JOHNSTON BRIDGE DECK REPLACEMENT

INFORMATION FOR ALTERNATIVE APPROVAL
ELECTORS' PROCESS (Borrowing $1.5 million)

(1) Official notice with elector response requirements and deadline

(2) Loan authorization bylaw 1591 as of third reading

(3) Taxation breakdown by property class for twelve year pay-out
NOTE: Property owner of house assessed at $100,000 would pay $8.40 per year for 12 years

(4) Copy of Sandwell Engineering bridge inspection report and cost estimates - Bylaw increased to $1.5 million to provide for any increase in steel costs in past year

QUESTIONS ON THIS PACKAGE COVERING THE:
- Elector process on opposing this loan to Maureen Murray, Deputy Clerk of City of Quesnel - 992-2111
- Information on actual Bridge construction work to Jack Marsh, Director of Public Works of City of Quesnel - 992-2111

VALID CITY ELECTORS WISHING TO OPPOSE THIS LOAN AUTHORIZATION MUST OBTAIN AND COMPLETE AN "Elector Response Form" FOR DELIVERY TO CITY HALL PRIOR TO 1 P.M. ON THURSDAY, SEPTEMBER 29, 2005.

CITY ELECTORS WHO ARE IN FAVOUR OF THIS LOAN AUTHORIZATION NEED SIGN NOTHING AT THIS TIME.

CITY OF QUESNEL

NOTICE OF ELECTOR ALTERNATIVE APPROVAL PROCESS
to the City's replacement of the Johnston Bridge deck under a
Loan Authorization Bylaw and to borrow a maximum of
One and a half million ($1,500,000) dollars through Municipal Finance Authority debentures

NOTICE is hereby given, pursuant to Sections 86 and 179 of the Community Charter, that the Council of the City of Quesnel wishes to borrow up to a maximum amount of One and a half million ($1,500,000) dollars for the funds required to replace the Johnston Bridge deck, including the cost of the steel.

City Council, on July 25, 2005, gave three readings to "Johnston Bridge Loan Authorization Bylaw No. 1591 of 2005" proposing to borrow by way of debentures a sum not exceeding $1,500,000 repayable not later than twelve (12) years from the date of issue of such debentures. A report from Sandwell Engineering was prepared along with schedules on costs to taxpayers for such debt, and copies are available for inspection at City Hall during regular business hours or on our website www.city.quesnel.bc.ca under "What's New" and "Reports". Annual debenture payments are estimated to be a maximum of $161,000 over the twelve year proposed term.

Elector response forms for this alternative approval process, as established by the local government, are available to the public at the Municipal Hall (410 Kinchant Street, Quesnel) or on the City website. Qualified electors who are in favour of this construction/loan do not have to sign any documents at this time. The area to which this approval process applies is the entirety of the City of Quesnel and thus the only Quesnel area residents who can sign such elector response forms opposing the purchase/loan are those who:

a) are Canadian citizens, and
b) are 18 years of age or older, and
c) have been a resident **within the City of Quesnel** boundaries for more than 30 days, and
d) a resident of the Province of British Columbia for more than six months.

A person not a resident within the City limits, BUT who owns property within the City in his/her individual name may be able to sign such elector response form, but should check with the Deputy City Clerk that he/she meets all requirements to be a non-resident property elector, prior to signing an elector response form.

UNLESS A MINIMUM OF TEN (10%) PERCENT OF THE CITY ELECTORS SIGN AND SUBMIT AN ELECTOR RESPONSE FORM TO CITY HALL, 410 Kinchant Street, Quesnel B.C. V2J 7J5 **PETITIONING CITY COUNCIL *NOT* TO PROCEED without obtaining the assent of the electors,** City Council may adopt this Loan Authorization Bylaw without further notice. **The deadline for receipt of the signed elector response forms at Quesnel City Hall is 1:00 P.M. ON SEPTEMBER 29, 2005. The City's 2005 Adjusted List of Electors totalled 5798 voters after the February 19, 2005 referendum, and thus 10% of the City Electors is considered to be 579 voters for the purpose of this approval process.**

Any questions on the above should be directed to the undersigned at 992-2111 between 8:30 a.m. and 4:30 p.m., Mondays to Fridays inclusive, except statutory holidays.

Dated at Quesnel, B.C. this 21st day of August, 2005 as the first of two publications of this notice.

MAUREEN MURRAY,
DEPUTY MUNICIPAL CLERK

BYLAW NO. 1591

CITY OF QUESNEL

A bylaw to authorize the borrowing for the replacement of the Johnston Bridge deck

WHEREAS the deck on the Johnston Bridge requires complete replacement in order to extend the life of this Bridge and handle the heavy truck traffic using same - at an estimated cost of $1.5 million;

AND WHEREAS this Bylaw intends to create a debt of $1.5 million to cover the City's costs of this project;

AND WHEREAS pursuant to Section 179 and 180 of the Community Charter, the assent of the electors is required prior to the authorization of these loans, and such approval was obtained, pursuant to Section 86 of the Community Charter, through the alternative approval process as authorized by Council;

NOW THEREFORE the Council of the City of Quesnel in open meeting assembled enacts as follows:

1. The Council is hereby empowered and authorized to undertake and carry out or cause to be carried out, the replacement of the Johnston Bridge deck and to do all things necessary in connection therewith and without limiting the generality of the foregoing, to borrow upon the credit of the City a sum not exceeding One Million, Five Hundred Thousand ($1,500,000) dollars to cover the total construction and engineering costs for same.

2. The Council of the City, through the Mayor and Corporate Administrator, are further empowered and authorized to complete such documents and to do all things necessary in connection with such borrowing.

3. The estimated life expectancy of the Johnston Bridge deck is approximately twelve (12) years, and accordingly, the maximum term for which debentures may be issued to secure the capital debt created by this Bylaw is twelve (12) years.

4. Reports with respect to this project is available on request, to the public and will be maintained with the records of this Bylaw.

5. This bylaw may be cited as “Johnston Bridge Loan Authorization Bylaw No. 1591 of 2005”.

READ A FIRST TIME this 25th day of July, 2005

READ A SECOND TIME this 25th day of July, 2005

READ A THIRD TIME this 25th day of July, 2005

RECEIVED the approval of the Inspector of Municipalities this 12th day of August, 2005.

NOTICE OF ALTERNATIVE APPROVAL PROCESS placed in the 21st and 28th of August issues of the Quesnel Cariboo Observer and the August 24th issue of the Quesnel Advisor.

FINALLY ADOPTED this day of 2005

_____
MAYOR

_____
CORPORATE ADMINISTRATOR

CERTIFIED A TRUE COPY OF BYLAW NO. 1591 AS AT THIRD READING GIVEN BY COUNCIL ON THE 25TH DAY OF JULY, 2005

_____
Maureen Murray, Deputy Clerk
CITY OF QUESNEL

Name of Muncipalitiy

Bylaw	1591, 2005		
Project	Johnston Bridge		
Base Principal		Usually zero (amount of prepaid capital)	
Capitalization Rate	4.00%	*changed in 2005 from 5.0%*	
Payment Periods	12		
Cost of Project	1,500,000	Future Value	
MFA Reserve Requirement		"Yes" or "No"	2.00%
Gross Project Cost	1,500,000		
% Borne by taxpayers	34.62%		
Cap Cost for taxpayers	1,500,000	Cost of the Project borne by tax payers	
Interest Rate	4.10%		
Annual Interest Expense	61,500		
Annual Principal Payment	99,828	161,328	**Total Annual Payment**

Assessed Property + Improvements - Based on 2005 Revised Assessment

Class	Assessment	# Properties	Average Property Cost	2005 Municipal Tax Rate
	A	B	C=B/A	D
1) Residential	326,791,273	3,904	83,707	5.29197
2) Utilities	5,066,116	17	298,007	39.20322
3) U-Mng Forest			-	
4) Major Industry	133,738,600	43	3,110,200	49.66370
5) Light Industry	4,802,600	12	400,217	26.81550
6) Business	119,989,850	444	270,247	12.23243
7) Mng Forest			-	
8) Rec (non-profit)	81,300	2	40,650	11.61178
9) Farm	183,600	13	14,123	5.29197
Total	590,653,339	4,435	4,217,151	150.1106

Tax Per Average Residential Property

The Property tax is equal to 7.03 *for an average residential property of* 83,707

or *$0.0840* *per $1000*

Sandwell

City of Quesnel
Quesnel, BC

Johnston Bridge Inspection

Portion **Final Report**

23 April, 2004
142751

Prepared By: _____ 23 April 2004
C.P. Tang, P.Eng., Project Engineer

Reviewed By: _____ 23 April, 2004
Gordon A. Lang., P.Eng., Vice President, Operations

Sandwell

Table of Contents

City of Quesnel
Quesnel, BC
Johnston Bridge Inspection

Bridge Rehabilitation Final Report

142751, 23 April, 2004

1 Introduction

This report is a follow up report on the overview inspection of Johnston Bridge conducted in June 2003 by Sandwell Engineering Inc. (Sandwell). The objective of this report is to review the maintenance and corrosion condition of Johnston Bridge and to recommend remedial measures with cost estimates.

Johnston Bridge is a 4-span steel plate girder bridge crossing the Quesnel River, connecting Front Street and Johnston Avenue, in the City of Quesnel. The bridge provides a northbound lane, a southbound lane and a sidewalk on the upstream side. A duct bank runs underneath the northbound lane with other utility pipes running along the downstream side of the bridge.

Sandwell was engaged to carry out an overview inspection of Johnston Bridge in June 2003. In the 2003 inspection, the plate girders and floor beams of the bridge were found to be in fair condition and pose no threat on the safety of the bridge. However, a number of the stringers have been corroded to such a state that they need to be replaced. These findings on the general condition of the bridge were submitted in a report to the City of Quesnel in July 2003.

A more detailed inspection was carried out by C. P. Tang of Sandwell Engineering Inc. on the 10th and 11th of March 2004 to assess the extent of corrosion on the stringers.

2 Description of Bridge

The current Johnston Bridge is a steel plate girder bridge commissioned in July 1974 which replaced an old timber truss bridge. The timber piles and cast-in-place concrete substructure of the old timber truss bridge have been retained in the current structure.

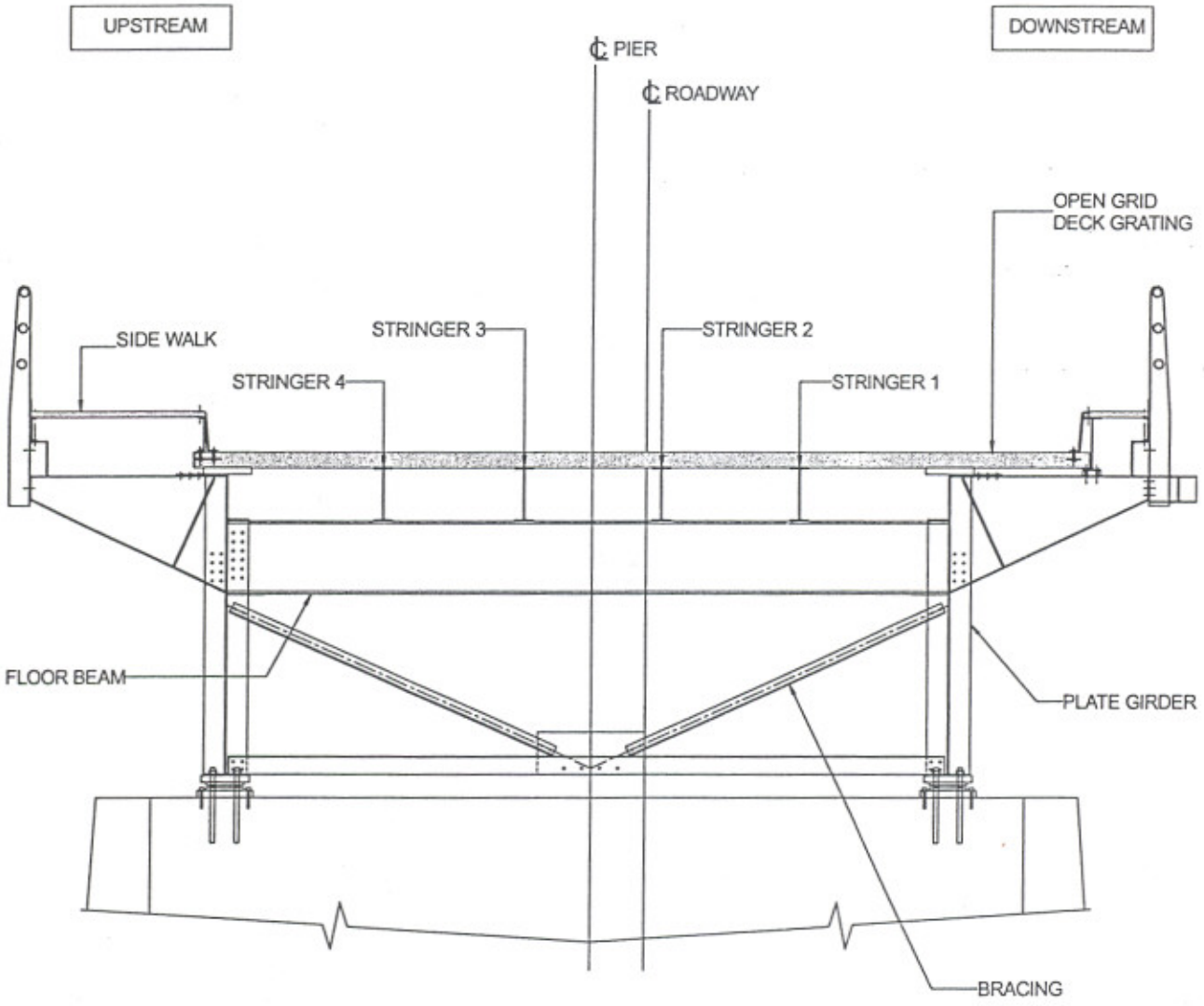
The bridge superstructure consists of two parallel steel plate girders simply supported on the South Abutment, three intermediate concrete piers and the North Abutment. The bridge deck is an open grid steel grating supported on longitudinal stringers. The longitudinal stringers are supported by transverse floor beams spanning between the two plate girders. Lateral stability of the bridge is provided by plan braces and diaphragms between the plate girders.

The steel bridge was designed by Willis, Cunliffe, Tait & Company Ltd. (WCTC) in 1972. Note No. 6 on drawing W1555-1-1 states *"Structural steel to be to CSA G40.11-1969 grade B except that handrail posts to be to CSA G40.12-1971 and handrail rails to be to CSA G40.16 or G40.17-1969."* Note No. 7 states *"Structural grid deck to be Armco welded bridge deck or equal, using CSA G40.11 grade A material."*

CSA G40.11-1969 covers two grades (A and B) of high strength low-alloy structural steel where saving in weight and increased durability are important. The long-term atmospheric corrosion resistance of these grades of steel is at least four times that of carbon structural steel without copper. These grades of steel are commonly known as weathering steel. A discussion on the corrosion of weathering steel in bridge construction is presented in Section 7 of this report.

It is mentioned in the report prepared by Stanley Associates Engineering Ltd. in 1994 that the bridge deck was replaced in 1990. Another report prepared by Sargent & Vaughan Engineering in 2001 indicates the current deck is an IKG Greulich 5 inch RB Open Grid Deck.

A typical cross section of the bridge is shown below.



TYPICAL SECTION

8 Conclusions

Summing up our current observations and recommendations from previous reports, we draw the following conclusions:

1. Corrosion of Johnston Bridge is due to deposit attack. Deposit comes from debris drop through the open grid deck onto the steel members. This deposit contains chloride and retains moisture. The deposit keeps the steel surface constantly wet, creating an environment in which weathering steel can corrode in a similar manner as carbon steel. The presence of chloride in the deposit accelerates corrosion.

2. Since the primary cause of corrosion is by deposit of salt-laden debris, to prevent deposit corrosion, the most effective way is to stop material deposit. A concrete deck is very efficient in stopping material deposit on the stringers and girders. To replace the current open grid deck with a concrete deck is the ideal solution. Unfortunately, as the current bridge is built on the old substructure, we have doubts about its integrity and capacity to support a concrete deck. It appeared that WCTC did consider the option of a concrete deck when they designed the current steel bridge to replace the old timber truss bridge but this option was ruled out. It has also been reported that Pier 3 had some movement after the erection of the steel bridge and Pier 1 had been repaired because of scouring. We do not recommend taking the risk of considerable load increase on the existing foundation. Failure of the foundation either in strength or settlement means complete loss of use of the bridge.

3. According to Stantec's reports, washing and inspection appears to considerably reduce the corrosion in the majority of the bridge. As stated in Santec's 2000 report, "*In general, the superstructure has not exhibited significant additional corrosion since the 1997 inspections. Other than the perforations of the stringer webs, there was not a significant difference from the 1994 inspection.*" The element that still undergoes excessive corrosion is the stringer. The worst location is the stringer web at floor beam support.

9 Recommendations

With regard to the damaged elements of the bridge, we recommend the following:

1. According to Stantec's 1998 load rating assessment and Stargent's review, the existing deck grating is over-stressed. Therefore, we would recommend replacing the existing grating with an appropriate bridge deck grating.

2. Since the bridge deck grating is welded on to the stringer, we would also recommend replacing the stringers at the same time. More than 40% of the stringers have lost more than 10% of their flange thickness in corrosion. Twenty three stringers have perforated webs and/or stiffeners. Five stringers have webs perforated beyond the flange of the floor beam. The addition of stiffeners is only a short-term temporary measure because the added stiffener will further trap deposit and accelerate the corrosion of the stringer.

With regard to corrosion protection, we would recommend the following:

1. Since it is not feasible to rehabilitate the bridge foundations economically, and completely replacing the open grid deck with a concrete deck is not possible, a strip of the open grid deck above the floor beam can be filled with polymer concrete as shown below. This can prevent debris accumulating on top of the floor beam and being trapped in the dead space of the stringer bounded by the stringer web and stiffener.

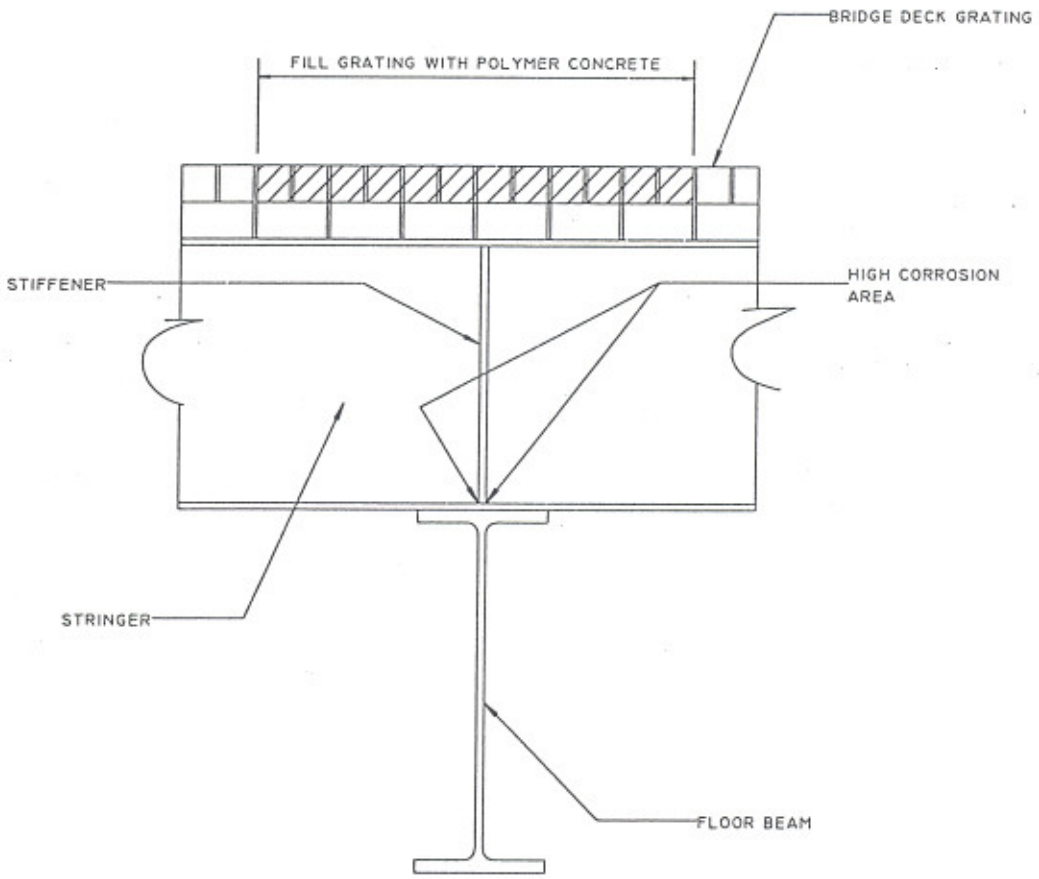


FIGURE 9.1 SHIELD THE STRING AND FLOOR BEAM FROM DEPOSIT BY FILLING A STRIP OF GRATING ABOVE THE FLOOR BEAM

2. Coat the replacement stringers with at least one coat of zinc rich primer that can protect the stringers from corrosion for 15 to 20 years.

3. Apart from using de-icing chemicals without chloride, the most economical solution to prevent corrosion is to regularly clean out the debris and wash the bridge. As summarized in Stantec's 2000 inspection report: "*Other than the perforations of the stringer webs, there was not a significant difference from the 1994 inspection.*" Washing of the bridge is very effective in reducing the corrosion of the bridge. We recommend scheduled inspection and washing the bridge at least once a year. To thoroughly wash

the underside of the bridge and facilitate inspection, a permanent aluminium or glass fiber reinforced polymer walkway can be constructed along the downstream side of the bridge. There is already a duct bank on the upstream side of the bridge.

4. We do not recommend installing deflector plates to the plate girder. The deflector plate itself will become a maintenance item. As mentioned in Sargent's report, welding of deflector plate can cause a fatigue problem and bolting of the deflector plate to the web of the girder will create another possible corrosion problem. Unless all gaps are properly sealed, capillary action can penetrate the faying surface and cause crevice corrosion. This type of corrosion have been reported by the Department of Transportation of Michigan State on their weathering steel girder webs that have road signs bolted on to the girders. For weathering steel, the best way is to leave it open to the atmosphere to undergo the cycles of wet and dry to form the protective oxide film. Washing the girders is more effective than using a deflector plate.

5. Although the bridge is in no imminent danger of collapse, it is recommended that the stringer replacement be undertaken as soon as possible to avoid potential local failures.

US Federal Highway Authority Technical Advisory T 5140.22 Uncoated Weathering Steel in Structures states *"Maintenance Action - effective inspection and maintenance programs are essential to ensure that all bridges reach their intended service life. This is especially true in the case of uncoated weathering steel bridges."* Further the Advisory further states *"Remove dirt, debris and other deposits that hold moisture and maintain a wet surface condition on the steel. In some situations, hosing down a bridge to remove debris and contaminants may be practical and effective. Some agencies have a regularly scheduled program to hose down their bridges."*

10 Estimated Costs

A preliminary estimate of probable costs has been prepared for the stringer replacement. At this time the cost for an access walkway has not been included as this is less essential than the structural issues. Also please note that at present, the cost of steel is increasing rapidly and therefore the costs are subject to change. The costs are presented in the table following.

Item	Quantity	Cost
Site set up and clean up	Sum	$5,000
Demolish and disposal of existing deck and stringers	Sum	$10,000
Replace existing welded bar grating	1,160m2	$760,000
Replace existing W460 x 61 stringer	38,700kg	$160,000
Coat new stringer with protective coating	1,050 m2	$45,500
Partial fill grating with polymer concrete	10m3	$15,000
Traffic management during bridge closure	Item	$12,000
Sub Total		**$1,007,500**
Design engineering (5%)	Item	$50,000
Site visits and inspection	Item	$10,000
Total		**$1,067,500**
20% Contingency	Item	$213,500
GRAND TOTAL		**$1,281,000**

11 References

1. Technical Advisory (T 5140.22 - 1989) Uncoated Weathering Steel in Structures, U S Department of Transportation Federal Highway Administration

2. Ronald D Medlock et al (2000) Performance of Weathering Steel in TxDOT Bridges, American Iron and Steel Institution

3. D G Manning et al (1984) Accelerated Corrosion in Weathering Steel Bridges - An Update, Ontario Ministry of Transportation and Communications

4. Performance of Weathering Steel in Highway Bridges: A Third Phase Report, American Iron and Steel Institution

5. National Cooperative Highway Research Program 136, Protective Coatings for Bridge Steel, Transportation Research Board, National Research Council

ELECTOR RESPONSE FORM OPPOSING THE CITY OF QUESNEL BORROWING OF A MAXIMUM OF $1.5 MILLION TO REPLACE THE DECK ON THE JOHNSTON BRIDGE

I SIGN THIS FORM CERTIFYING THAT I:

a) **Am a Canadian citizen and am 18 years of age or older, and resident with the City of Quesnel boundaries for more than 30 days (or a verified non-resident property elector), and in the Province of British Columbia for more than six months; and**

b) **Sign this Petition opposing the City of Quesnel's borrowing of a maximum of $1.5 million to replace the deck on the Johnston Bridge; and**

c) **Have not signed another Elector Response Form on this matter during the year 2005.**

QUESNEL LOAN AUTHORIZATION BYLAW NO. 1591 WILL PROCEED IF LESS THAN 579 QUALIFIED ELECTORS (10% of estimated total electors) SIGN THIS ELECTOR RESPONSE FORM OPPOSING THE CITY'S PURCHASE/LOAN. FORMS MUST BE RETURNED TO CITY HALL, 410 KINCHANT, QUESNEL PRIOR TO 1 P.M. ON SEPTEMBER 29, 2005.

ELECTOR'S NAME (Print full name)	**ELECTOR'S RESIDENTIAL ADDRESS (AND in the case of non-resident elector, the City property address which entitles him/her to vote)**	**ELECTOR'S SIGNATURE**