



Mpatamanga Hydropower Project

Environmental & Social Impact Assessment Volume II – Main ESIA Report

Sub-volume 5: Chapter 5 – Annexes 28 to 31

Prepared for
MHPL

Revision A
31 July 2024

Revision Record

Revision	Date	Prepared by:	Checked by:	Description:
A	31 July 2024	SLR Consulting See Section 1 for authors	D. Buffin	Issue for WB RSA review

To limit the size of the files of the ESIA document disclosed on internet, the ESIA Volume II has been divided into sub-volumes.

This sub-volume 5 contains Chapter 5 annexes 28 to 31.

Volume II – ESIA Report

- Chapter 1: Introduction
- Chapter 2: Project description
- Chapter 3: ESIA Process and Methodology
- Chapter 4: Policy, Legal and Institutional Framework
- Chapter 5: Environmental and Social Baseline Data
 - Chapter 5 Annexes – 1 to 16
 - Chapter 5 Annexes – 17 to 27
 - Chapter 5 Annexes – 28 to 31** *This sub-volume*
- Chapter 6: Alternative Analysis
- Chapter 7: Stakeholder Engagement
- Chapter 8: Impact Assessment & Mitigation Measures
- Chapter 9: Environmental Flows Assessment
- Chapter 10: Climate Change
- Chapter 11: Cumulative Impact Assessment
- Chapter 12: Transboundary Impact Assessment

Citation: SLR Consulting (2024). Mpatamanga Hydropower Project: Environmental and Social Impact Assessment, ESIA Report Revision 1, July 2024.

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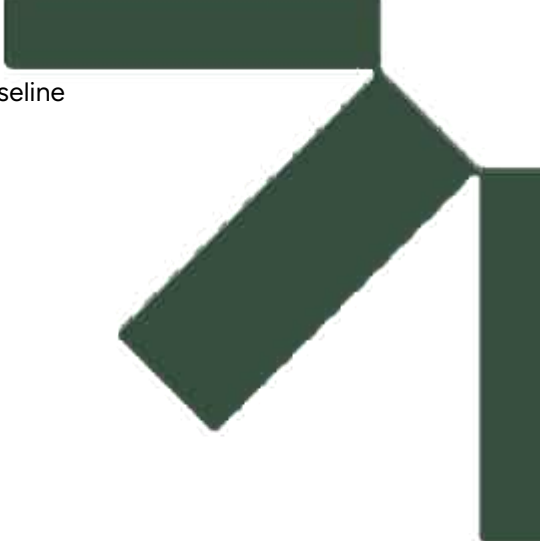
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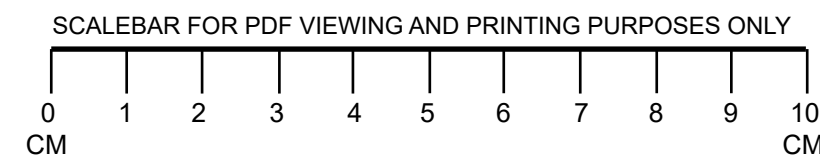
Annex 5-28: Viewpoint Photography

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 1: LOCAL ROAD, PHOMBEYA SUBSTATION
GRID REFERENCE: E:702705.839, N:8310703.955
ELEVATION: 586M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-10-23 TAKEN AT 10:57
DIRECTION OF VIEW: SOUTH WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY



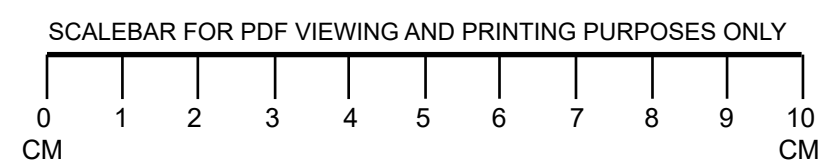
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MALAWI ESHA INCEPTION MPATAMANGA
VIEWPOINT PHOTOGRAPHY
JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 1 **DRAWING NO: XX**

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 1: LOCAL ROAD, PHOMBEYA SUBSTATION
GRID REFERENCE: E:702705.839, N:8310703.955
ELEVATION: 586 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-10-23 TAKEN AT 10:57
DIRECTION OF VIEW: NORTH WEST



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MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
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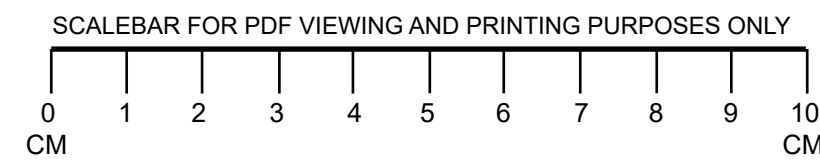
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DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 1 **DRAWING NO: XX**

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 3: ZALEG VILLAGE, M1/D314 JUNCTION
GRID REFERENCE: E: 697916.229, N: 8310703.955
ELEVATION: 464 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 12:15
DIRECTION OF VIEW: WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY



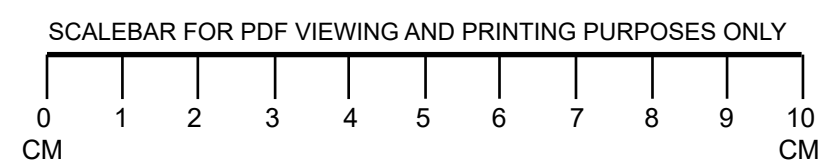
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VIEWPOINT 3 DRAWING NO: XX

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 3: ZALEG VILLAGE, M1/D314 JUNCTION
GRID REFERENCE: E: 697916.229, N: 8293883.312
ELEVATION: 464 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 12:15
DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
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PROJECTION: CYLINDRICAL

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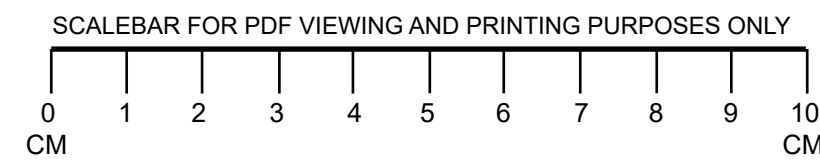
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VIEWPOINT 3 DRAWING NO: XX

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 4: MAKALE RIVER, NEAR JOHATHAN VILLAGE
GRID REFERENCE: E:683932.104, N:8275693.960
ELEVATION: 333 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 12:56
DIRECTION OF VIEW: EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY



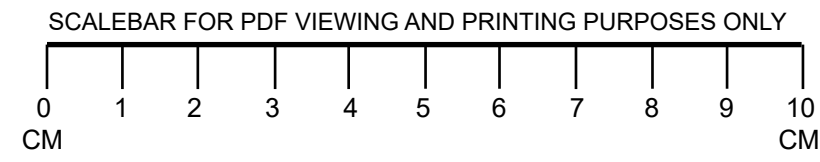
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JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 4 **DRAWING NO: XX**

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 4: MAKALE RIVER, NEAR JOHATHAN VILLAGE
GRID REFERENCE: E:683932.104, N:8275693.960
ELEVATION: 333 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 12:56
DIRECTION OF VIEW: SOUTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY



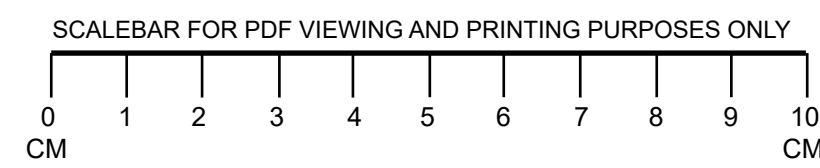
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VIEWPOINT 4 **DRAWING NO: XX**

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 5: S137 ROAD, FEREMU VILLAGE
GRID REFERENCE: E:680058.621, N:8263290.464
ELEVATION: 329 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 14:12
DIRECTION OF VIEW: NORTH EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY



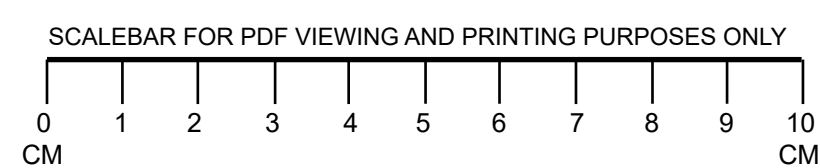
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VIEWPOINT PHOTOGRAPHY
JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT X DRAWING NO: XX

APPROXIMATE EXTENT OF MPATAMANGA 400KV TRANSMISSION LINE



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 5: S137 ROAD, FEREMU VILLAGE
GRID REFERENCE: E:680058.621, N:8263290.464
ELEVATION: 329 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 14:12
DIRECTION OF VIEW: SOUTH EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
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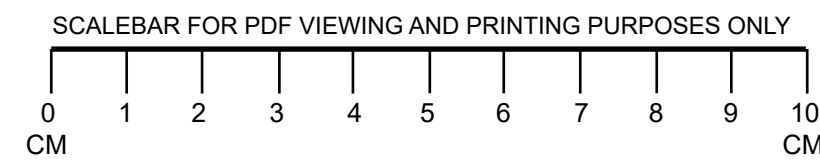
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VIEWPOINT PHOTOGRAPHY
JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT X DRAWING NO: XX

APPROXIMATE EXTENT OF MPATAMANGA MAIN RESERVOIR



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 6: S137 ROAD, NANO BANK OF SHIRE RIVER
GRID REFERENCE: E: 683616.568, N: 8263392.887
ELEVATION: 274 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 14:41
DIRECTION OF VIEW: EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY



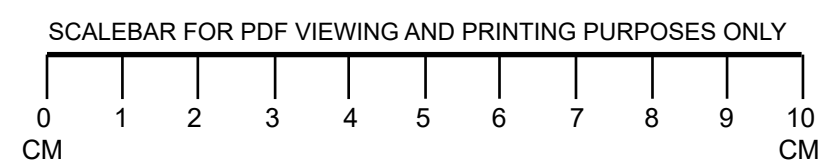
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MALAWI ESA INCEPTION MPATAMANGA
VIEWPOINT PHOTOGRAPHY
JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 6A **DRAWING NO: XX**

APPROXIMATE EXTENT OF MPATAMANGA MAIN RESERVOIR



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 6: S137 ROAD, NANO BANK OF SHIRE RIVER
GRID REFERENCE: E: 683616.568, N: 8263392.887
ELEVATION: 274 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-11-23 TAKEN AT 14:41
DIRECTION OF VIEW: SOUTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
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VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY

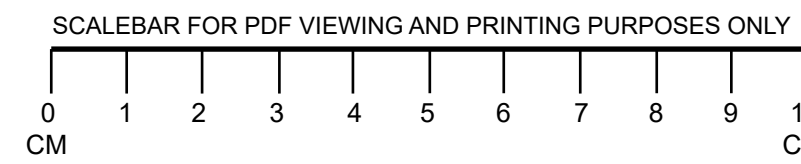


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MALAWI ESA INCEPTION MPATAMANGA
VIEWPOINT PHOTOGRAPHY
JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 6A **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 8: ISOLATED HILL, WEST OF MPATAMANGA GORGE
GRID REFERENCE: E:682294.820, N:8260327.185
ELEVATION: 335 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-10-23 TAKEN AT 16:20
DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
VIEW AT COMFORTABLE ARM'S LENGTH
ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY

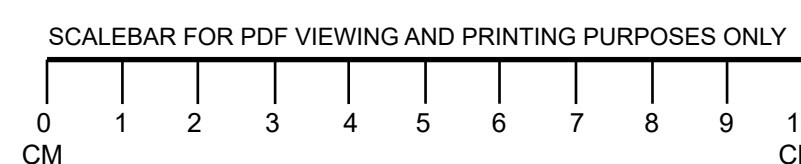


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MALAWI EISA INCEPTION MPATAMANGA
VIEWPOINT PHOTOGRAPHY
JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 8 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 8: ISOLATED HILL, WEST OF MPATAMANGA GORGE
GRID REFERENCE: E:682294.820, N:8260327.185
ELEVATION: 335 M AOD
DATE AND TIME OF PHOTOGRAPHY: 23-10-23 TAKEN AT 16:20
DIRECTION OF VIEW: EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
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MAKE AND MODEL OF CAMERA: NIKON D750
MAKE AND FOCAL LENGTH OF LENS: 50MM
PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
OCTOBER 2023 PHOTOGRAPHY

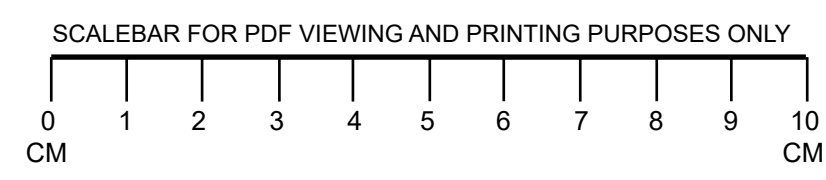


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MALAWI EISA INCEPTION MPATAMANGA
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JOB NO: 901.000030.00001
DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 8 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 9C: HALL MARTIN, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:886183.556, N:8242373.552
 ELEVATION: 174 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 15:02
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

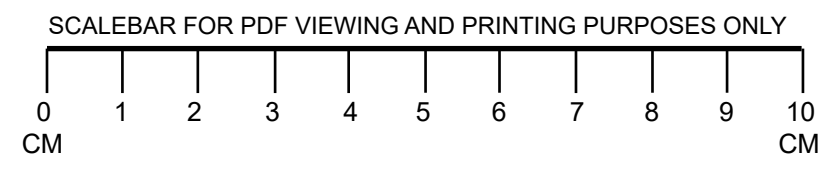
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 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
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 MALAWI ESA INCEPTION MPATAMANGA
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 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 9C **DRAWING NO: XX**



VIEWPOINT 9C: HALL MARTIN, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:886183.556, N:8242373.552
 ELEVATION: 174 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 15:02
 DIRECTION OF VIEW: EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
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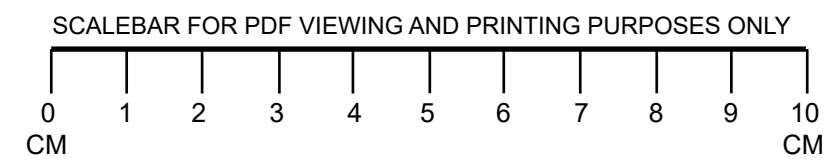
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 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 9C **DRAWING NO: XX**

231120_001000030.00001_02_XXXX_VIEWPOINT PHOTOGRAPHY_HD



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 10: HALL MARTIN DECK, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:685826.236, N:8243195.435
 ELEVATION: 178 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 15:20
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
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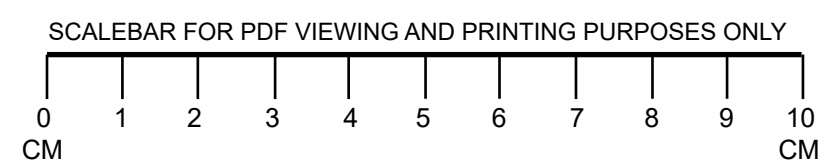


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VIEWPOINT 10 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 10: HALL MARTIN DECK, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:685826.236, N:8243195.435
 ELEVATION: 178 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 15:20
 DIRECTION OF VIEW: EASTNORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
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 VIEW AT COMFORTABLE ARM'S LENGTH
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MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
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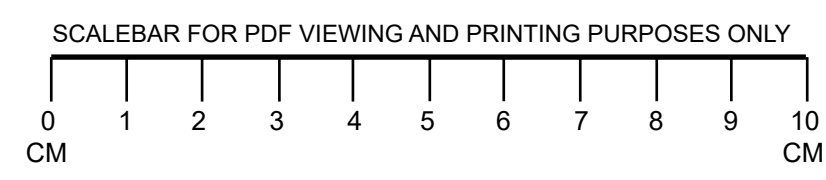


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 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 10 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 14C: COMMUNAL DECK AREA, MKULUMADZI LODGE, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:685739.411, N:8250612.480
 ELEVATION: 168 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 16:42
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

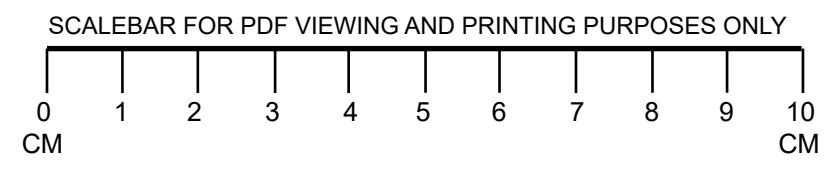
TYPE 1 VIEWPOINT PHOTOGRAPHY
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 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 14C **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 14C: COMMUNAL DECK AREA, MKULUMADZI LODGE, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:685739.411, N:8250612.480
 ELEVATION: 168 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 16:42
 DIRECTION OF VIEW: EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

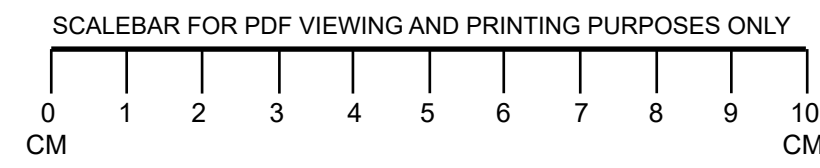
SLR
 MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 14C **DRAWING NO: XX**

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JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 15: MKULUMADZI LODGE, SHIRE RIVER
 GRID REFERENCE: E:685738.163, N:8250461.250
 ELEVATION: 184 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 10:15
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

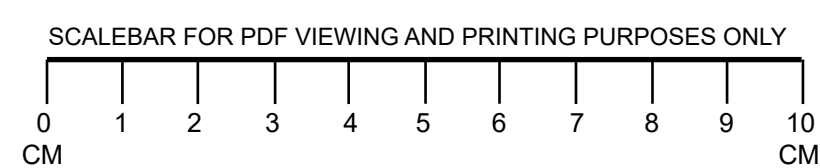


MPATAMANGA HPP
 MALAWI ESEA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 15 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 15: MKULUMADZI LODGE, SHIRE RIVER
 GRID REFERENCE: E:685738.163, N:8250461.250
 ELEVATION: 184 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 10:15
 DIRECTION OF VIEW: EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

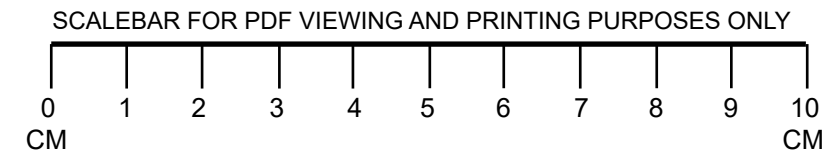


MPATAMANGA HPP
 MALAWI ESEA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 15 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 16C: MKULUMADZI LODGE 'STARBED', MAJETE WILDLIFE PARK
 GRID REFERENCE: E:684909.669, N:8251334.934
 ELEVATION: 241 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 17:45
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

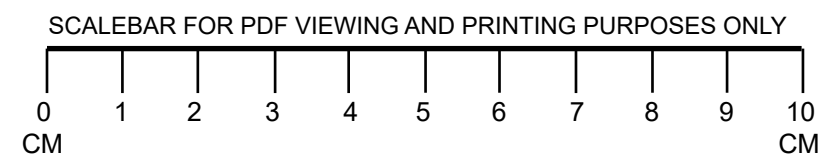
SLR
 MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 16C **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

DIRECTION OF KAPICHIRA DAM

VIEWPOINT 16C: MKULUMADZI LODGE 'STARBED', MAJETE WILDLIFE PARK
 GRID REFERENCE: E:684909.669, N:8251334.934
 ELEVATION: 241 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 17:45
 DIRECTION OF VIEW: EAST



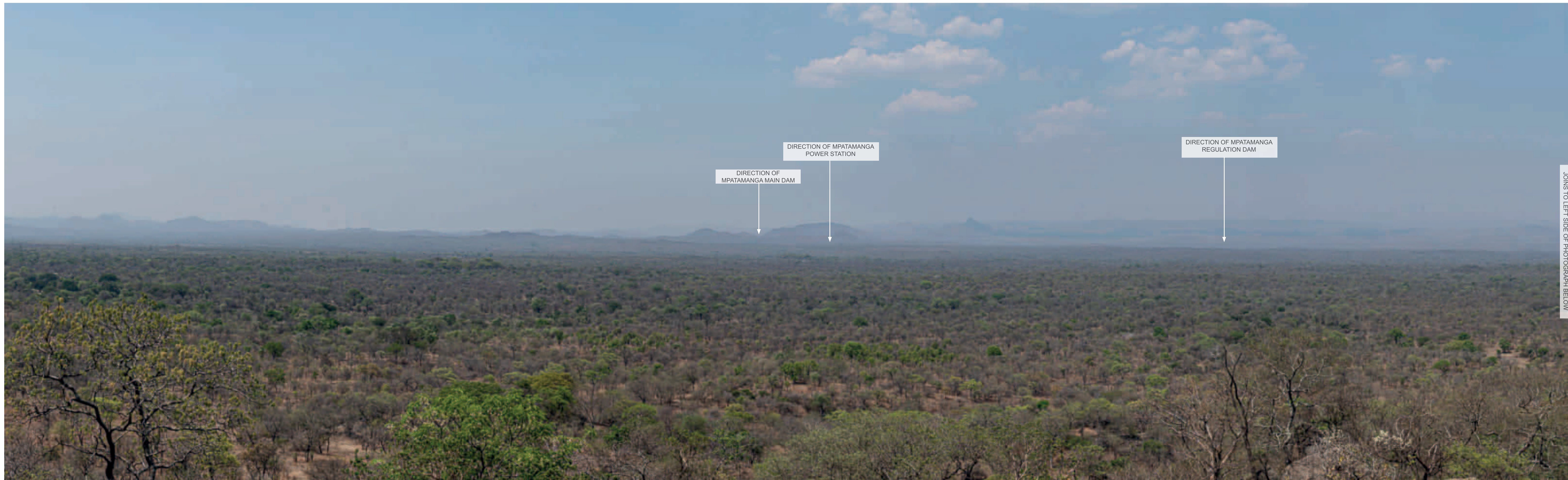
VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

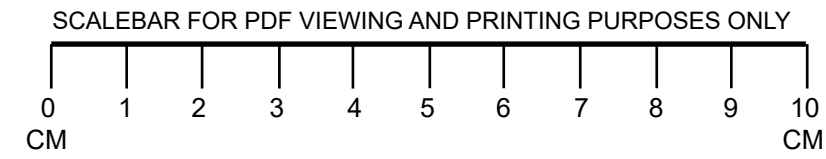
SLR
 MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 16C **DRAWING NO: XX**

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JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 17: CHINWALA HILL, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:677100.743, N:8250617.559
 ELEVATION: 380 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 13:04
 DIRECTION OF VIEW: NORTH EAST

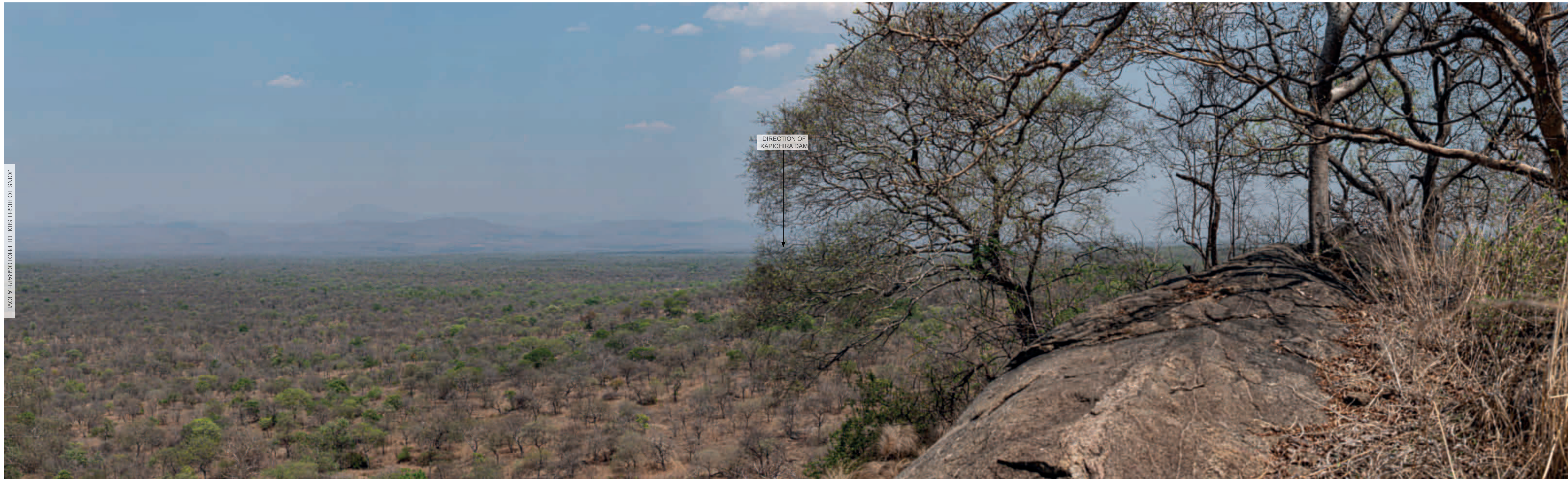


VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

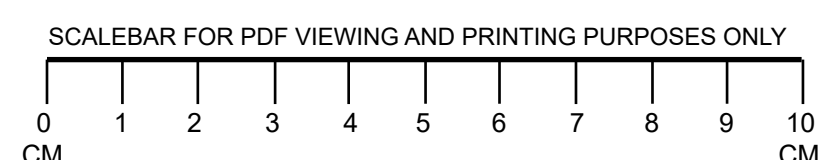
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

SLR
 MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 17 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 17: CHINWALA HILL, MAJETE WILDLIFE PARK
 GRID REFERENCE: E:677100.743, N:8250617.559
 ELEVATION: 380 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 13:04
 DIRECTION OF VIEW: SOUTH EAST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

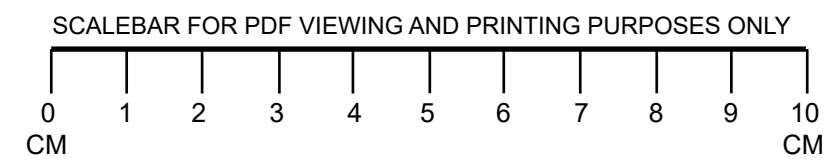
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

SLR
 MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 17 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 18: LOCAL ELEVATED POINT, BLANTYRE SIDE OF THE SHIRE RIVER
 GRID REFERENCE: E:687961.475, N:8250271.261
 ELEVATION: 278 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 09:14
 DIRECTION OF VIEW: WEST



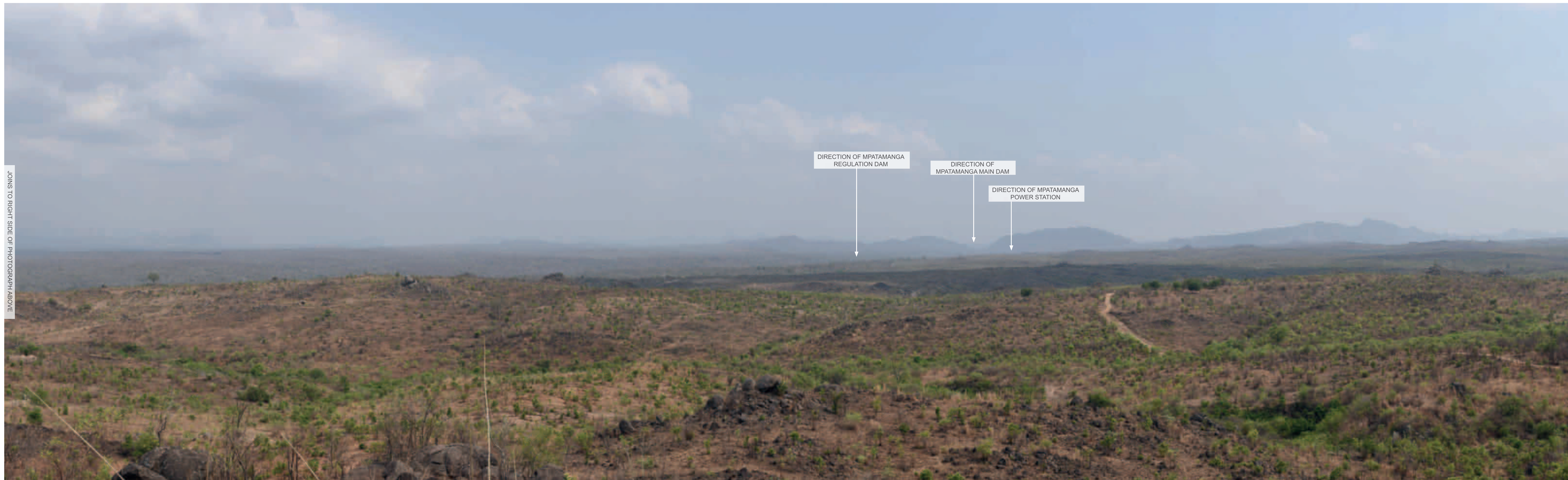
VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY



MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 18 **DRAWING NO: XX**



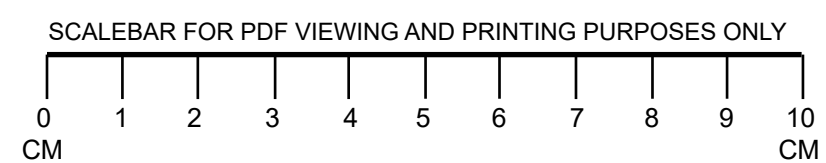
JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

DIRECTION OF MPATAMANGA REGULATION DAM

DIRECTION OF MPATAMANGA MAIN DAM

DIRECTION OF MPATAMANGA POWER STATION

VIEWPOINT 18: LOCAL ELEVATED POINT, BLANTYRE SIDE OF THE SHIRE RIVER
 GRID REFERENCE: E:687961.475, N:8250271.261
 ELEVATION: 278 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 09:14
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

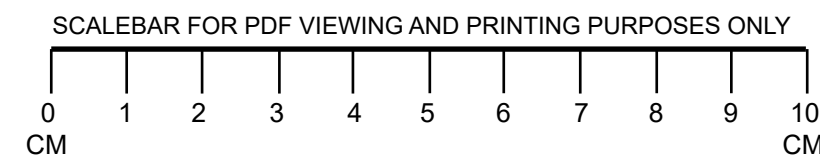


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 18 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 19: EAST OF ZIKUYENDA VILLAGE, BLANTYRE SIDE OF THE SHIRE RIVER
 GRID REFERENCE: E:691363.680, N:8253278.54
 ELEVATION: 379 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 10:43
 DIRECTION OF VIEW: WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

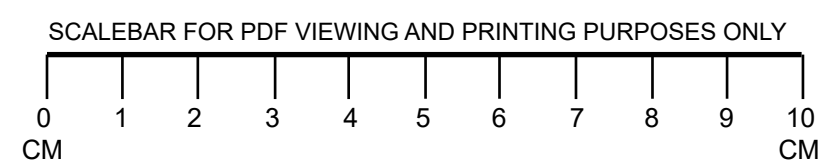


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 19 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 19: EAST OF ZIKUYENDA VILLAGE, BLANTYRE SIDE OF THE SHIRE RIVER
 GRID REFERENCE: E:691363.680, N:8253278.54
 ELEVATION: 379 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 10:43
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

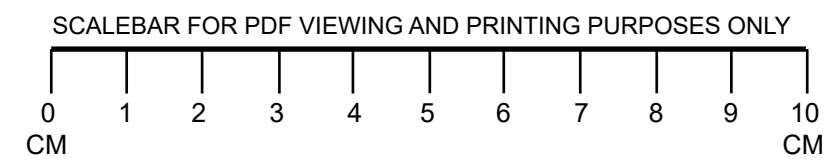


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 19 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 21: WEST OF MBWINJA VILLAGE, BLANTYRE BANK OF SHIRE RIVER
 GRID REFERENCE: E:688593.274, N:8253432.838
 ELEVATION: 284 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 12:54
 DIRECTION OF VIEW: WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

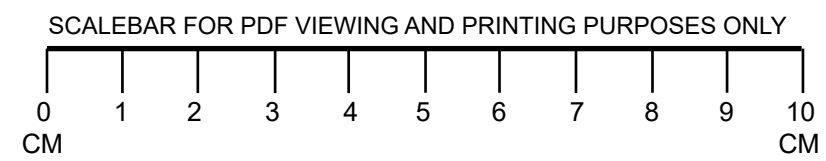
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 22 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 21: WEST OF MBWINJA VILLAGE, BLANTYRE BANK OF SHIRE RIVER
 GRID REFERENCE: E:688593.274, N:8253432.838
 ELEVATION: 284 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 12:54
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

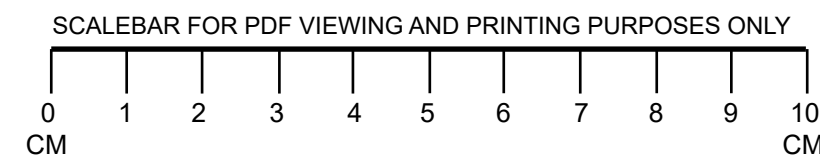
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 22 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 22: EAST OF MBWINJA VILLAGE, BLANTYRE SIDE OF THE SHIRE RIVER
 GRID REFERENCE: E:689761.760, N:8254767.619
 ELEVATION: 334 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 12:54
 DIRECTION OF VIEW: WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

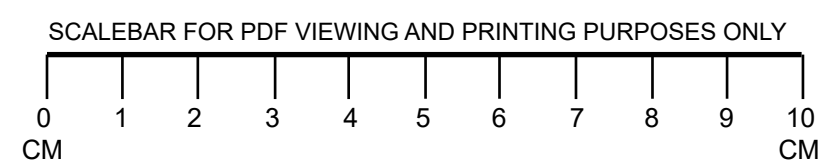


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 22 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 22: EAST OF MBWINJA VILLAGE, BLANTYRE SIDE OF THE SHIRE RIVER
 GRID REFERENCE: E:689761.760, N:8254767.619
 ELEVATION: 334 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 12:54
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

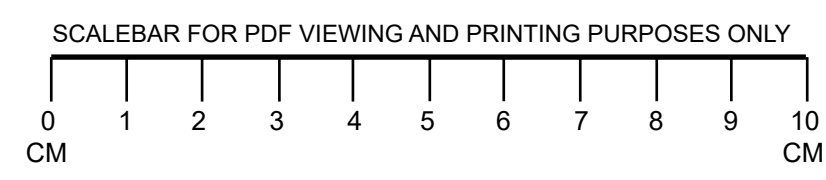


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 22 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 23: NORTH OF MBWINJA VILLAGE, BLANTYRE BANK
 GRID REFERENCE: E:888519.828, N:8256827.168
 ELEVATION: 320 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 13:45
 DIRECTION OF VIEW: SOUTH WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

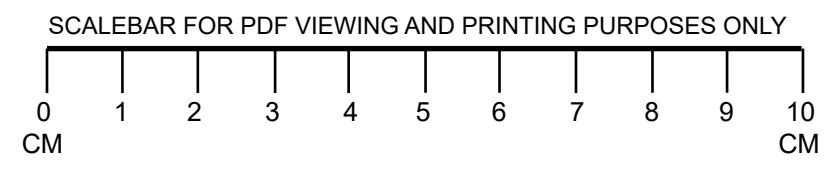
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 23 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 23: NORTH OF MBWINJA VILLAGE, BLANTYRE BANK
 GRID REFERENCE: E:888519.828, N:8256827.168
 ELEVATION: 320 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 13:45
 DIRECTION OF VIEW: NORTH WEST

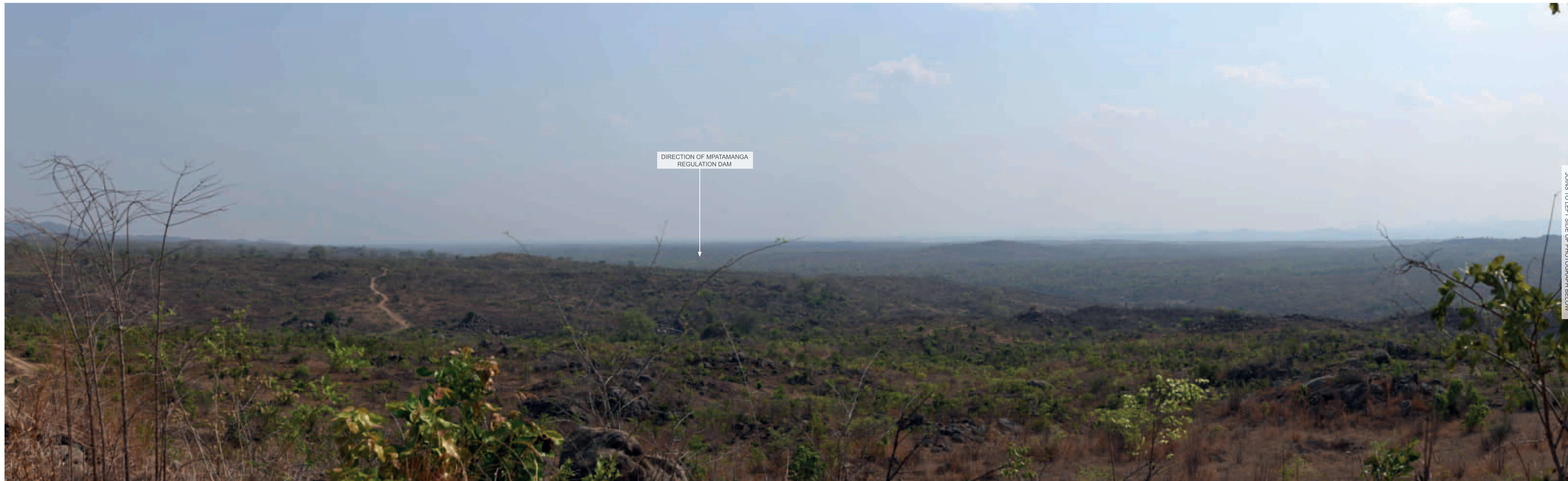


VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

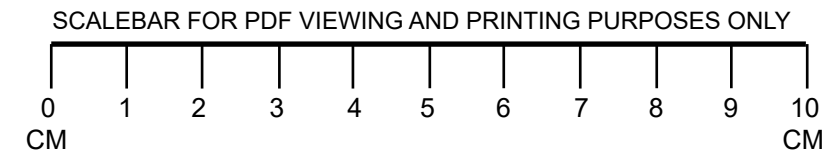
MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 23 **DRAWING NO: XX**



DIRECTION OF MPATAMANGA
REGULATION DAM

JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 24: MPATAMANGA GORGE, EDGE OF SOUTHERN SLOPES BLANTYRE BANK
 GRID REFERENCE: E:687070.952, N:8258084.177
 ELEVATION: 279 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 14:23
 DIRECTION OF VIEW: SOUTH WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

SLR
 MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 24 **DRAWING NO: XX**

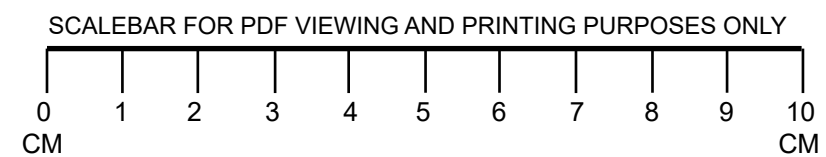


DIRECTION OF MPATAMANGA
MAIN DAM

DIRECTION OF MPATAMANGA
POWER STATION

JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 24: MPATAMANGA GORGE, EDGE OF SOUTHERN SLOPES BLANTYRE BANK
 GRID REFERENCE: E:687070.952, N:8258084.177
 ELEVATION: 279M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 14:23
 DIRECTION OF VIEW: NORTH WEST

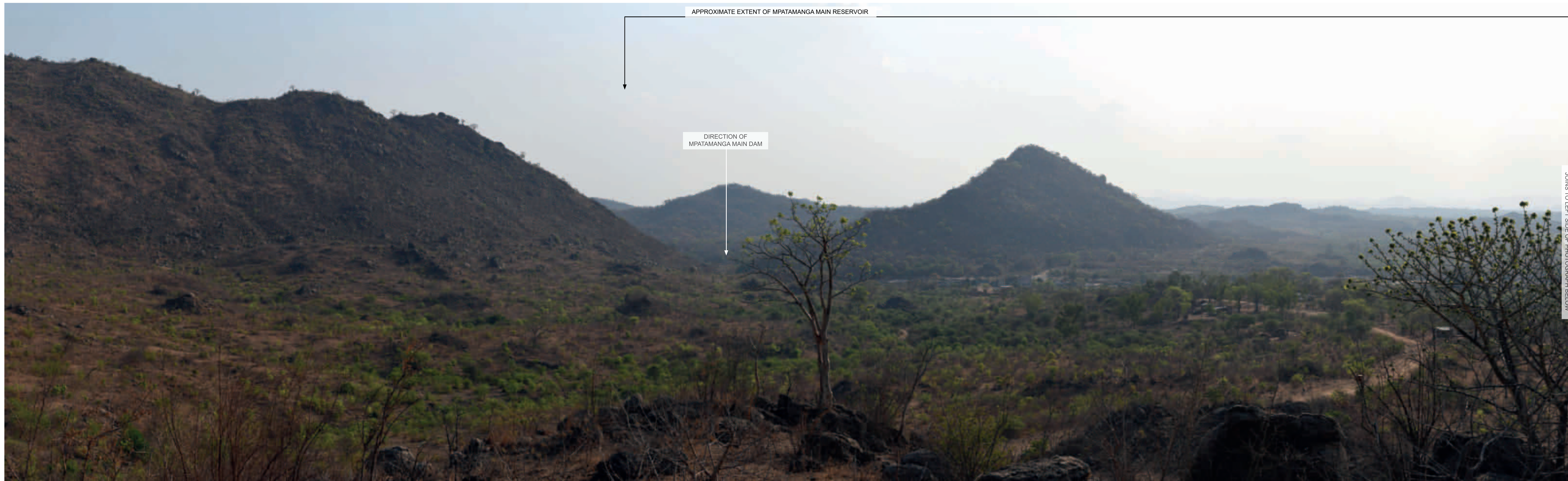


VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

SLR
 MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 24 **DRAWING NO: XX**

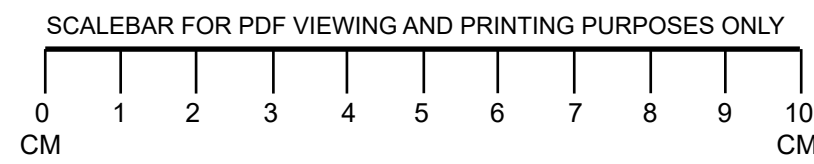


JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 25: S137 ROAD, BLANTYRE BANK
 GRID REFERENCE: E:685908.878, N:8261874.738
 ELEVATION: 301 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 15:39
 DIRECTION OF VIEW: SOUTH WEST

APPROXIMATE EXTENT OF MPATAMANGA MAIN RESERVOIR

DIRECTION OF MPATAMANGA MAIN DAM



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY



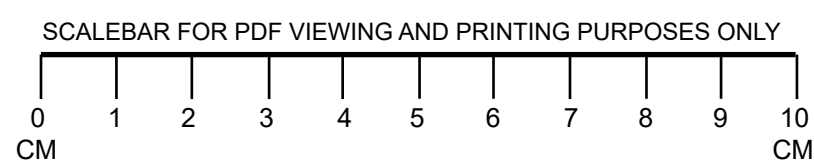
MPATAMANGA HPP
 MALAWI ESEA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 25 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

APPROXIMATE EXTENT OF MPATAMANGA MAIN RESERVOIR

VIEWPOINT 25: S137 ROAD, BLANTYRE BANK
 GRID REFERENCE: E:685908.878, N:8261874.738
 ELEVATION: 301 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 15:39
 DIRECTION OF VIEW: NORTH WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

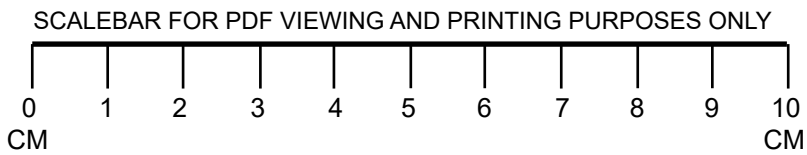


MPATAMANGA HPP
 MALAWI ESEA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 25 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 26: S137 ROAD, ABOVE CHASWANTHAKA VILLAGE
 GRID REFERENCE: E:686486.847, N:8263072.525
 ELEVATION: 312 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 15:59
 DIRECTION OF VIEW: WEST



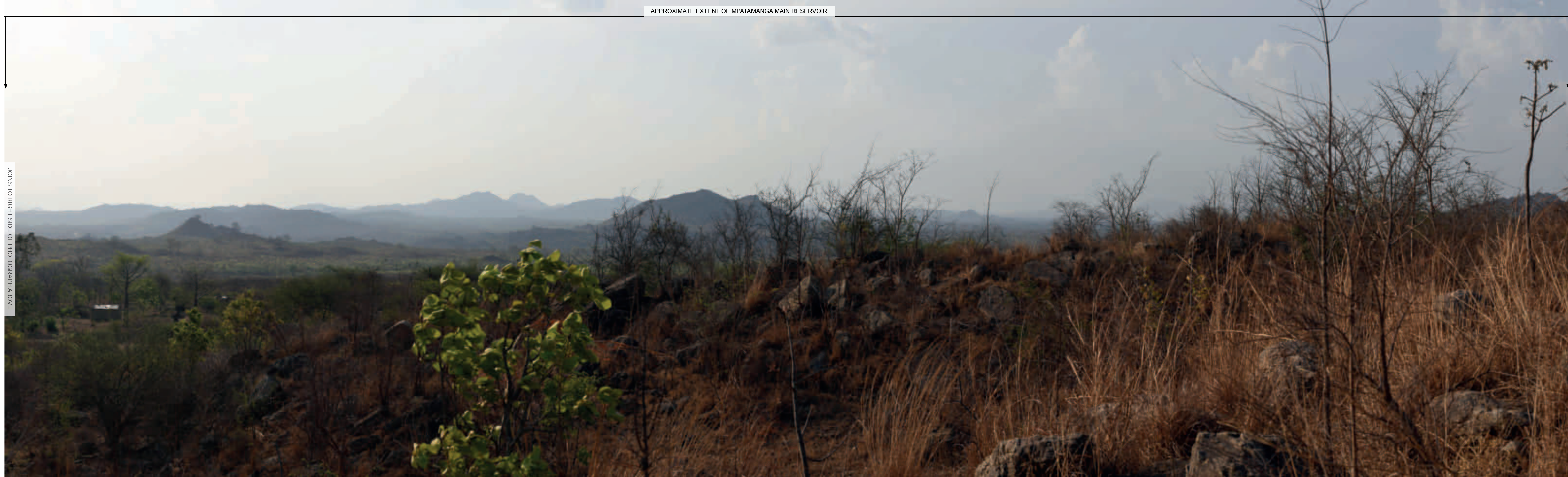
VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

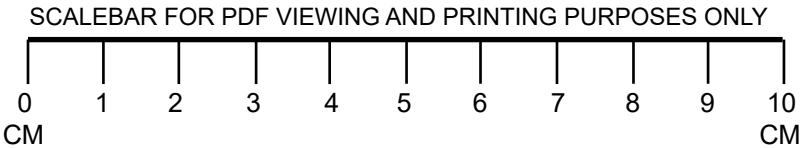


MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO. 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 26 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 26: S137 ROAD, ABOVE CHASWANTHAKA VILLAGE
 GRID REFERENCE: E:686486.847, N:8263072.525
 ELEVATION: 312 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 15:59
 DIRECTION OF VIEW: NORTH



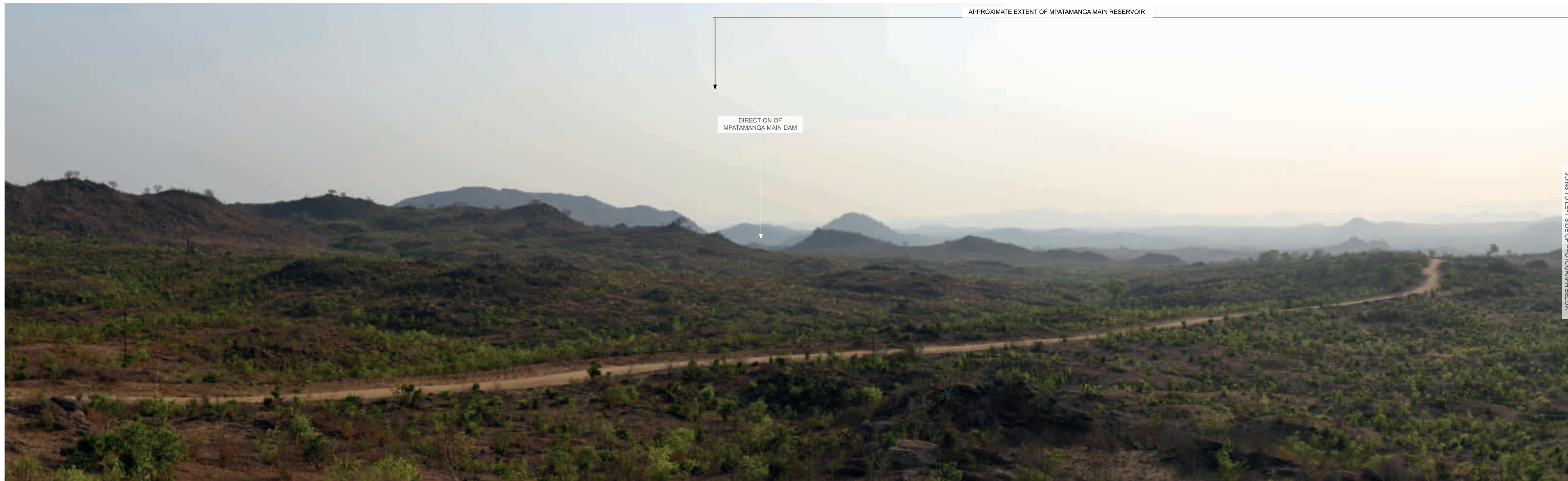
VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

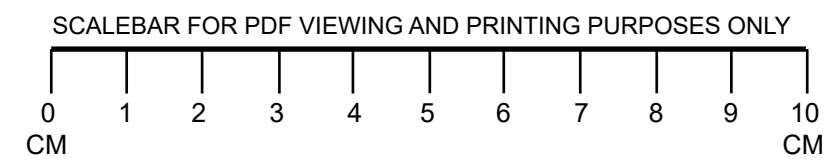


MPATAMANGA HPP
 MALAWI ESHA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO. 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 26 **DRAWING NO: XX**



JOINS TO LEFT SIDE OF PHOTOGRAPH BELOW

VIEWPOINT 27: S137 ROAD, EAST OF INOSI (TBC) VILLAGE
 GRID REFERENCE: E:687932.155, N:8264141.408
 ELEVATION: 354 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 16:21
 DIRECTION OF VIEW: WEST



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

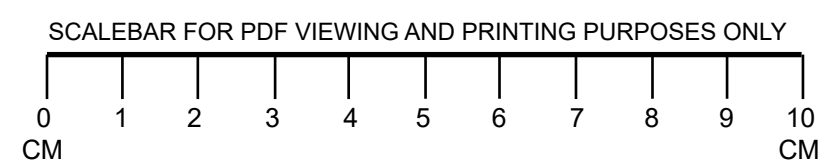
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

SLR
 MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 27 **DRAWING NO: XX**



JOINS TO RIGHT SIDE OF PHOTOGRAPH ABOVE

VIEWPOINT 27: S137 ROAD, EAST OF INOSI (TBC) VILLAGE
 GRID REFERENCE: E:687932.155, N:8264141.408
 ELEVATION: 354 M AOD
 DATE AND TIME OF PHOTOGRAPHY: 27-10-23 TAKEN AT 16:21
 DIRECTION OF VIEW: NORTH

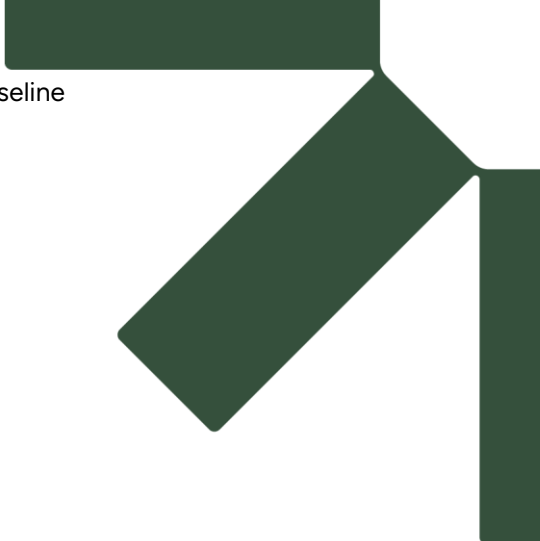


VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

SLR
 MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 27 **DRAWING NO: XX**

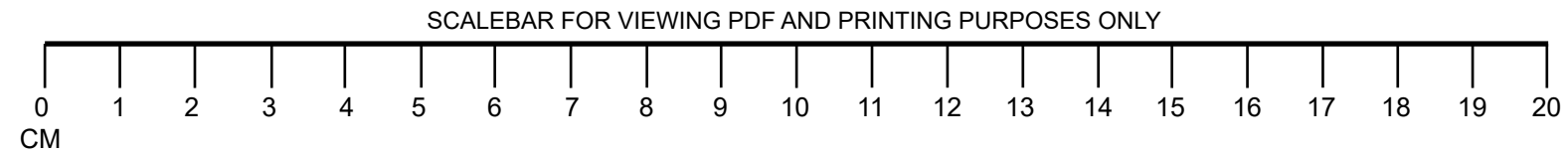


Annex 5-29: Night-Time Views



VIEWPOINT 9C: HALL MARTIN VIEW POINT IN THE LATE AFTERNOON IN THE MAJETE WILDLIFE RESERVE. LOOKING NORTH ACROSS A ROLLING TERRAIN ON INTACK MIOMBO WOODLAND AND EAST TO THE KAPICHIRA DAM HYDRO ELECTRIC PROJECT. NOTICE THE LIGHT POLLUTION GENERATED AT THIS LOCATION. HAZE OBSCURES THE MPATAMANGA MOUNTAIN ON THE FAR HORIZON.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 15:02
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

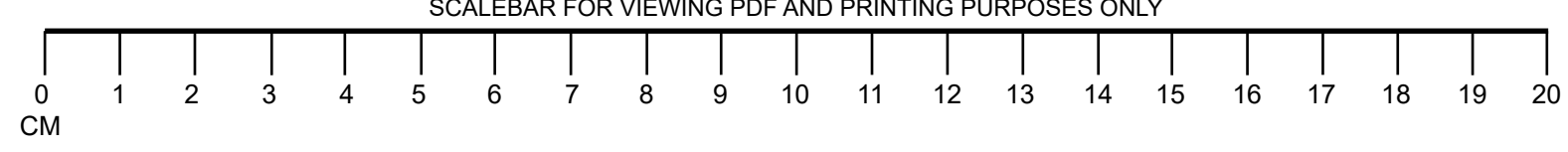
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001 000030 00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 9C **DRAWING NO: XX**



VIEWPOINT 9C: HALL MARTIN VIEW POINT IN THE LATE AFTERNOON IN THE MAJETE WILDLIFE RESERVE. LOOKING NORTH ACROSS A ROLLING TERRAIN ON INTACK MIOMBO WOODLAND AND EAST TO THE KAPICHIRA DAM HYDRO ELECTRIC PROJECT. NOTICE THE LIGHT POLLUTION GENERATED AT THIS LOCATION. HAZE OBSCURES THE MPATAMANGA MOUNTAIN ON THE FAR HORIZON.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 15:02
 DIRECTION OF VIEW: NORTH



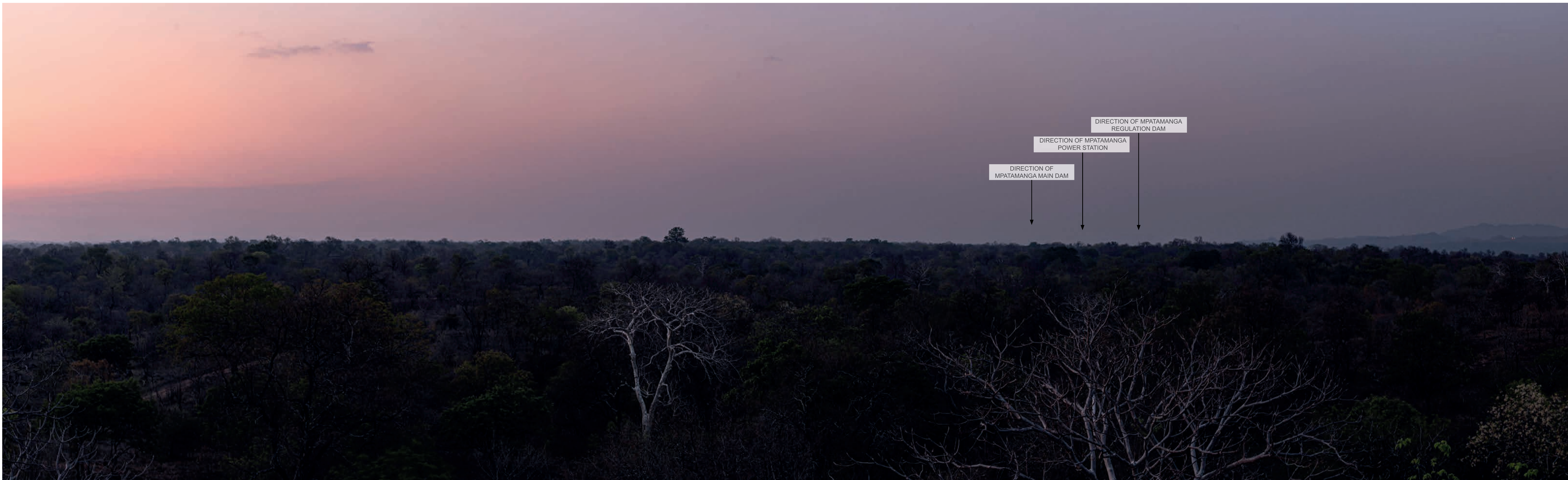
VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

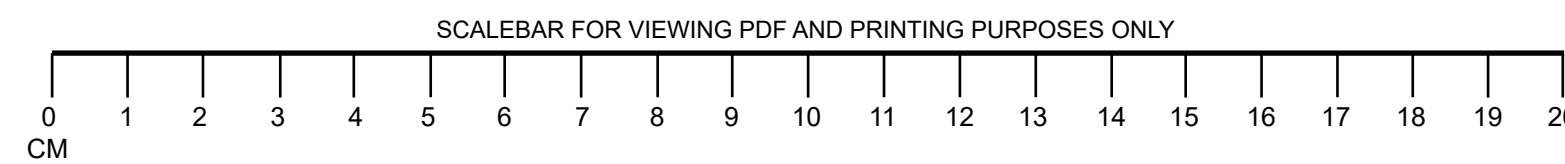
MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001 000030 00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 9C **DRAWING NO: XX**

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VIEWPOINT 9C: HALL MARTIN VIEW POINT AT NIGHT IN THE MAJETE WILDLIFE RESERVE. LOOKING NORTH ACROSS A ROLLING TERRAIN ON INTACK MIOMBO WOODLAND AND EAST TO THE KAPICHIRA DAM HYDRO ELECTRIC PROJECT. NOTICE THE LIGHT POLLUTION GENERATED AT THIS LOCATION. HAZE OBSCURES THE MPATAMANGA MOUNTAIN ON THE FAR HORIZON.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 18:00
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

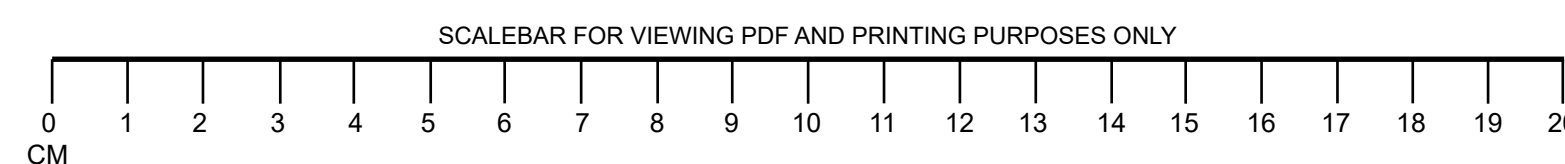


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001 000030 00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 9F **DRAWING NO: XX**



VIEWPOINT 9C: HALL MARTIN VIEW POINT AT NIGHT IN THE MAJETE WILDLIFE RESERVE. LOOKING NORTH ACROSS A ROLLING TERRAIN ON INTACK MIOMBO WOODLAND AND EAST TO THE KAPICHIRA DAM HYDRO ELECTRIC PROJECT. NOTICE THE LIGHT POLLUTION GENERATED AT THIS LOCATION. HAZE OBSCURES THE MPATAMANGA MOUNTAIN ON THE FAR HORIZON.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 24-10-23 TAKEN AT 18:00
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

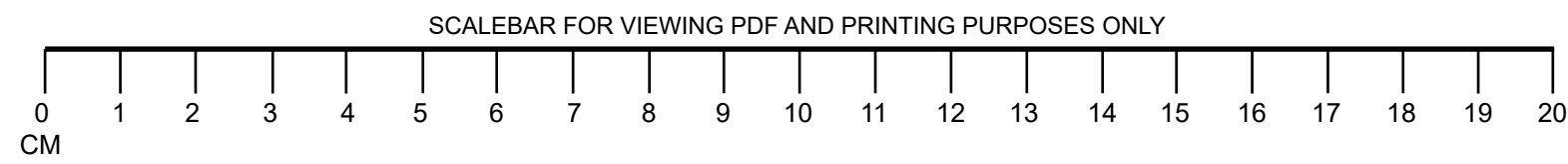


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001 000030 00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 9F **DRAWING NO: XX**



VIEWPOINT 14C: MKULUMADZI LODGE FROM A COMMUNAL SEATING AREA LOOKING NORTH IN THE LATE AFTERNOON TOWARDS THE MPATAMANGA GORGE. NOTICE THE DINNER TABLES IN THE FOREGROUND.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 16:42
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

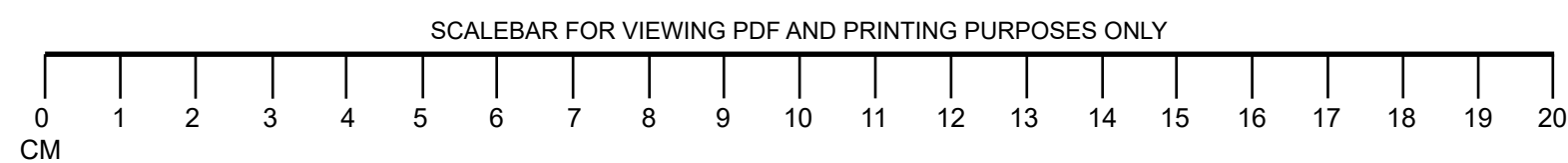


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 14C **DRAWING NO: XX**



VIEWPOINT 14C: MKULUMADZI LODGE FROM A COMMUNAL SEATING AREA LOOKING NORTH IN THE LATE AFTERNOON TOWARDS THE MPATAMANGA GORGE. NOTICE THE DINNER TABLES IN THE FOREGROUND.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 16:42
 DIRECTION OF VIEW: NORTH



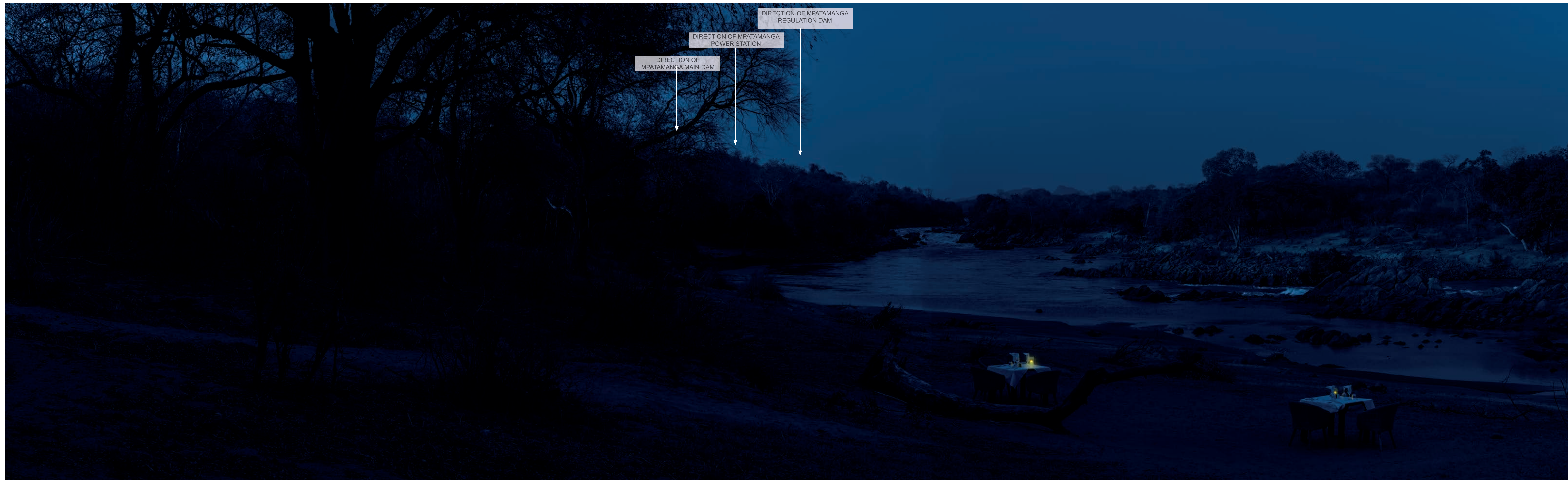
VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

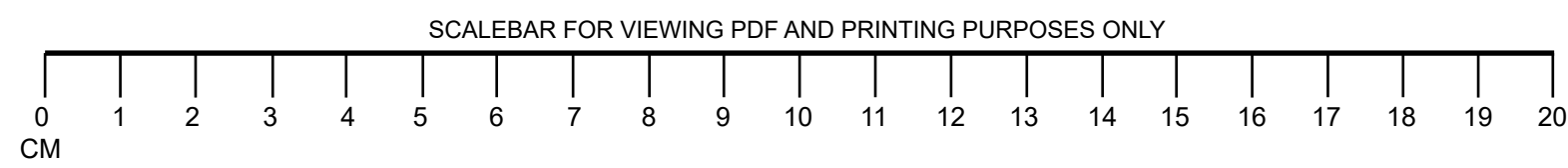


MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 14C **DRAWING NO: XX**



VIEWPOINT 14C: MKULUMADZI LODGE FROM A COMMUNAL SEATING AREA LOOKING NORTH IN THE EVENING TOWARDS THE MPATAMANGA GORGE. NOTICE THE DINNER TABLES IN THE FOREGROUND.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: REPRESENTATION OF NIGHT TIME LIGHTING FROM DAYTIME PHOTOGRAPH
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

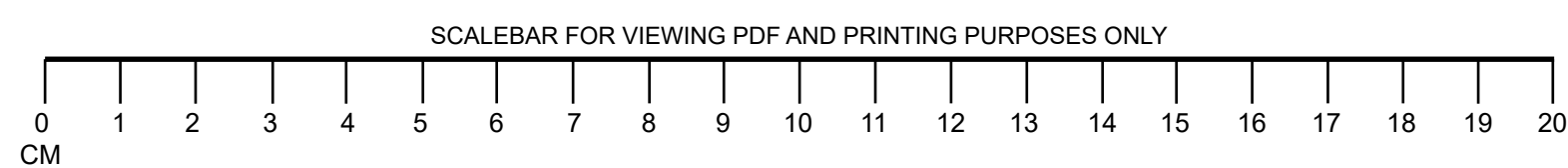


MPATAMANGA HPP
 MALAWI ESIA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 14C **DRAWING NO: XX**



VIEWPOINT 14C: MKULUMADZI LODGE FROM A COMMUNAL SEATING AREA LOOKING NORTH IN THE EVENING TOWARDS THE MPATAMANGA GORGE. NOTICE THE DINNER TABLES IN THE FOREGROUND.

GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: REPRESENTATION OF NIGHT TIME LIGHTING FROM DAYTIME PHOTOGRAPH
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

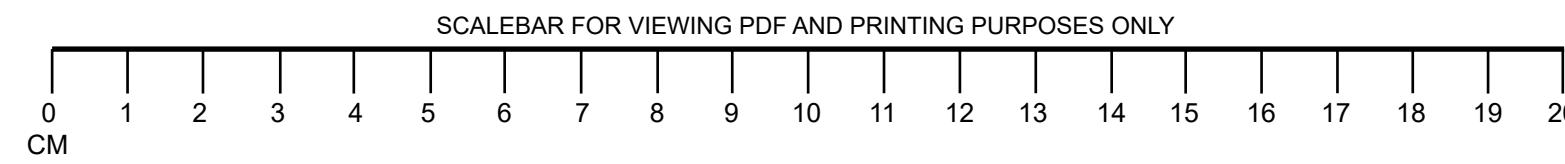
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY



MPATAMANGA HPP
 MALAWI ESIA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 14C **DRAWING NO: XX**



VIEWPOINT 16C: STARBED SITE LATE AFTERNOON LOOKING NORTH TO THE MPATAMANGA GORGE (LOCATION OF THE MAIN DAM)
 GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 17:45
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

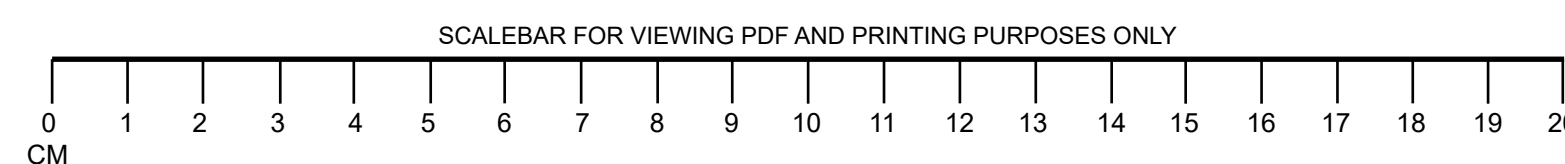
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY



MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 16C **DRAWING NO: XX**



VIEWPOINT 16C: STARBED SITE LATE AFTERNOON LOOKING NORTH TO THE MPATAMANGA GORGE (LOCATION OF THE MAIN DAM)
 GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 17:45
 DIRECTION OF VIEW: NORTH



VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

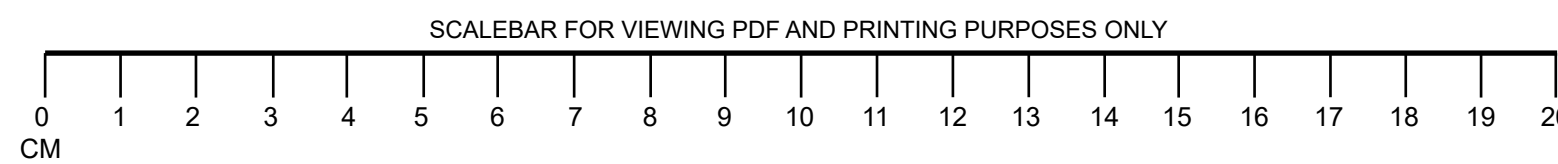
TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY



MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 001.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 16C **DRAWING NO: XX**



VIEWPOINT 16D: STARBED SITE LATE AFTERNOON SOUTH TO THE KAPICHIRA DAM SITE
 GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 18:07
 DIRECTION OF VIEW: SOUTH

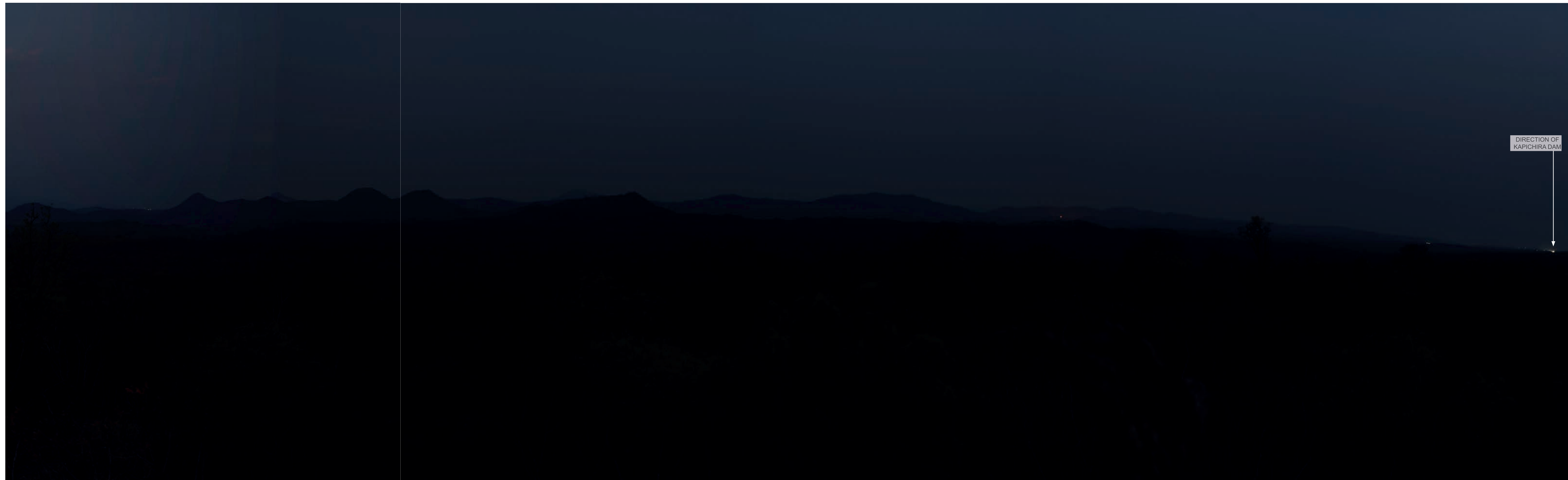


VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

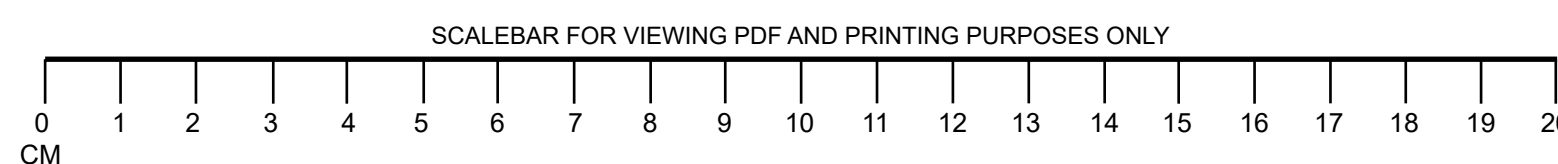
MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 16D **DRAWING NO: XX**



VIEWPOINT 16D: STARBED SITE LATE AFTERNOON SOUTH TO THE KAPICHIRA DAM SITE
 GRID REFERENCE: E:XX, N:XX
 ELEVATION: XXM AOD
 DATE AND TIME OF PHOTOGRAPHY: 25-10-23 TAKEN AT 18:07
 DIRECTION OF VIEW: SOUTH

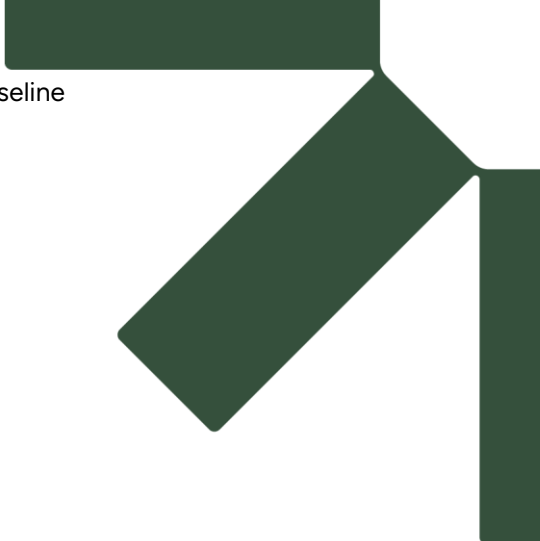


VIEWING BOX INCORPORATES UP TO 90° HORIZONTAL FIELD OF VIEW
 TO BE PRINTED AT A1 FOR ASSESSMENT PURPOSES
 VIEW AT COMFORTABLE ARM'S LENGTH
 ENLARGEMENT FACTOR: 96% TO BE PRINTED AT A1

MAKE AND MODEL OF CAMERA: NIKON D750
 MAKE AND FOCAL LENGTH OF LENS: 50MM
 PROJECTION: CYLINDRICAL

TYPE 1 VIEWPOINT PHOTOGRAPHY
 OCTOBER 2023 PHOTOGRAPHY

MPATAMANGA HPP
 MALAWI ESA INCEPTION MPATAMANGA
 VIEWPOINT PHOTOGRAPHY
 JOB NO: 901.000030.00001
 DATE: NOV 23 DRAWN: HD CHECKED: MJ APPROVED: MJ
VIEWPOINT 16D **DRAWING NO: XX**



Annex 5-30: Noise Survey Results



Table: 5-minute Attended History Results – MD1_D, dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Wed 01/11/2023 11:45	31.8	22.9	35.0	53.3
Wed 01/11/2023 11:50	31.4	21.7	34.1	50.7
Wed 01/11/2023 11:55	34.0	23.2	34.4	58.5
Wed 01/11/2023 12:00	31.5	23.3	34.6	49.5
Wed 01/11/2023 12:05	32.7	24.5	35.2	51.8
Wed 01/11/2023 12:10	33.1	22.9	35.4	52.8
Wed 01/11/2023 12:15	41.6	23.9	43.8	61.7
Wed 01/11/2023 12:20	40.0	24.8	40.2	60.1
Wed 01/11/2023 12:25	43.0	30.2	44.8	69.1
Wed 01/11/2023 12:30	40.7	28.2	40.6	66.9
Wed 01/11/2023 12:35	35.2	26.7	38.6	54.7
Wed 01/11/2023 12:40	42.2	30.4	46.1	55.5
Wed 01/11/2023 12:45	45.6	32.9	48.0	63.0

Table: 5-minute Attended History Results – MD1_N, dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Wed 01/11/2023 23:40	37.1	32.3	38.4	58.7
Wed 01/11/2023 23:45	40.4	34.1	43.2	57.0
Wed 01/11/2023 23:50	35.7	30.1	38.3	52.8
Wed 01/11/2023 23:55	38.7	31.3	41.4	58.3
Thu 02/11/2023 00:00	37.7	32.2	40.2	58.7
Thu 02/11/2023 00:05	34.3	29.2	36.9	53.0
Thu 02/11/2023 00:10	37.7	30.8	40.3	57.0

Table: 5-minute Attended History Results – MD2_D(1), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Wed 01/11/2023 09:55	48.5	33.9	50.8	67.7
Wed 01/11/2023 10:00	54.3	34.6	55.6	79.3
Wed 01/11/2023 10:05	50.8	34.5	51.8	74.3
Wed 01/11/2023 10:10	48.8	36.0	52.3	70.6
Wed 01/11/2023 10:15	48.9	35.7	50.5	69.6
Wed 01/11/2023 10:20	48.9	35.1	51.3	71.8
Wed 01/11/2023 10:25	47.8	33.2	49.7	73.4

Table: 5-minute Attended History Results – MD2_N(1), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Wed 01/11/2023 00:10	40.2	32.2	42.9	65.2
Wed 01/11/2023 00:15	40.5	30.7	45.1	55.9
Wed 01/11/2023 00:20	39.8	32.5	43.3	56.9



Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 00:25	42.4	33.2	45.3	64.1
Wed 01/11/2023 00:30	41.5	34.6	45.4	54.0
Wed 01/11/2023 00:35	36.6	31.9	39.4	53.6
Wed 01/11/2023 00:40	40.1	32.6	43.8	58.7

Table: 5-minute Attended History Results – MD2_D(2), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 10:35	42.1	28.2	43.7	62.7
Wed 01/11/2023 10:40	42.8	28.0	43.1	66.8
Wed 01/11/2023 10:45	43.2	26.5	40.4	66.4
Wed 01/11/2023 10:50	41.0	25.1	41.7	64.6
Wed 01/11/2023 10:55	39.4	29.0	42.3	59.6
Wed 01/11/2023 11:00	38.2	26.4	39.7	58.5
Wed 01/11/2023 11:05	38.5	27.3	41.0	55.8

Table: 5-minute Attended History Results – MD2_N(2), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 00:10	41.1	31.0	45.1	55.6
Wed 01/11/2023 00:15	44.3	30.5	49.1	59.2
Wed 01/11/2023 00:20	41.4	32.1	45.5	56.7
Wed 01/11/2023 00:25	43.6	34.0	46.9	57.0
Wed 01/11/2023 00:30	44.2	35.1	48.0	66.1
Wed 01/11/2023 00:35	38.2	32.6	41.4	50.2
Wed 01/11/2023 00:40	42.0	33.0	45.7	61.0

Table: 5-minute Attended History Results – MD2_D(3), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 10:35	41.8	30.3	43.6	60.6
Wed 01/11/2023 10:40	46.4	30.5	47.4	69.3
Wed 01/11/2023 10:45	47.2	30.2	44.0	69.3
Wed 01/11/2023 10:50	47.6	29.1	46.1	65.9
Wed 01/11/2023 10:55	43.8	31.3	46.2	63.8
Wed 01/11/2023 11:00	42.8	31.5	45.1	62.5
Wed 01/11/2023 11:05	44.5	33.0	47.3	60.0

Table: 5-minute Attended History Results – MD3_D, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Mon 30/10/2023 16:45	48.9	41.1	51.6	69.7
Mon 30/10/2023 16:50	46.8	40.4	49.7	63.2



Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Mon 30/10/2023 16:55	46.2	40.3	49.7	58.9
Mon 30/10/2023 17:00	45.2	40.2	48.2	60.2
Mon 30/10/2023 17:05	44.8	36.5	48.7	59.7
Mon 30/10/2023 17:10	41.9	36.7	44.7	55.8
Mon 30/10/2023 17:15	44.6	38.1	48.3	58.0

Table: 5-minute Attended History Results – MD4_D, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Mon 30/10/2023 15:10	44.7	42.0	46.3	49.9
Mon 30/10/2023 15:10	44.5	39.9	47.5	59.4
Mon 30/10/2023 15:15	42.1	39.0	42.7	62.6
Mon 30/10/2023 15:20	43.8	38.2	47.2	60.4
Mon 30/10/2023 15:25	43.4	38.8	46.1	58.2
Mon 30/10/2023 15:30	41.9	38.7	44.6	54.6
Mon 30/10/2023 15:35	43.5	38.9	46.2	58.6
Mon 30/10/2023 15:40	47.1	40.7	49.1	65.2
Mon 30/10/2023 15:45	43.8	39.3	46.7	56.5
Mon 30/10/2023 15:50	40.4	37.7	42.0	52.7
Mon 30/10/2023 15:55	42.8	39.0	44.9	55.7
Mon 30/10/2023 16:00	41.9	39.0	44.1	56.1
Mon 30/10/2023 16:05	43.2	39.8	45.5	58.0
Mon 30/10/2023 16:10	43.6	39.0	45.3	61.5

Table: 5-minute Attended History Results – MD4_N, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 00:20	42.0	39.6	43.4	57.3
Tue 31/10/2023 00:25	41.5	40.0	42.0	57.3
Tue 31/10/2023 00:30	40.7	38.4	41.9	55.2
Tue 31/10/2023 00:35	39.9	38.4	40.7	51.0
Tue 31/10/2023 00:40	40.0	38.8	40.9	50.7
Tue 31/10/2023 00:45	39.9	38.4	41.1	47.5
Tue 31/10/2023 00:50	41.5	39.2	41.8	66.5
Tue 31/10/2023 00:55	39.9	36.5	41.6	51.2

Table 5-minute Attended History Results – RD1_D, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 13:36	36.8	28.7	39.9	57.8
Wed 01/11/2023 13:40	32.6	24.9	35.7	50.1
Wed 01/11/2023 13:45	38.7	26.5	43.2	57.0



Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 13:50	33.5	25.8	36.9	50.8
Wed 01/11/2023 13:55	34.4	26.1	39.1	46.4
Wed 01/11/2023 14:00	35.6	28.6	39.1	55.7
Wed 01/11/2023 14:05	34.9	28.1	38.8	47.7

Table: 5-minute Attended History Results – RD1_N, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 22:17	41.9	36.4	44.6	54.6
Wed 01/11/2023 22:20	46.0	38.6	49.5	62.1
Wed 01/11/2023 22:25	48.5	42.2	51.6	65.7
Wed 01/11/2023 22:30	44.3	39.4	46.6	58.9
Wed 01/11/2023 22:35	42.1	36.8	44.8	53.1
Wed 01/11/2023 22:40	45.0	38.2	47.9	63.6
Wed 01/11/2023 22:45	45.7	40.7	48.9	56.4

Table: 5-minute Attended History Results – RD2_D, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 12:45	38.0	30.1	39.6	67.0
Tue 31/10/2023 12:50	34.6	30.7	37.4	48.8
Tue 31/10/2023 12:55	38.6	33.2	41.4	53.7
Tue 31/10/2023 13:00	39.3	34.8	42.6	51.4
Tue 31/10/2023 13:05	38.5	35.0	41.1	47.4
Tue 31/10/2023 13:10	38.3	32.6	42.1	53.0
Tue 31/10/2023 13:15	42.3	37.5	45.3	53.4
Tue 31/10/2023 13:20	53.1	35.2	57.9	69.6
Tue 31/10/2023 13:25	41.3	33.5	43.4	61.6
Tue 31/10/2023 13:30	41.6	36.4	44.0	55.3
Tue 31/10/2023 13:35	49.8	31.2	54.6	63.3
Tue 31/10/2023 13:40	52.0	32.0	57.4	65.3
Tue 31/10/2023 13:45	37.4	32.1	40.7	49.2

Table: 5-minute Attended History Results – RD2_N, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Mon 30/10/2023 22:30	42.3	37.2	44.2	63.3
Mon 30/10/2023 22:35	39.8	36.0	42.8	56.1
Mon 30/10/2023 22:40	41.0	37.5	43.7	51.9
Mon 30/10/2023 22:45	44.2	38.6	46.7	58.7
Mon 30/10/2023 22:50	40.9	37.0	43.1	63.0
Mon 30/10/2023 22:55	44.1	39.5	46.8	56.2



Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Mon 30/10/2023 23:00	42.1	35.5	43.8	70.1

Table: 5-minute Attended History Results – RD3_D, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Thu 02/11/2023 15:25	48.3	47.3	49.2	52.1
Thu 02/11/2023 15:30	47.3	45.4	48.7	51.4
Thu 02/11/2023 15:35	47.1	45.4	48.3	52.5
Thu 02/11/2023 15:40	46.8	45.0	47.3	62.5
Thu 02/11/2023 15:45	46.1	45.0	46.7	56.6
Thu 02/11/2023 15:50	46.2	45.1	47.1	55.7
Thu 02/11/2023 15:55	46.5	45.3	46.9	61.6
Thu 02/11/2023 16:00	46.7	45.3	46.9	59.2
Thu 02/11/2023 16:05	47.4	44.7	47.1	62.1
Thu 02/11/2023 16:10	46.1	45.1	46.9	48.9
Thu 02/11/2023 16:15	46.6	45.5	47.4	54.3
Thu 02/11/2023 16:20	46.2	45.3	47.0	48.8

Table: 5-minute Attended History Results – RD3_N, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Thu 02/11/2023 22:15	49.5	48.4	50.1	61.9
Thu 02/11/2023 22:20	49.6	48.9	50.1	51.4
Thu 02/11/2023 22:25	49.7	48.7	50.4	51.7
Thu 02/11/2023 22:30	49.5	48.6	50.2	52.1
Thu 02/11/2023 22:35	49.6	48.6	50.2	54.5
Thu 02/11/2023 22:40	49.5	48.9	50.0	51.3
Thu 02/11/2023 22:45	49.9	48.9	50.5	51.5
Thu 02/11/2023 22:50	49.8	48.9	50.4	51.6
Thu 02/11/2023 22:55	49.9	49.2	50.5	51.7
Thu 02/11/2023 23:00	50.2	49.3	50.9	51.9
Thu 02/11/2023 23:05	50.1	49.3	50.6	51.3
Thu 02/11/2023 23:10	50.0	49.2	50.6	51.5
Thu 02/11/2023 23:15	49.6	48.8	50.2	51.3

Table: 5-minute Attended History Results – RD4_D, dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Thu 02/11/2023 15:20	47.3	45.8	48.2	64.2
Thu 02/11/2023 15:25	51.7	49.7	52.8	54.2
Thu 02/11/2023 15:30	50.0	45.6	52.5	54.2
Thu 02/11/2023 15:35	46.2	45.0	47.3	49.4



Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Thu 02/11/2023 15:40	48.0	45.4	49.2	65.8
Thu 02/11/2023 15:45	47.2	45.8	48.1	54.1
Thu 02/11/2023 15:50	47.0	45.9	48.2	55.3
Thu 02/11/2023 15:55	46.3	45.2	47.0	56.0
Thu 02/11/2023 16:00	47.3	45.5	48.1	64.8
Thu 02/11/2023 16:05	47.0	45.6	48.3	59.6
Thu 02/11/2023 16:10	46.7	45.2	48.1	55.5
Thu 02/11/2023 16:15	48.5	46.0	49.9	60.1
Thu 02/11/2023 16:20	63.5	45.3	48.5	95.6

Table: 5-minute Attended History Results – RD4_N, dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Thu 02/11/2023 22:25	47.3	45.9	47.6	67.7
Thu 02/11/2023 22:30	47.0	46.2	47.8	49.5
Thu 02/11/2023 22:35	47.0	46.2	47.6	54.9
Thu 02/11/2023 22:40	46.4	45.8	46.9	50.0
Thu 02/11/2023 22:45	46.6	45.9	47.1	49.1
Thu 02/11/2023 22:50	46.3	45.7	46.8	47.8
Thu 02/11/2023 22:55	46.2	45.5	46.8	49.1
Thu 02/11/2023 23:00	46.1	45.3	46.6	53.5
Thu 02/11/2023 23:05	46.0	45.5	46.4	47.7
Thu 02/11/2023 23:10	46.2	45.5	46.7	50.2
Thu 02/11/2023 23:15	46.2	45.5	46.8	48.3
Thu 02/11/2023 23:20	46.3	45.6	46.7	52.0

Table: 5-minute Attended History Results – S137_1D(1), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 11:25	45.1	36.0	49.5	56.2
Tue 31/10/2023 11:32	45.7	38.4	48.0	64.9
Tue 31/10/2023 11:35	47.8	37.8	50.5	67.2
Tue 31/10/2023 11:40	48.2	37.5	49.0	72.0
Tue 31/10/2023 11:45	45.5	37.0	48.0	60.6
Tue 31/10/2023 11:50	44.8	36.9	47.6	63.0
Tue 31/10/2023 11:55	43.0	38.6	45.8	48.3

Table: 5-minute Attended History Results – S137_1D(2), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 11:20	49.9	33.6	53.9	66.0
Tue 31/10/2023 11:25	40.4	31.4	41.9	63.2



Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 11:30	39.9	32.1	41.7	59.2
Tue 31/10/2023 11:35	39.8	32.3	42.5	57.9
Tue 31/10/2023 11:40	41.4	34.2	44.2	61.4
Tue 31/10/2023 11:45	39.6	31.6	43.5	54.9
Tue 31/10/2023 11:50	40.0	32.5	42.0	65.6

Table: 5-minute Attended History Results – S137_1D(3), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 12:05	47.6	30.2	47.6	68.2
Tue 31/10/2023 12:10	38.9	31.9	41.3	57.7
Tue 31/10/2023 12:15	46.4	36.4	49.0	67.9
Tue 31/10/2023 12:20	41.9	30.5	45.1	62.6
Tue 31/10/2023 12:25	39.3	27.7	43.1	56.1
Tue 31/10/2023 12:30	50.2	34.4	52.7	66.8
Tue 31/10/2023 12:35	43.1	35.0	46.8	58.9

Table: 5-minute Attended History Results – S137_1D(4), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 12:05	49.6	29.2	45.7	70.9
Tue 31/10/2023 12:10	47.1	29.7	40.4	77.3
Tue 31/10/2023 12:15	52.9	34.1	50.1	79.6
Tue 31/10/2023 12:20	38.3	29.6	41.4	58.8
Tue 31/10/2023 12:25	36.7	27.7	39.4	55.1
Tue 31/10/2023 12:30	51.0	31.9	53.2	70.2
Tue 31/10/2023 12:35	41.1	33.7	43.6	58.3

Table: 5-minute Attended History Results – S137_1N(1), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Fri 03/11/2023 22:15	39.1	33.4	41.9	56.5
Fri 03/11/2023 22:20	38.6	33.4	41.6	47.4
Fri 03/11/2023 22:30	45.2	32.7	41.2	74.3
Fri 03/11/2023 22:35	39.0	34.9	41.8	49.7
Fri 03/11/2023 22:40	41.9	36.3	44.9	50.9
Fri 03/11/2023 22:45	47.8	35.7	49.4	71.2

Table: 5-minute Attended History Results – S137_1N(2), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Fri 03/11/2023 22:15	43.0	30.5	42.5	70.0
Fri 03/11/2023 22:20	36.8	31.3	38.5	62.0



Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Fri 03/11/2023 22:25	32.6	30.3	34.3	41.6
Fri 03/11/2023 22:30	33.8	31.0	36.0	41.1
Fri 03/11/2023 22:35	37.1	32.9	39.2	56.8
Fri 03/11/2023 22:40	37.8	32.9	40.4	44.9
Fri 03/11/2023 22:45	37.0	31.8	40.8	44.3

Table: 5-minute Attended History Results – S137_2D(1), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 15:10	44.0	30.3	47.4	61.7
Tue 31/10/2023 15:15	46.1	30.8	42.0	66.9
Tue 31/10/2023 15:20	45.2	33.3	42.0	64.0
Tue 31/10/2023 15:25	44.1	29.8	47.8	56.2
Tue 31/10/2023 15:30	42.9	29.3	42.2	63.1
Tue 31/10/2023 15:35	40.2	31.0	38.6	63.6
Tue 31/10/2023 15:40	41.6	31.9	43.3	66.1

Table: 5-minute Attended History Results – S137_2D(2), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 15:10	41.6	30.0	43.9	57.1
Tue 31/10/2023 15:15	43.8	32.5	44.2	61.7
Tue 31/10/2023 15:20	42.4	34.6	43.3	57.8
Tue 31/10/2023 15:25	43.2	30.9	46.9	52.6
Tue 31/10/2023 15:30	40.6	31.0	43.6	55.8
Tue 31/10/2023 15:35	39.5	33.2	41.1	60.3
Tue 31/10/2023 15:40	42.4	33.5	43.4	66.3

Table : 5-minute Attended History Results – S137_2D(3), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 15:55	44.8	35.0	48.3	62.3
Tue 31/10/2023 16:00	51.6	37.2	53.6	76.2
Tue 31/10/2023 16:05	45.9	35.7	47.5	69.0
Tue 31/10/2023 16:10	51.7	34.4	46.4	83.7
Tue 31/10/2023 16:15	48.9	38.0	51.1	71.3
Tue 31/10/2023 16:20	43.0	34.5	46.3	59.3
Tue 31/10/2023 16:25	45.3	36.3	48.7	59.9

Table : 5-minute Attended History Results – S137_2D(4), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 15:55	40.5	30.9	43.0	57.1



Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 16:00	43.7	32.5	44.7	64.3
Tue 31/10/2023 16:05	39.0	31.6	41.2	57.8
Tue 31/10/2023 16:10	39.9	29.6	40.1	61.3
Tue 31/10/2023 16:15	41.1	33.0	43.6	60.7
Tue 31/10/2023 16:20	38.5	30.6	41.3	55.8
Tue 31/10/2023 16:25	43.2	31.6	46.8	62.1

Table : 5-minute Attended History Results – S137_2N(1), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 22:25	38.6	31.7	41.7	55.7
Tue 31/10/2023 22:30	37.7	30.3	41.1	53.1
Tue 31/10/2023 22:35	37.5	32.9	39.8	55.1
Tue 31/10/2023 22:40	35.7	30.6	37.6	51.9
Tue 31/10/2023 22:45	36.1	31.5	38.3	51.5
Tue 31/10/2023 22:50	34.3	30.1	37.1	49.9
Tue 31/10/2023 22:55	34.9	28.9	38.2	48.0

Table : 5-minute Attended History Results – S137_2N(2), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 22:25	49.0	36.1	46.1	79.5
Tue 31/10/2023 22:30	40.8	33.3	44.5	55.0
Tue 31/10/2023 22:35	40.2	35.5	42.7	55.0
Tue 31/10/2023 22:40	39.2	33.6	41.5	57.6
Tue 31/10/2023 22:45	39.5	34.7	42.4	54.7
Tue 31/10/2023 22:50	38.1	33.2	40.7	48.6
Tue 31/10/2023 22:55	39.6	31.8	42.4	55.9

Table : 5-minute Attended History Results – S137_3D(1), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 13:05	51.0	48.0	52.0	70.9
Tue 31/10/2023 13:10	50.8	40.6	51.9	77.7
Tue 31/10/2023 13:15	49.2	42.0	50.9	71.5
Tue 31/10/2023 13:20	47.0	40.8	49.6	63.8
Tue 31/10/2023 13:25	49.3	45.0	51.5	60.0
Tue 31/10/2023 13:30	49.0	44.7	51.3	58.8
Tue 31/10/2023 13:35	48.8	44.4	50.6	61.4



Table : 5-minute Attended History Results – S137_3D(2), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 13:05	51.0	48.0	52.0	70.9
Tue 31/10/2023 13:10	50.8	40.6	51.9	77.7
Tue 31/10/2023 13:15	49.2	42.0	50.9	71.5
Tue 31/10/2023 13:20	47.0	40.8	49.6	63.8
Tue 31/10/2023 13:25	49.3	45.0	51.5	60.0
Tue 31/10/2023 13:30	49.0	44.7	51.3	58.8
Tue 31/10/2023 13:35	48.8	44.4	50.6	61.4

Table : 5-minute Attended History Results – S137_3D(3), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 13:50	51.3	42.6	54.5	67.6
Tue 31/10/2023 13:55	54.9	44.1	57.4	77.3
Tue 31/10/2023 14:00	52.5	42.8	54.7	71.6
Tue 31/10/2023 14:05	54.2	41.3	54.1	76.8
Tue 31/10/2023 14:10	54.8	40.6	55.1	78.1
Tue 31/10/2023 14:15	54.7	40.1	59.0	69.3

Table : 5-minute Attended History Results – S137_3D(4), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 13:45	48.4	39.5	51.6	70.4
Tue 31/10/2023 13:50	52.3	40.4	53.7	70.0
Tue 31/10/2023 13:55	50.6	42.9	51.8	68.6
Tue 31/10/2023 14:00	49.3	42.2	51.7	67.9
Tue 31/10/2023 14:05	54.9	40.8	52.3	77.2
Tue 31/10/2023 14:10	61.0	39.7	55.0	88.5
Tue 31/10/2023 14:15	54.4	40.1	59.0	71.4

Table : 5-minute Attended History Results – S137_3N(1), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Fri 03/11/2023 23:25	35.9	29.4	39.1	50.6
Fri 03/11/2023 23:30	40.5	28.6	45.3	55.2
Fri 03/11/2023 23:35	42.0	28.7	43.6	60.4
Fri 03/11/2023 23:40	35.4	27.4	37.0	56.2
Fri 03/11/2023 23:45	40.9	28.7	46.5	56.1
Fri 03/11/2023 23:50	40.4	30.4	42.9	61.1
Fri 03/11/2023 23:55	36.4	30.3	39.0	52.1



Table : 5-minute Attended History Results – S137_3N(2), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Fri 03/11/2023 23:25	38.5	28.3	42.4	56.4
Fri 03/11/2023 23:30	39.7	28.4	44.6	53.1
Fri 03/11/2023 23:35	38.6	28.8	43.1	55.3
Fri 03/11/2023 23:40	38.7	27.7	40.8	61.2
Fri 03/11/2023 23:45	41.7	27.8	47.3	55.5
Fri 03/11/2023 23:50	39.6	29.8	43.6	54.9
Fri 03/11/2023 23:55	37.4	29.1	39.1	56.5

Table : 5-minute Attended History Results – S137_4D(1), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 16:55	47.6	41.7	50.2	65.1
Tue 31/10/2023 17:00	57.1	42.6	57.4	77.1
Tue 31/10/2023 17:05	48.6	41.4	51.3	63.0
Tue 31/10/2023 17:10	51.1	44.9	54.6	62.3
Tue 31/10/2023 17:15	48.8	42.0	50.7	65.7
Tue 31/10/2023 17:20	54.5	41.1	50.5	76.7
Tue 31/10/2023 17:25	48.5	43.6	50.6	62.5

Table : 5-minute Attended History Results – S137_4D(2), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 16:55	45.2	39.4	45.5	67.5
Tue 31/10/2023 17:00	54.1	39.5	50.5	77.3
Tue 31/10/2023 17:05	49.4	39.9	47.3	71.6
Tue 31/10/2023 17:10	45.4	42.2	47.2	61.2
Tue 31/10/2023 17:15	44.9	41.1	47.3	60.0
Tue 31/10/2023 17:20	44.4	39.8	46.4	62.2
Tue 31/10/2023 17:25	44.2	41.9	45.6	60.1

Table : 5-minute Attended History Results – S137_4N(1), dB

Day, Date and Time	$L_{Aeq,5min}$	$L_{A90,5min}$	$L_{A10,5min}$	$L_{Amax(F)}$
Tue 31/10/2023 23:25	40.8	38.1	42.8	56.6
Tue 31/10/2023 23:30	39.4	35.6	41.8	48.2
Tue 31/10/2023 23:35	39.5	36.0	42.0	50.7
Tue 31/10/2023 23:40	37.9	34.1	40.5	51.5
Tue 31/10/2023 23:45	40.4	35.8	43.1	52.8
Tue 31/10/2023 23:50	40.1	34.9	42.9	49.9
Tue 31/10/2023 23:55	42.9	36.2	46.3	54.8



Table : 5-minute Attended History Results – S137_4N(2), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Tue 31/10/2023 23:25	41.4	37.9	42.3	60.6
Tue 31/10/2023 23:30	39.3	36.9	41.5	48.7
Tue 31/10/2023 23:35	39.3	36.1	41.3	53.8
Tue 31/10/2023 23:40	37.4	34.1	39.4	53.6
Tue 31/10/2023 23:45	40.7	36.2	43.3	49.9
Tue 31/10/2023 23:50	39.4	35.2	41.8	49.7
Tue 31/10/2023 23:55	39.9	35.6	42.6	51.6

Table: 5-minute Attended History Results – S137_5D(1), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 09:55	48.5	33.9	50.8	67.7
Wed 01/11/2023 10:00	54.3	34.6	55.6	79.3
Wed 01/11/2023 10:05	50.8	34.5	51.8	74.3
Wed 01/11/2023 10:10	48.8	36.0	52.3	70.6
Wed 01/11/2023 10:15	48.9	35.7	50.5	69.6
Wed 01/11/2023 10:20	48.9	35.1	51.3	71.8
Wed 01/11/2023 10:25	47.8	33.2	49.7	73.4

Table: 5-minute Attended History Results – S137_5D(2), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 10:35	42.1	28.2	43.7	62.7
Wed 01/11/2023 10:40	42.8	28.0	43.1	66.8
Wed 01/11/2023 10:45	43.2	26.5	40.4	66.4
Wed 01/11/2023 10:50	41.0	25.1	41.7	64.6
Wed 01/11/2023 10:55	39.4	29.0	42.3	59.6
Wed 01/11/2023 11:00	38.2	26.4	39.7	58.5
Wed 01/11/2023 11:05	38.5	27.3	41.0	55.8

Table : 5-minute Attended History Results – S137_5D(3), dB

Day, Date and Time	<i>L</i> _{Aeq,5min}	<i>L</i> _{A90,5min}	<i>L</i> _{A10,5min}	<i>L</i> _{Amax(F)}
Wed 01/11/2023 10:35	41.8	30.3	43.6	60.6
Wed 01/11/2023 10:40	46.4	30.5	47.4	69.3
Wed 01/11/2023 10:45	47.2	30.2	44.0	69.3
Wed 01/11/2023 10:50	47.6	29.1	46.1	65.9
Wed 01/11/2023 10:55	43.8	31.3	46.2	63.8
Wed 01/11/2023 11:00	42.8	31.5	45.1	62.5
Wed 01/11/2023 11:05	44.5	33.0	47.3	60.0

Table : 5-minute Attended History Results – S137_5N(1), dB



Day, Date and Time	<i>L</i>_{Aeq,5min}	<i>L</i>_{A90,5min}	<i>L</i>_{A10,5min}	<i>L</i>_{Amax(F)}
Wed 01/11/2023 00:15	40.5	30.7	45.1	55.9
Wed 01/11/2023 00:20	39.8	32.5	43.3	56.9
Wed 01/11/2023 00:25	42.4	33.2	45.3	64.1
Wed 01/11/2023 00:30	41.5	34.6	45.4	54.0
Wed 01/11/2023 00:35	36.6	31.9	39.4	53.6
Wed 01/11/2023 00:40	40.1	32.6	43.8	58.7
Wed 01/11/2023 00:45	37.8	35.5	39.7	42.5

Table : 5-minute Attended History Results – S137_5N(2), dB

Day, Date and Time	<i>L</i>_{Aeq,5min}	<i>L</i>_{A90,5min}	<i>L</i>_{A10,5min}	<i>L</i>_{Amax(F)}
Wed 01/11/2023 00:15	44.3	30.5	49.1	59.2
Wed 01/11/2023 00:20	41.4	32.1	45.5	56.7
Wed 01/11/2023 00:25	43.6	34.0	46.9	57.0
Wed 01/11/2023 00:30	44.2	35.1	48.0	66.1
Wed 01/11/2023 00:35	38.2	32.6	41.4	50.2
Wed 01/11/2023 00:40	42.0	33.0	45.7	61.0
Wed 01/11/2023 00:45	40.5	37.6	41.5	52.2

Annex 5-31: Consolidated Laboratory Results for Surface Water Quality

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Shire d/s Kamuzu Bridge		Lisungwe tributary		Shire d/s Tedzani	
			SW06		SW05		SW04	
			A	B	A	B	A	B
In-situ probe								
pH	[5;9]	[6.5;9]	7.99	7.99	8.38	8.38	8.35	8.35
ORP (mV)			110.40	110.4	127.20	127.2	146.60	146.6
Electrical Conductivity (µS/cm)		<1,500	292.0	292	310.0	309.97	290.5	290.5
Total Dissolved Solids (mg/L)			190.0	190	213.0	213	189.0	189
Dissolved Oxygen (mg/L)		>6	5.22	5.22	7.27	7.27	7.98	7.98
Dissolved Oxygen (%)		>80-90%	69.57	69.57	102.82	102.82	108.47	108.47
Temperature (°C)			28.91	28.91	32.70	32.7	30.49	30.49
Turbidity (NTU)	50		16.87	16.87	364.57	364.57	51.34	51.34
Salinity (PSU)			0.14	0.14	0.132	0.132	0.159	0.159
Laboratory analysis								
Total Dissolved Solids (mg/L)			171.0	171	181.0	181	181.0	181
Turbidity (NTU)	50		22.60	22.6	357.00	357	19.40	19.4
Biochemical Oxygen Demand (mg/L)			9.11	9.11	2.76	2.76	5.56	5.56
Chemical Oxygen Demand (mg/L)			50.20	50.2	32.10	32.1	59.70	59.7
Total Suspended Solids (mg/L)			14.0	14	210.0	210	13.0	13
Total Organic Carbon (mg/L)			0.071	0.071	1.079	1.079	0.410	0.41
Dissolved Organic Carbon (mg/L)			0.056	0.0563	0.058	0.058	0.101	0.101
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)			16.0	16	14.0	14	10.0	10
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)			114.0	114	137.0	137	131.0	131
Total Alkalinity (mg/L)								
Acidity (mg/L)			NA	NA	NA	NA	NA	NA
Fluoride F ⁻ (mg/L)			0.620	0.62	0.320	0.32	0.340	0.34
Chloride Cl ⁻ (mg/L)			18.30	18.3	18.30	18.3	20.90	20.9
Sulphate SO4 ²⁻ (mg/L)			3.21	3.21	0.90	0.9	3.21	3.21
Silica (SiO2) (mg/L)			1.522	1.522	2.110	2.11	1.500	1.5
Orthophosphate PO4 ³⁻ (mg/L)			0.08	0.08	0.17	0.17	0.13	0.13
Dissolved Inorganic Phosphorus (DIP) (mg/L)			0.04	0.04	1.66	1.66	0.09	0.09
Total Phosphorus (TP) (mg/L)			0.160	0.16	0.130	0.13	0.090	0.09
Total Phosphate (mg/L)								
Nitrates (mgNO3 ⁻ /L)		2.4	0	0	9.11	9.11	0	0
Nitrites (mgNO2 ⁻ /L)			0.02	0.02	0.09	0.09	0.07	0.07
Total Nitrogen (mgN/L)			0.094	0.094	0.392	0.392	0.319	0.319
Total Kjeldhal Nitrogen (mgN/L)			0.032	0.032	0.281	0.281	0.126	0.126
Ammonia-N (mgN/L)			0.121	0.121	0.506	0.506	0.412	0.412
Ammoniacal-N (mgN/L)			0.121	0.121	0.506	0.506	0.412	0.412
Dissolved Inorganic Nitrogen (DIN) (mgN/L)			NA	NA	NA	NA	NA	NA
Hardness on dissolved fraction (mg/L)			90.210	90.21	88.330	88.33	92.300	92.3
Hardness on total fraction (mg/L)			104.18	104.18	101.85	101.85	108.09	108.09
Aggressive CO2 (mg/L)			2.93	2.93	0	0	0	0
Boron (mg/L)		0.94	0.027	0.027	0.033	0.033	0.029	0.029
Dissolved salts								
Calcium (mg/L)			20.740	20.74	18.570	18.57	20.160	20.16
Magnesium (mg/L)			9.330	9.33	10.470	10.47	10.190	10.19
Potassium (mg/L)			7.40	7.4	4.40	4.4	7.50	7.5
Sodium (mg/L)			22.0	22	21.0	21	26.0	26
Total salts								
Calcium (mg/L)			24.80	24.8	22.30	22.3	24.80	24.8
Magnesium (mg/L)			10.260	10.26	11.520	11.52	11.210	11.21
Potassium (mg/L)			7.90	7.9	6.00	6	7.80	7.8
Sodium (mg/L)			27.0	27	26.0	26	33.0	33
Dissolved trace elements								
Iron (mg/L)			<0.0046	<0.0046	0.024	0.0236	1.142	1.142
Aluminium (mg/L)		0.055	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (µg/L)		1900	<0.05	<0.05	0.067	0.067	<0.05	<0.05
Selenium (µg/L)		11	3.1	3.1	3.5	3.5	3.6	3.6
Dissolved heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033	0.009	0.009	0.002	0.002	0.011	0.011
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	0	0	0.024	0.024	0.005	0.005
Mercury (mg/L)		0.0006	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arsenic (mg/L)								
Total trace elements								
Aluminium (mg/L)		0.055	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (mg/L)			1.835	1.835	17.459	17.459	3.711	3.711
Manganese (mg/L)			<0.002	<0.002	0.48	0.48	0.106	0.106
Selenium (µg/L)		11	3.3	3.3	3.8	3.8	3.7	3.7
Total heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	0	0	0.03	0.03	0.006	0.006
Arsenic (mg/L)								
Bacteriological parameter								
Faecal coliform (CFU/100mL)			180	180	268	268	120	120
Faecal Streptococcus (CFU/100mL)			NA	NA	NA	NA	NA	NA

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Shire at Main Res site		Shire u/s Likabula confluence		Shire d/s Likabula confluence	
			SW03		SW02		SW01	
			A	B	A	B	A	B
In-situ probe								
pH	[5;9]	[6.5;9]	8.34	8.34	8.35	8.35	8.35	8.35
ORP (mV)			104.20	104.2	105.60	105.6	88.00	88
Electrical Conductivity (µS/cm)		<1,500	290.1	290.11	291.3	291.29	274.9	274.9
Total Dissolved Solids (mg/L)			189.0	189	189.0	189	176.0	176
Dissolved Oxygen (mg/L)		>6	7.79	7.79	7.56	7.56	7.34	7.34
Dissolved Oxygen (%)		>80-90%	105.14	105.14	104.98	104.98	100.04	100.04
Temperature (°C)			29.69	29.69	31.65	31.65	30.25	30.25
Turbidity (NTU)	50		52.08	52.08	122.54	122.54	97.51	97.51
Salinity (PSU)			0.138	0.138	0.123	0.123	0.121	0.121
Laboratory analysis								
Total Dissolved Solids (mg/L)			168.0	168	187.0	187	180.0	180
Turbidity (NTU)	50		11.60	11.6	87.70	87.7	56.20	56.2
Biochemical Oxygen Demand (mg/L)			1.56	1.56	1.88	1.88	3.99	3.99
Chemical Oxygen Demand (mg/L)			11.20	11.2	22.10	22.1	31.20	31.2
Total Suspended Solids (mg/L)			8.0	8	63.0	63	38.0	38
Total Organic Carbon (mg/L)			0.062	0.062	0.065	0.065	0.054	0.054
Dissolved Organic Carbon (mg/L)			0.011	0.011	0.030	0.0298	0.047	0.0471
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)			14.0	14	18.0	18	16.0	16
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)			122.0	122	120.0	120	124.0	124
Total Alkalinity (mg/L)								
Acidity (mg/L)			NA	NA	NA	NA	NA	NA
Fluoride F ⁻ (mg/L)			0.420	0.42	0.290	0.29	0.260	0.26
Chloride Cl ⁻ (mg/L)			17.40	17.4	19.20	19.2	20.90	20.9
Sulphate SO4 ²⁻ (mg/L)			2.82	2.82	3.46	3.46	5.13	5.13
Silica (SiO2) (mg/L)			3.340	3.34	1.120	1.12	1.420	1.42
Orthophosphate PO4 ³⁻ (mg/L)			0.25	0.25	0.39	0.39	0.43	0.43
Dissolved Inorganic Phosphorus (DIP) (mg/L)			0.13	0.13	0.19	0.19	0.38	0.38
Total Phosphorus (TP) (mg/L)			0.090	0.09	0.130	0.13	0.170	0.17
Total Phosphate (mg/L)								
Nitrates (mgNO3 ⁻ /L)		2.4	0	0	0	0	0	0
Nitrites (mgNO2 ⁻ /L)			0.06	0.06	0.02	0.02	0.04	0.04
Total Nitrogen (mgN/L)			0.245	0.245	0.098	0.098	0.196	0.196
Total Kjeldhal Nitrogen (mgN/L)			0.131	0.131	0.082	0.082	0.052	0.052
Ammonia-N (mgN/L)			0.316	0.316	0.126	0.126	0.252	0.252
Ammoniacal-N (mgN/L)			0.316	0.316	0.126	0.126	0.252	0.252
Dissolved Inorganic Nitrogen (DIN) (mgN/L)			NA	NA	NA	NA	NA	NA
Hardness on dissolved fraction (mg/L)			88.530	88.53	86.160	86.16	78.630	78.63
Hardness on total fraction (mg/L)			101.81	101.81	101.19	101.19	88.06	88.06
Aggressive CO2 (mg/L)			0	0	0	0	0	0
Boron (mg/L)		0.94	0.028	0.028	0.011	0.011	0.025	0.025
Dissolved salts								
Calcium (mg/L)			17.480	17.48	21.230	21.23	16.580	16.58
Magnesium (mg/L)			10.900	10.9	8.280	8.28	9.040	9.04
Potassium (mg/L)			7.30	7.3	7.50	7.5	7.70	7.7
Sodium (mg/L)			26.0	26	27.0	27	26.0	26
Total salts								
Calcium (mg/L)			21.00	21	25.50	25.5	19.70	19.7
Magnesium (mg/L)			11.990	11.99	9.110	9.11	9.867	9.867
Potassium (mg/L)			7.40	7.4	7.80	7.8	7.90	7.9
Sodium (mg/L)			31.0	31	33.0	33	28.0	28
Dissolved trace elements								
Iron (mg/L)			1.227	1.227	2.858	2.858	2.043	2.043
Aluminium (mg/L)		0.055	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (µg/L)		1900	0.264	0.264	0.404	0.404	0.180	0.18
Selenium (µg/L)		11	3.2	3.2	3.4	3.4	3.2	3.2
Dissolved heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033	0.001	0.001	0.001	0.001	0.01	0.01
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	0	0	0	0	0.006	0.006
Mercury (mg/L)		0.0006	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arsenic (mg/L)								
Total trace elements								
Aluminium (mg/L)		0.055	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (mg/L)			5.917	5.917	9.342	9.342	6.808	6.808
Manganese (mg/L)			0.092	0.092	0.245	0.245	0.236	0.236
Selenium (µg/L)		11	3.4	3.4	3.5	3.5	3.4	3.4
Total heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	0	0	0	0	0.007	0.007
Arsenic (mg/L)								
Bacteriological parameter								
Faecal coliform (CFU/100mL)			206	206	110	110	50	50
Faecal Streptococcus (CFU/100mL)			NA	NA	NA	NA	NA	NA

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Shire Matope Gorge		Lisungwe tributary		Upper Mkulumadzi	
			WQ1		WQ2A		WQ4A	
			A	B	A	B	A	B
In-situ probe								
pH	[5;9]	[6.5;9]						
ORP (mV)								
Electrical Conductivity (µS/cm)		<1,500						
Total Dissolved Solids (mg/L)								
Dissolved Oxygen (mg/L)		>6						
Dissolved Oxygen (%)		>80-90%						
Temperature (°C)								
Turbidity (NTU)	50							
Salinity (PSU)								
Laboratory analysis								
Total Dissolved Solids (mg/L)			172	172	199	199	138	138
Turbidity (NTU)	50		39.4	39.4	148	148	45.3	45.3
Biochemical Oxygen Demand (mg/L)								
Chemical Oxygen Demand (mg/L)			NA	NA	NA	NA	NA	NA
Total Suspended Solids (mg/L)			21	21	105	105	32	32
Total Organic Carbon (mg/L)								
Dissolved Organic Carbon (mg/L)								
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)			10	10	12	12	10	10
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)			114	114	124	124	89	89
Total Alkalinity (mg/L)								
Acidity (mg/L)			0	0	0	0	0	0
Fluoride F ⁻ (mg/L)			0.37	0.37	0.15	0.15	0.45	0.45
Chloride Cl ⁻ (mg/L)			18.3	18.3	18.3	18.3	20.1	20.1
Sulphate SO4 ²⁻ (mg/L)			4.23	4.23	11.79	11.79	4.74	4.74
Silica (SiO2) (mg/L)								
Orthophosphate PO4 ³⁻ (mg/L)			0.098	0.098	0.809	0.809	0.771	0.771
Dissolved Inorganic Phosphorus (DIP) (mg/L)								
Total Phosphorus (TP) (mg/L)								
Total Phosphate (mg/L)			0.022	0.022	0.15	0.15	0.055	0.055
Nitrates (mgNO3 ⁻ /L)		2.4	0.294	0.294	2.427	2.427	2.133	2.133
Nitrites (mgNO2 ⁻ /L)								
Total Nitrogen (mgN/L)			0.29	0.29	0.293	0.293	2.551	2.551
Total Kjeldhal Nitrogen (mgN/L)								
Ammonia-N (mgN/L)								
Ammoniacal-N (mgN/L)								
Dissolved Inorganic Nitrogen (DIN) (mgN/L)			0.11	0.11	0	0	0.50	0.504
Hardness on dissolved fraction (mg/L)								
Hardness on total fraction (mg/L)								
Aggressive CO2 (mg/L)			NA	NA	NA	NA	NA	NA
Boron (mg/L)		0.94						
Dissolved salts								
Calcium (mg/L)			22.39	22.39	25.8	25.8	27.2	27.2
Magnesium (mg/L)			10.29	10.29	14.27	14.27	12.51	12.51
Potassium (mg/L)			7.40	7.4	4.6	4.6	3.7	3.7
Sodium (mg/L)			23	23	52	52	13	13
Total salts								
Calcium (mg/L)								
Magnesium (mg/L)								
Potassium (mg/L)								
Sodium (mg/L)								
Dissolved trace elements								
Iron (mg/L)			0.858	0.858	3.038	3.038	0.147	0.147
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Manganese (µg/L)		1900	<0.002	<0.002	0.211	0.211	0.046	0.046
Selenium (µg/L)		11	NA	NA	NA	NA	NA	NA
Dissolved heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Mercury (mg/L)		0.0006						
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total trace elements								
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Iron (mg/L)			2.679	2.679	9.06	9.06	3.747	3.747
Manganese (mg/L)			0.075	0.075	0.293	0.293	0.137	0.137
Selenium (µg/L)		11						
Total heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bacteriological parameter								
Faecal coliform (CFU/100mL)			120	120	240	240	110	110
Faecal Streptococcus (CFU/100mL)			52	52	100	100	62	62

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Shire u/s confluence with Mkulumadze		Shire d/s confluence with Mkulumadze		Shire d/s Kapichira	
			WQ4B		WQ4		WQ5	
			A	B	A	B	A	B
In-situ probe								
pH	[5;9]	[6.5;9]						
ORP (mV)								
Electrical Conductivity (µS/cm)		<1,500						
Total Dissolved Solids (mg/L)								
Dissolved Oxygen (mg/L)		>6						
Dissolved Oxygen (%)		>80-90%						
Temperature (°C)								
Turbidity (NTU)	50							
Salinity (PSU)								
Laboratory analysis								
Total Dissolved Solids (mg/L)			108	108	192	192	180	180
Turbidity (NTU)	50		8.88	8.88	32.4	32.4	34.2	34.2
Biochemical Oxygen Demand (mg/L)								
Chemical Oxygen Demand (mg/L)			NA	NA	NA	NA	NA	NA
Total Suspended Solids (mg/L)			3	3	16	16	21	21
Total Organic Carbon (mg/L)								
Dissolved Organic Carbon (mg/L)								
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)			12	12	8	8	16	16
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)			91	91	129	129	116	116
Total Alkalinity (mg/L)								
Acidity (mg/L)			5	5	0	0	0	0
Fluoride F ⁻ (mg/L)			0.05	0.05	0.62	0.62	0.53	0.53
Chloride Cl ⁻ (mg/L)			14.1	14.1	21.8	21.8	17.4	17.4
Sulphate SO4 ²⁻ (mg/L)			2.69	2.69	4.10	4.1	3.72	3.72
Silica (SiO2) (mg/L)								
Orthophosphate PO4 ³⁻ (mg/L)			0.132	0.132	0.25	0.25	0.775	0.775
Dissolved Inorganic Phosphorus (DIP) (mg/L)								
Total Phosphorus (TP) (mg/L)								
Total Phosphate (mg/L)			0.024	0.024	0.013	0.013	0.094	0.094
Nitrates (mgNO3 ⁻ /L)		2.4	0.396	0.396	0.75	0.75	2.325	2.325
Nitrites (mgNO2 ⁻ /L)								
Total Nitrogen (mgN/L)			1.33	1.33	0.437	0.437	0.519	0.519
Total Kjeldhal Nitrogen (mgN/L)								
Ammonia-N (mgN/L)								
Ammoniacal-N (mgN/L)								
Dissolved Inorganic Nitrogen (DIN) (mgN/L)			0	0.019	0	0	0	0.06
Hardness on dissolved fraction (mg/L)								
Hardness on total fraction (mg/L)								
Aggressive CO2 (mg/L)			NA	NA	NA	NA	NA	NA
Boron (mg/L)		0.94						
Dissolved salts								
Calcium (mg/L)			24.66	24.66	24.66	24.66	26.58	26.58
Magnesium (mg/L)			9.06	9.06	12.88	12.88	13.5	13.5
Potassium (mg/L)			1.9	1.9	7.2	7.2	7.4	7.4
Sodium (mg/L)			11.2	11.2	24	24	22	22
Total salts								
Calcium (mg/L)								
Magnesium (mg/L)								
Potassium (mg/L)								
Sodium (mg/L)								
Dissolved trace elements								
Iron (mg/L)			0.33	0.33	<0.004	<0.004	0.716	0.716
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Manganese (µg/L)		1900	0.092	0.092	0.046	0.046	0.013	0.013
Selenium (µg/L)		11	NA	NA	NA	NA	NA	NA
Dissolved heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Mercury (mg/L)		0.0006						
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total trace elements								
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Iron (mg/L)			1.385	1.385	2.677	2.677	2.366	2.366
Manganese (mg/L)			0.168	0.168	0.106	0.106	0.262	0.262
Selenium (µg/L)		11						
Total heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bacteriological parameter								
Faecal coliform (CFU/100mL)			126	126	42	42	22	22
Faecal Streptococcus (CFU/100mL)			62	62	12	12	6	6

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Shire u/s Likabula		Shire d/s Likabula		Lake North of Likabula	
			WQ5A		WQChik		WQLake1	
			A	B	A	B	A	B
In-situ probe								
pH	[5;9]	[6.5;9]						
ORP (mV)								
Electrical Conductivity (µS/cm)		<1,500						
Total Dissolved Solids (mg/L)								
Dissolved Oxygen (mg/L)		>6						
Dissolved Oxygen (%)		>80-90%						
Temperature (°C)								
Turbidity (NTU)	50							
Salinity (PSU)								
Laboratory analysis								
Total Dissolved Solids (mg/L)			192	192	190	190	234	234
Turbidity (NTU)	50		59.4	59.4	84.9	84.9	13.6	13.6
Biochemical Oxygen Demand (mg/L)								
Chemical Oxygen Demand (mg/L)			NA	NA	NA	NA	NA	NA
Total Suspended Solids (mg/L)			40	40	57	57	10	10
Total Organic Carbon (mg/L)								
Dissolved Organic Carbon (mg/L)								
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)			8	8	16	16	0	0
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)			127	127	127	127	176	176
Total Alkalinity (mg/L)								
Acidity (mg/L)			0	0	0	0	5	5
Fluoride F ⁻ (mg/L)			0.86	0.86	0.29	0.29	0.55	0.55
Chloride Cl ⁻ (mg/L)			20.8	20.8	17.3	17.3	25.3	25.3
Sulphate SO4 ²⁻ (mg/L)			4.10	4.1	5.00	5	5.77	5.77
Silica (SiO2) (mg/L)								
Orthophosphate PO4 ³⁻ (mg/L)			0.299	0.299	0.911	0.911	0.206	0.206
Dissolved Inorganic Phosphorus (DIP) (mg/L)								
Total Phosphorus (TP) (mg/L)								
Total Phosphate (mg/L)			0.015	0.015	0.038	0.038	0.025	0.025
Nitrates (mgNO3 ⁻ /L)		2.4	0.897	0.897	2.733	2.733	0.618	0.618
Nitrites (mgNO2 ⁻ /L)								
Total Nitrogen (mgN/L)			0.163	0.163	2.54	2.54	0.52	0.52
Total Kjeldhal Nitrogen (mgN/L)								
Ammonia-N (mgN/L)								
Ammoniacal-N (mgN/L)								
Dissolved Inorganic Nitrogen (DIN) (mgN/L)			0	0	0	0	0	0
Hardness on dissolved fraction (mg/L)								
Hardness on total fraction (mg/L)								
Aggressive CO2 (mg/L)			NA	NA	NA	NA	NA	NA
Boron (mg/L)		0.94						
Dissolved salts								
Calcium (mg/L)			29.75	29.75	26.58	26.58	28.51	28.51
Magnesium (mg/L)			15.25	15.25	13.25	13.25	20.74	20.74
Potassium (mg/L)			7.5	7.5	7.3	7.3	2.3	2.3
Sodium (mg/L)			23	23	37	37	22	22
Total salts								
Calcium (mg/L)								
Magnesium (mg/L)								
Potassium (mg/L)								
Sodium (mg/L)								
Dissolved trace elements								
Iron (mg/L)			<0.004	<0.004	0.716	0.716	<0.004	<0.004
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Manganese (µg/L)		1900	<0.002	<0.002	0.101	0.101	0.124	0.124
Selenium (µg/L)		11	NA	NA	NA	NA	NA	NA
Dissolved heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Mercury (mg/L)		0.0006						
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total trace elements								
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Iron (mg/L)			5.08	5.083	6.51	6.509	0.23	0.227
Manganese (mg/L)			<0.002	<0.002	0.106	0.106	0.137	0.137
Selenium (µg/L)		11						
Total heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bacteriological parameter								
Faecal coliform (CFU/100mL)			840	840	230	230	70	70
Faecal Streptococcus (CFU/100mL)			305	305	72	72	12	12

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Mwamphanzi u/s		Nchalo offtake		Bangula	
			WQMWAM		WQNchalo		WQ6	
			A	B	A	B	A	B
In-situ probe								
pH	[5;9]	[6.5;9]						
ORP (mV)								
Electrical Conductivity (µS/cm)		<1,500						
Total Dissolved Solids (mg/L)								
Dissolved Oxygen (mg/L)		>6						
Dissolved Oxygen (%)		>80-90%						
Temperature (°C)								
Turbidity (NTU)	50							
Salinity (PSU)								
Laboratory analysis								
Total Dissolved Solids (mg/L)			199	199	190	190	200	200
Turbidity (NTU)	50		17.1	17.1	94.5	94.5	70.2	70.2
Biochemical Oxygen Demand (mg/L)								
Chemical Oxygen Demand (mg/L)			NA	NA	NA	NA	NA	NA
Total Suspended Solids (mg/L)			12	12	74	74	44	44
Total Organic Carbon (mg/L)								
Dissolved Organic Carbon (mg/L)								
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)			10	10	8	8	8	8
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)			131	131	124	124	141	141
Total Alkalinity (mg/L)								
Acidity (mg/L)			0	0	0	0	0	0
Fluoride F ⁻ (mg/L)			0.65	0.65	0.35	0.35	0.58	0.58
Chloride Cl ⁻ (mg/L)			31.9	31.9	20.1	20.1	19.2	19.2
Sulphate SO4 ²⁻ (mg/L)			6.67	6.67	5.51	5.51	4.62	4.62
Silica (SiO2) (mg/L)								
Orthophosphate PO4 ³⁻ (mg/L)			0.127	0.127	0.412	0.412	0.554	0.554
Dissolved Inorganic Phosphorus (DIP) (mg/L)								
Total Phosphorus (TP) (mg/L)								
Total Phosphate (mg/L)			0.025	0.025	0.048	0.048	0.012	0.012
Nitrates (mgNO3 ⁻ /L)		2.4	0.381	0.381	1.236	1.236	1.60	1.602
Nitrites (mgNO2 ⁻ /L)								
Total Nitrogen (mgN/L)			0.165	0.165	1.632	1.632	1.66	1.661
Total Kjeldhal Nitrogen (mgN/L)								
Ammonia-N (mgN/L)								
Ammoniacal-N (mgN/L)								
Dissolved Inorganic Nitrogen (DIN) (mgN/L)			0	0	0	0.407	0	0
Hardness on dissolved fraction (mg/L)								
Hardness on total fraction (mg/L)								
Aggressive CO2 (mg/L)			NA	NA	NA	NA	NA	NA
Boron (mg/L)		0.94						
Dissolved salts								
Calcium (mg/L)			22.39	22.39	22.09	22.09	26.58	26.58
Magnesium (mg/L)			15.16	15.16	6.96	6.96	13.25	13.25
Potassium (mg/L)			2.8	2.8	7.2	7.2	6.9	6.9
Sodium (mg/L)			22	22	25	25	25	25
Total salts								
Calcium (mg/L)								
Magnesium (mg/L)								
Potassium (mg/L)								
Sodium (mg/L)								
Dissolved trace elements								
Iron (mg/L)			<0.004	<0.004	1.948	1.948	<0.004	<0.004
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Manganese (µg/L)		1900	0.104	0.104	0.179	0.179	0.090	0.09
Selenium (µg/L)		11	NA	NA	NA	NA	NA	NA
Dissolved heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Mercury (mg/L)		0.0006						
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total trace elements								
Aluminium (mg/L)		0.055	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Iron (mg/L)			1.39	1.385	7.40	7.4	6.24	6.241
Manganese (mg/L)			0.106	0.106	0.262	0.262	0.137	0.137
Selenium (µg/L)		11						
Total heavy metals								
Lead (mg/L)		0.0034	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028	<0.0028
Chromium (mg/L)	0.1	0.0033						
Copper (mg/L)		0.0014	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Zinc (mg/L)		0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Nickel (mg/L)		0.011	NA	NA	NA	NA	NA	NA
Arsenic (mg/L)			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bacteriological parameter								
Faecal coliform (CFU/100mL)			140	140	40	40	1	1
Faecal Streptococcus (CFU/100mL)			60	60	20	20	0	0

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Ruo River		Shire	Shire	Shire
			WQ7		HSM01	HSM01	HSM01
			A	B	23/08/2023	24/09/2023	23/10/2023
In-situ probe							
pH	[5;9]	[6.5;9]			8.5	8.47	8.06
ORP (mV)					190.3	82.2	162.3
Electrical Conductivity (µS/cm)		<1,500			262	262	152
Total Dissolved Solids (mg/L)							
Dissolved Oxygen (mg/L)		>6			80.1	8.49	3.94
Dissolved Oxygen (%)		>80-90%			101.3	112.3	54.8
Temperature (°C)					27.2	27.3	29.9
Turbidity (NTU)	50						
Salinity (PSU)					0.12	0.12	0.07
Laboratory analysis							
Total Dissolved Solids (mg/L)			150	150	131	131	76
Turbidity (NTU)	50		13.2	13.2			
Biochemical Oxygen Demand (mg/L)					0.28		0.9
Chemical Oxygen Demand (mg/L)			NA	NA	3		31
Total Suspended Solids (mg/L)			9	9			
Total Organic Carbon (mg/L)							
Dissolved Organic Carbon (mg/L)							
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)			12	12	9.6		2.4
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)			73	73	178		178
Total Alkalinity (mg/L)					162		150
Acidity (mg/L)			6.67	6.67			
Fluoride F ⁻ (mg/L)			0.51	0.51			
Chloride Cl ⁻ (mg/L)			27.0	27			
Sulphate SO4 ²⁻ (mg/L)			3.59	3.59			
Silica (SiO2) (mg/L)							
Orthophosphate PO4 ³⁻ (mg/L)			0.617	0.617	0.07		0.08
Dissolved Inorganic Phosphorus (DIP) (mg/L)							
Total Phosphorus (TP) (mg/L)							
Total Phosphate (mg/L)			0.049	0.049			
Nitrates (mgNO3 ⁻ /L)		2.4	1.85	1.851	7.4		5.5
Nitrites (mgNO2 ⁻ /L)					0.19		0.74
Total Nitrogen (mgN/L)			1.41	1.407	0.23		0.24
Total Kjeldhal Nitrogen (mgN/L)							
Ammonia-N (mgN/L)							
Ammoniacal-N (mgN/L)					0.14		0.16
Dissolved Inorganic Nitrogen (DIN) (mgN/L)			0	0.084			
Hardness on dissolved fraction (mg/L)							
Hardness on total fraction (mg/L)							
Aggressive CO2 (mg/L)			NA	NA			
Boron (mg/L)		0.94					
Dissolved salts							
Calcium (mg/L)			25.94	25.94	18.1		9.8
Magnesium (mg/L)			13.25	13.25	7.2		9.3
Potassium (mg/L)			2.2	2.2			
Sodium (mg/L)			16	16			
Total salts							
Calcium (mg/L)							
Magnesium (mg/L)							
Potassium (mg/L)							
Sodium (mg/L)							
Dissolved trace elements							
Iron (mg/L)			0.662	0.662	0.1		<0.01
Aluminium (mg/L)		0.055	<0.03	<0.03			
Manganese (µg/L)		1900	0.080	0.08			
Selenium (µg/L)		11	NA	NA			
Dissolved heavy metals							
Lead (mg/L)		0.0034	<0.012	<0.012			
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028			
Chromium (mg/L)	0.1	0.0033					
Copper (mg/L)		0.0014	<0.004	<0.004			
Zinc (mg/L)		0.008	<0.003	<0.003			
Nickel (mg/L)		0.011	NA	NA			
Mercury (mg/L)		0.0006					
Arsenic (mg/L)			<0.001	<0.001			
Total trace elements							
Aluminium (mg/L)		0.055	<0.03	<0.03			
Iron (mg/L)			1.88	1.876			
Manganese (mg/L)			0.293	0.293			
Selenium (µg/L)		11					
Total heavy metals							
Lead (mg/L)		0.0034	<0.012	<0.012			
Cadmium (mg/L)	0.01	0.0002	<0.0028	<0.0028			
Chromium (mg/L)	0.1	0.0033					
Copper (mg/L)		0.0014	<0.004	<0.004			
Zinc (mg/L)		0.008	<0.003	<0.003			
Nickel (mg/L)		0.011	NA	NA			
Arsenic (mg/L)			<0.001	<0.001			
Bacteriological parameter							
Faecal coliform (CFU/100mL)			440	440			
Faecal Streptococcus (CFU/100mL)			105	105			

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Shire	Shire	Shire	Mkulumadzi
			HSM01	HSM01	HSM01	HSM02
			15/11/2023	19/11/2023	17/12/2023	24/08/2023
In-situ probe						
pH	[5;9]	[6.5;9]	8.45	8.4	8.35	8.47
ORP (mV)			146	104.9	42.9	219.3
Electrical Conductivity (µS/cm)		<1,500	250	251	256	134
Total Dissolved Solids (mg/L)						
Dissolved Oxygen (mg/L)		>6	7.62	7.53	7.05	8.07
Dissolved Oxygen (%)		>80-90%	101.3	102.3	99.7	109.6
Temperature (°C)						
Turbidity (NTU)	50					
Salinity (PSU)			0.12	0.12	0.12	9.06
Laboratory analysis						
Total Dissolved Solids (mg/L)			125	126	128	67
Turbidity (NTU)	50					
Biochemical Oxygen Demand (mg/L)						2.2
Chemical Oxygen Demand (mg/L)						0
Total Suspended Solids (mg/L)						
Total Organic Carbon (mg/L)						
Dissolved Organic Carbon (mg/L)						
Alkalinity (Carbonate (CO ₃ ²⁻)) (mg/L)						0.04
Alkalinity (Bicarbonate (HCO ₃ ⁻)) (mg/L)						90
Total Alkalinity (mg/L)						73.9
Acidity (mg/L)						
Fluoride F ⁻ (mg/L)						
Chloride Cl ⁻ (mg/L)						
Sulphate SO ₄ ²⁻ (mg/L)						
Silica (SiO ₂) (mg/L)						
Orthophosphate PO ₄ ³⁻ (mg/L)						0.11
Dissolved Inorganic Phosphorus (DIP) (mg/L)						
Total Phosphorus (TP) (mg/L)						
Total Phosphate (mg/L)						
Nitrates (mgNO ₃ ⁻ /L)		2.4				6
Nitrites (mgNO ₂ ⁻ /L)						0.04
Total Nitrogen (mgN/L)						0.12
Total Kjeldhal Nitrogen (mgN/L)						
Ammonia-N (mgN/L)						
Ammoniacal-N (mgN/L)						0.18
Dissolved Inorganic Nitrogen (DIN) (mgN/L)						
Hardness on dissolved fraction (mg/L)						
Hardness on total fraction (mg/L)						
Aggressive CO ₂ (mg/L)						
Boron (mg/L)		0.94				
Dissolved salts						
Calcium (mg/L)						4
Magnesium (mg/L)						3.3
Potassium (mg/L)						
Sodium (mg/L)						
Total salts						
Calcium (mg/L)						
Magnesium (mg/L)						
Potassium (mg/L)						
Sodium (mg/L)						
Dissolved trace elements						
Iron (mg/L)						0.1
Aluminium (mg/L)		0.055				
Manganese (µg/L)		1900				
Selenium (µg/L)		11				
Dissolved heavy metals						
Lead (mg/L)		0.0034				
Cadmium (mg/L)	0.01	0.0002				
Chromium (mg/L)	0.1	0.0033				
Copper (mg/L)		0.0014				
Zinc (mg/L)		0.008				
Nickel (mg/L)		0.011				
Mercury (mg/L)		0.0006				
Arsenic (mg/L)						
Total trace elements						
Aluminium (mg/L)		0.055				
Iron (mg/L)						
Manganese (mg/L)						
Selenium (µg/L)		11				
Total heavy metals						
Lead (mg/L)		0.0034				
Cadmium (mg/L)	0.01	0.0002				
Chromium (mg/L)	0.1	0.0033				
Copper (mg/L)		0.0014				
Zinc (mg/L)		0.008				
Nickel (mg/L)		0.011				
Arsenic (mg/L)						
Bacteriological parameter						
Faecal coliform (CFU/100mL)						
Faecal Streptococcus (CFU/100mL)						

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Mkulumadzi	Mkulumadzi	Mkulumadzi	Mkulumadzi	Mkulumadzi
			HSM02	HSM02	HSM02	HSM02	HSM02
			24/09/2023	25/10/2023	18/11/2023	21/11/2023	14/12/2023
In-situ probe							
pH	[5;9]	[6.5;9]	8.47	8.31	8.22	8.24	8.23
ORP (mV)			96.7	89	150.9	104.5	70.8
Electrical Conductivity (µS/cm)		<1,500	144	136	144	142	256
Total Dissolved Solids (mg/L)							
Dissolved Oxygen (mg/L)		>6	8.42	7.41	6.4	7.03	7.05
Dissolved Oxygen (%)		>80-90%	110.4	103.1	98.5	98.1	89.9
Temperature (°C)							
Turbidity (NTU)	50						
Salinity (PSU)			0.07	0.06	0.07	0.07	0.12
Laboratory analysis							
Total Dissolved Solids (mg/L)			72	68	72	71	128
Turbidity (NTU)	50						
Biochemical Oxygen Demand (mg/L)			0	0.31			
Chemical Oxygen Demand (mg/L)			0	9			
Total Suspended Solids (mg/L)							
Total Organic Carbon (mg/L)							
Dissolved Organic Carbon (mg/L)							
Alkalinity (Carbonate (CO3 ²⁻)) (mg/L)				2.4			
Alkalinity (Bicarbonate (HCO3 ⁻)) (mg/L)				104.92			
Total Alkalinity (mg/L)				90.1			
Acidity (mg/L)							
Fluoride F ⁻ (mg/L)							
Chloride Cl ⁻ (mg/L)							
Sulphate SO4 ²⁻ (mg/L)							
Silica (SiO2) (mg/L)							
Orthophosphate PO4 ³⁻ (mg/L)				0.05			
Dissolved Inorganic Phosphorus (DIP) (mg/L)							
Total Phosphorus (TP) (mg/L)							
Total Phosphate (mg/L)							
Nitrates (mgNO3 ⁻ /L)		2.4		3.2			
Nitrites (mgNO2 ⁻ /L)				0.03			
Total Nitrogen (mgN/L)				0.1			
Total Kjeldhal Nitrogen (mgN/L)							
Ammonia-N (mgN/L)							
Ammoniacal-N (mgN/L)				0.07			
Dissolved Inorganic Nitrogen (DIN) (mgN/L)							
Hardness on dissolved fraction (mg/L)							
Hardness on total fraction (mg/L)							
Aggressive CO2 (mg/L)							
Boron (mg/L)		0.94					
Dissolved salts							
Calcium (mg/L)				3.5			
Magnesium (mg/L)				4.6			
Potassium (mg/L)							
Sodium (mg/L)							
Total salts							
Calcium (mg/L)							
Magnesium (mg/L)							
Potassium (mg/L)							
Sodium (mg/L)							
Dissolved trace elements							
Iron (mg/L)				<0.01			
Aluminium (mg/L)		0.055					
Manganese (µg/L)		1900					
Selenium (µg/L)		11					
Dissolved heavy metals							
Lead (mg/L)		0.0034					
Cadmium (mg/L)	0.01	0.0002					
Chromium (mg/L)	0.1	0.0033					
Copper (mg/L)		0.0014					
Zinc (mg/L)		0.008					
Nickel (mg/L)		0.011					
Mercury (mg/L)		0.0006					
Arsenic (mg/L)							
Total trace elements							
Aluminium (mg/L)		0.055					
Iron (mg/L)							
Manganese (mg/L)							
Selenium (µg/L)		11					
Total heavy metals							
Lead (mg/L)		0.0034					
Cadmium (mg/L)	0.01	0.0002					
Chromium (mg/L)	0.1	0.0033					
Copper (mg/L)		0.0014					
Zinc (mg/L)		0.008					
Nickel (mg/L)		0.011					
Arsenic (mg/L)							
Bacteriological parameter							
Faecal coliform (CFU/100mL)							
Faecal Streptococcus (CFU/100mL)							

Water Quality Parameters	Malawi Standard for Recreational Water	ANZECC Aquatic Ecosystems Guideline	Lisungwe	Lisungwe	Lisungwe	Lisungwe	Lisungwe
			HSM03	HSM03	HSM03	HSM03	HSM03
			24/08/2023	25/10/2023	18/11/2023	20/11/2023	14/12/2023
In-situ probe							
pH	[5;9]	[6.5;9]	8.7	8.51	8.42	8.44	8.74
ORP (mV)			185.9	86	163.8	129.8	65.2
Electrical Conductivity (µS/cm)		<1,500	274	264	247	226	347
Total Dissolved Solids (mg/L)							
Dissolved Oxygen (mg/L)		>6	8.06	6.78	7.23	6.54	6.13
Dissolved Oxygen (%)		>80-90%	107.5	101.8	98.8	96.6	90.5
Temperature (°C)							
Turbidity (NTU)	50						
Salinity (PSU)			0.13	0.12	0.12	0.1	0.16
Laboratory analysis							
Total Dissolved Solids (mg/L)			137	132	124	115	174
Turbidity (NTU)	50						
Biochemical Oxygen Demand (mg/L)			0.15		0.59		
Chemical Oxygen Demand (mg/L)			0		21		
Total Suspended Solids (mg/L)							
Total Organic Carbon (mg/L)							
Dissolved Organic Carbon (mg/L)							
Alkalinity (Carbonate (CO ₃ ²⁻)) (mg/L)			12		7.2		
Alkalinity (Bicarbonate (HCO ₃ ⁻)) (mg/L)			159		163		
Total Alkalinity (mg/L)			150.4		145.8		
Acidity (mg/L)							
Fluoride F ⁻ (mg/L)							
Chloride Cl ⁻ (mg/L)							
Sulphate SO ₄ ²⁻ (mg/L)							
Silica (SiO ₂) (mg/L)							
Orthophosphate PO ₄ ³⁻ (mg/L)			0.16		0.14		
Dissolved Inorganic Phosphorus (DIP) (mg/L)							
Total Phosphorus (TP) (mg/L)							
Total Phosphate (mg/L)							
Nitrates (mgNO ₃ ⁻ /L)		2.4	3.9		21		
Nitrites (mgNO ₂ ⁻ /L)			0.05		5.2		
Total Nitrogen (mgN/L)			0.15		0.05		
Total Kjeldhal Nitrogen (mgN/L)							
Ammonia-N (mgN/L)							
Ammoniacal-N (mgN/L)			0.2		0.22		
Dissolved Inorganic Nitrogen (DIN) (mgN/L)							
Hardness on dissolved fraction (mg/L)							
Hardness on total fraction (mg/L)							
Aggressive CO ₂ (mg/L)							
Boron (mg/L)		0.94					
Dissolved salts							
Calcium (mg/L)			7.7		7.4		
Magnesium (mg/L)			7.6		9.6		
Potassium (mg/L)							
Sodium (mg/L)							
Total salts							
Calcium (mg/L)							
Magnesium (mg/L)							
Potassium (mg/L)							
Sodium (mg/L)							
Dissolved trace elements							
Iron (mg/L)			0.8		<0.01		
Aluminium (mg/L)		0.055					
Manganese (µg/L)		1900					
Selenium (µg/L)		11					
Dissolved heavy metals							
Lead (mg/L)		0.0034					
Cadmium (mg/L)	0.01	0.0002					
Chromium (mg/L)	0.1	0.0033					
Copper (mg/L)		0.0014					
Zinc (mg/L)		0.008					
Nickel (mg/L)		0.011					
Mercury (mg/L)		0.0006					
Arsenic (mg/L)							
Total trace elements							
Aluminium (mg/L)		0.055					
Iron (mg/L)							
Manganese (mg/L)							
Selenium (µg/L)		11					
Total heavy metals							
Lead (mg/L)		0.0034					
Cadmium (mg/L)	0.01	0.0002					
Chromium (mg/L)	0.1	0.0033					
Copper (mg/L)		0.0014					
Zinc (mg/L)		0.008					
Nickel (mg/L)		0.011					
Arsenic (mg/L)							
Bacteriological parameter							
Faecal coliform (CFU/100mL)							
Faecal Streptococcus (CFU/100mL)							

End of this section