EAP EAP. VIA & HP Practitioner
Residential Development (erf 1497) – Vermont **2009**	Basic Assessment, EMP's, Landscape Planning Basic Assessment, EMP's	CRISTATUS INV 85 CC PJW Terblanche	EAP EAP & ECO

Single Dwelling Development (erf 278) – Malgas **2009** Petrol Filling Station (erf 1) – Swellendam **2009** Fish Processing Plant – St Helena Bay **2009** Bloemendal Wine Estate – Durbanville **2009** Maandagskop and Airport Quarries – Mosselbay and George **2009**	Scoping, EIA and EMP's Basic Assessment, EMP's VIA and HIA Environmental Management Programme Reports and Audits	Swellendam Municipality West Point Processing Pty Ltd Spirito Trade 82 Pty Ltd Terblanche Transport	EAP EAP & ECO VIA & HP Practitioner Environmental Auditor
Matroosberg Reserve (Farm 424) Ceres **2010** Kleinbaai Harbour Expansion (Erf 423) - Gansbaai **2010** Retirement Village Development (Erf 5379 & 5300) – Onrusrivier **2010** Industrial Development (Erf 2015) – Riversdale **2010**	Basic Assessment & EMP's Basic Assessment & EMP's Basic Assessment, EMP's & ECO Basic Assessment, EMP's & ECO	Erfdeel Boerdery Overstrand Municipality Tweefonteine Ontwikkelings Trust Hessequa Municipality	EAP & ECO EAP EAP & ECO EAP & ECO
Residential Development (Erf 987) – De Kelders **2011** Unlawful Vegetation Removal (Farm 237) - Elim **2011** Graveyard Development – Springbok, Okiep, Bergsig, Matjieskloof, Kommagas, Nababeep – Northern Cape **2011** Residential Development (Erf 8704) – Paarl **2011**	Basic Assessment & EMP's S 24 G & EMP Basic Assessments & EMP's Basic Assessment & EMP's	Hopefull Trust Moravian Church of Elim Nama Khoi Local Municipality Nevensaan Ontwikkelings	EAP EAP EAP EAP

Wetland Rehabilitation – Tesselaarsdal **2011**	Basic Assessment & EMP's	Department of Agriculture and Tesselaarsdal Action Group	EAP
Mushroom Farm Development (Farm 436/27) – Botrivier **2011**	Basic Assessment & EMP's Waste Licence	Ocean Mushrooms	EAP & ECO
Blouberg Mine Development (Farm 88 & 91) – Melkbosstrand **2012**	Visual Impact Assessment	Tip Trans	Visual Assessor
Urban Expansion Residential Estate (Farm 436/5) – Botrivier **2012**	Scoping, EIA & EMP's	Crimson Properties	EAP
Cemetery Development (Erf 513 – Napier **2012**	Basic Assessment & EMP's	Cape Agulhas Municipality	EAP
Coastal Sidewalks Development (Erf 462) - Franskraal **2012**	Basic Assessment & EMP's	Overstrand Municipality	EAP
Riverside Residence Development (Farm 321) – Stanford **2012**	Basic Assessment & EMP's	Astrodome Investments	EAP
Eco- Village Development (Farm 483/2) - Caledon **2012**	Basic Assessment & EMP's	Theewaterskloof Municipality	EAP
Botrivier Windfarms – Botrivier **2013**	Appointed to oppose the development of windfarms outside regional allocated areas as part of the "Wind Rush" period. Scrutinise and evaluate Scoping & EIA Documents on behalf of opposition. Handling of Appeal.	Wildekrans Wine Estate and Botriver Community	Opposing EAP
Resort Development (Farm 213) – Bonnievale **2013**	S24 G & EMP's	De Hoek Trust	EAP
Commercial Development – Chililabombwe Zambia **2013**	EIA	Shoprite Checkers	EAP
Birding Route Development – South Africa **2013 to 2016**	Environmental Planning to establish and support birding development in all the South African Provinces	E Snell & Co Funder and BirdLife	Environmental Planner

		SA and SANPARKs Honorary Rangers	
Intensive Feed Farm Development (Farm 728/2) – Grabouw **2013**	Basic Assessment & EMP's	Babel Trading	EAP & ECO
Uilenvlei Private Nature Reserve, resort development – Uilkraalmond **2013**	Basic Assessment & EMP's	Southern Spirit Properties	Compile & Review EAP
Development of five Cemeteries - Upington **2014**	Basic Assessment & EMP's	Khara Hais Local Municipality	EAP & HP
Commercial Development – Mongu Zambia **2014**	EIA	Shoprite Checkers	EAP
Establish Hartenbos River Water Users Association – Hartenbos **2014**	Draft Constitution, verify ELU's conduct Public Consultation	Hartenbos River Water Users Association	Water Resource Consulting
Commercial Development Cabinda – Angola **2014**	EIA	Shoprite Checkers	EAP
Resort Development (Farm 633 & 273) – Swellendam **2014**	Basic Assessment & EMP's	Bakkelys Drift Properties	EAP
Natures Path Lifestyle Village - Keurboomstrand **2015**	Heritage Impact Assessment guiding the EIA process towards a more aesthetic SDP	Sharples Environmental	Heritage Impact Assessor (HP)
Hazardous Waste Assessment – Castle Mews Woodstock **– 2015**	Assess hazardous waste contamination in basement of old buildings, establishing the source and report finding the competent authorities. Assist with drafting management actions to clean-up and resolve.	Castle Mews	Waste Assessor
Commercial Development Kuito – Angola **2015**	EIA	Shoprite Checkers	EAP
Residential Development (Farm 142/14) – Rheebok **2015**	Basic Assessment & EMP's	Mercedes Trust	EAP & ECO
		Shoprite Checkers	Water Assessor

Water Act and Use Interpretations for Commercial off grid Systems – Western Cape **2015** Coastal Sidewalk and Trail Development – Kleinmond **2015** Wetland Rehabilitation Plan; Operational Environmental Management Plan and Environmental Liaison Committee – Sun Valley Mall Noordhoek **– 2015**	Site Assessments, Technology Assessment, Legislation Applicability, Interpretation of the Water Act. Basic Assessment & EMP's Rehabilitation Plan, OEMP & ELC	 Overstrand Municipality Shoprite Checkers and City of Cape Town	 Review EAP EAP & ECO
Air Emissions Licence (2 Neil Hare Rd) - Atlantis **2016** Kenhardt Solar Power Farms and Power Lines – Northern Cape **2016-2018** Jetty Development in Protected Area (Farm 480/136) – Stillbaai **2016** Intensive feed Farm (Farm 226) – Hermanus **2016** Industrial Development (Erf 1) - Caledon **2016** Abalone Farm Development (Farm 421/1) – Doringbaai **2016** Stander Mine (Farm 189/83) – Wilderness **2016**	Air Emissions Assessment Appointed to investiage the development of solar farms an powerline distribution lines outside regional allocated areas as part of the "Solar Rush" period. Scrutinise and evaluate Scoping & EIA Documents on behalf of opposition. Handling of Appeal. Basic Assessment & EMP's Basic Assessment & EMP's Basic Assessment & EMP's Basic Assessment & EMP's Basic Assessment & EMP's	Malmesbury Sterilisasie Aanleg Dagab & Rooidam Farms Koringfontein Farm Bapchix Theewaterskloof Municipality Doring Bay Abalone Viadro 127	EAP Analysing EAP Review EAP Review EAP & ECO EAP Review EAP EAP & ECO

ECO Lifestyle Estate & Nature Reserve, Hoek vd Berg (Farm 572) – Hermanus **2017**	Scoping EIA & EMP's, HIA	Saddle Path Properties	Review EAP, Heritage Assessor and Water Assessor
Abalone Farm Development (Farm 108) - Jacobsbaai **2017**	Basic Assessment & EMP's	Jacobsbaai Sea Products	Compile & Review EAP & ECO
Demolition Waste Management – Cape Peninsula **2017 ongoing**	Waste Management Plans for demolition and redevelopments	Shoprite Checkers	Waste Assessor
Resort Development (406/58) – Slanghoek **2017**	Basic Assessment & EMP's	Slanghoek Resort	Review EAP & Visual Assessor
Resort Development (Farm 627/1) - Stanford **2017**	Basic Assessment & EMP's	Philipskop	Review EAP
Intensive Feed Farm (Farm 541/6) – Karwyderskraal **2017**	Basic Assessment & EMP's	Itakane Trading	Review EAP & ECO
Henkershoek Mine (Farm 628) – Albertinia **2017**	Basic Assessment & EMP's	Viadro 127	Compile & Review EAP
Heavy Minerals Prospecting (Alexcor Mining Right Area) – Alexanderbaai **2018**	Basic Assessment & EMP's	Vast Mineral Sands	EAP
Commercial Development Namibe – Angola **2018**	EIA	Shoprite Checkers	EAP
Resort Development (Farm 465) – Elgin **2018**	Basic Assessment & EMP's	On The Earth	Review EAP
Residential Development (Erf 1019) - Wilderness **2018**	Basic Assessment & EMP's	Costa	Compile & Review EAP
Residential Development (Erf 1156) – Witsand **2018**	Basic Assessment & EMP's	Westfield Trust	EAP & ECO
Van Der Stell Liquor Store – Stellenbosch **2019**	Heritage Impact Assessment	Shoprite Checkers	HP

Weir and Pipeline Development (Huiskloof River) – Botrivier **2019**	S24G & EMP's	Erin de Vigne	EAP
Crocodile Diving Facility (Erf 48) – Birkenhead **2019**	Cape Nature Permitting & EMP	Afrikanos	EAP
Abalone Farm Development (Farm 6/453) – Gouritsrivier **2019**	Basic Assessment & EMP's	Aqunion	Compile & Review EAP
Heavy Minerals Prospecting (Trans Hex Mining Right Area) – Hondelipbaai **2019**	Basic Assessment & EMP's	Saxon	EAP
Intensive Chicken Farm (Farm 487) – Caledon **2019**	Basic Assessment & EMP's	Elgin Free Range Chickens	Review EAP
Agricultural Cultivation (Farm 3/497) – Malgas **2019**	Scoping, EIA & EMP's	Eksteen Familie Trust	Review EAP
Airport Quarry (Farm 129/208) – George **2019**	Scoping, EIA & EMP's	Mercedes Trust	Compile & Review EAP
Constantia Emporium Retail Centre - **2020**	Heritage Interpretation Story & Signage	Shoprite Checkers	HP
Commercial Retail Development – City of Cape Town **2017 – 2020**	Environmental Management Plans & Environmental Control Officers various projects, Delft, Sun Valley, Constantia, Sitari, Brackenfell, Paarl, Table View and Gordons Bay.	Shoprite Checkers	EMP & ECO
Heavy Mineral Mines – Alexcor Northern Cape **2020 – 2021**	Environmental Impact Study	Deep Blue Minerals	EAP
Free Range Chicken Farms – **2020 – 2021**	Environmental Impact Assessment	Elgin Free Range Chickens	EAP
Sitari Retail Centre - **2021**	Heritage Interpretation Story & Signage	Shoprite Checkers	HP
Hoop Urban Expansion – Overberg **2022**	Environmental Impact Study Heritage and Visual Impact Study	Hoop Trust	EAP & HIA

EFRC Abattoir – **2022** Atlantis Air Quality - **2022**	Environmental Impact Assessment Atmospheric Impact Assessment	Elgin Free Range Atlantis Processors	EAP EAP
Cape Winelands Airport – City of Cape Town **2021 – 2023** West Point Processors (Fish Meal & Oil) – St Helena Bay **2019 – 2023**	Environmental Impact Assessment Environmental & Atmospheric Impact Study	Cape Winelands Airport TerraSan Group	EAP EAP
Sea Concession 2A, Heavy Mineral Mine – Port Nolloth **2023-2024** Memorialisation of Hardekraaltjie Cemetery – **2024** Rogland Sand Mine – Albertinia – **2024** Revitalization of Stellenbosch Mills Square - **2024**	Environmental Impact Assessment & EMP Heritage Assessment Basic Assessment & EMP Heritage Assessment	Whale Head Minerals University of Stellenbosch Terblanche Transport Shoprite Checkers	EAP HP EAP HP

References:

1. **Shoprite Checkers - Leon Myburgh (084 223 4788) lemyburgh@shoprite.co.za.**
2. **Cape Winelands Airport - Nick Ferguson (082 374 8769) nick@capewinelands.aero**
3. **West Point Processors - Marthin Potgieter (082 551 0217) marthin@saldanha.co.za**

C U R R I C U L U M   V I T A E

J E N N A   M A R E E   T H E R O N

E N V I R O N M E N T A L   A S S E S S M E N T   P R A C T I T I O N E R

EAPASA Reg no: 2022/5926

PERSONAL PROFILE

Gender: Female	Date of Birth: 4 October 1984
Nationality: South African	Languages: Proficient in English and Afrikaans

KEY COMPETANCIES

I completed my Bachelor's degree (International Studies) focusing on Political Science, History and Sociology in 2005 and my Master's degree (Cultural Tourism and Heritage Studies) at the University of Stellenbosch in 2007. My Master's degree was undertaken predominately through the Department of History and the Department of Geography & Environmental Studies. In 2008 I was accepted into the City of Cape Town's Environmental Resource Management Departments Internship Program for a 12-month period. My internship was invaluable to my career as it equipped me with the practical skills and knowledge behind environmental planning. I received a certificate of commendation for 'Outstanding contribution to the Environmental Internship Programme 2008'. I officially started my EAP career in 2009 as a professional Environmental Consultant within the Private Sector and resign from Doug Jeffery Environmental Consultants as a Senior Environmental Consultant in 2016 to pursue a freelance career as an Environmental Consultant. I have gained experience in rural and urban development with the emphasis on environmental impact assessment and management within South Africa, operating as an EAP for over 15 years.

During my career to date, I have accumulated experience in the following key areas:

- Environmental Impact Assessments [legislative & process],
- Environmental Management [environmental control, management plans, Environmental Management Systems],
- Community [facilitating, public participation];
- Waste Management Licenses [legislative & process];
- Air Emission Licenses [legislative & process],
- Coastal Water Discharge Permits [legislative & process],
- Section 34 Heritage Permits,
- Organizers [project management].

Advanced Legislative Knowledge in:

- National Environmental Management Act (Act No. 107 of 1998) and 2017 EIA Regulations;
- National Heritage Resources Act (Act No. 25 of 1999);
- Land Use Planning Ordinance (Ordinance 15 of 1985);
- National Environmental Management: Integrated Coastal Management Act (Act No. 24 of 2008);
- National Environmental Management: Waste Act (Act No. 59 of 2008);
- National Environmental Management: Air Quality Act (Act No. 39 of 2004); and
- National Water Act (Act 36 of 1998).

EDUCATION

2006-2007 Tertiary education (Cum Laude)

Stellenbosch University

Masters in Philosophy (MPhil), Cultural Tourism and Heritage Studies (2 Years)

2003-2005 Tertiary education

Stellenbosch University
Bachelor of Arts (BA), International Studies (3 Years)

EMPLOYMENT RECORD

OVER 15 YEARS EXPERIENCE IN EIA'S

Freelance Environmental Consultant (2017 - present)

Senior Environmental Assessment Practitioner

- Training and experience in applying the principles of Integrated Environmental Management (IEM), and in applying the Environmental Impact Assessment (EIA) Regulations to a number of development projects and initiatives in South Africa that trigger the National Environmental Management Act.
- Facilitation, co-ordination, management and monitoring of all aspects of the EIA process.
- Liaising with specialists and all members of the project team to ensure a full understanding of the scope of work required throughout the process;
- The compilation of reports: Applicability Applications, Constraints Analysis, Basic Assessment Reports, Scoping and Environmental Impact Assessment Reports, Damage Assessment Reports (24G Applications), Rehabilitation Plans, Audit Reports and Environmental Management Programmes;
- Liaising with interested and affected parties and facilitating the public participation process required in terms of the EIA Regulations; and
- The compilation of Section 34 Heritage Applications including the liaising with the public and heritage authorities.

Doug Jeffery Environmental Consultants (2009 - 2016)

Senior Environmental Assessment Practitioner

- Training and experience in applying the principles of Integrated Environmental Management (IEM), and in applying the Environmental Impact Assessment (EIA) Regulations to a number of development projects and initiatives in South Africa that trigger the National Environmental Management, the National Environmental Management: Waste Act etc..
- Facilitation, co-ordination, management and monitoring of all aspects of the EIA process.
- Liaising with specialists and all members of the project team to ensure a full understanding of the scope of work required throughout the process;
- The compilation of reports: Constraints Analysis, Basic Assessment Reports, Scoping and Environmental Impact Assessment Reports, and Damage Assessment Reports (24G Applications) etc.;
- Liaising with interested and affected parties and facilitating the public participation process required in terms of the EIA Regulations.

City of Cape Town: Environmental & Heritage Resource Management

Internship (2008)

- Read, assess and comment on EIA, EMP, OEMP, CEMP, and Basic Assessments as per NEMA.
- Read, assess and comment on land-use planning applications, mining applications and heritage applications.
- Process signage applications.
- Assess and prepare approvals for landscaping plans.
- Compliance monitoring.
- Undertake site visits and write reports.
- Attend meetings and take minutes.
- Liaise with ECO's.
- Filling and administrative tasks.
- Assist members of the public with general environmental, heritage and signage queries.

PROFESSIONAL AFFILIATION:

Member of IAIA (International Association for Impact Assessment)
Member of Association of Professional Heritage Practitioners – Western Cape (APHP)
Professional Member of EAPASA - EAPASA Reg no: 2022/5926

COURSE CONFERENCE PARTICIPATION:

I attended various DEA&DP & IAIA forum workshops, training programmes and conferences since 2008 to date.

PROJECT RECORD TO DATE:

COMPLETION DATE	PROJECT DESCRIPTION	TYPE	APPLICANT:	ROLE:
1 NOVEMBER 2023	THE "CARPENTERS WORKSHOP" ON ERF 18792, SOMERSET WEST	Section 34, NHRA	SHOPRITE CHECKERS (PTY) LTD	Main Author & Researcher of Heritage Statement. Assisted & reviewed by Paul Slabbert Liaised with Authorities & IA&Ps and conducted PPP
29 AUGUST 2023	THE "LOCOMOTIVE SHED" ON ERF 18792, SOMERSET WEST	Section 34, NHRA	SHOPRITE CHECKERS (PTY) LTD	
3 APRIL 2023	ERF 12257, HERMANUS (4 SEA ROAD, "THE KEEP")	Section 34, NHRA & NEMA Applicability Checklist	SERAF DEVELOPMENT 1 (PTY) LTD.	
1 AUGUST 2023	EXPANSION OF THE EXISTING SHOPRITE CHECKERS DISTRIBUTION CENTRE SITUATED ON ERF 8741 WELLS ESTATE, EASTERN CAPE PROVINCE.	AMMENDED EA	EQUITIES PROPERTY FUND LIMITED	<u>Principle EAP:</u> Main Author of all reports (reviewed by Paul Slabbert) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
End 2022	THE WEST POINT PROCESSORS FISH PROCESSING PLANT ERF 1097/3, ST HELENA BAY.	ANNUAL AUDIT REPORT	WEST POINT PROCESSORS	
AUGUST 2022	THE MATROOSBERG 4x4 TRAIL ON THE REMAINDER OF FARM 424 (CERES), PORTION 3 OF FARM 356 (CERES), FARM 355 (CERES), FARM 40 (WOCESTER) & THE REMAINDER OF FARM 57 (WOCESTER), WESTERN CAPE	EMP (OPERATIONAL PHASE)	MATROOSBERG RESERVAAT CC	
OCTOBER 2022	THE PROPOSED EXPANSION/ UPGRADING OF THREE DAMS AND ASSOCIATED INFRASTRUCTURE FOR THE PURPOSES OF ESTABLISHING ORCHARDS AS WELL AS THE CONSTRUCTION OF AN AIRSTRIP, HANGAR AND JETTY ON PORTION 4 OF FARM	BAR/EMP	FULELA TRADE AND INVEST 68 CC.	

	NO. 493 (INHOEK FARM), SWELLENDAM			
NOVEMBER 2022	THE PROPOSED REVERSE OSMOSIS (RO) PLANT AT THE WEST POINT FISH MEAL PROCESSING PLANT, ON ERF 1097, ST HELENA BAY, WESTERN CAPE	BAR/ EMP/ CWDP	WEST POINT PROCESSORS	
MAY 2022, amended AUG 23	REMOVAL OF VEGETATION ON PORTION 3 OF FARM JONKERSRUST, NO. 548, SWELLENDAM	REHAB PLAN	BLOMDAL PLASE PTY LTD	Principle EAP: Main Author of all reports (reviewed by Paul Slabbert) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
APRIL 2022	CAMP SITE ON PORTION 3 OF FARM MICHELS KRAAL NO. 457, SWELLENDAM	REHAB PLAN	KOESANIE TRUST	
27/07/2022	THE PROPOSED EXPANSION OF WEST POINT PROCESSORS, ON ERF 1097, ST HELENA BAY, WESTERN CAPE.	BAR/ EMP/ AEL/ CWDP	WEST POINT PROCESSORS	
End 2021	THE WEST POINT PROCESSORS FISH PROCESSING PLANT ERF 1097/3, ST HELENA BAY.	ANNUAL AUDIT REPORT	WEST POINT PROCESSORS	
NOVEMBER 2020	REMAINDER OF FARM (HOEK VAN DE BERG) NO. 572, HERMANUS: LANDING STRIP REHABILITATION PLAN	AUDIT REPORT	UVA PROPERTIES (PTY) LTD	
AUGUST 2020	THE WEST POINT PROCESSORS FISH PROCESSING PLANT ERF 1097/3, ST HELENA BAY.	CONTINGENCY PLAN	WEST POINT PROCESSORS	
End 2020	THE WEST POINT PROCESSORS FISH PROCESSING PLANT ERF 1097/3, ST HELENA BAY.	ANNUAL AUDIT REPORT	WEST POINT PROCESSORS	
25/11/2019	THE WEST POINT PROCESSORS FISH PROCESSING PLANT ERF 1097/3, ST HELENA BAY.	EXTERNAL AUDIT REPORT	WEST POINT PROCESSORS	Principle EAP: Independent Auditor
22/11/2019	THE PROPOSED CULTIVATION OF LAND ON PORTION 3 OF FARM MELK HOUTE BOSCH NO. 497, SWELLENDAM, WESTERN CAPE	EIA/EMP	JOHANNES EKSTEEN FAMILIETRUST	Principle EAP: Main Author of all reports

14/11/2019	THE UNLAWFUL CONSTRUCTION OF A PIPELINE AND A WEIR IN THE HUISKLOOF RIVER (BOTRIVIER)	24G/EMP	ERIN DE VIGNE (PTY) LTD.	(reviewed by Paul Slabbert) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
16/01/2017	THE CONSTRUCTION OF A COMMERCIAL SHOPPING CENTRE ON PORTION 6 OF FARM BARDALE NO.451 AND PORTION 6 OF FARM AMSTERDAM NO 949, BLUE DOWNS	AMENDMENT	SHOPRITE CHECKERS PROPERTIES (PTY) LTD.	
22/11/2016	THE PROPOSED CONSTRUCTION OF A JETTY, ON PORTION 136 OF FARM 480, MELKHOUTFONTEIN (RIVERSDAL).	BAR/ EMP	FARM KONINGSFONTEIN (PTY) LTD.	
22/08/2016	THE PROPOSED DEVELOPMENT OF AN ADDITIONAL RESERVOIR ON A PORTION OF PORTION 1 OF FARM NO. 888 (LA PARRISSA), PAARL (15/44)	BAR	DRAKENSTEIN MUNICIPALITY	Principle EAP: Main Author of all reports (reviewed by Paul Slabbert) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
20/07/2015	THE PROPOSED CONSTRUCTION OF A RESIDENTIAL DEVELOPMENT ON PORTIONS 9 AND 17 OF THE FARM NO. 681, FIRGROVE	BAR	JANIGENIX (PTY) LTD	
30/04/2015	THE PROPOSED DEMOLISHMENT OF THE EXISTING DWELLING AND THE CONSTRUCTION OF A NEW DWELLING ON ERF 46, CASTLE ROCK (14/39)	SBL	MR ROY JAMES GILES	
06/06/2016	THE PROPOSED RESIDENTIAL ESTATE ON PORTIONS 3, 9 & 14 OF FARM NO. 654, CROYDON, STELLENBOSCH	BAR	JV WILNET (PTY) LTD	
08/09/2014	THE PROPOSED FLAT SIGNAGE TO BE ERECTED ON THE FAÇADE OF BUILDINGS AND AN ENTRANCE WALL LOCATED ON PORTION 477 OF FARM NO 728 JOOSTENBERG VLAKTE 14/35	SIGNAGE APP	LOUGOT PROPERTY INVESTMENTS (PTY) LTD.	Principle EAP compilation & submission of application.

22/03/2016	THE UNLAWFUL CONSTRUCTION OF FACILITIES FOR THE CONCENTRATION OF ANIMALS FOR THE PURPOSE OF COMMERCIAL PRODUCTION (FEEDLOTS) ON PORTION 3 & 8 OF FARM 128 (OSDAM FARM), PIKETBERG 14/27	24G	OSDAM BOERDERY (PTY) LTD.	Principle EAP: Main Author of all reports (reviewed by Doug Jeffery) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
01/12/2015	THE PROPOSED RESIDENTIAL FARMING VILLAGE ON A PORTION OF FARM 1793, SIMONDIUM, PAARL (14/42)	BAR	NIEUWE SION (PTY) LTD.	
30/10/2014	THE UNLAWFUL DECOMMISSIONING OF A SERVICE STATION ON ERF 37366, OMURAMBA DRIVE, MONTAGUE GARDENS.	24G	VAIDRO 184 CC C/O JAN DE MUNCK INC.	
28/01/2015	THE PROPOSED UPGRADE OF MAIN ROAD 281 (DRAAIBERG), VILLIERSDORP (14/14).	BAR	PROVINCIAL GOVERNMENT WESTERN CAPE: DEPARTMENT OF TRANSPORT AND PUBLIC WORKS	
10/11/2015	THE PROPOSED INSTALLATION OF A PEDESTRIAN FOOTBRIDGE AND ASSOCIATED INFRASTRUCTURE OVER THE VYGEKRAAL RIVER ON ERF 32604 LOCATED BETWEEN KEWTOWN AND BRIDGETOWN	BAR	CITY OF CAPE TOWN TRANSPORT PLANNING DEPARTMENT	
11/08/15	THE UNLAWFUL EXPANSION OF TOURIST FACILITIES AND THE CONSTRUCTION OF INFRASTRUCTURE ON PORTION 26 OF FARM NO. 1041, FRANSCHHOEK 14/01.	24G	LA MOTTE WINE ESTATE (PTY) LTD.	
29/04/2014	THE PROPOSED FORMALISATION OF THE STORMWATER DRAINAGE LINE AT KM 1.6 OFF THE KLAASVOOGDS WES ROAD (DR 01368), ROBERTSON 13/35.	BAR	CAPE WINELANDS DISTRICT MUNICIPALITY	
24/01/2014	THE PROPOSED ADDITIONS TO THE EXISTING DWELLING, ERF	SBL	MR. GEORGE P	Principle EAP:

	5599, BETTY'S BAY		DALL	Main Author of all reports (reviewed by Doug Jeffery) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
07/01/2014	THE PROPOSED ALTERATIONS AND ADDITIONS TO THE EXISTING BUNGALOW ON ERF 490, THE RIDGE, CLIFTON.	SBL	MR.& MS. C. WIESE	
10/12/2014	THE PROPOSED CONSTRUCTION OF A WASTE RECYCLING FACILITY ON PORTION 660 OF FARM NO. 454, WIMBLEDON ESTATE, BLACKHEATH.	BAR	RE-ETHICAL ENVIRONMENTAL RE-ENGINEERING (KZN) (PTY) LTD.	
04/03/2014	THE PROPOSED DEMOLITION OF AN EXISTING DWELLING AND CONSTRUCTION OF A SINGLE RESIDENTIAL DWELLING AND ASSOCIATED INFRASTRUCTURE ON ERF 45, BANTRY BAY.	SBL	MR.S. B. UPPINK	
30/03/2016	THE PROPOSED DEVELOPMENT OF AN ADDITIONAL DWELLING ON PORTION 99 OF FARM 559 SKILPADVLEI, PRINGLE BAY 13/02	BAR	SKILPADVLEI FARM (PTY) LTD.	
14/11/2014	UNLAWFUL CONSTRUCTION OF A TRACK FOR THE TESTING AND RECREATIONAL USE OF MOTOR POWERED VEHICLES ON THE REMAINDER OF FARM 1610, FRANSCHHOEK (13/23)	24G	L'ORMARINS (PTY) LTD.	
19/03/2015	THE UNLAWFUL CONSTRUCTION OF A SLAGMENT PLANT AND A CEMENT BLENDING PLANT ON PORTION 656, 664 AND 665 OF FARM WIMBLEDON NO. 454, BLACKHEATH	24G	MR WILLIE SCHEEPERS	
10/10/2014	THE PROPOSED ESTABLISHMENT OF THE SITARI LIFESTYLE ESTATE ON ERF 1840, CROYDON IN THE HELDERBERG.	EIA/ AMENDMENT	SITARI COUNTRY ESTATE (PTY) LTD	
10/06/2014	THE UNLAWFUL COMMENCEMENT OF A LISTED ACTIVITY: THE INFILLING OF A WETLAND ON PORTION 10 OF FARM 654, CROYDON, STELLENBOSCH	24G	JV WILNET (PTY) LTD	Principle EAP: Main Author of all reports (reviewed by Doug Jeffery) Liaised with
28/11/2014	THE UNLAWFUL COMMENCEMENT Of A LISTED ACTIVITY: DISPOSAL Of WASTE TO LAND ON PORTION 14 OF FARM 654, CROYDON, STELLENBOSCH	24G	JV WILNET (PTY) LTD	

11/11/2014	THE PROPOSED DEMOLITION OF THE EXISTING RESIDENTIAL DWELLING AND ASSOCIATED INFRASTRUCTURE AND THE CONSTRUCTION OF A NEW RESIDENTIAL DWELLING AND ASSOCIATED INFRASTRUCTURE ON ERF 2595, GLEN BEACH, CAMPS BAY.	SBL	MR N. M. PHILLIPS	Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
03/06/2013	THE ESTABLISHMENT OF THE HERITAGE PARK RETIREMENT VILLAGE ON A PORTION OF THE FARM ONVERWACHT NO. 811 AND A PORTION OF THE FARM DIE BOS NO. 810, SOMERSET WEST (AN 231 /25/4 FARM 810 AND 811, SOMERSET WEST)	AMENDMENT	MR. S. H. EHLERS	
22/10/2012	THE PROPOSED FLAT 'LETTER' SIGN TO BE ERECTED ON THE FAÇADE OF A BUILDING LOCATED ON ERF 160462, RIEBEEK STREET, CAPE TOWN CBD.	SIGNAGE APP	ATTERBURY INVESTMENTS HOLDINGS LTD	<u>Principle EAP</u> compilation & submission of application.
18/01/2013	THE PROPOSED NEW SINGLE RESIDENTIAL DWELLING ON ERF 27, CASTLE ROCK, SIMON'S TOWN	BAR	MR AND MRS HUGH AND JENNIFER HERMAN	<u>Principle EAP:</u> Main Author of all reports (reviewed by Doug Jeffery) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
23/11/2012	THE PROPOSED UPGRADING OF THE R304 (KOELENHOF ROAD), STELLENBOSCH.	BAR	STELLENBOSCH MUNICIPALITY	
25/09/2014	THE UNLAWFUL RECONSTRUCTION AND EXPANSION OF AN IN-STREAM DAM ON PORTION 15 OF FARM NO. 1646, TWO RIVERS FARM, FRANSCHOEK	24G	TWO RIVERS FARMS AND GARDENS (PTY) LTD	
19/08/2013	THE PROPOSED UPGRADING OF THE MEDIUM VOLTAGE DISTRIBUTION NETWORK BETWEEN CLOVELL Y AND SIMONSTOWN	BAR	CITY OF CAPE TOWN: ELECTRICITY DIRECTORATE	
16/01/2013	THE PROPOSED GREEN TECHNOLOGY MANUFACTURING CLUSTER INDUSTRIAL DEVELOPMENT AND ASSOCIATED INFRASTRUCTURE ON PORTION 4 AND PORTION 1 Of FARM 1183, ATLANTIS.	BAR	CITY OF CAPE TOWN	

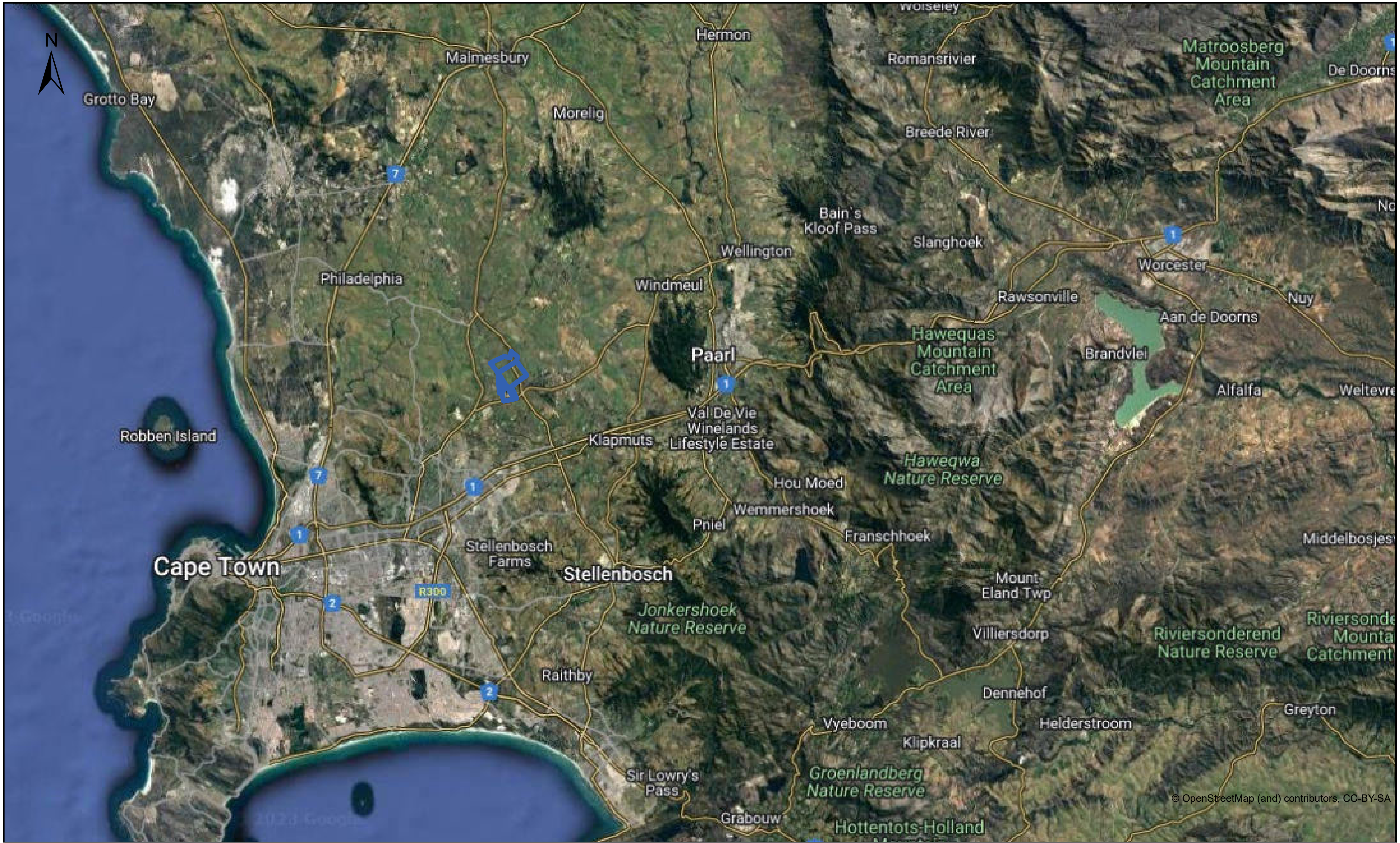
16/01/2013	THE PROPOSED GREEN TECHNOLOGY MANUFACTURING CLUSTER INDUSTRIAL DEVELOPMENT AND ASSOCIATED INFRASTRUCTURE ON PORTION O OF FARM CA1183 AND PORTION 93 OF FARM CA4, ATLANTIS.	BAR	CITY OF CAPE TOWN	
26/09/2014	THE UNLAWFUL COMMENCEMENT OF A LISTED ACTIVITY: DREDGING OF A CHANNEL IN THE KLEIN RIVER ESTUARY, CONSTRUCTION OF A WALKWAY AND THE PROPOSED CONSTRUCTION OF A JETTYY ON PORTION 1 OF FARM NO. 723, WORTELGAT, HERMANUS	24G	HERMANUS RIVIERA ESTATES CC TRADING AS MOSAIC PRIVATE SANCTUARY	
28/05/2012	THE PROPOSED FLAT SIGN TO BE ERECTED ON THE FAÇADE OF A BUILDING LOCATED ON ERF 3316, VICTORIA STREET, SOMERSET WEST.	SIGNAGE APP	BEAV INVESTMENT HOLDINGS	<u>Principle EAP</u> compilation & submission of application.
08/02/2012	THE PROPOSED FLAT SIGN TO BE ERECTED ON THE FAÇADE OF A BUILDING LOCATED ON ERF 12715, PHILLIPI.	SIGNAGE APP	CASHBUILD	
20/02/2012	THE PROPOSED CHICKEN HOUSES ON THE REMAINDER OF FARM NO. 403, TULBAGH DIVISION AND FARM NO. 201/3, PAARL DIVISION.	NID	KLEIN VALLEI (PTY) LTD	
19/06/2012	THE THEMBOKWEZI RESIDENTIAL DEVELOPMENT ON ERF NO. 51097, KHAYELITSHA, CAPE TOWN.	AMENDMENT	OLD MUTUAL PROPERTY (PTY) LTD	<u>Principle EAP:</u> assisted by Doug Jeffery Main Author of all reports (reviewed by Doug Jeffery) Liaised with Authorities,
12/04/2011 07/03/2014	THE PROPOSED RESIDENTIAL DEVELOPMENT ON ERF 4694 (MILKWOOD RISE), KOMMETJIE.	AMENDMENT	THE KOMMETJIE ESTATES (PTY) LTD	
25/11/2014	THE PROPOSED ESTABLISHMENT OF RESIDENTIAL ERVEN ON THE REMAINDER OF FARM NO. 948, KOMMETJIE	BAR	THE KOMMETJIE ESTATES LIMITED	
12/07/2013	PROPOSED UPGRADE AND EXTENTION OF THE WELLINGTON WASTEWATER TREATMENT WORKS.	EIA	DRAKENSTEIN MUNICIPALITY	
30/03/2011	CULTIVATION OF VIRGIN SOIL ON PORTIONS 11 AND 21 OF	BAR	SPRINGFIELD	

	FARM NO. 11.2, SPRINGFIELD ESTATE, ROBERTSON		ESTATE VINEYARDS (PTY} LTD	Organs of State, Public Consultation and Specialists Conducted PPP
25/11/2010	THE PROPOSED CHANGE OF LAND USE FROM ZONED UNDETERMINED TO ESTABLISH MALIBONGWE PARK RESIDENTIAL AREA ON THE REMAINDER OF ERF 830, PELICAN PARK	AMENDMENT	THE DEPARTMENT OF HUMAN SETTLEMENTS	
01/07/2014	THE PROPOSED UPGRADE OF THE WASTEWATER TREATMENT WORKS "WWTW" AT THE 'OLOF BERGH' DISTELLERY, GOUDINI	EIA	DISTELL (PTY) LTD	
19/10/2010	THE PROPOSED FLAT SIGN TO BE ERECTED ON THE FAÇADE OF A BUILDING LOCATED ON ERF 173335, PAARDEN EILAND.	SIGNAGE APP	FRANCIS CONSULTANTS (TOWN PLANNERS)	compilation & submission of application.
29/03/2012	THE TOWNSHIP DEVELOPMENT ON ERF NO. 56719, PHENDULA CRESENT, KHAYELITHSA.	AMENDMENT	JUBELIE PROJECT MANAGEMENT (PTY) LTD	Secondary EAP Main Author of all reports (reviewed by Doug Jeffery) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
08/02/2013	THE PROPOSED UPGRADE OF THE VILLIERSDORP WASTE WATER TREATMENT WORKS	EIA/ WASTE LICENSE	THEEWATERSKLOOF MUNICIPALITY	
30/01/2015	THE PROPOSED DEVELOPMENT OF A RETIREMENT VILLAGE AND ASSOCIATED INFRASTRUCTURE ON THE REMAINDER OF ERF 61, SIMONS TOWN	BAR	THE ROTARY CLUB OF CAPE TOWN	
12/05/2011	THE CONSTRUCTION OF A RESIDENCE ON ERF 52, LOVERS WALK, ROOIELS	24G	MIKE LEVETT	
24/10/2016	THE UNLAWFUL COMMENCEMENT OF LISTED ACTIVITIES: UNLAWFUL COMMENCEMENT OF LISTED ACTIVITIES TO ESTABLISH AN AGRI-PARK ON PORTION 128 OF FARM 468, STELLENBOSCH	24G	OLD ABLAND (PTY) LTD	
22/06/2011	THE RECTIFICATION OF THE UNLAWFUL CONSTRUCTION OF AN AIRSTRIP ON FARM NO. 417, GROOTVLEI, TULBAGH	24G	KARWEIDERSKRAAL TRUST	

19/11/2007	PROPOSED RESIDENTIAL DEVELOPMENT ON ERF NO. 1491, HAGLEY, BLUE DOWNS	AMENDMENT	MEIPROPS 22 (PTY) LTD	
27/07/2010	THE ESTABLISHMENT OF A SERVICE TRADE AREA ON FARM GROENFONTEIN NO. 716/16, PAARL	BAR	HELU PARK (PTY) LTD	
09/06/2010	THE DEVELOPMENT OF A RETIREMENT VILLAGE ON ERF NO.1738, MONTAGU	BAR	REALTY DYNAMIX 104 (PTY) LTD	
22/08/2011	UPGRADE OF THE DWARSKERSBOS SEWERAGE TREATMENT WORKS: PORTION 4 OF THE FARM 109 DWARSKERSBOS, BERGRIVIER MUNICIPALITY	EIA	BERGRIVIER MUNICIPALITY	
20/06/2012	THE DEVELOPMENT ON MEERENDAL PORTION 1 OF FARM NO. 159, DURBANVILLE.	BAR	MEERENDAL WINE ESTATE (PTY) LTD	<u>Secondary EAP</u> Main Author of all reports (reviewed by Doug Jeffery) Liaised with Authorities, Organs of State, Public Consultation and Specialists Conducted PPP
16/03/2011	CONSTRUCTION OF A SEWERAGE PIPELINE TO SERVE DRIFTSANDS	BAR	CITY OF CAPE TOWN	
24/11/2009	THE REZONING AND SUBDIVISION OF ERF NO. 21973, KHAYELITSHA	BAR	NU-WAY HOUSING DEVELOPMENTS (PTY) LTD	
24/11/2010	DAL JOSAFAT DEVELOPMENT ON ERF NO. 16161 AND REMAINDER OF ERF NO. 17680, PAARL	EIA	ERF 16161 PAARL DEVELOPMENT (PLY} LID	
21/07/2009	THE PROPOSED USE AND/OR DISPOSAL OF SEDIMENT FROM ZEEKOEVLEI, CAPE FARM NOS. 848-0, 840-1, 847-01, 846-0, 844-31, 837-0, 838-0 AND ERF 93284, ZEEKOEVLEI NATURE RESERVE	BAR	CITY OF CAPE TOWN	

ANNEXURE 2: LOCALITY PLAN

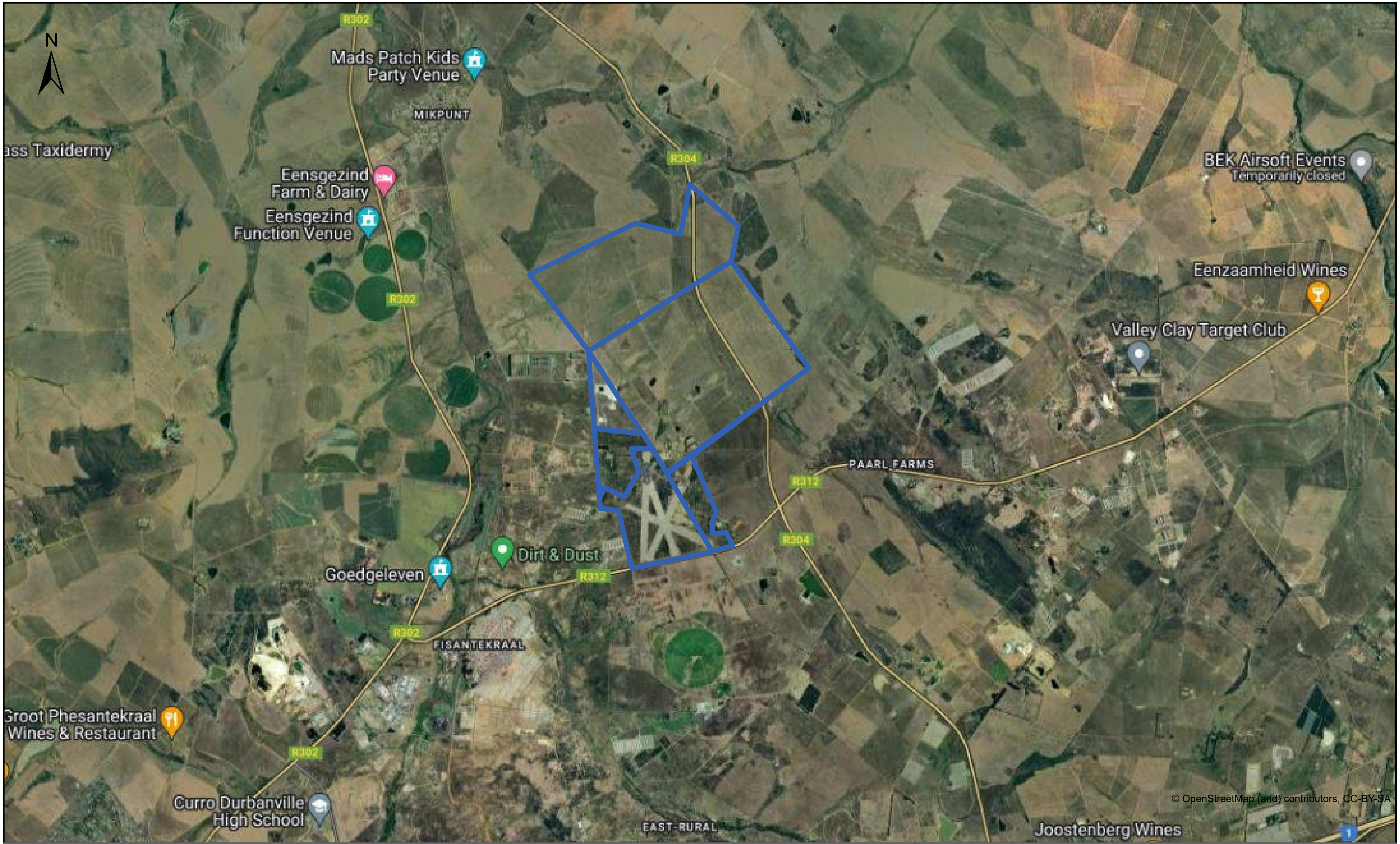
Location of CWA (cadastrals shown in blue outline



Date created: 2023/10/15

Western Cape Government FOR YOU

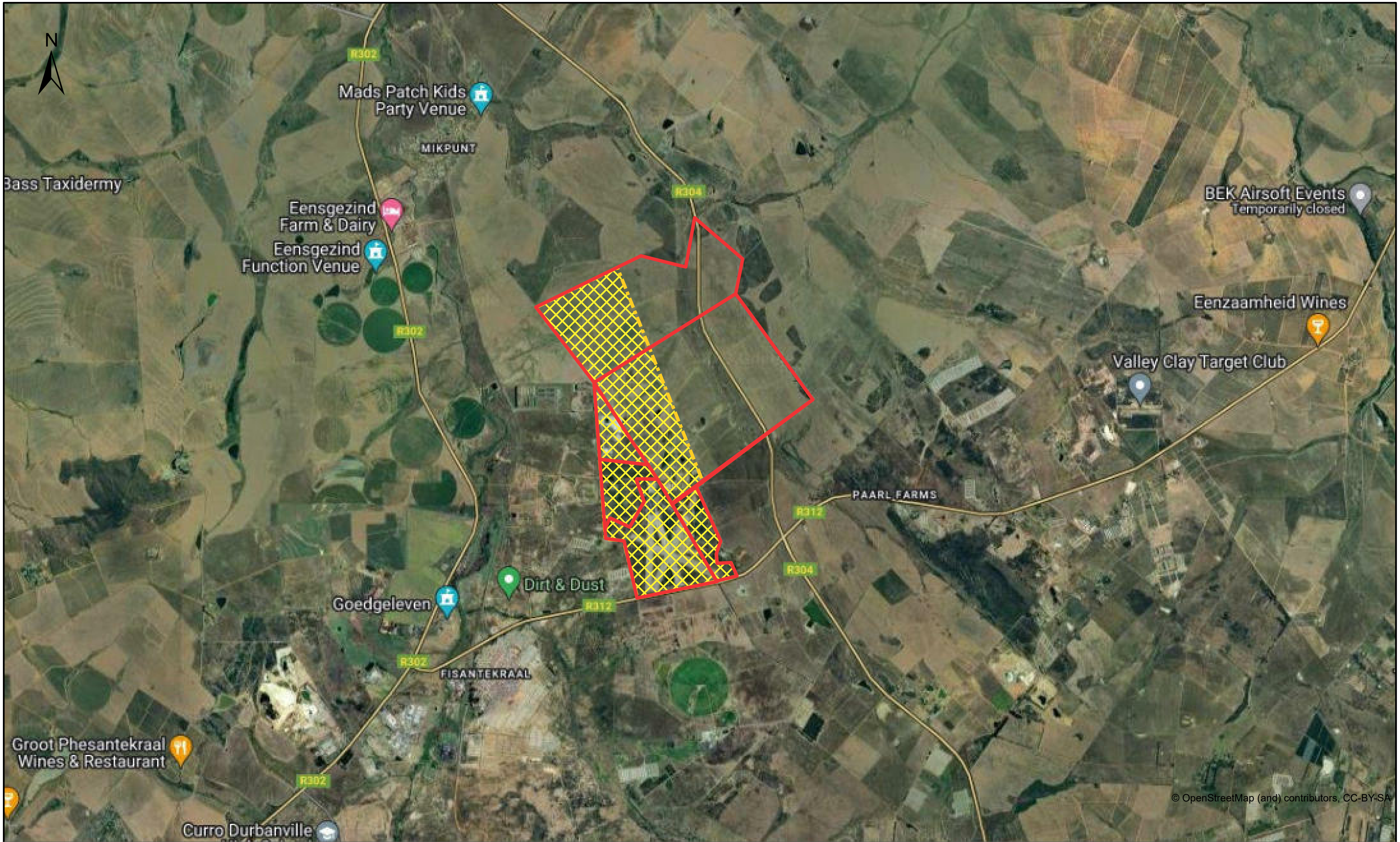
Location of CWA (cadastrals shown in blue outline)



Date created: 2023/10/15

Western Cape Government
FOR YOU

Development area CWA (yellow hatched area)

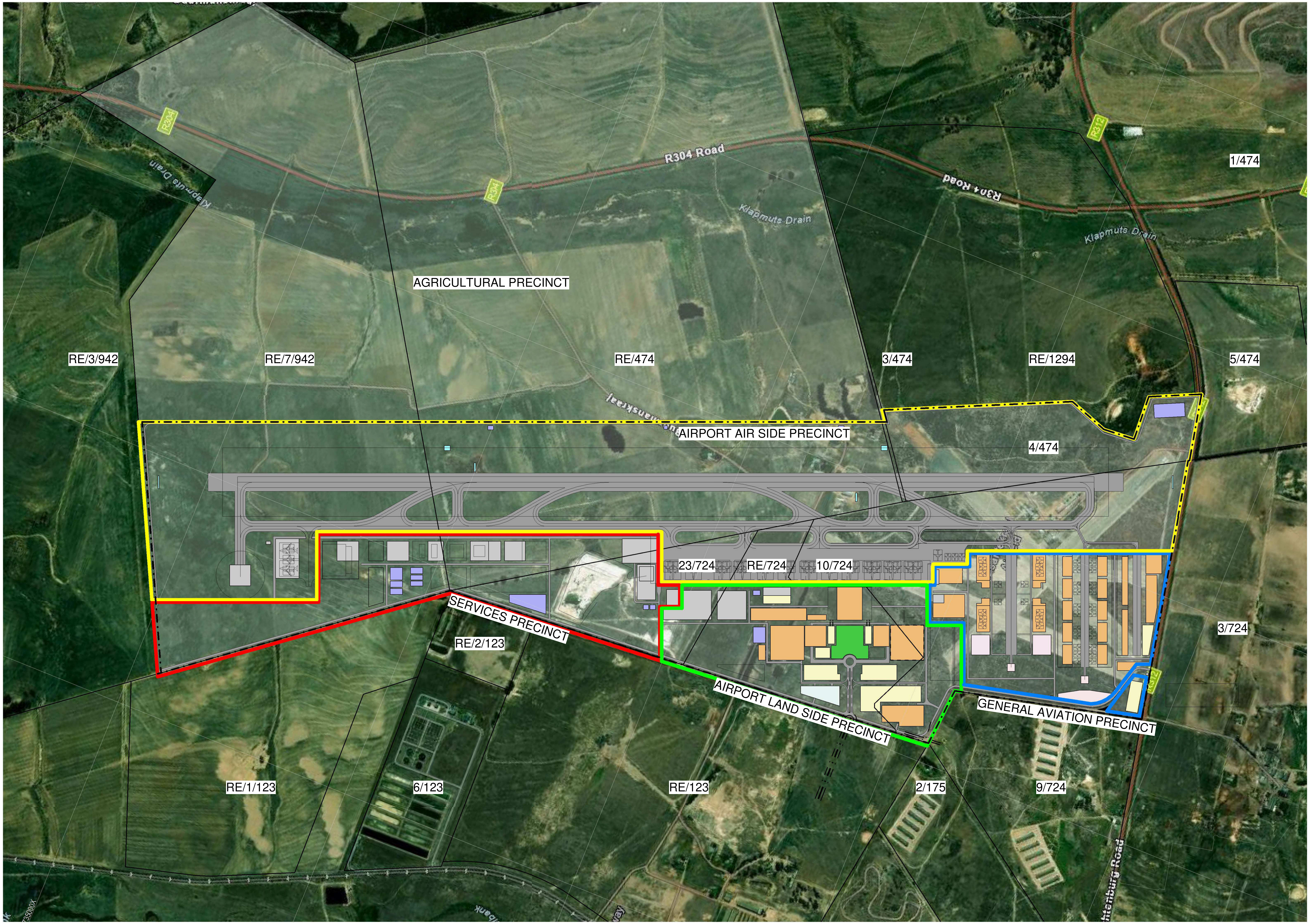


Date created: 2023/10/15

0 0.4 0.8 1.6 2.4 3.2 4 km

Western Cape Government
FOR YOU

ANNEXURE 3A: SITE DEVELOPMENT PLAN



SITE PLAN - PHASE 1

0 62.5 m 125.0 m 250.0 m

SCALE: 1:5000

GENERAL NOTES

* ALL BUILDING WORK AND BUILDING REQUIREMENTS ARE TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL BUILDING REGULATIONS AND BUILDING STANDARDS ACT (No 103 OF 1977).
* THIS DRAWING IS NOT TO BE SCALED. USE FIGURED DIMENSIONS ONLY.
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* ANY DISCREPANCIES, QUERIES, ETC., RELATED TO THIS DRAWING ARE TO BE REFERRED TO CAPEX PROJECTS, BEFORE ANY WORK IS COMMENCED.
* REINFORCED CONCRETE AND STRUCTURAL STEELWORK IS TO BE IN ACCORDANCE WITH THE STRUCTURAL ENGINEER'S DESIGN AND SPECIFICATIONS.

DRAINAGE NOTES

* ALL DRAINAGE RUNS TO BE ACCESSIBLE ALONG THEIR ENTIRE LENGTH.
* V.P.'s TO BE CARRIED UP TO 2m ABOVE ANY WINDOW OR DOOR OPENING IN THE BUILDING OR ANY OTHER BUILDING WITHIN A DISTANCE OF 6m.
* INSPECTION EYES (i.e.'s) TO BE PROVIDED AT ALL BENDS AND JUNCTIONS OF SOIL AND WASTE PIPES.
* RODDING EYES (r.e.'s) TO BE PROVIDED AT HEADS OF DRAINS AND AT A MAXIMUM OF 25m SPACINGS ALONG RUNS OF DRAINS.
* MARKED COVERS TO BE PROVIDED AT GROUND LEVEL FOR i.e's BELOW PAVING
* RESEAL TRAPS TO BE PROVIDED TO ALL WASTE FITTINGS.
* SOIL WATER DRAINS PASSING UNDER BUILDINGS TO BE ENCASED IN 150mm CONCRETE ALL ROUND AND BE PROVIDED WITH r.e.'s AS CLOSE TO THE BUILDING AS POSSIBLE AT BOTH ENDS.
* SOIL WATER PIPES HAVING A VERTICAL DROP EXCEEDING 1200mm TO THE MAIN DRAIN TO BE ANTI-SYPHONED.
* ALL BRANCH DRAINS EXCEEDING 6m IN LENGTH TO BE VENTED.
* uPVC PIPES ARE TO BE LAID IN ACCORDANCE WITH THE MANUFACTURERS TECHNICAL SPECIFICATIONS.

FIRE DEPARTMENT'S REQUIREMENTS

* ALL WORK IS TO COMPLY WITH SABS 400.
* a) EXTINGUISHERS TO BE INSTALLED IN ACCORDANCE WITH SABS 0105.
  b) HOSE REELS TO BE INSTALLED IN ACCORDANCE WITH SABS 543.
  c) HYDRANTS TO BE INSTALLED IN ACCORDANCE WITH SABS 1128 PART 1.
* PORTABLE FIRE EXTINGUISHERS TO BE HUNG ON PURPOSE MADE BOARDS AND LOCATED IN SECURE POSITIONS AS INDICATED ON PLAN.
* CLASS "B" FIRE DOORS TO COMPLY WITH SABS 1253 AND TO BE FITTED WITH APPROVED SELF CLOSING OR AUTOMATIC CLOSING DEVICES.
* STRUCTURAL ELEMENTS AND COMPONENTS TO COMPLY WITH TT7.
* FIRE EXIT DOORS ARE TO BE FITTED WITH EMERGENCY EXIT LOCKSETS.
* SYMBOLIC SAFETY SIGNS TO BE IN ACCORDANCE WITH S.A.B.S. CODE 1186 AND POSITIONED AS REQUIRED BY THE FIRE DEPARTMENT.

Rev	Description	Revision Date
9	ISSUED - BOUNDARY FENCE LINE ADJUSTED	2024-08-20
8	ISSUED - PHASE 1 UPDATED	2024-08-19
7	ISSUED FOR COMMENT	2024-08-15
6	ROADS UPDATED	2024-08-15
5	ISSUED FOR REVIEW	2024-08-14
4	Added ATCT and Helipad	2024-05-24
3	FOR REVIEW	2024-04-10
2	FOR REVIEW	2024-04-03
1	FOR REVIEW	2024-04-03

CAPEX PROJECTS
UNIT 10 First Floor
BOSKRUIN BUSINESS PARK
BOSKRUIN
cnr Kelly & Bosbok street
2188

Tel: 011 792 4260/ 8169

CLIENT

CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

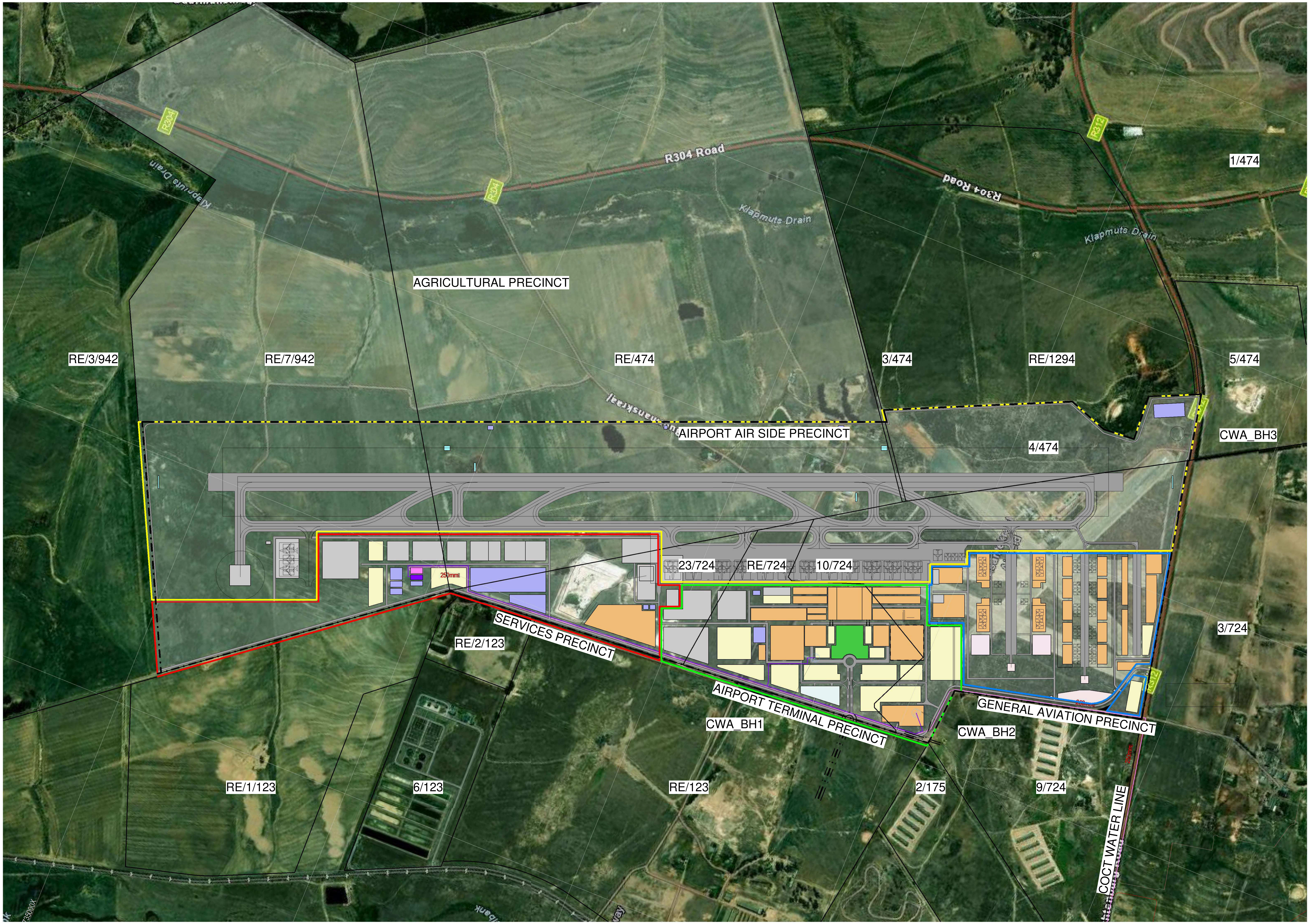
SACAP NO: ..

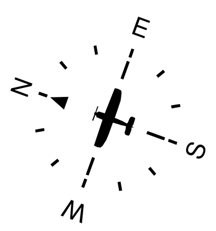
CLIENT
ENVIRONMENTAL CONSULTANT

TITLE
PHASE 1

DRAWING
CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 408	9
SCALE 1 : 5000	DATE 2024-08-20	DRAWN BY: CW DENNIS





SITE PLAN - PHASE 2

0 62.5 m 125.0 m 250.0 m

SCALE: 1:5000

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* RODDING EYES (r.e.'s) TO BE PROVIDED AT HEADS OF DRAINS AND AT A MAXIMUM OF 25m SPACINGS ALONG RUNS OF DRAINS.
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* RESEAL TRAPS TO BE PROVIDED TO ALL WASTE FITTINGS.
* SOIL WATER DRAINS PASSING UNDER BUILDINGS TO BE ENCASED IN 150mm CONCRETE ALL ROUND AND BE PROVIDED WITH r.e.'s AS CLOSE TO THE BUILDING AS POSSIBLE AT BOTH ENDS.
* SOIL WATER PIPES HAVING A VERTICAL DROP EXCEEDING 1200mm TO THE MAIN DRAIN TO BE ANTI-SYPHONED.
* ALL BRANCH DRAINS EXCEEDING 6m IN LENGTH TO BE VENTED.
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FIRE DEPARTMENT'S REQUIREMENTS

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  c) HYDRANTS TO BE INSTALLED IN ACCORDANCE WITH SABS 1128 PART 1.
* PORTABLE FIRE EXTINGUISHERS TO BE HUNG ON PURPOSE MADE BOARDS AND LOCATED IN SECURE POSITIONS AS INDICATED ON PLAN.
* CLASS "B" FIRE DOORS TO COMPLY WITH SABS 1253 AND TO BE FITTED WITH APPROVED SELF CLOSING OR AUTOMATIC CLOSING DEVICES.
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CAPEX PROJECTS
UNIT 10 First Floor
BOSKRUIN BUSINESS PARK
BOSKRUIN
cnr Kelly & Bosbok street
2188
Tel: 011 792 4260/ 8169

CLIENT

CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

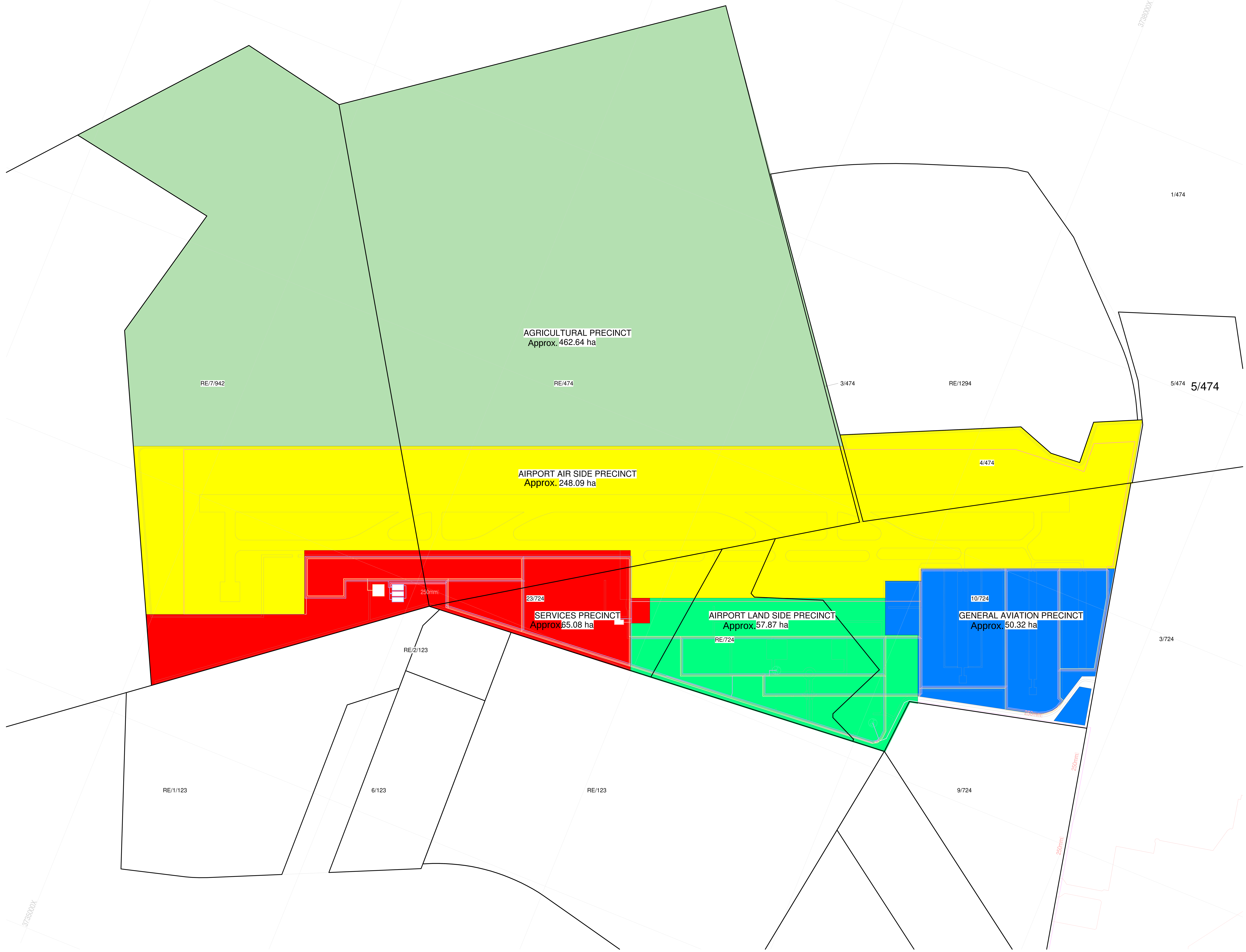
SACAP NO: ..

CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 2

DRAWING: CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 400	16
SCALE 1 : 5000	DATE 2025-01-23	DRAWN BY: CW DENNIS



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Rev	Description	Revision Date
3	AMENDMENT TO ARGICULTURAL PRECINCT AREA	2025-03-14
2	ha ADDED TO AREAS	2025-03-14
1	PHASE 2 KEY PLAN CREATED	2025-03-13

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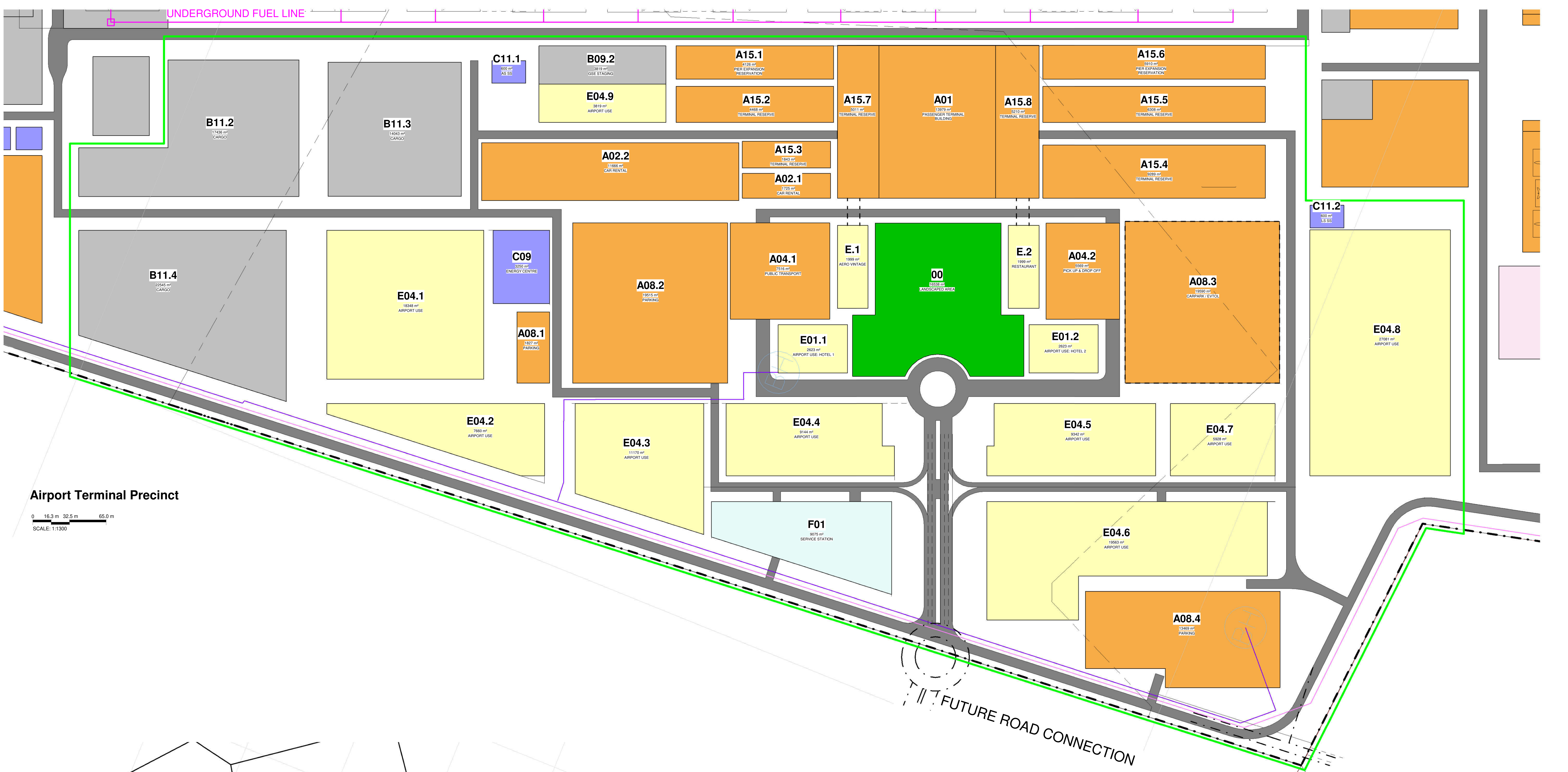
PHASE 2 KEY PLAN

DRAWING
CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 405	3

SCALE 1 : 5000 | DATE 2025-03-14 | DRAWN BY: CW DENNIS



56.54 ha

Name	Occupancy	Plot Area
00	LANDSCAPED AREA	16538 m²
A01	PASSENGER TERMINAL BUILDING	13979 m²
A02.1	CAR RENTAL	1725 m²
A02.2	CAR RENTAL	11666 m²
A04.1	PUBLIC TRANSPORT	7516 m²
A04.2	PICK UP & DROP OFF	5569 m²
A08.1	PARKING	1827 m²
A08.2	PARKING	19515 m²
A08.3	CARPARK / EVTOL	19590 m²
A08.4	PARKING	13469 m²
A15.1	PIER EXPANSION RESERVATION	4126 m²
A15.2	TERMINAL RESERVE	4468 m²
A15.3	TERMINAL RESERVE	1843 m²
A15.4	TERMINAL RESERVE	9289 m²
A15.5	TERMINAL RESERVE	6308 m²
A15.6	PIER EXPANSION RESERVATION	5910 m²
A15.7	TERMINAL RESERVE	5011 m²
A15.8	TERMINAL RESERVE	5210 m²

Name	Occupancy	Plot Area
B09.2	GSE STAGING	3819 m²
B11.2	CARGO	17436 m²
B11.3	CARGO	14043 m²
B11.4	CARGO	22545 m²

Name	Occupancy	Plot Area
C09	ENERGY CENTRE	3250 m²
C11.1	AS SS	600 m²
C11.2	LS SS	600 m²
E01.1	AIRPORT USE: HOTEL 1	2623 m²
E01.2	AIRPORT USE: HOTEL 2	2623 m²
E04.1	AIRPORT USE	18348 m²
E04.2	AIRPORT USE	7660 m²
E04.3	AIRPORT USE	11170 m²
E04.4	AIRPORT USE	9144 m²
E04.5	AIRPORT USE	9342 m²
E04.6	AIRPORT USE	19563 m²
E04.7	AIRPORT USE	5928 m²
E04.8	AIRPORT USE	27081 m²
E04.9	AIRPORT USE	3819 m²
E.1	AERO VINTAGE	1999 m²
E.2	RESTAURANT	1999 m²
F01	SERVICE STATION	9075 m²

MRO	Maintenance Repairs and Operations
FBO	Fixed Based Operators
GA	General Aviation
GSE	Ground Support Equipment
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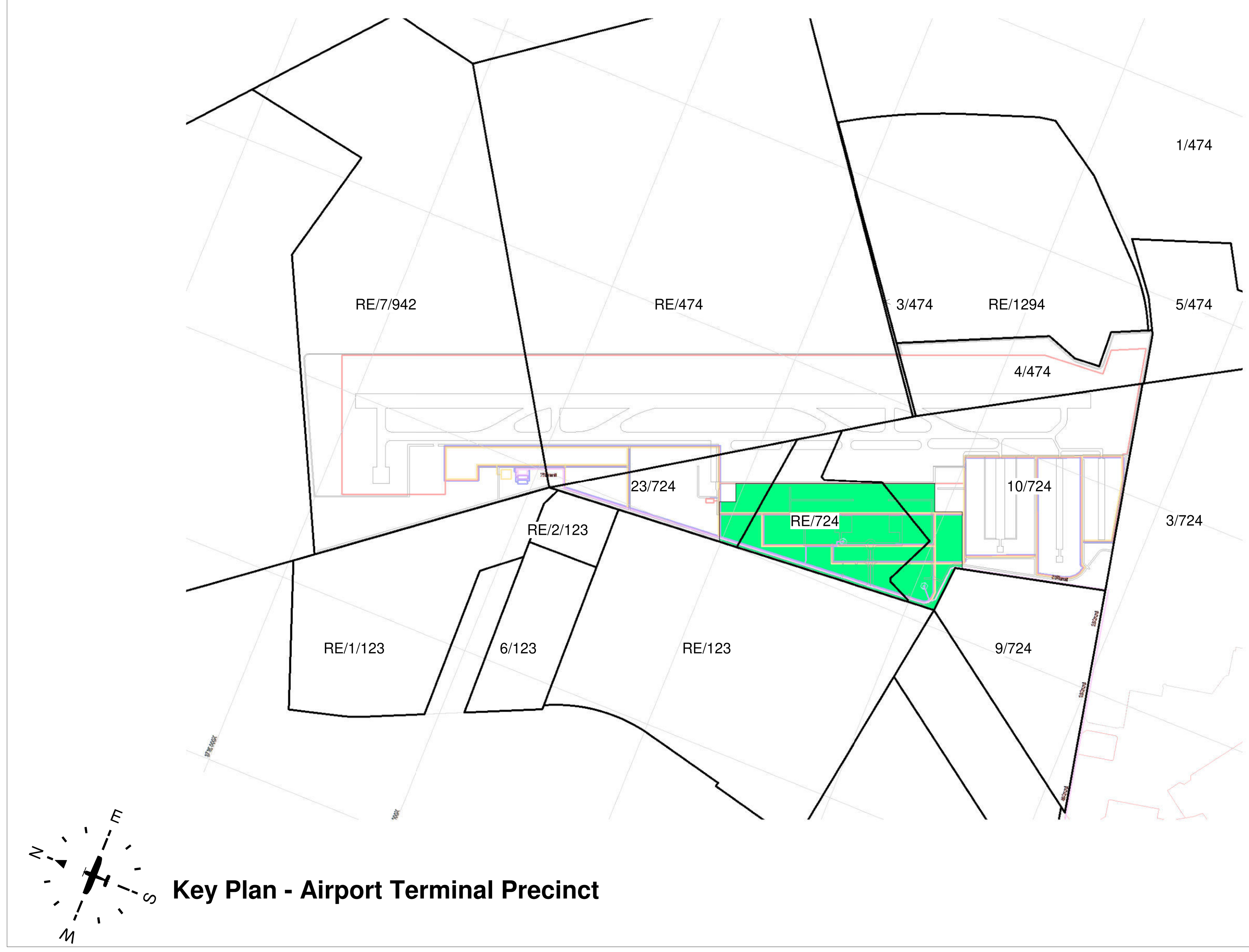

Key Plan - Airport Terminal Precinct

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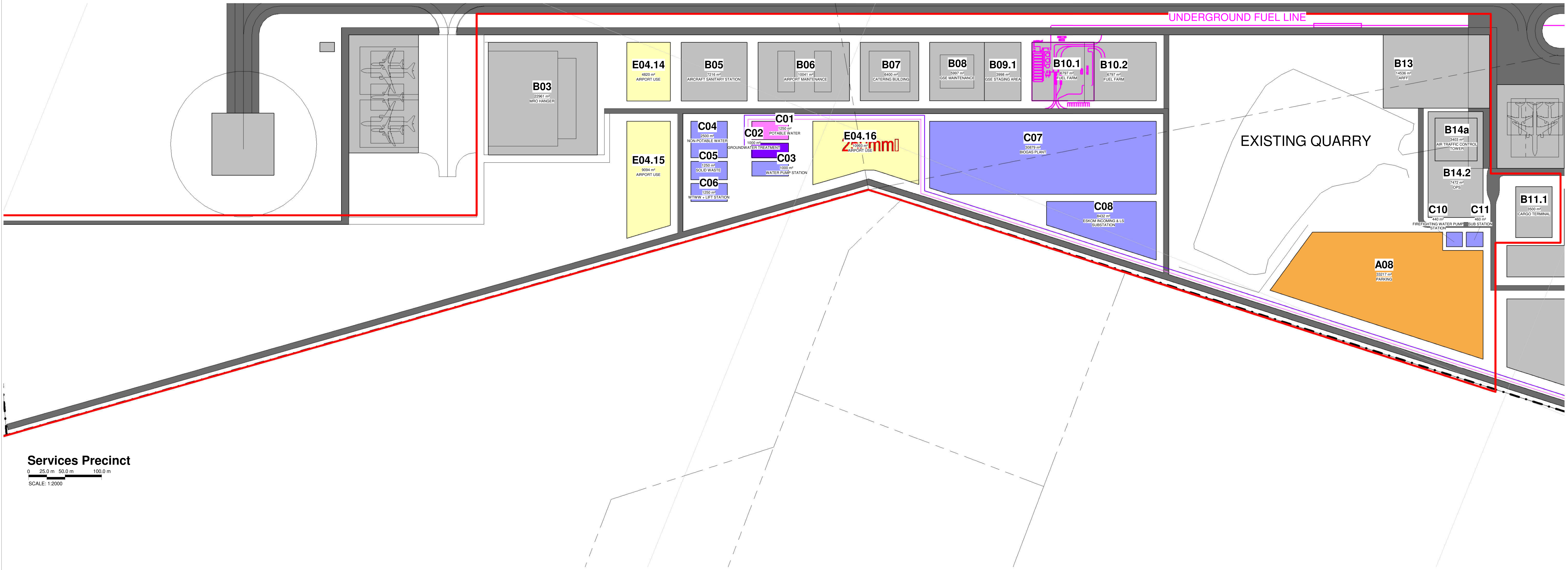
TITLE
PHASE 2 TERMINAL PRECINCT

DRAWING
CWA - PRECINCT PLANS

SIZE		DWG NO	REV
A0		2024-3297 401	16
SCALE	As indicated	DATE 2025-01-23	DRAWN BY: CW DENNIS



Services Precinct

0 25.0 m 50.0 m 100.0 m

SCALE: 1:2000

64.49 ha

Name	Occupancy	Plot Area
A08	PARKING	33217 m²
B03	MRO HANGER	22961 m²
B05	AIRCRAFT SANITARY STATION	7216 m²
B06	AIRPORT MAINTENANCE	10041 m²
B07	CATERING BUILDING	6400 m²
B08	GSE MAINTENANCE	5997 m²
B09.1	GSE STAGING AREA	3998 m²
B10.1	FUEL FARM	6797 m²
B10.2	FUEL FARM	6797 m²
B11.1	CARGO TERMINAL	3500 m²
B13	ARFF	14536 m²
B14.2	OPS	7472 m²
B14a	AIR TRAFFIC CONTROL TOWER	3403 m²

Name	Occupancy	Plot Area
C01	POTABLE WATER	1250 m²
C02	GROUNDWATER TREATMENT	1000 m²
C03	WATER PUMP STATION	1000 m²
C04	NON-POTABLE WATER	2500 m²
C05	SOLID WASTE	1250 m²
C06	WTWW + LIFT STATION	1250 m²
C07	BIOGAS PLANT	30879 m²
C08	ESKOM INCOMING & LS SUBSTATION	8432 m²
C10	FIREFIGHTING WATER PUMP STATION	440 m²
C11	SUB STATION	460 m²

Name	Occupancy	Plot Area
E04.14	AIRPORT USE	4820 m²
E04.15	AIRPORT USE	9094 m²
E04.16	AIRPORT USE	10993 m²

MRO	Maintenance Repairs and Operations
FBO	Fixed Based Operators
GA	General Aviation
GSE	Ground Support Equipment
ARFF	Aircraft Rescue and Firefighting
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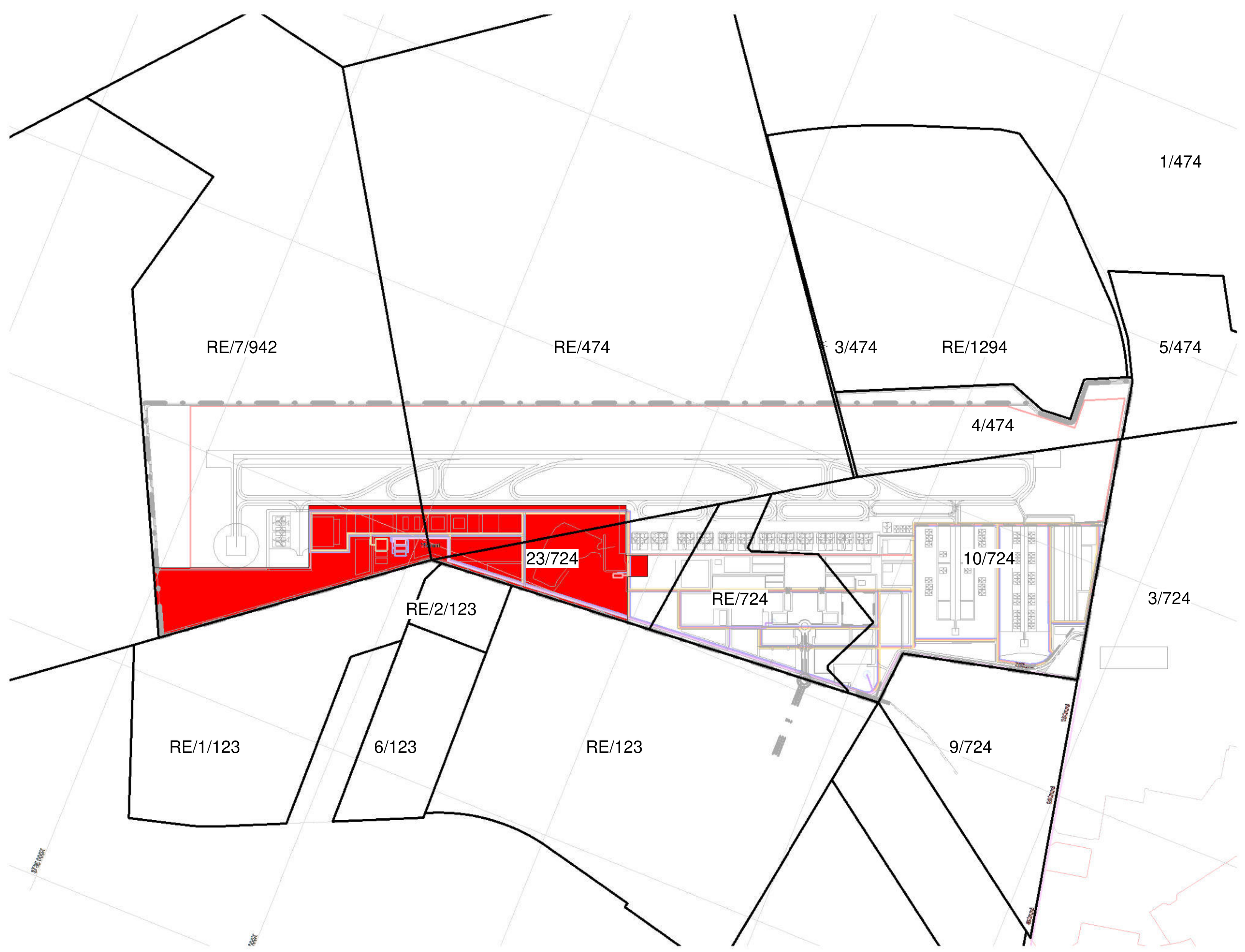

Key Plan - Services Precinct

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PHASE 2 SERVICES PRECINCT

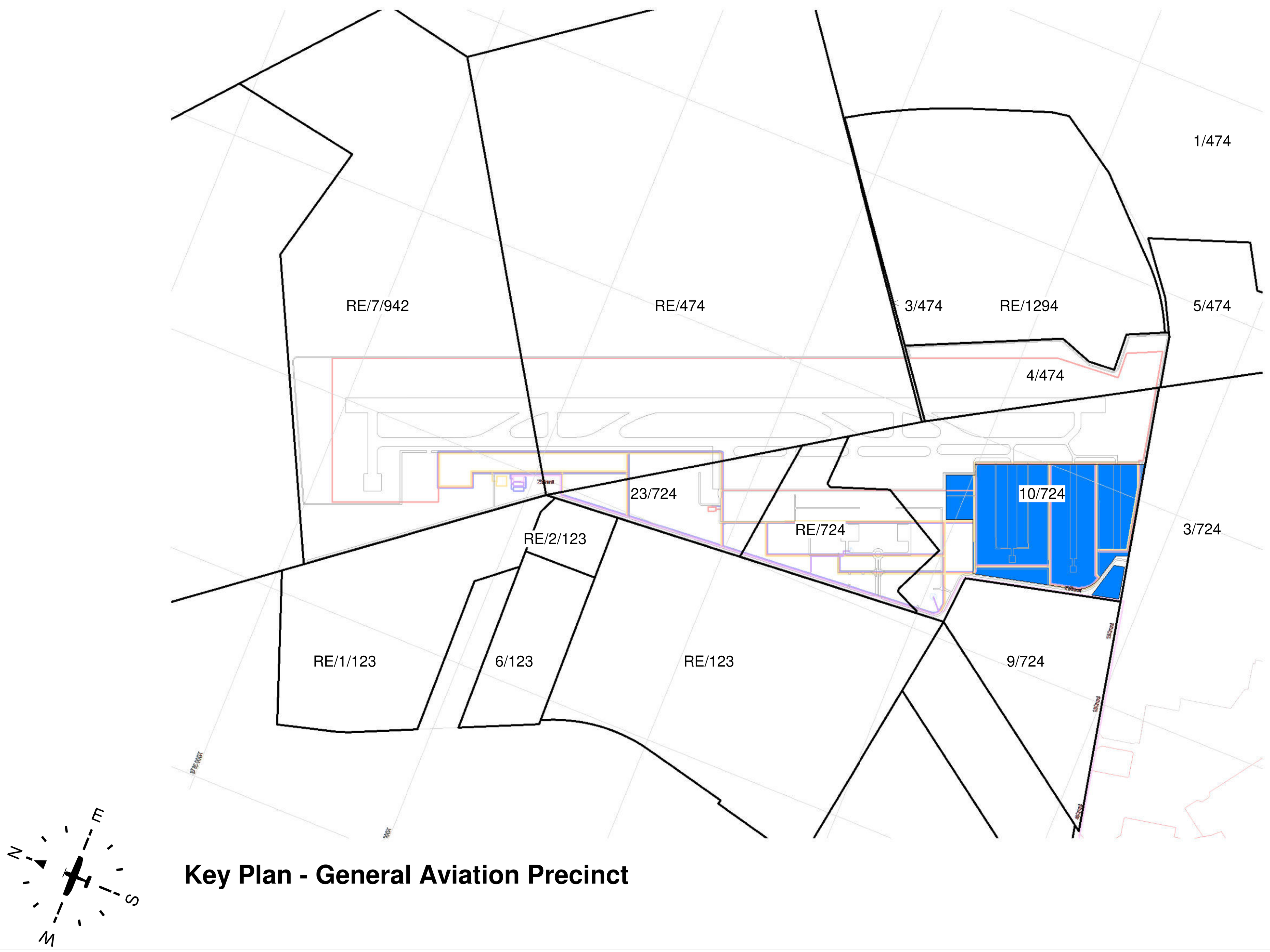
DRAWING
CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 402	16

SCALE As indicated | DATE 2025-01-23 | DRAWN BY: CW DENNIS

General Aviation Precinct

49.10 ha



Key Plan - General Aviation Precinct

Name	Occupancy	Plot Area
A03	GA/VIP/GOVERNMENT TERMINAL	6419 m²
A08.5	PARKING	10753 m²
A08.6	PARKING	2987 m²
A10.1A	FBO 1	5787 m²
A10.1B	FBO 1	1230 m²
A10.2A	FBO 2	5787 m²
A10.2B	FBO 2	1230 m²
A10.3A	FBO 4	5787 m²
A10.3B	FBO 4	1230 m²
A10.4A	FBO 3	5798 m²
A10.4B	FBO 3	1220 m²
A11.1	GA HANGERS	3200 m²
A11.2	GA HANGERS	3200 m²
A11.3	GA HANGERS	3200 m²
A11.4	GA HANGERS	3200 m²
A11.5	GA HANGERS	3200 m²
A11.6	GA HANGERS	3200 m²
A11.7	GA HANGERS	3200 m²
A11.8	GA HANGERS	3200 m²
A11.9	GA HANGERS	3200 m²
A11.10	GA HANGERS	3200 m²
A11.11	GA HANGERS	4678 m²
A11.12	GA HANGERS	4971 m²
A11.13	GA HANGERS	8512 m²
A16	GA CLUBHOUSE & FUELING	5204 m²

Name	Occupancy	Plot Area
B11	SPECIAL CARGO FACILITY	1575 m²
B14.1	OPS	1500 m²
B17.1	ACCESS CONTROL	102 m²
B17.2	ACCESS CONTROL	100 m²
B17.3	ACCESS CONTROL	100 m²
E04.12	TRANSPORT USE	6315 m²
E04.13	AIRPORT USE	4636 m²
PH.1	HELIPORT	6220 m²
PH.2	HELIPORT	6220 m²
PH.3	HELIPORT	992 m²
PH.4	HELIPORT	992 m²
PH.5	HELIPORT	8938 m²

MRO	Maintenance Repairs and Operations
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GA	General Aviation
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11	ISSUED TO PROFESSIONALS	2024-07-24
10	ISSUED	2024-07-24
9	ISSUED	2024-07-24
8	ISSUED	2024-07-23
7	Revised SDP/EIA For Comment	2024-07-23
6	Revised SDP/EIA For Comment	2024-07-23
5	Added ATCT and Helipad	2024-05-24
4	FOR REVIEW	2024-04-10
3	FOR REVIEW	2024-04-03
2	FOR REVIEW	2024-04-03
1	FOR REVIEW	2024-03-28

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BOSKRUIN
cnr Kelly & Bosbok street
2188
Tel: 011 792 4260/ 8169

CLIENT
CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

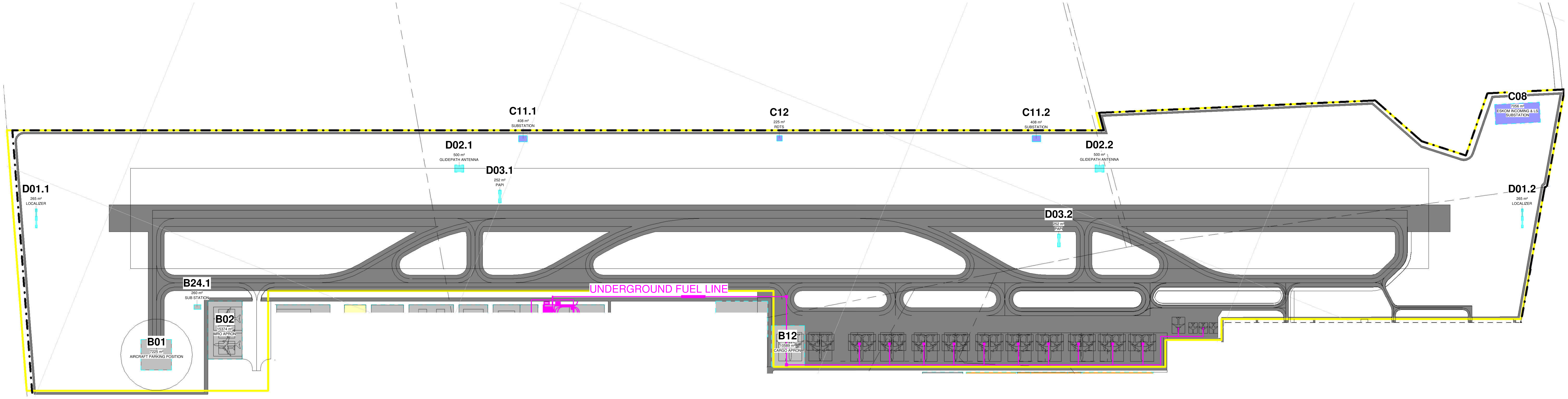
SACAP NO: ..

CLIENT
ENVIRONMENTAL CONSULTANT

TITLE
PHASE 2 GENERAL AVIATION PRECINCT

DRAWING
CWA - PRECINCT PLANS

SIZE		DWG NO	REV
A0		2024-3297 403	16
SCALE As indicated		DATE 2025-01-23	DRAWN BY: CW DENNIS



Airport Air Side Precinct

0 50.0 m 100.0 m 200.0 m

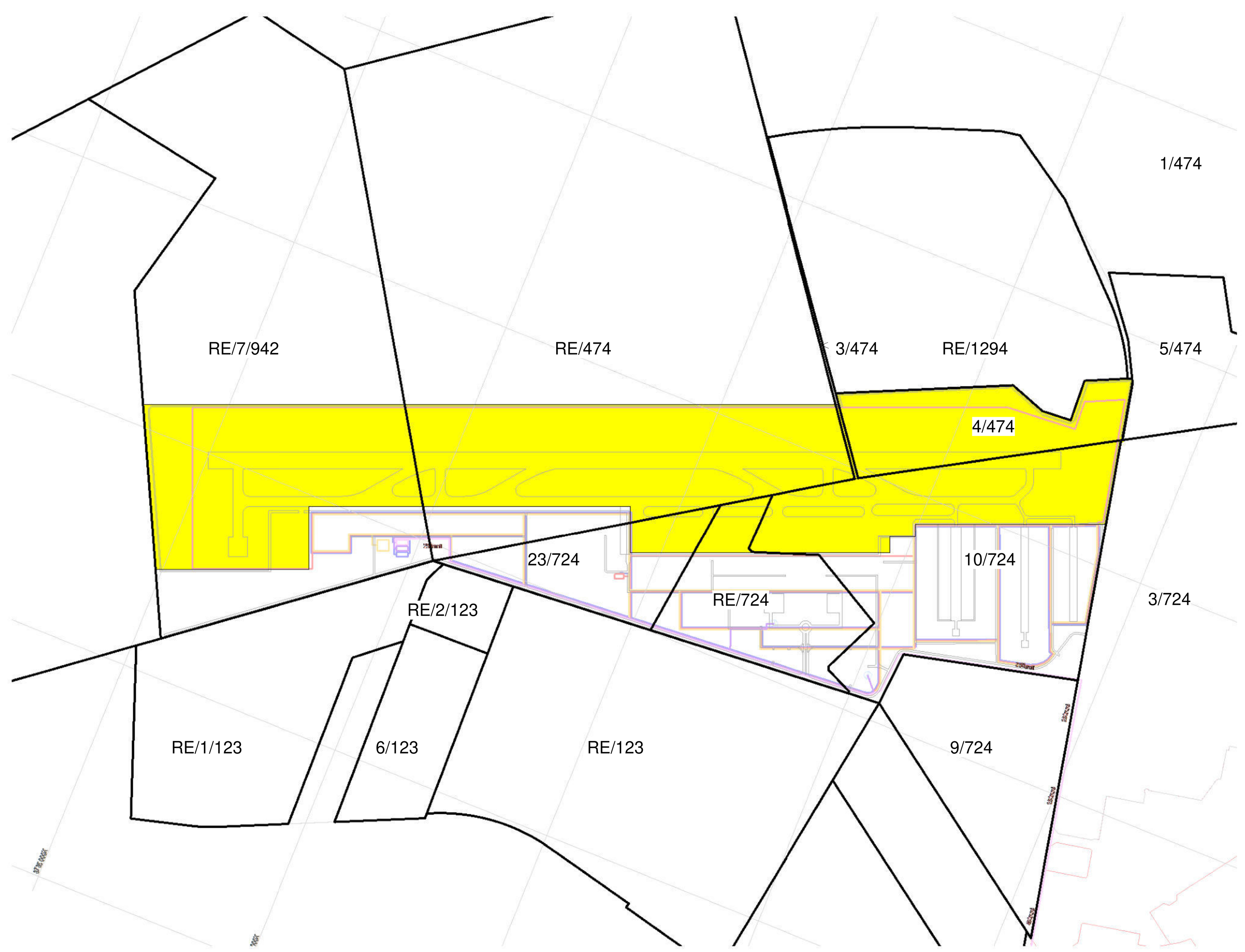
SCALE: 1:4000

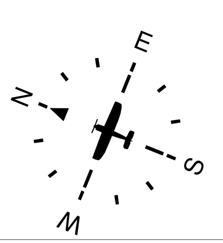
248.41 ha

Name	Occupancy	Plot Area
B01	AIRCRAFT PARKING POSITION	7225 m²
B02	MRO APRON	15374 m²
B12	CARGO APRON	10589 m²
B24.1	SUB STATION	260 m²

Name	Occupancy	Plot Area
C08	ESKOM INCOMING & LS SUBSTATION	7056 m²
C11.1	SUBSTATION	408 m²
C11.2	SUBSTATION	408 m²
C12	RDTS	225 m²
D01.1	LOCALIZER	265 m²
D01.2	LOCALIZER	265 m²
D02.1	GLIDEPATH ANTENNA	500 m²
D02.2	GLIDEPATH ANTENNA	500 m²
D03.1	PAPI	252 m²
D03.2	PAPI	252 m²

MRO	Maintenance Repairs and Operations
FBO	Fixed Based Operators
GA	General Aviation
GSE	Ground Support Equipment
ARFF	Aircraft Rescue and Firefighting
FATO	Final Approach and Take-off (Helipad)
WTWP/WTWW	Wastewater Treatment Plant / Works
RDTS	Remote Digital Control Tower System
PAPI	Precision Approach Path Indicator





Key Plan - Airport Air Side Precinct

GENERAL NOTES

* ALL BUILDING WORK AND BUILDING REQUIREMENTS ARE TO BE CARRIED OUT IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE NATIONAL BUILDING REGULATIONS AND BUILDING STANDARDS ACT (No 103 OF 1977).
* THIS DRAWING IS NOT TO BE SCALED. USE FIGURED DIMENSIONS ONLY.
* ALL DIMENSIONS AND LEVELS, ETC., TO BE CHECKED ON SITE, BEFORE ANY WORK IS COMMENCED.
* ANY DISCREPANCIES, QUERIES, ETC., RELATED TO THIS DRAWING ARE TO BE REFERRED TO CAPEX PROJECTS, BEFORE ANY WORK IS COMMENCED.
* REINFORCED CONCRETE AND STRUCTURAL STEELWORK IS TO BE IN ACCORDANCE WITH THE STRUCTURAL ENGINEER'S DESIGN AND SPECIFICATIONS.

DRAINAGE NOTES

* ALL DRAINAGE RUNS TO BE ACCESSIBLE ALONG THEIR ENTIRE LENGTH.
* V.P.'s TO BE CARRIED UP TO 2m ABOVE ANY WINDOW OR DOOR OPENING IN THE BUILDING OR ANY OTHER BUILDING WITHIN A DISTANCE OF 6m.
* INSPECTION EYES (i.e.'s) TO BE PROVIDED AT ALL BENDS AND JUNCTIONS OF SOIL AND WASTE PIPES.
* RODDING EYES (r.e.'s) TO BE PROVIDED AT HEADS OF DRAINS AND AT A MAXIMUM OF 25m SPACINGS ALONG RUNS OF DRAINS.
* MARKED COVERS TO BE PROVIDED AT GROUND LEVEL FOR i.e's BELOW PAVING
* RESEAL TRAPS TO BE PROVIDED TO ALL WASTE FITTINGS.
* SOIL WATER DRAINS PASSING UNDER BUILDINGS TO BE ENCASED IN 150mm CONCRETE ALL ROUND AND BE PROVIDED WITH r.e.'s AS CLOSE TO THE BUILDING AS POSSIBLE AT BOTH ENDS.
* SOIL WATER PIPES HAVING A VERTICAL DROP EXCEEDING 1200mm TO THE MAIN DRAIN TO BE ANTI-SYPHONED.
* ALL BRANCH DRAINS EXCEEDING 6m IN LENGTH TO BE VENTED.
* uPVC PIPES ARE TO BE LAID IN ACCORDANCE WITH THE MANUFACTURERS TECHNICAL SPECIFICATIONS.

FIRE DEPARTMENT'S REQUIREMENTS

* ALL WORK IS TO COMPLY WITH SABS 400.
* a) EXTINGUISHERS TO BE INSTALLED IN ACCORDANCE WITH SABS 0105.
  b) HOSE REELS TO BE INSTALLED IN ACCORDANCE WITH SABS 543.
  c) HYDRANTS TO BE INSTALLED IN ACCORDANCE WITH SABS 1128 PART 1.
* PORTABLE FIRE EXTINGUISHERS TO BE HUNG ON PURPOSE MADE BOARDS AND LOCATED IN SECURE POSITIONS AS INDICATED ON PLAN.
* CLASS "B" FIRE DOORS TO COMPLY WITH SABS 1253 AND TO BE FITTED WITH APPROVED SELF CLOSING OR AUTOMATIC CLOSING DEVICES.
* STRUCTURAL ELEMENTS AND COMPONENTS TO COMPLY WITH TT7.
* FIRE EXIT DOORS ARE TO BE FITTED WITH EMERGENCY EXIT LOCKSETS.
* SYMBOLIC SAFETY SIGNS TO BE IN ACCORDANCE WITH S.A.B.S. CODE 1186 AND POSITIONED AS REQUIRED BY THE FIRE DEPARTMENT.

Rev	Description	Revision Date
16	Amendment to B09, Update to table names	2025-01-23
15	BH, COCT Water Line, Fuel Line and Boundary Adjustments	2025-01-15
14	ISSUED - BOUNDARY FENCE LINE ADJUSTED	2024-08-20
13	ISSUED - PHASE 1 UPDATED	2024-08-19
12	ISSUED FOR REVIEW	2024-08-14
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CWA - PRECINCT PLANS

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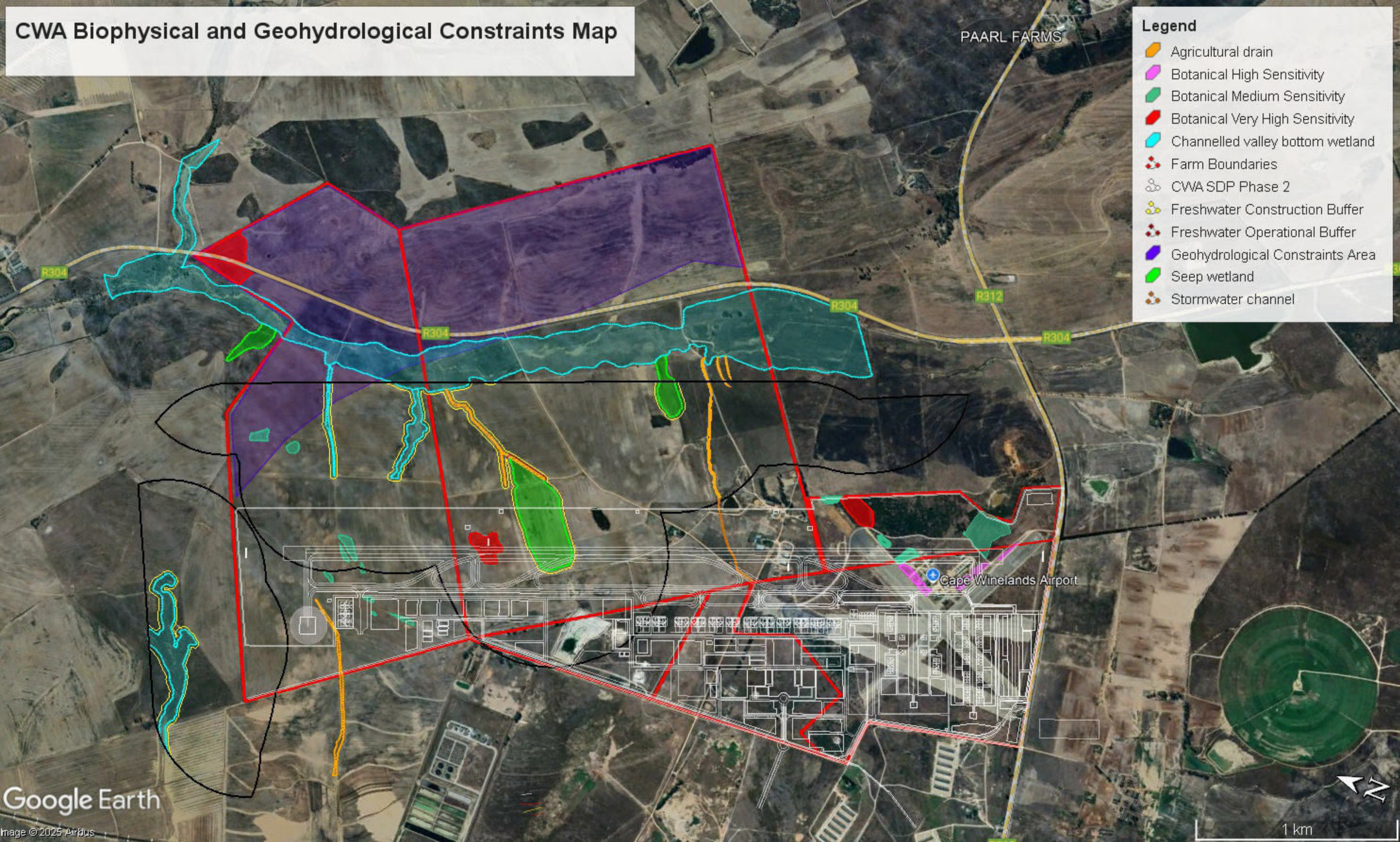
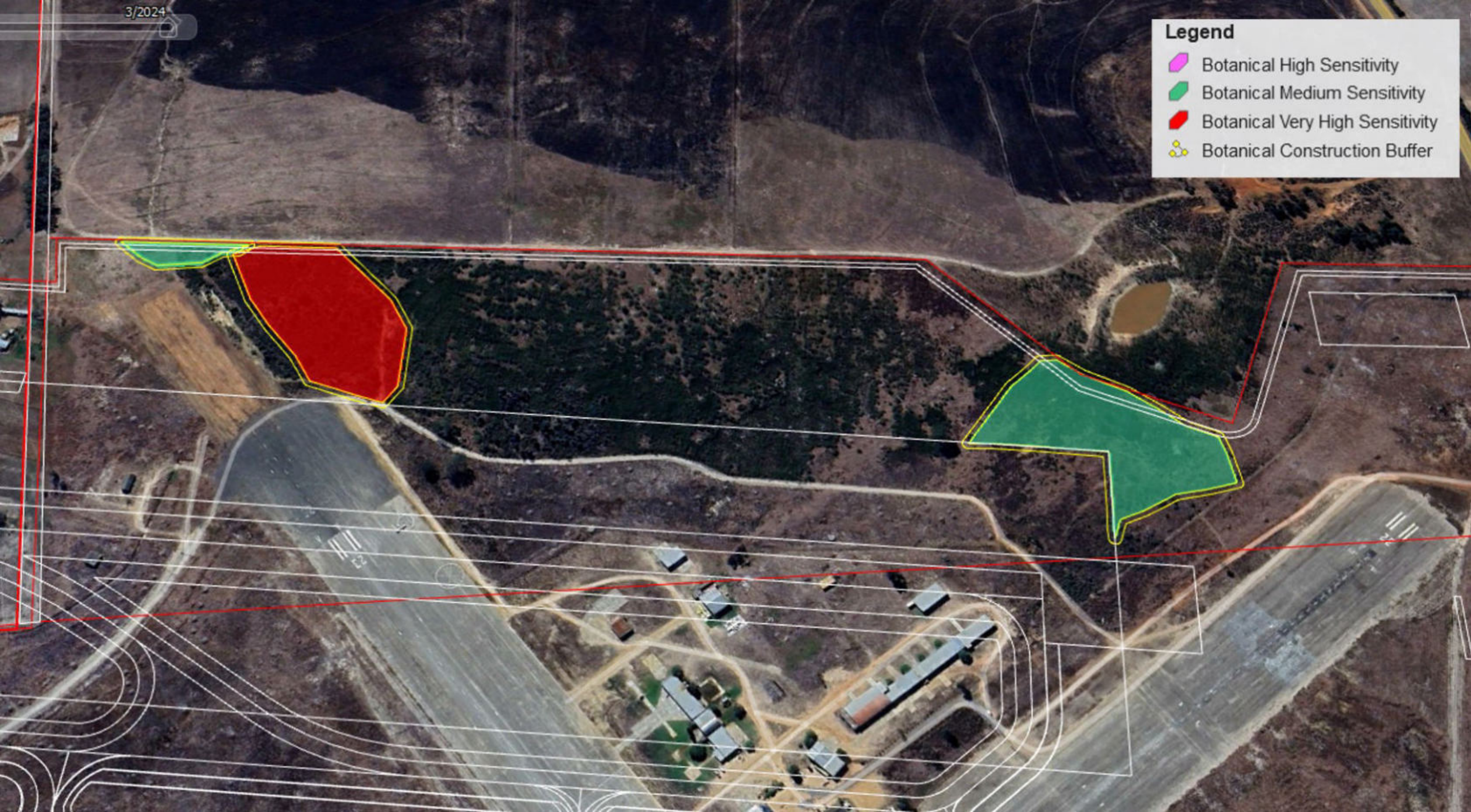
A0		2024-3297 404	16
SCALE As indicated		DATE 2025-01-23	DRAWN BY: CW DENNIS

ANNEXURE 3B: ENVIRONMENTAL SENSITIVITY MAP


CWA Biophysical and Geohydrological Constraints Map
Legend
Agricultural drain
Botanical High Sensitivity
Botanical Medium Sensitivity
Botanical Very High Sensitivity
Channelled valley bottom wetland
Farm Boundaries
CWA SDP Phase 2
Freshwater Construction Buffer
Freshwater Operational Buffer
Geohydrological Constraints Area
Seep wetland
Stormwater channel
PAARL FARMS
R304
R312
Cape Winelands Airport
Google Earth
Image © 2025 Airbus
1 km

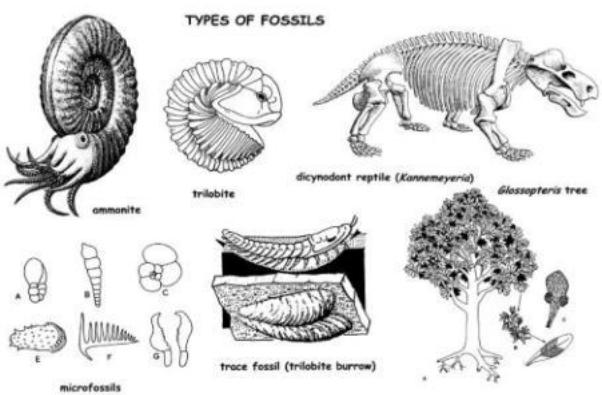

3/2024
Legend
Botanical High Sensitivity
Botanical Medium Sensitivity
Botanical Very High Sensitivity
Botanical Construction Buffer

ANNEXURE 4: FOSSIL FINDS POSTER

Palaeontology: what is a fossil?

Fossils are the traces of ancient life (animal, plant or microbial) preserved within rocks and come in two forms:

- Body fossils preserve parts, casts or impressions of the original tissues of an organism (e.g. bones, teeth, wood, pollen grains); and
- Trace fossils such as trackways and burrows record ancient animal behaviour.



How to report chance fossil finds: What should I do if I find a fossil during construction/mining?

If you think you have identified a fossil:

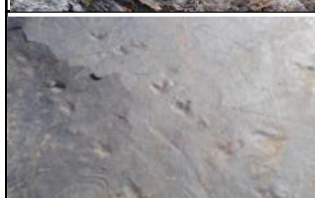
Immediately inform the ECO or Site Agent. He/she will then contact HWC and write a report and if necessary operations will stop in that specific area until the fossil is recovered

Heritage Western Cape
ceoheritage@westerncape.gov.za
021 483 5959
www.hwc.org.za

Types of palaeontological finding - What does a fossil look like?

Fossils vary in size, from fossilised tree trunks and dinosaur bones down to very small animals or plants. Finds can be **individual fossils** (one isolated wood log or bone) or **clusters and beds** (several bones, teeth, animal or plant remains, trace fossils in close proximity or bones resembling part of a skeleton). A bed of fossils is a layer with many fossil remains.

Below there is a list of few examples of fossils which may be identified during excavations in the Western Cape.

Image	Description	Image	Description
	Leaves		Snail shells and other shells
	Fossil wood		Bones of larger animals
	The remains of fish and marine life (e.g. teeth, scales, starfish)		Large burrows made by moles and other animals
	Stromatolites		Traces made by burrowing insects (ants, wasps, dung-beetles etc.).
	Animal footprints		

Images provided by Dr John Almond

Text by HWC's Archaeology, Palaeontology & Meteorites Committee June 2016

ANNEXURE 5: VELD FIRE MANAGEMENT PLAN

DEA&DP IN-PROCESS NR: 16/3/3/2/A5/20/2046/24

VELDFIRE MANAGEMENT PLAN FOR THE PROPOSED EXPANSION OF THE CAPE WINELANDS AIRPORT

(P10 OF FARM 724, RE OF FARM 724, P23 OF FARM 724, P7 OF FARM 942, RE OF FARM 474, P3 OF FARM 474 AND P4 OF FARM 474)

JULY 2025

PREPARED FOR
CAPEWINELANDS AERO (PTY) LTD

PREPARED BY
PHS CONSULTING

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Document Details

DOCUMENT TITLE	Veldfire Management Plan for the Proposed Expansion of the Cape Winelands Airport
NUMBER OF PAGES	47
DOCUMENT VERSION	Final Report for Submission

Document Control

	NAME	EAPASA REGISTRATION NUMBER	SIGNATURE	DATE
AUTHOR	Olivia Brunings	2023/6743 (Candidate)		03/07/2025
REVIEWER	Paul Slabbert	2019/1036		03/07/2025

PLEASE NOTE THAT ALL CHANGES FROM THE DRAFT REPORT FOR COMMENT VERSION 1 ARE UNDERLINED IN BLACK AND ALL CHANGES FROM THE DRAFT REPORT FOR COMMENT VERSION 2 ARE UNDERLINED IN RED. GENERAL TEXT CHANGES ARE NOT UNDERLINED

TABLE OF CONTENTS

KEY TERMS AND ABBREVIATIONS

Alien Vegetation Management Plan (AVMP) - A strategic framework designed to control, manage, and reduce the impact of alien invasive plant species in a specific area.

Applicant – Capewinelands Aero (Pty) Ltd. The Applicant who is the landowner, person in control of the land, developer and operator of the airport will be responsible for the overall implementation of the FVMP.

Auditing - A systematic and objective assessment of an organization's activities and services conducted and documented on a periodic basis to a predetermined standard.

Burn Unit – A specific, clearly defined area of land designated for a controlled burn (prescribed burn) during fire management operations.

CPFPA - The Cape Peninsula Fire Protection Association

CWA – Cape Winelands Airport

Crew Leader – A suitably qualified firefighter responsible for overseeing a team of firefighters during both wildfire suppression and controlled burns.

Defensible Space - A carefully maintained natural or landscaped area surrounding a structure, intentionally designed to minimize fire hazards. This space acts as a buffer zone that reduces the risk of wildfire spreading to the structure and provides easier access for firefighting operations.

Department of Environmental Affairs and Development Planning (DEA&DP)– the provincial authority for sustainable environmental management and integrated development planning.

Environmental Auditor – An independent EAP appointed to conduct an audit of the environmental management systems in place for an organization or development.

Environmental Manager (EM) – Head of the CWA Environmental Management Division. The EM will oversee all aspects of the Environmental Management on site. The Environment Manager is responsible for ensuring that the organization meets its environmental policy commitments and improves its environmental performance.

Environmental Management Division (EMD) – Designated entity for overseeing and ensuring environmental compliance throughout the construction and operation of CWA.

Environmental Management Programme (EMPr) - An environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation, and decommissioning of a project are managed, and that positive benefit of the projects are enhanced.

Environmental Control Officer (ECO) – a suitably qualified environmental consultant to be appointed by the Applicant to oversee the implementation of the suite of Environmental Management Plans complied for the site, inclusive of this Veld Fire Management Plan.

Fire Break - A fire break is a gap in vegetation or other combustible material that acts as a barrier to slow or stop the progress of a fire.

Fire Chief / **Fire Control Officer (FCO)**– A suitably qualified firefighter to be appointed by the Applicant to oversee and manage all fire-related operations on-site. The Fire Chief will be responsible for overseeing the implementation of the VFMP, ensuring the firefighting team is operationally prepared, addressing potential fire risks, supervising both preventive and emergency response actions and reporting on such actions.

Fire Danger Rating - A rating system that provides an indication as to the fire risk for a specific area on a specific day. The system evaluates factors influencing fire danger systematically and represent them in the form of fire indices. The fire danger rating is mandated by Chapter 3, Section 9(1) of the National Veld and Forest Fire Act 101 of 1998 and is developed daily by the South African Weather Bureau.

Firefighting Unit – A dedicated team of professionally trained firefighters stationed permanently at CWA to handle all fire-related emergencies. The team will be established under the CWA EMD and will hold the primary responsibility for implementing and maintaining the Veldfire Management Plan (VFMP), ensuring adherence to fire safety protocols and addressing any fire risks that may arise during the development's operational phase.

Fire Protection Association (FPA) - Organization formed by landowners in wildfire-risk areas to prevent, predict, manage, and to assist with the extinguishing of wildfires under the National Veld and Forest Fire Act (Act 101 of 1998). FPAs are co-operative structures established between Local Authorities, the State, private landowners (and their lessees) in areas of high wildfire risk.

National Environmental Management Act (Act 107 of 1998, as amended) (NEMA)– national legislation that provides principles for decision-making on matters that affect the environment.

Site - Area where the proposed development will take place

Veld Fire - The National Veld and Forest Fires Act, Act 101 of 1998 defines a veldfire as a veld (bush), forest or mountain fire.

Veld Fire Management Plan (VFMP) - A document designed to guide the prevention, mitigation, and response to veldfires in fire-prone ecosystems. It outlines strategies for managing fire risks while protecting the ecological integrity of the landscape and minimizing the threat to human life, property, and biodiversity

SECTION 1: CONTEXTUAL INFORMATION

1.1. Project Background

This report aims to supply Veldfire Management Plan (VFMP) for the proposed Cape Winelands Airport (CWA) Development. The development spans across the following cadastral portions (see Figure 1):

- Portion 23 of Farm 724,
- RE of Farm 724,
- Portion 10 of Farm 724,
- Portion 4 of Farm 474,
- RE of Farm 474,
- Portion 7 of Farm 942,
- Portion 3 of Farm 474.

Overview of the proposed development:

The CWA, historically known as Fisantekraal Airfield (FAFK), is located approximately 10.5 km northeast of Durbanville and 25 km northeast of Cape Town International Airport (CTIA) (see Figure 2). Initially constructed around 1943 as a South African Air Force aerodrome during World War II, CWA has since transitioned into a general aviation (GA) airfield. The current 150-hectare site includes four concrete runways, each 90 meters wide and varying in length between 700 meters and 1,500 meters. The facility supports various unscheduled operations such as recreational flying, flight training, aircraft maintenance, charter operations, crop spraying, and aerial banner towing.

The proposed development will expand the existing airport facilities, encompassing five additional cadastral portions, creating a combined area of 885 hectares. Of this area, 470 hectares will be allocated for airport development, including an airside precinct, terminal precinct, services precinct, general aviation precinct and associated landscaping (see Figure 3 & Figure 4). The remaining land will remain as agricultural zones, designated as an agricultural precinct (Figure 3 & Figure 4). This agricultural precinct will feature a combination of dryland agriculture, conservation of botanically sensitive areas, and wetland offsets.

The project envisions a phased development approach, including the realignment of a primary runway to an orientation of 01-19 with a length of 3.5 km. The upgraded CWA is planned to transition from a general aviation airfield into a commercial airport capable of facilitating long-haul, wide-body flights by airlines and unscheduled operators from across the world. The airport's expansion will serve multiple roles within the aviation sector and will support a variety of industries, including fixed-based operations, private charter services, flight training, helicopter services, aircraft maintenance, hotel and conferencing facilities, retail and food services, warehousing, logistics, and freight operations.

This VFMP forms part of the overarching Environmental Management Programme (EMPr) for CWA and serves as a strategic framework designed to manage the risks associated with veldfires within the CWA premises and guidance on the management of risk from surrounding areas. The plan provides clear policies and guidelines for CWA's approach to veldfire management, covering all phases from prevention and preparedness to response and recovery. It outlines the necessary strategies and assigns responsibilities to ensure that fire risks are minimized, while also aligning the airport's development with environmental best practices.

This VFMP is limited to veldfires only. It does not extend to fires within the built-up areas or relate to other emergencies that may occur on airport premises. Response plans for these eventualities will be provided in the Emergency Response Plan that will be compiled for the proposed development. <u>Furthermore, a complete and detailed Fire Protection Plan, for all the proposed buildings will be submitted during the building plan submission for the project.</u>

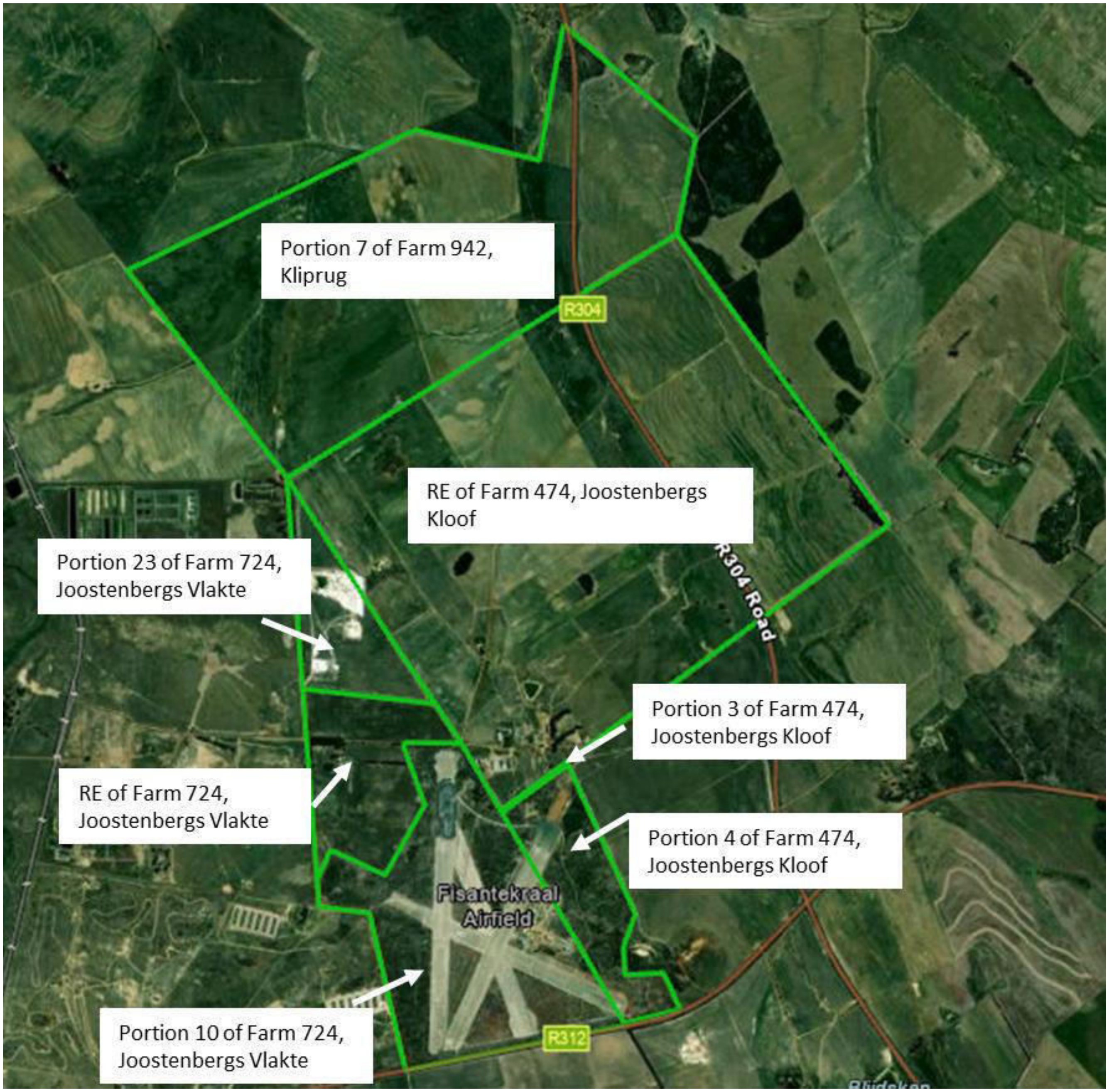

Figure 1: Cadastrals forming part of application area

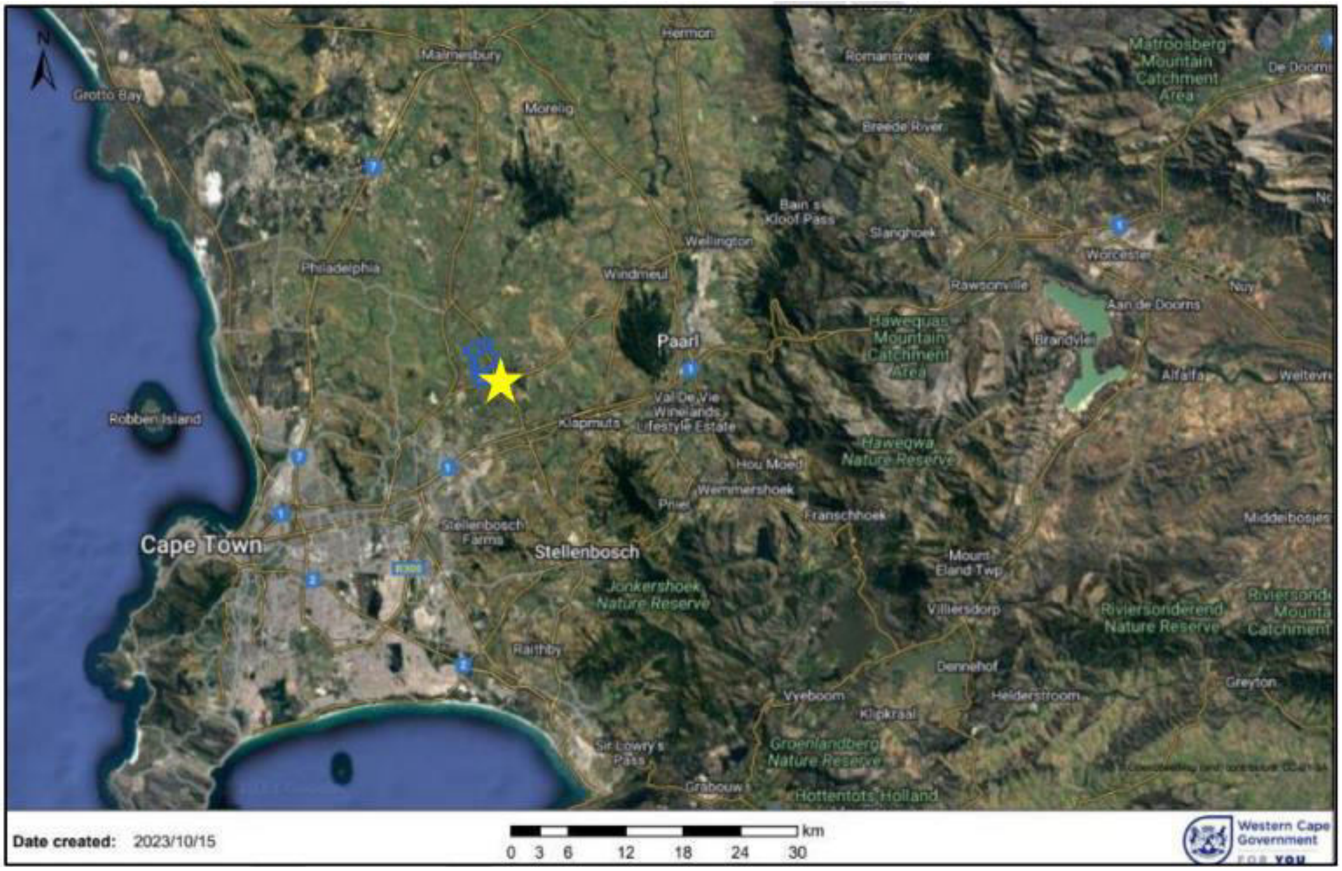

Figure 2: Regional location of CWA (indicated by yellow star and with cadastrals outlined in blue) (PHS Consulting, Oct 2023)

Figure 3: Phase 1 preferred SDP - Precinct Plan (Capex, August 2024)

Figure 4: Phase 2 preferred SDP - Precinct Plan (Capex, January 2025)

1.2. Purpose of the Veldfire Management Plan

The purpose of this VFMP is to ensure the safety of personnel and infrastructure, minimize environmental impact and ensure uninterrupted airport operations. To achieve these goals, the plan focuses on meeting the following objectives:

- **Protect Human Life:** Ensure the safety of all individuals, including staff and tenants, firefighters, and the public.
- **Safeguard Property and Assets:** Protect infrastructure and assets from veldfire damage.
- **Minimize Physical and Environmental Impact:** Reduce the adverse effects of veldfires and fire suppression techniques on both physical structures and the environment.
- **Promote Sustainable and Cost-Effective Protection:** Implement veldfire protection measures in an environmentally responsible and financially efficient manner.
- **Maintain Appropriate Fire Regimes:** Preserve environmental values by managing fire regimes through controlled burns that are suitable and necessary for conservation purposes.

1.3. Management Strategy

This fire management strategy takes a proactive approach to mitigating fire risks, guided by the following steps in the veldfire management cycle:

1. **Prevention:** Activities directed at reducing fire occurrence, including public awareness, law enforcement and the reduction of fire risks.
2. **Preparedness:** All activities designed to protect an area (including life, property, assets and values) from damage by fire.
3. **Response:** All the work and activities connected with fire-extinguishing operations, beginning with discovery and continuing until the fire is completely extinguished
4. **Recovery:** The process of returning a disturbed ecosystem or area as a result of a veldfire to its original state

Management objectives are essential for each stage of the veldfire management cycle. Prevention objectives focus on understanding the causes and potential impacts of veldfires. Preparedness objectives are informed by an understanding of veldfire behavior. Response and suppression objectives rely on insights into both veldfire behavior and their impact. Finally, restoration objectives are guided by a comprehensive understanding of the aftermath and consequences of veldfires.

1.4. Relevant legislation and policies

The following is a list of the principal legislation for veld fire management in the Western Cape as relevant to the proposed development. All activities on site must ensure compliance with the provisions of the legislation as applicable:

- The Constitution of the Republic of South Africa (Act 108 of 1996)
- Fire Brigade Services Act, Act 99 of 1987
- National Veld and Forest Fire Act, Act 101 of 1998
- GN 1054 of 2005 - The National Fire Danger Rating System in terms of the National Veld and Forest Fire Act, 1998, Act no 101 of 1998
- Disaster Management Act, Act 57 of 2002
- Conservation of Agricultural Resources Act, Act 43 of 198
- National Environmental Management Act (Act 107 of 1998) – NEMA
- National Environmental Management: Air Quality Management Act, Act 39 of 2004
- National Environmental Management: Biodiversity Act, Act 10 of 2004
- Pollution Prevention Act, Act 45 of 1965
- National Water Act, Act 36 of 1998
- Occupational Health and Safety Act (No. 85 of 1993)
- Basic Conditions of Employment Act 75 of 1997

The National Veld and Forest Fire Act, Act 101 of 1998, is of primary relevance to the VFMP. This legislation provides the legal framework for the prevention and control of veld, forest, and mountain fires across South Africa. The Act clearly defines the responsibilities and obligations of landowners to actively prevent and manage veldfires. It establishes minimum enforceable standards, such as the creation and maintenance of firebreaks and ensuring preparedness measures are in place. Compliance with this Act is essential for effective fire risk management on the Cape Winelands Airport premises.

In addition, the development will adhere to the following:

- SANS 10400–T: 2024 and the Community Fire Safety By-law, Provincial Gazette 5832 (as amended 29 June 2007 and 21 August 2015):
    - A Fire Engineer (ECSA Registered) shall be appointed for this project.
    - A Complete and Detailed Fire Protection Plan, for all the proposed buildings are required to be submitted during building plan submission for scrutinizing and approval.
        - Fire hydrants to be provided as per SANS 10400 – T4.35

        - Provide access for emergency vehicles complying with the Community Fire Safety By-law Section 12.
        - Provision of water for Fire Fighting (SANS 10400-W: 2011).
    - Storage and use of Flammable substances shall comply with Chapter 8 of the Community Fire Safety By-law.

1.5. Status of the Veldfire Management Plan

The VFMP must form part of all contractual documents for this project. The Environmental Authorization ascribes legal status to this Management Plan and any subsequent amendments thereto. The approval of the Management Plan by DEA&DP will require that the applicant and all appointed contractors must comply with the requirements herein. Any amendments/ changes/ upgrades to the Management Plan will require submission to and approval by DEA&DP.

This VFMP forms part of the contract identifying and specifying the procedures to be followed by contractors and employees of the facility to eliminate or reduce adverse fire risks associated with the proposed development. Should a contractor or employee persistently fail to observe the provisions of the Management Plan, the Environmental Control Officer (ECO) can recommend that the employee be removed from the site.

1.6. Responsibility and Enforcement of the VFMP

1.6.1. Applicant

The Applicant will be responsible for the overall implementation of the VFMP. The Applicant is accountable for the potential impacts of the activities that are undertaken and is responsible for managing these impacts. The Applicant has the overall environmental responsibility to ensure that the implementation of the operational requirements complies with the relevant legislation. The Applicant must ensure that he/she is fully familiar with the requirements of this VFMP, any relevant Environmental Authorization or any other legally binding documentation.

1.6.2. CWA Environmental Management Division

The CWA Environmental Management Division (EMD) will be established at the start of the construction phase to ensure environmental compliance throughout the project. The CWA EMD will appoint an Environmental Manager (EM) to oversee all aspects of the Environmental Management on site. The Environment Manager is responsible for ensuring that the organization meets its environmental policy commitments and improves its environmental performance. Not only do they monitor performance against and ensure compliance with relevant laws and regulatory requirements, but they are also proactive in identifying and promoting opportunities to reduce the environmental impact of the organization’s activities, products and services.

Led by an Environmental Manager, the CWA EMD will consist of several teams for e.g. landscaping, waste management, alien species control, fire management etc. During the initial phases it could be one multitask team to be split as the tasks increases. Each team will have a Control Officer reporting directly to the EM. In the case of Velf Fires this would be the Fire Chief / Fire Control Officer. The Environmental Manager will oversee the implementation of Environmental Management Plans (EMPr), compliance with regulations, day-to-day environmental management of the site, managing the necessary applications, and overseeing external service providers such as the appointed Environmental Control Officer. Responsibilities also include internal audits and developing strategies for waste minimization and emissions reduction.

1.6.3. CWA Firefighting Unit

The designated onsite firefighting unit will be responsible for the implementation of the VFMP. Upon appointment, all crew members must receive comprehensive training on the VFMP's requirements, with ongoing training provided to any newly appointed team members throughout the operational phase. It is the responsibility of the applicant to ensure that this training is conducted.

A Fire Chief / Fire Control Officer must be appointed must be appointed within the EMD to lead the firefighting team and oversee the implementation of the VFMP. The fire control officer will assume overall responsibility for managing the VFMF, employees and contractors and ensure and oversee the implementation of the VFMP onsite in its entirety. All decisions regarding fire related environmental procedures and protocol must be approved by the fire control officer, who also has the authority to stop any activity in contravention of the VFMP. The role of is interactive and must include daily site visits.

Key Responsibilities of the Fire Control Officer:

- Assume overall command of fire response operations onsite.
- Provide training to all staff on VFMP requirements.
- Conduct regular monitoring of the site to identify potential fire risks.
- Perform routine inspections of firefighting equipment and machinery, documenting the results of each inspection.
- Compile and submit monthly monitoring reports to the ECO.

- Work closely with the ECO, applicant, and contractors to resolve any fire risk issues that arise.
- Maintain detailed records of all fire incidents and responses.

This list of responsibilities is not exhaustive, and the Fire Chief must remain adaptable to additional tasks as necessary for fire safety and compliance.

1.6.4. The Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is responsible for overseeing and verifying the proper execution of the EMPr during the construction and operational phase. This includes ensuring that various contractors working on-site comply with the waste management plan within their designated areas. During the construction phase, an independent Environmental Assessment Practitioner (EAP) firm must be appointed to serve as the ECO who will work alongside the EM. Once the project transitions fully into the operational phase, this function can be managed by an in-house ECO within the CWA Environmental Management Division who will report to the EM. During the construction and operational phases, monthly ECO reports must be prepared and submitted to the Department of Environmental Affairs and Development Planning (DEADP) during construction and to the EM during operations.

1.6.5. The competent authority

DEA&DP will review the EMPr and on approval they may have the following role to play:

- Review and monitor implementation of the VFMPr;
- Review whether there is compliance by the applicant;
- Perform random control checks;
- Review incident and audit reports;
- Enforce legal mechanisms for contraventions of the VFMP.

1.6.5. Engineers and Contractors

The engineers and contractors, where applicable, are responsible for physically carrying out certain development and maintenance activities. The responsibilities indicated here are also relevant to sub-contractors.
The responsibilities of the engineers and contractors include but are not limited to the following:

- Be conversant with the VFMP, EMPr, any relevant Environmental Authorization or any other legally binding documentation;
- Have a responsibility to adhere to any conditions and recommendations laid out in above mentioned documentation;
- Prevent actions that may cause harm to the environment;
- Be responsible for any remedial activities in response to an environmental incident;

- Review and amend any construction activities to align with the VFMP, EMPr and Best Practice Principles;
- Ensure compliance of all site personnel and / or visitors to the VFMP, EMPr and any other authorisations.

SECTION 2: OVERVIEW OF SITE CONDITIONS

2.1. Climate

The proposed development site is located in a Mediterranean climate zone, with warm dry summers and mild wet winters. During the dry summer months vegetation can become dry and highly flammable, increasing the risk of veldfires. The average annual precipitation for the area is approximately 532mm/annum of which only 94mm (<20%) falls during the summer months (October – March) (GEOSS, Geohydrological Scoping Report, Sept 2023).

2.2. Vegetation and Landcover

The proposed development area forms part of the West Coast Renosterveld bioregion within the Fynbos biome located within what is now known as the Core Region of the Greater Cape Floristic Region (GCFR) (Nick Helme Botanical Surveys, Botanical Impact Assessment, September 2024). GCFR is highly biodiverse with high levels of endemism and is considered a global conservation priority with agriculture, urbanization, and alien plants posing the greatest threat, particularly to lowland habitats.

According to the South African Vegetation Map, the proposed airport precinct would naturally have been dominated by Swartland Granite Renosterveld (Endangered) along with smaller areas of Swartland Shale Renosterveld (Critically Endangered) and a minimal portion of Cape Flat Sand Fynbos (Critically Endangered) (Figure 5). These vegetation types require fire for optimal ecological functioning. Based on field verification, the appointed botanist however is of the opinion that the northern most remaining patch of natural vegetation should be classified as Swartland Silcrete Renosterveld which is Critically Endangered (Nick Helme Botanical Surveys, Botanical Scoping Study, February 2024).

2.2.1. Botanical Sensitivity

The Botanical Impact Assessment undertaken by Nick Helme revealed the following (Nick Helme Botanical Surveys, Botanical Impact Assessment, September 2024):

- About 93% of the site has been heavily disturbed and degraded over a long period of time, with the result that negligible indigenous vegetation is found in these areas, and these areas are of Low botanical sensitivity. Indigenous plant diversity is very low in the most disturbed parts of the airport precinct, and is low overall, compared to pristine Renosterveld, which would have at least 250 species in a site of this size (if pristine). There is no indigenous plant cover in the large cultivated areas in the agricultural precinct.

- Approximately 7% of the site (about 6.5ha) is deemed to be of Medium, High or Very High botanical sensitivity (Figure 6 - Figure 8).
- Two patches of very high sensitivity, four patches of high sensitivity and eight patches of medium sensitivity have been mapped in the airport precinct (Figure 6 & Figure 7) and two patches of very high sensitivity and two patches of medium sensitivity have been mapped in the agricultural precinct (Figure 8).
- Ideally all areas of Medium, High or Very High botanical sensitivity should be conserved and ideally, they would also all be ecologically connected via rehabilitated Low sensitivity areas. From a botanical perspective most of these areas would be ecologically viable, especially if connected by ecological corridors. Key ecological management interventions required would be ongoing alien vegetation management (pre and post burn) and management burns in the appropriate autumn season (once every 8-12 years).

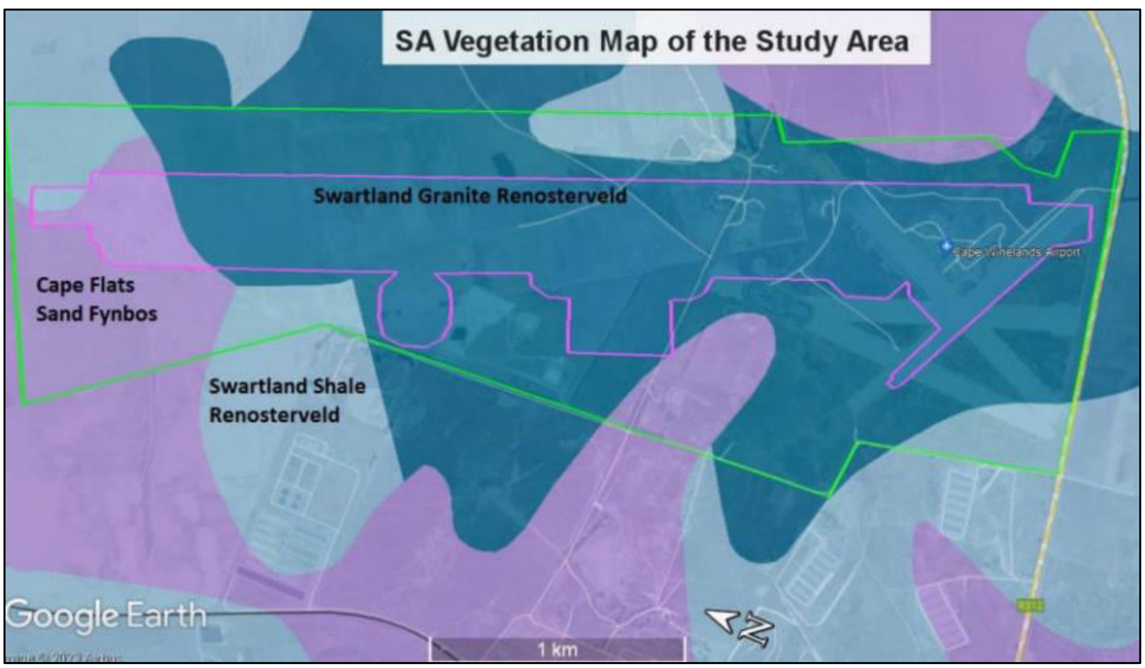

Figure 5: Extract of the SA Vegetation Map (Mucin & Rutherford 2012) showing that three different vegetation types would originally have occurred in the primary study area (excluding the Agricultural Precinct), with Swartland Granite Renosterveld making up the bulk of the site. The green polygon is the study area, and the pink polygon is the airside development footprint (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

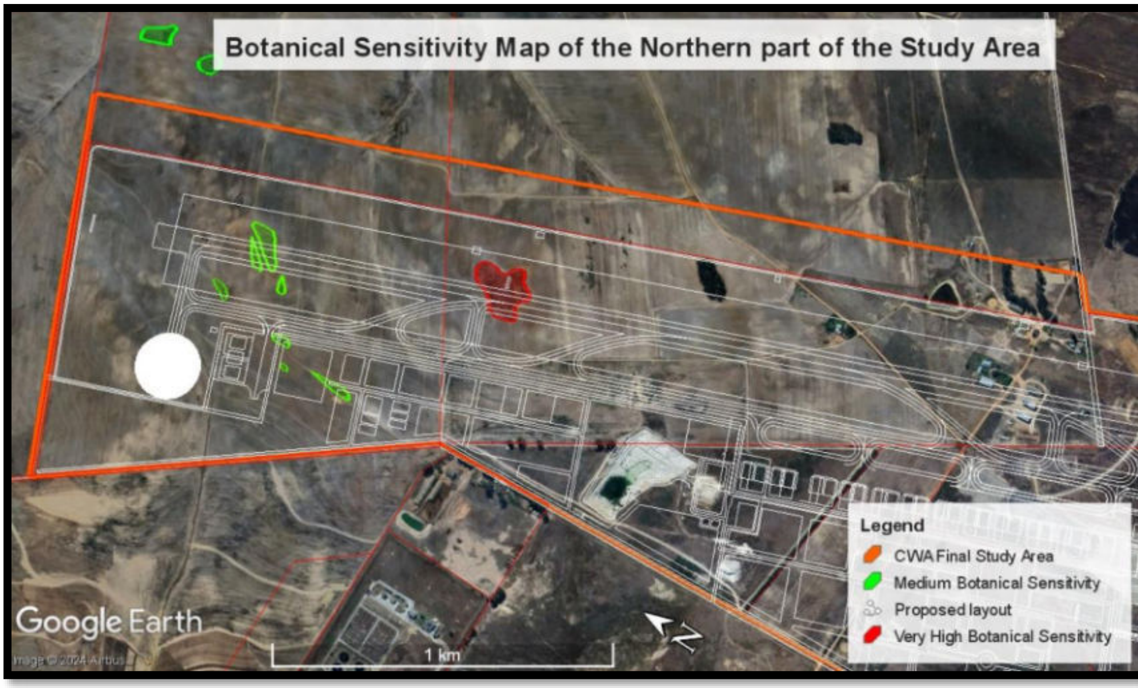

Figure 6: Botanical sensitivity map for the northern part of the airport precinct. All areas not shaded green or red within the study area are of Low botanical sensitivity (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

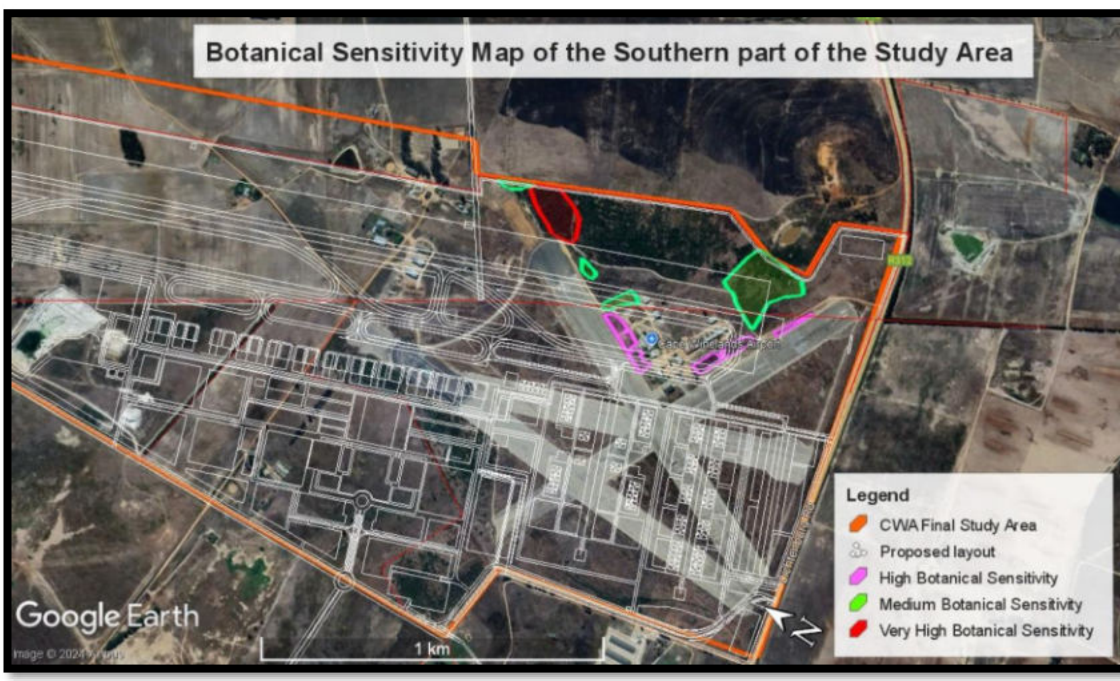

Figure 7: Botanical sensitivity map for the southern part of the study area. All areas within the airport precinct not shaded green, red or pink are of Low sensitivity (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

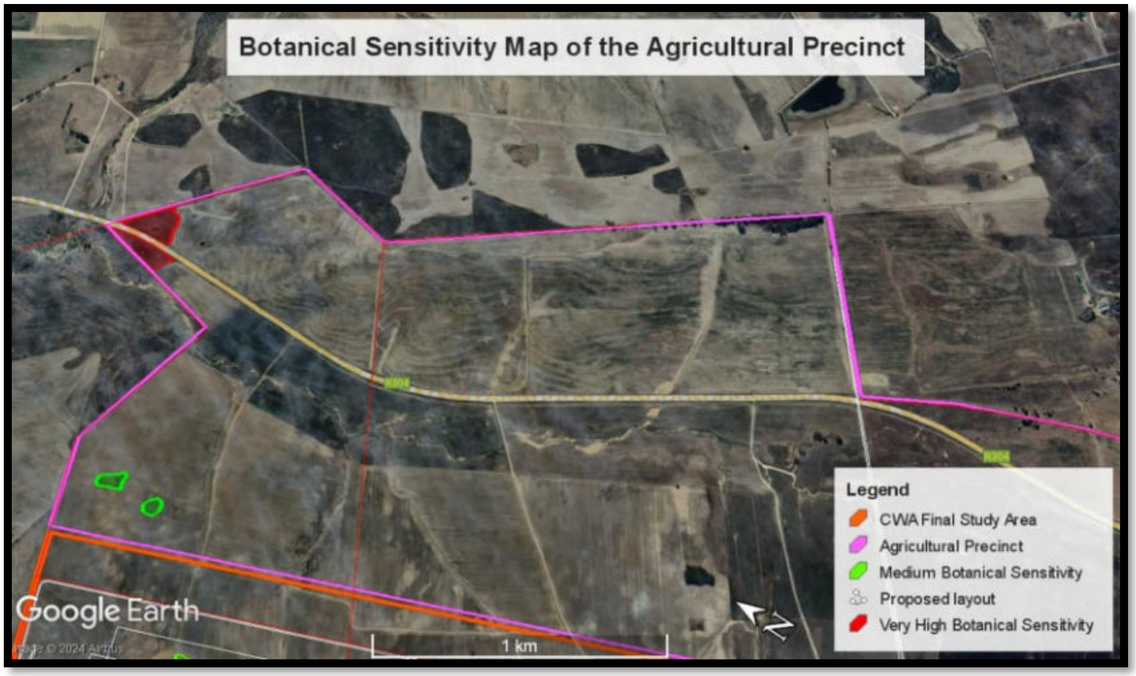

Figure 8: Botanical sensitivity map for agricultural precinct. All areas not shaded green or red within the precinct are of Low botanical sensitivity (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

2.2.2. Current Status of Vegetation

The Botanical Impact Assessment reveals that approximately 93% of the study area and about 88% of the proposed development area has experienced extensive disturbance and degradation over time, leading to very limited indigenous vegetation within these areas (Nick Helme Botanical Surveys, Botanical Scoping Study, February 2024). The remaining natural habitat within the airport precinct is classified as Swartland Silcrete Renosterveld and Swartland Shale Renosterveld. In contrast, the agricultural precinct, currently under cultivation, has no indigenous plant cover.

The proposed development site is currently affected by woody alien invasive species, predominantly *Acacia saligna* (Port Jackson), along with scattered *Leptospermum laevigatum* (Australian myrtle), *Pinus* species (pines), and *Eucalyptus* species (gums). A significant portion of the airport precinct was cleared of invasive woody vegetation in late 2020 and early 2021, with previous invasive coverage ranging from 50% to 100%. Despite the biocontrol fungus infecting many of the Port Jackson trees, leading to reduced seed production and some plant mortality, it is highly probable that a substantial seed bank remains onsite which could result in prolific regrowth following a fire or similar clearing event (Nick Helme Botanical Surveys, Botanical Impact Assessment, September 2024).

2.2.3. Extent of proposed vegetation removal

The proposed development will involve the removal of vegetation across the entire airport precinct, with the exception of three designated conservation patches as outlined in the landscaping plan (Figure 9). These conservation areas include:

- 1.6 hectares of very high conservation value vegetation
- 0.2 hectares of medium conservation value vegetation
- 1.6 hectares of additional medium conservation value vegetation

No additional vegetation removal is planned within the agricultural precinct. Existing cultivated areas will remain dedicated to agricultural use, while certain sections of the precinct will be rehabilitated as part of the wetland offset plan (Figure 10).

Figure 9: Cape Winelands Airport Landscape Concept Plan (Planning Partners, March 2025)

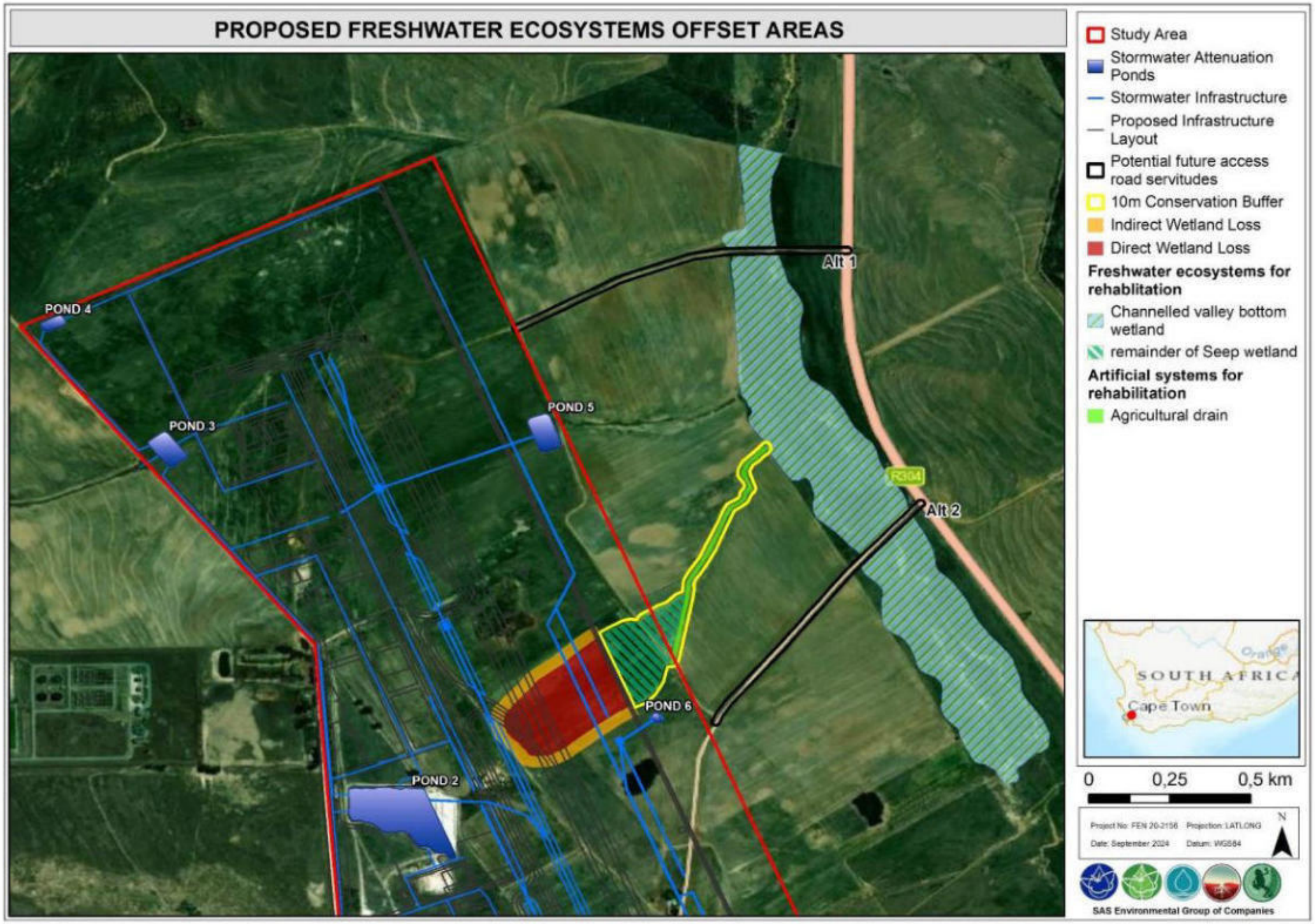

Figure 10: Extent of wetland to be lost (7.44 ha) vs identified wetland areas to be rehabilitated (FEN, Draf Wetland Offset Study and Implementation Plan, September 2024).

2.3. Fire History

Although Renosterveld, the natural vegetation of the area, is a fire-dependent ecosystem requiring burns every 8-12 years for optimal ecological function, the majority of the proposed development area has not experienced a fire in the past 14-25 years, as evidenced by site vegetation and historical satellite imagery dating back to 2004 (Nick Helme Botanical Surveys, Botanical Scoping Study, February 2024). Consequently, much of the indigenous vegetation on site is considered senescent and overdue for a burn. In the absence of fire for over 15-20 years, plant species diversity typically declines rapidly, but can recover dramatically post-fire due to the activation of soil-stored seed banks.

2.4. Landscaping Plan

A comprehensive landscaping plan has been developed for the airport precinct, as shown in Figure 9. The landscaping will incorporate fynbos and renosterveld planting, using specific species to achieve the required vegetation heights for airport operations. The development will also preserve patches of high botanical sensitivity (Figure 6 to Figure 8) and include wetland offsetting within the agricultural precinct (Figure 10).

A key ecological management action for areas landscaped with natural fynbos or renosterveld vegetation, as well as conservation zones, will involve conducting controlled management burns during the appropriate autumn season, approximately every 8-12 years. Further details on these controlled ecological burns are outlined in Section 3.3 of this VFMP.

Firescaping

Firescaping is the practice of creating a defensible space around buildings by incorporating fire-resistant plants, proper spacing, and strategic landscaping techniques. When planning fynbos or renosterveld planting near the building line, firescaping can be applied by incorporating more fire-resistant, succulent species. These include varieties from the Vygie family, such as *Lampranthus, Malephora, Drosanthemum, Delosperma, and Carpobrotus*, all of which have fleshy leaves that are highly resistant to fire. Alternatively, maintaining hand-cut firebreaks for at least 15m around buildings and other structures can also help reduce fire risks.

SECTION 3: FIRE PREVENTION

Fire prevention focuses on preventing the ignition of fires and minimizing the impact of any fires that do occur. Fire prevention is proactive.

3.1. The National Fire Danger Rating System

Chapter 3 of the Veldfire Act provides for the prevention of veldfires through a fire danger rating system. The South African Weather Services (SAWS) each day develops a rating for the day and a prediction for the following day. The Fire Danger Index (FDI) ratings as prescribed by the National Fire Danger Rating System in Terms of the National Veld and Forest Fire Act, 1998(Act No 101 Of 1998) – GN 1054 of 2005 uses 5 categories to rate the fire danger represented by color codes as indicated in Table 1 below.

All on-site firefighting personnel are required to monitor the Fire Danger Index (FDI) daily throughout the construction and operational phase of the development. When the FDI is 'High' or 'Very High' these ratings must be communicated to all relevant contractors, workers, and team leaders active on the site. This protocol will enable all personnel to adjust their activities in line with the prevailing fire conditions. The on-site firefighting teams must leverage the FDI data to implement proactive measures aimed at minimizing the risk of unintended ignitions and enhancing readiness for potential veldfires.

When the FDI rating is classified as 'High' or 'Very High,' the following proactive measures should be actioned:

- Restrict or modify high-risk activities such as:
  - Suspend all outdoor burning and heating
  - Limit the use of ground support equipment that involves combustion or high heat if they are not essential.
  - Delay any activities that involve open flames or high heat sources, including maintenance and construction that could produce sparks such as welding.
  - Implement stringent safety measures and increased supervision during aircraft refuelling operations.
  - Avoid the use of brushcutters for bushclearing or maintenance of fire breaks as this can result in sparks igniting the vegetation.
  - Avoid the use of chainsaws for tree felling as this can result in sparks igniting the vegetation – sparks are usually caused due to poor maintenance of the machine.
- Heightening surveillance across the site.
- Ensuring that all firefighting equipment is fully operational and that personnel are prepared for immediate deployment if a fire occurs.

Additionally, the FDI should inform the firefighting team's assessment of veldfire behaviour, guide control strategies, and determine the necessary actions corresponding to each fire danger level.

Table 1: Fire Danger Ratings

DANGER RATING	INSIGNIFICANT	LOW	MODERATE	HIGH	HIGH - EXTREME
Indicative Colour	*Blue*	*Green*	*Yellow*	*Orange*	*Red*
FIRE BEHAVIOUR	Veldfires are not likely to ignite. If they do, they are likely to go out without suppression action. There is little flaming combustion. Flame lengths generally lower than 0.5 metre. Rates of forward spread less than 2 metres per minute.	Veldfires likely to ignite readily but spread slowly. Flame lengths generally lower than 1.2 metres. Rates of forward spread less than 5 metres per minute.	Veldfires ignite readily and spread rapidly. Flame lengths between 1.2 and 2 metres. Rates of forward spread between 5 and 25 metres per minute.	Veldfires ignite readily and spread very quickly. Local crowning and short-range spotting. Flame lengths between 2 and 5 metres. Rates of forward spread between 25 and 35 metres per minute.	Conflagrations are likely in fynbos, stands of alien invasive trees and plantation forests. Long range fire spotting is likely in these fuel types. Flames lengths between 5 to 15 metres or more. Rates of forward spread of head fires can exceed 60 metres per minute.
FIRE SUPPRESSION DIFFICULTY	Veldfires easily approached and suppressed using hand tools.	Veldfires can safely be approached on foot and suppression is readily achieved through direct manual attack methods.	Direct attack constrained as veldfires are not safe to approach on foot for more than very short periods. Back burning from control lines can be undertaken if prevailing conditions are safe.	Serious control problems where - depending on fuel loads and prevailing weather - direct attack is not always feasible. Control through a combination of direct attack and indirect control measures such as aerial water bombing. Back burning should only be used after careful consideration.	Any form of fire control is likely to be precluded until weather conditions become more favourable. Equipment such as fire tenders should be used to protect properties on the urban edge. Back burning is dangerous and should be avoided.

FIRE PREVENTION AND PREPAREDNESS MEASURES	No precautions are needed	Fires including prescribed burns may be lit, used or maintained in the open air on the condition that persons making fires take reasonable precautions against such fires spreading. Keep a watch for unexpected changes in wind speed and direction.	No fires may be allowed in the open air except in designated fireplaces authorised by a Fire Protection Officer where a Fire Protection Association exists, or elsewhere, the Chief Fire Officer of the local fire service. Extreme caution should be taken when prescribed burning is undertaken.	No fires may be allowed under any circumstances in the open air. Fire Protection Associations and Municipal Disaster Management Centres must invoke contingency fire emergency and disaster management plans.	No fires may be allowed under any circumstances in the open air. All operations likely to ignite fires halted. Householders placed on alert Fire Protection Associations and Provincial Disaster Management Centres must invoke contingency fire emergency and disaster management plans including extraordinary readiness and response plans.
RECOMMENDED ACTIONS	None	None, other than prudent care to ensure that any open-air fires do not escape. Prescribed burning permissible.	Open-air fires should only be permitted in authorised fireplaces. Prescribed burning should be conducted with care, and any prescribed veldfires should be extinguished should the forecast fire danger-rating turn to high.	Ensure all staff and visitors are aware of prevailing high fire danger rating. High risk areas should be put on standby for evacuation, should the fire danger conditions forecasted become worse. All efforts should be made to bring any veldfires under control with maximum effort.	Fire-fighters and equipment placed on stand-by and be dispatch immediately at the first sign of a fire. High risk areas to be evacuated. Equipment such as helicopters and water tenders should concentrate efforts on the protection of houses and other structures.

APPLICATION OF THE NATIONAL VELD AND FOREST FIRE ACT, 101 of 1998			Above precautionary measure to be prescribed and made applicable nationally on days rated moderate.	Section 10(1)(b) of the National Veld and Forest Fire Act applies: no person may light, use or maintain a fire in the open air.	Section 10(1)(b) of the National Veld and Forest Fire Act applies: no person may light, use or maintain a fire in the open air.
RELATIONSHIP WITH DISASTER MANAGEMENT				The threat of disastrous wildfires exists at municipal level under these conditions. Municipal Disaster Management Centres must invoke contingency plans and inform Provincial Disaster Management Centre. (Section 49 of the Disaster Management Act, 57 of 2002).	The threat of disastrous wildfires at provincial level exists under these conditions. Provincial Disaster Management Centre must invoke contingency plans and inform National and Disaster Management Centre. (Section 49 of the Disaster Management Act, 57 of 2002).

3.2. Sources of fire

Understanding and managing the various sources of fire is essential to reducing the likelihood of fire outbreaks and minimizing their impact when they do occur. Likely sources of fire at the Cape Winelands Airport can be divided into three areas namely, natural sources, external activities, and onsite activities. Further details of potential fire sources, along with corresponding preventative measures, are provided in Table 2.

Table 2: Overview of potential Fire Sources and Management Actions for Effective Fire Prevention at the Cape Winelands Airport

Source		Risk	Prevention Action
Natural Sources	Lightning strikes when vegetation is dry	Natural ignition	Monitor weather conditions; deploy response teams during high-risk periods.
External Activities	Fire Spreading from Neighboring Properties	Fires from adjacent properties can spread across boundaries, increasing fire risk.	Establish firebreaks along property boundaries; communicate with neighboring landowners; collaborate on fire management.

	Intentional Fire Setting	Intentional fire-setting poses a fire risk.	Implement surveillance systems; promote community reporting; collaborate with law enforcement to detect and prevent arson.
Human Activities Onsite	Construction and Maintenance Work	Sparks from activities like welding and grinding can ignite dry vegetation.	Implement safety protocols, including fire watch personnel and equipment checks and ensure proper ventilation in work areas.
	Vehicle-Related Fires	Sparks from vehicles, especially off-road, can ignite dry vegetation.	Perform regular vehicle maintenance; establish firebreaks along access roads.
	Powerlines	Faulty or downed power lines can spark fires, especially in windy conditions.	Conduct regular inspections and maintenance; create firebreaks under and around power lines.
	Green Waste Stockpiles	Accumulated green waste can spontaneously combust, leading to fires.	Avoid stockpiling large amounts of green waste and ensure regular removal.
	Agricultural & Conservation Practices	Controlled burns can become uncontrolled, leading to wildfires.	Require clear guidelines and permits; closely monitor all burning activities.
	Aircraft Crash	A crash can result in a significant fire, particularly in or near natural areas.	Develop emergency response plans with specific protocols for aircraft-related fires; coordinate with aviation authorities.

3.3. Veld management

Given that natural, fire-adapted and fire-dependent fynbos and renosterveld vegetation will be present within the airport precinct as per the landscaping plan (Figure 9) as well as within the agricultural precinct, veld management will play an important role in the prevention of unplanned veld fires.

3.3.1. Prescribed Burning

Prescribed burning is a critical intervention for managing fire-prone and fire-adapted ecosystems like fynbos. In these environments, controlled burns help reduce fuel loads, minimizing the risk of uncontrolled wildfires while maintaining species diversity and essential ecological functions. The designated onsite firefighting unit will be the implementing agent for any necessary controlled burns within CWA property. Controlled burns must take numerous factors into account, and it is subject to a permitting process as outlined below:

Ecological Considerations

Variability in veldfire management is key to maintaining biodiversity. While there is no single "ideal" fire interval, it is important to vary the frequency of burns between 8 and 20 years, with an optimal range of 12 to 18 years. Burning too often (under 8 years) can harm species that haven't fully matured, while infrequent burns (over 25 years) can result in the loss of other species. Strict rotational burns are not practical, as unplanned wildfires and natural variability in fire intervals play a crucial role in promoting biodiversity. Additionally, veldfire intensity and size of the area burnt are important factors, as they influence species recovery and seed predation. Managing veldfires requires attention to a combination of ecological criteria such as vegetation age, species composition, fuel loads, and prevalence of invasive species to determine whether the ecosystem is ready for a controlled burn.

To effectively manage the natural vegetated areas within the site, it is recommended that an assessment of the veld condition be conducted at least every eight years by a suitably qualified botanist. The condition of areas with a medium, high and very high botanical sensitivity must however be monitored annually by a suitably competent botanist (or CoCT Environmental Management Dept.). The botanist will provide a recommendation on whether the vegetation is in need of a controlled burn and if the next assessment should be delayed or moved forward.

Climatic Considerations

Prescribed burns should be conducted under specific weather conditions to ensure safety and effectiveness while minimizing the risk of uncontrolled fires. Key weather conditions include:

1. **Temperature**: Moderate temperatures, typically between 10°C and 25°C, are preferred. Higher temperatures can increase fire intensity and make it harder to control.
2. **Wind**: Winds should be steady and not too strong, usually between 8 and 20 km/h. Strong winds can spread the fire too quickly, while calm conditions can lead to erratic fire behaviour due to insufficient ventilation.
3. **Fuel Moisture**: Moisture in the vegetation (fuel) should be balanced—not too wet or too dry. Dry fuel burns too intensely, while wet fuel will not ignite easily.

These factors, along with thorough monitoring of the fire danger ratings for the region, should guide the decision to undertake a prescribed burn.

Permitting Procedure

No one may carry out open burning of any material on any land or premises unless the person has first obtained written authorization for open burning from the City's Air Quality Management Unit. Examples of open burning include biodiversity burns of open veld, burning of agricultural stubble, and stack or fuel load reduction burns of biomass. Should it be determined that a prescribed burn is needed, a burning permit must be obtained by following the following steps:

1. Application Form: Download and complete the 'Open Burn Application Form' from the City of Cape Town or Cape Peninsula Fire Protection Associations website along with all required supporting documents as outlined in the application form. The burn period designated for Prescribed / Ecological / Biodiversity Burns is from 1 February to 30 April and from 1 September to 30 November.
2. Public Participation: Part of the Open Burn Permit application process requires that an applicant notify neighbouring properties regarding their intention to apply for an Open Burn Permit. This can be achieved by:
    - **Emailing notification letter to neighbouring properties**, includes Air Quality officials in the e-mail to serve as proof of the process.
    - **Letter drops**, take photos of letter drops to serve as proof of the process and include photos in submission of application.
    - **Place a notification in the local newspaper**, include a copy of the newspaper article/notification in the submission of application.
3. Submission: The completed and signed Open Burn Permit application form together with supporting documentation must be submitted to the City's Air Quality Management Unit at Bronwyn.Davidson@capetown.gov.za.

    Once the City's Air Quality Management Unit has received your application it will be reviewed followed by a joint site inspection by the Air Quality Management Department and Fire and Rescue Services. The proposed burn site/s should be prepared and ready prior to inspection.

Controlled burns may only be conducted on days with a low fire danger rating. Additionally, before any prescribed burn takes place, CWA must notify local Fire Rescue Services as well as any adjacent landowners to ensure they are informed and prepared for the event.

Controlled burns on neighboring properties

Controlled burns are a common agricultural practice on neighbouring properties. While the frequency of these burns has decreased in recent years, it remains an integral part of local agricultural management, and it is unlikely that the practice will be completely phased out.

Landowners wating to carry out a controlled burn must obtain the necessary permits from the City of Cape Town. Burns are only permitted on days with a low fire danger rating and typically occur between March and mid-April. Prior to conducting a burn, neighbours are required to notify local fire and rescue services. Additionally, should burns be required in close proximity to the airport, neighbours will also inform airport management.

Firebreaks

The western (landside) section of the landscaping plan features fynbos and renosterveld vegetation planted in well-defined blocks, as outlined in Figure 5. These blocks should be treated as individual management units for prescribed burning. Existing roads and pathways between the blocks can act as natural firebreaks. In areas without defined planting blocks, strategic firebreaks must be created by brush-cutting vegetation within each designated burn unit. In all cases, a firebreak—either existing or created through brush cutting—must be established around the perimeter of the designated burn unit before conducting a prescribed burn. This ensures containment and enhances safety during the burn operation.

Standard Operating Procedures

For large, controlled burns on and off site that may affect visibility and disrupt aviation activities, a Standard Operating Procedure (SOP) will need to be developed to ensure effective coordination between aviation operations and airport management teams. This SOP will establish protocols for managing potential risks to visual aviation, outlining clear communication channels between fire management teams, air traffic control, and airport authorities. Developing this SOP will be critical to minimize disruptions to aviation while maintaining safe and effective fire management practices.

High Botanical Sensitivity Arras

Once all alien invasive vegetation has been removed from the conservation areas (as per the Alien Vegetation Management Plan outlined for the site) (Figure 6 - Figure 8) all these areas must be subject to planned (controlled) burn regimes starting the following autumn, as this vegetation needs fire for optimal ecological functioning. The Very High sensitivity areas are the priority areas for ecological burns, which must be undertaken in the period

February – March. Burns should be professionally managed. The botanically sensitive areas will need to be burnt every 8-12 years for optimum ecological functioning.

Prior to the controlled burn firebreaks should be brushcut by hand around the perimeter of the sensitive areas (not within them) using handheld brushcutters.

The condition of all Very High, High and Medium sensitivity areas (Agricultural Precinct and on site) should be monitored every year by a suitably competent botanist (or CoCT Environmental Management Dept.), and they should make recommendations for any management changes or actions (alien clearing, lack of fire, etc.) that are needed in order to achieve optimal ecological functioning in these areas.

Pre-Development Burn

According to the botanical scoping report the majority of the indigenous vegetation on the site is overdue for a burn. To reduce potential fire hazards during the development phase, it is recommended that a controlled burn be conducted prior to the onset of construction.

3.3.2. Alien Vegetation Management

Managing invasive alien vegetation assists in reducing fire risk and preserving the ecological health of natural habitats. Alien species, such as pines and wattles, typically produce more biomass than indigenous fynbos, resulting in denser vegetation that increases fire intensity. Additionally, alien plants can disrupt the natural fire regime, negatively impacting the ecological integrity and biodiversity of native vegetation. To protect these ecosystems, alien vegetation must be continuously removed, following the guidelines outlined in the Alien Invasive Vegetation Management Plan for the site (Annexure 6 to the overall EMPr)

3.4. General Prevention Measures

In addition to the measures mentioned above the following general fire safety practices should be implemented onsite to prevent veldfires from occurring:

- Restrict or regulate outdoor activities that could pose a fire risk, such as smoking or using open flames, to designated areas that are well away from flammable materials and high-risk zones.
- Regularly inspect and maintain ground support equipment and machinery to ensure they are in good working condition and free from faults that could cause sparks or heat.
- Implement strict protocols for the use of equipment that generates heat or sparks, such as grinding or welding tools. Ensure these activities are carried out in designated, fire-safe areas.

- Ensure that fuel storage areas are properly managed, with clear guidelines for safe storage, handling, and disposal of flammable materials.
- Implement a hot work permit system for activities that involve welding, cutting, or other tasks that produce sparks or heat. Ensure these activities are only conducted under controlled conditions.
- Conduct regular patrols of the airport grounds to monitor for potential fire hazards and ensure compliance with fire safety protocols.
- At the onset of the fire season cut long grasses and dense shrubs and remove all dead material.
- Keep gutter free of leaf litter and other combustible materials.
- Trim branches away from power lines and telephone lines

SECTION 4: FIRE PREPAREDNESS

The objective of fire preparedness is to ensure that the airport is equipped to facilitate fast and effective response to any fire incident that may occur on-site or pose a threat to the facility and its operations. The level of preparedness should be based on the daily Fire Danger Rating. Firefighting personal must use Table 1 to understand veldfire behavior and veldfire control actions required for each fire danger rating class. Nevertheless, basic preparedness should be maintained throughout the fire season, irrespective of the Fire Danger Rating.

4.1. Fire Protection Association

Chapter 2 of the National Veld and Forest Fire Act (Act No. 101 of 1998) provides for the establishment of Fire Protection Associations (FPAs) by landowners to predict, prevent, manage, and extinguish veldfires. FPAs are voluntary associations formed by landowners in wildfire-prone areas, but membership is mandatory for municipalities and state landowners within the FPA's jurisdiction.

FPAs support landowners in fulfilling their responsibilities under the Act by offering compliance advice, coordinating fire management plans, distributing the daily fire danger rating to all members during wildfire season, facilitating shared fire breaks, and providing training opportunities. They also serve as a platform for coordinating efforts and sharing resources during large wildfire incidents.

The Cape Peninsula Fire Protection Association (CPFPA), established in 2003, covers the entire Cape Metropolitan area, including the proposed CWA development site. The CWA should become a member of the CPFPA, which is divided into three management wards: the West Ward (Peninsula), the East Ward (Cape Flats, Somerset West, Steenbras), and the North Ward (Durbanville, Klipheuwel, Philadelphia, Atlantis, Mamre). The CWA site is located in the North Ward.

4.2. Firebreaks

Establishing and maintaining effective and permanent firebreaks is essential for controlling veldfires, as they provide critical access points for fire response teams, create safe zones for firefighting efforts, and help prevent the spread of fire. Firebreaks are required to comply with Section 21(1) of the National Veld and Forest Fires Act (No. 101 of 1998), which mandates that every landowner must prepare and maintain a firebreak on their side of the boundary between their land and any adjoining land where a veldfire may start, burn, or spread.

To optimize firebreak effectiveness and site accessibility, the layout of firebreaks should be linked to access roads. This approach minimizes the areas needing preparation while ensuring comprehensive access throughout the development site. Firebreaks are required around the entire property perimeter. At the proposed development site, an internal road will be constructed along the airport precinct's perimeter and will be managed and maintained as a firebreak (Figure 9). This road and firebreak will be carefully designed to avoid all botanically sensitive areas. Additionally, internal roads within the airport precinct should be designed to function as defensible spaces in the event of a fire, with road verges regularly cleared of flammable vegetation. Firebreaks must also be established along the property boundaries within the agricultural precinct, as mandated by the National Veld and Forest Fire Act (No. 101 of 1998). The landscape plan indicates the position of roads that should double as firebreaks (Figure 9). Please note, when conducting prescribed burns, it is essential to establish additional strategic firebreaks, as detailed in Section 3.3.1, to ensure safety.

4.2.1. Firebreak creation and maintenance

All firebreaks established onsite must meet the following requirements:

- With due regard to the weather, climate, terrain and vegetation of the area, firebreaks must be wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land. A width of 15m, inclusive of the road, is recommended as a guide.
- The establishment and operation of firebreaks must not cause soil erosion. Firebreaks must be cut by means of a bossiekapper or handheld brush cutters in sensitive areas. No burning may be used to establish fire breaks.
- Firebreaks must be maintained reasonably free of flammable plants and fuels, as well as bushy and tall vegetation and trees capable of carrying a veldfire across it. The height of the vegetation within the firebreak must be kept as low as possible.

- Firebreaks must be established and maintained on an annual basis, with the initial establishment occurring prior to the onset of the fire season in early October.
- All required onsite firebreaks must be monitored monthly during the fire season.
- All material removed from the firebreaks must be cleared from the site to prevent it from becoming a fire hazard.
- Firebreaks should not be designed with sharp angles. Where roads serve as firebreaks, the adjacent vegetation must be managed to ensure smooth, continuous lines without abrupt changes in direction.
- Firebreaks should not be established in areas identified as having high ecological sensitivity (e.g. wetlands or areas of botanical significance). Instead, wherever possible, firebreaks should be strategically placed in locations already planned for disturbance, such as along roads or other planned infrastructure. This approach minimizes environmental impact while maintaining the effectiveness of the firebreaks.

These guidelines ensure that firebreaks serve as an effective tool for fire prevention and control, reducing the risk of wildfires spreading across property boundaries and threatening the airport precinct.

4.3. Equipment, facilities & staff

4.3.1. Aircraft rescue and firefighting (ARFF) services

A dedicated firefighting team will be appointed and maintained onsite at all times. For veldfire management, this team should comprise at least 9 firefighters and 1 crew leader. However, additional team members may be required depending on the specific needs of Aircraft Rescue and Firefighting (ARFF) services. The size and composition of the team should align with both veldfire risks and airport operational demands. All appointed firefighters must be appropriately qualified with recognized accreditations. All site operatives must receive training in awareness of the issues of fires, litter, and contaminants and all any staff involved in high fire-risk activities, such as hot work or refueling, must undergo relevant firefighting training to ensure preparedness and safety

The ARFF services will be located directly East of the air traffic control tower, close to the middle of the runway and complies with the ICAO requirements considering the response times of two minutes and not exceeding three minutes, to any point of the operational runway and any other part of the movement area.

4.3.2. Equipment

In accordance with the National Veld and Forest Fires Act equipment, protective clothing and trained personnel must be available on the site to fight and extinguish any fires. The following minimum equipment and tools must be kept on site, at all times:

Hand tools:

- Fire beaters
- Spades
- Rake hoes
- Fire extinguishers (not to be used in natural areas & PFC's should not be used)

Water related:

- 15l Backpack sprayers
- Potable water tanks (mounted on vehicles) ("Bakkie Sakkie" with a minimum of 500l water tank capacity)
- Trailer pump (>1000l)
- Designated fire response vehicles fully equipped with firefighting equipment
- Fire water tanks with access hydrants and pumps

PPE (Personal Protective equipment):

- Fire resistant jacket, pants, gloves
- Flash resistant hoods
- Cotton overalls and t-shirts
- Leather boots
- Goggles
- Breathing masks
- Hard hats

Other equipment:

- Spotlights, and headlamps (minimum of 1 per fire fighter)
- Bolt cutters
- First aid kit with burn shields (minimum 1 per fire fighter)
- Two-way radio's / Cell Phones

The quantity of required firefighting equipment depends on both the size of the property and the number of designated firefighters available. The CPFPA has established minimum standards for equipment, personnel, and protective clothing, as detailed in Tables 3 and 4 below. For properties of this size (101-1000 ha), the maximum thresholds outlined in these tables apply. It's important to note that these requirements are considered the minimum baseline requirements for veldfire management and additional resources may be necessary to ensure adequate fire preparedness and safety.

Table 3: CPFPA Minimum Equipment Requirements

Property Size in Ha.	Fire Beaters	15l rucksack pumps	Rake Hoes	First Aid kit	Cell Phones	Trailer pump, >1000l	Bakkie sakkie fast reaction units – 500l capacity	Compliance	
								YES	NO
1-10 Ha	3	2	3	1	1	-	-		
11-100 Ha	5	4	5	1	1	-	-		
101-1000 Ha	10	5	10	1	1	1	1		

Table 4: CWA Minimum Personnel and Protective Equipment Requirements

Size in Ha.	Fire fighters	Crew leader	Fire Boss	Fire protective clothing (= number of personnel)					Compliance	
				Cotton overalls	Cotton t-shirts	Leather boots	Flashood/Scarf & Goggles	Pair of gloves	YES	NO
1-10 Ha	2	1	-	3	3	3	3	3		
11-100 Ha	4	1	-	5	5	5	5	5		
101-1000 Ha	9	1	-	10	10	10	10	10		

All firefighting equipment must be serviced according to the manufacturer's instructions and no less frequently than the manufacturer's statutory requirements (annually). Firefighting vehicles must be maintained in optimal working condition with regular servicing. Fire extinguishers must be serviced at least once a year. An inspection register for all firefighting equipment must be maintained. Any defects or damages to vehicles or equipment must be reported immediately to the relevant manager.

Equipment should be positioned in readily accessible and clearly visible locations. Only trained employees are authorized to use firefighting equipment. In the case of any welding, grinding or other “hot work” being undertaken onsite, a fire extinguisher is to be readily available to extinguish any fire that may result from these activities. All heavy machinery used onsite should carry fire extinguishers, and all staff should be able to use them if required.

SECTION 5: FIRE RESPONSE

A well-planned and coordinated fire response is crucial. The goal of an effective fire response is to rapidly identify and implement strategies that contain and extinguish fires, minimize environmental impact, and ensure clear communication among all involved authorities throughout the process. Fire Response must be based on the potential threat not the immediate size of the veldfire.

5.1. Communication during a veldfire

Effective communication is essential for efficient response to veldfires. To minimize risk, damage, and costs, it's crucial to establish clear lines of authority and communication from the outset. Every veldfire operation must designate a Fire Chief, who commands the overall firefighting effort, and a Crew Leader, who oversees a team of up to 15 firefighters. For smaller fires, one person may fulfill both roles. Reliable communication tools, such as two-way radios, are necessary to ensure seamless coordination among all crew members involved in firefighting operations.

In all veldfire situations, the Fire Chief must maintain clear and ongoing communication with airport operators and key stakeholders, such as neighboring properties and municipal firefighting teams. This includes providing timely and accurate updates on the fire's location, size, and intensity. Such information is essential for airport operators to make informed decisions regarding the safety of operations, while also allowing other stakeholders to assess and implement any necessary management actions to protect their assets and interests.

Standard Operating Procedures

For large, veldfires on and off site that may affect visibility and disrupt aviation activities, a Standard Operating Procedure (SOP) will need to be developed in association FPA to ensure effective coordination between aviation operations and airport management teams. This SOP will establish protocols for managing potential risks to visual aviation, outlining clear communication channels between fire management teams, air traffic control, and airport authorities. Developing this SOP will be critical to minimize disruptions to aviation while maintaining safe and effective fire management practices.

5.2. Keeping the fire small

A rapid response significantly increases the chances of quickly containing and extinguishing a fire. To ensure this, it is essential to have effective systems in place for fire detection and reporting:

- <u>Fire Spotting:</u> During working hours, CWA ground staff, the control tower, and airport tenants are responsible for monitoring and reporting fires within airport bushland or approaching airport land. Outside of these hours, airport management will depend on remaining onsite staff, such as security personnel, and neighbouring communities for fire detection. To enhance fire detection and response, it is recommended to engage neighbouring communities in understanding the importance of timely fire reporting. Additionally, ensure that essential firefighting contact information is broadly disseminated to nearby landowners and adjacent communities.

- Reporting a fire: Fires originating onsite must immediately be reported to the designated firefighting unit stationed at the airport as well as the Cape Peninsula Fire Protection Association. All onsite and offsite fires must also be reported to the City of Cape Town Fire & Rescue Services Control Room: 021 590 1900, alternatively: 107 (from a landline) or 021 480 7700 (from a cell phone). The onsite firefighting unit must have a designated and publicly available contact number.

5.3. Response procedures

Once an onsite fire is reported to the onsite firefighting personal the appropriate response plan must be enabled as below:

1. Initial Response

1. Dispatch Firefighting Team: Upon receiving a report of a wildfire on airport property, the on-duty Fire Chief must immediately dispatch a firefighting team to the location. The dispatched team should be equipped with all necessary firefighting equipment and PPE.

2. On-Site Assessment and Action Plan

1. Assessment: Upon arrival, the designated Crew Leader will conduct an assessment of the wildfire's size, intensity, and potential threat.

2. Develop Action Plan: In consultation with the Fire Chief, the Crew Leader will formulate an appropriate action plan to effectively extinguish the wildfire. The method used to bring fires under control should be based on the daily Fire Danger Rating. Firefighting personnel must use Table 1 to understand veldfire behaviour and veldfire control actions required for each fire danger rating class.

3. Communication with Affected Parties

1. Inform Stakeholders: Depending on the level of threat, promptly notify all affected parties, including City Fire & Rescue Services, CPFPA, adjacent landowners, airport operators and other relevant stakeholders regarding the level of reaction required

4. Control and Coordination

1. Report Control Status: The Crew Leader must inform the Fire Chief once control of the wildfire has been established and when firefighting resources are being withdrawn from the site.

2. Joint Operations (if needed): If the wildfire is large or severe, coordinate joint operations with the City Fire & Rescue Services or the CPFPA to ensure a unified and effective response.

5. Post-Control Actions

1. Mopping Up: After final control has been established, continue mopping up the area to prevent re-ignition. This process will continue until the Fire Chief confirms that the wildfire is fully extinguished.

SECTION 6: FIRE RECOVERY

Recovery is the process of returning the affected area back to normal after the impact of a fire. The objectives of fire recovery include recording information about the fire and review and updating response and management plans as relevant.

6.1. Immediate recovery

After a veldfire has been brought under control, patrolling and inspections should continue until the Fire Chief is satisfied that the veldfire has been extinguished. Once a veldfire has been extinguished, all equipment should be returned to the correct storage facilities and inspected. Equipment must be cleaned, repaired if needed and prepared for future use.

6.2. Debriefing

After major veldfires, a formal debriefing should be conducted with all relevant agencies and parties involved in the firefighting effort. This debriefing is essential for discussing lessons learned, identifying necessary changes, and improving the response plan's efficiency. To ensure its effectiveness, the debriefing should be scheduled as soon as possible after the event. At this debriefing, the cause of the veldfire should be identified and discussed as this will assist with improved future management.

6.3. Recording the fire

Maintaining comprehensive records of fire extent and impact is crucial for effective fire prevention and bushland management. Furthermore, in accordance with the Veldfire Act, all veldfire incidents occurring on-site must be documented and reported to the relevant Fire Protection Association (see Section 4.1)

These records should include:

- The mapped spatial extent of the area burnt.
- An estimate of the percentage of the vegetation that remained unburnt within the area recorded. Veldfires often burn unevenly, leaving patches or "islands" of unburnt vegetation behind.

- Estimated fire intensity (high, moderate or low), based on the efficiency of fuel consumption in the burnt areas
- Fire origin/cause
- Date and time of the incident
- Method of fire reporting
- Fire Danger Index and weather conditions at the time
- Effectiveness of preparedness measures
- Fire response actions taken and required rehabilitation efforts

An example of a fire report template is provided in Appendix A.

6.4. Post fire fauna and flora management

Post fire rehabilitation requirements will be dependent on a number of factors such as the habitat/vegetation type impacted, the size of the fire, the intensity of the fire, the time of year and the success of natural post-fire regeneration. Alien invasive plant species, which often proliferate from existing seedbanks after a fire, may pose a significant challenge. To address this, monthly monitoring of the burnt area and prompt removal any emerging seedlings should be implemented post fire as outlined in the Alien Invasive Plant Management Plan – Annexure 6 to the overall EMPr.

SECTION 7: MONITORING AND COMPLIANCE

7.1. Monitoring

The implementation of this Veldfire Management Plan (VFMP) falls under the responsibility of the CWA Firefighting Unit. It is critical that all management actions outlined in the plan are strictly adhered to. Regular and thorough monitoring is essential to ensure compliance with VFMP specifications, identify any issues of non-conformance, and implement corrective actions to minimize fire risks and prevent environmental damage.

Monitoring activities should be carried out monthly by the appointed Fire Chief, ensuring that all aspects of the plan are effectively applied. The results from these checks must be documented and reported to the ECO appointed to the site.

Detailed records of all fire incidents, controlled burns, and relevant interventions must be meticulously maintained. These records should be submitted to the CWA Environmental Management Division on a monthly basis. To evaluate the effectiveness of the VFMP, the results will be analysed to develop key performance indicators (KPIs). It will be the responsibility of the Fire Chief to develop best practices based on these KPIs, ensuring continuous improvement across CWA veldfire management operations.

7.3. Review of the Veldfire Management Plan

The VFMP will be reviewed by the appointed Fire Chief on an ongoing basis. Based on observations during site inspections and issues raised during team meetings, the Fire Chief in collaboration with the CWA Environmental Management Division and appointed ECO will determine whether any procedures require adjustment to enhance the plan’s efficiency and applicability. The VFMP must be updated should any significant changes to operations be required. Updates must be guided and supported by a qualified environmental professional to ensure adherence to environmental and ecological best practices. All updates should be appended as an annexure to this document and must be distributed to all relevant stakeholders on site. This ensures that everyone involved is informed of the latest changes and can implement them accordingly to maintain compliance and operational efficiency.

7.4. Environmental Monitoring and Audits

Throughout the construction phase, monthly ECO reports must be compiled and submitted to DEADP. Throughout the operational phase, monthly ECO reports must be compiled and submitted to the site’s EM.

During the construction phase a qualified Environmental Auditor, appointed at the Applicant’s expense, must conduct six-monthly compliance audits of the EMPs in place for the site, including the VFMP. Once the project transitions fully to the operational phase, annual compliance audits of the same EMP suite, including the VFMP, must be undertaken. Internal audits should be undertaken on a regular basis as determined and managed by the site’s EM.

The audit should aim to:

1. Assess compliance with the key components of the EMPrs.
2. Identify critical areas requiring attention.
3. Recommend priority actions for improvement.

The audit must cover a range of issues, including the implementation of environmental controls, environmental management practices, and environmental monitoring.

Audit findings should guide any necessary updates or additions to the EMPrs to address new or unresolved environmental issues on site. National, provincial, and local authorities must be provided access to the facility for audit or inspection upon request.

7.5. Record Keeping

The Applicant should keep records of the following:

- Monthly monitoring reports submitted by the onsite Fire Chief / Fire Control Officer
- 6-monthly audit reports
- Annual audit reports
- Reviews and amendments of the VFMP
- Incident reports for all fire related incidents that occur onsite

Records should be kept and must be made available for review on request, based on adequate motivation.

APPENDIX A: FIRE REPORT TEMPLATE

Fire Report

Name:	**File reference number:**
Date & time of Fire:	**FDI on date of Fire:**
Reporting method:	**Weather on date of Fire:**

Section 1: Description of the fire (Location, time taken to control, fire intensity (high, medium or low) based on the efficiency of fuel consumption in burnt areas, effectiveness of preparedness measures)

Section 2: Response actions taken and remedial action required

Section 3: Mapped spatial extent of the area burnt & percentage of area burnt

Section 4: Steps to prevent recurrence

Section 5: Signatures

Fire Chief: ……………………………….	Date: ……………………………
ECO: ……………………………….	Date: ……………………………
Applicant: ……………………………….	Date: ……………………………

ANNEXURE 6: ALIEN VEGETATION MANAGEMENT PLAN

DEA&DP IN-PROCESS NR: 16/3/3/2/A5/20/2046/24

ALIEN VEGETATION MANAGEMENT PLAN FOR THE PROPOSED EXPANSION OF THE CAPE WINELANDS AIRPORT

(P10 OF FARM 724, RE OF FARM 724, P23 OF FARM 724, P7 OF FARM 942, RE OF FARM 474, P3 OF FARM 474 AND P4 OF FARM 474)

JULY 2025

PREPARED FOR
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Document Details

DOCUMENT TITLE	Alien Vegetation Management Plan for the Proposed Expansion of the Cape Winelands Airport
NUMBER OF PAGES	43
DOCUMENT VERSION	Final Report for Submission

Document Control

	NAME	EAPASA REGISTRATION NUMBER	SIGNATURE	DATE
AUTHOR	Olivia Brunings	2023/6743 (Candidate)		03/07/2025
REVIEWER	Paul Slabbert	2019/1036		03/07/2025

PLEASE NOTE THAT ALL CHANGES FROM THE DRAFT REPORT FOR COMMENT VERSION 1 ARE UNDERLINED IN BLACK. GENERAL TEXT CHANGES ARE NOT UNDERLINED

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KEY TERMS AND ABBREVIATIONS

Alien Vegetation Control Officer (ACO) – A suitably qualified team leader responsible responsible for managing the Alien Vegetation Management Unit and monitoring their progress.

Alien Vegetation Management Plan (AVMP) - A strategic framework designed to control, manage, and reduce the impact of alien and invasive plant species in a specific area

Alien Vegetation Management Unit – A dedicated team stationed permanently at CWA responsible for implementing and maintaining the Alien Vegetation Management Plan. This team ensures effective control and management of invasive species, aligning all activities with the plan's requirements.

Applicant – Capewinelands Aero (Pty) Ltd. The Applicant who is the landowner, person in control of the land, developer and operator of the airport will be responsible for the overall implementation of the AVMP.

Auditing - A systematic and objective assessment of an organization's activities and services conducted and documented on a periodic basis to a predetermined standard.

CWA – Cape Winelands Airport

Department of Environmental Affairs and Development Planning (DEA&DP)– the provincial authority for sustainable environmental management and integrated development planning.

Environmental Auditor – An independent EAP appointed to conduct an audit of the environmental management systems in place for an organization or development.

Environmental Manager (EM) – Head of the CWA Environmental Management Division. The EM will oversee all aspects of the Environmental Management on site. The Environment Manager is responsible for ensuring that the organization meets its environmental policy commitments and improves its environmental performance.

Environmental Management Division (EMD) – Designated entity for overseeing and ensuring environmental compliance throughout the construction and operation of CWA.

Environmental Management Programme (EMPr) an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation, and decommissioning of a project are managed, and that positive benefit of the projects are enhanced.

Environmental Control Officer (ECO) – a suitably qualified environmental consultant to be appointed by the Applicant to oversee the implementation of the suite of Environmental Management Plans complied for the site, inclusive of this Alien Vegetation Management Plan.

IAP – Invasive Alien Plants

Management Unit – A specific, clearly defined area of land designated for alien and invasive vegetation management according to a pre-determined schedule.

National Environmental Management Act (Act 107 of 1998, as amended) (NEMA)– national legislation that provides principles for decision-making on matters that affect the environment.

Site - Area where the proposed development will take place

SECTION 1: CONTEXTUAL INFORMATION

1.1. Project Background

Overview of the proposed development:

The Cape Winelands Airport (CWA), historically known as Fisantekraal Airfield (FAFK), is located approximately 10.5 km northeast of Durbanville and 25 km northeast of Cape Town International Airport (CTIA) (see Figure 1). Initially constructed around 1943 as a South African Air Force aerodrome during World War II, CWA has since transitioned into a general aviation (GA) airfield. The current 150-hectare site includes four concrete runways, each 90 meters wide and varying in length between 700 meters and 1,500 meters. The facility supports various unscheduled operations such as recreational flying, flight training, aircraft maintenance, charter operations, crop spraying, and aerial banner towing.

The proposed development will expand the existing airport facilities, encompassing five additional cadastral portions (see Figure 2), creating a combined area of 885 hectares. Of this area, 470 hectares will be allocated for airport development, including an airside precinct, terminal precinct, services precinct, general aviation precinct and associated landscaping (see Figure 4). The remaining land will remain as agricultural zones, designated as an agricultural precinct (Figure 4). This agricultural precinct will feature a combination of dryland agriculture, conservation of botanically sensitive areas, and wetland offsets.

Alien vegetation management:

Invasive alien plants pose a significant environmental challenge in South Africa, affecting nearly 10 million hectares of land (8.28% of the country). These species, introduced from regions such as Australia, the Americas, Europe, and Asia, were originally brought for various purposes—ranging from commercial use to ornamental planting and dune stabilization. Others have been introduced accidentally. Invasive alien vegetation outcompetes native plants, reduces biodiversity, adds to the fuel load increasing the fire frequency and intensity, transforms the riparian zones, affects the functioning of aquatic ecosystems by altering water quality and flow, and unnaturally supports an increase in some fauna.

The proposed Cape Winelands Airport (CWA) development site is notably impacted by invasive species such as *Acacia saligna* (Port Jackson), *Pinus* species (pines), and *Eucalyptus* species (gums) among others. While initial efforts to clear invasive vegetation from the original CWA site began in 2020 along with the development of an Alien Invasive Management Plan (AIMP), the redevelopment and expansion of the CWA necessitates an updated and comprehensive plan to address the broader site area. The current Alien Vegetation Management Plan (AVMP) has been developed to cover the entire CWA. This AVMP integrates the existing AIMP (October 2022) and will replace it, ensuring a unified approach to vegetation management across the expanded area.

Landowners are under a legal obligation to control invading alien plants occurring on their properties. This Alien Vegetation Management Plan forms part of the overarching Environmental Management Programme (EMPr) for the expansion and operation of the proposed CWA and serves as a strategic framework for managing invasive alien species on the entire CWA property. It covers all phase of the process, from targeted, systematic removal to ongoing management and control. The plan also establishes long-term, structured approaches for continued management and monitoring, ensuring the ecological integrity of the site both during and after the development process.

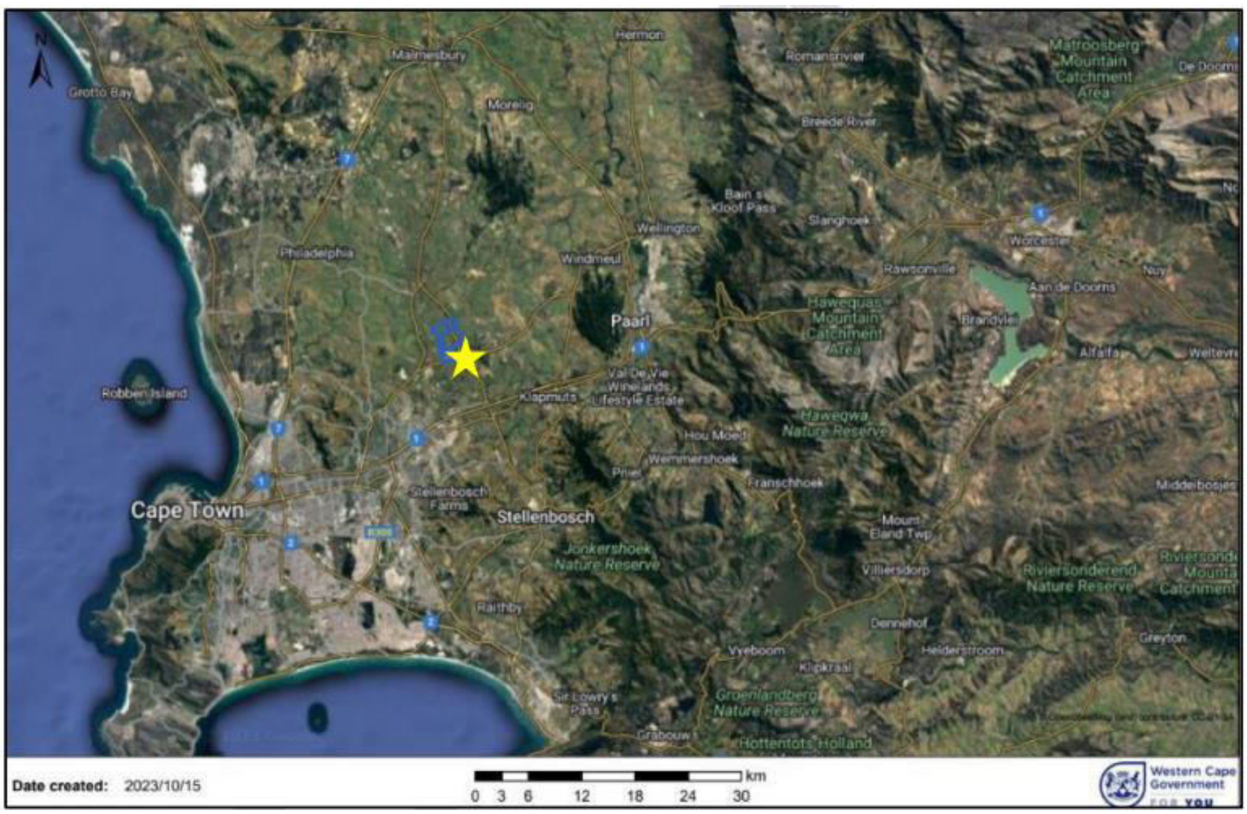

Figure 1: Regional location of CWA (indicated by yellow star and with cadastrals outlined in blue) (PHS Consulting, Oct 2023)

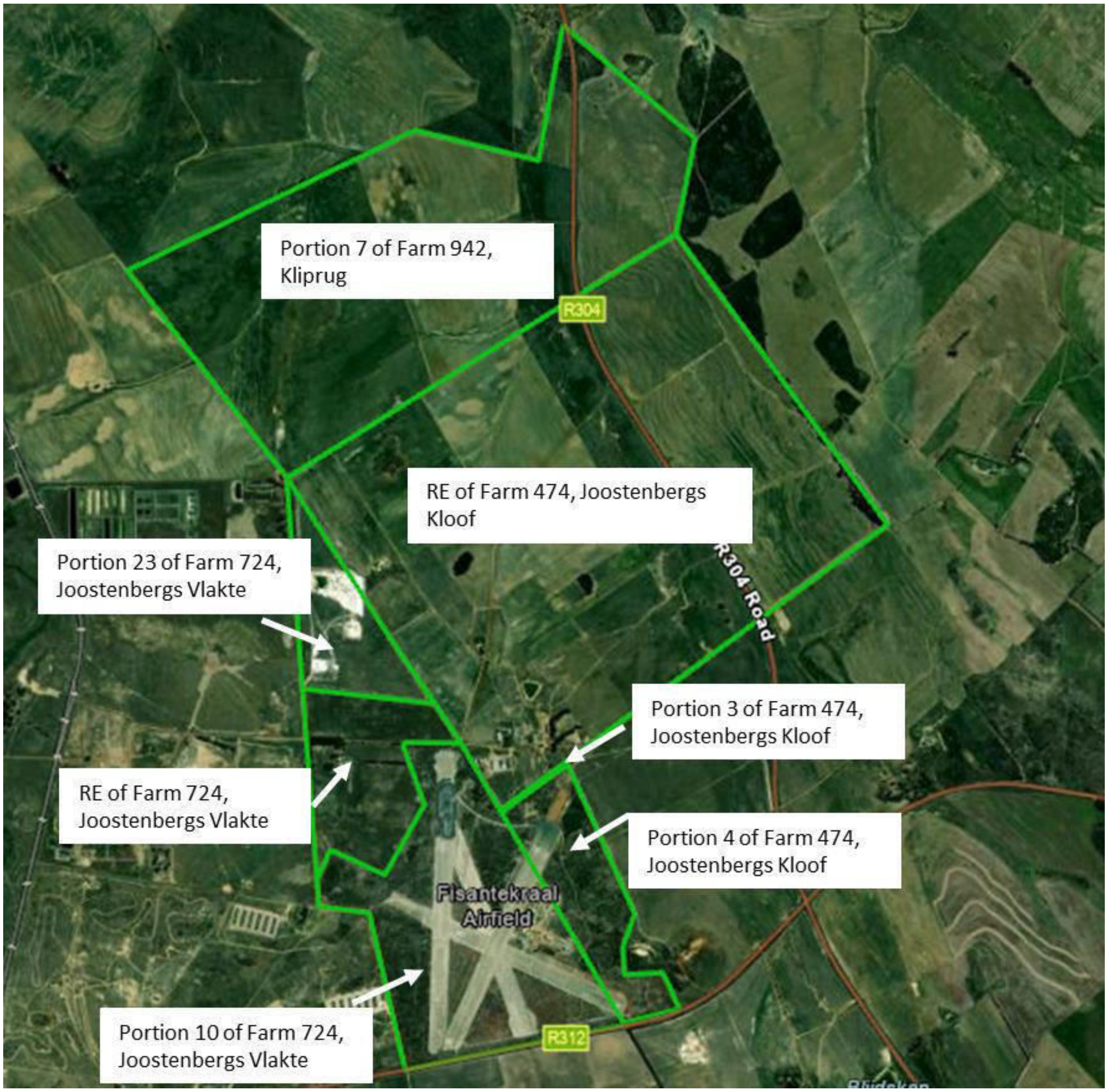

Figure 2: Cadastrals forming part of application area

Figure 3: Phase 1 preferred SDP - Precinct Plan (Capex, August 2024)

Figure 4: Phase 2 preferred SDP - Precinct Plan (Capex, January 2025)

1.2. Purpose of the Alien Vegetation Management Plan

The purpose of this Alien Vegetation Management Plan is to outline a comprehensive strategy for the complete eradication of alien invasive plants and the long-term maintenance of the site in an alien-free condition. This plan aims to ensure compliance with airport safety standards, restore ecological functioning, and improve habitat quality, particularly in areas of botanical sensitivity and ecological importance.

To achieve these goals, the plan focuses on meeting the following objectives:

- Identify and confirm areas for alien vegetation clearing.
- Establish methods for effective alien clearing, including necessary follow-up actions.
- Provide a realistic program with clear targets for the clearing process.
- Promote the conservation of indigenous plant species within the property.
- Support job creation and skills development in local communities.
- Ensure the sustainable reuse of cleared biomass to maximize environmental benefits.

1.3. Management Strategy

The Alien Vegetation Management Strategy is designed to ensure a structured, continuous, and effective approach to eradicating and managing invasive alien plants on the site. The strategy focuses on phased clearing, proper resource allocation, and collaboration between the in-house team and contractors during construction.

Before initiating the clearing of any section, it is essential to recognize that once the program begins, it must be carried through to completion. Ad hoc clearing without a structured follow-up plan is ineffective and provides little value. To achieve the desired outcomes, the program must be implemented in a phased, systematic manner, as detailed in this document. This approach ensures long-term success and sustainable management of the cleared areas.

1. Appointment of Alien Clearing Team

A trained and experienced team is essential to the success of follow-up efforts. The applicant must appoint an experienced in-house alien clearing team. This team should ideally be sourced from the local community and be knowledgeable in alien clearing techniques. Where necessary, training must be provided to ensure all workers can perform their duties effectively. The size of the team should be aligned with the scale of the site and the extent of the infestation. The team must include:

- At least one qualified supervisor with demonstrated experience in alien vegetation management. The supervisor will be responsible for managing the team and monitoring their progress and will be known as the Alien Vegetation Control Officer (ACO).
- Trained team members: All team members must undergo training upon appointment to ensure they are familiar with both the alien clearing methods and the specifics of this management plan. The following roles will need to be fulfilled:
    - Chainsaw operators for felling and cutting of invasive vegetation.
    - Herbicide applicators (where necessary) to ensure effective treatment of regrowth.
    - General workers to assist with various tasks.

The team should be fully briefed on the specific needs of the site, including any sensitive areas that require special attention or avoidance, the targets and schedule for follow-up events, and the immediate priority zones where urgent clearing is necessary.

2. <u>Construction Phase: Contractor Responsibilities</u>

   Once construction begins, contractors will be responsible for alien vegetation management within their assigned work areas. The following guidelines apply:

- Contractors must actively remove alien plants throughout all construction activities to prevent their spread within work zones. Hand-pulling seedlings is the most effective method for removal. Following initial clearing efforts, it is advisable for contractors to allocate a few minutes weekly for their teams to engage in hand-pulling seedlings, thereby maintaining control over emerging invasive plants.
- Construction activities disrupt soil and vegetation, increasing the risk of alien plant establishment. Therefore, clearing efforts must prioritize areas experiencing disturbance, such as excavated or cleared zones, to prevent the rapid spread of alien species in these high-risk areas.
- The requirement for alien vegetation management must be included in the tendering process to ensure that contractors allocate the necessary resources.

- Contractors must be supervised by the ECO to ensure compliance with the ongoing alien vegetation management during construction.

3. Construction Phase: In-House Alien Clearing Team

   Once construction in the airside precinct commences, the in-house team should concentrate primarily on this extensive area, ensuring it remains free of alien vegetation. Before this phase begins, the team can assist in other areas as required, depending on available capacity and specific requests from contractors.

4. Post-construction Phase: In-house Alien Clearing Team Responsibility

   Once construction is completed in a given area and handed over by the contractors, the in-house team will assume full responsibility for managing alien vegetation. This includes ongoing follow-up activities throughout the operational phase of the development. As the project advances, the in-house team must establish management units across the property and develop a clearing schedule to monitor initial clearing and follow-up efforts, ensuring alignment with the requirements of the management plan.

1.4. Relevant legislation and policies

The following is a list of the principal legislation for alien invasive vegetation management as relevant to the proposed development. All activities on site must ensure compliance with the provisions of the legislation as applicable:

- Conservation of Agricultural Resources Act (Act No. 43 of 1983)
- National Environmental Management Act, 107 of 1998
- National Environmental Management: Biodiversity Act, 2004 (Act No.10 of 2004)
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 Of 2004): Alien and Invasive Species Lists, 2020 (GN1003 of September 2020)
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 Of 2004) Alien and Invasive Species Regulations (GN R1020 of September 2020)
- Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947)
- National Water Act, Act 36 of 1998
- Section 31A of the Environment Conservation Act, 73 of 1989;
- Municipal by-laws and the National Veld and Forest Fire Act 101 of 1989
- Occupational Health and Safety Act (No. 85 of 1993)
- Basic Conditions of Employment Act 75 of 1997

Landowners are under legal obligation to control invading alien plants occurring on their properties by removing any listed invasive species. A listed invasive species means any species, which is listed in terms of section 70 of the National Environmental Management Biodiversity Act (NEMBA), whose establishment and spread occurs outside of its natural distribution range. In accordance with Section 70 of NEMBA Alien and Invasive Species lists have been published in Government Notice GN1003 of September 2020. All invasive species listed are classified into 4 categories to which specified regulations apply as detailed in GNR1020, in summary:

- Category 1a: These invasive species require compulsory control, and eradication is legally required. No permits are issued for these species.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control program. Remove and destroy. They have such high invasive potential that infestations may qualify for government-sponsored management. No permits are issued.
- Category 2: These species are regulated by area, requiring a demarcation permit to import, grow, possess, or trade. Category 2 plants are prohibited in riparian zones.
- Category 3: These species are regulated by activity, and individual permits are required for any restricted activities such as possession, sale, or cultivation. Like Category 2, Category 3 species are prohibited in riparian zones.

Species regulated under the Conservation of Agricultural Resources Act (CARA) (Act 43 of 1983), which are listed as weeds or invader plants, are exempt from NEMBA. In such cases, CARA's provisions take precedence over those of NEMBA.

1.5. Status of the Alien Vegetation Management Plan

The AVMP must form part of all contractual documents for this project. The Environmental Authorization ascribes legal status to this Management Plan and any subsequent amendments thereto. The approval of the Management Plan by DEA&DP will require that the applicant and all appointed contractors must comply with the requirements herein. Any amendments/ changes/ upgrades to the Management Plan will require submission to and approval by DEA&DP.

1.6. Responsible persons

1.6.1. Applicant

The Applicant will be responsible for the overall implementation of the AVMP. This includes ensuring adherence to all stipulations within the plan and appointing the necessary personnel to facilitate its complete execution. Furthermore, the Applicant must provide all principal contractors with a copy of the AVMP as part of the tender and contract documentation, allowing contractors to factor the plan's requirements into their respective construction contracts.

The Applicant also holds the overarching environmental responsibility to ensure that both construction and operational activities comply with relevant legislation. This entails a thorough understanding of the AVMP, any Environmental Authorizations, or other legally binding documentation associated with the project, to guarantee compliance at every stage.

1.6.2. CWA Environmental Management Division

The CWA Environmental Management Division (EMD) will be established at the start of the construction phase to ensure environmental compliance throughout the project. The CWA EMD will appoint an Environmental Manager (EM) to oversee all aspects of the Environmental Management on site. The Environment Manager is responsible for ensuring that the organization meets its environmental policy commitments and improves its environmental performance. Not only do they monitor performance against and ensure compliance with relevant laws and regulatory requirements, but they are also proactive in identifying and promoting opportunities to reduce the environmental impact of the organization's activities, products and services.

Led by an Environmental Manager, the CWA EMD will consist of several teams for e.g. landscaping, waste management, alien species control, fire management etc. During the initial phases it could be one multitask team to be split as the tasks increases. Each team will have a Control Officer reporting directly to the EM. In the case of Alien Vegetation this would be the Alien Vegetation Control Officer. The Environmental Manager will oversee the implementation of Environmental Management Plans (EMPr), compliance with regulations, day-to-day environmental management of the site, managing the necessary applications, and overseeing external service providers such as the appointed Environmental Control Officer. Responsibilities also include internal audits and developing strategies for waste minimization and emissions reduction.

1.6.3. CWA Alien Vegetation Management Unit

The designated CWA Alien Vegetation Management Unit will be responsible for the overall implementation of the AVMP. Upon appointment, all team members must receive comprehensive training on the AVMP's requirements, with ongoing training provided to any newly appointed team members throughout the operational phase. It is the responsibility of the applicant to ensure that this training is conducted.

A designated Alien Vegetation Control Officer must be appointed within the EMD to lead the alien vegetation management and oversee the implementation of the AVMP. The alien vegetation control officer will assume overall responsibility for managing the AVMP, employees and contractors and ensure and oversee the implementation of the AVMP onsite in its entirety. All decisions regarding alien vegetation related environmental procedures and protocol must be approved by the alien vegetation control officer, who also has the authority to stop any activity in contravention of the AVMP. The role of is interactive and must include daily site visits.

Key Responsibilities of the Alein Vegetation Control Officer:

- Assume overall command of alien vegetation removal operations onsite.
- Provide training to all staff on AVMP requirements.
- Conduct regular monitoring of the site to identify high priority areas for clearing.
- Compile and submit monthly monitoring reports to the ECO.
- Work closely with the ECO, applicant, and contractors to resolve any alien vegetation related issues that arise.

1.6.4. The Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is responsible for overseeing and verifying the proper execution of the EMPr during the construction and operational phase. This includes ensuring that various contractors working on-site comply with the waste management plan within their designated areas. During the construction phase, an independent Environmental Assessment Practitioner (EAP) firm must be appointed to serve as the ECO who will work alongside the EM. Once the project transitions fully into the operational phase, this function can be managed by an in-house ECO within the CWA Environmental Management Division who will report to the EM. During the construction and operational phases, monthly ECO reports must be prepared and submitted to the Department of Environmental Affairs and Development Planning (DEADP) during construction and to the EM during operations.

1.6.5. The Competent Authority

DEA&DP will review the AVMP and on approval they may have the following role to play:

- Review and monitor implementation of the AVMP;
- Review whether there is compliance by the Applicant;
- Perform random control checks;
- Review incident and audit reports;
- Enforce legal mechanisms for contraventions of the AVMP.

1.6.6. Engineers and Contractors

The engineers and contractors, where applicable, are responsible for physically carrying out certain development and maintenance activities. The responsibilities indicated here are also relevant to sub-contractors.
The responsibilities of the engineers and contractors include but are not limited to the following:

- Be conversant with the AVMP, EMPr, any relevant Environmental Authorization or any other legally binding documentation;
- Have a responsibility to adhere to any conditions and recommendations laid out in above mentioned documentation;
- Prevent actions that may cause harm to the environment;
- Be responsible for any remedial activities in response to an environmental incident;
- Review and amend any construction activities to align with the AVMP, EMPr and Best Practice Principles;
- Ensure compliance of all site personnel and / or visitors to the AVMP, EMPr and any other authorisations.

SECTION 2: OVERVIEW OF SITE CONDITIONS

2.1. Regional Context

The proposed development site is situated within the West Coast Renosterveld bioregion, part of the Fynbos biome and the Core Region of the Greater Cape Floristic Region (GCFR). The GCFR is one of six global floristic regions, and notably, it is the only one primarily confined to a single country, South Africa. Despite covering just 0.2% of the world's land surface, the GCFR hosts approximately 11,500 plant species, half of South Africa's total plant diversity. The region is characterized by a high degree of endemism, with many species being found nowhere else. However, extensive habitat loss from agriculture, urbanization, and alien plant invasions has led to severe conservation challenges. Around 67% of South Africa's threatened plant species are located in the southwestern Cape, making it a national and global conservation priority.

The West Coast Renosterveld bioregion is defined by high winter rainfall, fertile soils, low topographic diversity, large urban areas, intense agriculture and high levels if invasive vegetation. Due to this combination of factors, over 90% of the region's natural vegetation has been lost, resulting in one of the highest concentrations of threatened plant species globally. The lowland regions of the Cape metropole (stretching from Atlantis in the north, southeast to near Somerset West), generally known as the Cape Flats, is under enormous pressure in terms of its biological diversity. The study area lies just outside the northeastern fringes of what is normally considered the "Cape Flats".

2.2. Vegetation of the property

In order to plan for vegetation clearance, one needs to understand and record what types of vegetation occur in what areas on site. According to the South African Vegetation Map, three different vegetation types would have occurred in the study area before human disturbance (Figure 5).

Swartland Granite Renosterveld originally covered much of the site and is considered Endangered at both national (Government of South Africa, 2022) and regional levels (Holmes et al., 2008). Approximately 15% of the greater study area was historically Swartland Shale Renosterveld, which is classified as Critically Endangered on both national and regional scales. In the northern part of the site, Cape Flats Sand Fynbos, classified as Critically Endangered, was initially identified on the South African Vegetation Map. However, based on field verification, the remaining natural vegetation in this area has been identified as Swartland Silcrete Renosterveld, another Critically Endangered vegetation type (Nick Helme Botanical Surveys, Botanical Impact Assessment, September 2024).

2.2.1. Botanical Sensitivity

The Botanical Impact Assessment undertaken by Nick Helme revealed the following (Nick Helme Botanical Surveys, Botanical Impact Assessment, September 2024):

- About 93% of the site has been heavily disturbed and degraded over a long period of time, with the result that negligible indigenous vegetation is found in these areas, and these areas are of Low botanical sensitivity. Indigenous plant diversity is very low in the most disturbed parts of the airport precinct, and is low overall, compared to pristine Renosterveld, which would have at least 250 species in a site of this size (if pristine). There is no indigenous plant cover in the large, cultivated areas in the agricultural precinct.

- Approximately 7% of the site (about 6.5ha) is deemed to be of Medium, High or Very High botanical sensitivity (Figure 6 - Figure 8).
- Two patches of very high sensitivity, four patches of high sensitivity and eight patches of medium sensitivity have been mapped in the airport precinct (Figure 6 & Figure 7) and two patches of very high sensitivity and two patches of medium sensitivity have been mapped in the agricultural precinct (Figure 8).
- Ideally all areas of Medium, High or Very High botanical sensitivity should be conserved and ideally, they would also all be ecologically connected via rehabilitated Low sensitivity areas. From a botanical perspective most of these areas would be ecologically viable, especially if connected by ecological corridors. Key ecological management interventions required would be ongoing alien vegetation management (pre and post burn) and management burns in the appropriate autumn season (once every 8-12 years).

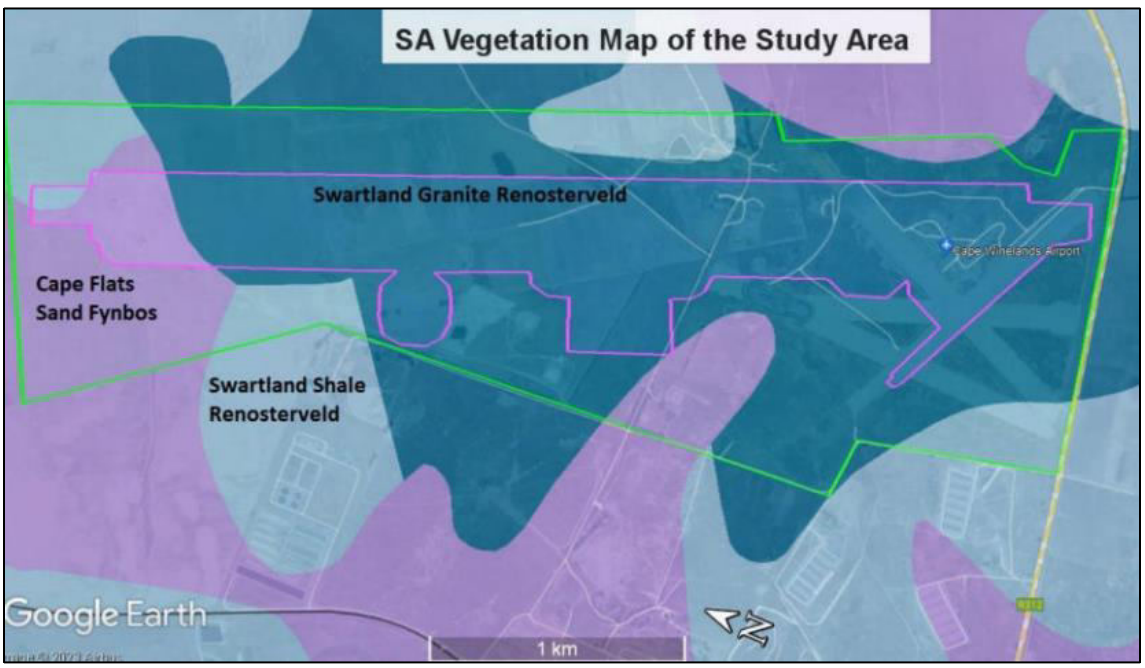

Figure 5: Extract of the SA Vegetation Map (Mucin & Rutherford 2012) showing that three different vegetation types would originally have occurred in the primary study area (excluding the Agricultural Precinct), with Swartland Granite Renosterveld making up the bulk of the site. The green polygon is the study area, and the pink polygon is the airside development footprint (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

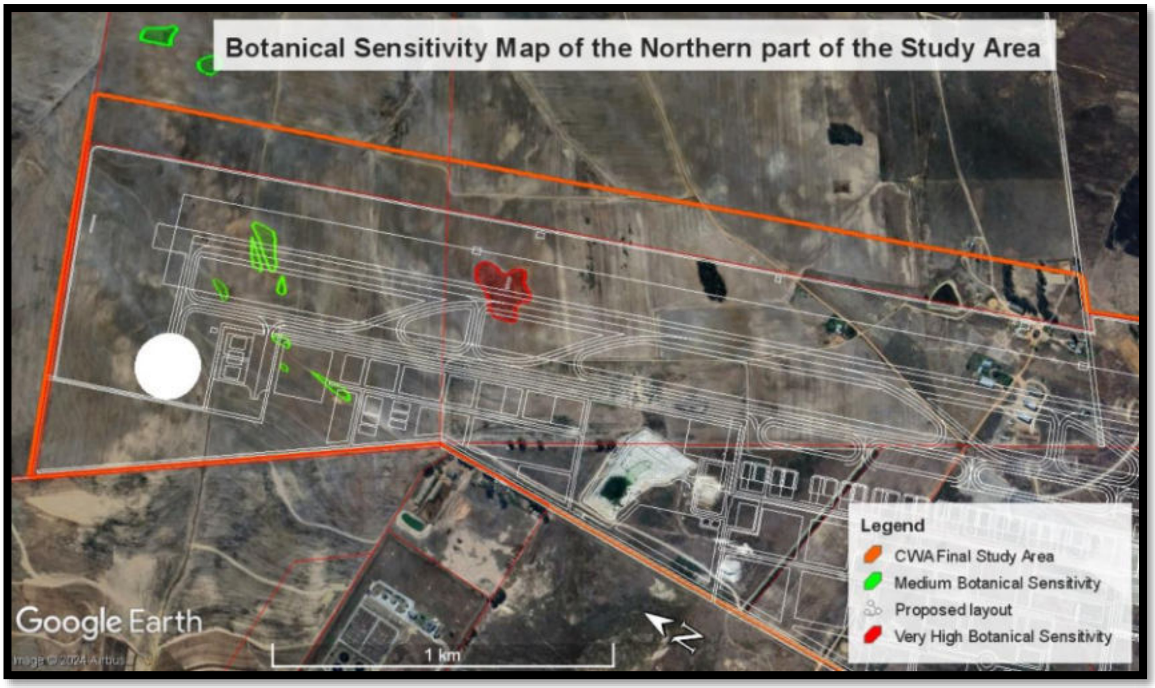

Figure 6: Botanical sensitivity map for the northern part of the airport precinct. All areas not shaded green or red within the study area are of Low botanical sensitivity (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

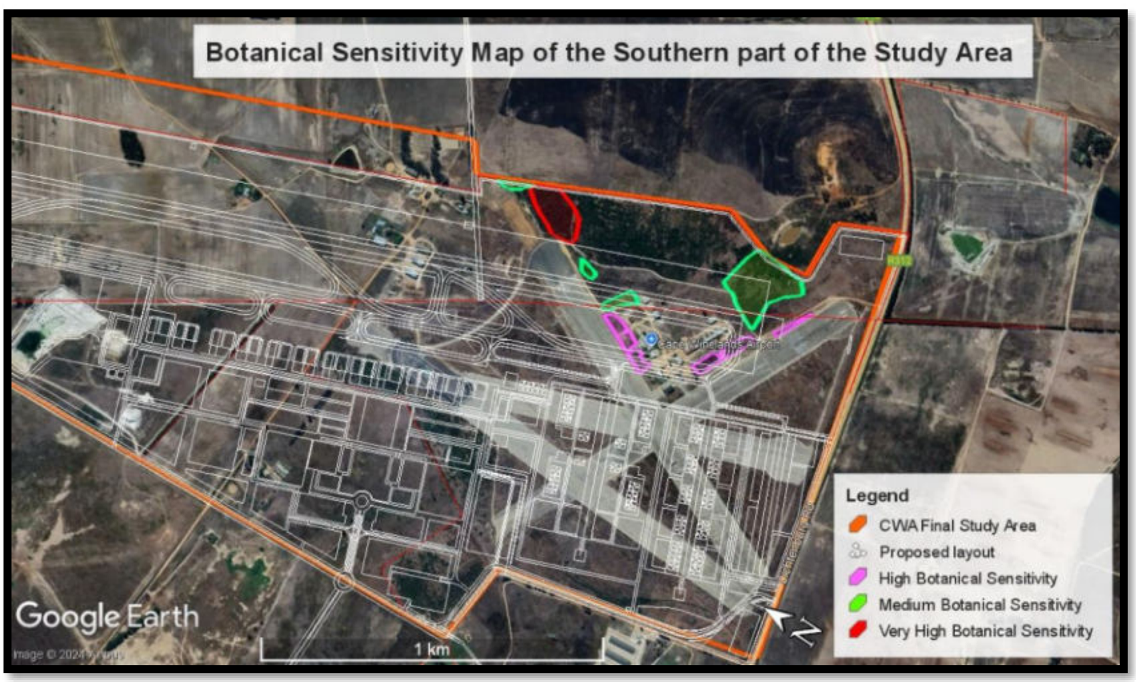

Figure 7: Botanical sensitivity map for the southern part of the study area. All areas within the airport precinct not shaded green, red or pink are of Low sensitivity (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

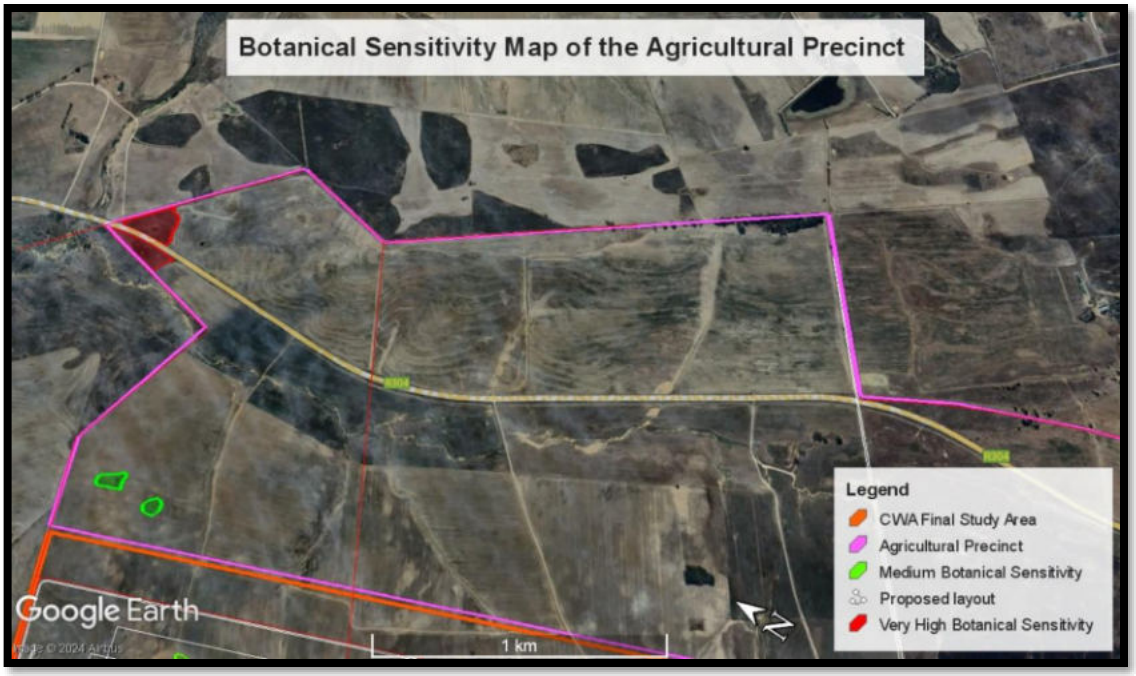

Figure 8: Botanical sensitivity map for agricultural precinct. All areas not shaded green or red within the precinct are of Low botanical sensitivity (Nick Helme Botanical Surveys, Impact Assessment, September 2024).

2.2.2. Alien and Invasive Vegetation Onsite

The airport precinct has been heavily infested with woody alien invasive vegetation, predominantly *Acacia saligna* (Port Jackson), with occasional occurrences of *Leptospermum laevigatum* (Australian myrtle), *Pinus spp*. (pines), and *Eucalyptus spp.* (gums). Prior to the clearance efforts in late 2020 and early 2021, the cover of woody alien invasive species ranged from 50% to 100%, averaging around 75%. Although the biocontrol fungus has significantly impacted Port Jackson, reducing seed production and even killing some plants, a substantial seedbank persists. This seedbank is likely to germinate following fire or other clearing methods, as demonstrated by past occurrences.

The dense cover of woody alien invasives is primarily a result of prior soil disturbances, which include cultivation, ferricrete quarrying in some areas, and extensive disturbances related to airfield development and maintenance. Even areas that appear undisturbed have been colonized by alien species through seed dispersal.

In these disturbed areas, the understorey is dominated by alien invasive herbs and grasses, including *Plantago lanceolata* (ribwort plantain), *Echium spp.* (Patterson's curse), *Erodium spp.* (cranesbill), *Lolium spp.* (ryegrass), and *Avena spp*. (wild oats).

2.4. Landscaping Plan

A comprehensive landscaping plan has been developed for the airport precinct, as shown in Figure 9. The landscaping will incorporate fynbos and renosterveld planting, using specific species to achieve the required vegetation heights for airport operations. An essential ecological management strategy for areas landscaped with natural fynbos or renosterveld vegetation is the continuous management and removal of all alien invasive species.

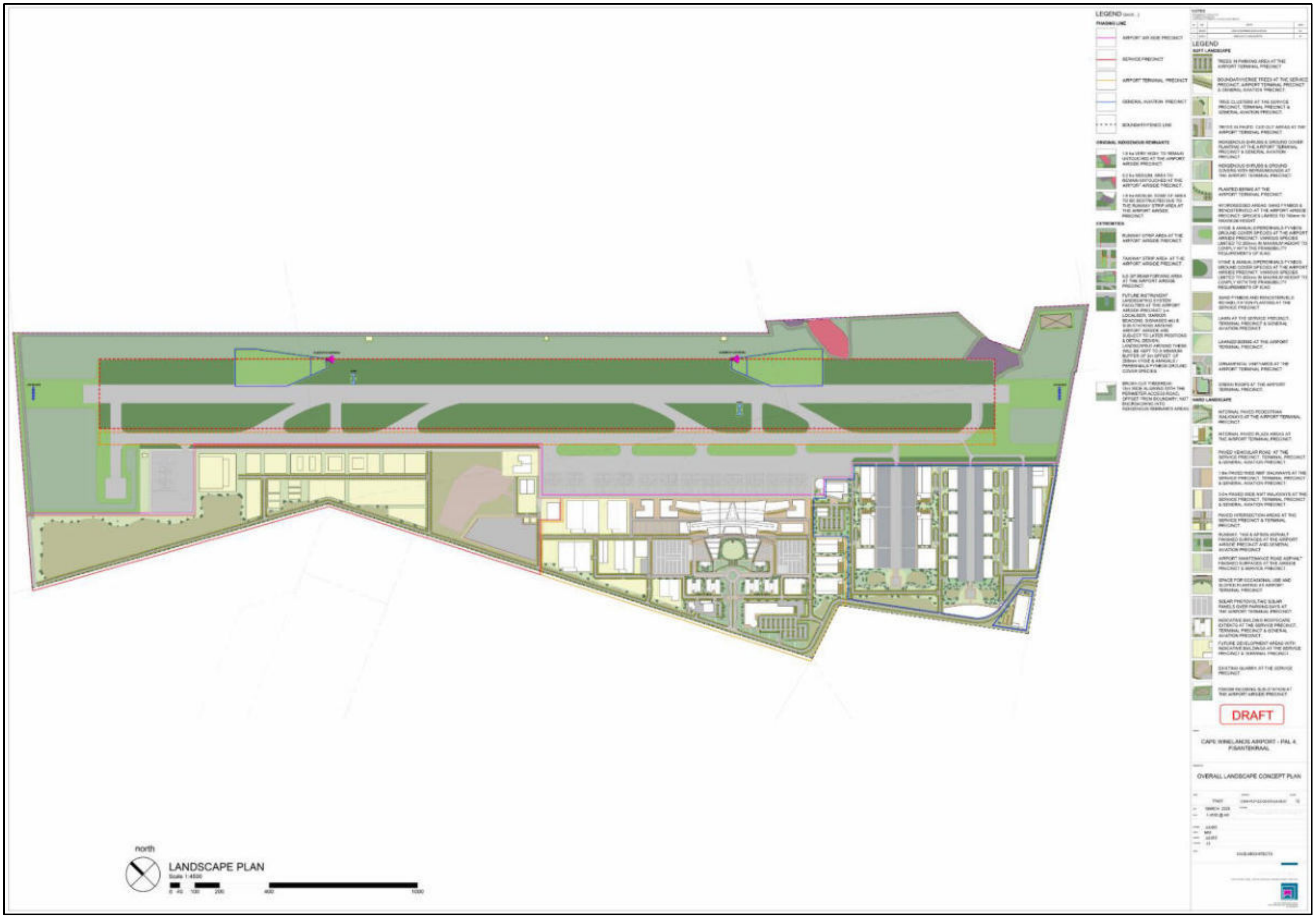

Figure 9: Cape Winelands Airport Landscape Concept Plan (Planning Partners, March 2025)

SECTION 3: CONTROL GUIDELINES

3.1. Priority Areas for Clearing

During the construction phase, the entire proposed development area should be systematically cleared of alien vegetation as per Section 1.3. to ensure that, once operational, ongoing maintenance will be the primary focus. Initial clearing will occur across the entire site, with priority given to areas where construction activities or ground disturbances are taking place. Wherever disturbance occurs during construction, alien vegetation clearing will be prioritized to prevent the spread of invasive species.

Once the site transitions to the operational phase, the following areas will be prioritized for clearing and ongoing maintenance:

1. Safety buffer Area Around the Runway: For safety reasons, the buffer area surrounding the runway will be cleared and maintained as the co-top priority.
2. Areas of Medium, High, and Very High Botanical Sensitivity (Figure 6- Figure 8) & Wetland Offset Areas (Figure 10). These ecologically significant areas will be cleared and maintained to protect sensitive vegetation and preserve critical habitats as the co-top priority.

   All invasive alien vegetation in the conservation areas on site must be removed within one year of any project approval, using appropriate methodology (see Martens et al 2021), by qualified personnel. Ongoing annual alien vegetation removal must be undertaken.

   No spraying of herbicide should be undertaken in any conservation areas.
3. Firebreaks: Maintaining firebreaks will be critical to reducing fire risk and ensuring compliance with fire management regulations.
4. Onsite Areas Planted with Indigenous Vegetation: Priority will be given to maintaining areas where indigenous vegetation has been planted to support local biodiversity and prevent the re-establishment of alien species.
5. Remainder of the Site: Any other areas on the site will be addressed after higher-priority zones have been cleared and maintained.

This phased and prioritized approach ensures effective alien vegetation control during both construction and operational phases, aligning with environmental best practices and safety requirements.

Please note: During the operational phase, any maintenance, landscaping, or other activities that cause disturbance should be flagged as focus areas for follow-up alien vegetation clearing.

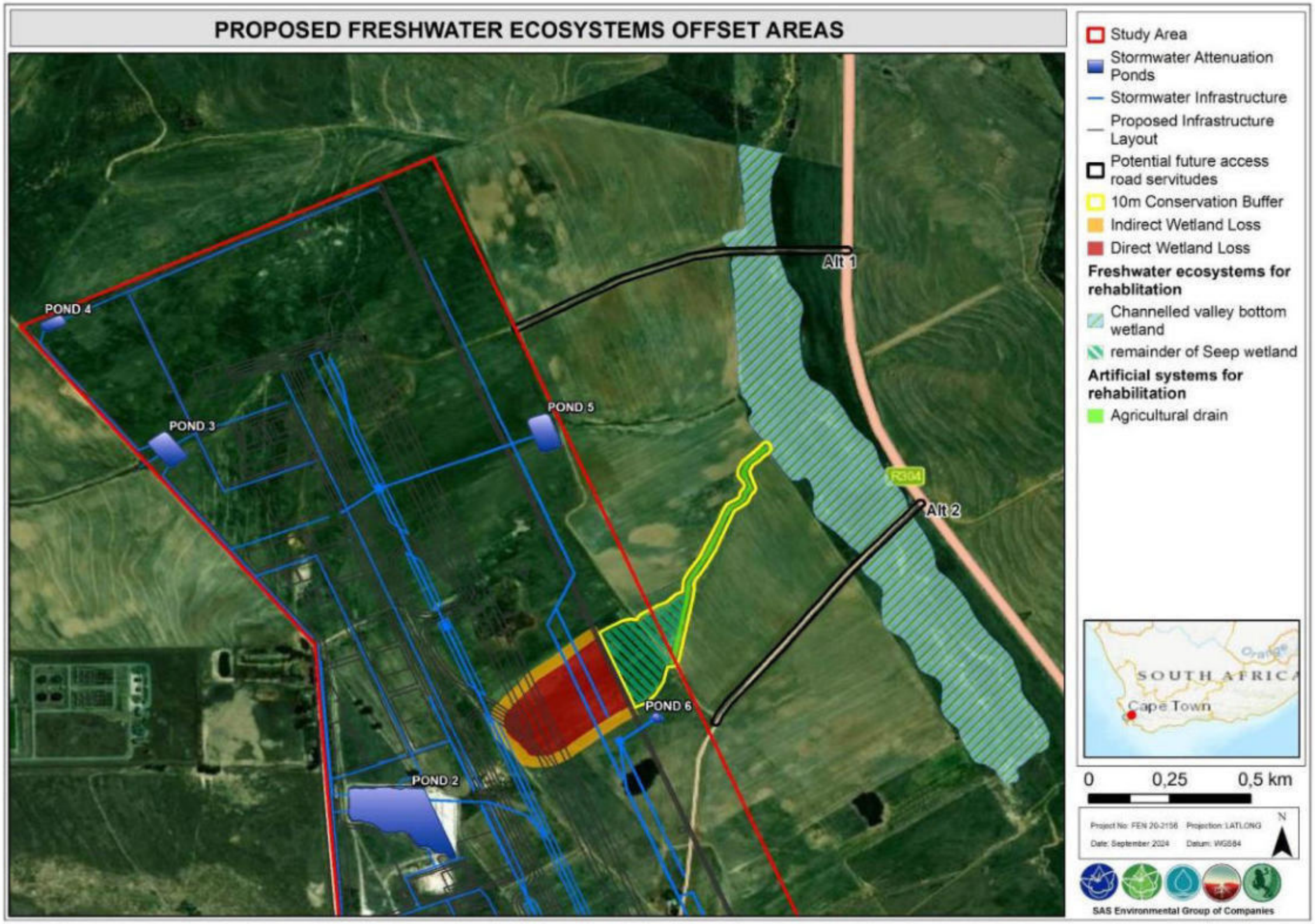

Figure 10: Extent of wetland to be lost (7.44 ha) vs identified wetland areas to be rehabilitated (FEN, Draf Wetland Offset Study and Implementation Plan, September 2024)

3.3. Construction Phase Activities Required

All contractors are responsible for alien vegetation management as per this plan within their designated work areas. To minimize soil and vegetation disturbance and reduce the risk of invasive alien plants establishing on site during the construction phase, the following actions are required:

Action	Frequency
Clearing of alien invasive vegetation should be undertaken as the work front progresses. Mass clearing should not be implemented unless the entire cleared area is to be developed immediately thereafter.	Weekly
For large areas of land clearance, soil stabilization methods, such as using packed brush, must be implemented. Organic matter used for stabilization should not be sourced from outside the site. Additionally, resprouting alien invasive vegetation must not be used as packed brush.	As required
Continuous follow-up monitoring and management, including hand-pulling emerging seedlings, must be practiced throughout the construction phase within active work areas.	Weekly
Care must be taken to avoid the introduction of alien invasive plant species to the site. Particular attention must be paid to imported material such as building sand or dirty earth-moving equipment. Stockpiles should be checked regularly and any weeds emerging from material stockpiles should be removed.	Weekly
ECO to conduct monthly surveys of all construction work areas to monitor the implementation of alien vegetation removal as required by the contractors.	Monthly
Independent audits of the AVMP implementation must be conducted every six months.	Every 6 months

3.4. Operational Phase Activities Required

Upon the completion of construction in a given area and the handover by contractors, the in-house team will resume full responsibility for alien vegetation management throughout the operational phase of the development. The following management actions are aimed at maintaining cleared areas free of invasive alien species:

Action	Frequency
Ongoing alien vegetation clearing follow-ups will be required in areas where primary clearing has taken place. Initial follow-up should take place four months after the area was initially cleared. Thereafter follow up should take place after year one of the initial clearing and continue on a dedicated annual basis thereafter.	Initial follow-up: 4 months after clearing Thereafter, annually.
Areas of natural vegetation that need to maintained or managed to reduce plant height or biomass, should be controlled using methods that leave the soil protected	As required

If disturbance (such as maintenance activities, landscaping, or fire) occurs within natural areas during the operational phase, these areas must be prioritized for follow-up clearance within one month of the disturbance.	Within 1 month of disturbance.
ECO to conduct monthly surveys of all vegetated areas to monitor the implementation of alien vegetation removal as required by the team.	Monthly
Independent audits of the AVMP implementation must be conducted annually.	Annually

3.5. General Alien Clearing Recommendations

The following priorities should be implemented at the onset of alien clearing activities:

- Areas identified in Section 3.1 to be cleared sequentially.
- Areas requiring follow-up treatment take precedence over areas which still require initial clearing. This is to reduce the time and cost required for follow-up.
- One should always consider the natural gradient of the area being cleared - all operations should follow the slope or drainage lines to minimize erosion.
- Less dense areas should then be targeted to prevent the build-up of species and the development of dense alien clumps. This will also help prevent the buildup of seed banks.
- Dense stands should be left for last, as these areas are unlikely to further increase in density. Dense stands also require dedicated and expensive follow-up treatments to prevent re-establishment.
- Areas around existing infrastructure should be cleared to reduce the fire risk.
- Disturbed footprint areas should be kept as small as possible when removing alien plant species.
- No vehicles should be allowed to drive through designated sensitive freshwater ecosystems areas during the eradication of alien and weed species.
- <u>To prevent the spread of seeds and spores alien clearing operations should not be conducted in high wind conditions.</u>

SECTION 4: CONTROL METHODS

4.1. General Management Methodology

The areas identified in Section 3.1 shall be cleared sequentially by implementing the following management methods where appropriate, the management team should instruct the clearing team regarding the appropriate methods to apply in a specific area:

4.1.1. Mechanical Control

This entails damaging or removing the plant by physical action. The following mechanical techniques could be used:

Hand pulling

Use: Seedlings with a stem diameter of <2cm

Hand pulling should be implemented as the preferred clearing technique as far as possible, since the entire plant is removed quickly and there is no chance of resprouting. When implemented correctly, this method is extremely effective, yet its application is limited to seedlings. Thus, regular monitoring and follow-up treatments are important to ensure successful and economical eradication using this technique. The procedure to be implemented is as follows:

1. Wearing gloves, grip the plant firmly at the base of the stem and pull hard to remove the entire plant, including the rootstocks.
2. If the roots of the plant break off during removal, use a spade to dig them out.
3. Shake the excess sandy material from the plant to ensure a higher mortality rate and make the plant easier to stockpile and lighter to transport.

Tree Popping

Use: Seedlings/Saplings with a stem diameter of approximately 2-5cm

This technique is used for medium tree specimens and involves the use of an implement commonly marketed as a "Tree-Popper". This tool consists of a base plate and a leaver that are joined to form a small pair of jaws. The tree is placed in the jaws of the tool and the leaver is used to pull the entire tree, including the roots, out. This tool is extremely useful for trees that are too large to be effectively removed by hand pulling yet are not yet large enough to require felling. The method to be used is similar to that outlined for hand pulling, however, the Tree-Popper is used instead of hands only.

Cutting / Felling

Use: Trees with a stem diameter of >5cm

Once the stems of trees reach a diameter of greater than 5cm, felling will need to be implemented to remove the individual. Felling can be undertaken using chain saws and/or bow saws. Trees must be cut with a neat straight cut to reduce the chance of resprouting and improve the effectiveness of stump herbicide treatment. Trees must be cut down as close to the ground as possible (between 5cm and 30cm above the ground). Felling must be undertaken by appropriately trained individuals that possess and make use of the required Personal Protective Equipment (PPE) for the task at hand. In the case of resprouting species, felling must be combined with chemical treatment of the cut stumps as detailed below.

Ring barking

Use: Stems with diameters greater than 15cm, where the time taken to fell, de-branch and stack would be excessive

Since this method means the tree is left standing, it is recommended only for single large trees or very low-density invasions, not for stands. Ring barking on smaller diameter stems is ineffective and it would be quicker to just cut the tree down. Basal bark treatment could be considered as an alternative in some cases.

- Slashers or axes should be used for debarking.
- Remove the bark and cambium (outer rings where the trunk grows) in a continuous band around the trunk of the tree at least 25 cm wide, starting as low as possible.
- Where clean debarking is not possible due to crevices in the stem or where exposed roots are present, a combination of bark removal and basal stem treatments should be carried out.

4.1.2. Chemical Control

Chemical control makes use of herbicides to kill target Invasive Alien Plants (IAPs). Chemical methods are a good choice when the IAPs are still seedlings or young. At this stage of a plant’s life, it is growing fast, so herbicides will be quickly translocated through the plant to reach the roots. The leaves and stem are young and green with a large surface area, allowing for good absorption of the herbicide. Chemical control should not be applied when it is raining. It is important to note that herbicide can also harm many non-target species and must always be used with the greatest care.

Herbicide Stump Treatment

Use: Resprouting species that have undergone felling treatment

Certain species, such as *Acacia saligna* ,are known to resprout from the stump or roots after felling. To prevent this an herbicide treatment needs to be applied post-felling. Once the tree has been cut down to create a smooth surface that exposes the outer rings of the stem where the trunk grows (the cambium) a died 3% Tryclopyr herbicide solution must be applied to the freshly cut surface. All side branches should also be removed from the stump and treated with herbicide. The herbicide treatment should be applied as soon as possible after felling (preferably within 3 minutes) to ensure effective treatment. Where trees with a diameter of greater than 10cm are felled, only the outer rings need to be treated with herbicide. When using a product that is mixed with penetrant oil, the entire stump and exposed roots must be treated.

Foliar treatment

Foliar treatment is when herbicide is applied to the leaves of the plant, usually by spraying.

- Spray herbicide with a knapsack sprayer, mist-blower or high-pressure sprayer firefighting unit, e.g. a bakkie-sakkie.
- The correct choice of nozzle is important to achieve an even spray cover.
- The best results can be expected in the active growing season (but some species are more susceptible to chemical absorption when they are sprayed in summer).

Blanket Spraying

Use: Young, dense, uniform stands of IAPs.

Blanket spraying, or broadcast spraying, is when herbicide is sprayed across an entire area of over 70% infestation. While this method is recognized, it should be used with a high level of caution due to the significant environmental risk. It is the most cost-effective way to eradicate young, dense, uniform stands of IAPs. Some IAPs, like introduced acacias, germinate by the thousands after fire. The first line of attack to reduce these numbers is the use of broadcast spraying. Calibration is crucial to ensure even distribution of herbicide over the target area

Aerial application

Use: Large-scale & inaccessible infestations of alien invasive vegetation

Aerial application is spraying either large-scale infestations or targeted inaccessible plants from an aircraft. While aerial application is a recognized method of IAP control, it is still under development and should be used with a high level of caution due to the significant environmental risk. Aerial spraying can only be done by registered and certified operators according to strict regulations. The pilot must ensure that the spray mixture is distributed evenly over the target area and that the wastage of herbicide, as well as drift onto indigenous species, is kept to a minimum. It is essential that the following criteria be met:

- Inform your neighbors well in advance before spraying commences.
- Use only an aerial registered product. Port Jackson (*Acacia saligna*) and Rooikrans (*Acacia cyclops*) have herbicides registered for aerial application.
- Adult Port Jackson and Rooikrans must be sprayed in summer (i.e. November–March) for optimum results.

4.1.3. Biological Control

Biological control using species-specific insects and diseases from the alien plant's native region has been implemented in South Africa, with 76 biocontrol agents released to target 40 invasive weed species. While active biocontrol is not recommended at this stage due to the severity of the current infestation, it remains a potential option for future management. Notably, a biocontrol fungus already present in South Africa has had a significant impact on Port Jackson plants at the site, reducing seed production and even killing some individuals.

4.2. Species Specific Methodology

4.2.1. *Acacia Saligna* (Port Jackson)

Seedlings

Hand-pulling or tree-popping should be employed, depending on site sensitivity. For chemical control, apply a foliar spray of Mamba (Glyphosate) as a spot treatment at 1.5% concentration, using 2-4 litres per hectare. Alternatively, a mixture of 50 ml of Garlon 4 or Viroaxe (Triclopyr Ester) with 10 litres of water can be applied at 1.5 litres per hectare. However, avoid using Garlon or Viroaxe in areas where pioneer grass seedlings are present. Touchdown (Glyphosate Trimesium) can also be applied at 2-4 litres per hectare where appropriate.

Young Trees and Saplings

Hand-pulling or tree-popping is effective. In less sensitive areas away from water bodies, Touchdown (Glyphosate Trimesium) can be used at the same rate of 2-4 litres per hectare.

Large Trees

These should be felled as close to ground level as possible, with stump treatment using Timbrel. Frilling, combined with Timbrel application, is also recommended.

The most effective approach combines mechanical methods with herbicide application. Follow-up weeding is necessary when seedlings reach 15-40 cm in height to ensure long-term control.

4.2.2. Gum trees (Eucalyptus spp.)

Seedlings

To ensure maximum success, all seedlings should be hand-pulled

Mature Trees

- Ring Barking and Stem Frilling: For effective control of mature trees, ring barking or stem frilling is recommended. A 10 cm wide cut should be made around younger trees, while mature trees may require a cut up to 30 cm wide. Strip barking is another viable method. Applying Timbrel to the frilled stem has proven effective, resulting in dead standing trees.
- Felling: Felling is commonly used for both mature trees and saplings, but it is essential to treat the stump with herbicide to prevent regrowth.

4.3. Herbicide Use Policy

1. Storage

All storage facilities are to comply with the requirements of AVCASA (Association of Veterinary and Crop Associations of South Africa) including the following:

Isolation

- Storage should be in a separate building and not sited near dwellings, livestock buildings, fodder or flammable materials. If located in a complex a completely sealed store is required.
- All stores to be located away from rivers, dams or boreholes
- The store should be located in a area which can be supervised

Accessibility

- Ease of delivery is important

- Accessibility from all sides in fire situations

2. Store construction

Store construction must adhere to specific requirements to ensure safety and functionality. Floors should be non-permeable, with screeded concrete preferred, though steel-sealed containers are acceptable. Walls should be made of brick or concrete and include air bricks for ventilation. Proper ventilation is essential, with vents placed either 200 mm from the floor or at roof level, and containers are permissible if they provide adequate airflow. The roof must be leak-proof and ventilated to manage temperatures. Steel doors with secure locking systems are required, while wooden doors should be reinforced with security gates. Windows must provide enough natural light to read product labels, or sufficient artificial lighting should be installed. Sanitation facilities with running water, soap, and towels must be readily available to staff, along with an eye wash station. Additionally, a shower facility is recommended to enhance safety standards.

3. Equipment

A table should be provided for decanting and measuring purposes. Measuring jugs, funnels, pumps and buckets should be available and used for herbicides only. A broom, spade and a dry fine absorbent material to contain spills should also be available.

4. Handling

Suitable protective clothing must be available and made compulsory. Chemical resistant aprons, gloves and eye protection must be worn when handling concentrates. Adequate hygiene aids such as running water, soap, towels and eyewash must also be available. Spill control methods should be in place. Concentrates should be decanted in a prescribed area and not in the field. All containers into which herbicides are decanted should be clearly marked with a copy of the original label secured to this container.

5. In field handling

Spray mixtures to be leak and spill proof, and kept away from personal belongings, food stuff etc. Containers should stand on suitable absorbent materials (Hessian sack) and out of direct sunlight, containers to be kept at least 20m away from water bodies, storage areas in the field should be marked with hazard tape. Filling sites should be pre-determined to prevent damage to sensitive vegetation. Cleaning of containers to take place at store and not in the field. Suitable protective clothing is required for all handlers.

6. Transportation

Herbicide to be carried on separate vehicle to labor or part of the vehicle which is isolated from people, food and clothing. Vehicles should carry absorbent material for any spillage. Materials should not be left unattended.

7. Disposal of containers

Designated officer to be responsible for correct disposal in accordance with AVCASA guidelines. All containers are to be suitably disposed of and not reused in domestic scenarios.

8. Public safety:

Warning signs should be erected where exposure to the general public can occur. Herbicides to be used in line with label recommendations. Treatment of areas within 50m of habitations or public areas should be avoided and done in consultation with the effected parties.

9. Environmental Safety

Area contamination must be minimised by careful and accurate application with a minimum amount of herbicide to achieve good control. All care must be taken to prevent contamination of any water bodies. This includes care in storage, application, cleaning equipment and disposal of containers, product and spray mixtures. Equipment should be washed where there is no danger of contaminating water sources and washings carefully disposed of in a suitable site. To avoid damage to indigenous or other desirable vegetation, product should be selected that will have the least effect on non-target vegetation (Coarse droplet nozzles should be fitted to avoid drift onto neighbouring vegetation).

10. Application

Equipment to be regularly inspected for leaks and irregular application devices. Rates of application and precautions and the use of adjuvant and water sources for mixing must be known and monitored.

11. Weather

Applications should not be undertaken in unfavorable conditions. Label recommendations for suitable application weather to be followed.

12. Mixing

To be conducted as per label.

13. Calibration

All equipment has to be correctly calibrated and maintained to achieve correct mix ratios.

**Source: Working for Water Program Herbicide Policy*

4.4. Personal Protective Equipment (PPE)

The use of Personal Protective Equipment (PPE) by staff controlling invasive alien plants in the field is a legal requirement. The PPE specifications differ for the different types of control. The use of chainsaws and brush cutters and will require slightly different PPE from someone hand pulling seedlings. Minimum PPE requirements are as follows: Overall, gloves, safety boots, hard hat, safety glasses, face mask,

4.5. Alternative Approaches for Biomass Clearance

The removal of alien vegetation biomass after clearing is just as critical as the clearing process itself, though often overlooked. Alternative approaches for the use of the biomass of alien vegetation material should be explored for the site in order to prevent the accumulation of debris and dense seed stores in this debris. Accumulated leaf litter and upper foliage not only harbor seeds but also increase fire risk on the site.

For large alien trees, the biomass can be repurposed as firewood, providing local communities with an opportunity to collect and sell it for additional income. Given the size of the property, investing in a chipper should be considered. Chipping the material allows it to be used as mulch or in brushwood packing with de-seeded branches as part of the rehabilitation program. Additionally, chipped material can be utilized for gardening, though care must be taken to avoid spreading alien seeds through the movement of chipped material across the site.

In cases where firewood collection and chipping are insufficient, controlled burns may be necessary, however this should be seen as a last resort. Controlled burns should only be conducted with the appropriate permits, under strict supervision, and with trained personnel and fire-fighting equipment on hand as outlined within the Veld Fire Management Plan compiled for the site (Annexure 5 to the overall EMPr).

Cut material can either be stockpiled for later removal or repurposed as erosion barriers. When larger plants are removed, the branches should be cut into smaller pieces such that they can be carried rather than dragged to their intended stockpile or reuse located. This minimizes disturbance and the potential spread of any seed that may be present on the plants. Small, hand-pulled stems that do not pose a risk of resprouting can be left on the ground to decompose into mulch or be chipped for further use. Seed-bearing material, once chipped, should be left to compost or allowed to germinate before being considered for reuse. However, stockpiled biomass presents a significant fire hazard due to its high flammability. To mitigate this risk, biomass should not remain on-site for more than a month before being properly utilized or removed entirely.

SECTION 5: MAINTENANCE AND FOLLOW-UP

Effective management of alien invasive vegetation requires not only the initial clearing but also diligent follow-up and maintenance to ensure long-term success. Given the substantial seed bank present in the area, ongoing germination of invasive species is expected to persist for years, demanding strict follow-up measures. Without consistent follow-up, costs and time required to achieve the ultimate clearing goals will escalate significantly. The maintenance and follow-up program are outlined as follows:

5.1. Timing and Frequency of Follow-Up

Initial Follow-Up: The first follow-up clearing should occur four months after the initial clearing. This period is critical to address seedling emergence and early regrowth of invasive vegetation.

Subsequent Follow-Up: After the four-month follow-up, the next intervention should take place one year after the initial clearing. Thereafter, follow-up treatments should occur on an annual basis to prevent re-establishment.

Continuous Rotational Management: Due to the vast size of the site, follow-up activities will need to be carried out on a rotational basis. This will ensure that all sections of the site are revisited within the required timeframes while maintaining steady progress.

As the project advances, the in-house team must establish management units across the property and develop a clearing schedule to monitor initial clearing and follow-up efforts, ensuring alignment with the requirements of the management plan.

5.2. Focus of Follow-Up Treatments

Seedling and Coppice Control: Follow-up efforts will primarily target seedlings and coppice regrowth from stumps or root systems. Controlling these early-stage regrowth is more cost-effective and efficient compared to dealing with fully re-established vegetation.

Short Intervals for Effectiveness: Close attention must be paid to the intervals between follow-up treatments, especially during the first year after initial clearing. Delays in follow-up will result in increased time and labor required, as the vegetation will have had time to re-establish.

5.3. Resource Allocation and Funding

Periodic clearing operations must be ongoing and adequately funded by the Applicant, who holds responsibility for the management of the site. A dedicated and well-planned budget should be set aside to ensure that follow-up work is carried out consistently (see Section 6).

5.4. General Monitoring Requirements

In general, the following principles apply for monitoring:

- Photographic documentation should be maintained for all areas to be cleared. This includes images taken before work begins, as well as at regular intervals during the initial clearing activities. Similarly, photographs should be taken before and after any follow-up clearing, and the progress of rehabilitation efforts should also be documented.
- Basic records must be kept of daily operations. This includes the specific areas or locations cleared, the number of labor units involved, and, if herbicide is used, the quantity applied.
- If invasive alien plants are detected during monitoring, immediate action must be taken to address the issue.

SECTION 6: BUDGETING

Successful alien clearing requires an ongoing and long term approach and is labor and time intensive and therefore becomes a costly exercise. When planning a budget for alien vegetation management, several key factors must be considered to ensure effective and sustainable control:

Vegetation

- Species – require different methods or control applications
- Density – coverage / stems per ha (for woody species)
- Area (ha)
- Height (m)
- Growth stage – vegetative, flowering, fruiting
- Location

Terrain

- Slope / Access
- Carrier volume for herbicides
- Transport (c/km)
- Equipment
- Method

Labour

- Type – skilled / unskilled
- Number
- Task Rate (person days/ha)
- Unit cost
- Availability

Technique

- Chemical(Spot treatment, Frilling, Stump treatment)
- Mechanical (Stem treatment, Ringbarking, Hand pulling)
- Biological (Soil treatment , bio control)
- Overall – Foliar / Soil Felling Compliments

Equipment

- Knapsacks, Foam sprayer, Stem injection, Nozzles
- Manual / mechanical (Slashers / Brush cutters)
- Maintenance (cost)

Herbicide

- Type
- Rate Spray volume (1/ha or %)
- Carrier
- Technical limits, Environment, Climatic factors, Timing

Costs

- Salaries / wages
- Other benefits / bonuses
- Training
- Overheads - Transport (c/km), Maintenance
- Other
- Allowance for downtime
- Environmental factors – slope, accessibility (WT), obstructive vegetation

Programme

- Duration
- Number of treatments
- Total cost for programme
- Budgeted cost / treated ha / situation / season

SECTION 7: MONITORING AND COMPLIANCE

7.1. Reporting and Record Keeping

The appointed ACO is responsible for submitting monthly reports to the ECO overseeing the site. The ECO should conduct a monthly site inspection of the site. These reports must detail the following (refer to temple provided in Appendix A):

- A summary of all clearing undertaken during the month, specifying whether it involved initial clearing or follow-up treatments.
- Clear identification of the areas on the site where clearing has taken place.
- The total area (in hectares or square meters) that was cleared.
- The specific clearing methods employed (e.g., mechanical clearing, manual removal, herbicide application).
- The number of workers involved in the clearing activities.
- Any difficulties or problems faced during the clearing operations (e.g., access issues, safety concerns, or weather delays).

In addition to the monthly reports, the applicant is required to maintain comprehensive records of all reports submitted by the ACO. These records should also include documentation of any reviews or amendments to the AVMP. This documentation is essential for tracking progress, ensuring compliance with the management plan, and adjusting strategies as needed. Records should be kept and must be made available for review on request, based on adequate motivation.

7.2. Environmental Monitoring and Audits

Throughout the construction phase, monthly ECO reports must be compiled and submitted to DEADP. Throughout the operational phase, monthly ECO reports must be compiled and submitted to the site's EM.

During the construction phase a qualified Environmental Auditor, appointed at the Applicant's expense, must conduct six-monthly compliance audits of the Environmental Management Plans (EMPs) in place for the site, including the AVMP. Once the project transitions fully to the operational phase, annual compliance audits of the same EMP suite, including the AVMP, must be undertaken.

The audit should aim to:

1. Assess compliance with the key components of the EMPrs.

2. Identify critical areas requiring attention.
3. Recommend priority actions for improvement.

The audit must cover a range of issues, including the implementation of environmental controls, environmental management practices, and environmental monitoring.

Audit findings should guide any necessary updates or additions to the EMPrs to address new or unresolved environmental issues on site. National, provincial, and local authorities must be provided access to the facility for audit or inspection upon request.

7.3. Record Keeping

The Applicant should keep records of the following:

- Monthly monitoring reports submitted by the onsite ACO
- 6-monthly audit reports
- Annual audit reports
- Reviews and amendments of the VFMP
- Incident reports for all fire related incidents that occur onsite

Records should be kept and must be made available for review on request, based on adequate motivation.

APPENDIX A: ALIEN VEGETATION CLEARING REPORT TEMPLATE

Alien Vegetation Clearance Report

Name:	**File reference number:**
Reporting Period:	
Total area (in ha) cleared/followed-up during reporting period:	
Number of workers involved in the clearing activities:	

Section 1: Provide a summary of all clearing undertaken during the month, specifying whether it involved initial clearing or follow-up treatments.

Section 2: Provide a map indicating the areas on the site where clearing has taken place.

Section 3: Outline the clearing methods employed (e.g., mechanical clearing, manual removal, herbicide application).

Section 4: Any difficulties or problems faced during the clearing operations (e.g., access issues, safety concerns, or weather delays).

Section 5: Signatures

ACO:	Date: ....
ECO:	Date: ....

ANNEXURE 7: WETLAND OFFSET STUDY AND IMPLEMENTATION PLAN

DRAFT WETLAND OFFSET STUDY AND IMPLEMENTATION PLAN

FOR THE PROPOSED CAPE WINELANDS AIRPORT DEVELOPMENT, FISANTEKRAAL, WESTERN CAPE

Prepared for:	PHS Consulting (Pty) Ltd
Report author:	B. Bleuler
Report reviewer:	S. van Staden (Pri. Sci. Nat)
Report Reference:	FEN 20-2156
Date:	January 2025

FEN CONSULTING

Part of the SAS Environmental Group of Companies

Website: http://www.sasenvironmental.co.za

Image not representative of assessment area as per this report. For illustrative purposes only.

EXECUTIVE SUMMARY

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to develop a wetland offset initiative and associated rehabilitation and management plan for the proposed Cape Winelands Airport (CWA) development in Fisantekraal, Western Cape Province. The proposed development activities will result in the infill and transformation of a seep wetland located within the study area.

During the offset initiative preparation, it was determined that 6.74 hectares (ha) (but with a total loss of 7.44 ha which accounts for indirect impacts) of wetland habitat would be lost due to the proposed CWA development. This loss translates into a residual impact of 3.97 functional hectare equivalents (HaE) and 13 habitat HaE of wetland to meet the no net loss objective. The assessment of these impacts highlighted the need for an on-site wetland offset to ensure that the ecological balance of the area is maintained.

The remaining seep wetland habitat (3.68 ha) in the eastern part of the study area along with a channelled valley bottom (CVB) wetland (36.2 ha) further east of the study area into which the seep wetland drains (via an agricultural drain), have been identified as suitable for rehabilitation and offset purposes. The offset strategy has been designed to compensate for the residual loss of wetland habitat, ensuring no net loss of wetland functionality. The target offset area will contribute 4.1 functional HaE and 30.5 habitat HaE, adequately offsetting the impacts of the proposed CWA development. The suitability of these systems is further reinforced by the significant potential for ecological restoration through targeted rehabilitation activities, particularly given their current status as largely to seriously modified wetlands.

The proposed rehabilitation plan focuses on restoring the hydrological regime drivers and geomorphological processes of the wetlands to ensure that ecological functions required to maintain a balanced ecosystem is supported. This is particularly of importance considering the extensive erosion that is evident in the CVB wetland. This will include the removal of dumped waste from the CVB wetland, land surface modification to facilitate natural water flow, and the planting of native vegetation to stabilize the soil and enhance wetland functionality. The implementation of these measures will improve the ecological condition of the wetlands, contributing to a net gain in wetland ecosystem services and habitat quality. In addition, the agricultural drain connecting the seep wetland to the CVB wetland was also earmarked for rehabilitation as efforts to remedy the CVB wetland may be futile if the erosion present in the agricultural drain is not addressed as well.

The rehabilitation and management plan developed as part of this report has been budgeted for, with the total budget amounting to R9,993,756.00, excluding VAT but including contingencies. The proponent has committed to funding the aftercare and maintenance of the rehabilitated wetland for a further period of thirty years, ensuring the long-term success of the offset initiative.

In conclusion, the proposed offset initiative is expected to significantly contribute to positive wetland resource management and conservation in the region. The offset strategy aligns with national and local biodiversity offset guidelines, and the selected offset site more than adequately offsets the residual impacts associated with the project. It is recommended that the proposed offset be approved by the relevant competent authorities as part of the development authorization process.

Note that all changes to the October 2024 version of the offset report are <u>underlined</u>.

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GLOSSARY OF TERMS

Alien vegetation:	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Biodiversity:	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer:	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flow into a river, wetland, lake, and ocean or contributes to the groundwater system.
Delineation (of a wetland):	To determine the boundary of a wetland based on soil, vegetation and/or hydrological indicators.
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region”.
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas
Hydromorphic soil:	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to living in anaerobic soil).
Hydrology:	The study of the occurrence, distribution and movement of water over, on and under the land surface.
Indigenous vegetation:	Vegetation occurring naturally within a defined area.
Watercourse:	In terms of the definition contained within the National Water Act, a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks
Wetland Vegetation (WetVeg) type:	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soil, which may in turn have an influence on the ecological characteristics and functioning of wetlands.

ACRONYMS

ACA	Additional Conservation Actions
AIP	Alien and Invasive Plant
AIPCP	Alien and Invasive Plant Control Plan
BBOP	Business and Biodiversity Offsets Programme
CBA	Critical Biodiversity Area
CoCT	City of Cape Town
CVB	Channelled valley-bottom
CWA	Cape Winelands Airport
DEA	Department of Environmental Affairs
DEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DFFE	Department of Forestry, Fisheries and the Environment
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EO	Environmental Officer
ESA	Ecological Support Area
FEN	Freshwater Ecologist Network Consulting (Pty) Ltd
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HaE	Hectare Equivalents
HGM	Hydrogeomorphic
m	Meter
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NFEPA	National Freshwater Ecosystem Priority Areas
NPI	Net Positive Impact
NWA	National Water Act, 1998 (Act No. 36 of 1998)
PES	Present Ecological State
RE	Remaining Extent
REC	Recommended Ecological Category
RMO	Recommended Management Objective
RQIS	Research Quality Information Services
RQS	Resource Quality Services
SACNASP	South African Council for Natural Scientific Professions
SAIAB	South African Institute of Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SA RHP	South Africa River Health Programme
SCC	Species of Conservation Concern
SDP	Spatial Development Plan
STS	Scientific Terrestrial Services (Pty) Ltd
VAT	Value added tax
WetVeg Groups	Wetland Vegetation Groups
WRMP	Wetland Rehabilitation and Management Plan
WULA	Water Use License Application

Note that all changes to the October 2024 version of the offset report are underlined.

1 INTRODUCTION

1.1 Background

The CapeWinelands Aero (Pty) Ltd Limited proposes to upgrade the existing Cape Winelands Airport (CWA) on Portions 3, 4 and Remaining Extent (RE) of Farm 474, Joostenbergs Kloof, Portions 23, 10 and the RE of the Farm 724 Joostenbergs Vlakte, and Portion 7 of Farm 942, Kliprug, in Fisantekraal, Western Cape Province (hereafter referred to as the “proposed CWA development”). The location and extent of the study area on which the proposed CWA development will be developed are illustrated in Figure 1 and Figure 2.

Based on the project layout plans (Figure 3), it is proposed that the freshwater ecosystems on site, more particularly a portion of the seep wetland in the central east portion of the study area, will be developed, and stormwater attenuation and detention ponds will be developed which will convey treated stormwater to the freshwater ecosystems downgradient of the proposed CWA development. The proposed CWA development will result in the loss of 6.74 ha of wetland habitat as delineated in the Freshwater Scoping Report conducted by Freshwater Ecologist Network (FEN) Consulting, dated 2024 (FEN, 2024).

1.2 Purpose of Study

The proposed loss can only be mitigated through implementation of a formal offset if a no net loss of wetland is to be achieved. As such, FEN was appointed to compile a wetland offset strategy and an associated Wetland Rehabilitation and Management Plan (WRMP) for the proposed development activities. Due to the above, an investigation into the freshwater ecosystems and wetland offset was launched for the proposed project. This strategy compensates for the residual loss of wetland habitat resulting from the proposed CWA development.

1.3 Scope of Work

The Scope of Work as part of this wetland offset strategy comprised of the following key components:

- To gather all relevant spatial data pertaining to wetlands and conduct a comprehensive review of the available wetland assessment reports for the project;
- To quantify the residual wetland losses by converting the area of wetland loss into two distinct values:
  - **Functional Hectare Equivalents**: this will be calculated to quantify the loss of regulating ecosystem services and water resource management; and
  - **Habitat Hectare Equivalents**: this will be determined to quantify the loss to biodiversity and ecosystem conservation;
- To identify, select, and screen potential offset options within the applicable property and/or greater region and evaluate these options to determine their suitability for meeting offset requirements using the guidelines provides by Macfarlane *et al.* (2016) for wetland offsets; and
- To attend meeting(s) with relevant stakeholders to identify and evaluate potential offset alternatives;
- Based on the findings and feasibility discussions, on-site and off-site options for wetland offsets were assessed in the surrounding area with preference given to offset areas with the highest probability of success;
- To conduct a site visit to ground-truth ecological conditions within the proposed recipient offset sites and address mitigation requirements to improve the functionality of these systems commensurately with the offset quantum required;
- To define the objectives and targets for the wetland offset strategy and describing the actions/ interventions needed together with the relevant stakeholders;

- To undertake a risk assessment using the Government Notice (GN) 4167 promulgated in terms of the National Water Act, 1998 (Act No. 36 of 1998) as amended (NWA) to identify the impacts imposed to the target offset sites as a result of the rehabilitation measures proposed;
- To prepare a comprehensive report documenting the findings and recommendations of the offset strategy. This report includes an evaluation of potential offset sites, the proposed measures for achieving the required offset targets, and a detailed rehabilitation and management strategy to ensure the long-term success and sustainability of the offset; and
- To develop a confirmatory Memorandum of Understanding describing the commitment of the proponent (CWA) to undertake and implement the offset plan.

1.4 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- It was assumed that the proponent will receive authorisation from the relevant provincial and/or national authorities (including the Department of Water and Sanitation (DWS), and/or the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP)) for the proposed CWA development. The provided WRMP does not seek to replace the Environmental Management Programme (EMPr) but has rather been designed in a manner that supports the EMPr through specific guidance of rehabilitation, monitoring and management of the offset areas. The WRMP however does not address mitigation measures required for the proposed CWA development;
- With regards to freshwater ecosystems and their delineation:
  - The ground-truthing and delineation of the freshwater ecosystem boundaries and the assessment thereof at the study area as part of the freshwater assessment, was confined to two site visits undertaken on the 17th of January 2022 and the 25th of April 2022 (Scoping Report dated 2024 – FEN, 2024);
  - Global Positioning System (GPS) technology is inherently somewhat inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur, however, the delineations as provided in this report are deemed accurate enough to fulfil the authorisation requirements as well as implementation of the mitigation measures provided;
  - Freshwater ecosystems and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the freshwater ecosystem boundaries may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results;
  - With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the proposed development activities have been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of wetland ecology;
  - The assessment of the freshwater ecosystems for offsetting purposes was confined to one of the three identified target recipient sites due to the significantly higher likelihood of rehabilitation success of the target recipient site. The assessment of the target recipient site was limited to a single site visit undertaken during April 2024;
  - Use was made of aerial photographs, digital satellite imagery as well as provincial and national wetland databases to identify areas of interest prior to the field survey of both the study and recipient target offset areas. Although all possible measures were undertaken to ensure all freshwater ecosystems and drainage features were assessed and delineated, some features may have been overlooked;
  - Based on the desktop assessment, it is clear that historical anthropogenic aspects (including extensive agricultural activities etc.) have impacted the hydrology,

geomorphology and vegetation structure of the wetlands. Despite this, the wetland delineations are fairly accurate given these limitations;

- All effort was made to understand the requirements for offset as best possible, however information on Critical Biodiversity Areas (CBAs) and on specific species of concern is often not available. Thus, best professional knowledge and best technological solutions, with special mention of GIS were used to best understand these aspects;
- The WRMP provided in this report is intended to provide a general direction for which the proponent can achieve the desired ecological state of the acquired offset area in the future. The strategy thus provides high-level context and principles for which implemented actions must adhere to. In-depth rehabilitation (including alien and invasive plant (AIP) control, earthwork activity plans, etc.) will need to be developed (at the appropriate time) under the guide of suitably trained specialists;
- As much effort as possible was made to liaise with relevant stakeholders and obtain indications of willingness to take part in the initiative, within budget constraints and within timeframes;
- This wetland offset study focuses on the high-level planning and overall wetland offset requirements, in addition to a high-level rehabilitation plan to be implemented at the target offset area; and
- A risk assessment was conducted for the wetlands associated with the target offset area.

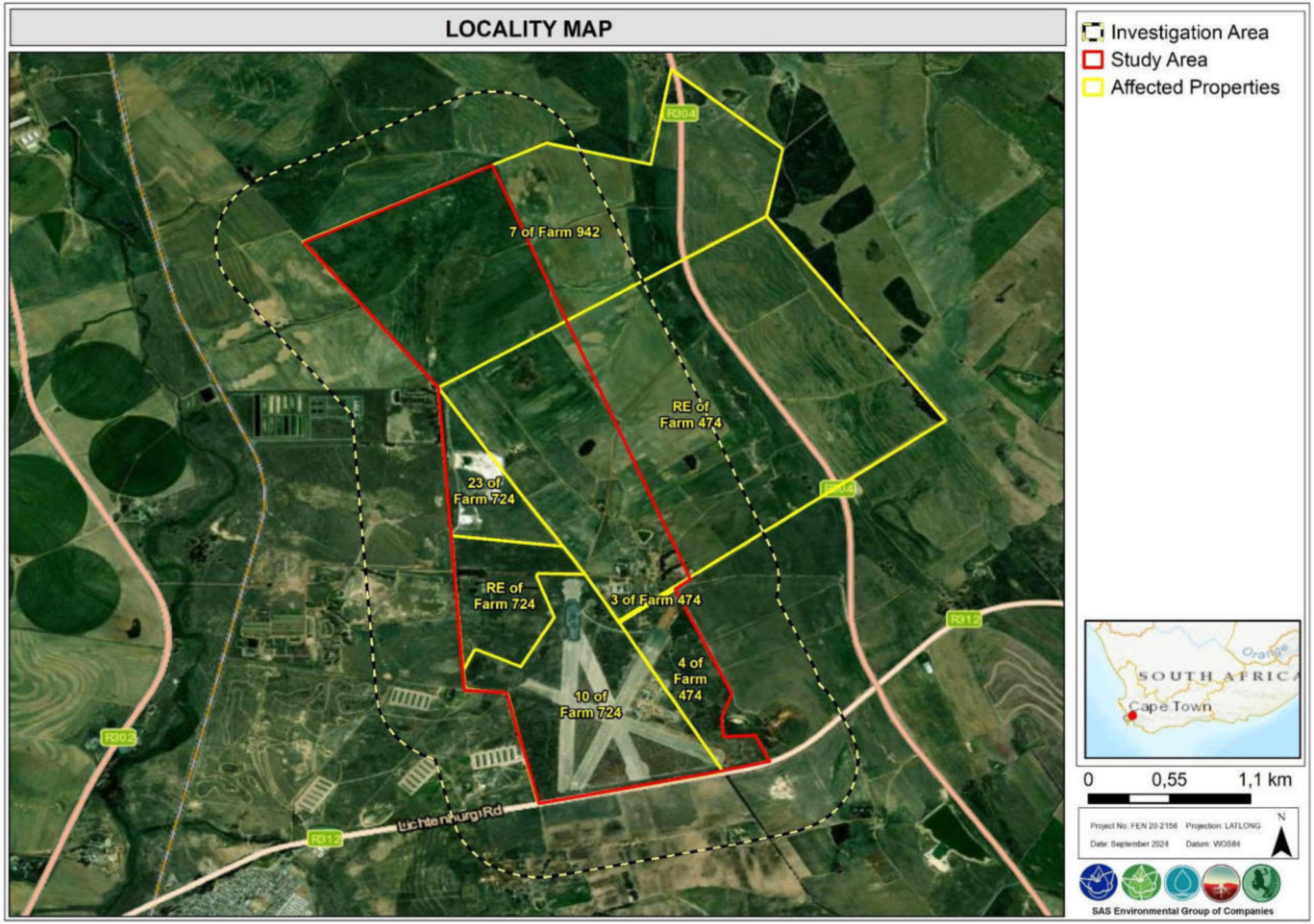


Figure 1: Digital satellite imagery of the study and investigation areas in relation to the surrounding environment.

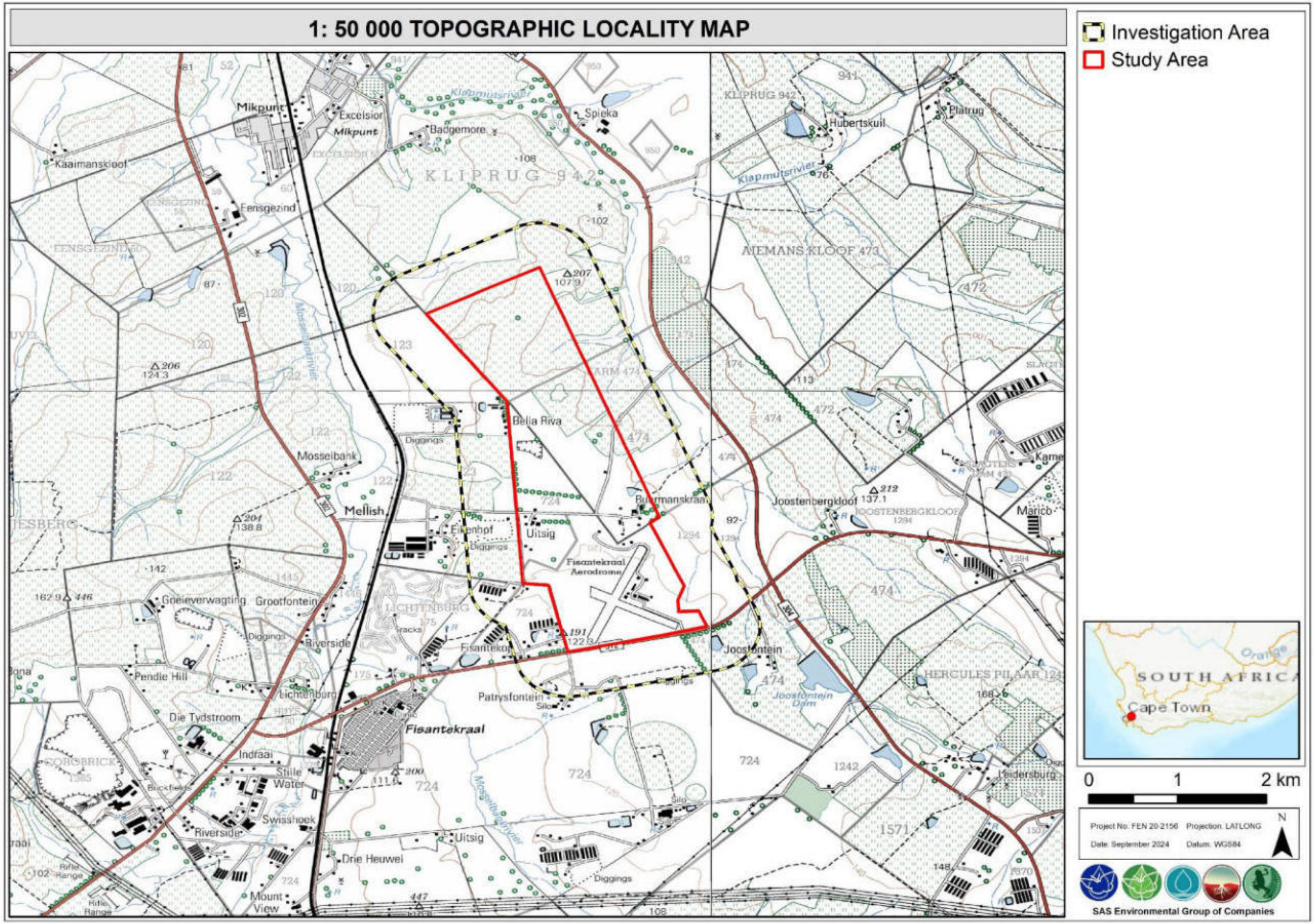


Figure 2: Location of the study and investigation areas depicted on a 1:50 000 topographical map, in relation to the surrounding area.

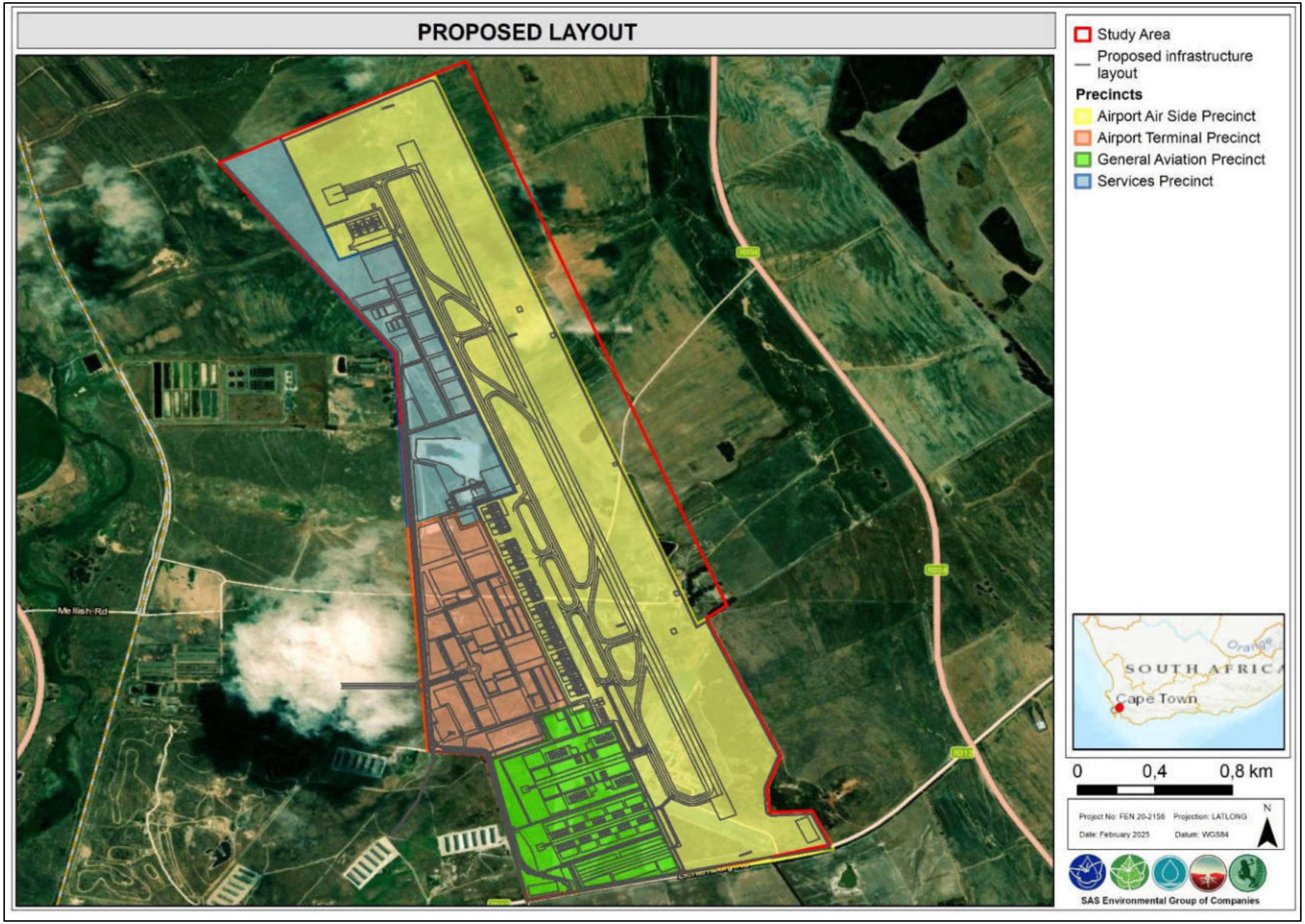


Figure 3: Proposed layout of the CWA development during Phase 2.

1.5 Applicable Legal Framework and Definitions

The following legislative documents were considered:

- The National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended (NEMA);
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
  - GN 2747 (Gazette Number 47526): The revised National list of Ecosystems that are Threatened and in need of Protection, dated 18 November 2022, as it relates to the NEMBA;
  - GN R.1020: Alien and Invasive Species Regulations, 2020, in Government Gazette 43735 dated September 2020 as it relates to the NEMBA;
  - GN 1003: Alien and Invasive Species Lists, 2020, in Government Gazette 43726 dated 18 September 2020, as it relates to the NEMBA;
  - GN 3009: Regulations Pertaining to Threatened or Protected Terrestrial Species and Freshwater Species in Government Gazette 47984 dated 3 February 2023, as it relates to the NEMBA;
  - GN 3569: National Biodiversity Offset Guideline, in government Gazette 48841 dated 23 June 2023, as it relates to the NEMBA;
  - GN 3012: List of Terrestrial and Freshwater Species that are Threatened or Protected, Restricted Activities that are Prohibited, and Restricted Activities that are Exempted, in Government Gazette 47984 dated 3 February 2023, as it relates to the NEMBA;
- The National Water Act, 1998 (Act No. 36 of 1998) (as amended) (NWA);
  - GN 4167 as published in the Government Gazette 49833 of 2023 as it relates to the National Water Act, 1998 (Act No. 36 of 1998); and
  - Section 21 of the NWA lists the following activities as water uses that are applicable to the rehabilitation of freshwater ecosystems:
    - Section 21 (c): impeding or diverting the flow of water in a freshwater ecosystem; and
    - Section 21 (i): altering the bed, banks, course, or characteristics of a freshwater ecosystem.

Please refer to Appendix B for additional legislative requirements.

The 2016 best-practice wetland offset guidelines (SANBI and DWS, 2016) were also consulted during the development of this Wetland Offset Strategy report.

As part of this memorandum, the following definitions as per the NWA are of relevance:

- **Watercourse** means (a) a river or spring, (b) a natural channel in which water flows regularly or intermittently, (c) a wetland, lake or dam into which, or from which water flows, and (d) any collection of water, which the Minister may, by notice of the Gazette, declare a watercourse;
- **Wetland** means "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil";
- **Riparian habitat** means "the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent areas"; and
- **Regulated area of a watercourse** means (a) the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam, (b) in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a

watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench, or (c) a 500 m radius from the delineated boundary (extent) of any wetland or pan.

2 OVERVIEW: WETLAND OFFSETS

Offsets are implemented as part of a mitigation hierarchy and are specifically intended to mitigate or compensate for the residual environmental impacts of development (often referred to as "compensatory mitigation") after all viable measures have been taken to first avoid or prevent, minimize or reduce, and remediate or rehabilitate those impacts (SANBI and DWS, 2016; Figure 4). Following the mitigation hierarchy, the following is applicable with respect to offsetting:

- First, the proposed development should try to avoid or prevent negative impacts on biodiversity and ecosystem services by seeking alternative types of development, or alternative locations, different scales of development, different layouts and siting of development components, etc.;
- Secondly, if the above-mentioned alternatives have been exhausted, every effort should be made to minimize negative impacts and to rehabilitate or remediate affected areas; and
- ‘Residual impacts’ are what will remain after minimizing impacts and rehabilitation. These residual impacts would then need to be compensated for, and this may involve the specific application of an offset.

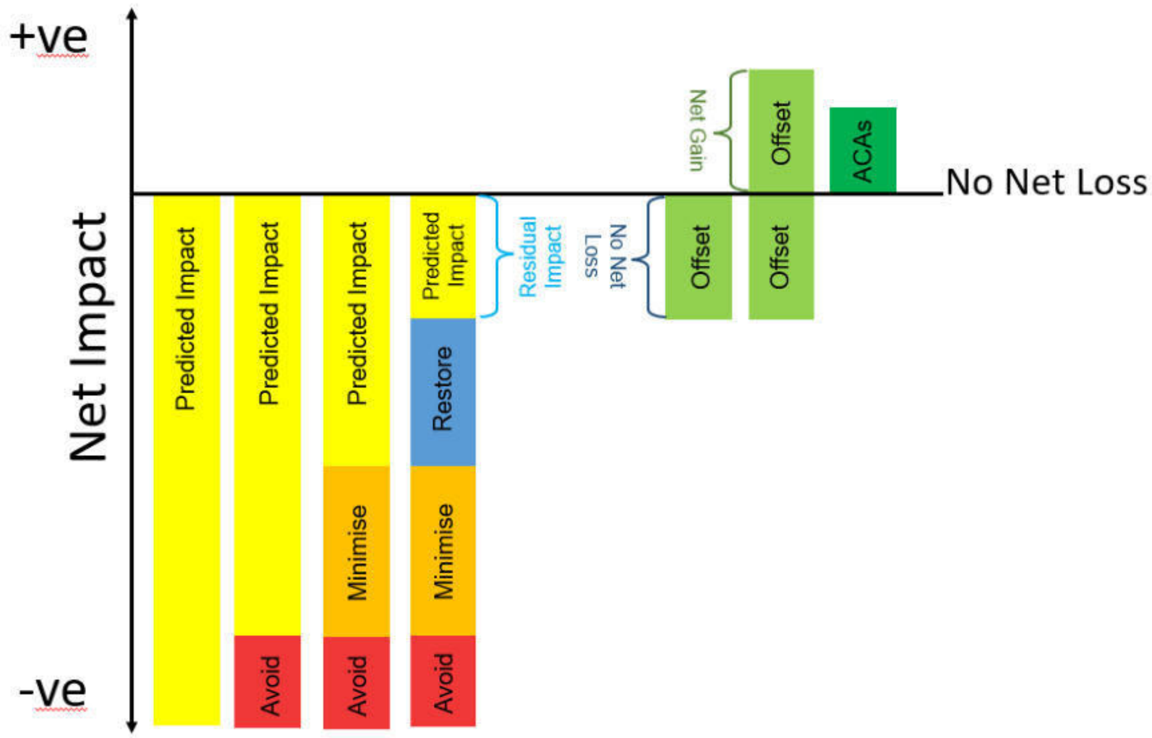


Figure 4: Depiction of the mitigation hierarchy and where offsets and additional conservation actions (ACAs) fit into the overall goal of achieving a net positive impact (NPI). Image adapted from Temple *et al*., (2012).

Environmental offsetting provides a means by which to slow – and possibly even reverse – “ecological deficit” by counterbalancing the degradation, destruction, and depletion of natural resources through protection, rehabilitation, restoration and replenishment.

The offsetting of impacts on freshwater systems is a critical component of biodiversity conservation and ecosystem management. According to the 2023 National Biodiversity Offset Guidelines, offsetting is necessary to counterbalance residual impacts on biodiversity that remain after all other mitigation measures, such as avoidance, minimization, and rehabilitation, have been applied. These guidelines emphasize that freshwater ecosystems, alongside terrestrial ecosystems, play a vital role in maintaining biodiversity and providing essential ecosystem services.

Freshwater systems are particularly susceptible to degradation due to development activities, necessitating a structured approach to mitigate these impacts. The guidelines stipulate that offsets should only be considered when significant residual impacts remain, underscoring the need for such measures to be a last resort. This approach ensures that offsets contribute to the long-term security and ecological integrity of biodiversity priority areas, including wetlands, rivers, and other freshwater habitats.

The stated goal of wetland offsets is to achieve no net loss and preferably a net gain on the ground with respect to water resources, ecosystem and habitat objectives, and species of special concern. This involves focusing on the importance of wetlands in supporting water resource management objectives, as well as recognizing the cultural values and uses of wetlands by people. Additionally, offsets should meet national and local objectives for habitat protection, avoid exacerbating the threat status of ecosystems, and prioritize the conservation of threatened, rare, or keystone wetland species (SANBI and DWS, 2016).

Effective offsetting for freshwater systems involves securing suitable offset sites that maintain or enhance the ecological conditions of similar habitats. This includes implementing comprehensive management plans and monitoring programs to ensure that the desired ecological outcomes are achieved and sustained over time. The 2016 Wetland Offset Guidelines (SANBI and DWS, 2016) further elaborate that wetland offsets should aim for "No Net Loss" and preferably a net gain concerning the full spectrum of functions and values provided by wetlands. These functions include water resource management, ecosystem services, and the protection of species of conservation concern (SCC).

Furthermore, wetland offsets are increasingly seen as a crucial tool in safeguarding against the rapid decline of wetland areas, which are under significant pressure from ongoing urban and industrial expansion. The guidelines emphasize the importance of adhering to a mitigation hierarchy, where offsets are applied only after exhaustive efforts have been made to avoid, minimize, and rehabilitate impacts. Wetland offsets cannot be applied as the only or first option and should be considered only once all other measures have been exhausted (SANBI and DWS, 2016). This approach is essential in preserving the critical ecosystem services provided by wetlands, such as water purification, flood regulation, and habitat for a wide range of species, including those that are rare or threatened.

By adhering to these principles, the offsetting process can provide measurable and lasting benefits to freshwater biodiversity, supporting the overall goal of no net loss of these critical ecosystems. Wetland offsets thus play an indispensable role in maintaining ecological balance and ensuring that development activities do not irreparably harm the natural environment.

According to the National Best Practice Guidelines (SANBI and DWS, 2016), the general wetland offset process should unfold as follows:

- Identification of issues and options to avoid and/or prevent residual negative impacts;
- Check if residual impacts would be offsetable;
- Draft preliminary offset proposal if offsets are feasible, and could and would be implemented;
- Discuss and obtain formal consent from biodiversity conservation agency/authority and competent authority to pursue detailed investigation of a wetland offset;
- Investigate wetland offset options, involving relevant specialists; and
- Where the environmental authorisation is conditional on a wetland offset, secure necessary legal agreements to implement offset, and to undertake monitoring, auditing and adaptive management.

3 ENVIRONMENTAL CHARACTERISATION OF THE STUDY AREA

3.1 Characterisation of the Freshwater Environment associated with the Study Area

FEN (2024) conducted a freshwater assessment in which all freshwater ecosystems within the study area were identified and described. The freshwater assessment confirmed the presence of a seep wetland (referred to in FEN, 2024 as seep wetland 1) in the central eastern portion of the study area (Figure 7). Numerous artificial features including impoundments and agricultural drains were also noted within the study area (Figure 7). Channelled valley bottom (CVB) wetlands were also identified within the northern and north-eastern extent of the investigation area.

The seep wetland is located on the side-slopes of a valley draining towards the larger CVB wetland located north east of the study area. The wetland has been modified as a result of impacts associated with extensive cultivation in the wetland's catchment, which has contributed to the modification of wetland vegetation composition of the seep wetland as well as the erosion of soil. The vegetation composition of the seep wetland has been replaced by ruderal and opportunistic AIPs such as *Cenchrus clandestinus*, which is heavily grazed. From a hydropedological point of view, the hydropedological processes are predicted to remain largely unmodified in the post development scenario, and the functionality of the wetlands identified within the catchment area will likely remain unchanged, provided that stormwater is appropriately managed (ZRC, 2024). Nevertheless, the proposed development will lead to the irreversible residual loss of the 6.74 ha of the seep wetland. As such, the loss of wetland habitat can only be managed by the highest level in the mitigation hierarchy, namely by means of a wetland offset.

In line with the mitigation hierarchy, as advocated by the Department of Environmental Affairs (DEA) *et al.* (2013) the following were considered as part of the investigation for the CWA development:

Table 1: Mitigation hierarchy considered as part of the CWA development.

Avoid/Prevent Impact	As part of the assessment, no other alternatives were deemed feasible due to the existing operation of the CWA at its current location. Selecting an alternative site to construct the CWA development was not considered feasible, therefore limiting areas where the expansion of the CWA could be undertaken.
Minimise Impact	The impacts on the freshwater ecosystems were minimized as far as feasibly possible by strategically placing particular development components outside and away from. Numerous discussions were undertaken between the freshwater specialist, the Environmental Assessment Practitioner (EAP) and the project engineers to determine how best to minimize the impacts of the CWA development on the surrounding freshwater environment, including strategically placing stormwater attenuation ponds outside wetland areas. The proposed CWA development initially would have included development on all of the subject properties indicated in Figure 1, which may have resulted in additional impacts to other CVB wetlands. The study area was however reduced to its current extent as indicated in Figure 1. Furthermore, the proposed CWA development would have resulted in an approximate 9 ha seep wetland loss if the entire study area footprint was to be developed, however this has also been significantly reduced to the current 6.74 ha. Lastly, as part of the layouts received for the EIA report, it was proposed to construct one of the attenuation ponds within the area considered as part of the offset investigation. The attenuation pond's location has subsequently been moved outside the offset site, to prevent any further wetland habitat loss and minimise further impacts to the wetland.

Rehabilitate/ Offset the Impact	Based on the CWA development design, approximately 6.74 ha of wetland habitat would still be lost as a result of direct impacts associated with the proposed CWA development. An ~ 40 ha area of the freshwater ecosystems and agricultural drain will be rehabilitated on site as part of the offset investigation/ requirements. Sections 4-10 below provides all relevant mitigation measures and rehabilitation actions that will be implemented.

Table 2 below presents the findings of the ecological assessment of the seep wetland within the study area.

Table 2: Summary of results of the field assessment of the seep wetland (FEN, 2024).

Freshwater Ecosystem	PES	Ecoservices	EIS
Seep wetland	Category D (Largely modified)	Very Low	Low

In addition to the seep wetland, the CVB wetland 1 into which seep wetland 1 drains (via an agricultural drain) was also assessed. The CVB wetland (termed CVB wetland 1 in FEN, 2024) was indicated to be in a seriously modified state (PES Category E) and indicated to have a moderate Ecological Importance and Sensitivity (EIS), based on the following assumptions:

- The wetland is within Critically Endangered terrestrial and wetland vegetation types, and very rare, although limited natural vegetation in the wetland remains;
- The wetland is a tributary of the Klapmuts River, which drains surface runoff from the adjacent agricultural areas toward the Klapmuts River in the north-eastern portion of the focus area;
- According to Scientific Terrestrial Services (STS; 2023a), *Grus paradisea* (Blue Crane - Vulnerable) is considered likely to pass through or utilise this CVB wetland for foraging while breeding likely takes place in adjacent cultivated fields; and
- The PES of the wetland is estimated to be seriously modified.

Figure 5: Representative photographs of CVB wetland. (Top) The topographical setting of the CVB wetland (blue dashed line) in a valley bottom position; (Bottom left) *Juncus sp*. and AIPs

including *Cenchrus clandestinus* found in the wetland; (Bottom right) Active grazing by cattle within the CVB wetland.

The WET-EcoServices model determined a moderately low to moderate supply importance for sediment trapping, nutrient and toxicant assimilation, food for livestock and cultivated foods, whereas the demand importance for regulating services, particularly sediment trapping and nutrient assimilation is considered high (Figure 6). This is attributed to the current land use of the greater area in which the CVB wetland is located, which is predominantly agricultural. The demand for biodiversity maintenance is moderate as a result of the critically endangered vegetation type in which the CVB wetland is located. The moderately high carbon storage demand importance of the CVB wetland stems from the potential of the wetland to store carbon.

After integrating the supply and demand importance scores for the central wetland, the model determined an overall moderate importance for sediment trapping and a moderately low to low importance for nutrient and toxicant assimilation, and food for livestock, yet a very low ecoservice provision for cultural and other provisioning services.

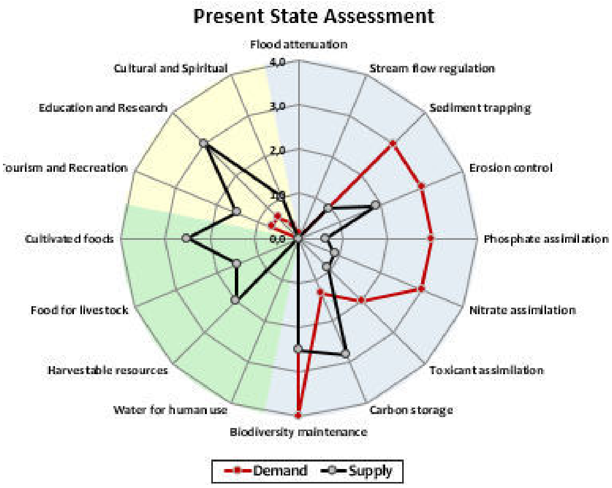


Figure 6: Results of the WET-EcoServices model for the CVB wetland, indicating the current ecosystem service provision.

The details pertaining to the methodology used to assess the CVB wetland is available in Appendix C of this report.

A risk assessment was conducted to identify the likely impacts of the development on the identified seep wetland (and downgradient wetlands in the investigation area as indicated in Figure 7), and a third site assessment was conducted on 24 April 2024, focussing on the offset considerations. The methods and results of the risk assessment associated with the offset are appended to this report as Appendix D and Appendix E, respectively.

3.2 Species of Conservation Concern associated with the Study Area

No SCC were identified during the site inspections undertaken by FEN Consulting in August and September 2022 or in April 2024. High levels of disturbance within the project footprint have significantly reduced the habitat available that could have supported floral and faunal SCC.

According to STS (2023b), no mammal or amphibian SCC were identified during the site investigations. However, two reptile SCC were identified. According to STS (2023b), numerous bird SCC may utilise the study area, although only one (Blue Crane, *Grus paradisea*) was noted on site during the field investigation in February and August 2022. STS (2023a&b) reported that the following faunal (including avifaunal, but not invertebrates) SCC are considered likely to utilise or pass through areas surrounding the proposed CWA development, and the freshwater ecosystems within and surrounding the study area, inclusive (species indicated with an asterisk (*) are known to inhabit and/or utilise freshwater ecosystems – although some only for foraging purposes):

- Cape Sand Snake (*Psammophis leightoni*; Vulnerable);
- Cape Dwarf Chameleon (*Bradypodion pumilum*; Vulnerable);
- Blue Crane* (*G. paradisea*; Near Threatened);
- Greater Flamingo* (*Phoenicopterus roseus;* Near Threatened);
- Lesser Flamingo* (*Phoenicopterus minor;* Near Threatened);
- Verreaux's Eagle* (*Aquila verreauxii*; Vulnerable);
- Great White Pelican* (*Pelecanus onocrotalus*; Vulnerable);
- Maccoa Duck* (*Oxyura maccoa*; Near Threatened);
- Secretary Bird* (*Sagittarius serpentarius*; Vulnerable);
- Black Harrier* (*Circus maurus*; Vulnerable);
- African Marsh-Harrier* (*Circus ranivorus*; Vulnerable); and
- Lanner Falcon* (*Falco biarmicus*; Vulnerable).

Numerous other faunal species were identified during the site assessments by STS. Refer to STS (2023a&b) for more information.

SCC identified by the botanist (Nick Helme Botanical Surveys, 2024) are listed below, although it is noted that none of these species are considered freshwater ecosystem adapted plants.

- *Babiana odorata* (Endangered);
- *Drosanthemum hispifolium* (Vulnerable);
- *Ficinia* sp nov. (Not yet assessed);
- *Gladiolus watsonius* (Near Threatened);
- *Lampranthus leptaleon* (Endangered);
- *Leucadendron verticillatum* (Critically Endangered);
- *Leucospermum grandiflorum* (Endangered);
- *Metalasia octoflora* (Vulnerable);
- *Muraltia macropetala* (Vulnerable);
- *Muraltia trinervia* (Near Threatened);
- *Podalyria microphylla* (Critically Endangered);
- *Restio duthieae* (Vulnerable);
- *Restio rigoratus* (Endangered); and
- *Xiphotheca lanceolata* (Vulnerable).

As none of these species have been identified within the seep wetland to be lost by neither the botanical nor the faunal specialists, the component of SCC was not included as part of the offset assessment. Should any of the above SCC or other indigenous vegetation be found within the rehabilitation area or offset area, these should be identified (and marked) prior to the commencement of rehabilitation activities and avoided during rehabilitation activities. Rehabilitating the CVB wetland however may provide more suitable habitat for avifaunal SCC such as the blue crane and flamingos to forage.

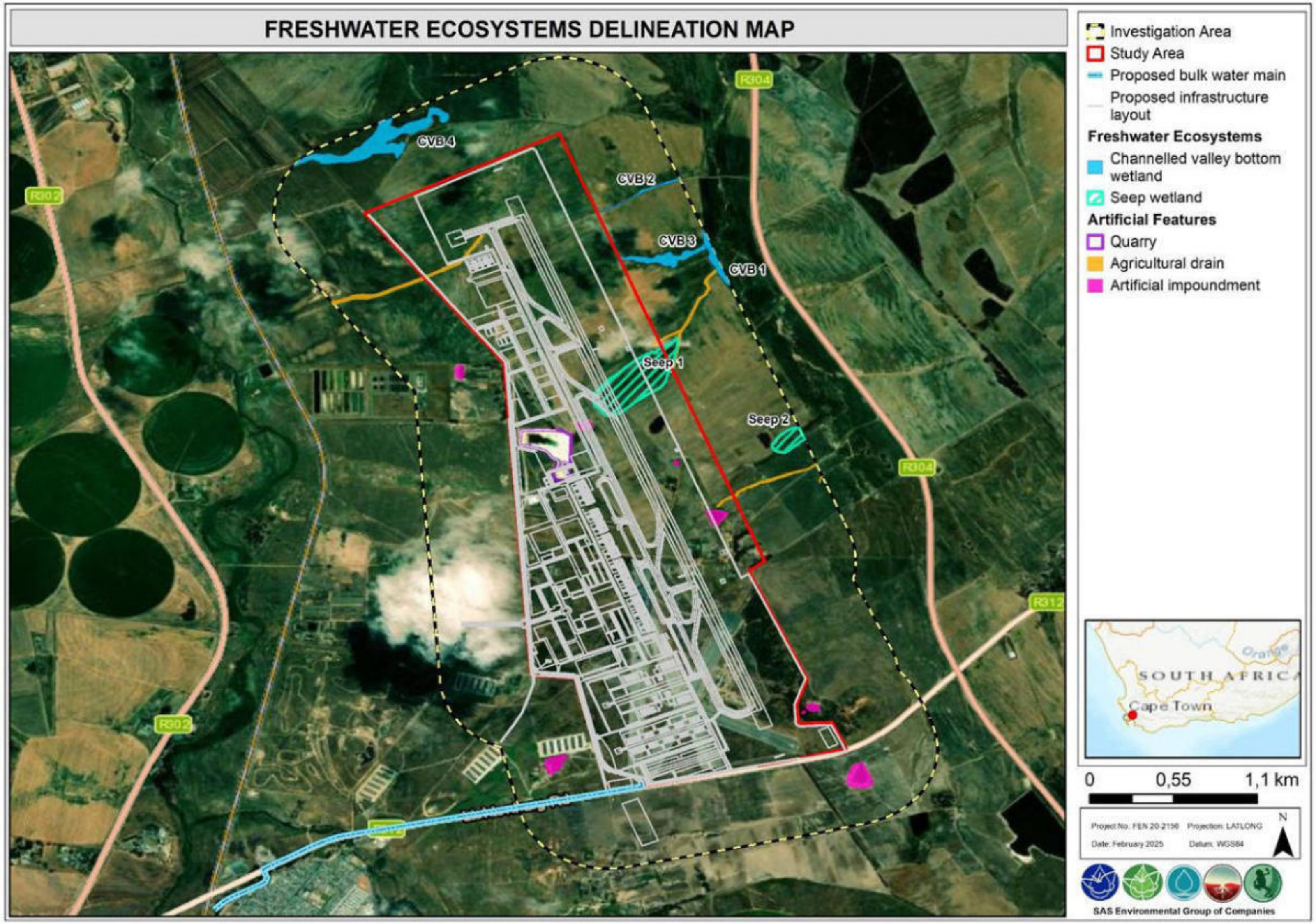


Figure 7: Map representing the delineated extent of the freshwater ecosystems and artificial features associated with the study and investigation areas and preliminary Spatial Development Plan (SDP).

4 OFFSET DETERMINATION METHODOLOGY

This section outlines the methods involved in the development of the Wetland Offset Strategy. Most of the outlined methodology is provided in Appendix F; where relevant, reference to this Appendix and the appropriate figures and/or tables is defined in the sub-sections below.

4.1 Residual Impact Assessment

Residual impacts are those impacts remaining after measures to minimise and rehabilitate/ remediate harm have been implemented. As wetland offsets are implemented to address significant residual impacts resulting from development projects (after appropriate avoidance, minimization, and rehabilitation measures have been considered), it is essential to quantify the residual impacts associated with development activities. The best-practice wetland offset guidelines (SANBI and DWS, 2016) suggest that the following key components be evaluated when assessing residual impacts. These components include (Figure 8):

- Water resource and ecosystem services;
- Ecosystem/habitat conservation; and
- SCC.

Figure 8: Key components to be considered when determining wetland offset requirements (image taken from the Wetland Offsets: best practice guidelines (SANBI and DWS, 2016)).

For the purposes of this residual impact assessment, all wetland losses were converted into the following quantities:

- **Functional hectare equivalents** in support of water resource management and disaster risk management. 'Functional hectare equivalents' are the equivalent area of wetland providing a measurable level of regulating ecosystem services (calculated as wetland area multiplied by functional value);
- **Habitat hectare equivalents** in support of ecosystem conservation. 'Habitat hectare equivalents' are the equivalent area of wetland with intact vegetation and habitat (calculated as wetland area multiplied by habitat value); and
- **Species offset ratios** in support of SCC. Ratios should be guided by factors such as threat status and the importance of the wetland in meeting species protection targets. Importantly, if no SCC make use of the wetland being investigated, then this assessment is not required (which applies to this offset strategy, refer to Section 3.2 above).

Please refer to Appendix F for methodology outlining how functional hectare equivalents and habitat hectare equivalents were calculated.

4.2 Determination of Offset Requirements and Targets

A summary of the key aspects used to calculate offset targets is provided here:

- Impacts to regulating ecosystem services in support of water resource management: Targets are set by multiplying the loss in functional hectare equivalents by the functionality importance ratio (set as 1:1 unless there are exceptional circumstances that would justify a higher ratio[1]);
- Impacts to carbon storage services in support of climate mitigation and adaptation: Targets are set by multiplying the loss in carbon hectare equivalents by the functionality importance ratio (set as 1:1 unless there are exceptional circumstances that would justify a higher ratio); and
- Impacts to ecosystem conservation: targets are set by modifying the residual impact calculations (habitat hectare equivalents) based on (i) ecosystem status, (ii) regional and national conservation context and the local context of the site.

Wetland offset targets for the three residual impact categories were calculated using wetland offset target calculators developed as part of the National Wetland Offsets Guideline (SANBI and DWS, 2016) as well as the Wet-EcoServices (Version 2) tool (Kotze *et al.*, 2020). Refer to Appendix F for further details.

4.3 Site Selection and Screening

The meeting of functional (regulating ecosystem services) targets requires a gain in wetland functionality through the rehabilitation and management of a degraded site or a site under threat before protection is considered (SANBI and DWS, 2016). Functional offset targets are typically achieved through the following means (as detailed in the provided WRMP (Section 6)):

- Rehabilitation actions / interventions that reinstate ecosystem functioning and integrity and the processes to drive the supply of regulating services;

[1] Allocation of functional importance ratios for key ecosystem services (as per Wet-EcoServices (Version 2) tool (Kotze *et al.*, 2020)) are defined as: 0.75 (demand between 0 – 1.0) for wetlands located within a context where they provide very limited benefits to society, 1 (demand between 1.1 – 2.0) for wetlands that are quite poorly placed to address key water-resource challenges, 1.25 (demand between 2.1 – 3.0) for wetlands that are well positioned to address key water-resource challenges, and 1.5 (demand > 3) for wetland located in critical areas, where wetland functions are particularly important .

- Actions that avert the loss of a wetland that is likely to degrade in the future (i.e. a headcut is migrating upstream through a wetland) (referred to as averted loss'); and/or
- The creation of a new artificial wetland referred to as 'establishment'.

In the first phase of the offset study, several *offset candidate sites* are considered. Candidate sites may include both on-site and off-site wetland offset options. A suite of site selection criteria has been identified by the National Wetland Offset Guidelines (DWS and SANBI, 2016), and are summarised in Table F6 (Appendix F). Final offset site selection must ensure that suitable compensation for the loss of freshwater features due to the proposed development is achievable, while addressing the suitability of a site in terms of meeting Water Resource and Ecosystem Service requirements (as per criteria listed in Table F6 (Appendix F).

The potential wetland offset candidate sites were screened in terms of the site selection criteria (Table F6, Appendix F). The offset candidate sites included the screening of numerous wetlands within the greater Fisantekraal and Durbanville area, including on-site and off-site wetlands. The desktop screening involved assigning scores to each of the selection criteria and the integration of these scores in the structured way for prioritisation purposes and the evaluation of the potential outcomes of identified preliminary offset options at a desktop level using applicable assessment tools and guidelines.

5 OFFSET RESULTS

The sections below provide the results pertaining to the offset strategy.

5.1 Residual Impact Assessment and Wetland Offset Targets

The wetland located within the study area is 10.42 ha in extent. The extent of the wetland to be lost as a result of development activities is 6.74 ha (an additional 0.7 ha wetland loss was also included in the offset calculations to account for indirect impacts, resulting in a total 7.44 ha area to be lost as a result of the proposed CWA development), whereas the remaining 3.68 ha of wetland will remain (Figure 9).

The following **residual impacts** were calculated for the seep wetland:
- Loss of **3.97 functional hectare equivalents (HaE)** of wetland (Table 3); and
- Loss of **1.86 habitat HaE** of wetland (Table 4).

Table 3: Summary of findings of the offset calculations for functional hectare equivalents.

Integrating scores to assess Functional Value & Hectare Equivalents		
Function / Service Groups	**Weighting (%)**	**Present State**
Flood Attenuation	10%	0.7
Streamflow Regulation	10%	1.0
Sediment Trapping & Erosion Control	20%	1.3
Water Quality Enhancement	60%	1.3
Weighted Supply Score		1.2
Realistic Reference score		3,2 (default)
Functional Value (%)		38.1 %
Wetland Area (Ha)		10,42
Functional Hectare Equivalents (Unadjusted)		**3.97**

Table 4: Summary of findings of the offset calculations for habitat hectare equivalents.

Ecosystem Conservation Targets			
Impact Assessment	Prior to development	Wetland size (ha)	**7.44 (includes a 32m indirect impact)**
		Habitat intactness (%)	**25**
	Post development	Habitat intactness (%)	**0**
		Change in habitat intactness (%)	**25**
	Development Impact (Habitat hectare equivalents)		**1.86**

The following **functional offset targets** were calculated:

- The functional offset target is to gain and secure **3.97 functional HaE** in the region through the rehabilitation and protection of wetlands (3.97 multiplied by the functional importance ratio of 1 = 3.97); and
- The ecosystem conservation target is to secure and protect **13 habitat HaE** of intact and representative wetland habitat, within the West Coast Shale Renosterveld wetland vegetation region (Table 5).

Table 5: Summary of findings of the offset target calculations for ecosystem conservation.

Ecosystem Conservation Targets				
Determining offset ratios	**Ecosystem Status**	Wetland Vegetation Group (or type based on local classification)	West Coast Shale Renosterveld	
		Threat status of wetland	Threat status	**CR**
			Threat status Score	**15**
		Protection level of wetland	Protection level	**Not Protected**
			Protection level Score	**2**
			Ecosystem Status Multiplier	**30**
	Regional and National Conservation context	Priority of wetland as defined in Regional and National Conservation Plans	Not specifically identified as important	**0.5**
			Regional & National Context Multiplier	**0,5**
	Local site attributes	Uniqueness and importance of biota present in the wetland	Low biodiversity value	**0,5**
		Buffer zone integrity (within 500m of wetland)	Buffer compatibility score	**0,2**
		Local connectivity	Moderate connectivity	**0,75**
			Local Context Multiplier	**0,5**
	Ecosystem Conservation Ratio			**6.98**
Offset Calculation	**Development Impact (Habitat hectare equivalents)**		**1.9**	
	Ecosystem Conservation Ratio		**7.0**	
	Ecosystem Conservation Target (Habitat hectare equivalents)		**13.0**	

It should be noted that rehabilitating only the remainder of the seep wetland (3.68 ha) will not be sufficient to achieve the 3.97 HaE wetland functionality and 13 HaE ecosystem conservation target. A CVB wetland which is fed by the seep wetland via an agricultural drain was therefore also investigated to achieve the offset target.

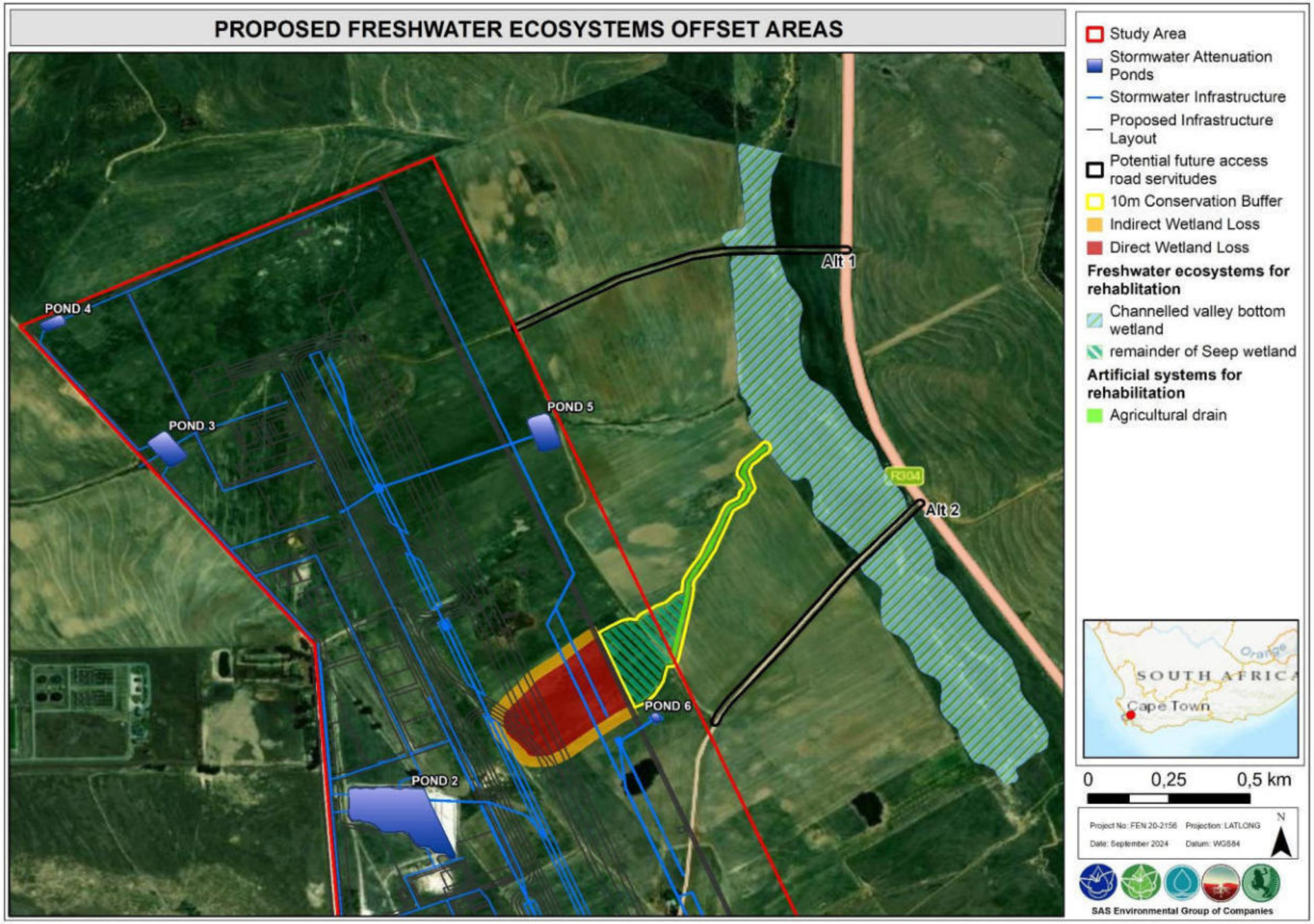


Figure 9: Extent of wetland to be lost (7.44 ha) *vs* identified wetland areas to be rehabilitated.

5.2 Site Selection and Screening Results

During meetings held with various officials, including the City of Cape Town, Cape Nature, the DEA&DP and the DWS, various offset options were discussed. A consensus was reached that an on-site offset would be beneficial to the area, particularly on the Remaining Extent (RE) of Farm 474, Joostenbergs Kloof and Portion 7 of Farm 942, Kliprug (Figure 1). This is based on the "like for like" concept, where biodiversity offsets generally target features or areas with similar biodiversity as that impacted by the proposed CWA development. As indicated by the offset calculator tool, in order to compensate for the 6.74 ha loss (combined loss of 7.44 ha) of the seep wetland, 3.97 HaE of wetland functionality and 13 HaE of ecosystem conservation has to be achieved. As a result, offsetting only the remainder of the seep wetland (3.68 ha) will not be sufficient to achieve the 3.97 HaE wetland functionality and 13 HaE ecosystem conservation target. A CVB wetland which is fed by the seep wetland via an agricultural drain was therefore also investigated to achieve the offset target.

During the project brief provided to the DWS, it was also discussed that future development in the form of constructing access roads through the CVB wetland may be necessary and has already been incorporated into future development planning by the Western Cape Government (see Figure 10 and Figure 11 for the preliminary Access Management Plan) for future development from the R304 situated east of the study area. Based on the Access Management Plan (ITS Engineers, 2012), some access road alternatives are being considered of which two may traverse the potential offset area (see Alt 1 and Alt 2 in Figure 9). During discussions of the Access Management Plan with the Environmental Assessment Practitioner (EAP), it was recommended that existing access roads be upgraded rather than constructing new roads, resulting in new impacts. During the meetings with the authorities it was discussed that only one of the road alternatives are to be utilised and/or formalised while the other is rehabilitated. Subsequent to the meetings, it was discussed and a consensus was reached with the project team that both road alternatives (Alt 1 and Alt 2) will remain or be formalised. Both road alternatives are subject to the necessary environmental authorisation processes prior to them potentially being developed in the future and as such, the two access roads that may traverse the CVB wetland offset area were incorporated into the offset calculations to account for the future use of the roads. General control measures applicable to roads are provided in Appendix E. If Alt 1 will be constructed or formalised, CVB wetland 2 north of the road is to be rehabilitated.

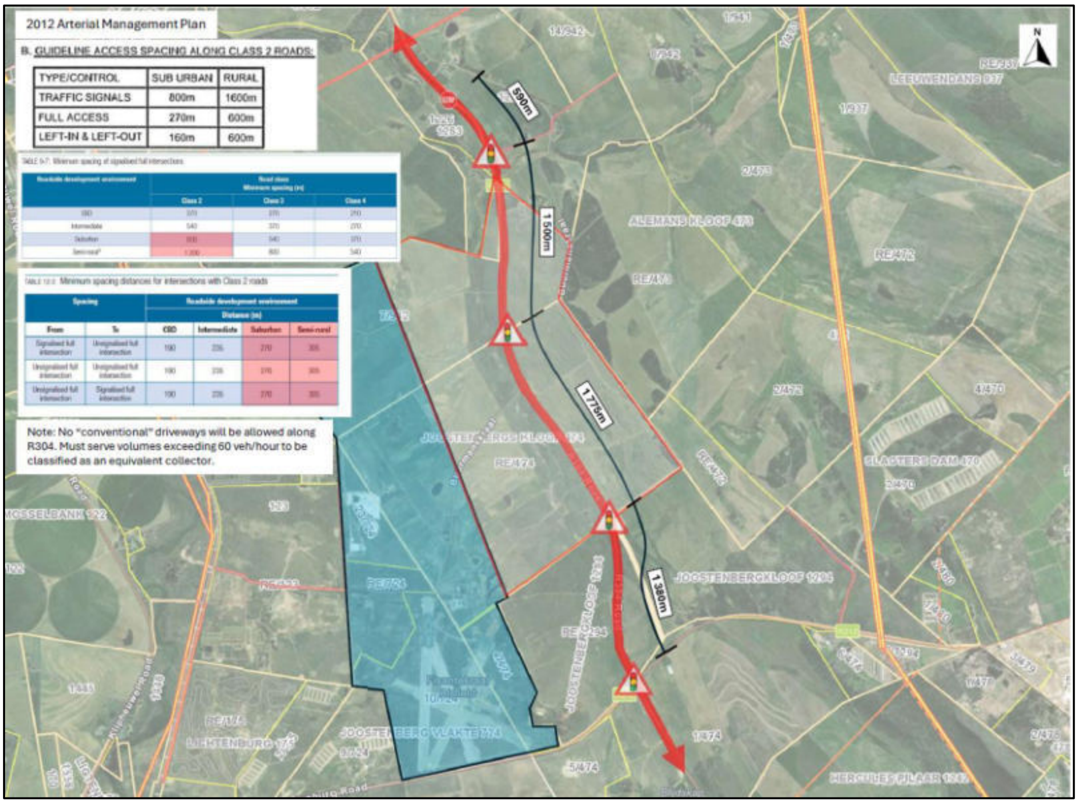


Figure 10: Draft Arterial Management Plan for the R304 (provided by the EAP).

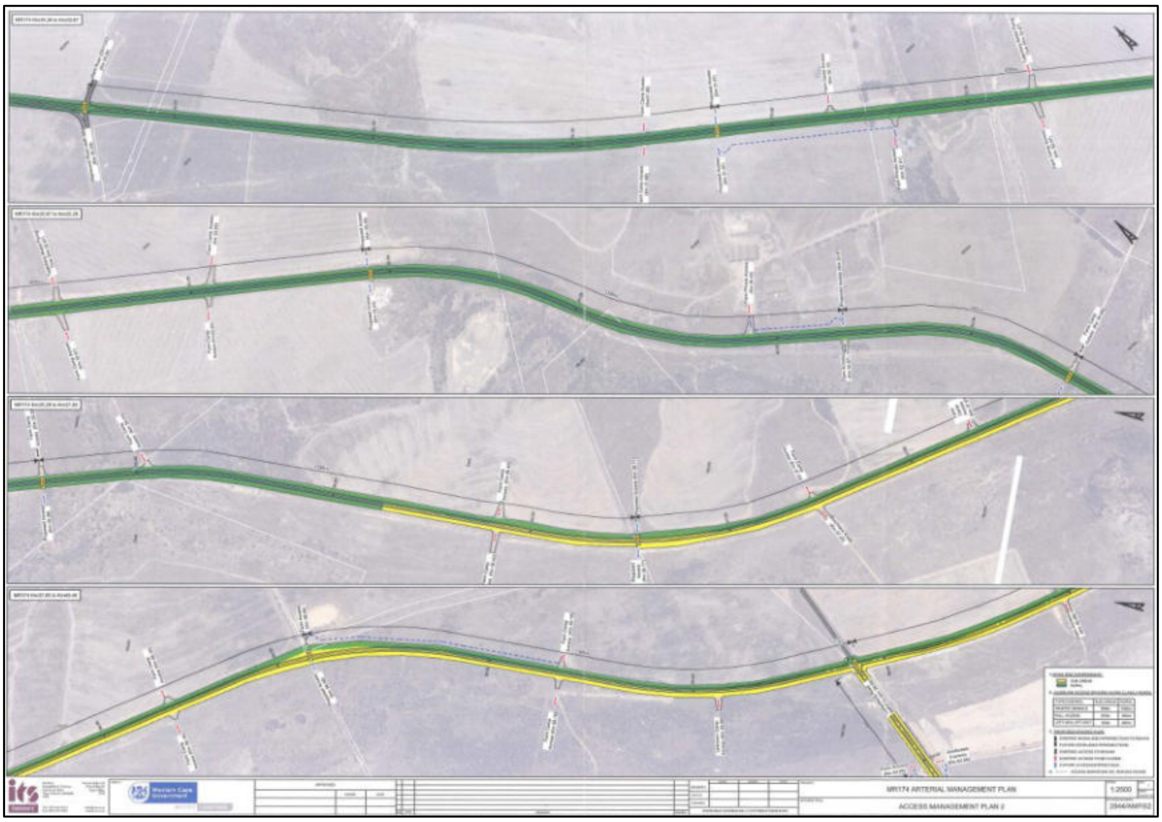


Figure 11: Draft Access Management Plan for the R304 (ITS Engineers, 2012).

The remaining wetland habitat east of the study area as well as the CVB wetland were thus selected as an on-site wetland offset (Figure 9) as these features have good rehabilitation potential and is already owned and/or managed by the proponent (Table 6). This reduces the risk of unsuccessful implementation of the offset significantly.

Table 6: Summary of preliminary screening assessment of potential candidate offset sites. Refer to Table F6 for further details on the various selection criteria.

<table>
<tr><th>Offset Site</th><th>Wetland habitat & HGM type</th><th>Landscape / Conservation planning</th><th>Wetland condition</th><th>Local biodiversity value</th><th>Ecological viability</th><th>Land-legal Issues</th><th>Downstream demand</th><th>Rehabilitation opportunities</th></tr>
<tr><td>Remaining seep wetland within the study area</td><td>Ideal</td><td rowspan="2">May be acceptable</td><td rowspan="2">Ideal</td><td rowspan="2">Acceptable</td><td rowspan="2">Potentially acceptable</td><td rowspan="2">Acceptable</td><td>Acceptable</td><td>Ideal</td></tr>
<tr><td>CVB wetland</td><td>Acceptable</td><td>Ideal</td><td>Acceptable</td></tr>
</table>

The key reasons of the decision to pursue the remainder of the seep wetland and the CVB wetland as the only option for wetland offset are:

- The land on which the offset site is located is owned and controlled by the CWA, which simplifies management of the wetlands and offset contribution as the community conflict risk in terms of land use is very low;
- Like-for-like offset will be achieved since the WET-VEG type of the development site and the offset area is the same, i.e. West Coast Shale Renosterveld (as indicated in Table 6);
- Offsetting ~40 ha of wetland area to compensate for the loss of 6.74 ha of seep wetland is considered a meaningful conservation and restoration effort which will create awareness to the public and private sectors with regards to the importance of wetland conservation; and
- The financial contribution to offset ~40 ha of wetland area will not amount to amount to wasteful expenditure as the CWA will manage the wetlands in perpetuity (at least for 30 years).

As part of the wetland offset investigation, various government officials and other relevant stakeholders were consulted to determine whether the above rehabilitation actions are deemed sufficient to offset the 6.74 ha seep wetland within the study area. During meetings held on 7 June 2024 and 16 September 2024, it was confirmed that all parties involved in the discussion support the rehabilitation of the seep wetland and CVB wetland hydrogeomorphic (HGM) unit as the target offset area (refer to Appendix J which contains minutes of meetings and the signed Memorandum of Understanding indicating CWA's commitment to undertake the wetland offset).

The following should be noted with regards to the selection of the remainder of the seep wetland and CVB wetland HGM unit:

- From a hydropedological point of view, the operation of the proposed CWA development, including the stormwater from the proposed development that will be released in an attenuated manner into the surrounding environment, will not negatively affect the rehabilitative efforts associated with the offset area, should the rehabilitation plan outlined in this report be implemented. The soils were found to be largely stagnating, characterised by the cemented layers which inhibits free vertical drainage of water and therefore, if water is released in an attenuated manner, it will likely mimic the natural flow of water;
- The bird strike specialist, Mr Albert Froneman, has indicated that the offset site in its current location will not significantly contribute to an increase in potential bird strikes associated with the operation of the proposed CWA development as the creation of open ponds within the offset site that attract large birds for foraging will be avoided (pers. comm.); and
- A wildlife management plan will be compiled for the proposed CWA development, which is to, with consideration of the nature of the CWA development, incorporate the recommendations of this offset plan in the management of wildlife on site and within the offset area.

5.3 Wetland Offset Gains

The selected wetland offset site encompasses ~40 ha which is available for offset purposes, thus offering enough area to fulfil the required offset targets. Specifically, these sites effectively meet the needs for both functional (3.97 ha) and habitat HaE (13 ha; Table 7). The suitability of these sites is further reinforced by the use of a like-for-like HGM unit (seep wetland) and the significant potential for ecological restoration through targeted rehabilitation activities, particularly given their current status as a category D (seep wetland) and category E (CVB wetland) wetlands, respectively. These factors make the selected wetlands an ideal choice for achieving the long-term conservation goals associated with the project.

Table 7: Wetland offset target calculation.

<table>
<tr><th rowspan="2"></th><th rowspan="2">Wetland offset target (HaE)</th><th rowspan="2">Proposed offset area (HaE)</th><th colspan="2">Final offset contribution (ha)*</th><th rowspan="2">Comments</th></tr>
<tr><th>Seep wetland</th><th>CVB wetland</th></tr>
<tr><td>Wetland functionality (HaE)</td><td>3.97</td><td>4.1 (0.3+3.8)</td><td rowspan="3">3.68</td><td rowspan="3">36.2</td><td>Offset contribution exceeds as what is required by the offset target</td></tr>
<tr><td>Ecosystem Conservation (HaE)</td><td>13.0</td><td>30.5 (2.8+27.7)</td><td>Offset contribution exceeds what is required by the offset target</td></tr>
<tr><td>Species Conservation (HaE)</td><td>-</td><td>-</td><td>Not assessed, however the biodiversity offset along with the wetland offset is regarded as appropriate to address species loss.</td></tr>
</table>

* The final offset contribution is the sum of the offset contribution of the respective wetlands, therefore equating to ~40 ha.

6 REHABILITATION AND MANAGEMENT PLAN

To identify and direct an optimal rehabilitation process, or to adopt the best possible/practicable rehabilitation approach, the desired outcomes of rehabilitation should be clear from the start. The designed Rehabilitation Plan is a system that seeks to achieve a required end state and will describe the activities required for the rehabilitation of the portions of the freshwater ecosystems within the study area.

Three key concepts are considered during rehabilitation strategies, e.g., “remediation”, “rehabilitation” and “restoration”, each with slightly different objectives and concepts. Below is a list of important terminology as adapted from McDonald *et al.* (2016) and Hattingh (2019):

- **Remediation** is the environmental clean-up of land and water contaminated by organic, inorganic or biological substances;
- **Rehabilitation** is the transformation of land disturbed from its original condition to a new and beneficial condition that does not necessarily resemble the pre-disturbance condition. Practical rehabilitation should consist of the following phases in best practice:
  - <u>Structural rehabilitation</u> involves the physical rehabilitation of areas, by means of earthworks, potential stabilisation of areas as well as any other activities required to develop a long term sustainable ecological structure;
  - <u>Functional rehabilitation</u> ensures that the functionality of the ecosystem (associated with the affected areas) supports the intended post-closure land uses. This requires monitoring during and after the rehabilitation project;

- Biodiversity reinstatement ensures that a reasonable level of biodiversity is re-instated to a level that supports the proposed post-closure land uses. In this regard special mention is made of re-instating vegetation to levels which will allow the natural climax vegetation community to become re-established or community suitable for supporting the intended land use; and
- Species reinstatement focuses on the re-introduction of any ecologically important species which may be important for socio-cultural, ecosystem functioning and conservation reasons. Species reinstatement need only occur if deemed necessary; and

➢ **Restoration** is defined as "the artificial acceleration of the processes of natural succession by putting back the original ecosystem's function and form" (Hattingh, 2019). The aim of any ecological restoration activity is to achieve ecosystem recovery as far as possible, so that the repaired ecosystem resembles an appropriate local native model.

Rehabilitation and restoration are a hierarchical and iterative process. Efficient planning of a rehabilitation or ecological restoration project involves clearly defining what terminology will be used to describe desired outcomes. Additionally, it is useful to have a hierarchy of those terms to efficiently organise planning and create timeframes in which certain outcomes from project efforts are to be achieved. Figure 10 is a hypothetical example of a hierarchy of terms to define and guide the rehabilitation and restoration initiative (adapted from McDonald *et al.,* 2016) which defines the level of detail of planning at each point in the hierarchy. Refer to Appendix G for additional information on the rehabilitation framework approach.

Vision:
Vision for the post rehabilitated landscape

Target:
Specific Target Ecosystems. Key ecosystem attributes for monitoring

Principles:
Finer level of focus. Status of target to achieve in long term. Broadly defines how desired target status will be achieved

Strategy & Objectives:
The changes and intermediate outcomes required to achive project goals. These need to be specific, measurable, achievable, realistic and time-bound. Makes use of quantifiable indicators

Criteria:
Includes indicators of restorative success/failure, e.g: Cessation of livestock grazing and weed dumping within 1 year. Criteria will include collecting data on the six key ecosystem attributes

Figure 12: Example of the hierarchy of terms to assist in achieving long term and short-term rehabilitation goals.

6.1 Rehabilitation Vision, Targets and Objectives

6.1.1 Vision

The vision for the post-rehabilitated seep and CVB wetland ecosystems is presented in the box below (note that the remainder of the seep wetland and the portion of the CVB wetland to be rehabilitated is collectively referred to as the 'freshwater ecosystems' in the box below):

WETLAND VISION
To ensure that the freshwater ecosystems are protected and rehabilitated, it is necessary to restore them to a structure and degree of functionality that offsets the loss of the western section of the seep wetland. This approach aims to ensure no net loss of ecological and socio-cultural functionality of the affected wetland system in the region. Additionally, it seeks to conserve the remaining portion of seep wetland habitat (and an additional portion of the CVB wetland) for the benefit of present and future generations including use for awareness initiatives pertaining to wetland resource management and offsets.

Should additional offset be required as a result of potential future development (over and above what was assessed as part of this offset investigation which included the future access roads through the CVB wetland) in the vicinity of the CWA, the vision is to further improve the ecological functionality of the freshwater ecosystems from the current target of 56% for the seep wetland and 54% for the CVB wetland HGM unit to closer to 70%, thereby further improving the ecological condition and functionality of the freshwater ecosystems by between 14 and 16% to moderately modified (Category C) systems. This would allow additional compensation and offset of future impacts that may arise as the CWA precinct develops, but may require extensive intervention. Long-term monitoring will also be required to inform the extent and nature of the required intervention.

6.1.2 Targets

The overarching target for rehabilitation has been defined as a point in the restoration continuum where the ecosystem function of the wetland hydrogeomorphic units proposed for conservation / rehabilitation has been restored to a point where the no net loss of wetland functionality and habitat occurs and ecoservice provision of the wetland hydrogeomorphic units improves without further human intervention to compensate for the direct impact and loss of functionality as a result of the proposed CWA development.

6.1.3 Objectives

The rehabilitation objectives for the wetland offset areas were determined to be:

- Re-establishment of hydrological drivers and geomorphological processes and associated improvement of wetland habitat to a functional state that ensures no net loss from the pre-development conditions including ecological importance and sensitivity and goods and services provision of regional wetlands;
- Improve stormwater management from the surrounding areas (especially since stormwater from the proposed CWA will be released into the seep wetland and considering the extensive erosion observed in the agricultural drain and CVB wetland) in a manner that supports the hydrological and geomorphological processes supporting the wetlands; and
- AIP species removal within the wetland hydrogeomorphic units proposed for conservation / rehabilitation, where required.

Table 8 summarises the broad rehabilitation objectives defined for the developed offset. It is important to note that because the rehabilitation process and associated framework is iterative, these rehabilitation objectives may be updated as part of the adaptive management components of the framework.

Table 8: Key rehabilitation objectives identified.

Aspect	Rehabilitation objective
Wetland	
Surface landform design	• To re-slope disturbed areas within parts of the CVB wetland reach and the agricultural drain to ensure that the natural wetland drainage regime is restored;

Aspect	Rehabilitation objective
Wetland	
	• To restore disturbed areas within parts of the seep wetland and CVB wetland reach and their associated catchments to ensure that the wetland functionality is improved; and • To reduce the impacts of soil erosion and maximise the probability of vegetation establishment.
Water (quantity and quality) – Stormwater inputs	• To implement appropriate stormwater-related management controls to ensure that stormwater emanating from the catchment of the seep wetland is managed so that it does not result in hydrological, geomorphological and water quality-related impacts in the landscape. This is partly included in the Stormwater Management Plan of the CWA (Zutari, 2024).
Alien Invasive Plant Control	• To remove identified AIP species within the wetlands and agricultural drain using best practise methods, as and when required; and • To monitor priority AIP areas and implement corrective actions.

6.2 Rehabilitation Process Outline

The proposed rehabilitation framework is represented in the diagram below (Figure 13). The process is described in Sections 7 to 10 that follow.

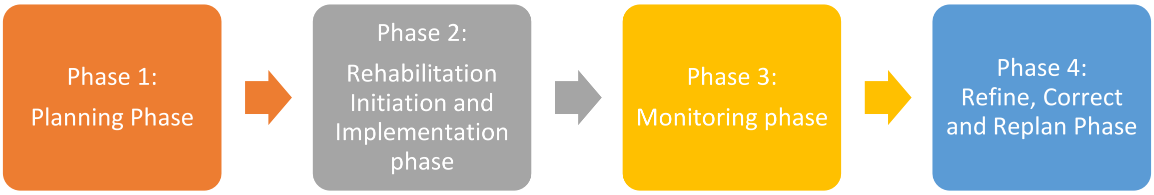


Figure 13: Rehabilitation framework for the proposed offset associated with the proposed CWA development.

7 PHASE 1 – PLANNING PHASE

This section sets out the necessary steps required for initial rehabilitation practices. It focuses on planning and identifying the need for concurrent rehabilitation activities (that can be set out in conjunction with construction and operational activities) as well as the requirements for long term rehabilitation planning in preparation for closure.

The provided rehabilitation plan serves as a management tool for the wetlands to be offset, designed to compensate for the anticipated wetland loss due to the proposed development activities. This ensures no net loss of remainder of the seep wetland and CVB wetland and, as much as possible, maintains the socio-cultural functionality and ecoservices provided by the affected wetland ecosystems. This will be achieved by rehabilitating and restoring the remaining seep wetland area and CVB wetland located in the east of the study area.

The developed WRMP presented in this report aims to improve the ecological integrity of the remaining (undeveloped) seep wetland habitat, a portion of the CVB wetland and the agricultural drain connecting the seep to the CVB wetland. It outlines how proposed development activities, which will directly impact a seep wetland within the study area, will be compensated through rehabilitation, management, and monitoring efforts. The plan also identifies the responsible parties and relevant timeframes for implementing these measures. The rehabilitation is envisaged to take no more than one year with minor potential aftercare and maintenance subsequently where interventions took place.

7.1 Principles

The principles of the planning phase are associated with the rules and principles that are set in place for successful rehabilitation to be achieved. A principle is a fundamental 'truth or law' that defines the direction or reasoning for a particular action. For rehabilitation planning, rehabilitation principles are used to define site-specific rehabilitation objectives and actions.

The principles associated with the proposed rehabilitation framework for the proposed CWA development offset are discussed in their relative components in the Table 9. These principles will need to be enforced throughout the proposed rehabilitation plan.

Table 9: Key principles identified for the offset and rehabilitation framework to be implemented for the wetlands associated with the CWA development offset.

Component	Principle/s
Financial Provision	• Sufficient financial resources must be set aside for the rehabilitation actions, including capital expenditure for procurement of required equipment and workforce and for ongoing and adaptive maintenance and management, as well as for required monitoring.
Regulatory Compliance	• Rehabilitation planning must be in accordance with legal compliance. • All proposed rehabilitation objectives and associated implementations will not conflict with local legislation. All rehabilitation objectives and associated activities will aim to comply with all relevant legal bodies, and where possible, go beyond legal compliance and add additional ecological value. • Approvals for work in sensitive habitats such as the threatened vegetation types, CBAs, and ecological support areas (ESAs) in terms of the NEMA.
Contractor Appointment	• Appointment of a suitably qualified Contractor(s) to undertake the required work: - Appointment of an implementing agent to audit and monitor the rehabilitation activities as well as to undertake the required post rehabilitation monitoring. - Should the Contractor not have the appropriate expertise for implementation of this plan then it is the responsibility of the Contractor to appoint a suitably qualified specialist ecologists to manage and oversee the implementation.
Stakeholders	• All stakeholders that will be affected by the rehabilitation measures will be identified and involved in the rehabilitation planning throughout the project lifecycle (as required). • Rehabilitation planning will be informed and accordingly adjusted based on stakeholder views, cultures and/or customs, possible uses and needs of the landscape.
Alien and Invasive Plant Clearing	• AIP species clearing will occur concurrently throughout the construction and operational phases of the CWA development, including in the development footprint and in the downstream reach of the wetlands to be rehabilitated. • Burning permits for AIP clearing will be required (if stack burning is to be utilized).
Monitoring	• Monitoring will be initiated at the first implementation of any rehabilitation activity. • Monitoring of the rehabilitated areas will be conducted progressively throughout the development's lifecycle and in conjunction with concurrent rehabilitation activities. • Data obtained from ongoing monitoring practices will be regularly assessed to identify trends that can demonstrate the success and/or failure of implemented rehabilitation activities. • The monitoring process will be linked to corrective, adaptive management practices.
Adaptive management	• An adaptive management protocol will be employed on-site, thus allowing for the implementation of alternative and improved rehabilitation activities and strategies so that corrective action can be implemented where required.

8 PHASE 2 – REHABILITATION INITIATION AND IMPLEMENTATION PHASE

This phase involves the rehabilitation activities needed to reach rehabilitation targets. This phase involves the in-field rehabilitation context of the rehabilitation plan set out in the planning phase, i.e., the on-site implementation of rehabilitation activities (e.g. surface landform design activities, AIP clearing etc., as set out during the planning phase).

8.1 Site-Specific Wetland Rehabilitation

A detailed site-specific WRMP has been developed for the target wetland areas located within the east of the study area.

Successful rehabilitation depends upon cogent conceptual planning, research and design flexibility. The proposed site-specific mitigation measures for the rehabilitation of the target offset areas are listed in Table 10. Note that the mitigation measures outlined in the Freshwater Impact Assessment report (FEN, 2024) remain applicable and must be implemented within the study area.

It is the opinion of the freshwater specialist that fairly extensive works need to be undertaken within the CVB wetland, agricultural drain and surrounding area, as part of the proposed rehabilitation and reinstatement to ensure the required ecoservice provision is maintained/improved and a PES of at least Category D (as per the requirements of the Wetland Offset) is achieved over the long-term. Rehabilitation works required for the seep wetland however does not require as extensive works as that of the CVB wetland and agricultural drain. The following main activities were identified, and the following sections provide relevant mitigation and rehabilitation requirements to address the activities required for the respective freshwater ecosystems:

- Removal of vegetation (AIPs and harvesting suitable wetland plants for revegetation);
- Remediation of gully and headcut erosion and resloping sections of CVB wetland and agricultural drain;
- Revegetation of the reinstated wetland footprint areas and agricultural drain; and
- Stormwater management from the study area.

Table 10 below summarises the rehabilitation requirements described above, which is elaborated on in Sections 8.2 to 8.5.

Table 10: Specific mitigation measures related to the freshwater ecosystems of the target offset areas to be implemented during the rehabilitation of the wetlands.

<table>
<tr><th colspan="5">Specific Mitigation Measures for the target offset areas</th></tr>
<tr><th colspan="5">Rehabilitation Phase</th></tr>
<tr><th colspan="5">Responsible Persons</th></tr>
<tr><th>Proponent</th><th>Project Manager</th><th>Civil Engineer</th><th>ECO</th><th>Contractor</th></tr>
<tr><th>Objective/ Requirement</th><th colspan="4">Control measures</th></tr>
<tr><td rowspan="4">Rehabilitation of impacted areas within the wetland target offset area proposed for conservation / rehabilitation.</td><td colspan="4">AIP clearing</td></tr>
<tr><td colspan="4">• The AIPs found within the study area and target offset area must be removed during the initial phases of the rehabilitation of the target offset area, which includes:
o The target offset area must be monitored for alien and invasive vegetation encroachment and all alien vegetation/weeds must be removed according to the alien vegetation control plan as described in Section 8.2 of this report. This is to include freshwater (i.e. aquatic/ water-related) invasive species, should these be detected within the waterbodies. Annual follow up should be undertaken for at least 3 years post construction to prevent further spread of AIPs in the target offset area; and
o Where applicable for the eradication of AIPs, care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used and water contamination is avoided.</td></tr>
<tr><td colspan="4">Remediation of gully and headcut erosion (particularly within the CVB wetland and agricultural drain)</td></tr>
<tr><td colspan="4">• Following completion of the construction activities associated with the CWA development, particularly given the increased risk of runoff, headcut erosion is of concern. Extensive headcut erosion is prevalent within the agricultural drain and CVB wetland, which if left unmanaged, such erosion will result in increased wetland habitat loss. It is thus imperative that headcuts and associated gullies be remediated as detailed in Section 8.3 below. below (when/if the need arises). This will involve:</td></tr>
</table>

<table>
<tr><th colspan="5">Specific Mitigation Measures for the target offset areas</th></tr>
<tr><th colspan="5">Rehabilitation Phase</th></tr>
<tr><th colspan="5">Responsible Persons</th></tr>
<tr><th>Proponent</th><th>Project Manager</th><th>Civil Engineer</th><th>ECO</th><th>Contractor</th></tr>
<tr><th>Objective/ Requirement</th><th colspan="4">Control measures</th></tr>
<tr><td rowspan="5"></td><td colspan="4">o Resloping and re-grading the outer perimeter of the agricultural drain to a maximum of a 1:3.5 slope thereby creating a gradual slope which will improve flow patterns within the agricultural drain; and
o Resloping and re-grading the outer perimeter of the CVB wetland in portions to a maximum of a 1:4 slope thereby creating a gradual slope towards the boundary of the CVB wetland area and creating temporary and seasonal wetland zones.</td></tr>
<tr><td colspan="4">Rehabilitation of natural flow patterns within the wetlands, agricultural drain and its immediate catchment</td></tr>
<tr><td colspan="4">• Rehabilitation of natural flow paths can be achieved through the following:
o The construction of bioswales at stormwater exits to support downgradient wetland areas (more specifically the seep wetland) with water released in an attenuated and polished manner;
o Modify the land surface particularly within the vicinity of the CVB wetland and agricultural drain to create a gentle slope that facilitates natural water flow into and through the CVB wetland to encourage spreading of flow and infiltration; and
o Plant native vegetation that is adapted to local hydrological conditions in the seep wetland, CVB wetland and agricultural drain. Vegetation can help slow down water flow, increase infiltration, and reduce erosion. It should be noted that stormwater ponding should be avoided to, where possible, prevent attracting larger birds from foraging, thereby reducing potential bird strikes during the operation of the CWA. An avifaunal specialist must be appointed to provide input into the design and must oversee the rehabilitation activities to ensure that areas suitable for ponding is not created. Refer to Section 8.4 for more detail. A suitably trained specialist should be consulted to guide on species selection and species propagation and planting techniques.</td></tr>
<tr><td colspan="4">Stormwater management and wetland recharge practices</td></tr>
<tr><td colspan="4">• Appropriate stormwater management can be used to recharge the remaining seep wetland.
o Considering the type of development (runway) and the bird strike potential, the stormwater management plan (Zutari, 2024) makes provision for dry attenuation ponds and dry swales, which does not support the ecological requirements of freshwater ecosystems' flora and fauna. As per Zutari (2024), stormwater from the study area will be treated via an infiltration process and only during a stormwater event larger than a 1 in 50 year event will stormwater be released into the remainder of the seep wetland as overland flow;
o Ensure stormwater and associated runoff does not create erosive supercritical flows that would otherwise alter the natural hydrological regime, particularly considering the above; and
o Design stormwater management infrastructure to mimic natural hydrological processes as far as possible; for example, ensure outlets at the dry swales are equipped with flow dissipating structures such as cobbles.</td></tr>
<tr><th colspan="5">Post Rehabilitation Phase</th></tr>
<tr><td>Long-term monitoring and maintenance</td><td colspan="4">• Establish a monitoring program to regularly check water quality and hydrological parameters. Maintenance plans should be in place to address any issues that arise, e.g., blockages in stormwater infrastructure or changes in vegetation health, etc. The monitoring program is to include wetland health and driver and receptor monitoring to ensure the maintenance and where possible improvement of wetland condition, particularly after the implementation of the offset activities; and
• Develop an adaptive management plan that allows for adjustments in key areas (e.g., stormwater management practices, AIP or erosion control, etc.) based on monitoring results and changing environmental conditions.</td></tr>
</table>

8.2 Alien and Invasive Plant Species Clearing

To allow for appropriate management interventions, AIPs within the target offset area need to be appropriately managed. Control of AIPs within the target offset area is important as these areas can act as a source for AIPs to spread if left uncontrolled. The control of AIPs will be most effective if it proceeds in phases. The three most important phases to consider during AIP control are:

- Phase 1: Initial control.
  AIPs must be removed from the target offset area. Although very few AIPs were identified within the target offset area, Nick Helme Botanical Surveys (2024) have reported numerous AIPs within the study area, including *Acacia saligna* (Port Jackson), *Leptospermum laevigatum* (Australian myrtle), *Pinus* sp. (Pines) and *Eucalyptus* sp. (gums) which may encroach into the wetland systems if unmanaged. Furthermore, considering the cultivated nature of the area surrounding the target offset area, some invasive herbs and grasses have also been identified, which includes *Plantago lanceolata* (ribwort plantain), *Echium* spp. (Pattersons curse), *Erodium* spp. (cranesbill), *Lolium* spp. (ryegrass) and *Avena* sp. (oats) (Nick Helme Botanical Surveys, 2024), which have all been found within the study area. AIPs of significance in the target offset area include *Cenchus clandestinus* and *A. saligna*;
- Phase 2: Follow-up control.
  Control of seedlings, root suckers and coppice growth. Mechanical and chemical control of AIPs are effective short-term solutions. Rigorous follow-up control is needed to sustain an AIP control plan over the medium-term. The aim is to deplete the seed bank and specific tactics for seed bank management can be employed. Follow-up control should be done on a minimum of two to three follow-ups per growing season, especially within the first year of control. This is of particular importance for *C. clandestinus*; and
- Phase 3: Maintenance control.
  Sustain low alien plant numbers with biannual to annual control. Continuous monitoring and maintenance of all areas where AIPs have been removed should continue during the management activities of the target offset area, with an additional five-year, annual control to be implemented to combat re-sprouting, and as an effort to deplete the existing alien species seedbank. It is very difficult and often expensive to completely eradicate alien species, which is why there is a need to maintain a control program over several years. Thereafter, the need for AIP control should be regularly assessed based on the need for control (adaptive management).

8.2.1 On-site AIP Control

On-site control should be implemented in line with the general principles and objectives set out in this report (Table 10) as well as any additional requirements as stipulated by the appointed Environmental Control Officer (ECO) (refer to Appendix H for further information).

General recommendations for AIP control and management are described below. Table 11 indicates the recommended control measures to be implemented as part of the rehabilitation plans. Recommended herbicides and active ingredients are also indicated in Appendix H2; however, the use of such herbicides should be regularly updated and provided in the regularly updated AIP control plan. It is important to note that AIP control must be conducted from the outer sections inwards in order to contain the existing AIP and prevent the further spread of AIP species.

Kikuyu grass (*C. clandestinus*) does not have to be completely eradicated from the areas to be rehabilitated. Instead, it should be managed through careful monitoring of the extent thereof to prevent its further spread. After the wetlands have been rehabilitated, the extent of *C. clandestinus* should be mapped. Follow up monitoring should be conducted quarterly for the first year and annually thereafter for the following three years to determine how far it has spread and should be eradicated from these areas. *C. clandestinus* management measures are discussed in Table 11 below (under the heading Species Specific Treatment).

Table 11: Relevant objectives and control measures to be implemented as part of the AIP species clearing.

<table>
<tr><th>Objectives or requirements</th><th>Control Measures</th></tr>
<tr><td colspan="2">Initial Control</td></tr>
<tr><td>General good housekeeping</td><td>Waste and Litter Problems
➢ Suitable ablution facilities need to be provided for all personnel;
➢ Waste and litter should be cleared and be disposed of at a registered and approved disposal site;
➢ Suitable general waste receptacles must be provided; and
➢ Dumping of waste or litter must be prohibited within the target offset area and all freshwater ecosystems. Any waste noted must be cleared immediately.</td></tr>
<tr><td>Mechanical Control</td><td>➢ Methods to be used to control AIP species within the rehabilitated areas include hand pulling (herbaceous species and saplings), frilling, ringbarking and tree felling, after which an applicable herbicide should be applied (see below), as and where applicable. It should be noted that no alien trees (with the exception of a few A. saligna saplings) were noted within the target offset area; as such AIP control should prioritise herb and grass species removal and control;
➢ Individual weeds can be uprooted or hoed out. However, in areas where weed density is high, uprooting is not recommended, as this will result in soil and seed bank disturbance, which will likely result in return flushes and germination of alien seedling growth;
➢ Acacia sp. saplings and seedlings where observed should be uprooted and where required, brush-cut and treated with the appropriate herbicides; and
➢ As invasive species density within the target offset site is low, burning of AIP stacks can be kept to a minimum. It is however noted that the area in which the target offset area is located, regular burning for indigenous species regrowth is required (Nick Helme Botanical Surveys, 2024).</td></tr>
<tr><td>Chemical Control</td><td>➢ Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle;
➢ Suitable dye must be used to limit over- or under spray of areas;
➢ Chemical control will entail limited usage of registered herbicides for a specific species and one must adhere to the measurements on the product label; and
➢ Label instructions may not be exceeded due to negative impacts on surrounding flora and fauna for the use of herbicides containing Glyphosate, Diquat and Paraquat in the identified freshwater ecosystems associated with the rehabilitated areas. These chemicals may only be used in the terrestrial zone of the rehabilitation areas.</td></tr>
<tr><td>Species Specific Treatment</td><td>The following are species specific treatment for the main AIPs noted within the target offset area. Use of these listed chemical treatments should occur after or during the mechanical removal process and may be used on other common weeds, as deemed appropriate by the ECO.

Treatment of Kikuyu Grass (Cenchrus clandestinus)
➢ A herbicide with active ingredient Glyphosate*, dalapon or haloxyfop-P methyl ester should be used. Plants should be sprayed during their active growing season (autumn). It is to be noted that Glyphosate* or haloxyfop herbicides may not be used within the freshwater ecosystems where water is free flowing as it is known to be toxic to aquatic life.
➢ Haloxyfop-P Methyl Ester is deemed to have a minimal environmental impact (although on an acute basis is toxic to aquatic life) and is not expected to leach into groundwater. Furthermore, it has been identified to degrade in soils under normal environmental conditions[2].
➢ It is highly recommended that extensive areas of C. clandestinus not be mown as a management action as the creation of artificial lawn areas can create habitat for hazardous bird species (A. Froneman, pers. comm.).

Treatment of Patterson's Curse (Echium sp)
➢ Hand pull plants. No herbicide is needed.
➢ Chemical control can be used with active ingredients chlorsulfuron, mesulfuron methyl, triasulfuron or Glyphosate* to control seed sets during the flowering season. Use of these listed chemical treatments should occur after or during the mechanical removal process.</td></tr>
</table>

[2] The DOW Chemical Company. 2011. Product Safety Assessment: haloxyfop-P Methyl Ester

Objectives or requirements	Control Measures
	Treatment of Port Jackson (*Acacia saligna*) ➢ Hand pull seedlings. No herbicide is needed. ➢ Lop/ prune young plants and treat them by means of a foliar spray of 50ml of Triclopyr Ester* mixed with 10l of water. Apply at a rate of 3 l/ha. Use of these listed chemical treatments should occur after or during the mechanical removal process. ➢ First cut adult plants down to a stump and frill them before treating with 300ml of Triclopyr Amine salt* mixed in 10 l of water and applied at a rate of 1.5 l/ha. Additionally, a Triclopyr Ester* solution can also be applied to approximately 0.6m length of stump. Use of these listed chemical treatments should occur after or during the mechanical removal process. ➢ Transport all branches that have been mechanically removed off site to a designated dumping facility. Cut branches should not be left in stockpiles as the seeds will likely germinate. **Treatment of Blue Gum** (*Eucalyptus* sp.*)* ➢ According to Ecoguard and Working for Water (2003), *Eucalyptus* seedlings can be cut at the stump and treated with Timbrel Access, whereas adult trees should be treated by means of foliar spray using Mamba. Other treatment methodologies have also been recommended by (SASRI, n.d.). According to SASRI (n.d.), mechanical treatment (without chemical treatment is also suitable for seedlings.
Planned burning	➢ Fire is not recommended as a control mechanism for AIPs and encroacher species, due to the risk of an uncontrolled fire occurring; ➢ Fire should therefore only be used in approved burn sites to burn materials removed from the rehabilitation areas and transported to the designated burn sites. These burn sites may be set-up within already disturbed areas such as recently cultivated areas or previously ploughed/mowed areas where the risk of an unplanned fire spreading to the surrounding vegetation is limited. The exact locations of such must be identified by the Contractor, in liaison with the ECO and relevant landowners/tenants; ➢ Access to and from these burn sites should be marked out by the Contractor; and ➢ Personnel responsible for the burn sites must be sufficiently trained on how to handle the burn sites and what the protocol is should a fire become uncontrolled.
Follow-up Control	
Follow-up AIP treatment	➢ Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made in the initial phase. If the follow up control phase is neglected, the alien infestation will become worse and denser than before the eradication process started; ➢ Follow-ups must be done for a minimum of three (3) times a year during the growing season (September – April) for the first three (3) years and thereafter a minimum period of four (4) years on an annual basis to ensure that new AIP and/or encroacher species infestation does not occur within the rehabilitated areas, after which the follow-up period should be re-assessed based on the need; ➢ An annual assessment before mobilisation of the clearing crew should be undertaken to determine equipment and personnel requirements to secure the necessary funding; ➢ After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings, and root suckers. The following should therefore be applied: • Plants that are less than 1m in height must be controlled by foliar application; and • Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.

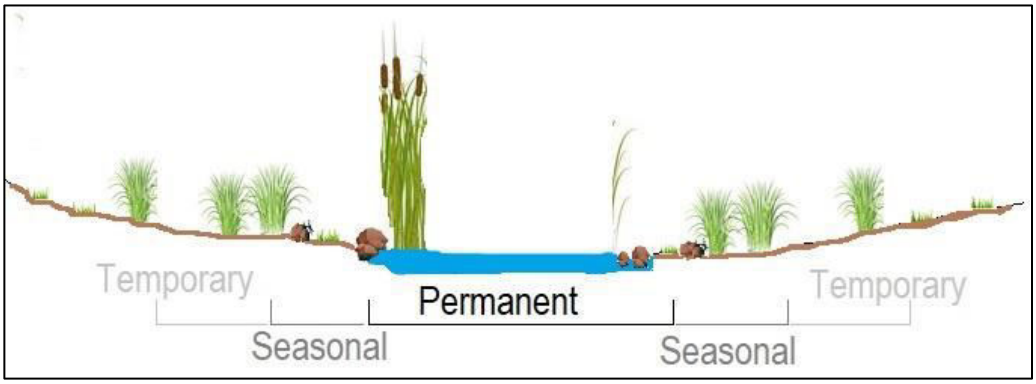
Species-specific control measures are provided in Appendix H2 and should be incorporated into an AIP control plan (which must be updated on a regular basis by a suitably trained individual). An example of a field form for monitoring alien vegetation which is to be completed by the relevant Contractor and/or the Implementing Agent is available in Appendix H3 of this report. Note that is only an example and should be modified based on the aspect of the rehabilitation area assessed. This form should be completed during the annual follow-up prior to mobilisation of any clearing teams to inform the planning of equipment, personnel and thus required funding.

In addition to the above, should any freshwater AIPs (i.e. water-related/ aquatic invasives) be detected within waterbodies within either the study area or the offset area, the removal of such species must form part of the alien invasive management activities. The removal of freshwater AIPs must be in line with the appropriate treatment methodologies for the particular plant species. The general control measures outlined in Table 11 above are also applicable to the freshwater AIPs; however, the use of machinery must be avoided so to not damage or alter the watercourses or receiving freshwater environment. If herbicides are essential for control, it is vital to ensure that only those approved herbicides listed by Working for Water as safe for waterbodies are utilised.

8.3 Remediation of Headcuts and Gullies (and the precursors thereof)

Active headcut erosion was noted within the CVB wetland and agricultural drain. Furthermore, continued grazing of the wetlands by resident cattle has led to soil disturbances and vegetation loss which has left the wetlands vulnerable to erosion. It is likely that the operation of the R304 and R312 roads east and south of the study area as well as the surrounding predominantly agricultural land use of the greater catchment has further contributed to the erosion observed in the CVB wetland.

In order to ensure that the geomorphology and hydrological regime of the CVB wetland (and the agricultural drain) is improved, the outer perimeter of the systems should be sloped to create seasonal and temporary wetland zones. This can be achieved by re-grading the perimeter of sections of the CVB wetland footprint to a 1:4 ratio, thereby creating a gradual slope towards the boundary of the footprint area (creating seasonal and temporary wetland zones) (Figure 14). The same approach is to be followed for the agricultural drain, but with a 1:3.5 ratio grading. The CVB wetland (and agricultural drain) footprint should not be uniformly levelled/excavated to increase the presence and diversity of niche habitats (Figure 14). In the case of the remaining seep wetland habitat, wetland zonation is also encouraged which can be achieved through the infilling of portions of the wetland to create the desired zonation. Oversight from a freshwater specialist and avifaunal specialist is recommended for this component of the rehabilitation phase to ensure the hydrological retention of the systems are not adversely altered and larger birds are not attracted to the rehabilitation areas. The avifaunal specialist should also be consulted to recommend suitable vegetation that could aid in deterring larger bird species.



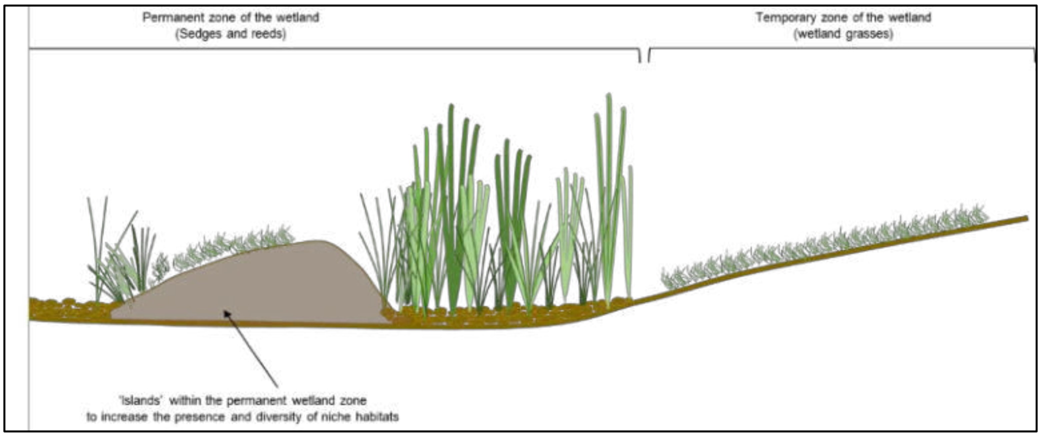


Figure 14: (Top) Schematic diagram of wetland zonation that must be recreated as part of the rehabilitation and reinstatement of the seep and CVB wetlands. (Bottom) Cross section of the footprint area of a wetland, indicating the desired zonation. Note that the creation of a permanent zone is not practical as the CVB wetland is a seasonal system. The image is for illustrative purposes only.

Re-sloping the CVB wetland and agricultural drain will ensure that the systems are free draining, and that no concentration or artificial ponding of flow occurs, thereby reducing the potential for an increased presence in large waterfowl which could result in an increased bird strike risk during the operational phase of the CWA. The slopes will also ensure that the inflow of stormwater from the seep wetland flows through the agricultural drain (in an easterly direction) into the CVB wetland, contributing to the hydrological drivers of the CVB wetland. Where possible, the re-sloping should be done manually, particularly within the active channel of the CVB wetland. It is advisable that machinery is only used within the seasonal and temporary zones. Should machinery be required for re-sloping, install sediment traps downstream of the proposed rehabilitation works to prevent sedimentation of the downstream reach and contain any spillage. A risk assessment (with mitigation measures) has been conducted for the proposed rehabilitation works within the seep and CVB wetlands, and is provided in Appendix E.

Sections within the wetlands and agricultural drain that are presently devoid of vegetation (particularly wetland adapted plants) should be appropriately rehabilitated by active planting of vegetation obtained from nearby nurseries or through hydroseeding with a veld reclamation mix. Strategies to ensure protection from the effects of flowing water, and the possible dislodging of individuals before root structures have developed enough, should be implemented. Vegetation reinstatement is elaborated on in Section 8.4. No botanical survey has been conducted in the area surrounding the target offset site to be rehabilitated. As such, should any SCC or other indigenous vegetation be found in these areas, these should be identified (and marked) prior to the commencement of rehabilitation activities and avoided during rehabilitation activities.

Certain general principles apply to all work within the wetland habitat (in the removal / rehabilitation of headcuts, gullies, drains and impounding features):

- The timing of the works is of critical importance. The undertaking of rehabilitation works during the wetter winter months when the wetland areas will be most inundated / saturated is strongly discouraged, as movement of equipment required for certain tasks is rendered more difficult with an associated increased risk of damage to wetland soils and vegetation, especially by tracked vehicles. Accordingly, rehabilitation actions must be timed to occur in the early spring to summer when conditions in the wetlands are drier. Undertaking works at this time would also limit the amount of time before the onset of the next growing season for vegetation to promote wetland vegetation regrowth as a key aspect of rehabilitation.
- Even during the dry summer season, certain parts of the wetlands (particularly the CVB wetland) in which rehabilitation works are required to be undertaken may potentially be saturated. In such cases, the on-site Environmental Officer (EO) and independent ECO must

determine the measures that are required to be implemented to ensure that the access of construction crews, and machinery is undertaken in a manner that does not result in damage to wetland soils and vegetation. In this case the following mitigation measures must be considered and implemented if deemed necessary by the ECO and EO:

- Careful consideration must be given to the point of access into the wetlands to complete works, and acknowledgement given to access for rehabilitation from both the western and eastern sides of the wetland in the case of the CVB wetland, and the northern and southern side of the seep wetland. The point of access with the least risk of damage to wetland habitat must be determined by the ECO and EO and works planned accordingly.
- Light machinery (such as a Bobcat excavator) must be utilised within the CVB wetland and agricultural drain rather than heavier tracked machinery such as excavators and TLBs. Under no circumstances are machinery allowed in the seep wetland;
- If temporary stockpiles are required with the works area (e.g. to stockpile small volumes of excavated soils to infill drains), the stockpiles must be placed outside the wetland footprint, preferably not within 10 m of the wetland footprint. Where possible, the stockpiles should be covered to limit the foraging of birds; and
- Once rehabilitation works are completed at a certain location, all foreign and excess material must be removed from the wetlands and agricultural drain.

8.4 Rehabilitation of natural flow patterns within the wetlands, agricultural drain and its immediate catchment

Effective rehabilitation of natural flow patterns in the wetland and its immediate catchment can be achieved through the following actions:

- Removal of Dumped Waste and Rubble: The first step in restoring the wetland's natural flow is the removal of all dumped waste and rubble (where applicable). To ensure this, contractors should use appropriate machinery and methods that minimize soil disturbance and avoid unnecessary compaction or erosion, with removal by hand being the most preferred option. Any compacted areas are to be ripped and reseeded;
- Land Surface Modification: Modifying the land surface is essential to facilitate the natural water flow into and through the wetlands. This process may involve filling in deep channels or excavating shallow areas to encourage water to spread evenly across the wetlands. Contractors should work closely with hydrological and ecological specialists to design a gentle slope that mimics natural topography, ensuring that water distribution supports wetland functions. Attention should be paid to maintaining soil integrity and preventing erosion during these activities. The recommendations outlined in Section 8.3 are to be used as a starting point; and
- Planting of Native Vegetation: Restoring vegetation is a key component of the rehabilitation process. Contractors should plant native vegetation species that are well-adapted to the local hydrological conditions. These plants will help slow down water flow, increase infiltration, and reduce erosion, contributing to the stabilization and ecological recovery of the wetland. A suitably trained specialist should be consulted to guide the selection of species, as well as techniques for propagation and planting. The specialist can also provide advice on the timing of planting to align with seasonal conditions that will maximize survival and growth rates. As a guide, several suitable species have been provided in Table 12 (a suitably trained specialist can provide guidance on the appropriate quantities to plant, in combination with other species as recommended by the specialist). The following must be noted:
    - Propagation and purchasing of the required species should have been undertaken as part of the Planning (Phase 1) and must be ready and available for transplantation into the seep and CVB wetland as soon as the AIP clearing and re-sloping activities have been completed. This is also applicable to the agricultural drain. The following points are of key importance for re-vegetation:

- Planting must start as soon as possible after soil profiling so as to reduce the duration of bare ground being exposed, which could lead to erosion and sedimentation of the area, and to establish ecological habitats. Furthermore, all disturbed areas as part of the rehabilitation, as well as where AIP have been removed should also be re-instated with native vegetation. For the seep wetland and agricultural drain, this (AIP control and revegetation) includes a 10 m buffer around the systems;
- Considering that the wetlands and surrounding area is currently actively grazed by resident cattle, prior to the commencement of revegetation, areas to be rehabilitated are to be demarcated as no-go areas to prevent revegetation efforts being compromised as a result of further grazing by cattle;
- Re-instatement of native vegetation should be undertaken in early May for the larger specimens (growing season) and early spring (August/September) for the smaller saplings. This will ensure that the hot summer months are avoided, and that species will be planted prior to the onset of winter rainfall, which will maximize growth and early establishment;
- Water will need to be made available for irrigation purposes for the first season after native vegetation has been planted. It is recommended that all planted specimens within the seasonal and temporary zone be watered during the first summer. It is anticipated that there will be a loss of some planted saplings. Additional specimens should be planted one year after the rehabilitation works, prior to the rainy season to maximise success for long-term proliferation;
- Should the Contractor not have the relevant expertise on planting of specimens, they should appoint a suitably qualified botanist or landscape architect to assist with the re-vegetation; and
- Saplings must be replanted annually during the winter period for the first 3 years after completion of construction, to maximise the success rate of revegetation. Since vegetation loss is common during re-establishing activities, provisioning of additional saplings will ensure a higher success rate.

The following criteria is recommended to be used to inform the selection of wetland plant species for the wetland footprint area and the agricultural drain:

- Plants must be hardy, and ideally able to withstand:
    - Occasional high sediment inputs due to disturbances in the catchment;
    - Periods of low oxygen, depending on zonation;
    - Periodic inundation (it is assumed that inundation is likely during the rainy season);
    - Plants must be readily available;
    - Plants must establish rapidly to restore wetland functionality as quick as possible; and
    - Plants should ideally be locally indigenous and no plants that are alien and invasive (e.g. Port Jackson) should be planted or allowed to remain in the area surrounding the proposed CWA development and target offset area.

It is important to note that the Contractor must ensure a variety of plants be used within the wetlands and consideration must be given to the wetland zonation (the wetlands are predominantly seasonal and temporary) when selecting plant species. It is noted that *C. clandestinus* has already invaded the area and regular maintenance will be required until the reinstated vegetation is self-sustaining.

The below list was compiled through the use of the field guide titled "Easy identification of some South African Wetland plants (Grasses, restios, sedges, rushes, bulrushes, Eriocaulons and Yellow-eyed grasses)" (van Ginkel *et al.*, 2011) where plant species were cross referenced with the broader investigation area. Additionally, wetland species as listed for the Southwest Sand Fynbos and West Coast Shale Renosterveld vegetation types in the book titled "Vegetation of South Africa, Lesotho and Swaziland" (Mucina and Rutherford, 2006) were added. Additional plant species can be sourced from the Cape Flats LIFE locally indigenous fynbos exchange list available in Appendix I (plants marked with an asterisk "*" can be sourced from Cape Flats). The below list provides recommended species that can be planted in the rehabilitated areas.

Table 12: Species that are suitable for use within the wetland during rehabilitation processes.

Growth Form	Species
Herbs and Succulents	*Sarcocornia* spp. (already found in the CVB wetland)
	Zantedeschia aethiopica
Rushes and Sedges	*Bolboschoenus maritimus*
	*Carex clavata**
	Carpha glomerata
	Cyperus congestus
	Cyperus denudatus
	Cyperus fastigiatus
	Cyperus thunbergii
	Epischoenus gracilis
	Epischoenus quadrangularis
	Ficinia capillifolia
	Isolepis cernua
	Isolepis diabolica
	Isolepis digitata
	Isolepis hystrix
	Isolepis incomtula
	Isolepis levynsiana
	Isolepis marginata
	Isolepis natans
	*Isolepis prolifera**
	Isolepis setacea
	Juncus dregeanus
	*Juncus effusus**
	*Juncus lomatophyllys**
	*Juncus lomatophyllys**
	Pycreus mundtii
	Pycreus nitidus
	Pycreus polystachyos
	Restio spp.
	Xyris capensis
Trees	*Psoralea pinnata**

By implementing these measures, contractors can significantly enhance the effectivity of the rehabilitation efforts, ensuring the wetland's natural flow patterns are restored and its ecological integrity is maintained.

8.5 Stormwater Management and Wetland Recharge

To address how appropriate stormwater management following the construction of the proposed CWA development and associated stormwater infrastructure could be used to recharge the remainder of the seep wetland, the proponent should consider the following measures:

- Appropriate stormwater management can be a valuable tool for recharging the remaining seep wetland without causing adverse effects. The design of stormwater infrastructure should ensure that runoff is directed to the wetland in a controlled manner that avoids waterlogging, which could otherwise disrupt the natural hydrological regime. This can be achieved by designing stormwater systems to mimic natural hydrological processes. For instance, the use of flow dissipating structures at the stormwater ponds' outlets with appropriate vegetation of the outlet area can slow down and filter stormwater before it reaches the wetland, allowing for gradual infiltration and reducing the risk of erosion. The tie-in of the stormwater attenuation ponds into seep wetland must be managed in such a way that turbulent and/or supercritical flows are not created. Where possible, the tie-ins should be widened to allow diffuse flow through the system;
- As recommended in the freshwater report (FEN, 2024), to minimise the risk of erosion and sedimentation, the base of the outlet structures of the stormwater attenuation ponds should be lined with pebbles and small rocks and should be in line with the beds of the freshwater ecosystem (and not below the ground level). This will also aid with flood attenuation (by increasing the surface roughness) and with the establishment of vegetation and prevent the establishment of a monoculture of reeds. Wetland vegetation suitable for seasonal saturation must also be established to bind the soil of the bed, and to prevent erosion. This will also diffuse flow and lower the velocity of water into the seep wetland (Figure 15);

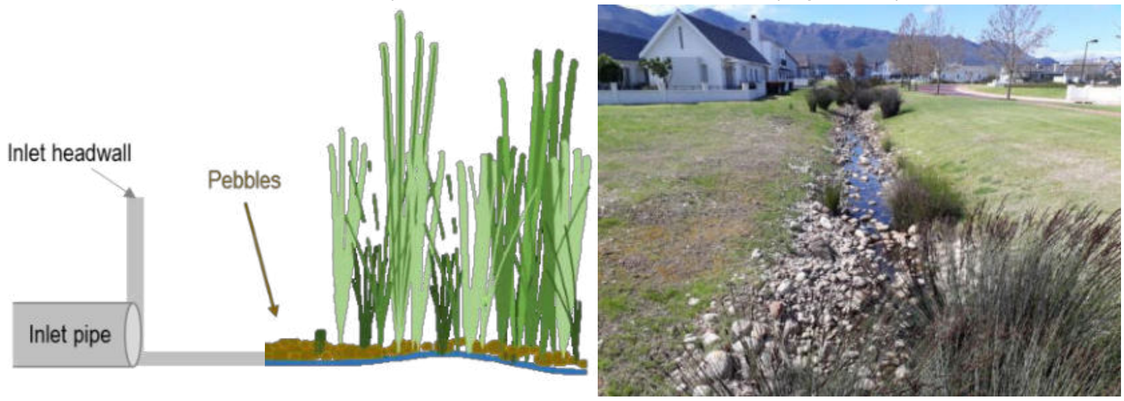


Figure 15: (Left) Schematic of the stormwater channel and tributary design. (Right) Example of a stormwater swale.

- Additionally, the stormwater management plan compiled for the CWA development (Zutari, 2024) should be amended to incorporate stormwater management of the offset area and should support the ecological requirements of the wetland's flora and fauna. Infrastructure should be designed to prevent abrupt changes in water levels, ensuring that habitat conditions remain stable and conducive to the survival of wetland species. By implementing these strategies, the proponent can enhance the ecological function of the wetland while managing stormwater effectively;
- The design of stormwater management systems that aim to recharge a nearby wetland should be undertaken by a qualified hydrological or civil engineer with experience in wetland and stormwater management. A stormwater management plan for the proposed CWA development has been compiled by Zutari (2024) which should be consulted. This specialist would be responsible for ensuring that the infrastructure is designed to mimic natural hydrological processes, such as those described above; and
- Additionally, a degree of ongoing monitoring is essential to ensure that the runoff does not negatively impact water quality or lead to excessive water entering the wetland system, which could disrupt its natural balance. This monitoring should focus on both water quantity and quality, as well as the health of the wetland's flora and fauna. An environmental specialist or ecologist should be involved in this monitoring process to assess the long-term impacts on the wetland ecosystem and to recommend any necessary adjustments to the stormwater management plan.

9 PHASE 3 – MONITORING PHASE

Prudent monitoring of the rehabilitated areas within the wetlands to be conserved or rehabilitated is of utmost importance, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage the progress of the rehabilitation interventions and any arising issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- Site walk through surveys should be applied as the preferred method of monitoring (at specified frequencies) with specific focus on:
  - Erosion monitoring (for the duration of the raining season);
  - Sedimentation (for the duration of the raining season);
  - Alien and invasive vegetation proliferation (at the start and end of the growing season).
- General habitat unit overviews as well as specific monitoring of wetland integrity (utilising wetland tools such as WET-Health and WET-Ecoservices), drivers and functionality should be undertaken;
- All data gathered should be measurable (qualitative and quantitative);
- Monitoring actions should be repeatable;
- Data should be auditable; and
- Reports should present and interpret the data obtained.

The monitoring plan comprises but is not limited to the following:

- Identification of areas of concern. These are areas that are affected by disturbances such as:
  - Erosion;
  - Waste dumping;
  - Alien vegetation species encroachment;
  - Soil compaction;
- Ensuring that the management/rehabilitation measures as stipulated in Sections 7 and 8 of this report are adhered to;
- A list of all alien vegetation species must be compiled as well as possible control methods such as manual, chemical or mechanical;
- Monitoring the rehabilitation areas from an avifaunal perspective, particularly identifying ponding in rehabilitation areas;
- Gathering all equipment required for the monitoring process; and
- Compiling a monitoring report.

For monitoring purposes of ecological integrity, it is recommended that a fixed-point monitoring method is implemented to ensure repeatability of assessments for better comparison. Selection of the fixed monitoring points should aim to achieve a comprehensive coverage of the target offset area as well as provide an indication of the impacts associated with high levels of anthropogenic activities on the floral community and the surrounding environment. Table 13 presents the monitoring actions associated with the rehabilitation plan for the wetland habitat. This monitoring plan must be implemented by a competent person and the findings of the plan must be submitted to the responsible authority for evaluation.

Table 13: Relevant objectives and control measures to be implemented as part of the rehabilitation of the wetlands associated with the target offset area (including the agricultural drain).

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
Planning						
Authorisations	1.	Ensure that all required licences and permits have been obtained before the start of rehabilitation.	➢ Implementing Agent	➢ Prior to the commencement of rehabilitation activities.	➢ Keep record of all permits, licences and authorisations.	➢ Required licences/ permits on file.
Site Establishment and Access Control	2.	Only undertake the rehabilitation works and the reinstatement of wetland habitat towards the end of the construction of the proposed CWA development. Dust generated from the construction works may smother new re-instated vegetation, specifically saplings and smaller species (e.g. *Isolepis* spp).			➢ Visual inspection.	➢ Limited rehabilitation works during construction of the proposed CWA development.
	3.	Implement access control for the potential recipient areas for all vehicles to ensure that no unauthorised persons are onsite.				➢ Access control is limited to the required vehicles and persons on site.
	4.	Clearly demarcate wetland zone boundaries with temporary fencing or similar in or near areas of active work. No personnel or vehicles are to be permitted to enter demarcated wetland zones unless essential.				➢ Rehabilitation areas demarcated. ➢ Access to demarcated wetland areas restricted.
	5.	Demarcate each rehabilitation area with danger tape prior to commencing rehabilitation activities, in order to control access and ensure that rehabilitation activities occur in the correct area. At no point should construction equipment extend past the designated construction site (unless for the required rehabilitation works). Demarcating rehabilitation areas must also ensure access to the rehabilitated wetlands by resident cattle is prohibited.				
	6.	Place adequate signage (in the appropriate languages commonly spoken in the area) around the planned rehabilitation areas.				➢ Signage is present.
	7.	Locate dedicated rehabilitation camp, laydown areas and parking areas for vehicles away from all identified sensitive areas.				➢ No camps, laydown areas, parking areas in sensitive areas.
	8.	Plan and demarcate all access roads to the relevant rehabilitation areas. Use of existing roads must be favoured.				➢ No evidence of tracks in sensitive areas.

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
Indigenous Plant Harvesting and Propagation	9.	Reinstate indigenous wetland species within the wetland habitat and the newly reinstated wetland areas (and agricultural drain) as part of the proposed rehabilitation plans. As such, make plans for where the species are to be sourced and include budgetary allowances for the purchasing of various species.	➢ Implementing Agent/ Contractor	➢ Throughout rehabilitation.	➢ Visual inspection of safely transporting and revegetating propagules and seeds, if and where required.	➢ Indigenous wetland species reinstated. ➢ Species sourced locally from nurseries such as Cape Flats LIFE.
	10.	Obtain indigenous plant species from a nursery such as the Cape Flats LIFE (plant list available in Appendix I).				
	11.	Secure the availability of species before rehabilitation activities commence to ensure that plants are ready and available for re-vegetation, so as not to leave areas exposed and vulnerable to erosion and incision.				➢ Sufficient quantity of seeds and propagules secured prior to commencement of revegetation. ➢ Suitable service provider appointed, if necessary.
	12.	Consider utilizing seeds and cuttings from indigenous vegetation found within the areas to be rehabilitated for revegetation. Removing entire plants from the CVB wetland is prohibited, considering that very few native vegetation remains in the wetland.				
Alien and Invasive Plants	13.	Ensure that AIP control planning takes place prior to commencement of other rehabilitation activities. Due to the extent of AIP proliferation within the potential recipient sites, it is suggested that AIP clearing takes place concurrently with the other rehabilitation measures outlined in this report.	➢ Contractor	➢ Prior to revegetation.	➢ No revegetation prior to AIP clearing.	➢ Date of commencement of initial AIP clearing.
	14.	Establish a period contract to allow for annual maintenance and removal of newly germinated plants for a minimum period of three years following rehabilitation. Long-term AIP control must be secured, as the success of the entire program will depend on it.		➢ Prior to rehabilitation.	-	➢ Record of contract.
Rehabilitation Plans	15.	Cost calculations must be performed for each area and addressed according to priority.		➢ Prior to commencement with rehabilitation.		➢ Rehabilitation cost calculated. ➢ Timetables created.
	16.	Create timetables for the control operations. Care must also be taken to include time when operations fall behind due to unfavourable weather conditions or labour strikes.				
	17.	Divide the areas to be cleared into specific control areas through the use of man-made or natural boundaries to specify specific areas e.g. roads, fences. Each area must be numbered to simplify record keeping.			➢ Visual inspection	➢ Areas divided into manageable sections.

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
Rehabilitation Plans	18.	Should the Contractor and/or the Implementing Agent not have the expertise to identify and mark the AIPs, it is the responsibility of the Contractor or Implementing Agent to appoint a suitably qualified botanist to assist.	➢ Contractor / Implementing Agent	➢ Throughout rehabilitation.	➢ Botanist appointed, if required.	-
	19.	Schedule all wetland rehabilitation work (Section 8.3 of the report) to commence during the drier summer season to limit the impact on the wetlands. Timeframes must thus be properly planned. This is also applicable to the agricultural drain.		➢ Prior to commencement of rehabilitation.	➢ Schedule only reflects rehabilitation during drier summer months.	➢ Record of schedule.
	20.	Make water available for irrigation purposes for the first season after indigenous vegetation has been planted. It is recommended that all planted specimens be watered during the first summer.		➢ Throughout rehabilitation, after revegetating, as and when required.	➢ Visual inspection of rehabilitated areas.	➢ Record of plant survivors.
	21.	Re-sloping the CVB wetland and agricultural drain to ensure that the systems are free draining, and that no concentration or artificial ponding of flow occurs that encourages foraging by larger bird (high-risk bird strike) species		➢ Throughout rehabilitation and throughout the life of the project	➢ Avifaunal monitoring of rehabilitated areas	➢ No evidence of open area ponding and of high-risk bird strike species
Unplanned Fire Management	22.	Unplanned fires can occur within the potential recipient sites and surrounds, particularly during summer. Thus, preventative measures should be implemented by the Implementing Agent in order to reduce the likelihood of fires. This includes: ➢ Restricted access to vulnerable areas; and ➢ Awareness - Contractors working on site must be made aware of how their actions may result in the ignition of wild fires and must be adequately prepared to suppress any fires that may start whilst they are working. Informational signage around the recipient site should be erected to promote vigilance and reporting of veldfires, and to indicate that no fires are to be permitted outside of designated burn sites, if any. Such burn sites must not be within the delineated wetland boundaries.		➢ Throughout rehabilitation.	➢ Visual inspection restricted areas. ➢ Inspect attendance register for training sessions.	➢ Restricted access areas implemented. ➢ Record of environmental awareness training. ➢ Number of fire incidents.

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
General						
Good housekeeping	23.	Provide suitable ablution facilities for all personnel.	➢ Implementing Agent/ Contractor	➢ Prior to commencement of rehabilitation. ➢ Throughout rehabilitation.	➢ Visual inspections. ➢ Record of waste disposal.	➢ Number of incidents of staff not using facilities. ➢ Number of pollution incidents.
	24.	Clear waste and litter and dispose thereof at a registered and approved disposal site.				
	25.	Provide suitable general waste receptacles.				
	26.	Prohibit the dumping of waste or litter within the offset site and all watercourses. Any waste noted must be cleared immediately.				
AIP Clearing						
Chemical Control as part of Initial Control	27.	Control dense seedling growth with knapsack sprayers with a flat fan nozzle.	➢ Contractor	➢ Throughout rehabilitation and AIP clearing.	➢ Visual inspection of areas where chemical control is applied. ➢ Visual inspection of content of herbicides used in chemical control.	➢ Incidence of use of herbicide with Glyphosate, Diquat and Paraquat.
	28.	Chemical control will entail limited usage of registered herbicides for a specific species, and one must adhere to the measurements on the product label.				
	29.	Use suitable dye to limit over- or under spray of areas.				
	30.	Take care as to not exceed label instructions of herbicides containing Glyphosate, Diquat and Paraquat within the identified watercourses associated with the rehabilitation area as these herbicides can have negative impacts on surrounding flora and fauna. These chemicals may only be used in the terrestrial zone of the rehabilitation areas.				
Species Specific Treatment – Port Jackson	31.	Hand pull seedlings. No herbicide is needed.			➢ Visual inspection.	➢ Appropriate treatment implemented.
	32.	Lop/ prune young plants and treat them by means of a foliar spray of 50ml of Triclopyr Ester* mixed with 10l of water. Apply at a rate of 3 l/ha. Use of these listed chemical treatments should occur after or during the mechanical removal process.				
	33.	First cut adult plants down to a stump and frill them before treating with 300ml of Triclopyr Amine salt* mixed in 10 l of water and applied at a rate of 1.5 l/ha. Additionally, a Triclopyr Ester* solution can also be applied to approximately 0.6m length of stump. Use of these listed chemical treatments should occur after or during the mechanical removal process.				
	34.	Transport all branches that have been mechanically removed off site to a designated dumping facility. Cut branches should not be	➢ Contractor	➢ Throughout rehabilitation and	➢ Record of disposal.	➢ No removed branches observed on site.

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
		left in stockpiles as the seeds will likely germinate.		AIP clearing.		
Species Specific Treatment – Kikuyu Grass	35.	Use an herbicide with active ingredient Glyphosate*, dalapon or haloxyfop-P methyl ester. Spray plants during their active growing season (autumn). It is to be noted that Glyphosate* or haloxyfop herbicides may not be used within the watercourses where water is free flowing as it is known to be toxic to aquatic life. Use of these listed chemical treatments should occur after or during the mechanical removal process. *Note: Haloxyfop-P Methyl Ester is deemed to have a minimal environmental impact (although on an acute basis is toxic to aquatic life) and is not expected to leach into groundwater. Furthermore, it has been identified to degrade in soils under normal environmental conditions*[3].			➢ Visual inspection of areas where chemical control is applied. ➢ Visual inspection of content of herbicides used in chemical control.	➢ Incidence of use of herbicide with Glyphosate, Diquat and Paraquat.
Species Specific Treatment – Patterson's Curse	36.	Hand pull plants. No herbicide is needed, however, chemical control can be used with active ingredients chlorsulfuron, mesulfuron methyl, triasulfuron or Glyphosate* to control seed sets during the flowering season. Use of these listed chemical treatments should occur after or during the mechanical removal process.			➢ Visual inspection.	➢ Appropriate treatment implemented.
Follow-up AIP treatment	37.	Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made in the initial phase. If the follow up control phase is neglected, the alien infestation will become worse and denser than before the eradication process started.	➢ Implementing Agent/ Contractor	-	-	-
	38.	Conduct follow-ups for a minimum of three (3) times a year during the growing season (September – April) for the first three (3) years and thereafter a minimum period of four (4) years on an annual basis to ensure that new AIP infestation does not occur within the rehabilitated areas, after which the follow-up period should be re-assessed based on the need.		➢ 3 times yearly for the first 3 years. ➢ Annually for a minimum of 4 years thereafter.	➢ Visual inspection.	➢ Record of follow ups implemented.

[3] The DOW Chemical Company. 2011. Product Safety Assessment: haloxyfop-P Methyl Ester

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
	39.	Undertake an annual assessment before mobilisation of the clearing crew to determine equipment and personnel requirements to secure the necessary funding.	➢ Implementing Agent/ Contractor	➢ Annually.	➢ Assessment undertaken.	➢ Number of equipment and personnel available for follow up control.
	40.	After initial control operations, dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers. The following should therefore be applied: ➢ Plants that are less than 1m in height must be controlled by foliar application; and ➢ Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.		➢ As and when required.	➢ Visual inspection.	➢ Record of alien vegetation removed. ➢ Correct clearing method implemented.
Site Specific Rehabilitation						
General	41.	No construction equipment or personnel may enter the wetlands to be rehabilitated, unless authorised as part of the rehabilitation interventions. The remaining extent of the portions of the wetlands to be rehabilitated are to be pegged by a suitably qualified freshwater ecologist or ECO (although fencing is preferred). Construction equipment is allowed in the area designated for the CVB wetland and agricultural drain's rehabilitation (during reshaping only), and this is to be limited to the Western Cape summer period.	➢ Contractor	➢ Throughout rehabilitation.	➢ Visual inspection.	➢ No unauthorized access in wetlands.
	42.	Do not store any equipment within the delineated wetlands while not in use. Any designated storage and parking bays must be located no closer than 32m of the envisaged extent of the wetlands.				➢ No stationary equipment in wetlands.
	43.	Should the ECO not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified wetland specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota.			➢ Wetland specialist appointed, if required.	-
Earthworks	44.	Conduct all rehabilitation work during the drier summer months leading up to the rainy season (November to May) to reduce contamination of surface water and ensure maximum survival of new plant species (see section below of re-vegetation). Some watering of plants during the first dry season may be necessary to ensure survival.	➢ Implementing Agent / Contractor	➢ Throughout rehabilitation.	➢ Visual inspection.	➢ Rehabilitation confined to summer months.

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
	45.	Keep footprint areas for equipment as small as possible to reduce unnecessary disturbances of soils and vegetation.				➢ Size of disturbed areas.
	46.	Any topsoil moved should be stockpiled and re-instated as indigenous vegetation seeds will be present within the soil. Topsoil will have a high density of alien invasive seeds which will need to be controlled into the operational phase. Where possible, topsoil stockpiles should be covered to prevent birds from foraging for unearthed invertebrates.				➢ Topsoil stored correctly.
	47.	All excess material removed as part of the rehabilitation activities that cannot be reused on site must be removed from site. At no point may this material be disposed on site or within any of the other freshwater ecosystems identified within the surrounding area.				➢ Excess material disposed of properly and at suitable waste management facilities.
	48.	Install sediment traps downstream of rehabilitation works to prevent sedimentation of downstream areas and to contain spillage from contaminating the downstream reach of the CVB wetland.	➢ Implementing Agent / Contractor	➢ Prior to commencement of earthworks.	➢ Visual inspection.	➢ Little to no sediment observed in downstream freshwater ecosystems.
Machinery and vehicle management	49.	Where possible, utilize existing roads. Keep vehicular disturbance footprint as small as possible when accessing the rehabilitation sites.		➢ Throughout rehabilitation.		➢ Vehicle access limited to what is essential.
	50.	Limit construction equipment within the freshwater ecosystems to what is essential.				
	51.	Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures.		➢ Weekly during rehabilitation works.		➢ Leaks and spillages reported to ECO.
	52.	Refuelling must take place outside of the delineated wetlands and 32m NEMA ZoR and must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil.		➢ Throughout rehabilitation.	➢ Visual inspection.	➢ No refuelling in close proximity to freshwater ecosystems.
	53.	Maintain all machinery and vehicles used during rehabilitation to prevent oil leaks.				➢ Little to no hydrocarbon or oil spillage.
	54.	Undertake any on-site refuelling and maintenance of vehicles and machinery in designated areas (preferably at the construction site camp) and away from the watercourses. Install oil traps and line these areas with an impermeable surface.				
	55.	Use appropriately sized drip trays for all refuelling and/or repairs done on machinery. Ensure that drip trays are strategically placed				

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
		for capture any spillage of fuel, oil, etc.				
	56.	Immediately clean up any spills through containment and removal of free product. Appropriately dispose of contaminated soil.		➢ Upon observation of spills.		➢ Safety disposal slips indicating quantity and location where contaminated soils were disposed of.
	57.	If breakdowns occur these must be towed offsite to the designated areas/workshops. This will ensure that incidental oil spills and leakage are minimised onsite and thus limit any opportunities of water contamination and water quality deterioration.		➢ As and when required.		-
Vegetation clearance	58.	In order to construct the proposed CWA development, vegetation will need to be cleared within and surrounding the seep wetland in the eastern portion of the study area. With the exception of suitable wetland vegetation that can be reused during rehabilitation, all vegetation removed (especially since many of the current vegetation is identified as AIP) must be disposed of at a suitable disposal facility.		➢ Prior to commencement of rehabilitation activities.		➢ Vegetation disposed of at a suitable disposal facility.
Erosion Prevention and Topsoil Management	59.	Inspect rehabilitated areas for erosion.		➢ Weekly during rehabilitation activities. ➢ After every major rainstorm and/ flood for the first wet season post rehabilitation.		➢ ECO report provides feedback on erosion.
	60.	Immediately rehabilitate any area where active erosion is observed in such a way as to ensure that the surface hydrology of the area is re-instated to conditions which are as natural as possible.	➢ Implementing Agent / Contractor	➢ Upon observation of erosion.	➢ Visual inspection.	➢ Visual surface erosion cleared.
	61.	Actions to be taken to prevent any further erosion from occurring within the rehabilitated areas are as follows (to be implemented as and when required): ➢ Re-vegetating the disturbed and rehabilitated areas (see below); ➢ Stabilise the soil through the use of geotextiles, especially effective with growing vegetation; and ➢ Apply a layer of mulch to the rehabilitated areas to allow the soil				

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
		to slowly soak up the water and reduce the impact of rain on bare soil.				
Waste management	62.	Remove all litter observed in the wetlands and the agricultural drain and dispose thereof at an appropriately licensed waste management facility.	➢ Contractor	➢ Upon observation of waste.		➢ Waste disposed of properly and at a suitable waste management facility. ➢ Waste management included in ECO reports.
Indigenous Species Re-vegetation	63.	Planting must start as soon as possible after site preparations (re-sloping) have been concluded to minimise the duration of bare ground being exposed which could lead to erosion and sedimentation of the area, and to establish ecological habitats. Furthermore, all disturbed areas as part of the rehabilitation, as well as where AIPs have been removed should also be re-instated with native vegetation.		➢ After AIP removal and site preparations.		➢ Record of commencement of revegetation. ➢ Photographic record of revegetation.
	64.	Re-instate native vegetation in late autumn (April). This will ensure that vegetation is allowed to become established prior to the onset of the winter rains, and prior to the onset of the dry summer period, which will maximize growth and early establishment.				
	65.	Appoint a suitably qualified botanist to assist with re-vegetation, should the Contractor not have the relevant expertise on planting of specimens.			➢ Botanist appointed, if required.	-
		Monitoring				
Administrative and Financial Monitoring	66.	Develop detailed budgets prior to the implementation of the program. This will include that all expenditure is accounted for and audited annually in accordance with the Public Finance Management Act, 1999 (Act No 1 of 1999).	➢ Contractor	➢ Prior to commencement of rehabilitation.	-	➢ Record of approved budget.
	67.	Monitor compliance with all relevant legislation (as outlined in this report, and any additional Acts which may be relevant in terms of corporate governance) and include this as part of the auditors' Terms of Reference.	➢ Sub-contracted auditor	➢ Prior to and throughout rehabilitation.	➢ Compliance against EA and WULA conditions.	➢ Record of non-compliances.
	68.	Regular communication with all stakeholders must take place.	➢ Implementing Agent	➢ Throughout the life of the project.	➢ Stakeholders' communication maintained.	➢ Record of communication with stakeholders.

Aspect	ID	Offset/ Rehabilitation Measure	Responsible	Implementation Timeframe	Monitoring Methods	Performance Indicators
Wetland Health	69.	Monitor all wetland areas earmarked for conservation and rehabilitation annually during the winter period.	➢ Implementing Agent / suitably appointed contractor	➢ Annually for the first three years post-rehabilitation.	➢ PES of systems maintained/ improved.	➢ Annual monitoring report compiled. ➢ Condition of the wetlands have not degraded since initial rehabilitation efforts have concluded.
AIP control	70.	Take a baseline assessment capturing densities and species of AIPs prior to the initial AIP clearing.	➢ Contractor	➢ Prior to AIP clearing.	➢ Screen the entire rehabilitation area(s). ➢ Log locations of any newly coppiced species to be treated/removed.	➢ Baseline report compiled.
	71.	Re-record AIP densities after the initial clearing, including all methods and chemicals used.		➢ After initial AIP clearing.		➢ Report compiled.
	72.	To ensure long-term maintenance measures are effective, quarterly assess and record densities and locations of newly coppiced AIPs during the first year post rehabilitation and annually during the growing season for the second and third year. Annual reports should include information from before and after mobilisation of follow-up clearing teams.		➢ For four years post AIP clearing.		➢ Quarterly report during first year of rehabilitation. ➢ Annual reports during the following three years post AIP clearing.
Re-vegetation	73.	Monitor the areas revegetated to ensure plant survival and ensure that no AIPs are outcompeting native species. Compile the following reports: ➢ Compile a report listing existing species as well as any endangered species that may need to be rescued prior to rehabilitation. Appoint a suitable botanist to assist, should the Contractor not have the expertise to undertake this list. ➢ Compile monthly reports for 6 months after the re-instatement. ➢ Compile annual reports during each growing season, for at least 3 years post rehabilitation.		➢ Prior to rehabilitation activities. ➢ Monthly for 6 months after re-instatement of vegetation. ➢ Annually during the growing season for at least three years post rehabilitation.	➢ Visual inspection	➢ Reports compiled.

***Note: This monitoring plan must be implemented by a competent person and submit the findings to the responsible authority for evaluation.**

10 PHASE 4 – REFINE, CORRECT AND REPLAN PHASE

This phase involves a “refine-correct-re-plan” approach that ensures that the rehabilitation plan is continuously being updated and improved so to effectively achieve the rehabilitation targets set out in the planning phase. Only once, on-site rehabilitation has started will this phase become significant.

Progressive rehabilitation is recommended as a management strategy for environmental liability. The proponent should be cognisant of the rehabilitation objectives and integrate as much of the rehabilitation activities into its processes, as possible.

Should the proponent require or not be capable of implementing the offset plan as outlined in this report, an implementing agent will be appointed to manage the offset area.

11 WETLAND OFFSET INITIATIVE BUDGET

For any conservation initiative to be successful, adequate funding needs to be put in place to ensure follow through of the project. A budget estimate was developed considering the cost of purchasing the land, as well as implementation aspects including:

- Rehabilitation and restoration activities (within the remainder of the seep wetland and a portion of the CVB wetland located east of the study area). This will be directed by the proponent;
- AIP control;
- Erosion management and control; and
- Budgetary requirements for monitoring and auditing purposes.

A budget estimate was developed considering the cost to develop the offset initiative as well as to provide budget to facilitate the implementation thereof. The budget has been developed to cover costs for a period of 30 years post rehabilitation. All budget estimates were developed on a Net Present Value basis in 2024.

The total budget for the Wetland Offset Initiative is **R11,493,000 (rounded)** for the restoration work to be done to support the rehabilitation and offset. A detailed cost breakdown for each phase is presented in the table below. The provided budget also includes the budget for the 30-year maintenance phase of **R1,206,000 (rounded)** for the entire period however this will largely fall within the proposed CWA development management budget and will be an additional cost to the CWA. It should be noted that the below budget does not allow for the management of the offset site. It is assumed that forms part of the biodiversity offset costs.

Table 14: Budget Summary for the Wetland Offset and Ecological Compensation Initiative.

	BUDGET COST ESTIMATE AS FOR THE IMPLEMENTATION OF THE WETLAND OFFSET FOR CAPE WINELANDS AIRPORT				
	WETLAND OFFSET				
	REVISION 0				**September 2024**
	DESCRIPTION	**UNIT**	**QTY.**	**RATE**	**TOTAL**
	SECTION 1 :LAND ACQUISITION AND MANAGEMENT				
1.1	Land acquisition costs	sum	0	R 0,00	R 0,00
1.2	Contractor Establishment	Rate	3	R 25 000,00	R 75 000,00
1.3	Contractor Safety File	Rate	3	R 12 000,00	R 36 000,00
1.4	Proffesional Oversight and management	Rate	36	R 10 000,00	R 360 000,00
					R471 000,00
	SECTION 2 : PREPARATION				
2.1	Alien and invasive species removal (trees)	m²	3000,0	R 2,77	R 8 310,00
2.2	Alien and invasive species removal (grasses)	m²	90000,0	R 1,88	R 169 200,00
2.3	Removal of waste and litter from wetland areas	sum	1	R 32 000,00	R 32 000,00
2.4	Temporary stormwater management measures including sediment traps	m	2000	R 38,56	R 77 120,00
2.5	Resloping/ shaping of areas where steep banks are present to 1:4 slopes prior to covering with erosion control blanket	m²	27000	R 5,50	R 148 500,00
2.6	Ripping and scarifying of areas to be planted and reseeded	m²	40000	R 2,75	R 110 000,00
	Total Preparation				**R545 130,00**
	SECTION 3 : PLANTING				
3.1	*Hydroseed with indigenous reclamation mixture suitable for wetland areas*	m²	90000	R 9,00	R 810 000,00
3.2	planting with specific wetland sedges and forbs		200000	R 27,00	R 5 400 000,00
	Total Planting				**R6 210 000,00**
	SECTION 4: OTHER				
4.1	(500m²)	roll	250	R 700,00	R 175 500,00
	Total Other				**R175 500,00**
	TOTAL COMPENSATION DEVELOPMENT COST				**6 930 630,00**
	SECTION 5: MAINTENANCE (rate per annum for a period of 30 years for alien control and revegetation)				
5.1	Proffesional Oversight and management	Sum	1,0	R 25 000,00	R 750 000,00
5.2	Annual follow up of alien vegetation control in the form of weeding of recruits (trees)	m²	200,0	R 5,00	R 30 000,00
5.3	Annual follow up of alien vegetation control (grasses and forbs)	m²	5000,0	R 1,88	R 282 000,00
5.4	Follow up reseeding where required *An acceptable cover means that not less than 75% of the re-vegetated area is to be covered with indigenous species and that there will be no bare patches of more than 10 x 10 mm in maximum dimension.*	m²	4000	R 12,00	R 144 000,00
	Total Maintenance				**R1 206 000,00**
	Sub Total (ex VAT)				**R 8 607 630,00**
	Preliminaries and General (10%)				R 693 063,00
	Contingencies (10%)				R 693 063,00
	Total (ex VAT)				**R 9 993 756,00**
	Total (incl. VAT)				**R 11 492 819,40**

NOTES:
1. The rates are to include site establishment as well as the supply of all plant, labour and materials to carry out the work.
2. Hydroseeding and planting is not to take place during the growing season only.
3. Water to be made available for the initial establishment phase of revegetated areas.

12 CONCLUSION

FEN was appointed to develop a wetland offset plan and associated WRMP for the proposed CWA development in Fisantekraal, Western Cape Province. Given that the complete destruction of on-site freshwater habitats will not occur, an on-site offset was considered, with the remaining portion of the seep wetland being selected as the preferred offset. However, considering that rehabilitating only the remainder of the seep wetland (3.68 ha) will not be sufficient to achieve the 3.97 HaE wetland functionality and 13 HaE ecosystem conservation target, and as such a CVB wetland which is fed by the seep wetland via an agricultural drain was therefore also investigated to achieve the offset target. This approach is ecologically optimal, offering a significant, high impact offset that supports greater biodiversity and ecosystem functionality.

The offset plan includes the rehabilitation of ~40 ha of wetland habitat which will compensate for the 7.44 ha total wetland loss resulting from the proposed CWA development. The impacts of the project require 3.97 functional HaE and 13 habitat HaE to be offset. The target offset area (remainder of the seep wetland and a portion of the CVB wetland as well as the agricultural drain feeding the CVB wetland) will provide these requirements, effectively compensating for the loss. The planned restoration is expected to improve the PES of the wetlands, contributing to a net gain in wetland functionality and elevating its ecological status, ensuring that the offset delivers a positive contribution to the region’s wetland conservation efforts.

The total budget for the offset and its management is **R11,492,814.40**, which includes implementation, rehabilitation, and long-term management costs.

The developed offset initiative is expected to significantly contribute to positive wetland resource management and conservation in the region. The offset strategy aligns with national and local biodiversity offset guidelines, and the selected offset site more than adequately offsets the residual impacts associated with the project. It is recommended that the proposed offset be approved by the relevant competent authorities as part of the development authorization process.

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APPENDIX A – Indemnity and Terms of Use

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APPENDIX B – Legislative Requirements

The Constitution of the Republic of South Africa, 1996	The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive normalization of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated Regulations as amended in 2021, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact. Provincial regulations must also be considered.
National Water Act , 1998 (Act No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i). A watercourse is defined as: a) A river or spring; b) A natural channel in which water flows regularly or intermittently; c) A wetland, lake or dam into which, or from which water flows; and d) Any collection of water which the minister may, by notice in the Gazette, declare a watercourse.
Government Notice 4167 as published in the Government Gazette 49833 of 08 December 2023 as it relates to the NWA (Act 36 of 1998) as amended	GN 4167 outlines the parameters and process of a General Authorisation (GA), which replaces the need to apply for a licence in terms of Section 40 of the NWA, provided that the water use is within the limits and conditions of the GA. The notice **replaces GN 509 of 2016.** The GA sets out the need to determine the regulated area of a watercourse, as well as the degree of risk posed by an activity/ies related to a particular water use. In accordance with GN 4167 of December 2023, the regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: a) the outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake, or dam; b) in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or c) In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans. The GA only applies to the use of water in terms of Section 21(c) and (i) of the NWA where the risk class is **Low** as determined through the application of the Risk Matrix as prescribed in the Notice. The GA also does not apply where other Section 21 water uses are triggered, does not apply for most sewage infrastructure and pipelines carrying hazardous materials, water uses associated with hazardous materials, water uses associated with water and wastewater treatment works, and for most mining-related water uses. The GA may be exercised as follows: i) Section 21(c) or (i) water use activities that are determined to pose a LOW Risk as determined through the application of the Risk Matrix as prescribed in the Notice can be undertaken subject to the general conditions of the GA; ii) Section 21(c) or (i) water use activities set out in Appendix D1 of the Notice can be undertaken *without* being subject to the requirement of a risk assessment and subject to the general conditions of the GA. Such water use activities in Appendix D1 include *inter alia* emergency river crossings, fence erection, solar renewable infrastructure that has no direct impact on watercourses and mini-scale hydropower developments; iii) Prescribed water use activities undertaken by certain State Owned Entities as detailed in Appendix D2 of the Notice can be undertaken *without* being subject to the requirement of a risk assessment and subject to the general conditions of the GA;

	iv) Maintenance work associated an existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix can be undertaken; v) River and stormwater management activities including maintenance of infrastructure as contained in a river management plan or similar management plan, may be conducted subject to the approval of such a plan by the relevant DWS regional office or catchment management agency; vi) Rehabilitation of wetlands or rivers where such rehabilitation activities have a LOW risk class as determined through the Risk Matrix can be conducted; and vii) Emergency work arising from an emergency situation and or incident associated with the persons' existing lawful water use entitlement can be undertaken, provided that all work is executed and reported in the manner prescribed in the Emergency protocol contained in Appendix C of the GA. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence within the water use as contemplated in the GA.

APPENDIX C – Method of Assessment

1. Desktop Study

Prior to the commencement of the field assessment, a background study, including a literature review, was conducted in order to determine the ecoregion and ecostatus of the larger aquatic system within which the freshwater ecosystems present in close proximity of the construction and proposed borehole abstraction are located. Aspects considered as part of the literature review are discussed in the sections that follow.

1.1 National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), DWA, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland feature present in the vicinity of the construction and proposed borehole abstraction.

1.2 *Department of Water and Sanitation (DWS) Resource Quality Information Services (RQIS) Present Ecological State / Ecological Importance and Sensitivity (PES/EIS) Database (2014)*

The PES/EIS database as developed by the DWS RQIS department was utilised to obtain background information on the project area. The PES/EIS database has been made available to consultants since mid-August 2014. The information from this database is based on information at a sub-quaternary catchment reach (subquat reach) level with the descriptions of the aquatic ecology based on the information collated by the DWS RQIS department from all reliable sources of reliable information such as SA RHP sites, Ecological Water Requirements sites and Hydro Water Management System sites. The results obtained serve to summarise this information as a background to the conditions of the freshwater ecosystem traversed by the proposed linear development.

2. Classification System for Wetlands and other Aquatic Ecosystems in South Africa (2013)

All wetland or riparian features encountered within the investigation area was assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems, hereafter referred to as the "Classification System" (Ollis, Snaddon, Job, & Mbona, 2013). A summary on Levels 1 to 4 of the classification system is presented in the tables below.

Table C1: Classification System for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	**LEVEL 2: REGIONAL SETTING**	**LEVEL 3: LANDSCAPE UNIT**
Inland Systems	DWA Level 1 Ecoregions	Valley Floor
	OR	Slope

	NFEPA WetVeg Groups OR Other special framework	Plain
		Bench (Hilltop / Saddle / Shelf)

Table C2: Hydrogeomorphic (HGM) Units for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems

From the classification system, Inland Systems are defined as **aquatic ecosystems that have no existing connection to the ocean**[4] (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but **which are inundated or saturated with water, either permanently or periodically.** It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups

For Inland Systems, the regional spatial framework that has been included in Level 2 of the classification system is that of the DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et. al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford), 2006) groups' vegetation types across the country, according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting

At Level 3 of the classification system for Inland Systems, a distinction is made between four Landscape Units (Table C1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis, Snaddon, Job, & Mbona, 2013):

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units

Seven primary HGM Types are recognised for Inland Systems at Level 4A of the classification system (Table C2), on the basis of hydrology and geomorphology (Ollis, Snaddon, Job, & Mbona, 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchannelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;

[4] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e. the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates;
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and
- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for “channel”, “flat” and “valleyhead seep”) is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et. al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze, Marneweck, Batchelor, Lindley, & Collins, 2009).

3. Wet-Ecoservices (2020)

The WET-Ecoservices (v2) method by Kotze *et al.* (2020) provides an overall importance score to each of the ecoservices listed below (Table C4). The overall importance score of each ecoservice is calculated by integrating its respective supply and demand scores (Table C3). Each ecoservice supply and demand score in turn is calculated using an algorithm that has been designed to reflect the relative importance and interactions of the attributes represented by indicators that characterise that ecoservice.

The supply of an ecoservice is related to the innate ability of the wetland to provide a particular service, tying to its PES, while the demand on an ecoservice is founded on the wetland’s catchment context (e.g. toxicant sources upstream), the number of beneficiaries and their level of dependency.

The WET-Health (v2) summary thus enables the reader to gauge both the relative importance of the individual ecoservice supply and demand scores and combined (overall) ecoservice importance.

➢ Flood attenuation	➢ Biodiversity maintenance
➢ Stream flow regulation	➢ Provision of water for human use
➢ Sediment trapping	➢ Provision of harvestable resources
➢ Phosphate assimilation	➢ Food for livestock
➢ Nitrate assimilation	➢ Provision of cultivated foods
➢ Toxicant assimilation	➢ Cultural and spiritual experience
➢ Erosion control	➢ Tourism and recreation
➢ Carbon storage	➢ Education and research

Table C3: Integration of ecoservice supply and demand scores to derive overall importance

Integrating scores for supply & demand to obtain an overall importance score						
		Supply				
		Very Low	Low	Moderate	High	Very High
Demand		0	1	2	3	4
Very Low	0	0.0	0.0	0.5	1.5	2.5
Low	1	0.0	0.0	1.0	2.0	3.0
Moderate	2	0.0	0.5	1.5	2.5	3.5
High	3	0.0	1.0	2.0	3.0	4.0
Very High	4	0.5	1.5	2.5	3.5	4.0

Table C4: Ecoservice importance categories and descriptions based on integration of supply and demand scores.

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

4. Ecological Importance and Sensitivity (EIS) (Rountree & Kotze, 2013)

The purpose of assessing importance and sensitivity of freshwater ecosystems is to be able to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Freshwater ecosystems with higher ecological importance may require managing such freshwater ecosystems in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term (Rountree & Kotze, 2013).

In order to align the outputs of the Ecoservices assessment (i.e. ecological and socio-cultural service provision) with methods used by the DWA (now the DWS) used to assess the EIS of other freshwater ecosystem types, a tool was developed using criteria from both WET-Ecoservices (Kotze *et, al.,* 2009) and earlier DWA EIA assessment tools. Thus, three proposed suites of important criteria for assessing the Importance and Sensitivity for wetlands were proposed, namely:

- Ecological Importance and Sensitivity, incorporating the traditionally examined criteria used in EIS assessments of other freshwater ecosystems by DWA and thus enabling consistent assessment approaches across freshwater ecosystem types;
- Hydro-functional importance, taking into consideration water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide; and
- Importance in terms of socio-cultural benefits, including the subsistence and cultural benefits provided by the wetland system.

The highest of these three suites of scores is then used to determine the overall Importance and Sensitivity category (Table C5) of the wetland system being assessed.

Table C5: Ecological Importance and Sensitivity Categories and the interpretation of median scores for biota and habitat determinants (adapted from Kleynhans, 1999).

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal	>0 and <=1	D

Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.		

5. General Habitat Integrity

The general habitat integrity of each site was discussed based on the application of the Index of Habitat Integrity (Kleynhans *et al.* 2008). It is important to assess the habitat at each site in order to aid in the interpretation of the results of the community integrity assessments, by taking habitat conditions and impacts into consideration. This method describes the Present Ecological State (PES) of both the in-stream and riparian habitat at each site. The method classifies habitat integrity into one of six classes, ranging from unmodified/natural (Class A) to critically modified (Class F), as indicated in Table C7 below.

Table C7: Classification of Present State Classes in terms of Habitat Integrity [Kleynhans *et al.*, 2008]

Class	Description	Score (% of total)
A	Unmodified, natural.	90 - 100
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 - 89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 - 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

6. The Riparian Vegetation Response Assessment Index (VEGRAI)

VEGRAI is designed for qualitative assessment of the response of riparian vegetation to impacts in such a way that qualitative ratings translate into quantitative and defensible results (Kleynhans *et al.*, 2007a). Results are defensible because their generation can be traced through an outlined process (a suite of rules that convert assessor estimates into ratings and convert multiple ratings into an Ecological Category).

Riparian vegetation is described in the National Water Act (Act No. 36 of 1998) as follows: 'riparian habitat' includes the physical structure and associated vegetation of the areas associated with a freshwater ecosystem which are commonly characterised by alluvial soil, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas.

Table C8: Descriptions of the A-F ecological categories.

Ecological category	Description	Score (% of total)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitat and biota may have taken place but the ecosystem functions are essentially unchanged.	80-89
C	Moderately modified. Loss and change of natural habitat have occurred, but the basic ecosystem functions are still predominately unchanged.	60-79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Critically modified. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances, the basic ecosystem functions have been destroyed and the changes are irreversible	0-19

7. Recommended Management Objective (RMO) and Recommended Ecological Category (REC) Determination

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability but carries a higher risk of ecosystem failure" (DWA, 1999).

The RMO (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the freshwater ecosystems (sections above), with the objective of either maintaining, or improving the ecological integrity of the freshwater ecosystem in order to ensure continued ecological functionality.

Table C9: Recommended management objectives (RMO) for freshwater ecosystems based on PES & EIS scores.

			Ecological Importance & Sensitivity (EIS)			
			Very High	High	Moderate	Low
PES	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	A Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D* Improve	E/F* Improve	E/F* Maintain	E/F* Maintain

***PES Categories E and F are considered ecologically unacceptable (Malan and Day, 2012) and therefore, should a freshwater ecosystem fall into one of these PES categories, an REC class D is allocated by default, as the minimum acceptable PES category.**

A freshwater ecosystem may receive the same class for the REC as the PES if the freshwater ecosystems are deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the freshwater ecosystem.

Table C8: Description of Recommended Ecological Category (REC) classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

8. Freshwater ecosystem Delineation

For the purposes of this investigation, a wetland is defined in the National Water Act, 1998 (Act No. 36 of 1998) as "land which is transitional between terrestrial and aquatic systems where the water table is at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil".

The wetland zone delineation took place according to the method presented in the DWAF (2005) document "A practical field procedure for identification and delineation of wetlands and riparian areas. An updated draft version of this report is also available and was therefore also considered during the wetland delineation (DWAF, 2008). The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The position in the landscape, which will help identify those parts of the landscape where wetlands are more likely to occur;
- The type of soil form (i.e. the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;
- The presence of wetland vegetation species; and
- The presence of redoxymorphic soil feature, which are morphological signatures that appear in soil with prolonged periods of saturation.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWAF, 2005 and 2008).

Riparian and wetland zones can be divided into three zones (DWAF, 2005). The permanent zone of wetness is nearly always saturated. The seasonal zone is saturated for a significant period of wetness (at least three months of saturation per annum) and the temporary zone surrounds the seasonal zone and is only saturated for a short period of saturation (typically less than three months of saturation per annum), but is saturated for a sufficient period, under normal circumstances, to allow for the formation of hydromorphic soil and the growth of wetland vegetation. The object of this study was to identify the outer boundary of the temporary zone and then to identify a suitable buffer zone around the wetland area.

APPENDIX D – Risk Assessment Methodology

In order for the proponent to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

DWS Risk Assessment Matrix (2023)

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
- **Environmental impacts** are the consequences of these impacts on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is;
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems;
- **Resources** include components of the biophysical environment;
- **Intensity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards;
- **Spatial scale** refers to the geographical scale of the impact; and
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The intensity, spatial scale and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 75. The likelihood of the impact occurring is determined by assigning a likelihood score of between 20% and 100%. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether control is necessary[5].

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

[5] Some risks/impacts that have low significance will however still require control

"RISK ASSESSMENT KEY" (Based on DWS 2023 publication: Section 21 c and i water use Risk Assessment Protocol)

Table D1: Intensity (What is the intensity of the impact on the resource quality - hydrology, water quality, geomorphology, biota?)

Negative impacts	
Negligible / non-harmful; no change in PES	0
Very low / potentially harmful; negligible deterioration in PES (<5% change)	+1
Low / slightly harmful; minor deterioration in PES (<10% change)	+2
Medium / moderately harmful; moderate deterioration in PES (>10% change)	+3
High / severely harmful; large deterioration in PES (by one class or more)	+4
Very high / critically harmful; critical deterioration in PES (to E/F or F class)	+5
Positive impacts	
Negligible; no change in PES	0
Very low / potentially beneficial; negligible improvement in PES (<5% change)	-1
Low / slightly beneficial; minor improvement in PES (<10% change)	-2
Medium / moderately beneficial; moderate improvement in PES (>10% change)	-3
Highly beneficial; large improvement in PES (by one class or more) and/or increase in protection status	-4
Very highly beneficial; improvement to near-natural state (A or A/B class) and/or major increase in protection status	-5

*PES of affected watercourses must be considered when scoring Impact Intensity

Table D2: Spatial Scale (How big is the area that the activity is impacting on, relative to the size of the impacted watercourses).

Very small portion of watercourse/s impacted (<10% of extent)	1
Moderate portion of watercourse/s impacted (10-60% of extent)	2
Large portion of watercourse/s impacted (60-80%)	3
Most or all of watercourse/s impacted (>80%)	4
Impacts extend into watercourses located well beyond the footprint of the activities	5

Table D3: Duration (How long does the aspect impact on the resource quality).

Transient (One day to one month)	1
Short-term (a few months to 5 years) OR repeated infrequently (e.g. annually) for one day to one month	2
Medium-term (5 – 15 years)	3
Long-term (ceases with operational life)	4
Permanent	5

Table D4: Likelihood of impact (What is the probability that the activity will impact on the resource quality).

Improbable / Unlikely	20%
Low probability	40%
Medium probability	60%
Highly probable	80%
Definite / Unknown	100%

Table D5: Rating Classes.

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

A low risk class must be obtained for all activities to be considered for a GA

Table D6: Calculations.

Intensity = Maximum Intensity Score (negative value for positive impact)	MAX = 5
Severity = Intensity + Spatial Scale + Duration (<Intensity - Spatial Scale - Duration> for positive impact)	MAX = 15 (MIN = -15 for +ve impacts)
Consequence = Severity X Importance rating	MAX = 75
Significance\Risk = (Consequence X Likelihood) X (100/75)	MAX = 100

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/Impacts were assessed for construction phase and operational phase; and
- Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed.

Control Measure Development

The following points present the key concepts considered in the development of control measures for the proposed construction:

- Control and performance improvement measures and actions that address the risks and impacts[6] are identified and described in as much detail as possible. Controlling measures are investigated according to the impact minimisation hierarchy as follows:
  - Avoidance or prevention of impact;
  - Minimisation of impact;
  - Rehabilitation; and
  - Offsetting.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, control or compensation; and
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

Recommendations

Recommendations were developed to address and control potential impacts on the ecology of the freshwater and riparian ecosystems traversed by or in close proximity of the proposed infrastructure.

[6] Control measures should address both positive and negative impacts

APPENDIX E – Risk Assessment and Summary of Impacts of the Cape Winelands Airport Development

RISK ANALYSIS: CONSIDERATION OF IMPACTS AND APPLICATION OF MITIGATION MEASURES

The results of the risk assessment are summarised below, including key mitigation measures for each activity. There are four key ecological impacts on the watercourses that are anticipated to occur namely:

- Loss of freshwater ecosystem habitat and ecological structure;
- Changes to the sociocultural and service provision;
- Impacts on the hydrology and sediment balance of the freshwater ecosystem; and
- Impacts on water quality.

Overall, the construction activities as it relates to the required rehabilitation activities associated with the target offset area are deemed to pose a ‘Low’ risk significance to both the remainder of the seep and the CVB wetland. The only exception is when rehabilitation is required outside the Western Cape dry season, when a coffer dam may need to be constructed to ensure continued flow of water into the downgradient reaches of the CVB wetland, resulting in a ‘Medium’ risk significance to the CVB wetland. Ongoing AIP control within the target offset area is considered to pose a ‘Low’ risk significance to the wetlands, whereas the operation of the rehabilitated wetlands will provide a positive impact once rehabilitative measures have been implemented.

General construction management and good housekeeping practices

Impacts which generally affect the freshwater ecology and biodiversity, and will likely occur as a result of this proposed development, which take place in close proximity to the proposed activities may impact on the receiving environment. Mitigation measures for these impacts are highlighted below and are relevant to the freshwater ecosystems identified in this report:

Development footprint and site establishment

- Keep development footprint areas as small as possible and limit vegetation clearing to what is absolutely essential;
- Limit the rehabilitation footprint to the footprint as included in the environmental authorisation / water use licence;
- Clearly define the boundaries of footprint areas, including contractor laydown areas and ensure that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled;
- Establish contractor laydown areas and stockpiles outside of the delineated wetlands and the 32m NEMA ZoR in consultation with the appropriate authority. Where possible use of existing disturbed areas along / through the wetlands should be utilised to gain access to the rehabilitation areas;
- Clearly demarcate the assessed wetlands and 32m NEMA ZoR with danger tape with input from an ECO and mark these areas as a 'no-go' area where no rehabilitation activities are planned;
- Provide appropriate sanitary facilities for the life of the construction phase and remove all waste to an appropriate waste facility; and
- No fires should be permitted in or near the construction area.

Future access road construction

- The access roads must be designed in such a way that the hydraulic connectivity and ecological condition of the CVB wetland is not further impacted, and that the rehabilitative effort invested into the offset site is not in vain. This may include, but not be limited to, the installation of culverts or the construction of causeways;

- Utilize existing roads or the proposed access roads to be upgraded to gain access to the construction site with no construction vehicles permitted to indiscriminately move through open areas and especially the wetland areas;
- Vehicles to be serviced and refuelled at the designated contractor laydown area;
- The construction footprint must be limited to the servitude area only and all areas outside the development footprint are to be rehabilitated on completion of construction;
- All proposed activities associated with the construction of the access roads over the CVB wetland will potentially result in bank destabilisation, particularly the construction of culverts within or causeways over the CVB wetland, and an increase in bank incision and sedimentation of the wetland. Therefore, sediment control devices must be constructed in situ prior to construction activities;
- Should construction works not be finalised during the dry season, an appropriately sized coffer dam area can be created and dewatered around the construction area associated with any pillars by using sandbags and cobbles. Water must be diverted into the downstream reaches, around the coffer area. Water must be allowed to recharge the downstream reaches at all times, although sediment traps must be installed upgradient of the wetland to ensure that volumes of sediment entering the wetland are minimised. Sediment traps are to be inspected daily and accumulated sediment to be removed by hand on a weekly basis;
- Ensure that the creation of the diversion (by means of sandbags) does not result in a significant water level difference upstream or downstream of the installation site;
- It is recommended that a suitably qualified freshwater specialist and independent Environmental Control Officer (ECO) should monitor any coffer dam areas created on site as well as sediment traps at least bimonthly during the construction period to monitor the CVB wetland conditions during construction and after the removal of the diversion;
- A suitably qualified hydrologist must provide guidance on the relevant sizes and width requirements of all culvert / causeway crossings;
- During the excavation activities, any soil/sediment or silt removed from the wetland (particularly for the construction of culverts within or causeways over the wetland) may be temporarily stockpiled in the road reserve but outside the wetlands. These stockpiles may not exceed 2 m in height, and their footprint should be kept to a minimum. Stockpiling of removed materials may only be temporary (may only be stockpiled during the period of construction at a particular site) and should be disposed of at a registered waste disposal facility;
- Should causeways be constructed, these structures should ideally be constructed within the seasonal or temporary zone of the wetland;
- Culverts, if applicable, must be installed to be in line with the beds of the wetland (not below the ground level) and erosion protection/outlet stabilisation structures such as a riprap or a concrete apron are recommended at the culvert outlets. The outlet channels of the proposed culverts must be lined with cobbles and revegetated with indigenous species to assist with water dispersal and reduction of water velocities prior to entering the wetland;
- The soil surrounding the construction areas must be suitably loosened on completion of construction activities and revegetated to prevent erosion;
- All embankments must be adequately sloped, ripped, topsoil reinstated and vegetated with indigenous wetland vegetation species;
- The CVB wetland 2 is to be rehabilitated as part of the access road construction, should an access road alternative adjacent to CVB wetland 2 be considered;
- Fresh asphalt, concrete and cement mortar should not be mixed near the watercourses. Mixing of cement may be done within the construction camp, however it may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. Consideration must be taken to use ready mix concrete;
- No mixed concrete or asphalt shall be deposited directly onto the ground or within the freshwater ecosystems. All concrete and/or asphalt must be brought in via a cement mixing truck which must remain within the road reserve, and cement/asphalt must be piped down to the proposed road footprint. Any areas that require manual application of cement/asphalt require that the mixed road surfacing materials be placed on a batter board or other suitable platform/mixing tray until it is deposited;
- A washout area should be designated outside of the freshwater ecosystems, and wash water should be treated on-site or discharged to a suitable sanitation system;
- At no point may batter boards/mixing trays or cement trucks be rinsed off on site and run-off water be allowed into the freshwater ecosystems;
- Cement bags (if any) must be disposed of in the demarcated hazardous waste receptacles and the used bags must be disposed of through the hazardous substance waste stream;

- Spilled or excess concrete/asphalt must be disposed of at a suitable landfill site. Chain of custody documentation must be provided;
- Adequate stormwater run-off measures must be put in place during the operation of the access roads and no stormwater may be directly released into the wetland. Attenuation ponds and/or sustainable drainage systems must be installed to assist with water “polishing” and reducing the velocity of water before entering the wetland. This will ensure no erosion or scouring occurs as a result of stormwater inputs;
- Hot spots for the build-up of debris and excess sediment must be identified and when necessary, debris/excess sediment must be removed by hand to prevent future flooding and potential damage to infrastructure. In this regard, special mention is made of periods following high rainfall and subsequent high instream water volumes. Removal of debris must be undertaken in line with the above listed construction mitigation measures; and
- Any erosion or gully formation must be identified on an ongoing basis and re-profiled and revegetated accordingly.

Waste management

- Store all hazardous chemicals as well as stockpiles on bunded surfaces in an appropriately designated area and away from the freshwater ecosystem and have facilities constructed to control runoff from these areas;
- Ensure that an adequate number of waste and “spill” bins are provided will also prevent litter and ensure the proper disposal of waste and spills;
- Ensure that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage; and
- All waste is to be removed from the site and disposed of at a registered facility.

Vehicle access and maintenance

- Where possible, utilise existing roads. Keep vehicular disturbance footprint as small as possible when accessing the rehabilitation sites;
- Limit construction equipment within the wetlands to what is essential;
- Undertake regular maintenance of vehicles and machinery to identify and repair minor leaks and prevent equipment failures;
- Maintain all machinery and vehicles used during rehabilitation to prevent oil leaks;
- Use appropriately sized drip trays for all refuelling and/or repairs done on machinery. Ensure that drip trays are strategically placed for capture any spillage of fuel, oil, etc.;
- Immediately clean up any spills through containment and removal of free product. Appropriately dispose of contaminated soil;
- If breakdowns occur these must be towed off site to the designated areas/workshops. This will ensure that incidental oil spills and leakage are minimised onsite and thus limit any opportunities of water contamination and water quality deterioration.

Vegetation

- Removal of the alien and weed species encountered on the target offset area must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)) (NEMA). Removal of species should take place throughout the relevant project phases;
- Species specific and area specific eradication recommendations:
    - Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;
    - Footprint areas should be kept as small as possible when removing alien plant species; and
    - No vehicles should be allowed to drive through designated sensitive wetland areas during the eradication of alien and weed species;
- Stockpile the removed vegetation outside of the delineated boundary of the wetlands. The footprint areas of these stockpiles should be kept to a minimum. Should the vegetation not be suitable for reinstatement or be alien/invasive vegetation species, where material cannot be reused as feed for livestock, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site;

- Retain as much indigenous vegetation as possible, and where possible remove native vegetation from areas where extensive earthworks using machinery are required;
- The clearing of vegetation must remain within the planned rehabilitation footprint only and may not extend beyond this area. No unnecessary disturbance within the wetlands that is outside the rehabilitation footprint will be tolerated.

Soil

- As far as possible, all construction activities, particularly earthworks, should occur in the low flow season, during the drier summer months;
- Should rehabilitation not be finalised during the dry season, a coffer dam area can be created and dewatered around the rehabilitation area by using sandbags and cobbles. Water must be diverted into the downstream reaches, around the coffer area. Water must be allowed to flow to the downstream reaches at all times. Water may only be released from the coffer dam, should it be necessary, once suitable water quality parameters for turbidity and pH have been met (water quality parameters to be determined by a freshwater specialist);
- All proposed activities will potentially result in bank destabilisation and sedimentation of the wetland downgradient of the rehabilitation works. Therefore, sediment control devices must be constructed in situ prior to rehabilitation activities;
- Sediment traps must be installed every 20 m downstream for any works for a length of 100 m;
- Ensure that the creation of the diversion (by means of sandbags) does not result in a significant water level difference upstream or downstream of the installation site;
- It is recommended that a suitably qualified freshwater specialist and ECO should monitor any diversion structures created on site as well as sediment traps at least bimonthly during earthworks to monitor the CVB wetland conditions during rehabilitation activities and after the removal of the diversion;
- As much vegetation growth as possible (of indigenous floral species) should be encouraged to protect soil;
- No stockpiling of topsoil is to take place within the recommended buffer zone around the watercourses, and all stockpiles must be protected with a suitable geotextile to prevent sedimentation of the wetland;
- All soil compacted as a result of construction activities as well as ongoing operational activities falling outside of project footprint areas should be ripped and profiled;
- A monitoring plan for the development and the immediate zone of influence should be implemented to prevent erosion and incision;
- With regards to excavation and soil compaction activities within the wetlands:
  - During the excavation activities, any soil/sediment or silt removed from the wetlands must be temporarily stockpiled outside the wetlands. These stockpiles may not exceed 2 m in height, and their footprint should be kept to a minimum. Stockpiling of removed materials may only be temporary (may only be stockpiled during the rehabilitation at a particular site) and should be disposed of at a registered waste disposal facility if not reused on site;
  - Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum, so as for later usage as backfill material or as part of rehabilitation activities;
  - All exposed soil must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) to prevent erosion and sedimentation of the wetlands;
  - The soil surrounding the rehabilitation areas must be suitably loosened on completion of construction activities and revegetated to prevent erosion; and
  - All embankments must be adequately sloped, ripped, topsoil reinstated and vegetated with indigenous wetland vegetation species.

DWS Risk Assessment Matrix (2023)

Table E1: Summary of the Risk Assessment outcomes for the rehabilitation work associated with the proposed CWA development offset.

Phase	No.	Activity	Impact	Potentially affected watercourses: Name/s	PES	Overall Watercourse Importance	Intensity of Impact on Resource Quality – Abiotic Habitat (Drivers): Hydrology	Water Quality	Geomorph	Biota (Responses): Vegetation	Fauna	Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood (Probability) of impact	Significance	Risk Rating	Confidence level
CONSTRUCTION	1	Site access, clearing and preparation for civil works which will involve: • Vehicular transport and access to the site; • Removal of vegetation and associated disturbances to soil; • Removal of topsoil and creation of topsoil stockpiles; and • Miscellaneous activities by construction personnel.	- Exposure of soil, leading to increased runoff and erosion, and thus increased sedimentation of the identified wetlands; - Indiscriminate movement of construction equipment through the wetlands; - Increased sedimentation of the wetlands, resulting in loss of freshwater habitat and ecological structure leading to impacts on biota; - Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles; - Decreased ecoservice provision; and - Proliferation of alien vegetation as a result of disturbances.	Channelled valley bottom wetland	E	Moderate	2	1	3	3	2	**6**	2	1	**9**	**3**	**27**	80%	**21,6**	L	Medium
				Seep wetland	D	Low	1	1	2	3	2	**6**	3	1	**10**	**2**	**20**	80%	**16**	L	Medium
	2	Clearing of vegetation (including alien vegetation) and rubble within the wetland habitat for rehabilitation	- Exposure of soil, leading to increased runoff and erosion, and thus increased likelihood for sedimentation of the wetlands; - Increased sedimentation of the wetlands, leading to smothering of vegetation in the downstream reaches; - Proliferation of alien and/or invasive vegetation as a result of disturbances; - Impacts to water quality as a result of the application of herbicides; and - Potential changes to the ecoservice provision of the wetlands.	Channelled valley bottom wetland	E	Moderate	3	3	3	4	2	**8**	2	1	**11**	**3**	**33**	60%	**19,8**	L	Medium
				Seep wetland	D	Low	3	2	3	4	3	**8**	3	1	**12**	**2**	**24**	60%	**14,4**	L	Medium

Phase	No.	Activity	Impact	Potentially affected watercourses: Name/s	PES	Overall Watercourse Importance	Intensity of Impact on Resource Quality – Abiotic Habitat (Drivers): Hydrology	Water Quality	Geomorph	Biota (Responses): Vegetation	Fauna	Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood (Probability) of impact	Significance	Risk Rating	Confidence level
	3	Groundbreaking and excavations within the wetlands as part of the rehabilitation activities which may include cut, fill and levelling of the side slopes of the wetlands.	- Disturbances of soil leading to ponding of water as a result of over compaction of soil in some areas, increased alien vegetation proliferation, and in turn altered wetland habitat and runoff patterns; - Altered runoff patterns, leading to increased erosion and sedimentation of the downstream wetland habitat; - Potential erosion and formation of preferential flow paths as a result of disturbed soil and inappropriate slopes resulting in sedimentation of the wetland; and - Potential impacts on water quality within the wetlands from leaking equipment.	Channelled valley bottom wetland	E	Moderate	3	3	3	3	2	**8**	3	2	**13**	**3**	**33**	80%	**26,4**	L	Medium
				Seep wetland	D	Low	2	2	4	3	2	**8**	3	2	**13**	**2**	**26**	60%	**15,6**	L	Medium
	4	Rehabilitation of the CVB wetland and seep wetland - revegetation	- Soil compaction within the wetlands; - Potential sedimentation of the wetlands due to activities within the wetlands	Channelled valley bottom wetland	E	Moderate	2	2	2	3	2	**6**	2	2	**10**	**3**	**30**	60%	**18**	L	High
				Seep wetland	D	Low	2	2	2	3	2	**6**	2	2	**10**	**2**	**20**	60%	**12**	L	High
OPERATIONAL	5	Functioning of the rehabilitated wetlands	No perceived negative impacts	Channelled valley bottom wetland	E	Moderate	-3	-2	-3	-3	-2	**-6**	3	2	**-11**	**3**	**-33**	100%	**-33**	+	High
				Seep wetland	D	Low	-3	-2	-3	-3	-2	**-6**	3	2	**-11**	**2**	**-22**	100%	**-22**	+	High

Phase	No.	Activity	Impact	Potentially affected watercourses: Name/s	PES	Overall Watercourse Importance	Intensity of Impact on Resource Quality – Abiotic Habitat (Drivers): Hydrology	Water Quality	Geomorph	Biota (Responses): Vegetation	Fauna	Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood (Probability) of impact	Significance	Risk Rating	Confidence level
	6	Ongoing alien and invasive vegetation removal (if required).	- Compaction of soils and loss of habitat as a result of ongoing disturbance from vehicles and equipment; - Impacts to water quality as a result of the application of herbicides; and - Disturbance of soils which could lead to erosion.	All ecosystems	D	Moderate	1	1	2	2	1	**4**	2	2	**8**	**3**	**24**	40%	**9,6**	**L**	Medium
	7	Functioning of the rehabilitated wetlands post-alien and invasive vegetation removal	No perceived negative impacts	All ecosystems	D	Moderate	-1	-1	-1	-1	-1	**-2**	3	2	**-7**	**3**	**-21**	100%	**-21**	**+**	High

APPENDIX F – Offset Determination Methodology

For the purposes of the residual impact assessment, all wetland losses were converted into the following quantities:

- **Functional hectare equivalents** in support of water resource management and disaster risk management. 'Functional hectare equivalents' are the equivalent area of wetland providing a measurable level of regulating ecosystem services (calculated as wetland area multiplied by functional value);
- **Habitat hectare equivalents** in support of ecosystem conservation. 'Habitat hectare equivalents' are the equivalent area of wetland with intact vegetation and habitat (calculated as wetland area multiplied by habitat value); and
- **Species offset ratios** in support of Species of conservation Concern (SCC). Ratios should be guided by factors such as threat status and the importance of the wetland in meeting species protection targets. Importantly, if no SCC make use of the wetland being investigated, then this assessment is not required (which applies to this offset strategy).

Digital Wetland Offset Calculators were used to calculate the above aspects. All calculations are automatically done in the relevant calculators. The digital calculator available within the WET-EcoServices (Version 2) tool (Kotze *et al*., 2020) was used to calculate the functional hectare equivalents (in support of water resource management), whereas the digital calculator from the Wetland Offset Guidelines (Macfarlane *et al.,* 2016), was used to calculate the habitat hectare equivalents (in support of ecosystem conservation targets) and species offset ratios (in support of SCC (where necessary)).

DETERMINING WATER RESOURCES AND ECOSYSTEM SERVICES OFFSET TARGETS

Calculation of Functional Hectare Equivalents

The functional hectare equivalents associated with each of the wetland units to be lost for the present state scenario were calculated as follows:

- The supply, demand and importance of the regulating ecosystem services provided by the wetland units were assessed using the WET-EcoServices (Version 2) tool (Kotze *et al*., 2020);
- The supply scores (including flood attenuation, streamflow regulation, sediment trapping and erosion control, and water quality enhancement; out of maximum score of 4) for each of the regulating services were then integrated into a single weighted supply score. This was done by assigning each of the regulating services a relative importance percentage based on the assessed demand for such services, and then aggregating these weighted scores. These weightings are used to define the offset currency mix for the study area;
- The weighted supply score was then converted into a functional value percentage by dividing the weighted supply score by the realistic reference state supply score for the relevant region; and
- The area of the relevant wetland unit (in hectares) was then multiplied by the functional value to calculate the functional hectare equivalents.

See Table F1 for a visual representation of the EcoServices interface for the offset calculations.

Table F1: Visual representation of the EcoServices interface for the offset calculations for functional hectare equivalents.

Integrating scores to assess Functional Value & Hectare Equivalents			
Function / Service Groups	**Weighting (%)**	**Present State**	**Future State**
Flood Attenuation	10%		
Streamflow Regulation	10%		
Sediment Trapping & Erosion Control	20%		
Water Quality Enhancement	60%		
Weighted Supply Score			
Realistic Reference score		3,2 (default)	
Functional Value (%)			
Wetland Area (Ha)			
Functional Hectare Equivalents (Unadjusted)			

Wetlands in certain settings may be playing more valuable roles than those in other locations. The loss of these wetlands may thus have a greater relative impact on Water Resources and Ecosystem Services and would require an increased offset target to adequately compensate for the services to be lost. A functional offset ratio is therefore introduced in order to differentiate between systems based on local demand. Loss of wetlands located in critical catchment contexts (high local demand scores) are therefore regarded as more significant (with higher offset requirements) than those located in contexts with low local demand.

The **wetland offset target** was calculated as follows: Functional importance ratios are calculated automatically in the spreadsheet tool based on the local demand scores for the wetland in question and weightings applied to the different Function / Service groups. Following the determination of the functional importance ratio, the *adjusted (final) functional hectare equivalents* can then be calculated by multiplying the *unadjusted functional hectare equivalents* by the functional importance ratio.

DETERMINING ECOSYSTEM CONSERVATION OFFSET TARGETS

Assessing Residual Impacts to Wetland Habitat

An assessment of the impact that wetland loss will have on wetland habitat and the ability to meet wetland conservation targets is necessary to determine Ecosystem Conservation offset targets. To undertake this assessment, use an appropriate tool to assess habitat intactness (condition) of the wetland (i) prior to and (ii) post-development. The residual impact is then calculated by comparing the pre- and post-impact scenarios.

In the absence of more appropriate measures, the vegetation module of WET-Health can be used as a surrogate measure for habitat intactness pre- and post-development. This is regarded as a more appropriate measure than the integrated PES score as the suitability of a wetland to support biodiversity is most strongly linked to vegetation attributes.

The selected habitat intactness measure must be expressed as a percentage (%). A wetland supporting completely natural habitat would therefore score 100% while a wetland that has been completely destroyed and lacks any natural habitat would score 0%. To calculate the change in functional value, the post development score (%) is simply subtracted from the pre-development score (%). The resultant score is then multiplied by wetland area to obtain a measure of the loss in wetland habitat in hectare equivalents.

Calculation of Habitat Hectare Equivalents

In summary, the habitat hectare equivalents associated with the wetland units within the project site for present state scenario were calculated as follows:

- The condition of the vegetation of the wetland units were assessed using the Level 1 WET-Health assessment tool (Macfarlane *et al.*, 2020).
- The vegetation impact scores out of 10 were converted into vegetation condition scores by subtracting the impact score from the maximum impact score of 10. E.g. an impact score of 6 is a condition score of 4. Thereafter, the condition scores were converted onto a habitat value percentage by dividing by the maximum condition score of 10.
- The area of the relevant wetland unit (in hectares) was then multiplied by the habitat value to calculate the habitat hectare equivalents.

Determining Ecosystem Conservation Ratios

Ecosystem Conservation ratios are calculated based on a suite of wetland characteristics that are important in determining conservation value. These include (i) ecosystem status; (ii) regional and national conservation context and (iii) local site attributes. The ecosystem status multiplier acts as the starting point but is adjusted downwards where the wetland has not been prioritised at regional or national level and where local site attributes that affect biodiversity value are sub-optimal.

Ecosystem Status

The significance of wetland loss is linked to the ecosystem threat status and protection levels of a given wetland type. An impact to a wetland with a higher threat status (e.g. Endangered) is therefore regarded as more significant than impacts to a wetland of lower threat status (e.g. Least Threatened) and therefore a higher ratio applies to the former. Similarly, impacts to wetland types that are poorly protected are regarded

The threat status and protection levels of **wetland vegetation groups**[7] should be used. The values are provided in the Wetland Offset Calculator spreadsheet as well summarised in this report. Where more suitable classifications and assessments are available at a regional level, these should be used.

The ecosystem status multiplier is simply calculated by multiplying the individual threat status and protection multipliers. The following scoring guidelines are used for this calculation:

- Threat status:
  Critically Endangered = 15; Endangered = 7.5; Vulnerable = 3; Least Threatened = 1
- Protection level:
  Not Protected = 2; Poorly Protected = 1; Moderately Protected = 0.75; Well Protected =0.25.

Regional and National Conservation Context

Wetlands have been prioritised through a number of systematic conservation planning processes. Maximum offset ratios are applied for priority wetlands, whereas requirements are lower for wetlands not prioritized in national or regional plans. This criterion should be evaluated by reviewing available national and regional datasets and using this to score the criterion using the scoring guideline below (Table F2).

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[7] The NFEPA Wetland Vegetation Group GIS dataset is available on SANBIs Biodiversity GIS: http://bgis.sanbi.org/NFEPA/NFEPAmap.asp#wetlandecosystemtypes

Table F2: Criteria for evaluating regional and national conservation context. Importance class Description Ratio

Importance class Description Ratio	Importance class Description Ratio	Importance class Description Ratio
Not specifically identified as important	Not a priority wetland in a local or regional conservation plan. Not identified as a wetland priority or within a River FEPA catchment (FEPA1).	0.5
Moderate importance	ESA (Ecological Support Area) identified in a local or regional conservation plan, or wetlands located within a River FEPA catchment (FEPA1).	0.75
High importance	The wetland is characterised by one or more special habitat or biodiversity attributes that makes the site important for local conservation efforts. This includes wetlands (i) supporting important populations of species of conservation concern; (ii) supporting large populations of wetland-dependant species; (iii) providing important migration, breeding or feeding sites; or (iv) characterised by unusually high natural habitat diversity.	1.0

Integrity of Adjacent Terrestrial Areas and Local Catchment

Recent research has emphasized that relatively undisturbed hinterlands are important for maintaining the populations of many wetland-dependant species. For example, many semi-aquatic species rely on terrestrial habitats for the successful recruitment of juveniles and to maintain optimal adult survival rates.

Adjacent terrestrial areas also screen wetlands from anthropogenic disturbances such as human presence and traffic or indirect impacts, such as noise and light pollution. Adjacent areas also provide potentially useful corridors, allowing the connection of breeding, feeding and refuge sites crucial to maintain the viability of populations of semi-aquatic species.

While adjacent terrestrial areas and local catchments provide important supporting habitat to allow species to carry out various activities, the functional value of such areas is still mostly dependent on the actual habitat value of the wetland. As such, the importance of these areas is secondary to wetland biodiversity attributes.

A weighting of 20% is applied to this criterion when calculating the local site context multiplier. As it is often difficult to precisely delineate the extent of the adjacent terrestrial area that is of importance to a particular wetland, a default 500m buffer (which aligns with DWS regulations) is used as the starting point. However, where local justification and data exists, a more accurately mapped local catchment or area of influence can be used instead. Landcover in the adjacent terrestrial areas should be mapped and assessed according to its ability to support wetland-dependent species.

Table F3 provides broad-level guidance but should be tailored according to available datasets and expert input.

Broad Landcover Category	Compatibility Score
Cultivated lands	0.5
Degraded natural habitat	0.75
Eroded Areas	0.25
Intact natural habitat	1
Forest plantations	0.25
Mines and quarries	0
Urban / built-up areas	0

A weighted average is then calculated as a measure of the compatibility of landuse within the buffer zone to support wetland-dependant biota. Scores calculated must be expressed as a range from 0 (totally incompatible landuse) to 1 (highly compatible landuse). A site level assessment for which the above guidance is followed is required for actual offset calculations. Where a desktop level assessment is being undertaken, the percentage natural habitat within 500m of the wetland can be used as a surrogate. This information is captured as “PERNAT500” in the NFEPA wetlands dataset or determined based on revised landcover mapping and analysis.

Local Connectivity

Landscape connectivity is important for local ecological processes including species movement. Whilst connectivity is regarded as being an important consideration, this is only relevant where a wetland is already able to support wetland dependant biota. It is also recognized that wetlands are able to support biota in the absence of good connectivity in instances where the wetland and buffer zone already provides sufficient suitable habitat. As such, this criterion is down-weighted significantly relevant to the other two site-based criteria. This criterion therefore only contributes 10% towards the local context multiplier.

This is evaluated by assessing the connectivity of the wetland to wetlands and other aquatic resources. Here, consideration should be given to (a) the proximity of wetland and / or riparian habitat (particularly within 500m of the wetland); (b) the level of fragmentation of habitat and therefore connectivity that remains and (c) the condition and associated biodiversity value (as supporting habitat) of adjacent water resources. These aspects can easily be assessed at a desktop level using a GIS or available aerial photography (including Google Earth imagery). Criteria for this evaluation are given in Table F4. For a desktop-level assessment, NFEPA wetland clusters can be used to identify wetlands with good connectivity. For detailed planning, a site-based assessment of connectivity must be undertaken using available information.

Table F4: Criteria for evaluating local connectivity.

Biodiversity Value Class	Description	Multiplier
Low connectivity	The wetland has very little connection with other water resources in the landscape (e.g. Very high levels of fragmentation with few wetlands nearby).	0.5
Moderate connectivity	The wetland is moderately connected with other water resources in the landscape. (e.g. Moderate levels of fragmentation but with reasonable connectivity to intact wetlands and /or riparian zones).	0.75
Good connectivity	The wetland is well connected with other water resources in the landscape. (e.g. Wetland clusters within 1 km of each other and embedded in a relatively natural landscape).	1.0

Calculating Final Ecosystem Conservation Offset Targets

The Ecosystem Conservation Ratio is first calculated by multiplying the (i) Ecosystem Status Multiplier; (ii) Regional and National Context Multiplier and (iii) Local Context Multiplier. The final Ecosystem Conservation offset target is then calculated by multiplying the loss in wetland habitat in hectare equivalents by the Ecosystem Conservation Ratio. All calculations are automatically done in the calculator.

Table F5: Digital Wetland Offset Calculator interface for 'Ecosystem Conservation Targets' as per the Wetland Offset Guidelines (SANBI and DWS, 2016).

Ecosystem Conservation Targets				
Impact Assessment	Prior to development	Wetland size (ha)		
		Habitat intactness (%)		
	Post development	Habitat intactness (%)		
		Change in habitat intactness (%)		
	Development Impact (Habitat hectare equivalents)			
Determining offset ratios	Ecosystem Status	Wetland Vegetation Group (or type based on local clasification)		
		Threat status of wetland	Threat status	
			Threat status Score	
		Protection level of wetland	Protection level	
			Protection level Score	
		Ecosystem Status Multiplier		
	Regional and National Conservation context	Priority of wetland as defined in Regional and National Conservation Plans	Moderate Importance	
		Regional & National Context Multiplier		
	Local site attributes	Uniqueness and importance of biota present in the wetland	Low biodiversity value	
		Buffer zone integrity (within 500m of wetland)	Buffer compatibility score	
		Local connectivity	Moderate connectivity	
		Local Context Multiplier		
	Ecosystem Conservation Ratio			
Offset Calculation	Development Impact (Habitat hectare equivalents)			
	Ecosystem Conservation Ratio			
	Ecosystem Conservation Target (Habitat hectare equivalents)			

CALCULATING SPECIES OF CONSERVATION CONCERN OFFSET TARGETS

The first step involves the identification and screening of species of potential concern that could be impacted by proposed development activities. The potential significance of impacts on species must then be assessed with input from an appropriate biodiversity specialist. Where significant negative residual impacts are anticipated, specific offset targets should then be set for each species using the minimum information requirements outlined below as a guide.

Assessing Residual Impacts to Species of Conservation Concern

An assessment of the predicted impact to species of conservation concern as a result of planned developments are required in order to set appropriate species targets. This assessment requires an appropriate species impact measure to be selected and applied to score the potential impact of planned development activities.

Methodologies for specifically quantifying impacts to threatened species for application in offset negotiations have not yet been developed for the South African context. Specialists undertaking this assessment will therefore need to consider the range of options available and use an appropriate species impact measure for local application. In cases where species requirements are strongly linked to habitat, the area and suitability of relevant habitat of the wetland may be used as a surrogate measure to determine preliminary offset targets (typically expressed as a species habitat measure). It is important to note here that measures may need to be tailored according to the specific habitat attributes of concern (e.g. hectares of core breeding or foraging habitat). In other situations, a composite measure of suitability that considers aspects in addition to habitat condition (e.g. local connectivity) may be relevant. For species whose presence is not strongly linked with measurable ecosystem attributes, a count of the number of individuals or other suitable species population measures such as numbers of breeding pairs may be a more appropriate means of quantifying potential impacts. Whichever measurement system is applied, it is important that the rationale for selection is clearly justified, and that the unit of measurement is clearly communicated. The same units must then be applied to both the impacted site and proposed offset locations. In the same way, it may be necessary to repeat this assessment for a range of different target species.

Once selected, the selected measurement system must be used to score the anticipated impact of planned development activities on species of conservation concern. This should be based on the change in the species impact measure, which is simply calculated by subtracting the post-development score from the predevelopment score.

Determining Offset Ratios

Ratios may be used to increase offset requirements for species of conservation concern in line with the significance of anticipated impacts. There is still very little guidance available for determining offset ratios for species of conservation concern. This should however be guided by factors such as threat status and the importance of the wetland in meeting species protection targets. Species conservation ratios will therefore need to be proposed by the biodiversity specialist and negotiated in consultation with the appropriate conservation agency. Species offset ratios should range from 1:1 (minimum requirement) upwards.

Calculating Final Offset Targets for Species of Conservation Concern

Offset targets for each species of conservation concern are calculated by multiplying the development impact (expressed as an appropriate species measure) by the relevant species conservation ratio. This process is repeated for each species of conservation concern selected.

OFFSET SITE SELECTION

In the first phase of the offset study, several *offset candidate sites* are considered. Candidate sites may include both on-site and off-site wetland offset options. A suite of site selection criteria has been identified by the National Wetland Offset Guidelines (DWS and SANBI, 2014), and are summarised in Table F6. Final offset site selection must ensure that suitable compensation for the loss of freshwater features due to the proposed development is achievable, while addressing the suitability of a site in terms of meeting Water Resource and Ecosystem Service requirements (as per criteria listed in Table F6.

Table F6. Offset site selection and screening tool to meet ecosystem conservation targets.

<table>
<tr><th>Criteria</th><th>Site attributes</th><th>Acceptability Guideline</th></tr>
<tr><td rowspan="5">Like-for-like Habitat Type</td><td colspan="2">1. Wetland habitat & HGM type – Wetlands selected should ideally be of the same habitat type (‘Like for like’ principle).</td></tr>
<tr><td>Wetland is of the same habitat in terms of vegetation composition / structure, HGM type and Wetland Vegetation Group:
• HGM type: Seeps and depressions
• Habitat type: Short and/ or medium height sedgeland and/or hygrophilous grassland habitat.
• Vegetation Group: Mesic Highveld Grassland Group 4.</td><td>Ideal</td></tr>
<tr><td>Wetland is a different HGM type but the same vegetation type, within the same Wetland Vegetation Group:
• HGM type: Channelled and un-channelled valley bottom wetlands
• Habitat type: Medium height sedgeland and / or hygrophilous grassland habitat.
• Vegetation Group: Mesic Highveld Grassland Group 4.</td><td>Acceptable</td></tr>
<tr><td>Wetland is a different HGM and habitat type, but within the same Wetland Vegetation Group:
• HGM type: Channelled and un-channelled valley bottom wetlands
• Habitat type: Medium to tall height herbaceous sedge and/or reed marsh vegetation.
• Vegetation Group: Mesic Highveld Grassland Group 4.
OR
Wetland is the same habitat type, but within a different adjacent Wetland Vegetation Group with a critical need for protection:
• HGM type: Seeps and depressions
• Habitat type: Short to medium tall sedgeland and/or hygrophilous grassland.
• Critically endangered Wetland Vegetation Group adjoining Mesic Highveld Grassland Group 4. with no protection.</td><td>Potentially acceptable but generally undesirable i.e. should only be considered if no viable offsets sites that are ideal / acceptable</td></tr>
<tr><td>Wetland is in another Wetland Vegetation Group (adjoining the Mesic Highveld Grassland Group 4.) of a lower threat status (trading down).</td><td>Generally unacceptable</td></tr>
<tr><td rowspan="4">Conservation Planning</td><td colspan="2">2. Landscape/Conservation planning – Wetland selection should be aligned with regional and national conservation plans where possible.</td></tr>
<tr><td>Wetlands have been identified as being of high importance in national, provincial and municipal conservation plans e.g. Critical Biodiversity Areas (CBAs), Freshwater Priority Areas (FEPAs), and/or within River FEPA catchments.</td><td>Ideal</td></tr>
<tr><td>Wetlands have been identified as moderately important in national, provincial and municipal conservation plans e.g. Ecological Support Areas (ESAs) and/or NFEPA support areas.</td><td>Acceptable</td></tr>
<tr><td>Wetlands have not been specifically identified as important in national, provincial and municipal conservation plans.</td><td>Potentially acceptable but generally undesirable</td></tr>
<tr><td rowspan="4">Wetland Condition</td><td colspan="2">3. Wetland condition — The habitat condition should ideally be in a moderately modified condition with good rehabilitation potential (Class C or D) and good/better than that of the impacted site prior to development.</td></tr>
<tr><td>Post-rehabilitation condition is Class B of higher.</td><td>Ideal</td></tr>
<tr><td>Post-rehabilitation condition is Class C.</td><td>Acceptable</td></tr>
<tr><td>Post-rehabilitation condition is Class D.</td><td>Generally unacceptable</td></tr>
<tr><td rowspan="2">Local Biodiversity Value</td><td colspan="2">4. Local biodiversity value - Wetlands that are unique or that are recognised as having high local biodiversity value should be prioritised for wetland protection.</td></tr>
<tr><td>The wetland is characterised by habitat and/or species of high biodiversity value i.e. presence of unique and noteworthy biodiversity attributes like high species or habitat diversity, rare species or habitat, unique features etc.</td><td>Ideal</td></tr>
</table>

	The wetland is characterised by habitat and/or species of moderate biodiversity value (i.e. some noteworthy features present).	Acceptable
	The wetland is characterised by habitat and/ species of low biodiversity value.	Generally unacceptable
Long-term Ecological Viability	**5. Ecological viability of site – Ecological connectivity and consolidation with other intact ecosystems together with the potential linkage between protected areas is preferable. Also, catchment land use transformation (current and planned) should be low to moderate to reduce risk of indirect impacts.**	
	The offset provides an opportunity to consolidate / expand existing protected areas. Catchment threats and pressures are low.	Ideal
	The wetland is well connected to other intact natural areas and there are no obvious land use threats to its long-term persistence.	Acceptable
	The wetland is moderately connected to other intact natural areas and there are measurable land use threats to its long-term persistence that can be managed.	Potentially acceptable but generally undesirable
	The wetland is poorly connected with other intact ecosystems/ there are land use threats to its long-term persistence and/or catchment highly transformed / catchment land uses have intense hydrological and geomorphological impacts.	Generally unacceptable
Land-legal Viability	**6. Land-legal Issues — The rezoning of the site to a formal conservation use is legally and practically feasible and does not contradict / is in line with current land use planning.**	
	Wetland is located on privately or state-owned land with no conflicting current or future land use zoning and is located within a single cadastral unit / property.	Ideal
	Wetland is located on privately or state-owned land with no conflicting current or future land use zoning and is located across 2-4 properties.	Acceptable
	Wetland is located on privately or state-owned land with no conflicting current or future land use zoning and is located across 5-8 properties.	Potentially acceptable but generally undesirable
	Wetland is located on privately or state-owned land with conflicting current or future land use zoning or development applications / rights and/or is located across >8 properties and/or the wetland is located within tribal authority land.	Generally unacceptable
Demand for Regulating Services	**7. Downstream demand for regulating ecosystem services — a higher demand for regulating ecosystem services provides an indication of the opportunity for the realisation of the gains in ecosystem services as well as the importance of such.**	
	There is a high to very high demand for regulating ecosystem services by downstream users.	Ideal
	There is a moderate to moderately high demand for regulating ecosystem services by downstream users.	Acceptable
	There is a low demand for regulating ecosystem services by downstream users.	Generally unacceptable
Rehabilitation Opportunities / Potential	**8. Rehabilitation opportunities – sites with a lower cost to benefit ratio for achieving wetland functional gains and with good rehabilitation potential are preferable over sites that require extensive and costly rehabilitation to achieve a PES C or higher.**	
	Wetland has good rehabilitation potential that can be achieved by relatively cost-efficient interventions.	Ideal
	Wetland has good rehabilitation potential that can be achieved by costly and extensive interventions.	Acceptable
	Wetland has poor rehabilitation potential OR Wetland has moderate rehabilitation potential that can be achieved by costly and extensive interventions.	Generally unacceptable

APPENDIX G – Rehabilitation and Management Plan Framework

Standard Practices for Planning, Implementing, and Monitoring Ecological Repair Projects

Important principles of rehabilitation or Ecological Repair project **implementation** include:

- No further or latent damage on natural resources is to be caused by the restoration/rehabilitation works;
- Planned interventions are interpreted and carried out responsibly, effectively and efficiently by suitably qualified, skilled and experienced people or under the supervision of a suitably qualified, skilled and experienced person;
- All interventions are undertaken in a manner that is responsive to natural processes and fosters and protects potential for natural and assisted recovery;
- Corrective changes of direction (to adapt to unexpected ecosystem responses) are facilitated in a timely manner and are ecologically informed and documented;
- All projects exercise full compliance with work, health, and safety legislation; and
- All project operatives communicate regularly with key stakeholders (or as required by funding bodies) to keep them abreast of progress.

The below figure (Figure G1) outlines standard practices used in Ecological Repair project planning where professional staff or contractors are engaged. They can be applied any rehabilitation or restoration project but the degree to which they are applied should be adapted to correspond to the size, complexity, degree of damage, regulatory status, and budgets of the particular project.

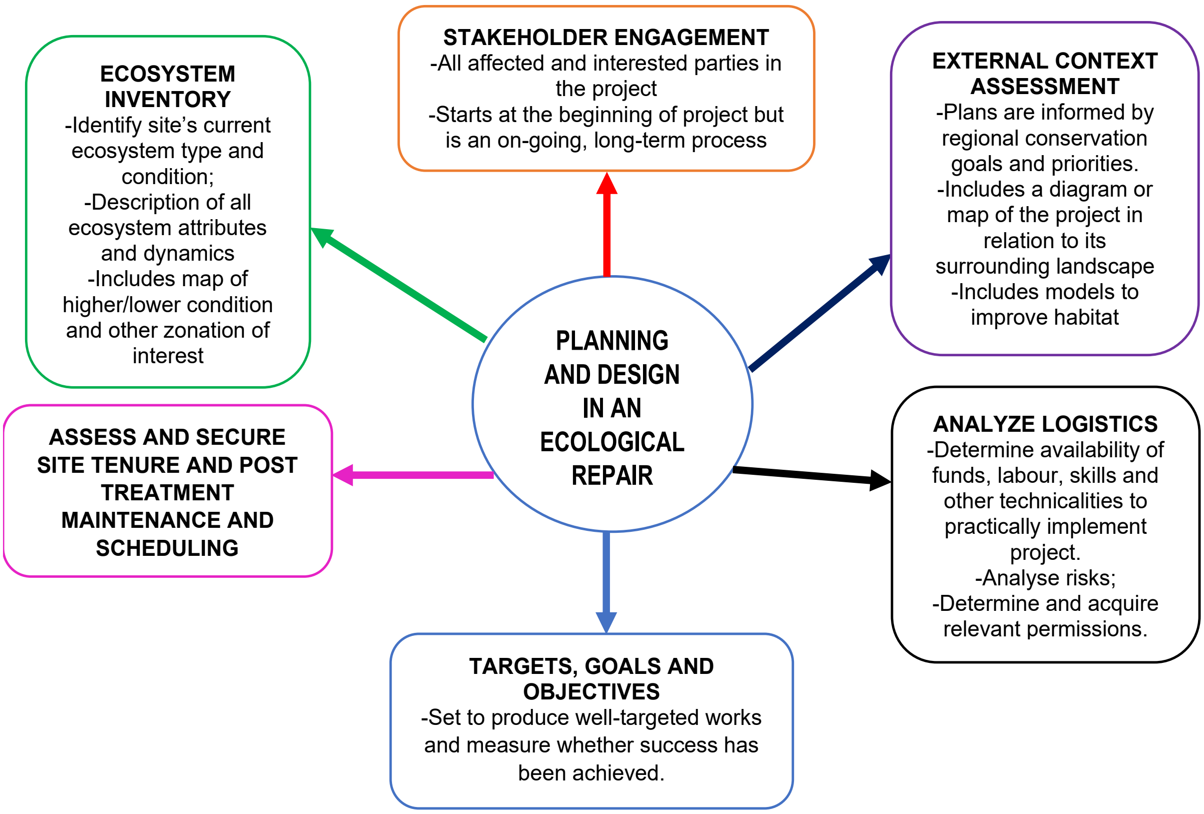


Figure G1: Planning and design process of rehabilitation and ecological restoration projects, according to McDonald *et al.* (2016).

Key Actions in Rehabilitation and Restoration Projects

Rehabilitation activities should be undertaken on a continual basis, with each iteration improving on the previous plan, i.e., in a continuous, cyclic nature. It is crucial that the rehabilitation plan be an ongoing process, where the plan is continually refined and improved. To achieve this, a rehabilitation framework has been proposed. This cyclic framework is divided into four phases, namely a planning phase, an implementation phase, a monitoring phase, and an adaptive management phase (Figure G2). This framework is a modified version of that presented by Hatting *et al.* (2019).

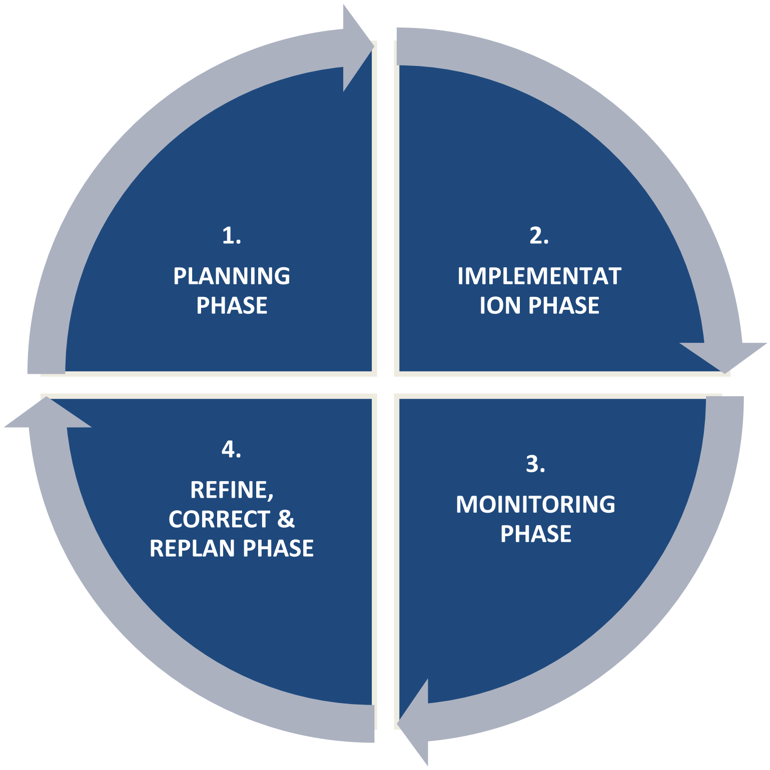


Figure G2: Schematic diagram illustrating the cyclic nature of the proposed rehabilitation framework. Each iteration (i.e., phase) is intended to identify strengths and weaknesses of the framework and implement improvements in the next round of rehabilitation.

The Phases can be summarised as follows (Hatting *et al.,* 2019):

1. Planning Phase: this phase outlines the rehabilitation targets and objectives that rehabilitation activities aim to achieve. It involves setting out a vision and objectives as well as a conceptual rehabilitation plan and design that can be implemented in conjunction with operational mining activities;
2. Implementation Phase: this phase involves the rehabilitation activities needed to reach rehabilitation targets. This phase involves the in-field rehabilitation context of the rehabilitation plan set out in the planning phase, i.e., the on-site implementation of rehabilitation activities (e.g., soil amelioration activities, vegetation trials etc.);
3. Monitoring Phase: this phase provides recommendations on monitoring methods required to successfully evaluate the implemented rehabilitation activities. During this phase the need for refinement of implementation activities is identified; and
4. Adaptive Management Phase: this phase involves a “refine-correct-re-plan” approach that ensures that the rehabilitation plan is continuously being updated and improved so to effectively achieve the rehabilitation targets set out in the planning phase.

Key Action 1: Planning: rehabilitation and restoration practice is based on knowledge of an appropriate local native reference ecosystem, taking environmental change into account.

Establishing the reference ecosystem model can be achieved by using existing reference sites that serve as analogues between the degraded site and its restoration target. When existing reference sites are unavailable, the reference model can be estimated, by collecting ecosystem information on local native plants, animals, other biota, and abiotic conditions from various sources. These sources include extant reference sites, field indicators, historical records, and predictive data. The reference model must account for ecosystem capacity to adapt to existing and anticipated environmental change. As such, the process of selecting a reference model should consider contemporary examples where they exist.

The second key concept underpinning successful Ecological Repair is clearly identifying what site-specific ecosystem attributes must be restored to facilitate ecosystem recovery. This involves dividing broad categories (species composition) into more detailed sub-categories (flora) to inform a given project's goals and objectives. Specific, measurable indicators are then used to evaluate an ecosystem's attributes before and after rehabilitation efforts to determine whether desirable change is being achieved or not. Effective indicators include details of the attribute (e.g.: physical conditions) to be evaluated; desired outcomes, e.g., soil rations; magnitude of the effect, e.g., 40% increase in plant cover) and specific timeframes in which outcomes are to be achieved. Please refer to Table DC below for the six main ecosystem attributes that can be measured in a rehabilitation or restoration project.

Table G1: Six important attributes of a target ecosystem and their goals and objectives, to help measure ER success.

Attribute	Examples of broad goals – for which more specific goals and objectives appropriate to the project would be developed
Absence of threats	Cessation of threats such as overutilization and contamination; elimination or control of invasive species.
Physical conditions	Reinstatement of acceptable topographical landscape features.
Species composition	Presence of desirable plant and animal species and absence of undesirable species.
Structural diversity	Reinstatement of layers, faunal food webs, and spatial habitat diversity.
Ecosystem functionality	Appropriate levels of growth and productivity, reinstatement of nutrient cycling, decomposition, habitat elements, plant-animal interactions, normal stressors, on-going reproduction, and regeneration of the ecosystem's species. Appropriate provision of goods and services to the local community.
External exchanges	Reinstatement of linkages and connectivity for migration and gene flow; and for flows including hydrology, fire, or other landscape scale processes.

Key Concept 2: Implementation (Approaches to ecosystem regeneration):

There are three approaches to facilitating ecosystem regeneration: "natural", "assisted" and "reconstruction". The diagram below describes what each approach entails, and where each approach is warranted, along the trajectory of ecosystem recovery. The more degraded and less functional an ecosystem, greater is the effort that is required to restore it. Reconstruction by means of engineering (e.g., earth works and artificial soil fertilisation) is required when the land has poor capability. However, as abiotic barriers are overcome by reconstructive efforts, natural processes take over and humans involved in the Ecological Repair project, begin to only assist what is naturally occurring by adding biotic factors. The ultimate goal is to get the ecosystem to the point of self/natural regeneration where human inputs are minimal. Refer to Figure G3 below for an illustration of the three approaches to ecosystem regeneration.

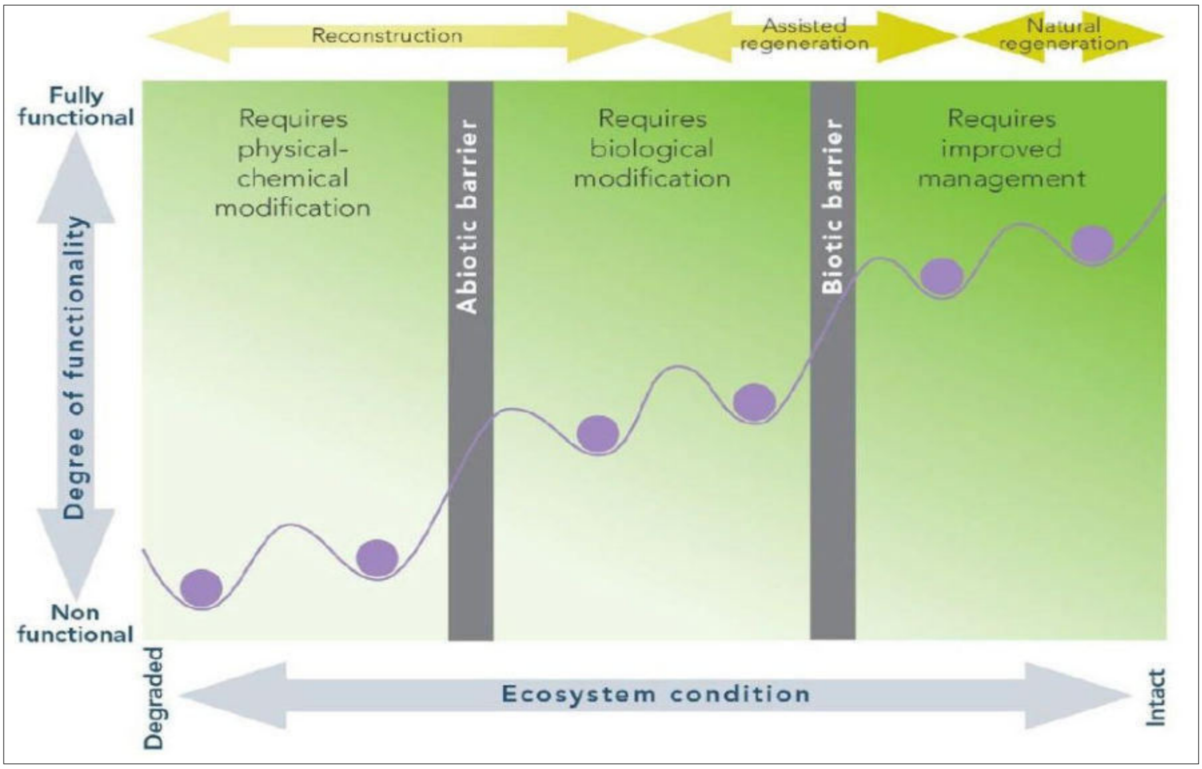


Figure G3: Conceptual model of ecosystem degradation and responses to it through restoration (McDonald *et al.,* 2016).

<u>Key Concept 3 and 4:</u> Maintenance and monitoring.

The next stage in the procession of an Ecological repair project after implementation, **is monitoring and maintenance**. Successful Ecological repair projects rely on well-developed monitoring and maintenance programs. These programs inform managers whether rehabilitation and restoration interventions and treatments are successful and what approaches need to be taken for future work. The management body is responsible for ongoing maintenance to prevent negative impacts and carries out any required monitoring of the site after completing the project. This is to ensure that the site does not regress into an unacceptable state. Comparison with an appropriate reference ecosystem will be ongoing. Important aspects of monitoring are as follows:

- Monitoring evaluated results i.e., determines whether goals and objectives are being achieved or not, and why;
- Collects baseline ecosystem data prior to works, to compare ecosystem before and after interventions and treatment;
- Makes use of appropriate sampling techniques for the area, that are scientifically sound. Sampling design can be simple but should still be scientifically rigorous and produce high confidence in results. In other words, data collection should be repeated at regular intervals, in the same sampling plots, using the same survey techniques. The simplest method that can be used, is fixed-point photography, with accompanying species composition and ecosystem descriptions. Ecological change is however, best expressed when quantified;
- Adequate records of interventions and treatments are maintained to ensure adequate implementation, inform adaptive management and enable future evaluation of results relative to the implemented actions. All treatment data, along with all evaluation monitoring records are maintained for future reference; and
- The management body is responsible for ongoing maintenance to prevent deleterious impacts and carries out any required monitoring of the site after completion of the project to ensure that the site does not regress into an undesirable state. Comparison with an appropriate reference ecosystem will be ongoing.

Ecosystem recovery may take many years to accomplish. As such, managers should adopt strategies of continuous improvement. To help managers track progress towards project goals over time, a star rating tool (5-levels or 'stars') for assessing and ranking degree of recovery over time can be used. Please see Table G2 for an example of how the "five-star" system for recording ecosystem recovery can be used against the six main ecosystem attributes referred to in key concept 2. Alternatively, a recovery wheel depicted in Figure G4 below can be used to track recovery overtime. Some key notes for interpreting the 5-star evaluation system are presented below:

- The system serves to evaluate the progression of an ecosystem along a trajectory of recovery;
- The system represents a conceptual gradient, providing a framework that can be interpreted by managers in more quantitative terms to suit a specific ecosystem;
- Evaluation can only be as rigorous (and therefore as reliable) as the monitoring that it informs; and
- Evaluation using the 5-star system must be site- and scale-specific.

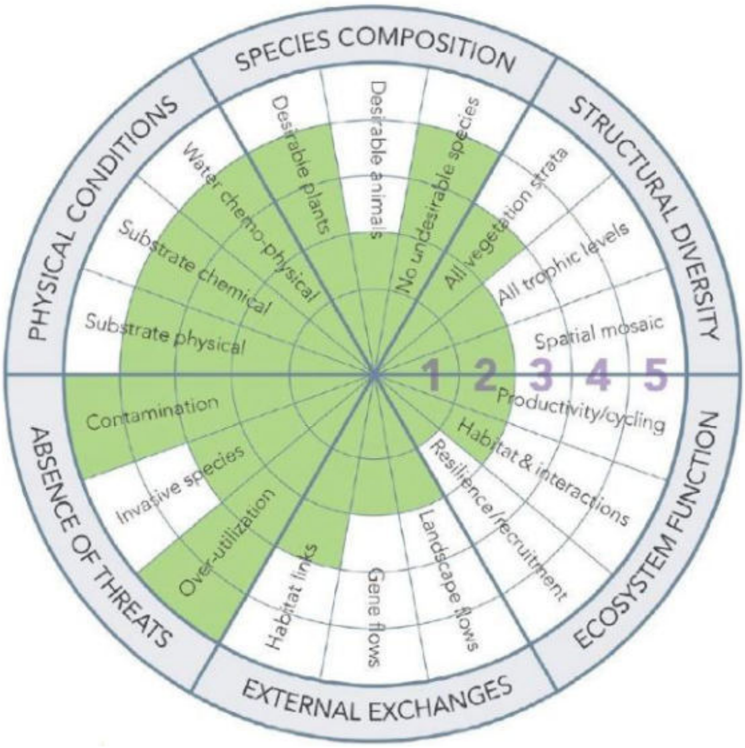


Figure G4: Progress evaluation 'recovery wheel' depicting a hypothetical 1-year old reconstruction project on its way to a 4-star condition. This template allows a manager to illustrate the degree to which the ecosystem under treatment is recovering over time. Note: Sub attribute labels can be adjusted or more added to better represent a particular ecosystem.

Table G2: A generic 1–5-star recovery scale interpreted in the context of the six key ecosystem attributes used to measure progress towards a self-organizing status (McDonald *et al.*, 2016).

ATTRIBUTE	★	★★	★★★	★★★★	★★★★★
Absence of threats	Further deterioration discontinued and site has tenure and management secured.	Threats from adjacent areas beginning to be managed or mitigated.	All adjacent threats managed or mitigated to a low extent.	All adjacent threats managed or mitigated to an intermediate extent.	All threats managed or mitigated to high extent.
Physical conditions	Gross physical and chemical problems remediated (e.g., contamination, erosion, compaction)	Substrate chemical and physical properties (e.g., pH, salinity) on track to stabilize within natural range.	Substrate stabilized within natural range and supporting growth of characteristic biota.	Substrate securely maintaining conditions suitable for ongoing growth and recruitment of characteristic biota.	Substrate exhibiting physical and chemical characteristics highly similar to that of the reference ecosystem with evidence they can indefinitely sustain species and processes.
Species composition	Colonising native species (e.g., ~2% of the species of reference ecosystem). No threat to regeneration niches or future successions.	Genetic diversity of stock arranged and a small subset of characteristic native species establishing (e.g., ~10% of reference). Low onsite threat from exotic invasive or undesirable species.	A subset of key native species (e.g., ~25% of reference) establishing over substantial proportions of the site. Very low onsite threat from undesirable species.	Substantial diversity of characteristic biota (e.g. ~60% of reference) present on the site and representing a wide diversity of species groups. No onsite threat from undesirable species.	High diversity of characteristic species (e.g., >80% of reference) across the site, with high similarity to the reference ecosystem; improved potential for colonization of more species over time.
Structural diversity	One or fewer strata present and no spatial patterning or trophic complexity relative to reference ecosystem.	More strata present but low spatial patterning and trophic complexity, relative to reference ecosystem.	Most strata present and some spatial patterning and trophic complexity relative to reference site.	All strata present. Spatial patterning evident and substantial trophic complexity, developing, relative to the reference ecosystem.	All strata present and spatial patterning and trophic complexity high. Further complexity and spatial pattering able to self-organize to highly resemble reference ecosystem.
Ecosystem functionality	Substrates and hydrology are at a foundational stage only, capable of future development of functions similar to the reference.	Substrates and hydrology show increased potential for a wider range of functions including nutrient cycling, and provision of habitats/resources for other species.	Evidence of functions commencing - e.g., nutrient cycling, water filtration and provision of habitat resources for a range of species.	Substantial evidence of key functions and processes commencing including reproduction, dispersal and recruitment of species.	Considerable evidence of functions and processes on a secure trajectory towards reference and evidence of ecosystem resilience likely after reinstatement of appropriate disturbance regimes.
External exchanges	Potential for exchanges (e.g., of species, genes, water, fire) with surrounding landscape or aquatic environment identified.	Connectivity for enhanced positive (and minimized negative) exchanges arranged through cooperation with stakeholders and configuration of site.	Connectivity increasing and exchanges between site and external environment starting to be evident (e.g., more species, flows etc.).	High level of connectivity with other natural areas established, observing control of pest species and undesirable disturbances.	Evidence that potential for external exchanges is highly similar to reference and long-term integrated management arrangements with broader landscape in place and operative.

APPENDIX H – Alien Plant Species Control and Specific Species Management

Appendix H1 – Alien Plant Species Control

The dominant alien floral species are predominantly associated with agricultural activities and should be identified by the ECO prior to the commencement of construction. An Alien and Invasive Plant (AIP) species control program should be developed for control of these species. The basic principles of a control program are presented below.

AIP control programs must include the following three phases (Campbell, 2000):

- Initial Control Phase: The existing population must be drastically reduced.
- Follow-up Control Phase: Control of coppice regrowth, root suckers and seedlings.
- Maintenance Phase: Low AIP density and numbers with a low annual control cost. During this phase, AIP is no longer considered a problem. It is important to monitor the situation of infestation during the growing season of the plants as to avoid re-infestation and to keep the control cost at a minimum.

1. Control Methods

To control AIP successfully, one must use a number of control methods. When using herbicides, the recommendations that are stated on the label of the specific product must be adhered to (Campbell, 2000).

2. Integrated Control Strategies

A combination of the most suitable and effective methods should be used to control a specific species in a particular situation. The following selection of appropriate control methods should take into account the following (Campbell, 2000):

- Species of alien and invasive weeds;
- The type of growth form (i.e. seedling, sapling, shrub or tree);
- The density of infestation;
- The terrain where the infestation is present;
- Rehabilitation requirements
- What resources are available;
- Speed or urgency that the control of the infestation requires – physical removal and biological control will take longer than chemical control.

2.1 Initial control phase

- **Hand pull:** saplings and seedlings must be pulled out by hand and regrowth must be controlled with herbicide (Campbell, 2000). All guidelines for the application of herbicide listed in this Rehabilitation Plan must be adhered to;
- **Frill:** a cane knife is used to cut frills into the stem. Herbicide must be applied (1-2 mm per frill) and must be done in 30min after frilling;
- **Soil application:** herbicide is applied to the soil and taken up by the plants roots

Integrated Strategies to Control Alien Trees (Standing trees; Campbell, 2000):

- Basal bark: Recommended herbicide is mixed with diesel as carrier and applied to the basal part of the stem;
- Strip bark: Bark is stripped from stem at waist height to ground level;

- Hand pull: Saplings and seedlings must be pulled out by hand and regrowth should also be controlled by hand pulling, or foliar spray;
- Frill: Use a cane knife and make frills into the stem. Herbicide must be applied (1-2mm per frill) and must be done in 30min after frilling;
- Foliar spray: Foliar spray application of specific herbicides; and
- Soil application: Herbicide is applied to the soil by means of foliar spray of specific herbicides and taken up by the plant's roots.

Fell trees – control stumps:

Trees should be felled and as soon as the trees are down, the stumps need to be treated with a registered herbicide mix with suitable dye and applied with a paintbrush, hand sprayers or knapsack sprayers. A low pressure must be used when using the hand- and knapsack sprayers, and a solid cone nozzle, e.g., CE1 or TG1. Wood needs to be removed and areas must be revegetated with grass species occurring naturally in the area (Campbell, 2000).

The following equipment must be used to cut trees and saplings:

- Chainsaw;
- Bow saw;
- Brush cutter;
- Cane knife; and
- Trolley mounted roll saw, e.g., "Bosvreter".

NB: The height of the cut stump must not exceed 15cm.

- **Methods for controlling trees:**
  - Cut stump treatment;
  - Total stump treatment; and
  - Using herbicide plugs.

- **Methods for controlling coppice, saplings and seedlings:**
  AIP infestation can comprise of different growing forms, and some of the growth forms cannot be utilised. These plants need to be cut with a brush cutter and the stumps need to be treated with herbicide that was mixed with a dye to show where treatment was applied. Foliar spray of the coppice tends to be the most effective method to use.

Placement of disposed wood is very important because if a fire breaks out, the brushwood can increase the intensity of the fire. When the fire intensity is too high, soil structure will be broken down and seedbanks in the soil will also be destroyed and bare patches of sterilized ground will be formed. The best practice is to use the branches to control erosion, create habitat or chip and remove for compost, bricketing or even as a fuel source. The utmost care must be taken to prevent any seeds of AIPs from spreading when using branches as brush packing.

Integrated Strategies to Control Alien Shrubs:

- **Alien shrubs that are less than 1m tall (Campbell, 2000):**
  - Registered herbicide must be used for foliar application;
  - Selective broadleaf herbicide that will not negatively impact on grass must be used when foliar application is done. When grass is not present, a selective or non-selective registered herbicide can be used;
  - Whenever dense seedling growth that are of uniform height are present, a flat fan nozzle with knapsack must be used; and
  - Seedling growth that is of uneven height (root suckers, short saplings, and coppice growth) a cone nozzle must be used.
- **Alien shrubs that are taller than 1m (Campbell, 2000):**
  - Shrubs that are taller than 1m must be reduced by using a brush cutter or cane knives; and
  - Mechanical uprooting of shrubs is not always a preferred method because the soil is disturbed, and this increases the risk of alien vegetation infestation. Erosion is also promoted by this activity, and soil loss will occur. Mechanical uprooting can be done in areas that have a dense grass cover, as the roots of the grass will keep the soil intact. After

uprooting the soil must be levelled and, if grass seeds are present, some grass seeds must be placed on these areas to promote grass regrowth.

Integrated Strategies to Control Alien Herbs (Milton, 2016):

Mechanical Control

Obstructive / encroaching indigenous vegetation or AIP species are to be manually or mechanically removed as far as possible. In order to prevent chemical contamination of the watercourses, chemical control should be avoided.

- **Manual removal:**
  - Immature, broad-leaved herbaceous weeds can be removed easily with a hoe or spade; and
  - Should the weeds have seed heads they must be gathered up, put in garbage bags or waste drums, transported and disposed of at a licensed waste disposal facility.

Chemical Control: taken from Safe and Effective Herbicide Use: A handbook for near-water applications. Online available at: https://www.epa.sa.gov.au/files/477387_pesticide_water.pdf**:**

Where manual removal consistently fails to reach control targets of AIP species and chemical control is deemed necessary, the following considerations are important:

- Prior to using herbicides in a watercourse or its edge, ensure you have considered all non-chemical options. If there is no alternative, then ensure that appropriate herbicide and application techniques are selected for the site as per herbicide label information and the Working for Water Herbicide guideline;
- **Pre-emergent herbicides are not suitable for watercourse use** – These herbicides are typically applied before the pest plant germinates and are often residual in the soil for long periods. They are generally not considered to be safe for use near waterbodies and are not recommended for use due to their persistence in the environment;
- **Selective herbicides** are designed to act on only one type of pest plant. Generally, selective herbicides will control either broadleaf species, grasses or woody weeds. These herbicides are useful when the focus may be on controlling a particular weed species. These herbicides may persist as residues in the environment and only registered herbicides for targeted species should be used;
- **Non-selective herbicides, if applied correctly, could have a minimal impact on the environment**. These herbicides are designed to be applied directly to the target pest plant, either through being sprayed onto foliage or applied directly to the cambium layer;
- If herbicide use is deemed necessary, the time of herbicide application needs to coincide with a time when rainfall, and t run-off, is likely to be low so to minimise impacts on aquatic life; and
- Preventing re-establishment will require follow-up control and revegetating the area with native grasses and shrubs.

Integrated Strategies to control alien grasses:

- **Burning**: Not recommended as burning can stimulate alien grasses and lead to in-effective management.
- **Hand clearing**: Not recommended for dense infestations as hand clearing / pulling can lead to significant soil disturbance and, consequently, can promote the establishment of alien grasses or other pioneer alien species.
- **Mowing**: Effective for dense stands of annual grasses if performed where grasses are in flower and seed has not yet set.
- **Chemical control**: Most effective method of controlling alien grasses. Pre-emergent systemic herbicides are most effective. Use within the riparian zone or a watercourse is however not recommended.
  Chemical control to be restricted to registered herbicides only.

3. Follow up control (Campbell, 2000)

Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made with the initial control work in the initial phase. If the follow-up control phase is neglected, the alien infestation will become worse and denser than before the eradication process started. It is essential to sustain the follow-up phase because it will prevent the suppression of alien seedlings on planted grasses.

Follow up treatment control must use the following methods:

- Chemical control methods: Only use registered herbicides to control any alien species. Instruction on the herbicide labels must be followed carefully.
- Mechanical control methods
- Biological control methods that are available.

<table>
<tr><td colspan="2">Control methods for dense regrowth: After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers.</td></tr>
<tr><td>Chemical control / foliar application:</td><td>• Plants that are less than 1 m in height must be controlled by foliar application.
• Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle.
• If grass is present, the use of a registered selective herbicide must be used so as not to harm the grass, and if grass is not present a registered non-selective or selective herbicide can be used.
• Suitable dye must be used at all times to limit over- or under spray of areas.</td></tr>
<tr><td>Mechanical control:</td><td>• Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.
• When stump density is high, plants should not be cut. This is impractical, and there will be many untreated stumps. Instead cut the stumps in dense areas with brush cutters and remove the top growth. Stumps will start to coppice, and foliar spay must be used to control the coppice regrowth.</td></tr>
<tr><td colspan="2">Control methods for low-medium density regrowth: Neglecting to control low-medium density regrowth will result in densification and spreading as well as additional control costs.</td></tr>
<tr><td>Chemical control:</td><td>• Cut stump method must be used and stumps must be cut up to a height of 15 cm and must be sprayed within an hour of cutting the plant with a registered herbicide. Herbicide must be applied with knapsack sprayers set to low pressure, using cone nozzles, e.g. TG1 or CE1. Hand sprayers can also be used to apply herbicide. A suitable dye must be used to ensure all stumps are treated. Only the cut surface must be treated with herbicide, and the side of the stumps must not be treated.
• Foliar spray can be applied to regrowth that is up to the height of 1m. Herbicide must be applied using knapsacks with solid cone nozzle and must be mixed with a suitable dye to prevent over- or under spraying of treated areas.</td></tr>
<tr><td>Mechanical control:</td><td>• Seedlings can be removed from wet soil by hand pulling. Gloves can be used for hand protection during the operation.</td></tr>
</table>

Table H1: Manual and Mechanised Methods of Clearing.

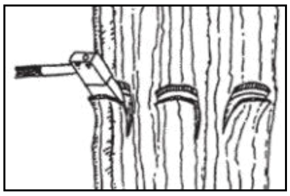
<table>
<tr><th>Risk to Ecosystem</th><th>Infestation density & plant size targeted</th><th>Required Tools</th><th>Reference Photograph</th></tr>
<tr><td colspan="4">HAND-PULLING
All seedlings Must be pulled out by hand. All root material should be removed to avoid re-sprouting of the plant.</td></tr>
<tr><td>Safe to use throughout the subject property including watercourses as no chemicals are used.

Hand pulling does create soil disturbance, but if the area is sparsely invaded such disturbances are unlikely to be ecologically damaging.</td><td>Low or sparse infestation.

Aimed at seedlings and saplings:

Plants that are small enough to be pulled out with roots intact.</td><td>No special tools required

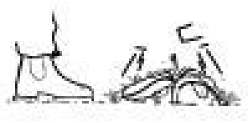
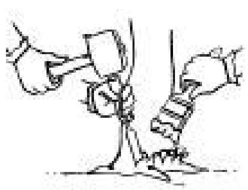
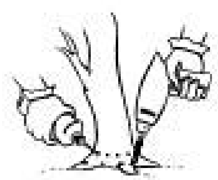
Gloves and spade optional.</td><td></td></tr>
</table>

Risk to Ecosystem	Infestation density & plant size targeted	Required Tools	Reference Photograph
WRENCH PULLING A weed wrench is a manually operated, all-steel tool designed to remove woody plants by uprooting it.			
Safe to use throughout the subject property including watercourses as no chemicals are used. Wrench pulling does create soil disturbance, but if the area is sparsely invaded such disturbances are unlikely to be ecologically damaging.	Low or sparse infestation. Aimed at saplings: Plants that are small enough to be pulled out with roots intact.	A weed wrench	
RING-BARKING Removal of a ring of bark at least 25 cm wide and pull down to just below ground level. Ring barking interferes with the circulation of the tree and results in tree mortality.			
Low No contamination of watercourses with herbicides as these are applied directly to the tree.	Low or sparse infestation. Aimed at killing large / mature trees.	A cane knife or axe is used to remove the bark of the tree and cambium, in a horizontal band about 30 cm wide (about 50 cm from the ground).	
STRIP-BARKING			
Low No contamination of watercourses with herbicides as these are applied directly to the tree	Low or sparse infestation. Most effective for large / mature trees: The bark of large trees can be stripped completely, from waist height down to the base of the trunk.	Cane knife or axe. ***Herbicide, if used, should be applied to the stripped surface immediately after strip-barking. This is an effective but time-consuming method.*	
FRILLING *more cost-effective than ringbarking or strip-barking. The technique where an axe or cane knife is used to chip/cut around the base of a tree (±2 mm deep) in order to place herbicide into the cuts (cutting not to be as deep as to ringbark). Herbicide to be applied within 30 minutes from frilling.			
Low No contamination of watercourses with herbicides as these are applied directly to the tree	Low or sparse infestation. Most effective for mature trees: Small trees can be frilled by cutting an angled groove into the bark and cambium, right the way around the tree trunk.	Cane knife or axe, depending on how hard the bark and cambium layers of the tree are. Herbicide is then applied into the groove, which kills the tree as it seeps into the cambium tissue.	

Risk to Ecosystem	Infestation density & plant size targeted	Required Tools	Reference Photograph
CUT-STUMPING			
<u>Low</u> No contamination of watercourses with herbicides as these are applied directly to the tree. **Stumping can also imply the treatment of the remaining stump after felling with an appropriate herbicide.	Low or sparse infestation. Most effective for large / mature trees, but works on saplings too: Plants with a stem/ trunk diameter larger than 10 mm can be cut as low to the ground as possible with a saw or cane knife.	Saw or cane knife	
SLASHING			
<u>Low</u> No contamination of watercourses with herbicides as these are applied directly to the tree. ***Care should be taken to prevent plant material and propagules from ending up in surrounding natural areas.*	Low or sparse infestation. The seed stalks/branches of annuals (plants that die each year after they set seed) can be slashed before the seeds have matured.	Slashed with a cane knife, mattock, bill hook or slasher before the seeds have matured. ***Costs are generally low for controlling annuals in this way, as no herbicide is required.*	
BRUSH-CUTTER			
Possible pollution caused by bar oil[8]., spills from refuelling or mixing of oil and fuel.	Dense stands can be cleared. Popular for controlling low-growing thickets of AIPs.	Heavy duty motorised brush-cutters that are usually powered by a small two-stroke engine.	
CHAINSAW			
Possible pollution caused by bar oil, spills from refuelling or mixing of oil and fuel.	Dense stands can be cleared. For felling large trees and can be used to cut logs and branches into shorter lengths.	A chainsaw	

[8] Bar oil is designed to stick to the chain and bar of a chainsaw

Table H2: Manual and Mechanised Methods of clearing, with the application of herbicide (taken from Safe and Effective Herbicide Use: A handbook for near-water applications. Online available at: http://www.epa.sa.gov.au/files/477387_pesticide_water.pdf

Picture reference	Method	Type of Weed	Equipment Required	Notes
	Foliar Spray	Herbs, Bulbs, Woody weeds	Knapsack, Vehicle mounted tank, Herbicide mix	Ensure herbicide is being applied at the right concentration and rate to cover the foliage of the pest plant with fine droplets and avoid run-off. A flat-fan nozzle and low pump pressure will assist in reducing spray drift.
	Cut and Swab	Woody weeds, Shrubs and Trees	Saw, chainsaw, Loppers, Herbicide mix, Bush for herbicide application	Ensure herbicide is applied quickly to cut stump (usually within 30 seconds). Apply during active growing period of plant for best results. Do not apply herbicide to the point of run-off.
	Frill and Paint	Shrubs and Trees	Axe, hatchet, Herbicide mix, Brush for herbicide mix application	Frill trunk thoroughly and treat major surface roots where visible. Expose sapwood and apply herbicide immediately. For deciduous species, apply herbicide during active growth period.
	Drill and Fill	Shrubs and Trees	Drill, Application bottle, injection gun, Herbicide mix.	Drill to sapwood only and apply herbicide to drill hole immediately. Drill and fill major surface roots where appropriate. For deciduous species, apply herbicide during active growth period.
	Scrape and Paint	Woody weeds	Knife or sharp blade, Paintbrush, applicator bottle, Herbicide mix.	Scrape main or major stems of the plant. Apply herbicide immediately after scraping.

Implement Annual Alien and Invasive Control Plan (Campbell, 2000):

- An Annual Operation Plan (AOP) Must be implemented for areas that are of high priority. The following Must be included into the budget for the specific resources e.g., equipment, herbicide and labour. Care Must be taken not to control too large of an area at a time. The following is an approximate indication of how much of the budget Must be dedicated to each aspect:
  - 75% Must be used to follow-up control and also rehabilitation of the previous year's work;
  - 20% Must be used to control new areas; and
  - 5% will be for an emergency e.g., loss of planted grass, mass seed regeneration or coppice.
- Timetables Must be created for the control operations. Care Must also be taken to include the time when operations fall behind due to unfavourable weather or labour strikes; and

- The plan must be set out in such a way that it should be flexible enough as to adjust it, so progress is made.

4. Monitor performance and change actions as necessary

It is important that monitoring of the AIPCP be carried out to determine the efficiency of the plan and to determine the costs and the allocation of time and manpower for such an exercise. Methods to obtain this data could include fixed-point photography as a further means of documenting change. Annual monitoring of AIPs must be performed to determine the extent of an infestation and to monitor if the AIP control program is efficient or not.

Gathering of information (Campbell, 2000):

- The target offset area must be divided into specific control areas. Use man-made or natural boundaries to specify specific areas e.g., roads, fences. Each area Must be numbered to simplify record keeping;
- A detailed AIP survey must be performed in each numbered area, and the following information Must be recorded:
  - AIP species that are present during the survey and their specific growth form e.g., herb, shrub and trees, including any coppice present;
  - Density of infestation Must be recorded in an estimation of percentage (%) cover:
    - 0-5% Scattered infestation;
    - 5-25% Sparse;
    - 25-50% Medium;
    - 50-75% Dense;
    - 75-100% Very dense;
  - These areas Must be ranked Low, Medium or High priority for control of AIP and rehabilitation. The following criteria Must be used to rank the area according to importance: Threat to biodiversity, carrying capacity and water yield; and
  - Suitable grass species for the specific land use Must be determined and grass naturally occurring in the area Must be used to rehabilitate the area.

Prudent AIP fixed monitoring points of the subject property is of utmost importance, as this will ensure a continual flow of data, enabling all parties involved to accurately assess and manage biodiversity-related progress and issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- Fixed point monitoring (radius transect method) should be applied as the preferred method of monitoring (while the line transect method is an alternative method which can be considered from a site dependant respective);
- All data gathered should be measurable (qualitative and quantitative);
- Monitoring reports should be repeatable and temporally and spatially comparable;
- Data should be auditable; and
- Data, when compared to previous sets, should show spatial and temporal trends.

Fixed monitoring points should form the key aspect of the AIP monitoring plan with each priority area represented by several monitoring points.

5. General Health and Safety Requirements for AIP clearing

All personnel to be provided with the appropriate Personal Protective Equipment (PPE) for clearing of AIPs and/or encroaching indigenous vegetation. The use of PPE by staff controlling AIPs in the field is required by law. The PPE specifications differ for the different types of control. Mechanised control includes the use of a chainsaws and brush-cutters and will therefore require slightly different PPE from someone using manual control (cane knife, slasher, knapsack sprayer, etc.). Tables H3 – H5 below specify the minimum required PPE for AIP clearing.

Table H3: PPE for manual control.

Item	Specification
Overall	100% cotton, two-piece overalls are the best for absorbing perspiration; they last longer and are cooler. However, various cotton/polyester blends are available and suitable.
Rubber gloves	Standard rubber gloves for fieldwork are sufficient. Wrist length gloves are preferable over elbow length gloves for a warm climate.
Leather gloves	Standard wrist length leather gloves are appropriate.
Safety boots	Gumboots or standard safety boots, which support the ankles, are acceptable. Steel toecaps are recommended for workers working with hand tools or with large trees.
Hat – (hardhat/ wide brim hat)	If working with large trees, on steep gradients or if any other safety risks may be present, then wearing a hardhat is advisable. Alternatively, a wide brim hat can be used to protect the worker from the sun.
Safety glasses	Large, clear safety glasses, which allow air to pass through, are acceptable. Glasses with elastics, (e.g., welding glasses) are not acceptable as they tend to fog when a person perspires.
Face mask	A face mask which covers the nose and mouth is essential when mixing herbicides and for foliar application.
Raincoat	A raincoat is necessary in case workers are caught in the rain or can be worn early morning to avoid getting wet from dew.

Table H4: PPE for mechanised control.

Item	Specification
Chainsaw safety pants	Standard long safety chainsaw pants that provide protection against the chainsaw.
Leather gloves	Standard wrist length, leather gloves.
Safety boots with steel cap	Steel toecaps are essential for safety of the workers. Safety boots, not gumboots, are to be worn as they provide support around the ankle.
Hardhat	A hardhat with a visor and earmuffs is necessary for all mechanised control.
Safety glasses	Chainsaw safety glasses provide total cover around the eyes, thus preventing wood chips, stones, etc. entering.
Raincoat	A standard two-piece raincoat. However, it is better not to use mechanised control when it is raining.

Table H5: PPE for chemical control.

Suitable protective clothing must be available and use thereof is compulsory.	- Goggles or face shield to protect the eyes; - Chemical-resistant gloves to protect hands; - Overalls to protect legs, arms, torso and groin; - Respirator with filter cartridges to prevent inhalation of herbicide vapour or mist. Rubber or PVC boots to protect feet. Washable or chemical-resistant hat to protect head and scalp; and - PVC apron for use during mixing.
	NB Adequate hygiene aids must be readily available e.g., plentiful water, soap, towels and eye wash. Dedicated mixing of herbicide must be established, this area must be able to control a possible spill as to not contaminate surrounding areas.

Appendix H2 – Specific Alien Plant Species Management

Table H6: Control options (as provided by Working for Water Alien Species and Herbicide List v2.10 (Sharp 2012)) for Alien and Invasive species that may potentially spread into the target offset area. Hand pull only refers to seedlings. (Campbell, 2000). Care must me given as to not use herbicides containing Glyphosate close to water bodies.

Scientific Name	Common Name	Growth Form	NEMBA Category	Targeted Size Class	Treatment Method	Herbicide
Acacia saligna	Port Jackson	Woody species	1b	Seedling	Hand pull	No herbicide needed Triclopyr (as butoxy ethyl ester)
Cenchrus clandestinus	Kikuyu grass	Grass		Adult	Foliar spray	Glyphosate (as isopropylamine salt)
Echium sp	Pattersons curse	Herbaceous	1b	Young	Foliar spray	Glyphosate (as phosponic acid)
Eucalyptus sp (treatment is species specific)	Blue Gum	Woody species	1b in riparian areas	Seedling	Hand pull	No herbicide needed
				Adult	Cut / frill	Triclopyr (as amine salt)
Leptospermum laevigatum	Australian myrtle	Herbaceous	1b	Seedling	Hand pull	No herbicide needed
Pinus spp.	Pine	Woody species	Species dependent	Adult	Ring bark	Glyphosate (as sodium salt) (species dependent)

Appendix H3 – Example Field Form for Report Content for Alien Invasive Vegetation Monitoring

Proposed field form for report content.

<table>
<tr><td>Date:</td><td colspan="2"></td><td>Name of recorder:</td><td colspan="4"></td></tr>
<tr><td>Sensitive area:</td><td colspan="2"></td><td>GPS point:</td><td colspan="3"></td><td></td></tr>
<tr><td>AIP control present:</td><td>YES</td><td>NO</td><td colspan="2">AIP regrowth present:</td><td>YES</td><td>NO</td><td></td></tr>
<tr><td colspan="3">Description of Infestation:
(Species, Diversity, Abundance, Density, Extent, level of recruitment and trends.)</td><td colspan="5">Photo of infestation:</td></tr>
</table>

APPENDIX I – Cape Flats Fynbos Nursey Stocklist

FynbosLIFE
Locally Indigenous Flora Education

Tel: 082 378 9445
Email: info@fynboslife.com

URBAN REVEGETATION PROJECTS FOR PEOPLE AND WILDLIFE

fynboslife.com fynboslife @fynboslife

Cape Town lowland waterwise and wetland plants supplied by our **Cape Flats Fynbos Nursery**

CAPE TOWN VELD TYPE PLANT LISTS & LANDSCAPING GUIDELINES AUG 2018

Available quantities shown after price, i.e. R8.90 (price) | 10 (quantity available)
Multipot plug size: 7.5cm diameter x 10cm depth (cavities slightly larger than ecotrays)
Minumum 50 plants per order. We do not charge VAT.
Species not currently available can be grown to order. Lead times are species-specific and vary between 3 months and 3 years.
Delivery: 10% for 30km radius and 15% for 60km radius. Minimum delivery fee R150.00.
NURSERY OPEN BY APPOINTMENT ONLY

This species catalogue is alphabetical, with reference to suitable veld types in Cape Town. Veld type landscaping conserves water and wildlife, and supports Cape Town's irreplaceable, highly threatened biodiversity. 19 nationally-recognised vegetation types and 10 of SA's 21 Critically Endangered vegetation types occur within Cape Town's boundaries. 6 are endemic to the City, occuring nowhere else in the world, and 9 are critically under-conserved. Locally indigenous urban biodiversity gardens (LIFE gardens) are thus ecological and educational assets, showcasing our rich natural heritage and promoting stewardship of the broader Fynbos Biome/Cape Floral Kingdom. Every LIFE garden, irrespective of size, counts towards conservation if local forms of species are planted in their original veld type. The horticulturally-viable species listed here represent a fraction of all species in Cape Town. The list is continually expanding as we trial new local plants in cultivation.

Landscapes for LIFE:
L Locally indigenous plants
I Innovation, Infiltration & Interest
F Forage/Food for people & wildlife; frog-friendly (incl. ponds & permeable fencing)
E Education & Ecosystem services

A QUICK GUIDE TO LANDSCAPING BY VELD TYPE IN CAPE TOWN:

1. Planning & Waterscaping
a. Note suburb/location of garden and refer to veld type key (pg 2) and vegetation map in Appendix A to determine the relevant veld type. This will give you an indication of the soil type and original vegetation of the site. Test soil pH and note topsoil consistency/texture (sand, clay, loam) as these may have been altered through disturbance.
b. Consider rainfall, slope/aspect, wind direction and microclimates of the site prior to plant species selection. Waterscape to capture rainfall and slow water loss.

2. Plant Selection
a. Select plants using the veld type key below or the species lists provided in Appendix B.
b. Mimic succession in nature by starting with pioneers and introducing specialist species like ericas and proteas after 3-5 years.
c. Source only forms of species grown from local Cape Town lowland genetic stock. This ensures hyperlocal adaptation and avoids genetic contamination of locally adapted forms. Locally indigenous plants should be re-established within 10km of their source and narrow endemics within 5km. Use pure, naturally-evolved species, avoiding hybrids and cultivars. For part-local part-exotic gardens, rather include non-invasive water-wise exotics than domestic exotics. Domestic exotics pose a threat of hybridisation and invasive spread e.g. Virgilia oroboides subsp. ferruginea (from George) and Virgilia divaricata (George to Port Elizabeth) introduced to Cape Town and threatening the local Virgilia oroboides subsp. oroboides.
d. Choose a variety of flower shapes, sizes, colours and scents to sustain a diversity of pollinators.
e. Look for drought-adapted leaves, e.g. succulence, hairy/grey/cobwebby, small, linear, divided, leathery/lignified, waxy.
f. Add edible and aromatic species to supplement or replace thirsty exotic veggie and herb gardens.
g. Avoid tall trees on the Cape Town lowlands, as they would not naturally occur here and require excess water to thrive.
h. For more information on species selection and terminology please consult @fynboslife on Facebook or Instagram for weekly posts on locally indigenous species and how to use them in Cape Town gardens.

3. Ground Preparation & Planting
a. Timing: Plant after the first flush of rains, i.e. early winter (May/June/July) in Cape Town.
b. Keep root disturbance to a minimum during and after planting.
c. Avoid fertilisers and dug-in mulch. Add a thick 10cm surface layer of wood chips around the base of plants. Use very well-decomposed compost if necessary, and apply sparingly on the surface only. Plant a living mulch.

4. Irrigation & Maintenance
a. Drip irrigate every second day for two weeks, then twice a week or as needed until plants are established, and over the first 2-3 summers as required. Restrict greywater to less sensitive species like Helichrysums, Pelargoniums & Salvias.
b. Replenish wood chip mulch in late spring and summer.
c. Prune lightly and regularly to prolong life of plants. Most shrubs listed live for 5-15 years; bulbs and trees are longer-lived.

Prepared by Caitlin von Witt 2018/08/13

VELD TYPE KEY (note this list is not exhaustive and only includes the veld types currently represented by our Cape Flats Fynbos Nursery):	
CFDS	**CAPE FLATS DUNE STRANDVELD** Endangered (coastal, neutral-alkaline sands; mostly water-wise, wind-resistant plants)
CFSF	**CAPE FLATS SAND FYNBOS** Critically Endangered (sandy, nutrient-poor, acidic soils on the Cape Flats; mostly water-wise and wind-resistant plants)
SPGF	**SOUTH PENINSULA GRANITE FYNBOS** Critically Endangered (clay soils on lower S & E slopes of Table Mountain; plants have relatively high water/nutrient needs)
CLFW	**CAPE LOWLAND FRESHWATER WETLAND** Critically Endangered (plants for irrigated applications, retention ponds, eco-pools, wetlands, river beds/banks)
PSR	**PENINSULA SHALE RENOSTERVELD** Critically Endangered (fertile clay soils; mostly water-wise, wind-resistant plants)
SSR	**SWARTLAND SHALE RENOSTERVELD** Critically Endangered (fertile clay soils; mostly water-wise, wind-resistant plants)
PSF	**PENINSULA SANDSTONE FYNBOS** Endangered (nutrient-poor acidic soil; mostly water-wise, wind-resistant plants)
HSF	**HANGKLIP SAND FYNBOS** Vulnerable (acid to neutral sand near the coast; mostly water-wise, wind-resistant plants)
LAF	**LOURENSFORD ALLUVIUM FYNBOS** Critically Endangered (seasonally wet flats near Strand)
ASF	**ATLANTIS SAND FYNBOS** Critically Endangered (sandy, nutrient-poor, acidic soils on the West Coast; mostly water-wise and wind-resistant plants)

SPECIES LISTED ALPHABETICALLY:

Species name (A-Z)	SIZE 4L/21cm and 2L/15cm	 Multipot plugs (311ml)	 6-pack plugs (90ml)	Description	Veld Type	Image
	PRICE | QUANTITY AVAILABLE					
Agathosma capensis	R23.40 (15cm) | 50			Steenbokbuchu. Evergreen, rounded shrub to 1m. Aromatic leaves and mauve flowers. Good bee forage. Flowering time mainly July-Nov. Suitable for lower clay slopes and sandy coastal flats as a border plant.	SPGF	
Agathosma glabrata **(Endangered)**	R23.40 (15cm) | 1			Lemon-scented buchu. Compact shrub to 50cm with bright purple flowers from July-Dec. Attracts bee and butterfly pollinators. For damp sandy flats and dune slacks.	CFDS CFSF	
Anthospermum aethiopicum	R18.90 (4L) | 5			Dioecious shrub to 2m; attractive filler shrub for moist areas. Flowering time: Aug-Jan. Suitable for clay or seasonally wet sandy soils.	ASF PSR CFSF SSR SPGF LAF	
Arctotheca populifolia	R16.95 (4L) | 5			Creeping, mat-forming perennial groundcover to 20cm. Grey heart-shaped leaves and yellow daisy flowers. Good bee forage. Excellent dune stabiliser for dry, sandy conditons.	HSF CFDS	
Arctotis incisa	R15.75 (4L) | 25	R8.90 | 0	R4.10 | 24	Sprawling grey-leaved perennial daisy to 40cm. Suitable for dry, sandy conditions.	CFDS CFSF	
Arctotis stoechadifolia	R15.75 (4L) | 0	R8.90 | 0	R4.00 | 72	Fast-growing groundcover, for dry sandy conditions.	CFDS	
Athanasia crithmifolia	R18.65 (4L) | 40	R8.90 | 0		1.5mx1.5m seasonal wetland shrub. Fast-growing, large yellow flowerheads attract many insect pollinators.	CFSF PSR SPGF SSR CLFW	

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Athanasia dentata	R18.15 (4L) | 20	R9.00 | 0		1mx1m shrub for dry, sandy and windy conditions. Large yellow daisy flowers and fresh-green toothed leaves.	CFDS CFSF	
Athanasia trifurcata	R16.95 (4L) | 30	R8.90 | 0		1mx1m shrub for dry, sand or clay. Extremely wind- and water-wise. Bee forage.	CFDS PSR CFSF SSR SPGF LAF	
Carex clavata	R15.25 (2L) | 10	R9.00 | 20		50cm tall seasonal wetland sedge with attractive chestnut brown flower spikes	CLFW CFSF SSR	
Carpobrotus edulis		R7.40 | 60	R3.80 | 48	Sour fig, popular edible plant. Fast-growing succulent groundcover to 50cm for coastal conditions. A useful sand stabiliser. Pale yellow flowers.	CFDS HSF CFSF	
Carpobrotus acinaciformis		R7.40 | 20	R3.80 | 24	Sour fig - popular edible plant. Fast-growing succulent groundcover to 50cm for coastal conditions. A useful sand stabiliser. Bright pink flowers.	CFDS	
Chasmanthe aethiopica	R17.60 (4L) | 5			Winter-flowering bulb to 0.5m. Orange tubular flowers pollinated by sunbirds. Sun or semi-shade. Hardy. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (May/June/July).	CFDS HSF CFSF PSR SPGF SSR	
Chasmanthe floribunda	R17.60 (4L) | 10			Winter-flowering bulb to 1m. Orange tubular flowers pollinated by sunbirds. Sun or semi-shade. Hardy. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (May/June). More robust and floriferous than *C. aethiopica*.	CFSF SPGF	
Chironia baccifera	R19.80 (4L) | 1			Ornamental shrub with starry pink flowers, 40cm-1m. Withstands dry, sandy, windy conditions once established.	CFDS SPGF PSR	
Chrysocoma coma-aurea	R16.95 (4L) | 15	R8.90 | 20		0.6mx0.6m shrub with a mass of yellow button-shaped flowers in spring. For sand or clay in dry, windy conditions. Attracts bees.	CFDS CFSF PSR	
Cliffortia ericifolia **(Endangered)**	R18.15 (4L) | 0	R9.40 | 20		50cm tall shrub with small ericoid glossy green leaves. Suitable as a filler for seasonally wet sands over clays, or acid sands.	CFSF ASF CLFW CFDS	
Cliffortia ferruginea	R16.95 (4L) | 0	R8.90 | 0	R4.15 | 6	Groundcover to 40cm with glossy green leaves for seasonally wet sands. Full sun or semi-shade.	CFSF CLFW ASF	
Cliffortia juniperina var. *juniperina*		R9.50 | 5		Warty caperose. Fine-leaved filler species to 1m for full sun.	CFSF SPGF	

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Cliffortia obcordata	R15.75 (4L) | 20	R8.90 | 0		1.2mx1.5m shrub for dry, sandy and windy conditions.	CFSF SPGF	
Cliffortia strobilifera	R15.75 (4L) | 80	R8.90 | 20	R4.00 | 0	3mx3m fast-growing wetland shrub with lush green foliage	CFSF CLFW	
Coleonema album	R19.95 (4L) | 2			White confetti bush. 2m tall buchu with small honey-scented flowers. Withstands coastal (dry, sandy, windy) conditions.	CFDS HSF	
Commelina africana	R15.75 (12cm) | 5			Common yellow commelina. Spreading groundcover to 50cm for sandy soil in semi-shade to full sun. Yellow flowers from Oct-Mar.	PSF	
Cotyledon orbiculata	R23.40 (4L) | 10	R9.20 | 0		Pig's ear. 1m tall succulent with silvery grey leaves with a red margin. Orange tubular flowers attract bees and birds. For well-drained soils in semi-shade to full sun. Ideal for rockeries.	CFDS HSF	
Cynodon dactylon			R1.45 (200-plug tray) | 100	Couch grass/kweek. Perennial, water-wise mat forming grass. Full sun to semi-shade.	LAF HSF CFSF PSR SPGF SSR	
Cyperus textilis	R16.95 (4L) | 60	R8.90 | 20	R4.15 | 528	1-3m tall wetland sedge. Provides nesting material for birds. May be used to clean polluted water.	CLFW	
Dasispermum suffruticosum		R9.20 | 0		Dune celery. Sprawling coastal perennial with slightly fleshy stems and leaves. Small white/cream flowers.	CFDS	
Delosperma litorale	R16.95 (4L) | 10		R4.15 | 24	Trailing vygie groundcover with white flowers. Hardy, suited to coastal conditions.	CFDS	
Ehrharta calycina		R8.90 | 0		Perennial grass to 0.7m with rose pink flowerheads. For acidic sandy soils.	ASF CFDS	
Ehrharta villosa var. villosa	R17.60 (4L) | 5			Tall (1-1.5m) perennial grass for alkaline sands. Florets softly silvery hairy.	CFDS HSF ASF	
Elegia nuda	R19.40 (4L) | 0			1m tall upright wetland restio, compact growth. For seasonally wet acid sands.	HSF CFSF ASF	
Elegia tectorum (Fish Hoek)	R19.40 (4L) | 50	R9.30 | 40	R4.35 | 0	1.5m tall seasonal wetland restio. Dwarf form of Elegia tectorum. For seasonally wet neutral sands.	CFDS HSF	

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Eragrostis curvula		R9.00 | 140		Weeping love grass. Perennial tufted grass to 1 (to 1.5)m. Good forage, erosion control and an attractive ornamental grass that provides food for seed-eating birds. For full sun/semi-shade on sandy or clay slopes. Not suitable for seasonally wet flats or near nature reserves as can be invasive.	SPGF	
Erica annectens **(Vulnerable, Cape Peninsula Endemic)**	R21.80 (15cm) | 5			Approx. 60cm-1m tall, erect to spreading dwarf shrub. Orange to red 2cm-long corolla tube attracts nectar-feeding birds. Flowering time: Dec-Feb. Grows on acidic moist rock ledges from Noordhoek to Simonstown.	PSF	
Erica cerinthoides	R21.80 (15cm) | 5			Fire erica. Shrub to 1m for full sun in well-drained acidic sand. Red tubular flowers attract sunbirds.	CFSF PSF SPGF	
Erica curviflora	R21.80 (15cm) | 5			Water heath. Streamside/seepage shrub to 1.6m with showy, curved, tubular orange-red flowers which attract sunbirds. For full sun.	CUFW	
Erica ericoides	R40.00 (15cm) | 2			Compact shrub to 80cm. Small pale pink honey-scented flowers from Jan-Apr. Suitable for acid sand or clay on slopes and flats.	SPGF PSF	
Erica mammosa (white-flowered 'gilva' form)	R40.00 (15cm) | 2			Nine-pin heath. Tall, branching shrub to 2m. 2cm-long tubular white flowers attract bird pollinators. Flowering time: Dec-Apr. For full sun in well-drained acid sands, thrives in sandy seepage areas.	PSF SPGF	
Erica margaritacea **(Critically Endangered Cape Flats Endemic)**	R38.50 (15cm) | 5			Pearl heath. Compact shrub to 50cm. Pearly white-pink flowers in summer attract insect pollinators. Suitable for seasonally wet acid sands in full sun.	CFSF	
Erica subdivaricata	R38.50 (15cm) | 4			Shrub to 1m with small bell-shaped, white flowers that attract insect pollinators. Suitable for damp, partially shady spots.	CFSF	
Erica verticillata **(Extinct in the Wild)**	R40.00 (15cm) | 4			Whorled heath. Tall shrub to 1.5m with mauve-pink flowers from late summer to autumn. Suitable for seasonally wet acid sands in full sun. Attracts nectar-feeding birds.	CFSF	
Eriocephalus africanus	R16.40 (4L) | 60	R8.90 | 0		Wild rosemary, edible herb. 1.2mx1.2m shrub for dry, sandy and windy conditions.	CFDS SSR CFSF HSF PSR	

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Eriocephalus racemosus	R17.40 (4L) | 25			Wild rosemary, edible herb. 1.2m hardy erect shrub for dry, sandy conditions. Less robust than *E. africanus*.	HSF ASF	
Euclea racemosa	R65.00 (10L) | 0			Sea guarrie. Small to medium-sized tree, ideal for hedges. Edible fruit, attracts birds. Dry, sandy and windy conditions.	CFDS ASF SSR HSF	
Euryops pectinatus	R17.40 (4L) | 20	R8.90 | 20		Golden daisy bush. Shrub to 1.5m with divided grey-green leaves and large yellow daisy flowers, free flowering. For sull sun on sandy or clay slopes.	PSF	
Falkia repens	R14.60 (2L) | 10	R8.90 | 40	R4.15 | 48	Fast-growing groundcover for moist areas in sun or shade. Pink trumpet-shaped flowers.	CFDS CFSF	
Felicia filifolia	R16.40 (4L) | 20	R8.90 | 0		1mx1m shrub for dry, sandy and windy conditions. Showy purple daisy flowers in spring.	CFDS PSR SSR	
Ficinia bulbosa	R18.80 (4L) | 80			Sedge with delicate, fresh green culms to 50cm. For irrigated areas.	CFDS ASF CFSF	
Ficinia capitella	R18.80 (4L) | 5			Sedge with fine, pendulous lime-green culms to 30cm. For irrigated areas.	CFDS CFSF	
Ficinia indica	R18.80 (4L) | 0			0.4m tall sedge for seepage areas. Rich chestnut-coloured spikes.	LAF PSF CFSF SPGF	
Ficinia lateralis	R18.80 (4L) | 50			0.6m tall tufted sedge for seasonally wet coastal sands. Wind tolerant.	CFDS	
Ficinia nodosa (Scirpus nodosus)	R16.95 (4L) | 20	R8.90 | 300		1m tall sedge with fresh green stems. For seasonally wet areas. Withstands summer drying. Excellent wetland filtration and soil stabilisation.	CFDS CFSF CLFW	
Freylinia lanceolata	R19.40 (4L) | 50			Small tree to 4m with cream-coloured, honey-scented tubular flowers. Attracts pollinators. For irrigated applications.	CLFW	
Fuirena coerulescens		R9.50 | 0		Delicate sedge to 50cm for damp areas.	CFDS	
Geranium incanum	R14.60 (2L) | 20	R8.90 | 20	R4.10 | 24	Groundcover for damp sandy soils. Delicate pale pink/white flowers.	CFDS CLFW CFSF SSR HSF	

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Gladiolus angustus	R18.20 (15cm) | 0		R4.25 | 72	Marsh painted lady. Bulbous plant, spring flowering. Sold as clump of approx. 3 shooting bulbs in 15cm pot during growing season.	CFDS CLFW	
Gnidia pinifolia	R16.95 (15cm) | 5			Pine-leaf saffron bush. Shrub to 1m with long tubular flowers which are fragrant at night, attracting moth pollinators. Flowers all year round. For full sun on lower slopes and sheltered sandy flats.	SPGF ASF	
Gnidia squarrosa	R16.40 (15cm) | 5			Aandbossie. Lax shrub, 1-2m. Cream flowers from June-Oct, scented at night. For full sun on sandy slopes and flats.	SPGF CFDS	
Gomphostigma virgatum	R16.95 (4L) | 2	R8.90 | 2		Shrub to 2.6m with scented white flowers. For damp soils in wetlands or along freshwater streams.	CLFW	
Gymnosporia buxifolia	R21.80 (4L) | 10			Spikethorn. Large shrub/ small tree, 3-7m, excellent spiny security hedge. Showy flowers attract insect pollinators, which in turn attract birds.	CFSF SPGF ASF	
Helichrysum crispum		R8.90 | 80		Small rounded shrub to 50cm, woolly grey leaves, creamy white flowers. For dry, sandy, windy conditions.	CFDS HSF LAF	
Helichrysum cymosum	R16.95 (4L) | 2	R8.90 | 40	R4.15 | 24	Gold carpet. Low shrub with grey foliage and yellow flowerheads. For sun or semi-shade in seasonally wet sand. Water well to establish.	CFDS CFSF SPGF	
Helichrysum dasyanthum	R17.60 (4L) | 20	R8.90 | 0		1mx1m shrub with yellow flowers. For dry, sandy and windy conditions.	CFDS CFSF SPGF SSR	
Helichrysum niveum	R16.95 (4L) | 1			Dwarf twiggy, ericoid shrublet to 20cm. Adapted to dry, sandy and windy conditions.	HSF CFDS	
Helichrysum patulum	R15.75 (4L) | 10	R8.90 | 40	R4.05 | 24	1mx1.5m sprawling shrub for dry, sandy and windy conditions.	CFDS PSR SSR	
Helichrysum petiolare	R16.95 (4L) | 15	R8.90 | 0		1mx1m shrub with soft grey foliage. For semi-shade to full sun in a sheltered position.	SPGF	
Helichrysum teretifolium	R18.20 (4L) | 10	R9.00 | 20		Compact groundcover to 30cm with dark green foliage and cream flowers. For semi-shade to full sun on sandy flats and slopes.	CFDS HSF	

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VELD TYPE KEY (note this list is not exhaustive and only includes the veld types currently represented by our Cape Flats Fynbos Nursery):	
CFDS	**CAPE FLATS DUNE STRANDVELD** Endangered (coastal, neutral-alkaline sands; mostly water-wise, wind-resistant plants)
CFSF	**CAPE FLATS SAND FYNBOS** Critically Endangered (sandy, nutrient-poor, acidic soils on the Cape Flats; mostly water-wise and wind-resistant plants)
SPGF	**SOUTH PENINSULA GRANITE FYNBOS** Critically Endangered (clay soils on lower S & E slopes of Table Mountain; plants have relatively high water/nutrient needs)
CLFW	**CAPE LOWLAND FRESHWATER WETLAND** Critically Endangered (plants for irrigated applications, retention ponds, eco-pools, wetlands, river beds/banks)
PSR	**PENINSULA SHALE RENOSTERVELD** Critically Endangered (fertile clay soils; mostly water-wise, wind-resistant plants)
SSR	**SWARTLAND SHALE RENOSTERVELD** Critically Endangered (fertile clay soils; mostly water-wise, wind-resistant plants)
PSF	**PENINSULA SANDSTONE FYNBOS** Endangered (nutrient-poor acidic soil; mostly water-wise, wind-resistant plants)
HSF	**HANGKLIP SAND FYNBOS** Vulnerable (acid to neutral sand near the coast; mostly water-wise, wind-resistant plants)
LAF	**LOURENSFORD ALLUVIUM FYNBOS** Critically Endangered (seasonally wet flats near Strand)
ASF	**ATLANTIS SAND FYNBOS** Critically Endangered (sandy, nutrient-poor, acidic soils on the West Coast; mostly water-wise and wind-resistant plants)

SPECIES LISTED ALPHABETICALLY:

Species name (A-Z)	SIZE 4L/21cm and 2L/15cm	 Multipot plugs (311ml)	 6-pack plugs (90ml)	Description	Veld Type	Image
	PRICE | QUANTITY AVAILABLE					
Agathosma capensis	R23.40 (15cm) | 50			Steenbokbuchu. Evergreen, rounded shrub to 1m. Aromatic leaves and mauve flowers. Good bee forage. Flowering time mainly July-Nov. Suitable for lower clay slopes and sandy coastal flats as a border plant.	SPGF	
Agathosma glabrata **(Endangered)**	R23.40 (15cm) | 1			Lemon-scented buchu. Compact shrub to 50cm with bright purple flowers from July-Dec. Attracts bee and butterfly pollinators. For damp sandy flats and dune slacks.	CFDS, CFSF	
Anthospermum aethiopicum	R18.90 (4L) | 5			Dioecious shrub to 2m; attractive filler shrub for moist areas. Flowering trime: Aug-Jan. Suitable for clay or seasonally wet sandy soils.	ASF, PSR, CFSF, SSR, SPGF, LAF	
Arctotheca populifolia	R16.95 (4L) | 5			Creeping, mat-forming perennial groundcover to 20cm. Grey heart-shaped leaves and yellow daisy flowers. Good bee forage. Excellent dune stabiliser for dry, sandy conditons.	HSF, CFDS	
Arctotis incisa	R15.75 (4L) | 25	R8.90 | 0	R4.10 | 24	Sprawling grey-leaved perennial daisy to 40cm. Suitable for dry, sandy conditions.	CFDS, CFSF	
Arctotis stoechadifolia	R15.75 (4L) | 0	R8.90 | 0	R4.00 | 72	Fast-growing groundcover, for dry sandy conditions.	CFDS	
Athanasia crithmifolia	R18.65 (4L) | 40	R8.90 | 0		1.5mx1.5m seasonal wetland shrub. Fast-growing, large yellow flowerheads attract many insect pollinators.	CFSF, PSR, SPGF, SSR, CLFW	

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Athanasia dentata	R18.15 (4L) | 20	R9.00 | 0		1mx1m shrub for dry, sandy and windy conditions. Large yellow daisy flowers and fresh-green toothed leaves.	CFDS CFSF	
Athanasia trifurcata	R16.95 (4L) | 30	R8.90 | 0		1mx1m shrub for dry, sand or clay. Extremely wind- and water-wise. Bee forage.	CFDS PSR CFSF SSR SPGF LAF	
Carex clavata	R15.25 (2L) | 10	R9.00 | 20		50cm tall seasonal wetland sedge with attractive chestnut brown flower spikes	CLFW CFSF SSR	
Carpobrotus edulis		R7.40 | 60	R3.80 | 48	Sour fig, popular edible plant. Fast-growing succulent groundcover to 50cm for coastal conditions. A useful sand stabiliser. Pale yellow flowers.	CFDS HSF CFSF	
Carpobrotus acinaciformis		R7.40 | 20	R3.80 | 24	Sour fig - popular edible plant. Fast-growing succulent groundcover to 50cm for coastal conditions. A useful sand stabiliser. Bright pink flowers.	CFDS	
Chasmanthe aethiopica	R17.60 (4L) | 5			Winter-flowering bulb to 0.5m. Orange tubular flowers pollinated by sunbirds. Sun or semi-shade. Hardy. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (May/June/July).	CFDS HSF CFSF PSR SPGF SSR	
Chasmanthe floribunda	R17.60 (4L) | 10			Winter-flowering bulb to 1m. Orange tubular flowers pollinated by sunbirds. Sun or semi-shade. Hardy. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (May/June). More robust and floriferous than *C. aethiopica*.	CFSF SPGF	
Chironia baccifera	R19.80 (4L) | 1			Ornamental shrub with starry pink flowers, 40cm-1m. Withstands dry, sandy, windy conditions once established.	CFDS SPGF PSR	
Chrysocoma coma-aurea	R16.95 (4L) | 15	R8.90 | 20		0.6mx0.6m shrub with a mass of yellow button-shaped flowers in spring. For sand or clay in dry, windy conditions. Attracts bees.	CFDS CFSF PSR	
Cliffortia ericifolia **(Endangered)**	R18.15 (4L) | 0	R9.40 | 20		50cm tall shrub with small ericoid glossy green leaves. Suitable as a filler for seasonally wet sands over clays, or acid sands.	CFSF ASF CLFW CFDS	
Cliffortia ferruginea	R16.95 (4L) | 0	R8.90 | 0	R4.15 | 6	Groundcover to 40cm with glossy green leaves for seasonally wet sands. Full sun or semi-shade.	CFSF CLFW ASF	
Cliffortia juniperina var. *juniperina*		R9.50 | 5		Warty caperose. Fine-leaved filler species to 1m for full sun.	CFSF SPGF	

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Cliffortia obcordata	R15.75 (4L) | 20	R8.90 | 0		1.2mx1.5m shrub for dry, sandy and windy conditions.	CFSF SPGF	
Cliffortia strobilifera	R15.75 (4L) | 80	R8.90 | 20	R4.00 | 0	3mx3m fast-growing wetland shrub with lush green foliage	CFSF CLFW	
Coleonema album	R19.95 (4L) | 2			White confetti bush. 2m tall buchu with small honey-scented flowers. Withstands coastal (dry, sandy, windy) conditions.	CFDS HSF	
Commelina africana	R15.75 (12cm) | 5			Common yellow commelina. Spreading groundcover to 50cm for sandy soil in semi-shade to full sun. Yellow flowers from Oct-Mar.	PSF	
Cotyledon orbiculata	R23.40 (4L) | 10	R9.20 | 0		Pig's ear. 1m tall succulent with silvery grey leaves with a red margin. Orange tubular flowers attract bees and birds. For well-drained soils in semi-shade to full sun. Ideal for rockeries.	CFDS HSF	
Cynodon dactylon			R1.45 (200-plug tray) | 100	Couch grass/kweek. Perennial, water-wise mat forming grass. Full sun to semi-shade.	LAF HSF CFSF PSR SPGF SSR	
Cyperus textilis	R16.95 (4L) | 60	R8.90 | 20	R4.15 | 528	1-3m tall wetland sedge. Provides nesting material for birds. May be used to clean polluted water.	CLFW	
Dasispermum suffruticosum		R9.20 | 0		Dune celery. Sprawling coastal perennial with slightly fleshy stems and leaves. Small white/cream flowers.	CFDS	
Delosperma litorale	R16.95 (4L) | 10		R4.15 | 24	Trailing vygie groundcover with white flowers. Hardy; suited to coastal conditions.	CFDS	
Ehrharta calycina		R8.90 | 0		Perennial grass to 0.7m with rose pink flowerheads. For acidic sandy soils.	ASF CFDS	
Ehrharta villosa var. villosa	R17.60 (4L) | 5			Tall (1-1.5m) perennial grass for alkaline sands. Florets softly silvery hairy.	CFDS HSF ASF	
Elegia nuda	R19.40 (4L) | 0			1m tall upright wetland restio, compact growth. For seasonally wet acid sands.	HSF CFSF ASF	
Elegia tectorum (Fish Hoek)	R19.40 (4L) | 50	R9.30 | 40	R4.35 | 0	1.5m tall seasonal wetland restio. Dwarf form of Elegia tectorum. For seasonally wet neutral sands.	CFDS HSF	

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Eragrostis curvula		R9.00 | 140		Weeping love grass. Perennial tufted grass to 1 (to 1.5)m. Good forage, erosion control and an attractive ornamental grass that provides food for seed-eating birds. For full sun/semi-shade on sandy or clay slopes. Not suitable for seasonally wet flats or near nature reserves as can be invasive.	SPGF	
Erica annectens **(Vulnerable, Cape Peninsula Endemic)**	R21.80 (15cm) | 5			Approx. 60cm-1m tall, erect to spreading dwarf shrub. Orange to red 2cm -long corolla tube attracts nectar-feeding birds. Flowering time: Dec-Feb. Grows on acidic moist rock ledges from Noordhoek to Simonstown.	PSF	
Erica cerinthoides	R21.80 (15cm) | 5			Fire erica. Shrub to 1m for full sun in well-drained acidic sand. Red tubular flowers attract sunbirds.	CFSF PSF SPGF	
Erica curviflora	R21.80 (15cm) | 5			Water heath. Streamside/seepage shrub to 1.6m with showy, curved, tubular orange-red flowers which attract sunbirds. For full sun.	CLFW	
Erica ericoides	R40.00 (15cm) | 2			Compact shrub to 80cm. Small pale pink honey-scented flowers from Jan-Apr. Suitable for acid sand or clay on slopes and flats.	SPGF PSF	
Erica mammosa (white-flowered 'gilva' form)	R40.00 (15cm) | 2			Nine-pin heath. Tall, branching shrub to 2m. 2cm -long tubular white flowers attract bird pollinators. Flowering time: Dec-Apr. For full sun in well-drained acid sands, thrives in sandy seepage areas.	PSF SPGF	
Erica margaritacea **(Critically Endangered Cape Flats Endemic)**	R38.50 (15cm) | 5			Pearl heath. Compact shrub to 50cm. Pearly white-pink flowers in summer attract insect pollinators. Suitable for seasonally wet acid sands in full sun.	CFSF	
Erica subdivaricata	R38.50 (15cm) | 4			Shrub to 1m with small bell-shaped, white flowers that attract insect pollinators. Suitable for damp, partially shady spots.	CFSF	
Erica verticillata **(Extinct in the Wild)**	R40.00 (15cm) | 4			Whorled heath. Tall shrub to 1.5m with mauve-pink flowers from late summer to autumn. Suitable for seasonally wet acid sands in full sun. Attracts nectar-feeding birds.	CFSF	
Eriocephalus africanus	R16.40 (4L) | 60	R8.90 | 0		Wild rosemary, edible herb. 1.2mx1.2m shrub for dry, sandy and windy conditions.	CFDS SSR CFSF HSF PSR	

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Eriocephalus racemosus	R17.40 (4L) | 25			Wild rosemary, edible herb. 1.2m hardy erect shrub for dry, sandy conditions. Less robust than *E. africanus*.	HSF ASF	
Euclea racemosa	R65.00 (10L) | 0			Sea guarrie. Small to medium-sized tree, ideal for hedges. Edible fruit, attracts birds. Dry, sandy and windy conditions.	CFDS ASF SSR HSF	
Euryops pectinatus	R17.40 (4L) | 20	R8.90 | 20		Golden daisy bush. Shrub to 1.5m with divided grey-green leaves and large yellow daisy flowers, free flowering. For sull sun on sandy or clay slopes.	PSF	
Falkia repens	R14.60 (2L) | 10	R8.90 | 40	R4.15 | 48	Fast-growing groundcover for moist areas in sun or shade. Pink trumpet-shaped flowers.	CFDS CFSF	
Felicia filifolia	R16.40 (4L) | 20	R8.90 | 0		1mx1m shrub for dry, sandy and windy conditions. Showy purple daisy flowers in spring.	CFDS PSR SSR	
Ficinia bulbosa	R18.80 (4L) | 80			Sedge with delicate, fresh green culms to 50cm. For irrigated areas.	CFDS ASF CFSF	
Ficinia capitella	R18.80 (4L) | 5			Sedge with fine, pendulous lime-green culms to 30cm. For irrigated areas.	CFDS CFSF	
Ficinia indica	R18.80 (4L) | 0			0.4m tall sedge for seepage areas. Rich chestnut-coloured spikes.	LAF PSF CFSF SPGF	
Ficinia lateralis	R18.80 (4L) | 50			0.6m tall tufted sedge for seasonally wet coastal sands. Wind tolerant.	CFDS	
Ficinia nodosa (Scirpus nodosus)	R16.95 (4L) | 20	R8.90 | 300		1m tall sedge with fresh green stems. For seasonally wet areas. Withstands summer drying. Excellent wetland filtration and soil stabilisation.	CFDS CFSF CLFW	
Freylinia lanceolata	R19.40 (4L) | 50			Small tree to 4m with cream-coloured, honey-scented tubular flowers. Attracts pollinators. For irrigated applications.	CLFW	
Fuirena coerulescens		R9.50 | 0		Delicate sedge to 50cm for damp areas.	CFDS	
Geranium incanum	R14.60 (2L) | 20	R8.90 | 20	R4.10 | 24	Groundcover for damp sandy soils. Delicate pale pink/white flowers.	CFDS CLFW CFSF SSR HSF	

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Gladiolus angustus	R18.20 (15cm) | 0		R4.25 | 72	Marsh painted lady. Bulbous plant, spring flowering. Sold as clump of approx. 3 shooting bulbs in 15cm pot during growing season.	CFDS CLFW	
Gnidia pinifolia	R16.95 (15cm) | 5			Pine-leaf saffron bush. Shrub to 1m with long tubular flowers which are fragrant at night, attracting moth pollinators. Flowers all year round. For full sun on lower slopes and sheltered sandy flats.	SPGF ASF	
Gnidia squarrosa	R16.40 (15cm) | 5			Aandbossie. Lax shrub, 1-2m. Cream flowers from June-Oct, scented at night. For full sun on sandy slopes and flats.	SPGF CFDS	
Gomphostigma virgatum	R16.95 (4L) | 2	R8.90 | 2		Shrub to 2.6m with scented white flowers. For damp soils in wetlands or along freshwater streams.	CLFW	
Gymnosporia buxifolia	R21.80 (4L) | 10			Spikethorn. Large shrub/ small tree, 3-7m, excellent spiny security hedge. Showy flowers attract insect pollinators, which in turn attract birds.	CFSF SPGF ASF	
Helichrysum crispum		R8.90 | 80		Small rounded shrub to 50cm, woolly grey leaves, creamy white flowers. For dry, sandy, windy conditions.	CFDS HSF LAF	
Helichrysum cymosum	R16.95 (4L) | 2	R8.90 | 40	R4.15 | 24	Gold carpet. Low shrub with grey foliage and yellow flowerheads. For sun or semi-shade in seasonally wet sand. Water well to establish.	CFDS CFSF SPGF	
Helichrysum dasyanthum	R17.60 (4L) | 20	R8.90 | 0		1mx1m shrub with yellow flowers. For dry, sandy and windy conditions.	CFDS CFSF SPGF SSR	
Helichrysum niveum	R16.95 (4L) | 1			Dwarf twiggy, ericoid shrublet to 20cm. Adapted to dry, sandy and windy conditions.	HSF CFDS	
Helichrysum patulum	R15.75 (4L) | 10	R8.90 | 40	R4.05 | 24	1mx1.5m sprawling shrub for dry, sandy and windy conditions.	CFDS PSR SSR	
Helichrysum petiolare	R16.95 (4L) | 15	R8.90 | 0		1mx1m shrub with soft grey foliage. For semi-shade to full sun in a sheltered position.	SPGF	
Helichrysum teretifolium	R18.20 (4L) | 10	R9.00 | 20		Compact groundcover to 30cm with dark green foliage and cream flowers. For semi-shade to full sun on sandy flats and slopes.	CFDS HSF	

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Hellmuthia membranacea	R18.20 (4L) | 5			50cm-1m tall sedge with large attractive flowerheads. Drought tolerant. Excellent soil stabiliser.	CFDS	
Hermannia pinnata	R18.20 (4L) | 0			Fast growing, mat-forming shrublet to 0.15m with creeping stems. Pale orange, nodding bell-shaped flowers. Suitable for sandy, well-drained soil.	HSF	
Imperata cylindrica		R9.20 | 40		Sword grass. Perennial rhizomatous grass to 50cm for seasonally wet areas. Host plant for the Critically Endangered Barber's ranger butterfly (*Kedestes barberae bunta*) in False Bay Nature Reserve.	CFDS HSF CFSF CLFW	
Isolepis prolifera	R14.75 (2L) | 10	R8.90 | 100		Low trailing sedge, rooting at the nodes. Grows in marshy conditions or 5-10cm deep water.	CLFW	
Jordaaniella dubia	R16.95 (4L) | 35		R4.15 | 600	Hardy creeping vygie with large yellow flowers. For dry, sandy, windy conditions.	CFDS HSF	
Juncus capensis	R18.20 (4L) | 20	R9.10 | 0		50cm tall seasonal wetland rush. Excellent wetland filtration and soil stabilisation.	CLFW SPGF	
Juncus effusus	R18.20 (4L) | 0	R9.10 | 10		Soft rush - 50cm-1m tall seasonal wetland rush.	SPGF CLFW	
Juncus kraussii	R16.95 (4L) | 50	R8.90 | 100	R4.15 | 0	1m tall wetland rush. Host plant for damselflies.	CFDS CLFW	
Juncus lomatophyllus	R18.80 (4L) | 10	R9.20 | 10		40cm tall wetland rush. Filtration for ecopools and grey water wetlands.	CLFW	
Kiggelaria africana	R105.00 (20L, 1.5m) | 0			Wild peach. Fast-growing tree to 20m for sheltered slopes or ravines in clay or loamy soil. Symbiotic relationship with *Acraea horta* butterfly, with the caterpillars attracting birds.	SPGF CLFW	
Lampranthus emarginatus		R9.40 | 0		Clusterleaf brightfig. Vygie to 30cm with narrow grey leaves and a show of purple flowers in spring/summer. For sandy flats and slopes in full sun.	SPGF PSR	
Lampranthus filicaulis **(Vulnerable)**		R9.40 | 0		Threadleaf brightfig. Prostrate perennial vygie with pink flowers in spring. For sandy irrigated areas.	CFSF SPGF	

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Lampranthus reptans **(Near Threatened)**		R9.00 | 20	R4.20 | 24	Creeping perennial vygie with showy yellow flowers for irrigated areas (grows naturally in seasonal wetlands).	CFSF	
Lampranthus stenus **(Critically Endangered)**		R9.40 | 20		Narrowleaf brightfig. Vygie to 30cm with narrow grey leaves and pink flowers in late spring/summer. For sandy flats and slopes in full sun.	CFSF	
Leonotis leonurus	R15.80 (4L) | 50	R8.90 | 120		2mx2m shrub for dry, sandy and windy conditions. Rewarding orange tubular flowers. Prune hard after flowering.	CFDS CFSF SPGF CLFW ASF	
Lessertia frutescens	R17.20 (4L) | 50			Cancer bush. Shrub to 1,5m tall with silvery grey compound leaves and nectar-rich orange-red flowers in spring, attracting sunbirds. For coastal sands and stony slopes. Water well to establish, water-wise thereafter. Short-lived but readily seeds itself.	CFDS ASF	
Leucadendron argenteum **(Rare and Endangered)**	R24.00 (2L) | 4			Silver tree. 7-10m tall tree with silvery-hairy leaves and separate male and female plants. Flowers attract beetle pollinators. Females produce cones. For full sun in sandy granite-derived soils only. No compost or fertiliser.	SPGF	
Leucadendron coniferum **(Vulnerable)**	R20.60 (4L) | 0	R9.60 | 20		Dune conebush. Coastal shrub or small tree, 2-4m. Attractive silvery green foilage. Withstands dry, sandy, windy conditions. No compost or fertiliser.	CFDS HSF	
Leucadendron floridum **(Critically Endangered Cape Peninsula Endemic)**	R24.00 (15cm) | 0			Flats conebush. Dioecious shrub to 2m. Attractive silvery green foliage. Wind- and beetle-pollinated. For permanently moist sands adjacent rivers/wetlands. No compost or fertiliser.	CFSF SPGF HSF CLFW PSF	
Leucadendron lanigerum var. lanigerum **(Endangered)**	R20.60 (4L) | 0	R9.60 | 0		Common shale conebush. Shrub to 1.5m. Flowering time: July-Sep. No compost or fertiliser.	ASF SSR LAF	
Leucadendron laureolum	R28.50 (4L) | 40			Laurel-leaf conebush. Large protea to 2.5m. Flowering time: June-Aug. For acid sands, wind tolerant. No compost or fertiliser.	HSF CFSF PSF	
Leucadendron levisanus **(Critically Endangered Cape Flats Endemic)**	R20.60 (4L) | 50	R9.60 | 0		Cape Flats conebush. 1-2m tall protea for seasonally wet acid sands. Tolerant of windy conditions. No compost or fertiliser.	CFSF	
Leucadendron salignum	R28.50 (4L) | 0			Common sunshine conebush. Large shrub to 2m. Flowering time: May-Dec. Full sun. For acid sands, wind tolerant. No compost or fertiliser.	HSF ASF LAF	

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Leucadendron strobilinum **(Cape Peninsula Endemic)**	R24.00 (2L) | 10			Peninsula conebush. Large shrub to 2.6m. Flowering time: Sep-Oct. For damp, rocky slopes in neutral-acid sand. Full sun. No compost or fertiliser.	PSF	
Leysera gnaphalodes	R16.40 (2L) | 4		R4.20 | 24	Shrublet to 0.4m with pale grey foliage. Suitable for windswept clay slopes. Flowering time: Sep-Nov.	ASF SSR	
Linum africanum	R16.40 (15cm) | 5			Wild flax. Compact shrub to 30cm with copious yellow flowers in summer. For semi-shade. Variable habitat from clay slopes to coastal sands.	SPGF	
Lobelia anceps (Lobelia alata)	R14.75 (2L) | 0	R8.90 | 0	R4.15 | 24	Groundcover with pretty blue flowers for irrigated areas.	CFSF SPGF CLFW	
Maurocenia frangula	R82.50 (10L) | 4			Bittersweet cherry. Small rounded tree to 3m with large leathery dark green leaves. Small white flowers from May to June followed by showy, edible cerise fruit. Occurs in coastal forest and rocky slopes. Plant in full sun in sandy soil.	CFDS	
Melianthus major	R18.80 (4L) | 2			Kruidjie-roer-my-nie. Large streamside shrub to 3m. Rusty-red, nectar-rich flower spikes attract birds. Prefers rich, moist, well-drained soils in full sun to semi-shade. Prune heavily in summer.	SPGF CLFW	
Mentha longifolia subsp. capensis	R15.75 (4L) | 40	R8.90 | 20		Edible wild mint. For seasonal wetlands.	SPGF CLFW	
Metalasia densa	R20.60 (4L) | 0			Erect shrub to 2m with green to white-woolly foliage. For sandy, windy conditions. Flowering time: June-Oct.	HSF PSR ASF PSF CFSF	
Metalasia muricata	R16.95 (4L) | 80	R8.90 | 40		2mx2m silvery-grey shrub with cream honey-scented flowerheads. For dry, sandy and windy conditions along the coast.	CFDS HSF ASF	
Mimetes fimbrifolius **(Rare Cape Peninsula Endemic)**	R24.00 (2L) | 10			Tree pagoda. 4x5m tree with flowerheads clasped by reddish-yellow leaves at branch tips. Flowering time: Jul-Dec. Attracts bird pollinators. For full sun on moist rocky slopes and sandy flats. May live for up to 100 years!	PSF	
Monopsis lutea	R16.35 (4L) | 30	R8.90 | 60	R4.10 | 24	Marsh groundcover with pretty yellow flowers and bright green trailing stems. Damp sands.	CLFW SSR	

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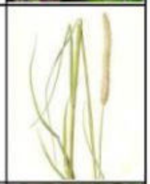
Morella cordifolia	R18.80 (4L) | 80	R9.30 | 0		Waxberry. 2-3m tall spreading shrub for dry, sandy and windy conditions.	CFDS CFSF HSF	
Muraltia mitior **(Endangered)**	R19.60 (4L) | 70	R9.40 | 0		Beautiful purple-flowered shrub with finger-like branches to 1m. For sandy, seasonally wet areas.	CFDS	
Muraltia (Nylandtia) spinosa	R20.00 (4L) | 0			Tortoise berry; 1.5x1m shrub with masses of purple flowers in winter and edible fruit. For dry, sandy and windy conditions.	CFDS CFSF HSF	
Olea europaea subsp. africana	R105.00 (20L) | 10			Wild olive. 9mx12m tree with glossy green foliage. Drought-, frost- and wind-resistant. Fruit attracts birds.	CFDS CFSF SPGF PSR SSR	
Orphium frutescens (pink)	R16.95 (4L) | 120	R8.90 | 0		80cm tall upright wetland shrub with showy pink flowers. Buzz-pollinated by carpenter bees.	CFDS CFSF CLFW	
Orphium frutescens (white)	R16.95 (4L) | 120	R8.90 | 0		80cm tall upright wetland shrub with showy white flowers. Buzz-pollinated by carpenter bees.	CFDS SPGF CLFW	
Osteospermum fruticosum	R16.40 (4L) | 0	R8.90 | 0	R4.10 | 24	Trailing African daisy. Semi-succulent groundcover to 40cm with white flowers, ray florets mauve on underside. Attracts butterflies. Full sun. Wind- and drought- resistant.	CFDS	
Osteospermum incanum	R16.95 (4L) | 0			Spreading, fast-growing shrub to 1.5m. Leaves softly hairy, grey. For dry, sandy and windy conditions.	CFDS CFSF	
Osteospermum moniliferum	R16.40 (4L) | 20	R8.90 | 40		Large, spreading, fast-growing shrub to 3m. Edible berries attract birds. For dry, sandy and windy conditions.	CFDS HSF CFSF SSR SPGF PSF	
Otholobium bracteolatum	R16.40 (4L) | 120	R8.90 | 0	R4.10 | 24	1mx1.5m shrub with purple and white pea flowers. Adapted to dry, sandy, windy conditions.	CFDS	
Otholobium decumbens		R8.90 | 20		Prostrate mat-forming forb with mauve flowers. For full sun in sandy soil.	CFSF SPGF	
Otholobium fruticans **(Rare Peninsula Endemic)**	R16.40 (2L) | 30			40cmx1m trailing semi-shrub with purple flowers. For sandy acidic soil on the slopes of Table Mountain.	SPGF PSF	

Passerina paleacea	R19.60 (4L) | 20	R9.50 | 20		Rare gonnabos. Shrub to 1m with ericoid leaves. For neutral to alkaline sands in full sun.	CFDS	
Pelargonium betulinum	R16.95 (4L) | 0	R8.90 | 10		Camphor-scented pelargonium. 1mx1m shrub for dry, sandy and windy conditions. Showy pink flowers.	CFDS CFSF HSF	
Pelargonium capitatum	R15.80 (4L) | 40	R8.90 | 20		Rose-scented pelargonium. Fast-growing groundcover with pink flowers on long stalks. Water- and wind-wise.	CFDS CFSF SPGF HSF	
Pelargonium cucullatum subsp. *tabulare*	R16.90 (12cm) | 4			Tree pelargonium. Shrub to over 2m with showy pink flowers in late spring/summer. Full sun, drought tolerant.	CFSF SPGF PSR HSF	
Pennisetum macrourum	R18,80 (4L) | 0			African feather grass. Beautifully backlit tall wetland grass to 2,5m. Suitable for full sun to semi-shade in marginal or well-irrigated applications.	CFSF CLFW	
Phylica ericoides	R18.80 (4L) | 80	R9.20 | 20		1m tall spreading shrub with white button-like flowers. For dry, sandy and windy conditions.	CFDS HSF CFSF SPGF	
Plecostachys serpyllifolia	R15.80 (4L) | 5	R8.90 | 40	R4.00 | 24	1mx1m seasonal wetland shrub with cobwebby grey foliage.	SPGF CLFW HSF	
Podalyria calyptrata	R38.50 (15cm) | 2			Sweetpea bush. Large shrub to 3m with glossy silvery-green foliage. Showy pink flowers in spring attract carpenter bees, honeybees, hoverflies, butterflies and birds. For damp acid sand or clay in full sun.	SPGF PSF	
Podalyria sericea **(Vulnerable)**	R38.50 (15cm) | 0			Small rounded shrub 1mx1m. Silvery-shiny leaves and pink flowers in spring/summer. Attracts carpenter bees, honeybees, butterflies and other insects, which in turn attract birds. For full sun on acid-neutral sand or clay slopes.	SPGF PSF	
Polygala myrtifolia	R19.40 (4L) | 0			September bush. Evergreen, water-wise shrub/small tree of 1-4m, for use as a windbreak or hedge. Striking purple flowers mainly in autumn and spring. Provides forage for bees.	CFDS CFSF SPGF	

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Prionium serratum	R20.00 (4L) | 2			Palmiet. Large wetland graminoid to 2m or more. Excellent water purifier. Flowerheads eaten as a vegetable when in bud.	CLFW	
Pseudoselago spuria **(rare Cape Flats form)**	R18.20 (4L) | 5	R9.00 | 20		Powderpuff plant. Upright perennial shrub to 60cm, white flowerheads. Prefers moist, sandy soils. Full sun.	CFSF	
Psoralea aphylla	R18.80 (4L) | 20			Seasonal wetland shrub to 2m, leaves reduced, shoots silvery hairy, stems weeping, masses of mauve/white flowers in summer. Now rare on the Cape Flats. Plant in full sun under irrigation.	CFSF CLFW	
Psoralea glaucina **(Critically Endangered Cape Flats Endemic)**	R18.20 (4L) | 0	R9.00 | 40		Groundcover for seasonally damp neutral-alkaline sands. Purple pea flowers.	CFDS	
Psoralea pinnata	R18.20 (4L) | 200	R9.00 | 20		3-4mx2m fast-growing seasonal wetland plant/small tree with masses of mauve and white flowers in late spring/summer.	CFSF SPGF CLFW HSF	
Psoralea repens	R15.80 (4L) | 2	R8.90 | 80	R4.00 | 24	Groundcover for alkaline sands. Drought- and wind- resistant. Purple pea flowers.	CFDS	
Ruschia macowanii	R15.80 (4L) | 60	R8.90 | 40		1mx1m sprawling vygie for dry, sandy and windy conditions	CFDS	
Salvia africana-caerulea		R9.60 | 5		Blue sage. 1.5mx1.5m aromatic shrub for clay slopes and flats.	SPGF SSR PSR ASF	
Salvia africana-lutea	R16.95 (4L) | 100	R8.90 | 20		1.5mx1.5m shrub for dry, sandy and windy conditions. Orange, tubular, bird-pollinated flowers.	CFDS HSF PSR SSR	
Salvia chamelaeagnea	R16.95 (4L) | 10	R8.90 | 20		Rough blue sage. Dense shrub to 2m for irrigated areas/seasonal wetlands in clay soils. Lime green foliage and large blue and white flowers in summer.	SPGF CLFW	
Salvia lanceolata	R17.60 (4L) | 0			1.5mx1.5m shrub for dry, sandy and windy conditions. Peach-orange, tubular, bird-pollinated flowers.	CFDS ASF	
Scabiosa incisa	R17.60 (4L) | 2			Fast-growing perennial groundcover with beautiful mauve, long-stemmed flowerheads from spring to summer. For coastal sands in full sun. Attracts butterflies.	CFDS	

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Schoenoplectus scirpoides	R18.20 (4L) | 30	R9.00 | 0	Ex open R6.00 | 0	2m tall attractive wetland reed. Requires permanent water, 50cm deep.	CLFW	
Scirpoides thunbergii	R18.20 (4L) | 2	R9.00 | 0		0.7m tall rhizomatous sedge. Suitable for sandy damp areas.	ASF CFSF	
Searsia crenata	R19.80 (4L) | 10	R9.50 | 0		Shrub/small tree to 4m. Ideal coastal or inland hedging plant. Drought and wind tolerant. Host plant for butterflies; berries attract birds. Full sun.	CFDS CFSF SPGF	
Searsia lucida	R19.80 (4L) | 0	R9.60 | 0		Shrub/small tree (3-5mx4m) with attractive glossy green leaves. Excellent hedging plant. Drought and wind tolerant. Berries attract birds. Full sun.	CFDS HSF CFSF SPGF	
Selago canescens	R16.40 (2L) | 0			Bitterbush. Evergreen shrub to 1.5m with attractive mauve flowers. Flowering time: July-Sep. Host plant for butterflies. For loamy soil in full sun.	SPGF	
Selago corymbosa	R16.40 (2L) | 0			Perennnial densely leafy shrublet to 0.6m. Creamy white flowerheads. Host plant for butterflies. Suitable for sun or semi-shade.	SPGF	
Senecio halimifolius	R15.80 (4L) | 50	R8.90 | 360		2mx1.5m seasonal wetland shrub with yellow daisy flowers which attract insect pollinators. Tolerates summer drying.	CFDS CFSF SPGF CLFW SSR	
Seriphium plumosum (Stoebe cinerea)	R18.90 (2L) | 40			Many branched grey-woolly, shrub to 1.5m for clay slopes in semi-shade to full sun.	SPGF	
Seriphium plumosum (Stoebe plumosa)	R21.40 (4L) | 0	R9.50 | 0		1mx1m shrub with woolly grey foliage for dry, sandy and windy conditions. Water-wise contrast filler.	CFDS CFSF LAF	
Serruria aemula **(Endangered Cape Flats Endemic)**	R24.00 (2L) | 0	R9.60 | 20		Shrublet to 0.5m with finely divided leaves. Silvery-pink flowers appear from July-October. For irrigated or seasonally wet sands in full sun. No compost or fertiliser.	CFSF	

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Serruria foeniculacea **(Critically Endangered Cape Flats Endemic)**	R21.40 (4L) | 10	R9.50 | 10		1mx1m protea with silvery pink flowers. For seasonally wet acid sands. No compost or fertiliser.	CFSF	
Serruria glomerata **(Vulnerable Cape Peninsula Endemic)**	R24.00 (2L) | 0			Compact shrublet to 0.5mx0.5m. Flowering time: Aug-Oct. Suitable for seasonally wet acid sands. No compost or fertiliser.	HSF CFSF	
Sideroxylon inerme **(Protected tree)**	R180.00 (20L, 3m) | 2			Milkwood. 10-15m tall tree with glossy green leaves, small white flowers and purple/black fruit which attracts birds. Suitable for coastal conditions.	CFDS	
Solanum africanum	R16.95 (4L) | 2	R8.90 | 40		Dronkbessie. Creeping succulent shrub with stems to 3m. Groups of pendulous mauve flowers with yellow stamens followed by black berries.	CFDS	
Stachys aethiopica	R16.40 (15cm) | 5		R4.10 | 24	Kattekruie. Hardy spreading groundcover with delicate white-pink flowers. For semi-shade.	CFDS SSR SPGF PSR	
Struthiola dodecandra	R19.40 (4L) | 2	R9.30 | 0		1-1.5m tall shrub with sweet-smelling white flowers. For seasonally wet flats and slopes.	CFSF SPGF CLFW	
Struthiola striata	R19.80 (4L) | 30			Shrub to 1m with small tubular flowers, scented at night, moth-pollinated. For damp sandy flats.	ASF CFSF	
Tarchonanthus littoralis	R33.00 (4L) | 10; R105.00 (20L, 1.5m) | 40			Camphor tree. 2-9m semi-deciduous, hardy, water-wise tree with grey leaves for coastal conditions. Excellent windbreak/tall hedge.	CFDS	
Tetragonia decumbens	R15.80 (4L) | 40	R8.90 | 60	R4.00 | 144	Dune spinach - popular edible plant. Fast-growing groundcover to 50cm for coastal conditions. A useful sand stabiliser.	CFDS HSF	
Tetragonia fruticosa	R15.80 (4L) | 2	R8.90 | 0		Slaaibos - popular edible plant. Fast-growing groundcover to 50cm for coastal conditions. A useful sand stabiliser.	CFDS HSF	
Thamnochortus punctatus	R21.80 (4L) | 0			Steenbok reed. Dwarf perennial restio to 1m, spreading to 0.5m at the base. For full sun in well-drained soil. Water well to establish.	ASF CFSF	
Thamnochortus spicigerus	R21.80 (4L) | 40	R9.50 | 200		Tall thatching reed. Large tussock-forming reed to 2.5m, spreading to 1.5m at the base. For well-drained, neutral-alkaline sand in full sun.	CFDS HSF	

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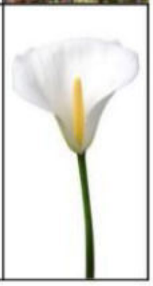
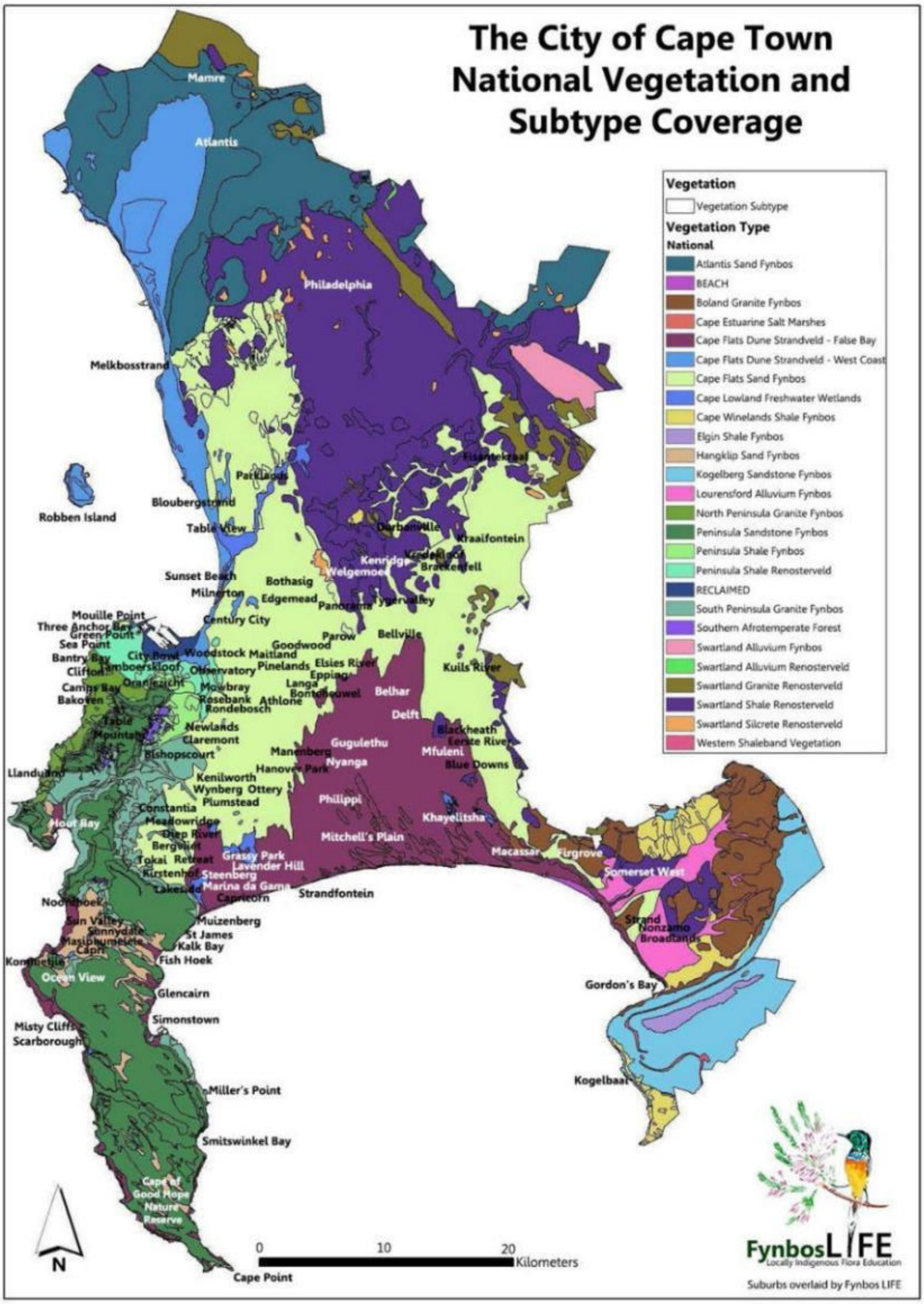
Trachyandra ciliata	R16.40 (4L) | 5			Veldkool. Perennial to 50cm for coastal sands. Edible flower buds can be steamed or boiled in the same way as asparagus, or cooked in a stew.	CFDS	
Trachyandra divaricata	R16.40 (4L) | 20	R8.90 | 20		Sandkool. Perennial to 50cm for coastal sands. The branched edible flower buds can be steamed or boiled.	CFDS, HSF	
Tribolium uniolae	R18.90 (2L) | 0			Tufted perennial grass to 0.6m with compact golden flowerheads. For sandy or clay slopes and flats.	ASF, PSF, LAF, SPGF, CFSF	
Wachendorfia thyrsiflora	R19.40 (4L) | 10			Marsh butterfly lily. Tall evergreen geophyte with spikes of yellow flowers reaching 2.5m (Sep-Dec). For permanently marshy areas in full sun.	SPGF, CFSF, CLFW, PSF, HSF	
Watsonia meriana	R17.60 (4L) | 0			Cormous plant, leaves to 0.6m, flowers to 2m. Tubular red flowers attract sunbirds. For seasonally inundated areas. Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season (winter/spring).	CFDS, CFSF, SPGF, CLFW	
Watsonia tabularis **(Cape Peninsula Endemic)**	R18.20 (4L) | 0			Cormous plant, sword-shaped leaves to 1m, orange flowers from Nov-Jan, bird-pollinated. Water-wise, suited to sunny rockeries. Prefers neutral to acid soils (occurs naturally on sandstone from sea level to Table Mt summit). Sold as clump of approx. 3 shooting bulbs in 4L bag during growing season.	CFSF, SPGF, PSF	
Zantedeschia aethiopica				Arum lily. Geophytic species to 1m with fresh green foliage and elegant large white spathes; these support a microcosm of wildlife from beetles to bees to frogs and spiders. For full sun or semi-shade in marshy conditions. Evergreen with permanent moisture availability, deciduous with seasonal moisture. Rhizomes attract porcupines.	CLFW, SPGF, CFSF	

Prepared by Caitlin von Witt 2018/08/13

APPENDIX A. CITY OF CAPE TOWN VEGETATION MAP WITH SUBURBS OVERLAID



Prepared by Caitlin von Witt 2018/08/13

APPENDIX J – Stakeholder Engagement Correspondence

Appendix J1 – Meeting Minutes with Cape Nature, COCT and DEA&DP

MARK BOTHA

CONSERVATION STRATEGY, TACTICS AND INSIGHT

Biodiversity Offset for the Cape Winelands Airport

Meeting Record: DEA&DP, CapeNature & City of Cape Town – Biodiversity Management Branch

7 June 2024 09h00 – 11h00: Google meet Platform online .

Present online: Frances Balayer, (FB); Ayesha Hamdulay (AH) – **DEA&DP**
Alana Duffel-Canham (ADC); Ismat Adams (IA), Marius Wheeler (MW) - **CapeNature**
Jacques vd Merwe (JvdM) – CCT
Paul Slabbert (PS) **PHS Consulting – EAP**
Bianca Bleuler (BB) **FEN Consulting: Freshwater & Wetland Offset**
Mark Botha (MB) **Biodiversity Offset**. Also compiled this meeting record.

Declined /Apologised: Cliff Dorse, Charmaine Oxtoby (CCT). Marlene Laros, Eldon van Boom, Natasha Bieding (**DEA&DP**)

Meeting Objective: Initial Consultation and Offset overview. Authorities to query offset development up to this point, confirm existence of key concerns, fatal flaws, and required specific information needs in Assessment and Offset Reports.

1. Listed Activity & Development Overview: see attached PPT

PS provided a short PPT overview of the CWA develop, the aeronautical and CAA ad biophysical constraints. This set the scene for the Wetland and Biodiversity Offset inputs to follow.

Questions:

FB queried adherence to the Mitigation hierarchy and other possible mitigation prior to offsets?
IA asked what opportunities existed to avoid the very high significance patches?

PS confirmed that the constraints on runway length, alignment and the location of the quarry precluded any other avoidance or minimisation. Rehabilitation is not sufficient in these ecosystems – thus the EAP and client knew offsets would likely be triggered.

FB queried whether CWA would be able to handle the traffic volumes as an alternative to CTIA.

PS confirmed that CWA was being designed to do so.

EMAIL: mark@ecological.co.za CELL +27.84.588.8346

P.O. Box 233
Noordhoek 7979
South Africa

43 Sea Cottage Drive
Noordhoek 7979
South Africa

2. Wetland impact and offset proposals – see attached PPT

BB gave an overview of the Wetland impacts, present and desired ecological states and calculated offset requirements (13,7ha FE + 6,7 ha ecosystem target) . She presented the range of rejected candidate sites, explaining the lack of seep wetlands available for offsets, and confirmed the best option would be on-site rehabilitation of a channelled valley bottom (CVB) wetland of the Klapmuts river.

Questions:

FB checked whether the proposed wetland rehabilitation would require further authorisations, and if so, whether this would be included in the CWA application?

PS confirmed that if there were no objections from the authorities to the current proposals, then the wetland rehab measures would be included in the current application.

IA was concerned that a seep wetland impact was being exchanged for a CVB offset outcome. He stipulated that the reports would need a full motivation for the seep wetland loss and the trading for a CVB wetland.

BB responded that seeps are scarce and unavailable to provide the full offset required, and that the condition of the impacted seep is poor, and possibly even worse than when assessed (in 2022). Further, the remaining small seep south of the current impacted one would be included in the rehabilitation proposals, and that the functional benefits of the offset would materialise in the same system as the impacted seep – which is the objective of wetland offsets.

PS added that the east of the site would play a role in stormwater management as required by CCT, and that this could be built into the current wetland rehabilitation measures.

MW requested confirmation that the offset site was within the ownership and control of the applicant – PS responded in the affirmative.

MB queried whether there is an opportunity to secure the rehabilitation of a larger upland area between the impacted seeps, runway safety zone and the CVB wetland – to provide greater ecological functioning, provide ore area for receiving search and rescue species, and to take advantage of the fine scale gradients in soil type, texture, depth and moisture for renosterveld rehabilitation. JvdM acknowledged the benefits of this/

PS noted that although there might be a small opportunity for this, the client was also concerned about retaining agricultural production in the region, and there would be constraints on the rehabilitation option. BB reiterated that a buffer of at least 32m around each wetland would need to be retained and rehabilitated to a functional renosterveld type.

3. Terrestrial Impact and offset proposals – See attached PPT

MB gave a quick background to the project, focusing on the biodiversity impacts and the initial calculation of offset requirements by Nick Helme. He confirmed that ecosystem distribution is complex in the area, but most of the impact is on Swartland Renosterveld on granite and shales. MB confirmed that a terrestrial offset of 77 ha of the impacted vegetation types is needed, focusing on the priorities in the BioNet that are not adequately protected. The top candidate site is large enough and hosts the impacted CR species of concern, among many other red-listed species.

Questions:

IA questioned if the top candidate site was awarded NR eligibility from site review due to previous reactive offsets – JvdM & MB confirmed that it was assessed proactive by CCT in 2012.

ADC confirmed that land use pressure is increasing in the region, and that CN would require any site protection agreements to be in perpetuity. IA added that he was expecting the site to be secured appropriately in some way prior to any EA being awarded.

MB confirmed that and site protection arrangement would be in perpetuity, and that a survey and subdivision and subsequent transfer to the CCT or a PBO was optimal means to achieve this. The management agreement would be for a minimum of 30 years and if possible capitalise an endowment to cover costs for the foreseeable future.

MW supported that if the CCT wishes to take on management, that that would be ideal.

Meeting ended at 10h15 - 7 June 2024

Appendix J2 – Meeting minutes of the offset discussion held with the DWS

Part of the SAS Environmental Group of Companies

FEN CONSULTING

Applying science to the real world

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www.sasenvironmental.co.za

Project name: Cape Winelands Airport Development Wetland Offset Discussion						
Venue	**Teams**	**Date**	**16/09/2024**	**Time**	**14:00**
Chairperson	**Bianca Bleuler**		**Minutes prepared by**	**Freshwater Ecologist Network Consulting (Pty) Ltd**	

Attendance			**Apologies**
Stephen van Staden	(SvS)	stephen@sasenvgroup.co.za	Mark Botha
Bianca Bleuler	(BB)	bianca@sasenvgroup.co.za	
Amanda Fritz-White	(AF)	amanda@phsconsulting.co.za	
Paul Slabbert	(PS)	paul@phsconsulting.co.za	
Olivia Brunings	(OB)	olivia@phsconsulting.co.za	
Shaddai Daniel	(SD)	DanielS@dws.gov.za	
Warren Dreyer	(WD)	DreyerW@dws.gov.za	

Item	Description
1.	**Welcome** Bianca Bleuler (BB) of FEN Consulting welcomed everybody to the meeting and reminded everyone that the draft offset report was distributed for comment.
2.	**Attendance and Apologies** Refer to the table above and the attendance register for attendees and apologies.
3.	**Background** BB gave a background of the project. She described the locality of the project indicating that the study area has been subject to historical mining and agriculture and activities associated with the Cape Winelands Airport (CWA). BB further explained that a specialist freshwater impact assessment was done by FEN Consulting indicating the potential impacts of the development of the DWS on the wetlands associated with the study area and described the ecological condition of the freshwater ecosystems associated with the study area. The seep wetlands are considered largely modified whereas the channelled valley bottom (CVB) wetlands 2 and 3 are considered seriously modified. All

Item	Description
	freshwater ecosystems have very low ecoservice provision and low/ marginal ecological importance and sensitivity. BB explained the offset consideration criteria and noted a lack of seep wetlands in the greater catchment to achieve like for like offset from a hydrogeomorphic point of view. Initial investigation identified numerous potential areas as suitable areas for offsetting, including the three wetlands identified by Khula Environmental Consultants in 2018, and an onsite offset. It was determined that, in terms of physical hectares, 6.74 ha of wetland area would be lost and an additional 0.7 ha of indirect wetland impact is anticipated. The wetland offset investigation was thus based on an estimated loss of 7.44 ha. In terms of the quantum of offset, it was determined that the 6.74 ha of seep wetland could be offset with a 3.3 functional hectare equivalence (HaE) and conservation HaE of 13.0 ha.
4.	**Target offset wetlands explained**
	BB described the ecological condition of the onsite wetlands to be offset indicating the largely and seriously modified conditions of the remainder of the seep and CVB 1 wetlands, respectively and explained which wetland areas are targeted for offset. It was noted that in addition to the remainder of the seep wetland and CVB wetland 1, the agricultural drain connecting the two systems would also be rehabilitated.
5.	**Future access road considerations**
	BB discussed the potential for future development of access roads through the CVB wetland which has been incorporated into future development planning by the Western Cape Government. Environmental Impact Assessment (EIA) and Water Use Authorisation (WUA) are still to be conducted for these roads prior to them potentially being developed in the future. Based on the Access Management Plan, some access road alternatives are considered of which two may traverse the potential offset area, and it was recommended that existing access roads be upgraded rather than constructing new roads. The access roads that may traverse the CVB wetland offset area were incorporated into the offset calculations to account for their future potential development. BB explained that from a freshwater perspective, only one of the two proposed access roads be developed and the other rehabilitated. One of the access roads is also located adjacent to a CVB wetland which is to be rehabilitated should that road alternative be selected as the preferred road.
6.	**Offset initiative summary**
	BB explained that with the offsetting of the remainder of the seep wetland and CVB wetland 1, the offset target will be exceeded with a 0.1 HaE gain in functional HaE and a 17.5 HaE gain in ecosystem conservation HaE. An additional gain is anticipated for the rehabilitation of the agricultural drain hydrologically connecting the seep wetland to the CVB wetland 1, which was not calculated as part of the offset investigation.
7.	**KRCA Rehabilitation Plan**
	BB explained the rehabilitation plan, with particular focus on the following aspects: • Improving hydraulic regime of the wetlands; • Remediation of gully and headcut erosion and incision; • Alien invasive species control (although to a limited extent); • Revegetation; • Alien grass (particularly kikuyu) management; and • Ongoing maintenance and management.
8.	**Comments and questions**
	Warren Dreyer (WD) indicated that in principle he was pleased with the approach but that formal feedback will be provided. Shaddai Daniel (SD) asked if CWA will be falling under ACSA. Paul Slabbert (PS) indicated that CWA is a private project and not an ACSA project.

Item	Description
	SD asked whether the overall operations and the maintenance management, including stormwater management, as well as maintenance and management of the watercourses, will be undertaken by the private entity and not in partnership with ACSA, which PS confirmed. SD then queried whether the stormwater management and hydropedological impacts to the wetland offset will be included into the offset report particularly considering the current problems observed at the Cape Town International Airport as a result of the high water table. BB responded that the offset report for CWA will be updated to include stormwater management and hydropedological considerations. BB also indicated that the study area slopes away from the airstrip, implying that any stormwater directed to the wetlands will have no implications on the operations of the CWA. From a hydropedological point of view the proposed CWA also does not pose a significant risk to the wetlands. SD reiterated that the offset report would need to incorporate a hydropedologist opinion on the offset to which BB responded that it will be included in the report. SD asked how the stormwater on site will be managed and how it will impact the wetlands. BB responded by indicating that the impacts of stormwater management is included in the freshwater report but reference to the report and its recommendations will be made in the offset report. SD wanted clarity on whether the off site offsets are still to be investigated to achieve the 13 ha ecological conservation HaE. BB indicated that the 13 HaE will be achieved by the onsite offset reiterating the rehabilitation of ~ 40 ha of wetland area to achieve the offset target. SD asked if having the offset site in such close proximity to the CWA would have an operational impact on the CWA. BB indicated that this would have to be confirmed by the relevant specialists. Amanda Fritz-Whyte (AF) indicated that faunal and avifaunal studies have been conducted along with a bird strike report. AF indicated that all stormwater ponds except for the quarry will be dry ponds. The quarry will however be designed to have additional protection measures to deter birds. The bird strike specialist have been providing input and guidance on the design and stormwater area landscaping. A wildlife management plan will also be developed but will only be finalised after the Environmental Authorisation has been obtained. SD indicated that the impacts with regards to bird strikes and wildlife may need to be provided to the Department of Water and Sanitation earlier as input cannot be provided without it. PS reiterated that the offset interventions will not result in large standing bodies of water due to the non-perennial nature of the system. As such the bird strike risk is considered low as large birds will not be drawn to the wetlands. PS also reiterated the difference between the CWA and Cape Town International Airport site in that CWA is not a low-lying site and the airstrip is in a high lying area. In response to the future road development, SD reiterated that any areas that are going to be allocated and designated as offset areas are not going to be allowed to have development within them. BB indicated that both road alternatives' footprints were explicitly excluded from the offset investigations. Existing roads will also be used rather than creating new roads and additional mitigation measures were added to the report which must be implemented to ensure that the functionality of the system will be maintained. PS indicated that the roads form part of the Province's Road Access Strategy, so the access roads were included from an access point of view rather than a future urban expansion point of view. DS asked whether designs for the road are available in order to understand if there will be specification for subsurface flow allowance. BB indicated that the idea would be to ensure hydraulic connectivity of the system through inclusion of culverts etc. in the design of the roads. SD indicated her concern that the roads will have additional impacts on the offset area which would require other mitigation measures but will have to review the offset report in more detail. SD asked whether the offset report contains detail on habitat creation and ecoservice provision to which BB responded that it does.
9.	**Way Forward**
	BB ended off the meeting noting that the meeting minutes will be shared and thanked the participants for their time in attending the meeting. BB and AF indicated that if the Department have any questions, the project team can be contacted.
	The meeting closed at 14h45

Appendix J3 – Draft Memorandum of Understanding

Draft Memorandum of Understanding

Of

CAPEWINELANDS AERO (PTY) LTD

HEREIN REPRESENTED BY

MR DEON CLOETE

IN HIS CAPACITY AS DIRECTOR FOR *CAPEWINELANDS AERO (PTY) LTD*

HE BEING DULY AUTHORISED THERETO

TO ENSURE INTEGRITY OF THE TARGET OFFSET AREA

This Memorandum of Understanding (MoU) sets for the terms and understanding of the CAPEWINELANDS AERO *(PTY) LTD* to *OFFSET THE REQUIRED 6.74 HA OF WEST COAST SHALE RENOSTERVELD WETLAND BY REHABILITATING THE ON SITE TARGET OFFSET AREA.*

PERMEABLE

PRE-EMPTING the conditions of the environmental authorisation in terms of the National Environmental Management Act, 2004 (Act No 8 of 2004) as well as the Water Use Authorisation for offsetting an ~ 40 ha area of wetland (remaining portion of a seep wetland and a channelled valley bottom wetland) on Portion 7 of Farm 942, Kliprug and the Remaining Extent of Farm 474, Joostenbergs Kloof as a result of the development and resultant loss of 6.74 ha of wetland on the same property, for which the environmental authorisation and Water Use Authorisation is yet to be issued.

ACKNOWLEDGING CapeWinelands Aero (Pty) Ltd's commitment to protect the target offset area;

MINDFUL of the need for Sustainable Development to support development and implementation of scientifically sound procedures for integrated approaches to land use planning;

DESIROUS of the sustainable development of the target offset area whilst optimising benefits to local communities;

RECOGNISING the outstanding universal value of natural freshwater ecosystems and the fact that it may provide habitat to species of conservation concern, not only of the Republic of South Africa, but of humankind as a whole deserving protection and transmission to future generations;

FURTHER RECOGNISING the significance that the target offset area is to be protected in perpetuity (at least for thirty years);

CONCERNED that the target offset area is under increased pressure from an ecological functionality and conservation point of view;

COMMITTED to maintaining the integrity of the target offset area and to ensuring that negative impacts of development are avoided, minimised or remedied in pursuit of sustainable development; and

ACKNOWLEDGING that the participation of all stakeholders is crucial to the conservation and sustainable development of the target offset area and that this will be enhanced through long-term cooperative efforts guided by the relevant biodiversity offsets programmes and implementation plans.

HEREBY AGREE AS FOLLOWS:

ARTICLE I - DEFINITIONS

In this Agreement the following expressions shall bear the following meanings and related expressions shall bear corresponding meanings:

"Cape Nature" means Cape Nature, provincial biodiversity authority;

"CapeWinelands Aero" means the CapeWinelands Aero (Pty Ltd (the developers);

"COCT" means City of Cape Town;

"Community" means community as defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998);

"DEA&DP" means the Department of Environmental Affairs and Development Planning;

"DWS" means the Department of Water and Sanitation;

"MoU" means this Memorandum of Understanding and its annexures;

"NEMA" means the National Environmental Management Act, 1998 (Act No. 107 of 1998) and related amendments and regulations;

"NWA" means the National Water Act, 1998 (Act No. 36 of 1998) and related regulations;

"Parties" means the CapeWinelands Aero and any other party that may be involved in the offset programme, which may include Cape Nature, COCT, DEA&DP and DWS;

"Stakeholders" means individuals or groups of individuals or representative institutions with a stake, direct interest or a right recognisable under law in the development and management of the Conservation Area, such as local or provincial authorities;

"Sustainable development" means sustainable development as defined in the National Environmental Management Act, 1998 (Act No. 107 of 1998);

"Target offset area" means the remaining seep wetland and portion of the channelled valley bottom (CVB) wetland to be rehabilitated which is located on potion 7 of Farm 942 and the remaining extent of Farm 474. The offset area associated with the remainder of the seep wetland is 3.68 ha in extent, whereas the portion of the CVB wetland to be rehabilitated is 36.2 ha in extent. Future development planning by the Western Cape Government in the form of constructing access roads through the CVB wetland from the R304 may be necessary. The two access roads that may traverse the CVB wetland offset area have been purposefully excluded from the target offset area.

ARTICLE II - OBJECTIVES

The goal of this Draft MoU is to comply, as far as possible with the relevant provisions of the Environmental and Water Use authorisation still to be issued. Should minor adjustments to the offset be required this Draft MoU may need to be amended accordingly.

The purpose of this Draft MoU is to ensure the integrity of target offset area through comprehensive biodiversity offsets programmes thereby optimising benefits to local communities. This Draft MOU assumes that the remainder of the seep wetland and CVB wetland HGM unit will be rehabilitated to a Category D and E ecological condition, respectively as part of this offset investigation. Should additional offset investigation be required, the Draft MOU may need to be amended accordingly.

To attain the goal of this Draft MoU, the Parties agree to:

i) CapeWinelands Aero aims to provide funding and rehabilitate the target offset area in the manner as defined in the Approved Offset Plan on Portion 7 of Farm 942, Kliprug and the Remaining Extent of Farm 474, Joostenbergs Kloof;
ii) promote alliances in the management of natural resources in support of wetland areas;
iii) ensure compliance with the provisions of this MoU as well as with the requirements of other applicable legislation through monitoring and evaluation;
iv) encourage social, economic and other partnerships among Stakeholders;
v) promote integrated planning, research, education, awareness and capacity building;
vi) collaborate in formulating detailed wetland offsets programmes and implementation plans; and
vii) provide adequate financial, human and other resources for the effective implementation of the MoU.

ARTICLE III - DEVELOPMENT OF BIODIVERSITY OFFSET PROGRAMMES

The Parties agree to develop detailed wetland offset programmes which will form part of this MoU as annexures. The offset framework will be underpinned by, among others, the following components:

a) Obtaining the relevant statutory authorization for the relevant rehabilitation activities;
b) Identified earthworks that will be required after more detailed analyses;
c) Alien vegetation clearing; and
d) Improvement of wetland habitat and functionality.

The above components for offsets will be translated into more comprehensive programmes and implementation plans.

ARTICLE IV - INSTITUTIONAL ARRANGEMENTS

INSTITUTIONAL ARRANGEMENT

CapeWinelands Aero agrees to:

i) ensure coordination of the implementation of this MoU through the established Environmental Advisory Committee (EAC) or relevant subcommittees constituted by the Parties and any other person or organisations identified and agreed to by the Parties;
ii) capacitate the EAC to be able to champion and monitor the development and implementation of the biodiversity offsets programmes and implementation plans;
iii) ensure periodic review and updating of the biodiversity offsets programmes and implementation plans;

iv) appoint an implementing agent to oversee the management of the offset area, should CapeWinelands Aero require to or not be capable of implementing the wetland offset plan;
v) ensure effective participation of other key stakeholders, including government and nongovernmental organisations, communities, landowners, the academic community and the private sector at the international, national and local levels, in the implementation of the MoU;
vi) develop means whereby local communities sustainably benefit from the use of natural and cultural resources provided by the target offset area.

PRINCIPLES OF COOPERATION

The Parties shall observe the following principles in their cooperation in terms of this MoU:

a) Respect the role of the lead institution on an agreed joint program;
b) Acknowledge each Party's support;
c) Honour commitments; and
d) Ensure that information of mutual interest is forwarded to each Party within reasonable timeframes.

ARTICLE VI - CONFIDENTIALITY

Any Party shall treat information furnished by another Party or another person for purposes of the execution of this MoU as confidential.

A Party so furnished with information shall not disclose such information to any other person without the prior written consent of any other Party and shall take reasonable steps to ensure that such information is not disclosed to another person.

The Parties shall continue to observe the principle of confidentiality even after the MoU is no longer valid or is suspended for any reason whatsoever by CapeWinelands Aero.

ARTICLE VII - CORRUPTION

CapeWinelands Aero acknowledge and commit themselves to a policy of zero tolerance towards corrupt activities.

The Parties shall assist each other in developing fraud and corruption prevention strategies.

ARTICLE VIII - REVIEW AND AMENDMENTS

CapeWinelands Aero shall review, where necessary, the contents of the final MoU annually or when deemed necessary.

No alteration, variation, addition or agreed cancellation of the final MoU shall be of any force or effect unless reduced to writing in an addendum to the final MoU and signed by any additional Parties involved or their duly authorized signatories.

CapeWinelands Aero shall review the progress achieved in the implementation of the final MoU one (1) year after it has entered into force.

ARTICLE IX - DISPUTE RESOLUTION

Any disagreement or dispute arising within CapeWinelands Aero or between any involved Parties with regard to interpretation or implementation of this MoU shall be settled amicably, or if not possible, through the procedures and processes as laid down in Chapter 4 of NEMA.

ARTICLE X - ENTRY INTO FORCE, DURATION AND TERMINATION

The rights, responsibilities and obligations of CapeWinelands Aero to this Draft MoU shall commence on the signature date of the final MoU.

The Final MoU may be terminated by any Party giving one (1) year's written notice in advance to other Parties.

ARTICLE XII - GENERAL

1. Entire contract

This Draft MoU and its annexures constitutes the entire Draft agreement of CapeWinelands Aero with regard to the matters dealt within this Draft MoU and no representations, terms, conditions or warranties not contained in the Final MoU shall be binding.

2. Variation, cancellation and waiver

No contract varying, adding to, deleting from or cancelling the final MoU, and no waiver of any right under the Final MoU, shall be effective unless reduced to writing and signed by or on behalf of CapeWinelands Aero.

3. Cession

No Party may cede that Party's rights or delegate that Party's obligations without the prior written consent of the other Parties.

4. Applicable law

This Draft MoU shall be interpreted and implemented in accordance with the laws of South Africa.

ARTICLE XIII – DOMICILIUM AND SIGNATURE

CapeWinelands Aero choose as its *domicilia citandi et executandi* an address set out in this clause for all purposes arising out of or in connection with this Draft MoU at which addresses all processes and notices arising out of or in connection with this Draft MoU, its breach or termination may validly be served upon or delivered. For purposes of this MoU CapeWinelands Aero's address is as defined below the signatory below.

(Partner signature)

Date: 11 November 2024

Deon Cloete

Partner name

Capewinelands Aero (Pty) Ltd

organization, position

PO Box 13449,
Mill Street,
Gardens
8010

APPENDIX K – Details, Expertise and Curriculum Vitae of Specialists

Bianca Hagen MPhil Environmental Management (Stellenbosch University)
Stephen van Staden MSc Environmental Management (University of Johannesburg)

1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	FEN Consulting (Pty) Ltd		
Name / Contact person:	Stephen van Staden		
Postal address:	221 Riverside Lofts, Tygerfalls Boulevard, Bellville,		
Postal code:	7539	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	Environmental Management (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Stephen van Staden, declare that -

- 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 relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, 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

Signature of the Specialist

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF BIANCA BLEULER

PERSONAL DETAILS

Position in Company	Junior Field Specialist
Joined SAS Environmental Group of Companies	2023

MEMBERSHIP IN PROFESSIONAL SOCIETIES

None

EDUCATION

Qualifications

MPhil Environmental Management (Stellenbosch University)	2022
PGD Environmental Management (Stellenbosch University)	2018
BSc Hons Biodiversity and Ecology (Stellenbosch University)	2017
BSc Biodiversity and Ecology (Stellenbosch University)	2016

Short Courses

Tools for Wetland Assessment presented by Prof. F. Ellery and Rhodes University	2020

AREAS OF WORK EXPERIENCE

South Africa –Western Cape

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Environmental Control Officer (ECO) work
- Environmental Management Programme (EMPr) compilation

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Plant Species and Landscape Plans

SAS ENVIRONMENTAL GROUP OF COMPANIES SPECIALIST CONSULTANT INFORMATION –

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing Member, Group CEO, Water Resource Discipline Lead, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SEGC	2003 (year of establishment)
Other Business	Trustee of the Serenity Property Trust

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP);
Accredited River Health Practitioner by the South African River Health Program (RHP);
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum;
Member of the Gauteng Wetland Forum;
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

CORE FIELDS OF EXPERTISE

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

Freshwater Assessments

- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species and Landscape Plans
- Freshwater Offset Plans
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Hydropedological Assessment

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments

ANNEXURE 8: WASTE MANAGEMENT PLAN

DEA&DP IN-PROCESS NR: 16/3/3/2/A5/20/2046/24

WASTE MANAGEMENT PLAN FOR THE EXPANSION OF THE CAPE WINELANDS AIRPORT

(P10 OF FARM 724, RE OF FARM 724, P23 OF FARM 724, P7 OF FARM 942, RE OF FARM 474, P3 OF FARM 474 AND P4 OF FARM 474)

JULY 2025

COVER IMAGE NOT REPRESENTATIVE OF THE PROJECT SITE
© ADOBE STOCK

PREPARED FOR
CAPEWINELANDS AERO (PTY) LTD

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Document Details

DOCUMENT TITLE	Waste Management Plan for the proposed expansion of the Cape Winelands Airport
NUMBER OF PAGES	69 (excluding appendices)
DOCUMENT VERSION	Final Report

Document Control

	NAME	EAPASA REGISTRATION NUMBER	SIGNATURE	DATE
AUTHOR	Jenna Theron	2022/5926		<u>22 June 2025</u>
REVIEWER	Paul Slabbert	2019/1036		<u>24 June 2025</u>
EDITOR & REVIEW	Olivia Brunings	2023/6743 (Candidate)		<u>24 June 2025</u>

PLEASE NOTE THAT ALL CHANGES TO THE DRAFT REPORT FOR COMMENT (VERSION 1) ARE <u>UNDERLINED</u>.

PLEASE NOTE THAT ALL CHANGES TO THE DRAFT REPORT FOR COMMENT (VERSION 2) ARE <u>UNDERLINED & IN BLUE</u>.

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KEY TERMS AND ABBREVIATIONS

Applicant – Capewinelands Aero (Pty) Ltd

Auditing - A systematic and objective assessment of an organization's activities and services conducted and documented on a periodic basis to a predetermined standard.

Baling – the manual or mechanical tying, bundling or wrapping of compressed waste material.

Chipping – the manual or mechanical chopping or cutting of garden waste into smaller pieces in preparation for further processing.

Competent Authority – the organ of state charged by the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)(as amended), as the licensing authority.

Composting – means a controlled biological process in which organic materials are broken down by micro-organisms by means of aerobic and anaerobic processes.

CWA – Cape Winelands Airport

Department of Environmental Affairs and Development Planning: Waste Management (DEA&DP: WM)– the provincial authority for sustainable environmental management and integrated development planning.

DWS - Department of Water & Sanitation

EA – Environmental Authorisation

EAP – Environmental Assessment Practitioner

EM – Environmental Manager

EMD - Environmental Management Division

Environmental Management Programme (EMPr) an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation, and decommissioning of a project are managed, and that positive benefit of the projects are enhanced.

Environmental Control Officer (ECO) – a suitably qualified environmental consultant to be appointed by the Applicant to oversee the implementation of the suite of Environmental Management Plans complied for the site, inclusive of this Veld Fire Management Plan.

Handling – means functions associated with the movement of waste, including storage, treatment and ultimate disposal, by means of manual systems or automated systems;

National Environmental Management Act (Act 107 of 1998, as amended) (NEMA)– national legislation that provides principles for decision-making on matters that affect the environment.

N&S - Norms & Standards

Separation at Source (S@S) - Involves sorting post-consumer waste at the point of generation—whether at homes, businesses, or industrial sites—using a system that divides waste into categories, such as a two-bag system for recyclables and non-recyclables (e.g., wet and dry waste). At the Airport, S@S means providing separate bins at each waste collection point, ensuring that waste is properly sorted before being transported to the Waste Management Facility for further processing

Shredding – the breaking down of waste material, through manual or mechanical cutting or tearing into smaller parts.

Sorting – the manual or automated separation of waste materials according to type, class, state of contamination or usability for a particular purpose.

Site - Area where the proposed development will take place.

Waste Facility – a commercial place, infrastructure or containment of any kind including associated structures or infrastructure where there is sorting, shredding, grinding, crushing, screening, chipping or baling of general waste.

WCO – Waste Control Officer

WMP – Waste Management Plan

WMF - Waste Management Facility

WULA – Water Use License Application

WWTW – Waste Water Treatment Works

SECTION 1: CONTEXTUAL INFORMATION

1.1. Background

This report is an Environmental Management Programme (EMPr) for the Waste Management Facilities proposed at the Cape Winelands Airport (CWA). PHS Consulting was appointed by *Capewinelands Aero (Pty) Ltd* to compile this document in order to satisfy the requirements of NEM: WA. The CWA development, historically known as Fisantekraal Airfield (FAFK), is located approximately 10.5 km northeast of Durbanville and 25 km northeast of Cape Town International Airport (CTIA) (see Figure 1).

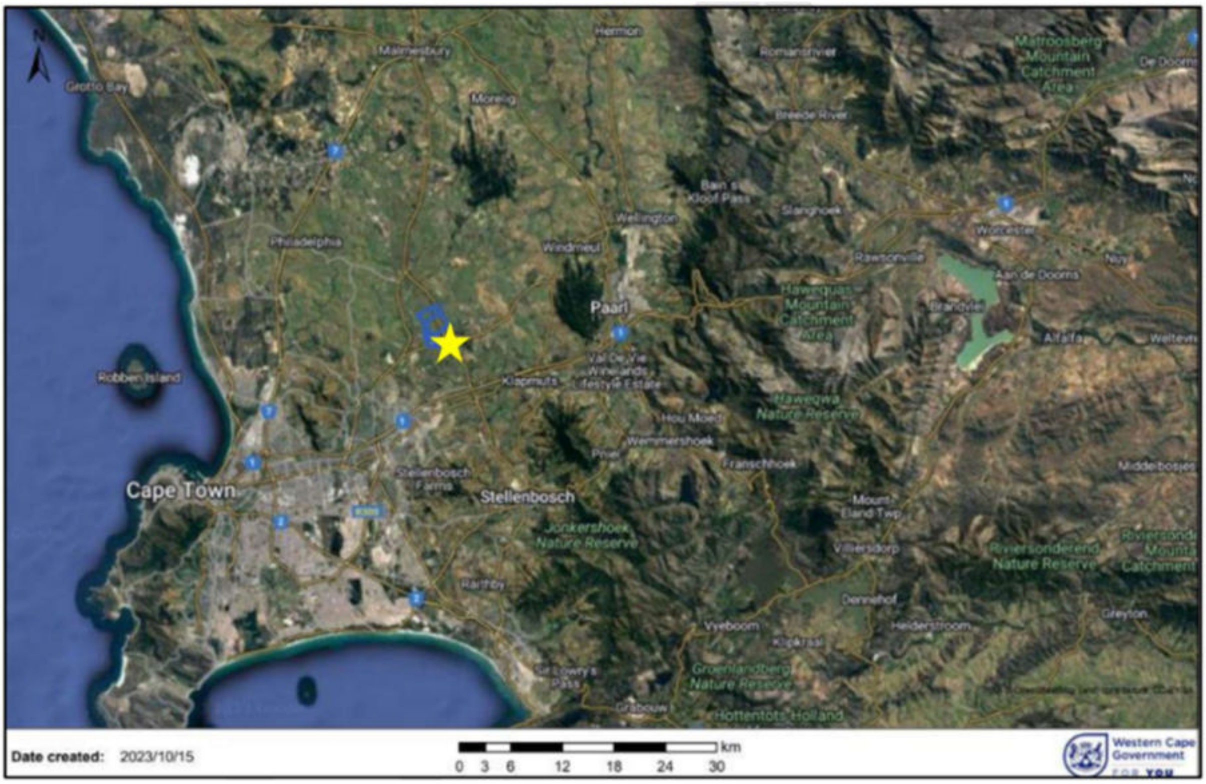


Figure 1: Regional location of CWA (indicated by yellow star and with cadastrals outlined in blue).

Initially constructed around 1943 as a South African Air Force aerodrome during World War II, CWA has since transitioned into a general aviation (GA) airfield. The current 150-hectare site includes four concrete runways, each 90 meters wide and varying in length between 700 meters and 1,500 meters. The facility supports various unscheduled operations such as recreational flying, flight training, aircraft maintenance, charter operations, crop spraying, and aerial banner towing. The development spans across the following cadastral portions (see Figure 2):

- Portion 23 of Farm 724,
- RE of Farm 724,
- Portion 10 of Farm 724,

- Portion 4 of Farm 474,
- RE of Farm 474,
- Portion 7 of Farm 942,
- Portion 3 of Farm 474.

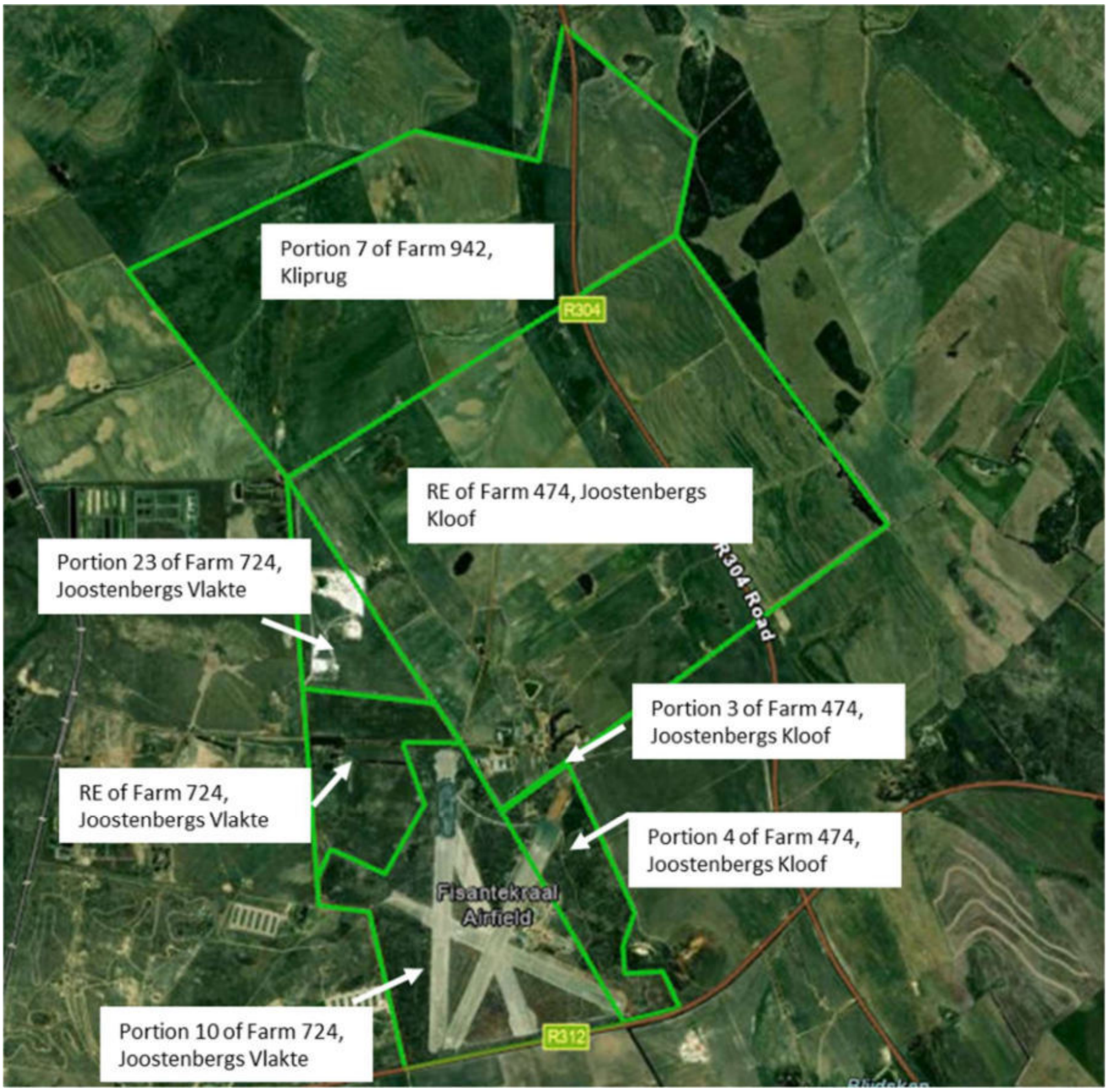


Figure 2: Cadastrals forming part of application area

The proposed development will expand the existing airport facilities, encompassing five additional cadastral portions, creating a combined area of 885 hectares. Of this area, 470 hectares will be allocated for airport development, including an airside precinct, terminal precinct, services precinct, general aviation precinct and associated landscaping (**Appendix A**). The remaining land will remain as agricultural zones, designated as an agricultural precinct. This agricultural precinct will feature a combination of dryland agriculture, conservation of botanically sensitive areas, and wetland offsets.

The project envisions a phased development approach, including the realignment of a primary runway to an orientation of 01-19 with a length of 3.5 km. The upgraded CWA is planned to transition from a general aviation airfield into a commercial airport capable of facilitating long-haul, wide-body flights by airlines and unscheduled operators from across the world. The airport's expansion will serve multiple roles within the aviation sector and will support a variety of industries, including fixed-based operations, private charter services, flight training, helicopter services, aircraft maintenance, hotel and conferencing facilities, retail and food services, warehousing, logistics, and freight operations.

No Waste License application is required for the proposed project, in terms of the National Environmental Management: Waste Act (NEM: WA), 2008 (Act 59 of 2008). However, CWA will have to adhere and register in terms of several "Norms & Standards" as per NEM: WA. One of the requirements is the compilation of an EMPr to be adopted by Department of Environmental Affairs and Development Planning: Waste Management (DEA&DP: WM). However, considering the project will have an overarching EMPr, of which this document will form an Annexure, we will refer to this document as a Waste Management Plan (WMP) instead.

Waste management is the process of collecting, treating, recycling, and disposing of different waste materials to reduce the environmental impact of waste. A WMP plays a key role in achieving sustainable waste management. The purpose of this plan is to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste that is generated from the proposed development activities. The plan prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste. Airports, by their very nature, generate a significant amount of waste. This waste comes from a variety of sources and requires careful management to reduce environmental impacts. *Capewinelands Aero (Pty) Ltd* can effectively manage construction and operational waste by requiring in-house teams, contractors and operators to follow a Waste Management Plan that identifies:

- The types of waste materials that will likely be generated on a site;
- The procedures that will be used to collect, sort and store the waste materials;
- How the materials will be reused or recycled
- Who will haul away the waste material;
- The location to which the materials will be hauled; and
- Final disposal requirements

The compilation of the WMP was based on waste stream information available at the time of compilation. Construction practices and operations must be measured and analyzed to determine the efficiency of the plan and whether further revision of the plan is required. This WMP describes the facility management in detail, and is prescriptive, identifying specific individuals or organizations responsible for undertaking specific tasks to ensure that environmental impacts resulting from the operation of the CWA is minimized. This WMP is an open-ended document and information gained during on-going monitoring of procedures on site could lead to changes in the recommendations and specifications of this document. This plan should be updated should further detail regarding waste quantities and categorization become available, during the construction and/or operational stages.

1.2. Purpose and Principles of the WMP

The purpose of this Waste Management Plan is to describe the principles, procedures and management of the waste generated by Cape Winelands Airport and to ensure waste is reduced, reused and recycled wherever possible. The Waste Management Plan outlines measures to manage and mitigate waste generation and resource consumption during the construction and operation of the development. The Waste Management Plan is therefore designed to support an ecological based management approach underpinned by adaptive management principles through the entirety of the project life cycle.

In general, the following phases can apply: planning & design; pre-construction activities; construction activities; operational activities and rehabilitation &/or decommissioning. However, the need to include all the above phases depends on the scale and scope of each individual project. Decommissioning of the facility is not currently foreseen and therefore it is not further addressed in this document. The WMP focuses primarily on the construction and operational phase of the facility and is intended to guide construction and operational aspects in line with relevant legislative requirements and the recommendations made by the specialist and/or consultant(s) as applicable.

As indicated, the WMP forms part of the overarching EMPr for the CWA and will therefore be included and circulated as stipulated in the EMPr. The WMP must form part of all contractual documents for this project. The approval of the WMP by DEA&DP: WM will require that the landowner and all appointed contractors must comply with the requirements therein. Any amendments/ changes/ upgrades to the WMP will require submission to and approval by DEA&DP: WM.

Capewinelands Aero (Pty) Ltd are committed to implementing the WMP so that it is effective, accurate, economical and ensures that the procedures put into place are working and are maintained. The aim is to minimise waste and the reduction of waste pollution. An integrated approach to waste management will be implemented on site with the aim of:

- Considering the Life Cycle Analysis of waste on site allows one to better understand the true impacts of any given goods or services over the course of the entire life cycle.
- Product Stewardship accountability needs to be placed on those who design, manufacture, use, or dispose of products. Collaboration in this regard between CWA and its suppliers/ service providers can result in innovative and continued improving of achieving waste management targets.
- Prioritizing the reduction of waste volumes is therefore paramount. Continued education and training of all CWA staff, sub-contractors and passengers is required.

- If avoidance or reduction is not feasible, the maximum amount of waste is to be recycled or re-used through separation and sorting of waste on site.
- Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner possible.
- As a last resort, non-recoverable waste will be sent to the appropriate Landfill (hazardous or non-hazardous).
- Monitoring, recording and auditing of all waste management taking place on site.

Such an approach is illustrated in Figure 3 below.

Source: http://www.enviroserv.co.za/pages/content.asp?SectionId=496

Figure 3: The integrated waste management approach to waste.

1.3. Status of the WMP

The WMP must form part of all contractual documents for this project. The WMP includes all relevant documentation within this report and/or referred to within it. The approval of the WMP by DEA&DP: WM will require that the landowner and all appointed contractors must comply with the requirements therein. Any amendments/ changes/ upgrades to the WMP will require submission to and approval by DEA&DP: WM.

1.4. Comment to the WMP

The WMP forms part of the contract identifying and specifying the procedures to be followed by all contractors, and employees of the facility to eliminate or reduce adverse impacts of the works on the environment. The appointed EAP will hand over the WMP to the landowner/operator for implementation. Should the landowner/operator, contractor or employee persistently fail to observe the provisions of the WMP, the auditing EAP can recommend remediation actions including notification of the relevant authority for a compliance audit.

Copies of the WMP will be made available to all senior personnel on site, who will be required to familiarize themselves with the contents of the document and to follow procedures accordingly. Each contractor involved in the development and/or operation of the facility will be expected to sign for, and thus acknowledge receipt of the final WMP, and thereby will be expected to abide by the specifications of the document, as well as annexures and any amendments thereto.

The WMP will include goals and objectives set to achieve the required environmental standards. The Landowner will be responsible for the overall implementation of the WMP

1.5. Relevant legislation and policies

Waste in South Africa is currently governed by means of a number of pieces of legislation, including:

- National Environmental Management: Waste Act (NEM: WA), 2008 (Act 59 of 2008) (as amended).
- The South African Constitution (Act 108 of 1996).
- Hazardous Substances Act (Act 5 of 1973).
- Health Act (Act 63 of 1977).
- Environment Conservation Act (Act 73 of 1989).
- Occupational Health and Safety Act (Act 85 of 1993).
- National Water Act (Act 36 of 1998).
- The National Environmental Management Act (Act 107 of 1998).
- Municipal Structures Act (Act 117 of 1998).
- Municipal Systems Act (Act 32 of 2000).

- Mineral and Petroleum Resources Development Act (Act 28 of 2002).
- National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEM: AQA)
    - The provisions of the National Dust Control Regulations published in terms of section 53 (o), read with section 32 of the NEM: AQA.
    - The provisions of the National Greenhouse Gas Emission Reporting Regulations published in terms of section 53 (aA), (o) and (p), read with section 12 of the NEM: AQA.
    - The National Ambient Air Quality Standards published in terms of section 9 (1) of the NEM: AQA.
- City of Cape Town: Integrated Waste Management By-law, 2009.

It was clarified with DEA&DP: WM that no Waste License application is required for the proposed project, in terms of the National Environmental Management: Waste Act (NEM: WA), 2008 (Act 59 of 2008) based on the following:

- The airport will have a WMF of approx. 1250 m^2, where all waste streams will go for temporary storage and where waste separation will take place.
- General waste will be sorted and temporarily stored in various categories.
- Shredding and baling of general waste will take place.
- All sorted, shredded or baled recyclable waste will be collected by recycling companies for off-site processing.
- Organic, food, garden, decomposable waste will go to a composting facility and bio-digester that will generate electricity. Alternatively organic waste will be collected by an accredit service provide for off-site composting.
- A sewerage package plant is proposed as an alternative to a conventional Waste Water Treatment Works.
- The sewerage effluent water generated by the package plant is normally used for irrigation or toilet flushing.
- The biodigester requires water to operate, but the water demand can be reduced or replaced by the sewerage effluent water from the sewage package plant (SPP).
- Considering the airports location the biodigester intents to use biomass sourced from the surrounding agricultural area, supplemented by general food waste from the airport or other organic /decomposable waste.
- Hazardous waste will be removed to a licensed facility.
- The intent is not to feed raw sewage sludge into the bio-digester, this will go into the SPP and then the outflow effluent water will be used in the biodigester. Bio-solids after treatment will be removed to a licenced facility alternatively if tested as non-hazardous it can be used in the biodigester.

- The combined tons of waste and water/ sewerage effluent water per day will probably exceed 100 Tons per day with the ability to produce 1 MW of continues power.
- The by-product from the bio-digester plant comprises "liquid fertilizer" which is planned to be used as organic agricultural fertiliser."

Based on the above, CWA will have to register and adhere in terms of the following Norms & Standards (N&S) due to the waste activities described above and the exceedance of the thresholds below:

- "National Norms and Standards for the Storage of Waste" (GN926 of 29 November 2013) should the facility have the capacity to store more than 80m^3 for hazardous waste and/or 100m^3 for general waste at any one time and for a period exceeding 90 days. (CWA 1250 m2 waste facility)
- "National Norms and Standards for Sorting, Shredding, Grinding, Crushing, Screening, Chipping or Baling of General Waste" (GN1093 of 11 October 2017) if general waste is sorted, shredded, grinded, crushed, screened, chipped or baled in an operational area at the facility exceeding 1000m^2. If the operational area does not exceed 1000m^2, the facility needs to register in terms of GN1093 only and adhere to section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and sections 16(1) and 16(3) of the NEM: WA. (CWA 1250 m2 waste facility).
- National Norms and Standards for Organic Waste Composting (GN 561 in GG 44762 of 25 June 2021) read with GN 1757 in GG 45907 of 11 February 2022. The composting facility will process less than 10 tonnes per day of organic waste, therefore it will be registered ito the N&S and aligned with the requirements of applicable integrated waste management by-laws and comply with the principle of duty of care as per S28 of NEMA.
- The activity of anaerobic digestion (biodigester) resort under the NEM: WA "*National Norms and Standards for Organic Waste Treatment*", published as GN. No. 1984 of 1 April 2022, and no longer requires an application for a waste management licence. Facilities that have the capacity to process in excess of 10 tonnes of organic waste per day need to register in terms of and adhere to GN No. 1984. (BIOMASS exceeds 10 tonnes per day plus the additional organic waste streams).
- GN No. 1984 above does not apply to any infectious animal waste, raw sewage or sewage sludge that does not meet the minimum quality standards for sludge as determined by the Department of Waste and Sanitation in their "*National Norms and Standards for Domestic Waste and Sanitation Services*", published as GN No. 982 of 8 September 2017. (The intent is to regard treated solids from the on-site WWTW as hazardous, to be removed from site, however if the minimum standards can be achieved it could be used in the bio-digester. Please note it needs to adhere to the requirement for the submission of Standard Operating Procedures (SOP) in accordance with section 6.2 of GN No. 1984.

- DEA&DP: Waste Management noted the intent to use the digestate from the anaerobic digester as a liquid fertiliser. The Department requested that once available, the digestate be analysed to determine its suitability as a liquid fertiliser, and that these results be made available to the Department, the DWS and the Western Cape Department of Agriculture.
- DEA&DP: Waste Management requires more information on the future biosolids resulting from the sewage package plant before a classification of the waste can be awarded. If the biosolids are regarded as hazardous it will be transported and disposed of at a hazardous waste facility. If not deemed hazardous it will be fed into the biodigester. Waste classification of the biosolids will also depend on an analysis provided on the chemical constituency of the biosolids, and depending on end use, the Department might require total concentration and leachable concentration tests to be conducted on the biosolids.

This Waste Management Plan (WMP) is in part fulfilment of the aforementioned NEM: WA Norms and Standards. Please note the WMP is an evolving document that will be shaped by the EIA process and final detailed operational procedure will become clear during the design phases for the WMF. As a norm a new waste facility must be registered with the competent authority in accordance with the N&S within 90 days prior to any construction of the WMF taking place. Considering the amount of time before the WMF will be constructed in relation to the current junction in the EIA process, it is therefore highly likely that this WMP will only be finally adopted by DEA&DP: WM after the Environmental Authorisation for the projects has been issued. Some design details of the WMF will therefore not form part of the WMP at this point in time until it's required to finally submit the WMP for adoption. Therefore 90 days prior to the construction of the WMF a NEM: WA Registration form will be submitted adhering to all the requirements of the N&S as attached under Annexure B.

1.6. The competent authority

DEA&DP: WM will review the WMP and on approval they may have the following role to play:

- Review and monitor implementation of the WMP;
- Review whether there is compliance by the landowner;
- Perform random control checks;
- Review ECO, incident and audit reports; and
- Enforce legal mechanisms for contraventions of the WMP.

SECTION 2: PROJECT DETAIL

2.1. Planning Phase

The SDP is divided into four (4) Precincts namely Airside, Airport Landside, General Aviation and Services Precincts. Please refer to Figure 4 & Figure 5 and Appendix A for more detail. The site has dedicated areas earmarked for waste management inside the services precinct (Figure 6). The rational for the location of infrastructure on site was primarily dictated by the 3.5 km runway orientation, this resulted in the airside precinct to be on the east of the site and the landside precincts to be located on the western side of the site. This also allowed for effective integration with the future urban area, services and access roads. Therefore, the services precinct was also positioned on the west to support the landside development. The WMF is opposite the City of Cape Town's WWTW, an area not suitable for residential development, and therefore suitable for the proposed activities.

The EIA process identified all bio-physical environments and constraints regarded as sensitive. Noteworthy sensitive areas that will remain on site after development is intact indigenous vegetation on the south eastern side of the runway and a partly remaining seep wetland on the eastern side of the runway all within the airside precinct. None of these areas will be exposed to any waste risks considering the services precinct where the WMF is located on the western side completely separated from these environments. Waste generated in these natural areas is organic waste generated by the natural landscape or windblown waste in the form of plastic or paper originating on or off-site. The main waste streams on site will be on the western side of the site, within the built environment. Any waste escaping the management system will end up in the stormwater system that will have sufficient retention and trap capacity to eliminate waste risks. The location of the waste facilities is on stable level ground, it will be inside a contained demarcated area designed in accordance with the N&S, therefore the on-site waste risk is limited and only relevant if managed poorly. The risk of waste smell to airport and surrounding land users is mitigated by the fact that the WMF is inside the services precinct, separate from the airport airside and landside precincts. This separation is regarded as sufficient to avoid waste smell impacts. The implementation of the WMP and N&S will also mitigate the possible impact of flies, rodents or pests etc. considering the design and management requirements as per N&S.

The agricultural area to the east of the airport contains wetland areas, however it's far from the waste management facility on the west, it also falls within two separate water sheds eliminating the risk of contamination via stormwater surface flows. The main waste streams originate on the west of the site, directly connected via a contained service network to the WMF. Therefore, neighboring areas to the west of the airport are most vulnerable to the waste streams. The risk of unmanaged waste stream reaching an off-site area is considered low. If waste is spilled or mismanaged, it could either flow via stormwater to neighboring sites, blow by wind or disperse foul odors onto neighboring properties. But if managed well, all waste streams should move efficiently to the WMF, that is contained within a defined service precinct where it will be managed, delivered, handled and collected. All waste skips should be covered at all time and waste storage facilities should all be under roof and closed off.

2.2. Construction Phase

The airside precinct will be developed first (Figure 4). This relates to the demolition of existing unwanted infrastructure, usable material will be crushed for compaction re-use on site, unwanted waste will be removed to recycling or landfill, followed by earthmoving, cut and fill, then the construction of the new 3.5 km airstrip with associated airside infrastructure.

During the initial demolition and construction phase, the waste facilities will relate to a mobile waste yard managed by the contractors and the position will be away from sensitive features and informed by site logistics i.e. where works are taking place. Thereafter landside development will commence. As soon as the services precinct is established the WMF will be established and formally developed and used for the remainder of the construction an operational phase (Figure 6)

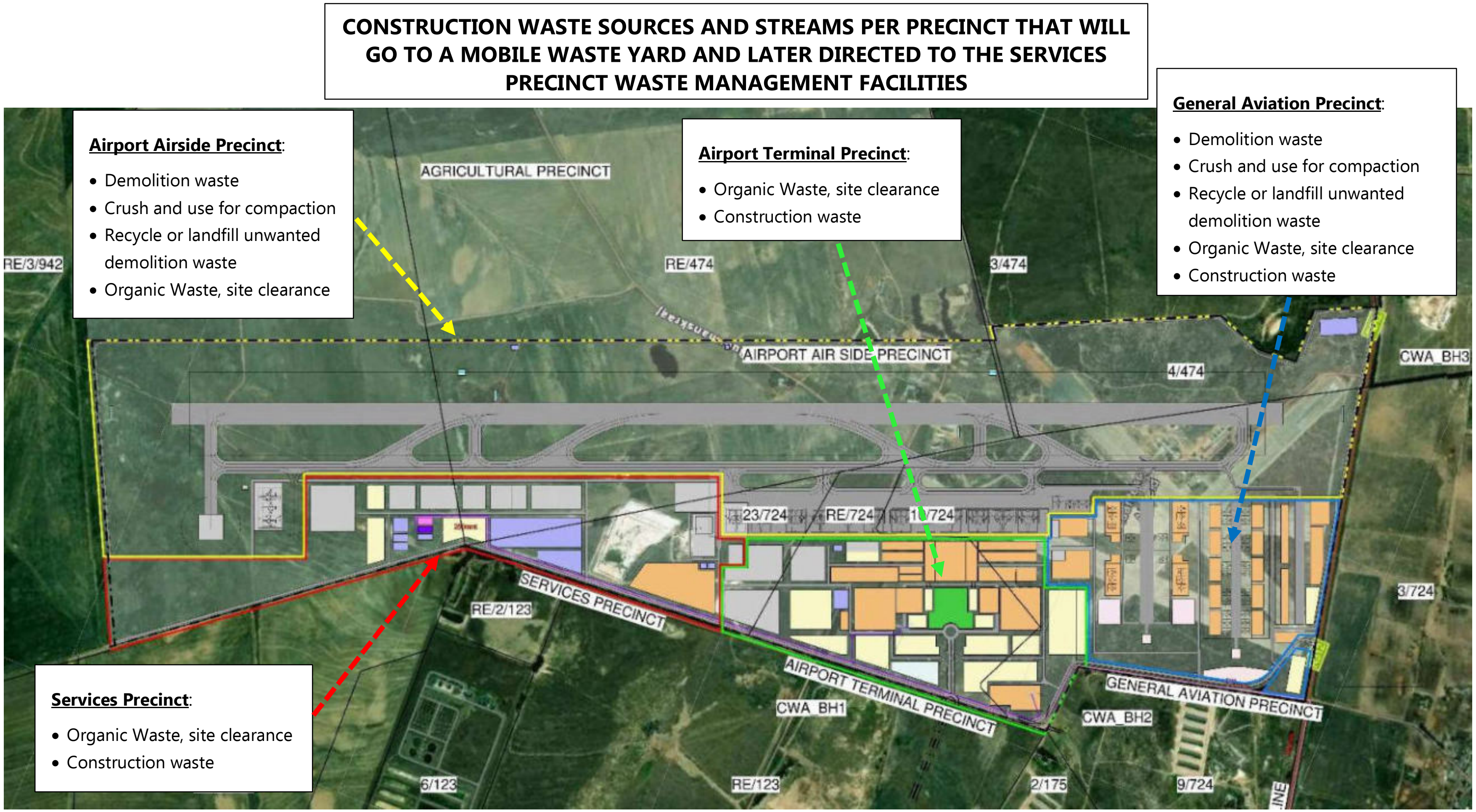


Figure 4: The Phase 2 SDP for the Cape Winelands Airport expansion. All waste streams during construction will be separated at source from where it will go to a mobile waste yard, location determined by logistics. When the services precinct (red outlined area also refer to Figure 6 below) is complete all waste streams will go to the waste management facility from where it will be collected and removed from site.

2.3. Operational Phase

Figure 5 indicates the various waste streams during operations in each precinct. While every waste source, before feeding into the waste stream, will be expected to implement a certain level of sorting and temporary storage at the source, ultimately all waste will end up in the Services Precinct (Figure 6), where it will be managed and from where it will be collected by external service providers. The Services Precinct will include a dedicated Waste Management Facility (WMF) for General Solid Waste management as well as a dedicated area for the Sewage Package Plant WWTW and Biodigester with a composting area. During the initial demolition and construction works a mobile waste yard will be used by the contractor, located in a low sensitivity but logistical functional area. Soon after the services precinct is established the dedicated WMF will be used for construction and operational waste management.

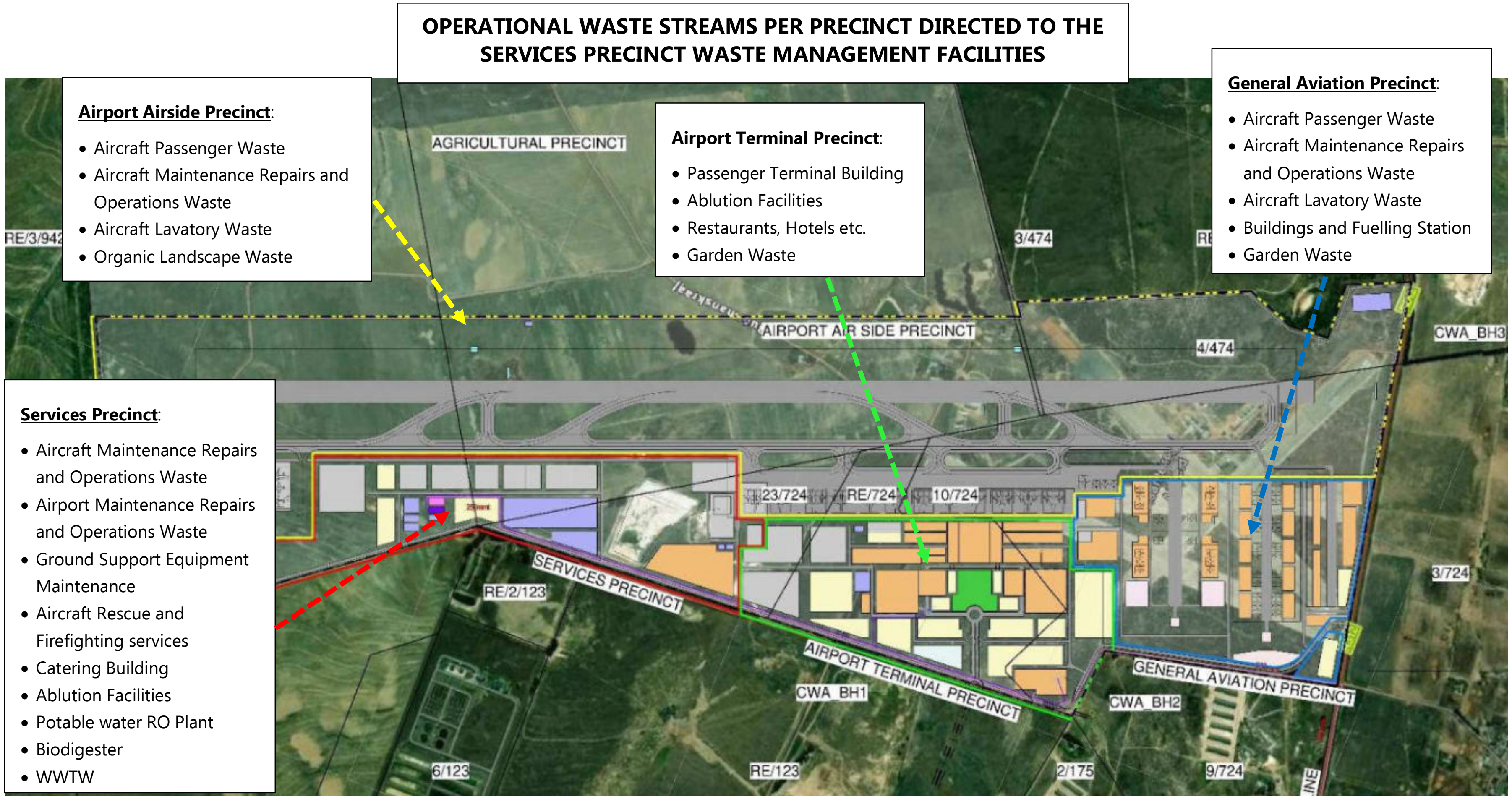
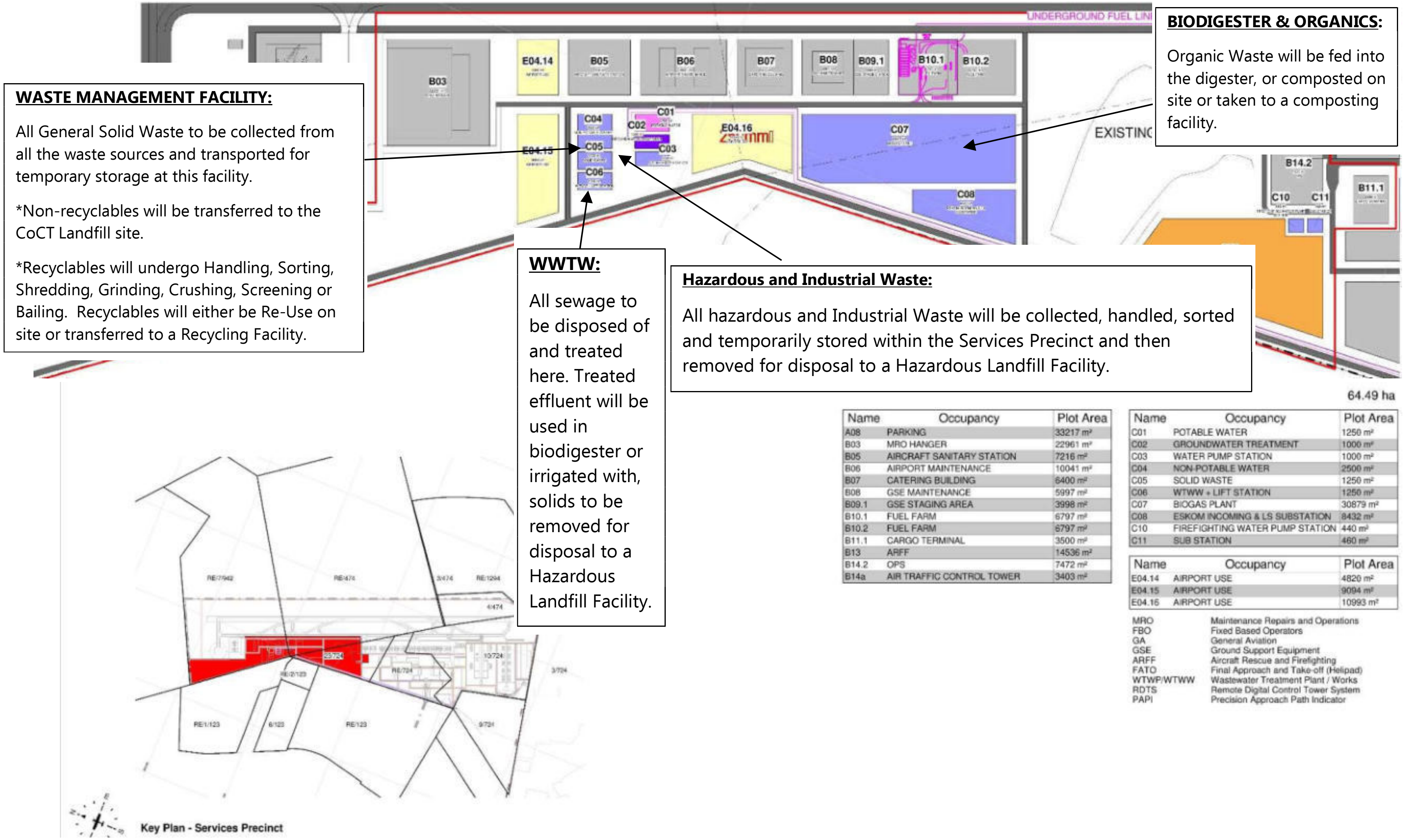


Figure 5: The Phase 2 SDP for the Cape Winelands Airport expansion. All waste streams on the airport will be separated at source from where it will go to the services precinct (red outlined area) for the management of waste on site and where it will be collected for further off-site management.



Name	Occupancy	Plot Area
A08	PARKING	33217 m²
B03	MRO HANGER	22961 m²
B05	AIRCRAFT SANITARY STATION	7216 m²
B06	AIRPORT MAINTENANCE	10041 m²
B07	CATERING BUILDING	6400 m²
B08	GSE MAINTENANCE	5997 m²
B09.1	GSE STAGING AREA	3998 m²
B10.1	FUEL FARM	6797 m²
B10.2	FUEL FARM	6797 m²
B11.1	CARGO TERMINAL	3500 m²
B13	ARFF	14536 m²
B14.2	OPS	7472 m²
B14a	AIR TRAFFIC CONTROL TOWER	3403 m²

Name	Occupancy	Plot Area
C01	POTABLE WATER	1250 m²
C02	GROUNDWATER TREATMENT	1000 m²
C03	WATER PUMP STATION	1000 m²
C04	NON-POTABLE WATER	2500 m²
C05	SOLID WASTE	1250 m²
C06	WTWW + LIFT STATION	1250 m²
C07	BIOGAS PLANT	30879 m²
C08	ESKOM INCOMING & LS SUBSTATION	8432 m²
C10	FIREFIGHTING WATER PUMP STATION	440 m²
C11	SUB STATION	460 m²

Name	Occupancy	Plot Area
E04.14	AIRPORT USE	4820 m²
E04.15	AIRPORT USE	9094 m²
E04.16	AIRPORT USE	10993 m²

MRO Maintenance Repairs and Operations
FBO Fixed Based Operators
GA General Aviation
GSE Ground Support Equipment
ARFF Aircraft Rescue and Firefighting
FATO Final Approach and Take-off (Helipad)
WTWP/WTWW Wastewater Treatment Plant / Works
RDTS Remote Digital Control Tower System
PAPI Precision Approach Path Indicator

Figure 6: The 'Services Precinct' within the Cape Winelands Airport development where waste will be managed and collected.

SECTION 3: RESPONSIBILITIES AND ENFORCEMENT OF THE WMP

3.1. The Applicant: Capewinelands Aero (Pty) Ltd

The Applicant who is the landowner, developer and operator of the airport will be responsible for the overall implementation of the WMP.

The Applicant is accountable for the potential impacts of the activities that are undertaken and is responsible for managing these impacts. The Applicant has the overall environmental responsibility to ensure that the implementation of the operational requirements complies with the relevant legislation. The Applicant must ensure that he/she is fully familiar with the requirements of this WMP, any relevant Environmental Authorization or any other legally binding documentation.

3.2 The CWA Environmental Management Division (EMD) & Environmental Manager (EM)

The **CWA Environmental Management Division (EMD)** will be established at the start of construction to ensure environmental compliance throughout the project. The CWA EMD will appoint an **Environmental Manager (EM)** to oversee all aspects of Environmental Management on site. The Environment Manager is responsible for ensuring that the organisation meets its environmental policy commitments and improves its environmental performance. Not only do they monitor performance and ensure compliance with relevant laws and regulatory requirements, but they are also proactive in identifying and promoting opportunities to reduce the environmental impact of the organisation's activities, products and services.

Led by an Environmental Manager, the CWA EMD will consist of several teams e.g. landscaping, waste management, alien species control, fire management etc. During the initial phases it could be one multitask team to be split as the tasks increase. Each team will have a Team Leader reporting directly to the in-house ECO during operations, and EM during construction. In the case of waste management this would be the Waste Control Officer (WCO). The Environmental Manager will oversee the implementation of Environmental Management Plans (EMPr), compliance with regulations, day-to-day environmental management of the site, managing the necessary applications, and overseeing external service providers such as the appointed Environmental Control Officer (ECO) during construction. Responsibilities also include internal audits and developing strategies for waste minimization and emissions reduction.

3.3. The Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is responsible for overseeing and verifying the proper execution of the EMPr during the construction and operational phase. This includes ensuring that various contractors working on-site comply with the waste management plan within their designated areas. During the construction phase, an independent Environmental Assessment Practitioner (EAP) firm must be appointed to serve as the ECO who will work alongside the EM. Once the project transitions fully into the operational phase, this function can be managed by an in-house ECO within the CWA Environmental Management Division who will report to the EM. During the construction phase, monthly ECO reports must be prepared and submitted to the Department of Environmental Affairs and Development Planning (DEADP) during construction and to the EM during operations.

3.4. Waste Control Officer

A designated Waste Control Officer (WCO) must be appointed within the EMD to lead the waste team to manage the day-to-day operation of the Waste Management Facility and oversee the implementation of the WMP. The waste control officer will assume overall responsibility for managing the WMF, employees and contractors and ensure and oversee the implementation of the WMP onsite in its entirety. All decisions regarding environmental procedures and protocol must be approved by the WCO, who also has the authority to stop any activity in contravention of the WMP. The role of is interactive and must include daily site visits with the following:

- Conduct environmental awareness training on the operation of the facility and implementation of the WMP;
- Monitor the site and operation of the facility for potential environmental issues on a daily basis,
- Consult with the Applicant, and all staff/contractors to resolve emerging environmental issues;
- Review method statements and determine the most environmentally sensitive options of *modus operandi* for the development tasks,
- Oversee the implementation of environmental procedures set out in this document,
- Report on environmental issues,
- Receive minutes of all site meetings,
- Maintain open and direct communication with the Applicant, contractors, and authorities,

- Monitor contractors, the WMP and the implementation thereof; followed by reporting to the relevant authorities,
- Take immediate action on site where clearly defined no-go areas/actions are violated, or in danger of being violated, and to inform the Applicant immediately,
- Keep an up-to-date record of works on site, as they relate to environmental issues in the Site Control Register including records of non-compliance incidents,
- Be contactable by the public regarding matters of environmental concern as they relate to the development,
- Issue any instructions to the management team via an appropriate management tool,
- Keep photographic records of site visits and records of communication to and from relevant authorities,
- Keep a Site Control Register consisting of the following sections:
  - The **Site Control Sheet** will be used to set out weekly reports in which the findings from daily site monitoring activities are consolidated.
  - The **Environmental Site Instruction Section** will be used to record all general site instructions relating to the protection of the environment and instructions issued by the site manager for the purpose of facilitating the issuing of the site instruction by the landowner.
  - The **Incidents Reporting Section** will be used to record all incidents pertaining to environmental issues onsite as well as remedial actions steps that were or need to be taken.
  - The **Complaints Register** will be used to record all complaints received and responses thereto.

Please note the above list is not exhaustive, the responsibilities of the site manager are adaptive and extent beyond environmental aspects. Many of these tasks would also be performed by the ECO on a larger scale.

3.5. Engineers and Contractors

The engineers and contractors, where applicable, are responsible for physically carrying certain development and maintenance activities. The responsibilities indicated here are also relevant to sub-contractors.

The responsibilities of the engineers and contractors include but are not limited to the following:

- Be conversant with the WMP, EMPr, any relevant Environmental Authorisation or any other legally binding documentation;
- Have a responsibility to adhere to any conditions and recommendations laid out in above mentioned documentation;
- Prevent actions that may cause harm to the environment;

- Be responsible for any remedial activities in response to an environmental incident;
- Review and amend any construction activities to align with the WMP, EMPr and Best Practice Principles;
- Ensure compliance of all site personnel and / or visitors to the WMP, EMPr and any other authorisations.

SECTION 4: WASTE HIERARCHY & REDUCING WASTE TO LANDFILL

Waste materials fall into four categories for management (after pre-treatment), which include: Re-use; Recycle; Residual wastes; and Landfill. From a very early stage the EM, ECO and WCO needs to look at how to manage the waste generated, thereby reducing the amount of waste to be removed from the project site.

The waste hierarchy is a simple ranking system used for the different waste management options according to which is the best for the environment. The most preferred option is to prevent waste, and the least preferred choice is disposal in landfill sites (Figure 7). The waste hierarchy outlines a preferred order for waste management: prevention, reuse, recycling, and energy recovery, with disposal as a last resort. This strategic approach promotes environmentally friendly practices, ensuring efficient resource use and reducing environmental impact.

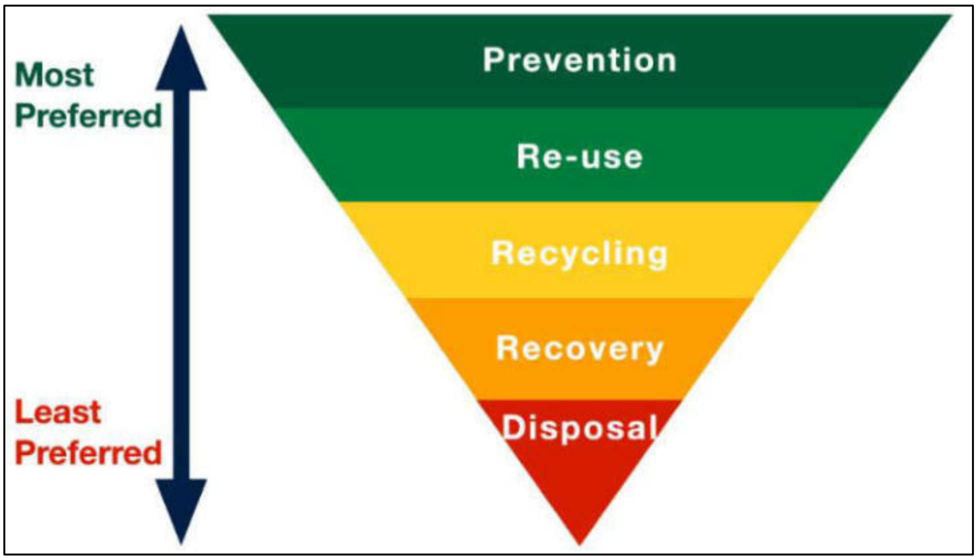


Figure 7: The Waste Hierarchy.

4.1 Prevention

The idea of avoiding things becoming waste in the first place is essential and the preferred option in the waste hierarchy. When we take action to prevent waste from arising in the first place, there is simply less waste. Less waste means less need to reuse products, less disposal, less expenses and most importantly, less waste at landfill sites.

We can prevent waste by using fewer and avoiding unnecessary materials during design, manufacturing and packaging products. It also means using less hazardous waste materials where you can.

This can be achieved through various strategies, such as:

- Promoting refillable water bottles and promoting reusable shopping bags. Airports can partner with concessionaires to offer discounts or incentives for passengers who bring their own reusable water bottles and shopping bags. Additionally, installing convenient water refill stations throughout the terminal can discourage the purchase of bottled water.
- Encouraging concessionaires to use sustainable packaging. Airports can incentivize businesses to use biodegradable or compostable packaging materials for food and beverages. Collaborating with concessionaires to explore alternative packaging options, such as paper or plant-based materials, can significantly reduce reliance on traditional plastic packaging.
- Implementing digital solutions. Replacing paper boarding passes and printed schedules with digital alternatives can significantly reduce paper waste. Airports can invest in mobile applications that allow passengers to access boarding passes, flight information, and terminal maps electronically. This not only reduces paper consumption but also enhances the passenger experience with a more streamlined and convenient travel process.
- Partnering with airlines to reduce single-use items. Collaboration between airports and airlines can lead to initiatives like eliminating unnecessary in-flight plastic service ware or offering pre-packaged meals with minimal plastic wrapping. Airports can leverage their partnerships with airlines to implement sustainable practices throughout the entire travel journey, reducing waste generation at both the airport and onboard flights.

4.2 Re-use

If surplus materials can be used in the future site works, they are classified as re-use materials. If they are surplus to requirements and need to be removed from site and they can be removed and used in their present form, they can be removed from site for re-use. The surplus products will be labelled, and a storage area recorded for future reference.

When waste is created, the waste hierarchy prioritizes reuse. Where possible, reusing products and materials before it becomes waste is the next best option. By cleaning, repairing and refurbishing items, we can significantly increase the number of things we reuse. As more single-use products are being phased out for reusable alternatives, re-using things is more accessible than ever.

4.3 Recycling

If surplus materials cannot be reused in their present form but could be used in a different form, they will be sent to recycling or labelled as future recycling. Recycling plays a vital role in diverting waste from landfills and conserving resources. Recycling is the most environmentally friendly solution when it comes to disposing of waste.

Today, most items we use can now be recycled. Everyday products that we can recycle include paper, cardboard, glass, wood, metal and most plastics. Ways of encouraging recycling during the operational phase include:

1. Setting up clearly labelled bins:

   Bins for different recyclable materials like paper, plastic, and metal should be easily identifiable and conveniently located throughout the terminal buildings, concourses, and even in public areas outside the terminal. Using standardised colour-coding systems and clear signage with pictograms can ensure intuitive waste segregation by passengers and staff, regardless of language barriers.

2. Educating passengers and staff:

   Clear signage, informational kiosks, and awareness campaigns can encourage proper sorting of recyclable items, reducing contamination and improving recycling efficiency. Engaging educational programs can target both passengers and airport personnel to ensure everyone understands the importance of waste segregation and contributes effectively. Making use of digital displays and interactive kiosks can provide informative and engaging content to educate travellers about the airport's recycling practices and encourage their participation.

3. Partnering with recycling facilities:

   Establishing strong relationships with local recycling facilities ensures proper processing and responsible management of collected recyclables. Partnering with local facilities not only supports the regional recycling infrastructure but also reduces transportation distances associated with waste hauling, reducing the environmental impact of the recycling process itself.

4.4 Recovery

Recovery is the next best option when we can't apply the first 2 Rs of waste management in the waste hierarchy. For waste that we can't recycle, it may be possible to recover energy in the form of "waste to energy". Waste to energy is the process of incinerating non-recyclable waste to produce electricity. This helps reduce our reliance on fossil fuels and decreases carbon emissions.

Composting is also a method we use when we can't recycle materials. Composting turns organic wastes into nutrient-rich food for plants.

4.5 Landfill

Residual waste can come in several forms including:

- Waste that cannot be disposed of due to its category, class or material (e.g. old tyres, metals and contaminated waste). Ways of reusing or disposing of the waste from the site needs to found; and
- Unused machinery, spare parts or discarded parts. All items of this nature will be identified and dated. These items will be assessed quarterly to gauge their importance for potential future use. Once an item is deemed to have little or no future potential to be utilised, it will be either assessed for reuse in another form or disposed of from the site.

Residual waste can be an eyesore, fire hazard and has potential to impact on the environment through leachates. All residual wastes will be identified, and new residual wastes will be added to the residual waste catalogue for auditing. Residual wastes that are deemed essential or have the potential for future use will be stored in a neat and tidy manner and where possible under cover to avoid or reduce the potential for further corrosion or damage to the product.

Furthermore, if the above options cannot be satisfied, then the only alternative left is to send the surplus materials to landfill. The least sustainable option in the waste hierarchy and our last resort is landfill and incineration when energy recovery isn't possible.

SECTION 5: WASTE TYPES, SOURCES AND STREAMS

5.1. Construction Phase

Construction Waste (Figure 8) can be divided into four categories (General Solid Waste, Organic Waste, Hazardous & Industrial Waste, and Sewage) which entails waste generated during the construction phase of the proposed development, namely: Site clearance & excavation activities; construction of airside infrastructure first followed by landside infrastructure and buildings; demolition of existing infrastructure and buildings; and maintenance work required. The types of waste, materials and sources of waste have been summarized as follows:

A. General Solid Waste

Waste Materials: Soil / Sand, Concrete, Rock, Metals, Asphalt, Plastic, Wood, Bricks & masonry materials, Glass, Nails, Cement Bags etc.

Waste Sources: Demolition, land clearing & excavation; construction of new buildings & material; and maintenance work.

General Solid Waste will undergo: Collection, Identification, Handling, Sorting, Storage, Crushing as pre-treatment of the waste type prior to Transfer, Disposal, Re-Use or Recycling. Recyclables will be re-used/ recycled on site or taken to a Recycling Facility. Non-recyclables will be transferred to a Landfill.

B. Organic Waste

Waste Materials: Topsoil, Alien clearing and indigenous or general vegetation removal etc.

Waste Source: Land clearing & excavation.

Organic Waste will undergo: Collection, Identification, Handling, Sorting and Storage as pre-treatment of the waste type prior to Transfer to the Biodigester or Composting Facility.

C. Hazardous & Industrial Waste

Waste Materials: Asbestos; old fuel storage infrastructure/ equipment, hydrocarbon waste etc.

Waste Sources: Demolition, land clearing & excavation; maintenance work; accidental hydrocarbon spills and hydrocarbon waste from vehicle, equipment and machinery parts and servicing (oil cans, filters, rags etc).

Industrial Waste will be collected and temporarily be sorted on site for storage if parts could be reuse or recycled (collected for recycling). All hazardous waste will be transferred and disposed of at the Hazardous Landfill Facility.

D. Sewage (Hazardous)

Waste Materials: Sewage; Lavatory Waste etc.

Waste Sources: Existing infrastructure and portable toilets.

Sewerage Waste will undergo: Storage, Collection and Transfer initially to the Municipal WWTW until the Package Plant WWTW on site is completed.

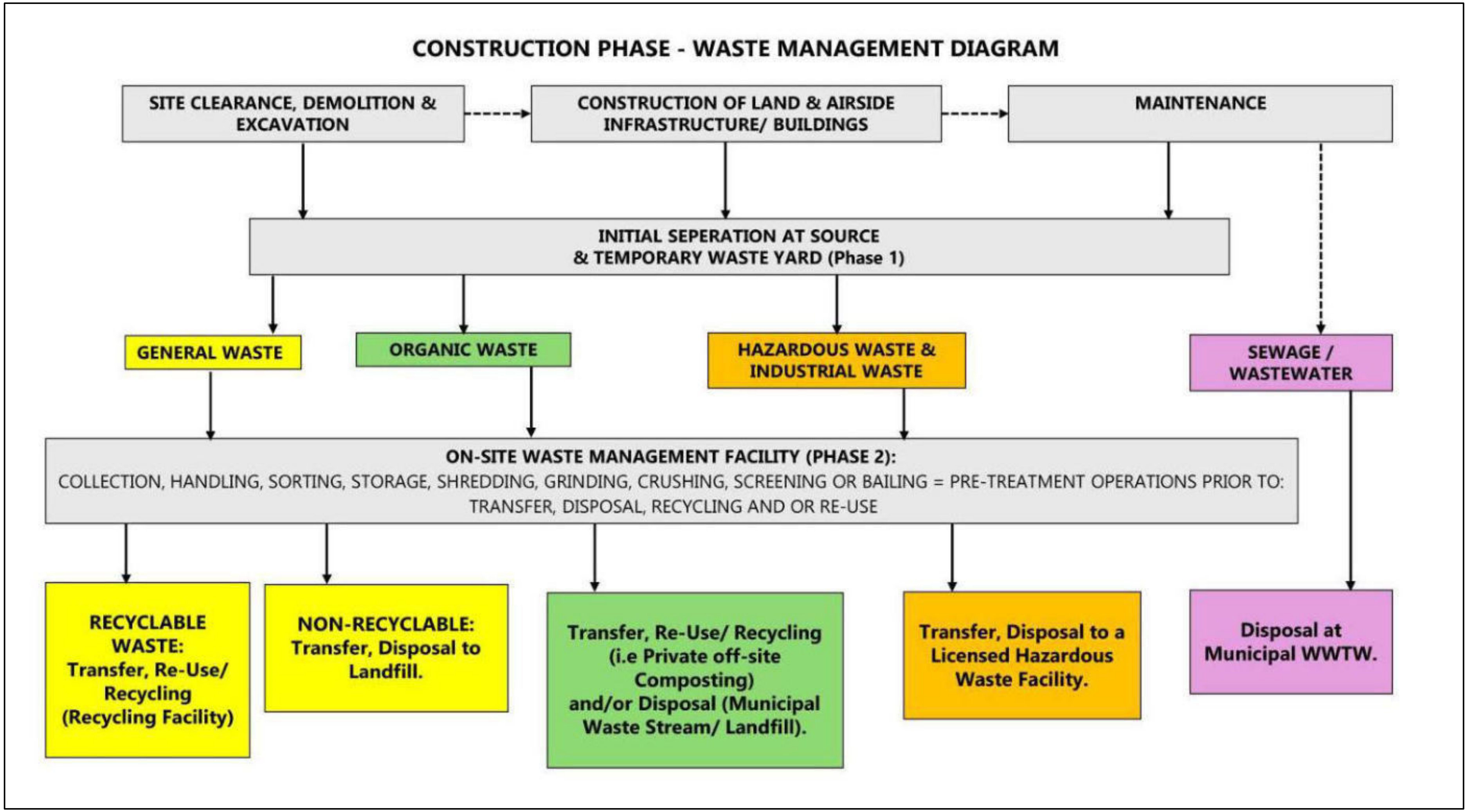


Figure 8: The lifecycle of the construction waste from the Cape Winelands Airport.

5.2. Operational Phase

The site and its associated activities will generate waste at various stages of operation. Waste generated during the operational phase can be divided into several main categories (General Solid Waste, Organic Waste, Hazardous & Industrial Waste and Sewage). The expected volume of each waste type is not available at this time and specific service providers will be contracted in to assist, remove and dispose of waste types present onsite, where necessary. The types of waste generated during the Operational Phase can be summarised into the following waste types which include waste material and source:

A. General Solid Waste (Figure 9)

Domestic waste from the airside precinct in the form of airplane users and the landside precinct in the form of restaurants, hotels and offices on site will be separated at source into general (non-hazardous), recyclable (non-hazardous), organic waste and hazardous. These waste steams will be moved to the waste management facility in the services precinct. The general waste will be collected by the service provider and disposed of at a licensed landfill. The recyclable materials will be collected from site by recycling companies for further processing. The organic waste will be used in the on-site bio-digester or composting facility.

Airplane waste from the airside precinct can be split into 2 waste streams:

- "Normal" Waste - such as magazines, plastic bottles etc. This is discarded to the designated waste storage area onsite from where it is disposed into the various waste streams e.g. recycling etc.
- Galley waste – This is and remains the airline/catering contractor's property and thus responsibility. The airport does not take responsibility for it. Although certain Airports classify this waste as Hazardous.

Waste Materials: Plastic, Paper, Cardboard, Metal, Glass etc. (Some recyclable & some non – recyclable)

Waste Sources: Terminal Waste, Tenant Waste, Airline Waste (Deplaned waste is mostly mixed), Cargo Waste, General Aviation Sector, Restaurants, Hotel, Offices, Warehousing etc.

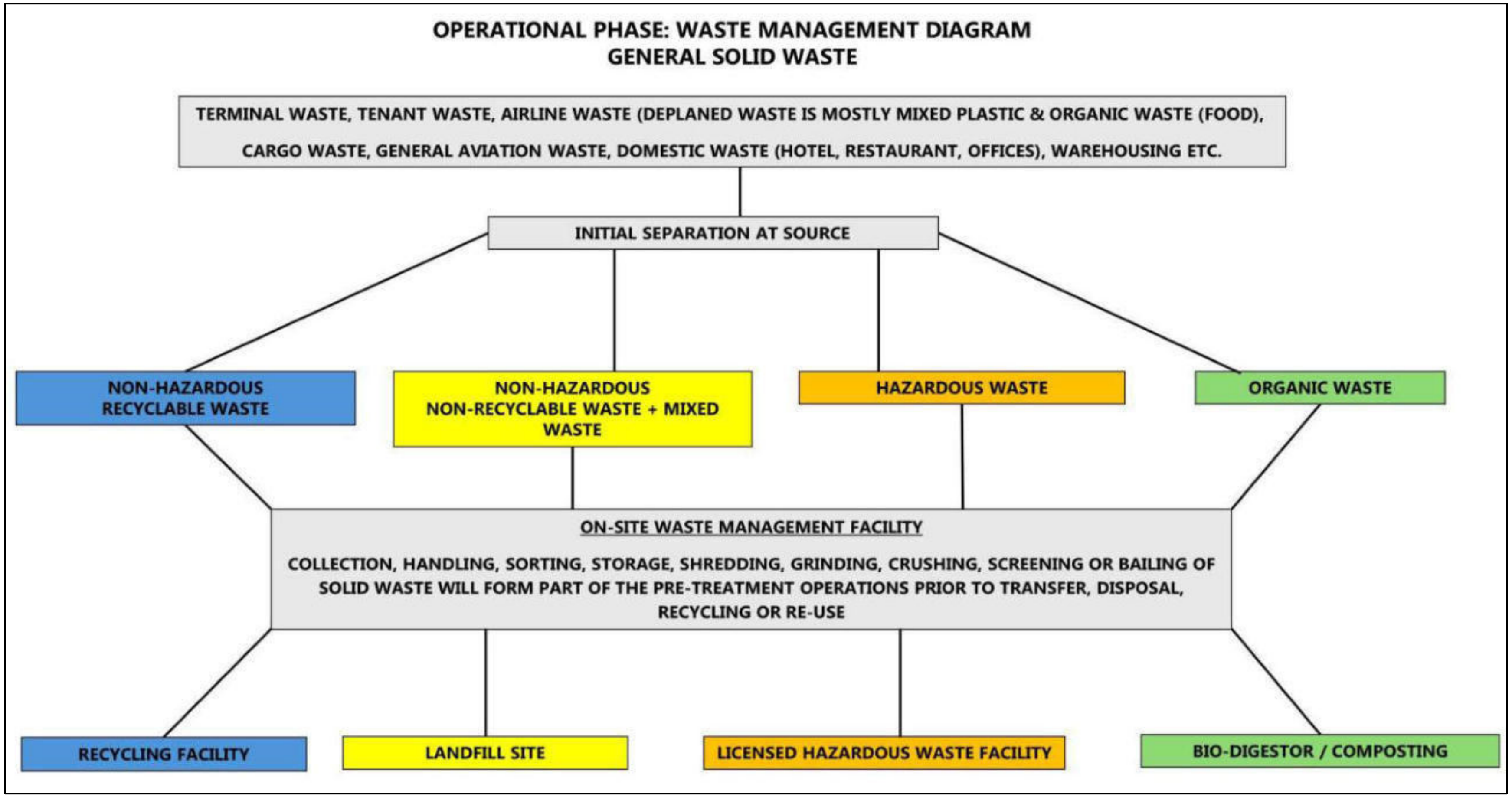


Figure 9: The lifecycle of operational general solid waste from the Cape Winelands Airport.

B. Organic Waste (Figure 10)

Garden waste from landscaping (non-hazardous) will be sent to composting site or the biodigester. Domestic waste from the restaurants, hotel and offices on site will be separated at source into general/non-recyclables (non-hazardous), recyclable (non-hazardous) and organic. The organic waste will be sent to the biodigester, on site composting facility and/or an off-site licensed composting facility.

Waste Materials: Food waste, Garden waste from landscaping etc.

Waste Sources: Terminal Waste, Tenant Waste, Arline Waste (Deplaned waste is mostly mixed), General Aviation Sector, Hotel, Residential etc.

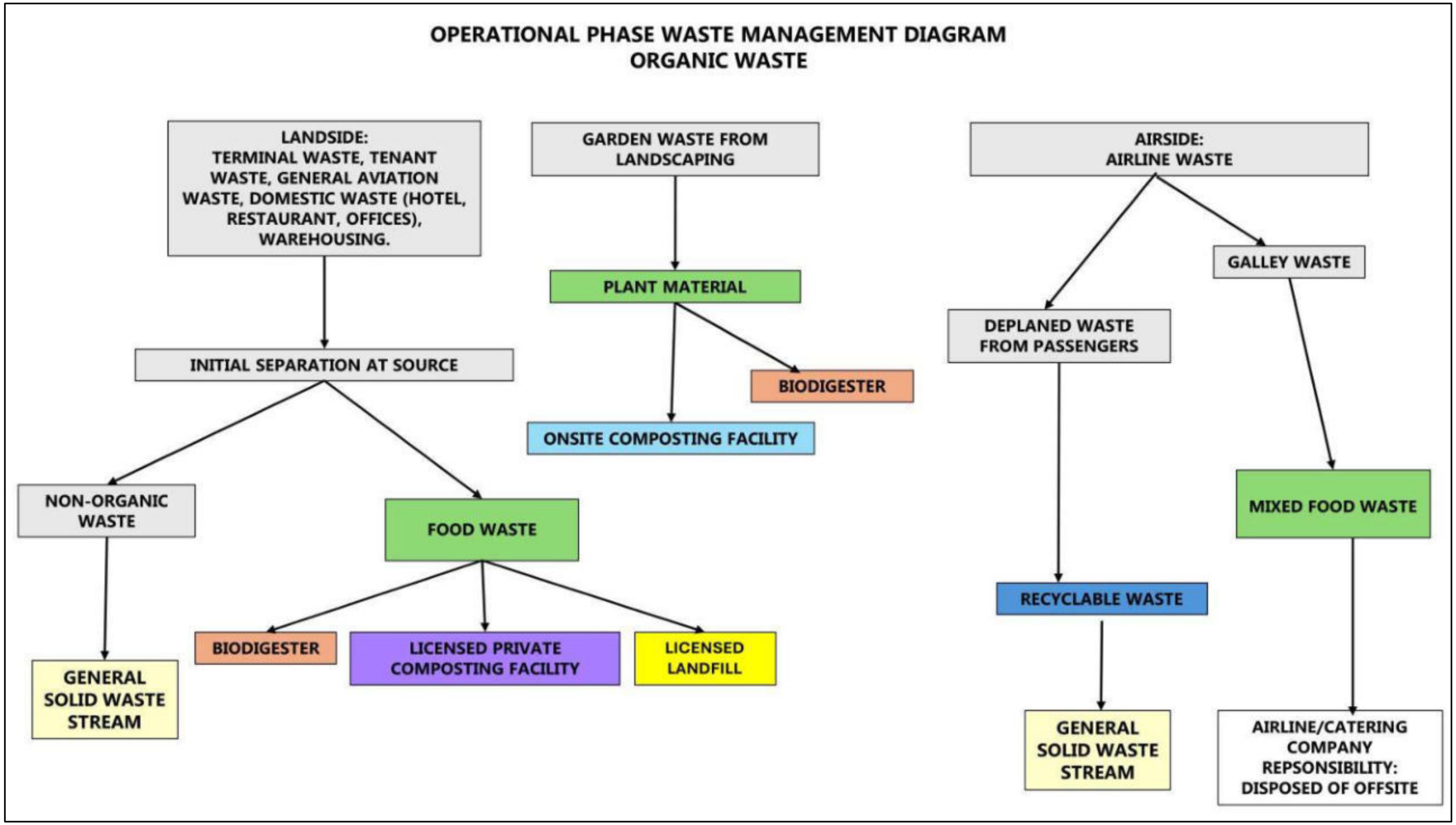


Figure 10: The lifecycle of operational organic waste from the Cape Winelands Airport.

C. Hazardous and Industrial Waste (Figure 11)

Used oils and fuels (hazardous) will be collected for re-use by recycling companies. Oil containing rags and materials (hazardous) will be disposed of to a Hazardous Landfill Facility. Any waste metals (non-hazardous) will be sent to recycling.

Waste Materials: Used oils and fuels; Oil containing rags and materials; Paint, metal work debris, chemicals/ chemical residue; Solar panels, batteries; non-recyclable glass; tyres etc.

Waste Sources: Refueling activities; Materials originating from aviation and vehicle maintenance, waste generated during various airport & industrial operations etc.

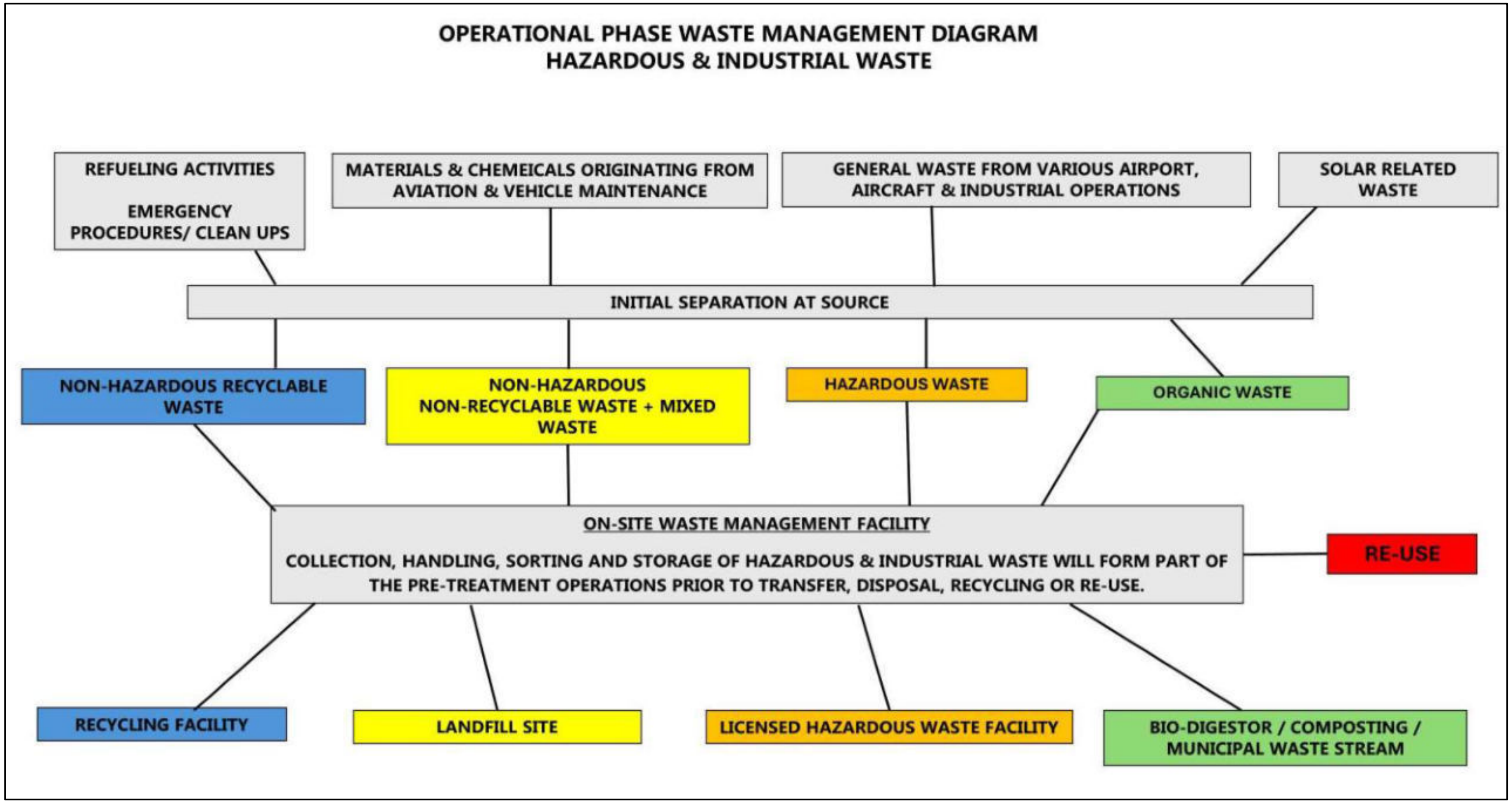


Figure 11: The lifecycle of operational hazardous and industrial waste from the Cape Winelands Airport.

D. Sewage (Hazardous) (Figure 12)

Sewage is the part of wastewater that is contaminated with feces or urine but is often used to mean any wastewater. The site will have its own wastewater treatment works (WWTW) as an alternative to the conventional City of Cape Town WWTW directly NW of the site (However, the site will have a connection to the CoCT WWTW, which would be used in emergencies or during maintenance of the on-site WWTW). The plant will generate treated sludge/ biosolids and treated effluent water. The treated effluent water will be used as a supplementary input liquid in the biodigester on site to generate electricity. The treated sludge will be disposed to landfill. The raw sewage goes through a pre-screening process where certain solids are removed. As this takes place prior to treatment, any material that is removed remains classified as hazardous. This material will need to be temporarily stored and removed by honey suckers from time to time before being disposed at a licensed hazardous waste facility. There will also be a solid component after the treatment has been undertaken. Seeing as this has been through the treatment process it is no longer regarded as hazardous and could potentially be used to feed into the biodigester. However, it will be tested and only used if proven to be non-hazardous.

Waste Materials: Sewage; lavatory waste, wastewater etc.

Waste Sources: All onsite buildings and Aircrafts etc.

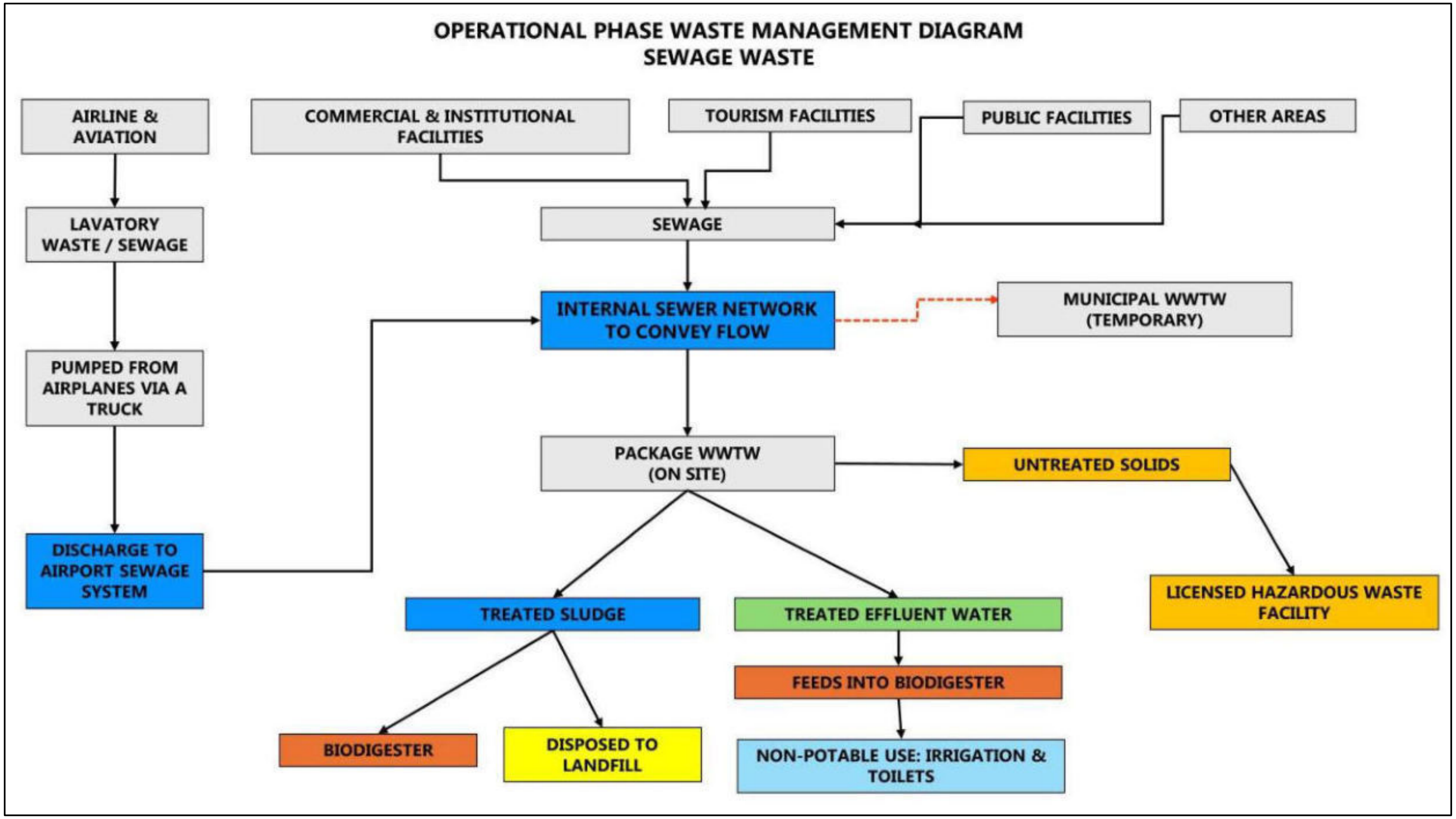


Figure 12: The lifecycle of operational sewage waste from the Cape Winelands Airport.

E. Other Waste:

- Waste input and output related to the biodigester

  The biodigester will output digestate as liquid and solid fraction. The liquid fraction can be used for irrigation on site and the solid fraction for fertilizer application to land, dependent on development of a suitable offset market. Considering the liquid and solid fraction can be reused this does not constitute waste.

- Brine from potable water treatment plant

  Brine will either go straight into the pipeline heading to the Municipal WWTW or, if the onsite Package Plant WWTW is in operation, disposing of brine into the WWTW would need to be investigated further. If neither of these options will be utilized, brine will be disposed of at a Landfill Facility.

- Spills and emergency procedures

  This relates to contaminated peat and materials used during emergency procedures to clean up for example hydrocarbon spills etc. In addition, waste as a result of training procedures e.g. firefighting residue is also as a result of emergency procedures. This will further be addressed as part of the **Emergency Response Plan (to be developed after Environmental Authorisation)**.

SECTION 6: IMPACTS AND MITIGATION MANAGEMENT

The applicant is committed to the implementation of the waste hierarchy to achieve a reduction to landfill and to contribute to a productive the waste economy. Table 1 below summarizes the Waste Types, Sources, Stream handling and Impacts if the waste hierarchy is applied of the Construction and Operational Phases at CWA.

Table 1: Waste Types, Sources, Stream handling & Impact at the CWA.

Waste Type	Materials	Source	Recommended Stream Handling	Impact
Construction Phase				
General Waste	Soil / Sand, Concrete, Rock, Metals, Asphalt, Plastic, Wood, Bricks & masonry materials, Glass, Nails, Cement Bags etc.	Land clearing, Demolition & excavation; construction of runway new buildings & material; maintenance work.	**Re-use:** Keep topsoil; Cut and Fill with on-site material; Crushing and re-use for compaction **Recycle:** Sorting Metals and wood **Disposal Landfill:** Transfer disposal of unwanted	**Off-site:** Reduce landfill to 20%; large reduction of impact on landfill space, transport reduce traffic on roads and emissions **On-Site:** Initial mobile managed waste yard, later fixed managed WMF as per recommendations and N&S – Low impact
Organic Waste	Alien clearing and indigenous vegetation removal etc.	Land clearing & excavation.	**Re-use:** Shredding (chipper) biomass, mulch use to stabilise exposed sandy areas **Composting on-site:** Organics **Composting off-site:** Transfer excess	**Off-site:** Reduce landfill to 0% total reduction of impact on landfill space, transport reduce traffic on roads and emissions **On-Site:** Managed stabilisation reduces dust impact and composting for future landscaping as per recommendations and N&S – Very Low impact

Hazardous & Industrial Waste	Asbestos; old fuel storage infrastructure/ equipment, hydrocarbon waste etc.	Demolition, land clearing & excavation; maintenance work; accidental hydrocarbon spills and hydrocarbon waste from vehicle, equipment and machinery parts and servicing (oil cans, filters, rags etc).	**Specialized:** Safe handling, storage **Recycle:** Limited **Disposal Landfill:** Licensed Hazardous Waste Facility.	**Off-Site:** No reduction in landfill unavoidable **On – site:** Low if specialized handling applies
Sewage	Sewage; Lavatory Waste etc.	Existing infrastructure and portable toilets.	Initial phases **Disposal**: CoCT WWTW Later Phases **Re-use:** On-site treatment, use treated effluent **Disposal:** Hazardous bio-solids	**Off-site:** initial phase to CoCt WWTW, capacity exists **On-site:** Manage WWTW, reduce pressure on off-site infrastructure, positive use of waste water as part of energy generation; Low impact if handled as per recommendations and N&S
Waste Type	**Materials**	**Source**	**Recommended Stream Handling Stream**	**Impact**
Operational Phase				
General Solid Waste	Plastic, Paper, Cardboard, Metal, Glass etc. (Some	Terminal Waste, Tenant Waste, Airline Waste (Deplaned	**Prevent:** Industry changes	**Off-site:** Reduce landfill to 50% large reduction of impact on landfill space,

	recyclable & some non – recyclable)	waste is mostly mixed), Cargo Waste, General Aviation Sector, Restaurants, Hotel, Offices, Warehousing etc.	**Recycle:** Handling, Sorting, Storage, Shredding, Grinding, Crushing, Screening or Bailing prior to collection **Non-Recycling:** Handling, Storage Transfer or Landfill Disposal	transport reduce traffic on roads and emissions. **On-site:** Fixed managed WMF as per recommendations and N&S – Low impact
Organic Waste	Garden waste from landscaping etc. Food waste	Terminal Waste, Tenant Waste, Arline Waste (Deplaned waste is mostly mixed), General Aviation Sector, Hotel, Residential etc.	**Re-use:** Shredding (chipper) biomass, mulch use to stabilize reduce moisture evaporation **Composting on-site:** Organics **Composting off-site:** Transfer excess **Treatment:** Biodigester	**Off-site:** Reduce landfill to 0% total reduction of impact on landfill space, transport reduce traffic on roads and emissions **On-Site:** Managed stabilization; composting for future landscaping; treatment to Biogas energy as per recommendations and N&S – Very Low impact
Hazardous and Industrial Waste	Used oils and fuels; Oil containing rags and materials; Paint, metal work debris, chemicals/ chemical residue; Solar	Refueling activities; Materials originating from aviation and vehicle maintenance; spills from training and	**Specialized:** Safe handling, storage **Recycle:** Limited	**Off-Site:** No reduction in landfill unavoidable **On – site:** Low if specialized handling applies

	panels, batteries; hydrocarbon waste etc.	emergency situations/ procedures etc.	**Disposal Landfill:** Licensed Hazardous Waste Facility.	
Sewage	Sewage; Lavatory Waste etc.	All onsite buildings; Aircrafts etc.	**Treatment:** on-site WWTW **Re-use:** use treated effluent in Biogas or irrigation or flushing of toilets **Disposal:** Hazardous bio-solids	**Off-site:** CoCT WWTW, reduction by 90% **On-site:** Managed WWTW, reduce pressure on off-site infrastructure, positive use of waste water as part of energy generation; Low impact if handled as per recommendations and N&S
Brine from Reverse Osmosis (RO) Plant	Brine	RO Plant for Potable Water.	**Disposal:** WWTW/ Landfill	**Off-site:** Low quantities **On-site:** Low quantities

The following additional impacts is possible if large quantities of waste are self-managed on-site. The N&S provide clear guidance the designs and actions to apply but additional mitigation measures have been identified to reduce the impacts on and off site:

Table 2: Impacts associated with an on-site WMF

	Impact	Activity	Proposed mitigation
1	Natural resource contamination	Natural areas located on the east of the airside precinct are separated from waste activities however, stormwater originating from the site	• Minimize the use of wash water onsite as far as possible by applying high pressure hoses. • The facility must be managed such that all runoff originating from the site is diverted into a stormwater control channel that contain detention and trapping facilities before it leaves the WMF. • All stormwater control channels in close proximity to WMF must be suitably lined to prevent seepage into groundwater.

		could contain waste and can result in pollution or waste can be dispersed by wind into the natural areas	• The overflow of stormwater channels needs to be trapped and allowed to settle in a detention pond. • The nutrient rich stormwater originating from the composting and biodigester site must be trapped and used as a moisture additive within the composting facility to enhance the composting process. • No nutrient enriched water may be released offsite. • All stormwater infrastructure must be regularly inspected and serviced to ensure design capacity and integrity is maintained. • To ensure suitable stormwater control capacity is maintained onsite, stormwater channels must be kept free from silt. The stormwater control channels must be cleared of any sedimentation (if required) during the dry season. • All water that has entered the composting and biogas areas must be treated as leachate. • To prevent nutrient rich leachate from percolating into the ground, the land areas where composting are established should be compacted to ensure that the soil drainage is poor or virtually impervious. • All wind dispersed waste must be collected on a daily basis and taken to the WMF • The WMF must have closed containers to avoid wind dispersing waste
2	Generation of atmospheric emissions and odors	Waste trucks entering and exiting the WMF transport potentially foul-smelling material. In addition, active composting, organic piles emit volatile compounds.	• All trucks or vehicles transporting waste material will be required to secure and cover all loads with shade cloth to avoid debris or plastic etc. that can blow or fall on public roads or areas. • Composting operations should process organic material on the same day to avoid stagnant heaps. • Optimizing certain variables can minimize composting emissions. The carbon-nitrogen ratio, temperature, moisture content (at least 25%), aeration, and pH must be monitored by the facility manager on a weekly basis to ensure optimal organic matter breakdown without production of excessive atmospheric emissions or odors. • All storage and operating areas need to be contained in bunkers, lined and covered where required.

			• The WMF in the services precinct is located directly opposite the City of Cape Town Fisantekraal WWTW therefore part of a node already exposed to odors where residential development is not likely.
3	Soil Erosion	The increased bare, hardened and compacted surfaces associated with the facility results in reduced surface roughness, increased run-off and increased erosion potential. Areas where stormwater runoff is concentrated are most likely to experience erosion.	• Wherever possible, ensure that the WMF surface is covered by tar, concrete or paving and areas around the stormwater system vegetated as per landscape and SWMP. • Establish and maintain suitable vegetation cover at all stormwater concentration points. These areas include road verges, the banks of stormwater channels, berms and other infrastructure that may increase surface runoff. • Should any erosion be detected, the ECO must identify the cause of such erosion and ensure that the most appropriate method of mitigation or stabilization is employed as soon as possible.
4	Generation of dust and noise	The movement of transport trucks to and from the facility will result in the generation of dust and noise.	• The level of dust and noise generated by WMF activities will be insignificant in the broader landscape, especially after the roads a surfaced. Nevertheless, it is recommended that working hours are restricted to 06:00 to 18:00 daily. • All transport vehicles and machinery/equipment used onsite must be regularly maintained and kept in good working order to prevent excessive noise. • It is recommended that a dustcart is available onsite to water down dusty roads not tarred, particularly during the dry summer months. • A suitable speed limit (40 – 60 km/h) must be enforced on all access roads. • Ensure compliance with the provisions as set out in the National Environmental Management: Air Quality Act (NEM: AQA), National Dust Control Regulations (Notice 827 of 2013) and Western Cape Noise Control Regulations (P.N. 200/2013).

5	Visual impacts	Given the location of the facility visual impacts are expected to be negligible.	• Scrape and sweep all areas where material is processed weekly to ensure that minimal waste material is present outside the contained areas
6	Consumption of resources (water)	Inefficient use of valuable freshwater for cleaning of waste bins and areas.	• Maintain all water infrastructure in a good working condition. • Use high pressure power hoses for cleaning. • Ensure that all taps remain closed when not in use. • Educate all employees on the importance of natural resources and wise water use practices. • Should any leaks occur, these must be reported immediately and repaired as soon as possible. • When emptying transport bins, ensure all material is removed manually as far as practicably possible to minimize the need for wash water.
7	Attraction Birds and Vermin.	Waste activities have the potential to attract flies.	With suitable management, this impact can be kept to a minimum. The flowing management measures should however continue to be followed: • All organic waste delivered to the site must be covered or worked immediately. • Apply roofs over waste areas to avoid attraction. • Apply containment of waste to avoid attraction. • Apply bait stations for organic pest control. • Correct management of pH and temperature within the composting rows will control the spread of pests and diseases as larva/eggs/worms/bacteria can't live at optimal composting temperatures. • Ensure that WMF does not have pooling or standing water. • Best practice pest control measures will be implemented, and a Certified Pest Control Company will be appointed at the onset of the Construction and Operational Phases to ensure that preventative measures are put in place and monitored to ensure the effectiveness of the Pest Control Schedule.

8	Leakage of potentially hazardous substances	Operation of trucks and machinery can result in leaking or spilling of fuel or oil which is hazardous for the environment.	• All transport vehicles and machinery must be confined to access roads and approved development footprints. • All transport vehicles and machinery/equipment used onsite must be regularly maintained and kept in good working order to prevent potential leaks.
9	Employment opportunities	The operation of the facility generates the opportunity to create additional direct and indirect employment opportunities.	• This is a positive impact. No mitigation required.

SECTION 7: DEVELOPMENT PHASE REQUIREMENTS

7.1. Planning and Design Requirements

Based on the above, CWA will have to register and adhere to the following Norms & Standards (N&S) due to the waste activities described above. Each of these N&S list specific criteria that need to be planned and designed for. The position of the WMF is inside the services precinct of the CWA and this precinct is located away from public operations and residential areas. The site is opposite the CoCT WWTW, a zone suitable for waste management.

Find attached under Appendix B the following specification documents that will be adhered to and included in the WMP when the N&S Application is submitted to DEA&DP: WM:

a. National Norms and Standards for the Storage of Waste (GN926 of 29 November 2013)
b. National Norms and Standards for Sorting, Shredding, Grinding, Crushing, Screening, Chipping or Baling of General Waste (GN1093 of 11 October 2017).
c. National Norms and Standards for Organic Waste Composting (GN 561 in GG 44762 of 25 June 2021) read with GN 1757 in GG 45907 of 11 February 2022.
d. National Norms and Standards for Organic Waste Treatment (GN. No. 1984 of 1 April 2022
e. National Norms and Standards for Domestic Waste and Sanitation Services", published as GN No. 982 of 8 September 2017.

7.2. Construction Phase Requirements

The N&S listed below provide specific criteria how the WMF need to be constructed. Find attached under Appendix B the following specification documents that will be adhered to and included in the WMP when the N&S Application is submitted to DEA&DP: WM:

a. National Norms and Standards for the Storage of Waste (GN926 of 29 November 2013)
b. National Norms and Standards for Sorting, Shredding, Grinding, Crushing, Screening, Chipping or Baling of General Waste (GN1093 of 11 October 2017).
c. National Norms and Standards for Organic Waste Composting (GN 561 in GG 44762 of 25 June 2021) read with GN 1757 in GG 45907 of 11 February 2022.
d. National Norms and Standards for Organic Waste Treatment (GN. No. 1984 of 1 April 2022
e. National Norms and Standards for Domestic Waste and Sanitation Services", published as GN No. 982 of 8 September 2017.

7.3. Reduce transportation of waste

- City of Cape Town (and neighbouring municipalities) registered service providers will be contracted to remove and recycle waste from the site.
- The following Landfill sites will be used to deposit waste that cannot be recycled or re-used:
  - General Waste can be transported to the Vredenburg landfill site.
  - All hazardous waste will be transported to the Vissershok site. Vissershok site is off the N7 into Frankdale Road, adjacent to Morningstar.
- Specialist Waste removal companies such as *EnviroServe* and *Wasteman* can be used for dangerous or contaminated waste.

SECTION 8: OPERATIONAL & CONSTRUCTION PHASE REQUIREMENTS AND MANAGEMENT OBJECTIVES

Section 6 of this report identified several impacts related to the operation of the WMF. Many of the impacts can be mitigated by management procedures and regarded as goals to be implementation. Management activities were described to achieve the objectives together with monitoring and target criteria.

8.1 Components of Waste Management

- Goals: The key environmental goals are set for the operation of the property.
- Objectives: These are set to meet the goals.
- Risk & Impacts: If the goal is not achieved.
- Actions: Measures put in place to achieve objectives.
- Monitoring: To check if the objectives are achieved.
- Targets: Indicators of the effectiveness of the programme.
- Remedial Action: If targets are not met.

8.2. Waste Management

The CWA will have an on-site waste management facility for waste generated during the Construction & Operational Phase of the proposed development however during the initial demolition and construction phases a mobile waste yard will be created and managed by the contractor with the location depending on logistics. As soon as the services precinct is completed and accessible then a more permanent WMF will be developed. A plan for the management of waste during construction and operational phase is detailed below.

8.2.1 Construction Phase:

As previously stated, construction practices must be measured and analyzed in order to determine the efficiency of the plan and whether further revision of the plan is required. A Method Statement, in line with this WMP, detailing specific waste management practices during construction should be prepared by the Contractor prior to the commencement of construction.

8.2.1.1 Waste Assessment / Inventory

- The EM in consultation with the WCO must develop and presented to the independent ECO, implement and maintain a waste inventory reflecting all waste generated during construction for all waste streams.
- Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.
- Once a waste inventory has been established, targets for minimization, re-use, recycling of waste should be set.

8.2.1.2 Waste collection, handling and storage

- Each subcontractor must implement their own waste recycling system (separation @ source), i.e. separate bins or skips for food waste, plastics, paper, wood, glass cardboard, metals, concrete, brick etc.
- Portable toilets must be monitored and maintained daily.
- Waste collection bins or skips and hazardous waste containers must be provided by the principal contractor and placed at various areas around site for the storage of all waste streams.
- Initially a dedicated mobile waste yard area must be established on site for the storage of all waste streams, with final disposal to landfill the last option. The location will be determined prior to the commencement of construction, to fit into the logistics of the construction operations.
- Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass, concrete, brick etc.).
- Hazardous waste must be stored within a bunded area or contained skip constructed according to SABS requirements. The volume of waste stored in the bunds must not exceed 110% of the bund capacity.
- The location of all temporary waste storage areas must aim to minimize the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and avifauna and vermin control. All temporary waste storage areas must be at least 100m away from sensitive areas as identified within the site plans and pointed out by the ECO.
- Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- Waste must be removed from site on a weekly basis.
- Vegetation removed from the site must be chipped, used on site to stabilize soils alternatively removed from the site and disposed of at an appropriate waste disposal facility.

- A dedicated waste management team must be appointed by the principal contractors, whom will be responsible for ensuring the continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the ECO during construction.
- All waste removed from site must be done so by a registered/ licensed subcontractor, who must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month.

8.2.1.3. Management of waste storage areas

- A central waste yard area would be established, at which waste (incl. recyclables) would be stored. Some materials would be stored in stockpiles while others would be stored in bins or skips. Stockpiles and bins would be appropriately labelled, managed and monitored.
- The position of all waste storage areas inside the yard must be located 100 meters away from sensitive areas as specified in the site plans and pointed out by the ECO.
- The waste storage area must have a suitable storm water system separating clean and dirty storm water.
- Waste storage areas attracting birds must be under roof, or the waste storage containers must be covered with tarpaulins (or similar material) to prevent the ingress of water.
- Collection bins or skips placed around site and at subcontractors' camps must be maintained and emptied on a regular basis by the principal contractor.
- Waste must be stored in designated containers and not on the ground.
- Inspections and maintenance of bunds must be undertaken daily. Bunds must be inspected for leaks or cracks in the foundation and walls.
- It is assumed that any rainwater collected inside the bund is contaminated and must be removed and stored as hazardous waste, and not released into the environment. If any leaks occur in the bund, these must be removed immediately.

8.2.1.4. Disposal

- Waste generated on site must be removed on a regular basis, as determined by the WCO and ECO. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.
- Waste must be removed by a suitably qualified contractor and disposed at an appropriately licensed landfill site. Proof of appropriate disposal must be provided by the contractor.

8.2.1.5. Record keeping

- The success of the waste management plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal. Recorded data can indicate the effect of training and education, or the need for education.

- This will provide trends and benchmarks for setting goals and standards, providing clear evidence of the success or otherwise of the plan.
- Documentation (waste manifest, certificate of issue or safe disposal) must be kept by the WCO detailing the quantity, nature, and outcome of any regulated waste for audit purposes.
- Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

8.2.2. Operational Phase:

It is expected that the operational phase will result in the production of general, organic and hazardous waste in accordance with Table 1 above. All waste generated will be required to be temporarily separated and stored at the source (S@S), in appropriate sealed containers/ areas, prior to transfer to the Waste Management Facility (WMF) on site.

The following waste management principles apply during the operational phase:

- The EM in consultation with the in-house ECO and WCO must develop, implement and maintain a waste inventory reflecting all waste generated during operation for all waste streams.
- The intent is to encourage and develop a separation system at source, that will assist in handling the waste streams.
- The waste storage area would allow for the further separation of waste streams based on their management requirements and would therefore include:
    - Wheeled bins;
    - Front lift bins;
    - Bulk bins and skips;
    - Bulk material storage bays;
    - Hazardous waste storage areas;
    - Bunded bulk storage for fuels and oils etc.;
    - Balers for cardboard/ plastic;
    - Battery storage containers;
    - The biodigester for recovery of energy from organic waste; and
    - A composting facility for processing garden and food waste.
- Quarantined Waste would be managed in accordance with the requirements of the relevant quarantine authority.
- The position of all waste storage areas is in the Services Precinct away from sensitive areas. The main waste storage area must have a suitable storm water system separating clean and dirty storm water.
- Waste storage areas must be under roof, or the waste storage containers must be covered with tarpaulins (or similar material) to prevent the ingress of water and attraction of birds and vermin.

- S@S is crucial for effective waste management. All waste must be stored in appropriate temporary storage containers (separated between different operational wastes, and contaminated or wet waste) at each operational area prior to being taken to the waste storage area for final sorting (if required).
- Recyclable waste should be further separated into appropriate bins or skips under categories as per Figure 13 (S@S).

Figure 13: Colour coded storage bins and skips for the separation of solid waste.

- Adequate waste collection bins placed in correct locations in the development and in the WMF must be supplied. Separate bins and skips should be provided for various waste streams (S@S).
- Temporary waste storage containers must be inspected for any sign of deterioration on a biannual basis.
- Recyclable waste must be removed from the waste stream and stored separately (S@S).
- Waste storage shall be in accordance with all best-practice guidelines and under no circumstance may waste be burnt on site.
- The Airport Workshop uses oils etc. Oil separators will be installed at this location and will need to be emptied/cleaned regularly.
- Hazardous waste will be removed to a licensed facility.
- General waste will be sorted and temporarily stored in various categories. Some shredding and baling of general waste will take place on site. All sorted, shredded or baled recyclable waste will be collected by recycling companies for offsite processing.
- Organic, food, garden, decomposable waste will go to composting and or a biodigester.
- A sewage package plant is proposed as an alternative to a conventional Municipal Wastewater Treatment Works. The treated sewage effluent water generated by the package plant is normally used for irrigation or toilet flushing but could also be used to supplement the biodigester.

- A biodigester and PV is proposed to reduce the need for Eskom supply. Considering the airport's location, the biodigester intends to use Biomass, supplemented by general food waste from the airport and/or other organic /decomposable waste from the area.
- The "waste" from the biodigester plant comprises "liquid fertilizer" which is planned to be used as organic agricultural fertilizer (refer to Section below).
- Vegetation removed from the site must be stored, chipped and removed to the composting facility for reuse or if appropriate to the Biodigester.
- Waste generated on site must be removed on a regular basis throughout the operational phase.
- Waste that cannot be reused or recycled must be removed by a suitably qualified contractor and disposed of at an appropriately licensed landfill site. Proof of appropriate disposal must be provided to the Waste Control Officer by the contractor.

8.3. Reduce transportation of waste

- City of Cape Town (and neighbouring municipalities) registered service providers will be contracted to remove and recycle waste from the site.
- The following Landfill sites will be used to deposit waste that cannot be recycled or re-used:
    - General Waste can be transported to the Vredenburg landfill site.
    - All hazardous waste will be transported to the Vissershok site. Vissershok site is off the N7 into Frankdale Road, adjacent to Morningstar.
- Specialist Waste removal companies such as *EnviroServe* and *Wasteman* can be used for dangerous or contaminated waste.

SECTION 9: MONITORING AND COMPLIANCE

9.1. Environmental Reporting

To ensure that the necessary environmental waste issues are adequately addressed and recorded, the following environmental reporting shall be undertaken:

- During construction the independent ECO will compile monthly reports as per the EMPr requirements, a dedicated section on waste will be included. These reports will be sent to DEA&DP monthly.
- During operations the inhouse ECO will compile monthly reports as per the EMPr requirements, a dedicated section on waste will be included. These reports will be sent to the EM monthly.
- An internal audit detailing the environmental performance of the facility must be conducted every 12 months by the owner of the waste management facility and an official report thereof must be prepared. These audit reports must be safely stored and made available to the external auditor as well as the environmental authority (upon request).
- External audits of the waste facility must be conducted every 12 months by an independent auditor (EAP) and official audit reports must be prepared documenting the findings. The external audit report must be submitted to the provincial authority upon request and must include (but is not limited to) the following
    - An indication of the compliance of the facility with the National Norms and Standards for this WMP as approved by the provincial authority:
        - National Norms and Standards for the Storage of Waste (GN926 of 29 November 2013)
        - National Norms and Standards for Sorting, Shredding, Grinding, Crushing, Screening, Chipping or Baling of General Waste (GN1093 of 11 October 2017).
        - National Norms and Standards for Organic Waste Composting (GN 561 in GG 44762 of 25 June 2021) read with GN 1757 in GG 45907 of 11 February 2022.
        - National Norms and Standards for Organic Waste Treatment (GN. No. 1984 of 1 April 2022
        - National Norms and Standards for Domestic Waste and Sanitation Services", published as GN No. 982 of 8 September 2017.
    - An indication of compliance with requirements issued by the relevant authority either at national, provincial or local level.
    - An indication of any major environmental incidents or non-compliance that occurred and details of how the incidents or non-compliance were addressed.

  - An indication of the presence of records of safe disposal certificates for all hazardous or general waste removed from the facility.
  - An indication if hazardous waste is separated from general waste and that such waste is removed by a registered waste handling company for either recycling or disposal at a registered facility.
- Incident reporting
  - All incidents must be recorded, and the appointed environmental manager/waste control officer must be notified. See Appendix C for a template of an Incident Report to serve as a guideline for the recording and addressing of emergency incidents as and when they occur.

9.2 Record Keeping

The applicants EM should keep records of the following:

- Internal and external audit reports.
- A site control register:
  - The control register must outline daily monitoring undertaken by the site manager.
  - It is recommended that the register is in a digital format as this will ensure that all records are easily accessible for internal and external auditing requirements.
  - An incident and complaints register must form part of the overall site control register.
- Reviews of the WMP,
- Amendments to the WMP
- Quantities of incoming waste types.

Records should be kept and must be made available for review on request, based on adequate motivation. Minutes of meetings on site must reflect environmental queries, complaints, actions agreed upon, dates of eventual compliance and must form part of the official environmental site record.

In addition to the summary report, the environmental manager / waste control officer shall keep photographic records of site visits and an ad hoc record of incidents or events on site, especially in the case of transgressions from WMP specifications. Such photographs are to be taken with an in-camera dating facility.

9.3 Method Statements

For identified activities the Contractor is requested to submit a method statement (MS) for comment by the EM ECO or WCO. The method statement must provide a step-by-step plan (which may include a schematic diagram etc.) to inform the responsible person(s) on the process and actions to take in a sequential and logical manner, which aims to reduce the impact of undertaking the activity within a reasonable timeframe and cost.

The format should clearly indicate the following:

What - a brief description of the work to be undertaken;

How - a detailed description of the process of work, methods and materials;

Where - a description/sketch map of the locality of work; and

When - the sequencing of actions with due commencement dates and completion date estimates.

The Contractor must submit the method statement to the EM, ECO or WCO prior to the start of any construction activity. Work may not commence until the comments of the site manager/waste control officer have been received and taken into consideration, and the EM, ECO or WCO has approved the method statement for implementation on site.

9.4. Monitoring

The monitoring of works on site is necessary to demonstrate compliance with the specifications of the WMP and to allow for problems or issues of non-conformance to be identified and appropriate corrective measures to minimize environmental damage to be implemented.

The WMF and all waste storage containers will be inspected weekly to ensure that they are maintained in a condition appropriate for their use and containment of the specific waste.

Skips and/or bins will need to be monitored regularly to ensure that cross contamination doesn't occur. All waste removed from site including products for reuse will also be monitored to ensure no cross contamination.

Monitoring should include daily visual checks by the EM, ECO or WCO, as well as a review of site documentation. Monitoring should include photographic records as outlined in this document. An internal audit detailing the environmental performance of the facility must be conducted every 12 months by the owner of the waste management facility and an official report thereof must be prepared. These audit reports must be safely stored and made available to the external auditor as well as the environmental authority (upon request). The internal auditor shall complete the performance record at the end of each table in section 9.2 of this document, as a record of transgressions or problems experienced on site, and how they were dealt with. External audits of the waste management facility must be conducted every 24 months by an independent auditor (EAP) and official audit reports must be prepared documenting the findings.

9.5. Waste Control Sheets

The sheets below must be used by the EM, ECO or WCO as basis for the development of a Site Control Register.

a. <u>Communication Construction and Operation</u>

TASK	**MITIGATION AND ENVIRONMENTAL CONTROLS**	ACTION
Site Control Register	• To be updated on a regular basis	EM, ECO or WCO
Public complaints	• To be recorded in complaints register, along with records of responses to them in the Site Control Register	EM, ECO or WCO
Environmental Awareness education	• Each contractor team, tenants and operators involved with the waste management activity at CWA are to attend an introduction or annual training session.	EM, ECO or WCO
Method Statements	• All waste source point owners or tenants need to be contractually tied to waste separation at source and the procedure of collection and removal to the WMF. • Record of members attending training sessions to be kept, and updated regularly • Method statements to indicate What, How, Where and When activities are to take place. • Method statements for each relevant activity identified by ESM and ECO to be submitted prior to the start of that activity on site. • Work or waste activity is not to commence until method statement approved by ESM or ECO and Site Manager if necessary.	Contractor or Operators
COMMENTS/ UPDATE		
RECORD OF PERFORMANCE		

Acceptable		**Details of Transgression**	**Responsible Party**	**Action Taken**	**Date**
Yes	**No**				

b. Site Actions Construction

TASK	MITIGATION AND ENVIRONMENTAL CONTROLS	ACTION
Waste Stream handling	• Implement waste stream handling procedures for construction as per Table 1 above	Contractor, EM ECO, WCO
COMMENTS/ UPDATE		
RECORD OF PERFORMANCE		

Acceptable		**Details of Transgression**	**Responsible Party**	**Action Taken**	**Date**
Yes	**No**				

c. Site Action Operations

TASK	MITIGATION AND ENVIRONMENTAL CONTROLS	ACTION
Waste Stream handling	• Implement waste stream handling procedures for operations as per Table 1 above	Contractor, EM ECO & WCO
COMMENTS/ UPDATE		
RECORD OF PERFORMANCE		

Acceptable		**Details of Transgression**	**Responsible Party**	**Action Taken**	**Date**
Yes	**No**				

d. General Site Procedures

TASK	MITIGATION AND ENVIRONMENTAL CONTROLS	ACTION
Avoid natural resource contamination	• Minimize the use of wash water onsite as far as possible by applying high pressure hoses. • The facility must be managed such that all runoff originating from the site is diverted into a stormwater control channel that contain detention and trapping facilities before it leaves the WMF. • All stormwater control channels in close proximity to WMF must be suitably lined to prevent seepage into groundwater. • The overflow of stormwater channels needs to be trapped and allowed to settle in a detention pond. • The nutrient rich stormwater originating from the composting and biodigester site must be trapped and used as a moisture additive within the composting facility to enhance the composting process. • No nutrient enriched water may be released offsite. • All stormwater infrastructure must be regularly inspected and serviced to ensure design capacity and integrity is maintained. • To ensure suitable stormwater control capacity is maintained onsite, stormwater channels must be kept free from silt. The stormwater control channels must be cleared of any sedimentation (if required) during the dry season. • All water that has entered the composting and biogas areas must be treated as leachate. • To prevent nutrient rich leachate from percolating into the ground, the land areas where composting are established should be compacted to ensure that the soil drainage is poor or virtually impervious. • All wind dispersed waste must be collected on a daily basis and taken to the WMF • The WMF must have closed containers to avoid wind dispersing waste	EM, ECO & WCO
Avoid the generation of	• All trucks or vehicles transporting waste material will be required to secure and cover all loads with shade cloth to	EM, ECO & WCO

atmospheric emissions and odors	avoid debris or plastic etc. that can blow or fall on public roads or areas. • Composting operations should process organic material on the same day to avoid stagnant heaps. • Optimizing certain variables can minimize composting emissions. The carbon-nitrogen ratio, temperature, moisture content (at least 25%), aeration, and pH must be monitored by the facility manager on a weekly basis to ensure optimal organic matter breakdown without production of excessive atmospheric emissions or odors. • All storage and operating areas need to be contained in bunkers, lined and covered where required. • The WMF in the services precinct is located directly opposite the City of Cape Town Fisantekraal WWTW therefore part of a node already exposed to odors where residential development is not likely.	
Avoid Soil Erosion	• Wherever possible, ensure that the WMF surface is covered by tar, concrete or paving and areas around the stormwater system vegetated as per landscape and SWMP. • Establish and maintain suitable vegetation cover at all stormwater concentration points. These areas include road verges, the banks of stormwater channels, berms and other infrastructure that may increase surface runoff. Should any erosion be detected, the ECO must identify the cause of such erosion and ensure that the most appropriate method of mitigation or stabilization is employed as soon as possible.	EM, ECO & WCO
Avoid the generation of dust and noise	• The level of dust and noise generated by WMF activities will be insignificant in the broader landscape, especially after the roads a surfaced. Nevertheless, it is recommended that working hours are restricted to 06:00 to 18:00 daily. • All transport vehicles and machinery/equipment used onsite must be regularly maintained and kept in good working order to prevent excessive noise. • It is recommended that a dustcart is available onsite to water down dusty roads not tarred, particularly during the dry summer months.	EM, ECO & WCO

	• A suitable speed limit (40 – 60 km/h) must be enforced on all access roads. Ensure compliance with the provisions as set out in the National Environmental Management: Air Quality Act (NEM: AQA), National Dust Control Regulations (Notice 827 of 2013) and Western Cape Noise Control Regulations (P.N. 200/2013).	
Avoid Visual impacts	Scrape and sweep all areas where material is processed weekly to ensure that minimal waste material is present outside the contained areas	EM, ECO & WCO
Limit Consumption of resources (water)	• Maintain all water infrastructure in a good working condition. • Use high pressure power hoses for cleaning. • Ensure that all taps remain closed when not in use. • Educate all employees on the importance of natural resources and wise water use practices. • Should any leaks occur, these must be reported immediately and repaired as soon as possible. When emptying transport bins, ensure all material is removed manually as far as practicably possible to minimize the need for wash water.	EM, ECO & WCO
Limit Attraction Birds and Vermin	With suitable management, this impact can be kept to a minimum. The flowing management measures should however continue to be followed: • All organic waste delivered to the site must be covered or worked immediately. • Apply roofs over waste areas to avoid attraction. • Apply containment of waste to avoid attraction. • Apply bait stations for organic pest control. • Correct management of pH and temperature within the composting rows will control the spread of pests and diseases as larva/eggs/worms/bacteria can't live at optimal composting temperatures. • Ensure that WMF does not have pooling or standing water • Best practice pest control measures will be implemented, and a Certified Pest Control Company will be appointed on the onset of the Construction and Operational Phases to ensure that	EM, ECO & WCO

	preventative measures are put in place and monitored to ensure the effectiveness of the Pest Control Schedule.	
Avoid Leakage of potentially hazardous substances	• All transport vehicles and machinery must be confined to access roads and approved development footprints. • All transport vehicles and machinery/equipment used onsite must be regularly maintained and kept in good working order to prevent potential leaks.	EM, ECO & WCO
COMMENTS/ UPDATE		
RECORD OF PERFORMANCE		

Acceptable		**Details of Transgression**	**Responsible Party**	**Action Taken**	**Date**
Yes	**No**				

9.6. Review of the WMP

The WMP will be reviewed by the EM and ECO on an ongoing basis. Based on observations during site inspections and issues raised at site meetings, the EM will determine whether any procedures require modification to improve the efficiency and applicability of the WMP on site. The WMP must be updated and submitted to the competent authority should any significant changes occur to the operations regarding the waste facility.

Any such changes or updates will be registered in the weekly record, as well as being included as an annexure to this document. Annexures of this nature must be distributed to all relevant parties on site.

9.7. Environmental Audits

Internal auditing will take place annually during the operational phase. A suitably qualified EAP Environmental Auditor is to be appointed, at the expense of the Applicant, to undertake external audits of compliance with the WMP. External audits of the waste facility must be conducted annually by an independent auditor and official audit reports must be prepared documenting the findings.

Objectives should be to audit compliances with the key components of the WMP, to identify main areas requiring attention and recommend priority actions. The audit should cover a cross section of issues, including implementation of environmental controls, environmental management, and environmental monitoring.

Results of the audits should inform changes required to the specifications of the WMP or additional specifications to deal with any environmental issues which arise on site and have not been dealt with the in the current document.

The national, provincial and local authorities must be given access to audit or inspect the facility if requested.

9.8. Incident reporting

Environmental incident reporting is a vital part of communication. Employees are required to report all environmental related problems, incidents, and pollution, so that the appropriate mitigation actions can be implemented timeously. See Appendix B for a template that can be used for incident reporting

The EM shall investigate the incident and record the following information:

- How the incident happened;
- The reasons the incident happened;
- How rehabilitation or clean up needs to take place;
- The nature of the impact that occurred;
- The type of work, process or equipment involved; and
- Recommendations to avoid future such incidents and/or occurrences.
- Shall inform the ECO & WCO of all incidents that were reported.
- Shall consult with the ECO & WCO for recommendations on actions to be taken or implemented where appropriate (e.g., clean-ups).

9.9. External Records and Monitoring

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. The appointed waste contractor is to provide monthly reports to the operator containing the following information:

- Monthly volumes/ mass of the different waste streams collected;
- Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- Monthly volumes/ mass of the waste that is recycled; and
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place.

Monitoring the quantity and types of wastes being generated by the CWA operations will be recorded in the wastes logbook and always kept on site so that regular reviews can be undertaken.

All products that are of concern in relation to the waste being generated will be replaced were possible for products that are less wasteful and/or considered to be environmentally friendly.

The Applicant will continue to review the type of surplus materials produced and were possible, change the site design and operation to minimize products that go to landfill. Recycling or reuse of waste is a priority.

The WMP and its importance will be communicated to the whole team regularly. Business wide updates including improved recycling amounts will be communicated and discussed at management and 'toolbox' meetings.

The WMP will be analyzed to produce key performance indicators, and it will be the EM and ECO's responsibility to develop best practice solutions throughout the CWA operations and monitor them.

A **Groundwater Monitoring Plan** will be implemented to monitor potential impacts of waste sources and assist with the development of environmentally sustainable practices as part of the CWA EMPr.

The waste facility should be free from odour or emissions that are likely to cause a nuisance. An **Odour Monitoring Plan** can be developed during operations by the EM and ECO and implemented to monitor potential odour impacts associated with the various waste streams on site and assist with the development of environmentally sustainable solutions, where applicable, should this become a concern.

The **Emergency Preparedness and Response Plan** to be compiled post authorization, as a condition of approval and as stipulated in the CWA EMPr, includes the:

- Emergency response plan,
- Hazard Identification,
- Remedial Actions, and
- Preventative measures.

9.10. Operational Waste Survey

Carrying out a waste survey is an important first step in refining a waste management plan. In particular, such information is crucial to developing a recycling program. A waste survey can reveal a lot about the patterns of people in the facility as well as their use and distribution of everyday items throughout the facilities and grounds. This would however require specific knowledge of airport operations and applicable regulations, as the situations that each airport faces are unique and highly dependent on its geographical and social condition.

A waste survey by the EM should include:

- Identifying materials that can and cannot be recycled in the region.
- Locations within the airport that generate waste.
- The types of waste generated in each area (paper, scrap metal, plastic, etc.).
- Identifying materials that can be reduced, reused, and recycled.
- The quantity of waste generated by each area of the airport (airlines, administrative offices, enplaned and deplaned passengers, concessions, etc.).
- Commodity rates for recyclable materials.

- Costs associated with processing recyclables.
- Hauling, disposal, and labour costs for landfill-bound waste.

9.11. Laboratory Tests:

Once available, the digestate from the anaerobic biodigester will be analysed by the EM to determine its suitability as a liquid fertiliser, and that these results be made available to DEA&DP, the DWS and the Western Cape Department of Agriculture.

After the onsite WWTW are functional testing on the biosolids resulting from the sewage package plant will be considered before a classification of the waste can be given. The waste classification of the biosolids will also depend on an analysis provided on the chemical constituency of the biosolids, and depending on end use, the total concentration and leachable concentration tests will be conducted on the biosolids. This will determine how this waste source is handled.

SECTION 10: TRANSGRESSIONS IN TERMS OF WMP

The Applicant must comply with the requirements of this WMP on an on-going basis and any failure on his part to do so will entitle the relevant competent authorities to **take corrective action against the transgressor**.

In the event that any activities are undertaken outside the scope of the adopted WMP requirements, in terms of the action outlined within the given method statement, the person(s) responsible will potentially be subject to Section 24(F) of NEMA and that appropriate enforcement and compliance requirements will follow by the competent authority.

Transgressions relate to actions by the Applicant, contractor or contractor team members whereby damage or harm is inflicted upon the environment or any feature thereof and where any of the conditions or specifications of the WMP/ EMPr/ EA/ WULA are infringed upon.

In instances of environmental damage, the damage is, where possible, to be repaired and rehabilitated using appropriate measures, as specified and undertaken by appropriate specialists, for the account of the responsible party.

Issues of non-compliance noted by the EM/ ECO are to be communicated to relevant parties and appropriate action must be taken to rectify the situation. Issues of non-compliance must be reported in the required site visit report. The EM/ECO will advise on appropriate corrective actions when necessary.

SECTION 11: CONCLUSION

The waste management plan is prepared for the construction and operational (including maintenance) phases of the CWA, which would collate measures to manage waste and thus avoid and mitigate impacts to human health and the environment. A combination of on-site and off-site management measures would provide a range of options to reuse, recycle, recover and treat waste generated at the proposed airport. However, there are other considerations to waste management such as waste reduction, segregation of waste, disposal of waste, financial impacts of waste disposal and recording, monitoring, education and reviewing.

Construction practices and operations must be measured and analyzed to determine the efficacy of the plan and whether further revision of the plan is required. This plan should be updated should further detail regarding waste quantities and categorization become available, during the construction and/or operational stages.

APPENDIX A: SITE DEVELOPMENT PLAN AND ASSOCIATE PLANS

APPENDIX B: NORMS AND STANDARDS

APPENDIX C: INCIDENT REPORT TEMPLATE

Environmental Incident Report

Date:	**File reference number:**
Name:	
Exact location of incident:	

Section 1: Description of incident

Section 2: Remedial action required

Section 3: Relevant Documentation

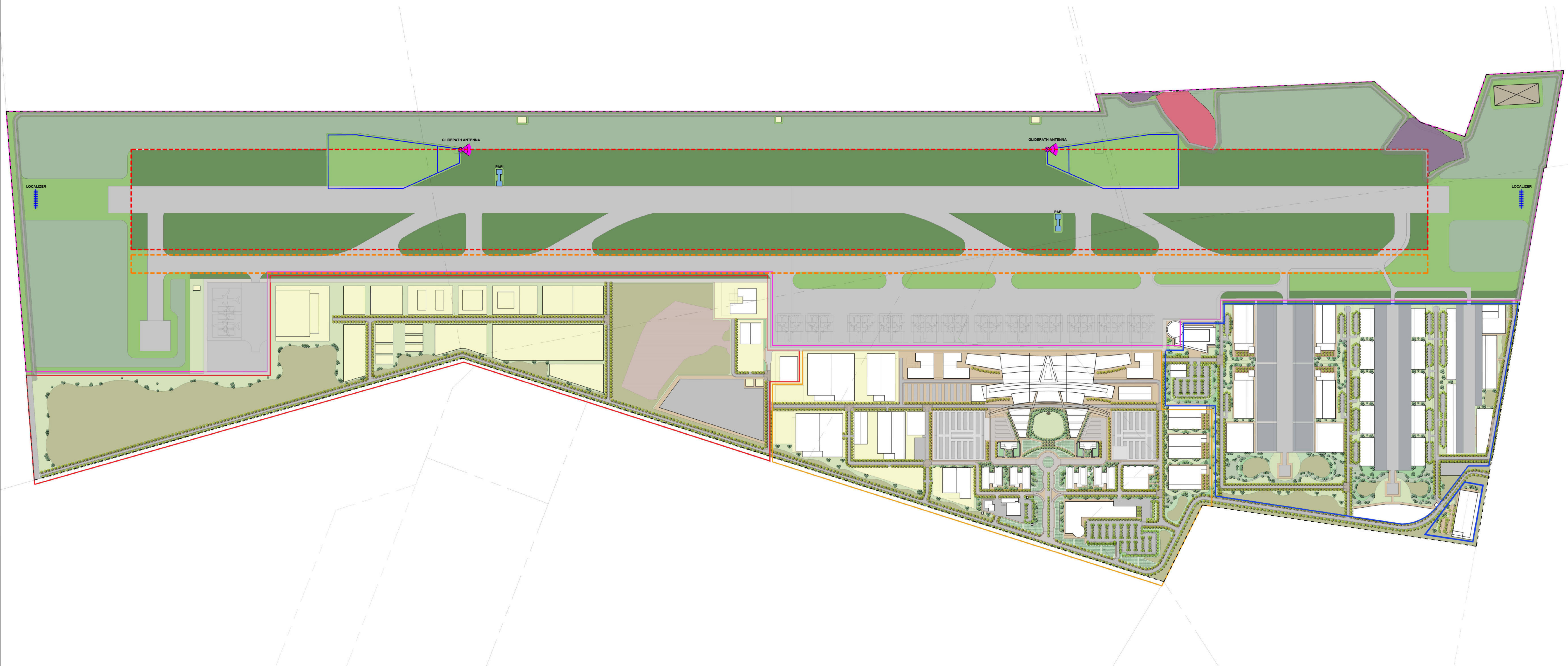
Section 4: Steps to prevent recurrence

Section 5: Signatures

Environmental manager:	Date: ....
ECO:	Date: ....
Landowner:	Date: ....

APPENDIX D: CV OF EAP

ANNEXURE 9: LANDSCAPING PLAN (s)



north

LANDSCAPE PLAN

Scale 1:4500

0 40 100 200 400 1000

LEGEND (cont...)

PHASING LINE

- AIRPORT AIR SIDE PRECINCT
- SERVICE PRECINCT
- AIRPORT TERMINAL PRECINCT
- GENERAL AVIATION PRECINCT
- BOUNDARY/FENCE LINE

ORIGINAL INDIGENOUS REMNANTS

- 1.6 ha VERY HIGH; TO REMAIN UNTOUCHED AT THE AIRPORT AIRSIDE PRECINCT.
- 0.2 ha MEDIUM; AREA TO REMAIN UNTOUCHED AT THE AIRPORT AIRSIDE PRECINCT.
- 1.6 ha MEDIUM; SOME OF AREA TO BE DESTRUCTED DUE TO THE RUNWAY STRIP AREA AT THE AIRPORT AIRSIDE PRECINCT.

EXTREMITIES

- RUNWAY STRIP AREA AT THE AIRPORT AIRSIDE PRECINCT.
- TAXIWAY STRIP AREA AT THE AIRPORT AIRSIDE PRECINCT.
- ILS GP BEAM FORMING AREA AT THE AIRPORT AIRSIDE PRECINCT.
- FUTURE INSTRUMENT LANDSCAPING SYSTEM FACILITIES AT THE AIRPORT AIRSIDE PRECINCT (i.e LOCALISER, MARKER BEACONS, SIGNAGES etc) & SUB-STATIONS AROUND AIRPORT AIRSIDE ARE SUBJECT TO LATER POSITIONS & DETAIL DESIGN; LANDSCAPING AROUND THESE WILL BE KEPT TO A MINIMUM BUFFER OF 5m OFFSET OF 200mm VYGIE & ANNUALS / PERENNIALS FYNBOS GROUND COVER SPECIES.
- BRUSH-CUT FIREBREAK: 15m WIDE ALIGNING WITH THE PERIMETER ACCESS ROAD; OFFSET FROM BOUNDARY; NOT ENCROACHING INTO INDIGENOUS REMNANTS AREAS.

NOTES

- WRITTEN DIMENSIONS TO BE TAKEN, NOT SCALED
- ALL DIMENSIONS TO BE CHECKED ON SITE
- ANY DISCREPANCIES TO BE COMMUNICATED TO THE LANDSCAPE ARCHITECT IMMEDIATELY

NO.	DATE	REVISION	DRAWN
11	2025.02.05	ADDED 15m WIDE FIREBREAK AROUND ACCESS ROAD	MM
12	2025.03.07	GENERAL UPDATE TO LEGEND DESCRIPTION	MM

LEGEND

SOFT LANDSCAPE

- TREES IN PARKING AREA AT THE AIRPORT TERMINAL PRECINCT
- BOUNDARY/VERGE TREES AT THE SERVICE PRECINCT, AIRPORT TERMINAL PRECINCT & GENERAL AVIATION PRECINCT.
- TREE CLUSTERS AT THE SERVICE PRECINCT, TERMINAL PRECINCT & GENERAL AVIATION PRECINCT.
- TREES IN PAVED CUT-OUT AREAS AT THE AIRPORT TERMINAL PRECINCT.
- INDIGENOUS SHRUBS & GROUND COVER PLANTING AT THE AIRPORT TERMINAL PRECINCT & GENERAL AVIATION PRECINCT
- INDIGENOUS SHRUBS & GROUND COVERS WITH BERMS/MOUNDS AT THE AIRPORT TERMINAL PRECINCT.
- PLANTED BERMS AT THE AIRPORT TERMINAL PRECINCT.
- HYDROSEEDED AREAS: SAND FYNBOS & RENOSTERVELD AT THE AIRPORT AIRSIDE PRECINCT; SPECIES LIMITED TO 700mm IN MAXIMUM HEIGHT.
- VYGIE & ANNUALS/PERENNIALS FYNBOS GROUND COVER SPECIES AT THE AIRPORT AIRSIDE PRECINCT: VARIOUS SPECIES LIMITED TO 200mm IN MAXIMUM HEIGHT TO COMPLY WITH THE FRANGIBILITY REQUIREMENTS OF ICAO.
- VYGIE & ANNUALS/PERENNIALS FYNBOS GROUND COVER SPECIES AT THE AIRPORT AIRSIDE PRECINCT: VARIOUS SPECIES LIMITED TO 300mm IN MAXIMUM HEIGHT TO COMPLY WITH THE FRANGIBILITY REQUIREMENTS OF ICAO.
- SAND FYNBOS AND RENOSTERVELD REHABILITATION PLANTING AT THE SERVICE PRECINCT.
- LAWN AT THE SERVICE PRECINCT, TERMINAL PRECINCT & GENERAL AVIATION PRECINCT
- LAWNED BERMS AT THE AIRPORT TERMINAL PRECINCT.
- ORNAMENTAL VINEYARDS AT THE AIRPORT TERMINAL PRECINCT.
- GREEN ROOFS AT THE AIRPORT TERMINAL PRECINCT.

HARD LANDSCAPE

- INTERNAL PAVED PEDESTRIAN WALKWAYS AT THE AIRPORT TERMINAL PRECINCT.
- INTERNAL PAVED PLAZA AREAS AT THE AIRPORT TERMINAL PRECINCT.
- PAVED VEHICULAR ROAD AT THE SERVICE PRECINCT, TERMINAL PRECINCT & GENERAL AVIATION PRECINCT.
- 1.8m PAVED WIDE NMT WALKWAYS AT THE SERVICE PRECINCT, TERMINAL PRECINCT & GENERAL AVIATION PRECINCT.
- 3.0m PAVED WIDE NMT WALKWAYS AT THE SERVICE PRECINCT, TERMINAL PRECINCT & GENERAL AVIATION PRECINCT.
- PAVED INTERSECTION AREAS AT THE SERVICE PRECINCT & TERMINAL PRECINCT.
- RUNWAY, TAXI & APRON ASPHALT FINISHED SURFACES AT THE AIRPORT AIRSIDE PRECINCT AND GENERAL AVIATION PRECINCT
- AIRPORT MAINTENANCE ROAD ASPHALT FINISHED SURFACES AT THE AIRSIDE PRECINCT & SERVICE PRECINCT.
- SPACE FOR OCCASIONAL USE AND SLOPED PLANTING AT AIRPORT TERMINAL PRECINCT
- SOLAR PHOTOVOLTAIC SOLAR PANELS OVER PARKING BAYS AT THE AIRPORT TERMINAL PRECINCT.
- INDICATIVE BUILDING ROOFSCAPE EXTENTS AT THE SERVICE PRECINCT, TERMINAL PRECINCT & GENERAL AVIATION PRECINCT.
- FUTURE DEVELOPMENT AREAS WITH INDICATIVE BUILDINGS AT THE SERVICE PRECINCT & TERMINAL PRECINCT.
- EXISTING QUARRY AT THE SERVICE PRECINCT.
- ESKOM INCOMING SUB-STATION AT THE AIRPORT AIRSIDE PRECINCT.

DRAFT

PROJECT

CAPE WINELANDS AIRPORT - PAL 4, FISANTEKRAAL

DRAWING TITLE

OVERALL LANDSCAPE CONCEPT PLAN

JOB No.	DRAWING Nr.	REVISION
77437	CWA-PLP-ZZ-00-DR-LA-0001	12

DATE MARCH 2025

SCALE 1:4500 @ A0

DESIGNED JJ/JED
DRAWN MM
CHECKED JJ/JED
APPROVED JJ

CLIENT VIVID ARCHITECTS

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