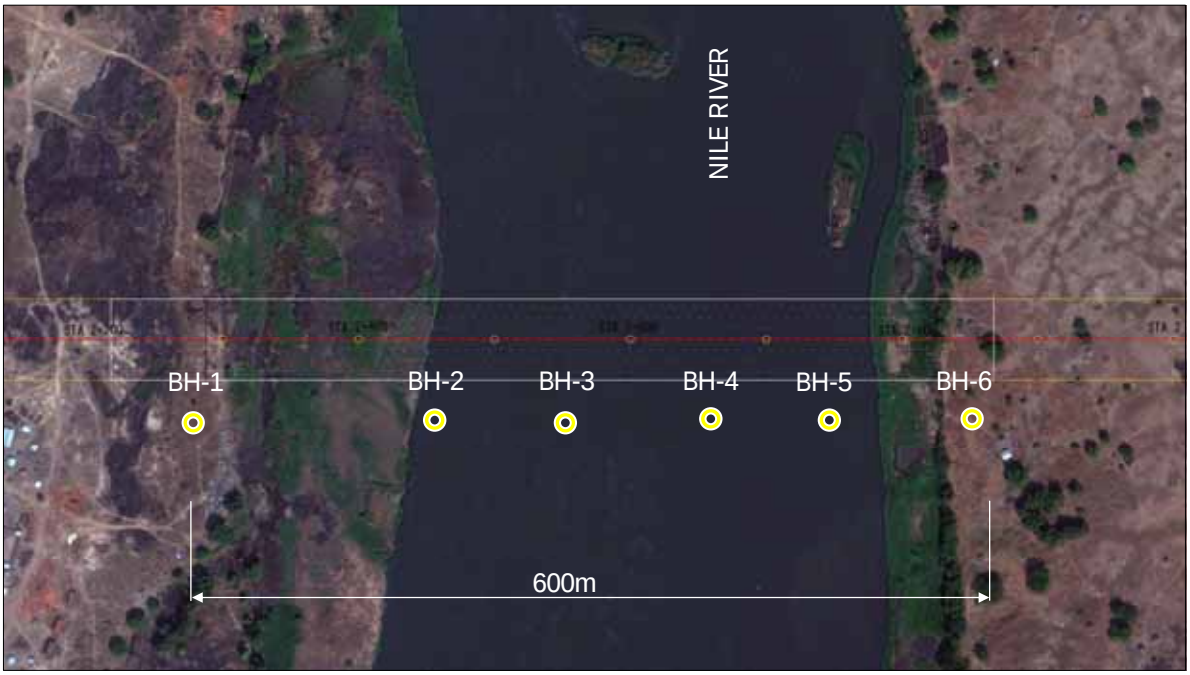
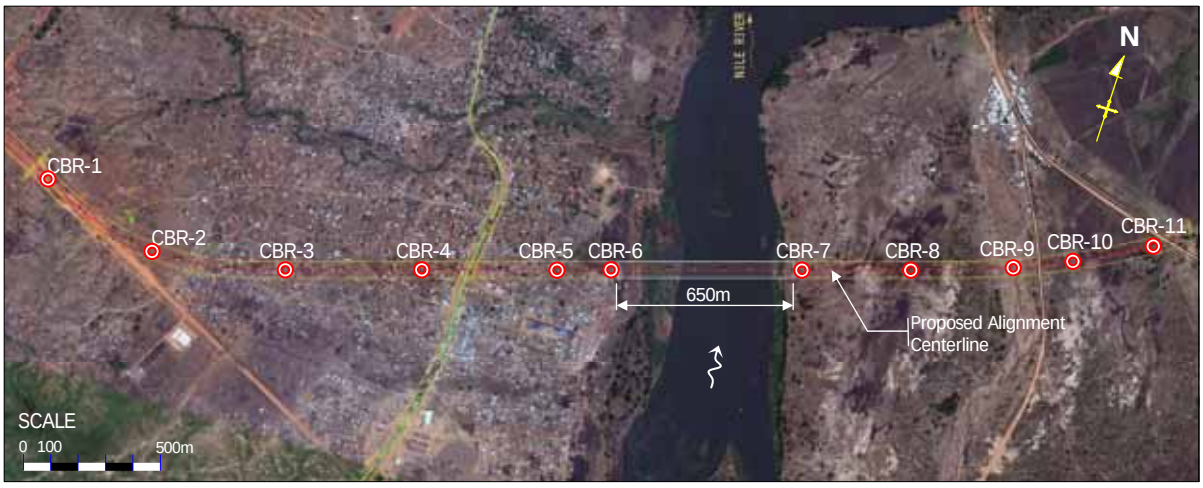
資料 6. 地質調査結果

地質調査結果

橋梁部の地質状況を把握するため、下図に示す 6 箇所（陸上部 2 箇所、水中部 4 箇所）でボーリング調査が実施された。6 箇所のボーリング柱状図を添付資料に列記する。その他、アプローチ道路での土質状況を明確にするため、11 箇所で CBR 試験が実施された。さらに土や砂、骨材の材料試験が各 3 箇所で実施された。

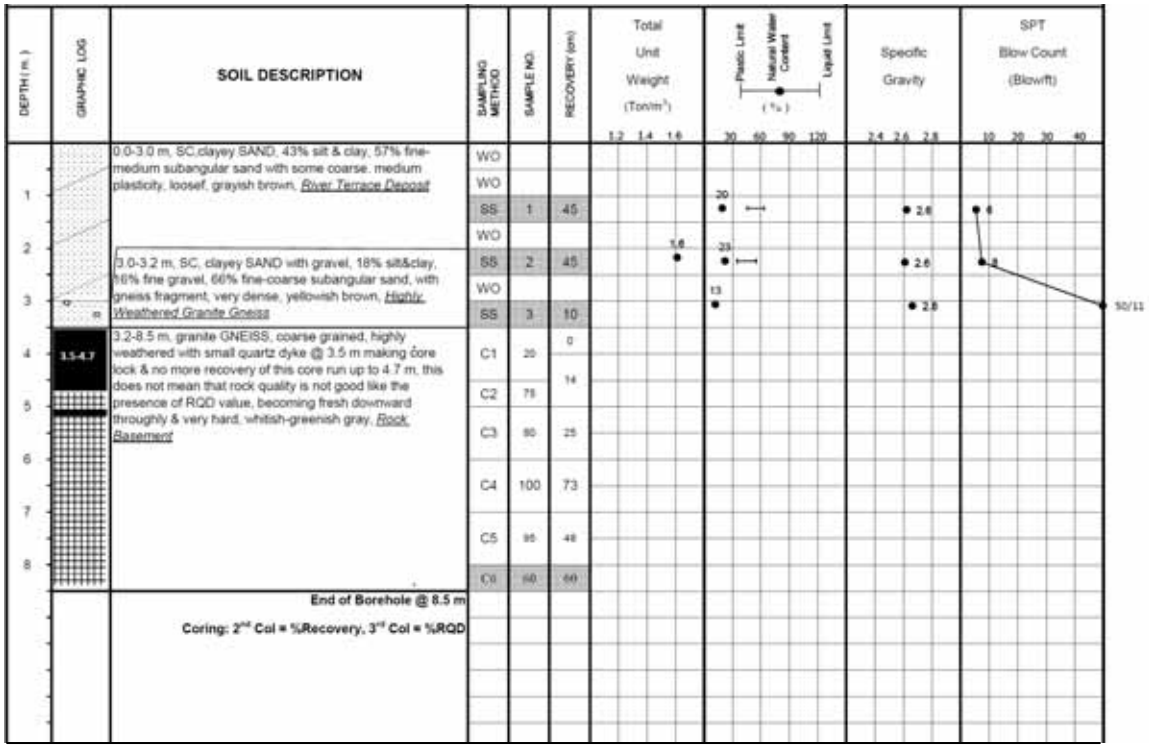


図資 6-1　橋梁設計のためのボーリング位置 (6 箇所)

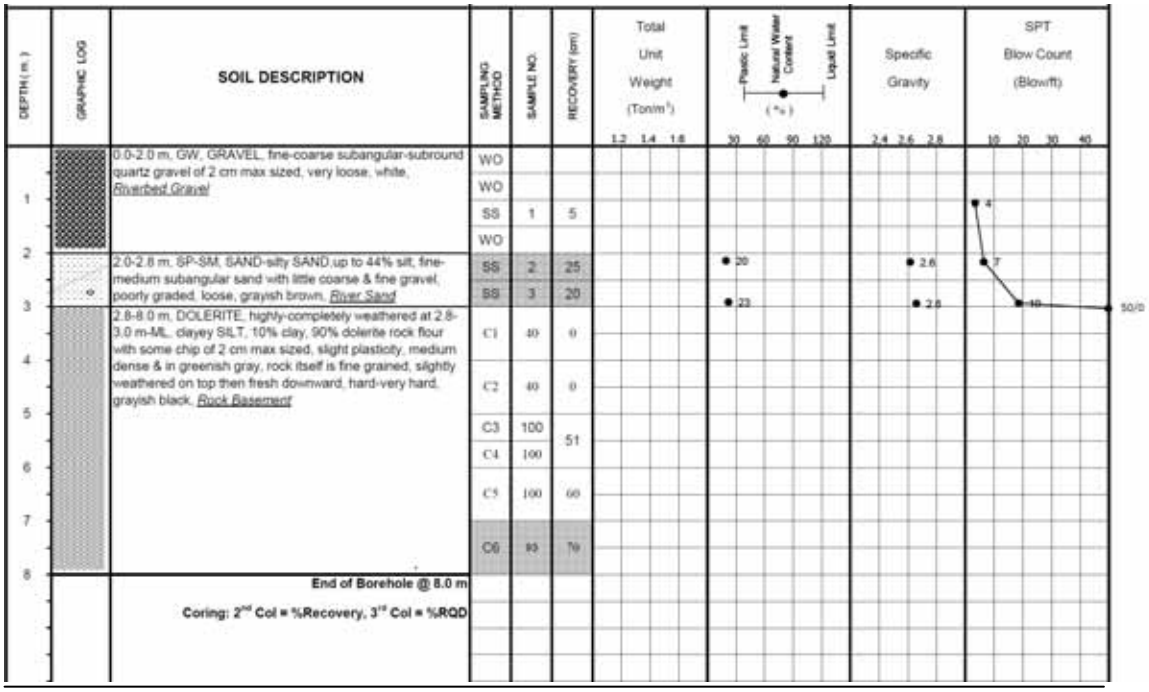


図資 6-2　アプローチ道路の CBR 試験位置 (11 箇所)

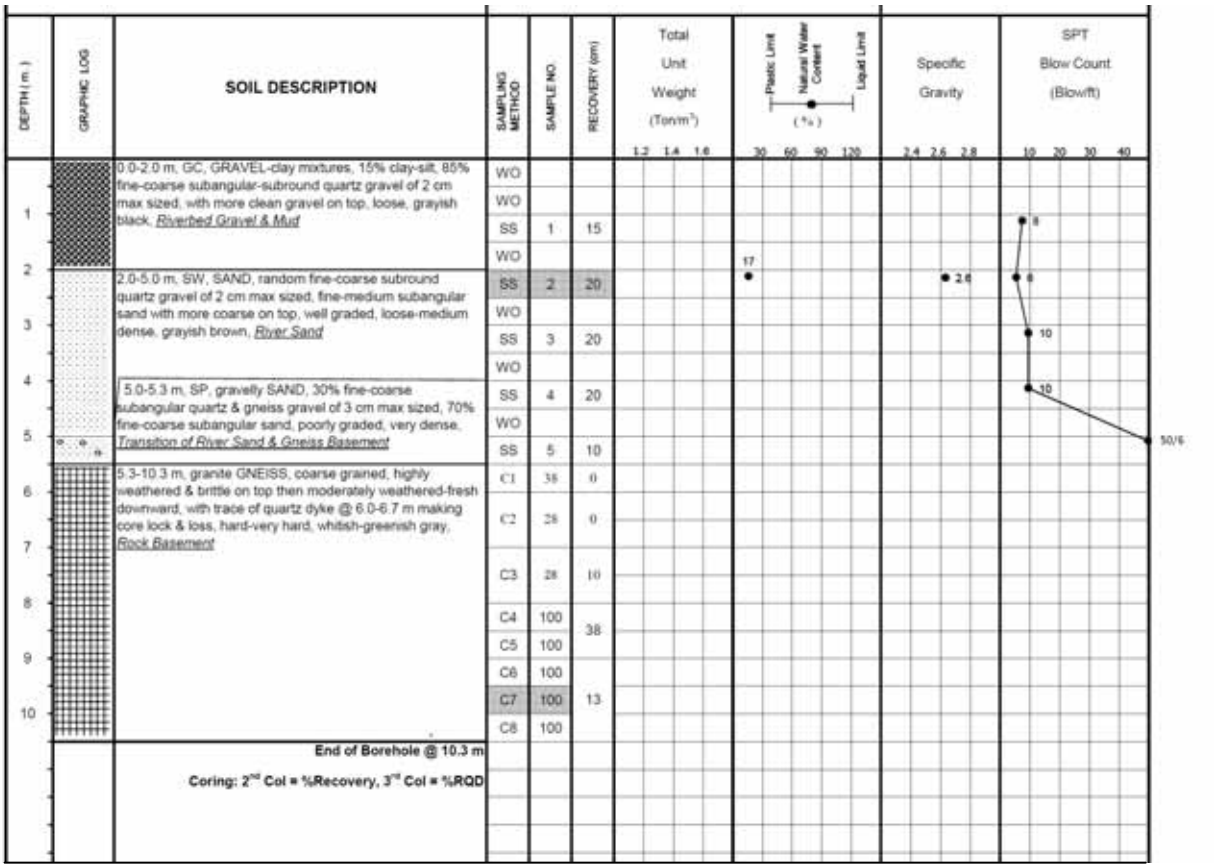
ボーリング柱状図 BH1



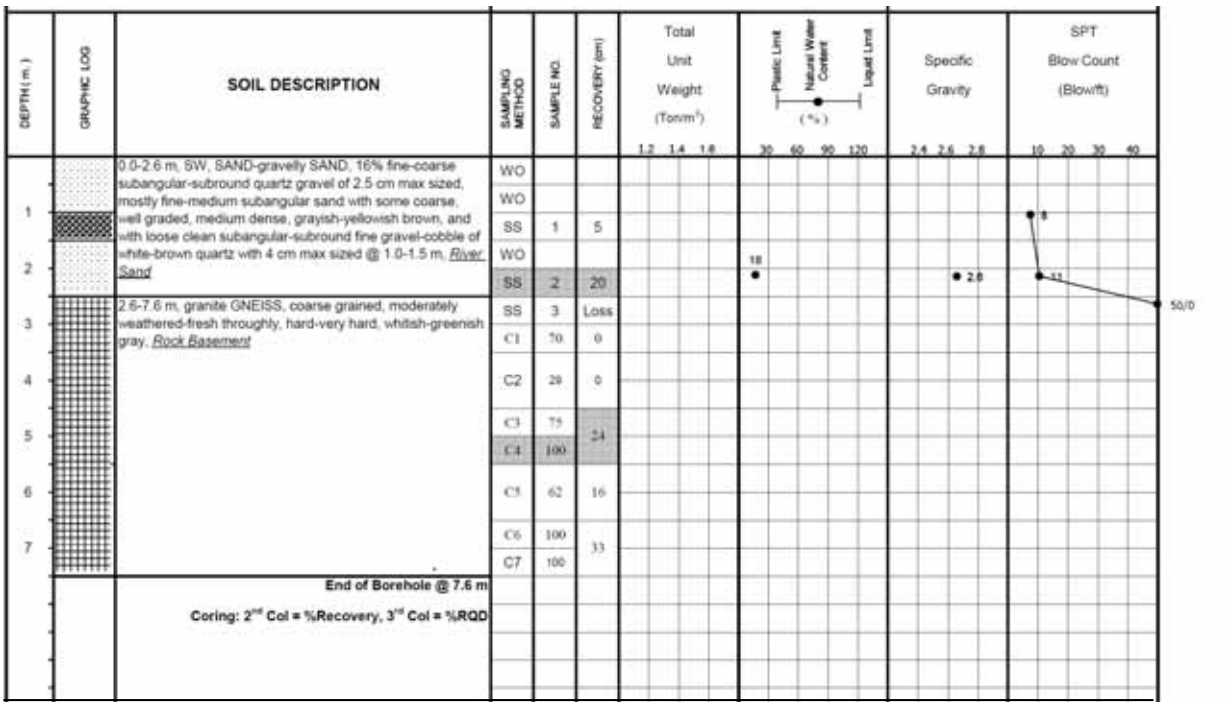
ボーリング柱状図 BH2



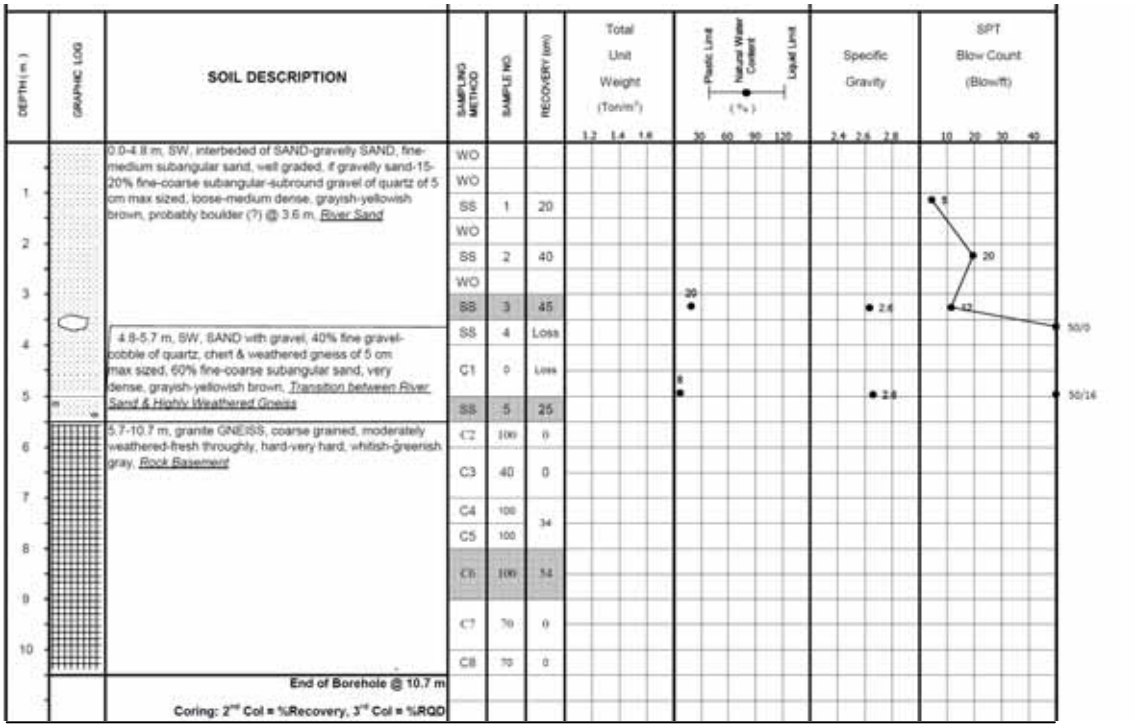
ボーリング柱状図 BH3



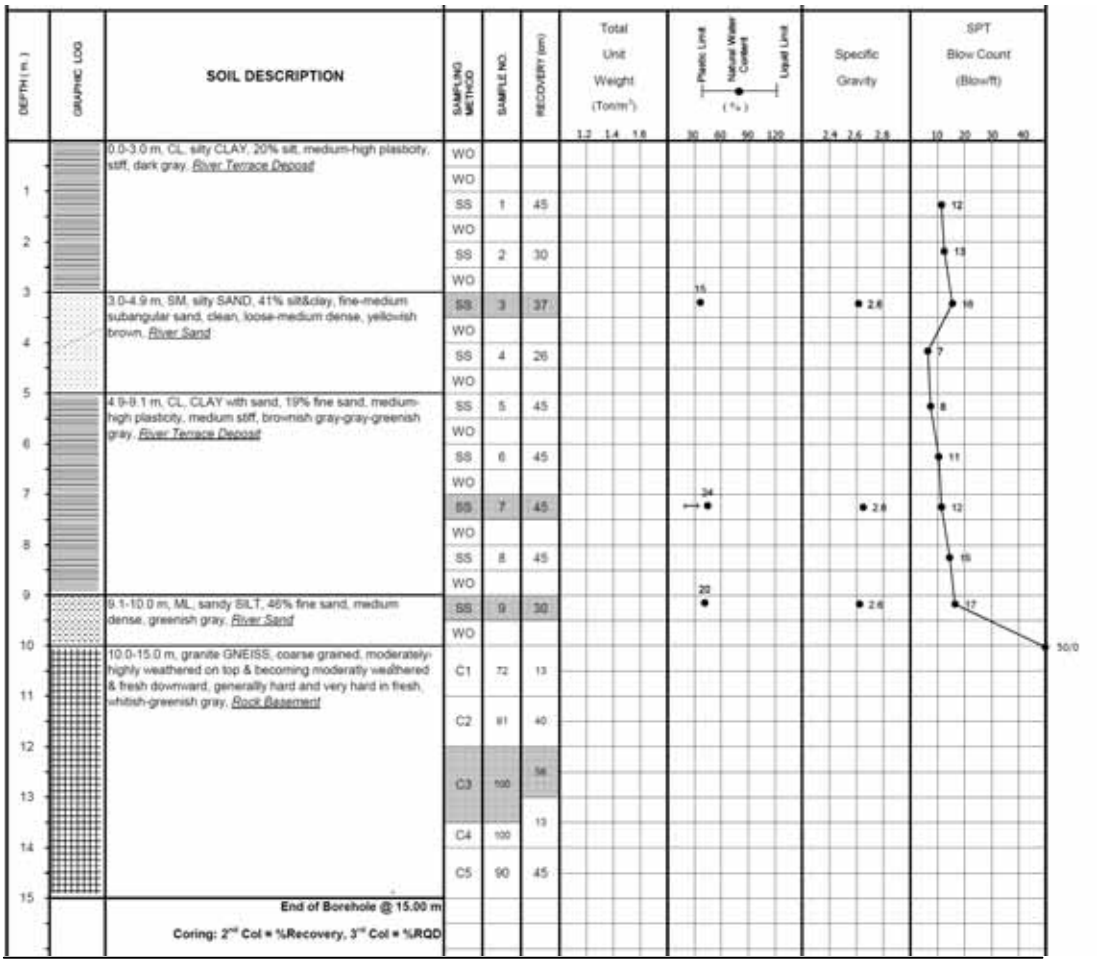
ボーリング柱状図 BH4



ボーリング柱状図 BH5



ボーリング柱状図 BH6



Soundness Test Results

Project : New Nile River Bridge, S-Sudan

Location : Fattouch Crushing Plant Testing Date : 21/03/2011

Tested by : MAA ASSHTO Classification :

Testing Method ☑ Sodium sulphate Solution ☐ Magnesium sulphate Solution

TESTING DATA

Sample No.	Type of Sample	Sieve Size		Grading of Original Sample	Weight of Fractions Before Test	Weight of Fractions After Test	Percentage Passing Designated Sieve After Test	Weighted Percentage Loss
		Passing	Retained	(%)	gm.	gm.	(%)	(%)
AGG1	Coarse Aggregate	2 1/2"	1 1/2"					
		1 1/2"	3/4"	60.1	1509.00	1509.0	0.0	0.0
		3/4"	3/8"	39.9	1000.85	989.0	1.2	0.5
		3/8"	No.4					
		Total		100	2509.85	2498.03		**0.47**

Remarks :

資料 7. 地震調査結果

ナイル架橋の耐震設計資料

1. Past Earthquake Records in Juba

The available data on past earthquake occurrences in Juba and the surrounding areas is very limited with some incident records presented in **表資 7-1** and shown in **図資 7-1** and **7-2**. It is seen in the records of **図資 7-1** and **7-2** that earthquake epicenters occur in the northern and eastern of Juba near the Nile River. Earthquakes of magnitudes of more than 7.0 are experienced at least twice in the year 1990 at a distance of about 60kms from Juba. Moreover, closer earthquake events occurred at just 16kms and 25kms from Juba, although the magnitudes are just over 5.0.

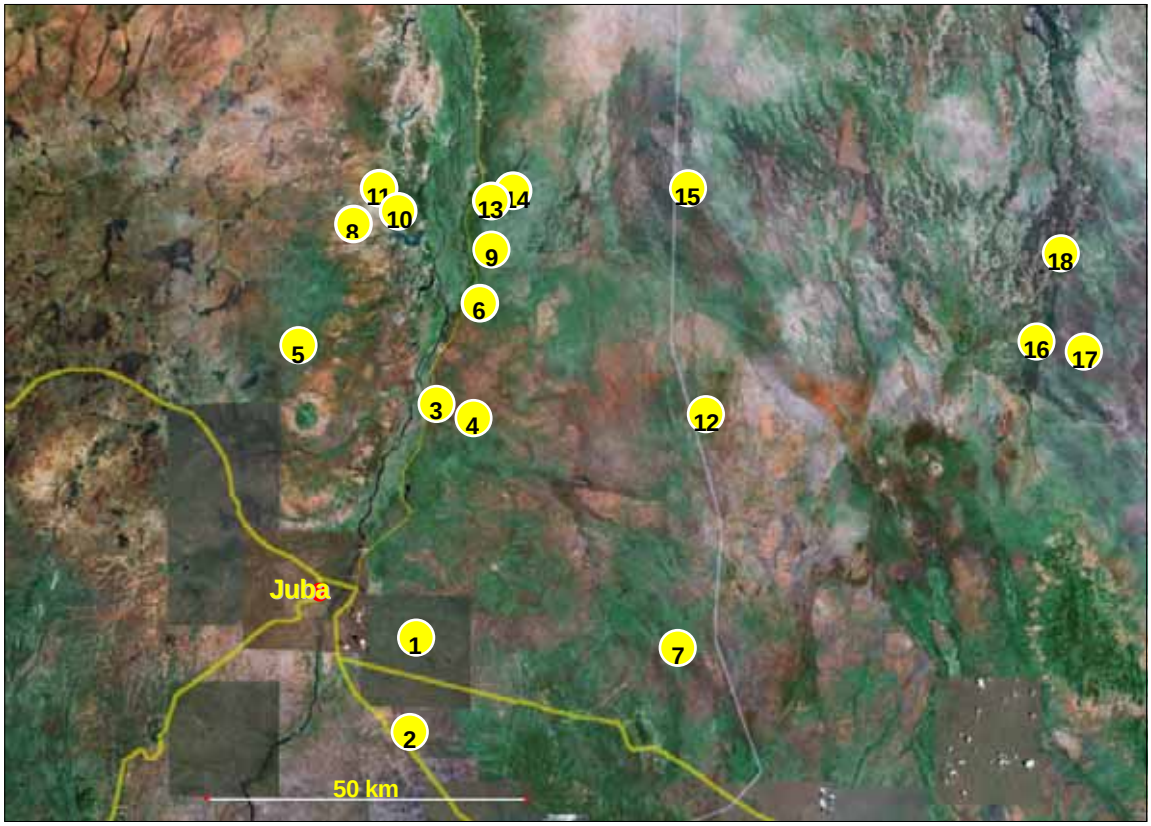
In this regard, although with a very limited data available, it is necessary to consider the seismic excitation effects in the design of structures in Juba and its surrounding areas, including the proposed Nile River Bridge.

表資 7-1　ジュバにおける既往の地震記録

No.	Magnitude	Date	Time of Occurrence	Depth of Hypocenter (km)	Distance from JUBA (km)
1	5.1	15-Oct-1982	8:37:00 AM	10.0	25
2	5.0	02-Mar-1992	8:30:00 PM	10.0	41
3	***7.2***	***20-May-1990***	***2:22:00 AM***	***14.9***	***67***
4	5.4	29-Mar-1991	9:06:00 AM	10.0	125
5	6.5	24-May-1990	7:34:00 PM	16.5	54
6	***7.1***	***24-May-1990***	***8:00:00 PM***	***16.0***	***63***
7	5.5	24-May-1990	10:16:00 PM	10.0	71
8	5.3	25-May-1990	12:42:00 AM	10.0	69
9	5.0	26-May-1990	2:22:00 PM	10.0	37
10	5.0	27-May-1990	7:29:00 AM	10.0	16
11	5.1	03-Jun-1990	4:23:00 PM	10.0	87
12	5.2	20-Jun-1990	6:47:00 PM	15.6	64
13	6.6	09-Jul-1990	3:11:00 PM	12.6	61
14	5.3	28-Jul-1990	4:46:00 PM	10.0	118
15	5.2	10-Jan-1991	7:06:00 AM	11.4	38
16	5.2	07-Sep-1990	12:12:00 AM	10.0	66
17	5.0	03-Oct-1992	4:22:00 PM	33.0	57
18	5.0	11-Dec-1990	5:09:00 AM	10.0	127

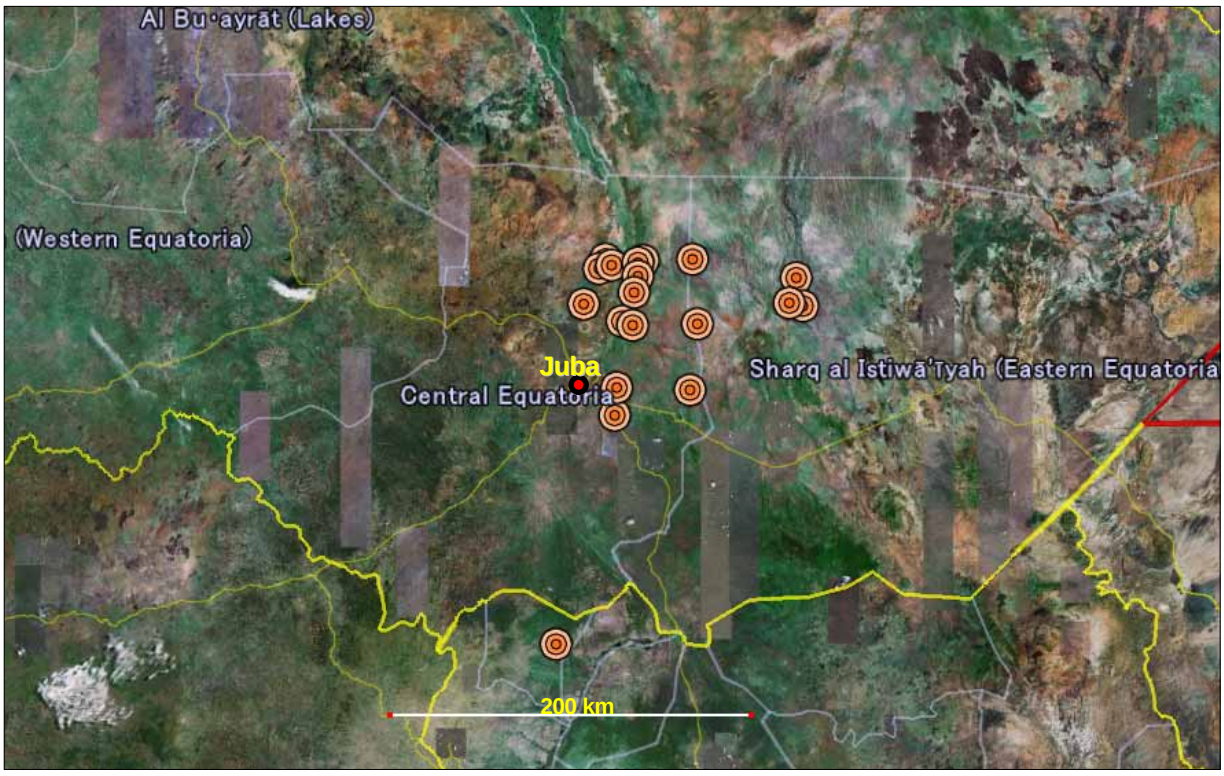
*Seismic data are based on the United States Geological Survey (USGS).

**Refer to Figure 1-1 for the locations of the events.



*Refer to Table 1-1 for the details of the events.

図資 7-1 ジュバ近辺の地震発生状況



図資 7-2 広域における地震発生状況

2. Horizontal Peak Ground Acceleration

The design earthquake ground motion at the bridge site is determined in consideration of the information on earthquake histories around the bridge site, geological structures, geotechnical conditions, active faults, earthquakes occurring in the plate-boundaries near the site and existing strong motion earthquake records.

The corresponding peak ground acceleration in Juba from the different earthquake events can be calculated using the attenuation equation recommendations of the Specifications for Highway Bridge - Part V Seismic Design, Japan Road Association (JRA), as shown in **表資 7-2**.

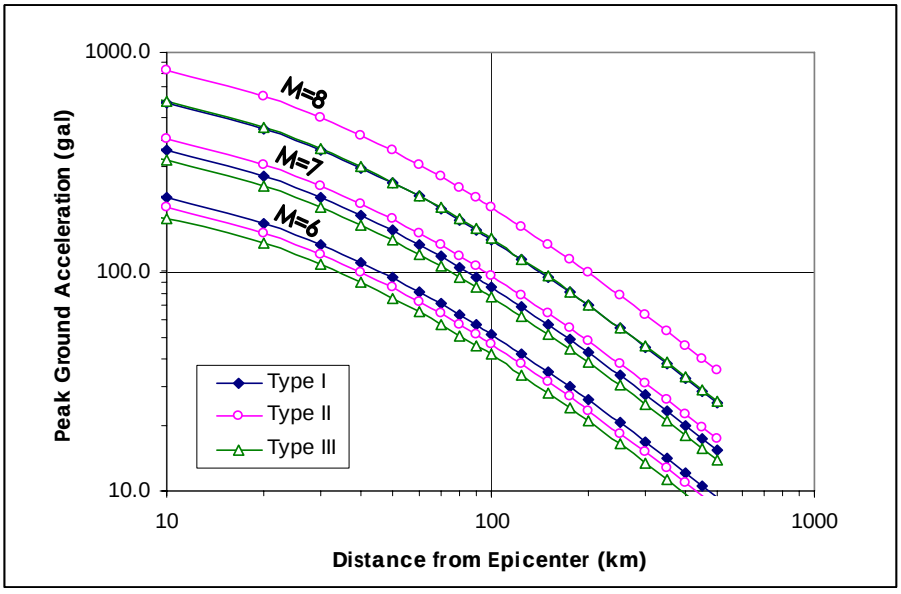
The three types of earthquake attenuation equations given in the JRA are as follows:

表資 7-2 マグニチュードから推定される地震面における地震加速度 (gal)

Type	Peak Ground Acceleration	Ground Condition
Type I	$H_{max} = 987.4 \times 10^{0.216M} \times (\quad + 30)^{-1.218}$	- includes good diluvial ground and rock
Type II	$H_{max} = 232.5 \times 10^{0.313M} \times (\quad + 30)^{-1.218}$	- denotes diluvial and alluvial ground other than Types I and III
Type II	$H_{max} = 403.8 \times 10^{0.265M} \times (\quad + 30)^{-1.218}$	- includes soft ground of alluvial ground

where: α : peak ground acceleration (gal)
M : earthquake magnitude
: distance from epicenter (km)

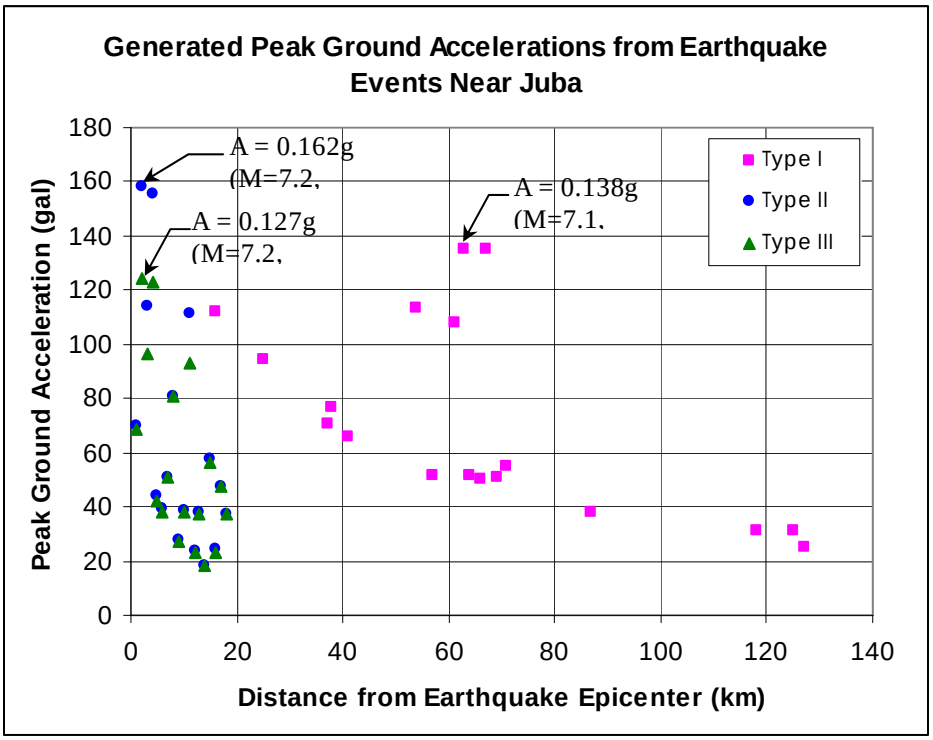
Considering earthquakes of Magnitudes M = 6, 7 and 8, the peak ground accelerations as function of earthquake distance from the epicenter is plotted in **図資 7-3**.



図資 7-3 地表面最大加速度 (gal) とマグニチュード、距離の関係

The peak ground accelerations generated by the earthquakes given in **表資 7-1** is calculated based on the equations in **表資 7-2** for the three soil type conditions and plotted in **図資 7-4**. The ground conditions in Juba can be taken as Type I and Type II conditions with shallow rock formations. In this regard, the peak

ground accelerations are calculated as 0.162g and 0.138g for soil Types II and I respectively.



g = gravitational acceleration (980.6 cm/sec^2)

図資 7-4 地表面最大加速度 (表資 7-1 による)

3. Design Peak Ground Acceleration

At present, there is no established map for the design peak ground acceleration in Southern Sudan to be used in determining the appropriate response spectrum for earthquake effects. However, the limited available data on earthquake occurrences for the past 30years indicates that the peak ground acceleration in Juba approaches values of 160gals (0.162g) for Type II soil and 140gals (0.138g) for Type I soil.

AASHTO 3.10 stipulates that " bridges shall be designed to have a low probability of collapse but may suffer significant damage and disruption to service when subject to earthquake ground motions that have seven percent probability of exceedance in 75 yrs".

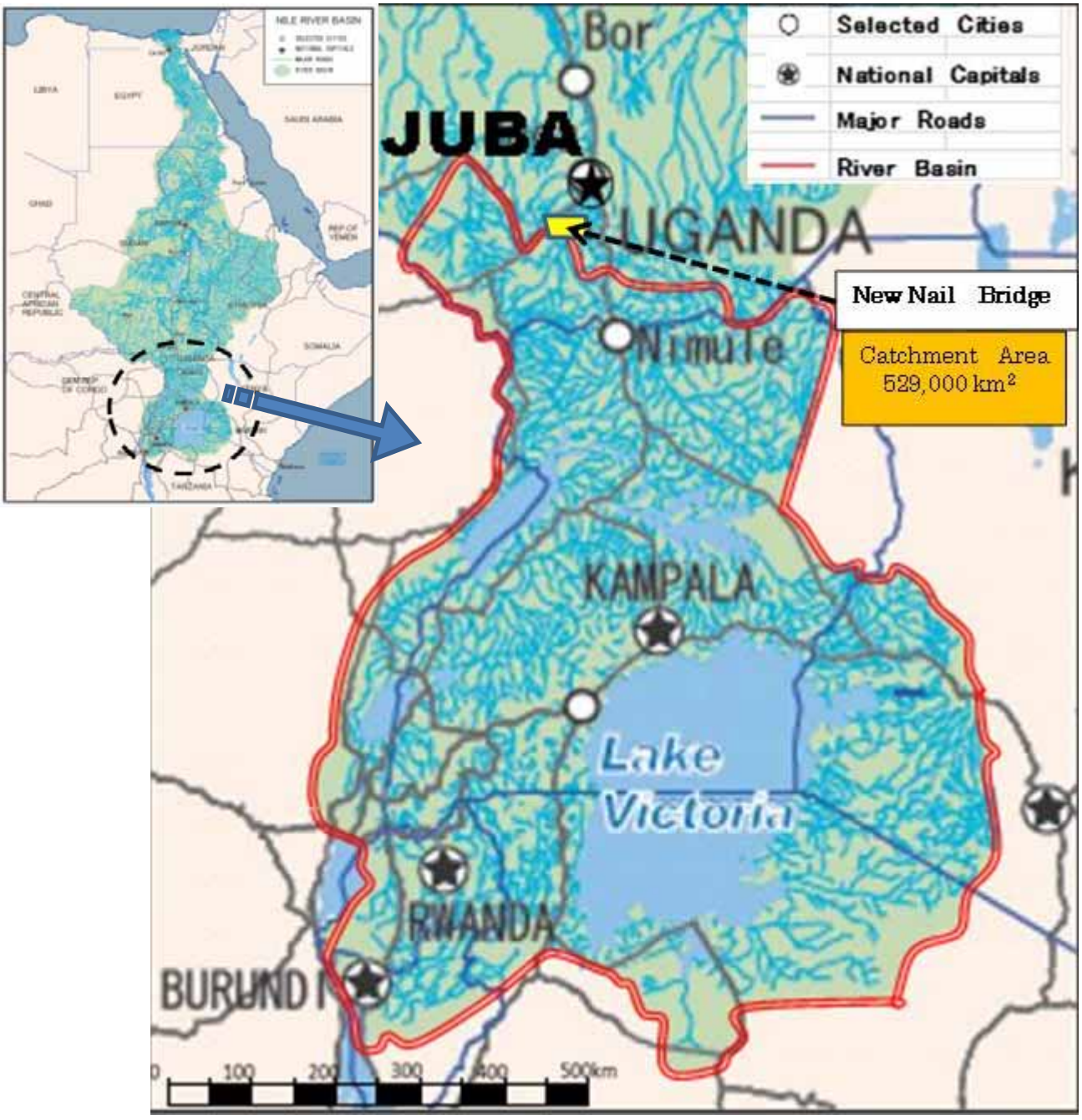
On the other hand, assuming a moderate earthquake with high probability of occurrence, JRA recommends the value of the standard response spectra (So) to be 200 gals (0.1≦T ≦1.1) for Type I and 250 gals (0.2≦T ≦1.3) for Type II under Level 1 seismic performance (bridge level keeping its sound functions during and earthquake).

In this regard, it is recommended that the value of 0.20g be used for the design peak ground acceleration, which is about 25% higher than the recorded ground accelerations in Juba.

資料 8. 水文調査結果

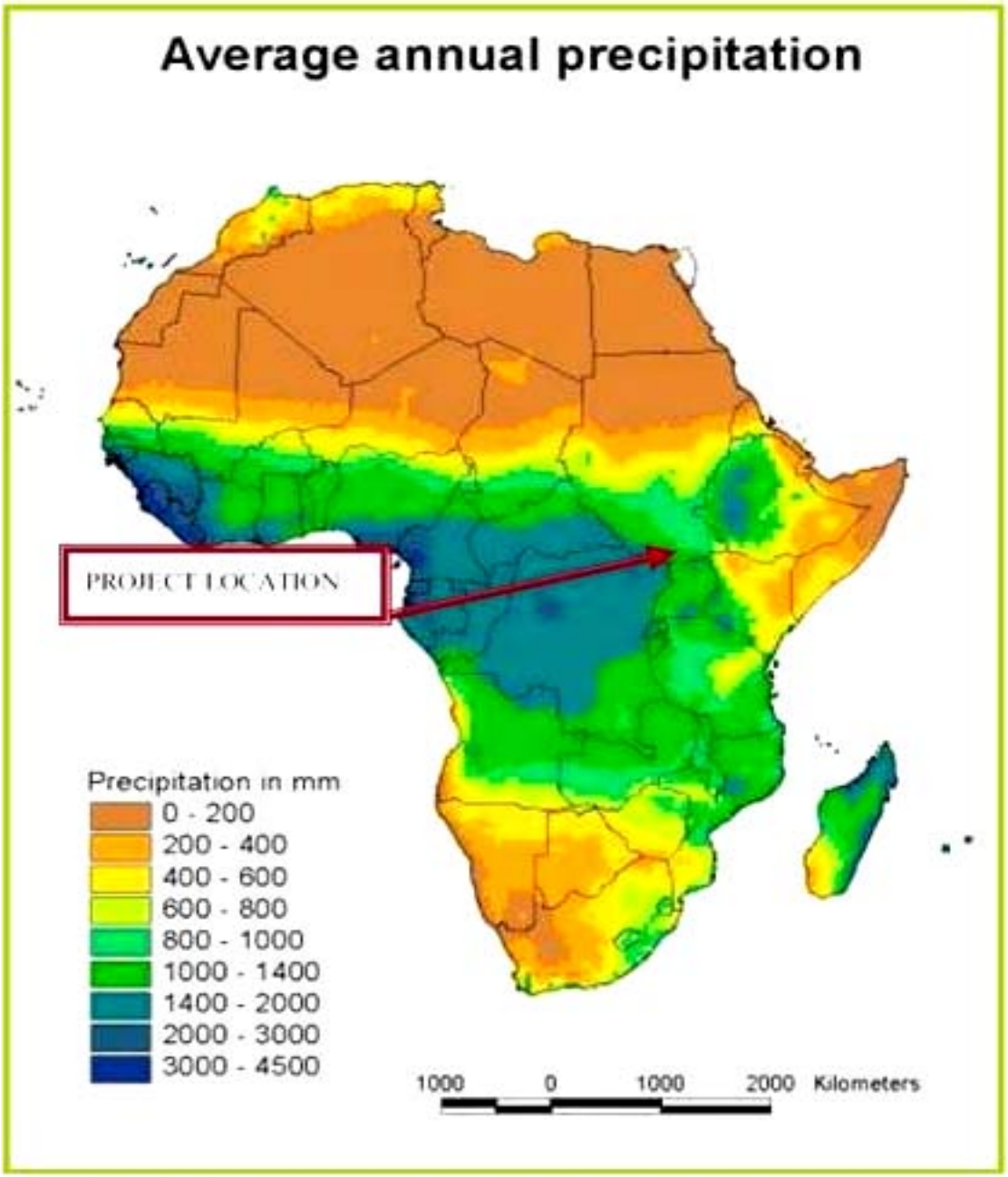
水分調査結果

① 架橋地点上流域の流域図



図資 8-1 River Basin Upper New Nail Bridge

② アフリカの年平均降雨量分布



出典：EIDCR　CHAPTER 5 Hydrological Condition

図資 8-2　Average Annual Precipitation

(1) 架橋地点の河道特性

① 平面、縦・横断特性

架橋地点周辺においては、計画道路予定敷地内を中心に、2011 年１月～3 月に現地測量が実施された結果を以下に示す。

図資 8-4　河川横断図(全体)

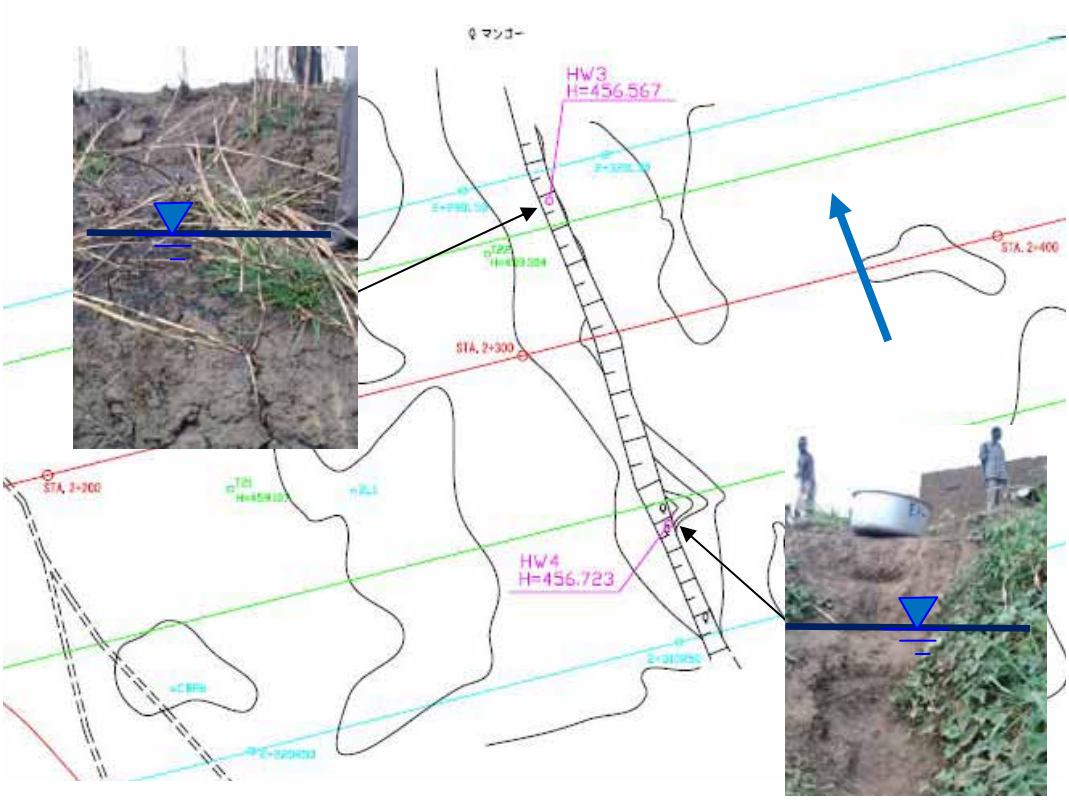
図資 8-5　河川横断図(道路ｾﾝﾀｰ)

図資 8-6　河川水位縦断図

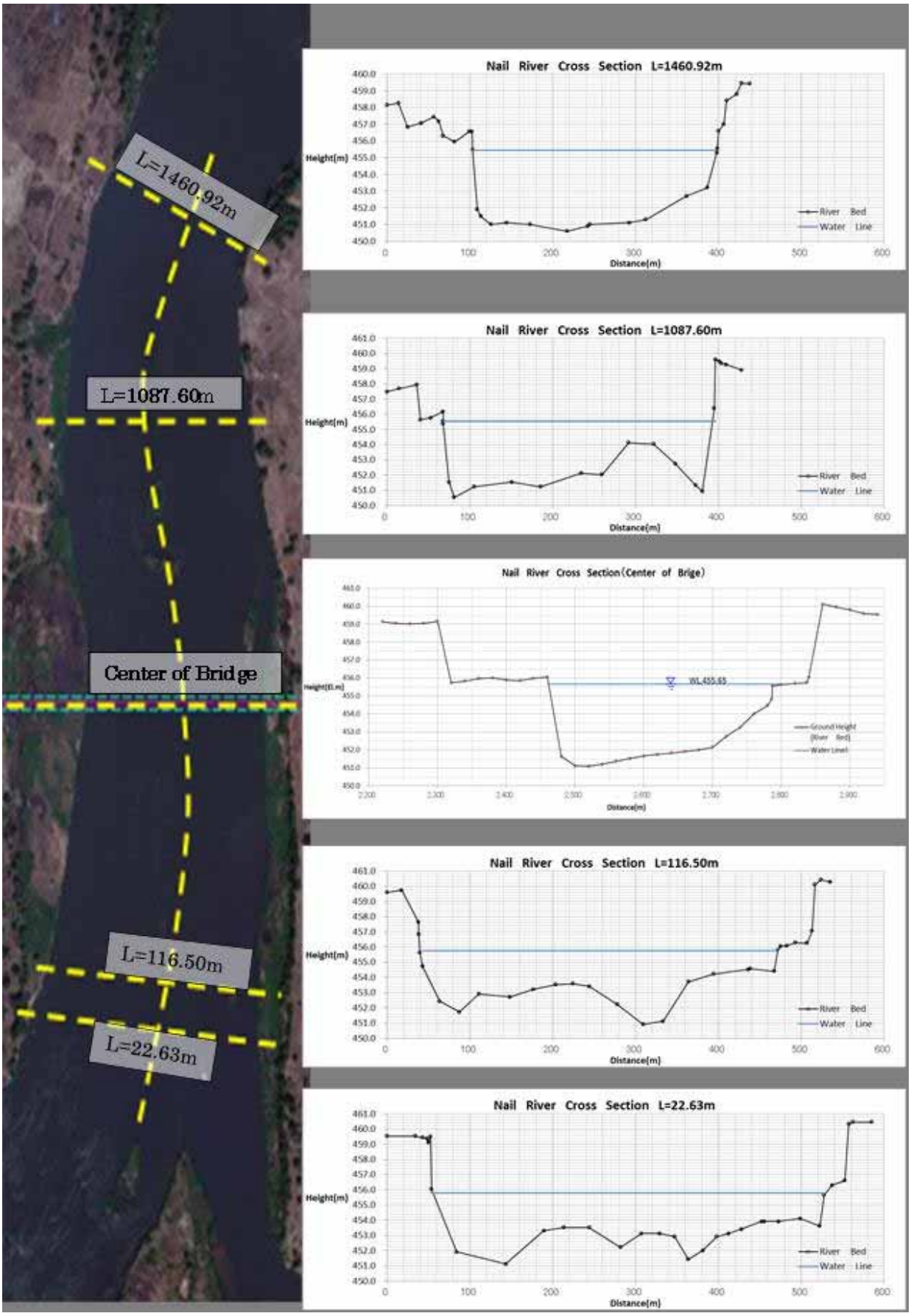
- 架橋地点の左岸側は、約 150m の高水敷を有する復断面形状の自然河道である。
- 測量時の水面高は、455.65EL.m であった。
- 水面追跡した縦断測量結果を整理すれば、水面勾配は 1/3,900 である。

この区間にあっては、現時点で河道計画は存在していないので、橋台位置の選定によって、橋長が大きく異なってくるため、計画流量流下時の HWL 位置が重要となる。

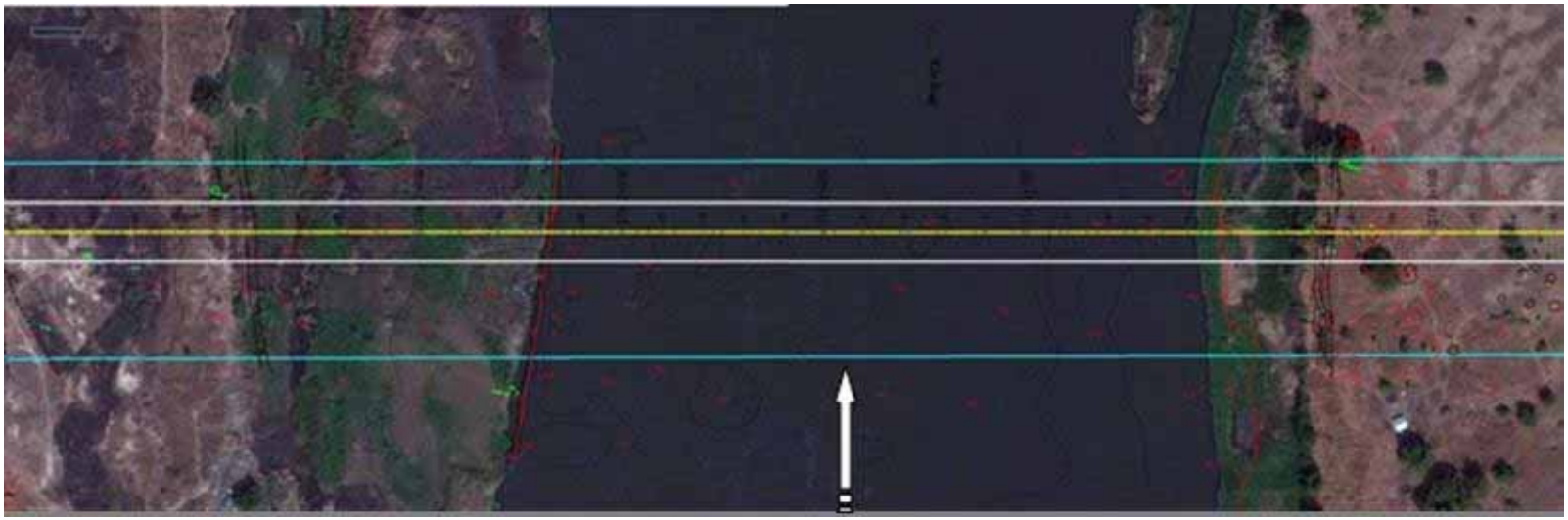
なお、昨年の雨季(2010 年)における最高水位について、現地踏査時のヒアリング地点を測量した結果、図資 8-3 の高さであった。2 か所の平均で 456.65EL.m であり、道路ｾﾝﾀｰの断面における現況水面高から１m高い位置である。

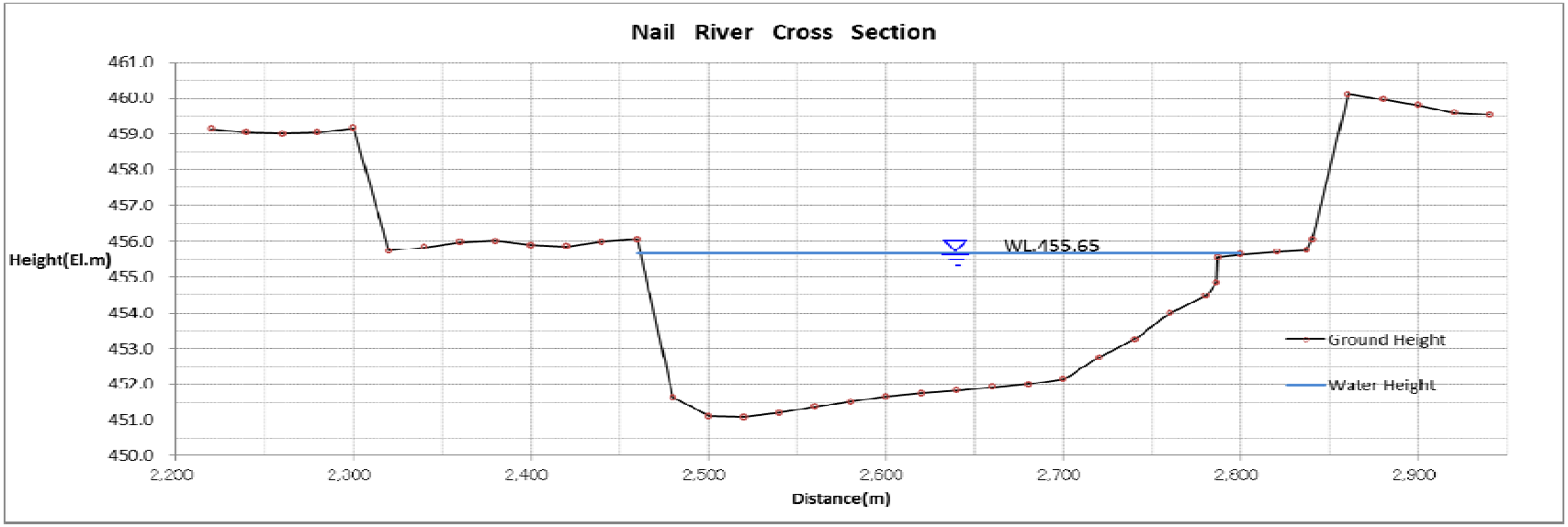


図資 8-3　2010 年最高水位位置(ヒアリング)

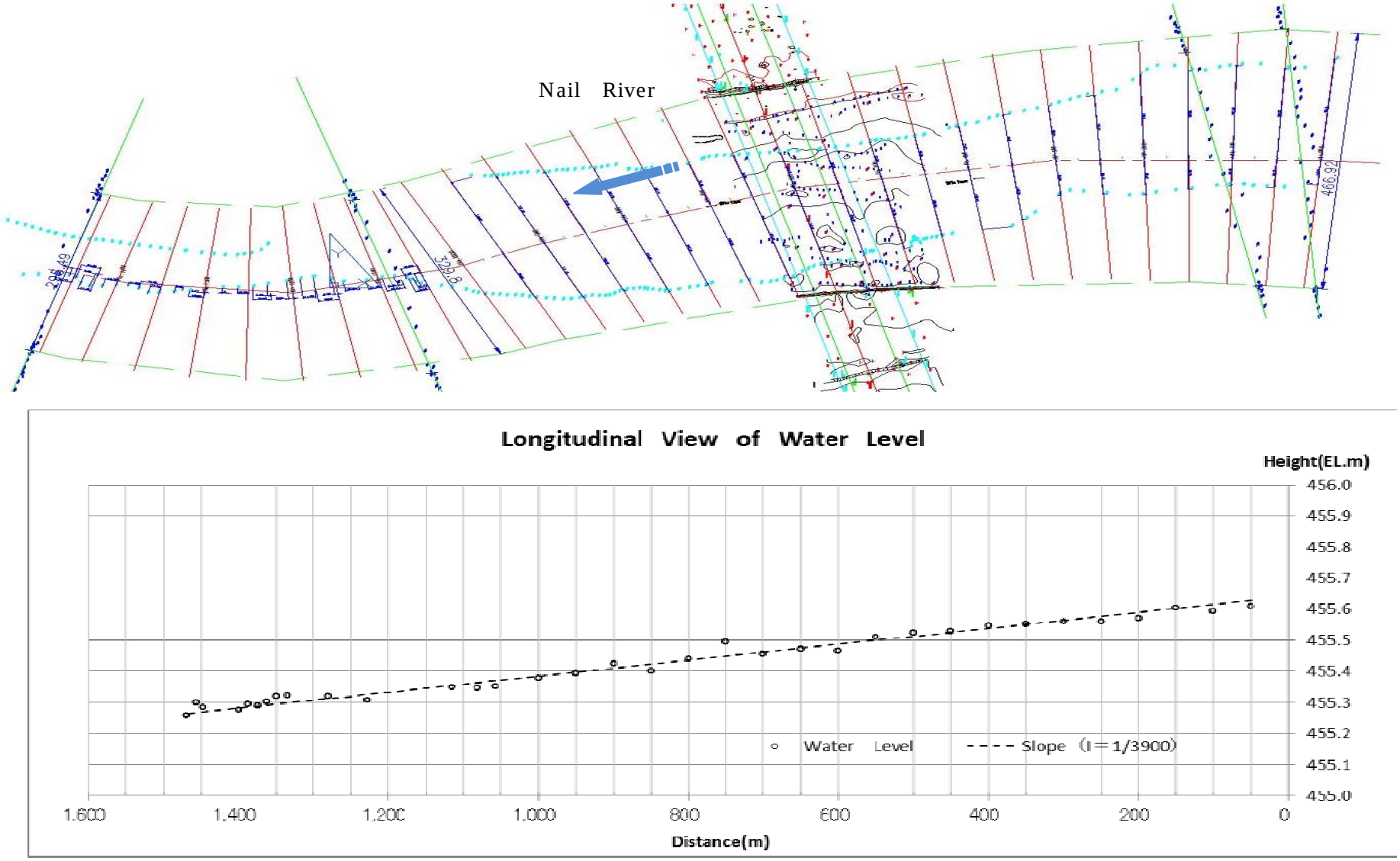


図資 8-4 河川横断図 (全体)





図資 8-5 河川横断図 (道路センター)



図資 8-6 河川水位縦断図

② 架橋計画地点近傍における流況

一方、架橋計画地点の近傍における流況資料としては、JUBA 市内の水供給施設地点において、停戦協定後以降水位観測ゲージが設置され、1 回/日の水位観測が実施されている。

2007 年の雨季は、月間に 0.5m程度しか水位変動がみられないが、2008, 2009 年は 1.0～1.2m程度の変化が見受けられる。この観測地点は、架橋計画地点から約 5km 下流に位置しているので、実測した水面勾配：1/3900 に基づいて架橋地点の水位変化を推算すれば、記録期間内の変化は以下となる。2011 年 2 月の実測水位は 455.65El.m だったので、ほぼ期間内平均水位と同じである。

記録期間内の水位変動（架橋地点に換算）

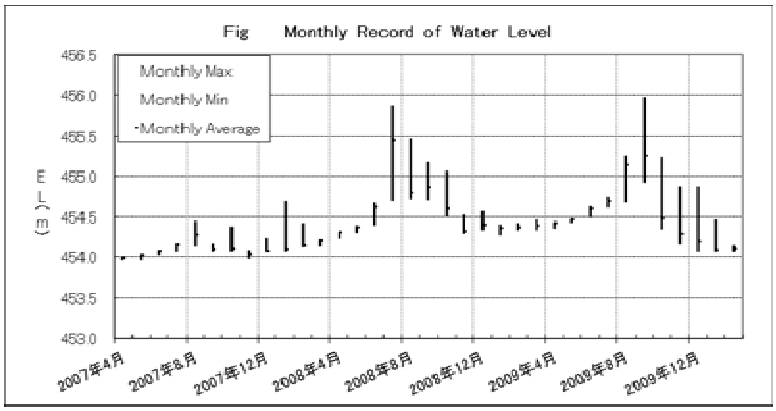
単位：EL.m

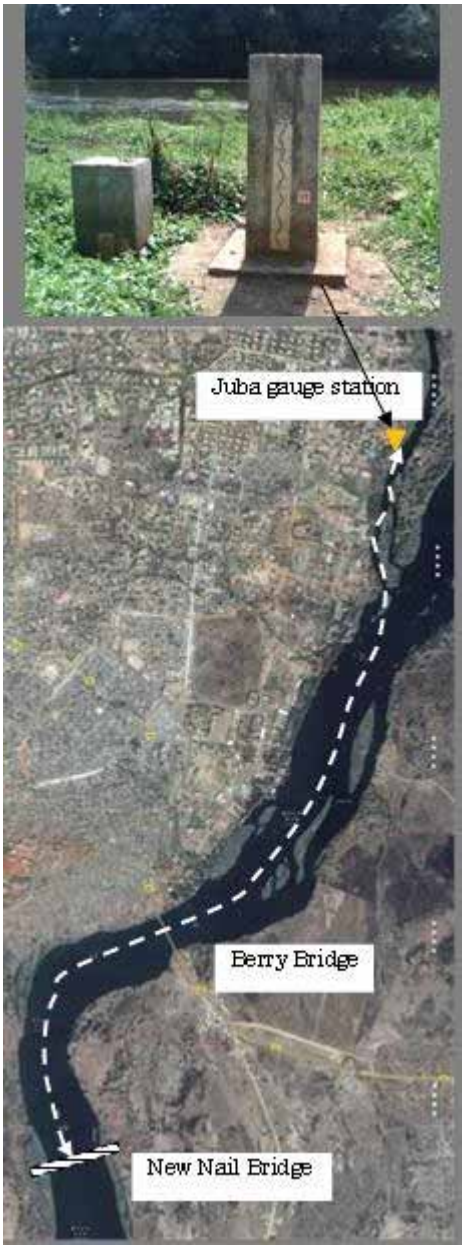
最大	最少	平均
457.3	455.2	455.7

表　月間水位データー覧　（JUBA市内　浄水施設地点）

単位：EL.m

月	Monthly Max	Monthly Min	Monthly Average	月	Monthly Max	Monthly Min	Monthly Average
2007年4月	454.15	454.07	454.096	2008年10月	455.47	454.72	454.788
2007年5月	454.47	454.07	454.072	2008年11月	455.87	454.7	455.433
2007年6月	454.88	454.07	454.185	2008年12月	454.67	454.4	454.614
2007年7月	454.88	454.16	454.278	2009年1月	454.4	454.3	454.37
2007年8月	455.23	454.34	454.466	2009年2月	454.31	454.23	454.303
2007年9月	455.97	454.92	455.239	2009年3月	454.22	454.14	454.205
2007年10月	455.25	454.67	455.126	2009年4月	454.43	454.13	454.138
2007年11月	454.75	454.61	454.687	2009年5月	454.69	454.07	454.086
2007年12月	454.63	454.49	454.596	2009年6月	454.24	454.07	454.07
2008年1月	454.47	454.43	454.461	2009年7月	454.09	453.98	454.03
2008年2月	454.43	454.36	454.417	2009年8月	454.39	454.07	454.097
2008年3月	454.47	454.33	454.382	2009年9月	454.17	454.07	454.086
2008年4月	454.43	454.33	454.367	2009年10月	454.45	454.14	454.275
2008年5月	454.41	454.27	454.356	2009年11月	454.17	454.07	454.145
2008年6月	454.57	454.33	454.399	2009年12月	454.07	454.03	454.063
2008年7月	454.53	454.29	454.313	2010年1月	454.03	453.96	454.018
2008年8月	455.07	454.5	454.588	2010年2月	453.99	453.96	453.986
2008年9月	455.17	454.71	454.857				





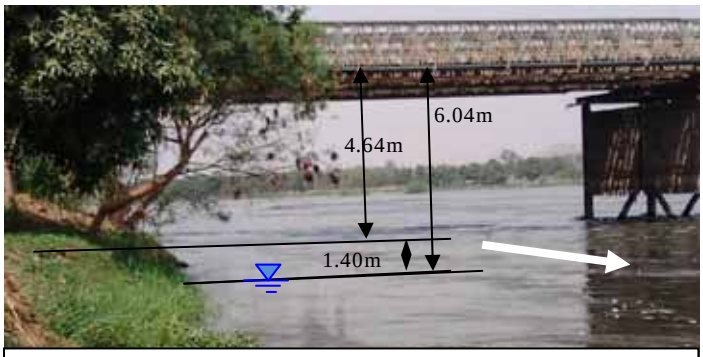
図資 8-7　架橋地点近傍の流況

③ 既設 Juba　Bridge の余裕高

既設 Juba　Bridge の遠望(左岸レストランより 2011.02.26)

2011 年 2/26 及び 3/6 の現地踏査にて、橋梁桁下から水面までの距離計測や昨年の最高水位の聞き取りを実施した。

JubaBridge 右岸下流の桟橋(現在故障中 2011.03.06)



Juba Bridge　右岸第 1 径間と余裕高(2011.03.06)

既設 Juba　Bridge 地点の横断測量成果はないので、簡単に橋梁部（42m×6 径間）の川幅で矩形断面を想定の上、等流計算にて水位上昇程度を検証すると、下記の結果となる。

（水面勾配は架橋地点の 2011 年 2 月測量成果、粗度係数は架橋地点と同一 0.03 と仮定）

水面勾配(i)＝1/3900
粗度係数(n)＝0.03
川幅＝252m　(矩形断面想定)

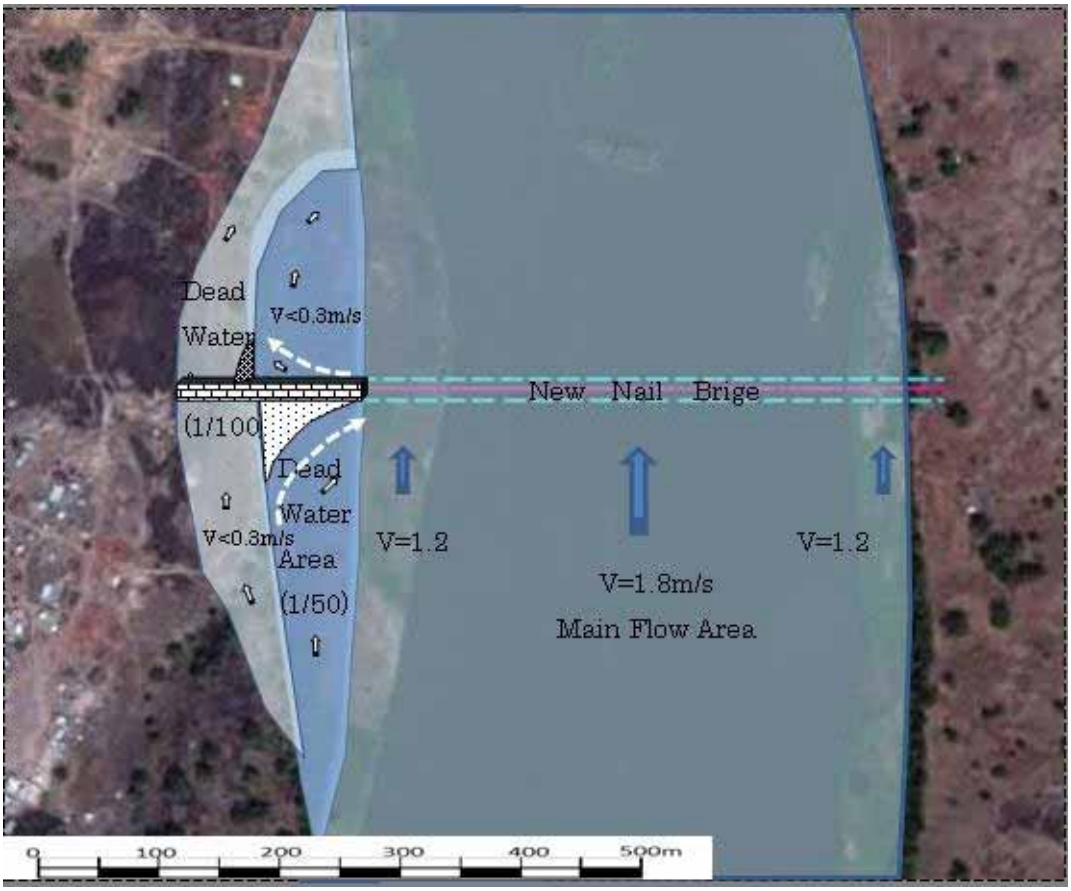
水深 (m)	平均流速 (m/s)	流量 (m^3/s)	備　　考
4.0	1.32	1,330	架橋地点の現況流量相当
5.0	1.52	1,920	架橋地点の2010年最大流量相当
9.0	2.21	5,000	架橋地点の設計流量 (1/100) 相当

昨年の最高水位は、現況水面から約 1.2m 上昇（聞き取り結果）しており、架橋地点での聞き取り結果（約 1m）より 20cm 高いが、誤差を勘案すればこの程度は問題の無い範囲である。計画流量時には現況水面から約 5m 上昇が推定されるので、既設橋の桁下余裕高は 1m 程度と見込まれる。

④ 橋台位置と橋長について

雨季に毎年～1/50 確率規模程度まで浸水する左岸高水敷においては、架橋地点の上下流河道平面形状に基づけば、河岸から約 80m 区間は死水域が形成される範囲である。この死水域区間は洪水流の流下範囲ではないため、盛土にて道路とし、その端部に橋台を設置する場合、橋長=約 480m となり、工事費などの点で優位性が予想される。

しかし、主流部に比較して流速が遅いものの、一般的には、浮遊砂は上流側の盛土区間で捕捉されて堆砂を繰り返し、下流側では盛土に平行な流れによって河岸の一部が侵食される傾向が生じる。ある期間経過後には模式図資 8-8　のような上流堆積、下流侵食域の形成が想定される。



図資 8-8　高水敷に橋台を設置した場合の影響想定図

従って、具体的な影響範囲の推定が必要となるため時間を要し、現在の高水敷利用者の利便性に大きな支障を与えることとなる。また、盛土区間の用地買収や侵食保護対策等も必要である。さらには、自然形成された河道区間であり、洪水時には流速が遅いものの毎年冠水するので、自然環境保全の観点からも人工構造物の設置は最小限に留めるべきと判断される。従って 1/50 確率では浸水しない左岸段丘頂部に橋台を設置するのが得策であり、橋長 560mとなる。

橋長と断面形状から基準径間長を満たすべく、径間構成は以下が設定された。

左岸高水敷区間：径間長 30m×5 径間（150m）-----橋脚幅 2m×5 本

主流区間：径間長 87.5m×4 径間（350m）----------橋脚幅 3m×3 本

右岸高水敷区間：径間長 30m×2 径間（60m）-------橋脚幅 2m×2 本

なお、高水敷部は主流区間に比較して流速も遅く、区分流量を勘案すると、以下の状況であることから、基準径間長を 30m と設定した。

左岸高水敷区間：540$m^{3/}$s------基準径間長：23m

主流区間：4220$m^{3/}$s----------基準径間長：45m

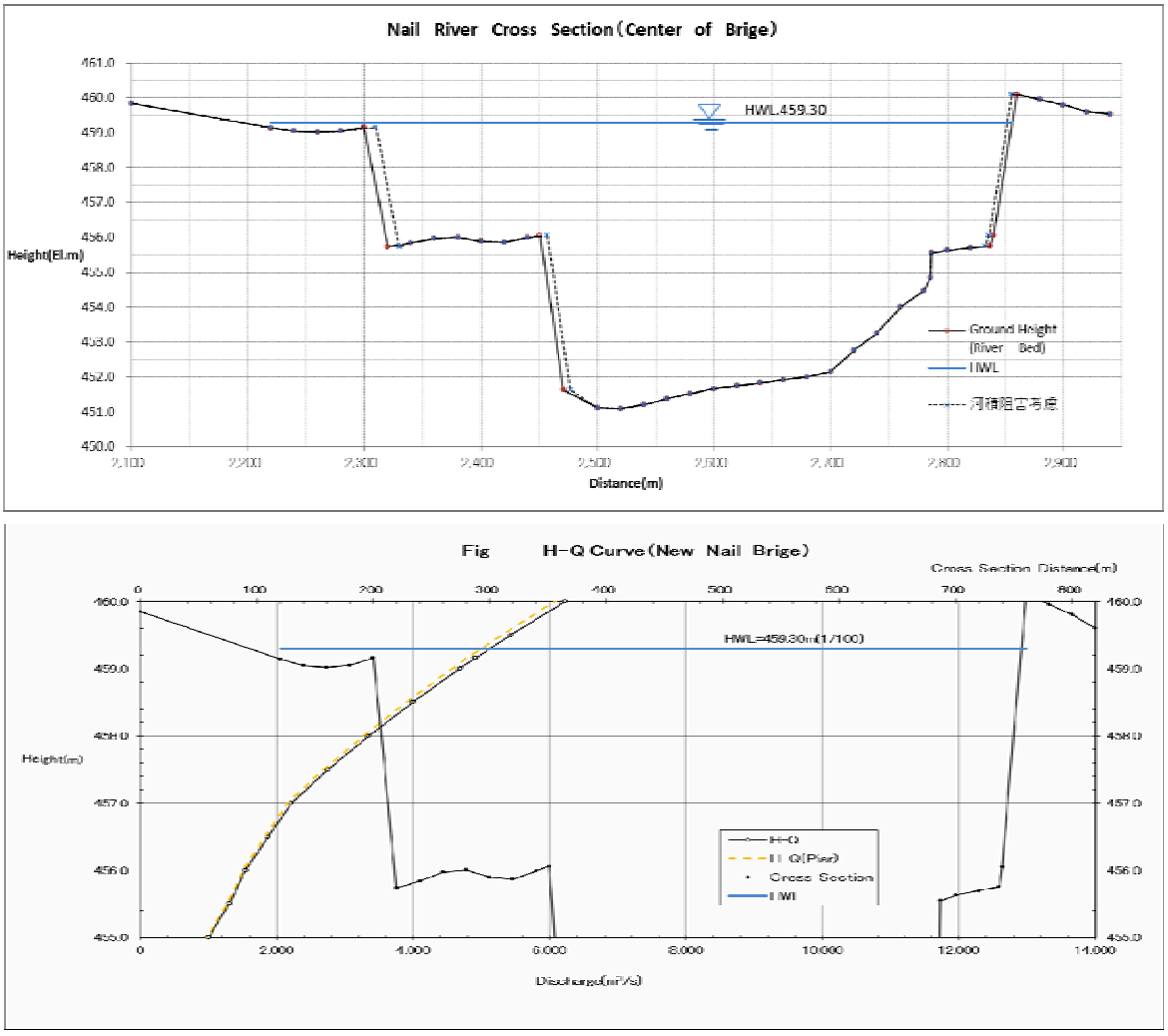
右岸高水敷区間：240$m^{3/}$s------基準径間長：22m

⑤ 橋脚設置に伴う流下断面阻害の影響について

参考までに、橋脚設置に伴う流下断面の阻害状況を検証すると以下のとおりである。

計画断面において、橋脚幅相当分の断面積が縮小するものとして図資 8-9 の縮小断面を対象に、等流計算で HWL を検証した。

計算結果は、計画流量：5,000m3/s に対して、計算水位は 459.29Elm (計画断面より 7cm 上昇)であり、HWL を超えないので、橋脚の河積阻害に関する影響は問題の無いことがわかる。



図資 8-9 橋脚の流下断面阻害に対する影響

⑥ 架橋計画地点の等流計算結果数値表

表資 8-1 架橋位置断面の等流計算結果 数値表

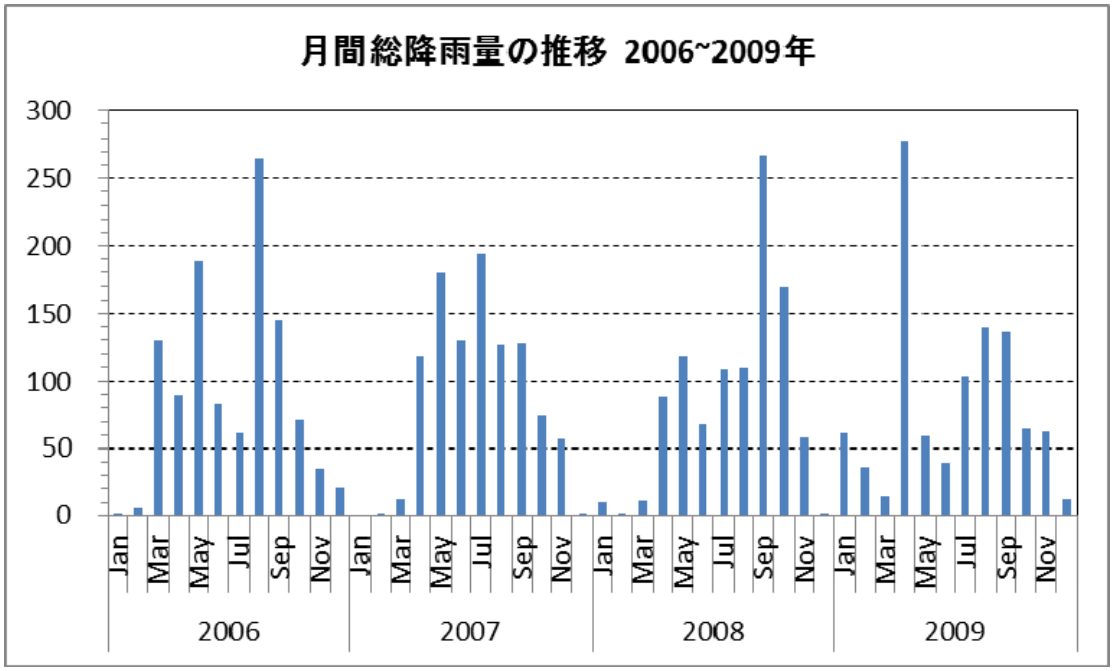
ナイル川架橋地点のH-Q計算表
(計画断面：道路センター)

	水面勾配(i)=	1/3900	粗度係数(n)=	0.030	
水位	断面積	径深	水面幅	平均流速	H-Q
DL(m)	(m^2)	(m)	(m)	(m/s)	(m^3/s)
451.1	0	0.000	0.0	0.000	0
451.5	24	0.241	99.3	0.207	5
452.0	93	0.555	166.9	0.361	33
452.5	204	0.834	244.6	0.473	97
453.0	331	1.249	265.2	0.619	205
453.5	469	1.650	284.1	0.745	350
454.0	615	2.050	299.7	0.861	530
454.5	771	2.388	322.4	0.954	735
455.0	934	2.824	330.4	1.066	996
455.5	1,100	3.294	333.4	1.182	1,300
456.0	1,296	3.335	507.4	1.192	1,544
456.5	1,558	3.377	526.7	1.201	1,872
457.0	1,823	3.419	532.1	1.211	2,208
457.5	2,090	3.881	537.5	1.318	2,755
458.0	2,360	4.338	542.9	1.420	3,351
458.5	2,633	4.791	548.2	1.517	3,994
459.0	2,908	5.240	553.6	1.610	4,684
459.2	2,996	5.382	555.3	1.639	4,912
459.5	3,186	5.705	557.0	1.704	5,430
460.0	3,465	6.177	559.5	1.797	6,227
460.5	3,745	6.670	560.0	1.891	7,084
461.0	4,025	7.169	560.0	1.985	7,989
461.5	4,305	7.668	560.0	2.076	8,936
462.0	4,585	8.166	560.0	2.165	9,925
462.5	4,865	8.665	560.0	2.252	10,956
463.0	5,145	9.164	560.0	2.338	12,027
463.5	5,425	9.662	560.0	2.422	13,138

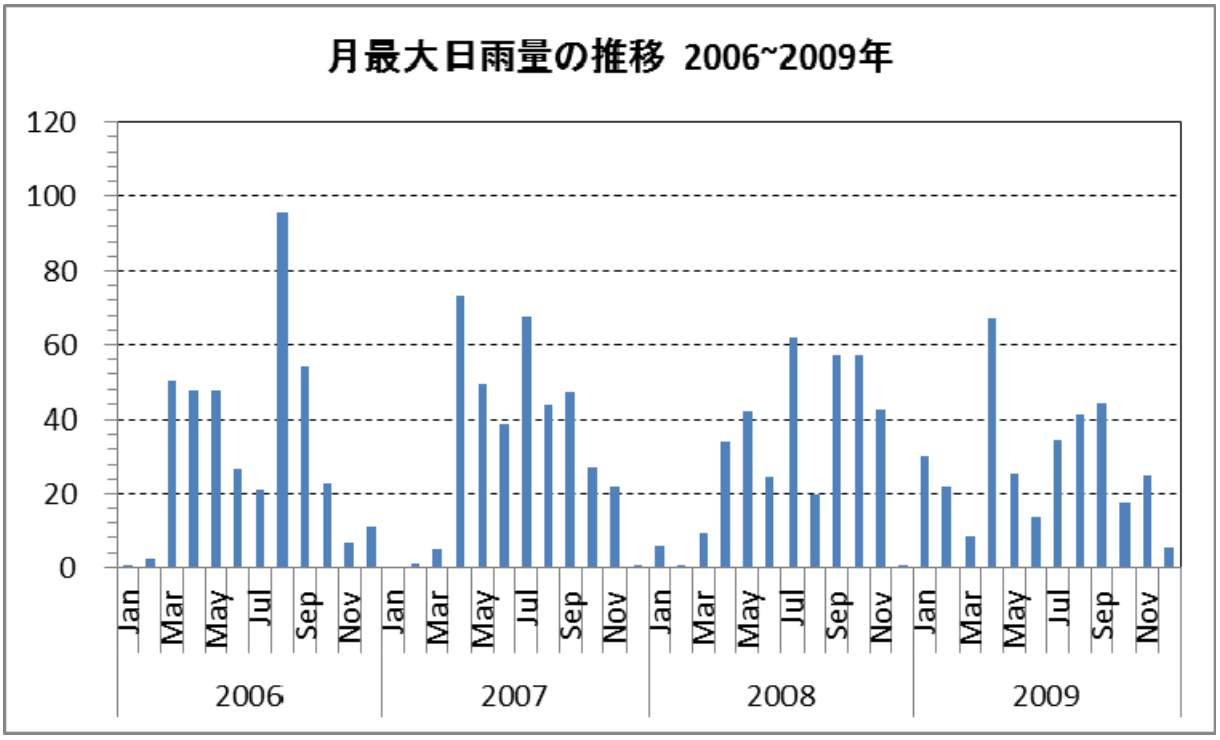
ナイル川架橋地点のH-Q計算表
(橋脚阻害の縮小断面：道路センター)

	水面勾配(i)=	1/3900	粗度係数(n)=	0.030	
水位	断面積	径深	水面幅	平均流速	流量
DL(m)	(m^2)	(m)	(m)	(m/s)	(m^3/s)
451.1	0	0.000	0.0	0.000	0
451.5	23	0.243	94.8	0.208	5
452.0	89	0.552	160.9	0.359	32
452.5	197	0.827	238.6	0.470	93
453.0	322	1.240	259.2	0.616	198
453.5	456	1.640	278.1	0.742	339
454.0	599	2.038	293.7	0.858	514
454.5	752	2.374	316.4	0.950	714
455.0	913	2.809	324.4	1.063	970
455.5	1,076	3.278	327.4	1.178	1,267
456.0	1,265	3.327	488.2	1.190	1,505
456.5	1,520	3.376	512.7	1.201	1,826
457.0	1,777	3.424	518.1	1.213	2,155
457.5	2,038	3.885	523.5	1.319	2,688
458.0	2,301	4.341	528.9	1.420	3,268
458.5	2,567	4.793	534.2	1.517	3,895
459.0	2,835	5.241	539.6	1.611	4,566
459.2	2,921	5.382	541.3	1.639	4,789
459.5	3,106	5.705	543.0	1.704	5,293
460.0	3,378	6.176	545.5	1.797	6,070
460.5	3,651	6.669	546.0	1.891	6,905
461.0	3,924	7.167	546.0	1.984	7,787
461.5	4,197	7.666	546.0	2.075	8,710
462.0	4,470	8.165	546.0	2.164	9,675
462.5	4,743	8.663	546.0	2.252	10,680
463.0	5,016	9.162	546.0	2.337	11,724
463.5	5,289	9.661	546.0	2.421	12,806

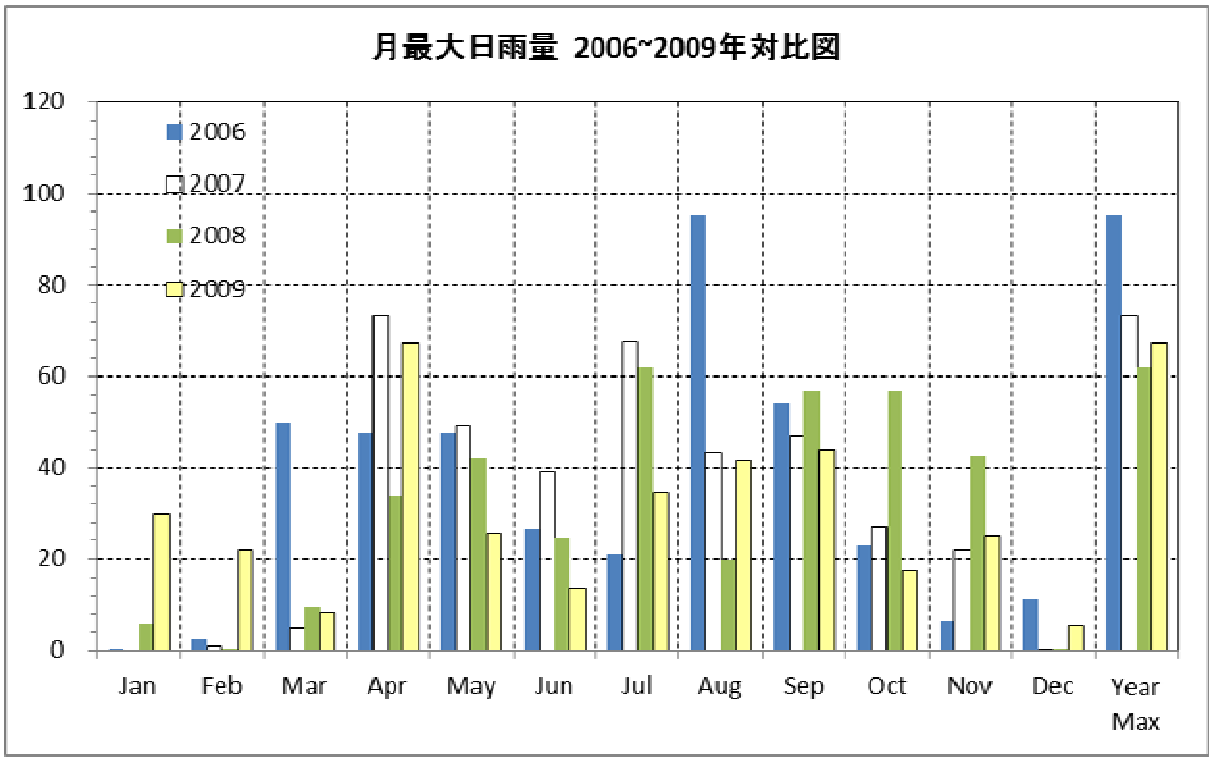
⑦ Juba 市内の降雨特性



図資 8-10 月間総降雨量の推移 2006～2009 年



図資 8-11 月最大日雨量の推移 2006～2009 年



図資 8-12 月最大日雨量の推移 2006～2009 年対比図

表資 8-2 日雨量年表

2006年 日雨量年表 Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1					47.5					1.5		
2				0.1	3.0	0.1		0.1				
3				0.1				22.0		1.0		
4						6.5	21.0	25.0				1.0
5				0.1	0.1		0.1	24.5	7.5			4.0
6						1.5		25.0	1.5			11.0
7			1.5					6.0				5.5
8							2.0	95.5		1.5	3.0	
9			45.0	0.1	2.5	0.1		9.0	6.0	6.5		
10			0.5	0.1	6.5	26.5	10.0	15.0	1.0		6.5	
11				0.1	7.5		3.0				4.5	
12		1.0	50.0	0.1	21.0	2.6			1.0		1.5	
13		0.1	1.0	2.7	0.1		1.5	15.0	2.0			
14	0.1			0.1	6.5			0.5			1.5	
15			0.1	0.1		5.5	0.1	0.1			6.0	0.1
16		0.1	1.0	0.1	0.1	4.0		1.0			6.0	
17			18.0	3.5	20.8				41.0		3.5	
18	0.1	0.1	7.0		1.0	0.1	0.1					
19			0.8	1.6		4.5	2.5					
20		0.1				18.0			1.0		2.0	
21		1.0	1.0	1.0				3.0	8.0	12.5	1.0	
22		2.5	0.1		17.6			0.1	54.0	23.0		
23		0.1		21.0	13.5		10.0		8.5	8.5		
24				0.1	17.0		9.5	2.0		0.1		
25				11.0				7.0	0.1	1.5		
26				0.1		0.1		4.5		4.0		
27		1.0	1.5		0.1	0.1				6.5		
28			0.5		23.8			10.0	6.5	3.0		
29		-	2.0			13.0				1.0		
30		-		47.5		-	1.0		6.5	0.1		
31		-	0.1	-	0.1	-	-		-	-		
月総雨量	0.2	6.0	130.1	89.5	188.7	82.6	60.8	265.3	144.6	70.7	35.5	21.6
最大	0.1	2.5	50.0	47.5	47.5	26.5	21.0	95.5	54.0	23.0	6.5	11.0
平均	0.1	0.7	8.1	4.7	10.5	5.9	5.1	14.0	10.3	5.1	3.6	4.3
無降雨日数	29	19	15	11	13	15	18	12	16	16	21	26
降雨日数	2	9	16	19	18	15	13	19	14	15	9	5

: No Rainfall
0.1: Trace
0: No Record In That Day

2007年 日雨量年表 Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				0.1	0.1		7.0		1.0			
2						12.8	0.1	0.1	17.5			
3					3.5	0.1	9.5	2.5	4.0		22.0	
4					0.1				1.0		1.0	0.1
5			0.1			39.0		20.0	47.0	1.5		
6					6.5		0.1			0.1		
7					22.0	23.0		16.5				
8							5.2				1.0	0.1
9			5.0	0.1	2.5	4.5		43.5				
10			1.8	5.7		20.5		0.1	9.5		20.5	
11				10.5			60.3	0.1	18.0			
12					18.3				14.0			
13				73.5	13.5		5.5	11.5		5.5		0.1
14				4.0	20.0			0.1		8.0		
15			0.1			1.5	0.1	1.0	7.5		3.5	
16				0.1	18.0		67.5	0.1			0.1	
17			0.1		49.3		2.0	0.1	1.0	13.0		
18				0.1	6.5					27.0		
19						1.5		6.5	1.0	10.5		
20						0.1				0.1		
21				4.0		0.1			5.5	6.5		
22			1.5			27.0		8.0		2.5		
23			0.1					0.1		0.1	8.5	
24								0.1				
25		0.1		4.5			10.5	0.1	1.0			
26		1.0						7.0	0.1			
27			0.1	0.1		0.1		1.0				
28			3.5	1.0	3.8		9.5	5.0				
29			0.1		11.5	0.1	13.5			-		
30		-	0.1	14.2	4.5		3.5	0.1	-	-		
31		-	-	-	0.1	-	-	3.5	-	-		
月総雨量	0.0	1.1	12.5	117.9	180.2	130.3	194.3	127.0	128.1	74.8	56.6	0.3
最大	0.0	1.0	5.0	73.5	49.3	39.0	67.5	43.5	47.0	27.0	22.0	0.1
平均	0.0	0.6	1.1	9.1	11.3	10.0	13.9	5.8	9.2	6.8	8.1	0.1
無降雨日数	31	27	19	17	15	17	16	9	15	17	24	28
降雨日数	0	2	12	13	16	13	15	22	15	14	6	3

: No Rainfall
0.1: Trace
0: No Record In That Day

2008年 日雨量年表 Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				1.0		24.5						
2				0.1	10.5	7.0	0.1					
3					1.5		9.0		27.0	2.5	1.0	
4					8.5			0.1		10.0	8.0	
5					11.5			2.5	45.0	1.5		0.1
6				1.5		20.5			12.0	3.0		
7			0.0		1.5			5.0	45.5		42.5	
8			0.0	0.1	0.1			6.0		3.5	3.0	
9			0.0		3.5	5.5		1.0			3.5	
10			0.0			1.0	0.1					
11				1.0				18.5	22.5			
12			0.0	4.5	0.1			1.0	57.0	1.5		
13	1.0		0.0	23.5			14.5	1.0	17.0	40.5		
14	2.5		0.0	2.0	14.0	2.0			3.0	1.5		
15	0.1		0.0	0.1				7.0		0.1		
16			0.0	2.5			62.0	19.0	3.5			
17			0.0		1.0		3.0		0.1			
18	0.1		0.0		42.0			7.5	0.1			
19	6.0		0.0	13.5	0.1			19.8				
20			0.0	0.1	0.1	1.0			7.5			
21			0.0	34.0				1.0				
22			0.0	3.5	0.1		0.1			57.0		
23			0.0		3.0		5.0	2.5		17.0		
24			0.0	1.5	-				7.0			
25			0.0				1.5		15.5			
26		0.1	0.0			1.0	1.5	2.0		1.0		
27			0.0					6.0				
28	-							1.5		29.5		
29		0.1	2.5	0.1	20.0	5.5	11.0	4.0				
30		-	9.3		-			0.1	4.5	-		
31		-	-	-	-	-		4.0	0.1	0.1	-	
月総雨量	9.7	0.2	11.8	89.0	117.5	68.0	107.8	109.5	267.3	168.7	58.0	0.1
最大	6.0	0.1	9.3	34.0	42.0	24.5	62.0	19.8	57.0	57.0	42.5	0.1
平均	1.9	0.1	0.5	5.6	7.3	7.6	9.8	5.5	16.7	12.1	11.6	0.1
無降雨日数	25	27	8	14	12	21	20	11	15	16	25	30
降雨日数	6	1	23	16	19	9	11	20	15	15	5	1

: No Rainfall
0.1: Trace
0: No Record In That Day

2009年 日雨量年表 Juba International Airport

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			0.1						13.0			
2						0.1		3.0	2.0	5.0		1.5
3				18.0		1.5		1.0			2.0	
4		0.1		1.0					1.0	17.5	1.0	5.5
5							12.0	9.0	0.1		5.0	
6			0.1	4.0			1.0	5.5				
7				9.5		8.5	21.0		1.5	12.5		
8						1.5	3.0		1.5			
9		0.1	1.5	19.6				41.5				
10		0.1	0.1	5.0	0.1				2.5			1.0
11				7.2	16.0		34.5		44.0			
12				35.0	0.1				6.5		2.0	1.0
13						0.1					10.5	0.1
14				1.5			0.1		0.1		4.0	
15				22.0	12.0	1.8		27.0	0.1		25.0	3.0
16			2.5	24.5			1.0			4.0		
17							7.0					
18		5.0		38.0		13.5	1.0		0.1			
19		1.5	0.1	2.5				4.0	5.0			
20		3.0		14.5	25.5					0.1		
21	0.1		1.5	2.5	1.1	6.0		1.5	5.0		6.0	0.1
22			8.5	0.1		0.1	2.0	34.5	0.5			
23			0.1					0.1				
24	0.1	0.1	0.1			0.1	18.0	10.0	25.0	1.0	4.5	
25	30.0		0.1			0.1	1.0	1.0		7.0	0.1	
26	0.1				0.1			2.0	5.5	7.0		
27	1.0	4.0				6.5						
28		22.0		67.2			2.1		13.0	7.0	2.5	
29	19.0	-	0.1	1.0	1.5				10.5	4.0		
30	10.5	-	-	5.0	2.5							
31		-	-	-	-				-		-	
月総雨量	60.8	35.9	14.8	278.1	58.9	39.8	103.7	140.1	136.8	65.1	62.6	12.2
最大	30.0	22.0	8.5	67.2	25.5	13.5	34.5	41.5	44.0	17.5	25.0	5.5
平均	8.7	4.0	1.2	14.6	6.5	3.3	8.0	10.8	7.6	6.5	5.7	1.7
無降雨日数	24	19	17	11	22	18	18	18	11	21	19	24
降雨日数	7	9	14	19	9	12	13	13	19	10	11	7

: No Rainfall
0.1: Trace
0: No Record In That Day

資料 9. ステークホルダーミーティング
議事録及び参加者名

ステークホルダーミーティング議事録及び参加者名

		日付
第一次現地調査	第 1 回ステークホルダー協議	2010 年 11 月 9 日
第二次現地調査	第 2 回ステークホルダー協議（TOR 説明）	12 月 15 日
第三次現地調査	グループ協議（農民）	2011 年 2 月 24−25 日
	第 3 回ステークホルダー協議	2 月 27 日
	合同サイト視察	3 月 2〜4 日
	第 4 回ステークホルダー協議	3 月 17 日
	第 5 回ステークホルダー協議（概要説明）	3 月 24 日

(1) 第一次現地調査

第 1 回スーテクホルダー協議　2010 年 11 月 9 日

Report on 1st Stakeholders meeting on 9th November 2010

Report of the 1st Stakeholders Meeting,

Prepared by MTR

9th November 2010

Attachment:

- Minutes of Meeting (3 pages)
- Attendant Lists
  - Original with Signature
  - Typed
- Invitation Letter (2 pages)
- Proposed Participant
- Handout
  - Program (same as 2nd page of invitation letter)
  - Presentation - Project Outline
  - Presentation - Environmental and Social Consideration
- Photos

Minutes of Meeting for the 1st Stakeholders Meeting

Date: 8th November 2010

Venue: Home and Away Business Center

Time: 10:00-12:30

Chaired by: Mr. Otim, Deputy Director, MTR

Opening Speech 10:10:25

Mr. Murice Rahman, Director of Road Safety, Ministry of Transport and Bridge (MTR), GoSS

Stating that the resettlement issue is very important in this project

Mr. Louis Gore George, the 1st Director General of Ministry of Physical Infrastructure (MOPI), CES:

Stating the proposed bridge is critically important. We should follow the findings and recommendation made through the study

Presentation of Project Outline 10:25-10:35 as per Power Point Attached

Mr. Otim Bong, Deputy Director, MTR

Presentation of Environmental and Social Considerations 10:50-11:50 as per Power Point Attached

Mr. Shoji, Social Specialist of JICA Study Team

Discussion:11:50-12:30

Mr. Butrus Apollo, Southern Sudan Land Commission (SSLC), GoSS.:

Presently, there is no proper land policy or act. We are now trying to prepare. However we have a referendum on coming January and are afraid that approval of these new laws will delayed further more.

Mr. Shoji: Study team will fully support you to prepare proper compensation plan.

Mr. Joseph Lam, Ministry of Environment (MOE), GoSS.

The compensation is made one time only or continuously?

Mr. Shoji: Basically one time only and, based on the results of post

Mr. Dorina Keji, MOE: (a) How about impact to global warming? (b) How about the quality of river water since we have a drinking water treatment plant down stream?

Mr. Shoji: (a) Released Carbon Dioxide, green house gas, from vehicles will be reduced due to reduction of consumed fuel since efficiency of traffic flow will be improved by the new bridge. (b) As for river water contamination, we will study the most suitable construction methods to minimize the disturbance of river bed/sediments

Ms Gloria H.Sao, UNHCR: (a) Compensation amount will be replaceable amount? (b) How about treatment of landless people?

Mr. Shoji: Value-Assessment Committee will be set up and determine replaceable prices. A minimum plot will be provided to landless people

Mr. Butrus Appllo, SSLC: A group relocation site, 14 miles west from Juba, is being planned.

Mr. Charls Andrea Joda, Director of Rejaf Payam, Information disclosure to is critically important. Without it, the project can result in failed.

Mr. Otim, MTR: It is impossible to implement the project without notifying to the residents. Please continue to joining to these stakeholders meetings from now on as well.

Ms Cecilia, MOE: How to secure the ROW area after declaring Cut-Off Day, since many people will come back to Southern Sudan after referendum?

Mr.Otim, MTR: It is important that everybody meet together and study various measures for all people.

Closing remark

Mr. Maurice Rahman. MTR

Report on 1st Stakeholders meeting on 9th November 2010

No.		Title	Organisation	Mobile Phone	Signature
1	Maurice Reham	D/G Road Safety	MTR		
2	Peter Makuol	Senior Officer	MTR		
3	Otim Bong	D/Director	MTR		
4	Butrus Apollo	Coordinator	SSLC (GOSS)		
5	Gloria H. Sao	Prof. Asst	UNHCR		
6	Alsushi Nashimoco	Ass. reintegration officer	UNHCR		
7	Emmanuel Matay	D/G Housing CESM	MOPI CESM		
8	Lewis Gore	1st D/G infrastructure	MOPI		
9	Kiyotaka Tamari	Project Fomulation Aduson	JICA		
10	Joseph Lam	Director	MOE		
11	Moses Gogonya	A/Inspector for E/A	MOE		
12	Dorina Keji	A/Inspector for GIS	MOE		
13	Cecilia Mogga Kenyi	S/Insp for Pollution	MOE		
14	Charles Andrea Joda	Director/ Rejaf Payam	L.Govt.CES/Juba		

No.	Name	Title	Organization	Mobile Phone	Signature
1	Maurice Rehan	D/G Road Safety	MTR		
2	Peter Mo Kuol	Senior Officer	MTR		
3	Ofiri Borg	D/Director	MTR		
4	Butrus Apollo	Coordinator	SSLC (GOSS)		
5	Giora H. Sono	Prof. Asst.	UNHCR		
6	Atsushi Nashimoto	Ass. Reintegration Officer	UNHCR		
7	Emmanuel Matingo	DG Housing CESM	MOPI CES		
8	Lewis Gore	1st DG Infrastructure	MOPI		
9	Kiyotaka Tamura	Project Formulation Advisor	JICA		
10	Joseph Lam	Director	MPE		
11	Moses Goyonga	A/Insp. for EIA	MOE		
12	Donna Keji	A/Insp for GIS	MOE		
13	Cecilia Mogga Kenyi	S/Insp for Pollution	MoE (Goss)		
14	Charles Andrea Jada	Director/Rejaf Payam	Local Govt. CES/Juba County		
15					
16					
17					
18					
19					
20					

Date 4th November 2010

Subject: **Invitation for 1st Stakeholders Meeting on Environmental /Social Survey Study Planning for the New Nile River Bridge Project**

Dear Sir /Madam

The Following the Road Network Development Master Plan proposed under the Juba Transport Infrastructure and Capacity Development Study completed by JICA in December 2009,Government of Southern Sudan emphasized on the development of Roads Network and identified the urgent of construction Circumferential road including the New River Nile Bridge with the objective of the following :

1. To improve the International road network and provide direct link to Uganda and Kenya through Juba –Nimule Road.

2. Politically: I will symbolize the fruits of peace and catalyze economic development of Government of Southern Sudan.

Based on this the Government of Japan has entrusted study to be conducted to identify the viability of the Project through the Japan International Cooperation Agency JICA. This is to be done through a Preparatory Survey to be conducted in stages and during this study the existing Environmental and Social Conditions related to the Nile River Bridge will be assessed for planning purposes like the Resettlement Action Plan for people who will be affected by the project in accordance to the Legal frame works of both Japan Guidelines and World Bank. Therefore you are invited to attend the 1st Environmental /Social Consideration Stake holders Meeting to introduce the concept of the project on the 8th November 2010 at 9:30 Am at Home and Away Business Centre the program as attached .Your participation is highly appreciated.

Yours Sincerely:

Eng.Jacob Marial
Director General-Roads and Bridges
Ag.Under Secretary
Ministry of Transport and Roads:
Government of Southern Sudan –GOSS.

Program Outline or the 1st Stakeholders Meeting Environmental /Social Survey Study planning on 8th November 2010 at 9:30Am.

- Date: 8th (Monday) November; 2010.
- Venue: Home and Away Business Centre
- **Program :**

- 9:30 -10.00am Arrival and Registration

- 10:00-10:15am Opening by the D/G Roads and Bridges –Ministry of Transport and Roads Goss
  Opening Remarks by 1ST Director General; Mr. Louis George Gore –MOPI

- 10:15 -11:30am Outline of the Project ,presented by the D/Director Urban Roads Eng.Otim Bong

- 11:45 -11:45Am - Tea Break

- 11:45-12:30Pm Environmental and Social Considerations, Presented by Mr. Shoji /Ms Umiguchi

- 12:30 -12:45Pm Discussions and Observations.

- 12:45-13:00Pm -Closing Remarks by 1ST Director General; Mr. Louis George Gore –MOPI and Lunch

List of Proposed Participant:

- Goss

1) Mr. Jacob, Director General, Ministry of Transport and Road
2) Undersecretary, Ministry of Environment Ministry
3) Chairman, Southern Sudan Land Commission
4) Undersecretary, Ministry of Forest and Agriculture
5) Undersecretary, Ministry of Health
6) Chairman, Commission of Census and Statics
7) Traffic Police, Ministry of Interior
8) Road Safety Officer, Ministry of Transport and Road

- CES

9) Mr. Louis, The First Director General, Ministry of Physical Infrastructure
10) Director General, Road and Bridge, Ministry of Physical Infrastructure
11) Director General, Housing, Ministry of Physical Infrastructure
12) Director General, Land and Survey, Ministry of Physical Infrastructure
13) Director General, Agriculture and Forest
14) Minister, Ministry of Environment
15) Commissioner of Juba County
16) Executive Director of Rajaf, Payam (East bank)
17) Executive Director of Lorogo, Payam (West bank)
18) Paramount Chief of Rajaf
19) Paramount Chief of Loroggo

- Donor

20) UNDP
21) USAID
22) UNEP
23) UNHCR
24) World Bank
25) Tamari, JICA

PREPARATORY SURVEY ON THE PROJECT FOR CONSTRUCTION OF NILE RIVER BRIDGE IN SOUTHERN SUDAN

Ministry of Transport and Roads, GOSS
Ministry of Physical Infrastructure, CES

Japan International Cooperation Agency
CTI Engineering International Co., Ltd.
Eight-Japan Engineering Consultants, Inc.

JICA

Location Map

Project Scope

Facility	No. Lanes	Length (m)
Bridge	2	560
Road	2	3,900

Project Objective

The objective of the project is to construct, in close collaboration with GOSS, a new Nile River Bridge and its approach roads to divert and distribute the traffic within and around the city areas without concentrating at the central part of Juba.

Juba Road Network Master Plan

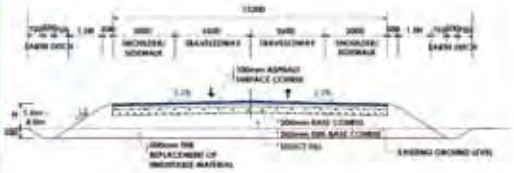
Preparatory Survey Schedule

Undertakings by Southern Sudan to Achieve Project Goals/Objectives

- ✓ Dialogues with PAPs and information disclosure
- ✓ Carry-out procedures and obtain approvals for project
- ✓ Expropriation of land for project right-of-way and resettlement of affected persons
- ✓ Securing resettlement site and temporary yard areas for construction
- ✓ Preparation of Resettlement Site
- ✓ Removal of existing structures and other obstructions
- ✓ Obtaining approvals for environmental permits, mining and quarrying, removal of trees, safety and occupational hazards
- ✓ Relocation of utilities
- ✓ Operation and maintenance of the subject facilities
- ✓ Bank handling charges
- ✓ Taxes and duties

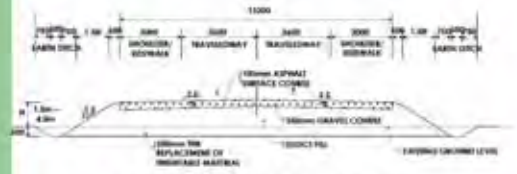
Alternative Alignment/Bridge Locations

Approach Road Section



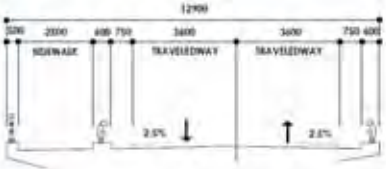
2-Lane Approach Road

Construction Access Road Section



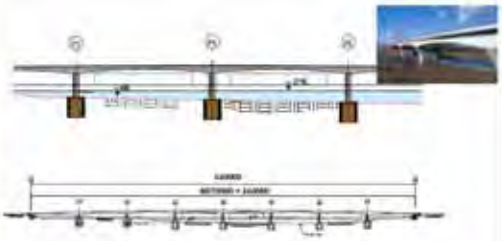
2-Lane Construction Access Road

Bridge Deck Section



2-Lane Bridge Section

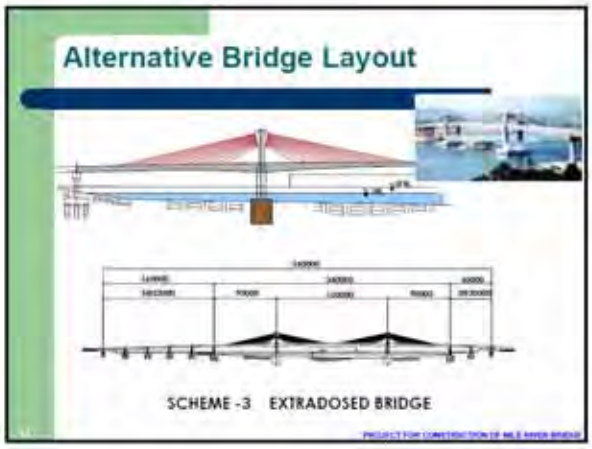
Alternative Bridge Layout



SCHEME - 1 8-SPAN CONTINUOUS PC BOX GIRDER BRIDGE

Alternative Bridge Layout

SCHEME – 2 8-SPAN STEEL ARCH BRIDGE


Alternative Bridge Layout
SCHEME -3 EXTRADOSED BRIDGE

THE PROJECT FOR CONSTRUCTION
OF
NILE RIVER BRIDGE
IN
SOUTHERN SUDAN

Environmental and Social Considerations
By Shoji/Umiguchi

Japan International Cooperation Agency
CTI ENGINEERING INTERNATIONAL CO.,LTD
EIGHT-JAPAN ENGINEERING CONSULTANS, INC

Content of Presentation

- A. Terminology
- B. Flow of Grant
- C. Required Policy for EIA/RAP
- D. Content of EIA
- E. Content of RAP

A. Terminology

- EIA: Environmental Impact Assessment
- RAP: Resettlement Action Plan
- ROW: Right of Way
- GoSS: Government of Southern Sudan
- CES: Central Equatoria State
- JICA: Japan International Cooperation Agency
- WB: World Bank

B. Flow of Grant

Preparation of EIA/RAP by Goss/CES
↓
Approval of EIA/RAP by Stakeholders
↓
Approval of EIA/RAP by Goss
↓
Approval of Grant by Japanese Government

B.1 Approval by Stakeholders Meetings

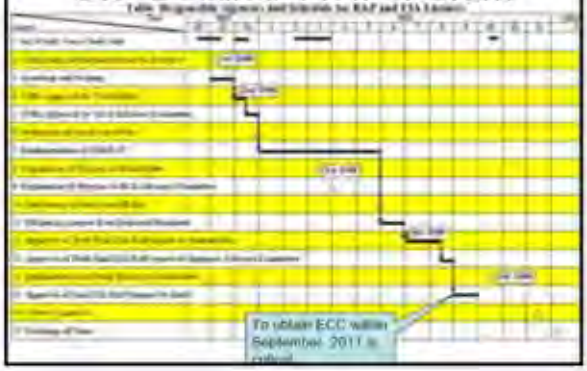
Following Stakeholders Meetings (SHM) are required as the process of EIA/RAP

- 1st Stakeholders Meeting for Project outline (this time meeting)
- 2nd stakeholders meeting for TOR approval (December 2010)
- 3rd Stakeholders Meeting for Study Progress approval (March 2011)
- **4th Stakeholders Meeting for Draft Final Reports Approval (July-August 2011)**
- 5th Stakeholder Meetings for Study Report Explanation (October 2011)

B.2 Approval by JICA Environment Advisory Committee

- Approval of TOR
- Approval of Study Progress
- **Approval for Draft Final EIA/RAP Reports**

B.3 Detailed Flow of Grant



C. Requirement for EIA/RAP

- To fulfill the laws, policies and practices in Southern Sudan, in addition to that,
- To follow the JICA Environmental and Social Considerations Guideline

D. Content of EIA as per JICA Guidelines

D.1 Screening and Scoping
D.2 Understanding of the Project
D.3 Prediction of Environmental Impacts
D.4 Environmental Management Planning
D.5 Monitoring and Evaluation Planning
D.6 Cost Estimation

D.1 Screening and Scoping

- The purpose is to determined the necessity of EIA and what items to studies
- To pick up possible items which can be negatively impacted.

D.1.1 Natural Environmental Impacts

- Air pollution
- Water pollution
- Soil pollution
- Waste
- Noise and vibrations
- Ground subsidence
- Offensive odors
- Geographical features
- Bottom sediment
- Biota and ecosystems
- Water usage
- Accidents
- Global warming

D.1.2 Social Environmental Impacts

- Involuntary resettlement
- Local economies, such as employment, livelihood, etc.
- Land use and utilization of local resources
- Social institutions such as social infrastructure and local decision-making institutions
- Existing social infrastructures and services
- Poor, indigenous, or ethnic people
- Misdistribution of benefits and damages
- Local conflicts of interest
- Gender
- Children's rights
- Cultural heritage
- Infectious diseases such as HIV/AIDS

D.2 Understanding of the Project

- Description of the project including.
- Site
- Structure
- Work Period
- Cost
- Labors
- Material used
- Waste generated

D.3 Prediction of Environmental Impacts

- Based on the content of project assume the degree of impacts thorough:
- experiences
- hearing
- site surveys
- environmental monitoring
- numerical analysis

D.4 Environmental Management Planning

- To propose mitigation measures to each of the negative impacts predicted. For example:
- Resettlement Action Planning for possibly displaced people
- Environmental management planning while construction/after operation
- Safety/Health management planning

D.5 Monitoring and Evaluation Planning

- To verify and correct, if necessary, environmental managing activities
- Monitoring shall be basically continued while construction and after operation to be confident that negative impacts have been properly mitigated.

D.6 Cost Estimation

- To prepare the budget for the cost to implement environmental mitigation plans, for example:
- Compensation for displaced people
- Spraying of water while earth filling work

E. Contents of RAP as per JICA guidelines

E.1 Screening and Scoping
E.2 Understanding project
E.3 Alternative study
E.4 Policy and Legal Framework
E.5 Participation and Consultation
E.6 Socio-economic Survey
E.7 Compensation Policy Planning
E.8 Grievance Redressing
E.9 Monitoring and Evaluation

Continued:

E.10 Implementation Schedule Planning
E.11 Replacement Cost Survey
E.12 Compensation Matrix Planning
E.13 Income Restoration Planning
E.14 Declaration of Cut-Off Day
E.15 Demarcation
E.16 Census
E.17 Asset Inventory
E.18 Cost Estimation

E.1 Screening and Scoping

- Same as D.1

E.2 Understanding project

- Same as D.2

E.3 Alternative study

- To select the most feasible option with the minimum negative environmental impact, for example;
- Comparison of Possible Routes 1,2,3,4,5 by number of displaced people/construction cost
- Zero option, in case of without project, shall be considered together

E3.1 Alternative routes

E.4 Policy and Legal Framework

- To understand the present laws, sub-laws and practices of recipient government
- To clarify the responsible/mandated agencies for environmental management activities
- By these, to propose what rules and organizations shall have to be established, if necessary, to fulfill the requirement of JICA Environmental and Social Considerations Guidelines

E.5 Participation and Consultation

- To incorporate the opinion, request, desire of Project Affected Peoples as much possible
- Stakeholders meetings (4 times more)
- Small group discussion for vulnerable people (aged, poor, landless, widowed, handicapped)

E.6 Socio-economic Survey

- To know the response to the project
- To clarify the levels of life, livelihood/income of affected peoples so that the level of compensation/assistance can be properly determined
- The maximum numbers of 500 households shall be door to door interviewed including directly and indirectly affected people.

E.7 Compensation Policy Planning

- The levels of life, livelihood/incomes of affected people shall be maintained or improved by the project (digging of tube well?)
- Compensation prices shall be replaceable/purchasable amount to regain the lost assets, as is determined by the Value-Assessment Committee
- Additional assistants (money, in kind) to those, if their life level/livelihood are not restored.

E.8 Grievance Redressing

- Fair, impartial and quick responded grievance committee shall be established, if necessary, to take immediate action to resolve the grieves raised
- The committee member shall includes representatives of affected people and NGOs.

E.9 Monitoring and Evaluation

- To verify if resettlement activities are properly implemented such as:
  - Asset inventory was properly done
  - Compensation was paid as per agreed
  - Relocation plot is allocated beforehand
  - Life level/livelihood are restored as before

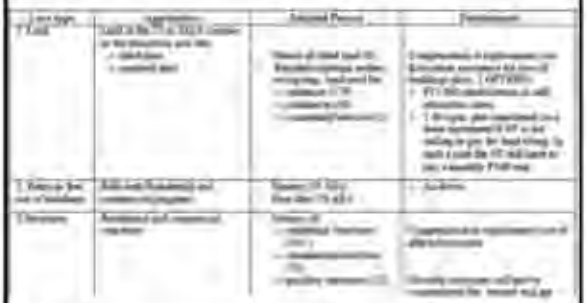
E.10 Implementation Schedule Planning

- To propose the detailed time table of resettlement activities

E.11 Replacement Cost Survey

- To establish the replaceable/purchasable compensation unit prices for the lost assets by the project, Value-assessment Committee including not only government agencies but also representatives of displaced people/communities and human-right NGO shall be established
- Based on the committee, compensation unit prices are finalized, to which prices every affected people shall follow.

E.12 Compensation Matrix Planning



E.13 Income Restoration Planning

- To provide the program for those whose income level can be deteriorated.
- Generally program includes:

- Provision of allowances
- Micro finance
- Job training (agriculture, etc)
- Priority provision of work at construction site

E.14 Declaration of Cut-Off Day

- To prevent the encroacher into the possible project area
- To prohibit new development (building construction, new cultivation of farm)
- To freeze the transaction of lands to prevent speculation

E.15 Demarcation

- To install the pegs on ground surface to indicate the boundary of ROW, within which, all properties shall be cleared before construction work

E.16 Census

- To confirm the number, type, entitlement etc of people with in the ROW to be displaced

E.17 Asset Inventory

- To estimated the assets with in the ROW based on the prices determined by Value-assessment Committee
- Note that if the remaining portion out of ROW is too less, all the assets outside ROW shall be compensated as well

E.18 Cost Estimation

- To estimate the total cost for above resettlement activities

End

- Thank you very much

Venue of the 1st Stakeholders Meeting
(Home and Away Business Center)

Participants

Presentation made by MTR

Photo The 1st Stakeholders Meeting held on 8th November 2010