



M9 ကိုစက်လှေဖြင့်ဆွဲ၍ ရေစီနှုန်းတိုင်းတာနေစဉ်Laptop ဖြင့် Monitoring ကြည့်ရှုစစ်ဆေးပုံ



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ကတွယ်ကျွေဖြတ်မြောင်းတွင်တိုင်းတာနေပုံ



ကတွယ်ကျွေတွင်တိုင်းတာနေပုံ



River Surveyor M9 တိုင်းတာရန် တပ်ဆင်နေပုံ



ကုတ္တိုမြစ် U/Sဘက်တွင်တိုင်းတာနေပုံ

**The Republic of The Union of Myanmar  
Ministry of Agriculture and Irrigation  
Irrigation Department**

**Report of the Flow Measurement by Using  
River Surveyor M-9 at the Kokkowa River**

**Hydrology Branch  
2012, November, (30)**



# **Report of the Flow Measurement by Using River Surveyor M-9 at the Kokkowa River**

## **Introduction**

1. Hydrology Branch was given the assignment to take the flow measurement at Kokkowa river near Pantaing sluice gate (2) by using the River surveyor M-9. This assignment was given from the outcome of the meeting between JICA Team (YCDC) (The Project for the Improvement of water supply, sewerage and Drainage system in Yangon City) and Team of the Irrigation Department headed by Deputy Director General (Lower Myanmar) Irrigation Dept. which was held on 23 Nov 2012 at Head office Yangon.

## **Location of Station**

2. Water level station at Kokkowa River near Pantaing sluice gate no.2 (near Pantaing village, Htantapin Township, Yangon Region)[Maintained by Yangon Region Office]

## **Field Observation**

3. Measuring Discharge by using River surveyor M-9 and taking survey data in both side of River bank and water level were carried out by staff of Hydrology Branch. The velocity of Kokkowa River is approximate 0.895 m/sec. Discharge measuring by boat using M-9 are taken 6 times.

## **Result**

4. The location map of the flow measurement at Kokkowa river is as shown in Annex (1). The discharge of Kokkowa River taking on (24.11.12) time (11:00) Am is  $1941.446 \text{ m}^3/\text{sec}$  and as shown in Annex (2). Cross section of Kokkowa River by using River Surveyor M-9 is as shown in Annex (3). River Cross Section at the water level station is as shown in Annex (4).

Sr. No	Station	Width (m)	Area (m <sup>2</sup> )	Mean Speed (m/s)	Total Discharge (Q) m <sup>3</sup> /sec
1.	Kokkowa Water level station	219.26	2170.4	0.895	1941.446

Water level of Kokkowa river station at (24.11.12) time (11:00) Am is (2.89) ft.

**Remark**

Actually the water level station at Kokkowa River is installed for monitoring only high water level (June to October) concerning with flood protection of embankment. Highest water level is available from this water level monitoring. From the current monitoring of water level for dry season water by taken Irrigation Department Yangon division is available from 2008 to 2011.

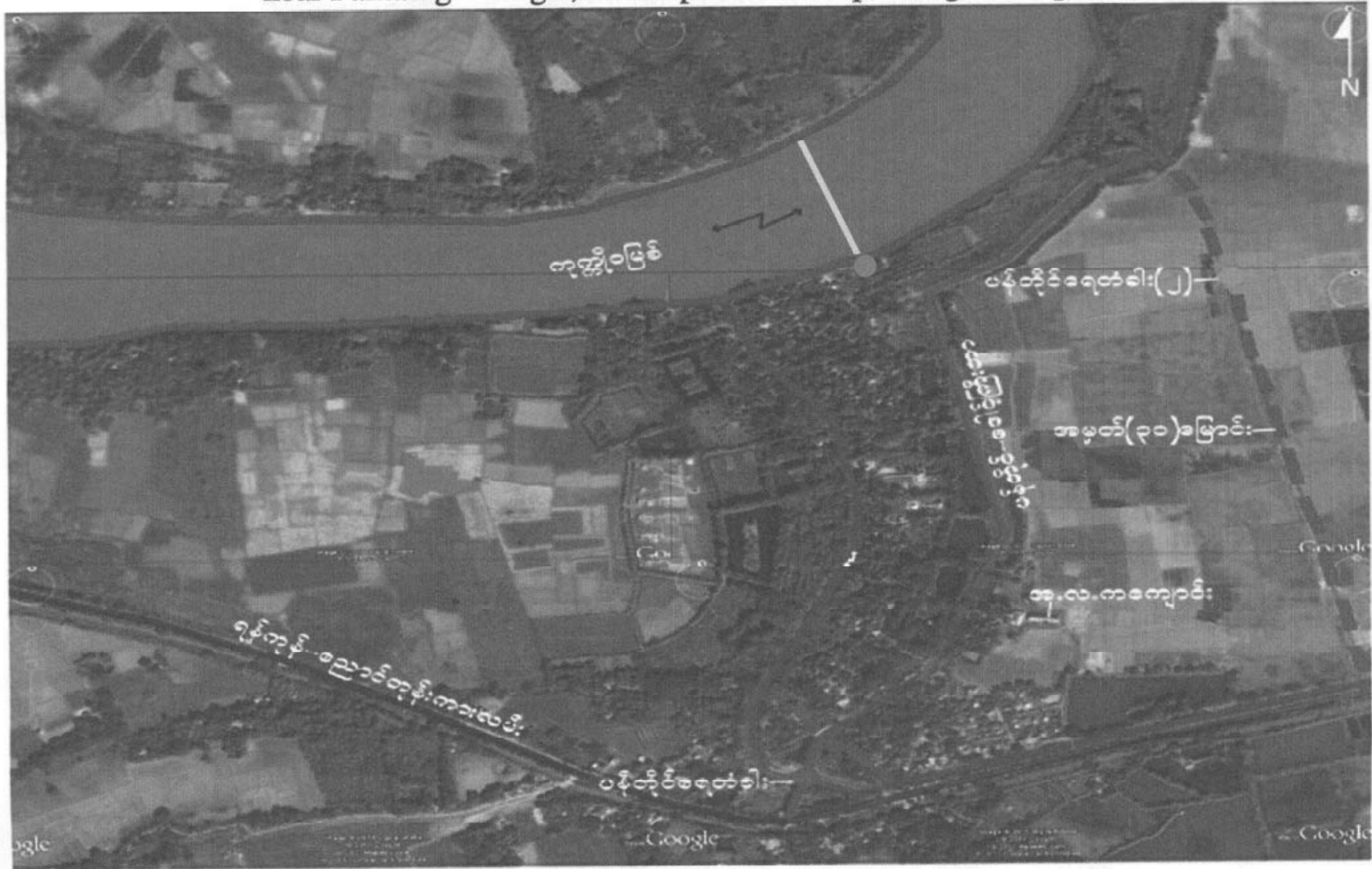
All the water level taken from Irrigation Department at the mentioned gauge station need to be verified by YCDC or JICA itself.

The list of the staffs and officers of Hydrology Branch in taking flow measurement at Kokkowa river by using River Surveyor M-9.

Date 24.11.12

Sr.No	Name	Designation	Office
1.	Daw Khon Ra	Director	Director Office Hydrology Branch, Yangon
2.	U Naing Lin Tun	Staff Officer	
3.	U Aung Thu		
4.	U Htet Myet Lin		
5.	U Thet Wai Tun		
6.	Daw Moh Moh San	E.S	
7.	Daw Than Win	Assistant Director	Assistant Director Office Hydrology Branch, Yangon
8.	Daw Khin Si Si Hlaing	S.S.A.E	
9.	U Thein Oo	S.A.E	
10.	U Myint Htwe		
11.	U Kyaw Kyaw Oo	S.S.A.E	Yangon Region
12.	U Yan Moe Oo	S.A.E	

The Location Map measured by River Surveyor M9 at Kokkowa River near Pantaing Village , Htantapin Township, Yangon Region



- The Location Measured by River Surveyor M9
- Kokkowa Water Level Station

## Discharge Measurement Summary

Date Measured: Saturday, November 24, 2012

Site Information		Measurement Information	
Site Name	Kokkowa	Party	Hydro
Station Number	1	Boat/Motor	Boat
Location	WL Station	Meas. Number	4

System Information		System Setup		Units	
System Type	RS-M9	Transducer Depth (m)	0.08	Distance	m
Serial Number	2365	Salinity (ppt)	0.0	Velocity	m/s
Firmware Version	2.00	Magnetic Declination (deg)	0.8	Area	m <sup>2</sup>
Software Version	2.70			Discharge	m <sup>3</sup> /s
				Temperature	degC

Discharge Calculation Settings				Discharge Results	
Track Reference	Bottom-Track	Left Method	Sloped Bank	Width (m)	219.26
Depth Reference	Vertical Beam	Right Method	Sloped Bank	Area (m <sup>2</sup> )	2,170.4
Coordinate System	ENU	Top Fit Type	Power Fit	Mean Speed (m/s)	0.895
		Bottom Fit Type	Power Fit	Total Q (m <sup>3</sup> /s)	1,941.446

Measurement Results																			
Tr		Time		Distance				Mean Vel		Discharge						%			
#		Time	Duration	Temp	Track	DMG	Width	Area	Boat	Water	Left	Right	Top	Middle	Bottom	Total	M8Total	Measured	
1	L	10:41:50 AM	0:06:03	28.1	232.49	209.05	214.05	2,183.4	0.640	0.882	0.15	-0.06	124.13	1,474.60	327.42	1,926.242	--	76.5	
2	R	10:48:05 AM	0:07:12	28.3	230.78	213.49	219.49	2,189.8	0.534	0.899	1.59	-0.09	126.48	1,515.12	324.89	1,967.976	--	77.0	
3	R	11:01:44 AM	0:07:17	27.9	254.49	216.92	222.92	2,128.7	0.582	0.904	1.45	-0.11	123.57	1,481.63	317.30	1,923.837	--	77.0	
4	R	11:15:00 AM	0:06:07	27.9	239.31	214.58	220.58	2,179.9	0.652	0.894	0.76	-0.36	122.74	1,491.58	333.01	1,947.729	--	76.6	
				Mean	28.3	239.27	213.51	219.26	2,170.4	0.602	0.895	0.99	-0.16	124.23	1,490.73	325.65	1,941.446	0.000	76.8
				Std Dev	0.1	9.35	2.86	3.25	24.4	0.047	0.008	0.58	0.12	0.39	15.32	5.65	17.920	0.000	0.2
				COV	0.0	0.039	0.013	0.015	0.011	0.079	0.009	0.584	-0.764	0.011	0.010	0.017	0.009	0.000	0.003

Exposure Time: 0:26:39

Tr1=20121124104149r.rivr; Tr2=20121124104803r.rivr; Tr3=20121124110143r.rivr; Tr4=20121124111459r.rivr;

## Comments

Tr1=20121124104149r.rivr - 2.23 ft; Tr2=20121124104803r.rivr - 2.89 ft; Tr3=20121124110143r.rivr - 2.89 ft; Tr4=20121124111459r.rivr - 2.89 ft;

## Compass Calibration

Results: PASS

Score is excellent.

Magnetic interference is fairly low.

Calibration score: M17.00Q9

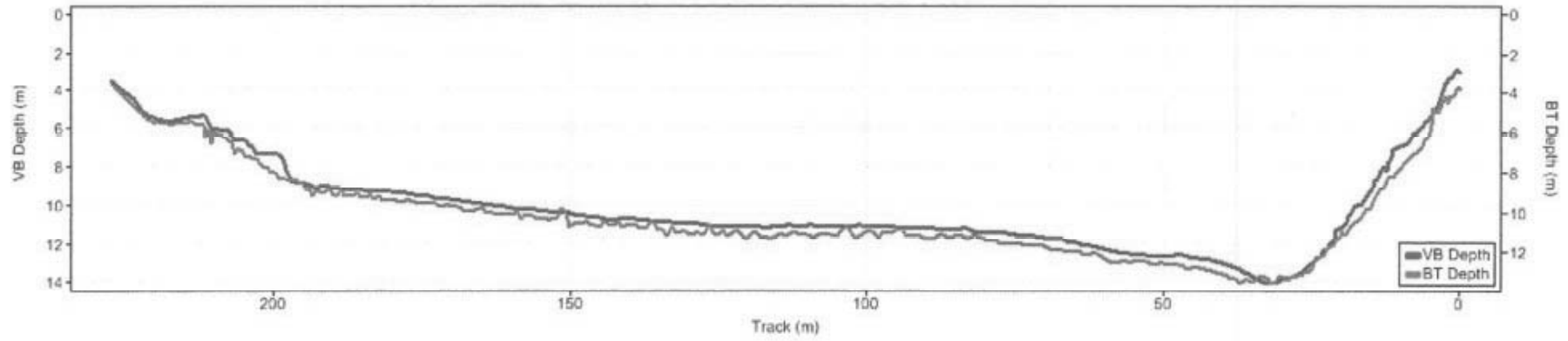
## System Test

System Test: PASS

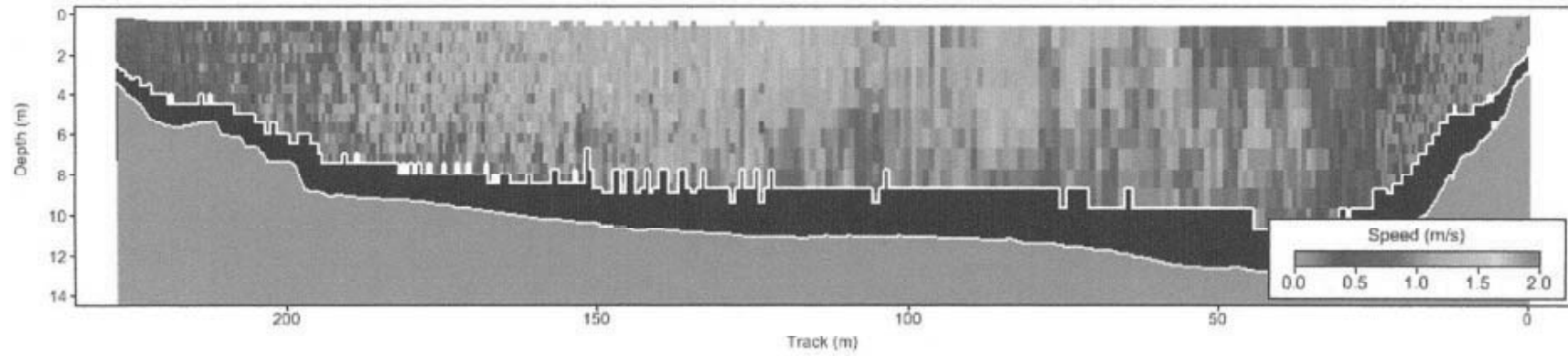
Parameters and settings marked with a \* are not constant for all files.

Report generated using SonTek RiverSurveyor Live v2.70

### Kokkowa River @ Water Level Station



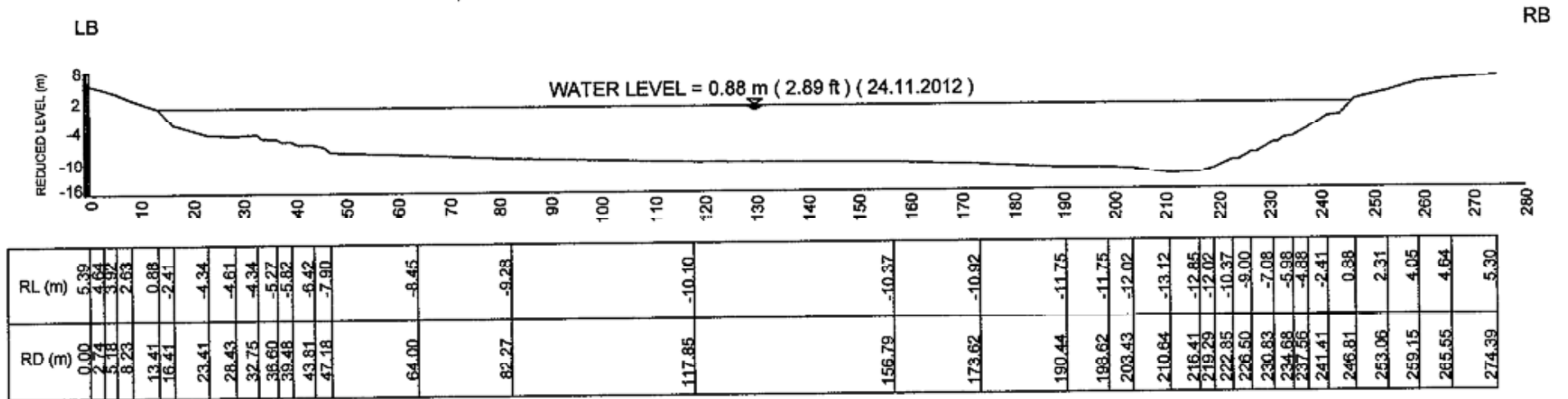
### Cross Section of Kokkowa River



### Velocity Distribution of Kokkowa River

**CROSS SECTION OF KOKKOWA RIVER ,HTANTABIN TOWNSHIP**

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AREA = 2293.38 m<sup>2</sup>

WETTED PARAMETER P = 239.64 m

NOTE: TBM = 5.64 m ( 18.5 ft )

RIVER WIDTH = 232.8 m





Preparing to measure Discharge by River Surveyor M9



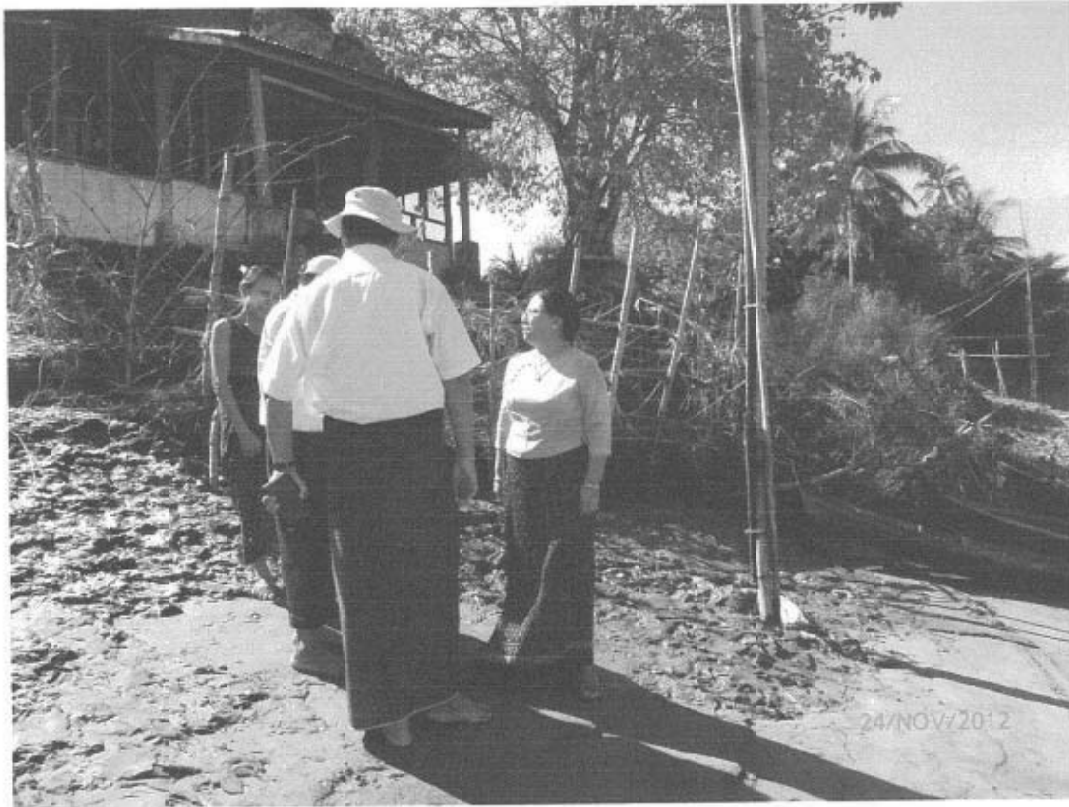
Preparing to measure Discharge by River Surveyor M9 at Kokkwa River



Discharge Measured by River Surveyor M9 at Kokkowa River



Monitoring with Laptop when discharge measured by River Surveyor M9



**Kokkowa Water Level Station , Pantaing Village, Htantapin Township**



**Taking Surveying at the bank of Kokkowa River**

The Republic of The Union of Myanmar  
Ministry of Agriculture and Irrigation  
Irrigation Department

**Report of the Flow Measurement by Using  
River Surveyor M-9 at Htantapin Township,  
Kokkowa River**

Hydrology Branch  
2013, April, (20)

**Report of the Flow Measurement by Using River Surveyor M-9 at  
Htantapin Township , Kokkowa River**

## Introduction

1. Hydrology Branch was given the assignment to take the flow measurement at Kokkowa river by using the River surveyor M-9. This assignment was given by the HeadOffice, Irrigation Department, Letter No. 1804/Siman-1 dated on (14.3.2013) and to assist (YCDC) (The Project for the Improvement of water supply, sewerage and Drainage system in Yangon City) .

## Location of Station

2. Water level station at Kokkowa river, Htantapin Township, Yangon Region, as indicated in Annex (1).

## Field Observation

3. Measuring Discharge by using River Surveyor M-9 and taking survey data in both side of River bank and water level were carried out by staff of Hydrology Branch at (20.3.13). The Six no. of Discharge measurements by Boat were taken at that time. Cross Sections and velocity distribution of each measurement are as shown in Annex 4-9. Measuring Time is from 6:20 A.M to 7:15 AM.

## Results

4. The result for 6 no. of flow measurements are as shown in Annex (2). According the results of six flow measurement, three result should be used to compute the mean discharge and as shown in Annex (3). Detail results are as followed.

-2-

Sr. No	Station	Width (m)	Area (m <sup>2</sup> )	Velocity (m/s)	Total Mean Discharge (Q) m <sup>3</sup> /sec
1.	Water level station ( Kokkowa River)	222.65	1908.4	0.646	1233.613

Water level of Kokkowa river station at (20.3.13) time (6:20) A.M is (0.23) ft.

## Remark

Numbers of Measuring of discharge by using River Surveyor M9 are Six Times. But only three result of measurement is good. Results of three measurements are considered unreliable, because of the tide effect. Therefore only three times measured results should be used reliably.

The list of the staffs and officers of Hydrology Branch in taking flow measurement at Kokkowa river by using River Surveyor M-9.

Date 20.3.13

Sr.No	Name	Designation	Office
1.	Daw Than Win	Assistant Director	Assistant Director Office Hydrology Branch, Yangon
2.	U Zaw Min Oo	S.S.A.E	
3.	Daw Khin Si Si Hlaing		
4.	U Sein Lwin	E.S	
5.	U Thet Wai Htun	A.E	Director Office Hydrology Branch, Yangon
6.	Daw Moh Moh San	E.S	



**The Location Map measured by River Surveyor M9 at Kokkowa River near Pantaing Village , Htantapin Township, Yangon Region**



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-  The Location Measured by River Surveyor M9
-  Kokkowa Water Level Station



# Discharge Measurement Summary

Date Measured: Wednesday, March 20, 2013

Site Information		Measurement Information	
Site Name	kokkowa	Party	hydro
Station Number	1	Boat/Motor	boat
Location	WL station	Meas. Number	3

System Information		System Setup		Units	
System Type	RS-M9	Transducer Depth (m)	0.08	Distance	m
Serial Number	2365	Salinity (ppt)	0.0	Velocity	m/s
Firmware Version	2.00	Magnetic Declination (deg)	0.8	Area	m <sup>2</sup>
Software Version	2.70			Discharge	m <sup>3</sup> /s
				Temperature	degC

Discharge Calculation Settings				Discharge Results	
Track Reference	Bottom-Track	Left Method	Sloped Bank	Width (m)	222.65
Depth Reference	Vertical Beam	Right Method	Sloped Bank	Area (m <sup>2</sup> )	1,908.4
Coordinate System	ENU	Top Fit Type	Power Fit	Mean Speed (m/s)	0.646
		Bottom Fit Type	Power Fit	Total Q (m <sup>3</sup> /s)	1,233.613

Measurement Results																		
Tr	Time		Distance				Mean Vel		Discharge						%			
#	Time	Duration	Temp.	Track	DMG	Width	Area	Boat	Water	Left	Right	Top	Middle	Bottom	Total	MBTotal	Measured	
1	R	6:35:30 AM	0:05:07	28.1	233.36	218.11	222.11	1,919.5	0.760	0.666	0.10	-0.53	79.27	1,001.02	198.04	1,277.897	--	78.3
2	L	6:41:20 AM	0:05:49	28.2	225.67	218.25	222.25	1,895.7	0.647	0.656	0.04	-0.42	72.51	987.15	183.79	1,243.069	--	79.4
3	R	6:48:09 AM	0:05:25	28.3	231.62	219.59	223.59	1,910.1	0.713	0.618	0.16	0.04	72.37	919.27	188.04	1,179.875	--	77.9
			<b>Mean</b>	28.2	230.22	218.65	222.65	1,908.4	0.706	0.646	0.10	-0.30	74.72	969.15	189.96	1,233.613	0.000	78.5
			<b>Std Dev</b>	0.1	3.29	0.67	0.67	9.8	0.047	0.021	0.05	0.24	3.22	35.72	5.97	40.572	0.000	0.6
			<b>COV</b>	0.0	0.014	0.003	0.003	0.005	0.066	0.032	0.486	-0.807	0.043	0.037	0.031	0.033	0.000	0.008

Exposure Time: 0:16:21

Tr1=20130320063529r.rivr; Tr2=20130320064119r.rivr; Tr3=20130320064807r.rivr;

## Comments

Tr1=20130320063529r.rivr - 0.23 ft; Tr2=20130320064119r.rivr - ; Tr3=20130320064807r.rivr - ;

## Compass Calibration

Results: PASS  
Score is excellent.  
Magnetic interference is very low.

Calibration score: M4.00Q9

## System Test

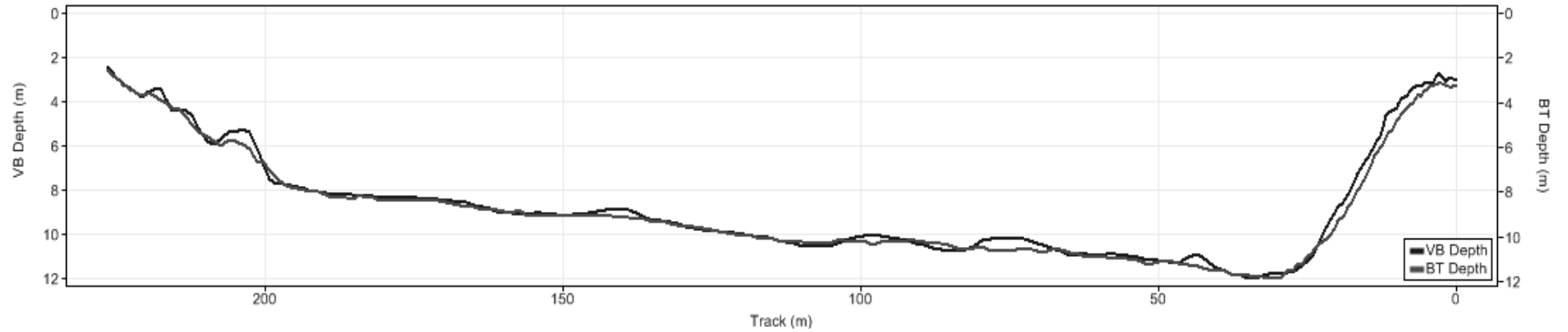
System Test: PASS

Parameters and settings marked with a \* are not constant for all files.

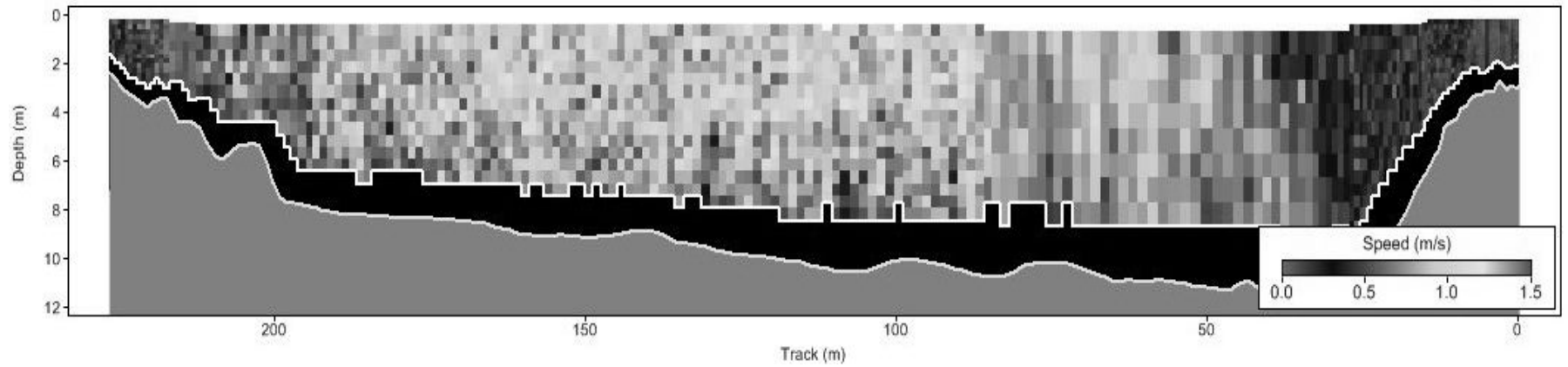
Report generated using SonTek RiverSurveyor Live v2.70

# Kokkowa River at Water Level Station

11/11/11 (Water Level = 0.23ft) 11/11/11



Cross Section of Kokkowa River



Velocity Distribution of Kokkowa River

# Discharge Measurement Summary

Date Measured: Wednesday, March 20, 2013

Site Information		Measurement Information	
Site Name	kokkowa	Party	hydro
Station Number	1	Boat/Motor	boat
Location	WL station	Meas. Number	6

System Information		System Setup		Units	
System Type	RS-M9	Transducer Depth (m)	0.08	Distance	m
Serial Number	2365	Salinity (ppt)	0.0	Velocity	m/s
Firmware Version	2.00	Magnetic Declination (deg)	0.8	Area	m <sup>2</sup>
Software Version	2.70			Discharge	m <sup>3</sup> /s
				Temperature	degC

Discharge Calculation Settings				Discharge Results			
Track Reference	Bottom-Track	Left Method	Sloped Bank	Width (m)	222.91		
Depth Reference	Vertical Beam	Right Method	Sloped Bank	Area (m <sup>2</sup> )	1,919.1		
Coordinate System	ENU	Top Fit Type	Power Fit	Mean Speed (m/s)	0.600		
		Bottom Fit Type	Power Fit	Total Q (m <sup>3</sup> /s)	1,150.251		

Measurement Results																		
Tr	Time		Distance				Mean Vel		Discharge						%			
#	Time	Duration	Temp.	Track	DMG	Width	Area	Boat	Water	Left	Right	Top	Middle	Bottom	Total	MBTotal	Measured	
1	R	6:35:30 AM	0:05:07	28.1	233.36	218.11	222.11	1,919.5	0.760	0.666	0.10	-0.53	79.27	1,001.02	198.04	1,277.897	--	78.3
2	L	6:41:20 AM	0:05:49	28.2	225.67	218.25	222.25	1,895.7	0.647	0.656	0.04	-0.42	72.51	987.15	183.79	1,243.069	--	79.4
3	R	6:48:09 AM	0:05:25	28.3	231.62	219.59	223.59	1,910.1	0.713	0.618	0.16	0.04	72.37	919.27	188.04	1,179.875	--	77.9
4	L	6:53:52 AM	0:04:54	28.4	228.19	217.18	221.18	1,924.2	0.776	0.585	0.12	-0.31	65.37	886.92	173.24	1,125.335	--	78.8
5	R	6:59:07 AM	0:05:59	28.4	245.96	221.39	225.39	1,912.4	0.685	0.558	0.16	-0.17	66.35	835.63	164.62	1,066.588	--	78.3
6	L	7:05:17 AM	0:04:07	28.4	226.18	218.96	222.96	1,952.8	0.916	0.517	0.18	0.08	59.87	793.97	154.64	1,008.744	--	78.7
			<b>Mean</b>	28.3	231.83	218.91	222.91	1,919.1	0.749	0.600	0.13	-0.22	69.29	903.99	177.06	1,150.251	0.000	78.6
			<b>Std Dev</b>	0.1	6.89	1.33	1.33	17.5	0.086	0.053	0.05	0.22	6.22	74.87	14.59	94.367	0.000	0.5
			<b>COV</b>	0.0	0.030	0.006	0.006	0.009	0.115	0.088	0.376	-1.018	0.090	0.083	0.082	0.082	0.000	0.006

Exposure Time: 0:31:21

Tr1=20130320063529r.rivr; Tr2=20130320064119r.rivr; Tr3=20130320064807r.rivr; Tr4=20130320065351r.rivr; Tr5=20130320065906r.rivr; Tr6=20130320070517r.rivr;

**Comments**  
 Tr1=20130320063529r.rivr - 0.23 ft; Tr2=20130320064119r.rivr - ; Tr3=20130320064807r.rivr - ;  
 Tr4=20130320065351r.rivr - ; Tr5=20130320065906r.rivr - ; Tr6=20130320070517r.rivr - ;

**Compass Calibration**  
 Results: PASS  
 Score is excellent.  
 Magnetic interference is very low.  
 Calibration score: M4.00Q9

**System Test**  
 System Test: PASS

Parameters and settings marked with a \* are not constant for all files.

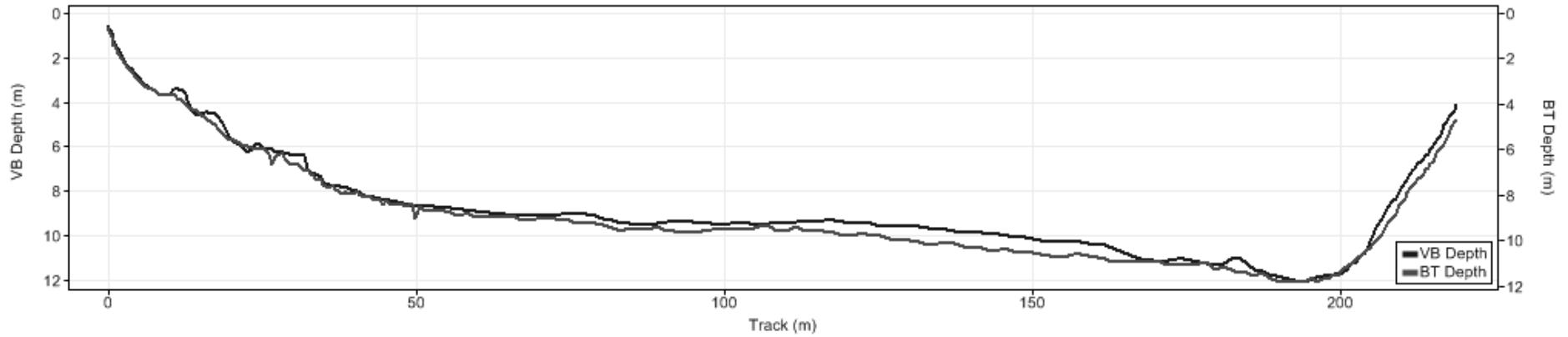
Report generated using SonTek RiverSurveyor Live v2.70

# Kokkowa River @ Water Level Station

Measure at Time 6:41 A.M

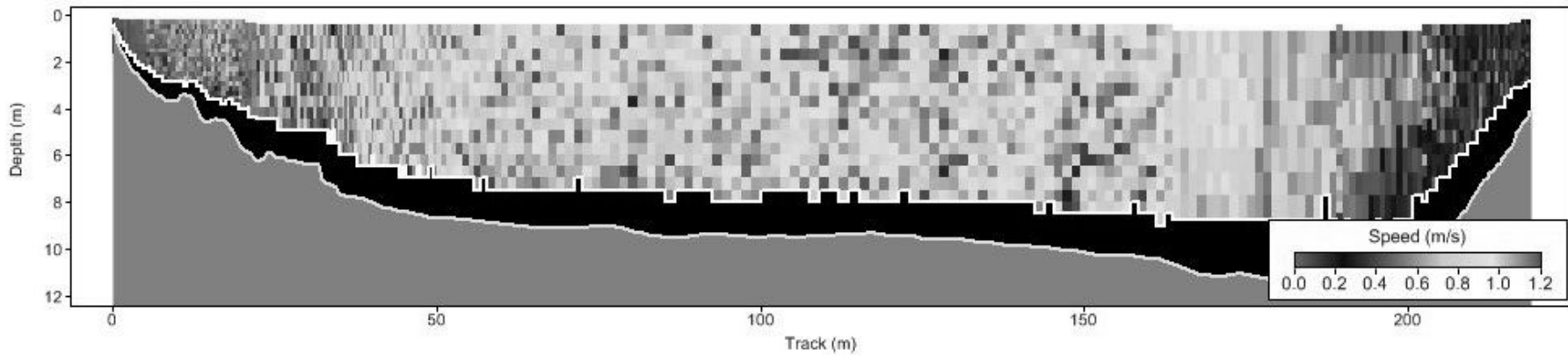
Water Level =0.23 ft

Results Q=1243.069 cumec



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## Cross Section of Kokkowa River



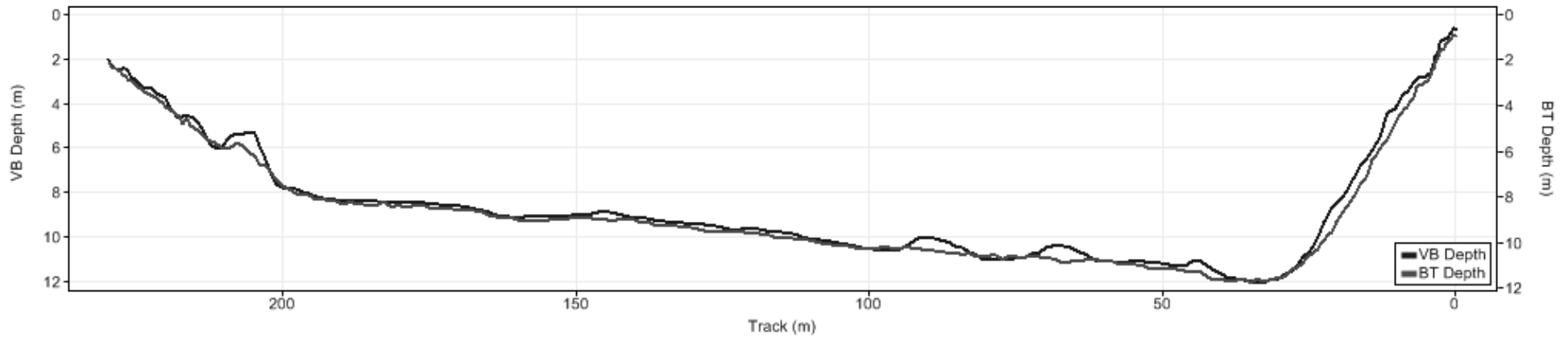
## Velocity Distribution of Kokkowa River

# Kokkowa River @ Water Level Station

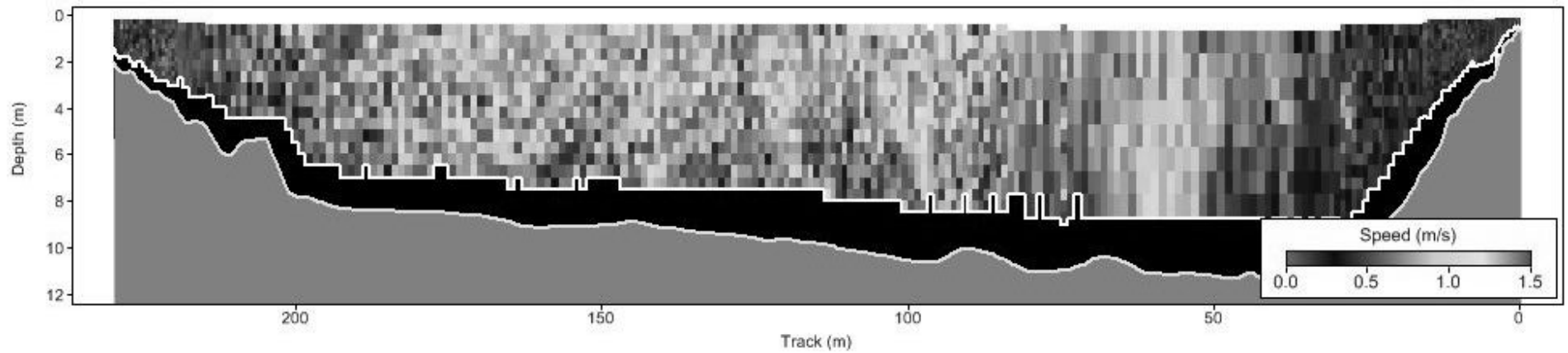
Measure at Time 6:48 A.M

Water Level = 0.23 ft

Results Q=1179.875 cumec



## Cross Section of Kokkowa River



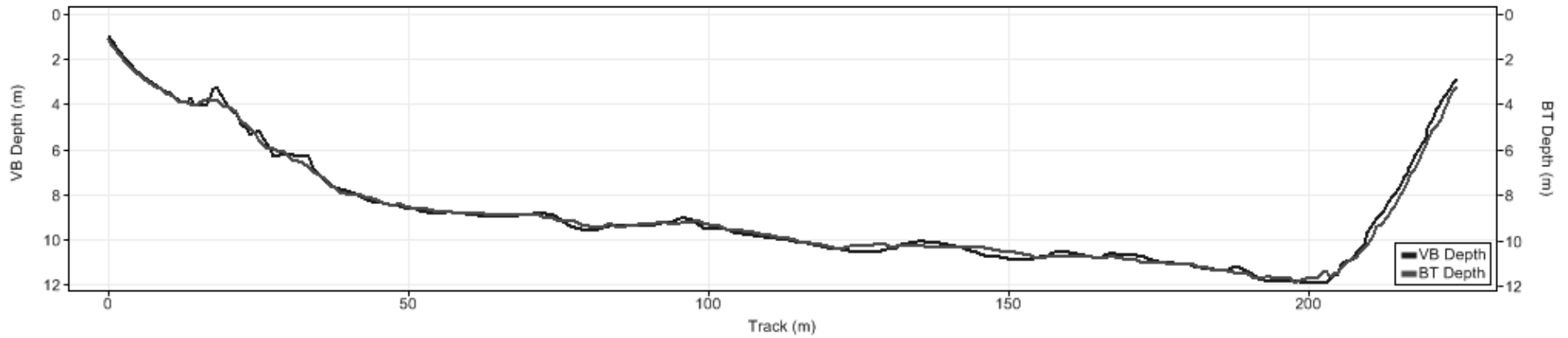
## Velocity Distribution of Kokkowa River

# Kokkowa River @ Water Level Station

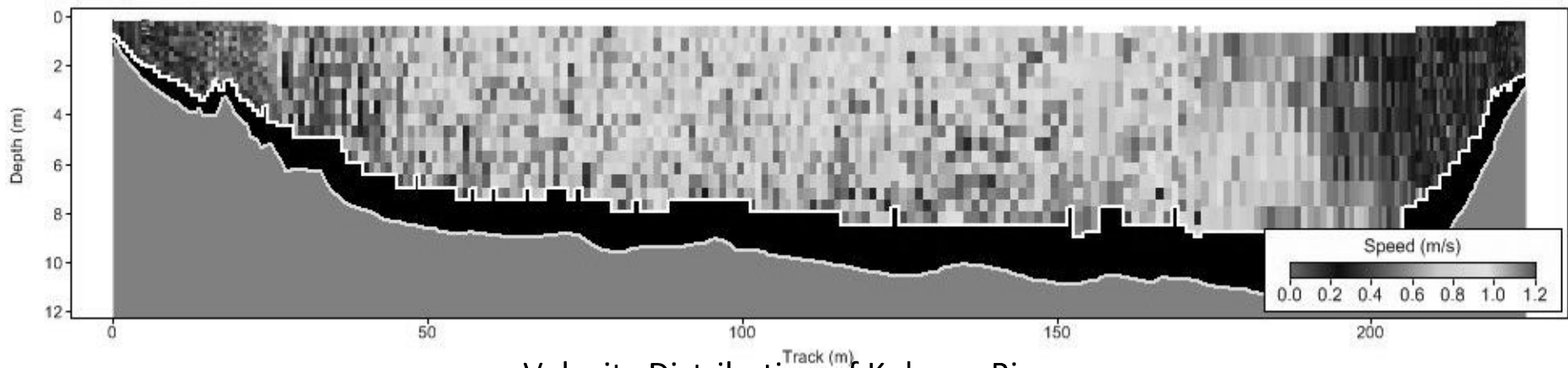
Measure at Time 6:53 A.M

Water Level =0.28 ft

Results Q=1125.335 cumec



## Cross Section of Kokkowa River



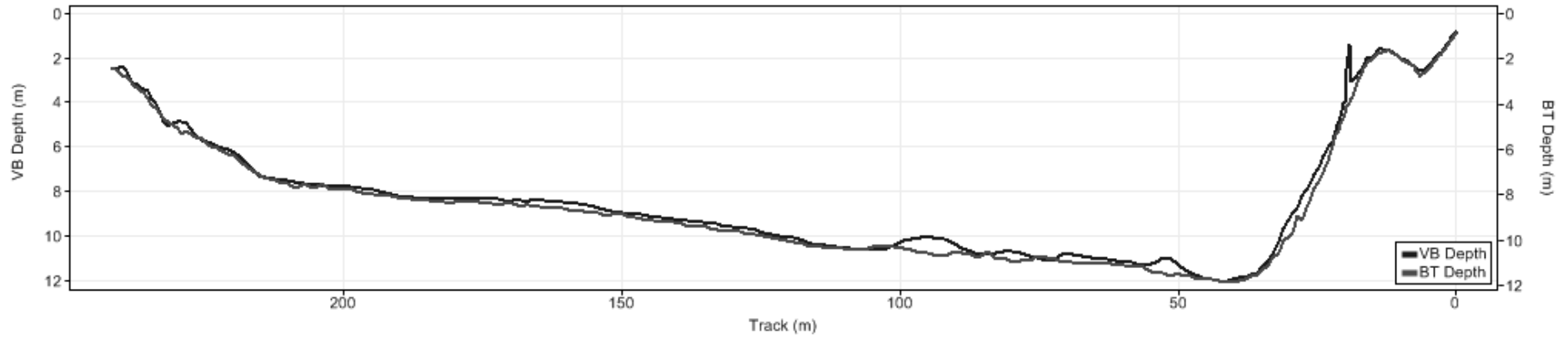
## Velocity Distribution of Kokkowa River

# Kokkowa River @ Water Level Station

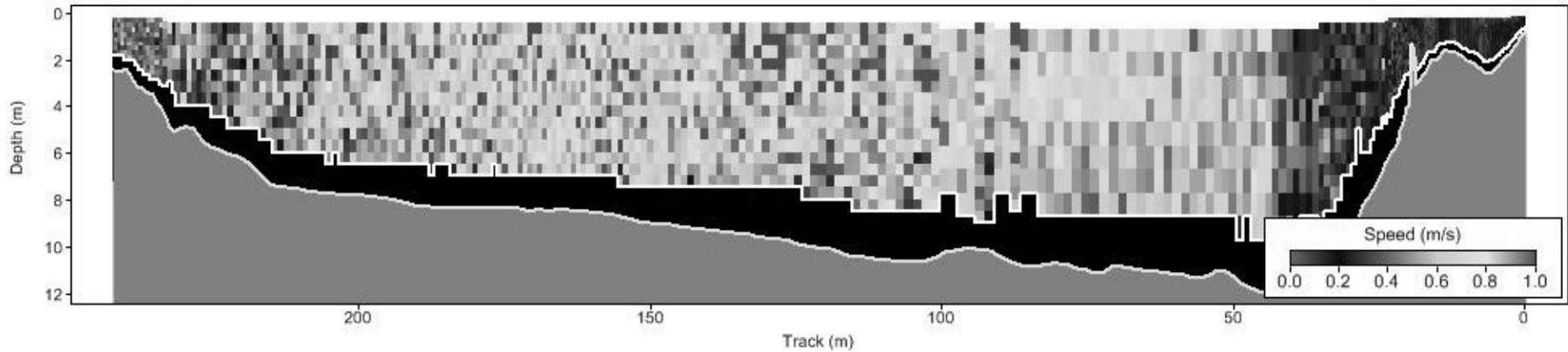
Measure at Time 6:59 A.M

Water Level =0.28 ft

Results Q=1066.588 cumec



Cross Section of Kokkowa River



Velocity Distribution of Kokkowa River

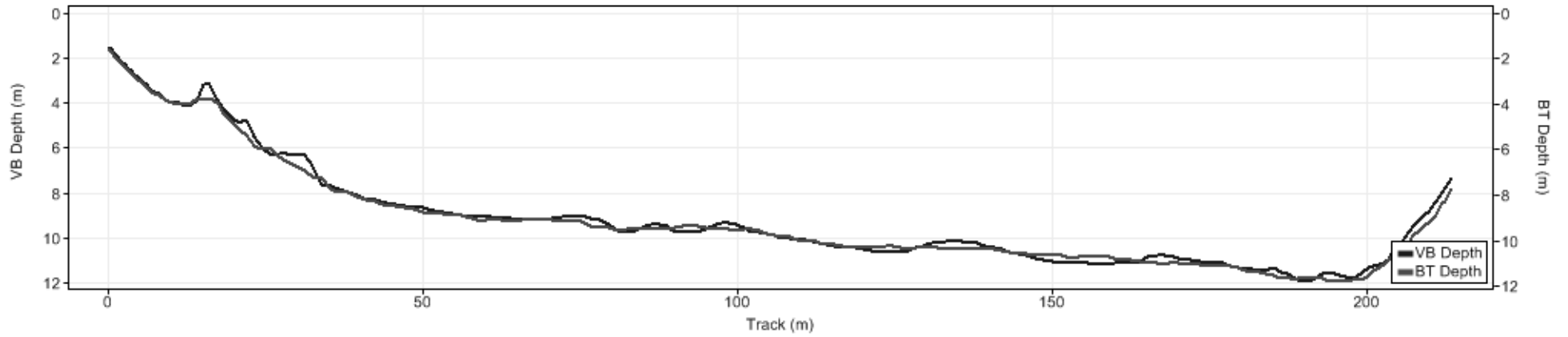


# Kokkowa River @ Water Level Station

Measure at Time 7:05 A.M

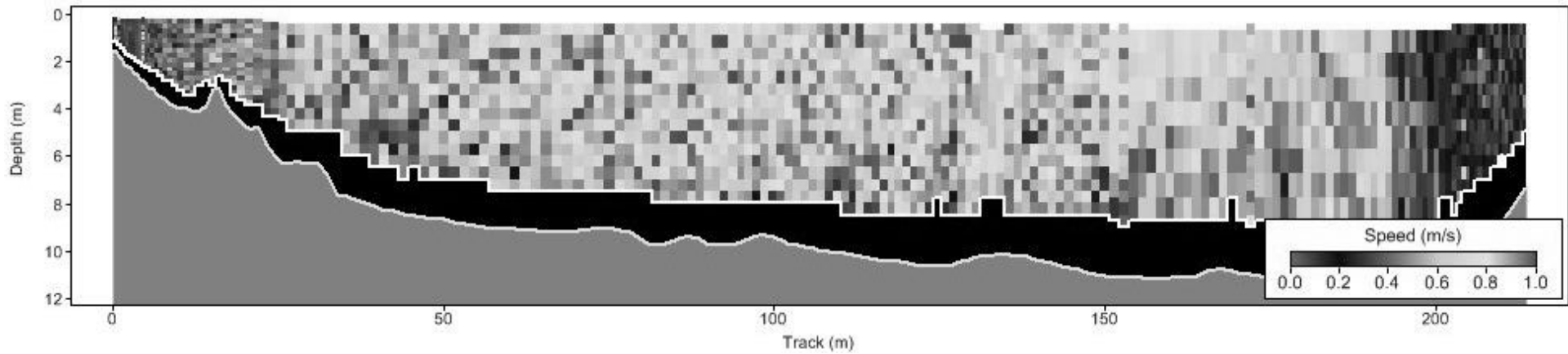
Water Level = 0.44 ft

Results Q=1008.744 cumec



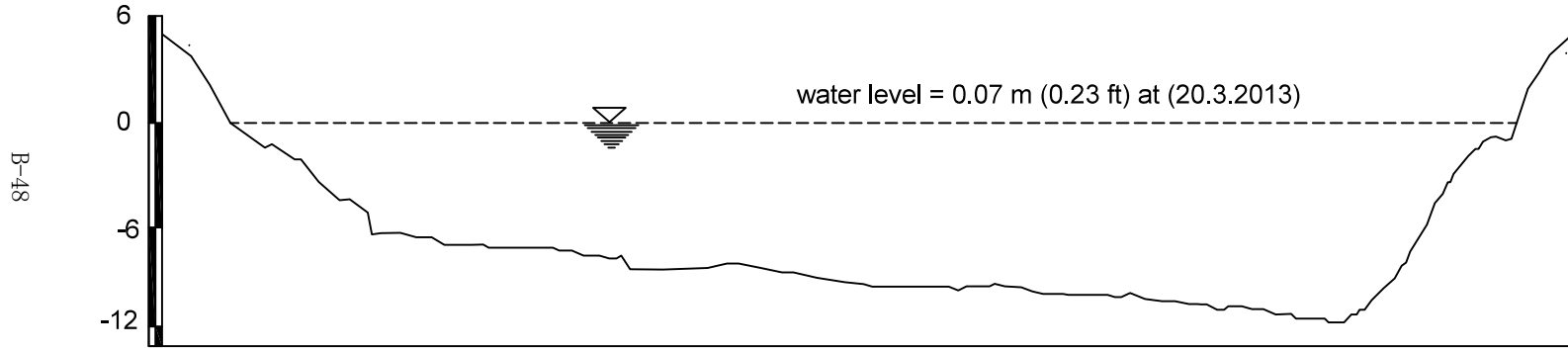
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## Cross Section of Kokkowa River



## Velocity Distribution of Kokkowa River

### CROSS SECTION OF KOKKOWA RIVER

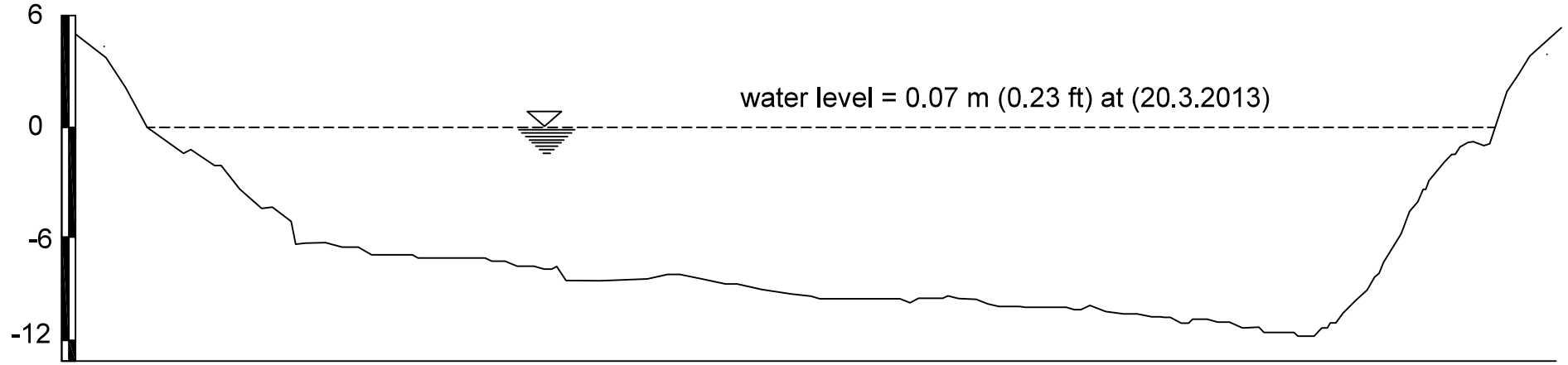


RD (M)	0	12.19	38.51	88.51	138.51	188.51	238.51	253.75
RL(M)	5.16	0.07	-6.57	-9.14	-10.29	-11.43	-3.43	5.334

Annex (4)

### CROSS SECTION OF KOKKOWA RIVER

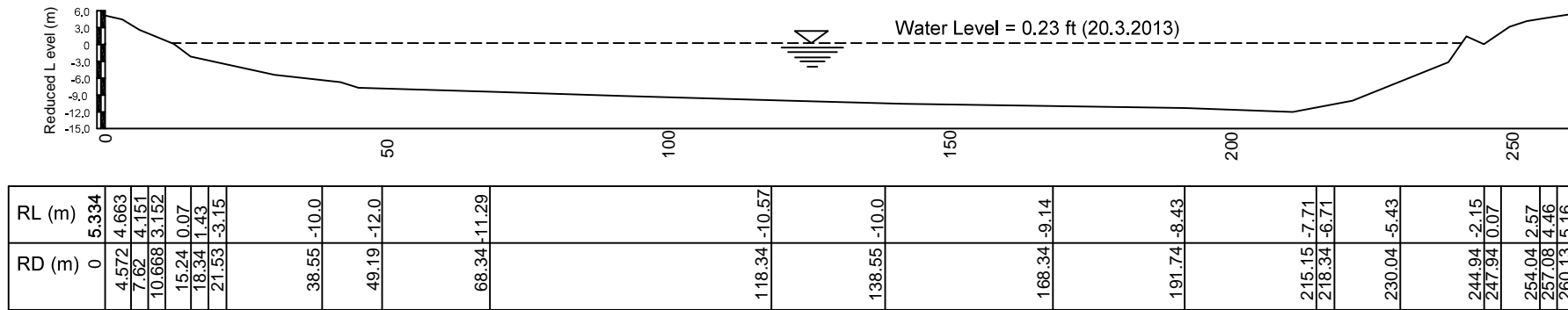
B-49



RD (M)	0	12.19	38.51	88.51	138.51	188.51	238.51	253.75
RL(M)	5.16	0.07	-6.57	-9.14	-10.29	-11.43	-3.43	5.334

### CROSS SECTION OF KOKKOWA RIVER

05-B



AREA = 2094.86 m<sup>2</sup>

WETTED PARAMETER P = 234 m

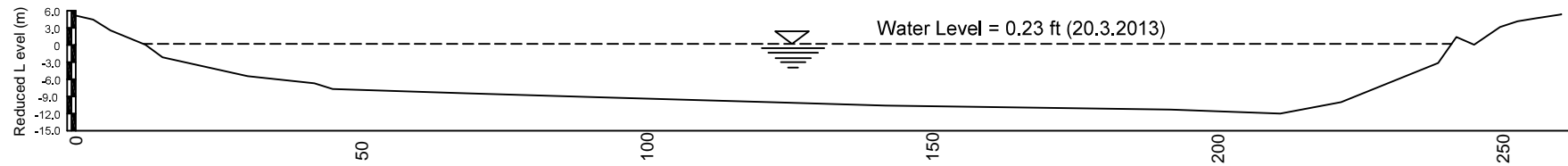
NOTE: TBM = 3.378 m ( 11.08 ft )

RIVER WIDTH = 229.125 m

Scale ~1"=2'-6"

# CROSS SECTION OF KOKKOWA RIVER

B-51



RL (m)	5.334	4.663	4.151	3.152	0.07	1.43	-3.15		-10.0	-12.0		11.29		-10.57		-10.0		-9.14		-8.43		-7.71	-6.71		-5.43		-2.15	0.07	2.57	4.46	5.16
RD (m)	0	4.572	7.62	10.668	15.24	18.34	21.53		38.55	49.19		68.34		118.34		138.55		168.34		191.74		215.15	218.34		230.04		244.94	247.94	254.04	257.08	260.13

AREA = 2094.86 m<sup>2</sup>

WETTED PARAMETER P = 234 m

NOTE: TBM = 3.378 m ( 11.08 ft )

RIVER WIDTH = 229.125 m

Scale ~1"=2'-6"