SUICIDE PREVENTION BARRIER FEASIBILITY STUDY REPORT 18_19 SH1N BSN 4232 AUCKLAND HARBOUR BRIDGE

383545-18_19-BR-SH1-4232-RP-FS-001-REV_F1

May 2019

Released under the Official Information Act 1982

Auckland Harbour Bridge

May 2019

This report has been prepared for the benefit of the NZ Transport Agency (NZTA). No liability is accepted by the Auckland Motorway Alliance (AMA) or sub-consultant of the AMA, with respect to its use by any other person.

This disclaimer shall apply notwithstanding that the report may be made available to other persons for an application for permission or approval or to fulfil a legal requirement.

DOCUMENT INFORMATION	
Document No.	383545-18_19-BR-SH1-4232-RP-FS-001-REV_F1
Subject:	SUICIDE PREVENTION BARRIER FEASIBILITY STUDY REPORT 18_19 SH1N BSN 4232 AUCKLAND HARBOUR BRIDGE
Purpose:	Final

QUALITY ASSURANCE STATEMENT		
Prepared By:-	s 9(2)(a) [redacted]	
Reviewed By:-		
Authorised By:-		
Report Date:-	22 May 2019	

REVISION SCHEDULE					
Rev. No	Date	Description	Prepared by	Reviewed by	Approved by
F1	06/19	FINAL – comments from Alex Ingram *AHB Alliance Manager*	s 9(2)(a) [redacted]		
F0	05/19	For Client Review			

Released under the Official Information Act 1982

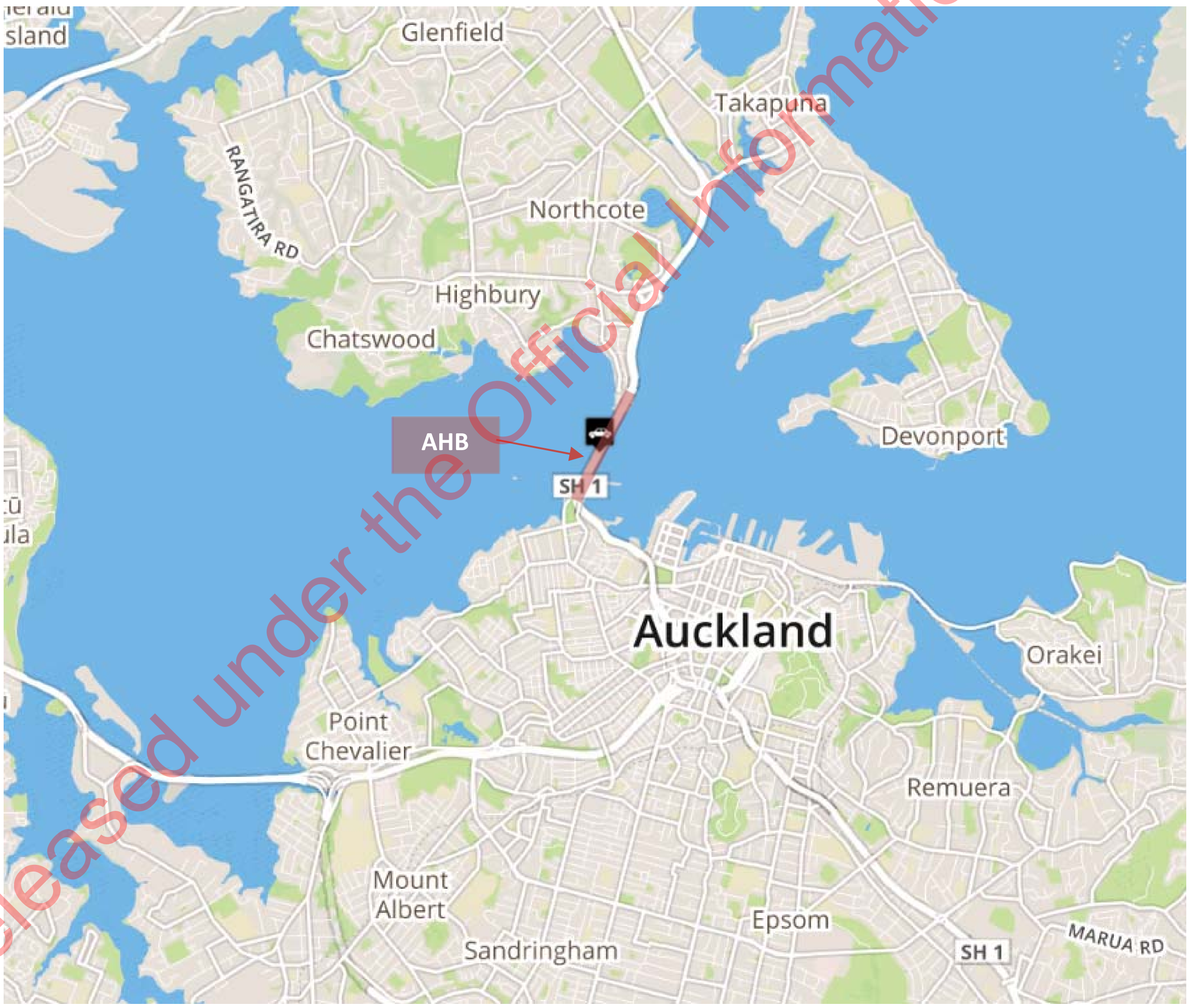
Contents

Released under the Official Information Act 1982

1 BRIDGE DETAILS & LOCATION PLAN

1.1 Introduction

Bridge Name:	Auckland Harbour Bridge
BSN:	4232
Highway:	SH1N
RP:	01N-0414-B/9.600



Released under the Official Information Act 1982

2 RECOMMENDATIONS FOR MAINTENANCE/REPAIRS

2.1 Executive Summary

This report has examined viable options for using an extended height barrier system as a preventative measure to reduce the number of suicide attempts undertaken from Auckland Harbour Bridge.

Based on previous research it is clear that suicide prevention barrier is an effective strategy for reducing suicide in that particular location and that people are unlikely to increase level of effort to overcome all types of barrier system. However, it was also shown that this system should not be held in isolation and that if combined with social service promotion and education in the local community the suicide attempt rate in the wider region of the structure would be more effective.

International best practice has shown that there is not a one size fits all when it comes to effective suicide prevention barrier systems. In high profile suicide bridge locations, it was shown that there are anomalous factions that will go to great lengths to make an attempt from a protected structure but the rate extremely low. Therefore, for the Auckland Harbour Bridge the most suitable system would have to be fit for purpose to suit that particular location and will have to be based on location specific criteria.

To accurately consider the most suitable option for this location a number of factors were considered including; constructability of the system; Effectiveness in the location; aesthetic impact on the iconic structure for both road users and observers from the city; as well as the costs of both initial installation and on-going maintenance. Another key element to understand is the limited capacity of the east and west extensions attached to either side of the original truss structure. Any additional dead load on the deck will have an impact on the capacity of the extensions to carry live loads and the impacts as such will need to be fully assessed prior to construction. Another significant load case is "wind loading" and the choice of mesh was decided in order to reduce the effects of this load transferring to the barrier and deck.

A final consideration for the most suitable system is the future uses of the Auckland Harbour Bridge under development at the moment. The most significant of these is the construction of the Auckland Harbour Bridge Shared Path to the east side. The designs for this new pedestrian walkway and cycleway are in close proximity to the location for the barrier system and so the proposed system should attempt to not impact this design where feasible.

These options showed that the most suitable proposed system would be a vertical extension to the existing low-level vehicular barrier. This report finds this option to be the most suitable given the above constraints as it requires minimal alteration to existing M&E equipment on the structure and future designs in order to be installed, it will provide effective levels of hindrance to suicide attempts as well as pre-fabricated panels enabling minimal disruption to the road user.

The suggested costs for the works are estimated to be: $12,800,000m - $26,400,000*

**Valuation based on current market values and previous work undertaken as part of the Auckland Motorway Alliance*

Released under the Official Information Act 1982

3 INTRODUCTION

3.1 General

Auckland Harbour Bridge (AHB) has been identified as suffering from a significantly over proportionate number of suicide attempts within the Auckland region. Studies in other locations have shown that by increasing the difficulty of committing suicide from a bridge structure there is a reduction in the numbers of attempts form the structure with no significant increase in the surrounding region [2]. Therefore, utilising some form of physical prevention would have a social benefit for the Auckland region.

"There has been a sharp increase in the number of people committing suicide, new statistics show. The [New Zealand] coroner revealed on [24/08/2018] 668 people died by suspected suicide from July 2017-June 2018. It's the fourth year in a row the number has increased, and 10 percent more than the previous year's figure of 606."[1]

Auckland Harbour Bridge forms one of the most critical structures in the Auckland infrastructure providing crossing over the Waitamata Harbour between the Auckland CBD and the north shore, carrying over 180,000 vehicle movements a day. Suicide attempts from the structure have been the cause of major disruption on the network and with the increasing rates the liklihood of this occuring inreases on an annual basis.

The Bridge comprises multiple forms of construction developed at varying times with main steel arch structure having an east and west extension (often refferred to as clip-ons) to increase the number of running lanes to eight. The moveable barrier on the central section of the deck allowing variation between 3 and 5 lanes either north or south, which can be used during night time closures to reduce disruption.

3.2 Current Measures

Previous actions taken on the bridge include the installation of bouys that can be deployed at the point of entry at the press of a button located at multiple point on both east and west extension as well as full camera monitoring system to identify possible suicide attempts. There are also a number of barriers at an increased height over the north span, these were installed to prevent debris damaging local properties but also act as an anti-climb fence.

In order to reduce the rate of suicide attempts from the structure, the Auckland Harbour Bridge Alliance are considering retrofitting preventative measues and this report aims to provide guidance to the most suitable option.

Released under the Official Information Act 1982

[1] *https://www.newshub.co.nz/home/lifestyle/2018/08/statistics-show-sharp-rise-in-number-of-suicides.html {accessed 14/09/2019}*

[2] *Sinyour M, Schaffer A, Redelmeier DA, et al, Did the suicide barrier work after all? Revisiting the Bloor Viaduct natural experiment and its impact on suicide rates in Toronto, https://bmjopen.bmj.com/content/7/5/e015299*

3.3 Auckland Harbour Bridge Shared Path

As part of an Auckland project to increase non-motor vehicle travel in and around the region the NZTA have been working to develop multi modal coastal path. The Path is designed to run alongside SH1 north of the Auckland Harbour Bridge connecting the Bridge to exisiting walkway/cycling facilities to Northcote and Devonport . The overall proposal of the costal path would be to link the Northshore to the Central Business District (CBD) which would require the path to travel over the Auckland Harbour Bridge.

The current plan for the Auckland Harbour Bridge Shared Path is that it will comprise a fully open circa 5m wide pedestrian walkway and cycleway supported from the substructure on newly constructed piers. The Shared Path has been designed with the preffered option taken forward to full business case. The business case is due to be considered by the NZTA board in late 2019 with possible construction commencement in late 2020. There is substantiual political pressure to deliver the scheme, which has been increasing due to extensive public pressure focused on this multi modal transport route. This will form an important factor in the selection of the most suitable barrier option, as the works should not interfere with the possible SkyPath construction.

For information the artists impressionof the proposed AHB Shared Path is shown in the figure below:

https://www.nzta.govt.nz/projects/auckland-harbour-bridge-shared-path/

Released under the Official Information Act 1982

4 BRIDGE BARRIER BEST PRACTICE

4.1 Local Examples

Over the period of time of the Auckland Motorway Alliance there have been a number of high-profile deaths and serious injuries related to bridges, where the existing barrier systems <1.4m high have allowed people and projectiles falling from bridge decks. Most of these events are low profile and have not had much media recognition although the threat posed to the motorway customers has continued to increase through the life of the Alliance and is likely to continue to increase based on the growth of the Auckland urban centre and international trends.

Within the Auckland area there have been an array of bridge screens retrofitted to existing steel and concrete road and foot bridges as well as new structures with high containment level barrier systems.

New Construction:

- Tirohanga Whanui – Footbridge Stainless Steel 3m tall X-Mesh system – Spanning SH1
- Kirkbride - Road bridge with pedestrian walkway, architectural contoured overhanging X-Mesh system – Spanning SH20
- Westgate Footbridge - Footbridge Stainless Steel 3m tall X-Mesh system – Spanning SH16

Retrofitted:

- Dilworth – Footbridge with X-Mesh system to >3m supported by bridge structural members
- Walter Stevens – Road bridge, Galvanised post with hurricane mesh, 3m tall – Spanning SH1
- Alfirston Road – Road bridge, Galvanised post with hurricane mesh, 3m tall – Spanning SH1
- Regan Road – Road bridge, Galvanised post with hurricane mesh, 3m tall – Spanning SH1
- Bairds Rd – Road bridge, Galvanised post with hurricane mesh, 3m tall – Spanning SH1
- Princes St - Road bridge, Galvanised post with hurricane mesh, 3m tall – Spanning SH1
- Panama Rd - Road bridge, Galvanised post with hurricane mesh, 3m tall – Spanning SH1
- Carrington Road – Road Bridge, handrails replaced with 1.8m anti climb screens – Spanning SH16
- Nelson Rd On-ramp– Steel and Plexi-glass vertical outward raking system – Spanning CMJ

Awaiting construction:

- Killington Crescent Footbridge –Galvanised posts and X-Mesh system inward overhang – Spanning SH20

Other bridges of note in the Auckland region of note are those where there have been recorded deaths from falling, but no security screens have been installed to date are as follows:

- Greenlane Interchange Bridge;
- Hopetoun St Underpass;
- Bond St Underpass; and
- Market Rd Underpass.

Released under the Official Information Act 1982

A study of the risk posed within the Auckland region based on internationally recognised standards that take into account a number of the key contributing factors and the list of structures above were identified as posing the greatest risk. They were selected more for the risk posed from falling/dropped items causing damage to road vehicle users travelling under the bridge, rather than the previous experience of falling/suicide. The barrier systems have been in place on a number of the structures for more than 5 years and to date have all proved successful to prevent both dropped items and suicide attempts.

4.2 International Guidance

An examination of the 2002 the Road Traffic Authority in Australia (RTA AustRoads) detailed the criteria for selecting structures for retrofit barriers to be based on number of location-based and historical factors that are used to accurately score the risk posed to road users from thrown items and the risk of falls from the structure. These factors include:

- Proximity to schools/churches, shopping and public transport;
- Proximity to hospital (including mental health facilities;
- Landmark structure;
- Ease of pedestrian access;
- Ease of vehicle stopping;
- Height above ground/water level;
- Length; and
- Previous incidents

When assessed against these factors Auckland Harbour bridge's risk score is >70, which is significantly above the recommended threshold for safety screen requirement (>30). The major factors leading to this risk are the fact the structure is landmark and the height and length.

If the structure is reassessed based on there being a full barrier system and a period of no incidents, then the risk would drop below the threshold risk value. Therefore, it is shown that installation of a barrier system would be suitable based on international guidance.

Released under the Official Information Act 1982

4.3 International Examples

In order to gain an understanding of international best practice in relation to suicide barriers retrofitted onto iconic type structures research was undertaken to highlight the range of examples used globally.

Some examples of structures with associated costs are shown below with images of the systems shown in Appendix:

Bloor Viaduct – Toronto, Canada - $6 million USD (490m)

>3m tall galvanised steel posts with vertical steel galvanised bars at 100mm centres.

The Bloor viaduct in Toronto is a well-documented example of a structure that suffered from a substantially increased risk of suicide attempts prior to the installation of the fencing, approximately 60 per annum. Since installation of the system this has dropped reduced to 1 per annum. This shows that although the barrier may not be impossible to climb or circumvent they are a significant enough deterrent for the clear majority of people considering using the structure as a means to attempt suicide.

Golden Gate Bridge San Francisco, USA - $193 million USD (2,737m)

Horizontal steel cantilever beams with expanded steel mesh, red coating to match structure (approx. 4m below deck level)

This system appeared unique in terms of major bridge structures, and at the time of writing this report the construction work had not been fully completed. The Golden Gate Bridge is one of the most iconic bridge structures in the world and has had such a prolific issue with suicides that multiple documentary films have been produced detailing the extreme level of suicides attempts undertaken from the bridge. The design of the barrier system on this structure has been selected for a number of constructability reasons posed by the catenary suspension arrangement of the main structure but also the aesthetic appeal of the structure. The system is positioned so that it is not possible to make a suicide attempt without hitting the netting, where as a vertical barrier could be climbed even if measures such as a ladder were utilised. This system is discussed as a deterrent as it removes the effectiveness of an attempt and makes the likelihood of inflicting a high level of pain and damage to the person making the attempt almost certain.

West Gate, Melbourne, Australia - $20 million AUD (390m)

This barrier system is >3m tall and comprises an outward raking stainless steel box section posts system with mesh infill panel.

This system was a retrofit to this concrete structure spanning the Yarra River in Melbourne that had high level of suicide attempts. The new anti-suicide barrier was installed to the edge of the deck outside of the existing barrier system.

Released under the Official Information Act 1982

5 PREVENTION OPTIONS FOR AHB

5.1 Introduction

In order to progress the feasibility study the most suitable options have been selected from those seen globally as best practice:

- Vertical Anti Climb barrier; and
- Horizontal Fall prevention barrier

In order to identify the most suitable option for AHB, the following factors are required to be fully understood:

- Constructability;
- Effectiveness;
- Additional loading on the existing structure;
- Aesthetic Impact;
- Cost; and
- Maintenance.

5.2 Vertical Anti Climb Barrier

The vertical anti climb barrier as standard would be a 3m tall steel post and mesh system that is constructed in such a way that it is highly unlikely that the average person would be able to scale the barrier.

For the purposes of the design of the AHB there would be a number of options for how the system could be attached to the structure. Limitation on the placement include available space on the open sides and adjacent furniture that would enable climbing.

Based on the factors it was identified that the most suitable system would either replace the existing barrier or sit directly on top of the existing barrier. The October 2018 report [AHB] Barrier Safety Assessment notes that the capacity of the existing barrier is below TL3 requirements and would not be adequate to meet the current national requirement of a TL5 for this location. Therefore, any replacement of the barrier would require the system to be upgraded which according to the report would require "significant strengthening of the AHB structure". The cost benefit ratio of undertaking this level of upgrade was not considered to be high enough and therefore eliminated from considerations.

Therefore, the most suitable design for a vertical barrier given the existing constraints would be to construct the new system from the existing barrier system. It should be noted that at the location where the structure is in close proximity to residential housing on the north embankment a form of this vertical barrier has already been installed. The assumed main purpose for this barrier is to reduce the risk of debris being launched toward the properties from vehicles travelling along SH1 in this location. The existing system comprises galvanised steel angle posts welded to the open box beam (OBB) top rail for the barrier system with diamond mesh panels between the posts supported by a tubular galvanised steel frame. The arrangement of the barrier system does not create a significantly difficult fence system to climb, as the barrier is <2.5m in total and there are locations for foot and hands holds to assist in climbing.

Released under the Official Information Act 1982

To the south of AHB there is an increased height barrier system utilised as a noise prevent wall for local residents and as protection for pedestrians using the adjacent footpath. The system comprises steel posts with >3m high clear plexiglass type panels (image shown in Appendix A). This form of system has an improved aesthetic appearance and matches that used on Nelson St On-ramp. However, due to the increased effect of wind loading due to the solid panel system and the limited capacity of the 'clip-ons' this system was not taken further as part of this report.

The proposed system as shown in Appendix B and is identified as option A with the screen arrangement shown on drawing 1/72/148/7104.

This option comprises a full stainless system for reduced maintenance requirements with Square Hollow Section (SHS) posts frames and expanded mesh. The system has a flush arrangement with the substrate barrier system which will ensure that there is no way for people in foot to be able to climb the system unaided.

The main issues with the proposed system are:

- Functionality of the existing barrier system at providing containment for errant vehicles;
- Capacity and longevity of the deck to take the additional dead load of the barrier system; and
- Aesthetic impact of the barrier system on road users.

Note that we have not assessed the effects of the additional wind loadings on the 'clip-on' box girders.

5.3 Horizontal Fall Prevention Barrier

The horizontal barrier system was identified as an option based on international work undertaken on the Golden Gate bridge, which historically has suffered from extremely high suicide rates comparatively.

The concept of this arrangement is that although it will not stop people from jumping from the bridge the mesh will catch them at a lower level, so they do not fall the full height from the deck to the water. On the Golden Gate Bridge in San Francisco, CA due to the construction type of the deck they are able they are able to place the horizontal mesh approximately 4m below the deck level. This means that people are unlikely to choose to jump from the deck as it is clear they will land in the netting or on the steelwork likely causing injury but unlikely to result in a death. On AHB it is not possible to create such a distance between the deck and the horizontal barrier, so this risk of injury is reduced. The horizontal barrier will not be visible/obvious from the majority of viewing locations of the structure. When driving along the roadway the system will be out of site, then when viewed from the Auckland city or Devonport the system will blend into the steelwork on the deck.

The main issues with this proposed system are:

- Functionality of the system to prevent a determined suicide attempt;
- Maintenance of the system including removing rubbish and debris from the mesh;
- Clash of system with SkyPath to east side of structure; and
- Capacity and longevity of the deck to take the additional dead load of the barrier system.

Released under the Official Information Act 1982

5.4 Qualitative and Cost Evaluation

In order to determine the most suitable system for the scheme a matrix of the factors considered as part of the selection criteria.

	Option A Vertical	Option B Horizontal
Aesthetics	Significant Impact to roadway user restricting view of city from on deck but overall the view of the bridge from the city is likely to be impacted.	Very little impact to view from deck and from city looking at structure.
Constructability	Option is installed on top of the existing barrier as previously done. Possible reduction to overall capacity of existing barrier system.	Difficult access and installation using crane and EWP will be required.
Construction Cost	Relatively low construction costs compare to other options as re-using exiting barrier.	Higher construction costs due to difficulty of install. Unless installation can be undertaking from existing gantries.
Maintenance Cost	Panels and post likely to suffer from stone chippings and impact damage over time, easily replaceable due to individual components removeable during night time closures.	System unlikely to be damaged but will build up debris and areas may suffer damage over time. Cost of undertaking maintenance likely to be higher due to difficult access.
Shared Path Clash	This system does not clash with the proposed Shared Path design as shown in section 3.3.	This system is highly likely to clash with the Shared Path design and considerable liaison between the designers would be required.
Installation Time	As all mesh panels are able to be fabricated off-site the time required for installation is reduced on-site.	Installation time will be extensive due to new deck fixings and limited working are using scaffolding system.
Suicide Prevention	This system is identified as being effective to reduce 99% of attempts from the structure.	Concern is raised that due to the limited distance between the deck and the netting this system will not be effective to deter suicide attempts. This system is also less common system so functionality is not clear.
Safety Impact – Road User	There no physical reduction of the outermost lane width, but drivers of large vehicles (buses/trucks) may be encourage to drive further away to prevent clash with wing mirrors.	No impact on road user safety due to location below deck.
Safety Impact – AHB Operational team	Emergency egress from the box girder gantry will be impeded by system. Additional safety measures required.	Emergency egress from the box girder gantry will be impeded by system. Additional safety measures required.

Form the qualitative analysis above of the factors effecting the selection of the most appropriate system it is clear that vertical system has less areas of concern, however it is clear that the horizontal will have less impact on the network in terms of aesthetics and installation.

Released under the Official Information Act 1982

The cost breakdown below is a high-level consideration of the elements based on previous work undertaken and some initial engagement with contractors and suppliers, further quotation will be required for budgeting purposes.

	Option A Vertical	Option B Horizontal
Non-Construction		
Design Costs	$ 100,000	$ 125,000
Design Verification	$ 10,000	$ 12,000
Safety in design & approval meetings	$ 10,000	$ 10,000
Iwi & Urban Liaison	$ 15,000	$ 5,000
Surveying	$ 35,000	$ 200,000
Contingency circa 15%	$ 25,000	$ 53,000
Construction		
Closures and TM Costs including communications	$ 120,000	$ 60,000
Steelwork	$ 8,000,000	$ 15,000,000
Scaffolding system/EWP	$ 100,000	$ 2,500,000
Manual Labour Costs & Installation Process & Plant	$ 1,500,000	$ 2,800,000
Painting System to existing elements following install	$ 200,000	$ -
Contingency circa 25%	$ 2,500,000	$ 5,200,000
Total	**$ 12,840,000**	**$ 26,360,000**

The costs developed here again suggest that the vertical option will be less costly overall but due to all the work being required to be undertaken from the deck there are significantly more closures required which could have knock on economic costs which are not discussed here.

5.4.1 Recommendation

Based on the above evaluation tables of qualitative factors and cost it is the recommendation of this report that installation of the vertical system on the existing barrier would be the most cost-effective solution, that is an effective suicide prevention system for the Auckland Harbour Bridge. However, before taking this design further additional investigation is recommended to be undertaken.

The further investigation recommended above are critical decision points and are needed to prevent the outcome of the scheme from having severely negative impacts on AHB including:

- amount of shy effect reduction decreasing safety levels for road users;
- reduction of barrier containment level due increased barrier height; and
- detailed review of barrier design to understand full impact of dead load and additional wind load on existing structure.

Released under the Official Information Act 1982

APPENDIX A. PHOTOGRAPHS

A selection of the photographs of the Auckland Harbour Bridge to give a picture of the elements discussed in this document are included in this Appendix:

Released under the Official Information Act 1982

1. Main Span – west elevation

2. View of underside of extension construction

Released under the Official Information Act 1982

3. Existing low-level barrier along majority of structure

4.Exising barrier to south of Auckland harbour Bridge

Released under the Official Information Act 1982

APPENDIX B. GLOBAL EXAMPLES

Bloor Viaduct Vertical barrier system

Bloor Viaduct Vertical barrier system

Released under the Official Information Act 1982

Golden Gate Bridge horizontal barrier system

Golden Gate Bridge horizontal barrier system

Released under the Official Information Act 1982

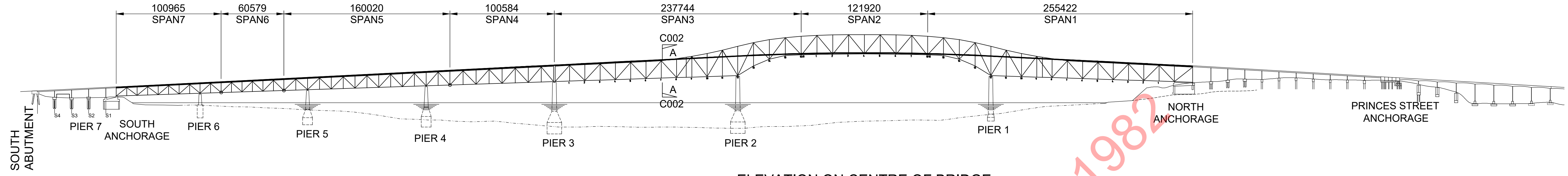
West Gate Bridge outward raking barrier system

West Gate Bridge outward raking barrier system

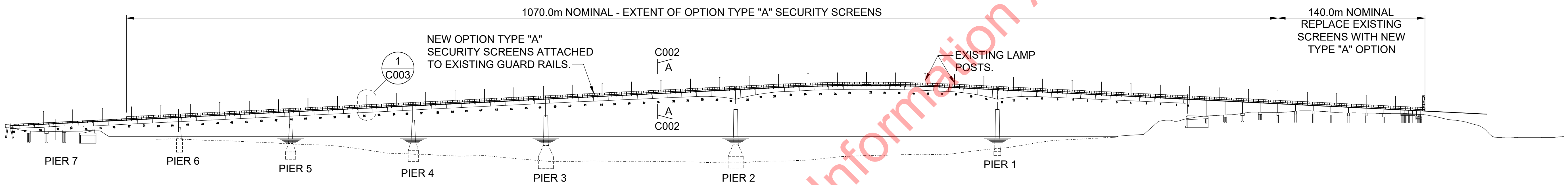
Released under the Official Information Act 1982

APPENDIX C. DRAWINGS

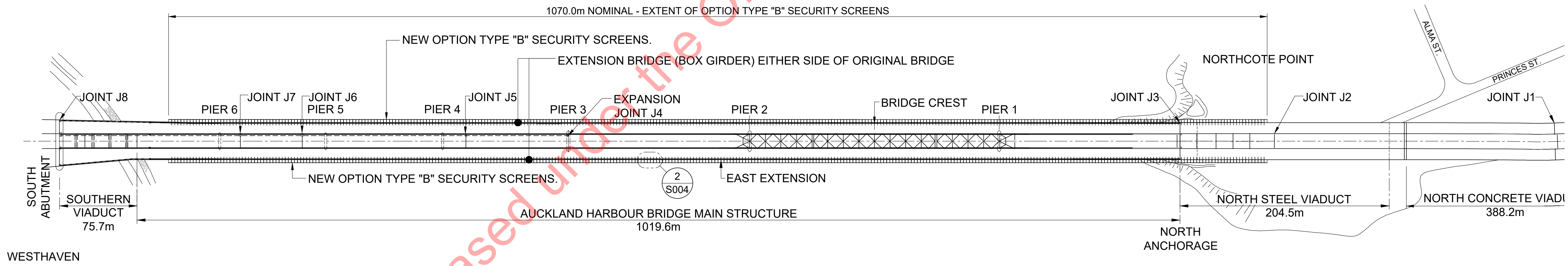
Released under the Official Information Act 1982



ELEVATION ON CENTRE OF BRIDGE
SCALE 1:2000 @ A1



ELEVATION ON EAST BOX OUTER WEB
WESTERN BOX SIMILAR
SCALE 1:2000 @ A1



BRIDGE PLAN VIEW
SCALE 1:2000 @ A1

Released under the Official Information Act 1982

PRELIMINARY

Revision	Amendment	Approved	Revision Date
1	ISSUED FOR DISCUSSION	C.W.	16.04.19

NZ TRANSPORT AGENCY WAKA KOTAHI
Auckland Harbour Bridge
Part of Auckland Motorways

wsp OPUS
Auckland Office
+ 64 9 355 9500
P O Box 5848
Auckland 1141
New Zealand

Designed by.	Approved by.	Approved Date
C. WICKHAM	D. ASHBY	16.04.2019
Drawn by.	**Scales**	
N. METCALFE	AS SHOWN	

Project
AUCKLAND HARBOUR BRIDGE
PROPOSED SECURITY SCREENS
OPTIONS A AND B

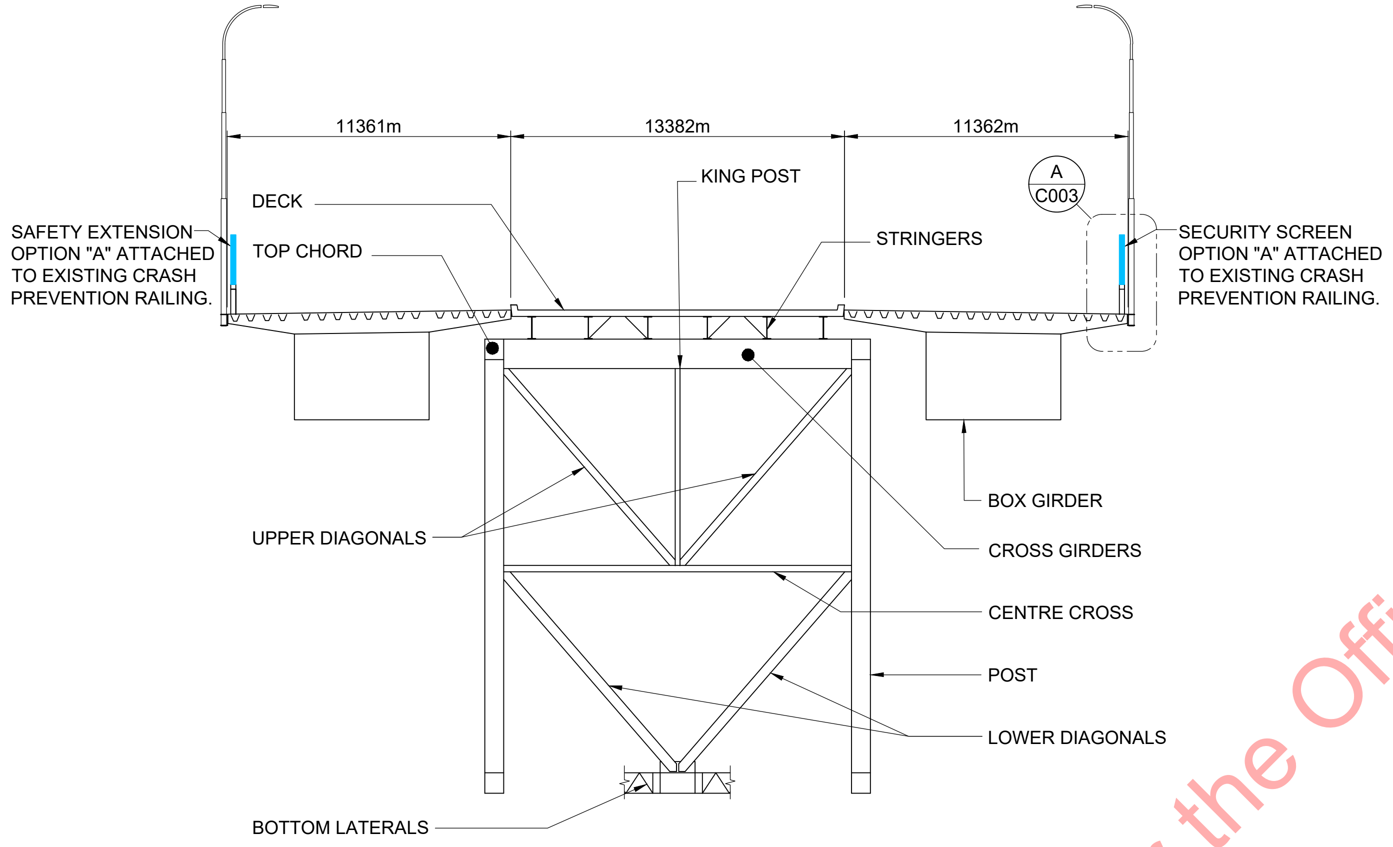
Sheet
GENERAL ARRANGEMENT

Project No.	DIPS No.	Sheet. No.	Revision
1-T0001.19	1/72/148/7104	C001	1

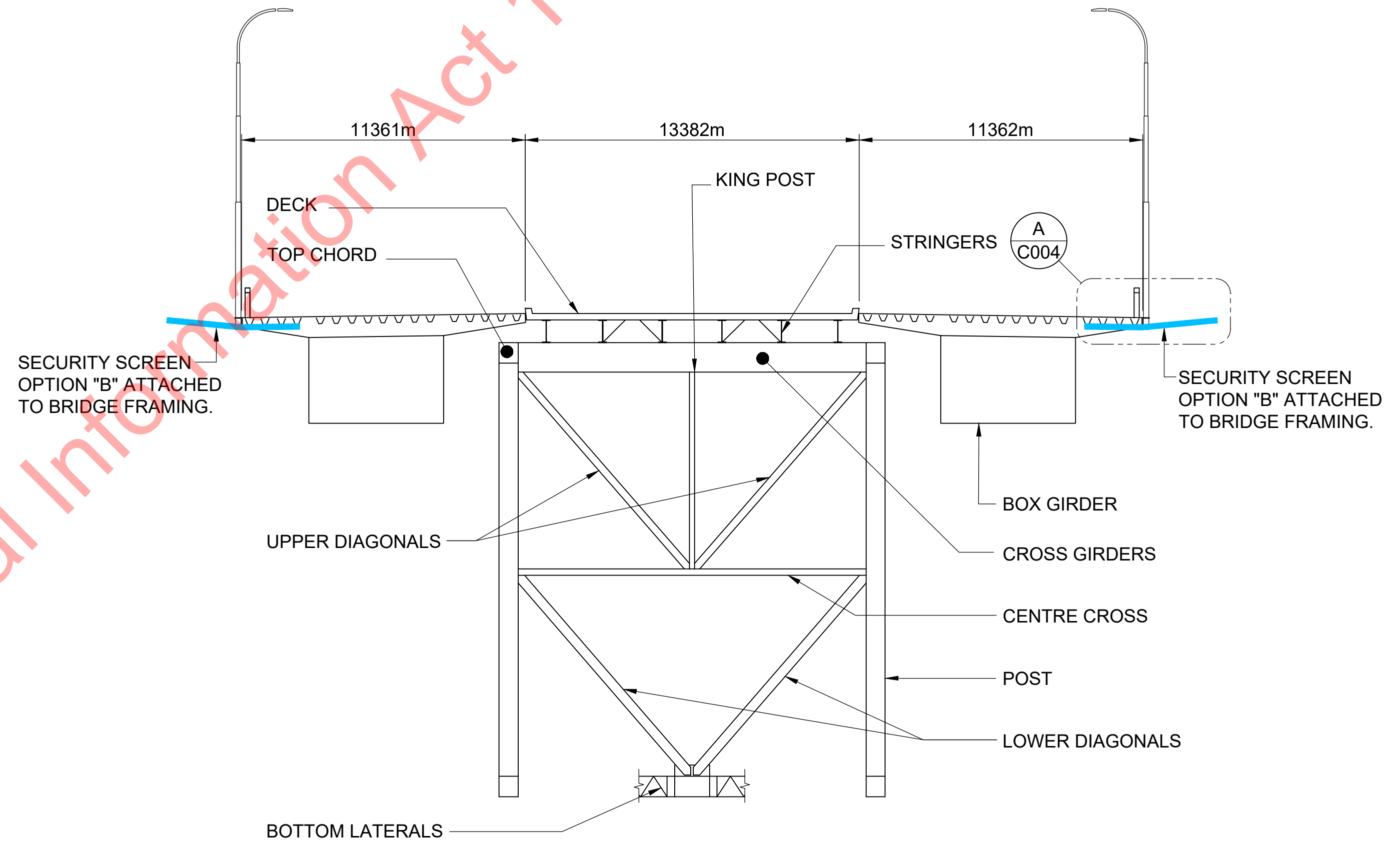
Original Sheet Size A1 [841x594]

Cad File:- U:\WSPOpusNZ\AU\civ_drawings_g\Struct_bldgs\Projects\AutoCAD\1-T0001.19 AMA AHB Security Screens\Struct\1-72-148-7104_C001_C006.dwg - Tab:- C001(1)

Plot Date 16.04.2019 - 10:59:59 am



SECTION A C001
OPTION "A" - 1:150



SECTION A C001
OPTION "B" - 1:150

Released under the Official Information Act 1982

PRELIMINARY

Revision	Amendment	Approved	Revision Date
1	ISSUED FOR DISCUSSION	C.W.	16.04.19

NZ TRANSPORT AGENCY WAKA KOTAHI
Auckland Harbour Bridge
Part of Auckland Motorways

WSP | OPUS
Auckland Office
+ 64 9 355 9500
P O Box 5848
Auckland 1141
New Zealand

Designed by.	Approved by.	Approved Date
C. WICKHAM	D. ASHBY	16.04.2019
Drawn by.	Scales	
N. METCALFE	1:150 (A1) 1:300(A3)	

Project
AUCKLAND HARBOUR BRIDGE
PROPOSED SECURITY SCREENS
OPTIONS A AND B

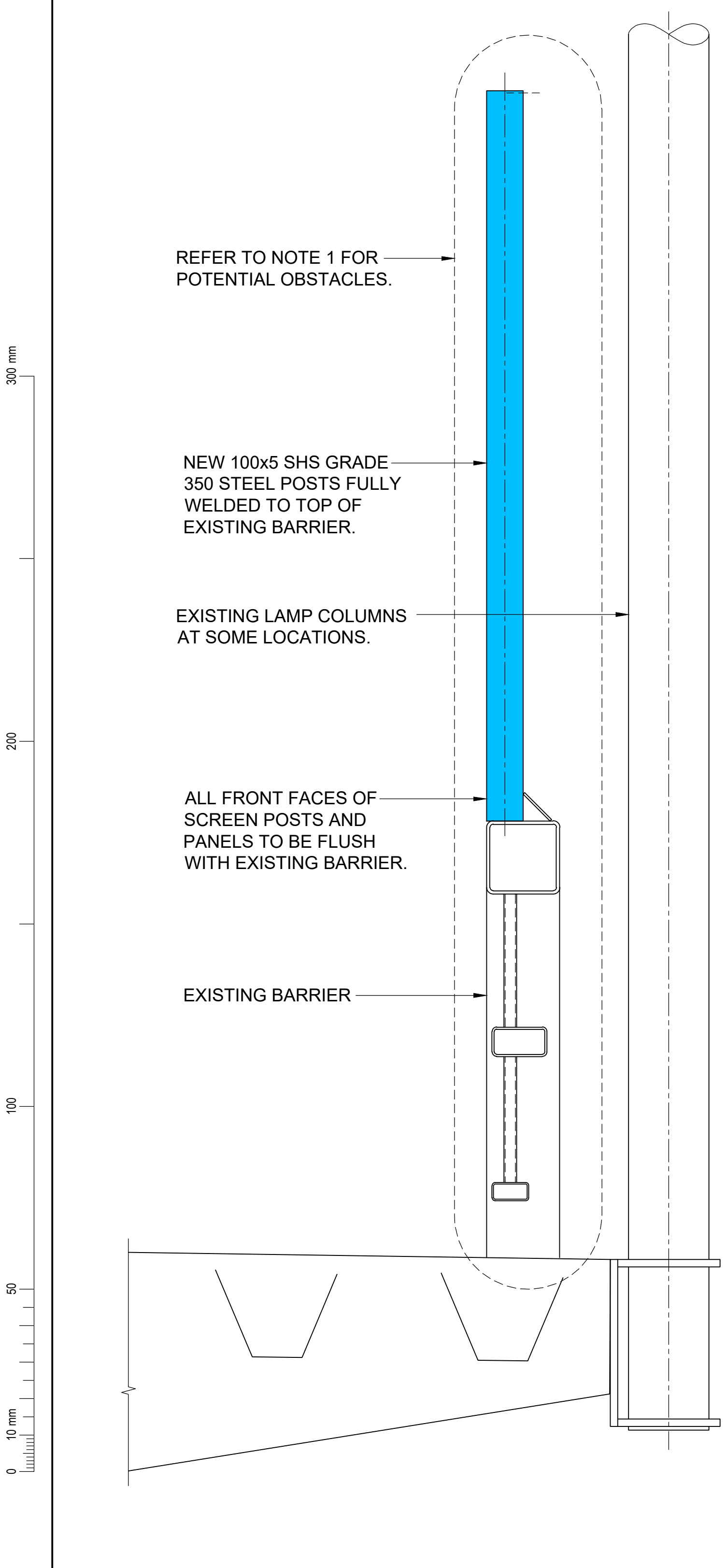
Sheet
CROSS SECTIONS SHOWING SECURITY SCREENS
DISPLAYING OPTIONS TYPES "A" AND "B"

Project No.	DIPS No.	Sheet. No.	Revision
1-T0001.19	1/72/148/7104	C002	1

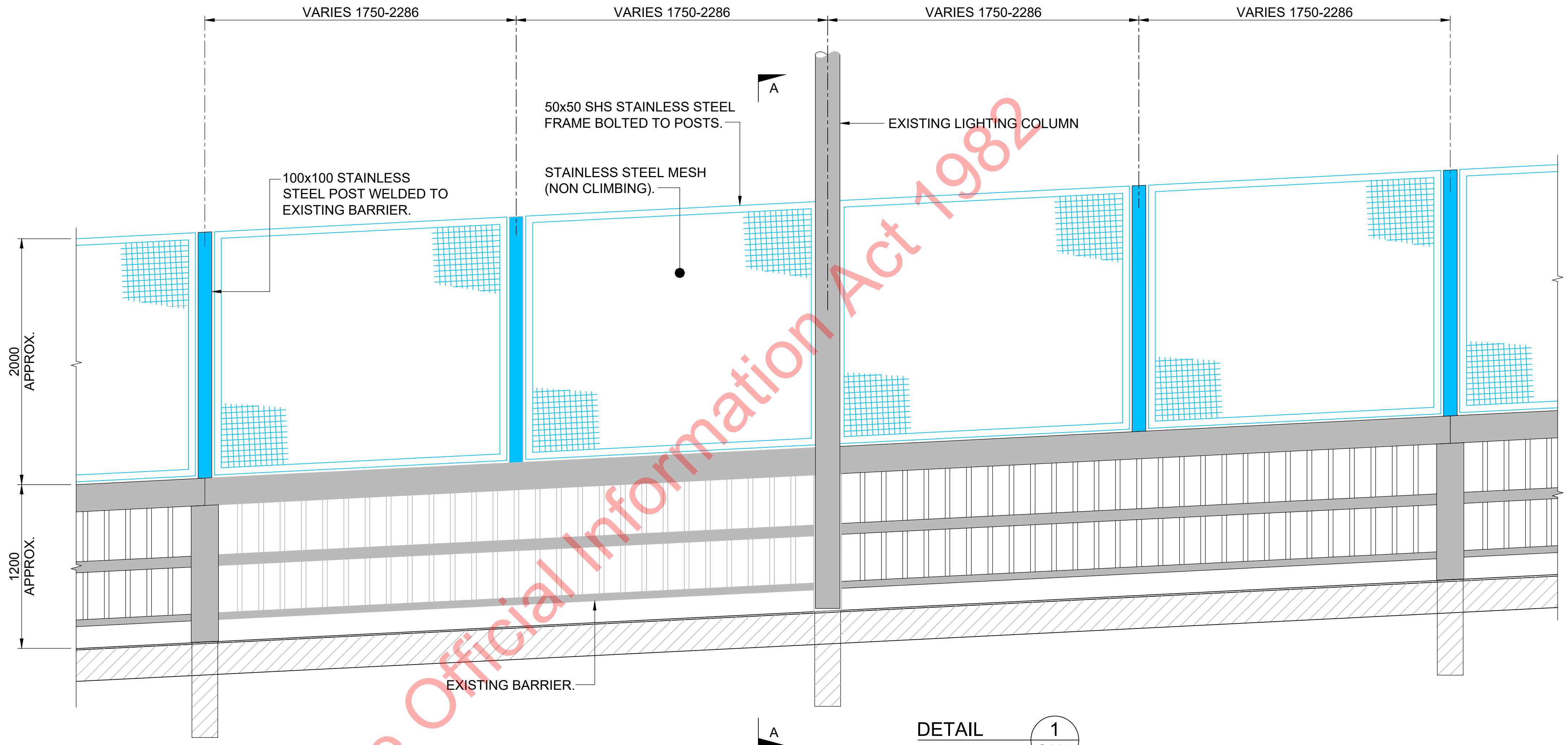
Original Sheet Size A1 [841x594]

Cad File:- U:\WSPOpusNZ\AU\civ_drawings_g\Struct_bldgs\Projects\AutoCAD\1-T0001.19 AMA AHB Security Screens\Struct\1-72-148-7104_C001_C006.dwg - Tab:- C002(1)

Plot Date 16.04.2019 - 11:00:57 am



SECTION A
1:10(A1) 1:20(A3) -



DETAIL 1
1:20(A1) 1:40(A3) C001

Released under the Official Information Act 1982

NOTES:

1. SCREEN SUPPORT POSTS TO BE VERTICAL IN ALL DIRECTIONS.
2. POTENTIAL OBSTACLES THAT MAY CLASH WITH NEW SCREENS ARE:
   * ACCESS LADDERS TO OVERHEAD SIGN GANTRIES.
   * SMALL TRAFFIC SIGN PANELS.
   * RESCUE MARKER BUOYS.
   * LIGHTING COLUMNS.
   * EXISTING DEBRIS SCREENS.

PRELIMINARY

Revision	Amendment	Approved	Revision Date
1	ISSUED FOR DISCUSSION	C.W.	16.04.19

NZ TRANSPORT AGENCY WAKA KOTAHI
Auckland Harbour Bridge
Part of Auckland Motorways

WSP OPUS
Auckland Office
+ 64 9 355 9500
P O Box 5848
Auckland 1141
New Zealand

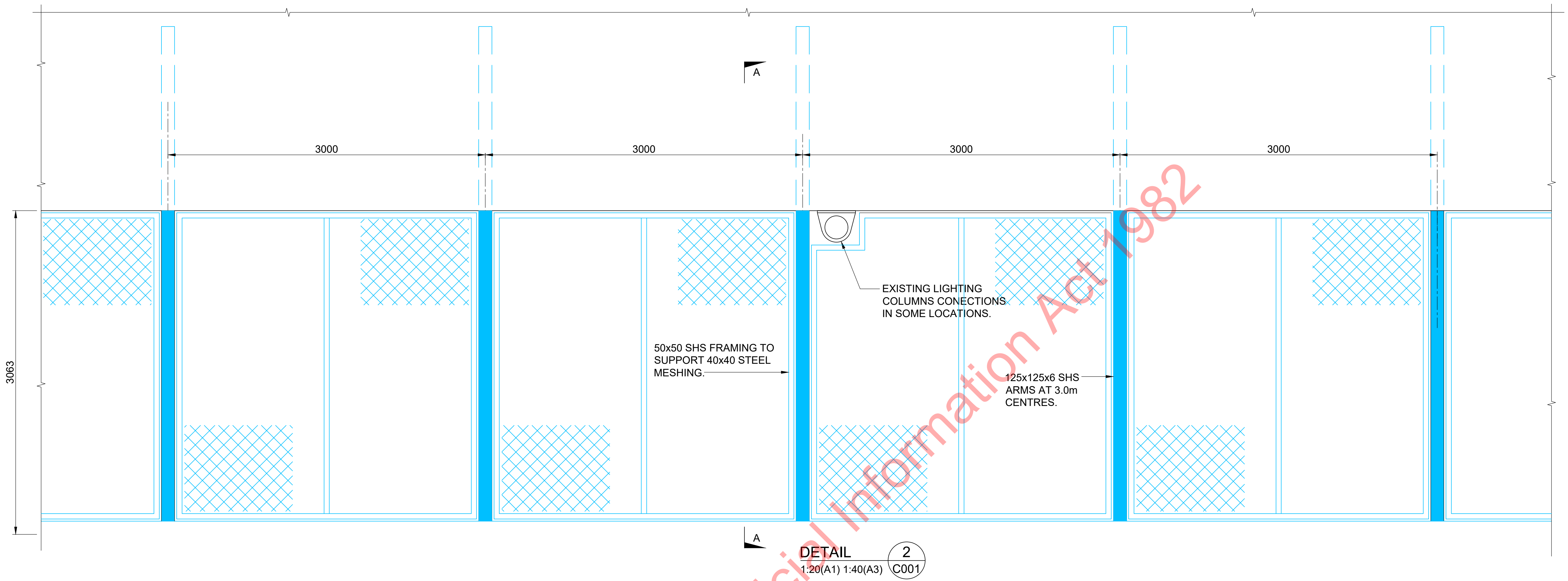
Designed by.	Approved by.	Approved Date
C. WICKHAM	D. ASHBY	16.04.2019

Drawn by.	Scales
N. METCALFE	1:20 (A1) 1:40(A3)

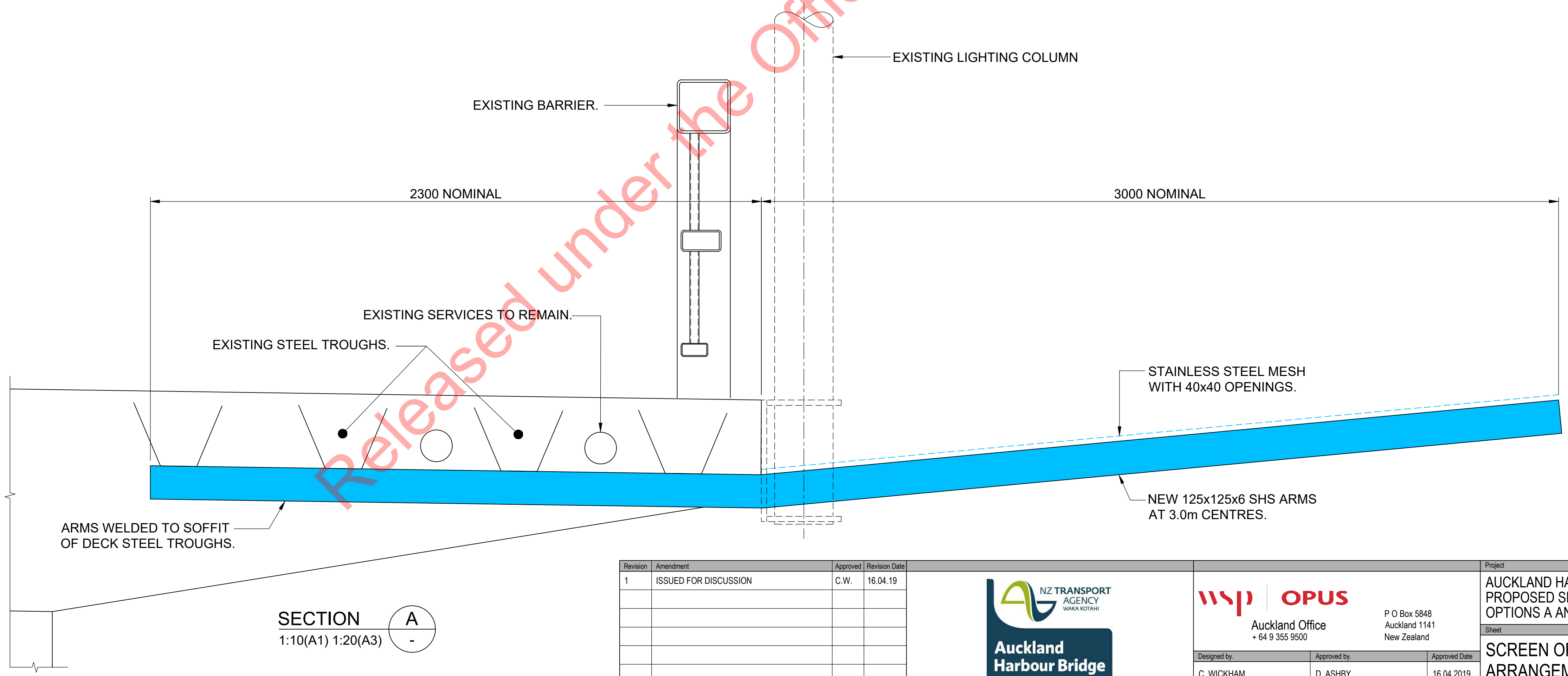
Project: AUCKLAND HARBOUR BRIDGE PROPOSED SECURITY SCREENS OPTIONS A AND B

Sheet: SCREEN - OPTION A ARRANGEMENT

Project No.	DIPS No.	Sheet. No.	Revision
1-T0001.19	1/72/148/7104	C003	1



DETAIL 2 / C001
1:20(A1) 1:40(A3)



SECTION A / -
1:10(A1) 1:20(A3)

Released under the Official Information Act 1982

PRELIMINARY

Revision	Amendment	Approved	Revision Date
1	ISSUED FOR DISCUSSION	C.W.	16.04.19

NZ TRANSPORT AGENCY WAKA KOTAHI
Auckland Harbour Bridge
Part of Auckland Motorways

WSP OPUS
Auckland Office
+ 64 9 355 9500
P O Box 5848
Auckland 1141
New Zealand

Designed by.	Approved by.	Approved Date
C. WICKHAM	D. ASHBY	16.04.2019

Drawn by.	Scales
N. METCALFE	1:10 (A1) 1:20(A3)

Project
AUCKLAND HARBOUR BRIDGE
PROPOSED SECURITY SCREENS
OPTIONS A AND B

Sheet
SCREEN OPTION "B"
ARRANGEMENTS

Project No.	DIPS No.	Sheet. No.	Revision
1-T0001.19	1/72/148/7104	C004	1