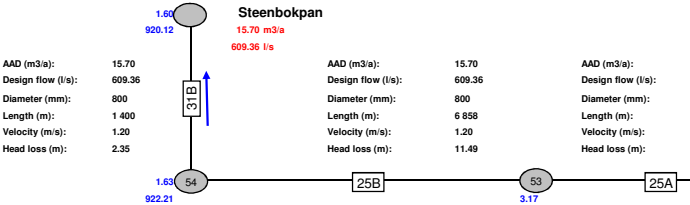


2014 WATER REQUIREMENTS

Demand Centre	Requirement (Mm3/a)	Losses (2%)	Requirement + losses	Peak Factor	Q (Mm3/a)	Q (l/s)
Zeeland	9.4	0.188	9.6	1.2	11.51	364.84
Matimba	3.6	0.072	3.672	1.2	4.41	139.73
Exaro	9.0	0.18	9.18	1.2	11.02	349.32
IPPs	4.4	0.088	4.488	1.2	5.39	170.78
Medupi	6.0	0.12	6.12	1.2	7.34	232.88
CF3&4 Mining	5.3	0.106	5.406	1.2	6.49	205.71
Steenbokpan	15.7	0.314	16.014	1.2	19.22	609.36
	53.4		54.468			2072.60

Water from Mokolo Dam



Note 1: Design flow = $\{[(\text{Demand} \times 10^9) / (365 \times 24 \times 3600)] + \text{losses}\} \times 1.2$

where : losses = 2%
1.2 = "dam refill peak" allowance

Legend

609	Design flow incl peaks & losses (l/s)
16	Annual Average Demand + losses (m3/a)
7.43	Dinamic Pressure at node (bar) (min 1.5 bar required)
919.81	Elevation at node (m)
▲	Dams/Weirs
44	Pipe node #
15	Pipe section #
—	Delivery pipeline

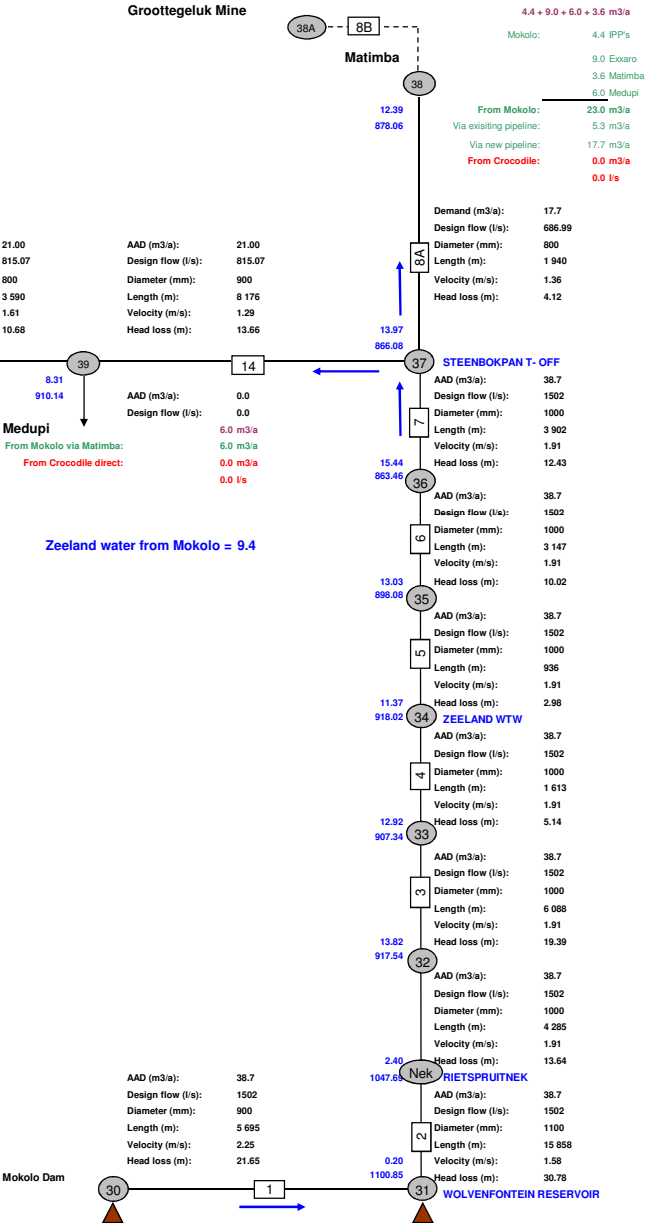
PIPE LENGTHS GRAVITY MAINS	
800 mm	34 019 m
900 mm	8 176 m
1000 mm	19 971 m
1100 mm	15 858 m
Total length	78 024 m

PIPE LENGTHS PUMP MAINS	
900 mm	5 695 m
Total length	5 695 m

Flow in existing pipeline from Mokolo Dam	
Demand from Zeeland and Matimba	
$9.4 + 3.6 \times 1.7 = 14.7$ million m3/s AAD	

Flow in new pipeline from Mokolo Dam	
Demand (Steenbokpan, Medupi, Exaro, IPP's)	38.7
Q (Mm3/a) with losses and PF	47.37
Q (l/s)	1502.05

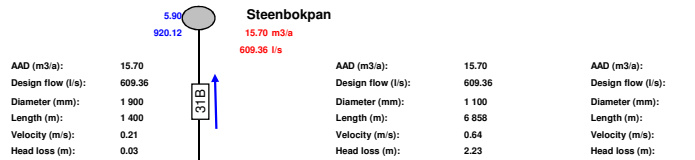
Lephalale/Steenbokpan delivery layout
PHASE 1 - piplines sized for Phase 1 requirements
Scenario 9 Feasibility



2014 WATER REQUIREMENTS

Demand Centre	Requirement (Mm³/a)	Losses (2%)	Requirement + losses	Peak Factor	Q (Mm³/a)	Q (l/s)
Zeeland	9.4	0.188	9.6	1.2	11.51	364.84
Matimba	3.6	0.072	3.672	1.2	4.41	139.73
Exaro	9.0	0.18	9.18	1.2	11.02	349.32
IPP's	4.4	0.088	4.488	1.2	5.39	170.78
Medupi	6.0	0.12	6.12	1.2	7.34	232.88
CF3&4 Mining	5.3	0.106	5.406	1.2	6.49	205.71
Steenbokpan	15.7	0.314	16.014	1.2	19.22	609.36
	53.4		54.468			2072.60

Water from Mokolo Dam



Note 1: Design flow = $\{[(\text{Demand} \times 10^9) / (365 \times 24 \times 3600)] + \text{losses}\} \times 1.2$
where : losses = 2%
1.2 = "dam refill peak" allowance

Legend

609	Design flow incl peaks & losses (l/s)
16	Annual Average Demand + losses (m³/a)
7.43	Dinamic Pressure at node (bar) (min 1.5 bar required)
919.81	Elevation at node (m)
▲	Dams/Weirs
44	Pipe node #
15	Pipe section #
—	Delivery pipeline

PIPE LENGTHS GRAVITY MAINS

800 mm	1 940 m
900 mm	11 766 m
1000 mm	19 971 m
1100 mm	42 947 m
1900 mm	1 400 m
Total length	78 024 m

PIPE LENGTHS PUMP MAINS

900 mm	5 695 m
Total length	5 695 m

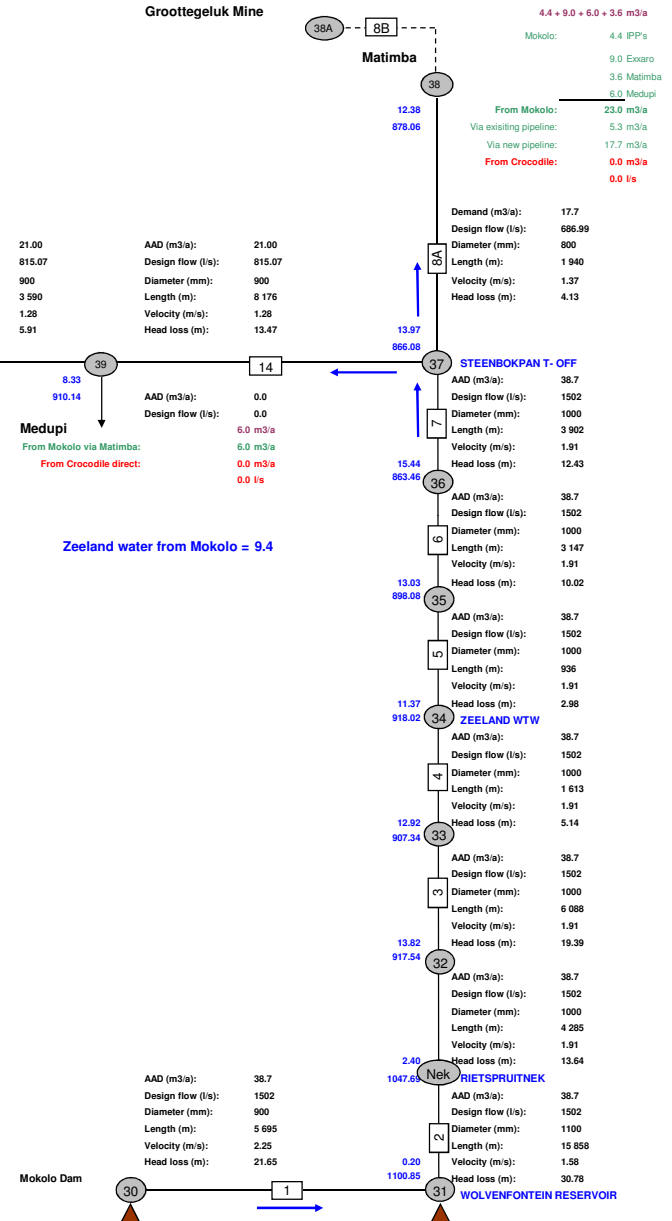
Flow in existing pipeline from Mokolo Dam

Demand from Zeeland and Matimba
 $9.4 + 3.6 + 1.7 = 14.7$ million m³/s AAD

Flow in new pipeline from Mokolo Dam

Demand (Steenbokpan, Medupi, Exaro, IPP's)	38.7
Q (Mm³/a) with losses and PF	47.37
Q (l/s)	1502.05

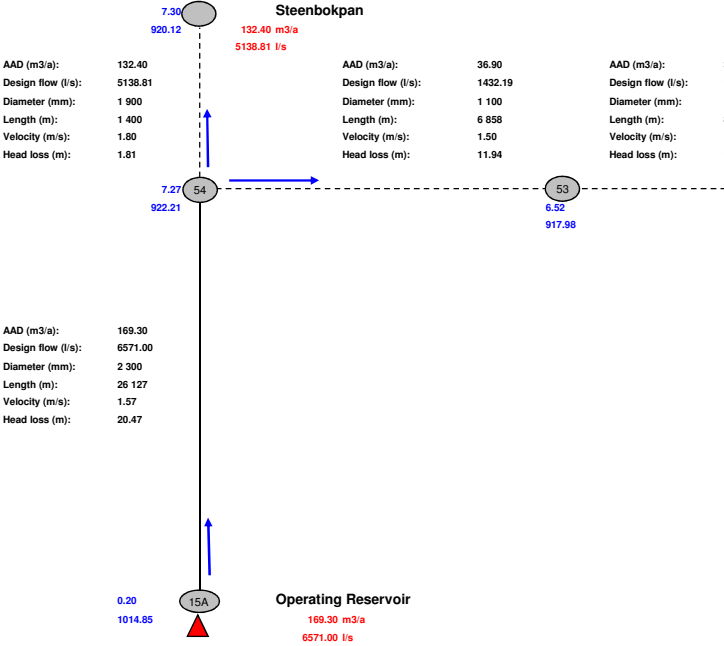
Lephalale/Steenbokpan delivery layout PHASE 1 - pipelines optimized for Phase 2 requirements Scenario 9 Feasibility



2030 WATER REQUIREMENTS

Demand Centre	Requirement (Mm3/a)	Losses (2%)	Requirement + losses	Peak Factor	Q (Mm³/a)	Q (l/s)
Zeeland	9.2	0.184	9.4	1.2	11.26	357.08
Matimba	3.6	0.072	3.672	1.2	4.41	139.73
Exaro	13.2	0.264	13.464	1.2	16.16	512.33
IPP's	15.6	0.312	15.912	1.2	19.09	605.48
Medupi	14.0	0.28	14.28	1.2	17.14	543.38
CF3&4 Mining	10.0	0.2	10.2	1.2	12.24	388.13
Steenbokpan - Eskom	132.4	2.648	135.048	1.2	162.06	5138.81
	198		201.96			7684.93

Water from Mokolo Dam
Water from Croc River



Legend

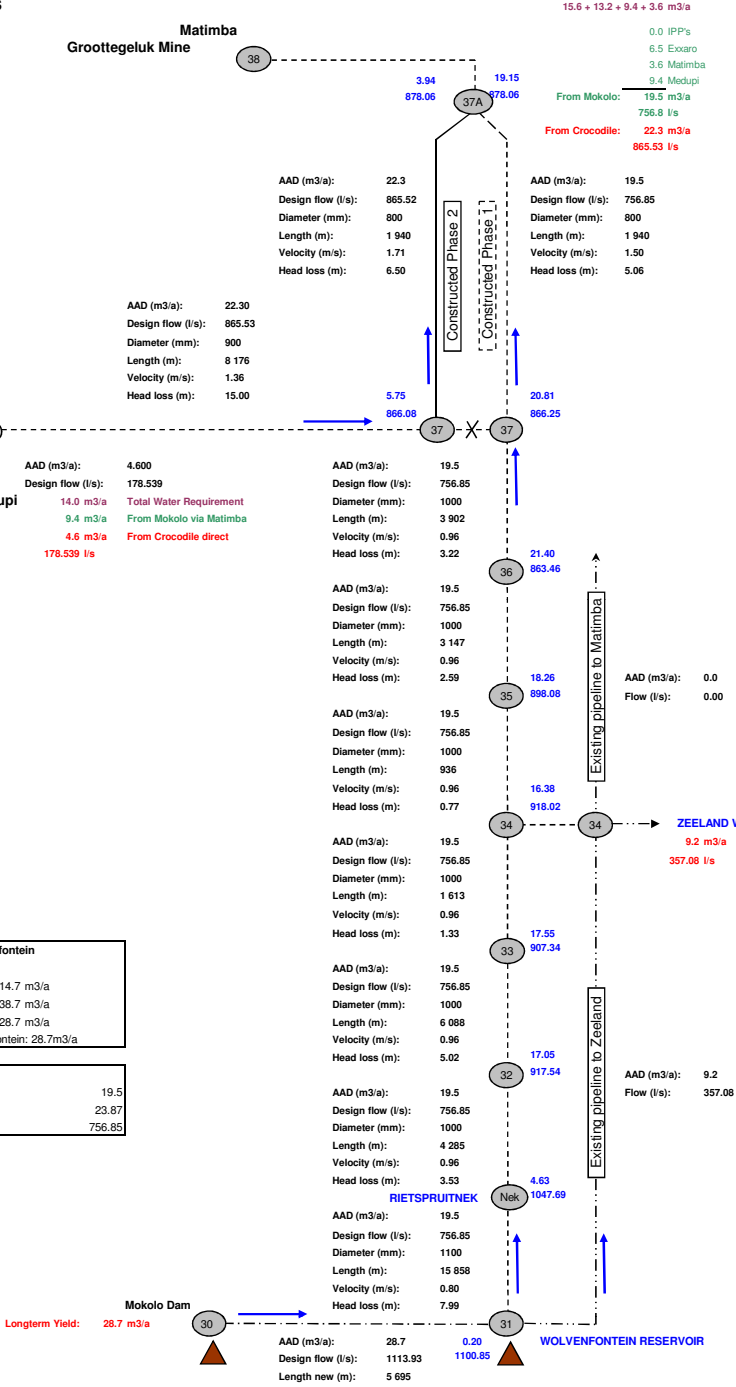
5139	Design flow incl peaks & losses (l/s)
132	Annual Average Demand + losses (m³/a)
7.43	Dynamic Pressure at node (bar) (min 1.5 bar required)
919.81	Elevation at node (m)
	Dams/Weirs
	Pipe node #
	Pipe section #
----	Gravity Mains constructed during Phase 1
—	Gravity Mains constructed during Phase 2
- - - -	Pump Mains Mokolo Dam to Wolvenfontein
- . . . -	Existing pipeline to Zeeland

PIPE LENGTHS GRAVITY MAINS (Excluding pipelines supplying operational reservoir)			
DIAMETER	PHASE1	PHASE2	TOTAL
800 mm	1 940	1940	3 880 m
900 mm	11 766	0	11 766 m
1000 mm	19 971	0	19 971 m
1100 mm	42 947	0	42 947 m
1900 mm	1 400	0	1 400 m
2300 mm	0	26 127	26 127 m
Total length	78 024	28 067	106 091 m

PIPE LENGTHS PUMP MAINS	
900 mm	5 695 m
Total length	5 695 m

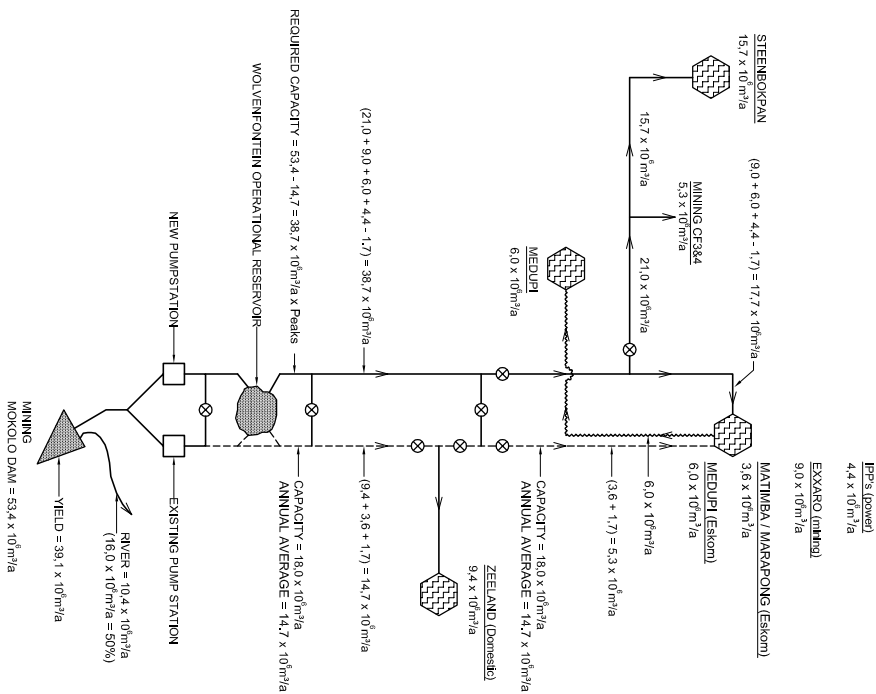
Note 1: Design flow = $[(\text{Demand} \times 10^9) / (365 \times 24 \times 3600)] + \text{losses}] \times 1.2$
where : losses = 2%
1.2 = "dam refill peak" allowance

Lephalale/Steenbokpan delivery layout
Longterm - Operating Reservoir, Combined Pipelines
Scenario 9 Feasibility

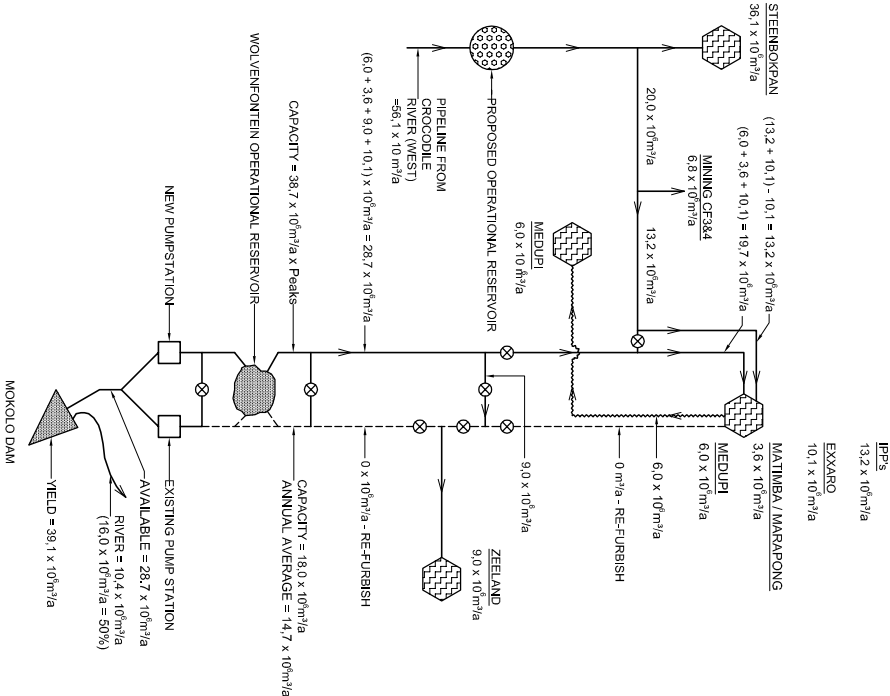


MOKOLO CROCODILE (WEST) SCHEMATIC FLOW DIVISION BETWEEN USERS FOR SUPPLY FROM MOKOLO DAM

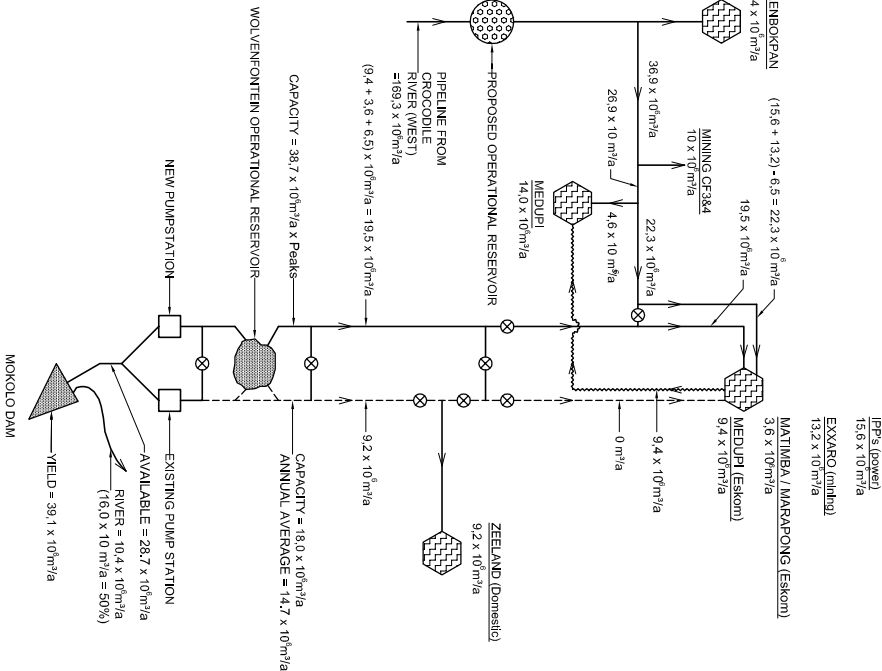
PHASE 1 (2014)



REFURBISH EXISTING PIPELINE
(2015)



PHASE 2 (2025)



LEGEND:

EXISTING PIPELINE
NEW PIPELINE

VALVES
DIRECTION OF FLOW

ESKOM
USERS

PROPOSED OPERATIONAL RESERVOIR
EXISTING OPERATIONAL RESERVOIR

DIVISION OF MOKOLO DAM FLOW:
* EXISTING PIPELINE = ZEE LAND + MATIMBA + EXXARO/IPPS (excess capacity)
= (9.4 + 3.6 + 1.7) x 10⁶ m³/a
= 14.7 x 10⁶ m³/a
* NEW = (21.0 + 9.0 + 6.0 + 4.4 - 1.7) x 10⁶ m³/a
= 38.7 x 10⁶ m³/a

DIVISION OF MOKOLO DAM FLOW:
* EXISTING PIPELINE = ZEE LAND
= 0 x 10⁶ m³/a
* NEW = MEDIPI + MATIMBA + ZEE LAND + EXXARO/IPPS (excess capacity)
= (6.0 + 3.6 + 9.0 + 10.1) x 10⁶ m³/a
= 28.7 x 10⁶ m³/a

DIVISION OF MOKOLO DAM FLOW:
* EXISTING PIPELINE = ZEE LAND
= 0.2 x 10⁶ m³/a
* NEW = (28.7 - 9.2) = 19.5 x 10⁶ m³/a
= MEDIPI + MATIMBA + EXXARO/IPPS (surplus from dam)
= (9.4 + 3.6 + 6.5) x 10⁶ m³/a