Klohn Crippen Berger

City of Edmonton

Site Location Study

City of Edmonton Fire Rescue Services
River Rescue and City Core Support Station

Final Report

June 2013
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June 11, 2013

Project Management and Maintenance Services
Community Services
City of Edmonton
18th Floor Century Place
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Edmonton, Alberta
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Devin Richards
Project Officer, Civic Project Delivery

Dear Mr. Richards:

Site Location Study - City of Edmonton Fire Rescue Services River Rescue and City Core Support Station

This report is an instrument of service of Klohn Crippen Berger Ltd. The report has been prepared for the exclusive use of the City of Edmonton (Client) for the specific application to the Site Location Study - City of Edmonton Fire Rescue Services River Rescue and City Core Support Station. The report's contents may not be relied upon by any other party without the express written permission of Klohn Crippen Berger. In this report, Klohn Crippen Berger has endeavoured to comply with generally-accepted professional practice common to the local area. Klohn Crippen Berger makes no warranty, express or implied.

Should you have any questions, please contact the undersigned at (780) 733-4586.

Yours truly,
KLOHN CRIPPEN BERGER LTD.

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DISCLAIMER

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1 INTRODUCTION

1.1 Project Understanding

Fire Rescue Services (FRS) is mandated to provide River Rescue Services in the North Saskatchewan River Valley (NSRV). Although River Rescue Services operations are based out of Station 21, which is located at the river's edge, the present operating model requires the use of a crew stationed at Station 6 (located at 96 Street NW and 81 Avenue NW). The non-linear route required to travel between Station 6 and Station 21 adds 10 to 15 minutes to the response time for launching the rescue boat. In addition, the crew at Station 6 is among the busiest in the City of Edmonton (City), responding to over 3700 events in 2012. The dependence of a frequently unavailable crew from Station 6 for River Rescue Services; or conversely, the loss of the Station 6 crew to FRS during a river rescue operation, are both negative scenarios that could be prevented by stationing a permanent crew at Station 21. The establishment of a trained River Rescue crew in a facility at the edge of the North Saskatchewan River will resolve potential issues with the current delivery model, provide a staffed facility in the Central Core, and proactively resolve other FRS operational issues. To this end, the City is working to develop a staffed FRS River Rescue Station that will also provide backup rescue services to the Central Core and house specialized emergency response equipment (the Project).

This report is a response to City of Edmonton's Community Services Committee's motion made on August 20, 2012 that a site location study and a subsequent environmental impact screening assessment (EISA) be conducted with the goal of finding the best solution to meet the needs of River Rescue and Fire Rescue Support Services.

Five sites were identified as potential Project locations by the City:

- Rossdale: 9315 101 Street (Station 21 existing location);
- Cloverdale: 9812 96a Street (Rafters Landing);
- Queen Elizabeth Park: 10370 Queen Elizabeth Park Road (Dantzers Hill east of Walterdale Bridge);
- Riverdale: 10296 87 St. north of Dawson Bridge; and,
- North Rossdale: approximately at 9903 Rossdale Road at James McDonald Bridge.

The North Saskatchewan River Valley Area Redevelopment Plan - Bylaw No. 7188 (NSRVARP) sets out a process for considering major public facilities within the River Valley. This Project is required to meet the requirements of Section 3.5.3 of the NSRVARP along with other City objectives.

1.2 Study Objective and Scope

Klohn Crippen Berger Ltd. (KCB) was commissioned by the City to assist in the evaluation of the five identified sites. KCB was to assemble existing information to be used by the City as assessment criteria for the purpose of short-listing the potential sites. Based on the information gathered during

the site location study, the City was to identify the site or sites to be screened through an EISA. The EISA is intended to provide site specific information that City Council requires to make an informed decision for the location of a boat launch and downtown Fire Rescue support services prior to approving Project funding. The specific activities associated with the site location study are:

- define the general characteristics of a good boat launch site, including key criteria through which to assess the characteristics, and, based on existing available information, rank the five locations first, based on the boat launch site criteria and, secondly, on the ability of the locations to meet the needs to support Fire Rescue operations in the City's core; and secondly,
- review EBA (2001) which described potential soil and groundwater contamination on the Station #21 site (KCB 2013).

This report presents the findings of the site location study. The remainder of this submission is structured as follows:

- Section 2: Methodology
- Section 3: Study Activities
- Section 4: Key Findings
- Section 5: Closing

2 METHODOLOGY

The methodology utilized for the site ranking included the following activities:

- meetings with City staff and winter site visit;
- review of documentation;
- discussions with other municipalities with similar facilities;
- development and review of evaluation criteria and a criteria ranking system;
- development and completion of the site ranking matrix; and,
- discussion of findings.

The level of data available (i.e., existing information and information gathered during the site visit), was sufficient for use as a basis for criteria development. The level of data was also suitable for planning level (i.e., scoping) comparisons between the sites. The assessment and ranking were based on qualitative and, where available, quantitative information and focused on identifying potential constraints at any of the sites that would restrict a site from advancing to the more detailed assessment. Most of the rankings were based on existing information and one winter site visit in January, 2013. An opportunistic visit to examine the engineered riverbank at the Rossdale site was also conducted in May, 2013.

3 STUDY ACTIVITIES

3.1 Meetings with City staff and site visit

On January 28, 2013, KCB met with City staff to discuss the Project and with members of FRS from Station 6, the station currently responsible for operation of the emergency boat. The meeting was held at Station 21 to discuss their "on the ground" experience regarding what makes a good location for a boat launch and any challenges that they may be facing at the existing location. Key items identified by the Fire Rescue personnel were:

- site location (e.g., sheltered, easy access to river);
- water depth;
- siltation build-up;
- proximity to publically accessible, elevated viewpoint above site; and,
- proximity to areas with higher existing/anticipated call volume.

This informal meeting was followed by a visit to four of the five sites with City staff. The Queen Elizabeth Park site was not accessible due to construction of the new Walterdale Bridge. The purpose of the site visits was to gain an understanding of the sites in terms of location and potential constraints on and around the sites. As the ground was snow covered and the river was partially frozen, it was not possible to observe the actual shoreline or water conditions at the sites.

3.2 Review of Documentation

Literature related to boat launch sites was reviewed to identify and rank criteria relative to each potential site. The information included reports and unpublished data from the City, along with Federal and Provincial approval requirements.

3.2.1 Literature Related to Boat Launch Sites

The following literature related to boat launch sites was reviewed:

- The City of Edmonton - About Fire Rescue Services, accessed on February 12, 2013 (http://www.edmonton.ca/for_residents/about-fire-rescue-services.aspx).
- Shore Coastal: Capes Region Boating Strategy, accessed on February 12, 2013 (http://www.reba.org.au/Capes%20Region%20Boating%20Strategy%20January%202011.pdf).
- Aviva Community Fund, accessed on February 12, 2013 (http://www.avivacommunityfund.org/ideas/acf16325).
- The Bridge River Lillooet News, accessed on February 12, 2013 (http://www.lillooetnews.net/article/20121121/LILLOOET0101/311219994/-1/lillooet/still-time-to-vote-for-boat-launch-project).

- GMS Works #37, Reservoir Access Along Williston Lake and Peace River, Mackenzie Landing Document.
- Shores Coastal. 2011. Capes Region Boating Strategy: for Shire of Busselton and Shire of Augusta-Margaret River, Final Report. January 2011.
- Oregon State Marine Board. 2011. Design Guidelines for Recreational Boating Facilities, Third Edition. September 2011.
- BC Parks: Park Design Guidelines & Data. Day-Use Areas: Boat Launches.
- State of California Department of Boating and Waterways. 2005. Layout and Design Guidelines for Marina Berthing Facilities, July 2005.
- State of California Department of Boating and Waterways. 1991. Layout, Design and Construction Handbook for Small Craft Boat Launching Facilities, March 1991.

3.2.2 Information Provided by the City

Information provided by the City for review and consideration in the assessment included:

- North Saskatchewan River Valley Area Redevelopment Plan - Bylaw No. 7188;
- figure showing the location of summer river rescue calls 2009 to 2011;
- general site location maps;
- aerial imagery;
- 4 minute and 8 minute rescue response zone figures;
- Rescue Truck site suitability document; and,
- City of Edmonton Strategic Plan (http://www.edmonton.ca/city_government/city-vision-and-strategic-plan.aspx).

3.2.3 Federal and Provincial approval requirements

Regulatory governance for the construction and operation of a boat launch on the North Saskatchewan River falls under both Federal and Provincial jurisdictions. To determine approval requirements and potential temporal constraints to construction, the following information was reviewed.

- Federal
  - *Fisheries Act* (RSC 1985, c F-14);
  - *Navigable Waters Protection Act* (R.S.C., 1985, c. N-22); and,
  - *Migratory Birds Convention Act*, 1994 (SC 1994, c 22).

- Provincial
  - *Public Lands Act* (RSA 2000, c P-40);
  - *Water Act* (RSA 2000, c W-3);
  - *Environmental Protection and Enhancement Act* (RSA 2000, c E-12)*;*
  - *Historical Resources Act* (RSA 2000, c H-9);
  - Alberta's *Wildlife Act* (RSA 2000, c W-10); and,
  - *Fisheries (Alberta) Act,* (RSA 2000, c F-16).

3.3 Discussions with Other Municipalities

Attempts were made to contact a number of other municipalities with emergency boat launch facilities to discuss their experience with the facilities and contact was successful with:

- City of Saskatoon Fire and Protective Services (S), Personal Communication. Dave Bykowy, Assistant Chief of Staff and Development Safety. Phone number: 1-306-975-2520. Contacted on February 25, 2013 at 2:30pm PST; and,
- City of Prince George Fire and Rescue Services (PG), Personal Communication. Chief James Sweet, Chief Training Officer. Phone number: 1-250-561-7667. Contacted on February 27, 2013 at 11:10am PST.

Both City of Saskatoon and City of Prince George representatives were asked about their experience with their respective existing facility and the factors that, in their experience, are important in locating an emergency boat launch. Key items identified were:

- good vehicular accessibility (PG);
- boat launch and related, necessary accessories quickly and easily accessible throughout all seasons (S);
- concrete boat launch (S);
- site exposure – site not prone to siltation (i.e. boat launch not located in an area prone to sand/soft soil deposits) (PG);
- site exposure - waves and swells (i.e. high water river conditions are not too high and/or fast for safe boat launch access) (PG);
- boat launch not located on a bend in the river, but on 'straightaway' (S, PG);
- located in an area free from hazards which may damage boats and equipment (i.e. not located amidst a rocky beach) (PG); and,

- central location close to city services (i.e. health care resources) and/or emergency resources. (PG).

3.4 Criteria and Ranking

During the site location study, the five potential sites were assessed on a series of criteria related to institutional and site characterization, environmental characterization, and socio-economic characterization (including First Nations and Archaeology). A mix of qualitative and quantitative assessments was used to rank the potential sites.

3.4.1 Criteria Identification and Ranking System Development

Based on the activities described in Section 3.1, Section 3.2 and Section 3.3 as well as professional experience, a list of criteria for a good location for a boat launch and rescue truck were developed. In addition to the general list of criteria, a listing of key criteria, which was a sub-set of the general criteria, was prepared.

A ranking system was also developed and generally used to assist in ranking the sites. The system provided for each criterion to be ranked on a relative 4-point scale, with:

- 4 = No issues; relatively "best" condition;
- 3 = Mild-moderate issue; may require additional cost, design or mitigation measures but is not a hindrance;
- 2 = Moderate issue; will require additional cost or mitigation measures, but could be made to work; and,
- 1 = A negative in choosing the site.

The criteria and associated ranking system are provided in Table 1.

3.4.2 Review with the City

Once the draft criteria and ranking system were developed, they were discussed with the City and revised to incorporate the feedback.

3.5 Development and completion of an assessment matrix

Once the criteria and ranking system were developed, a matrix was prepared and the five potential sites were ranked on both:

- The river rescue boat launch criteria; and,
- The criteria provided by FRS regarding the suitability of the sites for a base for support trucks and equipment.

The matrix for the five sites is presented in Table 2 with key criteria being presented in red font. The findings of the assessment are discussed in Section 4.

Table 1 Criteria and Associated Ranking System

ATTRIBUTE	SUITABILITY CRITERIA			
	4	3	2	1
General Measures	**No significant issue; "best" condition**	**Mild-moderate issue; may require additional cost, design or mitigation measures but is not a hindrance**	**Moderate issue; will require additional cost or mitigation measures, but could be made to work.**	**A negative in choosing this site**
Institutional and Site Characterization				
Maneuverability on local roads/constrictions	No constrictions	One constriction	More than one area of constriction.	More than one area of constriction with traffic flow impediments.
Site size	At least 1.5 acres	Less than 1.5 acres and City owned property available to reach required size	Less than 1.5 acres and private property required to reach required size	Less than 1.5 acres and uncertainty as to whether any additional land is available
Launch Access	River edge is 0-25 m from potential building site	River edge is 26-50 m from potential building site	River edge is 51-100 m from potential building site	River edge is >100 m from potential building site
Topography	Gentle slope	Moderately sloped site	Moderately sloped site	Steeply sloped site
Geotechnical	Stable foreshore slope, engineered slopes	Rare and minor morphological changes expected to foreshore slope	Regular but manageable morphological changes expected to foreshore slope	Slopes are active and require engineering controls.
Room for vehicle and boat maneuverability	Unlimited area for a vehicle and boat trailer to maneuver safely and back down the ramp.	Suitable area for a vehicle and boat trailer to maneuver safely and back down the ramp.	Area for a vehicle and boat trailer to maneuver safely and back down the ramp requires high skill.	Limited area for maneuvering trailer and boat with a chance of incident occurring.
Can accommodate a double wide boat launch	Yes	Score value not used	Score value not used	No
Proximity to structures and Navigation Hazards	No evident hazards	One in-river hazard (i.e., large rock)	Multiple in river hazards (i.e., rocks)	The site is proximate to bridges or utilities that affect waterflow and create unsafe conditions
Low Water Conditions	Meets depth requirements during all seasons	Shallow areas around which the boat can be navigated.	Shallow water near launch that may ground boat.	Sandbars present and extend distance to suitable water depth.
High Water Conditions	Water levels and velocity always suitable for safe launching or landing	Water levels and velocity normally suitable for safe launching or landing	Occasional high water conditions are too high or fast for safe launching or landing	Regularly occurring high water conditions that are too high or fast for safe launching or landing
Location relative to High Level bridge	Closest to High Level Bridge	Closer to High Level than Dawson	Closer to Dawson than High Level	Closest to Dawson Bridge
Sight lines	Located on straight section	Score value not used	Located on river bend	Score value not used
Confluence turbulence	Site is not near the confluence of a stream or outfall	Score value not used	Score value not used	Site is near the confluence of a stream or outfall
Flooding	Riverbanks are high and site is protected from flooding	Riverbanks are high and only 1 in 100 flood levels are expected to affect the	Riverbanks are high and only 1 in 25 flood levels are expected to affect the	Riverbanks are low and frequent flooding could be problematic
Substrate conditions	Site is not in an area prone to siltation or scour (i.e. not located in an area prone to sand/soft soil movements)	Score value not used	Score value not used	Site not prone to siltation given river bed conditions.
Lighting	Waiting for City input	Waiting for City input	Waiting for City input	Waiting for City input
Launching and Landing	Site is protected from wind exposure and infrastructure such as a parallel wharf or pontoon floats are not required and is located on the inside bend	Inside bend	Straight section	Outside bend
Public Overlook	Public cannot see on-site activities.	Score value not used	Score value not used	Elevated viewpoint that is accessible to the public would allow for viewing of
Site Protection	Score value not used	Site will not require a breakwater or foreshore armoring	Site will require a breakwater or foreshore armoring	Score value not used
Access for Operations and Maintenance in all Required Seasons	Two way access and egress	Score value not used	Score value not used	One way road
Distance to Arterial Road/East West Movement	Shortest local street	Relatively second shortest	Score value not used	Longest local street
Bridge Crossings	No crossings	Score value not used	One crossing	Two crossings
Economic				
Boat Launch	Exists or requires minor upgrading	Score value not used	Score value not used	Does not exist
Infrastructure to Access River from Site	Existing or minor upgrades	Construction of a short ramp is required	Construction of a long ramp or boathouse and pier is required.	Construction of a bridge is required due to an intersection with a public path.
Access Road Construction	Minimal Upgrades	Some upgrades or short relocation	Moderate upgrades and relocation	New road construction
Support Building Construction	Exists or requires minor upgrading	Score value not used	Score value not used	Does not exist
Social				
Historical Resources Impact Assessment	Not Required	Required	Score value not used	Score value not used
Visual Quality	Little to no change in visual quality	Score value not used	Some change in visual quality	Major change in visual quality
Construction	Minimal disturbance to neighborhood	Some disturbance to neighborhood	Major disturbance to neighborhood	Score value not used
Current site use	No change	Score value not used	Score value not used	Major change
Ongoing public use	No or minimal effect on existing public use	Some change but most activities can continue	Change to the character of the area	Major change to the character of the area
Change in emergency truck traffic numbers	Score value not used	Increase of 200 to 250 truck trips annually	Increase of 240 to 300 truck trips annually	Score value not used
Impact on Other Community Initiatives	None	Score value not used	Some conflict	Key conflict in use/planning
Impact of Other Initiatives on the Station (demand in area of station)	High demand associated with a primary response station	Score value not used	Score value not used	Low demand associated with a support station.
Impact of other initiatives on the station (response time)	None or positive	Some conflict/effect on response time	Major conflict (e.g., increased river use in the area of the station, increased traffic reducing response time)	Score value not used
Environmental				
Riverbank	No damage to riverbank from ongoing boat use	Intermittent damage	Ongoing damage	Constant, major damage to riverbank from ongoing boat use
Wildlife and Vegetation	Use of existing cleared area	Little to no clearing required; connectivity of wildlife corridors is not expected to be significantly altered.	Moderate clearing required; connectivity of wildlife corridors is not expected to be significantly degraded because suitability of habitat is low.	A major amount of clearing required within important wildlife movement corridor habitat.
Fisheries	Site not located to Class A Watercourse	Class A Watercourse identified near site location	Class A Watercourse is adjacent to site location	Site is located within a Class A Watercourse
Permitting	Permitting underway	New permits required	New permitting with challenges	Acquisition of permits unlikely
Site Maintenance	Site location will not require maintenance or emergency clearing	Clearing of built up sediment and floating debris would require minimal maintenance	Clearing of built up sediment and floating debris would require moderate maintenance	Clearing of built up sediment and floating debris would require intensive maintenance

Key criteria are denoted in found in shaded cells.

Table 2 Site Matrix with Key Technical/Permitting Criteria

OPTION	North Rossdale	Cloverdale	Riverdale	Queen Elizabeth Park	Rossdale
Institutional and Site Characterization					
Maneuverability on local roads/constrictions	3	4	1	4	2
Site size	1	4	4	4	4
Launch Access (distance to river from boat storage location)	3	1	2	3	2
Topography	3	1	3	1	3
Geotechnical	2	2	2	2	4
Room for vehicle and boat maneuverability	3	4	4	4	4
Can accommodate a double wide boat launch	4	4	4	4	4
Proximity to in-river structures	1	1	3	2	4
Low Water Conditions	3	1	1	3	2
High Water Conditions	3	3	3	4	3
Location relative to High Level Bridge	3	2	1	4	3
Sight lines	3	4	3	4	3
Confluence turbulence	4	4	4	4	3
Substrate Conditions					
Flooding	2	4	2	4	3
Lighting	2	2	2	2	2
Launching and Landing	2	3	2	2	3
Public Overlook	1	3	1	1	2
Site Protection	2	3	2	2	3
Access for Operations and Maintenance in all Required Seasons	4	4	4	1	3
Distance to Arterial Road/East West movement	4	4	3	4	2
Bridge Crossings	4	3	4	2	4
Economic					
Boat Launch Facilities	1	1	1	1	4
Infrastructure Required to Access River from Site	3	1	3	2	4
Access Road Construction	3	3	2	2	4
Support Building Construction	1	1	1	1	3
Social					
Historical Resources Impact Assessment	3	3	3	3	4
Visual Quality	1	1	1	2	3
Construction	2	3	2	3	3
Current site use	1	1	1	1	2
Ongoing public use	2	2	1	2	4
Change in emergency truck traffic	2	2	2	2	3
Impact on other community initiatives	1	1	2	1	4
Impact of other initiatives on the station (demand)	1	1	1	1	1
Impact of other initiatives on the station (response time)	3	4	3	2	3
Environmental					
Riverbank	2	2	2	2	4
Wildlife and Vegetation	2	1	2	2	4
Fisheries	4	4	3	4	4
Permitting	3	3	2	3	4
Site Maintenance	3	2	3	3	2

*Key criteria are denoted in red font

4 KEY STUDY FINDINGS

The total score of each potential site was determined by adding the individual scores for each of the criterion. The total scores and rankings of the five sites are presented in Table 3.

Station 21 ranked highest overall as well as within in each of the categorical components. The remaining sites rank similarly across the combinations based on available information. The aggregate score of the relative rankings for each category indicate that the Rossdale site was most suitable (indicated by lowest aggregate score). It should be noted that this ranking was based on information available at the time of the study and was intended for planning level decision processes.

Table 3 Site Scores and Rankings

OPTION	North Rossdale	Cloverdale	Riverdale	Queen Elizabeth Park	Rossdale
Total Points					
All	**95**	**97**	**90**	**98**	**123**
Institutional and Site Characterization	57	61	55	61	63
Economic	8	6	7	6	15
Social	16	18	16	17	27
Environmental	14	12	12	14	18
Relative Rankings					
Institutional and Site Characterization	4	2	5	2	1
Economic	2	4	3	4	1
Social	4	2	4	3	1
Environmental	2	4	4	2	1
Aggregate Score	**12**	**12**	**16**	**11**	**4**

5 CLOSING

This site location study is submitted in confidence and its contents may not be divulged to third parties without express written consent of Klohn Crippen Berger Ltd.

If you have any questions, please contact the undersigned at 604-251-8448 or dlamash@klohn.com.

KLOHN CRIPPEN BERGER LTD.

Debra Lamash
Director, Socio-Environment

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Project Manager

APPENDIX I

Ranking Assumptions and Explanations

Ranking Assumptions and Explanations

Criteria	Data Used for Ranking	Assumptions/Basis for Ranking	Considerations
Institutional and Site Characterization			
Maneuverability on local roads/constrictions	Current maps and imagery	Riverdale received the lowest rank based on one-way traffic issues and narrow, constricting access roads. Rossdale requires travel through relatively narrower neighbourhood streets, but two-way access is available. North Rossdale roadways are not constricting, but some 90 degree turns are required for egress.	Response Time
Site size	Current maps, imagery and planning information from the City.	All sites with the exception of North Rossdale have sufficient space for construction a desired site plan. Currently, the North Rossdale is relatively smaller.	Response Time
Launch Access	Distance to river edge from approximate boat storage location as determined through measurements made using Google Earth with 2011 imagery. No site was within 25 m of the river edge.	Ranking based on distance measured.	Response Time
Topography	Based on publicly available photos of the sites taken from the river or from across the river.	Ranked based on height and slope of bank.	Cost, Environment
Geotechnical	Opportunistic site visit with engineer	visual inspection of engineered riverbank. Only at the Rossdale location.	Cost, Environment
Room for vehicle and boat maneuverability	Current maps, imagery and planning information from the City.	Distance from potential boat launch site to existing or planned in-river structures. Based on site size and potential available space to allow for unimpeded vehicle and boat maneuverability. It is expected that all site designs would take this into consideration. However, the overall space available at the North Rossdale site is expected to be smaller than the rest of the sites; therefore, it received a lower ranking.	Response Time
Can accommodate a double wide boat launch	Maps and imagery.	Ability or inability of site to accommodate a double side boat launch. It is expected that all site designs would take this into consideration.	Response time
Proximity to in-river structures	Maps and imagery. Distance from potential boat launch site to existing or planned in-river structures.	All sites with the exception of Rossdale are downstream from a bridge or pier (Cloverdale).	Safety
Low Water Conditions	Maps and imagery	Sandbars would extend the distance to access the water. The inside bends of rivers where back-eddies form would have the greatest potential for sandbar formation and these areas were ranked lower. Imagery available on Google Earth was used to determine if sandbars have been present historically. Google Earth imagery indicates sandbar presence at Cloverdale (2008 imagery), Riverdale (2007, 2008 imagery). Rossdale is located on the inside of a bend in the river, but no images of a sandbar have been found to date. Thus it received a slightly higher ranking than Cloverdale and Riverdale.	Cost, Response Time
High Water Conditions	Not ranked as information was not available	Not ranked as information was not available.	Safety, Cost, Response Time
Location relative to High Level Bridge	Maps and imagery	Distance from potential boat launch site to High Level Bridge. Important because of effect of river current on response time to areas with higher call volumes.	Response Time
Sight lines	Maps and imagery	Ranked based on being on a river bend (more limited sight lines) or on a straight section of the river.	Safety
Confluence turbulence	Maps and imagery	A stormwater outfall is located <100 m upstream from the Rossdale location. It received a slightly lower value.	Safety
Substrate Conditions	Area is or is not in an area prone to siltation. Not ranked as river substrate information was not available.	The assumption that the river bed substrate was the same at each location was not made.	Safety, Cost, Response Time
Flooding	Estimated based on the photos provided in the photo tab and on the brief site visits.	All sites fall within the estimated 1:100 year flood level (http://www.envinfo.gov.ab.ca/FloodHazard/). Raw data (1994) from Alberta Environment and Sustainable Resource Development for the 1:25 high water levels for the North Saskatchewan River Valley within the limits of the City of Edmonton has been obtained. The data has been submitted to a KCB hydrologist for modeling. The current rankings are based on publicly available photos of the sites taken from the river or from across the river.	Safety, Cost, Response Time
Lighting	Assumed any site would introduce light to the river valley	All ranked the same	Cost, Safety

Launching and Landing	Maps, imagery, and professional opinion.	Location on river - e.g., inside bend, outside bend, straight section. Safety of launches and landings are based on expected relative water velocities.	Safety
Public Overlook	Current maps and imagery	The Queen Elizabeth Park site could be viewed from the Walterdale Bridge, Riverdale from the Dawson Bridge, and North Rossdale from the James MacDonald Bridge. The launch at Rossdale can be viewed from the footbridge, but the potential crowd would be smaller than would could gather on a major bridge. The Cloverdale site is approximately 200 upriver from the footbridge spanning the river. The sightlines to rescue operations would be limited.	Safety
Site Protection	Maps, imagery, and professional opinion.	Location on river - e.g., inside bend, outside bend, straight section. Based on relative water velocities and momentum, more scouring is expected along outside of bends relatively to straight sections. More scouring is expected along straight sections relative to the inside of bends.	Cost, Environment
Access for operations and maintenance in all required seasons	Current maps and imagery	All sites with the exception of the Queen Elizabeth Park site have two-way access. Queen Elizabeth Park has only one-way access leaving the site; northbound across the Walterdale Bridge.	Response Time
Distance to Arterial Road/East West movement	Current maps and imagery	The longest distance from a site to an arterial road is found at Rossdale. Community street access is also required at Riverdale, but the distance is not as far as that found at Rossdale.	Response Time
Bridge Crossings	Current maps and imagery	Cloverdale has access to both the Low Level and James MacDonald bridges. The Queen Elizabeth Park site has immediate access to the Walterdale Bridge, but if the bridge becomes impassible, no other access across the river is available due to one-way traffic. The other sites have immediate access to one bridge and can travel in two directions.	Response Time
Economic			
Boat Launch Facilities	Presence or absence of existing boat launch	The existing infrastructure at Rossdale would require much less capital investment. It would also cause less environmental disturbance relative to the development of a new site.	Cost, Environment
Infrastructure required to access river from site	Maps and imagery. Based on proximity of support infrastructure to boat launch location and infrastructure required to access boat launch site.	Bridge construction would be required where the launch access intersects with public trails or pathways. The Cloverdale site received the lowest ranking based on the expected requirement to build a footbridge over the boat launch ramp. Similar to the Rossdale site. Due to the steepness of the bank at the Queen Elizabeth Park site, a long ramp or the construction of a boathouse would be required.	Cost, Response Time, Environment
Access Road Construction	Current maps and imagery	All sites with the exception of Rossdale would require the construction of new access roads. The parking access to the riverboat in Cloverdale and the park access at North Rossdale were considered to be pre-existing advantages.	Cost
Support Building Construction	Presence or absence of existing support buildings	Presence or absence of existing support buildings. The existing infrastructure at Rossdale would require much less capital investment. It would also cause less environmental disturbance relative to the development of a new site.	Cost, Environment
Social			
HRIA	Alberta Culture Regulations	Alberta Culture has noted that any ground disturbance at any of the sites will require an HRIA due to the sensitivity of historical and archaeological sites along the river.	Environment
Visual Quality	Degree of change in visual quality around the site, proximity of potential site to residences	North Rossdale, Cloverdale and Queen Elizabeth Park would change the visual quality of current park space. Rossdale already exists, so there would be no change in visual quality.	Environment
Construction	Anticipated level of disturbance to the neighbourhood during construction based on new infrastructure required	Cloverdale is the farthest removed from residences. Rossdale would require the least construction activity.	Environment
Current site use	No change or change to existing site use	Rossdale would not see a change is the use of the site.	Environment
Ongoing public use	Potential effect on public use of the area around the proposed site.	Rossdale would not see a change in public use of bike paths along the river due to the pre-existing foot bridge. All other sites would conflict with city park use. Riverdale received the lowest rating because the boat launch would displace current dragonboat access to the river.	Environment

Change in emergency truck traffic	Change in the number of emergency truck trips based on estimates from the City	Rossdale would have the lowest relative increase in truck trips.	Environment
Impact on other community initiatives	Potential effect on other initiatives in the community - based on information provided by the City	North Rossdale master planning includes residential developments to the proposed property line of the fire and rescue site. The master plan for the Queen Elizabeth Park conflicts with the development of a fire and rescue station. Proposed LRT bridge construction is expected to conflict with the construction of a fire and rescue station at the Cloverdale site. The magnitude of the conflict between dragonboat activities the construction of a station at the Riverdale site is not considered to be equal to what would be expected at the Queen Elizabeth Park and Cloverdale sites.	Environment
Impact of other initiatives on the station (demand)	Damand on a river rescue and support fire rescue station would be the same since the intended use of the station at each location is the same.	All ranked the same	Response Time
Impact of other initiatives on the station (response time)	Ranking based on whether new community initiatives would affect response time.	Increased park traffic subsequent to the redevelopments in Queen Elizabeth Park and around the North Rossdale site may add traffic congestion. Community traffic in the neighbourhoods of Rossdale and Riverdale would pose potential delays in response time. No changes to the Cloverdale site are expected to potentially affect station activity. The greatest change in traffic is expected to be associated with improvements made to the Queen Elizabeth Park.	Response Time
Environmental			
Riverbank	Opportunistic site visit with engineer	visual inspection of engineered riverbank. Only at the Rossdale location.	Cost, Environment
Wildlife and Vegetation	Google Earth Imagery and aerial photography, professional opinion.	The Cloverdale site would require a long swath of habitat removal to get access to the river. The habitat in the area is relatively intact and would be considered important wildlife corridor habitat in the river valley. No or minimal additional alteration of wildlife habitat is required at Rossdale. The other sites may require some habitat removal but the extents are short and or the current suitability of habitat is relative low.	Environment
Fisheries	Alberta Water Codes of Practice maps.	Class A watercourse as per the Alberta Water Codes of Practice is located a few hundred metres downstream from the Riverdale site. The other sites are all equivalent with respect to fish habitat.	Environment
Permitting	Alberta and Canada regulations	Permit applications have been submitted for Rossdale to maintain use until the completion of the site location study and potential construction of a new launch at a different location. The permits will be applicable to potential construction and operation activities at the site. The permitting requirements will be similar for all other sites with the exception of Riverdale. The proximity of the Class A Watercourse may make permit acquisition more challenging.	Environment
Site Maintenance	Google Earth Imagery and aerial photography, professional opinion.	Assumed that inside bend with would have back-eddies and would deposit sediments. Outside bends have the highest potential for floating debris to get hung up. The Rossdale and Cloverdale sites are located on the inside bend of the river and received a lower rating than the other three sites that are located on straight sections of the river.	Cost, Environment, Response Time

Key criteria are denoted in red font