



water affairs

Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

The uMkhomazi Water Project Phase 1 (uMWP1)

Senior Officials Information Session

Calderwood Estate
18 March 2014

Contents of this presentation

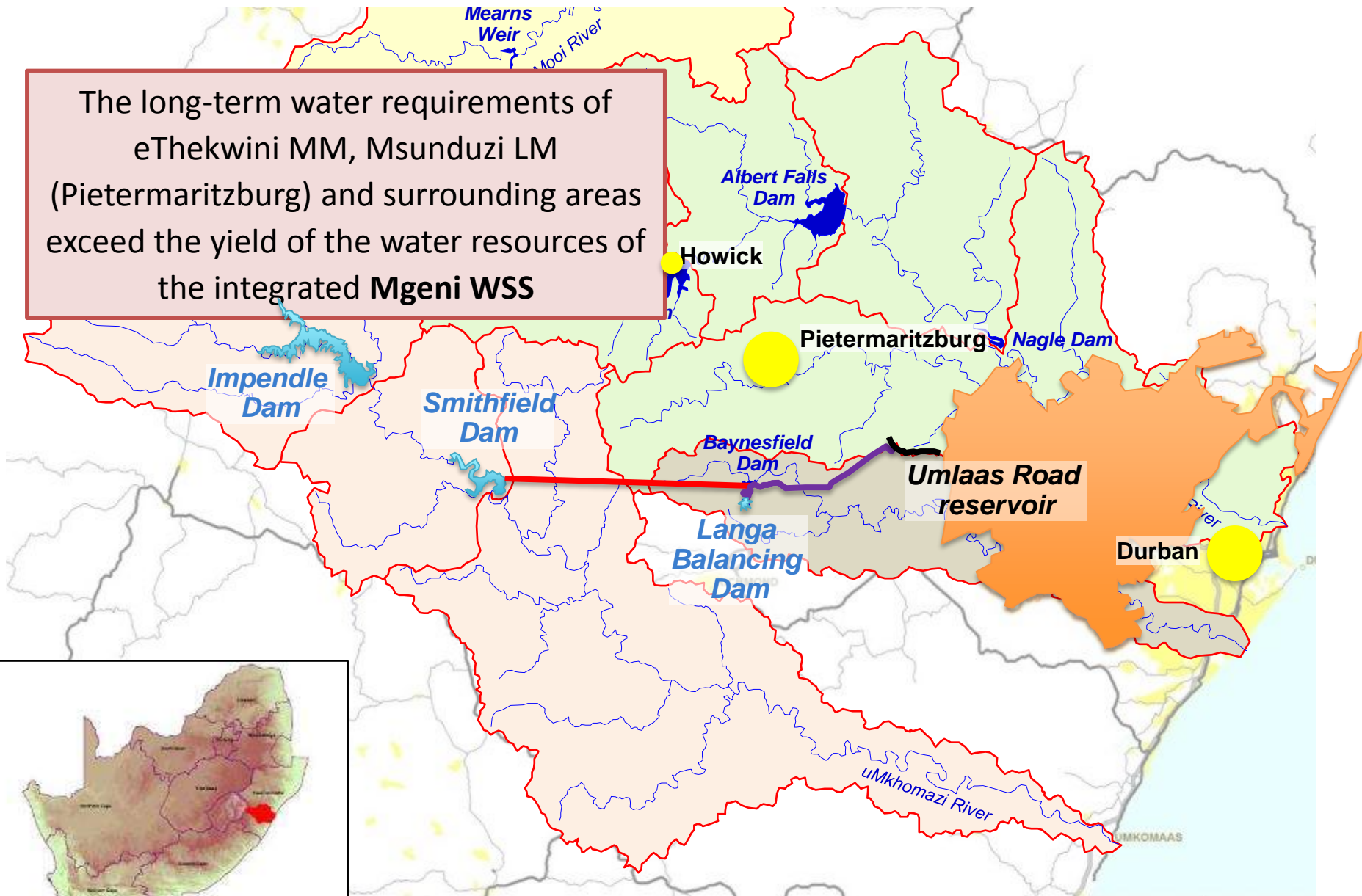
- Project background and motivation
- Project description
 - Scheme
 - Raw water components
 - Potable water components
 - Environmental impact assessment and public participation
- Project information
 - Financial aspects and institutional arrangements
 - Programme



PROJECT BACKGROUND & MOTIVATION

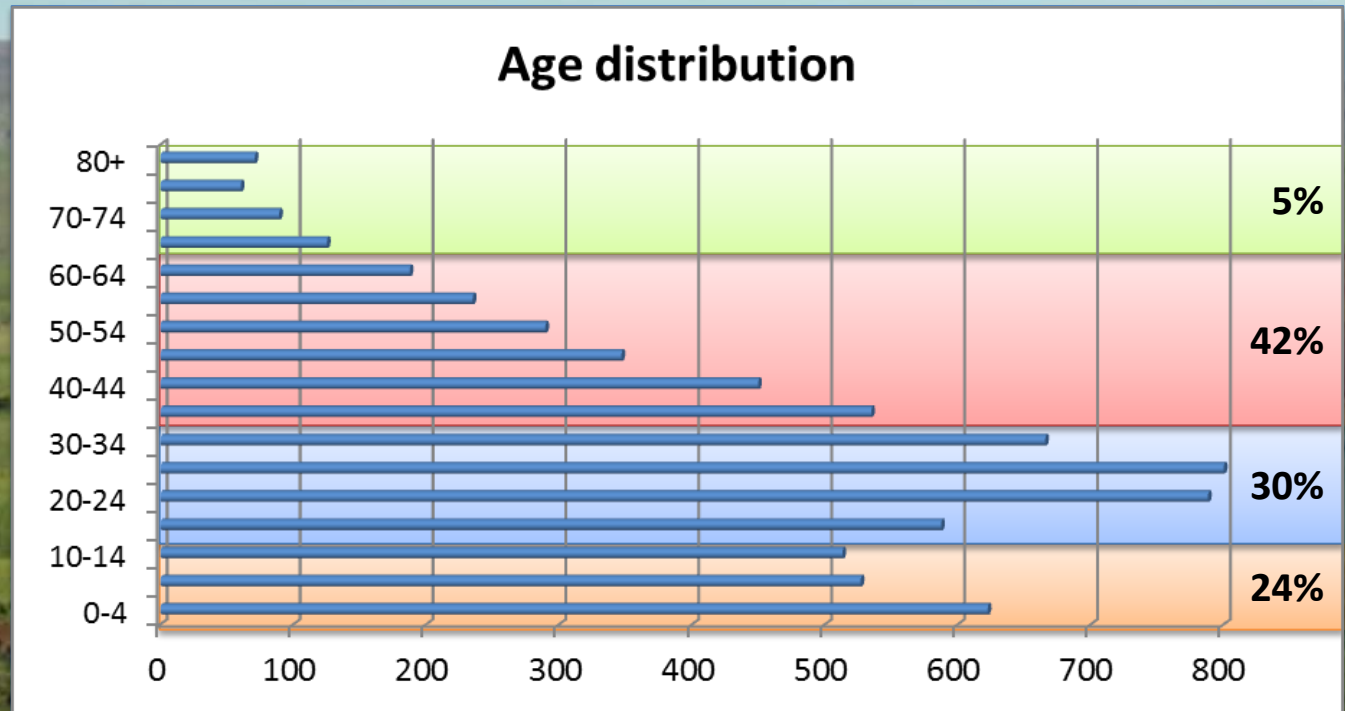
Project background

The long-term water requirements of eThekweni MM, Msunduzi LM (Pietermaritzburg) and surrounding areas exceed the yield of the water resources of the integrated **Mgeni WSS**

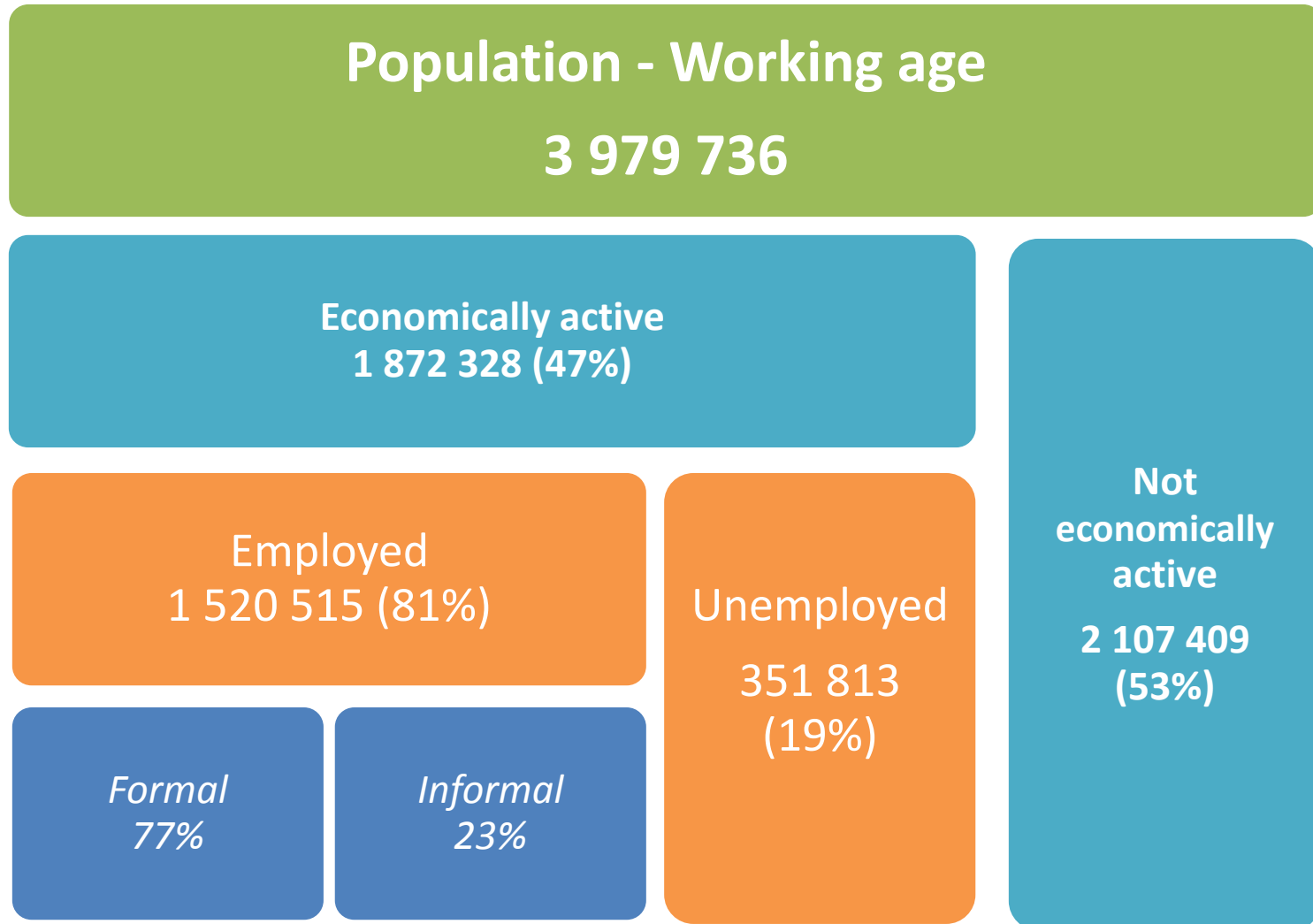


A few facts...

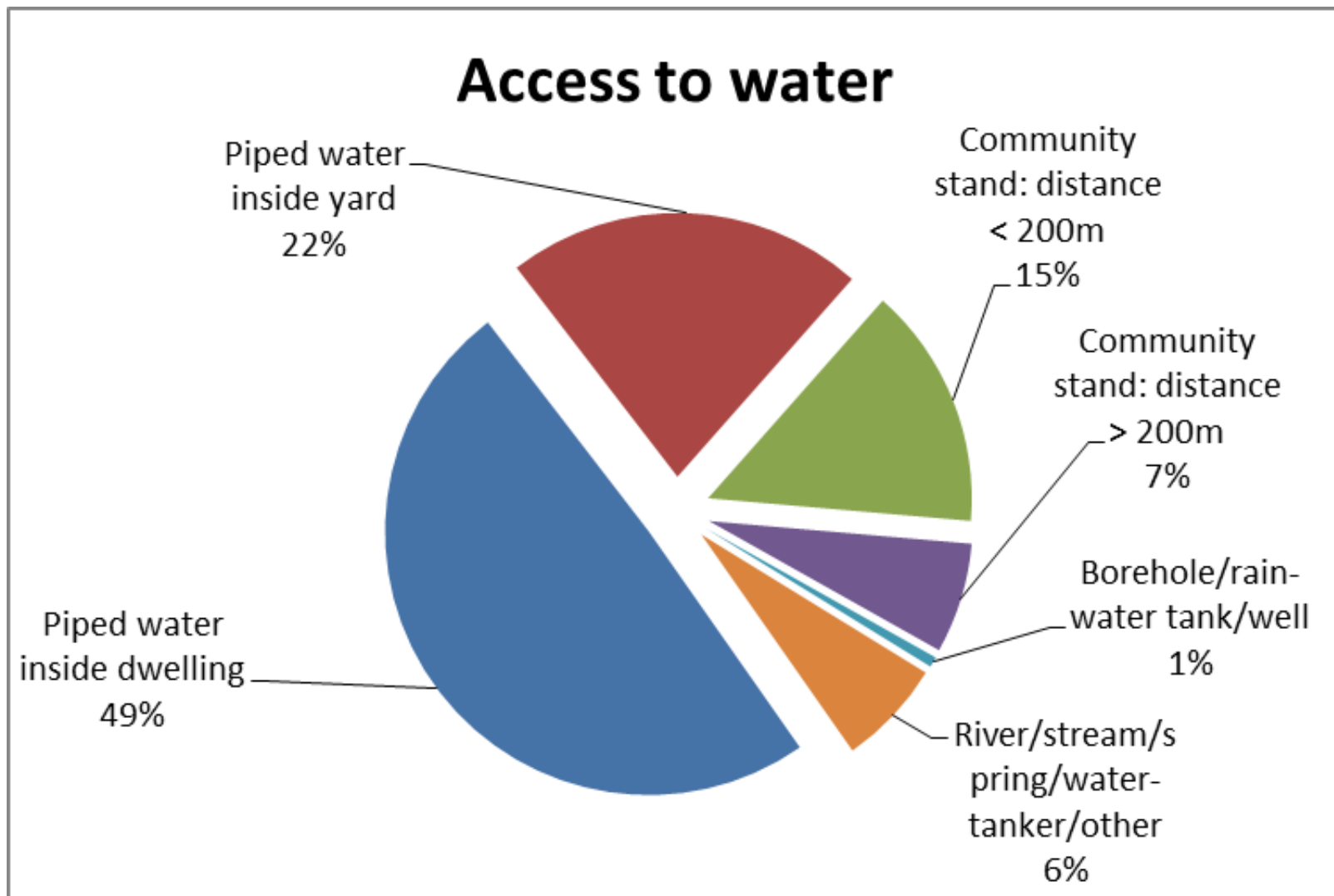
- The uMWP will supply 6 million people
- The uMWP will supply to the increasing supply areas, including the poorest of the poor



Mgeni System socio-economic baseline

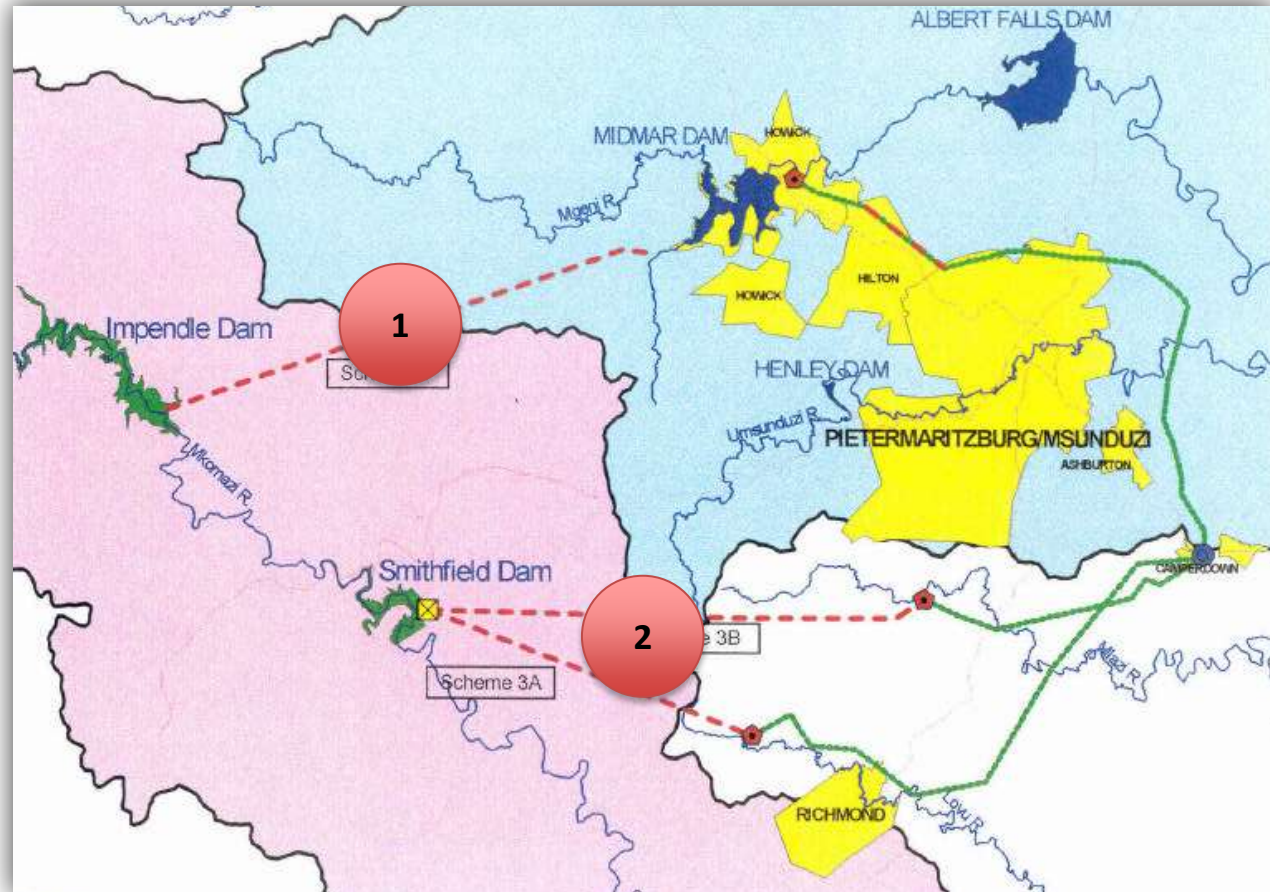


Mgeni System socio-economic baseline

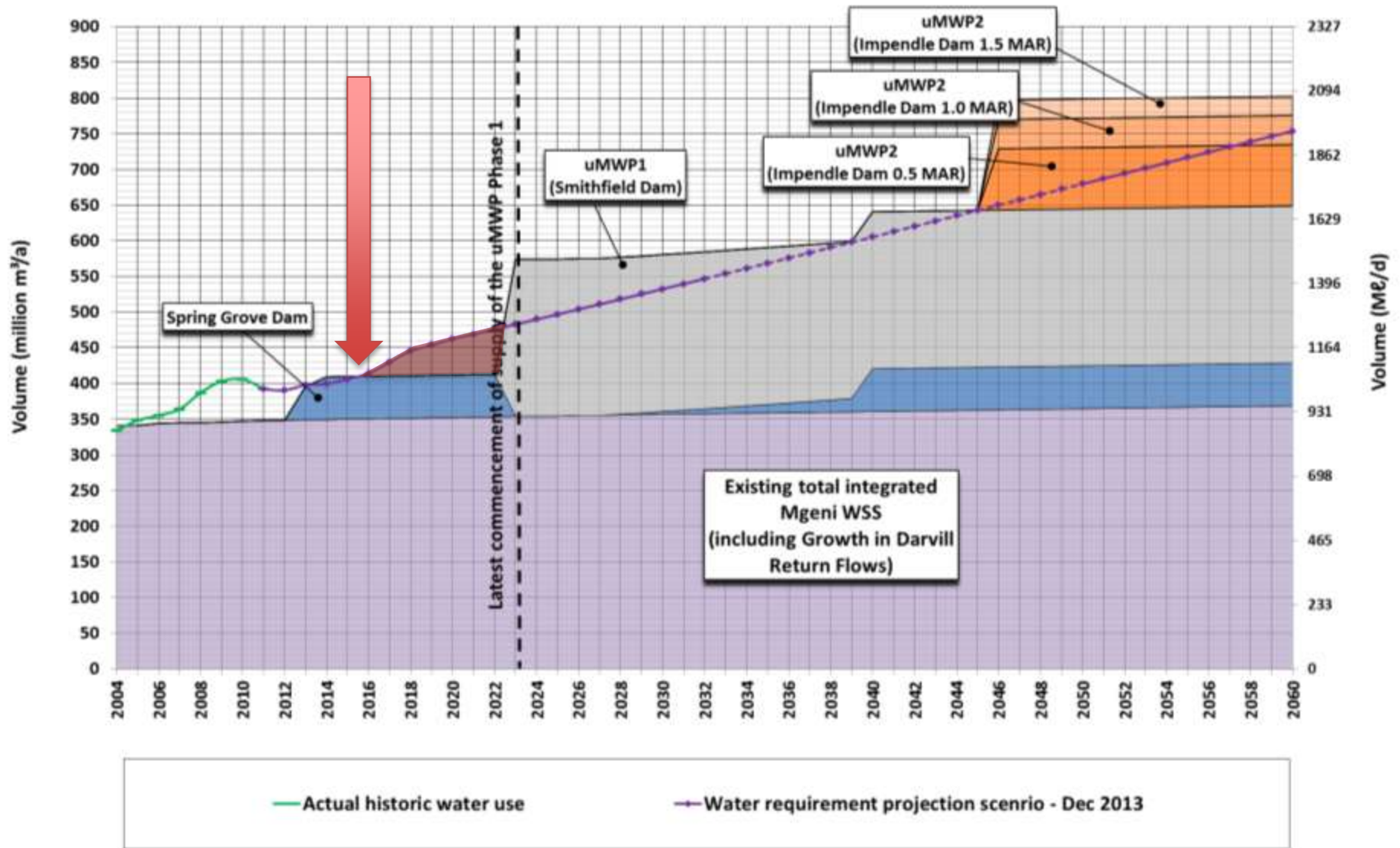


Pre-feasibility options

- 8 alternative schemes were initially identified
- **Impendle** and **Smithfield** scheme configurations most suitable for further investigation
- The pre-feasibility investigation (1998) recommended the Smithfield Scheme (incl. Impendle) for **detailed feasibility-level investigation**
- The Smithfield Scheme (incl. Impendle) would be **independent** of the existing Mgeni System, thus reducing the risk of limited or non-supply



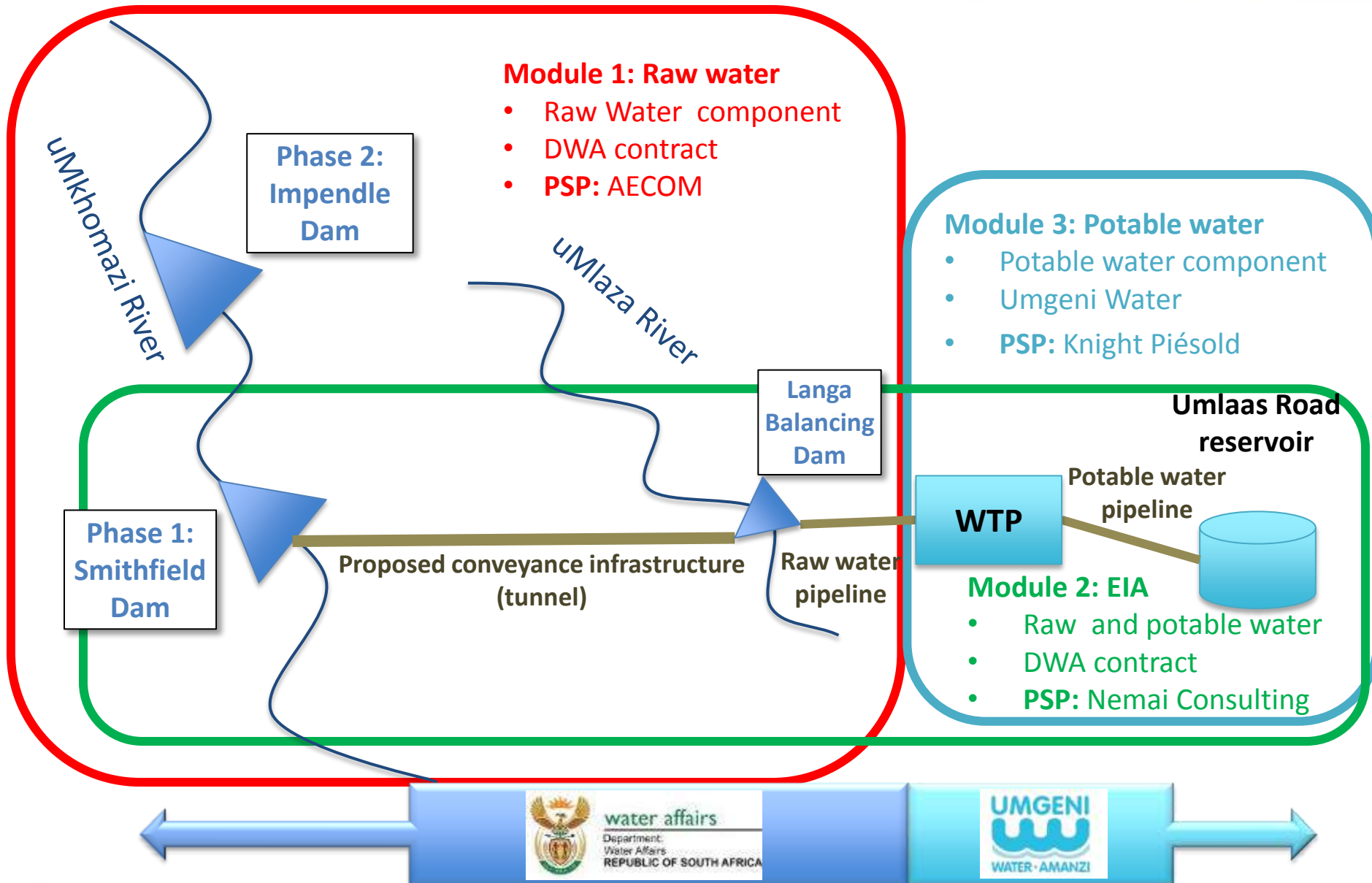
Integrated Mgeni WSS water balance





STUDY COMPOSITION

Project components & study modules





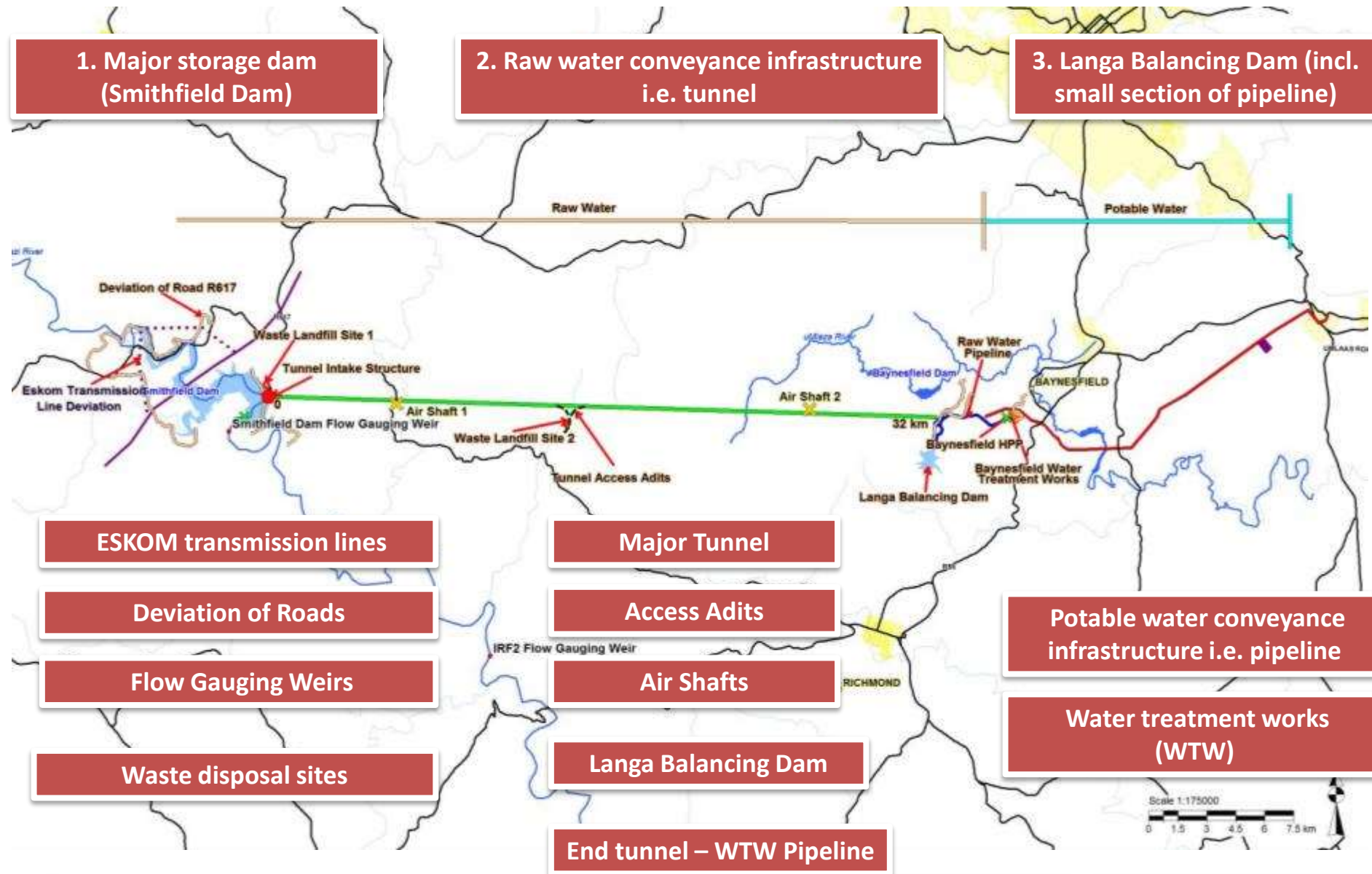
PROJECT LAYOUT DESCRIPTION

Overall layout of the scheme

1. Major storage dam
(Smithfield Dam)

2. Raw water conveyance infrastructure
i.e. tunnel

3. Langa Balancing Dam (incl.
small section of pipeline)



ESKOM transmission lines

Major Tunnel

Deviation of Roads

Access Adits

Flow Gauging Weirs

Air Shafts

Waste disposal sites

Langa Balancing Dam

Potable water conveyance
infrastructure i.e. pipeline

Water treatment works
(WTW)

End tunnel – WTW Pipeline



SMITHFIELD DAM

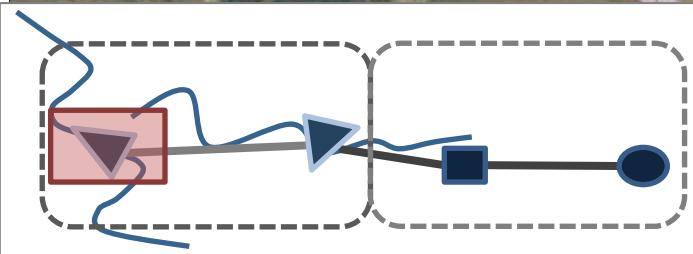
Quarry and earthfill borrow areas

Proposed Smithfield Dam

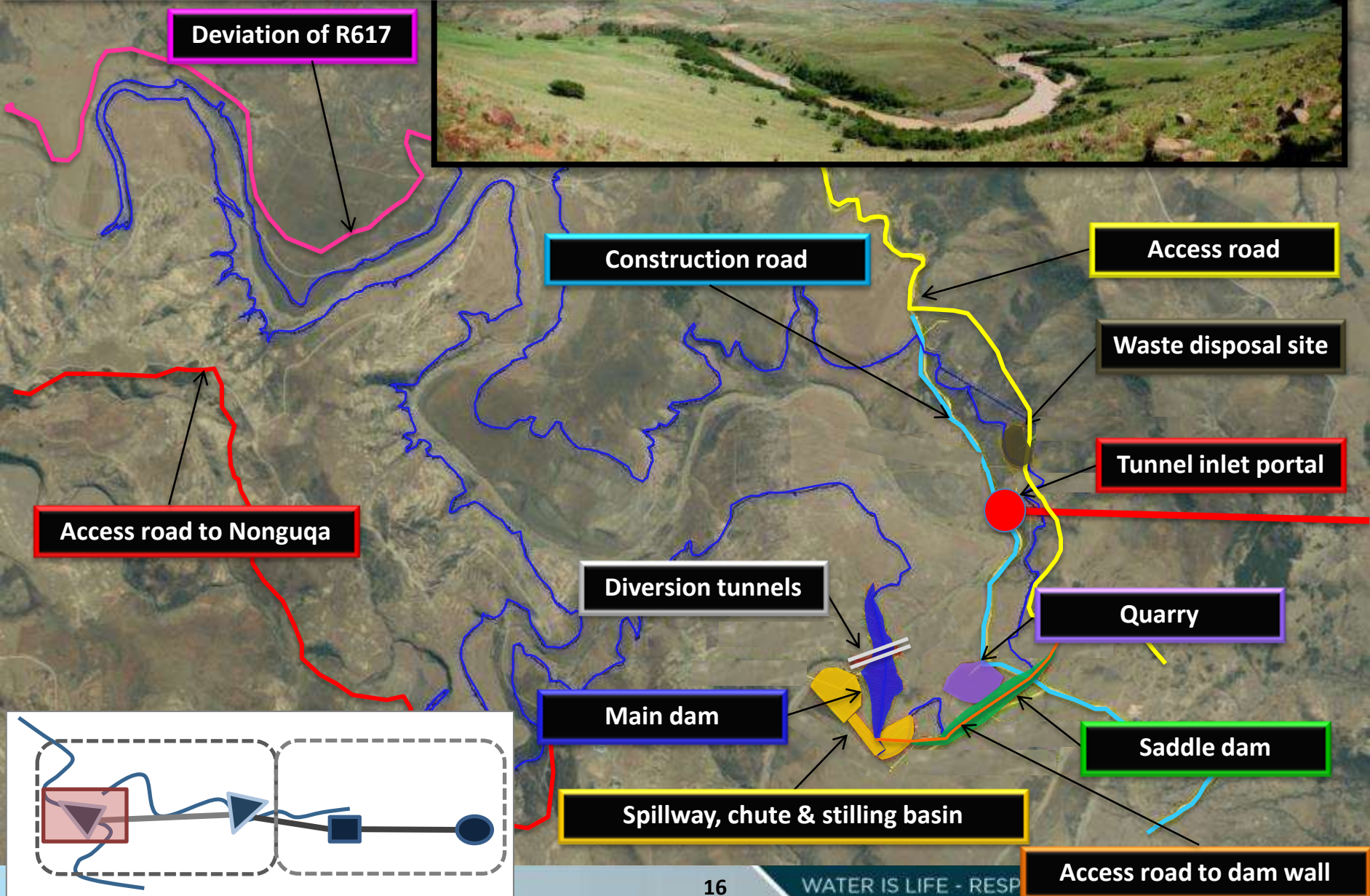
Dolerite quarry area

Earthfill Borrow Areas

Rockfill Quarry area



Proposed Smithfield Dam



Deviation of R617

Construction road

Access road

Waste disposal site

Tunnel inlet portal

Access road to Nonguqa

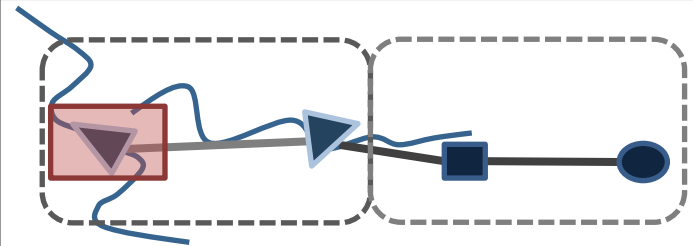
Diversion tunnels

Quarry

Main dam

Saddle dam

Spillway, chute & stilling basin

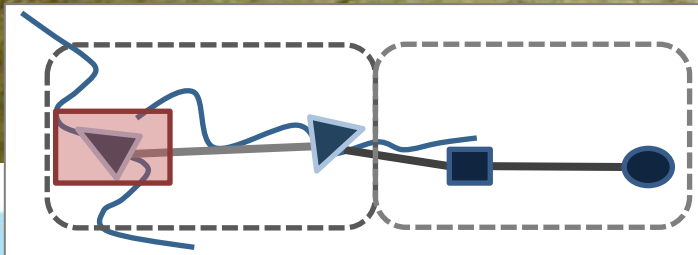


Access road to dam wall

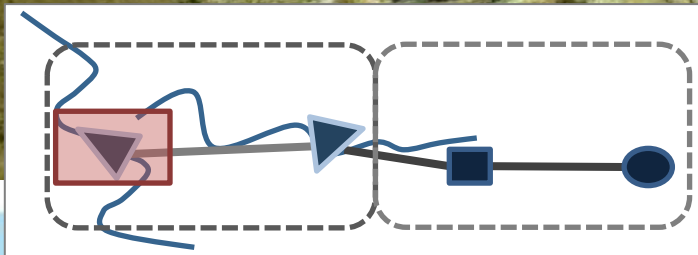
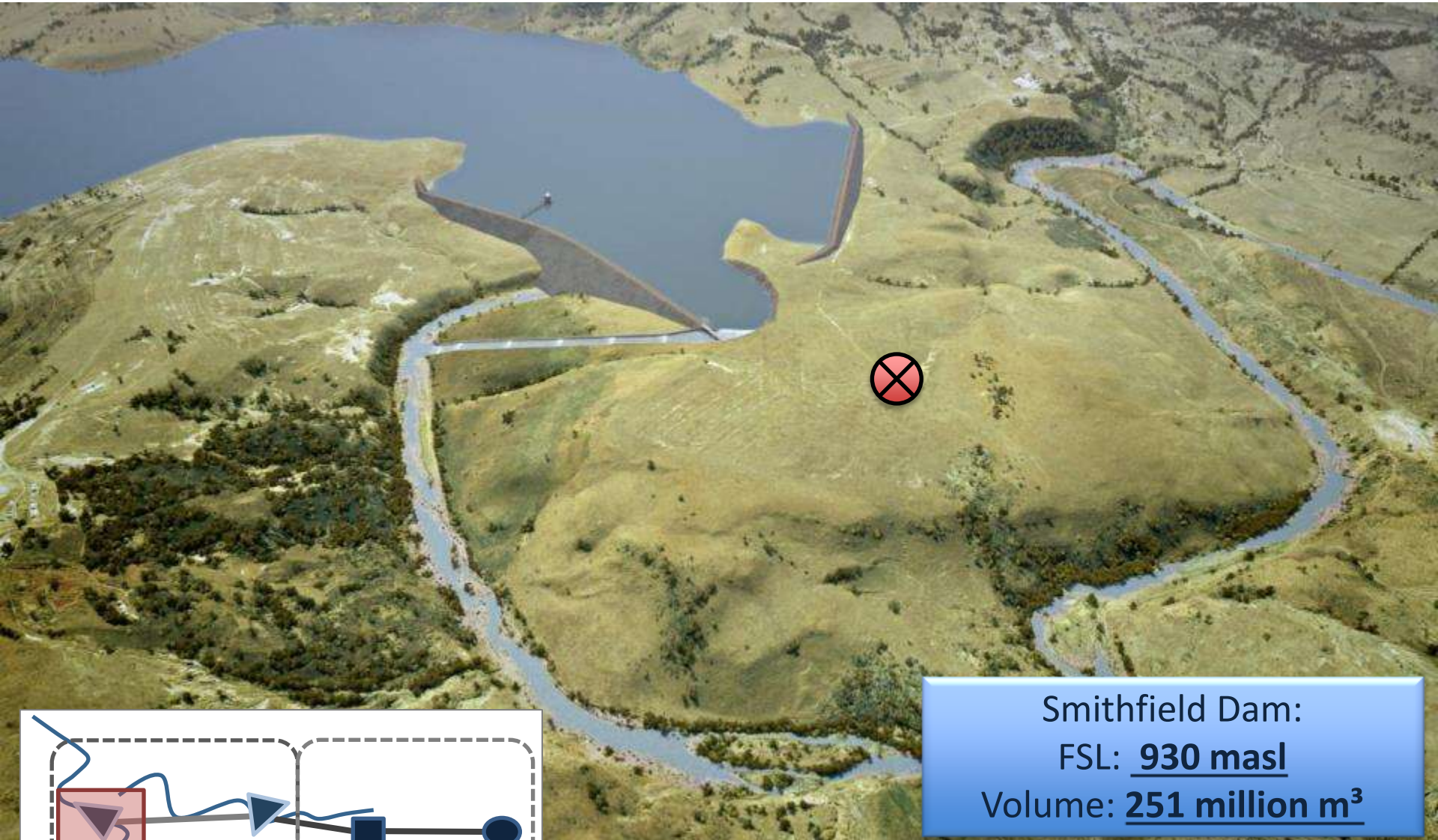
Characteristics of Smithfield Dam

Parameter	Main dam	Saddle dam
Type of dam	Zoned earth core rockfill dam	Zoned earthfill embankment dam
DWA classification	Category III	
Storage volume as a percentage of Mean Annual Runoff - MAR (%)	31	
Full supply level – FSL (masl)	930	
Minimum operating level – MOL (masl)	887.2	
Gross storage capacity at FSL (million m ³)	251	
Live storage capacity at FSL (million m ³)	226	
Surface area at FSL (km ²)	9.53	
Catchment area (km ²)	2 058	
Crest level (masl)	935	
Maximum wall height (m)	81	26
Crest length of wall (m)	1 200	1 090
Spillway type	Main side channel	Fuse plug
Spillway shape	Ogee	Broad-crested
Spillway length (m)	150	100
1:100 year yield (million m ³ /a) (2012 in-catchment development levels)	220	

Smithfield Dam: Draft artist impression (1)

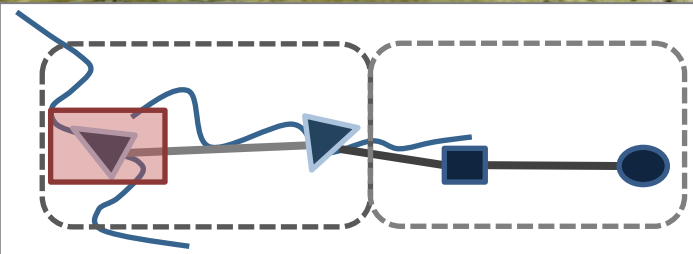


Smithfield Dam: Draft artist impression (2)



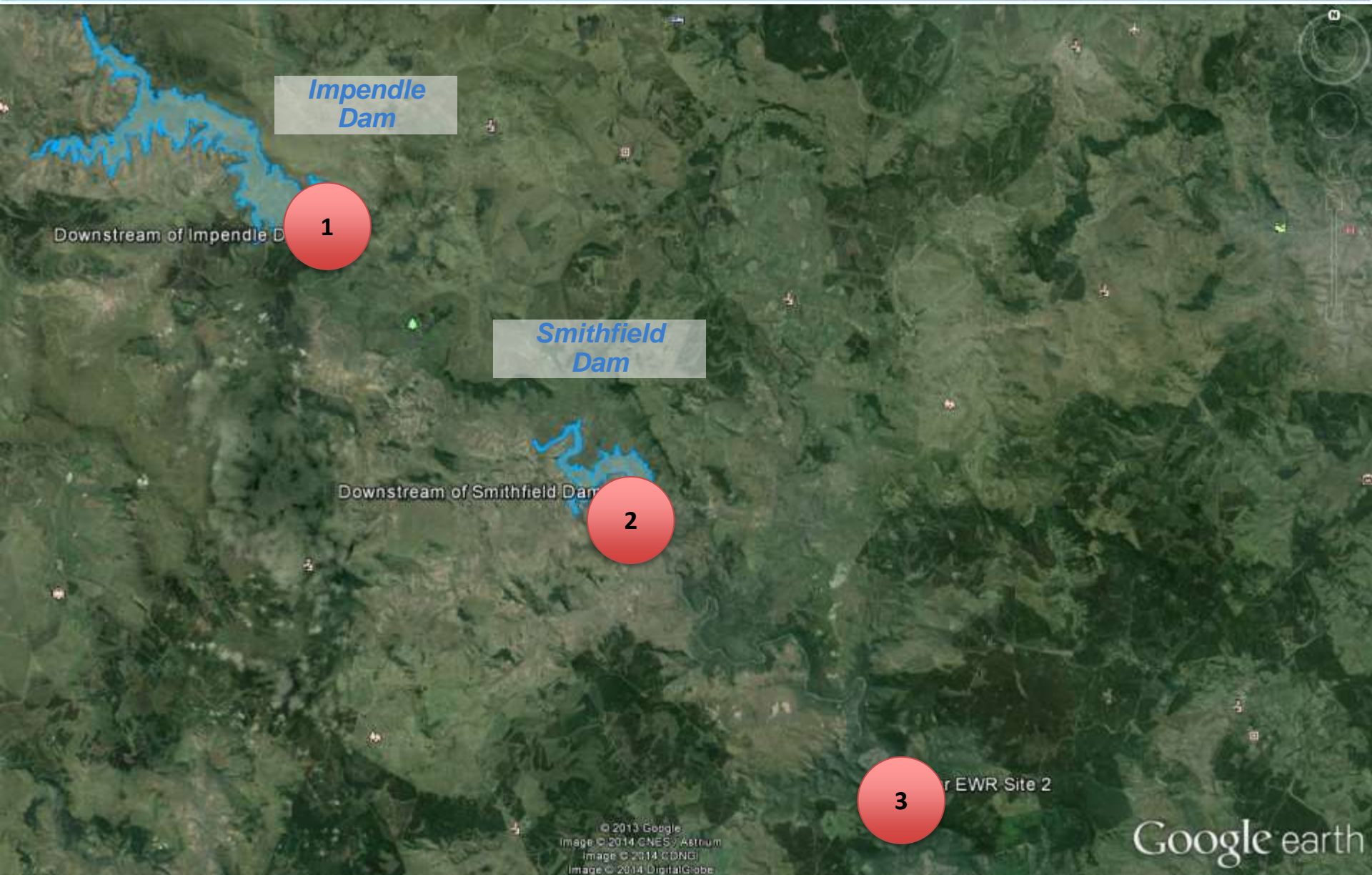
Smithfield Dam:
FSL: 930 masl
Volume: 251 million m³

Smithfield Dam: Draft artist impression (3)

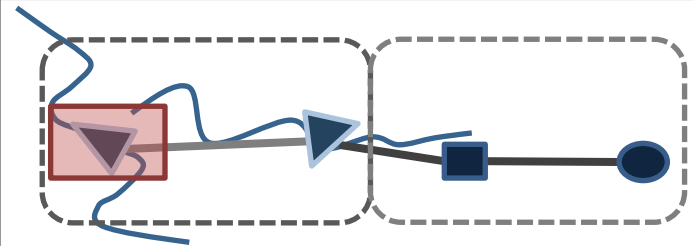
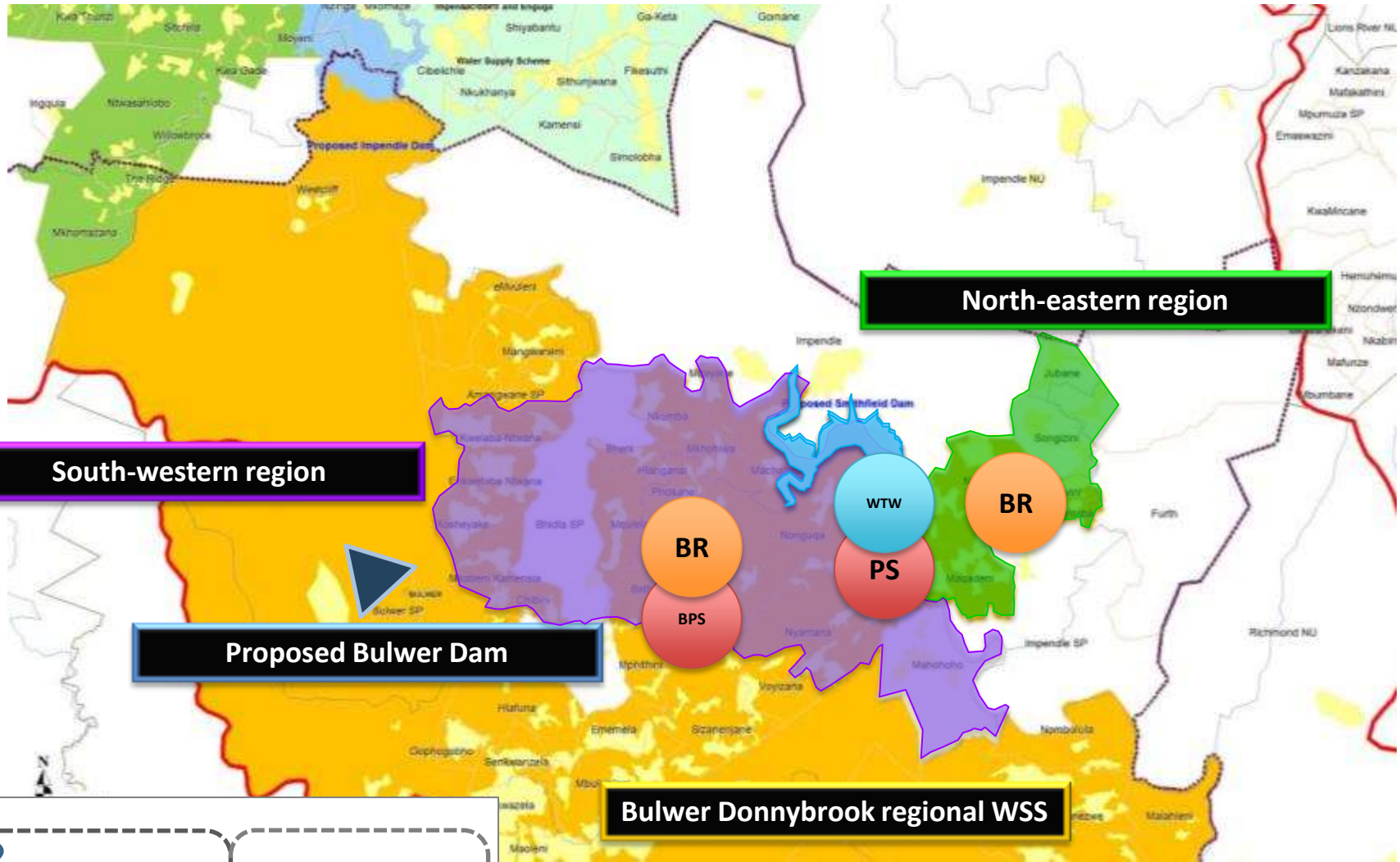


In comparison:
Midmar Dam
Volume: **235.5 million m³**

Proposed flow gauging weirs

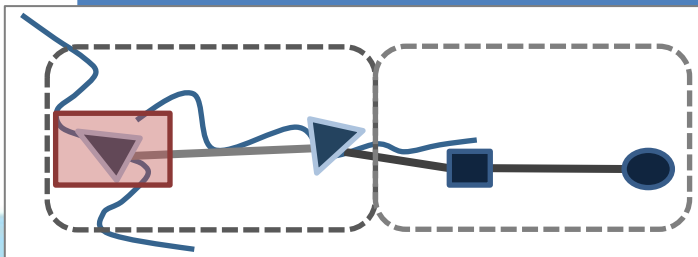


Bulwer Donnybrook regional WSS



Smithfield Dam local WSS

Communities surrounding Smithfield Dam that currently have access to some form of piped water	73%
Current combined water requirement of communities surrounding Smithfield Dam	± 1 Mm ³ /a
Total capital cost (incl. engineering fees & environmental and social costs)	R 113.70 million
Operational (electricity) cost (2063)	R 4.43 million/annum
Maintenance cost (2063)	R 1.91 million/annum
Unit Reference Value (URV)	R21/m ³





RAW WATER CONVEYANCE INFRASTRUCTURE (TUNNEL)

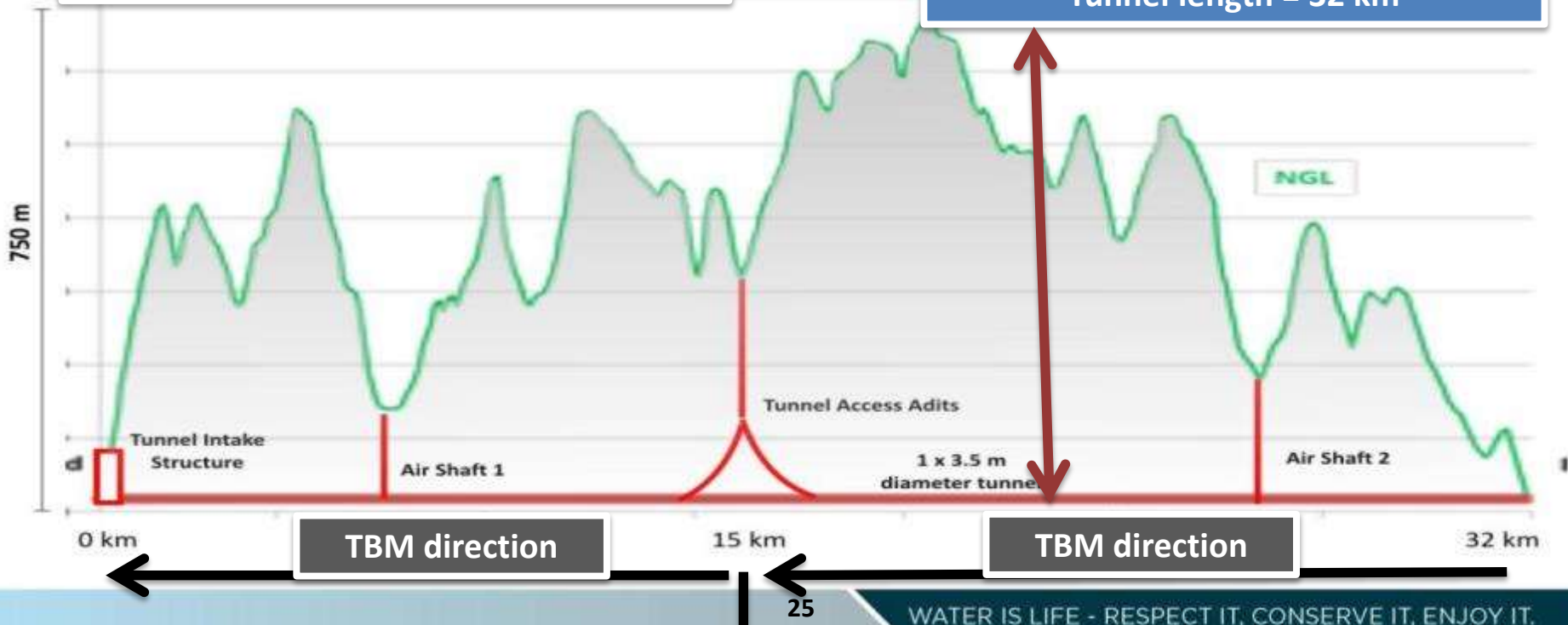
Characteristics of the tunnel

Type: Pressure tunnel
Maximum transfer capacity: 8.65 m³/s

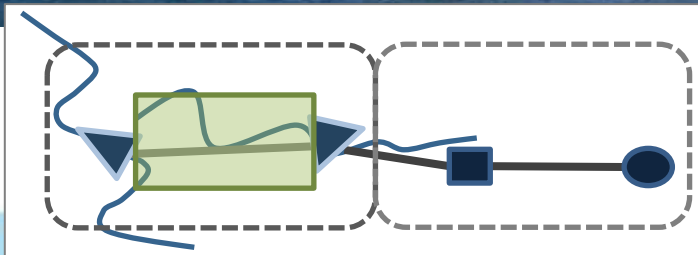


Tunnel cover depth (@ deepest) = 636 m

Tunnel length = 32 km

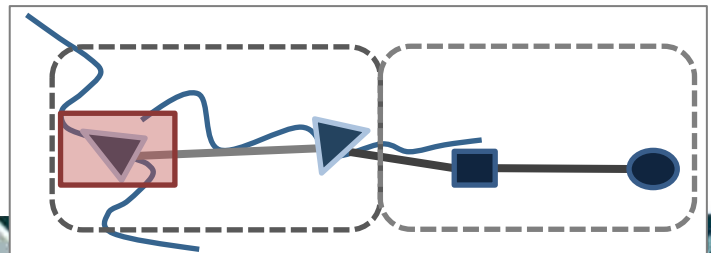
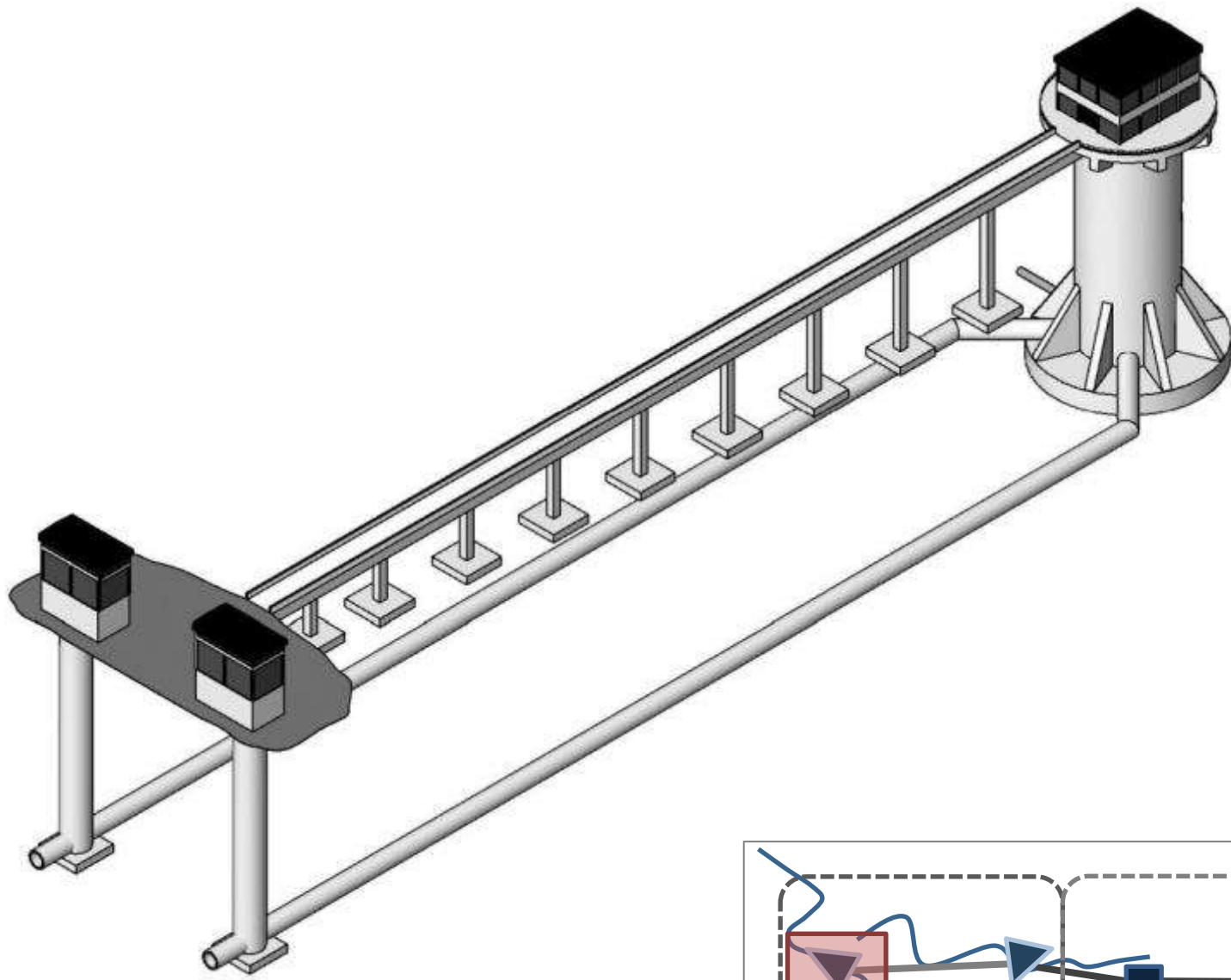


Tunnel boring machine (TBM)

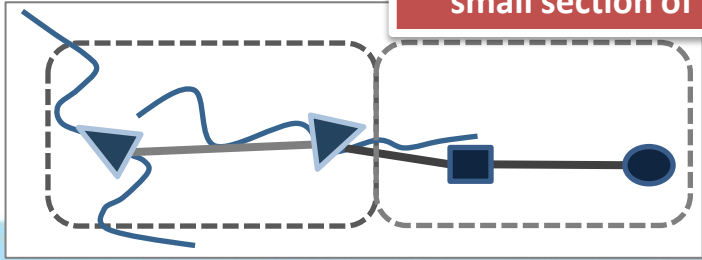
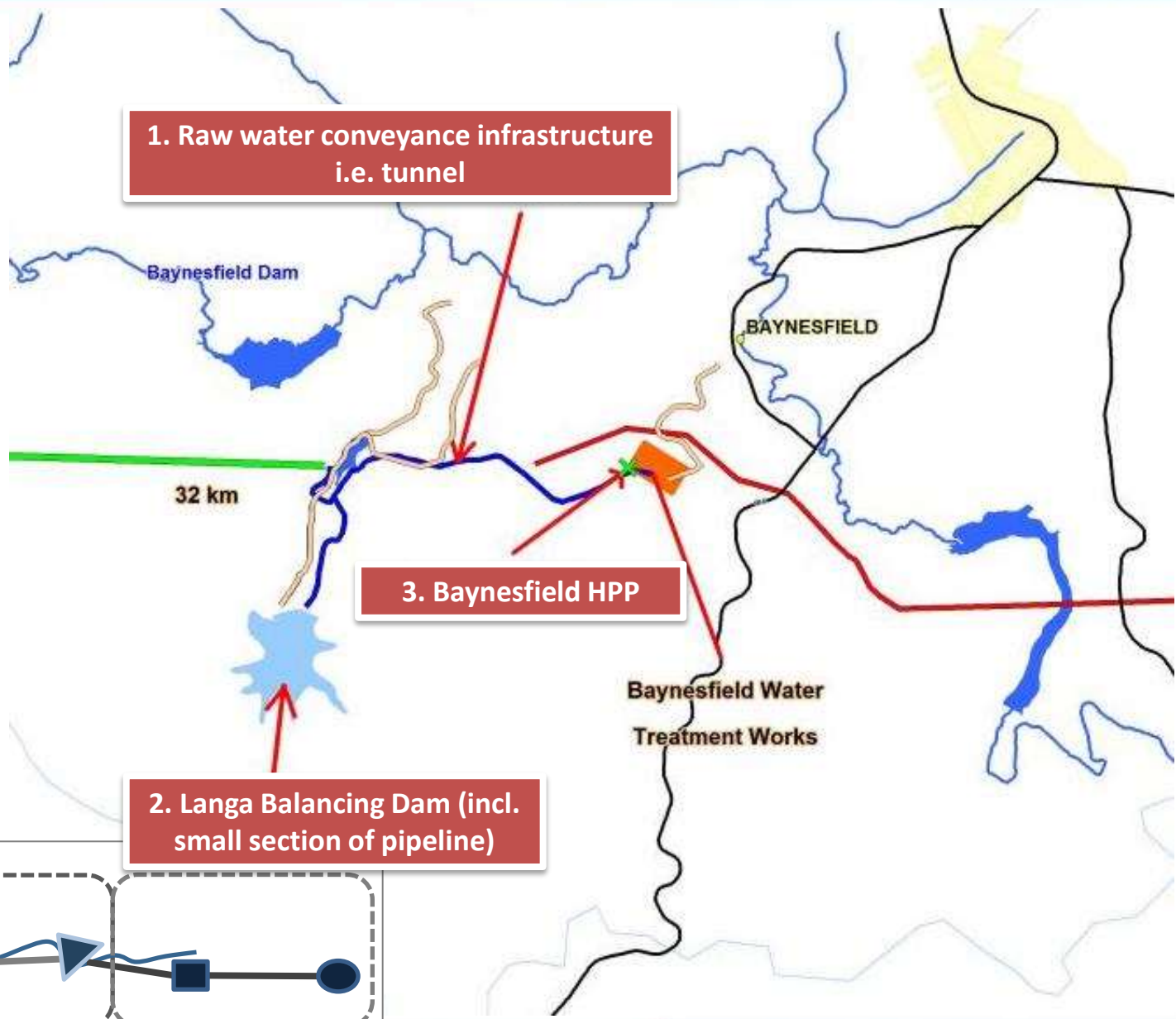




Tunnel intake structure



Raw water conveyance infrastructure to WTP





LANGA BALANCING DAM

CFRD example



Proposed Langa Balancing Dam



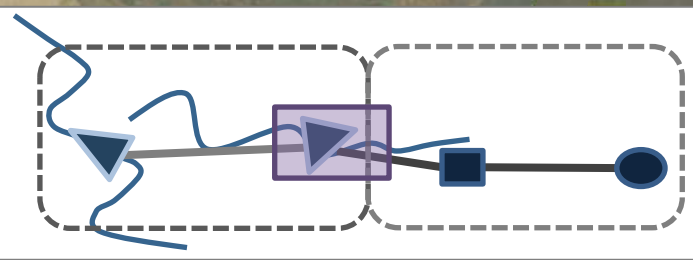
Dam wall

Waste disposal site alternative / berm at toe of dam

Spillway & chute

Quarry / borrow area

Construction camp



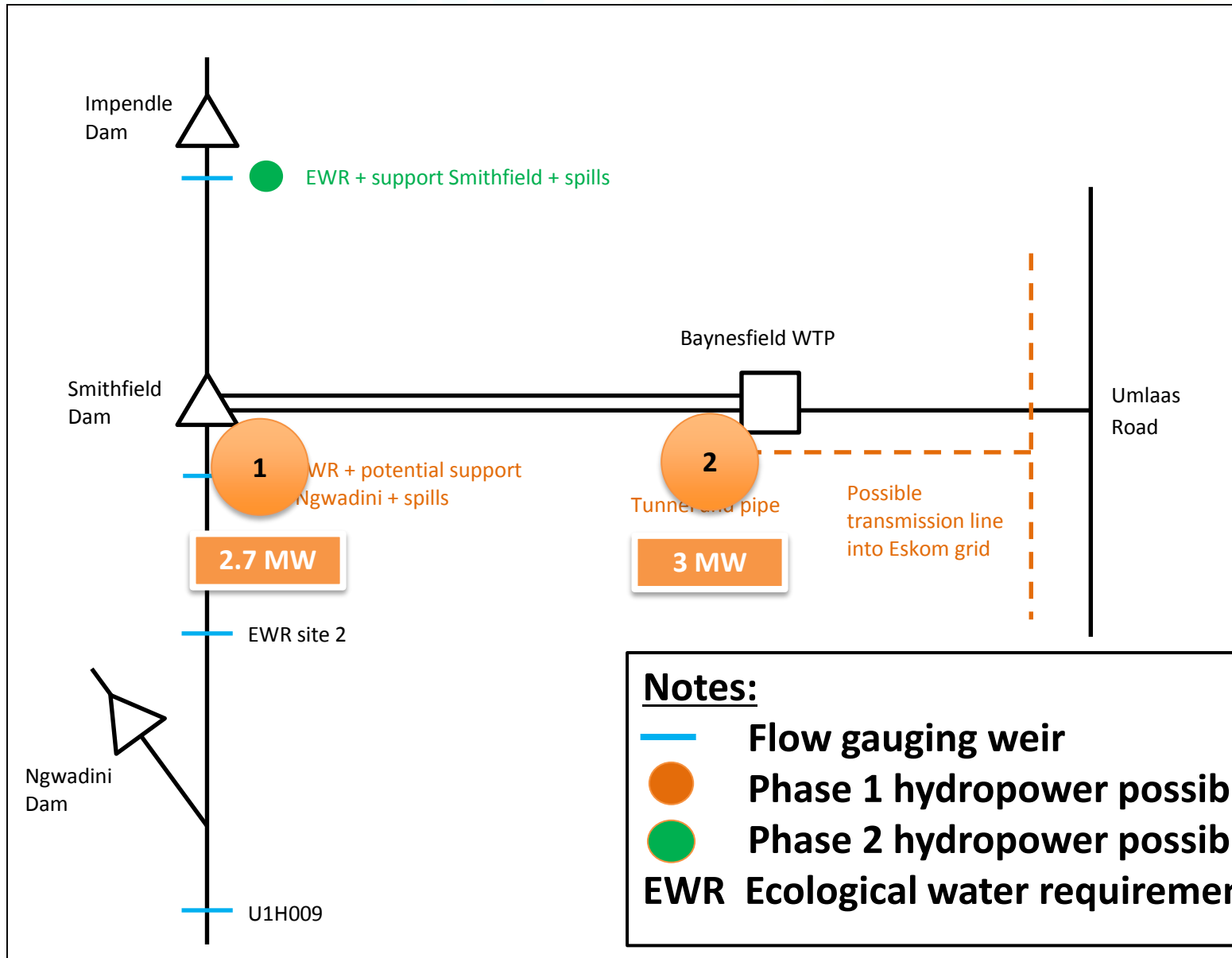
Characteristics of Langa Balancing Dam

Parameter	
Type of dam	Concrete faced rockfill dam (CFRD)
DWA classification	Category III
Full supply level – FSL (masl)	919.4
Minimum operating level – MOL (masl)	890
Gross storage capacity at FSL (million m ³)	± 15
Live storage capacity at FSL (million m ³)	12.5
Surface area at FSL (km ²)	0.95
Catchment area (km ²)	5.4
Crest level (masl)	930
Maximum wall height (m)	± 50



HYDROPOWER POTENTIAL

Proposed hydropower

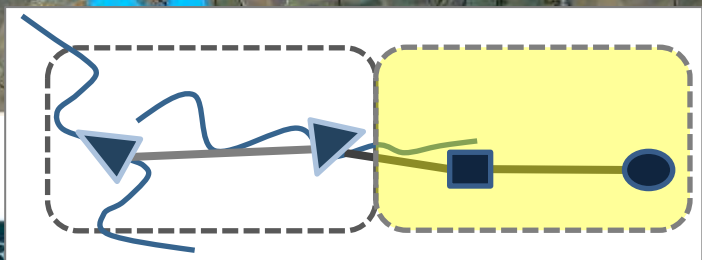
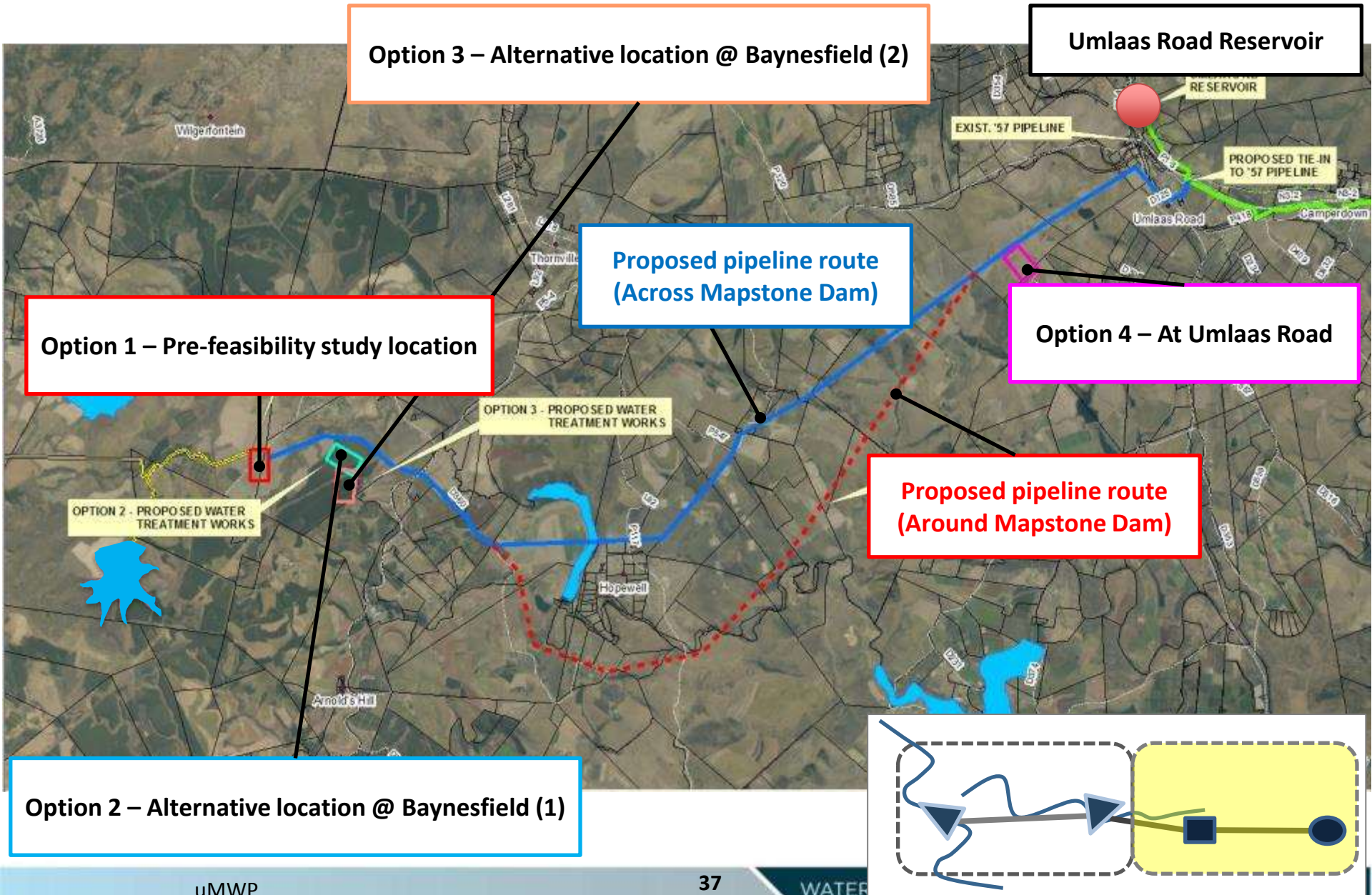




POTABLE WATER COMPONENTS

1. Water Treatment Works
2. Potable Water Storage
3. Potable Water Pipeline

Potable water conveyance infrastructure and WTW

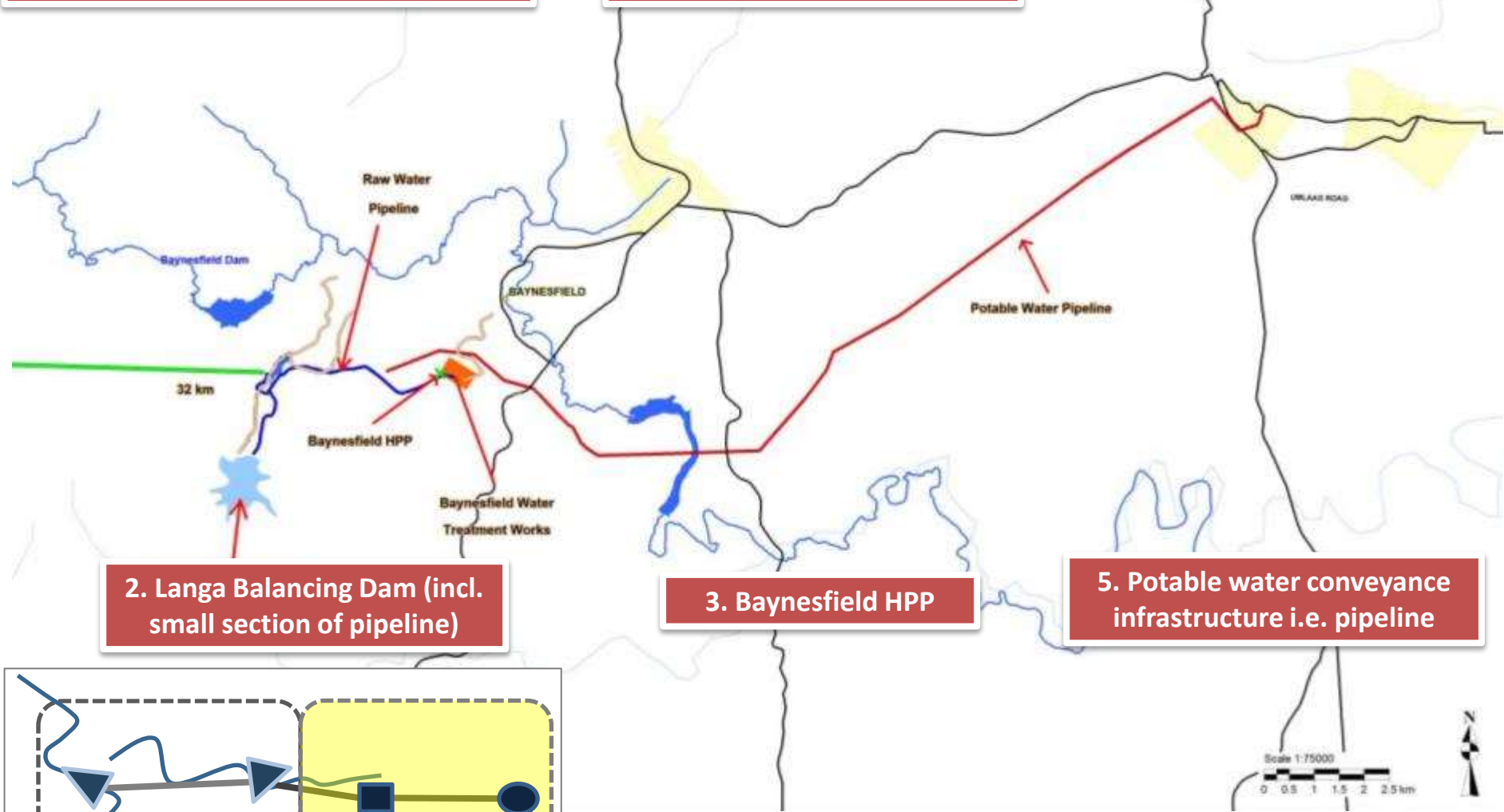


Potable water conveyance infrastructure & WTW

1. Raw water conveyance infrastructure i.e. tunnel

4. Water treatment works (WTW)

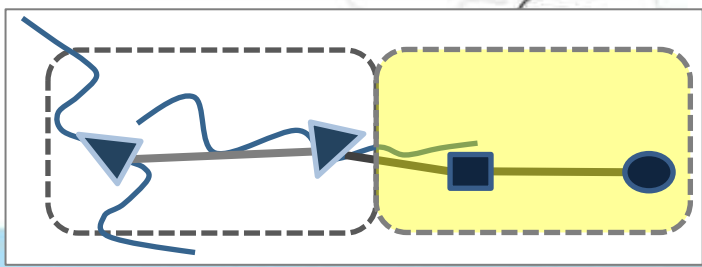
6. Roads



2. Langa Balancing Dam (incl. small section of pipeline)

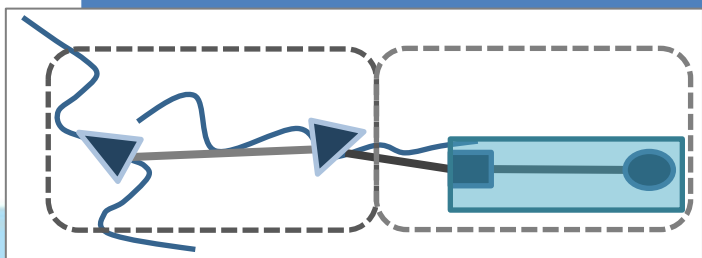
3. Baynesfield HPP

5. Potable water conveyance infrastructure i.e. pipeline



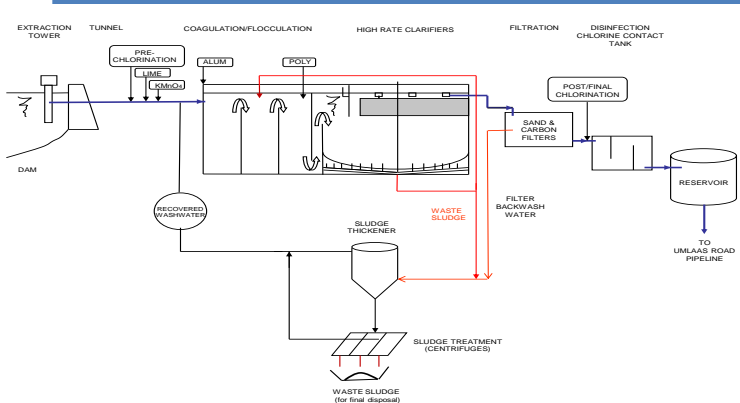
Characteristics of the potable water pipeline

Aspect	Description
Material:	Carbon steel
Diameter:	2.5 metres
Capacity:	500 MI/day
No. of pipelines:	Two in parallel (ULTIMATE)
Length:	21.3 km (or 24.5 km on alternate route)
Type:	Gravity

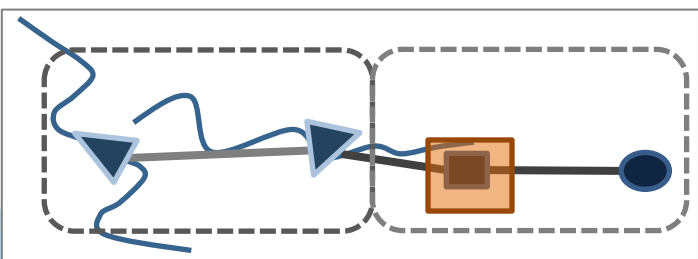
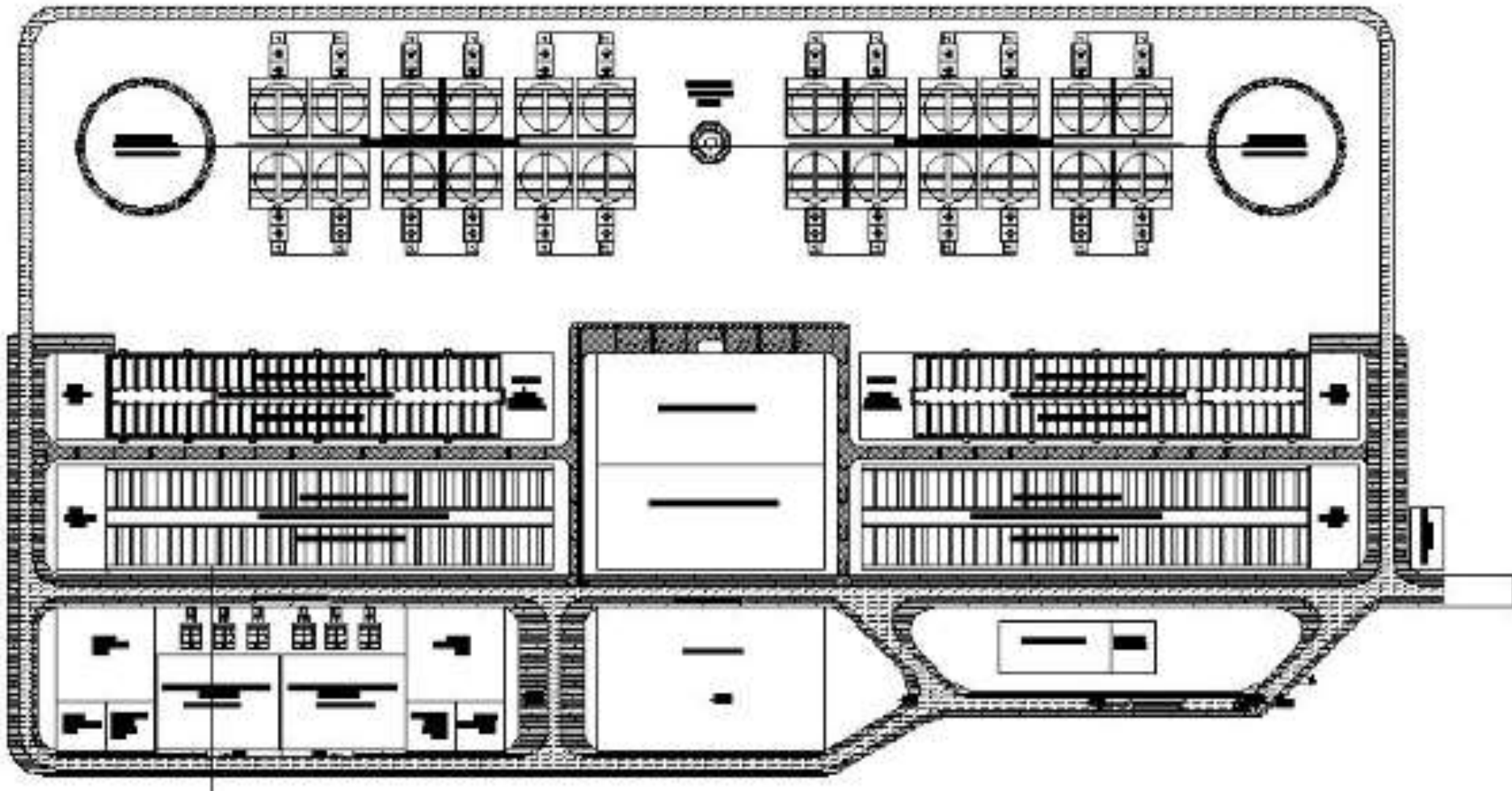


Characteristics of the water treatment works

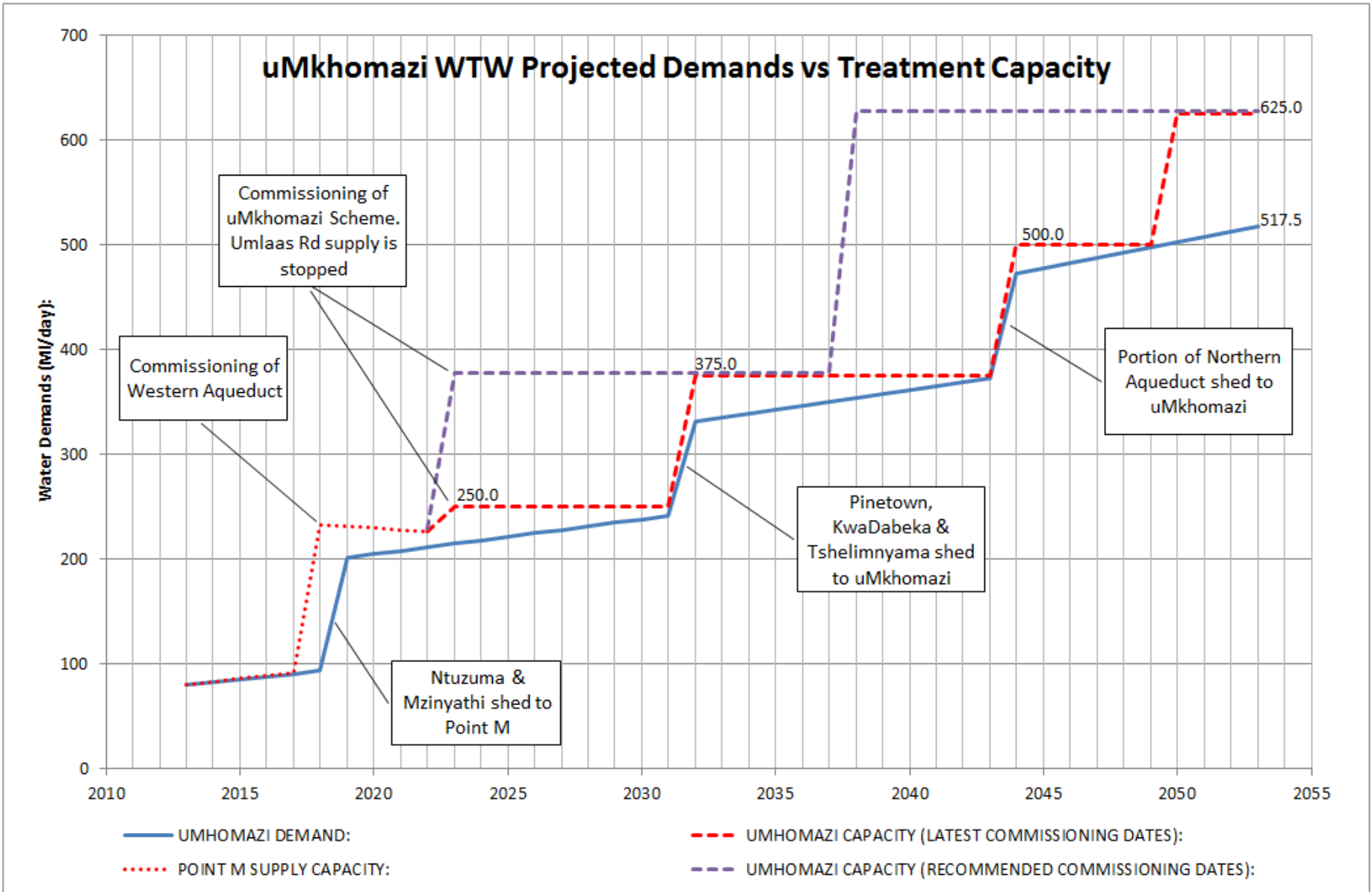
Aspect	Description
Capacity (overall):	1 250 Mℓ/d in ten trains of 125 Mℓ/d Initially 375 Mℓ/d
Area (footprint):	600 m by 350 m
Unit processes employed:	<ul style="list-style-type: none"> • Flash mixing and coagulation; • Flocculation; • Sedimentation; • Filtration; • Disinfection; • Sludge dewatering and thickening.
Chemicals employed:	<ul style="list-style-type: none"> • Potassium permanganate for oxidation of iron and manganese; • Lime for stabilization; • Alum and poly as coagulant/flocculant; • Bentonite as ballasting agent; • Chlorine for disinfection – pre and post chlorination required.



Water treatment works - Layout



Water treatment works - Layout



ENVIRONMENTAL IMPACT ASSESSMENT & PUBLIC PARTICIPATION



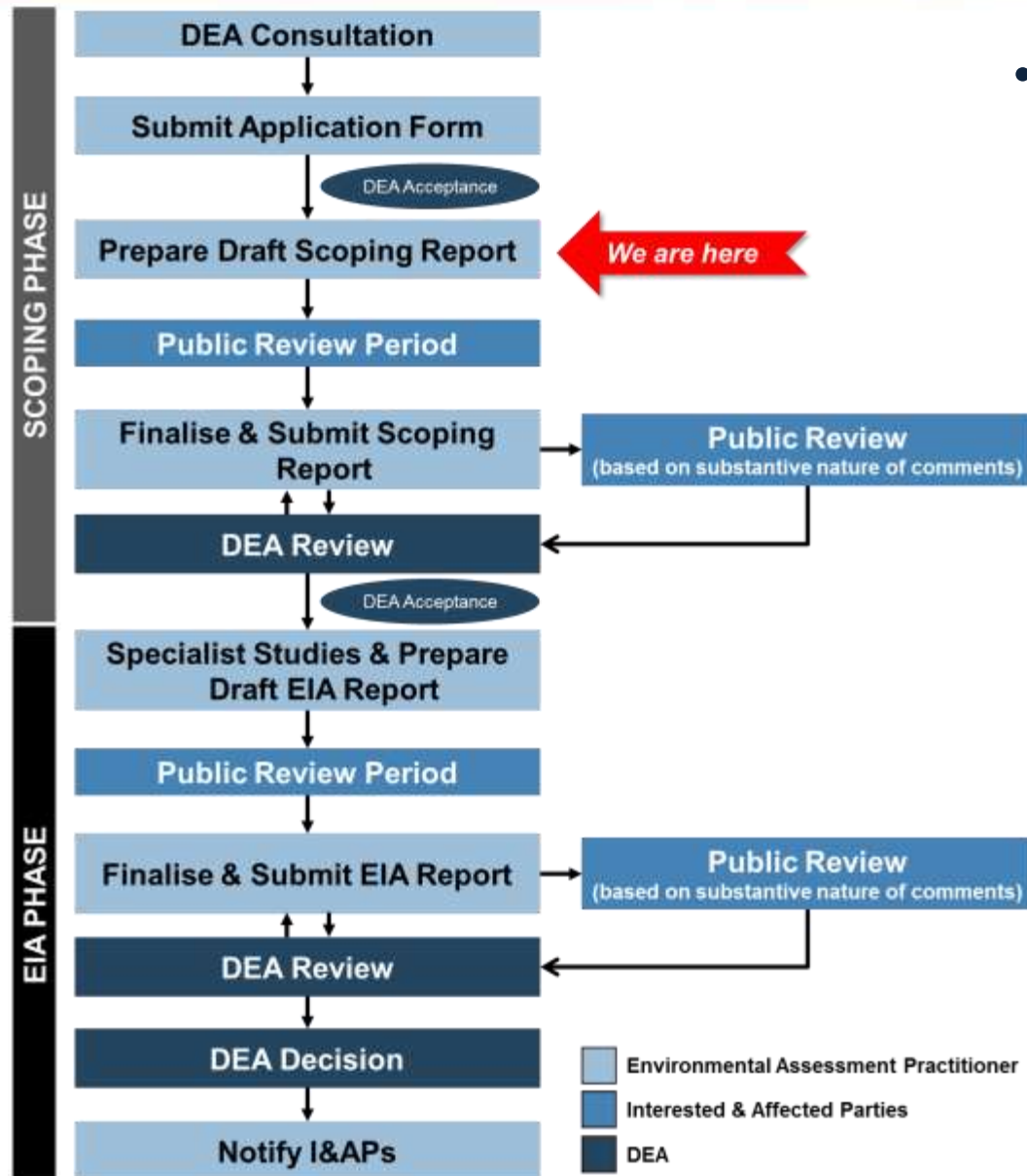
Raw Water



Potable Water



Scoping and EIA Phase



• Environmental Authorisations:

- ✓ NEMA – EIA
- ✓ NWA – WUL from DWA
- ✓ MPRDA – Borrow pit permits from DMR
- ✓ NHRA – Permits from Amafa
- ✓ NEM:WA – Waste Management Licence



PROJECT INFORMATION

- **Project financials**

- From current planning: the uMkhomazi Water Scheme Phase 1 will cost about **R12 billion** (2013)
- May add about **R2.3/kl** to the Umgeni Water charge

- **Preliminary institutional arrangements**

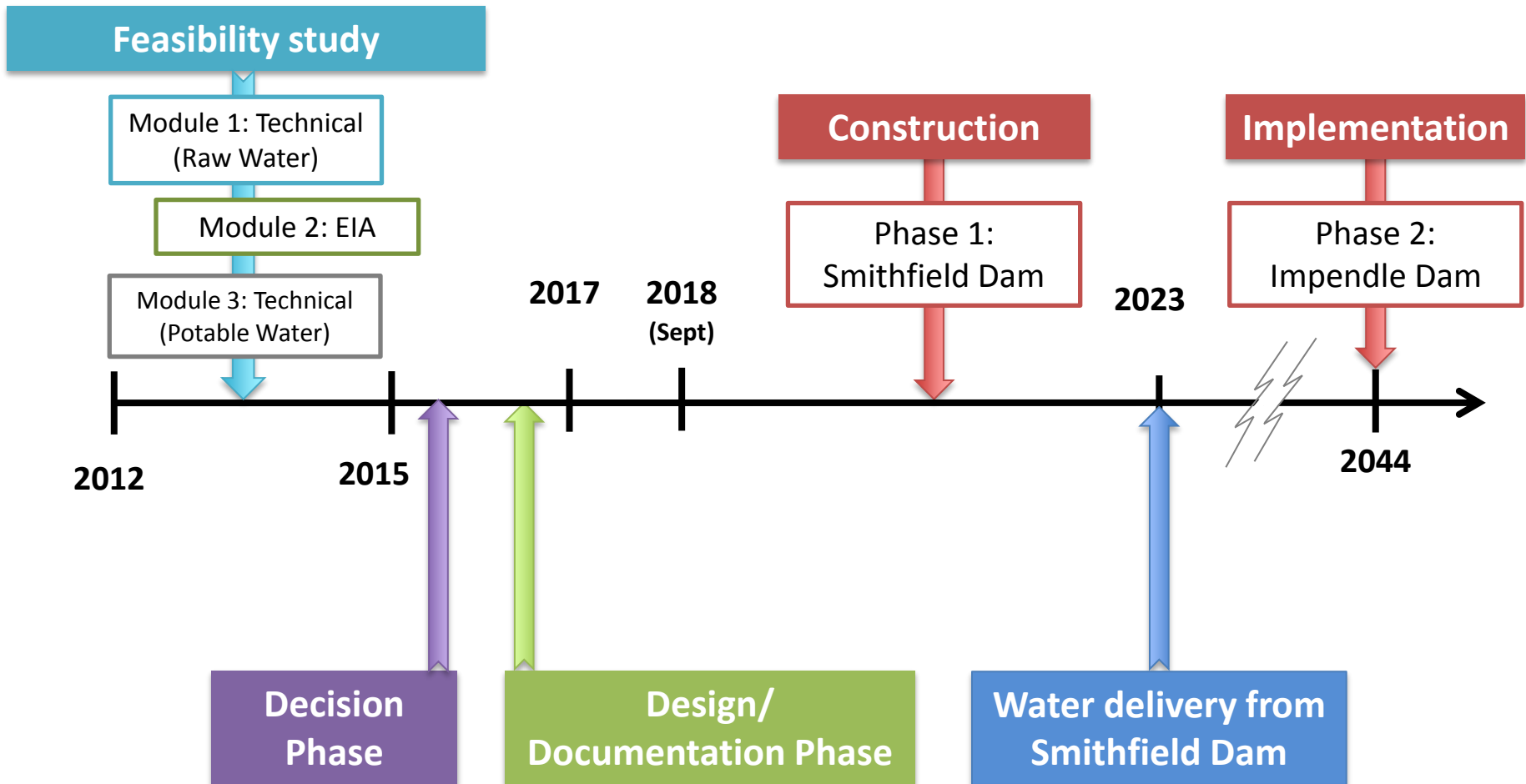
- Owner: DWA / Umgeni
- Operator: Umgeni Water
- Implementing agent: TCTA and/or Umgeni Water

Project financials

Component	Capital cost (excl. VAT) R (million)
<u>Raw water conveyance structure</u>	
1. Smithfield Dam	1 904
2. uMkhomazi - uMlaza tunnel + adits + ventilation shafts	3 655
3. Tunnel end - Langa Dam - Baynesfield WTW pipeline	198
4. Langa Balancing dam	531
5. Transmission lines	130
6. Smithfield Dam and Baynesfield hydropower plants	68
7. Waste disposal sites	35
8. Gauging weirs	60
9. Roads and bridges	324
Sub-total: Raw water conveyance structure	6 905
Contingency 25%	1 726
Administration and project management 15%	1 036
Total Raw Water Conveyance Structures	9 667
<u>Potable water conveyance structure</u>	
1. Baynesfield WTW - Umlaas Road pipeline and potable water reservoirs	1 710
2. Water Treatment Works (625 Ml/d = 228 mill m ³ /a)	977
Sub-total: Potable water conveyance structure	2 687
TOTAL	

Total capital cost: R 12 354 million
Total operating cost: R24.7 million/annum

Project programme





Thank you

“...Once completely developed, phase 1 and 2 of the uMWP will be the largest water transfer scheme in South Africa, comparable to the Lesotho Highlands Water Project in terms of volume and tunnel lengths and diameters...”

<http://www.dwa.gov.za/Projects/uMkhomazi/default.aspx>