

# ALAT ZA PROCJENU VIŠESTRUKIH RIZIKA NA SISTEME VODOSNABDIJEVANJA (TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES DECISION SUPPORT SYSTEM) (WASPP - DSS) PRIMJER PP NIKŠIĆA



Webinar  
28 Februar 2022



PP8- Do.o. "Vodovod i kanalizacija" Nikšić  
Kovač Darko



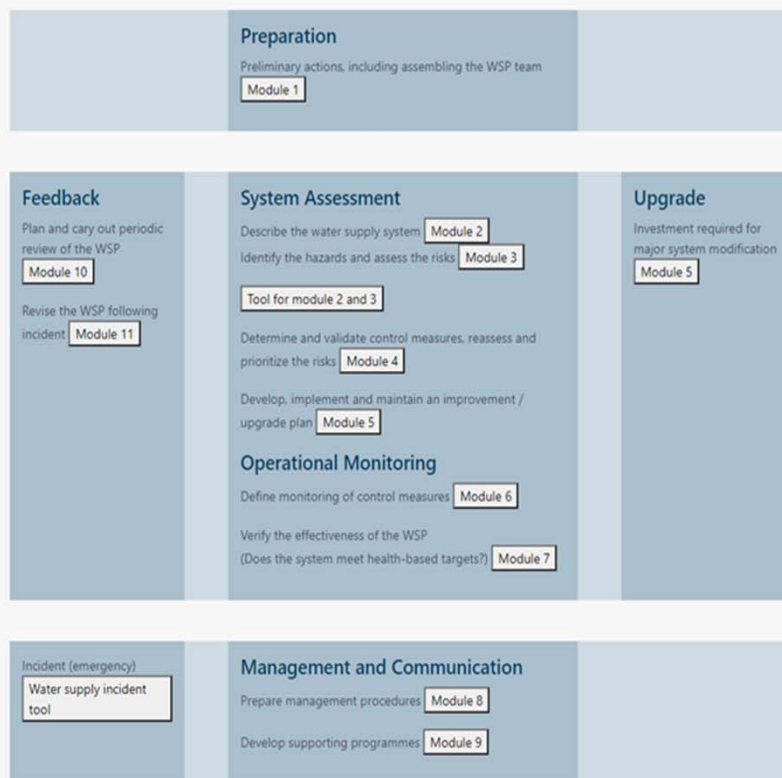
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# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES DECISION SUPPORT SYSTEM) (WASPP - DSS)

## How to prepare a water safety plan (WSP)



**Modul 1.** Preliminarne aktivnosti, formiranje WSP tima

**Modul 2.** Opisivanje sistema vodosnabdijevanja

**Modul 3.** Identifikovanje hazarda (opasnosti) i procjena rizika

**Modul 4.** Određivanje i potvrđivanje (validacija) kontrolnih mjera, ponovo procjenjivanje i određivanje prioriteta rizika

**Modul 5.** Razvijanje, implementacija i održavanje plana za poboljšanje/nadogradnju

**Modul 6.** Definisane praćenja kontrolnih mjere

**Modul 7.** Provjera efikasnosti WSP. Da li sistem ispunjava zdravstvene ciljeve

**Modul 8.** Priprema procedure upravljanja

**Modul 9.** Razvijanje programa podrške


**Modul 10.** Planiranje i sprovođenje periodičnih pregleda WSP

**Modul 11.** Revidiranje WSP nakon incidenata.



# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES (DECISION SUPPORT SYSTEM) (WASPP - DSS)

- Ukupno postoji 11 modula. Naš alat je razvijen specifično za module 2 | 3
- Modul 2. Opis Sistema vodosnabdijevanja
- Modul 3. Identifikacija hazarda i procjena rizika.


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Unas forum
Hazard strings database (for internal use)
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## Module 2: DESCRIBE THE WATER SUPPLY SYSTEM

A detailed description of the water supply system is required to support the subsequent risk assessment process. It should provide sufficient information to identify where the system is vulnerable to hazardous events, relevant types of hazards, and control measures.

Provide a thorough and accurate system description of the complete water supply chain, from catchment to consumer, with sufficient detail to facilitate hazard identification, including:

- written description of all major process steps
- system flow diagrams / schematics
- description of intended users and uses of the water supply
- comparison of water quality standards or targets with water quality achieved in practice.

For more information and guidelines refer to [Water Safety Plan Manual \(World Health Organization\)](#)

## Module 3: IDENTIFY HAZARDS AND HAZARDOUS EVENTS AND ASSESS THE RISKS

For each step in the water supply chain, identify hazards and hazardous events that threaten the safety of the water supply, and assess the associated risks.

**Hazard:** A chemical, physical or microbial agent that can cause harm to public health

**Hazardous event:** An event or situation that introduces hazards to, or fails to remove them from the water supply.

**Risk:** the likelihood that a hazardous event will occur combined with the severity of its consequences.

**Key actions include:**

1. Identifying the hazards and hazardous events:

The description of the hazardous event should be specific, clearly describing what can happen to the water supply system and how it can happen (i.e. cause and effect).

2. Assessment of risk

The risk associated with each hazardous event should be assessed to distinguish between significant and less significant risks.

**Important distinction** – This first (or 'initial') risk assessment does not consider any preventative control measures that are already in place. Consideration of existing control measures in the risk assessment takes place in Module 4.

Process step	Hazardous event	Hazard	Risk if no controls in place			Classification
			Likelihood	Severity	Score	
Catchment	Contamination of raw water due to cattle defecating in the river near the off-take point	Microbial Physical	5	5	25	H
Treatment	Contamination arising from chlorine under-dosing due to failure of chlorine dose pump	Microbial	4	5	20	H
Distribution/Storage	Contamination of water due to vermin accessing the treated water storage tank	Microbial	3	3	9	M
Household	Contamination of drinking-water due use of insanitary household water storage container	Microbial Chemical	3	5	15	M

H - high; M - medium; L - low

Example of a table from a WSP to document hazards, hazardous events and the subsequent risk assessment (WHO)

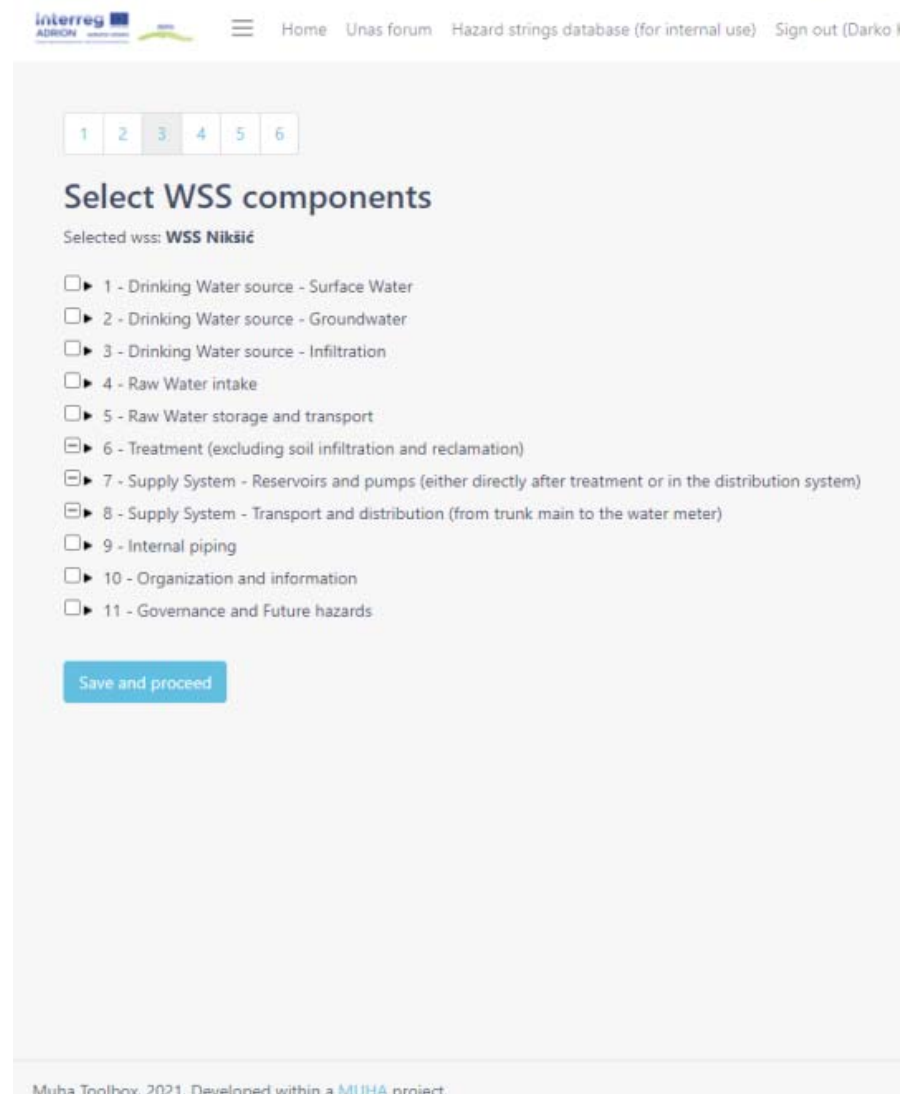
For more information and guidelines refer to [Water Safety Plan Manual \(World Health Organization\)](#)





# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES (DECISION SUPPORT SYSTEM) (WASPP - DSS)

Komponente sistema vodosnabdjevanja:

1. izvori vode za piće-površinski;
2. izvori vode za piće-podzemni;
3. izvori vode za piće-infiltracija;
4. zahvat sirove vode;
5. skladištenje i transport sirove vode;
6. tretman;
7. rezervoari i pumpe;
8. transport i distribucija;
9. unutrašnji cjevovodi;
10. organizacija i informisanje;
11. upravljanje i buduće opasnosti.



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1 2 3 4 5 6

### Select WSS components

Selected wss: **WSS Niksić**

- 1 - Drinking Water source - Surface Water
- 2 - Drinking Water source - Groundwater
- 3 - Drinking Water source - Infiltration
- 4 - Raw Water intake
- 5 - Raw Water storage and transport
- 6 - Treatment (excluding soil infiltration and reclamation)
- 7 - Supply System - Reservoirs and pumps (either directly after treatment or in the distribution system)
- 8 - Supply System - Transport and distribution (from trunk main to the water meter)
- 9 - Internal piping
- 10 - Organization and information
- 11 - Governance and Future hazards

Save and proceed

Muha Toolbox, 2021, Developed within a MUHA project.



# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES DECISION SUPPORT SYSTEM) (WASPP - DSS), PRIMJER PP NIKŠIĆA

1 2 3 4 5 6

## Evaluate risk if no controls are in place

Selected wss: **WSS Nikšić**

### Select component

- ▶ 1 - Drinking Water source - Surface Water (0 / 38 done)
- ▶ 2 - Drinking Water source - Groundwater (28 / 28 done)
- ▶ 3 - Drinking Water source - Infiltration (8 / 9 done)
- ▶ 4 - Raw Water intake (16 / 16 done)
- ▶ 5 - Raw Water storage and transport (0 / 6 done)
- ▶ 6 - Treatment (excluding soil infiltration and reclamation) (38 / 136 done)
- ▼ 7 - Supply System - Reservoirs and pumps (either directly after treatment or in the distribution system) (29 / 40 done)
  - 7.2 - Clear Water reservoir (0 / 11 done)
  - 7.3 - Pumping station (12 / 12 done)
  - 7.4 - Valves (both in reservoirs as in pumping stations) (5 / 5 done)
- ▶ 8 - Supply System - Transport and distribution (from trunk main to the water meter) (55 / 55 done)
- ▶ 9 - Internal piping (54 / 54 done)
- ▶ 10 - Organization and information (69 / 69 done)
- ▶ 11 - Governance and Future hazards (61 / 62 done)

### Detail view 7.2 - Clear Water reservoir

#### Hazard - 136.3 Contamination of water

Hazard category: Failure of water transport/storage/pumping system

HAZARDOUS EVENT OR TRIGGER:

Visitors to the reservoirs

Hazardous event category (NACE): WSS management (36)

ACCIDENT TYPE:

Permanent

external related | consequence of hazard in other sub-system

biological | chemical

#### Consequences

Water quality - Contaminated water (pathogens)

#### Measures

No measures are defined for this hazard.

#### PROBABILITY OF OCCURENCE

- WEEKLY (5)  MONTHLY (4)  ANNUALLY (3)  EVERY 10 YEARS (2)  
 EVERY 30 YEARS OR MORE (1)  HAZARD NOT PRESENT (0)  
 HAZARD IS PRESENT BUT PROBABILITY CAN'T BE ASSESSED (3)

#### SEVERITY OF CONSEQUENCES

- MINIMAL EFFECTS (1)  MINOR EFFECTS (2)  MODERATE EFFECTS (3)  MAJOR EFFECTS (4)  
 SEVERE EFFECTS (5)

Severity should be chosen based on WSS operator experience.

#### RISK IF NO CONTROLS IN PLACE (INITIAL RISK)

Likelihood 0

Severity of consequences

Score N/A

Risk

risk legend:  no risk,  very low risk,  low risk,  medium risk,  high risk,  very high risk

#### COMMENTS

I HAVE FINISHED WITH EVALUATION OF THIS HAZARDOUS EVENT.

Please indicate when you are done evaluating this hazardous event.

#### Hazard - 136.4 Contamination of water

Hazard category: Failure of water transport/storage/pumping system


#### PROBABILITY OF OCCURENCE

- WEEKLY (5)  MONTHLY (4)  ANNUALLY (3)  EVERY 10 YEARS (2)



# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES DECISION SUPPORT SYSTEM) (WASPP - DSS), PRIMJER PP NIKŠIĆA





I HAVE FINISHED WITH EVALUATION OF THIS HAZARDOUS EVENT.  
Please indicate when you are done evaluating this hazardous event.

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**Hazard - 141.2 No/low pressure/flow in network water. Network water contamination**

Hazard category: Failure of water transport/storage/pumping system

HAZARDOUS EVENT OR TRIGGER:  
Damage or destruction of pumping station due to human-caused accidents (car, truck or aircraft collision, landslides caused by leakage or nearby excavation)  
Hazardous event category (NACE): Other - human induced

ACCIDENT TYPE:  
Accidental and permanent

design related | external related | consequence of hazard in other sub-system

biological | chemical | radiological or physical (including turbidity) | insufficient availability of water supplied to customers

**Consequences**

Water quantity - No/insufficient water supply to customers and fire fighting  
Water quality - Contaminated water

**Measures**

No measures are defined for this hazard.

PROBABILITY OF OCCURENCE

WEEKLY (5)  MONTHLY (4)  ANNUALLY (3)  EVERY 10 YEARS (2)  
 EVERY 30 YEARS OR MORE (1)  HAZARD NOT PRESENT (0)  
 HAZARD IS PRESENT BUT PROBABILITY CAN'T BE ASSESSED (3)

SEVERITY OF CONSEQUENCES

MINIMAL EFFECTS (1)  MINOR EFFECTS (2)  MODERATE EFFECTS (3)  MAJOR EFFECTS (4)  
 SEVERE EFFECTS (5)

Severity should be chosen based on WSS operator experience.

RISK IF NO CONTROLS IN PLACE (INITIAL RISK)


Likelihood	10
Severity of consequences	3
Score	9
<b>Risk</b>	<b>Medium</b>

risk legend:  no risk,  very low risk,  low risk,  medium risk,  high risk,  very high risk

COMMENTS

Theoretically possible, but very low probability.

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I HAVE FINISHED WITH EVALUATION OF THIS HAZARDOUS EVENT.  
Please indicate when you are done evaluating this hazardous event.

---

**Hazard - 141.3 No/low pressure/flow in network water. Network water contamination**

Hazard category: Failure of water transport/storage/pumping system

HAZARDOUS EVENT OR TRIGGER:  
Intentional damage or destruction of pumping station (terrorism, sabotage, vandalism, arson)  
Hazardous event category (NACE): Other - human induced

ACCIDENT TYPE:  
Accidental

PROBABILITY OF OCCURENCE

WEEKLY (5)  MONTHLY (4)  ANNUALLY (3)  EVERY 10 YEARS (2)  
 EVERY 30 YEARS OR MORE (1)  HAZARD NOT PRESENT (0)  
 HAZARD IS PRESENT BUT PROBABILITY CAN'T BE ASSESSED (3)

SEVERITY OF CONSEQUENCES

MINIMAL EFFECTS (1)  MINOR EFFECTS (2)  MODERATE EFFECTS (3)  MAJOR EFFECTS (4)  
 SEVERE EFFECTS (5)

Severity should be chosen based on WSS operator experience.

# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES DECISION SUPPORT SYSTEM) (WASPP - DSS), PRIMJER PP NIKŠIĆA

1 2 3 4 5 6

## Evaluate risk if no controls are in place

Selected wss: **WSS Nikšić**

### Select component

- ▶ 2 - Drinking Water source - Groundwater (28 / 28 done)
- ▶ 3 - Drinking Water source - Infiltration (8 / 9 done)
- ▶ 4 - Raw Water intake (16 / 16 done)
- ▶ 5 - Raw Water storage and transport (0 / 6 done)
- ▶ 6 - Treatment (excluding soil infiltration and reclamation) (38 / 136 done)
- ▶ 7 - Supply System - Reservoirs and pumps (either directly after treatment or in the distribution system) (29 / 40 done)
- ▶ 8 - Supply System - Transport and distribution (from trunk main to the water meter) (55 / 55 done)
- ▼ 9 - Internal piping (54 / 54 done)
  - 9.1 - General (11 / 11 done)
  - 9.2 - Drinking water internal installation (8 / 8 done)
  - 9.3 - Hot water plumbing system (7 / 7 done)
  - 9.4 - Point-of-Entry and Point-of-Use treatment devices (8 / 8 done)
  - 9.5 - Water collection (4 / 4 done)
  - 9.6 - Water storage and transportation Water storage before consumption (14 / 14 done)
  - 9.7 - Rain Water Harvesting (2 / 2 done)
- ▶ 10 - Organization and information (69 / 69 done)
- ▶ 11 - Governance and Future hazards (61 / 62 done)

### Detail view 9.1 - General

#### Hazard - 143.5 Water contamination

Hazard category: Failure of internal distribution (quality, quantity, pressure, T...)

HAZARDOUS EVENT OR TRIGGER:

Poor hygiene in plumbing systems installation/repair  
Hazardous event category (NACE): WSS management (36) - internal

ACCIDENT TYPE:

Accidental and permanent

operation related | consequence of hazard in other sub-system

biological | chemical | radiological or physical (including turbidity)

#### Consequences

Water quality - Contaminated water (pathogens)  
Water quality - Contaminated water (chemicals)  
Water quality - Contaminated water (taste/odor)

#### Measures

No measures are defined for this hazard.



#### PROBABILITY OF OCCURRENCE

- WEEKLY (5)
  MONTHLY (4)
  ANNUALLY (3)
  EVERY 10 YEARS (2)
  EVERY 30 YEARS OR MORE (1)
  HAZARD NOT PRESENT (0)
  HAZARD IS PRESENT BUT PROBABILITY CAN'T BE ASSESSED (3)

#### SEVERITY OF CONSEQUENCES

- MINIMAL EFFECTS (1)
  MINOR EFFECTS (2)
  MODERATE EFFECTS (3)
  MAJOR EFFECTS (4)
  SEVERE EFFECTS (5)

Severity should be chosen based on WSS operator experience.

#### RISK IF NO CONTROLS IN PLACE (INITIAL RISK)

Likelihood	3
Severity of consequences	1
Score	3
<b>Risk</b>	<b>Very low</b>

risk legend:  no risk,  very low risk,  low risk,  medium risk,  high risk,  very high risk

#### COMMENTS

I HAVE FINISHED WITH EVALUATION OF THIS HAZARDOUS EVENT.

Please indicate when you are done evaluating this hazardous event.

#### Hazard - 143.6 Water contamination

Hazard category: Failure of internal distribution (quality, quantity, pressure, T...)

#### PROBABILITY OF OCCURRENCE

- WEEKLY (5)
  MONTHLY (4)
  ANNUALLY (3)
  EVERY 10 YEARS (2)



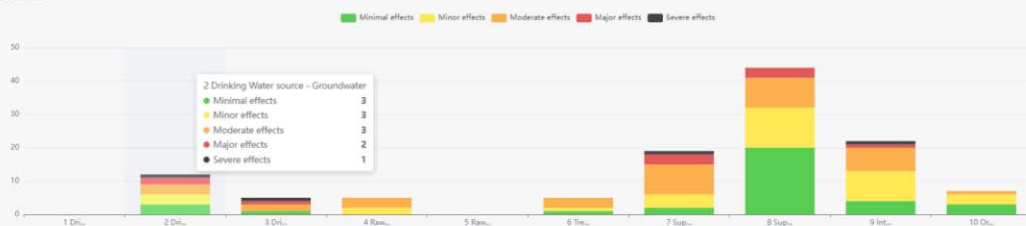
# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES DECISION SUPPORT SYSTEM) (WASPP - DSS), PRIMJER PP NIKŠIĆA

- Izveštaj o unesenim podacima predstavljen je u grafičkom obliku

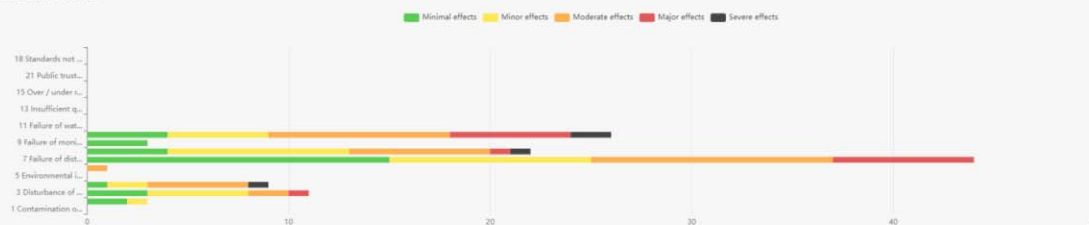


## Severity of consequences

Severity of consequences by component



Severity of consequences by hazard



## Risk evaluation

Risk category by component

Very low risk Low risk Medium risk High risk Very high risk



# TOOLKIT FOR WATER SAFETY PLANNING PROCEDURES DECISION SUPPORT SYSTEM) (WASPP - DSS), PRIMJER PP NIKŠIĆA

- Identifikovane hazarde sa inicijalnom procjenom rizika možemo eksportovati u MS Word ili MS Excel

Preview WSP data

Download WSP data as MS Word file

Component id	Component	Hazard id	Hazard	Hazard category	Hazardous event or trigger	Hazardous event category (EMCC)	Accident type	Hazardous event ref.	Hazardous object	Consequences	Measures	Likelihood	Severity of consequences	Score	Risk	Comment	The evaluation considered done in each application
1.1	Catchment area	1.1.1	Contamination of catchment zone	Failure of raw water source	Industrial discharge of chemicals	Industrial (C)	Non-spill		accidental pollution	Water quality - Contaminated water (chemicals)	Drinking water (Drinking water) - Adaptation of the Pumping Station ; Drinking water (Drinking water) - Installation of rain-buried pipe ;	C	A	B	Low		Yes
1.1	Catchment area	1.1.2	Contamination of catchment zone	Failure of raw water source	Sewer overflow due to rainfalls or failure	Water water management (D)	Accidental		leak	Water quality - Contaminated water (chemicals) ; Water quality - Contaminated water (chemicals) ; Water quality - Insufficient water				N/A		Yes	
1.1	Catchment area	1.1.3	Contamination of catchment zone	Failure of raw water source	Break of sediments by dredging or slaying	Traffic (H)	Accidental and permanent			Water quality - Contaminated water (chemicals) ; Water quality - Contaminated water (chemicals) ; Water quality - Contaminated water (chemicals)				N/A		Yes	
1.1	Catchment area	1.1.4	Contamination of catchment zone	Failure of raw water source	Break into catchment with release of soil sand or contaminants because of natural or CC induced increased erosion and turbidity	Natural	Accidental		leak, turbidity, change of pH	Water quality - Contaminated water (chemicals)				N/A		Yes	
1.1	Catchment area	1.1.5	Contamination of catchment zone	Failure of raw water source	Earthquake	Earthquake	Accidental		earthquake	Water quality - Contaminated water (chemicals) ; Water quality - Contaminated water (chemicals) ; Water quality - Insufficient water				N/A		Yes	
1.1	Catchment area	1.1.6	Contamination of catchment zone	Failure of raw water source	Landslide	Landslide	Accidental			Water quality - Contaminated water (chemicals) ; Water quality - Contaminated water (chemicals) ; Water quality - Insufficient water				N/A		Yes	
1.1	Catchment area	1.1.7	Contamination of catchment zone	Failure of raw water source	Disposal of manure	Agriculture (A)	Accidental and permanent			Water quality - Contaminated water (chemicals) ; Water quality - Contaminated water (chemicals) ; Water quality - Insufficient water				N/A		Yes	
1.1	Catchment area	1.1.8	Contamination of catchment zone	Failure of raw water source	Livestock	Agriculture (A)	Accidental and permanent			Water quality - Contaminated water (chemicals) ; Water quality - Contaminated water (chemicals) ; Water quality - Insufficient water				N/A		Yes	
						Agriculture (A)	Accidental and permanent			Water quality - Contaminated water (chemicals)				N/A		Yes	

Preview WSP

Exported from: WSS Nikšić

Download WSP data as MS Word file

## Water Safety Plan

This draft water safety plan was generated with the help of Muha Project tool (<http://muha.wpp.muhaprojekt.com>)

### Module 1: ASSEMBLE THE WSP TEAM

Establish a multidisciplinary team with the technical expertise needed to develop, implement and maintain an effective WSP. Appoint a strong team leader and clearly define the roles and responsibilities for each team member. Engage senior management to secure their support for development of the WSP and, where necessary, identify which external stakeholders and expertise may be required.

**Key actions include:**

1. Engaging senior management and securing financial and resource support
2. Identifying the required expertise and appropriate size of the team
3. Appointing a team leader
4. Defining and recording the roles and responsibilities of the individuals on the team
5. Defining the time frame to develop the WSP

For more information and guidelines refer to [Water Safety Plan Manual \(World Health Organization\)](#)

### Module 2: DESCRIBE THE WATER SUPPLY SYSTEM

A detailed description of the water supply system is required to support the subsequent risk assessment process. It should provide sufficient information to identify where the system is vulnerable to hazardous events, relevant types of hazards and control measures.

Provide a thorough and accurate system description of the complete water supply chain, from catchment to consumer, with sufficient detail to facilitate hazard identification, including:

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- system flow diagram / schematics
- description of intended users and uses of the water supply
- comparison of water quality standards or targets with water quality achieved in practice.

For more information and guidelines refer to [Water Safety Plan Manual \(World Health Organization\)](#)

### WSS Info

WSS name: WSS Nikšić

WSS description: Later

### WSS components

- 1 - Drinking Water source - Surface Water
  - 1.1 - Catchment area
  - 1.2 - Monitoring system
  - 1.3 - Source water
- 10 - Organization and information
  - 10.1 - Organization
  - 10.2 - Resource related
- 11 - Governance and Future Hazards
  - 11.1 - Governance Internal
    - 11.1.1 - Governance - General
    - 11.1.2 - Governance - Source of water
    - 11.1.3 - Governance - Treatment
    - 11.1.4 - Governance - Transport & Distribution
    - 11.1.5 - Governance - Personal
  - 11.2 - Future Hazards
    - 11.2.1 - Source of water

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Alat WASPP-DSS je dostupan na adresi

<http://muha.apps.vokas.si/home>



# HVALA NA PAŽNJI!

