INTEGRATED WATER QUALITY MANAGEMENT SYMPOSIUM

Water Quality Monitoring Networks: Making a case for improvement

31 May 2017

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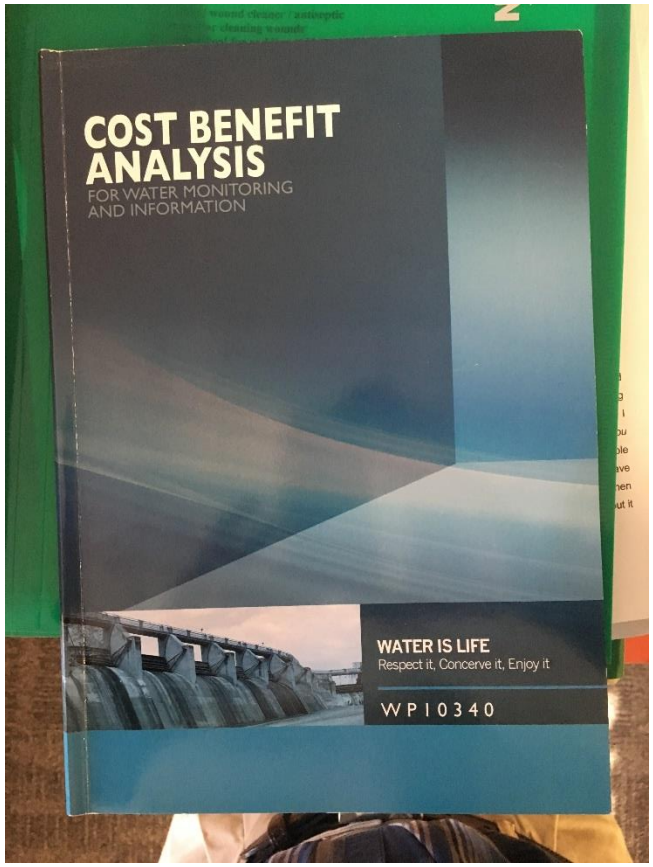
RAND WATER

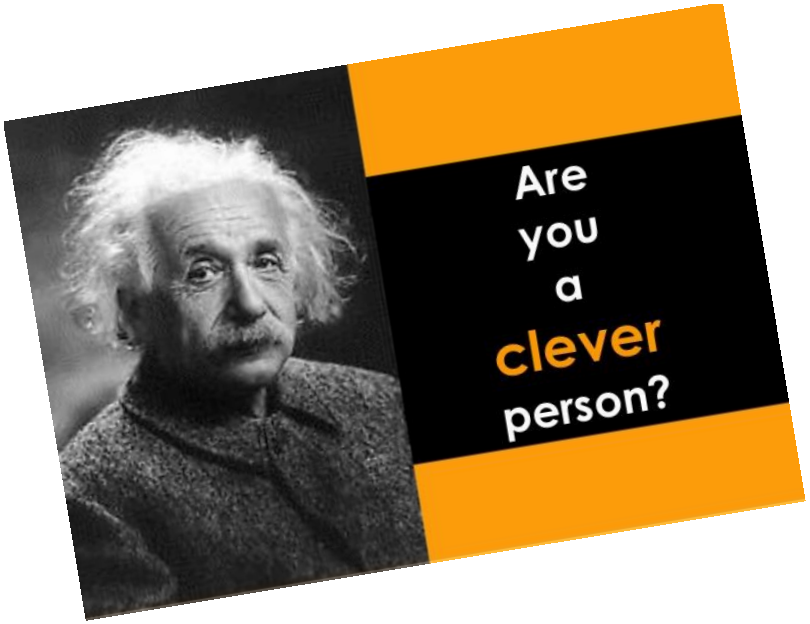
Costs vs Benefits

- NPV in 2011 = R25.974 m/a
- BCR = R10.77:1



What do we want?

Ch 14 of NWA requires establishment of monitoring and information systems.

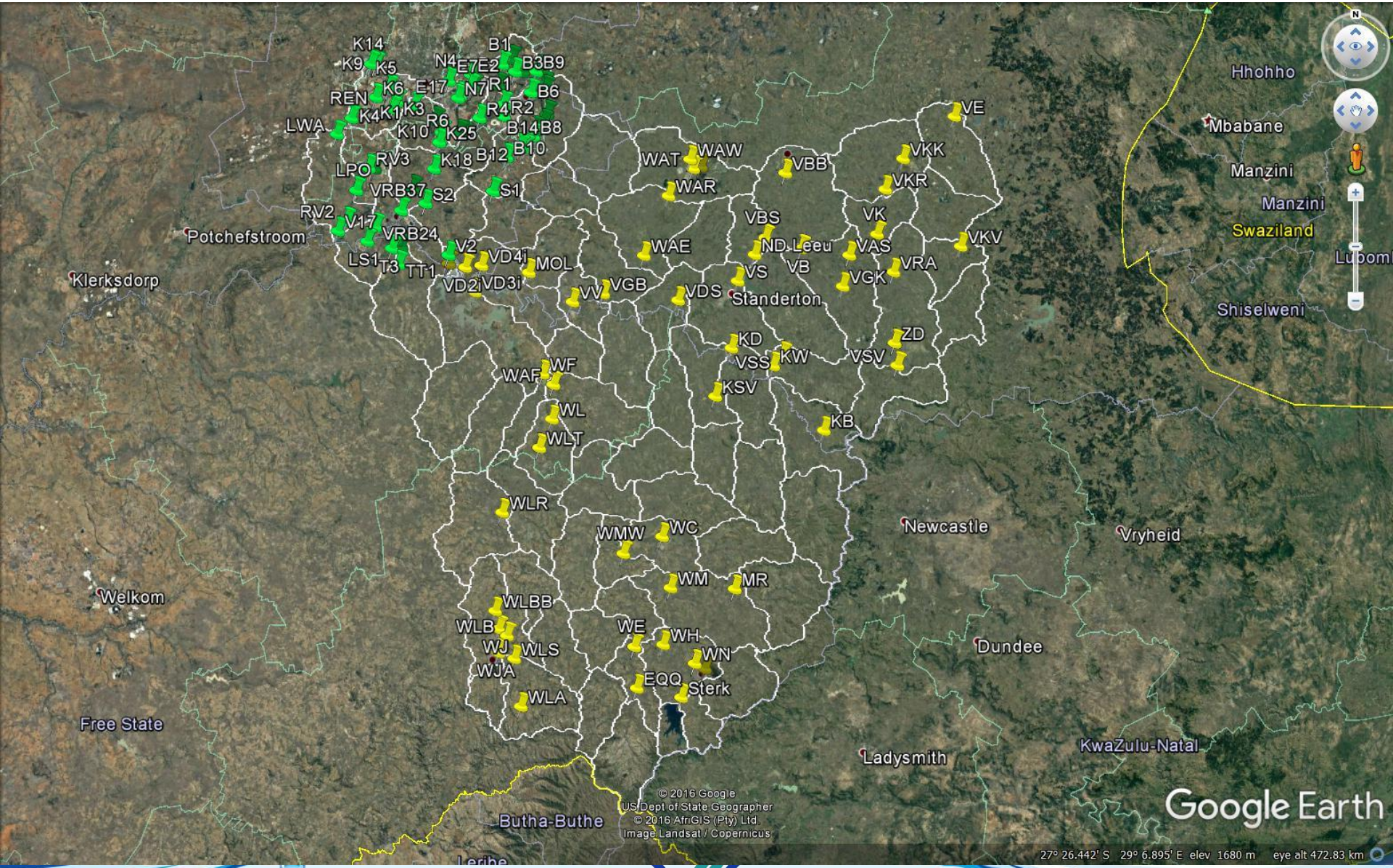


Knowledge vs Wisdom

Why do we want to monitor?

- It depends on what you want to know?
  - Implement NWA
    - River Classification
    - Reserve determination
    - RQO
    - Issue licenses
    - Allocate abstractions
    - Monitor discharges
    - Manage disasters / incidents
  - Other :
    - Water purification
    - Agriculture
    - Industry

Where do we monitor?



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How do we monitor?

Routine & Ad-hoc

Online

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How often do we monitor?

- Online.
- Daily (Operations).
- Weekly (Recreation report).
- Bi-weekly.
- Monthly.
- Quarterly.
- Bi-annually (SASS).
- Annually.

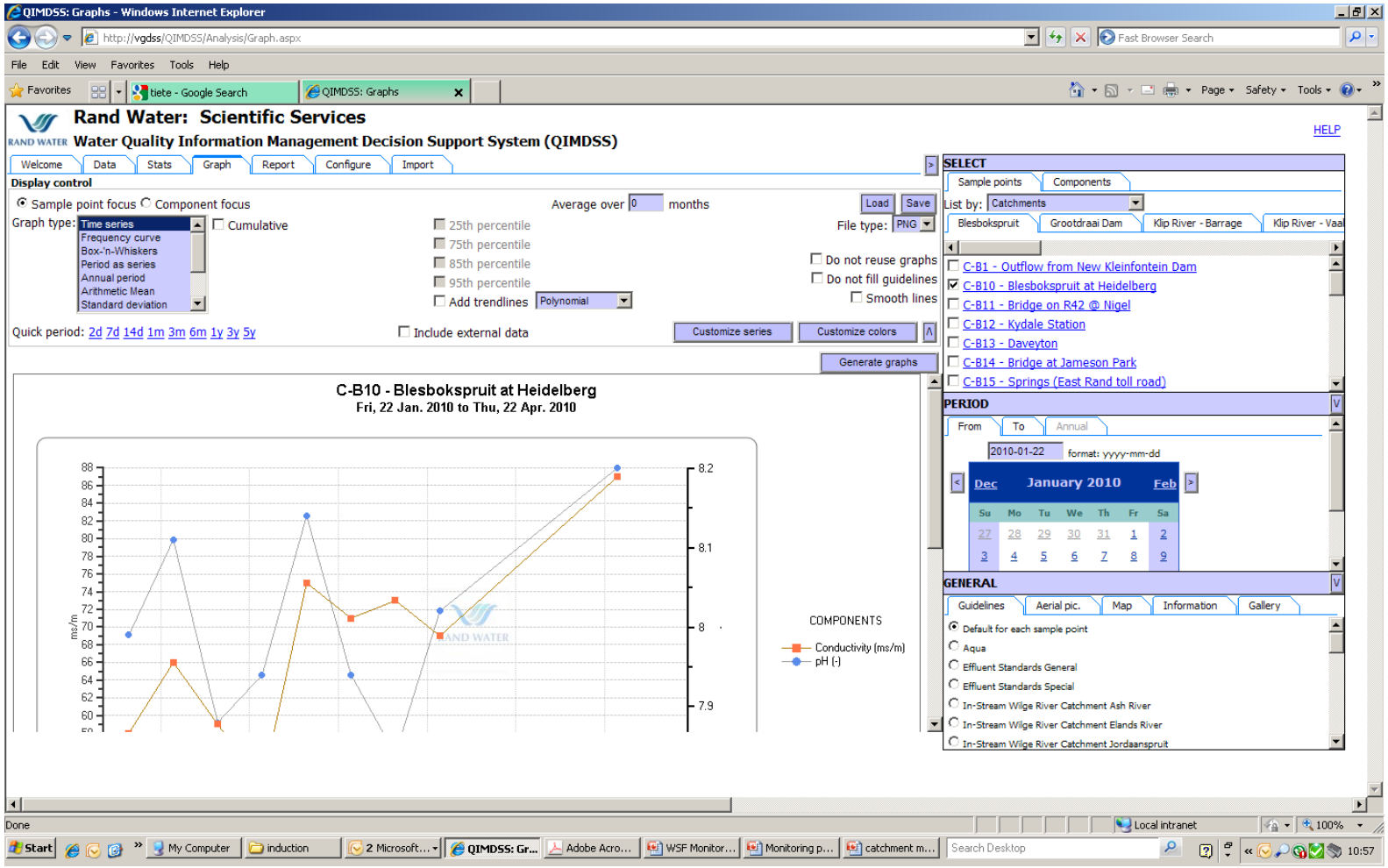
What do we monitor?

- Organic.
- Inorganic.
- Microbiological.
- Biological.
- Flows / levels
- *ISO 17025 accreditation.*

Data and information management

- Data is managed through a Laboratory Information Management System (LIMS).
  - LabWare is the software of choice.
- Approved data is released for use.
  - Quality Information Decision Support System (QIMDSS) is the software of choice.

Data and information management



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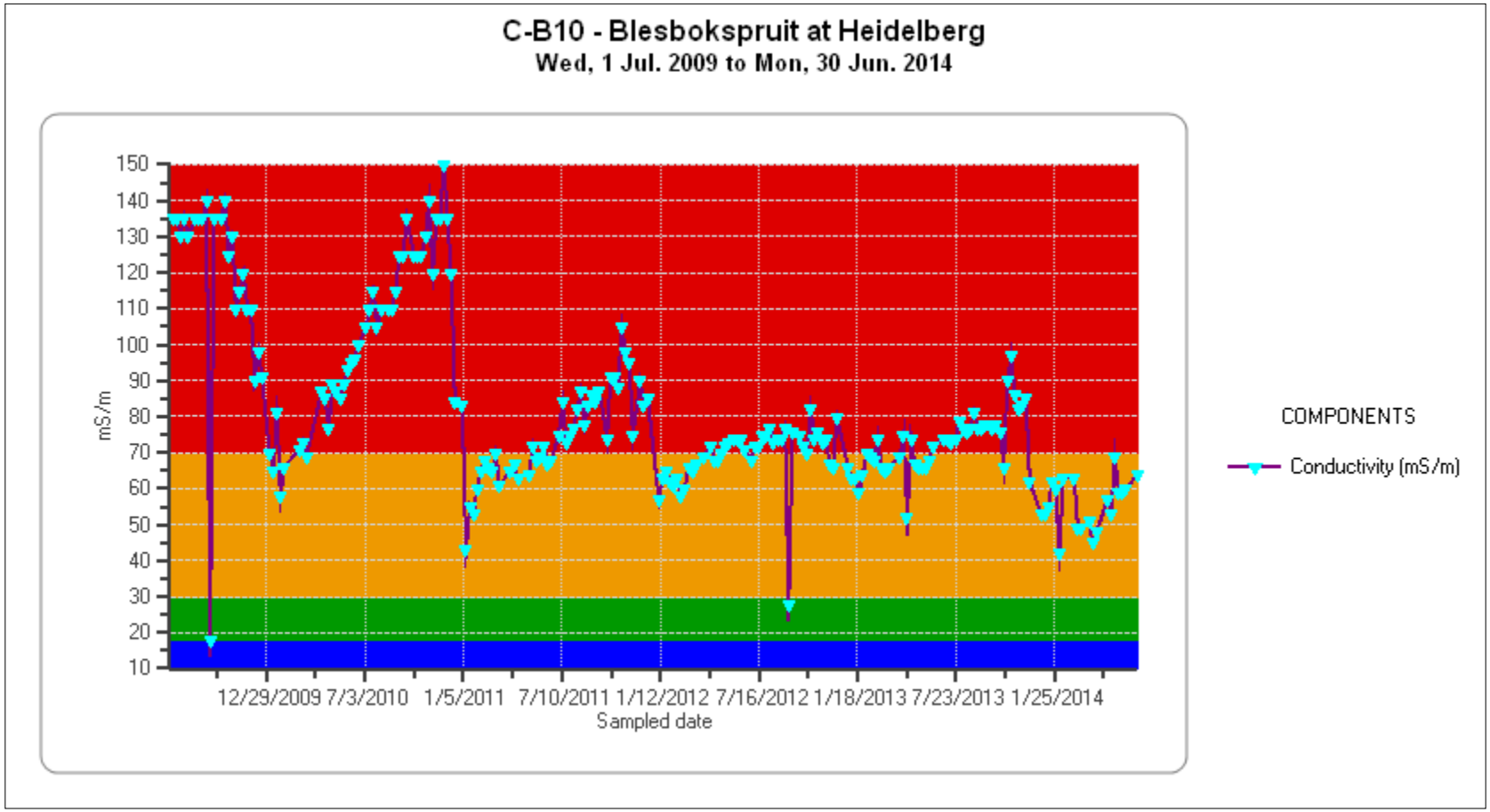
Data and information management



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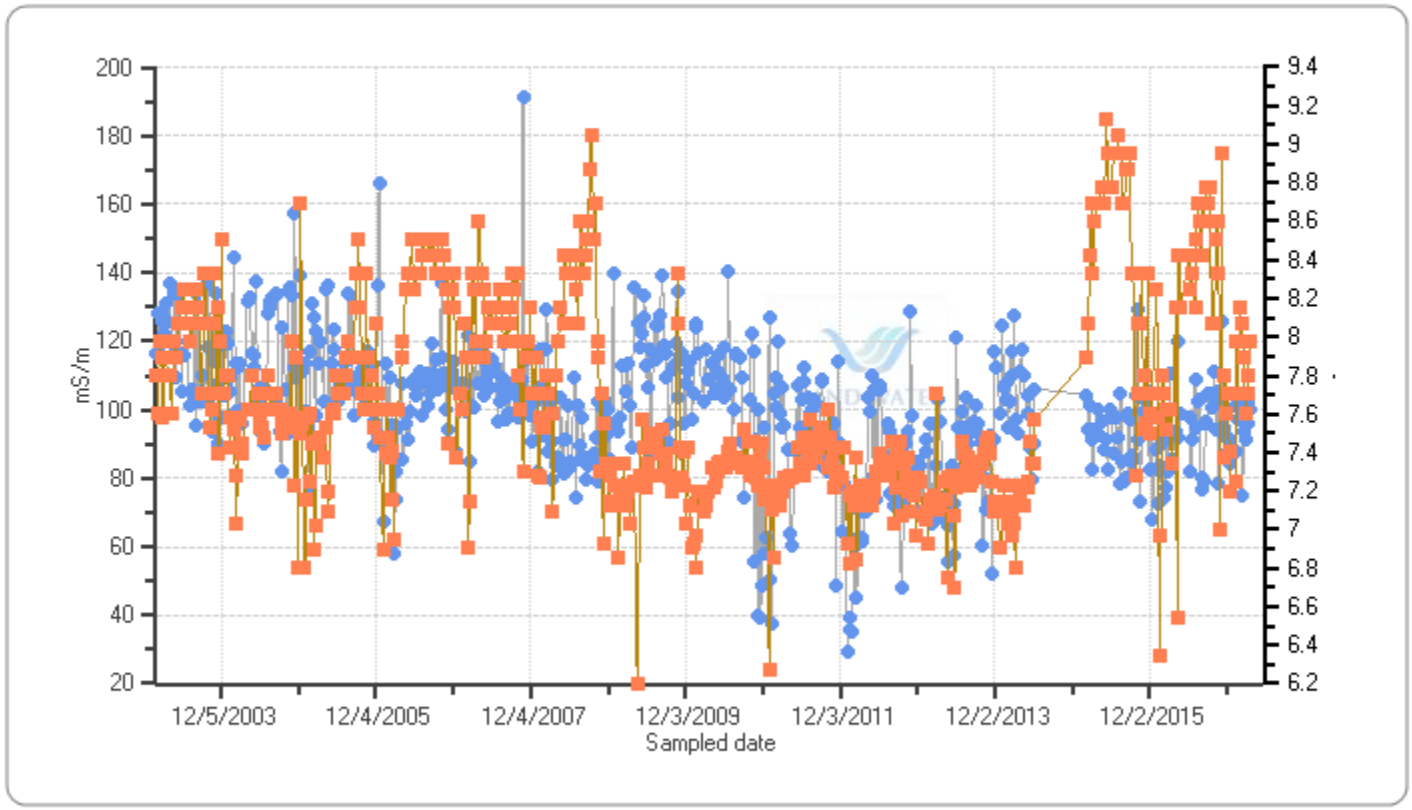
Data and information management



Reporting – Catchment forums & public

Rand Water
Quarterly Water Quality Status of the Blesbokspruit Catchment 01 Apr 2016 - 31 Mar 2017

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Sample Points	Sample Point Description	Aluminium	Ammonia	Chemical Oxygen Demand	Chloride	Conductivity	Daphnia Toxicity	Dissolved Oxygen	E.coli	Fluoride	Iron	Magnesium	Manganese	Nitrate	pH	Phosphate	Sodium	Sulphate	Suspended Solids
B1	Outflow from New Kleinfontein Dam	0.04	0.46		22	45		9.6		4.71	0.15	9	0.10	0.57	8.0	0.13	23	36	
		0.06	0.26		30	37		4.6		0.33	0.21	10	0.12	0.65	8.0	0.10	27	46	
	026.183 E28.334	0.03	0.24		29	38		6.4		0.32	0.11	8	0.06	0.82	7.9	0.10	25	55	
		0.03	0.16		24	27		7.6		0.30	0.12	8	0.06	0.10	7.7	0.13	16	20	
B2	Outflow from Van Ryn Dam	0.03	10.63		66	68		4.2		0.24	0.11	10	0.15	1.28	8.0	0.93	59	61	
		0.03	6.30		56	56		5.7		0.27	0.15	9	0.04	1.50	8.0	1.50	54	181	
		0.04	5.63		51	59		5.4		0.23	0.67	8	0.10	0.27	7.6	2.27	52	40	
	026.166 E28.371	0.07	4.56		48	43		4.9		0.30	0.63	8	0.09	0.21	7.6	1.05	31	35	
B3	Stream from Brakpan Lake	0.03	1.76		64	49		8.1		0.19	0.01	11	0.03	1.90	7.7	0.16	52	65	
		0.04	1.19		49	46		7.7		0.22	0.05	9	0.04	1.83	7.8	0.13	39	113	
		0.06	0.62		77	56		3.8		0.15	0.11	9	0.03	2.23	7.8	0.53	58	64	
	026.209 E28.385	0.07	0.15		55	48		4.3		0.15	0.30	12	0.11	0.86	7.3	0.13	40	77	
B4	Causeway @ Alexander Dam	0.04	0.51		49	42		7.9		0.27	0.08	10	0.06	0.76	8.3	0.18	41	56	
		0.05	0.35		46	50		4.1		0.29	0.15	13	0.09	1.17	8.2	0.13	46	83	
		0.03	0.20		48	50		6.2		0.20	0.08	10	0.13	0.15	8.1	0.27	51	55	
	026.211 E28.415	0.06	0.15		34	44		5.2		0.30	0.12	12	0.40	0.30	7.3	0.13	30	74	
B9	Outflow from Cowles Dam	0.07	0.64		57	88		5.9	22	0.42	0.15	27	0.22	3.31	7.7	0.15	71	149	
		0.05	0.51		87	113		3.6	62	0.26	0.16	28	0.17	2.82	7.7	0.10	86	228	
		0.12	1.04		80	101		4.6	47	0.31	0.14	27	0.36	3.34	7.6	0.15	88	186	
	026.209 E28.467	0.07	0.66		41	64		6.3	6,548	0.18	0.15	15	0.23	1.52	7.5	0.52	46	99	
B13	Stream from Daveyton below Welgedacht WWTW	0.06	2.35		63	66		2.8	7,029	0.34	0.64	12	0.25	1.77	7.4	1.11	76	74	
		0.05	3.40		61	69		2.8	2,449	0.26	0.64	11	0.20	1.64	7.2	1.03	69	72	
		0.08	2.04		49	63		4.4	673	0.29	0.67	10	0.14	0.83	7.4	1.09	58	72	
	026.199 E28.480	0.09	0.74		66	67		3.2	699	0.25	0.31	11	0.15	1.00	7.4	0.91	56	59	
B5	Blesbokspruit @ Welgedacht	0.07	4.03		70	67		2.7		0.31	0.45	18	0.26	0.90	7.6	0.78	79	112	
		0.09	4.17		74	83		2.6		0.21	0.65	17	0.47	0.96	7.4	1.42	81	133	
		0.11	3.90		71	51		1.2		0.21	0.61	16	0.42	0.43	6.3	1.01	78	152	
	026.215 E28.480	0.05	0.83		53	52		3.0		0.26	0.26	12	0.34	0.34	7.4	0.46	41	86	
B16	Blesbokspruit @ Grootviei Mine Train Bridge	0.03	2.30		68	80		7.3		0.39	0.14	21	0.35	1.13	7.6	0.63	75	163	
		0.07	4.34		66	107		5.3		0.22	0.19	36	0.22	0.78	7.5	0.56	86	363	
		0.03	0.87		87	158		5.7		0.34	0.15	47	0.57	1.26	7.5	1.38	114	99	
	026.256 E28.498	0.03	0.64		75	81		2.8		0.28	0.25	23	0.35	0.54	7.5	0.51	64	259	
B6	Klein Blesbokspruit @ Selection Park	0.03	0.38		67	49		8.6		0.31	0.05	13	0.04	0.65	8.0	0.13	42	60	
		0.04	2.93		53	59		7.6		0.24	0.32	15	0.25	0.34	7.9	1.13	49	96	
		0.06	0.20		27	29		5.8		0.30	0.26	12	0.26	0.16	6.3	0.10	25	43	
	026.283 E28.444	0.21	0.15		70	55		7.7		0.38	0.12	15	0.35	0.21	7.9	0.17	39	148	
B15	Blesbokspruit on N17 Toll Road @ Springs	0.03	0.85		69	72		5.0		0.35	0.03	19	0.11	0.83	7.6	0.59	68	125	
		0.05	4.13		64	113		5.4		0.21	0.11	32	0.11	0.72	7.5	0.54	81	265	
		0.04	0.23		56	147		5.9		0.28	0.06	30	0.17	0.50	7.5	0.66	78	217	
	026.271 E28.504	0.03	0.21		33	88		5.9		0.29	0.07	21	0.38	0.30	7.6	0.58	62	180	
B17	Blesbokspruit @ Marievale Bird Sanctuary	0.03	0.50		63	70		3.9		0.38	0.18	19	0.90	0.20	7.6	0.46	62	108	
		0.03	0.20		81	127		6.1		0.23	0.23	40	0.90	0.10	7.6	0.26	92	288	
		0.03	0.20		88	150		3.3		0.44	0.03	44	0.36	0.45	7.7	0.62	118	237	
	026.369 E28.508	0.03	0.15		77	103		4.2		0.36	0.03	26	0.24	0.10	7.7	0.67	67	318	
B11	Blesbokspruit on R42 bridge @ Nigel	0.05	0.49		76	69		9.3		0.24	0.05	19	0.14	0.19	7.7	0.58	67	102	
		0.04	0.24		90	128		6.8		0.23	0.03	37	0.08	0.50	7.9	0.51	104	372	
		0.03	0.20		89	148		7.4		0.35	0.02	44	0.21	0.40	7.9	0.50	120	177	
	026.391 E28.497	0.03	0.15		73	92		4.9		0.42	0.02	25	0.05	0.10	7.8	0.72	66	287	
B7	Stormwater drain from Nigel Dam	0.03	1.04		66	90		5.9		0.45	0.47	25	1.50	0.43	7.3	0.13	88	298	
		0.03	1.27		62	119		3.9		0.35	0.25	29	1.02	0.24	7.7	0.18	101	272	
		0.03	0.28		42	71		6.5		0.31	0.39	24	2.06	0.38	5.5	0.10	96	308	
	026.416 E28.466	0.13	0.19		54	60		4.6		0.50	0.50	14	0.93	0.16	7.5	0.13	53	208	
B8	Blesbokspruit @ Nigel	0.08	0.49		65	71		7.9	19,717	0.33	0.09	19	0.13	1.46	8.0	0.55	66	138	
		0.07	0.45		81	128		6.7	2,154	0.37	0.07	34	0.63	0.28	8.1	0.26	105	230	
		0.15	0.45		74	92		6.0	3,255	0.33	0.12	33	0.23	0.22	6.8	0.40	95	261	
	026.439 E28.456	0.11	0.39		75	92		5.7	1,174	0.33	0.34	24	0.93	0.17	7.8	0.53	68	244	
B14	Blesbokspruit @ Jameson Park	0.06	0.70		59	67		2.6		0.41	0.06	17	0.05	1.66	7.9	0.61	66	101	
		0.11	0.28		88	126		4.1		0.29	0.09	34	0.21	0.47	8.1	0.34	104	380	
		0.08	0.43		79	129		7.4		0.35	0.21	36	0.20	1.83	7.7	0.58	105	157	
	026.479 E28.426	0.18	0.15		43	86		6.6		0.33	0.23	23	0.14	0.38	7.8	0.57	64	205	

Quality of Water in the Vaal Barrage Reservoir

Date Sampled 17 May 2017

Interpretation of the results obtained from water samples collected at the respective sample points (refer map above).

Escherichia coli (E.coli) Predicted symptoms include: Skin irritations, infections & intestinal disorders*		*E.coli* counts per 100ml at sample points									
		1	2	3	4	5	6	7	8	9	10
	This Week	228	16	5,780	866	299	107	20	46	12,910	31
	Last Week	248	18	1,733	1,986	3,090	59	20	53	4,570	0
Guideline		Low risk of gastrointestinal disorders *E.coli* < 130 counts/100ml		Slight risk of gastrointestinal disorders *E.coli* 130 - 200 counts/100ml		Significant risk of gastrointestinal disorders *E.coli* 200 - 400 counts/100ml			High risk of gastrointestinal disorders *E.coli* > 400 counts/100ml		

Blue Green Algae Predicted symptoms include: Skin irritations, infections & intestinal disorders*		Blue Green algae counts at sample points									
		1	2	3	4	5	6	7	8	9	10
	This Week	315	64	302	< 40	1,278	241	2,775	2,715	1,146	6,637
	Last Week	< 40	< 40	< 40	241	362	2,335	603	< 40	603	83,260
Guideline		Low Risk Blue Green algae < 20,000 cells/ml			Moderate Risk Blue Green algae 20,000 – 100,000 cells/ml				High Risk Blue Green algae > 100,000 cells/ml		

Algal Pigments Predicted nuisance conditions include: Scums & smells		Algal pigments expressed as Chlorophyll-a levels at sample points									
		1	2	3	4	5	6	7	8	9	10
	This Week	11	6	6	6	8	5	9	18	5	18
	Last Week	20	42	4	5	11	16	13	80	8	42
Guideline		Low Risk Chlorophyll-a < 15ug/l			Moderate Risk Chlorophyll-a 15 - 30ug/l				High Risk Chlorophyll-a > 30ug/l		

* If ingested. X Sample not received / no data available. Reports generated every Friday of the year.

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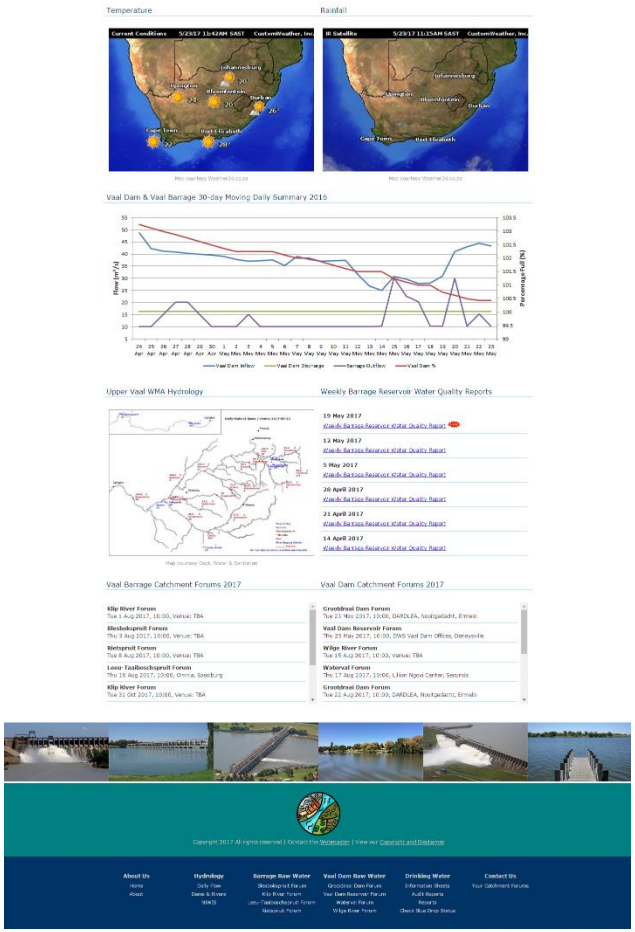
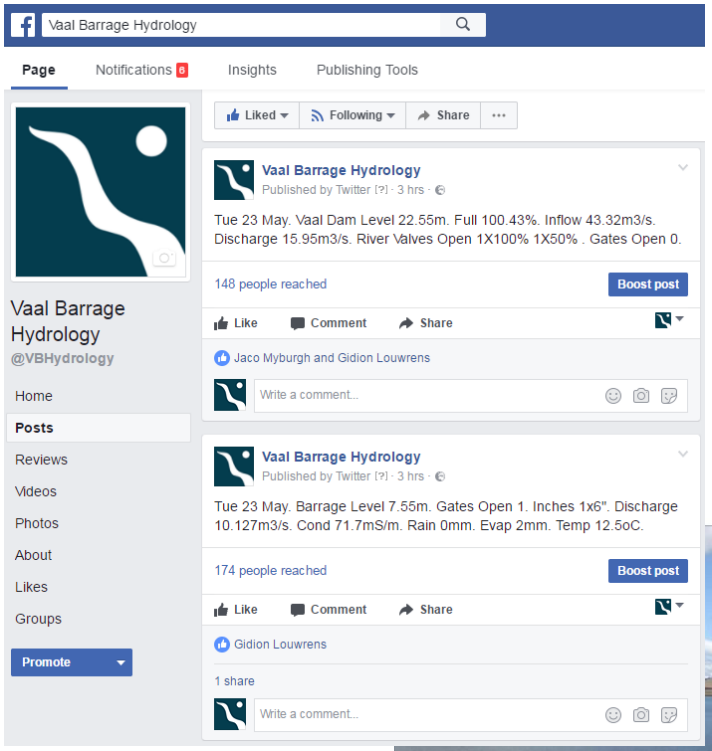
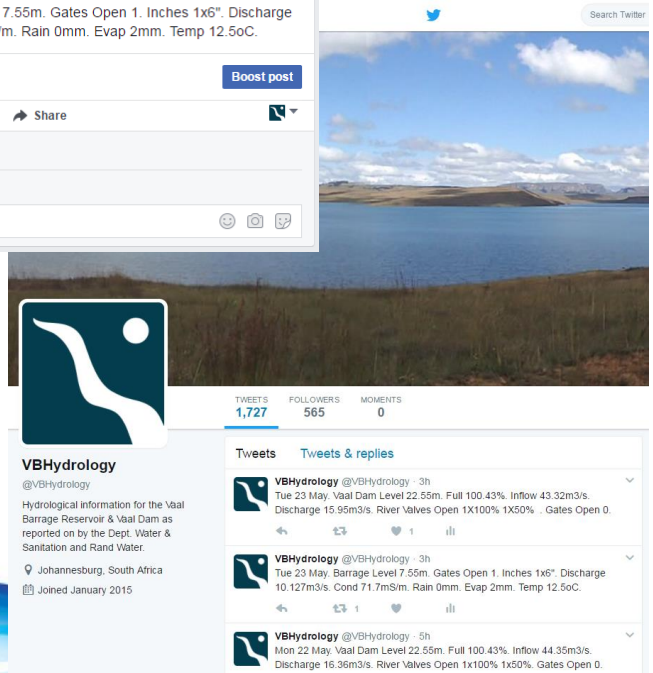
Reporting – Website







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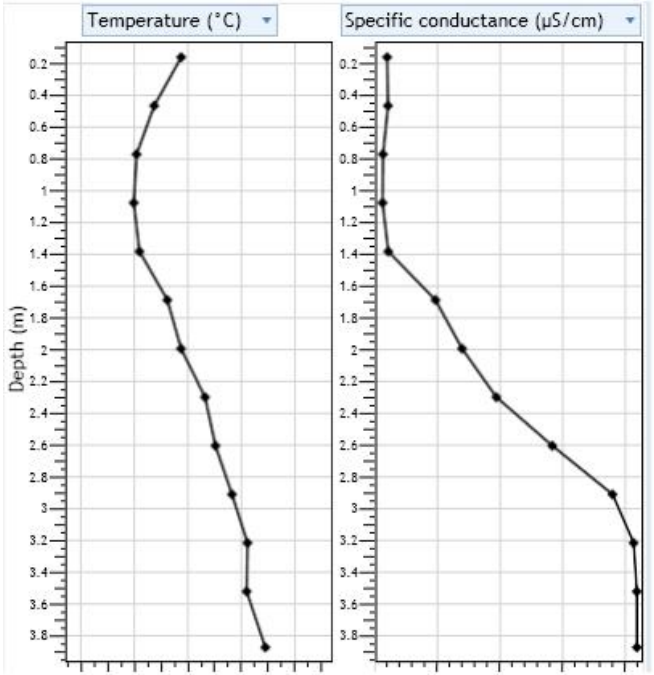
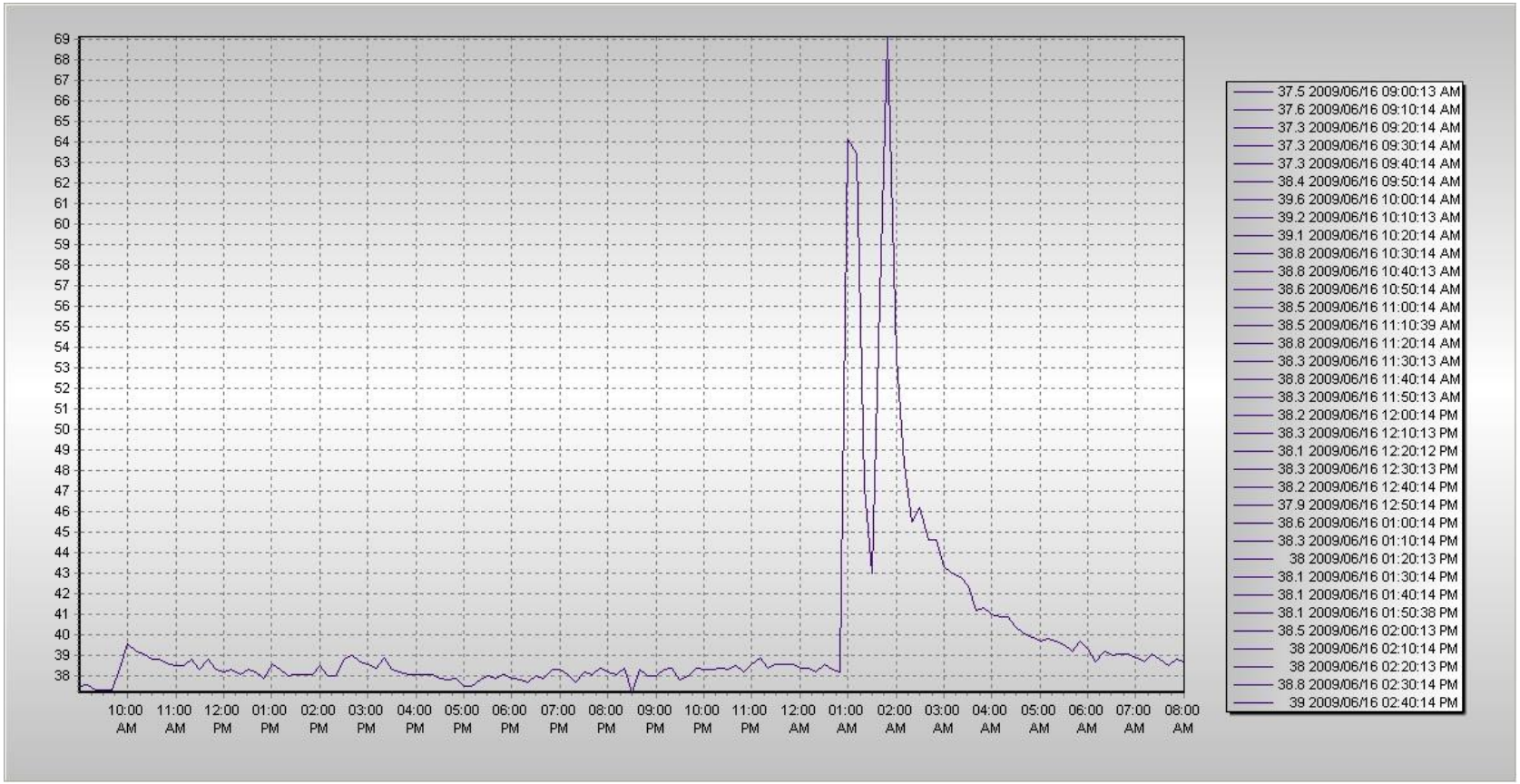
Specialised monitoring – Cast-A-Way



Data and information management

Online turbidity @ Lethabo weir

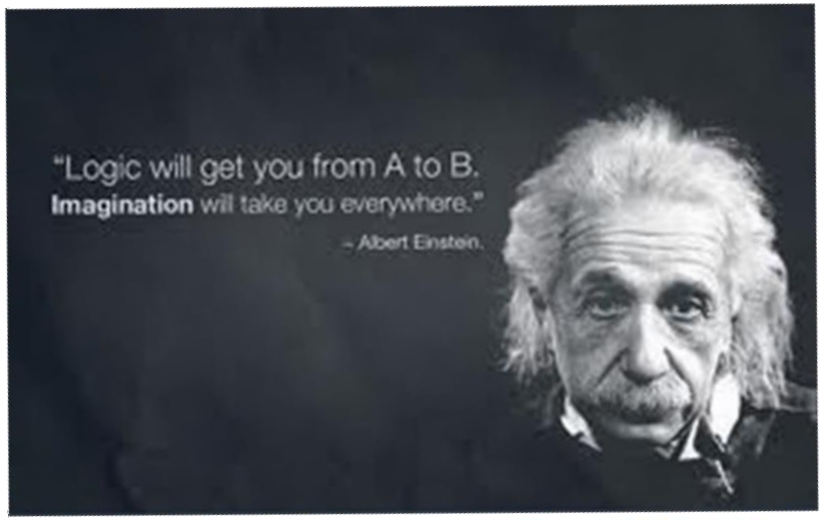


So why are we here? Obstacles

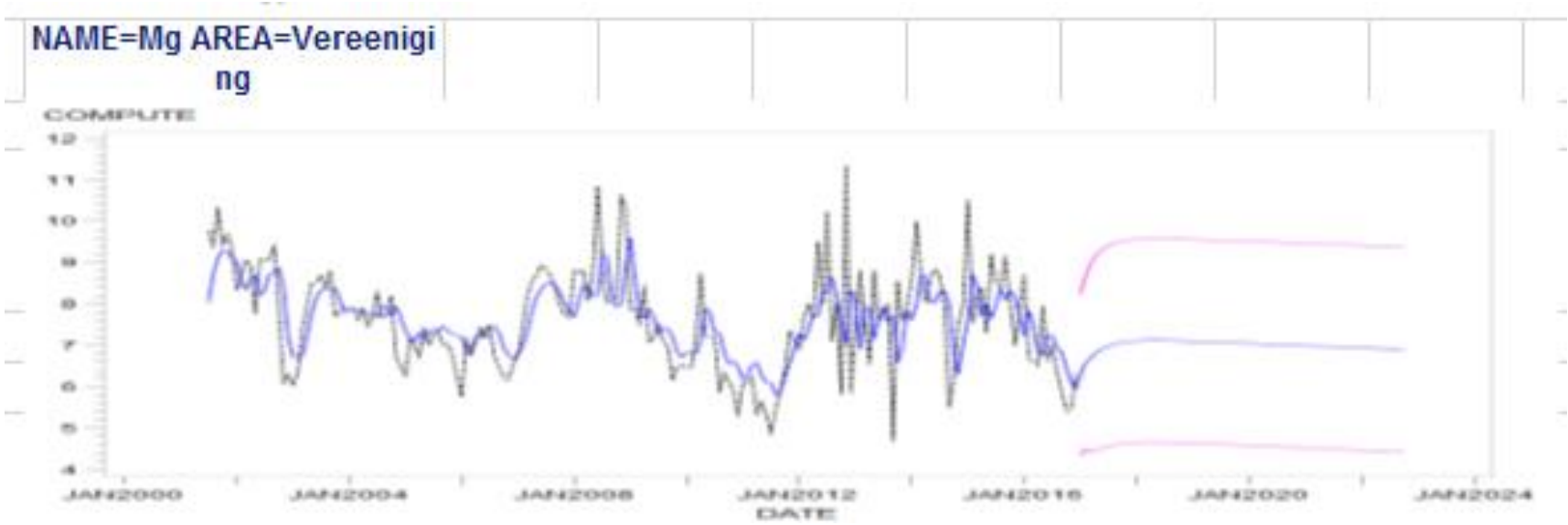
- Different needs
- River Classification / RQO's/Reserve
- Its expensive, time consuming
- Data are never enough…
- Data analyses & reporting must be appropriate
- Data/lab accreditation
- Lab capacity
- Standards & methods
- Centralised database
- We don't know what we don't know – emerging contaminants

Quo Vadis?

- If we have all of the above, what will we have?
  - Just a toy ……
- Information must be effectively utilised to change/improve water quality (i.e law enforcement, correct license conditions, abstraction allocations etc etc…)



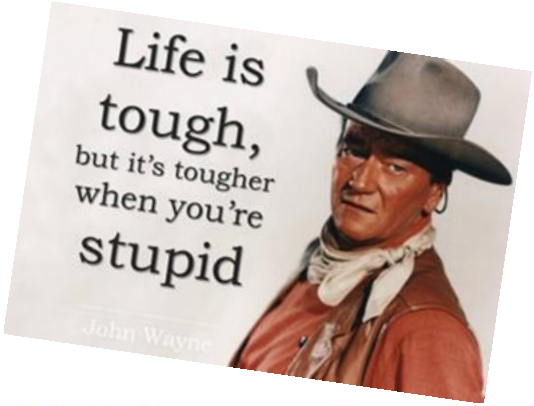
And then some….

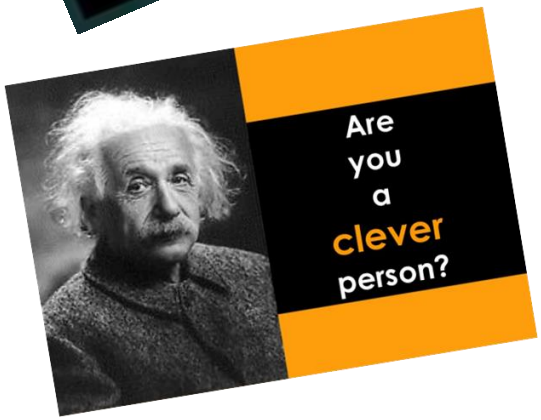


Be the Hilux …

WQM is like wrestling with a gorilla ……

… be tougherer and smarterer…





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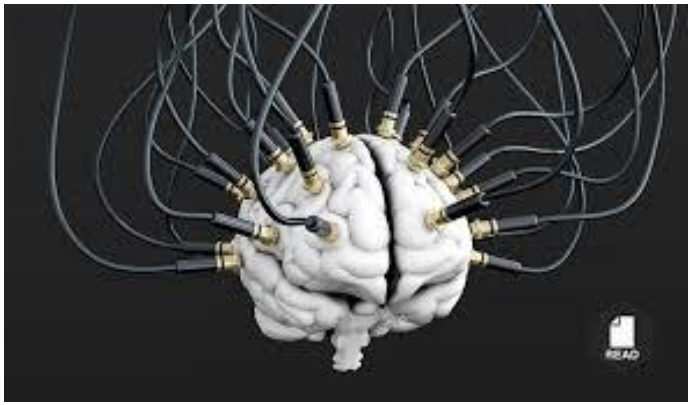
Quo Vadis?

- Are we making the right management decisions?
  - If not why not?
  - What do we need?
- Claudia Schiffer…. (supermodel)
  - And she is very expensive…

Quo Vadis?

Dynamic catchment “supermodel” to predict water quality as well as flows & floods.

- *data → info → knowledge → wisdom*
  - Land use changes (satellite data)
  - Rainfall / runoff data, flows
  - Water Quality data
  - Limnology model




If you're happy
and you know it...
clap your...oh