Appendices

Appendix A
Base Data for MCA

Trans Kalahari Rail - Development Plan

Multi Criteria Analysis of Western Route Options

Project 243411

	Standard Gauge		Cape Gauge		Diff Nth vs South	
	SG Northern Option	**SG Southern Option**	**Cape G Northern Option**	**Cape G Southern Option**	Std G	Cape G
Total length (km)	1525	1352	1525	1352	-11%	-11%
Highest route elevation MSL (m)	1864	1448	1864	1448	-22%	-22%
Via	Gobabis	Mariental	Gobabis	Mariental		
Horixontal curves less than 600m	5.00%	0.00%	5.00%	0.00%		
Horixontal curves less than 1000m	10.85%	64.64%	10.85%	64.64%		
Slope greater than 1.00% (no.)	4	2	4	2	-50%	-50%
Slope greater than 1.00% (m)	14624	2804	14624	2804	-81%	-81%
Slope greater than -1.00% (no.)	10	8	10	8	-20%	-20%
Slope greater than -1.00% (m)	57580	37872	57580	37872	-34%	-34%
Road over rail bridges (no.)	83	57	83	57	-31%	-31%
Road over rail bridges (total length m)	2340	1360	2340	1360	-42%	-42%
Rail over river bridge (no.)	223	194	223	194	-13%	-13%
Rail over river bridge (total length m)	19870	16900	19870	16900	-15%	-15%
Longest rail bridge (m)	3110	1860	3110	1860	-40%	-40%
Total bridge area (m2)	173200	142400	173200	142400	-18%	-18%
Tunnels (no.)	3	0	3	0	-100%	-100%
Tunnels (total length m)	15695	0	15695	0	-100%	-100%
Earthworks - Cut Volume (000 m3)	16550	21970	15070	20290	33%	35%
Earthworks - Fill Volume (000 m3)	41210	22990	44580	23780	-44%	-47%
Earthworks Balance (C/F %)	40%	96%	34%	85%		
Train crew requirements @ 65Mtpa (no.)	240	170	420	290	-29%	-31%

Capex - Below Rail (USD m)	SG Northern Option	SG Southern Option	Cape G Northern Option	Cape G Southern Option	Std G	Cape G
Earthworks	820.7	724.5	726.2	652.4	-12%	-10%
Bridge Structures and Culverts	828.1	672.9	720.1	585.1	-19%	-19%
Tunnel Costs	502.2	0.0	473.8	0.0	-100%	-100%
Track Works	1300.7	1144.6	1303.7	1167.5	-12%	-10%
Drainages and Environmental Controls	246.2	217.8	246.2	217.8	-12%	-12%
Fencing, Road Signage and Road Furniture	36.2	32.1	36.2	32.1	-12%	-12%
Passing Loops	75.8	61.6	111.5	109.4	-19%	-2%
Level Crossings	28.1	28.1	24.7	24.7	0%	0%
Control Centre (allocation)	1.0	1.0	1.0	1.0	0%	0%
Wayside Equipment	10.9	9.6	10.9	9.6	-12%	-12%
Telecommunications	146.4	129.8	146.4	129.8	-11%	-11%
Signall, Comms, Power and Others	261.9	230.1	294.6	274.6	-12%	-7%
Construction Sub-Total	**4258.3**	**3252.0**	**4095.5**	**3204.0**	-24%	-22%
Access Track	26.1	23.1	26.1	23.1	-12%	-12%
Property	53.7	47.5	53.7	47.5	-12%	-12%
Construction Camp (share of total)	91.2	76.8	91.2	76.8	-16%	-16%
Sub-Total	**4429.2**	**3399.3**	**4266.4**	**3351.4**	-23%	-21%
Contractor Indirect Costs	1458.5	1109.3	1390.1	1076.9	-24%	-23%
Sub-Total	**5887.7**	**4508.6**	**5656.5**	**4428.3**	-23%	-22%
Contingency	843.9	641.8	804.3	623.0	-24%	-23%
Total Section Below Rail Capital Costs	**6731.6**	**5150.4**	**6460.8**	**5051.3**	-23%	-22%
Capitalised Interest	561.3	426.9	534.9	414.4	-24%	-23%
Total Below Rail Capital Cost (incl. capitalised interest)	**7292.9**	**5577.3**	**6995.7**	**5465.7**	-24%	-22%

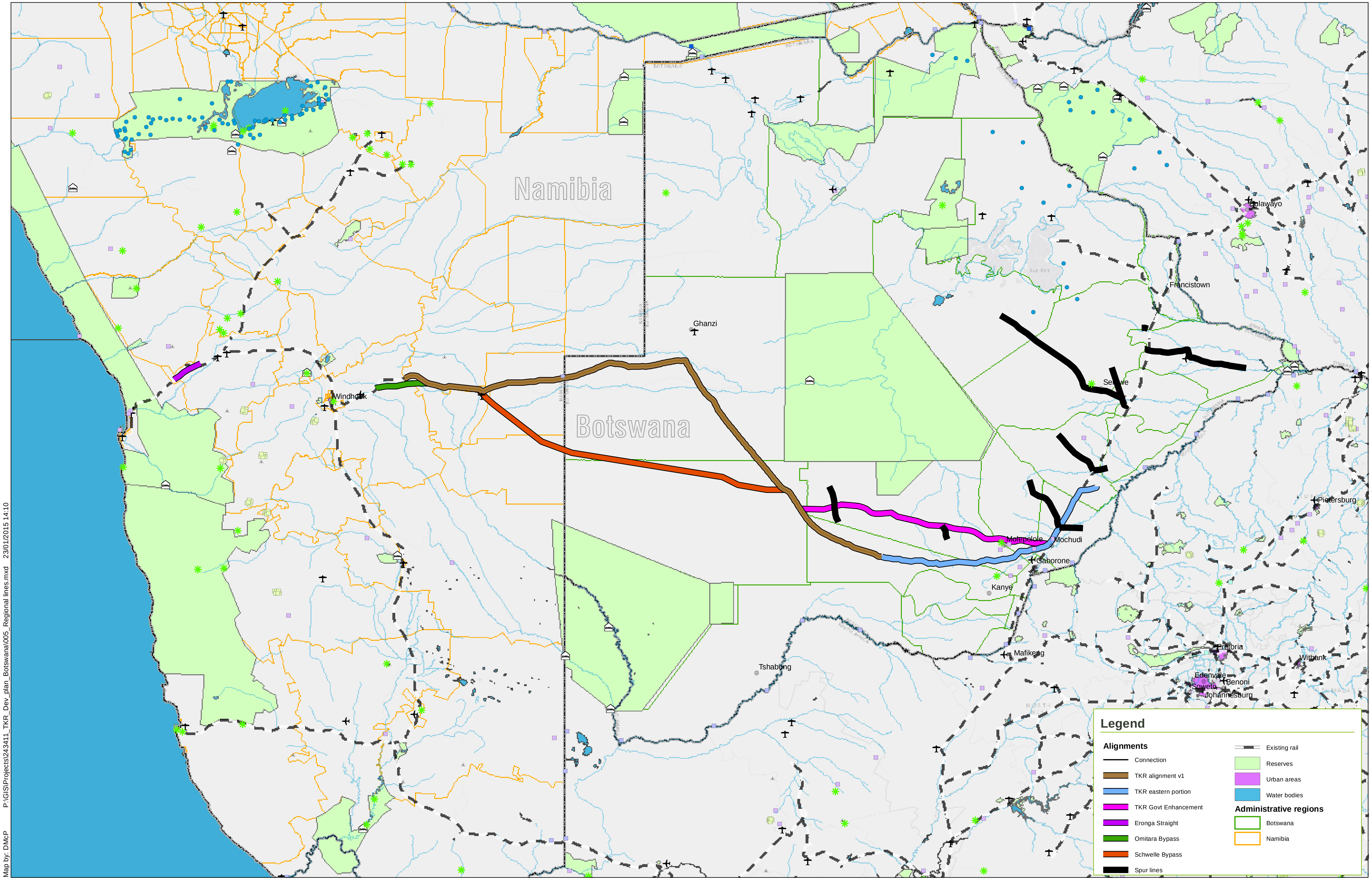
Opex - Below Rail	SG Northern Option	SG Southern Option	Cape G Northern Option	Cape G Southern Option	Std G	Cape G
Structures & Track Maintenance	997	876	999	892	-12%	-11%
Facilities Maintenance	6	5	6	5	-12%	-17%
Comms & Trackside Systems Maintenance	186	163	186	166	-12%	-11%
Business Overheads	178	157	179	159	-12%	-11%
Train Control	155	126	263	234	-19%	-11%
Total Below Rail Operating Costs	**1522**	**1327**	**1633**	**1456**	-13%	-11%
Recurring Capital	1052	799	1037	798	-24%	-23%
Total Below Rail Operating Costs (incl recurring)	**2574**	**2126**	**2670**	**2254**	-17%	-16%
Operations						
Number of coal wagons able to be hauled by 1 loco	44	48	32	32	9%	0%
Number of intermodal wagons able to be hauled by 1 loc	37	41	25	25	11%	0%

Total coal fleet - Train sets (at 65Mtpa)	55	39	99	70	-29%	-29%
Total coal fleet - Coal Locomotives (at 65Mtpa)	221	157	397	281	-29%	-29%
Total coal fleet - Coal Wagons (at 65Mtpa)	9680	7488	12672	8960	-23%	-29%
Total intermodal fleet - Train sets	19	16	24	21	-16%	-13%
Total intermodal fleet - intermodal Locomotives	77	65	97	85	-16%	-12%
Total intermodal fleet - intermodal Wagons	2812	2624	2400	2100	-7%	-13%
Capex - Above Rail (Total)						
Rollingstock capital investment	3023.1	2349.5	3691.2	2698.5	-22%	-27%
Rail Yard (including facilities)	815.0	669.3	1015.9	761.4	-18%	-25%
Total Above Rail Capital Cost	**3838.1**	**3018.8**	**4707.1**	**3459.9**	-21%	-26%
Capitalised Interest	309.4	243.5	379.6	279.0	-21%	-27%
Total Above Rail Capital Cost (incl. capitalised interest)	**4147.5**	**3262.3**	**5086.7**	**3738.9**	-21%	-26%
	138.3	108.7	169.6	124.6		
Capex - Above Rail (Coal Only)						
Rollingstock capital investment	2432.8	1826.1	3170.9	2242.9	-25%	-29%
Rail Yard (including facilities)	592.1	458.8	813.8	578.6	-23%	-29%
Total Above Rail Capital Cost	**3024.9**	**2284.9**	**3984.7**	**2821.5**	-24%	-29%
Capitalised Interest	243.7	184.1	321.2	227.4	-24%	-29%
Total Above Rail Capital Cost (incl. capitalised interest)	**3268.6**	**2469.0**	**4305.9**	**3048.9**	-24%	-29%
	109.0	82.3	143.5	101.6		

Above Rail Operating Costs (30 Year Total, USD m)	SG Northern Option	SG Southern Option	Cape G Northern Option	Cape G Southern Option	Std G	Cape G
Locomotive Maintenance	4396.3	3531.1	7425.9	6446.5	-20%	-13%
Wagon Maintenance	4957.6	4375.7	6153.5	5391.5	-12%	-12%
General Yard Maintenace NES (eg track & signal)	*452.4*	*366.4*	542.5	400.4	-19%	-26%
Building Maintenace	*54.8*	*42.0*	*90.8*	*67.6*	-23%	-26%
Crew Quarters	*5.6*	*4.2*	*9.2*	*6.5*	-25%	-29%
Locomotive Maintenance Facility	*73.4*	*60.5*	*103.7*	*83.5*	-18%	-19%
Underfloor Wheel Lathe	*15.6*	*15.6*	*15.6*	*15.6*	0%	0%
Wagon Maintenance Facility	*105.3*	*87.4*	*126.3*	*91.8*	-17%	-27%
Provisioning Facility	*36.7*	*30.2*	*51.8*	*41.8*	-18%	-19%
Yard & Facilities Maintenance	743.7	606.2	939.8	707.2	-18%	-25%
Yard Electric Energy Use	5.1	4.1	5.9	4.4	-18%	-25%
Fuel Cost	11713.9	9438.1	13554.2	11441.8	-19%	-16%
Crew Cost	835.5	587.4	1434.6	1012.7	-30%	-29%
Business Overheads	1640.0	1365.0	2393.1	2033.7	-17%	-15%
Total Above Rail Operating Costs (30 years)	**24292.2**	**19907.6**	**31906.9**	**27037.8**	-18%	-15%
Total Above Rail Operating Costs (Avg/year)	809.7	663.6	1063.6	901.3	-18%	-15%
Coal Only Above Rail Operating Costs (30 Year Total, USD m)						
Locomotive Maintenance	3635.4	2920.9	6338.4	5491.9	-20%	-13%
Wagon Maintenance	4530.6	3997.7	5735.8	5024.7	-12%	-12%
General Yard Maintenace NES (eg track & signal)	*331.8*	*256.1*	*439.2*	*310.6*	-23%	-29%
Building Maintenace	*40.3*	*29.2*	*73.0*	*51.2*	-28%	-30%
Crew Quarters	*3.6*	*2.8*	*7.3*	*4.6*	-25%	-37%
Locomotive Maintenance Facility	*51.8*	*41.0*	*82.1*	*61.9*	-21%	-25%
Underfloor Wheel Lathe	*7.8*	*7.8*	*7.8*	*7.8*	0%	0%
Wagon Maintenance Facility	*80.1*	*63.8*	*104.2*	*72.2*	-20%	-31%
Provisioning Facility	*25.9*	*20.5*	*41.0*	*31.0*	-21%	-25%
Yard & Facilities Maintenance	541.4	421.2	754.5	539.4	-22%	-29%
Yard Electric Energy Use	3.3	2.6	4.4	3.1	-23%	-29%
Fuel Cost	10279.2	8159.2	12089.5	10046.2	-21%	-17%
Crew Cost	619.0	413.9	1168.5	781.1	-33%	-33%
Business Overheads	1398.9	1163.1	2099.6	1775.6	-17%	-15%
Total Above Rail Operating Costs	**21007.8**	**17078.6**	**28190.7**	**23661.9**	-19%	-16%
Total Above Rail Operating Costs (Avg/year)	700.3	569.3	939.7	788.7	-19%	-16%

Coal Only	SG Northern Option	SG Southern Option	Cape G Northern Option	Cape G Southern Option	Std G	Cape G
Total Capex	10561.5	8046.3	11301.6	8514.6	-24%	-25%
Total Opex	23582.2	19204.8	30860.7	25915.9	-19%	-16%
Estimated Equivalent USD / tonne	32.9	25.7	38.2	30.2	-22%	-21%
Below Rail Component	15.3	11.8	14.8	11.7	*-23%*	*-21%*
Above Rail Component	17.6	13.9	23.4	18.6	*-21%*	*-21%*

Appendix B
Mine Spur Lines



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aurecon

Date: 23/01/2015 Version: 0 Job No: 243411

Coordinate system: GCS_WGS_1984 Source:

Trans-Kalahari Rail Study

Regional alignments and spurs

Appendix C
Terminal Layout

STRAIGHT CONVEYOR OPTION 15.5km OF CONVEYOR, 5x TRANSFER STATIONS	solid red line
POSSIBLE CURVED CONVEYOR OPTION 13.8km OF CONVEYOR, 1x TRANSFER STATIONS	dotted line
POSSIBLE ARIAL ROPE CONVEYOR OPTION 9.7km OF CONVEYOR, NO TRANSFER STATIONS	dash-dot line

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CLIENT	REV	DATE	REVISION DETAILS	APPROVED
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SCALE	SIZE
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DESIGNED	
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PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE

PROJECT	TRANS KALAHARI RAIL WALVIS BAY
TITLE	STOCKYARD AND CONVEYOR LAYOUT OPTIONS OPTION 1

DRAWING No.	PROJECT No.	WBS	TYPE	DISC	NUMBER	REV
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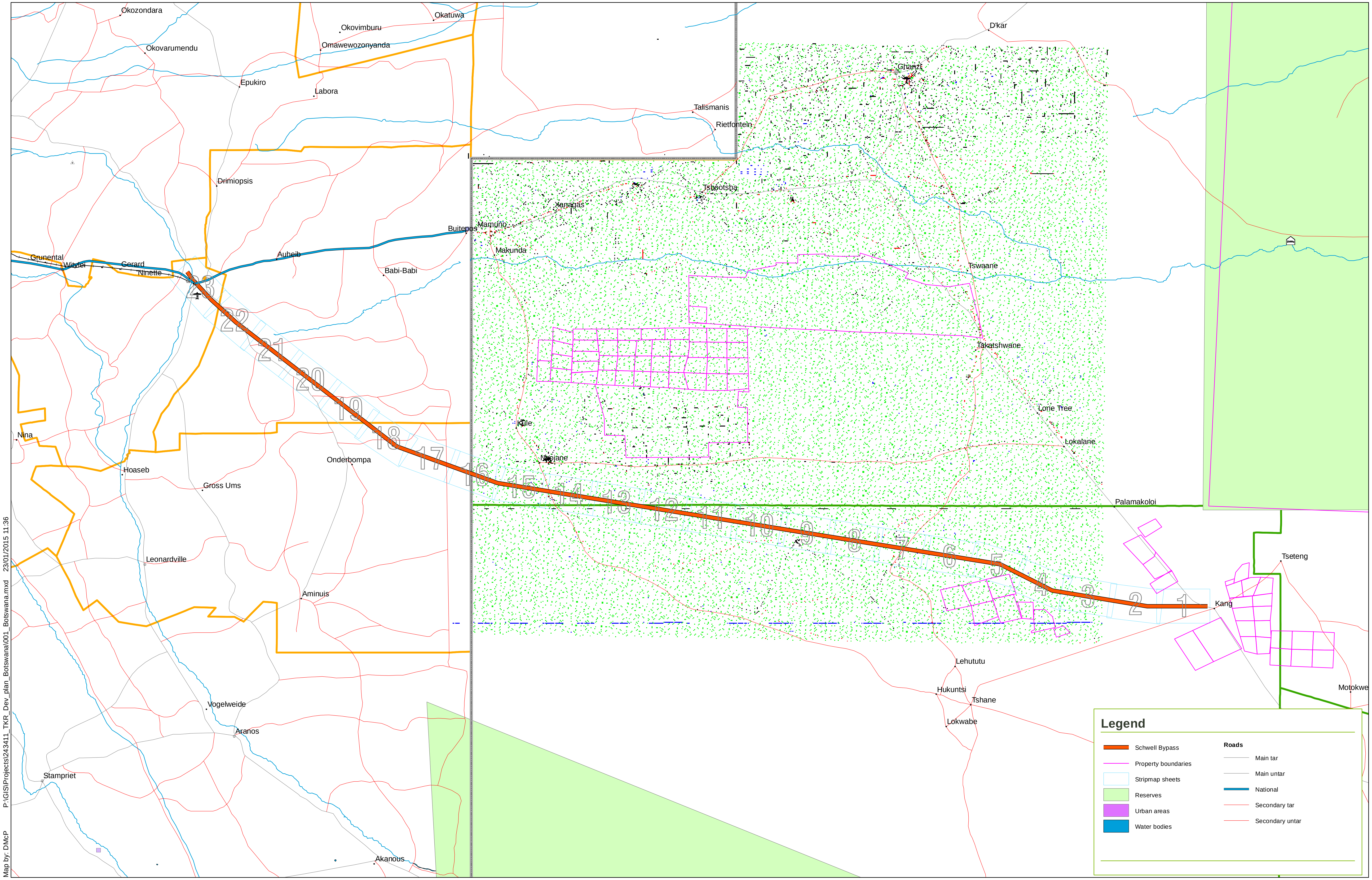
Appendix D
Schwelle Crossing



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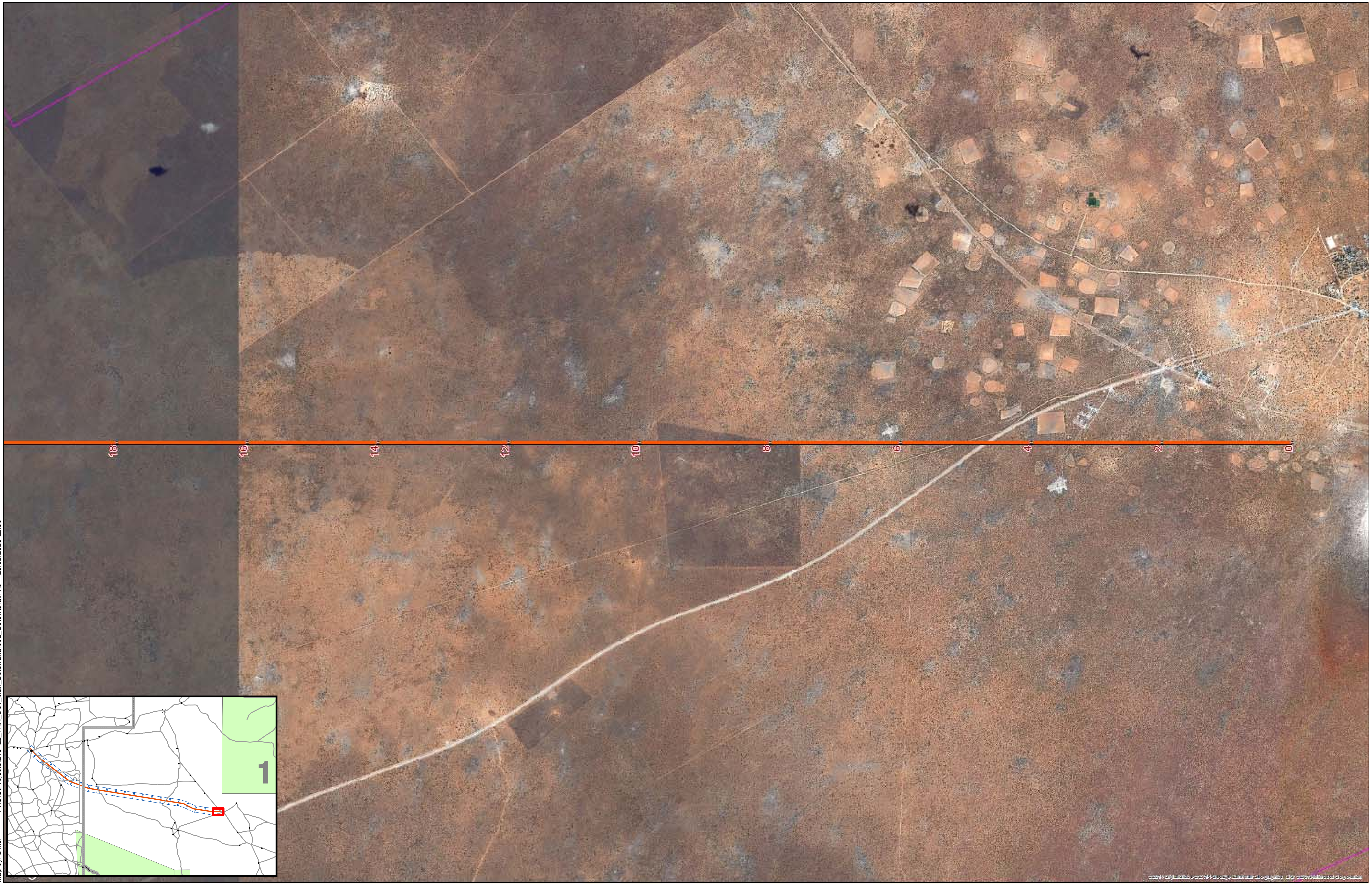
Trans-Kalahari Rail Study

Schwelle Bypass route



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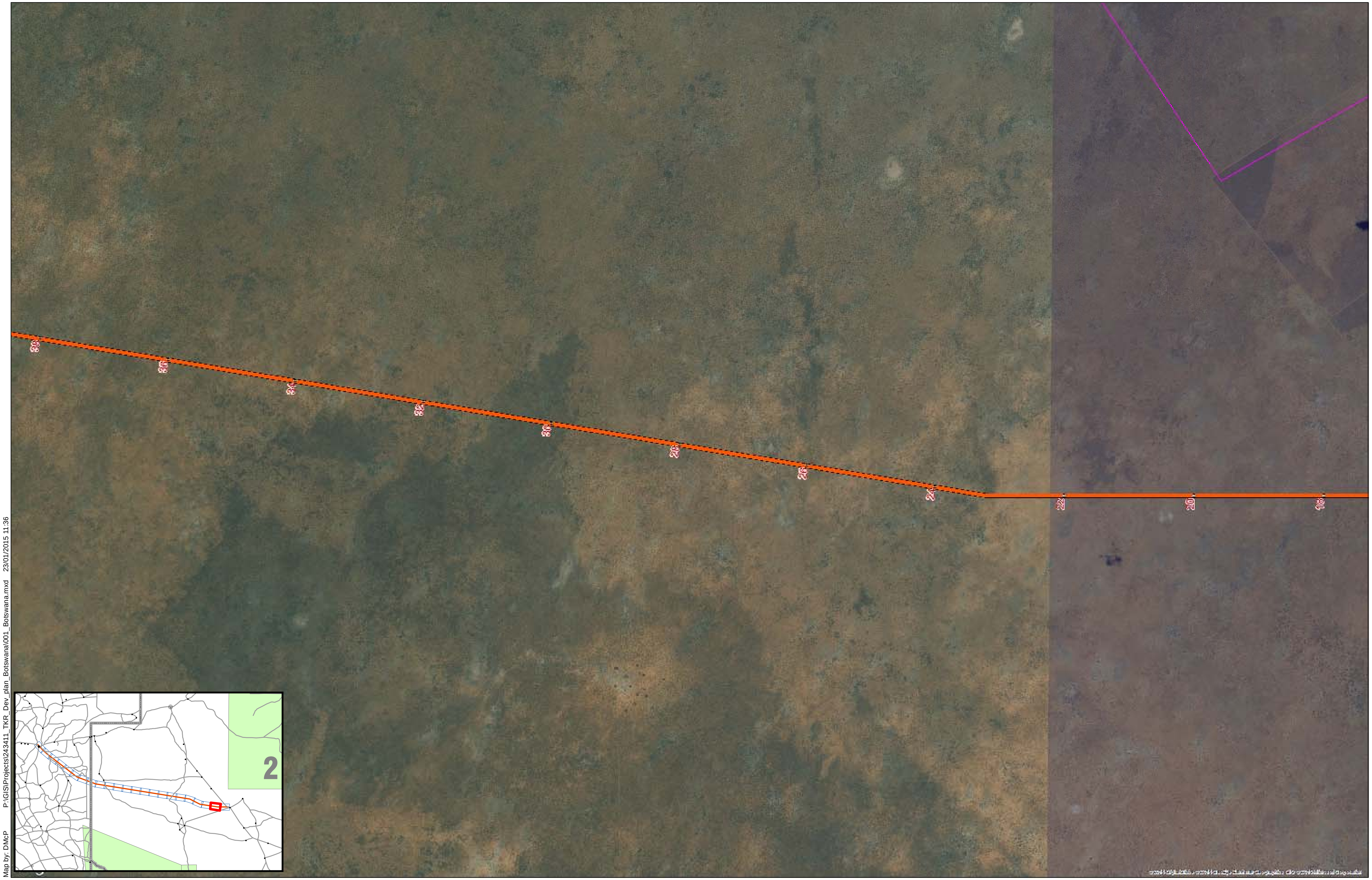
Trans-Kalahari Rail Study

Schwelle Bypass route



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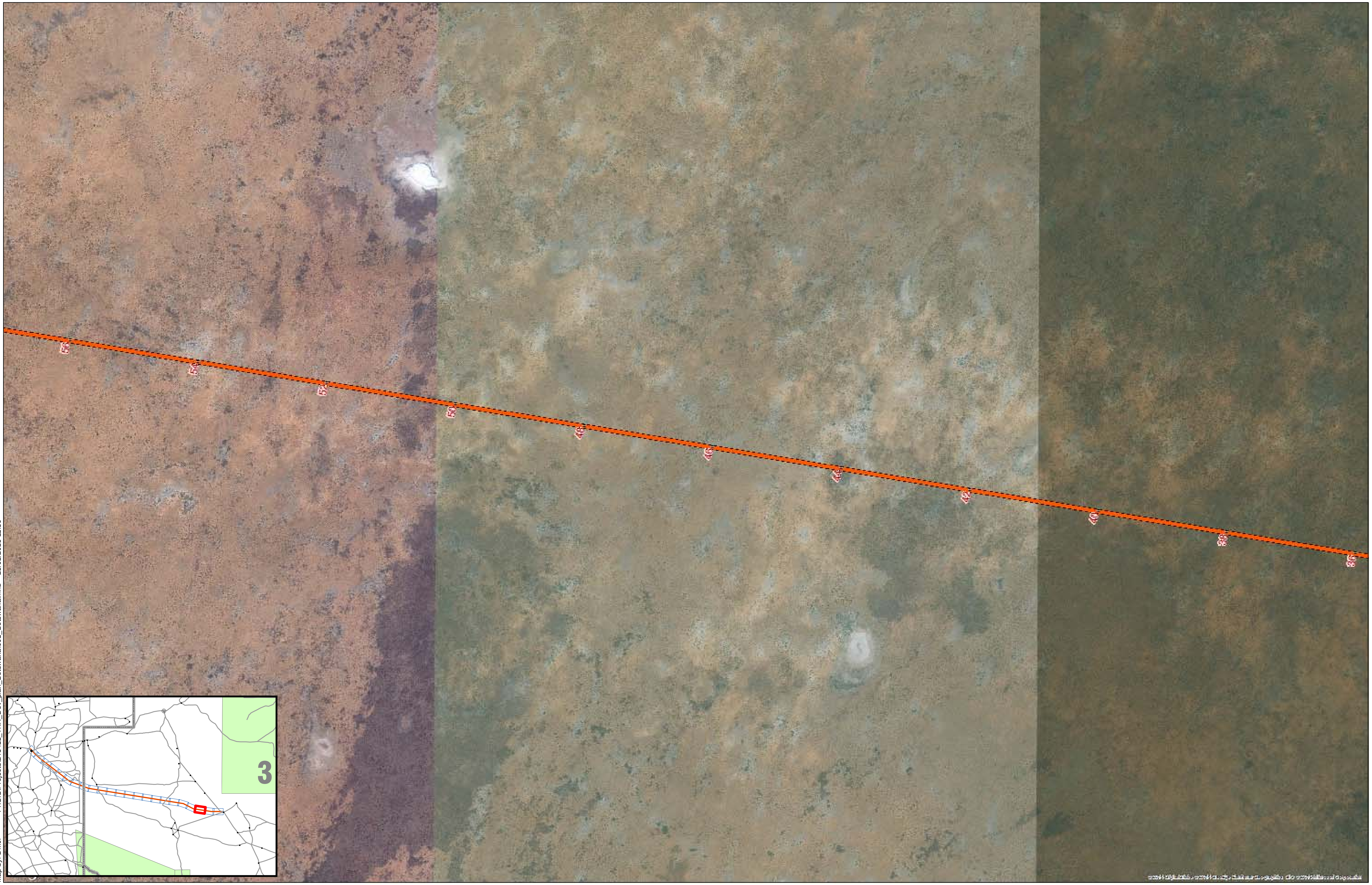
Trans-Kalahari Rail Study

Schwelle Bypass route



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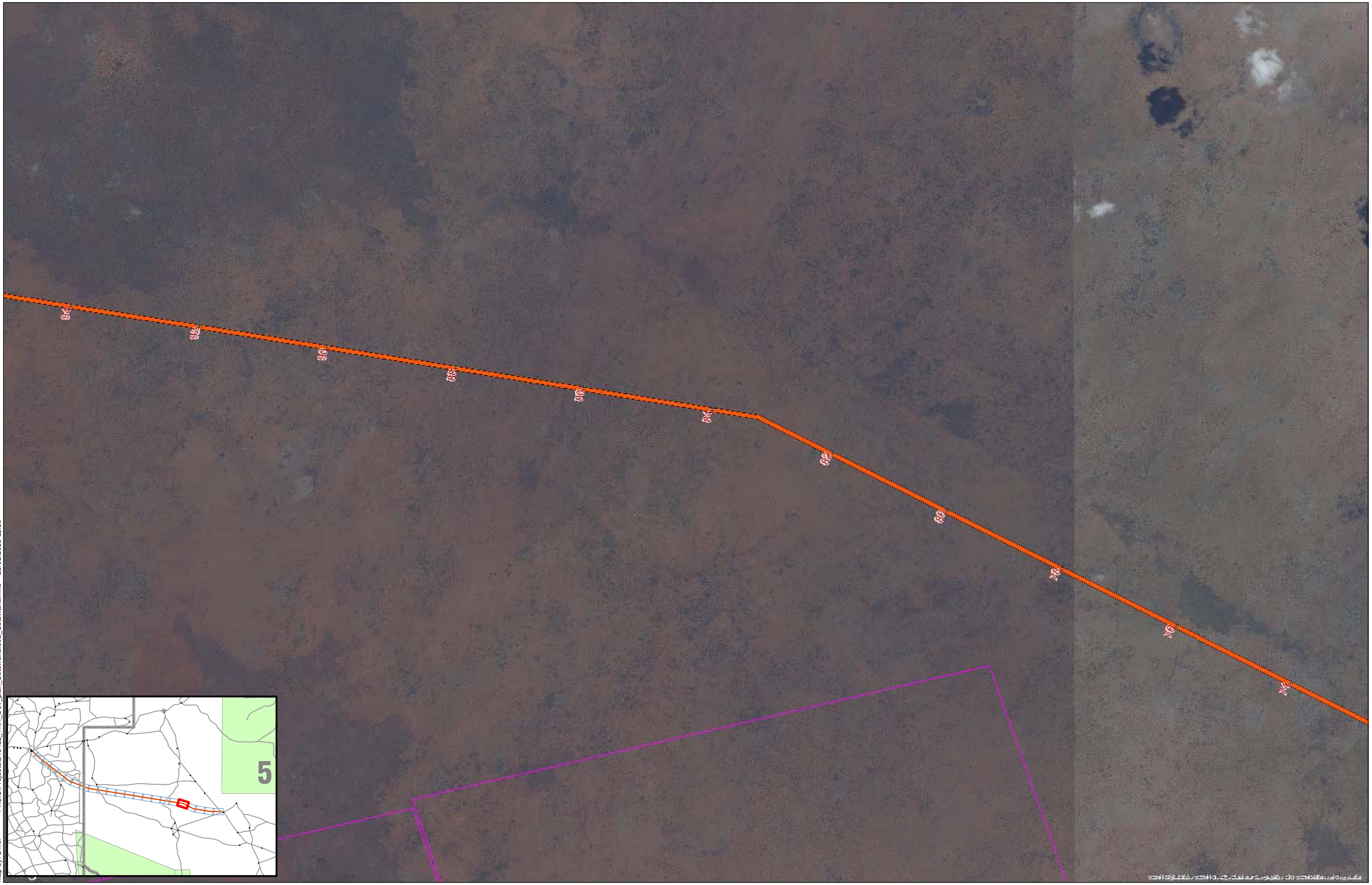

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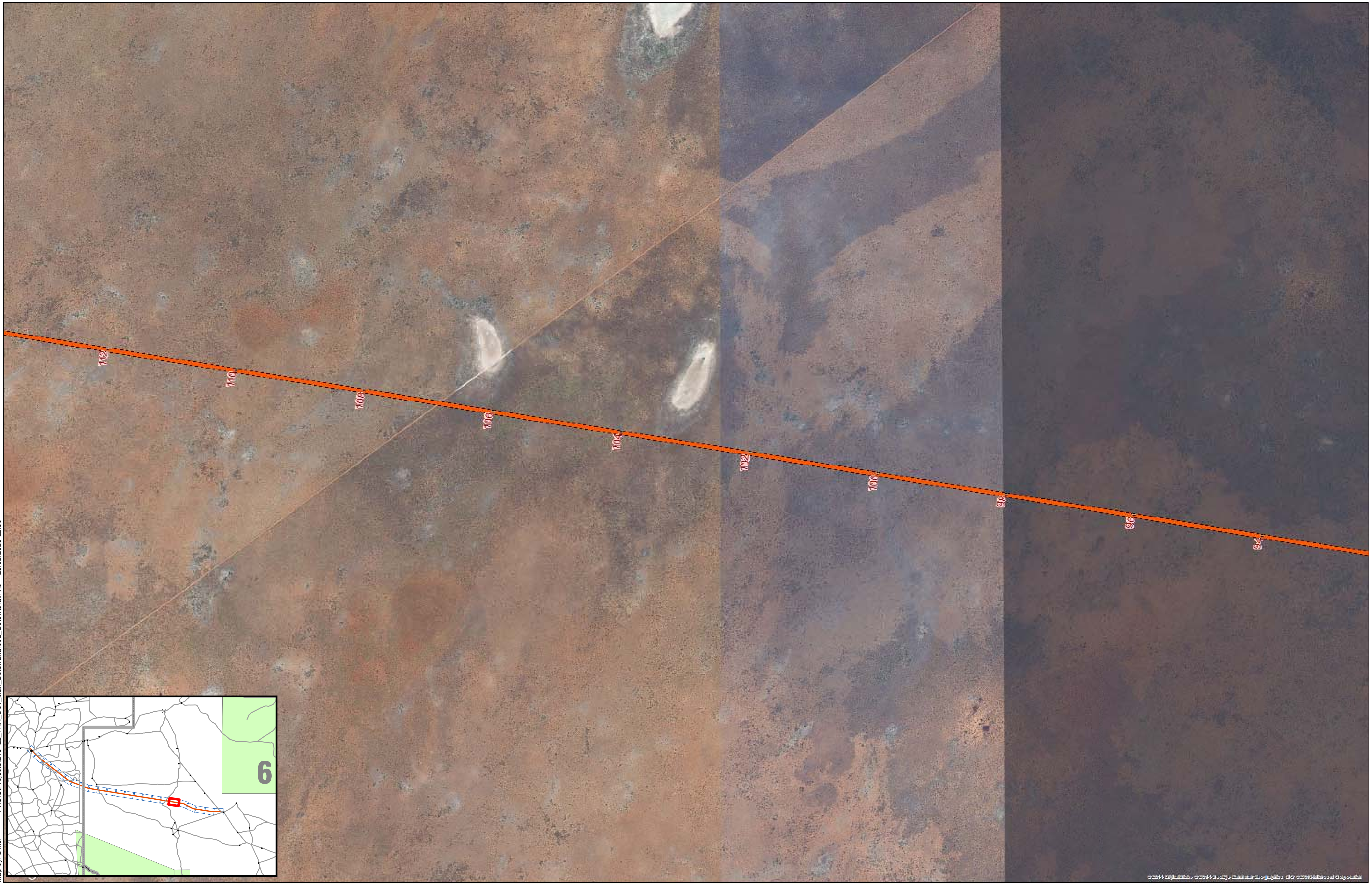
Schwelle Bypass route



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Trans-Kalahari Rail Study

Schwelle Bypass route

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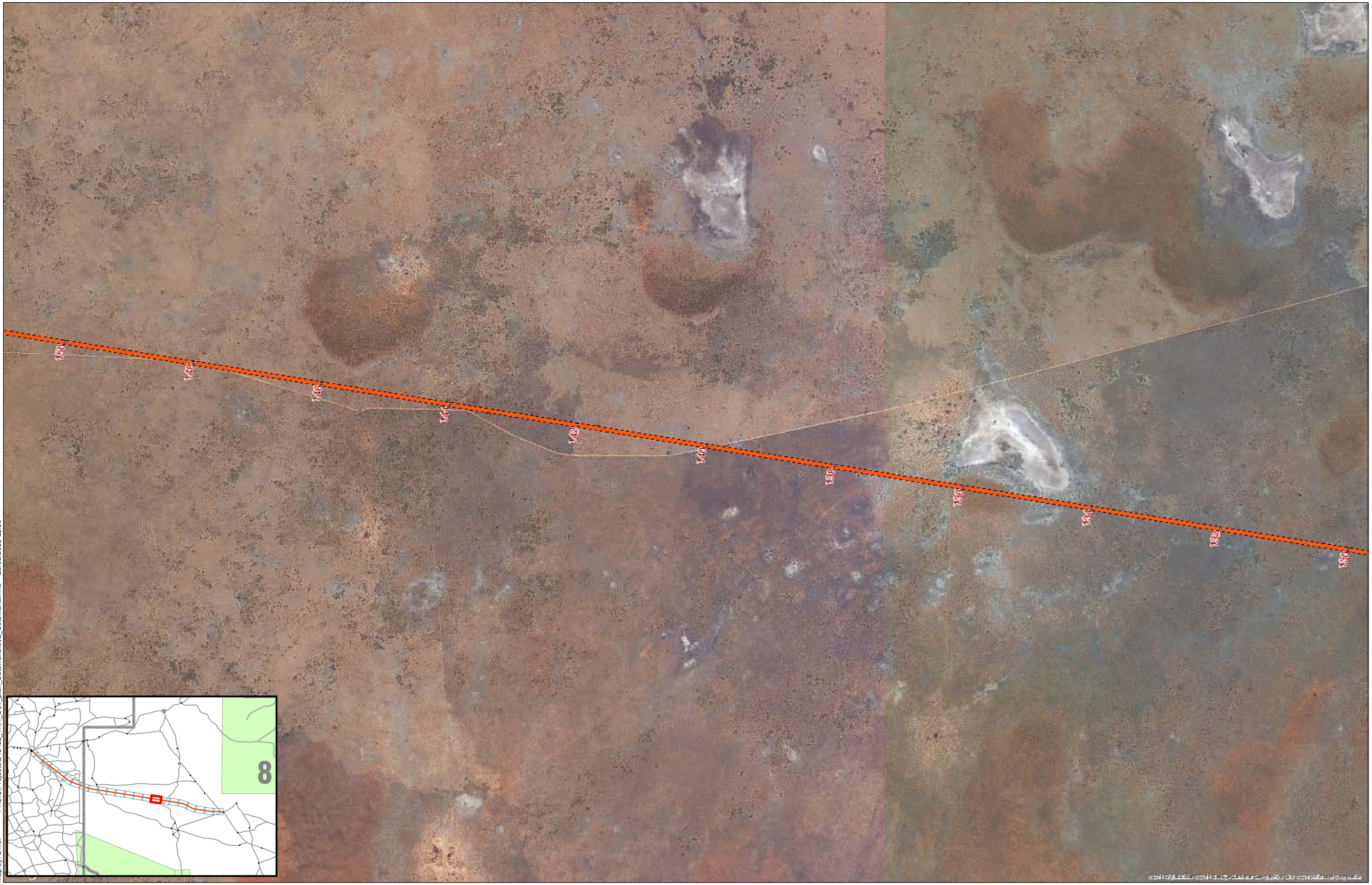

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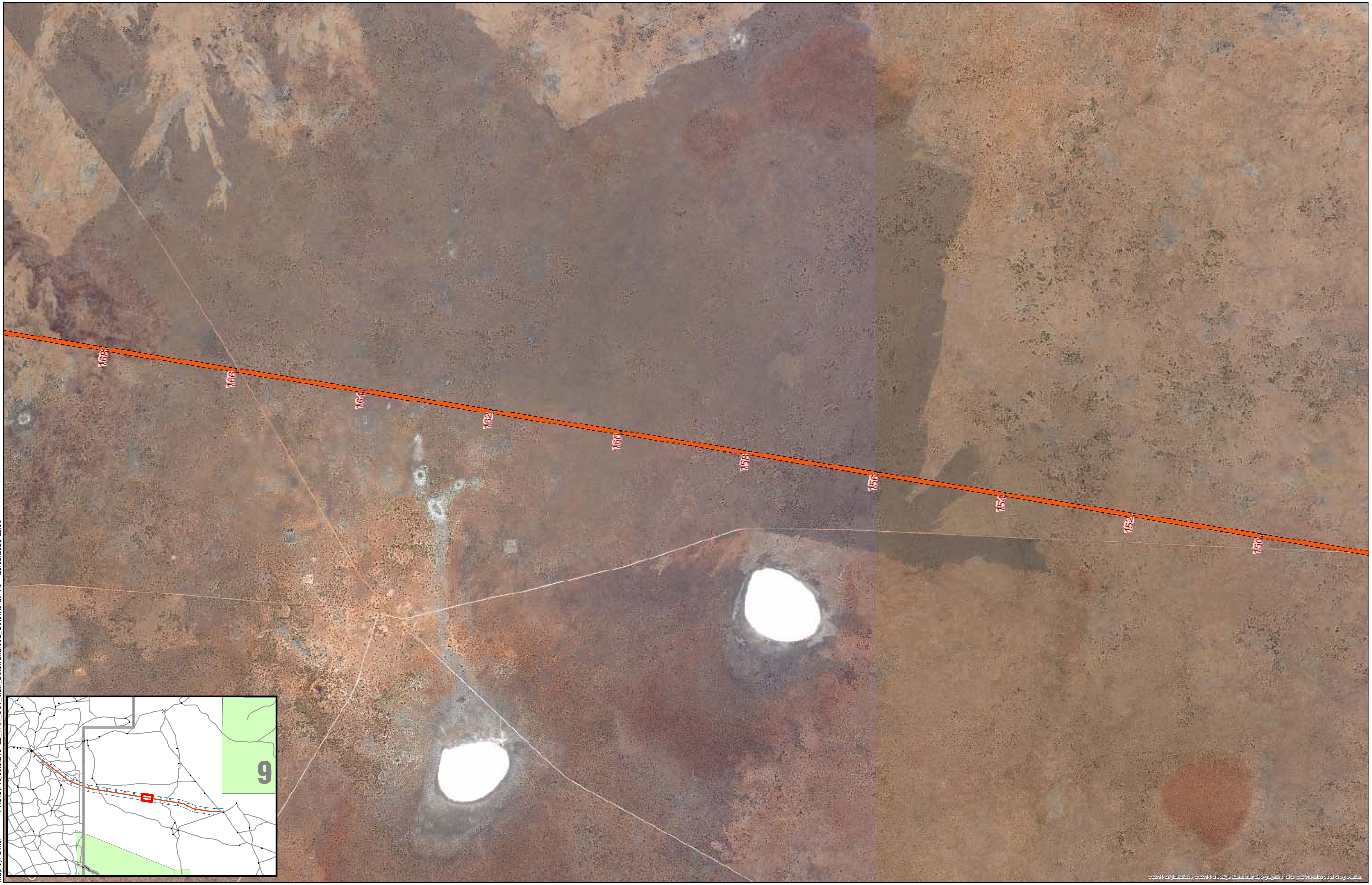

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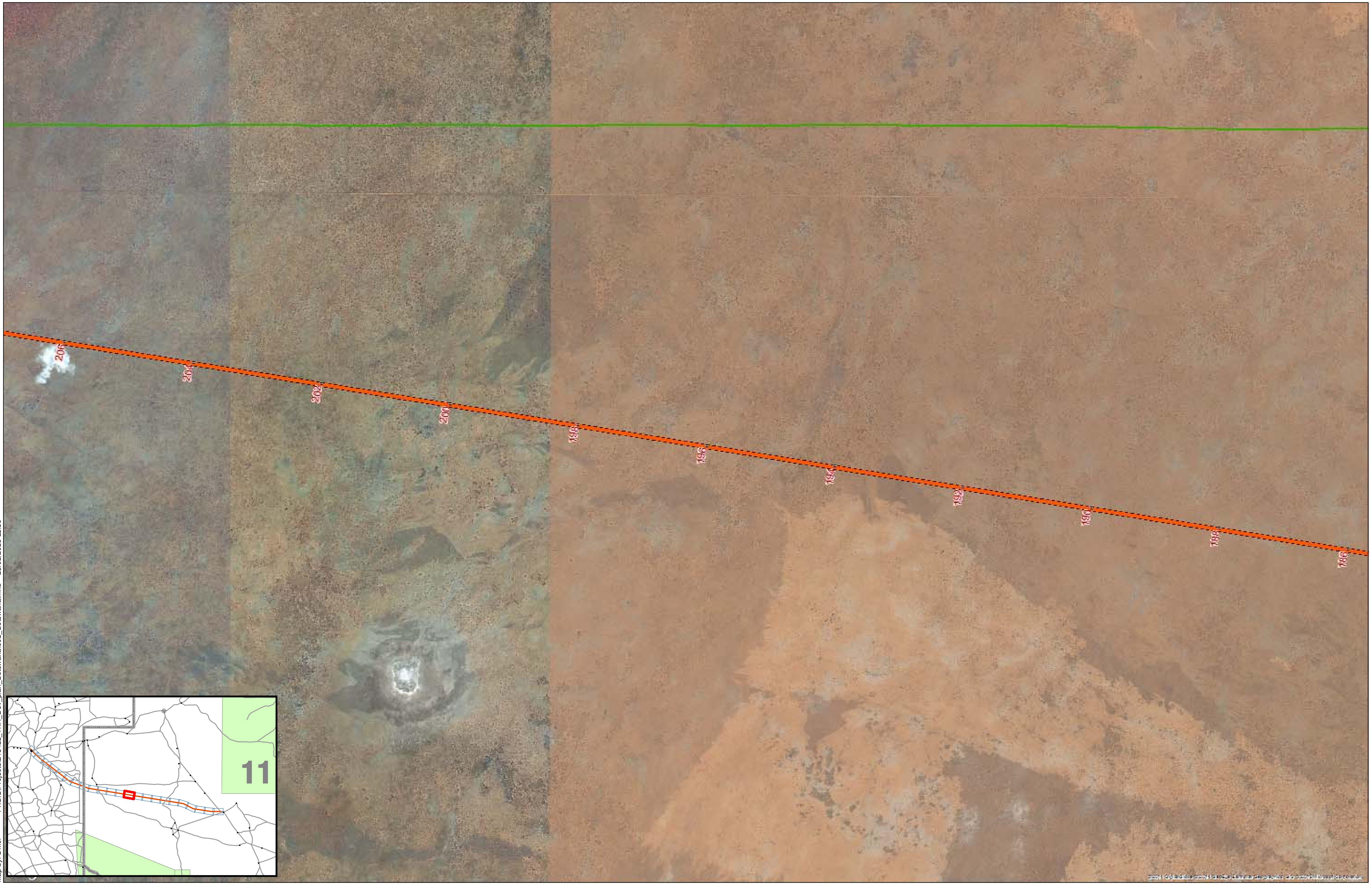

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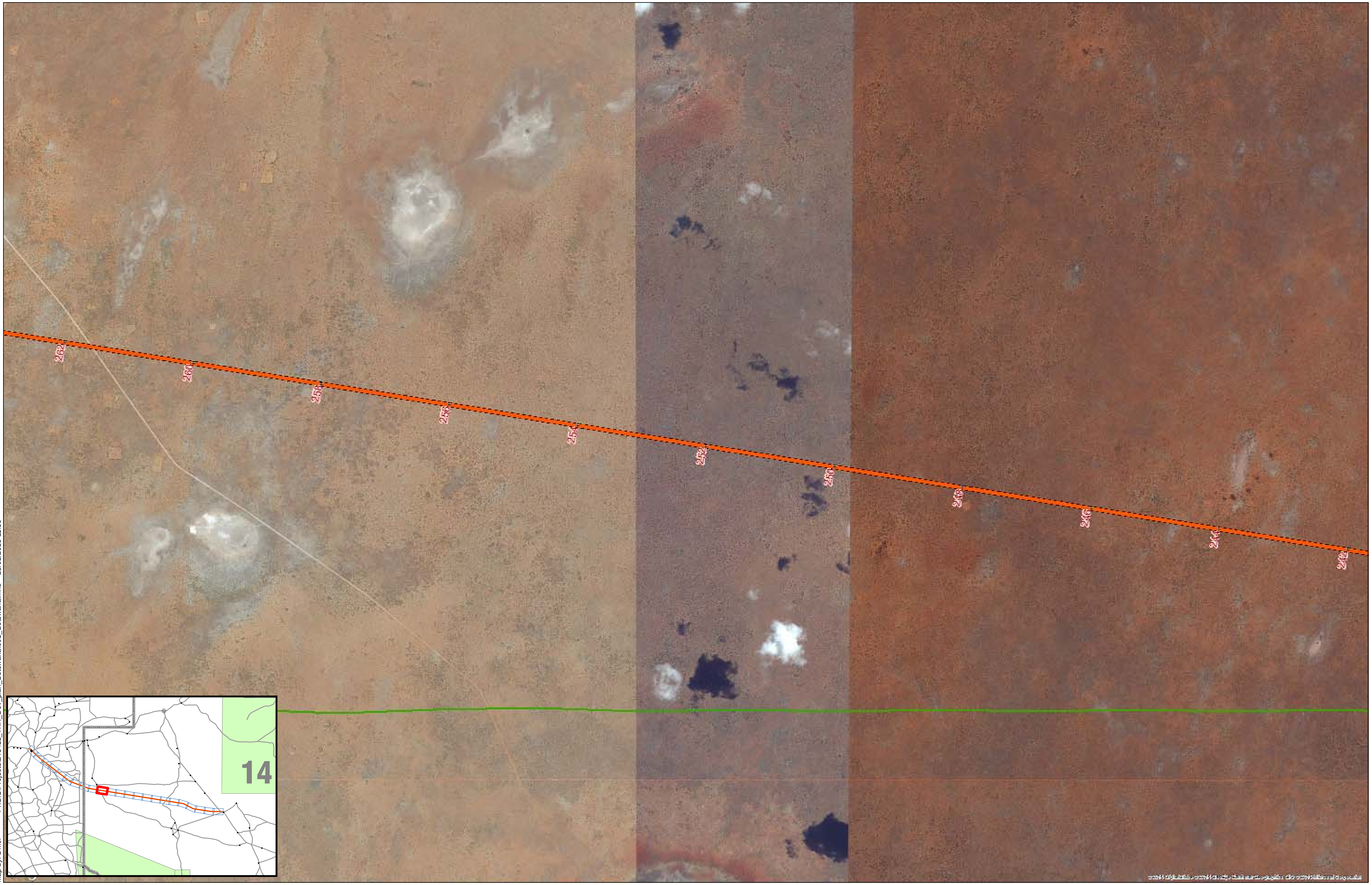

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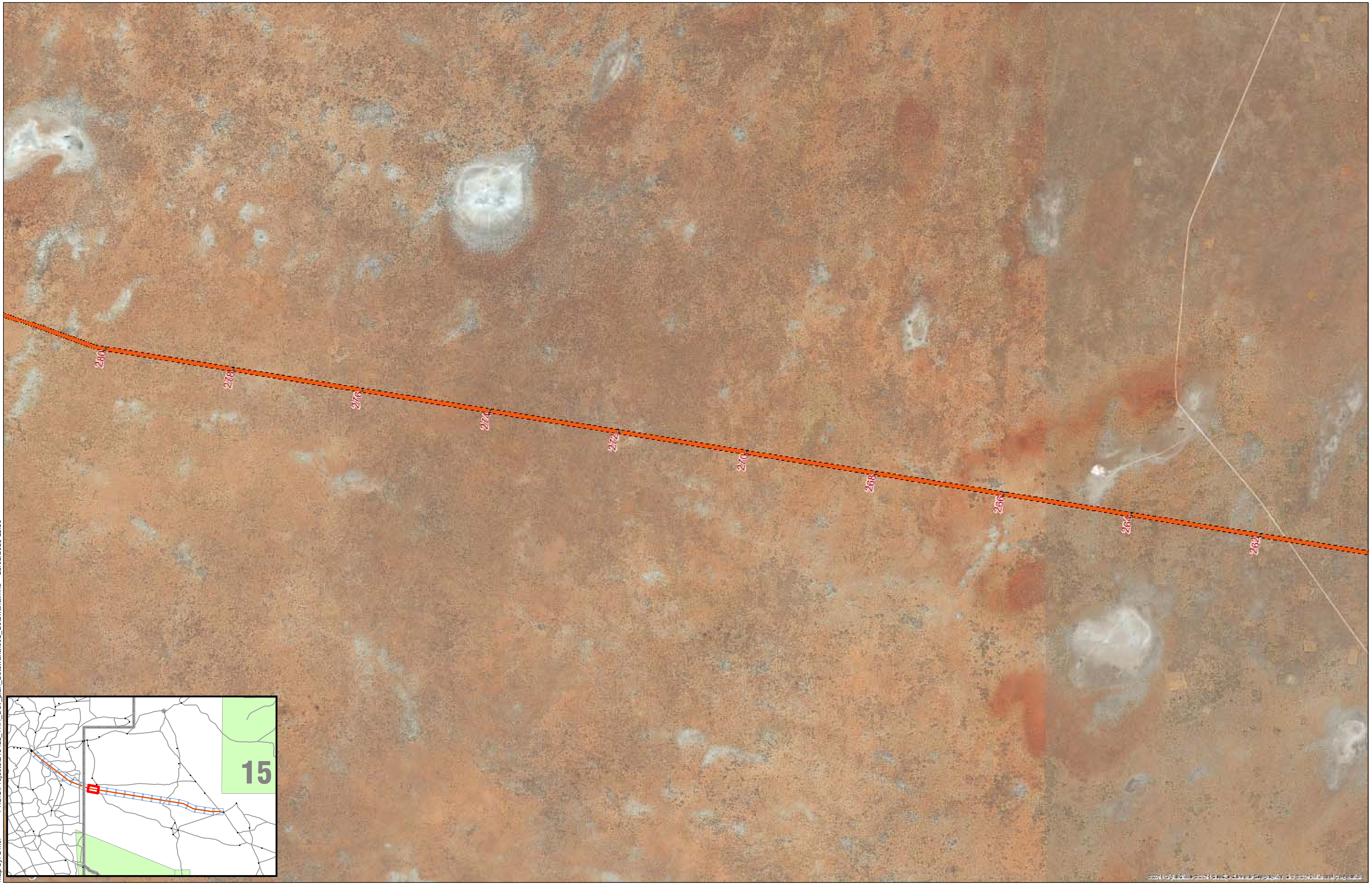

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Trans-Kalahari Rail Study

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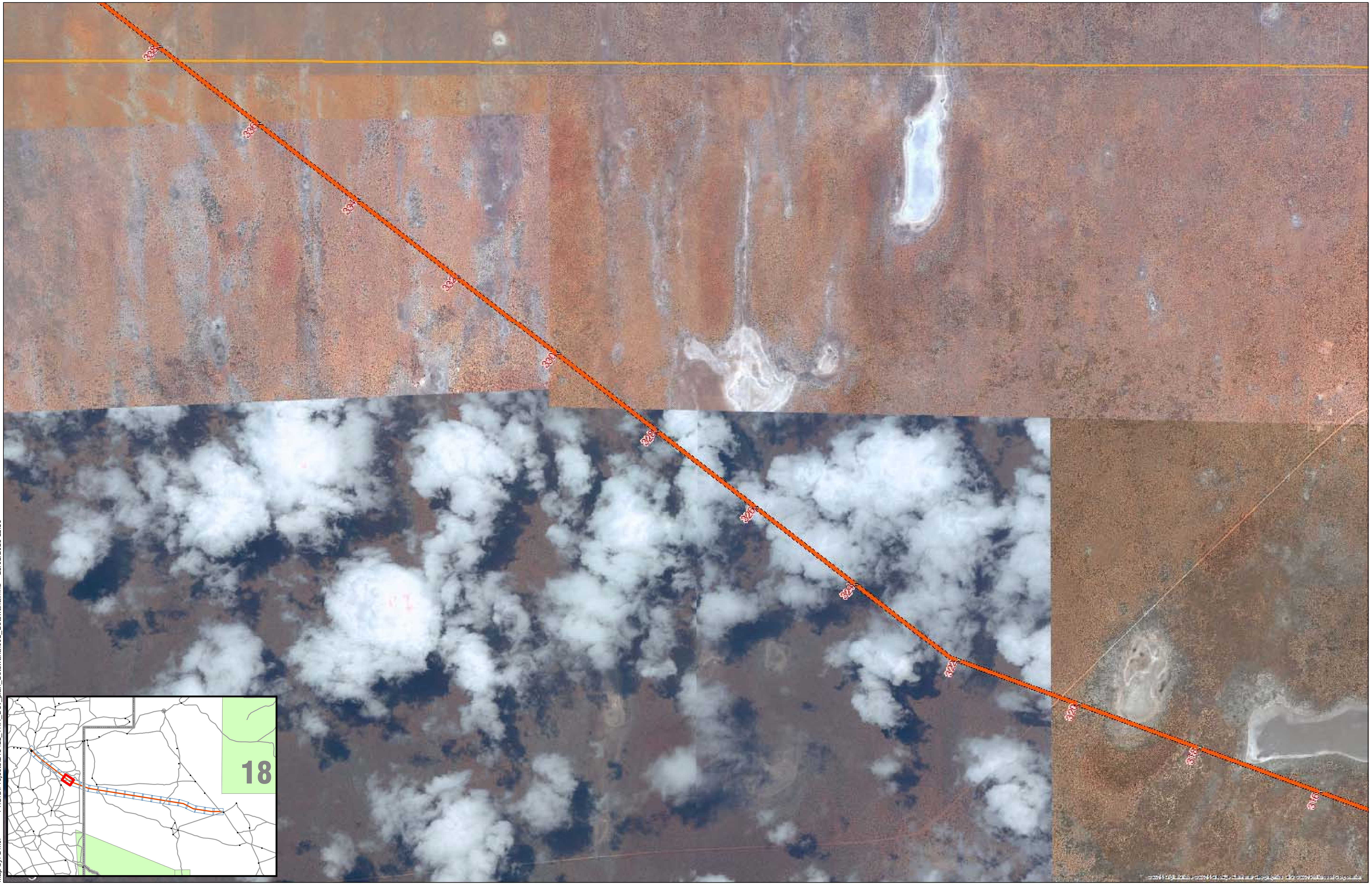

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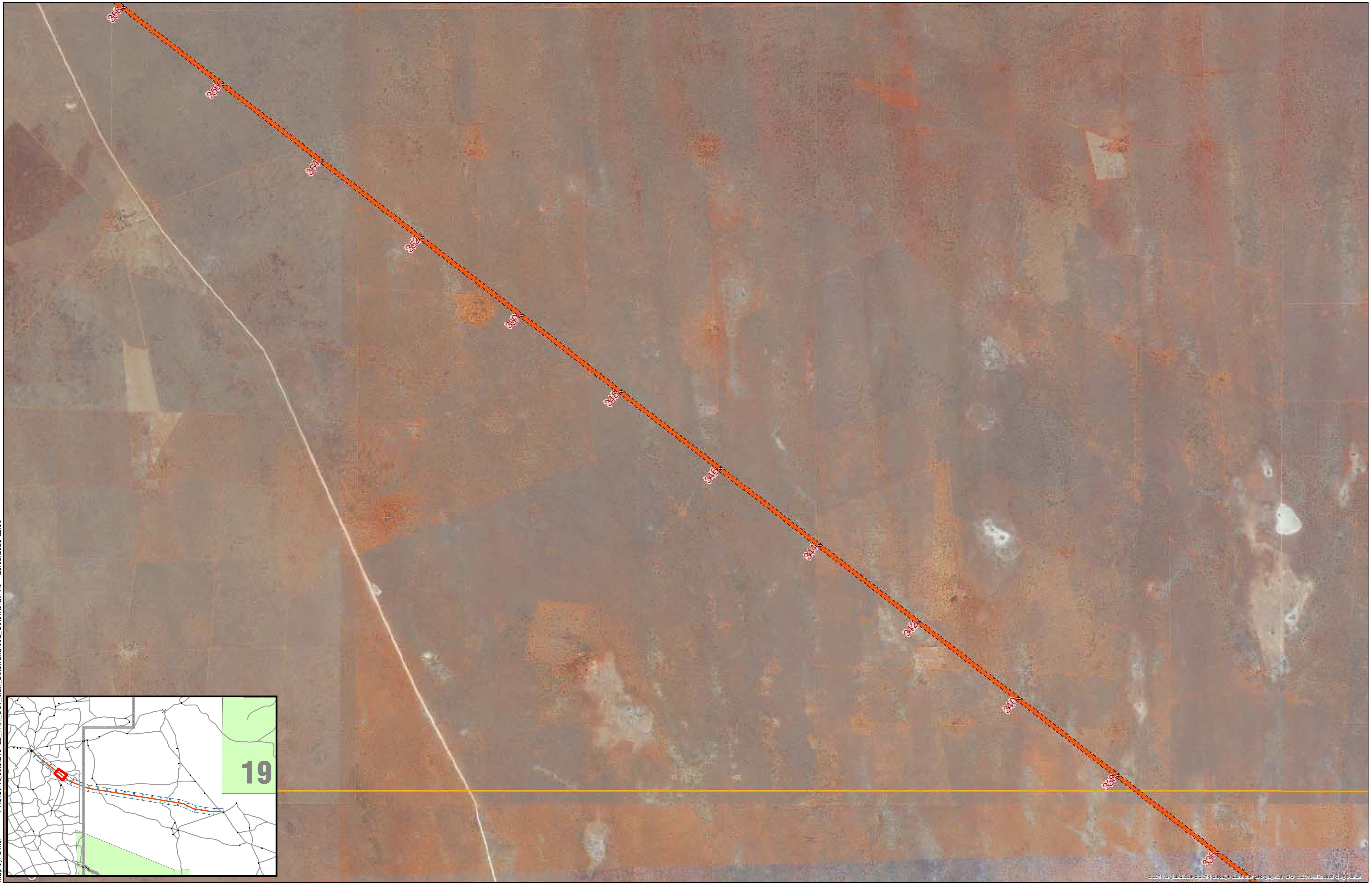

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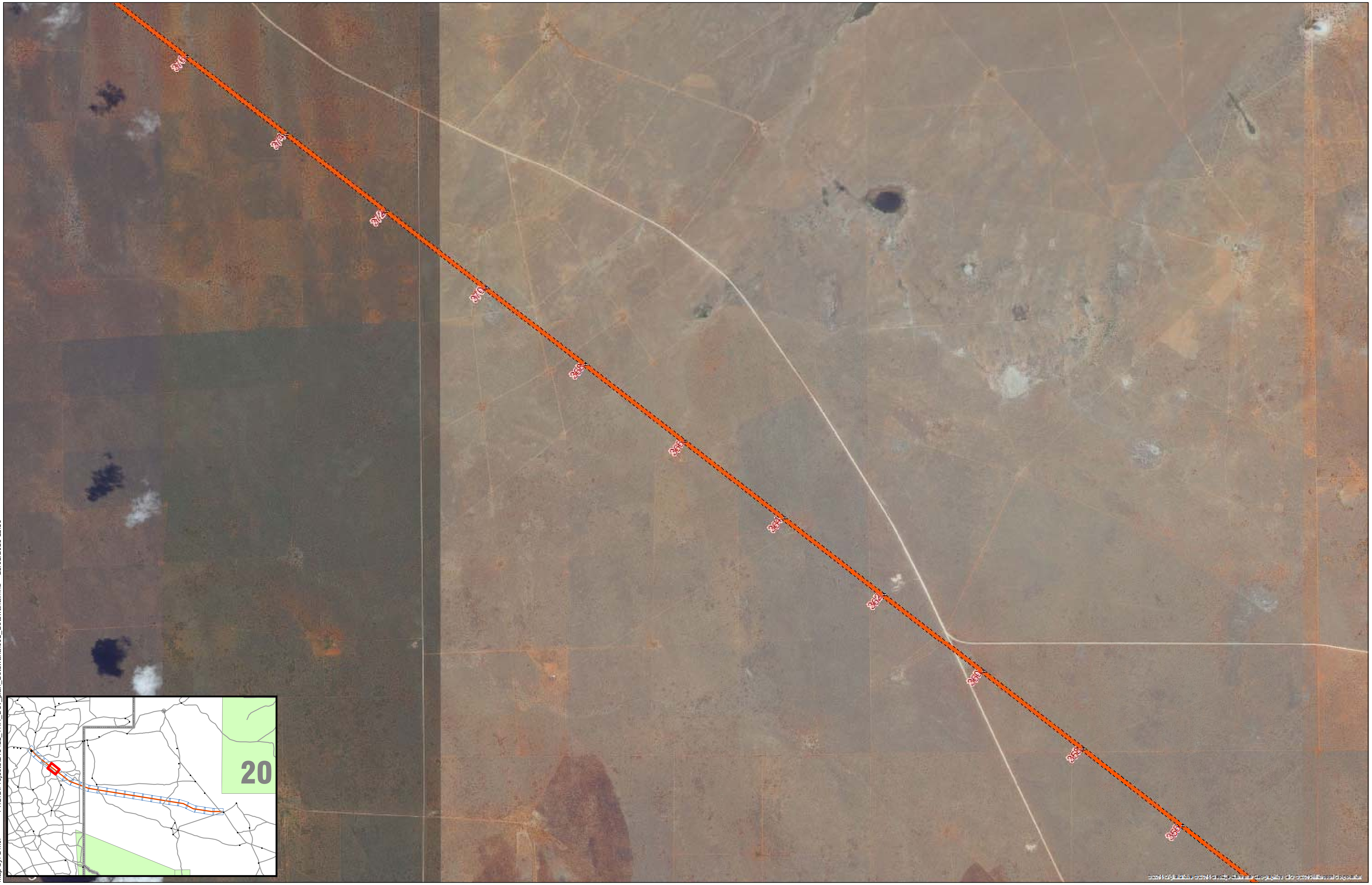
Date: 23/01/2015 Version: 0 Job No: 243411

Coordinate system: GCS_WGS_1984 Source:

Trans-Kalahari Rail Study

Schwelle Bypass route



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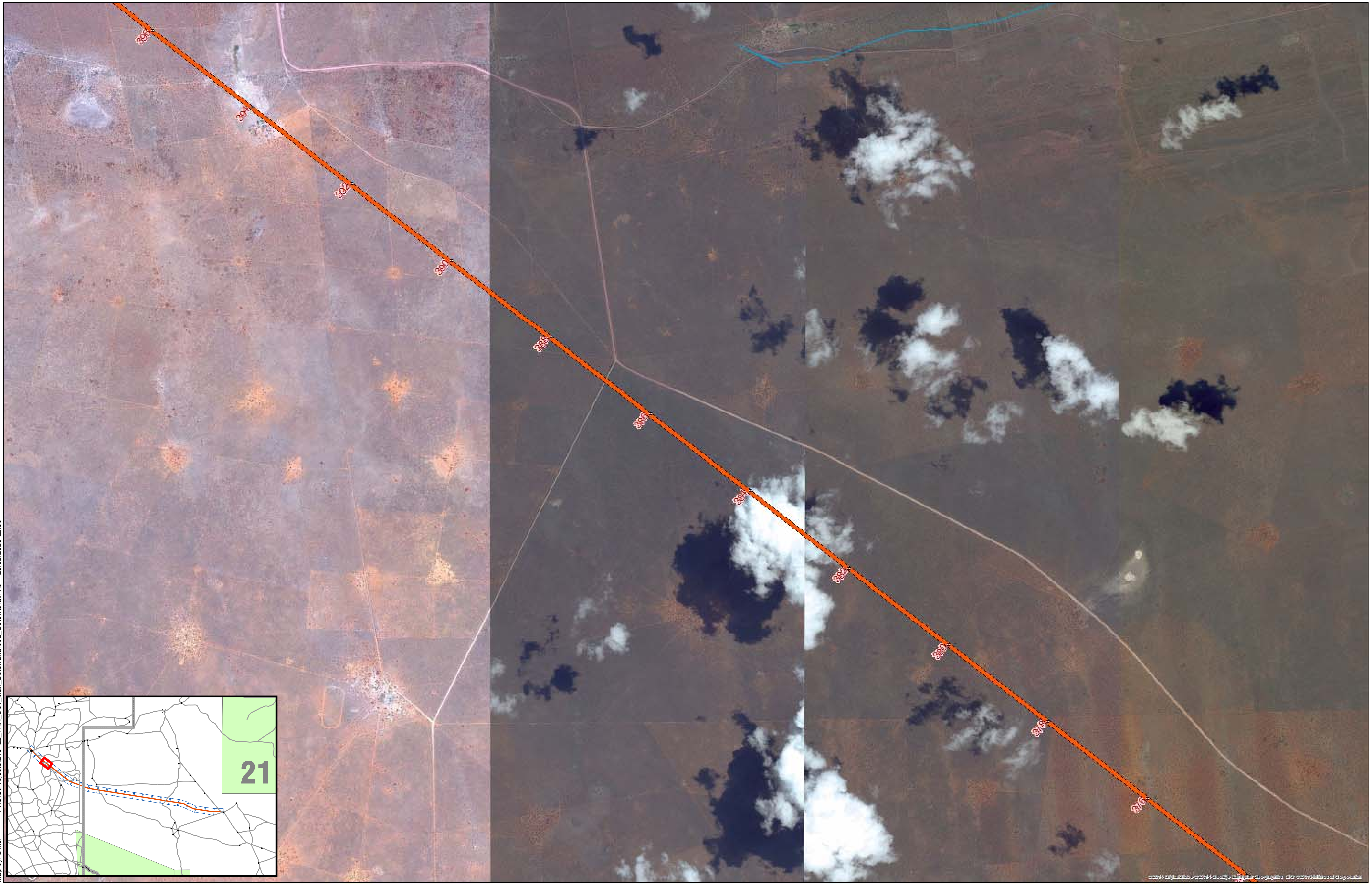

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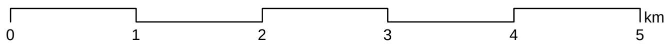

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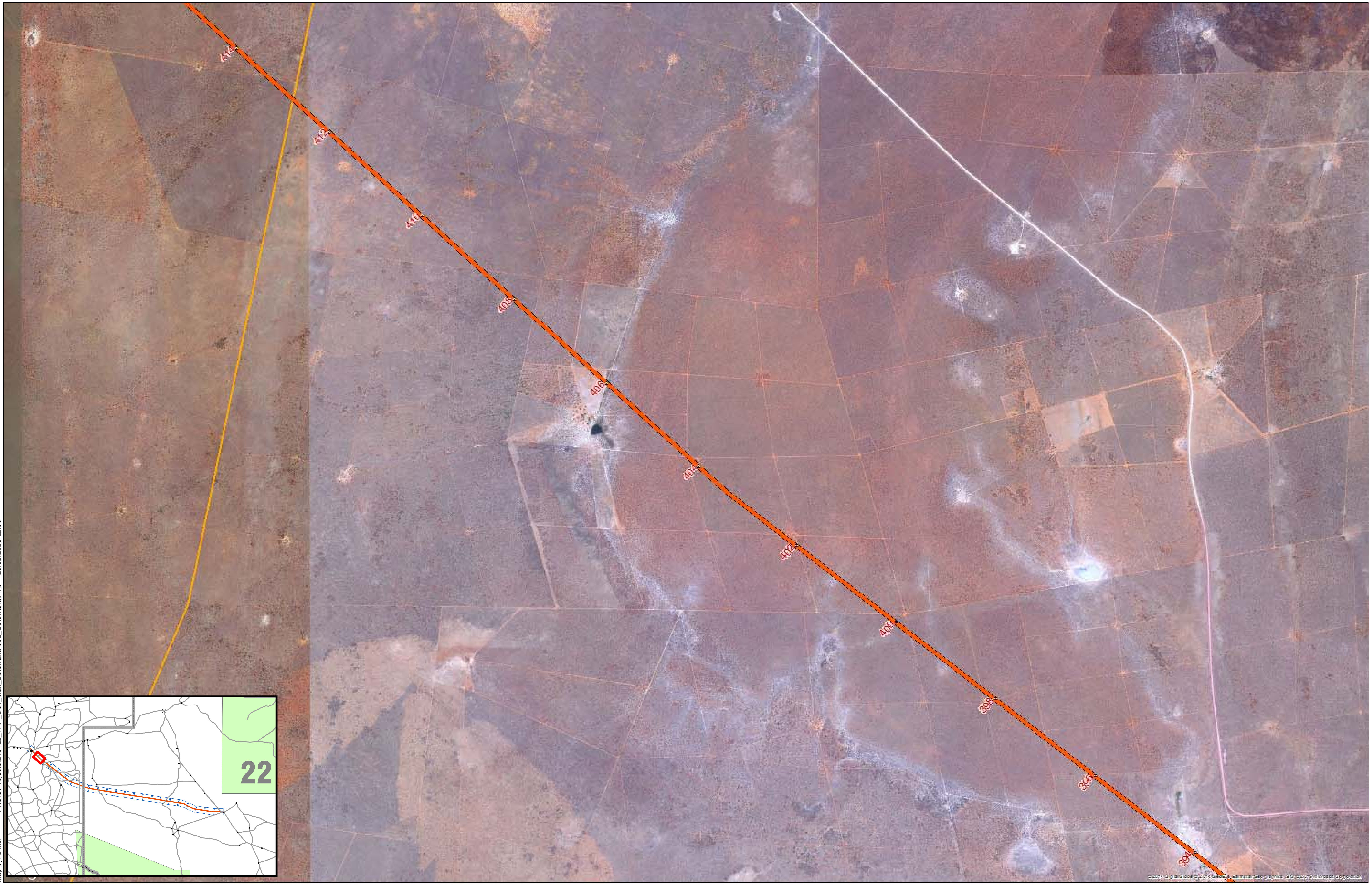

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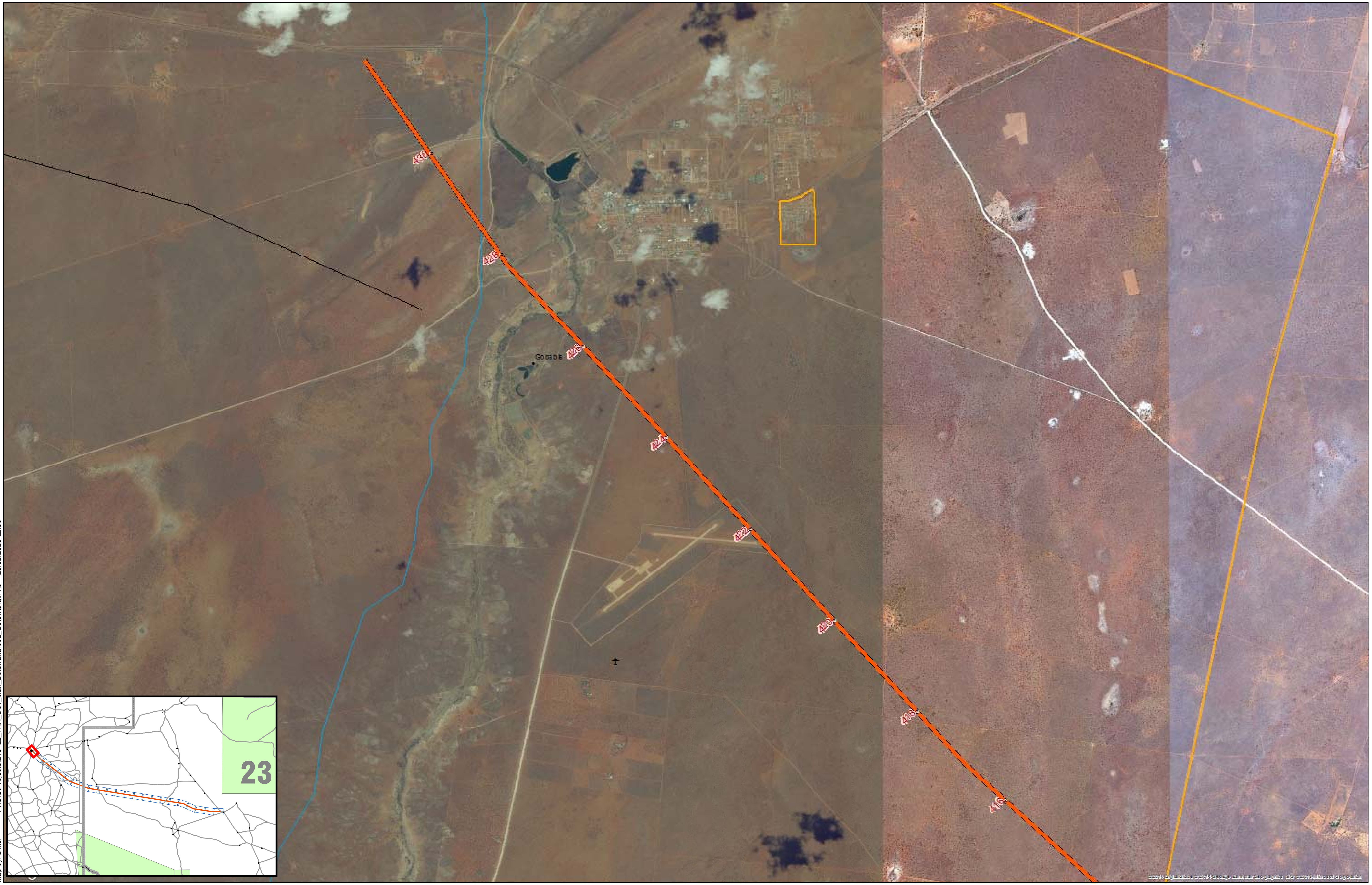

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Trans-Kalahari Rail Study

Schwelle Bypass route

Appendix E
Deloitte Financial and Commercial Assessment

Deloitte.

Trans-Kalahari Rail and Port project
Preliminary financial and commercial assessment

27 January 2015 – Rev B

FINAL DRAFT FOR COMMENT

A Trans-Kalahari Rail and Port project would provide a rail line from the coal basins in Botswana to the Walvis Bay port in Namibia thereby enabling the export of currently untapped coal reserves in Botswana.

This report provides a preliminary financial and commercial assessment of the project.

The findings are preliminary in nature and subject to further refinement.

Deloitte.

Deloitte Touche Tohmatsu
ABN 74 490 121 060

Riverside Centre
Level 25
123 Eagle Street
Brisbane QLD 4000
GPO Box 1463
Brisbane QLD 4001 Australia

Tel: +61 (0) 7 3308 7000
Fax: +61 (0) 7 3308 7003
www.deloitte.com.au

27 January 2015

Mr Ken Devencorn
Technical Director, Resources & Manufacturing Services
Aurecon
Level 14, 32 Turbot Street
Brisbane QLD 4000 Australia

Dear Mr Devencorn,

Please find enclosed our report on the preliminary financial and commercial assessment of the Trans-Kalahari rail and port project.

This report has been written in accordance with our contract dated 8 September 2014. The report may be relied upon by your client, the Government of Botswana, in describing the preliminary financial and commercial assessment of the project as of 22 January 2015. Deloitte disclaims all liability to any party other than the Government of Botswana for all costs, loss, damage and liability that the third party may suffer or incur arising from or relating to or in any way connected with the provision of the deliverables to a third party without our prior written consent. You have agreed that you will not amend the report or distribute the report to outside parties (other than as a part of the deliverables to be submitted to your Client under the project) without prior written approval from Deloitte. If others choose to rely on the report in any way they do so entirely at their own risk.

As per our scope of works, we have not sought to independently verify the accuracy of publically available data or the information provided to us by Aurecon, in particular the capital cost estimates.

For all enquires on this report please contact Ben Ellis (Director). Ben's contact details are benellis@deloitte.com.au or +61733087491.

Yours sincerely

Mark Ingham
Partner
Deloitte Touche Tohmatsu

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2. World coal market	8
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Glossary

Table 1: Glossary

Term	Definition
Above rail	Rail transport services provided by passenger and freight transport operators. Does not include ownership of rail tracks (see Below Rail).
Access arrangement	An arrangement for third party access to a railway provided by the Project Company.
Anchor mine	A large mine upon which the entire infrastructure project (rail and port) can be underwritten (i.e. to secure project finance).
Bank guarantee	A form of on demand guarantee issued by a bank.
Below rail	Provision of rail infrastructure services to freight and passenger rail transport operators, including rail tracks and associated infrastructure such as signalling.
Brownfield	Project involving refurbishment of an existing facility, or building on a site where there have previously been major structures.
Capex	Capital costs. Usually, the initial costs of construction the project.
Concession agreement	A PPP contract relating to a Concession to operate a project.
Concessionaire	The private sector party to a Concession agreement.
Cross border risks	Risks which arise when a loan or investment is made from one country to a project in another.
Debt	Finance provided by the lenders.
Debt service	Payment of interest and debt principal instalments.
Discount rate	The percentage rate used to reduce a future cash flow to a current value.
Due diligence	Review and evaluation of the proposed contracts between parties and their related risks. Carried out by lenders and the Government.
Equity	The proportion of the project's capex contributed by the investors to the Project Company, either as capital or subordinated debt.
Greenfield	Project involving construction a completed new facility, or building on a site where there have previous been no major structures.
Hand back	Return of the project (facility) to the Government at the end of the PPP contract.
Hurdle rate	The discount rate or minimum IRR used to determine if an investment produces the minimum required return.
Investment bank	A bank which organises PPP investment funds but does not provide debt.
Investors	Sponsors and other parties investing equity into the Project Company.
IRR	Internal rate of return. The rate of return on an investment calculated from its future cash flows.
KPI	Key performance indicators. Used to measure service standards under the PPP contract.
Lenders	Banks or bond investors.
Limited recourse loan	Finance with limited guarantees from the Sponsors.
Middlings	Low energy coaly material, usually as a by-product of the coal washing process.
Opex	Operating costs.
PPP	Public-private partnership. A contract under which the private sector party invests in a facility to provide a service on behalf of the Government.
PPP contract	The contract between the Government and the Project Company does the design, construction, finance and operation of the project.
Project Company – Project Co	The SPV which is the Government's counterparty under the PPP contract.

Term	Definition
Project finance	A method of raising long term debt financing for major projects based on lending against the cash flow generated by the project alone. It depends on a detailed evaluation of a project's construction, operating and revenue risks and their allocation between investors, lenders and other parties through contractual and other arrangements.
Ramp up	The early years after construction of a project, when the usage is still building up.
Richard's Bay benchmark	Richard's Bay thermal coal spot price is the benchmark price for most South African thermal coal sold on shorter-term contracts.
SPV	Special purpose vehicle. A legal entity with no activity other than those connected to its borrowing to develop the project.
Sponsors	The investors who bid for, develop and lead the project through their investment in the Project Company.
Subordinated debt	Debt provided by investors whose debt service is paid after amount due to the lenders but before payments of dividends.
Tariff	Payments under a contract (i.e. access arrangement).
Thermal coal	Thermal coal - is mainly used in power generation. Coking coal - also known as metallurgical coal - is mainly used in steel production.
WACC	Weighted Average Cost of Capital. The weighted average of the costs of a company's equity and debt funding.

1. Introduction

1.1 Overview

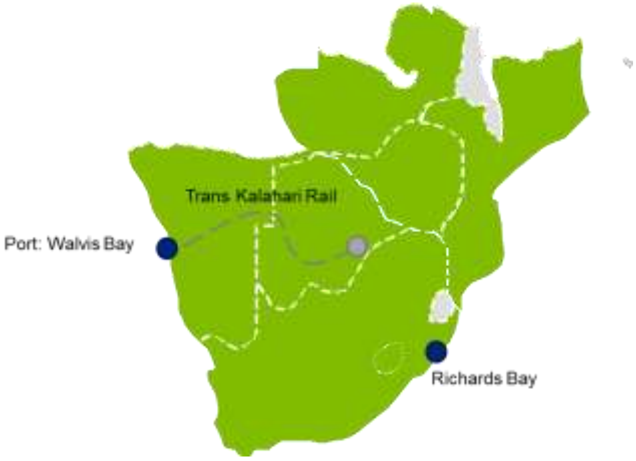
Deloitte Touche Tohmatsu (Deloitte) was engaged by Aurecon Australasia (Aurecon) to undertake a preliminary financial and commercial assessment of the proposed Trans-Kalahari Rail (TKR) and Port project. Aurecon was engaged by the Government of Botswana to prepare a Development Plan for the project. The preliminary financial and commercial assessment undertaken by Deloitte forms a key input to the development plan for the project. The purpose of this study is to inform future Government decision-making about the project by:

1. Assessing the financial viability of potential mines using the project based on a mine to port financial modelling.

2. Assessing the key commercial factors of the project.

The project will connect the undeveloped coal fields in Botswana via new rail infrastructure to a new port in Walvis Bay, Namibia. The proposed rail connection will be in excess of 1,500km (Figure 1).

Figure 1: The Trans-Kalahari Rail and Port project



Team

This report has been developed by Deloitte Australia’s transport economics and infrastructure advisory practice. To assist in the development of this report Deloitte engaged specialist advisory firm Nine-Squared Pty Ltd who are expert economic and commercial advisors in the transport and resources sector, and Enable Advisory Pty Ltd who are expert advisors in mining capital and operating cost estimation.

Structure of report

The report is structured as follows:

- Chapter 2 provides a brief description of the world coal market.
- Chapter 3 describes the results of the financial modelling including the mining, rail and port costs.
- Chapter 4 investigates the potential commercial factors affecting the project.
- Chapter 5 concludes the report and outlines any implication of the assessment on the project.

2. World coal market

2.1 Introduction

This chapter provides an overview of the world coal market and the potential outlook for coal based on estimated global energy needs. This chapter also provides country briefings on a selection of major competitors to Botswana coal and also likely export markets. The likely competitors to Botswana coal include Indonesia, Australia and South Africa, while the likely export markets include India, China, Japan and South Korea. China and India were selected as they are expected to be the primary market for coal of Botswana quality. Japan and South Korea were chosen as they are large importers of coal. In particular, Japan is facing new challenges regarding energy production as the country considers a shift away from nuclear. Germany was selected as a representation of the European market. It is important to consider Europe given its geographic proximity to potential Botswana coal exports.

2.2 World energy outlook

Over the period to 2035, coal is expected to continue as the second highest used energy source globally behind oil and ahead of gas, biomass, nuclear, hydro and other renewables. However, there is a significant part of the oil and coal markets which do not overlap as oil is primarily used for transport fuel while coal relates to stationary energy sources. Renewables and nuclear energy are expected to realise significant increases in demand while gas is expected to close much of the gap and approach the demand levels of coal[1].

Table 2 shows, China is expected to be the primary source of energy demand in 2035 at almost twice the level of the United State on a country by country basis. While China is expected to be responsible for the largest proportion of energy demand, India is expected to take over as the principal source of growth between 2020 and 2030.

Table 2: Forecast primary energy demand in 2035

Country	Energy Demand (Mtoe)
China	4,060
United States	2,240
Europe	1,710
India	1,540
Eurasia	1,370
Middle East	1,050
Africa	1,030
Southeast Asia	1,000
Brazil	480
Japan	440

Source: World Energy Outlook 2013, International Energy Agency

2.3 African energy outlook

African Energy Forecasts suggest that the sub-Saharan energy system is likely to expand rapidly to 2040 in line with the demands placed upon it. More specifically, population is forecast to double to 1.75 billion, the economy is likely to quadruple and energy demand is expected to increase by approximately 80 per cent. It is also noted, however, that despite improvements to efficiency and

[1] Prof. Dr. F.-J. Wodopia, EURACOAL
http://unctad.org/meetings/en/Presentation/SUC_MEM2014_09042014_WODOPIA.pdf

capacity challenges still exist in meeting this forecast energy demand, including large scale infrastructure investments required to produce and deliver energy to end user[2].

While the growth in demand appears significant, total energy demand grows in absolute terms by less than 40 per cent that of China and less than 50 per cent that of India, despite overtaking both in terms of population. Sub-Saharan Africa is expected to account for 20 per cent of global population while only accounting for 5 per cent of global energy demand, indicating that the energy demand per capita is much lower when compared to India and China. This reflects the unique economic development and industrialisation characteristics present in Sub-Saharan Africa. Similarly, energy intensity of production is forecast to decline over the period to be 55 per cent lower than in 2012. This is due to the low efficiency levels of current energy production resulting from aging generation technology and fuel input quality. As these improve over the period, the required level of energy input is expected to decline.

Energy demand in sub-Saharan Africa is forecast to increase by approximately 50 per cent by 2040. Despite this increase, the share of energy derived from coal is expected to decrease over the period from the current 18 per cent to 15 per cent. The table below shows the forecast primary energy demand in Africa for 2012 and 2040.

Table 3: Primary energy demand in Africa – Forecast (millions of tonnes oil equivalent, Mtoe)

Country	2012		2040	
	Coal	Total	Coal	Total
Africa	105	739	164	1,322
North Africa	4	170	10	284
Sub-Saharan Africa	101	570	154	1,039
West Africa	0.4	197	15	355
Central Africa	0	37	0	81
East Africa	0.4	112	11	232
Southern Africa	101	223	127	371

Source: African Energy Outlook, International Energy Agency, pg. 78

At present, South Africa and Mozambique form the largest African coal exporters with South Africa being the sixth-largest coal exporter in the world. Despite South Africa historically being the main supplier of coal to Europe (almost exclusively steam coal), export flow has been increased to the Pacific basin due to higher demand for coal of this quality and higher prices. Estimates have the free on board (FOB) costs falling in the range of $40-$70 per tonne. Despite these advantages, production from major areas (such as the Mpumalanga province) is set to decline. As production begins to decline in the existing areas, there may be a need to develop other coal producing regions such as the Waterberg fields near the Botswanan border. This, in turn, would require major investment in rail transportation and potentially investment in port infrastructure. Mozambique focuses primarily on coking coal and, as such, is not focused on in this assessment.

2.4 Importing countries

The world's top ten importers of coal are provided in Table 4. China, India, Japan, South Korea and Germany are expected to be the markets initially targeted as buyers of Botswanan coal. These major importing countries represent 57.5% of total global coal imports.

[2] African Energy Outlook, International Energy Agency

Table 4: Top ten global thermal coal importers (2011 to 2013)

Country	Coal Imports (Mt 2011)	Coal Imports (Mt 2012)	Coal Imports (Mt 2013e)	Proportion of total global imports (2013)
China	177.6	235.2	250.1	23.3%
India	98.2	128.8	142.2	13.3%
Japan	121.6	131.6	141.8	13.2%
South Korea	96.9	92.7	95.5	8.9%
Chinese Taipei	60.6	61.5	61.5	5.7%
United Kingdom	26.6	39.7	43.2	4.0%
Germany	39.1	39.8	42.7	4.0%
Malaysia	21.9	22.6	23.1	2.2%
Russia	27.9	26.7	22.9	2.1%
Netherlands	20.1	20.3	21.9	2.0%
Other	225.9	232.3	227.6	21.2%
Total	**916.4**	**1,031.2**	**1,071.5**	**100%**

Source: Coal Information 2014, International Energy Agency

2.5 Exporting countries

The world's top 10 exporters are provided in Table 5. South African exports represent a small part of the global leaders. Australia and Indonesia form the majority of the total global exports. Additionally, their proximity to major importers such as Japan, China, South Korea results in a comparative transport cost advantage.

Table 5: Top ten global thermal coal exporters (2011 to 2013)

Country	Coal Exports (Mt 2011)	Coal Exports (Mt 2012)	Coal Exports (Mt 2013e)	Proportion of total global exports (2013)
Indonesia	353.4	384.3	423.3	41.2%
Australia	144.1	159.2	182.1	17.7%
Russia	109.6	112.5	117.5	11.4%
Columbia	77.8	81.7	72.9	7.1%
South Africa	68.4	75.3	71.8	7.0%
United States	34.1	50.6	47.1	4.6%
Kazakhstan	29.8	30.0	32.3	3.1%
DPR of Korea	11.2	12.0	16.7	1.6%
Viet Nam	17.2	15.2	12.0	1.2%
Netherlands	12.5	13.7	10.8	1.1%
Other	51.6	44.1	41.3	4.3%
Total	**909.7**	**978.6**	**1,027.8**	**100%**

Source: Coal Information 2014, International Energy Agency

2.11 Coal prices

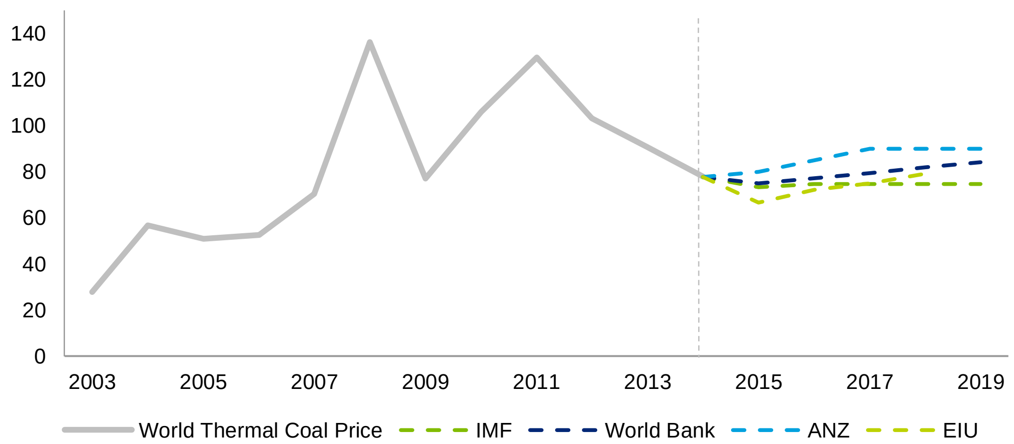
The price of thermal coal rose dramatically between 2003 and 2008 (see Figure 2). A booming world economy driven by the rapid industrialisations of Brazil, Russia, India and China (the BRIC countries) caused worldwide electricity demand to skyrocket, driving up input prices. As a result, the world price of thermal coal rose 287% from 2003 ($27.95/Mt) to 2008 ($136.18/Mt)[3]. The price of thermal coal peaked in July 2008 at $192.86/Mt due to several factors, namely unseasonably cold weather in China increasing electricity demand, flooding in Queensland (Australia) disrupting supply and high crude oil and natural gas prices driving energy demand toward coal. Demand fell sharply following the global financial crisis in late 2008, causing coal prices to drop to $77.03/Mt in 2009.

[3] Thermal coal is used for its heating value, typically in electricity generation. The Australian export price from Newcastle/Port Kembla represents the world price as Australia accounts for about 60.0% of the world's coal exports.

As the world economy recovered over 2010, coal prices rebounded, averaging $106.03/Mt. In the subsequent year coal mines in Queensland again saw widespread flooding in early 2011. Because Australian mines account for about 60.0% of the world's coal exports, the flooding severely restricted worldwide supply, with average price of $129.61/Mt for the year.

As global economic growth stalled in 2012 and 2013, inventory stockpiles remained high around the world, depressing prices. As a result, the price fell 20.3% 2012 and 12.2% in 2013. Furthermore, miners are tied to rail and port contracts that oblige them to pay shipping costs even if they do not ship any product which makes it is difficult for coal producers to scale back production in an effort to decrease supply and push up prices. Miners therefore typically continue to ship coal at low prices, at a smaller loss than if they did not ship any at all. This predicament has kept miners putting more coal into the market, pushing prices down[4].

Figure 2: World Thermal Coal Price (US$/Mt)



Source: IMF as of October 2014. Note: world price is based on Australian thermal coal (~6,667kcal/kg, less than 1% sulphur, 14% ash, Newcastle/Port Kembla)

The world price of thermal coal is forecast to remain close to current levels according to IMF projections (as of November 2014). The growth of the BRIC economies is projected to slow which will result in lower electricity demand growth. This is expected to keep forecast prices at close to current levels in the short term. Official projections from the IMF as of November 2014 are shown in Table 6.

Table 6: Coal Price Projections (US$/Mt)

Coal	2015	2016	2017	2018	2019
IMF	$71.6	$74.7	$74.7	$74.7	$74.7
World Bank	$75.0	$77.2	$79.4	$81.8	$84.1
EIU	$66.7	$72.2	$75.0	$79.0	n/a
ANZ	$80.0	$85.0	$90.0	$90.0	$90.0
Average	**$73.3**	**$77.3**	**$79.8**	**$81.4**	**$82.9**

Source: (ANZ as of October 2014) http://knoema.com/xfakeuc/coal-prices-long-term-forecast-to-2020-data-and-charts

4 IBISWorld (2014)

3. Preliminary financial assessment

3.1 Approach

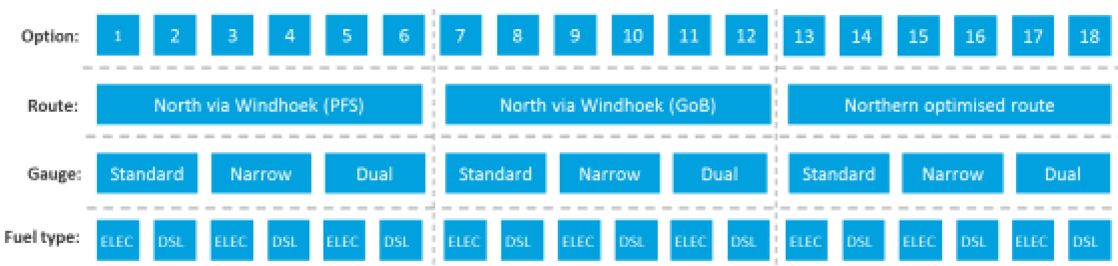
The financial viability of the TKR is dependent on its final development specification (including associated assumptions) and the impact of this on key stakeholders.

For the purpose of this study the TKR development specification was narrowed down to include the following three alignment options that link Botswana to Walvis Bay:

- **The northern route via Windhoek to Walvis Bay (PFS)**
  - The prefeasibility study identified a Northern route via Windhoek to Walvis Bay.
- **The Government of Botswana route (GoB)**
  - On March 2014 a Bilateral Agreement was signed between Botswana and Namibia approving a rail corridor for the TKR via Windhoek to Walvis Bay. This has been termed the GoB route alignment for the purpose of this report.
- **The optimised northern route (Optimised)**
  - Given the investment required for each additional kilometre of railway, Aurecon considered whether the GoB alignment could be optimised to reduce the total required km of track. Aurecon identified a number of potential efficiencies that have been modelled as the optimised northern route.

Each alignment option was given the potential to be developed as a standard gauge, dual gauge or narrow gauge railway with either an electrified or non-electrified (i.e. diesel) track. This resulted in a total of 18 options being assessed within the preliminary financial analysis (see Figure 3). Option 10 is designated as the project defined in the Bilateral Agreement.

Figure 3: Modelled options



Note: DSL = Diesel, ELEC = Electricity

Each option was considered from the perspective of key stakeholders including:

- Potential miners;
- the Governments of Botswana and Namibia; and
- Potential below rail and port investors.

This was considered critical as the incentives for each stakeholder vary and are in some cases negatively correlated, for example a lower mining royalty may benefit the miners but decrease the amount of tax collected by the Government. In order for the TKR to be viable, appropriate incentives need to exist for all key stakeholders. However, given that the commercial viability of all stakeholders will be dependent on the ability of the mines to make a profit from their operations this was the focus of the analysis.

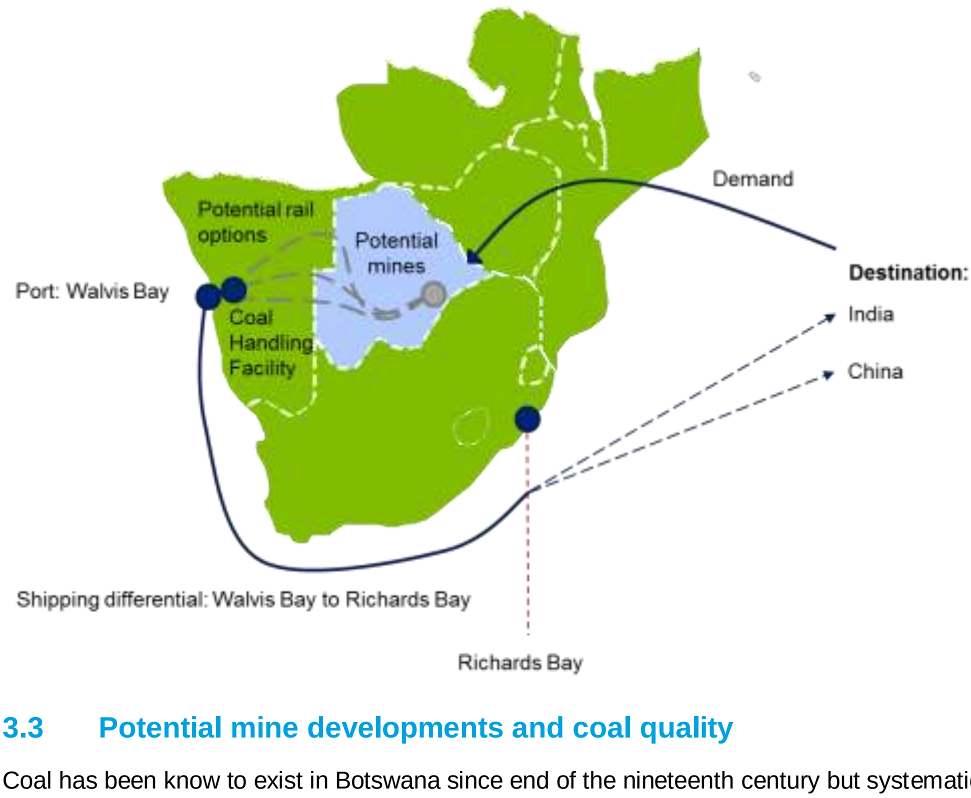
3.2 Model methodology

The model focussed on assessing the revenues and expenses attributable to each set of stakeholders across each element of the overall supply chain for the identified options. This included an assessment of the magnitude and quality of Botswana's current coal reserves and the potential global demand for this coal as well as the costs associated with key supply chain elements including:

- Potential mines
- Below rail infrastructure
- Above rail infrastructure and services
- Coal handling facility
- Port at Walvis Bay
- Shipping costs to potential customers

Each of these elements is discussed in turn below. Figure 4 provides an illustrative example of the different elements assessed as part of this project.

Figure 4: Botswana coal supply chain



3.3 Potential mine developments and coal quality

Coal has been know to exist in Botswana since end of the nineteenth century but systematic exploration did not begin until the late 1940s and Botswana's first (and only) coal mine began production in 1973.

Since 1970, interest in the coal resource of Botswana has attracted the attention of several companies and a significant area of the country has been explored for coal deposits of possible economic potential. This exploration has confirmed the presence of large resources of low-medium quality bituminous coal, which in certain areas responds to beneficiation (i.e. washing) to produce coal suitable for export markets.

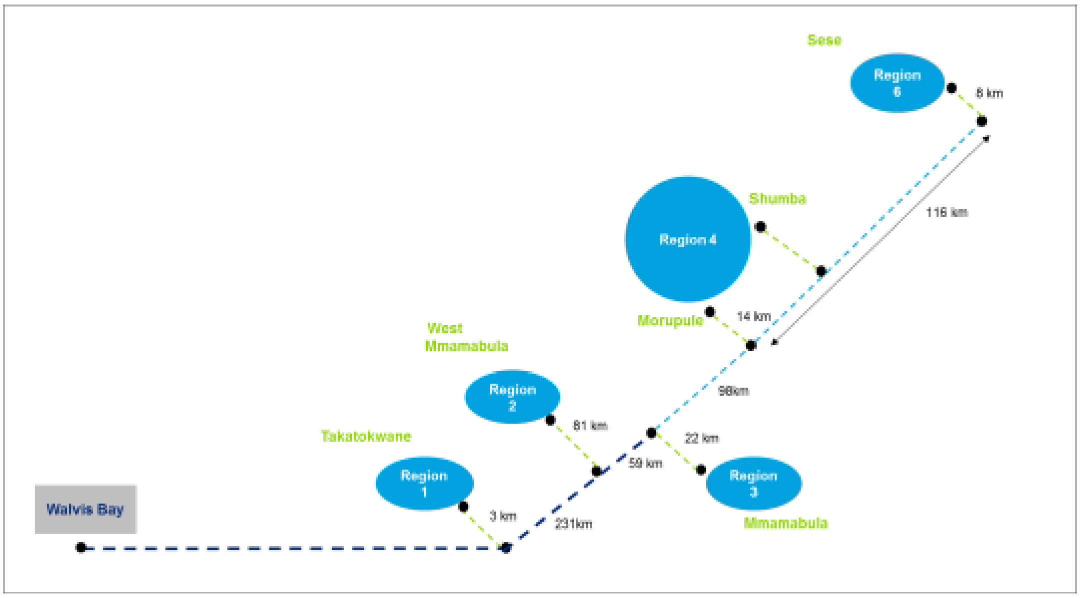
Development regions

The potential resource is currently controlled by a number of different mining companies that have bought exploration rights throughout the coal basin. These potential miners have published information on the quality of their deposits and it is this data that has been used as the basis for determining the size and quality of coal deposits that could be developed if they had access to the railway. Using this data we have developed estimates of potential production from five potential mining regions. The regions were selected to be representative of the different coal seams and the likely geographic range of potential mines along the TKR. Each mining region was analysed to estimate its potential scale, marketability and risk profile as well as likely extraction and investment costs.

Data from a wide range of sources including the following potential mines was used in this analysis:

- Takatokwane Project (Walkabout)
- Mmamabula West (Africa Energy)
- Mmamabula (Jindal)
- Moropule (Debswana diamond company i.e. Anglo American and the Government of Botswana)
- Sese (African Energy)

Figure 5: Stylised map of regions modelled



It is noted that there are other mining potential mining regions but the data available on these regions is not as extensive as those listed above it is not likely that the coal from these regions will be significantly better than those listed above in terms of coal quality and mining cost.

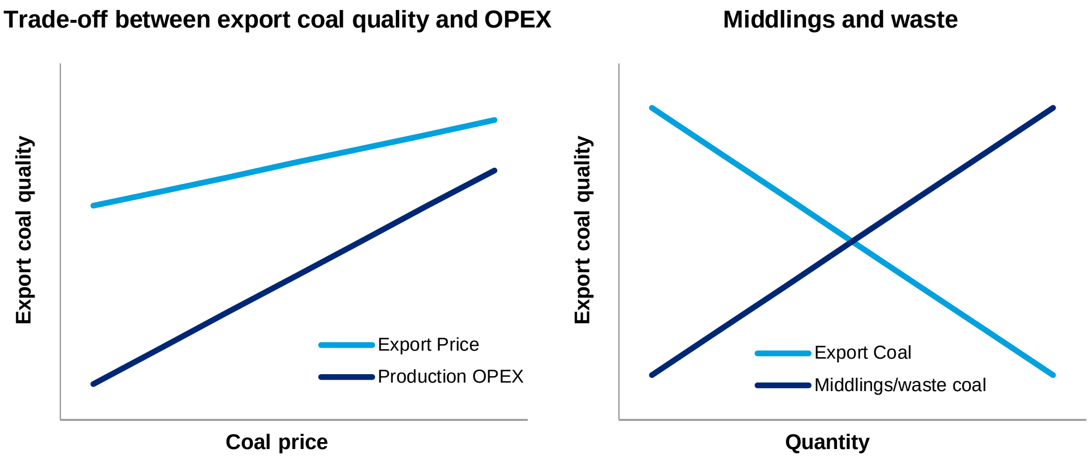
Coal quality

Botswana coal is thermal coal which is typically assessed based on three key characteristics:

1. Energy level
2. Ash content
3. Presence of trace elements (e.g. Sulphur)

Raw coal resources in Botswana can be described as having high ash levels, low to moderate energy and high sulphur, through processing the coal can be improved (i.e. the ash and sulphur content can be reduced) but as illustrated in Figure 6 this has a cost in terms of both production costs and waste output. The higher the quality of the coal produced the higher the cost of production and production of waste product (middlings) and the lower the quantity of coal produced per tonne of raw coal mined.

Figure 6: Trade-off between export coal quality / price and production costs

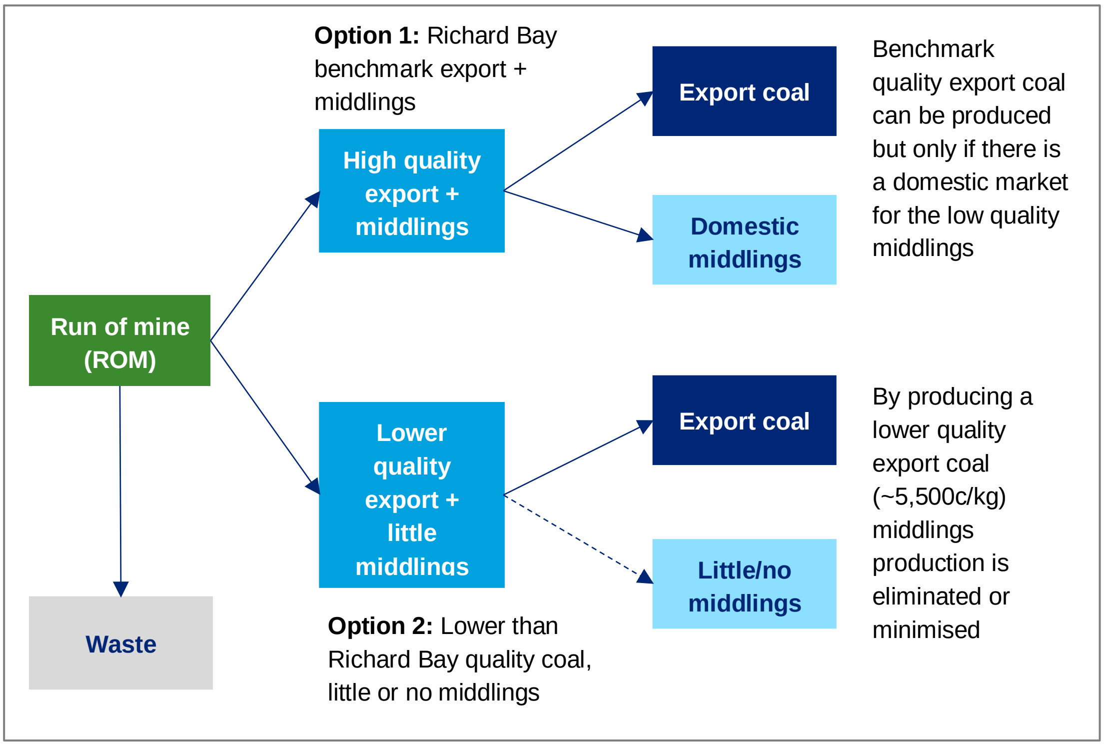


The miners' actual choice of production technique will depend on the market for coal at the time the railway is built but broadly miners will have two options:

- **Option 1:** Produce a relatively high quality product (higher energy, lower ash and sulphur) export product. This will secure a higher price but a lower yield and relatively large volumes of low energy coaly material as either a by-product of the coal washing process (middlings) or waste from open cut mining of seams with high ash and uneconomic yields. This material is important for several reasons. First, if it is not utilised it may become an environmental hazard as it may spontaneously combust and it is likely to be acid generating due to the high sulphur content and therefore add to operating capital and rehabilitation costs. Second, to cover the cost of producing this product miners need to be able to sell it. Many of the undeveloped projects in Botswana include the sale of this material in the forecasted project economics. Typically this material has been assumed to be sold to domestic power stations and other local end-users. It could also be utilised for coal to liquids processes if the economics are attractive. The size of the market for this material however appears limited and the returns low. Optimistic assumptions in this regard are a risk to the project economics and viability.
- **Option 2:** Produce a higher ash, lower energy export thermal product for the Indian and Chinese markets and a smaller volume of middlings / domestic thermal coal. This will secure lower FOB prices but increased volumes and reduce the cost and issues associated with unutilised middlings.

If all miners chose Option 1 it is estimated that approximately 20mtpa of middlings would be produced if coal exports were to reach 60 mtpa. Given the regional and domestic market for middlings coal appears small (current Botswana domestic demand can be satisfied with 2mtpa) it would seem that Botswana miners will generally favour Option 2. As a result it is anticipated that the majority of producers will blend to produce a higher volume mid range product with a calorific value of around 5,500 c/kg, an ash content of 16% and sulpur of <1%.

Figure 7: Coal production options



Coal Volume

Botswana has insitu reserves of over 2 billion tonnes of coal and individual miners such as Jindal, Walkabout, Africa Energy and Debswana have plans that show that each of their mines could be expanded to produce over 20mtpa of export coal. As a result while there is no one individual mine or miner that could produce 65mtpa of export coal there is a large number of possible combinations of different miners that could potentially develop their mines to produce 65mtpa (or more) of export coal for a period of over 40 years. However, it is noted that these mine developments will require significant investment in detailing drilling around the deposits before they can be developed.

Coal Price

Individual seaborne coals are priced by reference to benchmark coal that has specific coal qualities.

There are a number of benchmarks which are specific to particular regions but the two most widely published benchmarks of thermal coal are the Richards Bay and Newcastle benchmarks. The McCloskey Richards Bay FOB benchmark coal is rated 6000 c/kg net air dried with an ash content of 16% and a maximum sulphur content of 1%. In December 2014 this coal was trading for approximately 65USD per tonne (FOB). Variations in price from this benchmark are generally related three key factors

- **Calorific value:** all other things being equal there is a close to linear relationship between calorific value and price, a 10% reduction in the calorific value of the coal will result in a 10% reduction in the price.
- **Sulphur content:** high sulphur content (>1%) will preclude the sale of the coal to some major markets and typically results in a lower sale price.
- **Ash levels:** higher ash levels result in higher waste disposal costs at power stations can result in a price discount and /or preclude the sale of the coal to some markets where disposal costs are very high (e.g. Japan).

Table 7 presents an estimate of the probable FOB price per tonne that could be achieved for the range of coal products that are likely to be produced from Botswana mines served by the TKR. It is expected the majority of Botswana coal will sell at a discount of around 8% to the Richards Bay benchmark (not accounting for the impact of higher shipping costs).

Table 7: Estimated price variations from Richards Bay benchmark for Botswana coal

Price estimation	kcal	Ash discount	Price - $USD/t
Export @ 15% ash and 6,209kcal/kg	6,209	0%	$67
Export @ 13% ash and 6,200kcal/kg	6,200	0%	$67
Richards Bay Benchmark 15% ash and 6,000 kcal/kg	**6,000**	**0%**	**$65**
Export @ 18% ash and 6,000kcal/kg	6,000	0%	$65
Export @ 20% ash and 5,731kcal/kg	5,731	0%	$62
Export @ 20% ash and 5,500kcal/kg	5,500	0%	$60
Export @ 17% ash and 5,250kcal/kg	5,250	0%	$57
Export @ 27% ash and 4,500kcal/kg	4,500	0%	$49
Export @ 22% ash and 4,500kcal/kg	4,500	0%	$49
Domestic middlings @37% ash and 4,175kcal/kg	4,175	20%	$36

Coal Production Costs

Enable was engaged to estimate mining costs for the potential mines in Botswana. Enable sourced publically available information on undeveloped Botswanan coal resources and mine planning studies as well as operating cost data for existing South African operations. This information has been utilised to estimate (by benchmarking) the likely mine operating costs for Botswanan coal projects thought to typify the potential mining districts. Capital costs have been similarly estimated using high level benchmarking data from published statements on Botswana projects. Indicative capital costs per annual tonne of production for a low ratio open cut mine and a standard configuration bord and pillar operation have been compiled.

The operating and capital costs generally utilised in the financial assessment are shown in Table 8.

Table 8: Estimated Operating and Capital Costs per ROM tonne produced

Mine type	Rate per ROM tonne
• Underground (bord and pillar)	• Operating costs USD25.0 • Capital cost USD50
• Open cut (Truck shovel)	• Operating costs USD13.4 • Capital cost USD30

Source: Enable

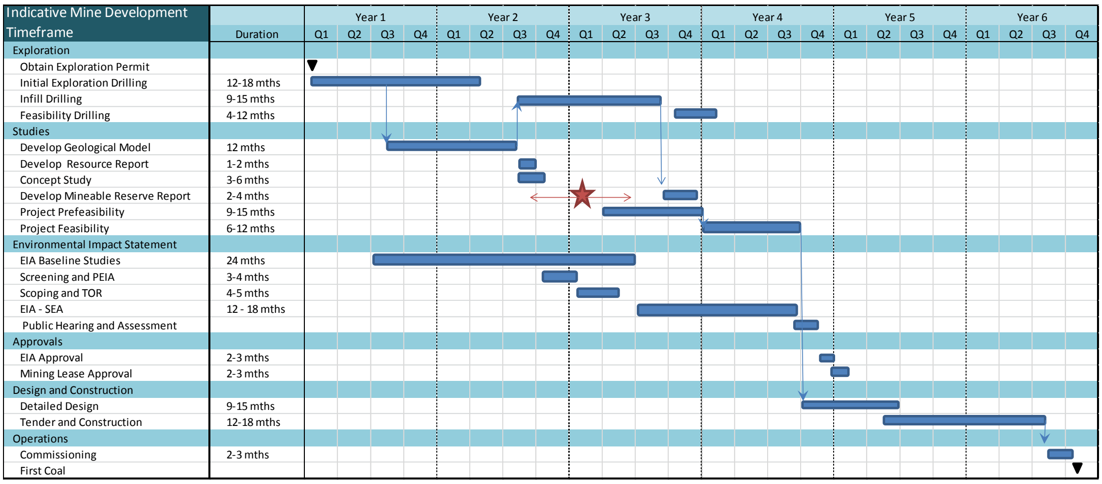
This cost data is high level and assumes that power and water supply issues are resolved such that the impacts on operating and capital costs are minor. This may be an optimistic assumption. The cumulative impact on power and water sources and infrastructure may be considerable and significantly impact operating and capital costs. In Queensland Australia water studies have indicated that 200ML of fresh (raw untreated) water are required per 1Mt of coal production. This volume is achieved with very high levels of water recycling in the mine and processing plants

Mine Development

Enable has developed an indicative coal mine development schedule (see Figure 8) based on Enable's understanding of the Botswanan regulatory requirements, and typical exploration, feasibility, environmental and stakeholder engagement processes.

A well-resourced and successful project could achieve first coal production within six years from discovery assuming all the relevant approvals (both internal and external) are progressed as quickly as possible.

Figure 8: Indicative mine development time table



Note: Development timeframes will vary and may be affected by the nature and scale of deposit, mode of operation, options assessed, environemtal impacts, corporate approach, government time frames and community objections.

3.4 Below Rail Capital and Operating Cost

Inputs

Below rail infrastructure refers to the railway tracks, turnouts, track formation, earthworks, signalling, telecommunication systems, etc. that is required to run a railway. It excludes the rollingstock and train yards.

Below rail infrastructure and associated maintenance and operating costs varied depending on the option being assessed. All opex and capex inputs were developed based on information provided by Aurecon. These inputs are summarised in Table 9 and Table 10.

Table 9: Below rail capital costs

Option	Route	Gauge	Fuel type	Mainline capex (USD m)	Spur capex* (USD m)
1	North via Windhoek (PFS)	Standard	Electric	9,055	503
2			Diesel	6,752	364
3		Narrow	Electric	9,075	498
4			Diesel	6,713	358
5		Dual	Electric	9,527	503
6			Diesel	7,226	364
7	North via Windhoek (GoB)	Standard	Electric	8,955	503
8			Diesel	6,671	364
9		Narrow	Electric	8,999	498
10			Diesel	6,639	358
11		Dual	Electric	9,420	503
12			Diesel	7,137	364
13	Northern optimised route	Standard	Electric	8,534	503
14			Diesel	6,368	364
15		Narrow	Electric	8,544	498
16			Diesel	6,338	358
17		Dual	Electric	8,968	503
18			Diesel	6,802	364

*Note that spur capex was based on Aurecon estimates of USD 3.11m per track km for standard gauge diesel track, USD 3.06m for narrow gauge diesel track, USD 4.30m per track km for standard gauge electric track and USD 4.26m for narrow gauge electric track. Total track km for the spurs in use was estimated by Aurecon as 117km.

Table 10: Below rail track km and opex

Option	Route	Gauge	Fuel type	Mainline track km	Spur track km*	Opex / GTK
1	North via Windhoek (PFS)	Standard	Electric	1,587	117	0.00055
2			Diesel	1,587	117	0.00051
3		Narrow	Electric	1,587	117	0.00054
4			Diesel	1,587	117	0.00051
5		Dual	Electric	1,587	117	0.00057
6			Diesel	1,587	117	0.00054
7	North via Windhoek (GoB)	Standard	Electric	1,563	117	0.00055
8			Diesel	1,563	117	0.00051
9		Narrow	Electric	1,563	117	0.00054
10			Diesel	1,563	117	0.00051
11		Dual	Electric	1,563	117	0.00057
12			Diesel	1,563	117	0.00054
13	Northern optimised route	Standard	Electric	1,455	117	0.00055
14			Diesel	1,455	117	0.00051
15		Narrow	Electric	1,455	117	0.00054
16			Diesel	1,455	117	0.00051
17		Dual	Electric	1,455	117	0.00057
18			Diesel	1,455	117	0.00054

*Note that the total track km for spurs in use was estimated as 117km

In addition to these inputs, it was necessary to estimate the following:

- The construction period required for the below rail investment (estimate: 3 years)
- The below rail assets depreciable life (estimate: c. 30-40 years)
- The method of depreciation to be applied (estimate: straight line depreciation)
- The ramp up period and capital staging assumptions
- The potential WACC required by the below rail investor (Table 11)

Table 11: Potential WACC required by below rail investor

Parameter	Estimate	Justification
Gearing (% debt)	40.0%	These core parameters were estimated assuming the infrastructure owners are able to sign bankable long term (10 year +) take or pay arrangements with miners and/or the miners have credit ratings of at least AA-. Investors and their bankers will not invest in the project at these returns if this is not the case.
Asset Beta	0.70	
Equity Beta	1.17	
Debt Beta	12.0%	
Debt Rating	BBB+	
Debt Margin	2.9%	
Debt financing	0.125%	
Market Risk Premium	6.5%	
Risk Free Rate	3.4%	Based on high level assessment of current debt rates assuming debt is denominated in USD
Corporate Tax Rate	22.0%	Based on current Botswana corporate tax rate
Inflation Rate #	2.5%	Based on long term inflation forecast
Cost of Equity	11.0%	Calculated fields
Cost of Debt	6.4%	
Nominal pre-tax WACC	11.0%	
Real Post-tax WACC	**6.5%**	

Calculations

Using the inputs provided, a below rail tariff was calculated for each section of mainline rail and each spur using a standard regulatory building blocks approach. This approach allows revenue to be collected in relation to:

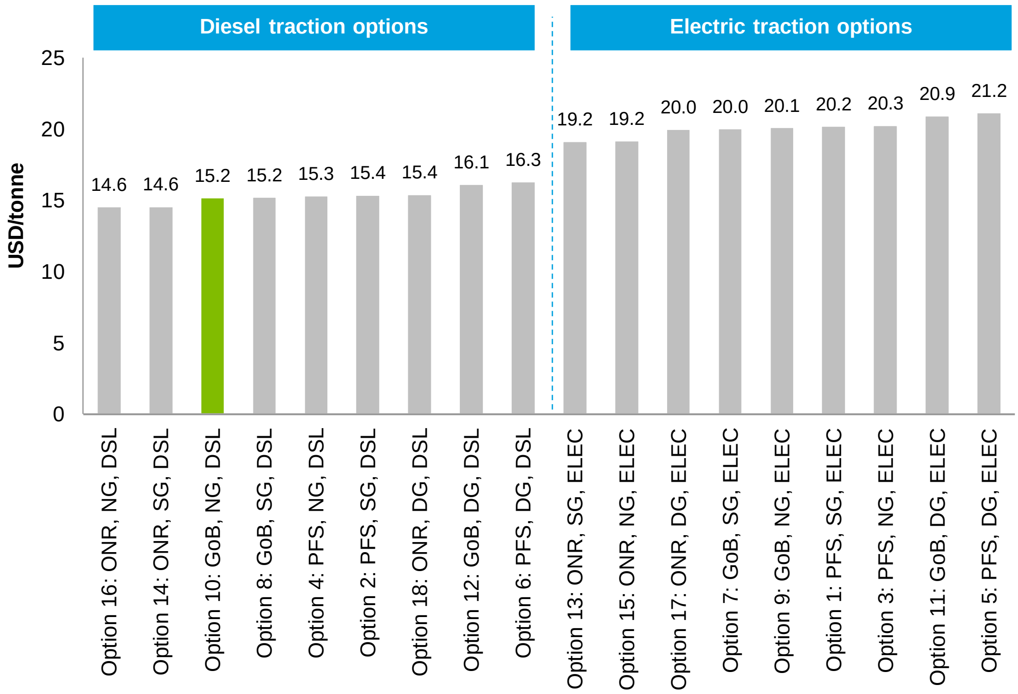
- Depreciation;
- Return on capital (to the relevant investor); and
- Maintenance and operating costs

This total revenue is then standardised by calculating it across a relevant unit, in this case gross tonne kilometres (GTK). Once below rail tariffs had been calculated as a USD/GTK figure for each relevant rail section, a more comprehensive estimate could be developed in relation to below rail costs for different potential miners. Note that below rail investors were always assumed to achieve a return equivalent to their estimated WACC.

Key Findings

For the purposes of comparison of options the NPV of the total cost of operating and financing the infrastructure over a 40 year period was divided by the NPV of the total tonnes assumed to use the railway over the same period. The analysis showed that choice of traction was the most significant determinant of below rail tariffs. Over a full 40 year time horizon, in all cases, diesel traction was shown to produce the lowest average tariffs for miners (Figure 9)[5].

Figure 9: Combined miners below rail tariffs over a 40 year time horizon (USD/tonne)

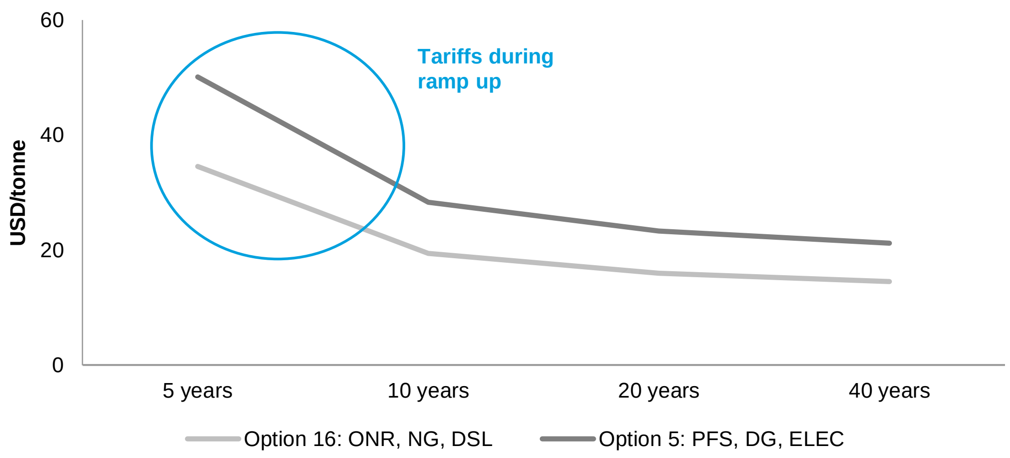


Source: Deloitte
* Option 10 is the project as defined in the Bilateral Agreement
Note: WB = Walvis Bay, ONR = Northern optimised route, GoB = North via Windhoek (GoB), PFS = North via Windhoek (PFS), SG = standard gauge, DG = dual gauge, NG = narrow gauge, DSL = diesel, ELEC = electric

Overall, the combined below rail tariff for miners across the 40 year time horizon appeared reasonable. However, when looking at tariffs over shorter time periods they appeared significantly higher (Figure 10).

[5] Note that in all cases investors received their required WACC and would therefore be likely to be neutral across options, although the overall investment required to fund below rail diesel traction would be lower than electric in all cases.

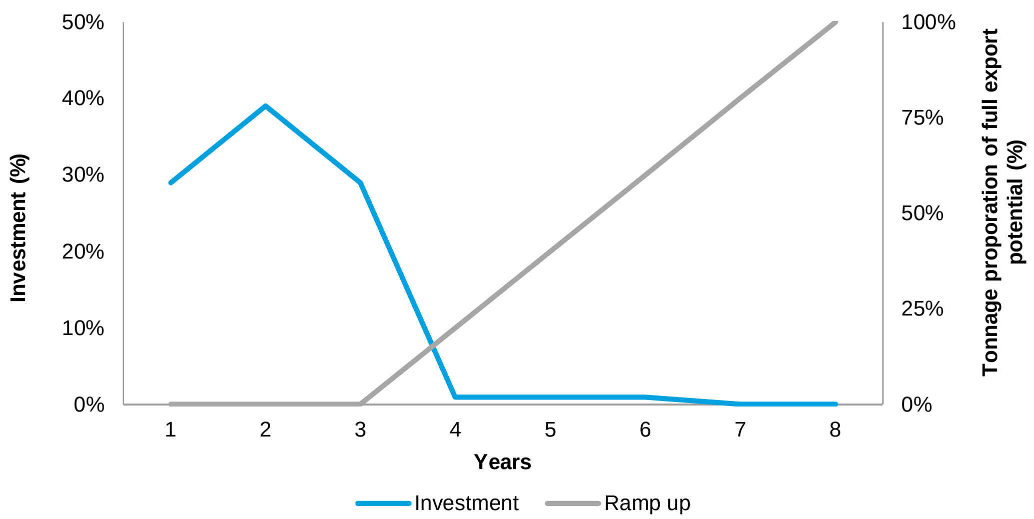
Figure 10: Combined miners below rail tariffs over different time horizons (USD/tonne)



Source: Deloitte
Note: WB = Walvis Bay, ONR = Northern optimised route, GoB = North via Windhoek (GoB), PFS = North via Windhoek (PFS), SG = standard gauge, DG = dual gauge, NG = narrow gauge, DSL = diesel, ELEC = electric

This discrepancy was found to occur (Figure 11) as the most significant proportion of investment in the project would need to occur before mines could start ramping up to the full 65mtpa level of anticipated production. As a result tariffs appear much higher in initial years as investors require similar levels of return across much lower tonnages. Overall this suggests that some form of intervention or support may be required in these initial ramp-up years.

Figure 11: Indicative timing of below rail investment compared to mine ramp-up (i.e. railed tonnes)



Source: Deloitte

3.5 Above Rail Capital and Operating Costs

Inputs

Above rail infrastructure refers to the locomotives, wagons and yards required to run a railway. Above rail assets and infrastructure varied depending on the option being assessed and were developed based on information provided by Aurecon. Above rail costs related to five key categories including:

- Above rail supporting infrastructure (i.e. train yards)
- Above rail assets (i.e. the consists required)
- General opex and maintenance
- Fuel costs

- Labour costs (i.e. in relation to staff required to crewing costs)

The key inputs for these figures as provided by Aurecon are summarised in Table 12 to Table 15.

Table 12: Consist assumptions

Consist assumptions*	Standard gauge	Narrow gauge	Dual gauge
Locos per consist	5	5	5
Weight per loco	195	160	195
Wagons per Consist	240	160	240
Per Wagon Weight Unloaded (tonnes)	22	20	22
Per Wagon Weight Loaded (tonnes)	128	104	128

*Note assumptions do not vary between electric and diesel

Table 13: Cycle time assumptions

Cycle time assumptions	Standard gauge		Narrow gauge		Dual gauge	
	Electric	Diesel	Electric	Diesel	Electric	Diesel
Days operational	345	345	345	345	345	345
Train speed	57.70	56.80	60.30	59.50	57.70	56.80
Loading	5.7	5.7	3.3	3.3	5.7	5.7
Unloading	2.8	2.8	1.8	1.8	2.8	2.8
Provisioning	4.0	4.0	4.0	4.0	4.0	4.0
Border delays	0.0	0.0	0.0	0.0	0.0	0.0
Refuelling delays	0.25	0.33	0.25	0.33	0.25	0.33

Table 14: Maintenance and opex and labour cost assumptions

Option	Route	Gauge	Fuel type	Maintenance and opex (USD/GTK)	Labour rate (USD/hr)	Crew per train
1	North via Windhoek (PFS)	Standard	Electric	0.00116	51	2
2			Diesel	0.00127	50	2
3		Narrow	Electric	0.00153	48	2
4			Diesel	0.00169	55	2
5		Dual	Electric	0.00116	51	2
6			Diesel	0.00127	50	2
7	North via Windhoek (GoB)	Standard	Electric	0.00116	52	2
8			Diesel	0.00128	51	2
9		Narrow	Electric	0.00154	49	2
10			Diesel	0.00169	48	2
11		Dual	Electric	0.00116	52	2
12			Diesel	0.00128	51	2
13	Northern optimised route	Standard	Electric	0.00117	55	2
14			Diesel	0.00128	54	2
15		Narrow	Electric	0.00154	52	2
16			Diesel	0.00169	51	2
17		Dual	Electric	0.00117	55	2
18			Diesel	0.00128	54	2

Table 15: Fuel assumptions

Cycle time assumptions	Standard gauge		Narrow gauge		Dual gauge	
	Electric	Diesel	Electric	Diesel	Electric	Diesel
Diesel usage (litres/loco km)		9.65		6.53		9.65
Cost of diesel (USD/litre)		0.92		0.92		0.92
Electricity usage (kWh/loco km)	39.5		39.5		39.5	
Cost of electricity (USD/kWh)	0.15		0.15		0.15	

Calculations

Above rail assets, infrastructure and ongoing opex and maintenance were used to calculate an above rail tariff for each miner. This tariff was calculated using a standard regulatory building blocks approach which allows revenue to be collected in relation to:

- Depreciation;
- Return on capital (to the relevant investor); and
- Maintenance and operating costs

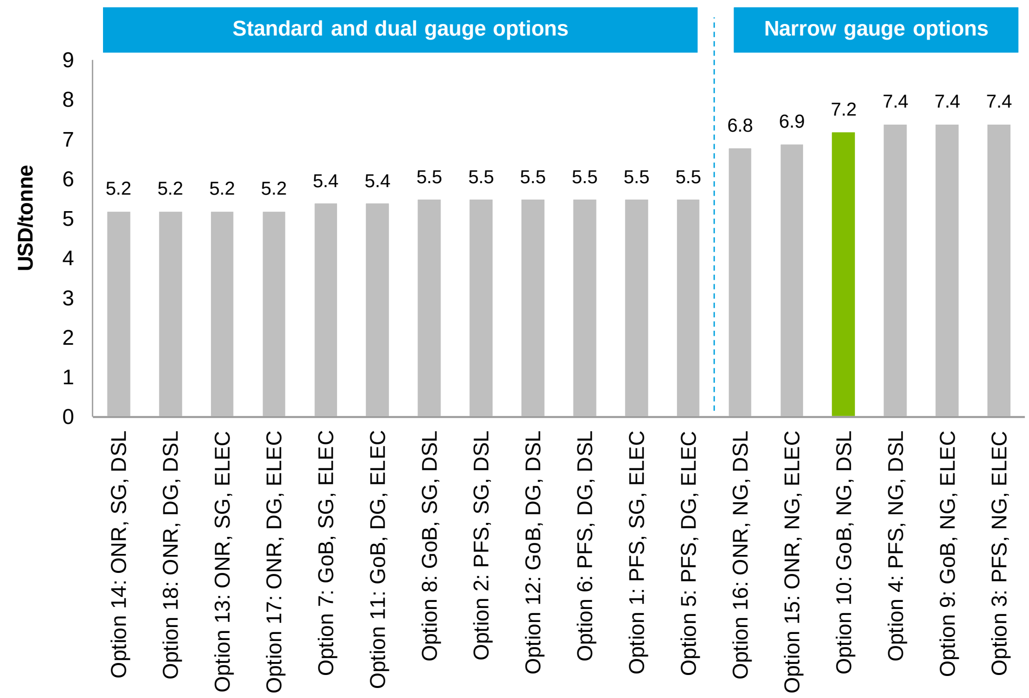
This revenue was calculated across gross tonne kilometres (GTK) for each of the relevant miners. In addition to this, the relevant fuel and labour costs were also calculated for each relevant miner based on their respective usage requirements from mine door to port.

Key findings

For the purposes of comparison between options the NPV of costs over a 40 year period was divided by the NPV of the total tonnes over the same period. The analysis showed different results across above rail asset and labour charges compared to above rail fuel charges. Total above rail charges excluding crew labour charges and fuel charges are shown in Figure 12. It is evident from the results that gauge is the most significant determinant of these costs, with standard and dual gauge both outperforming narrow gauge. Alignment is the next most important factor. The optimised northern route performs best, followed by the GoB route and then the PFS. Finally fuel choice is also seen to impact charges, however the impact in this case is extremely marginal with electric only slightly outperforming diesel.

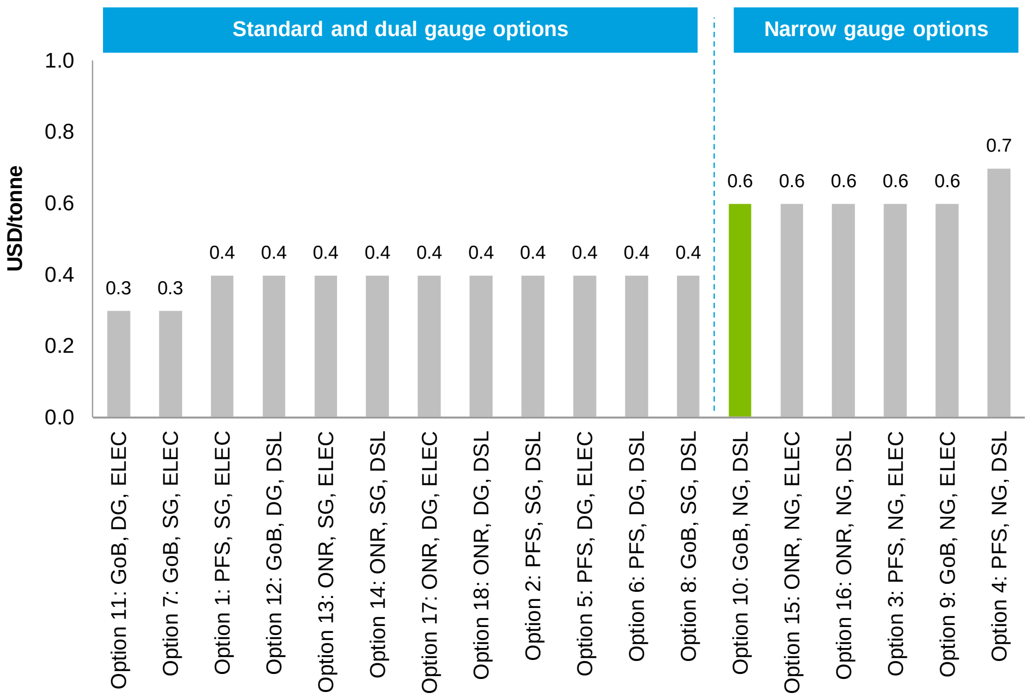
Figure 13 shows the crew labour costs for above rail across different options. The results are in line with those seen in Figure 12. However, Figure 14 shows the choice of diesel vs. electric traction to have the most significant impact on fuel costs. This is followed by the alignment and then the choice of gauge.

Figure 12: Above rail tariffs over a 40 year time horizon (USD/tonne)



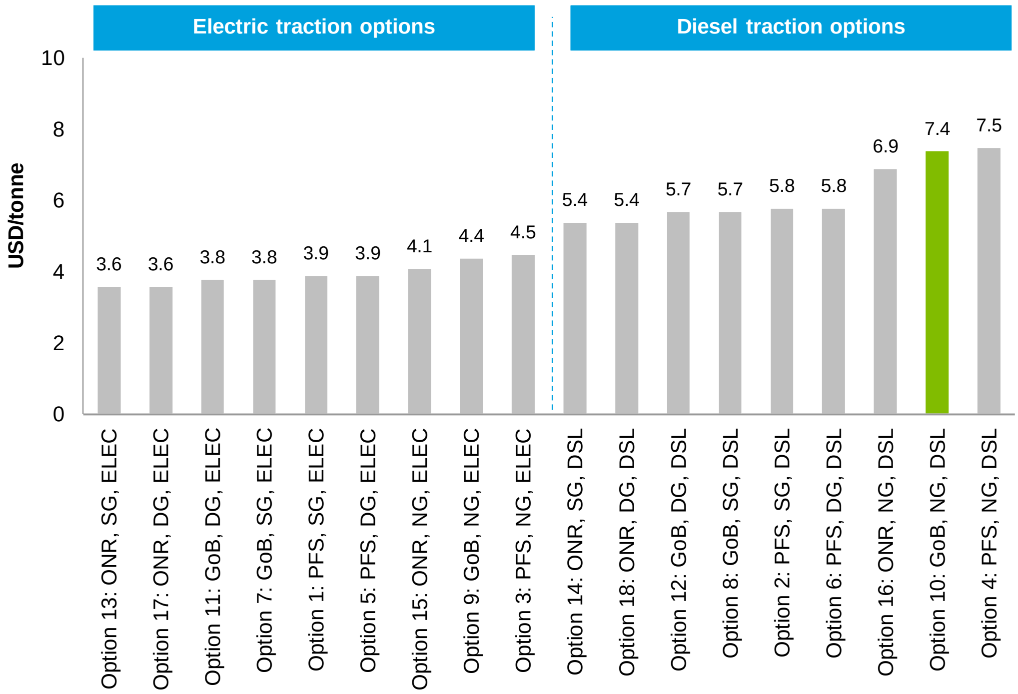
Source: Deloitte
* Option 10 is the project as defined in the Bilateral Agreement
Note: WB = Walvis Bay, ONR = Northern optimised route, GoB = North via Windhoek (GoB), PFS = North via Windhoek (PFS), SG = standard gauge, DG = dual gauge, NG = narrow gauge, DSL = diesel, ELEC = electric

Figure 13: Above rail labour charges over a 40 year time horizon (USD/tonne)



Source: Deloitte
* Option 10 is the project as defined in the Bilateral Agreement
Note: WB = Walvis Bay, ONR = Northern optimised route, GoB = North via Windhoek (GoB), PFS = North via Windhoek (PFS), SG = standard gauge, DG = dual gauge, NG = narrow gauge, DSL = diesel, ELEC = electric

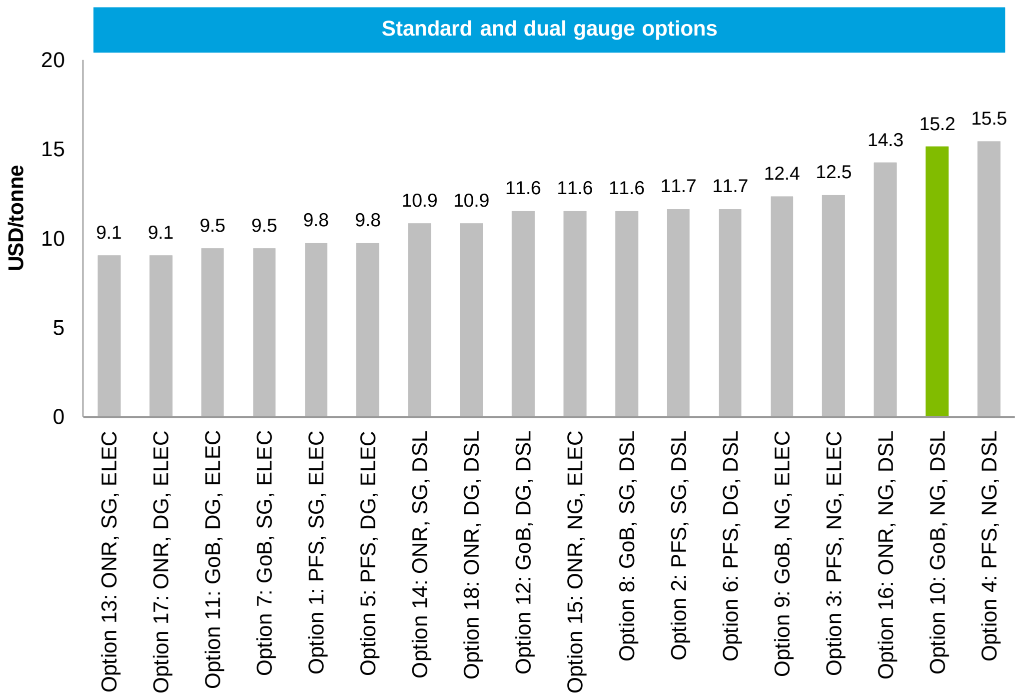
Figure 14: Above rail fuel charges over a 40 year time horizon (USD/tonne)



Source: Deloitte
* Option 10 is the project as defined in the Bilateral Agreement
Note: WB = Walvis Bay, ONR = Northern optimised route, GoB = North via Windhoek (GoB), PFS = North via Windhoek (PFS), SG = standard gauge, DG = dual gauge, NG = narrow gauge, DSL = diesel, ELEC = electric

When combined into a single above rail charge, it is evident that the most significant factor influencing above rail costs is the choice of gauge, followed by the fuel type and then the alignment (Figure 15). The results show that standard and dual gauge are always preferred to narrow gauge, that electric is preferred to diesel and finally that the optimised northern route is the most efficient followed by the GoB route and then the PFS.

Figure 15: Combined above rail costs over a 40 year time horizon (USD/tonne)



Source: Deloitte
* Option 10 is the project as defined in the Bilateral Agreement
Note: WB = Walvis Bay, ONR = Northern optimised route, GoB = North via Windhoek (GoB), PFS = North via Windhoek (PFS), SG = standard gauge, DG = dual gauge, NG = narrow gauge, DSL = diesel, ELEC = electric

Overall there is no significant ramp-up issue in relation to the above rail component of rail charges. This is because it is much easier to stage above rail investment in line with ramp-up. This is evident when looking at changes in above rail tariffs over time.

3.6 Coal Handling Facility Capital and Operating Costs

Inputs

The coal handling facility (CHF) had the same design specification across all options. Key inputs are summarised in Table 16 and Table 17.

Table 16: CHF input assumptions

Description	Value
Construction capex (to handle 16mtpa)	USD 948.9 m
Incremental capex (to handle 65mtpa)	USD 1,473.4 m
Construction period	3 years
Depreciable life	30 years
Operating costs	USD 2 /tonne
Mine ramp-up	0 – 65mtpa in 5 years

Note: capex figures have been taken from the pre-feasibility study and are consistent with real 2014 prices (Source: as advised by Aurecon)

Table 17: Potential WACC required by CHF investor

Parameter	Estimate	Justification
Gearing (% debt)	40.0%	These core parameters were estimated assuming the infrastructure owners are able to sign bankable long term (10 year +) take or pay arrangements with miners and/or the miners have credit ratings of at least AA-. Investors and their bankers will not invest in the project at these returns if this is not the case.
Asset Beta	0.70	
Equity Beta	1.17	
Debt Beta	12.0%	
Debt Rating	BBB+	
Debt Margin	2.9%	
Debt financing	0.125%	
Market Risk Premium	6.5%	
Risk Free Rate	3.4%	Based on high level assessment of current debt rates assuming debt is denominated in USD
Corporate Tax Rate	22.0%	Based on current Botswana corporate tax rate
Inflation Rate #	2.5%	Based on long term inflation forecast
Cost of Equity	11.0%	Calculated fields
Cost of Debt	6.4%	
Nominal pre-tax WACC	11.0%	
Real Post-tax WACC	**6.5%**	

Calculations

Investment in the CHF combined with ongoing operating costs were used to calculate a single CHF tariff. This tariff was calculated using a standard regulatory building blocks approach which allows revenue to be collected in relation to:

- Depreciation;
- Return on capital (to the relevant investor); and
- Maintenance and operating costs

This revenue was calculated across railed tonnes for each of the relevant miners[6].

Key findings

The average CHF tariff across a 40 year period (calculated as the NPV of CHF charges over the NPV of tonnes) was USD 6.0/tonne.

3.7 Port Capital and Operating Costs

Inputs

The port design was assumed to be consistent across all options. Key inputs are summarised in Table 18 and Table 19.

Table 18: Port input assumptions

Description	Value
Construction capex (to handle 16mtpa)	USD 655.5 m
Incremental capex (to handle 65mtpa)	USD 560.2 m
Construction period	3 years
Depreciable life	30 years
Operating costs	USD 1.1 /tonne

[6] Note that the CHF investor was always assumed to achieve a return equivalent to its estimated WACC.

Table 19: Potential WACC required by port investor

Parameter	Estimate	Justification
Gearing (% debt)	80.0%	These core parameters were estimated assuming the infrastructure owners are able to sign bankable long term (10 year +) take or pay arrangements with miners and/or the miners have credit ratings of at least AA-. Investors and their bankers will not invest in the project at these returns if this is not the case.
Asset Beta	0.60	
Equity Beta	3.00	
Debt Beta	12.0%	
Debt Rating	BBB+	
Debt Margin	2.9%	
Debt financing	0.125%	
Market Risk Premium	7.0%	
Risk Free Rate	3.4%	Based on high level assessment of current debt rates assuming debt is denominated in USD
Corporate Tax Rate	22.0%	Based on current Botswana corporate tax rate
Inflation Rate #	2.5%	Based on long term inflation forecast
Cost of Equity	24.4%	Calculated fields
Cost of Debt	6.4%	
Nominal pre-tax WACC	11.4%	
Real Post-tax WACC	**7.3%**	

Calculations

Investment in the CHF and ongoing operating costs were used to calculate a single CHF tariff. This tariff was calculated using a standard regulatory building blocks approach which allows revenue to be collected in relation to:

- Depreciation;
- Return on capital (to the relevant investor); and
- Maintenance and operating costs

This revenue was calculated across railed tonnes for each of the relevant miners[7].

Key findings

The average port tariff across a 40 year period (calculated as the NPV of port charges over the NPV of tonnes) was USD 3.3/tonne.

3.8 Shipping

Inputs

The following key assumptions were made to calculate approximate shipping differential costs.

- Walvis Bay shipments would be split 50:50 between Panamax and Capesize vessels, compared to 100% Panamax shipping from Richards Bay.
- The estimated cost per day of Panamax vessels was set at USD 15k compared to USD 25k for Capesize vessels.
- The deadweight tonne capacity of Panamax vessels was assumed to be 80,000 tonnes compared to 140,000 tonnes for Capesize vessels, with capacity of 53,333 tonnes and 93,333 tonnes respectively.
- Loading at Walvis Bay was estimated to occur at a rate of 120,000 tonnes per day compared to approximately 72,000 tonnes per day at Richards Bay. Unloading was estimated to occur at a rate of 72,000 tonnes per day for both ports.

[7] Note that the CHF investor was always assumed to achieve a return equivalent to its estimated WACC.

- Wait time included in a return trip for each vessel was estimated to be 2 days for both Walvis Bay and Richards Bay.
- India was selected as the most likely destination for Botswanan coal.

Calculations

Key inputs were used to estimate total time taken for a return journey from Walvis Bay compared to Richards Bay. This was due to the fact that the Richards Bay benchmark price of coal (taken to most closely approximate the potential price to be achieved from Botswanan coal) would be discounted by any shipping cost differential incurred by end customers (in this case Indian purchasers).

Key findings

A return trip from Walvis Bay to Mormugao Port in India (selected as a proxy delivery location as it is one of the largest coal ports in India) was estimated to take 33.3 days compared to 23.7 days from Richards Bay. This equated to an average shipping cost differential of USD 2.2/tonne over a 40 year period.

3.9 Other model factors

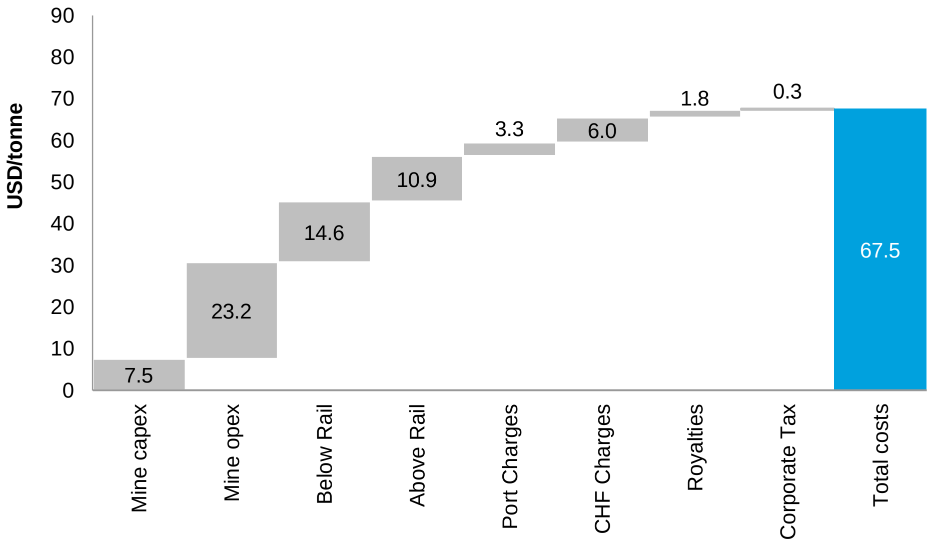
Revenue from other sources

Generally non-bulk and passenger rail services have limited ability to contribute more than their incremental cost. Potential revenue from these sources have therefore been assumed to cover only their incremental cost and therefor been excluded from the assessment. Aurecon has however estimated revenue from other sources able to contribute to the fixed costs of the rail infrastructure. Approximately USD 6m / annum was identified as possible contribution to the fixed cost attributable to some of Botswana's copper deposits to be railed using the TKR. It was assumed that the owner of the copper deposit/s would pay for their own spur line and required above rail assets and any incremental material handling and port expansion costs.

3.10 Estimated Total Cost of Mining and Transport Costs

Figure 16 illustrates the total cost of mining and transporting the coal to Walvis Bay for each component of the supply chain for the lowest cost option (the Base Case). Average costs have been standardised by taking the NPV of potential costs over the NPV of potential tonnes over a 40 year period. The most significant costs are seen to relate to mining opex and rail costs.

Figure 16: Combined miners average cost under the Base Case over a 40 year horizon assuming a Richards Bay FOB price of USD 65/tonne



Source: Deloitte

Table 20 ranks the 18 options in terms of the total cost, from lowest cost to highest cost. It provides an indication of the cost to miners of variations from the base case (being "Option 14: standard gauge, optimised northern alignment, diesel"), key findings are:

- Dual gauge adds $0.80 per tonne
- Dual gauge and the GOB alignment costs $2.10 per tonne
- Dual gauge, the GOB alignment and electric traction costs $4.80 per tonne

The implications of these cost variations are discussed in more detail in Section 3.13.

Table 20: NPV of costs to all miners over NPV of total tonnes over a 40 year time horizon assuming a Richards Bay FOB price of USD 65/tonne

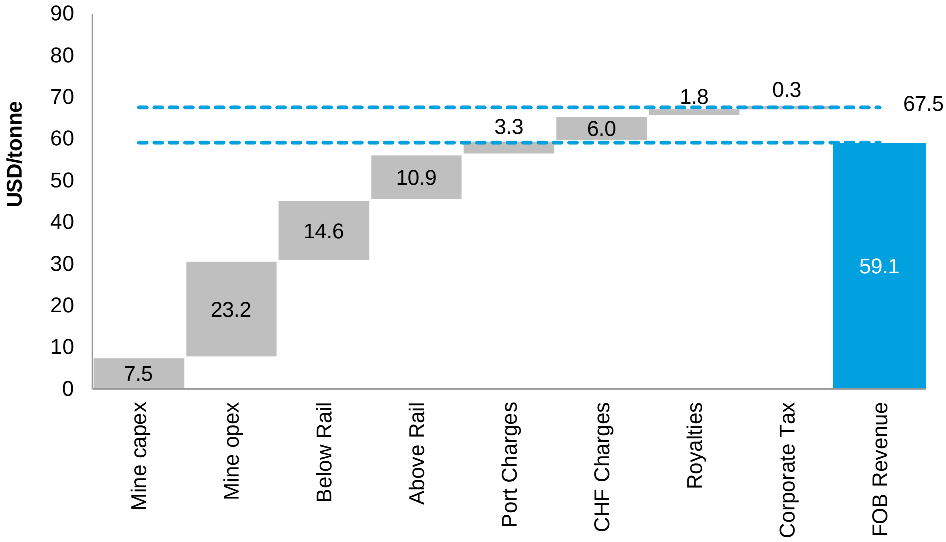
Option reference	Upfront mine capex	Mining opex	Below rail charges	Above rail charges	CHF charges	Port charges	Royalties and corp. tax	Total charges
	USD/tonne							
Option 14: ONR, SG, DSL	7.49	23.19	14.59	10.88	3.26	5.98	2.10	67.48
Option 18: ONR, DG, DSL	7.49	23.19	15.44	10.88	3.26	5.98	2.06	68.29
Option 8: GoB, SG, DSL	7.49	23.19	15.24	11.58	3.26	5.98	2.02	68.75
Option 2: PFS, SG, DSL	7.49	23.19	15.40	11.69	3.26	5.98	2.01	69.02
Option 12: GoB, DG, DSL	7.49	23.19	16.15	11.58	3.26	5.98	1.99	69.63
Option 6: PFS, DG, DSL	7.49	23.19	16.33	11.69	3.26	5.98	1.98	69.92
Option 13: ONR, SG, ELEC	7.49	23.19	19.17	9.08	3.26	5.98	2.00	70.17
Option 16: ONR, NG, DSL	7.49	23.19	14.55	14.27	3.26	5.98	1.92	70.66
Option 17: ONR, DG, ELEC	7.49	23.19	20.02	9.08	3.26	5.98	1.98	70.99
Option 7: GoB, SG, ELEC	7.49	23.19	20.04	9.54	3.26	5.98	1.96	71.45
Option 1: PFS, SG, ELEC	7.49	23.19	20.23	9.76	3.26	5.98	1.94	71.85
Option 10: GoB, NG, DSL	7.49	23.19	15.19	15.16	3.26	5.98	1.87	72.14
Option 11: GoB, DG, ELEC	7.49	23.19	20.95	9.54	3.26	5.98	1.93	72.34
Option 15: ONR, NG, ELEC	7.49	23.19	19.21	11.58	3.26	5.98	1.90	72.60
Option 4: PFS, NG, DSL	7.49	23.19	15.35	15.50	3.26	5.98	1.86	72.62
Option 5: PFS, DG, ELEC	7.49	23.19	21.15	9.76	3.26	5.98	1.92	72.75
Option 9: GoB, NG, ELEC	7.49	23.19	20.12	12.36	3.26	5.98	1.86	74.26
Option 3: PFS, NG, ELEC	7.49	23.19	20.29	12.47	3.26	5.98	1.86	74.53

Source: Deloitte
* Option 10 is the project as defined in the Bilateral Agreement
Note: ONR = Northern optimised route, GoB = North via Windhoek (GoB), PFS = North via Windhoek (PFS), SG = standard gauge, DG = dual gauge, NG = narrow gauge, DSL = diesel, ELEC = electric

3.11 Estimated Returns to Miners

Figure 17 compares the estimated FOB cost of mining and transporting the coal to Walvis Bay to the expected revenue per tonne that the miners will receive for their produce (given the current Richards Bay Benchmark price of $65 per tonne) for the most viable option (the Base Case). Average costs have been standardised by taking the NPV of potential costs over the NPV of potential tonnes over a 40 year period.

Figure 17: Combined miners average cost under the Base Case over a 40 year horizon assuming a Richards Bay FOB price of USD 65/tonne

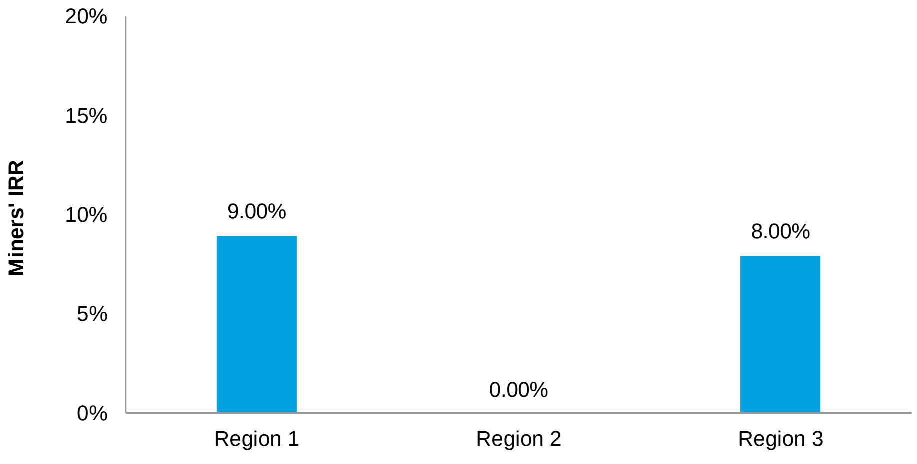


Source: Deloitte

The results in Figure 17 show that at current prices[8] even under the Base Case, total costs for the whole supply chain are expected to exceed total revenue. This analysis assumes that the coal production is spread across the three most prospective coal producing regions and as revenues and costs are discounted at a WACC equivalent to a 15% pre-tax real return. This WACC is an estimate of the minimum return that miners would be willing to accept to develop their mines.

As detailed in Figure 18 at current prices the highest expected returns to a miner is approximately 9%, this is well below the minimum benchmark of 15% (pre-tax real return).

Figure 18: IRR of different mining regions over a 40 year horizon and assuming a Richards Bay FOB price of USD 65/tonne



Source: Deloitte

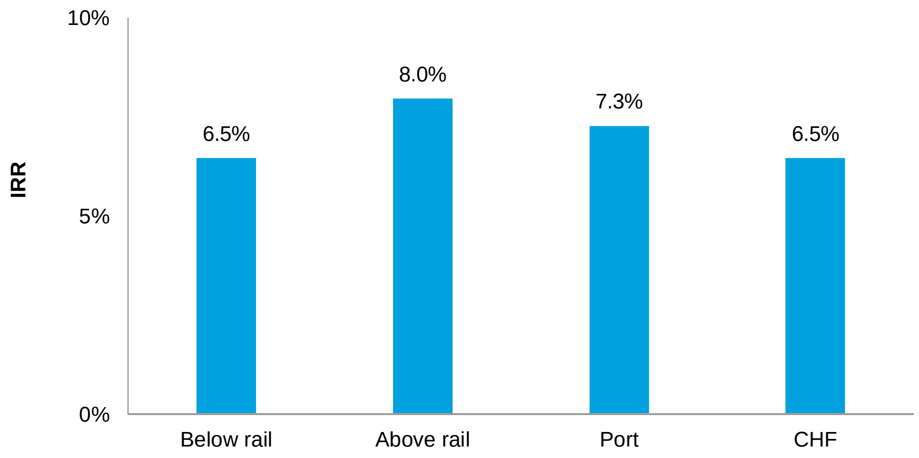
For the railway to get funding it miners in all regions would need to be able to show their investors that there project was viable. To achieve this it is estimated that the Richards Bay benchmark price of coal would have to be at least USD81 per tonne and forecast to remain above that level for the life of the mines. This is approximately USD16 higher than it was in December 2014.

[8] At the time of this report these were taken to be approximately USD 65/tonne for coal which approximated the Richards Bay benchmark.

3.12 Returns to Infrastructure investors

The Model assumes that infrastructure investors always receive a return equal to their estimated WACC. These returns are summarised in Figure 19. As a result, returns to infrastructure investors do not change across options. However, it is important to note that these returns are all based on the assumptions that the miners sign up long terms take or pay arrangements with the infrastructure owners.

Figure 19: Investors estimated WACCs



Source: Deloitte

3.13 Implications for Government

The Government's perspective may change significantly depending on whether or not they choose to invest in the project. For the purpose of the analysis it was assumed that the project would need to be viable on a standalone basis with Government involvement limited to facilitate the project rather than investing in it.

Assuming there is no Government investment in the TKR, private investors are likely to select the most efficient option for development of the TKR – as in, the Base Case. Therefore if the Government continues to prefer the alignment and gauge set out in the Bilateral Agreement, it may be required to subsidise the incremental investment required (from the Base Case) in order to ensure miners profitability is not impacted as a result. Alternatively investors will need to wait until the price of coal is proportionally higher for the miners to be willing to invest in the project.

The likely incremental impact on miners' tariffs (from the Base Case) is shown in Table 21. As shown the likely impact of selecting the Bilateral Agreement scenario is an increase of approximately USD4.4/tonne of coal railed.

Table 21: Incremental USD/tonne cost to miners of different options

Additional $/tonne	Windhoek (GoB)	Optimised northern route	Windhoek (PFS)
Diesel, SG			2.6
Diesel, DG	0.8	2.3	3.9
Diesel, NG	1.7	4.4	5.6
Electric, SG	2.6	4.8	5.6
Electric, DG	3.4	5.3	6.1
Electric, NG	4.0	7.4	7.7

Table 22 shows that the total incremental investment support required by Government (taking both capital spending and construction finance interest into account) is approximately USD 1.055bn.

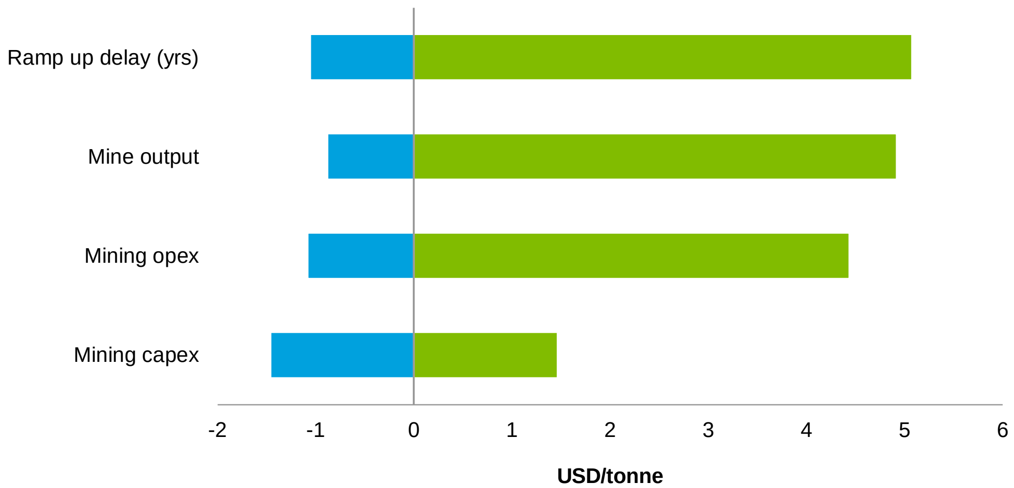
Table 22: Investment required to achieve different options

Additional $/tonne	Windhoek (GoB)	Optimised northern route	Windhoek (PFS)
Diesel, SG	-	342.7	630.7
Diesel, DG	196.2	555.3	941.8
Diesel, NG	413.8	1,055.0	1,339.9
Electric, SG	619.6	1,164.1	1,347.3
Electric, DG	817.7	1,272.1	1,465.8
Electric, NG	950.1	1,773.9	1,847.6

3.14 Sensitivity analysis

Sensitivity analysis was performed on all key variables. Sensitivities have a high variation of 20% and a low variation of minus 20% unless otherwise stated. Results have been grouped according to key supply chain elements. Figure 20 shows mine returns are almost equally sensitive to a longer than expected ramp up period, lower than expected mine output and higher than expected mine operating costs. To minimise these risks it would be expected that miners invest heavily in studying their resource and planning its development prior to signing any agreements with infrastructure owners. For example, it is understood that Xstrata spent over $200m and two years on pre-planning the development of a major mine in Queensland.

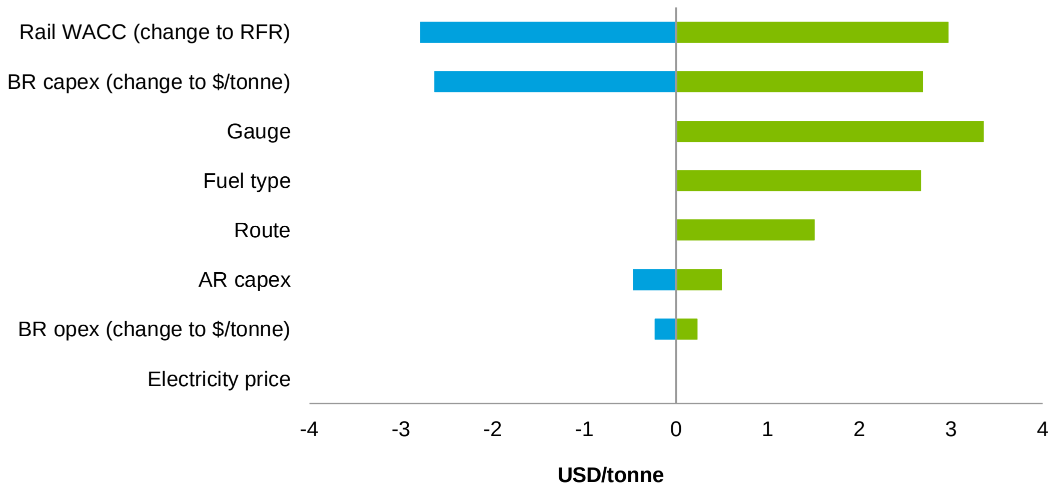
Figure 20: Mine related sensitivity variables



Source: Deloitte
Ramp up:-1 year and +5 years
Mine output: -5% and +20%
Mining capex: -5% and +20%

Figure 21 details the impact of a range of variables on total rail costs. It indicates that no one variable has the impact of the mining related variables but in aggregate the potential variation in costs caused by factors such as that below rail capex, WACC, gauge and fuel type of capital is significant. The graph shows that switching from standard gauge or dual gauge to narrow gauge or from diesel to electric traction could negatively impact the combined NPV of miners by approximately USD 3 per tonne.

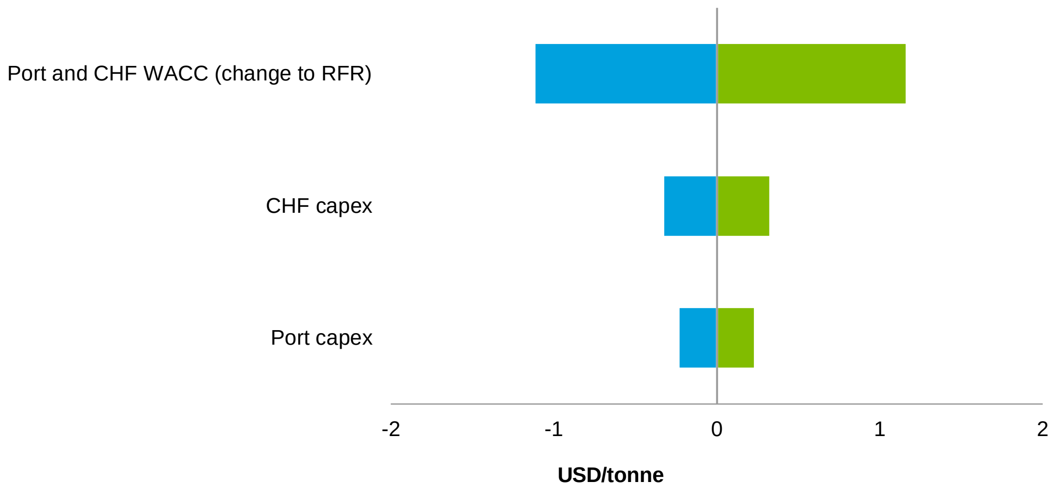
Figure 21: Rail sensitivities



Source: Deloitte
Rail WACC: -2 percentage points and +2 percentage points

Figure 22 shows that variables related to the CHF and port (including the estimated WACC) have a much lower impact on costs to miners those impacting on the rail and mining factors.

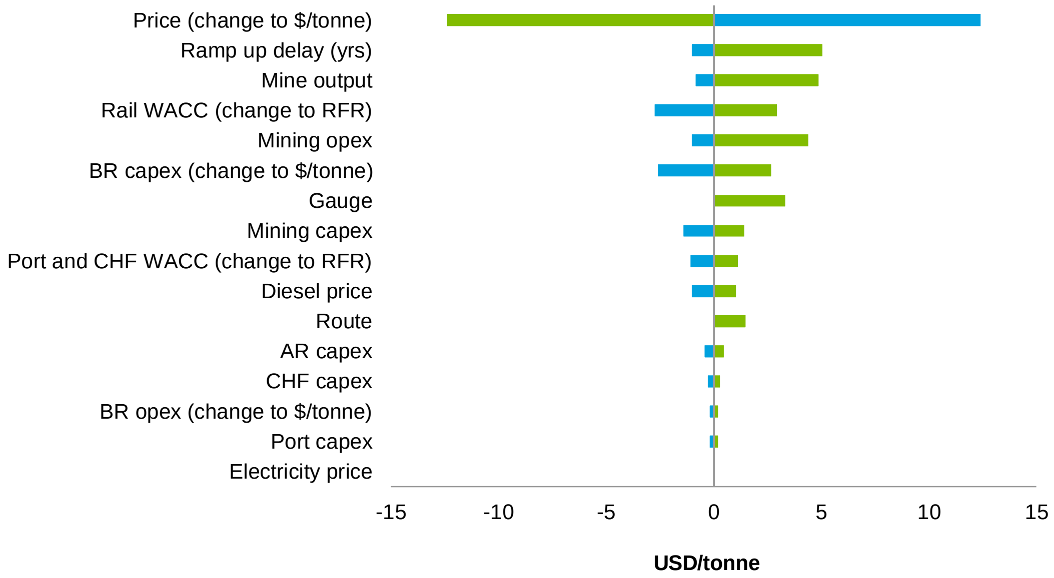
Figure 22: Port and CHF sensitivities



Source: Deloitte
Port and CHF WACC: -2 percentage points and +2 percentage points

Figure 23 includes all variables included in the sensitivities above analysis and price. It shows that despite the significance of key variables noted above price is by far the most significant impacting combined miner returns. However, of those variables which are at least partially under the influence of government policy gauge and fuel type are the most material.

Figure 23: Summary Sensitivity Tests



Source: Deloitte

4. Preliminary commercial assessment

4.1 Introduction

According to Article 5 of the Bilateral Agreement, the investment model for the project is through a Public Private Partnership (PPP). A special purpose vehicle (a joint owned company, JOC) will be formed by government agencies from Botswana and Namibia who will issue the concession to develop the project[9]. It is proposed that the joint owned company will be formed by Botswana Railways and TransNamib Holdings Limited. At the end of the concession period the project transfers back to the JOC.

As part of the preliminary commercial assessment, the potential delivery strategy, financing and funding structure for the project are investigated. This chapter outlines the issues surrounding the use of a potential PPP funding structure for the project.

The main features of the project that may lend it to be delivered through a PPP are:

- Substantial capital costs which are estimated to be up to USD12b (below and above rail and port capital costs).
- The long life of asset.
- Integral component to the coal supply chain and potentially other mineral resources, bulk goods and containers.
- Significant scope for innovation in the design, construction and operation of the asset (or components of it).
- May appeal to overseas investors with a different risk appetite and funding profile.
- Scope for innovation by the private sector requiring careful consideration of the risk transfer issues.

The discussion in the following pages outlines the high level issues associated with the delivery of the project. However to make an informed decision, a more detailed analysis in line with the international infrastructure procurement guidelines will need to be made to determine the optimal approach to deliver the project.

4.2 What is a PPP?

A PPP is a service contract between the public and private sectors where the government contracts the private sector to deliver infrastructure and related services over the long term. The private provider would build the asset and operate or maintain it to specified standards over the term of the concession. The private provider usually finances the project.

PPPs typically make the private sector parties who build the infrastructure financially responsible for its condition and performance throughout the asset's lifetime. Under a PPP a licence is granted to the private sector to use the asset for the PPP term (usually between 20 to 35 years).

In a PPP arrangement for the Trans-Kalahari rail and port project, the government would:

- Prepare an output-based specification rather than a prescriptive specification which would require the asset to be available for rail freight services, in this case coal haulage.

[9] Note: the joint owned company is a special purpose vehicle set up to manage the PPP contract and concession. It may not be the vehicle the respective governments use to invest in the project.

- Engage a provider to deliver the construction and operation of the line over the long term, e.g. 20 to 35 years or more.
- Require the provider to design, finance, construct, operate and maintain the project.
- Transfer revenue / demand risk to the private sector.
- Eventually take back ownership of the asset at a specified handover quality/standard.

Given the fixed asset nature of the project, a PPP contract is likely to focus on the infrastructure assets only (e.g. the below rail). However, the Bilateral Agreement has provisions for the PPP to provide operations (e.g. port and above rail).

The table below shows a high level assessment of the pros and cons of PPP structures for project delivery.

Table 23: Pros and cons of PPP structures

Advantages	Disadvantages/issues
• Full integration of design, construction, financing and maintenance responsibilities with a proponent that has significant experience in the rail and port sector.	• Success relies on well-defined functional and service specifications, including capacity and other operational requirements.
• Greater transfer of risk to the private sector, for example risks surrounding construction, operational and environmental issues. These may be better managed by the private sector.	• Where there are multiple concept designs being developed simultaneously during the bid phase, this can require significant stakeholder resources.
• Potential for greater innovation in design and construction, as the private sector would take account of whole of life cost of project including earthworks, operation and maintenance.	• Changes to design may require additional contract negotiations.
• Transfer of lifecycle cost risk encourages efficient design and quality construction and finishes. For example, bridges would be designed to facilitate efficient maintenance practices.	• The ability to make a variation needs to be addressed in the contract, for example where fire safety regulations and climate change and related environmental / safety regulations change over time.
• Overall design and fit-for-purpose risk lies with the private sector party, including suitability for use by coal trains.	• Potential for higher government agency tendering costs.
• Potential for lower cost of asset development and service provision through private sector efficiencies and better planning of maintenance activities to fit within allowed maintenance windows on an operational railway.	• Requires departmental skills (or consultants) for financial and technical assessment, tendering and management.
• Involvement of private funders (banks / equity investors) adds additional level of scrutiny to project, increasing confidence that outcomes will be achieved. For example, forecast coal demand and individual mine viability will be examined by an additional set of experts.	• Need to educate stakeholders who are likely to be unfamiliar with this procurement method to ensure that other project success factors are not compromised.
• Performance standards for rail operations are in place, such as operating speeds, waiting times etc.	• Cost of funds may be higher, especially if a demand risk transfer PPP is utilised.
• Will provide an additional source of funds as government balance sheet is stretched.	• Less control over project and less flexibility as delivery is based on the contract, for example maintenance scheduling may interfere with rail operations.
	• Procurement process is generally longer and more expensive.

Source: Deloitte

4.3 Risks

When considering the delivery of the project via a PPP, it is important to consider the key risks associated with the PPP approach. Table 24 sets out the major risks involved in a PPP project.

Table 24: Major risks in a PPP project

Risk	Discussion
Site Risk	This includes the risk that the project land will be unavailable or unable to be used at the required time, or the site will generate unanticipated liabilities such as existing contamination. We understand that the route is not currently defined, but is mainly owned by both the respective governments and private landowners. It is envisaged that it will be relatively straight-forward to make the site available as required (however this might be a time consuming process e.g. stakeholder engagement and land acquisition process).
Design, construction and commissioning	This is the risk that the design, construction or commissioning of the facility (or certain elements of those processes) is carried out in a way that results in adverse consequences for cost and/or service delivery for third parties i.e. miners using the project.
Sponsor risk	In establishing a project consortium, the sponsor typically establishes the private party in the form of a special purpose vehicle (SPV), which contracts with government. The SPV is simply an entity created to act as the legal entity of a project consortium. Sponsor risk is the risk taken by government that the SPV will not fulfil their contractual obligations.
Financial risk	This includes the risk that private finance will not be available, the project will not prove financially robust or changes in financial parameters will alter the bid price before financial close.
Market risk	This includes the risk that demand for the project or the prices that are able to be charged will vary from that initially projected so that the total revenue derived from the project over the project term may vary from initial expectations. Here the project is reliant on the coal mining industry, which historically has been associated with changing demand.
Network and interface risk	This arises where the contracted services rely on certain infrastructure or inputs in order to be performed successfully. On the project, interfaces with both below and above rail operators will be significant.
Industrial relations risk	This is the risk that industrial action impacts on the performance under the contractual obligations.
Legislative and government policy risk	This is the risk that government will exercise its powers, including but not limited to the power to legislate and determine policy, in a way which disadvantages the project. For the TKR project, these risks include: • Labour laws for skilled migrant workers • Changes to work health and safety requirements • Changes to environmental requirements and climate change standards • Noise and vibration and air pollution requirements • Construction standards / codes.
Force Majeure risk	This refers to the risk that events may occur which will have a catastrophic effect on either party's ability to perform its obligations under the contract.
Asset ownership risk	This includes the risk of maintaining the asset to the requisite standard or the risk that the construction of competing facilities will occur. For example, potential competing rail route options could occur through South Africa or Mozambique.
Environmental risk	The project will be constructed within a sensitive environmental area and there will be risks surrounding approvals and permitting, as well as during construction and operations to ensure that the impact on the environment are minimised. Environmental and social mitigation can form a substantial risk and cost item for the TKR. Also as the majority of international banks have agreed to undertake business in such a way as to comply with the Equator Principles they are likely to require proof, normally obtained through independent due diligence reviews, which show that the project has been designed and will be procured in such a manner as to have complied with the Equator Principles.
Tax risk	The risk that changes in the taxation framework may impact on the financial assumptions of the project.
Interest rate risk	This is the risk of adverse interest rate movements will affect the viability of the commercial model for the PPP contract.

Source: Deloitte

Once the risks for the project are identified, they are then allocated between the public and private sectors in order to allocate them to the party that can best manage the risks. Through this process the value for money of the project can be maximised. The table below sets out an indicative risk allocation for a PPP project to deliver the project. To improve the commercial viability of the project, the government may need to accept responsibility for a greater number of risks. For example, the government could assume responsibility for the environmental and planning approval process.

Table 25: Potential risk sharing arrangements

Risk	Risk allocation
Scope and specification risk	
• Scope/specification risk	• Government
Site and approvals risks	
• Site availability and access risk	• Government
• Site condition and geotechnical risk	• Private
• Land acquisition risk	• Government
• Environmental approvals risk	• Shared
• Planning approvals risk	• Shared
Design, construction and commissioning risks	
• Design risks	• Private
• Environmental Compliance	• Private
• Construction risks	• Private
• Construction cost escalation risk	• Private
• Supplier risk	• Private
Operating risks	
• Demand risk	• Private
• Operating performance risks	• Private
• Maintenance risks	• Private
• Operating cost escalation risks	• Private
• Change in specification risks	• Government
• Environmental Compliance	• Private
• Competition risk	• Government
Other risks	
• Interface risk with operators	• Private
• Change in legislation	• Shared
• Industrial relation risk	• Private

Source: Deloitte

4.4 Previous PPPs in Botswana

While PPPs hold significant benefits, they also present formidable challenges, both at earlier and later stages of market development, as countries increasing apply the PPP approach to infrastructure projects across a number of sectors.

PPP experience is limited in Botswana with only one transaction completed[10]. The only PPP project in Botswana involved the construction of a new headquarters for the South African Development Community (SADC) in Gaborone. It was built on land in the CBD, donated by the Government of the Botswana through a 99 year-lease agreement signed in 2007 between SADC and the Government of Botswana. The Government of Botswana also serves as the guarantor of the PPP agreement. The Bongwe Consortium was awarded the 17 year DBFMO (Design, Build, Finance, Maintain, Operate) PPP contract by the Botswana Government in 2007. Transaction details are shown in Table 26.

[10] Likewise PPP experience in Namibia is limited to one project, the Erongo Desal PPP.

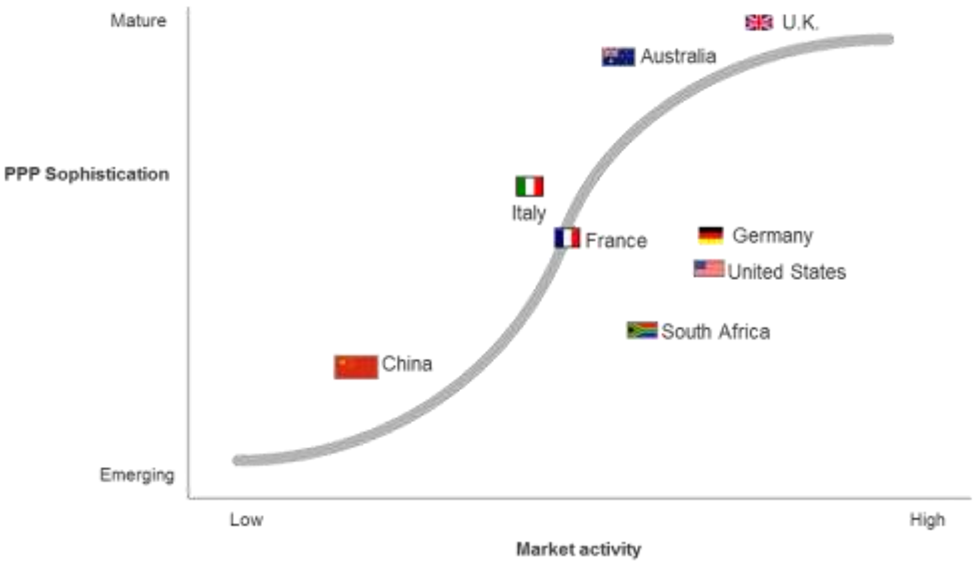
Table 26: SADC HQ PPP

Transaction details	Comment
Financial close	15 October 2007
SPV	Bongwe Consortium
Value	$30m USD
Equity	$10m USD
Debt	$20m USD
Debt/equity ratio	67:33
Finance type	Project finance
Concession	DBFMO
Concession period	17 years

Source: IJGlobal (2014)

A big part of moving up the maturity curve entails improving a government's capacity to execute and manage innovative partnerships (see Figure 24). Lessons learned from PPP leaders suggest several strategies for successful execution of PPPs.

Figure 24: PPP Country Maturity and Market Activity Curve



First, governments need a clear framework for partnerships that confers adequate attention on all phases of a life-cycle approach and ensures a solid stream of potential projects. This can help avoid problems of a poor PPP framework, lack of clarity about outcomes, inadequate government capacity to manage the process, and an overly narrow transaction focus. The Government of Botswana currently has a policy document for PPPs, the "Public-Private Partnership Policy and Implementation Framework" from the Ministry of Finance. However, the current framework consists of a 20 page document and does not provide practical guidance to assess the suitability of a PPP for the Trans-Kalahari rail and port project. The assessment of the project as a PPP will therefore need to be undertaken in accordance with international guidance, such as the World Bank or from major PPP countries such as Australia, Canada or the United Kingdom.

Second, a strong understanding of the new innovative PPP models developed to address more complex issues can help governments to achieve the proper allocation of risk, even in conditions of pronounced uncertainty about future needs. This allows governments to better tailor PPP approaches to particular situations and infrastructure sectors.

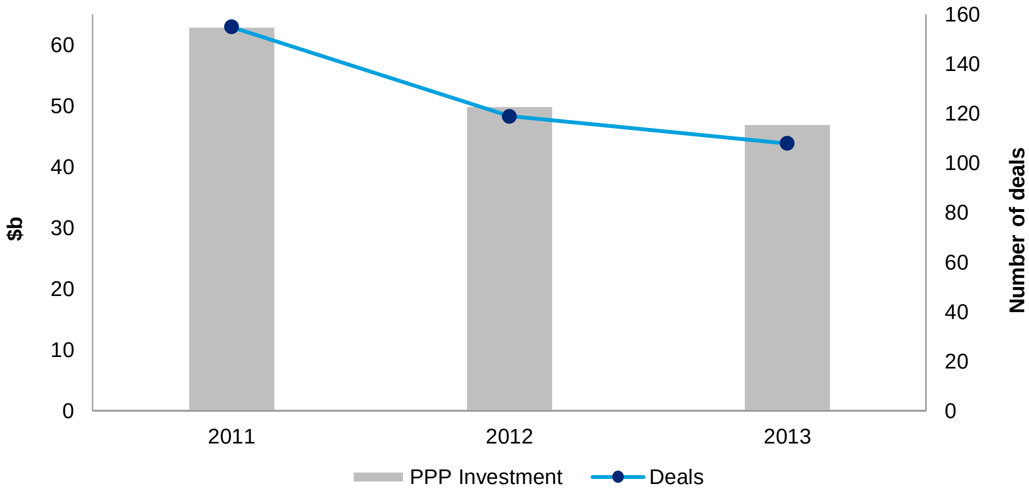
Last, in addition to providing higher-quality infrastructure at lower cost, governments can use PPP transactions to unlock the value from undervalued and underutilized assets, such as land and buildings, and use those funds to help pay for new infrastructure[11].

[11] From Deloitte "Closing the Infrastructure Gap: The Role of Public Private Partnerships".

4.5 Global PPP markets

Global economic conditions have improved since the global finance crisis, and global infrastructure investment rose in 2013. However, according to data from IJGlobal (2014), PPP investment declined, particularly for new-build projects with high construction costs. As a result, the global PPP market is now in its third year of decline (see Figure 25).

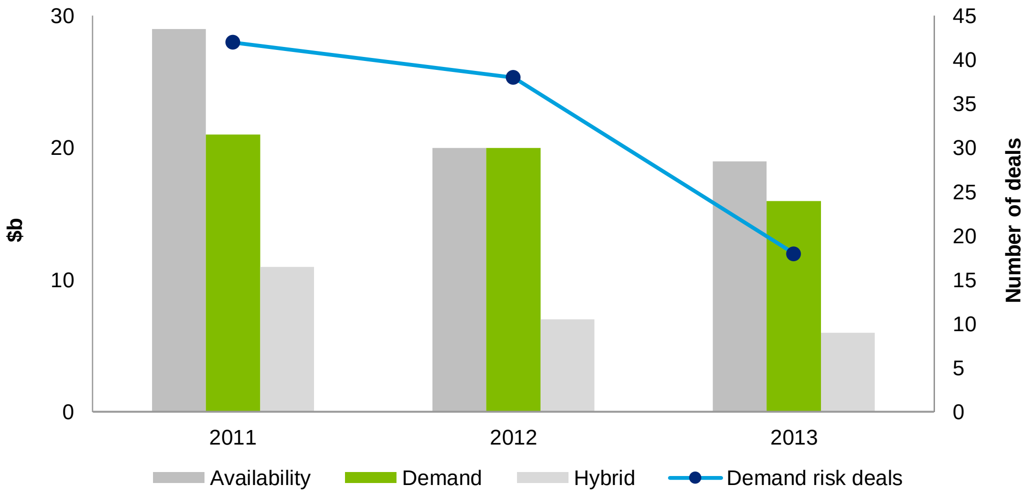
Figure 25: Global PPP Investments (all infrastructure types)



Source: IJGlobal (2014)

In terms of deal activity, a total of 108 transactions reached financial close in 2013, of which 92 projects carried a construction risk, a lower proportion than the previous year. Of the 92 construction projects that closed in 2013, projects that benefited from availability payments accounted for 78%, demand risk projects 18%, and hybrid structures accounted for the rest. As shown in Figure 26, the risk appetite of investors for demand risk PPPs has fallen significantly. According to information from IJGlobal, the number of demand risk PPPs was over 40 in 2011 but has fallen to less than 20 in 2013.

Figure 26: Global PPP infrastructure by risk profile 2011 to 2013



Source: IJGlobal (2014)

It is also important to consider the size and scale of the Trans-Kalahari rail and port project and its impact on the attractiveness to investors. For example, the majority of deals in the last three years required capital investment of between $100 million and $500 million. In 2013, only 12 PPP deals were larger than $1 billion each, and their combined value makes up more than half of the total market volume that year. These large scale projects are provided in Table 27.

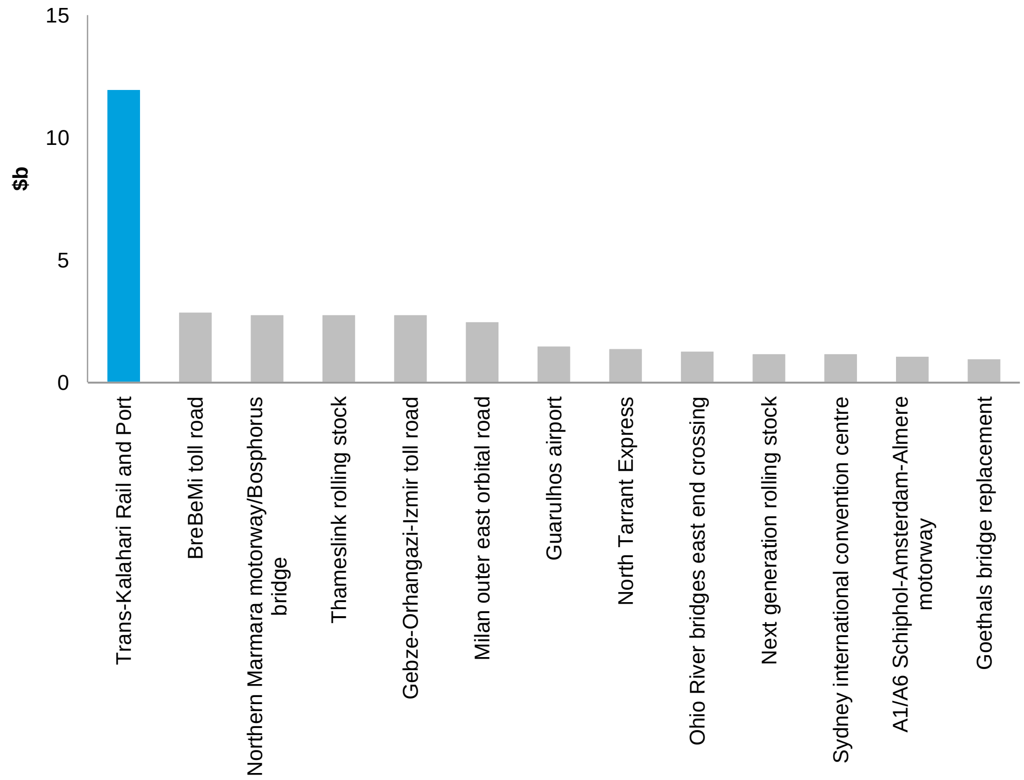
Table 27: Largest global PPP deals in 2013

Country	Type	Project	Capital cost ($b)
Italy	Road	BreBeMi toll road	$2.9b
Turkey	Road	Northern Marmara motorway/Bosphorus bridge	$2.8b
UK	Rollingstock	Thameslink rolling stock	$2.8b
Turkey	Road	Gebze-Orhangazi-Izmir toll road	$2.8b
Italy	Road	Milan outer east orbital road	$2.5b
Brazil	Airport	Guarulhos airport	$1.5b
US	Road	North Tarrant Express	$1.4b
US	Road	Ohio River bridges east end crossing	$1.3b
Australia	Rollingstock	Next generation rolling stock	$1.2b
Australia	Entertainment	Sydney international convention centre	$1.2b
Netherlands	Road	A1/A6 Schiphol-Amsterdam-Almere motorway	$1.1b
US	Road	Goethals bridge replacement	$1.0b

Source: IJGlobal (2014)

Figure 27 shows that the Trans-Kalahari rail and port project would be one of the largest PPP deals in recent history.

Figure 27: Comparison of the project to other PPP deals in 2013



Source: IJGlobal (2014)

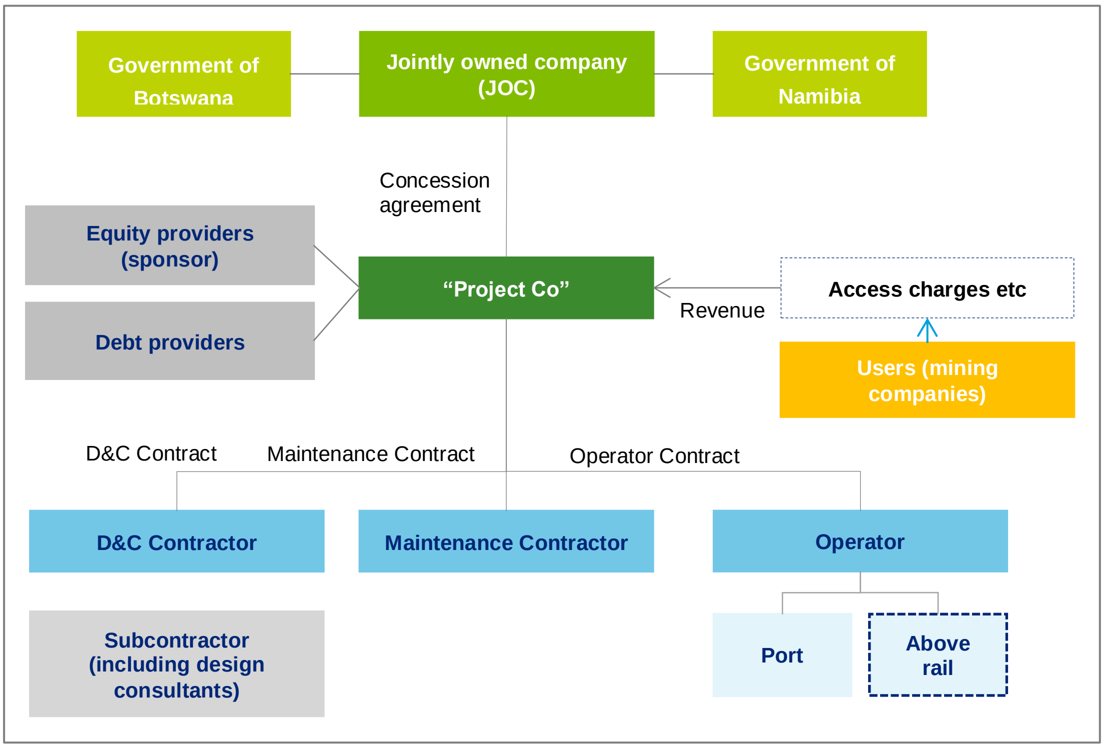
4.6 Bilateral agreement

The Bilateral Agreement states that the project includes "the evaluation, development, design, construction, financing, ownership, operation, repair, replacement, refurbishment, maintenance and expansion of the Trans-Kalahari railway line, coal terminal and associated loading facilities in Walvis Bay". According to Article 5 of the Bilateral Agreement, the project shall be development through a PPP model based on a Design, Build, Own, Operate, Transfer (DBOOT) contractual arrangement whereby the developer:

- Undertakes the financing, design, construction, operation and maintenance of the project.
- Owns the project during the concession period.
- Operates the project over the concession period to revoke its investment, operating and maintenance expenses for the project under such a tariff structure as may be agreed upon in the concession agreement or the specific project regulatory framework.
- At the end of the concession period transfer the project to the JOC.

The structure of the PPP model described in the Bilateral Agreement is shown in Figure 28. Under the proposed PPP model in the Bilateral Agreement, the project is horizontally integrated (i.e. the Project Company "Project Co" would own both the railway line and the dedicated port).

Figure 28: Proposed PPP model from the Bilateral Agreement



While the Bilateral Agreement outlines that the rail and port are to be operated by the developer, it is not clear if "operations" explicitly means above rail, as opposed to "operating" the below rail. For this reason the Bilateral Agreement needs to better define the inclusion of above rail operations.

Regardless, it is envisaged that an open access railway regime would be adopted that allows both above rail operations for the Project Co, third party rail operator (e.g. Aurizon, Burlington Northern etc) and/or mining companies (e.g. using their own locomotives).

Ultimately, the final PPP structure and regulatory regime adopted by the government will determine whether the Project Co is able to be vertically integrated i.e. own both the below rail and the above rail operations.

4.7 Delivering the project

The use of PPPs for mining related infrastructure can lead to disagreements between government and the private sector about how the infrastructure is to be used. For example, governments typically view the project as a catalyst for broader economic growth. When governments contribute to the project, e.g. through gifting of land, they assume rights to influence the design and operation (usage) of the project. The government might also wish to use the project to foster other parts of the economy (i.e. the project has multiple uses). For example, the project is expected to be a dedicated coal railway. However, the government may want to ensure that general container freight or passenger services can use the project. This can significantly impact on the efficiency of the coal supply chain.

On the other hand, the private sector has a more narrow view of the project scope and is driven by generating a return on the project relative to its risks.

Getting the balance right is crucial.

There are very few examples of successful mining infrastructure PPPs in the world, and no examples in Africa. This does not mean that it is impossible, rather it demonstrates the magnitude of the challenges that stakeholders face to structure and finance the project.

The lack of examples suggests that there are limited options with respect to commercial structures that will results in successful project financing. Historically, it also reflects the reluctance of mining companies to share infrastructure. Typically two structures can be used – PPP (third party) or integrated mine and rail (miner owned railway). Around the world governments have invested in rail infrastructure to stimulate their mining industries (e.g. the Queensland Government led the investment in rail infrastructure). Other rail projects have been fully integrated with the mine (i.e. miner develops own railway) as is the case currently in the Western Australia Pilbara region. Case studies have been provided in the following pages.

Table 28 below summarises the potential ownership models for the project. For completeness we have included a government ownership option.

Table 28: Comparison of delivery models

	Public sector	Mining company	PPP (Third party)
Decision maker	Government	Mining company(ies)	Investors
Country financial exposure	Maximum	Limited	Limited
Key attributes	• Maximum government flexibility in deciding usage • Operations and maintenance performed by government contractor	• Infrastructure evaluated as a consolidated project with the mine • Limited government ability to influence usage • Operations and maintenance performed by mining company or contracted out • Lower risk of product transport = lower risk premium for mining company	• Suitable for servicing multiple small mines • Evaluated on a standalone basis • Limited government ability to influence usage • Operations and maintenance performed by concessionaire or contracted out • Small mine company comfort with mine deposit delivery outlook
Risks	• Operational inefficiency • Mismanagement • Potentially higher costs • Funding risk	• Political risk • Regulatory risk	• Political risk • Potentially higher operating costs • Potentially higher tariffs • Regulatory risk • Operating risk
Likelihood of project financing	Low	High	High (but lower than mining company ownership model)

Source: IFC (2013)

Under the public ownership model, the project is majority owned by the government. Operations and maintenance are either undertaken by state owned enterprises (e.g. Botswana Rail) or contracted out. The biggest benefit of this model is that the government has the greatest degree of freedom to implement and develop the project as it wishes. This allows the government to maximise the use of the infrastructure to benefit the greatest number of potential users across multiple sectors to help grow the economy (i.e. multi-user and multi-purpose).

However given the lack of public sector capital and the mismanagement of many developing countries running stated owned infrastructure, historically many mining companies have decided to develop their own infrastructure. From a miners perspective, the ideal model involves the full ownership and integration of the mine, rail and port projects. Under this ownership model, the project has the highest likelihood of proceeding as a proportion of the repayment of the limited recourse loan would be underwritten by the coal volumes of the mining company itself. The drawback of this option is that government would loss some control over the development of the project. However, the government could improve its control by including specific conditions in the agreement. For example, allowing multi-user access (i.e. other miners). However the government must be careful not to place unduly conditions that might impact the project economics.

Some undeveloped mining deposits may fail to become commercial viable if they are required to absorb the entire costs of the related transport infrastructure. Some mining projects are simply located too far away from import markets to generate the profits required to pay for the infrastructure on a standalone basis. For these reasons, a PPP model may be attractive. The critical difference between the mining ownership model is that under the PPP model the project will be evaluated on a standalone basis. Therefore the project must be able to demonstrate that it can generate profits in its own right. That is, it must pay for its operating and maintenance costs, taxes and debt service and generate the required rate of return for its equity investors rather than being accounted for as one of the costs of the overall mining operation. Under a PPP model, it is crucial to understand the credit profile of each of the different miners using the railway. In some cases, users will not be credit worthy. The commercial viability of the project will be heavily dependent on the credit quality of the different users. The viability of the project becomes more complicated when not all users are identified at the time of the financing of the project (i.e. different mine commissioning timetables).

Case study – Queensland coal rail network

The Queensland mining related infrastructure networks serve as useful case study to understand the government ownership model. In this example, the rail network was initially government owned and then sold to a third party.

In Queensland, the below rail infrastructure is currently owned and maintained by Aurizon. The company also provides above rail services and is required to allow third parties to access its network.

The development of the Queensland coal rail network began in the 1940s and was owned by the government. As such the government was responsible for the full capital, maintenance and operating costs of the network (some capital costs were shared with miners). Over the next 70 years coal exports increased from around 3,000 tonnes per annum to 183mtpa in 2010 when the government's coal operations (below and above rail) were then sold off and publically listed. The ownership of the railway moved from government ownership to third party ownership. The freight rail assets were moved from QR National (government company) to the new company, Aurizon, who became the owner/operators of the network. The market capitalisation of the newly listed company was around $5 billion which included the below and above rail assets.

This case study shows that the development of the coal railway network and ports were government led. Miners lacked the financial capacity to develop the associated infrastructure and were reliant on support from the government (although it should be acknowledged that some capital investment in the railways was provided by the miners). Third party ownership was only viable once the infrastructure was developed and there were significant volumes of coal on the rail network due to a strong coal mining industry.

Case study – Western Australia iron ore rail network

The Western Australian mining related infrastructure networks serve as useful case study to understand some of the benefits and costs of the mining company ownership model.

In the Pilbara region of Western Australia, there are four privately owned rail networks used for iron ore exports by three large mining companies, BHP Billiton, Rio Tinto and Fortescue Metals Group (FMG).

Table 29: Miner owned railways in the Pilbara

Miner	Railway	Gauge	Opening	Length
BHP	Mount Newman	Standard	1969	426km
	Goldsworthy	Standard	1966	208km
Rio Tinto	Hamersley & Robe River	Standard	1966	1,300km
FMG	Fortescue Railway	Standard	2008	280km

Initially, miners Rio Tinto and BHP Billiton built privately owned rail networks which linked mining tenements to privately owned ports on the coast. These networks were beneficial to both state and federal governments as they allowed mines to become viable with no direct financial costs to government.

However, in 2004 FMG applied to use sections of the Rio Tinto and BHP Billiton railway network in order to develop its “Cloud Break” deposit. Both the two incumbent railway owners argued that the railway was an important part of the production process (another user on the railway would impact production at the mine) and that the iron ore wasn’t saleable until it reached the port. This argument posed a challenge to the existing legislation. After lengthy legal battles in which access was granted and then reversed, FMG eventually built its own greenfield railway at a cost of $2.5 billion.

This case study highlights that for Rio Tinto and BHP Billiton a miner owned railway was the preferred choice. This granted the miners complete control over the operations of their network, and therefore all of the costs of production along the supply chain. Without the investment from the miners, the state government would not have been able to fund the infrastructure required and the iron ore industry would have floundered. However, as the iron ore industry grew and other miners wanted to develop their deposits the existing regulation was not strong enough to ensure third party access. Therefore, if the miner owned ownership model is selected it is important that any regulation that is put in place to allow third party access, learns from the Pilbara iron ore example and addresses the key issues.

Figure 29: Pilbara iron ore rail networks

Case study – Moatize mine and Nacala rail & port

The Moatize coal mine in Mozambique serves as a useful case study for the miner owned railway model. Similar to Botswana, the Government of Mozambique is unable to fund the necessary coal related infrastructure due to the high costs involved.

Moatize is located 600km north of the port of Beira and has an estimated reserve of around 690 million tons of metallurgical and thermal coal. In 2013, it had an annual production of 3.8 million tons, but Brazilian miner, Vale is in the process of expanding its capacity.

The increased production will be too great for the existing Sena railway, which transports coal from the mine to Beira, to handle. The single-track railway is the primary mode of transport to the port; as such one of the priorities of the project is to develop a multi-billion dollar port and railway complex to support increased production levels. The Nacala Corridor project involves the construction of a new railway and port handling facilities to enable Vale to export coal through the Port of Nacala, 912km east of the mine.

The development is expected to cost $4.4 billion and be funded with a project finance facility that will feature Japanese export credit agencies (ECAs) and banks. In December 2014, due to cash flow problems, Vale agreed to sell a stake in the Moatize coal mine to Japanese trading house Mitsui for $763 million. In a statement, Mitsui said it would pay $450 million for 15% in the Moatize mine, invest a sum of $188 million to help fund the mine's expansion programme and take a 50% stake in a subsidiary of Vale which is developing a rail and port network associated with the project for around $313 million.

Figure 30: Moatize mine in Mozambique

Source: IJGlobal and Vale

4.8 Funding options

Funding refers to the sources of cash available to pay for the project. This is opposed to financing, which are the mechanisms available to convert the requirement for lump sum cashflows during the construction period to a requirement for payments over time (for example borrowing money and repaying the loan over time).

Table 30 sets out some potential forms of funding that may be used for the project. Due to the nature of the project, there is likely to be one main source of funding. The main source is from access payments from mining companies.

Due to the size of the project, any additional funding would be welcomed. For example, under a hybrid PPP approach governments may support a proportion of the funding requirement.

Table 30: Potential funding sources for the TKR

Funding source	Discussion	Potential value
Access arrangements – over time	Mining companies may be willing to enter into long term access contracts with access payments made over time. This will provide a guaranteed level of revenue to the project that can be used to obtain finance to pay for the construction costs. A large established mining company, would provide significantly more certainty (and hence more attractive financing) then the junior miners, at least until the mines were operational and had an operating history. In the case of the project, the access contract will be directly with the asset owner, the PPP. The access contract could be intermediated or supported by the government in order to increase the 'bankability' of the contract and hence achieve more favourable financing terms. For a large company, the benefit from government support is likely to be lower than if the counterparty was a junior miner due to the lower credit quality of the junior miners.	Unknown – likely significant with a major miner or a number of smaller miners
Access arrangements – up front	Mining companies may be willing to enter into long term access contracts with an up-front access payment that guarantees access for the period of the contract. This will provide cash during the development of the project that can be used to pay for construction costs. As a large established mining company would have the capacity to fund an up-front payment of this type. However, the junior miners are less likely to have the balance sheet strength or capacity to raise funds to make a significant up-front payment. There are also considerable coordination problems and potential competition issues in trying to coordinate investment between a large group of small miners.	Unknown – likely significant with a major miner or a number of smaller miners
Government of Botswana	The Government of Botswana may be willing to provide some funding for the project in order to facilitate the development of the export coal industry.	Potentially 15% of rail capital costs
Government of Namibia	The Government of Namibia may be willing to provide some funding for the project in order to facilitate the development of its economy.	Unknown – likely insignificant
Other users	There is the potential for other users on the project at a later point in time. For example from intermodal traffic or other bulk commodities. However, these users have not been identified at this stage and their contribution to the project is likely to be insignificant.	Unknown – likely insignificant

Source: Deloitte

For completeness we have identified three different funding options for the PPP. The following PPP options are potentially available:

- Demand risk PPP
- Availability PPP
- Hybrid PPP.

4.8.1 Demand risk PPP

Under this option, a private consortium is appointed to design, build, own, operate and then transfer (DBOOT) back the infrastructure after a specified period. In return for these services the private consortium is allowed to keep the revenue collected from the service. This is the model proposed in the Bilateral Agreement.

This option has the benefits that a single entity is responsible for the delivery of the services, increasing the level of risk transfer and incentive to design and operate the facilities based on the lowest whole of life cost. Also, the transfer of demand risk to the private sector may provide value for money benefits to government where the private sector is able to confidently forecast the level of future demand.

However, the contractual arrangements for a PPP are often complex and time consuming to procure, lowering the number of tenderers and adding cost to the project. In addition, funding costs are likely to be higher where demand risk lies with the private sector. This is especially the case in this project, where the level of future usage is uncertain, given that the forecast for future commodity demand levels is not well understood. On a demand risk based PPP project, debt gearing can be expected to be approximately 60-70%. However on this project, given its nature and risks, it is likely that debt gearing would be less than 50%. This is significantly lower than for availability based PPPs (80-90%), resulting in a higher cost of capital.

In recent years the private sector's appetite to assume revenue risk on 'greenfield' infrastructure development has reduced, as a result of a number of high profile failures on several projects[12]. In addition, the GFC and tightening debt markets have changed views on the level of risk involved. While there are still some projects where the private sector will take demand risk (where there is a well demonstrated demand for the infrastructure that can be quantified accurately), the majority of projects have required the government to take some or all of the risk, for example through the use of payments based on the availability of the infrastructure, or provision of a floor level of demand/revenue.

A demand risk PPP may possibly appeal to an overseas investor with a different risk profile and long-term perspective of an integrated supply chain including teaming up with a rail company to partly finance the project.

For example, the Galilee rail corridor in North Queensland has seen a joint venture (JV) between Aurizon (Aurizon is a rail infrastructure owner and above rail operator) and Hancock-GVK (Hancock is a leading mining company and GVK is a major Indian infrastructure / mining / power provider). Under the terms of this arrangement, the parties have combined to offer a consolidated mine, rail and port solution. Following the completion of the transaction, Aurizon would gain the rights to operate and jointly manage with GVK the rail infrastructure to exclusively provide rail haulage from GV Hancock's Alpha and Kevin's Corner mines for up to 60mtpa of coal[13]. The proposed structure for that project is shown in Figure 31.

More generally on the Queensland freight network, Aurizon has responsibility through different business entities for both below rail and above rail activities, although in the case of the latter, they compete with other rail operators to secure cargo. In the above rail operations, contracts are usually sold on a take-or-pay basis with the miners effectively taking the demand risk.

The project will largely involve the movement of coal (potentially as well an assumption of new products). Rail access charges will be levied by the Project Co (however, there may be complex approval/legislative/policy approvals required depending on the regulatory regime adopted).

It is expected that the PPP proponent of the project would be required to take on 100% of the demand risk. Based on our experience and given the level of uncertainty surrounding the level of rail traffic demand it is unlikely that reasonably priced funding for the project would be available where more than 20% of the revenue is subject to demand risk.

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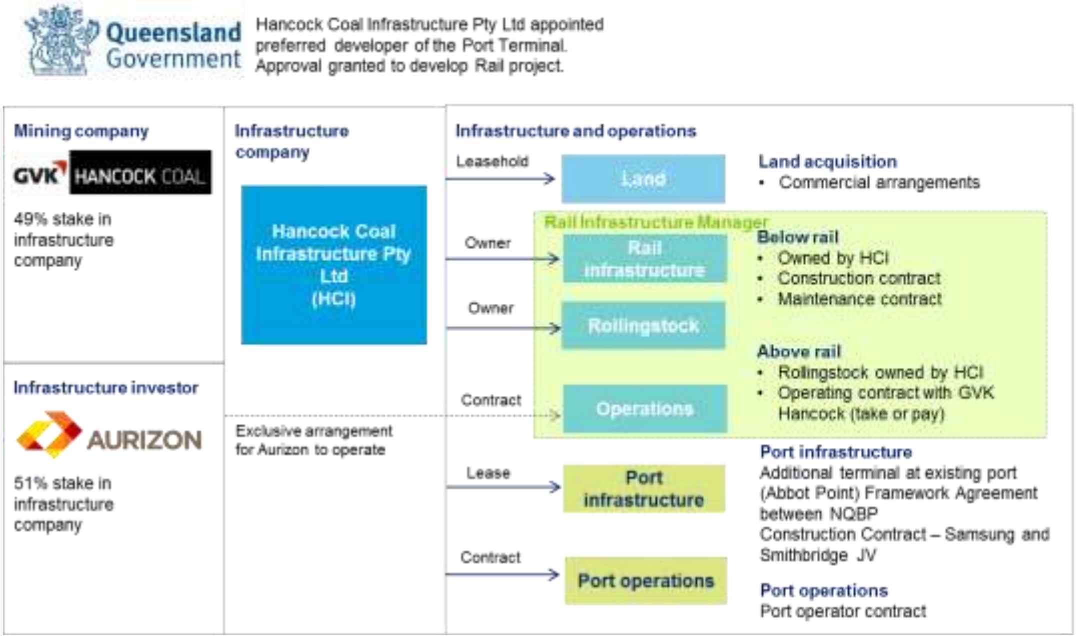
[12] For example in Australian toll roads such as the Cross City and Lane Cove Tunnels in Sydney, RiverCity Motorway and Airport Link Motorway in Brisbane, and passenger rail projects such as the Airport Rail Link in Sydney.

[13] As of December 2014, GVK has been unable to finance the project.

Figure 31: Proposed structure of the GVK-Hancock rail and port project in the Galilee Basin, Queensland



4.8.2 Availability PPP

Under this option, a private consortium is appointed to deliver and operate the project and in return for these services a monthly payment is made by the government to reflect the cost of funding and operating the infrastructure. This payment is conditional on the private sector meeting the service requirements set out in the contract, including availability of the infrastructure, condition of the assets (maintenance program undertaken), and providing the desired frequency of service. If these conditions are not met, each performance failure incurs a deduction against the monthly charge.

For example, a Service Level Agreement (SLA) may include requirements that the project be able to handle a certain number of trains per day, of a specified length and weight. Also that the track is available for use 95% of the time and that maintenance periods are limited to weekends or nights. At the end of the contract, the project would have to be handed back to the government in a specified condition. Where the SLA's are not achieved, there would be deductions from the monthly availability payment based on the severity of the non-compliance. Over the years prior to the end of the contract, the condition of the assets would be monitored, and deductions made if it was not being maintained at the required level.

This option has the benefit that a single entity is responsible for the delivery of the services, increasing the level of risk transfer and incentive to design and operate the facilities based on the lowest whole of life cost. Also, the availability based payment stream is generally considered low risk by financiers, leading to lower funding costs.

In a transport context, a number of UK trunk roads, the below rail infrastructure for the Docklands Light Rail and the Peninsular Freeway in Victoria were all developed by the private sector with payments by governments providing that the infrastructure is operational. They were constructed under PPP contracts where the private sector designed, constructed and maintained the facility for a set period. At the end of the concession the assets are returned to the ownership of the State. In return for provision of a working asset, the private sector contractor is paid a monthly availability payment.

As noted in the financial modelling, until prices return to greater than $81/t a demand risk PPP will not be bankable. Options for government are to fund up-front, over time or provide a state backed guarantee to the Project Co.

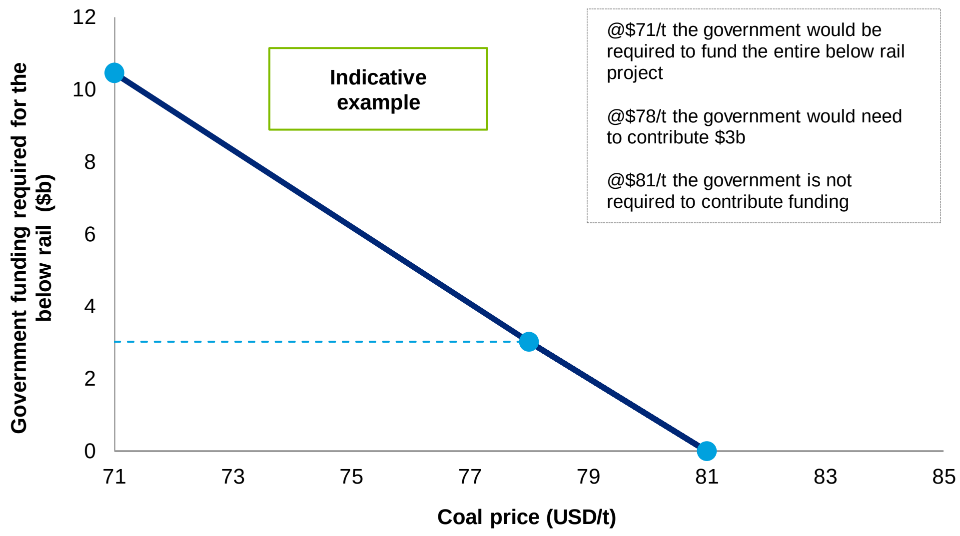
Any contribution to the project by the Government of Botswana would likely be for a proportion of the below rail asset. We have modelled the government funding requirement at various coal prices[14], see

[14] The contribution required would depend on the coal price to ensure that the mines are profitable.

Figure 32. Under the scenarios shown, the government would not charge users for below rail access and would only generate an economic return through royalties and taxes[15].

Figure 32 shows for example that at a coal price of $71/t, the government would need to fund the entire below rail project of approximately $10 billion USD and make rail access free of charge to miners to ensure that the miners IRR is above the hurdle rate of 15% (real pre-tax WACC). The government contribution is lower if coal prices are $78/t as the miners are able to help fund a proportion of the capital costs. At $81/t the project is viable without a government contribution.

Figure 32: Indicative government contribution required for the below rail at different coal prices to ensure mines are profitable (i.e. IRR >15%)



Source: Deloitte

4.8.3 Hybrid PPP

Under this option a combination of government finance, demand risk and availability payments could be used. To date, there have been few projects that have used both demand risk and availability payments, as there are generally different investors and return expectations for demand risk versus availability projects[16]. Where they are combined, investors would default to the higher returns, removing the cost benefits associated with the low risk availability payments.

On this project, funding could be structured as a combination of government grants and an availability payment PPP. The level of government grant would depend on the availability of government funding and whether there was a preference for paying for the project up front or over time.

Alternatively, the project could be funded as a combination of government grant and a demand risk PPP. However, we would expect that the proportion of the project that could be funded by a demand risk PPP would be low – funders are unlikely to accept significant risk on freight volumes, resulting in low expected revenues being used to forecast debt and equity returns. In order to understand the level of funding that may be possible, a more detailed analysis of forecast coal rail traffic and the prices charged for access to the TKR will be required as coal prices improve.

[15] It is unlikely that royalties and taxes alone would be sufficient to cover the government's contribution.
[16] The F3-M2 highway link project in New South Wales is currently being considered using a combination of Federal and State government grants and a demand risk PPP with the private sector. This has been done because the Federal / State governments do not have sufficient funding available to pay for the whole project themselves, and the forecast traffic on the road is not sufficient to ensure returns for investors without support from the government.

4.9 Financing

A large project such as this project is typically financed through project financing (through a limited recourse loan). PPPs are generally financed on a limited recourse basis meaning that loan is payable by the Project Co and not the sponsors[17].

Under a public sector ownership model, the responsibility for financing the project rests entirely with the government. The construction of such a large project presents economic opportunities and challenges for both Botswana and Namibia which may justify an investment from government. Botswana is considered investment grade and credit worthy countries can raise finance from capital markets[18]. Both governments have access to international and domestic credit markets which could be used to finance the project.

Raising the money domestically through debt will pull savings away from other sectors of the economy, increasing the cost of capital which will reduce private sector investment. The increased government debt could alternatively be financed via the central bank directly increasing the supply of money. This would have similar effects on private sector activity due to higher inflation and the resulting lower returns on investment. The exchange rate regimes in each country are different. However, raising the debt internationally will have similar effects as the increased inward capital flows will result in higher domestic inflation.

Botswana's debt ceiling is legislated at 40% of GDP, that is, 20% local and 20% external debt. At current reports, Botswana has around 16-17% of external debt. Therefore the ability to raise external debt to support the project is limited. Given the project costs, capital contributions from the Botswana or Namibian governments are not likely to be significant (see Table 31).

Alternatively, concessional financing, from the World Bank, for some proportion of the project has been identified as an option. However, IFC (2013) notes that "World Bank commitments in Sub-Saharan Africa and across all sectors totalled USD 37.7 billion as of January 2012. However, for iron-ore rich countries, World Bank net commitments for transport projects were USD 1.3 billion as of January 2012 versus an estimated need of more than USD 50 billion for iron ore projects alone". This seriously puts into question the ability for concession funding from the World Bank to contribute a significant proportion of financing to the project.

Therefore, involving the private sector, through project finance seems the only viable option to source the necessary funds for the project.

Table 31: Mismatch between Botswana budget resources and size of capital required

Factor	Measure
S&P sovereign credit rating	A-
Gross domestic product (GDP)	$14b (2013)
Debt ceiling	Limit 40% of GDP (current debt 15-17% external and 5-7% internal)
Project capital costs	Total $11b to $15b (~$6b-$8.5b for Below Rail) (~$2b for Above Rail) (~$3.2b for Port)

Source: various

As noted earlier, for PPPs, the private sector usually finances projects via project finance on a limited recourse basis. A limited recourse loan limits the exposure of corporate balance sheets from the risks of a particular project. In project finance, lenders (debt providers) look at the cash flows of the project itself as those using the railway and port are the only source of repayment for the limited recourse loan – that is, the miners. Investors typically establish a special purpose vehicle ("SPV") or project company to develop, finance, construct, and operate a project. It is the SPV or project company that raises the financing, with the investors exposure limited to the amount of equity being contributed to the project.

A number of key factors considered by lenders before offering project finance is shown in Table 32.

[17] Although in some cases there is some recourse to sponsors. For example, the no recourse threshold is generally only reached when the project is operational.
[18] Note: Namibia is only rated BBB- according to Fitch sovereign credit rating (2014).

Table 32: Lenders considerations for project finance

Lenders key factors	Description
Project sponsor	Quality of the project sponsor is generally the first aspect lenders assess. Lenders focus their review and analysis on the experience, reliability and creditworthiness of the company or consortium of companies responsible for developing, building, owning and (potentially) operating the project. In particular, lenders will likely require completion guarantees. They will therefore assess the financial ability of the company or individual shareholders in a consortium to stand behind their guarantees.
Financial viability and economics	The project will be assessed on a stand-alone basis. Project finance lenders focus their analysis on the project's cash flow, as they are lending against this single cash flow stream from the project. In this case, usage of the rail and port is made solely by miners. Lenders will therefore need to have confidence that economics of the project stack up. In this case, this means that mines need to be profitable and the outlook for coal needs to be positive.
Compliance	Compliance with various performance standards on social and environmental sustainability. For example, the Equator Principles.
Risks	Lenders will only lend to a project if, and only if, both commercial and non-commercial risks are adequately mitigated.
Stakeholders	Project finance lenders focus their attention on understanding and analysing project participants, to ensure that they are technically and financially capable of honouring their contractual obligations. The main contractual arrangements made between the stakeholders are the "take or pay" arrangements. In particular, the lenders will need to get comfortable with each counterparty's experience, credibility and creditworthiness. Lenders will especially scrutinise the counterparty's track record in similar projects. The key stakeholders in this project are the miners. For large miners this is not expected to be a major concern. However this may prove a problem for some junior miners. In this instance, junior miners will need to have their own bank guarantees so that the project finance lenders can be confident that any arrangement made with a junior miner will be honoured.

Source: IFC (2013)

A key factor that may limit the financing of the project concerns the coordination of all the stakeholders involved in the project. The sharing of infrastructure between the miners is likely to raise issues around timing. For the project to be successfully developed, the concurrent development and financing of the mines is a prerequisite. According to the IFC (2013), "even if this is the case, the level of complexity necessary in a debt financing of such a structure might deter certain lenders from participating. The banks would have to underwrite multiple mines since they will need to evaluate the probability of each mine continuing production. Furthermore, solid contractual relationships would have to be established between all of the mines, the project company that would own the infrastructure, and the lenders themselves. And, cross-default provisions would likely have to be established between the mines and the infrastructure. The combination of these factors will make the debt financing so complex that it would be difficult to execute them even in developed markets, let alone in developing regions".

4.9.1 Example structuring and financing

A common cited problem with greenfield mining related infrastructure is the "chicken and egg" situation, i.e. does the railway and port need to be developed before the mines? Or do the mines need to be developed before the railway and port?

In practice, the rail, port and mine projects are mutually dependent. That is, the viability of each project depends on the viability of the other.

To describe the interrelationship between the rail and port project, and the mines, we have developed three simple examples to show the interaction between each of the stakeholders.

The following simple examples have been developed:

1. Relationship between the Project Co and a mining company ("Mining Co") where the Mining Co intends to use its own locomotives. It is assumed that the Mining Co's use of the railway and port will cover the debt repayments of the Project Co.

2. Relationship between the Project Co and a Mining Co where the Mining Co intends to use the locomotives of a third party rail operator ("Rail Co"). It is assumed that the Mining Co's use of the railway and port will cover the debt repayments of the Project Co.

3. Relationship between the Project Co and Mining Co “A” where the Mining Co “A” intends to use its own locomotives, and Mining Co “B’ where the Mining Co “B” intends to use the locomotives of a third party, Rail Co. It is assumed that both the demand from Mining Co “A” and Mining Co “B” for the rail and port is required to cover the Project Co’s debt repayments.

Example 1 – Relationship between Project Co and Mining Co

Figure 33 shows the interactions between the Project Co, Mining Co “A” and the various banks and debt providers. In this example we assume that Mining Co “A” will use its own locomotives and that the use of the railway and port by Mining Co “A” is sufficient to cover the debt repayment for the project.

The diagram shows the following features:

1. The Project Co will not be able to secure project finance from lenders without some form of guarantee that there is a steady cash flow to repay the debt. Therefore, the Project Co requires “take or pay” (ToP) agreements with Mining Co “A” to demonstrate to lenders that there is likely to be demand for the project, and therefore revenue, which can be used to repay the debt.

2. The debt providers to the Project Co will undertake due diligence on Mining Co “A” to ensure that the ToP agreement is credit worthy. This can be an issue for junior miners unless the ToP is supported by a bank guarantee[19].

3. Before both the bank guarantee is given and the debt providers to Project Co are satisfied that the ToP is bankable, Mining Co “A” would have to demonstrate that the economics of its mining operation are commercially viable if the rail and port are developed. In particular, lenders will want to ensure that the mining operation of Mining Co “A” is competitive and sits in the lower quartiles of the global production cost curve for coal. This will ensure continuing operations even at times of depressed commodity prices. In this case, achieving the lower end production cost curve will mean not only delivering the lowest possible mining cost, but also the lowest possible transportation cost[20].

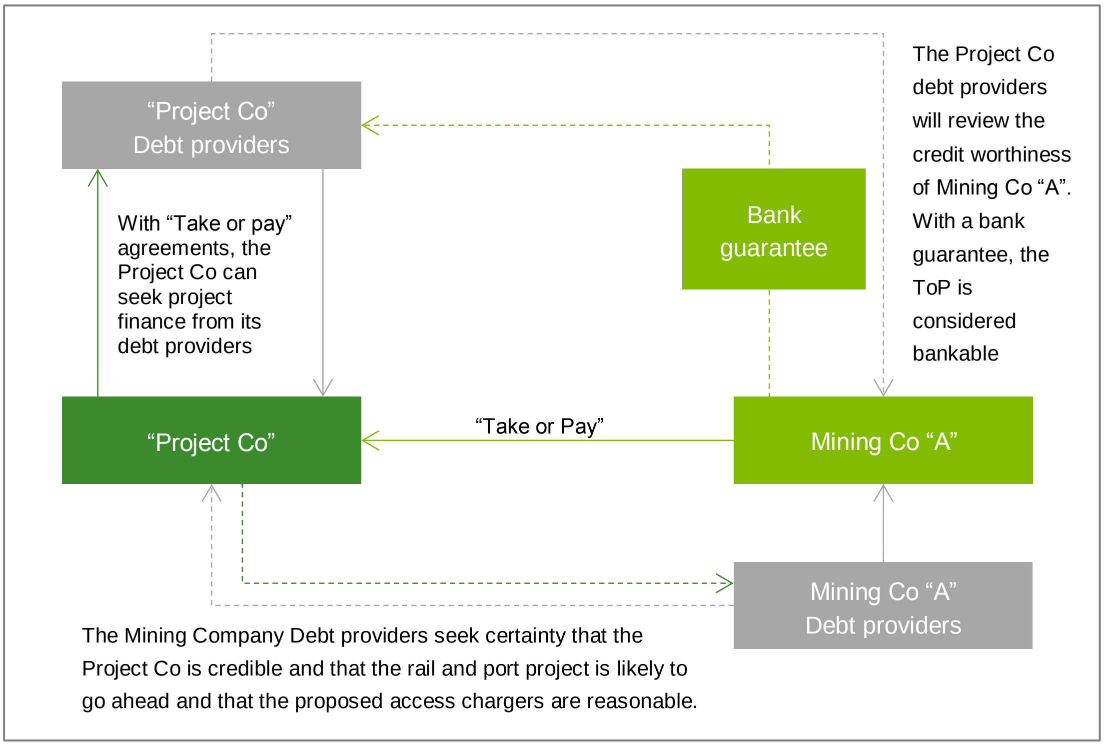
4. The debt providers to Mining Co “A” will not provide financing to develop the mine until they are certain that Mining Co “A” will be able to repay its debt. This means that Mining Co “A” must demonstrate that with a path to market, via the rail and port project, their mine generates sufficient profits to repay the debt. Therefore the debt providers to Mining Co “A” will review the economics of the mine but will also be concerned with the ability of the Project Co to deliver the rail and port project on time and on budget, and for the agreed access charges.

For this scenario to be considered bankable, it would require a large miner that would have coal export volumes sufficiently large to cover the capital and operating costs of the rail and port project. Therefore the rail and port project would be fully funded and underwritten by a large “anchor” mining client.

[19] In this instance, a bank guarantee is a written commitment issued on the mining company’s behalf in favour of the Project Co to undertake to pay on demand the amount specified in the guarantee to meet the obligations of Mining Co “A” under the ToP.

[20] IFC (2013)

Figure 33: Example relationship between Project Co and Mining Co “A”



Source: Deloitte

Example 2 - Relationship between Project Co, Mining Co and Rail Co

This example is a variation from Example 1, where the mining company does not have its own locomotives and requires a third party for the transport of its product. Figure 34 shows the added complication to the arrangements between the parties.

The additional features of this example include:

1. Mining Co “B” needs to sign a ToP agreement with both the Project Co and the Rail Co. The ToP with the Rail Co guarantees that it will use the services of Rail Co to transport its product. Essentially the ToP with the Project Co is for capacity on the below rail and the ToP will the Rail Co is for above rail services.

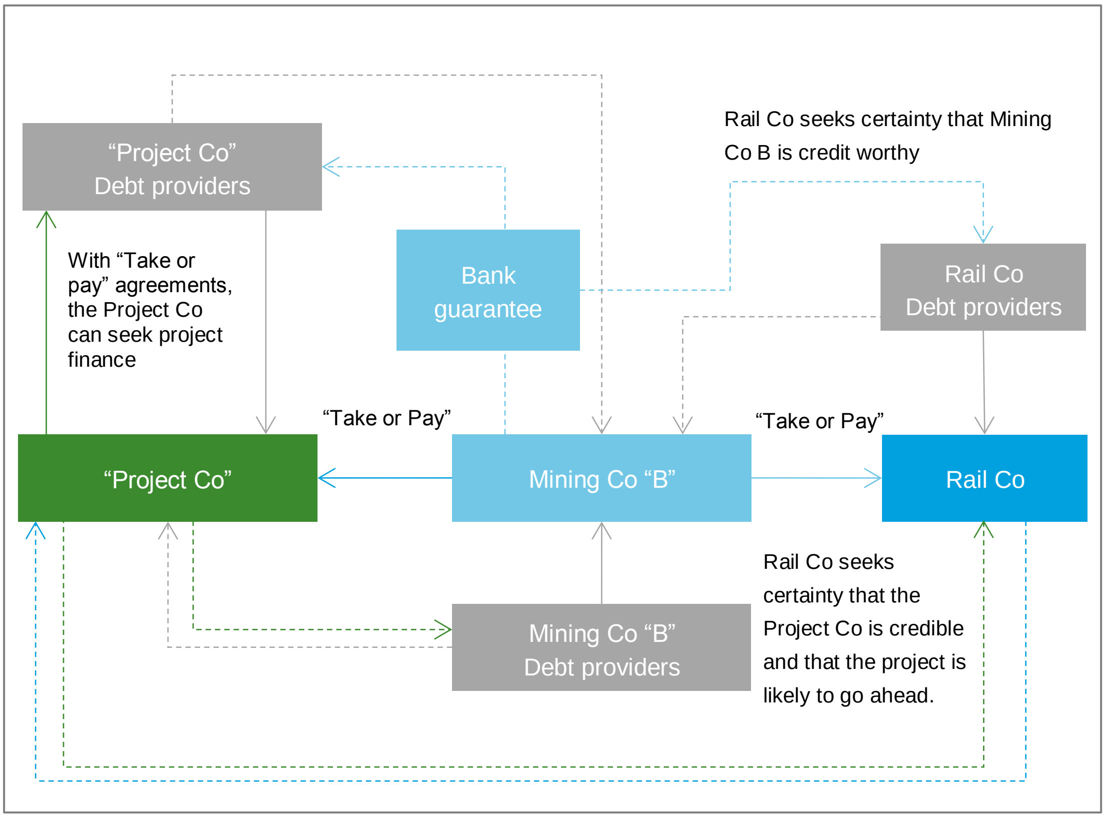
2. Rail Co requires the ToP from Mining Co “B” in order to receive finance from its debt providers to purchase new rollingstock etc. As shown in the previous chapter the upfront above rail capital costs are expected to be around $2b (depending on the gauge and traction).

3. The debt providers to Rail Co will review the credit worthiness of the ToP provided by Mining Co “B” and in the case of junior miners will require a bank guarantee.

4. Rail Co and its debt providers will also want assurances that the Project Co will be able to deliver the rail and port project on time and budget.

This example shows the extra layer of project finance that is required for Rail Co to provide its services to Mining Co “B”. Like Example 1, this example assumes that Mining Co “B” is a large miner and has volumes using the rail and port sufficient for the Project Co to repay its debts.

Figure 34: Example relationship between Project Co, Mining Co "B" and Rail Co



Source: Deloitte

Example 3 - Relationship between Project Co, Mining Co "A" & "B" and Rail Co

The final example is shown in Figure 35. Example 3 shows the interactions between the Project Co, the two mining companies (Mining Co "A" and "B") and the third party above rail operator, Rail Co. This example shows the complex interactions that are involved when two mining companies are involved in the transaction. In this example it is assumed that the Project Co needs the volumes from both Mining Co "A" and Mining Co "B" (50-50 split) to repay its debt.

The additional features of this example include the following:

1. The Project Co will not be able to secure debt financing from lenders without ToPs from both Mining Co "A" and Mining Co "B".

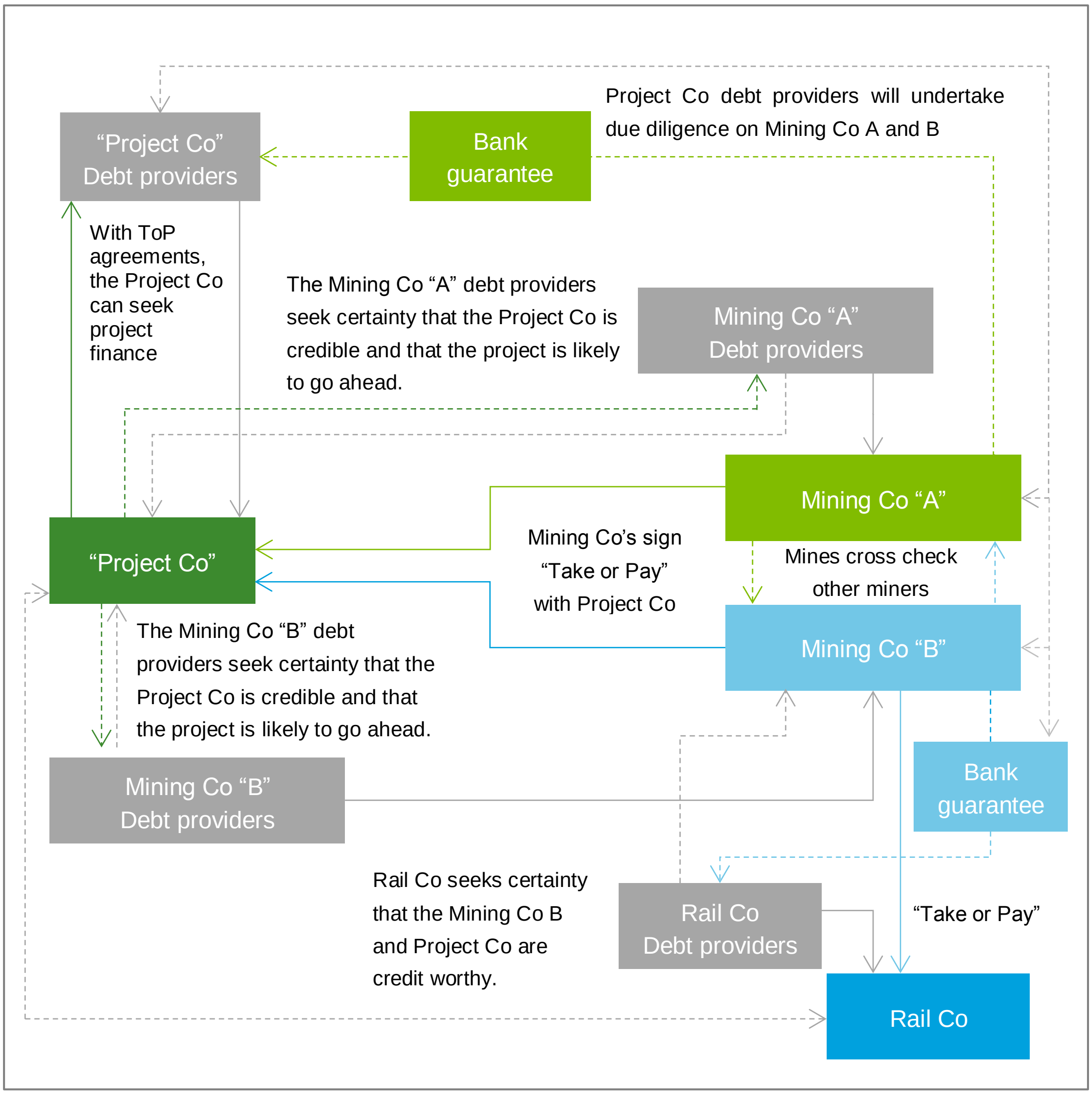
2. The debt providers to the Project Co will have to undertake due diligence on Mining Co "A" and Mining Co "B". Both miners must be able to demonstrate the viability and sustainability of their operations. The debt providers to the Project Co will be concerned with the likelihood of both mines being able to deliver on their commitments as the project financing depends on the volumes from both miners. Timing will be an important factor in their analysis. For example, will both mines develop according to the agreed timeframe and ramp up accordingly?

3. Mining Co "A" and Mining Co "B" will not seek financing for their projects unless they have confidence that the other party will agree to its commitments on the rail and port project. It is highly unlikely that the mining companies will agree formally in writing to each other.

4. The Rail Co is now also interested in Mining Co "A" as its ToP with Mining Co "B" is dependent on the viability of Mining Co "A" and the flow on viability to the Project Co.

This example shows the complexities involved when two miners are involved. It shows that each of the stakeholder's operation impacts the commercial viability of the others. The Project Co would need to be underwritten by both mines and lenders need confidence of the continued production of each mine. A number of cross-defaults would need to be in place to protect each lender. The combination of these factors will make the debt financing difficult to execute in practice. As of the beginning of 2015, the Botswana coal mining industry is dominated by small and medium players. In the current state it is likely that the project would need to be underwritten by more than two miners.

Figure 35: Example relationship between Project Co, Mining Co "A" & "B" and Rail Co



Source: Deloitte

Case study – Newcastle Port Acquisition

The Port of Newcastle acquisition serves as a recent case study into the financing of coal related infrastructure. The acquisition involved two major equity providers and five major debt providers.

The Port of Newcastle is one of the world's largest coal export ports and primarily serves shippers to Japan and China. In the 12 months to 30 June 2013 a record 142.6 million tonnes of coal was exported from the port.

The New South Wales government awarded the 98-year lease of the port to Hastings Fund Management and China Merchants Group in April 2014. Hastings Fund Management and China Merchants Group agreed to pay A$1.75 billion, including transaction costs for the lease of the port and its associated infrastructure. Hastings Fund Management and China Merchants Group signed a A$885 million financing with five banks for the acquisition.

The financing is understood to comprise A$800 million in term loans, split between two facilities with maturities of three and five years, and an A$85 million working capital facility, which carries a maturity of three years. The five banks lending on the deal are:

- Australia and New Zealand Banking Group (ANZ)
- Commonwealth Bank of Australia
- DBS
- HSBC
- Westpac

This case study highlights that for an acquisition of a brownfield piece of infrastructure with an established demand profile, seven stakeholders where required to finance a $1.7 billion deal. When compared to the Trans-Kalahari railway and port project, which will be entirely greenfield, it highlights the complexity that will be involved to structure and finance the project.

Source: IJGlobal http://www.ijonline.com/articles/91484/hastings-wins-australias-newcastle-port-lease

5. Implications of preliminary assessment

5.1 Implications for the project

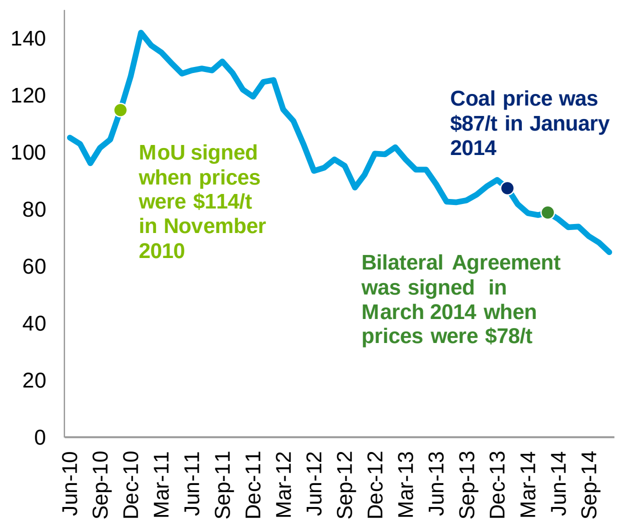
Botswana has substantial coal reserves that can produce at least 65mtpa of medium quality export coal that would be expected to sell at a discount of around 8% to the Richards Bay benchmark. This coal is of equivalent quality to that which is already bought by both China and India.

Mine development and capital costs are expected to be at the lower end of world mine cost curves but significant investment is required by miners before they can develop their resources. To gain funding for this investment the miners will need to be able to show their investors that they have a viable path to market for their coal. Our analysis suggest that the TKR could provide investors with this confidence if the Richards Bay price of coal rises and is sustain at prices above USD81 and the most efficient infrastructure options are developed. At the current Richards Bay benchmark price of USD65 the analysis shows that it will not be economic to develop the mines and utilises the TKR and Walvis Bay port option.

Clearly, the coal market has changed significantly since the various commitments were made by government (see Figure 36). This has changed the landscape in which the project is viewed by potential investors. Since the signing of the Memorandum of Understanding (MoU) and the Bilateral Agreement coal prices have fallen significantly The MoU was signed between the two governments when the coal price was $114 per tonne in November 2010 while the Bilateral Agreement was signed in March 2014 when the coal price was $78 per tonne. Since the signing of the Bilateral Agreement in March the coal price has fallen by 20% in 9 months to around $65 per tonne (December 2014).

However, the price of coal was above USD87 in January 2014, meaning that such a price rise is possible to make the project viable, but to facilitate the development it will be critical for Botswana to select the most efficient scenario for development of the TKR.

Figure 36: Coal price and announcements ($USD/t)



Source: various

Sensitivities suggest there are three critical areas in which the government can impact on the potential viability of the railway:

- Alignment
- Gauge
- Locomotive fuel type

If potential investors are not provided the flexibility to choose the most efficient development options the price of coal required to provide investors with a viable return on their mine developments would be expected to rise to well above USD90.

The bankability of the project will also depend on its intended purpose and usage. This is yet to be defined and it will be important for the BFS to consider all of the options. For example, is the project dedicated to mining operations or will it be used by other users such as general freight or passengers?

Public financing is most likely unavailable, meaning private financing is the only viable source of capital. From a lenders perspective there is an inverse relationship between complexity and bankability. Lenders favour simple and less complex projects, see Figure 37.

The bankability of project will be heavily dependent on the credit quality of the different users. The bankability of the project becomes more complicated when not all users are identified at the time of the financing of the project (different mine commissioning timetables).

Figure 37: Complexity and bankability

Source: IFC (2013)

The miners are the sole source of revenue for the project and therefore the source of debt repayment for the limited recourse loan. Lenders will spend a significant amount of time studying the credit quality of the users and their 'ability to pay'. Lenders will assess the individual viability of the mines using the project. In particular, lenders will want to ensure that the mining operation is competitive and sits in the lower quartiles of global production curves to ensure operations will continue during depressed commodity prices[21].

This means that not only do the mines have to be cost effective, the project must provide the lowest transportation cost possible.

The quality of the "anchor" mine is, and always will be, a *sine qua non* of a successful, feasible and bankable mining infrastructure project. The structure most likely to receive non-recourse financing in support of the development of the project is one in which the mining company is partially or substantially owner of the infrastructure. This allows the project to be underwritten based on volume from the anchor mine itself as shown in Figure 38[22]. While this type of structure would be preferred by lenders, it will also require strong regulation to ensure the provision of third party access.

Small mines lack the scale to develop the project on their own. A large volume is necessary to justify the development of the project. Our analysis suggests that 65mtpa of coal traffic is required (at a coal price of $81/t). There is currently not a large anchor mining client with these volumes in Botswana. Without a large anchor mining client the rail and port will need to be shared by multiple miners, which will increase the complexity of the financing and structuring of the project.

Timing is crucial. For the project to be underwritten by a syndicate of small miners, the concurrent development and financing of each one of the small mines is a prerequisite. The banks would have to

[21] IFC (2013).

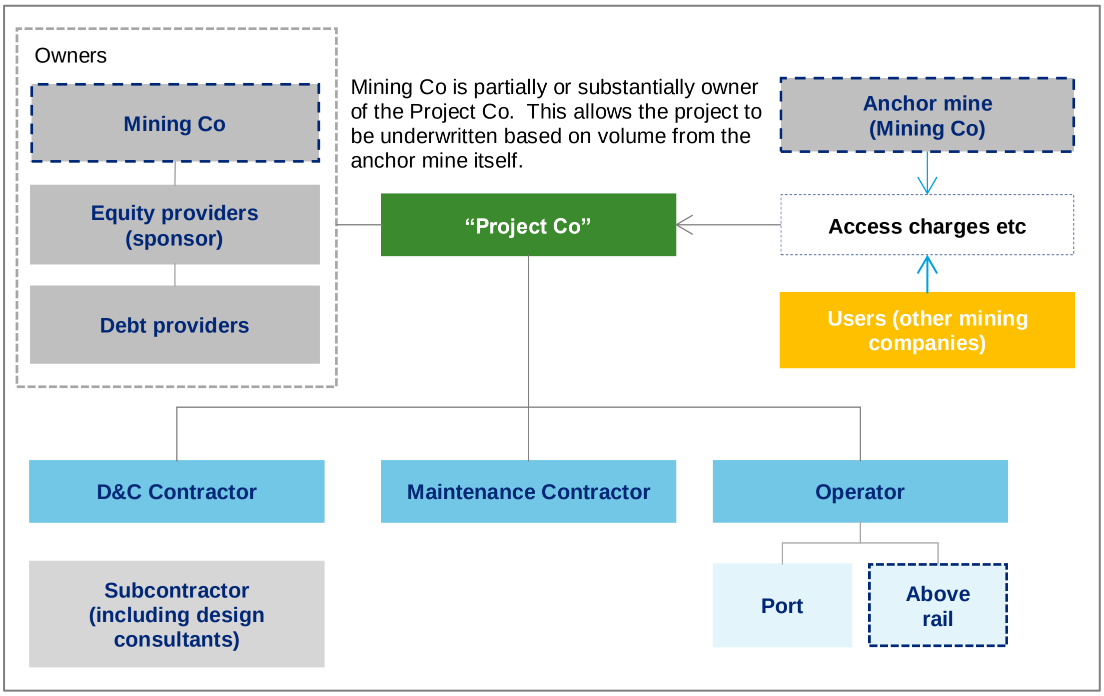
[22] Approaches to structuring infrastructure projects around the world typically involve a mix of miners, infrastructure (constructors) and above rail operators developing the project, for example the GVK-Hancock and Aurizon project in Queensland. In some cases the infrastructure investors also have stakes in the mining project as well, for example POSCO, a South Korean infrastructure provider, has a stake in the Adani "Carmichael" mine project in the Galilee basin.

underwrite multiple mines since they will need to evaluate the probability of each mine continuing production[23].

The scale of the project will present a challenge to most infrastructure funds and financial investors. As shown earlier, the appetite for demand risk PPPs is on the decline.

This is not to say that non-traditional financial investors such as Chinese state-owned development funds or commercial banks might not be willing to finance greenfield transport mining infrastructure. However, it would be expected that in this case, the financing would be tied to the award to a Chinese mining company of the mineral rights supporting the project.

Figure 38: PPP structure with investment by mining company



In summary, the key requirements for the PPP include:

- The project will require an anchor mining customer to enable the Project Co to obtain project finance.
- Project financing by a PPP for the project is only feasible if its cash flows are assured under a robust take-or-pay (TOP) agreement from an investment-grade anchor client. In most cases, this will involve parent or bank guarantees.
- The major mining companies are best-placed to support the PPP approach.
- Some junior mining companies do not have sufficient credit standing to support this structure. The downturn in commodity prices has meant that even the largest mining groups are managing their balance sheet exposures very carefully.
- The critical "underwriting" contribution made by investment grade anchor mining customer must be adequately compensated/rewarded in the context of any infrastructure sharing arrangements.
- A package of "foundation rights" will generally be needed, which could include priority access rights, a pre-agreed upside-sharing mechanism, etc.
- Lastly, public authorities might have to accept that multi-usage demands made to transport mining infrastructure operators might have to be initially or permanently restricted to secure, first and foremost, the delivery of an efficient mining transport system at the lowest possible cost to its anchor user/client.

[23] IFC (2013)

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Aurecon Australasia Pty Ltd
ABN 54 005 139 873
Level 14, 32 Turbot Street
Brisbane QLD 4000
Locked Bag 331
Brisbane QLD 4001
Australia

T +61 7 3173 8000
F +61 7 3173 8001
E brisbane@aurecongroup.com
W aurecongroup.com

Aurecon offices are located in:
Angola, Australia, Botswana, Chile, China, Ethiopia, Ghana, Hong Kong, Indonesia, Lesotho, Libya, Malawi, Mozambique, Namibia, New Zealand, Nigeria, Philippines, Qatar, Singapore, South Africa, Swaziland, Tanzania, Thailand, Uganda, United Arab Emirates, Vietnam.