IWA WSP Kenya

International Water Association

Session 8:

Review Overall Water Safety Planning Experiences & Share Lessons Learned

South Africa

Philip de Souza

Emanti Management

Presentation Roadmap

- Background
  - SA water services
  - National WQM initiatives
- Water safety planning
- SA Case Studies
  - Typical challenges
  - WSP experiences
- Use of web-enabled WSP tools
- Conclusions

Background: SA Water Services

- Major challenges

→**Achieving water services targets**

→**Provision of sustainable services by municipalities due to:**

  - Lack of skills and capacity at municipalities
  - Lack of integrated planning
  - Poor management of functions (DWQ, water use efficiency, O&M, WWT, customer care, etc.)
  - Political interference

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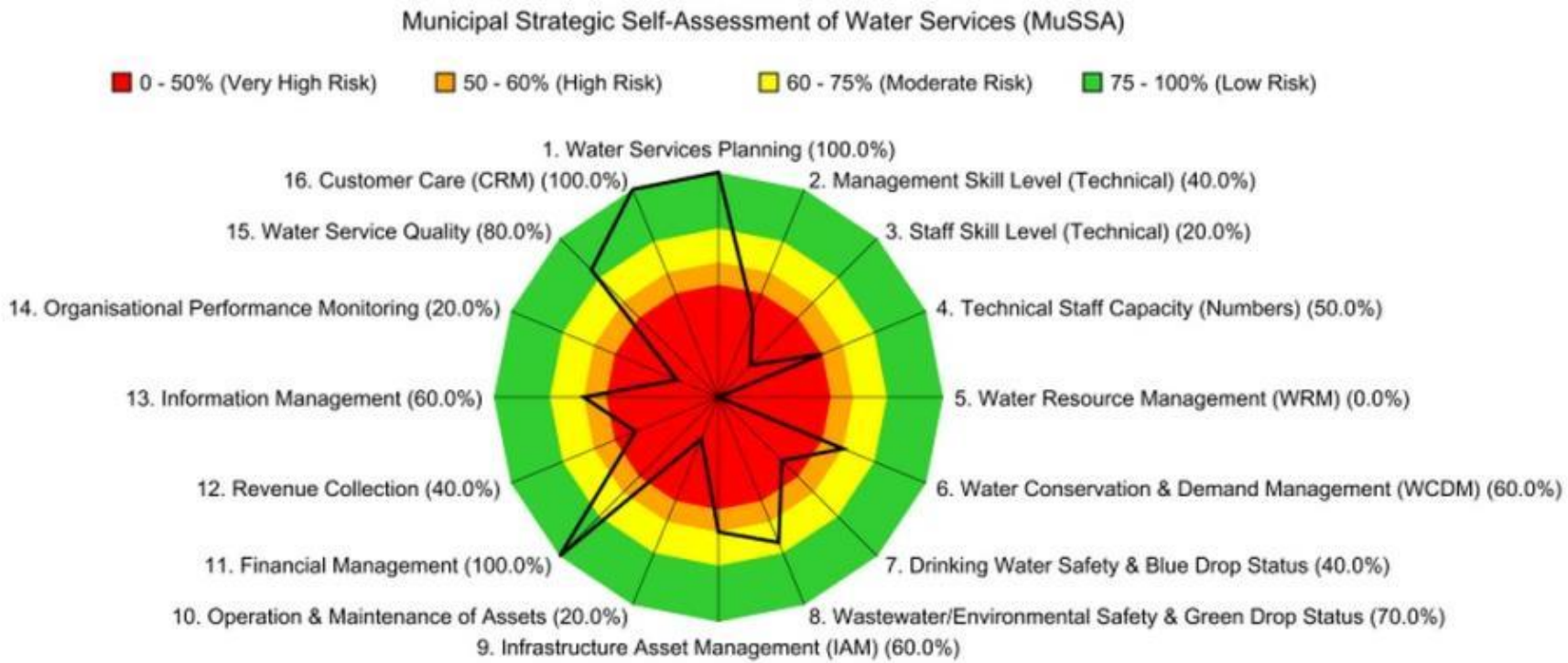
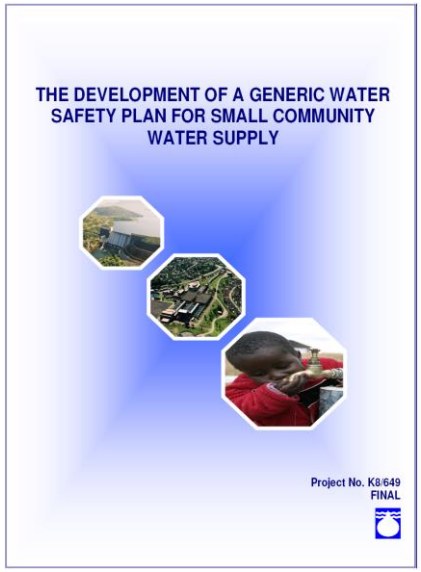
Municipal Strategic Self-Assessment (MuSSA)



Local Municipality – Political turbulence and staff losses

National Water Quality Initiatives

- Municipal Water Quality Management (eWQMS) (2006)
  - Awareness, common language
- Incentive based Regulation (Blue Drop & Green Drop Programmes) (2008)
- Blue Drop Certification requires WSPs
- New SANS 241
- WRC → need to provide municipalities with a WSP orientated tool
  - Generic WSP for Small Community Water Supplies
  - Web-enablement of a WSP via eWQMS
    - Resources → WRC, WHO, Techneau, etc



Water Treatment

Distribution

Resource

Municipality must monitor and manage from source to consumer to source

Consumer

Catchment

Wastewater Treatment

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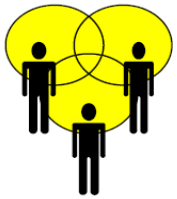
DEVELOPMENT OF A WATER SAFETY PLAN

Step 1: Water Supply System Assessment

Assemble team of expertise to carry out a Water Safety Plan



Define the intended use of water

Example:


Industrial


Domestic

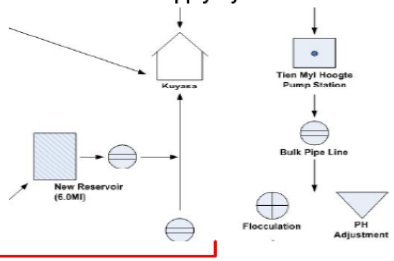

Agricultural

Describe the Water Supply System

Collect on:

1. Water sources
2. Water treatment
3. Distribution network
4. Procedures

Compile a flow diagram of the Water Supply System



Step 2: Risk Assessment

Identify Hazards & Hazardous events


Surface- & Ground water source


Treatment systems


Distribution of water


Other water delivery systems

Assess the risks of the hazard in terms of:

RISK RATING = LIKELIHOOD X CONSEQUENCE

LIKELIHOOD	RATING	CONSEQUENCE	RATING
Almost certain (once a day or permanent feature)	1	Catastrophic (Death expected from exposure)	100
Likely (once per week)	0.8	Major (Population exposed to significant illness)	70
Moderately likely (once per month)	0.5	Moderate (Large aesthetic impact)	20
Unlikely (once per year)	0.2	Minor (Small aesthetic impact)	2
Rare (1 in 5 years)	0.1	Insignificant (No impact)	1

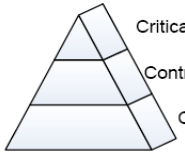
Prioritize risk in terms of the rating

score — High risk

score — Low risk

Step 3: Risk Management

Identify control measures to reduce levels of hazards



Corrective Actions to control measures

Must be supported by **Contingency plan**

Define how control measures will be monitored

A monitoring plan is vital NB to ensure control measures are closely monitored

Establish procedures to verify that the Water Safety Plan is working effectively

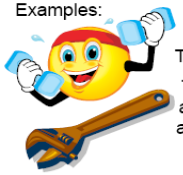
Verification includes:

Audit

Spot checks

Develop supporting programmes

Examples:



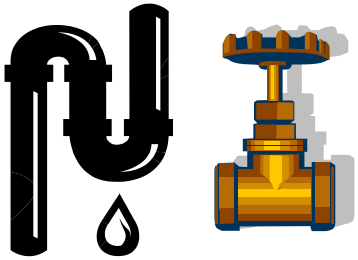
Training

Tools for managing actions of staff such as quality assurance systems

Prepare Management Procedures for

Emergency situations

Essential WSP Actions



System Assessment

Effective Operational Monitoring

Management

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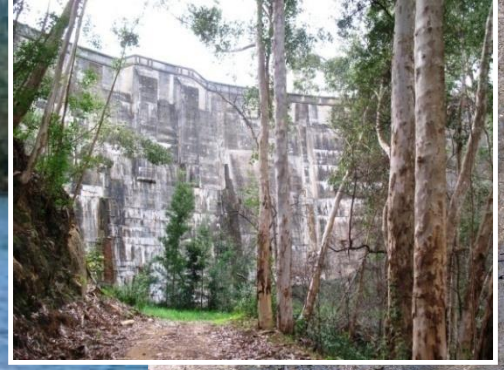


Source

Treatment


AIR
BLOWER


CYLINDERS AND PORTABLE TANKS
NOU SLUNDERS
VASGFKETTING
KEEP CYLINDERS
CHAINED


Atemfilter 2730
0121 CE 95
Bestell-Nr
Lagerfähig bis.
EN 141
A2 B2 E2 K1
NOVEMBER 2005


MIXED
LOAD
WHITE HYDRATED
WATER TREATMENT LIME


Reservoirs/Network


POISON
OGIW
POYIZIN

What is the benefit?

- Nairobi → 450,000 m3/d
  - Unaccounted for Water = 45%
- Lets assume:
  - 25% → illegal connections
  - 20% → losses
  - So 90,000 m3/d lost revenue
- If we have improved efficiencies of only 5%
  - Save 4,500 m3/d
- Sales price ~ KS30/m3
- Savings ~ KS4 million/month

Photos: Willem Wegelin (WRP)

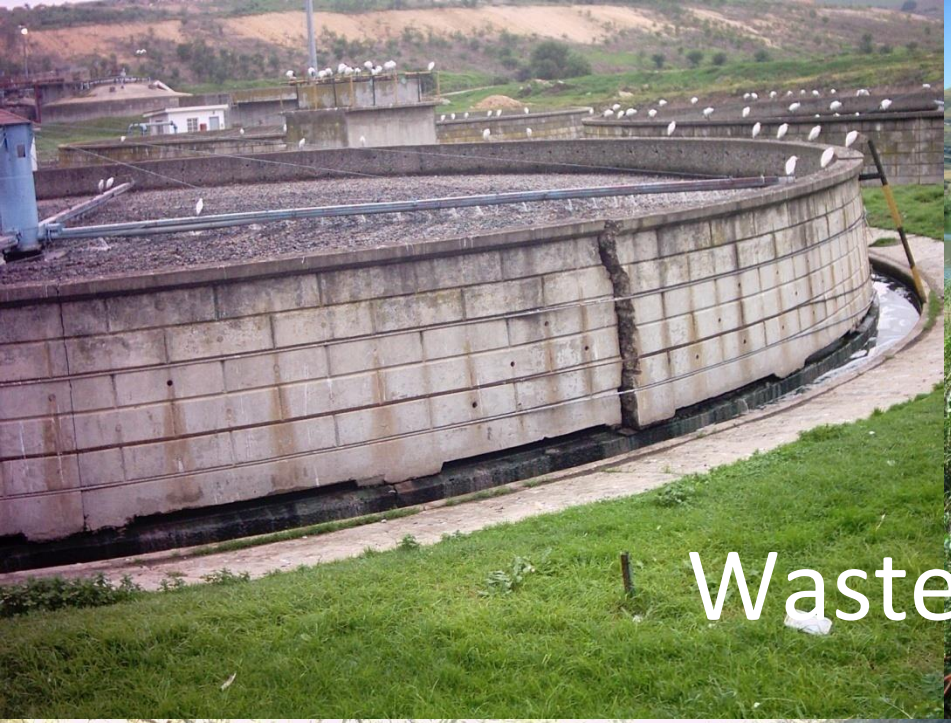








Consumer



Wastewater

Rivers

Water Safety Planning: SA Experience

- BDC 1st Round (2009): 440 systems assessed
- BDC 2nd Round (2010): 787

  systems assessed

  - 154 assessed systems (~20%) had WSPs
  - Some of the WSPs only had the risk assessment section completed, only for WTWs (i.e. WSP not fully implemented)
- BDC 3rd Round (2011): Results → end June 2011

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Water Safety Planning: SA Experience

- Some municipalities had policies/protocols/procedures/etc BUT not always **up to-date** or **centrally located** or **nicely packaged**
- See value of managing DWQ using WSP → **improved understanding** of their challenges
- Implementation of plans → **insufficient numbers or skilled** operational and maintenance staff
- BDC a **high profile indicator** of municipal performance → priority item/funding should be forthcoming
- **Need guidance** to more easily complete a WSP, flag high risk issues, & tracking corrective actions

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WRC WSP Tools

- ***Water Safety Plan Status Checklist***
  - Rapidly assess progress in the WSP process (i.e. “where are we and what do we still need to do”)
  - Considers typical WSP steps & asks 5 key questions per step
  - A colour-coded “spider-diagram” output is provided of the status
- ***Water Safety Plan Tool***
  - Prepare a Water Safety Plan
  - Based on WRC, WHO and other guidelines
  - Also included wastewater components (i.e. integrated water management, alignment with Green Drop requirements)

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Water Safety Plan Checklist (Excel)

WRC Water Safety Plan Checklist Tool Version Jan 2011.xls [Compatibility Mode] - Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View | Add-Ins

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Water Safety Plan Checklist Tool

If you have any queries regarding the tool, please contact

Step 2 of 3

Water Safety Plan Status Checklist

Instructions

1. The checklist contains 8 sections (with 5 questions per section) that ne
40 questions).

2. Use the scoring methodology shown below to complete the checklist.

3. NOTE: To ensure a balanced opinion, it is recommended that at least 3
complete the WSP checklist.

4. Once you have completed all answers, go to the status worksheet to vie

Scoring Rules	
Strongly disagree or don't know	0
Disagree	1
Neutral	2
Agree	3
Strongly agree	4

1. General | 2. WSP Checklist | 3. WSP Status

1. Water Safety Plan Team			2. Water Supply System Assessment			
1.1	A multi-disciplinary team of experts has been assembled to carry out the WSP	4	2.1	The water supply system has been described from catchment to consumer	4	3.1
1.2	The WSP team has been informed of their duties and are committed to the process	4	2.2	The wastewater system has been described from collection to discharge	2	3.2
1.3	A WSP methodology (e.g. steps 1 - 10) has been defined and agreed by the WSP team	4	2.3	A flow diagram of the entire water and wastewater system has been developed using the symbol chart	4	3.3
1.4	The WSP team regularly meets to discuss issues, review progress, etc	4	2.4	The system description has been confirmed by site visits, interactions with stakeholders, etc		
1.5	WSP development and implementation is funded and supported by top management	4	2.5	The system description information has been documented		

Comments
Right click on th
cell, go to insert
comment, leave
comments if you
wish

1. General | 2. WSP Checklist | 3. WSP Status

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Water Safety Plan Checklist (Excel)

WRC Water Safety Plan Checklist Tool Version Jan 2011.xls [Compatibility Mode] - Microsoft Excel

Home | Insert | Page Layout | Formulas | Data | Review | View | Add-Ins

In association with

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Water Safety Plan Checklist Tool

If you have any queries regarding the tool, please contact P de Souza (Emanti) (021 88

Step 3 of 3

Water Safety Plan Status

NOTE: The results presented below are automatically populated from prev

Key
Red - Poor (i.e. very poor/no progress)
Yellow - Needs attention (i.e. limited/slow progress)
Green - Acceptable (i.e. good progress)

Overall Status	Needs Attention
Category	Status
1. Water Safety Plan Team	Acceptable
2. Water Supply System Assessment	Acceptable
3. Hazard & Risk Assessment	Needs Attention
4. Control Measures & Corrective Actions	Needs Attention
5. Monitoring & Verification	Poor

1. General | 2. WSP Checklist | 3. WSP Status

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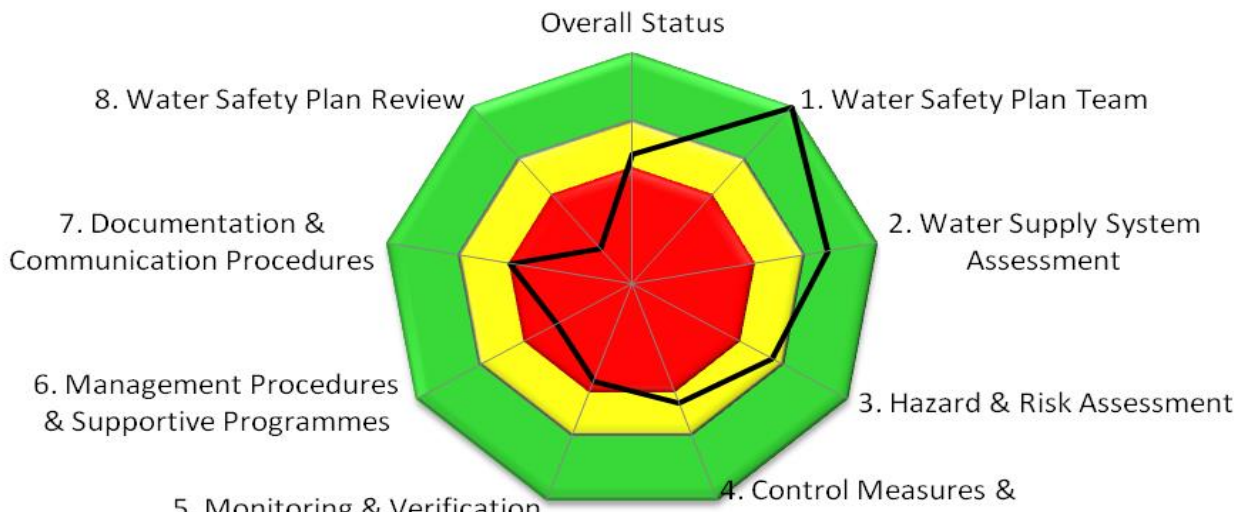
Water Safety Plan Status



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Water Safety Plan Checklist (Web)

Drinking Water | Dashboard | Data Entry | Reports | Risk Toolbox | Setup | Admininistration | Logout

WRC Water Safety Plan Status Checklist: Test

SECTION: 1. Water Safety Plan Team

1. A multi-disciplinary team of experts has been assembled to carry out the WSP
   Strongly agree (fully complete/in place)
2. The WSP team has been informed of their duties and are committed to the process
   Agree (substantially complete/in place)
3. A WSP methodology (e.g. steps 1 - 10) has been defined and agreed by the WSP team
   Neutral (partially complete/in place)
4. The WSP team regularly meets to discuss issues, review progress, etc
   Agree (substantially complete/in place)
5. WSP development and implementation is funded and supported by top management
   Strongly agree (fully complete/in place)

Back | Next | Continue later

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Water Safety Plan Checklist (Web)

WRC Water Safety Plan Status Checklist: Test

Thank you for completing the questionnaire!

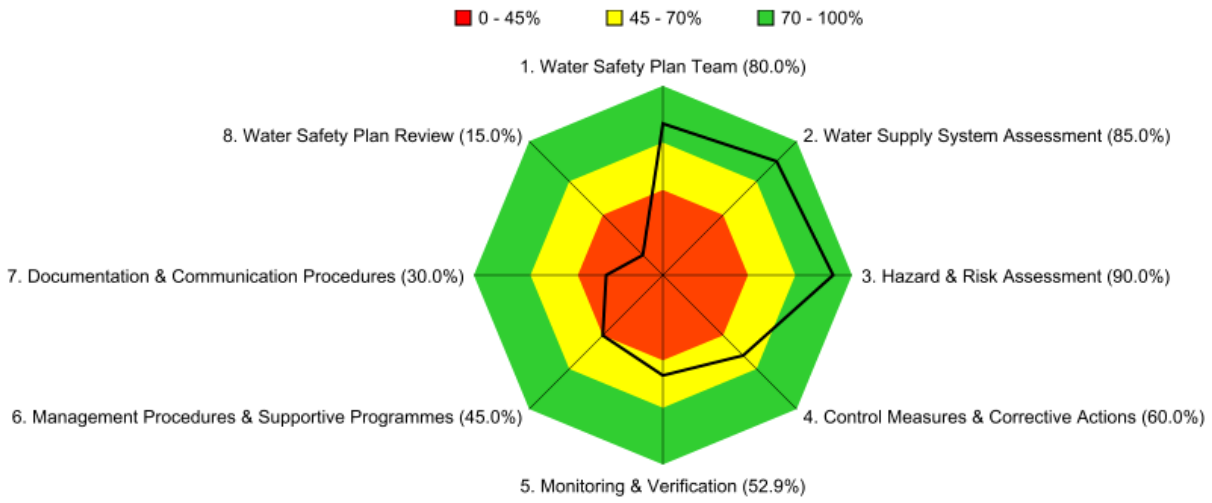
- View Spider Chart

« Return to questionnaires

Logged I

WRC Water Safety Plan Status Checklist

Name	Test
Submitted By	Philip de Souza
Date	07 March 2011



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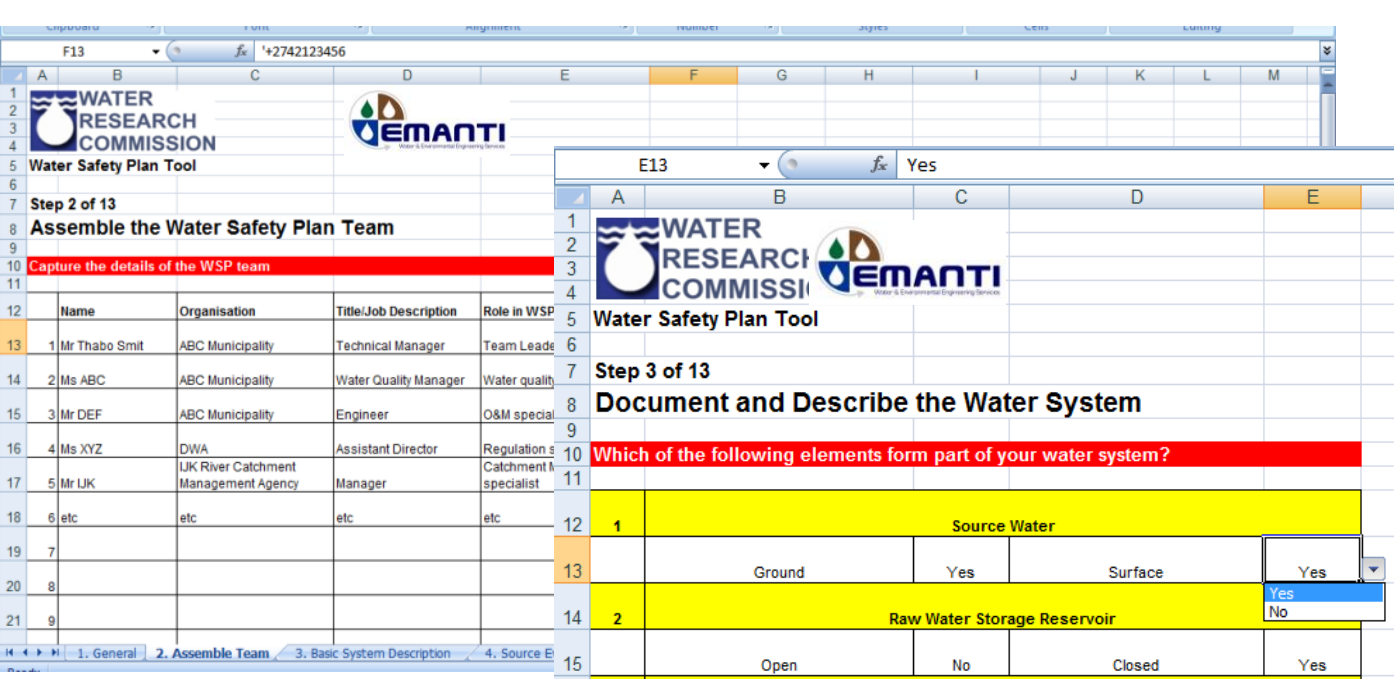
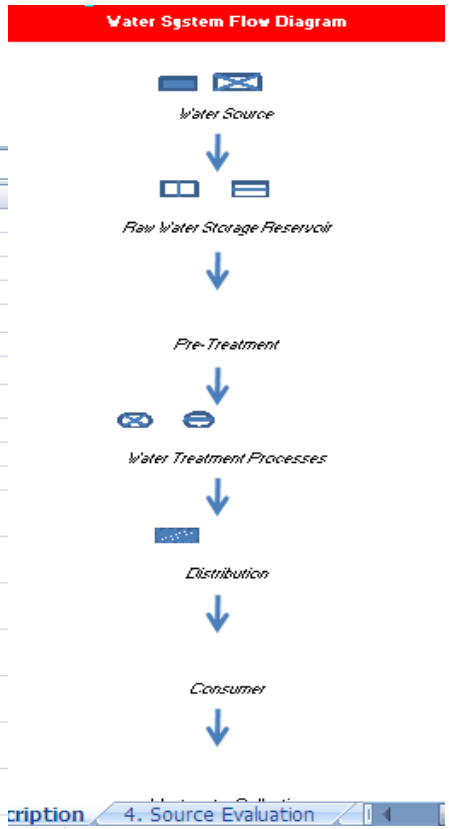
Develop a Water Safety Plan (Excel)





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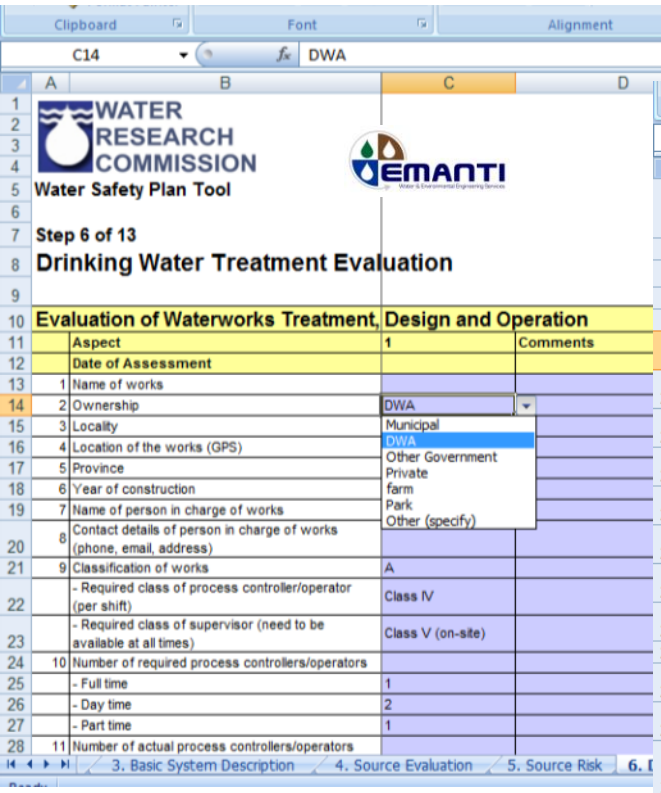
Develop a Water Safety Plan (Excel)



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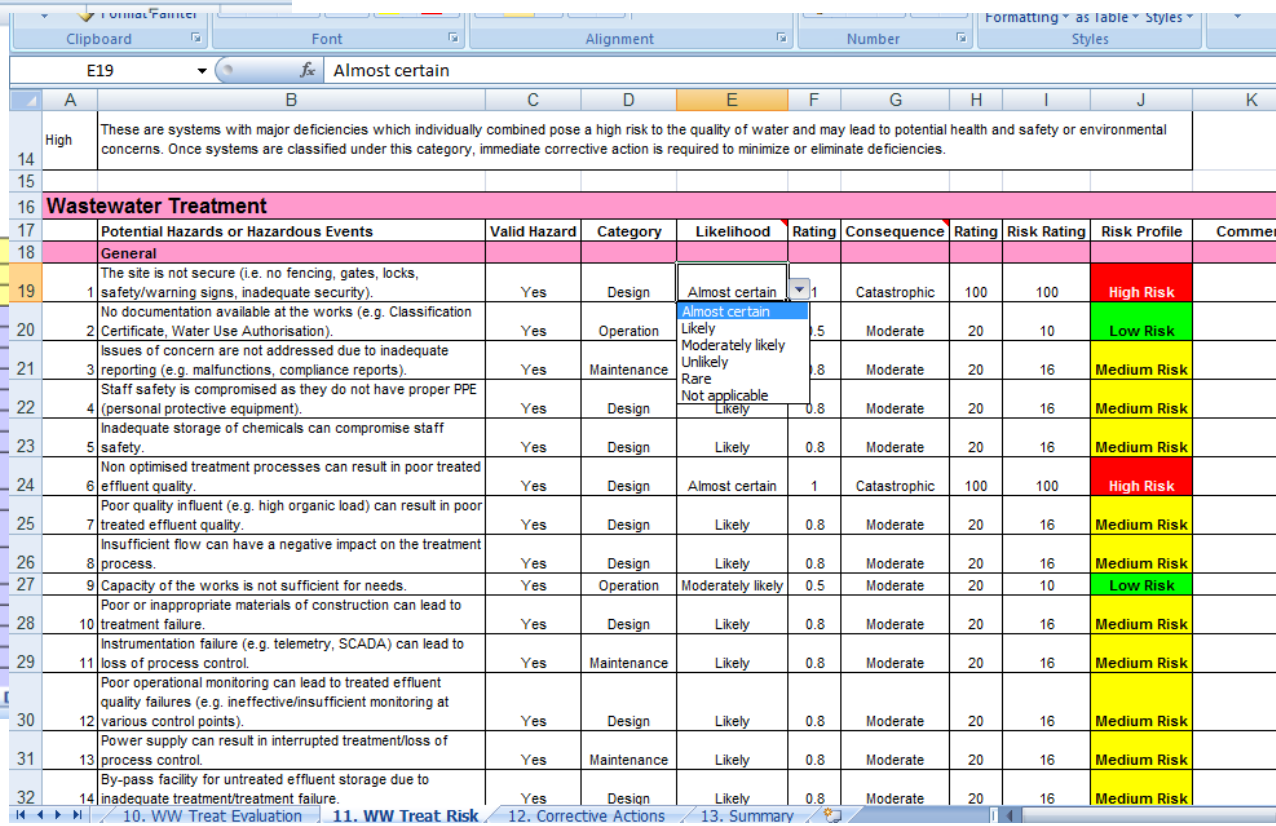
Water Safety Plan Tool

Step 6 of 13

Drinking Water Treatment Evaluation

		Evaluation of Waterworks Treatment, Design and Operation		
		Aspect	1	Comments
		Date of Assessment		
	1	Name of works		
	2	Ownership	DWA	
	3	Locality		
	4	Location of the works (GPS)		
	5	Province		
	6	Year of construction		
	7	Name of person in charge of works		
	8	Contact details of person in charge of works (phone, email, address)		
	9	Classification of works	A	
		- Required class of process controller/operator (per shift)	Class IV	
		- Required class of supervisor (need to be available at all times)	Class V (on-site)	
	10	Number of required process controllers/operators		
		- Full time	1	
		- Day time	2	
		- Part time	1	
	11	Number of actual process controllers/operators		

Ownership dropdown: Municipal, DWA, Other Government, Private, farm, Park, Other (specify)



		Wastewater Treatment								
		Potential Hazards or Hazardous Events	Valid Hazard	Category	Likelihood	Rating	Consequence	Rating	Risk Rating	Risk Profile
		General								
	1	The site is not secure (i.e. no fencing, gates, locks, safety/warning signs, inadequate security).	Yes	Design	Almost certain	1	Catastrophic	100	100	High Risk
	2	No documentation available at the works (e.g. Classification Certificate, Water Use Authorisation).	Yes	Operation		0.5	Moderate	20	10	Low Risk
	3	Issues of concern are not addressed due to inadequate reporting (e.g. malfunctions, compliance reports).	Yes	Maintenance		0.8	Moderate	20	16	Medium Risk
	4	Staff safety is compromised as they do not have proper PPE (personal protective equipment).	Yes	Design	Likely	0.8	Moderate	20	16	Medium Risk
	5	Inadequate storage of chemicals can compromise staff safety.	Yes	Design	Likely	0.8	Moderate	20	16	Medium Risk
	6	Non optimised treatment processes can result in poor treated effluent quality.	Yes	Design	Almost certain	1	Catastrophic	100	100	High Risk
	7	Poor quality influent (e.g. high organic load) can result in poor treated effluent quality.	Yes	Design	Likely	0.8	Moderate	20	16	Medium Risk
	8	Insufficient flow can have a negative impact on the treatment process.	Yes	Design	Likely	0.8	Moderate	20	16	Medium Risk
	9	Capacity of the works is not sufficient for needs.	Yes	Operation	Moderately likely	0.5	Moderate	20	10	Low Risk
	10	Poor or inappropriate materials of construction can lead to treatment failure.	Yes	Design	Likely	0.8	Moderate	20	16	Medium Risk
	11	Instrumentation failure (e.g. telemetry, SCADA) can lead to loss of process control.	Yes	Maintenance	Likely	0.8	Moderate	20	16	Medium Risk
	12	Poor operational monitoring can lead to treated effluent quality failures (e.g. ineffective/insufficient monitoring at various control points).	Yes	Design	Likely	0.8	Moderate	20	16	Medium Risk
	13	Power supply can result in interrupted treatment/loss of process control.	Yes	Maintenance	Likely	0.8	Moderate	20	16	Medium Risk
	14	By-pass facility for untreated effluent storage due to inadequate treatment/treatment failure.	Yes	Design	Likely	0.8	Moderate	20	16	Medium Risk

Likelihood dropdown: Almost certain, Likely, Moderately likely, Unlikely, Rare, Not applicable

High: These are systems with major deficiencies which individually combined pose a high risk to the quality of water and may lead to potential health and safety or environmental concerns. Once systems are classified under this category, immediate corrective action is required to minimize or eliminate deficiencies.

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Develop a Water Safety Plan (Excel)

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Water Safety Plan Tool

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Step 13 of 13

Summary

NOTE: The results presented below are automatically populated from previous inputs - DO NOT MODIFY H

To prioritise risks, users need to click on "Risk Rating" (column E), then select "Data", "Sort by", "Risk Rati

Summary Status and Ranking

Component	Hazard	Valid Hazard	Category	Risk Rating	Risk Profile	Co Me Pla
Source	Raw water turbid after heavy rain. May contain droppings of animals and birds.	Yes	Design	0	No Risk	0
Source	Dead animals.	No	Maintenance	16	Medium Risk	0
Source	Droppings of animals/birds can introduce harmful micro-organisms into the water body.	Yes	Design	16	Medium Risk	0
Source	Low flow, high nutrient levels and warm conditions - can make cyanobacterial and algal growth more likely.	Yes	Operation	0.1	Low Risk	0
Source	Falling water levels due to drought or drawdown of water body.	No	Maintenance	0	No Risk	0
Source	Vandalism or sabotage may pollute the water with chemicals or microbes or damage equipment and infrastructure.	Yes	Design	16	Medium Risk	0
Source	Intake screens become clogged or damaged.	Yes	Operation	70	High Risk	0
	Bushfires can result in fire retardants in the water					

E14 Risk Rating

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Water Safety Plan Tool

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Step 13 of 13

Summary

NOTE: The results presented below are automatically populated from previous inputs - DO NOT MODIFY

To prioritise risks, users need to click on "Risk Rating" (column E), then select "Data", "Sort by", "Risk Ra

Summary Status and Ranking

Component	Hazard	Valid Hazard	Category	Risk Rating	Risk Profile	C M P
DW Treatment	Non optimised treatment processes can result in poor water quality.	Yes	Design	100	High Risk	0
DW Treatment	Poor quality raw water can impact treatment process.	Yes	Design	100	High Risk	0
DW Treatment	Insufficient flow can have a negative impact on treatment process.	Yes	Design	100	High Risk	0
DW Treatment	Under dosing of oxidant due to dosing malfunction, power failure, oxidant supply runs out or increased demand on raw water.	Yes	Design		High Risk	0
DW Treatment	Dosing malfunction can reduce floc formation and thus the inefficient removal of harmful micro-organisms, organic material, colour and turbidity.	Yes	Operation	100	High Risk	0
DW Treatment	Dosing malfunction due to equipment failure or power failure. Possible interruption to chlorination (chlorine under dosing, chlorine overdosing).	Yes	Maintenance	100	High Risk	0

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Develop a Water Safety Plan (Web)

WRC Water Safety Plan: Calvinia

Name of system: Calvinia

Save Cancel

WRC Water Safety Plan: Calvinia

SECTION: 1 of 9 - Record of Completion

TO SAVE, click on the "Next" or "Continue Later" button.

1. Name: Brian Meyer
2. Title/Job Description: Technical Manager
3. Locality: Calvinia
4. Address: Hoop Street
5. Province: Northern Cape
6. Telephone: 0273418500

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Develop a Water Safety Plan (Web)

WRC Water Safety Plan: Calvinia

SECTION: 4 of 9 - Source Water Evaluation

If you are not responsible for operation, maintenance or management of any water source

1. Name of catchment
   Hantam Berge
2. Name of raw water supply source
   Karee Dam
3. Location of source - Latitude (N-S)
   ?
4. Location of source - Longitude (E-W)
   ?
5. Water source of water is used?
   Dam
6. Name and contact details of person in charge of supply
   J. Nel; 0273418500
7. Indicate if the water source is vulnerable to contamination from the following:
   - ☐ Upstream activities
   - ☐ Agricultural/livestock farms

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Develop a Water Safety Plan (Web)

Hantam Municipality — Water Quality Management System

Drinking Water | Dashboard | Data Entry | Reports | Risk Toolbox | Setup | Logout

Logged in: socialdev1

WRC Water Safety Plan: Calvinia

SECTION: 7 of 9 - Water Treatment Risk Assessment

TO SAVE, click on the "Next" or "Continue Later" button.

7.1 General

	Valid Hazard	Category	Likelihood	Consequence
The site is not secure (i.e. no fencing, gates, locks, safety/warning signs, inadequate security).	Yes	Planning/Design	Rare (once in 5 years)	Insignificant (no impact)
No documentation available at the works (e.g. Classification Certificate, Water Use Authorisation).	Yes	Operation	Unlikely (once a year)	Moderate (large aesthetic impact)
Issues of concern are not addressed due to inadequate reporting (e.g. malfunctions, compliance reports).	Yes	Maintenance	Rare (once in 5 years)	Moderate (large aesthetic impact)

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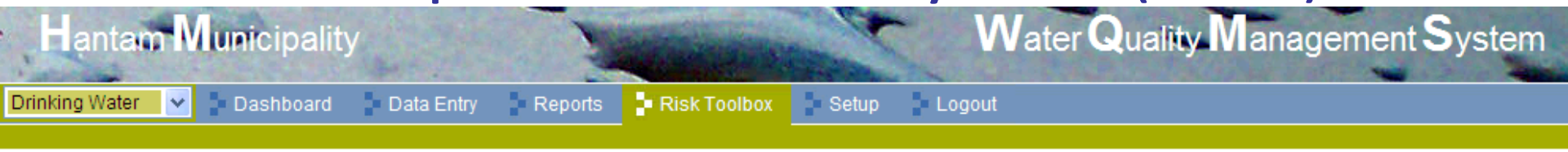
Develop a Water Safety Plan (Web)



Logged in: socialdev1

Water Safety Plan Summary Report

Risk Profile

No risk	The hazard is not applicable in this instance.
Low risk	These are systems that operate with minor deficiencies. Usually the systems meet requirements specified by the appropriate guidelines/standards.
Medium risk	These are systems with deficiencies which individually or combined pose a high risk. These systems would not generally require immediate action but the deficiencies could be more easily corrected to avoid future problems.
High risk	These are systems with major deficiencies which individually combined pose a high risk and may lead to potential health/safety/environmental/etc concerns. Once systems are classified under this category, immediate corrective action is required to minimize or eliminate deficiencies.

Component	Hazard	Valid Hazard	Category	Risk Rating	Risk Profile	Control Measure in Place (if any)	Is the Control Measure Effective?	Corrective Actions	Who? (Responsible Person)	When? (Date)	Estimated Cost
9.8 Rain Water Harvesting	First flush of water can enter storage tank.	Yes	Planning/Design	35.00	Medium Risk						
9.8 Rain Water Harvesting	Bird/animal droppings contaminate water.	Yes	Maintenance	35.00	Medium Risk						

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Develop a Water Safety Plan (Web)

5.1 Surface Water (Rivers and Streams)	Gaseous emissions from industrial accidents or forest fires can pollute the water (e.g. explosions, fires, etc).	No	Not applicable	0.00	No Risk						
5.1 Surface Water (Rivers and Streams)	Industrial and agricultural activity can pollute the water (e.g. harmful organisms, toxic chemicals, air deposits, air pollution, land spreading of manure, feedlot runoff, etc).	No	Not applicable	0.00	No Risk						
5.1 Surface Water (Rivers and Streams)	Domestic waste (wastewater, on-site septic tanks, litter, municipal landfills, etc) can pollute the water.	No	Not applicable	0.00	No Risk						
5.1 Surface Water (Rivers and Streams)	Falling water levels due to drought or drawdown of water body.	No	Not applicable	0.00	No Risk						
5.1 Surface Water (Rivers and Streams)	Livestock, human activity at water source.	No	Not applicable	0.00	No Risk						

« Return to questionnaires

Submit Corrective Actions | Export as spreadsheet

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Develop a Water Safety Plan (Web)

Water Quality Management System

Reports | Risk Toolbox | Setup | Admininistration | Logout

Logged in: thabisaberarivier

...deficiencies. Usually the systems meet requirements specified by the appropriate

...individually or combined pose a high risk. These systems would not generally require ...be more easily corrected to avoid future problems.

...which individually combined pose a high risk and may lead to potential health/safety ...are classified under this category, immediate corrective action is required to minimize

Valid Hazard	Category	Risk Rating	Risk Profile	Control Measure in Place (if any)	Is the Control Measure Effective?	Corrective Actions	Who? (Responsible Person)	When? (Date)
Yes	Operation	70.00	High Risk	Yes	Yes	Recent in	Rassie Both	July 2

wspsummary.csv [Read-Only] - Microsoft Excel

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A1 | Component

	A	B	C	D	E	F	G	H	I	J	K	L
1	Compone	Hazard	Valid Haza	Category	Risk Ratin	Risk Profil	Control M	Is the Con	Corrective	Who? (Re	When? (D	Estimated
2	7.1 Gener	Poor oper	Yes	Operation	70	High Risk	Yes	Yes	Recent int	Rassie Bot	Jul-10	No costs
3	9.6 House	Household	Yes	Operation	56	Medium R	No	No	Education	Consumer	N/A	N/A
4	9.6 House	Household	Yes	Operation	35	Medium R	No	No	Education	Consumer	N/A	N/A
5	7.6 Chlorir	Dosing ma	Yes	Operation	14	Medium R	No	No	currently i	R. Bothma	Next finar	>R15000
6	5.1 Surfac	Droppings	Yes	Maintenai	10	Low Risk	Yes	No				
7	5.1 Surfac	Bushfires	Yes	Maintenai	7	Low Risk	Yes	Yes	Every sec	Rassie Bot	Start os th	Internal s
8	9.4 Valves	Valve or n	Yes	Operation	4	Low Risk						
9	9.1 Protec	Water qua	Yes	Maintenai	4	Low Risk						
10	7.5 Powde	Poor oper	Yes	Operation	4	Low Risk						
11	7.5 Powde	Poor oper	Yes	Operation	4	Low Risk						
12	7.1 Gener	Power sup	Yes	Operation	4	Low Risk						
13	5.1 Surfac	Raw wate	Yes	Operation	2	Low Risk						
14	7.4 Filtrati	Incomplet	Yes	Operation	1.6	Low Risk						
15	9.6 House	Backflow	Yes	Design	1	Low Risk						
16	7.4 Filtrati	Rapid star	Yes	Operation	1	Low Risk						
17	5.1 Surfac	Intake scr	Yes	Maintenai	1	Low Risk						
18	9.1 Protec	Poor mon	Yes	Operation	0.4	Low Risk						
19	9.1 Protec	Poor hygi	Yes	Operation	0.4	Low Risk						
20	9.1 Protec	Man made	Yes	Design	0.2	Low Risk						
21	7.4 Filtrati	Failure to	Yes	Operation	0.2	Low Risk						
22	7.6 Chlorir	Chlorine c	Yes	Operation	0.1	Low Risk						

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Conclusions (1)

- ✓ Don't be intimidated!
  - Start small……top 5 issues?
  - Quick-wins → Low hanging fruit
  - "…we do all this…we just don't call it a Water Safety Plan"
- ✓ Don't limit your scope!
  - Not just water quality – IAM, safety, etc
  - "Soft" issues are just as important (e.g. staff mentoring)
- ✓ It makes business sense!
  - E.g. Water losses – save money
- ✓ Use tools/resources BUT make own "homemade" WSP
- ✓ Own the plan (not the consultant's plan)

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Conclusions (2)

- ✓ Tools are available to help → **But only YOU can take ACTION!**
- ✓ You have a plan (congratulations!) – **SO WHAT?? Plan means nothing without ACTION!**
- ✓ Once you know there is an issue → it is a crime not to take action!
- ✓ Keep plan up-to-date (living document)
  - Not once-off
  - Have regular meetings (Where are we? What have we done? What must we still do?)
  - Timeframe and responsibilities
  - Sign-off by top management

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Conclusions (3)

- ✓ Involve all levels (top → bottom)
  - Top management buy-in essential!
  - Who is the most important person in a community?
    - Mayor or process controller??
  - Do I make ash or electricity?
- ✓ "we are all consumers"
- ✓ **Nike → Just do it!**
- ✓ **Adidas → Impossible is nothing!**
- ✓ **Obama → Yes we can!**
- ✓ **IWA → think big, start small, scale up!**

adidas

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