Risk Assessment Tool for Weir Removal

With the Environment Agency

By Kelly Quantrill

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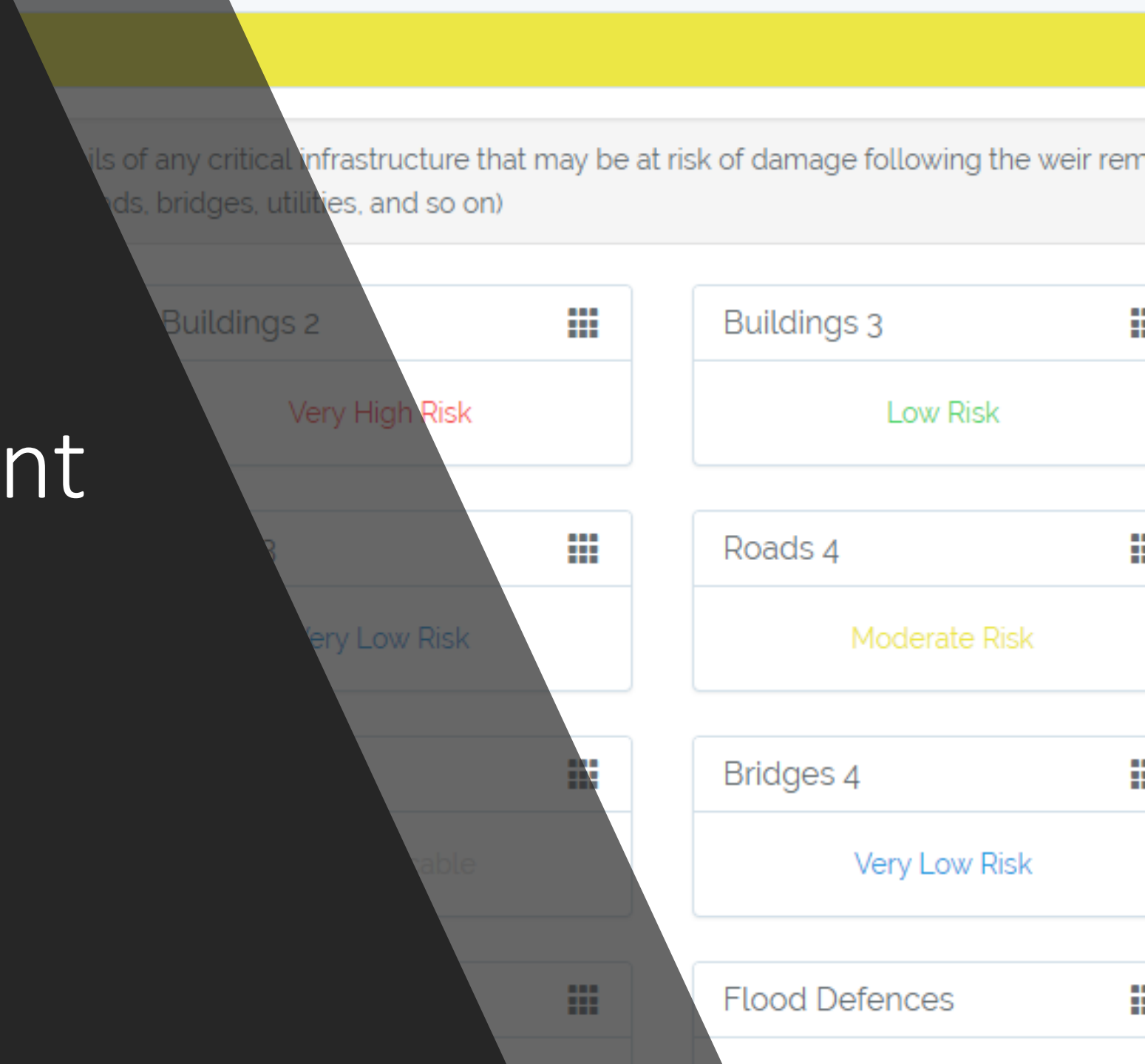


indices
familiarity models
assessment models

About Me

Project aim

Team members

Data structures

Final tool

https://risk-check.io/

Development stages

Case Study

Agenda

Msc in Risk at Durham University, Institute for Hazards, Risk and Resilience (IHRR)

Database analyst

Linguistics 2010

Combine risks

First stage assessment

User inputs characteristics

Tool outputs risk rating

Usable in business cases

Project Aim

1

Kelly Quantrill

Data

Durham

2

Claire Pattison

Geomorphologist

EA

3

Phil Rippon

Fisheries

EA

4

Bryan Gruneberg

Developer

Kage International

5

Holly Sims

Illustrator

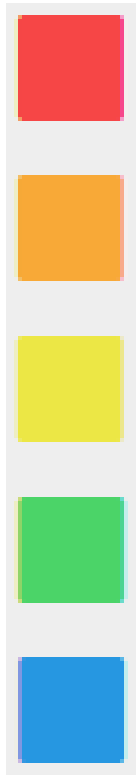
hollysims.co.uk

Team Members

https://risk-check.io/

The Risk Assessment Tool

Data Structures



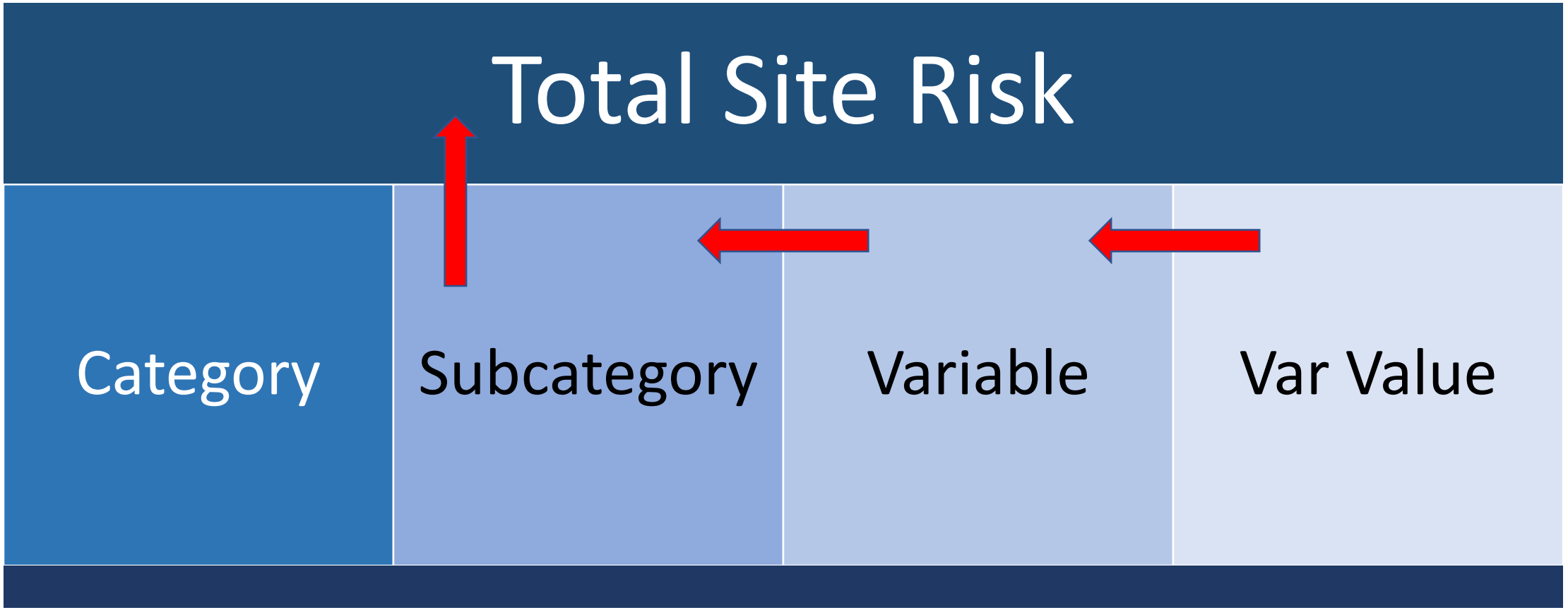
Very High Risk 5.

High Risk 4.

Moderate Risk 3.

Low Risk 2.

Very Low Risk 1.



Hierarchy

Variable 1	Variable 2
Value 1	Value 1
Value 2	Value 2
Value 3	Value 3

Weighting	Variable 1 Archaeology	Variable 2 Aesthetics
1	None	Unattractive
2	Regional	Somewhat attractive
3	National	Very attractive
Ranking	2	1

Weighting	Archaeology	Aesthetics
1	None	Unattractive
2	Regional	Somewhat attractive
3	National	Very attractive

Knowledge Weighting

Ranking

2	1	Certain
	1.5	Somewhat Certain
	2	Uncertain

1

Weighting	Archaeology	Aesthetics
1	None	Unattractive
2	Regional	Somewhat attractive
3	National	Very attractive
Ranking	2	1

3 * 2 * 2
= 12

12 / 5
= 2.4

- Very High Risk
- High Risk
- Moderate Risk
- Low Risk
- Very Low Risk

Knowledge Weighting

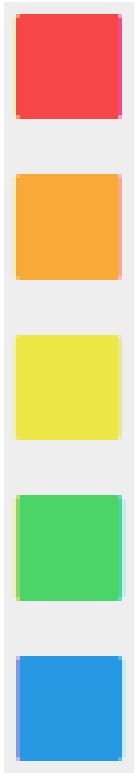
Risk = W_{arc} * R_{arc} * KW_{arc}

1	Certain
1.5	Somewhat Certain
2	Uncertain

= 2 * 2 * 1

= Var1 + Var2…

Example:



Very High Risk	5 .	> 9.6
High Risk	4 .	> 7.2 <= 9.6
Moderate Risk	3 .	> 4.8 <= 7.2
Low Risk	2 .	> 2.4 <= 4.8
Very Low Risk	1 .	<= 2.4

Weighting	Archaeology	Aesthetics
1	None	Unattractive
2	Regional	Somewhat attractive
3	National	Very attractive
Ranking	2	1

Risk = W_{arc} * R_{arc}

= 2 * 2

= Var1 + Var2…

- Very High Risk
- High Risk
- Moderate Risk
- Low Risk
- Very Low Risk

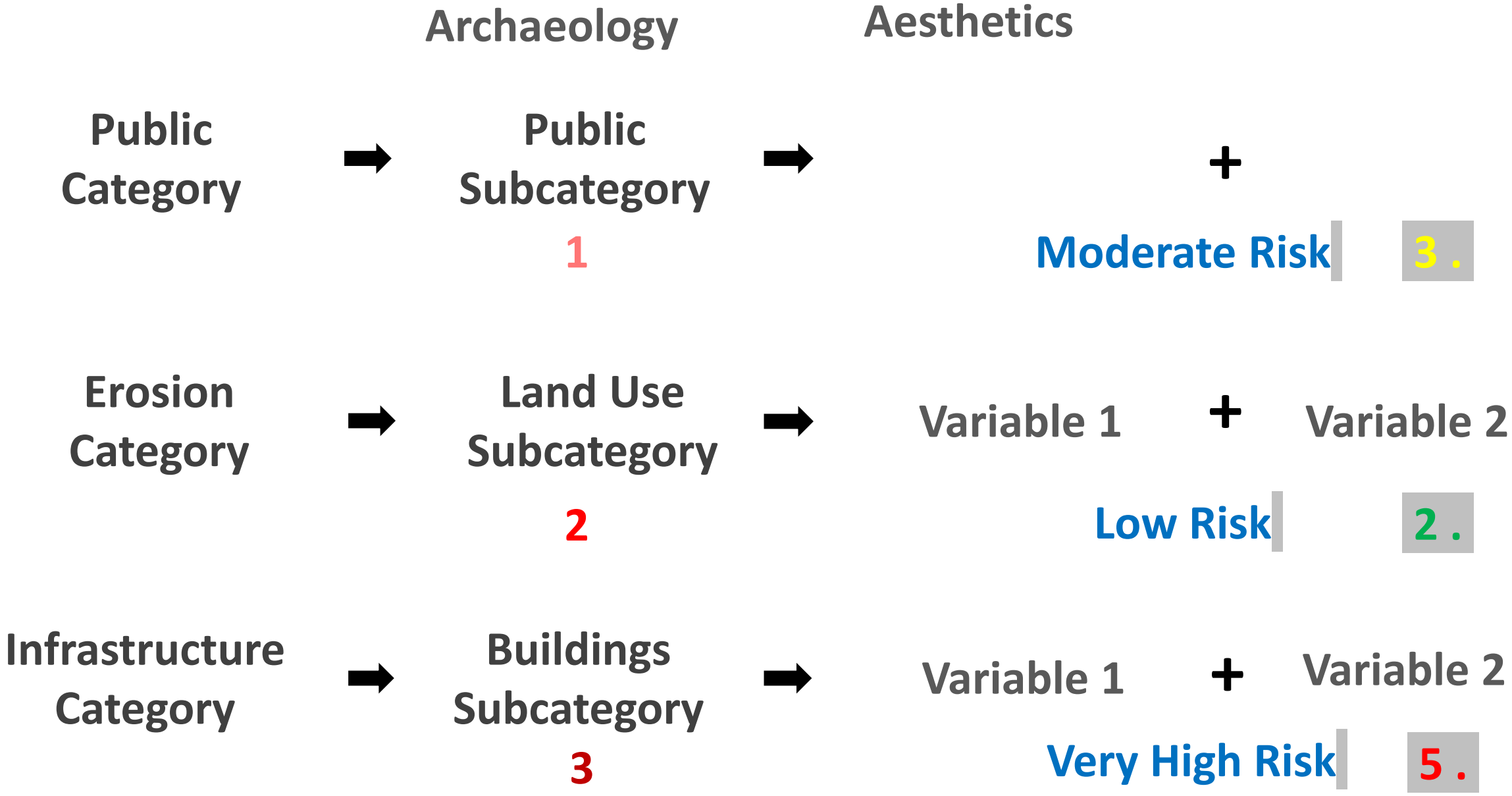
Weighting	Archaeology	Aesthetics
1	None	Unattractive
2	Regional	Somewhat attractive
3	National	Very attractive
Ranking	2	1

Risk = W_{arc} * R_{arc}

= 2 * 2

= Var1 + Var2…

- Very High Risk
- High Risk
- Moderate Risk
- Low Risk
- Very Low Risk


Archaeology
Aesthetics
Public Category
Public Subcategory
1
+
Moderate Risk
3 .
Erosion Category
Land Use Subcategory
2
Variable 1
+
Variable 2
Low Risk
2 .
Infrastructure Category
Buildings Subcategory
3
Variable 1
+
Variable 2
Very High Risk
5 .

Public Category → Public Subcategory 1 → Archaeology + Aesthetics * 3 .

Erosion Category → Land Use Subcategory 2 → Variable 1 + Variable 2 * 2 .

Infrastructure Category → Buildings Subcategory 3 → Variable 1 + Variable 2 * 5 .

Infrastructure Model

Public Model

Public Category → Public Subcategory → Archaeology + 3 Aesthetics

1 * 3 .

Erosion Category → Land Use Subcategory → Variable 1 + 1 Variable 2

2 * 2 .

Infrastructure Category → Buildings Subcategory → Variable 1 + 2 Variable 2

3 * 5 .

Subcategory risk level index:

$(R_{var1} * W_{var1} * KW_{var1}) + (R_{var2} * W_{var2} * KW_{var2\ldots})$

Where R = variable rank; W = variable value weighting; KW = knowledge weighting

Category risk level index:

$(CW_{subcat1} * RL_{subcat1}) + (CW_{subcat2} * RL_{subcat2\ldots})$

Where CW = internal subcategory weighting; RL = risk level (1 - 5)

Total site risk level index:

$(GW_{subcat1} * RL_{subcat1}) + (GW_{subcat2} * RL_{subcat2\ldots})$

Where GW = global subcategory weighting; RL = risk level (1 - 5)

Category	Subcategory
Infrastructure	Buildings
	Roads
	Bridges
	Utilities
	Mining
	Flood Defences
Erosion	River Typology
	Geomorphological Characteristics
	Primary Habitat Types
	Secondary Habitat Types
	Land Use
Contaminated Sediments	Contaminated Sediment
Fisheries	Fisheries
Public	Public
Flooding	Flood Zone
	Flood Perception
Function	Historical Function(s)
	Current Function(s)
Conservation	Conservation

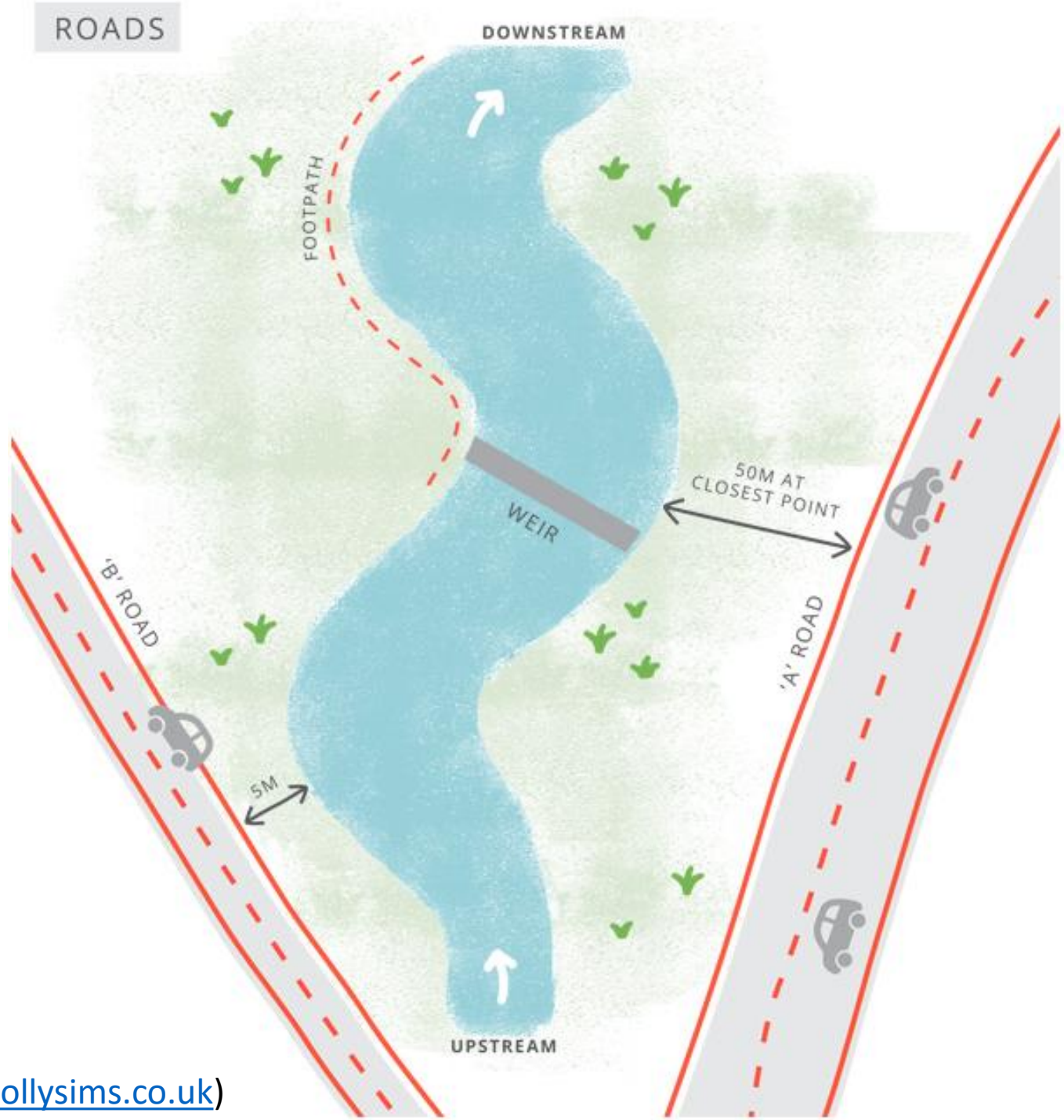


Illustration by Holly Sims (www.hollysims.co.uk)

The Finished Product

https://risk-check.io/

Weir Removal Risk Assessment Tool

Admin | Kelly Quantrill

Home

Kelly Quantrill's Assessments

Explore Models | Add Assessment

Name	Description	Model	Risk Rating
Test - 20 August 2017	Testing description	Infrastructure High	Moderate Risk
Test - 15 December 2017	Testing description	Infrastructure High	Low Risk
Test	Test	Infrastructure High	Low Risk
test2	test2	Infrastructure High	Very Low Risk
Test3	test3	Infrastructure High	Very Low Risk

Create Assessment

⚠ Once created, an assessment submission takes on average **45 minutes** to complete.
⬇ Your answers to assessment questions are automatically saved.

Name

Description

Assessment Model

The model you select here can not be changed once you start your assessment. The models prioritise different categories in the tool. For example, if you are aware that there is a high volume of infrastructure in the area then select the "Infrastructure High" model. If you are uncertain of which one to choose then leave it set to the default.

Infrastructure High

How familiar are you with the site you are assessing?

This can not be changed once the assessment has been started.

Very familiar / Familiar

Save

Assessment Model

The model you select here can not be changed once you start your assessment. The models prioritise different categories in the tool. For example, if you are aware that there is a high volume of infrastructure in the area then select the "Infrastructure High" model. If you are uncertain of which one to choose then leave it set to the default.

Infrastructure High

How familiar are you with the site you are assessing?

This can not be changed once the assessment has been started.

Very familiar / Familiar

Test - 20 August 2017

Testing description

Risk Rating

- Very High Risk
- High Risk
- ← Moderate Risk
- Low Risk
- Very Low Risk

Expected Benefits

- ← Very High Benefit(s)
- High Benefit(s)
- Moderate Benefit(s)
- Low Benefit(s)
- Very Low Benefit(s)

Infrastructure — Moderate Risk

In this category you can fill out the details of any critical infrastructure that may be at risk of damage following the weir removal. This is anything in the area that you might be concerned about (buildings, roads, bridges, utilities, and so on)

Buildings 1	Buildings 2	Buildings 3	Buildings 4
Very Low Risk	Not Applicable	Not Applicable	Not Applicable
Buildings 5	Roads 1	Roads 2	Roads 3
Not Applicable	Very High Risk	Not Applicable	Low Risk
Roads 4	Roads 5	Bridges 1	Bridges 2
Very High Risk	Not Applicable	Very High Risk	Not Applicable

Proximity

How near or far are these buildings from the weir or area of expected adjustment?

None

None Selected

Far: more than 20m from the weir or area of adjustment

Between 5m and 20m of the weir or area of adjustment Press enter to select

Close: Less than 5m from the weir or area of adjustment

Select option

Land Use 1 — Very High Risk

(click to zoom)

Land use near the site, which may be a cause of concern in the event of weir removal for various reasons (e.g. soil compaction, erosion, etc.). There are multiple optional entries available as separate Land Use subcategories in the event of several land use types being present at the site that you may be concerned about contributing to the risk. Feel free to fill out as many as are relevant to your project.

Type

What is the type of land use near the site?

Residential (incl temporary or informal homes eg caravan parks, camping)

None Moderate Significant

Access

?

Public safety

?

Tourism

?

Fisheries

?

Hydromorphology

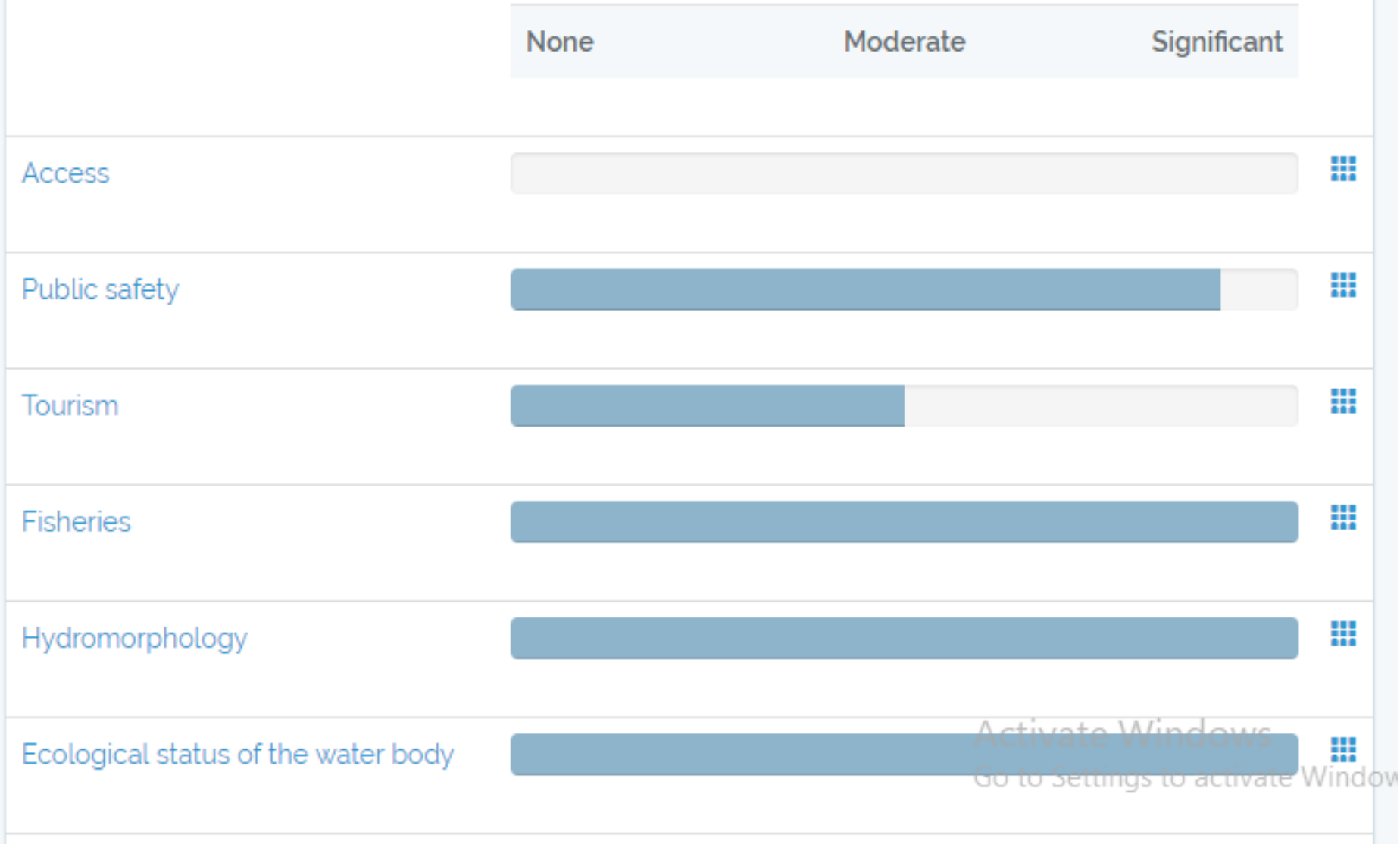
?

Ecological status of the water body

?

Benefits

These are the areas that you expect will improve as a direct or indirect result of the removal project.



Very High	maximum value >= 7 & count > 1
High	maximum value >= 7
Moderate	4 <= maximum value <= 6
Low	2 <= maximum value <= 3
Very Low	maximum value <= 1

Benefits

Test - 20 August 2017

Testing description

Risk Rating

- Very High Risk
- High Risk
- ← Moderate Risk
- Low Risk
- Very Low Risk

Expected Benefits

- ← Very High Benefit(s)
- High Benefit(s)
- Moderate Benefit(s)
- Low Benefit(s)
- Very Low Benefit(s)

Development Stages

1

Wireframe in Mockflow

http://weir.enactlabs.com/

2

Data structures in spreadsheet

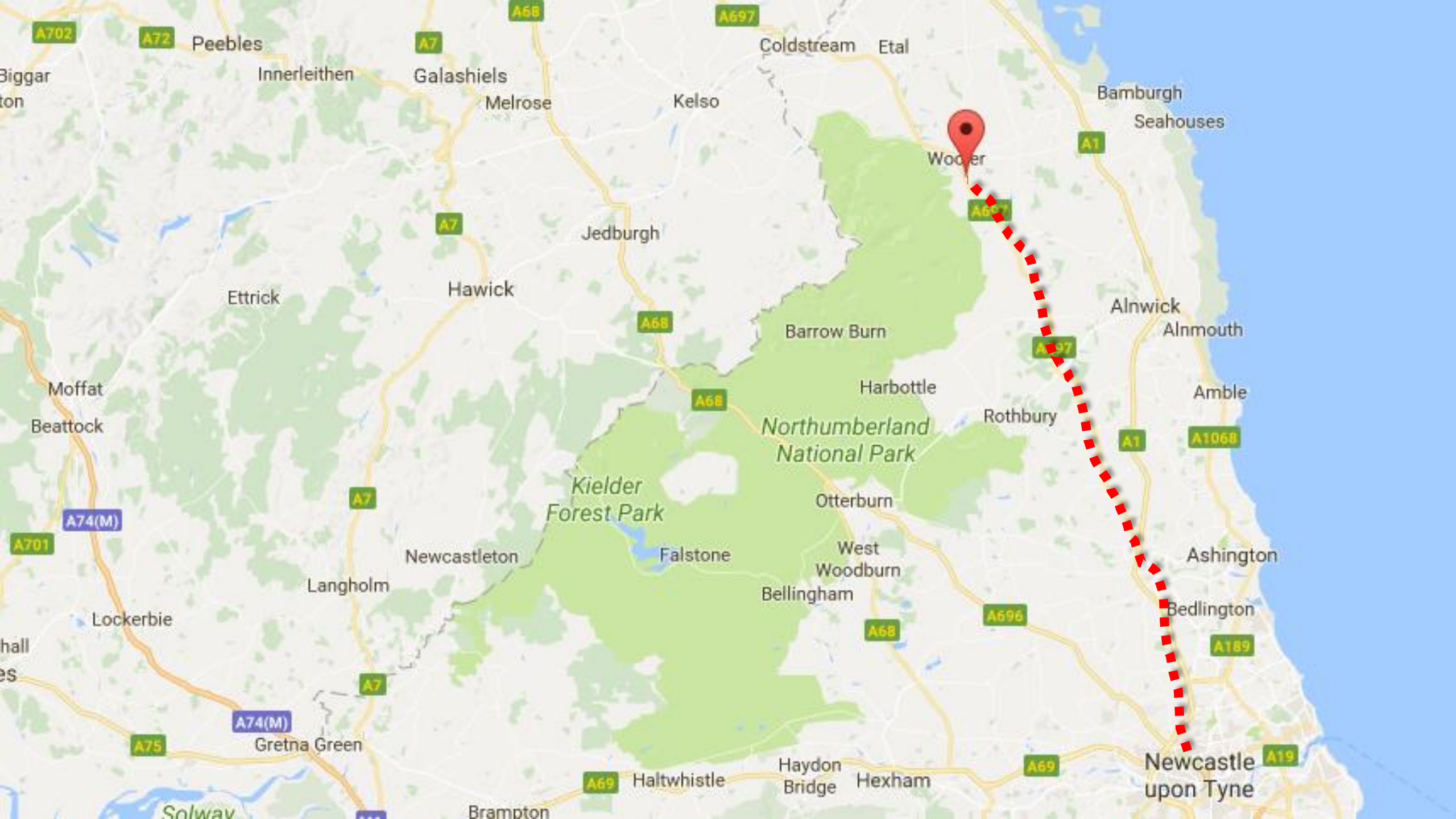
http://bit.ly/2uDp18p

3

Web App

https://risk-check.io/

Case Study


A702
A72
Peebles
Innerleithen
A7
Galashiels
A68
A697
Coldstream
Etal
Melrose
Kelso
Bamburgh
Seahouses
A1
Wooler
A697
A7
Jedburgh
Ettrick
Hawick
A68
Barrow Burn
Alnwick
Alnmouth
A697
Moffat
Beattock
A68
Harbottle
Rothbury
Amble
A1
A1068
Northumberland
National Park
Kielder
Forest Park
A7
Otterburn
A74(M)
A701
Newcastleton
Falstone
West
Woodburn
Ashington
Langholm
Bellingham
Lockerbie
A696
Bedlington
A68
A189
A7
A74(M)
A75
Gretna Green
A69
Haltwhistle
Haydon
Bridge
Hexham
A69
Newcastle
upon Tyne
A19
Brampton

Haugh Head ford on Wooler Water. Pic by Kelly Quantrill

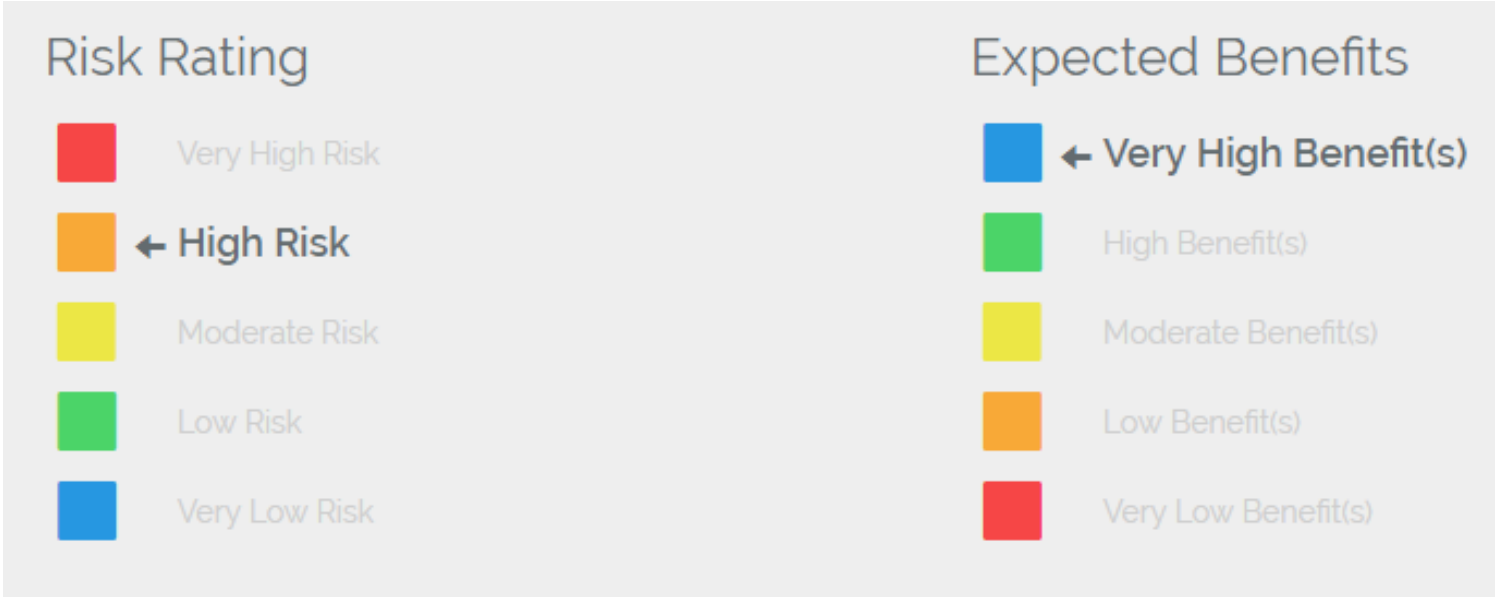
Haugh Head ford on Wooler Water. Pic by Kelly Quantrill

Haugh Head ford on Wooler Water. Pic by Kelly Quantrill

In the Wild

Haugh Head Weir

"Very Familiar" familiarity model
"Infrastructure High" assessment model



High Risk: Infrastructure; Morphological Adjustment Including Erosion

Moderate Risk: Fisheries; Flooding; Function

Benefits: Public Safety; Fisheries; Conservation; Ecological Status of the Water Body

Thank You

Please visit
https://risk-check.io/

User guide available on request

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Environment Agency

Durham University