KJE PPP Project Phase 1

Technical Appendix Surface & Groundwater

DRAFT

SURFACE & GROUNDWATER

Methodology

Several studies have been conducted as part of the ESIA process to characterise baseline surface and groundwater conditions along Phase 1 of the KJE alignment. A brief methodology for each study along with a map of key monitoring sites are presented below.

Earth Systems 2018

Surface water samples were taken from major drainages as informed by hydrological analysis of the project area. Samples for laboratory analysis were collected for each of the seven sites along with field parameters (pH, EC, ORP, T). All samples were collected immediately downstream of the project footprint where possible.

Groundwater sampling sites were informed by public facility census data collected along Phase 1 of the KJE alignment. The four most frequented groundwater sources within the ROW were sampled for laboratory analysis while two sources immediately adjacent to the ROW were also sampled. Field parameters (pH, EC, ORP, T) were collected for an additional three sources within the alignment and four sources outside, but close to, the ROW.

Literature Review

Water quality data was also interpreted from a range of studies (Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011). The collated data from these studies is presented below.

ICS 2013

KJE

Field parameters and water samples of key waterbodies were taken along the proposed KJE alignment. Physical water quality assessment involves determination of parameters which include pH, temperature, turbidity, transparency, among others. Chemical water quality assessment involves the assessment of various parameters including; Conductivity as well as also salinity, Dissolved Oxygen (DO), nitrate-N, orthophosphates, Chemical oxygen demand (COD), Biochemical oxygen demand (BOD) and Pesticides.

KSB

To provide a baseline against which future audits could be compared to ascertain the impact of KSB, surface and groundwater samples were picked to ascertain the general water chemistry of the area before the road construction. The water quality samples were taken at selected points which include the flow points (those that could be accessed easily), some community water sources as well as crossing areas.

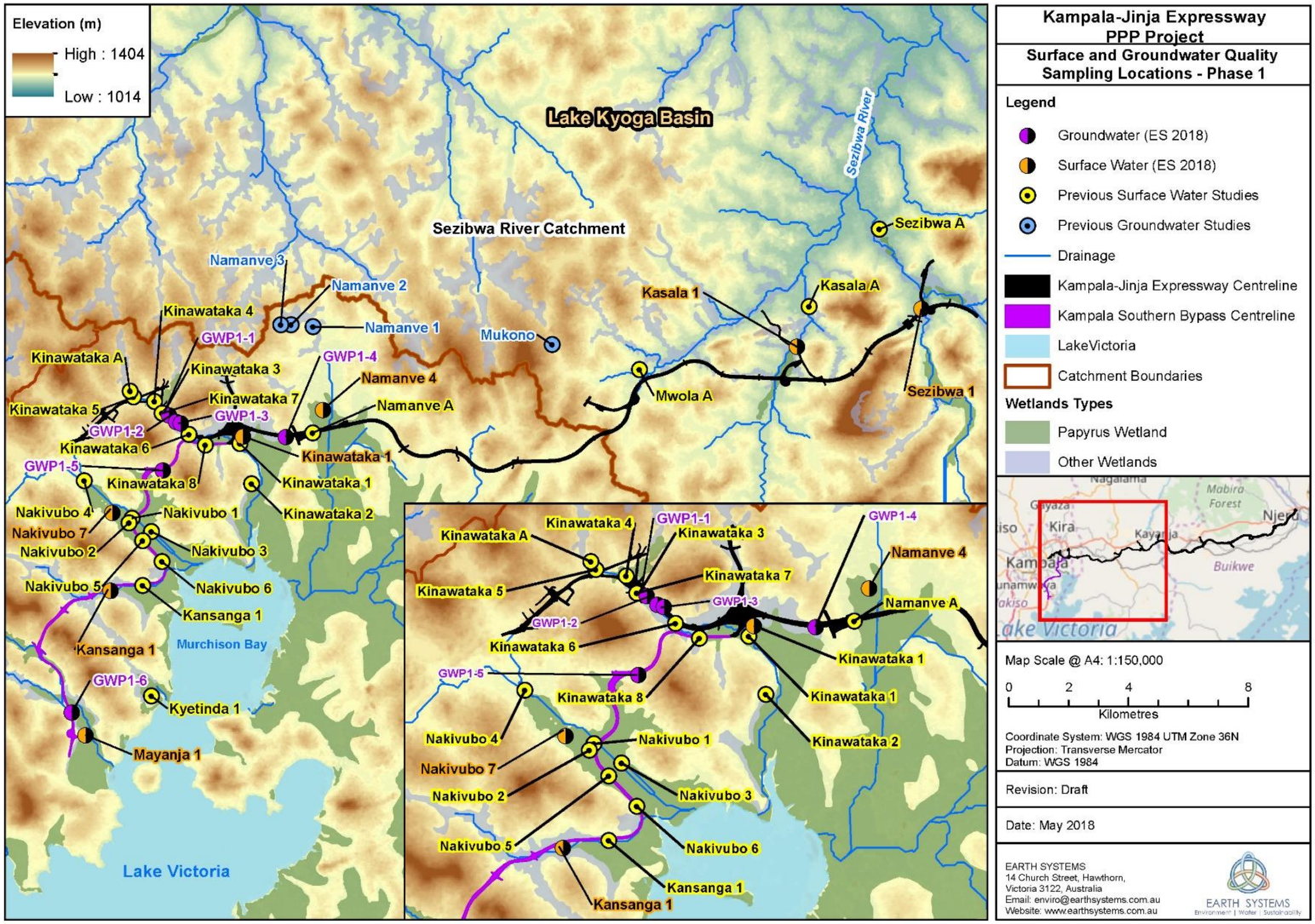

Figure 1: Surface and groundwater water sampling locations in the vicinity of KJE Phase 1 (Earth Systems, Kaggwa et al. 2001, Akurut et al. 2017, Nabulo et al. 2008, Muwanga & Barifaijo 2006, Walakira, 2011, ICS 2015)

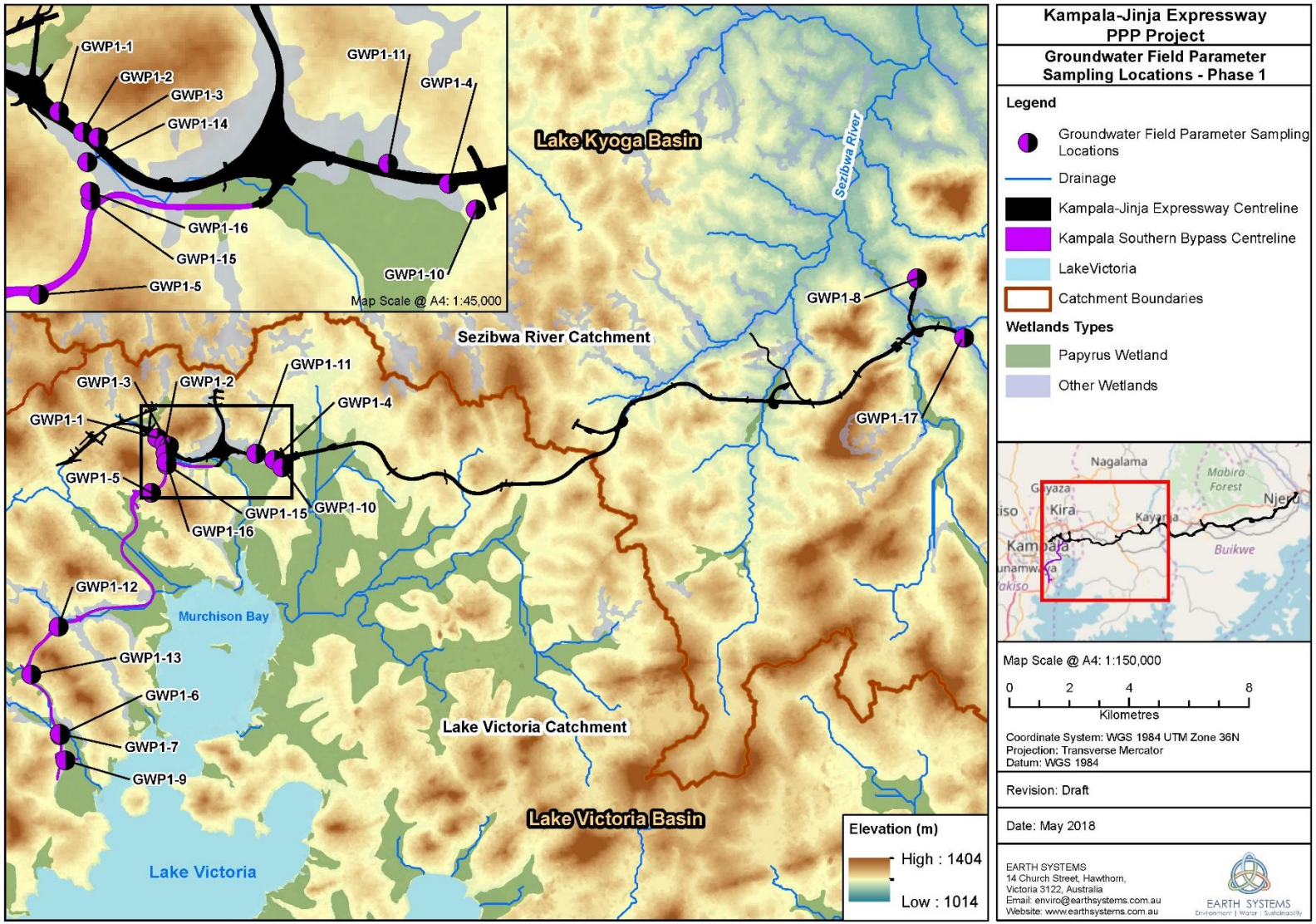

Figure 2: Groundwater field parameter sampling locations (Earth Systems)

Surface and Groundwater Data

Earth Systems 2018

Surface Water

Site Name	Sample Date	Location*		Field Parameters			
		Northing	Easting	pH	EC (uS/cm)	ORP (mV)	T (°C)
Mayanja 1	25/03/2018	26193	456805	6.9	463	160	22.5
Kansanga 1	25/03/2018	31037	457637	7.48	586	-15	23.8
Kinawataka 1	25/03/2018	36194	462074	7.44	380	40	27
Nakivubo 7	25/03/2018	33634	457700	7.3	580	-220	25.3
Ssezibwa 1	26/03/2018	40461	484762	7.01	60	100	23.1
Kasala 1	26/03/2018	39188	480597	6.5	85	136	27
Namanve 4	26/03/2018	37069	464751	7.5	375.6	185	25.8

* WGS84 UTM Zone 36N

Plate 1: Surface water sampling site Mayanja 1

Plate 2: Surface water sampling site Kansanga 1

Plate 3: Surface water sampling site Kinawataka 1

Plate 4: Surface water sampling site Nakivubo 7

Plate 5: Surface water sampling site Ssezibwa 1

Plate 6: Surface water sampling site Kasala 1

Telephone
+256 (0) 414 250 464 (Gen)
+256 (0) 414 250 474
Email: dgal@mia.go.ug
Website: www.mia.go.ug

In any Correspondence on this subject please quote No. GE059/18

April 04, 2017

THE REPUBLIC OF UGANDA

MINISTRY OF INTERNAL AFFAIRS
DIRECTORATE OF GOVERNMENT ANALYTICAL LABORATORY
Plot No. 2 Lourdel Road
Wandegeya,
P.O.BOX 2174
Kampala - Uganda

REPORT OF ANALYSIS

Description of Sample

Six River water samples labeled 'Sezibwa 1' (SZ1), 'Kasala 1' (KAS!), 'Musamya 1' (MUS1), 'Kagonja 1' (KAG1), 'Kitimbwa 1' (KIT1) and 'Namamve Ø' (NAMØ) were received on March 27, 2018 for compliance to US 201:2008; Specifications for Drinking (Potable) Water Class II

Methods of Analysis

Metal ions were quantified from an acidified sample, at respective wavelengths, using Atomic Absorption Spectrometry technique, Shimadzu 6300. A five-point calibration curve was used to get the concentration of each metal ion. Nitrates, phosphates, sulphates, chlorides and ammonia were determined by UV-VIZ Spectrometry technique, Shimadzu, 1601 at respective absorption wavelengths. Coliforms and *E. coli* were determined by Membrane Filtration Technique at 37ºC and 44ºC respectively. All determinations were done in duplicate.

Results of Analysis

The mean analysis values are as below;

Parameter	Result						Limits/Authority
	SZ1	KAS1	MUS1	KAG1	KIT1	NAMØ	
pH	6.9	6.6	6.8	7.2	6.5	6.8	6.5 – 8.5
Color (TCU)	6	6	8	4	6	6	15 Max
Conductivity(µS/cm)	128	132	232	212	164	282	2500 Max
Total Dissolved Solids (mg/l)	968	958	988	975	958	997	1500 Max
Total Suspended Solids (mg/l)	12	15	14	18	10	22	Not indicated
Total Alkalinity (mg/L)	68	76	54	68	64	56	Not Indicated
Total Hardness (mg/l)	37	42	44	36	28	27	Not Indicated
Turbidity (NTU)	**14**	**14**	**15**	**16**	**15**	**18**	10 Max
Calcium (mg/kg)	18.2	18.6	21.7	16.9	18.4	18.8	Not Indicated
Copper (mg/l)	1.6	1.4	1.4	1.2	1.6	1.4	2.0 Max
Iron (mg/l)	**2.6**	**4.2**	**2.2**	**2.7**	**1.8**	**2.6**	1.0 Max
Lead (mg/l)	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	0.01	0.01 Max
Magnesium (mg/l)	12.8	14.3	12.4	12.6	14.6	12.8	150 Max
Manganese (mg/l)	0.07	0.02	0.04	0.08	0.06	0.09	0.1 Max
Zinc (mg/l)	1.2	1.5	1.8	2.3	1.4	2.4	Not Indicated
Ammonia (mg/l)	0.5	0.3	0.2	0.6	0.2	0.8	1.0
Chlorides (mg/l)	124	128	132	126			500 Max
Nitrates (mg/l)	4.4	6.8	5.3	2.8	4.3	12.8	50 Max**
Phosphorus (mg/l)	1.6	1.2	1.7	1.6	1.4	2.8	Not Indicated
Sulphates (mg/l)	128	134	118	134	134	228	Not Indicated
Oil & Grease (mg/L)	0	0	0	0	0	1.2	Not Indicated
BOD_5 (mg/L)	46.4	42.5	42.8	46.5	48.8	65.8	Not Indicated
COD (mg/L)	87.6	96.6	94.8	88.8	96.7	99.8	Not Indicated
Total Coliforms cfu/100ml)	**8**	**10**	0	0	**6**	**12**	Absent
E. coli (cfu/100ml)	**2**	**4**	0	0	**2**	**4**	Absent

Remarks

1. * Detection Limit, AAS technique, Shimadzu 6300 ** Short Term Exposure
2. Parameters in bold do not meet requirements of the Standard
3. Results relate to sample and are reported on as received basis

Justus Mike Ocom
Senior Government Analyst

"Go Scientific for a Safe and Just Society"

Telephone
+256 (0) 414 250 464 (Gen)
+256 (0) 414 250 474
Email: dgal@mia.go.ug
Website: www.mia.go.ug

In any Correspondence on this subject please quote No. GE 054/18

April 4, 2018

THE REPUBLIC OF UGANDA

MINISTRY OF INTERNAL AFFAIRS
DIRECTORATE OF GOVERNMENT ANALYTICAL LABORATORY
Plot No. 2 Lourdel Road
Wandegeya,
P.O.BOX 2174
Kampala - Uganda

REPORT OF ANALYSIS

Description of Sample
Four river water samples labeled 'Mayanja 1' (MAYA1), 'Kansanga 1' (KANS1), 'Nakivubo 1' (NAKI1) and 'Kinawataka 1' (KINA1) were received on March 26, 2018 for compliance to US 201:2008; Specifications for Drinking (Potable) Water Class II

Methods of Analysis

pH was determined using a pH Meter. Metal ions were quantified from an acidified ashed sample, at respective wavelengths, using Atomic Absorption Spectrometry technique, Shimadzu 6300. A five-point calibration curve was used to get the concentration of each metal ion. Nitrates, phosphates, sulphates, and ammonia were determined by UV-VIZ Spectrometry technique, Shimadzu, 1601 at respective absorption wavelengths. All determinations were done in duplicate.

Results of Analysis
The mean analysis values are as below;

Parameter	Result				Limits/Authority
	MAYA1	KANS1	NAKI1	KINA1	
pH	6.8	6.8	7.4	7.2	6.5 – 8.5
Color (TCU)	2	2	**27**	14	15 Max
Conductivity(µS/cm)	134	138	428	212	2500 Max
Total Dissolved Solids (mg/L)	1127	1124	**2874**	997	1500 Max
Total Suspended Solids (mg/L)	10	10	142	18	Not Indicated
Total Alkalinity (mg/L)	78	77	168	88	Not Indicated
Total Hardness (mg/L)	68	68	121	56	Not Indicated
Turbidity (NTU)	9	9	**78**	**18**	10 Max
Calcium (mg/L)	24.4	24.2	58.4	32.5	Not Indicated
Copper (mg/L)	1.8	1.8	**4.7**	**2.8**	2.0 Max
Iron (mg/L)	**6.2**	**6.4**	**12.4**	**6.2**	1.0 Max
Lead (mg/L)	≤0.001*	≤0.001*	**2.2**	**1.2**	0.01 Max
Magnesium (mg/L)	24.6	24.2	28.9	18.8	150 Max
Manganese (mg/L)	0.08	0.08	**2.7**	**1.5**	0.1 Max
Zinc (mg/L)	1.5	1.8	1.8	1.2	Not Indicated
Ammonia (mg/L)	0	**1.2**	**12.4**	**4.2**	1.0 Max
Chlorides (mg/L)	124	129	435	324	500 Max
Nitrates (mg/L)	4.6	4.8	21.6	12.7	50 Max**
Phosphorus (mg/L)	1.6	1.5	6.2	2.3	Not Indicated
Sulphates (mg/L)	123	120	256	187	Not Indicated
Oil & Grease (mg/L)	0	0	14.2	4.6	Not Indicated
BOD_5	44.8	36.8	88.2	58.4	Not Indicated
COD	88.6	68.6	137.4	112.2	Not Indicated
Coliforms (cfu/100ml)	**6**	**8**	**2400**	**1124**	Absent
E. coli (mg/L)	**2**	**2**	**1834**	**96**	Absent

Remarks
1. * Detection limit; Atomic Absorption Technique, Shimadzu, 6300 ** Short Term Exposure
2. Parameters in bold do not meet requirements of the standard
3. Results relate to sample and are reported on as received basis

Justus Mike Ocom
Senior Government Analyst

"Go Scientific for a Safe and Just Society"

CERTIFICATE OF ANALYSIS

Work Order	: **PR1828666**	Issue Date	: 16-Apr-2018
Customer	: **Earth Systems, Environment-Water-Sustainability**	Laboratory	: ALS Czech Republic, s.r.o.
Contact	: John Muchan	Contact	: Client Service
Address	: 14 Church St Hawthorn Victoria 3122 Australia	Address	: Na Harfe 336/9 Prague 9 - Vysocany 190 00 Czech Republic
E-mail	: john.muchan@earthsystemsafrica.com	E-mail	: customer.support@alsglobal.com
Telephone	: ----	Telephone	: +420 226 226 228
Facsimile	: ----	Facsimile	: +420 284 081 635
Project	: KJEXP1775	Page	: 1 of 8
Order number	:	Date Samples Received	: 03-Apr-2018
C-O-C number	: ----	Quote number	: PR2011EARSY-AU0003
Site	: Kampala, Uganda	Date of test	: 04-Apr-2018 - 12-Apr-2018
Sampled by	: Client Mr. Muchan	QC Level	: ALS CR Standard Quality Control Schedule

General Comments

This report shall not be reproduced except in full, without prior written approval from the laboratory.
The laboratory declares that the test results relate only to the listed samples.
Sample(s) PR1828666/001-010, method W-NTOT-IR was/were filtered prior to analysis (filter porosity 0.45 µm).

Responsible for accuracy

Testing Laboratory No. 1163
Accredited by CAI according to
CSN EN ISO/IEC 17025:2005

Signatories		*Position*
Zdeněk Jirák		Environmental Business Unit Manager

Analytical Results

Sub-Matrix: **WATER**

				Client sample ID	Mayanja 1		Kansanga 1		Nakivubo 7	
				Laboratory sample ID	PR1828666-001		PR1828666-002		PR1828666-003	
				Client sampling date / time	25-Mar-2018 09:00		25-Mar-2018 10:00		25-Mar-2018 11:00	
Parameter	*Method*	*LOR*	*Unit*		**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters										
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m		**43.3**	± 10.0%	**61.8**	± 10.0%	**58.5**	± 10.0%
pH Value	W-PH-PCT	1.00	-		**7.38**	± 1.1%	**7.46**	± 1.1%	**7.35**	± 1.1%
Agregate Parameters										
Sum of calcium and magnesium	W-HARD-DG	0.0020	mmol/L		**1.35**	----	**1.35**	----	**1.22**	----
Calcium (Ca)	W-HARD-DG	0.0020	mmol/L		**1.03**	----	**1.03**	----	**0.938**	----
Magnesium (Mg)	W-HARD-DG	0.00040	mmol/L		**0.321**	----	**0.318**	----	**0.281**	----
Sum of Calcium and Magnesium as CaCO3	W-HARD-DG	0.20	mg CaCO3/L		**135**	----	**135**	----	**122**	----
Nonmetallic Inorganic Parameters										
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L		**1.63**	± 15.0%	**9.56**	± 15.0%	**15.2**	± 15.0%
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L		**2.10**	± 15.0%	**12.3**	± 15.0%	**19.6**	± 15.0%
Chloride	W-CL-IC	1.00	mg/L		**26.2**	± 15.0%	**52.6**	± 15.0%	**48.2**	± 15.0%
Fluoride	W-F-IC	0.200	mg/L		**0.283**	± 15.0%	**0.296**	± 15.0%	**0.245**	± 15.0%
Nitrates	W-NO3-IC	2.00	mg/L		**19.5**	± 15.0%	<2.00	----	<2.00	----
Nitrites	W-NO2-IC	0.040	mg/L		<0.040	----	<0.040	----	<0.040	----
Orthophosphate	W-PO4O-SPC	0.040	mg/L		**0.112**	± 20.0%	**0.679**	± 20.0%	**3.23**	± 20.0%
Phosphorus (as P2O5)	W-PTOT-SPC	0.120	mg/L		**0.626**	± 20.0%	**4.21**	± 20.0%	**5.76**	± 20.0%
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L		**13.1**	± 15.0%	**26.0**	± 15.0%	**14.5**	± 15.0%
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L		**1.98**	± 26.1%	**12.4**	± 20.2%	**16.6**	± 20.1%
Total Nitrogen as N	W-NTOT-IR	0.10	mg/L		**7.63**	± 30.0%	**10.5**	± 30.0%	**14.1**	± 30.0%
Total Phosphorus as P	W-PTOT-SPC	0.050	mg/L		**0.273**	± 20.0%	**1.84**	± 20.0%	**2.51**	± 20.0%
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.150	mg/L		**0.838**	± 20.0%	**5.64**	± 20.0%	**7.71**	± 20.0%
Nitrate as N	W-NO3-IC	0.500	mg/L		**4.40**	± 15.0%	<0.500	----	<0.500	----
Nitrite as N	W-NO2-IC	0.010	mg/L		<0.010	----	<0.010	----	<0.010	----
Orthophosphate as P	W-PO4O-SPC	0.010	mg/L		**0.037**	± 20.0%	**0.221**	± 20.0%	**1.05**	± 20.0%
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L		**260**	± 10.0%	**332**	± 9.9%	**326**	± 9.9%
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L		**137**	± 12.0%	**182**	± 12.0%	**177**	± 12.0%
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		**137**	----	**182**	----	**177**	----
Total Metals / Major Cations										
Aluminium	W-METMSDG2	5.0	µg/L		**497**	± 10.0%	**2370**	± 10.0%	**1220**	± 10.0%
Antimony	W-METMSDG1	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Arsenic	W-METMSDG1	1.0	µg/L		<1.0	----	**1.3**	± 10.0%	**1.2**	± 10.0%
Barium	W-METMSDG2	1.0	µg/L		**109**	± 10.0%	**163**	± 10.0%	**93.7**	± 10.0%
Beryllium	W-METMSDG1	0.20	µg/L		<0.20	----	<0.20	----	<0.20	----
Bismuth	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Boron	W-METAXDG1	0.010	mg/L		**0.013**	± 10.0%	**0.040**	± 10.0%	**0.049**	± 10.0%
Cadmium	W-METMSDG1	0.20	µg/L		<0.20	----	**0.23**	± 10.0%	**0.32**	± 10.0%
Calcium	W-METAXDG1	0.050	mg/L		**41.3**	± 10.0%	**41.4**	± 10.0%	**37.6**	± 10.0%
Chromium	W-METMSDG1	5.0	µg/L		<5.0	----	**5.3**	± 10.0%	<5.0	----
Cobalt	W-METMSDG2	0.50	µg/L		**3.05**	± 10.0%	**6.06**	± 10.0%	**2.38**	± 10.0%
Copper	W-METMSDG2	1.0	µg/L		**2.8**	± 10.0%	**7.9**	± 10.0%	**5.8**	± 10.0%
Iron	W-METAXDG1	0.0050	mg/L		**3.19**	± 10.0%	**6.59**	± 10.0%	**2.81**	± 10.0%
Lead	W-METMSDG1	1.0	µg/L		**2.1**	± 10.0%	**18.9**	± 10.0%	**11.3**	± 10.0%
Lithium	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	**2.0**	± 10.0%
Magnesium	W-METMSDG2	10	µg/L		**7330**	± 10.0%	**6970**	± 10.0%	**6340**	± 10.0%
Magnesium	W-METAXDG1	0.020	mg/L		**7.82**	± 10.0%	**7.72**	± 10.0%	**6.83**	± 10.0%
Manganese	W-METMSDG2	0.50	µg/L		**1260**	± 10.0%	**1360**	± 10.0%	**806**	± 10.0%
Mercury	W-HG-AFSDGL	0.0050	µg/L		**0.0064**	± 10.0%	<0.0050	----	<0.0050	----
Molybdenum	W-METMSDG1	1.0	µg/L		**1.6**	± 10.0%	**3.7**	± 10.0%	**2.6**	± 10.0%
Nickel	W-METMSDG1	3.0	µg/L		**3.4**	± 10.0%	**7.3**	± 10.0%	**4.2**	± 10.0%
Potassium	W-METAXDG1	0.015	mg/L		**18.7**	± 10.0%	**38.2**	± 10.0%	**29.7**	± 10.0%

Sub-Matrix: **WATER**				Client sample ID	Mayanja 1		Kansanga 1		Nakivubo 7	
				Laboratory sample ID	PR1828666-001		PR1828666-002		PR1828666-003	
				Client sampling date / time	25-Mar-2018 09:00		25-Mar-2018 10:00		25-Mar-2018 11:00	
Parameter	*Method*	*LOR*	*Unit*		**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued										
Selenium	W-METMSDG1	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Silicon	W-METAXDG2	0.60	mg/L		**15.4**	± 10.0%	**10.9**	± 10.0%	**9.26**	± 10.0%
Silver	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Sodium	W-METAXDG1	0.030	mg/L		**24.8**	± 10.0%	**44.4**	± 10.0%	**42.9**	± 10.0%
Strontium	W-METMSDG2	1.0	µg/L		**257**	± 10.0%	**257**	± 10.0%	**225**	± 10.0%
Sulphur	W-METAXDG2	0.10	mg/L		**4.76**	± 10.0%	**9.33**	± 10.0%	**6.59**	± 10.0%
Tellurium	W-METMSDG2	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Thallium	W-METMSDG1	0.50	µg/L		<0.50	----	<0.50	----	<0.50	----
Tin	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Titanium	W-METMSDG2	5.0	µg/L		**13.6**	± 10.0%	**50.2**	± 10.0%	**27.7**	± 10.0%
Uranium	W-METMSDG3	0.10	µg/L		**1.00**	± 10.0%	**1.44**	± 10.0%	**0.65**	± 10.0%
Vanadium	W-METMSDG2	5.0	µg/L		<5.0	----	**19.0**	± 10.0%	**7.6**	± 10.0%
Zinc	W-METMSDG2	2.0	µg/L		**15.6**	± 10.0%	**186**	± 10.0%	**78.6**	± 10.0%

Sub-Matrix: **WATER**				Client sample ID	Kinawataka 1		Musamya 1		Kitembwa 1	
				Laboratory sample ID	PR1828666-004		PR1828666-005		PR1828666-006	
				Client sampling date / time	25-Mar-2018 12:00		26-Mar-2018 07:00		26-Mar-2018 08:00	
Parameter	*Method*	*LOR*	*Unit*		**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters										
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m		**38.0**	± 10.0%	**11.3**	± 10.0%	**11.1**	± 10.0%
pH Value	W-PH-PCT	1.00	-		**7.46**	± 1.1%	**6.59**	± 1.2%	**7.21**	± 1.1%
Agregate Parameters										
Sum of calcium and magnesium	W-HARD-DG	0.0020	mmol/L		**1.16**	----	**0.442**	----	**0.435**	----
Calcium (Ca)	W-HARD-DG	0.0020	mmol/L		**0.925**	----	**0.307**	----	**0.234**	----
Magnesium (Mg)	W-HARD-DG	0.00040	mmol/L		**0.239**	----	**0.135**	----	**0.201**	----
Sum of Calcium and Magnesium as CaCO3	W-HARD-DG	0.20	mg CaCO3/L		**116**	----	**44.2**	----	**43.5**	----
Nonmetallic Inorganic Parameters										
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L		**3.18**	± 15.0%	<0.040	----	<0.040	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L		**4.10**	± 15.0%	<0.050	----	<0.050	----
Chloride	W-CL-IC	1.00	mg/L		**22.8**	± 15.0%	**2.81**	± 15.0%	**3.62**	± 15.0%
Fluoride	W-F-IC	0.200	mg/L		**0.335**	± 15.0%	<0.200	----	<0.200	----
Nitrates	W-NO3-IC	2.00	mg/L		**7.60**	± 15.0%	<2.00	----	<2.00	----
Nitrites	W-NO2-IC	0.040	mg/L		**1.14**	± 25.0%	<0.040	----	<0.040	----
Orthophosphate	W-PO4O-SPC	0.040	mg/L		**0.103**	± 20.0%	<0.040	----	<0.040	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.120	mg/L		**1.42**	± 20.0%	**0.646**	± 20.0%	<0.120	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L		**15.4**	± 15.0%	**6.79**	± 15.0%	<5.00	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L		**4.20**	± 21.5%	**1.62**	± 28.7%	**0.62**	± 57.4%
Total Nitrogen as N	W-NTOT-IR	0.10	mg/L		**6.18**	± 30.0%	**0.71**	± 30.0%	**0.57**	± 30.0%
Total Phosphorus as P	W-PTOT-SPC	0.050	mg/L		**0.618**	± 20.0%	**0.282**	± 20.0%	**0.050**	± 20.0%
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.150	mg/L		**1.90**	± 20.0%	**0.865**	± 20.0%	**0.154**	± 20.0%
Nitrate as N	W-NO3-IC	0.500	mg/L		**1.72**	± 15.0%	<0.500	----	<0.500	----
Nitrite as N	W-NO2-IC	0.010	mg/L		**0.347**	± 25.0%	<0.010	----	<0.010	----
Orthophosphate as P	W-PO4O-SPC	0.010	mg/L		**0.034**	± 20.0%	<0.010	----	<0.010	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L		**225**	± 10.0%	**136**	± 10.3%	<10	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L		**143**	± 12.0%	**35.4**	± 12.0%	**45.8**	± 12.0%
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		**143**	----	**35.4**	----	**45.8**	----
Total Metals / Major Cations										
Aluminium	W-METMSDG2	5.0	µg/L		**1730**	± 10.0%	**757**	± 10.0%	**235**	± 10.0%
Antimony	W-METMSDG1	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Arsenic	W-METMSDG1	1.0	µg/L		**1.0**	± 10.0%	<1.0	----	**1.0**	± 10.0%
Barium	W-METMSDG2	1.0	µg/L		**120**	± 10.0%	**50.4**	± 10.0%	**36.6**	± 10.0%

Sub-Matrix: **WATER**				Client sample ID	Kinawataka 1		Musamya 1		Kitembwa 1	
				Laboratory sample ID	PR1828666-004		PR1828666-005		PR1828666-006	
				Client sampling date / time	25-Mar-2018 12:00		26-Mar-2018 07:00		26-Mar-2018 08:00	
Parameter	*Method*	*LOR*	*Unit*		**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued										
Beryllium	W-METMSDG1	0.20	µg/L		<0.20	----	<0.20	----	<0.20	----
Bismuth	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Boron	W-METAXDG1	0.010	mg/L		**0.014**	± 10.0%	<0.010	----	<0.010	----
Cadmium	W-METMSDG1	0.20	µg/L		<0.20	----	<0.20	----	<0.20	----
Calcium	W-METAXDG1	0.050	mg/L		**37.1**	± 10.0%	**12.3**	± 10.0%	**9.39**	± 10.0%
Chromium	W-METMSDG1	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Cobalt	W-METMSDG2	0.50	µg/L		**5.11**	± 10.0%	**3.34**	± 10.0%	**1.16**	± 10.0%
Copper	W-METMSDG2	1.0	µg/L		**9.5**	± 10.0%	**4.0**	± 10.0%	**1.0**	± 10.0%
Iron	W-METAXDG1	0.0050	mg/L		**5.52**	± 10.0%	**4.82**	± 10.0%	**3.00**	± 10.0%
Lead	W-METMSDG1	1.0	µg/L		**13.8**	± 10.0%	**2.7**	± 10.0%	<1.0	----
Lithium	W-METMSDG2	1.0	µg/L		<1.0	----	**1.2**	± 10.0%	**1.2**	± 10.0%
Magnesium	W-METMSDG2	10	µg/L		**5350**	± 10.0%	**3100**	± 10.0%	**4560**	± 10.0%
Magnesium	W-METAXDG1	0.020	mg/L		**5.81**	± 10.0%	**3.28**	± 10.0%	**4.88**	± 10.0%
Manganese	W-METMSDG2	0.50	µg/L		**1020**	± 10.0%	**323**	± 10.0%	**191**	± 10.0%
Mercury	W-HG-AFSDGL	0.0050	µg/L		**0.0128**	± 10.0%	**0.0093**	± 10.0%	**0.0242**	± 10.0%
Molybdenum	W-METMSDG1	1.0	µg/L		**1.6**	± 10.0%	<1.0	----	<1.0	----
Nickel	W-METMSDG1	3.0	µg/L		**3.9**	± 10.0%	**5.6**	± 10.0%	**3.1**	± 10.0%
Potassium	W-METAXDG1	0.015	mg/L		**13.5**	± 10.0%	**3.08**	± 10.0%	**1.09**	± 10.0%
Selenium	W-METMSDG1	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Silicon	W-METAXDG2	0.60	mg/L		**13.6**	± 10.0%	**11.0**	± 10.0%	**12.7**	± 10.0%
Silver	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Sodium	W-METAXDG1	0.030	mg/L		**24.0**	± 10.0%	**3.96**	± 10.0%	**7.03**	± 10.0%
Strontium	W-METMSDG2	1.0	µg/L		**208**	± 10.0%	**60.4**	± 10.0%	**51.2**	± 10.0%
Sulphur	W-METAXDG2	0.10	mg/L		**5.49**	± 10.0%	**3.22**	± 10.0%	**0.84**	± 10.0%
Tellurium	W-METMSDG2	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Thallium	W-METMSDG1	0.50	µg/L		<0.50	----	<0.50	----	<0.50	----
Tin	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Titanium	W-METMSDG2	5.0	µg/L		**42.9**	± 10.0%	**25.1**	± 10.0%	**8.1**	± 10.0%
Uranium	W-METMSDG3	0.10	µg/L		**1.45**	± 10.0%	**0.19**	± 10.0%	<0.10	----
Vanadium	W-METMSDG2	5.0	µg/L		**12.5**	± 10.0%	**9.0**	± 10.0%	<5.0	----
Zinc	W-METMSDG2	2.0	µg/L		**65.2**	± 10.0%	**43.6**	± 10.0%	**10.4**	± 10.0%

Sub-Matrix: **WATER**				Client sample ID	Kagonja 3		Ssezibwa 1		Kasala 1	
				Laboratory sample ID	PR1828666-007		PR1828666-008		PR1828666-009	
				Client sampling date / time	26-Mar-2018 09:00		26-Mar-2018 01:00		26-Mar-2018 11:00	
Parameter	*Method*	*LOR*	*Unit*		**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters										
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m		**10.5**	± 10.0%	**6.05**	± 10.0%	**8.96**	± 10.0%
pH Value	W-PH-PCT	1.00	-		**7.35**	± 1.1%	**7.01**	± 1.1%	**6.67**	± 1.2%
Agregate Parameters										
Sum of calcium and magnesium	W-HARD-DG	0.0020	mmol/L		**0.378**	----	**0.173**	----	**0.301**	----
Calcium (Ca)	W-HARD-DG	0.0020	mmol/L		**0.216**	----	**0.0943**	----	**0.174**	----
Magnesium (Mg)	W-HARD-DG	0.00040	mmol/L		**0.162**	----	**0.0787**	----	**0.127**	----
Sum of Calcium and Magnesium as CaCO3	W-HARD-DG	0.20	mg CaCO3/L		**37.8**	----	**17.3**	----	**30.1**	----
Nonmetallic Inorganic Parameters										
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L		**0.069**	± 15.0%	**0.060**	± 15.0%	**0.071**	± 15.0%
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L		**0.088**	± 15.0%	**0.078**	± 15.0%	**0.092**	± 15.0%
Chloride	W-CL-IC	1.00	mg/L		**4.95**	± 15.0%	**3.55**	± 15.0%	**3.09**	± 15.0%
Fluoride	W-F-IC	0.200	mg/L		<0.200	----	<0.200	----	<0.200	----
Nitrates	W-NO3-IC	2.00	mg/L		<2.00	----	<2.00	----	<2.00	----
Nitrites	W-NO2-IC	0.040	mg/L		**0.218**	± 25.0%	<0.040	----	<0.040	----
Orthophosphate	W-PO4O-SPC	0.040	mg/L		<0.040	----	<0.040	----	<0.040	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.120	mg/L		<0.120	----	<0.120	----	**0.202**	± 20.0%
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L		<5.00	----	<5.00	----	<5.00	----

Sub-Matrix: **WATER**				Client sample ID	**Kagonja 3**		**Ssezibwa 1**		**Kasala 1**	
				Laboratory sample ID	*PR1828666-007*		*PR1828666-008*		*PR1828666-009*	
				Client sampling date / time	26-Mar-2018 09:00		26-Mar-2018 01:00		26-Mar-2018 11:00	
Parameter	*Method*	*LOR*	*Unit*		**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Nonmetallic Inorganic Parameters - Continued										
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L		**0.53**	± 66.0%	**0.90**	± 42.1%	**1.13**	± 35.6%
Total Nitrogen as N	W-NTOT-IR	0.10	mg/L		**1.33**	± 30.0%	**0.79**	± 30.0%	**1.06**	± 30.0%
Total Phosphorus as P	W-PTOT-SPC	0.050	mg/L		<0.050	----	<0.050	----	**0.088**	± 20.0%
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.150	mg/L		<0.150	----	<0.150	----	**0.270**	± 20.0%
Nitrate as N	W-NO3-IC	0.500	mg/L		<0.500	----	<0.500	----	<0.500	----
Nitrite as N	W-NO2-IC	0.010	mg/L		**0.066**	± 25.0%	<0.010	----	<0.010	----
Orthophosphate as P	W-PO4O-SPC	0.010	mg/L		<0.010	----	<0.010	----	<0.010	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L		**108**	± 10.5%	**60**	± 11.3%	**112**	± 10.5%
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L		**32.9**	± 12.0%	**13.1**	± 12.0%	**32.6**	± 12.0%
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		<2.0	----	<2.0	----	<2.0	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		<2.0	----	<2.0	----	<2.0	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L		**32.9**	----	**13.1**	----	**32.6**	----
Total Metals / Major Cations										
Aluminium	W-METMSDG2	5.0	µg/L		**438**	± 10.0%	**72.5**	± 10.0%	**176**	± 10.0%
Antimony	W-METMSDG1	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Arsenic	W-METMSDG1	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Barium	W-METMSDG2	1.0	µg/L		**38.5**	± 10.0%	**20.1**	± 10.0%	**39.7**	± 10.0%
Beryllium	W-METMSDG1	0.20	µg/L		<0.20	----	<0.20	----	<0.20	----
Bismuth	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Boron	W-METAXDG1	0.010	mg/L		<0.010	----	<0.010	----	<0.010	----
Cadmium	W-METMSDG1	0.20	µg/L		<0.20	----	<0.20	----	<0.20	----
Calcium	W-METAXDG1	0.050	mg/L		**8.68**	± 10.0%	**3.78**	± 10.0%	**7.00**	± 10.0%
Chromium	W-METMSDG1	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Cobalt	W-METMSDG2	0.50	µg/L		**0.80**	± 10.0%	**1.24**	± 10.0%	**1.01**	± 10.0%
Copper	W-METMSDG2	1.0	µg/L		**1.6**	± 10.0%	<1.0	----	<1.0	----
Iron	W-METAXDG1	0.0050	mg/L		**1.82**	± 10.0%	**3.69**	± 10.0%	**4.60**	± 10.0%
Lead	W-METMSDG1	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Lithium	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	**1.2**	± 10.0%
Magnesium	W-METMSDG2	10	µg/L		**3640**	± 10.0%	**1880**	± 10.0%	**2950**	± 10.0%
Magnesium	W-METAXDG1	0.020	mg/L		**3.94**	± 10.0%	**1.91**	± 10.0%	**3.08**	± 10.0%
Manganese	W-METMSDG2	0.50	µg/L		**95.0**	± 10.0%	**149**	± 10.0%	**289**	± 10.0%
Mercury	W-HG-AFSDGL	0.0050	µg/L		**0.0087**	± 10.0%	<0.0050	----	<0.0050	----
Molybdenum	W-METMSDG1	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Nickel	W-METMSDG1	3.0	µg/L		<3.0	----	<3.0	----	<3.0	----
Potassium	W-METAXDG1	0.015	mg/L		**1.44**	± 10.0%	**4.67**	± 10.0%	**5.59**	± 10.0%
Selenium	W-METMSDG1	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Silicon	W-METAXDG2	0.60	mg/L		**16.4**	± 10.0%	**9.20**	± 10.0%	**13.4**	± 10.0%
Silver	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Sodium	W-METAXDG1	0.030	mg/L		**6.77**	± 10.0%	**4.08**	± 10.0%	**5.37**	± 10.0%
Strontium	W-METMSDG2	1.0	µg/L		**46.3**	± 10.0%	**25.9**	± 10.0%	**52.4**	± 10.0%
Sulphur	W-METAXDG2	0.10	mg/L		**1.76**	± 10.0%	**0.54**	± 10.0%	**1.06**	± 10.0%
Tellurium	W-METMSDG2	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Thallium	W-METMSDG1	0.50	µg/L		<0.50	----	<0.50	----	<0.50	----
Tin	W-METMSDG2	1.0	µg/L		<1.0	----	<1.0	----	<1.0	----
Titanium	W-METMSDG2	5.0	µg/L		**14.0**	± 10.0%	<5.0	----	**5.3**	± 10.0%
Uranium	W-METMSDG3	0.10	µg/L		**0.15**	± 10.0%	<0.10	----	**0.10**	± 10.0%
Vanadium	W-METMSDG2	5.0	µg/L		<5.0	----	<5.0	----	<5.0	----
Zinc	W-METMSDG2	2.0	µg/L		**26.4**	± 10.0%	**6.6**	± 10.0%	**14.6**	± 10.0%

Sub-Matrix: **WATER**				Client sample ID	**Namanve 1**		**----**		**----**	
				Laboratory sample ID	*PR1828666-010*		----		----	
				Client sampling date / time	26-Mar-2018 17:00		----		----	
Parameter	*Method*	*LOR*	*Unit*		**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters										
Electrical Conductivity @ 25°C	W-CON-PCT	0.10	mS/m		**35.4**	± 10.0%	**----**	----	**----**	----

Sub-Matrix: **WATER**

				Client sample ID	Namanve 1		----		----	
				Laboratory sample ID	PR1828666-010		----		----	
				Client sampling date / time	26-Mar-2018 17:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Physical Parameters - Continued									
pH Value	W-PH-PCT	1.00	-	**7.61**	± 1.0%	**----**	----	**----**	----
Agregate Parameters									
Sum of calcium and magnesium	W-HARD-DG	0.0020	mmol/L	**0.953**	----	**----**	----	**----**	----
Calcium (Ca)	W-HARD-DG	0.0020	mmol/L	**0.738**	----	**----**	----	**----**	----
Magnesium (Mg)	W-HARD-DG	0.00040	mmol/L	**0.214**	----	**----**	----	**----**	----
Sum of Calcium and Magnesium as CaCO3	W-HARD-DG	0.20	mg CaCO3/L	**95.3**	----	**----**	----	**----**	----
Nonmetallic Inorganic Parameters									
Ammonia and ammonium ions as N	W-NH4-SPC	0.040	mg/L	**1.44**	± 15.0%	**----**	----	**----**	----
Ammonia and ammonium ions as NH4	W-NH4-SPC	0.050	mg/L	**1.85**	± 15.0%	**----**	----	**----**	----
Chloride	W-CL-IC	1.00	mg/L	**16.0**	± 15.0%	**----**	----	**----**	----
Fluoride	W-F-IC	0.200	mg/L	**0.489**	± 15.0%	**----**	----	**----**	----
Nitrates	W-NO3-IC	2.00	mg/L	<2.00	----	**----**	----	**----**	----
Nitrites	W-NO2-IC	0.040	mg/L	**0.381**	± 25.0%	**----**	----	**----**	----
Orthophosphate	W-PO4O-SPC	0.040	mg/L	**0.210**	± 20.0%	**----**	----	**----**	----
Phosphorus (as P2O5)	W-PTOT-SPC	0.120	mg/L	**0.506**	± 20.0%	**----**	----	**----**	----
Sulphate as SO4 2-	W-SO4-IC	5.00	mg/L	**5.05**	± 15.0%	**----**	----	**----**	----
Total Kjeldahl Nitrogen as N	W-NKJ-PHO	0.50	mg/L	**2.18**	± 25.2%	**----**	----	**----**	----
Total Nitrogen as N	W-NTOT-IR	0.10	mg/L	**2.59**	± 30.0%	**----**	----	**----**	----
Total Phosphorus as P	W-PTOT-SPC	0.050	mg/L	**0.221**	± 20.0%	**----**	----	**----**	----
Total Phosphorus as PO4 3-	W-PTOT-SPC	0.150	mg/L	**0.677**	± 20.0%	**----**	----	**----**	----
Nitrate as N	W-NO3-IC	0.500	mg/L	<0.500	----	**----**	----	**----**	----
Nitrite as N	W-NO2-IC	0.010	mg/L	**0.116**	± 25.0%	**----**	----	**----**	----
Orthophosphate as P	W-PO4O-SPC	0.010	mg/L	**0.068**	± 20.0%	**----**	----	**----**	----
Dissolved solids dried at 105 °C	W-TDS-GR	10	mg/L	**160**	± 10.2%	**----**	----	**----**	----
Acid neutralizing capacity (alkalinity) as CaCO3 pH 4.5	W-ALK-PCT	2.0	mg CaCO3/L	**153**	± 12.0%	**----**	----	**----**	----
Hydroxide Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	**----**	----	**----**	----
Carbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	<2.0	----	**----**	----	**----**	----
Bicarbonate Alkalinity as CaCO3	W-ALK-PCT	2.0	mg CaCO3/L	**153**	----	**----**	----	**----**	----
Total Metals / Major Cations									
Aluminium	W-METMSDG2	5.0	µg/L	**275**	± 10.0%	**----**	----	**----**	----
Antimony	W-METMSDG1	1.0	µg/L	<1.0	----	**----**	----	**----**	----
Arsenic	W-METMSDG1	1.0	µg/L	<1.0	----	**----**	----	**----**	----
Barium	W-METMSDG2	1.0	µg/L	**73.2**	± 10.0%	**----**	----	**----**	----
Beryllium	W-METMSDG1	0.20	µg/L	<0.20	----	**----**	----	**----**	----
Bismuth	W-METMSDG2	1.0	µg/L	<1.0	----	**----**	----	**----**	----
Boron	W-METAXDG1	0.010	mg/L	**0.021**	± 10.0%	**----**	----	**----**	----
Cadmium	W-METMSDG1	0.20	µg/L	<0.20	----	**----**	----	**----**	----
Calcium	W-METAXDG1	0.050	mg/L	**29.6**	± 10.0%	**----**	----	**----**	----
Chromium	W-METMSDG1	5.0	µg/L	<5.0	----	**----**	----	**----**	----
Cobalt	W-METMSDG2	0.50	µg/L	**1.58**	± 10.0%	**----**	----	**----**	----
Copper	W-METMSDG2	1.0	µg/L	<1.0	----	**----**	----	**----**	----
Iron	W-METAXDG1	0.0050	mg/L	**2.39**	± 10.0%	**----**	----	**----**	----
Lead	W-METMSDG1	1.0	µg/L	**2.3**	± 10.0%	**----**	----	**----**	----
Lithium	W-METMSDG2	1.0	µg/L	<1.0	----	**----**	----	**----**	----
Magnesium	W-METMSDG2	10	µg/L	**4800**	± 10.0%	**----**	----	**----**	----
Magnesium	W-METAXDG1	0.020	mg/L	**5.22**	± 10.0%	**----**	----	**----**	----
Manganese	W-METMSDG2	0.50	µg/L	**873**	± 10.0%	**----**	----	**----**	----
Mercury	W-HG-AFSDGL	0.0050	µg/L	<0.0050	----	**----**	----	**----**	----
Molybdenum	W-METMSDG1	1.0	µg/L	**1.9**	± 10.0%	**----**	----	**----**	----
Nickel	W-METMSDG1	3.0	µg/L	<3.0	----	**----**	----	**----**	----
Potassium	W-METAXDG1	0.015	mg/L	**10.6**	± 10.0%	**----**	----	**----**	----
Selenium	W-METMSDG1	5.0	µg/L	<5.0	----	**----**	----	**----**	----
Silicon	W-METAXDG2	0.60	mg/L	**12.6**	± 10.0%	**----**	----	**----**	----
Silver	W-METMSDG2	1.0	µg/L	<1.0	----	**----**	----	**----**	----

Sub-Matrix: **WATER**

			Client sample ID	**Namanve 1**		**----**		**----**	
			Laboratory sample ID	*PR1828666-010*		----		----	
			Client sampling date / time	26-Mar-2018 17:00		----		----	
Parameter	*Method*	*LOR*	*Unit*	**Result**	**MU**	**Result**	**MU**	**Result**	**MU**
Total Metals / Major Cations - Continued									
Sodium	W-METAXDG1	0.030	mg/L	**42.5**	± 10.0%	**----**	----	**----**	----
Strontium	W-METMSDG2	1.0	µg/L	**211**	± 10.0%	**----**	----	**----**	----
Sulphur	W-METAXDG2	0.10	mg/L	**2.15**	± 10.0%	**----**	----	**----**	----
Tellurium	W-METMSDG2	5.0	µg/L	<5.0	----	**----**	----	**----**	----
Thallium	W-METMSDG1	0.50	µg/L	<0.50	----	**----**	----	**----**	----
Tin	W-METMSDG2	1.0	µg/L	<1.0	----	**----**	----	**----**	----
Titanium	W-METMSDG2	5.0	µg/L	**7.1**	± 10.0%	**----**	----	**----**	----
Uranium	W-METMSDG3	0.10	µg/L	**0.90**	± 10.0%	**----**	----	**----**	----
Vanadium	W-METMSDG2	5.0	µg/L	<5.0	----	**----**	----	**----**	----
Zinc	W-METMSDG2	2.0	µg/L	**50.4**	± 10.0%	**----**	----	**----**	----

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, delivery date in brackets without a time component will be displayed instead. Measurement uncertainty is expressed as expanded measurement uncertainty with coverage factor k = 2, representing 95% confidence level.
Key: LOR = Limit of reporting; MU = Measurement Uncertainty

The end of result part of the certificate of analysis

Brief Method Summaries

Analytical Methods	*Method Descriptions*
Location of test performance: Bendlova 1687/7 Ceska Lipa Czech Republic 470 01	
W-NKJ-PHO	CZ_SOP_D06_07_007.A (CSN EN 25663, CSN ISO 7150-1) Determination of Kjeldahl nitrogen by spectrophotometry.
Location of test performance: Na Harfe 336/9 Prague 9 - Vysocany Czech Republic 190 00	
W-ALK-PCT	CZ_SOP_D06_02_072 (CSN EN ISO 9963-1,CSN EN ISO 9963-2, CSN 75 7373, SM2320) Determination of acid neutralizing capacity (alkalinity) by potentiometric titration and determination of the carbonate hardness and determination of CO_2 forms by calculation from measured values including the calculation of total mineralization.
W-CL-IC	CZ_SOP_D06_02_068 (CSN EN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-CON-PCT	CZ_SOP_D06_02_075 Determination of electrical conductivity (based on CSN EN 27 888, SM 2520 B, CSN EN 16192).
W-F-IC	CZ_SOP_D06_02_068 (CSN EN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-HARD-DG	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, CSN 75 7358 samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-HG-AFSDGL	CZ_SOP_D06_02_096 (US EPA 245.7, CSN EN ISO 178 52, CSN EN 16192, samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2.) Determination of Mercury by Fluorescence Spectrometry. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-METAXDG1	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, CSN 75 7358 samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-METAXDG2	CZ_SOP_D06_02_001 (US EPA 200.7, ISO 11885, CSN EN 16192, US EPA 6010, SM 3120, CSN 75 7358 samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by atomic emission spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-METMSDG1	CZ_SOP_D06_02_002 (US EPA 200.8, CSN EN ISO 17294-2, US EPA 6020A, CSN EN 16192, CSN 75 7358 samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by mass spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.

Analytical Methods	*Method Descriptions*
W-METMSDG2	CZ_SOP_D06_02_002 (US EPA 200.8, CSN EN ISO 17294-2, US EPA 6020A, CSN EN 16192, CSN 75 7358 samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by mass spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-METMSDG3	CZ_SOP_D06_02_002 (US EPA 200.8, CSN EN ISO 17294-2, US EPA 6020A, CSN EN 16192, CSN 75 7358 samples prepared as per CZ_SOP_D06_02_J02 chap. 10.1 and 10.2) Determination of elements by mass spectrometry with inductively coupled plasma and stoichiometric calculations of compounds concentration from measured values including the calculation of total mineralization and calculating the sum of Ca+Mg. Sample was homogenized and mineralized by nitric acid in autoclave under high pressure and temperature prior to analysis.
W-NH4-SPC	CZ_SOP_D06_02_019 (CSN EN ISO 11732, CSN EN ISO 13395, CSN EN 16192, CSN EN 13370, SM 4500-NO2(-), SM 4500-NO3(-)) Determination of sum of ammonium and ammonium ions, nitrite and the sum of nitrite and nitrate ions by discrete spectrophotometry and determination of nitrite, nitrate, ammonia, inorganic, organic, total nitrogen, free ammonia and dissociated ammonium ions by calculation from measured values including the calculation of total mineralization.
W-NO2-IC	CZ_SOP_D06_02_068 (CSN EN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-NO3-IC	CZ_SOP_D06_02_068 (CSN EN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-NTOT-IR	CZ_SOP_D06_02_094 (CSN EN 12260) Determination of bound nitrogen (TNb) following oxidation to nitrogen oxides by EC or IR detection.
W-PH-PCT	CZ_SOP_D06_02_105 Determination of pH by potentiometry (based on CSN ISO 10523, US EPA 150.1, CSN EN 16192, SM 4500-H(+) B).
W-PO4O-SPC	CZ_SOP_D06_02_022 (CSN EN ISO 6878 SM 4500-P) Determination of orthophosphate by discrete spectrophotometry and determination of orthophosphate's phosphorus by calculation from measured values including the calculation of total mineralization.
W-PTOT-SPC	CZ_SOP_D06_02_080 Determination of total phosphorus by discrete spectrophotometry and determination of phosphorus as P2O5 and PO4 3- by calculation from measured values (based on CSN EN ISO 6878 and CSN ISO 15681-1).
W-SO4-IC	CZ_SOP_D06_02_068 (CSN EN ISO 10304-1, CSN EN 16192) Determination of dissolved fluoride, chloride, nitrite, bromide, nitrate and sulphate by ion liquid chromatography and determination of nitrite nitrogen and nitrate nitrogen and sulfate sulfur by calculation from measured values including the calculation of total mineralization.
W-TDS-GR	CZ_SOP_D06_02_071 (CSN 757346, CSN 757347, CSN EN 16192, CSN EN 15216) Determination of dissolved solids (RL105) and dissolved solids annealed (RAS) using glass fibre filters by gravimetry and determination of loss of ignition of dissolved solids (RL550) by calculation from measured values (glass microfibre filter of porosity 1,5 µm - Environmental Express).

A `*` symbol preceding any method indicates laboratory or subcontractor non-accredited test. In the case when a procedure belonging to an accredited method was used for non-accredited matrix, would apply that the reported results are non-accredited. Please refer to General Comment section on front page for information. If the report contains subcontracted analysis, those are made in a subcontracted laboratory outside the laboratories ALS Czech Republic, s.r.o.
The calculation methods of summation parameters are available on request in the client service.

Groundwater

Site Name	Site Nickname	Within ROW (Y/N)	Sample Date	Location*		Field Parameters			
				Northing	Easting	pH	EC (uS/cm)	ORP (mV)	T (°C)
GWP1-1	Katongo Well (Mamma Esther Spring Well)	Y	12/04/2018	36895	459589	4.84	180	310	27
GWP1-2	Thailand 2 Spring Well	Y	12/04/2018	36690	459831	4.85	220	220	25
GWP1-3	Thailand 1 Spring Well	N	12/04/2018	36635	459984	5.72	250	250	24
GWP1-4	Kituuka Water Spring	Y	12/04/2018	36173	463501	5.33	120	200	24
GWP1-5	Nakku Spring Well	Y	12/04/2018	35061	459389	5.39	230	250	25
GWP1-6	-	N	12/04/2018	26955	456350	6	270	235	24
GWP1-7	GW_2	N	-	27009	456336	-	-	-	-
GWP1-8	Spring Well	Y	-	40240	486576	-	-	-	-
GWP1-9	KEE	Y	12/04/2018	26117	456521	6.09	270	160	24
GWP1-10	Kigobe Water Spring	N	12/04/2018	35913	463773	-	-	-	-
GWP1-11	Kirinya Namataba Spring	N	12/04/2018	36372	462893	5.72	190	206	24
GWP1-12	Kiwawu Protected Well	Y	12/04/2018	30591	456295	5.46	300	300	24
GWP1-13	Namitumba Spring	Y	12/04/2018	28988	455375	6.14	270	239	24
GWP1-14	Alipo	N	11/04/2018	36387	459875	4.96	350	300	25
GWP1-15	Alipo2	N	11/04/2018	36005	459912	5.68	430	230	24
GWP1-16	Alipo3	N	11/04/2018	36091	459903	5.19	285	230	24
GWP1-17	Spring Well of Damyano	Y	9/5/2018	40234	486580	4.85	340	280	23

* WGS84 UTM Zone 36N

Plate 7: Groundwater sampling site GWP1-1

Plate 8: Groundwater site GWP1-2

Plate 9: Groundwater site GWP1-3

Plate 10: Groundwater site GWP1-4

Plate 11: Groundwater site GWP1-5

Plate 12: Groundwater site GWP1-6

Plate 13: Groundwater site GWP1-7

Plate 14: Groundwater site GWP1-9

Plate 15: Groundwater site GWP1-8

Plate 16: Groundwater site GWP1-13

Plate 17: Groundwater site GWP1-10

Plate 18: Groundwater site GWP1-11

Plate 19: Groundwater site GWP1-12

Plate 20: Groundwater site GWP1-16

Plate 21: Groundwater site GWP1-14

Plate 22: Groundwater site GWP1-15

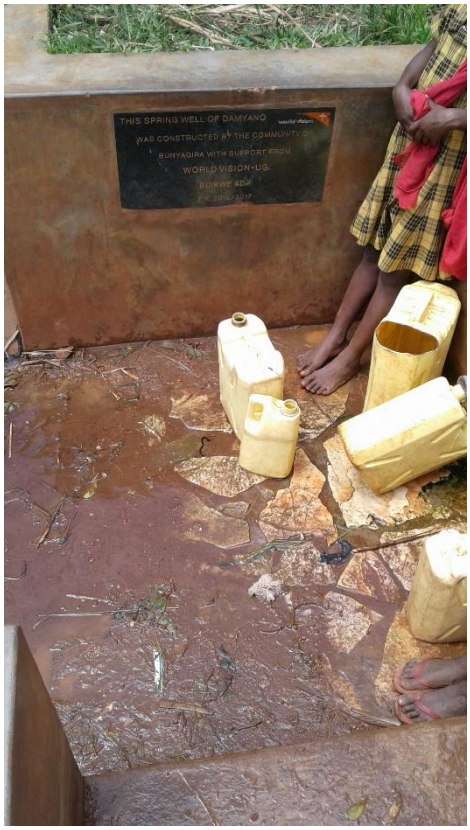

Plate 23: Groundwater site GWP1-17

Telephone
+256 (0) 414 250 464 (Gen)
+256 (0) 414 250 474
Email: dgal@mia.go.ug
Website: www.mia.go.ug

In any Correspondence on this subject please quote No. GE077/18

April 27, 2017

THE REPUBLIC OF UGANDA

MINISTRY OF INTERNAL AFFAIRS
DIRECTORATE OF GOVERNMENT ANALYTICAL LABORATORY
Plot No. 2 Lourdel Road
Wandegeya,
P.O.BOX 2174
Kampala - Uganda

REPORT OF ANALYSIS

Description of Sample

Six water samples labeled 'GWP 1', 'GWP 2', 'GWP 3', 'GWP 4', 'GWP 5' and 'GWP 6' were received on April 20, 2018 for compliance to US 201:2008; Specifications for Drinking (Potable) Water Class II

Methods of Analysis

Metal ions were quantified from an acidified sample, at respective wavelengths, using Atomic Absorption Spectrometry technique, Shimadzu 6300. A five-point calibration curve was used to get the concentration of each metal ion. Nitrates, phosphates, sulphates, chlorides and ammonia were determined by UV-VIZ Spectrometry technique, Shimadzu, 1601 at respective absorption wavelengths. Coliforms and *E. coli* were determined by Membrane Filtration Technique at 37ºC and 44ºC respectively. All determinations were done in duplicate.

Results of Analysis

The mean analysis values are as below;

Parameter	Result						Limits/Authority
	GWP 1	GWP 2	GWP 3	GWP 4	GWP 5	GWP6	
pH	6.5	6.8	6.8	6.6	7.2	6.5	6.5 – 8.5
Color (TCU)	4	5	3	5	4	4	15 Max
Conductivity(µS/cm)	132	128	128	134	132	130	2500 Max
Total Dissolved Solids (mg/l)	968	997	988	978	898	958	1500 Max
Total Suspended Solids (mg/l)	8	10	12	8	10	10	Not Indicated
Total Alkalinity (mg/L)	78	82	78	84	77	83	Not Indicated
Total Hardness (mg/l)	38	42	42	54	39	42	Not Indicated
Turbidity (NTU)	8	9	8	10	10	9	10 Max
Calcium (mg/kg)	22.4	24.6	18.7	24.8	24.6	20.7	Not Indicated
Copper (mg/l)	1.8	1.6	1.2	1.2	1.7	1.4	2.0 Max
Iron (mg/l)	**1.8**	**2.4**	**1.2**	0.8	**2.4**	**2.6**	1.0 Max
Lead (mg/l)	≤0.001*	≤0.001*	≤0.001*	≤0.001*	≤0.001*	0.01	0.01 Max
Magnesium (mg/l)	18.4	13.4	14.7	12.8	12.4	13.5	150 Max
Manganese (mg/l)	0.02	0.04	0.07	0.05	0.04	0.08	0.1 Max
Zinc (mg/l)	1.2	0.8	1.2	1.6	1.2	1.2	Not Indicated
Ammonia (mg/l)	0	0	0.4	0	0.4	0.4	1.0
Chlorides (mg/l)	128	132	132	138	127	132	500 Max
Nitrates (mg/l)	1.4	2.3	1.4	1.6	1.2	2.2	50 Max**
Phosphorus (mg/l)	2.4	1.2	1.8	2.2	2.4	1.6	Not Indicated
Sulphates (mg/l)	115	122	112	128	132	124	Not Indicated
Oil & Grease (mg/L)	0	0	0	0	0	04.	Not Indicated
BOD_5 (mg/L)	44.6	42.7	44.9	48.2	42.7	44.8	Not Indicated
COD (mg/L)	88.3	88.4	78.9	89.5	80.1	82.2	Not Indicated
Total Coliforms cfu/100ml)	**4**	**2**	2	4	**4**	**6**	Absent
E. coli (cfu/100ml)	**2**	0	0	0	0	0	Absent

Remarks

1. * Detection Limit, AAS technique, Shimadzu 6300 ** Short Term Exposure
2. Parameters in bold do not meet requirements of the Standard
3. Results relate to sample and are reported on as received basis

Justus Mike Ocom
Senior Government Analyst

"Go Scientific for a Safe and Just Society"

Literature Review

Surface Water

Site ID	Easting*	Northing*	pH	EC (µS/cm)	BOD (mg/L)	DO (mg/L)
Kyetinda 1	459000	27500	6.5			3
Kansanga 1	458700	31200			47.35	2.8
Nakivubo 1	458350	33450			66.05	1
Nakivubo 2	458250	33300	7.15	566.7		
Nakivubo 3	459000	33000	7.17	561.7		
Nakivubo 4	456750	34700	7.2	813		
Nakivubo 5	458700	32700	7.3	465		
Nakivubo 6	459350	32000	6.9	319		
Kinawataka 1	461950	35950			44.65	1.5
Kinawataka 2	462350	34600	6.91	380.7		
Kinawataka 3	459400	36950	5.85	187.3		
Kinawataka 4	459100	37350	6.63	145.6		
Kinawataka 5	458400	37500	8.47	341	16.4	
Kinawataka 6	460250	36250	5.07	362	93.2	
Kinawataka 7	459350	36950	7	386		
Kinawataka 8	460800	35900	7.2	386		
Kinawataka A	458282	37689	8	298	63.14	
Namanve A	464397	36301	6.9	86.9		
Mwola A	475330	38413	7.5	77.9	1.99	
Kasala A	480989	40516	7.5	66	0.01	
Sezibwa A	483341	43113	7.2	69.1	0.5	

* WGS84 UTM Zone 36N

Site ID	Ammonia (mg/L)	Nitrate (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)	Lead (mg/L)	Copper (mg/L)	Zinc (mg/L)
Kyetinda 1	0.42	0.072	1.5	0.395			
Kansanga 1	6.55						
Nakivubo 1	10.2						
Nakivubo 2			7.28		0.05	0.02	0.16
Nakivubo 3			7.56		0.05	0	0.02
Nakivubo 4					0.22	0.01	0.02
Nakivubo 5					0.24	0.01	0.01
Nakivubo 6					0.01	0.01	0.01
Kinawataka 1	5.55						
Kinawataka 2			7.53		0.05	0.01	0.25
Kinawataka 3			8.25		0	0.04	0.16
Kinawataka 4			6.87		0.01	0.02	0.11
Kinawataka 5			3.52	0.345	0.074	0.52	
Kinawataka 6			13.75	0.521	0.154	0.059	
Kinawataka 7					0.01	0.01	0.01

Site ID	Ammonia (mg/L)	Nitrate (mg/L)	Total Nitrogen (mg/L)	Total Phosphorous (mg/L)	Lead (mg/L)	Copper (mg/L)	Zinc (mg/L)
Kinawataka 8					0.09	0.01	0.01
Kinawataka A		0.024		0.22			
Namanve A		0.2		0.2			
Mwola A		0.2		0.8			
Kasala A		0.18		0.06			
Sezibwa A		0.16		1			

Groundwater

Site ID	Easting*	Northing*	pH	EC (µS/cm)	Nitrate (mg/L)	Total Phoshorus (mg/L)
Namanve 1	464404	39850	6.4	133	0.14	0.11
Namanve 2	463676	39909	6	122	0.42	0.18
Namanve 3	463332	39907	5.9	108	0.81	0.1
Mukono	477000	38650	6.02	116	4.34	

* WGS84 UTM Zone 36N

ICS 2013

KJE

Sampling Point name	Parameter			
	Mean Temp (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Remarks
Victoria Nile at the bridge to Jinja,	25.4	8.4	8.4	Water hyacinth. Altitude: 1136m
Naava stream,	23.9	10.1	7.7	Swamp shrubs, maize fallow, borehole water. Altitude: 1195m
Naava stream point 2	-	-	-	Thick water cabbage on top of stagnant water, elephant grass, swamp grass, water was not accessible Altitude: 1187m
Kagonjo stream/wetland	20.0	6.0	8.2	Palms, reeds, papyrus, swamp grass, shrubs. Altitude: 1190m
Kinywa stream	25.6	7.2	8.6	Swamp grass, shrubs, maize plantation. Altitude: 1194m
Balunginjuru stream 1	24.8	10.1	8.9	Spear grass, swamp grass, maize fallow, banana plantation. Altitude: 1198m
Balunginjuru stream 2	24.3	9.6	8.3	Clear stream water, rice plantation, banana plantation, sugar cane plantation. Altitude: 1192m
Kyetinda stream	22.3	8.9	8.0	Sugar cane plantation, pine-tree plantation, clear protected spring water. Altitude: 1215m
Mabuguwe stream at culvert 1	31.4	7.9	7.6	Sugar cane plantation, brownish water. Altitude: 1208m
Mabuguwe stream 2– Kidadiri	27.1	7.9	7.8	Sugar cane plantation, swamp grass Altitude: 1209m
Mabuguwe stream at culvert 3, point 6	22.6	8.6	7.2	Clear protected spring water, sugar cane fallow/plantation Altitude: 1223m
Kasininya stream in Mabira forest	21.9	9.7	8.3	Clear protected spring water, forest reserve Altitude: 1182m
Lwankima stream in Mabira forest	20.3	7.8	7.8	Forest reserve, brownish water, soggy ground Altitude: ----m
Musamya river in Sugar cane plantation	32.5	6.9	7.8	Sugar cane plantation Altitude: 1233m

Sampling Point name	Parameter			
	Mean Temp (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Remarks
Musamya river in Sugar cane plantation, point 2	28.2	8.4	8.1	Brownish water, sugar plantations. Altitude: 1166m
Mubitakalwuto stream 1	28.3	6.0	7.9	Sugar cane plantations Altitude: 1173m
Kafuwaluwa stream	29.5	9.0	8.2	Sugar cane plantations Altitude: 1160m
Mubitakalwuto stream 2	22.8	8.5	8.5	Sugar cane plantations, pine-tree plantation bathing/washing area Altitude: 1171m
Mubitakalwuto stream 3	24.1	7.5	7.4	Pine-tree plantation, sugar cane plantations, water weeds, slightly turbid water Altitude: 1205m
Mubitakalwuto stream 4	31.5	8.5	9.0	Clear stream water, sugar cane plantations Altitude: 1203m
Jugula stream	24.1	8.5	8.1	Shrubs, palms. Altitude: 1149m
Nakalasa/Wabuyimba/Jugula Stream in Mutangize.	22.3	7.6	7.9	Shrubs, brownish water. Altitude: 1105m
Nakalasa/Wabuyimba/Jugula Stream in Mutangize, point 2	21.6	4.7	7.5	Brownish water Altitude: 1196m
Sezibwa River	20.1	7.5	7.2	Swamp grass, papyrus, palms, phragmites, and reeds. Altitude: 1097m
Kasaala Stream	20.6	9.7	7.5	forest reserve, large algae coated stones, greenish water, paper factory nearby Altitude: 1114m
Mwola Stream	21.2	7.5	7.5	swamp grass, palms, shrubs Altitude: 1132m
Kazi stream	-	-	-	Seasonal stream, no water point accessed, Dandira forest reserve, reeds. Altitude: 1136m
Kayobe swamp 1	-	-	-	Bog, water not accessible, shrubs, palms, soggy area, seasonal water body Altitude: 1142m
Kayobe swamp 2	25.6	8.5	7.6	water collected from a pond, swamp grass, palms Altitude: 1140m

Sampling Point name	Parameter			
	Mean Temp (°C)	Dissolved Oxygen (DO) (mg/l)	pH	Remarks
Kayobe swamp 3	25.3	8.2	6.9	Phragmites, shrubs, brick making nearby, palms, elephant Altitude: 1141m
Kinawataka swamp at culvert (1)(end point for water sampling)	22.8	5.2	8.0	Urbanised area close to the swamp, dirty water in sampled area, reclaimed swamp. Altitude: 1161m

Sampling site name	Kayobe swamp 1	Kayobe swamp 2	Kayobe swamp 3	Kinawataka swamp at culvert (1) (End point for water sampling)
GPS Coordinates	E: 0035410 N 0467186	E: 0043537 N 0467905	E: 0036301 N 0464397	E: 0037689 N: 0458282
Color (Hazen units)	-	178.42	160.26	94.934
BOD5 (mg/L)	-	2.96		63.14
COD (mg/L)	-	10.174	2.1801	84.32
Oil & Grease (mg/L)	-	0.5	0.5	0.5
pH	-	7.6	6.9	8.0
EC (uS/cm)	-	46	86.9	298
Total Iron (mg/L)	-	0.00	0.10	0.20
TDS (mg/L)	-	23	43	148
Calcium (mg/L)	-	32.80	16.40	7.00
Magnesium (mg/L)	-	1.20	2.48	1.26
Total Hardness (mg/L)	-	2.00	32.00	7.00
Bicarbonates (mg/L)	-	20	20	60
Turbidity (NTU)	-	7.6717	11.9598	10.7389
Total Suspended solids (mg/L)	-	1	4	6
Chloride (mg/L)	-	3.0	3.0	10.0

Sampling site name	Kayobe swamp 1	Kayobe swamp 2	Kayobe swamp 3	Kinawataka swamp at culvert (1) (End point for water sampling)
Phosphate (mg/L as P)	-	0.50	0.20	0.22
Total phosphorous (mg/L as P)	-	0.0661	0.0554	0.0894
Nitrate (mg/L)	-	0.22	0.20	0.024
Nitrite (mg/L)	-	0.32	0.00	0.020

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NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE

Certificate of Analysis

Nature of Samples : Research Work
Date Sampled : 18th April 2013
Sample type : Surface/ Spring Water
Date received : 22rd April 2013
TEST RESULTS;

Parameters	Unit	Results					Method	Drinking Water Standards
		SP1	SP2	SP3	SP4	SP5		
Electrical Conductivity	µs/cm	362	365	177	479	144	1050	1500
Total Dissolved solids	mg/l	253.4	255.5	124	300	100	1041	1000
Total Hardness as $CaCO_3$	mg/l	110	120	49	130	39	1080	800
pH	Unit	7.2	7.2	5.8	6.0	7.2	1020	5.5-8.5
Turbidity	NTU	123	131	0.5	18.9	3.36	1060	30
Colour	Units	ND	ND	1	9	2.5	1000	15
Calcium	mg/l	33.6	35.2	14	30	8	1080	250
Magnesium	mg/l	6.24	7.68	3.36	13.2	4.56	1080	250
Sodium	mg/l	29.6	29.2	17.2	30.3	17.3	1050	200
Potassium	mg/l	14.6	14.6	6.2	10	4.1	1100	N/A
Total Alkalinity as CaCO3	mg/l	150	155	19	56	19	1070	N/A
Bicarbonates	mg/l	182	189	22.2	68	23.2	1070	N/A
Sulphates	mg/l	5	5	2	10	3	1150	250
Chlorides	mg/l	3	4	32	37	23	1140	350
Nitrates as N	mg/l	0.6	0.7	4.8	7.8	3.2	1180	50
Nitrites as N	mg/l	<0.002	<0.002	0.014	0.024	0.013	1190	2
Phosphates	mg/l	0.21	0.32	0.14	0.17	0.1	1210	N/A
Total Suspended Solids (105°C)	mg/l	1	16	29	2	12	1030	N/A
Total Suspended Solids (500°C)	mg/l	<1	10	20	<1	4.3	1051	N/A
Temperature	°C	24.5	24.5	24	24.5	25	2000	N/A
Chemical Oxygen Demand	mg/l	<22	22	<22	<22	<22	1240	N/A

Remarks: N/A =Not available, ND=Not detected

Issued by
Principal Analyst

Notes; Samples are analyzed on as received basis. The laboratory does not bear any responsibility as to the representative characters of the samples. Results are therefore based on the analyzed sample delivered.

NATIONAL WATER QUALITY REFERENCE LABORATORIES
30 APR 2013
NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE
Sign:.....

Republic of Uganda

NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE

Certificate of Analysis

Nature of Samples : Research Work
Date Sampled : 18th April 2013
Sample type : Surface/ Waste Water
Date received : 22rd April 2013

TEST RESULTS;

Parameters	Unit	Results					Method	Wastewater Standards
		SP5	SP7	SP8	SP9	SP10		
Electrical Conductivity	µs/cm	518	121	214	373	397	1030	N/A
Total Dissolved solids	mg/l	362.6	85	150	261	278	1041	1200
Total Hardness as $CaCO_3$	mg/l	136	28	110	110	80	1080	N/A
pH	Unit	5.7	5.7	7.6	7.5	7.1	1020	6-8
Turbidity	NTU	125	2.25	11.7	77	40	1060	30
Colour	Units	ND	ND	ND	ND	ND	1000	15
Calcium	mg/l	37.2	7.2	32	36	20.8	1080	100
Magnesium	mg/l	10.32	2.4	7.2	4.8	6.7	1080	100
Sodium	mg/l	31.8	17.4	20.3	26.3	22.4	1090	N/A
Potassium	mg/l	21.6	3.2	6.6	12.4	10.4	1100	N/A
Total Alkalinity as CaCO3	mg/l	220	22	96	160	19	1070	N/A
Bicarbonates	mg/l	268	26.8	117	195	183	1070	N/A
Sulphates	mg/l	52	7	4	3	2	1150	500
Chlorides	mg/l	2	16	19	9	2	1140	500
Nitrates as N	mg/l	1.3	2	0.2	0.8	0.1	1190	50
Nitrites as N	mg/l	<0.002	0.015	0.01	0.129	0.008	1190	2
Phosphates	mg/l	1.59	0.09	0.18	0.31	0.13	1210	5
Total Phosphates	mg/l	3.0	ND	0.5	0.44	0.33		10
Total Suspended Solids (105°C)	mg/l	30	3.3	4.3	2	6.3	1050	N/A
Total Suspended Solids (500°C)	mg/l	4	2	3	1.3	6	1051	N/A
Temperature	°C	25	24.5	24.5	24.5	24	2000	20-35
Chemical Oxygen Demand	mg/l	81	<22	<22	<22	<22	1241	100
Biological Oxygen Demand	mg/l	55	5	6	5	5	1240	50

Remarks; N/A =Not available, ND=Not detected

Issued by

Principal Analyst

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PRINCIPAL ANALYST LABORATORIES
Water Quality Management Department
Directorate of Water Resources Management Department
P.O Box 19, Entebbe
Tel: 041-321342
Fax: 041-321308
26 APR 2013
NATIONAL WATER QUALITY REFERENCE LABORATORY - ENTEBBE