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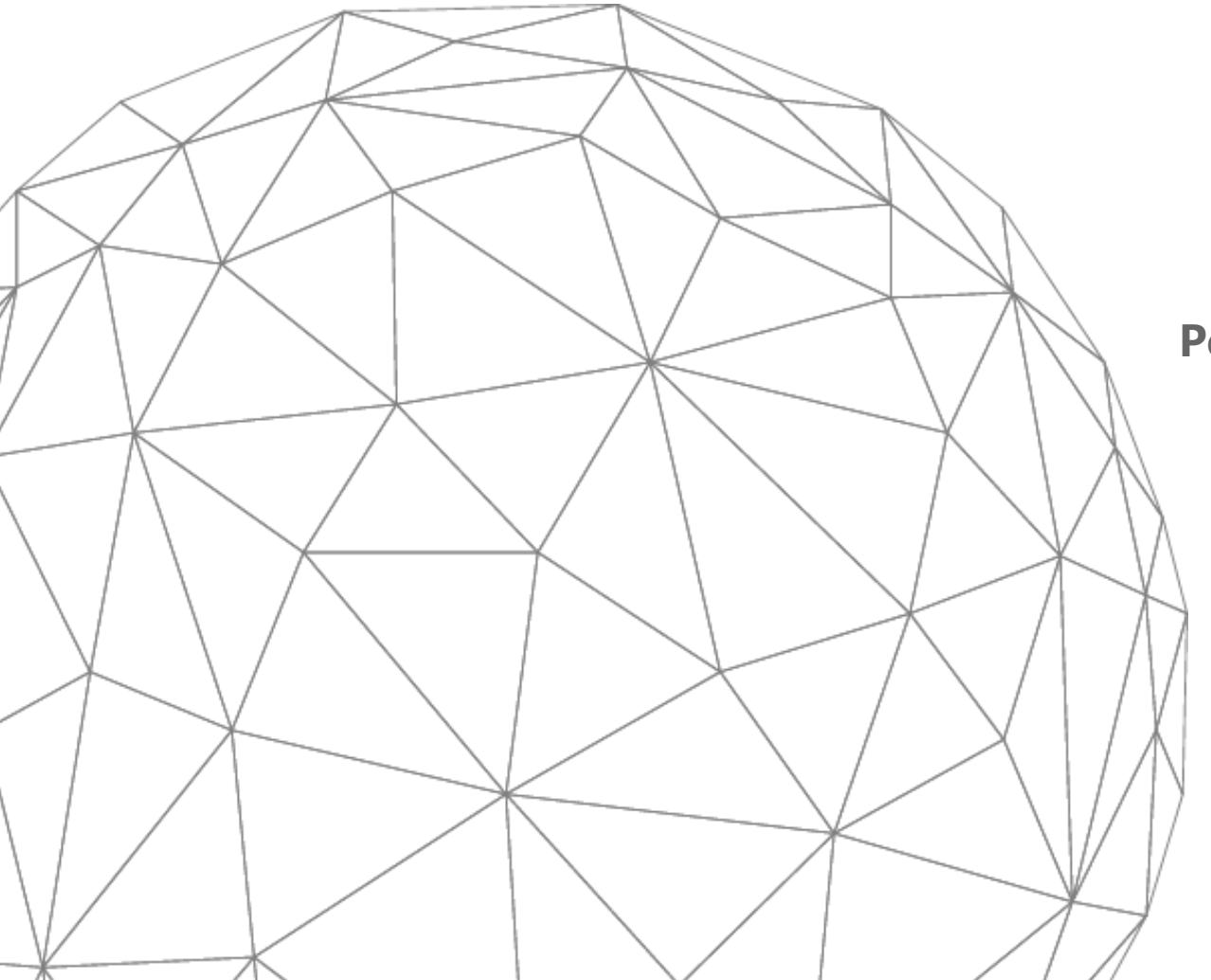

EUROPEAN ASSOCIATION OF GEOSCIENTISTS AND ENGINEERS

Petroleum geology and potential of Karoo related rift basins, NE Namibia and NW Botswana

Scot Evans
CEO ReconAfrica

EAGE Global Hotspots: Southern Africa
17-18 February 2021
Online

WWW.EAGE.ORG

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Newly Discovered Kavango Basin in Namibia & Botswana

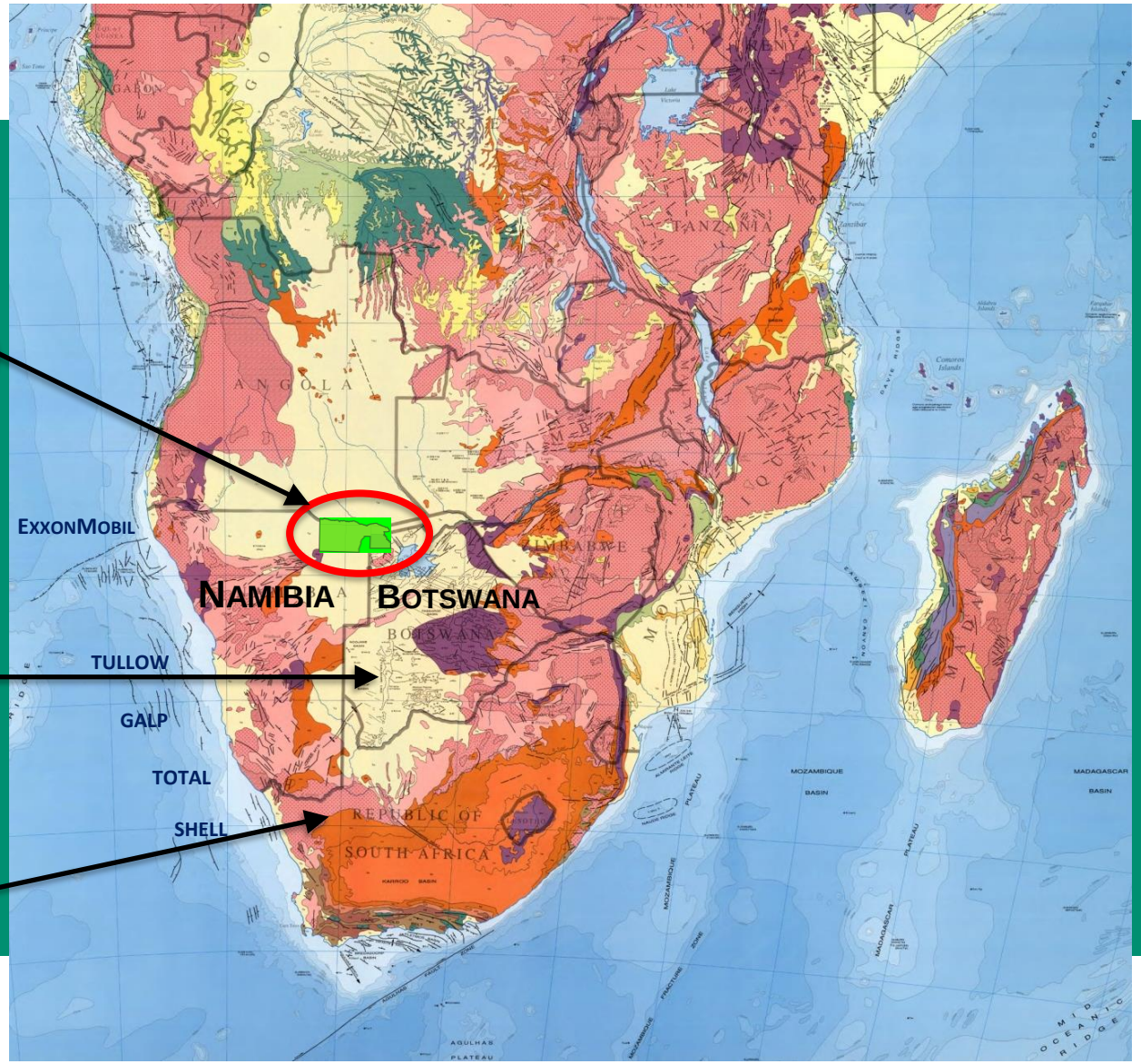
- 8.5 MM acres covers the entire basin
- Potentially one of the largest onshore undeveloped hydrocarbon basins in the world
- Stable governments
  - Licence Contracts
- Successful Technical Team
  - In depth knowledge of the basin
- Catalyst-rich near term
  - Drilling program underway to confirm active petroleum system

ReconAfrica Acreage location

ReconAfrica
Petroleum Exploration
Licences

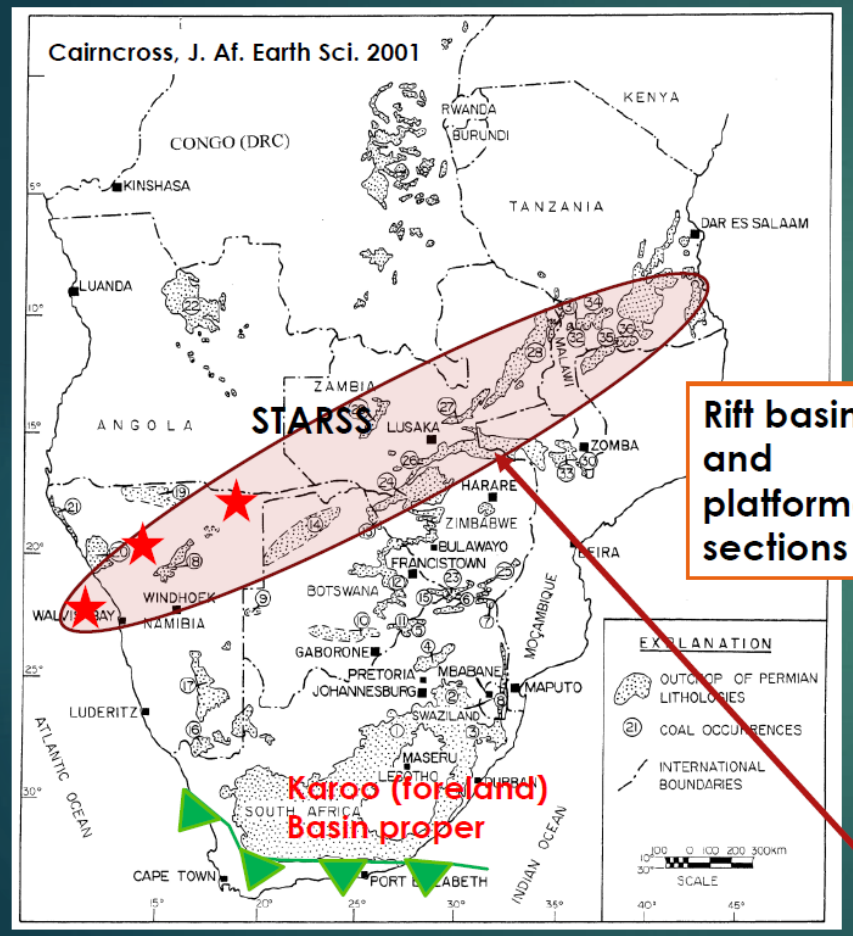
YELLOW AREAS:
Sedimentary Basins

PINK AND ORANGE AREAS:
crystalline basement in outcrop

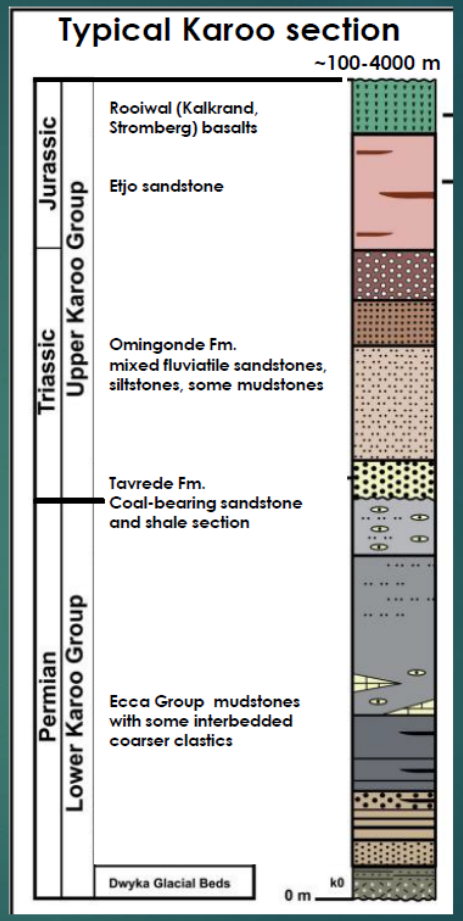


Permian-Triassic Karoo supergroup

What and where is *Karoo*?



Rift basins and platformal sections



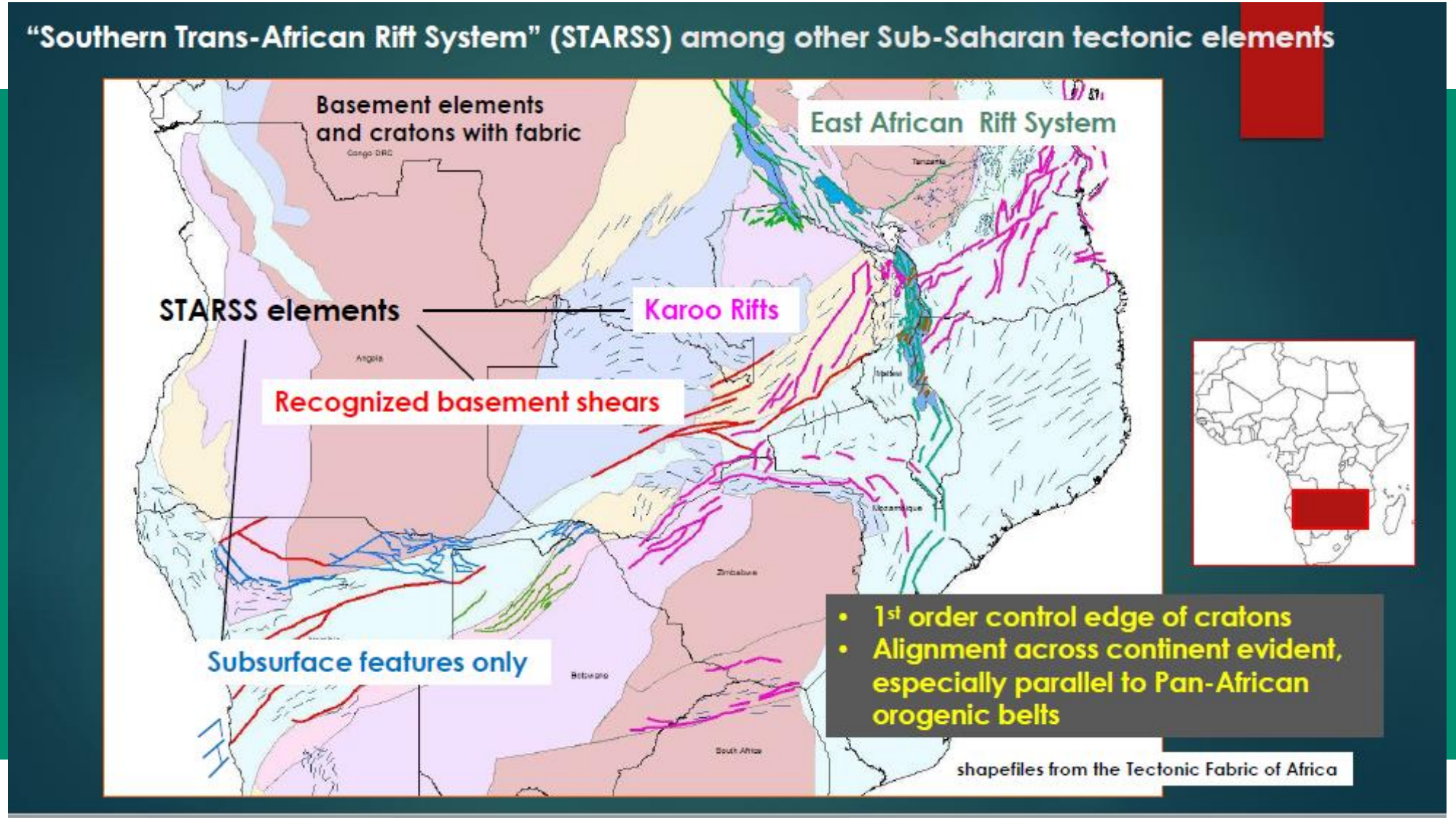
Supergroup with coarsening upward section; tectonically expanded periods of lacustrine and/or marine section

Glacial section

Section shown for Zambezi graben, from Viglietti et al., J. Af. Earth Sci. 2018

Granath, Dickson, Wanke, and Odegarde, PESGB HGS Joint Africa Session 2020

Southern Africa Tectonic Elements



Granath, Dickson, Wanke, and Odegarde, PESGB HGS Joint Africa Session 2020

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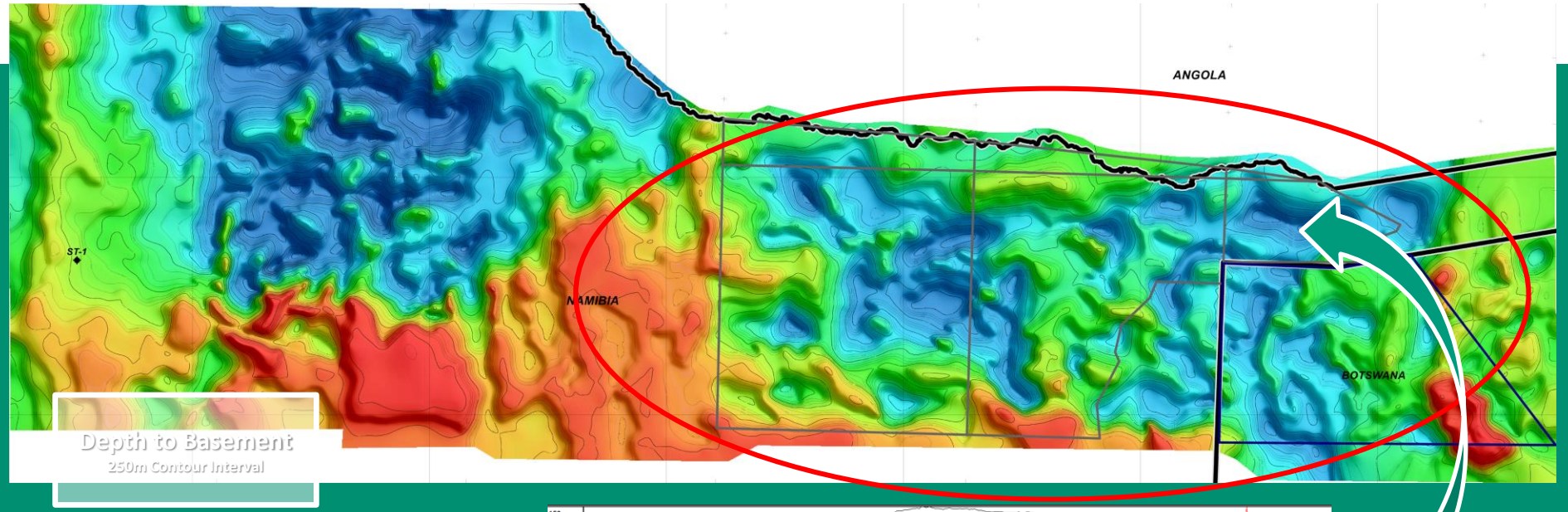
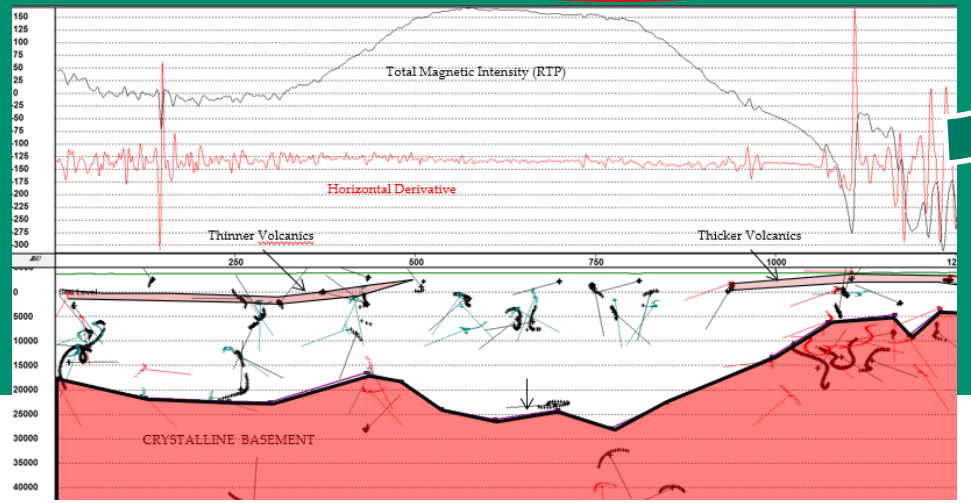
Eastern Owambo and Kavango Basin Depth to Basement





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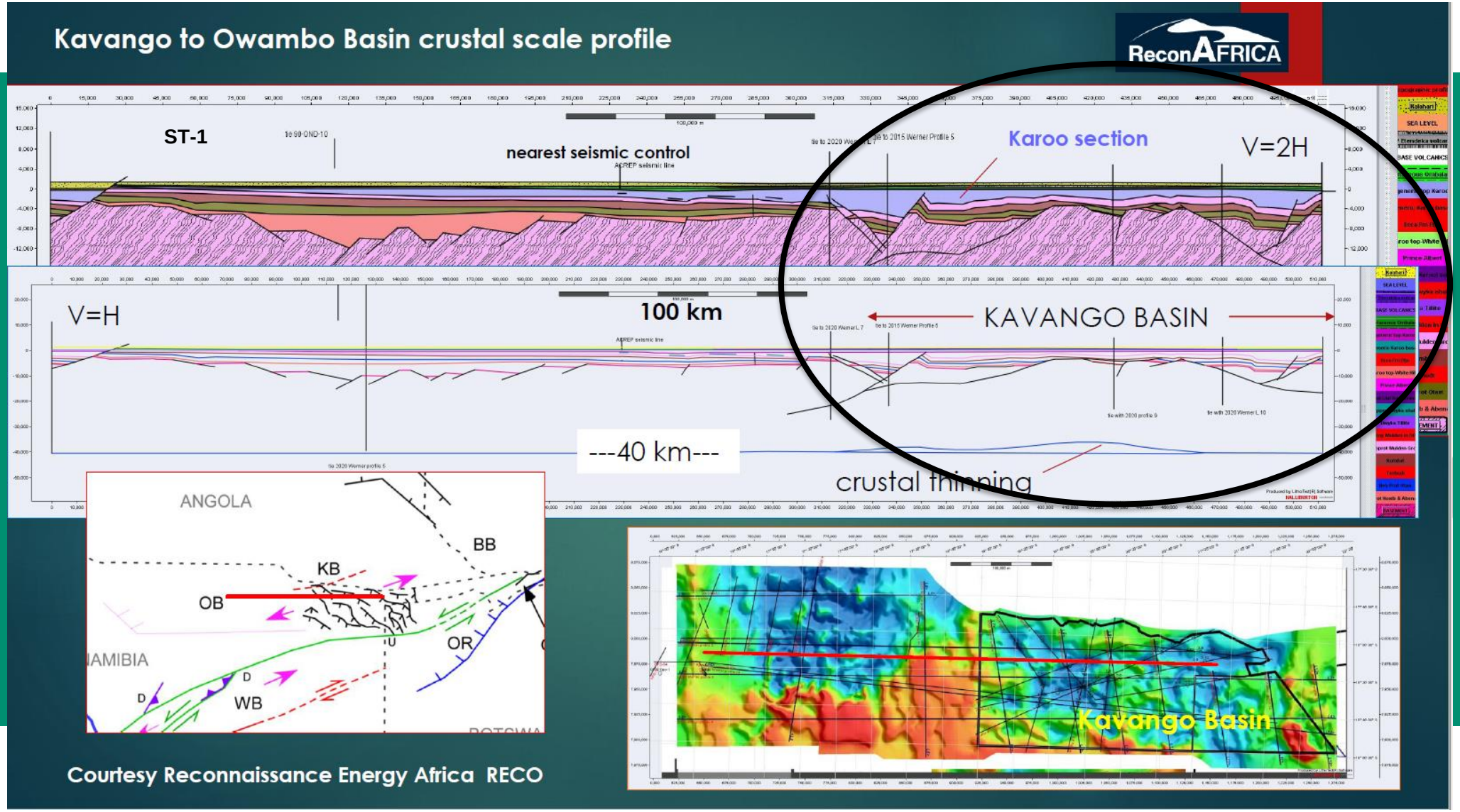
Crustal scale Profile NE Namibia NW Botswana

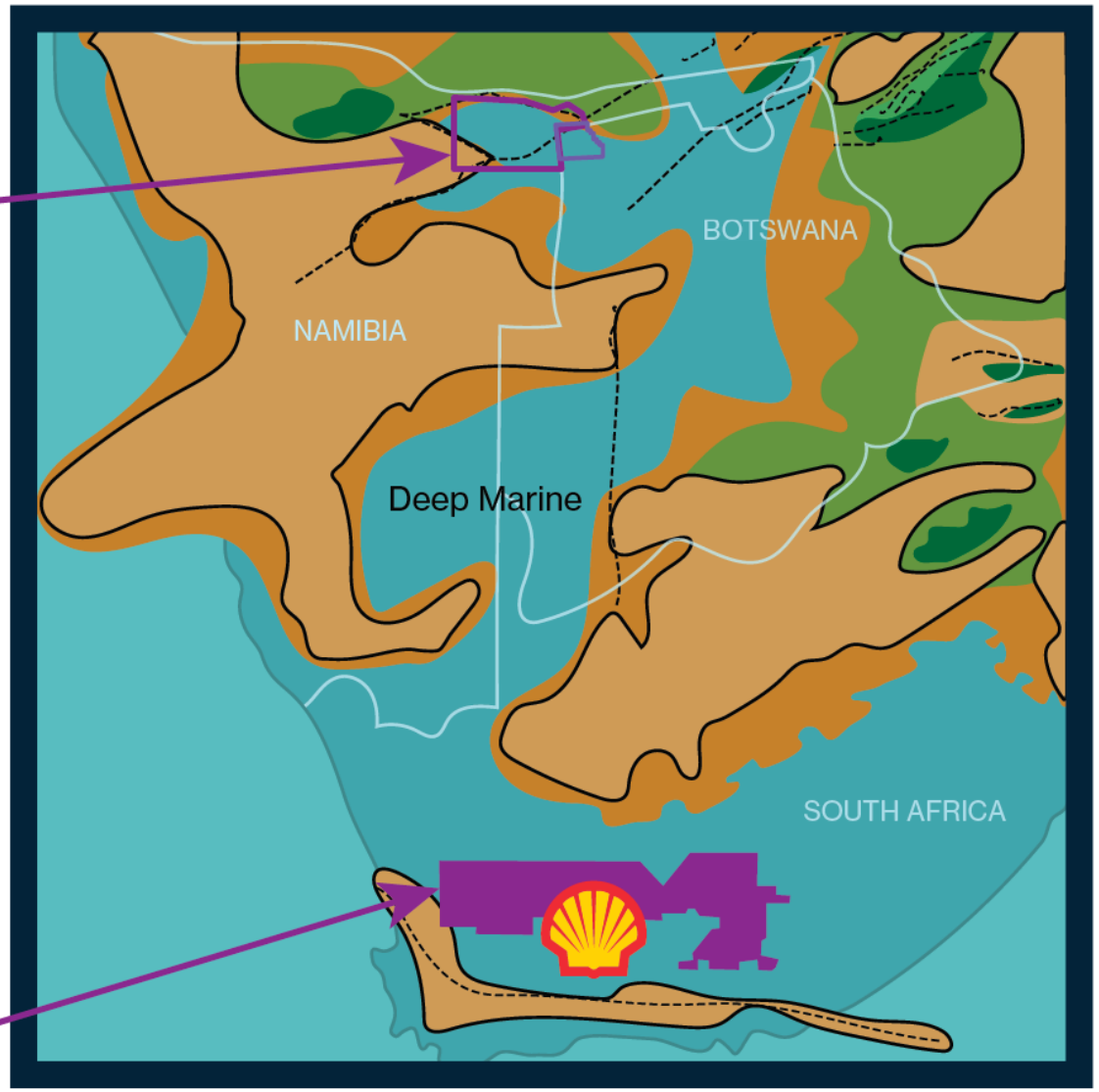


Paleogeographic Karoo (Ecca) setting

KAVANGO BASIN
ReconAfrica
Namibia Licence 73
and Botswana Licence
001/2020

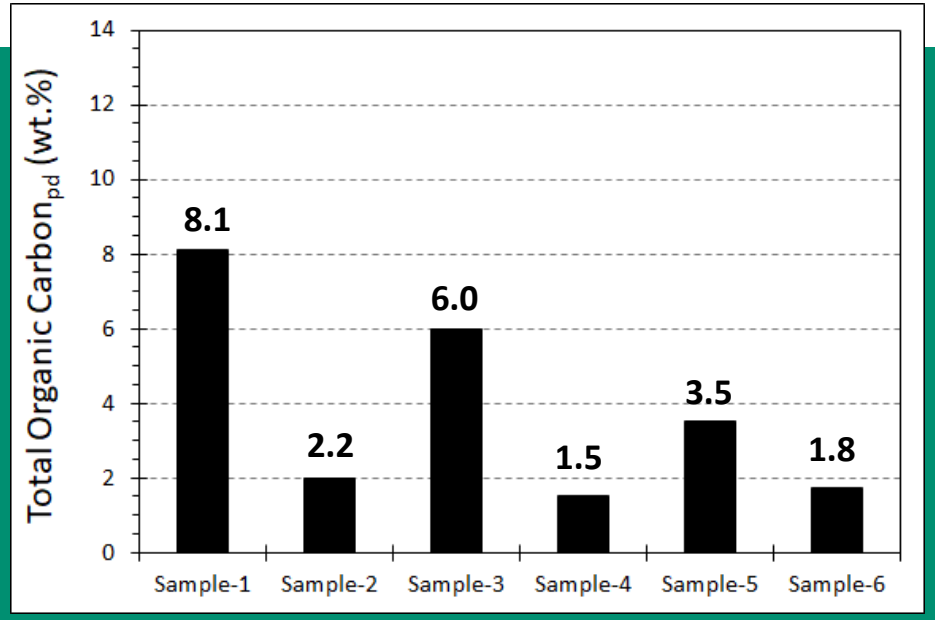
KAVANGO BASIN KAROO
Interpreted to be the same depositional environment as Shell's organic-rich Whitehill Permian formation

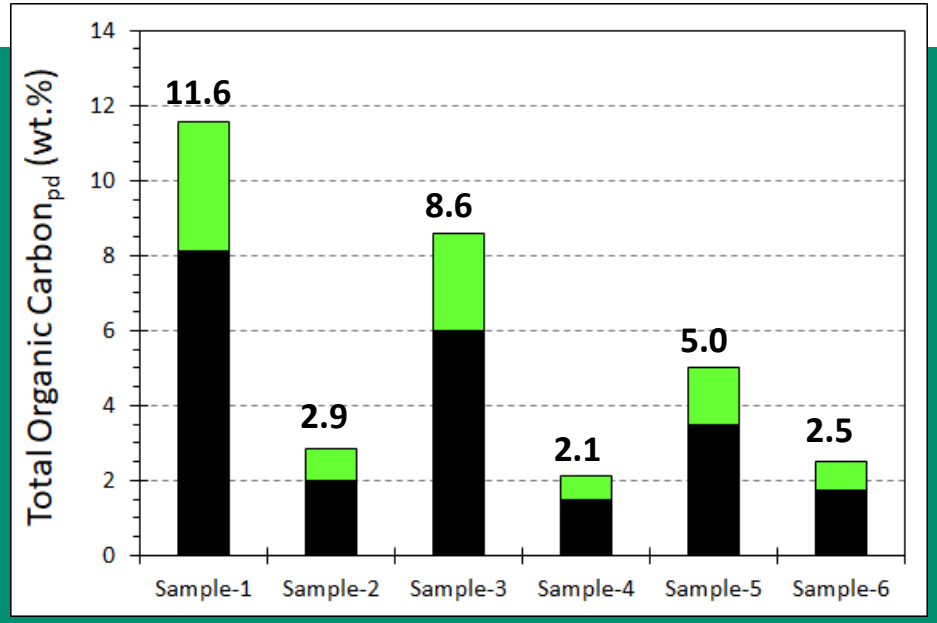
South Africa Karoo
Shell's Whitehill Permian 370 TCF Recoverable (EIA Estimate)



PEL 73
PEL 001/2020
Marine (shallow to deep)
Paralic/deltaic/shoreface
Deltaic/fluvial/lacustrine
Fluvial-alluvial/peat swamp
Continental depocentre
Country Borders
STARSS rift system

WHITEHILL, KAROO BASIN, SOUTH AFRICA





Average TOC at high conversion: **3.81%**

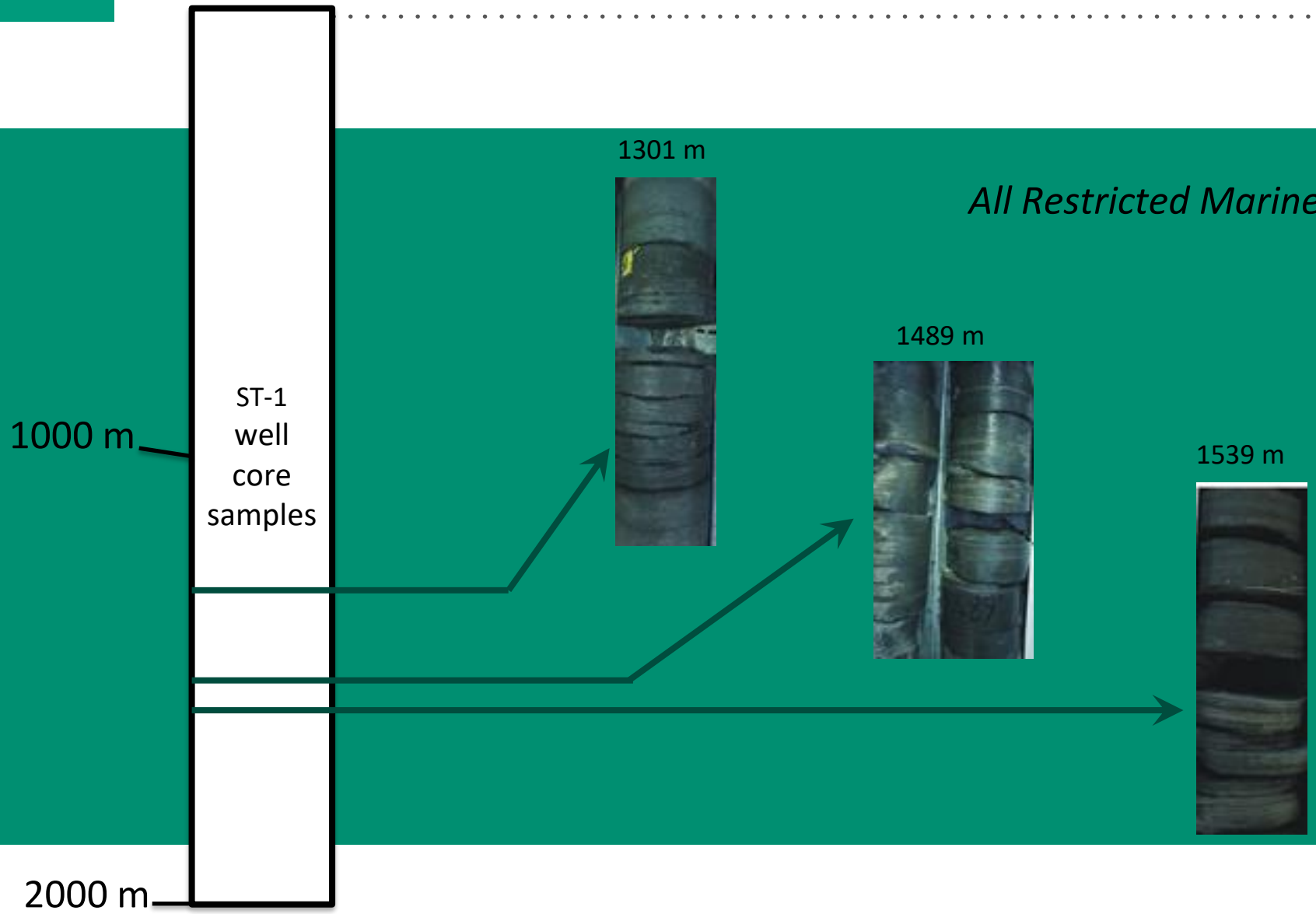
Utilizing a Hydrogen Index of 358 mg/g,
Average restored TOC: **5.44%**

Difference in TOC is **1.63%** or converted to petroleum **460 boe/af**

At only **100 ft** of source rock thickness, this is **29.5 mmboe/section**

ST-1 Well, Owambo Basin, Onshore Namibia

All Restricted Marine or Lacustrine



Source Rock Geochemistry
Estimated Petroleum Generation:

Total Petroleum Generation per section/640 acres (Expelled and Retained)						
Conversion	**Thickness in Feet**					
	200 (mmboe/section)	300 (mmboe/section)	328* (mmboe/section)	400 (mmboe/section)	443** (mmboe/section)	500 (mmboe/section)
50% Kerogen Conversion	24	37	40	49	54	61
75% Kerogen Conversion	37	55	60	73	81	92

* net thickness from geological data
** net thickness from Shell's Permian source rock section, Karoo basin, South Africa

50% Kerogen Conversion = ~ 0.84 vitrinite reflectance
75% Kerogen Conversion = ~ 1.10 vitrinite reflectance

Total Petroleum Generation Potential over ReconAfrica's Kavango Basin Acreage (8.5 million acres)						
Conversion	**Thickness in Feet**					
	200 1641 sections* (billion boe)**	300 1641 sections* (billion boe)**	328 1641 sections* (billion boe)**	400 1641 sections* (billion boe)**	443 1641 sections* (billion boe)**	500 1641 sections* (billion boe)**
50% Kerogen Conversion	40	60	66	80	89	100
75% Kerogen Conversion	60	90	99	120	133	150

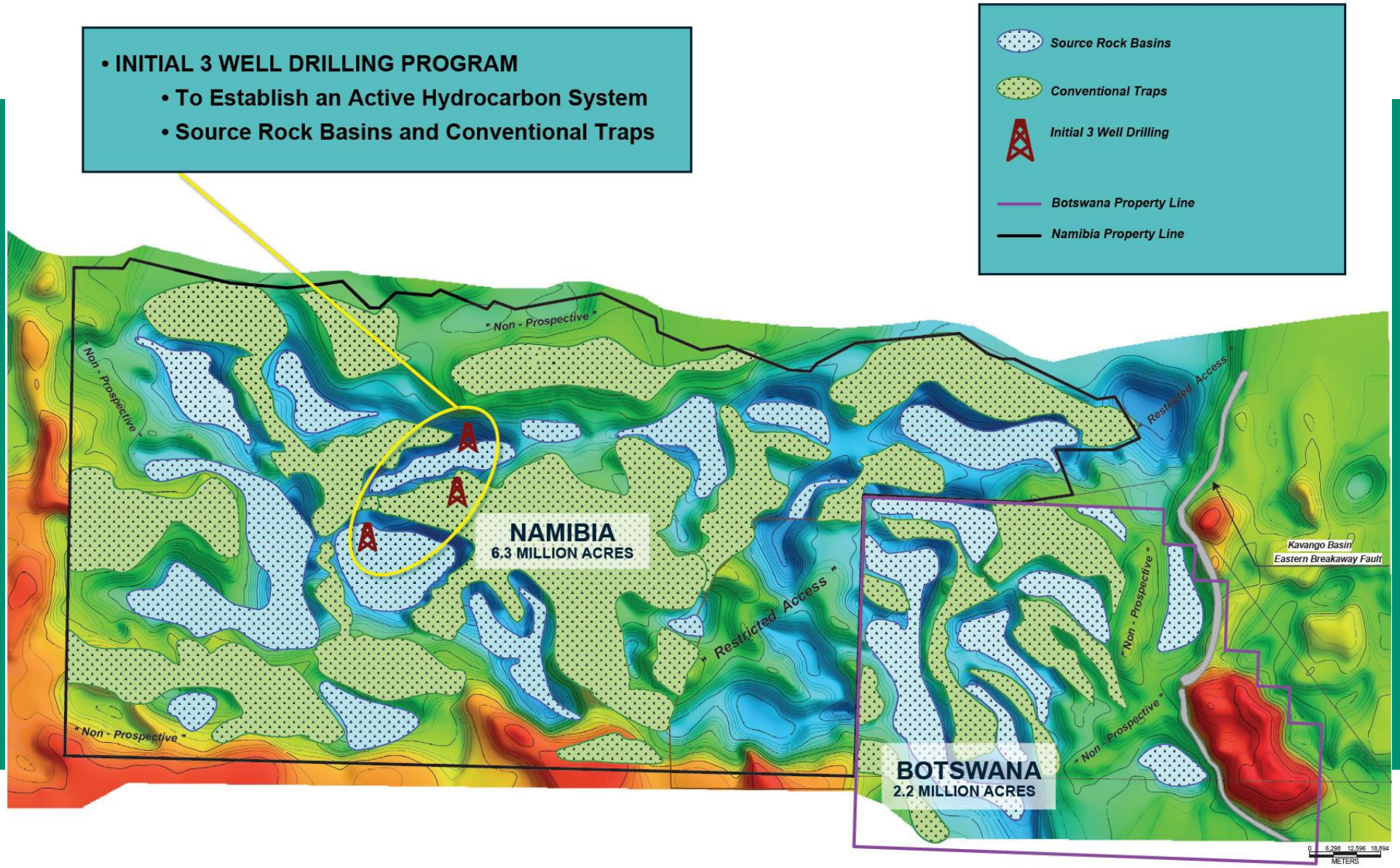
* 1641 sections represents 12% of ReconAfrica total holdings of 13,671 sections
** boe = barrels of oil equivalent

50% Kerogen Conversion = ~ 0.84 vitrinite reflectance
75% Kerogen Conversion = ~ 1.10 vitrinite reflectance

*** Source – Daniel Jarvie, Worldwide Geochemistry LLC.**

Play Maps Deep Kavango Basin

- **INITIAL 3 WELL DRILLING PROGRAM**
  - To Establish an Active Hydrocarbon System
  - Source Rock Basins and Conventional Traps



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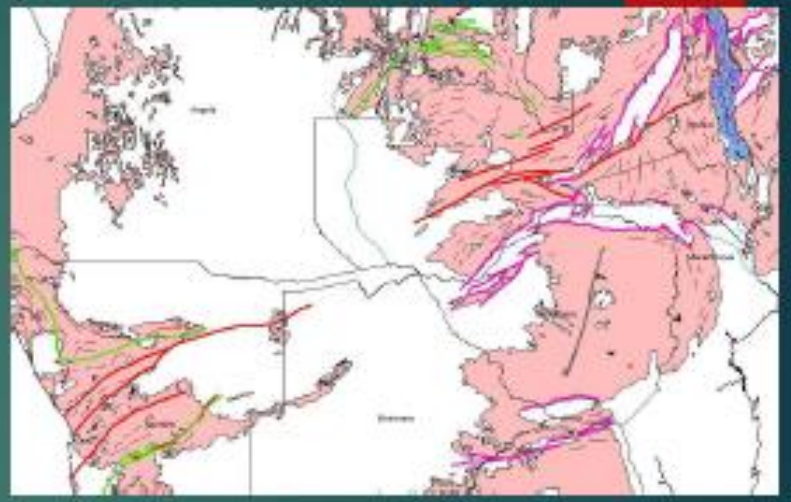
Conclusions

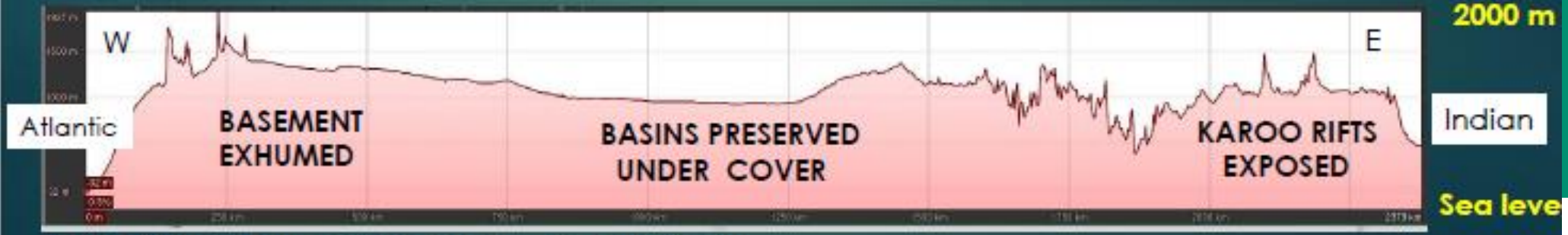
CONCLUSIONS

Petroleum implications for Karoo basins

- Extensional basins developed across continent
- Could harbor extensive source, reservoir, and seal sections
- In west, only preserved offshore
- In east many Karoo basins exposed down to Karoo sections—potential for breaching
- In center (mid-Namibia & Angola to Zambia/Botswana/Zimbabwe) basins preserved under K and Cenozoic cover



Purdy project basement outcrop



Trans-African topographic profile—Google Earth