CONSTRUCTION LEADERS

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August 30, 2018

Certificate of Conformance

Re: Johnson Street Bridge
Our File # 2261300-2I

The undersigned hereby certifies that the Work not previously certified in our COV1190 2018-03-31 Certificate of Conformance, has been completed and inspected for compliance with the Contract Documents, defects have been corrected and deficiencies have been completed, and equipment and systems have been tested adjusted and balanced and are fully operational. In respect of the first sentence in Article 3.3, PCL certifies only that it constructed the Work in accordance with the following documents (listed in order of precedence):

1. EOR responses to Contractor issued requests for information following the EOR review of Shop Drawings;
2. Reviewed Shop Drawings in which "reviewed" is deemed to mean that the EOR did not observe any aspect or element of the Shop Drawing that did not comply with the Contract Documents - as outlined in Appendix A, Clause 4.19 (c) (i);
3. EOR responses to Contractor issued requests for information that modify or amend the design prior to the EOR review of Shop Drawings;
4. Appendix E Structural Specifications, Item 10: Supply and Fabrication of Structural Steel Rev. 4;
5. Issued for Construction (IFC) Drawings; and
6. Issued for Detailing (IFD) Drawings.

Certified by:

PCL Constructors Westcoast Inc., per its authorized signatory:

Name: Joe Oliverio
Title: Senior Manager, Finance & Administration | Secretary

PCL CONSTRUCTORS WESTCOAST INC.
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Flood Murray International, Inc

Johnson Street Bridge: Pre-Opening Road Safety Audit

A road safety audit of conditions associated with the interim opening of the Johnson Street Bridge in the City of Victoria, British Columbia.

DRAFT

March 28, 2018

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 OVERVIEW 1
1.2 FOCUS OF THIS REVIEW 1
1.3 BASIS OF THIS REVIEW 1

2 FIELD OBSERVATIONS 2

3 BRIDGE LIFT OPERATIONS 9

4 OTHER MATTERS 10

1 INTRODUCTION

1.1 Overview

At the request of the City of Victoria, BC, WSP has conducted a pre-opening road safety audit in preparation for the interim opening of the new Johnson Street Bridge located in Victoria, B.C. This audit report must be read in conjunction with our February 19, 2016 report entitled: Johnson Street Bridge: Road Safety Assessment.

1.2 Focus of this review

Our audit addresses both road safety and operational issues. In carrying out our work, we conducted a field review of the interim condition of the new Bridge in advance of the proposed March 31, 2018 opening.

We have examined the various issues upon which we provide comment from a road safety, human factors, and operational perspective only, and do not attempt to deal with the question of cost-effectiveness in this report. Readers of this document should recognize that road design and operational decisions necessarily encompass and must be influenced by the need to provide cost-effective overall solutions to design problems and to respond to key value based design elements including unique and signature features, which may distinguish such a crossing as a potential place making or tourism feature. While it is essential that safety be considered explicitly during the process – as is the intent with this review - it is not the only factor that will influence the final overall resolution of the road safety questions under consideration.

1.3 Basis of this review

Except as specifically noted in the text, we have based our audit on the following information sources:

- A field review of interim opening conditions at the new Johnson Street Bridge on March 26, 2018. During this field review several bridge lifts were conducted.
- A meeting with representatives from the City of Victoria.

2 FIELD OBSERVATIONS

The following points summarize observations from the road safety audit teams field investigation.

- At the project limit on Harbour Road (approximate station 40+200) a zone of increased collision risk is present. At this location, the Galloping Goose Trail interacts with a sidewalk, a pedestrian crossing, a bicycle left turn lane from southbound Harbour Road to the southbound Galloping Goose Trail, existing on-street bike lanes, and a wide uncontrolled driveway access. Opportunities to reduce potential conflicts at this location should be considered. One option may include the provision of a stop bar and stop sign for northbound bicycles on the Galloping Goose Trail, as indicated in Figure 1, below.

  Discussions with representatives from the City of Victoria indicate that a reconfiguration of the bicycle facility on Harbour Road is planned. It is unknown how this planned facility will interface with the current interim facility. As a result, the audit team has not provided comment on this matter.

Figure 1: Galloping Goose Trail – north limit

- At the time of this field review, a significant amount of finish work was incomplete. This work included railings, signage, line painting, and the east and west project limit tie-ins. Due to the incomplete nature of these elements; the audit team was unable to provide comment on these elements.

- To address roadside concerns adjacent to the Galloping Goose Trail, temporary fencing has been installed. This temporary fencing should be connected to the adjacent permanent hand railing to ensure continuity.

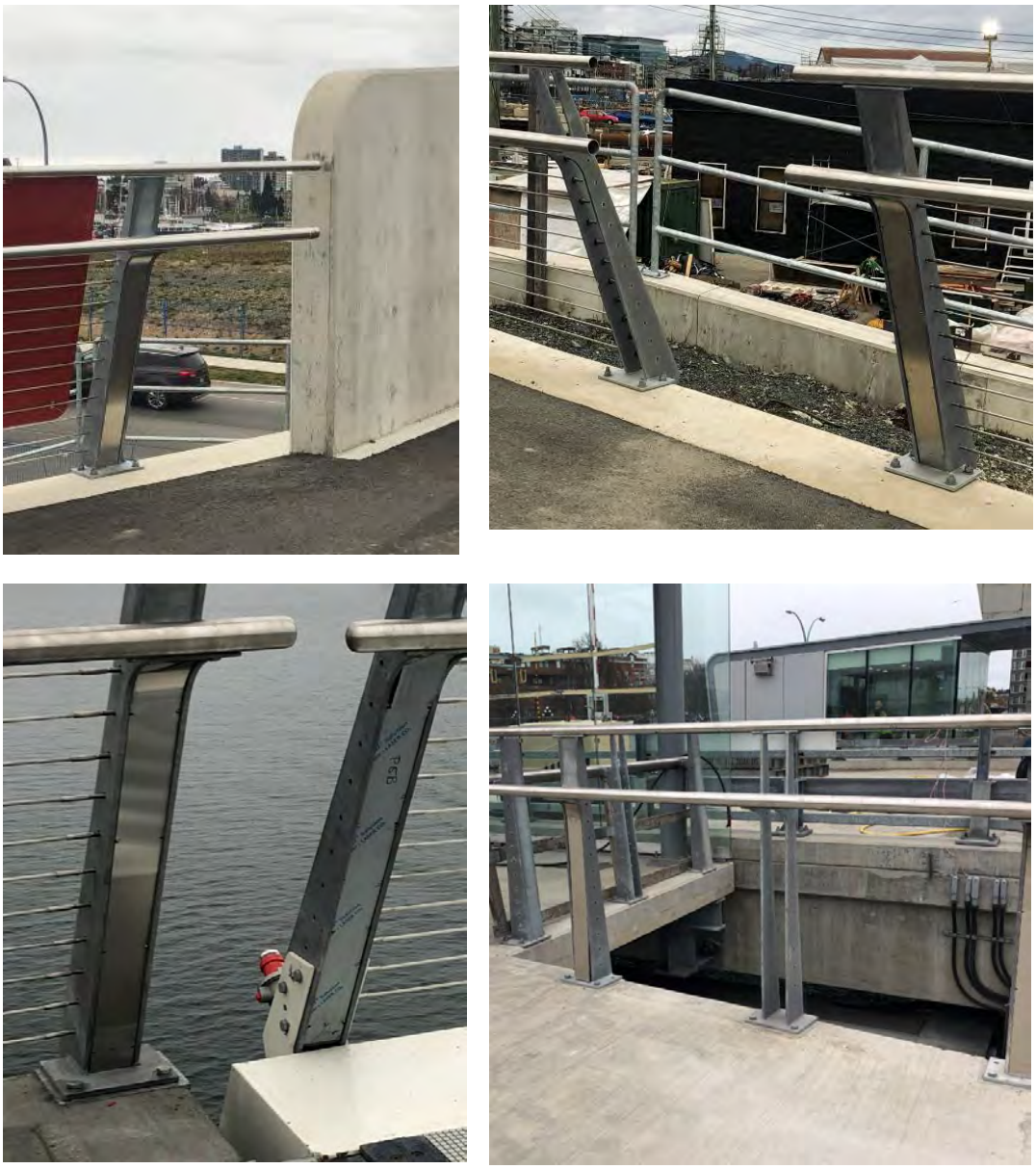
Figure 2: Tie –in of temporary fencing is incomplete

- Temporary fencing should be placed on both sides of the trail between the Pedestrian Bridge and the Mile 0.2 Bridge to address the roadside safety hazards present (See Figure 3).

Figure 3: Temporary fencing required on both sides of trail

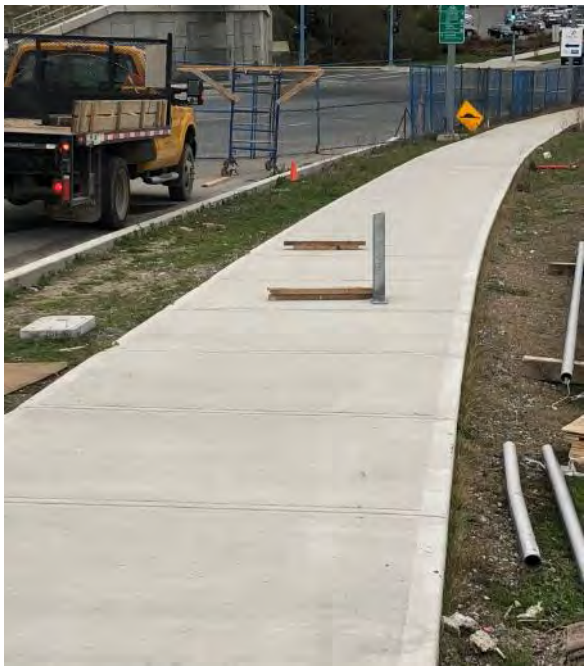
- Throughout the study area, numerous gaps in the multi-use deck (MUD) and Pedestrian Walkway railing were observed. These gaps are the result of missing sections of railing and gaps between successive barrier installations. These gaps are of particular concern for small children and should be closed prior to opening.

Figure 4: Gaps in barrier – Some examples



- Grading is required adjacent to the sidewalk on the north side of Esquimalt Road between station 10+180 and 10+280 to eliminate the tripping hazard present.

Figure 5: Incomplete grading adjacent to sidewalk



- Along Esquimalt Road, exposed barrier ends present a roadside hazard to vehicles. These barrier ends should be equipped with crashworthy barrier end-treatments. As part of the interim opening, an appropriate temporary end-treatment should be provided.

Figure 6: Exposed barrier end presents a roadside hazard

- At several gate arm installations on the MUD, the counterweights appear to present a potential hazard to pedestrians as they may hit or pin someone standing next to them when engaged. Of particular concern are young

children. These gate arm installations should be at least temporarily physically delineated for the interim opening until a permanent fix can be developed and installed. The physical delineation should be designed to prevent physical access to the immediate area created by the potential hazard.

Figure 7: Gate arms present a potential hazard to pedestrians

- The west expansion joint on the MUD presents a potential tripping, snagging hazard for pedestrians and bicycles. Discussions with the design team suggest that protective plate or some form of filler are not viable treatment options at this location. As a result, some form of delineation and warning should be provided to the public. One possible option could involve painting the joint yellow and providing “Bump” warning signs.

  We also note that a significant gap is present at both ends of the expansion joint installation. This is of particular concern for small children. These gaps must be closed.

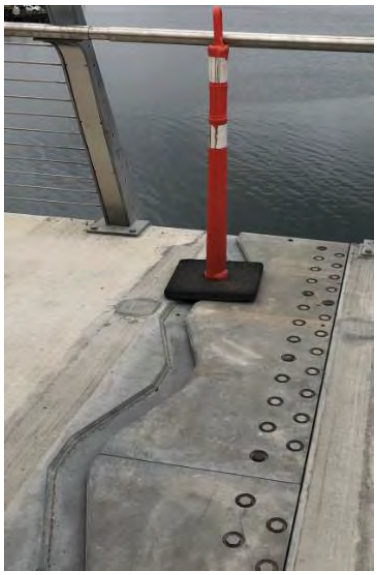
Figure 8: West expansion joint (Note the gap on the left side of the figure).

- Opportunities to minimize the trip hazard present on the MUD at the East Pier Joint by adjusting the centre plate should be examined.

Figure 9: East deck heel join

- The east expansion joint on the MUD presents a potential tripping hazard. Discussions with the design team indicate that a bevelled plate is being installed prior to the bridge opening to reduce this risk.

Figure 10: East expansion joint – Potential tripping hazard



- The aluminum deck surface on the MUD and pedestrian walkway appears to lose some of its frictional characteristics when wet, particularly when moving in a transverse direction across the MUD. The installation of “Slippery When Wet” warning signs on the MUD and pedestrian walkway should be considered.

- It is unclear how the existing bi-directional bike lanes on Pandora Avenue are to be connected as part of the interim condition. A connection that provides clear and concise positive guidance to cyclists, pedestrians and vehicle drivers is required.

- Although not complete at the time of our field review, the interim tie-ins at the east and west ends of the project will need to provide all users with concise and clear positive guidance. This will require careful consideration of the temporary signage, line painting and delineation provided.

3 BRIDGE LIFT OPERATIONS

During the field review the road safety team met with representatives from the City of Victoria and one of the new Johnson Street Bridge Masters in the bridge control room. During this meeting a bridge lift was conducted and the traffic control process was reviewed. The following points summarize our observations.

- Lift operations on the new bridge are heavy reliant on CCTV as the driving lanes, MUD, pedestrian walkway, and gate arms are not fully visible from the control room. While CCTV is a useful tool, the number of camera views in the Bridge Master's control office, and the associated need to monitor them continuously increases the Bridge Master's workload during a lift. This increased workload increases the potential for error in the complex steps associated with the process.

- The current CCTV monitor size and location within the control room appear inadequate. Monitors should be positioned to so that they are visible from the control panel without the Bridge Master having to leave the control panel area. The CCTV images presented on these monitors should also be of sufficient size and clarity to ensure the Bridge Master can see all necessary activity. Multiple monitors may be desirable.

- A detailed review of the CCTV coverage should be conducted prior to opening to ensure adequate coverage of key areas on the bridge (full view of driving lanes, bike lanes, MUD, Pedestrian walkway, gates, and approaches to the gates) and the bridge approaches is provided.

- The provision of a Public Address (PA) system that allows the Bridge Master to warn straggles on the MUD and pedestrian walkway prior to a lift is required. If a system cannot be installed prior to the interim opening, appropriate temporary measures should be provided.

4 OTHER MATTERS

During the last road safety assessment conducted by our road safety team in February 2016 and summarized in a report entitled Johnson Street Bridge: Road Safety Assessment, concerns associated with the plan to provide the public with close access to moving the component of the bridge were identified. After experiencing a lift of the new bridge from a pedestrian's standpoint, seeing the close proximity of the Bridge's moving components to the sidewalk and their ready accessibility, the road safety team has an even greater concern for public safety. Although not being opened to the public as part of this interim opening, the road safety team felt it was important to reiterate our past concerns. These concerns have been repeated below.

- Although an extensive network of Closed Circuit Television (CCTV) monitoring will be deployed on the new bridge to assist the Bridge Master during the lift process, the associated need to monitor this network continuously increases the Bridge Master's workload during a lift, and will also increase the potential for error. This is particularly the case when pedestrians and cyclists may be in and around the immediate area of working parts of the lift bridge (as is the case in the new bridge). In such cases, their presence is a given, but CCTV cannot be of assistance in controlling aberrant behaviours and it is unreasonable to expect the Bridge Master to be able to do so. Such aberrant behaviours are a known risk factor in such situations and have not been uncommon in the existing bridge situation. This suggests a significant potential challenge to both the lift process and the Bridge Master's ability to appropriately control the risk situation for the public present when the bridge is being lifted.

- As with the existing bridge, on the new facility, it appears that when the new bridge lifts, debris on the deck will be directed onto a structure panel above the area where people will be permitted to stand while the bridge is being lifted, and should not be directed onto pedestrians within the ring. Nonetheless, such a design does not eliminate the potential for debris interaction under certain situations (freezing temperatures, high winds, etc.). Such potential should be examined and appropriate remedial action taken to eliminate this risk if it has not already been considered.

- The concept of allowing people to stand in close proximity to a very large moving object (the bridge and parts of the bascule) is interesting but of substantive concern. In addition to the potential for aberrant behaviours as noted above, standing in close proximity to a large moving object in the form of a moving portion of a large part of the structure within which observers will be standing, does present real concerns from a risk standpoint. The occurrence of any substantive mechanical or structural failure is likely to have a very low probability of occurrence, but a very significant likelihood of high levels of consequence (fatalities and personal injuries) if it does happen. Deliberately allowing the public to expose itself to such a risk situation may not be appropriate from a general public safety policy or engineering standpoint, particularly when public behavioural aspects of that risk environment will be uncontrollable.

- In respect of the point raised above, we note that in locations with similar circumstances on a construction site (overhead work, crane operations etc) risk would be well defined and understood, and carefully controlled through the use of substantive access control and other protective measures for workers and the public. Such measures are well defined in regulatory form, generally through occupational health and safety legislation.

- During a lift, the sidewalk section of the bridge spills back onto a fixed section of the sidewalk. Concerns exist with respect to the potential for debris falling on waiting pedestrians.

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March 28, 2018

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 OVERVIEW 1
1.2 FOCUS OF THIS REVIEW 1
1.3 BASIS OF THIS REVIEW 1

2 FIELD OBSERVATIONS 2

3 BRIDGE LIFT OPERATIONS 9

4 OTHER MATTERS 10

5 SIGNATURE PAGE 11

1 INTRODUCTION

1.1 Overview

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1.2 Focus of this review

Our audit addresses both road safety and operational issues. In carrying out our work, we conducted a field review of the interim condition of the new Bridge in advance of the proposed March 31, 2018 opening.

We have examined the various issues upon which we provide comment from a road safety, human factors, and operational perspective only, and do not attempt to deal with the question of cost-effectiveness in this report. Readers of this document should recognize that road design and operational decisions necessarily encompass and must be influenced by the need to provide cost-effective overall solutions to design problems and to respond to key value based design elements including unique and signature features, which may distinguish such a crossing as a potential place making or tourism feature. While it is essential that safety be considered explicitly during the process – as is the intent with this review - it is not the only factor that will influence the final overall resolution of the road safety questions under consideration.

1.3 Basis of this review

Except as specifically noted in the text, we have based our audit on the following information sources:

- A field review of interim opening conditions at the new Johnson Street Bridge on March 26, 2018. During this field review several bridge lifts were conducted.
- A meeting with representatives from the City of Victoria.

2 FIELD OBSERVATIONS

The following points summarize observations from the road safety audit teams field investigation.

- At the project limit on Harbour Road (approximate station 40+200) a zone of increased collision risk is present. At this location, the Galloping Goose Trail interacts with a sidewalk, a pedestrian crossing, a bicycle left turn lane from southbound Harbour Road to the southbound Galloping Goose Trail, existing on-street bike lanes, and a wide uncontrolled driveway access. Opportunities to reduce potential conflicts at this location should be considered. One option may include the provision of a stop bar and stop sign for northbound bicycles on the Galloping Goose Trail, as indicated in Figure 1, below.

Transportation team

Discussions with representatives from the City of Victoria indicate that a reconfiguration of the bicycle facility on Harbour Road is planned. It is unknown how this planned facility will interface with the current interim facility. As a result, the audit team has not provided comment on this matter.

Figure 1: Galloping Goose Trail – north limit

- At the time of this field review, a significant amount of finish work was incomplete. This work included railings, signage, line painting, and the east and west project limit tie-ins. Due to the incomplete nature of these elements; the audit team was unable to provide comment on these elements.

- To address roadside concerns adjacent to the Galloping Goose Trail, temporary fencing has been installed. This temporary fencing should be connected to the adjacent permanent hand railing to ensure continuity.

Completed

Figure 2: Tie –in of temporary fencing is incomplete

- Temporary fencing should be placed on both sides of the trail between the Pedestrian Bridge and the Mile 0.2 Bridge to address the roadside safety hazards present (See Figure 3).

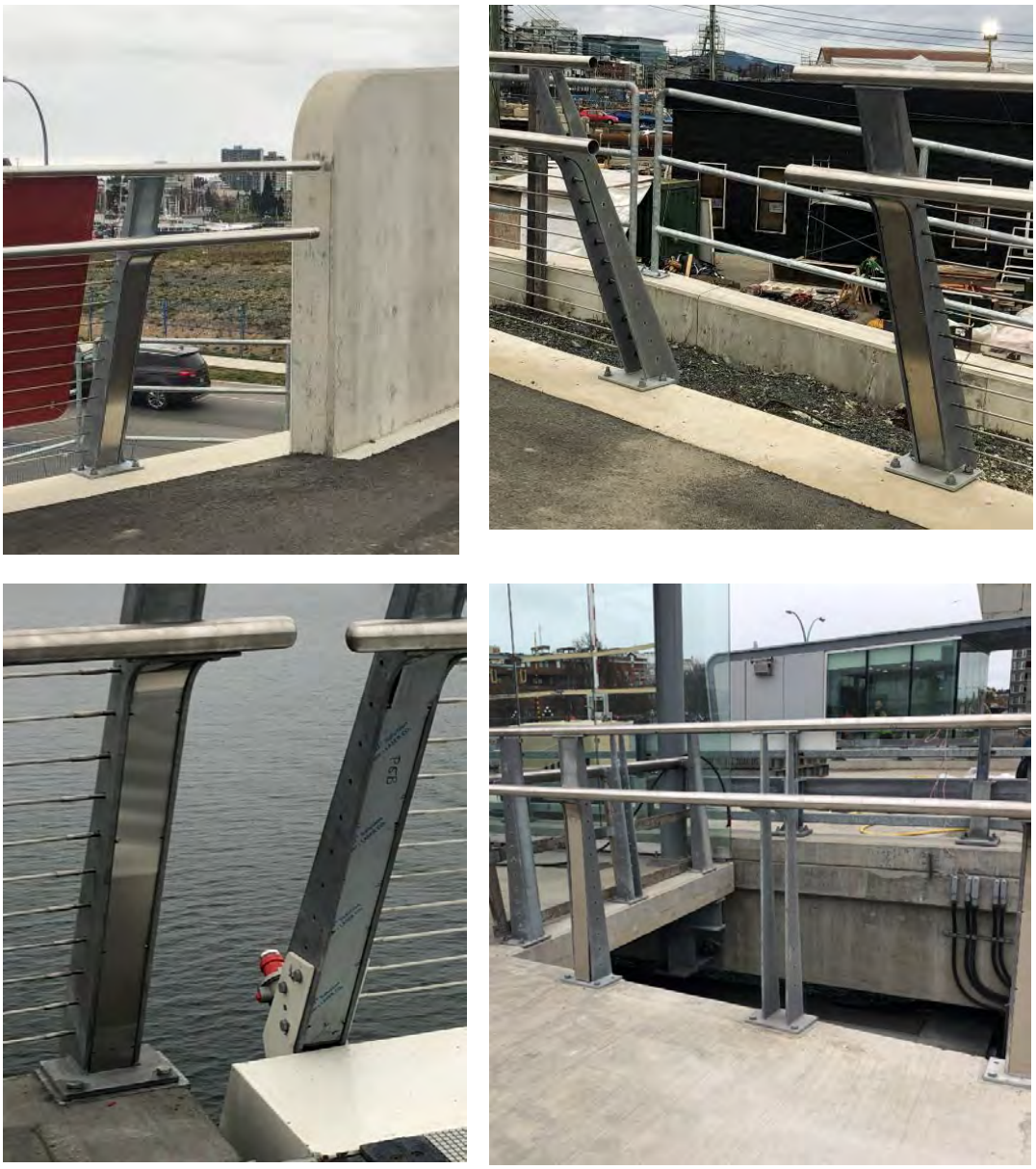
Completed

Figure 3: Temporary fencing required on both sides of trail

- Throughout the study area, numerous gaps in the multi-use deck (MUD) and Pedestrian Walkway railing were observed. These gaps are the result of missing sections of railing and gaps between successive barrier installations. These gaps are of particular concern for small children and should be closed prior to opening.

Completed

Figure 4: Gaps in barrier – Some examples



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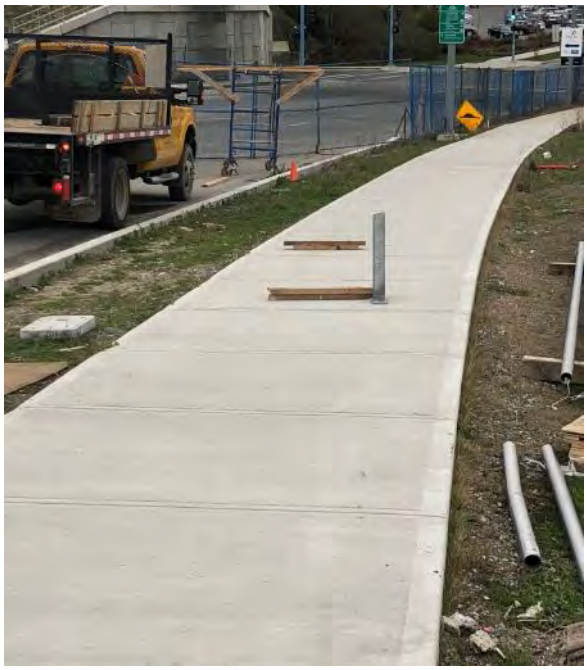
Completed

Figure 5: Incomplete grading adjacent to sidewalk



- Along Esquimalt Road, exposed barrier ends present a roadside hazard to vehicles. These barrier ends should be equipped with crashworthy barrier end-treatments. As part of the interim opening, an appropriate temporary end-treatment should be provided.

Completed

Figure 6: Exposed barrier end presents a roadside hazard

- At several gate arm installations on the MUD, the counterweights appear to present a potential hazard to pedestrians as they may hit or pin someone standing next to them when engaged. Of particular concern are young

children. These gate arm installations should be at least temporarily physically delineated for the interim opening until a permanent fix can be developed and installed. The physical delineation should be designed to prevent physical access to the immediate area created by the potential hazard.

Temp fence in place and the permanent fence under construction and will be installed by mid Jan.

Figure 7: Gate arms present a potential hazard to pedestrians

- The west expansion joint on the MUD presents a potential tripping, snagging hazard for pedestrians and bicycles. Discussions with the design team suggest that protective plate or some form of filler are not viable treatment options at this location. As a result, some form of delineation and warning should be provided to the public. One possible option could involve painting the joint yellow and providing “Bump” warning signs.

Completed

We also note that a significant gap is present at both ends of the expansion joint installation. This is of particular concern for small children. These gaps must be closed.

Figure 8: West expansion joint (Note the gap on the left side of the figure).

- Opportunities to minimize the trip hazard present on the MUD at the East Pier Joint by adjusting the centre plate should be examined.

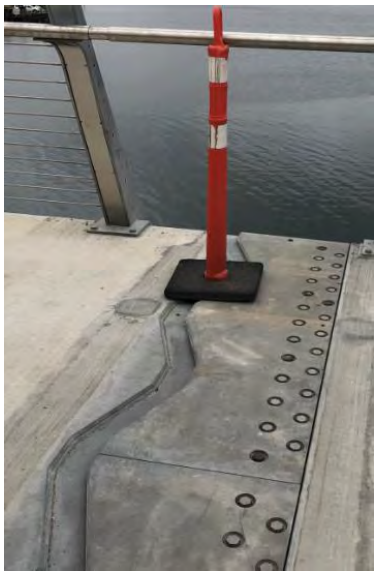
Completed

Figure 9: East deck heel join

- The east expansion joint on the MUD presents a potential tripping hazard. Discussions with the design team indicate that a bevelled plate is being installed prior to the bridge opening to reduce this risk.

Completed

Figure 10: East expansion joint – Potential tripping hazard



- The aluminum deck surface on the MUD and pedestrian walkway appears to lose some of its frictional characteristics when wet, particularly when moving in a transverse direction across the MUD. The installation of "Slippery When Wet" warning signs on the MUD and pedestrian walkway should be considered.

Completed

- It is unclear how the existing bi-directional bike lanes on Pandora Avenue are to be connected as part of the interim condition. A connection that provides clear and concise positive guidance to cyclists, pedestrians and vehicle drivers is required.

- Although not complete at the time of our field review, the interim tie-ins at the east and west ends of the project will need to provide all users with concise and clear positive guidance. This will require careful consideration of the temporary signage, line painting and delineation provided.

WSP recommended signs were installed

3 BRIDGE LIFT OPERATIONS

During the field review the road safety team met with representatives from the City of Victoria and one of the new Johnson Street Bridge Masters in the bridge control room. During this meeting a bridge lift was conducted and the traffic control process was reviewed. The following points summarize our observations.

Recommendation was addressed by implementing certified operator only through a comprehensive training program

Lift operations on the new bridge are heavy reliant on CCTV as the driving lanes, MUD, pedestrian walkway, and gate arms are not fully visible from the control room. While CCTV is a useful tool, the number of camera views in the Bridge Master's control office, and the associated need to monitor them continuously increases the Bridge Master's workload during a lift. This increased workload increases the potential for error in the complex steps associated with the process.

Completed

- The current CCTV monitor size and location within the control room appear inadequate. Monitors should be positioned to so that they are visible from the control panel without the Bridge Master having to leave the control panel area. The CCTV images presented on these monitors should also be of sufficient size and clarity to ensure the Bridge Master can see all necessary activity. Multiple monitors may be desirable.

Completed

- A detailed review of the CCTV coverage should be conducted prior to opening to ensure adequate coverage of key areas on the bridge (full view of driving lanes, bike lanes, MUD, Pedestrian walkway, gates, and approaches to the gates) and the bridge approaches is provided.

PA system installed

- The provision of a Public Address (PA) system that allows the Bridge Master to warn stragglers on the MUD and pedestrian walkway prior to a lift is required. If a system cannot be installed prior to the interim opening, appropriate temporary measures should be provided.

4 OTHER MATTERS

During the last road safety assessment conducted by our road safety team in February 2016 and summarized in a report entitled Johnson Street Bridge: Road Safety Assessment, concerns associated with the plan to provide the public with close access to the moving components of the bridge were identified. After experiencing a lift of the new bridge from a pedestrian's standpoint, seeing the close proximity of the Bridge's moving components to the sidewalk and their ready accessibility, the road safety team has an even greater concern for public safety. Although not being opened to the public as part of this interim opening, the road safety team felt it was important to remind the City of our past concerns, as follows;

- Although an extensive network of Closed Circuit Television (CCTV) monitoring will be deployed on the new bridge to assist the Bridge Master during the lift process, the associated need to monitor this network continuously increases the Bridge Master's workload during a lift, and will also increase the potential for error. This is particularly the case when pedestrians and cyclists may be in and around the immediate area of working parts of the lift bridge (as is the case in the new bridge). In such cases, their presence is a given, but CCTV cannot be of assistance in controlling aberrant behaviours and it is unreasonable to expect the Bridge Master to be able to do so. Such aberrant behaviours are a known risk factor in such situations and have not been uncommon in the existing bridge situation. This suggests a significant potential challenge to both the lift process and the Bridge Master's ability to appropriately control the risk situation for the public present when the bridge is being operated.

It was addressed by stopping pedestrians away from the mentioned area

- It appears that when the new bridge is operated, debris on the deck will be directed into areas where the public will be permitted to stand. Such potential should be examined and appropriate remedial action taken to eliminate this risk.

- The concept of allowing people to stand in close proximity to a very large moving object (the bridge and parts of the bascule) is of concern. In addition to the potential for aberrant behaviours as noted above, standing in close proximity to a large moving object in the form of a moving portion of a large part of the structure within which observers will be standing, does present real concerns from a risk standpoint. The occurrence of any substantive mechanical or structural failure is likely to have a very low probability of occurrence, but a very significant likelihood of high levels of consequence (fatalities and personal injuries) if it does happen. Deliberately allowing the public to expose itself to such a risk situation may not be appropriate from a general public safety standpoint, particularly when public behavioural aspects of that risk environment will be uncontrollable.

In summary, the City must carefully consider the risks outlined above prior to permitting public to access these areas during bridge operations.

5 SIGNATURE PAGE

This review and commentary was prepared by WSP for the City of Victoria. The material in it reflects WSP's best judgement in light of the information available to us at the time of the review. Any use which the City of Victoria or any third party makes of this review, or any reliance on it or decisions made based on it, are the responsibility of the City of Victoria or the third party. WSP accept no responsibility for damages, if any, suffered by the City of Victoria or any third party as a result of decisions made or actions based on this review.

December 18, 2018

Geoffrey B. Millen, P. Eng. WSP Date

Feb 28, 2019

The recommendations by the auditor where applicable has been considered and required actions have been taken.
In addition to these recommendations, City has taken some other safety measures to properly address any safety concern to the public and city staff.

Taaj Daliran

Briefing Notes

DATE:

PREPARED BY: Taaj Daliran

SUBJECT: Johnson Street Bridge: Pre- Opening Road Safety Audit

Overview

At the request of the City of Victoria, BC, WSP has conducted a pre-opening road safety review in preparation for the interim opening of the new Johnson Street Bridge located in Victoria, B.C. Focus of the review was to address both road safety and operational concerns. WSP conducted a field review of the interim condition of the new Bridge and provided the report (Appendix-1) in advance of the proposed March 31, 2018 opening.

Field Observations and Corrective Actions

The following summarize observations from the WSP road safety audit team field investigation, and the actions taken by the city to address the findings:

Page / Paragraph	Observation / Recommendation	Action Taken / Status
Page 2 Paragraph 2	At the project limit on Harbour Road (approximate station 40+200) a zone of increased collision risk is present. At this location, the Galloping Goose Trail interacts with a sidewalk, a pedestrian crossing, a bicycle left turn lane from southbound Harbour Road to the southbound Galloping Goose Trail, existing on-street bike lanes, and a wide uncontrolled driveway access. Opportunities to reduce potential conflicts at this location should be considered. One option may include the provision of a stop bar and stop sign for northbound bicycles on the Galloping Goose Trail, as indicated in Figure 1, below. Discussions with representatives from the City of Victoria indicate that a reconfiguration of the bicycle facility on Harbour Road is planned. It is unknown how this planned facility will interface with the current interim facility. As a result, the audit team has not provided comment on this matter.	The condition of the merging Galloping Goose path, private driveway and Harbour Road existed prior to the work starting on the new Johnson Street Bridge. Following opening of the multi use deck, bollards were added to the Galloping Goose adjacent the intersection to slow cyclists and prevent vehicles from driving on the pathway. Harbour Road investment, including driveway configuration changes and rearrangement of bicycle facility on Harbour Road will minimize conflicts. Capital project approved by Council in August 2019.
Page 2 Paragraph 4	To address roadside concerns adjacent to the Galloping Goose Trail, temporary fencing has been installed. This temporary fencing should be	Additional temporary fencing were installed and all of them connected to the adjacent permanent hand railing.

	connected to the adjacent permanent hand railing to ensure continuity.	
Page 3 Paragraph 1	Temporary fencing should be placed on both sides of the trail between the Pedestrian Bridge and the Mile 0.2 Bridge to address the roadside safety hazards present	Temporary fencing placed on both sides of the trail between the Pedestrian Bridge and the Mile 0.2 Bridge
Page 4 Paragraph 1	Throughout the study area, numerous gaps in the multi-use deck (MUD) and Pedestrian Walkway railing were observed. These gaps are the result of missing sections of railing and gaps between successive barrier installations. These gaps are of particular concern for small children and should be closed prior to opening.	The missing sections of railing were installed and the gaps between railings and barrier were closed prior to opening.
Page 5 Paragraph 1	Grading is required adjacent to the sidewalk on the north side of Esquimalt Road between station 10+180 and 10+280 to eliminate the tripping hazard present.	Grading were completed prior to the opening.
Page 5 Paragraph 2	Along Esquimalt Road, exposed barrier ends present a roadside hazard to vehicles. These barrier ends should be equipped with crashworthy barrier end-treatments. As part of the interim opening, an appropriate temporary end- treatment should be provided.	Barrier end-treatments were installed prior to the opening.
Page 5 Paragraph 3	At several gate arm installations on the MUD, the counterweights appear to present a potential hazard to pedestrians as they may hit or pin someone standing next to them when engaged. Of particular concern are young children. These gate arm installations should be at least temporarily physically delineated for the interim opening until a permanent fix can be developed and installed. The physical delineation should be designed to prevent physical access to the immediate area created by the potential hazard.	Temporary fencing installed prior to the opening and they were replaced by permeant fencing later.
Page 6 Paragraph 2	The west expansion joint on the MUD presents a potential tripping, snagging hazard for pedestrians and bicycles. Discussions with the design team suggest that protective plate or some form of filler are not viable treatment options at this location. As a result, some form of delineation and warning should be provided to the public. One possible option could involve painting the joint yellow and providing “Bump” warning signs. We also note that a significant gap is present at both ends of the expansion joint installation. This is of particular concern for small children. These gaps must be closed.	Joint were painted yellow and “Bump” warning signs were installed to address the concern.
Page 7 Paragraph 1	Opportunities to minimize the trip hazard present on the MUD at the East Pier Joint by adjusting the centre plate should be examined.	The centre plate were adjusted to minimize the trip hazard.

DRAFT

Page 8 Paragraph 1	The east expansion joint on the MUD presents a potential tripping hazard. Discussions with the design team indicate that a bevelled plate is being installed prior to the bridge opening to reduce this risk.	A bevelled plate were installed prior to the bridge opening.
Page 8 Paragraph 2	The aluminum deck surface on the MUD and pedestrian walkway appears to lose some of its frictional characteristics when wet, particularly when moving in a transverse direction across the MUD. The installation of "Slippery When Wet" warning signs on the MUD and pedestrian walkway should be considered.	"Slippery When Wet" warning signs were installed.
Page 8 Paragraph 3	It is unclear how the existing bi-directional bike lanes on Pandora Avenue are to be connected as part of the interim condition. A connection that provides clear and concise positive guidance to cyclists, pedestrians and vehicle drivers is required.	Bicycle Traffic Signals on Pandora Avenue with red/yellow/green, elephants feet paint markings and no right turn on red signage is in place at the intersection of Pandora/Store.
Page 8 Paragraph 4	Although not complete at the time of our field review, the interim tie-ins at the east and west ends of the project will need to provide all users with concise and clear positive guidance. This will require careful consideration of the temporary signage, line painting and delineation provided.	the recommended temporary signage, line painting and delineators were installed prior to the opening.
Page 9 Paragraph 2	Lift operations on the new bridge are heavy reliant on CCTV as the driving lanes, MUD, pedestrian walkway, and gate arms are not fully visible from the control room. While CCTV is a useful tool, the number of camera views in the Bridge Master's control office, and the associated need to monitor them continuously increases the Bridge Master's workload during a lift. This increased workload increases the potential for error in the complex steps associated with the process.	Recommendation was addressed by implementing operator certification after being through a comprehensive training program.
Page 9 Paragraph 3	The current CCTV monitor size and location within the control room appear inadequate. Monitors should be positioned to so that they are visible from the control panel without the Bridge Master having to leave the control panel area. The CCTV images presented on these monitors should also be of sufficient size and clarity to ensure the Bridge Master can see all necessary activity. Multiple monitors may be desirable.	Small monitor were re[laced with a big screen TV to provide clear view.
Page 9 Paragraph 4	A detailed review of the CCTV coverage should be conducted prior to opening to ensure adequate coverage of key areas on the bridge (full view of driving lanes, bike lanes, MUD, Pedestrian walkway, gates, and approaches to the gates) and the bridge approaches is provided.	Review were conducted. SE and NW CCTV cameras were re-located.
Page 9 Paragraph 5	The provision of a Public Address (PA) system that allows the Bridge Master to warn straggles on the MUD and pedestrian walkway prior to a lift is	PA system was installed.

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	required. If a system cannot be installed prior to the interim opening, appropriate temporary measures should be provided.	
Page 10 Paragraph 3	As with the existing bridge, on the new facility, it appears that when the new bridge lifts, debris on the deck will be directed onto a structure panel above the area where people will be permitted to stand while the bridge is being lifted, and should not be directed onto pedestrians within the ring. Nonetheless, such a design does not eliminate the potential for debris interaction under certain situations (freezing temperatures, high winds, etc.). Such potential should be examined and appropriate remedial action taken to eliminate this risk if it has not already been considered.	SE gate were equipped with inside mesh and an overhead clear protection and pedestrians are guided to stop away from the area.
Page 10 Paragraph 4	The concept of allowing people to stand in close proximity to a very large moving object (the bridge and parts of the bascule) is interesting but of substantive concern. In addition to the potential for aberrant behaviours as noted above, standing in close proximity to a large moving object in the form of a moving portion of a large part of the structure within which observers will be standing, does present real concerns from a risk standpoint. The occurrence of any substantive mechanical or structural failure is likely to have a very low probability of occurrence, but a very significant likelihood of high levels of consequence (fatalities and personal injuries) if it does happen. Deliberately allowing the public to expose itself to such a risk situation may not be appropriate from a general public safety policy or engineering standpoint, particularly when public behavioural aspects of that risk environment will be uncontrollable.	It has been part of the design to allow public to be close and watch the bridge lift. However public are stopped out of the area with falling objects hazards.
Page 11 Paragraph 2	During a lift, the sidewalk section of the bridge spills back onto a fixed section of the sidewalk. Concerns exist with respect to the potential for debris falling on waiting pedestrians.	SE gate were equipped with inside mesh and an overhead clear protection and pedestrians are guided to stop away from the area.

Respectfully submitted,
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Engineering and Public Works

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