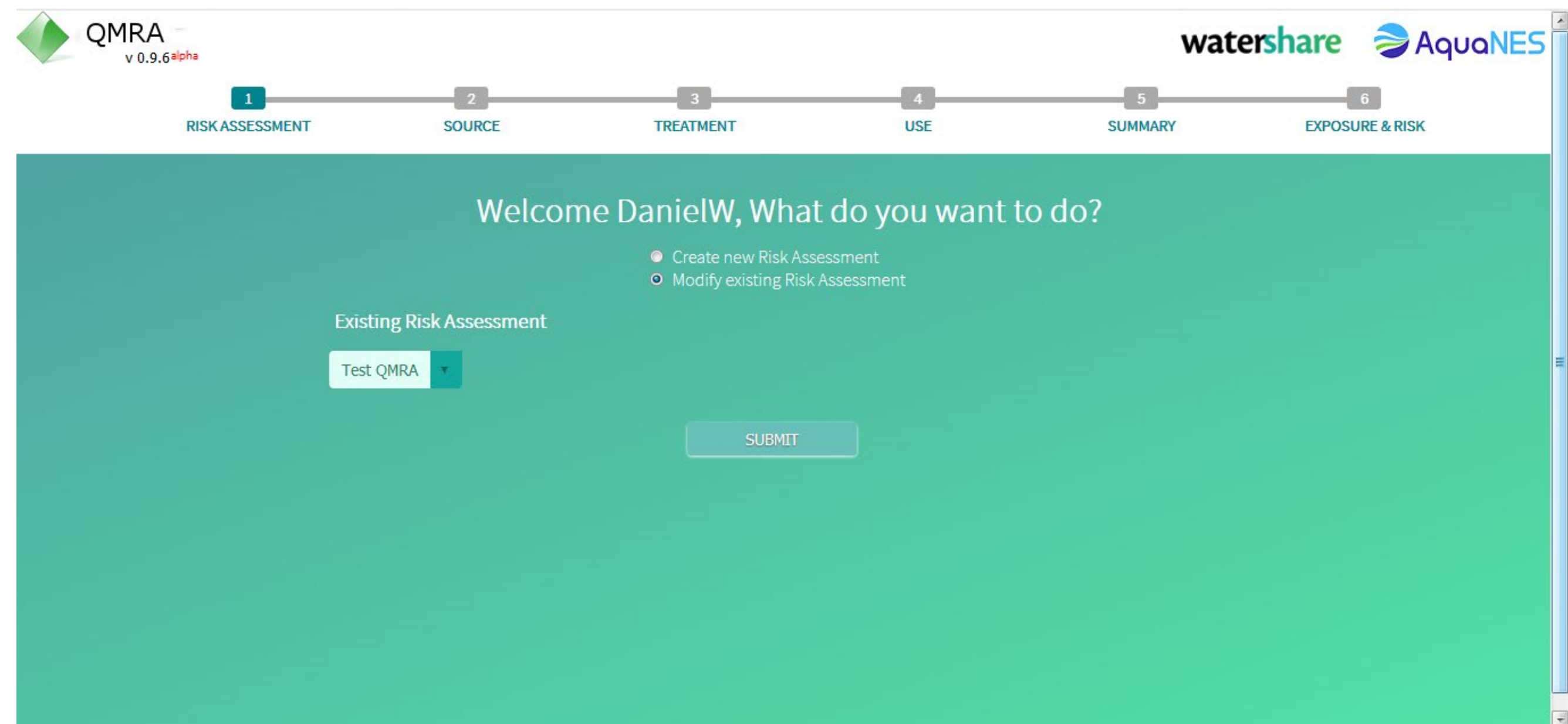




Workflow for Quantitative Microbial Risk Assessment with AquaNES online tool

Step 1: Create new QMRA or open existing QMRA

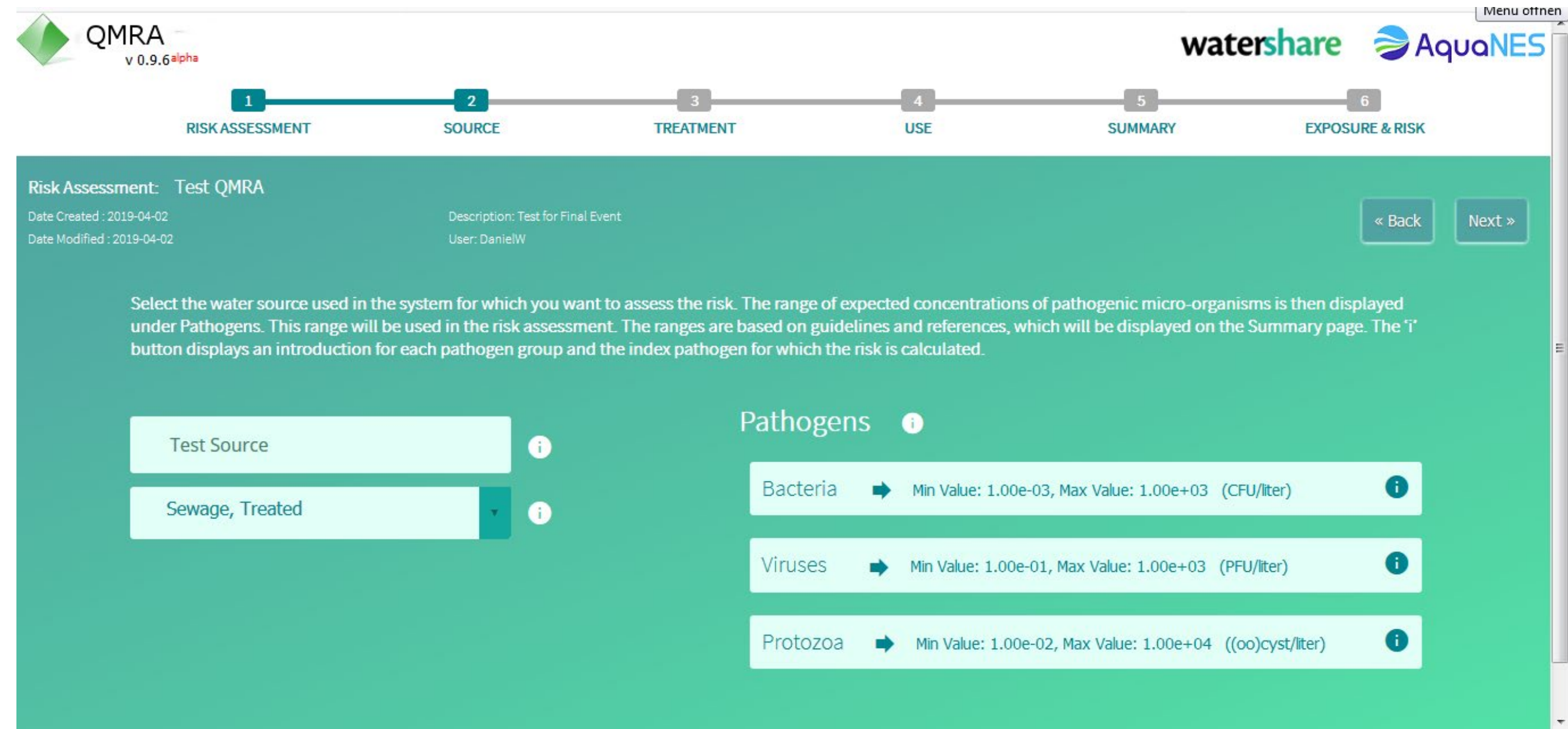


Welcome DanielW, What do you want to do?

- Create new Risk Assessment
- Test QMRA

SUBMIT

Step 2: Selection of source water with predefined water qualities



Risk Assessment: Test QMRA

Select the water source used in the system for which you want to assess the risk. The range of expected concentrations of pathogenic micro-organisms is then displayed under Pathogens. This range will be used in the risk assessment. The ranges are based on guidelines and references, which will be displayed on the Summary page. The 'i' button displays an introduction for each pathogen group and the index pathogen for which the risk is calculated.

Test Source

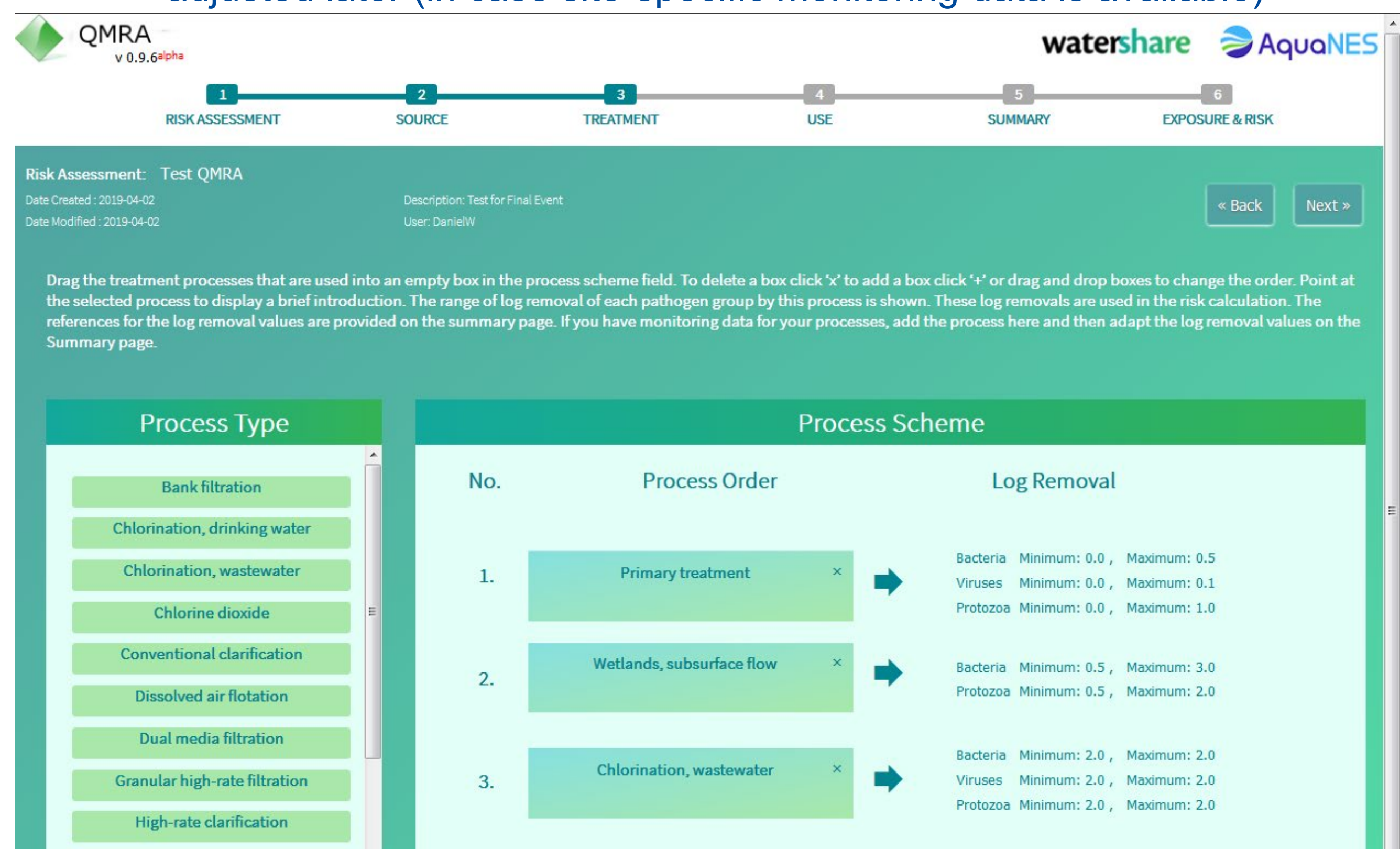
Sewage, Treated

Pathogens

Pathogen	Min Value	Max Value	Unit
Bacteria	1.00e-03	1.00e+03	(CFU/liter)
Viruses	1.00e-01	1.00e+03	(PFU/liter)
Protozoa	1.00e-02	1.00e+04	((oo)cyst/liter)

Step 3: Selection of Treatment Train

- Several predefined treatment processes are available (>20)
- Adjust number of treatment steps as needed for the case study
- Insert treatment steps into blank boxes by drag and drop
- Default values for each treatment step are displayed, which can be adjusted later (in case site-specific monitoring data is available)

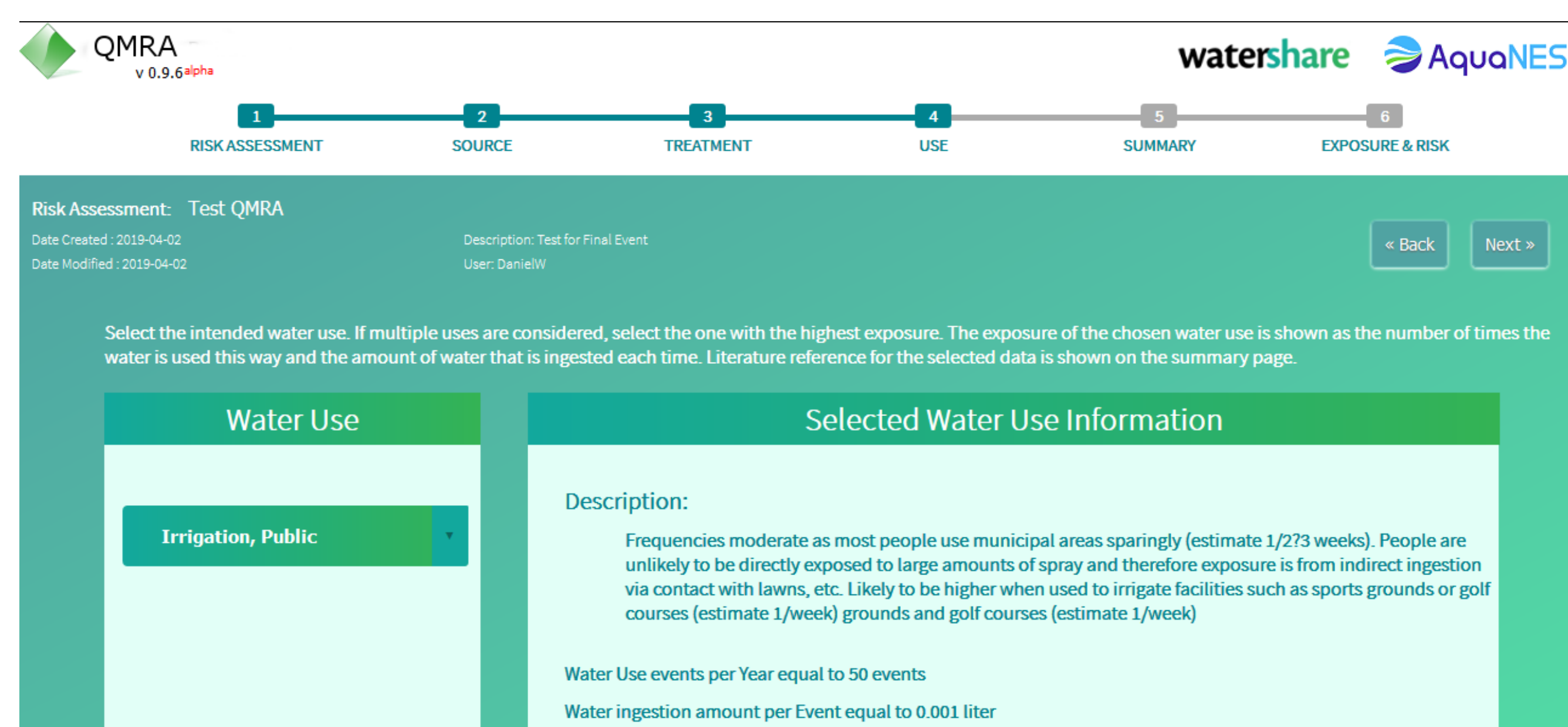


Risk Assessment: Test QMRA

Drag the treatment processes that are used into an empty box in the process scheme field. To delete a box click 'x' or add a box click '+' or drag and drop boxes to change the order. Point at the selected process to display a brief introduction. The range of log removal of each pathogen group by this process is shown. These log removals are used in the risk calculation. The references for the log removal values are provided on the summary page. If you have monitoring data for your processes, add the process here and then adapt the log removal values on the Summary page.

No.	Process Order	Log Removal
1.	Primary treatment	Bacteria Minimum: 0.0, Maximum: 0.5 Viruses Minimum: 0.0, Maximum: 0.1 Protozoa Minimum: 0.0, Maximum: 1.0
2.	Wetlands, subsurface flow	Bacteria Minimum: 0.5, Maximum: 3.0 Protozoa Minimum: 0.5, Maximum: 2.0
3.	Chlorination, wastewater	Bacteria Minimum: 2.0, Maximum: 2.0 Viruses Minimum: 2.0, Maximum: 2.0 Protozoa Minimum: 2.0, Maximum: 2.0

Step 4: Select foreseen type of water usage



Risk Assessment: Test QMRA

Select the intended water use. If multiple uses are considered, select the one with the highest exposure. The exposure of the chosen water use is shown as the number of times the water is used this way and the amount of water that is ingested each time. Literature reference for the selected data is shown on the summary page.

Water Use

Irrigation, Public

Selected Water Use Information

Description:

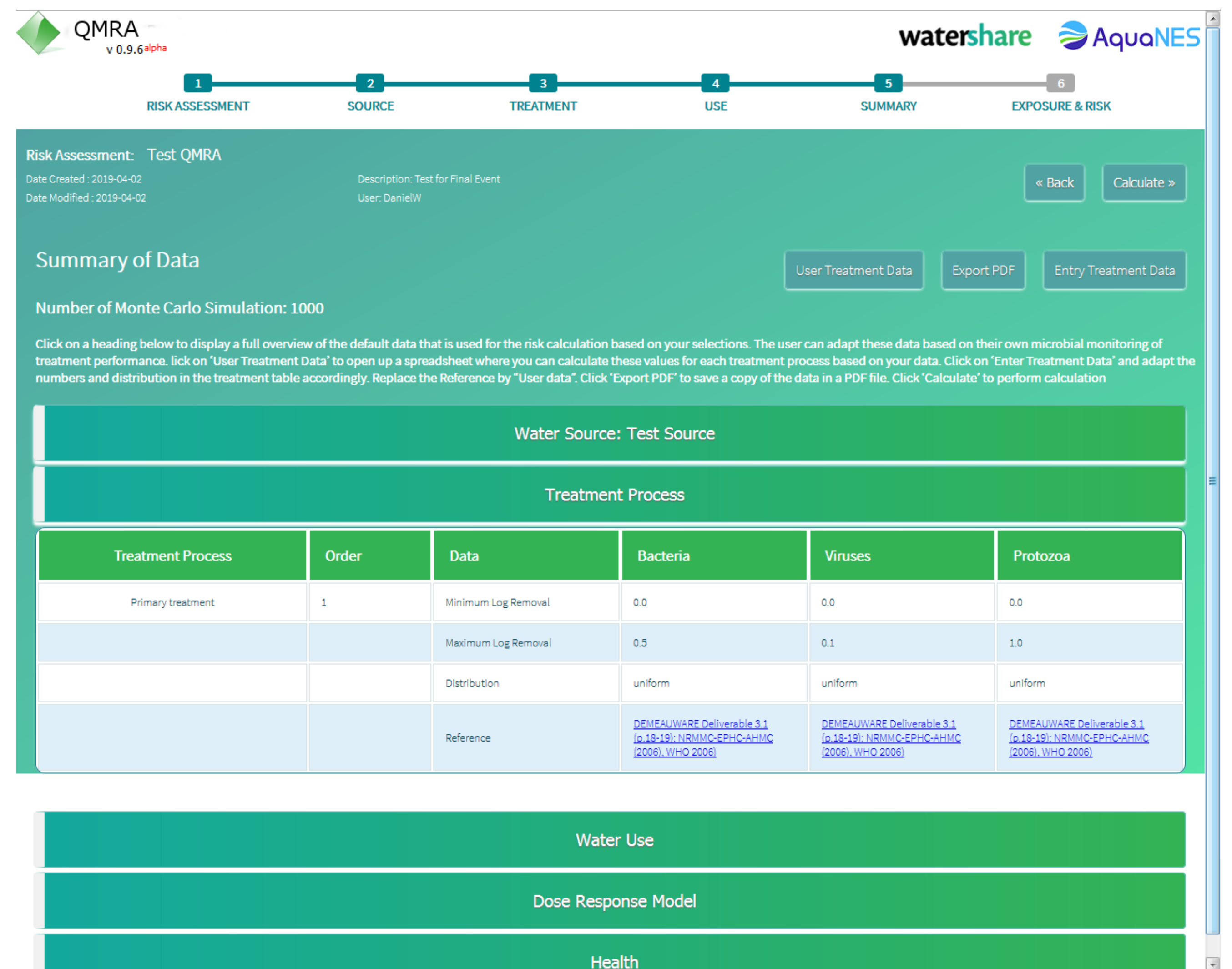
Frequencies moderate as most people use municipal areas sparingly (estimate 1/273 weeks). People are unlikely to be directly exposed to large amounts of spray and therefore exposure is from indirect ingestion via contact with lawns, etc. Likely to be higher when used to irrigate facilities such as sports grounds or golf courses (estimate 1/week) grounds and golf courses (estimate 1/week)

Water Use events per Year equal to 50 events

Water ingestion amount per Event equal to 0.001 liter

Step 5: Summary page with all assumptions made for the QMRA

- Overview of all input parameters is shown in fold-out tables
- Log-removal of treatment steps can be adapted by selecting "Entry Treatment Data" opening the summary table "Treatment Process"
- Min/Max removal can be adjusted and distribution type can be modified (set to "norm" = normal distribution), change reference to "User data"
- Clicking on "User Treatment Data" opens an excel file which can be used to calculate the appropriate log-removal credits for each treatment step from given monitoring data
- Further optimization of the tool will improve user data input
- Input data for QMRA can be exported as pdf (Button "Export PDF")



Risk Assessment: Test QMRA

Summary of Data

Number of Monte Carlo Simulation: 1000

Click on a heading below to display a full overview of the default data that is used for the risk calculation based on your selections. The user can adapt these data based on their own microbial monitoring of treatment performance. Click on 'User Treatment Data' to open up a spreadsheet where you can calculate these values for each treatment process based on your data. Click on 'Enter Treatment Data' and adapt the numbers and distribution in the treatment table accordingly. Replace the Reference by "User data". Click "Export PDF" to save a copy of the data in a PDF file. Click "Calculate" to perform calculation

Water Source: Test Source					
Treatment Process					
Treatment Process	Order	Data	Bacteria	Viruses	Protozoa
Primary treatment	1	Minimum Log Removal	0.0	0.0	0.0
		Maximum Log Removal	0.5	0.1	1.0
		Distribution	uniform	uniform	uniform
		Reference	DEUFAWASSF Deliverable 3.1 (2018-2019) (https://www.researchgate.net/publication/330061110) (2008, WHO 2008)	DEUFAWASSF Deliverable 3.1 (2018-2019) (https://www.researchgate.net/publication/330061110) (2008, WHO 2008)	DEUFAWASSF Deliverable 3.1 (2018-2019) (https://www.researchgate.net/publication/330061110) (2008, WHO 2008)

Water Use

Dose Response Model

Health

Step 6: Summary of results

- After running of the Monte-Carlo-Simulation (takes 5-60 s) the results are display as boxplots depending on use scheme
- The red line indicates the maximum acceptable risk level according to WHO guidelines
- The following results are given:
 - Infection risk per person per year
 - DALYs per person per year (DALY: disability-adjusted life years)
- Below the graph the results are given as tables (values exceeding the guideline risk level are shown in red)
- Results can be exported as pdf (Button "Export PDF")

