

# Using Biodiversity Plans to Guide Mitigation and Offsets for a Zinc Mine in Northern Cape, South Africa

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Photo: Philip Desmet



Smithsonian  
Institution



# Objectives & Scope

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## Case study example of:

- Integration of EIA and Biodiversity Offset Processes
- Application of mitigation hierarchy
- Application of bioregional plans to offset identification

## EIA:

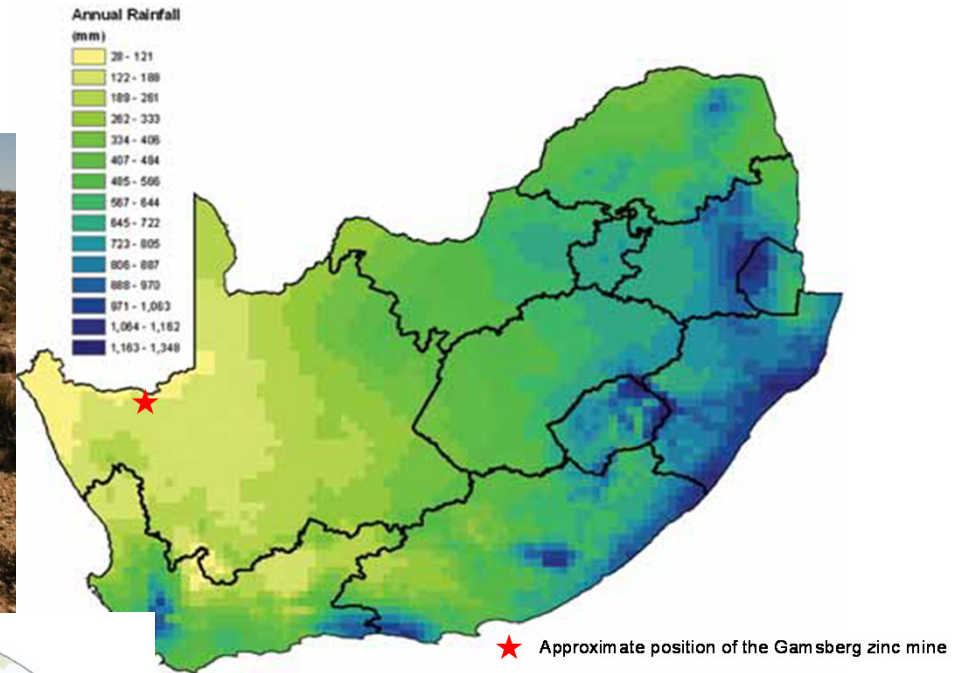
- EIA required to obtain environmental license of Zinc mine
- Botanical richness and need for offset known at start

## Offset Process

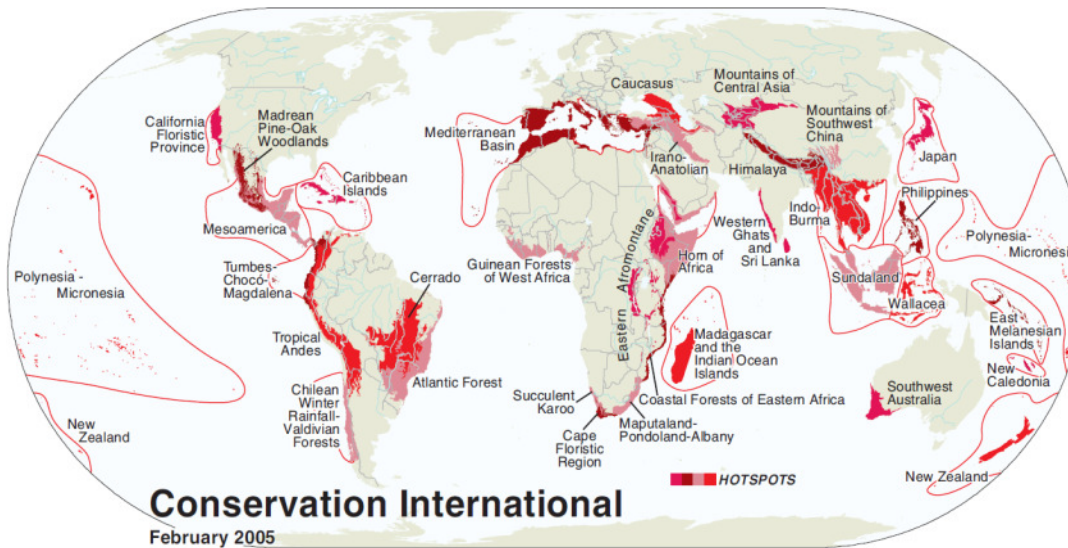
- Offset study in parallel with EIA (separate contract)
- Botanist involved in EIA and offset process

# Introduction – Gamsberg Location & Context

## ■ Northern Cape, near Namibia

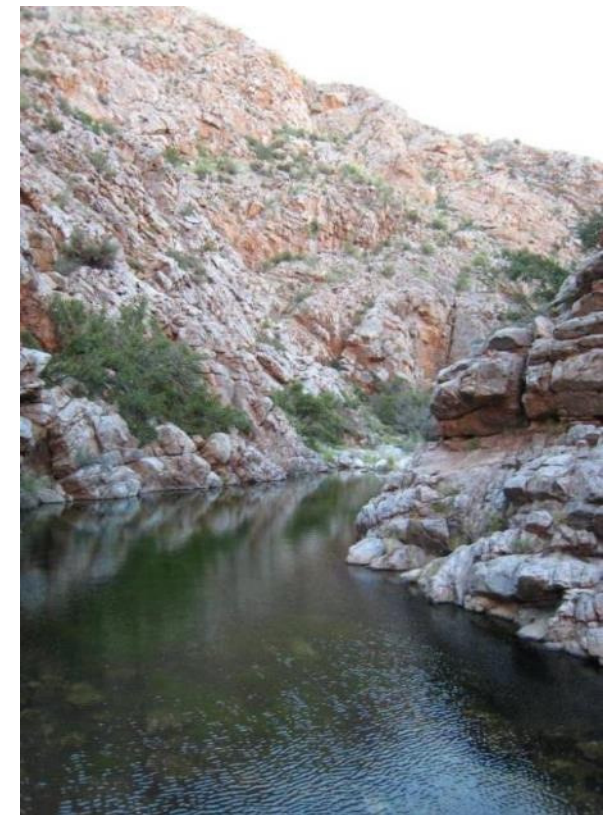
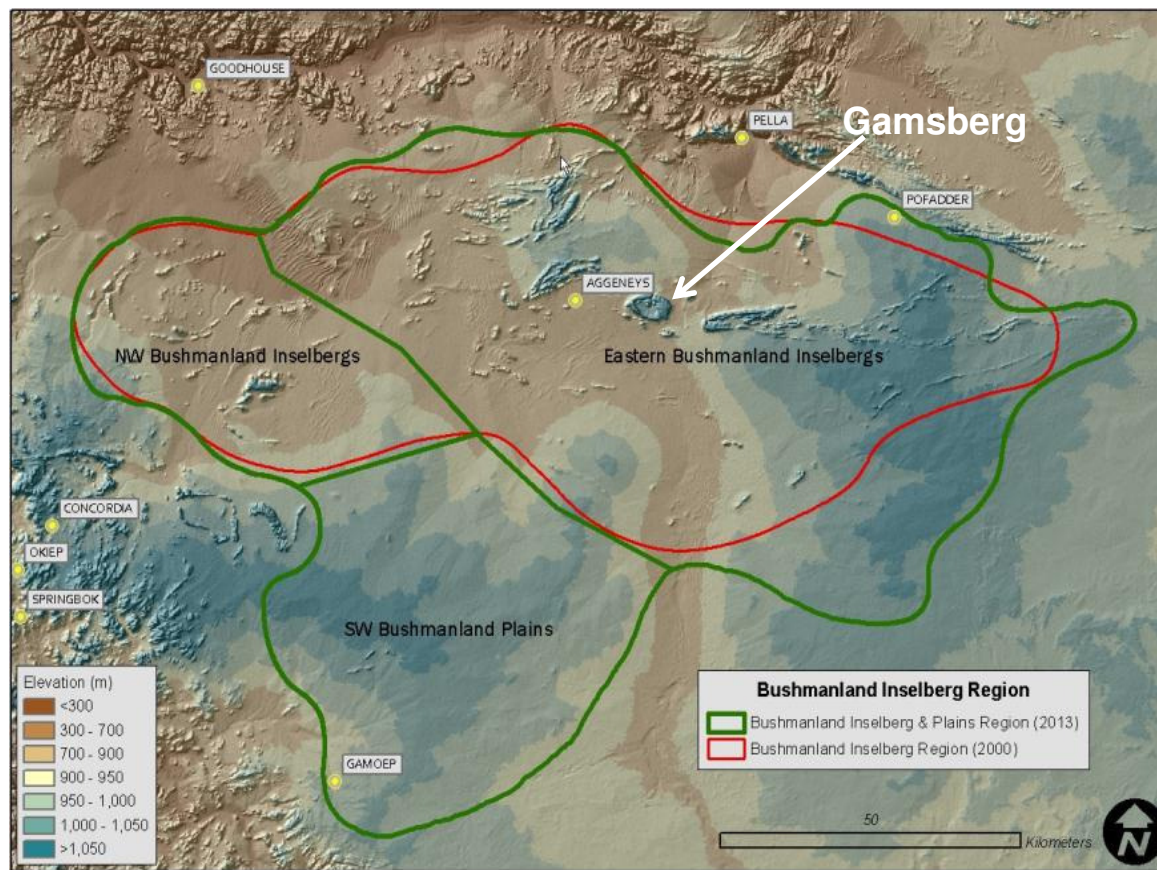


- Succulent Karoo biodiversity hotspot – succulent flora
- None formally conserved



# Gamsberg Conservation Context

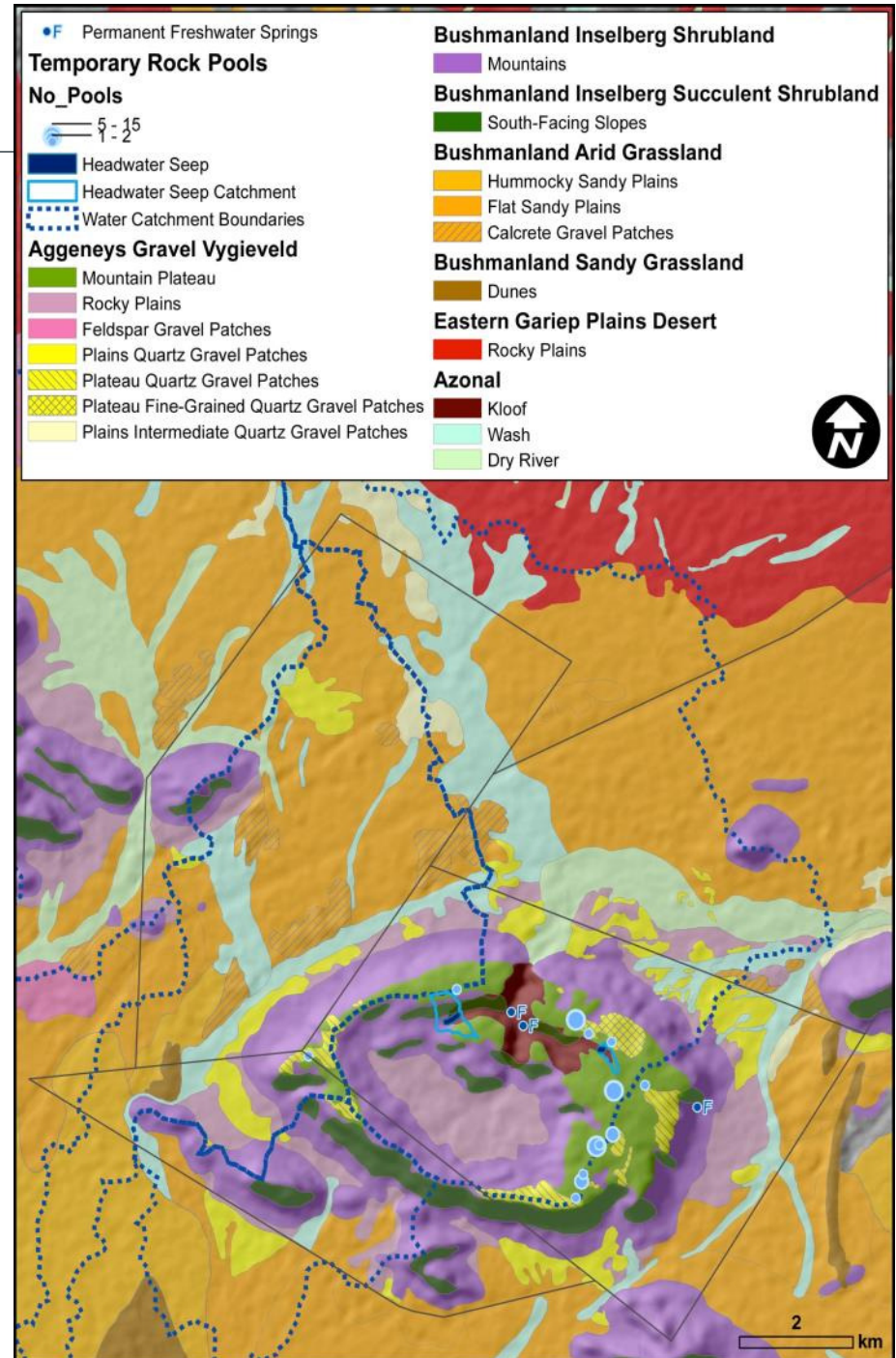
- Bushmanland Centre of Endemism – rocky inselberg succulents (~397 succulents; 16 endemic; 4 restricted; kloof)
- Gamsberg inselberg (7x5km) - Critical Biodiversity Area



Kloof

# Vegetation Mapping

- Regional fine-scale vegetation map (2005)
- Namakwa District Bioregional Plan 2009
- Additional surveys in 2010 and 2013
- Basis for identifying potential offset sites



# Application of Mitigation Hierarchy

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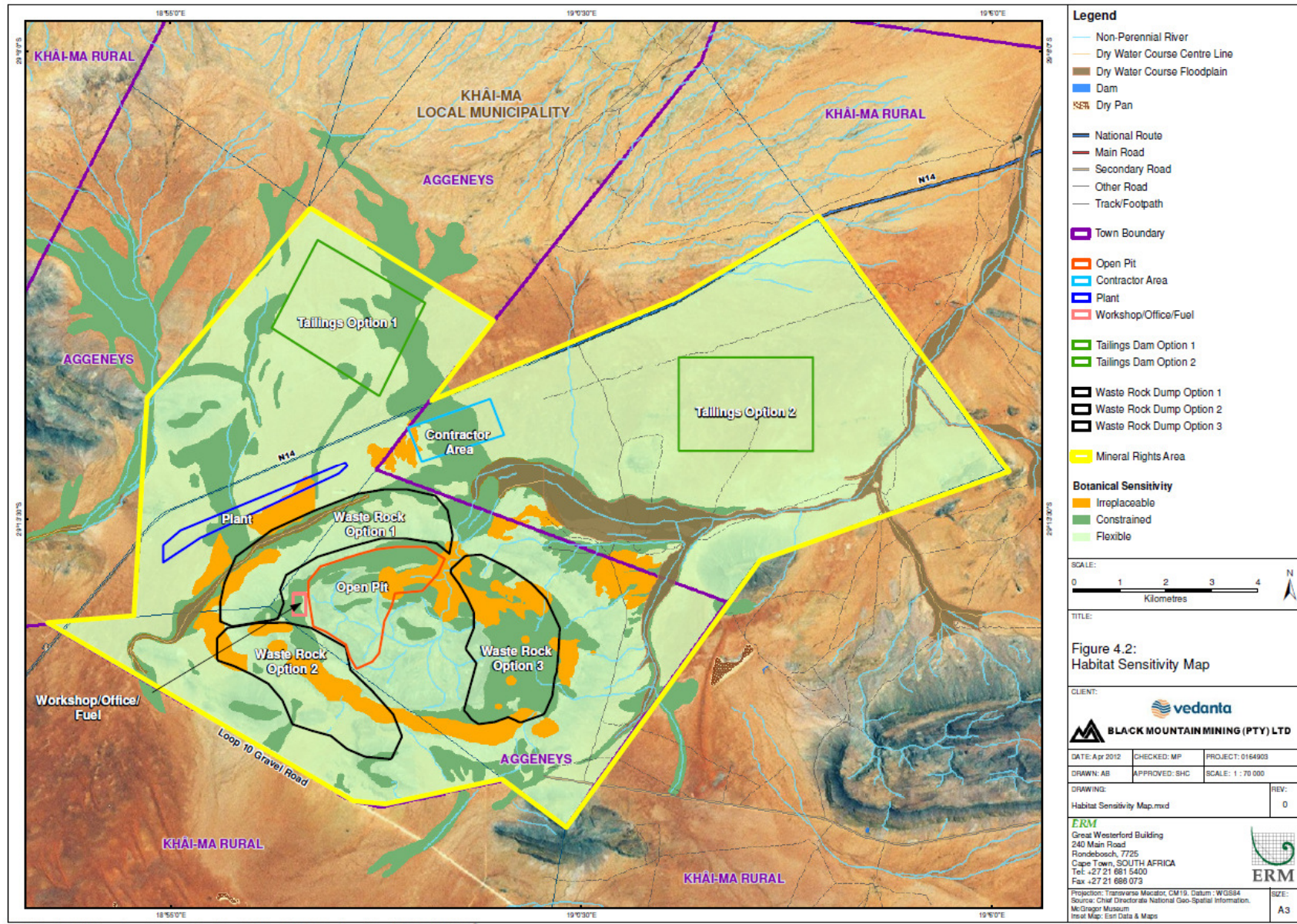
## Avoidance:

- **Open Pit versus Underground Mining**
- **Alternative Location & Design of Infrastructure:**
  - Pit design – set back zone from kloof (water protection)
  - Moved waste dump locations to avoid sensitive flora
  - Adjusted siting of processing facilities & access roads

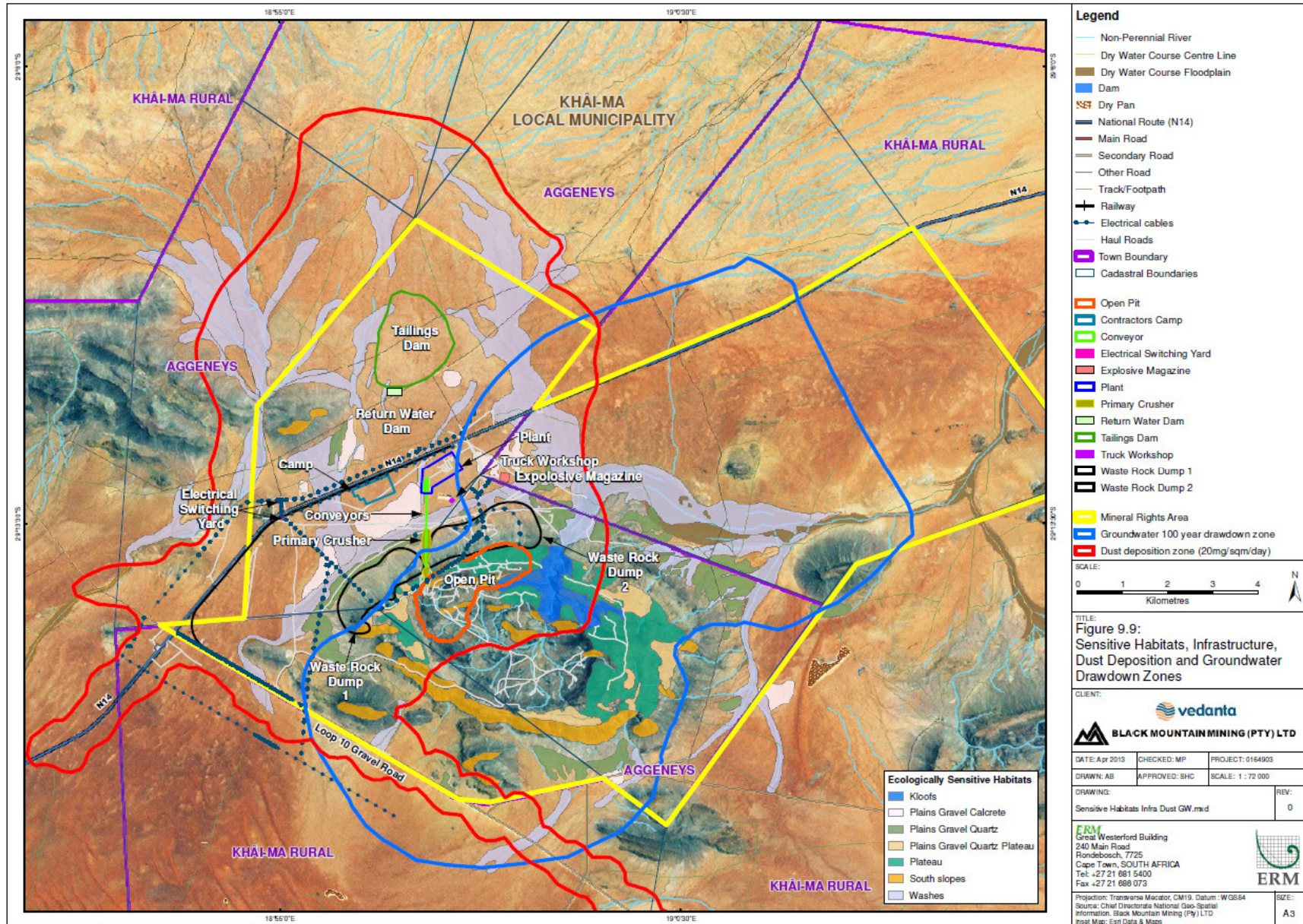
## Minimisation:

- **Separate types of waste rock (minimise pollution)**
- **Dust suppression (black dust)**
- **Water management (protect seeps/kloof)**

# Vegetation Sensitivity Mapping



# Integrated Sensitivity Mapping



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Title: Proj:0164903\_GambergMap.mxd; D:\Topo\Apr1012\Sensitive\_habitats\_infra\_DustGW.mxd





# Offset Requirements

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## Quantifying Offset Requirements

- Measured residual negative impacts (hectares impacted)
- Calculated Offset Ratios (SA national conservation targets)
- Quantified Offset Area Requirements
- No net loss test (biodiversity offset achievable)

## Identification & selection of Offset Sites

- Priority areas in fine-scale vegetation map of Bushmanland Inselberg Region.
- Process Priorities (connectivity, consolidation, corridors)
- Mine property unaffected by mining included (set aside)

# Residual Impact and Offset Requirements

Vegetation Types; Habitat units	Conservation Status	Mine Footprint (a)	Dust Deposition (b)		Groundwater Drawdown (c)	Extent of Impact (a+b+c)	Final Ratio	Regional Extent	Offset Required/ Available	No Net Loss Test
			50 mg/m <sup>2</sup> /day	20 mg/m <sup>2</sup> /day						
			<b>Aggeneys Gravel Vygieveld</b>							
Mountain plateau	Constrained (VU)	123.2	58.5	117.1	280.8	181.7	6	1 763	1 090	Yes
Plateau quartz gravel	Irreplaceable (VU)	10.2	39.5	1.8	98.5	51.5	6	449	309	Yes
Plateau quartz gravel (fine grain)	Irreplaceable (VU)			49.1		49.1	8	58	58	No
Plains quartz gravel	Irreplaceable (VU)	115.9	179.9	110.9	325.5	406.7	5	5 974	1 830	Yes
Plains quartz gravel intermediate	Constrained (LC)		56.5	231	240.4	56.5	1	1 201	56	Yes
Plains feldspar gravel	Constrained (LC)		17.4	73.8		91.2	1	1 237	91	Yes
Plains rocky	Constrained (LC)	71.8	160.6	559	237.6	232.5	2	11 723	349	
<b>Bushmanland Inselberg Shrubland</b>										
Mountains	Flexible (LC)	535.4	335.5	751.3	1 314.50	871	2	42 037	1 306	Yes
<b>Bushmanland Arid Grassland</b>										
Flat sandy plains	Flexible (LC)	447.5	1 947.00	2 083.60	3 038.30	2 394.50	1	148 057	2 394	Yes
Hummocky sandy plains	Flexible (LC)	17.2	316.8	447.4	0	334	1	105 803	334	Yes
Calcrete gravel plains	Irreplaceable (EN)	20.3	154.1	229.4	44.6	403.7	16	1 732	1 732	No
<b>Bushmanland Sandy Grassland</b>										
Mobile sandy dunes	Flexible (LC)		5.3	29.6	18.1	5.3	1	104 571	5	Yes
<b>Easten Gariep Plains Desert</b>										
Plains Rocky	Flexible (LC)			252.1	120.7		1	24 376	0	
<b>Bushmanland Inselberg Succulent Shrubland</b>										
Southern Slopes	Irreplaceable (VU)	58.1	40.3	133.4	246	98.4	9	4 597	886	Yes
<b>Azonal Habitats</b>										
Kloof	Irreplaceable	27.8			148.9	176.7		847	2 Kloofs	No
Freshwater springs & Head-water seep	Irreplaceable				-	-			4 Springs	No
River (Wash with sub-surface flow)	Flexible (LC)	11.9			1 010.20	1 022.10	2	±7000	1 533	Yes
Wash	Constrained	39.9	442.4	928.9	276.5	482.3	2	32 293	723	Yes
<b>TOTAL IMPACTED AREA (ha) (RESIDUAL IMPACT)</b>		<b>1480</b>	<b>3 754</b>	<b>465</b>	<b>1 160</b>	<b>6 857</b>				
Key to shading Habitat affected by respective impact		High proportion of available habitat affected		Very high proportion of available habitat						
Key to shading No Net Loss Achievement		No Net Loss Test Failed		Technically not offset due to impact		Net Gain achieved by optimal offset portfolio and Mine properties				

# Results of Offset Site Selection

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- Most targets met (net gain for two habitat types)
- Offset targets not met for two habitat types:
  - Kloofs, headwater seeps and springs  
(Gamsberg kloof 1 of 3 in region)
  - Quarz & Calcrete Gravel types (***only if dust impacts occur***)
- Compensation (protect alternative habitat/features)
  - Freshwater habitats – kloofs / wetlands in adjacent region
  - Quartz / Gravel habitats – secure regional representation of succulent communities

# Results of Offset Process

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- Environmental License Issued:
  - conditional on biodiversity offset (areas identified)
  - subject to an offset agreement
  
- Biodiversity offset agreement (mining company and Provincial regulatory authority):
  - Specified land units to be acquired in phased approach
  - Specified costs, vehicles purchased, office set up; fencing
  - IUCN to audit the offset implementation process - 5 years
  - Agreement holds for 10 years post application for closure certificate.

# Limitations / Uncertainties

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## **Uncertainties - Offset Approach:**

- Impact of dust on succulent vegetation (precautionary)
- Impact of pit dewatering on water drawdown and vegetation

## **Challenges – Offset Outcome:**

- Guaranteeing the offset in perpetuity
  - Future mining rights in offset area
  - Legal jurisdiction
  - Duration of responsibility (post closure)
  - Financial provisions for offset
- Phased approach to offset implementation

# Conclusions

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- Integration of EIA and offset process - increased pressure to apply mitigation hierarchy & reduce residual impact

## **Critical success features:**

- Available fine-scale vegetation maps & maps of national conservation priorities
- Specialist knowledge – botanical & offset experts
- Enforceable offset requirement in environmental license, including need for independent auditing

# Acknowledgements

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## Key Contributors:

- Mark Botha & Susie Brownlie (offset planning & review)
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