

Arrowsmith Water Service Englishman River Water Intake Study Phase 1 - Conceptual Planning

Discussion Paper 6-2 - Development of a List of Potential Intake Sites

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Previous Issue: None

1 Introduction

The consultant team has completed the first part of Task 6-2 – Potential Intake / Treatment Plant Site Identification. This activity has involved the development of a constraint mapping process to evaluate a 10 km stretch of the Englishman River for suitability for a new river intake and accompanying water treatment plant. The results of this constraint mapping process formed part of the Workshop Brief for the workshop held on March 9, 2010. The objective of the Workshop was to review the scoring for the various stretches of the river and to select a list of potential sites for more detailed evaluation.

This discussion paper extends on the Workshop Brief and presents the results of the workshop discussion.

2 Constraint Mapping Process

The constraint mapping process is intended as a rigorous scientific and engineering analysis to evaluate the entire 10 km stretch for suitability as the future intake site. The approach involved the following steps:

- Dividing the river into segments (termed polygons) that would allow individual segments to be evaluated. Nineteen segments were selected based on the river configuration. Further dividing these segments into the east and west banks of the river yielded 38 polygons.
- Five categories were selected for the scoring process:
 - land use compatibility,
 - heritage / archaeology concerns,
 - ecological impacts,
 - geotechnical conditions, and
 - water system considerations.

Each of the five categories was further subdivided into a number of issues or topics (termed subcategories). These are shown in the attached sheets.

- The subcategories were scored using a range of 1 to 5, with “1” representing the poorest score and “5” being the best score. The scoring in the subcategories was aggregated up to the category score. In a same manner, the category scores were aggregated up to an Overall Suitability for Water Intake score. In this summary, the higher the number – the more suitable the polygon is for an intake.

The constraint mapping model uses a GIS geo database, with the scoring at the working level done in EXCEL software. The scoring was then migrated to the GIS geo database in order to produce colour graphics that show the relative scoring.

The constraint mapping model is constructed with the ability to weight the categories to analyze the sensitivity of the scoring. For the workshop, all the categories were weighted equally. The scoring at the subcategory level, however, used variable weighting based on the significance of the subcategory issue. This weighting is shown on the individual category sheets.

Where a polygon had varying characteristics in a particular category, the polygon was scored according to the most favourable section of the river reach. In the working notes, comments are provided as to the variation in the reach. The scoring of a polygon primarily refers to the suitability for an intake. However, in the scoring, the team was cognizant that the water treatment plant would be located either adjacent or nearby the intake and included this in the scoring.

Under the “Land Use Compatibility” category, there is a subcategory termed “property available for purchase”. Where it is unlikely that property is available, the polygon is scored as “1”. As the lack of ability to acquire property essentially eliminates this polygon, the polygon is shown in “red” in the sheet. This red shading is carried over to the Summary Scoring Sheet to indicate that this polygon has been effectively eliminated from further consideration.

The scoring is shown in the appended material in two ways. First, six maps are provided showing the Total Score and Five Categories. Second, the detailed numerical scoring is shown on the EXCEL based sheets.

3 Discussion

At the workshop, it was agreed that the constraint mapping process was a “tool” to allow a complex set of variables to be ranked in a numerical fashion. The process should not be used to simply pick the highest ranking polygons as the best intake and water treatment plant sites. Rather the process should be used to indicate trends.

Overall scoring ranged from a low of 2.7 to a high of 4.3. Eight sites scored at 4.0 or above. Four sites scored at 4.2 with one site at 4.3. With the exception of the extreme upstream end of the river (1E; 1W; 2E; 2W), the clear trend was that the lower reaches of the river (from 12E / 12W down)

scored the highest. This is generally due to the fact that this reach of the river is more stable; has less ecological and human use impacts and is closer to the existing water infrastructure.

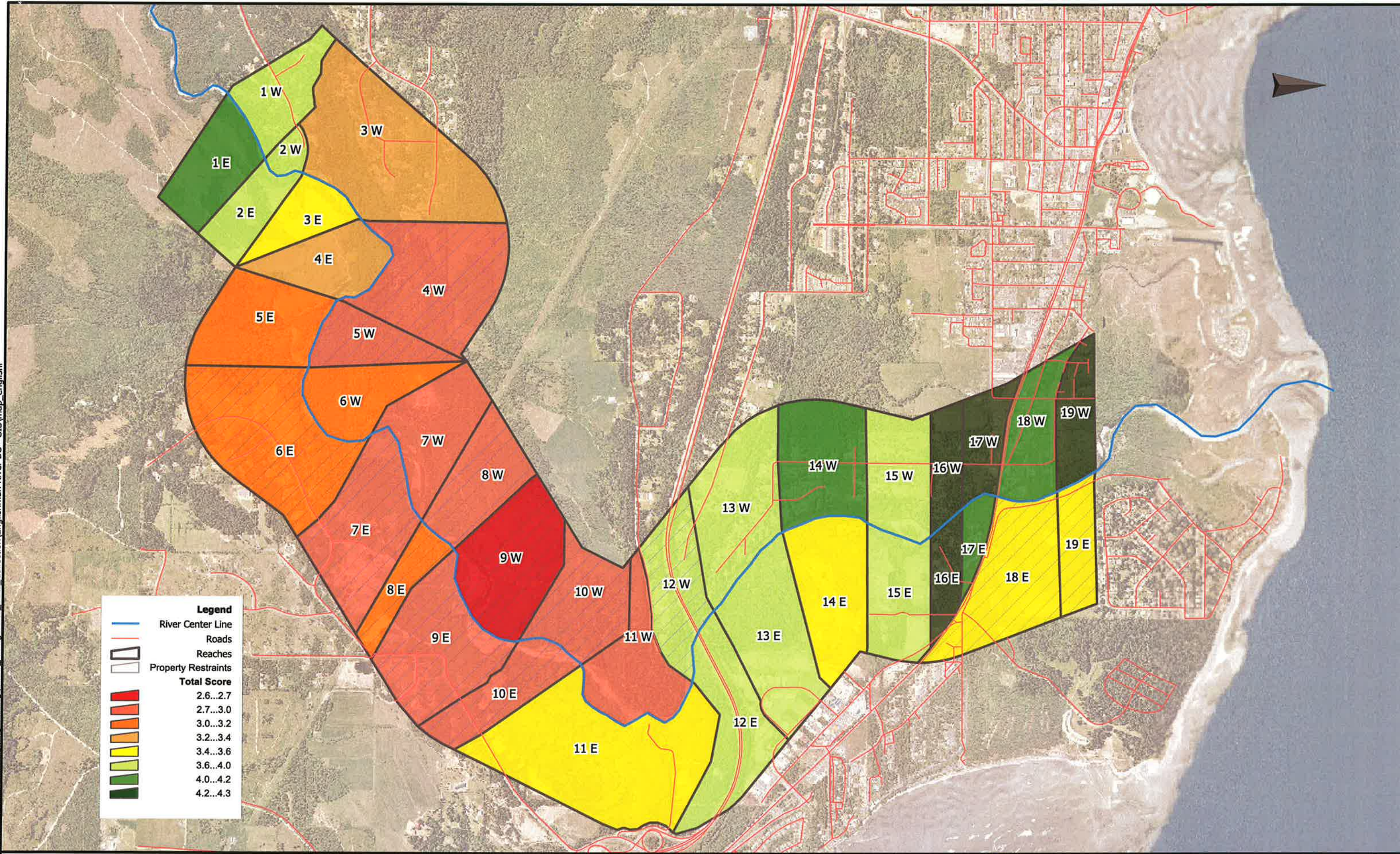
It was agreed that the focus for identification of intake / WTP sites should be on the lower section of the river (12 E / 12 W and below). The next step will be the identification of specific properties along this section of the river. While the original work plan laid out a three step approach (long list – short list – 2 or 3 sites), the merit of using a two step process was discussed at the workshop. This would see the consultant team identify 4 or 5 properties and do a full analysis on these sites. A TBL (triple bottom line) analysis would then be carried out with the AWS team to identify the preferred sites. There was agreement to adopt this approach.

4 Summary

The workshop concluded that the constraint mapping process showed a distinct trend – that the lower reach of the Englishman River (from just above the Hwy 19 bridge down to just above the mouth) was the preferred location for the new intake and water treatment plant.

The consultant team will now proceed with the identification of specific properties within this section of the river for further engineering and environmental analysis.

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Legend

- River Center Line
- Roads
- Reaches
- Property Restraints

Total Score

2.6...2.7
2.7...3.0
3.0...3.2
3.2...3.4
3.4...3.6
3.6...4.0
4.0...4.2
4.2...4.3

Total Score Map

Projection: UTM Zone 10
Datum: NAD83



Legend

- River Center Line
- Roads
- Reaches
- Property Restraints

Land Use Compatibility

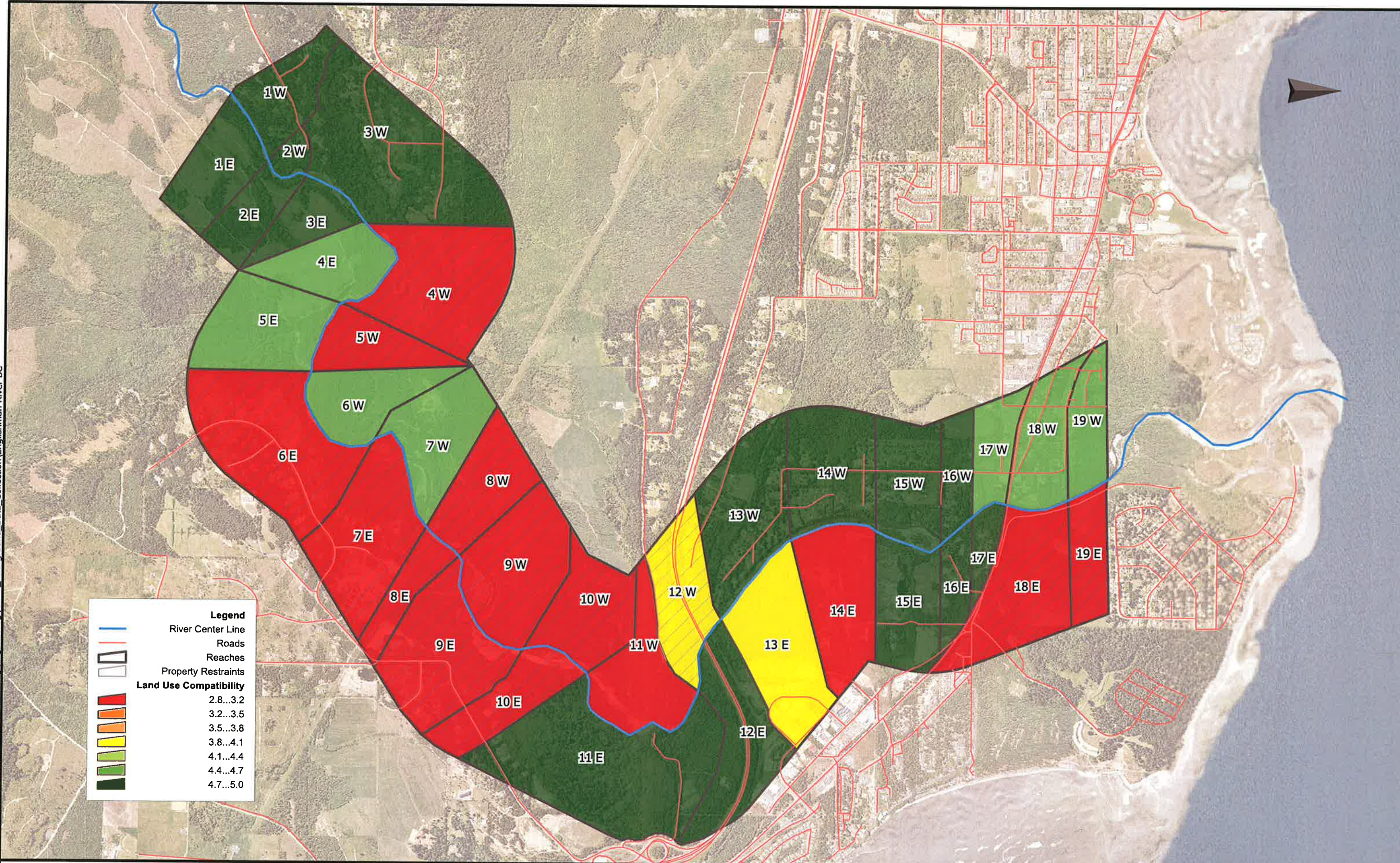
Dark Green	4.7...5.0
Light Green	4.4...4.7
Yellow-Green	4.1...4.4
Yellow	3.8...4.1
Orange	3.5...3.8
Red-Orange	3.2...3.5
Red	2.8...3.2

Land Use Compatibility Map

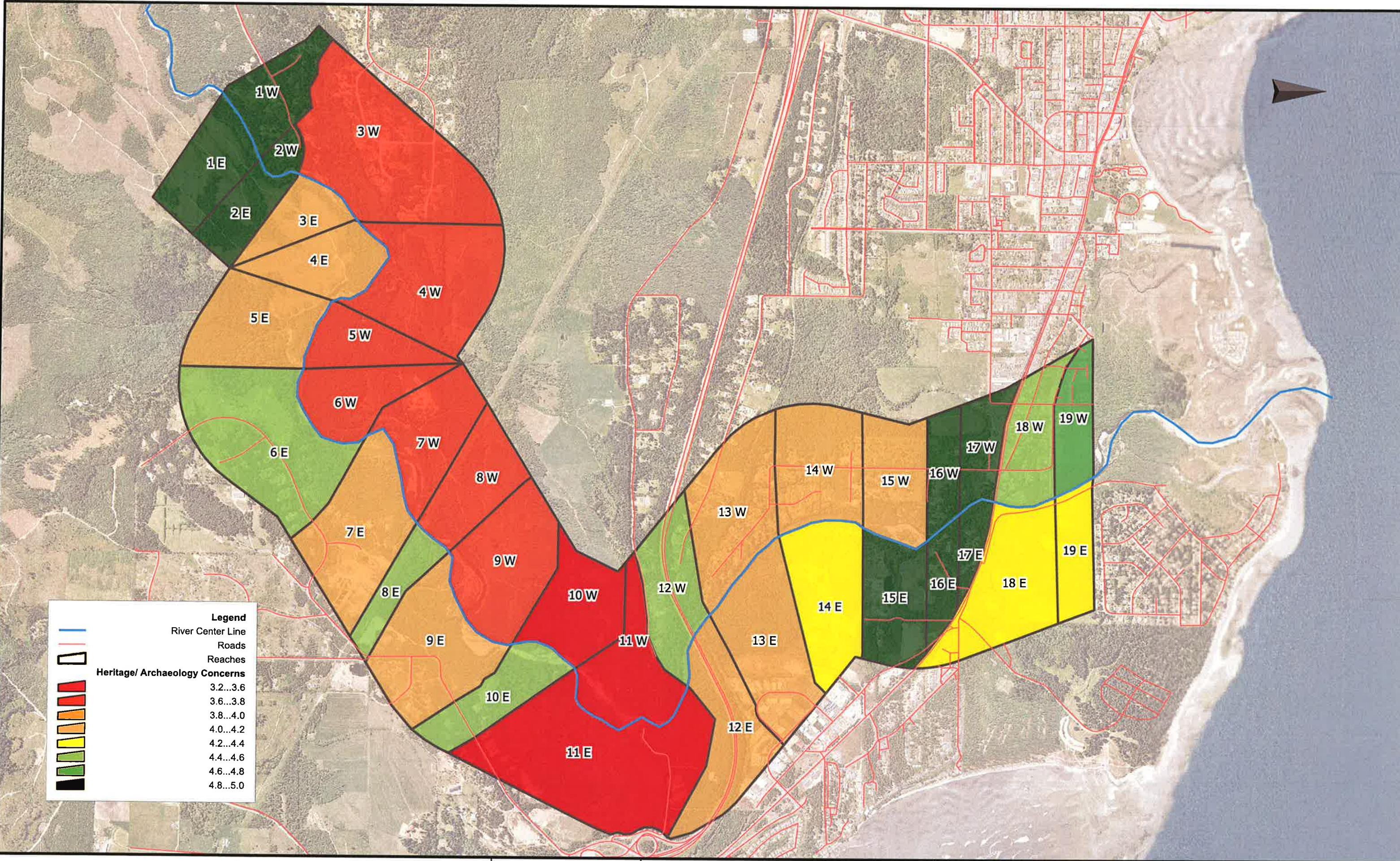
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Legend

- River Center Line
- Roads
- Reaches

Heritage/ Archaeology Concerns

Dark Red	3.2...3.6
Red	3.6...3.8
Orange-Red	3.8...4.0
Orange	4.0...4.2
Light Orange	4.2...4.4
Yellow-Orange	4.4...4.6
Yellow	4.6...4.8
Light Green	4.8...5.0

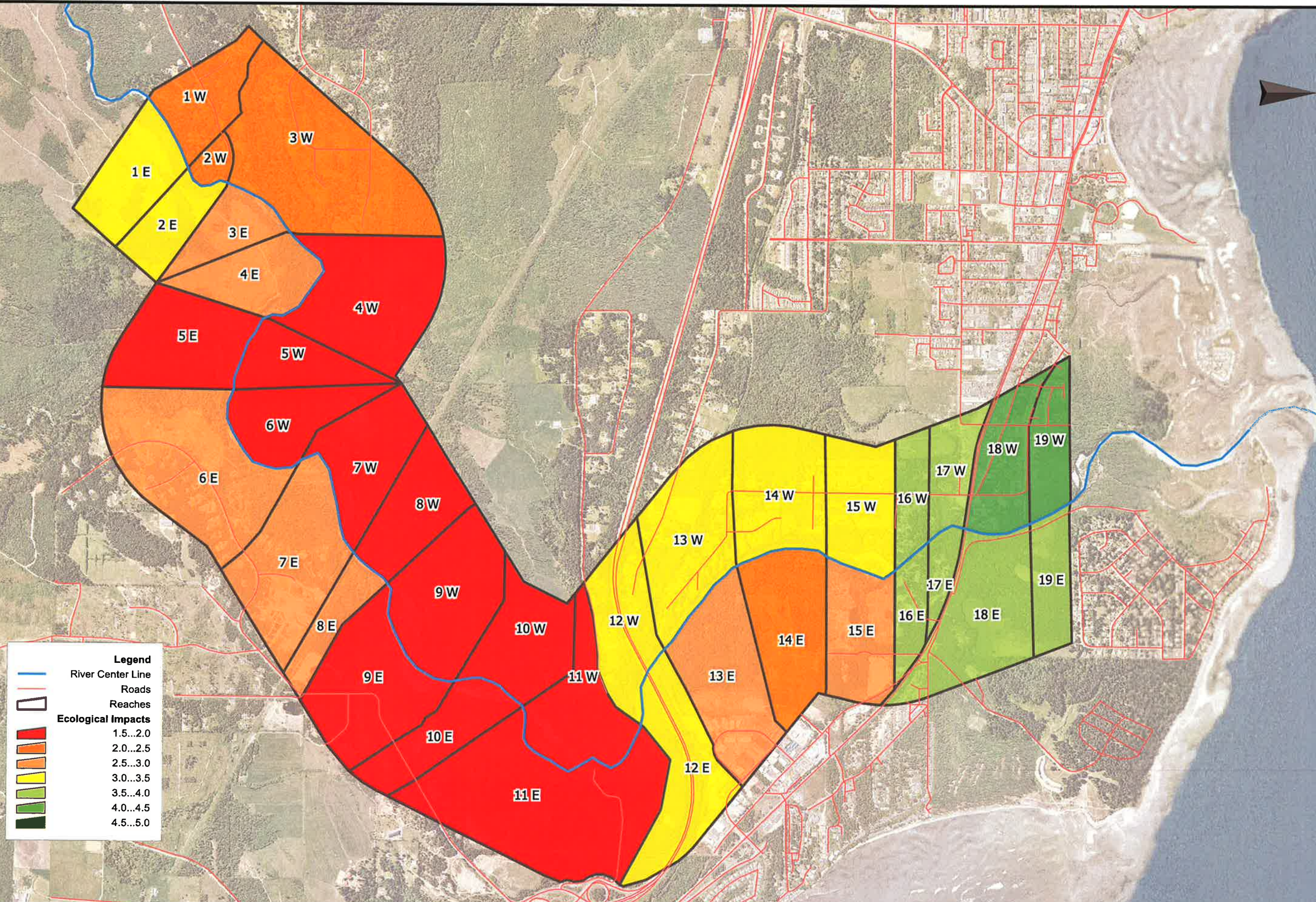
Heritage/ Archaeology Concerns Map

Projection: UTM Zone 10
Datum: NAD83



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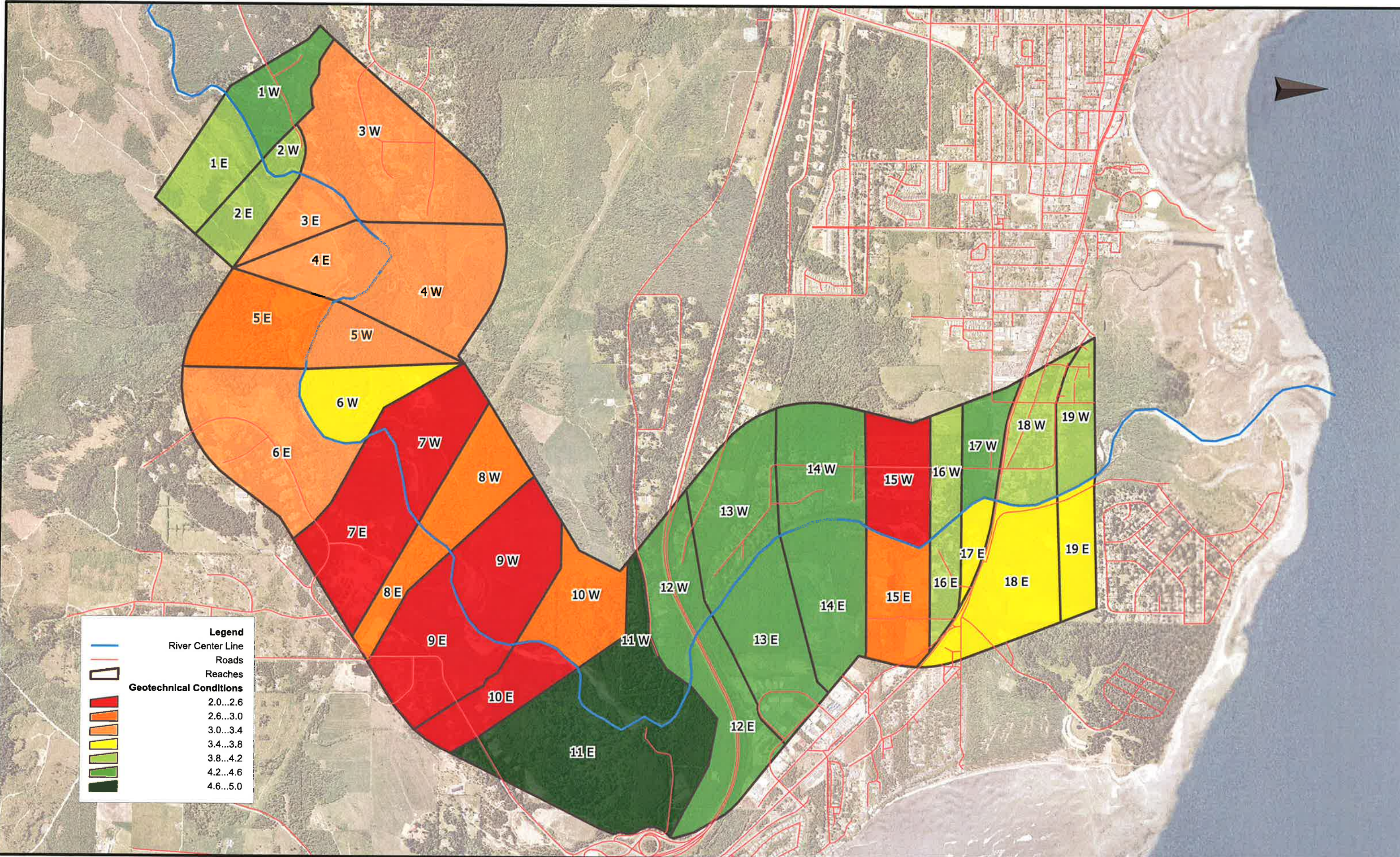


Ecological Impacts Map

Projection: UTM Zone 10
Datum: NAD83



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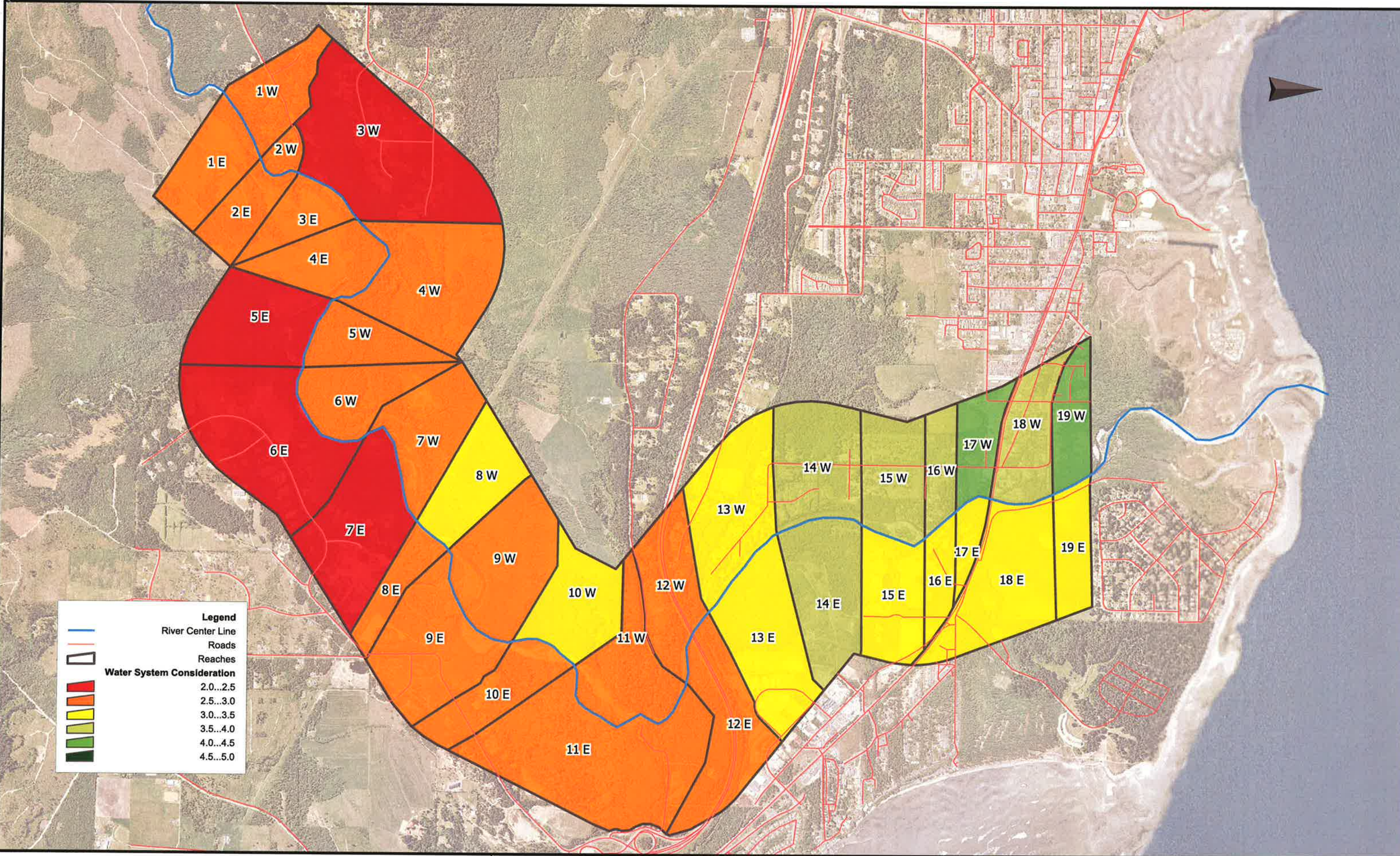
Geotechnical Conditions Map

Projection: UTM Zone 10
Datum: NAD83



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Legend

- River Center Line
- Roads
- Reaches

Water System Consideration

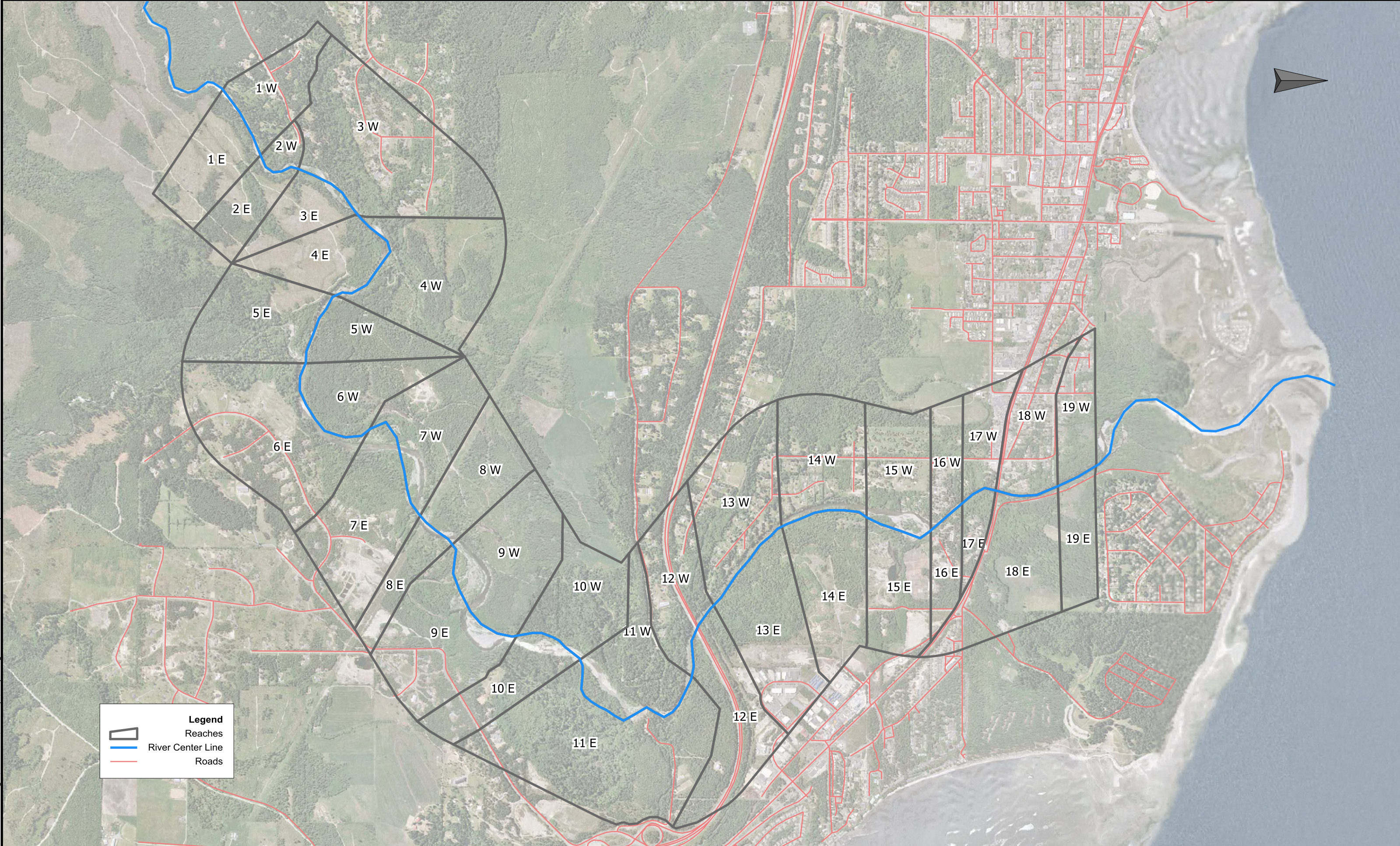
- 2.0...2.5
- 2.5...3.0
- 3.0...3.5
- 3.5...4.0
- 4.0...4.5
- 4.5...5.0

Water System Consideration Map




Projection: UTM Zone 10
Datum: NAD83



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Legend

-  Reaches
-  River Center Line
-  Roads

Reach Overview Map

Projection: UTM Zone 10
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**ARROWSMITH WATER SERVICE
 ENGLISHMAN RIVER INTAKE STUDY
 DEVELOPMENT OF LONG-LIST OF POTENTIAL INTAKE SITES**

Scoring Summary Sheet

River Reach	Categories					
	Land Use Compatibility Scoring	Heritage / Archaeology Concerns Scoring	Ecological Impacts Scoring	Geotechnical Conditions Scoring	Water System Considerations Scoring	Overall Suitability for Water Intake
	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100
1W	4.8	5.0	2.2	4.3	2.5	3.8
1E	4.8	5.0	3.2	4.2	2.8	4.0
2W	4.8	5.0	2.2	4.1	2.5	3.7
2E	4.8	5.0	3.2	3.9	2.7	3.9
3W	4.8	3.8	2.0	3.2	2.4	3.2
3E	4.8	4.0	2.5	3.2	2.7	3.4
4W	3.0	3.8	1.5	3.0	2.6	2.8
4E	4.6	4.0	2.7	3.1	2.6	3.4
5W	3.0	3.8	1.5	3.1	2.8	2.8
5E	4.6	4.0	1.5	2.9	2.3	3.1
6W	4.4	3.8	1.5	3.4	2.9	3.2
6E	3.0	4.5	2.7	3.3	2.1	3.1
7W	4.4	3.8	1.5	2.1	3.0	2.9
7E	3.0	4.0	2.7	2.6	2.3	2.9
8W	3.0	3.8	1.5	2.8	3.0	2.8
8E	3.0	4.5	2.5	3.0	2.6	3.1
9W	3.0	3.8	1.5	2.4	2.9	2.7
9E	3.0	4.0	2.0	2.2	2.7	2.8
10W	3.0	3.5	1.5	2.7	3.3	2.8
10E	3.0	4.5	1.5	2.5	2.6	2.8
11W	3.0	3.3	1.6	4.6	2.5	3.0
11E	5.0	3.3	1.6	4.6	3.0	3.5
12W	3.8	4.5	3.1	4.6	2.8	3.7
12E	5.0	4.0	3.1	4.6	2.8	3.9
13W	5.0	4.0	3.1	4.3	3.1	3.9
13E	3.8	4.0	2.6	4.3	3.5	3.6
14W	5.0	4.0	3.1	4.3	3.8	4.0
14E	3.2	4.3	2.4	4.2	3.8	3.6
15W	5.0	4.0	3.1	2.6	3.8	3.7
15E	5.0	5.0	2.9	3.0	3.2	3.8
16W	5.0	5.0	3.5	4.0	3.8	4.2
16E	5.0	5.0	3.8	4.0	3.4	4.2
17W	4.4	5.0	3.5	4.6	4.3	4.3
17E	5.0	5.0	3.8	3.7	3.4	4.2
18W	4.4	4.5	4.0	3.8	3.9	4.1
18E	2.8	4.3	3.5	3.5	3.5	3.5
19W	4.4	4.8	4.0	3.8	4.1	4.2
19E	2.8	4.3	3.8	3.6	3.4	3.6

Notes

- 1 Category scoring is to the nearest 0.5
- 2 Lowest scoring is 1. The highest scoring is 5.
- 3 The sum of the weightings must equal 1. For example, if all categories are weighted equally, each of the five categories has a weighting of 0.2.
- 4 Red indicates significant property constraints.

**ARROWSMITH WATER SERVICE
 ENGLISHMAN RIVER INTAKE STUDY
 DEVELOPMENT OF LONG-LIST OF POTENTIAL INTAKE SITES**

Land Use Compatibility

River Reach	Attributes						Summary of Score for Intake	Comments
	Property Available for Purchase	Can Current Land Use be Changed to Accommodate WTP	Is Current Land Use a Higher Value than for Water Supply Infrastructure	Would Use as Intake or WTP Impact Adjacent Land Use	Concern About Historic Land Use			
	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	Scoring 1 - Low likelihood 3 - Moderate likelihood 5 - Substantial likelihood Weighting 20 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100		
1W	5.0	5.0	5.0	4.0	5.0	4.8	Electoral Area F/Rural/Forestry	
1E	5.0	5.0	5.0	4.0	5.0	4.8	Electoral Area F/Rural/Forestry	
2W	5.0	5.0	5.0	4.0	5.0	4.8	Electoral Area F/Rural/Forestry	
2E	5.0	5.0	5.0	4.0	5.0	4.8	Electoral Area F/Rural/Forestry	
3W	5.0	5.0	5.0	4.0	5.0	4.8	Electoral Area F/Rural/Forestry	
3E	5.0	5.0	5.0	4.0	5.0	4.8	Electoral Area F/Rural/Forestry	
4W	1.0	1.0	5.0	3.0	5.0	3.0	RDN/Nature Trust Wildlife Management Area DL	
4E	5.0	5.0	5.0	3.0	5.0	4.6	Electoral Area F/Rural/Forestry	
5W	1.0	1.0	5.0	3.0	5.0	3.0	RDN/Nature Trust Wildlife Management Area DL	
5E	5.0	5.0	5.0	3.0	5.0	4.6	Electoral Area F/Rural/Forestry	
6W	4.0	5.0	5.0	3.0	5.0	4.4	RDN/Nature Trust - WTP/Intake Reserve	
6E	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 564	
7W	4.0	5.0	5.0	3.0	5.0	4.4	RDN/Nature Trust - WTP/Intake Reserve	
7E	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 564	
8W	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 602	
8E	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 564	
9W	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 602	
9E	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 564	
10W	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 602	
10E	1.0	1.0	5.0	3.0	5.0	3.0	Nature Trust Block 564	
11W	1.0	1.0	5.0	3.0	5.0	3.0	COP/RDN Park Nature Trust Block 602	
11E	5.0	5.0	5.0	5.0	5.0	5.0	Nature Trust Bk 564, northern portion in City non ALR non Park	
12W	1.0	5.0	5.0	3.0	5.0	3.8	COP Park/Highway 19 Corridor	
12E	5.0	5.0	5.0	5.0	5.0	5.0	Highway 19 Corridor	
13W	5.0	5.0	5.0	5.0	5.0	5.0	Rural Residential	
13E	5.0	5.0	2.0	2.0	5.0	3.8	COP Residential Zone	
14W	5.0	5.0	5.0	5.0	5.0	5.0	Rural Residential	
14E	5.0	5.0	2.0	2.0	5.0	3.2	COP Residential Zone/Closed Landfill	
15W	5.0	5.0	5.0	5.0	5.0	5.0	Rural Residential	
15E	5.0	5.0	5.0	5.0	5.0	5.0	Rural Residential	
16W	5.0	5.0	5.0	5.0	5.0	5.0	Rural Residential	
16E	5.0	5.0	5.0	5.0	5.0	5.0	Rural Residential	
17W	5.0	5.0	2.0	5.0	5.0	4.4	COP Commercial	
17E	5.0	5.0	5.0	5.0	5.0	5.0	Rural Residential	
18W	5.0	5.0	2.0	5.0	5.0	4.4	COP Commercial and Residential	
18E	1.0	1.0	5.0	2.0	5.0	2.8	ALR	
19W	5.0	5.0	2.0	5.0	5.0	4.4	COP Residential	
19E	1.0	1.0	5.0	2.0	5.0	2.8	ALR	

Notes

- Category scoring is to the nearest 0.5
- Lowest scoring is 1. The highest scoring is 5.
- The sum of the weightings must equal 1. For example, if all categories are weighted equally, each of the five categories has a weighting of 0.2.
- Red indicates significant property constraints.

March 5, 2010
 Project Number: 2009-2356

**ARROWSMITH WATER SERVICE
 ENGLISHMAN RIVER INTAKE STUDY
 DEVELOPMENT OF LONG-LIST OF POTENTIAL INTAKE SITES**

Heritage / Archaeological Concerns

River Reach	Heritage / Archaeological Concerns Scoring	Human Activities Scoring	Summary of Score for Intake
	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 50 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 50 out of 100	1 - Less suitable 3 - Moderately suitable 5 - Very suitable
1W	5.0	5.0	5.0
1E	5.0	5.0	5.0
2W	5.0	5.0	5.0
2E	5.0	5.0	5.0
3W	5.0	2.5	3.8
3E	5.0	3.0	4.0
4W	5.0	2.5	3.8
4E	5.0	3.0	4.0
5W	5.0	2.5	3.8
5E	5.0	3.0	4.0
6W	5.0	2.5	3.8
6E	5.0	4.0	4.5
7W	5.0	2.5	3.8
7E	5.0	3.0	4.0
8W	5.0	2.5	3.8
8E	5.0	4.0	4.5
9W	5.0	2.5	3.8
9E	5.0	3.0	4.0
10W	4.5	2.5	3.5
10E	5.0	4.0	4.5
11W	4.0	2.5	3.3
11E	4.0	2.5	3.3
12W	5.0	4.0	4.5
12E	5.0	3.0	4.0
13W	5.0	3.0	4.0
13E	5.0	3.0	4.0
14W	5.0	3.0	4.0
14E	5.0	3.5	4.3
15W	5.0	3.0	4.0
15E	5.0	5.0	5.0
16W	5.0	5.0	5.0
16E	5.0	5.0	5.0
17W	5.0	5.0	5.0
17E	5.0	5.0	5.0
18W	5.0	4.0	4.5
18E	5.0	3.5	4.3
19W	4.5	5.0	4.8
19E	5.0	3.5	4.3

Notes

- 1 Category scoring is to the nearest 0.5
- 2 Lowest scoring is 1. The highest scoring is 5.
- 3 The sum of the weightings must equal 1. For example, if all categories are weighted equally, each of the five categories has a weighting of 0.2.
- 4 Archaeological and historical site impacts based on known archaeological sites in the area.
- 5 Human activities assessment based on existing biking and walking trails, known sport fishing locations, and residential lots.

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Ecological Impacts

River Reach	Attributes											
	Potential Impact to Mammals	Potential Impact to Birds	Potential Impact to Amphibians and Reptiles	Potential Impact to Arthropods	Potential Impact to Gastropods	Potential Impact to Rare and Endangered Species	Potential Impact to Wildlife Habitat	Potential Impact on Mainstem Rearing Habitat	Potential Impact on Mainstem Spawning Habitat	Potential Impact on Flows	Potential Impact on Migration: Access to Tribes, etc.	Summary of Score for Intake
	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 5 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 5 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 5 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 5 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 5 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 15 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 5 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 30 out of 100	Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 5 out of 100
1W	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.5	5.0	1.0	4.5	2.2
1E	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.0	1.0	4.5	3.2
2W	2.0	2.0	2.0	2.0	2.0	2.0	2.0	4.5	5.0	1.0	4.5	2.2
2E	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.0	1.0	4.5	3.2
3W	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.5	3.0	1.0	4.0	2.0
3E	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.0	1.0	4.0	2.5
4W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.5	3.0	1.0	4.5	1.5
4E	4.0	3.0	4.0	4.0	4.0	3.0	3.0	3.5	3.0	1.0	4.5	2.7
5W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.5	3.0	1.0	4.0	1.5
5E	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.5	3.0	1.0	4.0	1.5
6W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.0	4.5	1.5
6E	4.0	3.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	1.0	4.5	2.7
7W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.0	4.5	1.5
7E	4.0	3.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	1.0	4.5	2.7
8W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.0	4.5	1.5
8E	3.0	2.0	3.0	4.0	3.5	3.0	3.0	3.0	3.0	1.0	4.5	2.5
9W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.0	4.0	1.5
9E	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	1.0	4.0	2.0
10W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.0	4.5	1.5
10E	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.0	4.5	1.5
11W	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.5	4.0	1.6
11E	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0	3.0	1.5	4.0	1.6
12W	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2.0	4.5	3.1
12E	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2.0	4.5	3.1
13W	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2.0	4.5	3.1
13E	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3.5	3.5	2.0	4.5	2.6
14W	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2.0	4.5	3.1
14E	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.5	3.5	2.0	4.5	2.4
15W	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	2.0	4.5	3.1
15E	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.5	2.0	4.5	2.9
16W	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.5	3.5	3.0	4.5	3.5
16E	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	3.5	3.0	4.5	3.8
17W	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.5	3.5	3.0	4.5	3.5
17E	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	3.5	3.0	4.5	3.8
18W	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	3.5	3.0	4.5	4.0
18E	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4.5	3.5	3.0	4.5	3.5
19W	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	3.5	3.0	4.5	4.0
19E	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	3.5	3.0	4.5	3.8

Notes

- 1 Category scoring is to the nearest 0.5
- 2 Lowest scoring is 1. The highest scoring is 5.
- 3 The sum of the weightings must equal 1. For example, if all categories are weighted equally, each of the five categories has a weighting of 0.2.

**ARROWSMITH WATER SERVICE
 ENGLISHMAN RIVER INTAKE STUDY
 DEVELOPMENT OF LONG-LIST OF POTENTIAL INTAKE SITES**

Geotechnical Considerations

River Reach	Attributes										
	Historic Channel Migration Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Scour and Bedload Movement Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Reach Morphology Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Reach Type Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Location Relative to Tributary Junctions Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Bank Stability Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Upslope Hazards Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Flood Potential Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Foundation Conditions Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Constructability Scoring 1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	Summary of Score for Intake 1 - Less suitable 3 - Moderately suitable 5 - Very suitable
1W	5.0	3.0	5.0	5.0	5.0	4.0	5.0	5.0	3.0	3.0	4.3
1E	5.0	3.0	5.0	5.0	5.0	4.0	3.5	5.0	3.5	3.0	4.2
2W	5.0	2.5	3.0	5.0	5.0	4.0	3.0	5.0	5.0	3.0	4.1
2E	5.0	2.5	2.0	5.0	5.0	4.0	3.5	5.0	3.5	3.0	3.9
3W	1.5	2.5	3.0	3.0	4.0	3.0	3.0	4.0	5.0	2.5	3.2
3E	1.5	2.5	3.0	3.0	4.0	3.0	3.5	5.0	3.5	3.0	3.2
4W	5.0	4.0	2.0	2.5	1.0	3.0	5.0	1.0	2.5	4.0	3.0
4E	1.5	4.0	3.0	2.5	2.0	3.5	3.5	3.0	3.5	4.5	3.1
5W	2.5	5.0	5.0	1.0	2.0	3.0	5.0	2.0	2.5	3.0	3.1
5E	2.5	5.0	5.0	1.0	2.0	3.0	3.0	1.0	2.5	4.0	2.9
6W	1.0	3.5	4.0	1.0	4.0	3.0	5.0	4.0	3.5	5.0	3.4
6E	5.0	2.0	4.0	5.0	1.0	1.0	4.0	5.0	5.0	1.0	3.3
7W	1.0	1.0	1.0	1.0	1.0	3.0	5.0	1.0	2.5	4.5	2.1
7E	1.0	1.0	1.0	1.0	2.0	3.0	5.0	3.0	3.5	5.0	2.6
8W	1.0	1.0	1.0	1.0	5.0	3.0	5.0	3.0	2.5	5.0	2.8
8E	1.0	1.0	1.0	1.0	5.0	3.0	5.0	4.0	3.5	5.0	3.0
9W	1.0	1.0	1.0	1.0	2.0	3.0	5.0	2.0	2.5	5.0	2.4
9E	1.0	1.0	1.0	1.0	1.0	3.0	5.0	2.5	3.5	3.0	2.2
10W	1.0	1.0	1.0	1.0	3.0	3.0	5.0	4.0	3.0	5.0	2.7
10E	1.0	1.0	1.0	1.0	3.0	3.0	3.0	4.0	3.5	4.0	2.5
11W	5.0	5.0	4.5	5.0	3.0	5.0	5.0	5.0	5.0	3.5	4.6
11E	5.0	5.0	4.5	5.0	3.0	5.0	5.0	5.0	5.0	3.5	4.6
12W	5.0	5.0	4.5	5.0	3.5	5.0	5.0	5.0	4.0	3.5	4.6
12E	5.0	5.0	4.5	5.0	3.5	5.0	5.0	5.0	4.0	3.5	4.6
13W	5.0	5.0	5.0	5.0	5.0	4.0	5.0	1.0	4.0	4.0	4.3
13E	5.0	5.0	5.0	5.0	5.0	4.0	5.0	1.0	4.0	4.0	4.3
14W	5.0	5.0	5.0	5.0	5.0	4.0	5.0	1.0	3.5	4.0	4.3
14E	5.0	5.0	5.0	5.0	5.0	3.5	5.0	1.0	3.5	4.0	4.2
15W	1.0	1.0	1.0	1.0	4.0	3.0	5.0	1.0	3.5	5.0	2.6
15E	1.0	1.0	1.0	1.0	4.0	3.0	5.0	5.0	3.5	5.0	3.0
16W	5.0	4.5	5.0	2.5	5.0	3.0	5.0	1.0	3.5	5.0	4.0
16E	5.0	4.5	5.0	2.5	5.0	3.0	5.0	1.0	3.5	5.0	4.0
17W	5.0	5.0	4.5	4.5	2.0	5.0	5.0	5.0	5.0	4.5	4.6
17E	5.0	5.0	4.0	4.5	2.0	3.0	5.0	1.0	2.0	5.0	3.7
18W	5.0	5.0	4.5	2.5	3.0	3.0	5.0	1.0	4.0	5.0	3.8
18E	3.0	5.0	4.5	2.5	3.0	3.0	5.0	1.0	3.0	5.0	3.5
19W	5.0	4.0	5.0	2.0	5.0	3.0	5.0	1.0	3.0	5.0	3.8
19E	3.0	4.0	5.0	2.0	5.0	3.0	5.0	1.0	3.0	5.0	3.6

Notes

- 1 Category scoring is to the nearest 0.5
- 2 Lowest scoring is 1. The highest scoring is 5.
- 3 The sum of the weightings must equal 1. For example, if all categories are weighted equally, each of the five categories has a weighting of 0.2.
- 4 Scoring of 6W is for west side only, the more favourable side.
- 5 Scoring for 11W and 11E are for north side only.
- 6 Scoring for 17W is for north side only

**ARROWSMITH WATER SERVICE
 ENGLISHMAN RIVER INTAKE STUDY
 DEVELOPMENT OF LONG-LIST OF POTENTIAL INTAKE SITES**

Water System Considerations

River Reach	Attributes									
	Sufficient Space for WTP Here or Nearby Scoring	River Depth Allows Intake Const./Maint. Scoring	Impact of Sea Level Rise Scoring	Hydraulic Impact of Site Elevation Scoring	Distance to Connect WTP to Dist. System Scoring	Reasonable Vehicle Access Scoring	Power can be Readily Brought to Site Scoring	Opportunity to Generate/Recover Energy Scoring	Wastewater Manageability Scoring	Summary of Score for Intake
	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 15 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 10 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 15 out of 100	1 - Substantial concerns 3 - Moderate concerns 5 - Few or no concerns Weighting 20 out of 100	1 - Considerable constraints 3 - Minor to some constraints 5 - No to minor constraints Weighting 5 out of 100	1 - Considerable constraints 3 - Minor to some constraints 5 - No to minor constraints Weighting 5 out of 100	1 - Considerable constraints 3 - Minor to some constraints 5 - No to minor constraints Weighting 10 out of 100	1 - Less suitable 3 - Moderately suitable 5 - Very suitable
1W	4.0	2.0	5.0	3.0	2.0	1.0	1.0	1.0	1.0	2.5
1E	5.0	2.0	5.0	5.0	1.0	1.0	1.0	1.0	1.0	2.8
2W	4.0	2.0	5.0	3.0	2.0	1.0	1.0	1.0	1.0	2.5
2E	4.5	2.0	5.0	5.0	1.0	1.0	1.0	1.0	1.0	2.7
3W	3.0	2.0	5.0	2.5	2.0	2.0	1.0	1.0	1.0	2.4
3E	5.0	2.0	5.0	4.0	1.0	1.0	1.0	1.0	1.0	2.7
4W	4.5	1.0	5.0	3.0	2.0	2.0	1.0	1.0	1.0	2.6
4E	5.0	1.0	5.0	4.5	1.0	1.0	1.0	1.0	1.0	2.6
5W	4.5	2.0	5.0	4.0	2.0	2.0	1.0	1.0	1.0	2.8
5E	3.0	2.0	5.0	4.5	1.0	1.0	1.0	1.0	1.0	2.3
6W	4.5	2.0	5.0	4.0	2.0	2.0	2.0	1.0	1.0	2.9
6E	3.0	2.0	5.0	1.5	1.0	1.0	2.0	1.0	1.0	2.1
7W	5.0	2.0	5.0	4.0	2.0	2.0	2.0	1.0	1.0	3.0
7E	3.5	2.0	5.0	2.5	1.0	1.0	2.0	1.0	1.0	2.3
8W	4.5	3.0	5.0	4.0	2.0	2.0	2.0	1.0	1.0	3.0
8E	3.0	3.0	5.0	5.0	1.0	1.0	2.0	1.0	1.0	2.6
9W	4.5	2.0	5.0	4.5	2.0	2.0	2.0	1.0	1.0	2.9
9E	4.5	2.0	5.0	5.0	1.0	1.0	2.0	1.0	1.0	2.7
10W	5.0	3.0	5.0	4.0	3.0	2.0	2.0	1.0	1.0	3.3
10E	3.0	3.0	5.0	5.0	1.0	1.0	2.0	1.0	1.0	2.6
11W	1.5	4.0	5.0	1.0	3.0	3.0	2.0	1.0	1.0	2.5
11E	3.0	4.0	5.0	4.5	1.0	3.0	2.0	1.0	2.0	3.0
12W	1.0	4.0	5.0	2.0	3.0	4.0	3.0	1.0	2.0	2.8
12E	1.0	4.0	5.0	1.0	2.0	4.0	4.0	1.0	4.0	2.8
13W	1.5	4.0	5.0	2.0	3.0	5.0	3.0	1.0	3.0	3.1
13E	4.0	4.0	5.0	4.0	2.0	2.5	4.0	1.0	4.0	3.5
14W	3.5	4.0	5.0	3.0	3.0	5.0	3.0	1.0	5.0	3.8
14E	4.5	4.0	5.0	5.0	2.0	2.5	4.0	1.0	5.0	3.8
15W	3.5	3.0	5.0	4.0	3.0	5.0	4.0	1.0	5.0	3.8
15E	3.5	3.0	5.0	3.5	2.0	2.5	3.0	1.0	4.0	3.2
16W	3.0	4.0	4.0	4.0	4.0	5.0	4.0	1.0	4.0	3.8
16E	4.0	4.0	4.0	5.0	2.0	3.0	3.0	1.0	3.0	3.4
17W	3.5	5.0	3.0	4.5	5.0	5.0	5.0	1.0	5.0	4.3
17E	3.5	4.0	3.0	5.0	3.0	3.0	4.0	1.0	3.0	3.4
18W	3.0	4.0	2.0	4.0	5.0	5.0	5.0	1.0	5.0	3.9
18E	4.5	4.0	2.0	4.0	3.5	4.0	2.0	1.0	3.0	3.5
19W	4.5	4.0	1.0	4.0	5.0	5.0	5.0	1.0	5.0	4.1
19E	4.5	4.0	1.0	4.0	3.5	4.0	2.0	1.0	3.0	3.4

Notes

- 1 Category scoring is to the nearest 0.5
- 2 Lowest scoring is 1. The highest scoring is 5.
- 3 The sum of the weightings must equal 1. For example, if all categories are weighted equally, each of the five categories has a weighting of 0.2.
- 4 Evaluation for 11E is for the south end of 11E only. North end is very steep to the point of being unviable.
- 5 The river is generally at a low elevation with low velocities. It is unlikely that energy recovery will be a significant component at any of the reaches. Ranked this as 1.0 for all reaches.