Ministers' Rail Advisory Committee

Evaluation CBNS Sydney Subdivision

Preliminary REVIEW of OPERATING, COSTS, GEOTECHNICAL and INFRASTRUCTURE IMPROVEMENTS RAIL LINE – Subsidized Portion of Sydney subdivision MP 20.0 to 113.8 Nova Scotia

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LIST OF ABBREVIATIONS

CAPEX	Capital Expenditure
CBNS	Cape Breton & Central Nova Scotia Railway
CN	Canadian National
CWR	Continuous Welded Rail
HBDED	Hot Box and Dragging Equipment
G&W	Genesee & Wyoming
MP	Mile Post
OPEX	Operational Expenditure
PSR	Permanent Speed Restriction
SOW	Statement of Work
S/D	Subdivision
THW	Treated Hard Wood
N.S.	Nova Scotia

1. EXECUTIVE SUMMARY

This Executive Summary will provide a brief review of the Consultant's activities, findings and recommendations related to the review of the operating and maintenance costs related to maintaining operations of the Cape Breton & Central Nova Scotia Railway rail line (Point Tupper to Sydney) provided by the Nova Scotia Department of Transportation & Infrastructure Renewal. The track inspection was performed on June 16-17, 2015.

The Project Tasks and Deliverables identified for this project were as follows:

Phase 1 – Operating and Maintenance Costs for Current Rail Line

- Review the current rail users and volumes.
- Review of material made available by Nova Scotia Department of Transportation & Infrastructure Renewal regarding maintenance and repair requirements.
- Final report in detailed PDF and summary presentation format, to be delivered to the working group, and senior officials.

Phase 2 – Review of Geotechnical and Infrastructure Improvements

- Review and assessment of the geotechnical report and infrastructure evaluation of the current rail line provided by the Nova Scotia Department of Transportation & Infrastructure Renewal.
- Work plan and costing to bring the line to either Transport Canada Class 3 or Class 4 track standards.
- Review the infrastructure reports noting limitations to operating double stack container trains.
- Final report in detailed PDF and summary presentation format, to be delivered to the working group, and potentially senior officials.

With respect to meeting the tasks and deliverables presented, CANARAIL was provided with the following information from Mr. Steve Newson, Policy Advisor, Nova Scotia Transportation and Infrastructure Renewal and in addition to this information the CANARAIL representatives performed a hi-rail field track inspection:

- Genesee and Wyoming Submissions Infrastructure Improvement Costs – Sydney Subdivision.

This information consisted of the following:

- CANARAIL SOW Evaluation CBNS Sydney Subdivision
- Tab 1 – Overview
- Tab 2 – Map of Cape Breton and Central Nova Scotia Railway (CBNS)
- Tab 3 – Geotechnical Estimates of September, 16, 2014 and December 3, 2014 – Prepared by Stantec Consulting – Membertou, N.S.
- Tab 4 – Signals and Communications
- Tab 5 – Track Investment
- Tab 6 – Bridges and Culverts – 2014 Bridge Inspection Report - May 2014, prepared by PARSONS
- Tab 7 – Statement of Work

In addition to the above data CANARAIL representatives, in conjunction with two CBNS personnel undertook a two day track inspection with primary focus on the track structure and secondary focus on the geotechnical locations identified in the Stantec report. The inspection was a combination of hi-rail and walking. Field data gathered during the inspection has been summarized in Appendices – A, B, C, and D.

As a follow up to the track inspection CANARAIL representatives were provided with the following data information:

- Copy of the Cape Breton & Central Nova Scotia Railway – TIME TABLE NO. 9 – Effective 0001 Atlantic Standard Tome, February 19, 2012
- Cape Breton & Central Nova Scotia Track Chart

The following is a summary of the conclusions contained in the body of this report.

1.1. SUMMARY OF CONCLUSIONS

Table 1-1: Summary of Conclusions

ITEM	TYPE OF CONCLUSION	DESCRIPTION
PHASE I – OPERATING and MAINTENANCE COSTS for CURRENT RAIL LINE		
1.	**Rail Management**	**Rail Condition – 115 Lb. RE Sydney Steel** The majority of rail on this line was installed circa 1975 / 1976. The rail is a mix of CWR and Jointed, ratio estimated at 65 / 35 CWR vs. Jointed. The rail surface condition is good. There are a few locations where the base of the rail is showing signs of aggressive rusting from exposure to the salt water. No CAPEX rail relay is required over the next 5 years.
2.	**Tie Management**	**Wood Tie Condition – No. 2 THW – Length @ 8 foot:** Many of the ties have been in track prior to the rail placement of 1975 / 1976, therefore has a track life exceeding 40+ years. These ties are quickly reaching their useful service life. Tie defect ratios are approaching 40% in some tangent segments and will require a new tie program if rail service is re-established. A 5-Year Wood tie program is required. Estimated requirements at 15,000 ties per year.
3.	**Ballast Management**	**Ballast Condition – Crush rock:** In general, there is sufficient ballast cross section for Class 3 track. The tie cribs are full and 8 – 10 inches of shoulder ballast. Some segments of the roadbed is contaminated with weeds and grasses. These locations are normally associated with areas prohibited from chemical weed spraying.

ITEM	TYPE OF CONCLUSION	DESCRIPTION
		Ballast requirements for the next 5-Years will be associated with tie programs and minor surfacing requirement. Ballast quantities are estimated at 5,500 – 6,000 tons annually.
4.	**Rail Traffic**	**Rail Users & Volumes** Based on information provided by CBNS for years 2009 to 2014, car load shipment has been in a steady decline from a high of 1080 cars in 2009 to 331 cars in 2014.
5.	**Maintenance and Repair Costs**	**OPEX** Operating costs identified for track maintenance and Bridges and Culvert maintenance is considered to be understated by approximately 50%. **CAPEX** The CAPEX costs identified for Track and Signals & Communications are considered to be realistic based on information gathered during field inspection trip. The CAPEX costs identified for Bridge as well as Geotechnical repairs cannot be verified within a representative accuracy for the reasons presented below. Based on the PARSONS report dated May 2014, 108 bridges were inspected. On the subsidized portion of the Sydney subdivision, 27 bridges were inspected, for which 15 of them included in the immediate capital program (C1) and 12 in the next three year capital plan (C3) in the subdivision. No rating of the structures has been performed. None of the structures are categorized as restrictions/critical review condition. The status of those 27 Sydney subdivision bridges C1 type are a threat to the structure's ability to safely carry traffic and C3 condition is substandard and may soon begin to impact the structure ability to safely carry traffic at timetable speed. The accuracy of the CAPEX program is noted as ±50% for an amount of $9.7 million (mean variable from 4.8 M$ to 14.5 M$) for next year repair program and the following three years, strictly for the subsidized portion of the Sydney subdivision. In our opinion, the inspection and the cost evaluation are at a too large accuracy to status on the exact cost repair in the time frame program.
PHASE 2 – REVIEW OF GEOTECHNICAL and INFRASTRUCTURE IMPROVEMENTS		
6.	**Geotechnical Management**	The cost associated with remedial action is not defined by the limited geotechnical review by Stantec Consulting in their letters of September 16, 2014 and December 3, 2014 to Genesee & Wyoming Canada Inc. The cost identified in the Stantec document are related to further more detailed investigation. Notwithstanding, in the Table 1, under geotechnical, a preliminary estimate of $2.5 million dollars is indicated to resolve geotechnical issues / concerns on the Sydney subdivision. In our

ITEM	TYPE OF CONCLUSION	DESCRIPTION
		opinion, Stantec should status on the requirements of further investigation, then detail and comment the cost estimate to resolve the geotechnical issue.
7.	**Track Classification Management**	**Infrastructure Improvement for Class 3 Track** As per the referenced CBNS Timetable, the maximum authorized speeds for the Sydney subdivision demanded that this rail line be maintained to the requirements of a Class 3 Track. And, based on the field data gathered during the track inspection of 16th and 17th June 2015, this rail line was being maintained to the Class 3 requirements as per Transport Canada's – Rules Respecting Track Safety (TC E-54). The above statement is based on visual observations and track measurements recorded under no loading. At the time of the inspection, CANARAIL did not have access to Track Geometry Vehicle and / or Ultrasonic test vehicle data. NOTE: No verification was performed on the timing frequencies of the signal circuits for the automated public road/rail crossings, however, CBNS officials confirm that crossing circuits were acceptable for the speeds identified in the referenced Timetable.
8.	**Track Classification Management**	**Infrastructure Improvement for Class 4 Track** Insufficient data available to present a realistic cost estimate associated with upgrading the Sydney subdivision to Class 4 track. CONCLUSION: The improvement of the infrastructure for Class 4 track would require an extensive amount of work for all aspects of the railway covered by this report: track, bridges, earthworks, road-rail crossings, and geotechnical issues. CANARAIL emphasizes that it would require vast efforts and major capital expenditures.
9.	**Double-Stack Containers**	**Transport of Double-Stack Containers** Based on the data on vertical clearance presented in PARSONS' Individual Bridge Reports 2014 and the supplemental information provided by the Nova Scotia Department of Transport and Infrastructure Renewal, it appears two bridges do not comply with the Standards Respecting Railway Clearances as per Transport Canada (TC EC-05) standards (please reference Appendix P). These bridges are as follows: • Grand Narrows Bridge MP 57.7 • Fairmont St. Overhead Bridge MP 99.

2. INTRODUCTION

The Sydney subdivision of the Cape Breton and Central Nova Scotia Railway runs from Havre Boucher to Sydney, Nova Scotia. This rail line is a standard gauge (4 '- 8 ½") railway consisting of approximately 113.8 track miles of Class 3 mainline track. The rail line was a part of CN Rail's network until 1993 when it was sold to a short line railway. As of 2012, the rail line is, as per reports operated and as per information on site, owned by CBNS, and prior to January 2015, when CBNS ceased operating freight traffic over the line, traffic volume for year 2014 consisted of approximately 330 car loads. Over the previous 5-year period (2009 – 2013) car loading decreased from a high of 1080 cars in 2009 to a low of 842 cars in 2013.

As per Cape Breton & Central Nova Scotia Railway TIMETABLE NO. 9, – Effective 0001 – Atlantic Standard Time – February 19, 2012 (see Annex E), the following maximum authorized speeds were identified:

Table 2-1 : Maximum Authorized Speeds

MAXIMUM AUTHORIZED SPEED	PERMANENT SPEED RESTRICTIONS	MPH
MP 0.0 to MP 68.4		**35**
	MP 2.7 to MP 2.9	20
	MP 8.7 to MP 8.9	10
	MP 55.3 to MP 55.8	10
	MP 55.8 to MP 57.4	30
	MP 57.4 to MP 58.1	10
MP 68.4 to MP 86.0		**40**
	MP 70.5 to MP 70.9	35
	MP 78.5 to MP 78.7	35
MP 86.0 to MP 113.8		**25**
	MP 98.5 to MP 98.8	15
	MP 112.95 to MP 113.8	10

Under the maximum authorized speeds, the Sydney Subdivision is classified as a Class 3 track under Transport Canada - Rules Respecting Track Safety (TC E-54). When track conditions are maintained to Transport Canada guidelines for Class 3 track the maximum allowable operating speeds are as follows; passenger trains at 60mph, and freight trains at 40 mph. Passenger trains have not operated on the rail line for several years.

When the maximum authorized speeds for the CBNS Sydney subdivision are compared to those of Transport Canada, it is acknowledged that CBNS officials have restricted the freight trains to a speed equal to or less than Transport Canada's maximum allowable operating speeds for Class 3 track, i.e., of 40mph, from MP 0.0 to MP 86.0. From MP 86.0 to MP 113.8, the maximum authorized speed of 25mph is equivalent to a Transport Canada - Class 2 track. In addition, several Permanent Speed

Restrictions (PSR), the majority aligned with track stability issues identified by Stantec Consultants, have been placed on the track as per locations provided in the above table.

Although the rail line is classified as a Class 3 Track – Operating Speed Limits - CBNS Operating officials restricted freight traffic to a maximum operating speed of 25mph, and in October 2014, CBNS filed with the Nova Scotia Utility and Review Board to decommission and abandon the rail line. In effect, the 25mph operating speed restriction was equivalent to reducing the Sydney subdivision to a Class 2 track rating. NOTE: No information submitted to CANARAIL identifies that an official request from CBNS was presented to the Nova Scotia Utility and Review Board and / or to Transport Canada to reclassify this rail line to a Class 2 track. As well, CBNS track officials have not, to date, taken any action to adjust the superelevation on curves to reflect the restricted operating speed. It is our understanding from the information gathered on site that, as of January, 2015, the only movement on the Sydney subdivision consist of the occasional locomotive that is taken to Sydney for maintenance overhaul. Under this movement, the locomotives are restricted to 10mph with operating orders to "stop and proceed" at each public road crossing. This operating order is to protect against the potential malfunctioning of the crossing protection lights.

2.1. PURPOSE AND SCOPE

CANARAIL has been requested by Nova Scotia Transportation and Infrastructure Renewal to undertake a review of the operating and maintenance costs information (OPEX and CAPEX) submitted by CBNS in conjunction with their application of October 2014 to the Nova Scotia Utility and Review Board to decommission and abandon the rail operations between Point Tupper and Sydney, approximately 100 miles of main line railway track. The Project Tasks and Deliverables identified for this project were as follows:

Phase 1 – Operating and Maintenance Costs for Current Rail Line

- Review the current rail users and volumes.
- Review of material made available by the Nova Scotia Department of Transportation & Infrastructure Renewal regarding maintenance and repair requirements.
- Final report in detailed PDF and summary presentation format, to be delivered to the working group, and senior officials.

Phase 2 – Review of Geotechnical and Infrastructure Improvements

- Review and assessment of the geotechnical report and infrastructure evaluation of the current rail line provided by the Nova Scotia Department of Transportation & Infrastructure Renewal.
- Work plan and costing to bring the line to either Transport Canada Class 3 or Class 4 track standards.
- Review the infrastructure reports noting limitations to operating double stack container trains.
- Final report in detailed PDF and summary presentation format, to be delivered to the working group, and potentially senior officials.

2.2. METHODOLOGY

With respect to meeting the tasks and deliverables presented, the consultant (CANARAIL) was provided with the following information from Mr. Steve Newson, Policy Advisor, Nova Scotia Transportation and Infrastructure Renewal:

- Genesee and Wyoming Submissions Infrastructure Improvement Costs – Sydney Subdivision.

This information consisted of the following:

- Tab 1 – Overview.
- Tab 2 – Map of Cape Breton and Central Nova Scotia Railway (CBNS).
- Tab 3 – Geotechnical Estimates of September, 16, 2014 and December 3, 2014 – Prepared by Stantec Consulting – Membertou, N.S.
- Tab 4 – Signals and Communications.
- Tab 5 – Track Investment.
- Tab 6 – Bridges and Culverts – 2014 Bridge Inspection Report - May 2014, prepared by PARSONS.
- Tab 7 – Statement of Work.

In addition to the email exchanges, and the electronic transfer of the above noted data, CANARAIL representatives, in conjunction with two CBNS personnel undertook a two day track inspection with primary focus on the track structure and secondary focus on the geotechnical locations identified in the Stantec reports. The inspection was a combination of hi-rail and walking. Field data gathered during the inspection has been summarized in Appendices – A, B, C, and D.

Prior to the track inspection, a brief meeting was conducted on the morning of June 16, 2015, with Mr. Steve Newson, Policy Advisor - Nova Scotia Transportation and Infrastructure Renewal. The meeting was conducted at the CBNS office located at 121 King Street, Stellarton, Nova Scotia. CANARAIL and CBNS representatives were in attendance.

The deliverables identified for this Track Inspection were as follows:

1. Carry out a hi-rail track inspection of the rail line from MacIntyre Lake to Sydney, Nova Scotia (M.P. 20.0 – M.P. 113.8).
2. Conduct walking "spot inspections" at various locations on the rail line. Record condition of track components at these locations.
3. Inspect the geotechnical locations identified in the Stantec reports of September 16 and December 3, 2014.
4. Inspect road / rail crossings.
5. Summarize and analysis the data collected and use to evaluate operations and maintenance costs submitted by CBNS.

3. TRACK INSPECTION

On June 16, 2015, CANARAIL representatives travelled to Stellarton, N.S. to meet with CBNS representatives.

The CANARAIL representatives spent 2 days on the Sydney Subdivision, June 16 and 17, 2015, hi-railing and inspecting track conditions.

3.1. SUMMARY OF DAILY ACTIVITIES

The following matrix summarizes the work carried out by CANARAIL representatives.

Table 3-1 : Summary of Daily Track Inspections

DAY	TERRITORY (LOCATION)	WORK PERFORMED
Day 1 Tuesday 16 June 2015	Havre Boucher – Cross Point (M.P. 0.0 – M.P. 71.9)	CANARAIL representatives met CBNS representatives at their office at Stellarton, N.S. for introductions and to review project guidelines, discuss deliverables and methodology. Inspected track by hi-rail vehicle from Havre Boucher to Cross Point. In addition to the Hi-rail inspection we stopped at 20+ locations to have a better appreciation of the track structure and condition of road crossings. This information has been summarized and is presented in this report.
Day 2 Wednesday 17 June 2015	Sydney to Cross Point (M.P. 110.0 – M.P. 71.9)	Inspected track by hi-rail vehicle from Sydney to Cross Point. As per Day 1, we inspected track by hi-rail vehicle from Sydney to Cross Point. We stopped at 20+ locations to have a better appreciation of the track structure and condition of road crossings. This information has been summarized and is presented in this report.

4. TRACK STRUCTURE

On the subsidized portion of the Sydney subdivision, there is a minimum of 27 bridges of various designs.

The Sydney rail line consists of approximately 113.8 main line miles, 9 passing sidings, and yard tracks at Port Hasting / Port Hawkesbury, North Sydney, Jefferson. The culvert estimation for the total 113.8 main line miles is known as in excess of 600, and several industrial spurs, those elements of infrastructure was not included in the present SOW.

With the freight traffic over the past few years at one train per week or as required, the passing sidings received limited to no maintenance. Should the decision be to put this rail line back in service and pending on traffic demands, the passing sidings may require some maintenance demands.

The following components of turnouts have been removed:

- West switch Grand Narrows, Frog removed.
- West end Jefferson mile 107.70 switch was removed.

4.1. TRACK ALIGNMENT

From information retrieved from the CBNS Track Chart, the track between Havre Boucher and Sydney (M.P. 0.0 – M.P. 113.8) consist of 268 individual curves with the maximum curvature recorded at 8° (radius 716.78 ft. or 218.47 m) and 142 curves with radii less than 1432.9 ft. or 436.68 m (≥ 4°). Maximum gradient on the line is recorded at 1.9 % between MP 34.3 – M.P. 33.85. Numerous segments exist with gradient in excess of 1.0%.

Appendix C provides a comparison between actual field superelevation, calculated balanced speed, and maximum authorized speed as per CBNS Timetable No. 9 dated Feb 19, 2012. From review of this data it is noted that the superelevation placed on a number of curves does not meet the requirement for balance speed through the curve. If the rail line is returned to service the elevation placed on the curves should be sufficient for balanced speed through the curves.

For information only, a theoretical and proposed balanced elevation is presented in the spreadsheet. Prior to implementing a proposed balance elevation, field speed trials should be conducted to determine the average speed of the freight trains over the particular curves. With this information a more appropriate elevation can be calculated.

4.2. RAIL

The main line rail is a 115 Lb RE rail sections with an estimated 65 / 35 ratio of CWR vs. Jointed rails.

A large majority of the rail are stamped "SYDNEY – 1974 or newer. No rail laying records were available, however, with the majority of the rails stamped 1974, would support the fact that the rail was installed post 1974, most likely in 1975 or 1976. In general, the rail head profile is in good condition for both the CWR and the jointed rail segments and can be expected to last several years under annual tonnages in the range of 1 to 5 MTPA. As can be expected, rail placed in the sharper curves will have a reduced life. To help prolong the life of the jointed rails, it is recommended standard maintenance practice to undertake a slotting program to remove the longitudinal plastic deformation of the rail head steel from the rail ends. The removal of this flowed steel will prevent against flakes of steel breaking off from the rail-ends.

4.3. RAIL ANCHOR PATTERN

The rail anchor pattern consists of the following:

- CWR – Primary - Box-anchor every 3rd track tie. Secondary – Box-anchor every 2nd track tie.
- Jointed Rail - Primary - Box-anchor every 3rd track tie.
- Bridge Approaches and Turnouts – Box-anchor every track tie for approximately 150 - 200 feet prior to the bridge approaches and at turnouts.

The rail anchors are a mix of spring and drive-on anchors.

4.4. RAIL LUBRICATORS

No wayside rail lubricators are present in track, however at several locations the lubricant holding tank remains on site. The owner shall assess the potential risk to the environment.

4.5. TIES – TIE PLATES AND SPIKE PATTERN

The rail is supported with treated hardwood ties, double-shouldered tie plates, and cut spikes. The ties are No. 2 Treated hardwood (8 in. * 6 ½ in. * 8 ft. - 6 inch in length).

The TIE PLATES are double-shoulder and measure 7 ¾ x 11 inches and 7 ¾ * 14 inches with 1:40 cant and are in acceptable condition.

The SPIKE PATTERN varies throughout the rail line. The spiking pattern on curve track normally has 3 spikes per tie plate and tangent track will have 2 spikes per tie plate. However, some variation was identified where these patterns were not consistent.

The overall condition of the track ties is rated as good for Class 3 track, and there has been a concerted effort to ensure a sufficient quantity of solid ties is present in the curved territory. Notwithstanding, isolated sections, albeit short in distance, were identified on tangent track with high defect ratios verse solid ties.

Appendix D is a summary of the Tie Programs from year 2007 to year 2015. As well, CANARAIL representatives evaluated in-field tie condition (defect ratio) at a number of locations and results are identified in this spreadsheet.

No wood ties have been installed post 2011.

4.6. BALLAST

With the exception of a few locations, the ballast cross-section is acceptable for the speeds identified. The tie cribs are full and the ballast extends 8 – 12 inches beyond the end of the wood ties. Ballast under the base of tie was not measured, however, there are a number of locations in which vegetation is present in the roadbed.

5. TRACK INSPECTION - WALKING

The CANARAIL representatives gathered detailed information on track and rail conditions at a number of locations. The information is summarized in the spreadsheet identified as **Appendix A**.

The following sections of this report identify some of the more common track conditions witnessed during the walking inspection.

5.1. TRACK – CONDITIONS

The main line consist of a mixture of CWR and jointed 115 RE rail sections with no identifiable logic as to why CWR or jointed rail was placed at the locations they exist. The vast majority of the rails are in good condition. The track ties are No. 2 treated hardwood and 8 feet in length. The defect ratio for the tie range from 20% to 50+%. The defect ratios tend to be higher in the tangent segments, indicative of the fact that tie program priority was focused for curve tracks. As well, high spikes were witnessed at several locations along the line. The ballast cross section is full with adequate shoulder ballast, however, there are sections with vegetation in the roadbed. It has been past practice of CBNS to schedule an annual chemical weed spray program to help prevent weed growth in the roadbed.

Wide track gauge has been a concern in the past for many of the curves. Extensive re-gauging has taken place in the past to correct gauge. And, if train service is re-established it will be necessary to verify that tie conditions will support the dynamic impact of curving forces throughout the curvature, especially the sharper curves. Track alignment and cross level is rated as very good on this rail line.

5.2. TURNOUT – CONDITIONS

There are nine passing sidings on the Sydney subdivision from MacIntyre Lake to Sydney (M.P. 20.0 – M.P. 113.8). The turnouts for the sidings are manual No. 10 – 115 lbs rail with 16 ft. - 6 inch switch points and spring frogs. One exception, the turnout for the Point Edward Industrial Spur has a rail bound manganese steel (RBM) frog. Although the sidings have not received much activity over the past few years, all turnouts remain in track and functional with the exception of west turnout at Grand Narrows. The frog for the west turnout at Grand Narrows has been removed from track.

In general, the rail components of the turnouts are in good condition. Some maintenance is required to adjust the fitting of the horn and hold down housing for the spring frogs.

5.3. ROADWAY CROSSINGS

There is a total of 55 public road crossing plus numerous private and farm crossing from MacIntyre Lake to Sydney (MP 20.0 – MP 113.8). Forty of the public crossing is equipped with automated protection consisting of "flashing lights and bells". An asphalt road surface and rubber flangeways is present at the majority of the public crossing, however some are provided with wood planks. In general the road surface materials are in good condition.

As per Tab 4 – Signals and Communications – of the "Genesee and Wyoming Submissions Infrastructure Improvement Costs – Sydney Subdivision", thirty-eight of the public crossings have been identified for signalling and communications upgrade requirements related to "warning time + Advanced Warning Devices (AWD)".

The design of the automatic crossing protection systems at the 38 public crossing were not validated against the requirements of Transport Canada regulations. Notwithstanding, the automated crossing protection has been in place for several years.

5.4. WAYSIDE DETECTORS – ROLLING STOCK

There are 3 **Hot Box and Dragging Equipment Detectors (HB & DED)** in place. The HBDED are placed at the following mileages: Mile 10.8, Mile 42.8, and Mile 77.5.

As per date of inspection, the detectors were in working order. The condition of the wood ties at the approaches to the detectors requires attention. Several defective ties at each location and gauge-rods used to help hold track gauge.

As per Tab 4 – Signals and Communications – of the "Genesee and Wyoming Submissions Infrastructure Improvement Costs – Sydney Subdivision", the 3 Hot Box Detectors have been identified for upgrade to smart Scan and Hot Wheel Detectors.

6. CAPEX – ESTIMATED

As per information provided by the Nova Scotia Department of Transportation & Infrastructure Renewal - Tab 1 – Overview, the following CAPEX costs were submitted. The following has been based on the assumption that the line will be operated as a Class 3 railway:

Table 6-1 : Capex Costs

ITEM	2015	2016	2017	2018	2019	TOTAL
Geotechnical	$ 0.50 M	$ 0.50 M	$ 0.50 M	$ 0.50 M	$ 0.50 M	**$ 2.5 M**
Signals Communications	$ 0.33 M	$ 0.33 M	$ 0.33 M	$ 0.30 M	$ 0.29 M	**$ 1.6 M**
Track	$ 2.56 M	$ 2.61 M	$ 2.67 M	$ 2.72 M	$ 2.77 M	**$ 13.3 M**
Bridges (*)	$ 2.00 M	$ 2.00 M	$ 2.00 M	$ 2.00 M	$ 2.00 M	**$ 10.0 M**
Culverts	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	**$ 1.0 M**
TOTAL	**$ 5.59 M**	**$ 5.64 M**	**$ 5.70 M**	**$ 5.75 M**	**$ 5.79 M**	**$ 28.4 M**

Note: Budget numbers submitted by CBNS (No information about level of accuracy, except for bridges).

(*) Costs information for the Sydney subdivision (MP 20 – MP 113.8) contained in the May 2014 Report presented by PARSONS Consultants to CBNS identified a CAPEX cost of $ 9.66 M directed over a 3-year period. These costs were considered rough estimates and within an accuracy of ± 50%.

6.1. GEOTECHNICAL

Written reports prepared by Stantec Consulting Ltd. confirmed a number of primary and secondary locations with geotechnical issues / concerns. Stantec definition for geotechnical classification is as follows:

A "primary" location is an area that has been identified of having geotechnical issues / concerns that is medium to high risk of having direct consequences to the business and / or health and safety of personnel and should be further reviewed within a moderate to progressive timeline.

A "secondary" location is an area showing early signs of geotechnical issues / concerns that is low risk of having direct consequences to the business and / or health and safety of personnel in the immediate future but should be reviewed as required or on a minimal annual basis.

For the section between MacIntyre Lake to Sydney (MP 20 to MP 113.8), the subsidized portion, Stantec identified five "primary" locations and three "secondary" locations.

The cost associated with remedial action is not defined by the limited geotechnical review by Stantec Consulting in their letters of September 16, 2014 and December 3, 2014 to Genesee and Wyoming. The cost identified in the Stantec document is related to further, more detailed investigations. Notwithstanding, in the Tab 1, under geotechnical, a preliminary estimate of $2.5 million dollars is indicated to resolve geotechnical issues / concerns on the Sydney subdivision. In our opinion, Stantec should status on the requirements of further investigation, then detail and comment on the cost

estimate to resolve the geotechnical issue. We have estimated approximately a total of 260 m of slope stability requiring rock protection or slope stability intervention as per our site observation. Under the Tab 1, the $ 2.5 million for the locations identified in the Stantec reports (estimated at 108 meters) appears to be not sufficient neither the amount related. It is assumed the rock protection will have to come from good rock quarries for riprap, based on the rock observed provisions will have to be included in the cost for important transportation.

As per the geotechnical report by Stantec (with some mile post correction based on on-site visit), CANARAIL summarized the observations and recommendations of Stantec report as per Appendix H.

6.2. SIGNALS AND COMMUNICATIONS

From a review of the CAPEX costs presented in Tab 4 – Signals and Communications – of the "Genesee and Wyoming Submissions Infrastructure Improvement Costs – Sydney Subdivision", the costs identified are considered acceptable with the exception of the following costs:

- The costs identified for the smart Scan and Hot Wheel Detector is considered to be low. Dependant on specifications, the costs for this type of equipment may approach $ 90,000 - $100,000 CDN. As well, it is noted that no labour costs has been assigned for the installation of this equipment. Labour costs associated with installation may approach 50% of material costs.
- The costs identified for the electrical alimentation lead (Ac) for road crossing MP 34.63 – MacLeod Road, appears to be expensive. It may be due to the length of cable. However, without knowledge of the design features costs verification is not possible.

6.3. TRACK

From information gathered during the track inspection the following is a summary of the anticipated capital work required over the next 5 year period.

- Rail – No rail required.
- Ties – Twenty five percent of the ties will require replacement over the next 5-years. At an estimated 3000 ties per track mile, there will be a requirement for (3000 * 0.25 * 93.8 miles) 70,350 ties, i.e. 14,070 ties / year.
- Costs: $110.00 per tie * 14,070 ties = $ 1,547,700.
- Switch Ties – Nine main line sidings for 18 main line turnouts + numerous industrial leads.
- Estimated at 2-Sets of turnout ties per year.
- Costs: $ 250.00 per tie * 240 ties per turnout = $ 60,000.
- Surfacing – following the Tie Gang.
    - Approximately 19 track miles per year at 250 tons of ballast per mile equals 4,750 tons per year;
    - Ballast Costs: $20.00 per ton * 4750 tons = $ 95,000;
    - Placement Costs: $1.50 per ft. * 19 miles * 5280 ft. / Mi. = $ 150,480.

- Surfacing – Alignment and Cross-level.
  - Workload estimated at five percent of total miles, (95 miles * 0.05) equals 4.75 track miles. Ballast required at 250 tons / mile * 4.75 miles = 1188 tons;
  - Ballast Costs: $20.00 per ton * 1188 tons = $ 23,760;
  - Placement Costs: $ 1.50 per ft. * 4.75 miles * 5280 ft. / Mi. = $ 37,620.
- Road Crossings – Rehabilitation
  - Fifty-five public crossing exist between MP 20.0 to MP 113.8. At an estimated road surface life of 10 years there will be a requirement to rehabilitate 5.5 road crossings per year;
  - Costs: 5.5 Road Crossings * $ 60,000 per crossing = $ 330,000;
  - Note: this costs does not include any costs associated with flashing lights.
- ESTIMATED ANNUAL COSTS:
  - Ties = $ 1,547,700;
  - Switch Ties = $ 60,000;
  - Ballast = $ 95,000 + $ 23,760;
  - Place Ballast (Surfacing) = $ 150,480 + $ 37,620;
  - Road Crossings = $ 330,000;
  - Total Annual = $ 2,244,560 vs. CBNS = $ 2,562,480 (Year 2015).

The above costs is within 15% of the CAPEX costs submitted by CBNS for track investment, therefore CAPEX costs submitted by CBNS is considered realistic.

6.4. BRIDGES AND CULVERTS

As per the report of PARSONS of May 2014, named "2014 Bridge Inspection Report Cape Breton Nova Scotia Railway", the following observations of the report are noted, under the responsibilities of PARSONS :

- Inspection program involved detailed inspections of all accessible members on all identified bridges where the Railway has maintenance responsibility. Members were accessed from the deck, the ground and by climbing (where possible), and with the use of a bridge inspection vehicle on 10 bridges. Inaccessible members were inspected from below or through open decks, where possible.
- This inspection did not include underwater inspection, inspection of buried components or load rating of structures. In cases where a specialized investigation is warranted, this is noted in our recommendations.
- A total of 108 bridge sites were inspected [for both the Hopewell and Sydney subdivisions].

- It consisted of two inspection passes. The first pass consisted of a methodical tour by hi-rail vehicle along subdivision lines. Each bridge along the way was photographed and an inspection was carried out. The second pass utilized of a snooper bridge inspection vehicle to reach members that were not otherwise accessible in the first pass.
- Measurements were taken of section loss in girder flanges.
- The bridges inspected with snooper are listed as follows:
  - 1. Sydney 110.70
  - 2. Sydney 104.70
  - 3. Sydney 104.40
  - 4. Sydney 103.30
  - 5. Sydney 99.50
  - 6. Sydney 91.60
  - 7. Sydney 87.50
  - 8. Sydney 87.40
  - 9. Sydney 57.80
- These inspections involved hands on inspections of all accessible members on each structure to identify obvious problems and investigate any apparent deficiencies that are accessible to the inspector.
- Inspection efforts focused on areas that commonly develop structural problems, such as bearing areas and connections.
- This inspection used subjective inspection techniques and relied heavily upon human judgment. It is possible that some deficiencies may not have been discovered. The inspection does not guarantee that all defects will be identified. Internal steel defects, latent defects and defects in inaccessible areas may not be located. However, we are confident that all critical visible defects on accessible components have been found.
- **Estimated costs are provided where appropriate to assist the Railway in preparing budget** requirements**. These costs are considered to be rough estimates and are within an accuracy of ±50%.**
- Recommendations and priorities are based on conditions present at the time of this inspection, utilizing industry standards and information made available to us by the Owner.
- No ratings of the structures have been performed. Conditions and standards can and do change, so frequent re-inspection and evaluation is recommended.

Based on the PARSONS report on the subsidized portion of the Sydney subdivision, 27 bridges were inspected, for which 15 of them included in the immediate capital program (C1) and 12 in the next three year capital plan (C3) in the subdivision.

- No rating of the structures has been performed.
- None of the structures are categorized as restrictions/critical review condition.
- The status of those 15 Sydney subdivision bridges C1 type are a threat to the structure's ability to safely carry traffic.
- The 12 structures C3 condition is substandard and may soon begin to impact the structure ability to safely carry traffic at timetable speed.

The accuracy of the CAPEX program is noted as ±50% for an amount of $ 9.7 M (mean variable from $ 4.8 M to $ 14.5 M) for Next Capital Program and the Next 3 Year Capital Program, strictly for the subsidized portion of the Sydney subdivision.

It is our opinion, the inspection and the cost evaluation are at a too large accuracy to status on the exact cost repair in the time frame program. The actual level of information does not permit to status on representative work required or on costs associated. The accuracy should be approximately 30%.

Based on our opinion, the repair cost for bridge structures will be more in the upper portion of the PARSONS cost estimate bracket, that is between $ 9.7 M to $ 14.5 M. In the event of increased train traffic, it is important to undertake a structural capacity study of the bridges prior to any traffic with special focus on the portion of the structures that rest in the tidal zone range of 8 – 12 ft. from mean water levels.

7. OPEX – ESTIMATED

The OPEX evaluation must include all activities covered by regular maintenance, including without limitation:

- Train operation: Crew manpower, fuel, maintenance and servicing locomotives and equipment.
- Track maintenance: Brush cutting, weed control, rail replacement, tie replacement, ballast replacement, track geometry testing, and ultrasonic testing.
- Bridges and Culverts: Inspections, repairs, and rust prevention.
- Signal maintenance.
- Other costs: insurance, property, electricity, maintenance vehicles, maintenance of equipment.

As per information provided by Nova Scotia Department of Transportation & Infrastructure Renewal - Tab 1 – Overview, the following CAPEX costs were submitted.

Table 7-1 : OPEX Costs

ITEM	2015	2016	2017	2018	2019	TOTAL
Geotechnical	Nil	Nil	Nil	Nil	Nil	**Nil**
Signals Communications	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	**$ 1.0 M**
Track*	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	**$ 1.0 M**
Bridges & Culverts*	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	$ 0.20 M	**$ 1.0 M**

Note: Budget numbers submitted by CBNS.
*In our opinion, the OPEX plan expenses for track, bridges and culverts appear to be underestimated.

7.1. GEOTECHNICAL

No OPEX costs have been identified for activities associated with geotechnical issues as these costs would be classified under CAPEX. There is a potential for OPEX costs associated with geotechnical specialized inspection at every 4 months, or as required, based on the actual damage observed.

7.2. SIGNALS AND COMMUNICATIONS

The annual OPEX costs of $200,000 identified for signals and communications maintenance is considered to be adequate. Under present operations, as per CBNS information, this service is contracted out to X-Rail at an estimated 1.5 employees per year.

7.3. TRACK

The OPEX costs identified for annual track maintenance is considered to be understated based on the requirement to maintain 95 miles of railway track transporting 0.5 to 1.0 million tons annually of rail cars on a weekly, and potentially on a daily basis. The following is a summary of the major activities required and a rough estimate of OPEX costs to support the activities:

- A minimum of 2 permanent track employees, estimated at $ 100,000 – $ 115,000 annually, plus the potential for additional temporary staff or contract service to assist with winter snow operations,
- Materials used in the maintenance operations, estimated at a ratio of 1:1 - Material to Labour. Estimated costs at $ 100,000 – $ 115,000.
- Maintenance vehicles and M.O.W. equipment, estimated at $ 10,000 - $ 15,000 per year.
- Annual brush cutting to clear sight lines at road crossings, and chemical weed spray, estimated at $25,000 – $30,000 annually.
- Annual operating costs associated with Transport Canada requirements for track geometry and ultrasonic testing estimated at a combined price of $ 40,000 – $ 45,000 annually.
- Temporary staff and/or contract service provider to respond to track deficiencies identified by the ultrasonic and track geometry test vehicles. Costs contingent on number of deficiencies reported. Estimated at $ 10,000 – $1 5,000 annually.

Based on the above maintenance activities, a $ 285,000 - $ 335,000 OPEX cost for track maintenance is presented.

In addition to the activities listed above, the railway should have a contingency fund to protect against the unplanned and unexpected activities associated with adverse weather conditions, derailments, and other such occurrences.

7.4. BRIDGES AND CULVERTS

For bridges, the amount of $ 200,000 per year for 27 bridge structures on the subsidized portion of the Sydney subdivision appears to be too low based on the size of structures, as well as their level of damage at this point. The majority of this annual amount would be assigned to cover inspection and minor repairs without any additional requirements.

In summary, we consider the OPEX amount of $ 200,000 for annual maintenance to be insufficient.

8. INFRASTRUCTURE IMPROVEMENTS – CLASS 3 TRACK

As recorded earlier in this report, the maximum authorized speeds as per the referenced Timetable, puts the Sydney subdivision into a Class 3 track as per Transport Canada's Rules Respecting Track Safety. Notwithstanding the fact that the CBNS officials issued operating instructions restricting authorized speed to 25 mph pending approval from the Nova Scotia Utility and Review Board for abandonment, the existing track's roadbed structure complies with Class 3 parameters with exception granted to those geotechnical issues presented by Stantec Consultants and addressed in this report. The design of the automatic crossing protection systems at the 38 public crossing were not validated against the requirements of Transport Canada regulations. Notwithstanding, the automated crossing protection has been in place for several years.

In summary, under the assumption that the 5-Year CAPEX programs identified and supported in this report are completed as scheduled, it is CANARAIL's evaluation that the Sydney subdivision will be acceptable for Class 3 track. Ultimate sign-off by CANARAIL on Class 3 track will require a follow-up track inspection to verify CAPEX programs are completed to appropriate standards.

9. INFRASTRUCTURE IMPROVEMENTS – CLASS 4 TRACK

Under the acknowledgement that the Sydney subdivision will be at Class 3 track standards post the 5-Year CAPEX programs identified, the following is a list of design and major cost issues that must be evaluated prior to the Sydney Subdivision being classified as a Class 4 Track as per Transport Canada – Rules Respecting Track Safety (TC E-54).

- Tie defect ratios;
- Maximum allowable superelevation to be placed on curves;
- Speed restrictions associated with the maximum allowable superelevation;
- Redesign of spiral lengths to accommodate increased superelevation;
- The effects of increased spiral lengths on the track roadbed;
- The effects of increased speed on further CAPEX and OPEX costs;
- The potential requirement to redesign the signalling circuits for the Rail/Road crossing with automated crossing protection, flashing lights and bells. As well, the increased speed may demand improved sight lines at all non-automated rail/road crossing on the line.
- The design and existing condition of bridges;
- Rail connection beyond Cape Breton.

9.1. TIE DEFECT RATIOS

The tie replacement program for Class 3 track under the 5-Year CAPEX program was identified at 25 percent of total ties in track. Based on field data collected during the track inspection of 16th and 17th June 2015, the number of ties per mile ranged from 2980 to 3317 per track mile. For this report, tie density will be set at 3000 ties per track mile.

As per Transport Canada – Rules Respecting Track Safety – PART II – TRACK SAFETY RULES – Section D – TRACK STRUCTURE - Crossties, the following is a comparison of the minimum requirements for non-defective crossties by Class of Track.

Table 9-1 : Classes of Track – Non-Defective Tie Requirements

CLASS OF TRACK	MAX. ALLOWABLE OPERATING SPEED (MPH)	WOOD TIES (MINIMUM REQUIRED NON-DEFECTIVE TIES PER 39 FT. RAIL)
	Freight	**Track**
Class 1	10	5
Class 2	25	8
Class 3	**40**	**10**
Class 4	**60**	**12**

In acknowledgement of the required quantity of non-defective wood ties per 39 foot rail length as per the Transport Canada – Rules Respecting Track Safety, to upgrade the Sydney subdivision from Class 3 track to Class 4 track, the potential excess for an additional demand of 20% more wood ties over the 5-year CAPEX program. Under Class 3 operations, a total of 70,350 wood ties were identified,

therefore to meet Class 4 standards wood tie demands may reach (70,350 * 1.20) 84,420 ties, an increase of 14,000 ties.

Estimated costs associated with the purchase and installation of increased demand for wood ties equals 14,000 * $110 = $ 1,540,000.

The Transport Canada – Rules Respecting Track Safety do not quantify the number of consecutive defective ties acceptable in clusters. To this end, information from CN Rail Engineering Track Standards – June 2011 – Ties – TS 2.0 Timber Tie Installation and Maintenance – Paragraph 7 states the following: *"A cluster (or spot renewal) program should be undertaken where there is a high frequency of:*

a) Four or more consecutive defective ties;
b) Three or more consecutive defective ties in a curve greater than 2°; or
c) *Defective ties in joint area."*

NOTE: The number of non-defective track ties in any 39 foot (12m) length of rail must at all times be sufficient to hold line, surface and gauge within limits prescribed in applicable Transport Canada standards.

9.2. HORIZONTAL CURVATURE – SUPERELEVATION – SPIRAL REDESIGN

The track alignment of the Sydney subdivision consists of numerous locations of heavy gradient and sharp horizontal curvature. Train operations on the Sydney subdivision have been dealing with the heavy gradients since inception, therefore it is not considered to have any major impact on operations for Class 4 track versus those experienced under Class 3 track. Unfortunately, horizontal curvature and the associated superelevation and spiral requirements will impact the maximum authorized operating speeds over the line.

With the presents of horizontal curvature in the alignment, railway operating personnel are faced with decisions on how they will address the effects of the centrifugal forces from a train operating through the curve. Centrifugal forces result in a number of undesirable effects to both the rail car and the track structure and all of those listed below are further aggravated with an increase in speed:

- Possible displacement of wagon loads;
- Risk of locomotives and/or wagons overturning;
- Risk of derailment caused by the wheels mounting the outer rail;
- Increased rail and tie deterioration;
- High lateral forces on the track effecting track alignment and gauge.

To limit the effects of centrifugal forces, railroads design superelevation into the curves, that is, the outside rail of the curve is elevated above the inside rail. And, as per Transport Canada – Rules Respecting Track Safety, a limitation of 6 inches is placed on the maximum cross level allowed on the outside rail. NOTE: Special instruction apply to curves with elevation greater than 6 inches.

Under the preference that the majority of rail traffic should operate at equilibrium speed over a rail line, the Sydney subdivision classified as a Class 4 track with a maximum operating speed of 60 mph will result in a Permanent Speed Restriction (PSR) for all curves greater than 2° - 22' – 51" due to insufficient elevation, a minimum of 193 curves. Should the decision be to operate at the 3-Inch

Unbalance as allowable under Transport Canada Track Safety Rules, a Permanent Speed Restriction (PSR) will be required for all curves greater than 3° - 34' – 17", a minimum of 145 curves.

NOTE: With the Sydney subdivision classified as a Class 3 track and its maximum degree of curvature recorded at 8 degrees, no Permanent Speed Restrictions are required due to insufficient elevation on curvature.

If the decision was to proceed with reclassifying the Sydney subdivision from Class 3 track to Class 4 track, it would be necessary to adjust superelevation and spiral lengths on the vast majority of curves. In total, there are 291 curves on the Sydney subdivision. In order to present a realistic cost estimated to perform the adjustment to superelevation and spirals, detailed information is required on existing length of curves, existing elevation on the curves, and the present length of the spirals.

In the absence of the required information identified above, CANARAIL is not prepared to present a cost estimate for this work.

9.3. EFFECTS OF INCREASED SPEED – CLASS 4 TRACK VS. CLASS 3 TRACK

As per Transport Canada – Rules Respecting Track Safety, Classes of Track are assigned based on Operating Speed Limits. Under this definition, if the Sydney Subdivision is reclassified from a Class 3 track to a Class 4 track it will result in the rail line being identified for a "maximum allowable operating speed for freight trains of 60 mph". Class 3 track allows for a "maximum allowable operating speed for freight trains of 40 mph".

Under data compiled by the American Railway Engineering Association – Part 4 - Equated Mileage Parameters, the effect on CAPEX and OPEX demands when a Class 3 track is reclassified for operations as a Class 4 track, i.e. increase in speed from 40 mph to 60 mph with all other variables constant between Classes, is an increase of 12.5 to 15 percent.

In addition, the actual bridge condition of Sydney Subdivision is not able to handle an increase of speed from Class 3 to Class 4 on bridges.

9.4. RAIL/ROAD CROSSINGS – AUTOMATED PROTECTION CIRCUITS AND SIGHT LINES

A review of the Crossing Survey information provided by CBNS identifies the following classification of rail/road crossings on the Sydney Subdivision:

- Public Crossing complete with automated protection, flashing lights and bells – 41
- Public Crossings – reflectorized sign – 13
- Private, Farm, and Others – 177

With an increase in train speeds on the Sydney subdivision, it will be a requirement to validate the design parameters of the 41 automated crossing protection system. And, pending on review, it is highly probable that the signal timing circuits for the crossings will need to be upgraded. An upgrade will involve, as a minimum, the renewal and relocation of the insulating rail joints and new wiring. It is difficult to provide a realistic cost estimate to upgrade these automated crossing without knowledge of the existing design parameters, however as a comparison, if a completely new automated crossing with lights and bells were proposed the costs estimate would be in the range of $100,000 to $125,000, in consideration power utilities are available in ±50 meters close to the crossing. As a very rough estimate, and contingent on the unknowns, the costs to upgrade an existing crossing may be in the

range of $15,000 – $50,000. This dollar range is presented with the understanding that the condition of some of the *"in-place"* materials will allow for reuse.

With respect to the other public crossings, private, farm and others, rail transportation authorities will demand that sight lines are applicable for the operating speeds.

Notwithstanding the costs identified above, we do not have sufficient data available to provide a realistic cost estimate for the work and material necessary to upgrade the crossings for Class 4 track speeds.

9.5. BRIDGE DESIGN AND EXISTING CONDITIONS

Prior to a reclassification of the Sydney subdivision to a Class 4 track it will be necessary to review the original design parameters for the bridges and further evaluate their structural stability post the capital expenditure identified in the PARSONS Report.

NOTE: Reference Page 5, Table 2-1 of this report, the Canso Causeway (MP 8.6 - 8.9) and the Grand Narrows (MP 57.4 – 57.9) Bridges are restricted to 10 mph as per Cape Breton & Central Nova Scotia Railway TIMETABLE NO. 9, – Effective 0001 – Atlantic Standard Time – February 19, 2012 (see Annex E).

9.6. RAIL CONNECTION BEYOND CAPE BRETON

An important aspect that should be taken in consideration regarding the reclassification of Sydney Subdivision to Class 4 is that it is not a stand-alone track. Rail traffic entering or leaving Cape Breton, via the Sydney subdivision, from or for central Canada and beyond must transit over different rail lines owned and operated by different parties. The benefits of upgrading the Sydney subdivision to Class 4 would be lessened if these rail lines do not meet the requirements of Class 4.

CONCLUSION:

The upgrade of Sydney Subdivision to Class 4 would require considerable efforts and capital expenditures. The upgrade of the railway would necessitate the addition of numerous ties, extensive track realignment and earthworks in curves, bridge improvements, upgrading of rail/road crossing protection, and geotechnical stability works. CANARAIL does not have sufficient information in order to present a cost estimate, but can safely assert major capital expenditures would be required in order to upgrade the Sydney Subdivision to meet the requirements for Class 4.

10. CONTAINER TRAINS - DOUBLE STACK

In anticipation for the potential to transport double-stack container cars over the Sydney Subdivision the following three technical points from a rail operations standpoint must be verified. These points are:

1. Design of track structure acceptable for double-stack container traffic.
2. All Overhead structures and Railway Through Truss bridges must have the vertical and horizontal clearances stipulated in Transport Canada – Standards Respecting Railway Clearances (TC E-05), (See Appendix K and L).
3. The loaded double-stack container cars must be in compliance with PLATE H – Equipment Diagram for Limited Interchange Service as per AAR Manual of Standards and Recommended Practices – Car Construction Fundamentals and Details. (See Appendix J for diagram).

With respect to Item 1, the design of the track structure is acceptable for the transport of double-stack container cars.

With respect to Item 3, North American Interchange rules dictate that Rail Operators utilize the appropriate rail cars to meet the Plate H dimensions.

With respect to Item 2 – Transport Canada's TC E-05; a total of 9 Overhead structures and Through Truss bridges exist on the Sydney Subdivision as per the below table.

Table 10-1 : Sydney Subdivision - Overhead & Through Truss Bridges

LOCATION	DESCRIPTION	VERTICAL CLEARANCE (*)	COMPLIANCE TC E-05
M.P. 8.70	Canso Causeway – Through Truss – 1 Span	> 22 ft.	Yes
M.P. 13.05	Port Malcolm Rd. Overhead Bridge	24.5 ft.	Yes
M.P. 15.80	Highway 104 - Overhead Bridge	24.5 ft.	Yes
M.P. 57.8	Grand Narrows Bridge – Through Truss – 8 Spans	> 21.5 ft. < 22 ft.	No
M.P. 58.35	Grand Narrows Hwy – Overhead Bridge	24.5 ft.	Yes
M.P. 91.90	Highway 105 – Overhead Bridge	22.3 ft.	Yes
M.P. 98.0	King St. – Overhead Bridge	22.3 ft.	Yes
M.P. 99.9	Fairmont St. – Overhead Bridge (Bridge closed to vehicular traffic)	Inconclusive	No
M.P. 103.1	Seaview Dr. – Overhead Bridge	22.2 ft.	Yes

NOTE (*): The vertical clearances contained in the above table were retrieved from the Bridge Report prepared by PARSONS Consultants, with the exception of the Canso Causeway Bridge, the Grand Narrows Bridge and the Overhead Bridge at Fairmont Street, for which the PARSONS report does not record the vertical height clearance. The clearance diagrams of these three bridges, as provided by the Nova Scotia Department of Transportation and Infrastructure Renewal, are presented in Appendix P. Upon examination of these clearance diagrams, the following can be noted:

- The Canso Causeway Bridge is compliant with Transport Canada – Standards Respecting Railway Clearances (TC E-05) standards Diagram 2 – All Railway Bridges, Snowsheds, and Overhead Timber Bridges.
- The Grand Narrows Bridge is **not compliant** with Transport Canada – Standards Respecting Railway Clearances (TC E-05) standards. The structure appears marginally inside Diagram 2 of TC E-05 standards. It implies that the vertical clearance is slightly lower than prescribed by this standard. As well, the top portion of the diagonal braces to the portal entrance of the bridge show to be slightly inside Diagram 2 template.
- The Fairmont Street Overhead Bridge is **not compliant** with Transport Canada – Standards Respecting Railway Clearances (TC E-05). Based on the analysis of the Clearance Diagram provided for this bridge, the structure is well inside Diagram 1 of TC E-05 standards. Plate H passes under the bridge with a clearance of 2.6". Potential remedial actions may include raising the bridge or removing the structure.

Moreover, it is important to note that the data collection for these clearance diagrams was completed in 2013. It is unknown to CANARAIL whether the track has been lifted since. It is also possible that the position of the top of rail has been modified by natural events, such as freeze-thaw cycles. It is important the clearances be validated by the rail operator prior to any movement of double-stack containers.

11. PHOTO GALLERY

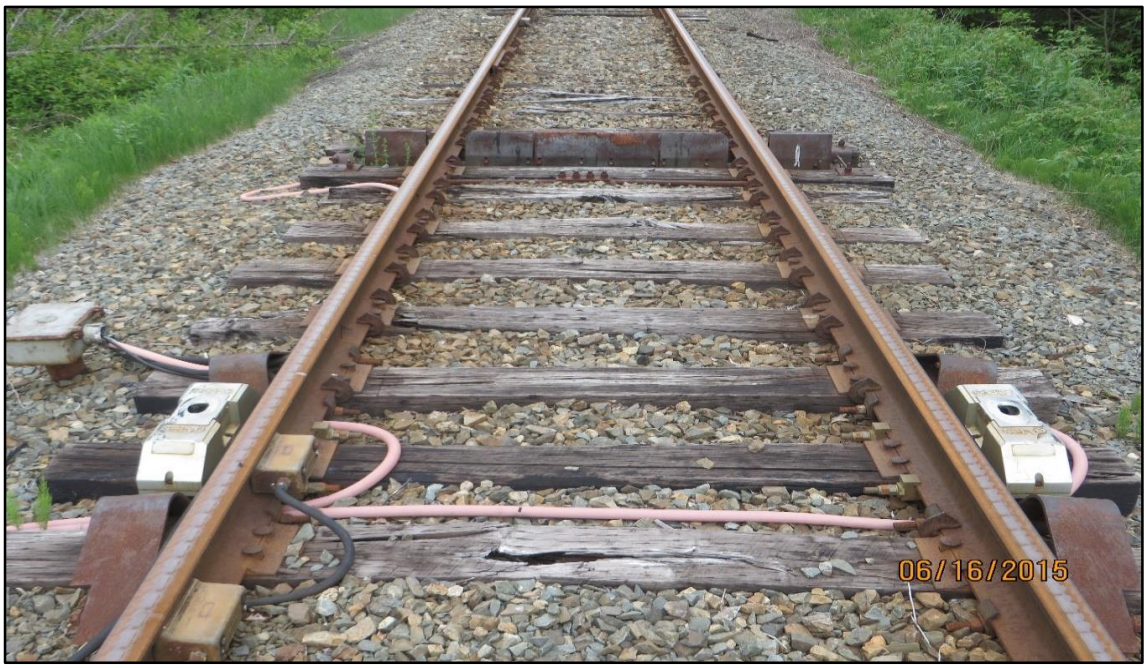
The section is reserved for photographs that are presented in support of the observations and comments put forth in this Report.

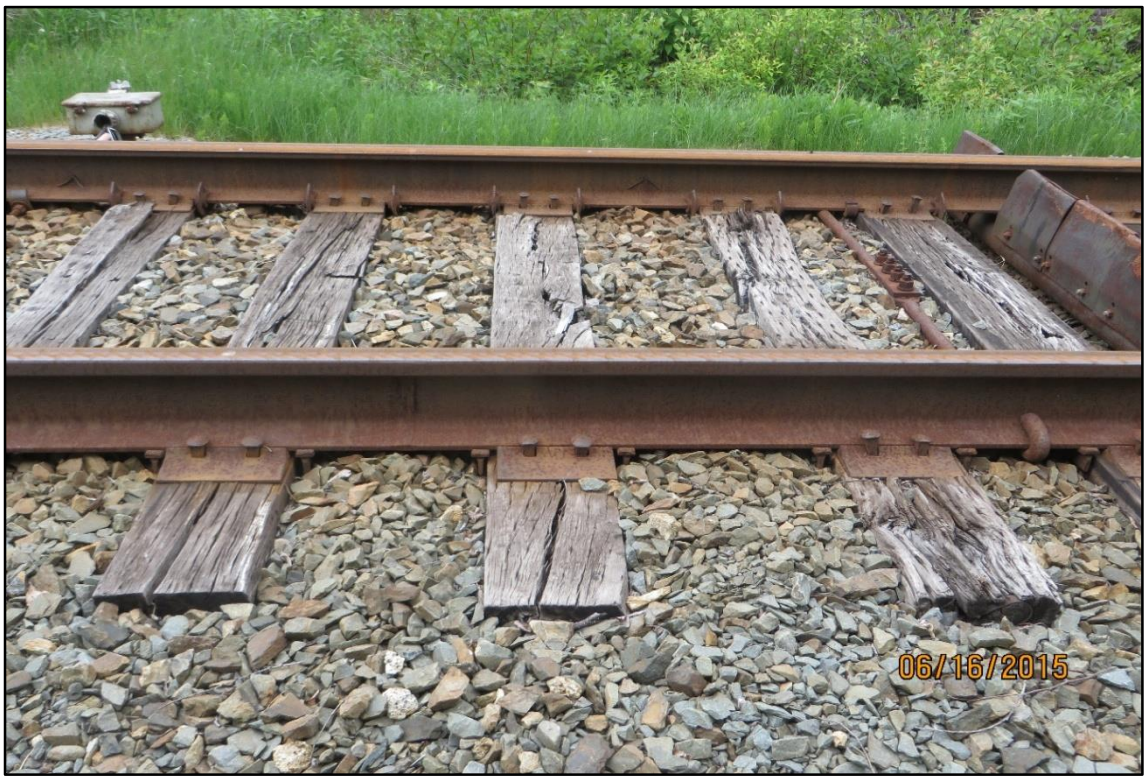
PHOTO M.P. 25.46 – Track alignment – R.H. Curve
Good ballast cross-section and solid ties

M.P. 33.37 – Tangent Track
Vegetation in roadbed – Defect ratio for ties at 45% - 55%

M.P. 41.3 – East Turnout - ORANGEDALE
No. 10 Turnout with Spring Frog

M.P. 52.08 - ROAD CROSSING – FLASHING LIGHTS
Gravel roadway approaches and wood planks





M.P. 42.8 - HOT BOX AND DRAGGING EQUIPMENT DETECTOR
New wood ties required to hold track gauge across the detector

M.P. 53.7 – TRACK ALIGNMENT – MacKinnon Harbour
This area identified by Stantec Consulting Ltd

M.P. 57.7 – BRIDGE - GRAND NARROWS
Swing Span at east end of bridge
Manual interlocking between M.P. 57.4 and M.P. 57.9

M.P. 104.86 – LEVEL ROAD CROSSING
A total of 15 road crossing between M.P. 104.8 to M.P. 113.9

M.P. 90.56 – ROAD CROSSING
This crossing leads into a Camp Grounds and Mobile Trailer Park

M.P. 85.85 – TANGENT TRACK
Tie Defect Ratio at 50% - 55%

M.P. 103.3 – BRIDGE PLATE
Heavy rust

12. APPENDICES

The following Appendices form part of this report.

- Appendix A – Track Inspection Notes
- A spreadsheet summarizing the field notes recorded during the track inspection. The spreadsheet contains information on the various track components as well as a "comments" column.
- Appendix B – Track Data – Gauge and Elevation
- This spreadsheet summarizes the gauge and superelevation information gathered for a number of curves
- Appendix C – Track Data – Curves
- This spreadsheet summarizes the actual field superelevation recorded on curves and compares calculated balanced speed verses Timetable speeds.
- Appendix D – Tie Program (2007 – 2015) and Tie Defect Ratio
- Appendix E – CBNS Timetable No. 9 – Effective February 19, 2012
- Appendix F – CBNS Track Chart
- Appendix G – CBNS – Crossing List – Sydney Subdivision
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APPENDIX A

Track Inspection Notes

APPENDIX - A

CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY
TRACK INSPECTION (MacINTYRE LAKE - SYDNEY)
16 & 17 JUNE 2015

LOCATION (Mile Post)	DEGREE	TRACK ALIGNMENT	RAIL		TIES - THW	TIE PLATES (D.S.) (1:40 Cant)	RAIL ANCHORS (Fair & Spring)	RAIL FASTENERS (Cut Spikes - 5 1/2 In.)	BALLAST	COMMENTS 16 - 17 JUNE 2015
			NORTH	SOUTH						
MP 20.2	**2°**	RIGHT HAND CURVE	115 Lb. RE - CWR Sydney 1974 HIGH Rail: Minimal head wear.	115 Lb. RE - CWR Sydney 1974 LOW Rail: Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @ 15% - 20%	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate Secondary: 3 Spikes / Plate	Full cribs and shoulder. Limited vegetation.	Track Alignment - Good Rail Condition: Good Tie Condition: Good
MP 21.4	**5°**	RIGHT HAND CURVE	115 Lb. RE - CWR Sydney 1974 HIGH Rail: Minimal head wear.	115 Lb. RE - CWR Sydney 1974 LOW Rail: Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @ 35% - 40%	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: LOW Rail: 3 Spikes / plate HIGH Rail: 2 Spikes / Plate Secondary: 2 Spikes /Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good **Tie Condition: Poor to Fair. Ties required.** Spike Condition: Some high spikes.
MP 22.0	**0°**	TANGENT	115 Lb. RE - CWR Sydney 1974 HIGH Rail: Minimal head wear.	115 Lb. RE - CWR Sydney 1974 LOW Rail: Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @ 10% - 15%	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good Tie Condition: Good
MP 23.36	**6°**	RIGHT HAND CURVE	115 Lb. RE - Jointed Sydney 1974 HIGH Rail: Head wear: 5/16 to 3/8 Flange Wear: 0	115 Lb. RE - Jointed Sydney 1974 LOW Rail: Head wear: 6/16 to 9/32 Flange Wear: 0	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	7 3/4 x 14 D.S.	Type: Drive-On (Fair) Pattern: Boxed 3rd tie.	Primary: 3 Spikes / plate	Full cribs and shoulder.	Track Alignment - Good. Tie Condition: Medium Rail Condition: Fair Rails in curve have been transposed: High to Low & Low to High.
MP 25.46	**3°**	RIGHT HAND CURVE	115 Lb. RE -CWR Sydney 1974 HIGH Rail: Head wear: 1/4 to 9/32 Flange Wear: 0	115 Lb. RE - CWR Sydney 1974 LOW Rail: Head wear: 9/32 Flange Wear: 0	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Boxed 2nd tie.	Primary: 3 Spikes / plate Secondary: 2 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Fair Tie Condition: Medium
MP 27.5	**3°**	LEFT HAND CURVE	115 Lb. RE - JOINTED Sydney 1974 **LOW Rail:** Head wear: 9/32 to 11/32 Flange Wear: 0	115 Lb. RE - JOINTED Sydney 1974 **HIGH Rail:** Head wear: 1/4 to 9/32 Flange Wear: 3/16	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	7 3/4 x 11 D.S.	Type: Drive-On (Fair) Pattern: Boxed 3rd tie.	Primary: 3 Spikes / plate Secondary: 2 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Fair Tie Condition: Medium
MP 31.15	**4°**	RIGHT HAND CURVE	115 Lb. RE - CWR / JOINTED Sydney 1974 **HIGH Rail:** Head wear: 3/16 Flange Wear: 3/16	115 Lb. RE - CWR / JOINTED Sydney 1974 **LOW Rail:** Head wear: 5/16 Flange Wear: 0	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Mixed 2nd & 3rd ties.	Primary: 2 Spikes / plate Secondary: 3 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Fair Tie Condition: Medium
MP 33.37	**0°**	TANGENT	115 Lb. RE - CWR Sydney 1974 Minimal head wear.	115 Lb. RE - CWR Sydney 1974 Minimal head wear.	Type: No.2 THW - 8 ft. **Defect Rate @ 45% - 55%**	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder. Vegetation in roadbed.	Track Alignment - Good. Rail Condition: Good **Tie Condition: POOR. Ties required.**
MP 35.6	**4°**	LEFT HAND CURVE	115 Lb. RE - CWR Sydney 1974 **LOW Rail:** Head wear: 1/8 to 3/16 Flange Wear: 0	115 Lb. RE - CWR Sydney 1974 **HIGH Rail:** Head wear: 3/32 to 3/16 Flange Wear: 3/16	Type: No.2 THW - 8 ft. Defect Rate @ 10% - 15%	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 3 Spikes / plate Secondary: 2 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good Tie Condition: Good
MP 39.22	**0°**	TANGENT	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	7 3/4 x 11 D.S.	Type: Drive-On (Fair) Pattern: Boxed 2nd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good Tie Condition: Medium

APPENDIX - A

CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY
TRACK INSPECTION (MacINTYRE LAKE - SYDNEY)
16 & 17 JUNE 2015

LOCATION (Mile Post)	DEGREE	TRACK ALIGNMENT	RAIL		TIES - THW	TIE PLATES (D.S.) (1:40 Cant)	RAIL ANCHORS (Fair & Spring)	RAIL FASTENERS (Cut Spikes - 5 1/2 In.)	BALLAST	COMMENTS 16 - 17 JUNE 2015
			NORTH	SOUTH						
MP 42.8	**0°**	TANGENT **TWO-WAY TALKER - HOT BOX & DRAGGING EQUIP DETECTOR**	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @ 25% - 30%	7 3/4 x 11 D.S.	Type: Drive-On (Fair) Pattern: Boxed 2nd tie.	Primary: 3 Spikes / plate Secondary: 2 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good **Tie Condition: POOR at approaches to HBDE Detector.**
MP 43.4	**4°**	LEFT HAND CURVE	115 Lb. RE - JOINTED Sydney 1974 **LOW Rail:** Head wear: 3/32 to 11/32 Flange Wear: 0	115 Lb. RE - JOINTED Sydney 1974 **HIGH Rail:** Head wear: 1/4 to 3/8 Flange Wear: 1/16 to 1/8	Type: No.2 THW - 8 ft. Defect Rate @ 15% - 20%	7 3/4 x 11 D.S.	Type: Drive-On (Fair) Pattern: Boxed 2nd tie.	Primary: 3 Spikes / plate Secondary: 2 Spikes / Plate	Full cribs and shoulder. Vegetation in roadbed.	Track Alignment - Good. Rail Condition: Good Tie Condition: Good
MP 48.03	**4°**	LEFT HAND CURVE	115 Lb. RE - CWR Sydney 1974 **LOW Rail:** Head wear: 3/32 to 3/16 Flange Wear: 0	115 Lb. RE - CWR Sydney 1974 **HIGH Rail:** Head wear: 5/32 to 3/16 Flange Wear: 7/32 to 1/4	Type: No.2 THW - 8 ft. Defect Rate @ 30% - 35%	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate Secondary: 3 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good **Tie Condition: Medium. Some ties required.**
MP 53.7	**0°**	TANGENT	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @ 45% - 50%	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder.	**Track Alignment - POOR.** Rail Condition: Good Tie Condition: Medium
MP 54.1	**3°**	LEFT HAND CURVE ***"Sink Hole to North side of track."***	115 Lb. RE - JOINTED Sydney 1974 **LOW Rail.**	115 Lb. RE - JOINTED Sydney 1974 **HIGH Rail.**	Type: No.2 THW - 8 ft. Defect Rate: Derailment Area - Wheel off - 50% cut ties.	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: LOW Rail: 3 Spikes / plate HIGH Rail: 2 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good **Tie Condition: POOR @ Sink-hole. Ties required.**
MP 55.4	**5°**	RIGHT HAND CURVE ***"Track Settlement - Poor Alignment"***	115 Lb. RE - CWR Sydney 1974 **HIGH Rail.**	115 Lb. RE - CWR Sydney 1974 **LOW Rail.**	Type: No.2 THW - 8 ft. Defect Rate:	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate Secondary: 3 Spikes / Plate	Full cribs and shoulder.	**Track Alignment - POOR - Track settlement** Rail Condition: Good Tie Condition: Medium
MP 55.58	**8°**	LEFT HAND CURVE ***"Bank stabilization concerns"***	115 Lb. RE - JOINTED Sydney 1974 **LOW Rail.**	115 Lb. RE - JOINTED Sydney 1974 **HIGH Rail.**	Type: No.2 THW - 8 ft. Defect Rate:	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 3 Spikes / plate Secondary: 2 Spikes / Plate	Full cribs and shoulder.	**Track Alignment - Unstable** Rail Condition: Good Tie Condition: Medium
MP 55.93	**7° & 4°**	LEFT HAND CURVE (Compound)	115 Lb. RE - JOINTED Sydney 1974 **LOW Rail:** Head wear: 1/4 Flange Wear: 0	115 Lb. RE - JOINTED Sydney 1974 **HIGH Rail:** Head wear: 0 Flange Wear: 0	Type: No.2 THW - 8 ft. Defect Rate @ 15% - 20%	7 3/4 x 14 D.S.	Type: Spring (Wooding) Pattern: Boxed 2nd tie.	Primary: 3 Spikes / plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good Tie Condition: Good.
MP 60.1	**0°**	TANGENT ***"Slope stabilization - North side"***	115 Lb. RE - CWR Sydney 1974 Minimal head wear.	115 Lb. RE - CWR Sydney 1974 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @35% - 40%	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder. Vegetation in roadbed.	**Track Alignment -Unstable** Rail Condition: Good **Tie Condition: Fair to Medium - Ties required.**
MP 68.56	**0°**	TANGENT ***"Slope stabilization - North side"***	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	115 Lb. RE - JOINTED Sydney 1974 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @30% - 35%	7 3/4 x 11 D.S.	Type: Drive-On Fair) Pattern: Boxed 2rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder. Vegetation in roadbed.	**Track Alignment -Unstable** Rail Condition: Good **Tie Condition: Fair to Medium - Ties required.**
MP 77.5	**0°**	TANGENT **TWO-WAY TALKER - HOT BOX & DRAGGING EQUIP DETECTOR**	115 Lb. RE - JOINTED Sydney 19?? Minimal head wear.	115 Lb. RE - JOINTED Sydney 19?? Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @ 25% - 30%	7 3/4 x 11 D.S.	Type: Drive-On (Fair) Pattern: Boxed 2nd tie.	Primary: 3 Spikes / plate Secondary: 2 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good **Tie Condition: POOR at approaches to HBDE Detector.**
MP 77.90	**0°**	TANGENT	115 Lb. RE - CWR Sydney 1973 Minimal head wear.	115 Lb. RE - CWR Sydney 1973 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @40% - 45%	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder.	Track Alignment - Good Rail Condition: Good **Tie Condition: POOR - Ties required.**

APPENDIX - A

CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY
TRACK INSPECTION (MacINTYRE LAKE - SYDNEY)
16 & 17 JUNE 2015

LOCATION (Mile Post)	DEGREE	TRACK ALIGNMENT	RAIL		TIES - THW	TIE PLATES (D.S.) (1:40 Cant)	RAIL ANCHORS (Fair & Spring)	RAIL FASTENERS (Cut Spikes - 5 1/2 In.)	BALLAST	COMMENTS 16 - 17 JUNE 2015
			NORTH	SOUTH						
MP 80.3	**0°**	TANGENT	115 Lb. RE - CWR Sydney 19?? Minimal head wear.	115 Lb. RE - CWR Sydney 19?? Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate: ??	7 3/4 x 11 D.S.	Type: Channel Lok Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder. **Heavy Vegetation in roadbed.**	Track Alignment - Good Rail Condition: Good Tie Condition: Medium
MP 82.80	**4°**	LEFT HAND CURVE	115 Lb. RE - JOINTED Sydney 1974 **LOW Rail:** Head wear: 1/8 Flange Wear: 0	115 Lb. RE - JOINTED Sydney 1974 **HIGH Rail:** Head wear: 1/8 Flange Wear: 0	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	HIGH Rail: 7 3/4 x 14 D.S. LOW Rail: 7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: 3 Spikes / plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good Tie Condition: Medium.
MP 85.85	**0°**	TANGENT	115 Lb. RE - JOINTED Sydney 1966 Minimal head wear.	115 Lb. RE - JOINTED Sydney 1966 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @50% - 55%	7 3/4 x 11 D.S.	Type: Drive-On (Fair) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder. Heavy Vegetation in roadbed.	Track Alignment - Good Rail Condition: Good **Tie Condition: POOR - Ties required.**
MP 88.82	**5°**	LEFT HAND CURVE	115 Lb. RE - JOINTED Sydney 19?? **LOW Rail:** Head wear: 5/16 - flat Flange Wear: 0	115 Lb. RE - JOINTED Sydney 19?? **HIGH Rail:** Head wear: 3/16 to 1/4 Flange Wear: 3/16	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	7 3/4 x 11 D.S.	Type: Spring (Wooding) Pattern: Boxed 3rd tie.	Primary: Mixed -3 Spikes / Plate & 2 Spikes / Plate	Full cribs and shoulder. Shoulder ballast away from tie ends - 4-Wheelers. **Vegetation in roadbed.**	Track Alignment - Good. Rail Condition: Good Tie Condition: Good.
MP 93.0		TANGENT	115 Lb. RE - JOINTED Sydney 1961 Minimal head wear.	115 Lb. RE - JOINTED Sydney 1961 Minimal head wear.	Type: No.2 THW - 8 ft. Defect Rate @45% - 50%	7 3/4 x 11 D.S.	Type: Drive-On (Fair) Pattern: Boxed 3rd tie.	Primary: 2 Spikes / plate	Full cribs and shoulder. Vegetation in roadbed.	Track Alignment - Good Rail Condition: Good **Tie Condition: POOR - Ties required.**
MP 97.11	**4°**	RIGHT HAND CURVE	115 Lb. RE - JOINTED Sydney 1976 **HIGH Rail:** Head wear: 3/16 Flange: 0 to 1/8	115 Lb. RE - JOINTED Sydney 1976 **LOW Rail:** Head wear: Flat	Type: No.2 THW - 8 ft. Defect Rate @ 15% - 20%	7 3/4 x 11 D.S.	Type: Spring Pattern: Boxed 3rd tie.	Primary: LOW Rail: 3 Spikes / plate HIGH Rail: 2 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition: Good. Tie Condition: Good
MP 103.25	**5°**	LEFT HAND CURVE	115 Lb. RE - JOINTED Sydney 1976 **LOW Rail:** Head wear: 3/16 Flange: 0	115 Lb. RE - JOINTED Sydney 1976 **HIGH Rail:** Head wear: 3/16 Flange Wear: 3/16	Type: No.2 THW - 8 ft. Defect Rate @ 10% - 15%	7 3/4 x 14 D.S.	Type: Spring Pattern: Boxed 3rd tie.	Primary: 3 Spikes / plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition:Good. Some chipped rail ends. Tie Condition: Good
MP 107.7	**5°**	RIGHT HAND CURVE	115 Lb. RE - JOINTED Sydney 1976 **HIGH Rail:** Head wear: 3/16 Flange: 1/8 to 3/16	115 Lb. RE - JOINTED Sydney 1976 **LOW Rail:** Head wear: 7/32 to 7/16 Flange Wear: 0	Type: No.2 THW - 8 ft. Defect Rate @ 20% - 25%	7 3/4 x 14 D.S.	Type: Spring Pattern: Boxed 3rd tie.	Primary: 3 Spikes / plate Secondary: 3 Spikes / Plate	Full cribs and shoulder.	Track Alignment - Good. Rail Condition:Good. Some chipped rail ends. Tie Condition: Medium

APPENDIX B

Track Data – Gauge and Elevation

APPENDIX - B			CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY SYDNEY SUBDIVISION - CLASS 3 TRACK TRACK DATA - GAUGE & ELEVATION											
LOCATION	DEGREE	DIRECTION		STATIONS										
				1	2	3	4	5	6	7	8	9	10	AVG.
				(Inches)										
M.P. 20.2	2	R.H. CURVE	Gauge	56,625	56,750	56,750	56,750	56,750	56,750	56,750	56,750	56,750	56,625	56,725
			Elevation	1,500	1,375	1,750	1,750	1,750	1,750	1,875	2,000	1,875	2,000	1,763
M.P. 21.4	5	R.H. CURVE CWR Rail	Gauge	57,000	56,750	56,750	57,000	56,750	56,750	56,750	56,125	56,125	56,750	56,675
			Elevation	4,000	4,250	4,500	4,625	4,500	4,500	4,500	4,500	4,500	4,375	4,425
M.P. 23.36	6	R.H. CURVE Jointed Rail	Gauge	57,000	56,875	57,000	56,875	56,125	56,125	56,625	56,625	56,750	56,625	56,663
			Elevation	4,375	4,500	4,375	4,375	4,250	4,375	4,375	4,250	4,375	4,375	4,363
M.P. 25.46	3	R.H. CURVE CWR Rail	Gauge	56,500	56,500	56,500	56,500	56,375	56,250	56,375	56,250	56,500	56,250	56,400
			Elevation	4,625	4,625	4,500	4,625	4,500	4,500	4,500	4,500	4,375	4,375	4,513
M.P. 27.5	3	L.H. CURVE Jointed Rail	Gauge	56,500	56,500	56,500	56,625	56,625	56,500	56,500	56,500	56,750	56,625	56,563
			Elevation	2,500	2,500	2,500	2,500	2,625	2,500	2,500	2,375	2,250	1,875	2,413
M.P. 31.15	4	R.H. CURVE CWR Rail	Gauge	56,500	56,500	56,500	56,625	56,500	56,625	56,500	56,625	56,500	56,625	56,550
			Elevation	3,500	3,375	3,250	3,125	3,500	3,375	3,625	3,500	3,750	3,500	3,450
M.P. 35.6	4	L.H. CURVE CWR Rail	Gauge	56,625	56,625	56,500	56,625	56,375	56,500	56,625	56,500	56,500	56,750	56,563
			Elevation	3,500	3,625	3,625	3,500	3,500	3,125	2,750	2,625	2,500	2,250	3,100
M.P. 43.4	4	L.H. CURVE Jointed Rail	Gauge	56,750	56,500	56,375	56,625	56,785	56,625	56,625	57,000	56,750	56,500	56,654
			Elevation	3,750	3,875	4,000	3,625	4,000	4,000	4,125	3,750	4,000	4,125	3,925
M.P. 48.03	4	L.H. CURVE	Gauge	57,000	57,000	57,125	56,875	57,125	56,875	56,750	57,125	56,750	56,750	56,938
			Elevation	4,375	4,375	4,250	4,125	4,125	4,125	4,125	4,000	4,000	4,000	4,150
M.P. 55.93	7 4	L.H. CURVE Jointed Rail	Gauge	56,500	56,375	56,750	56,500	56,250	56,375	56,500	56,875	56,750	56,750	56,563
			Elevation	4,000	3,875	3,875	4,000	4,125	4,000	4,000	3,625	3,875	4,375	3,975
M.P. 107.7	5	R.H. CURVE Jointed Rail	Gauge	56,625	56,625	56,750	56,625	56,500	56,625	56,625	56,500	56,750	56,500	56,613
			Elevation	1,125	1,250	1,250	1,250	1,500	1,375	1,375	1,375	1,500	1,500	1,350
M.P. 103.25	5	L.H. CURVE CWR Rail	Gauge	56,625	56,750	56,625	56,625	56,500	56,500	56,625	56,625	56,500	56,500	56,588
			Elevation	2,625	2,625	3,000	3,250	3,500	3,625	4,750	3,875	3,875	4,000	3,513
M.P. 97.11	4	R.H. CURVE Low - Jtd. Rail High - CWR Rail	Gauge	56,625	56,625	56,625	56,500	56,625	56,750	56,500	56,500	56,500	56,500	56,575
			Elevation	3,750	3,750	3,750	3,750	3,750	3,875	4,000	3,750	3,750	3,875	3,800
M.P. 93.00	0	TANGENT Jointed Rail	Gauge	56,625	56,500	56,500	56,500	56,500	56,375	56,500	56,500	56,500	56,625	56,513
			Elevation	-0,500	0,000	0,125	0,000	0,125	-0,250	0,250	-0,375	-0,375	-0,375	-0,138
M.P. 88.82	5	L.H. CURVE Jointed Rail	Gauge	56,500	56,750	56,375	56,375	56,500	56,250	56,625	56,625	56,500	56,500	56,500
			Elevation	3,500	3,250	4,000	3,750	3,625	3,875	3,750	3,375	3,375	3,500	3,600
M.P. 82.80	4	L.H. CURVE CWR Rail	Gauge	56,750	56,750	56,750	56,500	56,500	56,500	56,500	56,500	56,750	56,750	56,625
			Elevation	2,875	3,125	3,875	4,125	4,500	4,500	3,750	3,125	2,750	2,750	3,538

APPENDIX C

Track Data – Curves

APPENDIX - C	CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY SYDNEY SUBDIVISION - CLASS 3 TRACK TRACK DATA - ELEVATION vs. CALCULATED BALANCED SPEED vs. ZONE SPEEDS								
				CLASS 3					
LOCATION	DEGREE	DIRECTION	Superelevation (Field)	$V_{bal.}$	$V_{Max.}$	CBCNS TIMETABLE NO. 9 MAX AUTHORIZED SPEED & PSO	COMMENTS	THEORETICAL Superelev. (E_{bal}) Freight Train	PROPOSED Superelev. (E_{bal}) Freight Train
				mph	mph	mph		Inches	Inches
M.P. 20.2	2	R.H. CURVE	1,763	35,5	58,3	35	Field Superelevation - Acceptable elevation for Balanced speed.	1,715	1,75
M.P. 21.4	5	R.H. CURVE CWR Rail	4,425	35,6	46,1	35	Field Superelevation - Acceptable elevation for Balanced speed.	4,2875	4,25
M.P. 23.36	6	R.H. CURVE Jointed Rail	4,363	32,2	41,9	35	Field Superelevation - Insufficient elevation for Balanced speed.	5,145	5,00
M.P. 25.46	3	R.H. CURVE CWR Rail	4,513	46,4	59,8	35	Field Superelevation - Too much elevation for Balanced speed.	2,5725	2,50
M.P. 27.5	3	L.H. CURVE Jointed Rail	2,413	33,9	50,8	35	Field Superelevation - Insufficient elevation for Balanced speed.	2,5725	2,50
M.P. 31.15	4	R.H. CURVE CWR Rail	3,450	35,1	48,0	35	Field Superelevation - Acceptable elevation for Balanced speed.	3,43	3,50
M.P. 35.6	4	L.H. CURVE CWR Rail	3,100	33,3	46,7	35	Field Superelevation - Insufficient elevation for Balanced speed.	3,43	3,50
M.P. 43.4	4	L.H. CURVE Jointed Rail	3,925	37,4	49,7	35	Field Superelevation - Too much elevation for Balanced speed.	3,43	3,50
M.P. 48.03	4	L.H. CURVE CWR Rail	4,150	38,5	50,5	35	Field Superelevation - Too much elevation for Balanced speed.	3,43	3,50
M.P. 55.93	7	COMP - L.H. CURVE Jointed Rail	3,975	28,5	37,7	30	Field Superelevation - Insufficient elevation for Balanced speed.	4,41	4,25
M.P. 55.93	4	COMP - L.H. CURVE Jointed Rail	3,975	37,7	49,9	30	Field Superelevation - Too much elevation for Balanced speed.	2,52	2,50
M.P. 107.7	5	R.H. CURVE Jointed Rail	1,350	19,6	35,3	25	Field Superelevation - Insufficient elevation for Max. speed.	2,1875	2,00
M.P. 103.25	5	L.H. CURVE CWR Rail	3,513	31,7	43,1	25	Field Superelevation - Too much elevation for Balanced speed.	2,1875	2,00
M.P. 97.11	4	R.H. CURVE Low - Jtd. Rail High - CWR Rail	3,800	36,8	49,3	25	Field Superelevation - Too much elevation for Balanced speed.	1,750	1,75
M.P. 93.00	0	TANGENT Jointed Rail				25	TANGENT TRACK		
M.P. 88.82	5	L.H. CURVE Jointed Rail	3,600	32,1	43,4	25	Field Superelevation - Too much elevation for Balanced speed.	2,1875	2,00
M.P. 82.80	4	L.H. CURVE CWR Rail	3,538	35,5	48,3	25	Field Superelevation - Too much elevation for Balanced speed.	1,750	1,75

APPENDIX D

Tie Program (2007 – 2015) and Tie Defect Ratio

APPENDIX - D

CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY
SYDNEY SUBDIVISION - CLASS 3 TRACK

MILEAGE		TIE PROGRAM by YEAR										TRACK INSPECTION 16 & 17 JUNE 2015 TIE DEFECT RATIO
		2007	2008	2009	2010	2011	2012	2013	2014	2015	TOTAL	
20	21	893		195							1088	15% - 20%
21	22			210							210	35% - 40%
22	23										0	10% - 15%
23	24										0	20% - 25%
24	25										0	
25	26	300		197							497	20% - 25%
26	27	100		295							395	
27	28										0	20% - 25%
28	29										0	
29	30			355							355	
30	31			321							321	
31	32			720							720	20% - 25%
32	33			770							770	
33	34										0	45% - 55%
34	35					810					810	
35	36					596					596	10% - 15%
36	37	239				334					573	
37	38	535									535	
38	39	536		190							726	
39	40		535	381							916	20% - 25%
40	41		402	250							652	
41	42			185	247						432	
42	43			359	385						744	25% - 30%
43	44				390						390	15% - 20%
44	45				547						547	
45	46				428						428	
46	47				501						501	
47	48				513						513	
48	49										0	30% - 35%

APPENDIX - D

CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY
SYDNEY SUBDIVISION - CLASS 3 TRACK

MILEAGE		TIE PROGRAM by YEAR										TRACK INSPECTION 16 & 17 JUNE 2015 TIE DEFECT RATIO
		2007	2008	2009	2010	2011	2012	2013	2014	2015	TOTAL	
49	50										0	
50	51										0	
51	52										0	
52	53			295							295	
53	54										0	45% - 50%
54	55		506								506	50% Cut ties - wheel off.
55	56										0	15% - 20%
56	57										0	
57	58										0	
58	59		738								738	
59	60										0	
60	61										0	35% - 40%
61	62			195							195	
62	63										0	
63	64										0	
64	65										0	
65	66										0	
66	67	937									937	
67	68		445	620							1065	
68	69			716							716	30% - 35%
69	70										0	
70	71										0	
71	72										0	
72	73										0	
73	74										0	
74	75										0	
75	76						80				80	
76	77						345				345	
77	78										0	25% - 30%
78	79										0	40% - 45%

APPENDIX - D

CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY
SYDNEY SUBDIVISION - CLASS 3 TRACK

MILEAGE		TIE PROGRAM by YEAR										TRACK INSPECTION 16 & 17 JUNE 2015 TIE DEFECT RATIO
		2007	2008	2009	2010	2011	2012	2013	2014	2015	TOTAL	
79	80		282								282	
80	81			255		664					919	
81	82					778					778	
82	83					647					647	20% - 25%
83	84					967					967	
84	85										0	
85	86										0	50% - 55%
86	87										0	
87	88										0	
88	89										0	20% - 25%
89	90										0	
90	91										0	
91	92										0	
92	93										0	
93	94										0	45% - 50%
94	95			145							145	
95	96			554							554	
96	97										0	
97	98										0	15% - 20%
98	99			348	190						538	
99	100						804				804	
100	101						481				481	
101	102						604				604	
102	103						607				607	
103	104						453				453	10% - 15%
104	105						411				411	
105	106		600		201		189				990	
106	107		600		540						1140	
107	108					821					821	20% - 25%
108	109						519				519	

APPENDIX - D

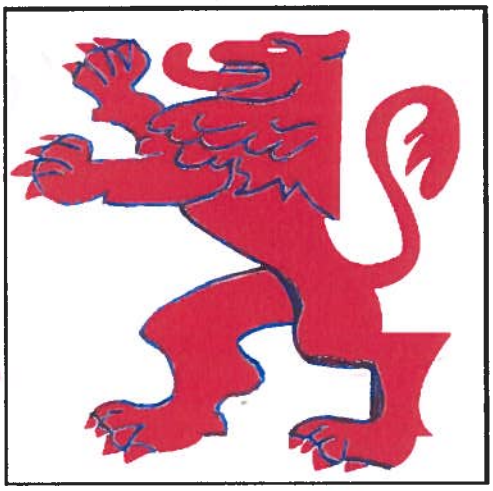
CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY
SYDNEY SUBDIVISION - CLASS 3 TRACK

MILEAGE		TIE PROGRAM by YEAR										TRACK INSPECTION 16 & 17 JUNE 2015 TIE DEFECT RATIO
		2007	2008	2009	2010	2011	2012	2013	2014	2015	TOTAL	
109	110						758				**758**	
110	111					883	100				**983**	
111	112						242				**242**	
112	113						626				**626**	
113	114						406				**406**	
TOTAL		**3540**	**4108**	**7556**	**3942**	**6500**	**6625**	**0**	**0**	**0**	**32271**	

APPENDIX E

CBNS Timetable No. 9 – Effective February 19, 2012

SAFETY FIRST



Cape Breton & Central Nova Scotia Railway

TIME TABLE NO. 9

EFFECTIVE 0001
ATLANTIC STANDARD TIME
FEBRUARY 19, 2012

Brad Ovitt
REGIONAL VICE-PRESIDENT

Shannon Toner
GENERAL MANAGER

GENERAL OFFICE
121 King Street
Stellarton, Nova Scotia

TIME TABLE NUMBER 9
CAPE BRETON & CENTRAL NOVA SCOTIA RAILWAY

TABLE OF CONTENTS

Job Briefing	Page 02
Statement of Safety Policy	Page 03
Security Alert	Page 04
Emergency Response	Page 05
Sydney Subdivision	Page 06
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CBNS System Special Instructions	Page 19
Radio Directory	Page 21
American Rail Dispatching Center	Page 23
Railway Operating Officers	Page 23
Medical Officers	Page 23
Operating Practices Support	Page 23

Stewart

A RailAmerica Company

JOB BRIEFING

Prior to performing any task requiring the coordination of two or more employees, those employees involved must hold a "job briefing" to ensure all have a clear understanding of the task to be performed and their individual responsibility and must discuss the following:

1. The job(s) to be done or move(s) to be made.

2. The responsibility of each employee.

3. Any additional instructions due to an unusual condition.

4. Any specific reminder due to a hazardous condition or unusual practice.

5. When on or near track, discuss how you are protected, what your limits are, what type and time given. If necessary, an additional briefing should be held as the work progresses or the situation changes.

AS YOU COMPLETE YOUR JOB BRIEFING ASK YOURSELVES

a. Is the work area clean and clear of hazards?
b. Do we have the right tools to do the job?
c. Have we conducted a thorough inspection of the tools and equipment we will be utilizing?
d. Are we following all the rules and safety procedures contained in the CROR and GOI?

STATEMENT OF SAFETY POLICY

It is the policy of RailAmerica that its operations be conducted in a safe manner. As an integral part of this policy, the management believes that:

- All injuries can be prevented.
- We are committed to provide a safe work environment for all employees.
- Employees of all levels are accountable for their own safety, the safety of their co-workers, preventing injuries and accidents, and displaying safe work behavior.
- Remember: No job is so important, no service so urgent that we cannot take time to perform all work safely.
- Working safely is a condition of employment.

SECURITY ALERT

A Security Alert has been issued to all transportation and petroleum operators in North America with respect to security information related to possible terrorism activity around the world.

All members of The Railway Association of Canada and the Association of American Railroads are accordingly reminding employees of the North American railway industry of the need for increased vigilance in our daily activities. The following three steps are recommended courses of action:

1. Look for trespassers and others loitering on railway property and report them to the proper authority. Pay particular attention to inspection of passing trains and standing equipment.
2. Tighten access to yards and terminals – where possible limit points of entry to facilities and report suspicious activity.
3. Notify the Rail Traffic Control Centre or other proper authority of unusual occurrences during train operations – frequent undesired emergency applications, unusual obstructions on track, malfunctioning signals, and again suspicious activity.

The RailAmerica system of short line and regional railways in North America has established a SINGLE REPORTING NUMBER to report all SECURITY TYPE CONCERNS OR MATTERS. This number will allow the company to connect directly to the Association of American Railroads Security base. Reports accordingly should be made to:

1-800-800-3490

EMERGENCY RESPONSE

Railway employees are to be prepared for emergency situations that may be encountered on the job. These include crossing accidents, derailments, fire, personal injury, release of hazardous materials and others. The Canadian Rail Operating Rules, Air Brake and Train Handling Rules and Safety Rules Book all include information about proper emergency response.

First priority is the safety and protection of human life. Check on the condition of fellow crew members and any third parties that may be affected by the emergency. Do not move unconscious or injured parties unless failure to do so presents a clear and certain danger. In the event of personal injury to a fellow crew member, seek medical help at the first opportunity. Responsibility to protect company property, public property, lading in freight cars, and livestock comes after necessary steps have been taken to protect human life.

Second priority is to notify RTC, railway supervisors and (if necessary) professional emergency responders such as EMS, police, or fire departments. When doing so, clearly state name, company name and location of incident. The telephone is the preferred method. A list of emergency numbers is listed in the timetable.

Third priority is to gather facts and assist with response. Take note of everything that occurs, especially witnesses, times that emergency responders are called and when they arrive, names of police officers, location of hazardous materials cars within train condition of derailed cars, license plate numbers of vehicles and positions of train crew members when accident occurred.

In the event of a hazardous material spill, shipping papers and response guidelines must be secured and made available to fire and public safety personnel. Detailed information about the condition of freight cars must also be made available.

TIME TABLE NUMBER 9
SYDNEY SUBDIVISION

METHOD OF CONTROL	DOB LIMITS	W ← SYDNEY SUBDIVISION → E	MILES FROM HAVRE BOUCHER	SIDING CAPACITY IN FEET	CAUTIONARY LIMITS	HOT BOX AND DRAGGING EQUIPMENT DETECTOR
OCS	DOB	SYDNEY BC	113.8		112.8	
		5.8 JEFFERSON	108.1	3350		
		4.5 LEITCHES CREEK	103.6	1500		
		4.8 NORTH SYDNEY	98.8	1780		
		6.2 GANNON	92.6	5200		
		20.7 CROSS POINT	71.9	5550		77.5
		13.8 GRAND NARROWS	58.1	3350		
		16.9 ORANGEDALE	41.2	5400		42.8
		8 RIVER DENYS	33.2	3100		
		19.6 TUPPER C	13.6	3865	15.0	
		1.3 PORT HAWKESBURY BC	12.3			
		2.8 PORT HASTINGS	9.5		12.0	10.8
		9.5 HAVRE BOUCHER C	0.0	YARD	1.5	

OCS Between Havre Boucher and Sydney controlled by RTC Saint Albans
CROR Rules 301 to 315 Apply

TIME TABLE NUMBER 9
SYDNEY SUBDIVISION FOOTNOTES

1. MAXIMUM AUTHORIZED SPEED

MP 0.0 TO MP 68.4.....35 MPH
MP 68.4 TO MP 86.0.....40 MPH
MP 86.0 TO MP 113.8.....25 MPH

2. PERMANENT SPEED RESTRICTIONS

MP 2.7 TO MP 2.9.....20 MPH
MP 8.7 TO MP 8.9.....10 MPH
MP 55.3 TO MP 55.8.....10 MPH
MP 55.8 TO MP 57.4.....30 MPH
MP 57.4 TO MP 58.1.....10 MPH
MP 58.1 TO MP 61.3.....30 MPH
MP 70.5 TO MP 70.9.....35 MPH
MP 78.5 TO MP 78.7.....35 MPH
MP 98.5 TO MP 98.8.....15 MPH
MP 112.95 TO MP 113.8.....10 MPH

3. METHOD OF CONTROL

MP 0.0 to 1.5 .....Cautionary Limits
MP 1.5 TO 12.0..... OCS
MP 12.0 TO 15.0..... Cautionary Limits
MP 15.0 TO MP 112.8.....OCS
MP 112.8 TO MP 113.8..... Cautionary Limits

4. JOINT OPERATIONS

None

TIME TABLE NUMBER 9
SYDNEY SUBDIVISION FOOTNOTES

5. RAILROAD CROSSINGS AT GRADE

None

OTHER INTERLOCKINGS

Canso Swing Span Mile 8.7

Manual interlocking limits are in effect between mile 8.6 and mile 8.9. Stop signs are located at mile 8.6 eastward and 8.9 westward. After stopping, trains may proceed on verbal authority of the bridgetender which must be repeated. In case of radio failure, the phone number for the bridgetender is (902) 625-0022.

Grand Narrows Swing Span Mile 57.7

Manual interlocking limits are in effect between mile 57.4 and mile 57.9. Stop signs are located at mile 57.4 eastward and 57.9 westward. After stopping, trains may proceed on verbal authority of the bridgetender which must be repeated. In case of radio failure, the phone number for the bridgetender is (902) 578-0865.

6. INDUSTRIAL SPURS

Aulds Cove Industrial Siding SK03 Mile 7.75 extends 2,285 feet from main track. Switch points face west. Derail target must be removed before operating derail and replaced after derail is placed in derailing position.

Point Tupper Spur Mile 13.58 extends 6,336 feet from main track. Switch points face east. NewPage Corporation gates secured with switch locks. CBNS will contact NewPage security (625-3333) prior to entering and when departing the facility. Employees must not ride sides of cars beyond the derails on any track while performing switching operations inside the gate. See other specific instructions Sydney Subdivision restricted clearances.

Nova Scotia Power Commission Spur Mile 13.6 extends 2.4 miles from main track. Switch points face east. See hand brake requirements under other specific instructions Sydney Subdivision. Two industries located on Spur, Nova Scotia Power Commission and SOEI Fractionation Plant.

Nova Scotia Power Commission Gate secured with switch lock. Crews must call 902-623-0536 (Savage) at NSPC 20 minutes prior to arrival at NSPC 20 minutes prior to arrival to have gate unlocked. A running test of train brakes must be performed prior to entering Nova Scotia Power Commission plant. Account sharp decline at end of track SJ50, all movements must use extreme caution in this vicinity.

SOEI Fractionation Plant Gate secured with switch lock. Prior to entering the SOEI Fractionation Plant their control room is to be advised. Phone 625-6570 or 625-6571. When leaving the site it will again be necessary to advise the control room. **NOTE:** The use of cellular telephones is prohibited within the confinements of the SOEI fractionation plant. Telephones are to be turned off before entering site.

Point Edward Spur Mile 107.9 extends 2.7 miles from main track. Switch points face east. Movements over all public crossings at grade must be protected by a qualified person, except public crossing at grade mile 1.89. Movements switching in track SD 40 must not leave cars on main track within 300 feet of switch.

TIME TABLE NUMBER 9
SYDNEY SUBDIVISION FOOTNOTES

7. PUBLIC CROSSINGS AT GRADE

Approach the following crossings at the speed indicated, within the distance specified. Normal speed may be resumed when the crossing is fully occupied.

MILE	NAME	APPROACH DISTANCE	SPEED
12.1	Philpott St	500 Ft	20
12.23	Water St		10
96.08	Legatto St	800 Ft (Westward only)	20
96.43	Main St	800 Ft (Eastward only)	20
98.92	King St	370 Ft	10
99.09	Peppet St	600 Ft	20
99.22	Brook St	600 Ft	20

Mile 12.23 Water Street Do not exceed 10 MPH entering public crossing at grade mile 12.23 Sydney Sub until crossing fully occupied account sightline restrictions.
Mile 98.92 King Street Warning devices automatic. Stop signs both sides of crossing to govern movement on other than main track.
Mile 113.78 Prince Street Semi-automatic gates. Stop signs both sides of crossing. Train or engine movements must not proceed beyond stop signs until gates have been activated by a qualified railway employee. Pushbuttons located in boxes either side of crossing on both tracks. Start pushbuttons lower the gates and stop pushbuttons raise the gates. Gates will rise automatically after movement has cleared the circuits. All applicable CROR rules governing movements over public crossing at grade remain in force.
Mile 113.90 Ferry Street Warning devices non-automatic. Stop signs both sides of crossing.
Whistle Restriction Whistle signal 14L is prohibited approaching the following public crossing at grade except to prevent an accident:

Mile 112.95 Kings Road
Mile 113.14 Bentinck Street
Mile 113.28 George Street
Mile 113.39 Brookland Street
Mile 113.50 Townsend Street
Mile 113.78 Prince Street
Mile 113.90 Ferry Street

8. RADIO CHANNEL INSTRUCTIONS

See CBNS System Special Instructions PAGE 22

TIME TABLE NUMBER 9
SYDNEY SUBDIVISION FOOTNOTES

9. SPECIFIC SWITCH INSTRUCTIONS

CROR 104 (i) Main track switches located at mile 13.58 (SJ10B); mile 13.6 (SJ50B) and mile113.63 (SC11) may be left lined and locked in reverse position.
CROR 104 (o) Non main track switches in Sydney yard and Havre Boucher yard may be left lined and locked in reverse position.
CROR 104.5 – Special Derail. Derail located east end of track SJ50B may be left in the non-derailing position and locked only when equipment is not stored on the descending grade at the east end of the track. Derail located on track SJ10B may be left in the non-derailing position only when equipment is not present.

10. DEFECT DETECTOR LOCATIONS & INSTRUCTIONS

DETECTOR LOCATION	BO SET OFF LOCATION
10.8	SJ40 Port Hawkesbury – Port Hastings
42.8	SH49 Alba - Orangedale
77.5	Gannon – SH26 Boisdale

See RailAmerica GOI Section 4, Items 15 – 21 for Defect Detector instructions.

11. OTHER TRACKS

PORT HASTINGS	**MP 9.5 extends 2,408 feet from main track. Switch points face both east and west.**
ALBA	**MP 46.2 extends 490 feet from main track. Switch points face east.**
MCKINNON HARBOR	**MP 52.1 extends 370 feet from main track. Switch points face west.**
BOISDALE	**MP 75.5 extends 230 feet from main track. Switch points face west.**
LITTLE BRAS D'OR	**MP 91.9 extends 200 feet from main track. Switch points face west.**
NORTH SYDNEY IND. PARK	**MP 97.8 extends 4,520 feet from main track. Switch points face east.**
SUPERIOR PROPANE	**MP 98.2 extends 480 feet from main track. Switch points face west.**
CO-OP ATLANTIC	**MP 108.9 extends 1,240 feet from main track. Switch points face west.**
IRVING PROPANE	**MP 111.6 extends 445 feet from main track. Switch points face west.**

TIME TABLE NUMBER 9
SYDNEY SUBDIVISION FOOTNOTES

12. OTHER SPECIFIC INSTRUCTIONS

PRIVATE CROSSINGS AT GRADE

CROR 14 (L) is applicable at least ¼ mile in advance of the following private crossings at grade.
Mile 86.20 – Mile 100.7 – Mile 111.4 – Mile 111.6 – and Mile 111.7

SIX-AXLE LOCOMOTIVES

Six-axle locomotives are prohibited from operating on the following tracks:

Mile 97.8	Copal track SE40
Mile 98.2	Superior track SE34
Mile 108.1	Point Edward Spur track SD40
Mile 108.9	Co-op Atlantic track SD30
Mile 111.6	Irving Propane track SC35

HAND BRAKE REQUIREMENTS

Tupper and NSPC Spur mile 13.6
When handling tank cars for the fractionation plant, the minimum number of hand brakes must be applied according to the following chart.

1 to 5	**tank cars**	**2 handbrakes**
6 to 8	**tank cars**	**3 handbrakes**
9 to 11	**tank cars**	**4 handbrakes**
12 to 14	**tank cars**	**5 handbrakes**
15 to 17	**tank cars**	**6 handbrakes**
18 to 20	**tank cars**	**7 handbrakes**

DESIGNATED TRACKS

Unattended Locomotive Tie up Tracks
Tupper tracks SJ58 and SJ59
Point Tupper track SJ06A
Port Hawkesbury tracks SJ40 and SJ43.
Dangerous Goods Storage Tracks
Sydney track SA62 and Havre Boucher tracks TL03 and TL04.

EQUIPMENT RESTRICTIONS

All locomotive groups permitted.
Heaviest car permitted between mile 0.0 and mile 15 gross weight 268,000 lbs.
Heaviest car permitted between mile 15 and mile 112.8 gross weight 263,000 lbs.

TIME TABLE NUMBER 9
SYDNEY SUBDIVISION FOOTNOTES

RESTRICTED CLEARANCES

LOCATION OF RESTRICTED CLEARANCE NOT MARKED OR INDICATED BY RESTRICTED CLEARANCE SIGNS		
LOCATION	**OBSTRUCTION**	**SIDE TRACK OR OVERHEAD**
NEWPAGE CORP. Tracks SJ11IN, SJ14IN, SJ15IN, SJ16IN, and SJ18IN	Unloading racks, piping and ladders	Overhead and both sides. Box cars are not to be used as reachers due to restricted clearance
IRVING PROPANE **Track SC35**	Light pole	South side
SYDNEY Mile 113.6	Wires	Overhead

Caution: There may be other permanent and/or temporary close clearances not listed in this time table.

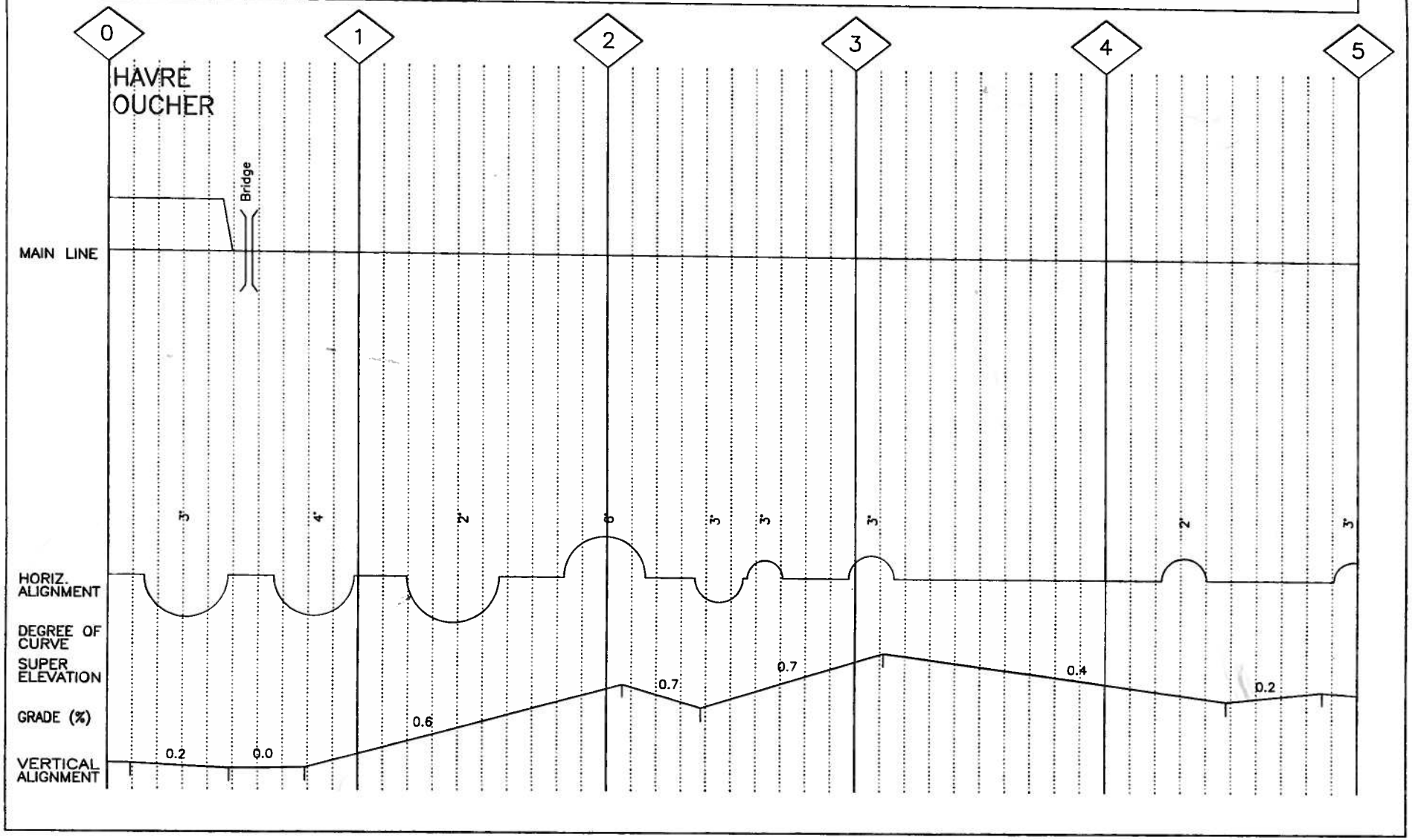
APPENDIX F

CBNS Track Chart

CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 1 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 0 – MP 5

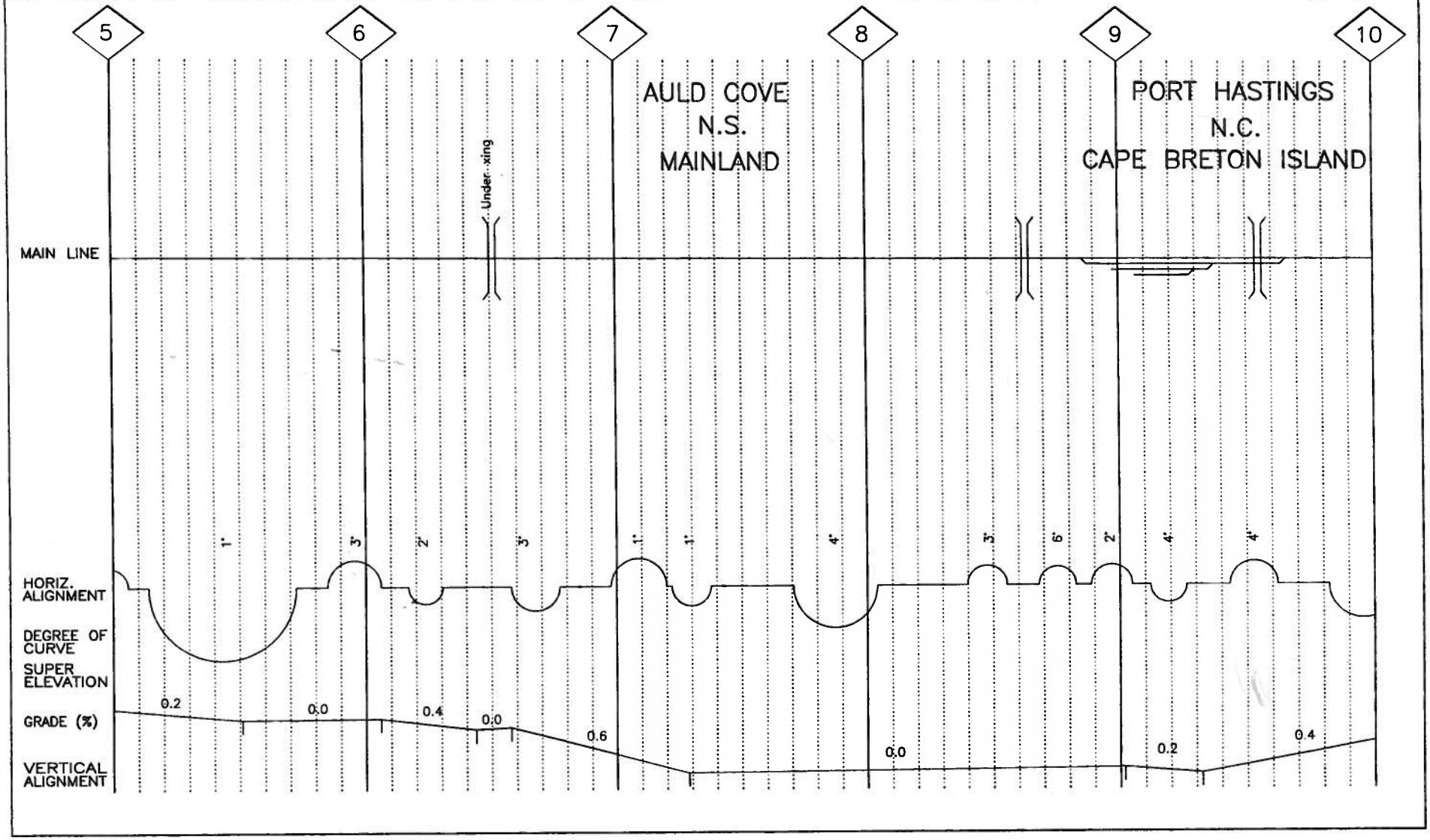
MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 2 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 5 -- MP 10

MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



CROUCH ENGINEERING®

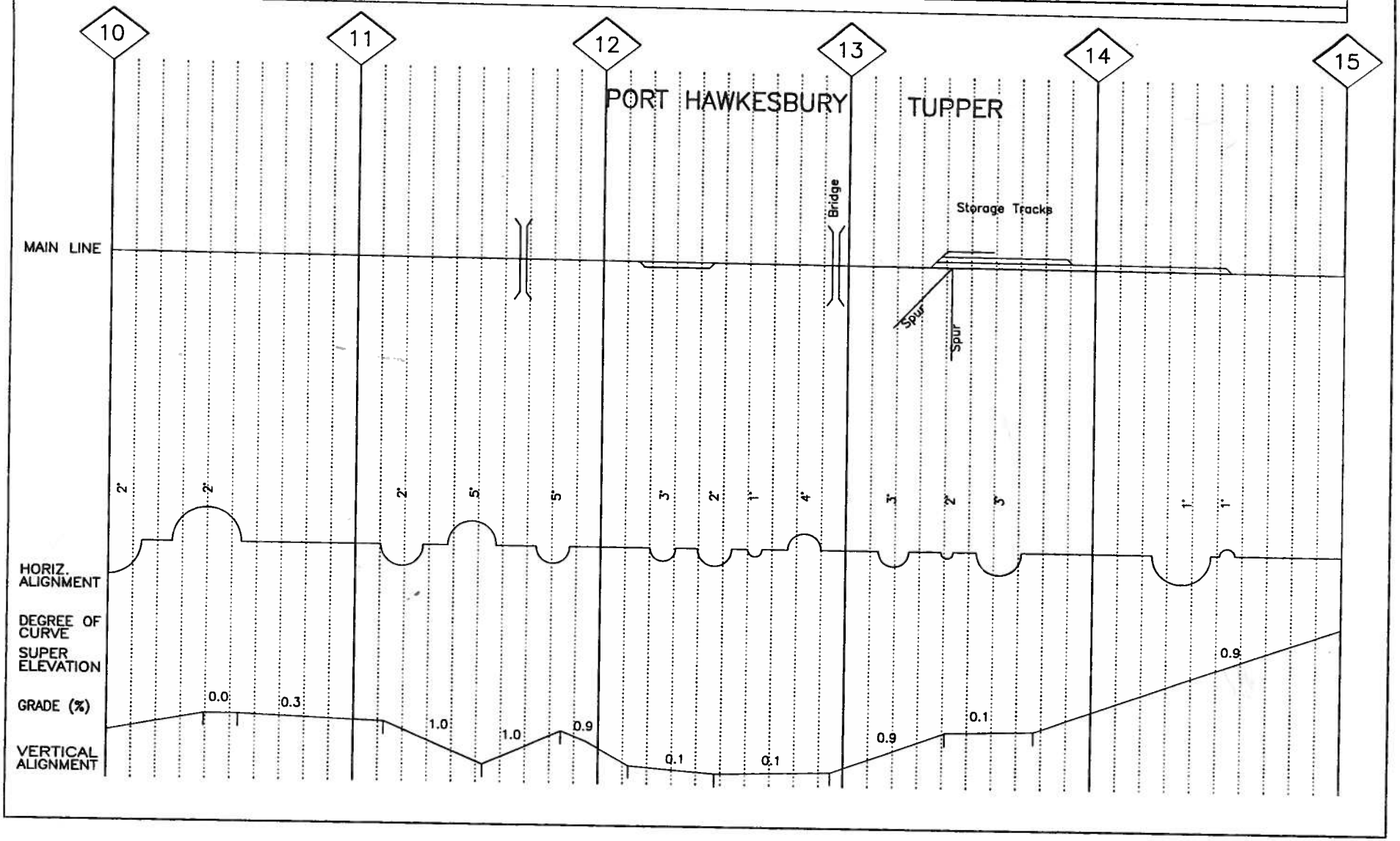
CAPE BRETON & CENTRAL NOVA SCOTIA
Track Chart

PAGE: 3 of 23

LAST REVISED DATE: 5-14-2003

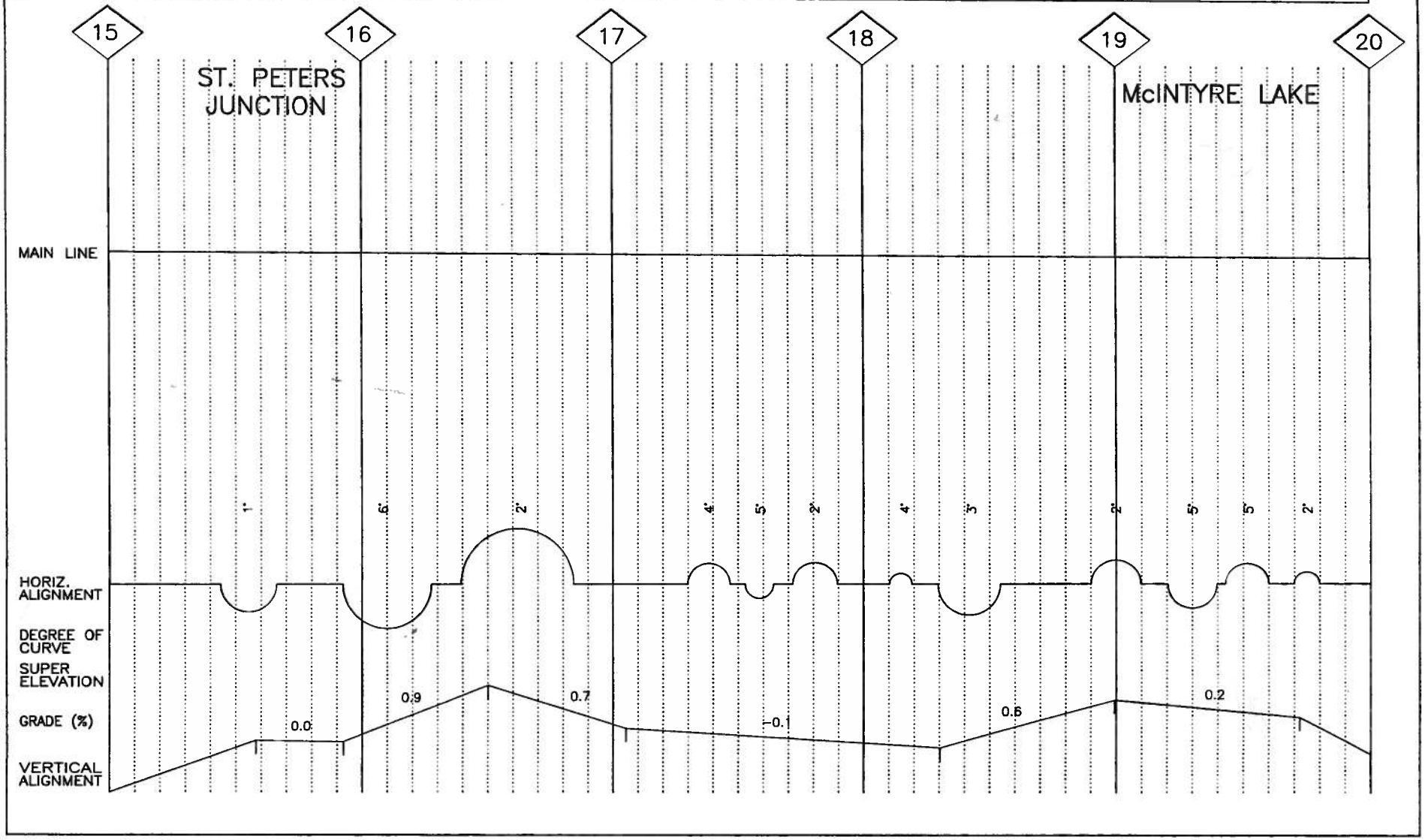
Sidney MP 10 – MP 15

MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 4 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 15 – MP 20

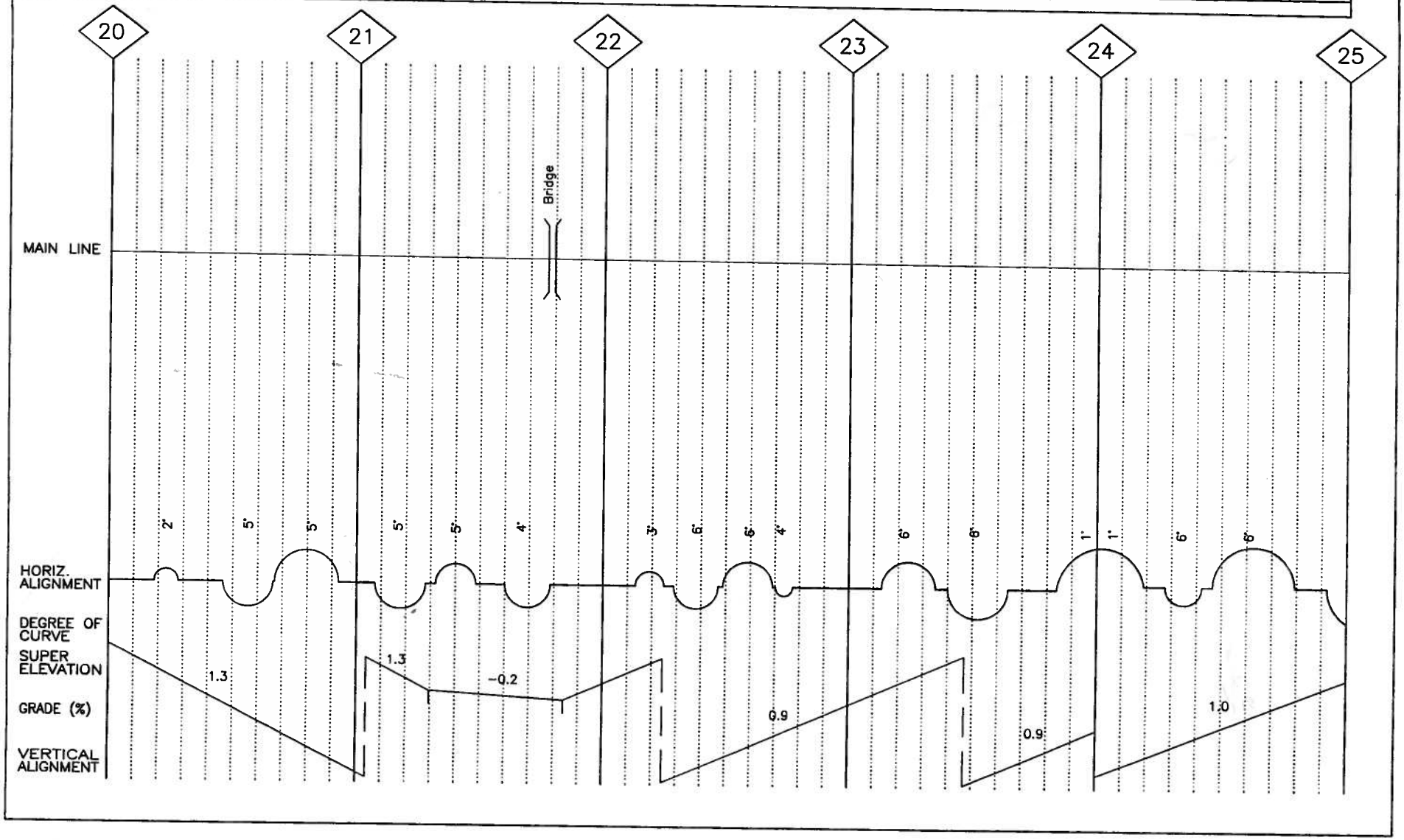
MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 5 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 20 – MP 25

MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CROUCH ENGINEERING®

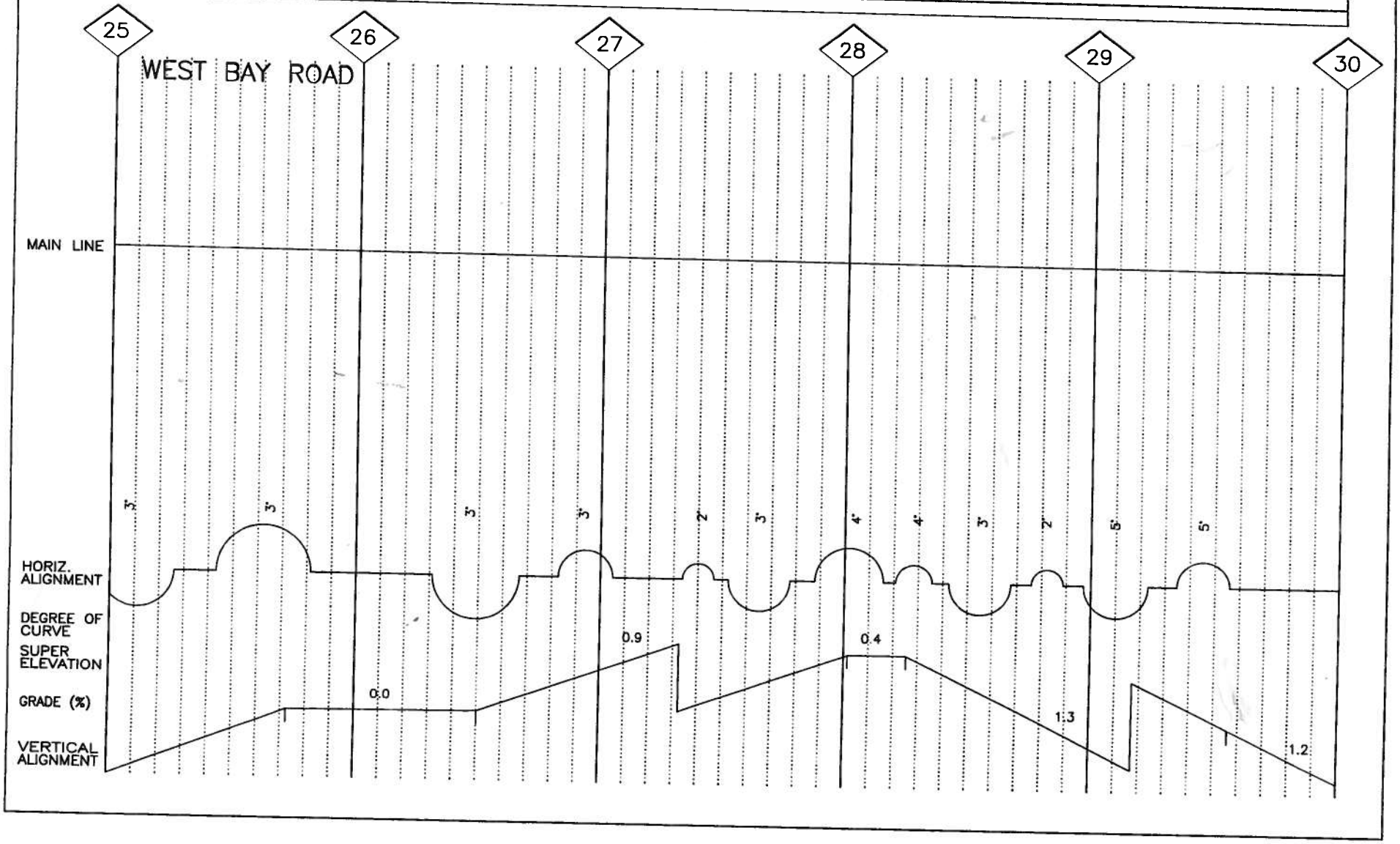
CAPE BRETON & CENTRAL NOVA SCOTIA
Track Chart

PAGE: 6 of 23

LAST REVISED DATE: 11-18-2002

Sidney MP 25 - MP 30

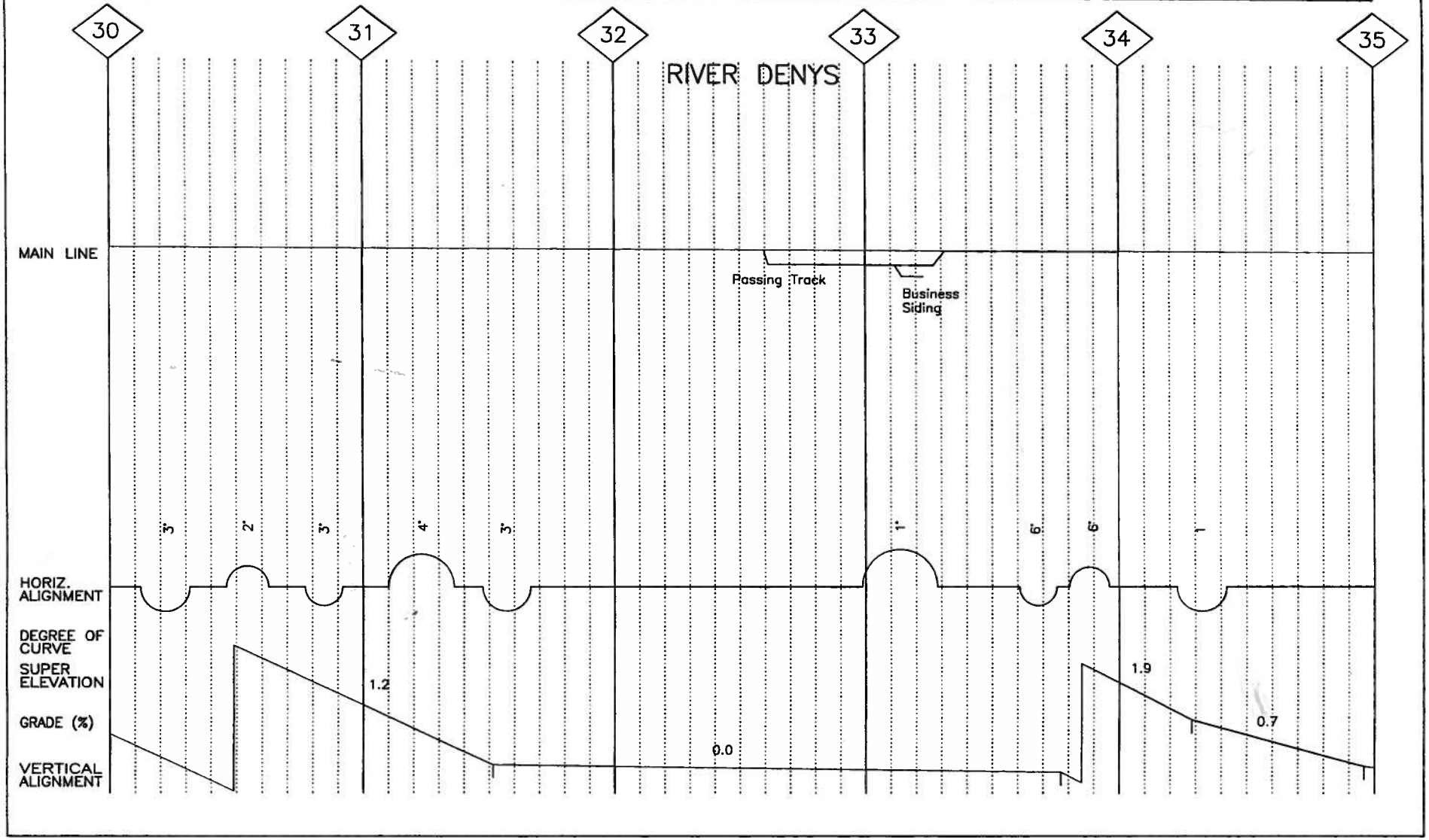
MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CROUCH ENGINEERING®

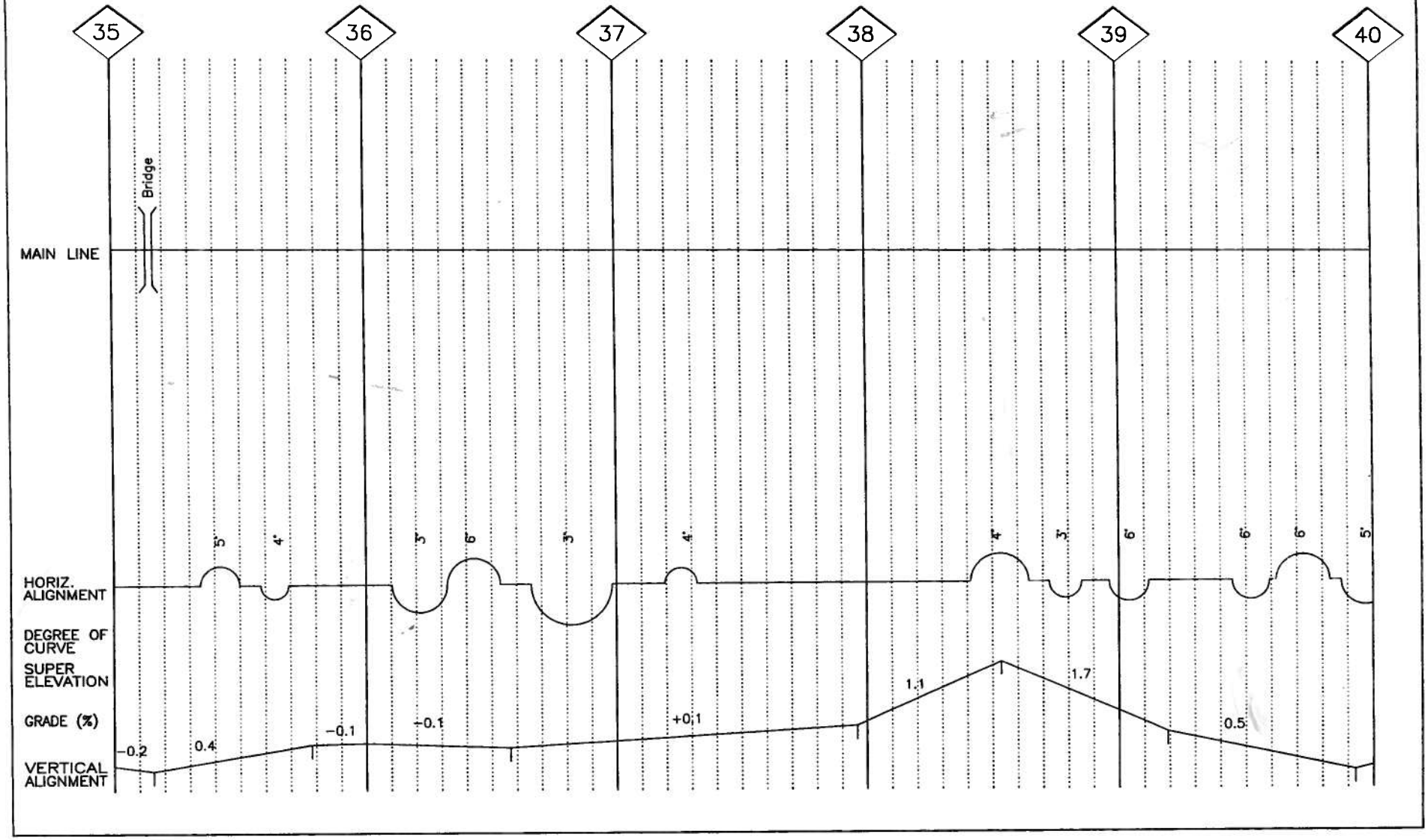
CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 7 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 30 – MP 35

MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



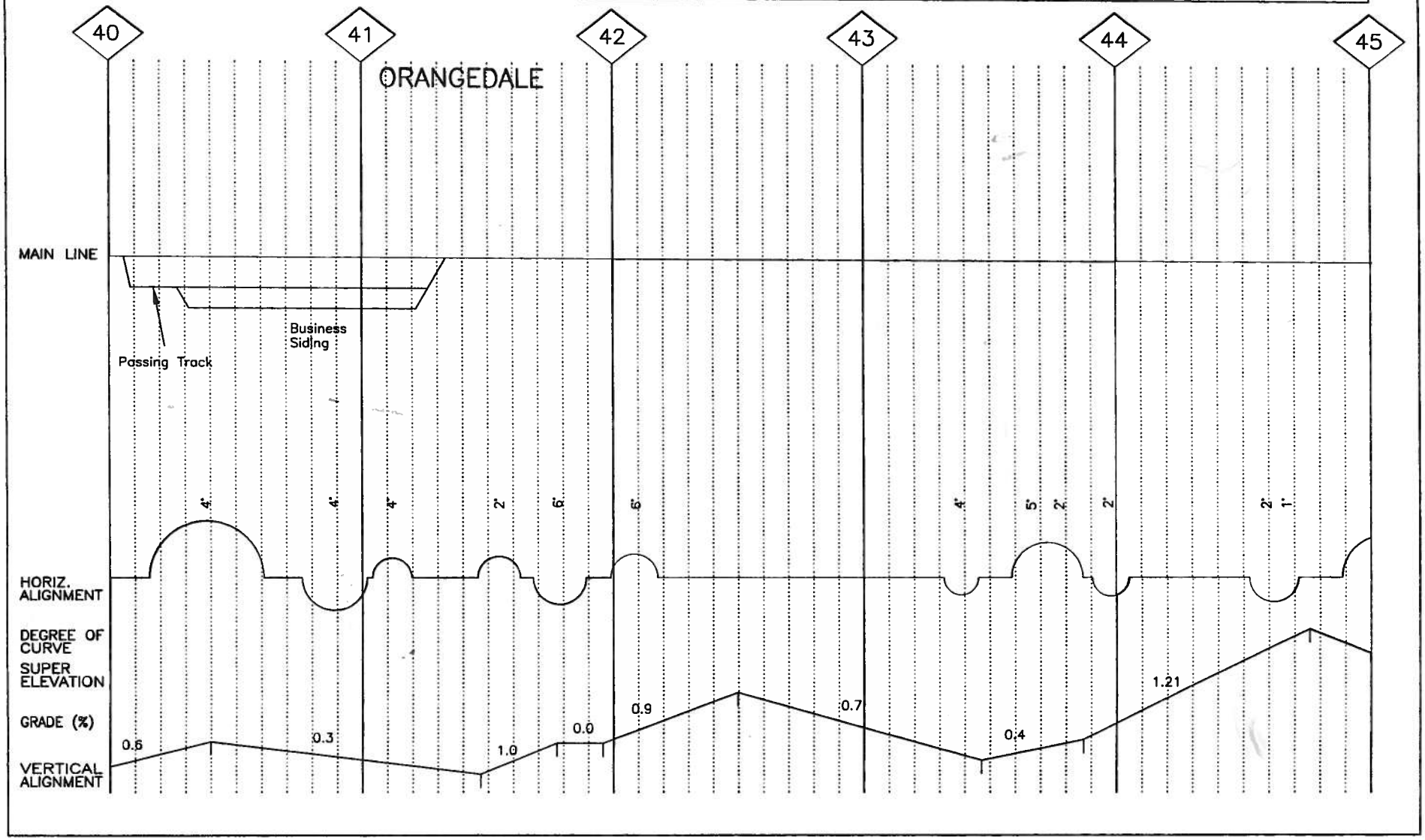
CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 8 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 35 – MP 40

MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	

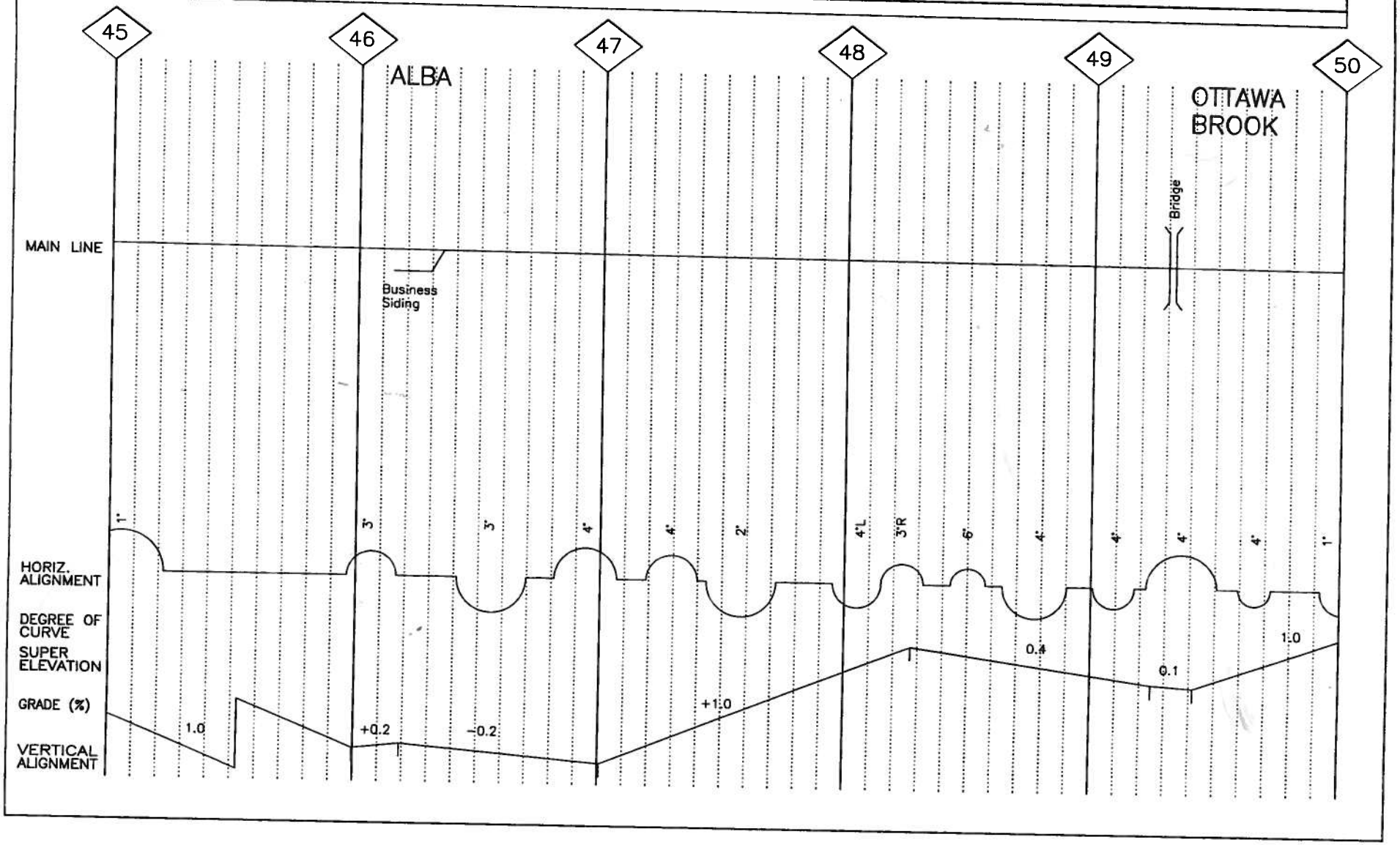


CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 9 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 40 – MP 45

MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



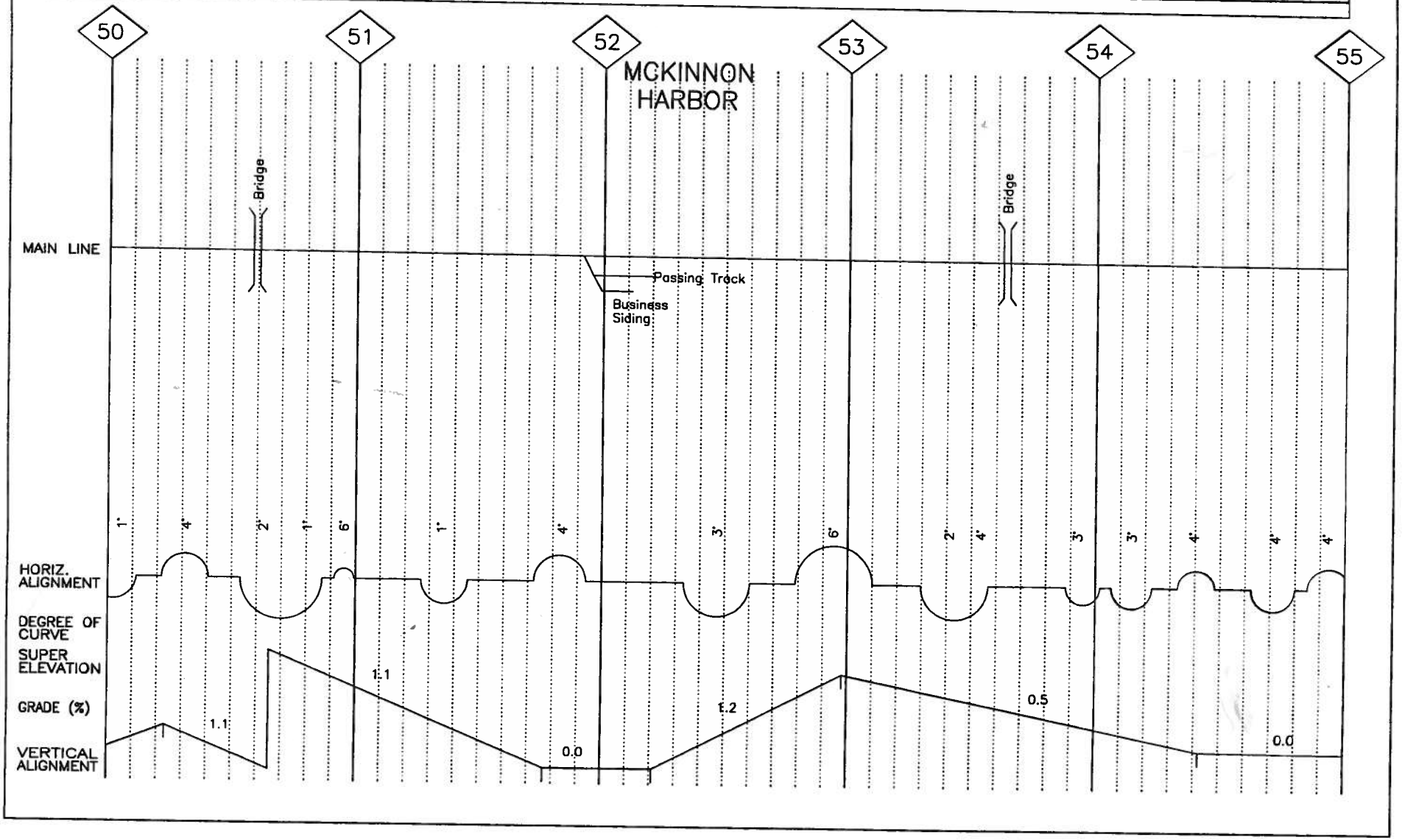
MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 11 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 50 – MP 55

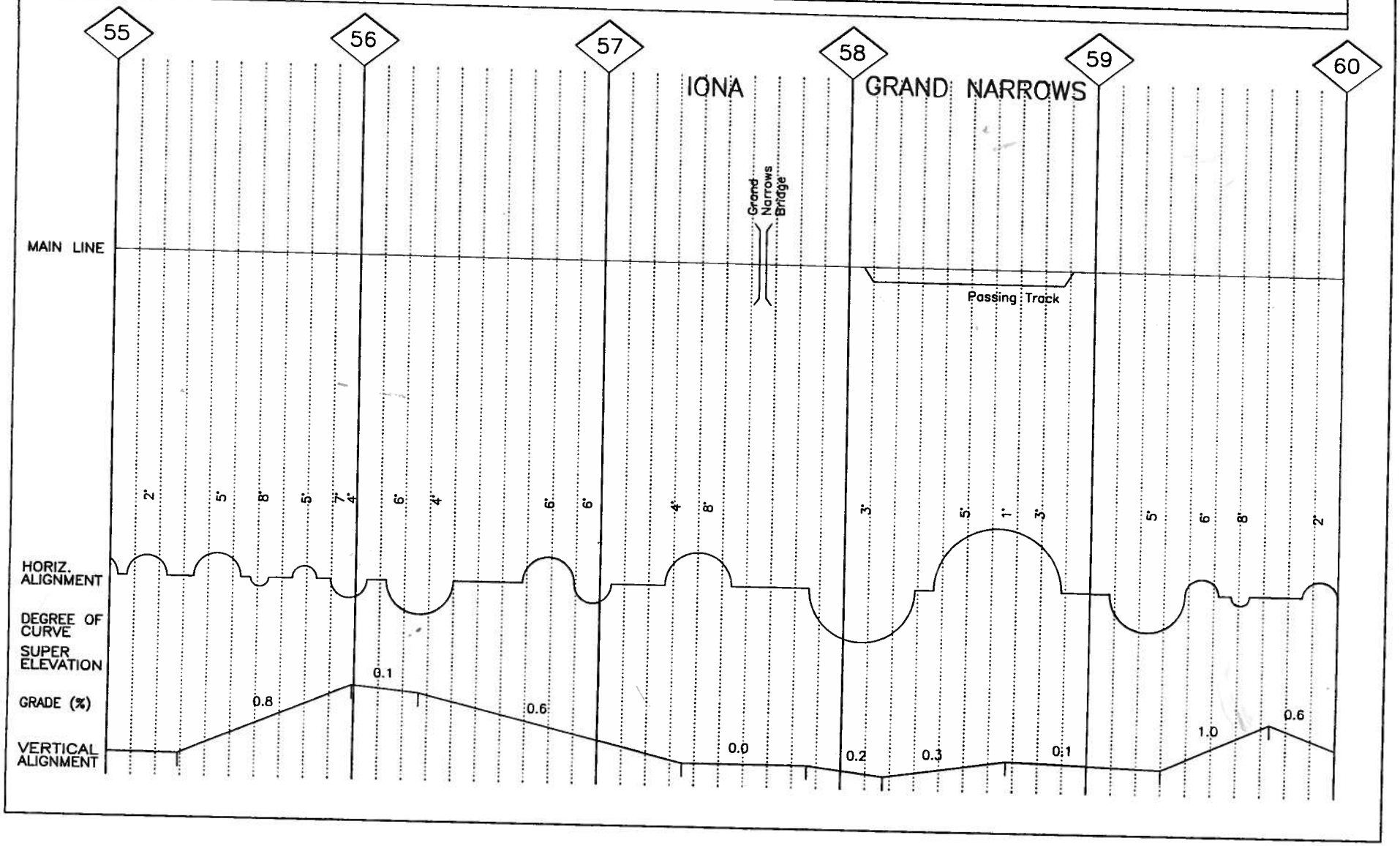
MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



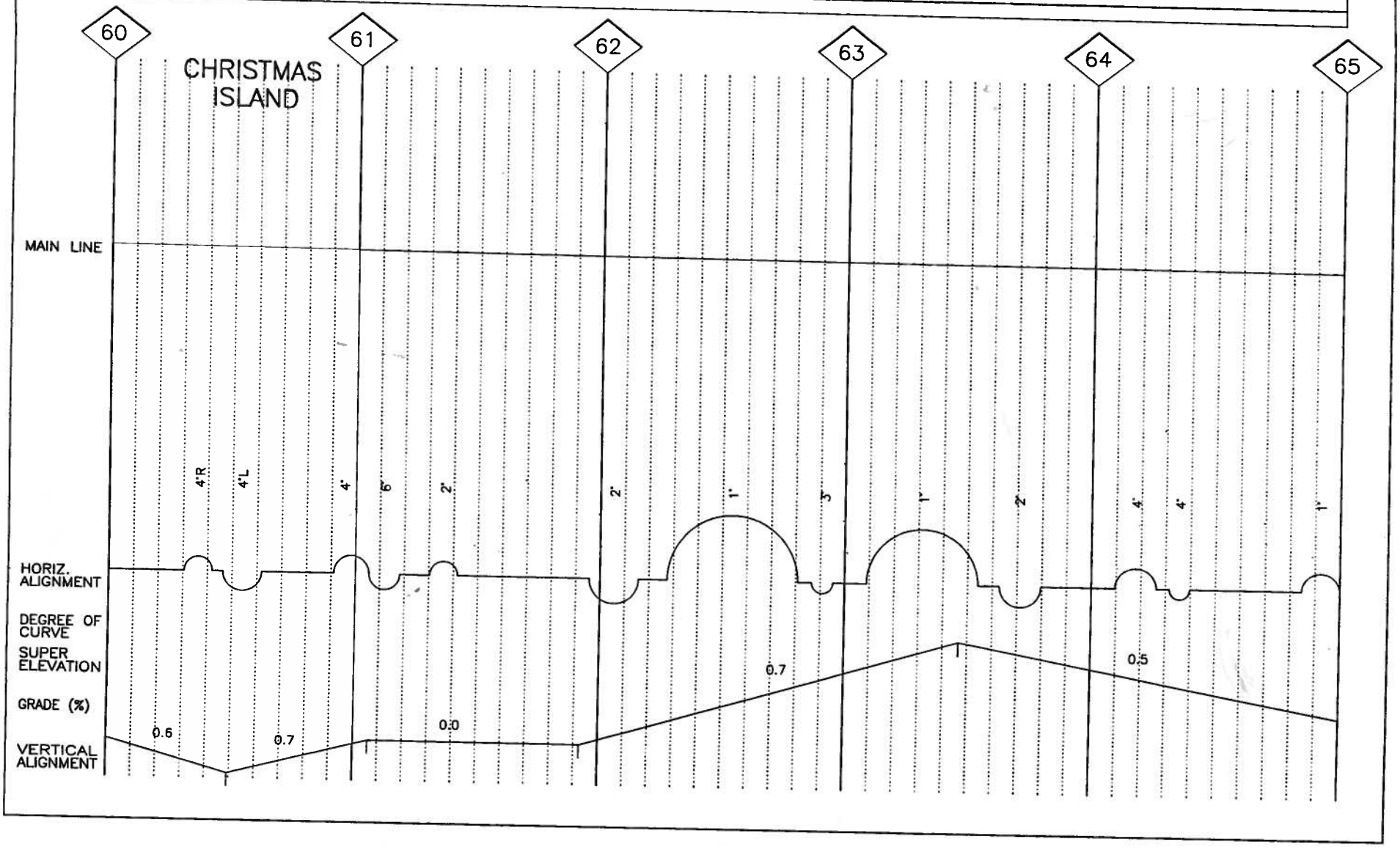
CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 12 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 55 – MP 60

MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR

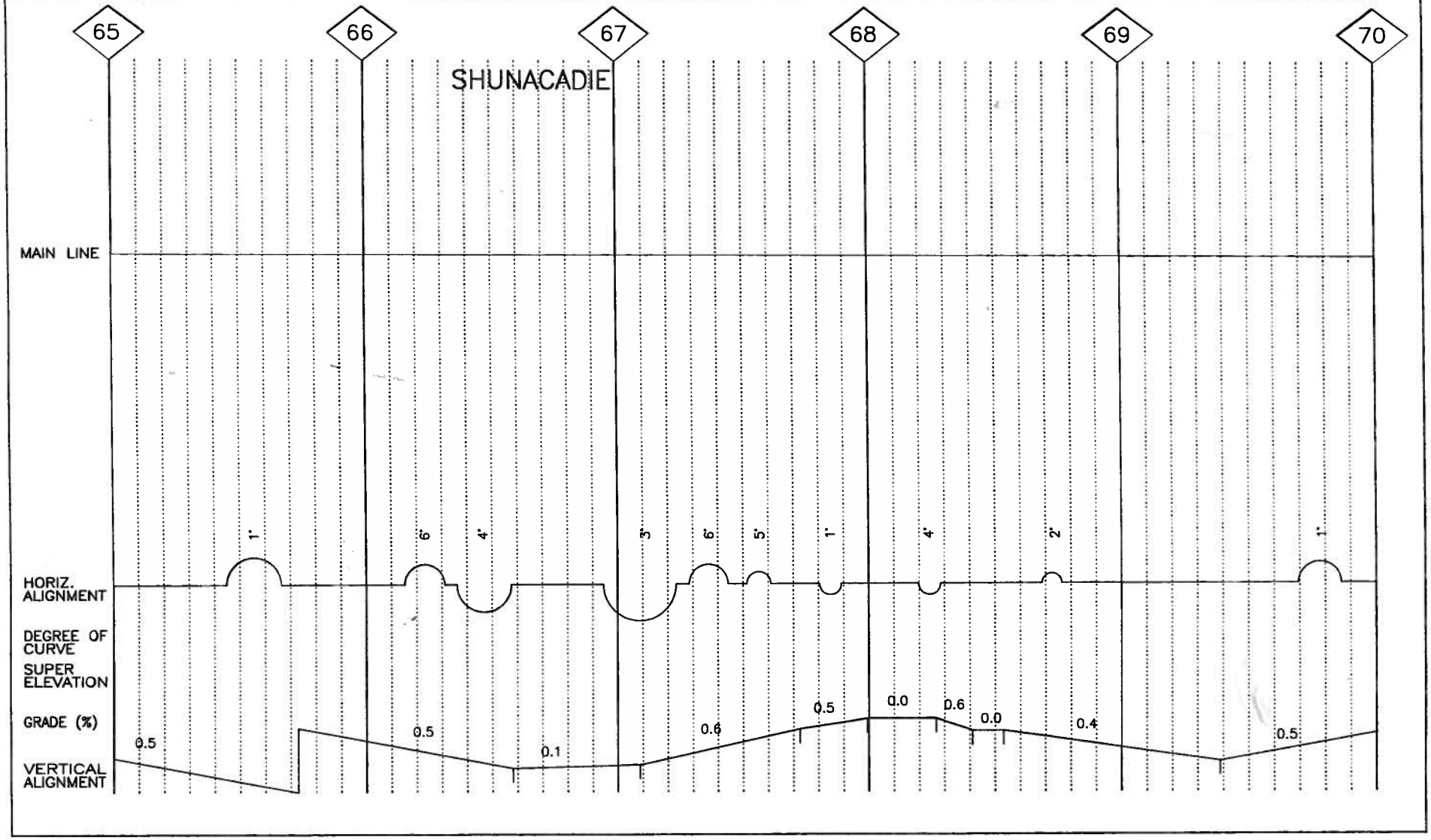


MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 14 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 65 – MP 70

MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



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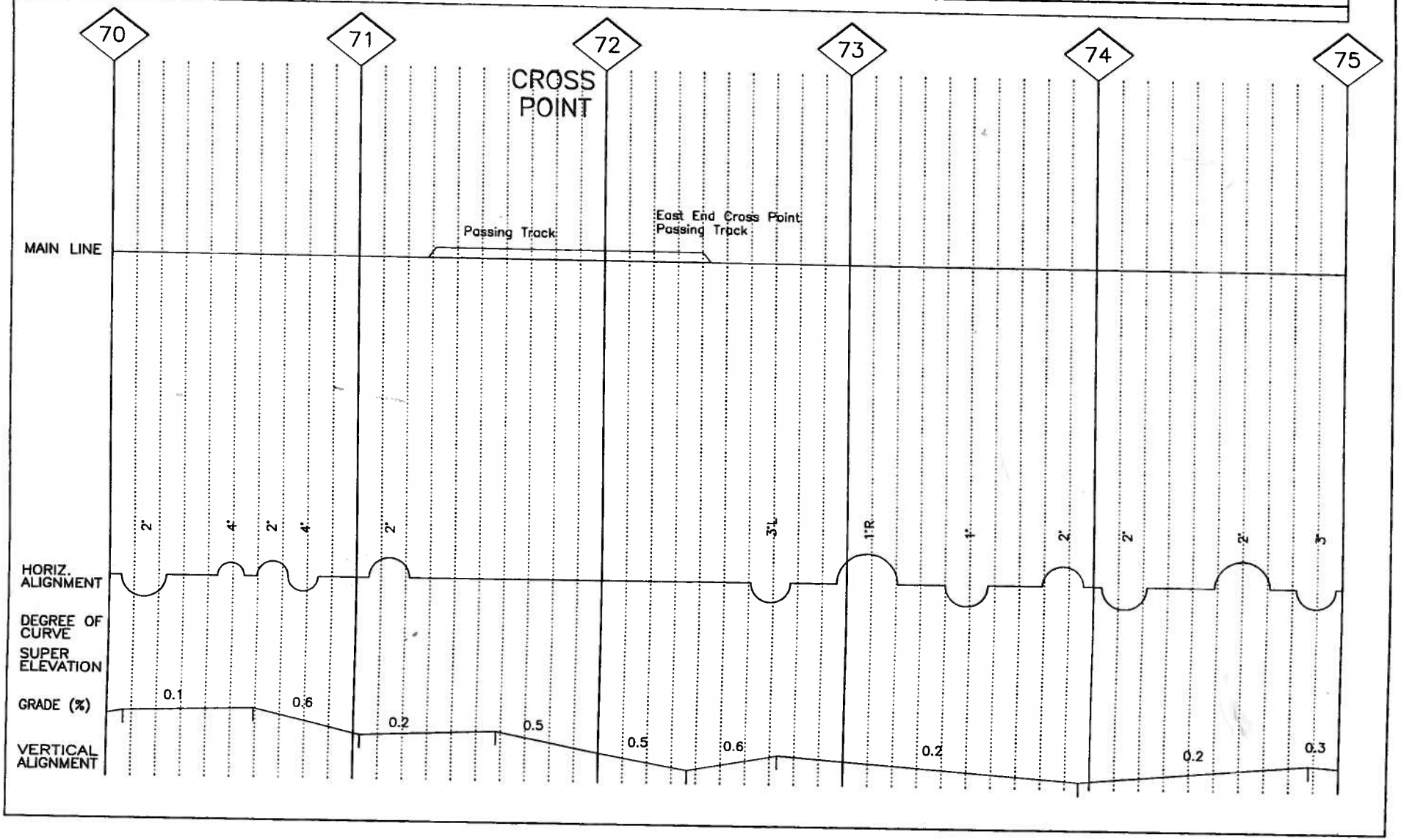
CAPE BRETON & CENTRAL NOVA SCOTIA
Track Chart

PAGE: 15 of 23

LAST REVISED DATE: 5-14-2003

Sidney MP 70 – MP 75

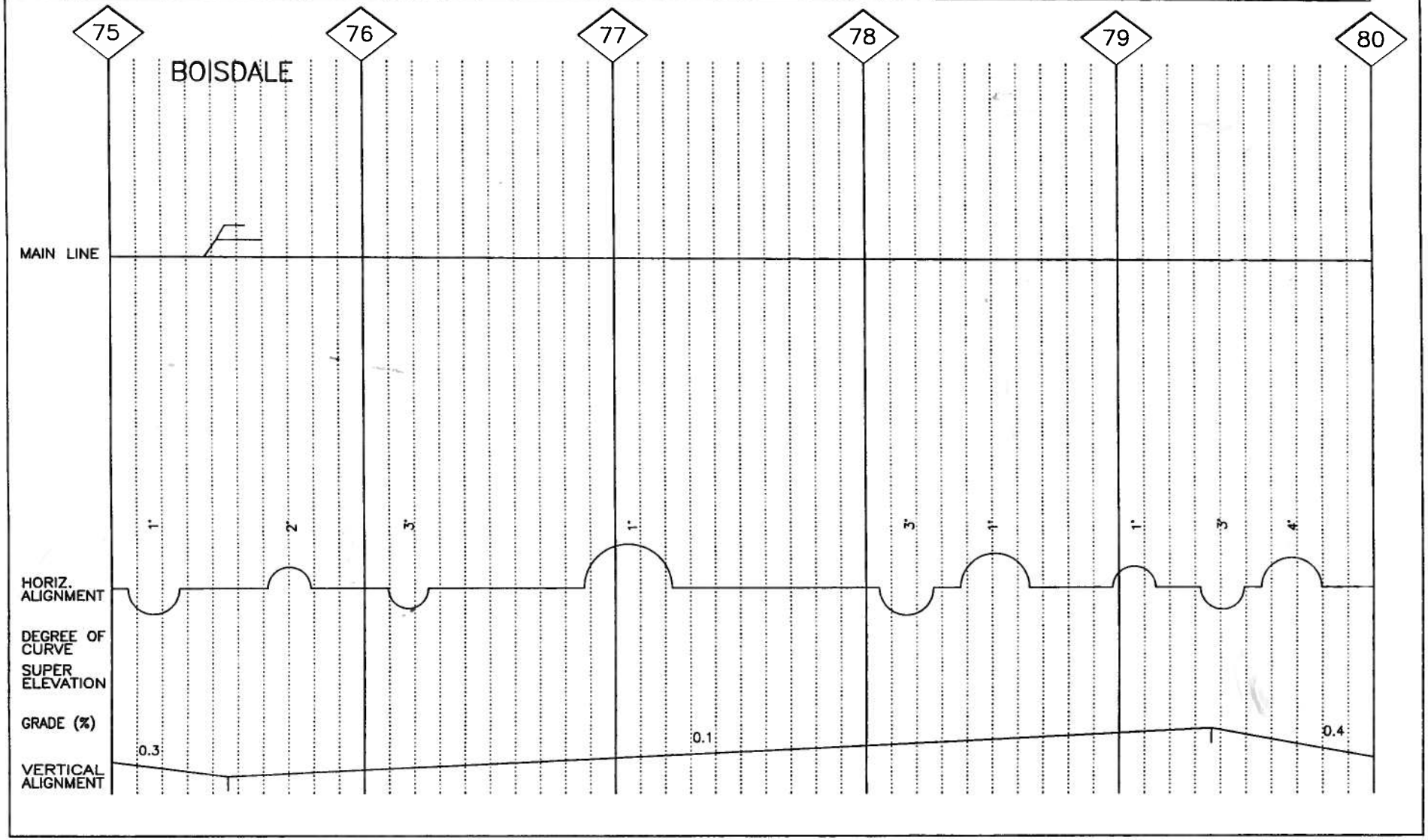
MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 16 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 75 – MP 80

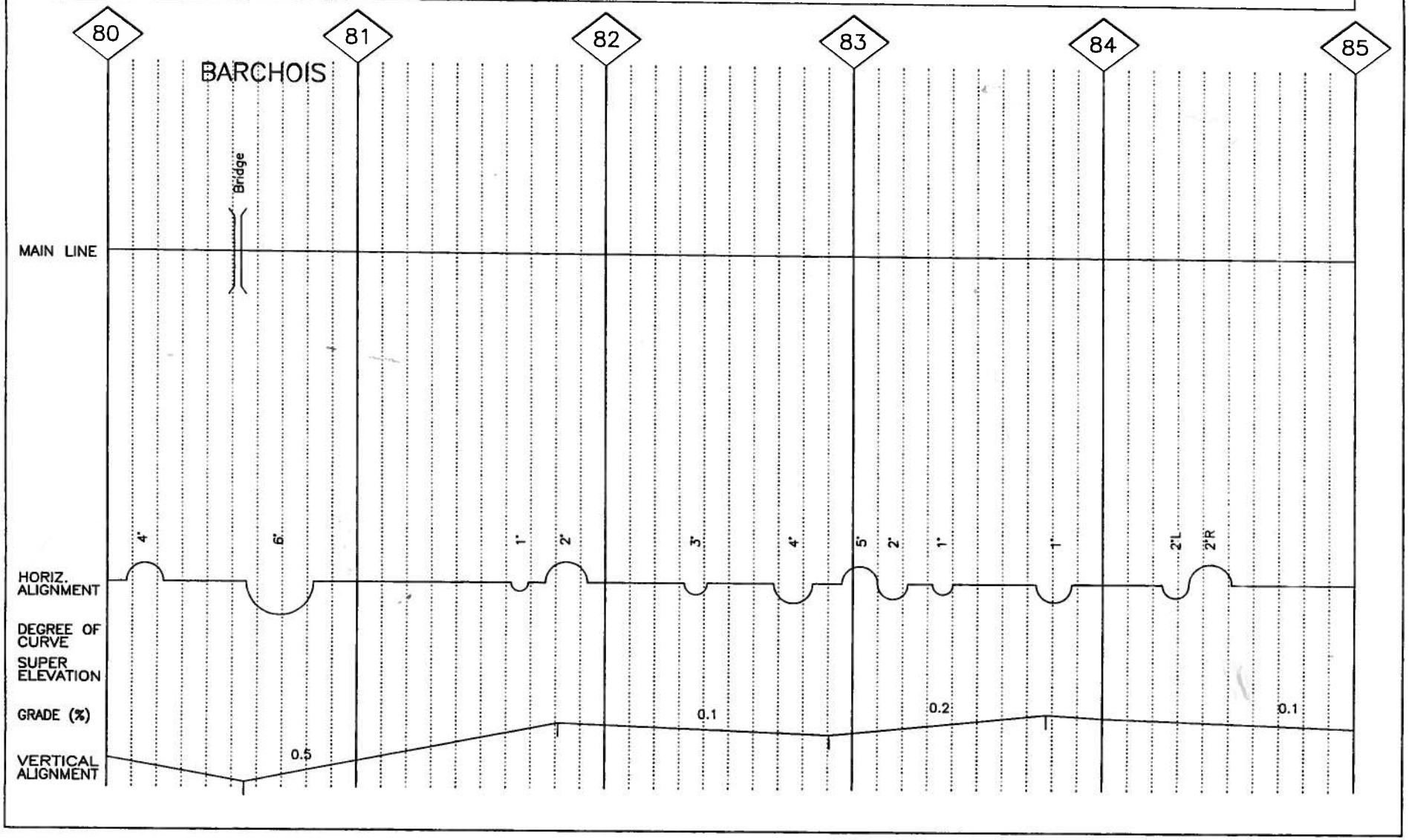
MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 17 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 80 – MP 85

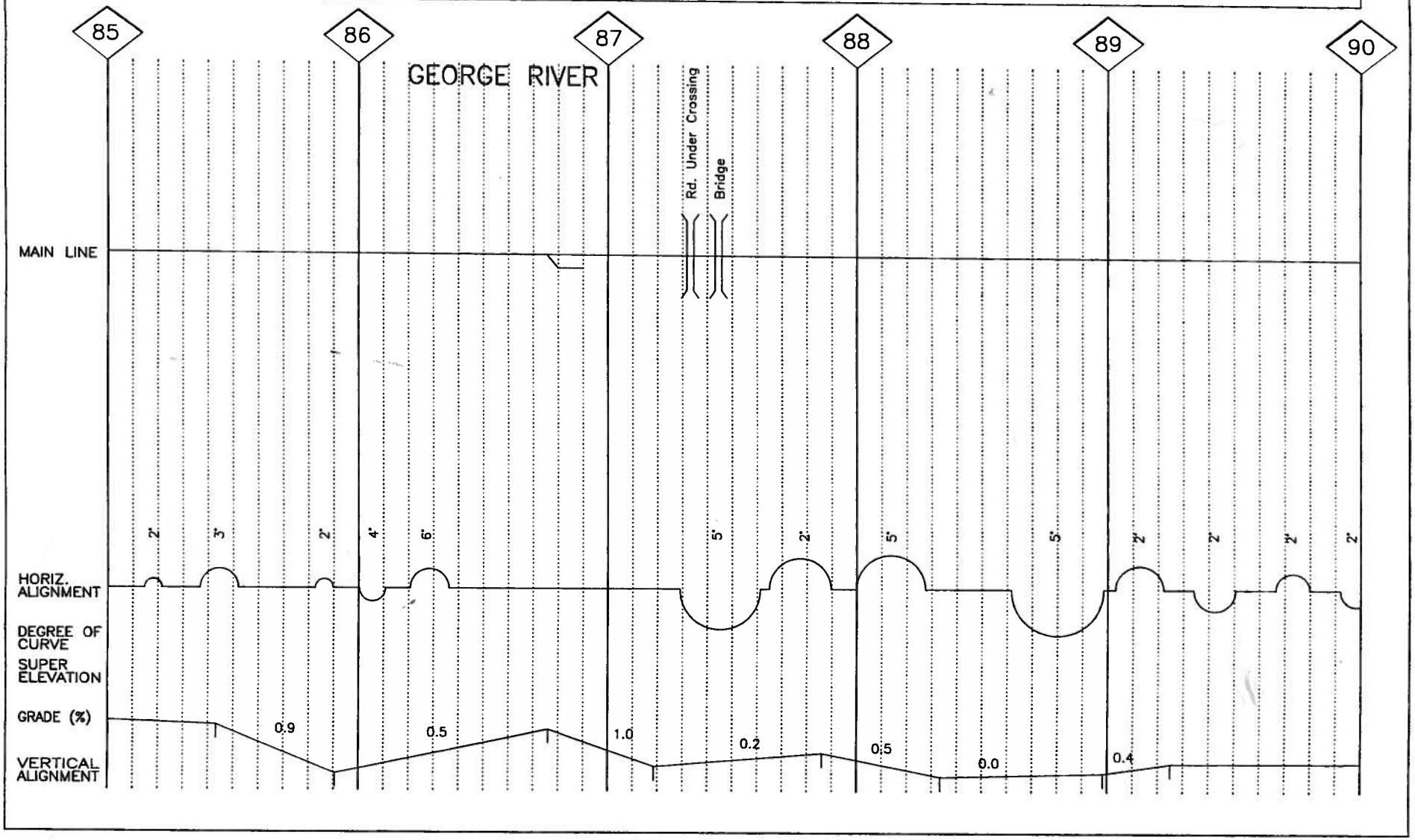
MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 18 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 85 – MP 90

MAIN LINE
RAIL
TIES
SURFACING
BALLAST
W CONTROL
SPEED
T CONTROL
GEO CAR
D CAR



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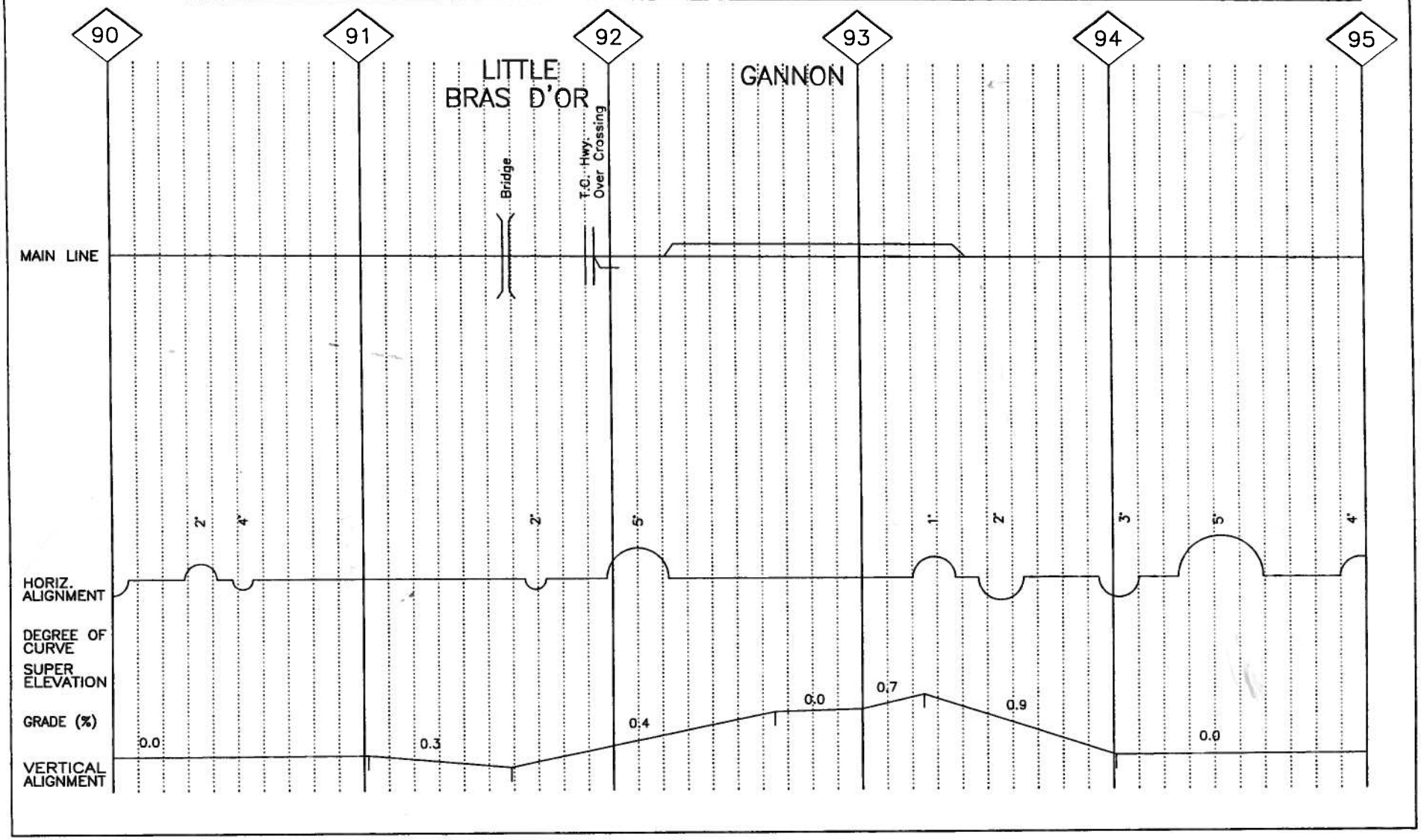
CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 19 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 90 – MP 95

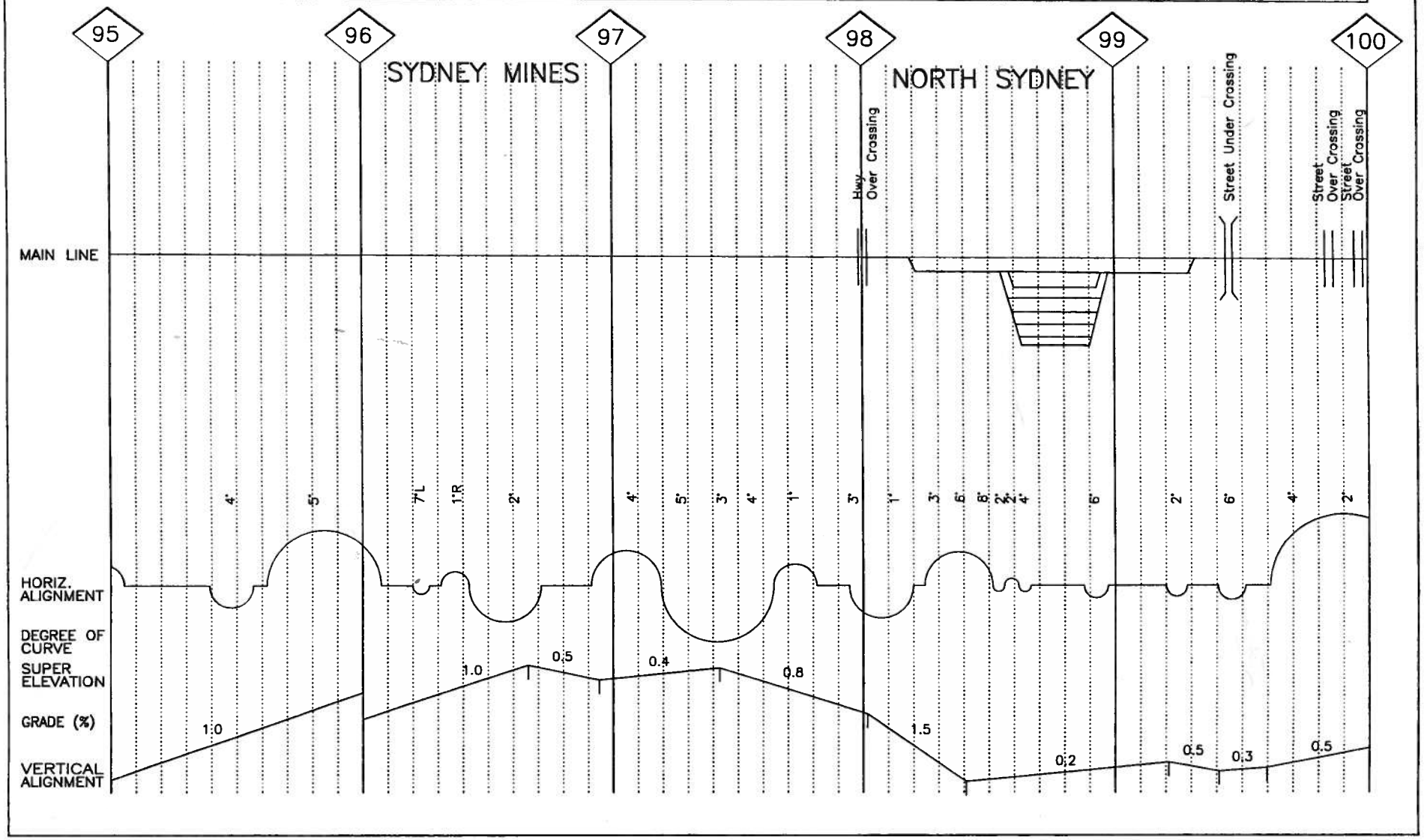
MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 20 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 95 – MP 100

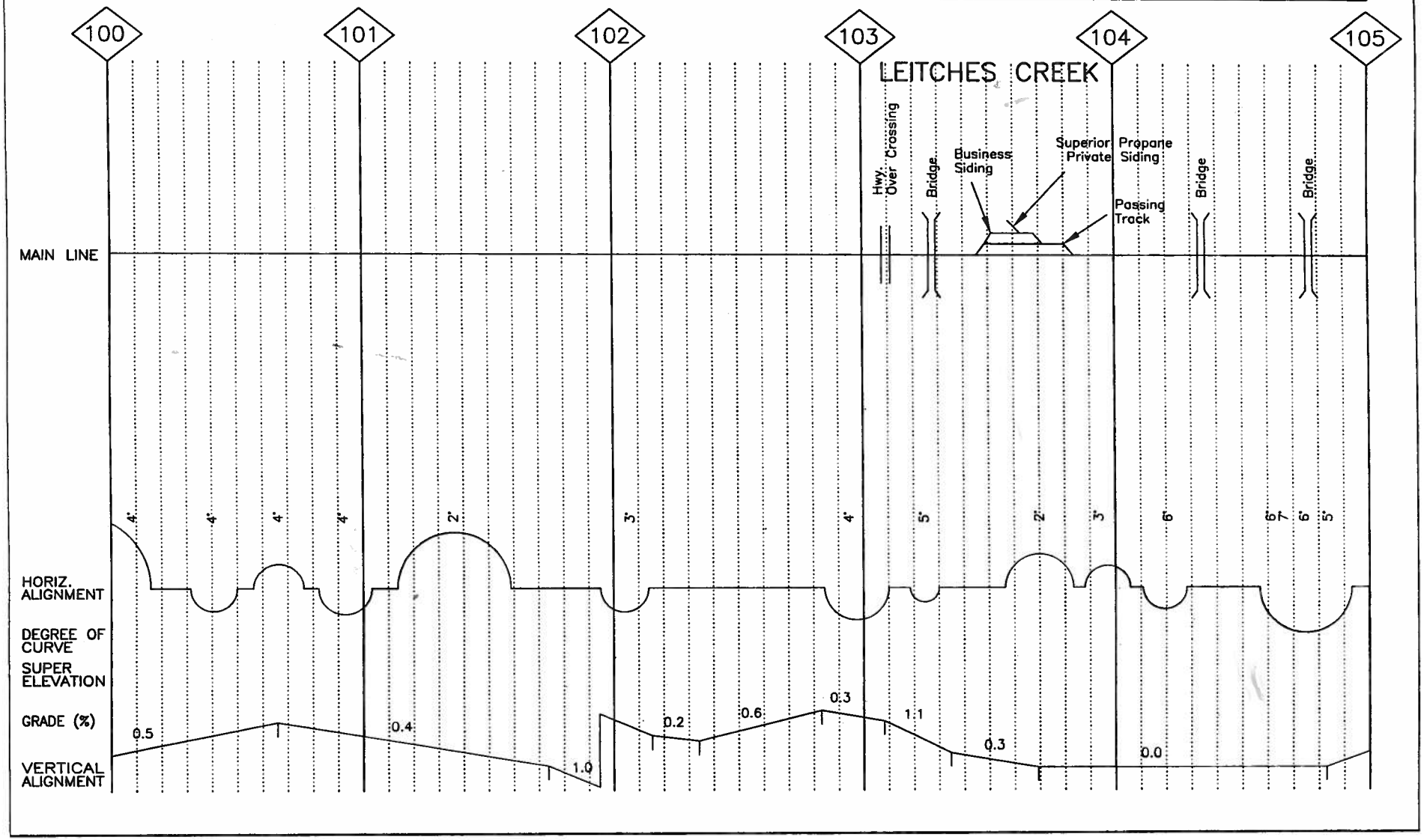
MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 21 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 100 – MP 105

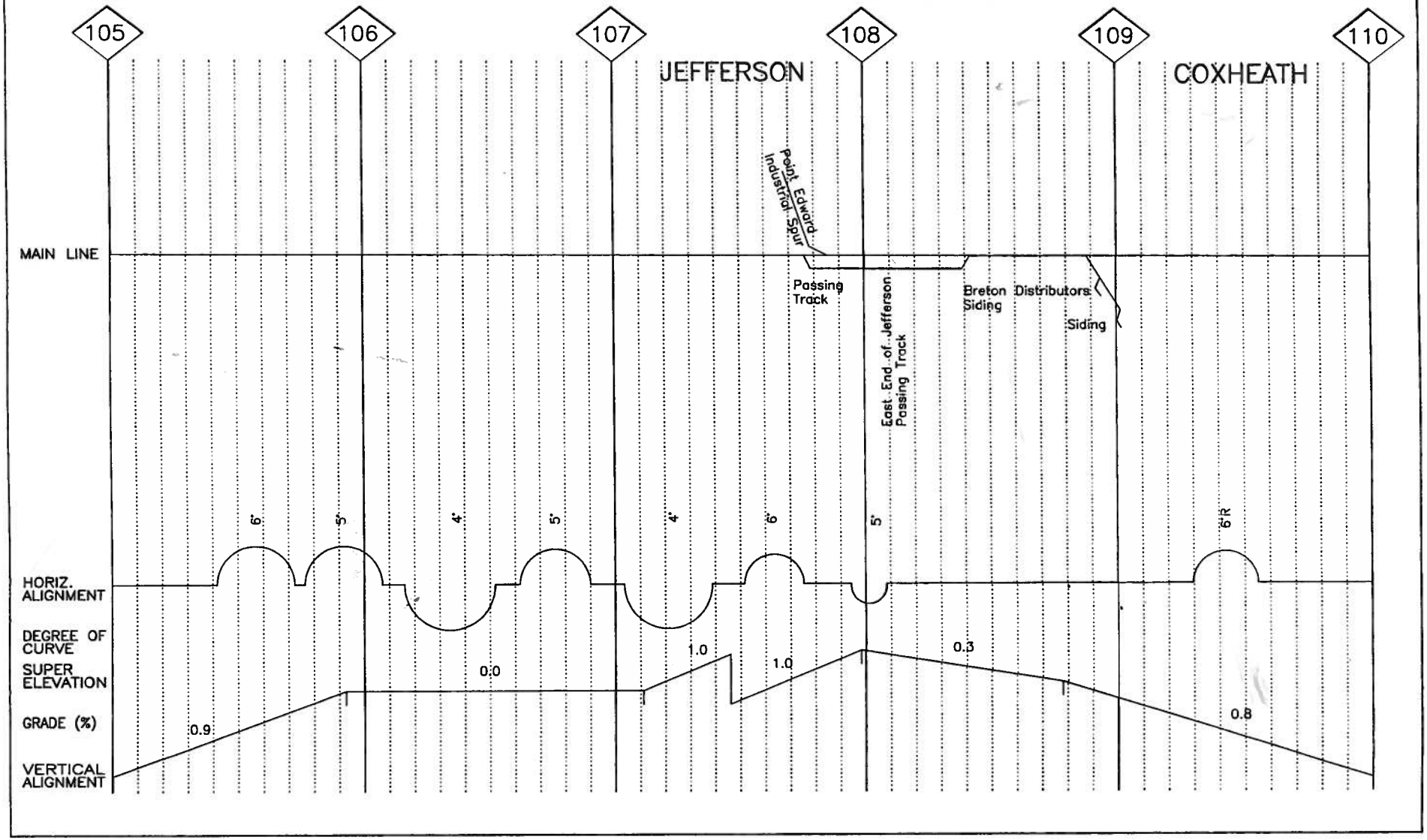
MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 22 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 105 – MP 110

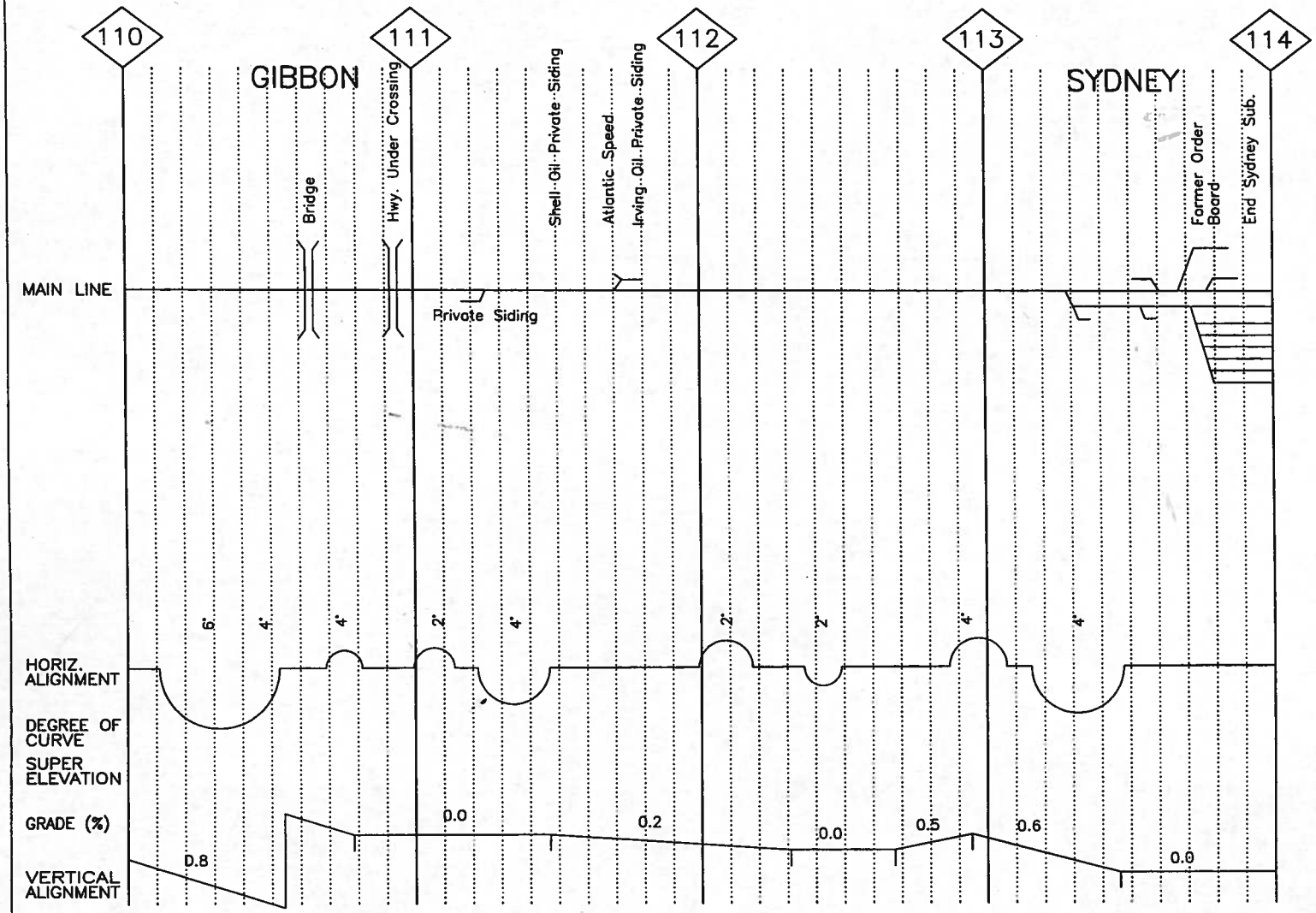
MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



CROUCH ENGINEERING®

CAPE BRETON & CENTRAL NOVA SCOTIA Track Chart	PAGE: 23 of 23	LAST REVISED DATE: 5-14-2003	Sidney MP 110 – MP 114

MAIN LINE	
RAIL	
TIES	
SURFACING	
BALLAST	
W CONTROL	
SPEED	
T CONTROL	
GEO CAR	
D CAR	



APPENDIX G

CBNS – Crossing List – Sydney Subdivision

Cape Breton & Central Nova Scotia Railway

Sydney Sub Crossing Survey

Mileage		Road Location	Township	Type	Type Of Device		Flange Filler	Latitude	Longitude
Mile	0.54			Private		Planks	N/A	N45.67556	W61.51946
Mile	0.66			Farm		Planks	N/A	N45.67540	W61.51682
Mile	0.75			Farm		Planks	N/A	N45.67547	W61.51506
Mile	0.84	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.67631	W61.51258
Mile	0.92	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.67711	W61.51155
Mile	0.99			Farm		Planks	N/A	N45.67754	W61.51118
Mile	1.02	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.67845	W61.51072
Mile	1.28			Farm		Planks	N/A	N45.68222	W61.50967
Mile	3.45			Farm		Planks	N/A	N45.68948	W61.48331
Mile	3.70			Farm		Planks	N/A	N45.68612	W61.47684
Mile	5.43			Private		Planks	N/A	N45.66822	W61.45737
Mile	6.26	Cove Motel	Auld's Cove	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.65831	W61.44883
Mile	6.56	Highway # 4	Auld's Cove		Subway				
Mile	7.09	Road To Mulgrave	Auld's Cove	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.64846	W61.43975
Mile	8.70			Private		Planks	N/A	N45.64714	W61.41369
Mile	8.85			Private		Planks	N/A	N45.64771	W61.41080
Mile	9.30	Main Line		Private		Asphalt	Rail Seal	N45.64429	W61.40085
Mile	9.30	Siding		Private		Planks	N/A	N45.64429	W61.40085
Mile	9.30	Back Track		Private		Planks	N/A	N45.64429	W61.40085
Mile	11.05			Private		Planks	N/A	N45.62958	W61.37555
Mile	12.08	Philpott Street	Port Hawkesbury	Public		Planks	N/A	N45.61641	W61.36618
Mile	12.23	MacQueen Street	Port Hawkesbury	Public	Reflectorized Sign	Asphalt	Rail Seal	N45.61478	W61.36449
Mile	13.03	Point Tupper	Point Tupper		Overhead Bridge				
Mile	15.78	Route 104	St.Peters Junction		Overhead Bridge				
Mile	19.25	Macintyre Lake	Macintyre Lake	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.64742	W61.27292
Mile	22.30	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.68682	W61.24947
Mile	22.52	Morrison's Road	Clevland	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.68896	W61.24887
Mile	22.79			Farm		Planks	N/A	N45.69245	W61.25029
Mile	23.10	Farm Crossing - Type = L Level		Farm		Planks	Rail Seal	N45.69731	W61.24990
Mile	23.70	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.70553	W61.24592
Mile	25.76	West Bay Road	West Bay	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.73128	W61.25772
Mile	27.80	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.75883	W61.24992
Mile	28.38	MacArthur Road	Big Brook	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.76396	W61.24208
Mile	30.14	Big Brook Road	Big Brook	Public	Flashing/Lights/Bells	Planks	No Flange Rail	N45.78191	W61.22062
Mile	30.80			Private		Planks	N/A	N45.79067	W61.21696
Mile	33.12	River Deny's	River Deny's	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.81746	W61.18985
Mile	34.63	Marble Mountain Road	River Deny's	Public	Flashing/Lights/Bells	Asphalt		N45.83292	W61.16819
Mile	36.94	Eden Road	Eden	Public	Flashing/Lights/Bells	Planks		N45.85125	W61.13059
Mile	38.85	Malagawatch	Malagawatch	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.87477	W61.11354
Mile	39.50	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.88419	W61.11008
Mile	40.20	Mackenzie Road	West of Orangedale	Public	Reflectorized Sign	Planks	Rail Seal	N45.89245	W61.10925

Mile	41.36	Orangedale	Orangedale	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N45.90126	W61.09051
Mile	41.90	Farm Crossing - Type = L Level		Private		Planks	N/A	N45.90585	W61.08194
Mile	42.32	Orangedale Road	Orangedale	Public	Flashing/Lights/Bells	Planks	No Flange Rail	N45.90986	W61.07684
Mile	43.40	Gilles Cove Road	Orangedale	Public	Reflectorized Sign	Planks		N45.91521	W61.05585
Mile	43.60	Iona Road	Orangedale		Subway				
Mile	44.30	Gillis Cove Road	Gilles Cove	Public	Reflectorized Sign	Planks		N45.92012	W61.03876
Mile	45.11	Robertson Road	Alba	Public	Reflectorized Sign	Planks		N45.92574	W61.02386
Mile	46.16	Alba	Alba	Public	Flashing/Lights/Bells	Planks		N45.93002	W61.00348
Mile	47.29	John Neil George Road	Estmere	Public	Reflectorized Sign	Planks		N45.93229	W60.99989
Mile	49.35	Ottawa Brook	Ottawa Brook		Subway				
Mile	49.90	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.93658	W60.03420
Mile	50.25			Private		Planks	N/A	N45.93960	W60.92727
Mile	50.30	Farm Crossing - Type = L Level		Private		Planks	N/A	N45.93977	W60.92689
Mile	50.40			Farm		Planks	N/A	N45.94016	W60.92474
Mile	50.95			Farm		Planks	N/A	N45.94318	W60.91485
Mile	51.25			Private		Planks	N/A	N45.94458	W60.90844
Mile	51.35			Private		Planks	N/A	N45.94508	W60.90617
Mile	51.50			Private		Planks	N/A	N45.94558	W60.77334
Mile	52.08	MacKinnon Harbour	MacKinnon Harbour	Public	Flashing/Lights/Bells	Planks		N45.94706	W60.89235
Mile	52.71	Red Point East Road	MacKinnon Harbour	Public	Reflectorized Sign	Planks		N45.94807	W60.88021
Mile	53.63	Iona-Little Narroes Road	MacKinnon Harbour		Subway				
Mile	56.50	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.95030	W60.81339
Mile	56.80	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.95317	W60.81311
Mile	59.10	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.96115	W60.77334
Mile	60.90	Christmas Island	Christmas Island	Public	Reflectorized Sign	Planks		N45.97498	W60.74402
Mile	61.32	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.97805	W60.73715
Mile	61.55					Planks	N/A	N45.98043	W60.73307
Mile	61.65	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.98131	W60.73138
Mile	61.70					Planks	N/A	N45.98157	W60.73080
Mile	61.83					Planks	N/A	N45.98270	W60.72870
Mile	61.87	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.98304	W60.72805
mile	61.90					Planks	N/A	N45.98326	W60.72761
Mile	62.05					Planks	N/A	N45.98480	W60.72477
Mile	62.35					Planks	N/A	N45.98810	W60.72107
Mile	62.50	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.98967	W60.71898
Mile	62.70					Planks	N/A	N45.99138	W60.71584
Mile	63.13					Planks	N/A	N45.99479	W60.70838
Mile	63.20					Planks	N/A	N45.99563	W60.70672
Mile	63.55	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.99805	W60.70087
Mile	63.70	Farm Crossing - Type = L Level		Farm		Planks	N/A	N45.99892	W60.69831
Mile	63.80					Planks	N/A	N46.00002	W60.69632
Mile	63.90	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.00079	W60.69517
Mile	64.15					Planks	N/A	N46.00332	W60.69127
Mile	64.48					Planks	N/A	N46.00580	W60.68519
Mile	64.55					Planks	N/A	N46.00656	W60.68399

Mile	64.65	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.00768	W60.68222
Mile	64.90	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.00971	W60.67900
Mile	64.98	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.01056	W60.67745
Mile	65.45					Planks	N/A	N46.01484	W60.66958
Mile	65.65					Planks	N/A	N46.01636	W60.66652
Mile	65.70	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.01701	W60.66499
Mile	65.85	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.01806	W60.66262
Mile	66.25			Private		Planks	N/A	N46.02060	W60.65531
Mile	66.80			Private		Planks	N/A		
Mile	67.15	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.02700	W60.64089
Mile	68.99	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.04364	W60.61268
Mile	69.25	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.04569	W60.60851
Mile	69.80	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.05031	W60.59923
Mile	69.96			Private		Planks	N/A	N46.05156	W60.59599
Mile	71.10			Private		Planks	N/A	N46.06190	W60.57724
Mile	71.20			Private		Planks	N/A	N46.06267	W60.57566
Mile	71.28	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.06322	W60.57441
Mile	71.40			Private		Planks	N/A	N46.06423	W60.57195
Mile	71.40	Siding Track		Private		Planks	N/A	N46.06423	W60.57195
Mile	71.60			Private		Planks	N/A	N46.06562	W60.56853
Mile	71.60	Siding Track		Private		Planks	N/A	N46.06562	W60.56853
Mile	71.63			Private		Planks	N/A	N46.06575	W60.56815
Mile	71.63	Siding Track		Private		Planks	N/A	N46.06575	W60.56815
Mile	71.85			Private		Planks	N/A	N46.06733	W60.56435
Mile	71.85	Siding Track		Private		Planks	N/A	N46.06733	W60.56435
Mile	72.08	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.06901	W60.56025
Mile	72.08	Farm Crossing - Siding		Farm		Planks	N/A	N46.06901	W60.56025
Mile	72.10			Private		Planks	N/A	N46.06925	W60.55968
Mile	72.10	Siding Track		Private		Planks	N/A	N46.06925	W60.55968
Mile	72.50			Private		Planks	N/A	N46.07224	W60.55225
Mile	72.70					Planks	N/A	N46.07370	W60.54896
Mile	72.75			Private		Planks	N/A	N46.07422	W60.54814
Mile	72.80	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.07479	W60.54743
Mile	72.90	Private Crossing		Private		Planks	N/A	N46.07582	W60.54607
Mile	73.00			Private		Planks	N/A	N46.07673	W60.54479
Mile	73.15			Private		Planks	N/A	N46.07795	W60.54306
Mile	73.25			Private		Planks	N/A	N46.07889	W60.54131
Mile	73.48			Private		Planks	N/A	N46.08102	W60.53685
Mile	73.80			Private		Planks	N/A	N46.08444	W60.53156
Mile	73.98			Private		Planks	N/A	N46.08570	W60.52905
Mile	74.17	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.08729	W60.52569
Mile	74.25			Private		Planks	N/A	N46.08841	W60.52408
Mile	74.40			Private		Planks	N/A	N46.08982	W60.52201
Mile	74.50	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.09047	W60.52105
Mile	74.65			Private		Planks	N/A	N46.09211	W60.51787

Mile	74.75			Private		Planks	N/A	N46.09257	W60.51640
Mile	75.01	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.09472	W60.51149
Mile	75.20	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.09607	W60.50922
Mile	75.25			Private		Planks	N/A	N46.09692	W60.50809
Mile	75.35	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.09813	W60.50657
Mile	75.50	Main Line		Private		Planks	N/A	N46.09929	W60.50514
Mile	75.50	Passing Track		Private		Planks	N/A	N46.09929	W60.50514
Mile	75.50	Back Track		Private		Planks	N/A	N46.09929	W60.50514
Mile	75.65			Private		Planks	N/A	N46.10120	W60.50277
Mile	75.85			Private		Planks	N/A	N46.10121	W60.50275
Mile	75.90			Private		Planks	N/A	N46.10337	W60.49886
Mile	76.35			Private		Planks	N/A	N46.10812	W60.49180
Mile	76.45	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.10928	W60.49081
Mile	76.55			Private		Planks	N/A	N46.11061	W60.48978
Mile	76.73	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.11277	W60.48811
Mile	76.88	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.11457	W60.48656
Mile	77.20	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.11843	W60.48251
Mile	77.60					Planks	N/A	N46.12197	W60.47651
Mile	77.90					Planks	N/A	N46.12505	W60.47106
Mile	78.10					Planks	N/A	N46.12636	W60.46876
Mile	78.43			Farm		Planks	N/A	N46.13088	W60.46511
Mile	78.47					Planks	N/A	N46.13137	W60.46472
Mile	78.65					Planks	N/A	N46.13350	W60.46251
Mile	78.90					Planks	N/A	N46.13605	W60.45906
Mile	78.99	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.13704	W60.45770
Mile	79.80	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.14470	W60.44569
Mile	80.78			Private		Planks	N/A	N46.14690	W60.42628
Mile	80.87	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.14807	W60.42551
Mile	81.21			Private		Planks	N/A	N46.15261	W60.42240
Mile	81.60			Private		Planks	N/A	N46.15770	W60.41891
Mile	82.36	Grand Narrows Road	Long Island	Public	Reflectorized Sign	Planks	N/A	N46.16713	W60.41108
Mile	82.60			Private		Planks	N/A	N46.17043	W60.40890
Mile	82.95	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.17516	W60.40771
Mile	83.92			Private		Planks	N/A	N46.18787	W60.39959
Mile	84.40			Private		Planks	N/A	N46.19412	W60.39494
Mile	84.73	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.19788	W60.39064
Mile	84.90	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20007	W60.38802
Mile	85.20	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20307	W60.38433
Mile	86.30	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20986	W60.36354
Mile	86.40	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20956	W60.36170
Mile	86.60	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20901	W60.35817
Mile	86.80	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20843	W60.35446
Mile	86.90	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20794	W60.35131
Mile	87.27	Farm Crossing - Type = L Level		Private		Planks	N/A	N46.20683	W60.34428
Mile	87.35	George's River	George's River Station		Subway				

Mile	88.45	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.21183	W60.32430
Mile	88.91			Private		Planks	N/A	N46.21230	W60.31593
Mile	90.49			Private		Planks	N/A	N46.23254	W60.30079
Mile	90.56	Johnson Road	Bras d'Or	Public	Flashing/Lights/Bells	Planks	Metal Flange Rail	N46.23335	W60.30040
Mile	90.77			Farm		Planks	N/A	N46.23620	W60.29907
Mile	90.90	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.23899	W60.29778
Mile	91.05	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.24019	W60.29723
Mile	91.35	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.24417	W60.29538
Mile	91.70			Farm		Planks	N/A	N46.24895	W60.29329
Mile	91.90	Tran Canada Highway	Bras d'Or		Overhead Bridge				
Mile	92.00	Station Road	Little Bras D'or	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.25331	W60.29184
Mile	92.11	Alder Point Road	Little Bras D'or	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.25447	W60.29041
Mile	92.95			Private		Planks	Rail Seal	N46.25686	W60.27296
Mile	93.45	Little Pond Road	Little Bras D'or	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.25761	W60.26332
Mile	93.61	Shore Road	Little Bras D'or	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.25796	W60.25970
Mile	95.35			Private		Planks	Metal Flange Rail	N46.25437	W60.23409
Mile	95.56	Atlantic Ave	Sydney Mines	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.25138	W60.23267
Mile	96.08	Pond Street	Sydney Mines	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.24511	W60.23287
Mile	96.27	Vickers Lane	Sydney Mines	Public	Reflectorized Sign	Planks		N46.24328	W60.23584
Mile	96.43	Main Street	Sydney Mines	Private		Planks	No Flange Rail	N46.24170	W60.23726
Mile	97.23			Private		Planks		N46.23107	W60.24783
Mile	97.51			Private		Planks	N/A	N46.22911	W60.24958
Mile	97.65	industrial Park Road	North Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.22720	W60.24986
Mile	98.08	Gannon Road	North Sydney	Public	Flashing/Lights/Bells	Asphalt	Metal Flange Rail	N46.22087	W60.25045
Mile	98.20	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.22007	W60.25026
Mile	98.92	King Street	North Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.21218	W60.25961
Mile	99.07	Peppet Street	North Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.21033	W60.26061
Mile	99.22	Brook Street	North Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.20824	W60.26173
Mile	99.43	Regent Street	North Sydney		Subway				
Mile	99.73	Pedestrian Crossing	North Sydney	Public	Reflectorized Sign	Planks	No Flange Rail	N46.20156	W60.26026
Mile	100.28	Musgrave Lane	North Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.19479	W60.26630
Mile	100.70	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.19100	W60.27131
Mile	100.80	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.18999	W60.27352
Mile	101.10	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.18703	W60.27761
Mile	101.34			Private		Planks	N/A	N46.18377	W60.28032
Mile	101.70	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.18215	W60.28506
Mile	102.09	Seaview Golf and Country	North Sydney	Public	Reflectorized Sign	Planks	Metal Flange Rail	N46.18106	W60.29462
Mile	102.20	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.18009	W60.29686
Mile	102.25	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.17967	W60.29760
Mile	103.09	Seaview Drive	North Sydney		Overhead Bridge				
Mile	103.35	Main Track		Private		Asphalt	Metal Flange Rail	N46.16560	W60.30688
Mile	103.35	Pass Track		Private		Asphalt	Metal Flange Rail	N46.16560	W60.30688
Mile	103.35	Pass Track		Private		Asphalt	Metal Flange Rail	N46.16560	W60.30688
Mile	104.20	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.15565	W60.30520
Mile	104.65	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.15098	W60.29969

Mile	104.75			Private		Planks	N/A	N46.15075	W60.29761
Mile	104.86	Point Edward Road	Leitches Creek	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.15143	W60.29514
Mile	104.90	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.15214	W60.29419
Mile	105.45			Private		Planks	N/A	N46.15821	W60.28736
Mile	105.60	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.15874	W60.28556
Mile	106.15	Farm Crossing - Type = L Level		Farm		Planks	N/A	N46.15261	W60.28050
Mile	108.30	Sydport Acess O/H	Coxheath		Overhead Bridge				
Mile	108.34	Main Track		Private		Planks	N/A	N46.13485	W.60.26218
Mile	108.34	Siding		Private		Planks	N/A	N46.13485	W60.26218
Mile	109.68	Coxheath Road	Coxheath	Public	Flashing/Lights/Bells	OMNi	N/A	N46.11917	W60.23592
Mile	109.98			Farm		Planks	N/A	N46.11480	W60.23754
Mile	110.07	Coxheath Road	Coxheath	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.11365	W60.23798
Mile	110.54	Bungalow Road	Coxheath	Public	Reflectorized Sign	Planks	No Flange Rail	N46.10943	W60.23321
Mile	110.95	Keltic Drive	Sydney River		Subway				
Mile	111.37			Private		Asphalt	Rail Seal	N46.11288	W60.21693
Mile	111.63			Private		Planks	Flange Rail OK	N46.11577	W60.21351
Mile	111.72	Irving Oil (Requires Planks)	Sydney River	Private	Flashing/Lights/Bells	Planks	Metal Flange Rail	N46.11665	W60.21268
Mile	112.95	Kings Road, Sydney	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal		
Mile	113.14	South Bentnck Street	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.13140	W60.19189
Mile	113.28	George Street	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.13263	W60.18958
Mile	113.39	Brookland Street (Main)	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.13390	W60.18847
Mile	113.39	Brookland Street (Spur)	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.13390	W60.18847
Mile	113.50	Townsend Street	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.13547	W60.18826
Mile	113.78	Prince Street	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.13898	W60.18891
Mile	113.90	Ferry Street (Main)	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.14521	W60.13906
Mile	113.90	Ferry Street (Yard)	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.14521	W60.13906

Cape Breton & Central Nova Scotia Railway

Interchange Track Sydney

Mileage		Road Location	Township	Type	Type Of Device		Type Flange Filler		
Mile	0.09	Prince Street	Sydney	Public	Flashing/Lights/Bells	Asphalt	Rail Seal	N46.13906	W60.18805
Mile	0.50	Inglis Street (Main)	Sydney	Public	Reflectorized Sign	Asphalt	Rail Seal	N46.14228	W60.18321
Mile	0.50	Inglis Street Passing Track)	Sydney	Public	Reflectorized Sign	Asphalt	Rail Seal	N46.14228	W60.18321
Mile	0.799	Cape Breton Street	Sydney	Public	Reflectorized Sign	Asphalt	Metal Flange Rail	N46.14550	W60.18027

APPENDIX H

CANARAIL Summary Sheet of Stantec's Geotechnical Report (Tab 3)

GEOTECHNICAL ISSUES						
CBNSR Mile Location *(corrections in italics)*	**Name Location**	**Geotechnical Field Observations and Other Information**	**General Summary of Geotechnical Investigation/Assessment/Monitoring Work Plan**	**Photo Log Stantec**	**Prioritized Issue/ Concern**	**Subtotal of Opinion of Probable Further Evaluation Cost**
Non Subsidized Rail Line						
2.6	Havre Boucher	• **Local slope stability issue** • No subsidence issues reported.	• **Geotechnical Investigation: Borehole Program** • Two boreholes to maximum depths of six meters below existing ground surface. • Cross sectional survey of slope. • Laboratory testing. • Report.	No Photos	2	$12,500
2.8	Havre Boucher	• **Global slope stability issue** • On the north side of the rail line, an approximate 20 lineal meter wide section of slope showed signs of global slope stability failure. • Slope generally appears to have moved in a south to north direction on the north side of the rail line. • Visual confirmation of soil bulging near mid slope and at toe. Vegetation up rooted and trees have fallen. • Two slope indicator casings and two ground monitoring wells, from a previous geotechnical investigation, were encountered; one pair of the above noted instrumentation was each located on the south and north side of the rail line near the crest of the slope. • CBNSR personnel reported the following: 1) Rail line is generally repaired twice per year due to significant settlements. 2) Summer of 2013, rail line settled approximately 150 mm. 3) Original dog leg turn removed and replaced with temporary rail line realignment.	• **Geotechnical Investigation: Borehole Program** • Maximum of two boreholes to maximum depths of 12 meters below existing ground surface. • Installation of two independent plastic standpipes for measuring piezometric groundwater levels. • Installation of two slope inclinometers. • Cross sectional survey of slope. • Laboratory testing. • Report.	1 to 6	2	$22,000
2.9	Havre Boucher	• **Global stability and/or existing retaining wall issues** • On the north side of the rail line, an approximate 26 lineal meter wide section of slope showed signs of global slope stability failure and/or existing retaining wall failure. • The nearest distance between the rail line and crest of slope failure and exisiting retaining wall is approximately 8 meters. • Visual review of the recently realigned section of rail line indicates some current settlement. • The existing retaining wall which has failed was constructed of steel HP columns, timber lagging, steel whalers, and steel cable/rod tie backs. • Based on a brief visual review, the south side of the rail line appears to be stable. • CBNSR personnel reported the following: 1) Approximatelt two years ago the rail line was realigned introducing a temporary dog leg to avoid the slope stability issues, related safety issues, and rail line maintenance. 2) Temporary realignment placed the rail line approximately six meters south of the old rail line location.	• **Geotechnical Investigation: Borehole Program** • Maximum of two boreholes to maximum depths of 12 meters below existing ground surface. • Installation of two independent plastic standpipes for measuring piezometric groundwater levels. • Installation of three slope inclinometers. • Cross sectional survey of slope. • Laboratory testing. • Report.	6 to 11	1	$25,000
3.0	Havre Boucher	• **Global stability and/or existing retaining wall issues** • On the north side of the rail line, an approximate 70 lineal meter wide section of slope showed signs of global slope stability failure and/or existing retaining wall failure. • The nearest distance between the rail line and crest of most recent surface subsidence and an exisiting retaining wall is approximately 3 and 8 meters, respectively. • The existing retaining wall which has failed was constructed of steel HP columns, timber lagging, steel whalers, and steel cable/rod tie backs. • Based on a brief visual review, the south side of the rail line appears to be stable. • CBNSR personnel reported the following: 1) Due to significant settlement issuesin the past, the original rail line was realigned in the summer of 2012. 2) Since the completion of rail line realignment, subsidence has continued north of the new rail location.	• **Geotechnical Investigation: Borehole Program** • Maximum of three boreholes to maximum depths of 12 meters below existing ground surface. • Installation of two independent plastic standpipes for measuring piezometric groundwater levels. • Installation of three slope inclinometers. • Cross sectional survey of slope. • Laboratory testing. • Report.	12 to 17	1	$25,000
8.5	Port	• **Local stability issue near crest of slope**	• **Geotechnical Investigation: Test Pit Program**	18 to 22	1	$5,500

GEOTECHNICAL ISSUES						
CBNSR Mile Location *(corrections in italics)*	**Name Location**	**Geotechnical Field Observations and Other Information**	**General Summary of Geotechnical Investigation/Assessment/Monitoring Work Plan**	**Photo Log Stantec**	**Prioritized Issue/ Concern**	**Subtotal of Opinion of Probable Further Evaluation Cost**
	Hawkesbury	• On the north side of the rail line, an approximate 10 lineal meter wide section of slope showed signs of local stability failure. • The nearest distance between rail line to crest of slope of approximately 1.8m. • South side of rail bounded by a bedrock outcrop. North side of rail is bounded by the Strait of Canso.	• Two test pits excavated to approximately four meters below existing ground surface and/or to maximum extent of excavator bucket or practical refusal of the bucket. • Cross sectional survey of slope. • Laboratory testing. • Reporting.			
Subsidized Rail Line						
53.8	MacKinnon Harbour	**• Local slope stability issue** • Gypsum bedrock outcrop. • No subsidence issues reported.	• Perform an annual review of all "secondary" locations and/or as required. • For the present slope conditions, Stantec would measure physical slope anomalies using a conventional measuring tape and survey level. • Prepare field report.	53 to 58	3	$2,200 per visit
~~54.6~~ *55.6*	Jamesville	**• Weathering of bedrock formation** • Existing rail line placed through a cut in the side of a cliff consisting mainly of a Gypsum formation. • The north side of the rail line is bounded by a cliff wall of Gypsum and the south side of the rail line bounded by a steep cliff. The steep cliff has a vertical face with a significant height. • An approximate 20 m lineal section of the cliff appears to be experiencing local stability issues at the crest. • Over the same lineal section, the cliff appears to have begun undermining at the toe which is likely in part due to tidal erosion. • Nearest distance from rail line to crest of cliff is approximately 2.4 m. • CBNSR personnel reported the following: 1.) A section of rock face had recently broken off near the toe of the cliff.	• Field Review by Principal Geotechnical/Geological Engineer	23 to 28	1	$7,700
~~55.1~~ *56.1*	Jamesville	**• Local slope stability issue** • On the south side of the rail line, an approximate 15 lineal meter section of slope showed signs of local stability failure. • Nearest distance from rail line to crest of slope failure is approximately 1.4 meters. • Face of displaced slope showed a surficial layer of heterogeneous mixture of fill consisting of organics and slag. • Approximately 11 m easterly another slope failure had occurred in the past which has been repaired by reshaping of the slope and backfilling with rip rap rock. • CBNSR personnel reported the following: 1.) The existing slope failure had occurred over the last two years.	• Geotechnical Investigation: Borehole Program Program • Two boreholes to maximum depths of six metres below existing ground surface. • Cross sectional survey of slope • Laboratory Testing • Report	29 to 34	2	$12,500
57.0	Jamesville	**• Local slope stability issue** • Open tension crack. • No subsidence issues reported.	*Information not provided.*	59 to 60	3	
58.8	Jamesville	**• Local slope stability issue** • Two locations in the general area experienced slope stability issues approximately two years ago. • Some local stability issues beginning occur between the two previous slope failures. • Some vertical subsidence of approximately 2.3 m observed in the general area of the local stability.	*Information not provided.*	61 to 64	3	
60.1	MacInnis Pond	**• Local slope stability issue** • On the south side of the rail line, an approximate 12 lineal meter wide section of slope with an approximate 1.8 m vertical subsidence at the crest of the slope was observed. • Nearest distances from rail line to crest of slope failure varied from approximately 1.4 to three meters. • Face of displaced slope showed surficial layers of fill consisting of ballast followed by silty sand, followed by a 75 mm thick layer of rootmat, followed by 300 mm thick layer of slag underlain by glacial till. • Approximately 18 m easterly, a previous slope failure had occurred which had been repaired by reshaping of the slope and backfilling with rip rap rock. • CBNSR personnel reported the following:	• Geotechnical Investigation: Borehole Program • Maximum of two boreholes to maximum depths of 12 metres below existing ground surface. • Installation of two independent plastic standpipes for measuring piezometric groundwater levels • Installation of two slope inclinometers • Cross sectional survey of slope • Laboratory Testing • Report	35 to 40	2	$22,000

GEOTECHNICAL ISSUES						
CBNSR Mile Location *(corrections in italics)*	**Name Location**	**Geotechnical Field Observations and Other Information**	**General Summary of Geotechnical Investigation/Assessment/Monitoring Work Plan**	**Photo Log Stantec**	**Prioritized Issue/ Concern**	**Subtotal of Opinion of Probable Further Evaluation Cost**
		1.) The previous slope failure had occurred and been repaired approximately two years ago.				
~~68.3~~ *68.5*	Shenacadie	**• Global slope stability issue** • On the north side of the rail line, an approximate 45 lineal metre wide section of cliff is partially separated / hanging from the land mass. • Main fracture varies from approximately 2.5 to four metres in width and three to four meters deep. • The section of hanging cliff is heavily vegetated with grass and trees. • Face of fracture shows the section of hanging cliff has overburden soils consisting of an approximate 900 mm thick surficial layer of rootmat followed by 1.5 m thick of glacial till underlain by weathered Sedimentary bedrock. • Based on visual observation, the north rail line appeared to have slightly displaced northerly. • On the south side of the rail line, based on a brief visual review, there were no signs of unstable masses or global slope disturbances. • CBNSR personnel reported the following: 1.) Original failure/fracture was reported approximately seven years ago. 2.) Stantec personnel (formally Jacques Whitford) had reviewed the fractured section. 3.) The rail line had to be lifted twice over the last seven years due to settlement issues.	• Field Review by Principal Geotechnical/Geological Engineer	41 to 46	1	$7,700
103.3	Leitches Creek	**• Local slope stability issue** • A slope stability failure has occurred on the east side of rail line. • Approximately 16 m lineal meter section of slope has been affected. • Nearest distances from rail line to crest of slope failure vary from approximately 2.3 to four meters. • Toe of slope is approximately six metres from body of water.	• Geotechnical Investigation: Borehole Program • One borehole to maximum depth of 12 metres below existing ground surface. • Cross sectional survey of slope. • Laboratory Testing • Report	47 to 52	2	$15,000

APPENDIX I

Statement of Work & Genesee and Wyoming Submissions Infrastructure Improvement Costs Sydney Subdivision

NOVA SCOTIA

Request for Proposal

Statement of Work:
Evaluation of the Cape Breton and Central Nova Scotia Railway Sydney Subdivision

1.0 Overview

The Cape Breton and Central Nova Scotia Railway (CBNS) is a 395 km railway operating in Nova Scotia between Truro and Sydney with spurs at Stellarton, Trenton, Point Tupper and Sydney. Sydney Subdivision is 189 km. Since 2012, the service has been operated by Genesee and Wyoming.

The Sydney Subdivision has been operating at a financial loss since 2001. In 2002, the Company filed for the abandonment of the Sydney Subdivision due to sustained losses suffered after the closure of Devco and Sysco. Since 2003, the Province has been providing a subsidy of approximately $2.5 million per year to operate the Sydney Subdivision.

The line offers daily freight service between Truro and Point Tupper, with weekly service to Sydney Subdivision or as required based on traffic volume.

The Sydney Subdivision has undergone a significant decline in traffic and freight volumes. Average annual rail traffic is less than 500 railcars. The Company estimates that 10,000 railcar movements annually would be required to maintain the line. The Province has conducted studies with the Company to identify potential new customers. Despite best efforts, volumes continue to decline.

In October 2014, Genesee and Wyoming filed with the Nova Scotia Utility and Review Board to decommission and abandon the rail line. This would eliminate rail service between northern Cape Breton and mainland Nova Scotia.

Significant investment in the Cape Breton economy, including the redevelopment of port facilities, could be seriously hampered by a loss of this rail line.

Project Name	Ministers' Rail Advisory Committee: Evaluation CBNS Sydney Subdivision
Client Department	TIR
Contact Name	Steve Newson, Policy Advisor Shannon Delbridge, Executive Director, Strategic Initiatives
Contact Phone	Steve Newson 902-424-6728 Shannon Delbridge 902-424-5242
Contact e Mail	Stephen.newson@novascotia.ca Shannon.delbridge@novascotia.ca
Begin date	May 29, 2015
End date	June 17, 2015

2.0 Requirements

The terms and conditions of the **DTIR Standing Offer for Consulting Services (Building Design)** apply in full to the services and products provided under this Statement of Work.

2.1 Project Scope and Time-Frames

Phase 1 of this project would be to review the operating and maintenance costs related to maintaining operations of the rail line (Point Tupper to Sydney) provided by Genesee & Wyoming and provide an opinion on the cogency of the costs.

Phase 2 of this project is to evaluate the level of investment that would be required in order to upgrade the Sydney Subdivision of the Cape Breton – Central Nova Scotia Railway to meet the requirements of the individual standards:

(a) Transport Canada, Track Safety Rules - Class 3 track (max. 45 mph)

(b) Transport Canada, Track Safety Rules - Class 4 track (max. 60 mph)

The consultant will submit a draft report reviewed by the client who may submit information or comments to be incorporated in a final report.

This would require an assessment of the information provided by Genesee & Wyoming to the province on the current state of the lines and a summary plan and costing for work required to bring it up to each of the standards above.

Work would begin on May 29th, 2015 to be completed by June 17th, 2015.

2.2 Project Tasks and Deliverables

Phase 1 Operating and Maintenance Costs for Current Rail Line:

- Review of current rail users and volumes.
- Review of material made available by Genesee & Wyoming regarding maintenance and repair requirements.
- Final report in detailed PDF and summary presentation format, to be delivered to the working group, and senior officials.

Phase 2 Review of Geotechnical and Infrastructure Improvements

- Review and assessment of the geotechnical report and infrastructure evaluation of the current rail line provided by Genesee & Wyoming.
- Work plan and costing to bring the line to either Transport Canada Class 3 or Class 4 track standards.
- Review the infrastructure reports noting limitations to operating double stack container trains.
- Final report in detailed PDF and summary presentation format, to be delivered to the working group, and potentially senior officials.

2.3 Consultant / Department Responsibilities

The proponents will:

- Review all relevant information
- Perform detailed evaluation and analysis.
- Deliver a PDF or Word version draft report
- Discuss refinement of the report and findings
- Deliver a final detail report in PDF format and a summary overview presentation delivered to the Ministers Railway Advisory Committee.

The Department will provide support as requested, including arranging access to Genesee & Wyoming information.

All project deliverables are to be presented to the client contact or their designated representatives for review, approval and acceptance.

All deliverables are to be submitted in electronic format. All work to be carried out on site and must be performed to the satisfaction of the client department. All deliverables will be reviewed to ensure development standards and efficiencies are utilized. All work products are the property of the client department.

2.4 Proponent Qualifications

- The proponents must have in-depth knowledge of the railway industry, including clear engineering expertise.
- The proponent may require access to expertise outside of the Province.
- At least one person who would be involved in the work should have the demonstrated capacity to accurately forecast costs involved in rail line maintenance and improvements. Please include an example of a recent forecast and how the resulting work matched the forecast.
- Please provide three examples of similar work completed within the last 3 years including references and contact information, references may be called.
- Please provide resumes for each person who would be involved in the project, showing any similar work.

2.5 Sustainability

- The Province of Nova Scotia, through its Sustainable Procurement Policy (2009) is committed to purchasing goods, services, and construction in a manner that is better for our economy, our environment, and our communities. To find out more about this initiative go to: www.novascotia.ca/tenders/sustainable-procurement.aspx .

- Include a requirement for the vendor to describe how the service that they are providing will be provided in a sustainable manner (e.g. considering

greenhouse gas reduction, waste reduction, toxicity reduction, worker health and safety, and local economic development).

2.6 Mandatory Criteria

- **i** All proposals must be submitted in Canadian dollars (CDN) exclusive of all taxes
- **ii** Identify rail industry expertise, including engineering.
- **iii** At least one resource with demonstrated forecasting capacity related to rail line maintenance and improvements.

3.0 Evaluation Criteria

Please submit an estimate of costs for the specific and defined project. Clearly show the number of days estimated to perform the services as well as hourly rates proposed for the project.

Evaluation will be based on the mandatory criteria above, on the prior experience of the firm and on staff assigned to the project.

4.0 Vendor Information

Please provide your Vendor Contact Information.

Vendor Name	
Contact Name	
Contact Phone	
Contact Fax	
Contact e-Mail	

May 25, 2015

Genesee and Wyoming Submissions

Infrastructure Improvement Costs

Sydney Subdivision

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Tab 7	Statement of Work

Overview

Genesee & Wyoming has provided the Province with information on a proposed five year capital program to upgrade the Cape Breton and Central Nova Scotia Railway on the Sydney Subdivision to operate the track as Class 3-4 track. The Sydney Subdivision starts in Haver Boucher (Mile 0.00) to Sydney (Mile 113.9). Upgrading the track would permit operating speeds of 40 to over 60 miles an hour.

Significant infrastructure investment would need to be made to address the following key areas:

Geotechnical – there are local and global slope stability issues on the Sydney Subdivision (Havre Boucher to Sydney). Stantec has identified these locations on the rail line. The preliminary amount to resolve these issues is in the order of $2.5 million.

Signals and Communications – the projected capital amount for improvements to the signals and communications systems is $1.8 million over five years and an annual maintenance expense of $200,000.

Track Investment - Over a five year period track capital and maintenance expenses would be over $14 million. Capital costs would be approx. $13.3 million with an additional annual maintenance expense of $200,000 a year.

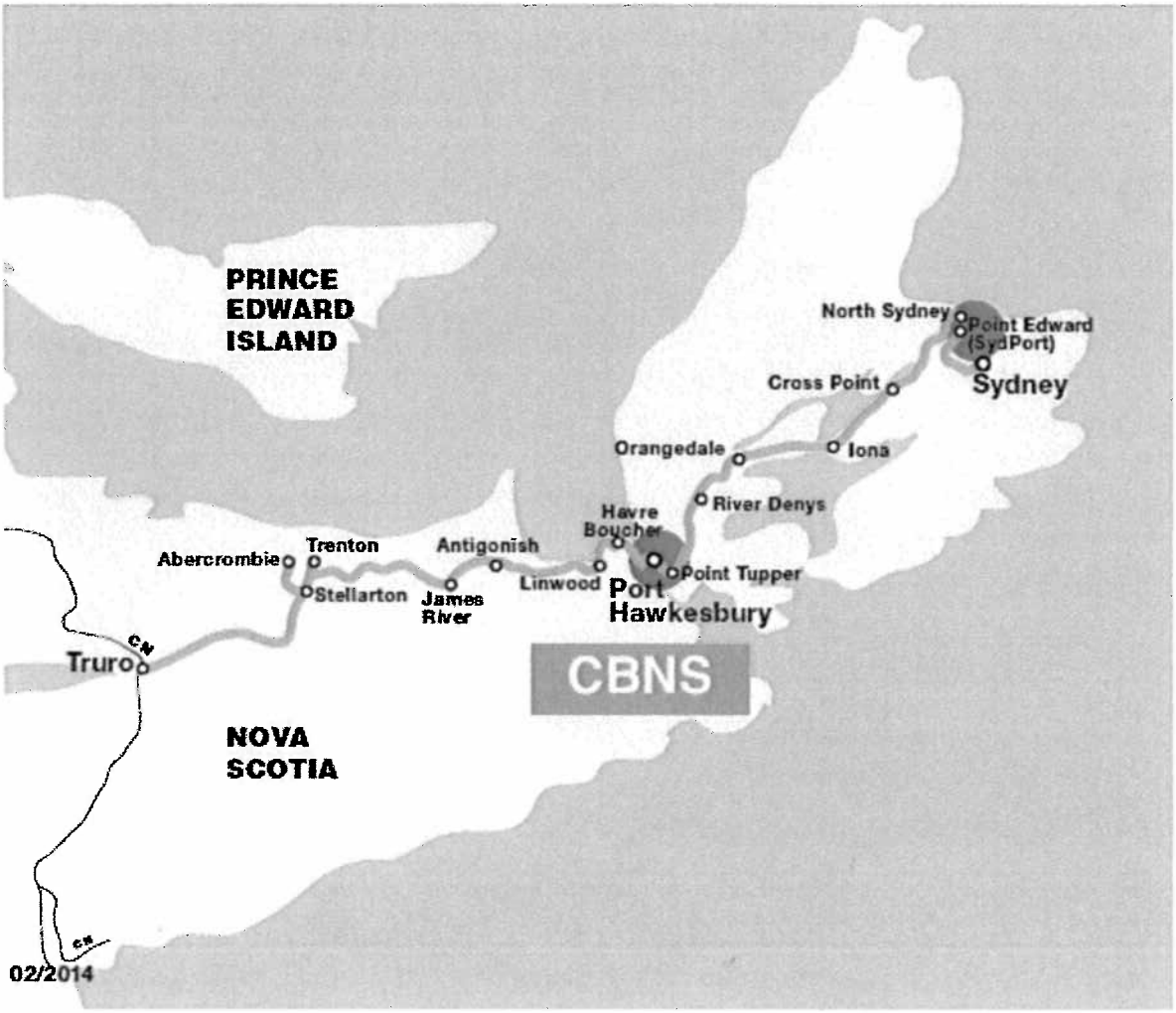
Bridges and Culverts – G&W provided a $10 million conservative projection for bridge capital improvements over five years. Culvert repairs and replacements would be an addition $1 million; $200,000 a year. Included is information on individual structures derived from the railway's annual bridge inspection process.

Time Table Number 9
Sydney Subdivision Footnotes

METHOD OF CONTROL	TGBO LIMITS	SYDNEY SUBDIVISION (E ↑ / W ↓)	MILES FROM HAVRE BOUCHER	SIDING CAPACITY IN FEET	CAUTIONARY LIMITS	HOT BOX AND DRAGGING EQUIPMENT DETECTOR
OCS	TGBO	SYDNEY BC	113.8			
		5.8 JEFFERSON	108.1	3350	112.8	
		4.5 LEITCHES CREEK	103.6	1500		
		4.8 NORTH SYDNEY	98.8	1780		
		6.2 GANNON	92.6	5200		
		20.7 CROSS POINT	71.9	5550		77.5
		13.8 GRAND NARROWS	58.1	3350		
		16.9 ORANGEDALE	41.2	5400		42.8
		8 RIVER DENYS	33.2	3100		
		19.6 TUPPER C	13.6	3865	15.0	
		1.3 PORT HAWKESBURY BC	12.3			
		2.8 PORT HASTINGS	9.5		12.0	10.8
		9.5 HAVRE BOUCHER C	0.0	YARD	1.5	

OCS Between Havre Boucher and Sydney controlled by RTC Saint Albans
CROR Rules 301 to 315 Apply

TAB 2


PRINCE
EDWARD
ISLAND
North Sydney
Point Edward
(SydPort)
Sydney
Cross Point
Orangedale
Iona
River Denys
Havre
Boucher
Abercrombie
Trenton
Antigonish
Linwood
Point Tupper
Port
Hawkesbury
Stellarton
James
River
CBNS
Truro
CN
NOVA
SCOTIA
CN
02/2014

Stantec Consulting Ltd.
207 - 201 Churchill Drive, Membertou, NS B1S 0H1

December 3, 2014
File: 121617798

Attention: Mr. Andre Lapalme
Genesee & Wyoming Canada Inc.
Bureau 600, 9001 Boulevard de l'Acadie
Montreal, Quebec H4N 3H5

Dear Mr. Lapalme,

Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS

Introduction

On June 18, 2014, as part of our limited geotechnical review, Stantec Consulting Ltd. (Stantec) completed a site reconnaissance of the Cape Breton Nova Scotia Railway (CBNSR) line from Havre Bouche, NS (Mile 0) to Sydney, NS (Mile 113.8), also referred to as the "site". The purpose of the reconnaissance was to conduct a visual review of 10 "primary" locations, as identified by CBNSR personnel, for potential geotechnical issues and/or concerns that might require further investigation and assessment. During the site reconnaissance several "secondary" locations were identified as areas showing potential for future geotechnical concerns. Our comments on the "primary" and "secondary" locations follow.

Work Plan

The work plan included the following:

- A desktop review of readily available information for the identified areas of concern which included topographic mapping, geological mapping and, where applicable, previous geotechnical investigation reports.
- Accompanied with CBNSR personnel on a one day trip along the line with a brief stop at each of the 10 "primary" locations.
- During our site reconnaissance, CBNSR and Stantec personnel identified several "secondary" locations which showed signs of potential future geotechnical issues.
- Preparation of this geotechnical review report summarizing our findings as they pertain to geotechnical related issues and/or concerns, prioritized from highest to lowest locations of immediate issues/concerns.
- Preparation of a proposal that includes a work plan and opinion of probable cost to complete a more thorough geotechnical investigation/assessment for areas of concern that have been identified.

Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS

Summary of Findings and Prioritized List for Limited Geotechnical Review

Based on discussions with CBNSR personnel, it is understood that the rail line running from Havre Boucher, NS (Mile 0) to MacIntyre Lake, NS (Mile 20) is a non-subsidized section of the "Sydney Subdivision". And, this non-subsidized section of rail line is and will continue to play a vital role in CBNSR's transportation services which are mainly provided to the Point Tupper, NS industrial business hub (i.e. pulp and paper mill). Therefore, geotechnical issues/concerns along this section of rail line should be of highest priority. It should be noted, that five "primary" locations over this section of main line have been identified by CBNSR personnel and confirmed by Stantec personnel as having significant geotechnical issues/concerns. *A "primary" location is an area that has been identified of having geotechnical issues/concerns that is medium to high risk of having direct consequences to the business and/or health and safety of personnel and should be further reviewed within a moderate to progressive timeline.*

It is further understood, up to the end of 2014, that the rail line running from MacIntyre Lake, NS (Mile 20) to Sydney, NS (Mile 113.8) is a provincially subsidized section of the "Sydney Subdivision" main line. With the provincial subsidy ending, a significant decline in rail line transportation services over this section of main line and high maintenance costs; CBNSR have applied to the Nova Scotia Utility and Review Board (NSUARB) to abandon this section of its main line. As part of CBNSR's due diligence, they have requested to have identified "primary" and "secondary" locations along this section of main line to be reviewed for geotechnical issues/concerns. It should be noted, that five "primary" locations over this section of main line have been identified by CBNSR personnel and confirmed by Stantec as having geotechnical issues/concerns. In addition, three "secondary" locations have been identified. *A "secondary" location is an area showing early signs of geotechnical issues/concerns that is low risk of having direct consequences to the business and/or health and safety of personnel in the immediate future but should be reviewed as required or on a minimal annual basis.*

Upon completion of our limited geotechnical review, Stantec have separated and itemized the "primary" and "secondary" locations for each of the non-subsidized and subsidized sections of the "Sydney Subdivision" main line. In addition, each "primary" and "secondary" location has been prioritized in accordance to the following priority scale. The following priority nomenclature has been prepared summarizing the general requirements for further geotechnical review:

- Priority 1 – Applies to "Primary" issues/concerns. Requires further geotechnical review, geotechnical investigation, site survey and continued monitoring within a progressive timeline.
- Priority 2 - Applies to "Primary" issues/concerns. Requires further geotechnical review, geotechnical investigation, site survey within a moderate timeline.

**Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS**

- Priority 3 – Generally reserved for "secondary" issues/concerns. Requires further geotechnical review and monitoring on an as required basis.

Each location is identified in Tables 1 and 2 by a geographical name and CBNSR mileage point, a brief description of our initial observations of issues/concerns, and a priority number.

The following Table 1 summarizes our findings and prioritized issue/concern for each "primary" location of concern:

Table 1 – Summary of Findings and Prioritization for "Primary" Locations

Name Location	CBNSR Mile Location	Geotechnical Field Observations and Other Information	Photo Log (Appendix C)	Prioritized Issue/Concern
Non Subsidized Rail Line				
Havre Boucher	2.6	• ***Local slope stability issue*** • No subsidence issues reported.	No Photos	2
Havre Boucher	2.8	• ***Global slope stability issue*** • On the north side of the rail line, an approximate 20 lineal meter wide section of slope showed signs of global slope stability failure. • Slope generally appears to have moved in a south to north direction on the north side of the rail line. • Visual confirmation of soil bulging near mid slope and at toe. Vegetation up rooted and trees have fallen. • Two slope indicator casings and two ground monitoring wells, from a previous geotechnical investigation, were encountered; one pair of the above noted instrumentation was each located on the south and north side of the rail line near the crest of the slope. • CBNSR personnel reported the following: 1.) Rail line is generally repaired twice per year due to significant settlements.	1 to 6	2

Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS

Name Location	CBNSR Mile Location	Geotechnical Field Observations and Other Information	Photo Log (Appendix C)	Prioritized Issue/Concern
		2.) Summer of 2013, rail line settled approximately 150 mm. 3.) Original dog leg turn removed and replaced with temporary rail line realignment.		
Havre Boucher	2.9	• ***Global stability and/or existing retaining wall issues.*** • On the north side of the rail line, an approximate 36 lineal meter wide section of slope showed signs of global stability failure and/or existing retaining wall failure. • The nearest distance between the rail line and crest of slope failure and existing retaining wall is approximately eight meters. • Visual review of the recently realigned section of rail line indicates some current settlement. • The existing retaining wall which has failed was constructed of steel HP columns, timber lagging, steel whalers, and steel cable/rod tie backs. • Based on a brief visual review, the south side of the rail line appears to be stable. • CBNSR personnel reported the following: 1.) Approximately two years ago the rail line was realigned introducing a temporary dog leg to avoid the slope stability issues, related safety issues, and rail line maintenance. 2.) Temporary realignment placed the rail line approximately six meters south of the old rail line location.	6 to 11	1

Havre Boucher	3.0	• ***Global stability and/or existing retaining wall issues*** • On the north side of the rail line, an approximate 70 lineal meter wide section of slope showed signs of global stability failure and/or existing retaining wall failure. • The nearest distance between the rail line and crest of most recent surface subsidence and an existing retaining wall is approximately three and eight meters, respectively. • The existing retaining wall which has failed was constructed of steel HP columns, timber lagging, steel whalers, and steel cable/rod tie backs. • Based on a brief visual review, the south side of the rail line appears to be stable. • CBNSR personnel reported the following: 1.) Due to significant settlement issues in the past, the original rail line was realigned in the summer of 2012. 2.) Since the completion of rail line realignment, subsidence has continued north of the new rail location.	12 to 17	1
Port Hawkesbury	8.5	• Local stability issue near crest of slope. • On the north side of the rail line, an approximate 10 lineal meter wide section of slope showed signs of local stability failure. • Nearest distance from rail line to crest of slope is approximately 1.8 m. • South side of rail line bounded by a bedrock outcrop. • North side of rail line is bounded by the Strait of Canso.	18 to 22	1
Subsidized Rail Line				
Jamesville	54.6	• ***Weathering of bedrock formation*** • Existing rail line placed through a cut in the side of a cliff consisting mainly of a Gypsum formation. • The north side of the rail line is bounded by a cliff wall of Gypsum and the south	23 to 28	1

**Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS**

		side of the rail line bounded by a steep cliff. The steep cliff has a vertical face with a significant height. • An approximate 20 m lineal section of the cliff appears to be experiencing local stability issues at the crest. • Over the same lineal section, the cliff appears to have begun undermining at the toe which is likely in part due to tidal erosion. • Nearest distance from rail line to crest of cliff is approximately 2.4 m. • CBNSR personnel reported the following: 1.) A section of rock face had recently broken off near the toe of the cliff.		
Jamesville	55.1	• ***Local slope stability issue*** • On the south side of the rail line, an approximate 15 lineal meter section of slope showed signs of local stability failure. • Nearest distance from rail line to crest of slope failure is approximately 1.4 meters. • Face of displaced slope showed a surficial layer of heterogeneous mixture of fill consisting of organics and slag. • Approximately 11 m easterly another slope failure had occurred in the past which has been repaired by reshaping of the slope and backfilling with rip rap rock. • CBNSR personnel reported the following: 1.) The existing slope failure had occurred over the last two years.	29 to 34	2
MacInnis Pond	60.1	• ***Local slope stability issue*** • On the south side of the rail line, an approximate 12 lineal meter wide section of slope with an approximate 1.8 m vertical subsidence at the crest of the slope was observed. • Nearest distances from rail line to crest of slope failure varied from approximately	35 to 40	2

**Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS**

		1.4 to three meters. • Face of displaced slope showed surficial layers of fill consisting of ballast followed by silty sand, followed by a 75 mm thick layer of rootmat, followed by 300 mm thick layer of slag underlain by glacial till. • Approximately 18 m easterly, a previous slope failure had occurred which had been repaired by reshaping of the slope and backfilling with rip rap rock. • CBNSR personnel reported the following: 1.) The previous slope failure had occurred and been repaired approximately two years ago.		
Shenacadie	68.3	• ***Global slope stability issue*** • On the north side of the rail line, an approximate 45 lineal metre wide section of cliff is partially separated/hanging from the land mass. • Main fracture varies from approximately 2.5 to four metres in width and three to four meters deep. • The section of hanging cliff is heavily vegetated with grass and trees. • Face of fracture shows the section of hanging cliff has overburden soils consisting of an approximate 900 mm thick surficial layer of rootmat followed by 1.5 m thick of glacial till underlain by weathered Sedimentary bedrock. • Based on visual observation, the north rail line appeared to have slightly displaced northerly. • On the south side of the rail line, based on a brief visual review, there were no signs of unstable masses or global slope disturbances. • CBNSR personnel reported the following: 1.) Original failure/fracture was reported approximately seven years ago.	41 to 46	1

**Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS**

		2.) Stantec personnel (formally Jacques Whitford) had reviewed the fractured section. 3.) The rail line had to be lifted twice over the last seven years due to settlement issues.		
Leitches Creek	103.3	• ***Local slope stability issue*** • A slope stability failure has occurred on the east side of rail line. • Approximately 16 m lineal meter section of slope has been affected. • Nearest distances from rail line to crest of slope failure vary from approximately 2.3 to four meters. • Toe of slope is approximately six metres from body of water.	47 to 52	2

Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS

The following Table 2 summarizes our findings and prioritized issue/concern for each "secondary" location of concerns:

Table 2 – Summary of Findings and Prioritization for "Secondary" Locations

Name Location	CBNSR Mile Location	Geotechnical Field Observations and Other Information	Photos (Appendix D)	Prioritized Issue/Concern
Subsidized Rail Line				
MacKinnon Harbour	53.8	• ***Local slope stability issue*** • Gypsum bedrock outcrop. • No subsidence issues reported.	53 to 58	3
Jamesville	57.0	• ***Local slope stability issue*** • Open tension crack. • *No subsidence issues reported.*	59 to 60	3
Jamesville	58.8	• ***Local slope stability issue*** • Two locations in the general area experienced slope stability issues approximately two years ago. • Some local stability issues beginning to occur between the two previous slope failures. • Some vertical subsidence of approximately 2.3 m observed in the general area of the local stability.	61 to 64	3

Reference: Limited Geotechnical Review and Site Reconnaissance Report
Sydney Subdivision of the CBNSR; Havre Boucher, NS to Sydney, NS

Closure

A proposal for further geotechnical review, comprising a summary of our understanding of the project, work plan, schedule, deliverables and opinion of probable cost, will be prepared for each of the 10 "primary" and three "secondary" locations under separate cover.

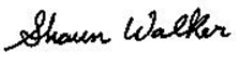
Use of this report is subject to the Statement of general conditions provided in Appendix A. It is the responsibility of Genesee & Wyoming Canada Ltd., who is identified as "the client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd. should any of these be not satisfied. The Statement of General Conditions addresses the following:

- Use of the report
- Basis of the report
- Standard of care
- Interpretation of site conditions
- Varying or unexpected conditions

This report was prepared by Shaun M. Walker, P.Eng. and reviewed by Brian T. Grace, P.Eng.. Should you have any questions, please do not hesitate to contact us.

Regards,

STANTEC CONSULTING LTD.



Shaun M. Walker, P.Eng.
Associate, Geotechnical Engineer
Phone: (902) 564-1855 Ext. 564-1234
Fax: (902) 564-8756
shaun.walker@stantec.com

Attachment: Appendix A – Statement of General Limitations
Appendix B – Site Location Plan
Appendix C – Photo Log for "Primary" Locations
Appendix D – Photo Log for "Secondary" Locations

APPENDIX A
STATEMENT OF GENERAL CONDITIONS

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

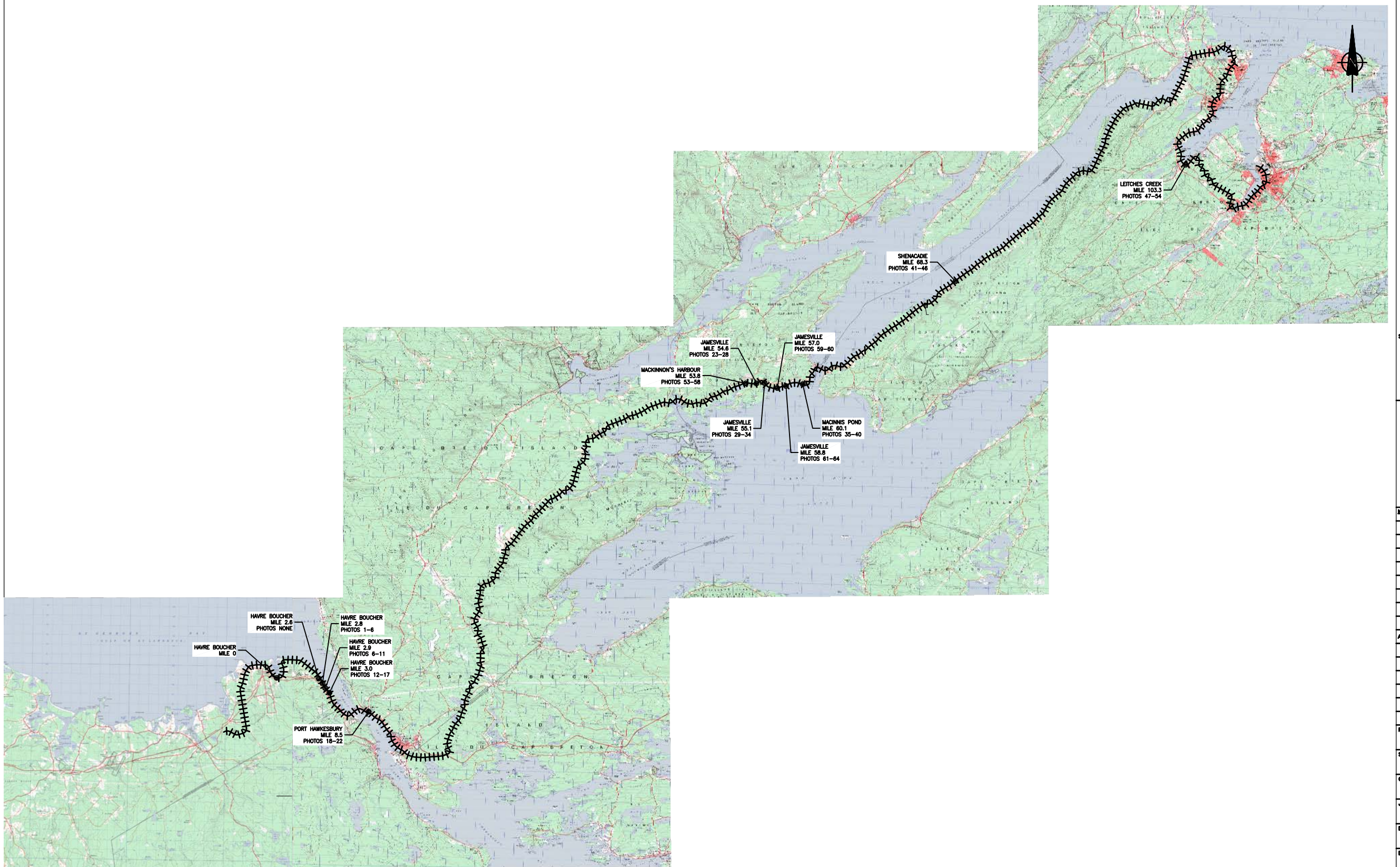
STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or sub-surface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

APPENDIX B
SITE LOCATION PLAN



LEGEND:

- REVIEW LOCATIONS
  MILEAGE FROM HAVRE BOUCHER
- APPROXIMATE LOCATION OF CBNS RAILWAY

STAMP

STAMP

NOTE: THIS DRAWING ILLUSTRATES SUPPORTING INFORMATION SPECIFIC TO A STANTEC CONSULTING LTD PROJECT AND MUST NOT BE USED FOR OTHER PURPOSES.

APP'D	NO.	DETAILS	DATE
		REVISIONS	
X		X	X
DWG. NO.		DESCRIPTION	DATE

REFERENCES

PROJECT: LIMITED GEOTECHNICAL REVIEW
SITE ASSESSMENT

SITE ADDRESS: HAVRE BOUCHER (MILE 0) TO SYDNEY (MILE 113.8)
NOVA SCOTIA

CLIENT: GENESEE & WYOMING CANADA LTD.

JOB No.:	SCALE:	DATE:
121617798	NTS	SEPT 15, 2014
DRAWN BY: BDP	DESIGNED BY:	APPROVED BY

DRAWING TITLE:

SITE LOCATIONS

DRAWING No.:	REVISION No.
1	–

Stantec

APPENDIX C
PHOTO LOG OF "PRELIMINARY" LOCATIONS

Photo 1 – Mile 2.8: Non Subsidized Line
Easterly Looking Westerly
June 18, 2014

Photo 2 – Mile 2.8: Non Subsidized Line
South Side of Line
June 18, 2014

Photo 3 – Mile 2.8: Non Subsidized Line
Crest of Slope on North Side of Line
June 18, 2014

Photo 4 – Mile 2.8: Non Subsidized Line
Mid Slope on North Side of the Line
June 18, 2014

Photo 5 – Mile 2.8: Non Subsidized Line
Toe of Slope on North Side of Line
June 18, 2014

Photo 6 – Mile 2.8: Non Subsidized Line
North Looking South: Toe of Slope
June 18, 2014

Photo 7 – Mile 2.9: Non Subsidized Line
Westerly Looking Easterly: Line Realignment
June 18, 2014

Photo 8 – Mile 2.9: Non Subsidized Line
Line Settlements
June 18, 2014

Photo 9 – Mile 2.9: Non Subsidized Line
Side View Showing Line Settlements
June 18, 2014

Photo 10 – Mile 2.9: Non Subsidized Line
Crest of Slope: Sloughing
June 18, 2014

Photo 11 – Mile 2.9: Non Subsidized Line
Toe of Slope: Bulging
June 18, 2014

Photo 12 – Mile 3.0 : Non Subsidized Line
Easterly Looking Westerly
June 18, 2014

Photo 13 – Mile 3.0: Non Subsidized Line
Crest of Slope/Top of Existing Retaining Wall
June 18, 2014

Photo 14 – Mile 3.0: Non Subsidized Line
Crest of Slope (East Side): Sloughing
June 18, 2014

Photo 15 – Mile 3.0: Non Subsidized Line
Crest of Slope (West Side): Sloughing
June 18, 2014

Photo 16 – Mile 3.0: Non Subsidized Line
Middle of Slope/Toe of Retaining Wall
June 18, 2014

Photo 17 – Mile 3.0: Non Subsidized Line
Middle of Slope/Crest of Retaining Wall
June 18, 2014

Photo 18 – Mile 8.5: Non Subsidized Line
Westerly Looking Easterly: Sloughing
June 18, 2014

Photo 19 – Mile 8.5: Non Subsidized Line
Easterly Looking Westerly: Sloughing
June 18, 2014

Photo 20 – Mile 8.5: Non Subsidized Line
South Side of Line: Toe of Slope
June 18, 2014

Photo 21 – Mile 8.5: Non Subsidized Line
North Side of Line: Bedrock Outcrop
June 18, 2014

Photo 22 – Mile 8.5: Non Subsidized Line
North Side of Line: Bedrock Outcrop
June 18, 2014

Photo 23 – Mile 54.6: Subsidized Line
Westerly Looking Easterly: Bedrock Outcrop
June 18, 2014

Photo 24 – Mile 54.6: Subsidized Line
Undermining at Toe of Cliff
June 18, 2014

Photo 25 – Mile 54.6: Subsidized Line
Close Up of Toe of Cliff
June 18, 2014

Photo 26 – Mile 54.6: Subsidized Line
South Side of Line
June 8, 2014

Photo 27 – Mile 54.6: Subsidized Line
Area Between Line and Cliff
June 18, 2014

Photo 28 – Mile 54.6: Subsidized Line
Local Sloughing Near Crest of Cliff
June 18, 2014

Photo 29 – Mile 55.1: Subsidized Line Westerly Looking Easterly
June 18, 2014

Photo 30 – Mile 55.1: Subsidized Line Easterly Looking Westerly
June 18, 2014

Photo 31 – Mile 55.1: Subsidized Line Sloughing Near East End of Slope
June 18, 2014

Photo 32 – Mile 55.1: Subsidized Line Sloughing Near West End of Slope
June 18, 2014

Photo 33 – Mile 55.1: Subsidized Line Vertical Displacement at Crest of Slope
June 18, 2014

Photo 34 – Mile 55.1: Subsidized Line Vertical Displacement at Crest of Slope
June 18, 2014

Photo 35 – Mile 60.1: Subsidized Line
Easterly Looking Westerly
June 18, 2014

Photo 36 – Mile 60.1: Subsidized Line
North Side of Line: Sloughing at Crest
June 18, 2014

Photo 37 – Mile 60.1: Subsidized Line
Vertical Displacement at Crest of Slope
June 18, 2014

Photo 38 – Mile 60.1: Subsidized Line
Vertical Displacement at Crest of Slope
June 18, 2014

Photo 39 – Mile 60.1: Subsidized Line
Crest of Slope Consisting of Fill
June 18, 2014

Photo 40 – Mile 60.1: Subsidized Line
Close Up of Sloughing Near Crest of Slope
June 18, 2014

Photo 41 – Mile 68.3: Subsidized Line
North Side of Line
June 18, 2014

Photo 42 – Mile 68.3: Subsidized Line
Significant Slope Movement
June 18, 2014

Photo 43 – Mile 68.3: Subsidized Line
North Looking South: Slope Movement
June 18, 2014

Photo 44 – Mile 68.3: Subsidized Line
Easterly Looking Westerly: Close Up of Line
June 18, 2014

Photo 45 – Mile 68.3: Subsidized Line
Conditions at Toe of Slope
June 18, 2014

Photo 46 – Mile 68.3: Subsidized Line
South Side of Line
June 18, 2014

Photo 47 – Mile 103.3: Subsidized Line
North Looking Southerly: East Side of Line
June 18, 2014

Photo 48 – Mile 103.3: Subsidized Line
North Looking Southerly: West Side of Line
June 18, 2014

Photo 49 – Mile 103.3: Subsidized Line
North Looking South: East Side of Line:
June 18, 2014

Photo 50 – Mile 103.3: Subsidized Line
South Looking North: East Side of Line
June 18, 2014

Photo 51 – Mile 103.3: Subsidized Line
Area Between Line and Crest of Slope
June 18, 2014

Photo 52 – Mile 103.3: Subsidized Line
Close Up of Soughing at Crest of Slope
June 18, 2014

APPENDIX D
PHOTO LOG OF "SECONDARY" LOCATIONS

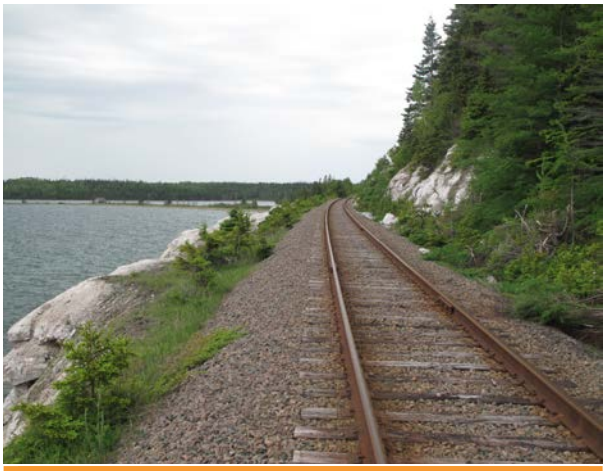


Photo #53 - Mile 53.8: Subsidized Line
East looking West – Crest of Embankment

Photo #54 – Mile 53.8: Subsidized Line
Local Sloughing Near Crest

Photo #55 – Mile 53.8: Subsidized Line
Toe of Embankment

Photo #56 – Mile 53.8: Subsidized Line
East Looking Westerly

Photo #57 – Mile 53.8: Subsidized Line
Toe of Embankment

Photo #58 – Mile 53.8: Subsidized Line
Soughed Material at Toe

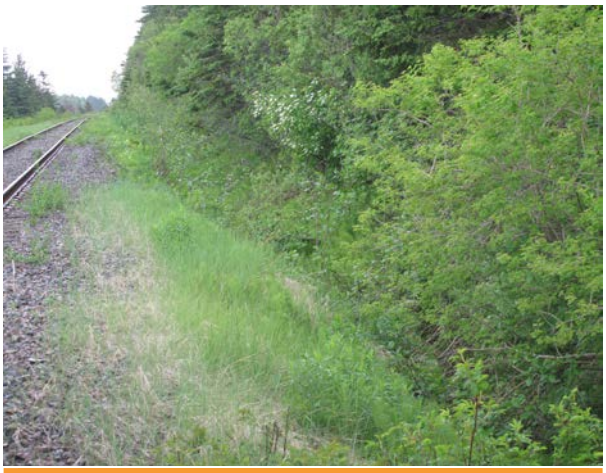


Photo #59 - Mile 57.0: Subsidized Line
West Looking Easterly, South Side of Rail

Photo #60 – Mile 57.0: Subsidized Line
Surficial Sloughing

Photo #61 – Mile 58.8: Subsidized Line
West Looking Easterly; North Side of Rail - Localized Sloughing

Photo #62 – Mile 58.8: Subsidized Line
Location Remediated East of Subject Slope

Photo #63 – Mile 57.0: Subsidized Line
Location Remediated West of Subject Slope

Photo #64 – Mile 58.8: Subsidized Line
East Looking Westerly, South Side of Rail

September 16, 2014
Mr. Andre Lapalme

Reference: Draft Proposal for Further Geotechnical Assessment
Sydney Subdivision of the CBNSR from Havre Boucher, NS to Sydney, NS

Table 1 – Opinion of Probable Cost for "Primary" Locations

Name Location	CBNSR Mile Location	General Summary of Geotechnical Investigation/Assessment/Monitoring Work Plan	Prioritized Issue/Concern	Subtotal of Opinion of Probable Cost
Non Subsidized Rail Line				
Havre Boucher	2.6	• ***Geotechnical Investigation: Borehole Program*** • *Two boreholes to maximum depths of six metres below existing ground surface.* • *Cross sectional survey of slope.* • *Laboratory Testing* • *Report*	2	$12,500
Havre Boucher	2.8	• ***Geotechnical Investigation: Borehole Program*** • *Maximum of two boreholes to maximum depths of 12 metres below existing ground surface.* • *Installation of two independent plastic standpipes for measuring piezometric groundwater levels.* • *Installation of two slope inclinometers* • *Cross sectional survey of slope.* • *Laboratory Testing* • *Report*	2	$22,000
Havre Boucher	2.9	• ***Geotechnical Investigation: Borehole Program*** • *Maximum of three boreholes to maximum depths of 12 metres below existing ground surface.* • *Installation of two independent plastic standpipes for measuring piezometric groundwater levels.* • *Installation of three slope inclinometers* • *Cross sectional survey of slope* • *Laboratory Testing* • *Report*	1	$25,000
Havre Boucher	3.0	• ***Geotechnical Investigation: Borehole Program***	1	$25,000

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Table 1 – Opinion of Probable Cost for "Primary" Locations

Name Location	CBNSR Mile Location	General Summary of Geotechnical Investigation/Assessment/Monitoring Work Plan	Prioritized Issue/Concern	Subtotal of Opinion of Probable Cost
		• *Maximum of three boreholes to maximum depths of 12 metres below existing ground surface.* • *Installation of two independent plastic standpipes for measuring piezometric groundwater levels.* • *Installation of three slope inclinometers* • *Cross sectional survey of slope* • *Laboratory Testing* • *Report*		
Port Hawkesbury	8.5	• **Geotechnical Investigation: Test Pit Program** • Two test pits excavated to approximately four metres below existing ground surface and/or to maximum extent of excavator bucket or practical refusal of the bucket. • Cross sectional survey of slope. • Laboratory Testing • Reporting	1	$5,500
Subsidized Rail Line				
Jamesville	54.6	• ***Field Review by Principal Geotechnical/Geological Engineer***	1	$7,700
Jamesville	55.1	• ***Geotechnical Investigation: Borehole Program*** • *Two boreholes to maximum depths of six metres below existing ground surface.* • *Cross sectional survey of slope* • *Laboratory Testing* • *Report*	2	$12,500
MacInnis Pond	60.1	• ***Geotechnical Investigation: Borehole Program*** • *Maximum of two boreholes to maximum depths of 12 metres below existing ground surface.* • *Installation of two independent plastic*	2	$22,000

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Table 1 – Opinion of Probable Cost for "Primary" Locations

Name Location	CBNSR Mile Location	General Summary of Geotechnical Investigation/Assessment/Monitoring Work Plan	Prioritized Issue/Concern	Subtotal of Opinion of Probable Cost
		standpipes for measuring piezometric groundwater levels. • *Installation of two slope inclinometers* • *Cross sectional survey of slope* • *Laboratory Testing* • *Report*		
Shenacadie	68.3	• ***Field Review by Principal Geotechnical/Geological Engineer***	1	$7,700
Leitches Creek	103.3	• ***Geotechnical Investigation: Borehole Program*** • *One borehole to maximum depth of 12 metres below existing ground surface.* • *Cross sectional survey of slope.* • *Laboratory Testing* • *Report*	2	$15,000
			Total Opinion of Probable Cost (excluding HST)	**$154,900**

Table 2 – Opinion of Probable Cost for "Secondary" Locations

Name Location	CBNSR Mile Location	General Summary of Geotechnical Investigation/Assessment/Monitoring Work Plan	Prioritized Issue/Concern	Opinion of Probable Cost
Subsidized Rail Line				
MacKinnon Harbour	53.8	• ***Perform an annual review of all "secondary" locations and/or as required.*** • For the present slope conditions, Stantec would measure physical slope anomalies using a conventional measuring tape and survey level. • Prepare field report.	3	$2,200 per visit

Description Sydney Sub		(1)2015	(2)2016	(3)2017	(4)/2018	(5)2019	
Install Radio Communication		$0.00	$0.00	$0.00	$125,000.00	$125,000.00	
HBD, HWD Dragging Up Grade		$65,000.00	$68,000.00	$70,000.00			
Warning time + upgrade AWD (Rusty Rail) + plan		$268,000.00	$258,300.00	$257,400.00	$175,600.00	$169,800.00	
		(1)2015	(2)2016	(3)2017	(4)2018	(5)2019	Total 2015-2019
Total		$333,000.00	$326,300.00	$327,400.00	$300,600.00	$294,800.00	**$1,582,100.00**

Mile post	Subdivision	Existing Type	New Type	TD4+ Diode	Charger	Batteries	Miscellaneous	Print & Plan	Labors	LED	Ac feed	Case	Gates	U/G Cable	Ins-Joints	Total	Year
6.26	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00		$0.00	$0.00			$2,200.00	$19,200.00	Year 1 (2015)
7.09	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00		$0.00	$0.00			$2,200.00	$19,200.00	Year 1 (2015)
10.80	Sydney	HBD to be upgraded with smart Scan, replaced existing Dragging Equipment and install HWD														$65,000.00	Year 1 (2015)
19.25	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00		$0.00	$0.00			$2,200.00	$19,200.00	Year 1 (2015)
22.52	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00	$4,800.00	$0.00	$0.00			$2,200.00	$24,000.00	Year 1 (2015)
25.76	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00		$0.00	$0.00			$2,200.00	$19,200.00	Year 1 (2015)
28.38	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00		$0.00	$0.00			$2,200.00	$19,200.00	Year 1 (2015)
30.14	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00		$0.00	$0.00		$20,000.00	$2,200.00	$39,200.00	Year 1 (2015)
33.12	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00	$4,800.00	$0.00	$0.00			$2,500.00	$24,300.00	Year 1 (2015)
34.63	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00		$65,000.00	$0.00			$2,500.00	$84,500.00	Year 2 (2016)
36.94	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00	$4,800.00	$0.00	$0.00			$2,500.00	$24,300.00	Year 2 (2016)
38.85	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00	$4,800.00	$0.00	$0.00			$2,500.00	$24,300.00	Year 2 (2016)
41.36	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00	$6,000.00	$0.00	$0.00			$2,750.00	$25,750.00	Year 2 (2016)
42.32	Sydney	DC	AC/DC	$1,800.00	$1,800.00	$3,500.00	$1,700.00	$2,700.00	$5,500.00	$4,800.00	$0.00	$0.00			$2,750.00	$24,550.00	Year 2 (2016)
42.80	Sydney	HBD to be upgraded with smart Scan, replaced existing Dragging Equipment and install HWD														$68,000.00	Year 2 (2016)
46.16	Sydney	DC	AC/DC	$2,000.00	$2,000.00	$4,000.00	$1,900.00	$3,000.00	$6,000.00	$4,800.00	$0.00	$0.00			$2,750.00	$26,450.00	Year 3 (2016)
52.08	Sydney	DC	AC/DC	$2,000.00	$2,000.00	$4,000.00	$1,900.00	$3,000.00	$6,000.00	$4,800.00	$0.00	$0.00			$2,750.00	$26,450.00	Year 3 (2016)
77.50	Sydney	HBD to be upgraded with smart Scan, replaced existing Dragging Equipment and install HWD														$70,000.00	Year 3 (2017)
90.56	Sydney	DC	AC/DC	$2,000.00	$2,000.00	$4,000.00	$1,900.00	$3,000.00	$6,000.00	$4,800.00	$0.00	$0.00			$2,750.00	$26,450.00	Year 3 (2016)
92.00	Sydney	DC	AC/DC	$2,000.00	$2,000.00	$4,000.00	$1,900.00	$3,000.00	$6,000.00	$6,000.00	$0.00	$0.00			$2,750.00	$27,650.00	Year 3 (2016)
92.11	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00		$0.00	$0.00			$3,000.00	$23,800.00	Year 3 (2017)
93.45	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$4,800.00	$0.00	$0.00			$3,000.00	$28,600.00	Year 3 (2017)
93.61	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$0.00			$3,000.00	$29,800.00	Year 3 (2017)
95.56	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00		$0.00	$0.00			$3,000.00	$23,800.00	Year 3 (2017)
96.08	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$0.00			$3,000.00	$29,800.00	Year 3 (2017)
96.43	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$8,400.00	$0.00	$0.00			$3,000.00	$32,200.00	Year 3 (2017)
97.65	Sydney	MD 660	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$0.00			$6,000.00	$32,800.00	Year 3 (2017)
98.08	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$0.00			$3,000.00	$29,800.00	Year 3 (2017)
98.92	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$0.00			$0.00	$26,800.00	Year 3 (2017)
99.07	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$4,800.00	$0.00	$0.00			$0.00	$25,600.00	Year 3 (2017)
99.22	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$0.00			$0.00	$26,800.00	Year 3 (2017)
100.28	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00		$0.00	$0.00			$0.00	$20,800.00	Year 3 (2017)
104.86	Sydney	C						$3,300.00				$0.00				$3,300.00	Year 3 (2017)
109.69	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00		$0.00	$0.00			$0.00	$20,800.00	Year 3 (2017)
110.07	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00		$0.00	$0.00			$3,000.00	$23,800.00	Year 5 (2018/2019
111.65	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$8,400.00	$0.00	$0.00			$0.00	$29,200.00	Year 5 (2018/2019
112.98	Sydney	C						$3,300.00				$0.00				$3,300.00	Year 5 (2018/2019
113.14	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$7,200.00	$0.00	$0.00			$0.00	$28,000.00	Year 5 (2018/2019
113.28	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00		$0.00	$0.00			$0.00	$20,800.00	Year 5 (2018/2019
113.39	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$4,800.00	$0.00	$0.00			$0.00	$25,600.00	Year 5 (2018/2019
113.50	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$0.00		$20,000.00	$0.00	$46,800.00	Year 5 (2018/2019
113.78	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$20,400.00	$0.00	$0.00	$30,000.00		$0.00	$71,200.00	Year 5 (2018/2019
113.90	Sydney	DC	AC/DC	$2,200.00	$2,200.00	$4,400.00	$2,100.00	$3,300.00	$6,600.00	$6,000.00	$0.00	$25,000.00			$0.00	$51,800.00	Year 5 (2018/2019
1.89	Sydney spur	C															

Subdivision	Sydney
Total Miles	95
BR or ML	ML
Class	2

	Measure	UNITS One Time	Per Year	Unit cost	Capital Spend Yr 1	Yr 2	Yr3	Yr 4	Yr 5
Rail	Lin Ft	0	0	$50.00	$0	$0	$0	$0	$0
Ties	Ea	76000	15200	$110.00	$1,672,000	$1,705,440	$1,739,549	$1,774,340	$1,809,827
Sw ties	Ea	1200	240	$250.00	$60,000	$61,200	$62,424	$63,672	$64,946
Ballast	Ton	95000	19000	$20.00	$380,000	$387,600	$395,352	$403,259	$411,324
Surfacing	Trk Ft	501,600	100,320	$1.50	$150,480	$153,490	$156,559	$159,691	$162,884
Crossings	Ea	25	5	$60,000.00	$300,000	$306,000	$312,120	$318,362	$324,730
Bridges	Per foot	0	0	$30.00	$0	$0	$0	$0	$0
Signal	Lump Sum	0	0	$45,000.00	$0	$0	$0	$0	$0
Vehicle	Lump Sum	1		$185,000.00	$0	$0	$0	$0	$0
TOTALS					$2,562,480.00	$2,613,730	$2,666,004	$2,719,324	$2,773,711

Project	Per Mile	Road	Life span	Per Year
Rail	10560	1003200	50	20064
Ties	3200	304000	40	7600
Sw ties	50	4750	40	118.75
Ballast	2000	190000	30	6333
Surf	5280	501600	5	100320
Crossings	0.75	70	15	4.7

5.1 Program Immediately/Next Capital Program

Sub	Mileage	Priority	Recommendations	Cost
Hopewell	42.20	C1	Replace outside stringers for all 4 spans	$600,000
Hopewell	43.00	C1	Reset span to remove horizontal kink and replace all anchor bolts	$20,000
Hopewell	51.90	C1	Encase base of abutment 1 in reinforced concrete to repair concrete erosion	$50,000
Hopewell	51.90	C1	Rehabilitation to improve compatibility of trusses and floor system	$250,000
Hopewell	54.50	C1	Repair large spall in slab soffit - $50,000	$60,000
Hopewell	56.10	C1	Replace both roller bearings on west abutment	$80,000
Hopewell	65.90	C1	Complete installation of walkway and handrail (unfinished)	$20,000
Hopewell	65.90	C1	Strengthen all 5 spans as per Delcan study - DPG flanges and webs - all 5 spans	$400,000
Hopewell	66.10	C1	Replace deck	$68,000
Hopewell	66.10	C1	Replace all 14 stringers and all top floorbeam flanges, repair floorbeam webs	$395,000
Hopewell	70.70	C1	Repair/encase concrete spalls on pier nosing, headwalls and soffits	$100,000
Hopewell	78.40	C1	Replace timber bearing blocks	$10,000
Hopewell	81.10	C1	Replace FB0 and FB1 bottom flanges	$30,000
Hopewell	82.20	C1	Replace all 12 stringers - to be confirmed by analysis	$180,000
Hopewell	84.40	C1	Repair pier caps / bearing seats for piers 1, 12 and 16 including seat for TPG span	$120,000
Hopewell	88.50	C1	Encase base of abutment 1 in reinforced concrete to repair concrete erosion	$50,000
Hopewell	95.20	C1	Replace both inside stringers in all 7 bays and strengthen main girder webs	$320,000
Hopewell	106.40	C1	Rebuild both concrete backwalls - chip out loose materal and cast to original dimensions	$50,000
Hopewell	106.40	C1	Replace 9 bottom flange angles and webs - to be confirmed by analysis	$180,000
Hopewell	111.90	C1	Repair east abutment bearing seats - chip out loose material and recast to original	$50,000
Oxford	74.70	C1	Replace deck	$350,000
Sydney	0.50	C1	Replace 10 stringers and strengthen main girder webs	$260,000
Sydney	11.70	C1	Protect second approach embankment with rip rap and add ballast	$15,000
Sydney	11.70	C1	Repair bearing seats for both abutments - chip out loose material and recast to original	$100,000
Sydney	11.70	C1	Chp out and recast abutment backwall including wingwalls	$40,000
Sydney	21.90	C1	Analyze capacity for reductions in stringers and floorbeams	
Sydney	21.90	C1	Replace all 20 TPG span 2 stringers - confirm with analysis	$300,000
Sydney	21.90	C1	Replace all 11 TPG span 2 floorbeams - confirm with analysis	$330,000
Sydney	35.20	C1	Analyze capacity for reductions in stringers and floorbeams	
Sydney	35.20	C1	Replace all 14 span 1 stringers - confirm with analysis	$210,000
Sydney	35.20	C1	Replace all 8 span 1 floorbeams - confirm with analysis	$240,000
Sydney	35.20	C1	Replace 10 of 11 span 2 top floorbeam flanges - confirm with analysis	$150,000
Sydney	35.20	C1	Replace all 20 span 2 stringers - confirm with analysis	$300,000
Sydney	43.70	C1	Analyze capacity for reduced girder flanges	
Sydney	49.40	C1	Analyze capacity for reduced girder flanges	
Sydney	50.70	C1	Analyze capacity for reduced girder flanges	
Sydney	57.80	C1	Chip away loose material and reface west abutment seat and backwall	$70,000
Sydney	57.80	C1	Analyze capacity for reduced stringer flanges	
Sydney	57.80	C1	Replace bottom stringer flanges for 15 stringers in span 4 - confirm with analysis	$225,000
Sydney	57.80	C1	Replace perforated steel wedge gear support at west end of swing span	$10,000
Sydney	67.40	C1	Protect abutment 1 right wingwall and embankment with riprap	$5,000
Sydney	72.10	C1	Chip back loose concrete & reface headwall, soffit and pier to original lines	$100,000
Sydney	73.30	C1	Dump rip rap to repair erosion on left side of second approach	$5,000
Sydney	87.40	C1	Analyze for girder flange reduction	
Sydney	87.50	C1	Analyze for reduced top and bottom floorbeam flanges	
Sydney	99.50	C1	Analyze for floorbeam flange reduction	
Sydney	103.30	C1	Analyze for reduced stringer and floorbeam flanges	
Sydney	103.30	C1	Replace stringers - to be confirmed with analysis	$300,000
Sydney	104.40	C1	Weld repair bearing stiffeners	$20,000
Sydney	104.40	C1	Replace deck	$98,000
Sydney	104.40	C1	Analyze for reduced floorbeam flanges	
Sydney	104.40	C1	Replace all main girder bottom flange rivets with bolts (rivet heads gone)	$100,000
Sydney	104.70	C1	Analyze for reduced stringers	
Sydney	110.70	C1	Analyze for reduced floorbeam flanges	
Sydney	110.70	C1	Test remaining pile cap concrete at toes of abutments for integrity/quality	$10,000
Sydney	110.70	C1	Underwater inspection of sheet pile walls for integrity below water	$15,000
Sydney Spur	1.00	C1	Install missing tie spacers	$10,000
				$6,296,000

5.2 Next 3 Year Capital Plan

Sub	Mileage	Priority	Recommendations	Cost
Hopewell	88.50	C2	Replace deck	$71,000
Sydney	49.40	C2	Replace deck	$500,000
Sydney	50.70	C2	Replace deck	$450,000
Sydney	57.80	C2	Spot and replace 100 ties on spans 1 to 6 to break up bad clusters	$120,000
Hopewell	3.20	C3	Point stone abutments (est. 40 LF) and pin vertical crack in abutment 1	$40,000
Hopewell	3.20	C3	Install steel anchor plates on soffit to connect spreading slabs	$18,000
Hopewell	3.20	C3	Install timber ballast retainers on both headwalls	$8,000
Hopewell	5.40	C3	Install CSP arch insert - already designed with contractor	$150,000
Hopewell	16.20	C3	Replace right timber bearing block on west abutment	$3,000
Hopewell	42.20	C3	Underwater inspection	$15,000
Hopewell	42.20	C3	Replace mainline track deck	$320,000
Hopewell	64.40	C3	Replace all 4 girders	$100,000
Hopewell	65.90	C3	Chip back loose material and repair abutment 1 bearing seat	$50,000
Hopewell	76.20	C3	Clean and reset or replace both roller bearings on abutment 2	$80,000
Hopewell	81.10	C3	Replace stringer diaphragms at both abutments	$20,000
Hopewell	81.10	C3	Repair stringer bearing pedestals at west abut - shim and level all stringer bearings	$30,000
Hopewell	84.40	C3	Repair pier caps / bearing seats for piers 2, 5, 14, 24, 27, 28 and 30	$250,000
Hopewell	84.40	C3	Replace deck on thru truss span	$173,000
Hopewell	88.50	C3	Underwater inspection of pier	$5,000
Hopewell	88.50	C3	Repoint pier in the tidal range	$50,000
Hopewell	95.00	C3	Rebuild both concrete backwalls - chip out loose materal and cast to original dimensions	$50,000
Hopewell	106.40	C3	Encase both west abutment wingwalls and the east abutment left wingwall	$90,000
New Page	0.30	C3	Replace hollow timber bearing blocks (or replace small bridge with culvert)	$8,000
Oxford	74.80	C3	Repair abutment 1 bearing seats - chip out loose material and recast to original	$50,000
Oxford	74.80	C3	Replace deck	$50,000
Sydney	8.70	C3	Relace bridge tenderer's office floorbeam	$10,000
Sydney	21.90	C3	Chip out seats, recast and encase pier 1	$100,000
Sydney	21.90	C3	Replace 8 knee brace webs and repair bearing stiffeners	$50,000
Sydney	31.30	C3	Reinstall encasement concrete at base of pier	$50,000
Sydney	39.30	C3	Install CSP arch insert and encase wingwalls (similar to Sydney 55.2)	$350,000
Sydney	39.80	C3	Chip back loose concrete and reface pier and span 2 soffit	$80,000
Sydney	43.70	C3	Replace 16 severely reduced anchor bolts	$10,000
Sydney	43.70	C3	Weld repair exterior bearing stiffeners	$5,000
Sydney	49.40	C3	Weld repair all abutment interior bearing stiffeners	$10,000
Sydney	49.40	C3	Replace perforated steel tower bracing	$150,000
Sydney	49.40	C3	Encase tower 2 - bent 5 - left pedestal in concrete	$20,000
Sydney	49.40	C3	Replace flange angles for 9 top flanges on 60' spans - confirm with analysis	$450,000
Sydney	49.40	C3	Replace interior shelf angles on all 60' spans - confirm with analysis	$250,000

5.2 Next 3 Year Capital Plan (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Sydney	49.40	C3	Splice repair bottom flanges of 60 foot spans near bearings (example: 50.70 span 1)	$240,000
Sydney	50.70	C3	Replace top lateral braces on bents 4 and 5	$20,000
Sydney	50.70	C3	Splice repair bottom flanges of spans 1, 3 and 9 and holed bracing	$90,000
Sydney	50.70	C3	Replace holed lower laterals, connection plates and cross frames	$100,000
Sydney	50.70	C3	Repair perforated left tower leg channels in bays 6 and 9	$50,000
Sydney	50.70	C3	Replace interior shelf angles on all 60' spans - confirm with analysis	$210,000
Sydney	51.80	C3	Chip away loose material and recast headwalls/curbs	$30,000
Sydney	57.80	C3	Chip away loose material and reface pier 1 seat (west swing span rest pier)	$50,000
Sydney	57.80	C3	Mechanical and Electrical Inspection	$35,000
Sydney	57.80	C3	Replace bottom stringer flanges for 25 stringers in spans 3 and 6 - confirm with analysis	$375,000
Sydney	57.80	C3	Underwater inspection	$25,000
Sydney	59.30	C3	Point masonry joints and pin vertical crack in east abutment (est. 120 LF)	$40,000
Sydney	60.70	C3	Point masonry joints and pin vertical crack in west abutment (est. 120 LF)	$40,000
Sydney	60.70	C3	Chip away loose material and recast right headwall/curb	$15,000
Sydney	72.10	C3	Replace ballast deck ties	$20,000
Sydney	73.30	C3	Point masonry joints and pin vertical crack in west abutment (est. 120 LF)	$40,000
Sydney	76.00	C3	Point masonry joints and pin vertical crack in west abutment (est. 60 LF)	$30,000
Sydney	80.50	C3	Repair abutment 1 bearing seat on left	$25,000
Sydney	80.50	C3	Replace FB0 web, FB4 web and floorbeam 3 bottom flange	$50,000
Sydney	80.50	C3	Splice repair bottom flanges near bearings (example: Sydney 50.70 span 1)	$40,000
Sydney	87.40	C3	Replace all 4 girders - confirm with analysis	$100,000
Sydney	87.50	C3	Reset right roller bearing of span 1 on pier 2	$10,000
Sydney	87.50	C3	Rebuild west abutment concrete backwall and seat - chip out loose materal and recast	$15,000
Sydney	87.50	C3	Replace reduced top and bottom FB flanges and webs - to be confirmed with analysis	$600,000
Sydney	87.50	C3	Encase all 3 piers and east abutment	$400,000
Sydney	88.40	C3	Concrete encase stone abutments and wingwalls	$80,000
Sydney	91.60	C3	Encase masonry abutments in tidal range	$100,000
Sydney	99.50	C3	Replace 4 FB top flanges and 5 FB bottom flanges - to be confirmed by analysis	$100,000
Sydney	99.90	C3	Demolish Fairmount St. Overhead Bridge	$25,000
Sydney	103.30	C3	Replace deck	$98,000
Sydney	103.30	C3	Replace floorbeams 1 to 9 - to be confirmed with analysis	$270,000
Sydney	104.40	C3	Point both abutments in the tidal range (300 LF)	$100,000
Sydney	104.40	C3	Replace 6 top floorbeam flanges and all floorbeam webs - to be confirmed by analysis	$300,000
Sydney	104.70	C3	Replace deck	$60,000
Sydney	104.70	C3	Replace stringers - to be confirmed by analysis	$180,000
Sydney	104.70	C3	Replace 6 perforated lower lateral braces and 4 connection plates	$50,000
Sydney	110.70	C3	Replace floorbeams 1 to 9 - to be confirmed by analysis	$270,000
Sydney	110.70	C3	Repair open joints and erosion of concrete at both abutments	$250,000
Sydney	111.65	C3	Replace sidewalk planks	$5,000
Sydney Spur	1.00	C3	Install missing handrails	$3,000
Sydney Spur	1.00	C3	Replace rotten timber backwalls	$20,000
				$8,797,000

a Genesee & Wyoming Company

2014 Bridge Inspection Report

Cape Breton Nova Scotia Railway

May 2014

BM 3458 BM A00

PARSONS

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1.0 Introduction

This report presents the results of the 2014 bridge inspection program for the Cape Breton Nova Scotia Railway and makes recommendations for maintenance actions. Results are presented in the following format:

1. The 2014 Inspection Summary Report, and
2. Inspection Form and Photos for each bridge/span

The Inspection Summary Report summarizes inspection findings and recommends bridge repair priorities for the Railway. The individual Inspection Forms are produced from Excel Spreadsheets. The Inspection Photo Report is produced with ACDSee photo software. The inspection photos are in contact sheet format with 6 documented photos per page. All reports are provided in both hard copy (in a 3 ring binder) and Adobe PDF format on disk. Electronic PDF reports are bookmarked by subdivision and mileage to allow quick access to individual bridge records. New this year, we have also included photo filename reference in all photo captions and all photo files on DVD for closer scrutiny, if desired.

This report contains recommendations for work extending out 3 years.

2.0 SCOPE OF WORK

The scope of work for the 2014 inspection program involved detailed inspections of all accessible members on all identified bridges where the Railway has maintenance responsibility. Members were accessed from the deck, the ground and by climbing (where possible), and with the use of a bridge inspection vehicle on 10 bridges. Inaccessible members were inspected from below or through open decks, where possible.

This inspection did not include underwater inspection, inspection of buried components or load rating of structures. In cases where a specialized investigation is warranted, this is noted in our recommendations.

A total of 108 bridge sites were inspected. The bridge list is included in Appendix A. This inspection report summarizes the findings of all of the above inspections.

For overhead bridges that are not the maintenance responsibility of the Railroad, only a cursory inspection was carried out below deck of the span that crosses the track.

3.0 INSPECTION PROCEDURES

Available bridge inspection information was reviewed prior to visiting the Hopewell Subdivision, Sydney Subdivision, Oxford Subdivision, Sydney Spur, New Page Spur and Scott Spur. This included inspection information available from previous inspection reports.

The 2014 inspection work was carried over a 15 day period from April 18th to May 3rd, 2014. It consisted of two inspection passes. The first pass consisted of a methodical tour by hi-rail vehicle along

subdivision lines. Each bridge along the way was photographed and an inspection was carried out. The second pass utilized of a snooper bridge inspection vehicle to reach members that were not otherwise accessible in the first pass. Measurements were taken of section loss in girder flanges. The bridges inspected with snooper are listed as follows:

1. Sydney 110.70
2. Sydney 104.70
3. Sydney 104.40
4. Sydney 103.30
5. Sydney 99.50
6. Sydney 91.60
7. Sydney 87.50
8. Sydney 87.40
9. Sydney 57.80
10. Oxford 74.70

These inspections involved hands on inspection of all accessible members on each structure to identify obvious problems and investigate any apparent deficiencies that are accessible to the inspector. Inspection techniques included hammer sounding of timber members to identify internal voids and concrete substructures to identify delaminations.

Inspection effort focused on areas that commonly develop structural problems, such as bearing areas and connections. This inspection used subjective inspection techniques and relied heavily upon human judgment. It is possible that some deficiencies may not have been discovered. The inspection does not guarantee that all defects will be identified. Internal steel defects, latent defects and defects in inaccessible areas may not be located. However, we are confident that all critical visible defects on accessible components have been found.

Stan Reimer P. Eng., a registered professional engineer in the Province of Nova Scotia, performed all inspections.

4.0 SUMMARY OF FINDINGS

The summary findings are reported below. For more information, please refer to the individual bridge reports.

Bridge repair progress completed since the last bridge inspections in May 2013 includes:

- Installation of new decks on Hopewell 12.9 and Hopewell 51.9
- Installation of new timber tie spacers on 6 bridges, and
- Brush clearing on ~20% of Hopewell subdivision bridges

For a complete list of work completed since 2013, see Appendix E of this report.

A snooper bridge inspection vehicle was utilized again this year to complete snooper inspections at the CBNS started last year. The snooper provides hands on access to many structural members that are otherwise not accessible. Measurements were taken of section losses. This has allowed for much more accurate assessment of primary member condition on CBNS bridges.

Summary of Estimated Repair Costs

The estimated cost of bridge repairs is much higher this year due to the identification of significant additional section loss in many bridges. Many of the recommendations have yet to be confirmed by analysis.

Next Capital Program – $6.3 million

Next Capital 3 Year Plan – $8.8 million

5.0 RECOMMENDATIONS

The following presents a list of repairs to be carried out over the next 3 years. Estimated costs are provided where appropriate to assist the Railway in preparing annual budget requirements. These costs are considered to be rough estimates and are within an accuracy of ±50%. It is assumed that all capital work will be carried out by contract resources. It is assumed that maintenance work will be undertaken by CBNS forces (such as lifting approaches, bearing seat cleaning and brush clearing). Please note that cost estimates were adjusted higher this year due to higher costs experienced recently for railway bridge repair projects.

Recommendations and priorities are based on conditions present at the time of this inspection, utilizing industry standards and information made available to us by the Owner. They are based on defects found that may limit the original capacity of the structures. No ratings of the structures have been performed. Conditions and standards can and do change, so frequent re-inspection and evaluation is recommended.

Priority System Codes

The inspection rating system has changed this year to the Genesee Wyoming standard.

D. Restrictions / Critical Review Condition represents a threat to the structure's ability to safely carry traffic. Traffic may need to be protected by reduced speed or other measures and repairs should be programmed immediately in order to avoid an unplanned bridge outage.

C1. Condition represents a threat to the structure's ability to safely carry traffic. Traffic may need to be protected by reduced speed or other measures and repairs should be programmed in the next capital program in order to avoid an unplanned bridge outage with the next inspection. Condition should be monitored periodically until repairs have been completed.

C3. Condition is substandard and may soon begin to impact the structures ability to safely carry traffic at timetable speed. Repairs should be programmed in the 3 year capital plan. Condition should be monitored periodically until repairs have been completed.

C5 Condition is substandard and may require repairs within 5 years depending upon rate of deterioration. The condition should be monitored to determine the rate of deterioration.

B. Preventive Maintenance – Condition requires maintenance that can be carried out by the Railway's own forces such as lifting approaches, clearing brush, cleaning bearing seats and removing beaver dams.

A. Good - Condition is currently acceptable with no repair actions anticipated within the next 5 years

See Appendix D for a detailed bridge by bridge list of recommendations.

5.1 Program Immediately/Next Capital Program

Sub	Mileage	Priority	Recommendations	Cost
Hopewell	42.20	C1	Replace outside stringers for all 4 spans	$600,000
Hopewell	43.00	C1	Reset span to remove horizontal kink and replace all anchor bolts	$20,000
Hopewell	51.90	C1	Encase base of abutment 1 in reinforced concrete to repair concrete erosion	$50,000
Hopewell	51.90	C1	Rehabilitation to improve compatibility of trusses and floor system	$250,000
Hopewell	54.50	C1	Repair large spall in slab soffit - $50,000	$60,000
Hopewell	56.10	C1	Replace both roller bearings on west abutment	$80,000
Hopewell	65.90	C1	Complete installation of walkway and handrail (unfinished)	$20,000
Hopewell	65.90	C1	Strengthen all 5 spans as per Delcan study - DPG flanges and webs - all 5 spans	$400,000
Hopewell	66.10	C1	Replace deck	$68,000
Hopewell	66.10	C1	Replace all 14 stringers and all top floorbeam flanges, repair floorbeam webs	$395,000
Hopewell	70.70	C1	Repair/encase concrete spalls on pier nosing, headwalls and soffits	$100,000
Hopewell	78.40	C1	Replace timber bearing blocks	$10,000
Hopewell	81.10	C1	Replace FB0 and FB1 bottom flanges	$30,000
Hopewell	82.20	C1	Replace all 12 stringers - to be confirmed by analysis	$180,000
Hopewell	84.40	C1	Repair pier caps / bearing seats for piers 1, 12 and 16 including seat for TPG span	$120,000
Hopewell	88.50	C1	Encase base of abutment 1 in reinforced concrete to repair concrete erosion	$50,000
Hopewell	95.20	C1	Replace both inside stringers in all 7 bays and strengthen main girder webs	$320,000
Hopewell	106.40	C1	Rebuild both concrete backwalls - chip out loose materal and cast to original dimensions	$50,000
Hopewell	106.40	C1	Replace 9 bottom flange angles and webs - to be confirmed by analysis	$180,000
Hopewell	111.90	C1	Repair east abutment bearing seats - chip out loose material and recast to original	$50,000
Oxford	74.70	C1	Replace deck	$350,000
Sydney	0.50	C1	Replace 10 stringers and strengthen main girder webs	$260,000
Sydney	11.70	C1	Protect second approach embankment with rip rap and add ballast	$15,000
Sydney	11.70	C1	Repair bearing seats for both abutments - chip out loose material and recast to original	$100,000
Sydney	11.70	C1	Chp out and recast abutment backwall including wingwalls	$40,000
Sydney	21.90	C1	Analyze capacity for reductions in stringers and floorbeams	
Sydney	21.90	C1	Replace all 20 TPG span 2 stringers - confirm with analysis	$300,000
Sydney	21.90	C1	Replace all 11 TPG span 2 floorbeams - confirm with analysis	$330,000
Sydney	35.20	C1	Analyze capacity for reductions in stringers and floorbeams	
Sydney	35.20	C1	Replace all 14 span 1 stringers - confirm with analysis	$210,000
Sydney	35.20	C1	Replace all 8 span 1 floorbeams - confirm with analysis	$240,000
Sydney	35.20	C1	Replace 10 of 11 span 2 top floorbeam flanges - confirm with analysis	$150,000
Sydney	35.20	C1	Replace all 20 span 2 stringers - confirm with analysis	$300,000
Sydney	43.70	C1	Analyze capacity for reduced girder flanges	
Sydney	49.40	C1	Analyze capacity for reduced girder flanges	
Sydney	50.70	C1	Analyze capacity for reduced girder flanges	
Sydney	57.80	C1	Chip away loose material and reface west abutment seat and backwall	$70,000
Sydney	57.80	C1	Analyze capacity for reduced stringer flanges	
Sydney	57.80	C1	Replace bottom stringer flanges for 15 stringers in span 4 - confirm with analysis	$225,000
Sydney	57.80	C1	Replace perforated steel wedge gear support at west end of swing span	$10,000
Sydney	67.40	C1	Protect abutment 1 right wingwall and embankment with riprap	$5,000
Sydney	72.10	C1	Chip back loose concrete & reface headwall, soffit and pier to original lines	$100,000
Sydney	73.30	C1	Dump rip rap to repair erosion on left side of second approach	$5,000
Sydney	87.40	C1	Analyze for girder flange reduction	
Sydney	87.50	C1	Analyze for reduced top and bottom floorbeam flanges	
Sydney	99.50	C1	Analyze for floorbeam flange reduction	
Sydney	103.30	C1	Analyze for reduced stringer and floorbeam flanges	
Sydney	103.30	C1	Replace stringers - to be confirmed with analysis	$300,000
Sydney	104.40	C1	Weld repair bearing stiffeners	$20,000
Sydney	104.40	C1	Replace deck	$98,000
Sydney	104.40	C1	Analyze for reduced floorbeam flanges	
Sydney	104.40	C1	Replace all main girder bottom flange rivets with bolts (rivet heads gone)	$100,000
Sydney	104.70	C1	Analyze for reduced stringers	
Sydney	110.70	C1	Analyze for reduced floorbeam flanges	
Sydney	110.70	C1	Test remaining pile cap concrete at toes of abutments for integrity/quality	$10,000
Sydney	110.70	C1	Underwater inspection of sheet pile walls for integrity below water	$15,000
Sydney Spur	1.00	C1	Install missing tie spacers	$10,000
				$6,296,000

5.2 Next 3 Year Capital Plan

Sub	Mileage	Priority	Recommendations	Cost
Hopewell	88.50	C2	Replace deck	$71,000
Sydney	49.40	C2	Replace deck	$500,000
Sydney	50.70	C2	Replace deck	$450,000
Sydney	57.80	C2	Spot and replace 100 ties on spans 1 to 6 to break up bad clusters	$120,000
Hopewell	3.20	C3	Point stone abutments (est. 40 LF) and pin vertical crack in abutment 1	$40,000
Hopewell	3.20	C3	Install steel anchor plates on soffit to connect spreading slabs	$18,000
Hopewell	3.20	C3	Install timber ballast retainers on both headwalls	$8,000
Hopewell	5.40	C3	Install CSP arch insert - already designed with contractor	$150,000
Hopewell	16.20	C3	Replace right timber bearing block on west abutment	$3,000
Hopewell	42.20	C3	Underwater inspection	$15,000
Hopewell	42.20	C3	Replace mainline track deck	$320,000
Hopewell	64.40	C3	Replace all 4 girders	$100,000
Hopewell	65.90	C3	Chip back loose material and repair abutment 1 bearing seat	$50,000
Hopewell	76.20	C3	Clean and reset or replace both roller bearings on abutment 2	$80,000
Hopewell	81.10	C3	Replace stringer diaphragms at both abutments	$20,000
Hopewell	81.10	C3	Repair stringer bearing pedestals at west abut - shim and level all stringer bearings	$30,000
Hopewell	84.40	C3	Repair pier caps / bearing seats for piers 2, 5, 14, 24, 27, 28 and 30	$250,000
Hopewell	84.40	C3	Replace deck on thru truss span	$173,000
Hopewell	88.50	C3	Underwater inspection of pier	$5,000
Hopewell	88.50	C3	Repoint pier in the tidal range	$50,000
Hopewell	95.00	C3	Rebuild both concrete backwalls - chip out loose materal and cast to original dimensions	$50,000
Hopewell	106.40	C3	Encase both west abutment wingwalls and the east abutment left wingwall	$90,000
New Page	0.30	C3	Replace hollow timber bearing blocks (or replace small bridge with culvert)	$8,000
Oxford	74.80	C3	Repair abutment 1 bearing seats - chip out loose material and recast to original	$50,000
Oxford	74.80	C3	Replace deck	$50,000
Sydney	8.70	C3	Relace bridge tenderer's office floorbeam	$10,000
Sydney	21.90	C3	Chip out seats, recast and encase pier 1	$100,000
Sydney	21.90	C3	Replace 8 knee brace webs and repair bearing stiffeners	$50,000
Sydney	31.30	C3	Reinstall encasement concrete at base of pier	$50,000
Sydney	39.30	C3	Install CSP arch insert and encase wingwalls (similar to Sydney 55.2)	$350,000
Sydney	39.80	C3	Chip back loose concrete and reface pier and span 2 soffit	$80,000
Sydney	43.70	C3	Replace 16 severely reduced anchor bolts	$10,000
Sydney	43.70	C3	Weld repair exterior bearing stiffeners	$5,000
Sydney	49.40	C3	Weld repair all abutment interior bearing stiffeners	$10,000
Sydney	49.40	C3	Replace perforated steel tower bracing	$150,000
Sydney	49.40	C3	Encase tower 2 - bent 5 - left pedestal in concrete	$20,000
Sydney	49.40	C3	Replace flange angles for 9 top flanges on 60' spans - confirm with analysis	$450,000
Sydney	49.40	C3	Replace interior shelf angles on all 60' spans - confirm with analysis	$250,000

5.2 Next 3 Year Capital Plan (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Sydney	49.40	C3	Splice repair bottom flanges of 60 foot spans near bearings (example: 50.70 span 1)	$240,000
Sydney	50.70	C3	Replace top lateral braces on bents 4 and 5	$20,000
Sydney	50.70	C3	Splice repair bottom flanges of spans 1, 3 and 9 and holed bracing	$90,000
Sydney	50.70	C3	Replace holed lower laterals, connection plates and cross frames	$100,000
Sydney	50.70	C3	Repair perforated left tower leg channels in bays 6 and 9	$50,000
Sydney	50.70	C3	Replace interior shelf angles on all 60' spans - confirm with analysis	$210,000
Sydney	51.80	C3	Chip away loose material and recast headwalls/curbs	$30,000
Sydney	57.80	C3	Chip away loose material and reface pier 1 seat (west swing span rest pier)	$50,000
Sydney	57.80	C3	Mechanical and Electrical Inspection	$35,000
Sydney	57.80	C3	Replace bottom stringer flanges for 25 stringers in spans 3 and 6 - confirm with analysis	$375,000
Sydney	57.80	C3	Underwater inspection	$25,000
Sydney	59.30	C3	Point masonry joints and pin vertical crack in east abutment (est. 120 LF)	$40,000
Sydney	60.70	C3	Point masonry joints and pin vertical crack in west abutment (est. 120 LF)	$40,000
Sydney	60.70	C3	Chip away loose material and recast right headwall/curb	$15,000
Sydney	72.10	C3	Replace ballast deck ties	$20,000
Sydney	73.30	C3	Point masonry joints and pin vertical crack in west abutment (est. 120 LF)	$40,000
Sydney	76.00	C3	Point masonry joints and pin vertical crack in west abutment (est. 60 LF)	$30,000
Sydney	80.50	C3	Repair abutment 1 bearing seat on left	$25,000
Sydney	80.50	C3	Replace FB0 web, FB4 web and floorbeam 3 bottom flange	$50,000
Sydney	80.50	C3	Splice repair bottom flanges near bearings (example: Sydney 50.70 span 1)	$40,000
Sydney	87.40	C3	Replace all 4 girders - confirm with analysis	$100,000
Sydney	87.50	C3	Reset right roller bearing of span 1 on pier 2	$10,000
Sydney	87.50	C3	Rebuild west abutment concrete backwall and seat - chip out loose materal and recast	$15,000
Sydney	87.50	C3	Replace reduced top and bottom FB flanges and webs - to be confirmed with analysis	$600,000
Sydney	87.50	C3	Encase all 3 piers and east abutment	$400,000
Sydney	88.40	C3	Concrete encase stone abutments and wingwalls	$80,000
Sydney	91.60	C3	Encase masonry abutments in tidal range	$100,000
Sydney	99.50	C3	Replace 4 FB top flanges and 5 FB bottom flanges - to be confirmed by analysis	$100,000
Sydney	99.90	C3	Demolish Fairmount St. Overhead Bridge	$25,000
Sydney	103.30	C3	Replace deck	$98,000
Sydney	103.30	C3	Replace floorbeams 1 to 9 - to be confirmed with analysis	$270,000
Sydney	104.40	C3	Point both abutments in the tidal range (300 LF)	$100,000
Sydney	104.40	C3	Replace 6 top floorbeam flanges and all floorbeam webs - to be confirmed by analysis	$300,000
Sydney	104.70	C3	Replace deck	$60,000
Sydney	104.70	C3	Replace stringers - to be confirmed by analysis	$180,000
Sydney	104.70	C3	Replace 6 perforated lower lateral braces and 4 connection plates	$50,000
Sydney	110.70	C3	Replace floorbeams 1 to 9 - to be confirmed by analysis	$270,000
Sydney	110.70	C3	Repair open joints and erosion of concrete at both abutments	$250,000
Sydney	111.65	C3	Replace sidewalk planks	$5,000
Sydney Spur	1.00	C3	Install missing handrails	$3,000
Sydney Spur	1.00	C3	Replace rotten timber backwalls	$20,000
				$8,797,000

Appendix A – Bridge List

Sub	Mileage	Bridge Name	Location	# Spans	Length (ft)	Structure Type	Deck Type	Year Built	Access
Hopewell	3.20	Stream	Truro	1	?	RCS	Ballast	?	< 1/2 mile
Hopewell	4.30	Christy's Brook	Truro	2	28	RCS	Ballast	1927	< 1/2 mile
Hopewell	5.40	Stream	Truro	1	?	RCS	Ballast	?	< 1/2 mile
Hopewell	12.90	Calvery River	West River	2	90	DPG	Open	1903	Road
Hopewell	16.20	Stream	West River	1	14	BM	Ballast	?	< 1/2 mile
Hopewell	21.90	Stream	West River	1	17	RCS	Ballast	1923	Road
Hopewell	28.90	Stream	Lorne	1	25	RCS	Ballast	1911	Road
Hopewell	35.10	Elgin Rd. Subway	Lorne	1	25	BM	Open	1911	Road
Hopewell	41.88	Hwy 104 O/H E/B	Stellarton	3		PC			
Hopewell	41.90	Hwy 104 O/H W/B	Stellarton	6		Beam			
Hopewell	42.20	East River	Stellarton	4	337	DBL TPG	Open	1905	Road
Hopewell	42.90	McLean St.	New Glasgow	1	37	DPG	Open	1908	Road
Hopewell	43.00	Dalhousie St.	New Glasgow	1	37	DPG	Open	1908	Road
Hopewell	50.60	Pine Tree Creek	New Glasgow	1	90	DPG	Open	1908	< 1/2 mile
Hopewell	50.70	Stream	New Glasgow	1	17	RCS	Ballast	?	< 1/2 mile
Hopewell	51.90	Sutherland River	New Glasgow	1	173	TT	Open	1905	< 1/2 mile
Hopewell	53.30	Shore Road O/H	New Glasgow			PT			
Hopewell	54.50	Stream	New Glasgow	1	17	RCS	Ballast	1915	Road
Hopewell	56.10	French River	New Glasgow	1	89	TPG	Open	1914	Road
Hopewell	64.40	Subway	Marshy Hope	1	25	DPG	Open	1908	Road
Hopewell	65.90	Barney River West	Marshy Hope	5	245	DPG	Open	1914	Road
Hopewell	66.10	Barney River East	Marshy Hope	1	72	DPG	Open	1914	< 1/2 mile
Hopewell	67.70	Bear Brook	Marshy Hope	1	18	BM	Open	1907	Road
Hopewell	69.30	Stream	Marshy Hope	2	30	RCS	Ballast	1954	< 1/2 mile
Hopewell	69.40	Stream	Marshy Hope	2	30	RCS	Ballast	1954	< 1/2 mile
Hopewell	70.70	Stream	Marshy Hope	2	25	RCS	Ballast	1954	< 1/2 mile
Hopewell	74.80	Stream	Marshy Hope	1		RCS	Ballast	?	< 1/2 mile
Hopewell	76.20	James River	Marshy Hope	1	101	TPG	Open	1905	< 1/2 mile
Hopewell	77.70	Brierly Brook #1	Marshy Hope	1	23	DPG	Open	1907	Road
Hopewell	78.40	Stream	Marshy Hope	1	?	PT	Ballast	?	< 1/2 mile
Hopewell	78.60	Brierly Brook #2	Marshy Hope	1	24	DPG	Open	1907	< 1/2 mile
Hopewell	81.10	Yankee Grant Brook	Marshy Hope	1	76	TPG	Open	1915	< 1/2 mile
Hopewell	82.05	Hwy 246 O/H	Marshy Hope	5		PC			
Hopewell	82.20	Murphy Brook	Marshy Hope	1	66	TPG	Open	1915	< 1/2 mile
Hopewell	82.50	Murphy Big Brook	Marshy Hope	2	162	TPG	Open	1917	< 1/2 mile
Hopewell	83.49	Stream	Marshy Hope	1	28	RCS	Ballast	1987	Road
Hopewell	84.40	West River	Marshy Hope	31	899	TT	Open	1910	< 1/2 mile
Hopewell	88.50	South River	Afton	2	170	TPG	Open	1917	> 1/2 mile
Hopewell	95.00	Pomquet River West	Afton	1	108	Pony Truss	Open	1903	< 1/2 mile
Hopewell	95.20	Pomquet River East	Afton	1	88	TPG	Open	1907	< 1/2 mile
Hopewell	99.20	Stream Old Hwy	Afton	2	47	RCS	Ballast	1918	< 1/2 mile
Hopewell	105.60	Hwy 104 O/H	Afton	3		Beam			
Hopewell	105.70	Monastery River	Afton	1	62	TPG	Open	1929	< 1/2 mile
Hopewell	106.40	Black River	Afton	1	109	TPG	Open	1917	Road
Hopewell	111.60	Hwy 4 Trunk Rd O/H	Havre Boucher	3		Beam			
Hopewell	111.90	Highway	Havre Boucher	1	57	TPG	Open	1954	Road
Oxford	74.70	Hornes Brook Viaduct			404	DPG	Open	1887	Road
Oxford	74.80	Old Hwy Subway			60	TPG	Open		Road
Oxford	74.90	New Hwy Subway			180	TPG	Ballast	2000	Road
New Page	0.30	Stream	Tupper	1	10	PT	Open	?	< 1/2 mile
New Page	0.50	Port Malcolm Rd O/H	Tupper	3		PC			
Scott Spur	1.50	Hwy 106 O/H	Scott Spur	3		Beam			
Sydney Spur	1.00	Stream	Jefferson	1		Beam	Open	?	Road
Sydney Spur	0.50	Victoria Road O/H	Jefferson	3		Beam			

Appendix A – Bridge List (cont'd)

Sub	Mileage	Bridge Name	Location	# Spans	Length (ft)	Structure Type	Deck Type	Year Built	Access
Sydney	0.50	Havre Boucher River	Havre Boucher	1	87	TPG	Open	1954	Road
Sydney	6.60	TCH Subway	Port Hastings	1	108	TPG	Ballast	1954	Road
Sydney	8.70	Swing w/ hwy	Port Hastings	1	305	TT Swing	Open	1954	Road
Sydney	9.60	Plaster Cove	Port Hastings	1	102	TPG	Open	1954	< 1/2 mile
Sydney	11.70	Grants Cove	Port Hawkesbury	1	87	TPG	Open	1954	< 1/2 mile
Sydney	13.05	Port Malcolm Rd O/H	Tupper	3		PC			
Sydney	13.10	Hawkesbury Harbour	Tupper	1	40	DPG	Open	1954	Road
Sydney	15.10	Added to list in 2014	Tupper	2	34	RCS	Ballast		< 1/2 mile
Sydney	15.80	Hwy 104 O/H	Tupper	3		Beam			
Sydney	21.90	River Inhabitants	Tupper	2	162	TPG	Open	1915	< 1/2 mile
Sydney	22.40	Stream	Tupper	1	26	RCS	Ballast	1917'	< 1/2 mile
Sydney	26.50	Stream	River Denys	2	24	RCS	Ballast	1955	< 1/2 mile
Sydney	30.20	Stream	River Denys	2	24	RCS	Ballast	1917	Road
Sydney	31.30	Stream	River Denys	2	24	RCS	Ballast	1917	Road
Sydney	35.20	River Denys	River Denys	2	188	TPG	Open	1915	< 1/2 mile
Sydney	39.30	Stream	Orangedale	1	18	RCS	Ballast	1915	< 1/2 mile
Sydney	39.80	Stream	Orangedale	2	36	RCS	Ballast	1917	Road
Sydney	41.40	Orangedale Cove	Orangedale	2	38	RCS	Ballast	1918	Road
Sydney	43.70	Gillis Cove Subway	Orangedale	1	19	Bm	Ballast	?	Road
Sydney	46.90	Little Narrows	Orangedale	3	54	RCS	Ballast	1917	< 1/2 mile
Sydney	49.40	Ottawa Brook	Orangedale	11	515	DPG	Open	1915	Road
Sydney	50.70	Walker Gulch	Grand Narrows	10	439	DPG	Open	1915	< 1/2 mile
Sydney	51.80	Stream	Grand Narrows	2	28	RCS	Ballast	?	< 1/2 mile
Sydney	53.70	Pedestrian Subway	Grand Narrows	1	21	RCS	Ballast	1992	Road
Sydney	55.20	Tidal Inlet	Grand Narrows	1	21	RCS	Ballast	1918	< 1/2 mile
Sydney	57.80	Grand Narrows	Grand Narrows	7	1715	TT	Open	1915	< 1/2 mile
Sydney	58.35	Hwy O/H	Grand Narrows	3		Beam			
Sydney	59.30	Coopers Pond	Grand Narrows	1	21	RCS	Ballast	1918	Road
Sydney	60.70	Stream	Grand Narrows	1	21	RCS	Ballast	1919	< 1/2 mile
Sydney	67.40	Stream	Cross Point	2	26	RCS	Ballast	1917	< 1/2 mile
Sydney	72.10	Cross Point	Cross Point	2	34	RCS	Ballast	1915	Road
Sydney	73.30	Stream	Cross Point	1	21	RCS	Ballast	1918	Road
Sydney	75.40	Boisdale	Cross Point	1	21	RCS	Ballast	1918	< 1/2 mile
Sydney	76.00	Stream	Cross Point	1	21	RCS	Ballast	1918	< 1/2 mile
Sydney	76.20	Stream	Cross Point	1	21	RCS	Ballast	1918	< 1/2 mile
Sydney	80.50	Barachois Lake	Cross Point	1	45	TPG	Open	1917	< 1/2 mile
Sydney	87.40	Public Road Subway	Gannon	1	24	DPG	Open	1910	Road
Sydney	87.50	George River	Gannon	4	352	TPG	Open	1910	< 1/2 mile
Sydney	88.40	Tidal Inlet	Gannon	1	15	RCS	Ballast	?	< 1/2 mile
Sydney	88.60	Tidal Inlet	Gannon	1	16	RCS	Ballast	?	< 1/2 mile
Sydney	91.60	Glebe Cove	Gannon	1	36	TPG	Open	1910	Road
Sydney	91.90	Hwy 105 O/H	Gannon	3		Beam			
Sydney	94.70	Tidal Inlet	Gannon	1	52	PSCT	Ballast	1983	Road
Sydney	98.00	King St. O/H	North Sydney	11		Beam			
Sydney	99.50	Regent St.	North Sydney	1	51	TPG	Open	1915	Road
Sydney	99.90	Fairmont St - Closed	North Sydney	3	69	OHVIA		1915	Road
Sydney	103.10	Seaview Drive O/H	Leitches Creek	1		RCS			
Sydney	103.30	Leitches Creek	Leitches Creek	1	106	TPG	Open	1915	< 1/2 mile
Sydney	104.40	Balls Creek	Leitches Creek	1	105	TPG	Open	1915	< 1/2 mile
Sydney	104.70	Campbells Creek	Leitches Creek	1	67	TPG	Open	1915	< 1/2 mile
Sydney	108.30	Sydport Access Rd.	Jefferson	3		Beam			
Sydney	110.70	Sydney River	Jefferson	1	106	TPG	Open	1915	< 1/2 mile
Sydney	110.95	Subway	Jefferson	1	45	TPG	Ballast	1957	Road
Sydney	111.65	Stream	Jefferson	1	11	PT	Open	?	Road
Sydney	113.20	Wentworth Park	Jefferson	2	34	RCS	Ballast	1917	< 1/2 mile

Appendix B Local Contractor Contact List

Bridge Repairs

Contractor	Telephone Number	Comments
Bob Homans Dineen Construction 89 Joseph Zatzman Drive Dartmouth NS, B3B 1N3	Tel: (902) 481-6602	Dineen Construction was the general contractor for the CBNS Hornes Brook Bridge project carried out several years ago. They were teamed with Cherubini Metal Works Ltd who carried out the steel fabrication work. They were on budget and very nearly on-time on this $800,000 project.
Bill Nauss Ampryor Consulting Inc. PO Box 365, 44 Valley Rd. Chester, Nova Scotia B0J 1J0 bnauss@ampryor.com	Cell: 902-233-4657	Bill Nauss used to work for Marid Industries and since left to form his own company. Bill has carried out many steel repair project for CBNS, most recently the replacement of 2 floorbeams and all stringer at Sydney 110.7 and bracing at Sydney 87.5.
Harry Neynens Marid Industries 267 Cobequid Road Lower Sackville, N.S. B4C 4E6	Tel: (902) 865-0326 Fax: (902) 865-1107	Marid Industries has carried out many recent projects for CBNS. They have generally performed well on past projects and are a good contractor for steel repairs.
Bruce Perry J. Mason Contracting Ltd. Bruce Perry brucevperry@gmail.com	Tel: (902) 861-2380 Fax: (902) 861-2306	J. Mason Contracting has worked on several concrete restoration related bridge projects recently for CBNS including pier cap repairs on the West River Bridge in Antigonish and some bridge seat work at the Hwy Subway at Hopewell 111. J. Mason's work appears reasonably good although they have not cleaned up very well after their work in Antigonish.
Bill Hopkins Cherubini Metal Works Ltd. 50 Joseph Zatzman Drive Dartmouth NS, B3B 1N8	Tel: (902) 468-5630 Fax: (902) 468-5742	Cherubini Metal Works fabricated and installed the steel A-frame towers for the Hornes Brook Viaduct strengthening project several years ago. This project was geometrically difficult and they did an excellent job. Cherubini is a good steel contractor for larger steel projects.
Le Groupe Sema **Rock Morel** 1899 Rue Desrosiers Mont-Joli Quebec, G5H 2J7	Tel: 418-775-7141 Cell: 418-775-7184	Le Groupe Sema has carried out many projects for OVRR, MKNR and SORR. Apparently, they have performed well in the past and have good resources for carrying out bridge repair projects including a bridge inspection vehicle.

Underwater Inspection Services

Contractor	Telephone Number	Comments
Greg Prichard Watech Services Inc 895 Valetta Street London, Ontario N6H 2Z4	519-289-5678 (office) 519-671-6541 (cell) 519-289-5901 (fax)	Greg has carried out underwater inspections for the SOR and OVR recently. He can carry out inspections and also cost estimate and carry out underwater repairs if required. The quality of reports is much better with Watech than with many other underwater inspection firms.

Movable Bridges - Mechanical/Electrical Inspection Services

Contractor	Telephone Number	Comments
Paul Bandlow, PE Principal Stafford Bandlow Engineering Inc. 573 Main Street, Suite 209 Doylestown, PA, 18901 www.movablebridgeengineers.com	Tel: 215 340 5830 Fax: 215 340 5815	For mechanical / electrical inspection of movable bridges we recommend Stafford Bandlow Engineering, Inc. of Doylestown, Pennsylvania. Parsons has experience with SBE in respect of the Burlington Canal Lift Bridge in Burlington, Ontario for PWGSC, and for the Pretoria Bridge in Ottawa, Ontario for the City of Ottawa.

Notes: 1. Selection of a contractor is up to the Railway.
2. Responsibility for construction belongs with the contractor.

Appendix C Repairs Carried Out Since 2013 Inspection

Subdivision	Mileage	Work Completed Since Last Inspection
Hopewell	12.90	Deck replaced
Hopewell	51.90	Deck replaced
Hopewell	67.70	Timber tie spacers installed
Hopewell	78.60	Timber tie spacers installed
Hopewell	88.50	Timber tie spacers installed
Hopewell	95.00	Timber tie spacers installed
Hopewell	106.40	Timber tie spacers installed
Hopewell		Brush cleared on 20% of bridges
Hopewell		Snooper inspections
Sydney	99.50	Timber tie spacers installed
Sydney		Snooper inspections

Appendix D Detailed Recommendations

Sub	Mileage	Priority	Recommendations	Cost
Hopewell	3.20	C3	Point stone abutments (est. 40 LF) and pin vertical crack in abutment 1	$40,000
Hopewell	3.20	C3	Install steel anchor plates on soffit to connect spreading slabs	$18,000
Hopewell	3.20	C3	Install timber ballast retainers on both headwalls	$8,000
Hopewell	4.30	B	Remove debris from pier nosing	
Hopewell	5.40	C3	Install CSP arch insert - already designed with contractor	$150,000
Hopewell	12.90	B	Clean bearing seats	
Hopewell	12.90	B	Clean bottom flanges and gussets	
Hopewell	12.90	B	Lift approaches	
Hopewell	16.20	B	Clean bearing seats	
Hopewell	16.20	B	Repair handrail	
Hopewell	16.20	C3	Replace right timber bearing block on west abutment	$3,000
Hopewell	35.10	B	Clean bearings seats	
Hopewell	42.20	B	Lift both approaches for both tracks	
Hopewell	42.20	B	Clean abutment bearing seats	
Hopewell	42.20	B	Install missing refuge bay handrails or remove 1 refuge bay from bridge	
Hopewell	42.20	C3	Underwater inspection	$15,000
Hopewell	42.20	C1	Replace outside stringers for all 4 spans	$600,000
Hopewell	42.20	C3	Replace mainline track deck	$320,000
Hopewell	42.90	B	Lift approaches	
Hopewell	42.90	B	Clean bearing seats	
Hopewell	42.90	B	Clean bottom flanges	
Hopewell	43.00	B	Replace broken deck cladding planks	
Hopewell	43.00	B	Clean bearing seats	
Hopewell	43.00	B	Clean bottom flanges	
Hopewell	43.00	B	Lift approaches	
Hopewell	43.00	C1	Reset span to remove horizontal kink and replace all anchor bolts	$20,000
Hopewell	50.60	B	Clean bearing seats	
Hopewell	50.60	B	Clean bottom flanges and gussets	
Hopewell	51.90	B	Lift approaches	
Hopewell	51.90	B	Clean bearing seats	
Hopewell	51.90	C1	Encase base of abutment 1 in reinforced concrete to repair concrete erosion	$50,000
Hopewell	51.90	C1	Rehabilitation to improve compatibility of trusses and floor system	$250,000

Appendix D Detailed Recommendations (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Hopewell	54.50	C1	Repair large spall in slab soffit - $50,000	$60,000
Hopewell	56.10	B	Clean bearing seats	
Hopewell	56.10	B	Lift east approach	
Hopewell	56.10	C1	Replace both roller bearings on west abutment	$80,000
Hopewell	64.40	B	Clean bearing seats	
Hopewell	64.40	C3	Replace all 4 girders	$100,000
Hopewell	65.90	B	Clean bearing seats	
Hopewell	65.90	B	Clean bottom flanges and gussets	
Hopewell	65.90	C1	Complete installation of walkway and handrail (unfinished)	$20,000
Hopewell	65.90	C3	Chip back loose material and repair abutment 1 bearing seat	$50,000
Hopewell	65.90	C1	Strengthen all 5 spans as per Delcan study - DPG flanges and webs - all 5 spans	$400,000
Hopewell	66.10	B	Clean bearing seats	
Hopewell	66.10	C1	Replace deck	$68,000
Hopewell	66.10	C1	Replace all 14 stringers and all top floorbeam flanges, repair floorbeam webs	$395,000
Hopewell	67.70	B	Clean bearing seats	
Hopewell	70.70	B	Clear drift from pier nose	
Hopewell	70.70	C1	Repair/encase concrete spalls on pier nosing, headwalls and soffits	$100,000
Hopewell	76.20	B	Clean bearing seats	
Hopewell	76.20	C3	Clean and reset or replace both roller bearings on abutment 2	$80,000
Hopewell	77.70	B	Clean bearing seats	
Hopewell	78.40	C1	Replace timber bearing blocks	$10,000
Hopewell	78.60	B	Clean bearing seats	
Hopewell	81.10	B	Clean bearing seats	
Hopewell	81.10	B	Lift approaches	
Hopewell	81.10	B	Install riprap slope protection at right embankment of east approach	
Hopewell	81.10	C3	Replace stringer diaphragms at both abutments	$20,000
Hopewell	81.10	C3	Repair stringer bearing pedestals at west abut - shim and level all stringer bearings	$30,000
Hopewell	81.10	C1	Replace FB0 and FB1 bottom flanges	$30,000

Appendix D Detailed Recommendations (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Hopewell	82.20	B	Clean bearing seats	
Hopewell	82.20	C1	Replace all 12 stringers - to be confirmed by analysis	$180,000
Hopewell	82.50	B	Clean bearing seats	
Hopewell	82.50	B	Clean bottom flanges and gussets	
Hopewell	84.40	B	Clean bearing seats	
Hopewell	84.40	B	Clean bottom flanges and gussets	
Hopewell	84.40	B	Lift approaches	
Hopewell	84.40	C1	Repair pier caps / bearing seats for piers 1, 12 and 16 including seat for TPG span	$120,000
Hopewell	84.40	C3	Repair pier caps / bearing seats for piers 2, 5, 14, 24, 27, 28 and 30	$250,000
Hopewell	84.40	C3	Replace deck on thru truss span	$173,000
Hopewell	88.50	B	Clean bearing seats	
Hopewell	88.50	B	Clean bottom flanges and gussets	
Hopewell	88.50	C1	Encase base of abutment 1 in reinforced concrete to repair concrete erosion	$50,000
Hopewell	88.50	C3	Underwater inspection of pier	$5,000
Hopewell	88.50	C2	Replace deck	$71,000
Hopewell	88.50	C3	Repoint pier in the tidal range	$50,000
Hopewell	95.00	B	Clean bearing seats	
Hopewell	95.00	B	Lift east approach	
Hopewell	95.00	C3	Rebuild both concrete backwalls - chip out loose materal and cast to original dimensions	$50,000
Hopewell	95.20	B	Clean bottom flanges and gussets	
Hopewell	95.20	B	Clean bearing seats	
Hopewell	95.20	C1	Replace both inside stringers in all 7 bays and strengthen main girder webs	$320,000
Hopewell	99.20	B	Remove drift log from right side of bridge	
Hopewell	105.70	B	Clean bearing seats	
Hopewell	105.70	B	Install 6 missing walkway planks	
Hopewell	106.40	B	Clean bearing seats	
Hopewell	106.40	B	Clean bottom flanges and gussets	
Hopewell	106.40	B	Lift east approach	
Hopewell	106.40	C1	Rebuild both concrete backwalls - chip out loose materal and cast to original dimensions	$50,000
Hopewell	106.40	C3	Encase both west abutment wingwalls and the east abutment left wingwall	$90,000
Hopewell	106.40	C1	Replace 9 bottom flange angles and webs - to be confirmed by analysis	$180,000
Hopewell	111.90	B	Clean bearing seats	
Hopewell	111.90	C1	Repair east abutment bearing seats - chip out loose material and recast to original	$50,000

Appendix D Detailed Recommendations (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
New Page	0.30	C3	Replace hollow timber bearing blocks (or replace small bridge with culvert)	$8,000
Oxford	74.70	B	Remove soil from tower legs at pedestals	
Oxford	74.70	C1	Replace deck	$350,000
Oxford	74.80	B	Lift approaches	
Oxford	74.80	B	Clean bearing seats	
Oxford	74.80	B	Spikes loose - double spike deck	
Oxford	74.80	C3	Repair abutment 1 bearing seats - chip out loose material and recast to original	$50,000
Oxford	74.80	C3	Replace deck	$50,000
Sydney	0.50	B	Lift approaches	
Sydney	0.50	C1	Replace 10 stringers and strengthen main girder webs	$260,000
Sydney	6.60	B	Clean bearing seats	
Sydney	8.70	B	Clean mud from bearings at both abutments	
Sydney	8.70	C3	Relace bridge tenderer's office floorbeam	$10,000
Sydney	9.60	B	Replace poor ties on both approaches	
Sydney	11.70	B	Lift both approaches	
Sydney	11.70	B	Spikes loose - double spike deck	
Sydney	11.70	C1	Protect second approach embankment with rip rap and add ballast	$15,000
Sydney	11.70	C1	Repair bearing seats for both abutments - chip out loose material and recast to original	$100,000
Sydney	11.70	C1	Chp out and recast abutment backwall including wingwalls	$40,000
Sydney	13.10	B	Clean bearing seats	
Sydney	13.10	B	Replace broken left handrail post	
Sydney	21.90	B	Clean bearing seats	
Sydney	21.90	C3	Chip out seats, recast and encase pier 1	$100,000
Sydney	21.90	C1	Analyze capacity for reductions in stringers and floorbeams	
Sydney	21.90	C1	Replace all 20 TPG span 2 stringers - confirm with analysis	$300,000
Sydney	21.90	C1	Replace all 11 TPG span 2 floorbeams - confirm with analysis	$330,000
Sydney	21.90	C3	Replace 8 knee brace webs and repair bearing stiffeners	$50,000
Sydney	30.20	B	Excavate streambed down to 3' clearance below bridge	
Sydney	31.30	C3	Reinstall encasement concrete at base of pier	$50,000

Appendix D Detailed Recommendations (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Sydney	35.20	B	Clean bearing seats	
Sydney	35.20	C1	Analyze capacity for reductions in stringers and floorbeams	
Sydney	35.20	C1	Replace all 14 span 1 stringers - confirm with analysis	$210,000
Sydney	35.20	C1	Replace all 8 span 1 floorbeams - confirm with analysis	$240,000
Sydney	35.20	C1	Replace 10 of 11 span 2 top floorbeam flanges - confirm with analysis	$150,000
Sydney	35.20	C1	Replace all 20 span 2 stringers - confirm with analysis	$300,000
Sydney	39.30	C3	Install CSP arch insert and encase wingwalls (similar to Sydney 55.2)	$350,000
Sydney	39.80	C3	Chip back loose concrete and reface pier and span 2 soffit	$80,000
Sydney	43.70	B	Clean bearing seats	
Sydney	43.70	C3	Replace 16 severely reduced anchor bolts	$10,000
Sydney	43.70	C3	Weld repair exterior bearing stiffeners	$5,000
Sydney	43.70	C1	Analyze capacity for reduced girder flanges	
Sydney	46.90	B	Add ballast to east approach embankment	
Sydney	49.40	B	Clear soil from bent 9 legs and pedestals	
Sydney	49.40	B	Clean abutment bearing seats	
Sydney	49.40	B	Clean bottom flanges, top shelf angles and gussets	
Sydney	49.40	B	Replace refuge bay decks and handrails or remove both from bridge	
Sydney	49.40	C2	Replace deck	$500,000
Sydney	49.40	C3	Weld repair all abutment interior bearing stiffeners	$10,000
Sydney	49.40	C3	Replace perforated steel tower bracing	$150,000
Sydney	49.40	C3	Encase tower 2 - bent 5 - left pedestal in concrete	$20,000
Sydney	49.40	C1	Analyze capacity for reduced girder flanges	
Sydney	49.40	C3	Replace flange angles for 9 top flanges on 60' spans - confirm with analysis	$450,000
Sydney	49.40	C3	Replace interior shelf angles on all 60' spans - confirm with analysis	$250,000
Sydney	49.40	C3	Splice repair bottom flanges of 60 foot spans near bearings (example: 50.70 span 1)	$240,000
Sydney	50.70	B	Clear soil from bent 4 right pedestal	
Sydney	50.70	B	Clean abutment bearing seats	
Sydney	50.70	B	Clean bottom flanges, top shelf angles and gussets	
Sydney	50.70	B	Replace refuge bay decks and handrails or remove both from bridge	
Sydney	50.70	C2	Replace deck	$450,000
Sydney	50.70	C3	Replace top lateral braces on bents 4 and 5	$20,000
Sydney	50.70	C3	Splice repair bottom flanges of spans 1, 3 and 9 and holed bracing	$90,000
Sydney	50.70	C3	Replace holed lower laterals, connection plates and cross frames	$100,000
Sydney	50.70	C3	Repair perforated left tower leg channels in bays 6 and 9	$50,000
Sydney	50.70	C1	Analyze capacity for reduced girder flanges	
Sydney	50.70	C3	Replace interior shelf angles on all 60' spans - confirm with analysis	$210,000

Appendix D Detailed Recommendations (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Sydney	51.80	C3	Chip away loose material and recast headwalls/curbs	$30,000
Sydney	57.80	C1	Chip away loose material and reface west abutment seat and backwall	$70,000
Sydney	57.80	C3	Chip away loose material and reface pier 1 seat (west swing span rest pier)	$50,000
Sydney	57.80	C3	Mechanical and Electrical Inspection	$35,000
Sydney	57.80	C2	Spot and replace 100 ties on spans 1 to 6 to break up bad clusters	$120,000
Sydney	57.80	C1	Analyze capacity for reduced stringer flanges	
Sydney	57.80	C1	Replace bottom stringer flanges for 15 stringers in span 4 - confirm with analysis	$225,000
Sydney	57.80	C3	Replace bottom stringer flanges for 25 stringers in spans 3 and 6 - confirm with analysis	$375,000
Sydney	57.80	C1	Replace perforated steel wedge gear support at west end of swing span	$10,000
Sydney	57.80	C3	Underwater inspection	$25,000
Sydney	59.30	C3	Point masonry joints and pin vertical crack in east abutment (est. 120 LF)	$40,000
Sydney	60.70	C3	Point masonry joints and pin vertical crack in west abutment (est. 120 LF)	$40,000
Sydney	60.70	C3	Chip away loose material and recast right headwall/curb	$15,000
Sydney	67.40	C1	Protect abutment 1 right wingwall and embankment with riprap	$5,000
Sydney	72.10	B	Remove drift debris from pier and span 1	
Sydney	72.10	B	Install riprap at east abutment right wingwall to protect embankment	
Sydney	72.10	C1	Chip back loose concrete & reface headwall, soffit and pier to original lines	$100,000
Sydney	72.10	C3	Replace ballast deck ties	$20,000
Sydney	73.30	C1	Dump rip rap to repair erosion on left side of second approach	$5,000
Sydney	73.30	C3	Point masonry joints and pin vertical crack in west abutment (est. 120 LF)	$40,000
Sydney	76.00	C3	Point masonry joints and pin vertical crack in west abutment (est. 60 LF)	$30,000
Sydney	80.50	B	Clean bearing seats	
Sydney	80.50	B	Clean bottom flanges and gussets	
Sydney	80.50	B	Replace backwall ties and approach ties below guard rail	
Sydney	80.50	C3	Repair abutment 1 bearing seat on left	$25,000
Sydney	80.50	C3	Replace FB0 web, FB4 web and floorbeam 3 bottom flange	$50,000
Sydney	80.50	C3	Splice repair bottom flanges near bearings (example: Sydney 50.70 span 1)	$40,000
Sydney	87.40	B	Clean bearing seats	
Sydney	87.40	C3	Replace all 4 girders - confirm with analysis	$100,000
Sydney	87.40	C1	Analyze for girder flange reduction	

Appendix D Detailed Recommendations (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Sydney	87.50	B	Clean bearing seats	
Sydney	87.50	C3	Reset right roller bearing of span 1 on pier 2	$10,000
Sydney	87.50	C3	Rebuild west abutment concrete backwall and seat - chip out loose materal and recast	$15,000
Sydney	87.50	C1	Analyze for reduced top and bottom floorbeam flanges	
Sydney	87.50	C3	Replace reduced top and bottom FB flanges and webs - to be confirmed with analysis	$600,000
Sydney	87.50	C3	Encase all 3 piers and east abutment	$400,000
Sydney	88.40	C3	Concrete encase stone abutments and wingwalls	$80,000
Sydney	91.60	B	Install timber ballast retainers at all 4 corners of bridge	$4,000
Sydney	91.60	C3	Encase masonry abutments in tidal range	$100,000
Sydney	99.50	B	Clean bearing seats	
Sydney	99.50	B	Replace poor approach ties under guard rails on both approaches	
Sydney	99.50	C1	Analyze for floorbeam flange reduction	
Sydney	99.50	C3	Replace 4 FB top flanges and 5 FB bottom flanges - to be confirmed by analysis	$100,000
Sydney	99.90	C3	Demolish Fairmount St. Overhead Bridge	$25,000
Sydney	103.30	B	Lift approaches	
Sydney	103.30	B	Clean bearing seats	
Sydney	103.30	C3	Replace deck	$98,000
Sydney	103.30	C1	Analyze for reduced stringer and floorbeam flanges	
Sydney	103.30	C3	Replace floorbeams 1 to 9 - to be confirmed with analysis	$270,000
Sydney	103.30	C1	Replace stringers - to be confirmed with analysis	$300,000
Sydney	104.40	C1	Weld repair bearing stiffeners	$20,000
Sydney	104.40	C1	Replace deck	$98,000
Sydney	104.40	C3	Point both abutments in the tidal range (300 LF)	$100,000
Sydney	104.40	C1	Analyze for reduced floorbeam flanges	
Sydney	104.40	C3	Replace 6 top floorbeam flanges and all floorbeam webs - to be confirmed by analysis	$300,000
Sydney	104.40	C1	Replace all main girder bottom flange rivets with bolts (rivet heads gone)	$100,000
Sydney	104.70	B	Clean bottom flanges and gussets	
Sydney	104.70	C3	Replace deck	$60,000
Sydney	104.70	C1	Analyze for reduced stringers	
Sydney	104.70	C3	Replace stringers - to be confirmed by analysis	$180,000
Sydney	104.70	C3	Replace 6 perforated lower lateral braces and 4 connection plates	$50,000

Appendix D Detailed Recommendations (cont'd)

Sub	Mileage	Priority	Recommendations	Cost
Sydney	110.70	B	Clean bottom flanges and gussets	
Sydney	110.70	C1	Analyze for reduced floorbeam flanges	
Sydney	110.70	C3	Replace floorbeams 1 to 9 - to be confirmed by analysis	$270,000
Sydney	110.70	C1	Test remaining pile cap concrete at toes of abutments for integrity/quality	$10,000
Sydney	110.70	C1	Underwater inspection of sheet pile walls for integrity below water	$15,000
Sydney	110.70	C3	Repair open joints and erosion of concrete at both abutments	$250,000
Sydney	110.95	B	Build up embankments at ends of sidewalk	
Sydney	111.65	C3	Replace sidewalk planks	$5,000
Sydney Spur	1.00	B	Remove debris from watercourse	
Sydney Spur	1.00	C1	Install missing tie spacers	$10,000
Sydney Spur	1.00	C3	Install missing handrails	$3,000
Sydney Spur	1.00	C3	Replace rotten timber backwalls	$20,000

Appendix E Section Loss Measurement Methodology

Flange section loss measurements were taken for main DPG girders, floorbeams and stringers during the 2014 bridge inspections. A snooper bridge inspection vehicle was provided for 4 days. We visited all remaining bridges requiring a snooper inspection at the CBNS. Bridges were selected for snooper inspection to reach members that were previously inaccessible without a snooper. The following bridges were inspected with the snooper this year:

11. Sydney 110.70
12. Sydney 104.70
13. Sydney 104.40
14. Sydney 103.30
15. Sydney 99.50
16. Sydney 91.60
17. Sydney 87.50
18. Sydney 87.40
19. Sydney 57.80
20. Oxford 74.70

The snooper was also attempted at Sydney 39.30 and Hopewell 54.50 in hopes of getting a better look at the soffits of these reinforced concrete structures. Access ultimately was limited due to the width of these structures.

Section Loss Measurements

Flanges were typically measured at 3 locations on each horizontal leg:

- ½" from the toe,
- middle of the leg, and
- ½" from the root

To calculate section loss an average thickness of remaining section was calculated for both legs in a flange and compared to the original flange thickness. Average thickness for a given leg was calculated as follows: (thickness at toe + thickness at middle + thickness at middle + thickness at root) / 4. Tapered flanges on rolled stringers were handled similarly. Original flange thicknesses were measured from "good" locations in a given member and referenced on drawings for angle size as a check.

Measurement Methodology

For measurement of section loss in a given girder, the worst location was selected in the middle half of the girder. In most cases the section loss was fairly uniform but in some cases, like for the stringers in some TPG bridges with sway braces connected to stringer bottom flanges, there was significant localized ½"grooving of the bottom flange in the middle half of the stringer. For DPG bottom flanges, there was so much debris buildup that the worst location was somewhat obscured. Cleaning of all steel bridge bottom flange is highly recommended to reduce corrosion and improve inspectability.

For stringer loss measurements on a given bridge where condition of stringers was fairly uniform, a worst stringer was selected for measurement for the purpose of rating the bridge capacity. For bridges with more variability in stringer condition, such as Sydney 0.5, all stringers were measured.

For floorbeam bottom flanges, where there was a fair amount of variation in section loss, every floorbeam was measured.

For floorbeam top flanges, access to measure by calipers was restricted by adjacent ties. So measurement of section loss was with a pit gauge from the top surface (the bottom surface of top flange legs was typically unreduced except at the edge). The extent of section loss varies considerably on top flanges with the worst loss outside the rails and usually no section loss between the rails. The location of highest stress in the top flanges is between the inner stringers. For 2 stringer floor systems, the location of the stringers is outside the rails close to where section loss is highest. So for floorbeam top flange section losses – the extent of section loss is estimated from the pitting depth and the uniformity or density of pitting.

For DPG girders, top flanges, shelf angles and bottom flanges were measured for every span for flanges with significant section loss.

A summary of section loss results is shown in Appendix F and the section loss spreadsheets are shown in Appendix G.

Appendix F Summary of Section Loss Measurement Results

Section Loss Measurement Results

The following list shows a summary of the governing section losses for the purposes of bridge load rating on the Sydney bridges. These values are based on the section loss calculation recorded in Appendix G and other measurements recorded in the inspection forms. Flanges with pitting up to 1/8" are considered to have negligible section loss and are not included in below.
For all built up flanges, section loss only refers to the horizontal portion of the flange, not the vertical flange angle legs. For rolled section flanges, section loss refers to the entire flange.

1. Sydney 57.8 – through truss – 2 rows of stringers – 8 bays per span
    - Reduction of stringers affects capacity
    - Span 1 stringers – top flange reduced 14%, bottom flange reduced 17%
    - Span 2 stringers – top flange reduced 14%, bottom flange reduced 17%
    - Span 3 stringers – top flange reduced 14%, bottom flange reduced 45%
    - Span 4 stringers – top flange reduced 21%, bottom flange reduced 55%
    - Span 5 stringers – newer stringers with max 1/8" pitting
    - Span 6 stringers – top flange reduced 14%, bottom flange reduced 20%
    - Span 7 stringers – newer stringers with max 1/8" pitting
    - Span 8 stringers – newer stringers with max 1/8" pitting
2. Sydney 87.4 – 4 steel girders
    - Reduction of flanges affects capacity
    - Girder 1 – top flange 26% reduced, bottom flange 28% reduced
    - Girder 2 – top flange 27% reduced, bottom flange 11% reduced
    - Girder 3 – top flange 21% reduced, bottom flange 10% reduced
    - Girder 4 – top flange 29% reduced, bottom flange 16% reduced
3. Hopewell 87.50 – 4 TPG spans with 4 rows of stringers
    - Reduction of top and bottom floorbeam flanges reduces capacity
    - Many floorbeam flanges holed along bottom flange
    - Bottom flanges worst and measured at exterior stringers (not highest stress location)
    - Span 1 – worst top FB flange reduced 30%,
    - Span 1 – all bottom FB flanges newer and OK
    - Span 2 – worst top FB `flange reduced 30%,
    - Span 2 – worst bottom FB flange reduced 28%
    - Span 3 – worst top FB flange reduced 30%,
    - Span 3 – worst bottom FB flange reduced 20%
    - Span 4 – worst top FB flange reduced 30%,
    - Span 4 – worst bottom FB flange reduced 19%
4. Sydney 99.50 – 1 TPG span with 2 rows of stringers
    - Reduction of top and bottom floorbeam flanges reduces capacity
    - Worst top FB flange reduced 33%
    - Worst bottom FB flange reduced 43%
5. Hopewell 103.30 – 1 TPG span with 2 rows of stringers
    - Reduction of top and bottom floorbeam flanges reduces capacity

- Worst top FB flange reduced 27%
- Worst bottom FB flange reduced 19%
- Reduction of stringer flanges reduces capacity
- Worst top stringer flange reduced 21%
- Worst bottom stringer flange reduced 32%

6. Hopewell 104.40 – 1 TPG span with 2 rows of stringers
    - Reduction of top and bottom floorbeam flanges reduces capacity
    - Worst top FB flange reduced 33%
    - Worst bottom FB flange reduced 22%
7. Hopewell 104.70 – 1 TPG span with 2 rows of stringers
    - Reduction of top and bottom floorbeam flanges reduces capacity
    - Worst top FB flange reduced 18%
    - Worst bottom FB flange reduced 1/8” pitting
    - Reduction of stringer flanges reduces capacity
    - Worst top stringer flange reduced 21%
    - Worst bottom stringer flange only 1/8” pitting
8. Hopewell 104.70 – 1 TPG span with 2 rows of stringers
    - Reduction of top and bottom floorbeam flanges reduces capacity
    - Worst top FB flange reduced 30%
    - Worst bottom FB flange reduced 35%

Appendix G Section Loss Calculations

Bottom Flange Angle Section Loss														
(in sixteenth of an inch)														
					West	West	West	East	East	East	Average	Unreduced	%
Sub	Mile	Span	FB	Below Stringer	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Thickness	Thickness	Reduced
Sydney	87.5	1	0	Left (1)	10	10	10	10	10	10	10	10	0%
		1	1	Left (1)	10	10	10	10	10	10	10	10	0%
		1	2	Left (1)	10	10	10	10	10	10	10	10	0%
		1	3	Left (1)	10	10	10	10	10	10	10	10	0%
		1	4	Left (1)	10	10	10	10	10	10	10	10	0%
		1	5	Left (1)	10	10	10	10	10	10	10	10	0%
		1	6	Left (1)	10	10	10	10	10	10	10	10	0%
		1	7	Left (1)	10	10	10	10	10	10	10	10	0%
		1	8	Left (1)	10	10	10	10	10	10	10	10	0%
		1	0	Right (4)	10	10	10	10	10	10	10	10	0%
		1	1	Right (4)	10	10	10	10	10	10	10	10	0%
		1	2	Right (4)	10	10	10	10	10	10	10	10	0%
		1	3	Right (4)	10	10	10	10	10	10	10	10	0%
		1	4	Right (4)	10	10	10	10	10	10	10	10	0%
		1	5	Right (4)	10	10	10	10	10	10	10	10	0%
		1	6	Right (4)	10	10	10	10	10	10	10	10	0%
		1	7	Right (4)	10	10	10	10	10	10	10	10	0%
		1	8	Right (4)	10	10	10	10	10	10	10	10	0%
		2	0	Left (1)	10	10	10	10	10	10	10	10	0%
		2	1	Left (1)	6	8	9	5	7	10	7.5	10	25%
		2	2	Left (1)	7	7	9	8	9	10	8.25	10	18%
		2	3	Left (1)	7	10	10	7	9	10	9	10	10%
		2	4	Left (1)	4	10	10	5	6	10	7.625	10	24%
		2	5	Left (1)	5	7	8	6	8	9	7.25	10	28%
		2	6	Left (1)	6	9	10	9	9	10	8.875	10	11%
		2	7	Left (1)	5	10	10	10	10	10	9.375	10	6%
		2	8	Left (1)	10	10	10	10	10	10	10	10	0%
		2	0	Right (4)	10	10	10	10	10	10	10	10	0%
		2	1	Right (4)	8	10	10	8	8	10	9	10	10%
		2	2	Right (4)	8	10	10	10	10	10	9.75	10	3%
		2	3	Right (4)	8	9	10	10	10	10	9.5	10	5%
		2	4	Right (4)	9	8	10	10	10	10	9.375	10	6%
		2	5	Right (4)	7	6	10	10	10	10	8.625	10	14%
		2	6	Right (4)	10	10	10	7	9	10	9.375	10	6%
		2	7	Right (4)	7	8	10	10	9	10	8.875	10	11%
		2	8	Right (4)	10	10	10	10	10	10	10	10	0%
		3	0	Left (1)	10	10	10	10	10	10	10	10	0%
		3	1	Left (1)	6	9	10	6	9	10	8.5	10	15%
		3	2	Left (1)	6	9	10	8	9	10	8.75	10	13%
		3	3	Left (1)	6	9	10	9	10	10	9.125	10	9%
		3	4	Left (1)	8	8	9	6	9	10	8.375	10	16%
		3	5	Left (1)	7	8	9	7	8	9	8	10	20%
		3	6	Left (1)	7	9	9	9	10	10	9.125	10	9%
		3	7	Left (1)	10	10	10	8	9	9	9.375	10	6%
		3	8	Left (1)	10	10	10	10	10	10	10	10	0%
		3	0	Right (4)	10	10	10	10	10	10	10	10	0%
		3	1	Right (4)	8	9	10	8	9	9	8.875	10	11%
		3	2	Right (4)	8	9	10	8	9	10	9	10	10%
		3	3	Right (4)	9	9	9	10	10	10	9.5	10	5%
		3	4	Right (4)	10	10	10	9	10	10	9.875	10	1%
		3	5	Right (4)	6	8	10	9	9	10	8.625	10	14%
		3	6	Right (4)	9	9	10	7	9	9	8.875	10	11%
		3	7	Right (4)	7	7	9	10	10	10	8.75	10	13%
		3	8	Right (4)	10	10	10	10	10	10	10	10	0%
		4	0	Left (1)	10	10	10	10	10	10	10	10	0%
		4	1	Left (1)	8	9	10	8	9	10	9	10	10%
		4	2	Left (1)	8	9	10	8	9	10	9	10	10%
		4	3	Left (1)	9	9	10	8	9	9	9	10	10%
		4	4	Left (1)	8	9	9	9	9	10	9	10	10%
		4	5	Left (1)	8	9	10	7	10	10	9.125	10	9%
		4	6	Left (1)	10	10	10	10	10	10	10	10	0%
		4	7	Left (1)	10	10	10	10	10	10	10	10	0%
		4	8	Left (1)	10	10	10	10	10	10	10	10	0%
		4	0	Right (4)	10	10	10	10	10	10	10	10	0%
		4	1	Right (4)	7	8	9	8	8	9	8.125	10	19%
		4	2	Right (4)	9	9	9	8	9	9	8.875	10	11%
		4	3	Right (4)	8	8	9	9	9	9	8.625	10	14%
		4	4	Right (4)	8	8	9	8	9	10	8.625	10	14%
		4	5	Right (4)	9	8	9	8	9	10	8.75	10	13%
		4	6	Right (4)	10	10	10	10	10	10	10	10	0%
		4	7	Right (4)	10	10	10	10	10	10	10	10	0%
		4	8	Right (4)	10	10	10	10	10	10	10	10	0%

Bottom Flange Angle Section Loss													
(in sixteenth of an inch)													
					West	West	West	East	East	East	Average	Unreduced	%
Sub	Mile	Span	FB	Below Stringer	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Thickness	Thickness	Reduced
Sydney	99.5	1	0	Left (1)	Access Blocked by Electrical Utility Wires							10	
		1	1	Left (1)	7	6	10	6	7	9	7.25	10	28%
		1	2	Left (1)	0	6	10	5	7	9	6.25	10	38%
		1	3	Left (1)	6	8	10	5	8	10	7.875	10	21%
		1	4	Left (1)	3	5	10	3	5	10	5.75	10	43%
		1	0	Right (2)	Access Blocked by Electrical Utility Wires							10	
		1	1	Right (2)	8	9	10	5	9	10	8.625	10	14%
		1	2	Right (2)	0	7	10	9	10	10	7.875	10	21%
		1	3	Right (2)	8	9	10	8	8	10	8.75	10	13%
		1	4	Right (2)	4	6	10	4	6	10	6.5	10	35%

Bottom Flange Angle Section Loss													
(in sixteenth of an inch)													
					West	West	West	East	East	East	Average	Unreduced	%
Sub	Mile	Span	FB	Below Stringer	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Thickness	Thickness	Reduced
Sydney	103.3	1	0	Left (1)	New Floorbeam							12	
		1	1	Left (1)	8	12	12	8	9	12	10.25	12	15%
		1	2	Left (1)	12	12	12	12	12	12	12	12	0%
		1	3	Left (1)	12	12	12	12	12	12	12	12	0%
		1	4	Left (1)	12	12	12	9	10	12	11.125	12	7%
		1	5	Left (1)	12	12	12	10	12	12	11.75	12	2%
		1	6	Left (1)	9	11	12	12	12	12	11.375	12	5%
		1	7	Left (1)	8	12	12	12	12	12	11.5	12	4%
		1	8	Left (1)	10	11	12	8	12	12	11	12	8%
		1	9	Left (1)	7	11	12	12	12	12	11.125	12	7%
		1	10	Left (1)	New Floorbeam							12	
		1	0	Right (2)	New Floorbeam							12	
		1	1	Right (2)	7	10	12	7	10	12	9.75	12	19%
		1	2	Right (2)	12	12	12	10	11	12	11.5	12	4%
		1	3	Right (2)	11	12	12	12	12	12	11.875	12	1%
		1	4	Right (2)	12	12	12	12	12	12	12	12	0%
		1	5	Right (2)	7	10	12	12	12	12	10.875	12	9%
		1	6	Right (2)	6	9	12	12	12	12	10.5	12	13%
		1	7	Right (2)	7	12	12	12	12	12	11.375	12	5%
		1	8	Right (2)	8	9	12	12	12	12	10.75	12	10%
		1	9	Right (2)	8	11	12	8	11	12	10.5	12	13%
		1	10	Right (2)	New Floorbeam							12	

Bottom Flange Angle Section Loss													
(in sixteenth of an inch)													
					West	West	West	East	East	East	Average	Unreduced	%
Sub	Mile	Span	FB	Below Stringer	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Thickness	Thickness	Reduced
Sydney	104.4	1	0	Left (1)	11	11	11	11	11	11	11	12	8%
		1	1	Left (1)	New web and bottom flange							12	
		1	2	Left (1)	10	10	10	9	11	12	10.375	12	14%
		1	3	Left (1)	11	11	11	8	11	12	10.75	12	10%
		1	4	Left (1)	OK - 1/8" pitting and flaking							12	
		1	5	Left (1)	0	10	12	10	11	12	9.5	12	21%
		1	6	Left (1)	OK - 1/8" pitting and flaking							12	
		1	7	Left (1)	OK - 1/8" pitting and flaking							12	
		1	8	Left (1)	OK - 1/8" pitting and flaking							12	
		1	9	Left (1)	OK - 1/8" pitting and flaking							12	
		1	10	Left (1)	OK - 1/8" pitting and flaking							12	
		1	0	Right (2)	OK - 1/8" pitting and flaking							12	
		1	1	Right (2)	OK - 1/8" pitting and flaking							12	
		1	2	Right (2)	OK - 1/8" pitting and flaking							12	
		1	3	Right (2)	OK - 1/8" pitting and flaking							12	
		1	4	Right (2)	9	11	12	0	10	12	9.375	12	22%
		1	5	Right (2)	OK - 1/8" pitting and flaking							12	
		1	6	Right (2)	OK - 1/8" pitting and flaking							12	
		1	7	Right (2)	OK - 1/8" pitting and flaking							12	
		1	8	Right (2)	OK - 1/8" pitting and flaking							12	
		1	9	Right (2)	OK - 1/8" pitting and flaking							12	
		1	10	Right (2)	OK - 1/8" pitting and flaking							12	

Bottom Flange Angle Section Loss													
(in sixteenth of an inch)													
					West	West	West	East	East	East	Average	Unreduced	%
Sub	Mile	Span	FB	Below Stringer	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Thickness	Thickness	Reduced
Sydney	110.7	1	1	Left (1)	8	11	12	5	8	11	9.25	12	23%
		1	2	Left (1)	8	9	11	9	9	10	9.25	12	23%
		1	3	Left (1)	6	7	9	9	11	12	9	12	25%
		1	4	Left (1)	8	9	10	10	11	12	10	12	17%
		1	5	Left (1)	7	10	11	9	10	11	9.75	12	19%
		1	6	Left (1)	5	7	12	7	11	12	9	12	25%
		1	7	Left (1)	7	11	12	5	8	11	9.125	12	24%
		1	8	Left (1)	6	11	11	9	11	12	10.25	12	15%
		1	9	Left (1)	3	8	9	3	10	11	7.75	12	35%
		1	1	Right (2)	6	10	12	7	10	10	9.375	12	22%
		1	2	Right (2)	3	10	11	11	11	12	9.875	12	18%
		1	3	Right (2)	7	9	12	7	8	9	8.625	12	28%
		1	4	Right (2)	6	8	10	7	8	10	8.125	12	32%
		1	5	Right (2)	6	9	11	6	9	11	8.75	12	27%
		1	6	Right (2)	6	10	11	6	9	12	9.125	12	24%
		1	7	Right (2)	8	10	11	8	11	11	10	12	17%
		1	8	Right (2)	9	11	11	10	11	11	10.625	12	11%
		1	9	Right (2)	8	11	11	8	11	11	10.25	12	15%

Stringer Flange Section Loss														
(in sixteenth of an inch)														
						Left	Left	Left	Right	Right	Right	Average	Unreduced	%
Sub	Mile	Span	Bay	Stringer	Flange	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Thickness	Thickness	Reduced
Sydney	57.8	1	2	Left (1)	Bottom	10	7	10	12	12	12	10.25	12	15%
		1	4	Left (1)	Bottom	9	10	11	7	11	11	10	12	17%
		3	5	Right (2)	Bottom	6	8	9	6	7	7	7.25	12	40%
		3	5	Left (1)	Bottom	7	10	10	7	10	10	9.25	12	23%
		3	6	Left (1)	Bottom	7	7	8	8	11	11	8.75	12	27%
		3	6	Right (2)	Bottom	8	10	11	8	8	8	8.875	12	26%
		4	2	Right (2)	Bottom	6	7	7	8	6	6	6.625	12	45%
		4	2	Left (1)	Bottom	9	8	8	9	9	9	8.625	12	28%
		4	4	Right (2)	Bottom	9	8	8	5	0	5	5.375	12	55%
		4	5	Right (2)	Bottom	4	5	5	8	6	5	5.5	12	54%
		6	2	Right (2)	Bottom	6	10	8	10	11	11	9.625	12	20%
		6	2	Right (2)	Bottom	7	11	11	10	11	11	10.375	12	14%
		4	5	Right (2)	Top	7	10	11	7	10	11	9.5	12	21%
		1	5	Right (2)	Top	7	11	11	10	11	11	10.375	12	14%

Stringer Flange Section Loss														
(in sixteenth of an inch)														
						Left	Left	Left	Right	Right	Right	Average	Unreduced	%
Sub	Mile	Span	Bay	Stringer	Flange	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Thickness	Thickness	Reduced
Sydney	87.4	1		Girder 1	Bottom	5	8	8	8	10	12	8.625	12	28%
		1		Girder 2	Bottom	12	12	12	9	9	10	10.625	12	11%
		1		Girder 3	Bottom	11	12	12	9	10	10	10.75	12	10%
		1		Girder 4	Bottom	12	12	12	4	5	6	8.5	12	29%
		1		Girder 1	Top	8	10	11	8	8	8	8.875	12	26%
		1		Girder 2	Top	8	8	9	9	9	10	8.75	12	27%
		1		Girder 3	Top	9	10	11	8	9	10	9.5	12	21%
		1		Girder 4	Top	8	8	9	12	12	12	10.125	12	16%

Stringer Flange Section Loss														
(in sixteenth of an inch)														
						Left	Left	Left	Right	Right	Right	Average	Average	%
Sub	Mile	Span	Bay	Stringer	Flange	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Difference	Total	Reduced
Sydney	103.3	1		Original		10	12.5	15	10	12.5	15		12.50	
		1	10	Right (2)	Top	9	11	12	8	10	12	2.1	11.9	15%
		1	10	Left (1)	Top	0	10	14	7	11	14	2.9	11.1	21%
		1	1	Left (1)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	2	Left (1)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	3	Left (1)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	4	Left (1)	Bot	6	10	14	6	10	14	2.5	11.5	18%
		1	5	Left (1)	Bot	6	10	14	6	10	14	2.5	11.5	18%
		1	6	Left (1)	Bot	6	10	14	6	10	14	2.5	11.5	18%
		1	7	Left (1)	Bot	6	10	14	6	10	14	2.5	11.5	18%
		1	8	Left (1)	Bot	6	10	14	6	10	14	2.5	11.5	18%
		1	9	Left (1)	Bot	8	12	16	8	12	16	0.5	13.5	4%
		1	10	Left (1)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	1	Right (2)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	2	Right (2)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	3	Right (2)	Bot	7	11	15	7	11	15	1.5	12.5	11%
		1	4	Right (2)	Bot	6	10	14	6	10	14	2.5	11.5	18%
		1	5	Right (2)	Bot	5	9	13	5	9	13	3.5	10.5	25%
		1	6	Right (2)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	7	Right (2)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	8	Right (2)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	9	Right (2)	Bot	4	8	12	4	8	12	4.5	9.5	32%
		1	10	Right (2)	Bot	4	8	12	4	8	12	4.5	9.5	32%

Stringer Flange Section Loss														
(in sixteenth of an inch)														
						Left	Left	Left	Right	Right	Right	Average	Average	%
Sub	Mile	Span	Bay	Stringer	Flange	1/2" - Toe	Middle	1/2" - Root	1/2" - Toe	Middle	1/2" - Root	Difference	Total	Reduced
Sydney	104.7	1		Original		10	12.5	15	10	12.5	15		12.50	
		1	1	Right (2)	Top	8	9	12	8	9	12	3.0	11.0	21%
		1	5	Right (2)	Top	8	10	12	8	11	12	2.3	11.8	16%
		1	6	Right (2)	Top	9	11	13	9	11	13	1.5	12.5	11%
		1	1	Right (2)	Bot	Only 1/8" pitting in all stringer bottom flanges								

APPENDIX J

Plate H – AAR Manual of Standards and Recommended Practices

PLATE H—EQUIPMENT DIAGRAM FOR LIMITED INTERCHANGE SERVICE

Standard S-2040

Adopted: 1994; Revised: 2007

1.0 SCOPE

This standard provides the maximum clearance requirements for double-stack container cars operating in controlled interchange and other limited interchange cars with extreme lower clearance.

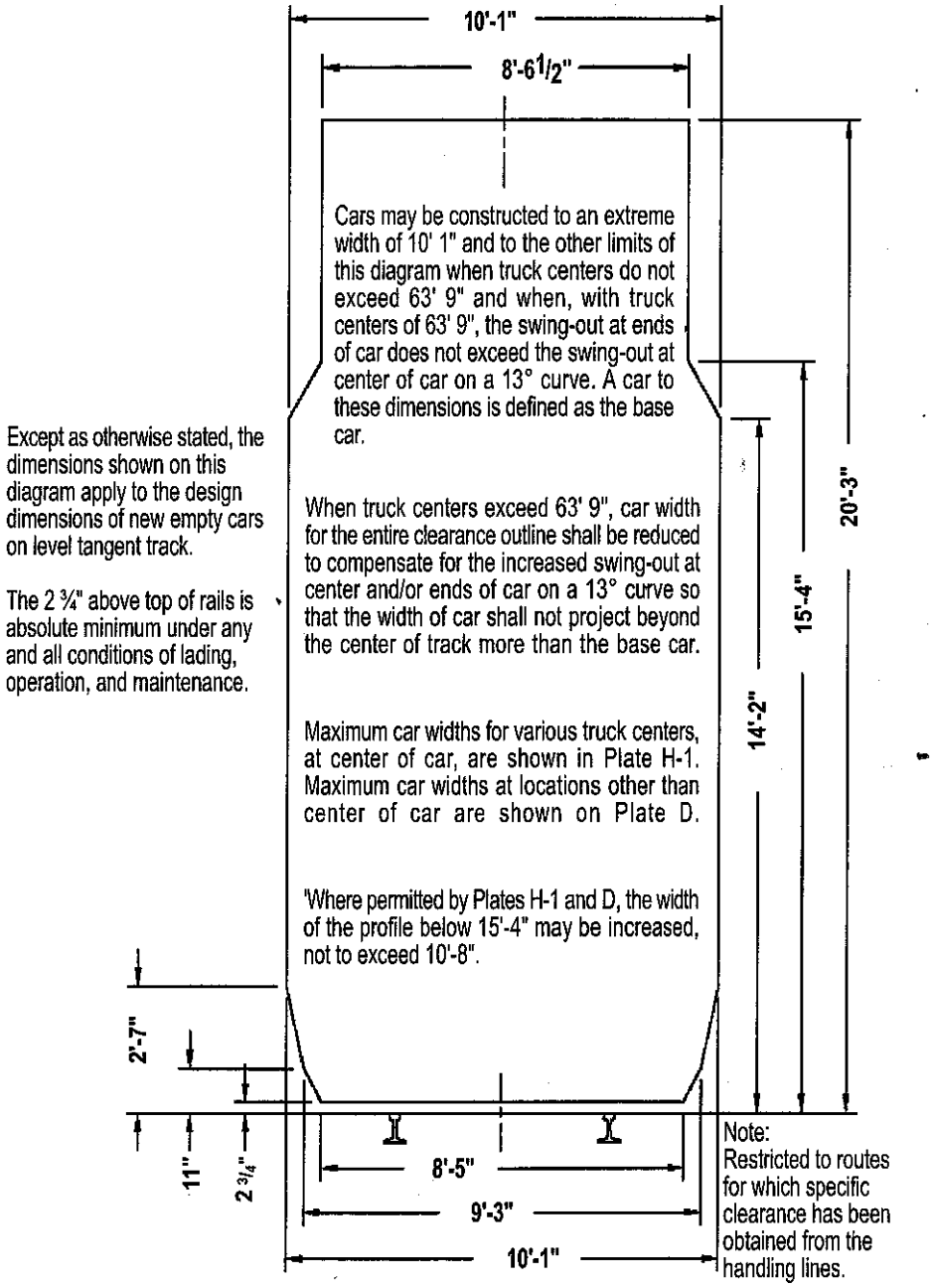
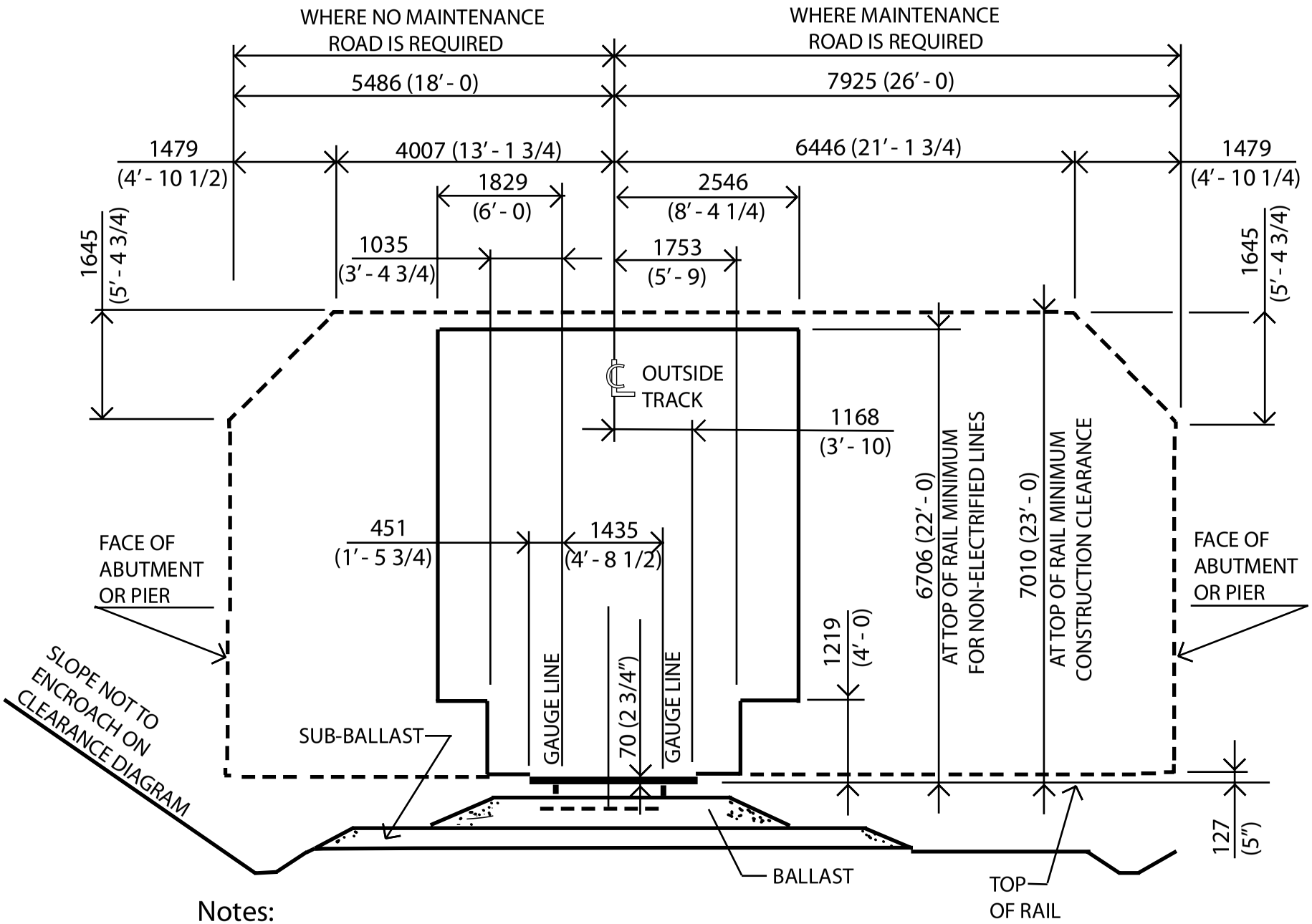


Fig. 1.1 Maximum clearance requirements for double-stack container cars

APPENDIX K

Diagram 1 – Transport Canada Standards Respecting Railway Clearances

Diagram 1: All Structures Over or Beside the Railway Tracks (Scale 1:75)



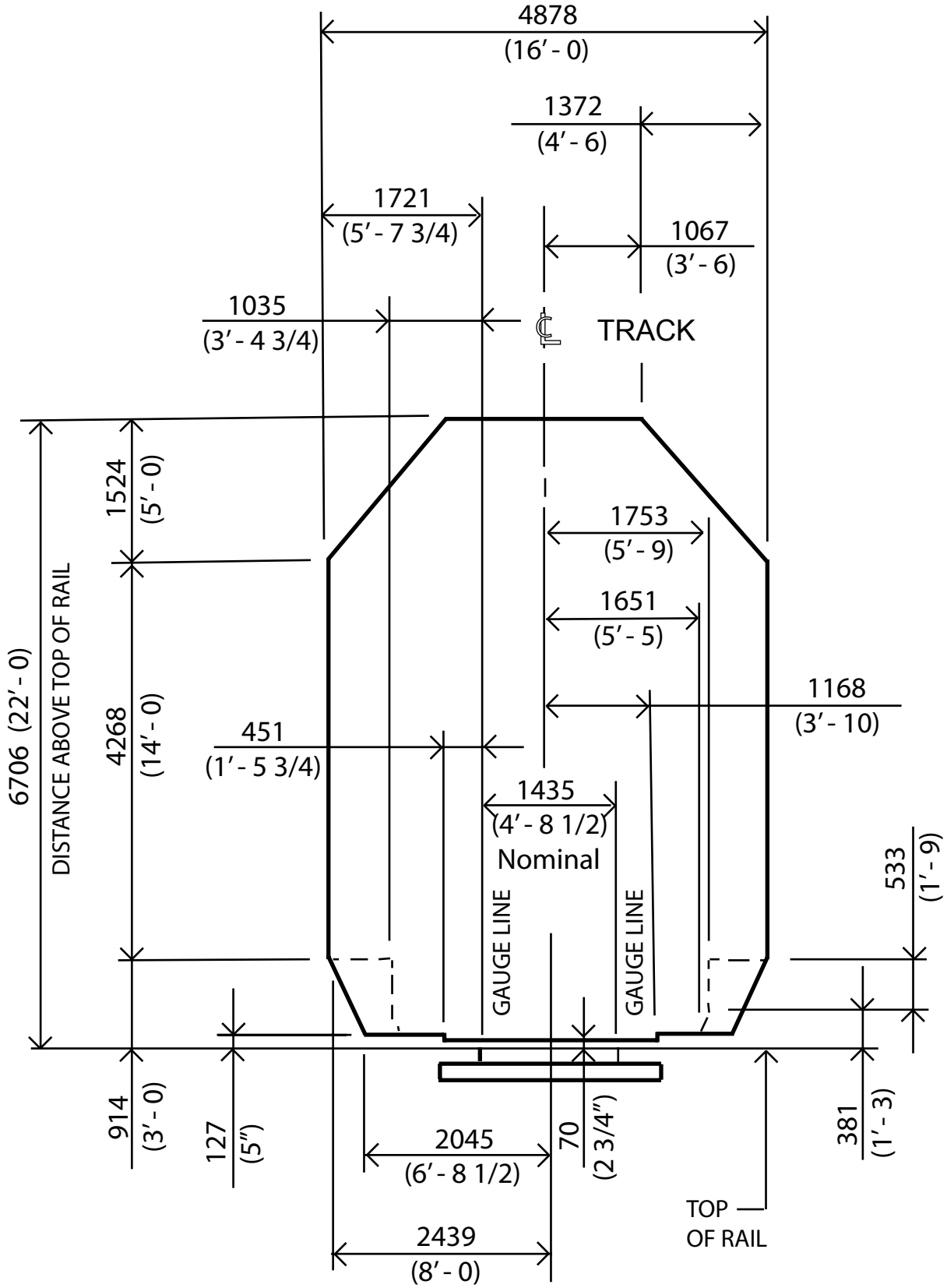
Notes:

- Solid lines indicate minimum standard clearances
- Broken lines indicate required clearances, where approved by the national transportation

APPENDIX L

Diagram 2 – Transport Canada Standards Respecting Railway Clearances

Diagram 2: All Railway Bridges, Snowsheds and Overhead Timber Bridges (Scale 1:75)



Note: Broken lines indicate minimum clearances that may be used when authorized by the chief engineer.

APPENDIX M

CBNS Carload Traffic

CBNS Carload Traffic

Customer	2009	2010	2011	2012	2013	2014*
Breton (now AFA)	30	53	31	36	24	10
Canwel	298	290	298	320	261	1
Copol	49	45	47	48	54	55
East Coast Rope	26	15	22	29	30	28
Imperial Oil	43	25	15	3	5	0
Superior Propane	107	101	130	64	43	80
Quality Concrete	52	89	68	56	35	25
TransAtlantic Preforms	130	132	107	91	67	65
Irving Oil	0	1	11	6	30	30
Hilly Acres	43	38	39	28	36	30
Hamilton Scrap	0	0	0	0	16	7
John Ross	32	34	3	1	0	0
PEV (spot business)	270	130	230	164	0	0
JD Irving Logs (spot business)	0	0	0	0	81	0
NSPI (spot business)	0	0	0	0	160	0
TOTAL:	**1080**	**953**	**1001**	**846**	**842**	**331**

Note: Information provided by Genessee and Wyoming, as of June 26, 2015.

(*) Incomplete information for 2014.

APPENDIX N

PowerPoint Presentation – Conference Call with Nova Scotia Rail Advisory Committee, July 30, 2015

Preliminary Review of Evaluation Cape Breton & Central Nova Scotia Railway (CBNS) – Sydney Subdivision MP 20.0 – 113.8

Overview of CANARAIL's opinion on the review of the operating and maintenance cost document provide by Genesee & Wyoming and the track inspection related to maintain the CBNS in operation

Presented to

Nova Scotia Transportation and Infrastructure Renewal

July 30, 2015

Purpose and Scope

CANARAIL mandate includes the following:

- **Phase 1 – Operating and Maintenance Costs for Current Rail Line**
  - Review the current rail users and volumes.
  - Review material made available by Genesee and Wyoming regarding maintenance and repair requirements.
  - Final report in detailed PDF and summary presentation format, to be delivered to the working group and senior officials.

- **Phase 2 – Review of Geotechnical and Infrastructure Improvements**
  - Review and assessment of the geotechnical report and infrastructure evaluation of the current rail line provided by Genesee and Wyoming.
  - Work plan and costing to bring the line to either Transport Canada Class 3 or Class 4 track standards.
  - Review the infrastructure reports noting limitations to operating double stack container trains.
  - Final report in detailed PDF and summary presentation format, to be delivered to the working group and potentially to senior officials.

Methodology

→ **The information provided by Nova Scotia consisted of the following:**

- Tab 1 – Overview.
- Tab 2 – Map of Cape Breton and Central Nova Scotia Railway (CBNS).
- Tab 3 – Geotechnical Estimates of September, 16, 2014 and December 3, 2014 – Prepared by Stantec Consulting – Membertou, N.S.
- Tab 4 – Signals and Communications.
- Tab 5 – Track Investment.
- Tab 6 – Bridges and Culverts – 2014 Bridge Inspection Report - May 2014, prepared by PARSONS.
- Tab 7 – Statement of Work.

→ **In addition, CANARAIL undertook a site visit (June 16 & 17, 2015) which included:**

- Track Inspection
  - Conduct walking "spot inspections" at various locations on the rail line. Record condition of track components at these locations.
  - Inspect the geotechnical locations identified in the Stantec reports of September 16 and December 3, 2014.
  - Inspect road/rail crossings.
- Meeting with Mr. Steve Newson, Policy Advisor - Nova Scotia Transportation and Infrastructure Renewal
  - Summarize and analysis the data collected and use to evaluate operations and maintenance costs submitted by G&W.

Conclusions – Phase I

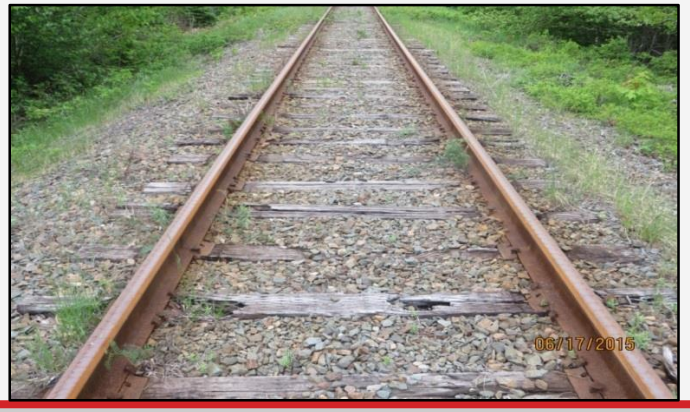
Operating and Maintenance Costs for Current Rail Line

- Rail Management:
  - Majority of rail (115 RE rail sections) installed circa 1975/1976
  - Estimated : 65% Continuous Welded Rail (CWR) & 35% Jointed Rail
  - Rail surface condition : Good
  - Some aggressive rusting in a few locations, due to salt water
  - No rail relay required over the next 5 years
  - 9 passing sidings manual No. 10 – 115 lbs rail with 16 ft. - 6 inch (not received much activity over the past few years) all turnouts remain in track and functional with the exception of west turnout at Grand Narrows which it was removed. Status: Good

Conclusions – Phase I

Operating and Maintenance Costs for Current Rail Line

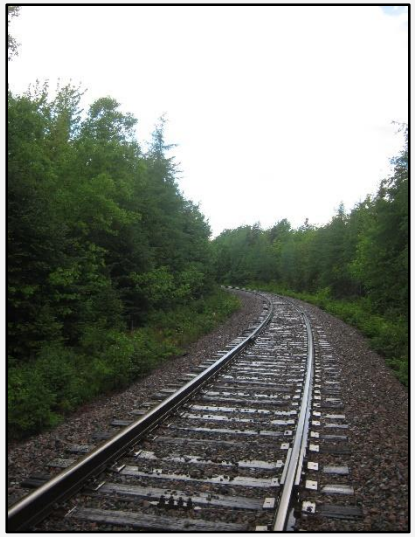
- Tie Management:
  - Tie Type – No.2 Treated Harwood – Length 8ft.
  - Track life: 40+ years
  - Defect ratio: ≈ 40% in some tangent segments
  - 5-year wood tie program required
    - 15,000 ties/year
- Prior to the re-establishing train service, it is recommended to verify that tie conditions will support the dynamic impact of curving forces throughout the curvature, especially the sharper curves in those areas where tie defect density exceeds Transport Canada Guidelines.



Conclusions – Phase I

Operating and Maintenance Costs for Current Rail Line

- Ballast Management:
  - In general, sufficient ballast cross section for Class 3 track
    - Tie cribs full
    - Shoulder ballast: 8-10 inches
  - Weed and grasses contamination
    - In some segments, normally associated with areas where chemical weed spraying is prohibited
  - Ballast requirements
    - For the next 5 years, associated with programs and minor surfacing requirement
    - 5,500 – 6,000 tons/year



Conclusions – Phase I

Operating and Maintenance Costs for Current Rail Line

- Rail Traffic (Based on info provided by G&W):
  - Car load shipment in a steady decline from 1080 cars in 2009 to 331 cars in 2014

- Roadway crossing:
  - Total of 55 public crossings,
  - 40 public crossings with automated protection- flashing lights & bells,
  - 38 of them are identified for Advance Warning Device upgrade requirements.

Conclusions – Phase I

Operating and Maintenance Costs for Current Rail Line

- Maintenance and Repair Costs:
  - OPEX
    - OPEX for track maintenance & bridges and culvert maintenance is considered **understated by ≈50%** (actually $**2** M for the next 5 years)
    - No OPEX identified for geotechnical work
  - CAPEX
    - Track ($13.3 M) and Signals and Communications ($1.6 M): Realistic
      - Based on field inspection
    - Bridge ($10 M), Culvert ($1 M) and Geotechnical Repairs ($2.5 M not sufficient):
      - Bridge Inspection and cost evaluation by PARSONS at too large accuracy to status on cost of repairs in the time frame program
        - ±50% for an amount of $9.7 million (mean variable from 4.8 M$ to 14.5M$)
        - It is important to undertake a structural capacity study of the bridges prior to any traffic with special focus on the portion of the structures that rest in the tidal zone range of 8 – 12 ft. from mean water levels

Conclusions – Phase II

Review of Geotechnical and Infrastructure Improvements

- Geotechnical Management:
  - Remedial action cost not defined by Stantec Consulting
  - Preliminary estimate: $2.5 million
    - In Overview (Table 1)
  - In order to resolve the geotechnical issue, CANARAIL believes Stantec Consulting should:
    - Status on the requirements of further investigation
    - Detail and comment the cost estimate

Conclusions – Phase II

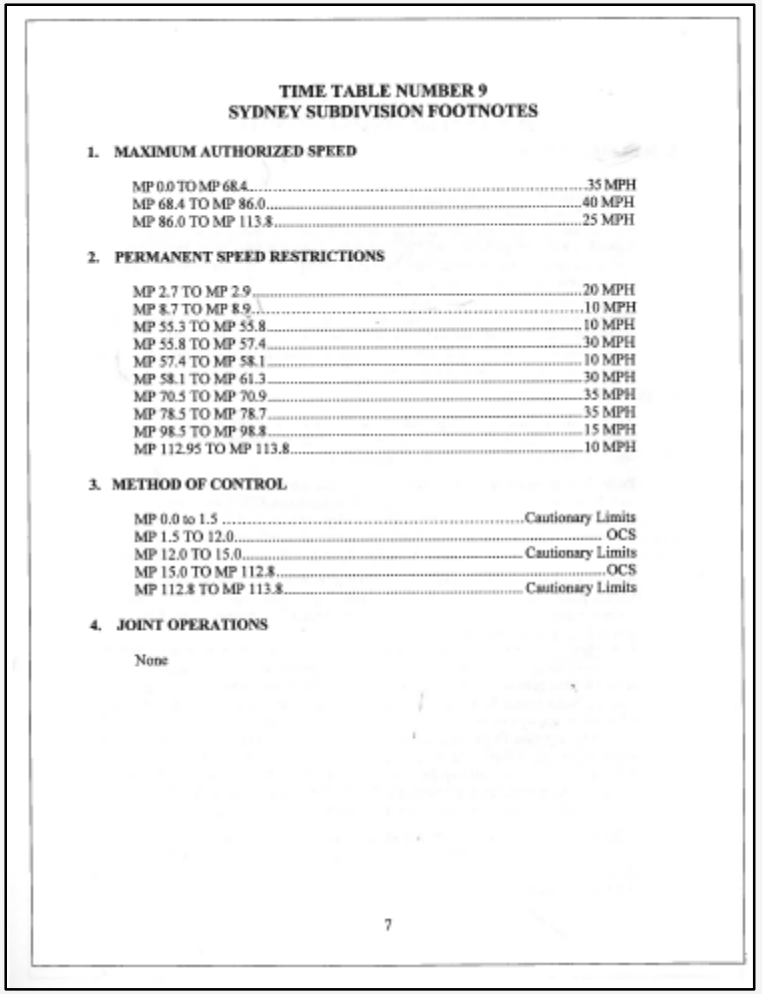
Review of Geotechnical and Infrastructure Improvements

- Track Classification Management:
  - Infrastructure improvement for Class 3 track
    - As per CBNS Timetable, maximum authorized speeds demanded that the rail line be maintained to the requirements of Class 3 track
    - As per data gathered on site, this rail line was being maintained to Class 3 requirements (TC E-54)
    - Note:
      - No verification performed on timing frequencies of the signal circuits for automated rail/road crossing
      - G&W officials confirm that crossing circuits were acceptable for the speeds identified in CBNS Timetable

Conclusions – Phase II

Review of Geotechnical and Infrastructure Improvements

- Track Classification Management:
  - <u>Infrastructure improvement for Class 4 track</u>
    - Insufficient data available to present a realistic cost estimate
  - Sydney Subdivision should maintained Class 3 (Passenger trains 60 mph and freight trains 40 mph), due to the following issues
    - Increased wood tie demands
    - Permanent Speed Restrictions for numerous curves
    - Hopewell subdivision is a Class 3 track



TIME TABLE NUMBER 9
SYDNEY SUBDIVISION FOOTNOTES

1. MAXIMUM AUTHORIZED SPEED

MP 0.0 TO MP 68.4	35 MPH
MP 68.4 TO MP 86.0	40 MPH
MP 86.0 TO MP 113.8	25 MPH

2. PERMANENT SPEED RESTRICTIONS

MP 2.7 TO MP 2.9	20 MPH
MP 8.7 TO MP 8.9	10 MPH
MP 55.3 TO MP 55.8	10 MPH
MP 55.8 TO MP 57.4	30 MPH
MP 57.4 TO MP 58.1	10 MPH
MP 58.1 TO MP 61.3	30 MPH
MP 70.5 TO MP 70.9	35 MPH
MP 78.5 TO MP 78.7	35 MPH
MP 98.5 TO MP 98.8	15 MPH
MP 112.95 TO MP 113.8	10 MPH

3. METHOD OF CONTROL

MP 0.0 to 1.5	Cautionary Limits
MP 1.5 TO 12.0	OCS
MP 12.0 TO 15.0	Cautionary Limits
MP 15.0 TO MP 112.8	OCS
MP 112.8 TO MP 113.8	Cautionary Limits

4. JOINT OPERATIONS

None

7

Conclusions – Phase II

Review of Geotechnical and Infrastructure Improvements

- Double-Stack Containers:
  - Sydney Subdivision may be identified acceptable for transport of double-stack container cars, **if** vertical clearance verified for:
    - Canso Causeway Swing Bridge MP 8.7
    - Grand Narrows Bridge MP 57.7
    - Fairmont St. Overhead Bridge MP 99.9


QUESTIONS?
THANK YOU

APPENDIX O

Questions Presented to CANARAIL by the Nova Scotia Rail Advisory Committee, Conference Call on July 30, 2015

EXECUTIVE SUMMARY

On 30th July 2015, CANARAIL representatives presented a Power Point Presentation, via conference call, to members of the Nova Scotia Rail Advisory Committee, chairperson, Shannon Delbridge, Executive Director, Strategic Initiatives, N.S. Department of Transportation and Infrastructure Renewal. To assist with the presentation, a copy of the PPP was forwarded by email to Ms. Delbridge for distribution to members of the Committee. Participants from CANARAIL Consultants Inc. as follows:

- Mr. Steeve Rousseau - Engineering and Infrastructures Director,
- Mr. Frank Taylor – Railway Specialist – Track and M.O.W. Operations
- Ms. Catherine Langford – Jr. Railway Engineer.

The presentation was open to questions from the committee members throughout, as well as at the end of the presentation.

This Executive Summary serves to identify the questions presented by members of the Committee, and CANARAIL's answer to the questions. The following is a list of the questions as recorded by the CANARAIL team.

Questions:

1) When did Genesee and Wyoming commence operating at 25 mph over the Sydney subdivision?
2) Why does Genesee and Wyoming operate at 25 mph rather than the Class 3 speed which allows for a maximum allowable operating speed of 40 mph for freight trains?
3) Is the Genesee and Wyoming identified 5-Year CAPEX expenditures of $30M sufficient to bring the complete Sydney Subdivision to a Class 3 standard?
4) Is the Hopewell Subdivision being operated at a Class 3 standard?
5) Is the 5-Year CAPEX identified by Genesee and Wyoming what G&W would be required to spend to keep the line at Class 3 standards**?**
6) There were three bridge structures identified requiring information on the available vertical height clearance prior to CANARAIL signing off on the rail line as acceptable for double stack container traffic, i.e. Canso Causeway Swing bridge – MP 8.7, Grand Narrows Bridge – MP 57.7, and Fairmont St. Overhead Bridge – MP 99.9. Committee members enquired as to why these vertical heights were not obtained during the field inspection?
7) If the vertical height clearances were provided to CANARAIL would CANARAIL be in a position to approve the Sydney subdivision for container traffic?

The following is a summary of the answers provided by CANARAIL representatives, during the conference call, to the questions referenced above.

ANSWERS:

Question 1:

When did Genesee and Wyoming commence operating at 25 mph over the Sydney subdivision?

Answer:

Canarail does not know the exact date for which Genesee and Wyoming commenced operating freight trains over the Sydney subdivision at 25 mph. However, it was acknowledged by G&W personnel that the freight trains were operating at a restricted speed of 25 mph prior to the closing of freight service effective January 2015. As well, officials of G&W confirmed during the track inspection of 16 and 17 June 2015, that effective January 2015, the only traffic presently operating over the Sydney subdivision is the odd locomotive that is sent to the Sydney maintenance facility for servicing. These locomotives operate under a general operating bulletin that restricts the speed to 10 mph.

Question 2:

Why does Genesee and Wyoming operate at 25 mph rather than the Class 3 speed which allows for a maximum allowable operating speed of 40 mph for freight trains?

Answer:

CANARAIL's scope of the mandate did not included this inquiry status over the G&W. During the site visit, June 16 & 17, 2015, this question with G&W did not come over the discussion regard the exact reasons as to why G&W decided to restrict the entire Sydney subdivision to a maximum allowable speed of 25 mph. However, notwithstanding the absences of confirmed information from G&W as to their reasons / logic for the blanket 25 mph speed, the following summary of information gathered, from the referenced document in this report and the field inspection notes of Appendix A, would support the placement of a blanket speed of 25 mph for the rail line.

- TIMETABLE NO. 9, – Effective 0001 – Atlantic Standard Time – February 19, 2012.
  This timetable placed "permanent speed restrictions" equal to or less than 25 mph at **6 separate locations** on the rail line.
- Appendix A – Summary of track inspection notes as per Track Inspection of 16 – 17 June 2015.
  As per review of the recorded track data per the 30 locations listed in this Appendix, CANARAIL's Track Specialist, if placed with the responsibility, would recommend a temporary slow order be placed at **14 of these locations** equal to or less than 25 mph. To this effect, 3 of the locations identified in Appendix A are covered by the list of permanent speed restriction per Timetable No. 9.
- Appendix I – Statement of Work – Tab 3 – Stantec Geotechnical Report.
  Stantec Consultants provided Genesee and Wyoming with 2 reports in 2014, in combination, identified **13 locations** for which they recorded geotechnical issues on or adjacent to the track roadbed on the Sydney subdivision.

- Appendix I – Statement of Work – Tab 6 – 2014 Bridge Inspection Report, May 2014 - PARSONS. The PARSONS' report identified 27 bridges they inspected on the Sydney subdivision of which they identified **15 bridges under category C1**. Their definition for a C1 classification is as follows. *"C1. Condition represents a threat to the structure's ability to safely carry traffic. Traffic may need to be protected by reduced speed or other measures and repairs should be programmed in the next capital program in order to avoid an unplanned bridge outage with the next inspection. Condition should be monitored periodically until repairs have been completed."*

In summary, a total of 48 locations have been identified as areas of concern to the safe operations of trains over the Sydney subdivision. And, from an operational standpoint, it would be impractical to place temporary slow orders flags along the rail right-of-way. Individual slow order flags would be overlapping, creating total confusion for the train operating crews.

Question 3:

Is the 5-Year CAPEX expenditure program identified by Genesee Wyoming to bring the complete Sydney Subdivision to a Class 3 standard?

Answer:

As per CANARAIL's Report, Section 6 – CAPEX – ESTIMATED, the 5-Year CAPEX Program presented by G&W identifies a total capital expenditures of $28.4M distributed as follows:

- Geotechnical @ $2.5M.
- Signals & Communications @ $1.6M
- Track @ $13.3M
- Bridges @ $10.0M
- Culverts @ $1.0M

The cumulative annual expenditures vary from a low of $5.59M in year 2015 to a high of $5.79M in year 2019.

As per the CANARAIL report, it is our conclusion that the 5-Year CAPEX expenditures identified for Track, and Signals & Communications, a combined total of $14.9M, are realistic estimates for these functions. Thus, based on this conclusion, it is CANARAIL's expert opinion, upon completion of the identified 5-year track and signals & communication expenditures the track and signal & communications would allow for a Class 3 standard. Ultimate sign-off by CANARAIL on Class 3 track will require a follow-up track inspection to verify CAPEX programs are completed to appropriate standards. Please note, this decision does not supersede the issues of concern identified below for bridges, culverts and geotechnical works.

With respect to the CAPEX expenditures identified for Geotechnical, Bridges, and Culverts, as per CANARAIL Report - Section 1.1 – Summary of Conclusions and Sections 6.1 – Geotechnical, and Section 6.4 – Bridges and Culverts, the following is CANARAIL's opinion:

- Bridges: The inspection and the cost evaluation presented in the PARSONS review of bridges is at a too large accuracy (± 50%) to status on the exact cost of repairs in the time frame allotted. As well, no rating of the bridge structures has been performed.

- Geotechnical: The costs associated with remedial action for the 8 location located within the subsidized portion of the Sydney subdivision, were not defined by Stantec, thus it is CANARAIL's

opinion that Stantec should status on the requirements of further investigation, then detail and comment the cost estimate to resolve the geotechnical issue.

In summary, due to the items identified for geotechnical, bridges, and culverts, CANARAIL is not prepared to agree that all track infrastructures will be acceptable for Class 3 speeds post completion of the identified 5-Year CAPEX Programs.

Question 4:

Is the Hopewell Subdivision being operated at a Class 3 standard?

Answer:

As per CANRAIL's Report dated July 28, 2015 and supported by the Cape Breton & Central Nova Scotia Railway TIMETABLE NO. 9, – Effective 0001 – Atlantic Standard Time – February 19, 2012 (see Annex E of this report) the Hopewell subdivision (Havre Boucher to Truro, a total of 116.2 track miles) is a Class 3 track as defined by Transport Canada – Rules Respecting Track Safety – TC E-54 – Part II – Track Safety Rules. This Transport Canada document classifies track based on operating speeds as follows:

CLASS OF TRACK: Operating Speed Limits (miles per hour)

Class of Track	The maximum allowable operating speed for freight trains is -	The maximum allowable operating speed for passenger trains is -
Class 1 track	10	15
Class 2 track	25	30
Class 3 track	**40**	**60**
Class 4 track	60	80
Class 5 track	80	95* (*) For LRC Trains, 100

As per referenced Timetable, the Hopewell subdivision has Maximum Authorized Speeds between 30 MPH and 40 MPH. These maximum authorized speeds places the Hopewell subdivision into the Class 3 category.

Question 5:

Is the 5-Year CAPEX identified by Genesee and Wyoming what G&W would be required to spend to keep the line at Class 3 standards?

Answer:

As per our answer to Question 3 above, CANARAIL is not prepared to agree that the 5-Year - $28.4M CAPEX Program will meet all infrastructure requirements necessary to re-establish train service on the Sydney subdivision to be a Class 3 track.

Furthermore, CANARAIL is not privileged with any information related to "purchase agreement and / or operational terms" that may have formed part of the Sale and Transfer or any other agreement that

may exist of the Sydney subdivision from its original owner CN Rail to Rail Tex, and / or Rail Tex to Rail America for which Genesee and Wyoming purchased Rail America in July 2012. Without this information, CANARAIL will not offer an opinion on responsibility for the CAPEX expenditures identified.

Question 6:

There were three bridge structures identified requiring information on the available vertical height clearance prior to CANARAIL signing off on the rail line as acceptable for double stack container traffic, i.e. Canso Causeway Swing bridge – MP 8.7, Grand Narrows Bridge – MP 57.7, and Fairmont St. Overhead Bridge – MP 99.9. **Committee members enquired as to why these vertical heights were not obtained during the field inspection?**

Answer:

The vertical height clearances for the railway bridges and overhead structures were not obtained during the track inspection due to the belief this information was included in the data presented in the 2014 Bridge Inspection Report prepared by PARSONS Consultants. This information was included for the other bridges and overhead structures, but unfortunately, was not part of the data tables for the three structures identified above. In addition, at our site visit on June 16 &17, 2015, Canarail representatives and G&W representatives were not equipped in term of health and safety to take that measurement with precision, neither been advised ahead it will be required to, if so Canarail would have covered it in its proposal and taken in account all associated constrains.

Question 7:

If the vertical height clearances were provided to CANARAIL would CANARAIL be in a position to approve the Sydney subdivision for container traffic?

Answer:

Yes, CANARAIL would be willing to approve the Sydney subdivision for double-stack container traffic provided the recorded vertical height clearances meet the requirements of Transport Canada - Standards Respecting Railway Clearances (as per Appendices K and L of this report).

Please note; the vertical clearance must be measured, by a technically competent person, from “the top of rail head to the lowest overhead structural member of the bridge infrastructure within the envelope provided by the referenced Transport Canada standards.”

Prepared by: **Mr. Frank Taylor**

Reviewed by: **Mr. Steeve Rousseau**

CANRAIL

31 July 2014

APPENDIX P

Clearance Diagrams

Client: CBNS
Trk. Seg.: SYDNEY SUB.
Info 1:
Info 2:

Date: 09/11/13
Time: 09:25:14
Trk. No.: SNG MAIN
Dir.: EAST

S.ELE: 00.9"
Dist: 008.688
Frame: 21

Curve: 0.00
Struc.: TT BRIDGE (CAPE BRETON)
File: CBNS_SYDNEY_SUB_MAIN_001.CUS

Language: E

Insert
☐ Check from top 1000
☑ Check from bottom 600

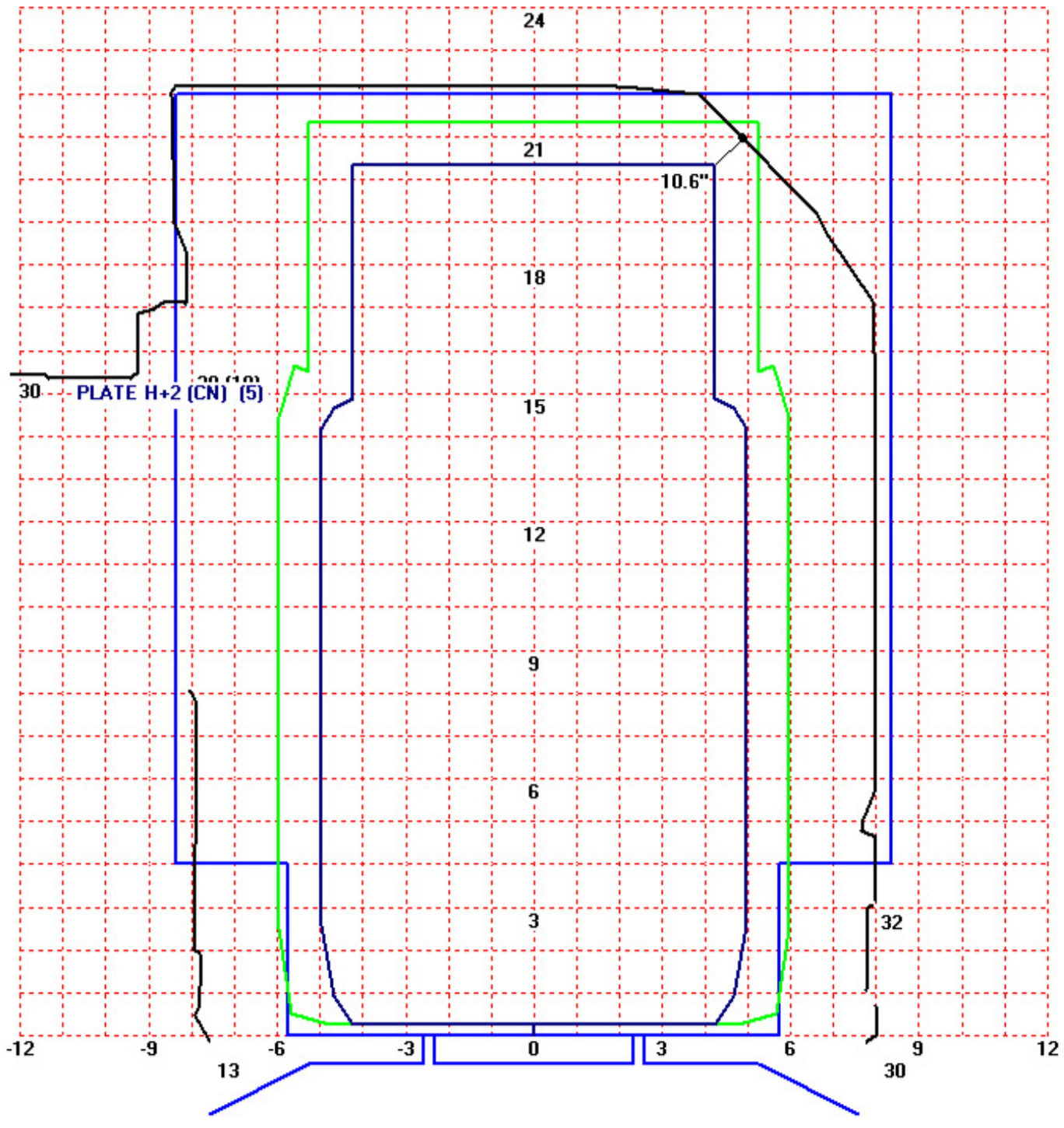
Select Cus File

Select Template File

Clear load

Routing

Dist. 008.688 To 8.749
Lat. 45.64718823 To 45.64745027
Long. -61.41352528 To -61.41234495
Hgt. 7.89 To 8.94



Client: CBNS
Trk. Seg.: SYDNEY SUB.
Info 1:
Info 2:

Date: 09/11/13
Time: 12:46:33
Trk. No.: SNG MAIN
Dir.: EAST

S.ELE: -00.2"
Dist: 057.828
Frame: 79

Curve: 0.00
Language: E
Struc.: TT GRAND NARROWS SWING-SPAN 7
File: CBNS_SYDNEY_SUB_MAIN_001.CUS

Insert
☐ Check from top 1000
☑ Check from bottom 600

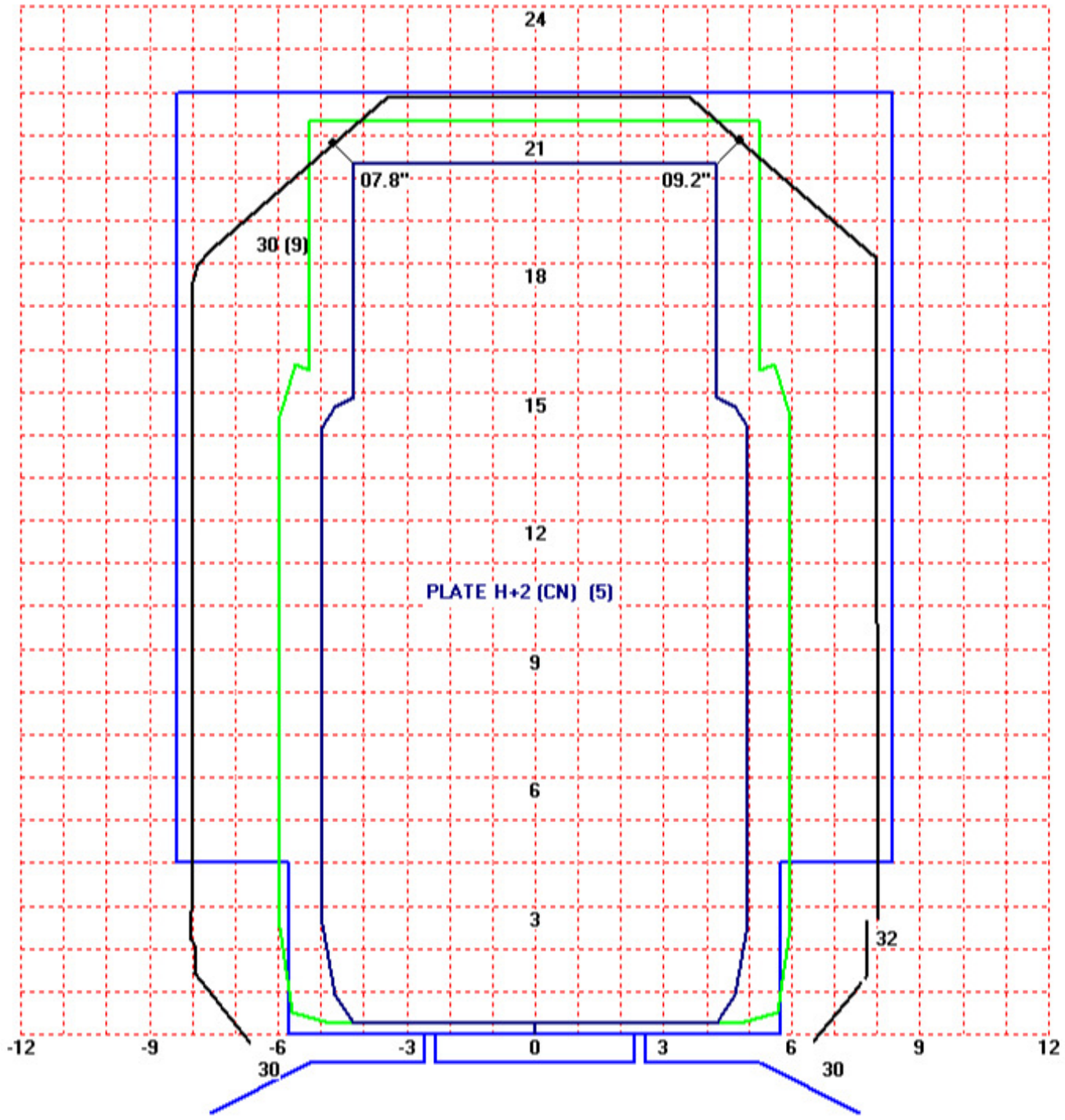
Select Cus File

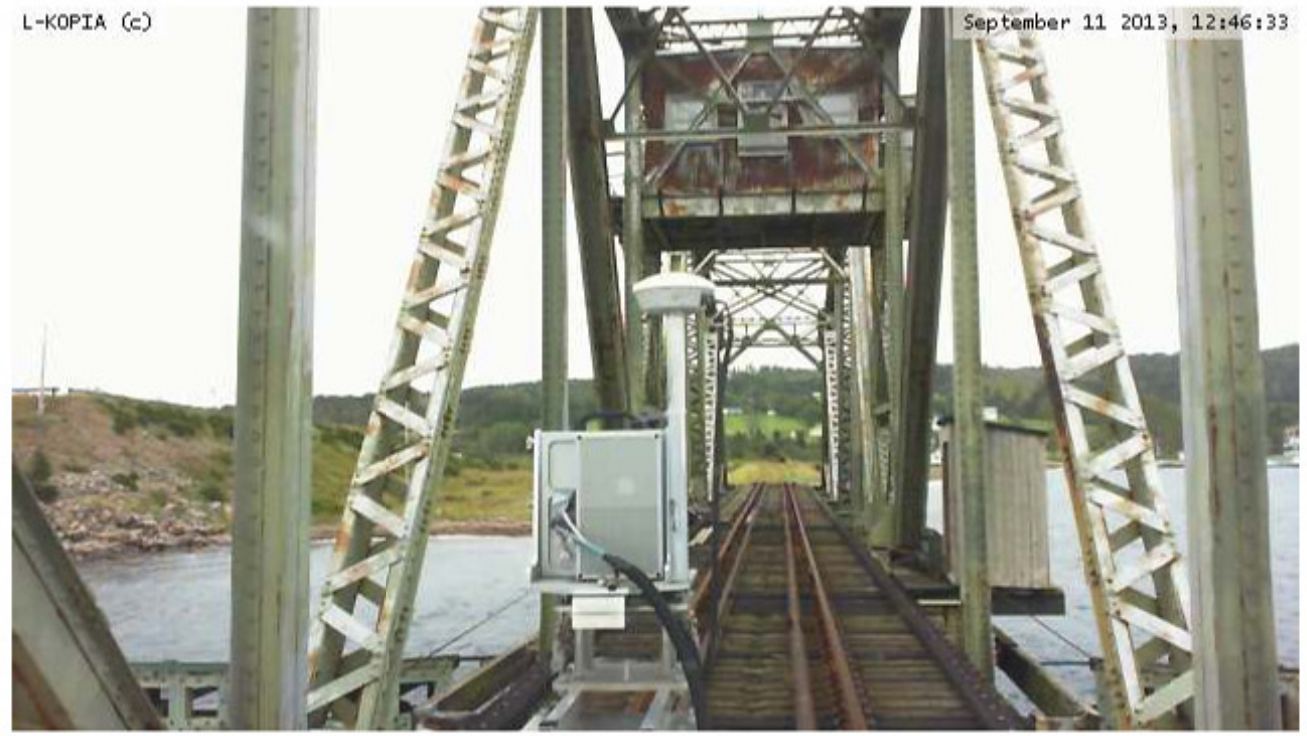
Select Template File

Clear load

Routing

Dist. 057.828 To 57.855
Lat. 45.95902836 To 45.95886296
Long. -60.79754733 To -60.79706637
Hgt. 8.90 To 9.77





Client: CBNS
Trk. Seg.: SYDNEY SUB.
Info 1:
Info 2:

Date: 09/11/13
Time: 16:02:34
Trk. No.: SNG MAIN
Dir.: EAST

S.ELE: 04.3"
Dist: 099.923
Frame: 152

Curve: 2.00
Language: E
Struc.: OVERPASS (FAIRMOUNT ST)
File: CBNS_SYDNEY_SUB_MAIN_001.CUS

Insert
☐ Check from top 1000
☑ Check from bottom 600

Select Cus File

Select Template File

Clear load

Routing

Dist. 099.923 To 99.928
Lat. 46.19783904 To 46.19777679
Long. -60.26144977 To -60.26148978
Hgt. 22.01 To 20.32