SCHEDULE 18

TECHNICAL REQUIREMENTS

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100.0 GENERAL

100.1 INTRODUCTION

References to section numbers in this Schedule are to section numbers of the Technical Requirements unless expressed otherwise.

This Section covers the general technical requirements applicable to all design, construction and operations of the Infrastructure.

The information in the Technical Requirements is organized as follows:

- Section 100 – General;
- Section 200 – Project Specifics;
- Section 300 – Design and Construction - New Infrastructure;
- Section 400 – Operations - New Infrastructure and Existing Infrastructure;
- Section 500 – Handback Requirements;
- Appendix A – Drawings;
- Appendix B – Select Department Standard Drawings and Reference Tables;
- Appendix C – Reporting Summary;
- Appendix D - *Historical Resources Act* (Alberta) Clearance Letters;
- Appendix E - Guide Signing for New Infrastructure;
- Appendix F – List of Acronyms;
- Appendix G – Alberta Infrastructure Land Lease Summary and Drawings;
- Appendix H – Automatic Traffic Recorder ("**ATR**") Specifications;
- Appendix I – Road Weather Information System - Drawing 18-I-01; and
- Appendix J – Access to Aggregate at the Star.

In the event of any conflict or inconsistency between the Sections/Appendices, such conflict or inconsistency shall be resolved on the basis of the wording in the higher up in the following list:

- Sections 100.1 and 200, including Appendices A, B, D, E, F, G, H, I and J;
- Sections 300, 400 and 500; and
- Section 100.2 and Appendix C.

References to any standards, publications, policies, guidelines or other requirements in the Technical Requirements (the "**Standards**"), are to the Standards that existed as of the deadline for the submission of SR Package 2 (as set out in the Request for Proposals issued by the Department for the DBFO Agreement).

Any Standards written by the Department, including without limitation Department Standard Drawings, can be found (or the location of where they can be found) on the Department's website.

100.1.1 DEFINITIONS

In this Schedule 18 (Technical Requirements), capitalized terms shall have the corresponding meaning as set out in section 1.1 of the DBFO Agreement (as defined below) and the following expressions shall have the following meanings (and where applicable their plurals have corresponding meanings):

"As-Built Construction Reports" has the meaning set out in Section 300.3.3;

"Bare Pavement" means the travel lanes, and walkway/pathways being free of snow, packed snow, frost and ice;

"Bridge Design Code" has the meaning set out in Section 300.5.2.1;

"bridge structures" include bridges, bridge size culverts (1.5 metre diameter or larger), retaining walls, and overhead and cantilevered sign structures that form the Infrastructure;

"C-D" means collector-distributor;

"Contractor's Engineer" means a Professional Engineer or engineers that are employed by or retained by the Contractor for the carrying out of the Project and the O&M;

"DBFO Agreement" means the Agreement to Design, Build, Finance and Operate Southeast Stoney Trail, Calgary between Her Majesty the Queen in right of Alberta and the Contractor, as defined therein, to which agreement this Schedule 18 (Technical Requirements) is attached;

"Department" means the Province, as represented by the Minister of Transportation, or its expressly authorized representatives or agents. The Department or Alberta Transportation was formerly known as Alberta Infrastructure and Transportation and so references to Alberta Infrastructure and Transportation are to the Department;

"Department of Infrastructure" means the Province, as represented by the Minister of Infrastructure;

"Detailed Designs" means the plans, specifications and drawings that the Contractor is required to provide pursuant to section 5.9 of the DBFO Agreement;

"Existing O&M Payment" has the meaning as set out in section 2 of Schedule 14 (Payment Schedule) to the DBFO Agreement;

"Functional Plan" means the Calgary East Ring Road, Functional Planning Study – Final Report (Volumes 1-3) dated April 2006 prepared by Earth Tech (Canada) Inc., the Calgary East Ring Road/East Freeway Access Management Plan for 84 Street SE (17 Avenue SE to Highway 22X) (Volumes 1 and 2) dated January 2009 prepared by CH2M HILL Canada Limited; and the South Calgary Ring Road - Functional Planning Study Deerfoot Trail SE to

Macleod S dated November 2009 prepared by Focus Engineering Ltd.;

“Infrastructure” means the New Infrastructure and the Existing Infrastructure;

“Local Authority” means The City of Calgary or the MD, as applicable;

“MD” means Rocky View County;

“Ministerial Consent” means the written consent of the Department of Infrastructure pursuant to section 5(2) of *Calgary Restricted Development Area Regulations* (AR 212/76, as amended);

“New O&M Payment” has the meaning as set out in section 2 of Schedule 14 (Payment Schedule) to the DBFO Agreement;

“Professional Engineer” means an individual who holds a certificate of registration to engage in the practice of engineering under the *Engineering, Geological and Geophysical Professions Act*, R.S.A. 2000, c. E-11, or any replacement legislation;

“Project Limits” means the limits of the Project as identified in Drawings 18-A-03 to 18-A-11, which limits are subject to adjustment in accordance with the Detailed Designs;

“Province” means Her Majesty the Queen in right of Alberta;

“Reclamation Certificate” means a reclamation certificate for disturbed lands as required by the *Environmental Protection and Enhancement Act* (Alberta), R.S.A. 2000, c. E-12, or any replacement legislation;

“roadways” include all mainline lanes and shoulders, interchange ramps, crossroads and other roads that form the Infrastructure, as well as the associated drainage systems, lighting, signage, signals, markings, landscaping, fencing and other appurtenances, excluding bridge structures;

“Schedule of Lane Closures” has the meaning as set out in Section 400.1.6;

“Service Roads” has the meaning provided in Section 200.2.3.18;

“Stage 1” means the initial configuration of the New Infrastructure as described in the Functional Plan (year 2033 for the Calgary East Ring Road Functional Planning Study and 2035 for the South Calgary Ring Road Functional Planning Study) and as modified and further detailed in the Technical Requirements;

“Storm Event” means a period of time of continuous precipitation and/or condensation and/or wind causing the formation of snow and/or ice on the roadway surface;

“Third Party Leased Lands” has the meaning as set out in Section 200.3.4.1; and

"Ultimate Stage" means the planned final configuration of the New Infrastructure as described in the Functional Plan and as modified and further detailed in the Technical Requirements.

Appendix F contains a list of acronyms frequently used within the Technical Requirements.

Words and abbreviations which are not defined in the Technical Requirements or the DBFO Agreement and which have well known technical or trade meanings and which are used in the Technical Requirements are used in accordance with such recognized meanings.

Standard units of measurement may be abbreviated in the Technical Requirements.

100.2 MANAGEMENT SYSTEMS AND PLANS

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Contractor's Construction Schedule and the Contractor's Management Systems and Plans to comply with the Technical Requirements.

100.2.1 QUALITY MANAGEMENT SYSTEM

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Quality Management System (the "**QMS**"), as attached in Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement.

The QMS shall be consistent with all of the requirements of the *ISO 9001:2008* Standard (and subsequent revisions) and shall cover all activities, products and services related to the Project and the O&M, prior to the execution of these activities, products and services. The Contractor shall make all QMS records available to the Department for inspection and review. The Contractor shall provide the Department with a copy of any or all quality records when requested within 48 hours of the request. The QMS shall address all stages of the Project and the O&M, specifically:

- Design;
- Construction; and
- Operations, including maintenance and rehabilitation.

The QMS shall stipulate how compliance with the Technical Requirements and the Contractor's Management Systems and Plans is ensured. During all stages of the Project and the O&M, work shall not be started on any component of the work until after the QMS has been completed and implemented for that component of the work. All records from the QMS for design, construction, operation, and maintenance, including all audits, shall be maintained and retained by the Contractor until the expiry of two years after the end of the Term or until otherwise agreed to in writing by the Department.

The individuals responsible for carrying out quality control and quality assurance shall be identified in the QMS.

The QMS shall include, but not be limited to:

100.2.1.1 Design

The QMS shall require all designs, drawings, specifications and similar documents, for all aspects of the Project and the O&M, to be stamped and signed by Professional Engineers in accordance with *Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) Practice Standard for Authenticating Professional Documents V2.0*.

The QMS shall require two levels of design checks as listed below:

(a) The QMS shall require all design work, including supplier designs, to be checked by a qualified Professional Engineer (the "**Check Engineer**"). The Check Engineer may be employed by the same legal entity doing the design work, provided the Check Engineer was not involved in that component of the design work. The Check Engineer shall stamp and sign all applicable design reports, drawings and specifications.

(b) The QMS shall require all bridge structure design work, including supplier designs, to be reviewed by a qualified, independent Professional Engineer (the "**Review Engineer**") selected by the Contractor but approved by the Department, acting reasonably, within 30 days of signing of the DBFO Agreement. The Review Engineer shall be employed by a legal entity that is not carrying out any design work for the Project, and that is at arm's length from and completely independent of the Contractor and any entity carrying out any design or design checking work for the Project. The design review for bridge structures done by the Review Engineer shall include, but not be limited to, the following:

- Complete review of the design data drawings including re-analysis of all aspects of the original design including hydrotechnical, geotechnical, geometric and operational safety components;
- Complete review and re-analysis of all aspects of the original structural design, preferably (but not essentially) by a methodology other than that used in the original design to ensure that the design parameters are relevant, the structural system is sound and the structural members are appropriately sized and detailed;
- Ensuring that the engineering drawings and construction specifications accurately convey the requirements of the original design; and
- Ensuring the completeness, integrity and accuracy of all aspects of the engineering drawings and construction specifications.

The Review Engineer shall provide independent design check notes and shall report that the design checks have been completed based on the information provided by the design engineer of record and is satisfied that the designs meet the Technical Requirements.

If a non-conformance in the design is determined at any time, including after construction, the Contractor shall undertake the necessary modifications to ensure the as-built New Infrastructure is in accordance with the Project Requirements.

100.2.1.2 Construction

The QMS shall provide for ensuring that the as-built Project is in conformance with the requirements of the engineering drawings and construction specifications developed for the New Infrastructure. The Contractor shall implement a methodology to verify compliance of the construction with the design requirements. Changes made to the design during construction shall be stamped and signed by Professional Engineers from the design team. At the end of construction a Professional Engineer from the design team shall be required to stamp and sign a declaration that the New Infrastructure has been constructed in accordance with the engineering drawings and construction specifications.

The Contractor shall make all QMS records available to the Department for inspection and review. The Contractor shall provide the Department with a copy of any or all quality records when requested within 48 hours of the request.

For all construction materials and products, the QMS shall detail the testing and acceptance program, including, but not limited to, the following:

- Material property or characteristics to be measured or inspected;
- Test methods and reference standards;
- Testing frequency;
- Inspection criteria and frequency; and
- Criteria for product acceptance/rejection.

The QMS shall require complete testing/inspection reports be prepared for the Project and the O&M, including all test results and inspection activities for all grade, subbase, base and surfacing materials, bridge structures, curb and gutter, sidewalks, drainage items, lighting, signals, signage, pavement markings, and other appurtenances.

Non-conforming construction works will be considered unacceptable and the Contractor shall undertake the necessary modifications to ensure the as-built New Infrastructure conforms to the requirements of the engineering drawings and construction specifications.

A pre-construction meeting is required for fabrication of precast elements, structural steel, sign structures or bridgerail. The Contractor shall conduct this meeting after the associated shop drawings have been reviewed in accordance with Schedule 5 (Design and Plan Certification Process and Review Procedure) to the DBFO Agreement, but before fabrication commences. The Contractor shall provide at least one week's notice to the Department prior to the meeting such that the Department and or its representatives may attend. The meeting shall be held at fabricator's plant and the Contractor shall ensure the plant superintendent and plant manager responsible for the work and any manufacturer's representative directly involved in the specialized work are in attendance.

100.2.1.3 Operations

The QMS shall provide for ensuring that the Project and the O&M conform to the Project Requirements and the O&M Requirements respectively, as well as operating consistently with adjoining roadways.

The Contractor shall update annually during the Operating Period, the plans detailing the inspection, operation, maintenance, and New Infrastructure rehabilitation activities that will be conducted during the upcoming year to ensure that all requirements in the DBFO Agreement are met. The plans shall include information on scheduling, traffic management and communications with stakeholders.

Non-conforming inspection, operation, maintenance and rehabilitation will be considered unacceptable and the Contractor shall undertake the necessary modifications to ensure conformance with the Technical Requirements.

100.2.1.4 Audits

100.2.1.4.1 Internal Audit

The Contractor shall undertake QMS Internal Audits, as per *ISO 9001:2008 Element 8.2.2*, during design, construction and operation, during the Construction Period and the Operating Period. The auditor shall follow the guidelines for *Auditing Management Systems, ISO 19011:2002* standard, as amended or substituted from time to time. The audit shall, at a minimum, ensure that all input requirements are adhered to and that the QMS is implemented and in compliance with the requirements of *ISO 9001:2008* standard, as amended or substituted from time to time, customer requirements and applicable regulatory standards. All elements shall be audited at least once per year.

All QMS deficiencies identified by the internal QMS auditor during the audit, must be addressed and corrective measures implemented by the Contractor. The Contractor shall communicate the results of all audits to the Department.

100.2.1.4.2 External Audit

In addition to the internal audits, the Contractor shall undertake QMS external audits during the design, construction and operation during the Construction Period and the Operating Period.

These external audits must be conducted by an independent QMS auditor certified by an accredited auditors' registration body such as International Register for Certificated Auditors ("**IRCA**"), Registrar Accreditation Board ("**RAB**"), National Quality Institute ("**NQI**"), or other equivalent body. The auditor must also be qualified to audit the scope of the QMS. The audit process shall follow the guidelines for *Auditing Management Systems*, *ISO 19011:2002*, as amended or substituted from time to time. The audit shall, at a minimum, ensure that all input requirements are adhered to and that the QMS is implemented and in compliance with the requirements of the *ISO 9001:2008* standard, as amended or substituted from time to time, customer requirements and applicable regulatory standards. A full system audit shall be completed within one year of the signing of the DBFO Agreement and thereafter at least once per year during the Construction Period and the Operating Period.

All QMS deficiencies identified by the external QMS auditor during the audit shall be addressed and corrective measures implemented by the Contractor within 30 days of completion of the audit. The results of the audit shall be documented and shall be submitted by the Contractor to the Department within seven days of audit completion. Evidence of the correction of any deficiencies identified in the audit shall be submitted by the Contractor to the Department within 30 days of completion of the audit.

If an external audit has not been completed within the specified time, Payment Adjustments of $2,400/week or any partial week, for the first four weeks and $6,000/week or any partial week, thereafter shall apply until so completed.

If any deficiencies identified by the external QMS auditor have not been corrected within the specified time, Payment Adjustments of $6,000/week or any partial week, for the first four weeks and $12,000/week or any partial week, thereafter shall apply until corrected.

100.2.2 ENVIRONMENTAL MANAGEMENT SYSTEM

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Environmental Management System (the "**EMS**"), as attached in Schedule 4 (Contractor's Management Systems and Plan) to the DBFO Agreement.

The EMS shall be consistent with all of the requirements of the *ISO 14001:2004* Standard and shall cover all activities, products and services related to the Project and the O&M prior to the execution of these activities, products and services. The EMS shall address all stages of the Project and the O&M, specifically:

- Design;
- Construction; and
- Operations, including maintenance and rehabilitation.

The Contractor shall develop, implement, and maintain and shall monitor update, and manage, during the Construction Period, an ECO Plan in accordance with all requirements of the *Environmental Construction Operations* ("**ECO**") *Plan Framework – Alberta Transportation/The City of Calgary/The City Of Edmonton – 2009 Edition* as part of the EMS and subject to section 5.5 (Contractor's Designs, Plans and Schedule) of the DBFO Agreement. The ECO Plan shall include written procedures and drawings addressing the environmental mitigation and protection issues relevant to the construction activities being performed by the Contractor within the TUC and the Road Right of Way. The ECO Plan may be submitted, throughout the Construction Period, in a phased approach as the Project is being completed. Items that shall be incorporated into the ECO Plan include, but are not limited to, the following:

- Compliance with environmental regulatory requirements;
- Topsoil handling including storage and replacement;
- Borrow excavations;
- Dust control;
- Erosion and sediment control during and after construction;
- Vegetation clearing, establishment and management (including weed control);
- Impacts to water bodies and monitoring activities; and
- Spill Management Plan. One of the requirements of the Spill Management Plan is for the Contractor to report all spills within the Project Limits to the relevant authorities forthwith, and also to the Department within 24 hours of the occurrence.

The Contractor shall develop, implement, and maintain and shall monitor update, and manage, until the end of the Term a Road Salt Management Plan in accordance with all requirements of the *Environment Canada - Code Of Practice For the Environmental Management Of Road Salts* as part of the EMS and subject to section 5.5 (Contractor's Designs, Plans and Schedule) of the DBFO Agreement.

The EMS shall stipulate how compliance with all applicable laws and all the requirements in the DBFO Agreement (including without limiting the generality of the foregoing the technical requirements/commitments in the Functional Plan), is ensured. During all stages of the Project and the O&M, work shall not be started on any component of the work until after the EMS has been completed for that component of the work. The EMS shall include, but not necessarily be limited to the following:

100.2.2.1 Monitoring and Inspection Programs

The EMS shall provide for documented environmental monitoring and inspection programs that verify compliance with all the requirements. The documented programs shall include a description of:

- The scoping of the monitoring and/or inspection programs;
- Frequency of inspection and/or monitoring events and rationale for frequency;
- Listing of applicable performance requirement criteria (may include legislative requirements);
- Methodologies;
- Reporting; and
- The responsibilities and requirements for conducting inspections, monitoring programs, reporting results and follow-up actions.

All deficiencies identified must be addressed and corrective and preventative measures implemented by the Contractor.

100.2.2.2 Internal Audit

The Contractor shall undertake internal EMS audits, as per *ISO 14001:2004 Element 4.5.5*, on a regular basis and in any event at least once per year during the design, construction and operation, during the Construction Period and the Operating Period. The auditor shall follow the current guidelines for *Auditing Management Systems*, *ISO 19011:2002*, as amended or substituted from time to time. The audit shall, at a minimum, ensure that all input requirements are adhered to and that the EMS is implemented and in compliance with the requirements of *ISO 14001:2004* standard, customer requirements and applicable regulatory and other requirements. All elements shall be audited at least once per year.

All internal audit results must be addressed, corrected and implemented by the Contractor.

100.2.2.3 External Audit

In addition to the internal audits, the Contractor shall undertake EMS external audits during design, construction and operations, during the Construction Period and the Operating Period.

These external audits must be conducted by an independent EMS auditor certified by an accredited auditors' registration body. The auditor must also be qualified to audit the scope of the EMS. The audit process shall follow the current guidelines for *Auditing Management Systems*, *ISO 19011:2002*, as amended or substituted from time to time. The audit shall, at a minimum, ensure that all the input requirements are adhered to and that the EMS is implemented and in compliance with the requirements of *ISO 14001:2004*, customer requirements and applicable legal and other requirements. A full system audit shall be completed within one year of the signing of the DBFO Agreement and thereafter at least once per year during the Construction Period and the Operating Period.

All EMS deficiencies identified by the external EMS auditor during the audit shall be addressed and corrective measures implemented by the Contractor within 30 days of the completion of the audit. The results of the audit shall be documented and shall be submitted by the Contractor to the Department within seven days of audit completion. Evidence of the correction of any deficiencies identified in the audit shall be submitted by the Contractor to the Department within 30 days of completion of the audit.

If an external audit has not been completed within the specified time, Payment Adjustments of $2,400/week or any partial week, for the first four weeks and $6,000/week or any partial week, thereafter shall apply until completed.

If any deficiencies identified by the external EMS auditor have not been corrected within the specified time, Payment Adjustments of $6,000/week or any partial week, for the first four weeks and $12,000/week or any partial week, thereafter shall apply until corrected.

100.2.3 <u>HANDLING OF QMS/EMS NON-CONFORMANCE</u>

Non-conformance of required outputs may be a deficiency in the characteristics, documentation or procedures that makes the quality of a product, activity or service unacceptable or not according to specified requirements and any other known acceptance criteria.

In all instances, the Contractor shall review and inspect remedial work and sign-off all the non-conformance reports whether the non-conformance is identified by the Department, the Contractor, or otherwise. All remedial work shall be at the Contractor's expense.

The Contractor shall maintain an up-to-date register of all non-conformance reports indicating their current status. A copy of all non-conformance reports shall be provided to the Department.

All deficiencies identified during the daily activity, inspections, audits and/or reviews (internal or external) must be addressed, and corrective measures must be implemented by the Contractor. The Contractor shall submit the results of all the corrective actions and disposition of all non-conformities to the Department.

100.2.4 PROJECT SCHEDULE

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Contractor's Construction Schedule.

During the construction of the Project, the Contractor shall provide the Department with Contractor's Construction Schedules that are sufficiently detailed to give the Department a minimum of two working days advance notice of all significant construction and fabrication activities.

100.2.5 TRAFFIC MANAGEMENT PLAN

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Traffic Management Plan, as attached in Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement. The Traffic Management Plan for specific components of the Project or the O&M, as applicable, shall be reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure) prior to the start of that component of the Project or the O&M, as applicable.

100.2.6 SAFETY PLAN

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Safety Plan, as attached in Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement. The Safety Plan for a specific component of the Project or the O&M, as applicable, shall be reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure) prior to the start of that component of the Project or the O&M, as applicable.

100.2.7 PUBLIC COMMUNICATION STRATEGIES

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Public Communication Strategies, as attached in Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement. The Public Communication Strategies for a specific component of the Project or the O&M, as applicable, shall be reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure) prior to the start of that component of the Project or the O&M, as applicable.

The Contractor shall be responsible for all public communications, which shall include but not be limited to, public presentations and construction update open houses, public advertisements and mail drops, project website development, project phone hotlines, handling public complaints, etc.

Any direct contact the Contractor makes with the media shall be subject to the prior review and approval of the Department. This shall include media releases, interviews, advertisements, etc.

The Contractor shall maintain comprehensive records of all communications activities including documentation of the information presented, the audience, relevant dates, etc.

If the Contractor proposes major deviations from the Functional Plan or approved plans, at anytime after execution of the DBFO Agreement until the end of the Term, and is deemed to be meeting the Technical Requirements, the Contractor shall in any event proceed through a public consultation process to obtain public approval/acceptance of such deviations including undertaking the following:

- defining who the stakeholders are;
- developing a communication plan that includes the defined stakeholders as participants;
- determining a process and mechanism on how public acceptance is to be determined, measured, and obtained;
- seeking and obtaining acceptance of the communication plan and approval process from the Department; and
- potentially seeking and obtaining approval from the Local Authority and meeting the Local Authority design standards for the deviation.

100.2.8 CONSTRUCTION MANAGEMENT PLAN

Subject to section 5.5 of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Construction Management Plan, as attached in Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement. The Construction Management Plan for a specific component of the Project or the O&M, as applicable, shall be reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure) prior to the start of that component of the Project or the O&M, as applicable.

100.2.9 OPERATION AND MAINTENANCE PLAN

Subject to section 5.5 (Contractor's Designs, Plans and Schedule) of the DBFO Agreement, the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Operation and Maintenance Plan, as attached in Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement.

The Operation and Maintenance Plan shall be finalized prior to Traffic Availability and with the exception of the snow clearing and ice control portion of the plan (the "**Snow Clearing and Ice Control Plan**") and the preferential bridge deck icing control portion of the plan (the "**Preferential Bridge Deck Icing Plan**"), shall be updated annually prior to the start of each calendar year.

The Snow Clearing and Ice Control Plan and Preferential Bridge Deck Icing Plan shall be updated annually and reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure) prior to September 15 of each year.

Traffic will not be allowed on the New Infrastructure until after the initial Operation and Maintenance Plan has been reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure).

The Contractor shall ensure that it addresses in the Operation and Maintenance Plan all of the components necessary for the safe and efficient operation of the Infrastructure. It may also be necessary for the Contractor to modify its operations to address deficiencies not specifically identified in the Technical Requirements but which are required for the safety of the travelling public or are recognized by the industry as a normal industry practice.

The Preferential Bridge Deck Icing Plan shall be reasonably designed to prevent preferential bridge deck icing from occurring on the PBD Bridges (as defined in Section 200.2.16 (Preferential Bridge Deck Icing)).

100.2.9.1 Payment Adjustments

If the Contractor fails to develop and provide the Department with an updated Operations and Maintenance Plan (with the exception of the Snow Clearing and Ice Control Plan and Preferential Bridge Deck Icing Plan) by the start of each calendar year, the Payment Adjustment shall be $1,200/week or any partial week, until it is submitted.

If the Contractor fails to develop and provide the Department with an updated Snow Clearing and Ice Control Plan and Preferential Bridge Deck Icing Plan by September 15 of each year, the Payment Adjustment shall be $6,000/week or any partial week, for the first four weeks and then $12,000/week or any partial week, thereafter until it is submitted.

100.2.10 INFRASTRUCTURE WHOLELIFE MANAGEMENT PLAN

Subject to section 5.5 (Contractor's Designs, Plans and Schedule) of the DBFO Agreement and in accordance with Section 100.2.1.3 (Quality Management System – Operations), the Contractor shall further develop, implement, and maintain and shall monitor, update, and manage, during the Construction Period and the Operating Period, the Infrastructure Wholelife Management Plan, as attached in Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement.

The Infrastructure Wholelife Management Plan shall be reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure) prior to Traffic Availability and shall be updated annually prior to the start of each calendar year.

Traffic will not be allowed on the New Infrastructure until after the initial Infrastructure Wholelife Management Plan has been reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure).

100.2.10.1 Payment Adjustments

If the Contractor fails to develop and provide the Department with an updated Infrastructure Wholelife Management Plan by the start of each calendar year, the Payment Adjustment shall be $1,200/week or any partial week, until it is submitted.

100.3 DEPARTMENT REVIEW

The Contractor shall make all design, construction and operations documentation relating to the design, construction, operation and performance of the Infrastructure available to the Department for the Department's review, measurement and observation purposes.

200.0 PROJECT SPECIFICS

200.1 INFRASTRUCTURE LIMITS

200.1.1 NEW INFRASTRUCTURE

The New Infrastructure consists of Southeast Stoney Trail, generally from 17 Avenue SE (Highway 1A) to the east side of the existing Macleod Trail interchange and is set out in Schedule 13 (New Infrastructure) attached to the DBFO Agreement.

The New Infrastructure shall also include existing roadways, existing grading and related appurtenances (such as drainage works, lighting, and signage) located within the Road Right of Way, including, but not limited to, the following components:

- Portions of 17th Avenue SE;
- Portions of Peigan Trail;
- Portions of 84th Street at Peigan Trail;
- Portions of 61 Avenue SE;
- Portions of Glenmore Trail SE;
- Portions of 130th Avenue SE - grading only;
- Portions of Highway 22X (Marquis of Lorne Trail);
- Portions of 52nd Street SE;
- Portions of Deerfoot Trail SE;
- Portions of McKenzie Lake Boulevard/Cranston Boulevard SE; and
- Portions of Sun Valley Boulevard/Chaparral Boulevard SE.

Highway 22X within the City of Calgary is also known as Marquis of Lorne Trail, Highway 2 is also known as Deerfoot Trail, and 196 Avenue SE is also known as Cranston Avenue/Seton Boulevard. Any references to Marquis of Lorne Trail, Deerfoot Trail, and Cranston Avenue/Seton Boulevard shall mean Highway 22X, Highway 2, and 196 Avenue SE respectively; and any references to Highway 22X, Highway 2, and 196 Avenue SE shall mean the Marquis of Lorne Trail, Deerfoot Trail, and Cranston Avenue/Seton Boulevard respectively. Any references to Dunbow Road SE shall mean 242 Avenue SE and vice-versa.

Unless otherwise specified, the Project Limits will be the boundary of the TUC, except where the New Infrastructure must extend beyond the boundary of the TUC to tie into the adjacent existing roadways, in which case the New Infrastructure located outside of the TUC will be considered part of the Project Limits.

200.1.1.1 New Infrastructure Limits - Interim Restrictions

As of November 6, 2009, the Province is still in the process of acquiring some properties required for the construction of the New Infrastructure. Such properties are known as "**To Be Acquired Lands**" and such term is defined in the second paragraph of section 4 of Schedule 12 (Lands). Unless otherwise authorized in advance and in writing by the Department, the Contractor shall not enter upon the To Be Acquired Lands until the To Be Acquired Lands have been transferred to the Department, which will be by July 31, 2010.

200.1.2 EXISTING INFRASTRUCTURE

Existing Infrastructure includes the existing bridge structures at the Deerfoot Trail interchange, the existing bridge structure at 196 Avenue, the existing bridge structures carrying Highway 22X over the Bow River, the existing bridge structures carrying Highway 2 over the Bow River, the Dunbow Road SE interchange ramps, and Highway 2 mainline from south of 196 Avenue SE to Highway 2A; as set out in Schedule 8 (Existing Infrastructure) attached to the DBFO Agreement.

200.2 DESIGN AND CONSTRUCTION OF NEW INFRASTRUCTURE

200.2.1 GENERAL

The Contractor is responsible for the design, construction, operation, maintenance and rehabilitation of the New Infrastructure which includes, but is not limited to, a multi-lane roadway, connecting roadways, crossroads, interchanges, bridge structures and associated infrastructure.

The design and construction requirements of the Department with respect to the location, function, stages and interconnection of the New Infrastructure are defined in the Functional Plan and the Technical Requirements.

The requirements of the Department for the New Infrastructure are consistent with staged project delivery of the Functional Plan, but for only the southeast component of Stoney Trail SE, as generally described below:

- Construction of Stoney Trail mainlines from 17 Avenue SE to the east side of Macleod Trail.
- Stoney Trail interchanges and crossroads at the following locations between TUC boundaries:
    - 17 Avenue SE;
    - Peigan Trail SE;
    - Glenmore Trail SE;
    - 114 Avenue SE;
    - Highway 22X (Marquis of Lorne Trail);
    - 130 Avenue SE (grading only)
    - 52 Street SE;
    - Deerfoot Trail SE;
    - McKenzie Lake Boulevard/Cranston Boulevard SE; and
    - Sun Valley Boulevard/Chaparral Boulevard SE.
- Flyover 61 Avenue SE.
- CNR grade separation South of Peigan Trail SE.
- CPR grade separation North of 114 Avenue.

The Contractor will be required to design and construct two Service Road jug-handles at the intersection of 114 Avenue and 84 Street; a single Service Road jug-handle at the intersection of 17 Avenue and 84 Street; and a Service Road intersection at the intersection of Peigan Trail and 84 Street. The 84 Street intersections at 17 Avenue and Peigan Trail will be signalized. The work will be handed back to the Local Authority after Traffic Availability.

The Contractor will be required to design and construct a Service Road access from Chaparral Street SE to the ATCO gas regulator station at Chapalina Way SE and 200 Chapalina Place SE.

For all traffic signals that will not form part of the New Infrastructure, the Contractor shall contract with The City of Calgary for the design and construction of the traffic signals; and shall contract with The City of Calgary for the maintenance of the traffic signals until Traffic Availability.

Stage 1 will include grading of the mainline, interchanges and crossroads to the Ultimate Stage, with exceptions as noted in Section 200.2.3 (Design Specifics).

The design of all crossroad elements, including ramps and intersections shall be supported by traffic simulation using Synchro/Sim Traffic software for the following interchanges:

- o 17 Avenue SE;
- o Peigan Trail SE;
- o Glenmore Trail SE;
- o 114 Avenue SE;
- o 130 Avenue SE;
- o 52 Street SE;
- o McKenzie Lake Boulevard/Cranston Boulevard SE; and
- o Sun Valley Boulevard/Chaparral Boulevard SE.

The Contractor will not be required to perform traffic simulations on systems interchanges. Traffic simulation using Synchro/Sim Traffic software is required for all service interchanges.

The simulation shall be performed using the Interchange Simulation File Package provided by the Department for the Contractor's use for developing and evaluating alternatives and for confirmation/validation of designs, as outlined in Section 200.2.3 (Design Specifics). The Interchange Simulation File Package (the "**Package**") is posted in the Electronic Data Room (as defined in the RFP) for this purpose and includes both Stage 1 and Ultimate Stage a.m. and p.m. peak hour Synchro/Sim Traffic model files for each interchange.

Specific instructions will be provided in the Package (comprising packages A, B & C) for the following:

Package A:

- Criteria for Failed Operations (list of Measures of Effectiveness as well as interchange performance criteria);
- Synchro Factors
  - o Signal Phasing requirements and application notes;
  - o Minimum Traffic Signal Timing Requirements and application notes;

    - Default Synchro/SimTraffic Model Parameters (parameters that are fixed and not to be modified in any way by the Contractor); and
    - Allowable Synchro/SimTraffic Model Adjustments (parameters that can be modified by the Contractor in searching for design alternatives);
- Synchro/SimTraffic Modeling Approach; and
- Simulation Results Evaluation.

Package B:

- Requirements for Turn Bay Lengths;
- Criteria for Determination of Turn Bay Lengths at Crossroad Ramp Intersections; and
- Examples.

Package C:

- Minimum Requirements for Synchro/SimTraffic Modeling;
- Evaluating Synchro/SimTraffic Models;
- Eliminating Queue Failures; and
- Synchro/SimTraffic Models.

If the Stage 1 or Ultimate Stage design for a service interchange proposed by the Contractor is different from the interchange configuration shown in the Package, the Contractor shall:

- Submit Synchro/SimTraffic files which demonstrate that operation of the Contractor's Stage 1 design will meet the requirements specified in the Package under the Stage 1 A.M. and P.M. peak hour period traffic conditions;
- Submit Synchro/SimTraffic files which demonstrate that operation of the Contractor's Ultimate Stage design will meet the requirements specified in the Package under the Ultimate Stage A.M. and P.M. peak hour period traffic conditions; and
- Demonstrate that the Contractor's Stage 1 design is compatible with the Ultimate Stage design.

Design Exception:

Requirements stipulated in Package B and C for Turn Bay Length and Elimination of Queue Failure do not apply to the eastbound to northbound movement on Glenmore Trail. A single left turn lane will be accepted for the eastbound to northbound movement on Glenmore Trail. The receiving ramp must still be designed to accommodate two lanes as noted on Drawing 18-A-14 in Appendix A.

200.2.2 GEOMETRIC DESIGN

The following design guides shall form the basis for the geometric design, and the order of hierarchy of these guides, unless specifically indicated otherwise, shall be consistent with the numeric order presented:

1. *Alberta Transportation Highway Geometric Design Guide and associated Design Bulletins;*
2. *Alberta Infrastructure and Transportation Roadside Design Guide, November 2007 and*

associated Design Bulletins;

3. *Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads;*
4. *The City of Calgary Design and Construction Standards; and*
5. *MD - engineering standards.*

In addition, the design shall meet the following requirements:

- The mainline is to be designed as a rural, illuminated, high speed, free-flow, fully access controlled facility;
- All interchange ramp exits and entrances are to be located on the right-hand side, and no left-hand exit or entrance ramps will be permitted;
- No left had side (median) lane additions or lane drops will be permitted on Stoney Trail or Highway 2 (Deerfoot Trail);
- Entrance ramp design shall follow the guidance shown in the publication A Policy on Geometric Design of Highways and Streets 2004 (pages 856 to 859) by AASHTO. The tapered design as shown in Exhibit 10-76-A should generally be followed for entrance ramps at service interchanges. If the ramp is part of a systems interchange, the parallel design as shown in Exhibit 10-76-B should generally be used;
- Only one exit ramp per direction is to be provided at freeway to freeway interchanges;
    - The following interchanges are considered freeway to freeway interchanges:
    - Glenmore Trail SE;
    - Highway 22X (Marquis of Lorne Trail); and
    - Deerfoot Trail SE.
- Alignment of crossroads which exist on tangent within the Project Limits shall remain on tangent in Stage 1 unless a curvilinear alignment is required to address the following:
    - land constraints; or
    - to complement natural topography; or
    - to facilitate the staged delivery of the Ultimate Stage.
- Transition from rural standards to urban standards (curb and gutter), where applicable, is to occur at the urban end of interchange ramps connecting to the crossroads;
- Lane balance shall be provided in Stage 1 and shall be maintained for subsequent staging up to the Ultimate Stage;
- The use of combinations of inter-related minimum design criteria is not acceptable;
- All elevated directional ramps shall be designed to accommodate two lanes, with the exception of northbound Cranston Boulevard SE to northbound Deerfoot Trail SE, which shall be one lane;
- Design Speed and Radii:
    - Stoney Trail Mainline..110 km/h
    - Crossroad (expressways)..90 km/h
    - Crossroad (arterials)..70 km/h
    - Collectors – distributor road (C-D)..80 km/h
    - Directional ramp – freeway to freeway (main level)..90 km/h
    - Directional ramp – freeway to freeway (elevated levels), with the exception of lateral stopping sight distance..80 km/h

- Minimum radii of freeway to freeway (elevated level) ramps .... 340 m
- Directional ramp – entering crossroad.............Match Design Speed of Crossroad
- Loop ramp off main line..50 km/h
- Minimum radii of loop ramp off mainline ....90 m
- Other directional ramps entering freeway (at gore).....................................90 km/h
- Loop ramp off crossroads and C-D road ....50 km/h
- Radii of loop ramp off crossroads and C-D roads ....90 m

Exceptions to design criteria include:

Stoney Trail/Highway 22X/88 Street Interchange
- Highway 22X, east of interchange design speed ....130 km/h
- Southbound to eastbound loop ramp design speed ....55 km/h
- Southbound to eastbound loop ramp radii ....110 m
- Northbound to westbound loop ramp design speed ....45 km/h
- Northbound to westbound loop ramp radii ....70 m
- 88 Street south of interchange - design speed.. 90 km/hr

Stoney Trail/52 Street SE Interchange
- Northbound to westbound loop ramp radii 66.3m
- Westbound to northbound ramp - minimum radius ....110 m

Stoney Trail/Deerfoot Trail SE Interchange
- Deerfoot Trail, from south of Highway 22X to the south Project Limit - design speed: .... 110 km/h
- Deerfoot Trail, north of interchange - design speed: .... 110 km/h
- Southbound to eastbound loop ramp - design speed...................................45 km/h
- Southbound to eastbound loop ramp radii ....70 m
- The basket-weave directional ramp for northbound Deerfoot Trail to eastbound Stoney Trail in the southeast quadrant of the interchange - minimum radius.130 m
- The entering roadway to the northbound to eastbound elevated directional ramp - design speed .... 110 km/h
- The exiting roadway from the westbound to southbound elevated directional ramp - design speed... 110 km/h
- Eastbound Stoney Trail to northbound Deerfoot Trail directional ramp (south of Stoney Trail) - design speed ....70 km/h
- The basket-weave directional ramp for northbound Deerfoot Trail to eastbound Stoney Trail in the southeast quadrant of the interchange – design speed ..60 km/h

Stoney Trail/Peigan Trail Interchange
- Peigan Trail SE - design speed: ....80 km/h
- Northbound to eastbound ramp entering Peigan Trail – minimum radius .... 70 m

196 Avenue SE Interchange
- The 196 Avenue loop ramps - minimum radius .... 55 m
- Westbound to northbound ramp – minimum radius ....110 m

  - Basket-weave bridge structure carrying the northbound C-D road over the ramp connecting 196 Avenue to Deerfoot Trail 80km/h

Stoney Trail/Glenmore Trail Interchange
  - Glenmore Trail - (vertical) - design speed .... 110 km/h
  - Northbound to eastbound ramp – minimum radius .... 250 m
  - Southbound to westbound ramp – minimum radius .... 250 m
  - Eastbound to southbound ramp exiting Glenmore Trail – minimum radius . 90 m

- **Posted Speed:** The design speed shall be a minimum 10 km/h greater than the posted speed, with the following exceptions:
  - Highway 22X, east of 88 Street ....100 km/h

- **Vertical Grades:**
  - Mainline .... 3.0% Max.
  - Directional Ramps and C-D Roads (90 km/h)...................................... 4.0% Max.
  - Directional Ramps and C-D Roads (80 km/h)...................................... 4.5% Max.
  - Ramps
    - On Ramps... 6.0% Max.
    - Off Ramps .... 4.0% Max.
  - Crossroads
    - Interchanges .... 4.0% Max.
    - Flyovers... 5.0% Max.
    - Urban cross-sections (curb & gutter) ....0.6% Min.
  - Design exceptions for Vertical Grades:

    Stoney Trail between the Chaparral Boulevard/Sun Valley Boulevard interchange and the Cranston Boulevard/McKenzie Lake Boulevard interchange.

    East of the Bow River - mainline... 3.6% Max.
    West of the Bow River - mainline.. 4.0% Max.
    Off-ramp from westbound Stoney Trail SE to southbound Chaparral Boulevard SE/northbound Sun Valley Boulevard SE ....6.0% Max.
    Off-ramp from eastbound Stoney Trail SE to southbound Cranston Boulevard SE/northbound McKenzie Lake Boulevard SE ....6.0% Max.

- **K Values:**
  The K Values shall meet or exceed the values shown in the following table:

Design Speed (Km/h)	Crest K Factor	SAG K Factor
130	250	110
120	190	92
110	141	78
100	98	63
90	66	51
80	45	40
70	29	31
50	10	15

Design Speed (Km/h)	Crest K Factor	SAG K Factor
45	7	12

- **Vertical Curves:**
- Minimum length of sag and crest vertical curves:
  - i. On mainline, Marquis of Lorne Trail, and Deerfoot Trail .... 300 m
  - ii. On directional ramps, C-D roads and other roads (Design Speed = 90 km/h) ....250 m
  - iii. On directional ramps, C-D roads and other roads (Design Speed = 80 km/h) .... 200 m
  - iv. On other roads (Design Speed = 70 km/h) .... 150 m
  - v. For the 196 Avenue SE (Cranston Avenue/Seton Boulevard) interchange, the eastbound to northbound loop ramp and the westbound to northbound directional ramp ....120 m

- Minimum distance between crest and sag vertical Points of Intersection (PI):
  - i. On mainline, Marquis of Lorne Trail, and Deerfoot Trail ....500 m
  - ii. On directional ramps, C-D roads and other roads (Design Speed = 90 km/h) ....400 m
  - iii. On directional ramps, C-D roads and other roads (Design Speed = 80 km/h) .... 300 m
  - iv. On other roads (Design Speed = 70 km/h) .... 250 m
  - v. For the 196 Avenue SE (Cranston Avenue/Seton Boulevard) interchange, the eastbound to northbound loop ramp and the westbound to northbound directional ramp ....120 m

- **Superelevation (e max):**
  - o All Roads .... 0.06 m/m

- **Ramp Terminals Along Mainline, Freeways and C-D Lanes:**
  - o Direct taper design as per *Alberta Transportation Highway Geometric Design Guide* for both exit and entrance terminals.
  - o The absolute minimum weaving distance between service interchanges shall be not less than 600m in all cases. The absolute minimum weaving distance between a system interchange and a service interchange or between system interchanges shall be not less than 800 metres in all cases. The weave distances shall be measured in accordance with the *Alberta Transportation Highway Geometric Design Guide.*

- **Lane Widths:**
  - o Mainline .... 3.7 m
  - o C-D Road - 1 Lane .... 4.8 m
    - 2 Lanes .... 3.7 m
  - o Ramp - 1 Lane .... 4.8 m
    - 2 Lanes .... 3.7 m

- Crossroads (Refer to The City of Calgary Standard Drawings and Bridge Drawings in Appendix A).
- Directional Ramps
  - 2 lanes .... 3.7 m
  - 1 lane .... 4.8 m

- **Shoulder Widths:**
  - Mainline
    - Inside (4 and 6 Basic Lanes) .... 2.5 m[1]
    - Inside (8 and 10 Basic Lanes) .... 3.0 m
    - Outside .... 3.0 m

Note #1 - All Stage 1 shoulders that will become a future traffic lane must be 3.7 m wide, except on bridge structures.

  - System Connectors
    - Inside .... 2.5 m
    - Outside .... 3.0 m
  - Directional Ramps
    - Inside (1 lane) .... 1.0 m
    - Inside (2 lanes) .... 2.5 m
    - Outside (1 lane) .... 2.5 m
    - Outside (2 lanes) .... 3.0 m
  - C-D Road
    - Inside (1 Lane) .... 1.0 m
    - Inside (2 Lanes) .... 2.5 m
    - Outside (1 Lane) .... 2.5 m
    - Outside (2 Lanes) .... 3.0 m
  - Ramp
    - Inside (1 Lane) .... 1.0 m
    - Inside (2 Lanes) .... 2.0 m
    - Outside (1 Lane) .... 2.5 m
    - Outside (2 Lanes) .... 3.0 m
  - Crossroads (Refer to Drawings in Appendix A.)

- **Median Width** (as defined in the *Alberta Transportation Highway Geometric Design Guide*)**:**
  - 6 Basic Lanes (Stage 1 with future lanes to be constructed to the inside)...30.6 m
  - 6 Basic Lanes (Ultimate Stage or Stage 1 with future lanes to be constructed to the outside) .... 23.2 m
  - 8 Basic Lanes (Stage 1 and Ultimate Stage) .... 23.2 m

- **Outer Separation for C-D roads in a multiple interchange configuration shall be as follows:**
  - 20.0 m - no transfer lane
  - 30.0 m - with transfer land(s)

- **Pedestrian Walk and Multi Use Trails:**
  - o Width of Multi Use Trail-on grade 3.0 m-on bridges and along retaining structures... 4.2 m
    (The 4.2 m width of Multi Use Trail allows for 0.6 m shy distance to the parapet and/or railing on each side.)
  - o Width of Pedestrian Walk
    - On grade and structures ....2.5 m
  - o Height of Bridge Parapet and/or Railing on bridge and downslope retaining structures outside of Multi Use Trail and Pedestrian Walk shall be .... 1.4 m.
  - o Multi Use Trail and Pedestrian Walk on bridge structures and downslope retaining structures shall be separated from the traffic lanes by a parapet.

- **Slopes** (*All slope ratios are expressed in horizontal:vertical.)***:**
  - Pavement Structure Sideslopes
    - Mainline, System Connectors, and Directional Ramps 6:1
    - C-D Roads, Ramps, and Crossroads 5:1
  - Subgrade Sideslopes
    - Mainline and System Connector
      Fill 0 - 2.5 m 6:1
      Fill 2.5 - 3.0 m .... Slope Variable, Toe at 15 m Fixed
      Fill 3.0 - 4.0 m 5:1
      Fill 4.0 - 5.0 m .... Slope Variable, Toe at 20 m Fixed
      Fill Over 5.0 m 4:1
    - C-D Roads and Ramps
      Fill 0 - 4.0 m 5:1
      Fill 4.0 - 5.0 m .... Slope Variable, Toe at 20 m Fixed
      Fill Over 5.0 .... 4:1
  - Bridge Approaches
    3:1 sideslope acceptable at bridge locations with guardrail and with subgrade to be widened by 1.0 m on each side.
    The subgrade width shall be tapered back to the unwidened subgrade width at a ratio of 30:1.
  - Bridge Headslopes ....2:1 Max.
  - Ditch Backslopes (Top of backslopes to be rounded)
    - Height 0.0 - 3.0 m 5:1
    - Height 3.0 - 5.0 m .... Slope Variable, Toe at 15 m Fixed
    - Height Over 5.0 m...3:1
  - Berms within the Road Right of Way...3:1 Max.
  - Berms within the TUC but outside the Road Right of Way………………………6:1 Max.*
    (* unless otherwise approved in writing and in advance by the Department of Infrastructure)

- **Width of Ditch** *(Ditches shall be rounded.)***:** 3.0 m Min.

- **Bridge Design**
  - o Bridge decks shall have a maximum grade of 3%. Bridges shall not be located on spiral curves or superelevation transitions.

- Exceptions to design criteria include:
  - EB to NB bridge configuration as shown on Drawing 18-A-43 for the EB-NB directional ramp over Deerfoot Trail.

- **Vertical Clearances** *(Allowance to be made during design for all future pavement overlays proposed prior to end of the Term and future railway ballast requirements.)*: `
  - Roadway - Underside of superstructure to top of roadway........................ 5.51 m Min.
  - Roadway – Underside of High Load Corridor superstructure to top of roadway ....9.14 m Min.
  - Railway - Underside of superstructure to top of roadway.......................... 5.51 m Min.
  - Sign Structures – Roadway surface to underside of sign structure or sign panel, whichever is lower.. 6.0 m Min.
  - Pedestrian Overpass - Underside of superstructure to top of roadway .... 5.7 m Min.
  - Roadway - Underside of superstructure to top of rail .... 7.01 m Min.
  - Roadway - To High Voltage Power Lines (69 kV and greater)................. 11.4 m Min. *(Contractor to confirm clearance requirements with power line utility and obtain confirmation in writing.)*
  - Canals - underside of superstructure to highest point on canal bank ....4.8 m Min.

- **Horizontal Clearances:**
  - Edge of shoulder to Bridge Headslope..3.0 m Min.
  - Edge of Ultimate Stage Travel Lane to face of bridge substructure element, retaining walls, existing or relocated power poles and towers, and overhead sign support for structures with two or more vertical supports shall be equal to or greater than the clear zone as specified in *TAC Geometric Design Guide for Canadian Roads*, section 3.1.3. Use of guardrail/barrier to reduce clear zone dimensions is not acceptable for these elements on Stoney Trail mainline, Marquis of Lorne Trail mainline, Highway 2 (Deerfoot Trail) mainline, and Glenmore Trail mainline, C-D roads, directional ramps or loop ramps where the loop ramp cross-section is an extension of the mainline or C-D cross-sections with the exception of the outer separation between SB Deerfoot Trail and the SB-EB ramp from SB Deerfoot Trail to EB Stoney Trail.
  - Edge of Travel Lane to Face of Bridge Parapet or Guardrail
    - Shall meet *TAC* minimum lateral clearance for stopping sight requirements, but shall not exceed 3.5 m.
  - Back of Guardrail to Solid Object
    - Distance to meet manufacturer’s recommendation for design deflection at each design speed.
  - Clear zone calculations for parclo ramps adjacent to bridges shall be based on the directional ramp standard of 90 km/h.

- **Stopping Sight Distance (“SSD”):**
  - Vertical - Exceed *TAC* upper value requirements by 25%
  - Horizontal - Meet or exceed *TAC* SSD upper limits for trucks with conventional braking systems (*TAC* Table 1.2.5.4)
  - Horizontal – In the case of curves at bridge and/or guardrail locations, meet or exceed *TAC* SSD lower limits with shoulder width not to exceed 3.5m. (*TAC* Table 1.2.5.4)

- **Decision Sight Distance**:
  - Stoney Trail, Deerfoot Trail, Highway 22X and Glenmore Trail mainline - interchange exit terminals - decision sight distance shall be based on a driver's eye height of 1.05 m and an object height of 0.0 m at the physical gore. Decision sight distance shall be provided appropriate to the applicable design speed
  - Crossroads - interchange exit terminals - decision sight distance shall be based on a driver's eye height of 1.05 m and an object height of 0.38 m at the physical gore. Decision sight distance shall be provided appropriate to the applicable design speed

- **Horizontal and Vertical Alignments – Stoney Trail Mainline:** The Contractor shall design the mainline horizontal and vertical alignment to avoid any perceived roller coaster or kinked curve appearance, and shall ensure that the alignment complements the existing topography.

- **Horizontal and Vertical Alignments – Crossroads:**
  - Vertical Alignment – K values specified above shall be used as a minimum.
  - Horizontal Alignment approach and departure tapers – follow *TAC* guidelines in designing approach and departure tapers, with taper ratios calculated based on the upper-range value of the design domain (*TAC* section 2.3.8).
  - Transition between two-lane / four-lane Roadways at Intersections – follow *TAC* guidelines in designing two-lane / four-lane transitions, with the parallel lane length calculated based on the upper-range value of the design domain (*TAC* section 2.3.9).
  - Turn Bay Length at Intersection – The length of a Left or Right Turn Bay shall satisfy both deceleration and storage requirements below:
    - Measurement of turn bay length is from the point where the turn bay lane width is 3.0 m to the stopline at the end of the turn bay.
    - Deceleration requirements:

Design Speed of Roadway	Minimum Length of Deceleration Lane including Taper, L_d
60 km/h	90 m
70 km/h	110 m
80 km/h	130 m
90 km/h	150 m
100 km/h	170 m
110 km/h	185 m
120 km/h	200 m
130 km/h	215 m

    - Storage requirements – to be determined based on results of simulation analysis. The length of the turn bay shall be designed so that either the queue in the through lane will not block the turn bays, or the queue in the turn bays will not spill out of the turn bay and block the adjacent through lane.

  - Turn Bay/Taper Length Leading into a Loop Ramp or Free-Flow Right Turn Roadway – The length of a Turn Bay/Taper shall satisfy both deceleration and storage requirements below:

- Measurement of turn bay length is from the point where the turn bay lane width is 3.0 m to the start of the controlling radius of the turning roadway
- Deceleration requirements:

Design Speed of Roadway	Minimum Length of Deceleration Lane including Taper, L_d				
	Design Speed of Turning Roadway Curve (km/h)				
	40	45	50	55	60
60 km/h	70 m	65 m	55 m	50 m	n/a
70 km/h	90 m	85 m	75 m	70 m	60 m
80 km/h	105 m	100 m	95 m	90 m	80 m
90 km/h	125 m	120 m	115 m	110 m	100 m
100 km/h	145 m	140 m	135 m	130 m	120 m
110 km/h	160 m	155 m	150 m	145 m	140 m
120 km/h	180 m	175 m	170 m	165 m	155 m
130 km/h	190 m	185 m	180 m	175 m	170 m

- Storage requirements – to be determined based on results of simulation analysis. The length of the turn bay shall be designed so that either the queue in the through lane will not block the turn bays, or the queue in the turn bays will not spill out of the turn bay and block the adjacent through lane.

o Curves shall be introduced at all through-lane deflections in the vicinity of ramp intersections along crossroads (deflections exceeding one degree). Curves shall be long enough to avoid the appearance of a kink but not so short as to require superelevation.

- **Number of Ramp Approach Lanes at Intersection:**
  - o For crossroads with cross-section of four lanes or more, the ramp intersection approach shall have two lanes to permit double left turn movements from the ramp.

- **Medians:**
  - o Except for Deerfoot Trail SE, the Contractor shall design the roadway to ensure median barriers are not required on the mainline. Medians on crossroads shall be raised type.
  - o All bridge piers located in the medians of Stoney Trail , Highway 2, and Marquis of Lorne Trail shall be centered in the median.

- **Intersections:**

  At-grade intersections shall be designed to accommodate a Turnpike Double (WB-36) design vehicle except for the design of the Service Roads intersections, in which case the WB-21 shall be the design vehicle. Intersection design shall use *desirable* standards from design guides and bulletins as an absolute minimum. At intersections where dual left turn movements are required, the WB-36 design vehicle shall be used for both lanes.

200.2.3 DESIGN SPECIFICS

Additional location specific guidelines have been developed to provide additional directions for Stage 1 construction. These guidelines are intended to ensure specific key elements are addressed in the New Infrastructure.

200.2.3.1 Local Authority Responsibilities

Each Local Authority is responsible for the design and construction of all roadway connections of the crossroads that are outside of the TUC but within the Local Authority's respective corporate limits, except as otherwise provided elsewhere in Section 200 (Project Specifics).

200.2.3.2 Intentionally Deleted

200.2.3.3 Roadway Mainline

Stoney Trail SE:

Stage 1 construction shall include Ultimate Stage subgrade for the mainline and auxiliary lanes, bridge structure fills, and associated loops and ramps, unless noted otherwise in this Section 200.2.3 (Design Specifics). Stage 1 paving shall include lane configuration as shown on Drawings 18-A-12 to 18-A-20 inclusive in Appendix A.

Stage 1 shall include the construction of Stoney Trail mainlines from north of 17 Avenue SE to east of Macleod Trail SE, with paving of three lanes in each direction, unless otherwise shown on Drawings 18-A-12 to 18-A-20 in Appendix A. Future expansion from 6-lanes to 8-lanes will generally be to the median side as shown in Appendix A Drawings 18-A-03 to 18-A-20 inclusive. All mainline bridges shall be designed and constructed to accommodate the ultimate laning configuration plus auxiliary lanes.

Highway 2 (Deerfoot Trail):

Stage 1 shall include the upgrading of Highway 2 from north of Stoney Trail to south of 196 Avenue SE as shown on Drawings 18-A-18 and 18-A-20 in Appendix A. Subject to Section 200.2.3.23 (Detours), the Contractor shall ensure that public traffic on Highway 2 is allowed to operate unimpeded at the existing standards and level of service throughout construction.

All existing roadway lighting along Highway 2 within the Project Limits shall be replaced as part of the New Infrastructure. Existing lighting infrastructure shall become the property of the Contractor.

Highway 22X:

The Marquis of Lorne Trail (Highway 22X) is currently operating as a 2-lane roadway from west of 56 Street to east of 88 Street, and as a 4-lane divided roadway from east of Macleod Trail to west of 56 Street. In general, Highway 22X between 88 Street and east of Macleod Trail will form part of the Stoney Trail mainline.

East of 88 Street, Highway 22X will be upgraded to a short 4-lane divided roadway before transitioning to match the existing 2-lane roadway as shown on Drawing 18-A-07 in Appendix A.

Subject to Section 200.2.3.23 (Detours), the Contractor shall ensure that public traffic on Highway 22X is allowed to operate unimpeded at the existing standards and level of service throughout construction. All existing roadway lighting along Highway 22X shall be replaced as part of the New Infrastructure. Existing lighting infrastructure shall become the property of the Contractor, except on sections of roadway currently under the jurisdiction of The City of Calgary in which case the existing lighting infrastructure shall be returned to The City of Calgary.

Highway 22X and Highway 2 (Deerfoot Trail):

For both Highway 22X and Deerfoot Trail SE, when detours are required, the minimum design speed, number of lanes, and shoulder width specified in Section 200.2.3.23 (Detours) shall apply.

The Local Authority or the Department's highway maintenance contractor for Deerfoot Trail/Highway 2, Carmacks Enterprises Ltd., as applicable, will perform snow and ice control of crossroads, detours, Highway 22X, and Highway 2 (Deerfoot Trail) within the Project Limits during the Construction Period. It is a Project Requirement that all other operation and maintenance of crossroads, detours, Highway 22X, and Highway 2 (Deerfoot Trail) within the Project Limits during the Construction Period, including but not limited to surface repair, line painting, signing, signal and lighting maintenance shall be the Contractor's responsibility and shall be conducted to meet the standards set out in the paragraph below. The Contractor shall notify the applicable entity doing the snow and ice control, with a copy of all such notices provided concurrently to the Department, one month before seasonal construction stops and starts on the applicable roadway. The Contractor shall provide the applicable entity doing the snow and ice control with details of all temporary construction installations to be operated and maintained throughout seasonal shutdown periods. A schedule of planned seasonal shutdown periods shall be provided to the applicable entity doing the snow and ice control and updated as required.

The following requirements, including without limitation Payment Adjustments (unless expressly stated otherwise), shall apply during the Construction Period (with such modifications as necessary) to Highway 22X and Highway 2 (Deerfoot Trail) (the "**Deemed New Infrastructure**") as if Highway 22X and Highway 2 (Deerfoot Trail) were New Infrastructure:

(a) Section 400.1.5 (Imminent Danger Repairs);

(b) Section 400.1.6 (Lane Closure) applied to any reduction of the minimum lane requirements for the Deemed New Infrastructure as set out in Section 200.2.3.23 (Detours). The provisions applicable to the Schedule of Lane Closures and telephone service shall not apply. Except with the prior written approval of the Department, acting reasonably, and except for an Excepted Lane Closure, the Contractor shall not close all lanes in either direction. For planned maintenance activities on Deemed New Infrastructure with two lanes in each direction the Contractor must have at least one lane in each direction open to traffic at all times, unless otherwise approved in writing and in advance by the Province, acting reasonably. Lane Closure Payment Adjustments shall not apply if a Lane Closure is caused by the snow and ice control on the Deemed New Infrastructure of the Local Authority and/or the Department's highway maintenance contractor (pursuant to a direct contract with the Department);

(c) Section 400.2.1.1 (Routine Observations);

(d) Section 400.2.2 (Emergency Maintenance);

(e) Section 400.2.3 (Routine Maintenance);

(f) Section 400.2.4 (Measuring for Compliance);

(g) Section 400.4.1 (Roadway Maintenance Requirements), except for the requirements in the second bullet under Section 400.4.1.2;

(h) Section 400.4.6 (General Pavement Maintenance Requirements), except the requirements in Sections 400.4.6.3 and 400.4.6.4 and that the definition of localized roughness in Section 400.4.6.2 shall be modified to be any abrupt deviation in excess of 12mm when measured with a 1.2m straight edge;

(i) Section 400.4.7 (Miscellaneous - Operation and Performance Requirements), except for the requirements in Section 400.4.7.9 and for any Payment Adjustments set out in Section 400.4.7; and

(j) Section 400.4.8 (Traffic Control Devices - Operation and Performance Requirements), except for any Payment Adjustments set out in Section 400.4.8.

The Contractor shall display during the Construction Period the Contractor's name and phone number on four signs located safely adjacent to Highway 22X and Highway 2 (Deerfoot Trail) within the Project Limits. Each sign panel shall be 4' x 8' and shall be manufactured on 3/4" plywood or extruded aluminum and the sheeting and sign supports shall be in accordance with the Department's recognized products list for non-standard signs. Lettering and symbols shall be clear and legible with minimum lettering size to be 200 mm. Reflective sheeting shall meet or exceed the minimum requirements as specified in the ASTM-4956, Performance Requirements Type IX or Type XI Unmetalized Cube Corner Microprismatic Retroreflective Element Material. All signs are to be installed within two months after the commencement date of the Construction Period and shall be maintained in accordance with Section 400.4.8.1 (Signs).

200.2.3.4 Crossroads

Roadways crossing Stoney Trail shall be designed and constructed in accordance with the Geometric Design standards presented in Section 200.2.2. At transition locations for roadway connections beyond the Project Limits the roadways shall meet the current standards of the Local

Authority. Crossroads to be constructed in Stage 1 are:

- 17 Avenue SE;
- Peigan Trail SE;
- 61 Avenue SE;
- Glenmore Trail SE;
- 114 Avenue SE;
- 130 Avenue SE (grading only);
- 88 Street SE (south side only);
- 52 Street SE;
- McKenzie Lake Boulevard/Cranston Boulevard SE; and
- Sun Valley Boulevard/Chaparral Boulevard SE.

The Contractor shall grade all crossroads to the Ultimate Stage configuration unless noted otherwise in this Section 200.2.3 (Design Specifics). Crossroads shall be paved to the Stage 1 configuration up to the Project Limits and then transitioned beyond the Project Limits to match the existing crossroad section. These transitions must meet current Local Authority standards for the crossroad and shall be deemed Service Roads for the purposes of section 5.18 of the DBFO Agreement except the warranty period shall only be one year.

Unless otherwise specified, the Contractor shall ensure that public traffic on existing cross roads within the Project Limits continues to operate unimpeded at the existing standards and level of service until Traffic Availability.

The Contractor shall consult with and coordinate its work with each Local Authority, as appropriate, regarding timing and tie-ins of the crossroads at the boundaries of the TUC.

Drawings 18-A-12 through 18-A-20 in Appendix A inclusive show the requirements for major arterial roads. Multi Use Trails and Pedestrian Walks requirements shall be as shown on Bridge Information Drawings in Appendix A for individual crossroads. Multi Use Trails and Pedestrian Walks off bridge structures shall extend to the Project Limits. Generally, the alignment of Multi Use Trails and Pedestrian Walks off structures shall be parallel to and offset from the centreline of the crossroad.

Para-curb ramps shall be constructed at all pedestrian crossings. These ramps shall be in accordance with the standards required by the Local Authority for the design and construction of roads within the Local Authority.

Approach nose treatments for islands and medians shall be in accordance with the standards required by the Local Authority for the design and construction of roads within the Local Authority.

Curbs installed on crossroads with design speed exceeding 70 km/h shall be mountable curbs.

The Local Authority or the Department's highway maintenance contractor for Deerfoot Trail/Highway 2, Carmacks Enterprises Ltd., as applicable, will perform snow and ice control of crossroads, detours, Highway 22X, and Highway 2 (Deerfoot Trail) within the Project Limits during the Construction Period. It is a Project Requirement that all other operation and maintenance of crossroads, detours, Highway 22X, and Highway 2 (Deerfoot Trail) within the Project Limits during the Construction Period, including but not limited to surface repair, line painting, signing, signal and lighting maintenance shall be the Contractor's responsibility and shall be conducted to meet the standards set out in the paragraph below. The Contractor shall notify the applicable entity doing the snow and ice control, with a copy of all such notices provided concurrently to the Department, one month before seasonal construction stops and starts on the applicable roadway. The Contractor shall provide the applicable entity doing the snow and ice control with details of all temporary construction installations to be operated and maintained throughout seasonal shutdown periods. A schedule of planned seasonal shutdown periods shall be provided to the applicable entity doing the snow and ice control and updated as required.

The following requirements, including without limitation Payment Adjustments (unless expressly stated otherwise), shall apply during the Construction Period (with such modifications as necessary) to all crossroads (the "**Deemed New Infrastructure**") as if all crossroads were New Infrastructure:

(a) Section 400.1.5 (Imminent Danger Repairs);

(b) Section 400.1.6 (Lane Closure) applied to any reduction of the minimum lane requirements for the Deemed New Infrastructure as set out in Section 200.2.3.23 (Detours). The provisions applicable to the Schedule of Lane Closures and telephone service shall not apply. Except with the prior written approval of the Department, acting reasonably, and except for an Excepted Lane Closure, the Contractor shall not close all lanes in either direction. For planned maintenance activities on Deemed New Infrastructure with two lanes in each direction the Contractor must have at least one lane in each direction open to traffic at all times, unless otherwise approved in writing and in advance by the Province, acting reasonably. Lane Closure Payment Adjustments shall not apply if a Lane Closure is caused by the snow and ice control on the Deemed New Infrastructure of the Local Authority and/or the Department's highway maintenance contractor (pursuant to a direct contract with the Department);

(c) Section 400.2.1.1 (Routine Observations);

(d) Section 400.2.2 (Emergency Maintenance);

(e) Section 400.2.3 (Routine Maintenance);

(f) Section 400.2.4 (Measuring for Compliance);

(g) Section 400.4.1 (Roadway Maintenance Requirements), except for the requirements in the second bullet under Section 400.4.1.2;

(h) Section 400.4.6 (General Pavement Maintenance Requirements), except the requirements in Sections 400.4.6.3 and 400.4.6.4 and that the definition of localized roughness in Section 400.4.6.2 shall be modified to be any abrupt deviation in excess of 12mm when measured with a 1.2m straight edge;

(i) Section 400.4.7 (Miscellaneous - Operation and Performance Requirements), except for the requirements in Section 400.4.7.9 and for any Payment Adjustments set out in Section 400.4.7; and

(j) Section 400.4.8 (Traffic Control Devices - Operation and Performance Requirements), except for any Payment Adjustments set out in Section 400.4.8.

200.2.3.5 Bridge Sections

Bridge Information Drawings 18-A-25 through 18-A-50 inclusive included in Appendix A identify deck cross-section; shoulder and sidewalk configurations; and key plan for all New Infrastructure bridge structures.

Bridge structures which grade separate Stoney Trail SE from crossroads or railways shall be constructed to enable widening of the structure to accommodate the Ultimate Stage laning configuration. Bridges over Stoney Trail SE shall be constructed in Stage 1 to span the Ultimate Stage laning configuration of Stoney Trail SE at that location.

200.2.3.6 Interchanges

Stage 1 construction shall include Ultimate Stage subgrade for all interchanges unless noted otherwise in this Section 200.2.3 (Design Specifics). Stage 1 paving shall include lane configuration as shown on Drawings 18-A-12 to 18-A-20 inclusive in Appendix A.

The Contractor shall ensure that traffic on existing roadways at all interchanges continues to operate unimpeded at the existing standards and level of service through the Project Limits throughout construction.

- Paving
  All pavement structures in the New Infrastructure to tie to the existing pavement at all Project Limits. In the event that the pavement structure for the New Infrastructure differs from that of the existing pavement, grading surfaces shall be transitioned to match seamlessly at Project Limits.

- Retaining Structures
  The Contractor is responsible for all retaining structures necessary for grading of all New Infrastructure within the Project Limits, including those associated with the Contractor's bridge design.

  All retaining wall structures shall have barriers along the top edge. The barrier type shall be in accordance with Section 200.2.4 (Miscellaneous Design Requirements). Barrier placement and construction shall be in accordance with safe roadside design practices as established in the Alberta Infrastructure and Transportation Roadside Design Guide, and Section 300.5 (Bridge Structures). Where a special situation is not covered by the Alberta

Infrastructure and Transportation Roadside Design Guide, provisions in the TAC Geometric Design Guide for Canadian Roads shall be used.

- Bridges
  All bridge structures at interchanges shall be designed and constructed to Ultimate Stage, unless shown otherwise in Drawings 18-A-25 to 18-A-50 inclusive.

- Hazard Protection
  The Contractor is responsible for the design and construction of all required hazard protection for the Contractor's constructed roadway and bridge structure elements.

- Signage
  The Contractor is responsible for the design, supply, and installation of all required signage for the Contractor's constructed roadway and bridge structure elements.

- Roadway Lighting
  The Contractor is responsible for design and installation of all required roadway lighting for the Contractor's constructed roadway and bridge structure elements.

- Traffic Signals
  The Contractor is responsible for design and installation of all necessary traffic signals on the specified interchange ramps and other intersections specified.

- Pavement Markings
  The Contractor is responsible for design and construction of all required pavement markings for the New Infrastructure roadway and bridge structure elements.

- Walks and Multi-use Trails
  The Contractor shall be responsible for the design and construction of all walks and multi-use trails to conform to The City of Calgary specifications. The multi-use trail shall be 3.0 m wide.

200.2.3.6.1 17 Avenue SE

The north terminal of the New Infrastructure is at 17 Avenue where the DBFO contractor for the Northeast Stoney Trail has constructed an at-grade Tee-intersection. The Contractor shall construct a service interchange as part of the New Infrastructure. The work includes the design and construction of the bridge structure at 17 Avenue SE which shall be designed and constructed to the Ultimate Stage configuration. The Contractor shall install traffic signals at all ramp terminal intersections on 17 Avenue SE.

Stoney Trail to the north of 17 Avenue has been constructed as a four lane undivided tee-intersection by the Northeast Stoney Trail DBFO contractor. The Contactor will be required to remove the tee-intersection and construct all necessary roadways required for the ultimate interchange configuration. The Contractor shall ensure that public traffic on 17 Avenue and Stoney Trail, north of 17 Avenue is allowed to operate unimpeded at the existing standards and level of service throughout construction.

Notwithstanding the requirements of Section 200.2.3.23 (Detours) the Contractor shall, at all times, maintain the existing dual left turn movements, from northbound 84 Street SE to westbound 17 Avenue SE at the intersection of 17 Avenue SE and 84 Street SE until such time as existing 84 Street SE is closed and relocated in conformance with the Technical Requirements. The dual left turn movements shall accommodate a WB-21 design vehicle.

17 Avenue SE is considered an arterial roadway with a 70 km/h design speed.

For Stage 1, the Contractor shall tie the New Infrastructure into a 4-lane cross section with curb and gutter.

The Contractor shall design and construct a Service Road jug-handle at the intersection of 17 Avenue and 84 Street as shown on Drawing 18-A-12 in Appendix A. The Service Road intersection shall be signalized. The Contractor shall hire The City of Calgary for the design and construction of the traffic signals; and shall hire The City of Calgary for the maintenance of the traffic signals until Traffic Availability. The existing intersection shall not be closed until such time as the relocated intersection is complete and opened to traffic.

Stoney Trail mainline and interchange ramps shall be designed and constructed to operate effectively in context with existing roadways to the north, east, and west Project Limits on Stoney Trail SE, and 17 Avenue SE, respectively. The north Project Limit shall be in accordance with Section 200.2.3.3 (Roadway Mainline). The west Project Limit shall be the end of the ramp tapers, and the east Project Limits will be the east side of the Service Road jug-handle intersection. Both the east and west Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

200.2.3.6.2 Peigan Trail SE

Peigan Trail SE is considered an expressway with an 80 km/h design speed.

The Contractor shall design and construct a service interchange at Peigan Trail SE as part of the New Infrastructure. The work includes the design and construction of the bridge structure at Peigan Trail SE which shall be designed and constructed to accommodate the Ultimate Stage configuration. The Contractor shall install traffic signals at all ramp terminal intersections on Peigan Trail SE.

Peigan Trail SE will have an ultimate configuration of six lanes with a median barrier. For Stage 1, the Contractor shall tie the New Infrastructure into a 2-lane cross section. West of Stoney Trail, the tie-in shall be constructed on the future westbound lanes. East of Stoney Trail, the tie-in shall be constructed on the future eastbound lanes.

The Contractor shall design and construct a Service Road intersection at the junction of Peigan Trail SE with 84 Street SE Street as shown on Drawing 18-A-13 in Appendix A. The Service Road intersection shall be signalized and handed back to the Local Authority after Traffic Availability. The Contractor shall contract with The City of Calgary for the design and construction of the traffic signals; and shall contract with The City of Calgary for the maintenance of the traffic signals until Traffic Availability. The existing intersection shall not be closed earlier than March 31, 2013, and only after the relocated intersection is completed and opened to traffic.

Both the east and west Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

The Contractor is advised that although Peigan Trail is not part of the Local Authority's High-Load Corridor, all New Infrastructure and Service Road infrastructure shall be designed and constructed to allow the transport of loads up to nine metres in height. Traffic signals and lighting that interfere with overdimension loads shall be equipped with rotatable mast structures.

200.2.3.6.3 61 Avenue SE

The Contractor shall construct a flyover bridge structure at 61 Avenue as shown on Drawing 18-A-29 in Appendix A as part of the New Infrastructure. Stage 1 shall include the construction of a single two-lane bridge structure, however, the Contractor's design shall accommodate the ultimate four-lane configuration.

61 Avenue SE is considered an arterial with a 70 km/h design speed.

The Contractor shall design and construct a crossroad tie-in at the intersection of 61 Avenue SE and 84 Street SE. The crossroad intersection shall be signalized and handed back to the Local Authority at Traffic Availability. The Contractor shall hire The City of Calgary for the design and construction of the traffic signal lights modifications; and shall hire The City of Calgary for the maintenance of the traffic signals until Traffic Availability.

The Contractor is advised that although 61 Avenue is not part of the Local Authority's High-Load Corridor, all New Infrastructure shall be designed and constructed to allow the transport of loads up to nine metres in height. Traffic signals and lighting that interfere with overdimension loads shall be equipped with rotatable mast structures.

Both the east and west Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

The Contractor shall coordinate with the Local Authority with regard to the connection to 61 Avenue on the west side of Stoney Trail beyond the TUC. If the Local Authority has not constructed 61 Avenue beyond the TUC by Traffic Availability, the Contractor shall dead-end the New Infrastructure at the Project Limits. If 61 Avenue beyond the TUC is completed, the Contractor shall tie the New Infrastructure into the Local Authority's roadway.

200.2.3.6.4 Glenmore Trail SE

Glenmore Trail SE is considered an expressway with a 90 km/h design speed. The Stage 1 posted speed shall be 70 km/h.

The Ultimate Stage for the interchange at Glenmore Trail SE will be a partially-directional free-flow systems interchange. The Contractor's design shall be consistent with the ultimate configuration. The Contractor will be required to grade the ultimate configuration of the loop ramps; however, the Contractor will not be required to grade the ultimate free-flow directional ramps. The Stage 1 bridge structure shall be 33.2 metres wide (parapet to parapet) to accommodate two through lanes in each direction and the auxiliary lane from the loop ramps with a 6.0 metre wide median which will accommodate the left turn movements in each direction. Tapers from the loop ramps shall not extend onto the bridge. In the Ultimate Stage, the same structure will accommodate three through lanes in each direction with a 6.0 metre wide median. The NB-WB and SB-EB loop ramp movements will be moved to separate structures to the north and south of the existing structure and the EB-NB and WB-SB movements will be moved to the directional ramps.

For Stage 1, the Contractor shall install traffic signals at all ramp terminal intersections on Glenmore Trail.

The Contractor is advised that Glenmore Trail SE is part of the Local Authority's High-Load Corridor. All New Infrastructure shall be designed and constructed to allow the transport of loads up to nine metres in height. Traffic signals and lighting that interfere with overdimension loads shall be equipped with rotatable mast structures.

As part of the Stage 1 construction, the Contractor shall close the intersection of 84 Street SE and Glenmore Trail SE. The Contractor shall construct cul-de-sac turn-arounds on both sides of Glenmore Trail. The cul-de-sac on the north side shall be designed to accommodate the WB-36 design vehicle. In addition, the Contractor shall construct a gated emergency access from Glenmore Trail to the northern turn-around. The Contractor shall not close the 84 Street intersection until at least March 31, 2013, and only then providing access is available from 84 Street to Peigan Trail SE and 114 Avenue SE, including access across Stoney Trail.

Notwithstanding the requirements of Section 200.2.3.23 (Detours) the Contractor shall, at all times, maintain the existing dual left turn movements, from eastbound Glenmore Trail SE to northbound 84 Street SE at the intersection of Glenmore Trail SE and 84 Street SE until such time as 84 Street SE may be closed in conformance with the Technical Requirements. The dual left turn movements shall accommodate a WB-21 design vehicle.

Glenmore Trail SE beyond the Project Limits will have an ultimate configuration of 6-lanes with a median barrier. For Stage 1, the Contractor shall tie the New Infrastructure into a 4-lane cross section west of Stoney Trail, and into the existing cross-section east of Stoney Trail.

Both the east and west Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

200.2.3.6.5 114 Avenue

The Contractor shall design and construct a service interchange at 114 Avenue SE as part of the

New Infrastructure. The work includes the design and construction of the bridge structure at 114 Avenue SE which shall be designed and constructed to accommodate the Ultimate Stage configuration. The Contractor shall install traffic signals at all ramp terminal intersections on 114 Avenue SE.

114 Avenue SE is considered an arterial with a 70 km/h design speed.

Stage 1 for 114 Avenue shall be 4-lane divided within the Project Limits to match existing roadway.

The Contractor shall relocate the existing 114 Avenue/84 Street intersection to a jug-handle configuration as shown on Drawing 18-A-15 in Appendix A. Traffic signals are not required. The Contractor is advised that the jug-handle service road on the east side of 114 Avenue shall be contained entirely within the available parcel described as Certificate of Title 061 060 939 Short Legal - 9411841, Blk1, Lot 2.

The existing 114 Avenue alignment shall be terminated at the boundary of the TUC. The existing roadway within the TUC shall be obliterated.

Both the east and west Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

The Contractor is advised that currently, The City of Calgary has not programmed the relocation of 114 Avenue SE west of the TUC boundary. The Contractor shall tie the new alignment into The City of Calgary's proposed new roadway. If, four months prior to the Contractor achieving Traffic Availability, The City of Calgary has not committed to complete construction of the relocated 114 Avenue SE beyond the west TUC boundary by Traffic Availability, the Contractor shall also construct a paved two-lane undivided temporary connection between the existing 114 Avenue SE and the new alignment inclusive of a stop-controlled intersection at this location. The temporary connection, if required, shall be constructed along the western edge of the TUC boundary within the TUC.

200.2.3.6.6 130 Avenue

Stage 1 for 130 Avenue SE includes only the grading of the approach fills and loop ramps within the boundaries of the TUC as shown on Drawing 18-A-15 in Appendix A. The grading shall be designed with a design speed of 70 km/h to accommodate the ultimate bridge.

Both the east and west Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

The Contractor shall coordinate with The City of Calgary with regard to the connection to 130 Avenue beyond the TUC.

200.2.3.6.7 Highway 22X

The Contractor shall design and construct a major free flow systems interchange at Highway 22X as New Infrastructure. The New Infrastructure for the systems interchange shall be in general accordance with Drawing 18-A-16 in Appendix A, and shall meet the requirements of Section 200.2.2 (Geometric Design) of Schedule 18 (Technical Requirements).

As described in Section 200.2.3.3 (Roadway Mainline) Highway 22X, east of the interchange, will be designed and constructed as a short 4-lane divided roadway that transitions into a 2-lane undivided roadway beyond the Project Limits. The 4-lane divided roadway, and the 4-lane to two lane transition will be considered New Infrastructure.

The design speed of Highway 22X east of 88 Street shall be 130 km/h. The posted speed shall be 100 km/h.

All bridge structures shall be constructed to their Ultimate Stage as part of Stage 1.

The Contractor shall close the existing 88 Street at the north boundary of the TUC. The existing roadway within the TUC shall be obliterated. The Contractor will not be permitted to close 88 Street access to Highway 22X until after March 31, 2012.

For Stage 1, 88 Street south of Highway 22X shall be transitioned from a four-lane divided to a two-lane undivided roadway within the boundary of the TUC. For Stage 1, 88 Street shall be paved to the south boundary of the TUC.

The Contractor is required to grade the ultimate eastbound to southbound directional ramp and the future twinning of 88 Street southbound.

The design speed for 88 Street south of the TUC shall be 90 km/h.

The existing 72 Street SE shall be closed where its alignment intersects with the north and south boundaries of the TUC. The Contractor shall obliterate 72 Street SE within the TUC .

200.2.3.6.8 52 Street

The Contractor shall design and construct a service interchange at 52 Street SE as part of the New Infrastructure. The work includes the design and construction of the bridge structure at 52 Street SE which shall be designed and constructed to accommodate the Ultimate Stage configuration. The Contractor shall install traffic signals at all ramp terminal intersections on 52 Street SE.

The Contractor’s design shall accommodate the geometry of the City’s future LRT crossing (to be constructed by others).

The existing 56 Street shall be closed at the north and south boundaries of the TUC. The existing roadway within the TUC shall be obliterated. The Contractor is advised that access from Highway 22X for the ENMAX facility on 56 Street SE south shall not be closed prior to December 31, 2010.

52 Street SE is considered an arterial with a 70 km/h design speed.

The 52 Street SE grade separation shall consist of 52 Street SE going over Stoney Trail. The Contractor shall confirm that the vertical alignment of Stoney Trail shall provide adequate clearance for the future LRT crossing as indicated in The City of Calgary's functional plan completed in 2006 and later amended in 2009.

Both the north and south Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

200.2.3.6.9 Deerfoot Trail

The work at Deerfoot Trail requires the modification of an existing Type A4 Parclo interchange into a major free-flow systems interchange. The Contractor shall ensure that public traffic continues to operate unimpeded at the existing standards and level of service throughout construction on both Deerfoot Trail and Stoney Trail.

The Contractor shall design and construct a systems interchange at Deerfoot as New Infrastructure. The interchange shall be constructed in its ultimate configuration. The New Infrastructure shall include the following:

- The Stoney Trail mainline;
- The Deerfoot Trail mainline;
- The directional ramp and bridge structures carrying westbound Stoney Trail onto southbound Highway 2;
- The directional ramp and bridge structure carrying northbound Highway 2 onto eastbound Stoney Trail;
- A directional ramp carrying westbound Stoney Trail to northbound Deerfoot Trail;
- A directional ramp and bridge structures carrying eastbound Stoney Trail onto northbound Deerfoot Trail;
- A directional ramp from southbound Deerfoot Trail to westbound Stoney Trail;
- A directional ramp from southbound Deerfoot Trail onto McKenzie Lake Boulevard;
- A directional ramp/loop ramp carrying southbound Deerfoot Trail onto eastbound Stoney Trail. As part of Stage 1, the Contractor shall grade the approach fills for the future loop ramp bridge structure;
- A single lane basket weave directional ramp carrying northbound Deerfoot Trail onto eastbound Stoney Trail;
- A directional ramp from Cranston Boulevard to northbound Deerfoot Trail, including one bridge structure;
- A basket weave directional ramp and loop ramp carrying northbound Deerfoot Trail onto westbound Stoney Trail. As part of Stage 1, the Contractor shall grade the approach fills for the future loop ramp bridge structure;
- A directional ramp carrying eastbound Stoney Trail onto southbound Deerfoot Trail.

A weave shall not be created between the traffic exiting from McKenzie Lake Boulevard/Cranston Boulevard to northbound Deerfoot Trail and the traffic exiting from eastbound Stoney Trail to northbound/southbound Deerfoot Trail.

Earth berms were installed parallel to Deerfoot Trail on the east and west sides as part of a previous agreement with others. The Contractor shall not reduce the upper most elevation of the existing earth berm unless a noise wall is constructed to an elevation equal to or greater than that of the existing earth berm it replaces. The noise wall shall be designed and constructed so that the requirements of Section 200.2.14 (Noise Attenuation) are satisfied. The noise wall shall be constructed prior the lowering of the existing earth berm or any portion thereof.

The north Project Limit will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

200.2.3.6.10 McKenzie Lake/Cranston Boulevard

The Contractor shall design and construct a service interchange at McKenzie Lake Boulevard/Cranston Boulevard SE as part of the New Infrastructure. The work includes the design and construction of the bridge structure at McKenzie Lake Boulevard/Cranston Boulevard SE which shall be designed and constructed to accommodate the Ultimate Stage configuration. The Contractor shall install traffic signals at all ramp terminal intersections on McKenzie Lake Boulevard SE and Cranston Boulevard SE.

McKenzie Lake Boulevard and Cranston Boulevard are considered arterials with a 70 km/h design speed.

The New Infrastructure shall be designed to tie into The City of Calgary’s connecting roadways near the boundary of the TUC.

The Contractor shall cooperate with The City of Calgary forces performing the rehabilitation of the eastbound Bow River structure. An area measuring approximately 2500 m^2 (50 m x 50 m) shall be left unoccupied for use as a laydown yard by The City of Calgary. The laydown yard area shall be located south of the Stoney Trail grade and east of the Bow River.

Access to McKenzie Meadows Golf Course is achieved via an existing roadway connecting to McKenzie Lake Boulevard in the northwest quadrant of the interchange. The access road is to remain open at all times with traffic operations maintained at current conditions and level of service. If a detour is required for access, the detour road must be constructed to an equal or better standard than the existing access road. The Contractor shall provide McKenzie Meadows Golf Corporation and Alberta Tourism, Parks, and Recreation with a minimum of 30 days written notice prior to the implementation of any detour.

Construction equipment will not be permitted to use the access road without the permission of McKenzie Meadows Golf Corporation and Alberta Tourism, Parks, and Recreation.

Existing drainage to McKenzie Meadows Golf Course and Rotary Park shall not be negatively impacted. Project drainage is not permitted to the areas leased, occupied or belonging to McKenzie Meadows Golf Corporation and Rotary Park.

Areas along the access road disturbed during construction shall be reinstated to match surroundings. Trees shall be replaced on a 1:1 basis and shall be consistent in location, species and caliper.

Roadside signage to Rotary Park and McKenzie Meadows Golf Course shall be installed within the Project Limits and shall follow the standard for Tourist Oriented Directional Signs in accordance with the Sign Up Alberta Tourism Highway Signage Program which is described on the website www.signupalberta.com under the category "Attraction Signs".

Existing signs are the property of McKenzie Meadows Golf Corporation. The main entrance sign to the golf course at the intersection of McKenzie Lake Boulevard and the existing access road shall remain in its current location and shall be protected from damage. The supplementary entrance sign further south along the access road shall be removed and returned to McKenzie Meadows Golf Corporation without damage.

Both the north and south Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

200.2.3.6.11 Sun Valley Boulevard/Chaparral Boulevard

The Contractor shall design and construct a service interchange at Sun Valley Boulevard/Chaparral Boulevard as part of the New Infrastructure. The work includes the design and construction of the bridge structure at Sun Valley Boulevard/Chaparral Boulevard which shall be designed and constructed to accommodate the Ultimate Stage configuration. The Contractor shall install traffic signals at all ramp terminal intersections on Sun Valley Boulevard and Chaparral Boulevard SE.

Sun Valley Boulevard/Chaparral Boulevard are considered aterials with a 70 km/h design speed. The Contractor's design shall accommodate the ultimate configuration loop ramps and the basket-weave directional ramps between Macleod Trail and Chaparral Boulevard, however, the grading of these ramps will not be part of Stage 1 construction.

The New Infrastructure shall be designed to tie into The City of Calgary's connecting roadways near the boundary of the TUC.

Both the north and south Project Limits will generally be at the TUC boundary, except where the vertical or horizontal ramp geometry extends beyond the TUC boundary, in which case the roadway extending beyond the TUC will be included in the Project Limits.

The Contractor shall construct a 6-metre wide gravel access road which centerline shall extend from the intersection of the centerline of Chaparral Street SE and the south boundary of the TUC north to the centre of the access component of the TUC. The centerline of the access road shall extend west along the centre of the access component of the TUC to the point where it intersects with the centerline of the existing access road and shall terminate at that point.

The Contractor shall construct an entrance for the access road at the intersection of Chaparral Street SE and the south boundary of the TUC that will consist of a concrete curb crossing and a typical lockable vehicle gate. The entrance will include 1 metre radius flares that transition from the concrete curb to the gravel access road.

After the Contractor has constructed the new gravel access road it shall obliterate the existing access road that is parallel to and offset approximately 40 metres south of the south edge of pavement of the eastbound carriageway of Highway 22X in accordance with Section 200.4.12 (Roadway Obliteration). The Contractor shall obliterate the access road in its entirety from its entrance at the south edge of pavement of the eastbound carriageway of Highway 22X offset approximately 445 metres west of the centerline of Chaparral Boulevard SE to the intersection of the centerline of the existing access road and the centerline of the new access road. The remainder of the existing access road south of the intersection of the centerline of the existing access road and the centerline of the new access road shall remain in place. The Contractor shall notify ATCO Gas and Pipelines Ltd. a minimum of 60 days prior to removal of the existing access road.

200.2.3.6.12 196 Avenue (Cranston Avenue/Seton Boulevard)

The work at 196 Avenue requires the modification of an existing Type A4 Parclo interchange to add the basket-weave bridge structure carrying the northbound C-D road over the ramp connecting 196 Avenue to Deerfoot Trail, to modify the exit taper for the westbound 196 Avenue to southbound Deerfoot Trail.

For the northbound to eastbound ramp terminal, the existing at-grade intersection configuration shall generally be retained. Notwithstanding the above, the northbound to eastbound movement at the ramp terminal shall be designed to accommodate a WB-36 design vehicle, and be of sufficient length so that queues on the northbound to westbound turn lanes do not obstruct the northbound to eastbound (right turn) movement.

Barrier systems shall be installed to separate the eastbound to northbound and westbound to southbound loop ramp entrances under the 196 Avenue structure from the mainline lanes of Deerfoot Trail.

The Contractor shall install traffic signals at ramp terminal intersections along 196 Avenue SE.

The modifications to the existing interchange shall accommodate the future twinning of 196 Avenue by others.

Cranston Avenue/Seton Boulevard are considered arterials with a 70 km/h design speed.

The east, west and south Project Limits are generally shown on the drawings in Appendix A. If the vertical or horizontal ramp geometry extends beyond these limits, the Project Limits will be extended to include all New Infrastructure.

200.2.3.7 Other Crossings

Stage 1 construction shall include Ultimate Stage subgrade for all other crossings unless noted otherwise in this Section 200.2.3 (Design Specifics). Stage 1 paving shall include lane configuration as shown on Drawings 18-A-28 and 18-A-31 to 18-A-34 in Appendix A.

The Contractor shall ensure that traffic on existing roadways at other crossings continues to operate unimpeded at the existing standards and level of service through the Project Limits throughout construction.

The Contractor shall design and construct a gated access to Lease 918H (NAL Resources well site) north of Glenmore Trail, east of Stoney Trail. The Contractor shall obtain prior written approval from the Department for gate types, sizes and locations. Access to this site will be provided from 84 Street SE.

- Paving
  All pavement structures in the New Infrastructure to tie to the existing pavement at all Project Limits. In the event that the pavement structure for the New Infrastructure differs from that of the existing pavement, grading surfaces shall be transitioned to match seamlessly at Project Limits.

- Retaining Structures
  The Contractor is responsible for all retaining structures necessary for grading of all New Infrastructure within the Project Limits, including those associated with the Contractor's bridge design.

  All retaining wall structures shall have barriers along the top edge. The barrier type shall be in accordance with Section 200.2.4 (Miscellaneous Design Requirements). Barrier placement and construction shall be in accordance with safe roadside design practices as established in the Alberta Infrastructure and Transportation Roadside Design Guide, and Section 300.5 (Bridge Structures). Where a special situation is not covered by the Alberta Transportation and Infrastructure Roadside Design Guide, provisions in the TAC Geometric Design Guide for Canadian Roads shall be used.

- Bridges
  All bridge structures at other crossings shall be designed and constructed to Ultimate Stage, unless shown otherwise in Drawings 18-A-25 to 18-A-50 inclusive.

- Hazard Protection
  The Contractor is responsible for the design and construction of all required hazard protection for the Contractor's constructed roadway and bridge structure elements.

- Signage
  The Contractor is responsible for the design, supply, and installation of all required signage for the Contractor's constructed roadway and bridge structure elements.

- Roadway Lighting
  The Contractor is responsible for design and installation of all required roadway lighting for the Contractor's constructed roadway and bridge structure elements.

- Pavement Markings
  The Contractor is responsible for design and construction of all required pavement markings for the New Infrastructure roadway and bridge structure elements.

- Walks and Multi-use Trails
  The Contractor shall be responsible for the design and construction of all walks and multi-use trails to conform to The City of Calgary specifications. The multi-use trail shall be 3.0 m wide.

200.2.3.7.1 CPR Crossing – North of 114 Avenue

As part of the New Infrastructure, the Contractor shall design and construct bridge structures to grade separate Stoney Trail from the Canadian Pacific Railway – Brooks Subdivision. Within the TUC, the Brooks Subdivision is currently five tracks with no plans for future expansion.
The grade separated structures shall accommodate the Ultimate Stage mainline lanes and ramps from the 114 Avenue SE interchange.

200.2.3.7.2 CNR Crossing – South of Peigan Trail

As part of the New Infrastructure, the Contractor shall design and construct bridge structures to grade separate Stoney Trail SE from the Canadian National Railway line.

The grade separated structures shall accommodate the Ultimate Stage mainline lanes and ramps from the Peigan Trail SE interchange.

200.2.3.7.3 WH (Western Headworks) Canal, South of Glenmore Trail

As part of the New Infrastructure, the Contractor shall design and construct bridge structures to carry the Stoney Trail mainline and the Glenmore Trail directional ramps over the existing WH (Western Headworks) Canal located south of the Glenmore Trail interchange.

The WH (Western Headworks) Canal is considered fish-bearing by Fisheries and Ocean's Canada, and is considered navigable by Transport Canada.

The WH Canal typically operates annually from as early as April 1st to as late as October 15th. The Canal Operating Season is defined as April 1st to October 15th of a given year. Outside of the Canal Operating Season, there may be flowing or standing water, ice, or snow in the WH Canal. Stormwater drainage to the WH Canal outside of the Canal Operating Season will be diverted to the Shepard Stormwater Project at Wasteway 2, which is operated by The City of Calgary. Shortly after seasonal shutdown of the WH Canal in October, a fish rescue is completed prior to October 15th. No construction work shall be done within the Full Supply Level of the WH Canal during the Canal Operating Season. Work performed adjacent to the WH Canal during the Canal Operating Season shall be completed with sufficient care so as not to impact or adversely affect the water delivery and water quality in the WH Canal. Any work within or adjacent to the WH

Canal outside of the Canal Operating Season shall also be completed with sufficient care so as not to impact water delivery and water quality in the WH Canal.

No New Infrastructure drainage is permitted to the WH Canal. Snow removal operations shall be carried out to ensure that snow, ice or any other substance from the overpassing bridge shall not enter the WH Canal.

Piers outside the Full Supply Level of the WH Canal are preferred. Full Supply Level in the WH Canal is defined as 2.75 m measured from the bottom of the WH Canal. However, the flow depth in the WH Canal may approach the top of bank (4.0 m) for short duration stormwater inflow events.

Piers may be designed to be located at or below the Full Supply Level of the WH Canal. The design and construction of any piers at or below the Full Supply Level shall ensure that:

- the WH Canal's bentonite liner located in the vicinity of the Shepard Ditch is not damaged and that the function of the bentonite liner remains as designed;
- scour of the WH Canal is prevented;
- existing hydraulic performance of the WH Canal is not altered, for example including measures to mitigate the occurrence of trapped debris and headloss;
- existing WH Canal freeboard is maintained;
- piers will not affect the performance of stormwater outfalls into the WH Canal;
- additional future WH Canal rehabilitation and maintenance costs are not incurred; and
- safety of canoeists using the WH Canal shall be taken into consideration at all levels of flow. In this regard, placement of the piers shall be as close to the edge of the WH Canal as possible and piers shall be without sharp edges.

Piers shall not interfere with the existing vehicular accesses and pedestrian pathways on the WH Canal banks.

All disturbed areas shall be reclaimed to match or exceed existing conditions. Any shrubs and trees that are disturbed or removed during construction shall be replaced on a 2:1 basis, regardless of their condition at the time of construction. Trees and shrubs shall be replaced with those of the same species, or approved alternate. Replacement trees and shrubs shall be of a similar size as those removed.

The existing vehicular accesses and pedestrian pathways along and adjacent to the WH Canal shall be maintained during construction. Should vehicular access or pedestrian pathway detours be required, measures including proper signage and fencing/barriers shall be installed to ensure public safety. The City of Calgary Pathways closure guidelines shall be used and satisfied.

Vehicular accesses and pedestrian pathways affected by construction shall be rehabilitated to their original state or better upon completion of construction. Any fencing removed for the construction work shall be reinstated upon completion of construction. Any pedestrian gates that are removed for construction must be wheelchair accessible upon re-installation.

Access roads along the WH Canal are to remain in their existing location with no alteration to their widths permitted. Existing accesses for maintenance vehicles at 68 Street and 84 Street are required and shall remain open unless an alternate access is approved by the Department.

Erosion control measures shall be implemented during construction. For any work that is conducted in the WH Canal outside of the Canal Operating Season, the WH Canal banks shall be rehabilitated to their original design or better.

The Contractor shall notify the Department at least fourteen working days prior to any proposed activity within the WH Canal right-of-way.

The Contractor is advised that the canal is used by canoeists, including members of the Bow Waters Canoe Club. Accordingly, should the Contractor require that the WH Canal be temporarily closed to canoe traffic during the Canal Operating Season, the Contractor shall undertake the following measures at least one month in advance of the closure:

- Notify the Bow Waters Canoe Club (Armand Magotiaux, Executive Director, (403) 235-2922) of such closure including its expected duration; and
- Provide signage and a map at the Bow Waters Canoe Club indicating that the WH Canal is closed to canoe traffic from Wasteway 1 to Chestermere Lake.

At least one week in advance of the closure the Contractor shall:

- Advertise the WH Canal closure in Calgary and Chestermere local newspapers; and
- Provide a boom in the WH Canal immediately downstream of the Wasteway 1 portage ramp (approximate Station 4+030).

The Province has entered into an Access and Maintenance Agreement with The City of Calgary dated November 21, 1991 and an Addendum thereto dated April 7, 1993 (together the "**Access Agreement**") which recognizes that the City wishes to use certain land to provide recreation benefits to its citizens, and which recognizes that the Province and the City have agreed to share responsibility for maintaining certain recreational facilities in accordance with the Access Agreement. Such maintenance work will need to be coordinated with certain portions of the Project and the O&M. Accordingly, the Contractor shall provide all reasonable cooperation with the City to enable the City to complete its obligations under the Access Agreement in the area that is within both the TUC and within the WH Canal right-of-way boundary, in accordance with the Access Agreement. If and as often as the Contractor becomes aware that activities in respect of the Access Agreement of The City of Calgary will affect or interfere with the Project, the O&M or any obligations of the Contractor under this DBFO Agreement, the Contractor shall as soon as practicable provide the Province with notice, including reasonable details, of those activities.

The following obligations of Alberta Environment under the Access Agreement shall be the obligations of the Contractor during the Construction Period in respect of that area which is common to, and formed by the intersection of, the TUC and the WH Canal right of way, namely:

- the review and repair of the structural integrity of primary pathways once per Canal Operating Season;
- the review and repair of fencing and of access control gates structural integrity seven times per Canal Operating Season; and
- the review and repair of the structural integrity of the Province's signs once per Canal Operating Season

For the avoidance of doubt, nothing in this Subsection 200.2.3.7.3 derogates from the obligation of the Contractor to obtain all regulatory approvals and permits that may be required by applicable laws.

200.2.3.7.4 Shepard Ditch Crossing – 114 Avenue East

The Contractor shall construct a bridge culvert/bridge structure crossing to carry 114 Avenue over the Shepard Ditch, on the east side of Stoney Trail. The Contractor shall design and construct the crossing of the Shepard Ditch in accordance with The City of Calgary's drainage design standards and long-term plans for Shepard Ditch.

The Contractor is advised that the Shepard Ditch was designed by The City of Calgary for a design surcharge flow of 49 cubic metres per second with minimum tailwater effects to the CP Railway crossing and 114 Avenue SE. The Contractor's design and construction of the bridge culvert/bridge structure through 114 Avenue SE shall be such that the design flows stated above are not reduced.

The Shepard Ditch must remain in service, passing underneath 114 Avenue SE. The detailed design of any bridge size culverts shall be in accordance with the Department's hydrotechnical requirements. Access to both sides of the Shepard Ditch south of the existing 114 Avenue SE must be maintained. As well, access to the canal off of 84 Street north to the new alignment of 114 Avenue SE must also be maintained. Where the realigned 114 Avenue SE will block access along the ditch, cul de sacs will be required as per the typicals shown in Drawing 18-A-24 in Appendix A.

The bridge culvert/bridge structure carrying 114 Avenue east across the Shepard ditch, shall be designed and constructed with sufficient length to accommodate the Ultimate Stage configuration for both 114 Avenue SE and the ramps.

Shepard Ditch is considered to be non-fish bearing by Fisheries and Oceans Canada.

200.2.3.7.5 Regional Trail/Watercourse – Glenmore Trail West

The City of Calgary has future plans to relocate a watercourse and construct a regional pathway within the TUC, west of the Glenmore Trail interchange. The Contractor shall design and construct a bridge culvert crossing of Glenmore Trail SE to accommodate the future watercourse realignment (by others).

The Contractor shall coordinate with The City of Calgary to ensure the bridge culvert is placed at the proper inverts, and has sufficient capacity to accommodate a design flow rate of 12 m^3/s.

Prior to Traffic Availability and the hand-over of the watercourse crossing to the Local Authority, the Contractor shall invite the Local Authority to attend the final project inspection for all infrastructure that will become the Local Authority's responsibility.

Following Traffic Availability, the Contractor shall hand-over the finished watercourse crossing to the Local Authority. All design, construction, hand-over, and warranty requirements for the watercourse crossing shall be in accordance with section 5.18 (Service Roads) of the DBFO Agreement, except that the term Service Roads will be replaced by the term "watercourse crossing" as necessary.

200.2.3.7.6 Westbound Bridge Carrying Stoney Trail Over the Bow River

Notwithstanding that the Highway 22X Bow River Bridges are defined as part of the Existing Infrastructure, the Contractor shall modify the existing westbound bridge structure to operate with three through lanes by eliminating the pedestrian walkway on the structure. This work shall include the removal of the existing precast concrete barriers; removal and disposal of the pedestrian railing mounted on the existing north concrete barrier; supply and installation of new traffic rail in accordance with Department Standard Drawings S-1702-06 to S-1705-06 inclusive on top of the existing north concrete barrier; and removal of other related appurtenances that delineate the walkway followed by the establishment of lane markings. The Contractor shall remove the portion of the pathway on the westbound bridge headslopes and complete reclamation to the area to match the surroundings.

The Contractor shall store the barriers on site and provide The City of Calgary with written notice (and with a copy concurrently to the Department) that any barriers to be salvaged are to be removed by the City within 30 days. If the City has not removed the barriers within 30 days from notice, the barriers become the property of the Contractor.

The Contractor shall establish a pathway connection from the sidewalk on the eastbound bridge to the existing pathway network on the east and west sides of the eastbound bridge. The pathway connections shall be of equivalent standard to the existing pathway connections at the westbound bridge.

The Contractor shall remove the pathway connections from the westbound bridge and landscape to a natural appearance.

200.2.3.8 Intentionally Deleted

200.2.3.9 Intentionally Deleted

200.2.3.10 Intentionally Deleted

200.2.3.11 Intentionally Deleted

200.2.3.12 Intentionally Deleted

200.2.3.13 Intentionally Deleted

200.2.3.14 Intentionally Deleted

200.2.3.15 Intentionally Deleted

200.2.3.16 Intentionally Deleted

200.2.3.17 Intentionally Deleted

200.2.3.18 Service Roads

The Contractor shall design and construct Service Roads as described herein, and as detailed in the Appendix A drawings.

The Contractor shall ensure that traffic on existing roadways and intersections continues to operate unimpeded at the existing standards and level of service throughout construction.

The Contractor is responsible for the design and construction of all permanent signing, pavement markings, lighting and signalization of Service Roads.

Where intersection lighting and traffic signals are required on Service Roads and Service Road intersections, the Contractor shall hire The City of Calgary to undertake the design and construction of the intersection lighting and traffic signals; and shall hire The City of Calgary for the interim maintenance of the intersection lighting and traffic signals until Traffic Availability.

Prior to Traffic Availability and the hand-over of Service Roads to the Local Authority, the Contractor shall invite the Local Authority to attend the final project inspection for all infrastructure that will become the Local Authority's responsibility.

200.2.3.18.1 17 Avenue Jughandle

The Contractor shall design and construct a Service Road jug-handle at the intersection of 17 Avenue and 84 Street. The new Service Road intersection shall be signalized.

The existing intersection shall not be closed earlier than March 31, 2013, and only then after the relocated intersection is completed and opened to traffic.

200.2.3.18.2 Peigan Trail/84 Street Intersection

The Contractor shall design and construct a Service Road intersection at the junction of Peigan Trail SE and 84 Street SE. The Service Road intersection shall be signalized.

All Service Road infrastructure shall be designed and constructed to allow the transport of loads up to nine metres in height on the roadway. Traffic signals and lighting that interfere with overdimension loads shall be equipped with rotatable mast structures.

200.2.3.18.3 61 Avenue/84 Street Intersection

The Contractor shall design and construct an intersection at the junction of 61 Avenue and 84 Street. This intersection is to be turned over to the Local Authority upon construction completion and shall be deemed a Service Road. The Service Road intersection shall be signalized.

All Service Road infrastructure shall be designed and constructed to allow the transport of loads up to 9 metres in height on the roadway. Traffic signals and lighting that interfere with overdimension loads shall be equipped with rotatable mast structures.

200.2.3.18.4 114 Avenue/84 Street Jughandles

The Contractor shall design and construct a jug-handle realignment of the existing 114 Avenue/84 Street intersection as shown on drawings in Appendix A.

The existing intersection shall not be closed until March 31, 2013, and only then when the relocated intersection is complete and opened to traffic.

Traffic signals are not required at the new intersection.

200.2.3.18.5 Intentionally Deleted

200.2.3.19 Intentionally Deleted

200.2.3.20 Road Closures

The Contractor shall be responsible for the physical closure of existing roads at locations shown on Drawings 18-A-12 to 18-A-20 in Appendix A.

The Contractor is responsible for all permits and approvals for the physical road closures and removals, construction of the required turnarounds, installation of appropriate signing regarding “no exit”, installation of barricades and disposal of all materials and restoration of the closed road to a natural landscaped area, including the restoration of drainage to its original lines. The roadway structure shall be removed then topsoiled and seeded in accordance with Section 200.2.9 (Topsoil and Seeding).

The Contractor is responsible for coordination of all removals and closures with the Local Authority. The Contractor shall apply to the Local Authority for road closure permits a minimum three months prior to the planned date of the road closure. The Department will be responsible for obtaining legal road closure and the Contractor shall cooperate with the Department in the supply of information for legal road closure.

The Contractor shall not close any road until such time as permanent alternative access to affected properties is available and in full operation. Notwithstanding the previous statement, when specified, the road closure shall not be implemented until after the specified date, if applicable.

The following shall apply:

- The Contractor shall close the existing intersection of 17 Avenue and 84 Street.
- The Contractor shall close 50 Avenue at the boundary of the TUC.
- The Contractor shall close the intersection of 84 street and Glenmore Trail. The Contractor shall not close the 84 Street intersection until after March 31, 2013, and only then after access to 84 street is available from Peigan Trail and 114 Avenue, and access across the TUC is available at Peigan Trail and 114 Avenue.
- The existing 114 Avenue alignment shall be terminated at the boundary of the TUC.
- The Contractor shall close the existing 88 street at the north boundary of the TUC, but not before March 31, 2012.
- The existing 72 Street shall be closed at the north and south boundaries of the TUC.
- The existing 56 Street shall be closed at the north and south boundaries of the TUC.
- The existing access road for Lease 942H (as described in Appendix G) shall be closed at Highway 22X.

Turnarounds shall be constructed at locations shown on Drawings 18-A-12 to 18-A-20 in Appendix A. When specified or shown on the drawings, turnarounds shall be designed and constructed to accommodate a WB-36 design vehicle.

200.2.3.21 Intentionally Deleted

200.2.3.22 Intentionally Deleted

200.2.3.23 Detours

The Contractor is responsible for maintaining existing traffic and access on all roadways and for all properties affected by the construction. The extent of all detours shall be constructed entirely within the TUC.

The Contractor shall provide detour plans showing geometry, traffic accommodation, and signing changes to the Local Authority for their information a minimum of 14 calendar days prior to detour implementation.

Detours for all crossroads, if required, shall maintain safe passage of traffic, and shall allow for the minimum number of specified lanes open in each direction at all times. All such detours must be constructed with a surface type equal to or better than the surface on the connecting roadways on either end of the detour, and shall meet specified minimum design and posted speeds. Detours shall be illuminated to equivalent standards of existing roadway.

Detour standards (minimum lanes and minimum design and posted speeds) are indicated in the following table:

Connecting Roadway(s)	Min. # Lanes (Each Direction)	Min. Shoulder Width (m)	Minimum Design Speed	Minimum Posted Speed
196 Avenue (Cranston Avenue/Seton Boulevard)	1	1.0	60	50
Deerfoot Trail	2 mainline lanes in each direction plus 1 lane ramps for all turning movements	2.0	90	80
Sun Valley Boulevard/Chaparral Boulevard	2	1.0	60	50
McKenzie Lake Boulevard/Cranston Boulevard	2	1.0	60	50
52 Street SE	1	1.0	60	50
88 Street SE	1	1.0	60	50
Highway 22X – west of 56 Street	2	1.5	70	60
Highway 22X – east of 56 Street	1	2.0	90	80
130 Avenue SE	0	N/A	N/A	N/A
114 Avenue SE	1	1.0	60	50
Glenmore Trail SE	1	1.0	60	50
61 Avenue	1	1.0	60	50
50 Avenue	0	N/A	N/A	N/A
Peigan Trail SE	1	1.0	60	50
17 Avenue SE	2	1.0	60	50

Notwithstanding the minimum lane requirements in the preceding table, the Contractor shall maintain throughout construction existing traffic movements at all loops and ramps, all movements at at-grade intersections, and accesses to properties affected by construction activities until the access is to be removed, where applicable. The detour extents shall be constructed entirely within the TUC.

The Department may permit short term local detours to reroute traffic at crossroads or interchanges to accommodate short term construction operations such as girder erection. Prior to the implementation of short term local detours the Contractor shall submit to the Department for review a detailed detour plan and other material to comply with The City of Calgary's processes for incorporation into the Contractor's Traffic Management Plan under Section 100.2.5, and an updated Traffic Management Plan identifying the number of lanes, all horizontal and vertical detour geometry, anticipated traffic volumes relative to peak traffic volumes, traffic management and traffic control devices, and hours of operation. A single lane detour may be used for short term, local detours wherever the traffic can be safely accommodated on a single lane. The Contractor shall notify the appropriate Local Authority and emergency service providers, with a copy of all such notices provided concurrently to the Department, a minimum of one week prior to all proposed short term traffic interruptions. Short term detours shall be limited to the hours of 10:00 pm to 6:00 am local time.

If the Contractor's detour requires the alteration of traffic signals or traffic signal timing on signals owned by The City of Calgary, the Contractor shall coordinate any changes with the City, and shall hire the City to make the necessary signal revisions. In addition, the Contractor shall confirm that the signal alteration will not result in a reduction of capacity during the AM and PM peak periods.

The Local Authority or the Department's highway maintenance contractor for Deerfoot Trail/Highway 2, Carmacks Enterprises Ltd., as applicable, will perform snow and ice control of crossroads, detours, Highway 22X, and Highway 2 (Deerfoot Trail) within the Project Limits during the Construction Period. It is a Project Requirement that all other operation and maintenance of crossroads, detours, and Highway 22X within the Project Limits during the Construction Period, including but not limited to surface repair, line painting, signing, signal and lighting maintenance shall be the Contractor's responsibility and shall be conducted to meet the standards set out in the paragraph below. The Contractor shall notify the applicable entity doing the snow and ice control, with a copy of all such notices provided concurrently to the Department, one month before seasonal construction stops and starts on the applicable roadway. The Contractor shall provide the applicable entity doing the snow and ice control with details of all temporary construction installations to be operated and maintained throughout seasonal shutdown periods. A schedule of planned seasonal shutdown periods shall be provided to the applicable entity doing the snow and ice control and updated as required.

The following requirements, including without limitation Payment Adjustments (unless expressly stated otherwise), shall apply during the Construction Period (with such modifications as necessary) to all detours (the "**Deemed New Infrastructure**") as if all detours were New Infrastructure:

(a) Section 400.1.5 (Imminent Danger Repairs);

(b) Section 400.1.6 (Lane Closure) applied to any reduction of the minimum lane requirements for the Deemed New Infrastructure as set out in Section 200.2.3.23 (Detours). The provisions applicable to the Schedule of Lane Closures and telephone service shall not apply. Except with the prior written approval of the Department, acting reasonably, and except for an Excepted Lane Closure, the Contractor shall not close all lanes in either direction. For planned maintenance activities on Deemed New Infrastructure with two lanes in each direction the Contractor must have at least one lane in each direction open to traffic at all times, unless otherwise approved in writing and in advance by the Province, acting reasonably. Lane Closure Payment Adjustments shall not apply if a Lane Closure is caused by the snow and ice control on the Deemed New Infrastructure of the Local Authority and/or the Department's highway maintenance contractor (pursuant to a direct contract with the Department);

(c) Section 400.2.1.1 (Routine Observations);

(d) Section 400.2.2 (Emergency Maintenance);

(e) Section 400.2.3 (Routine Maintenance);

(f) Section 400.2.4 (Measuring for Compliance);

(g) Section 400.4.1 (Roadway Maintenance Requirements), except for the requirements in the second bullet under Section 400.4.1.2;

(h) Sections 400.4.4 (Rutting Performance Requirement (New Infrastructure Only)) and 400.4.6 (General Pavement Maintenance Requirements). Detours shall be designed to accommodate the anticipated traffic and to meet the requirements of "$/Isolated Deficiency" column of Section 400.4.4.2 (Payment Adjustments) of Section 400.4.4 (Rutting Performance Requirement (New Infrastructure Only)) and Section 400.4.6 (General Pavement Maintenance Requirements), except the requirements in Sections 400.4.6.3 and 400.4.6.4 and that the definition of localized roughness in Section 400.4.6.2 shall be modified to be any abrupt deviation in excess of 12mm when measured with a 1.2m straight edge;

(i) Section 400.4.7 (Miscellaneous - Operation and Performance Requirements), except for the requirements in Section 400.4.7.9 and for any Payment Adjustments set out in Section 400.4.7; and

(j) Section 400.4.8 (Traffic Control Devices - Operation and Performance Requirements), except for any Payment Adjustments set out in Section 400.4.8.

Stoney Trail General Partnership through its subcontractor Carmacks Maintenance Services Ltd. will be responsible for winter maintenance on the portion of Stoney Trail SE located north of 17 Avenue.

The Contractor is expected to act reasonably and professionally throughout construction and shall take all reasonable precautions to prevent damage to existing infrastructure.

The Contractor will be permitted to detour traffic onto bridges included with the New Infrastructure prior to Traffic Availability.

200.2.3.24 Demolition

The Contractor shall demolish, remove and dispose (the "**Demolition**") of all buildings, associated works (wells, poles, etc.), other structures or installations located on the Affected Areas (as defined below), and all existing fences and above ground constructed features within the crossroads rights-of-way described in the City Agreement (as defined in Section 200.4.1 (The City of Calgary)). The Contractor shall obtain all required permits and approvals for the Demolition. The Province shall ensure the Affected Areas have been vacated by the Affected

Areas' tenants so as to enable the Contractor to carry-out the Demolition. The Contractor shall remove and dispose of all rubbish from the Affected Areas after tenants have vacated. The Contractor shall restore the Affected Areas after the Demolition to a landscaped state consistent with the surrounding area, including the restoration of existing drainage. Burial of the demolition materials shall not be allowed. The "**Affected Areas**" means those lease areas as set out in Appendix G (Alberta Infrastructure Land Lease Summary and Drawings).

200.2.4 MISCELLANEOUS DESIGN REQUIREMENTS

The Contractor shall meet or exceed the following miscellaneous design requirements:

- Design Vehicles - At-grade intersections shall be designed to accommodate Turnpike Double (WB-36) vehicles as defined in the *Alberta Transportation Highway Geometric Design Guide*;
- Rumble Strips - Longitudinal rumble strips on either shoulder or centreline shall not be used;
- Barrier - Unless noted otherwise in this Section, barriers used on mainline, connectors, ramps and C-D roads shall be modified thrie beam guardrail using steel posts (Type SGR09B as defined in "A Guide to Standardized Highway Barrier Hardware" by the Joint AASHTO-AGC-ARTBA Committee, May 1995). The minimum length of the steel guardrail posts shall be 2.06 m. Post spacing shall be 1.905 metres. Steel offset blocks shall be used. Concrete barriers may be used at bridge locations on crossroads. Vehicular Traffic Barriers that are supported on top of a retaining wall shall be rigid barriers and shall meet, the requirements of Performance Level 2 or higher as defined by the Canadian Highway Bridge Design Code (CAN/CSA-S6-06). Bicycle barriers meeting the requirements of the Canadian Highway Bridge Design Code (CAN/CSA-S6-06) shall be provided in locations where Walks and Multi-use Trails are located adjacent to and on the high side of a retaining wall. At all other locations, top of retaining walls shall be provided with "safety handrails". Safety handrails shall meet the requirements of the Canadian Highway Bridge Design Code (CAN/ CSA-S6-06), except the openings limit of 150 mm in the second paragraph of section 12.4.4.2 of the Canadian Highway Bridge Design Code shall not apply. Safety handrails shall have a minimum height of 1070 mm and, as a minimum, consist of vertical posts and two horizontal rails. The retaining wall shall be designed to resist the loads from all barriers;
- Energy Attenuator System - The energy attenuator systems for guardrail approach terminals shall pass all required tests for a Test Level 3 (TL-3) for terminals and redirective crash cushions of the *National Cooperative Highway Research Program ("**NCHRP**") Report 350*;
- Transitions to Bridge Parapets - The transitions to bridge parapets shall pass all required tests for a Test Level 4 (TL-4) of *NCHRP Report 350*;
- Bridge Barrier - Bridge barriers shall meet, as a minimum, the requirements of Performance Level 2 as defined by the *Canadian Highway Bridge Design Code* (CAN/CSA-S6-06), except that Performance Level 3 barriers shall be provided on all of the following structures:
    - All structures carrying the mainline;
    - All structures located on directional ramps;
    - All structures carrying Glenmore Trail SE; and
    - All structures carrying Peigan Trail SE;
- Signals - All signal systems shall be reasonably similar to those used by the Local Authority. The signal timing shall be coordinated with the Local Authority. The signal electronics shall

meet NEMA standards. All poles and hardware shall be galvanized;

- Traffic signal systems shall include emergency vehicle override system that is compatible with the Local Authority's emergency equipment, vehicle detection, and traffic signal communication interconnection systems;
- Maintenance cross-overs in the median of the mainline or between the mainline, C-D roads or ramps shall not be allowed;
- Roadway set-back distances from oil and gas wells shall be compliant with Energy Resources Conservation Board (or its successor) regulations and guidelines and shall address both the current operating status of the wells (which may include abandoned, decommissioned, or active wells) and the potential future operating status;
- Evaluation of Bridges for Permit Vehicles - All bridges shall be evaluated for permit vehicle configurations as shown in Sketches SK-2 through SK-8 inclusive in Appendix B. These permit vehicles shall be evaluated as Permit-Single Trip (PS) vehicles in accordance with Section 14 of Canadian Highway Bridge Design Code (CAN/CSA-S6-06). The outcome of the Contractor's evaluation shall be the maximum gross vehicle weight (GVW) that the bridge can carry for each permit vehicle configuration, and this information shall be indicated on the bridge drawings in a concise format consistent with the Department's *Engineering Drafting Guidelines for Highway and Bridge Projects*, and also this information shall be presented to the Department in a separate summary report as part of the As-Built Construction Reports. It should be noted that these permit vehicles do not meet the requirements for the simplified methods of analysis for live load as outlined in Section 5 of the Canadian Highway Bridge Design Code (CAN/ CSA-S6-06); and
- On roadways with design speed less than or equal to 70 km/h, urban pavement marking arrows shall be used in accordance with Figures TCS-C-401.1, TCS-C-405 and TCS-C-405.1 of the Department's *Highway Pavement Marking Guide* (March 2003). On roadways with a design speed greater than 70 km/h, rural pavement marking arrows shall be used in accordance with Figure TCS-C-401 of the Department's *Highway Pavement Marking Guide* (March 2003).

200.2.5 DRAINAGE

The basis for drainage design shall be generally as outlined in the Functional Plan except where noted below. Drainage works shall be designed in accordance with *Alberta Transportation's Design Bulletin #16/2003 - Drainage Guidelines for Highways Under Provincial Jurisdiction in Urban Areas* (Revised July 2007), *Alberta Transportation's Best Practice Guidelines for Culvert Selection* and in accordance with the requirements of the Local Authority.

The following exceptions to the design criteria as stated in Design Bulletin #16/ 2003 shall apply:

- Notwithstanding what is stated in Page 3 of 7 of the Design Bulletin #16/ 2003 regarding highway ditches, the highway ditches should maintain a minimum slope of 0.2% to prevent standing water and also be designed to minimize velocities to avoid excessive erosion.
- Notwithstanding what is stated in Page 4 of 7 of the Design Bulletin #16/ 2003 regarding dry ponds, the maximum allowable fluctuation of the 1:100 year event is 2.5m and the minimum bottom slope is 1.0%.

- Notwithstanding what is stated in Page 4 of 7 of the Design Bulletin #16/ 2003 regarding wet ponds, the allowable fluctuation depth above the permanent pool is 2.5m.

Stormwater storage facilities shall be sized to accommodate stormwater from within the Road Right of Way, remaining areas of the TUC, and pre-development flow volumes from areas outside the TUC within the natural drainage basin. Based on contouring, any existing upstream flows from contributing areas, not already shown in Drawings 18-A-51 and 18-A-52 in Appendix A should be incorporated into the drainage design of the TUC. Drawings 18-A-51 and 18-A-52 in Appendix A were provided by The City of Calgary, Water Resources. If pond sizing and piping need to be increased accordingly it shall be done on the basis that runoff from these upstream areas will be calculated using a maximum release rate of 1.0 L/s/ha. To define the additional area, if any, the TUC boundary in the Functional Plan is to be used and compared to boundary shown in Drawings 18-A-51 and 18-A-52.

All permanent drainage systems and facilities shall be designed and constructed as gravity flow. The use of pumping systems or forcemains will not be permitted.

The facilities shall be designed and operated to regulate all runoff discharge to receiving bodies at the approximate locations and in quantities generally outlined in the Functional Plan, and as noted herein.

The following information is supplementary to the Functional Plan, as shown in Drawings 18-A-51 and 18-A-52 in Appendix A. The comparison of drainage areas is shown in Table 1, along with allowable unit release rates for each area. The Functional Plan did not include the road portion between Deerfoot Trail and Macleod Trail, areas Q through U on Drawing 18-A-52 in Appendix A and areas A, F, G, K and L adjacent to the TUC on Drawings 18-A-51 and 18-A-52 in Appendix A.

Table 1. Comparison of Drainage Areas

Areas on Fig 1 & 2	**Unit Release Rate (L/s/ha)**	**Approx Area (ha)**	**Corresponding Functional Plan Area**		**Comments**
A	2.5	740	Not included		Adjacent to TUC
B	2.5	50	17 Avenue SE		
C	2.5	158	Peigan Trail		
D	2.5	82	61 Ave/Glenmore Tr		
E	2.5	141	61 Ave/Glenmore Tr		
F	2.5	78	Not included		Adjacent to TUC
G	2.5	99	Not included		Adjacent to TUC

H	1.0 or 2.5**	170	106 Ave/114 Ave N		**See comments below re: release
I	2.5	62	114 Ave S		
J	2.5	141	130 Ave N/130 Ave S		
K	1.0	22	Not included		Adjacent to TUC
L	1.0	17	Not included		Adjacent to TUC
M	2.5	218	22X N/22X/S		
N	2.5	66	52 St SE		
O	2.5	26	To Elgin pond		To Elgin/New Brighton system
P	2.5	55	To Elgin pond		To Elgin/Inverness system
Q	4.0	94	Not included		
R	4.0	23	Not included		
S	4.0	35	Not included		
T	4.0	153	Not included		
U	4.0	44	Not included		

- Area A, north of 17 Avenue SE and east of the TUC, to drain through a culvert under 17 Avenue SE, and, with Area A south of 17 Avenue, to drain to the pond in the Peigan Trail/TUC interchange via the channel downstream from the landfill. In addition to this pre-development flow rate from Area A, a post-development flow rate from the Northeast Stoney Trail (NEST) project will need to be accommodated. An approximate flow rate of 600 L/s has been identified to discharge through Area B via the 17 Avenue SE culvert from Area A and the NEST project. In addition to this flow, the conveyance system must be sized to accommodate an additional point discharge of 1,700 l/s at the south end of the existing culvert under 17 Avenue SE. The above flows plus an additional 200 l/s from the remaining Area A lands south of 17 Avenue SE, to be connected to the conveyance system approximately 800 metres south of 17 Ave SE in the future, are to be conveyed and discharged, into The City of Calgary's 68 Street pond outlet channel at a point downstream of the weir at N = 5653521.942, E = 5188.397. This drainage work must be complete and operational by December 15, 2010.
- Area B to discharge to the East Calgary landfill channel and the channel from 68 Street SE pond.
- Area C between south of 17 Avenue SE and south of Peigan Trail (approximately 51 Ave) to discharge into the pond in the Peigan Trail/TUC interchange, with runoff directed west to

Forest Lawn Creek.

- Areas D and E between Peigan Trail and the Western Headworks (WH) Canal west and east of the TUC road median to be designed to discharge to the Shepard Underdrain inlet.
- Areas F and G outside the TUC, from mid-point of 17 Avenue SE and Peigan Trail to WH Canal between TUC and 84 Street to be designed to discharge south and west into the Shepard Underdrain inlet. Any crossings at Peigan Trail and 61 Avenue SE must not block any ditch drainage or drainage course that crosses TUC lands.
- Area H between WH canal to 114 Avenue SE to be designed to drain into the Shepard Ditch. If discharged upstream of the CPR tracks, the allowable unit release rate is 1.0 L/s/ha. Alternatively, a portion of the 114 Avenue SE trunk sewer is required south of 114 Avenue SE, from the west boundary of the TUC, to convey runoff from Area H to the Shepard Ditch. If discharged to the 114 Avenue SE trunk, the allowable unit release rate is 2.5 L/s/ha. The 114 Avenue SE trunk shall be a 1500mm diameter concrete pipe, or equivalent capacity (2,050 L/s) box culvert, with a slope of 0.10%. The pipe shall discharge to the Shepard Ditch at approximate location 5810E, 5645950N. Invert of the pipe at the Shepard Ditch bank shall be 1020.05 m. Manholes shall be installed at a maximum centre to centre spacing of 185 m. No manholes shall be located within the road or clear zone for Stoney Trail mainline and ramps. The first manhole west of the Shepard Ditch shall be located east of the westbound 114 Avenue SE to northbound Stoney Trail ramp. The upstream (west) invert of this manhole shall be 1020.50 m. Minimum drops in inverts across manholes shall be 30 mm. The trunk shall continue west at a slope of 0.01% to terminate in a manhole near the west edge of the TUC at approximate coordinates E5295, N 5645950. Erosion protection of the slope of the Shepard Ditch shall be provided to prevent scour.
- Areas I and J between 114 Avenue SE to 150 Avenue SE to be designed to drain to the 130 Avenue SE storm trunk.
- Area K, east of and adjacent to the TUC at approximately 150 Avenue SE to be designed to discharge to the 130 Avenue SE storm trunk.
- Area L east of and adjacent to the TUC at approximately 150 Avenue SE to be designed to discharge to a storage facility and be released into the Mahogany storm trunk.
- Area M, the Highway 22X Interchange to be designed to discharge into the Mahogany storm trunk.
- Area N, between 70 Street SE and 52 Street SE to be designed to discharge into the Mahogany storm trunk. Construction of the Mahogany storm trunk is planned to start in late 2009 and to be in service before the requirement for Area N.
- Areas O and P to drain to the Elgin storm sewer system as detailed in the Auburn Bay Staged Master Drainage Plan (SMDP) by Stantec Consulting for Carma Developers. Area O ultimately drains to the New Brighton pond and Area P drains to the Inverness pond.
- Area Q, Cranston Blvd to Deerfoot Trail/Highway 22X Interchange, drains to the Fish Creek East Stormwater Quality Retrofit Pond via the Deerfoot Trail/Hwy 22X ponds.
- Area R, Bow River to Cranston Blvd, drains to the Fish Creek East Stormwater Quality Retrofit Pond via the existing Hwy 22X widening ponds on the north. This pond will discharge to the Fish Creek East area through a culvert under Hwy 22X.
- Area S, Bow River to Cranston Blvd, drains to the forebay of the Fish Creek East

Stormwater Quality Retrofit Pond.

- Area T, Macleod Trail/Highway 22X Interchange to Bow River, drainage from the Sun Valley Blvd/Highway 22X Interchange flows into a dry pond located in the northeast corner of the interchange and is then discharged to the wet pond south of Hwy 22X. The dry pond will need to be increased in size to accept the additional flows from the interchange. Catchment area on the north side of Hwy 22X is collected in the wet pond north of Hwy 22X and enters the south wet pond through a culvert. The south wet pond also accepts drainage from a total of 123 ha of catchment area on the south side of Hwy 22X and provides water quality improvements. All runoff from area T will discharge to the Lafarge Meadows Wetland via a control structure.
- Area U, east half of Macleod Trail/Hwy 22X intersection, the drainage in Area U is mainly contained in the wetlands with runoff during major events traveling east along Hwy 22X and draining into the south Hwy 22X Pond through area T.

Stoney Trail will be a major truck route and the provision of hazardous spill containment measures will need to be included in the stormwater management design.

Stormwater management facility locations shall be determined by the Contractor. Any proposed use of lands outside the Road Right of Way and within the TUC for stormwater management facilities shall require the Contractor to obtain prior written agreement from the Department of Infrastructure.

Stormwater storage facilities placed adjacent to power transmission towers shall be shaped to allow overland access to the tower and a surrounding work area for power company maintenance equipment at the time water levels in the ponds are at design high water levels. Specific details of the access and work area requirements will be developed jointly by the Contractor and the affected power company. The stormwater storage facilities shall be enclosed by fences. The stormwater storage facilities and fences shall be maintained by the Contractor.

If the Contractor makes an agreement to handle stormwater from outside the TUC with any party, then the Contractor shall ensure such agreements shall indemnify the Department from any future liability. Any such agreements shall require prior written approval of the Department.

Agreements for stormwater management facilities, ditch easements or other agreements which the Contractor may enter into, shall not provide for any payments from the Department without the Department's prior written consent. Such agreements must transfer to the Department at the end of the Term, at no cost to the Department, and must be enforceable in perpetuity.

The Contractor shall not sell drainage capacity in the stormwater management facilities to any third party.

The following miscellaneous drainage requirements shall be met:

- Use of smooth wall steel pipes shall require prior written agreement with the Department for the intended use;
- Manholes shall not be located within the paved area of the roadway, except for catch

basin/manholes in the urban section of the crossroads;

- All manholes in excess of 1.0 m depth shall have galvanized metal ladder rungs; and
- Permanent drainage systems and facilities shall be designed for gravity flow.

200.2.6 ROADWAY LIGHTING

The roadway lighting system shall seamlessly tie into other adjacent Provincial or Local Authority systems. Transitions shall be gradual, in both colour and intensity. The lighting system shall meet or exceed the following requirements:

- *Alberta Transportation Highway Lighting Guide Specifications* as amended by Design Bulletin 35;
- Light standard offsets shall be designed for the Ultimate Stage according to Figure 5.1 of the Department's *Highway Lighting Guide*;
- The lighting system shall be low or medium light pole systems. High mast systems may be used in areas located 600 m or more away from existing or future residential areas;
- Light standards shall be located in the centerline median or off the right side of the roadways for the mainline illumination and off the right side of the roadway for illumination of connectors, ramps, C-D roads and crossroads;
- Maintained luminance values shall be:
  - 0.6cd/m^2 for mainline Stoney Trail;
  - 0.6cd/m^2 throughout systems interchanges with appropriate transitions at the edge of the TUC;
  - 1.2cd/m^2 for crossroads at flyovers and service interchanges; and
  - 0.8cd/m^2 for ramps at service interchanges

  using only high pressure sodium lamps;
- Stoney Trail shall be considered an urban freeway for the purposes of the application of the Department's *Highway Lighting Guide*;
- Median light poles shall have breakaway bases;
- Crossroads shall be considered urban arterial for the purposes of the application of Table 5.1 in the *Alberta Transportation Highway Lighting Guide*;
- Electrical Cables - All electrical cables and communications/signals wiring shall be underground;
- Conduits for electrical supply to under bridge lighting shall be concealed within bridge piers or pier caps and shall not be routed through abutment ends. If, at a specific bridge structure, no piers exist or other conditions exist such that routing of conduits for electrical supply through the abutment ends is desired, alternative routing may be proposed for review and approval by the Department during detailed design.
- Continuous lighting is required on Stoney Trail mainline, including all ramps, connector roads, crossroads, and C-D roads;
- If the median clear zone exceeds 10.5m, pole heights of up to 20m may be permitted on break-away bases;
- Luminaires are generally to be "semi-cutoff". Crossroads that are in close proximity to neighbourhoods require "cutoff" luminaires and are generally described as:
  - 17 Avenue SE;

    - 52 Street SE;
    - McKenzie Lake Boulevard SE/Cranston Boulevard SE; and
    - Sun Valley Boulevard SE/Chaparral Boulevard SE. and
- Lighting requirements for Service Roads shall be governed by the Local Authority in which the Service Roads exist.

All other aspects of the lighting design shall be governed by the Department's *Highway Lighting Guide* as amended by Design Bulletin 35. According to Design Bulletin 35, the TAC Guide for the Design of Roadway Lighting (2006) is to be used as the source for lighting design parameters (i.e. lighting levels and warrants) while the Department's *Highway Lighting Guide* (including general design requirements, constructing and maintenance) is still the primary guideline to be used.

200.2.7 GUIDE SIGNING

Guide signing and guide sign structures for the New Infrastructure shall be designed, installed and maintained by the Contractor. The guide signing for the Project, including all mainline, interchanges and crossroad components, is identified on guide sign drawings ("**Guide Signing for New Infrastructure**") in Appendix E of Schedule 18 (Technical Requirements). Design Bulletin #58 shall apply to interchange sequencing signs. The New Infrastructure guide sign structures shall be designed to accommodate the loadings imposed by the addition of Ultimate Stage guide sign panels at a future time. They shall also be designed for additional guide sign panels, which will be added by third parties when the New Infrastructure is eventually extended westward beyond Macleod Trail SE.

All guide signs for the Project shall comply with the Department's *Highway Guide and Information Sign Manual,* dated October 2006, and includes drawings of the entire ring road at a level of detail and to the standards that are compatible with the Appendix E drawings. The guide sign panels shown in Appendix E have individually been identified according to the Department's Guide Sign Panel Identification Protocol in the Department's Guide Sign Master Plan (the "**Protocol**"). In general, the principles being followed in the Protocol are as follows:

For example, the designation 39-SW-01-OH-L indicates:

- 39 = Exit 39 and identifies the exit located 39 km originating from Highway 2 (Deerfoot Trail NE) and travelling clockwise;
- SW = identifies the location as being in the southwest quadrant of the interchange;
- 01 = Panel number at this location;
- OH = Support Structure Type (OH for Overhead, C for Cantilever, GM for Ground Mounted); and
- L = Panel Position on this structure (L for Left, M for Middle, R for Right).

This Protocol will apply to all guide sign panels for the New Infrastructure.

The details regarding the location, messaging and sizing of all overhead and cantilever mounted guide signs are set out in Appendix E. The Contractor shall install and maintain all overhead and cantilever signs and ground mounted guide signs required for the New Infrastructure, including without limitation, those signs set out in Appendix E. The Contractor acknowledges that certain overhead and cantilever mounted signs set out in Appendix E are located outside the TUC ("**Signs Outside the TUC**"). For the Signs Outside the TUC, the Contractor shall obtain all the necessary permits and approvals from the appropriate authorities in order to install and maintain the Signs Outside the TUC.

The Contractor shall remove all guide signs that contain messaging inconsistent with the requirements set out in Appendix E regarding sign messaging for the New Infrastructure; particularly, such guide signs shall be removed from existing sign structures located on Northeast Stoney Trail, Highway 22X (Marquis of Lorne Trail), and Deerfoot Trail. Existing crossroad guide signs containing messaging inconsistent with requirements set out in Appendix E which are located within the Local Authority shall be removed by the Local Authority. In this regard, the Contractor shall be provide advance notification to, and liaise/coordinate with, the Local Authority accordingly. In all cases, the timing of such guide sign removals shall be coordinated with the Contractor's schedule for Traffic Availability.

The Clearview Highway font shall be used on all guide signing in accordance with Design Bulletin #36, which is posted on the Department's web site.

The following font sizes and letter heights shall be used for the Project:

- Mainline Overhead Signage – 406 mm (16 inch) Clearview font.
- Mainline Shoulder Mounted Signage – 330 mm (13 inch) Clearview font. In cases where the street name is very long, the letter height may be reduced to 305 mm (12 inch).
- Non Mainline Overhead Signage – 330 mm (13 inch) Clearview font.
- Non Mainline Shoulder Mounted Signage – 254 mm (10 inch) Clearview font.

Overhead directional signs shall have reflective sheeting as specified under Section 300.4.2.11.1 (Reflective Sheeting) of Schedule 18 (Technical Requirements).

The Contractor shall submit shop drawings using the "**Clearviewhwy font software**" package for the message content and layout on the major guide signs prior to manufacturing to the Department. The Contractor shall obtain the Department's final written approval of all guide sign message content prior to manufacturing the guide signs.

200.2.8 LANDSCAPING

The relocation of trees impacted by the Project shall be done within the Lands and/or drainage facilities if it is safe and technically feasible. These trees shall be relocated where traffic operations, safety, and drainage are not compromised.

The Province shall have the right to allow third parties, such as the Local Authority or community groups, to carry out supplemental planting or enhanced formal landscape plantings (the "**Third Party Landscaping**") on lands in the TUC but outside the Road Right of Way. The Third Party Landscaping shall be on the following conditions:

- The proposed Third Party Landscaping shall not negatively impact the safety of the roadway or of the O&M;
- The Province shall own the Third Party Landscaping and the applicable third party shall maintain the Third Party Landscaping, and the Province and the applicable third party shall enter into an agreement addressing such ownership, such maintenance and any potential relocation of the Third Party Landscaping; and
- The Third Party Landscaping shall not be used for paid advertising.

Stormwater storage facility wet ponds shall have vegetation for water quality enhancement, and erosion control.

200.2.9 TOPSOIL AND SEEDING

Topsoil material shall be uniformly spread to a depth of 200 mm over the prepared areas to facilitate the required seeding and landscaping. Under no circumstances shall any topsoil be buried, wasted or otherwise disposed of. In the case of large amounts of surplus topsoil, the Contractor shall indicate how the material shall be handled and stored in a manner applicable to relevant regulatory requirements. The handling and storage of topsoil is to be included in the Contractor's Environmental Management System (Section 100.2.2) operational procedures.

Conventional seeding and/or hydro-seeding shall be carried out at the Contractor's discretion to meet the requirements of these specifications related to drainage and erosion.

Seeded areas shall show a uniform stand of grass during the calendar year following the year of initial seeding. Areas which do not show a uniform stand of grass shall be reseeded. A uniform stand of grass will show no bare spots greater than 1 square metre in size and provide a minimum of 80% ground cover.

All seed supplied by the Contractor shall be certified free of all noxious weed varieties identified in the *Weed Control Act* (Alberta) and The City of Calgary Community Standards Bylaw.

In order to maintain consistency in vegetation within the TUC, seeding of the New Infrastructure shall be the same as for existing portions of Stoney Trail where the following seed mixes have been used:

Areas within the Road Right of Way:

Hard fescue	*Festuca ovina*	25%
Streambank wheatgrass	*Agropyron riparium*	25%
Slender wheatgrass	*Agropyron trachycaulum*	20%
Foul bluegrass	*Poa palustris*	10%
Alkali grass	*Puccinellia distans*	10%
Red top	*Agrostis stolonifera (alba)*	10%

In Stormwater Ponds (between low water level and high water level):

Northern Wheatgrass	*Agropyron dasystachyum*	20%
Western Wheatgrass	*Agropyron smithii*	15%
Slough Grass	*Beckmannia syzigachne*	15%
Tall Manna Grass	*Glyceria grandis*	15%
Canada Wild Rye	*Elymus Canadensis*	10%
Fowl Bluegrass	*Poa palustris*	9%
Annual Rye	*Lolium multiflorum*	5%
American Milkvetch	*Vicia Americana*	5%
Tufted Hairgrass	*Deschampsia caespitosa*	4%
Rough Hairgrass	*Agrostis scabra*	2%

In Stormwater Ponds above high water level:

Northern Wheatgrass	*Agropyron dasystachyum*	21%
Indian Ricegrass	*Oryzopsis hymenoides*	21%
Western Wheatgrass	*Agropyron smithii*	17%
Canada Wild Rye	*Elymus Canadensis*	10%
Fowl Bluegrass	*Poa palustris*	9%
Sandberg's Bluegrass	*Poa sandbergii*	6%
American Milkvetch	*Vicia americana*	5%
Annual Rye	*Lolium multiflorum*	5%
Tufted Hairgrass	*Deschampsia caespitose*	4%
Rough Hairgrass	*Agrostis scabra*	2%

In Dry Pond Areas:

Foothills Rough Fescue	*Festuca scabrella*	23%
Porcupine Grass	*Stipa curtiseta*	13%
Blue Grama	*Bouteloua gracilis*	13%
Western Wheatgrass	*Agropyron smithii*	10%
Northern Wheatgrass	*Agropyron dasystachyum*	10%
Indian Ricegrass	*Oryzopsis hymenoides*	9%
Sand Grass	*Calamovifa*	8%
Green Needle Grass	*Stipa viridula*	8%
Oats	*Avium sp.*	3%
June Grass	*Koeleria macrantha*	2%
Sand Dropseed	*Sporoboulus cryptandrus*	1%

200.2.10 UTILITIES

This Section 200.2.10 is subject to section 4.8 (Utility, Railway and Drainage Agreements) of the DBFO Agreement. The Contractor shall locate all utility rights of way, easements, or similar interests (whether registered against title to the land or not) affected by the New Infrastructure. The Contractor shall deal with existing utilities in a manner that is consistent with the

Department's approach throughout the Province. The Contractor shall apply the information outlined in the "*Alberta Transportation Utility Guidance Manual*" when entering into an agreement with a utility company on behalf of the Department. The Contractor shall use one of the sample agreements provided in Appendix H of the "*Engineering Consultant Guidelines for Highway and Bridge Projects - Volume 1, Design and Tender, 2002*". Prior to the agreements being signed by the utility company and the Contractor, they are to be sent to the Department for review. In the event that changes to the wording of the standard agreements are required, the changes will require prior written approval by the Department. A period of two weeks will be required to review new agreement formats after which the Department will provide comments on the suitability. There may be cases in which a utility company consents to enter into a Utility Agreement with the Contractor, where such utility company does not require its pipeline facilities to have any casing protection. In such cases, the Department requires that all pipelines constructed of jointed pipe shall require continuous casing (i.e. casing with welded joints) as a protective measure for containment of a ruptured pipeline. The casing requirement shall apply when jointed pipelines are crossed by the new construction of a highway or by the new construction of its associated interchanges. For the Project, highways and associated interchanges shall include locations in which there are newly constructed or reconstructed infrastructure as part of the New Infrastructure. These locations are:

- Stoney Trail;
- Glenmore Trail;
- Highway 22X (Marquis of Lorne Trail; and
- Highway 2 (Deerfoot Trail).

The casings shall extend to a minimum of 5 meters beyond the back of the outer roadside ditch as required for the Ultimate Stage grading. Pipelines crossing the above highways and associated interchange locations or other roadways within the influence of the interchange shall be installed in accordance with the "*Alberta Transportation Utility Guidance Manual*". A pipeline is considered to be within the interchange if it is located within the footprint of the interchange extents of which are defined by the gore points of all connecting roadways.

Municipal utilities including water, wastewater and storm water pipelines shall be continuously cased when crossing the above highways and associated interchange locations if the pipelines are jointed and of a size of 1050 mm in diameter or less. Larger diameter jointed pipes do not require casing. Existing casings crossing Stoney Trail or municipal roadways within the influence of an interchange shall be extended or replaced to meet the casing requirements for Ultimate Stage grading.

In lieu of casing jointed pipes, continuous pipe sections may be used for the crossing. Continuous piping includes HDPE fused pipe with a minimum SDR rating of 11 or a welded continuous steel line all of sufficient strength to withstand expected loadings. Storm pipelines forming part of the roadside drainage collection system are not required to meet continuous pipe requirements. Storm pipelines from one stormwater management facility (SWMF) to another or from a SWMF to a natural water body crossing the above highways and associated interchange locations require casing equal to or less than 1050 mm in diameter and jointed. Continuous steel casings shall include cathodic protection to meet a minimum design life of 50 years.

The direct out-of-pocket costs that are incurred by the Contractor pursuant to this casing requirement in relation to the Project shall be subject to the cost-sharing arrangement between the Contractor and the Province as set forth in section 15.4(b) (Assistance with Permits and Utility Agreements) of the DBFO Agreement.

There may be cases in which a utility company consents to enter into a Utility Agreement with the Contractor, where such utility company does not require its powerline facilities to be buried. In such cases, the Department requires that all powerline facilities rated at 25kv or less shall be buried when crossed by the new construction of a highway or by the new construction of its associated flyovers and interchanges. The buried powerline facilities shall extend to a minimum of 5 meters beyond the backslope of the outer roadside ditches as required for the Ultimate Stage grading. The location of the first power pole and/or first pole anchors in any direction from the roadway shall be a minimum of 15 meters from the edge of pavement but in no case shall be closer than the back of the normal 4 meter wide outside road ditch unless in an area that is protected by a guard rail or barrier.

The direct out-of-pocket costs that are incurred by the Contractor pursuant to this requirement to bury powerline facilities in relation to the Project shall be subject to the cost-sharing arrangement between the Contractor and the Province as set forth in section 15.4(b) (Assistance with Permits and Utility Agreements) of the DBFO Agreement.

The Department has established utility contacts with the following utility companies, which are not all the relevant utility companies:

The known utility companies, owners and operators and their representatives are as follows:

Alberta Environment - Western Headworks Canal
c/o Deigan Blakely
3rd Floor, Deerfoot Square
2938 - 11 Street NE
Calgary, AB T2E 7L7
Telphone: (403) 297-5907

ATCO Gas
c/o Matt Laws
5th Floor, 909 - 11 Avenue SW
Calgary, AB T2R 1L8
Telephone: (403) 245-7687

Emergency Service
(403) 245-7222
(24 Hours)

ATCO Pipeline
c/o Dale Lesik
9th Floor, 10035 - 105 Street
Edmonton, AB T5J 2V6
Telephone: (780) 420-5482

Emergency Service
(780) 440-7380
(24 Hours)

ENMAX Power Corporation (Distribution) c/o Rick Kuhn - General Enquiries 8820 - 52 Street SE Calgary, AB, T2C 4E7 Telephone: (403) 514-3759 c/o Sonja Nichol - Conflict Resolution Telephone: (403) 514-3716	Emergency Service (403) 514-6100 or 311 (24 Hrs.)
ENMAX Corporation (Transmission Planning and Design) c/o Derek Hanna 141 - 50 Avenue. SE Calgary, AB, T2C 4E7 Telephone: (403) 514-2761	Emergency Service (403) 514-6100 or 311 (24 Hrs.)
Telus Communications Inc. c/o Rod Berting 12th Floor, 411 - 1 Street SE Calgary, AB, T2G 4Y5 Telephone: (403) 530-4329	Emergency Service (403) 310-2887 (24 Hrs.)
Shaw Cable Systems c/o Cathy Martin 2400 - 32 Avenue NE Calgary, AB, T2E 9A7 Telephone: (403) 539-6767	Emergency Service 1-866-344-7429 (0700-1530; M-F) (403)538-5206 (after hours)
The City of Calgary, Water Resources (Infrastructure Planning) c/o Zhong Xiang, M.Sc., P. Eng. 625 – 25 Avenue SE Calgary, AB, T2G 4K8 Telephone: (403) 268-2996	Emergency Service (403) 268-4355 or 311 (24 Hrs.)
The City of Calgary, Water Services (Feedermains) c/o Jim Buker, P.Eng. 625 - 25 Avenue SE Calgary, AB, T2G 4H3 Telephone: (403) 828-2965	Emergency Service (403) 268-4355 or 311 (24 Hrs.)
The City of Calgary, Water Resources (Storm and Sanitary) c/o Ian Morely 625 - 25 Avenue SE Calgary, AB, T2G 4H3 Telephone: (403) 268-5993	Emergency Service (403) 268-4355 or 311 (24 Hrs.)
AltaLink Management Ltd. (Transmission Lines and Towers) c/o Darin McMaster - Calgary and Area Cell (403) 850-6530 1035 - 7 Avenue SW Calgary, AB, T2P 2G9 Telephone: (403) 267-3400 Fax: (403) 267-3404	Emergency Service South Desk (403) 267-1516 North Desk (403) 267-1510 (24 Hrs.)

Penn West Petroleum Ltd.
c/o Cindy Grieder
1900, 255 - 5 Avenue SW
Calgary, AB T2P 3G6
Telephone: (403) 806-3666

NAL Resources Management Ltd.
c/o Pary Weiler
600, 550 - 6 Avenue SW
Calgary, AB T2P 0S2
Telephone: (403) 515-3467

The Contractor shall pay all costs associated with design, utility protection, relocation, damage to or other costs with respect to all utility rights of way, easements, or similar interests (whether registered against title to the land or not) affected by the New Infrastructure.

The Contractor shall locate any abandoned utilities which impact construction of the New Infrastructure. The Contractor shall remove and decommission any such abandoned utilities in accordance with industry practice and in accordance with any applicable laws.

The Contractor shall accommodate future utility rights of way, easements, or similar interests (the "**Future Utility**") on, under or above the Lands when requested by the Department. All costs associated with the installation, maintenance and operation of the Future Utility shall be the responsibility of the applicable Future Utility owner.

The Contractor shall recognize the authority of the Department to manage the TUC at all times (including both during the Construction Period and the Operating Period). The Contractor shall follow the *Transportation/Utility Corridor (TUC) Program Policy*, as may be amended from time to time, at all times when processing requests for Future Utility. For the purposes of the *Transportation/Utility Corridor (TUC) Program Policy*, the Contractor shall be considered a "stakeholder" in the TUC.

Applications for Ministerial Consent will be referred to the Contractor for comments who shall return such comments to Alberta Infrastructure for further review. The Contractor recognizes that its comments will not be binding. In its response, the Contractor shall identify commercially reasonable steps to accommodate any proposal forwarded to it by the Department of Infrastructure. The Contractor must be prepared (at minimum) to identify standard crossing requirements to proposed Future Utility providers at all times. The Contractor will take an open and cooperative approach in its dealings with existing and future TUC-housed utility suppliers at all times.

At the end of the Term, the Contractor shall return any and all utility as-built drawings and utility agreements to the Department of Infrastructure.

During the Operating Period, a Future Utility may need to be removed or relocated to facilitate major maintenance or rehabilitation by the Contractor. Relocation or removal of any Future Utility, including all associated costs, shall be borne by the owner of the applicable Future

Utility.

In the event that a Future Utility line is no longer required, the applicable Future Utility owner shall advise the Department of Infrastructure and the Contractor and such owner shall arrange for the applicable Future Utility to be removed and, when applicable, for the Lands to be restored to the condition commensurate with that prior to the installation of the applicable Future Utility.

200.2.11 RAILWAYS

This Section 200.2.11 is subject to section 4.8 (Utility, Railway and Drainage Agreements) of the DBFO Agreement. The Contractor shall enter into railway agreements with the relevant railway company at the Stoney Trail mainline crossings located North of 114 Avenue SE and South of Peigan Trail SE in respect of these railway crossings. The Contractor shall include the Department in all meetings, correspondence, and discussions with the railroad companies during the negotiations with the railroad companies pertaining to the development of railway agreements. The railway agreements shall be on terms and conditions consistent with the existing railway agreements between the Local Authority and the railway company in respect of these crossings. The Contractor shall obtain the Department's prior written approval to all railway agreements. Once approved all railway agreements are to be signed by the railway company and then sent to the Department for final execution. A period of two weeks will be required to review the agreements, after which the Department will provide comments on the suitability.

The Department has established contacts with the following railway companies:

- Canadian National Railways
  Contact: Al Erickson, Public Works Officer
  Telephone: 780-472-4093
  Fax: 780-472-3725
  E-mail: al.erickson@cn.ca
  Address: Canadian National, Operations Building, 5th Floor, Box 13, 10229 – 127 Avenue, Edmonton, AB T5E 0B9

- Canadian Pacific Railways
  Contact: Doug Younger, Manager Public Works
  Suite 700, Gulf Canada Square
  401 – 9 Avenue SW
  Calgary, AB, T2P 4Z4
  Telephone: 403-319-6416
  E-mail: doug_younger@cpr.ca

It shall be the Contractor's responsibility to pay all costs associated with design, railway protection and relocation associated with railway requirements.

It is the responsibility of the Contractor to conduct the work and adhere to the railway company's specifications and requirements.

200.2.12 MUNICIPAL AUTHORITIES

The Department has established contacts with the following municipality authorities:

- The City of Calgary
  Contact: Anne Cataford, Manager Network Planning
  The City of Calgary, Transportation
  Telephone: (403) 268-5984
  Fax: (403) 268-1874
  Email: anne.cataford@calgary.ca

- MD
  Contact: Bryon Riemann, Manager Project Delivery
  911 – 32 Avenue NE, Calgary, AB, T2E 6X6
  Telephone: 403-520-1196
  Fax: 403-277-3113
  Email: briemann@rockview.ca

200.2.13 ENVIRONMENTAL

A number of environmental assessment studies have been undertaken for the Project. THE SOUTHEAST STONEY TRAIL ENVIRONMENTAL ASSESSMENT VOL 1 & 2 (August 2009) is the environmental assessment (the "**EA**") that the Contractor shall refer to for the purposes of carrying out its obligations under the DBFO Agreement. The Calgary East Freeway Environmental Assessment – Final Report (Spencer Environmental Management Services, 2006) and the South Calgary Ring Road Environmental Assessment (AMEC Earth & Environmental, 2009) are available as information only.

The Contractor shall carry out and fulfill all of the requirements identified in the Table below (the "**Mitigation Measures**") entitled "Mitigation Measures for All Valued Ecosystem Components (VEC's) to be Performed by the Contractor". The Contractor shall provide the Department with reports on the Mitigation Measures every six months starting from the date of Execution of the DBFO Agreement until 12 months after Traffic Availability. All reports shall detail, to a level of detail and in a form satisfactory to the Department, acting reasonably, the Contractor's progress as it relates to the Mitigation Measures with specific regards to implementation and performance of the Mitigation Measures.

Notwithstanding the foregoing two paragraphs, the Contractor shall be responsible for obtaining and complying with all environmental approvals required by applicable law.

Mitigation Measures for All Valued Ecosystem Components ("VEC's") to be Performed by the Contractor

Valued Ecosystem Component	**Potential Project Effect**	**Mitigation Measures**
Soils ***Construction***	Soil erosion	• Develop appropriate site-specific erosion and sediment control (ESC) measures as part of the Contractor's ECO Plan
		• Implement, maintain and monitor ESC measures to stabilize disturbed soils until sufficient vegetation is established. Monitor for revegetation success within the TUC and the Road Right of Way.
		• Re-vegetate promptly following topsoil replacement.
		• Stabilize stockpiles in place for an extended period against erosion using appropriate methods.
		• Avoid soil handling during very windy and/or rainy conditions.
	Admixing	• Ensure topsoil is salvaged, stored and replaced appropriately during construction. The Contractor's ECO Plan Representative, or designate, will monitor soil handling activities during construction.
		• Strip to colour change or as directed by the Contractor's ECO Plan Representative or designate.
		• In areas of potentially gravelly and calcareous soils as indicated on Figure 3.2-2 of the EA, additional care shall be taken to ensure that topsoil is stripped to colour change only, or shallower as directed by the Contractor's ECO Plan Representative or designate. Care will be taken not to overstrip these areas into subsoil, and salvaged topsoil with elevated gravels will be stockpiled and replaced separately from non-gravelly topsoil.
		• If excess stones are brought to the surface, stones that are larger or in greater abundance than the pre-disturbance condition must be picked, as directed by the Contractor's ECO Plan Representative or designate.
	Rutting and compaction	• Monitor soil conditions, suspend soil handling under wet conditions as appropriate and/or as directed by the Contractor's ECO Plan Representative or designate.
		• Use appropriate equipment, subsoiling and/or ripping as needed to alleviate compaction prior to reclamation. (Note: Subsoiling is only effective when the soil is dry enough to shatter, as subsoiling wet soils can lead to deformation and alteration of the soil structure).
	Soil contamination caused by construction activities	• Implement mitigation measures as described under 'Hydrology – Contaminant Release'.
	Increased surface stones	• Separate handling/storage of gravelly soils. • Pick stones following topsoil replacement, as advised by the Contractor's ECO Plan Representative or designate.
	Wetland topsoil salvage	• Salvage and stockpile topsoil from wetlands that will be disturbed, for replacement in depressional areas and for use in compensation wetlands as appropriate.
Vegetation Native, Riparian and Rare Plant Communities	Vegetation clearing	• Revegetate disturbed areas as soon after construction as practicable. Implement reclamation best practices for soil handling and replacement, erosion control and re-vegetation. • Apply suitable seed mixes to revegetate disturbed areas. • Consider inclusion of an upland component as part of the Wetland Compensation Plan for the Project. • Monitor revegetation success within the TUC and the Road Right of Way and undertake remedial measures as appropriate.

Valued Ecosystem Component	**Potential Project Effect**	**Mitigation Measures**
	Loss of rare plant communities	• Explore potential for further avoidance of wetlands or portions thereof during detailed design, particularly wetlands SE1, SE5, SE28, SE42, SE80 and SE109 referred to in the EA. • Flagging all rare plant areas referred to in the EA prior to construction. • Salvage and stockpile topsoil from wetlands that will be disturbed, for replacement in depressional areas or for use in compensation wetlands as appropriate. • Separate soil salvages, storage and replacement in areas with identified rare plants as shown on environmental alignment sheets Appendix 6.0A and Figure 3.3-5 of the EA. • Compensate for wetland loss as required based on detailed designs and as negotiated with Alberta Environment (AENV) and Environment Canada (EC) to achieve no net loss of wetland function regionally.
	Dust	• Implement road watering or other appropriate dust control measures during construction. • Reclaim and revegetate disturbed areas as soon as practicable following construction. • During construction, the Project Contractor will conduct regular inspections of the TUC and the Road Right of Way, particularly during windy conditions, to ensure that best practices for dust control are being effectively implemented.
	Road salt	• Consider minimizing salt use on roadways to the extent practicable next to sensitive environmental receptors. • Include salt-tolerant species in seed mix for ditch areas (e.g., alkali grass). • Develop and implement Road Salt Management Plan for the Project.
	Weed establishment	• Programs to address long-term weed issues within the TUC and the Road Right of Way during the Operating Period shall be developed for noxious or restricted weeds in accordance with the Weed Control Act (Province of Alberta 2000). Establish priorities regarding the most problematic weed species.
		• The Contractor shall clean equipment after it has been used in weedy areas and shall pay particular attention to parts of equipment where grease and oil can collect.
		• Separate soil salvage, storage and replacement in areas of weed infestations, as indicated on environmental alignment sheets (as found in Appendix 6.0 A of the EA) and during site environmental inspections of the TUC and the Road Right of Way prior to soil salvage.
		• Reclaim to appropriate species immediately following construction.
		• Minimize areas of soil disturbance.
		• Monitoring for and controlling noxious weeds using appropriate methods on an ongoing basis, during the Construction Period and the Operating Period.
		• Control measures may include but are not limited to one or a combination of mowing at appropriate intervals prior to seed dispersal, targeted herbicide application, handpicking, tillage and remedial seeding as appropriate.
	Accidental spills	• Implement mitigation measures as described below under 'Hydrology – Contaminant release'.

Valued Ecosystem Component	Potential Project Effect	Mitigation Measures
	Introduction of fresh stormwater to alkaline ponds	• The Contractor will not route untreated stormwater to alkaline ponds.
Wetlands	Decrease in wetland habitat	• Explore potential for further avoidance of wetlands during detailed design. • Fence or flag area to be cleared.
		• Develop a Wetland Compensation Plan to address compensation for wetland loss as required based on detailed designs and as negotiated with Alberta Environment and Environment Canada to achieve no net loss of wetland function regionally in accordance with the requirements and objectives of the *Water Act* (Alberta) and the Federal Policy on Wetland Conservation in Canada.
		• Additional considerations for wetland compensation plan development, as proposed by Environment Canada, include separate forebays for compensatory wetlands as well as that compensation wetlands should not include the construction of islands in order to minimize the attraction to Canada Geese.
		• Guidance regarding objectives and considerations for the development of the Contractor's Wetland Compensation Plan are provided in Appendix 4.3A of the EA.
		• Salvage and stockpile topsoil from wetlands that will be disturbed, for replacement in depressional areas or for use in compensation wetlands as appropriate.
		• Re-vegetate disturbed areas as soon as practicable following construction.
	Alteration of hydrological regime	• The Contractor's grading design and installation of overland drainage measures (e.g., ditches, culverts, stormwater management facilities) should maintain surface water flow volumes for retained wetlands. If hydrologic regime of any retained wetlands cannot be maintained, account for impacts within the Wetland Compensation Plan.
Wildlife	Habitat loss	• Clearly mark clearing limits.
Construction		• Vegetation clearing will not occur between 1 April and 31 July of any given year to avoid the breeding season for migratory birds and prevent disturbance to breeding amphibians unless permission has been given to the Contractor to do so by a Professional Biologist (a member in good of Professional Biologists) upon the results of relevant surveys standing with the Alberta Society
		• Construction of Stormwater Management Facilities (SWMFs) and provision of compensation for impacts to wetlands affected by the Project will result in no net loss of wetland habitat function regionally.
		• The dens of specified animal species are protected under the *Wildlife Act* (Alberta). The nests of migratory birds are protected under the Federal *Migratory Birds Convention Act.* If a den site or bird nest is found at any time during land clearing or construction, Alberta Sustainable Resources Development will be contacted to determine the appropriate course of action before any work can proceed. Avoidance or mitigation measures may be required to ensure compliance with applicable legislation.
		• Implement mitigation measures as described above under 'Vegetation – Clearing' and 'Wetlands – Decrease in Wetland Habitat'.

Valued Ecosystem Component	Potential Project Effect	Mitigation Measures
	Decreased habitat effectiveness	• Implement mitigation measures as described above under 'Vegetation – Dust' and 'Soil – Soil Erosion' to prevent impacts to adjacent breeding and foraging habitat. • The Contractor shall comply with the mitigation measures for noise as identified in the VEC category "Noise Construction" below.
	Disruption of movements Mortality risk	• The Contractor shall comply with the mitigation measures for noise as identified in the VEC category "Noise Construction" below. • Ensure vegetation clearing occurs outside spring breeding period of 1 April - 31 July of any given year unless permission has been given to the Contractor to do so by a Professional Biologist upon the results of relevant surveys. • Improve line-of-sight on both sides of all roadways for the Project by maintaining wide ditches with low-lying vegetation. • During detailed design, consider installation of small mesh wire fencing in conjunction with Road Right of Way fencing where all roadway or interchange ramps pass near potential nesting wetlands, to prevent waterfowl crossing all roadways .
	Loss of rare or sensitive species in Shepard Slough Complex as defined in the EA	• Implement mitigation measures as described above under 'Vegetation – Clearing' and 'Wetlands – Decrease in Wetland Habitat'.
	Loss of or disturbance to peregrine falcon and short-eared owl	• Implement mitigation measures as described above under 'Vegetation – Clearing' and 'Wetlands – Decrease in Wetland Habitat'.
Wildlife Operation	Habitat loss – No further impact	
	Decreased habitat effectiveness	• Construct stormwater management facilities and provide of compensation for impacts to wetlands affected by the Project so as to result in no net loss of wetland habitat function regionally. • Consider the inclusion of an upland component as part of the Wetland Compensation Plan for the Project.
	Mortality risk	• Keep ditches clear of debris and tall vegetation to improve visibility and avoid providing cover for wildlife along the roadways. • Remove invasive bushy vegetation in the immediate vicinity of all roadways and consider of planting shrubs away from the road to reduce losses among birds. • Installing wildlife crossing signs on eastbound and westbound lanes, 500 m before the approach to the Bow River.
	Disruption of wildlife movements	• Culverts shall be designed ,sized and constructed to facilitate drainage within the Project. These culverts may provide opportunities for movements of small wildlife, particularly in the vicinity of wetlands. • Minimize direct and indirect disturbance to remaining wetlands and uplands in undisturbed sections of the Project.

Valued Ecosystem Component	**Potential Project Effect**	**Mitigation Measures**
Hydrology Construction	Contaminant release	• A Spill Management Plan ("**SMP**")will be developed to describe measures for spill prevention and emergency spill response including but not limited to spill control and response measures. The SMP shall form part of the Contractor's ECO Plan. • Provide appropriate measures for spill containment in fuel storage and servicing areas and include these measures in the SMP. • Train all personnel working on the Project regarding spill response and ensure appropriate spill kits are available near work areas. • Vegetated ditches provide detention for settling out of sediments and opportunity for spill removal and soil rehabilitation.
		• The Project's stormwater management infrastructure shall be designed and constructed to capture and direct all runoff, including possible spilled substances via road ditches and culverts, to stormwater management facilities. It is possible that the stormwater management facilities may serve in part to contain spilled substances and minimize the extent of their impact. Stormwater management ponds shall be designed and constructed to contain all runoff from a 24 hr, 1:100 year precipitation event. Pond forebays shall also be constructed so as to provide an opportunity for collection and disposal of spilled substances.
	Sedimentation	• Surface stability shall be promoted by leaving vegetation undisturbed in areas not exposed to construction. • Soil stockpiles will be located away from watercourses and slopes. • Implement mitigations as described above under 'Soil – Soil Erosion'. • Implement appropriate ESC measures for works adjacent to or which might potentially affect water bodies (such as the WH Canal and Forest Lawn Creek). • Vegetate ditches to provide detention for settling out of sediments upstream of stormwater management facilities and ultimately prior to discharge into natural drainages.
	Alteration of drainage patterns	• Maintain surface flows to wetlands retained within the TUC; develop compensation as part of the Wetland Compensation Plan as required, if hydrology of any wetlands will be altered.
	Interaction of stormwater management with existing City of Calgary stormwater system	• Communicate with the City of Calgary, Water Resources to confirm design compatibility.
Hydrology Operation	Increased stormwater release	• Design of stormwater management facilities in accordance with the Technical Requirements to maintain runoff volumes and control release rates based on 1:100 yr storm runoff.
	Contamination of waterbodies caused by bridge deck runoff	• Capture and release bridge deck runoff into a stormwater management facility for treatment prior to release to a receiving water body.
Groundwater Construction	Impacts to groundwater levels due to dewatering activities	• Visibly mark and/or fence off any known spring and well locations. • Avoid any known springs and water supply wells during construction; if other springs, water supply wells or other such features are encountered during construction, limit heavy equipment use and disturbance in proximity to the springs, water supply wells, or other such features to the extent practicable and install appropriate engineering controls to maintain groundwater flow.

Valued Ecosystem Component	**Potential Project Effect**	**Mitigation Measures**
	Seepage from cuts	• During detailed design, develop measures to manage potential seepage for the TUC and Road Right of Way, such as blanket drains and trench drains as outlined in Appendix E of the Calgary East Ring Functional Planning Study, April 2006..
Groundwater Operations	Changes to local shallow groundwater flow regime	• Implement appropriate engineering controls for the TUC and Road Right of Way such as drains to maintain groundwater flow as outlined in Appendix E of the Calgary East Ring Functional Planning Study, April 2006. • Design, locate and construct stormwater management facilities so as to maintain surface drainage patterns and release at controlled rates. Stormwater shall be released within the same catchment area as the area in which such stormwater originates and within the range of natural flows.
	Roadbed stability due to frost heave or softening of base	• During detailed design, evaluate options in areas of high groundwater to prevent roadbed instability in the TUC and Road Right of Way, such as longitudinal sub-drains and/or insulation barriers in the road base to redirect groundwater as outlined in Appendix E of the Calgary East Ring Functional Planning Study, April 2006.
	Changes to groundwater quality	• Implement mitigation measures as described above under 'Vegetation – Road Salts'. • Implement mitigation measures as described under 'Hydrology – Contaminant Release'. • Implement mitigation measures as described under 'Soils – Soil Erosion' to prevent sedimentation.
Water Quality Construction	Runoff and sediment transport	• Implement mitigations as described above under 'Hydrology – Sedimentation' and 'Soil – Soil Erosion'. • Monitor surface water quality as appropriate for construction activities near water.
	Release of contaminants	• Implement mitigation measures s as described above under 'Hydrology – Contaminant Release'.
Water Quality Operations	Stormwater runoff	• Utilize existing and proposed stormwater management facilities. • The design and construction of stormwater management facilities shall be in accordance with the Technical Requirements to maintain runoff volumes and control release rates.
	Release of contaminants	• Implement mitigation measures as described above under 'Hydrology – Contaminant Release'. • Capture and release bridge deck runoff into a stormwater management facility for treatment prior to a receiving water body.
Fisheries and Aquatic Resources Construction	Sediment release/fish passage/habitat loss	• Implement mitigations as described above under 'Hydrology – Sedimentation' and 'Soil – Soil Erosion'. • Monitor surface water quality as appropriate for construction activities near water.
		• Make every reasonable effort to minimize the duration of instream work and construction is halted during heavy rains.
		• Any instream works are conducted under "dry" conditions. Where flows exist, an isolation technique is used.
		• Prior to construction activities, fish in any areas where stranding may occur or in areas directly impacted by construction activities shall be rescued and released to an area containing sufficient flow and cover. The fish rescue may require a provincial permit and shall include:

Valued Ecosystem Component	Potential Project Effect	Mitigation Measures
		▯ Capture and handling procedures are designed to minimize mortality; and ▯ Rescue operations employing effective methods (e.g. electrofishing, seine netting, minnow trapping) are carried out as stipulated in the Provincial Fish Research License.
		• Culverts will be designed to allow for fish passage by ensuring culvert inverts are below streambed elevations.
		• Isolated crossings are conducted as follows: ▯ Maintain 100% of downstream flow at all times. ▯ Water from flumes, pump-around, diversions or other methods used to maintain downstream flow does not cause erosion or introduce sediment into the channel. Examples of options for preventing erosion include flow dissipaters, protection of the substrate with geotextile, and releasing water onto vegetation if it can be done without erosion. ▯ If a pump-around method is used to maintain downstream flow, back-up pumps with adequate capacity to maintain 100% of downstream flow at all times are on- site and ready to take over pumping if the operating pumps fail. The pumps are continually monitored to ensure downstream flow is maintained at all times until the isolation materials are removed and normal flows restored to the channel. ▯ Pump intakes do not disturb the streambed. Pumps are screened with a maximum mesh size of 2.54 mm and a maximum screen approach velocity of 0.038 m/s (as per DFO's Freshwater Intake End-of-pipe Fish Screen Guideline). ▯ Where earthen berms are used for isolation, there is containment and separation of berm materials from water at all points of contact. ▯ Berms (including all berm material) and/or other methods of isolation are completely removed from the channel and the streambed and streambank profiles returned to preconstruction conditions by the completion of the works or undertakings. ▯ Should the need for dewatering arise, water is released into a well vegetated area or settling basin and not directly into any watercourse. Water returning to the watercourses is equal to or exceeds the background water quality of the watercourse. ▯ Fish rescue is conducted using a seine net and/or electrofishing and the fish released unharmed downstream. The fish rescue is undertaken within any isolated areas prior to and during dewatering activities. In addition, fish rescue is undertaken on any bypass structures such as diversion channels and flumes prior to them being dewatered after use. Fish rescue may require a permit from the Province. ▯ No isolation is required if the channel is dry or frozen to the bottom at the site of the crossing construction.
		• Disturbance of riparian vegetation shall be kept to a minimum.
		• During construction and until revegetation is sufficient to prevent sediment erosion, effective sediment and erosion control measures are in place, functioning properly, and are maintained and/or upgraded as required to prevent sediment from entering fish habitat.

Valued Ecosystem Component	**Potential Project Effect**	**Mitigation Measures**
		• Excavated materials and debris is disposed of above the high water mark and located such that they do not enter any watercourse.
		• All fill material is obtained from off-site and not from below the average high water level of any watercourse.
		• If riprap is used, the riprap is clean, free of fine materials, and of sufficient size to resist displacement during design flood events. Riprap is placed at the original streambank grade to ensure that there is no infilling or narrowing of the watercourse at the crossing site.
		• All spoil materials are disposed of above the high water mark and located such that they will not re-enter any watercourse.
		• The works are conducted using land-based machinery or equipment operating from the upland and not within the steam channel.
		• Equipment is refueled and serviced in a manner which ensures that deleterious substances do not enter any watercourse. Equipment operating near any watercourse is free of external grease, oil, mud, or fluid leaks and an emergency spill response kit is kept on-site during construction.
		• A spill response plan has been prepared and is in place which will prevent deleterious substances from entering fish habitat.
	Accidental contaminant release to waterbodies	• Implement mitigation measures as described under 'Hydrology – Contaminant Release'.
Fisheries and Aquatic Resources Operation	Deleterious substance release from bridges over fish bearing water bodies	• Incorporate drainage controls to direct surface runoff from the bridge to stormwater management facilities. • Implement mitigations as described above under 'Hydrology – Sedimentation' and 'Soil – Soil Erosion'.
Air Quality Construction	Dust created by earthworks equipment	• Implement mitigation measures as described above under 'Vegetation – Dust' and 'Soil – Soil Erosion'.
Air Quality Operation	Vehicle emissions	• Ensure timing of traffic lights is optimized to reduce vehicle idling.
Socio-Economics and Land Use Construction	Communities (noise and dust)	• Implement mitigation measures as described above under 'Vegetation – Dust' and 'Soil – Soil Erosion'. • Hours of work on the Project will be restricted to the period between 7:00 AM and 10:00 PM Monday through Saturday. On Sundays and Statutory holidays, hours of work will be limited to the period between 9:00 AM and 10:00 PM. Activities exempt from this restriction are: – overhead sign structure installation; – girder erection; – concrete pours for bridge construction; and – line painting. • The Contractor must adhere to the hours of work unless an exemption is granted by the Department. • Consider use of vibratory or enclosed-hammer pile drivers during pile driving.
	Lafarge meadows	• Implement mitigation measures as described in 'Hydrology – Sedimentation'. • Stormwater management facilities shall be designed and constructed to include a portion of drainage to South Fish Creek stormwater pond, ultimately to feed future Lafarge Meadows wetland in accordance with the Technical Requirements.

Valued Ecosystem Component	Potential Project Effect	Mitigation Measures
	Transportation	• Implement traffic accommodation measures (e.g., detours, local access relocations and signage, along with public information and notices) to minimize effects on traffic congestion and maintain traffic flow.
	Utilities	• Plan relocation of utilities prior to and during construction so as to minimize service disruption.
	Recreation and pathways	• Implement mitigation measures as described above under 'Vegetation – Dust' and 'Soil – Soil Erosion'. • Hours of work on the Project will be restricted to the period between 7:00 AM and 10:00 PM Monday through Saturday. On Sundays and Statutory holidays, hours of work will be limited to the period between 9:00 AM and 10:00 PM. Activities exempt from this restriction are: – overhead sign structure installation; – girder erection; – concrete pours for bridge construction; and – line painting. • The Contractor must adhere to the hours of work unless an exemption is granted by the Department. • Manage public access to the TUC to ensure safety.
	Public safety	• Implement traffic accommodation measures (e.g., detours, local access relocations and signage, along with public information and notices) to minimize effects on traffic congestion and maintain traffic flow. • Provide notice to commuters and residents adjacent to the TUC of construction-related traffic and safety issues. • Manage public access to the TUC to ensure safety.
Socio-Economics and Land Use Operation	Communities (noise)	• Installation of noise attenuation barriers between the roadway and adjacent residential areas as required in accordance with the Technical Requirements.
	Parks and wetlands	• Promptly revegetate disturbed areas. • Operatie storm water management ponds in accordance with the Technical Requirements.
	Lafarge meadows	• Operate storm water management ponds in accordance with the Technical Requirements.
	Recreation and pathways	• Operate new pathway connections in accordance with the Technical Requirements.
Historical Resources Construction	North Component (as defined in the EA) – No further impact	
	South Component (as defined in the EA) – No further impact	
	Inadvertent Impacts to unrecorded historical resources during construction	• Suspend construction in area of any discovered artifact and contact Alberta Culture and Community Spirit ("ACCS") for required course of action before proceeding further.
Historical Resources Operation	No further impacts anticipated	

Valued Ecosystem Component	Potential Project Effect	Mitigation Measures
Noise Construction	Increased noise from construction equipment	• Hours of work on the Project will be restricted to the period between 7:00 AM and10:00 PM Monday through Saturday. On Sundays and Statutory holidays, hours of work will be limited to the period between 9:00 AM and 10:00 PM. Activities exempt from this restriction are: – overhead sign structure installation; – girder erection; – concrete pours for bridge construction; and – line painting. • The Contractor must adhere to the hours of work unless an exemption is granted by the Department. • Consider use of vibratory or enclosed-hammer pile drivers during pile driving.
Noise Operation	Noise levels in excess of 65 dBA Leq(24 hr)	• Install noise attenuation barriers between the roadway and adjacent residential areas as required in accordance with the Technical Requirements.
Lighting Operation	Increased illumination of non-TUC areas	• Lighting will be located adjacent to all roadways to ensure driver safety. • Where feasible, lighting will be used that minimizes lighting spill outside the TUC.

200.2.14 NOISE ATTENUATION

The Contractor is responsible for all noise attenuation for the New Infrastructure.

The Contractor shall ensure that the maximum noise level of 65 dBA Leq24 (A-weighted 24 hour equivalent sound level) measured 2 metres inside the affected property line is adhered to. If the threshold is exceeded, the Contractor shall implement noise mitigation measures. The mitigation of noise issues could include constructing noise walls or berms. The mitigation must be broadly supported by the affected residents.

Where a new residential subdivision is constructed (after October 1, 2009) adjacent to the New Infrastructure, the new residential subdivision development proponent will be responsible for noise attenuation in respect to that new residential subdivision.

The Contractor's responsibility for noise mitigation applies up to and including mainline AADT volumes of 95,000 vehicles per day, to be determined in accordance with Section 200.3.1 (Traffic Volume Payment Adjustments).

200.2.15 FENCING

Fencing shall be consistent with the Department's approach on other areas of Stoney Trail already constructed. The fencing shall be installed to separate the Lands from the rest of the TUC. For areas adjacent to existing residential developments, the fence shall be the Department's Class E Standard as shown on Standard Drawing CB6-2.12M5 in Alberta Transportation's CB-6 Manual (Highway Standard Plate), modified by replacing the two strand barbed wires (four point galvanized 2.5mm thick strands) at the top of the fence with two strand 3.35mm thick galvanized wire. In all other locations, the fence shall be the Department's Class B fence as shown on Standard Drawing CB6-2.12M2 in Alberta Transportation's CB-6 Manual

(Highway Standard Plates).

The Contractor must obtain approval from the Department for the proposed fence lines. The fenced areas must be of a practical size and dimension with free and clear access so that lease potential or other future uses of the rest of the TUC have not been compromised.

The Road Right of Way shall be fenced and the fencing shall extend to the TUC boundaries at the crossroads. Any stormwater storage facilities shall also be fenced.

Access to the utility components shall be controlled by gates. The Contractor shall install gates at various locations throughout the fence line so as to permit ease of access to the utility components, ensuring that no area is inaccessible. Gates shall be large enough to accommodate passage of vehicles, equipment, utility vehicles and farm equipment. The Contractor shall obtain prior written approval from the Department for gate types, sizes and locations. TUC access will be permitted from the crossroads only. No access points will be permitted from the mainline or its associated entrance and exit ramps.

200.2.16 PREFERENTIAL BRIDGE DECK ICING

The Contractor shall address the prevention of preferential bridge deck icing on the following bridges (the "**PBD Bridges**") in the Preferential Bridge Deck Icing Plan (as defined in Section 100.2.9):

PBD Bridges (New Infrastructure)

- The three bridges carrying westbound Stoney Trail to southbound Highway 2;
- The bridge carrying northbound Highway 2 to eastbound Stoney Trail; and
- The one bridge carrying eastbound Stoney Trail to northbound Highway 2.

The PBD Bridges that are part of the New Infrastructure (the "**PBD Bridges (NI)**") will be fitted with the Road Weather Information Systems ("**RWIS**") by the Department's contractor, Telvent Canada Ltd. ("**Telvent**") pursuant to an agreement dated April 11, 2005 (as amended March 6, 2007, July 7, 2008, and August 25, 2008) between the Department and Telvent (the "**RWIS Contract**"). The Contractor acknowledges having been provided with and having reviewed a copy of the RWIS Contract without the bid prices.

The Contractor shall permit Telvent to complete, prior to Traffic Availability, the installation and commissioning of RWIS on the PBD Bridges (NI).

For each of the PBD Bridges (NI), the RWIS Contractor shall be permitted by the Contractor to install sensors in the pavement approaching the applicable bridge and on the bridge itself and install RWIS tower structures in the Road Right of Way, in locations determined by the RWIS Contractor, acting reasonably.

Once the RWIS on the PBD Bridges (NI) is commissioned and operational, the Contractor shall be entitled to receive weather forecasts from Telvent on the same terms and conditions as the

Department's other highway maintenance contractors do under the RWIS Contract. The Department assumes no responsibility for the Contractor's use of such weather forecasts. The Department contact for information about the weather forecasts is:

> Allan Lo, P.Eng.
> Intelligent Transportation Systems and Traffic Safety Specialist
> Alberta Transportation
> (780) 415-1021.

The Contractor shall:

(a) provide all reasonable cooperation with Telvent, or any replacement RWIS contractor of the Department's, (the "**RWIS Contractor**") in respect of the installation, operation, maintenance, or rehabilitation of the RWIS for the New Infrastructure (the "**RWIS Work**");
(b) coordinate and schedule the Project or the O&M, as applicable, in such manner as will facilitate the RWIS Work;
(c) if and as often as it becomes aware of deficiencies in the RWIS Work as will materially adversely affect or interfere with the Project or the O&M, as applicable, or the obligations of the Contractor under the DBFO Agreement, immediately provide the Department with notice, including reasonable details, of those deficiencies;
(d) without limiting (a) and (b) above, design, build and rehabilitate the New Infrastructure to accommodate the RWIS as set out in Drawing 18-I-01 in Appendix I.
(e) without limiting (a) and (b) above, complete grading and landscaping to enable the installation of the RWIS tower structures for the PBD Bridges (NI) prior to Traffic Availability;
(f) without limiting (a) and (b) above, for the purposes of powering the RWIS systems, provide 120 VAC, 60 Hz power source to each of the four quadrants of each interchange requiring PBD Bridges (NI). Each power source shall be independent of the street lighting system, available continuously, metered, terminated with a breaker, and located within a weather proof and lock-secured panel box at a streetlight pole located in each of the respective interchange quadrants;
(g) without limiting (a) and (b) above, consult with the RWIS Contractor to determine the specific streetlight poles at which the RWIS power sources described in (f) above will be housed;
(h) without limiting (a) and (b) above, permit the RWIS Contractor to obtain power from the power sources described in (f) above provided the RWIS Contractor separately pays the power costs for the RWIS Work; and
(i) without limiting (a) and (b) above, provide traffic accommodation services to the RWIS Contractor, as reasonably requested by the RWIS Contractor, but at the cost of the RWIS Contractor, such cost as determined by the Contractor acting reasonably.

The Department shall arrange the reciprocal reasonable cooperation of the RWIS Contractor.

200.2.17 MISCELLANEOUS ENVIRONMENTAL CONCERNS

200.2.17.1 Wetland Compensation

The Contractor is responsible for wetland replacement, compensation and management activities during the Construction Period and the Operating Period. All regulatory requirements including design, construction, maintenance, monitoring and/or reporting shall be the responsibility of the Contractor. The Department must be kept apprised of all discussions and shall receive copies of all agreements respecting wetland replacement and compensation.

200.2.17.2 Campsites

There shall be no campsites or sleeping trailers permitted within the TUC. Notwithstanding the foregoing sentence, a work camp will be permitted in the southeast portion of the TUC during the Construction Period only, provided:

(a) the Contractor obtains all approvals, permits, and consents required by applicable law in respect of the work camp;
(b) the Contractor demonstrates that public consultation has been undertaken and public support has been achieved in respect of the work camp being a specific component of the Project and in accordance with Section 100.2.7 (Public Communication Strategies);
(c) the Contractor obtains a written confirmation (the "**Local Authority Work Camp Confirmation**") from the Local Authority within whose boundaries the proposed work camp is to be located, confirming the Local Authority has no concerns with the proposed work camp, or no concerns provided certain conditions are met, including without limitation agreeing to any required water, sewer, or other Local Authority utility connections;
(d) the Contractor acknowledges and agrees in writing with the Province (the "**Acknowledgement**") that the Contractor: (i) accepts all risks arising in any way from the work camp; and (ii) waives any right to claim a Relief Event arising in any way from the work camp, including the failure to obtain a Ministerial Consent. The Acknowledgement shall be in a form satisfactory to the Department, acting reasonably; and
(e) after the Contractor has complied with (a) to (d) immediately above, the Contractor obtains a Ministerial Consent for the proposed work camp. The Ministerial Consent, if granted, will incorporate the conditions, if any, set out in the Local Authority Work Camp Confirmation.

200.2.17.3 Burning

No burning will be allowed within the TUC.

200.2.17.4 Historical Resources

Copies of the March 2, 2006 *Historical Resources Act* clearance letter for Stoney Trail from 17 Avenue to Highway 2, the January 7, 2009 *Historical Resources Act* clearance letter for Highway 201, 17th Avenue SE to Highway 22X Access Management Study, and the August 25, 2009 and September 2, 2009 *Historical Resources Act* clearance letters for Stoney Trail from

Highway 2 to Macleod Trail are attached as Appendix D.

Pursuant to section 31 of the *Historical Resources Act*, should any paleontological or historical resources be discovered during the conduct of construction activities, the Contractor shall immediately inform the Department in writing.

200.2.17.5 Pollutants

The Contractor shall ensure that no pollutant occasioned by the construction of the Project or the O&M, including debris from clearing operations, petroleum products from equipment operations and construction refuse, is allowed to enter any water body whether flowing or static.

200.2.17.6 Topsoil

Topsoil, salvaged during the Project or the O&M, shall be maintained free of deleterious material and subsoil and shall be distributed evenly over designated areas once embankment construction and excavation have been completed. No burial, removal and/or sale of topsoil materials salvaged during the Project or the O&M is allowed without the prior written approval of the Department.

200.2.17.7 Organic Materials

Organic materials from wetland excavation shall be salvaged and stockpiled in separate stockpiles prior to reuse in accordance with environmental requirements. No burial, removal and/or sale of organic materials salvaged during the Project or the O&M is allowed without the prior written approval of the Department.

200.2.18 AESTHETICS

Having regard to the Department's "*Bridge Aesthetics Study*" dated April 2005, the aesthetics of the New Infrastructure shall be generally compatible with the northwest and northeast legs of Stoney Trail (the "**Other Legs**"). The following specific aesthetic features shall be incorporated into the New Infrastructure:

- the "wild rose" emblem on abutment wingwalls facing traffic;
- the aesthetic treatment of pier shapes for roadway grade separation bridges;
- the aesthetic treatment of concrete slope protection surfaces; and
- the use of pigmented sealers (three colours) on exposed concrete surfaces.

In addition, artistic renderings that cover a minimum of 25% of the exposed surface area shall be provided on all retaining walls except for retaining walls at railway overpasses.

The Contractor acknowledges having reviewed the plans and specifications for the Other Legs and acknowledges having inspected the condition of the Other Legs just prior to the signing of the DBFO Agreement.

The use of circular or square column cross sections in structure piers, as well as block-resembling or blunt ended pier caps on the Project is prohibited. Similar type architectural treatment shall be used as far as practicable for all structures having similar characteristics such as spans, superstructure type, etc.. Architectural treatments similar to the structures on Northeast Stoney Trail is desirable and shall be incorporated into the Contractor's design as much as practicable.

200.3 OPERATION AND MAINTENANCE OF THE INFRASTRUCTURE

200.3.1 TRAFFIC VOLUME PAYMENT ADJUSTMENTS

The New O&M Payments and the Existing O&M Payments shall be adjusted, in accordance with this Section, effective each April 1st of the Operating Period based upon changes in traffic volume calculated during the previous calendar year.

The Department shall provide automatic traffic recorder ("**ATR**") devices and all connections, to the Contractor for installation by the Contractor at the Contractor's expense on the Infrastructure. Thereafter, the Department shall, at its own expense, operate and maintain the ATRs throughout the Operating Period on the Infrastructure.

The detailed ATR specifications are contained in Appendix H – Automatic Traffic Recorder (ATR) Specifications.

The ATRs are to be installed at or near the following locations on the Infrastructure:

- Highway 2 mainline between the bridges carrying Highway 2 over the Bow River and the south Project Limit, south of 196 Avenue; and
- Stoney Trail mainline between 88 Street SE and 52 Street SE.

No other location or measurement shall be considered for the determination of traffic volume payment adjustments.

No payment adjustments shall be made based on partial years or for changes in traffic volume within the current year.

There shall be no traffic volume payment adjustment for the first April 1st of the Operating Period.

The Department shall count the total number of vehicles to cross a point in both directions during a calendar year and shall divide this total by the number of days in that calendar year to determine the average annual daily traffic (the "**AADT**"). For the partial year between Traffic Availability and the subsequent April 1st, the AADT shall be considered equivalent to the average daily traffic measured in that partial year. The AADT shall be calculated by the Department's traffic statistics consultant. In the event that the ATR is not recording for a given period of time, the Department's traffic statistics consultant shall make an estimate of AADT.

Weather conditions permitting, the Department shall repair the ATR to bring it into operation within four weeks of the time that the Department first becomes aware that the ATR is not functioning.

If the AADT for any calendar year exceeds 95,000 vehicles per day for the location identified on the New Infrastructure (Stoney Trail mainline between Macleod Trail SE and 88 Street SE), a onetime supplement of 5% of the New O&M Payment for such calendar year (before any traffic volume payment adjustment) shall be added to each of the New O&M Payments for the 12-month period starting April 1st after such calendar year.

If the AADT for any calendar year exceeds 95,000 vehicles per day for the location identified on the Existing Infrastructure (Highway 2 mainline between Highway 2A and south of 196 Avenue SE), a onetime supplement of 5% of an Existing O&M Payment for such calendar year (before any traffic volume payment adjustment) shall be added to each of the Existing O&M Payments for the 12-month period starting April 1st after such calendar year.

In the event that unusual conditions, such as construction activity by a Local Authority on roadways other than the New Infrastructure, result in a temporary change in traffic volume on the mainline of Stoney Trail, the Department, in the interest of both parties avoiding unnecessary costs, will advise the Contractor that the Department wishes to negotiate with the Contractor with respect to a temporary full or partial waiver of the Traffic Volume Payment Adjustment and a corresponding temporary full or partial waiver of certain requirements under Section 400.3 (Winter Maintenance Operation Requirements).

200.3.2 SNOW AND ICE CONTROL

Except as otherwise expressly provided in Sections 200.2.3.3 (Roadway Mainline - Highway 22X), 200.2.3.4 (Crossroads), and 200.2.3.23 (Detours), the Contractor shall be responsible during the Construction Period for the snow and ice control of the road surfaces as shown on Drawings 18-A-03 to 18-A-11 in Appendix A, except for the Service Roads. The Contractor shall be responsible for the coordination with the applicable entity doing the snow and ice control to ensure all roadway surfaces are properly cleared of snow and ice during the Construction Period.

200.3.3 INTENTIONALLY DELETED

200.3.4 WEED CONTROL AND LANDSCAPE MAINTENANCE

200.3.4.1 General

All areas within the TUC located South of 17 Avenue SE and East of Macleod Trail, except for Privately-Owned TUC Land (as defined in section 2 of Schedule 12 of the DBFO Agreement) and the Third Party Leased Lands, shall be maintained in a weed free condition by the Contractor until Construction Completion. The "**Third Party Leased Lands**" are those lands as set out in Appendix G (Alberta Infrastructure Land Lease Summary and Drawings) where it is indicated in the last column of Appendix G that the Contractor is not responsible for maintenance of the lease areas outside the Road Right of Way. Thereafter, all areas within the Road Right of Way and/or stormwater management facilities of the Infrastructure shall be maintained in a weed free condition by the Contractor until the end of the Term.

Weeds to be eradicated include all species identified under the *Weed Control Act* (Alberta) and the applicable Local Authority's bylaws, or species which interfere or compete with the seeded varieties. Volunteer crops from previous land use will be considered as weeds.

The Contractor shall be responsible for any fines or weed control notices issued for the TUC located South of 17 Avenue SE and East of Macleod Trail until Construction Completion and then for the Road Right of Way and/or any stormwater management facilities outside the Road Right of Way but inside the TUC until the end of the Term. All notices shall be dealt with in a timely fashion. Copies of all fines and notices shall be provided to the Department.

200.3.4.2 Method

Weed control shall be carried out by cultivation, seeding, and spraying. The areas (as set out in the first sentence of Section 200.3.4.1 (General)) not affected by the construction of the New Infrastructure as determined by the Contractor shall be tilled to ensure that all nuisance weeds are controlled. In addition, the tilled areas shall be seeded in the Spring of 2013 using the seed mixes in Section 200.2.9 (Topsoil and Seeding).

Any method of weed control adopted by the Contractor shall take into account wind directions and velocities. The Contractor shall ensure that residents located near the Infrastructure are not subjected to dust and/or spray drift resulting from its weed control operations. Natural areas shall not be subjected to spray drift. The Contractor shall be responsible for all costs associated with any damage to residential property, natural areas or retained plant materials resulting from spray drift or poor agricultural or weed control practices carried out by or for the Contractor.

In the event the Contractor chooses seeding with commercial crops as a method of weed control, any crops harvested shall become the property of the Contractor. The use of commercial crops as a method of weed control shall only be allowed during the Construction Period, not the Operating Period.

Pesticide applicators must meet all requirements in the *Code of Practice for Pesticides* (applicable by regulation under section 36 of the *Environmental Protection and Enhancement Act* (Alberta)). Pesticide applicators must also comply with all requirements of the *Environmental Protection and Enhancement Act* (Alberta), its associated regulations and all other applicable laws. The Contractor or any subcontractor that the Contractor hires for herbicide application must hold a valid Pesticide Service Registration with Alberta Environment (or its successor).

200.3.4.3 Weed Control Signage and Notification

The Contractor shall provide signs and notices to residents affected by the work prior to commencement of chemical applications. Signage and notification shall follow policies and procedures set by the Local Authority. The Contractor shall become familiar with the policies and procedures by contacting the Local Authority for the affected area.

The Contractor shall notify the Local Authority a minimum of 48 hours prior to spraying with information including the following: location, target weeds, chemicals to be used and date and time of application.

Prior to spraying, the Contractor shall purchase all necessary signage from the Local Authority to assist in identifying spray areas. Signage shall be installed at a minimum 100 m interval and at all entry points, corridors and walkways adjacent to the TUC or as directed by the Local Authority. The Contractor shall be responsible for displaying and removing signs in accordance with the time frame required for public notification and re-entry intervals. The Contractor is to ensure that signs refer project inquires to the Contractor's contact number.

The Contractor shall be responsible for obtaining information from the Local Authority regarding citizens in the vicinity of the TUC with medical sensitivities or other concerns related to spraying. The Contractor shall be responsible for determining if any such area residents are affected and then take appropriate measures to meet their specific needs.

200.3.4.4 Mowing and Fence Trimming

The Contractor shall carry out mowing and trimming around fences, as part of weed control in the following instances:

- as an emergency procedure in response to weed notices;
- to control weeds that are not effectively responding to the weed management program;
- as a clean up procedure at the end of the growing season; and
- in areas adjacent to residences where spraying is not feasible.

The trimming of weeds around fences shall be conducted as reasonably required and in any event at least once every 60 days during the period April 1 to October 31 each year.

200.3.4.5 Seed Establishment and Maintenance of Seeded Areas

Any area of unsatisfactory seed establishment shall be top dressed and reseeded by the Contractor. The acceptable minimum number of plants of all seeded species per square metre shall be 150.

The seeded areas shall be mowed/cut to 100 millimetre height a minimum of twice during the growing season. Baling and/or raking of the mowed/cut plant material shall be performed upon completion of the mowing/cutting operation in order to prevent accumulation of mulch. Bales and raked material shall be removed from site immediately upon completion of the baling/raking operation. All bales and raked material shall become the property of the Contractor.

Weeds that emerge during the one year establishment period are to be controlled as per the requirements and methods described in the Section 200.3.4.2 (Method).

200.3.5 MAINTENANCE OF DRAINAGE SYSTEMS

In addition to maintenance of the New Infrastructure drainage system, the Contractor is responsible for the maintenance of previously installed drainage systems on other portions of the Road Right of Way and the TUC as set out in Drawings 18-A-03 to 18-A-11 in Appendix A. This includes the entire drainage network from the source points to the various outfalls and all features in between. The Contractor shall ensure that the design hydraulic capacity of the network as a whole and each of its elements is maintained at all times. The Contractor shall note that some elements of the drainage network are shared between the Department and the Local Authority. The Contractor acknowledges as having reviewed the agreements describing the shared systems. The Contractor shall not be permitted to interfere with the function of any shared system without the permission of both the Department and the affected communities.

In the event of a roadway spill that impacts the drainage system, the Contractor shall be responsible for managing the clean up. This shall include but not be limited to implementing any safeguards to prevent contaminants from entering adjacent water bodies or the groundwater system.

200.3.6 BRIDGE INSPECTIONS

200.3.6.1 Level 1 BIM Inspections

Level 1 BIM inspections shall be completed for all bridges in the Existing Infrastructure within 30 days after Construction Completion. Level 1 inspections shall be repeated every 21 months thereafter, until the end of the Operating Period.

200.3.6.2 Level 2 Bridge Deck Inspections

Initial Level 2 Bridge Deck Inspections (as defined by *Alberta Transportation's Bridge Inspection and Maintenance System* ("**BIM**")) for bridges in the Existing Infrastructure shall be carried out by the Contractor as follows:

Starting in 2014:

- Bridge carrying the eastbound lanes of Stoney Trail over the Bow River;

Starting in 2022:

- Bridges carrying the eastbound and westbound lanes of Stoney Trail over Highway 2;
- Bridge carrying 196 Avenue SE over Highway 2;
- Bridges carrying the northbound and southbound lanes of Highway 2 over the Bow River; and

- Bridge carrying Dunbow Road over Highway 2.

Starting in 2026:

- Bridge carrying the westbound lanes of Stoney Trail over the Bow River;

Following the initial Level 2 Bridge Deck Inspection, subsequent Level 2 Bridge Deck Inspections for the bridges in the Existing Infrastructure shall be repeated by the Contractor at an interval of every four years, until the end of the Operating Period.

200.3.7 PREVENTATIVE BRIDGE MAINTENANCE

Sealing of the bridges in the New Infrastructure and Existing Infrastructure shall initially be carried out by the Contractor in 2014 and subsequently repeated at an interval of every four years thereafter until the end of the Operating Period.

200.3.8 INTENTIONALLY DELETED

200.3.9 SPECIAL EVENTS

There will be occasions where the Department requires the cooperation and coordination of the Contractor for special operations. Any work required by the Contractor under this Section 200.3.9 (Special Events) shall require a Change Order.

200.3.9.1 Full Lane Availability Events

Sometimes special events will be approved by the Department in the area which will generate extra traffic in the Infrastructure. Some events that generate extra traffic in the Infrastructure will occur independently of approval by the Department.

Such events may require:

- Installation of special banners or special signs;
- Adjustment of traffic signals; and
- Additional traffic management or traffic accommodation measures.

200.3.9.2 Partial or Full Closure Events

There will be times when the Infrastructure is utilized for special events ("**Approved Special Events**"), approved by the Department that may require closure or partial closure of the Infrastructure. The following measures may be required:

- Installation of special signs; and
- Additional traffic management or traffic accommodation measures.

The Contractor is required to develop a communications and operations plan to accommodate Approved Special Events when so notified by the Department. The Department shall approve such plan and the Contractor shall implement the approved plan.

Lane Closure Payment Adjustments shall not apply to lane closures required for Approved Special Events.

200.4 MISCELLANEOUS

200.4.1 THE CITY OF CALGARY

The Contractor acknowledges having reviewed a copy of the Highway Transfer Agreement between the Province and The City of Calgary dated March 31, 2007 (the "**City Agreement**"). The Contractor shall take all such actions, or refrain from such actions, as are necessary so as to enable the Province to comply with the Province's obligations under the City Agreement in respect of the Project, the O&M and the Infrastructure.

200.4.2 HOURS OF WORK / WORK RESTRICTIONS

On the days Monday through Saturday, construction work on the Project shall be restricted to the period between 7:00AM and 10:00PM local time. On Sundays and statutory holidays, construction work on the Project shall be restricted to the period between 9:00AM and 10:00PM local time.

Activities exempted from these time restrictions are:

- Overhead sign structure installation;
- Girder erection;
- Concrete pours for bridge construction; and
- Line painting.

Other activities may be exempted with the prior written approval of the Department subject to the review and evaluation of the predicted levels of impact to surrounding residents.

When the Contractor's construction work on the Project is being carried out within the jurisdictional boundaries of a particular Local Authority, then the Contractor's construction work shall be restricted to the hours permitted by that Local Authority's bylaws or the hours of work restrictions in the third paragraph above, whichever hours of work restrictions or parts of the restrictions are more restrictive. The Contractor may obtain a noise by-law waiver from the Local Authority (if required) and a waiver of the hours of work restrictions in the third paragraph above from the Department.

200.4.3 COORDINATION WITH LOCAL AUTHORITIES

The Contractor is responsible for coordinating all operations on crossroads with the Local

Authority during construction. Should a Local Authority initiate a lane rental policy for operations on that Local Authority's streets and roads, the policy will not apply on New Infrastructure crossroads.

The Contractor shall contact Anne Cataford, The City of Calgary; or Byron Riemann, MD at least 48 hours prior to commencing work on or adjacent to Local Authority roads.

The Contractor shall be responsible for the coordination of the design requirements and construction phasing with the Local Authority. The Contractor shall also be responsible for removal of and for coordination with the Local Authority regarding any required road removals and closures in the TUC.

200.4.4 POLICE AND FIRE SERVICES

Police and fire services for any area of the Infrastructure within the boundaries of a Local Authority will be provided by and under the jurisdiction of the Local Authority and obtained by 911 call.

The Contractor shall take all such actions, or refrain from all such actions, as are necessary to enable the police, Local Authority, and others with statutory duties or functions in relation to the Infrastructure or adjoining roads to fulfil those duties and functions. Without limiting the generality of the foregoing, the Contractor shall permit the police, Local Authority, and others with statutory duties or functions in relation to the Infrastructure, to carry out "Check Stops" and speed enforcement activities.

For any follow-up response necessary as a direct result of the emergency, the Contractor shall be responsible for all costs for such follow-up responses incurred as a direct result of the emergency including the placement and removal of barricades and timely removal of debris, which may be deposited on the Infrastructure.

200.4.5 LAND ISSUES

Administration of the TUC is undertaken by Department of Infrastructure on behalf of the Province. Any individual or organization proposing to enter the TUC outside the Road Right of Way to undertake an activity or use requires at least one authorization from Department of Infrastructure. The document entitled "*Transportation/Utility Corridor* ("**TUC**") *Program Policy*" published by Department of Infrastructure, as may be amended from time to time, explains in detail the objectives of the TUC program. Steps for obtaining Ministerial Consent and other related authorizations from Department of Infrastructure are included in this policy.

200.4.6 LAND REQUIREMENTS IN THE EXISTING TUC

By Construction Completion, the Contractor shall have installed a fence separating the Road Right of Way from the remaining utility components of the TUC (the "**TUC Outside the ROW**"). At that time, the Department of Infrastructure will desire to reassign the TUC Outside the ROW as lease areas. The Contractor will be relieved of its maintenance responsibility for those portions of the TUC Outside the ROW that the Contractor had responsibility, if the state of this land is acceptable to the Department of Infrastructure. Conditions for the handover back to the Department of Infrastructure shall require that these areas are fully vegetated and in a healthy and vigorous weed-free growing condition in accordance with the Contractor's Environmental Management System.

Currently, the lands forming the TUC in Southeast Calgary are leased by the Department of Infrastructure to tenants. A detailed tabulation of the leases and schedules for termination is given in Section 200.2.3.24 (Demolition). The Contractor's obligations for maintenance for the various parcels is set out in the tabulations in Section 200.2.3.24 (Demolition).

Any features or appurtenances related to the roadway, such as stormwater management facilities, that may fall within the TUC Outside the ROW shall remain the responsibility of the Contractor. The Contractor shall make specific arrangements with the Department of Infrastructure to ensure that the Contractor's maintenance of these features does not interfere with any future tenants or other land uses.

200.4.7 INTENTIONALLY DELETED

200.4.8 WORK BY OTHER FORCES

The Local Authorities will be responsible for operations and maintenance of crossing roadways beyond the Project Limits within their jurisdiction. The City of Calgary is responsible for operations and maintenance of Highway 22X from east of Macleod Trail to the west. The Department's maintenance contractor, Carmacks Enterprises Ltd. is responsible for operations and maintenance on Highway 2. The Stoney Trail General Partnership through its subcontractor Carmacks Enterprises Ltd. is responsible for operations and maintenance on the portion of Stoney Trail SE located north of 17 Avenue.

The Contractor shall coordinate all construction activities, and cooperate with any and all stakeholders within the Project Limits, including utility stakeholders, maintenance contractors and the Local Authority. This work includes but is not limited to the following:

- The twinning the 196 Avenue interchange by the Department;
- The rehabilitation of the eastbound bridge carrying Stoney Trail over the Bow River by The City of Calgary;
- 100 Street between 17 Avenue SE and Peigan Trail will be upgraded by The City of Calgary;
- 100 Street from 61 Avenue to the Shepard Ditch will be upgraded by the MD; and
- 104 Street from 138 Avenue SE to Highway 22X will be upgraded by the Department.

200.4.9 VEHICLE INSPECTION SERVICES

Commercial vehicles travelling on the Alberta provincial highway system are randomly inspected and weighed by officials from the Department (currently the Vehicle Inspection Services Branch of the Department). Commercial vehicles travelling on the Infrastructure will be inspected and weighed in a similar manner and frequency as on the rest of the provincial highway system.

The Contractor may purchase at agreed upon rates additional inspection services from the Department should the Contractor wish to increase the inspection frequency to reduce the potential for overload commercial vehicles travelling on the Infrastructure.

The Contractor will not be permitted to construct pull-out areas along the mainline.

200.4.10 SURVEY

The Contractor shall, as soon as reasonably practical after Construction Completion, obtain at its cost but on the Department's behalf, a survey (the "**Survey**") of the Lands. The Contractor shall provide the Department with copies of the Survey. The Contractor and the Department shall in good faith negotiate an amendment to the DBFO Agreement to describe the Lands by referencing the Survey.

200.4.11 CLEANING OF ROADWAYS

The Contractor shall not track material from the construction site onto roadways used by the public. If tracking should occur, the Contractor shall immediately remove all tracked material from the affected roadway.

200.4.12 ROADWAY OBLITERATION

All roadways, ramps, and access roads designated for removal, shall be landscaped neatly with slopes flatter than 5 horizontal to 1 vertical within the Road Right of Way, and flatter than 6 horizontal to 1 vertical outside the Road Right of Way. The landscaped areas shall be topsoiled and seeded in accordance with Section 200.2.9 (Topsoil and Seeding). Culverts shall be removed and the existing drainage patterns shall be maintained, unless the changes are incorporated in the drainage elements of the Contractor's design.

The Contractor shall assume ownership of all debris and salvaged materials, such as culverts, roadway lighting and traffic signals except as otherwise identified. After removal, the Contractor shall store on site any existing lighting or traffic signal systems owned by the Local Authority and shall provide the Local Authority with written notice, and the Department with a copy of such notice concurrently, that any materials to be salvaged are to be removed by the Local Authority within 30 days. If the Local Authority has not removed the materials within 30 days from notice, the lighting systems and/or traffic signal systems become the property of the Contractor.

200.4.13 STONEY TRAIL AGGREGATE RESOURCE

(1) Definitions relating to this Section of Schedule 18 are contained in the main body of the DBFO Agreement and in Appendix J hereto.

(2) The Contractor has the option of excavating Aggregate from the STAR for use solely in respect of the Project, with such excavation to commence no earlier than January 15, 2011.

(3) In order to exercise its option, the Contractor shall deliver the Contractor's Election Notice to the Department within 60 days of Execution of the DBFO Agreement. The Contractor's Election Notice is the Contractor's notice in writing which confirms the Contractor's irrevocable election to excavate, mine, stockpile, and haul Aggregate from the STAR for use solely in respect of the Project, with the total amount of Aggregate to be excavated, stockpiled and hauled not to exceed a maximum of 5.0 million tonnes of Aggregate.

(4) Subject to (5) below, the Contractor is limited to excavating, stockpiling and hauling a maximum of 2.0 million tonnes of Aggregate from the STAR per year, from January 15, 2011 to and until the date of STAR Completion, Traffic Availability, the date of Cancellation, or the date of termination of the DBFO Agreement, whichever occurs earliest.

(5) The Contractor is limited to excavating, stockpiling and hauling a maximum of 5.0 million tonnes of Aggregate from the STAR.

(6) In the event that the Contractor's option to access Aggregate from the STAR is exercised, the Contractor shall comply with the terms and conditions contained in this Section and in Appendix J hereto.

200.4.14 PROJECT SIGNAGE

The Contractor shall supply and install project signage applicable to projects delivered through federal and provincial partnership. The provincial signage shall be designed and fabricated in accordance with *Alberta Transportation's Design Bulletin #53/2007 – Project Identification Signs for Capital Construction Projects* (Revised August 2009). The federal signage shall be in accordance with *Canada's Economic Action Plan – Road Improvement* signage. Each of the provincial and federal project signage shall be ground mounted and measure no less than 1.2 metres by 2.4 metres. The signage shall be located within the Project Limits at the following locations with the exact locations to be determined in consultation with Department:

- Deerfoot Trail interchange (3 signs);
- Highway 22X/88 Street interchange (2 signs); and
- 17 Avenue SE (2 signs).

All provincial and federal signs shall be maintained in good condition during the Construction Period and for a period of twelve months after Traffic Availability. Approval for removal of the project signage shall be obtained from the Department prior to the removal and disposal of project signage, which is the responsibility of the Contractor.

Any additional signage within the Project Limits and not related to traffic operations shall be subject to approval by the Department.

The Contractor shall supply and install two WC-13 wildlife crossing signs 750 mm x 750 mm in size. The signs shall be located adjacent to the eastbound and westbound lanes on Highway 22X/Stoney Trail approximately 500 metres before the Bow River structures.

300.0 DESIGN AND CONSTRUCTION - NEW INFRASTRUCTURE

300.1 INTRODUCTION

This Section covers the design and construction requirements applicable to roadways and bridge structures in the New Infrastructure.

300.2 DESIGN – GENERAL

300.2.1 GENERAL DESIGN REQUIREMENTS

The performance requirements to be met in the design of all roadways, bridge structures and other appurtenances include requirements in the areas of safety, functionality/serviceability, durability/maintainability and aesthetics. The standards to which these performance requirements are to be met are generally specified in this Schedule 18 (Technical Requirements). If a performance requirement is not specified in this Schedule 18 (Technical Requirements), the performance requirement shall be set to a standard generally being met on new roadways and bridge structures of similar type on the Provincial highway system.

Bridge structures must be designed to be structurally and operationally safe in terms of accommodation of traffic, operations and maintenance activities for the duration of the 75 year service life.

All designs shall incorporate the appropriate selection of design concepts, design details, specifications, materials and construction methods and techniques.

300.2.2 RESPONSIBILITY FOR DESIGN

The Contractor is responsible for the design of all elements of the New Infrastructure including, but not limited to, all geotechnical investigations, environmental considerations and permits, topographic surveys, in-stream watercourse surveys, approvals and permits, other field investigations and technical analysis required to complete the designs in a professional and competent manner.

300.2.3 DESIGN DOCUMENTATION

Detailed design documents shall cover the full range of infrastructure required in the Project. Design documentation shall include, but not be limited to:

- Design reports for all aspects of the work including but not limited to the design decision process, criteria and assumptions used for each aspect of the design, agreements, permits, authorizations and special construction requirements.
- Detailed design drawings prepared in accordance with the Department's *Engineering Drafting Guidelines for Highway and Bridge Projects*, including availability in electronic format.
- Comprehensive construction specifications sufficiently detailed to describe the process or

end result requirements.

As a basis for this documentation, the Contractor shall further develop and finalize, as required, the design reports, plans and specifications in the Contractor's Designs, including, but not limited to:

- Design plans and profiles;
- Design cross-sections;
- Design appurtenances;
- Signing;
- Lighting;
- Roadside hazards;
- Pavement Design Report (Section 300.4.1.8.1);
- Bridge Structures Design Report (Sections 300.5.3 and 300.5.4); and
- Drainage Design Report (found in the Contractor's Designs or in the Contractor's Management Systems and Plans).

Details of design documentation requirements for these and other design issues are further expanded in this Schedule 18 (Technical Requirements).

Complete design document packages must be available prior to starting construction of the elements designed in any specific package. Any non-conformance with the Technical Requirements shall be rectified by the Contractor, whether the work has been constructed or not.

300.2.4 AESTHETICS

The Contractor is advised that the Department supports and encourages the inclusion of cost effective features to improve the overall roadway and bridge structure aesthetics.

The Contractor shall develop and incorporate in its design an aesthetic theme throughout the New Infrastructure that shall complement the surrounding environment and generally be compatible with similar features and structures located in the general vicinity, as indicated in Section 200 (Project Specifics).

Aesthetics shall be considered in the layout and design of all roadway elements. The aesthetic principles outlined in the Department's Bridge Aesthetics Study (Version 1.0, April 2005) shall be considered in the layout, shapes, details, finishes and architectural features of all bridge structures. Any proposed aesthetic features shall take into consideration routine and long-term maintenance costs and not lead to potential maintenance and rehabilitation problems in the future.

Proposed twin bridge structures shall be aesthetically similar and constructed of the same material type. Twin bridge structures are structures spanning a common opening and close enough to be located on the same bridge approach fills. Twin bridge structures shall have similar head slopes and openings.

Bridge headslopes are typically incapable of supporting vegetation due to the shadow created by the bridge structure. On railway overpass and grade separation bridge structures, the bridge headslope shall be covered with concrete slope protection that prevents erosion and enhances the appearance of the headslopes.

All electrical and communications wiring for the New Infrastructure shall be underground.

300.2.5 PROVISIONS FOR FUTURE STAGES

During design of the roadway elements, the Contractor shall be cognizant of the requirement for future expansion through the addition of lanes or other elements as detailed in Section 200 (Project Specifics). Design and construction must feasibly allow for future economical expansion through addition of lanes and other elements.

During design of the bridge structures, the Contractor shall be cognizant of the potential requirement for future widening and/or lengthening of the bridge structures. When required, the initial design and construction of the bridge structures shall consider provisions that feasibly allow for future economical bridge structure widening and/or lengthening.

Vertical grade lines shall be set so that all vertical clearance requirements are met after any anticipated bridge structure widening and/or lengthening or roadway rehabilitation has occurred.

300.2.6 ROADWAY SAFETY AUDITS

Roadway safety audits shall be performed pursuant to the DBFO Agreement and the Contractor's Management Systems and Plans. Roadway safety audits shall follow the Transportation Association of Canada ("**TAC**") work scope detailed in the *Canadian Road Safety Audit Guide*, for both design and pre-opening stages. The pre-opening safety audit must be conducted after the roadway is paved and all signage and pavement markings are complete. Roadway safety audits shall be an integral part of the QMS.

The Contractor shall provide the Department as soon as practicable with a copy of the Contractor's Response Report to each of the design and pre-opening safety audits. The Contractor shall implement, at its cost, those recommendations or suggestions in the design and pre-opening safety audits as determined by the Contractor, acting reasonably. The Contractor shall provide the Department with a written explanation as to those recommendations or suggestions in the design and pre-opening safety audits that the Contractor has decided not to implement. The Contractor shall implement or shall refrain from implementing, at its costs, those recommendations or suggestions in the design and pre-opening safety audits as directed in writing by the Department.

300.3 CONSTRUCTION - GENERAL

300.3.1 RESPONSIBILITY FOR CONSTRUCTION

The Contractor is responsible for the supply of all management, professional and technical services, supervision services, construction quality control and quality assurance services, labour, materials, and equipment for performing all of the duties and obligations necessary for delivering all of the requirements of the Project. The Contractor is responsible for obtaining and complying with requirements of all permits and other authorizations required for the construction of the New Infrastructure.

The Contractor shall ensure that construction conforms to the requirements of the design. All construction is to reflect a high degree of workmanship and all materials incorporated into the New Infrastructure shall meet long-term safety, durability and functionality requirements.

Changes to the design documents during construction shall be submitted to the Department for review purposes. Any changes to the design requirements will be subject to the Change Order requirements detailed in the DBFO Agreement.

The Contractor is responsible for reclaiming all areas of the Road Right of Way and/or drainage system that have been disturbed during construction of the Project and shall obtain any required Reclamation Certificates related to these activities within 12 months of completing the reclamation activity and shall provide a copy of same to the Department forthwith.

300.3.2 TRAFFIC MANAGEMENT

The Contractor shall maintain the safe and efficient passage of traffic on existing roadways within the Road Right of Way. All detours required to meet this requirement shall be paved.

Requirements for the accommodation of traffic during construction and operation until the end of the Term are set out in Section 200 (Project Specifics) and Sections 400.1 (Operations – General).

If the Contractor elects to truck haul materials over roads that are not designated as truck haul routes by the Local Authority, the Contractor shall be responsible for obtaining written approval from the Local Authority and the Department for use of proposed haul routes within their respective jurisdictions.

300.3.3 AS-BUILT INFORMATION

The Contractor shall compile and record information on the dimensions and physical characteristics of the New Infrastructure. The Contractor shall compile and retain the As-Built Roadway Construction Report, As-Built Surfacing Information, As-Built Pavement Structural Information, and As-Built Construction Report – Bridge Structures, As-Built Drawings, all as described below (the "**As-Built Construction Reports**") that include full descriptions of each phase of the work, including, but not limited to, as-built drawings, and inspection and test reports. All as-built information provided by the Contractor shall be authenticated by Professional Engineers in accordance with *Association of Professional Engineers, Geologists, and Geophysicists of Alberta (APEGGA) Practice Standard for Authenticating Professional Documents V2.0*.

The maximum time for completion and the providing of the As-Built Construction Reports to the Department shall be six months after Traffic Availability.

If the As-Built Construction Reports are not available to the Department within the specified time, a Payment Adjustment of $12,000/month or any partial month, for every month in excess of the specified time shall apply until available.

300.3.3.1 As-Built Roadway Construction Report

The As-Built Roadway Construction Report means an as-built report that contains sufficient detail so that an independent reviewer can gain a clear understanding of the Project. The report must be in an electronic PDF format and in hard copy. The As-Built Roadway Construction Report shall contain, but not be limited to the following:

- Project title;
- Scope of the Project, Project description and site plan;
- Project staff, subcontractors, equipment and suppliers;
- Actual Project schedule and key dates;
- Work progress, problems and solutions;
- Innovative and unique aspects of the Project;
- Safety, traffic accommodation and utility relocation;
- DBFO Agreement extensions, Change Orders, or supplemental work;
- Environmental issues;
- Photographs of key activities;
- Commentary on the materials testing results; and
- Copies of all correspondence to the Department and to the Contractor from the Department including minutes of meetings.

300.3.3.2 As-Built Surfacing Information

The Contractor shall prepare an as-built report known as the "As-Built Surfacing Information" which shall include but not be limited to the following:

Project Description - A complete description of the Project, including, but not limited to, the following:

- Highway control section number (e.g. 2:02);
- Project title;
- Project description and site plan;
- Project staff, subcontractors, equipment and suppliers;
- Surfacing schedule and key dates;
- Work progress, problems and solutions;
- Innovative and unique aspects of the surfacing;
- Safety, traffic accommodation and utility relocation;
- All concrete and asphalt mix designs;

- Change Orders;
- Environmental issues;
- Width and thickness charts;
- Photographs of key activities;
- Commentary on the materials testing results for grading and granular base course; and
- Commentary and summary of asphalt pavement and Portland cement concrete testing results.

300.3.3.3 As-Built Pavement Structural Information

The Contractor shall prepare an as-built report known as the "As-Built Pavement Structural Information" which shall include, but not be limited to:

Width and thickness diagrams - for each homogeneous section greater than 200 m in length, containing:

- Soil classifications;
- Subgrade additives used, if any (e.g. lime);
- The applicable plans, annotated to show any deviation from the original design;
- The results of any coring or drilling undertaken on the Project;
- The finished surface width (rounded to the nearest 100 mm);
- The constructed sideslope ratios of pavement structure and subgrade as applicable; and
- The constructed pavement structure thickness (rounded to the nearest 5 mm) including:
- The thickness of each layer; and
- The type and grade of asphalt cement and/or type and classification of Portland Cement concrete used.

300.3.3.4 As-Built Construction Report - Bridge Structures

The Contractor shall prepare an as-built report known as the "As-Built Construction Report – Bridge Structures" which shall contain, but not be limited to the following:

- Shop drawings for bridge material fabrication;
- Weld procedures;
- Mill reports for stressing strand;
- Stress-strain curves for stressing strand;
- Stressing calculations;
- Camber records;
- Construction Data Sheets for precast concrete girders;
- Mill certificates;
- Test reports for Charpy impact, hardness, radiography, ultrasonic, magnetic particle, and dye penetrant;
- Heat treatment records;
- Concrete and asphalt mix designs;
- Pile driving, pile drilling, foundation records;

- Concrete test results;
- Post-tensioning and stressing records;
- Material testing results including gradation analysis for backfill materials, clay seal, etc.; and
- Any other information recorded as part of the QMS and required to document material properties or construction details.

The documents listed in Section 300.5.4 (Final Design Report Requirements), shall also be submitted as part of the As-Built Construction Report - Bridge Structures.

300.3.3.5 As-Built Drawings

As-Built drawings are to be stamped and signed by a Professional Engineer.

As-Built drawings shall be in the same format as design drawings. The Contractor shall supply the following for the Department's record purposes.

Roads:

- One full-size stamped and signed set of C series drawings in 3 mil matte finish mylar film format;
- Two sets of 11x17 stamped and signed C series drawings (organized per roadway segment and placed in binders);
- One set of the electronic version of the stamped and signed C series drawings in Microstation .dgn format; and
- One set of the electronic version of the stamped and signed C series drawings in .pdf format.

Bridges:

- One full-size stamped and signed set of C series drawings in 3 mil matte finish mylar film format;
- Two sets of 11x17 stamped and signed drawings for each of Design Data, P series, and C series drawings (organized per bridge structure and placed in binders);
- One set of the electronic version of the stamped and signed C series drawings in Microstation .dgn format;
- One set of the electronic version of the stamped and signed P series drawings in Microstation .dgn format;
- One set of the electronic version of the stamped and signed C series drawings in .pdf format;
- One set of the electronic version of the stamped and signed P series drawings in .pdf format; and
- Two cerlox bound sets of stamped and signed shop drawings in 11x17 format.

The As-Built drawings shall show all relevant details of the New Infrastructure including, but not limited to, bridge structures, horizontal alignment, vertical alignment, cross-section elements, intersection layouts, interchanges, etc. Details of signing and pavement markings shall be described through reference to standard plans where possible. A detailed description and location of all underground utilities and conduits, showing horizontal locations, elevations, size and type of utility, etc., shall be shown on As-Built drawings.

300.4 ROADWAYS

300.4.1 DESIGN REQUIREMENTS

300.4.1.1 Geometric Design

The design shall be undertaken in accordance with the latest edition of *Alberta Transportation's Highway Geometric Design Guide* and applicable *Design Bulletins*, Section 200 (Project Specifics) and where noted, associated reference manuals or guidelines. Where specific design elements are not included in the *Alberta Transportation's Highway Geometric Design Guide* and applicable *Design Bulletins*, the design shall be undertaken to conform to the *TAC Geometric Design Guide for Canadian Roads*. All design performed for this Project shall fully comply with *Alberta Infrastructure and Transportation Roadside Design Guide*.

The design shall utilize, as a minimum, the design criteria stipulated in Section 200 (Project Specifics). Where design criteria are not specified, desirable design criteria shall be utilized, except where minimum design criteria are acceptable to the safety auditor. In no circumstance will the use of combinations of inter-related minimum design criteria be accepted.

The Contractor shall consider the ultimate design identified in the Functional Plan, or as detailed in Section 200 (Project Specifics), in all design decisions in order to facilitate any additions to the New Infrastructure durinf the Term or later. The design shall consider future costs, throwaway costs, user costs, safety, and identify an optimal design within such constraints. Life cycle cost considerations shall be documented in the design report to support the design decisions. The Project mainline, ramps and crossroads shall be designed for the design speeds identified in Section 200 (Project Specifics).

300.4.1.2 Intersections and Interchanges

The design of at-grade intersections shall be in accordance with *Alberta Transportation's Highway Geometric Design Guide* and any applicable *Alberta Transportation Design Bulletins*.

Interchanges shall be designed to the configurations established in the Functional Plan, to Section 200 (Project Specifics), or to equivalent alternative configurations accepted by the Department.

300.4.1.3 Soils

The Contractor shall undertake the grading design with due consideration for the soil types encountered. A geotechnical investigation shall be carried out by the Contractor in sufficient detail to allow for the identification of all soils issues.

The Contractor shall prepare and provide to the Department detailed geotechnical reports for the entire Project for the purpose of documenting soil conditions and the engineering recommendations for all soils issues. The reports shall be completed in accordance with the *Canadian Foundation Manual* and the Department's *Engineering Consultant Guidelines for Highway and Bridge Projects*.

300.4.1.4 Drainage

The drainage design shall prevent damage to the Road Right of Way, the TUC and the lands adjacent the TUC, caused by flooding or drainage problems.

The Contractor shall be responsible for obtaining all necessary permits and authorizations from, but not limited to, Alberta Environment, the Department, Department of Fisheries and Oceans, and the Local Authority, as applicable.

The drainage design shall include erosion control installations necessary for the in-situ conditions of the drainage works. The Department's *Design Guidelines for Erosion and Sediment Control for Highways* may be considered for such designs.

300.4.1.5 Hazard Protection

The use of barriers shall be limited to those areas where it is necessary to protect the travelling public from roadside hazards. All grade line design shall be such as to minimize the need for barriers.

The Contractor shall utilize the appropriate barrier configuration for providing protection for roadside hazards based on safety considerations. For drainage obstructions, the Contractor shall undertake the design to minimize the need for protection. In any special circumstance where protection is required, the Contractor shall protect the public from the hazard using a barrier that has passed all required tests for *NCHRP Report 350*, Test Level 3, unless otherwise specified in Section 200 (Project Specifics).

The Contractor shall use barrier end treatments that have passed all required tests for NCHRP Report 350, Test Level 3.

Where barriers are required and cannot be avoided by altering design characteristics of the roadway, thrie beam rail shall be used. The rail, support posts, and ancillary hardware shall be specified to meet the performance requirements described in *NCHRP Report 350*, Test Level 3 and Section 200 (Project Specifics).

300.4.1.6 Roadway Lighting

The Contractor shall design the roadway lighting in accordance with the requirements of the *Alberta Transportation Highway Lighting Guide*. The design shall result in lighting to levels identified in Section 200 (Project Specifics) for the full length of all roadways. The poles and bases shall meet the requirements of the *Alberta Transportation Highway Lighting Guide.*

All designed systems shall be in accordance with the *Canadian Electrical Code* and the regulations of the electrical inspection department having jurisdiction. The Contractor shall prepare shop drawings of all electrical components as part of the design. The drawings shall include poles, luminaires, distribution enclosures and bases. Shop drawings shall be stamped and signed by a Professional Engineer.

All poles and associated hardware shall be hot-dip galvanized in accordance with CSA standard G164-M. Where two or more galvanized sections will be placed in close proximity, the finished appearance of each section shall be similar to the adjacent galvanized section(s).

300.4.1.7 Landscaping

All non-hard surfaced areas within the Road Right of Way and other disturbed areas within the TUC shall be topsoiled and seeded to grass as noted in Section 200 (Project Specifics).

300.4.1.8 Pavement Structure

The Contractor shall design the pavement structures in accordance with recognized design procedures on the basis of actual soil parameters for the roadway subgrade. The pavement structures for all roadways within the New Infrastructure shall be designed with no reduction of or restrictions to allowable legal load(s), during spring time thawing conditions or at any other time. For pavement designs such as final-stage paving and rehabilitation, the Contractor's design methodology shall utilize back-calculated moduli values that the Contractor shall determine based on non-destructive testing.

Materials for the roadway surface may be asphalt concrete pavement or Portland cement concrete pavement. All travelled lanes and full shoulder widths shall be paved. Shoulder and lane materials do not have to be the same, however the potential for future widening must be addressed in the design such that increased cost does not result at the time of any future widening. The subgrade widening at tie-ins to existing roadways shall be constructed to avoid disruption of drainage along the subgrade surface and protect the integrity of the existing pavement structure. Pavement structure variation for New Infrastructure shall be introduced beyond the tie-in point to preserve subgrade drainage and structural integrity of existing roads.

The pavement structure design shall account for future widening as stipulated in the Functional Plan and Section 200 (Project Specifics). The design shall identify how the future expansion will be accomplished in a cost effective manner. The pavement design shall provide for the shoulder thickness on the side(s) proposed for future widening to provide structural capacity equivalent to the adjoining travel lane.

300.4.1.8.1 Pavement Design Report

The Contractor shall prepare and provide to the Department a pavement design report, for both new construction and subsequent preservation and rehabilitation strategies that shall include, as a minimum:

- All pertinent design inputs such as traffic, soils characteristics, characteristics of the proposed construction materials, environmental inputs to the design and for rehabilitation designs, the existing pavement structure;
- Site plan showing the limits of the roadway covered by the design report;
- Discussion of the inputs used to arrive at design recommendations and the rationale used in selecting the recommended design strategy;
- Typical cross section drawings for the recommended pavement design strategy; and
- For rehabilitation designs, graphical presentation of calculated moduli, overlay needs, and existing cross sections.

300.4.1.9 Traffic Control Devices

300.4.1.9.1 Signs

Sign patterns for standard signs shall conform to the *Alberta Transportation Sign Catalogue*. For signing not addressed by the *Alberta Transportation Sign Catalogue*, sign patterns shall conform to the *TAC Uniform Traffic Control Devices of Canada Sign Pattern Manual*. All lettering on signs shall conform to the series Type Highway Font from the *Standard Alphabet for Highway Signs*, available from the Federal Highway Administration (CHTO-20), Washington, D.C., 20590, unless otherwise specified by the *Alberta Transportation Sign Pattern Manual* or the *TAC Uniform Traffic Control Devices of Canada Sign Pattern Manual* for the applicable signs.

300.4.1.9.2 Traffic Signals

All traffic signal installations, including pedestrian controls, shall be designed in accordance with the current edition of the *TAC Manual of Uniform Traffic Control Devices for Canada*, and the *Canadian Capacity Guide for Signalized Intersections*. The Contractor shall identify as part of the Contractor's Designs any planned staging of signal installations (the "**Planned Future Signal Installations**") based on traffic volumes at other locations on the New Infrastructure. The Contractor shall verify annually the signal warrants for any unsignalized intersection within the Road Right of Way using the procedures outlined by the new TAC method in the document "*Traffic Signal Warrant Handbook*" which applies the *Canadian Traffic Signal Warrant Matrix Procedure*. The Contractor shall submit the warrant calculations to the Department as soon as practicable after verification. If the Total Priority Points (as defined in the *TAC Traffic Signal Warrant Handbook)* has been met(minimum 100 cumulative warrant points) and if instructed to do so in writing (the "**Notice**") by the Department, the Contractor shall install traffic signals at such applicable intersection(s) within 12 weeks after the Notice (the "**Installation Deadline**").

If the Contractor fails to complete the Planned Future Signal Installations on or before the Installation Deadline, the "first occurrence of a non-functioning signal location" of the Payment Adjustments set out in Section 400.4.8.2.3 (Traffic Signals – Payment Adjustments) at an amended rate of $600/day or any partial day, until rectified shall apply as if the Planned Future Signal Installations had been completed but for 24 hours per day the deemed installed signals were not at all operational. For the purpose of applying such Payment Adjustment, the time stipulated for completing repairs as set out in Section 400.4.8.2.2 (Traffic Signal – Completing

Repairs) shall be deemed to have expired on the Installation Deadline. The foregoing Payment Adjustment shall continue to accrue and be payable until such time as the Contractor completes the Planned Future Signal Installations.

The Contractor shall design all signalization to interface with the Local Authority signal system. The Contractor shall cooperate with the Local Authority to meet all of the requirements of the Local Authority's control system and the Contractor's signal shall have the ability to be controlled by the Local Authority's system.

Changes to signal timing may be initiated by the Contractor, the Local Authority or the Department. Such changes shall be accommodated at the cost of the Contractor over the Term.

All electronics shall be NEMA approved electronics. LED lights shall be implemented as per Alberta Infrastructure and Transportation's Design Bulletin #32 "LED Lamp Usage in Traffic Signals, Pedestrian Signals and Beacons".

Subject to Section 200 (Project Specifics), all signals shall be mounted on cantilever style poles and no alternative mounting systems will be allowed at any time.

All poles and associated hardware shall be hot-dip galvanized in accordance with CSA standard G164-M. Where two or more galvanized sections will be placed in close proximity, the finished appearance of each section shall be similar to the adjacent galvanized section(s).

All signal systems shall be similar in appearance to those used by the Local Authority on roadways of the same standard in adjacent areas.

300.4.1.9.3 Pavement Markings

The Contractor shall design, install and maintain painted or durable pavement markings with or without "cat eye reflectors" in conformance with the *Alberta Transportation Pavement Marking Guide* and the *Alberta Transportation Highway Geometric Design Guide.* The placement and details of chevron paint markings in gore areas shall be in accordance with the Department's Recommended Practice for Chevron Gore Pavement Markings, which can be found on the Department's website.

300.4.1.10 Miscellaneous

300.4.1.10.1 Fencing

Fencing shall be designed and installed along the entire length of the Lands and around any stormwater management facilities related to the New Infrastructure outside the Lands but inside the TUC, as specified in Section 200 (Project Specifics).

300.4.2 MATERIALS

The Contractor shall select the materials to be used for construction and ongoing maintenance to meet the Technical Requirements. Where materials, such as culverts and ducting, have an expected life of greater than 30 years, the selection of the appropriate materials shall be based on a minimum of a 50 year life for the material.

Except for reclaimed asphalt pavement ("**RAP**") materials, all construction materials shall be new materials specifically manufactured for their intended purposes.

300.4.2.1 Topsoil

Topsoil shall consist of a natural, friable surface soil of organic character, suitable for agricultural purposes.

300.4.2.2 Aggregates

Aggregates for Portland cement concrete shall be suitable for use in concrete, shall exhibit suitable long term performance characteristics and shall conform to the requirements of CSA Standard 3-A23.1. Specifically, aggregates for use in concrete pavements or appurtenances shall exhibit suitable resistance to alkali-aggregate reactivity.

Aggregates for use in asphalt concrete shall be selected to provide suitable long term performance.

300.4.2.3 Portland Cement Concrete

Portland cement concrete for use in roadway elements including pavements, curbs, gutters, sidewalks, barriers or other appurtenances shall consist of a mixture of Portland cement, supplementary cementing materials, fine aggregate, coarse aggregate, water and admixtures where required, in proportions to meet the requirements of the design.

Portland cement concrete designed for any application that will be in contact with winter maintenance materials shall consist of materials shown to provide adequate resistance to scaling and other freeze thaw damage.

The Portland cement used shall meet the requirements of CSA Standard 3-A5, Portland Cement, for the type of cement specified. The Portland cement concrete shall meet all the requirements of CSA Standard A23.1. For CSA A23.1 section 17.4.2, Air Content of Hardened Concrete, the confirmation of the air-void system shall be on drilled cores obtained from the in-place concrete.

300.4.2.4 Asphalt

Asphalt binders shall meet the requirements of Alberta Infrastructure and Transportation's Specification 5.7 (Supply of Asphalt) as stated in its *Standard Specifications for Highway Construction*, Edition 13, (2007), and any relevant Specification Amendments issued by the Department as of the deadline for the submission of SR Package 2.

300.4.2.5 Fencing Materials

Fencing materials are defined in Section 200.2.15 (Fencing).

300.4.2.6 Reinforced Concrete Pipe

Reinforced concrete pipe for storm sewers or culvert applications shall conform to the material and fabrication requirements of CSA Standard A257.2. Concrete manhole risers and tops shall conform to all the material and fabrication requirements of CSA Standard A257.4.

Joints for circular concrete and culvert pipe using flexible rubber-type gaskets shall conform to all the material and fabrication requirements of CSA Standard A257.3.

300.4.2.7 Polyvinyl Chloride Pipe

Polyvinyl chloride ("**PVC**") pipe shall be made of virgin PVC plastic as defined in CSA Standard C22.2 No. 211.1. Gaskets for PVC pipe shall conform to the requirements of CSA Standard B182.2.

300.4.2.8 Smooth Walled Steel Pipes

Smooth walled steel pipe materials are described in Section 200 (Project Specifics).

300.4.2.9 Corrugated Metal Pipe And Pipe Arches

Corrugated metal pipe and pipe arches (less than 1.5 m diameter) shall be selected to insure a minimum design life of 50 years for the soil conditions in which they are to be installed. Any pipe 1.5 m or larger is considered a bridge structure.

Corrugated steel pipe ("**CSP**") and pipe arches including couplers and appurtenances shall be galvanized, polymer coated or aluminum coated in accordance with the latest edition of CSA Standard G401.

Corrugated aluminum pipe ("**CAP**") and pipe arches including couplers and appurtenances shall be manufactured to meet the requirements of AASHTO M196 and M197 and shall be marked with the manufacturer's name or trade mark and the date of manufacture.

During installation, any damaged coating shall be reinstated with the appropriate material in accordance with CSA Standard G401.

300.4.2.10 Curbs, Gutters, Medians, Traffic Islands, Sidewalks and Other Appurtenances

All curbs, gutters, raised medians, traffic islands, sidewalks and other appurtenances shall be constructed with Portland cement concrete.

300.4.2.11 Permanent Highway Signs, Posts and Bases

Sign panels shall be shipped, stored and installed in a manner to prevent damage to any sign panels. All damaged signs shall be repaired or replaced by the Contractor. The installed sign panels shall be new, clean, and not bent or twisted. The reflectorized surface shall be free of scratches, marks, blemishes, blisters, tears or other defects.

300.4.2.11.1 Reflective Sheeting

Reflective sheeting for standard regulatory, warning and side mounted guide signs shall meet or exceed the minimum requirements as specified in ASTM D4956 for Type III and Type IV High Intensity Retro-Reflective Sheeting Material and Section 200 (Project Specifics).

For installations of the following signs:

- RA-1 "Stop";
- RA-2 "Yield";
- RB-22 "Wrong Way"; and
- RB-23 "Do Not Enter",

the reflective sheeting shall meet or exceed the minimum requirements as specified in the ASTM-4956, Performance Requirements Type IX or Type XI Unmetalized Cube Corner Microprismatic Retroreflective Element Material.

For overhead guide signs with sign illumination, the reflective sheeting shall meet or exceed the minimum requirements as specified in ASTM-4956, Performance Requirements Type III or IV, High Intensity Retroreflective Sheeting.

For specific warning signs (roadway alignment, traffic control ahead, hazard, and pedestrian signs), reflective sheeting shall meet or exceed the minimum requirements as specified in ASTM-4956, Performance Requirements Type IX or Type XI Unmetalized Cube Corner Microprismatic Retroreflective Element Material.

For overhead guide signs without sign illumination, the reflective sheeting shall meet or exceed the minimum requirements as specified in ASTM-4956, Performance Requirements Type IX or Type XI Unmetalized Cube Corner Microprismatic Retroreflective Element Material.

300.4.2.11.2 Sign Posts

Sign posts on rural cross-sections, including but not limited to the mainline facility, shall meet the material and breakaway requirements set forth in Section H8.2 (Sign Post Selection) of the Department’s Roadside Design Guide (November 2007). The material and breakaway requirements for sign posts on urban cross-sections may be selected to match adjacent existing urban sign post materials, provided that the material selected for all single posts is the same.

300.4.2.12 Pavement Marking Materials

The Contractor shall supply pavement marking materials that will meet the requirements of the design and the performance requirements in Section 400.4.8.3 (Pavement Markings). Re-application shall meet the same performance requirements.

300.4.2.13 Guardrail and Posts

Guardrail and post materials are described in Section 200 (Project Specifics).

300.4.2.14 Intentionally Deleted

300.4.2.15 Flexible Guide Post Traffic Delineators

Material for flexible guide post traffic delineators shall meet the requirements of *Alberta Transportation Standard Specifications for Highway Construction*, Specification 5.28, Supply Flexible Guide Post Traffic Delineators.

300.4.2.16 Intentionally Deleted

300.4.2.17 Underground Electrical Conduit and Cable Ducts

Underground electrical conduit utilities shall meet the requirements of the *Alberta Electrical and Communication Utility Code* and *CSA Standard C223 No. 7-94* "*Underground Systems*", with amendments as listed in the *Alberta Electrical and Communications Utility Code* and *CSA Standard B196.3 "PVC Underground Telecommunication Cable Ducting and Fittings*". All underground utility work shall be coordinated with the appropriate utility and shall follow the requirements of the *Canadian Electrical Code, Part 1, C22.1.*

300.5 BRIDGE STRUCTURES

300.5.1 GENERAL

300.5.1.1 Existing Reference Documents

Existing reference documents that are binding to the Project are noted below.

- *Bridge Welding Code* (AWS D1.5);
- *Canadian Highway Bridge Design Code* (CSA Standard S6-06);
- *Alberta Transportation's Engineering Drafting Guidelines for Highway and Bridge Projects;*
- *Alberta Transportation's Design Guidelines for Bridge Size Culverts; and*
- *Alberta Transportation's Roadside Design Guide.*

300.5.2 DESIGN CRITERIA

300.5.2.1 Design Codes

The Contractor shall complete all bridge structure design in accordance with *CAN/CSA-S6-06* (*Canadian Highway Bridge Design Code*) (the "**Bridge Design Code**"), which may be supplemented with other relevant codes and recognized current engineering practices and specifications with the prior written approval of the Department. Exceptions to CAN/CSA-S6-06 requirements are noted in this Section 300.5.2 (Design Criteria).

Live load distribution factors used for girder design shall not be less than the empirical factors specified in the Bridge Design Code unless specifically agreed to in writing by the Department. If a bridge does not satisfy the criteria that allow the empirical factors to be used, the live load distribution factors used for girder design shall not be less than the empirical factors that would have been used if the bridge had met these criteria. The distribution factors used shall be shown on the drawings.

Notwithstanding section 1.4.2.5 of the Bridge Design Code, approval will not be given for the use of single load path structures. Slab and girder bridge structures shall have a minimum of four girder lines. Piers with two columns or less shall meet the requirements of Section 300.5.2.10 (Substructures/Foundations).

300.5.2.2 Design Load

(a) Highway Bridges

The minimum highway bridge live load shall be CAN/CSA-S6-06 CL-800 plus Dynamic Load Allowance. Truck axle and wheel loads shall be proportioned from the CL-625 truck. No adjustments are required for the 9 kN/m uniformly distributed load for lane load.

In section 5.7.1.3 of the Bridge Design Code the width (B) of the bridge may be assumed to be reduced to a width that provides a value of B. < 10. The number of design lanes (n) to be reduced as required shall be consistent with the assumed bridge width (B).

As it relates to section 3.4.4 (Serviceability limit states) of the Canadian Highway Bridge Design Code (CAN/CAS-S6-06), the anticipated degree of pedestrian use for all bridges with sidewalks shall be "occasional pedestrian use".

(b) Pedestrian Bridges

The minimum pedestrian bridge live load shall be in accordance with section 3.8.9 of the Bridge Design Code.

(c) Future Wearing Surface

Bridges shall be checked for the effects of removing the top 25 mm of the deck and the subsequent placement of a 90 mm non-composite ACP wearing surface.

(d) Fatigue

All new bridges shall be designed to comply with CAN/CSA-S6-06 Class A Highway requirements (section 1.4.2.2). This requirement shall apply to all bridge components for considerations of structural fatigue.

(e) Vehicle collision load on bridge piers

The application of the collision load of 1400 kN as specified in section 3.15 of the Bridge Design Code, shall be limited to roadways with design speeds less than 80 km/h. For roadways with design speed ≥ 80 km/h, and bridge structural support within 10 m from edge of ultimate pavement, the vehicle collision load shall be increased to 1800 kN, assumed to act in any direction in a horizontal plane, and at a distance of 1200 mm above ground (Reference AASHTO LRFD Bridge Design specifications).

300.5.2.3 Hydrotechnical

Unless otherwise noted, the provisions of the Bridge Design Code with reference to section 1.3.4 Hydraulic Definitions and 1.9 Hydraulic Design shall NOT apply to the Project.

The technical requirements set out in the following Department publications form part of the Technical Requirements:

- *Culvert Sizing Considerations;*
- *Bridge Design Bulletin #5; and*
- *Bridge Best Practice Guidelines #7 and #9.*

For proposed bridge structures over watercourses, including bridge size culverts (1.5 m diameter or larger), the Department will evaluate the proponent's hydrotechnical design using the Department's current "*Hydrotechnical Design Guidelines for Stream Crossings*" document.

Bridge structure openings on watercourses shall be sized and protected so that over the 75-year service life of the structure they do not:

- Cause an unacceptable level of flooding on neighbouring flood sensitive lands and developments;
- Cause any flooding of the highway road surface;
- Have a negative impact on local channel stability; and
- Cause erosion affecting the stability of the bridge structure or roadway fills.

300.5.2.3.1 Minimum Freeboard for Stream Crossings

Bridges shall be designed to have a minimum 1.0 m freeboard.

Bridge size culverts shall be designed to have a minimum freeboard of one-sixth the culvert rise (to a maximum of 1.0 m) and a minimum invert burial depth of one-quarter the culvert rise (to a maximum of 1.0 m).

300.5.2.4 Geotechnical

Bridge structure foundations shall be designed in accordance with the Bridge Design Code.

The selection of representative or “characteristic” geotechnical parameters used to determine foundation capacity shall be based on the results of appropriate field and laboratory investigations (to be available to the Department on request) and shall represent the Contractor’s Engineer’s “best estimate” of the likely values of the parameters, taking into account all the factors that may have influence on the soil properties, in accordance with the Canadian Foundation Engineering Manual, 4th Edition, Chapter 8.5.

Silt material specified as “**ML**” or “**MH**” material (in accordance with the “**Modified Unified Soil Classification System**”) shall neither be used in the design and construction of the bridge headslopes and approach fills, nor in the roadway embankments. The global stability of bridge headslopes and approach fills, including the effects of retaining walls, shall be designed for a minimum factor of safety of 1.5

The design of the bridge approach fills and retaining walls, shall account for stability, long-term settlements and wall deformations. Stability analyses (to be available to the Department on request) shall be carried out to determine that head slopes and retaining walls shall have acceptable short term and long term stability in order to prevent failure or excessive deformation. Deformations of the embankment and wall (including settlement and lateral movements) shall be determined using appropriate deformation analyses, with representative soil parameters derived from site specific geotechnical investigations and local experience. The expected range of embankment and wall displacements including settlement and lateral movements shall be taken into account in the design of the bridge and shall provide for acceptable structural and aesthetics performance of the embankments and walls. Any differential settlement between the bridge structure and approach fills shall not cause a deviation of more than 1% from the roadway design grade.

300.5.2.5 Geometrics

The Contractor shall design a roadway grade line that optimizes the location and length of the bridge structures. Where practical, bridges shall be located on tangent horizontal alignments.

For deck drainage purposes, the Department considers a minimum grade of 1% to be desirable. However, the Department recognizes that grade line constraints for grade separation structures may require crest curves that result in portions of the bridge deck having a grade of less than 1%. Where practical, the crests of crest curves shall be located off of or at one end of the bridge opening.

Bridge deck widths shall as a minimum have the same width as the clear roadway on the bridge approaches. The bridge deck shall also have a 2% crown unless the grade line over the bridge structure is superelevated. The tops of sidewalks and medians shall slope 2% towards the roadway. The tops of abutment seats, pier caps, curbs and barriers shall have a wash slope of 3%.

Top of bridge headslope fill widths shall be out-to-out bridge end width plus 2 m. Taper rate from headslope fill width to approach roadway fill width shall be 30:1 or flatter. Corner transitions between headslope and sideslope shall use an elliptical curve at the toe of the slope.

Bridge structure support locations, e.g. piers, abutments, retaining walls, shall not be located within the underpassing roadway's clear recovery zone and shall allow all required Ultimate Stage sight distances to be met.

The vertical clearance posting (as determined below) for any grade separation bridge structures, including ultimate future widening, shall be a minimum of 5.4 m. At the time of any future repaving operation the vertical clearance shall remain unchanged under the bridge structures by use of pavement milling and filling with proper transitions.

The Department's process for determining the vertical clearance posting is as follows:

- Measure minimum vertical clearance between the roadway surface and lower bottom edge of the girder within roadway width including shoulders to the nearest centimetre (i.e. 5.74 m);
- Round down to the nearest decimetre (i.e. 5.7 m); then
- Subtract one decimetre for tolerance (i.e. Post vertical clearance as 5.6 m)

Vertical clearance signs shall be centered over the traffic lanes and mounted close to the girder bottom flange.

The minimum vertical clearance for any sign structures over the roadway shall be the greater of 6.0 m or 300 mm higher than the lowest grade separation structure in the vicinity.

300.5.2.6 Preferential Bridge Deck Icing

Bridge decks that are on a resultant slope of 4% or greater due to roadway grade and cross-slope or are located in areas where changes in traffic speed are required, shall be designed with systems that can either prevent preferential bridge deck icing or predict its occurrence in advance so that preventative measures can be taken.

300.5.2.7 Durability

Bridge structures shall be designed for a service life of 75 years unless noted otherwise. The designs shall take into account the need for ease of replacement of components whose service life is expected to be less than 75 years and for the provision of access for inspection and maintenance. The level of maintenance, rehabilitation and/or repair required during the service life of the bridge structures shall be consistent with or better than that generally anticipated to be required for other bridge structures of similar age and type on the Provincial highway system.

The Department's standard system for protecting a bridge deck from deterioration due to de-icing salts and steel reinforcement corrosion consists of a combination of:

- Class HPC concrete deck in deck, barrier, and curbs;
- Epoxy-coated deck steel reinforcement, including pretensioned strands;
- Stainless steel reinforcement in barriers, curbs and medians on abutments and/or superstructure elements; and
- A waterproofing membrane.

This standard bridge deck protection system shall be used unless otherwise specified in Section 200 (Project Specifics).

Deck Systems using Precast Concrete Partial Depth Panels shall meet the requirements of Section 300.5.16 (Deck Systems Using Precast Concrete Partial Depth Deck Panels).

The Department's standard deck waterproofing system as shown on the Department's Standard Drawing S-1443-98 (Revision 7) shall be used on all bridge decks. Bridge decks with waterproofing membranes shall have provisions made along the gutter lines to allow for the drainage of water that penetrates the asphaltic wearing surface. The asphalt mix type and grade shall be the same as used in the surface lift on the adjacent roadway.

Bridge deck drainage shall not be allowed to splash onto any exposed sub-structure concrete surfaces. Joints around abutments and approach slabs shall be sealed at the surface and kept sealed with proper maintenance. Any buried concrete elements that may potentially be exposed to leakage of salt contaminated moisture shall be protected by an approved impervous waterproofing membrane.

The number of deck joints shall be kept to a minimum and bridge superstructures shall be continuous for live load over the piers. All deck joints shall include provision to capture and manage deck drainage such that it does not come into contact with other concrete and steel surfaces of other bridge elements.

Class HPC concrete shall be used for all bridge decks, curbs, barriers, sidewalks, medians, roof slabs, approach slabs, concrete overlays and any other bridge components that will come into direct contact with de-icing salts.

An approved Type 1c sealer shall be applied to all concrete surfaces which are susceptible to deterioration by water and de-icing salts.

The following minimum clear cover for reinforcing steel shall be specified on the Detailed Designs. These are minimum requirements for inspection and checking during construction:

- Reinforcing steel in concrete subject to normal exposure 50 mm
- Reinforcing steel in concrete cast in contact with soil (no form) 75 mm
- Stainless steel reinforcement adjacent to front face of curb, median or barrier 50 mm
- Reinforcing steel in cast-in-place decks with waterproofing and overlay system
    - Top layer 50 mm
    - Bottom layer 40 mm
- Reinforcing steel in cast-in-place decks elements without waterproofing and overlay system, such as concrete dams at deck joints
    - Top layer 75 mm
    - Bottom layer 40 mm

The minimum clear cover for post-tensioning ducts in pre-cast concrete girders with 28 day concrete strength greater than or equal to 65 MPa shall be 45 mm (+ 5 mm).

Epoxy coated reinforcement shall be used for the following locations unless otherwise specified in Section 200 (Project Specifics). Uncoated black steel reinforcing shall not be accepted as a substitute, except for Precast Concrete Partial Depth Panels meeting the requirements of Section 300.5.16 (Deck Systems Using Precast Concrete Partial Depth Deck Panels):

- Both top and bottom layers of reinforcing steel in cast in place decks.
- Both layers of reinforcing steel in abutment roof slabs.
- Stirrups projecting from precast girders into deck slab.
- Reinforcing steel within 150 mm of the top of abutment backwalls, diaphragms and corbels.
- Reinforcing steel in wingwalls within 150 mm of the top of the concrete deck surface.
- Reinforcing steel dowels that connect the approach slab to the abutment corbel.
- Reinforcing steel in approach slabs, including sleeper slabs.

Stainless steel reinforcing shall be used in raised concrete medians, barriers, and curbs above the deck construction joint, including projecting dowels embedded into the deck pour.

300.5.2.8 Materials

a) Concrete:

Standard weight aggregates.

Normal Portland cement (Type GU) or Sulphate Resistant (Type HS) unless noted otherwise on drawings.

Classes and strengths:

DESCRIPTION	CLASS	f’c @ 28 days
1) Precast girders		50 to 70 MPa

DESCRIPTION	CLASS	f'c @ 28 days
2) *Precast MSE wall panels, Precast Concrete Partial Depth Panels for Deck System*	*HPC*	*45 MPa*
3) Abutments	C	35 Mpa
4) Piers including pile caps	C	35 Mpa
5) Cast-in-place decks, abutment roof slabs, approach slabs, diaphragms, blockouts and tops of abutment backwalls.	HPC	45 Mpa
6) Cast-in-place curbs & barriers	HPC	45 Mpa
7) Grout Keys (14 mm max. aggregates)	HPC	45 Mpa
8) Pipe piles and drilled caissons	Pile	25 Mpa
9) Concrete drain trough	B	25 Mpa
10) Concrete slope protection	B	25 MPa

b) Reinforcing Steel:

CSA G30.18M Grade 400, and Grade 400 W steel shall be used if the bars are to be welded.

Stainless steel reinforcement shall be solid stainless steel designed based on a minimum yield strength of 400 MPa, including hooks, development lengths and bar splices.

c) Prestressing Strand:

In accordance with ASTM Standard A-416 (fpu = 1860 MPa). Design shall be based on use of low relaxation strand.

d) Structural Steel:

1) Girders and all materials welded to girders.	CSA G40.21M-Grade 350AT CAT 3 or *ASTM A709 Grade 345WT* Type B with Charpy value of 27 J @ -30˚ C
2) Ungalvanized bearing and bracing materials bolted to girders.	CSA G40.21M-Grade 350A or ASTM A709 Grade 345 Type B
3) Galvanized bearing materials not welded to girders.	CSA G40.21M-Grade 300W
4) Miscellaneous steel including deck joints	CSA G40.21M-Grade 300W
5) Structural bolts	22 mm diameter A325M - Type 3 weathering steel

e) Anchor rods:

1)	Anchor rods for bearings in contact with black steel.	Stainless steel AISI Standard Type 316 Fy = 290 MPa
2)	Anchor rods for bearings in contact with galvanized steel.	Galvanized anchor bolts CSA G40.21M Grade 300W or ASTM A307
3)	High strength anchor rods, e.g. bridgerail posts anchors	ASTM A193 GRADE B7 (Fy = 725 MPa, Fu = 860 MPa). Note galvanizing of high strength material requires special procedure, see Drawing S1642-00.

300.5.2.9 Sign and Lighting Structures

Overhead and cantilevered sign structures and high mast lighting structures with a height greater than 20m shall be designed in accordance with the requirements of AASHTO "*Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*" (the "**AASHTO Standard Specs**"), latest edition plus interims and the following additional criteria:

- Equation 3-1 of AASHTO Clause 3.8.1 shall be modified as follows:

$$P_z = 2.7\ q\ K_z\ C_d$$

where q shall be taken from *CAN/CSA S6-06*, Table A3.1.7 for a return period of 50 years;

- The design ice thickness for ice accretion shall be the value given in *CAN/CSA S6-06*, Figure A3.1.4;
- For the design of all cantilevered sign structures, the Fatigue Importance Factors in Table 11-1 of the AASHTO Standard Specs shall be based on Fatigue Category I. The deflection for cantilevered sign structures, as specified in Clause 11.8 of the AASHTO Standard Specs shall not exceed 200 mm;
- Stresses for anchor bolts shall be limited to $0.50F_{pu}$ applied to the root tensile stress area at the Group Load Combination I, II and III. Stress range for Group IV shall be in accordance with section 11 of the AASHTO Standard Specs. The design shall allow for the failure of one anchor at any one location for each pile foundation. After such failure, the remaining anchors shall still be capable of meeting the above design requirements;
- Anchor bolts shall be pre-tensioned to $0.70\ F_{pu}$;
- Design sign panel area shall be taken as the largest of:
  - Initial stage sign panels;
  - Ultimate Stage sign panels (Ultimate Stage shall consider any potential changes due to safety audits, which changes and audits are the Contractor's responsibility); and
  - Area of 3.5 m x 60% of horizontal span length, placed in any position along the span;
- Sign structures shall have a permanent vertical camber of L ÷ 200 where L is the span of the horizontal arm of the sign structure;
- The tops of the concrete foundations shall project from 700 mm to 850 mm above the

adjacent ground surface on the traffic side. The exposed portion of the concrete foundation shall be of circular cross-section;

- The minimum vertical clearance below the sign panels shall be 6.0 metres; and
- The Contractor shall determine placement, clearance requirements, need for barrier protection, and type of structure (bridge or cantilevered) in accordance with guidance provided in *Alberta Infrastructure and Transportation Roadside Design Guide*, and prepare a general layout drawing for each individual sign structure in accordance with Department Standard Drawing S-1721-07.

300.5.2.10 Substructure/Foundations

Piling

All welded pile splices whose tensile or flexural capacity is critical to the structural integrity of the bridge (for example with integral bridges), shall be identified as tension splice welds on the Detailed Designs. These welds will require testing using non-destructive testing techniques. The following note is an example:

"ALL OF THE PILE SPLICE WELDS THAT ARE REQUIRED WITHIN THE TOP "X" METRES OF THE PILE ARE TENSION SPLICE WELDS"

Full length piles shall be provided wherever possible to avoid field splicing.

Dynamically cast-in place piles (Compacto piles) are not permitted.

Piers

Piers shall be supported on piles or spread footings. Spread footings shall only be used when founded directly on competent bedrock. Spread footings shall not be used for stream crossings.

The ends of pier cap cantilevers shall have cast-in stainless steel drip sheets across the full underside width of the pier cap to prevent staining of sub-structure concrete.

Piers with one column shall have a minimum cross-section of 2.8 m². Piers with two columns shall have a minimum cross-section area of 2.8 m² for each column or the columns shall be linked together with a strut extending from the top of the foundation to 1.4 m above the adjacent ground between the two columns. Piers with multiple columns shall have a minimum diameter of 1.5 m or an equivalent cross sectional area.

For monolithic pier diaphragms which are cast around girder ends, the girders shall be erected on a minimum 150 mm high plinth to provide sufficient clear space between the girder bottom and previously cast concrete, to ensure proper flow of concrete under the ends of the girders.

Ends of pier caps and pier shafts shall either be circular or chamfered (minimum 300 x 300 mm).

Abutments

Bridge ends shall be supported on piles. Bridge ends shall have cast-in-place wing walls oriented parallel to the overpassing roadway and cantilevered from the abutment seat or the superstructure end diaphragm.

Independent high abutment walls under the superstructure shall have wing walls flared away from the overpassing roadway or running generally parallel to the underpassing roadway.

The ends of wingwalls running generally parallel to the underpassing roadway shall be flared back in accordance with the Flare Rate Table in section H5.4.2 of the Roadside Design Guide and buried into the ground. Barriers shall be provided on top of wingwalls in accordance with the requirements for retaining walls as outlined elsewhere in this Schedule 18 (Technical Requirements).

Lateral wall displacements due to MSE deformations and movements of retaining wall foundation shall not result in the top of the wall moving in excess of 1 horizontal to 500 vertical relative to the bottom of the wall or 10 mm, whichever is smaller, after completion of construction and over the life of the structure. Any bridge components located on top of retaining walls, such as abutment seats, integral cantilevering wing walls, abutment deck joints, abutment bearings and traffic barriers, shall be designed to accommodate any movements resulting from lateral wall displacements.

The coping at the top of the MSE abutment wall have a minimum clear space of 300 mm to the front of the abutment seat.

Retaining walls with traffic running parallel to the top of the wall shall have rigid bridge barriers meeting the appropriate Performance Level requirements of CAN/CSA-S6-06 section 12. The retaining wall shall be designed to fully resist the collision loads applied to the barrier, and loads from any attachments such as signs and lamp posts. Safety handrails shall be mounted along the tops of all other retaining walls.

Bridge plaques and bench mark tablets shall be provided at bridge abutments in accordance with Department Standard Drawings S-1477-04 and S-1617-04.

Good drainage details shall be incorporated into the design of abutments and shall include the following:

- The joints around the approach slab shall be well sealed to prevent water infiltration (Reference Department Standard Drawings S-1411-87 (in Appendix B) and S-1443-98).
- A secondary system consisting of granular backfill, sheet wall drains and of sub-soil weeping drains shall be provided to collect, channel and remove the seepage.
- Sheet wall drains shall be provided and spot-glued to the earth face of the abutment seat and wingwalls to intercept and channel seepage into a perforated weeping drain with a

minimum positive drain slope of 2% that will be day-lighted on the headslope.
- Clean, well graded, crushed granular backfill with a maximum aggregate size of 25 mm (Des 2, Class 25) shall be provided behind abutment seats and wingwalls complete with perforated weeping drains under the abutment seat and wingwalls.
- Concrete drain troughs and "Scourstop" shall be placed at abutment corner locations at the low ends of bridges in accordance with Section 300.5.2.20 (Bridge Drainage).

Approach slabs shall be in accordance with the provisions of section 1.7.2 of the Bridge Design Code except as noted:

- Approach slabs shall have sufficient length to limit their rotation due to settlement to 1.0%.
- Approach slabs shall have a minimum length of 6000 mm (measured parallel to centreline of roadway).
- Approach slabs thickness shall be as required by the designer but shall have a minimum thickness of 250 mm.
- The minimum reinforcing in approach slabs shall be 20M @ 150 mm placed parallel to centreline of roadway and 15M @ 150 mm placed parallel to the abutment backwall.
- Approach slabs shall be connected to the bridge in a manner that provides for free hinging rotation without causing restraining moments.

Integral Abutments

Integral abutments (includes fully integral and semi-integral abutments) shall be designed to meet the following requirements (for guidance, see the Department's Bridge Structures Design Criteria, "Appendix A – Guidelines for Design of Integral Abutments"):

(a) Integral abutments may be used for steel girder bridges less than or equal to 75 m in length and for concrete girder bridges less than or equal to 100 m in length.

(b) The effects of skew and potential for twisting of superstructure on plan shall be analyzed and accounted for, especially for skew greater than 20°.

(c) The amount of structure and earth that have to move with the abutment during thermal movement of the superstructure shall be minimized. Abutment seat heights shall not be greater than 1.2 m and wingwall length shall not be greater than 8 m.

(d) Additional deck reinforcement shall be provided for negative bending moments due to torsional restraints provided by the stiff abutments diaphragms and adjacent girders.

(e) For fully integral abutments the abutment foundation shall be a single row of H-piles oriented for weak axis bending. For large movements, such as those exceeding the movement range of Type C1 control joints, piles shall be installed in permanent steel casings. The casings shall be filled with Styrofoam pellets. The Styrofoam pellets shall be "Storopack virgin polystyrene 14 kg/m^3 filler bead nominal diameter of 5 mm" or an approved equivalent. Steel casings shall be designed to last the same life as the bridge, and an appropriate sacrificial corrosion thickness or galvanizing shall be provided. The

H-piles shall be embedded a minimum of 2 pile widths into the abutment seat.

(f) The approach slab shall extend 0.5 m longer than the wingwalls. Provide erosion control for drainage around ends of wingwalls and seepage from the cycle control joints.

(g) Installation of expansion foam material behind integral abutments for the purpose of relieving earth pressures is not permitted.

(h) Integral approach slabs shall not be designed to move longitudinally in and out between stationary and parallel non-integral wingwalls.

(i) Two layers of polyethylene sheet or fabric shall be provided under the approach slab to minimize frictional forces due to horizontal movement. The connection between the approach slab and the superstructure shall be designed to resist these forces.

The following table shall be used to determine required joint types for various bridge superstructure lengths (centreline bearing abutment to centreline bearing abutment). When using this table, engineering judgement with due considerations for site specifics, such as traffic type and volume, are required. Alternative joint types will be considered for use by the Department based on a demonstration of their satisfactory performance.

Steel girder bridges	**Concrete girder bridges**	**Joint type***	**Approx. movement range**
< 45 m	< 60 m	C1	< 20 mm
45 m to 75 m	60 m to 100m	C2 or C3	20 < range < 32 mm
> 75 m	> 100 m	C4	> 32 mm
< 45 m	< 60 m	C1	< 20 mm
45 m to 75 m	60 m to 100m	C2 or C3	20 < range < 32 mm
> 75 m	> 100 m	C4	> 32 mm

**Details of "Joint Types" C1 to C4 are shown in "Appendix A - Guidelines for Design of Integral Abutments" of the Department's Bridge Structures Design Criteria.*

300.5.2.11 Abutment and Retaining Walls Structures

The height of a high abutment wall or retaining wall, or the combined height of multiple retaining walls shall not exceed 8.0 m at any location, except the height may be increased to 12 m at railway grade separations. The height of a retaining wall shall be taken as the vertical height from top of wall to top of finished grade immediately in front of the wall. Barriers shall be provided on top of all retaining walls.

Toe slopes encroaching into the clear zone in front of retaining walls shall be a recoverable slope of 1 vertical on 3 horizontal, or flatter.

Non-mechanically stabilized earth retaining walls shall be designed in accordance with the provisions of *CAN/CSA-S6-06*.

Mechanically Stabilized Earth (MSE) Walls shall meet requirements of Section 300.5.11 (Mechanically Stabilized Earth Walls).

Dry cast concrete block walls are not permitted.

300.5.2.12 Ducts and Conduit Systems

(1) Utility Ducts in Curbs and Barriers

The Contractor shall provide one 75 mm diameter utility duct on each side of the bridge deck for the future accommodation of utilities. If a bridge deck is to be widened on one side at the Ultimate Stage a utility duct is only required on the not-to–be-widened side of the bridge deck. If a bridge deck is to be widened on both sides at the Ultimate Stage, a utility duct is only required on one side of the bridge deck and the during detailed design the Department will determine upon request of the Contractor on which side of the bridge deck the utility duct will be placed. The utility ducts shall be placed within the bridge curbs and/or barriers and shall be extended beyond the ends of the abutment wingwalls and terminated behind the roadway approach rails. If additional utility ducts are required for the utility needs of the Project and the O&M, they may be placed within bridge curbs/barriers that will not be removed at the Ultimate Stage. Utility ducts shall not be placed within the bridge deck or attached to the bridge girders. Each utility duct shall be continuous and free and clear of obstructions.

O-ring expansion fittings shall be provided at all bridge expansion joints. At any locations where the curb/barrier may undergo rotation and/or vertical displacement, other appropriate fittings shall be used to accommodate the movements.

All utility ducts cast into curbs/barriers shall be PVC DB2, unless otherwise approved by the Department.

(2) Conduit Systems for Under-bridge Lighting

Any conduits required for wiring to under-bridge lighting systems shall be cast within the bridge piers and pier caps and shall not be routed through abutment ends. If, at a specific bridge structure, no piers exist or other conditions exist so that routing of conduits for electrical supply through the abutment ends is desired, alternative routing may be proposed for review and approval by the Department during detailed design.

The concealed conduit system shall comprise rigid PVC conduit having a minimum trade size of 38 mm, together with all industry-standard junction boxes and fittings. The system shall provide a continuous concrete and weatherproof conduit arrangement from below ground to the top surface of each pier cap.

Conduits shall be placed as follows:

(a) Conduits shall enter the bridge structure a minimum 1000 mm below finished ground elevation at the exterior of the pier as necessary and shall bend up to connect with a PVC junction box to be recessed on the exterior surface of the pier shaft 1000 mm above finished ground elevation. Minimum dimensions for this PVC junction box shall be 150 mm x 150 mm x 150 mm. The junction box may be larger if necessary for the proper connection and bonding of bridge wiring to incoming supply cables according to Canadian Electrical Code **(**“**CEC”)** requirements. The PVC junction box is to be set flush with the surface of the pier shaft and shall be fitted with a gasketted weatherproof cover.

(b) A riser conduit shall then extend up to a weather proof PVC access junction box secreted in the top surface of the pier cap. This box shall be sized for the number of luminaire conduits and wires to be accommodated at that point. For bridge structures where a concrete pier diaphragm precludes placement of an access junction box in the top of the pier cap, it may, subject to Department approval of detailed design, be placed unobtrusively in the face of the pier cap near its top edge. For bridge structures with integral pier cap/diaphragm, the riser conduit shall extend into the pier cap/diaphragm and up to the weather proof PVC access junction box secreted in the side surface of the pier cap/diaphragm.

(c) Additional weather proof access junction boxes may be installed in the pier cap as required by the width of the bridge and the number of luminaires to be serviced. These additional access junction boxes shall be supplied by a rigid PVC conduit not less than 25.4 mm trade size cast horizontally within the pier cap/diaphragm.

(d) Rigid conduits exiting the access junction boxes to service under-bridge luminaires shall be the minimum diameter consistent with CEC requirements for the number and sizes of wires employed and the availability of attachment support points, but not less than 12.7 mm inch trade size.

(e) Luminaire conduits shall be run in neat vertical and horizontal alignments, supported as necessary to comply with CEC requirements and to mitigate the effect of vibrations induced in the bridge by passing traffic.

(f) Luminaires shall be mounted on bridge pier caps or steel diaphragms as required. Where it is necessary to install a horizontal conduit run to access a luminaire, the conduit or any necessary conduit support tray or truss shall be fixed to the vertical face of the bridge girder haunch. No attachments shall be fixed to the girders or to the underside of the bridge deck.

(g) Luminaires conduits and/or conduit support equipment that are supported on the superstructure shall be located within interior girder bays.

(h) Luminaire conduits and/or conduit support equipment shall be attached to the bridge structure with anchors cast into the haunch concrete at appropriate locations.

(i) In the event that precast deck panels are utilized, anchors for the purpose of supporting lighting conduits shall be cast into the underside of the precast deck panels. These anchors shall be positioned at the edges of the precast deck panel so that the conduits are located within 100 mm of the edge of the girder top flange. Spacing between anchors in the precast deck panels and between anchors on adjacent precast deck panels shall not exceed the maximum conduit support distance allowed in the CEC.

(j) All wiring to under-bridge luminaires shall be RW90 of appropriate number and gauge to comply with voltage drop limitations. A continuous ground wire is required in all under-bridge lighting conduits to ensure the whole system is properly bonded. Conduits shall be sized to accommodate the noted wiring requirements.

(k) Prior to the wiring being installed, all conduits shall be proven to be free and clear of obstructions.

300.5.2.13 Intentionally Deleted

300.5.2.14 Intentionally Deleted

300.5.2.15 Deck, Curbs, Medians, Concrete Barriers, Sidewalks

(a) Deck slabs for beam and slab bridges designed with the empirical method in accordance with section 8.18.4 of *CAN/CSA-S6-06* shall have a minimum slab thickness equal to the greater of the girder spacing divided by 15.0 or 225 mm. Use of this method requires composite action between the slab and girder over the entire girder length. Clause 5.7.1.7.1 of CAN/CSA-S6-06 presents design guidelines for transverse bending moments in concrete decks supported on longitudinal girders. For the Project this clause of CAN/CSA-S6-06 shall be amended as follows:

- o the second paragraph shall be amended to read:

  "Concrete deck slabs that are proportioned in accordance with the empirical design method of clause 8.18.4 for the CL-800 Truck need not be analyzed for transverse bending moments due to live load, except for the cantilever portions."

- o in the third paragraph, sub clause (a)(i), the number '87.5' shall be replaced with the number '112', and the Truck type shall be revised from 'CL-625' to 'CL-800'.

(b) Deck and curb reinforcement required to develop the capacity of bridgerail post anchors are site specific designs. Guidance for design of decks supporting bridgerail posts is available from AASHTO LRFD Bridge Design Specifications 2007 Appendix section A13.4.3.

(c) Cast-in-place deck slabs for beam and slab bridges shall be minimum 225 mm thick. Cast-in-place deck slabs designed to be composite with supporting precast box beams shall be a minimum of 225 mm thick and have two mats of deck reinforcement.

(d) Deck Systems using Precast Concrete Partial Depth Panels shall meet the requirements of Section 300.5.16 (Deck Systems Using Precast Concrete Partial Depth Deck Panels)

(e) Full depth precast deck construction shall not be allowed.

(f) Stay in place corrugated steel, timber or other deck soffit formwork types are not allowed.

(g) The Contractor shall provide one 75 mm diameter utility duct on each side of the bridge deck for the future accommodation of utilities. If a bridge deck is to be widened on one side at the Ultimate Stage a utility duct is only required on the nonwidened side of the bridge deck. If a bridge deck is to be widened on both sides at the Ultimate Stage a utility duct required on one side of the bridge deck and the Department will determine on which side of the bridge deck the utility duct will be placed. The utility ducts shall be placed within the bridge curbs/ barriers and shall be extended beyond the ends of the abutment wingwalls and terminated behind the roadway approach rails. If additional utility ducts are required for the utility needs of the Project and the O&M they may be placed within bridge curbs/barriers that will not be removed at the Ultimate Stage. Utility ducts shall not be placed within the bridge deck or attached to the bridge girders. Each utility duct shall be continuous and free of debris and any obstructions that would prohibit sensor cables to be pulled through the conduit successfully.

(h) Concrete curbs and barriers shall have crack control joints at a maximum spacing of 3 m (centred between bridgerail posts where applicable). Longitudinal reinforcing in the curbs shall be discontinuous at the joints. Control joints shall extend down to the top of the concrete deck and shall be caulked prior to application of deck waterproofing membrane in accordance with Department Standard Drawings S-1443-98.

(i) Concrete paving lips along the edge of ACP are not permitted.

(j) The sidewalk portion of the deck slab shall consist of a structural deck slab protected by an asphalt waterproofing consisting of membrane and protection board. A second slab shall be poured on top of the structural deck slab with transverse tooled joints at a spacing matching adjacent curb/barrier control joints. The sidewalk shall have a curb projecting 100 mm above the finished top of the sidewalk along the outside edge. The sidewalk shall be higher than the adjacent road surface and drain through slots in the traffic separation barrier onto the roadway surface.

(k) The median portion of the deck slab shall consist of a structural deck slab protected by an asphalt waterproofing membrane consisting of membrane and protection board. A second slab shall be poured on top of the structural deck slab with transverse tooled joints at a spacing matching adjacent curb/barrier control joints. For posted speeds greater than 60 km/hr the median shall have semi-mountable or mountable curbs in accordance with the requirements of the Roadside Design Guide.

(l) The following set-back requirements or protective measures shall be followed when attachments, such as signs, lamp posts, sign structure support columns, piers of adjacent bridges, etc. are on top of or close behind bridge barriers:

Applicable roadside barrier standard	**Set-back or other treatment**
TL 2	305 mm minimum
TL 3	610 mm minimum
TL 4	For lamp posts and sign structure columns, provide PL2 combination barrier (Department Standard

	Dwg. S-1700 & S-1701 with a height of 1400 mm). If a PL3 bridgerail is required by the Bridge Design Code the overall height of the standard PL3 barrier (Dwg. S-1700, S-1701, S-1703) shall be increased to 1370by increasing the height of the concrete base. A set-back of 610 mm is required behind the top rail. For piers of adjacent bridges, a 3,000 mm minimum set-back is required.

Attachments shall be mounted on top of the curb or concrete barrier at locations close to the centreline of piers to avoid excessive vibration from traffic.

Base plates and anchors for attachments shall be grouted and sealed with a penetrating sealer. A minimum 40 mm nominal thickness grout pad shall be provided under base plates. The grout shall sit in a grout pocket recessed 20 mm into the surface of the structure. The grout pocket shall be 40 mm larger than the base plate around the perimeter.

(m) A minimum of two electrical connections are required on bridge decks to accommodate the copper sulphate electrode ("**CSE**") or half-cell testing as identified in Section 400.5.1.3.3 (Specialized Level 2 Inspections) of Schedule 18 (Technical Requirements) without damaging the deck waterproofing membrane.

The first electrical ground connection and associated hardware shall be located on the soffit of the deck overhang at the corner of the bridge identified as the CSE test origin in the Department's *Level 2 Bridge Inspection Manual* section 3.3.1. The second electrical ground connection shall be located at the opposite end and opposite soffit of the bridge. Ground connections shall be accessible by foot and without the use of specialized equipment.

300.5.2.16 Bearings

(a) Bearing types for beam and slab bridges shall be: a) steel reinforced elastomeric bearing pads with or without stainless steel and teflon sliding surfaces, b) fixed steel plate rocker bearings, c) proprietary pot bearings. Typical expansion bearing details shall be in accordance with the Department's Standard Drawing S-1761-08 (Typical Expansion Bearing Details).

(b) Steel reinforced elastomeric bearings with or without stainless steel and teflon sliding surfaces shall incorporate the following standard features:

- Steel sole plates and base plates shall be provided.
- Self-rocking pintel welded under base plate shall be used to ensure uniform contact between the elastomeric bearing pad and the girder bottom flange at erection. No extra construction tolerance is required when using the self-rocking pintel.
- All bearings shall be grouted in prior to casting deck concrete. Bearings pads shall be designed for all rotations that take place after the bearings are grouted.

- Notwithstanding section 11.6.6.2.2 of the Bridge Design Code elastomeric bearings shall conform to section 18 “Bearings” Division II of AASHTO Standard Specifications for Highway Bridges. Elastomeric material shall meet the requirements of AASHTO Grade 5 for cold temperature performance.
- Notwithstanding section 11.6.3.4.1 of the Bridge Design Code unconfined sheet PTFE may be bonded to an elastomeric bearing with a Shore A durometer hardness of 60.
- For expansion bearings, the elastomeric cover for the uppermost steel shim shall not be greater than 2 mm. Unfilled 1 mm thick Teflon sheet shall be bonded to the top of the elastomeric pad. The stainless steel sliding surface shall conform to AISI 304, No. 8 finish.
- Un-lubricated PTFE shall be specified.
- Elastomeric pads shall be restrained from walking out by means of 6 mm high corner keeper bars welded to the top of the base plate. The 6 mm height is to limit girder raising/jacking for future removal and replacement of bearing pads.

(c) Fixed steel plate rocker bearings consist of a curved steel rocker plate and a base plate, connected with anchor bolts or pintles. The curved surface of the rocker plate and the top central 250 mm width of the base plate shall be machined to a surface finish of 3.2 µm and a flatness tolerance of 0.001 x bearing dimension.

The base plates are installed level on galvanized steel shim stacks, and shall be grouted prior to casting deck concrete. A tapered shoe plate is not required with these bearings because of the large rotational capacity.

(d) Notwithstanding section 11.6.5.4 of the Bridge Design Code, the average stress in the Elastomer at serviceability limit states loads shall not exceed 30 MPa. The Elastomer shall conform to section 18 “Bearing”, Division II of AASHTO Standard Specifications for Highway Bridges and shall meet the requirements of AASHTO Grade 5 for cold temperature performance.

Notwithstanding section 11.6.3.6 of the Bridge Design Code, the average contact pressure for unfilled PTFE elements, based on the recessed area of the PTFE, shall not exceed the following:

Limit State	**Permanent Load (MPa)**	**All Loads (MPa)**
SLS	25	35
ULS	40	55

Notwithstanding section 11.6.3.6 of the Bridge Design Code, the average contact pressure for all loads at the ultimate limit state for PTFE elements filled with up to 15% by mass of glass fibres and used to face mating surfaces of guides for lateral restraint shall not exceed 55 MPa.

Pot bearings shall be installed on a level base plate on galvanized steel shim stacks, and grouted in prior to casting deck concrete. The bearings shall be designed for all rotations that take place after grouting, plus a fabrication and construction tolerance allowance of 0.01 Radian.

(e) Bearings shall be set level by using tapered sole plates except that for long bridges, the sliding plane of the abutment expansion bearings shall be set parallel to the grade slope for proper functioning of finger joints. Effects of longitudinal forces generated by the inclined sliding bearings on the structure shall be investigated.

(f) Bearing finishing and attachments

- Base plates shall be hot-dip galvanized or metallized.
- For steel girders, sole plates or rocker plates which are welded to the girder bottom flange shall be Grade 350AT Category 3. Sole plates or rocker plates which are bolted to the girder bottom flange can use other steel grades and shall be hot-dip galvanized.
- For precast girders, shoe plates cast into the girders and sole plates shall be hot-dip-galvanized. Sole plate can be attached to shoe plates by field welding or bolting. All galvanizing damaged by field welding shall be metallized after welding.
- Attachment by welding shall be in the longitudinal direction along the edge of the girder. Transverse overhead welding shall not be permitted. Transverse ends not welded shall be sealed with Sikaflex 1a or an approved caulking material.
- Galvanized surfaces shall be isolated from black steel by painting two coats of epoxy mastic paint.
- Galvanized surfaces in contact with concrete or cementitious grout shall have the contact surfaces protected by a barrier coating.
- Pot bearing components shall be metallized or galvanized and shall be attached to galvanized plates by bolting.

(g) Preparation of bearing load bearing plates in contact:

- Steel load plates in contact shall be machined to a surface finish of 3.2 μm and a flatness tolerance of 0.001 x bearing dimension. Contact surfaces with elastomeric pad and grout or cast-in-place concrete do not require machining. Where required, machining shall be performed prior to hot-dip galvanizing. Where the galvanizing process may cause distortion, metallizing shall be used instead.

(h) Expansion bearings shall provide an excess travel capacity in each direction of at least 25% of the theoretical thermal movement, but not less than 25 mm, beyond theoretical travel. An allowance shall be made for additional movement if required for concrete creep and shrinkage and foundation conditions. The stainless steel plate shall be wider than the elastomeric pad by at least 10 mm on each side.

(i) An 80 mm nominal thickness grout pad shall be provided under bearing base plates. The grout should sit in a grout pocket recessed 40 mm into the top of the substructure. The grout pocket shall be 75 mm larger than the base plate around the perimeter.

(j) Uplift bearings shall not be used.

(k) Shim plates used for shim stacks shall be hot-dip galvanized.

(l) Bridges and bearings shall be designed and detailed to allow for bearing replacement. Typical bearing replacement includes simultaneously jacking all girder lines to avoid damage to the deck, diaphragms and deck joint components. Locations for future jacking shall be shown on the Detailed Designs and shall be based on estimated jack and distribution plate sizes.

(m) Wherever practical, reinforced concrete shear keys independent of bearings (Reference Department Standard Drawing S-1761) shall be used to transfer permanent horizontal loads between the superstructure and substructure.

300.5.2.17 Girders

300.5.2.17.1 General

Attachment of utilities to bridge girders or other primary load carrying members shall not be permitted.

Clearance signs shall be provided on all bridge structures at the locations of underpassing roadways and shall be attached to the upstream fascia girder.

Except for integral abutment designs, abutment diaphragms shall be steel to provide open access for inspection and maintenance of bearings and abutment deck joints.

Continuous bridges shall have the same number of girders on adjacent spans or adjacent segments to be spliced in the field, such that each individual girder line is fully continuous from end to end of the structure.

300.5.2.17.2 Precast-Prestressed Concrete Girder Bridges

Precast-prestressed concrete girder bridges shall be designed to meet the following requirements:

(a) Typical NU girder details shall be in accordance with the Department's Standard Drawings S1757-08 and S1758-08 (NU Girder Bridges-Typical Details Sheet 1 and 2).

(b) Pier diaphragms shall be continuous cast-in-place concrete diaphragms and shall be either pinned, fully monolithic with the pier top or permit free expansion. Positive moment connections at piers shall be developed by either one or a combination of grouted unstressed tendons, bent-up strands or cast in hooked rebar. Minimum separation between girders ends shall be 150 mm with grouted tendons only, and 300 mm with bent strands or hooked rebar. For pier diaphragms with a pinned or expansion connection to the pier, girders ends shall be supported on double reinforced elastomeric pads. For pier diaphragms connected monolithically to the pier top, girder ends may be supported on plain elastomeric pads for erection loads only.

(c) The minimum age for girders before field cast continuity connection shall be 60 days. Girder design and detailing shall consider the effects of differential camber between girders, such as in haunch height variations and diaphragm connections. Girder design strength shall be based on the nominal girder depth assuming the minimum haunch height.

(d) Appropriate allowance for prestress (pre-tension and post-tension) shortening, shrinkage and creep shall be included in the fabricated length of the girders.

(e) Stirrup projections from the top of the precast girder into the deck shall meet all code requirements for lap splicing with vertical stirrups, and anchorage requirements for developing full composite action. All stirrups shall have 135º hooks around longitudinal bars. When projection of stirrups is less than 40 mm above the underside of the bottom mat of deck bars, additional hat shape extension bars shall be provided to tie the slab and the deck haunch together. When precast concrete partial depth deck panels are supported on the precast girder flanges, stirrup projection above the top surface of the precast girder flanges shall be sufficient to provide at least 25 mm of clearance between the underside of the stirrup tips and the top surface of the precast deck panels, in all locations. Longitudinal deck bars shall be detailed with a bar centred directly over the girder webs and the remaining bars spaced evenly between girder lines.

(f) Horizontal interface shear design for composite action shall satisfy the requirements from CAN/CSA-S6-06 or AASHTO LRFD Bridge Design Specifications 2007, whichever is more stringent.

(g) Additional vertical stirrups and closed ties for the bottom flange for crack control at pretension girder ends shall be provided in accordance with section 8.16.3.2 of the Bridge Design Code. Closed ties shall also be provided in the rest of the girder at a spacing of 300 mm. The top of the ties can be left open in the midspan region where there is conflict with post-tensioned cables.

(h) For post-tensioning ducts in pre-cast concrete girders with 28 day concrete strength greater than or equal to 65 MPa, the inside duct diameter shall not exceed 50% of the web thickness and the inside duct area shall be $\geq$ 250% of the strand area.

(i) For conventional abutments with deck joints, abutment girder ends shall be thickened and designed as part of the abutment steel diaphragm for transfer of lateral forces. Alternatively, a cast-in-place concrete end diaphragm can be used.

(j) For NU Girders and other "I" shaped girders all girder ends shall have cast-in shoe plates anchored into the girders.

(k) For NU Girders four bonded prestressing strands shall be incorporated in the top flange to assist in controlling stresses due to transportation and deck construction.

(l) For connecting diaphragms in exterior girders, no connection components shall be visible on the exterior surface of the girders.

(m) For girders containing pretensioning strands, Clause 8.15.4 of the Bridge Design Code states "the number of stands where the bonding does not extend to the ends of the member shall not exceed 25% of the total number of strands." This requirement shall apply to pretensioned only as well as combined pretensioned and post-tensioned girders. For combined pretensioned and post-tensioned girders, the 25% limit shall be applied to the total number of pretensioning strands only. In addition, the number of debonded strands in any horizontal row shall not exceed 40% of the strands in that row, and not more than 40% of the debonded strands, or four strands, whichever is greater, shall have the debonding terminated at any section. Debonded strands shall be symmetrically distributed about the centerline of the girder. Debonded lengths of pairs of strands that are symmetrically positioned about the centerline of the girder shall be equal. Exterior strands in each horizontal row shall be fully bonded.

The effect of debonding shall be such that all limit states are satisfied with consideration of the total developed resistance at any section being investigated. For pretensioned girder ends without thickened end blocks, the concrete cover to the end stirrup shall be 30 mm for girder end crack control.

300.5.2.17.3 Steel Girder Bridges

Welded steel plate girder bridges shall be designed to meet the following requirements:

(a) Typical welded steel plate girder details shall be in accordance with the Department's Standard Drawings S-1759-08 and S-1760-08 (Steel Plate Girder-Typical Details Sheet 1 and 2).

(b) Vertical stiffeners and girder ends shall normally be square to the girder flanges. Abutment detailing dimensions shall account for the effects of girder end tilt.

(c) Stiffened plate girder webs shall in no case have intermediate transverse stiffeners spaced at greater than 1.5 times the girder depth.

(d) All welded steel girders, regardless of span, shall be cambered for 100% of dead load deflection and roadway gradeline profile.

(e) All bearing stiffeners shall be "fit to bear bottom" and "fit only top", and then fillet welded to both top and bottom flanges.

(f) For long bridges with large expansion movements, the use of multiple bearing stiffeners shall be considered.

(g) Location of jacking stiffeners shall be based on estimated jack sizes required for bearing replacement, plus sufficient clearance to the edge of the abutment seat or pier cap.

(h) Diaphragm connector plates and intermediate stiffeners at stress reversal locations shall be welded to both top and bottom flanges. Corner cope of plates shall normally be 80 vertical x 35 mm horizontal for web thicknesses of 14 to 20 mm. Intermediate stiffeners, other than at stress reversal locations, shall be welded to the compression flange only, and cut short of the tension flange with web gap meeting the requirement of section 10.10.6.4 of the Bridge Design Code.

(i) Corners of stiffener plates projecting past the outside edge of flange plates shall be coped 45º.

(j) No intersecting welds are allowed. Where horizontal stiffeners and vertical stiffeners intersect on the same side of the web, the vertical stiffener shall be continuous. The horizontal stiffener shall be cut at the face of the vertical stiffener. The cut end shall be corner coped adjacent to the girder web (85 along web x 35 mm perpendicular to web) and welded to the vertical stiffener.

(k) All weld ends shall terminate 10 mm from the edge or end of plates.

(l) Gusset plates for attachment of horizontal bracing shall be bolted and not welded to girders.

(m) The following material properties shall be followed:

1)	Girders and all materials welded to girders.	CSA G40.21-Grade 350AT CAT 3 or ASTM A709 Grade 345WT Type B with Charpy value of 27J @ -30^{o}C
2)	Ungalvanized bearing and bracing materials bolted to girders.	CSA G40.21M-Grade 350A
3)	Structural bolts	22 mm diameter A325M - Type 3 weathering steel

All weathering steel shall be uncoated.

(n) The following features shall be used to prevent staining of sub-structure concrete:

- At pier locations, the exterior edge of the bottom flange of exterior steel girders shall have a 19 x 19 x 8000 mm long rubber strip centred over the pier, in accordance with the Department's Standard Drawing S-1760-08.
- For full integral abutments, where the girder steel is encased and in direct contact with concrete, a rubber strip shall be applied all around the bottom flange of all girders and also be bonded to the face of the concrete.

(o) Changes in girder flange widths shall be tapered at a taper of 2.5 (longitudinal):1 (transverse).

(p) Shear stud projections from the top of girder flanges into the deck shall meet all Bridge Design Code requirements for stud development and anchorage requirements and ensure full composite action in accordance with design requirements. When stud projection is less than 40 mm above the underside of the bottom transverse mat of deck bars, additional hat shape extension bars shall be provided to tie the slab and the deck haunch together. When precast concrete partial depth deck panels are supported on the girder flanges, stud projection above the top surface of the steel girder shall be sufficient to provide at least 25 mm of clearance between the underside of the stud head and the top surface of the precast deck panels, in all locations.

300.5.2.17.4 Intermediate Diaphragms

(a) Typical intermediate diaphragm locations and details shall be in accordance with the Department's Standard Drawings S-1757-08 to S-1760-08.

(b) Intermediate diaphragms are required in bridge structures with girder and slab superstructures unless their omission is agreed to in advance and in writing by the Department. Intermediate diaphragms in bridge structures with steel beam and slab superstructures shall have a maximum spacing of 8.0 m. Intermediate diaphragms in bridge structures with precast concrete beam and slab superstructures shall have a maximum spacing of 13.0 m.

(c) Intermediate diaphragms for steel or precast girders 1200 mm deep or shallower, shall be channel or W shape of at least 1/3 and preferably 1/2 the girder depth. For girders deeper than 1200 mm, full depth X or K bracing with top and bottom horizontals shall be provided.

(d) Intermediate diaphragms and girders shall be designed for construction loads during deck concrete placement in accordance with section 3.16 of the Bridge Design Code and other code requirements. Specifically, diaphragms, exterior steel and precast girders carrying deck overhangs shall be checked to ensure sufficient strength and stability to handle concentrated loads from deck finishing machines, work bridges, fog misting equipment, and loads from temporary walkways outside the edge of the deck slab. Loads assumed for such design shall be based on realistic estimates for each bridge and shall be shown on Detailed Designs. Diaphragms provided shall become part of the permanent structure and be left in place for possible future maintenance, i.e. widening, rehabilitation, etc.

300.5.2.18 Deck Joints

(a) New structures shall be fully continuous from end to end. Deck joints shall only be permitted at abutments. The following standard deck joints shall be used unless prior written approval is obtained from the Department to use other deck joints:

Department Standard Drawing	**Joint Type**	**Movement Range ***	**Transverse Joint Movement Range ****
S-1493	Multi-cell strip seal for skews < 20º	115 – 60 = 55 mm	± 13 mm
S-1626	Multi-cell strip seal for skew = 20º to 45º	55 mm	± 13 mm
S-1638, S-1639, S-1640	Finger plate joint	> 55 mm	As per design

** Joint gap movement shall be measured perpendicular to the axis of the deck joint (opening/closing of the joint).*

*** Transverse joint movement shall be measured parallel to the axis of the deck joint (shearing of the strip seal due to skew orientation).*

(b) Only approved strip seals listed on the Department's deck joint Standard Drawings shall be used. Multi-cell strip seal deck joints are the Department's preferred deck joint system. However, their use is limited by the movement ranges of the approved strip seals. Finger plate deck joints shall be used when any one or more of the following conditions are encountered:
  - skew > 45°;
  - total joint gap movement > 55 mm;
  - transverse joint movement > ± 13 mm measured from temperature at which the strip seal is installed.

The only exception to the above is for a fixed deck joint, where a multi-cell strip seal deck joint can be used for skews > 45°. For this situation, Department Standard Drawing S-1493 may be used.

(c) Deck joints shall incorporate stop movement bars to maintain a minimum joint gap of 60 mm to facilitate seal replacement. Designers should note that this is often larger than the minimum gap indicated on manufacturer's brochures, which provide gap widths suitable for first installation only.

(d) For strip seal type deck joints with skew angles within the range of 20º to 45º, snow plow guard plates shall be installed in accordance with Department Standard Drawing S-1626 to prevent snow plow blades from catching the edge of the joint extrusion. Welded snow plow guard plates shall not be located directly under wheel paths.

(e) Fingers plates shall be fixed to the deck side to allow jacking and raising of the superstructure.

(f) Modular seal deck joint systems are not permitted.

(g) Deck joints shall be recessed 5 mm below riding surfaces and 8 mm behind the vertical traffic faces of curbs, sidewalks, medians and barriers. The free ends of any cover plates shall be pointed towards the bridge abutments.

(h) Deck joints on steel girder superstructures shall be erected by bolting to the girders. The bolted connections shall utilized slotted holes to provide for adjustment in the vertical, lateral and longitundinal directions. Deck joints on concrete girder superstructures or abutments shall be erected on adjustable supports by projecting dowels with threaded couplers for elevation adjustment.

(i) Deck joints shall run continuously across the full width of the deck. Exterior bridge barriers and curbs shall have full cover plates on the inside face and across the top. Interior traffic separation barriers shall have full cover plates on both sides and across the top. Raised concrete medians shall have deck joints follow the top surface or run across the median at the deck level complete with cover plates across the median. Deck joints across the width of sidewalks or pathways shall have non-slip cover plates.

(j) Only neoprene multi-cell strip seals shall be permitted.

300.5.2.19 Bridgerails

(a) The Contractor shall use Department standard bridgerails, barriers, and approach end transitions, as listed in the following table.

Department Standard Drawing	Title	Application/ Transition Type
S-1642-00	PL-2 (TL-4) Double Tube Type Bridgerail – Bridgerail Details (Sheet 1 of 2)	Preferred bridgerail for most applications.
S-1643-00	PL-2 (TL-4) Double Tube Type Bridgerail – Approach Rail Transition Details (Sheet 2 of 2)	14 m long Thrie Beam Approach Rail Transition PL-2 (TL-4) and Strong Post Approach Rail (TL-3).
S-1650-00	PL-2 (TL-4) Single Slope Concrete Bridge Barrier – Barrier Details (Sheet 1 of 2)	Bridgerail for use in urban areas where aesthetics is important.
S-1651-00	PL-2 (TL-4) Single Slope Concrete Bridge Barrier – Approach Rail Transition Details (Sheet 2 of 2)	14 m long Thrie Beam Approach Rail Transition PL-2 (TL-4) and Strong Post Approach Rail (TL-3).
S-1681-07	PL-3 (TL-4) Bridgerail to Modified Thrie Beam Transition Details	8.2 m long Modified Thrie Beam Approach Rail Transition PL-2 (TL-4).
S-1700-06	PL-2 (TL-4) Combination Barrier – Bridgerail Details (Sheet 1 of 6)	Bridgerail for use on urban bridges with 4.2 m widened outside lane for cyclists.
S-1701-06	PL-2 (TL-4) Combination Barrier – Barrier End Details (Sheet 2 of 6)	Connects to single slope concrete road barrier.
S-1702-06	PL-3 (TL-5) Double Tube Type Bridgerail – Bridgerail Details (Sheet 3 of 6)	Bridgerail for use when high AADT with heavy truck volumes and/or high structure requires a PL-3 (TL-5) bridgerail.
S-1703-06	PL-3 (TL-5) Double Tube Type Bridgerail – Barrier End Details (Sheet 4 of 6)	N/A
S-1704-06	PL-3 (TL-5) Double Tube Type Bridgerail – Concrete Barrier Details (Sheet 5 of 6)	N/A
S-1705-06	PL-3 (TL-5) Double Tube Type Bridgerail – Approach Rail Transition Details (Sheet 6 of 6)	14 m long Thrie-Beam Approach Rail Transition PL-2 (TL-4) and Strong Post Approach Rail (TL-3).
S-1798-08	PL-2 (TL-4) Single Slope Concrete and Double Tube Type Barriers along Top of MSE Wall	Traffic barrier for traffic running adjacent to top of MSE retaining walls.

(b) When a vehicular bridge includes a sidewalk, a traffic separation barrier shall be provided between the sidewalk and the roadway. The barrier shall have a minimum height of 0.6m measured from the surface of the sidewalk.

(c) Pedestrian/Cyclist railing:

The pedestrian/cyclist handrail shall be 1300 mm high, mounted on a concrete curb projecting 100 mm above the sidewalk for a total handrail height of 1400 mm. Details of the handrail shall be based on the Department's Standard Drawing S-1401 (Vertical Bar Type Handrail) or S-1426 (Staggered Vertical Bar Type Handrail) as appropriate.

(d) Bridgerail Layout:

- Bridgerail expansion joints shall be provided at all deck joint locations. For long bridges, additional expansion joints shall be provided at a maximum spacing of 45 m.
- Department Bridgerail Standard Drawings show a standard bridgerail expansion joint with a gap of 100 mm, and a large expansion joint with a gap of 200 mm. The selection of the bridgerail expansion joint gap should ensure that the bridge deck expansion gap closes before the bridgerail expansion gap.
- Steel bridge railing for bridges with curve radii of 600 m or less shall be fabricated curved.

(e) Exterior bridge barriers adjacent to 4.2 m wide traffic lanes shall be combination traffic/ cyclist railings with a minimum height of 1400 mm.

300.5.2.20 Bridge Drainage

(a) Concrete drain trough terminals shall be located at low corners of bridges to channel water off of the bridge and to a drainage ditch lined by "Scourstop" or equivalent accepted by the Department. The drainage ditch shall extend to the bottom of the roadway approach fills. The concrete trough drains shall be designed to function as intended while accommodating differential settlements and other movements between the bridge and the roadway approach fills.

(b) Additional drains required to accommodate deck drainage or drainage through deck joints shall be hidden from view where practical. Drains, including mounting brackets that cannot be hidden from view shall receive a finish that is acceptable to the Department and that causes them to blend into the surrounding structure.

300.5.2.21 Engineering Drafting Requirements

(a) General

Drafting standards and standard details shall be in accordance with section 2 – Guidelines for Bridge Projects of the "Engineering Drafting guidelines for Highway and Bridge Projects".

All dimensions shall be ground dimensions. Stations may be given in either grid or ground coordinated. Skew angles shall be given to the nearest minute.

(b) The preferred drawing order for bridge type structures is as follows:

- General Layout.
- Information Sheet/Sheets.
- Abutments.
- Pier/Piers.

- Bearings.
- Girders.
- Deck.
- Deck Joints.
- Other (If required).
- Standard Drawings.

(c) Other types of structures (culverts, etc.) should follow the same basic order with drawings added and/or deleted as necessary.

(d) Clear zone requirements, calculated critical vertical clearances with their critical locations for current construction as well as the Ultimate Stage construction shall be shown on the General Layout for all grade separation structures. Design high water elevation, high ice elevation, low water elevation (with date of survey), design general and local scour elevations shall be shown on the General Layout of all river structures.

(e) Full detailed drawings for MSE walls shall be incorporated into the bridge drawing package. These drawings shall show details of how the MSE components interact with the abutment components. The drawings for the abutment components (i.e. piles, seat, wingwalls, backwalls, diaphragms, and approach slabs) shall also show details of how the MSE walls will interact with the abutment components.

(f) An index listing of all drawings included in the drawing set shall be shown on the first sheet of the set. The index shall be orientated from the bottom up; i.e., sheet No. 1 shown at the bottom and successive sheets listed upward from there.

(g) Control line designations shall be selected from the following list and be used consistently throughout the same set of drawings: Centreline NBL Hwy XX, Centreline N-W RAMP, Centreline RDWY, Centreline CROWN, Centreline BRG ABUT #X, Centreline ABUT #X, Centreline PIER #X.

(h) “Top of Finish Centreline Crown” stations and elevations are to be shown for each end of the structure. Top of Finished Centreline Crown is defined as the point where the headslope line intersects the finished centreline roadway profile. Station is given to the nearest decimetre and elevation to the nearest centreline.

(i) Substructure elements are to be numbered in the direction of increasing chainage, i.e. Abutment 1 or Pier 1 occurs at the lower chainage location and numbering increases from there.

(j) Reinforcing Steel Details

- All reinforcing steel bar marks, if used, are to be as per the Department’s *Engineering Drafting Guidelines for Highway and Bridge Projects*.
- Bar marks shall not be duplicated on a project unless the bars are identical.
- Incremented bars should each have their own bar mark.

- Epoxy coated bars are to be denoted with the suffix 'C'.

(k) Substructure / Foundations

The following design pile load information for abutment and/or pier piles shall be shown in the General Notes on the Information Sheet:

- SLS permanent loads only
- SLS extreme loads (combination #)
- ULS permanent loads only
- ULS extreme loads (combination #)
- Outlines of the foundations and approximated pile tip elevations are to be shown relative to test holes on the geotechnical information sheet.

(l) Girders

Span lengths established from preliminary engineering requirements shall be rounded up to the nearest whole metre.

Girder camber variations shall be accommodated by adjusting the deck formwork elevation and thickness of the deck haunch on the girders. The following standard note shall be shown on the deck drawing and shall apply to the nominal girder haunch and the outside of curb/ fascia dimensions:

"THESE DIMENSIONS WILL VARY DUE TO VARIATIONS IN GIRDER CAMBER. THE CONTRACTOR SHALL DETERMINE THE ADJUSTMENTS AND MAKE THE APPROPRIATE CORRECTIONS."

i. Steel Girder Superstructures:

The span lengths shown on the general layout drawings shall be measured at a fabrication temperature of +20°C, from centreline bearing to centreline bearing along the bottom flange for uniform depth girders, and along the top flange for tapered or haunched girders. Expansion bearings are to be centred on centreline bearing at -5°C.

Ground stationing for locating the centreline bearing of sub-structure elements shall be adjusted to account for the following:

- length difference between gradeline profile and horizontal surveyed distances,
- length difference due to thermal change between +20°C and -5°C,
- longitudinal shift due to off-plumb tilting of bearing stiffeners or control sections set perpendicular to the top flange, when span lengths are measured along the top flange,
- differences between ground distances and other surveying systems.

For expansion bearings, a bearing temperature setting chart shall be provided for positioning bearing components according to the girder temperature at the time of setting the bearing.

The following standard note shall be incorporated on the general layout drawing:

"GIRDER LENGTHS SHOWN ARE MEASURED ALONG BOTTOM (TOP) FLANGE AND ARE CORRECT AT +20°C. ABUTMENT AND PIER STATIONINGS ARE LOCATED SUCH THAT BEARINGS ARE CENTRED AT -5°C".

Welded steel girders shall be cambered for 100% of the dead load deflection and roadway gradeline profile. Camber data shall be shown on a camber diagram, at 10th span points, centreline of supports, and centreline of field splices, along with net camber values for individual girder segments between splices. For spans longer than 50 m, data shall be presented at 20th span points. Data shall include girder DL, deck DL, Super-imposed DL (including curb/barrier/median/sidewalk + wearing surface), and vertical grade.

Structural steel mass for steel girder superstructures shall be calculated and the mass, in tonnes, shall be shown in the 'General Notes' area on the steel girder drawings. Mass shall include girders, diaphragms, stiffeners, and splice plates but does not include deck joints, bearings, and bolts.

ii. Precast Concrete Girder Superstructures:

Lengths of precast concrete girders are to be shown on the general layout drawings together with pier diaphragm thicknesses between girder ends, and distance from abutment girder end to centreline abutment bearing. Precast girder lengths shall be set to meet geometric and clearance requirements and shall be measured along the bottom flange at a fabrication temperature of +20°C. Expansion bridge bearings are to be centred on centreline bearing at -5°C.

Ground stationing for locating the centreline bearing of sub-structure elements shall be adjusted to account for the following:

- length difference between gradeline profile and horizontal surveyed distances,
- length difference due to thermal change between +20°C and -5°C,
- differences between ground distances and other surveying systems.

For expansion bearings, a bearing temperature setting chart shall be provided for positioning bearing components according to the girder temperature at the time of setting the bearing. The bearing design and setting chart shall make allowances for girder shortening due to post-tensioning and long term shrinkage and creep.

The following standard note shall be incorporated on the general layout drawing:

"GIRDER LENGTHS SHOWN ARE MEASURED ALONG BOTTOM FLANGE AND ARE CORRECT AT +20°C. ABUTMENT AND PIER STATIONINGS ARE LOCATED SUCH THAT BEARINGS ARE CENTRED AT -5°C. Appropriate allowance for prestress (pre-tension and post-tension) shortening, shrinkage and creep shall be included in the fabricated length of the girders".

Theoretical calculated cambers based on best estimates shall be shown on the Detailed Designs. Camber data shall be provided at various construction stages, such as at transfer, erection, deck pour, post-tensioning, Super-imposed DL, gradeline profile, etc.

iii. Cast in Place Superstructures:

Data shall be presented on the drawings to allow setting of form elevations. The deflection data used in the determination of the form elevations shall be presented.

iv. Curved and flared Superstructures:

For curved structures with equal girder lengths (parallel chords) within each span, measure span length along girder lines as defined above.

For curved or flared bridges with variable girder lengths (either curved or chords) within a span, measure span length along a selected girder line near the centre on the general layout drawing, with a cross-reference to a detailed girder layout drawing showing complete geometry of all girders. Changes in girder flange widths shall be tapered at a taper of 2.5 (longitudinal):1 (transverse).

(m) Bridgerail

All dimensions for bridgerail layouts are to be given on centreline of bridgerail anchor bolts.

300.5.3 DESIGN REPORT REQUIREMENTS

Prior to initiating construction of a bridge structure, the Contractor shall submit a complete design package for the bridge structure, including as applicable *Canada Transportation Act* ("**CTA**") applications, approvals and agreements, *Navigable Waters Protection Act* ("**NWPA**") drawings, permit applications, approvals, and proof of advertising, Department of Fisheries and Oceans ("**DFO**") applications, approvals and orders, design drawings and construction specifications, to the Department. The completed design packages may be submitted in a manner suiting the Contractor's proposed design and construction schedule. They may also be submitted individually by bridge component, substructure, superstructure or for the complete bridge structure.

Unless otherwise noted, the design package for each bridge structure shall have the following:

- Design Data ("**DD**") Drawings as defined in Appendix J1 of the Department's *Engineering Consultant Guidelines for Highway and Bridge Projects.*
- Site-specific design (P) drawings ***(Note: 'P' is the designation used in the Department's bridge drawing record system for all bridge drawings relating to site specific projects (i.e. 16523-P). These drawing numbers will be assigned by the Department. The 'P' designation is changed to a 'C' for the as-constructed drawings).***

- Applicable Department Standard Drawings.
- Geotechnical report in accordance with CAN/CSA-S6-06 section 6.5.6, and including the global stability of bridge headslopes and retaining walls.

Design Data ("**DD**") Drawings, including hydrotechnical and geotechnical reports, shall be submitted prior to submission of the site specific Design Drawings. Design Data ("**DD**") Drawings are not required for bridge size culverts less than 4.5 m in diameter and for sign structures.

300.5.4 FINAL DESIGN REPORT REQUIREMENTS

Following final completion of the detailed design of a bridge structure, the Contractor shall submit copies of the following documents for the bridge structure, if applicable, to the Department for its bridge structure records system.

- Hydrotechnical report;
- Design notes;
- Design check notes;
- Geotechnical report;
- Corrosion survey report;
- *Canada Transportation Act* ("**CTA**") applications, approvals and agreements;
- *Navigable Waters Protection Act* ("**NWPA**") drawings, permit applications, approvals, and proof of advertising;
- Department of Fisheries and Oceans ("**DFO**") applications, approvals and orders;
- Design Data ("**DD**") Drawings, hardcopy and electronic Microstation.dgn format;
- Site-specific (P) drawings, hardcopy and electronic Microstation.dgn format; and
- Construction and material specifications not contained in Section 300 (Design and Construction - New Infrastructure).

300.5.5 CONSTRUCTION REQUIREMENTS

300.5.5.1 General

300.5.5.1.1 Materials

All materials incorporated into the bridge structures for the Project shall be new. Timber materials shall only be used for approach guardrail posts and blocking.

300.5.5.1.2 Existing Reference Documents

The Contractor is advised that the Department has an existing "Specifications for Bridge Construction" document that outlines the requirements for the construction of bridge structures. While the provisions of the document are not directly binding for the Project, unless noted otherwise, it is based on the Department's past experience and best practices and will provide guidance and assistance for the construction of the bridge structures.

300.5.5.1.3 Site Office for Bridge Construction

The Contractor shall provide and maintain in a clean and safe condition an office trailer at the site for the sole use of the Department. The site office trailer shall be located within the Contractor's working area, separate from the Contractor's office or any other structure, and shall meet the following requirements:

- Minimum floor area 11 m^2, with minimum headroom of 2.4 m
- Adequate lighting, heating and ventilation
- Windproof, weatherproof and insulated
- Lockable exterior door
- Adequate windows on all sides, with screens and shades
- Minimum two electrical receptacles
- Resilient flooring material
- One plan or drafting table with one stool
- One desk-minimum 1500 x 600, and two chairs
- One two-drawer filing cabinet.

Details of the site office trailer, its contents and its proposed location shall be submitted in advance to the Department for approval.

The Contractor shall provide the site office trailer prior to the commencement of any field work and ensure that it is continuously available until Traffic Availability has been achieved.

The location of the site office trailer will be determined by the Department based on the work sequence undertaken by the Contractor. The Contractor may be required to move the site office trailer occasionally, as may be reasonably requested by the Department from time to time, to locate it suitably with respect to the work.

If the site office trailer has not been provided to the Department prior to the commencement of any field work or becomes unavailable for the Department's use, Payment Adjustments of $2,000/week or portion thereof for the first four (4) weeks and $5,000/week or portion thereof thereafter shall apply.

300.5.6 CONSTRUCTION CRITERIA

300.5.6.1 Specifications For Bridge Construction

The specifications for bridge structures shall incorporate the following supplemental specifications for bridge structures that incorporate cast-in-place concrete, structural steel, precast concrete units, CSP and SPCSP culverts, post-tensioning and overhead and cantilever sign structures:

300.5.6.1.1 Cast-In-Place Concrete

All cast-in-place concrete proposed for the bridge structures in the Project shall be in accordance with Section 300.5.7 (Cast-In-Place Concrete).

300.5.6.1.2 Structural Steel

All structural steel proposed for the bridge structures in the Project shall be in accordance with Section 300.5.8 (Structural Steel).

300.5.6.1.3 Precast Concrete Units

All precast concrete units proposed for the bridge structures in the Project shall be in accordance with Section 300.5.9 (Precast Concrete Units).

300.5.6.1.4 CSP and SPCSP Structures

All proposed CSP and SPCSP bridge sized culverts in the Project shall be in accordance with Section 300.5.10 (Construction of CSP and SPCSP Structures).

300.5.6.1.5 Mechanically Stabilized Earth Walls

All proposed MSE Walls in the Project shall be in accordance with Section 300.5.11 (Mechanically Stabilized Earth Walls).

300.5.6.1.6 Sign Structures

All proposed overhead and cantilevered sign structures in the Project shall be in accordance with Section 300.5.12 (Sign Structures).

300.5.6.1.7 Piling

All piling proposed for the bridge structures in the Project shall be in accordance with Section 300.5.13 (Piling).

300.5.6.1.8 Reinforcing Steel

All reinforcing steel proposed for the bridge structures in the Project shall be in accordance with Section 300.5.14 (Reinforcing Steel).

300.5.6.1.9 Waterproofing Membrane

All waterproofing membrane proposed for the bridge structures in the Project shall be in accordance with Section 300.5.15 (Waterproofing Membrane).

300.5.6.1.10 Alternatives to Supplemental Specifications

The Department will consider proposed alternatives to the supplemental specifications, in whole or in part, subject to the proposed alternatives being equal to or better than the supplemental specifications in the judgement of the Department.

300.5.7 CAST-IN-PLACE CONCRETE

300.5.7.1 General

This specification includes the quality requirements, the sampling and testing of the materials and concrete, the methods of producing and handling the constituent materials, and the batching, mixing, handling, transporting, placing and curing as outlined, and which constitute good and acceptable construction practice in structural and similar work.

Metric versions are inferred, when available and relevant.

300.5.7.2 Submissions

The following information shall be submitted to the Department by a date that is reasonable having regard to the design and construction process and in any event within the times noted below. In the event that the Department requests any of the following information, the requested information shall be provided within seven days, notwithstanding the times noted below.

- Data showing conformance of the fly ash to the requirements of CSA A3000-03 Cementitious Material Compendium for Type “F” or “CI” fly ash (at least five days prior to placing concrete);
- Aluminum content of steel fibres used in Class HPC with steel fibres (at least five days prior to placing concrete);
- Concrete mix design for each type of concrete proposed (at least five days prior to placing concrete);
- Concrete trial batch results (at least five days prior to placing concrete);
- Concrete cylinder strength test results;
- Concrete placing schedule (at least two days prior to placing concrete);
- Type of machine proposed for grinding of deck, if required;
- Concrete crack measurements for Class HPC and Class HPC with steel fibres concrete (at least two days prior to sandblasting); and
- Concrete core strength results, if required.

300.5.7.3 Reference Drawings (as attached in Appendix B)

- Standard Concrete Joints S-1411-87
- Standard Construction Joints S-1412-99

300.5.7.4 Materials For Concrete

Concrete shall consist of Portland cement, aggregates, water and admixtures or additives which shall conform to the requirements as specified.

Cement - Normal Portland cement, Type GU, or Sulphate Resistant, Type HS, shall be supplied unless otherwise specified. Cement shall conform to the requirements of CSA Standard A3001-03, Portland Cements.

Water - Water to be used for mixing concrete or mortar shall conform to the requirements of CSA Standard A23.1 and shall be free from injurious amounts of alkali, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

Aggregates - Fine and coarse aggregates shall conform to the requirements of CSA Standard A23.1 and shall be stockpiled separately.

Admixtures - All admixtures, such as water-reducing agents, air-entraining agents and superplasticizers, shall conform to ASTM C494 and shall be compatible with all other constituents. The addition of calcium chloride, accelerators, retarders or set-controlling admixtures and air-reducing agents will not be permitted.

Silica Fume - Condensed silica fume shall conform to CSA Standard A3000-03 - Cementitious Material Compendium, Type SF, with a SiO2 content of at least 85%, of a maximum of 10% ignition loss, and no more than 1% SO3 content.

Air Entraining Agent - Air entraining agent shall be added to all concrete and shall conform to the requirements of ASTM C260.

Steel Fibres - When specified, steel fibres shall be Novocon XR, Wire Mix W50 or equivalent. The fibres shall conform to ASTM A820/A820M-04, Type 1 or 5 and be 50 mm in length with the aluminum content no more than 0.020% by mass when tested in accordance with test method Environmental Protection Agency (EPA) 3050B.

Fly Ash - All fly ash shall conform to the requirements of CSA Standard A3000-03 Cementitious Material Compendium for Type “F” or “CI” fly ash. Only compatible superplasticizing admixtures and air entraining agents shall be used with the fly ash.

300.5.7.5 Class and Composition of Concrete

300.5.7.5.1 Class of Concrete

Class of Concrete	Minimum Specified Compressive Strength at 28 Days MPa	Nominal Maximum Aggregate Size mm	Range of Slump mm	Total Air Cont. %	Max. Water/ Cementing materials Ratio
B	25	28 to 5	50 to 70	5 - 8	0.45
C	35	20 to 5	60 to 80	5 - 8	0.42
HPC	45	20 to 5	90 to 150	5 - 8	0.38
D	30	14 to 5	50 to 70	5 - 8	0.42
S	20	28 to 5	50 to 70	5 – 8	0.50
Pile	25	28 to 5	100 to 140	5 – 8	0.45

Note:

- The size of coarse aggregate shall be 28 to 5 mm for Class C concrete when used in mass pours such as piers and abutments.
- The fly ash shall not exceed 30% by mass of cementing materials, however for High Performance Concrete (HPC) it shall be in accordance with Section 300.5.7.5.2 (Class HPC and Class HPC with Steel Fibres) (e) & (g). Fly ash may be used in concrete mixes where the aggregate is assessed to be potentially alkali-silica reactive.
- The requirements for Class HPC concrete with steel fibres are the same as for Class HPC concrete. Additional requirements are listed in Section 300.5.7.5.2 (Class HPC and Class HPC with Steel Fibres).
- When the thickness of deck overlay concrete is specified as 50 mm or less, the nominal maximum top size of aggregate shall be 14 mm.

300.5.7.5.2 Class HPC and Class HPC with Steel Fibres

(a) Mix shall include silica fume and fly ash as supplementary cementing materials in combination with compatible air entraining, water reducing and/or superplasticizing admixtures, as required.

(b) The gradation limits for the fine aggregate shall conform to CSA Standard A23.1, except that the amount of material finer than 160 μm shall not exceed 5%.

(c) Coarse aggregate shall conform to CSA Standard A23.1 and the maximum combination of flat and elongated particles (4:1 ratio), as determined by CSA Standard A23.2-13A, shall not exceed 10% of the mass of coarse aggregate.

(d) Minimum cement content (excluding supplementary cementing materials) shall be 335 kg/m^3.

(e) Sum of silica fume and fly ash by mass of cementing materials shall be 17% to 20%.

(f) Silica fume by mass of cementing materials shall be from 6% to 8%.

(g) Fly ash by mass of cementing materials shall be 11% to 15%.

(h) Slump retention of test mix after 45 minutes of batching shall be at least 50% of initial slump. The initial slump of the trial mix shall be measured after an elapsed time from batching of not more than 15 minutes.

(i) Rapid chloride ion penetration shall be determined in accordance with ASTM C1202 on laboratory moist cured samples at 28 days. Rapid chloride ion penetration shall be less than 1000 coulombs. For HPC with steel fibres, testing shall be done without the presence of the steel fibres.

(j) An air-void spacing factor shall be determined in accordance with ASTM C457 modified point-count method at 100 times magnification. The average of all tests shall not exceed 230 μm with no single test greater than 260 μm.

(k) When Class HPC with steel fibres is specified, it shall contain 60 kg of 50 mm long steel fibres, per cubic metre.

(l) The temperature of the centre of the in-situ concrete shall not fall below 10^{o}C or exceed 60^{o}C and the temperature difference between the centre and the surface shall be controlled to within 20^{o}C. In addition, the requirements of Table 21 of CSA A23.1 shall apply.

(m) Trial batch(es) shall be performed prior to placement of concrete at site to verify that requirements pertaining to compressive strengths at seven and 28 days, rapid chloride ion penetration at 28 days and air void system parameters of hardened concrete have all been met. The shrinkage of the trial batch concrete shall be measured in accordance with ASTM C157 except that drying shall commence after seven days of curing and shrinkage determined after 28 days of drying. All data shall be submitted to the Department for information purposes.

300.5.7.5.3 Temperature

The temperature of all classes of concrete not containing silica fume shall be between 10°C and 25°C at discharge. Temperature requirements for Class HPC and Class HPC with steel fibres shall be between 10°C and 20°C at discharge.

300.5.7.5.4 Aggregate Tests and Concrete Mix Design

The Contractor shall prepare a concrete mix design for each proposed class of concrete. Each mix design shall include the following aggregate analysis:

- Fine and coarse aggregate sieve (CSA 23.2-2A);
- Amount of material finer than 80 μm in aggregate (CSA 23.2-5A);

- Organic impurities in sands for concrete;
- Results of deleterious substances and physical properties of aggregates included in Table 12, CSA Standard A23.1-04 (Test methods A23.2-23A, A23.2-24A, A23.2-29A);
- Assessment of potential for deleterious alkali-aggregate reactivity (“**AAR**”) (CSA A23.2-27A);
- Petrographic examination of coarse aggregate for concrete shall be required for Class HPC and Class HPC with steel fibres; and
- Sources of proposed aggregates.

The analysis of the aggregates shall be current and fully represent the material to be used in production. Sampling and testing shall have been done no more than 90 days prior to concrete production, except for petrographic examination of coarse aggregate for concrete which shall be no more than 120 days prior to concrete production. Additional analyses of more recent sampling shall be provided periodically to confirm that the aggregates continue to meet requirements. A break in production of a particular class of concrete shall not constitute the need for additional testing when the Contractor provides conclusive evidence that the material initially tested is still representative.

If the fine aggregate consists of a blend from more than one source, the "Fine Aggregate Sieve" analysis shall show the gradation of the blended fine aggregates. Similarly in the case of blended coarse aggregates, the "Coarse Aggregate Sieve" analysis shall indicate the gradation of the blended coarse aggregates.

Fine aggregate, tested in accordance with CSA Standard A23.2-7A, *“Organic Impurities in Sands for Concrete”*, shall produce a colour not darker than the Standard colour (Organic Plate Number 3). Aggregate producing a colour darker than the Standard colour will be rejected in the absence of a satisfactory record of performance of a similar class of concrete (minimum 30 tests over the last 12 months); provisions 4.2.3.3.3.2 (a) and (b) of CSA Standard CAN3-A23.1-04 shall not apply.

The potential for deleterious alkali-aggregate reactivity shall be assessed in accordance with CSA Standard A23.2-27A. This assessment shall include the risk level associated with structure size and environment, the level of prevention related to service life requirements and the determination of the appropriate preventative measures. For bridge structures, the service life is 75 years. Current (less than 18 months old) test data evaluating the potential alkali-silica reactivity of aggregates tested in accordance with CSA Standard A23.2-14A or CSA Standard A23.2-25A is required. In the absence of current test data and outside of areas of known highly reactive aggregate, the aggregate shall be presumed to be moderately reactive.

Petrographic analysis on the proposed coarse aggregates shall be performed in accordance with CSA A23.2-15A by experienced personnel employed by a CSA certified laboratory. The (weighted) petrographic number shall not exceed 130, and the ironstone content shall not exceed 0.8%. The Petrographic Analysis report shall be stamped by either a Professional Engineer, a professional geologist, or a geological engineer registered in the Province of Alberta.

The sampling and testing of aggregates, and the concrete mix design shall be completed by an independent CSA certified and qualified concrete testing laboratory which shall have a permit to practice in the Province of Alberta. Concrete mix designs including sampling and testing of aggregates may be completed by the concrete supplier, with the condition that documentation is stamped by a Professional Engineer. For either situation, the mix design including sampling and testing shall be reviewed and stamped for compliance with the respective specifications, by an independent CSA certified and qualified concrete testing laboratory having a permit to practice in the Province of Alberta. For either case, the testing laboratory shall provide an engineering opinion that the concrete aggregate and mix designs are suitable for the intended use and are expected to perform to specified standards.

For Class HPC and Class HPC with steel fibres the Contractor shall produce evidence that the proportions selected will produce concrete of the quality specified. This shall include the preparation of satisfactory trial mixes before the concrete is used. The trial mix shall be a minimum of 3 m^3 or 50% of the rated mixer capacity (whichever is greater) and simulate the anticipated placing procedures at site. In preparing the trial mixes, the workability and slump retention characteristics shall be assessed at 30-, 45- and 60-minute intervals. In addition the concrete from the trial mixes shall also satisfy the rapid chloride ion penetration requirements in accordance with Section 300.5.7.5.2 (Class HPC and Class HPC with Steel Fibres).

Concrete mixes that will be placed by concrete pump shall be designed for pumping.

300.5.7.5.5 Initial Mixes and Adjustments

For all classes of concrete other than HPC and HPC with steel fibres, in cases of initial mixing operations or changes in source of water or aggregate, the mix adopted shall be designed for an excess compressive strength of 10% above the specified 28-day nominal compressive strength. After the mix has been adequately proven as to strength and performance, adjustment may be undertaken, but only with the acceptance of the Department. If, during the progress of the work, the mix design is found to be unsatisfactory for any reason including poor workability, the Contractor shall make the necessary adjustments. Notwithstanding the Department’s review of the mix design, it remains the Contractor’s responsibility that the concrete meets all the requirements of the Technical Requirements.

300.5.7.6 Mixing Concrete

Mobile continuous mixers or other such concrete supply equipment will not be accepted for use.

All concrete shall be mixed thoroughly until it is uniform in appearance, with all ingredients uniformly distributed. In no case shall the mixing time per batch be less than one minute for mixers of one cubic metre capacity or less. The “batch” is considered as the quantity of concrete inside the mixer. This figure shall be increased by 15 seconds for each additional half cubic metre capacity or part thereof. The mixing period shall be measured from the time all materials are in the mixer drum.

The Contractor shall in no case load the mixer above its rated capacity. The Contractor shall maintain the mixer in good condition. Inner surfaces of the mixer shall be kept free of hardened concrete and mortar. Mixer blades which are bent or worn down so as to affect the mixing efficiency shall be renewed. Any mixer leaking mortar or causing waste of materials through faulty charging shall be taken out of service until repaired. The Contractor shall, at all times, operate the mixer at the speed recommended by the manufacturer and shall, if requested, supply the manufacturer's certification of the mixing capacity of the machine in use.

The mixer shall be fitted with an accurate and dependable means for measuring the water added, which is not affected by variation in pressure in the water supply line. All joints, valves and other parts shall be maintained so that there is no leakage of water into the mixer drum. Mixers that do not have an accurately working and dependable water gauge shall not be used.

Water shall be released first and continue to flow while the solid materials are entering the mixer. The water discharge pipe shall be so arranged and be of such size that the flow into the mixer is completed within the first quarter of the mixing time, and the water is delivered well within the mixer where it will be quickly mixed with the entire batch.

Air entraining agents and admixtures shall be placed in the mixer after the initial water is in the mixer drum but before the remaining materials are added. Superplasticizer shall be added after initial mixing and as per the manufacturer’s recommendation.

300.5.7.6.1 Truck Mixing

Truck mixers shall be of the revolving drum type, watertight, and so constructed that the concrete can be mixed to ensure uniform distribution of materials throughout the mass. All materials for the concrete shall be accurately measured and charged concurrently at the proportions which satisfy the approved mix design into the drum at the production plant. Increases in water-cement ratio will not be permitted.

The maximum size of batch in truck mixers shall not exceed the maximum rated capacity of the mixer as stated by the manufacturer and stamped in metal on the mixer. Truck mixing shall commence immediately upon introduction of ingredients into the drum and be continued for not less than 50 revolutions, with the mixing rate being in accordance with the manufacturer’s recommended rate, and shall be such as to thoroughly mix the concrete.

When adjustment to the mix by adding air entraining agent or superplasticizer at the site is made, the mixer shall be run for a minimum of 20 additional revolutions to ensure homogeneity of the concrete before discharge. Discharge chutes shall be kept clean and free from hardened concrete and shall be wetted down prior to use.

300.5.7.6.2 Time of Hauling

The maximum time allowed for all classes of concrete other than Class HPC and Class HPC with steel fibres including delivery to the site of the work and discharge shall not exceed 90 minutes after batching. Batching of all classes of concrete is considered to occur when any of the mix ingredients are introduced into the truck mixer drum, regardless of whether or not the drum is revolved. For Class HPC and Class HPC with steel fibres this requirement is reduced to 70 minutes. In hot weather, or under conditions contributing to quick setting of the concrete, a reduction in these times may be required.

300.5.7.6.3 Delivery

The concrete supplier shall have sufficient plant capacity and satisfactory transporting equipment to ensure continuous delivery at the rate required. The rate of delivery of concrete during concreting operations shall be such that cold joints will not develop. The methods of delivering and handling the concrete shall facilitate placing with a minimum of rehandling, and without damage to the structure or the concrete.

300.5.7.7 Inspection and Testing

The Department shall be afforded full access for any inspections that it may carry out relative to the concrete itself and/or the constituent materials. This includes at the worksite and any plant used for the manufacture of concrete wherever this may be situated. The access shall be adequate to permit proper sampling of concrete, making of test cylinders and testing slump and air content. The proper storage of all site cast concrete cylinders, including cylinders cast by the Department, in accordance with the relevant specifications is the responsibility of the Contractor and adequate cylinder storage space shall be provided prior to any concrete pour.

The results of the testing carried out by the Department will serve to monitor the quality assurance and quality control program of the Contractor.

The Contractor shall utilize ACI or CSA certified testers with extensive related experience to test at site, the air content, slump and temperature of each batch. Additional tests will be required if the results are borderline or widely variable. In case of an unacceptable result, one check test will be permitted. The certified testers shall also cast the test cylinders as specified in Section 300.5.7.7.3 (Test Cylinders). A unit weight shall be determined to represent each set of concrete test cylinders.

300.5.7.7.1 Strength Tests

A “Strength Test” shall consist of the compression tests of four standard test specimens, sampled, made, cured, and tested in accordance with CSA Standard Specifications as referenced with modifications as indicated. One cylinder shall be tested at seven days. The 28-day test result shall be the average of the strengths of the remaining three specimens, except that if any specimens in a test showing distinct evidence of improper sampling, molding or testing, shall be discarded and the remaining strengths averaged. Additional cylinders may be cast, at the discretion of the Contractor.

For Class HPC and Class HPC with steel fibres the Contractor shall take a strength test to represent each approximate 20 m^3 portion of the concrete pour, to a minimum of one strength test for every two loads of concrete. For all other concrete, the Contractor shall take a strength test to represent each bridge element or portion of the element (i.e. abutment seat, abutment backwall, pier footing, pier cap), except on larger pours a strength test will be taken to represent each approximately 30 m^3 portion of the concrete pour, to a minimum of one strength test for every three loads of concrete. Such tests shall be taken from representative batches.

300.5.7.7.2 Sampling

Sampling of concrete shall be carried out in accordance with CSA Standard A23.2-1C.

When a concrete pump is used to place concrete, sampling shall be at the end of the discharge hose.

300.5.7.7.3 Test Cylinders

Making and curing concrete test cylinders shall be carried out in accordance with CSA Standard A23.2-3C, except that the time for cylinders to reach the testing laboratory shall be between 20 and 48 hours. The test cylinders shall be cast by the Contractor in standard CSA approved heavy duty steel or plastic moulds. Plastic moulds shall have a wall thickness of at least 6 mm. The Contractor shall provide properly designed temperature-controlled storage boxes for test cylinders, as specified in section 7.3.2.1 of CSA Standard A23.2-3C for a period of at least 24 hours and further protection, from adverse weather and mishandling until removed from the site. The Contractor shall provide a max-min thermometer for each storage box and record site curing temperatures for all test cylinders. Storage in a portable building which will be used by Contractor's personnel or the Department during the first 24-hour storage period will not be permitted. Storage facilities shall be provided, installed, and approved before any concrete is placed. The Contractor shall be responsible to deliver the test cylinders to an independent CSA certified testing laboratory.

Handling and transporting of the cylinders shall be in accordance with CSA Standard 23.2-3C. No extra laboratory curing time will be allowed for cylinders that are delivered late to the laboratory. For Class HPC and HPC with steel fibres, the ends of cylinders shall be ground flat prior to testing.

If the test cylinders exhibit frost etchings or were stored at temperatures below 10°C or above 25°C, or are otherwise mishandled resulting in unreliable strength test results, the Department may reject these portions of the work unless core-testing, at the Contractor's expense confirms the in-situ strength of the concrete.

300.5.7.7.4 Slump

Slump tests shall be conducted in accordance with CSA Standard A23.2-5C.

300.5.7.7.5 Air Content

Air content tests shall be made in accordance with CSA Standard A23.2- 4C.

300.5.7.7.6 Testing Cylinders

Test cylinders will be tested in compression in accordance with CSA Standard A23.2 by an independent CSA certified testing laboratory engaged by the Contractor.

300.5.7.7.7 Failure to Meet Slump or Air Content Specifications

The Contractor will be allowed to adjust only the quantities of superplasticizer and air entraining agent at site. The Department reserves the right to reject any batch in the event of confirmed unacceptability as determined by quality control tests, and to require immediate removal of any concrete from this batch which may have already been placed in the structure.

300.5.7.8 Falsework and Formwork

300.5.7.8.1 General

All falsework and formwork drawings shall be prepared and sealed by a Professional Engineer. After installation and prior to any concrete placement the engineer shall inspect the falsework and/or formwork to confirm that it is in conformance with the design and drawings. All formwork shall be removed from the completed structure.

300.5.7.8.2 Standard Details

Refer to Department Standard Drawing S-1411-87 “Standard Concrete Joints” and Department Standard Drawing S-1412-99 “Standard Construction Joints,” attached in Appendix B, for details of joints.

300.5.7.8.3 Deck Formwork

Prior to commencing deck formwork, the Contractor shall profile all the girders and determine the deck concrete thickness and girder haunch dimensions required to achieve the specified grade line.

In the event that actual girder camber values vary significantly from the estimated values indicated on the drawings, the Contractor may raise or lower the grade line accordingly.

300.5.7.8.4 Forms for Exposed Surfaces

Forms for exposed surfaces which require a Class 1 "Ordinary Surface Finish" shall be made of good quality plywood, or an acceptable equivalent, of uniform thickness, with or without a form liner. Forms for exposed surfaces requiring a Class 2 "Rubbed Finish" or Class 3 "Bonded Concrete Surface Finish" shall be all new material consisting of Douglas Fir substrate with resin-impregnated paper overlay and factory treated chemically active release agent. All form material for exposed surfaces shall be full-sized sheets, as practical.

All forms for exposed surfaces shall be mortar-tight, filleted at all sharp corners, and given a bevel or draft in the case of all projections. At the top edges of exposed surfaces, the chamfers are to be formed by chamfer strips.

The minimum acceptable forming for all exposed concrete where the pour height is 1.5 m or less shall have 18 mm approved plywood, supported at 300 mm maximum on centres. Where the pour height is greater than 1.5 m the minimum acceptable forming for all exposed concrete shall have 18 mm approved plywood supported at 200 mm maximum on centres. The support spacings specified here assume the use of new material. Closer spacings may be required in case of re-used material. Strong-backs or walers placed perpendicularly to the supports shall be employed to ensure straightness of the form.

Metal bolts or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least 20 mm from the concrete surface. Break-back type form ties shall have all spacing washers removed and the tie shall be broken back a distance of at least 20 mm from the concrete surface. All fittings for metal ties shall be of such design that, upon their removal, the cavities which are left will be of the smallest possible size. Torch cutting of steel hangers and ties will not be permitted. Formwork hangers for exterior surfaces of decks and curbs shall be an acceptable break-back type with surface cone, or removable threaded type. Cavities shall be filled with cement mortar and the surface left sound, smooth, even and uniform in color.

300.5.7.8.5 Protection of “Weathering” Steel Girders

Where steel girders are fabricated of "weathering" steel, it is essential that the uniformity of rust formation is not adversely affected by the Contractor's operation.

The Contractor shall exercise utmost care and provide the necessary protection to prevent marking or staining of the girders. All joints between deck formwork and steel members (including interior girders, and diaphragms) shall be sealed to prevent leakage of cement paste or concrete. Caulking, duct tape, ethafoam, or any other suitable means or material, shall be used to achieve the seal.

Should foreign material spill onto the girders despite the protection provided, the Contractor shall clean off, wash, and sandblast the contaminated areas. Additionally, should the exterior face of an exterior girder become stained or marked, the entire exterior face of the girder line shall be lightly sandblasted and "weathered" so that uniformity of girder color is achieved.

"Weathering" shall be achieved by repeatedly fogging the exterior girder faces with clean water and allowing them to dry. Fogging should leave the girders wet but not "running wet", and should be repeated when the girders are completely dry.

300.5.7.9 Handling and Placing Concrete

300.5.7.9.1 General

The method of concrete placement shall have a consistent minimal impact on the concrete properties. All the necessary equipment for any particular pour shall be on site and proven to be in working condition before the pour commences, with backup equipment on site. The equipment shall be well maintained, suitable in kind and adequate in capacity for the work.

In preparation for the placing of concrete, all sawdust, chips and other construction debris and extraneous matter shall be removed from the interior of forms. Struts, stays, and braces, serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their locations, shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These temporary members shall be entirely removed from the forms and not buried in the concrete.

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement. When placing operations would involve free drop of concrete by more than 1 m, it shall be deposited through metal or other acceptable pipes.

Concrete for the structure shall be deposited in the forms in the order indicated on the Detailed Designs, and each portion placed between construction joints shall be placed in one continuous operation. No other order of pouring shall be done unless otherwise accepted by the Department.

300.5.7.9.2 Consolidation

Concrete, during and immediately after depositing, shall be thoroughly consolidated. The consolidation shall be done by mechanical vibration.

The Contractor shall provide a sufficient number of vibrators to properly compact each batch immediately after it is placed in the forms.

Vibrator operators shall be suitably instructed in the use of vibrators, and the importance of adequate and thorough vibration of the concrete.

300.5.7.9.3 Additional Requirements

When concrete placing is discontinued, for whatever reason, all accumulations of mortar splashed on the reinforcing steel and the form surfaces shall be removed. Dried mortar chips and dust shall not be puddled into the unset concrete. If the accumulations are not removed prior to the concrete becoming set, care shall be exercised not to injure or break the concrete-steel bond at and near the surface of the concrete, while cleaning the reinforcing steel.

Concrete shall be placed while fresh and before it has taken its initial set. Retempering of partially hardened concrete with additional water will not be permitted. No concrete shall be used which does not reach its final position in the forms within the time stipulated under Section 300.5.7.6.2 (Time of Hauling) above.

After initial set of the concrete, the forms shall not be jarred and no strain shall be placed on the ends of reinforcing bars which project.

Concrete which would be adversely affected by the presence of freestanding water shall be protected to prevent its occurrence, and the Contractor shall take whatever steps may be necessary to prevent free water build-up in the event of unexpected rainfall or similar occurrences for the first 24 hours.

Water used to keep equipment clean during the pour, or to clean equipment at the end of the pour, shall be discharged clear of the structure.

300.5.7.9.4 Pumping

The operation of the pump shall produce a continuous flow of concrete without air pockets. The equipment shall be so arranged that no vibrations result which might damage freshly placed concrete. When pumping is completed, the concrete remaining in the pipeline, if it is to be used, shall be ejected in such a manner that there will be no contamination of the concrete or separation of the ingredients.

300.5.7.10 Placing Pile Concrete

300.5.7.10.1 General

The Contractor shall make every attempt to obtain a “Dry” pile hole prior to placing pile concrete. The placement of pile concrete under water will only be permitted in the event that all reasonable attempts at obtaining a dry hole fail.

300.5.7.10.2 Concrete Placed in the Dry

Pile concrete shall be placed by means of a hopper equipped with a centre pipe drop tube. The pipe drop tube shall be a minimum of 200 mm in diameter and 2 m long. Concrete may be placed free fall, providing the fall is vertically down the centre of the casing or drilled hole and there are no transverse ties or spacers. Pile concrete shall have a slump range of 100 - 140 mm at time of discharge. Concrete in the upper 3 m of the piles shall be consolidated by the use of an approved concrete vibrator.

300.5.7.10.3 Concrete Placed Under Water

Placement of pile concrete under water shall be in accordance with Section 300.5.7.14 (Depositing Concrete Under Water) of this specification. Additionally, as a means of tesing for voids or other abnormalities in the concrete, all drilled pile shafts shall be equipped with access tubes to permit inspection by Crosshole Sonic Logging “**CSL**”. The Contractor shall supply and install a sufficient quantity and appropriately sized tubes for probe access in each drilled pile shaft.

Tubes supplied shall be round, have a regular internal diameter that is free from defects, obstructions and joints. Tubes shall be watertight, free from corrosion with clean internal and external faces to ensure a good bond between the concrete and the tubes. Tubes may be extended with watertight mechanical couplings.

Tubes shall be installed by the Contractor such that the CSL probes will pass through the entire length of the tube without binding. The Contractor shall ensure that the access tubes are plumb and shall verify that unobstructed passage of the probes is achievable.

The Contractor shall fit the tubes with a watertight shoe on the bottom and a removable cap on the top. Tubes shall be secured to the interior of the reinforcement cage a minimum of every 1.2 metres. Tubes shall be installed uniformly and equidistantly around the circumference of the pile such that each tube is spaced parallel for the full length. Tubes shall extend to within 150 mm of the drilled shaft bottoms, and shall extend a minimum of 600 mm above the drilled shaft tops.

The Contractor shall ensure that CSL tubes are not damaged during the installation of the reinforcement cage. Any tubes that are found to be damaged, or tubes that will not allow passage of the probe through the entire length of the tube shall be replaced by the Contractor.

The Contractor shall ensure that the tubes are capped to prevent debris from entering the access tubes until such time as the Department accepts the placement of the pile concrete. Upon completion of testing and acceptance of the pile concrete, the tubes shall be filled with an approved grout mix.

300.5.7.11 Placing HPC Concrete and HPC Concrete with Steel Fibres

300.5.7.11.1 General

Concrete placing will not be permitted when the air temperature is below +5°C or above 22°C, nor in the event of rain or excessive wind or dust, nor when there are other conditions detrimental to the concrete. Deck concrete placing shall normally be between the hours of 1800 and 1000 the following day. Night pours shall require proper lighting. The temperature of the concrete during discharge shall be between 10°C and 20°C. The temperature of the mix shall be maintained below the 20°C maximum temperature by the inclusion of ice to the mix which shall not alter the design water-cement ratio. Immediately prior to placing concrete, the substrates shall be thoroughly wetted down with clean water.

All deck concrete and deck overlay concrete shall be consolidated in accordance with Section 300.5.7.9.2 (Consolidation) even when vibratory drum type finishing machines are used.

300.5.7.11.2 Placing/Finishing Machines

For all deck concrete and deck overlay concrete, screeding shall be by concrete placing/finishing machines as follows or equivalents:

- Bidwell Model RF200, 364, 2450, 3600 and 4800;
- Gomaco Model C450.

The Contractor shall provide two work bridges, separate from the placing/finishing machine, of adequate length to completely span the width of the pour. The work bridges will facilitate the operations of concrete finishing and placing of wet burlap, and shall also be made available to the Department for review. The work bridges shall be supported essentially parallel to the concrete surface, between 250 mm and 600 mm above the concrete surface, and shall be at least 800 mm wide to permit diverse uses concurrently, and be rigid enough that dynamic deflections are insignificant.

300.5.7.11.3 Screed Guide Rails

Steel screed guide rails shall be installed to suit the profile of the required surface and to ensure a smooth and continuous surface from end to end of the bridge. Guide rails must be located outside of the finished surface of the pour for overlay concrete and also for deck concrete, unless specified otherwise in the Detailed Designs. All rails and supports shall be removed with minimum disturbance to the concrete.

300.5.7.11.4 Dry-Run

The finishing machine shall be set-up to match the skew angle of the bridge, when the skew angle exceeds 15°. For skewed bridge structures on vertical curves, this requirement may be altered to suit actual site conditions.

The finishing machine and guide rails shall be adjusted so that the height of the screed will finish the concrete to the design grade line and crown. To confirm the adjustment of the machine and guiderails, the screed shall be dry-run prior to the pour and clearance measurements taken at each of the girder tenth points. Re-setting of the machine and/or screed rails shall be done as necessary, to obtain an acceptable dry-run. Adjustments to the machine or screed rails will not be permitted after an acceptable dry-run has been completed.

Where screed rails are supported on cantilevered formwork that could deflect under the weight of the fresh concrete and the deck finishing machine, the Contractor shall pre-load a section of the cantilevered formwork on each side of the bridge to determine deflections that will occur during concrete placement. The formwork, machine and/or screed rails shall be adjusted to compensate for the expected formwork deflection.

300.5.7.11.5 Fog Misting and Wet Cure Systems

The Contractor shall prepare details of the fog misting and wet cure systems. Details shall include information with regards to the type and description of equipment and materials being used and work method/techniques employed to satisfactorily carry out the work. The fog misting and wet cure systems shall be demonstrated for adequacy and suitability, prior to placing HPC concrete.

300.5.7.11.6 Surface Defects and Tolerances

The finished surface of the concrete shall conform to the design grade line profiles as indicated on the Detailed Designs and/or as determined on site.

The surface shall be free from open texturing, plucked aggregate and local projections.

Except across the crown, the surface shall be such that when tested with a 3 m long straight edge placed anywhere in any direction on the surface, there shall not be a gap greater than 3 mm between the bottom of the straight edge and the surface of the deck anywhere below the straight edge.

The surface shall be checked by the Contractor, as described above, immediately after final bull floating and before texturing.

The surface shall again be checked by the Contractor at the end of the curing period in the same manner and to the same tolerance.

Areas that do not meet the required surface accuracy shall be clearly marked out and the Contractor shall:

(a) Grind down any areas higher than 3 mm but not higher than 10 mm above the correct surface.

(b) Correct any areas lower than 3 mm but not lower than 10 mm below the correct surface, by grinding down the adjacent high areas.

(c) When the deviation exceeds 10 mm from the correct surface, the deck slab shall be replaced for a length, width and depth which will allow the formation of a new slab, of the required quality, in no way inferior to the adjacent undisturbed slab.

Grinding shall be carried out by a machine, of a type and capacity suitable for the total area of grinding involved, until the surface meets the specified requirements.

300.5.7.12 Construction Joints

300.5.7.12.1 General

Construction joints shall be made only where indicated on the Detailed Designs or shown in the pouring schedule.

If not detailed on the Detailed Designs, or in the case of emergency, construction joints shall be installed according to Department Standard Drawing S-1412-99. Shear keys or inclined reinforcement shall be used where necessary to transmit shear, or to bond the two sections together. Construction joints should be located to allow a minimum of 50 mm minimum concrete cover on reinforcing steel running parallel to the joint. Refer to Department Standard Drawing S-1412-99 “Standard Construction Joints” attached in Appendix B.

300.5.7.13 Concreting In Cold Weather

The Contractor shall accept full responsibility for the protection of concrete during adverse weather conditions. In addition to the requirements stated below, all concrete shall be cured in accordance with Section 300.5.7.15 (Curing Concrete).

When the ambient air temperature is, or is expected to be, below 5°C the following requirements for cold weather concreting shall be put in place:

(1) All aggregate and mixing water shall be heated to a temperature of at least 20°C but not more than 65°C. The aggregates may be heated by either dry heat or steam; in the latter case the quantity of mixing water may need to be reduced. The temperature of the concrete shall be between 10°C and 25°C at the time of placing in the forms.

(2) The Contractor shall enclose the structure in such a way that the concrete and air within the enclosure can be kept above 15°C for a period of seven days after placing the concrete. Where elements being cast consist of HPC concrete, the seven day period is increased to 14 days. The enclosure shall be constructed so that a minimum 300 mm clearance exists between the enclosure and the concrete. To prevent overheating, the air temperature within the enclosure shall be monitored frequently, especially during the first 24 hours.

The relative humidity within the enclosure shall be maintained at not less than 85%.

The system of heating, and positioning of steam outlets, heaters, and fans, is to be designed to give the most uniform distribution of heat possible.

(1) Before placing concrete, adequate preheat shall be provided to raise the temperature of formwork, reinforcing steel, previously placed concrete, and/or soil to at least 10^{o}C. The Contractor shall be responsible to make all arrangements for heating, and to ensure continuous protection from unsatisfactory temperature and moisture conditions during the curing period. The preheat shall be adequate to ensure that no portion of the fresh concrete is damaged by freezing, or curing retarded by cold temperatures.

(2) Fully insulated formwork may be used as an alternative to provision of further heat during the curing period. Such formwork shall be designed and insulated with approved materials so that the initial heat of the mix, and the heat generated during the hydration of the cement, is retained to provide the specified curing conditions. The adequacy of the protection is the Contractor's responsibility.

(3) Protection and heating, where used, shall be withdrawn in such a manner so as not to induce thermal shock stresses in the concrete. The temperature of the concrete shall be gradually reduced to that of the surrounding air. To achieve this, in a heated housing, the heat shall be slowly reduced The temperature differential between the core of the element and the surface of the element shall not exceed 20^{o}C. In addition, the temperature differential between the surface of the element and the ambient air shall not exceed 15^{o}C. Ambient air temperature is defined as the temperature at mid-height of the element and 300 mm from the surface of the element.

300.5.7.14 Depositing Concrete Under Water

Concrete shall not be deposited in water except as specified, in which case anti-washout admixtures incorporating viscosity modifiers (whelan gum, etc.) may be used.

Concrete to be deposited in water shall be of the specified class, with mix design modified to yield 150 mm to 175 mm slump, and with an excess of 15% of the cement quantity added beyond its normal designed amount. The mix should contain an approved “anti-washout” admixture to enhance the performance of the mix. The concrete temperature shall be between 10°C and 25°C.

To prevent segregation, concrete shall be carefully placed in a compact mass, in its final position, by means of a concrete pump. When specifically reviewed and accepted by the Department, a properly designed and operated tremie may be used. The concrete shall not be disturbed after being deposited. Still water shall be maintained at the point of deposit and the forms underwater shall be watertight.

When placing concrete under water, the discharge end of the concrete pump line shall be lowered to the bottom of the form or hole. Pumping shall then proceed with the end of the discharge line being continually buried no less than 500 mm below the surface of fresh concrete at all times, to maintain a seal until the form or hole is completely filled with fresh uncontaminated concrete.

Concrete shall not be placed in water which is below 4°C.

The surface of the concrete shall be kept as nearly horizontal as is practicable at all times. The discharge end of the tremie shall be kept buried at least 0.3 m in previously placed concrete.

Dewatering will not be permitted while concrete is being placed. Dewatering may proceed when the concrete seal is sufficiently hard and strong. All laitance or other unsatisfactory material shall be removed from the exposed surface by scraping, chipping or other means which will not injure the surface of the concrete.

300.5.7.15 Curing Concrete

300.5.7.15.1 General

Freshly deposited concrete shall be protected from freezing, abnormally high temperatures or temperature differentials, premature drying, excessive moisture, and moisture loss for the period of time necessary to develop the desired properties of the concrete.

All concrete surfaces, other than where Class HPC and Class HPC with steel fibre concrete was utilized, which are to receive a Class 2 or 3 finish, shall be moist cured. The Contractor shall cover the concrete surface(s) with a single layer of clean, soaking wet burlap or light coloured filter fabric as soon as the surface will not be marred by so doing. The burlap or light coloured filter fabric shall be kept continuously wet for 72 hours. Curing requirements for HPC concrete and HPC concrete with steel fibres shall be in accordance with Section 300.5.7.15.3 (Curing

Requirements for Class HPC and Class HPC with Steel Fibres).

Where the formwork is left in place for 72 hours or more, no additional curing will be required.

Curing compound shall not be used on any concrete surfaces other than for concrete slope protection, as stated in Section 300.5.7.15.2 (Curing Requirements for Concrete Slope Protection).

300.5.7.15.2 Curing Requirements for Concrete Slope Protection

Concrete slope protection shall receive two coats of a curing compound. The first coat is to be applied immediately after the concrete has been satisfactorily finished, and the second coat is to be applied within three hours after the application of the first coat. In cases where premature drying is severe or is anticipated to be severe, then moist curing, as specified in Section 300.5.7.15.1 (Curing Concrete – General), will also be required.

300.5.7.15.3 Curing Requirements for Class HPC and Class HPC with Steel Fibres

For Class HPC or Class HPC with steel fibres, fog mist shall be applied continuously from the time of screeding until concrete is covered with filter fabric or burlap, in such a way as to maintain high relative humidity above the concrete and prevent drying of the concrete surface. Water shall not be allowed to drip, flow or puddle on the concrete surface during fog misting, when placing the filter fabric or burlap or at any time before the concrete has achieved final set. Equipment and materials necessary for the fog mist and wet cure systems shall be acceptably demonstrated prior to scheduling and placing of Class HPC concrete and Class HPC with steel fibres.

Two layers of light coloured filter fabric (Nilex C-14 or equivalent) or burlap shall be placed on the fresh concrete surface as soon as the surface will not be marred as a result of this placement. A fine spray of clean water shall be immediately applied to the filter fabric or burlap. Edges of the filter fabric or burlap shall overlap a minimum of 150 mm and shall be held in place without marring the surface of the concrete.

The filter fabric or burlap shall be in a continuously wet condition throughout the curing period, by means of soaker hoses or other means. Curing with filter fabric or burlap and water shall be maintained for a minimum period of 14 days. For rehabilitation work where public traffic is being impeded, HPC for concrete paving lips and blockouts immediately adjacent to deck joints, the wet cure period is reduced to three days, followed by the application of a chlorinated rubber curing compound.

During the cure period for Class HPC and Class HPC with steel fibres, the Contractor shall provide protection to ensure that the concrete temperature and the temperature differences remain within the limits specified in Sections 300.5.7.5.2(l) or 300.5.7.5.3, respectively. The Contractor shall supply and install two thermocouplers, in the centre and at the surface of the concrete, for every 100 m^2 of deck. The Contractor shall monitor and record (and provide all results to the Department forthwith, at its request) the temperatures every four hours for the first three days after concrete placement and every 12 hours thereafter during remaining curing period.

300.5.7.15.4 Class HPC and Class HPC with Steel Fibres

Immediately after the curing, the Contractor shall inspect the dry concrete surface(s) to identify all cracks. The width in millimetre and length in linear metres of cracks per square metre will be plotted by the Contractor. The Contractor shall repair the cracks at its own expense if crack width exceeds 0.2 mm. The following procedure shall be used in the treatment of same:

(a) Blow out cracks clean and dry with a jet of oil-free compressed air.

(b) Seal cracks with a gravity feed epoxy in accordance with the manufacturer's instructions. The gravity feed epoxy shall maximize the penetration by taking into consideration the ambient temperature, the substrate temperature, the viscosity and pot life of the material being used. Gravity feed epoxy material shall be reviewed by the Department prior to its usage.

(c) When cracks extend the full depth of the deck slab, barriers, curbs or to the top layer of reinforcement of decks that are cast to grade, epoxy injection will be required. The epoxy material and injection procedure shall be submitted by the Contractor to the Department for prior written approval.

300.5.7.16 Concrete Surface Finish

300.5.7.16.1 General

Surfaces requiring concrete finishing, shall conform to the requirements of Section 300.5.7.11.6 (Surface Defects and Tolerances). All mortar patches shall be cured as specified in Section 300.5.7.15 (Curing Concrete).

On unexposed concrete surfaces all cavities, honeycomb, and other deficiencies shall be thoroughly chipped out, cleaned, and after having been kept saturated with water for a period of not less than 30 minutes, shall be filled with cement mortar.

On exposed concrete surfaces to 600 mm below grade or, in the case of river piers, 600 mm below lowest water level, surface finishes shall be applied as follows:

Class 1 Ordinary Finish

- All exposed concrete surfaces unless other finishes are specified.

Class 2 Rubbed Finish

- Solid shaft river piers;

- Inside vertical surfaces of curb, barrier, median and sidewalk.

Class 3 Bonded Concrete Finish
- Abutment seats except top surface;
- Pier caps except top surface;
- Exterior faces of curtain walls/wingwalls;
- Grade separation piers except top surfaces;
- exterior concrete girder faces (see Sketch SK-1 in Appendix B);
- Exposed end surfaces of cast-in-place concrete diaphragms;
- Underside of the deck overhang to top flange of girder; and
- Exterior surfaces of curb, barrier and sidewalk.

Class 4 Floated Finish
- Top surfaces of concrete deck and roof slabs which are to receive waterproofing membranes and wearing surfaces;
- Top surfaces of abutment seats and pier caps.

Class 5 Floated Surface Finish, Broomed Texture
- Top surfaces of curbs, sidewalks, and medians;
- Approach slab concrete which will be covered by a wearing surface only (without waterproofing membrane); and
- Concrete slope protection.

Class 6 Floated Finish, Surface Textured
- Top surfaces of deck, roof and approach slabs which will not be covered with either waterproofing membrane or wearing surface.

Only approved wood or magnesium floats shall be used for finishing concrete.

300.5.7.16.2 Class 1. Ordinary Surface Finish

Unformed Surfaces - Immediately following placing and compacting, the concrete shall be screeded to conform to the required surface elevations, and then trowelled to ensure that the surface is free from open texturing, plucked aggregate, and local projections or depressions.

Formed Surfaces - Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces. On all surfaces the cavities produced by form ties, and all other holes, honeycomb areas, broken corners or edges and other defects, shall be thoroughly chipped out, cleaned, and after having been kept saturated with water for a period of not less than 30 minutes, shall be filled with cement mortar. Mortar shall be not more than one hour old. The mortar patches shall be cured as specified under Section 300.5.7.15 (Curing Concrete). All concrete joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges.

300.5.7.16.3 Class 2. Rubbed Finish

Immediately following the removal of forms, all fins and irregular projections shall be removed from all surfaces. All lines that are not true must be corrected by chipping, grinding or patching as necessary. Parging to correct irregularities will not be permitted. On all surfaces, the cavities produced by form ties, air bubbles and all other holes, honeycomb areas, broken corners or edges and other defects, shall be thoroughly exposed by wire brushing with a stiff bristled, powered, wire brush. The cleaned surface, after having been kept saturated with water for a period of not less than 30 minutes, shall be filled with cement mortar. Mortar shall be not more than one hour old. The mortar patches shall be cured as specified under Section 300.5.7.15 (Curing Concrete). All concrete joints in the completed work shall be left carefully tooled and free of all mortar and concrete. The joint filler shall be left exposed for its full length with clean and true edges. The small surface voids formed by air bubbles must be filled by rubbing a thin grout composed of bonding agent, water, clean fine sand and cement into the moistened surface. When the patching and filling have adequately hardened, a carborundum stone shall be used to finish the surface to a smooth, uniform and closed texture. Any voids opened during the stone rubbing process shall be refilled.

It is essential that the prepared concrete surface, including all patching and filling be uniform in colour and texture. All portions of bridge elements, including those cast in more than one pour, shall be of the same colour and texture. Any staining caused by cement, water, weather, or other conditions shall be prevented, removed, or covered. After the surface preparation has been completed the Contractor shall apply sealer as specified in Section 300.5.7.17 (Sealer).

If uniformity of colour is not achieved the Contractor, rather than applying the sealer as specified in Section 300.5.7.17 (Sealer), shall supply and apply an approved pigmented concrete sealer as specified for Section 300.5.7.16.4 (Class 3. Bonded Concrete Surface Finish).

300.5.7.16.4 Class 3. Bonded Concrete Surface Finish

Surface preparation shall be done as is specified for Section 300.5.7.16.3 (Class 2. Rubbed Finish), except that uniformity in colour is not required.

After the surface preparation has been completed, the concrete surfaces shall be pressure washed to remove all dust, dirt, laitance and all other bond breaking materials. The concrete surface shall be dried for a minimum of 24 hours. The Contractor shall then supply and apply a pigmented concrete sealer, which meets the requirements for a Type 3 sealer in Alberta Transportation's *"Specifications for Concrete Sealers"* (B388).

The pigmented concrete sealer shall be applied in accordance with the manufacturer's specifications. The colour of the proposed sealer shall be as specified in the design. A minimum of two applications of the pigmented sealer are required. When spray application is used the surface shall be back rolled. The Contractor shall ensure that no colour variation is visible, and shall match the colour of any previously painted adjoining surfaces. Acceptance of the pigmented sealer used will not be taken to relieve the Contractor of full responsibility for its acceptable performance and appearance.

300.5.7.16.5 Class 4. Floated Surface Finish

Unless otherwise noted on the Detailed Designs, concrete which is to receive a waterproofing membrane and a final wearing surface, shall be floated and trowelled as necessary to provide a smooth surface.

300.5.7.16.6 Class 5. Floated Surface Finish, Broomed Texture

The concrete surface shall be floated and trowelled as necessary to produce a smooth surface. The surface shall not vary more than 3 mm under a 3 m long straightedge.

After the concrete has set sufficiently, the surface shall be given a transversely broomed finish using a coarse broom to produce regular corrugations to a maximum depth of 3 mm. An edging tool shall be used at all edges and expansion joints. Where indicated on the Detailed Designs, sidewalk surfaces shall be laid out in blocks using an approved grooving tool.

300.5.7.16.7 Class 6. Floated Finish, Surface Textured

After the concrete has been bull floated, it shall be given a suitable texture with a "flat wire" texture broom having a single row of tines. The desired texture is transverse grooving which may vary from 1.5 mm width at 10 mm centres to 5 mm width at 20 mm centres, and the groove depth shall be 3 mm to 5 mm. This operation shall be done at such time and in such manner that the desired texture will be achieved while minimizing the displacement of the larger aggregate particles or steel fibres. The textured surface shall be uniform and consistent.

Following the surface texturing, a strip of the concrete along the inside curb line, shall be trowelled smooth and the surface left closed.

300.5.7.16.8 Concrete Finishing Under Bearings

All concrete areas on which bearing plates or pads are to be placed are to be at the required elevation, and are to be finished or ground to a smooth and even surface in preparation for bearing plates or pads. The finished surface shall not vary more than 1 mm over an area whose dimensions exceed the dimensions of the bearing plates by 60 mm. Air voids created by forming grout-pad depressions shall be filled with an approved patching material, well in advance of girder erection. In cold weather conditions this work shall be completed while the concrete is still warm.

300.5.7.17 Sealer

An approved Type 1c sealer shall be applied to all concrete surfaces which are susceptible to deterioration by water and de-icing salts. This shall include all concrete surfaces to 600 mm below grade, or in the case of river piers 600 mm below lowest water level, or as specified and shall include all surfaces which are to receive a Class 2, Class 4, Class 5 and Class 6 Finish. This does not apply to surfaces covered with waterproofing membrane and ACP wearing surface, drain troughs and concrete slope protection. Sealer will not be required on the underside of bridge decks and on concrete diaphragms in the interior bay areas; however, the faces of the end diaphragms nearest the abutment backwalls, inside faces of backwalls, top surface of abutment seats, excluding bearing recess pockets, and the deck and curb overhangs shall be sealed.

Type 1c sealers shall meet the Department's current "*Specifications for the Supply of Concrete Sealers - Evaluation Procedures for Sealers Used on Concrete Bridge Elements*" (B388).

The sealer shall be applied in accordance with the manufacturer's recommendations; however, the application rate shall be increased by 30% from that indicated on the approval list. Before applying the sealer the concrete shall be cured for at least 28 days. Mortar patches shall be cured for at least two days. The concrete surface shall be dry, and air blasted to remove all dust prior to applying sealer. In order to ensure uniform and sufficient coverage rates the Contractor shall apply measured volumes of sealing compound to appropriately dimensioned areas of concrete surface, using a minimum of two coats.

300.5.7.18 Concrete Strength Requirements

The Department reserves the right to reject any concrete whatsoever which does not meet all the requirements for that class of concrete as stated in Section 300.5.7.5 (Class and Composition of Concrete). However, provided that the Contractor's Engineer is of the opinion that the low strength concrete will meet all performance requirements throughout the life of the New Infrastructure, the Department may, in its sole discretion, accept concrete the strength of which falls below the specified strength requirements.

Payment Adjustments will be made in accordance with the following:

300.5.7.18.1 Class B Concrete, Pile Concrete, 25 MPa

Strength Test Results

24 MPa to 25 MPa	$30 per cubic metre
23 MPa to 24 MPa	$60 per cubic metre
22 MPa to 23 MPa	$90 per cubic metre
21 MPa to 22 MPa	$120 per cubic metre
20 MPa to 21 MPa	$160 per cubic metre

300.5.7.18.2 Class D Concrete, 30 MPa

Strength Test Results

29 MPa to 30 MPa	$30 per cubic metre
28 MPa to 29 MPa	$60 per cubic metre
27 MPa to 28 MPa	$90 per cubic metre
26 MPa to 27 MPa	$120 per cubic metre
25 MPa to 26 MPa	$160 per cubic metre

24 MPa to 25 MPa	$220 per cubic metre

300.5.7.18.3 Class C Concrete, 35 MPa

Strength Test Results

34 MPa to 35 MPa	$30 per cubic metre
33 MPa to 34 MPa	$60 per cubic metre
32 MPa to 33 MPa	$90 per cubic metre
31 MPa to 32 MPa	$120 per cubic metre
30 MPa to 31 MPa	$160 per cubic metre
29 MPa to 30 MPa	$220 per cubic metre
28 MPa to 29 MPa	$300 per cubic metre
27 MPa to 28 MPa	$400 per cubic metre

300.5.7.18.4 Class HPC Concrete, 45 MPa

Strength Test Results

44 MPa to 45 MPa	$40 per cubic metre
43 MPa to 44 MPa	$100 per cubic metre
42 MPa to 43 MPa	$180 per cubic metre
41 MPa to 42 MPa	$280 per cubic metre
40 MPa to 41 MPa	$400 per cubic metre

300.5.7.18.5 Class S Concrete, 20 MPa

Strength Test Results

18 MPa to 20 MPa	$30 per cubic metre
16 MPa to 18 MPa	$70 per cubic metre

The Payment Adjustments shall apply to the volume of concrete represented by the Strength Test as defined in Section 300.5.7.7.1 (Strength Tests).

Concrete with strengths below the scales shown;

i.e.
- Class B and Pile concrete below 20 MPa
- Class D concrete below 24 MPa
- Class C concrete below 27 MPa
- Class HPC concrete below 40 MPa
- Class S concrete below 16 MPa

are not acceptable to the Department.

If the minimum specified design strength for a class of concrete is increased above the design strength shown in Section 300.5.7.5 (Class and Composition of Concrete) then the Payment Adjustment strength ranges shown in this Section 300.5.7.18 (Concrete Strength Requirements) shall be increased by the same amount.

300.5.7.18.6 Coring for Compressive Strength Testing

Coring to confirm or contest low concrete Strength Test results shall be subject to approval by the Department. When coring is approved, arrangements shall be made by the Contractor, to employ a CSA Category 1 or higher level certified testing laboratory, all at the expense of the Contractor. The cores shall be taken and tested within seven days of the testing of the 28-day cylinders representing the concrete in question. Where practical, three 100 mm diameter cores shall be taken for each non-compliant Strength Test previously taken, and there shall be no doubt that the cores taken and the cylinders under consideration, represent the same batch of concrete. Cores may not be taken unless the Department is present. Cores shall be tested by an independent CSA certified Category 1 or higher level testing laboratory and in accordance with the requirements of CSA Standard A23.2-14C. The average strength of the cores as reported by the testing service shall constitute a test and such results shall be reported to the Department forthwith.

The acceptability of the as-delivered concrete shall be determined using the concrete cylinders, with the modifications set out in the next two sentences. In cases where the concrete strength, as indicated by the cores, is higher than the strength based on the concrete cylinder results, the core results shall be used as the basis for acceptance of the concrete. If the core strengths are lower than the strength from the concrete cylinder tests, the cylinder tests shall govern.

300.5.8 STRUCTURAL STEEL

300.5.8.1 General

This specification in Section 300.5.8 is for the supply, fabrication, delivery and erection of structural steel. Structural steel shall include steel girders, trusses, diaphragms, bracing, splice plates, deck drains, structural bearings, anchor bolts, dowels, deck joint assemblies, buffer angles, connector angles, anchor bolt sleeves, curb and median cover and trough plates, pier nose plates, pier bracing, bridge rails and miscellaneous components.

300.5.8.2 Submissions

The following information shall be submitted to the Department by a date that is reasonable having regard to the design and construction process and in any event within the times noted below. In the event that the Department requests any of the following information, the requested information shall be provided within seven days, notwithstanding the times noted below.

- Proposed fabrication sequences (at least five days prior to fabrication). The Department shall be advised a minimum of two days prior to a component being ready for inspection at an inspection station;

- Web and flange plate arrangements for welded plate girders (at least five days prior to fabrication);
- Welding procedures for all welds (at least five days prior to fabrication);
- Shop drawings (two copies) (at least five days prior to fabrication);
- Mill certificates for all material;
- Repair procedures for excessive girder camber, if required;
- Repair procedures for unsatisfactory weldments and accidental arc strikes, if required;
- Repair procedures for flame straightening of members, if required;
- Product data sheets for coatings required between galvanized steel and concrete;
- Repair procedures for galvanizing, if required;
- All results from Testing and Inspection (Section 300.5.8.4.4);
- Erection procedures, including drawings for falsework, berms and traffic accommodation (two copies) (at least 14 days prior to erection);
- Procedures for straightening bent material during erection, if required; and
- Methods of forming and pouring grout (at least 14 days prior to placing grout).

300.5.8.3 Supply and Fabrication

300.5.8.3.1 Standards

Fabrication of structural steel shall conform to "*The American Association of State Highway and Transport Officials (AASHTO), Standard Specifications for Highway Bridges*" and the *American Welding Society (AWS) - Bridge Welding Code, D1.5*.

All welding, cutting and preparation shall be in accordance with the AWS - *Bridge Welding Code, D1.5*.

300.5.8.3.2 Qualification

The Contractor shall be responsible for the work of all subcontractors.

The fabricator shall operate a recognized steel fabricating shop and be fully approved by the CWB as per Canadian Standards Association ("**CSA**") Standard W47.1 in the following Divisions:

- Fabrication of steel girders, girder components and welded steel trusses – Division 1;
- All other bridge components – Division 2.

Only welders, welding operators and tackers approved by the CWB in the particular category shall be permitted to perform weldments. Their qualifications shall be current and available for auditing by the Department.

300.5.8.3.3 Engineering Data

(1) Approval of Plate Arrangement for Welded Plate Girders

Prior to the placing of material orders, the Contractor shall prepare and provide sketch drawings showing the general description of the proposed fabrication scheme. This shall include the general arrangement of plates or shapes, including the location of all shop and field splices.

(2) Welding Procedures

Welding procedures shall be prepared for each type of weld used in the structure. The procedures shall bear the approval of the CWB and shall also be submitted to be reviewed by the Department prior to use on the structure.

(3) Shop Drawings

Shop drawings showing all details shall be prepared by the Contractor. The shop drawings shall be legible and of adequate quality to be reproduced and microfilmed.
In addition to specific details, the shop drawings shall include the following:

(a) Drawings showing details of connections not shown on the Detailed Designs shall bear the signature and stamp of a Professional Engineer;
(b) All dimensions shall be correct at 20°C unless otherwise noted;
(c) Weld procedure identification shall be shown on the shop drawings in the tail of the weld symbols;
(d) All material splice locations shall be shown on the drawings;
(e) Bearings shall be centered at -5°C;
(f) Shop assembly drawings shall indicate camber and splice joint offsets measured to the top of top flange at a maximum spacing of 4 m; and
(g) The Department's bridge file number and project name shall be shown on all the shop drawings.

(4) Proposed Fabrication Sequence

Prior to commencement of fabrication, the Contractor shall prepare an outline of the fabrication sequence that clearly describes the order of make-up and assembly of all the component parts, as well as shop assembly, inspection stations, and surface preparation.

(5) Mill Certificates

Mill certificates shall be obtained for all material before fabrication commences.

300.5.8.4 Materials

(1) Structural Steel

Structural steel shall conform to the standard noted on the Detailed Designs. Interpretation of equivalent steels will be as per Appendix "A" of the CSA Standard G40.21 (1976 only). Mill certificate data and results of impact tests shall be obtained prior to shipment of material from the mill to provide sufficient time for replacement or for heat treating of material that does not meet the Technical Requirements.

All steel for bridgerail shall conform to the standard noted on the Detailed Design. The silicon content for various bridgerail and handrail components shall be as follows:

- structural tubing less than 0.04%
- structural sections, handrail bars, base plate less than 0.04% or between 0.15% to 0.25%.

(2) Bolts

All bolts, nuts and washers shall conform to ASTM Standard A325 or shall meet property Class 8.8 of the Industrial Fasteners Institute for metric high strength structural bolts, nuts and washers. Metric bolts shall be marked with the symbol A325M and those of a "weathering" steel shall have the A325M symbol underlined. Metric nuts shall be marked with three circumferential lines with an "M" between two of them or shall be marked with a "3" if made of a weathering grade. Washers shall be identified as metric preferably by having an "M" indented in the surface or a "3" for weathering grades. Certified mill test reports for the fastener material shall be obtained.

(3) Stud Shear Connectors

All stud shear connectors shall conform to the chemical requirements of ASTM Standard A108, Grades 1015, 1018 or 1020. In addition they shall meet the mechanical properties specified in AWS D1.5, Table 7.1 for Type B studs. Certified mill test reports for the stud material shall be obtained.

(4) Bearings

Certified mill test reports for all bearing material shall be provided to the Department prior to installation.

(a) Stainless Steel
Stainless Steel shall conform to the requirements of American Iron and Steel Institute ("AISI") Standard Type 304, No. 8 - Mirror Finish.

(b) Elastomer
Elastomer compound shall conform to section 18 "Bearings" Division II of the AASHTO Standard Specifications for Highway Bridges 2002 edition. Elastomer compound shall

conform to low temperature AASHTO grade 5 material testing requirements in Table 18.4.5.1-1A and -1B at the specified hardness. When required, field welding adjacent to elastomeric pads shall be performed with care to avoid damage to the elastomer. The temperature of the steel adjacent to the elastomer should be kept below 120ºC. The distance between the weld and the elastomer should be at least 40 mm.

(c) Teflon
Teflon shall be unfilled, 100% virgin polymer.

(d) Base Plate Corrosion Protection
The base plate corrosion protection of the bottom surface of each base plate shall be in accordance with Section 300.5.8.4.3(3) (Additional Galvanizing Requirements for Bridgerail).

300.5.8.4.1 Welding

(1) Filler Metals and Welding Processes

Low hydrogen filler, fluxes and low hydrogen welding practices shall be used throughout. The deposited weld metal shall provide strength, durability, impact toughness and corrosion resistance equivalent to base metal. The low hydrogen covering and flux shall be protected and stored as specified by AWS Standard D1.5. Flux cored welding or use of cored filler wires in the submerged arc process or shielding gas processes, are not considered as conforming to low hydrogen practice, and will not be permitted.

(a) Submerged Arc Welding (SAW)
Submerged arc welding process is allowed for all flat and horizontal position welds. All flange and web butt joints shall be made by an approved semi or fully automatic submerged arc process. All web to flange fillet welds and all longitudinal stiffener to web fillet welds shall be made by an approved fully automatic submerged arc process.

(b) Shielded Metal Arc Welding (SMAW)
Shielded metal arc welding is allowed for girder vertical stiffener to flange fillet welds and for miscellaneous components such as deck drains, bridge bearings, deck joint assemblies, pier nose plates and buffer angles.

(c) Metal Core Arc Welding (MCAW)
Metal core welding process utilizing low hydrogen consumables with AWS designation of H4 is allowed for vertical stiffeners and horizontal gussets of the girders, bridgerails, and miscellaneous components such as deck drains, bridge bearings, deck joint assemblies, pier nose plates and buffer angles.

Field application of metal core arc welding is not allowed.

(2) Cleaning Prior to Welding

Weld areas must be clean, free of mill scale, dirt, grease and other contaminants prior to welding.

(3) Intentionally Deleted

(4) Tack and Temporary Welds

Tack and temporary welds shall not be allowed unless they are to be incorporated in the final weld. Tack welds, where allowed, shall be of a minimum length of four times the nominal size of the weld and length shall not exceed 15 times the weld size, and shall be subject to the same quality requirements as the final welds. Cracked tack welds shall be completely removed prior to welding over.

(5) Run-off Tabs

Run-off tabs shall be used at the ends of all welds that terminate at the edge of a member. The tabs shall be a minimum of 100mm long unless greater length is required for satisfactory work. They shall be tack welded only to that portion of the material that will not remain a part of the structure, or where the tack will be welded over and fused into the final joint. After welding, the tabs are to be removed by flame cutting, not by breaking off.

(6) Preheat

Preheat requirements shall be performed and maintained as per AWS D1.5, except that all welds on girder flanges shall be preheated to a minimum temperature of 100 degrees celcius unless a higher temperature is required by AWS D1.5 for the flange thickness. The preheat temperature of the web to flange joint shall be measured 75 mm from the point of welding on the side of the flange opposite to the side where the weld is being applied.

(7) Welding at Stiffener Ends

To prevent notching effects, stiffeners and attachments fillet welded to structural members shall have the fillet welds terminate 10 mm short of edges.

(8) Methods of Weldment Repair

Repair procedures for unsatisfactory weldments shall be prepared by an experienced welding engineer registered as a Professional Engineer prior to repair work commencing.

(9) Arc Strikes

Arc strikes will not be permitted. In the event of accidental arc strikes a repair procedure shall be prepared by an experienced welding engineer registered as a Professional Engineer. The repair procedure shall include the complete grinding out of the crater produced by the arc strike.

(10) Grinding of Welds

Flange butt welds shall be ground flush or to a specified slope on both sides. Web butt welds which are sufficiently smooth with a neat appearance and uniform profile will not require grinding. Fillet welds not conforming to acceptable profile shall be ground to the proper profile without substantial removal of the base metal. Grinding shall be smooth and parallel to the line of stress. Caution shall be exercised to prevent over grinding.

(11) Plug and Slot Welds

Plug welds or slot welds shall not be permitted.

(12) Field Welding

Where field welding of structural members is carried out, the following requirements shall be met:

(a) All welding, cutting and preparation shall be in accordance with the American Welding Society (AWS) - Bridge Welding Code, D1.5.

(b) Only welders approved by the Canadian Welding Bureau in the particular category shall be permitted to perform weldments.

(c) Welding procedures approved by the Canadian Welding Bureau shall be prepared and submitted for review by the Department prior to use on the structure.

(d) Low hydrogen filler, fluxes and welding practices shall be used in accordance with Section 300.5.8.4.1(1) (Filler Metals & Welding Processes).

(e) When the air temperature is below 10°C, all material to be welded shall be preheated to 100°C for a distance of 80 mm beyond the weld and shall be sheltered from the wind.

(f) When the air temperature is below 0°C, welding shall not be permitted unless suitable hoarding and heating is provided. The temperature inside the enclosure shall be a minimum of 10°C.

Where field welding of non-structural members is carried out, the following requirements shall be met:

(a) Journeyman welders with Class B tickets shall be permitted to perform weldments.

(b) Welding procedures prepared and stamped by a Professional Engineer shall be prepared.

(c) Low hydrogen filler, fluxes and welding practice shall be used in accordance with Section 300.5.8.4.1 (1) (Filler Metals & Welding Processes).

(d) When the air temperature is below 5°C, all material to be welded shall be preheated to 100ºC for a distance of 80 mm beyond the weld and shall be sheltered from the wind.

(e) When the air temperature is below 0°C, welding shall not be permitted unless suitable hoarding and heating, is provided.

Structural field welds are welds that are required to maintain the integrity of the structure. An example of non-structural field welding is Type 1 deck joint splices.

(13) Welding to Girder Flanges and Webs

With the exception of longitudinal web to flange welds, all stiffener, gusset plate, or any other detail material welds to girder flanges shall be a minimum of 300 mm from the flange butt welds.

With the exception of longitudinal web to flange welds and longitudinal stiffener to web welds, all stiffener, gusset plate, or any other detail material welds to girder webs shall be a minimum of 300 mm from the web butt welds.

300.5.8.4.2 Fabrication

Fabrication shall be performed in an enclosed area which is adequately heated. The shop temperature shall be at least 10°C.

(1) Heat Number Transfer

As the plate is subdivided for webs and flanges, all heat numbers shall be transferred to each individual section. The numbers shall remain legible until such time as the material location in the final assembly has been recorded. Mill identification numbers stamped into the material shall be removed by grinding at an appropriate time.

(2) Marking Systems

Steel stamps shall not be used. The only exception is the match marking of splice plates which may be steel stamped using low stress stamps. The stamps and specific locations of such stamps must be shown on the shop drawings.

(3) Cutting of Plate

All plate material for main members, splice plates and any plate material welded to the main member shall be flame cut using an automatic cutting machine. Shearing is not allowed.

(4) Flange Stripping

All flange material shall be cut so that the direction of the applied stress will be parallel to the direction of the plate rolling.

(5) Flame Cut Edges

The flame cut edges of girder flanges shall have a maximum Brinell hardness as stated by Section 300.5.8.4.4(10) (Hardness Test). The surface roughness of the flame cut edge shall not be greater than ANSI B46.1 500 μin. (12.5 μm) and be such that to allow Brinell hardness testing without spot grinding. The Contractor shall report all blow backs or signs of lamination observed during the cutting of the material. The Contractor will perform Brinell hardness tests on the as is flame cut edge. If the hardness exceeds the requirements, the edges shall be repaired so that they meet the requirements.

The surface of flame cut apertures shall be finished by grinding and shall be free of nicks and gouges.

(6) Vertical Alignment

The structure shall be fabricated to conform to the requirements of the deflection and vertical curve, as noted on the Detailed Designs. For rolled shapes, advantage shall be taken of mill camber that may be inherent in the material.

(7) Shop Assembly

(a) <u>Plate Girders</u>
Shop assembly of girders shall be by the progressive assembly method according to AASHTO, except that only two, instead of three, sections need to be assembled. The detailed method of assembly, including points of support, dimensional checks, method of trimming to length, drilling and marking of splices, shall be to the procedure prepared as per Section 300.5.8.3.3(4) (Proposed Fabrication Sequence). Each individual girder section shall meet the camber requirements for that particular length, with the splices between these sections falling on the theoretical camber line for the entire span. Correction for variation in flange thickness must be considered. When the camber of the girder fails to meet the required tolerance, the Contractor shall develop a method of repair prior to commencement of repair. The camber of each individual girder section must be known for the next two girder sections in the girder line prior to shop assembly of any particular girder section. This is to allow the use of a best fit line to reduce the effect of any camber differences should it be deemed necessary. Camber for plate girders will be measured on the top of the top flange. The camber of plate girders shall be measured in the "no load" condition.

(b) <u>Box Girders</u>
The progressive shop assembly for box girders shall be as per Section 300.5.8.4.2(7)(a) (Plate Girders); items described in this section are specific to box girders.

The camber of box girders shall be measured on the top of the top flange, and each top flange of a box shall individually meet the required camber. Girder sections assembled for splicing shall be supported within 2 m of the end of each section. Girder sections shall be supported in such a manner as to provide the correct angular relationship at the splice between girder sections while the splices are being reamed or drilled. Shop drawings shall clearly indicate the expected dead load deflection of each section and the elevations of the sections while supported for the drilling or reaming of each splice.

(c) Drilling
All splices shall be drilled from solid material while assembled or shall be sub-punched or sub-drilled and then reamed to full size while in the shop assembly position.

(8) Splice Plates

After shop assembly, splice plates and girders shall be clearly match marked to assure proper orientation and location of splice material for erection. All holes shall align with holes in the attached member. Splice plates shall then be removed, de-burred, solvent cleaned to remove all oil and sandblasted to remove all mill scale in order to provide a suitable faying surface. These plates shall then be securely ship-bolted to the girders. The match marking system shall be shown on the shop drawings.

(9) Bolt Holes

Clause 11.4.8 in Division II of AASHTO shall apply except that all bolt holes in load carrying segments of main members and any material welded to main members shall be drilled full size or sub-punched 5 mm smaller and reamed to full size. Punching of full size holes for secondary members such as bracings which are not welded to main member is allowed for material less than 16 mm thick. All holes in girder splices shall be circular and perpendicular to the member and shall be deburred to ensure a proper faying surface.

(10) Dimensional Tolerances

Normal tolerance for structural steel fabrication and fitting between hole groups will be ± 3 mm unless specified otherwise. The dimensional tolerances for structural members shall be within the AWS Standard D1.5, section 3.5, except as otherwise noted below:

(a) Girder Camber
Camber of beams and girders shall be uniform, true and accurate to the centreline of the top flange. Permissible variation in camber shall be within ± (0.2Lt + 3) mm; where Lt is the test length in metres. This applies to fabricated pieces only, prior to shop assembly. During shop assembly, splice points shall be located on the theoretical camber line or at a specified amount from the line.

Where field splices are eliminated by combining girder segments into longer girder lengths, the cambers of the girders at the eliminated splice points shall be within ± 3 mm.

(b) Box Girders
Tolerances for box girder camber, sweep and depth shall be measured relative to two imaginary surfaces: a vertical plane passing through the centre line of the girder; and a surface located at the theoretical underside of the top flanges following the theoretical camber of the girder.

(c) Splices
Fill plates shall not be permitted at main girder field splices unless specified. The tolerance for girder depth or box girder geometry shall be as specified by AWS D1.5, except that the difference between similar dimensions of the adjoining sections being spliced shall not exceed ± 3 mm.

(d) Fitted Stiffeners
The bearing ends of bearing stiffeners shall be flush and square with the web and shall have at least 75% of this area in contact with the flanges, whereas fitted stiffeners may have a gap of up to 1 mm between stiffener and flange.

(e) Bearing to Bearing Dimension
Bearing to bearing distance is a set dimension and therefore has no tolerance.

(f) Deck Joint Assemblies
Deck joint assemblies shall be assembled for inspection in a relaxed condition with erection angles removed. Approval of the assembly is required prior to application of the erection angles. Tolerances for straightness shall be considered over the length of the assembly between the crown and gutter line both before and after galvanizing. Deviation from straightness in a vertical plane shall not exceed ± 6 mm. Horizontal sweep or variations in gap setting shall not be greater than 3 mm.

(g) Combined Warpage and Tilt
Combined warpage and tilt of flange at any cross section of welded I-shape beams or girders shall be determined by measuring the offset at the toe of the flange from a line normal to the plane of web through the intersection of the centerline of the web with the outside surface of the flange plate. This offset shall not exceed 1/200 of the total width of the flange or 3 mm whichever is greater at bolted splice location. Bolted splices of main stress carrying members shall have parallel planes and the surfaces shall be in full contact without any gap.

(11) Corner Chamfer

Corners of all flanges shall be ground to a 2 mm chamfer. Corners of stiffeners, structural sections and plates shall be ground to a 1mm chamfer.

(12) Milling Tolerances

Tolerance for milled to bear stiffeners shall be 0.05 mm with at least 75% of the area in bearing.

(13) Web Panning

The maximum variation from flatness for webs shall be 0.01d where d is the least dimension of the panel formed by the girder flanges and/or stiffeners. Should the panning in one panel be convex and the panning in the adjacent panel be concave then the sum of the panning in the two adjacent sections shall not exceed that allowed for one panel.

(14) Flame Straightening

Flame straightening shall not be performed on any material or member without the development of a repair procedure by a Professional Engineer. The repair procedure shall address locations, temperatures and cooling rates.

(15) Stress Relieving

When stress relieving is specified, it shall be performed in accordance with AWS D1.5. Copies of the furnace charts shall be supplied to the Department.

(16) Handling and Storage

All lifting and handling shall be done using devices that do not mark, damage, or distort the assemblies or members in any way. Girders shall be stored upright, supported on sufficient skids and safely shored to maintain the proper section without buckling, twisting or in any way damaging or misaligning the material.

300.5.8.4.3 Surface Preparation and Coating

(1) Blast Cleaning

Unless otherwise noted, all steel components shall be blast cleaned after fabrication in accordance with the *Society for Protective Coating Standard (SSPC) No. SP6*. Essentially this is a surface from which all oil, grease, dirt, rust, foreign matter, mill scale and old paint have been completely removed except for slight shadows, streaks or discolourations caused by rust stain or mill scale oxide binder. The exterior face of exterior girders shall be uniform in appearance.

(2) Galvanizing

Galvanizing shall be by the hot dip method, after fabrication, in accordance with CSA Standard G164 with additions and exceptions as described in this specification. The fabricator shall provide a smooth finish on all edges and surfaces, and remove all weld spatter and all welding flux residue from the steel components prior to galvanizing.

Repair of galvanizing shall only be done if bare areas are infrequent, small, and suitable for repair. A detailed repair procedure shall be prepared by a Professional Engineer prior to its use. It should be noted that repairs may require complete removal of the galvanized coating and regalvanizing. Repair shall be in compliance with ASTM A780, Method A3 Metallizing. The thickness of the metallizing shall be 180 μm, and the repair tested for adhesion. The finished appearance shall be similar to the adjacent galvanizing.

(3) Additional Galvanizing Requirements for Bridgerail

The bottom surface of each base plate shall be protected by a medium grey colour barrier coating to prevent contact between the zinc and the concrete. The galvanized surface must be roughened prior to application of barrier coating. The surface preparation of the galvanized surface and the dry film thickness ("**DFT**") of the coating shall be in accordance with the coating manufacturer's recommendations. The Contractor shall test the adhesion of fully cured coating as per ASTM D3359. The method selected for testing (Method A or B) shall depend on the dry film thickness of the coating. The coating manufacturer's product data sheets shall be obtained prior to the application of the coating. The adhesion test result shall meet a minimum of "4B" classification, i.e. a maximum allowable flaking of 5%.

The fabricator shall provide a smooth finish on all edges and surfaces, and remove all weld spatter and all welding flux residue from the steel components prior to galvanizing. The galvanized finish shall meet the aesthetic requirements of the application and shall have a continuous outer free zinc layer without any significant zinc-iron alloy showing through the outside surface. Lumps, globules or heavy deposits of zinc will not be permitted. Handrails shall be free of any sharp protrusions or edges.

Double dip galvanizing is not advised but will be accepted if a surface finish similar in appearance, colour and quality to that of single dip galvanizing is produced. The lapped area of the double dip shall be straight, the coating smooth, adherent and free of uncoated areas, blisters, flux deposits, dross inclusions, acid and black spots.

300.5.8.4.4 Testing and Inspection

(1) Access

The Contractor shall provide full access for the inspection of material and workmanship by the Department. Free access shall be allowed to the Department to all parts of the works. When required by the Department, the Contractor shall provide needed manpower for assistance in inspection duties.

(2) Testing by the Department

The Department may perform visual, radiographic, ultrasonic, magnetic particle and any other inspection that may be required at its own expense.

(3) Testing by the Contractor

Any test records made by the fabricating shop in the course of normal quality control shall be open to the Department for inspection.

All welds shall be visually inspected by an independent welding inspector certified to Level 3 of CSA W178.2.

(4) Inspection Station

To ensure that each stage of inspection is performed in an orderly manner, during the fabrication of major structures, inspection stations shall be set up at specific points. Sub-assemblies of the work will then be checked by the Contractor, and all deficiencies shall be corrected, prior to the work being sent to the next stage of fabrication.

Typical check points for a plate girder are:

- Flange plates prepared.
- Web plates prepared.
- Web to flange welds completed prior to fitting any stiffeners.
- Completion of all welding prior to splicing.
- Splice set-up prior to drilling.
- Surface preparation and coating.
- Clearance to ship.

(5) Non-destructive Methods of Examination

The methods of non-destructive examination shall be in accordance with the following standards:

- Radiography - AWS Standard D1.5
- Ultrasonic - AWS Standard D1.5
- Magnetic Particle - ASTM Standard E-709
- Dye-Penetrant - ASTM Standard E-165
- Hardness tests - ASTM Standard E-103

The non-destructive examination shall be done by a company certified to CAN CSA W178.1. Radiographic testing and magnetic particle testing technicans shall be certified to Level II of CGSB.

(6) Radiographic Inspection Schedule

Unless otherwise noted, radiographic inspection of welded plate girders shall be performed by the Contractor in accordance with the following schedule:

(a) 100% of all tension flange and stress reversal butt welds, all stiffener butt welds and all diaphragm butt welds, and any groove welded attachments to flange plates.
(b) A minimum of 25% of all other flange butt welds randomly selected for each structure. Additional testing may be required to ensure the quality of welds.
(c) All web butt welds in tension and stress reversal zones plus additional 300 mm of web butt weld in compression zone at the end of the web.

(7) Radiographic Inspection of Miscellaneous Material

Unless otherwise noted, radiographic inspection of miscellaneous material shall be performed by the Contractor in accordance with the following schedule:

(a) 100% of all tension members.
(b) 50% of all other members.

(8) Magnetic Particle Inspection Schedule

Unless otherwise noted, magnetic particle inspection of welded plate girders shall be performed by the Contractor for each girder section in accordance with the following schedule:

(a) 50% of the web to flange welds or any fillet welds placed on flange plates.
(b) 10% of the web to stiffener welds.
(c) 100% of the stiffeners to flange welds.
(d) 100% of the bearing sole plate to flange welds.
(e) 20% of the diaphragm connector plate welds.

(9) Dye Penetrant Inspection

Dye penetrant inspection shall be performed by the Contractor at the ends of the weld metal of all flange butt welds after the removal of run-off tabs. Defects discovered by this inspection shall be repaired by the Contractor, and the suspect area re-inspected.

(10) Hardness Tests

Hardness tests shall be performed by the Contractor on the flame cut edges of the girder flange prior to assembly. Unless otherwise noted, the hardness of the flame cut edges shall not exceed a maximum Brinell as noted below:

(a) For carbon steels with a yield strength less than and including 300 MPa, the maximum Brinell shall be 200 BHN.

(b) For carbon steels with a yield strength greater than 300 MPa, the maximum Brinell shall be 220 BHN.

Remedial work to the edges which exceed the specified hardness shall be performed and re-inspected prior to assembly.

(11) Testing Stud Shear Connectors

Stud shear connectors shall meet all requirements as outlined by AWS D1.5. The Contractor shall perform bend testing in accordance with AWS D1.5. When bend testing, the studs shall be bent towards the centre of the girder.

(12) Testing of Deck Joint Strip Seal

The installation of strip seals in deck joints shall be tested by the Contractor for leakage. The failed areas shall be corrected and retested. The defective or torn seal shall be replaced at the Contractor's expense.

300.5.8.5 Structural Steel Erection

The Contractor shall erect the structural steel, remove any temporary construction, and do all work required to complete the erection in accordance with the Detailed Designs and the Technical Requirements. No field welding, additional drilling or any other modifications shall be made to steel elements other than deck joints. The Contractor shall not erect the structural steel until the substructure concrete has been cured a minimum of three days and achieved 80% of the 28 day specified concrete strength requirement. Without restricting generality, erection includes:

- placing of anchor bolts and bearings;
- erection of temporary supporting structures;
- erection of structural steel;
- placing of expansion assemblies;
- grouting of anchor bolts;
- placing and sealing of grout pads; and
- touch-up painting as required.

300.5.8.5.1 Transporting, Handling and Storing Materials

Material to be stored shall be placed on timber blocking. It shall be kept clean and stored in a properly drained area. Girders and beams shall be placed upright and shored. Long members, such as deck joint assemblies, buffer angles, columns and chords, shall be supported on timber blocking to prevent damage from deflection.

Girders and beams shall be transported in the vertical position. However these elements may be transported in other positions provided:

- A Professional Engineer (structural discipline) performs the analysis and provides a written statement that the proposed method will not damage the elements and a copy of the same shall be provided to the Department forthwith.
- Upon arrival at the site and prior to erection, the elements shall be checked by the Contractor to ensure all tolerances are met. The Contractor shall provide an adequate flat storage area for the inspection.

300.5.8.5.2 Bridge Girders

(1) Temporary Supporting Structures and Berms

The temporary supporting structures and berms shall be designed, constructed and maintained to safely support all loads. Berms shall be constructed in a manner and of such materials that they will not be eroded by stream flow nor introduce silt into the water. The Contractor shall prepare drawings for temporary supporting structures, berms, and for traffic control and accommodation where applicable. All drawings shall bear the seal of a Professional Engineer.

Temporary supporting structures and/or berms will not be permitted to remain in any stream channel during spring break-up or run-off periods, unless all necessary approvals have been obtained from pertinent agencies.

Incidental damage to other property, such as earth fills and stream banks, resulting from the existence of berms, shall be the responsibility of the Contractor.

(2) Erection Procedure

The Contractor shall prepare, and provide to the Department forthwith, a detailed erection procedure in advance of the scheduled start of erection. The erection procedure shall include all drawings and documents necessary to describe the following:

(a) Traffic accommodation strategy, as applicable.

(b) Access to work, earth berms and work bridges.

(c) Type and capacity of equipment.

(d) Sequence of operation including position of cranes and trucks with members.

(e) Position of cranes relative to substructure elements such as abutment backwalls, with details of load distribution of wheels and outriggers.

(f) Lifting devices and lifting points. No drilling of additional holes or any other modifications, including field welding, shall be made to steel elements other than deck joints. Lifting devices shall not be welded to the girders.

(g) Details of temporary works, supporting structures drawings, including proposed methods to be used to ensure the required splice elevations and structure shape prior to bolt torquing method of providing temporary supports for stability, top of girder elevations at each bearing and each slice location where appropriate.

(h) Bolt tightening sequence.

(i) Grout Pad Construction (refer to Section 300.5.8.5.2(10) (Grout Pockets and Grout Pads)).

(j) Details of release of temporary supporting structures.

(k) Provide an "As-Constructed" detailed survey of the substructure showing the following:
- location and elevation of all bearing grout pad recesses,
- shim height at each bearing location,
- top of girder elevations at each bearing (and each splice location where appropriate), and

- longitudinal measurements between centrelines of bearings of all substructure units.

The erection procedure shall be stamped by a Professional Engineer who shall assume full responsibility to ensure that its erection procedure is being followed. Safety and compliance with the *Occupational Health and Safety Act* (Alberta) and regulations thereunder shall be an integral part of the design.

Before erection begins the Contractor shall do a complete superstructure layout by means of chalk lines and markings applied to all substructure units, showing bearing and girder positions in accordance with the layout plan.

(3) Fall Protection for Girder Erection and Deck Forming

In order to provide a safe working area for girder erection and deck formwork, the Contractor shall provide 100% fall protection and a safe work procedure.

(4) Bearings and Anchorage

Masonry bearing plates shall not be placed upon bridge seat bearing areas which are improperly finished, deformed or irregular. Bearing plates shall be set level in their exact position.

The Contractor shall remove anchor bolt void forming materials, and accurately set the anchor bolts, except where the bolts were cast into the concrete. Any residues on the concrete surfaces, such as oils, grease or other contaminants, shall be removed by sandblasting. All methods and materials for setting anchor bolts and constructing bearing pads shall be subject to the Department's prior review and acceptance. The location of the anchor bolts, in relation to the slotted holes in the expansion shoes, shall correspond with the temperature at the time of erection. The nuts on the anchor bolts, at the expansion ends of spans, shall be adjusted to permit free movement of the spans.

When steel bearings are employed in conjunction with grout pockets in the substructure, the bearings shall be set accurately on galvanized steel shims, and grouted as detailed on the Detailed Designs, after the erection has been completed. The shims must be located so that a minimum of 75 mm grout coverage is provided. When grout pockets are not detailed, the bearing plates shall be set on the properly finished bearing areas in exact position and shall have a full and even bearing on the concrete.

(5) Straightening Bent Material

Straightening of plates, angles or other shapes will not be permitted without a detailed procedure prepared by a Professional Engineer, and provided to the Department for its prior review, prior to any straightening being undertaken.

Following the straightening of a bend or buckle, the surface of the metal shall be carefully inspected for evidence of fractures, which may include non-destructive testing.

(6) Assembly

The parts shall be accurately assembled as shown on the shop drawings and all match-marks shall be followed. The material shall be carefully handled to avoid damage. Hammering, which will injure or distort the members, shall not be permitted. Bearing surfaces and surfaces to be in permanent contact shall be clean before the members are assembled.

Splices and field connections shall have one half of the holes filled with bolts and cylindrical erection pins (half bolts and half pins evenly distributed throughout the splice or connection) before bolting. Splices and connections carrying traffic during erection shall have three-fourths of the holes filled.

Fitting-up bolts shall be of the same nominal diameter as the bolts, and cylindrical erection pins shall be sized to accurately fit the holes.

Should adjustments in elevation of the girder splices become necessary only enough pins or bolts shall be removed to allow free rotation of the joint.

(7) High-Tensile-Strength Bolted Connections

(a) General

Bolted parts shall fit solidly together when assembled. Contact surfaces, including those adjacent to the washers, shall be descaled or carry the normal tight mill scale. Contact surfaces shall be free of dirt, paint, oil, loose scale, burrs, pits and other defects that would prevent solid seating of the parts. Unless otherwise noted, bolts in exterior girders shall be installed with the heads on the outside face of the girder web and bolts in all girders shall be installed with the heads on the bottom faces of lower flanges. Nuts for bolts that will be partially embedded in concrete shall be located on the side of the member that will be encased in concrete.

Connections shall be assembled with a hardened washer under the bolt head or nut, whichever is the element turned in tightening. Surfaces of bolted parts in contact with the bolt head and nut shall be parallel.

For sloped surfaces, bevelled washers shall be used. The bevelled washers shall be designed to produce a bearing surface normal to the bolt axis.

Bolts shall be of new quality and stored in weatherproof containers to prevent loss of lubrication or accumulation of dirt.

All girders shall be erected with elevations and alignments checked prior to any bolt tightening.

(b) Bolt Tension

Tightening of all high strength bolts shall be by the turn-of-nut method. Before final tightening there shall be a sufficient number of bolts brought to a “snug tight” condition to ensure that the parts of the joint are brought into full contact with each other. “**Snug tight**” is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remaining holes in the connection and brought to snug tightness. After all bolts have been taken to the snug tight condition, the Contractor shall match mark the outer face of each nut and protruding end of bolt to have a common reference line to determine the relative rotation. All bolts in the joint shall then be tightened additionally by the applicable amount of nut rotation specified below, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

Amount of rotation of nut relative to bolt, regardless of which is turned:
- 1/3 turn where bolt length is 4 bolt diameters or less
- 1/2 turn where bolt length is over 4 bolt diameters and not exceeding 8 bolt diameters
- 2/3 turn where bolt length exceeds 8 bolt diameters

Notes:
- tolerance 1/6 turn (60o) over, nothing under
- length of bolt measured from underside of head

(c) Reuse of Fasteners
High strength bolts shall be tensioned only once and shall not be reused. Retightening previously tightened bolts, which may have been loosened by tightening adjacent bolts shall not be considered as reuse.

(d) Department Inspection
The Contractor shall provide safe and adequate access meeting O*ccupational Health and Safety Act* (Alberta) requirements to all working areas, including all necessary scaffolding to enable the Department to carry out its inspection. The Contractor shall provide a competent workman to assist the Department in the inspection of bolt tightening work.

(8) Misfits

The correction of minor misfits involving reasonable amounts of reaming, cold cutting and chipping will be considered incidental to the work of erection. However, any deformation which prevents the proper assembling and fitting up of parts by the moderate use of drift pins, or by a moderate amount or reaming and slight chipping or cutting, shall be reported immediately to the Contractor's Engineer.

(9) Girder Adjustment

It is essential that the girders are erected with utmost attention being given to girder positioning, alignment, and elevation. Adjustment to girder position, bearing location and bearing elevation shall be done in order to achieve as closely as possible the lines and grades shown on the Detailed Designs.

The Contractor shall ensure that the structural steel is maintained in correct alignment until the adjoining or encasing concrete components have been completed.

(10) Grout Pockets and Grout Pads

The Contractor shall fill the grout pockets and construct the grout pads using Sika 212 flowable grout or equivalent. Filling of grout pockets and construction of grout pads shall be done by workers competent in this work.

Grout shall be packaged in waterproof containers with the production date and shelf life of the material shown. It shall be mixed, placed, and cured in strict accordance with the manufacturer's recommendations.

The method of forming and pouring the grout shall be submitted for review and acceptance. Dry-pack methods of constructing grout pads will not be accepted.

Sealer shall be supplied and applied to the exposed grout pad surfaces in accordance with Section 300.5.7.17 (Sealer).

(11) Grouting in Cold Weather

When the daily minimum air temperature, or the temperature of the girders, bearings or substructure concrete, in the immediate area of the grouting, falls below 5°C, the following provisions for cold weather grouting shall be affected:

(a) Before grouting, adequate preheat shall be provided to raise the temperature of the adjacent areas of the girders, bearings and substructure concrete to at least 10°C.
(b) Temperature of the grout during placing shall be between 10°C and 25°C.
(c) The grout pads (or girders where appropriate) shall be enclosed and kept at 10°C to 25°C for at least five days. The system of heating shall be designed to prevent excessive drying-out of the grout.

(12) Removal of Falsework, Berms, and Clean-Up

Upon completion of the erection the Contractor shall remove all earth material or falsework placed in the stream channel or elsewhere during construction. The Contractor shall remove all piling, excavated or surplus materials, rubbish and temporary buildings, replace or renew any damaged fences, and restore in an acceptable manner all property damaged during the execution of its work.

The Contractor shall leave the bridge site, roadway and adjacent property in a neat restored and presentable condition. When required, the Contractor shall provide written evidence to the Department that affected property owners or regulatory agencies have been satisfied.

All steel shall be left clean and free of oil, grease, mud, dust, road spray or other foreign matter.

300.5.9 PRECAST CONCRETE UNITS

300.5.9.1 General

This specification in Section 300.5.9 (Precast Concrete Units) is for the supply, manufacture, delivery and erection of prestressed and precast concrete bridge units and miscellaneous precast components.

300.5.9.2 Submissions

The following information shall be submitted to the Department by a date that is reasonable having regard to the design and construction process and in any event within the times noted below. In the event that the Department requests any of the following information, the requested information shall be provided within seven days, notwithstanding the times noted below.

- Shop drawings (two copies) (at least five days prior to fabrication);
- Stressing calculations including jack calibration data (two copies) (at least five days prior to fabrication);
- Load/elongation curve for prestressing strand (at least five days prior to fabrication);
- Concrete and grout mix designs, including test data showing conformance of cement, silica fume, aggregate and admixtures to required standards (at least five days prior to fabrication);
- Details of concrete curing systems (at least 14 days prior to fabrication);
- Time-temperature graphs showing concrete curing rates;
- Mill certificates for miscellaneous steel;
- Certified mill test reports for all bearing material;
- Repair procedures for galvanizing, if required;
- Repair procedures, if required, for repair of casting defects or other damage to precast concrete units;
- Concrete cylinder strength results;
- Concrete core strength results, if required;
- Erection procedures, including drawings for falsework, berms and traffic accommodation (two copies) (at least 14 days prior to erection and grading); and
- Methods of forming and pouring grout.

300.5.9.3 Reference Drawing (attached in Appendix B)

Type 1c Sealer for Precast Girders, Department Standard Drawing S-1637-97.

300.5.9.4 Supply and Manufacture

300.5.9.4.1 Standards

The manufacture of prestressed and precast concrete bridge units shall be in accordance CSA A23.4.

Where imperial/metric conversions are necessary, The National Standard of Canada, CAN3-Z234.1-79 shall be used as the basis of conversion.

300.5.9.4.2 Qualification

The fabricator shall operate a recognized precast concrete fabricating plant and shall be fully certified by the Canadian Precast/Prestressed Concrete Institute (CPCI) Certification Program.

300.5.9.5 Engineering Data

(1) Shop Drawings

Shop drawings showing all necessary fabrication details of the precast units, such as reinforcing steel, blockouts, stressing system, anchorage devices, void support system and screed rail shall be prepared. The shop drawings shall be legible and of adequate quality to be reproduced and microfilmed.

The Department's bridge file number and project name shall be shown on shop drawings.

(2) Stressing Calculations

Stressing calculations showing elongations and gauge pressures as well as the strand release sequence data shall be prepared. Jack calibrations, performed within the previous six months, shall be obtained.

(3) Stressing Steel Certificate

A copy of the load/elongation curve for each lot of stressing steel shall be obtained.

(4) Concrete and Grout Mix Design

A concrete mix design and grouting mortar mix design shall be prepared by the Contractor. The mix design shall indicate the design strength, proportions of the constituent materials, type and brand of cement, type and brand of silica fume, origin of aggregates and brand names of all admixtures. The sampling and testing of aggregates, including the concrete mix design, shall be completed by an independent CSA certified and qualified concrete testing laboratory, which shall have the appropriate permit to practice in the Province of Alberta. Concrete mix designs, including sampling and testing of aggregates, may be completed by the concrete supplier, provided that the corresponding documentation is stamped for compliance by a Professional Engineer. In both cases, the mix design, including sampling and testing, shall be reviewed and stamped for compliance with the respective specifications by an independent CSA certified and qualified concrete testing laboratory, which has the appropriate permit to practice in the Province of Alberta. In both cases, the testing laboratory shall provide an engineering opinion that the concrete aggregate and mix designs are suitable for their intended use and are expected to perform to specified standards.

The concrete mix design information shall include one microscopic air-void analysis performed by an independent testing laboratory in order to determine the spacing factor of the hardened concrete. The test sample shall be made from a trial concrete batch, vibrated into a cylinder mould so as to represent the level of vibration of the production concrete in the forms. If adjustments to the mix design are necessary, the air-void analysis shall be repeated.

Only the prepared mix design shall be used to cast units. Changes in cement type, and/or decreasing cement content shall be construed as a change in mix design and will not be allowed.

(5) Other Data

Test data to prove conformance to the standards for other materials including cement, silica fume, aggregate and admixtures shall be obtained.

(6) Construction Data Sheets

During manufacture, the construction data sheets shall be kept up to date and available for the Department's review.

300.5.9.6 Materials

(1) Cement

Portland cement conforming to the requirements of CSA A5 shall be used.

(2) Water

Water to be used for mixing concrete or mortar shall conform to the requirements of CSA Standard A23.1 and shall be free from injurious amount of alkali, organic materials or deleterious substances. The Contractor shall not use water from shallow, stagnant or marshy sources.

(3) Silica Fume

Ten percent condensed silica fume by weight of cement (plus or minus 0.5%) shall be used in all precast concrete. Condensed silica fume shall conform to Tables 5 and 6 of CSA Standard A3000-03 - Cementitious Material Compendium, Type SF, with a SiO_2 content of at least 85%, of a maximum of 10% ignition loss, and no more than 1% SO_3 content. An acceptable compatible superplasticizing admixture shall be used together with the silica fume.

(4) Aggregates

(a) <u>Normal Weight Aggregates</u>
Fine and coarse normal weight aggregates shall conform to the requirements of CSA A23.1, with maximum aggregate size of 14 mm.

(b) Lightweight Aggregates

Fine and coarse lightweight aggregates shall conform to the requirements of the ASTM C330, with maximum aggregate size of 14 mm.

(5) Air Entraining Agent

Air entraining agent shall conform to the requirements of the ASTM C260.

(6) Chemical Admixtures

Chemical admixtures shall conform to the requirements of ASTM C494. All chemical admixtures must be suitable for use in precast concrete, be supplied by the same manufacturer as the air entrainment agent, and be compatible with each other. The addition of calcium chloride, accelerators, retarders or set controlling admixtures and air reducing agents will not be permitted.

Acceptable admixtures are air-entraining agents, superplasticizers and water-reducing agents.

(7) Concrete

Concrete shall consist of Portland cement, condensed silica fume, aggregates, water and acceptable admixtures. The type of concrete to be used will be specified on the Detailed Designs.

The unit weight, entrained air and air void spacing requirements for the various types of concrete are specified in Table 300.5.9.6 below.

Table 300.5.9.6

Type of Concrete	Aggregates	Concrete Unit Weight, Plastic State kg/m^3	Minimum Total Air Content %	Maximum Air Void Spacing Factor (hardened concrete) mm
Standard Weight	Fine and Coarse Standard Weight	--	5	0.23
Lightweight	Fine and Coarse Lightweight	1680 ± 5%	6	0.23
Semi-Lightweight	Fine Standard Weight & Coarse Lightweight	1920 ± 5%	6	0.23

(8) Reinforcing Steel

Plain and epoxy coated reinforcing steel shall conform to Section 300.5.14 (Reinforcing Steel).

(9) Stressing Strand

Stressing strand and wire shall be uncoated Grade 1860, low relaxation 7-wire strand conforming to the requirements of the ASTM A416. Shop drawings and stressing calculations shall clearly show the type of strand to be used, and changes will not be allowed during production.

(10) Lifting Hooks

Lifting hooks made of prestressing strand shall conform to the requirements of ASTM A416, and shall be fabricated in a manner that distributes the load evenly to all strands.

(11) Miscellaneous Steel

Miscellaneous steel shall conform to the requirements of the CSA *CAN/CSA G40.21M-300W* or *ASTM A36* or as specified on the Detailed Designs. The Contractor shall obtain mill certificates to prove conformance to the standard. Fabrication shall conform to Section 300.5.8 (Structural Steel).

(12) Bridgerail and Anchor Bolts

The assemblies shall be hot dip galvanized after fabrication. All nuts and washers shall be shop assembled on the anchor bolts.

(13) Voids and Ducts

All void and duct material must remain dimensionally stable during the casting and curing of the units. Voids shorter than 400 mm shall be eliminated except when noted otherwise on the Detailed Designs.

(14) Bearings

Certified mill test reports for all bearing material shall be provided to the Department prior to installation.

(a) <u>Stainless Steel</u>
Stainless Steel shall conform to the requirements of American Iron and Steel Institute ("**AISI**") Standard Type 304, No. 8 Mirror Finish.

(b) <u>Elastomer</u>
Elastomer compound shall conform to section 18 "Bearings" Division II of the AASHTO Standard Specifications for Highway Bridges 2002 edition. Elastomer compound shall conform to low temperature AASHTO grade 5 material testing requirements in Table 18.4.5.1-1A and -1B at the specified hardness. When required, field welding adjacent to elastomeric pads shall be performed with care to avoid damage to the elastomer. The temperature of the steel adjacent to the elastomer should be kept below 120°C. The distance between the weld and the elastomer should be at least 40 mm.

(c) Teflon
Teflon shall be unfilled, 100% virgin polymer.

(d) Base Plate Corrosion Protection
The bottom surface of each base plate shall be protected by a medium grey colour barrier coating, to prevent contact between the zinc and the concrete. The galvanized surface must be roughened prior to application of barrier coating. The surface preparation of the galvanized surface and the dry film thickness (DFT) of the coating shall be in accordance with the coating manufacturers recommendations. The Contractor shall test the adhesion of fully cured coating as per ASTM D3359 "Standard Test Methods for Measuring Adhesion by Tape Test". The method selected for testing (Method A or B) shall depend on the dry film thickness of the coating. The coating manufacturer's product data sheets shall be obtained prior to the application of the coating. The adhesion test result shall meet a minimum of "4B" classification i.e. a maximum allowable flaking of 5%.

(15) Galvanizing

Galvanizing shall be by the hot dip method, after fabrication, in accordance with the current edition of CSA Standard G164 with additions and exceptions as described in this specification. The Contractor shall provide a smooth finish on all edges and surfaces, and remove all weld spatter and all welding flux residue from the steel components prior to galvanizing.

Repair of galvanizing shall only be done if bare areas are infrequent, small and suitable for repair. A detailed repair procedure shall be prepared by a Professional Engineer, and provided to the Department, prior to its use. It should be noted that repairs may require complete removal of the galvanized coating and regalvanizing. Repair shall be in compliance with ASTM A780, Method A3 Metallizing. The thickness of the metallizing shall be 180 μm, and the repair tested for adhesion. The finished appearance shall be similar to the adjacent galvanizing.

300.5.9.7 Manufacture

(1) Forms

Precast concrete units are to be manufactured in steel forms. For all beam members, the forms shall be designed such that they can be removed without damaging the beam. For all "I" or "T" beam members, the side forms shall be removed horizontally away from the beam by a method that prevents any contact of the form with the top flange after release of the form. The top flange shall not be subjected to a vertical force at anytime.

Holes or voids cast into the top flange of "I" or "T" girders to accommodate deck formwork, will not be permitted.

(2) Reinforcing Steel

Fabrication, handling, storage, placement and fastening of all steel reinforcement shall conform to Section 300.5.14 (Reinforcing Steel).

(3) Stressing Strand

Stressing strand shall be free from corrosion, dirt, grease, rust, oil or other foreign material that may impede the bond between the steel and the concrete. Stressing strand shall be protected at all times from manufacture through to encasing concrete or grouting. Stressing strand that has sustained physical damage at any time shall be rejected. Stressing strand splices shall not be placed within a precast concrete unit.

Stressing strands shall not be stressed for more than 36 hours prior to being encased in concrete. The stress in the stressing strands shall be measured both by the jacking gauges and by the elongation of the strands. The maximum allowable discrepancy between jack pressure and elongation shall be within 5%. Alternatively, the factors contributing to the difference must be identified and corrected before proceeding. Changes in strand temperature and slippage at strand anchorages shall be monitored between stressing and concrete encasement. Any changes in strand stress due to these effects shall be accounted for in the design.

Seven wire stressing strand with any broken wire shall be removed and replaced. All stressing strands shall be checked for wire breaks before placement of concrete.

The prestressed unit ends shall have 15 mm deep strand termination recesses formed around the strands. All strands shall be cut flush with the bottom of the recesses, and the recesses shall then be cement mortar grouted flush with the ends of the girders. An approved Type 1C sealer shall be applied over the patched recessed areas prior to steam curing. Sealer shall not be applied to the patched recessed areas when girder ends are designed to be encased in field cast concrete.

The Contractor shall be responsible for recording and reporting the elongation to the Department, or tension of each strand during the stressing operation, if requested by the Department.

(4) Void and Duct Placement

Voids and ducts shall be placed as shown on the Detailed Designs and must be tied and securely held in the required positions to prevent movement. Continuous ducts shall align precisely. The ends of the voids shall be sealed. Voids found to be distorted, damaged or of insufficient strength will be rejected. Blow holes caused by air expanding within the voids and rising to the surface, shall be repaired when the concrete is in the plastic state.

(5) Concrete Measuring, Mixing and Placing

The procedures outlined in ACI 304 shall be followed. The time from initial mixing of the concrete until placing the concrete in the forms shall not exceed one hour. The time between the successive placement of concrete onto previously placed concrete shall not exceed 45 minutes.

(6) Concrete Temperature

The concrete temperature shall be between 10°C and 30°C at the time of placing this concrete in the forms.

(7) Finished Riding Surface

Where the top surface of the girder is designed to be the riding surface, the use of a continuous screed rail, independent of the top of the grout keys, shall be employed. The top surface shall follow a smooth profile, which incorporates the required camber adjustments.

(8) Camber Hubs

Three camber hubs shall be placed in each girder, located along the centreline of the girder at the midpoint and 150 mm from each end. The camber hubs shall consist of 10 mm galvanized bars, of sufficient length to project vertically 10 mm above the riding surface.

The Contractor shall store the members in such a manner as to provide access for measuring camber. The Contractor shall record the girder camber at the midpoint of each girder within 24 hours of girder destressing.

(9) Concrete Finish

The concrete surfaces of units shall be finished as specified.

(a) Class 1 Form Surface Finish
This finish is essentially that obtained when concrete has been cast and adequately compacted in a properly oiled steel form. All fins, honeycomb, irregularities, cavities over 10 mm diameter or other similar defects shall be thoroughly chipped out. These areas shall be saturated with water for a period of not less than 30 minutes, carefully pointed and trued with mortar of a colour which will match the existing concrete. Mortar used for pointing shall be less than one hour old.

The patches shall be properly cured by placing the repaired unit in the curing enclosure for a period of four days immediately after patching.

The finished surfaces shall be true and uniform. All surfaces which cannot be repaired satisfactorily shall be finished as specified for Class 2.

(b) Class 2 Rubbed Finish
Class 2 finish shall be essentially the same as Class 1 except that all holes, cavities and defects shall be repaired so that the finished surface presents a smooth, true, dense, uniformly coloured, and non-stained appearance. The concrete surfaces shall be thoroughly wire brushed to expose any hole or cavity prior to repairs. All residue of form oil shall be removed from the surface.

(c) Class 3 Bonded Concrete Surface Finish
The surface shall be prepared in accordance with the requirements of Section 300.5.9.7(9)(b) except that it need not be of uniform colour. After the surface preparation has been completed, the concrete surfaces shall be pressure washed to remove all dust, dirt, laitance and all other bond

breaking materials. The concrete surface shall be dried for a minimum of 24 hours. The Contractor shall then supply and apply a pigmented concrete sealer, which meets the requirements for a Type 3 sealer in Alberta Transportation's "*Specifications for Concrete Sealers*" (B388).

The pigmented sealer shall be applied in accordance with the manufacturer's specifications. The colour of the proposed sealer shall be as specified in the design. A minimum of two applications of the pigmented sealer are required. When spray application is used the surface shall be back rolled. The Contractor shall ensure that no colour variation is visible, and shall match the colour of any previously painted adjoining surfaces. Acceptance of the pigmented sealer used will not be taken to relieve the Contractor of full responsibility for its acceptable performance and appearance.

(d) Class 4 Floated Surface Finish
After the concrete has been consolidated and the surface carefully screeded to the cross section and profile shown on the Detailed Design, it shall be floated and trowelled as necessary to provide a closed, uniformly textured surface without brooming.

(e) Class 5 Floated Surface Finish, Broomed Texture
After the concrete has been consolidated, the surface shall be carefully screeded to the cross section and profile shown on the Detailed Design. When the concrete has hardened sufficiently, the surface shall be finished with a broom of an accepted type. The broom strokes shall be perpendicular to the edge of the unit, and extended from edge to edge, with adjacent strokes slightly overlapped producing corrugations of 2 to 3 mm in depth. Brooming shall be done when the concrete has set sufficiently to produce clear, crisp brooming marks which do not sag or slump, without tearing the surface or disturbing coarse aggregate particles. After final brooming the surface finish shall be free of porous spots, irregularities, depressions, pockets and rough spots and must not vary more than 5 mm when measured using a 3 m straight edge.

Accepted finishing and edging tools shall be used on all edges and expansion joints after brooming.

(10) Curing

All prestressed concrete units shall be cured at an elevated temperature. The curing of prestressed concrete units shall essentially be in accordance with CSA A23.4 unless otherwise specified. The ambient curing temperature shall be increased at a rate not exceeding 20°C per hour until a maximum temperature of not more than 60°C is attained.

Care must be exercised to protect prestressed and non-prestressed concrete units from thermal shock at all times until the units have been fully cured.

(a) Prestressed Concrete

(i) Curing in the Form
The initial application of heat shall commence only after the last of the freshly placed concrete

has attained its initial set, which is normally two to four hours after casting. Heat shall not be applied directly to the concrete, but by a method that will produce a consistent ambient temperature throughout the entire form and enclosure. The increase in temperature and the holding temperature shall be monitored and permanently recorded on a chart at a minimum of 3 quarter points along the form.

(ii) Curing After Removal From the Form

Upon removal from the forms the units shall be cleaned, patched and finished within a period not exceeding 12 hours. The units shall be placed in a manner that will facilitate any clean up or repair work, and that will allow full inspection of all surfaces. Within 24 hours of removal from the form, the units shall be placed within a suitable enclosure, for curing.

The curing enclosure shall provide a minimum of 150 mm of free air space between the concrete surfaces and the coverings. Flexible coverings shall be secured to prevent any moisture loss.

The difference in ambient air temperature adjacent to the concrete at different locations within the enclosure shall not exceed 10°C at any time.

The curing process shall be continued for a period of 4 days with one of the following methods:

1) Steam Curing

Steam jets shall not directly impinge on the concrete surfaces. The steam must be in a saturated condition maintaining an atmosphere of 95% to 100% relative humidity and a uniform ambient temperature of 40^{o}C – 60^{o}C.

For days with periods of four or more hours within a 24-hour period, where measured temperature or humidity levels do not meet the required limits, these days will not count as a full day of steam cure. An additional day of steam cure beyond the specified four days will be required for each non compliant day.

2) Curing with Continuous Misting & Heat

Sufficient number of atomizing misting nozzles shall be strategically located to produce a fine mist with 100% relative humidity in the enclosure. The water shall be preheated to a temperature which will produce a misting temperature compatible with the ambient temperature. The enclosure shall be heated with radiant heaters to a temperature of 40°C – 60°C. Dry heat shall never touch the concrete surface at any time. A control system shall be installed to shut off the heat when the humidity level drops below 90% in the enclosure. Should the temperature in the concrete rise above 40°C without the misting, the unit will be rejected.

Two continuously recording thermometers and two continuously recording hygrometers shall be provided for each curing enclosure to monitor the concrete and curing rates. All time-temperature and time-humidity recordings shall be clearly shown with a graph.

(b) Non-Prestressed Concrete

Curing of all non-prestressed concrete shall be in accordance with one of the following methods.

(i) Elevated Temperature Curing

Upon removal from the forms the units shall be cleaned, patched, finished and elevated temperature cured for four days as per Section 300.5.9.7 (10) (a) (Prestressed Concrete).

(ii) Moist Curing

The units may be moist cured in lieu of elevated temperature curing as noted below:

Upon removal from the forms the units shall be cleaned, patched, finished, and ready for inspection within a period not exceeding 12 hours. Patching shall be performed with an approved product and at an ambient temperature of 15°C to 30°C. After completion of patching and finishing, within 24 hours of removal from the form, the units shall be placed under two layers of light colored filter fabric (Nilex C-14 or equivalent) or burlap at an ambient temperature of not less than 15°C. The filter fabric or burlap shall be kept in a continuously wet condition throughout the curing period by means of a soaker hose or other means as reviewed and accepted by the Department. Curing with filter fabric or burlap and water shall be maintained for a minimum period of seven days.

(11) Release of Stressing Strand

The stressing strand shall not be released until the specified concrete release strength is attained, and the release shall be in accordance with the accepted sequence.

Evidence of casting defects shall be repaired prior to release of the strands.

(12) Repairing Damaged Concrete

Repairs to defects such as cracks, honeycombs or spalls shall be carried out in accordance with this section. Any unacceptable cracks, honeycombs or spalls will result in the rejection of the unit.

All repair procedures shall be developed by a Professional Engineer and agreed to by a Professional Engineer from the design team prior to the commencement of the repair. All repairs shall be completed prior to curing of the unit at an ambient temperature of 15°C to 30°C.

In this section, the “bearing area” of a girder is defined as the portion of the girder bottom flange up to the underside, but not including the radiused transition between the bottom flange and the web, directly above the bearing. The bearing area extends from the end of the unit to 75 mm beyond the edge of the shoe plate. The “anchorage area” of a girder is defined as the full-height portion of the girder that is less than two times the girder depth from the end of the girder but is not in the bearing area.

(i) Cracks

The following cracks are unacceptable and may result in rejection of the unit unless accepted and signed off by the design engineer and reviewed by the Department:

- Cracks in the bearing area of a girder.
- Cracks in the anchorage area of a girder exceeding 0.5 mm in width.
- Cracks outside of the girder bearing and anchorage areas exceeding 0.2 mm in width or longer than 300 mm.

All cracks 0.2 mm or greater in width shall be repaired by epoxy injection in accordance with the manufacturer's instructions. Coring shall be carried out to confirm the penetration of the epoxy into the crack, if so requested by the Department.

(ii) Honeycombs and Spalls

The following conditions of honeycomb or spall are unacceptable and may result in rejection of the unit unless accepted and signed off by the design engineer and reviewed by the Department.

- Any honeycomb or spall in the bearing or anchorage areas of a girder.
- Major honeycombs and spalls in areas outside the bearing or anchorage areas of a girder. Major honeycombs and spalls are described as honeycombs and spalls that are more than 30 mm deep or more than 0.1 m^2 in area.

When approved by the design engineer and reviewed by the Department, repairs for honeycombs and spalls may be made using a cementitious material. Repairs of minor honeycombs and spalls may be made after destressing of the girder. However major honeycombs and spalls shall be repaired before destressing the girder.

(13) Sealer

The Contractor shall supply and install an approved Type 1c sealer to the girder surfaces as shown on Sketch SK-1 of Appendix B "Finishes and Sealing for Exterior Concrete Girders". Type 1c sealers shall be in accordance with Section 300.5.7.17 (Sealer) and pigmented sealer shall be in accordance with Section 300.5.7.16.4 (Class 3. Bonded Concrete Surface Finish). The sealer shall be applied on clean dry surfaces free of form oil, and in accordance with the manufacturer's recommendations.

The Contractor shall ensure that the sealer is not applied in the grout pockets, lifting hook pockets or areas of the girders that will have field concrete cast against them.

The Department reserves the right to sample and test the sealer supplied by the Contractor.

(14) Sandblasting

The concrete surfaces in shear key, block out, diaphragm and girder end void locations shall be sandblast roughened. The blasting shall be sufficient to remove all laitance and uniformly expose the aggregate particles.

(15) Dimensional Tolerances of Cast Units

The maximum dimensional deviation in mm, of cast units from that as detailed on the Detailed Designs shall not exceed the following:

Length	-	± 20 mm x length (m) ÷ 50
Width	-	± 3 mm
Depth	-	± 5 mm
Camber	-	± 20 mm x length (m) ÷ 50
Sweep (NU Girders)	-	1 mm/m
Sweep (Other Girders)	-	deviation from true, 20 mm x length (m) ÷ 50
Projection of Stirrups		
Top of Girder	-	± 12 mm
Bearing Areas	-	out of flatness of bearing areas, 3 mm
Bulkheads	-	warpage or tilt of ends, 5 mm
Rail Anchor Bolts	-	out of line, 5 mm
	-	in spacing, 5 mm
	-	in projection, 5 mm
Dowel Holes	-	out of plumb, 5 mm
Void Location	-	surface to void dimension, ± 15 mm after casting

(16) Handling and Storage

Precast units shall be handled by means of accepted lifting devices at designated locations. Units shall be maintained in an upright position, supported near the ends and on stable foundations.

(17) Identification of Units

Fabricator's name, year of manufacture, unit serial number and design loading shall be cast into the bottom of the units in 50 mm letters about 1.0 m from the unit end.

(18) Fabrication of Prestressed/Precast Units in Cold Weather

The Contractor shall accept full responsibility for the protection of prestressed/precast concrete units when fabricating in adverse weather conditions.

When the ambient temperature is, or is expected to be, below 5°C during fabrication the following provisions for cold weather casting shall be put in place:

(1) The Contractor shall construct an enclosure such that the ambient temperature within the enclosure shall be kept between 15°C and 30°C. The enclosure shall be sufficiently sized that it will accommodate steel forms, workers and the casting equipment. The enclosure temperature shall be constantly monitored.

(2) The heating system shall be designed to provide uniform distribution of heat and the combustion by-products shall be kept out of the enclosure.

(3) Before casting concrete, adequate preheat shall be provided to raise the temperature of the formwork, reinforcing steel, stressing strand, miscellaneous iron, etc. to at least 10°C.

(4) The fabricated units shall be kept in the enclosure until they are patched, repaired and transferred to the curing enclosure.

300.5.9.8 Testing and Inspection

(1) Access

The Contractor shall provide the Department with suitable and safe access to the works for the purposes of testing and inspection of the precast concrete units. The Contractor shall provide the following:

(a) Cylinder storage box with temperature control and a max./min. thermometer, as per CSA A23.2-3C.
(b) A calibrated weigh scale.

(2) Inspection

The Contractor shall be responsible for all quality control and relevant testing. Inspection of the units by the Department will not relieve the Contractor of its responsibility for quality control.

(3) Test Methods

Sampling, making, curing and testing concrete specimens shall be in accordance with the requirements of the following CSA standards:

- Sampling - A23.2-1C
- Concrete Test Cylinders - A23.2-3C
- Testing Concrete Cylinders - A23.2 - 9C
- Air Content - A23.2-4C
- Unit Weight of Concrete - A23.2-6C
- Air Void Determination – A23.2-17C

(4) Testing by the Contractor

The Contractor shall engage an independent CSA certified testing laboratory to conduct all the required concrete testing and ensure that the concrete supply meets all requirements of the Technical Requirements. The Contractor shall maintain the required air entrainment by testing and making adjustments to the mix prior to and during the placing of concrete in the forms.

The Contractor's testing agency shall make and test concrete cylinders to determine the 28-day compressive strength. Samples for testing shall be taken from the fresh concrete being placed in the forms at the rate of one set of cylinders for every three bridge units cast continuously. A set shall consist of a minimum of three cylinders. A strength test will be the average of the 28-day strengths of the three cylinders (one set). Continuous casting shall mean no break in the casting longer than one hour.

(5) Release Strength Test Cylinders

The Contractor shall arrange to make and test concrete cylinders to prove that the required release strength as stated on the Detailed Designs has been attained prior to release of the stressing strand. When one or more units are cast continuously, at least two cylinders shall be taken from the concrete of the last unit poured to represent the release strength for all units. These cylinders shall be cured with the bridge unit. Only testing of the first cylinder will be necessary if the required release strength is obtained. In the event all cylinders are tested without the required strength being obtained, the Contractor's Engineer and the Department shall be contacted.

300.5.9.9 Failure To Meet Strength Requirements

(1) Right of Rejection

The Department reserves the right to reject any concrete whatsoever which does not meet the specified strength determined in accordance with this Section 300.5.9 (Precast Concrete Units).

In the event that the concrete tested is more than 4 MPa below the specified 28-day compressive strength, the bridge units fabricated from the concrete represented by the test specimens shall be rejected. In the event that the unit has been delivered and/or erected in the field, it shall be removed and returned to the Contractor's plant for replacement.

(2) Coring

If any concrete tested fails to meet the specified strength, the Contractor may request permission to core. If the coring is accepted by the Department, the Contractor shall make arrangements, to employ a CSA certified, Category 1 or higher level qualified testing laboratory, at the Contractor's expense.

The Contractor's Engineer will specify the location of the coring to ensure that the cores represent the same concrete as the cylinders. The average of three adjacent cores taken from one bridge unit shall constitute a test. The cores shall be taken and tested in accordance with CSA Standard A23.2- 14C within seven days of the date of testing the 28-day cylinders. The core test will represent all bridge units represented by the strength test. Alternatively, the Contractor may choose to take a core test from each of the other units in question, in which case each of these core tests will then represent a bridge unit.

The acceptability of the as-delivered concrete shall be determined using the concrete cylinders, with the modification set out in the next two sentences. In cases where the concrete strength, as indicated by the cores, is higher than the strength based on the concrete cylinder results, the core results shall be used as the basis for acceptance of the concrete. If the core strengths are lower than the strength from the concrete cylinder tests, the cylinder tests shall govern.

300.5.9.10 Erection of Precast Concrete Units

300.5.9.10.1 General

The Contractor shall erect the units, remove any temporary construction, and do all work required to complete the erection in accordance with the Detailed Designs and the Technical Requirements. No drilling, nailing, or any other modifications shall be made to the concrete elements. The Contractor shall not erect precast concrete girders until the substructure concrete has been cured a minimum of three days and achieved 80% of the 28-day specified concrete strength requirements.

Without restricting generality, erection includes:

- Removing anchor bolt grout can lids;
- Placing and grouting anchor bolts and bearings;
- Erecting the girders;
- Placing and grouting of connector bolts and diaphragms;
- Post-tensioning;
- Placing and sealing grout bearing pads; and
- Cutting-off lifting hooks and grouting lifting holes on exterior girders and all lifting hook pockets.

300.5.9.10.2 Handling And Storing Materials

Precast concrete units to be stored shall be placed upright and shored on timber blocking and kept clean and properly drained.

300.5.9.10.3 Temporary Supporting Structures And Berms

The temporary supporting structures and berms shall be properly designed and substantially constructed and maintained for the forces which may come upon them. Berms shall be constructed in a manner and of such materials that they will not be eroded by stream flow nor introduce silt into the water. The Contractor shall prepare drawings for temporary supporting structures and berms, and for traffic control and accommodation where applicable. All drawings shall bear the seal of a Professional Engineer.

Temporary supporting structures and/or berms will not be permitted to remain in any stream channel during spring break-up or run-off periods, unless all necessary approvals have been obtained by the Contractor from pertinent agencies.

Incidental damage to other property, such as fills and stream banks, resulting from the existence of berms, shall be the responsibility of the Contractor.

300.5.9.10.4 Erection Procedure

The Contractor shall prepare a detailed erection procedure in advance of the scheduled start of erection. The erection procedure shall include all drawings and documents necessary to describe the following:

(a) Access to work, earth berms and work bridges.

(b) Type and capacity of equipment.

(c) Sequence of operation, including position of cranes, trucks with girders, and traffic accommodation.

(d) Detailed crane position on the ground, particularly adjacent to substructure elements, such as abutment backwalls, with details of load distribution on wheels and outriggers.

(e) Details of crane position on the structure, showing wheel loads and axle spacing of equipment moving on structure.

(f) Loads and their position from crane wheels and outriggers during all positions of lifting when crane is on structure.

(g) Details of temporary works, supporting structure drawings, including proposed methods to be used to ensure the required splice elevations and structure shape prior to placing concrete, and/or post-tensioning and method of providing temporary supports for stability.

(h) Details of lifting of units, showing vertical forces at lifting hooks.

(i) Provisions for control and adjustment of errors for width and positioning of curbs or exterior units.

(j) Complete details of blocking for bearings where necessary to constrain movements due to horizontal forces and/or gravity effects.

(k) Details of post-tensioning procedures, including strand specifications, jack dimensions, pressures, forces and elongations, and grouting.

(l) Grout pad construction (refer to Section 300.5.9.10.6 (Grout Pockets and Grout Pads)).

(m) Details of release of temporary supporting structures.

(n) Provide an “As Constructed” detailed survey of the substructure showing the following:
- location and elevation of all bearing grout pad recesses;
- shim height at each bearing location; and
- top of girder elevations at each bearing (and each splice location where appropriate).

The erection procedure shall bear the seal of a Professional Engineer, who shall assume full responsibility to ensure that its design is being followed. Safety and compliance with the *Occupational Health and Safety Act* (Alberta) and regulations thereunder, shall be integral parts of the design.

Before erection begins the Contractor shall do a complete superstructure layout by means of chalk lines and markings applied to all substructure units, showing bearing and girder positions in accordance with the approved layout plan.

300.5.9.10.5 Girder Adjustments

It is essential that the girders be erected with utmost attention being given to girder positioning, alignment, and elevation. The Contractor shall adjust girder position, bearing location and bearing elevation in order to achieve as closely as possible the lines and grades shown on the Detailed Designs. The Contractor shall minimize any differential camber (girder to girder), and the sweep of the girders, by jacking, loading of girders, winching, or whatever means are necessary, and shall provide the necessary temporary attachments to hold the girders in position.

The maximum dimensional deviation in mm, of erected precast concrete units from that as detailed on the Detailed Designs shall not exceed the following:

- Sweep (NU Girders) - 1 mm/m
- Sweep (Other Units) - deviation from true, 20 mm x length (m) ÷ 50

300.5.9.10.6 Grout Pockets And Grout Pads

The Contractor shall construct grout pads using Sika 212 flowable grout or equivalent. Filling of grout pockets and construction of grout pads shall be done by workers competent in this work.

Grout shall be packaged in waterproof containers with the production date and shelf life of the material shown. It shall be mixed, placed, and cured in strict accordance with the manufacturer's recommendations.

Dry pack methods of constructing grout pads will not be accepted.

Sealer shall be applied to the exposed grout pad surfaces in accordance with Section 300.5.7.17 (Sealer).

300.5.9.10.7 Grouting In Cold Weather

When the daily minimum air temperature, or the temperature of the girders, bearings or substructure concrete, in the immediate area of the grouting, falls below 5 degrees celcius, the following provisions for cold weather grouting shall be affected:

(a) Before grouting, adequate preheat shall be provided to raise the temperature of the adjacent areas of the girders, bearings, and substructure concrete to at least 10^{o}C.

(b) Temperature of the grout during placing shall be between 10°C and 25°C.

(c) The grout pads (or girders where appropriate) shall be enclosed and kept at 10°C to 25°C for at least five days. The system of heating shall be designed to prevent excessive drying-out of the grout.

300.5.9.10.8 Bearings and Anchorage

The Contractor shall remove anchor bolt void forming materials prior to grouting. Any residues on the concrete surface, such as oils, grease or other contaminants that can reduce bonding characteristics, shall be removed by sandblasting.

Anchor bolts shall be set accurately and grouted with a non-shrink cement grout. The location of the anchor bolts, in relation to the slotted holes in the expansion shoes, shall correspond with the temperature at the time of erection. The nuts on the anchor bolts, at the expansion ends of spans, shall be adjusted to permit free movement of the spans.

When steel bearings are employed in conjunction with grout pockets in the substructure, the bearings shall be set accurately on galvanized steel shims, and grouted as detailed on the Detailed Designs, after the erection has been completed. The shims must be located so that minimum 75 mm grout coverage is provided. When grout pockets are not detailed, the bearing plates shall be set on the properly finished bearing areas in exact position and shall have a full and even bearing on the concrete.

Where the design requires that the girders bear on neoprene pads placed directly on pier or abutment seat concrete, the Contractor shall supply and install shims cut from lead sheeting to ensure full and uniform bearing.

300.5.9.10.9 Assembly

The parts shall be accurately assembled as shown on the Detailed Designs. The material shall be carefully handled so that no parts will be distorted, broken or otherwise damaged. Bearing surfaces, and surfaces to be in permanent contact, shall be cleaned before the members are assembled. Diaphragms shall be erected as indicated on the Detailed Designs.

300.5.9.10.10 Lifting Hooks and Lifting Holes

After the girders are properly erected and positioned, all lifting holes on exterior girders shall be filled with an accepted grout; all lifting hooks shall be cut off 50 mm below surface, and all lifting hook pockets shall be filled with grout.

300.5.9.10.11 Painting of Metal Parts

All non-galvanized metal parts, including bearing surfaces not in contact, shall be painted two field coats of paint.

300.5.9.10.12 Post-Tensioning

300.5.9.10.12.1 General

This work consists of post-tensioning and grouting of cable ducts for cast-in-place and precast concrete.

300.5.9.10.12.2 Submissions

The following information shall be submitted to the Department:

- Post-tensioning drawings illustrating the stressing system and, where appropriate, design details and sequence of stressing (two copies);
- Stressing calculations taking into account all applicable losses (two copies);
- Load/elongation curves for the prestressing strand;
- Mill certificates for the prestressing strand; and
- Details of permanent anchoring devices.

300.5.9.10.12.3 Standards

Applicable requirements of the current edition of the following standards shall be followed:

- *CSA A23.1/23.2 – Concrete Materials and Method of Concrete Construction.*
- *CSA A23.4 – Precast Concrete Materials and Construction.*
- *Section 300.5.7 (Cast-in-Place Concrete).*
- *Guide Specification Acceptance Standards for Post Tensioning Systems – PTI.*
- *Specifications for Grouting of Post Tensioned Structures - PTI.*
- *AASHTO LRFD Bridge Construction Specifications.*

300.5.9.10.12.4 Qualification

The Contractor, or its subcontractor, shall have extensive experience in this work and shall utilize only fully trained, competent and experienced operators. The Contractor shall ensure that the site supervisor responsible for the tensioning and grouting operations is at the site whenever these operations are being carried out.

300.5.9.10.12.5 Materials

(1) Prestressing Strand

Stressing strand shall conform to the requirements of Sections 300.5.9.6(9) (Prestressing Strand) and 300.5.9.7(3) (Stressing Strand).

Corrosion inhibitor is required when the stressing and grouting operations are not completed within 20 calendar days of the installation of the stressing steel. The corrosion inhibitor, when required, shall be water-soluble and shall have no deleterious effect on the steel, grout or concrete; or bond strength of steel to concrete.

(2) Anchorages and Distribution

All stressing steel shall be secured at the ends by means of permanent anchoring devices. These devices shall comply with *CAN/CSA S6-06* Clause 8.4.4.1.

Steel distribution plates or assemblies may be omitted when the anchoring devices are sufficiently large and used in conjunction with an embedded steel grillage that effectively distributes the compressive stresses to the concrete.

(3) Ducts

Ducts shall be corrugated, semi-rigid galvanized metal tubes and be capable of withstanding concrete pressures without excessive deformation or permitting the entrance of cement paste during the placement of concrete. The ducts shall have sufficient rigidity to maintain the required profile between points of supports. The interval between supports shall not exceed 1.0 m.

The Contractor shall provide mortar tight inlets and outlets in all ducts with a nominal diameter of 20 mm in the following locations:

- The anchorage area;
- All high points of the duct, when the vertical distance between the highest and lowest point is more than 500 mm;
- Place an inlet at or near the lowest point; and
- Place a free draining outlet at all low points of duct.

The Contractor shall provide inlets and outlets with valves, caps or other devices capable of withstanding the grouting pressure. The ducts and vents shall be securely fastened in place to prevent movement. The Contractor shall provide details of inlets and outlets on the shop drawings.

(4) Concrete

Concrete shall be supplied in accordance with Section 300.5.7 (Cast-in-Place Concrete), however the maximum size of coarse aggregate shall be 10 mm and the 28-day compressive strength shall be a minimum of 50 MPa.

(5) Grout

Grout shall be Class C as described in Table 10.9.3-1 of, and the properties as described in Table 10.9.3-2 of, the AASHTO LRFD Bridge Construction Specification. In addition to the requirements noted in these tables, a test for wet density shall also be performed in accordance with the “Standard Test Method for Density” ASTM C138. Prebagged grouts shall be packaged in plastic lined bags or coated containers, stamped with the date of manufacture, lot number and mixing instructions. Copies of the quality control data for each lot number and shipment sent to the job site shall be provided to the Department for review prior to grouting. Materials with a total time from manufacture to usage in excess of six months shall be retested and certified by the supplier before use, or shall be removed from the job site and replaced.

The average minimum compressive strength of 3 cubes at 28 days shall be a minimum of 50 MPa as per CSA A23.2-1B. The results for bleed test and fluidity test shall meet the requirements noted in Table 10.9.3-2 of the AASHTO LRFD Bridge Construction Specifications.

The Contractor is responsible to perform all grout testing in the field and shall notify the Department a minimum of 24 hours prior to grouting and grout testing in the field. The frequency of grout testing shall be as follows:

Strength Test
Precast Concrete Girders: One strength test per girder line
Cast-In-Place Girders: One strength test for every four longitudinal ducts

Bleed Test
At the beginning of each day's grouting operation, perform a wick induced bleed test in accordance with ASTM C940 and with modifications noted in Table 10.9.3-2 of the AASHTO LRFD Bridge Construction Specifications.

Fluidity Test
At the inlet and outlet, perform fluidity test in accordance with the standard ASTM C939 flow cone test or the modified ASTM C939 flow cone test.

Wet Density Test

Perform wet density test in accordance with American Petroleum Institute Mud Balance Test API Practice 13B-1 "Standard Procedures for Field Testing Water-Based Drilling Fluids".

300.5.9.10.12.6 Equipment

(1) Stressing

- Hydraulic jacks and pumps of sufficient capacity shall be used for tensioning of strands;
- The force induced in the prestressing strand shall be measured using calibrated jacking gauges, load cells or a calibrated dynamometer;
- The pressure gauge shall have an accurate reading dial at least 150 mm in diameter;
- The forces to be measured shall be within 25 and 75% of the total graduated capacity of the gauge, unless calibration data clearly establishes consistent accuracy over a wider range; and
- The measuring devices shall be calibrated at least once every six months. The jack and the gauge shall be calibrated as a unit. A certified calibration chart shall be kept with each gauge.

(2) Grouting

- A high speed shear mixer shall be used that is capable of continuous mechanical mixing and producing grout that is free of lumps and undispersed cement. The water supply to the mixer shall be measured by an accurate gauge;
- The holding tank shall be capable of keeping the mixed grout in continuous motion until it is used. The outlet to the pump shall have a screen with 3 mm maximum clear opening;
- A positive displacement type pump shall be used which is capable of producing an outlet pressure of at least 1.0 MPa. A pressure gauge having a full-scale reading of no greater than 2 MPa shall be placed at some point in the grout line between the pump outlet and the duct inlet. A spare fully functional pump shall also be on site;
- Standby flushing equipment with water supply shall be available at the site prior to commencing grouting;
- The grouting equipment shall be of sufficient capacity to ensure that grouting of the longest duct can be completed within 30 minutes after mixing; and
- Grout hoses and their rated pressure capacity shall be compatible with the pump output and the maximum grout pressure. All connections from the grout pump to the duct shall be airtight so that air cannot be drawn into the duct.

300.5.9.10.12.7 Construction

(1) Checking Post Tensioning Ducts

Prior to placing post-tensioning steel, the Contractor shall verify that all ducts are unobstructed.

(2) Welding

Welding of stressing tendons shall not be permitted. Stressing tendons shall not be used as an electrical “ground”. Where the ends of strands are welded together to form a tendon so that the tendon may be pulled through the ducts, the length of the strands used as an electrical “ground” or 1.0 m, whichever is greater, shall be cut off from the welded end prior to stressing.

(3) Tensioning

Post-tensioning shall be carried out as per the Detailed Designs and stressing calculations. The stressing and release of tendons shall be done in the sequence specified on the Detailed Designs. All strands in each tendon shall be stressed simultaneously with a multi-strand jack. The force in the tendons shall be measured by means of pressure gauge and shall be verified by means of tendon elongation. All tendons shall be tensioned to a preliminary force as necessary to eliminate any slack in the tensioning system before elongation readings are started. This preliminary force shall be between 15 and 25 percent of the final jacking force.

Stressing tails of post-tensioned tendons shall not be cut off until the record of gauge pressures and tendon elongations has been reviewed by a Professional Engineer. A record of the following post-tensioning operations shall be kept for each tendon installed:

- Project Name and File Number;
- Subcontractor;
- Tendon location and size;
- Date tendon installed;
- Tendon pack/heat number;
- Modulus of elasticity (E);
- Date stressed;
- Jack and gauge identifier;
- Required jacking force and gauge pressures;
- Elongation (anticipated and actual);
- Anchor set (anticipated and actual);
- Stressing sequence;
- Witnesses to stressing operation;
- Grout information (Brand Name);
- Time for grouting each tendon; and
- Date grouted.

(4) Concreting

The anchorage recesses shall be concreted after tensioning but before grouting the tendons.

The concrete surface of the anchorage recesses shall be abrasive blasted. The recesses shall be thoroughly wetted and covered with a thin cement paste coating immediately before placing fresh concrete.

(5) Grouting

All ducts or openings shall be clean and free of all deleterious matter that would impair bonding of the grout to the ducts and stressing steel. All ducts shall be thoroughly flushed out with water and blown out with compressed oil free air. All inlets and outlets shall be checked for their capacity to accept injection of grout by blowing compressed oil free air through the system.

A thoroughly mixed grout, meeting all the requirements described in Section 300.5.9.10.12.5 (5) (Grout) shall be passed through a screen with 3 mm maximum clear openings before entering the pump. All grout vents shall be opened prior to commencement of grouting. The duct shall be completely filled by injecting grout from the lowest end of the tendon in an uphill direction. Grout shall be pumped continuously through the duct until no visible signs of water or air are ejected at the outlet. A fully operational grout pump shall be on site for all pumping procedures. A continuous, one way flow of grout shall be maintained at a rate of 5 to 15 lineal metres of duct per minute. The grouting of a tendon shall be completed within 30 minutes of mixing of the grout.

The pumping pressure at the injection vent shall not exceed 1 MPa. If the actual pressure exceeds the maximum allowed, the injection vent shall be closed and the grout shall be injected at the next vent that has been or is ready to be closed as long as one-way flow is maintained. Grout shall not be injected into a succeeding vent from which grout has not yet flowed. A fluidity test shall be performed on each tendon from the discharge outlet. The measured grout efflux time shall not be faster than the efflux time measured at the inlet or the minimum efflux time established. If the grout efflux time is not acceptable, additional grout shall be discharged from the discharge outlet. Grout efflux time shall be tested. This cycle shall be continued until acceptable grout fluidity is achieved. To ensure the tendon remains filled with grout, the ejection and injection vents shall be closed in sequence, respectively under pressure when the tendon duct is completely filled with grout. Valves and caps are not to be removed until the grout has set.

Grouting will not be permitted when the air temperature is below 5°C or above 25°C, nor when there are other conditions that would be detrimental to the grouting operations.

The Contractor shall provide 50 mm deep grout tube termination recesses formed around the tubes projecting from top of the deck. After grouting, all tubes shall be cut flush with the bottom of the recesses, and the recesses shall then be grouted flush with the top of the deck.

300.5.9.10.13 Removal of Falsework and Site Clean-Up

Upon completion of the erection the Contractor shall remove all earth material or temporary supporting structures placed in the stream channel or elsewhere during construction. The Contractor shall remove all piling, excavated or surplus materials, rubbish and temporary buildings, replace or renew any damaged fences, and restore in an acceptable manner all property damaged during the execution of its work.

The Contractor shall leave the bridge site, roadway and adjacent property in a neat restored, and presentable condition, and when required, the Contractor shall provide the Department with written evidence that affected property owners or regulatory agencies have been satisfied.

300.5.10 CONSTRUCTION OF CSP AND SPCSP STRUCTURES

300.5.10.1 General

This section describes the requirements for the supply, fabrication, delivery and installation of Corrugated Steel Pipe and Structural Plate Corrugated Steel Pipe with an equivalent diameter of 1.5 m or greater.

Abbreviations for the various types of metal pipe are as follows:

- CSP — Corrugated Steel Pipe
- CSP Arch — Corrugated Steel Pipe Arch
- SPCSP — Structural Plate Corrugated Steel Pipe
- SPCSP Arch — Structural Plate Corrugated Steel Pipe Arch

300.5.10.2 Submissions

The following information shall be submitted to the Department by the Contractor by a date that is reasonable having regard to the design and construction process and in any event no later than 21 days after request by the Department, acting reasonably:

- Shop drawings (two copies); and
- Dates fabricated materials are to be shipped from the fabricating plant. This information shall be provided to the Department a minimum of two days prior to shipping.

300.5.10.3 Reference Drawings (attached in Appendix B)

Installation of Large Steel Pipes, Department Standard Drawing S-1418-03

300.5.10.4 Reference Tables (attached in Appendix B)

Details of Standard 2:1 Sloped End Sections for CSP Round Culverts	A
Details of Standard 2:1 Sloped End Sections for CSP Arch Culverts	B
Details of Standard 2:1 Sloped End Sections for SPCSP Round Culverts	C

300.5.10.5 Supply and Fabrication

300.5.10.5.1 Standards

The supply and fabrication of all galvanized, polymer coated and aluminum coated Corrugated Steel Pipe including couplers and appurtenances and Structural Plate Corrugated Steel Pipe shall be in accordance with the current edition of CSA Standard G401 with additions and exceptions as described in this Section 300.5.10 (Construction of CSP and SPCSP Structures).

300.5.10.5.2 Engineering Data

(1) Shop Drawings

Shop drawings for SPCSP structures and any non-standard materials (e.g. elbows, bottomless arch details, horizontal ellipses, etc.) as well as bevel end details shall be prepared.

(2) Plate Arrangement

The arrangement of the plates for SPCSP structures shall be shown on the shop drawings. The shop drawings shall also indicate that the bolts in the valley of each longitudinal seam are nearer to the visible edge of the plate than the bolts in the crest. With the exception of “change of radii” locations, all longitudinal seams shall be staggered a minimum of 2N.

300.5.10.5.3 Materials

Previously installed pipe shall not be used. All pipe supplied shall be clearly marked with the following information at intervals of not less than 3 m.

- Manufacturer's Name or Trade Mark;
- Nominal Thickness and Type of Metal;
- Plate/Metal Coating (for non-standard coating);
- Specification Designation;
- Plant Designation Code; and
- Date of Manufacture.

300.5.10.5.4 Fabrication

(1) Fabrication of CSP

(a) Sloped Ends
Sloped end sections are required for each culvert unless otherwise shown in the Detailed Designs. When 2:1 sloped end sections are specified, the Reference Tables A and B (see Section 300.5.10.4 (Reference Tables (attached in Appendix B))) will apply unless stated otherwise.

(b) Termination of Lockseams
On pipes 1.0m diameter or larger all lockseams terminating at the cut edges of a sloped or square end section shall have a 75mm length of fillet weld run along both sides of the lockseam (staggered 300mm apart) at each cut edge. The weld and surrounding area shall be zinc coated in accordance with CSA G401.

(c) Cut Ends
All cut edges of a sloped or square end section shall be made smooth by grinding so that all the burrs are removed. Any damaged protective coating shall be recoated with appropriate material in accordance with CSA G401.

(d) Recorrugated Ends
All corrugated steel pipes shall have ends recorrugated to provide annular corrugations for couplers.

(e) Couplers
Only annular corrugated couplers will be accepted unless specified otherwise. The couplers for pipes 1.6 m and over in diameter shall be a minimum of 600 mm width. There shall be a minimum of five bolts per coupler.

(2) Fabrication of SPCSP

(a) Sloped Ends
Sloped end sections are required for each culvert unless otherwise noted on the Detailed Designs. When 2:1 sloped end sections are specified, the Reference Table C (see Section 300.5.10.4 (Reference Tables (attached in Appendix B))) will apply unless stated otherwise.

300.5.10.5.5 Shop Inspection

(1) Inspection, Sampling, and Testing

All materials shall be subject to inspection by the Department. The Contractor shall provide safe, convenient access acceptable to the Department for inspection and sampling of the materials, and shall cooperate in the inspection and sampling process when requested to do so.

(2) Notification

The Contractor shall contact the Department prior to contemplated shipment. This is to facilitate inspection of the materials at the plant.

300.5.10.5.6 Storage of Material

(1) Storage Stains

In addition to CSA G401, SPCSP material is to be stored concave down. This requirement is to reduce the occurrence of storage stain damage on plates that are not going to be assembled immediately.

300.5.10.5.7 Handling of Material

All culvert material shall be handled carefully and in such manner as to prevent bruising, scaling or breaking of the galvanized coating. Culvert material shall also be handled and unloaded without undue stress and in such a manner that the radii or dimensions of the pipes remain true. Coupling bands shall be shipped with all necessary hardware and fittings attached thereto, or in suitable shipping containers. All SPCSP bolts are to be shipped with plates. Where the material supplied is damaged, the Contractor shall immediately separate nested sections of plate or pipe to facilitate more detailed inspection.

300.5.10.6 Installation

Metal pipes are flexible, and their resistance to deformation depends on careful bedding and backfilling. As they deflect under vertical load they must build up wide support and therefore, to obtain maximum load bearing capacity, it is essential that the material under and beside the pipe be of good quality, carefully placed and properly shaped and compacted as specified on the Detailed Designs. It is essential that the structure be kept dewatered to the bottom of the excavation until all backfilling is complete.

300.5.10.6.1 Bedding

Where the bottom of the excavation lies at 600 mm or less below the pipe invert the fill material shall be compacted by the Contractor to a minimum of 95% of Standard Proctor Density at optimum moisture content. Where the bottom of the excavation extends more than 600 mm below the pipe invert, the fill material shall be compacted at the 600 mm level to a minimum of 95% of Standard Proctor Density at optimum moisture content. The structural fill shall be placed in lifts not exceeding 150 mm when compacted. The Contractor shall use whatever materials, labour, equipment and incidentals are necessary to achieve a stable bed.

When foundation conditions are considered soft and unstable, the Contractor shall supply and place woven geotextile filter fabric at the base of the excavation between the clay seals as shown on Department Standard Drawing S-1418-93 (see Section 300.5.10.3 (Reference Drawings (attached in Appendix B))). The woven geotextile filter fabric shall be in accordance with the following table:

Woven Geotextile Filter Fabric	
Specifications and Physical Properties	
Grab Strength	1275N
Elongation (Failure)	15%
Puncture Strength	275 N
Burst Strength	3.6 MPa
Trapezoidal Tear	475 N
Minimum Fabric Lap to be 1.0 m	

The granular material within 150 mm of the bottom of pipe shall be placed in a loose uncompacted state. All other structural fill, including the clay seepage cutoffs, shall be compacted to a minimum of 95% of Standard Proctor Density at optimum moisture content.

The top of the bedding is that portion of the structural fill in contact with the bottom of the pipe and shall be constructed to the exact grade. Where camber is specified, the top of the bedding shall be constructed on a gradual crest curve with no sudden breaks in the grade. Where preshaping is specified, the top of the bedding shall be constructed to the exact curvature of the bottom plates. The top of the preshaping shall be 200 mm to 300 mm below the horizontal seam which joins the sidewall to the bottom plates, or as shown on the Detailed Designs.

300.5.10.6.2 Assembly

Assembly of CSP
CSP sections shall be laid so that the ends are in close contact. Couplers shall be well fitted and evenly tightened all around the pipe.

Assembly of SPCSP
SPCSP shall be assembled as shown on the drawings which will be provided by the pipe supplier and as outlined below:

(a) All bolted seams shall be properly lapped and plates shall be in contact for the full width and length of the lap. The bolts in the valley of each longitudinal seam shall be nearer to the visible edge of the plate than the bolts in the crest.

(b) After two complete rings have been loosely assembled, the vertical dimensions shall be checked and where necessary adjusted with horizontal cables and/or supports to obtain design rise dimensions.

(c) Each adjacent ring shall then be assembled and adjusted in a similar manner until the entire structure is loosely assembled and conforms to design geometry with nested plates.

(d) The vertical axis shall be upright and the longitudinal seams shall be straight. Rotation of the pipe and/or spiralling of the longitudinal seams shall not be permitted.

(e) Adjustments shall be made to produce design dimensions with fully nested laps. When horizontal tie cables are used for shape adjustment, adequate means shall be taken to ensure distribution of concentrated forces at the pipe walls. Distortion of the pipe side walls at the cable points will not be tolerated.

(f) Unless otherwise indicated by the manufacturer's specifications, bolts shall be torqued to not less than 200 Nm and not more than 340 Nm. This includes bolts which connect special features to the pipe.

(g) Distortion of bolt holes caused by over-torquing, or poor assembly methods will not be permitted. Where additional holes are required they shall be drilled. Torch cutting of holes or welding on the pipe will not be permitted.

(h) The shape of the pipe shall be maintained within two percent of design dimensions. This includes the rise, the span, and any chords or chord offsets.

300.5.10.6.3 Backfilling

When the assembly of the structure has been completed, backfilling with granular and or non-granular materials as specified on the Detailed Designs may proceed. In addition, the requirements set out in the four paragraphs below shall be met.

When the air temperature is below $0^{o}C$, no backfilling is allowed. All backfill materials shall be in a thawed state when placed and compacted. No backfill material will be permitted to be placed on frozen substrate.

The backfilling under the haunches shall be compacted in thin layers filling all corrugations and ensuring firm contact with the entire bottom surface of the pipe.

The backfilling shall fill each corrugation, be free of voids and provide uniform support to the pipe. The backfill shall be placed such that the level of fill on one side of the pipe does not exceed the level of fill on the other side of the pipe by more than 300 mm.

The Contractor shall supply suitable material for the compacted non-granular backfill. Generally the material shall consist of clay or till materials. Highly plastic clay material or material with a high silt content will not be permitted.

300.5.10.6.4 Strutting for Composite Concrete/SPCSP Structure

For composite concrete/SPCSP structures strutting and scaffolding shall be supplied and installed as shown on the Detailed Designs.

300.5.10.7 Concrete Work

Where detailed and specified, concrete work shall be constructed as shown on the Detailed Designs and in accordance with the relevant sections of Section 300.5 (Bridge Structures):

- Section 300.5.7 - Cast-In-Place Concrete
- Section 300.5.14 - Reinforcing Steel

300.5.10.8 Fish Baffles

Fish baffles shall be constructed as shown in the Detailed Designs.

300.5.10.9 Rock Riprap

Rock riprap shall be placed as shown in the Detailed Designs.

300.5.11 MECHANICALLY STABILIZED EARTH WALLS

300.5.11.1 General

This specification is for the design, supply, fabrication and construction of mechanically stabilized earth ("**MSE**") retaining walls with precast concrete facing panels. MSE retaining walls shall include, but not be limited to, excavation for the wall, concrete levelling pads, precast concrete panels, compacted granular backfill, soil reinforcement, perforated drain pipe complete with filter fabric sock, surface drains, cast-in-place concrete wall coping, traffic barrier, pedestrian railing, permanent safety railing, hardware and all associated materials.

MSE retaining walls shall be designed and constructed in accordance with the drawings and the provisions contained herein.

300.5.11.2 Design

300.5.11.2.1 Design Requirements

The design shall include location, layout, geometry control, global stability and allowable foundation bearing capacity, stability and all elements for a complete MSE wall system.

The most stringent requirements of the most current version of the following standards shall be met:

- Canadian Highway Bridge Design Code (CSA Standard CAN/ CSA-S6-06);

- AASHTO LRFD Bridge Design Specifications;
- Alberta Transportation Roadside Design Guide Section H7.6.

The design life for all MSE wall components shall be 100 years.
Highway and bridge surface drainage shall be controlled and channelled away from the back of the MSE walls and mechanically stabilized earth mass.

Weeping drains consisting of perforated 150 mm diameter pipe complete with filter sock shall be provided near the front and the back bottom corners of the mechanically stabilized earth mass. The weeping drains shall be day lighted or connected for positive drainage. A water level within the mechanically stabilized earth mass shall be assumed to be at the invert level of the weeping drains or higher should the design warrant it.

MSE walls with traffic running parallel to the top of the wall shall have rigid bridge barriers meeting the requirements of CAN/CSA-S6-06 section 12. Such bridge barriers shall be located on top of the MSE walls and supported on a moment slab to resist sliding and overturning. Flexible guardrail systems shall not be used. All obstacles, such as sign supports and lighting posts, mounted on top of the barriers shall meet set-back and clearance requirements specified in Alberta Transportation’s *Roadside Design Guide.* The MSE wall design shall account for all load effects from such accessories.

Water carrying appurtenances, such as catch basins, drainage inlets/outlets, culverts etc., shall be placed away from the end of the soil reinforcement zone, and provisions shall be made to mitigate the detrimental effects of potential leakage.

Obstructions, such as foundation piles and associated casings, or such as casings for future pile installations in the soil reinforcement zone, shall be accommodated with appropriate arrangement of soil reinforcing around such obstructions. For those MSE wall systems that lend themselves to splaying of the soil reinforcement, the splay angle shall not exceed 20° from the perpendicular of the facing panel. For other MSE wall systems, coverage ratios of soil reinforcement shall be specifically developed for each wall location within the Project.

Barriers required at the top of all retaining walls may be mounted on top of MSE wall coping, with all design forces and movements accounted for in accordance with CAN/CSA-S6-06.

Minimum precast concrete panel thickness shall be 140 mm, excluding any additional thickness required for aesthetic surface treatment. Minimum cover to reinforcing steel shall be 50 mm on both front and back faces of the panels.

Precast concrete panels shall be designed to accommodate a differential settlement of 100 mm in 10 metres of length along the wall. The spacing between adjacent panels shall be designed to be 20 mm nominal.

Joints between panels should have a lip and recess (ship lap) configuration so that joint material is protected and overall aesthetics is enhanced. Butt joints may be considered if the Contractor can provide a backing board with sufficient strength and durability to meet the 100 year design life requirement.

Acute corners less than 70° inside panels shall not be allowed.

Special corner units shall be used when interior angle between adjacent panels is 130° or less.

The top of the cast-in-place concrete wall coping shall be smooth and have no steps or abrupt changes in height.

MSE wall panels shall be fully supported by compacted backfill without voids on the non-exposed side.

For stepped levelling pads, the maximum elevation difference between adjacent steps shall not exceed 750 mm. The minimum length of each stepped section shall be 2250 mm.

Where staged construction is required and large differential settlement is expected between stages, appropriately located full height vertical slip joints shall be provided.

300.5.11.2.2 Submissions

The following information shall be submitted to the Department by a date that is reasonable having regard to design and construction process and in any event no later than seven days after request by the Department, acting reasonably:

a) Design notes shall be presented in a legible and logical format, and shall be sufficiently detailed to allow a technical review of design concepts and assumptions used in the design. Where necessary, the design package shall be accompanied by properties of materials used together with the appropriate test certificates.

b) Shop drawings shall be legible and of adequate quality to be reproduced and microfilmed. As a minimum, shop drawings shall contain:

- The Department bridge file number and project name on each drawing.
- Design criteria and materials lists.
- Wall layout plan and elevation complete with dimensions and elevations, and typical wall cross-sections.
- All component and connection details.
- Site drainage and drainage details.

The Contractor shall incorporate as-built conditions and re-submit the revised design notes and shop drawings for records at the completion of construction.

300.5.11.3 Materials

300.5.11.3.1 Concrete Materials

The fabrication of precast concrete panels shall conform to the requirements of Section 300.5.9 (Precast Concrete Units). Any panel with crack exceeding 0.15 mm in width or 0.1 mm/m2 (of panel area) in length shall be rejected. The concrete for the panels shall be Class HPC, conforming to the requirements of Section 300.5.7.5 (Class and Composition of Concrete), with the exception that maximum aggregate size shall be 14 mm. The concrete levelling pads and the MSE wall coping shall conform to the requirements of Section 300.5.7 (Cast-In-Place Concrete). The concrete for the levelling pads shall be Class B and the concrete for the wall coping shall be Class HPC. Chamfered edges shall be created around the periphery of all precast facing panels. The exposed faces of the precast panels and the cast-in-place wall coping shall have a Class 3 finish.

300.5.11.3.2 Concrete Reinforcing Materials

Reinforcing steel is to be in accordance with Section 300.5.6.1.8 (Reinforcing Steel). Reinforcing steel shall conform to CAN/CSA G30.18 Grade 400 deformed billet steel bars and be epoxy coated.

300.5.11.3.3 Soil Reinforcing Materials

Steel reinforcement shall be galvanized in accordance with ASTM Standards A123/A123M-02 and A153/A153M-04. The minimum coating thickness shall be determined by the Contractor to meet the 100 year design life or the minimum coating thicknesses specified in ASTM Standards A123/A123M-02 and A153/A153M-04, whichever minimum is greater. Geosynthetic reinforcements shall meet AASHTO LRFD Bridge Design Specifications Clause 11.10.6.4.3b. The requirements “for applications involving severe consequences of poor performance or failure” shall apply. Product specific durability studies shall be carried out to determine the product-specific long term strength reduction factor (RF). These studies shall be used to estimate the short term and long term effects of the environment factors on the strength and deformational characteristics of the geosynthetic reinforcement throughout the specified design life.

Geosynthetic reinforcing materials shall satisfy the requirements of the following tests:

- GG 1-87 “Standard Test Method for Geogrid Rib Tensile Strength”
- GG 2-87 “Standard Test Method for Geogrid Rib Junction Strength”
- GG 3-90 “Standard Test Method for Tensile Creep Testing of Geogrids”
- GG4-05 “Standard Practice for Determination of the Long Term Creep Design Strengths of Geogrids”

Geosynthetic reinforcing materials shall contain stabilizers or inhibitors to prevent degradation of properties due to ultraviolet light exposure.

300.5.11.3.4 Safety Rail Materials

Safety Rail shall be fabricated in accordance with Section 300.5.8 (Structural Steel).

300.5.11.3.5 Backfill Materials

The structural backfill shall be "Crushed Aggregate Material" meeting the requirements of the following table:

Designation/Class

Metric Sieve Size (CGSB 8-GP-2M)	Crushed Aggregate Material Des 2 Class 20	Crushed Aggregate Material Des 2 Class 25	Crushed Aggregate Material Des 2 Class 40
Sieve Size µm	**Percent Passing**	**Percent Passing**	**Percent Passing**
125 000			
80 000			
50 000			
40 000			100
25 000		100	70 - 94
20 000	100	82 - 97	
16 000	84 - 94	70 - 94	55 - 85
10 000	63 - 86	52 - 79	44 - 74
5 000	40 - 67	35 - 64	32 - 62
1 250	22 - 43	18 - 43	17 - 43
630	14 - 34	12 - 34	12 - 34
315	9 - 26	8 - 26	8 - 26
160	5 - 18	5 - 18	5 -18
80	2 - 10	2 - 10	2 - 10
% fractures by weight (2 faces)	60+	60+	50+
Plasticity Index		NP - 6	NP - 6
L.A. Abrasion Loss Percent Maximum		50	50

*Note: The backfill designation type shall be chosen by the Contractor's Engineer for wall design based on expected performance of geosynthetic reinforcement.

The physical properties of the structural granular backfill material selected by the Contractor's Engineer for wall design shall be used by the MSE wall supplier in the design of the MSE walls. The selected structural granular backfill material shall also meet the following electrochemical parameters:

REQUIREMENTS FOR STEEL REINFORCING

Resistivity	≥ 3000 ohm-cm
pH	5 - 10
Chlorides	≤ 100 ppm
Sulphates	≤ 200 ppm
Organic Content	≤ 0.1%

REQUIREMENTS FOR GEOSYNTHETIC REINFORCING

pH	2 - 12
Organic Content	≤ 0.1%
Design Temperature at the Wall Site	≤ 30^{o}C

In no case shall any backfill material placed within 2.0 m of the face panels have more than 5% passing the 0.75 mm sieve size.

300.5.11.3.6 Sealer Materials

Sealer shall be applied to the exposed concrete surfaces of the precast concrete panels and the cast-in-place wall coping in accordance with Section 300.5.7.17 (Sealer).

300.5.11.3.7 Geotextile Filter Fabric

Woven geotextile filter fabric shall be in accordance with the following table of minimum average roll value properties:

Non-Woven Geotextile Filter Fabric	
Specifications and Physical Properties	
Grab Strength	650 N
Elongation (Failure)	50%
Puncture Strength	275 N
Burst Strength	2.1 MPa
Trapezoidal Tear	250 N

Minimum Fabric Lap to be 300 mm

300.5.11.4 Construction

The Contractor shall employ qualified personnel experienced in constructing MSE walls to complete this work. The MSE wall shall be installed in accordance with the supplier's recommendations. The supplier of the MSE wall system shall provide a qualified representative on site to advise the wall erection crew regarding construction procedures. The representative shall be present for a minimum of 25% of the time throughout all phases of MSE wall construction as determined by the wall supplier.

The construction of the MSE wall system shall conform to the details on the shop drawings.

300.5.11.4.1 Conformance Criteria

The Contractor shall provide formalized documentation, sealed and signed by the Contractor's Engineer that is responsible for each of the following construction phases, and prior to commencement of each subsequent construction activity:

- Foundation base preparation
- On-site delivery of all components
- Alignment of precast wall panels as per contract requirements
- Backfill material gradations and compaction requirements

Upon completion of the MSE wall installation, the Contractor shall submit documentation that states that the materials and work have been supplied and installed in general conformance with the Engineer stamped and sealed "for construction" drawings and the Technical Requirements.

300.5.11.4.2 Excavation

Excavation shall be done to establish grades to within reasonably close conformity to the design grades and limits shown on the drawings and shop drawings. The foundation subgrade shall be proof rolled to identify any soft spots. Soft material shall be removed and replaced with compacted granular material to the satisfaction of the design engineer.

300.5.11.4.3 Backfill

Backfill placement shall closely follow erection of each course of panels. Backfill shall be placed in such a manner as to avoid any damage or disturbances of the wall materials or misalignment of the face panels. All wall materials that are damaged during backfill placement shall be removed and replaced at the Contractor's expense. Any misalignment or distortion of the face panels due to placement of backfill shall be corrected by the Contractor at the Contractor's expense.

A minimum 300 mm wide strip of filter fabric shall be installed behind all face panel joints. An adhesive shall be used to hold the fabric securely against the panels.

No equipment shall be allowed to run directly on the soil reinforcement. Backfill compaction shall be performed in such a manner that the compactor shall move in a direction parallel to the wall panels and work toward the end of the soil reinforcement away from the wall facing. Only hand operated power tampers and vibrators shall be used for compaction within 750 mm of the wall panels. At the completion of each day’s work the Contractor shall slope the last level of backfill material away from the wall panels, so as to direct potential run-off away from the wall face. In addition, the Contractor shall not permit any surface runoff from adjacent areas to enter the wall construction site.

300.5.11.4.4 Precast Panel Tolerance

Precast concrete panel manufacturing tolerances shall be as described in CSA A23.4. The tolerances after installation shall be:

1. The out-of-flatness of wall surfaces measured in any direction shall not exceed 10 mm/m.
2. The offset of adjacent panel edges at joints shall not exceed 10 mm.
3. The variation of the nominal joint gap width shall not exceed 1.5 mm/m at any location.
4. The overall out-of-vertical alignment of the completed wall (from top to bottom) shall not exceed 13 mm/ for any 3 m section of wall height.

Should any sections of the wall system or any individual panels be out of tolerance, the backfill shall be removed and the panels reset to the proper tolerance.

To facilitate construction of the cast-in-place concrete coping, nominal-sized, pre-formed holes in the top row of precast panels are permitted providing the holes are located a minimum 100 mm above the underside of the coping.

300.5.11.4.5 Precast Panel Storage

Precast concrete panels shall be stacked on timber planks or pallets and separated by timber blocks. Soil reinforcing material and connectors shall be stored clear of the ground. All materials shall be covered and protected from rain, snow, dirt and ultraviolet light. The precast panels shall be stored such that the uniform color of the panels is maintained and protected from staining or discoloration.

300.5.12 SIGN STRUCTURES

300.5.12.1 General

This Section 300.5.12 (Sign Structures) is for the design, supply, fabrication, erection and all associated work pertaining to overhead and cantilevered sign structures and panels.

300.5.12.2 Submissions

The following information shall be submitted to the Department by a date that is reasonable having regard to the design and construction process and in any event no later than 21 days after request by the Department, acting reasonably:

- Shop drawings (two copies);
- Welding procedures for all welds;
- Proposed fabrication sequence and schedules. The Department shall be notified a minimum of two days prior to a component being ready for inspection at an inspection station;
- Mill certificates for all material;
- Repair procedures for unsatisfactory weldments and accidental arc strikes, if required;
- Product data sheets for coatings required between galvanized steel and concrete;
- Repair procedures for galvanizing, if required;
- The results of seam weld testing; and
- Method for forming and placing of grout.

300.5.12.3 Reference Drawings (attached in Appendix B)

Sign Structure Steel Identification Plaque, Department Standard Drawing S-1682-02

300.5.12.4 Engineering Data

(1) Shop Drawings

The shop drawings shall be legible and of adequate quality to be reproduced and microfilmed. All shop drawings shall be done on standard 11 x 17 or 22 x 34 sheet sizes. The shop drawings shall include the following:

(a) The Department's Bridge File numbers, A-Ident numbers and project title, as provided by the Department, shall be shown on all the shop drawings.

(b) Design criteria for each individual sign structure, including:
- AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 4th Edition and 2002 Interims;
- Initial sign panel area and/or minimum design sign panel areas;
- Design wind pressure;
- Fatigue category and fatigue loadings;
- Design ice thickness;
- Other dead loads;
- Design temperature range;
- Foundation soils parameters; and
- Critical anchor bolt forces.

(c) Each individual shop fabricated section or assembly shall be shown separately with complete and clearly identified welded or bolted details.

(d) Weld procedure identification shall be shown on the shop drawings in the tail of the weld symbols.

(e) All material splice locations shall be shown on the shop drawings.

(f) Complete material list.

(g) Erection procedure including tensioning procedure for anchor bolts.

300.5.12.5 Supply and Fabrication

300.5.12.5.1 Standards

Fabrication of sign structures shall conform to the *AASHTO Standard Specifications for Highway Bridges* and the *American Welding Society* ("**AWS**") - *Bridge Welding Code, D1.5*.

Where imperial/metric conversions are necessary, The National Standard of Canada, CAN 3-Z234.1-79 shall be used as the basis of conversion.

All welding, cutting and preparation shall be in accordance with the American Welding Society ("**AWS**") - *Bridge Welding Code*, *D1.5,* and D1.1.

300.5.12.5.2 Qualification

The Contractor, or its subcontractor, shall operate a recognized steel fabricating shop and be fully approved by the CWB as per CSA W47.1 in Divisions 1 or 2.

Only welders, welding operators and tackers approved by the Canadian Welding Bureau in the particular category shall be permitted to perform weldments. Their qualifications shall be current and available for review by the Department.

300.5.12.5.3 Engineering Data

(1) Welding Procedures

Welding procedures shall be prepared for each type of weld used in the structure. The procedures shall bear the approval of the Canadian Welding Bureau.

(2) Proposed Fabrication Sequence

Prior to commencement of fabrication, the Contractor shall prepare an outline of the fabrication sequence that clearly describes the order of make-up and assembly of all the component parts, as well as shop assembly and inspection stations.

(3) Mill Certificates

Mill certificates shall be obtained for all material before fabrication commences.

(4) Schedules

The Contractor shall prepare and keep current a complete fabrication schedule.

300.5.12.5.4 Materials

(a) All materials shall be new.
(b) The use of aluminum is not acceptable.
(c) Structural steel plate material shall conform to CSA -G40.21M 300W (*Silicon content less than 0.04% for the shafts, whereas for flanges and base plates the silicon content shall be either less than 0.04% or between 0.15% to 0.25%.)*.
(d) All bolts, nuts and washers shall conform to ASTM A325 or shall meet property class 8.8 of the Industrial Fasteners Institute for metric high strength structural bolts, nuts and washers. Certified mill test reports for the fastener material shall be obtained.

Anchor bolts shall be fabricated from DYWIDAG thread bars conforming to the requirements of CSA G279.

All steel materials including all hardware and anchor bolts shall be hot–dip galvanized.

300.5.12.5.5 Welding

(1) Filler Metals

Low hydrogen filler, fluxes and low hydrogen welding practices shall be used throughout. The low hydrogen covering and flux shall be protected and stored as specified by AWS D1.5. Flux cored welding or use of cored filler wires in the submerged arc process or shielding gas processes are not considered as conforming to low hydrogen practice. These methods will not be permitted. However, metal core welding process utilizing low hydrogen electrodes with AWS designation of H4 will be allowed. The deposited weld metal shall provide strength, durability, impact toughness and corrosion resistance equivalent to base metal.

(2) Cleaning Prior to Welding

Weld areas must be clean, free of mill scale, dirt, grease, and other contaminants prior to welding.

(3) Longitudinal Seams

All longitudinal seams shall be made by a semi or fully automatic submerged arc or metal core welding process.

(4) Weld Penetration

The full penetration welds shall be completed using properly fitted backing bars or backgouged to sound metal. The longitudinal seams shall have a minimum 60% penetration; however if a backing bar is used for the longitudinal seam, the weld penetration shall be 90%. The following welds shall have 100% penetration:

(a) Column to base plate.
(b) Member to flange plate.
(c) Flange plate to gusset plate.
(d) Longitudinal seam welds within 150 mm of circumferential welds and 150 mm beyond hand holes (when provided) shall be full penetration groove welds. The transitions between full and partial penetration welds shall be ground smooth.
(e) Backing bar splices.

The backing bars for full penetration welds shall be properly fitted and the member prepared to a sharp edged 45° chamfer. The groove weld shall be placed in a minimum of two passes by using 100°C of preheat (unless higher preheat is required as per AWS-D1.5) and maintain a root opening of 5 mm. A rod size no greater than 4.0 mm shall be used for the first pass. A reinforcing fillet weld shall be placed all around the joint.

(5) Tack and Temporary Welds

Tack and temporary welds shall not be allowed unless they are to be incorporated in the final weld. Tack welds, where allowed, shall be of a minimum length of four times the nominal size of the weld, and shall be subject to the same quality requirements as the final welds. Cracked tack welds shall be completely removed prior to welding over.

(6) Run-off Tabs

Run-off tabs shall be used at the ends of all welds that terminate at the edge of a member. The tabs shall be a minimum of 100mm long unless greater length is required for satisfactory work. They shall be tack welded only to that portion of the material that will not remain a part of the structure, or where the tack will be welded over and fused into the final joint. After welding, the tabs are to be removed by flame cutting, not by breaking off.

(7) Methods of Weldment Repair

Repair procedures for unsatisfactory weldments shall be prepared by a Professional Engineer experienced in welding prior to repair work commencing.

(8) Arc Strikes

Arc strikes will not be permitted. In the event of accidental arc strikes, the Contractor shall have a repair procedure prepared by a Professional Engineer. The repair procedure shall include the complete grinding out of the crater produced by the arc strike.

(9) Plug and Slot Welds

Plug welds or slot welds shall not be permitted.

300.5.12.5.6 Fabrication

Fabrication shall be performed in an enclosed area which is adequately heated. The shop temperature shall be at least 10°C. Field welding will not be allowed.

(1) Cutting of Plate

All plate material for main members and any plate material welded to the main member shall be flame cut using an automatic cutting machine. Shearing is not allowed.

Corners of plates and structural sections shall be ground to a 1mm chamfer.

(2) Additional Requirements

(a) Each column, arm, extension, clamp and bracket shall be fabricated from one piece of sheet steel.
(b) Intermediate circumferential butt welds will not be allowed, however horizontal members greater than 12 m span may have a bolted splice.
(c) Columns, arms, extensions and clamps shall be brake press formed or roll formed. The brake press knife shall have a radius suitable for the thickness of the material and nature of the bend.
(d) All plate edges shall be free of notches and gouges.
(e) The depth or projection of any imperfections on the inner or outer surfaces shall not exceed 15% of wall thickness. Any depth or projection up to 33% of wall thickness may be repaired by welding. Any excessive projecting weld metal shall be removed.
(f) The diameter of bolt holes in base plates shall be 10 mm larger than the bolt diameter.
(g) Punching of full size holes will not be permitted. The holes shall be circular and perpendicular to the member and shall be deburred to ensure a proper faying surface.
(h) Hand holes with cover plates are required on the top and bottom of columns of illuminated sign structures.
(i) Hand hole (when required) shall be stiffened by providing a reinforcing rim with semi-circular ends. The rim shall be welded to the member with a full penetration groove weld supplemented with an all around fillet weld.
(j) Only low stress stamps shall be used for identification marks. The stamps and specific location shall be shown on the shop drawings.
(k) Stiffeners are not allowed on column to base plate and member to flange plate connections.

(3) Dimensional Tolerances

All fabrication shall meet the tolerances described below:

(a) Straightness
The straightness of any item shall not exceed the overall length divided by 300 from the surface at any point. This shall be measured with a straight line joining the surface at both ends. The difference between the straight line and the surface shall then be measured to determine the straightness.

(b) Twisting
The twist in the overall length of any column, arm, or extension shall not exceed 7°.

(c) Length
The specified length of any item shall be within 0 to 60 mm or -0 to +5% (whichever is less) with the exception of sign bridge spans which shall be within 5 mm of the specified dimensions in the unloaded condition. The tolerance for height shall be –0 to +60 mm.

(d) Across the Flat Dimensions
The average of all across the flats dimensions from a given cross section shall be within 1% of the specified dimension. In addition, the ratio of the maximum to minimum across the flats dimensions shall be less than or equal to 1.05.

(e) Tolerance for Flatness of Base Plates and Flange Plates
Surfaces of column base plates shall be flat to within 3 mm tolerance in 305 mm, and to within 5 mm tolerance overall. Faying surfaces of flange plates shall be flat to within 2 mm tolerance overall.

(f) Arm Rise
Arm rises apply to unloaded structure in the standing position.

(4) Pre-Assembly

After welding and fabrication but prior to galvanizing, the Contractor shall pre-assemble all structures complete with sign clamps to check the fit and geometry. Pre-assembled structures may be inspected by the Department.

The structures shall then be disassembled for galvanizing.

(5) Galvanizing

Galvanizing shall be by the hot dip method, after fabrication, in accordance with the current edition of CSA Standard G164 with additions and exceptions as described in this Section 300.5.12 (Sign Structures). The Contractor shall provide a smooth finish on all edges and surfaces, and remove all weld spatter and all welding flux residue from the steel components prior to galvanizing. Lumps, globules or heavy deposits of zinc will not be permitted. All threaded holes or threaded couplings shall be retapped after galvanizing.

Repair of galvanizing shall only be done if bare areas are infrequent, small, and suitable for repair. A detailed repair procedure shall be prepared by a Professional Engineer. It should be noted that repairs may require complete removal of the galvanized coating and regalvanizing. Repair shall be in compliance with ASTM A 780, Method A3 Metallizing. The thickness of the metallizing shall be 180 µm, and the repair tested for adhesion. The finished appearance shall be similar to the adjacent galvanizing.

(6) Base Plate Corrosion Protection

The bottom face of each base plate shall be protected by a medium grey colour barrier, to prevent contact between the zinc and the grout. The galvanized surface must be roughened prior to application of barrier coating. The surface preparation of the galvanized surface and the dry film thickness ("**DFT**") of the coating shall be in accordance with the coating manufacturer's recommendations. The Contractor shall test the adhesion of fully cured coating as per ASTM D3359. The method selected for testing (Method A or B) shall depend on the dry film thickness of the coating. The coating manufacturer's product data sheets shall be obtained prior to the application of the coating. The adhesion test result shall meet a minimum of "4B" classification, i.e. a maximum allowable flaking of 5%.

300.5.12.5.7 Testing and Inspection

(1) Access

The Contractor shall provide full facilities for the auditing of material and workmanship. Free access shall be allowed to the Department to all parts of the works. When required by the Department, the Contractor shall provide needed manpower for assistance in inspection duties.

(2) Testing by the Contractor

The Contractor shall provide quality control throughout the course of fabrication. All test records made by the fabricating shop in the course of normal quality control shall be open to the Department for inspection.

All welds shall be visually inspected by an independent welding inspector certified to Level 3 of CSA W178.2.

The Contractor shall arrange to have all full penetration welds inspected either by ultrasonic testing or radiographic inspection methods. Partial penetration seam welds shall be inspected by ultrasonic testing. The frequency of partial penetration weld inspections shall be three random locations per weld and the length of weld for ultrasonic inspection at each location shall be 200 mm. Calibration blocks for each thickness shall be prepared for ultrasonic testing to establish sensitivity levels and acceptance criteria. The Non-Destructive Testing shall be done by a company certified to CAN/CSA W178.1. Ultrasonic and radiographic testing technicians shall be certified to Level II of CGSB.

(3) Testing by the Department

The Department may perform visual, radiographic, ultrasonic, magnetic particle and any other testing that may be required at its own expense.

(4) Inspection Station

To ensure that each stage of inspection is performed in an orderly manner, during the fabrication, inspection stations will be set up at specific points. Certain items of the work will then be checked, and deficiencies shall be corrected, prior to the work being sent to the next stage of fabrication. These check points shall be determined by the Contractor prior to commencement of fabrication.

(5) Non-destructive Methods of Examination

The methods of non-destructive examination shall be in accordance with the following standards:

- Radiography - AWS D1.5;
- Ultrasonic - AWS D1.5; and
- Magnetic Particle - ASTM E-709.

(6) Inspection Schedule

All welds will be visually inspected.

Ultrasonic inspection will be performed on full penetration welds.

300.5.12.5.8 Identification Tag

The Contractor shall supply and install an identification tag on one column of each structure at 2.4 m above base plate. The column shall be drilled and tapped for 2-10 mm diameter attachment bolts. The identification tag shall be fabricated as per Department Standard Drawing S-1682-02 (see Appendix B).

300.5.12.6 Erection

All product damaged in shipping shall be replaced.

The Contractor shall not erect the structural steel until the substructure concrete has been cured a minimum of three days and achieved 80% of the 28-day specified concrete strength requirement.

All components shall be handled with care to prevent stress to the components through bending or twisting. The use of steel chains as slings shall not be permitted. Any damage to the components through overstress, scratching or denting shall be repaired or replaced.

The structure shall be set accurately on galvanized shim plates. The shim plates must be located so that a minimum of 75 mm grout coverage is provided from shims to grout edge. The method of forming or pouring the grout shall be documented. Dry-pack methods of constructing grout pads will not be allowed.

Hand hole bolts shall be coated with anti-seize lubricant.

(1) High-Tensile-Strength Bolted Connections

Bolted parts shall fit solidly together when assembled. Contact surfaces shall be free of dirt, grease, burrs, pits and other defects that would prevent solid seating of the parts. Connections shall be assembled with a hardened washer under the bolt head or nut, whichever is the element turned in tightening. Surfaces of bolted parts in contact with the bolt head and nut shall be parallel.

(2) Bolt Tension

All structural bolts shall be tightened by using turn-of-nut method to provide bolt tension specified in Table 1 set out at the end of this Section 300.5.12.6 (Erection). There shall first be enough bolts brought to a "snug tight" condition to ensure that the parts of the joint are brought into full contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remaining holes in the connection and brought to snug tightness. All bolts in the joint shall then be tightened additionally by the applicable amount of nut rotation specified below, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

Amount of rotation of nut relative to bolt, regardless of which is turned:

- 1/3 turn where bolt length is 4 bolt diameters or less;
- 1/2 turn where bolt length is over 4 bolt diameters and not exceeding 8 bolt diameters; and
- 2/3 turn where bolt length exceeds 8 bolt diameters.

<u>Notes</u>

- o tolerance 1/6 turn (60^{o}) over, nothing under; and
- o length of bolt measured from underside of head.

Table 1 - BOLT TENSION

Specified Bolt Size (A325M Bolts)	Minimum Bolt Tension		Commonly Supplied Equivalent Imperial Size (A325 Bolts)	Minimum Bolt Tension	
	Kilonewtons	pounds-force		Kilonewtons	pounds-force
M16X2	94	21,180	5/8	85	19,200
M20X2.5	147	33,050	3/4	126	28,400
M22X2.5	181	40,700	7/8	175	39,250
M24X3	212	47,660	1	227	51,500
- -	- -	- -	1 1/8	251	56,450
M30X3.5	337	75,760	1 1/4	319	71,700

- -	- -	- -	1 3/8	380	85,450
M36X4	490	110,160	1 1/2	463	104,000

300.5.12.7 Foundation

Where detailed and specified, concrete work shall be constructed as shown on the Detailed Designs and in accordance with the relevant sections of Section 300.5 (Bridge Structures):

Section 300.5.7 - Cast-In-Place Concrete
Section 300.5.13 - Piling
Section 300.5.14 - Reinforcing Steel

(1) Material

All reinforcing steel shall conform to CSA G30.18-M92 Grade 400.
All concrete shall be Class C – 35 MPa, with Type HS sulphate resistance cement.

(2) Anchor Bolt Installation

Anchor bolt assemblies shall be supplied and installed in one complete assembly and consist of, but not be limited to, anchor bolts, complete with plate washers, full length sleeves filled with corrosion inhibiting paste, top temporary templates, bottom anchor plates, bottom anchor nuts, thin clamping nuts, and all necessary hardware for post-tensioning and future de-tensioning. No welding of any component is allowed. Anchor bolts shall be true and plumb. Anchor bolts shall be post-tensioned to 70% of the ultimate strength after the grout pads have attained design strength. The top anchor nuts shall have plastic caps, and all voids including annular space in the base plate shall be filled with corrosion inhibiting paste. Sufficient anchor bolt projection shall remain for future work. All post-tensioning work and materials shall meet the requirements of Chapter 3 - Specifications of the PTI Post-Tensioning Manual.

(3) Grout Pockets and Grout Pads

The Contractor shall fill the grout pockets and construct the grout pads using Sika 212 flowable grout or equivalent. Filling of grout pockets and construction of grout pads shall be done by workers competent in this work. The grout pocket shall be 25 mm deep and the total grout thickness shall not be less than 75 mm.

Grout shall be packaged in waterproof containers with the production date and shelf life of the material shown. It shall be mixed, placed, and cured in strict accordance with the manufacturer's recommendations.

The method of forming and pouring the grout shall be documented. Dry-pack methods of constructing grout pads will not be allowed.

(4) Grouting in Cold Weather

When the daily minimum air temperature, or the temperature of the girders, bearings or substructure concrete, in the immediate area of the grouting, falls below 5°C, the following provisions for cold weather grouting shall be affected:

(a) Before grouting, adequate preheat shall be provided to raise the temperature of the substructure concrete to at least 10°C.
(b) Temperature of the grout during placing shall be between 10°C and 25°C.
(c) The grout pads shall be enclosed and kept at 10°C to 25°C for at least five days. The system of heating shall be designed to prevent excessive drying-out of the grout.

(5) Clean-Up

All steel shall be left clean and free of oil, grease, mud, dust, road spray or other foreign matter.

300.5.13 PILING

300.5.13.1 General

This Section 300.5.13 (Piling) is for the supply and installation of steel H-piles, plain and galvanized steel pipe piles, precast concrete piles, and cast-in-place concrete piles. It includes driven bearing piles, drilled cast-in-place concrete bearing piles, and drilled cast-in-place concrete/steel pipe composite bearing piles.

300.5.13.2 Submittals

The following information shall be submitted to the Department by a date that is reasonable having regard to the design and construction process and in any event no later than 21 days after request by the Department, acting reasonably:

- Mill certificates for piling
- Pile driving equipment and procedures to be used for the installation of driven piles; and
- Pile drilling equipment and procedures to be used for the installation of drilled piles.
- Non-destructive testing results for steel pile splices.

300.5.13.3 Reference Drawings (attached in Appendix B)

- Standard Pipe Pile Splice - S-1414-87
- Standard H-Pile Splice - S-1415-87
- Standard Closed Pipe Pile End Plate – S-1479

300.5.13.4 Materials

300.5.13.4.1 Steel “H” Piling

Steel "H" piling shall meet the requirements of Specification ASTM A36, CSA G40.21M 300W or better. Where piling is designated in metric dimensions, imperial equivalent piling will be acceptable. Mill certificates shall be obtained prior to pile installation.

Splice plates shall be fabricated to the dimensions shown on Department Standard Drawing S-1415-87 "Standard H-Pile Splice" (see Appendix B).

300.5.13.4.2 Steel Pipe Piling

Steel pipe piling shall meet the requirements of Specification ASTM 252 Grade 2 or better, except that hydrostatic testing is not required. Although piling is designated in metric dimensions, imperial equivalent piling will be acceptable. Mill certificates shall be obtained prior to pile installation. Some out-of-roundness of the pipe is acceptable provided an acceptable splice can be completed.

Galvanized piling shall be galvanized by the hot dip method, in accordance with CSA Standard G164.

Splice backup rings and closed pipe pile end plates shall be fabricated as shown on Department Standard Drawing S-1414-87 "Standard Pipe Pile Splice" and Department Standard Drawing 1479 "Standard Closed Pipe Pile End Plate" (see Appendix B).

300.5.13.4.3 Timber Piling

The use of timber piling will not be permitted.

300.5.13.4.4 Pile Concrete

Concrete shall meet the requirements of Pile Concrete as specified in Section 300.5.7 (Cast-In-Place Concrete).

300.5.13.4.5 Reinforcing Steel

Steel reinforcement incorporated in the pile concrete shall meet the requirements specified in Section 300.5.14 (Reinforcing Steel).

300.5.13.5 Handling

Piling shall be handled, hauled and stored in a manner that avoids damage to the piling materials. Loading and unloading shall be by crane, loader or other appropriate hoisting equipment.

Care shall be taken in order to prevent damaging the galvanized surface on galvanized piling.

Fabric slings, wood blocking or other approved methods shall be used to support and separate galvanized piling when handling, hauling or storing. Piling on which the galvanized coating has been damaged shall be replaced or repaired. Where repair of damaged galvanizing is required, the repair shall be by metallizing in conformance with ASTM A780, Method A3, to a thickness of 180 Φm.

300.5.13.6 Driven Bearing Piles

300.5.13.6.1 Equipment and Driving Methods

Acceptable driving equipment are diesel hammers, vibratory hammers, or driving frames. The use of drop hammers will not be permitted under any circumstances.

The driving of piles with driving extensions shall be avoided if practicable. When driving extensions are used, one pile from each group of 10 shall be a long pile driven without extensions, and shall be used as a test pile to determine the average bearing power of the group. For the special types of piling, driving heads, mandrels, or other devices in accordance with the manufacturer's recommendations shall be provided so that the pile may be driven without damage and without unnecessary trimming.

Adequate precautions shall be taken to ensure that the piles are in proper alignment, including the use of such installation frames, fixed leads or other means as are necessary.

Piles shall be driven with a variation of not more than 20 mm per metre from the vertical or from the batter shown on the Detailed Designs, except that piles in exposed bents shall not be out of position at the ground line by more than 50 mm and shall not be out of position more than 25 mm in the pile cap. Foundation piles shall not be out of the position shown on the Detailed Designs more than 150 mm after driving.

For pile installation purposes, the Contractor shall paint markings on each pile at 0.25 m intervals, with a label at each 1.0 m interval, starting from the toe of the pile.

300.5.13.6.2 Bearing Values

The piles shall all be driven to the tip elevations shown on the Detailed Designs, or lower, to achieve the required stability and specified minimum bearing capacity. The pile bearing capacities shall be estimated by the Bearing Formulas of this Section 300.5.13.6 (Driven Bearing Piles).

In the case of friction piles, the piles shall be driven to the tip elevations shown on the Detailed Designs, or lower, in order to achieve the required stability and design load carrying capacity.

<u>Bearing Formulas</u>
The safe bearing values for piles shall be determined by the following formulas:

For Diesel Hammers

$$P = \frac{165 \times E \times F}{S + 5}$$

Where P = pile reaction at Service Limit State (SLS) (kilonewtons)
E = energy output of hammer (kilojoules)
F = efficiency factor
S = the average penetration per blow for the last 10 to 20 blows (mm per blow)

The efficiency factor of the hammer shall be determined at site by comparing the actual recorded blows per minute to data provided by the manufacturer of the hammer.

The above formula is applicable only when:

(1) The head of the pile is not broomed, crushed, or deformed.
(2) The penetration is reasonably quick and uniform.
(3) A driving extension is not used.

300.5.13.6.3 Steel Piles

Steel piles shall consist of structural steel shapes or pipes of the section shown on the Detailed Designs or otherwise specified.

When pipe piles are to be driven closed-ended, one section of pipe for each proposed pile shall be supplied with the end-plate welded-on, in conformity with Department Standard Drawing S-1479 "Standard Closed Pipe Pile End Plate" (see Appendix B).

When pipe piles are to be driven open-ended and the interiors cleaned out, a power screw rotary auger shall be used to remove the required material. All loose material and all material adhering to the walls of the piles shall be removed.

The total energy developed by the hammer shall be sufficient to achieve the required bearing value or tip elevation, but in no case shall the total energy developed be less than 35 kJ per blow.

The head shall be cut squarely and a driving cap or follower shall be provided to hold the axis of the pile in line with the axis of the hammer. The follower shall be of adequate dimensions to allow driving the pile without trimming or reducing the cross-section of the pile. When damage or buckling is evident at the driving end of the pile, in order to obtain the desired bearing capacity or penetration of the pile, the driving end of the piling shall be reinforced, or, other suitable equipment or procedures provided, to prevent such damage.

Piles shall be cut off level at the required elevation. If capping is required, the connection shall be made according to details shown on the Detailed Designs.

300.5.13.6.3.1 Steel Pile Splices

When splicing, whatever means necessary shall be employed to match out-of-round piling. Exposed pile splices shall be avoided. Refer to Department Standard Drawing S-1415-87 "Standard H-Pile Splice" and Department Standard Drawing S-1414-87 "Standard Pipe Pile Splice" (see Appendix B) with the exception that Item 1 for both “Requirements and Procedure for Splicing H-Piles” and “Requirements and Procedure for Splicing Pile Piles” is replaced with “All field welding shall be in accordance with Section 300.5.8.4.1(12)”.

Where the upper portions of piling are specified to be galvanized, excess piling shall be removed from the ungalvanized portion of the piling to ensure that the galvanized portion extends to the elevation shown on the Detailed Designs. Splicing within the galvanized portion of the piling shall be avoided; however if splicing becomes necessary due to unforeseen circumstances, the damage galvanized area shall be metallized.

Site welding personnel shall be advised of the hazardous fumes which are generated during welding or cutting of the galvanized steel.

The Contractor shall perform Non Destructive Testing (“**NDT**”) for a minimum of 20% of all full penetration compression splice welds for all piles for each bridge component. NDT shall be done for the welds for which visual inspection may indicate having some defect. Additional NDT may be required for the full penetration compression splice welds to ensure the integrity of the structure. In addition, the Contractor shall inspect 100% of the full penetration tension splice welds, as defined on the Detailed Designs. This inspection work shall be by either ultrasonic testing or radiographic inspection methods. The non-destructive testing shall be done by a company certified to CAN/CSA W178.1. Ultrasonic and radiographic testing technicians shall be certified to Level II of CGSB. Welds shall be repaired if full penetration has not been achieved.

Temporary caps shall be supplied and secured on all open pipe piles or drilled holes.

300.5.13.6.4 Defective Piles

The procedure incident to the driving of piles shall not subject them to excessive and undue abuse producing deformation of the steel, or crushing and spalling of the concrete. Piles damaged by improper driving, or driven out of proper location, or driven below the cut-off elevation, shall be corrected by one of the following methods:

(a) The piles shall be withdrawn and replaced by new and, if necessary, longer piles, or

(b) replacement piles shall be driven adjacent to defective or low piles, or

(c) the piles shall be spliced or built up, as otherwise provided herein, or a sufficient portion of the footing extended to properly embed the piles. All piles, pushed up by the driving of adjacent piles or by any other cause, shall be driven down again.

In case the required penetration and bearing capacity are not obtained, the Contractor may provide a hammer of greater energy or resort to pre-drilling.

300.5.13.7 Drilled Cast-in-place Concrete Bearing Piles

300.5.13.7.1 General

In addition to drilled cast-in-place concrete bearing piles this Section 300.5.13.7 (Drilled Cast-in-place Concrete Bearing Piles) shall include drilled cast-in-place concrete/steel pipe composite bearing piles. The work shall include drilling and belling the holes, as required, supplying and placing the steel pipe and reinforcing steel, and supplying, placing, protecting and curing the concrete.

300.5.13.7.2 Equipment and Drilling Methods

Due to the nature of the work, the drilling subcontractor shall have adequate equipment and a proven record of competence in this work.

Only powered screw rotary type augers will be acceptable for drilling.

The installation of further piling shall not proceed if for any reason, the quality of the adjacent piling is compromised due to the effects of vibration or other reasons.

300.5.13.7.3 Drilling Pile Holes

The drilled pile holes shall be stabilized and sealed by means of temporary casings or other methods to prevent the possible collapse of the pile holes or ingress of water. Every attempt necessary shall be made to obtain "dry" pile holes prior to placing the pile concrete.

Temporary casing, if used in drilling operations, shall be removed from the hole as pile concrete is being poured. The bottom of the casing shall be maintained below the top of the concrete during withdrawal and pouring operations. Separation of the concrete during withdrawal operations shall be avoided by hammering or otherwise vibrating the casing.

The elevations shown on the Detailed Designs of the bottoms of the pile holes shall be considered approximate only, and further drilling may be required as necessary to secure satisfactory bearing of the piles.

Where belling of the piles is specified, belling shall proceed only after the pile hole has been drilled to the specified elevation.

The walls and bottoms of the pile holes shall be cleaned to remove all loose and extraneous material. The presence of any gas shall be determined and appropriate means and equipment shall be employed to ensure a safe work site. Pile reinforcement and pile concrete shall not be placed until the pile hole is deemed acceptable.

300.5.13.7.4 Open Drilled Holes

All open drilled holes on the site shall be covered until the time they are filled with concrete or otherwise properly backfilled. The covers shall be of adequate strength and securely fitted so that machinery and workmen are protected against cave-in and surface water is prevented from running into the pile hole.

300.5.13.7.5 Reinforcement

Steel reinforcement shall be fabricated in the sizes and to the dimensions shown on the Detailed Designs and shall be placed, centered and braced in the pile hole as detailed.

Particular care shall be taken in locating projecting "column dowel bars", to a tolerance not exceeding 10 mm in any direction, and pouring will not be permitted until provisions are made to confirm to this requirement.

Adequate "shoes" or spacers shall be firmly anchored to the reinforcement to ensure the reinforcement is kept centered in the concrete.

300.5.13.7.6 Concrete Placement

When the reinforcement has been acceptably placed, concrete shall be immediately deposited in the pile hole. The concrete shall be "Pile Concrete" and the provisions of Section 300.5.7 (Cast-In-Place Concrete) shall apply.

Suitable forms shall be used to maintain the specified dimensions of concrete piles above ground level.

300.5.13.7.7 Cold Weather Conditions

In cold weather, which shall be considered to exist if nighttime low temperatures are expected to be below 0°C, heated concrete shall be used. Such concrete shall have a temperature of between 15°C and 25°C when placed.

When the ground against which pile concrete is placed is below -5°C, the concrete shall be protected from heat loss. The pile boring shall be made oversize down to the depth of 2 m, and the concrete shall be poured in an insulated form. Concrete at the top of the pile is to be insulated. After four days the form and insulation may be removed, and the space is to be backfilled immediately with compacted non-granular fill or lean concrete to the elevation of top of pile.

In a region where the ground temperature is above -10°C but below -5°C, the hole may be bored 100 mm diameter oversize, and filled directly with pile concrete, as an alternative to the procedure described above. Concrete at the top of the pile is to be insulated.

If the top of the pile extends above the existing ground surface, in cold weather, it is to be adequately protected from the cold for a period long enough to ensure proper curing.

300.5.13.7.8 Pile Tolerance

Piles shall be accurately located, and shall be installed plumb or at the batter specified on the Detailed Designs. The maximum tolerance allowed shall be 50 mm for variation off the centre of any pile at the cut-off elevation, and no pile shall be out of plumb or specified batter by more than 20 mm per metre. Any pile out of centre or plumb beyond the tolerances specified shall be corrected.

300.5.13.8 Pile Capacity Testing

300.5.13.8.1 Static Load Testing

The size and number of piles shall be determined or confirmed by static load tests when design requirements dictate, or when field conditions are significantly different from those considered during design. Static load tests shall be in general conformance with ASTM D3689-07. Osterberg or Statnamic tests may be used in place of static load tests.

Where sufficient static load testing has been done to satisfy Limit State Design, Load and Resistance Factor Design (“**LRFD**”), or reliability-based design statistical requirements, the factored geotechnical resistance may be taken as 0.6.

Where allowable or working state design methods are used in the design, or where the requirements of Limit State Design are not fulfilled, the allowable load shall be considered as 50% of that load which, after a continuous application of 48 hours, produces a permanent settlement not greater than 6 mm measured at the top of the pile. This maximum settlement shall not increase by a continuing application of the test load for a further period of 60 hours or longer.

300.5.13.8.2 Dynamic Load Testing / Pile Driving Analysis (PDA) Testing

Dynamic Load Testing using a Pile Dynamic Analyzer (“**PDA**”) can be employed as an alternate or supplemental test method to static load tests for the determination of pile capacity. The impact imparted on the pile by the hammer should be sufficient to fully mobilize the pile skin friction and end bearing resistance of the pile. In general, this requires that a net permanent set per blow of at least 3 mm (and not greater than 8 mm) be achieved upon impact from the pile hammer.

For driven piles, the PDA test shall be conducted at the end of the initial driving stage, such that the end bearing and skin friction resistance can be determined upon initial placement of the pile. Where time dependant changes in the soil conditions are anticipated, such as pile setup or relaxation, additional tests shall be conducted upon re-strike on a sample of previously tested piles to determine the bearing parameters after driving induced pore pressures have dissipated. The re-strike should be conducted approximately one to two weeks or longer after initial driving.

For cast-in-place piles, the PDA test shall be conducted more than 1 week from the installation of the pile.

The Wave Equation Analysis of Piles ("**WEAP**") method can be used to provide real time monitoring of pile stresses, pile integrity, hammer performance, and pile capacity; and in some cases can be used to confirm pile termination depths when borehole information is not available. A signal matching analysis using a Case Pile Wave Equation Program ("**CAPWAP**") is required for the determination of the capacity of the pile for design methods.

Where sufficient dynamic load testing has been done to satisfy Limit State Design, LRFD or reliability-based design statistical requirements, the factored geotechnical resistance may be taken as 0.5.

To ensure good quality data resulting from the PDA test, ASTM D4945-00 shall be followed. In addition to this procedure, at least two accelerometers on a driven pile and four accelerometers on a cast in place pile shall be installed. All accelerometers and transducers shall be calibrated and inspected to ensure proper attachment to the pile.

Pile driving equipment shall be sized such that piles can be driven with reasonable effort to the specified ultimate bearing capacity, without damaging the pile. Approval of the pile driving equipment by the Department will be based on the WEAP analysis and/or PDA testing. Under no circumstances will superposition of axial and shaft capacity from different strikes, re-strikes or any combination thereof be permitted in the determination of the overall bearing capacity of the pile.

The Contractor shall submit details of the proposed pile driving equipment for review by the Department a minimum of 14 days prior to the commencement of pile installation. The information provided shall include the following:

- Hammer Data: Hammer type, manufacturer, model number, serial number, maximum rated energy and range in operating energy, stroke at maximum rated energy and range of operating stroke, ram weight, and modifications
- Striker Plate Data: weight, diameter, thickness, and composition
- Hammer Cushion Data: Manufacturers, area, thickness per plate, number of plates, total thickness, and composition
- Helmet Data: Weight, composition
- Pile Cushion Data: Material, area, thickness per sheet, number of sheets, and total thickness of cushion

The PDA testing agency shall report, to the Contractor and to the Department, the preliminary test results within 24 hours of testing, and the final test results within seven days of testing. As a minimum, the testing agency shall report the following for the strike tested:

- Pile and hammer information
- Energy imparted
- Maximum stress

- Hammer blow rate
- CAPWAP input parameters including quake and damping factors and distribution
- Shaft friction, end bearing and total pile capacity

The Department will use the test results to assess the data and determine the subsequent refusal criteria, requirements for modification of driving procedures or equipment, and pile acceptance. Any work done on the foundation elements (pile caps, cut-off, welding, etc) prior to received approval of test results from the Department will be at the risk of the Contractor.

300.5.13.8.3 Testing Frequency

Sufficient load testing shall be conducted to satisfy Limit State Design, Load and Resistance Factor Design ("**LRFD**"), or reliability-based design statistical requirements. For Static Load Testing this translates to a minimum of at least one pile for each group of 100 piles shall be tested. The frequency of testing shall be increased to account for changing soil conditions, pile sections and types, and construction methods.

Where the PDA methods are used strictly as a QA/QC tool, a minimum of 5% to 10% of production piles shall be monitored dynamically. When used as a design or confirmatory tool, a minimum of 10 to 15% of piles (including tests at each sub-structure associated with the Project or where soil conditions are expected to vary) shall be tested. These tests can be conducted either at end of initial drive or at re-strike to prove the required ultimate capacity of the pile. Where the capacity of the pile at re-strike is relied upon for design, one third of the initial piles tested shall be tested during re-strike.

The piles selected for either static or dynamic testing should be representative of other piles in the same structure/area. Where driven piles exhibit lower driving resistances and/or shorter penetrations than normal, or where cast in place piles experienced extraneous soil, groundwater, and/or installation conditions, additional tests over and above minimum standards will be required. Further, additional tests should accompany changes in piling equipment, procedure, and pile requirements.

300.5.14 REINFORCING STEEL

300.5.14.1 General

This Section 300.5.14 (Reinforcing Steel) is for the supply, fabrication, handling and placing of reinforcing steel. Reinforcement bars shall be supplied in the lengths and shapes, and installed as indicated on the Detailed Designs. All reinforcing steel shall meet the requirements of the current edition of Reinforcing Steel Institute of Canada Manual of Standard Practice.

300.5.14.2 Certification

Epoxy-coated reinforcing steel shall be coated by a manufacturer certified under the Concrete Reinforcing Steel Institute ("**CRSI**") Voluntary Certification program for Fusion-Bonded Epoxy Coating Applicator plants.

300.5.14.3 Fabrication

Reinforcing steel shall conform to the requirements of the CSA Standard G30.18M Grade 400. Unless specified otherwise, all hooks and bends for black reinforcing bars shall be bent using the pin diameters and dimensions as recommended in the Reinforcing Steel Institute of Canada, (RSIC), Manual of Standard Practice, 1 Sparks Avenue, Willowdale, Ontario M2H 2W1, Phone: 416-499-4000. Unless specified otherwise, all hooks and bends for epoxy coated reinforcing bars shall be bent using the pin diameters and dimensions as recommended in CAN/CSA-S6-06. Reinforcing bars shall conform accurately to the dimensions shown on the Detailed Designs and within the fabricating tolerance as shown in the RSIC, Manual of Standard Practice.

Epoxy-coated reinforcing steel shall be prepared and coated according to the requirements of ASTM A775 and the Ontario Provincial Standard Specification ("**OPSS**") 1442, Material Specification for Epoxy-coated Steel Reinforcement for Concrete with additions and exceptions as described in this Section 300.5.14 (Reinforcing Steel). Film thickness of the coating, after curing, shall be 175 Φm to 300 Φm (7 to 12 mils). The epoxy coating material shall conform to the requirements of OPSS 1443, Material Specification for Organic Coatings for Steel Reinforcement.

Mesh reinforcement shall be supplied in flat sheets only.

300.5.14.4 Handling and Storage

Steel reinforcement shall be stored above the surface of the ground, upon platforms, skids, or other supports, and protected from mechanical injury and surface deterioration caused by exposure to conditions producing rust. Steel reinforcement incorporated in the work shall be free from loose rust, scale, dirt, paint, oil, and other foreign material.

Special care shall be taken when handling epoxy-coated reinforcing steel to prevent damage to the epoxy coating. Epoxy-coated reinforcing bars shall not be dropped or dragged, and shall be lifted with non-metallic slings. Bar-to-bar abrasion and excessive sagging of bundles must be prevented, and bundles shall be handled with spreaders and non-metallic slings.

On site storage of the epoxy-coated reinforcing steel shall not exceed 120 days, and exposure to daylight shall not exceed 30 days. If the exposure time is expected to exceed 30 days, the reinforcing steel shall be protected by covering with opaque polyethylene sheeting or equivalent protective material.

300.5.14.5 Field Repair of Epoxy Coating

All damage to epoxy coating shall be field repaired up to the time the reinforcing steel is incorporated into the concrete structure, whether the damage is due to field cutting or handling damage. Where field cutting of the epoxy-coated reinforcing steel is necessary, it shall be either sheared or saw cut.

Repair of damaged coating, sheared or sawed ends shall be done using the epoxy coating supplier's approved patching material and in accordance with the patching material manufacturer's written recommendations regarding surface preparation and patching material application. At a minimum the areas to be repaired shall be cleaned by removing all surface contaminants and damaged coating before applying patching material. Where rust is present, it shall be entirely removed immediately before applying the patching material. The patching material shall be overlapped onto the original coating for 25 mm or as recommended by the manufacturer. The dry film thickness of the patched areas shall be between 175 Φm to 300 Φm. When the field repairs result in a total bar surface area covered by patching material that exceeds 5% of the bar surface area, the bar shall be replaced.

300.5.14.6 Placing and Fastening

All steel reinforcement shall be accurately placed in the positions shown on the Detailed Designs, and firmly tied and chaired before placing the concrete. When placed in the work it shall be free from dirt, detrimental rust, loose scale, paint, oil or other foreign material. Bars shall be tied at all intersections, except where spacing is less than 250 mm in each direction, when alternate intersections shall be tied. Tack welding of reinforcing steel shall not be allowed.

Distances from the forms shall be maintained by means of stays, spacers, or other approved supports. Reinforcing cover shall not be less than the minimum specified on the Detailed Designs. Spacers for securing reinforcement from contact with the forms or for separation between layers of bars shall be plastic chairs, precast concrete supports, galvanized metal or epoxy-coated metal, of acceptable shape and dimensions. Precast concrete supports shall be used for all exposed faces of curbs, medians and barriers. Precast concrete supports shall have compressive strengths equal to or exceeding the placed concrete. Tie-wire for epoxy coated reinforcing shall be plastic coated. Any metal chairs protruding through the surface of the hardened concrete shall be cut back at least 25 mm, and the holes filled in accordance with Section 300.5.7.16.2 (Class 1 Ordinary Surface Finish). Metal chairs shall not be used to support reinforcement on surfaces which are to be exposed or are to be finished; where possible, this reinforcement is to be supported entirely from above.

300.5.14.7 Splicing

Splices shall be staggered where possible.

For lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain a clearance of not less than the required minimum clear distance to other bars, and the required minimum distance to the surface of the concrete. In general, suitable lap lengths will be achieved by the placing of bars of the lengths as set out in the Detailed Designs.

Sheets of mesh or bar mat reinforcement shall overlap each other sufficiently to maintain a uniform strength and shall be securely fastened at the ends and edges. The edge lap shall not be less than one mesh in width.

300.5.14.8 Solid Stainless Steel Reinforcing Bars

Solid stainless steel reinforcing bars shall conform to the requirements of ASTM A276 and A955M "Deformed and Plain Stainless Steel Bars for Concrete Reinforcement" and shall be deformed stainless steel meeting the material requirements of AISI Grade 316LN, 2205, 2101, 2304 or UNSS24100 (XM28). The minimum yield strength shall be 400 MPa. The design of the reinforcing bars, including hooks, development lengths and bar splices shall be based on yield strength of 400 MPa.

Fabrication of the solid stainless steel reinforcing bars shall be such that the bar surfaces are not contaminated with deposits of iron and nonstainless steels. Solid stainless steel reinforcing bars shall be stored separately from carbon steel reinforcing bars. All chairs or bar supports shall be nonmetallic. Tiewire shall be Grade 316L stainless steel or equivalent in the grade of bar used.

300.5.15 WATERPROOFING MEMBRANE

300.5.15.1 General

This Section 300.5.15 (Waterproofing Membrane) shall include the supply and installation of an approved deck waterproofing system as shown on Department Standard Drawing S-1443-98 (see Section 300.5.15.2). The area to be covered by the waterproofing system shall be as shown on the Detailed Designs.

300.5.15.2 Reference Drawings

Department Bridge Standard Drawing S-1443-98 "Deck Water Proofing System with 80 mm Two-Course Hot-Mix Asphalt Concrete Pavement"

300.5.15.3 Materials

All materials for this application shall be from the List of Approved Materials (see Section 300.5.15.7). No substitutions will be made without the prior approval of the Department.

Tack Coat
The tack coat used in conjunction with the asphalt membrane shall be primer, cut back with an equal volume of gasoline type solvent, or an acceptable alternative cut-back asphalt product and be compatible with the asphalt membrane.

Asphalt Membrane
Asphalt membrane shall be hot applied rubberized asphalt and meet all requirements of the Ontario Ministry of Transportation's OPSS 1213 Specification. The asphalt membrane shall be supplied in cakes ready for melting and application.

Rubber Membrane
The rubber membrane shall be 1.2 mm thick butyl rubber.

Membrane Reinforcing Fabric
Membrane reinforcing fabric shall be spun bonded sheet structure composed of 100% continuous filament polyester fibres bonded together at their crossover points. The membrane shall be supplied in minimum widths of 300 mm. The performance of the material shall be unaffected by the heat generated by the waterproofing processes.

Wick Drain
Wick drain shall be composite polypropylene with a total thickness of 3.6 mm and supplied in 100 mm widths. The puncture strength shall be a minimum of 45 N measured in accordance with ASTM D4833. The performance of the material shall be unaffected by the heat generated by the waterproofing processes.

Waterproofing Protection Board
The protection board shall be a durable panel of 3 mm thickness specifically designed to provide a protective cushion between the hot mix asphaltic concrete pavement and the asphalt waterproofing membrane. It shall have a water absorption property of 5% or less and shall meet the Ontario Ministry of Transportation Specification OPSS 1215 for Protection Board.

300.5.15.4 Equipment

An acceptable heating and mixing kettle shall be used to heat the hot-applied rubberized asphalt membrane. The kettle shall be of the double boiler oil transfer type with a built-in agitator and equipped with permanently installed dial type thermometers to measure the temperature of the melted compound and the oil.

300.5.15.5 Installation

300.5.15.5.1 Traffic Restrictions

Traffic restrictions apply to all traffic other than the construction equipment directly associated with the waterproofing operations and the paving operations that follow.

After sandblasting operations have commenced, construction traffic will not be allowed on the sandblasted area until the ACP has been placed and cooled to ambient temperature.

300.5.15.5.2 Procedure

All of the operations involved in waterproofing shall be performed in sequential order, such that there are no delays between individual operations except those necessary to meet the requirements of this Section 300.5.15 (Waterproofing Membrane).

300.5.15.5.3 Surface Preparation

The deck concrete, including curbs, sidewalks and medians must be completely dry and cured at least 14 days before application of tack or membrane can proceed.

The existing surface of the concrete shall be completely sandblasted or shotblasted to expose sound, laitance-free concrete. All dirt and debris shall be removed and disposed of, leaving a prepared surface satisfactory for tack coating. Tack coating and waterproofing shall not commence until the concrete surface is fully cleaned.

Immediately prior to the application of the tack coat, the concrete surface shall be air blasted to remove all dust and any other foreign material. The tack coat shall be cut back 50% with gasoline solvent. The application rate shall be such that the tack material will be absorbed into the concrete, resulting in a surface that is dull and black in appearance. The application of an excessive amount of tack as indicated by a shiny black surface shall be avoided. Tack coat material shall be applied with approved equipment which will provide uniform application at the required rate. The tack coat shall be applied only when the concrete is dry and clean, and when the air and concrete surface temperatures are above 5 degrees celcius. Waterproofing equipment or material shall not be permitted on the tack coat until it has fully cured and is completely tack-free.

300.5.15.5.4 Waterproofing of Joints and Cracks

Special attention shall be paid to waterproofing over all construction joints, lift hook pockets, patches and cracks.

Prior to the application of the asphalt membrane to the deck, a coat of hot asphalt membrane at least 4 mm thick and wide enough to extend 200 mm on either side of the joint or crack shall be applied in accordance with Section 300.5.15.5.7 (Application of Protection Board) to the tack-coated concrete surface. A strip of membrane reinforcing fabric material wide enough to extend 150mm on either side of the construction joint, lift hook pocket, patch or crack shall be applied while the asphalt membrane is still hot and tacky. Membrane reinforcing fabric shall be overlapped 100mm when multiple strips are used.

Along all curbs, barrier walls, and deck drains the hot asphalt membrane shall be applied to the height of the top of the hot mix ACP surface course, and 150mm onto the deck. The butyl rubber membrane shall extend 50mm up the vertical faces, and 100mm onto the deck surface, and overlapped 100mm when multiple strips are used. The rubber membrane shall be applied while the asphalt membrane is still hot and tacky.

300.5.15.5.5 Installation of Wick Drain

Wick drains shall be placed along the full length of gutters and installed when the asphalt membrane is still hot and tacky. Special attention shall be given to waterproofing and wick drain modifications at deck drain pipe locations. Wick drain details shall be in conformance with Department Standard Drawing S-1443-98 (Revision 7).

300.5.15.5.6 Application of Asphalt Membrane

Cakes of asphalt membrane shall be melted in the mechanically agitated heating and mixing unit specified. This unit shall keep the contents continuously agitated until the material can be drawn free flowing and lump-free from the mixing unit at a temperature not exceeding that recommended by the manufacturer.

Membrane shall not be applied until the tack coat has cured completely. The asphalt membrane shall be applied within the temperature range recommended by the manufacturer, to the clean, tack-coated concrete deck, to form a uniform film having a minimum thickness of 4mm and a maximum thickness of 6mm. The laying operation shall commence at the low end of the bridge and shall be such that discontinuities in the membrane are avoided and any joints lapped 150mm. The membrane shall be applied over all waterproofed joints and cracks, and shall extend up the face of curbs, barrier walls, and deck drains, to the height of the top of the hot mix surface course. Deck drains and drainage tubes shall not be plugged.

300.5.15.5.7 Application of Protection Board

The asphalt membrane thickness shall be checked to ensure conformance to the Technical Requirements, prior to placing the protection board. Protection boards shall be laid on the asphalt membrane, commencing at the low end of the bridge and overlapping to produce a shingling effect, while the membrane is still hot, with the length of the board running transversely, on the deck. The protection boards shall be placed with edges overlapping a minimum of 12mm to a maximum of 25mm both longitudinally and transversely. The protection board edge shall be within 5mm of all curbs, drain verticals, and deck joint verticals.

Protection boards shall be placed such that the longitudinal (direction of traffic flow) joints are staggered at least 150mm. It shall be rolled by means of a linoleum or lawn type roller while the membrane is still warm, in order to ensure good contact with the membrane. Holes shall be cut through the protection board to allow water to drain freely through the drainage tubes. In instances where edges of the protection board curl up, the edges shall be cemented down using hot membrane material. Protection boards that are warped, distorted or damaged in any way, by manufacture, storage, handling or exposure to weather, shall be rejected.

300.5.15.6 Sampling and Testing

Sufficient quantities of the asphalt membrane, rubber membrane, membrane reinforcing fabric and protection board shall be supplied from the materials being used on the Project for immediate analysis, flow tests, water absorption, or for other future testing purposes. All test results shall be provided to the Department forthwith, upon its request.

300.5.15.7 List of Approved Materials

300.5.15.7.1 Hot Applied Rubberized Asphalt Membrane

- "Bakor" 790-11
- "Beamalastic 1213 BDM"
- “Ultraseal 3750”

300.5.15.7.2 Rubber Membrane

- "Elastosheet 6147"
- ABP47 Elastometric Reinforcement@
- ABakor 990-25"

300.5.15.7.3 Waterproofing Protection Board

Test results and samples of proposed protection board shall be submitted to the Department for review.

Acceptable products of protection board shall consist of spun glass fibres and not cellulose reinforcing fibres. Products which currently meet the 5% or less water absorption requirement are:

- "Vibraflex MTO Protection Board"
- "Bakor Asphalt Protection Board"
- "IKO Protectboard"

300.5.15.7.4 Membrane Reinforcing Fabric

- “Remay 2016” or approved equivalent

300.5.15.7.5 Wick Drain

- “Nelix MD/7407” or approved equivalent

300.5.15.8 Paving Equipment and Methods

300.5.15.8.1 General

Equipment and methods used for asphalt concrete pavement on bridge deck waterproofing membranes shall be adequate to produce and place the material as specified.

300.5.15.8.2 Paver

Pavers shall be self-propelled and operated to maintain required levels, cross-falls and joint matching.

300.5.15.8.3 Compaction Equipment

Sufficient self propelled equipment shall be provided to obtain the required degree of compaction of the asphalt concrete mixture. The compaction capability of the equipment used shall equal or exceed the placing rate of the spreading operations and shall be capable of obtaining the required compaction before the temperature of the mat falls below specified levels. Compaction equipment shall be of a suitable size, weight and type, such that displacement of the mat and/or disruption of underlying materials does not occur. Specialized equipment may be required to achieve adequate compaction and smoothness in tight corners, such as adjacent to expansion assemblies and deck joints.

A minimum of two pieces of compaction equipment shall be provided. They shall be rollers of at least 10 tonnes mass, one rubber tired and one smooth steel drum type. Vibrators on vibratory rollers shall not be activated.

The compaction equipment shall be in proper mechanical condition and shall be operated such that uniform and complete compaction is obtained throughout the entire width, depth and length of the pavement being constructed. Rollers provided shall leave a smooth, properly finished surface, true to grade and cross-section without ruts or other irregularities. All compaction equipment shall be equipped with methods of wetting the tires or drums to prevent adhesion or pickup of the asphalt mixture.

300.5.15.9 Placement of Asphalt Concrete Pavement

300.5.15.9.1 Protection of Adjacent Bridge Components

The Contractor must protect curbs, deck joints, and expansion assemblies to prevent splatter or spillage of asphaltic materials.

300.5.15.9.2 Tack Coat

Asphalt tack coat shall be applied to the existing protection board and between lifts of asphalt concrete pavement.

The surface to be tacked shall be dry and free of loose or deleterious material when the tack is applied.

The asphalt tack coat shall be applied in a uniform manner at an application rate of 0.5 ℓ/m² and suitable asphalt temperature. Air temperature in the shade at the time of application shall be 5°C or higher.

On areas where traffic is to be accommodated, the tack coat shall be applied in two operations. In the first operation one half of the width shall be tacked with the remaining half being tacked after the first half has cured.

The tack coat shall be protected from traffic or other damage. Areas on which the tack has been damaged by traffic shall be retacked.

300.5.15.9.3 Spreading and Compaction

300.5.15.9.3.1 General

The mixture shall be placed only upon a dry, frost free substrate on which the tack coat has cured, and under suitable weather and temperature conditions. Prior to the delivery of the mixture on the work, the base shall be cleaned of all loose or foreign material. The mixture shall be spread and compacted during daylight hours only, unless artificial light is provided.

During spreading and compaction operations, care shall be taken at all times to ensure that:

- Asphalt mixture is not wasted over the side or onto the adjacent surface mat.
- Damage is not done to the waterproofing membrane, curbs, manholes, drains or medians.
- Damage is not done to guide posts, guardrails, signs, power conduits or any other roadside installations.

Immediate and adequate repair shall be made of any damage resulting from construction activities.

300.5.15.9.3.2 Spreading

The mix shall be spread at a temperature sufficient for specified compaction and finishing at the final placement area.

The manner of placing shall ensure safe accommodation of traffic, quality control and drainage. The longitudinal and transverse edges of each lane shall be straight in alignment, uniform, and of the same thickness as the adjoining pavement layer. Adequate measures for the protection of the exposed edges shall be maintained throughout the work.

Each layer shall be placed, finished and compacted for the full width, and then allowed to cool down to 50 degrees celcius or colder prior to commencing the subsequent layer.

In the placing of successive layers, the individual mixture spreads shall be aligned in a manner such that the longitudinal joints in successive layers do not coincide. Unless otherwise directed, the lateral distance between the longitudinal joints in the successive layers shall be not less than 0.30 m. The longitudinal joint of the final lift of asphalt concrete pavement shall not be located within the wheel path areas.

The surface of all lifts shall not exhibit evidence of segregation, such as pockets of fine and coarse material.

All longitudinal and transverse joints shall be of the vertical butt joint type, made in a careful manner, well bonded and sealed, and shall be finished to provide a continuous, smooth profile across the joints.

300.5.15.9.3.3 Compaction

The compaction process shall be monitored using a Control Strip Method. Control Strips are generally established on each mat placed.

The Control Strip lift shall be compacted using at least the following equipment:

(a) One steel roller weighing not less than 10 t; and

(b) One self-propelled pneumatic rollers, ballasted to its maximum capacity, weighing not less than 10 t.

Once the mix has been spread by the paver and the initial pass of the breakdown roller has been done, moisture and density measurements for determining the Control Density will commence at five locations within the Control Strip area, and will continue following repeated passes of the compaction equipment until the apparent maximum density is attained. These measurements will be taken using nuclear testing equipment.

The pavement shall be compacted to a minimum average density of 97% of Marshall Density, with no individual density less than 95%.

When the compaction methods and procedures are not achieving the desired compaction specifications, cores of the top lift pavement shall be taken. The number of cores will be determined by the Department. The cores will be tested by the Contractor and the results provided to the Department as soon as they become available.

Percent compaction will be expressed in percent of Marshall Standard Density. The Marshall Standard Density used for determining pavement compaction shall be as follows:

(a) Marshall Densities determined on field sampled mix, or if not available then;
(b) Marshall Design Density as reported in the accepted mix design.

Coring shall be done using methods which will not damage the rubberized asphalt membrane or protection board. Core holes shall be completely de-watered and dried. A generous application of liquid asphalt shall be applied to the bottom and sides of the core hole and allowed to cure. Asphalt mix shall then be tamped in lifts into the core hole until flush with the surface of the surrounding pavement.

Coring shall not be undertaken without the approval of the Department.

In order to maintain the crown of the bridge deck and approaches, the Contractor shall avoid operating the compaction equipment on or across the crown. Compaction procedures and equipment shall be such that displacement of the mixture does not occur. Roller wheels shall be kept slightly moistened by water or oil to prevent picking up the mixture, but an excess of either water or oil will not be permitted.

In cases where the asphaltic mixture is placed under weather and temperature conditions which may be considered less than ideal, normal operations shall be modified to provide special attention to these situations such that specified compaction results are achieved.

300.5.15.9.3.4 Hot-Applied Rubberized Membrane Waterproofing

The first layer of the ACP Wearing Surface shall be spread by the asphalt paver moving with the laps in the protection board.

With the possibility of damage to the waterproofing membrane, the paver must not push the delivery trucks and all equipment must perform all turning movements off the bridge deck. Dumping of the asphalt mixture onto the protection board ahead of the paver will not be permitted.

The prepared material shall be placed and compacted in two nominal 40 mm layers.

To avoid displacement of the mixture the first lift shall be compacted only after the spread asphalt mixture has cooled to 105Degrees C. The second lift shall be compacted when the spread asphalt mixture is within the following temperature ranges:

ASPHALT GRADE	COMPACTION TEMPERATURE RANGE	
	FIRST LIFT	**SECOND LIFT**
150 - 200 (A)	MAX. 105 Degrees C	128 Degrees C – 138 Degrees C
200 - 300 (A)	MAX. 105 Degrees C	123 Degrees C – 133 Degrees C

Due to the cooler compaction temperature (105Degree C) of the first lift, it may not be possible to achieve the 97 percent average density.

300.5.16 DECK SYSTEMS USING PRECAST CONCRETE PARTIAL DEPTH DECK PANELS

300.5.16.1 General

This specification in Section 300.5.16 is for the design, fabrication and construction of deck systems using precast concrete partial depth deck panels.

Unless otherwise noted in this Section 300.5.16, all the requirements of Section 300.5.2 (Design Criteria) shall apply to the design of deck systems using precast concrete partial depth deck panels.

Unless otherwise noted in this Section 300.5.16, all the requirements of Section 300.5.9 (Precast Concrete Units) shall apply to the supply, manufacture, delivery and erection of precast concrete partial depth deck panels.

Unless otherwise noted in this Section 300.5.16, all the requirements of Section 300.5.7 (Cast-in-place Concrete) shall apply to the construction of deck systems using precast concrete partial depth deck panels.

300.5.16.2 Design

Deck slabs using precast concrete partial depth deck panels shall be permitted with the following design requirements:

(a) The empirical method in accordance with section 8.18.4 of *CAN/CSA-S6-06* shall not be permitted for design of composite deck slab systems using partial depth precast deck panels.

(b) The precast deck panels shall be prestressed and the prestressing strand shall be 9.5mm diameter.

(c) The composite deck slab system shall be designed using flexural design methods based on elastic moments.

   i) For square deck slabs continuous over three or more girder lines, the maximum positive and negative transverse moments shall be determined using the simplified elastic method in accordance with section 5.7.1.7.1 of *CAN/CSA-S6-06,* with P adjusted to 112 kN to correspond with the CL-800 Design Truck. These moments shall be used to design the maximum transverse positive moment reinforcing requirements in the panels and the composite slab as well as the transverse maximum negative moment reinforcing requirements in the cast-in-place portion of the deck slab. In addition, reinforcement development and cut-off locations shall be determined using moment envelopes based on elastic analysis.

   ii) For curved or skewed bridges, all moments shall be determined by elastic analysis.

   iii) For all bridges the following minimum transverse positive moment reinforcing shall be provided over supporting girder lines :

      1. For steel girders provide transverse 15M epoxy coated reinforcing bars spaced at 300 mm on centre, placed directly on the top surface of the precast deck panel and placed perpendicular to the girder lines. This reinforcing shall be continuous over each girder line and shall extend towards the midspan of each deck panel a distance not less than 700 mm beyond the edge of the deck panel.

      2. For NU girders extend all of the panel prestressing strands out the panel ends and across the girder centre line a distance sufficient to provide a lap splice of 700 mm with the prestressing strand from opposing panels supported on the same girder.

(d) The minimum composite deck slab system thickness shall be the greater of the girder spacing divided by 15.0 or 225 mm. In addition, the following shall be satisfied:

i) The precast deck panel shall have a minimum thickness of 90 mm.

ii) The cast-in-place concrete portion of the deck slab shall have a minimum thickness of 115 mm.

(e) The minimum design compressive strength for the precast deck panel shall be f'c = 45 MPa at 28 days and f'ci = 30 MPa at release.

(f) The stresses in the precast panel concrete shall not exceed the following:

i) From transfer until the 28 day strength is attained:
- Compression: 0.6 f' ci
- Tension: 0.5 fcri

ii) After the 28 day strength is attained and at serviceability limit states:
- Tension: fcr
    - iii)The average compressive stress in the panel at prestress strand release shall be ≤ 7.0 MPa.

(g) The precast deck panel system shall conform to the following:

i) The precast panels shall have a minimum age of 45 days and a maximum age of 120 days when the cast-in-place portion of the deck is cast.

ii) The precast panels shall be positively anchored into the cast-in-place portion of the deck. This shall be accomplished by extending all of the prestress strands a minimum of 100 mm outside the panel ends or by extending adequate reinforcing steel outside of the panel ends.

iii) The cast-in-place slab shall have 15M continuous bottom longitudinal reinforcing bars (parallel to girders lines) spaced at 300 mm on centre placed directly on top of the precast deck panels. Where conflict with the transverse positive moment reinforcing bars exists, these longitudinal reinforcing bars shall be placed directly on top of the transverse reinforcing bars.

(h) Prestressing strand and reinforcing steel cast into the panels shall be black steel. This includes any prestressing strand or reinforcing steel that extends out of the panels, but are kept in the bottom layer of the deck reinforcing. Black steel projecting from panels shall stay in the same horizontal plane and shall not be bent up past the top of the precast panel.

(i) All reinforcing steel in the cast-in-place portion of the deck system shall be epoxy-coated steel.

(j) The precast panel length shall be set to provide a minimum 75 mm bearing (as measured perpendicular to the girder line) on the haunch concrete. A minimum 50 mm thick haunch shall be provided beneath the underside of the panels.

(k) For steel girders, shear stud projections above the top surface of the steel girder shall be sufficient to provide at least 25 mm of clearance between the underside of the stud head and the top surface of the precast deck panels. For precast concrete girders, stirrup projections above the top surface of the precast girder flanges shall be sufficient to provide at least 25 mm of clearance between the underside of the stirrup tips and the top surface of the precast deck panels.

300.5.16.3 Fabrication

The panels shall be cast flat.

All edges of the panel shall have a minimum 20x20 mm chamfer, except the transverse joint which shall have a 55x55 mm chamfer along the top edges.

300.5.16.3.1 **Stressing Strand**

Strand termination recesses for the panels are not required.

300.5.16.3.2 **Surface Finish**

The top surface of panels shall be clean, free of laitance, and roughened to 3 mm amplitude with spacing not greater than 15 mm with grooves parallel to strands.

300.5.16.3.3 **Tolerances for Panels**

Precast concrete deck panels shall meet the following tolerances:

a) Panel lengths: ± 5 mm (as measured perpendicular to the girder lines).

b) Panel widths: ± 10 mm (as measured parallel to the girder lines).

c) The maximum difference in plan view diagonal dimensions (squareness) of rectangular panels:
Not greater than 3.5 mm per meter of diagonal length.

d) Thickness of panel: + 5 mm, - 3 mm.

e) For prestressed panels, strands shall be located at the centroid of the panel with a vertical tolerance of + 0 mm, - 3 mm, measured from the soffit and a horizontal tolerance of ± 10 mm.

f) Deviation from straightness of panel edges along the transverse joint between adjacent panels shall not exceed 1.5 mm per metre length (panels with greater deviation will be rejected).

g) Vertical bowing of panels out of plane, after casting and immediately prior to erection, in the direction of measurement, shall not be greater than the panel length/360 or the panel width/360, whichever is less, and in no case shall it exceed 10 mm maximum.

h) Warping of the panel shall not be greater than 5 mm per metre of distance from the nearest adjacent corner.

Tolerance measurement results shall be provided to the Department forthwith, upon its request. If any of the tolerances listed above are not met, the panel unit shall be considered unacceptable and will be rejected unless accepted and signed off by the design engineer and reviewed by the Department.

300.5.16.3.4 **Defects and Deficiencies Causing Rejection**

A panel having any one of the following defects or deficiencies will be rejected:

a) Panels with honeycombing, voids, cavities, spalls when the depth exceeds 25 mm or when the area of defect exceeds 150 mm x 150 mm.

b) Panels with any crack located parallel to or over the strands or reinforcing steel.

c) Panels with any crack at the edges and / or with cracks at the bottom.

d) Panels with cracks that are deeper than 25 mm and/or wider than 0.3 mm.

300.5.16.4 Erection and Construction

The precast panels shall be erected on temporary supports on the girders. The precast panels shall be erected so that the transverse joint between adjacent panels is never greater than 5 mm.

The cast-in-place haunches shall be cast monolithically with the deck. The haunches shall be formed to be flush with the edge of the girder flanges.

When casting the deck, place the girder haunch concrete first in continuous strips ahead of the rest of the concrete. Carefully vibrate the concrete over the girders to ensure that the concrete completely fills the area under the precast panel overhangs. Then place and vibrate the remaining deck concrete. This process must be completed within a sufficiently short timeframe to ensure that a cold joint does not form between the haunch concrete and the rest of the deck concrete.

All haunch forming material shall be completely removed after casting the deck to fully expose the haunches.

All lifting hooks for the precast panels shall be removed after erection.

400.0 OPERATIONS - NEW INFRASTRUCTURE AND EXISTING INFRASTRUCTURE

400.1 OPERATIONS - GENERAL

This Section 400.0 (Operations - New Infrastructure and Existing Infrastructure) covers the operations, maintenance and rehabilitation requirements applicable to roadways and bridge structures in the Infrastructure.

400.1.1 RESPONSIBILITY FOR OPERATIONS

The Contractor is responsible for the supply of all management, supervision, professional and technical services, quality control and assurance, labour, materials, utilities and equipment for performing all of the duties and obligations to operate, maintain and rehabilitate the Infrastructure during the Operating Period.

These responsibilities include the supply and payment for electrical power for roadway lighting and signalization, and any other utilities required for the New Infrastructure. The Contractor is responsible for safe and efficient site traffic accommodation during the Operating Period.

The operational and performance requirements described in the Technical Requirements represent the requirements that shall be met throughout the Operating Period. The Contractor shall measure roadway and bridge structure conditions and assure compliance to the operational and performance requirements throughout the Operating Period. Where specific operational and performance requirements are not given, the Contractor is expected to operate and maintain roadway elements and bridge structures to a standard of safety, effectiveness and operation equal to, or better than, what is currently being provided on other roadway systems of similar age and type on the Provincial highway system.

Reduction of or restrictions to allowable legal load(s), during spring time thawing conditions or at any other time, is not permitted for any roadway within the New Infrastructure, during the Operating Period.

The Contractor shall display during the Operating Period the Contractor's name and phone number on eight signs located safely adjacent to Stoney Trail and Highway 2 (Deerfoot Trail) within the Project Limits. Each sign panel shall be 4' x 8' and shall be manufactured on 3/4" plywood or extruded aluminum and the sheeting and sign supports shall be in accordance with the Department's recognized products list for non-standard signs. Lettering and symbols shall be clear and legible with minimum lettering size to be 200 mm. Reflective sheeting shall meet or exceed the minimum requirements as specified in the ASTM-4956, Performance Requirements Type IX or Type XI Unmetalized Cube Corner Microprismatic Retroreflective Element Material. All signs are to be installed by Traffic Availability.

400.1.2 MAINTENANCE AND REHABILITATION REQUIREMENTS

The requirements to be met in the maintenance of the Infrastructure during the Operating Period shall conform to the requirements of the Contractor's Operation and Maintenance Plan of Schedule 4 (Contractor's Managements Systems & Plans) to the DBFO Agreement. In addition, the requirements to be met in the maintenance and rehabilitation of the New Infrastructure during the Operating Period shall conform to the requirements for design and construction of the New Infrastructure, as well as those of the Contractor's Infrastructure Wholelife Management Plan (such Plan forming part of Schedule 4 (Contractor's Management Systems and Plans) to the DBFO Agreement).

As-Built Construction Reports shall be updated, as required, to reflect maintenance and rehabilitation activities that change the physical dimensions or characteristics of the Infrastructure. The maximum time for completion and the providing of the updated As-Built Construction Reports to the Department shall be two months after completion of the maintenance or rehabilitation activity. If the updated As-Built Construction Reports are not available to the Department within the specified time, a Payment Adjustment of $2,400/month or any partial month, for every month in excess of the specified time shall apply until available.

The Contractor is responsible for reclaiming all areas of the Road Right of Way and/or stormwater management facilities that have been disturbed during the Operating Period and shall obtain any required Reclamation Certificates related to these activities within 12 months of completing the reclamation activity, and provide a copy of the same to the Department forthwith.

400.1.3 COMPLIANCE WITH PERFORMANCE REQUIREMENTS

During the Operating Period, the Infrastructure shall be maintained in conformance with any allowable tolerances as specified for individual performance requirements, subject to the following:

- If measurements indicate that the Infrastructure no longer complies with the performance requirements but falls within the permitted tolerance(s), the Contractor will have the option of correcting the Infrastructure such that it conforms to the performance requirements or foregoing the repairs and paying Payment Adjustments. The option of foregoing repairs shall not be allowed at the handback of the Infrastructure to the Department at the end of the Term.

- If measurements indicate that the Infrastructure no longer complies with the performance requirements and also exceeds any allowable tolerances, the Contractor shall repair the Infrastructure so that it conforms to the performance requirements.

For performance requirements that do not include an allowable tolerance, the Contractor shall complete such work as required to achieve full compliance to the performance requirements.

In addition to the Contractor's regular inspection and measurements, the Department may undertake reviews and measurements of the Infrastructure at any time and will advise the Contractor of non-compliance.

Where Payment Adjustments are described relative to a kilometre section of the roadway, the kilometre will be a continuous section of a single lane. Neither the requirement nor the Payment Adjustments will be pro-rated based on a partial kilometre length, but will be calculated for the next highest full kilometre length. Crossroads and individual ramps or loops will be considered as discrete sections and treated as one kilometre regardless of the actual length. Where Payment Adjustments are described relative to a period of time or a portion thereof, the Payment Adjustment shall not be prorated but shall be applied in full even if only a portion of the specified period of time has elapsed.

400.1.3.1 Alternative Inspection and Testing Methods

During the Operating Period, new technological developments may result in alternative inspection and testing methods and techniques that are more accurate, effective or economical. Mutually agreeable alternative inspection and testing methods and techniques may be introduced during the Operating Period. These new testing methods and techniques may also require new mutually agreeable performance requirements that are consistent with the intent of existing performance requirements.

400.1.4 APPEAL OF DEPARTMENT MEASUREMENTS

In any case where Department measurements have concluded that a deficiency exists, the Contractor may appeal within 30 days, the results of any measurement. Measurements made by the Contractor, using methods and equipment of equal or better accuracy to the Department's specified methods, which indicate the appealed component is not deficient, will be the only cause accepted for allowing an appeal.

The Department and the Contractor will mutually select an independent third party to undertake the appeal measurement(s).

The appeal measurements will be arranged for and paid by the Department and the new measurements shall be binding on the Contractor and the Department and shall not be subject to the Dispute Resolution Procedure. Notwithstanding the foregoing, the Department may, at its sole discretion, elect to accept the measurements submitted by the Contractor as cause for the appeal and forego further measurements.

If the independent third party's measurements verify the deficiency, the Contractor shall be invoiced by the Department, and shall reimburse the Department, for the third party appeal measurement costs plus an additional $4,200 per appeal.

Any Payment Adjustments supported by the independent third party's measurements shall be upheld. If the independent third party's measurement(s) verify that no deficiency exists, such Payment Adjustments shall be reversed.

400.1.5 IMMINENT DANGER REPAIRS

In instances where the Contractor and/or the Department determines an Imminent Danger (as defined below) exists on the Infrastructure, the Contractor shall have representation within the Road Right of Way, on route to the Imminent Danger, within 30 minutes of becoming aware of, or of the time the Contractor should have been aware of, the Imminent Danger and shall immediately initiate action to protect traffic and the public from the Imminent Danger and shall continue the action until the Imminent Danger is eliminated. This action may take the form of a temporary solution, including the closing of traffic lanes, until permanent repairs are able to be undertaken or the Imminent Danger is removed. If protective action is not undertaken or traffic is not protected from the Imminent Danger immediately, the Department may elect to undertake such action as it determines necessary and the Contractor shall be responsible for the actual cost of the actions which may include the cost of accommodating traffic over, through or around portions of the Infrastructure, if necessary, plus a 25% administration fee. These costs shall be deducted from Payments to be made to the Contractor. In instances where the Contractor fails to meet the above timelines and/or the Department is forced to undertake action to protect any user from an Imminent Danger, the Contractor shall also be assessed a Payment Adjustment of $12,000/occurrence. The third occurrence in any consecutive 12 month period anywhere on the Infrastructure shall be a potential Termination Event for the purposes of and having the consequences set out in section 16.8(k) of the DBFO Agreement. The Department shall provide the Contractor with timely notice after the Department has considered it necessary to take action to protect a user from an Imminent Danger situation. The responsibility for the repair of the cause of the Imminent Danger shall be governed by the DBFO Agreement and the other applicable provisions of the Technical Requirements.

For the purposes of this section, "**Imminent Danger**" refers to a safety hazard that may be encountered by any user of the Infrastructure due to an accident, condition or any other abnormal occurrence on the Infrastructure.

400.1.6 LANE CLOSURE

Under no circumstance, except for an Excepted Lane Closure (as defined below), shall the Contractor close all lanes in either direction during the Operating Period nor implement measures to require or to seek to encourage the public to use an alternative route away from the Infrastructure.

If as a result of an Excepted Lane Closure the need arises to use signs or other measures to require the public to use an alternative route away from the Infrastructure, the Contractor may effect such measures, provided that the Contractor shall as soon as reasonably practicable advise the Department of such measures and the reasons therefore. The Contractor shall take all reasonable steps to minimize the duration of such measures.

Within 60 days after Traffic Availability, the Contractor shall submit to the Department in accordance with the Review Procedure as set out in Schedule 5 (Design and Plan Certification and Review Procedure) to the DBFO Agreement (the "**Review Procedure**"), a schedule for Lane Closures (as defined below) in respect of the Infrastructure for the first 12 month period after Traffic Availability (the "**Agreement Year**") and the next succeeding Agreement Year. No later than January 1 in each Agreement Year after the first Agreement Year the Contractor shall submit to the Department in accordance with the Review Procedure a schedule for Lane Closures in respect of the Infrastructure for the next succeeding Agreement Year. Each schedule of Lane Closures (the "**Schedule of Lane Closures**") shall give details of the proposed lanes of Lane Closure, start and end dates for each period of Lane Closure, and the work to be carried out.

The Contractor shall inform the Department of any changes to a Schedule of Lane Closures no later than 60 days prior to the commencement of the applicable Lane Closure.

The Department may raise comments in respect of any period of Lane Closure requested in a Schedule of Lane Closures. In such event, the Department shall notify the Contractor thereof with reasons and shall indicate, in the case of an objection, an appropriate duration for such Lane Closure and in any other case a period when the unacceptable period can be re-scheduled, on the basis that each such re-scheduled period shall be as close as reasonably practicable to the requested period of Lane Closure and of equal duration or, if the Contractor has indicated another period and/or duration that would be preferable to it and that is acceptable to the Department, such other period and/or duration. The Contractor shall thereupon amend the applicable Schedule of Lane Closures accordingly and re-submit the same to the Department in accordance with the Review Procedure.

The Department's approval of Lane Closures shall not be unreasonably withheld or delayed, having regard to the factors set out in the Review Procedure.

The Contractor shall not affect any Lane Closures save:

- in accordance with the Schedule of Lane Closures to which no objection has been made under the Review Procedure; or
- in an Excepted Lane Closure.

Notwithstanding that there has been no objection to the Schedule of Lane Closures in accordance with the Review Procedure, the Department may upon 60 days prior written notice require the Contractor to re-schedule a period of Lane Closure if due to a change in circumstances such re-scheduling is necessary.

The Department may not require:

- that such period of Lane Closure be brought forward by more than 60 days from the scheduled date of commencement of such period; or
- that a period of Lane Closure be deferred by more than 60 days from the scheduled date of commencement.

If as a result of an Excepted Lane Closure, the need arises for unscheduled maintenance or repair work requiring Lane Closures, the Contractor shall effect such Lane Closures provided that the Contractor shall as soon as reasonably practicable advise the Department of such closure and the reasons therefore and shall take all reasonable steps to minimize the duration of such Lane Closure.

All Lane Closures shall be subject to the Lane Closure Payment Adjustments except Lane Closures (the "**Excepted Lane Closure**") arising, and without being caused by a breach by the Contractor of any of the obligations of the Contractor under the DBFO Agreement or the negligence of the Contractor or those for whom the Contractor is responsible at law, from:

- an emergency, including without limitation clean-up of a motor vehicle accident;
- an order of the police, fire department, emergency medical services, military, or other similar emergency services providers;
- Approved Special Events as defined in Section 200.3.9.2 (Special Events – Partial or Full Closure Events);
- Severe Storm Events (as defined in Section 400.3.1 (Winter Maintenance Operation Requirements – General));
- Repairs to the Infrastructure caused by the Province, its agents, employees, and contractors (except the Contractor but including, without limitation, those contractors other than the Contractor engaged by the Province under sections 7.3, 7.4 or 11.8 of the DBFO Agreement) and employees and by third party damage provided, if the Contractor is obligated or retained to do the repairs, all reasonable steps are being taken by the Contractor to complete the repairs in accordance with the Contractor's obligations;
- a direction of the Department or the performing of the Province's obligations under the DBFO Agreement;
- any Deficiency or EI Rehab Deficiency (as both terms are defined in section 6.6 of the DBFO Agreement); or
- any rehabilitation work being carried out or having been carried out by or on behalf of the Department in relation to the Existing Infrastructure.

The Contractor shall provide to the Department such information (including without limitation details of proposed Lane Closures and information about its traffic safety and management measures on the Infrastructure) as may be required for purposes of any information service operated by or on behalf of the Department from time to time.

The Contractor shall operate during the Operating Period a telephone service answered by a knowledgeable person of the Contractor to respond to questions from the public in relation to the Infrastructure.

Subject to the Excepted Lane Closures, for every full or partial hour of Lane Closure (as defined below) occurrence anywhere on the Infrastructure, during the Operating Period, the Contractor shall be assessed a Payment Adjustment at the applicable lane closure rate. The length of the Lane Closure for determination of Lane Closure Payment Adjustments shall be rounded up to the next higher whole kilometre.

For planned maintenance and rehabilitation activities on roadways or bridge structures that have two lanes in each direction, the Contractor must have at least one lane open to traffic in each direction at all times.

For planned maintenance and rehabilitation activities on roadways or bridge structures that have three lanes or four lanes in each direction, the Contractor must have at least two lanes open to traffic in each direction at all times.

Lane Closure Payment Adjustments are as follows:

Type	Timing/Duration	Rate
Peak Hours* - Weekdays	0600 to 0900 and 1530 to 1800 hrs	$480/hr/lane-km
Day – Weekdays	0900 to 1530 hrs	$180/hr/lane-km
Day - Weekends and Statutory Holidays	0600 to 1800 hrs	$180/hr/lane-km
Evening	1800 to 2200 hrs	$120/hr/lane-km
Night	2200 to 0600 hrs	No Charge

* *A Lane Closure for planned operational purposes may not be started during Peak Hours.*

A Lane Closure is defined as:

- Any partial or complete closure of a traffic lane; or
- Any reduction of posted speed to less than 75% of the normal posted speed prior to construction impacting any through lane, merge lane or ramp, collector-distributor (C-D) road, turn lane, crossroad, bridge structure, detour or other road forming a part of or connected to the Infrastructure.

Conclusion of Lane Closure is defined as:

- Continuous, smooth, paved intact travel surface;
- Traffic control removed and traffic fully restored; and
- Cause of closure has been removed and all safety requirements have been satisfied.

Also reference Section 400.5.1.3.7 (Traffic Accommodation).

400.1.7 IN-SERVICE SAFETY REVIEW (NEW INFRASTRUCTURE ONLY)

On as as-needed basis, the Department will compare the reported collision rates on roadway segments and interchanges on the New Infrastructure to rates recorded on similar segments of divided highways and interchanges in Alberta.

If the collision rate on any roadway segment or interchange on the New Infrastructure exceeds the benchmark by 10% or more, the Department may elect to conduct an In-Service Safety Review. If so elected, the review will be undertaken within three months of notification of the need for such a review. The In-Service Road Safety Review shall be undertaken following the Transportation Association of Canada's guidelines.

The Department will provide a copy of the In-Service Safety Review to the Contractor. The Contractor shall implement any minor operational recommendations at its cost within six months of the completion of the review. The minor operational recommendations shall include the following:

- Provision and installation of delineators;

- Revised snow clearing and ice control procedures;
- Bridge deck icing plan procedures;
- Revised pavement markings;
- Revised directional, regulatory and warning signing (does not include sign structures);
- Revised traffic signal timings; and
- Guardrail adjustment or installation of new guardrail.

If the minor operational recommendations from the In-Service Safety Review are not implemented within the specified time by the Contractor, a Payment Adjustment of $1,200/week or any partial week, for the first four weeks and $2,400/week or any partial week, thereafter shall apply until all of the minor operational recommendations are implemented.

400.2 INSPECTION, EMERGENCY AND ROUTINE MAINTENANCE REQUIREMENTS

400.2.1 ROADWAY INSPECTIONS REQUIREMENTS

The Contractor's Operation and Maintenance Plan (Section 100.2.9) shall include details on how roadway inspections will be carried out and shall as a minimum, meet the following requirements:

- Inspect the roadway at a minimum frequency of every two hours between 6:30 a.m. and 6:30 p.m., Monday to Friday with the exception of non-Business Days, and every four hours between 6:30 p.m. and 6:30 a.m., Monday to Friday with the exception of non-Business Days;
- Inspect the roadway a minimum of once every four hours (24 hours per day) on days other than Business Days;
- Observe road conditions, repair requirements, snow or weather issues, icing conditions on bridge decks, and sign conditions for each inspection; and
- Confirm the retroreflectivity of signs visually during dark (night time conditions) at least once every two months. Signs that are reasonably considered to be deficient shall be tested within 30 days of the visual inspection.

The Contractor shall provide sufficient resources to patrol the roadway, to observe, react to and report all circumstances or conditions affecting the travelling public or the future repair of the roadway or appurtenances. The Contractor shall investigate reports of adverse conditions from members of the public, regulatory agencies, police authorities and the Department, and perform the immediate repair of all hazardous conditions in accordance with Section 400.1.5 (Imminent Danger) and Section 400.2.2 (Emergency Maintenance).

400.2.1.1 Routine Observations

During the performance of roadway inspections, emergency maintenance, routine maintenance or at any other time the Contractor's personnel are travelling on the roadway, such personnel shall observe conditions of the roadway surface, appurtenances, and the Road Right of Way for the purpose of identifying any deficiencies and scheduling such work as required to maintain compliance to the Technical Requirements.

Items of work which would typically be identified during routine observations include but are not limited to the following:

- Damaged signs and delineators;
- Drainage problems including blockages, erosion or lack of capacity of ditches, culverts and drainage grates, particularly during spring thaw and run-off. The Contractor shall make interim repairs in these areas when possible;
- Any required cleaning, litter removal or snow removal;
- Damage to structures or appurtenances;
- Roadside or median barriers which have been damaged or moved from the original position, or any other condition that prevents, or reduces the effectiveness of the barrier from performing its intended function;
- Graffiti;
- Burned out lights on the roadway lighting systems;
- Non-functioning, malfunctioning or burned out lights on traffic control lighting systems; and
- Condition of bridge structure components, e.g. bridge rail, bridge deck and bridge deck joints.

400.2.1.2 Daily Road Reports

As part of normal winter duties or as otherwise required, the Contractor shall provide daily road reports in the Department's standard format to the Alberta Motor Association by 0600 hours. These reports shall detail driving conditions on the Infrastructure and shall be updated as required, so that the travelling public is kept current with changing roadway or weather conditions. The Contractor shall provide the Department with a copy of all reports issued.

400.2.2 EMERGENCY MAINTENANCE

Any work identified which falls under the category of emergency maintenance or otherwise results in an unsafe condition shall be immediately addressed by the Contractor and, subject to the DBFO Agreement and the other applicable provisions of the Technical Requirements, at the Contractor's cost.

Emergency maintenance activities, requiring the Contractor's immediate response by having representation within the Road Right of Way, on route to the emergency, within 30 minutes of becoming aware of, or of the time the Contractor should have become aware of, include but are not limited to, the following:

- Repairing or replacing critical regulatory signs (STOP and YIELD) or performing temporary repairs of signs;
- Removing from the roadway surface, roadkill and debris of a size or type that may create a hazard;

- Report all incidences of roadkill to the appropriate authorities;
- If an animal is injured, the Contractor shall contact the police and/or fish and wildlife officials, who will determine and arrange for the action required;
- In cases involving livestock, the Contractor shall remove the carcass from the roadway surface and contact the owner of the animal to dispose of the carcass. If the owner cannot be contacted, the Contractor shall remove the carcass from the Road Right of Way, dispose of the carcass at an approved site and immediately notify the Department;
- Repairing traffic signals and advanced warning devices, including without limitation:
  - Resetting signals if the lights are in flash mode;
  - Replacing burned-out bulbs; or
  - When the lights are completely out of service, setting up portable STOP signs from all directions until permanent repairs occur;
- Responding to accidents or natural disasters, including without limitation:
  - Traffic control, including erecting detours or barricades in accordance with appropriate traffic control requirements;
  - Supply and erection of emergency signs;
  - Cleaning-up the accident or disaster site;
  - Removing from the roadway surface, any material including damaged guardrail which presents a hazard to the travelling public;
  - Applying absorbent material to minor spills at accidents;
  - Placing “Police Emergency Ahead” signs at the scene of collisions, spills or obstructions on the roadway;
  - Providing emergency traffic control and arrowboards;
  - Reopening of the roadway within one hour of clearing the accident or natural disaster; and
  - Communication with, coordinating with, and providing access for, emergency response services that may be required on the Infrastructure or be required to pass over the Infrastructure;
- Notification of and cooperation with the relevant emergency and/or regulatory authorities in the containment and clean-up of all spills, including those in ditches and ponds. The Contractor shall also notify the Department of any spills within 24 hours of any occurrence;
- Providing adequate marking of any conditions on the roadway surface or in the Road Right of Way which are a hazard to the travelling public, including:
  - Emergency repair and marking of unsafe or poor pavement conditions; and
  - Emergency repair and/or marking of unsafe or poor bridge structure conditions.

400.2.3 ROUTINE MAINTENANCE

The Contractor’s routine maintenance activities shall include, but not be limited to, the following:

- Removing and disposing of incidental refuse and litter from within the Road Right of Way;
- Straightening or reinstalling sign posts;
- Shimming and tightening connections on breakaway sign posts as required;

- Straightening or reinstalling delineator posts and replacing reflective strips on guardrails and delineator posts;
- "Summerize" signals and control boxes;
- "Winterizing" signals and control boxes;
- Washing signs, delineators and reflective strips on guardrail. If soap is used, it must be biodegradable;
- Removing graffiti from all sites;
- Removing non-conforming signs from within the Road Right of Way;
- Performing annual inspections of all drainage system components, scheduling required maintenance and draining, and completing such maintenance and draining prior to freeze-up each year;
- Removing minor blockages in the drainage system on a regular basis; and
- Removing, collecting and disposing of winter sand, tracked dirt and all other debris from the roadway.

400.2.4 MEASURING FOR COMPLIANCE

For all roadway inspection, emergency maintenance and routine maintenance requirements, the Contractor shall undertake the work within the time periods stipulated in the Technical Requirements and in accordance with the Contractor's Operation and Maintenance Plan (Section 100.2.9).

400.2.5 PAYMENT ADJUSTMENTS

If the roadway inspection, emergency maintenance and routine maintenance are not completed within the required time period on the Infrastructure, the Contractor shall be assessed the following Payment Adjustments.

In this section, "**occurrence**" refers to an occurrence anywhere on the Infrastructure.

If the Contractor fails to undertake the roadway inspections, Payment Adjustments shall be made as follows. The number of occurrences of non-conformance shall be determined for a consecutive 12 month period.

- $2,500 for the first occurrence;
- $5,000 for the second occurrence;
- $10,000 for the third occurrence; and
- $20,000 for the fourth occurrence and each occurrence thereafter.

If the Contractor fails to undertake routine maintenance in any consecutive 12 month period, Payment Adjustments shall be made as follows:

- $5,000 for the first occurrence;
- $10,000 for the second occurrence;
- $20,000 for the third occurrence, and each occurrence thereafter.

If the Contractor fails to undertake emergency maintenance in any consecutive 12 month period, Payment Adjustments shall be made as follows:

- $20,000 for the first occurrence;
- $40,000 for the second occurrence; and
- The third occurrence shall be a potential Termination Event for the purposes of and having the consequences set out in section 16.8(k) of the DBFO Agreement.

The Department shall notify the Contractor after the first and second occurrence of non-compliance with an emergency maintenance performance requirement in any consecutive 12 month period.

400.2.6 REPORTING PROCEDURES

All actions taken related to Section 400.2.2 (Emergency Maintenance), shall be reported immediately to the Department.

The Contractor shall record conditions identified during roadway inspections, and any work performed as a result of the observations. Such information shall be reported to the Department. The report shall make a distinction between conditions that required immediate response and those that could be scheduled as future work.

The Contractor shall record and report monthly, all routine maintenance performed, including segments worked and activities performed.

These reports shall include:

- Segment(s) worked; and
- Action(s) taken.

400.3 WINTER MAINTENANCE OPERATION REQUIREMENTS

400.3.1 GENERAL

When undertaking winter maintenance operations, the Contractor shall coordinate its operations to achieve Bare Pavement (as defined below) conditions on all driving lanes and pathways or walkways. "**Bare Pavement**" is defined as the travel lanes, and walkway/pathways being free of snow, packed snow, frost and ice. Gore areas may have accumulations of loose snow up to 100 mm and shoulders may have accumulations of loose snow up to 30 mm. Drainage points shall be kept free of snow and debris.

All roadways within the Infrastructure shall have a class assigned to each segment, as described in the following table, on the basis of AADT for that segment. The AADT for all segments shall be determined in accordance with Section 200.3.1 (Traffic Volume Payment Adjustments).

Winter snow clearing and ice control traffic segments may change in length or class depending on the changes in traffic volume (AADT), throughout the Operating Period.

The following table defines the requirements for snow clearing and ice control for the Infrastructure.

Should winter snow and ice conditions dictate, the “Max. Time to Bare Pavement” requirement may be waived by the Department if the temperature after the “Max. Time to Bare Pavement” is below the indicated value in the last column of the following table. During this time of cold temperatures, the Contractor shall apply winter abrasive material and attempt to physically remove ice and packed snow from the roadway surface. At all times, abrasives will be present on all slippery surfaces within the driving lanes, to ensure safety for the travelling public.

Once the temperature rises above the indicated value in the last column of the following table, the “Max. Time to Bare Pavement” requirement shall recommence, and the Contractor will have the full time to achieve Bare Pavement.

A “**Severe Storm Event**” is defined as:

a. A combination of heavy snowfall over a short duration, accumulation of more than 2 cm/hr, or snowfall greater than five days duration, wetter snow, and high winds that results in visibility conditions such that snowplow operations become hazardous and such operations should reasonably cease for several hours;
b. A wind event where the wind is greater than 60 km/h for four consecutive hours; or
c. A freezing rain or hail event where the accumulation on fixed objects is greater than 6 mm.

Winter Maintenance Standards							
					Severe Storm Event		Max. Time to Bare Pavement Temperature Waiver (°C)
Class	AADT Range	Max. Time to React (hrs)	Max. Time to Bare Pavement (hrs)	Clean Up (hrs)	Max. Time to Bare Pavement (hrs)	Clean Up (hrs)	
A	0 to 30 000	1.5	5	48	10	120	-10
AA	30 001 to 75 000	1.0	3	48	6	120	-15
AAA	75 001 to 125 000	0.5	2	24	4	96	-20
AAAA	125 001 and above	0.5	2	24	4	72	-30

Pathways and walkways shall be cleaned of snow within 48 hours of the end of the Storm Event (as defined below).

The reaction time shall be measured from the time that the Contractor is made aware or notified, or becomes aware or should have been aware of, the need to mobilize equipment, to the time the Contractor starts to engage in snow/ice removal activities with the appropriate equipment. The Contractor shall have engaged snow/ice control activities prior to an accumulation of 15 mm of loose snow. The Contractor may be made aware by its own forces, by the Department, Local Authorities or by police authorities.

The time to Bare Pavement shall be measured from the end of the Storm Event. "**Storm Event**" shall be defined as a period of time of continuous precipitation and/or condensation and/or wind causing the formation of snow and/or ice on the roadway surface. The end of a storm event shall be considered the last known time of precipitation, heavy snow drifting or condensation affecting the roadway.

Clean-up shall be undertaken after the Storm Event. Banks or drifts of snow greater than 0.5 m shall be removed to at least 2 m from all high speed (posted 100 km/hr or greater) driving surfaces. Intersection sight distance shall be restored on all ramps, intersections and crossroads. Time to complete clean-up is measured from the time precipitation or heavy snow drifting has stopped to the time all clean-up activities are complete.

The Contractor shall prepare an annual specific and updated Snow Clearing and Ice Control Operations Plan that meets the requirements of Section 400.3 (Winter Maintenance Operation Requirements). The plan must be acceptable to the Department and in place by September 15th of each year.

During a Major Snowfall Event (as defined below), the Contractor shall provide a minimum level of snow removal service that includes maintaining one driving lane open in both directions (including on/off ramps). The Contractor shall return to the snow removal effort required to achieve Bare Pavement conditions as soon as the snowfall begins to subside. A "**Major Snowfall Event**" is defined as one where there is heavy snowfall over a short duration, accumulation of snow of more than 2 cm/hour, or snowfall greater than five days in duration.

The Snow Clearing and Ice Control Operations Plan must provide for the deployment of snowplows and spreader equipment capable of meeting and which does meet the following objectives:

- The Infrastructure roadways must be open to the driving public at all times, unless the Department closes the road;
- All lanes remain operational during snow conditions;
- Plowing shall commence prior to snow accumulation reaching 15 mm on any roadway. The maximum allowable accumulation of loose snow on the roadway is to be 30 mm;
- The deployment of snowplows and spreader units shall be calculated based on these requirements and the locations of the Contractor's sand and salt stockpiles;
- If required to meet labour and plowing standards and/or where storm intensities are beyond the capabilities of the normal snow removing equipment complement during storms which last more than 48 hours, identify a procedure for obtaining and deploying additional resources;
- Snowplows and spreader units shall respond within the applicable response times;
- Include a contingency plan to address storm conditions which may force the closure of the roadway facility or instances where traffic prevents the deployment of the standard snowplow/equipment complement;
- Plowing coverage shall provide for the continuous integrated plowing of both shoulder and surface of the roadway facility including interchange ramps, intersections and cross-roads;
- Snowplowing on bridges shall be done to prevent snow, ice or other substances from being

thrown onto underlying roadway, railways or canals;

- A plan for meeting the Section 400.3 (Winter Maintenance Operation Requirements), in case of a winter storm or winter driving conditions, during the non-winter months;
- Address the cover-off of equipment operators who meet their "Hours of Service" limits or tire. Provide cover-off operators and ensure all equipment remains operational and operated, for the duration of the storm and for the clean-up periods;
- Provide for the provision of regular winter condition reporting to the Department and the Alberta Motor Association ("**AMA**") or any other agency identified by the Department; and
- Coordinate winter maintenance with the Local Authority.

The accepted Snow Clearing and Ice Control Operations Plan shall be adhered to throughout the Operating Period.

400.3.2 EQUIPMENT AND MATERIALS

The Contractor's Snow Clearing and Ice Control Operations Plan (see Sections 100.2.9 and 400.3.1) shall include periods for which the level of equipment shall be available throughout the winter months and identify levels of equipment that will be available during non-winter months to respond to snow falls during these periods.

Specifications for plowing and sanding trucks shall, as a minimum, be in accordance with applicable law, including without limitation the *Traffic Safety Act* (Alberta) and any regulations thereunder and any replacement or successor legislation, and applicable Department standards, as identified in *Alberta Transportation Maintenance Contracts for Rural Highways*.

Sand and salt materials shall be stored in a manner identified in the EMS (Section 100.2.2). The Environment Canada - Code Of Practice For The Environmental Management Of Road Salts shall be used as a guideline. The Contractor shall adjust the materials storage and handling practices as necessary to address changes or developments in the environmental concerns for any of the materials used.

400.3.3 SNOW CLEARING AND ICE CONTROL OPERATIONS

The Contractor shall conduct all winter maintenance activities with the objective of achieving Bare Pavement (as defined in Section 400.3.1) conditions as quickly as possible and in all cases within the stipulated time periods. Activities shall comply with the accepted Snow Clearing and Ice Control Operations Plan (see Sections 100.2.9 and 400.3.1) and the following:

- The required complement of snowplows shall be deployed within the time limits identified;
- Emergency vehicles and equipment shall be deployed on the roadway system in the event that the standard equipment complement cannot meet Section 400.3 (Winter Maintenance Operation Requirements);
- Snowplows and sand/salt spreader trucks shall be operated in accordance with applicable laws and regulations;
- Snow/ice equipment shall be operable and operated on a 24 hour basis, throughout the Storm

Events (as defined in Section 400.3.1) and subsequent clean up;
- All equipment shall be operated with due diligence to prevent damage to the Infrastructure, and with due regard for the safety of the travelling public; and
- The Contractor shall be responsible for any and all damages.

400.3.3.1 Measuring for Compliance

The Contractor shall monitor its performance relative to Section 400.3 (Winter Maintenance Operation Requirements) and record all response times and snow and ice accumulations in a maintenance management record which shall be provided to the Department on a monthly basis.

400.3.3.2 Non-Compliance

If the Contractor fails to comply with any of Section 400.3 (Winter Maintenance Operation Requirements), despite such a failure, the Contractor shall immediately mobilize in order to minimize snow and ice accumulations.

If non-compliance is observed, Payment Adjustments will be assessed against the Contractor.

Non-compliance is defined as any one of the following:

- The Contractor fails to deploy equipment in accordance with the accepted Snow Clearing and Ice Control Operations Plan (see Sections 100.2.9 and 400.3.1);
- The Contractor has failed to deploy additional resources in accordance with the Snow Clearing and Ice Control Operations Plan;
- The Contractor has failed to plow/remove and/or apply materials as identified in the accepted Snow Clearing and Ice Control Operations Plan;
- The Contractor failed to meet the deployment time frames;
- The Contractor fails to achieve Bare Pavement (as defined in Section 400.3.1) or no ice conditions within the specified time frames following the end of a Storm Event (as defined in Section 400.3.1); and
- The Contractor fails to supply any ice control materials.

400.3.3.3 Payment Adjustments

When the Contractor is non-compliant, Payment Adjustments shall be made as follows:

- $12,000 for each occurrence of non-compliance during a Storm Event (to a maximum of $72,000 total for the Infrastructure);
- $24,000 for each occurrence of non-compliance during a subsequent Storm Event in any consecutive 12 month period (to a maximum of $145,000 total for the Infrastructure); and
- The third occurrence of any non-compliance within a consecutive 12 month period but in a separate third Storm Event shall be a potential Termination Event for the purposes of and having the consequences set out in section 16.8(k) of the DBFO Agreement.

The number of occurrences of non-conformance shall be determined for a consecutive 12 month period.

The Department shall notify the Contractor after the first and second occurrences of non-compliance in any consecutive 12 month period. In this section, "occurrence" refers to an occurrence anywhere on the Infrastructure.

400.3.4 PREFERENTIAL BRIDGE DECK ICING

The Contractor shall implement and carry out the Preferential Bridge Deck Icing Plan (see Section 100.2.9 (Operation and Maintenance Plan)). For the purposes of the Technical Requirements, "**preferential bridge deck icing**" shall mean ice formation within the driving lanes of a bridge deck during a weather circumstance when ice formation within the driving lanes of the roadway leading to and from such bridge deck is not occurring.

400.3.4.1 Measuring for Compliance

The Contractor shall monitor its performance relative to the Preferential Bridge Deck Icing Plan and record all occurrences of preferential bridge deck icing and response times in a maintenance management record which shall be provided to the Department on a monthly basis.

400.3.4.2 Non-Compliance

The Contractor shall be in non-compliance under this Section 400.3.4.2 if preferential bridge deck icing is observed within any of the driving lanes on any of the PBD Bridges (as defined in Section 200.2.16 (Preferential Bridge Deck Icing)) and either:

- such icing has occurred as the result of the Contractor's failure to comply with the current Preferential Bridge Deck Icing Plan; or
- upon becoming aware of such preferential bridge deck icing, the Contractor fails to immediately mobilize in order to reasonably minimize such preferential bridge deck icing; or
- preferential bridge deck icing has previously occurred on any of the PBD Bridges under the same Preferential Bridge Deck Icing Plan during a prior distinct weather circumstance occurring in the prior 12 month period.

(each a "**Preferential Bridge Deck Icing Non-Compliance Event**").

400.3.4.3 Payment Adjustments

When the Contractor is non-compliant pursuant to Section 400.3.4.2 (Non-Compliance), Payment Adjustments shall be made as follows:

- $12,000 for each occurrence of a Preferential Bridge Deck Icing Non-Compliance Event during a distinct weather circumstance (to a maximum of $72,000 total for the Infrastructure) (the "**First Set of Occurrences**");

- $24,000 for each occurrence of a Preferential Bridge Deck Icing Non-Compliance Event following the First Set of Occurrences during a subsequent but separate and distinct weather circumstance in any consecutive 12 month period (to a maximum of $145,000 total for the Infrastructure) (the "**Second Set of Occurrences**"); and
- The third occurrence of any Preferential Bridge Deck Icing Non-Compliance Event within a consecutive 12 month period but during a separate and distinct weather circumstance shall be a potential Termination Event for the purposes of and having the consequences set out in section 16.8(k) of the DBFO Agreement.

The number of occurrences of non-compliance shall be determined for a consecutive 12 month period.

The Department shall notify the Contractor after the First Set of Occurrences and the Second Set of Occurrences in any consecutive 12 month period. In this section, "**occurrence**" refers to an occurrence anywhere on the Infrastructure.

400.3.4.4 Plan Replacement

The Contractor shall be entitled at any time to replace the Preferential Bridge Deck Icing Plan provided such replacement plan shall be reasonably designed to prevent preferential bridge deck icing from occurring on the PBD Bridges (as defined in Section 200.2.16), including without limitation be reasonably designed to rectify any previous failures in preventing preferential bridge deck icing, and is reviewed in accordance with Schedule 5 (Design and Plan Certification and Review Procedure).

400.4 ROADWAYS

400.4.1 ROADWAY MAINTENANCE REQUIREMENTS

The Contractor shall maintain the entire pavement structure, appurtenances, and all associated works in accordance with the performance requirements, until the end of the Operating Period. All areas of pavement including shoulders and gores shall be maintained to similar conditions as the driving lanes.

400.4.1.1 Measuring and Testing For Compliance

The Contractor shall be proactive in maintenance of the roadways and appurtenances and shall test conformance with the performance requirements on a minimum of an annual basis or as stipulated by the Technical Requirements. The Contractor shall schedule testing prior to August 1st of each year so that any required repairs can reasonably be completed in the same calendar year. All test results shall be provided to the Department forthwith, upon its request.

For each of the Technical Requirements, the Department may also conduct measurements for compliance and advise the Contractor of any deficiencies.

400.4.1.2 Completing Repairs

When a specific deficiency is identified and times are not defined in the following sections, the Contractor shall correct the work such that it complies with the performance requirements in accordance with the following:

- If the Contractor is aware, or should have been aware, of the deficiency prior to September 1st in any calendar year, the Contractor shall complete the repairs prior to October 31st of the same calendar year;
- When a deficiency with respect to Section 400.4.2.4 (Cross-Slope and Superelevation) or Section 400.4.3 (Smoothness Requirements) is identified during the Operating Period the Contractor shall correct the work such that it complies with the performance requirements by July 31 of the following year; or
- If the Contractor is aware or should have been aware of the deficiency after September 1st in any calendar year, the Contractor shall complete the repairs prior to June 30th of the following calendar year.

For all deficiencies, the Contractor shall complete the repairs within these timelines. Failure to do so will result in the applicable Payment Adjustments being assessed. Notwithstanding the allowances for delaying repairs over the winter period the Contractor shall schedule testing to allow time for required repairs within the calendar year. In the event that the Contractor is aware of a deficiency after September 1 due to delays in testing, the specified Payment Adjustment will be assessed for the period until repairs are complete, including the winter period.

400.4.2 PAVEMENT GEOMETRIC REQUIREMENTS (NEW INFRASTRUCTURE ONLY)

This Section 400.4.2 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

The Contractor shall maintain all roadway sections to the designed lines and grades. The following tolerances shall be met. Tolerances refer to the finished pavement surface.

400.4.2.1 Cross-Slope and Superelevation Rates

The roadway superelevation and cross-slope rates shall be maintained to be within ±0.35% of the design rates immediately after construction and within ±1.0% of the design rates during the Operating Period.

400.4.2.2 Pavement Widths

The pavement surface width shall be constructed and maintained to the width defined by the standard cross section for the specific area of roadway. The mainline pavement surface width shall not be more than 0.35 m less than the design width immediately after construction and shall not be less than the design width after any pavement rehabilitation undertaken during the

Operating Period.

400.4.2.3 Measuring For Compliance

The Contractor shall measure the roadway superelevation and cross-slope immediately prior to Traffic Availability and after each major surface rehabilitation and whenever the surface appears to not meet the superelevation and cross-slope requirements. Notwithstanding the foregoing, the Department may elect to test or measure the roadway independently if there are concerns regarding the serviceability of the roadway.

The pavement width shall be measured following initial construction and after each rehabilitation which has an impact on roadway width, by means of conventional survey techniques at a minimum of 20 equally spaced measurements per kilometre.

For measurements made using inertial profiling devices, the limiting values will apply to each 100 m segment of the roadway and the average value determined for each consecutive one km section based on the absolute value of the difference in measured and designed cross-slope or superelevation. For width measurements an average value per kilometre, or fraction thereof, shall be determined based on measurements each 50 m.

If the results of the measurements indicate that the work does not comply with the specified criteria, the work will be deemed to be deficient and the Contractor shall schedule remedial work within the specified time period indicated in Section 400.4.1.2 (Completing Repairs).

Measurements for cross-slope and superelevation shall be made by the Contractor immediately prior to Traffic Availability and then as a minimum of once every three years thereafter using a laser based Class I inertial profiling device as defined by ASTM E950, or better. Measurements made using an inertial profiler device shall be averaged for 100 m segments of the roadway.

Cross-slope and superelevation measurements shall be collected for each lane on a continuous basis and reported at 50 m intervals. The measurements shall be made across the entire lane width utilizing an inertial profiling vehicle combining a vehicle frame referenced inertial measurement unit ("**IMU**") with a minimum roll accuracy of 0.01° and a minimum of 10 height sensors. Continuous cross-slope and superelevation measurements shall be calculated based on the linear best fit of the measured transverse profile averaged for each 100 m lane segment of the roadway. The cross-slope and superelevation shall be collected to an accuracy of +/- 0.02 percent and reported to +/- 0.1 percent for each 100 m lane segment.

The Contractor shall conduct an on-site verification prior to the start of the measuring for compliance. The cross-slope and superelevation equipment verification will be based on direct comparison with manually measured transverse profiles at verification sites established by the Department for the evaluation of inertial profiling devices on local area roadway(s). This verification validates the cross-slope and superelevation measurements of the inertial profiling device by using direct comparisons to known roadway geometry. The Contractor is required to run the inertial profiling device over the specified site(s) three times to determine the accuracy and repeatability of the inertial profiling device. The average cross-slope and average superelevation over the 500 m site(s) derived through the automated data collection must be within 0.1 percent of the average cross-slope and superelevation derived through manual survey. The values derived from the automated data collection will be considered repeatable if the values from each run are within +/- 1 standard deviation of the mean for the three runs. All test and measurement results shall be provided to the Department forthwith.

400.4.2.4 Payment Adjustments

Payment Adjustments shall be assessed on a $/lane-km basis for cross-slope and superelevation rate measurement. Pavement width Payment Adjustments shall be assessed on a $/km basis for width variations. Payment Adjustments shall apply to full or partial kilometres and full or partial weeks and shall be assessed until the deficiency is corrected.

Payment Adjustments:

(a) Cross-Slope and Superelevation:

If following construction and prior to the New Infrastructure being opened for use by the public, the roadway superelevation and cross-slope rates are measured and are found not to be maintained within ±0.35% of the design rates then the New Infrastructure shall not be opened for use by the public and no Payment shall be paid until such time as the deficiency is corrected.

If during the Operating Period, the roadway superelevation and cross-slope rates are measured and are found not to be maintained within ±1.0% of the design rates then the following Payment Adjustments will apply:

- $3,600/week or any partial week, for the first four weeks the deficiency is not remedied; then
- $11,000/week or any partial week, thereafter.

Percentages refer to a numeric deviation from the designed percentage and not to a percentage deviation. This means that if the designed percentage is 6%, the deviation referred to in the pre-public use scenario is > 5.65% and < 6.35 %; and the deviation referred to in the operations scenario is > 5.0% and < 7.0%.

(b) Pavement Width Less than Design Width (Mainline):

If following construction and prior to the New Infrastructure being opened for use by the public, the mainline pavement surface width is measured and is found to be up to 0.35 m narrower than the design width then any Payment shall be reduced by an amount equal to the length of the non-conforming roadway, rounded to the next highest kilometre, multiplied by $108,000/km.

If following construction and prior to the New Infrastructure being opened for use by the public, the mainline pavement surface width is measured and is found to be more than 0.35 m narrower than the design width then the New Infrastructure shall not be opened for use by the public and no Payment shall be paid until such time as the deficiency is corrected.

If after pavement rehabilitation, the mainline pavement surface is measured and is found to be less than the design width then the Contractor must repair the deficiency within the timeframes specified in Section 400.4.1.2 (Completing Repairs). A failure to repair such deficiencies shall be a potential Termination Event for the purposes of and having the consequences set out in section 16.8(k) of the DBFO Agreement.

(c) Pavement Width Less than Design Width (C-D Roads, Ramps and Crossroads):

If following construction and prior to the New Infrastructure being opened for use by the public, the pavement surface width on C-D roads, ramps or crossroads is measured and is found to be less than the design width then the New Infrastructure shall not be opened for use by the public and no Payment shall be paid until such time as the deficiency is corrected.

If after pavement rehabilitation, the pavement surface width on C-D roads, ramps or crossroads is measured and is found to be less than the design width then the Contractor must repair the deficiency within the timeframes specified in Section 400.4.1.2 (Completing Repairs). A failure to repair such deficiencies shall be a potential Termination Event for the purposes of and having the consequences set out in section 16.8(k) of the DBFO Agreement.

400.4.3 SMOOTHNESS REQUIREMENTS (NEW INFRASTRUCTURE ONLY)

This Section 400.4.3 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

The roadways shall be maintained with an International Roughness Index ("**IRI**") value equal to or less than those shown in the following table:

Specified Maximum IRI Values

	During Operating Period		**After Initial Construction of New Infrastructure and Immediately Before Traffic Availability**	
Design Speed (km/hr)	**IRI (mm/m) (1 km average)**	**IRI (mm/m) (100 m average)**	**IRI (mm/m) (1 km average)**	**IRI (mm/m) (100 m average)**
> 110	1.9	2.9	0.9	1.9
> 90 $\leq$ 110	2.0	3.0	1.0	2.0
> 70 $\leq$ 90	2.2	3.2	1.2	2.2
$\leq$ 70	2.4	3.4	1.4	2.4

at all times based on a one kilometre average value for each lane. Furthermore, individual 100 m long sections shall be maintained with an IRI value less than or equal to the corresponding specified maximum IRI values.

400.4.3.1 Measuring For Compliance

Measurements shall be made by the Contractor immediately prior to Traffic Availability and then at a minimum of once every three years thereafter using a laser based Class 1 inertial profiling device as defined by ASTM E950, or better. The IRI shall be determined in accordance with ASTM E1926 and the recommended "*Best Practice Guidelines*" contained within "*Standardization of IRI Data Collection and Reporting in Canada*" as published by the Transportation Association of Canada. In addition to the "*Best Practice Guidelines*", the IRI for each lane in each direction is to be determined, anomalous roughness events are to be identified with an event "log" during data collection, the start and end limits are to be identified, the data is to be collected during the same week from year to year, and where "should" is used in the *TAC* "*Best Practices Guidelines*" it means that it must be done.

The Contractor shall conduct an on-site verification prior to the start of the measuring for compliance. The profile measurement and IRI post-processing and reporting verification will be based on direct comparison with manually measured longitudinal profiles in each wheel path at verification sites established by the Department for the evaluation of inertial profiling devices on local area roadway(s). The Contractor is required to run the inertial profiling device over the specified site(s) three times to measure the accuracy and repeatability of the inertial profiling device. The average IRI values for each wheel path over the 500 m site(s) derived through the automated data collection must be within 10% of the IRI derived through manual survey. The values derived from the automated data collection will be considered repeatable if the values from each run are within plus or minus 5% of the mean for the three runs.

The limiting IRI values will apply to the average value determined for each consecutive one km section of each lane. All average IRI values will be collected to the nearest 0.01 mm/m and reported to the nearest 0.1 mm/m value.

If the results of the tests or measurements indicate that the work no longer complies with the specified criteria, the work will be deemed to be non-compliant and the Contractor shall undertake the necessary work to address the non-compliance. All test and measurement results shall be provided to the Department forthwith.

400.4.3.2 Payment Adjustments

If the repairs are not completed within the applicable specified time period in Section 400.4.1.2 (Completing Repairs), the Contractor shall be assessed the following Payment Adjustments. The Payment Adjustment shall apply to full or partial lane-kilometres and 100 m sections, as applicable, and will be assessed until the deficiency is corrected.

Payment Adjustments:

Deviation Above Specified Maximum IRI Values as listed in Section 400.4.3 and measured on a 1 lane-km interval:

[1]**Deviation Above Specified Maximum IRI Value (mm/m)**	**Payment Adjustment ($/lane km)**
1. After Initial Construction	
Average IRI is less than (Specified Maximum IRI)	No Payment Adjustment. Roadway may be opened.
Average IRI is equal to or greater than (Specified Maximum IRI) and less than (Specified Maximum IRI + 1.0)	Roadway may open, however repairs and Payment Adjustments to apply. $3,600/week or any partial week, for first 4 weeks, then $11,000/week or any partial week, thereafter
Average IRI is equal to or greater than (Specified Maximum IRI +1.0)	No Payment Adjustment. Cannot open roadway.
2. During Operating Period	
Average IRI is greater than (Specified Maximum IRI + 0.3)	$3,600/week or any partial week, for first 4 weeks, then $11,000/week or any partial week, thereafter

Note [1] Deviation refers to the numeric difference from the specified IRI value, i.e. if the design speed was 110 kph the roadway must be maintained at an IRI of less than 2.0 mm/m. If the measured IRI during the Operating Period was greater than 2.3, then a Payment Adjustment would apply.

Deviation Above Specified Maximum IRI Value as listed in Section 400.4.3 and measured on a 100-metre lane interval.

Deviation Above Specified Maximum **IRI Value (mm/m)**	**Payment Adjustment ($/100 m lane section)**
1. After Initial Construction	
Average IRI is equal to or less than (Specified Maximum IRI)	No Payment Adjustment. Roadway may be opened.
Average IRI is greater than (Specified Maximum IRI) and less than or equal to (Specified Maximum IRI + 1.0).	Roadway may open, however repairs and Payment Adjustments to apply. $3,600/week or any partial week, for first 4 weeks, then $11,000/week or any partial week, thereafter
Average IRI is greater than (Specified Maximum IRI + 1.0)	No Payment Adjustment. Cannot open roadway.
2. During Operating Period	

Deviation Above Specified Maximum **IRI Value (mm/m)**	**Payment Adjustment ($/100 m lane section)**
Average IRI is greater than (Specified Maximum IRI + 0.3)	$3,600/week or any partial week, for first 4 weeks, then $11,000/week or any partial week, thereafter

Payment Adjustments for lane-km averages are based on the average of both wheel path test results and Payment Adjustments shall apply to full or partial lane-kilometres. The Payment Adjustment assessment for individual 100 m sections shall be based on the average of both wheel path test results and Payment Adjustments shall apply to each 100 m section of non-compliance.

400.4.4 RUTTING PERFORMANCE REQUIREMENTS (NEW INFRASTRUCTURE ONLY)

This Section 400.4.4 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

The roadway shall be maintained with rut depths of less than 14 mm at all times based on one km average values. For 100 m sections the rut depths shall be maintained to be less than 19 mm and for any isolated section, less than 25 m in length, the rut depths shall be maintained to less than 29 mm.

400.4.4.1 Measuring For Compliance

Measurements shall be made by the Contractor immediately prior to Traffic Availability and then at a minimum of once every three years thereafter using a laser based Class 1 inertial profiling device as defined by ASTM E950, or better and equipped with a minimum of 10 lasers. Testing shall be performed during the same week for each test year. Rut depth measurements shall be collected for each lane on a continuous basis and reported at 50 m intervals. Rut depth measurements made with an inertial profiling device shall be averaged for each 100 m lane segment of the roadway for each wheel path of each lane. The rut depths shall be collected to an accuracy of +/- 0.5 mm and reported to +/- 1 mm for each 100 m lane segment.

The Contractor shall conduct an on-site verification prior to the start of the measuring for compliance. The wheel path rut depth measurement equipment verification will be based on direct comparison with manually measured transverse profiles at verification sites established by the Department for the evaluation of inertial profiling devices on local area roadway(s). The Contractor is required to run the inertial profiling device over the specified site(s) three times to measure the accuracy and repeatability of the inertial profiling device. The average rut depth over the 500 m site(s) derived through the automated data collection must be within +/- 3 mm of the average rut depth derived through manual survey. The values derived from the automated data collection will be considered repeatable if the values from each run are within +/- 1 standard deviation of the mean for the three runs.

Measurements of localized areas shall be carried out using a 1.8 m straight edge in accordance with ASTM E1707.

The limiting rut depth values will apply to the average value determined for each consecutive one km section for each lane. Additionally, for each lane, each individual 100 m section rut depth value shall be <19 mm and all localized areas shall be maintained to have rut depth measurements of <29 mm. Localized areas shall be determined for individual wheel path locations, all other rut measurements will be based on the average of both wheel path locations, for each lane. All average rut values shall be rounded down to the nearest mm and reported as an integer value.

If the results of the tests or measurements indicate that the work no longer complies with the specified criteria, the work will be deemed to be non-compliant and the Contractor shall undertake the necessary work to address the non-compliance. All test and measurement results shall be provided to the Department forthwith.

400.4.4.2 Payment Adjustments

If the repairs are not completed within the applicable specified time period, Section 400.4.1.2 (Completing Repairs), the Contractor shall be assessed a Payment Adjustment. The $/lane-km value shall apply to full or partial kilometres and shall be assessed until the deficiency is corrected.

Payment Adjustments:

Average Rut Depth (mm)(1 km average)	**$/lane-km**	**Average Rut Depth (mm) (100 m section)**	**$/Lane 100 m Section**	**Rut Depth (mm) (Isolated Deficiency)**	**$/Isolated Deficiency**
After initial construction >4	No payment, cannot open roadway	After initial construction >4	No payment, cannot open roadway	After initial construction >4	No payment, cannot open roadway
During operations >14 - must fix within specified time period	$3,600/week or any partial week, for first four weeks, then $11,000/week or any partial week, thereafter	During operations >19 - must fix within specified time period	$3,600/week or any partial week, for first four weeks, then $11,000/week or any partial week, thereafter	During operations >29 - must fix within specified time period	$2,400/week or any partial week, for first four weeks, then $7,200/week or any partial week, thereafter

Payment Adjustments for lane-km averages are based on both wheel path test results. The Payment Adjustment for individual 100 m sections applies to the average of both wheel paths except that isolated sections shall be based on individual wheel paths and can result in a Payment Adjustment based on both wheel paths at the same station location. The Payment Adjustment for 100 m sections applies to each 100 m section of non-compliance.

400.4.5 SKID RESISTANCE REQUIREMENTS (NEW INFRASTRUCTURE ONLY)

This Section 400.4.5 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

ASTM E274 or alternate testing methods, as approved by the Department, shall be used to determine the skid resistance of the pavement along the New Infrastructure.

ASTM E 1960 shall be used to determine the calibrated wet friction at 60 km/h (F60) and the speed constant of wet pavement friction (SP). The resulting International Friction Index ("**IFI**") shall be reported along with the actual skid numbers determined.

Areas of pavement which exhibit a physical appearance of polishing, flushing or bleeding and/or which exhibit a higher than average incidence of accidents shall be tested for skid resistance.

400.4.5.1 Measuring For Compliance

After Traffic Availability, areas of pavement on the New Infrastructure which exhibit a visual appearance of polishing, flushing or bleeding and/or which exhibit a higher than average incidence of accidents shall be tested for skid resistance within 30 days of the date which the Contractor first became aware, or the date which the Contractor should have been aware, of such conditions, weather permitting. All test and measurement results shall be provided to the Department forthwith.

400.4.5.2 Completing Repairs

If results of the tests or measurements indicate that the New Infrastructure no longer complies with the specified criteria, the New Infrastructure will be deficient, requiring repair. When a specific deficiency is identified, the Contractor shall correct the work such that it complies with the minimum requirements within 60 days of the deficiency being confirmed. All test and measurement results shall be provided to the Department forthwith.

400.4.5.3 Payment Adjustments

If the repairs are not completed within the applicable specified time period, the Contractor shall be assessed a Payment Adjustment. The $/lane-km value shall apply to full or partial kilometres and will be assessed until the deficiency is corrected.

During operations, Skid Number < 30 - must fix within specified time period	$3,600/lane-km/week or any partial week, for first four weeks, then $11,000/lane-km/week or any partial week.

400.4.6 GENERAL PAVEMENT MAINTENANCE REQUIREMENTS

The Contractor shall maintain all pavement sections including shoulders and gore areas on a regular basis in order to ensure that they remain in a structurally sound and safe condition and continue to provide the service for which they were intended recognizing the Contractor is not responsible for rehabilitating the Existing Infrastructure.

The Contractor shall maintain the pavement surface in a safe condition. If a pavement deficiency is a hazard to motorists, it shall be repaired immediately regardless of size. The following sections provide detailed requirements.

In respect of the Existing Infrastructure only:

(a) the repair methods for localized deficiencies, localized roughness, and localized cracking for both asphalt and Portland cement concrete pavements shall be as indicated in Section 100.2.9 (Operation and Maintenance Plan);

(b) the Contractor is not responsible for any work at joints in the Portland cement concrete pavement, if any, for the Existing Infrastructure, where work such as mud jacking and grinding, is due to slab movements;

(c) the responsibility for the cost of the repair shall be governed by the DBFO Agreement and other applicable provisions of the Technical Requirements;

(d) the Contractor will be responsible for reporting any pavement related problems with skid resistence, roughness, cross slope, superelevation, structural or other deficiency to the Department; and

(e) the term "**localized**" means access within one metre or less from each other.

400.4.6.1 Localized Deficiencies

Localized deficiencies within any travel lane which are > 0.1 square metre shall be repaired within 24 hours following the time when the Contractor became aware, or should have become aware, of the deficiency. Localized deficiencies which are not located within the travel lanes and/or do not exceed 0.1 square metres shall be repaired within 21 days following the time when the Contractor became aware, or should have become aware, of the deficiency. Spalling or other distress at crack locations and joints shall be treated as a localized deficiency.

400.4.6.2 Localized Roughness

All areas of the pavement shall be maintained true to lines and grades. Localized areas, such as transverse cracks or joints, shall be maintained to prevent localized roughness. Deficiencies which cause localized roughness shall be repaired. The definition of localized roughness shall be any abrupt deviation in excess of 6 mm when measured with a 1.2 m straight edge.

400.4.6.3 Localized Cracking – Asphalt Concrete Pavements (Existing Infrastructure Only)

For all localized cracking in asphalt concrete pavements on the Existing Infrastructure, all transverse cracks between 2mm and 25mm in width and all longitudinal cracks between 2mm and 12mm in width shall be routed and sealed. Routed cracks with missing sealant shall be re-sealed. Transverse cracks greater than 25mm and longitudinal cracks greater than 12mm are to be spray patched. The Contractor shall prepare and carry out a crack sealing program annually, with a completion date for the work of August 31 each year of the Operating Period.

400.4.6.4 Localized Cracking – Portland Cement Concrete Pavements (Existing Infrastructure Only)

For all localized cracking in Portland cement concrete, if any, on the Existing Infrastructure, all random cracks between 2mm and 20mm in width shall be sawn/routed and sealed. Sawn/routed cracks with missing sealant shall be re-sealed. The Contractor shall prepare and carry out a crack sealing program annually, with a completion date for the work of August 31 each year of the Operating Period.

400.4.6.5 Measuring For Compliance

The Contractor shall inspect the Infrastructure on a continual basis as part of the schedule of inspection, and shall identify deficiencies related to Section 400.4.6 (General Pavement Maintenance Requirements). All test and measurement results shall be provided to the Department forthwith.

400.4.6.6 Completing Repairs

The Contractor shall undertake any required repairs within the time lines indicated for the specific maintenance need. Where a specific timeline is not indicated, the repairs shall be undertaken within 30 days of the time the Contractor became aware, or should have become aware, of the deficiency. Maintenance repair requirements apply year-round and may be required during poor weather conditions. All test and measurement results shall be provided to the Department forthwith.

400.4.6.7 Payment Adjustments

If repairs, permanent or otherwise, are not completed within the stipulated time period, the

Contractor shall be assessed Payment Adjustments at a rate of $600/required repair for each seven day period or any partial week, until the deficiency is corrected.

For the Existing Infrastructure only, if the annual crack sealing programs are not completed by August 31st each year, the Contractor shall be assessed a Payment Adjustment of $2,000/km or any partial km, of single direction unsealed mainline, C-D road, ramp or crossroad/month or portion thereof, until the annual programs are completed.

400.4.7 MISCELLANEOUS - OPERATION AND PERFORMANCE REQUIREMENTS

This Section 400.4.7 covers the performance requirements of specific appurtenances and maintenance activities that must be performed to a specified standard by the Contractor. Notwithstanding the foregoing sentence but subject to the DBFO Agreement, all infrastructure associated with the Infrastructure shall be maintained in an adequate condition and function as designed.

Non-specified items of the Infrastructure such as, but not limited to, backslope, sideslope, or embankment movements, fencing, and pavement shoulders or gore areas shall be maintained to a level consistent with standard practice. Non-specified items shall be monitored and maintained in accordance with standard industry practice. The timing for completing repairs detailed in Section 400.4.1.2 (Completing Repairs), will apply except as specifically noted. Subject to specific reporting requirements specified elsewhere in this Section 400.4.7 (Miscellaneous - Operation and Performance Requirements), all test, measurement, inspection, and other results (including both pre-repair and post-repair) in this Section 400.4.7 (Miscellaneous - Operation and Performance Requirements) shall be recorded and retained by the Contractor, and such records shall be provided to the Department forthwith, upon its request.

400.4.7.1 Delineators

Delineators shall be maintained clean at all times and shall exhibit a minimum retroreflectivity of 80% of design value.

The Contractor shall maintain delineator guideposts plumb within 50 mm throughout their length.

Delineators shall be maintained within 5% of design height and shall not deviate from design locations by more than 50 mm.

Delineators shall be maintained to provide the intended delineation at all times. Delineators that are damaged, or otherwise removed, such that they are not providing the desired delineation shall be replaced.

400.4.7.1.1 Measuring For Compliance

The Contractor shall identify damaged, missing or otherwise ineffective delineators during roadway inspections. At least once per year, the Contractor shall complete a visual inspection and, when required (i.e. vertical alignment more than 50 mm out of plumb), shall realign delineator guideposts to within 13 mm of plumb throughout their length.

400.4.7.1.2 Completing Repairs

Delineators that become soiled shall be cleaned within seven days providing weather conditions permit.

Delineators that are damaged, missing or otherwise fail to function as designed, shall be replaced within seven days.

400.4.7.1.3 Payment Adjustments

Payment Adjustments shall be assessed against the Contractor for each delineator which does not comply with the requirements of this Section 400.4.7.1 (Delineators) within the stipulated time period at a rate of $24/delineator/day or any partial day, until made to comply.

400.4.7.2 Roadway Lighting

Roadway lighting includes all lights designed and constructed for the Infrastructure or subsequently added to the Infrastructure. The Contractor shall undertake the necessary maintenance to ensure that the desired illumination is provided to motorists at all times. The Contractor shall inspect the operation of the entire roadway lighting system, including the structural integrity of components, power supply, conduit, cables and equipment on a regular basis and this shall be included in the Contractor's QMS (Section 100.2.1). In addition, the following shall apply:

- Individual lights/luminaires shall be maintained to provide light output in accordance with the manufacturer's rated design parameters and lighting shall be maintained and operated to provide the level of illumination as designed;
- Poles shall be maintained plumb within 10 mm in 1 m;
- Poles and other mounting hardware shall be maintained in a clean and neat repair, with no corrosion visible;
- Concrete bases shall be maintained to be structurally adequate for the design loads;
- A regular monitoring program for evaluating the condition of all roadway lights, including the supporting infrastructure shall be conducted and deficiencies in light standards, bases, power supply or other luminaire elements reported to the Department as soon as practicable; and
- All portions of the installation and any repairs or modifications shall with respect to the Existing Infrastructure comply fully with the original designs and any applicable codes and with respect to the New Infrastructure comply fully with the Detailed Designs and construction requirements and any applicable codes.

400.4.7.2.1 Measuring for Compliance

The Contractor shall conduct a regular monitoring program for evaluating the condition of all roadway lights, including all supporting infrastructure, within the Infrastructure. The Department may inspect lights at any time and notify the Contractor of any non-compliance with the Technical Requirements.

400.4.7.2.2 Completing Repairs

The Contractor shall undertake repairs within the following guidelines, from the time that the deficiency is known, or should have been known, to the Contractor:

- Outage of 2 or less consecutive lamps shall be repaired within 96 hours.
- Outage of 2 to 5 consecutive lamps shall be repaired within 72 hours.
- Outage of more than 5 consecutive lamps shall be repaired within 48 hours.
- Repair or replacement of lighting infrastructure damaged by an accident shall be done within seven days.

An outage is defined as total failure of the lamp to light, failure of the lamp to produce the manufacturer's rated output (to such an extent that it is visually apparent when compared to other lamps), intermittent lighting caused by cycling on and off, or light is prevented from being properly distributed to the roadway surface.

Poles which are out of alignment more than allowed in the Technical Requirements shall be corrected within 60 days. Any condition of poles or concrete foundations that affect the structural integrity of the installed lighting system shall be repaired within 20 days except for high mast systems, which shall be repaired within five days.

When the work necessitates the replacement of lighting structures, only new materials shall be used, unless otherwise directed in advance and in writing by the Department.

400.4.7.2.3 Payment Adjustments

The Contractor shall be assessed Payment Adjustments for failing to adjust, maintain, repair/replace lamps or components of the roadway lighting system within the stipulated time as follows:

- Lamp repair/replacement, $120/lamp/day or any partial day, that the lamp remains in need of repair/replacement; and
- Repair or adjustment of any pole, base or other lighting system component, $120/component/day or any partial day, that the component needs adjustment.

400.4.7.3 Barriers and Guardrail

Barriers and guardrail shall be maintained to function as designed and to have a neat and tidy appearance at all times. The Contractor shall inspect the condition of guardrail on the Infrastructure on a regular basis and this shall be included in the Contractor's QMS (Section 100.2.1). In addition, the following shall apply:

- Guardrail that is dented, bent, twisted or otherwise misaligned shall be repaired or replaced. Barriers and guardrail shall be maintained in proper alignment, as designed, at all times. Permissible tolerances for plumb and horizontal grades shall be 20 mm from design grades. Permissible tolerances for vertical grades shall be 40 mm from design grade;
- Barriers and guardrail shall be visible at all times and reflective markers shall be clean and function as designed;
- Guardrail damaged by collision shall be replaced. When guardrail is damaged it shall be repaired immediately to assure the continued protection of the travelling public. When immediate permanent repair is not possible, temporary repairs shall be implemented immediately. Permanent repairs shall be with new materials and shall be installed to original design specifications, unless otherwise directed in advance and in writing by the Department;
- Posts which are structurally unsound, loose, out of plumb, or otherwise failing to provide the required functionality, shall be replaced;
- All components shall be securely fastened with the designed fasteners at all times;
- Concrete barrier that has concrete pieces missing or structural weakening shall be replaced; and
- The Contractor shall conduct a regular monitoring program for evaluating the condition of all guardrails on the Infrastructure and reporting deficiencies in the guardrail installations on the Infrastructure to the Department as soon as practicable.

400.4.7.3.1 Measuring for Compliance

The Contractor shall undertake daily inspections of all barriers and guardrail sections within the Infrastructure.

400.4.7.3.2 Completing Repairs

In situations when barriers or guardrails are missing or damaged such that they do not function as intended, the Contractor shall undertake repairs or temporarily protect the area immediately. All other non-compliant sections of barrier or guardrail shall be repaired within 60 days. In instances where temporary repairs are required, such temporary repairs may not be in place for more than five days. In winter months when permanent repairs may not be possible due to freezing conditions, temporary measures may stay in-place until the ground is free of frost.

400.4.7.3.3 Payment Adjustments

Following the expiration of the specified time-frame for completing repairs, or in the case where temporary repairs have been in-place until weather permits repairs to be more reasonably undertaken, a Payment Adjustment of \$240/metre/day or any partial day, of non-compliant barrier or guardrail shall be assessed until the repairs are completed.

400.4.7.4 Grass Cutting and Landscape Maintenance

400.4.7.4.1 General

The Contractor shall maintain the vegetation in all areas of the Road Right of Way and stormwater management facilities. The Contractor shall remove and dispose of any dead vegetation and re-seed grass, if necessary, to retain the overall landscaping within the Road Right of Way and stormwater management facilities.

Grass within the Road Right of Way and stormwater management facilities shall not exceed 300 mm in height, at any time.

Weed control shall be carried out, by the Contractor, as required to control noxious weeds including all noxious weeds identified under the Weed Control Act (Alberta) and Local Authority bylaws.

400.4.7.4.2 Weed Control

400.4.7.4.2.1 Operating Standards, Approvals and Permits

The Contractor shall comply with the operating standards and practices of the Industrial Vegetation Management Association of Alberta and shall have a service approval agreement from Alberta Environment, or its successor. All personnel applying chemicals shall have a valid applicators license issued by Alberta Environment, or its successor.

Special use approvals issued by Alberta Environment, or its successor, will be required in instances where chemicals are to be sprayed within 30 m of an open body of water. In such instances, the Contractor shall advertise the proposed work in newspapers local to the area, 30 days prior to the scheduled starting date of the work.

The Contractor shall provide the Department with a copy of the newspapers containing the advertisement. All public concerns shall be referred, by the Contractor, to Alberta Environment, or its successor, who will identify any work conditions in the approval. The Contractor shall be responsible for obtaining the special use approval and shall comply with the conditions specified therein.

The Contractor is liable for any damage caused to areas outside the Road Right of Way occasioned by its use of chemicals for weed control and shall promptly handle any damage claims in this regard. The Contractor shall also pay any fines/penalties assessed by the governing authority for failure to promptly comply with applicable requirements.

For the Existing Infrastructure, the Contractor shall not be responsible for watering or re-planting materials but shall be responsible for the weed control within the designated areas, including the planting areas, and shall be responsible for the removal of dead vegetation. The Contractor shall be responsible for replacing plants damaged by the Contractor or by those for whom it is legally responsible.

400.4.7.4.2.2 Materials

The Contractor shall select and supply the appropriate chemical for vegetation control. Only chemicals approved by the appropriate department of the Federal Government for general industrial spraying shall be used. The Contractor shall supply any signs required to identify treated areas in public use areas.

400.4.7.4.2.3 Procedures

The Contractor's use of chemicals, application rates and methods shall comply with the policies, rules and regulations of Alberta Environment, or its successor. The Contractor shall maintain accurate records of all applications including the type and amounts of chemicals used and the locations treated. If requested, the Contractor shall supply this information to the Department along with copies of the bills of lading and the manufacturer's recommended application rates for the chemicals used. The Contractor shall dispose of empty chemical containers only at approved disposal sites.

400.4.7.4.3 Measuring for Compliance

The Contractor shall undertake periodic inspections of all areas of the Road Right of Way and stormwater management facilities to assess the need for any type of landscape maintenance including grass cutting, re-seeding/re-planting, weed control and the removal of dead vegetation. The monitoring program shall comply with the program documented in the Contractor's EMS (Section 100.2.2). The Department may inspect landscaping at any time and notify the Contractor of any non-compliance to these specifications.

Alberta Environment, or its successor, and the Local Authority will also inspect for noxious weeds and any order or direction given to the Contractor regarding deficiencies in compliance shall be dealt with immediately.

400.4.7.4.4 Completing Repairs

When the Contractor fails to observe the need for maintenance, or fails to undertake maintenance within two weeks, then the Contractor will be considered non-compliant and the specified Payment Adjustments will be applied.

400.4.7.4.5 Payment Adjustments

Payment Adjustments shall be assessed against the Contractor on the following basis:

- Grass in excess of the specified maximum height, $120/hectare or any partial hectare/month or any partial month, for any portion of a hectare that fails to meet these requirements.

400.4.7.5 Litter Clean Up

The Contractor shall maintain the Road Right of Way and the drainage system to be reasonably free of litter. The Road Right of Way must be free of any and all litter that may cause damage to vehicles, or otherwise result in a safety hazard for roadway users. The Contractor shall:

- Conduct an annual litter clean up, each spring. Following the annual clean up no litter shall be visible within the Road Right of Way and the drainage system;
- Conduct litter clean up, to the same standard as the spring clean up, on or about July 30, and September 30 each year during the Operating Period. In addition, the Contractor shall clean up any litter that covers more than 0.025 cubic metres (one cubic foot) in size or greater within the Road Right of Way or the drainage system within one week of observing the litter;
- Remove litter, including dead animals, on the roadway that has the potential to affect traffic immediately and dispose of. Dead animals at any other location on the Road Right of Way or the drainage system shall be removed within six hours of being observed and disposed of;
- Report all incidences (together with reasonable details thereof) of motor vehicles that the Contractor has reason to believe have been abandoned, are parked in contravention of law, regulation or by-law, or are otherwise left unattended in a manner that obstructs the normal movement of traffic or constitutes a present or potential hazard to persons or property, to the appropriate law enforcement authorities as soon as reasonably practical and in any event within 24 hours from the time the Contractor was aware or should have been aware of such incidences. The Contractor shall fully cooperate and properly coordinate with the appropriate law enforcement authorities in the seizure or removal of such motor vehicle;
- Remove graffiti from any location visible from the roadway within 96 hours. Graffiti that cannot be effectively removed shall be covered with appropriate materials; and
- Remove all waste or other litter generated by the Contractor's operation.

Notwithstanding the above requirements for litter clean-up the Contractor shall work with and coordinate with policing authorities and registered motor vehicle owners and their insurers to facilitate clean up of debris resulting from accidents within the Road Right of Way.

400.4.7.5.1 Measuring for Compliance

The Contractor shall undertake periodic inspections of all areas of the Road Right of Way and drainage system to assess the need for litter clean up.

The Contractor will be considered to be non-compliant with this Section 400.4.7.5 (Litter Clean Up) if any of the following occur:

- An annual spring clean-up campaign has not been conducted, or has been conducted but has not removed all visible litter from the Road Right of Way and drainage system, by June 1st of each year;
- The specified summer and fall clean up operations have not been completed by August 15 and October 15 respectively, in each year;
- Litter that poses a hazard has not been removed within the specified time period;
- The Department or the Contractor identifies that the Road Right of Way and drainage system is littered and unsightly and such litter is not removed within the specified time frame;

- Failure to report abandoned vehicles to the appropriate law enforcement authorities as soon as reasonably practical and in any event within 24 hours from the time the Contractor was aware or should have been aware of such incidences or failure to fully cooperate and properly coordinate with the appropriate law enforcement authorities in the seizure or removal of such motor vehicles;
- Graffiti is not removed or appropriately covered within the specified time frames; and
- Waste generated by the Contractor has not been removed within one week of the completion of the work associated with the waste, or if such waste is creating an unsightly or hazardous condition.

400.4.7.5.2 Completing Clean Up

When the Contractor fails to observe the need for litter clean-up, or fails to undertake cleanup required within the specified time, then the Contractor will be considered non-compliant and the specified Payment Adjustments shall be applied.

400.4.7.5.3 Payment Adjustments

If the Contractor is determined to be non-compliant, a Payment Adjustment of $300/day, or any partial day, shall be assessed for each and every occurrence of non-compliance. An occurrence is any single or multiple non-compliance. Payment Adjustments for litter clean up are cumulative but shall not exceed $600/day. The Payment Adjustment shall be assessed for each day, or portion thereof, until the cleanup is completed.

400.4.7.6 Drainage Systems

Drainage systems shall be maintained to function as designed and to assure that environmental requirements are met at all times.

The Contractor shall undertake drainage system maintenance to ensure that the roadway surfaces and all other elements of the Infrastructure are safe and effectively drained.

The requirements of this section apply to any aspect of the Infrastructure that serves a drainage function, including, but not limited to:

- Drainage structures;
- Culverts;
- Ditches;
- Stormwater management facilities;
- Curb and gutter (drainage function);
- Manholes, inlet and outlet structures, catch basins, flumes; and
- Storm sewers.

The Contractor shall ensure that environmental requirements required by legislation or design are met at all times and shall maintain all aspects of the drainage facilities to prevent the discharge of silt or sediments into water courses.

Drainage system elements shall be maintained to assure full hydraulic and structural capacity.

Ditches, sideslopes, backslopes and any land within the Road Right of Way, the drainage system and/or parts of the TUC drained by the Infrastructure system shall be protected from erosion, including wind erosion. The Contractor shall be responsible for any damage to the Road Right of Way, the TUC, or any lands adjacent the TUC caused by a deficiency in the maintenance of the drainage system for the Infrastructure or by a deficiency in the design and construction of the drainage system for the New Infrastructure.

The Contractor shall manage the drainage system such that deficiencies are repaired immediately if erosion or sedimentation is a potential, or within one year for all other repairs.

400.4.7.6.1 Measuring for Compliance

The Contractor shall complete regular inspections of the Infrastructure to assess the function of the drainage systems and to schedule maintenance and repairs.

400.4.7.6.2 Completing Repairs

The Contractor shall plan for and complete repairs to the drainage system on an annual basis. Drainage deficiencies identified by the Contractor's inspection shall be corrected within two months of the date of the inspection excepting if such repairs are necessary to prevent the potential for ponding of water on the road surface or if potential for erosion or sedimentation exists, in which case repairs shall be made immediately.

400.4.7.6.3 Payment Adjustments

The ponding of water on the road surface at anytime is not acceptable. For each and every case in which ponded water remains on the road surface for greater than 60 minutes, the Contractor shall be assessed a Payment Adjustment per day, or portion thereof, until the water is removed and the cause of the ponding is rectified.

For paved areas with ponds up to 4 m^2 the Payment Adjustment shall be $1,200/pond/day or any partial day. For paved areas with ponds in excess of 4 m^2 a Payment Adjustment of $6,000/pond/day or any partial day, shall be made.

If erosion of lands occurs, the Contractor shall be assessed a Payment Adjustment if it is not repaired, and the cause rectified within one week of the time of the Contractor becoming aware or should have been aware of the deficiency, of $600/day or any partial day, until repairs are complete.

For all other drainage system deficiencies, the Contractor shall complete the necessary repairs within the stipulated time period or be assessed a Payment Adjustment of $120/day or any partial day, for each deficiency, until the deficiency is repaired.

400.4.7.7 Curb And Gutter

Curb and gutter and any associated works shall be maintained to function as designed recognizing the Contractor is not responsible for the rehabilitation of the Existing Infrastructure. References to curb and gutter shall include curb or gutter sections which may exist separately within the New Infrastructure. The following shall apply:

- Curb and gutter shall be maintained to ensure that their function in overall drainage and driver guidance is maintained at all times;
- Curb and gutter shall be maintained to ensure no ponding of water anywhere along the length of the curb, within the gutter or on any roadway or shoulder;
- Broken or damaged concrete shall be replaced when required to restore functionality;
- Scaling of a concrete surface shall be limited to no more than 10% of surface area in any five lineal metre section of curb and gutter;
- Cracking of concrete shall be limited to a maximum crack width of 3 mm, occurring at a maximum frequency of one crack every 2 m; and
- Curb height shall be maintained to meet the requirements of the design specifications and in no case shall be less than 150 mm.

400.4.7.7.1 Measuring for Compliance

The Contractor shall undertake periodic inspections of all curb and gutter sections within the Infrastructure for the purpose of evaluating the functionality and the condition of the concrete materials.

400.4.7.7.2 Completing Repairs

The Contractor shall complete repairs to restore the functionality of the curb and gutter sections to the level and alignment for which they were originally designed. General repairs shall be completed within 180 days of the time when the Contractor knew of, or should have known of, the deficiency. Replacements of curb and gutter for surface scaling and/or cracking which do not impair functionality shall be completed within 180 days of the time when the Contractor knew or should have known of the deficiency.

400.4.7.7.3 Payment Adjustments

Payment Adjustments for each instance where a curb and gutter section does not conform to the Technical Requirements, and is not repaired within the stipulated time period, shall be $1,200/occurrence/day or any partial day, until rectified.

400.4.7.8 Walks and Multi-use Trails

Walks and multi-use trails shall be maintained to function as designed. The Contractor shall undertake the necessary maintenance to ensure that any walks and multi-use trails within the Infrastructure are maintained in a condition that is safe for pedestrian traffic. The following shall apply:

- Vertical displacement at joints or cracks that exceed 5 mm shall be repaired or replaced to remove the differential elevation and remove any tripping hazard;
- Concrete that is cracked in multiple locations within the same general area of a walks and multi-use trails or otherwise results in a discontinuity that may pose a tripping hazard or be a safety concern shall be removed and replaced;
- Concrete surfaces that exhibit scaling over more than 15% of the surface area in any 1 m^2 section and results in a rough surface texture shall be removed and replaced; and
- Crack widths in excess of 5 mm require repairs or replacement of the walks and multi-use trails section(s) affected.

400.4.7.8.1 Measuring for Compliance

The Contractor shall undertake periodic inspections of walks and multi-use trails for evaluating the condition of all walks and multi-use trails within the Infrastructure.

400.4.7.8.2 Completing Repairs

The Contractor shall complete repairs to restore the functionality of the walks and multi-use trails to the level for which it was originally designed. Repairs shall be completed within 180 days of the time when the Contractor knew of, or should have known of, the deficiency.

400.4.7.8.3 Payment Adjustments

Payment Adjustments for each instance where a walks and multi-use trails do not conform to the Technical Requirements, shall be $1,200/occurrence/month or any partial month, until rectified.

400.4.7.9 Subgrade Sideslopes and Backslopes (New Infrastructure Only)

This Section 400.4.7.9 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

Subgrade sideslopes shall be maintained as a uniform, smooth surface or straight line from the edge of pavement to edge of sideslope. Over the Operating Period, the straight line sideslope may vary from the design slope angle by no more than 1%.

Backslopes shall be maintained as a uniform, smooth surface or straight line from the ditch bottom to the top of the slope. Over the Operating Period, the straight line backslope may vary from the design slope angle by no more than 2%.

Depressions or abrupt elevation changes greater than 0.05m, for a distance of 2.0 m down the sideslope shall be repaired by the Contractor. Abrupt changes in slope angle that form a depression greater than 0.1 m from the design straight line or slumping in sideslopes or backslopes shall be repaired by the Contractor.

400.4.7.9.1 Measuring for Compliance

The Contractor shall undertake periodic inspections for evaluating the condition of all subgrade sideslopes and backslopes within the New Infrastructure.

400.4.7.9.2 Completing Repairs

The Contractor shall complete repairs to restore the functionality of the sideslopes and backslopes to the level for which it was originally designed. Areas that require repair within the clear zone shall be completed within 30 days of the time when the Contractor knew of, or should have known of, the deficiency. Other areas requiring repair shall be completed shall be completed within 180 days of the time when the Contractor knew of, or should have known of, the deficiency.

400.4.7.9.3 Payment Adjustments

Payment Adjustments for each instance when where the sideslope and backslope does not conform to the requirements herein, shall be $1,200/occurrence/week or any partial week, for deficiencies located within the clear zone and $1,200/occurrence/month or any partial month, for other deficiencies.

400.4.8 TRAFFIC CONTROL DEVICES - OPERATION AND PERFORMANCE REQUIREMENTS

400.4.8.1 Signs

Signs shall be maintained such that they function as designed. The Contractor shall undertake the necessary maintenance to ensure that the desired message is available to motorists at all times. The following shall apply:

- Signing which does not function as designed shall be adjusted, relocated, and/or supplemented to meet the intended function. This includes ensuring signs are not obscured by other signs and do not provide conflicting messages;
- All signs shall be maintained to the physical size, materials, and lettering as designed and constructed for the original installation;
- Signs shall be kept clean and legible at all times;
- Signs shall have an acceptable level of retroreflectivity. Generally, acceptable retroreflectivity can be determined by visual examination of the sign under night-time driving conditions. Signs that exhibit reduced or blotchy retroreflectivity in excess of 25% of the sign area shall be considered to have unacceptable retroreflectivity. Sign reflectivity shall meet the requirements of ASTM D4956;
- Measurement of retroreflectivity will be determined in accordance with ASTM E1709 using a portable retroreflectometer;
- Signs shall be replaced if sign-sheeting material delaminates from the sign blank;
- Sign posts shall be maintained straight and true and shall not lean more than 25 mm in 1 m in

any direction;

- Signs shall be kept level, within 25 mm in 1 m, and properly orientated for the travelling public;
- All post replacement of mounted signs shall be the same type as the original installation;
- Galvanized or painted posts shall have the coating maintained such that no corrosion is visible;
- The maintenance of breakaway bases shall be conducted to meet the requirements of the design specifications;
- Signs or billboards containing advertising or for any commercial purpose are not permitted. The Contractor is responsible for the removal of all such signs/billboards; and
- The Contractor shall remove any non-conforming signs or any unauthorized signs from the Road Right of Way.

400.4.8.1.1 Measuring for Compliance

The Contractor shall conduct a regular monitoring program for evaluating the condition of all signs within the Infrastructure.

400.4.8.1.2 Completing Repairs

The Contractor shall repair/replace any sign that is damaged, stolen, vandalized or which otherwise fails to meet the requirements of this Section 400.4.8 (Traffic Control Devices - Operation and Performance Requirements), within the following timelines:

- Non-critical regulatory signs shall be repaired/replaced within 48 hours;
- Standard information/directional signs shall be repaired/replaced within 14 days; and
- Non-standard information/directional signs shall be repaired/replaced within 60 calendar days.

For straightening, or otherwise maintaining signs, the work shall be conducted within 21 days, unless the deficiency is such as to affect the effectiveness of the sign.

Unauthorized signs shall be removed within one day.

These time lines apply to the time elapsed from when the Contractor knew of, or should have known of, the deficiency with respect to any specification requirement in Section 400.4.8 (Traffic Control Devices - Operation and Performance Requirements).

400.4.8.1.3 Payment Adjustments

Payment Adjustments shall be assessed against the Contractor for failing to maintain, repair/replace signs within the stipulated time as follows:

- General maintenance - $120/sign/week for any whole or partial week the sign remains in need of maintenance;

- Repair or replacement of regulatory signs - $1,200/sign/day, or any partial day, until rectified;
- Repair or replacement of information signs < 1 m^2 or failure to remove an unauthorized sign - $120/sign/day or any partial day, until rectified; and
- Repair or replacement of information signs $\geq$ 1 m^2 - $300/sign/day or any partial day, until rectified.

400.4.8.2 Traffic Signals

Traffic signals shall be maintained as designed and shall be fully functional at all times. The following shall apply:

- Signal lights, including any cross-walk lights or advance warning devices shall be maintained such that all lights function at all times;
- Electronics associated with signals shall be maintained such that all signals are functioning at all times;
- Power supplies for signal installations shall be protected, maintained and serviced as required to ensure an uninterrupted power supply is available to keep the signals functioning at all times;
- Signal poles shall be maintained straight and true and shall not lean more than 10 mm in 1 m in any direction;
- Poles, control cabinets and other signal hardware shall be maintained such that no corrosion is visible and that corrosion does not affect the structural and operational integrity of any elements; and
- All repairs shall comply with the original design requirements.

400.4.8.2.1 Measuring for Compliance

The Contractor shall conduct a regular monitoring program for evaluating the condition of all traffic signals within the Infrastructure.

400.4.8.2.2 Completing Repairs

The Contractor shall repair/replace any signals damaged, stolen, vandalized or which otherwise fail to meet the requirements of this Section 400.4.8.2 (Traffic Signals), within the timelines as follows:

- For non-functioning signals, signing shall be installed immediately to direct traffic until signal function is restored;
- For all signals, repairs shall be undertaken immediately to restore the full functionality of the signal;
- For straightening signal standards, or otherwise maintaining signals, the work shall be conducted within 30 days, unless the deficiency is such as to affect the functioning of the signal; and
- Corrosion remediation shall be carried out within 30 days.

A signal that is not functioning as intended by the Contractor's Engineer is considered to be a non-functional signal. A signal is considered non-functional when: 3-colour operation is not available; or when the signal is not using the optimal 3-colour programming (for a given time of day or event) in the controller; or at any location at which 3-colour signal operation is not available on any signal head for traffic from one (or more) directions.

The time lines apply to the time elapsed from when the Contractor knew of, or should have known of, the deficiency.

400.4.8.2.3 Payment Adjustments

Any period when the traffic signals are not fully functional, for any reason whatsoever, including power failure under the Contractor's control, shall result in a Payment Adjustment, following the expiration of the specified time period for completing the specific repair, in accordance with the following:

- First occurrence of a non-functioning signal location - $600/hour or any partial hour, until rectified;
- First occurrence of non-functioning bulb or colour display (maximum of one at a signal location) - $120/day or any partial day, until rectified;
- First occurrence of non-functioning bulb or colour display (2 to 4 non-functioning lights or colour displays (provided no non-functioning two bulbs or colour display of the same type affects traffic in any single direction)) - $240/day or any partial day, until rectified;
- First occurrence of mis-aligned signal pole - $120/day or any partial day, until rectified; and
- Each occurrence to remediate corrosion within the specified time - $120/occurrence/month or any partial month, until rectified.

Payment Adjustments for further occurrences of non-compliance following the first occurrence shall be twice the value shown above for each and every such further occurrence. In this section, "occurrence" refers to an occurrence anywhere on the Infrastructure.

The number of occurrences of non-compliance shall be determined for a consecutive 12 month period.

400.4.8.3 Pavement Markings

Pavement markings shall be maintained such that they function as designed. Pavement markings shall be maintained to achieve the following general objectives:

- To provide positive lane delineation for the safe and orderly movement of traffic on the Infrastructure.
- To convey information to a vehicle operator without diverting the driver's attention.
- To complement regulations or warnings by other devices such as traffic signals or signs.

All non-illuminated sections of roadway shall have markings with a minimum retroreflectivity of 100 mcd/lux/m^2 based on a minimum of five discreet measurements in any area of concern. All markings shall be maintained in a manner such that they are in proper repair, fully visible, complete and intact. Specifically but not exclusively, the Contractor shall ensure that:

- Dirt or debris which obscures the markings is removed;
- Breaks in markings caused by repair work, accident or any other reason, are reinstated;
- Temporary markings for scheduled resurfacing are installed;
- Markings comply with all design requirements and the following tolerances:
  - Nominal 100 mm wide lines shall be applied to a tolerance of 100 mm to 110 mm;
  - Nominal 200 mm line widths shall be applied to a tolerance of 200 to 210 mm;
  - All direction dividing, lane dividing or continuity lines shall not exceed a maximum dimensional length deviation of +/- 100 mm for a specified 6.0 m or 3.0 m length of space; and
  - All markings shall be applied at the proper location in accordance with the designed markings and in no case shall vary from the design location by more than 100 mm;
- All non-conforming markings are obliterated from the roadway; and
- Painted pavement markings shall exhibit:
  - No excessive (more than 10%) overspray;
  - No splattering of paint;
  - Clean definitive edges;
  - No more than five tracks per km;
  - Uniform distribution of glass beads across the line; and
  - Uniform thickness.

400.4.8.3.1 Measuring for Compliance

The Contractor shall inspect the Infrastructure on a continual basis and will identify deficiencies related to general maintenance requirements. Deficient lines or markings will be measured and rounded up to the nearest full kilometre for the Payment Adjustment. Measurement of retroreflectivity of the pavement markings will be determined in accordance with ASTM Standard Test Method E1710 using a portable retroreflectometer.

400.4.8.3.2 Completing Repairs

Temporary markings following repair work, scheduled maintenance or rehabilitation shall be installed the same day as the work is performed.

Permanent markings are required to be installed within seven days of temporary markings being installed.

Incorrect or confusing markings shall be removed immediately. This may involve remedial measures pending scheduling of permanent removal.

400.4.8.3.3 Payment Adjustments

If temporary markings are not installed within the time period specified, Payment Adjustments in the amount of $6,000 per line/marking per km or any partial km, per day or any partial day, shall be assessed until the temporary markings are installed.

If the permanent markings to replace temporary markings are not installed to the required standard within the stipulated time period, Payment Adjustments in the amount of $120 per line/marking per km or any partial km, per day or any partial day, shall be assessed to the Contractor until the repairs are made.

If non-compliant markings are not re-installed to the required standard within the stipulated time period, Payment Adjustments of $120 per marking/day or any partial day, shall be assessed until the markings are re-installed.

If incorrect or confusing markings are not removed within seven days, Payment Adjustments in the amount of $120/marking/day or any partial day, shall be assessed to the Contractor until the repairs are made.

400.4.9 ROAD TRAFFIC NOISE MITIGATION (NEW INFRASTRUCTURE ONLY)

This Section 400.4.9 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

Requirements for road traffic noise mitigation are described in the Section 200 (Project Specifics). If the AADT exceeds 95,000 vehicles per day on the New Infrastructure, the Contractor will be relieved of the responsibility for further road traffic noise mitigation.

400.4.9.1 Measuring For Compliance

The Contractor shall measure noise levels to confirm noise levels are in compliance with Section 200 (Project Specifics). Noise measurements will generally be made in response to public complaints but will not be required more than once in any 12 month period. All test and measurement results shall be provided to the Department forthwith, upon its request.

400.4.9.2 Completing Repairs

When measurements indicate noise exceeds the limiting noise level, the Contractor shall undertake remedial action to either reduce the noise levels generated or to effectively screen the areas as required to reduce noise levels. Any proposed screening devices shall require the prior written approval of the Department. The Contractor shall complete repairs required to result in compliance with the limiting noise level within 180 days of becoming aware of the non-compliance. All test and measurement results shall be provided to the Department forthwith, upon its request.

400.4.9.3 Payment Adjustments

Subject to the 2nd sentence of Section 400.4.9 (Road Traffic Noise Mitigation), if the Contractor fails to implement repairs to attain compliance within the stipulated time period, the Contractor shall be assessed a Payment Adjustment as set out below until repaired.

For the first 180 days, the Payment Adjustment shall be $60,000/30 day period or any partial 30 day period, for each km of roadway or any partial km, which exceeds the noise level.

Following the 180 day period, a Payment Adjustment of $120,000/30 day period or any partial 30 day period, for each km of roadway or any partial km, shall be assessed.

If within 360 days of the time period stipulated for completing repairs, the Contractor has not completed repairs to result in compliance, the Department may undertake the construction of sound attenuating works and deduct the costs, plus a 25% administration fee, from Payments to be made to the Contractor.

The Contractor's responsibility for noise mitigation applies to and includes mainline AADT volumes of 95,000 vehicles per day. AADT volumes shall be determined in accordance with Section 200.3.1 (Traffic Volume Payment Adjustments).

400.4.10 TESTING CONDUCTED WITH AN INERTIAL PROFILER (EXISTING INFRASTRUCTURE ONLY)

Once every three years, the Contractor shall measure the smoothness (IRI), and rutting of the Existing Infrastructure roadways, except all ramps and crossroads.

Measurements with the inertial profiler shall be in accordance with the requirements of the following sections. The measurements must be obtained after June 1st and before August 1st in the years the measurements are obtained:

- Section 400.4.2 (Pavement Geometric Requirements)
- Section 400.4.3 (Smoothness Requirements); and
- Section 400.4.4 (Rutting Performance Requirements).

The data collected for the inertial profiler shall be submitted to the Department on CD ROM in accordance with the ASCII CSV file structure formats and file naming convention used by the Department forthwith.

All data collected by the Contractor is confidential to the Department and shall be turned over to the Department and shall become the property of the Department and may be used in any manner the Department deems appropriate. The Contractor shall not use this data for any purpose nor shall the Contractor disseminate any information to any parties other than the Department.

400.4.10.1 Measuring for Compliance

Measurements with the inertial profiler must be collected during the same week from test year to test year. The profile measurements and IRI post-processing shall be submitted to the Department within three weeks of the collection of the field data.

400.4.10.2 Payment Adjustments

If the field measurements are not collected within the same week of the year in each testing year, the Contractor shall be assessed Payment Adjustments at a rate of $2,000/week or any partial week, for each week in which the field measurements vary from the required week.

If the profile measurements and IRI post-processing is not submitted within the stipulated time period, the Contractor shall be assessed Payment Adjustments at a rate of $500/week or any partial week, for each week that the information is not submitted.

400.5 BRIDGE STRUCTURES

400.5.1 OPERATIONS

400.5.1.1 General

During the Contractor's regularly scheduled inspections of the roadway and appurtenances as specified in Section 400.2 (Inspection, Emergency and Routine Maintenance Requirements), the Contractor shall pay special attention to the condition, functionality and safe operation of the bridge structures. The Contractor shall ensure that qualified personnel carry out the regularly scheduled inspections. Any deficiencies that pose an imminent danger to the travelling public shall be addressed immediately.

In addition, regular scheduled bridge inspections as outlined in Section 400.5.1.3 (Performance Compliance Inspection and Testing) shall be completed by the Contractor to measure and determine compliance of the bridge structures forming part of the Infrastructure with the bridge structure performance requirements identified in Section 400.5.3 (Performance Requirements). Appropriate preventative maintenance, repair and rehabilitation actions are expected to be required during the Operating Period. The Contractor is expected to take appropriate action to address identified deficiencies within specified time periods to ensure the long-term durability and serviceability of the bridge structures.

400.5.1.2 Utility Accommodation

The Contractor shall accommodate utilities on the bridge structures when requested by the Department. All costs associated with the installation, maintenance and operation of the utilities shall be the responsibility of the utility owner.

During the Operating Period, the utility line may need to be removed or relocated to facilitate major maintenance, rehabilitation, replacement or closure of a bridge structure. Relocation or removal of the utility line, including all associated costs, shall be borne by the owner of the utility.

In the event that a utility line is no longer required, the utility owner shall advise the Department and the Contractor and arrange for the line to be removed and, when applicable, for the structure to be restored to the condition commensurate with that prior to the installation of the line.

400.5.1.3 Performance Compliance Inspection and Testing

400.5.1.3.1 Inspections and Testing

All bridge structures included in the Infrastructure will be considered a component of the provincial bridge structure inventory and as such shall be subject to at least the same level of inspection as are all other bridge structures on the Provincial highway system.

The Contractor or its designated representative shall complete bridge inspection and testing of the bridge structures to measure and determine compliance to the performance requirements. The compliance inspection and testing shall be based on the Department's existing *Bridge Inspection and Maintenance* ("**BIM**") *System.*

The BIM system consists of two levels of inspection. Level 1 inspections are routine inspections that are carried out on a regular inspection cycle and are primarily a visual inspection carried out without the use of specialized equipment for testing or for access. Level 2 inspections will also be carried out on a specified interval or on a one-time site-specific basis. Using specialized equipment and expertise, the Level 2 inspections gather detailed and quantified information and data on a particular bridge structure or bridge element.

400.5.1.3.2 Routine Level 1 Inspections

The Contractor shall complete routine Level 1 inspections in accordance with the Department's current *Bridge Inspection and Maintenance* ("**BIM**") *System* to confirm that the performance requirements in Section 400.5.3 (Performance Requirements) are being met. Only qualified and experienced bridge inspectors that have a current Class A certification under the Department's BIM system shall complete the inspections.

The routine Level 1 bridge inspections will be completed at the prescribed cycle as follows:

- Initial inspection within 30 days after Construction Completion; and
- Every 21 months after the initial inspection.

The routine inspection cycle may be shortened if deemed necessary by the inspector due to condition, functionality, use of the bridge structures or any other reason.

The Contractor shall complete each routine Level 1 inspection within the time period of one month prior to the originally scheduled date of the routine Level 1 inspection to one month following the originally scheduled date of the routine Level 1 inspection.

400.5.1.3.3 Specialized Level 2 Inspections

The Department currently carries out a number of specialized Level 2 inspections including concrete deck, copper sulphate electrode ("**CSE**") or half-cell testing, chloride ion content testing, ultrasonic inspection of steel elements, scour survey, steel culvert barrel measurement, timber coring, concrete girder, paint system and vertical clearance measurement.

For the bridges forming part of the New Infrastructure using the Department's standard deck protection system as identified in Section 300.5.2.7 (Bridge Structures – Design Criteria – Durability) the Contractor shall complete the following specialized Level 2 inspections to determine the condition of the concrete bridge decks:

- Year 15 Concrete deck inspection, CSE testing, Chloride ion content testing;
- Year 20 Concrete deck inspection, CSE testing, Chloride ion content testing; and
- Year 25 Concrete deck inspection, CSE testing, Chloride ion content testing.

For alternative deck protection systems used on bridges in the New Infrastructure the Contractor shall identify the performance criteria and the testing proposed for determining if the performance of the concrete bridge decks at Years 15, 20 and 25 meets the performance criteria.

For bridges forming part of the Existing Infrastructure, the Contractor shall complete specialized Level 2 inspections in accordance with the schedule outlined in Section 200.3.6.2 (Level 2 Bridge Deck Inspections) to determine the condition of the concrete bridge decks. The specialized Level 2 deck inspections shall consist of concrete deck inspection, CSE testing and chloride ion content testing.

Only qualified and experienced bridge inspectors that have a current Class A certification under the Department's BIM system shall complete the inspections.

The specialized Level 2 inspection and testing, except for the submission of inspection results, shall be completed between May 15 and September 15 of the testing year specified.

400.5.1.3.4 Inspection and Testing Notification

The Contractor shall notify the Department a minimum of two weeks in advance of the scheduled inspection and testing date and time.

The Department reserves the right to direct the Contractor to complete all or a portion of the specified Level 2 inspections in Section 400.5.1.3.3 for the New Infrastructure and the Existing Infrastructure. The Contractor shall request clarification from the Department four weeks in advance of the scheduled Level 2 testing which of the tests specified in Section 400.5.1.3.3 shall be completed for each structure. The Department may elect to have a representative on site during the Contractor's scheduled inspection and testing. The Department also reserves the right to complete inspection or testing concurrently with the Contractor's scheduled inspection and testing or at any other time. In the event the Department elects to complete inspection and testing concurrently with the Contractor's scheduled inspection and testing, the Contractor shall provide the required traffic accommodation and assistance and cooperation.

The Department will use in-house or external engineering consultants to complete the inspection and testing on their behalf. Only qualified and experienced bridge inspectors that have a current Class A certification under the Department's BIM system will perform the Department's inspection and testing work.

400.5.1.3.5 Inspection Reporting

Within 30 days of the completion of a routine Level 1 bridge inspection and within 90 days of the completion of a specialized Level 2 bridge inspection and testing, the Contractor shall provide the results of the inspection and testing to the Department. In addition to the inspection and testing results, the Contractor shall submit a report identifying any components or elements in respect of the Infrastructure found to be non-compliant with the performance requirements in Section 400.5.3 (Performance Requirements). Each identified deficiency will be categorized as structural and operational or standard maintenance in accordance with the requirements of Section 400.5.2 (Bridge Maintenance and Operations) along with the specified time period for commencement or completion of repair and/or remediation actions.

400.5.1.3.6 Payment Adjustments

In the event the Contractor fails to complete the scheduled inspection and testing requirements, including the submission of inspection results to the Department, the Department shall assess the following Payment Adjustments for late submission of inspection results:

- $12,000/bridge/month or any partial month, for routine Level 1 inspections until submitted;
- $24,000/bridge/year or any partial year, specialized Level 2 inspections until submitted.

400.5.1.3.7 Traffic Accommodation

The Contractor is expected to generally perform inspections and testing during non-peak traffic periods and on dates that cause a minimum of inconvenience to the travelling public.

The bridge inspection and testing may require inspectors and workers to be on or in close proximity to the roadway, making traffic accommodation necessary. The Contractor shall provide all necessary temporary signing and traffic accommodation for the duration of the inspection and testing at its own cost.

Lane Closure Payment Adjustments (see Section 400.1.6) shall be charged during inspection and testing carried out by the Contractor but not for testing and inspection carried out by the Department.

400.5.1.3.8 Measurement and Determination

The Department has made every effort to develop and use measurable and quantifiable performance requirements for the bridge structure elements. The BIM system minimizes the subjective nature of these evaluations through formal guidelines and extensive training and certification of inspection personnel.

400.5.2 BRIDGE MAINTENANCE AND OPERATIONS

400.5.2.1 General

For the Existing Infrastructure, the Contractor shall be required to carry out preventative maintenance actions on the bridge structures during the Operating Period. The Department will be responsible for the repair of all structural and operational deficiencies (see description in Section 400.5.2.2) and standard maintenance deficiencies (see description in Section 400.5.2.3) in respect of the Existing Infrastructure.

For the New Infrastructure, the Contractor shall be required to maintain the bridge structures in a safe and effective operating condition at all times during the Operating Period. This will require preventative maintenance, standard maintenance and periodic rehabilitation actions during the Operating Period.

The quality and standard of the maintenance, repair, and rehabilitation actions shall be appropriate to ensure the 75 year service life of the bridge structures.

400.5.2.2 Structural and Operational (New Infrastructure Only)

This Section 400.5.2.2 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

Structural and operational deficiencies are deficiencies that compromise public safety and must be repaired prior to the 20 months allowed for standard maintenance repairs. An inexhaustive list of some structural and operational deficiencies are as follows:

- Repair of misalignment or cracking to steel girders caused by collision damage, overloads or other causes;
- Repair of excessive cracking, spalling or reinforcement damage to concrete girders caused by collision damage, overloads or other causes;
- Repair of potholes in the bridge deck;
- Repair of deck joint components protruding above the riding surface and causing a hazard to traffic;
- Repair of misalignment, cracking or rupture of bridgerail or guardrail components caused by collision damage or other causes;
- Repair of culverts with deformations exceeding those allowed by the performance requirements;

- Repair of longitudinal cracked seams in culverts; and
- Repair of misalignment and cracking in sign structure support components.

All structural or operational deficiencies identified shall be notified to the Department forthwith. The Contractor shall commence work to rectify a structural or operational deficiency within 60 days of identification.

For some deficiencies that may not be effectively repaired or rectified during inclement weather, the Department at its sole discretion may extend the required time period for commencement of work to 180 days.

400.5.2.3 Standard Maintenance (New Infrastructure Only)

This Section 400.5.2.3 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

If the Department agrees that deficiencies do not fall within the category of structural and operational they shall be categorized as standard maintenance. These deficiencies are expected to be non-safety and non-hazard related. The Contractor shall complete work to rectify these deficiencies within 20 months of identification.

400.5.2.4 Preventative Bridge Structures Maintenance

The Contractor shall carry out a preventative bridge structures maintenance program for the duration of the Operating Period. The program shall include annual washings of the bridge decks, sealing of all bridge decks exposed to de-icing salts and sealing of all curbs. For the Existing Infrastructure, sealing of all bridge decks shall be with an approved sealer and sealing of all curbs with an approved Type 2a sealer; and sealing shall be carried out in accordance with the schedule outlined in Section 200.3.7 (Preventative Bridge Maintenance). For the New Infrastructure, sealing of all bridge decks, curbs and barriers shall be with an approved Type lc sealer.

400.5.2.5 Payment Adjustments

In the event the Contractor fails to meet the specified schedule for preventative maintenance actions or satisfactory repair and remediation of identified deficiencies, the Department shall assess the following Payment Adjustments:

400.5.2.5.1 Structural and Operational (New Infrastructure Only)

This Section 400.5.2.5.1 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

In the event the Contractor fails to commence work within 60 days of identification of a structural or operational deficiency, a Payment Adjustment of $1,200/day or any partial day, per deficiency shall be assessed until the Contractor commences and diligently pursues completion of the work.

For deficiencies where the Department has extended the required time period for commencement of work to 180 days, a Payment Adjustment of $1,200/day or any partial day, per deficiency if the Contractor fails to commence work within 180 days of being notified of the deficiency and shall be assessed until the Contractor commences and diligently pursues completion of the work.

400.5.2.5.2 Standard Maintenance (New Infrastructure Only)

This Section 400.5.2.5.2 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

In the event the Contractor fails to complete work within 20 months of a standard maintenance deficiency being identified, a Payment Adjustment of $6,000/month or any partial month, per deficiency shall be assessed until the Contractor completes the work.

400.5.2.5.3 Preventative Bridge Structures Maintenance

In the event the Contractor fails to complete the scheduled preventative bridge structures maintenance (see Section 400.5.2.4 (Preventative Bridge Structures Maintenance)), with the exception of annual bridge washings within the year scheduled, a Payment Adjustment of $6,000/bridge/month or any partial month, shall be assessed until the Contractor completes the work.

In the event the Contractor fails to complete the annual bridge washings by June 1st of the year scheduled, a Payment Adjustment of $6,000/bridge/month or any partial month, shall be assessed until the Contractor completes the work.

400.5.2.6 Bridge Structure Maintenance and Rehabilitation Requirements (New Infrastructure Only)

This Section 400.5.2.6 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

At least two weeks prior to commencement of any bridge structures maintenance actions, the Contractor shall submit detailed design drawings and construction specifications required for the proposed work to the Department for information and review, if applicable.

At least one month prior to commencement of bridge structures rehabilitation actions, the Contractor shall submit detailed design drawings and construction specifications for the proposed work to the Department for information and review.

400.5.2.7 Notification Of Bridge Structure Maintenance and Rehabilitation (New Infrastructure Only)

This Section 400.5.2.7 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

The Contractor shall notify the Department a minimum of two weeks in advance of any proposed bridge structure maintenance or rehabilitation actions. The written notification shall outline the type of work proposed, schedule for commencement and completion, hours of work and any lane closures or impacts to the travelling public.

400.5.3 PERFORMANCE REQUIREMENTS (NEW INFRASTRUCTURE ONLY)

This Section 400.5.3 applies to the New Infrastructure only and does not apply to the Existing Infrastructure.

400.5.3.1 General

The individual components and elements of bridge structures shall be in adequate condition and functioning as designed during the Operating Period.

No component or element shall show evidence of any loss in structural strength and shall operate safely and in a manner consistent with the Department's Bridge Inspection and Maintenance System.

Notwithstanding the performance requirements stated in Sections 400.5.3.2 (Individual Component Requirements – Bridges), 400.5.3.3 (Individual Component Requirements – Bridge Culverts) and 400.5.3.4 (Individual Component Requirements – Sign Structures) for bridges, bridge culverts and sign structures respectively, all individual components rated three or less under the Department's Bridge Inspection and Maintenance System shall be considered to be in non-conformance.

400.5.3.2 Individual Component Requirements - Bridges

400.5.3.2.1 Approach Slab

There shall be a smooth transition on and off the bridge structure from the roadway. A smooth transition is defined as the grade on the approach slab deviating less than 1% from the design grade. Any voids beneath the approach slab shall be filled if the approach slab grade deviates by more than 1% from the theoretical grade.

400.5.3.2.2 Wearing Surface

The wearing surface on bridge structures shall meet the rutting requirements as stated for the roadway in 400.4.4 (Rutting Performance Requirements).

The wearing surface on bridge structures shall meet the skid resistance requirements as stated for the roadway in 400.4.5 (Skid Resistance Requirements).

Asphalt concrete pavement ("**ACP**") wearing surfaces on bridge structures shall meet the general pavement maintenance requirements as stated for the roadway in 400.4.6 (General Pavement Maintenance Requirements).

The pavement markings on bridge structures shall meet the pavement lines and message requirements as stated for the roadway in 400.4.8.3 (Pavement Markings).

400.5.3.2.3 Concrete Bridge Decks

Unless noted otherwise, the bridge deck shall not have any physical defects or chemical deterioration.

Concrete bridge decks cast-to-grade shall not have any cracks greater than 0.1 mm in width and a linear measurement of 0.2 m of cracking per square metre of bridge deck area.

The underside of all concrete decks shall be free of stains resulting from deterioration, efflorescence and exudation.

Any cracking on the deck underside shall be limited to a maximum width of 0.3 mm.

The following performance requirements for specialized Level 2 inspections shall be met for the Department's standard deck protection system as identified in Section 300.5.2.7 (Durability):

Year 1 of the Operating Period
Electrical resistance between electrical ground connections shall be measured and recorded to the nearest Ohm (Ω).

Year 15 of the Operating Period
CSE test results showing a minimum of 90% of deck area with readings less negative than –0.300 mV.

Maximum average total chloride content of 0.010, by percent weight, at the top mat of reinforcing or 100 mm depth, whichever is less.

Year 20 of the Operating Period
CSE test results showing a minimum of 85% of deck area with reading less negative than –0.300 mV.

Maximum average total chloride content of 0.015, by percent weight, at the top mat of reinforcing or 100 mm depth, whichever is less.

Year 25 of the Operating Period
CSE test results showing a minimum of 80% of deck area with reading less negative than –0.300 mV.

Maximum average total chloride content of 0.020, by percent weight, at the top mat of reinforcing or 100 mm depth, whichever is less.

Deck testing shall be carried out in accordance with the requirements of the Department's *Level 2 Bridge Inspection Manual*.

The copper sulphate electrode testing is based on the ASTM C876 method with some minor differences.

Chloride content testing is performed in accordance with the "*Standard Test Method for Chloride Content in Concrete Using the Specific Ion Probe*" as described in SHRP-S-330, Appendix F or "*The Method of Field Determination of Total Chloride Content*" as described in SHRP-S-328, Volume 6 or approved equivalent test method such as Alberta Transportation Test Method TLT 520.

All test results shall be provided to the Department forthwith.

400.5.3.2.4 Curbs, Barriers, and Medians

There shall be no physical defects or chemical deterioration. Any scaling shall be limited to light scaling over a maximum surface area of 10% of the face and top of the curb, barrier or median.

Cracking shall be limited to a maximum width of 0.3 mm occurring at a maximum frequency of one crack every 2 m over the length of the bridge structure.

There shall be no exposure of utility voids or other formed voids.

Differential movement in the horizontal or vertical direction shall be limited to 6 mm.

Expansion joints shall be free for movement and not cracked or spalled due to insufficient travel.

400.5.3.2.5 Bridge and Pedestrian Rails

Elements shall be free of collision damage, horizontal and vertical misalignment, improper guardrail laps, loose connections and missing nuts and bolts.

Steel components shall be free of deformation, cracks, and corrosion.

Anchor bolts shall have proper alignment and firm anchorage.

There shall be no physical defects or chemical deterioration in the grout pads.

400.5.3.2.6 Deck Joints

Deck joints shall be vertically aligned, properly anchored, have freedom of movement and not have variation in the gap opening more than 10% along the length of the deck joint. There shall be no missing or loose bolts.

All deck joints shall capture and manage deck drainage such that it does not come into contact with the concrete and steel surfaces of other bridge elements.

For finger joints, the fingers shall sit level, have no cracks and the trough system under the joint shall function without signs of leakage or debris accumulation.

For gland type joints, there shall be no signs of leakage or holes or damage to the seal or leakage around the joint.

Steel components shall be free of deformation, cracks and corrosion.

400.5.3.2.7 Bridge Deck Drainage Systems

Potholes or the build up of gravel or debris shall not cause any ponding on the bridge deck or impede the flow of water away from the bridge deck.

Deck drains and pipes shall not be clogged with debris.

Down spouts shall be low enough to prevent splashing of water on superstructure and substructure elements.

There shall be no ponding of water along the shoulders or in the driving lanes.

For grade separations, the location of drains shall not create ponding water or an icing hazard on the roadway below.

400.5.3.2.8 Concrete Girders

Prestressed concrete girders shall not have any physical defects or chemical deterioration or staining.

Any cracks or defect in the prestressed concrete girders shall meet the requirements of Section 300.5.9.7 (Manufacture).

There shall be no signs of damage or deterioration due to impacts or collisions.

400.5.3.2.9 Steel Girders

Steel girders shall be free of harmful corrosion, notches and cracks.

Bolted connections shall be free of deformation, warping and missing, worn, sheared or deformed fasteners.

Web stiffeners shall not have any evidence of buckling.

Girders shall not show any evidence of sags, buckling, bowing or twisting.

All welds shall be free of cracks.

There shall be no signs of damage or deterioration due to impacts or collisions.

400.5.3.2.10 Paint Protection System

The paint protection system applied to the end of steel girders shall be free of signs of cracking, peeling, or chipping of the paint protection system.

400.5.3.2.11 Sidewalks

Sidewalk surfaces shall be smooth but have adequate traction and be free of debris.

There shall be no physical defects or chemical deterioration. Any scaling shall be limited to light scaling over a maximum surface area of 10% of the sidewalk area.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre of sidewalk area.

Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

400.5.3.2.12 Bearings

Bearings shall be operational and shall be free of all debris that may impede movement.

Expansion bearings shall have available travel relative to temperature without excessive vibrations or movement under traffic.

Coating system on bearings shall be functioning and intact.

Component parts shall have proper alignment, proper contact surfaces and minimum resistance.

Bearing pads and plates shall be in proper position.

There shall be no physical defects or chemical deterioration in the grout pads.

Elastomeric components shall be free of cracks and splits along the edges. Minor bulging of the elastomeric components shall be limited to 10% of the component thickness.

Anchor bolts shall have proper alignment and firm anchorage.

Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

400.5.3.2.13 Bearing Seats and Caps

Caps shall not have any rotation or displacement.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

The bottoms of bearing seats shall not be exposed due to soil settlement or other reasons.

Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

400.5.3.2.14 Backwalls and Breastwalls

There shall not be any significant loss of material below the backwall or breastwall.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

400.5.3.2.15 Wingwalls and Retaining Walls

Wingwalls and retaining walls shall have proper vertical and horizontal alignment. The bottoms of these elements shall not be exposed due to soil settlement or other reasons.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

400.5.3.2.16 Piers

Piers shall not have any evidence of collision damage or damage due to ice or debris.

Visible piles shall not have any evidence of bowing or misalignment due to deterioration, impact, excessive loads or unintended lateral loading.

There shall be no signs of heaving or settlement.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking of concrete components shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

Steel components shall be free of corrosion, notches, cracks, sheared bolts and cracked welds.

400.5.3.2.17 Nose Plates

There shall be no missing plate sections or loose connections.

There shall not be loss of section due to corrosion.

Nose plates with significant impact damage shall be repaired or replaced.

400.5.3.2.18 Concrete Finishes

Concrete finishes in visible areas shall not be stained, chipped or peeling.

400.5.3.2.19 Slope Protection for River Crossing

Any settlement of the headslope fill in the vicinity of the abutment shall be limited to 150 mm.

Slope or scour rock riprap protection shall be of the required gradation and quality as specified in the Detailed Designs.

Average rock size and thickness of the rock layer shall be as specified in the Detailed Designs.

For concrete slope protection, gaps between the abutment and the slab shall be limited to 100 mm.

There shall be no crushing of concrete around the pier or bulging at the toe.

There shall be no physical defects or chemical deterioration. Any scaling shall be limited to light scaling over a maximum surface area of 10% of the slope protection.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre of the slope protection area.

400.5.3.2.20 Slope Protection for Grade Separation

Any settlement of the headslope fill in the vicinity of the abutment shall be limited to 150 mm.

For concrete slope protection, gaps between the abutment and the slab shall be limited to 100 mm.

There shall be no crushing of concrete around the pier or bulging at the toe.

There shall be no physical defects or chemical deterioration. Any scaling shall be limited to light scaling over a maximum surface area of 10% of the slope protection area.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre of the slope protection area.

Drainage shall not penetrate below the slab and there shall be no presence of voids below the slab.

400.5.3.2.21 River Training Works

Average rock size, gradation and thickness of the rock layer shall be as specified in the Detailed Designs.

There shall not be significant scour or erosion around or under the training works.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

400.5.3.2.22 Other Bridge Structure Elements

Other bridge structure elements not listed in these requirements shall be in adequate condition and functioning as designed throughout the Operating Period.

400.5.3.3 Individual Component Requirements – Bridge Culverts

400.5.3.3.1 Embankments

Embankments shall not show any signs of instability such as slumping, excessive settlement, or cracking.

Embankments shall not show any signs of erosion such as gullying or erosion or scour along the toe of the sideslope.

The slope of the embankment shall be as specified in the Detailed Designs.

400.5.3.3.2 Headwalls and Collars

Headwalls and collars shall not have excessive settlement or rotation and must be securely connected to the barrel or bevel section.

Headwalls and collars shall not show any signs of piping, scour or erosion.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

Steel components shall not have excessive corrosion, loss of section or loose connections.

400.5.3.3.3 Wingwalls

Any gap or void between the wingwall and the barrel section shall be limited to a maximum of 75 mm. There shall not be any loss of fill material.

Wingwalls shall have proper vertical alignment and be securely connected to the headwall, if applicable.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

Steel components shall not have excessive corrosion, loss of section or loose connections.

400.5.3.3.4 Cutoff Walls

Cutoff walls shall be securely connected to the culvert invert.

There shall be no signs of undermining, piping or uplift.

400.5.3.3.5 Bevel Ends

For flexible culverts, any deformation (dimensional change) is limited to within 7% of the design or as-constructed dimensions.

There shall be no physical defects or chemical deterioration of concrete culverts. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

400.5.3.3.6 Roofs

For flexible culverts, any deformation (dimensional change) is limited to within 7% of the design or as-constructed dimensions.

There shall be no physical defects or chemical deterioration of concrete culverts. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

400.5.3.3.7 Sidewalls

For flexible culverts, any deformation (dimensional change) is limited to within 7% of the design or as-constructed dimensions.

There shall be no physical defects or chemical deterioration of concrete culverts. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

400.5.3.3.8 Floors

For flexible culverts, any heaving (dimensional change) is limited to within 7% of the design or as-constructed dimensions.

There shall be no physical defects or chemical deterioration of concrete culverts. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

400.5.3.3.9 Circumferential Seams

Circumferential seams shall not be misaligned between adjoining sections.

There shall be no evidence of infiltration of backfill material caused by improper connections or separation of adjoining sections.

Circumferential seams shall not have any cracks.

400.5.3.3.10 Longitudinal Seams

Longitudinal seams shall not have any cracks.

Longitudinal seams shall not have any signs of bolt tipping, distortion, cusping, improper nesting or signs of corrosion.

400.5.3.3.11 Coatings

Steel culvert material may have some superficial rust but no pitting or loss of section.

400.5.3.3.12 Fish Passage Enhancement Features

Concrete, steel or rock boulders used for baffles or other fish enhancement features shall be located as specified in the Detailed Designs.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

Steel material may have some superficial rust but no pitting or loss of section.

400.5.3.3.13 Waterway Adequacy

There shall be no reduction in the culvert opening of more than 35% due to debris accumulation, gravel or siltation.

400.5.3.3.14 Slope Protection

Slope or scour protection shall be of the required gradation and quality, as specified in the Detailed Designs.

Average rock size, gradation and thickness of the rock layer shall be as specified in the Detailed Designs.

400.5.3.3.15 River Training Works

Average rock size, gradation and thickness of the rock layer shall be as specified in the Detailed Designs.

There shall not be significant scour or erosion around or under the training works.

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.

Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

400.5.3.3.16 Other Bridge Culvert Structure Elements

Other bridge culvert structure elements not listed in these requirements shall be in adequate condition and functioning as designed throughout the Operating Period.

400.5.3.4 Individual Component Requirements - Sign Structures

400.5.3.4.1 Pedestal

There shall be no physical defects or chemical deterioration of concrete components. Any scaling shall be limited to light scaling over a maximum surface area of 10%.
Any cracking shall be limited to a maximum width of 0.3 mm and a linear measurement of 1 m of cracking per square metre.

400.5.3.4.2 Column

Columns shall be properly aligned with no bends, bows or kinks.

Steel components shall be free of corrosion, notches, cracks, sheared or loose bolts and cracked welds.

400.5.3.4.3 Connections/Bearings

There shall be no missing anchor nuts and all nuts shall be fully torqued.

Anchor bolts shall have proper alignment and firm anchorage.

There shall be no physical defects or chemical deterioration in the grout pads.

All concrete in the area of the connections shall be sound.

Welds and connections shall be free of cracks and defects.

400.5.3.4.4 Superstructure Elements

The superstructure is defined as that portion of the sign structure that is attached to the support columns and spans between the columns.

Steel elements shall not show any evidence of sags, buckling, bowing or twisting.

Bolted connections shall be free of deformation, warping, and missing, loose, worn, sheared or deformed fasteners.

Steel elements shall be free of corrosion, notches and cracks.

All welds shall be free of cracks.

400.5.3.4.5 Coatings

Coatings shall be intact and effective in preventing corrosion and loss of section.

There shall be no rusting, scaling, peeling, blistering, discolouration or other defects.

400.5.3.4.6 Other Sign Structure Elements

Other sign structure elements not listed in these requirements shall be in adequate condition and functioning as designed throughout the Operating Period.

500.0 HANDBACK REQUIREMENTS

500.1 ROADWAY HANDBACK REQUIREMENTS - NEW INFRASTRUCTURE

At the end of the Term, when the Department assumes responsibility for the New Infrastructure, the roadway shall meet or exceed the following requirements:

500.1.1 CONDITION OF PAVEMENT

The pavements shall meet or exceed the following requirements:

- Cross-scope and superelevation <0.5% deviation from design rate. Percentages refer to a numeric deviation from the designed percentage and not to a percentage deviation. This means that if the designed percentage is 2% the deviation referred to is >1.5% and <2.5%;
- Pavement surface width shall not be less than design width (*Subject to the Payment Adjustment provisions in Section 400.4.2 (Pavement Geometric Requirements.).*

PAVEMENT SMOOTHNESS		
Design Speed (kph)	**IRI (mm/m) 1 km Average**	**IRI (mm/m) (100 m Section)**
>110	1.9	2.9
>90 ≤110	2.0	3.0
>70 ≤90	2.2	3.2
≤70	2.4	3.4

- 1 km average rutting shall be < 10 mm;
- 100 m section average rutting shall be < 15 mm;
- Isolated area rutting shall be < 25 mm;
- Minimum skid number (skid resistance) = 30; and
- Pavement Smoothness IRI Values shall be less than or equal to the numbers in the above table.

500.1.2 PAVEMENT SURFACE CONDITION

The pavement surface, including lanes and shoulders, shall be free of any evidence of structural weakness, pitting, potholes, ravelling, segregation, scaling, delamination, localized roughness and all other deficiencies. All cracks and joints shall be sealed with a sealant acceptable to the Department. The pavement surface shall be free and clear of dirt, sand and other debris.

500.1.3 STRUCTURAL REQUIREMENTS

At the time the Department assumes responsibility of the roadway, the structural capacity of each and every lane of the roadway shall be such that a rehabilitation design for 10 years of traffic loading starting as of the date the Department assumes responsibility for the roadway will require no more than a 50 mm asphalt concrete overlay or equivalent treatment for the pavement type.

The 10 year traffic loading will be determined based on traffic estimates at the time, but in no case will it exceed 10 million equivalent single axle loads for any lane of any section of roadway.

The rehabilitation needed for the requirement above will be determined by an independent consultant retained and paid for by the Department and acceptable to both the Department and the Contractor.

500.1.4 CONDITION OF ALL SIGNS

All signs on the New Infrastructure must be in-place and functioning as designed and shall meet or exceed the following:

- Have an acceptable level of retroreflectivity. No signs shall exhibit reduced or blotchy retroreflectivity in excess of 25% of the sign area;
- Regulatory signs shall have a minimum retroreflectivity of 250 cd/lux/m^2 at an observation angle of 0.2° and a light entry angle of -4°;
- Information signs shall have a minimum retroreflectivity of 170 cd/lux/m^2 at an observation angle of 0.2° and a light entry angle of -4°;
- Signs shall exhibit no sign-sheeting material delaminations from the sign blank;
- Sign posts shall be maintained straight and true and shall not lean more than 25 mm in 1 m in any direction;
- Signs shall be kept level, within 25 mm in 1 m, and properly orientated for the travelling public;
- Galvanized or painted posts shall have no visible corrosion; and
- All posts of mounted signs are of the same type.

500.1.5 CONDITION OF GUARDRAIL

All guardrail on the New Infrastructure must be installed and functioning as designed and meet or exceed the following:

- All guardrails shall be within 6 mm maximum for plumb and grade;
- All posts are sound and vertical; and
- All components shall be securely fastened with the designed fasteners.

500.1.6 CONDITION OF BARRIERS

All barriers on the New Infrastructure must be installed and functioning as designed and meet or exceed the following:

- All missing pieces and/or areas of structural weakening must be replaced.

500.1.7 CONDITION OF LIGHTING

All lighting systems and related components on the New Infrastructure must be installed and functioning as designed and meet or exceed the following:

- Poles shall be plumb within 10 mm in 1 m;
- Poles and other mounting hardware shall be clean and neat, with no structural corrosion and all visible corrosion areas are to be re-galvanized by methods approved by the Department;
- Concrete bases shall be structurally adequate for the design loads; and
- Each individual light/luminaire shall be operational, provide light output in accordance with the manufacturer's rated design parameters, and overall illumination in accordance with the Detailed Designs.

The Contractor shall cooperate with the Department to coordinate the transfer of supply of electrical power at the end of the Operating Period.

500.1.8 CONDITION OF TRAFFIC SIGNALS

All signal systems on the New Infrastructure must be installed and functioning as designed and meet or exceed the following:

- All signal lights, including any crosswalk lights or advance warning devices, shall be fully functional;
- Electronics associated with signal operation shall be fully functional;
- Signal poles shall be straight and true and shall not lean more than 10 mm in 1 m in any direction;
- Poles, control cabinets and other signal hardware shall have no structural corrosion and all visible corrosion areas are to be re-galvanized by methods approved by the Department; and
- Power supplies are protected and in good condition.

The Contractor shall cooperate with the Department to coordinate the transfer of supply of electrical power at the end of the Operating Period.

500.1.9 CONDITION OF THE DRAINAGE SYSTEM

All components of the drainage system on or related to the New Infrastructure must be installed and functioning as designed. Culverts shall have no perforations. Any perforated culvert shall be replaced or lined as directed by the Department. All ditches, culverts, storm sewers, manholes, inlet and outlet structures, stormwater management ponds and other appurtenances shall be fully operational and clear of any debris or accumulated material.

500.1.10 CONDITION OF CONCRETE CURBS, GUTTERS, SIDEWALKS, BARRIERS (NON-STRUCTURE RELATED)

All concrete infrastructure on the New Infrastructure must be installed and functioning as designed and meet or exceed the following:

- Broken, spalled or damaged concrete shall be replaced where required to restore functionality;
- Curb height shall meet the requirements of the design specifications and in no case shall be less than 150 mm;
- Differential elevation at joints or cracks that exceeds 5 mm shall be repaired or replaced to remove the differential elevation and remove any tripping hazard;
- Concrete that is cracked in multiple locations within the same general area of a sidewalk or otherwise results in a discontinuity that may pose a tripping hazard or be a safety concern shall be removed and replaced; and
- Concrete surfaces that exhibit scaling and results in a rough surface texture shall be removed and replaced.

500.1.11 CONDITION OF LANDSCAPING

All lands disturbed by the Contractor shall have been reclaimed and Reclamation Certificates obtained prior to handback, with a copy of all such Reclamation Certificates provided to the Department as soon as practicable.

All landscaping on the New Infrastructure must be in place and functioning as designed and meet or exceed the following:

- There are no bare spots greater than one square metre in size;
- There is a minimum of 80% ground cover for any 100 square metre area;
- No noxious weeds are present; and
- Grass in the Road Right of Way shall not exceed 300 mm in height.

500.1.12 CONDITION OF FENCING

All fencing on the New Infrastructure must be installed and functioning as designed and meet or exceed the following:

- All posts must be sound and vertical;
- All wires must be in place with no noticeable sag; and
- All gates must be in place and fully operational.

500.1.13 CONDITION OF PAVEMENT MARKINGS

All pavement markings on the New Infrastructure must be installed and functioning as designed and meet or exceed the following:

- All non-illuminated sections of roadway shall have markings with a minimum retroreflectivity of 150 mcd/lux/m² based on a minimum of five discreet measurements in any area of concern;
- Nominal 100 mm wide markings shall be within a tolerance of 100 mm to 110 mm;
- Nominal 200 mm wide markings shall be within a tolerance of 200 to 210 mm;

- All direction dividing, lane dividing or continuity markings shall not exceed a maximum dimensional length deviation of +/- 100 mm for a specified 6.0 m or 3.0 m length of space;
- All markings shall be at the proper location in accordance with the designed markings and in no case shall vary from the design location by more than 100 mm; and
- All painted markings shall display the following:
  - No excessive (more than 10%) overspray;
  - No splattering of paint;
  - Clean definitive edges;
  - No more than five tracks per km; and
  - Uniform distribution of glass beads across the line.

500.1.14 CONDITION OF ROAD TRAFFIC NOISE MITIGATION

All road traffic noise mitigation elements by the Contractor's design on the New Infrastructure shall be installed and functioning as designed and meet or exceed the following:

- Road traffic noise as measured in accordance with Section 200.2.14 (Noise Attenuation) shall not exceed 65 dBA Leq_{24}.

500.1.15 CONDITION OF DELINEATORS

All delineators on the New Infrastructure shall be installed and functioning as designed and meet or exceed the following:

- Delineators shall exhibit a minimum retroreflectivity of 80% of the design value;
- Delineator guideposts shall be plumb within 13 mm throughout their length; and
- Delineators shall be within 5% of design height and not deviate from design locations by more than 50 mm.

500.2 BRIDGE STRUCTURES HANDBACK REQUIREMENTS - NEW INFRASTRUCTURE

500.2.1 GENERAL

At the end of the Operating Period, the bridge structures shall be handed back to the Department. The structures shall be in adequate condition and function as designed with no loss of structural strength and shall meet the handback performance requirements at the end of the Term. The Contractor shall complete any required maintenance or rehabilitation prior to the end of the Term to meet the required functionality state and handback condition prior to returning the bridge structures to the Department's control and management.

Notwithstanding the handback performance requirements stated in this section and Sections 400.5.3.2 (Individual Component Requirements – Bridges), 400.5.3.3 (Individual Component Requirements – Bridge Culverts) and 400.5.3.4 (Individual Component Requirements – Sign Structures), all individual components rated 4 or less under the Department's *Bridge Inspection* *and Maintenance (BIM) System* shall be considered in non-conformance.

500.2.2 INDIVIDUAL COMPONENT REQUIREMENTS - BRIDGES

With the exception of Section 500.2.2.1 (Concrete Bridge Decks), bridges shall meet the performance requirements specified in Section 400.5.3.2 (Individual Component Requirements – Bridges) at the end of the Term.

Concrete bridge decks shall meet the performance requirements stated in Section 500.2.2.1 (Concrete Bridge Decks) at the end of the Term.

500.2.2.1 Concrete Bridge Decks

Unless noted otherwise the bridge deck shall not have any physical defects or chemical deterioration.

Concrete bridge decks cast-to-grade shall not have any cracks greater than 0.1 mm in width and a linear measurement of 0.2 m of cracking per square metre of bridge deck area.

The underside of all concrete decks shall be free of stains resulting from deterioration, efflorescence and exudation.

Any cracking on the deck underside shall be limited to a maximum width of 0.3 mm.

The following handback performance requirements for specialized Level 2 inspections shall be met for the Department's standard deck protection system as identified in Section 300.5.2 (Bridge Structures – Design Criteria);

Year 30 of the Operating Period
CSE test results showing a minimum of 75% of deck area with reading less negative than –0.300 mV.

Maximum total average chloride content of 0.025, by percent weight, at the top mat of reinforcing or 100 mm depth, whichever is less.

The deck area shall not be delaminated or debonded as determined by chain drag testing.

Deck testing shall be carried out in accordance with the requirements of the Department's *Level 2 Bridge Inspection Manual.*

The copper sulphate electrode testing is based on the ASTM C876 method with some minor differences.

Chloride content testing is performed in accordance with the "*Standard Test Method for Chloride Content in Concrete Using the Specific Ion Probe*" as described in SHRP-S-330, Appendix F, "*The Method of Field Determination of Total Chloride Content*" as described in

SHRP-S-328, Volume 6 or an approved equivalent test method such as Alberta Transportation Test Method TLT 520.

500.2.3 INDIVIDUAL COMPONENT REQUIREMENTS – BRIDGE CULVERT STRUCTURES

Bridge culvert structures shall meet the handback performance requirements specified in Section 400.5.3.3 (Individual Component Requirements – Bridge Culverts) at the end of the Term.

500.2.4 INDIVIDUAL COMPONENT REQUIREMENTS - SIGN STRUCTURES

Overhead and cantilever sign structures shall meet the handback performance requirements specified in Section 400.5.3.4 (Individual Component Requirements – Sign Structures) at the end of the Term.

500.3 ROADWAY HANDBACK REQUIREMENTS - EXISTING INFRASTRUCTURE

At the end of the Term, when the Department assumes responsibility for the Existing Infrastructure, the roadway shall meet or exceed the following requirements:

500.3.1 PAVEMENT SURFACE CONDITION

The pavement surface, including lanes and shoulders, shall be free of pitting, potholes, ravelling, scaling, delamination, localized roughness, localized deficiencies, and other deficiencies.

- All asphalt concrete pavement transverse and random cracks between 2 mm and 25 mm and all longitudinal cracks between 2 mm and 12 mm shall be routed and sealed. Transverse cracks greater than 25 mm and longitudinal cracks greater than 12 mm shall be spray patched.
- All Portland cement concrete random cracks between 2 mm and 20 mm in width shall be sawn/routed and sealed, and sawn/routed cracks missing sealant shall be re-sealed.
- Areas of localized roughness shall be repaired. Localized roughness shall be any abrupt deviation in excess of 6 mm when measured with a 1.2 m straight edge.
- Roadway surface shall be clean and free of dirt, sand and other debris.
- All cracks shall be sealed with a sealant acceptable to the Department.

500.3.2 CONDITION OF ALL SIGNS

All signs on the Existing Infrastructure must be in-place and functioning as designed and shall meet or exceed the following:

- Have an acceptable level of retroreflectivity. No signs shall exhibit reduced or blotchy retroreflectivity in excess of 25% of the sign area;
- Regulatory signs shall have a minimum retroreflectivity of 250 cd/lux/m^2 at an observation angle of 0.2◦ and a light entry angle of -4◦;

- Information signs shall have a minimum retroreflectivity of 170 cd/lux/m^2 at an observation angle of 0.2◦ and a light entry angle of -4◦;
- Signs shall exhibit no sign-sheeting material delaminations from the sign blank;
- Sign posts shall be maintained straight and true and shall not lean more than 25mm in 1m in any direction; and
- Signs shall be kept level, within 25mm in 1m, and properly orientated for the travelling public.

500.3.3 CONDITION OF GUARDRAIL

- All accident damaged guardrail on the Existing Infrastructure must be repaired or replaced and functioning as designed; and
- All guardrails shall be clean and any reflective markers shall be functioning as designed.

500.3.4 CONDITION OF BARRIERS

- All accident damaged barriers on the Existing Infrastructure must be repaired or replaced and functioning as designed; and
- All barriers shall be clean and any reflective markers shall be functioning as designed.

500.3.5 CONDITION OF LIGHTING

All lights/luminaires on the Existing Infrastructure must be installed and functioning as designed and meet or exceed the following:

- Accident damaged lighting system components must be repaired or replaced and be functioning as designed; and
- Each individual light/luminaire shall be operational, provide light output in accordance with the manufacturer’s rated design parameters, and overall illumination in accordance with the Detailed Designs.

500.3.6 CONDITION OF TRAFFIC SIGNALS

All signal systems on the Existing Infrastructure must be functioning as designed and meet or exceed the following:

- All signal lights, including any crosswalk lights or advance warning devices, shall be fully functional;
- Electronics associated with signal operation shall be fully functional;
- Signal poles shall be straight and true and shall not lean more than 10 mm in 1 m in any direction; and
- Power supplies are protected and in good condition.

500.3.7 CONDITION OF THE DRAINAGE SYSTEM

All components of the drainage system on or related to the Existing Infrastructure must be functioning as designed. All ditches, culverts, storm sewers, manholes, inlet and outlet structures, stormwater management ponds and other appurtenances shall be fully operational and clear of any debris and accumulated material.

500.3.8 CONDITION OF CONCRETE CURBS, GUTTERS, SIDEWALKS, BARRIERS (NON-STRUCTURE RELATED)

All concrete infrastructure on the Existing Infrastructure installed by the Contractor must be functioning as designed and meet or exceed the following:

- Broken, spalled or damaged concrete shall be replaced where required to restore functionality;
- Differential elevation at joints or cracks that exceeds 5 mm shall be repaired or replaced to remove the differential elevation and remove any tripping hazard;
- Concrete that is cracked in multiple locations within the same general area of a sidewalk or otherwise results in a discontinuity that may pose a tripping hazard or be a safety concern shall be removed and replaced; and
- Concrete surfaces that exhibit scaling and results in a rough surface texture shall be removed and replaced.

500.3.9 CONDITION OF LANDSCAPING

All landscaping on the Existing Infrastructure must be in place and functioning as designed and meet or exceed the following:

- Grass within the Road Right of Way shall not exceed 300 mm in height;
- No noxious weeds are present; and
- Seeded area shows no bare spots greater than 1 m^2 in size.

500.3.10 CONDITION OF FENCING

All fencing on the Existing Infrastructure must be installed and functioning as designed and meet or exceed the following:

- All posts must be sound and vertical;
- All wires must be in place with no noticeable sag; and
- All gates must be in place and fully operational.

500.3.11 CONDITION OF PAVEMENT MARKINGS

All pavement markings on the Existing Infrastructure must be installed and functioning as designed and meet or exceed the following:

- All pavement markings shall have a minimum retroreflectivity of 150 mcd/lux/m^2 based on a minimum of five discreet measurements in any area of concern;
- Nominal 100 mm wide markings shall be within a tolerance of 100 mm to 110 mm;
- Nominal 200 mm wide markings shall be within a tolerance of 200 to 210 mm;
- All direction dividing, lane dividing or continuity markings shall not exceed a maximum dimensional length deviation of +/- 100 mm for a specified 6.0 m or 3.0 m length of space;
- All markings shall be at the proper location in accordance with the designed markings and in no case shall vary from the design location by more than 100 mm; and
- All painted markings shall display the following:
  - No excessive (more than 10%) overspray;
  - No splattering of paint;
  - Clean definitive edges;
  - No more than five tracks per km; and
  - Uniform distribution of glass beads across the line.

500.3.12 CONDITION OF DELINEATORS

All delineators on the Existing Infrastructure shall be installed and functioning as designed and meet or exceed the following:

- Delineators shall exhibit a minimum retroreflectivity of 80% of the design value;
- Delineator guideposts shall be plumb within 13 mm throughout their length; and
- Delineators shall be within 5% of design height and not deviate from design locations by more than 50 mm.

500.4 BRIDGE STRUCTURES HANDBACK REQUIREMENTS - EXISTING INFRASTRUCTURE

At the end of the Term, maintenance and operations responsibilities for the bridge structures shall be handed back to the Department. There are no handback requirements for bridge structures in the Existing Infrastructure at the end of the Term.

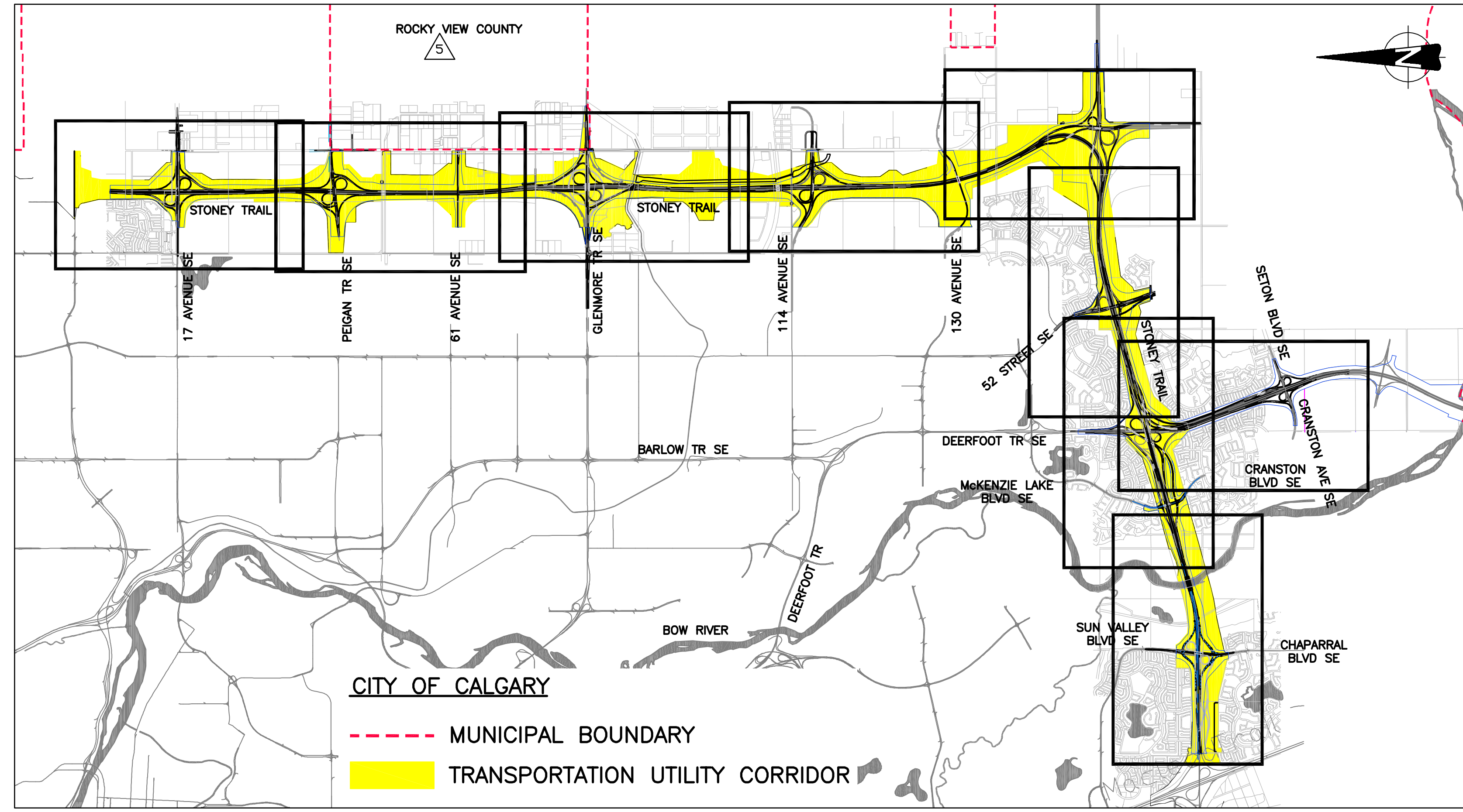
APPENDIX A - DRAWINGS

18-A-01	1 OF 52	COVER SHEET 1 OF 2
18-A-02	2 OF 52	COVER SHEET 2 OF 2
PROJECT LIMITS AND TO BE ACQUIRED LANDS		
18-A-03	3 OF 52	NORTH OF 17 AVENUE SE TO SOUTH OF 17 AVENUE SE
18-A-04	4 OF 52	NORTH OF PEIGAN TRAIL SE TO SOUTH OF 61 AVENUE SE
18-A-05	5 OF 52	NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE
18-A-06	6 OF 52	NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE
18-A-07	7 OF 52	SOUTH OF 130 AVENUE SE TO STONEY TRAIL
18-A-08	8 OF 52	WEST OF 88 STREET SE TO WEST OF 52 STREET SE
18-A-09	9 OF 52	EAST OF DEERFOOT TRAIL SE TO WEST OF McKENZIE LAKE BLVD SE
18-A-10	10 OF 52	EAST OF SUN VALLEY BLVD SE TO WEST OF SUN VALLEY BLVD SE
18-A-11	11 OF 52	STONEY TRAIL TO SOUTH OF SETON BLVD SE
PROJECT SCOPE – STAGE 1		
18-A-12	12 OF 52	NORTH OF 17 AVENUE SE TO SOUTH OF 17 AVENUE SE
18-A-13	13 OF 52	NORTH OF PEIGAN TRAIL SE TO SOUTH OF 61 AVENUE SE
18-A-14	14 OF 52	NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE
18-A-15	15 OF 52	NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE
18-A-16	16 OF 52	SOUTH OF 130 AVENUE SE TO STONEY TRAIL
18-A-17	17 OF 52	WEST OF 88 STREET SE TO WEST OF 52 STREET SE
18-A-18	18 OF 52	EAST OF DEERFOOT TR SE TO WEST OF McKENZIE LAKE BLVD SE
18-A-19	19 OF 52	EAST OF SUN VALLEY BLVD SE TO WEST OF SUN VALLEY BLVD SE
18-A-20	20 OF 52	STONEY TRAIL TO SOUTH OF SETON BLVD SE
TYPICAL SECTIONS AND DETAILS		
18-A-21	21 OF 52	TYPICAL SECTIONS - CROSS ROADS
18-A-22	22 OF 52	TYPICAL SECTIONS - CROSS ROADS
18-A-23	23 OF 52	TYPICAL SECTIONS - STONEY TRAIL
18-A-24	24 OF 52	DETAILS - CUL DE SAC
BRIDGE INFORMATION DRAWINGS		
18-A-25	25 OF 52	INDEX SHEET
18-A-26	26 OF 52	EB-WB 17 AVE SE OVER STONEY TRAIL
18-A-27	27 OF 52	EB-WB PEIGAN TRAIL SE OVER STONEY TRAIL
18-A-28	28 OF 52	NB-SB STONEY TRAIL AT CNR
18-A-29	29 OF 52	EB-WB 61 AVE SE OVER STONEY TRAIL
18-A-30	30 OF 52	EB-WB GLENMORE TRAIL OVER STONEY TRAIL
18-A-31	31 OF 52	NB-SB STONEY TRAIL OVER WH CANAL
18-A-32	32 OF 52	EB-WB GLENMORE TRAIL TO SB STONEY TRAIL OVER WH CANAL
18-A-33	33 OF 52	NB STONEY TRAIL TO EB-WB GLENMORE TRAIL SE OVER WH CANAL
18-A-34	34 OF 52	CPR NORTH OF 114 AVE SE AT STONEY TRAIL
18-A-35	35 OF 52	EB-WB 114 AVE SE OVER STONEY TRAIL
18-A-36	36 OF 52	INTENTIONALL DELETED
18-A-37	37 OF 52	NB-SB STONEY TRAIL TO 88 STREET SE OVER HIGHWAY 22X
18-A-38	38 OF 52	WB HIGHWAY 22X TO STONEY TRAIL OVER STONEY TRAIL
18-A-39	39 OF 52	SB STONEY TRAIL TO 88 STREET SE OVER STONEY TRAIL SE
18-A-40	40 OF 52	NB-SB 52 STREET SE OVER STONEY TRAIL
18-A-41	41 OF 52	EB CRANSTON BLVD SE TO NB DEERFOOT TRAIL SE OVER EB STONEY TRAIL TO SB DEERFOOT TRAIL
18-A-42	42 OF 52	EB STONEY TRAIL TO NB DEERFOOT TRAIL SE DIRECTIONAL RAMP OVER EB-WB STONEY TRAIL

18-A-43	43 OF 52	EB STONEY TRAIL TO NB DEERFOOT TRAIL SE OVER NB-SB DEERFOOT TRAIL SE
18-A-44	44 OF 52	WB STONEY TRAIL TO SB DEERFOOT TRAIL SE OVER NB DEERFOOT TRAIL SE
18-A-45	45 OF 52	WB STONEY TRAIL TO SB DEERFOOT TRAIL SE OVER NB DEERFOOT TRAIL SE TO EB-WB STONEY TRAIL
18-A-46	46 OF 52	WB STONEY TRAIL TO SB DEERFOOT TRAIL SE OVER EB STONEY TRAIL
18-A-47	47 OF 52	NB DEERFOOT TRAIL SE TO EB STONEY TRAIL OVER EB STONEY TRAIL
18-A-48	48 OF 52	NB DEERFOOT TR TO EB STONEY TR OVER CRANSTON AVE SE/WB SETON BLVD SE TO NB DEERFOOT TR
18-A-49	49 OF 52	NB-SB McKENZIE BLVD SE /CRANSTON BLVD SE OVER EB-WB STONEY TRAIL
18-A-50	50 OF 52	SUN VALLEY BLVD SE/CHAPARRAL BLVD SE OVER STONEY TRAIL
18-A-51	51 OF 52	SE RING ROAD DRAINAGE - PART 1
18-A-52	52 OF 52	SE RING ROAD DRAINAGE - PART 2 & 3

DRAWING LIST

18–A–01	–	COVER SHEET 1 OF 2
18–A–02	–	COVER SHEET 2 OF 2
PROJECT LIMITS AND TO BE ACQUIRED LANDS		
18–A–03	–	NORTH OF 17 AVE SE TO SOUTH OF 17 AVE SE
18–A–04	–	NORTH OF PEIGAN TR SE TO SOUTH OF 61 AVE SE
18–A–05	–	NORTH OF GLENMORE TR SE TO SOUTH OF GLENMORE TR SE
18–A–06	–	NORTH OF 114 AVE SE TO SOUTH OF 130 AVE SE
18–A–07	–	SOUTH OF 130 AVE SE TO STONEY TRAIL
18–A–08	–	WEST OF 88 STREET SE TO WEST OF 52 ST SE
18–A–09	–	EAST OF DEERFOOT TR SE TO WEST OF McKENZIE LAKE BLVD SE
18–A–10	–	EAST OF SUN VALLEY BLVD SE TO WEST OF SUN VALLEY BLVD SE
18–A–11	–	STONEY TRAIL TO SOUTH OF SETON BLVD SE
PROJECT SCOPE – STAGE 1		
18–A–12	–	NORTH OF 17 AVE SE TO SOUTH OF 17 AVE SE
18–A–13	–	NORTH OF PEIGAN TR SE TO SOUTH OF 61 AVE SE
18–A–14	–	NORTH OF GLENMORE TR SE TO SOUTH OF GLENMORE TR SE
18–A–15	–	NORTH OF 114 AVE SE TO SOUTH OF 130 AVE SE
18–A–16	–	SOUTH OF 130 AVE SE TO STONEY TRAIL
18–A–17	–	WEST OF 88 STREET SE TO WEST OF 52 ST SE 4
18–A–18	–	EAST OF DEERFOOT TR SE TO WEST OF McKENZIE LAKE BLVD SE
18–A–19	–	EAST OF SUN VALLEY BLVD SE TO WEST OF SUN VALLEY BLVD SE
18–A–20	–	STONEY TRAIL TO SOUTH OF SETON BLVD SE
TYPICAL SECTIONS AND DETAILS		
18–A–21	–	CROSS ROADS – STAGE 1 & ULTIMATE
18–A–22	–	CROSS ROADS – STAGE 1 & ULTIMATE 4
18–A–23	–	STONEY TRAIL – STAGE 1 & ULTIMATE 4
18–A–24	–	DETAILS – CUL DE SAC 4
BRIDGE INFORMATION DRAWINGS		
18–A–25	–	INDEX SHEET
18–A–26	–	EB–WB 17 AVE SE OVER STONEY TRAIL
18–A–27	–	EB–WB PEIGAN TRAIL SE OVER STONEY TRAIL
18–A–28	–	NB–SB SE STONEY TRAIL AT CNR 4
18–A–29	–	EB–WB 61 AVE SE OVER STONEY TRAIL
18–A–30	–	EB–WB GLENMORE TRAIL OVER STONEY TRAIL
18–A–31	–	NB–SB STONEY TRAIL OVER WH CANAL 4
18–A–32	–	EB–WB GLENMORE TRAIL TO SB STONEY TRAIL OVER WH CANAL 4
18–A–33	–	NB STONEY TRAIL TO EB–WB GLENMORE TRAIL SE OVER WH CANAL 4
18–A–34	–	CPR NORTH OF 114 AVE SE AT STONEY TRAIL 4
18–A–35	–	EB–WB 114 AVE OVER STONEY TRAIL
18–A–36	–	INTENTIONALLY DELETED
18–A–37	–	NB–SB STONEY TRAIL TO 88 STREET SE OVER HIGHWAY 22X 4
18–A–38	–	WB HIGHWAY 22X TO STONEY TRAIL OVER STONEY TRAIL 4
18–A–39	–	SB STONEY TRAIL TO 88 STREET SE OVER STONEY TRAIL 4
18–A–40	–	NB–SB 52 STREET SE OVER STONEY TRAIL
18–A–41	–	EB CRANSTON BLVD TO NB DEERFOOT TRAIL OVER EB STONEY TRAIL TO SB DEERFOOT TRAIL
18–A–42	–	EB STONEY TRAIL TO NB DEERFOOT TRAIL DIRECTIONAL RAMP OVER EB–WB STONEY TRAIL
18–A–43	–	EB STONEY TRAIL TO NB DEERFOOT TRAIL OVER NB–SB DEERFOOT TRAIL
18–A–44	–	WB STONEY TRAIL TO SB DEERFOOT TRAIL OVER NB DEERFOOT TRAIL
18–A–45	–	WB STONEY TRAIL TO SB DEERFOOT TR OVER NB DEERFOOT TR TO EB–WB STONEY TRAIL
18–A–46	–	WB STONEY TRAIL TO SB DEERFOOT TRAIL OVER EB STONEY TRAIL



SOUTHEAST STONEY TRAIL
DESIGN, BUILD, FINANCE AND OPERATE
CALGARY, ALBERTA, CANADA

SCHEDULE 18
APPENDIX A - DRAWINGS
ISSUED FOR ADDENDUM 25
DECEMBER 10, 2009

CH2MHILL

Alberta TRANSPORTATION

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL SCHEDULE 18 APPENDIX A DRAWINGS COVER SHEET SHEET 1 OF 2

PLAN No. 18–A–01 | CONTRACT No. 7875/09

No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

DRAWING LIST

BRIDGE INFORMATION DRAWINGS

18–A–47	–	NB DEERFOOT TRAIL TO EB STONEY TRAIL OVER EB STONEY TRAIL
18–A–48	–	NB DEERFOOT TR TO EB STONEY TR OVER CRANSTON AVE SE/WB SETON BLVD TO NB DEERFOOT TR
18–A–49	–	NB–SB CRANSTON BLVD SE/McKENZIE BLVD SE OVER EB–WB STONEY TRAIL
18–A–50	–	SUN VALLEY BLVD SE/CHAPARRAL BLVD SE OVER STONEY TRAIL
18–A–51	–	SE RING ROAD DRAINAGE – PART 1
18–A–52	–	SE RING ROAD DRAINAGE – PART 2 & 3

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL
SCHEDULE 18 APPENDIX A DRAWINGS
COVER SHEET
SHEET 2 OF 2

BAR CODE

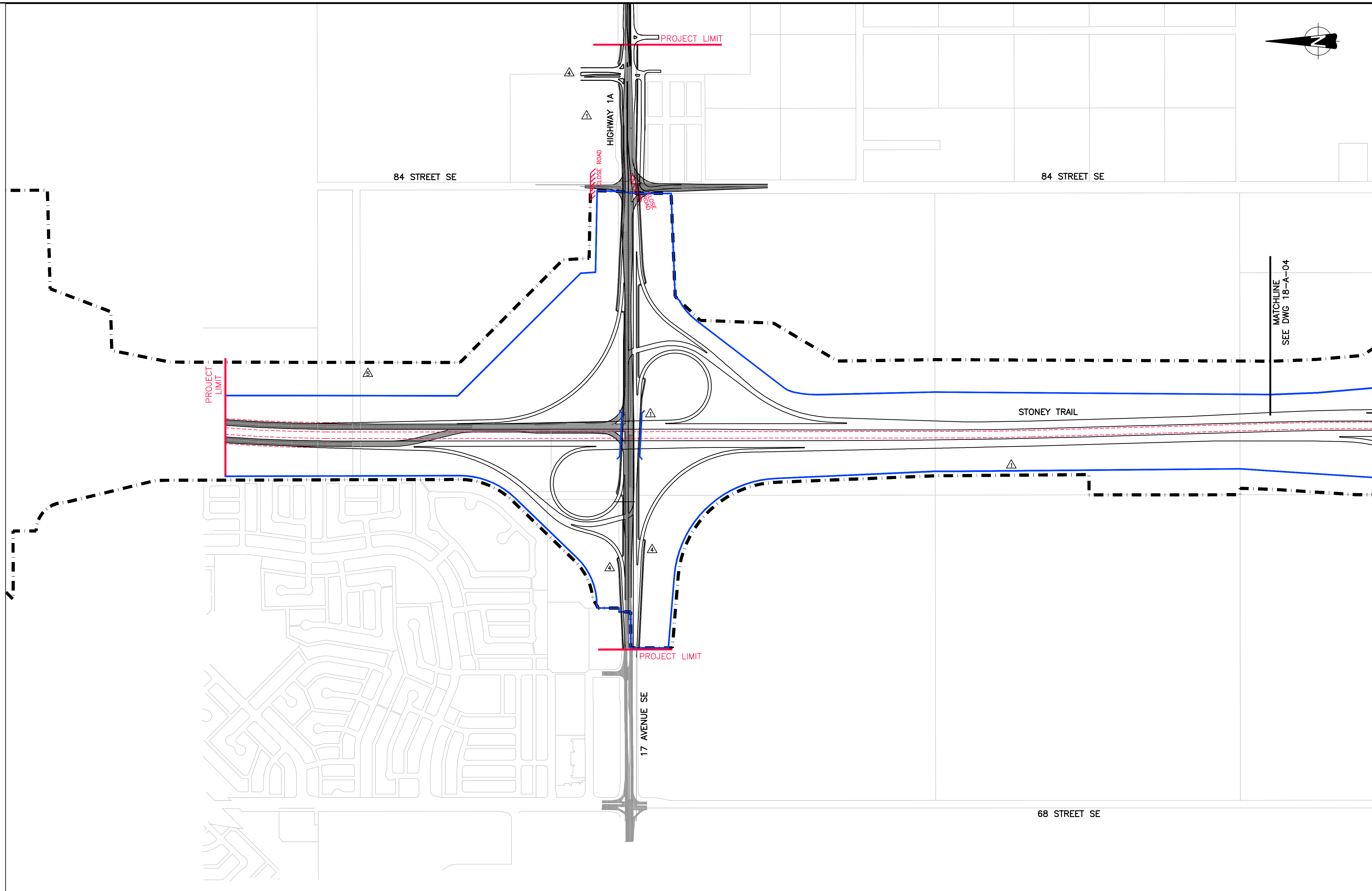
PLAN No.	18–A–02	
CONTRACT No.	7875/09	
PLAN LOCATION		
PHOTO No.		
TITLE SEARCH DATE		
GRAPHICS FILE		

No.	REVISION	BY	DD.MM.YY		BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 1, 4 & 7	JB		SURVEYED	–	–
4	ISSUED FOR ADDENDUM 11	JB		DESIGNED	–	–
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB		CHECKED	–	–
6	ISSUED FOR ADDENDUM 25	JB	10.12.09	DRAWN	–	–

PLOTTED: Dec/10/2009 2:22 pm BY: hbuch
NDM PROJECT: CGY / SESTOE–388694 / SOUTH EAST STONEY TRAIL OWNERS ENGINEER / DELIVERABLES / 18–A–02.DWG DEC/10/2009 10:57 a.m. LAYOUT: Layout1 USER: hbuch

CH2MHILL

Alberta TRANSPORTATION

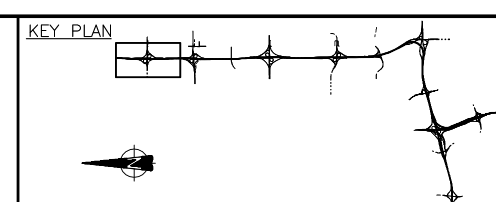


NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- 1 MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- 1 ULTIMATE STAGE (NOT IN DBFO AGREEMENT) 6
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY 4
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY 4
- EXISTING ROADS
- STAGE 1 BRIDGES 5

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF 17 AVENUE SE TO
SOUTH OF 17 AVENUE SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–03

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF 17 AVENUE SE TO
SOUTH OF 17 AVENUE SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

BAR CODE

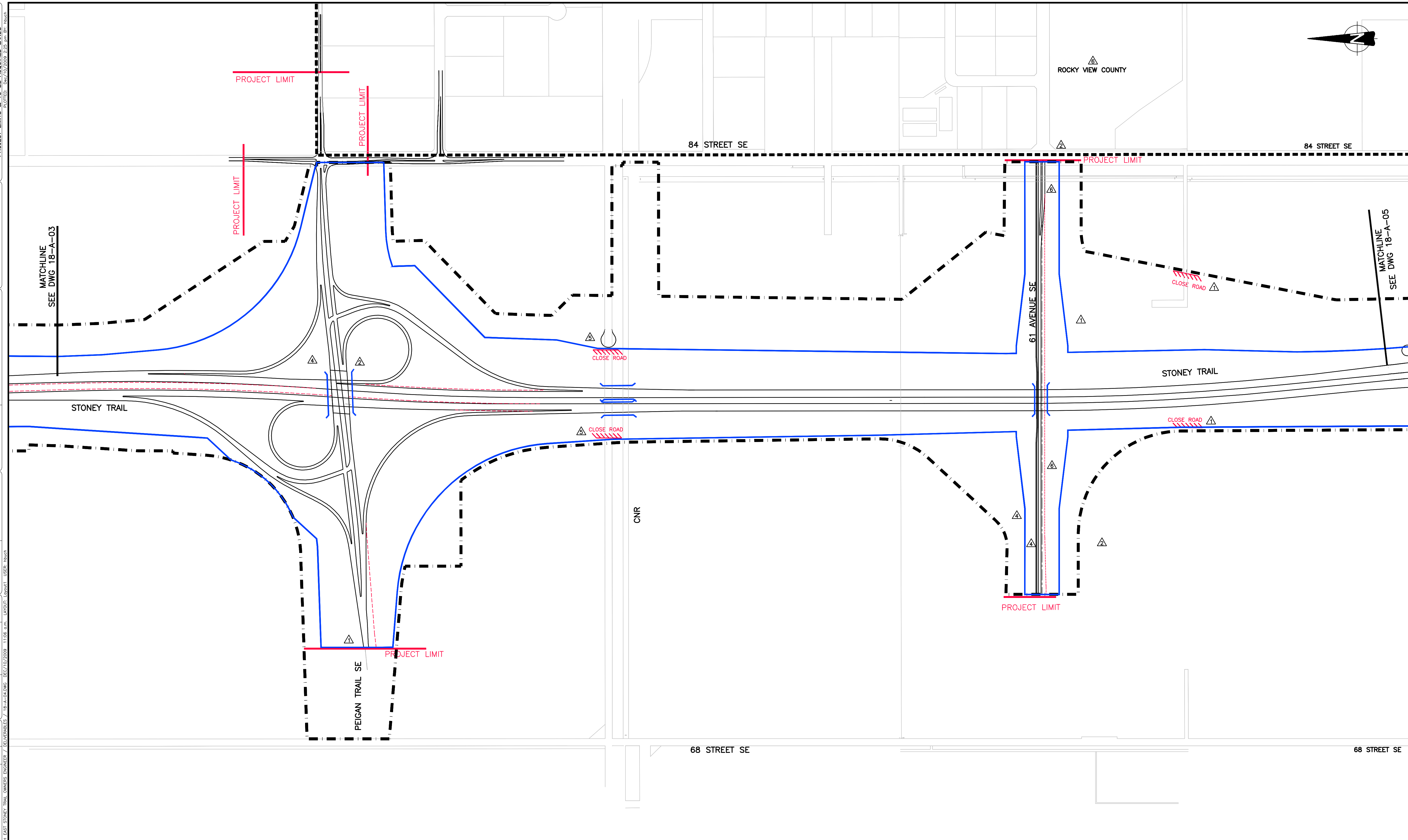
PLAN No.	18–A–03
CONTRACT No.	7875/09
PLAN LOCATION	

		DD.MM.YY
PHOTO No.	–	–
TITLE SEARCH DATE	–	–
GRAPHICS FILE	–	–

	BY	DD.MM.YY
SURVEYED	JB	
DESIGNED	JB	
CHECKED	JB	
DRAWN	JB	10.12.09

No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

NDM PROJECT: CGY / SESTOE–388694 / SOUTH EAST STONEY TRAIL OWNERS ENGINEER / DELIVERABLES / 18-A-03.DWG



NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN DBFO AGREEMENT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF PEIGAN TRAIL SE TO
SOUTH OF 61 AVENUE SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–04

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF PEIGAN TRAIL SE TO
SOUTH OF 61 AVENUE SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS
PLOTTED: Dec/10/2009 2:25 pm BY: hbuch

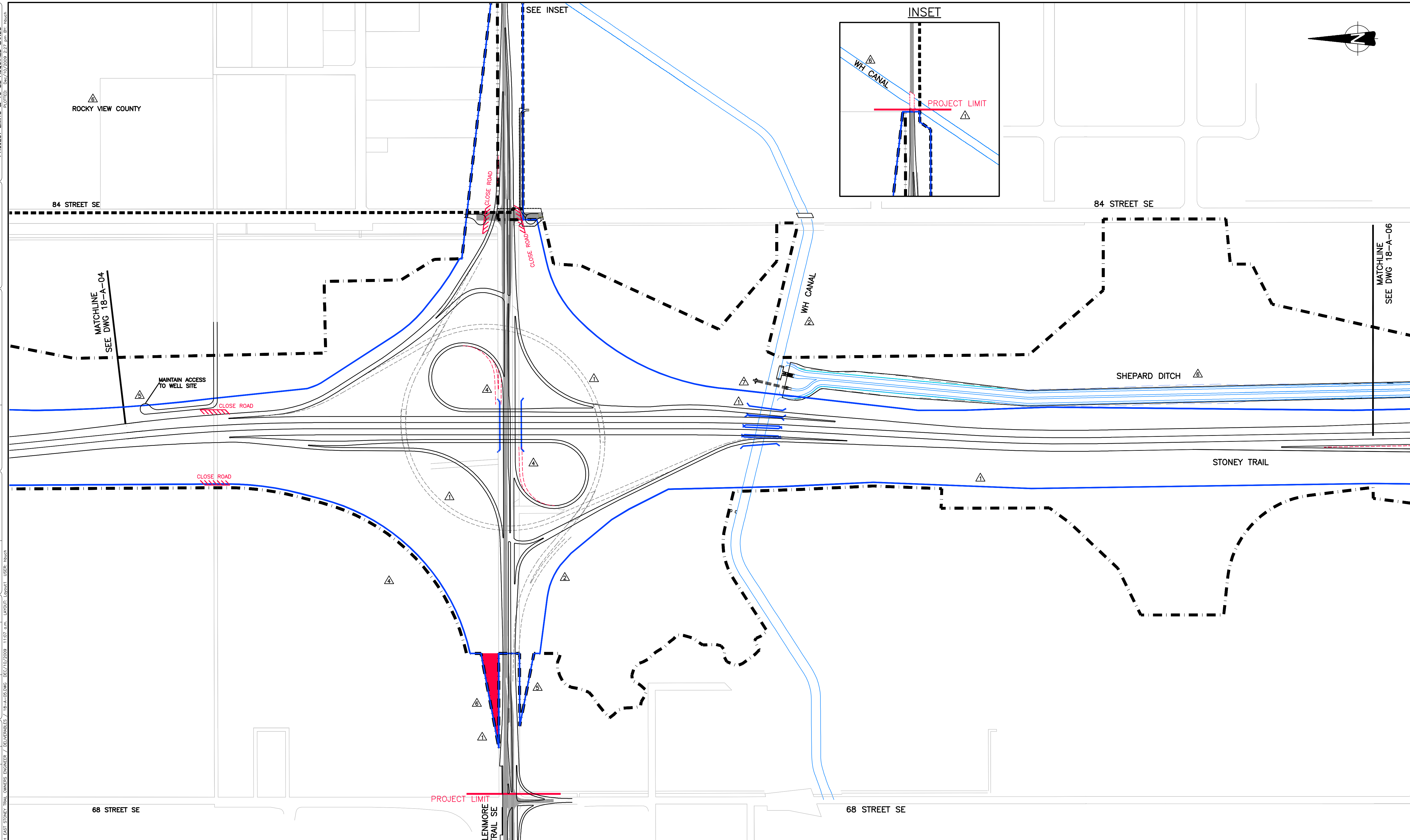
BAR CODE

PLAN No.		18–A–04
CONTRACT No.		7875/09
PLAN LOCATION		

PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY		BY	DD.MM.YY
1–5	ISSUED FOR ADDENDUM 1, 4, 7, 11 & 16	JB		SURVEYED	–	–
6	ISSUED FOR ADDENDUM 17	JB		DESIGNED	–	–
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB		CHECKED	–	–
8	ISSUED FOR ADDENDUM 25	JB	10.12.09	DRAWN	–	–

NDM PROJECT: CGY / SESTOE–388694 / SOUTH EAST STONEY TRAIL OWNERS ENGINEER / DELIVERABLES / 18–A–04.DWG DEC/10/2009 11:06 a.m. LAYOUT: Layout1 USER: hbuch



NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN CONTRACT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF GLENMORE TRAIL SE TO
SOUTH OF GLENMORE TRAIL SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-05

Alberta TRANSPORTATION

SCALE 1:5000
0 100m
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18
NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

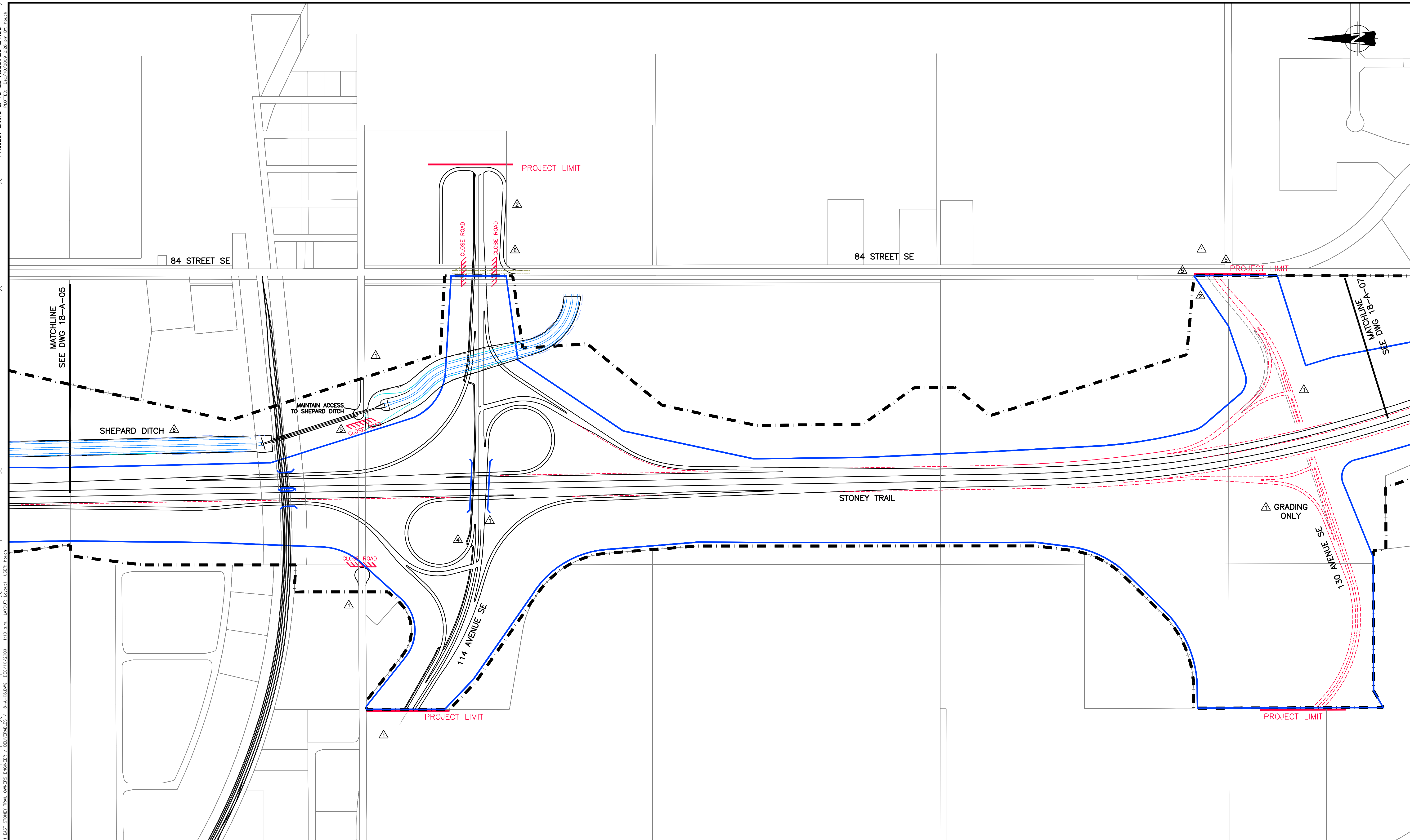
BAR CODE

PLAN No.	CONTRACT No.	PLAN LOCATION
18-A-05	7875/09	

PHOTO No. | TITLE SEARCH DATE | GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1-5	ISSUED FOR ADDENDUM 1, 4, 7, 11 & 16	JB	
6	ISSUED FOR ADDENDUM 17	JB	
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
8	ISSUED FOR ADDENDUM 25	JB	10.12.09

SURVEYED | DESIGNED | CHECKED | DRAWN



NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN DBFO AGREEMENT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18

NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-06

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18
NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

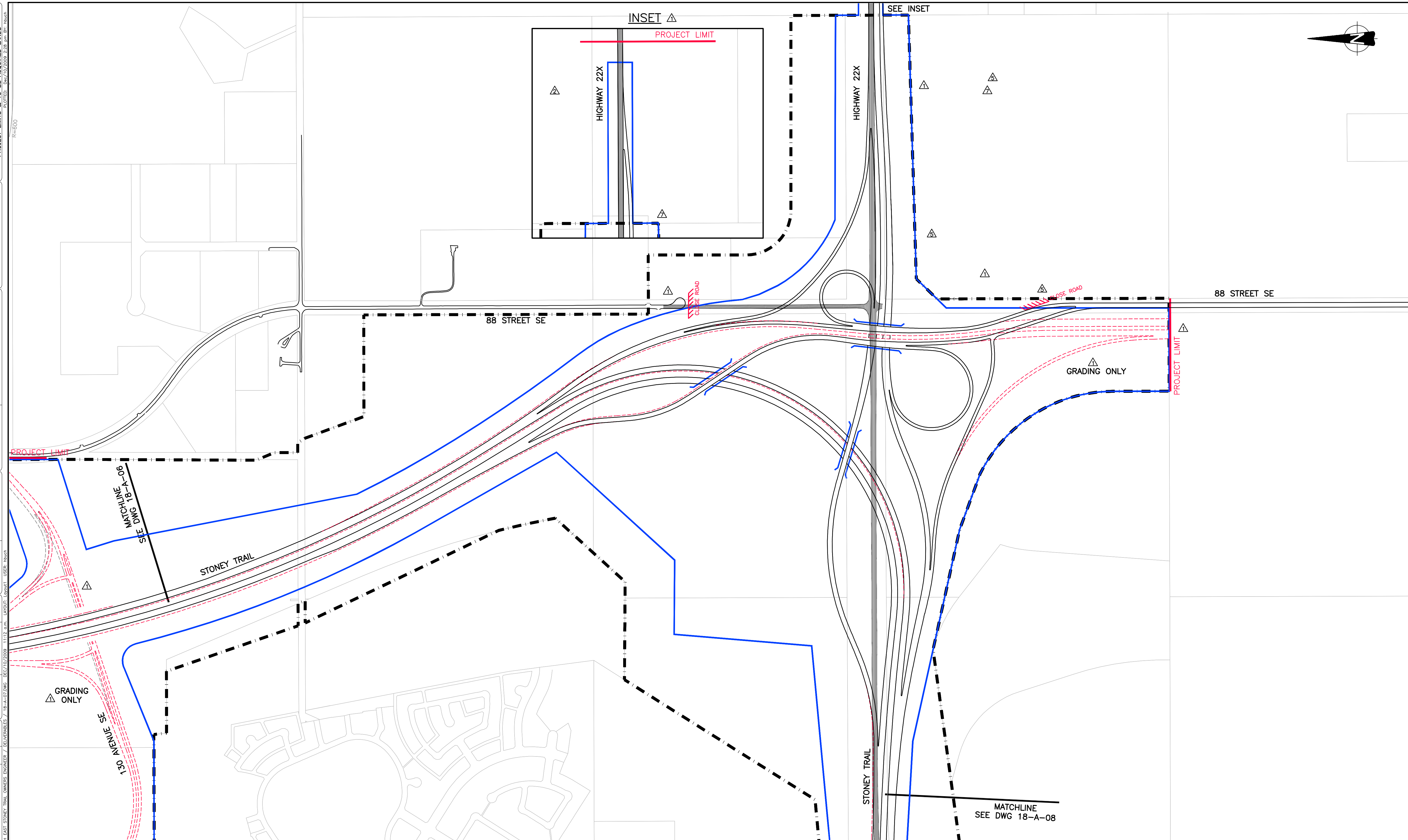
BAR CODE

PLAN No. 18-A-06
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1-4	ISSUED FOR ADDENDUM 1, 4, 7 & 11	JB	
5	ISSUED FOR ADDENDUM 16	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
7	ISSUED FOR ADDENDUM 25	JB	10.12.09

SURVEYED
DESIGNED
CHECKED
DRAWN



NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN DBFO AGREEMENT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
SOUTH OF 130 AVENUE SE TO
STONEY TRAIL
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–07

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
SOUTH OF 130 AVENUE SE TO
STONEY TRAIL
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

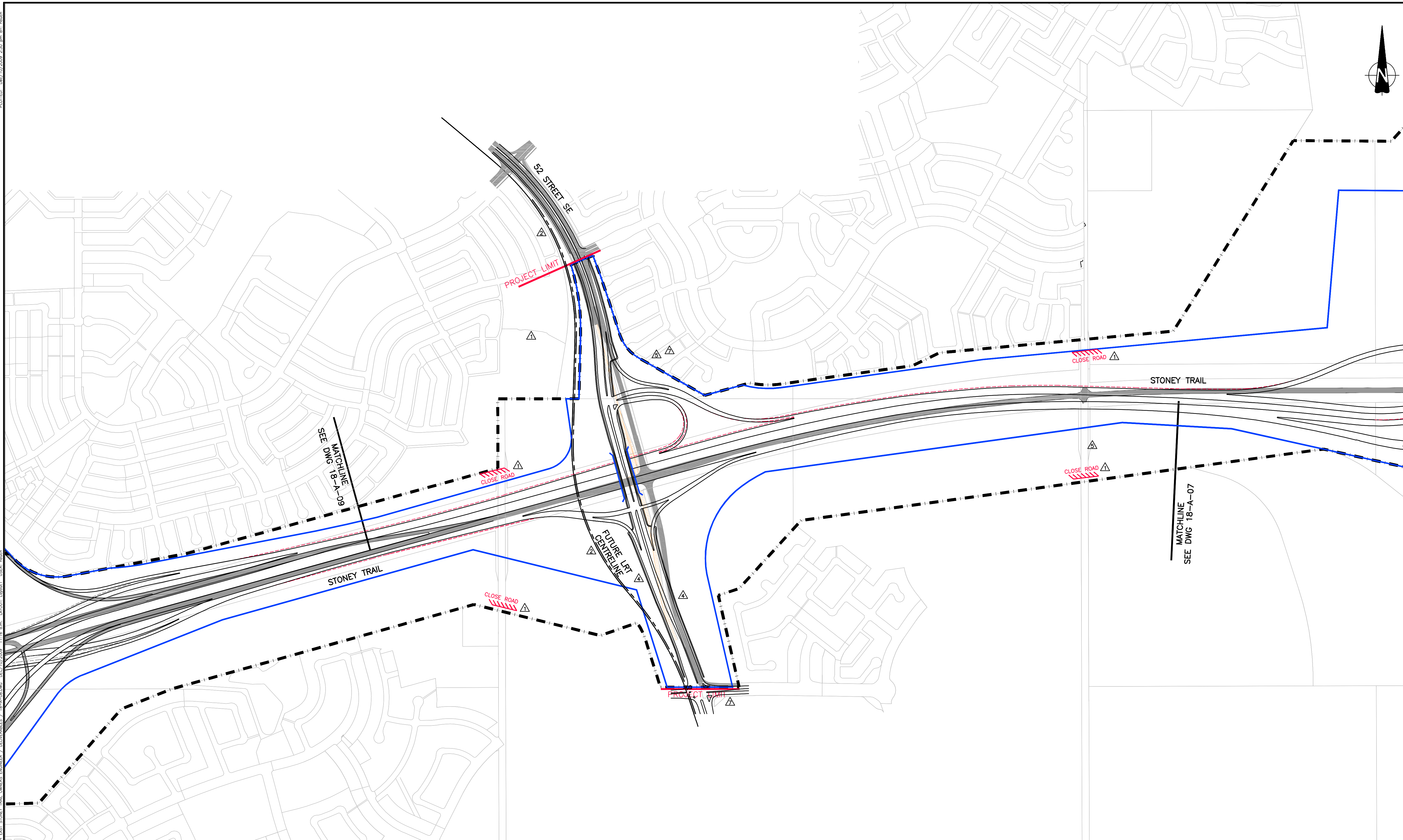
BAR CODE

PLAN No. 18–A–07
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1–4	ISSUED FOR ADDENDUM 1, 4, 7 & 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
7	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

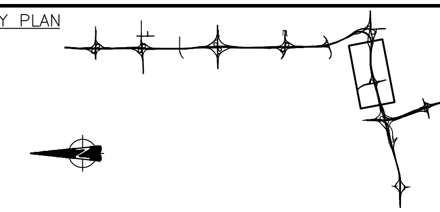


NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN DBFO AGREEMENT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
WEST OF 88 STREET SE
TO WEST OF 52 STREET SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–08

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
WEST OF 88 STREET SE
TO WEST OF 52 STREET SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

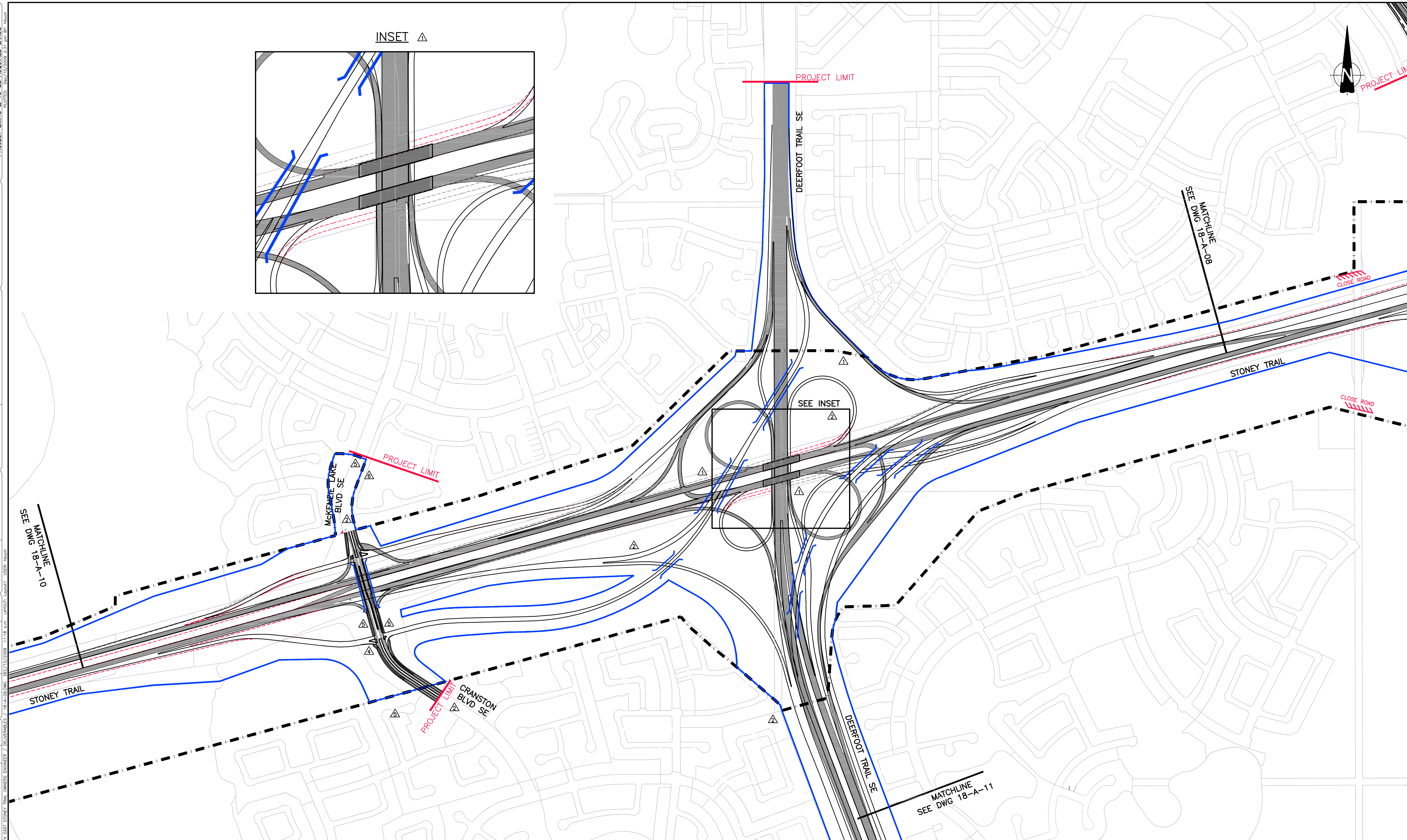
BAR CODE

PLAN No. 18–A–08
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1–4	ISSUED FOR ADDENDUM 1, 4, 7 & 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
7	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–



NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN DBFO AGREEMENT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
EAST OF DEERFOOT TRAIL SE TO
WEST OF McKENZIE LAKE BLVD SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–09

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18
EAST OF DEERFOOT TRAIL SE TO WEST OF McKENZIE LAKE BLVD SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

BAR CODE

PLAN No. 18–A–09
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
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5	ISSUED FOR ADDENDUM 11	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
7	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
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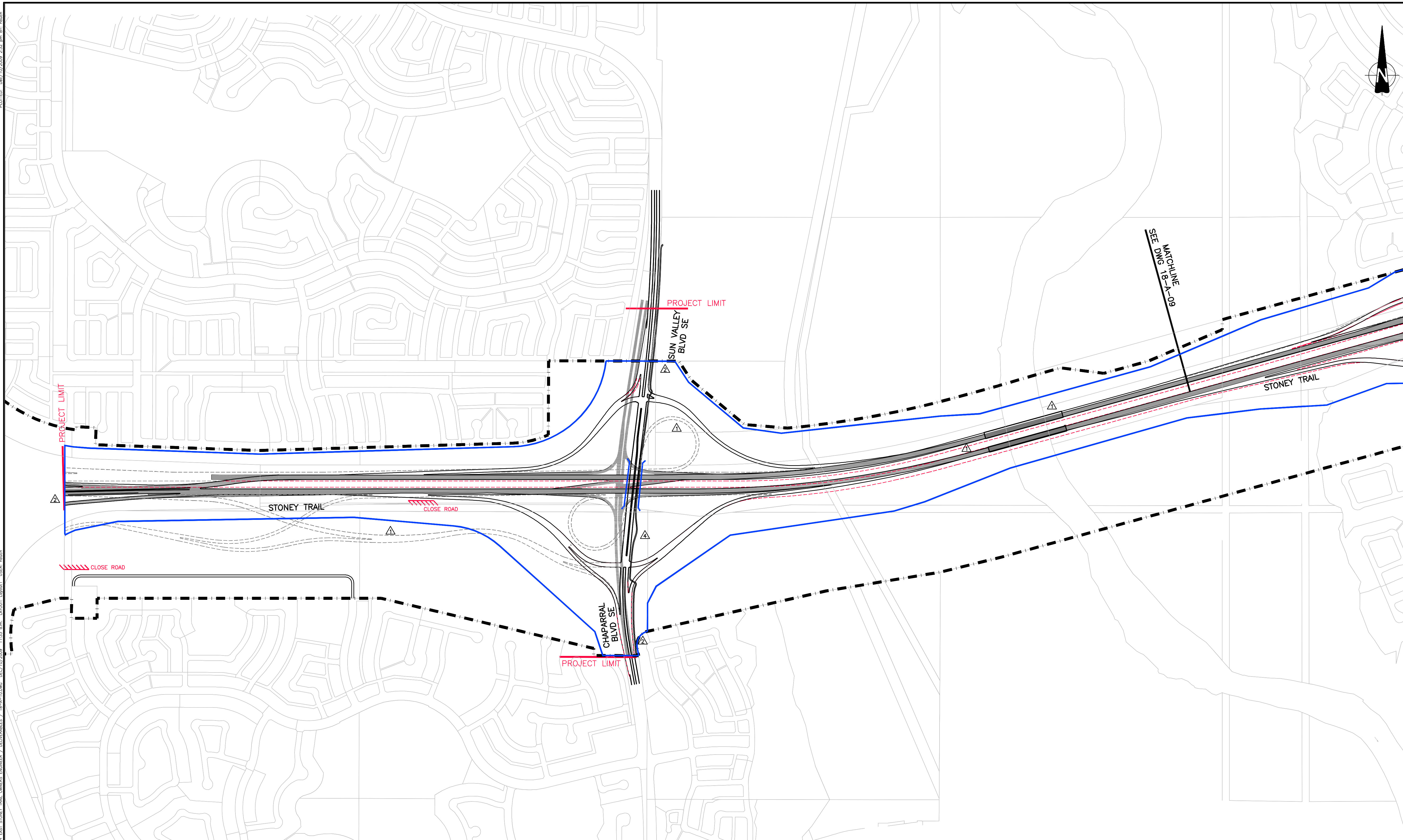
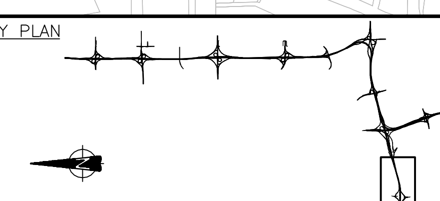


NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN DBFO AGREEMENT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
EAST OF SUN VALLEY BLVD SE TO
WEST OF SUN VALLEY BLVD SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-10

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
EAST OF SUN VALLEY BLVD SE TO
WEST OF SUN VALLEY BLVD SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

BAR CODE

PLAN No.	18-A-10
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
STONEY TRAIL TO
SOUTH OF SETON BLVD SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

PLOTTED: Dec/10/2009 2:33 pm BY: hbuch

BAR CODE

PLAN No.	18–A–11
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY		BY	DD.MM.YY
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5	ISSUED FOR ADDENDUM 11	JB		DESIGNED	–	–
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB		CHECKED	–	–
7	ISSUED FOR ADDENDUM 25	JB	10.12.09	DRAWN	–	–

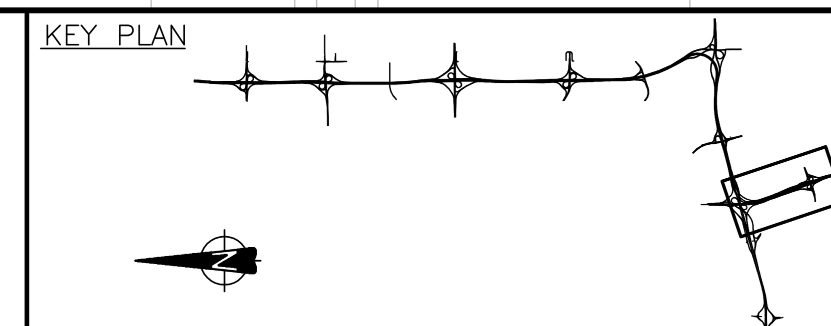
NDM PROJECT: CGY / SESTOE–388694 / SOUTH EAST STONEY TRAIL OWNERS ENGINEER / DELIVERABLES / 18–A–11.DWG DEC/10/2009 2:33 p.m. LAYOUT: Layout1 USER: hbuch

NOTES:

LEGEND

- PROJECT LIMIT
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- ULTIMATE STAGE – GRADING ONLY
- ULTIMATE STAGE (NOT IN DBFO AGREEMENT)
- TO BE ACQUIRED LANDS OUTSIDE THE TUC BOUNDARY
- TO BE ACQUIRED LANDS WITHIN THE EXISTING TUC BOUNDARY
- EXISTING ROADS
- STAGE 1 BRIDGES

KEY PLAN



Consultant Job No. 388694

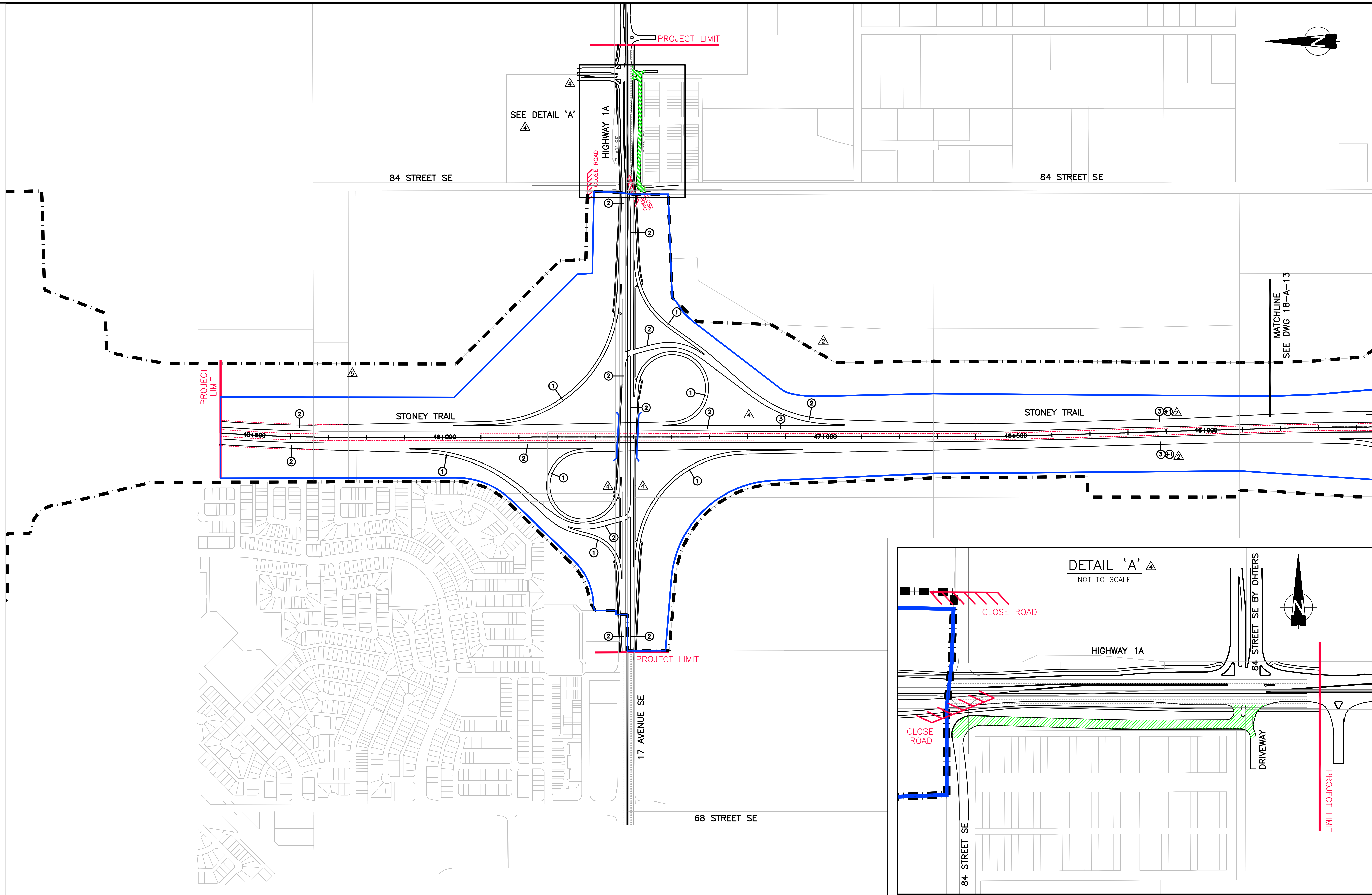
CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
STONEY TRAIL TO
SOUTH OF SETON BLVD SE
NEW INFRASTRUCTURE
PROJECT LIMITS & TO BE ACQUIRED LANDS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–11

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE



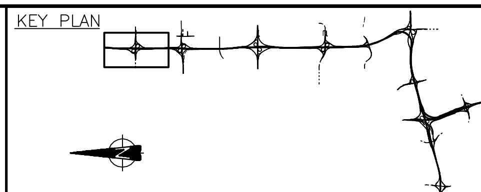
NOTES:

1. REFER TO DRAWINGS 18-A-21 TO 18-A-23 FOR ULTIMATE STAGE GRADING REQUIREMENTS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- (2) NUMBER OF PAVED LANES
- NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF 17 AVENUE SE TO
SOUTH OF 17 AVENUE SE
PROJECT SCOPE – STAGE 1

Alberta TRANSPORTATION

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-12

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 NORTH OF 17 AVENUE SE TO SOUTH OF 17 AVENUE SE PROJECT SCOPE – STAGE 1

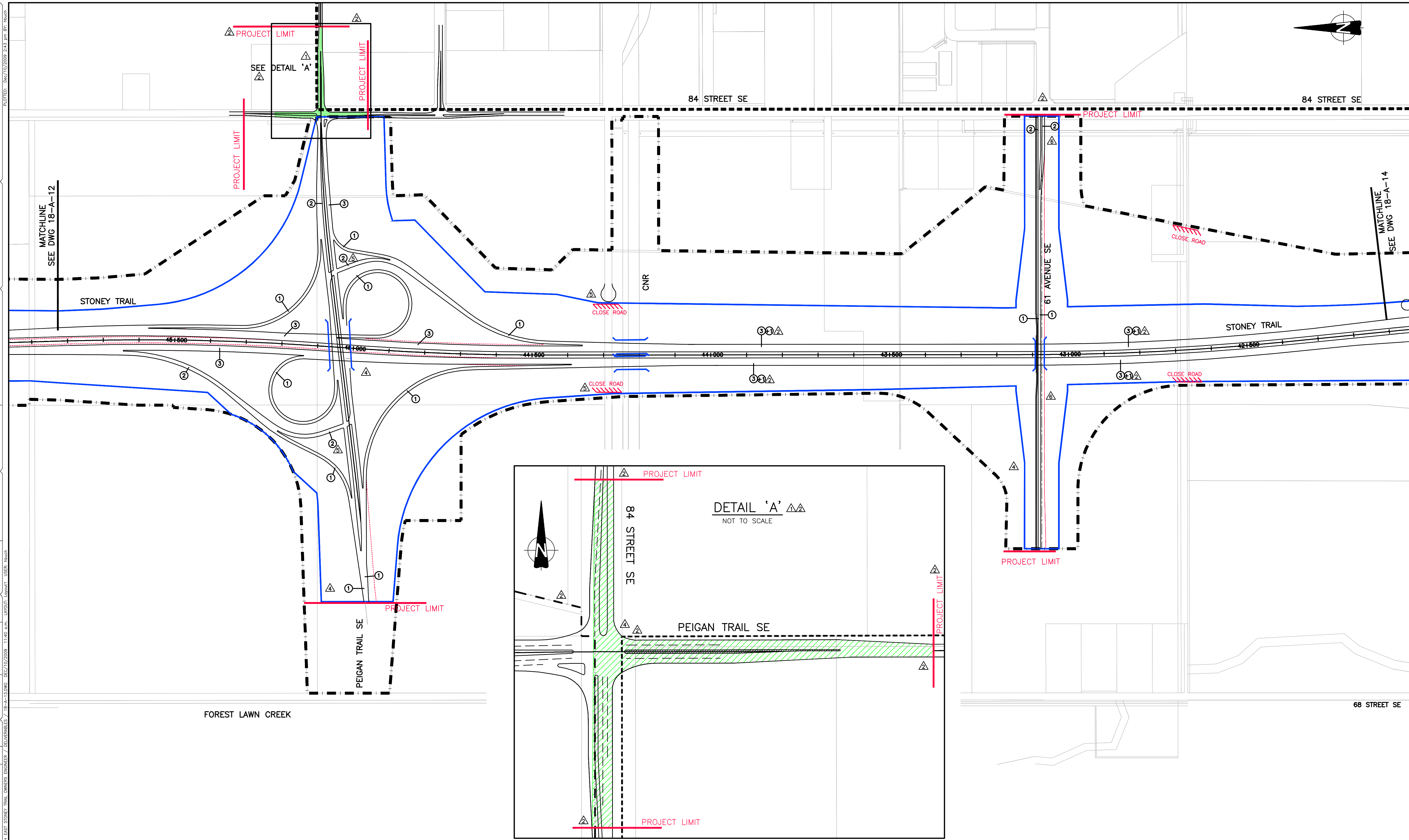
BAR CODE

PLAN No. 18-A-12
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

SURVEYED
DESIGNED
CHECKED
DRAWN 10.12.09

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09



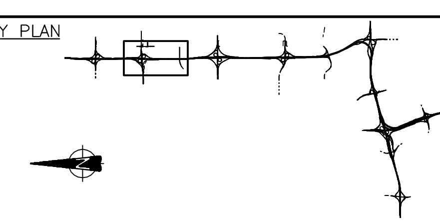
NOTES:

1. REFER TO DRAWINGS 18-A-21 TO 18-A-23 FOR ULTIMATE STAGE GRADING REQUIREMENTS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- NUMBER OF PAVED LANES
- NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF PEIGAN TRAIL SE TO
SOUTH OF 61 AVENUE SE
PROJECT SCOPE – STAGE 1

Alberta TRANSPORTATION

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-13

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF PEIGAN TRAIL SE TO SOUTH OF 61 AVENUE SE
PROJECT SCOPE – STAGE 1

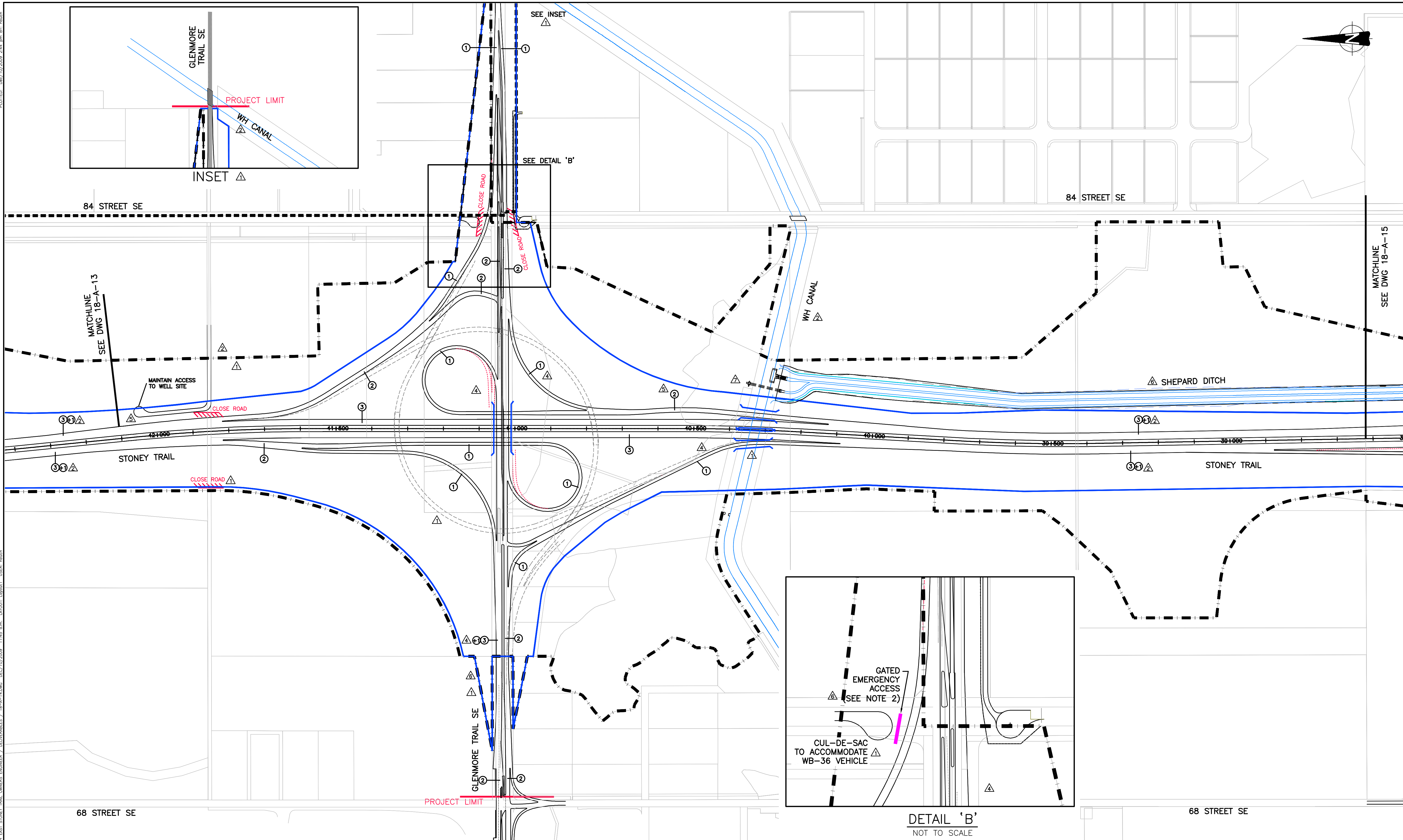
BAR CODE

PLAN No. 18-A-13
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1-5	ISSUED FOR ADDENDUM 1, 4, 7, 11 & 16	JB	
6	ISSUED FOR ADDENDUM 17	JB	
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
8	ISSUED FOR ADDENDUM 25	JB	10.12.09

SURVEYED
DESIGNED
CHECKED
DRAWN



DETAIL 'B'

NOT TO SCALE

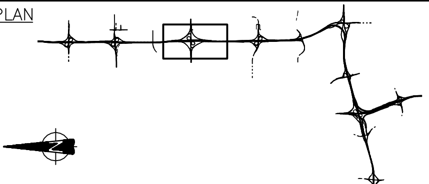
NOTES:

1. REFER TO DRAWINGS 18-A-21 TO 18-A-23 FOR ULTIMATE STAGE GRADING REQUIREMENTS
2. REFER TO THE CITY OF CALGARY STANDARD SPECIFICATIONS ROADS CONSTRUCTION 2009 FILE No. 454.1001.027 SHEET 93 OR APPROVED EQUIVALENT FOR GATED EMERGENCY ACCESS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- (2) NUMBER OF PAVED LANES
- (+1) NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE
PROJECT SCOPE – STAGE 1

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–14

Alberta TRANSPORTATION

0 100m

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO SCHEDULE 12
NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE
PROJECT SCOPE – STAGE 1

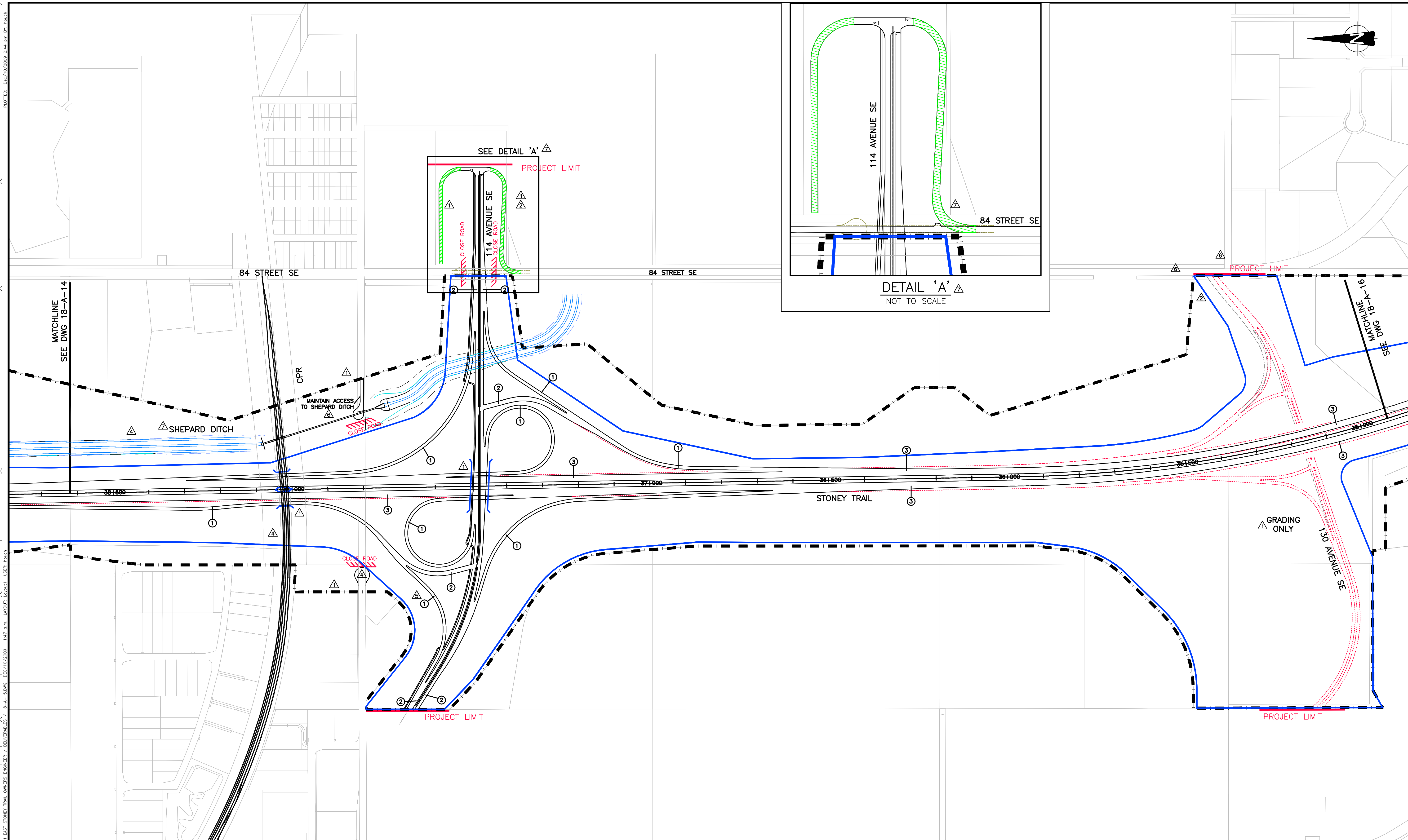
PLOTTED: Dec/10/2009 2:44 pm BY: hbuch

BAR CODE

PLAN No.	18–A–14
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY		BY	DD.MM.YY
1–5	ISSUED FOR ADDENDUM 1, 4, 7, 11 & 16	JB		SURVEYED	–	–
6	ISSUED FOR ADDENDUM 17	JB		DESIGNED	–	–
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB		CHECKED	–	–
8	ISSUED FOR ADDENDUM 25	JB	10.12.09	DRAWN	–	–

NDM PROJECT: CGY / SESTOE-388694 / SOUTH EAST STONEY TRAIL OWNERS ENGINEER / DELIVERABLES / 18-A-14.DWG DEC/10/2009 11:45 a.m. LAYOUT: Layout1 USER: hbuch



NOTES:

1. REFER TO DRAWINGS 18-A-21 TO 18-A-23 FOR ULTIMATE STAGE GRADING REQUIREMENTS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- ② NUMBER OF PAVED LANES
- ① NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
NORTH OF 114 AVENUE SE TO
SOUTH OF 130 AVENUE SE
PROJECT SCOPE – STAGE 1

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-15

Alberta TRANSPORTATION

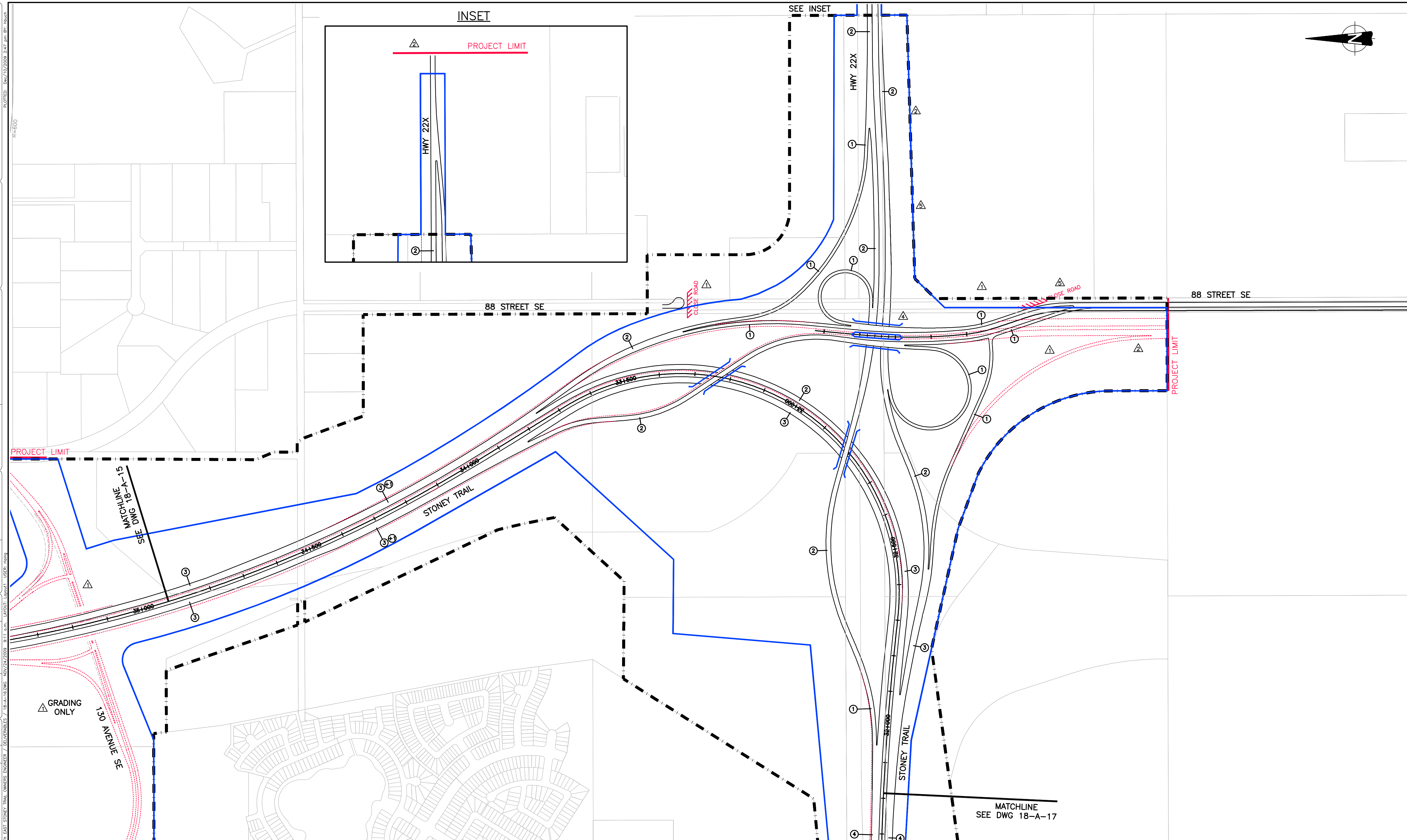
SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE PROJECT SCOPE – STAGE 1

PLAN No. 18-A-15 CONTRACT No. 7875/09

No.	REVISION	BY	DD.MM.YY
1-5	ISSUED FOR ADDENDUM 1, 4, 7, 11 & 16	JB	
6	ISSUED FOR ADDENDUM 17	JB	
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
8	ISSUED FOR ADDENDUM 25	JB	10.12.09



NOTES:

1. REFER TO DRAWINGS 18-A-21 TO 18-A-23 FOR ULTIMATE STAGE GRADING REQUIREMENTS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- NUMBER OF PAVED LANES
- NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18

SOUTH OF 130 AVENUE SE TO STONEY TRAIL
PROJECT SCOPE – STAGE 1

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–16

Alberta TRANSPORTATION

SCALE 1:5000 (0 – 100m)
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 SOUTH OF 130 AVENUE SE TO STONEY TRAIL PROJECT SCOPE – STAGE 1

BAR CODE

PLAN No. 18–A–16
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1–4	ISSUED FOR ADDENDUM 1, 4, 7 & 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
7	ISSUED FOR ADDENDUM 25	JB	10.12.09

SURVEYED | DESIGNED | CHECKED | DRAWN

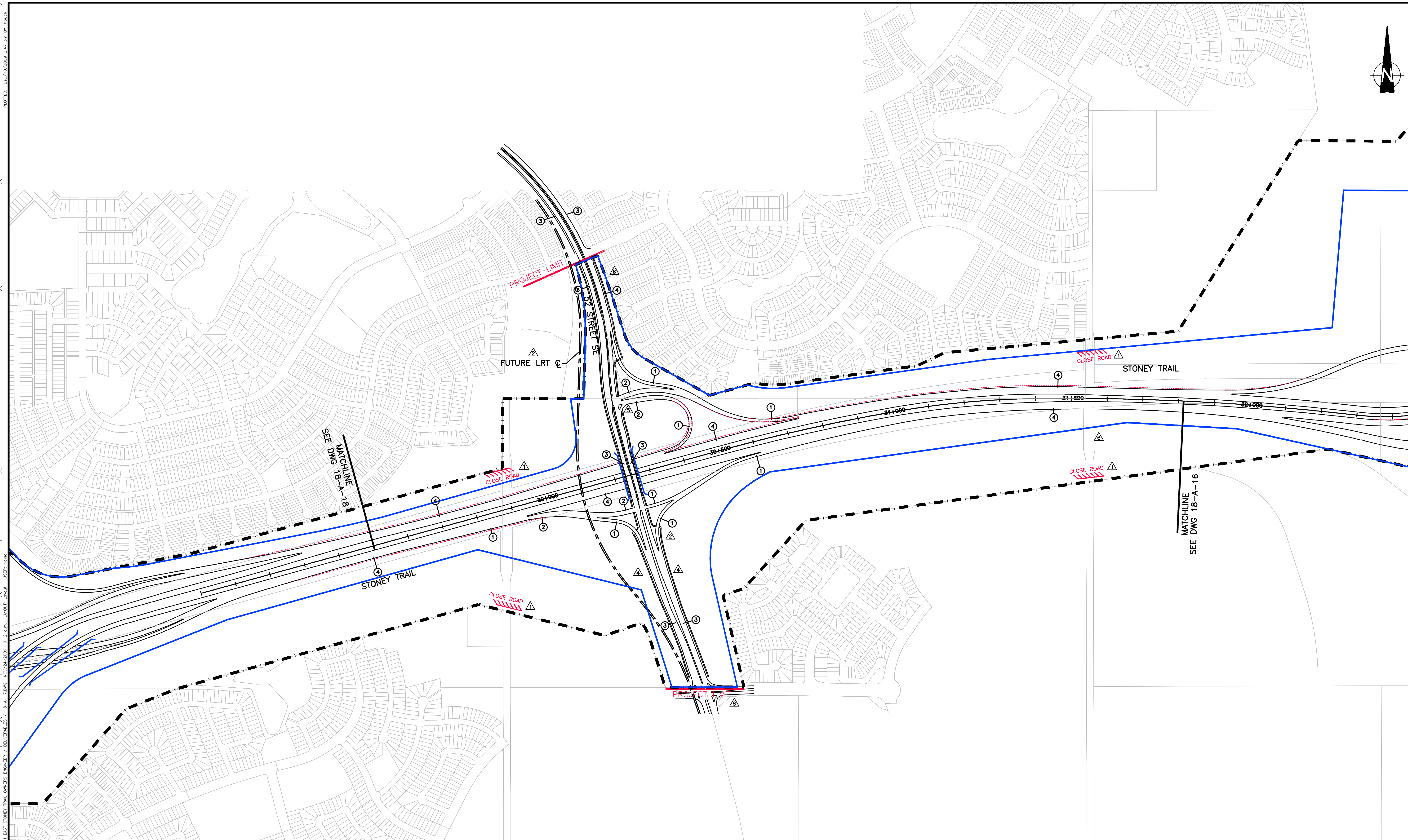
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
WEST OF 88 STREET SE
TO WEST OF 52 STREET SE
PROJECT SCOPE – STAGE 1

BAR CODE

PLAN No.	18–A–17
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY
1–5	ISSUED FOR ADDENDUM 1, 4, 7, 11 & 12	JB	
6	ISSUED FOR ADDENDUM 17	JB	
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
8	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–



NOTES: ⚠1 ⚠4

1. REFER TO DRAWINGS 18–A–21 TO 18–A–23 FOR ULTIMATE STAGE GRADING REQUIREMENTS. ⚠8

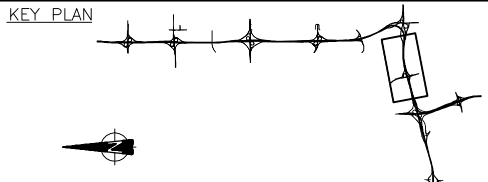
LEGEND ⚠1

ROAD CLOSURE
T.U.C. BOUNDARY
ROAD RIGHT OF WAY
PROJECT LIMITS

(2) NUMBER OF PAVED LANES
(+1) ⚠2 NUMBER OF PAVED AUXILIARY LANES
ULTIMATE STAGE (GRADING ONLY)
ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT) ⚠8
PAVING

SERVICE ROAD
STAGE 1 BRIDGES
MUNICIPAL BOUNDARY

KEY PLAN



Consultant Job No. 388694

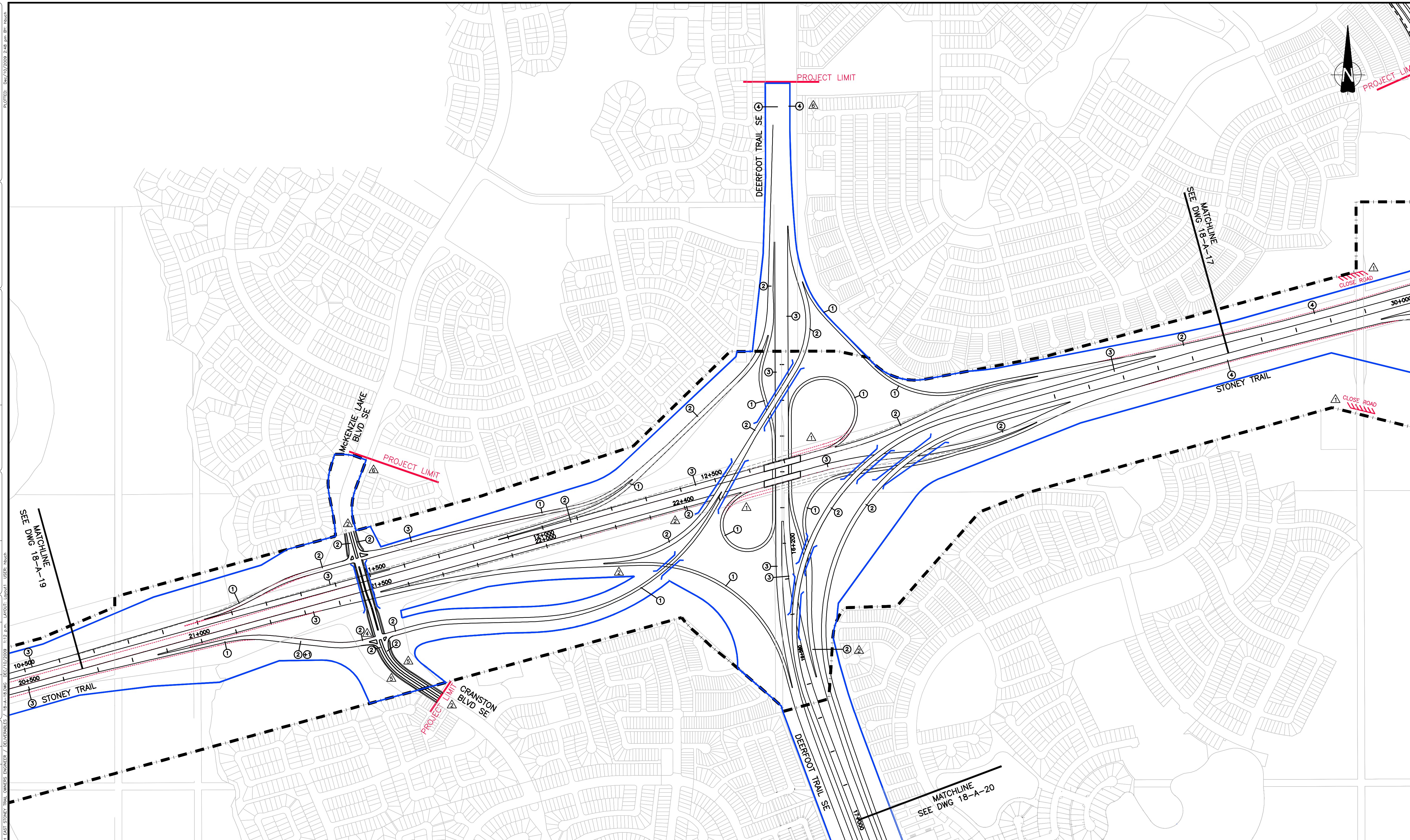
CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
WEST OF 88 STREET SE ⚠4
TO WEST OF 52 STREET SE
PROJECT SCOPE – STAGE 1

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–17

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE



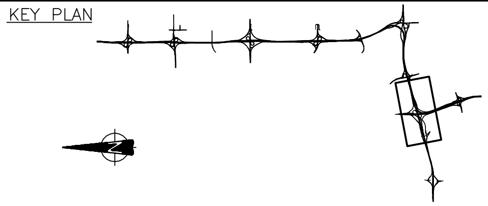
NOTES:

1. REFER TO DRAWINGS 18-A-21 TO 18-A-23 FOR ULTIMATE STAGE GRADING REQUIREMENTS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- NUMBER OF PAVED LANES
- NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
EAST OF DEERFOOT TRAIL SE TO
WEST OF McKENZIE LAKE BLVD SE
PROJECT SCOPE – STAGE 1

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-18

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

No.	REVISION	BY	DD.MM.YY
1–5	ISSUED FOR ADDENDUM 1, 4, 7, 9 & 11	JB	
6	ISSUED FOR ADDENDUM 17	JB	
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
8	ISSUED FOR ADDENDUM 25	JB	10.12.09

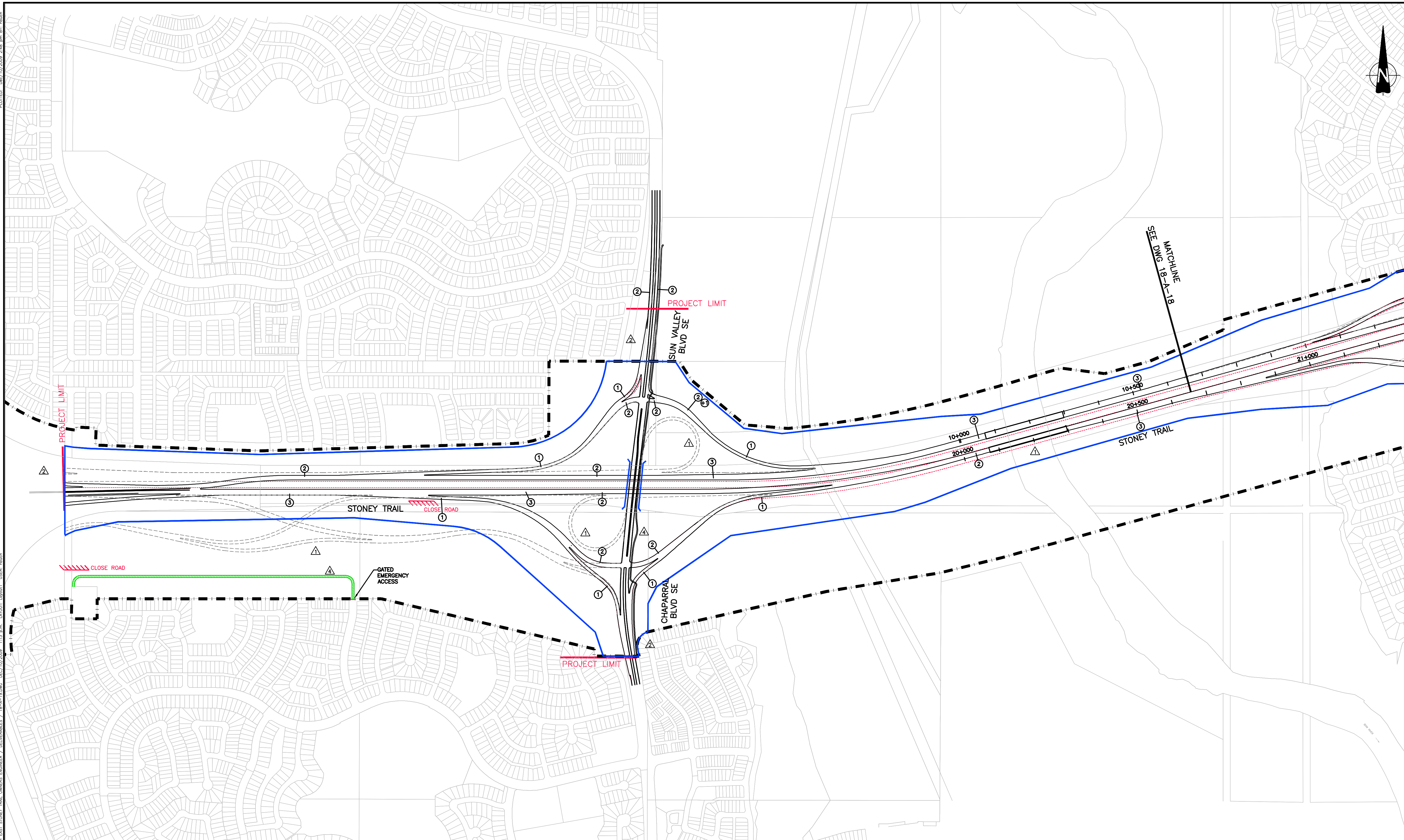
SURVEYED – DESIGNED – CHECKED – DRAWN

PHOTO No. – TITLE SEARCH DATE – GRAPHICS FILE

PLAN No. 18-A-18 – CONTRACT No. 7875/09 – PLAN LOCATION

BAR CODE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
EAST OF DEERFOOT TRAIL SE TO
WEST OF McKENZIE LAKE BLVD SE
PROJECT SCOPE – STAGE 1



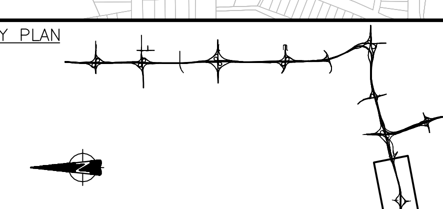
NOTES:

1. REFER TO DRAWINGS 18–A–21 TO 18–A–23 FOR ULTIMATE STAGE GRADING REQUIREMENTS.
2. REFER TO THE CITY OF CALGARY STANDARD SPECIFICATIONS ROADS CONSTRUCTION 2009 FILE No. 454.1001.027 SHEET 93 OR APPROVED EQUIVALENT FOR GATED EMERGENCY ACCESS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- (2) NUMBER OF PAVED LANES
- (+1) NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
EAST OF SUN VALLEY BLVD SE TO
WEST OF SUN VALLEY BLVD SE
PROJECT SCOPE – STAGE 1

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–19

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
EAST OF SUN VALLEY BLVD SE TO
WEST OF SUN VALLEY BLVD SE
PROJECT SCOPE – STAGE 1

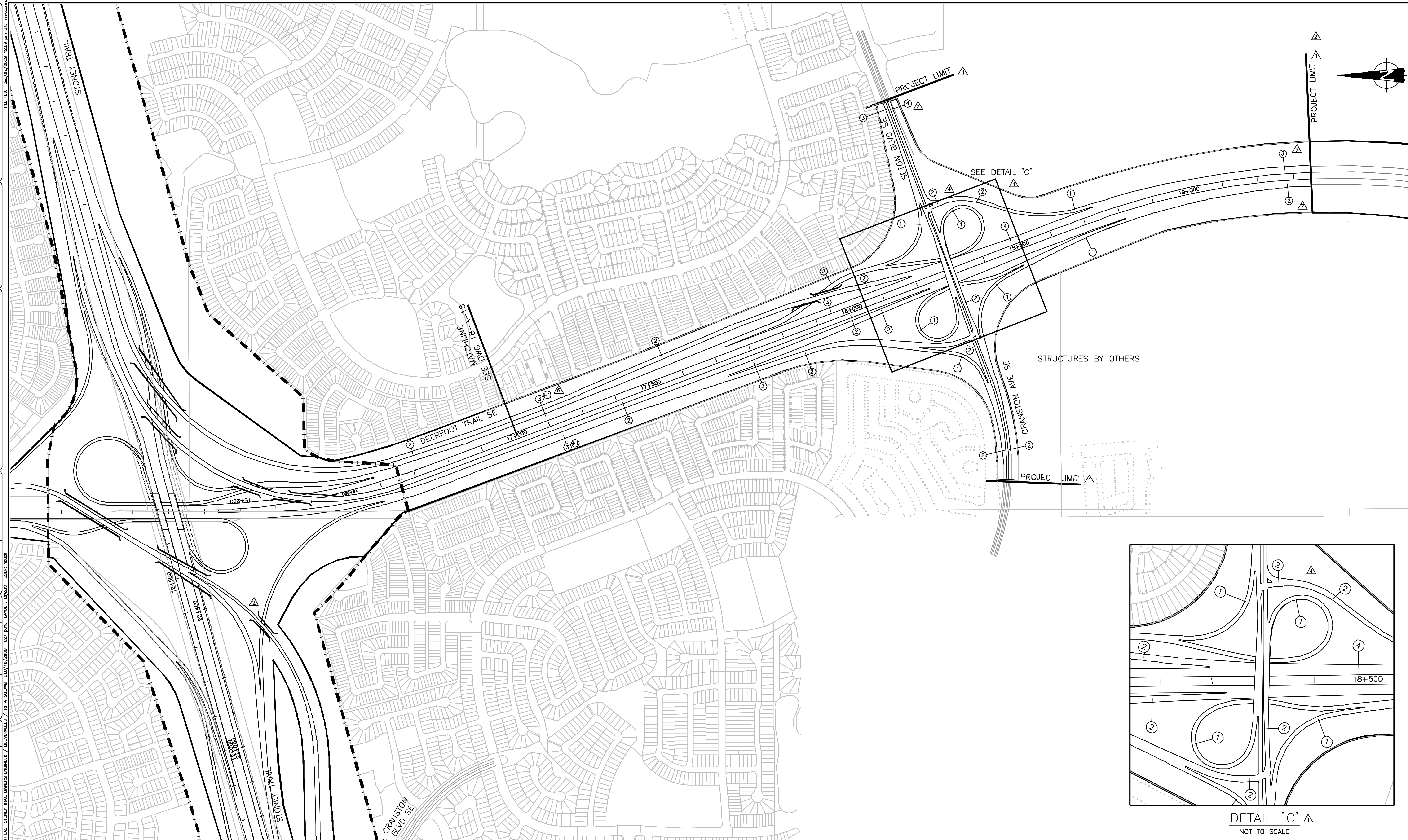
BAR CODE

PLAN No. 18–A–19
CONTRACT No. 7875/09
PLAN LOCATION

No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



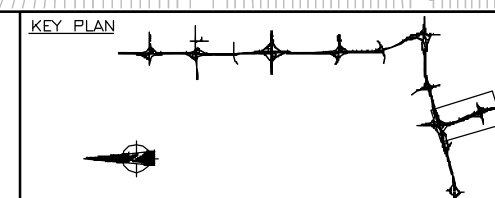
NOTES:

1. REFER TO DRAWINGS 18-A-21 TO 18-A-23 FOR ULTIMATE GRADING REQUIREMENTS.

LEGEND

- ROAD CLOSURE
- T.U.C. BOUNDARY
- ROAD RIGHT OF WAY
- PROJECT LIMITS
- NUMBER OF PAVED LANES
- NUMBER OF PAVED AUXILIARY LANES
- ULTIMATE STAGE (GRADING ONLY)
- ULTIMATE STAGE (GRADING NOT IN DBFO AGREEMENT)
- PAVING
- SERVICE ROAD
- STAGE 1 BRIDGES
- MUNICIPAL BOUNDARY

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
STONEY TRAIL TO SOUTH OF SETON BLVD SE
PROJECT SCOPE – STAGE 1

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-20

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

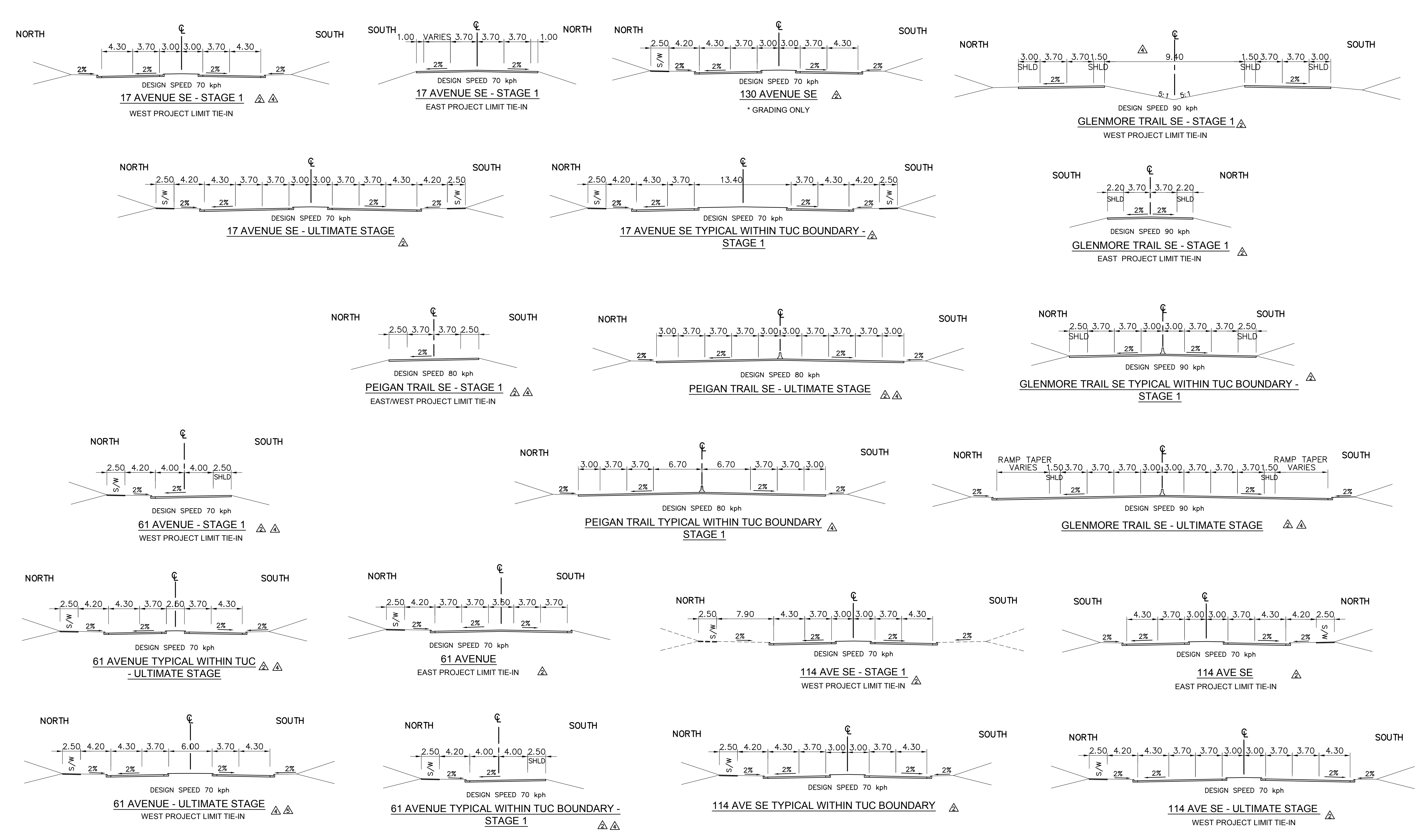
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
STONEY TRAIL TO
SOUTH OF SETON BLVD SE
PROJECT SCOPE – STAGE 1

BAR CODE

PLAN No.	18-A-20
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY
1-4	ISSUED FOR ADDENDUM 1, 4, 7 & 9	JB	
5	ISSUED FOR ADDENDUM 11	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
7	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-



NOTES:

1. FOR FURTHER DETAILS REFER TO SCHEDULE 18 SECTION 200 PROJECT SPECIFICS.
2. ALL CROSS SECTIONS ARE DRAWN AT T.U.C. BOUNDARY UNLESS OTHERWISE NOTED.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
TYPICAL SECTIONS
CROSS ROADS
STAGE 1 & ULTIMATE STAGE

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

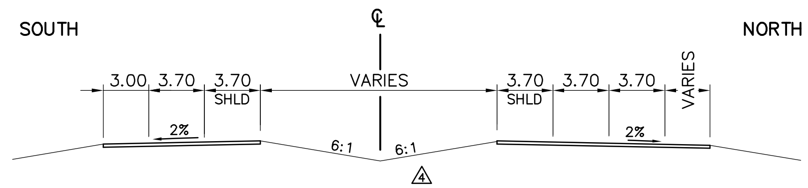
REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-21

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

No.	REVISION	BY	DD.MM.YY
1-4	ISSUED FOR ADDENDUM 1, 4, 7 & 11	JB	
5	ISSUED FOR ADDENDUM 16	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	10.12.09
7	ISSUED FOR ADDENDUM 25	JB	

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 DRAWINGS TYPICAL SECTIONS CROSS ROADS STAGE 1 & ULTIMATE

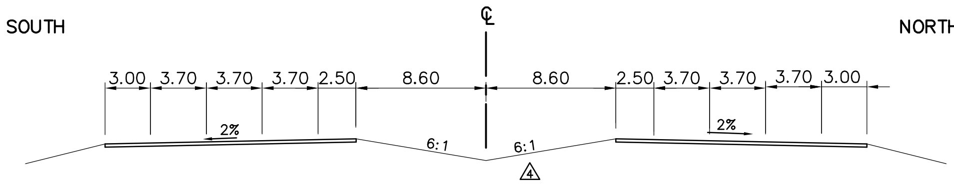
PLAN No. 18-A-21
CONTRACT No. 7875/09



DESIGN SPEED 130 kph

HWY 22X /STONEY TRAIL INTERCHANGE - STAGE 1

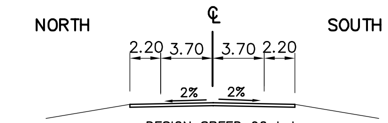
EAST OF INTERCHANGE



DESIGN SPEED 130 kph

HWY 22X /STONEY TRAIL INTERCHANGE - ULTIMATE STAGE

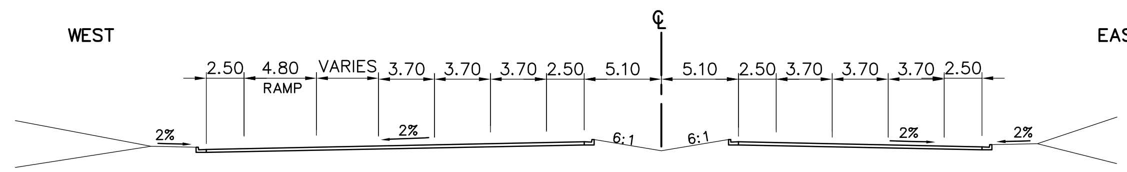
EAST PROJECT LIMIT TIE-IN



DESIGN SPEED 90 kph

88 ST/STONEY TRAIL INTERCHANGE STAGE 1

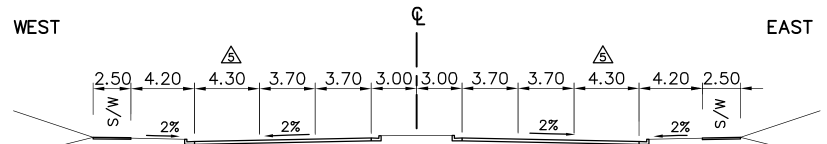
SOUTH PROJECT LIMIT TIE-IN



DESIGN SPEED 90 kph

88 ST/STONEY TRAIL INTERCHANGE - ULTIMATE STAGE

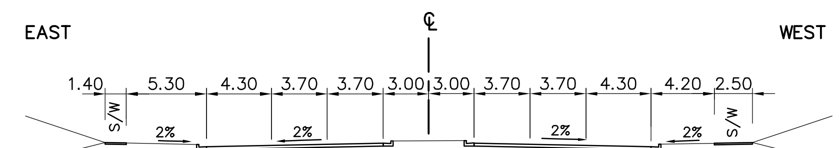
SOUTH PROJECT LIMIT TIE-IN



DESIGN SPEED 70 kph

52 ST SE

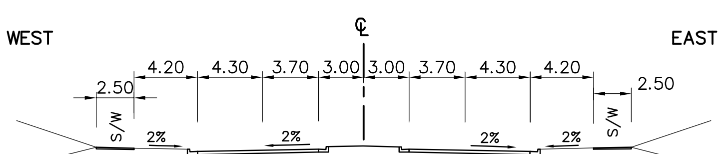
WITHIN TUC BOUNDARY



DESIGN SPEED 70 kph

52 ST SE

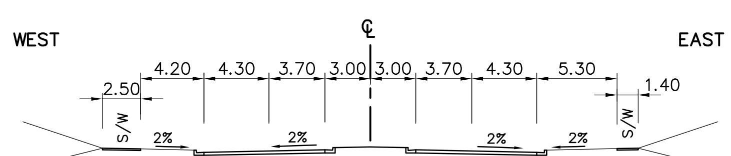
NORTH & SOUTH PROJECT LIMIT TIE-IN



DESIGN SPEED 70kph

McKENZIE LAKE BLVD SE / CRANSTON BLVD SE

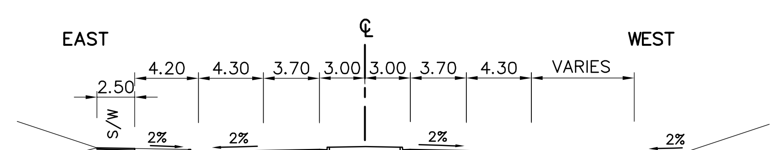
WITHIN TUC BOUNDARY



DESIGN SPEED 70kph

McKENZIE LAKE BLVD SE / CRANSTON BLVD SE

NORTH & SOUTH PROJECT LIMIT TIE-IN



DESIGN SPEED 70 kph

SUN VALLEY BLVD / CHAPARRAL BLVD

NOTES:

1. FOR FURTHER DETAILS REFER TO SCHEDULE 18 SECTION 200 PROJECT SPECIFICS.
2. ALL CROSS SECTIONS ARE DRAWN AT T.U.C. BOUNDARY UNLESS OTHERWISE NOTED.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
TYPICAL SECTIONS
CROSS ROADS
STAGE 1 & ULTIMATE STAGE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-22

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 DRAWINGS TYPICAL SECTIONS CROSS ROADS STAGE 1 & ULTIMATE

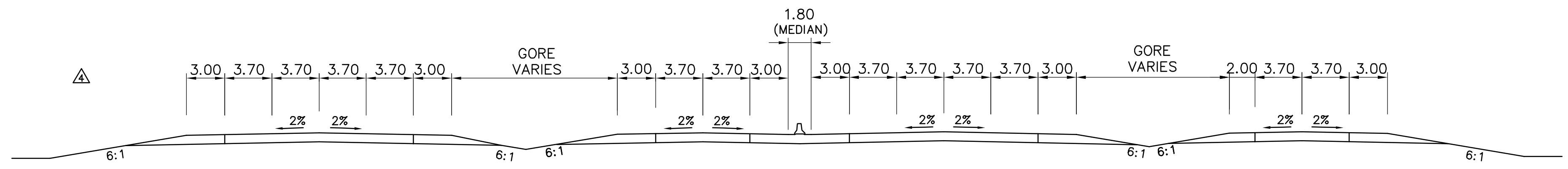
BAR CODE

PLAN No. 18-A-22
CONTRACT No. 7875/09
PLAN LOCATION

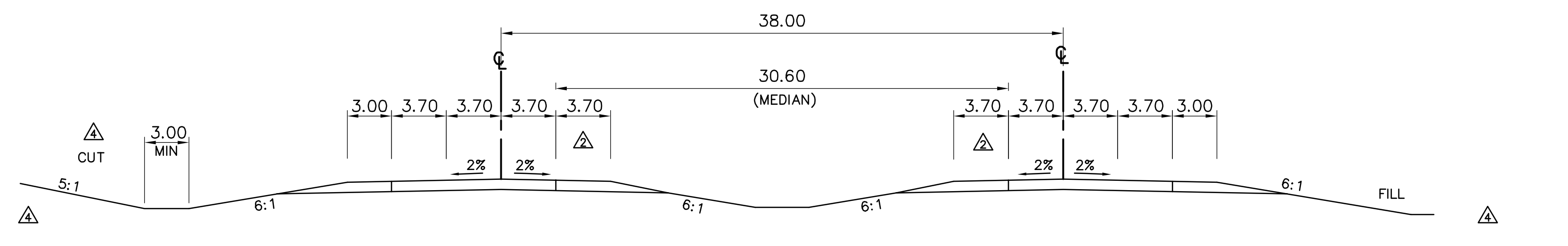
No.	REVISION	BY	DD.MM.YY
1-5	ISSUED FOR ADDENDUM 1, 4, 7, 11 & 12	JB	
6	ISSUED FOR ADDENDUM 16	JB	
7	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
8	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

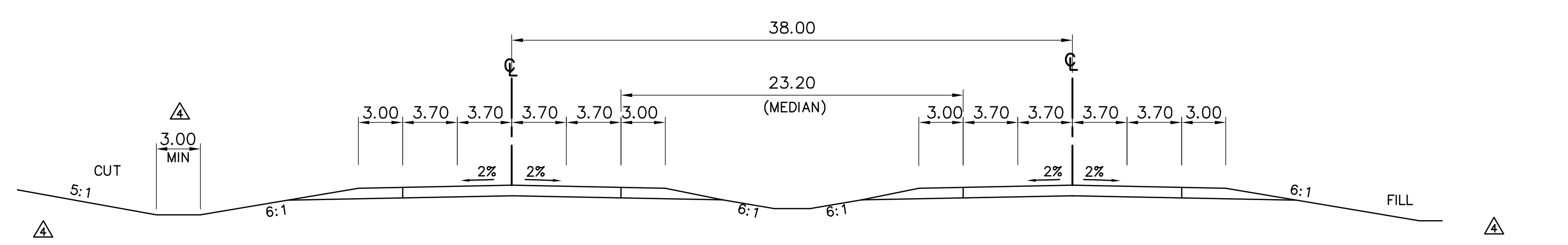
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



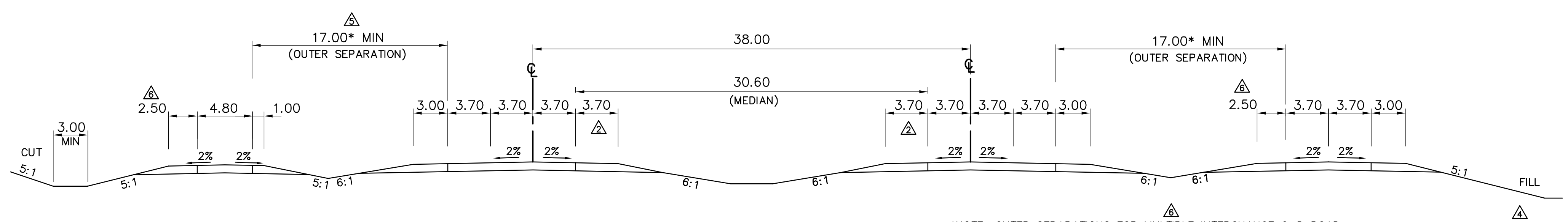
DEERFOOT TRAIL BETWEEN HWY 22X
& CRANSTON RD / SETON BLVD
NTS



MAIN LINE
(STAGE 1 WIDENING ON INSIDE)
NTS



MAIN LINE
(ULTIMATE WIDENING ON INSIDE)
NTS



MAIN LINE
(STAGE 1 WITH C-D ROAD)
NTS

*NOTE: OUTER SEPARATIONS FOR MULTIPLE INTERCHANGE C-D ROAD
- 20.0m (NO TRANSFER LANE)
- 30.0m (WITH TRANSFER LANE/LANES)

NOTES:
1. FOR FURTHER DETAILS REFER TO SCHEDULE 18 SECTION 200 PROJECT SPECIFICS.
2. ALL CROSS SECTIONS ARE DRAWN AT T.U.C. BOUNDARY UNLESS OTHERWISE NOTED.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
TYPICAL SECTIONS
STONEY TRAIL
STAGE 1 & ULTIMATE STAGE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-23

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
TYPICAL SECTIONS
STONEY TRAIL
STAGE 1 & ULTIMATE STAGE

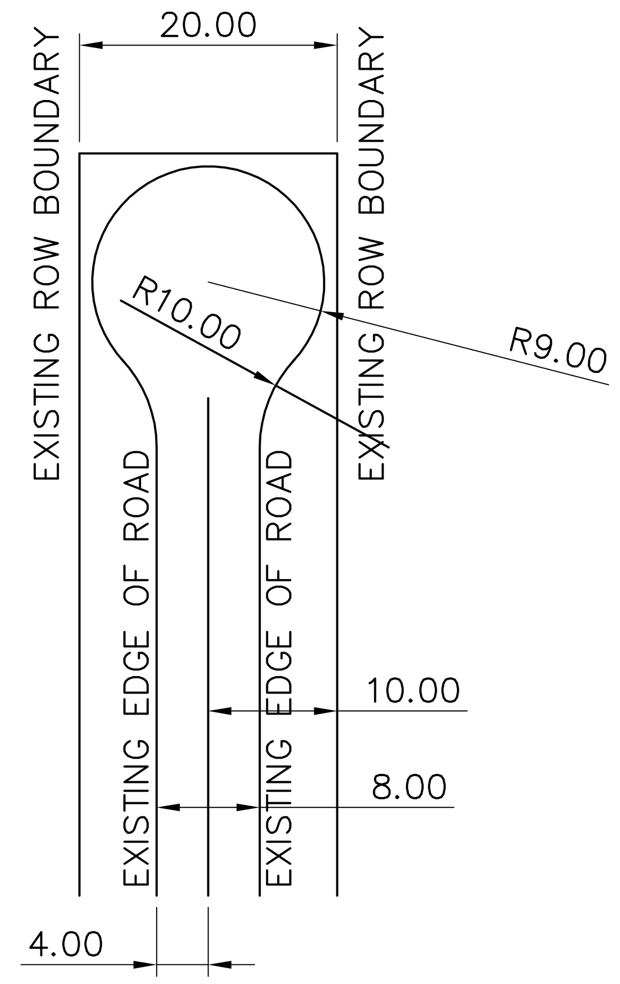
BAR CODE

PLAN No. 18-A-23
CONTRACT No. 7875/09
PLAN LOCATION

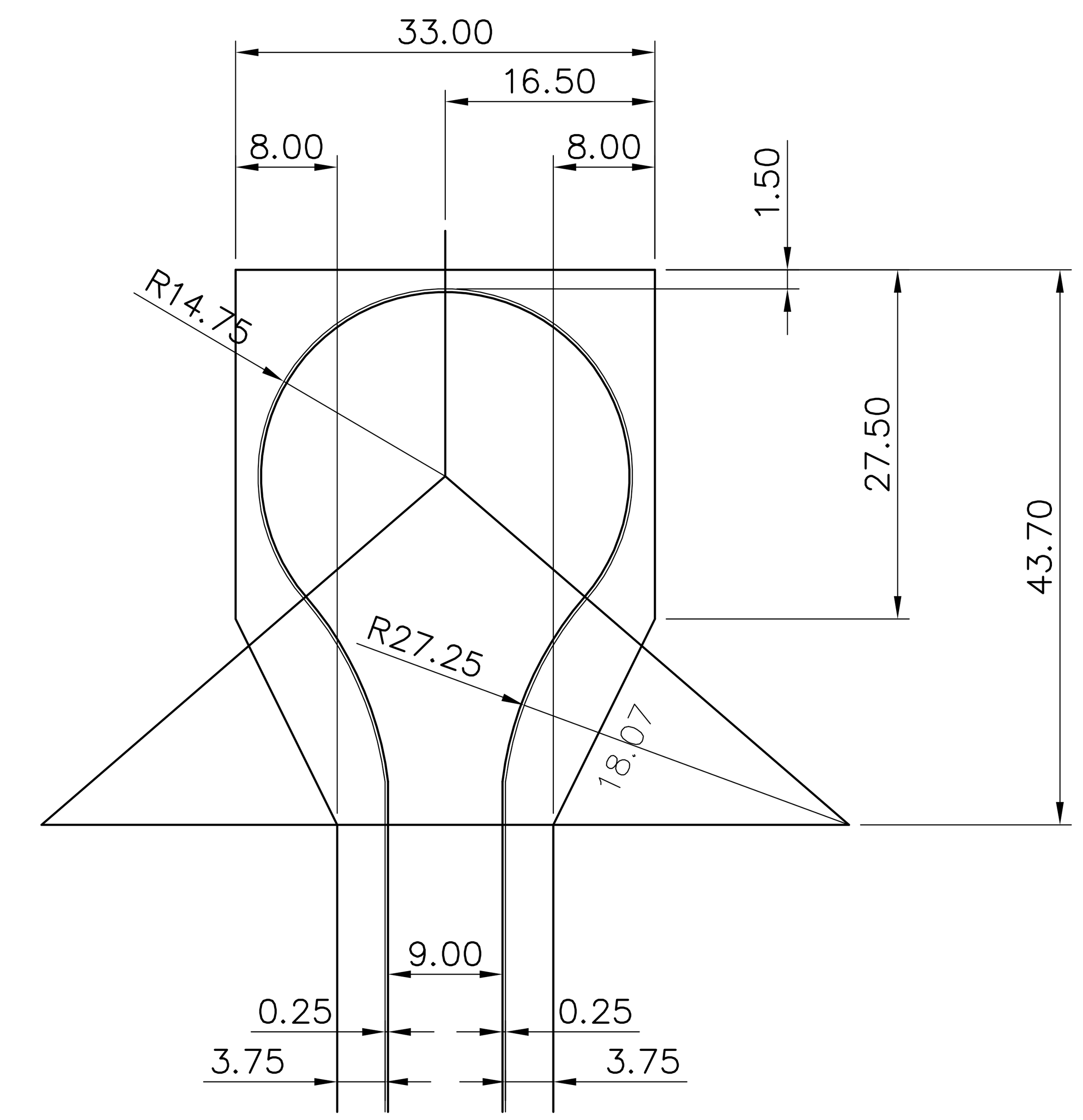
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

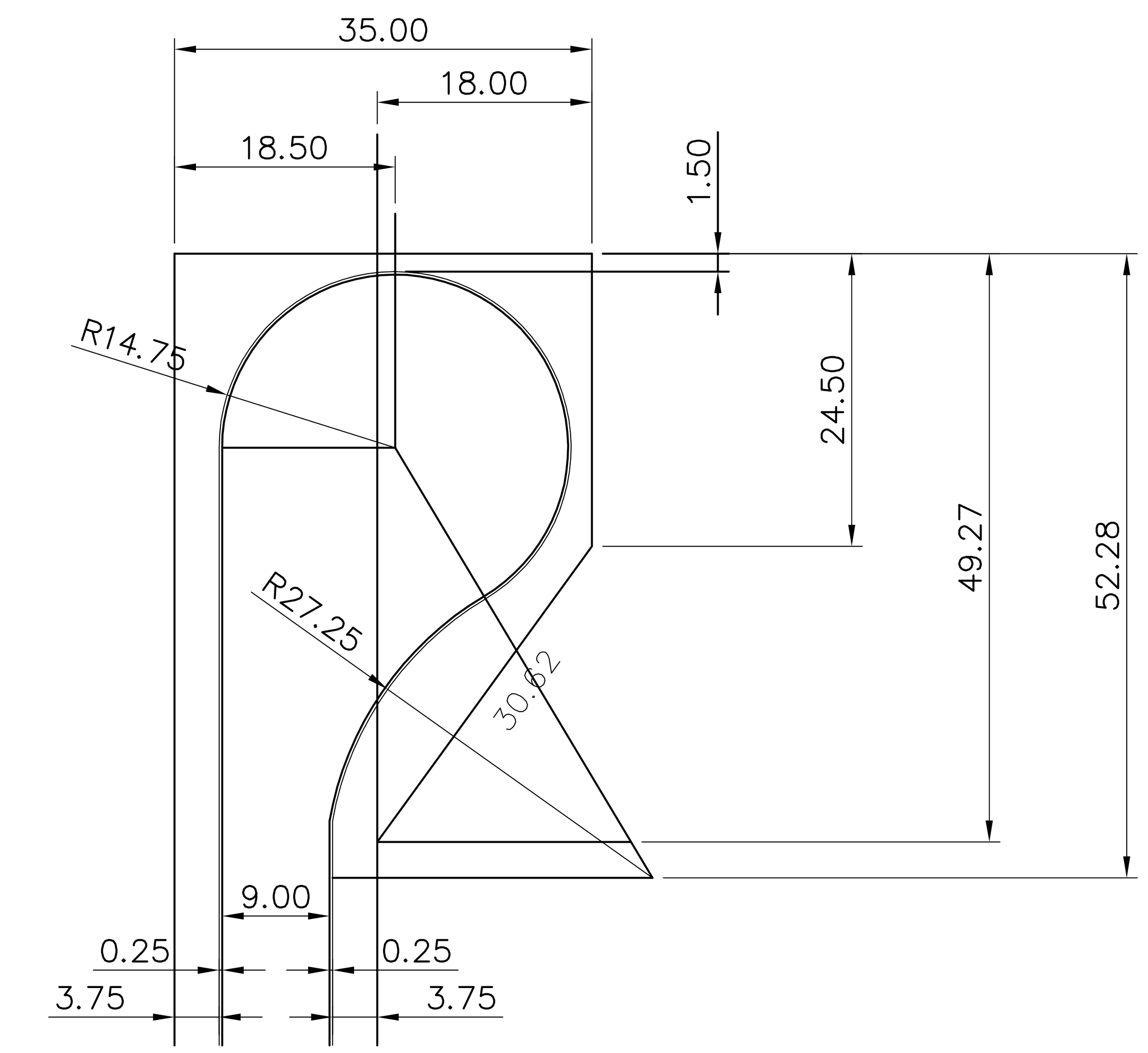
No.	REVISION	BY	DD.MM.YY
1-4	ISSUED FOR ADDENDUM 1, 4, 7 & 9	JB	
5	ISSUED FOR ADDENDUM 11	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

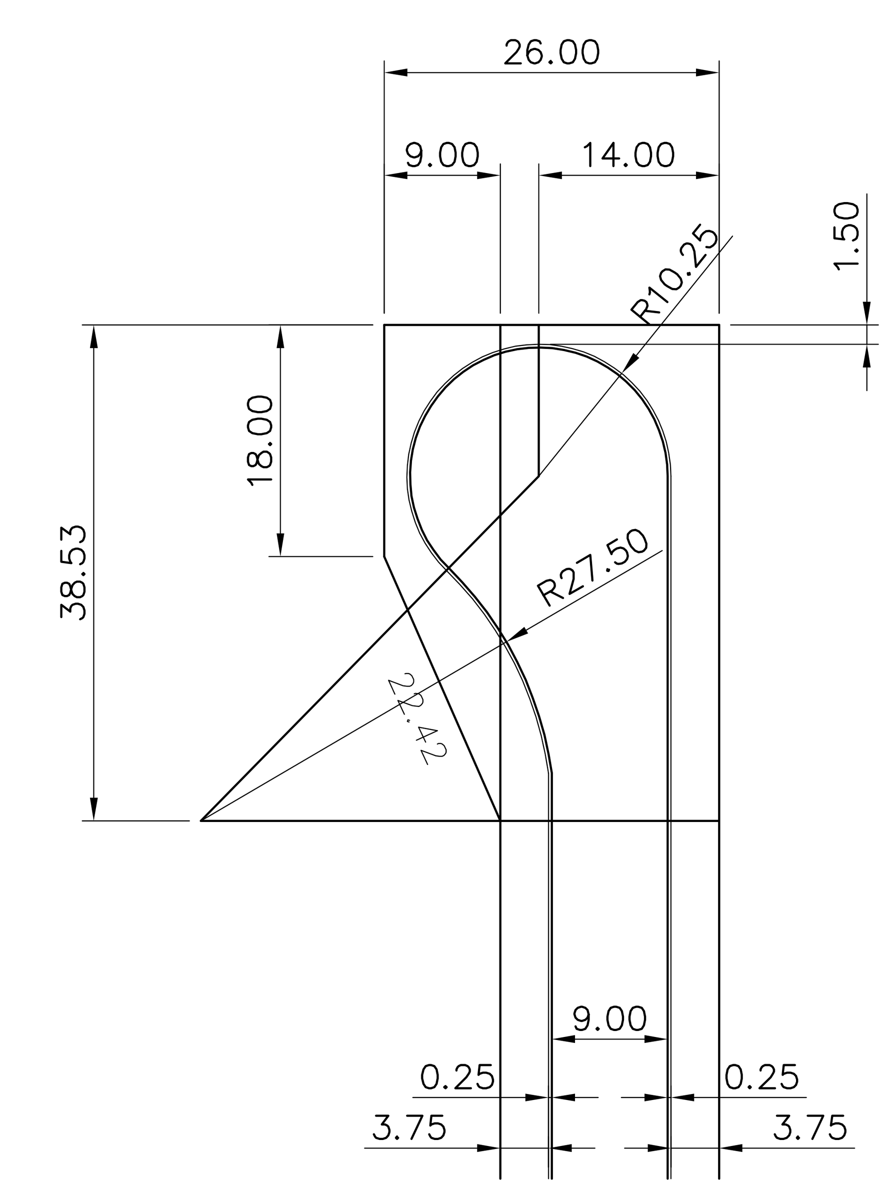
	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-



AT STANDARD CUL DE SAC







THE CITY OF CALGARY STANDARD CUL DE SAC

NOTES: ⚠
1. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
DETAILS
CUL DE SAC

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–24

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
DETAILS
CUL DE SAC

PLOTTED: Dec/10/2009 2:55 pm BY: hbuch

BAR CODE

PLAN No.	18–A–24
CONTRACT No.	7875/09
PLAN LOCATION	

PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

Alberta TRANSPORTATION

CH2MHILL

PLAN DESCRIPTION
SCHEDULE 18 DRAWINGS
BRIDGE INFORMATION DRAWINGS
INDEX SHEET

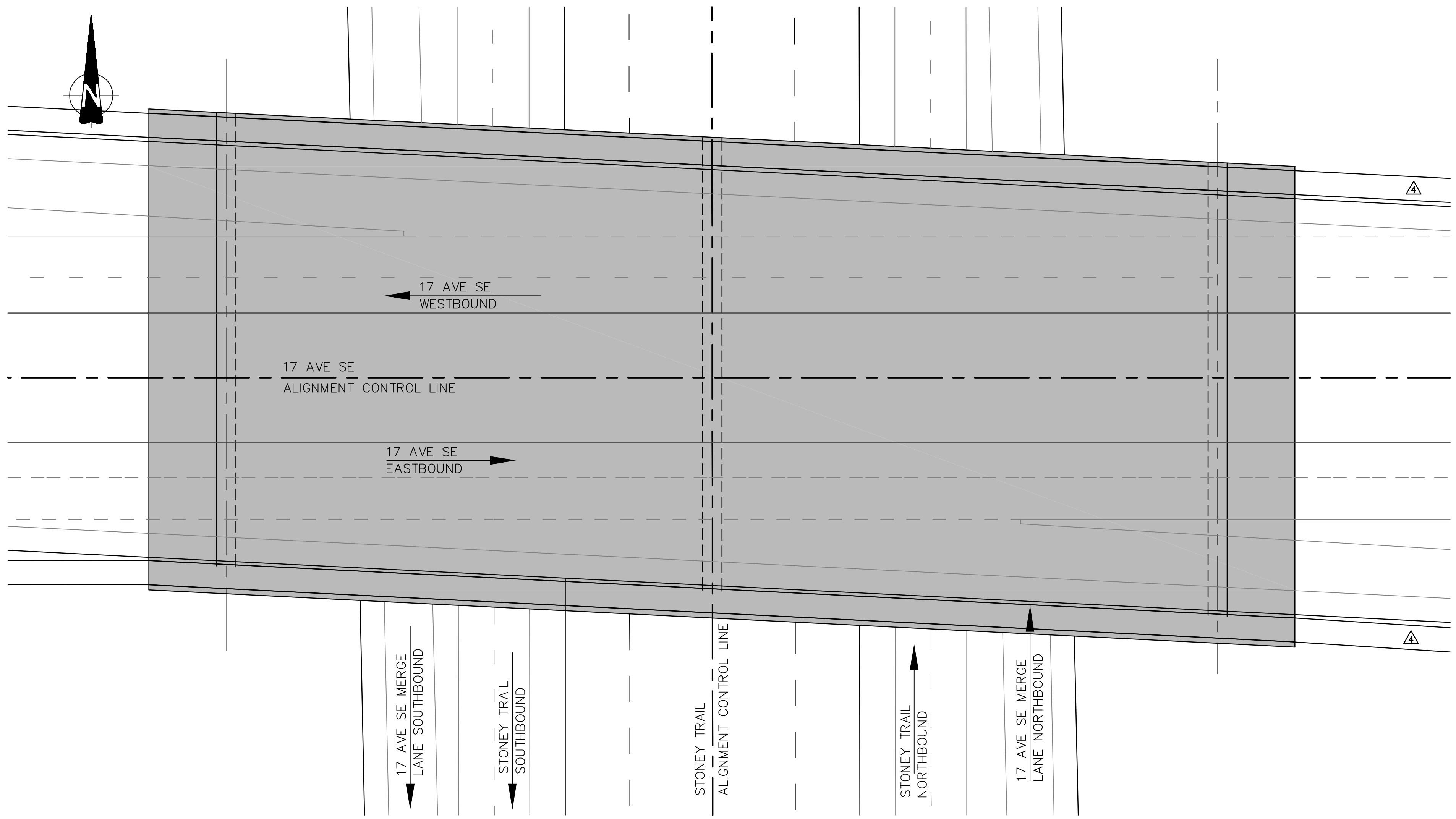
PLOTTED: Dec/10/2009 3:00 pm BY: hbuch

BAR CODE

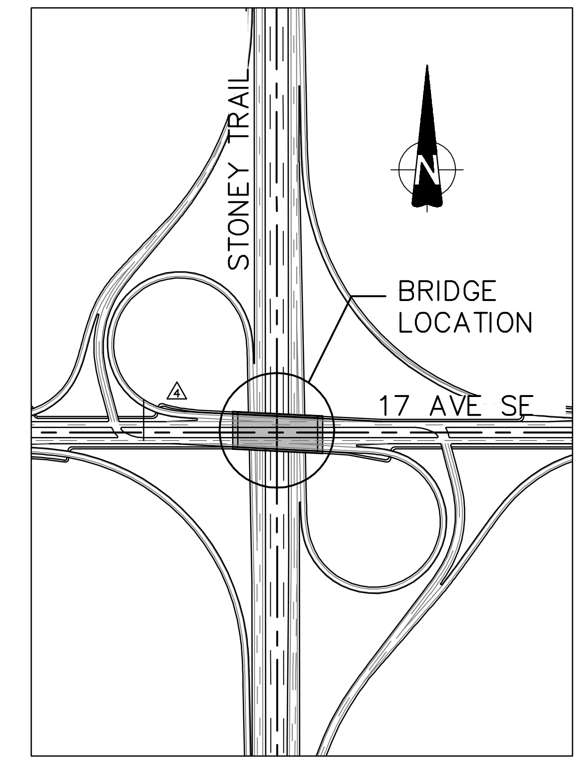
PLAN No.	18–A–25
CONTRACT No.	
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DATE		BY	DATE
1–3	ISSUED FOR ADDENDUM 4, 7 & 11	JB		SURVEYED	–	XX/200X
4	ISSUED FOR ADDENDUM 12	JB		DESIGNED	–	XX/200X
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB		CHECKED	–	XX/200X
6	ISSUED FOR ADDENDUM 25	JB	10.12.09	DRAWN	JH	XX/2009

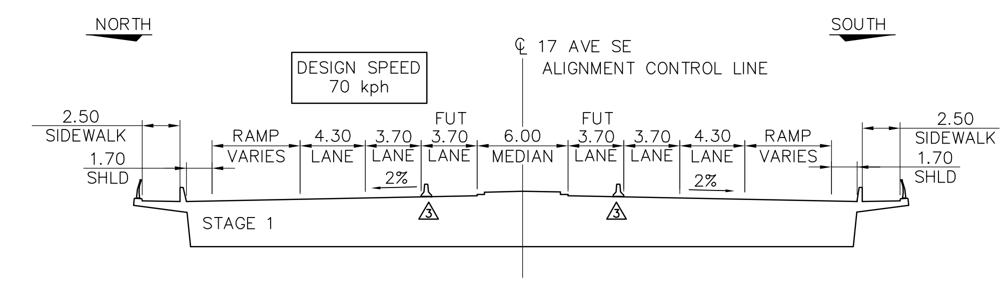
NDM PROJECT: CGY / SESTOE–388694 / SOUTH EAST STONEY TRAIL OWNERS ENGINEER / DELIVERABLES / 18–A–25.DWG DEC/10/2009 1:44 p.m. LAYOUT: Layout1 USER: hbuch



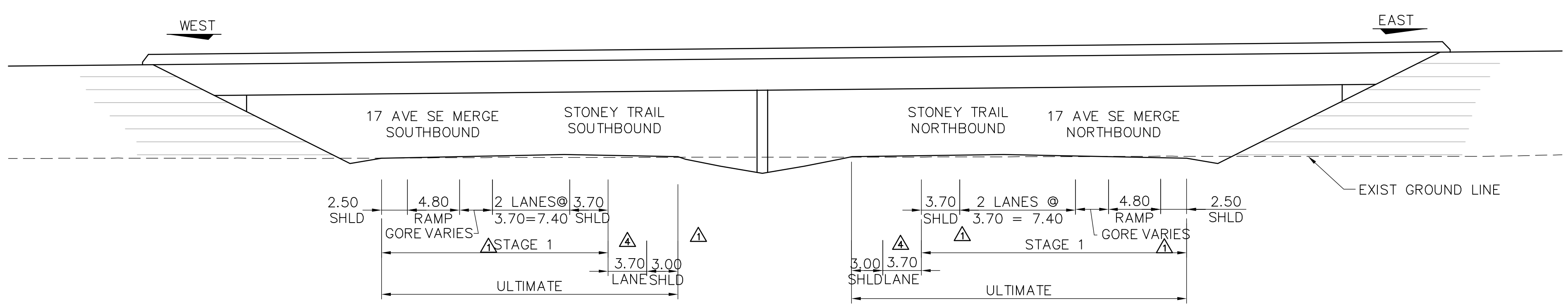
PLAN
NTS



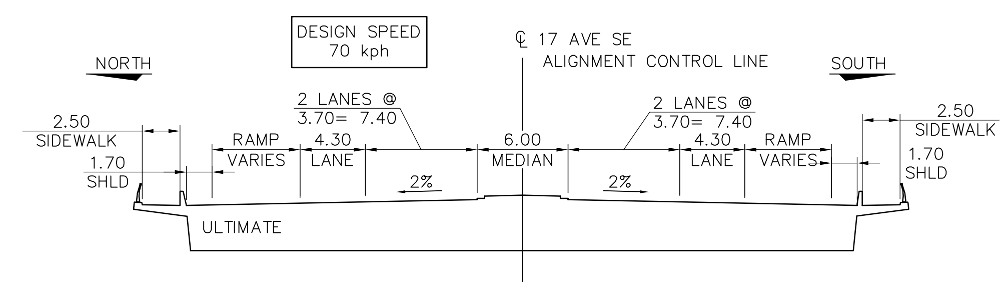
KEY PLAN
1:5000



BRIDGE SECTION – STAGE 1
NTS



BRIDGE ELEVATION
NTS

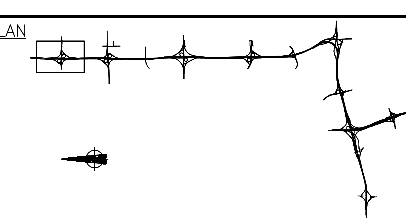


BRIDGE SECTION – ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO. 82441

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB-WB 17 AVE SE OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18-A-26

Alberta TRANSPORTATION

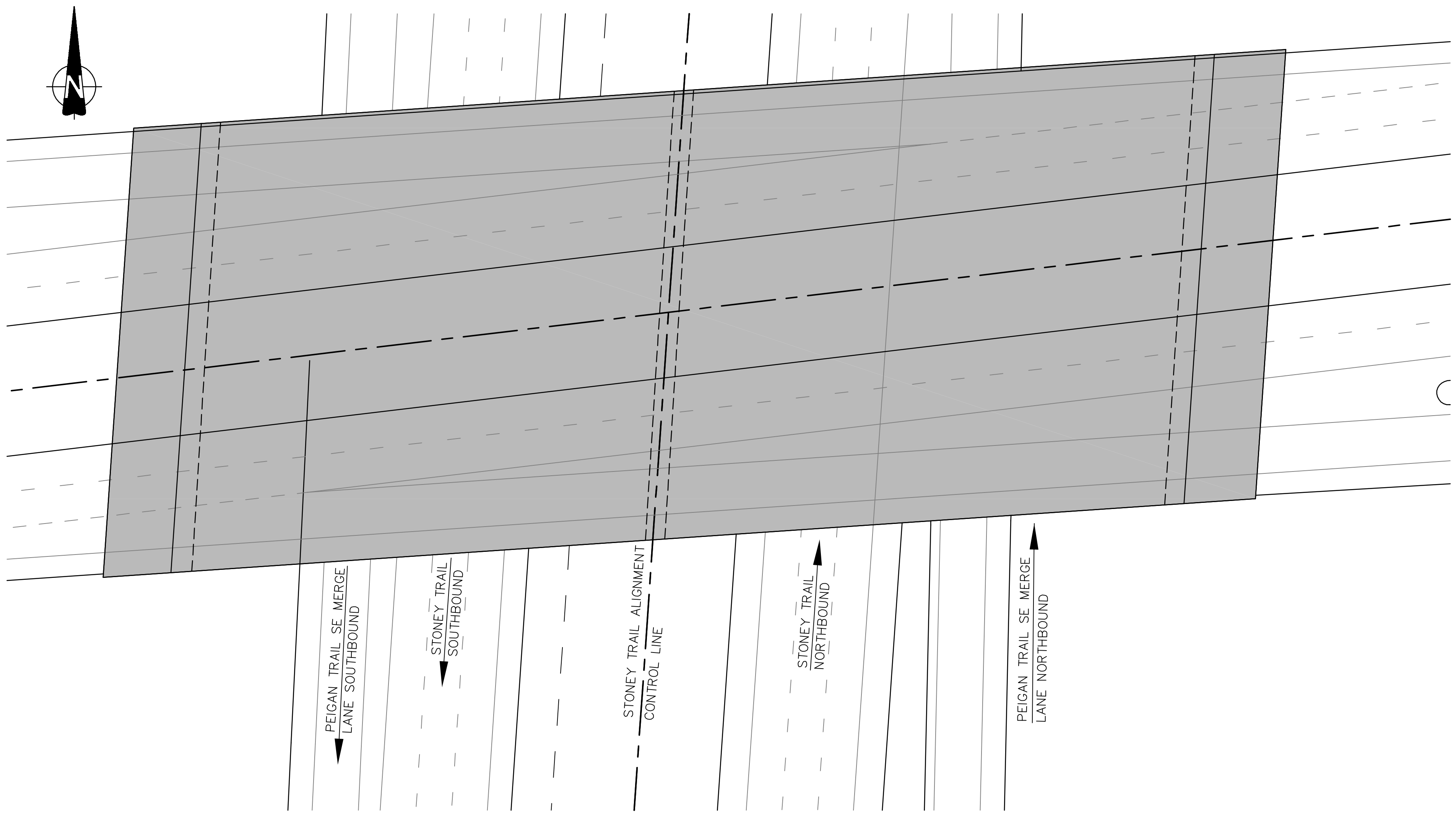
N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB-WB 17 AVE SE OVER STONEY TRAIL

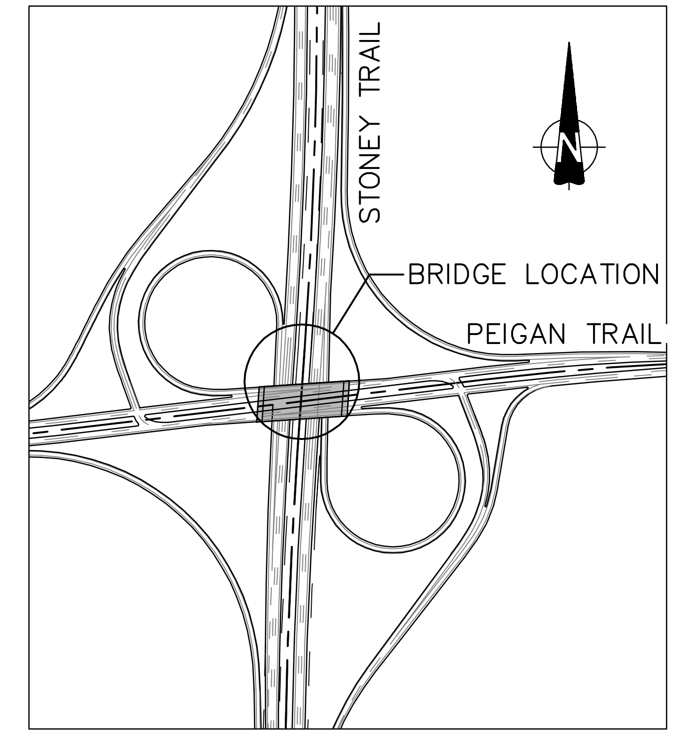
BAR CODE

PLAN No.	18-A-26
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY		BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 4, 7 & 9	JB		SURVEYED	–	–
4	ISSUED FOR ADDENDUM 11	JB		DESIGNED	–	–
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB		CHECKED	–	–
6	ISSUED FOR ADDENDUM 25	JB	10.12.09	DRAWN	–	–



PLAN
NTS



KEY PLAN
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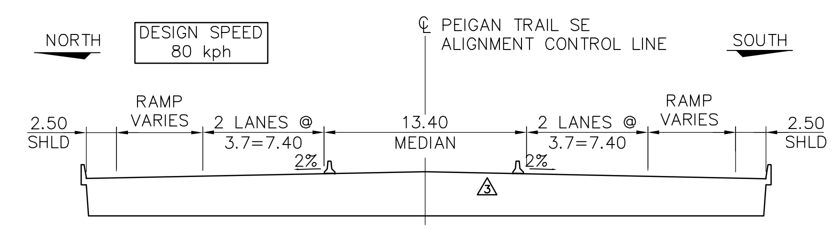
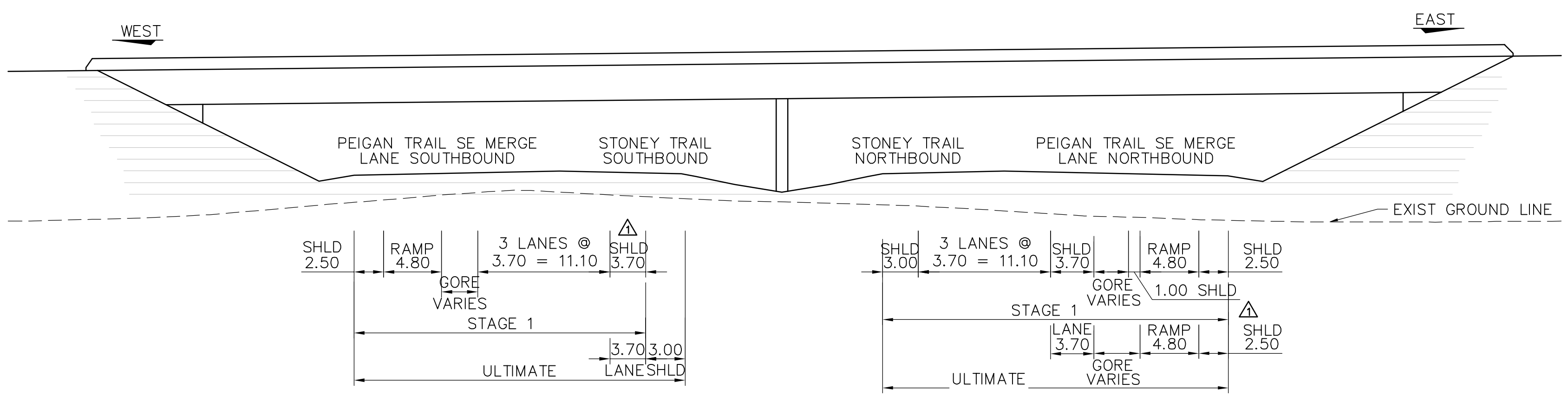
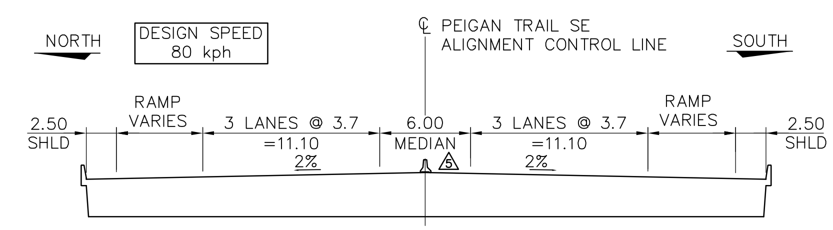


BRIDGE SECTION – STAGE 1
NTS



BRIDGE ELEVATION
NTS

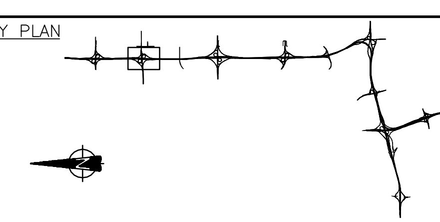


BRIDGE SECTION – ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82442

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB–WB PEIGAN TRAIL SE OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–27

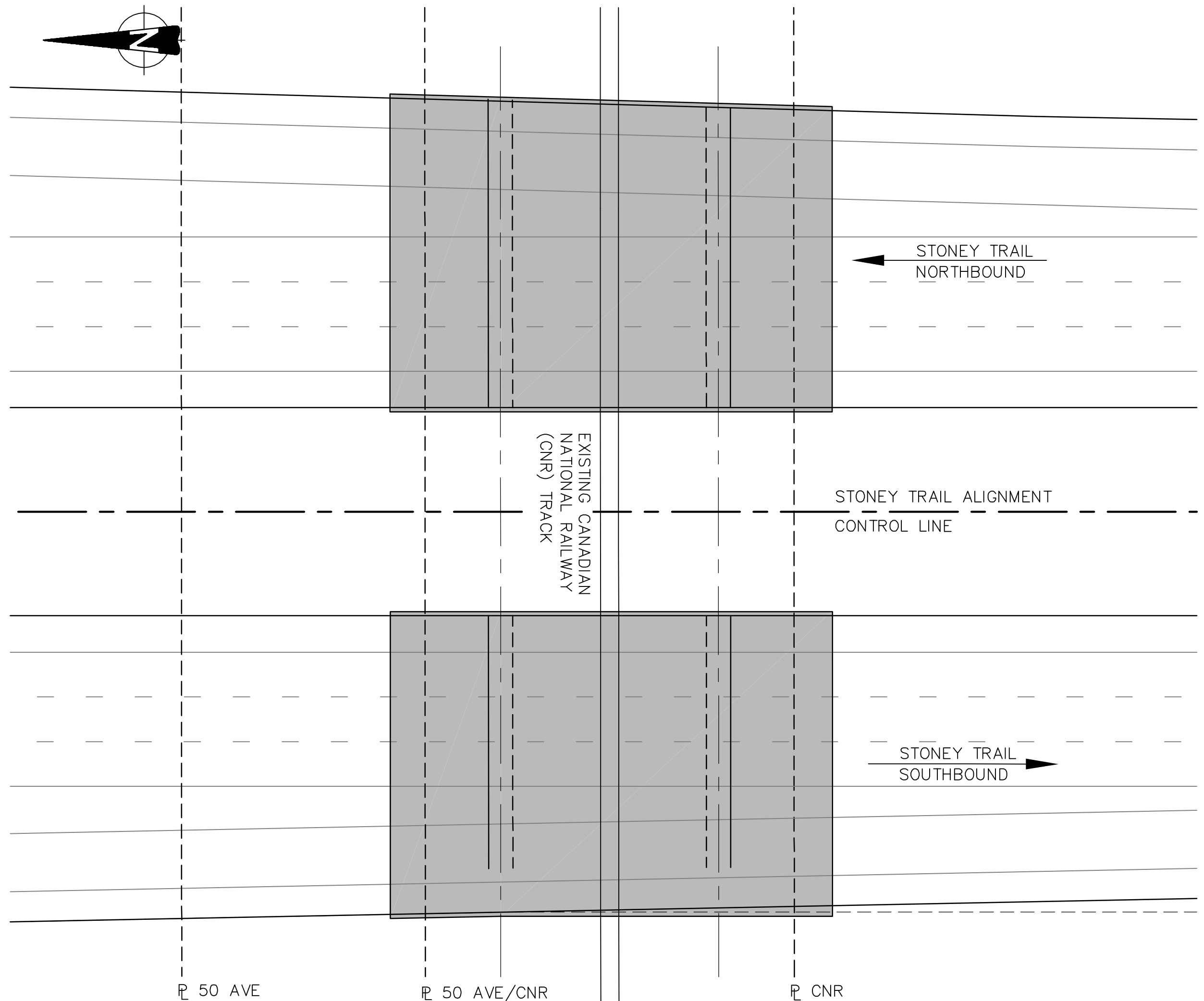
Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

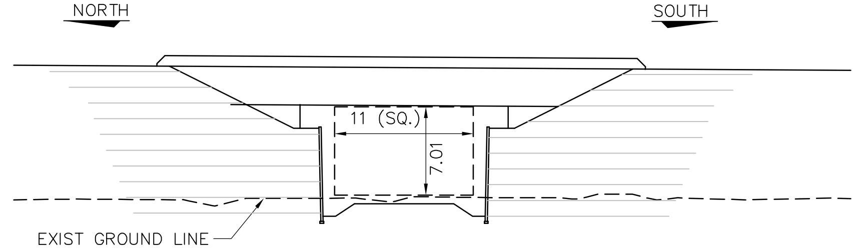
PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 BRIDGE INFORMATION DRAWINGS EB-WB PEIGAN TRAIL SE OVER STONEY TRAIL

PLAN No. 18–A–27
CONTRACT No. 7875/09
PLAN LOCATION

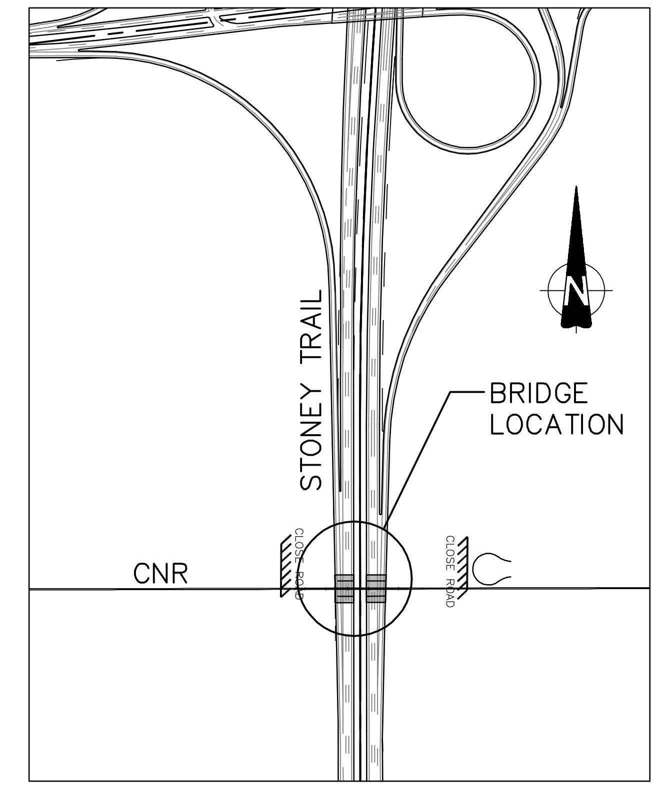
No.	REVISION	BY	DD.MM.YY
1–4	ISSUED FOR ADDENDUM 4, 7, 9 & 11	JB	
5	ISSUED FOR ADDENDUM 16	JB	
6	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
7	ISSUED FOR ADDENDUM 25	JB	10.12.09



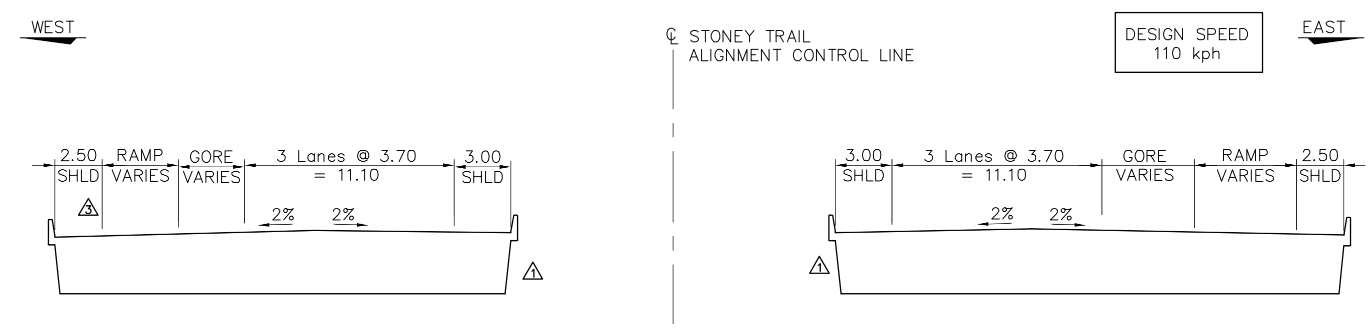
PLAN
NTS



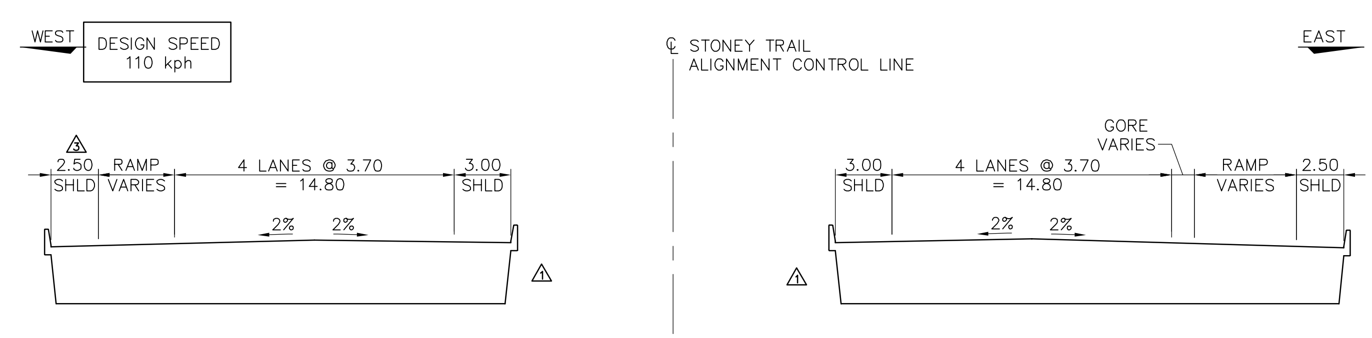
BRIDGE ELEVATION
NTS



KEY PLAN
1:5000



BRIDGE SECTION – STAGE 1
NTS

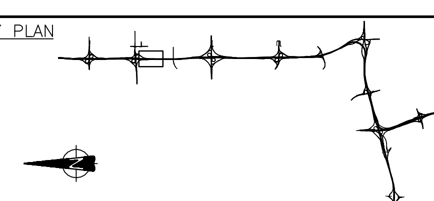


BRIDGE SECTION – ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82443

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB STONEY TRAIL AT CNR

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–28

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

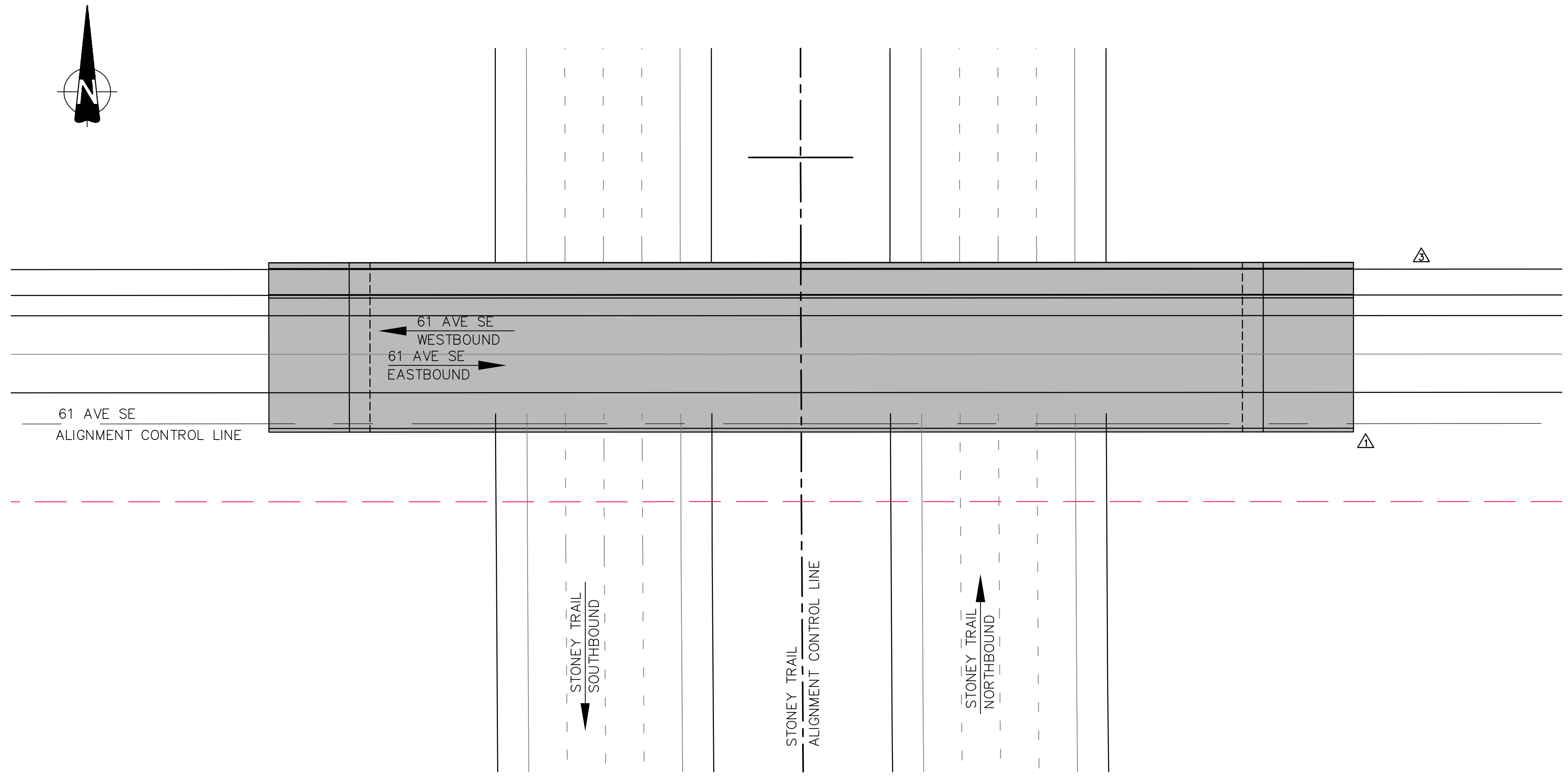
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB STONEY TRAIL AT CNR

BAR CODE

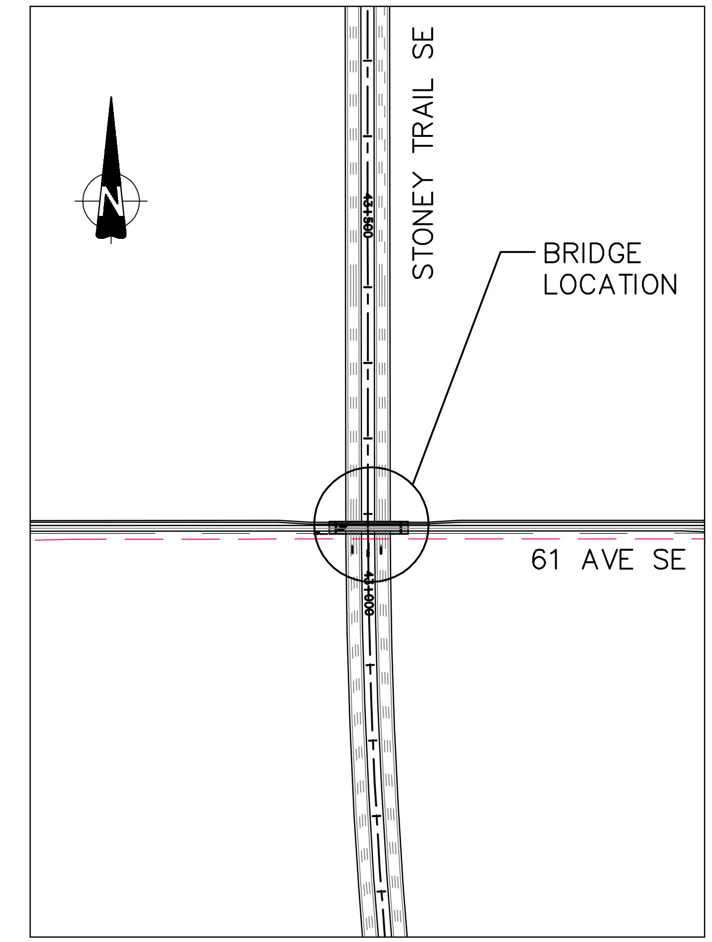
PLAN No.	18–A–28
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

BY	DD.MM.YY		BY	DD.MM.YY
		SURVEYED	–	–
JB		DESIGNED	–	–
JB		CHECKED	–	–
JB	10.12.09	DRAWN	–	–

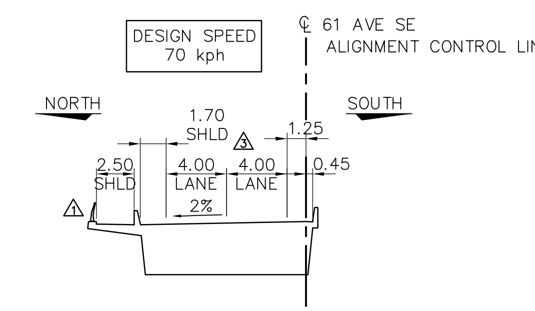
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	



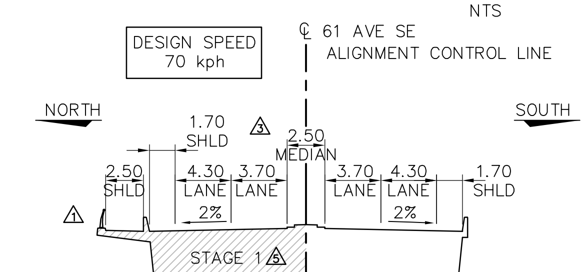
PLAN – STAGE 1
NTS



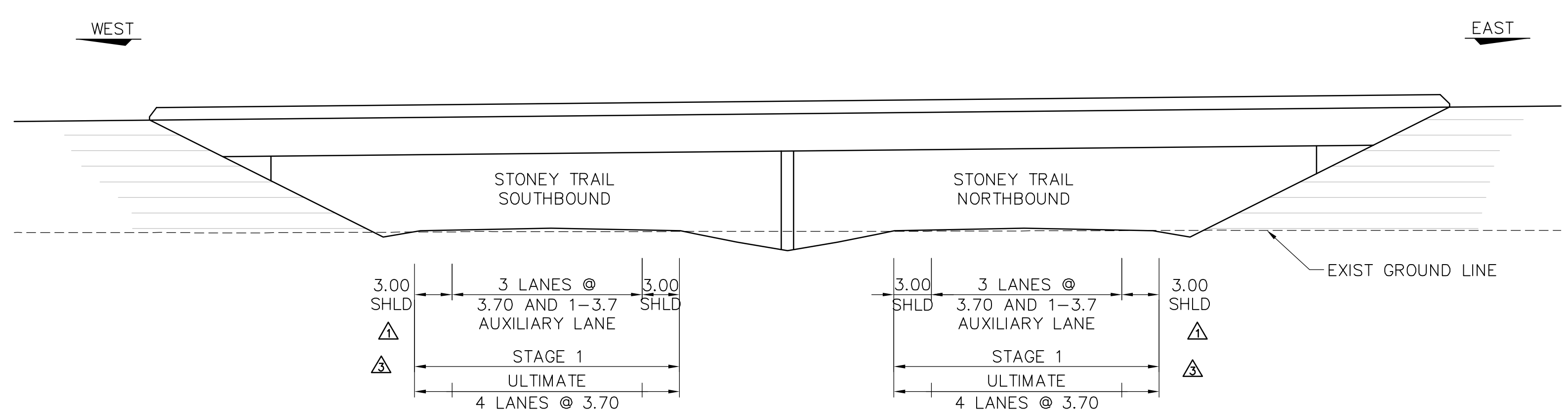
KEY PLAN
1:5000



BRIDGE SECTION – STAGE 1
NTS



BRIDGE SECTION – ULTIMATE
NTS

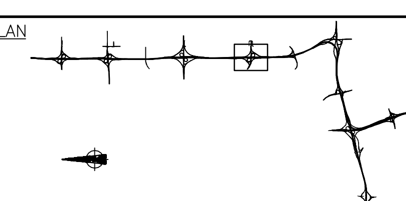


BRIDGE ELEVATION
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82455

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB–WB 61 AVE SE OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–29

Alberta
TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

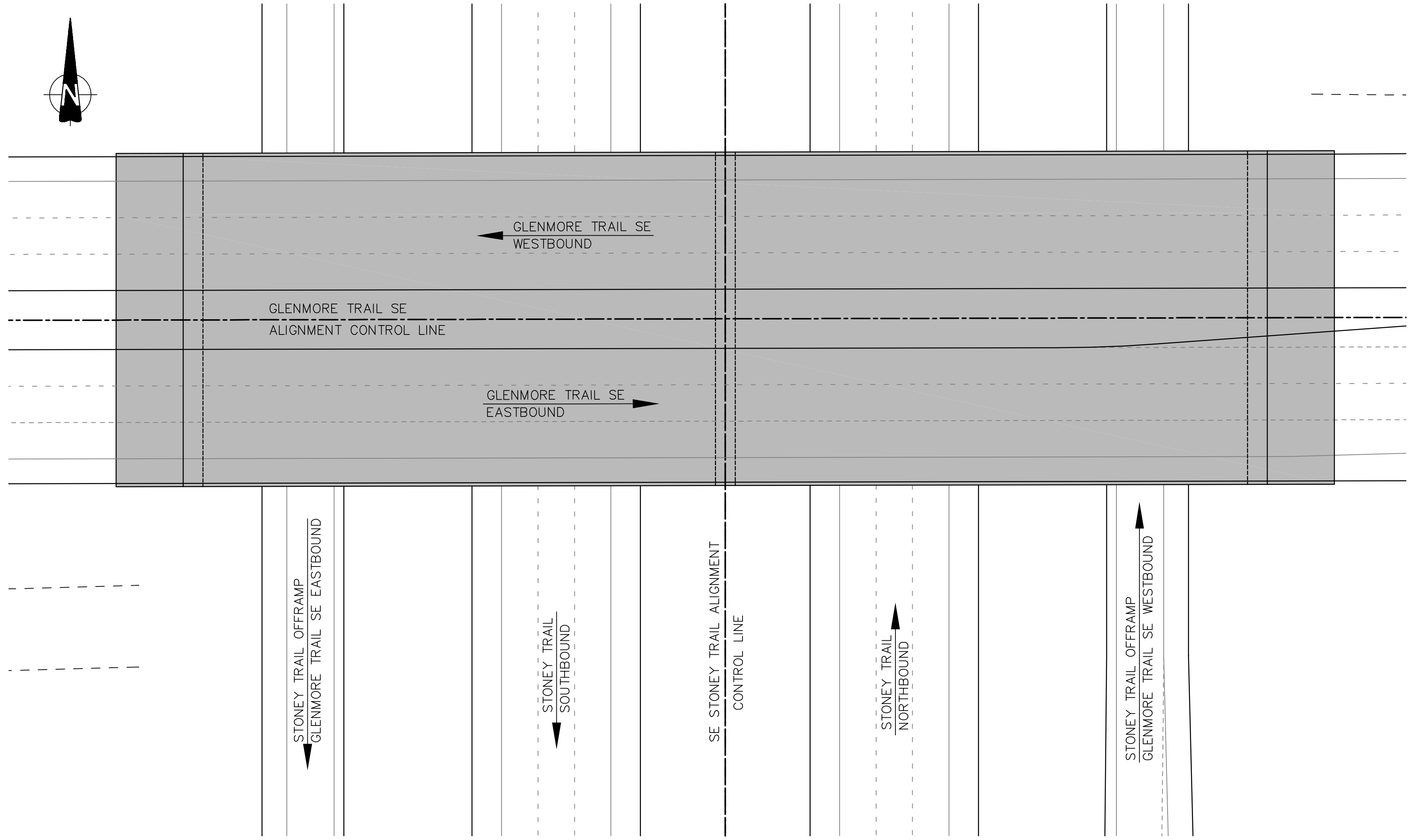
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
EB–WB 61 AVE SE OVER STONEY TRAIL

BAR CODE

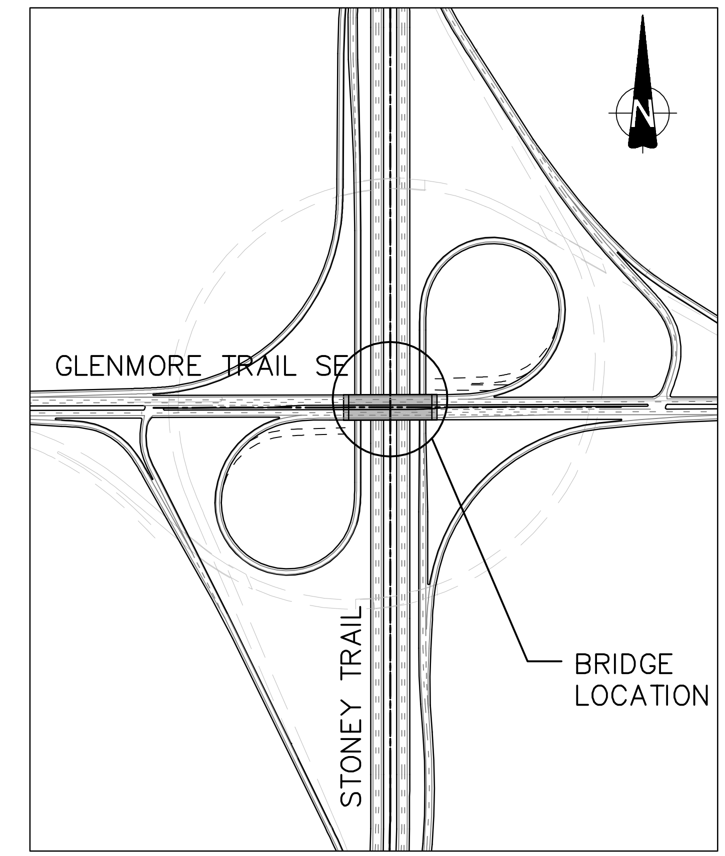
PLAN No.	18–A–29
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

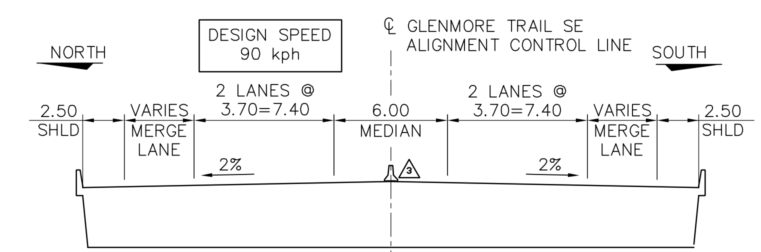
No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 4, 7 & 11	JB	
4	ISSUED FOR ADDENDUM 12	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09



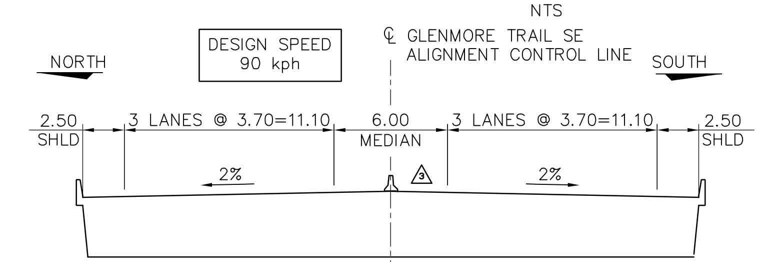
PLAN
NTS



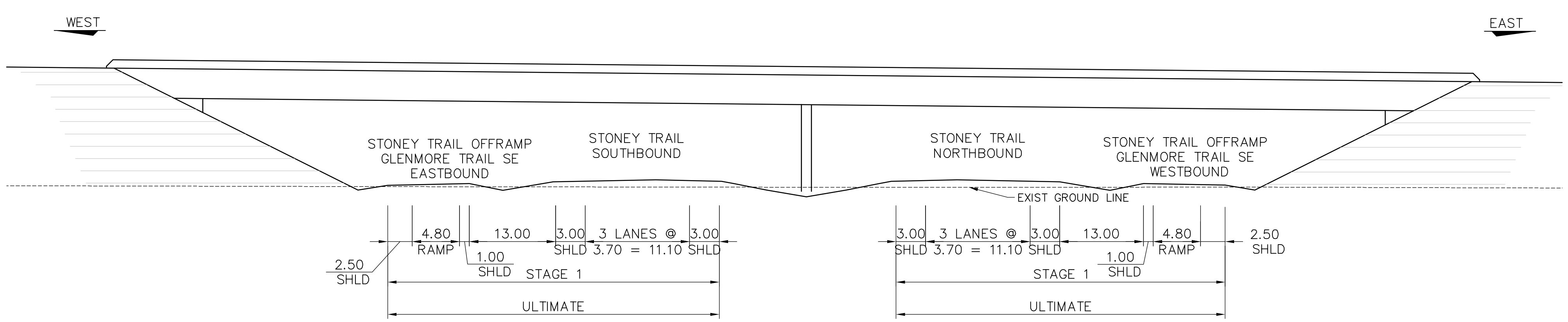
KEY PLAN 3
1:5000



BRIDGE SECTION – STAGE 1
NTS



BRIDGE SECTION – ULTIMATE
NTS

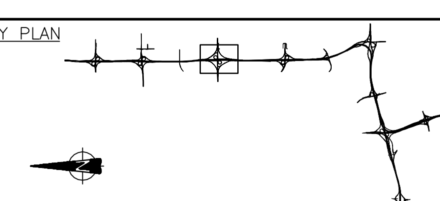


BRIDGE ELEVATION
NTS

NOTES: 3

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82444

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB–WB GLENMORE TRAIL OVER STONEY TRAIL

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–30

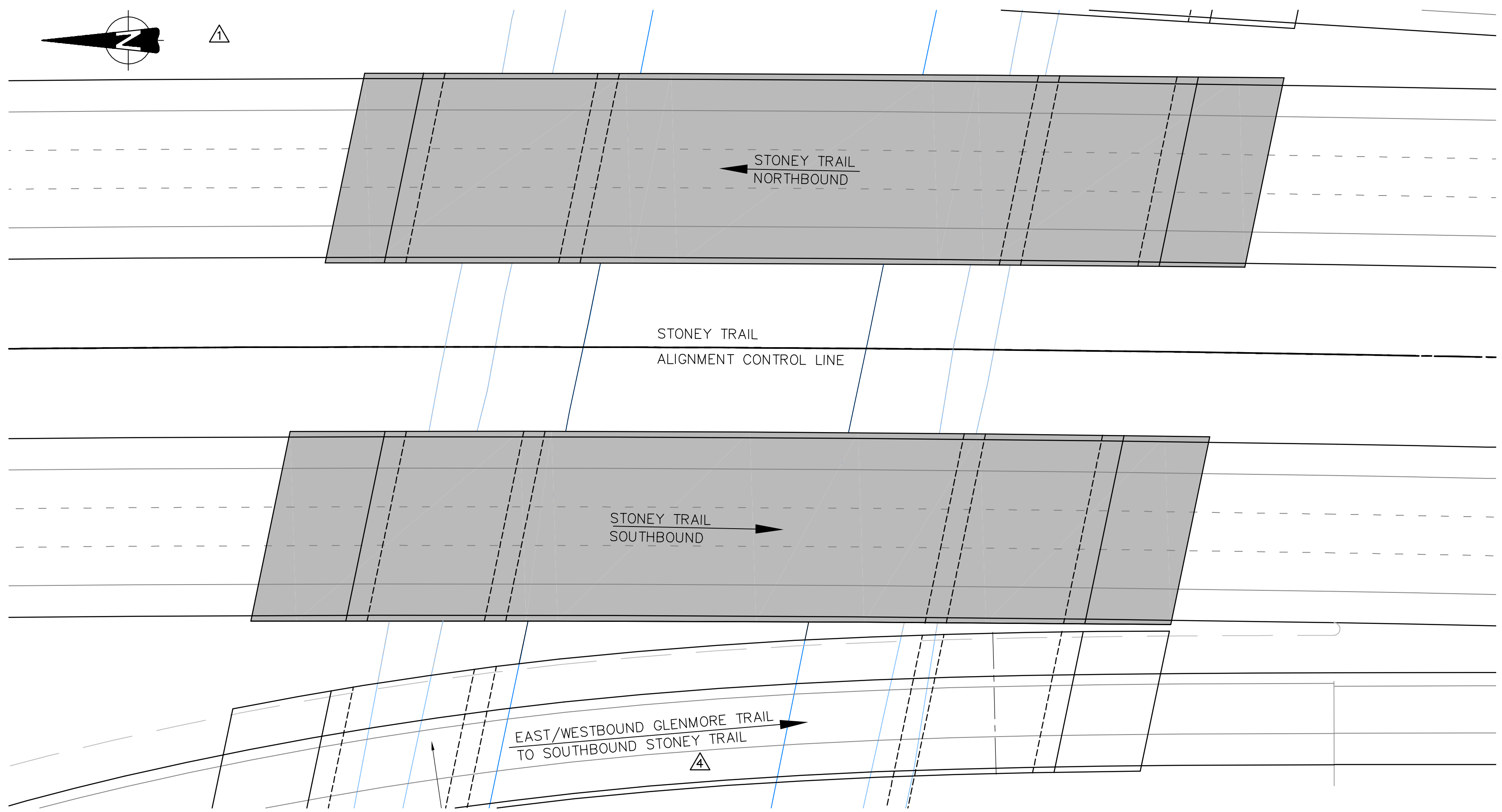
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB–WB GLENMORE TRAIL OVER STONEY TRAIL

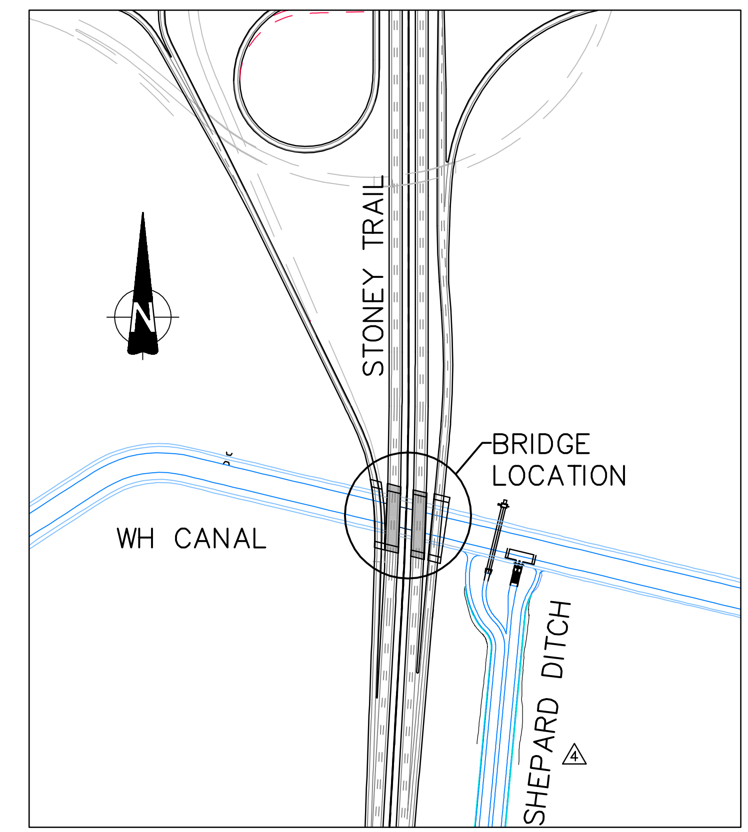
BAR CODE

PLAN No.	18–A–30
CONTRACT No.	7875/09
PLAN LOCATION	

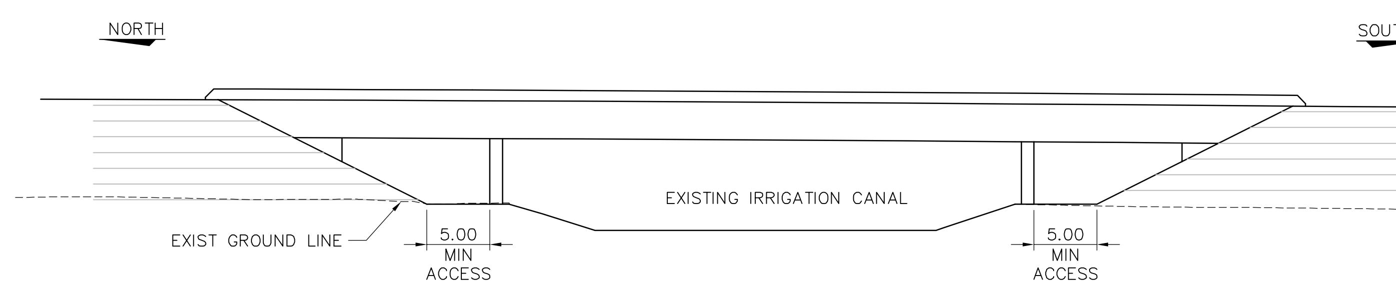
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09



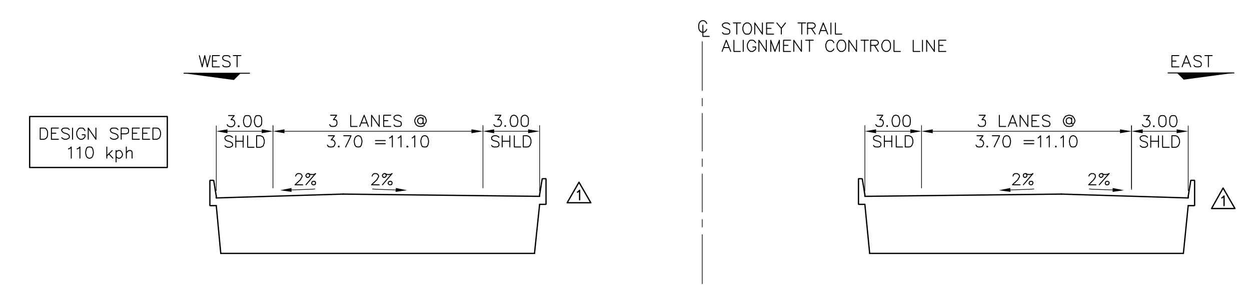
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

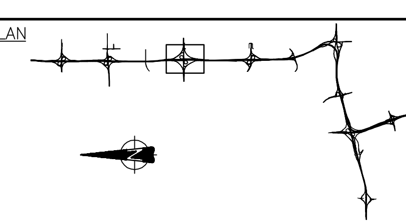


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82445

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB STONEY TRAIL OVER WH CANAL

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–31

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB STONEY TRAIL OVER WH CANAL

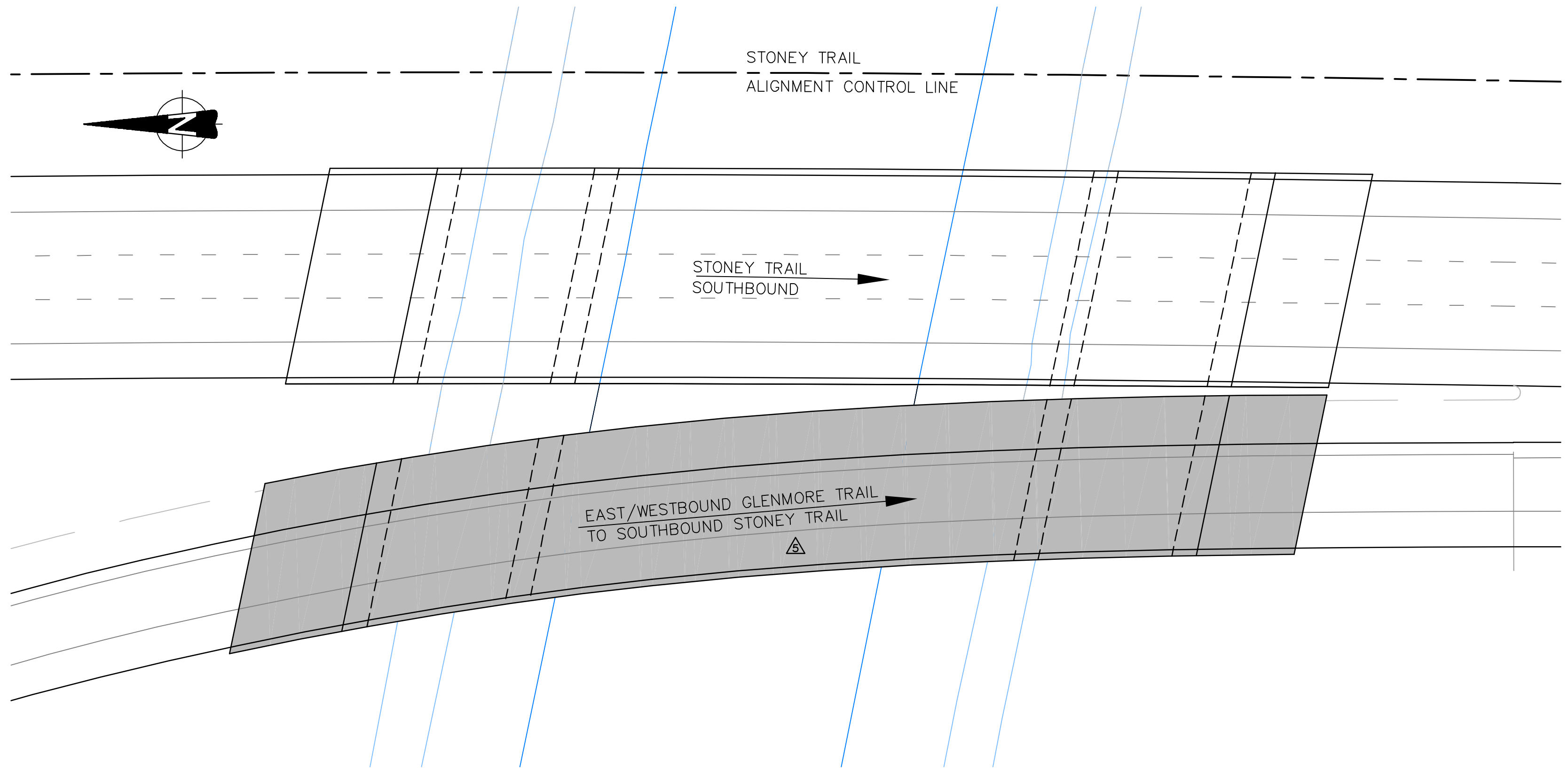
BAR CODE

PLAN No.	18–A–31
CONTRACT No.	7875/09
PLAN LOCATION	

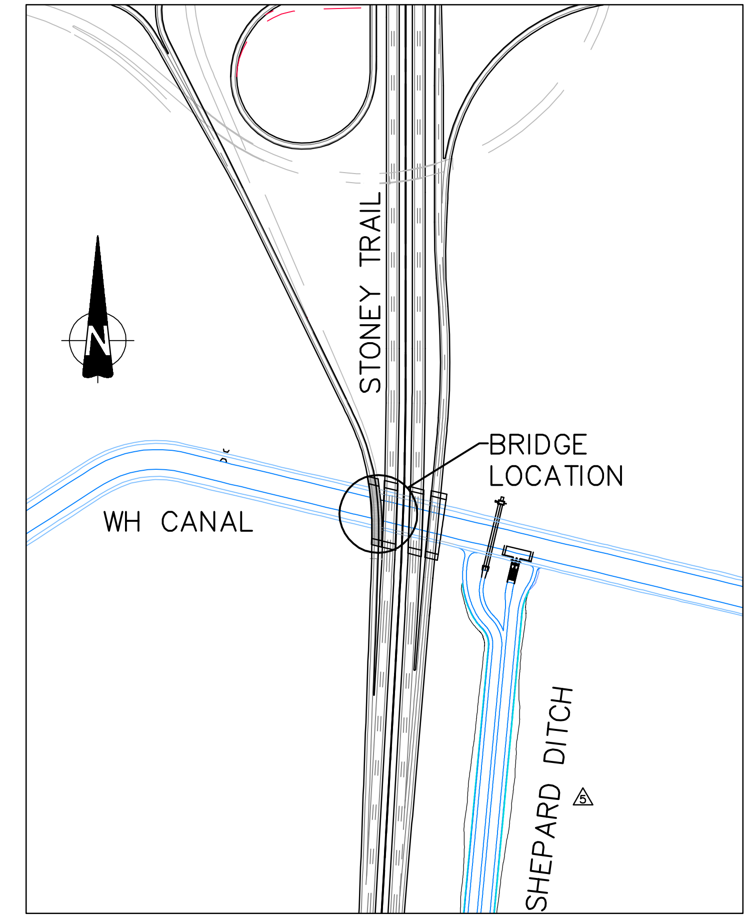
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

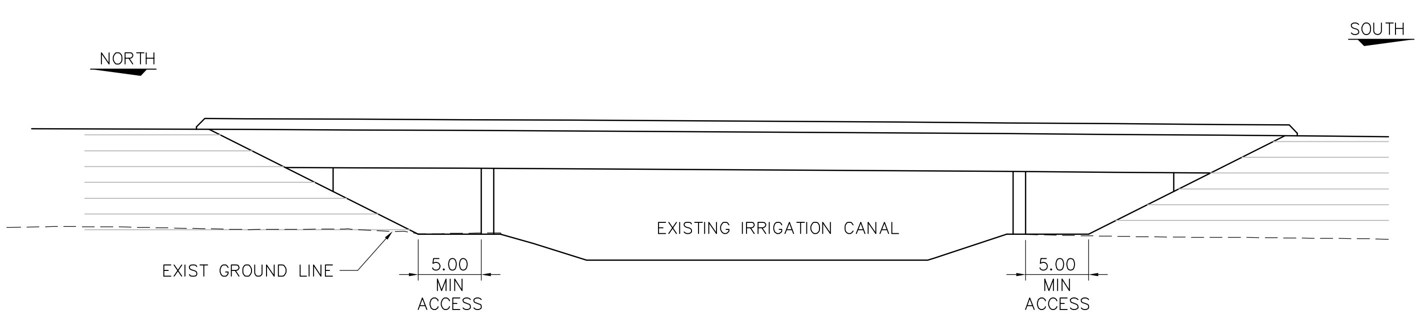
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09



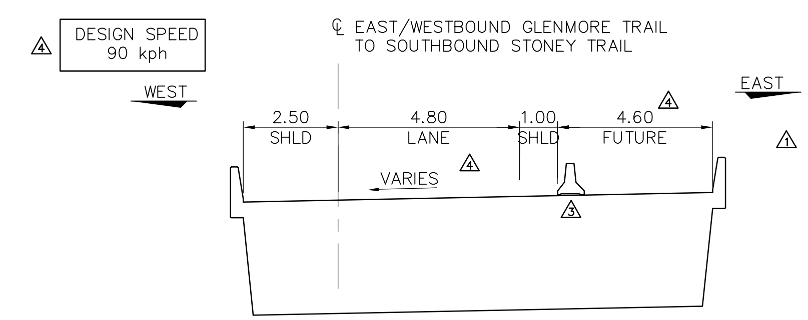
PLAN
NTS



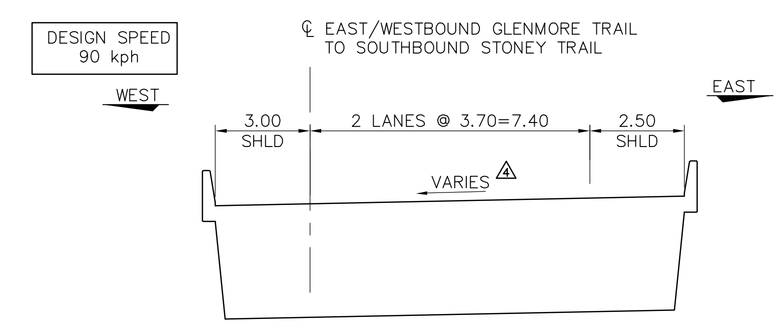
KEY PLAN
1:5000



BRIDGE ELEVATION
NTS



BRIDGE SECTION – STAGE 1
NTS

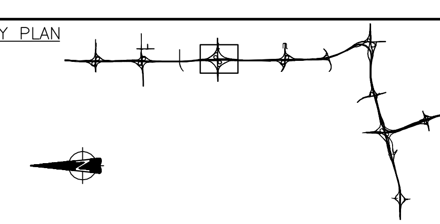


BRIDGE SECTION – ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82445

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB–WB GLENMORE TRAIL SE TO SB STONEY TRAIL
OVER WH CANAL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–32

Alberta
TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB–WB GLENMORE TRAIL TO SB STONEY TRAIL
OVER WH CANAL

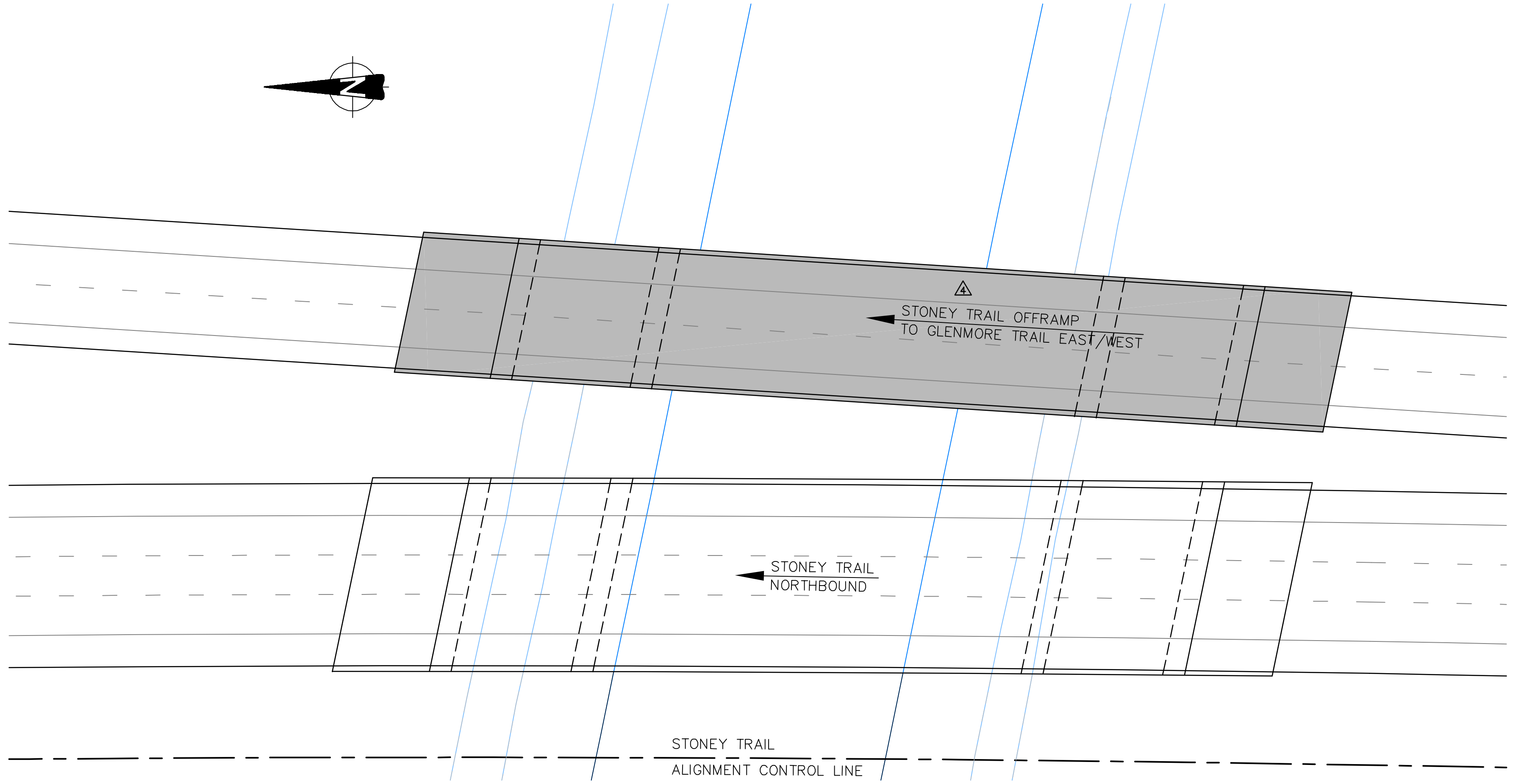
BAR CODE

PLAN No. 18–A–32
CONTRACT No. 7875/09
PLAN LOCATION

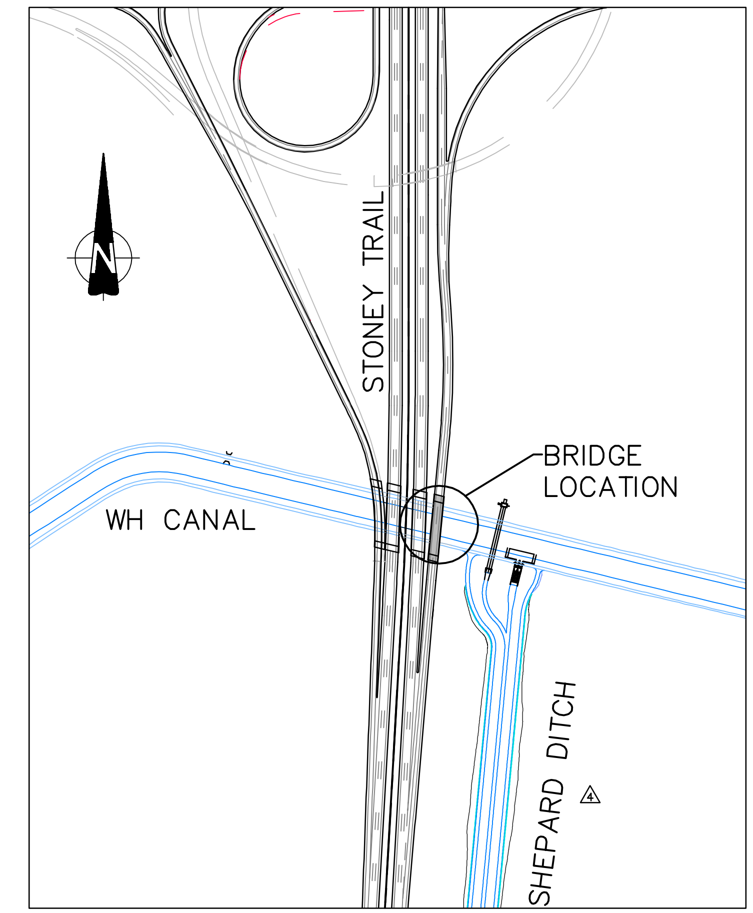
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

	DD.MM.YY	BY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

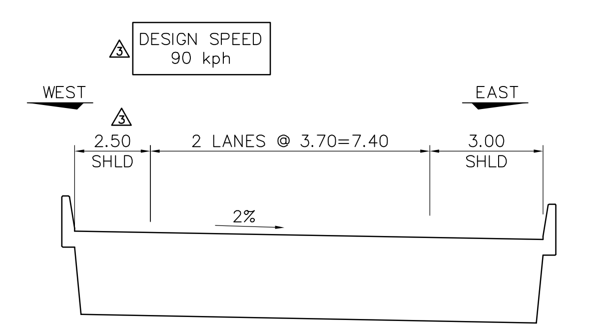
No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 4, 7 & 9	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09



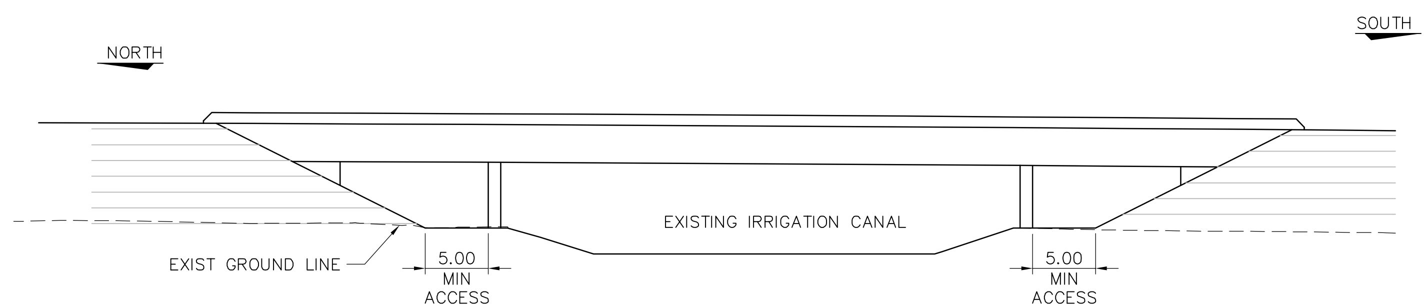
PLAN
NTS



KEY PLAN
1:5000



BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

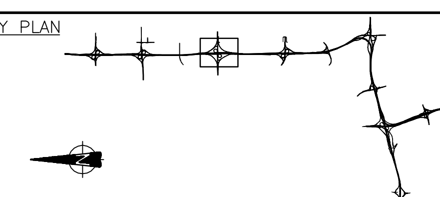


BRIDGE ELEVATION
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82445

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWING
NB STONEY TRAIL TO EB–WB
GLENMORE TRAIL SE OVER WH CANAL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–33

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

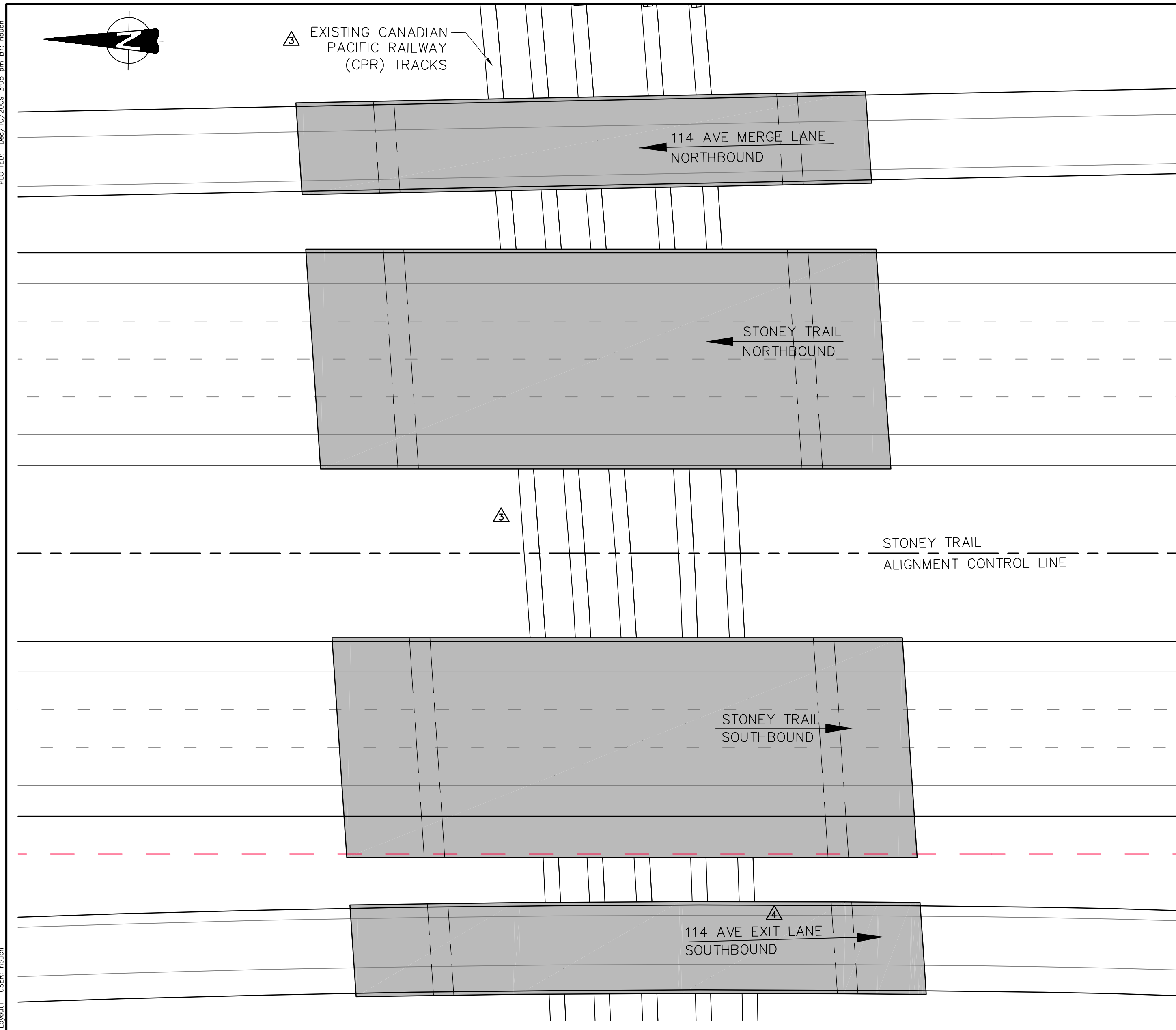
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB STONEY TRAIL TO EB–WB
GLENMORE TRAIL SE OVER WH CANAL

BAR CODE

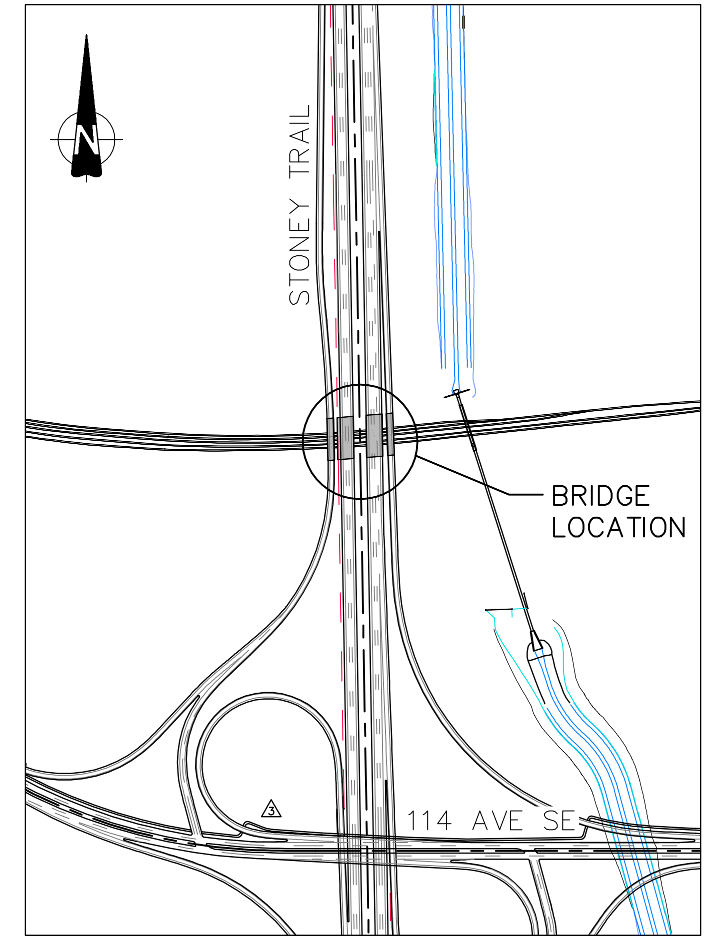
PLAN No.	18–A–33
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

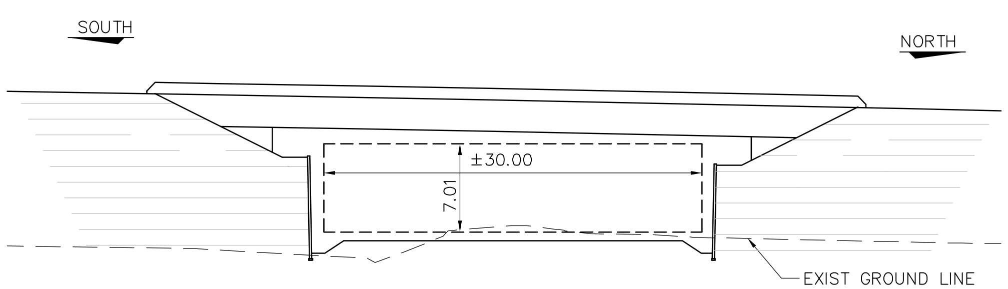
	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–



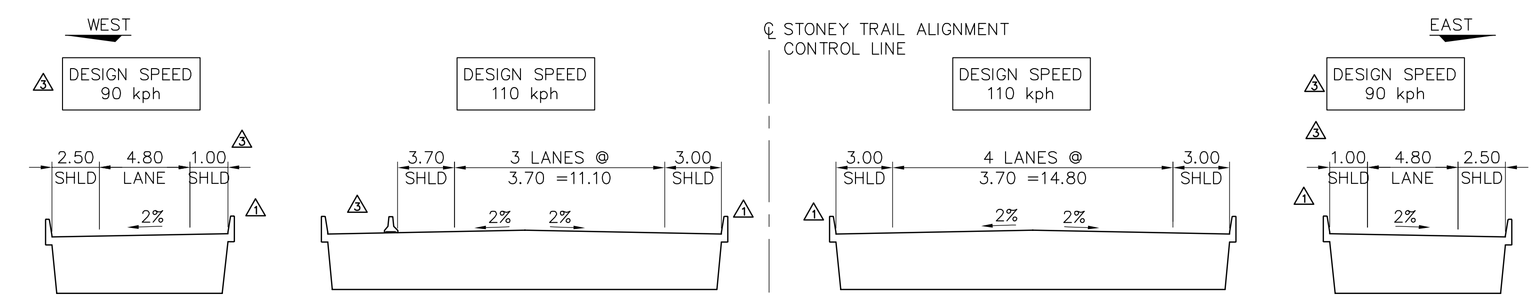
PLAN
NTS



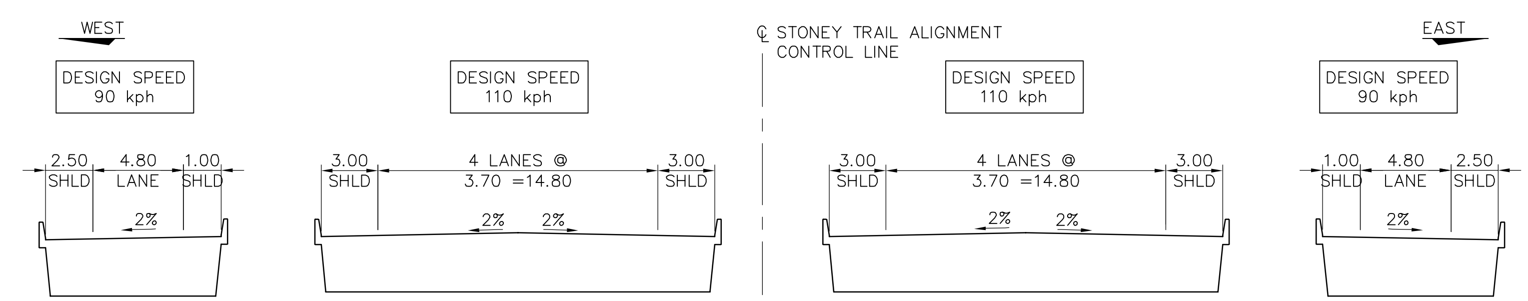
KEY PLAN
1:5000



BRIDGE ELEVATION
NTS



BRIDGE SECTION – STAGE 1
NTS

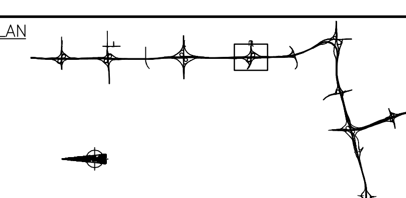


BRIDGE SECTION – ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO. 82446

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
CPR NORTH OF 114 AVE SE
AT STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-34

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
CPR NORTH OF 114 AVE SE
AT STONEY TRAIL

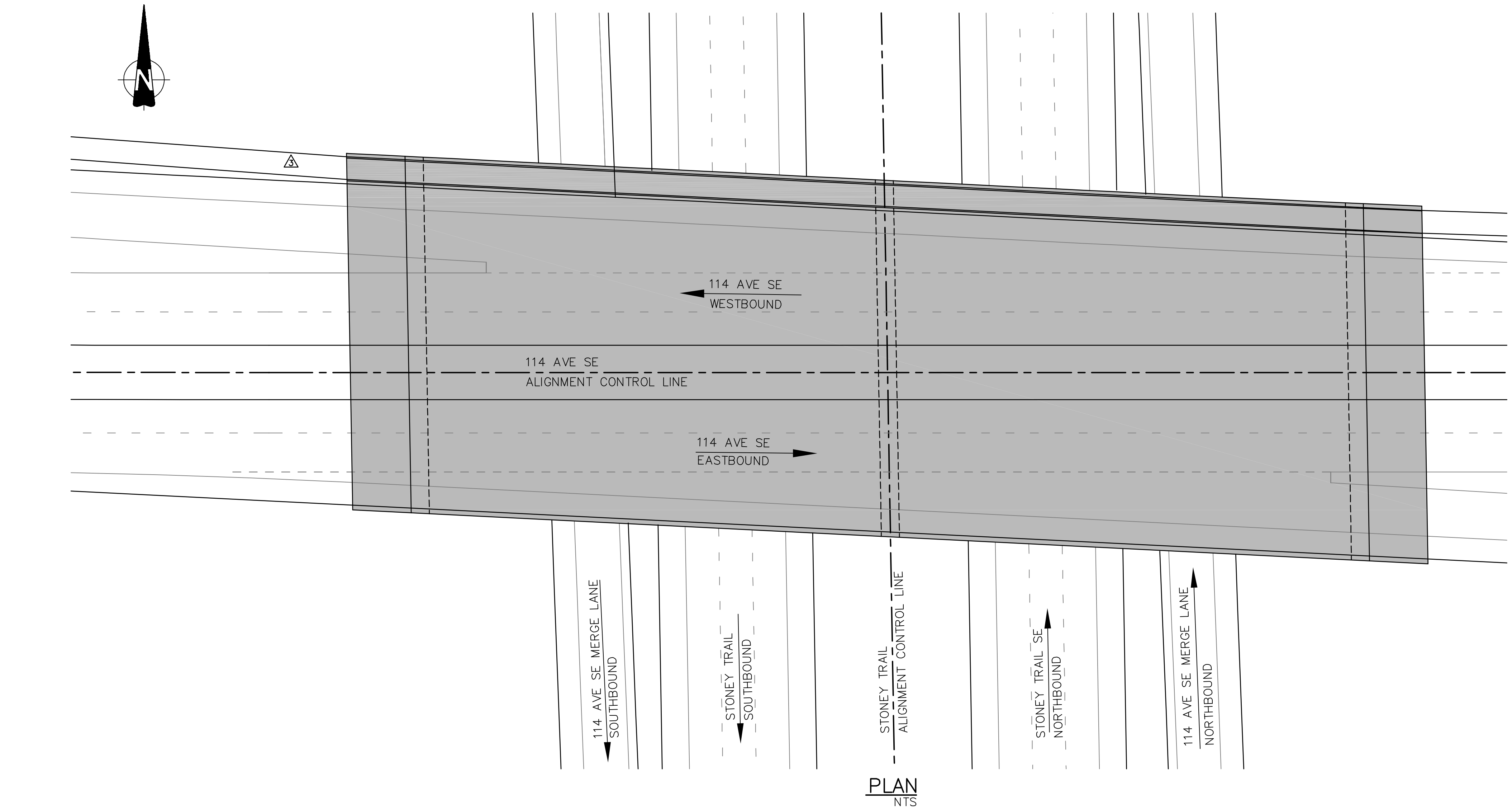
BAR CODE

PLAN No.	18-A-34
CONTRACT No.	7875/09
PLAN LOCATION	

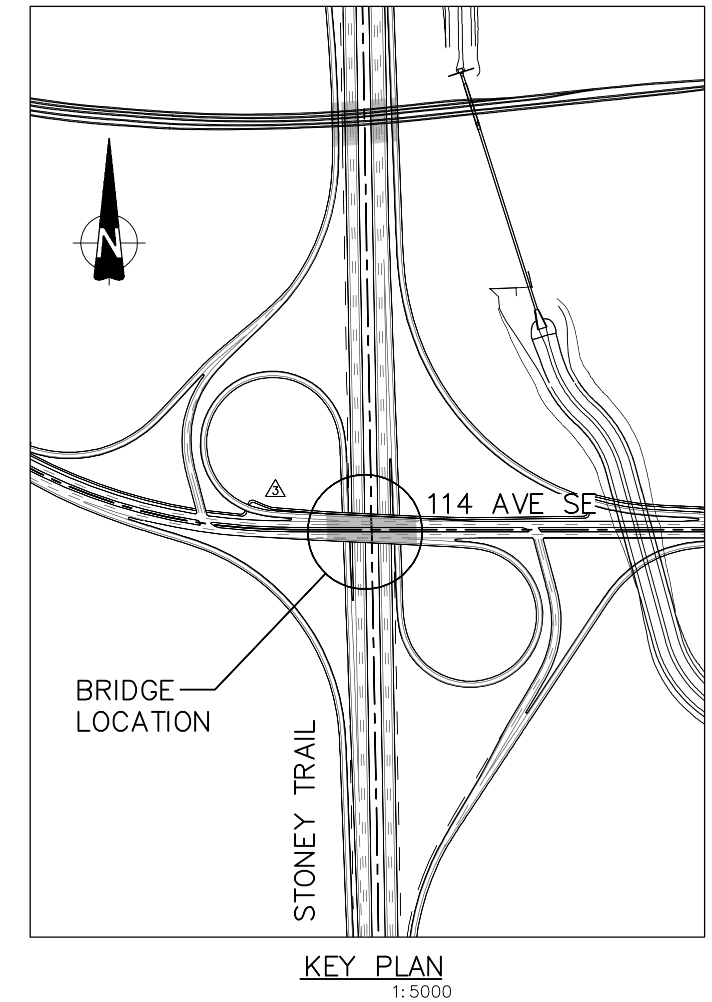
PHOTO No.	TITLE SEARCH DATE	GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1-2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

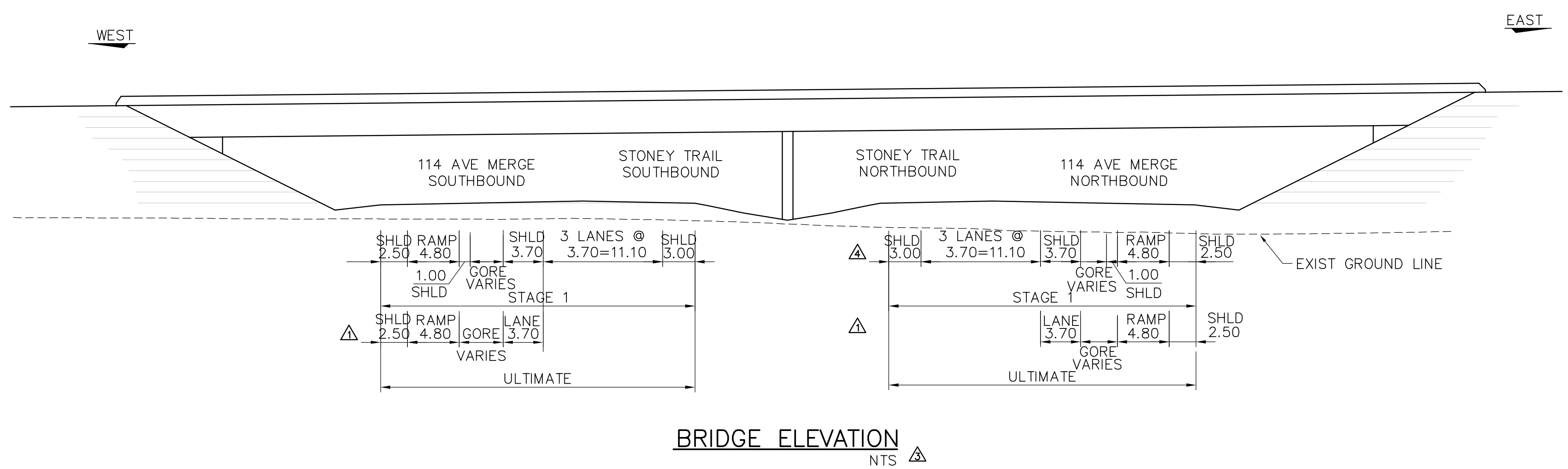
	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-



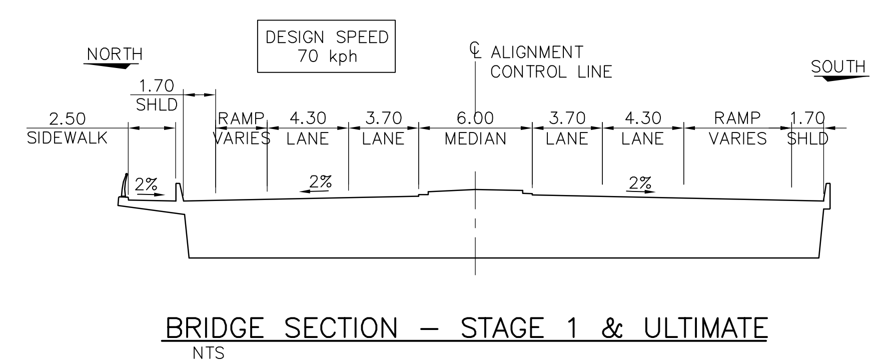
PLAN
NTS



KEY PLAN
1:5000



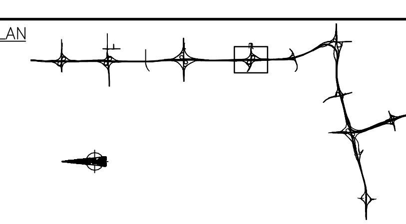
BRIDGE ELEVATION
NTS



BRIDGE SECTION – STAGE 1 & ULTIMATE
NTS

NOTES:
1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO. 82447

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
EB–WB 114 AVE SE OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–35

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 4, 7 & 11	JB	
4	ISSUED FOR ADDENDUM 12	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

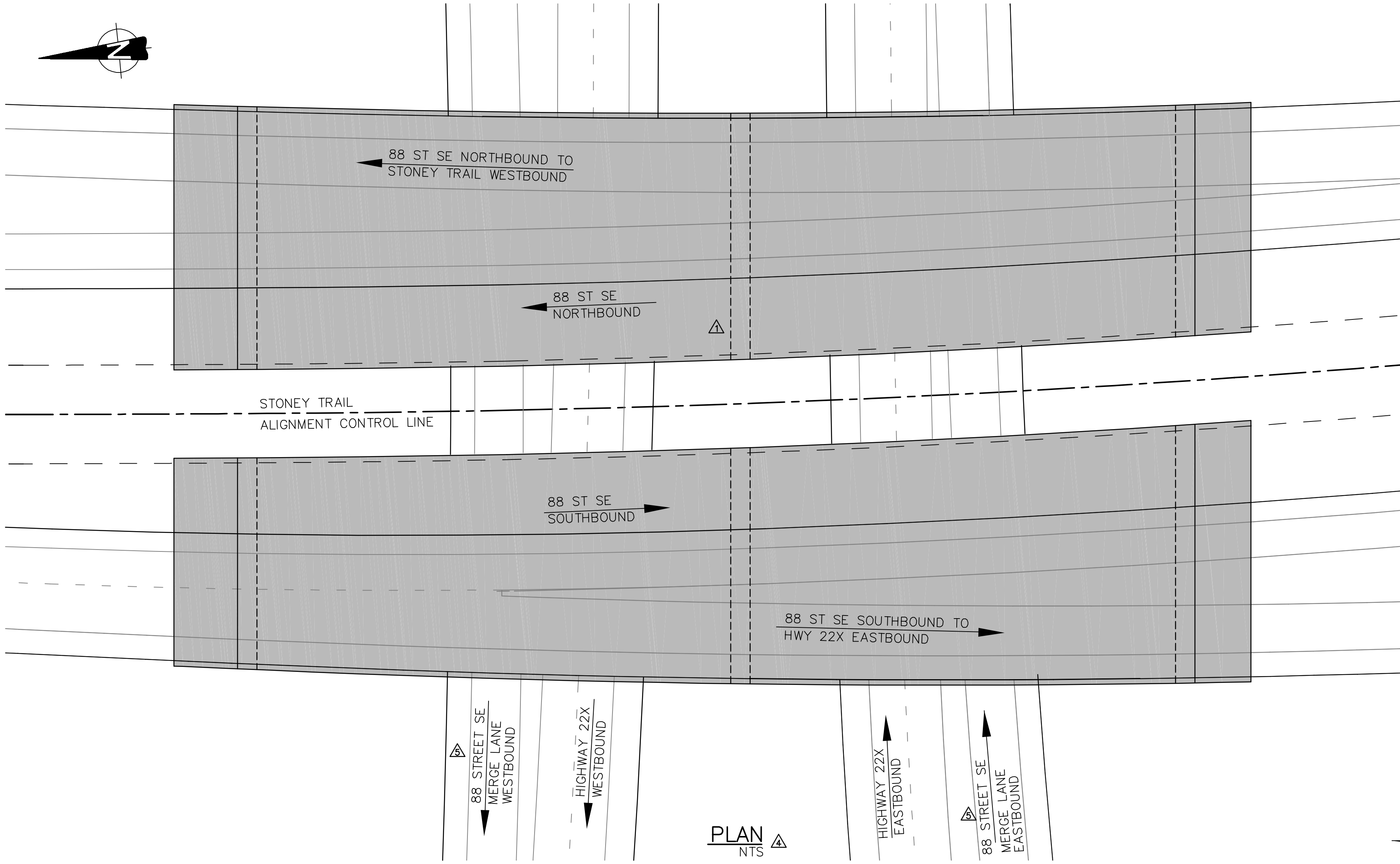
SURVEYED – DESIGNED – CHECKED – DRAWN

PHOTO No. – TITLE SEARCH DATE – GRAPHICS FILE

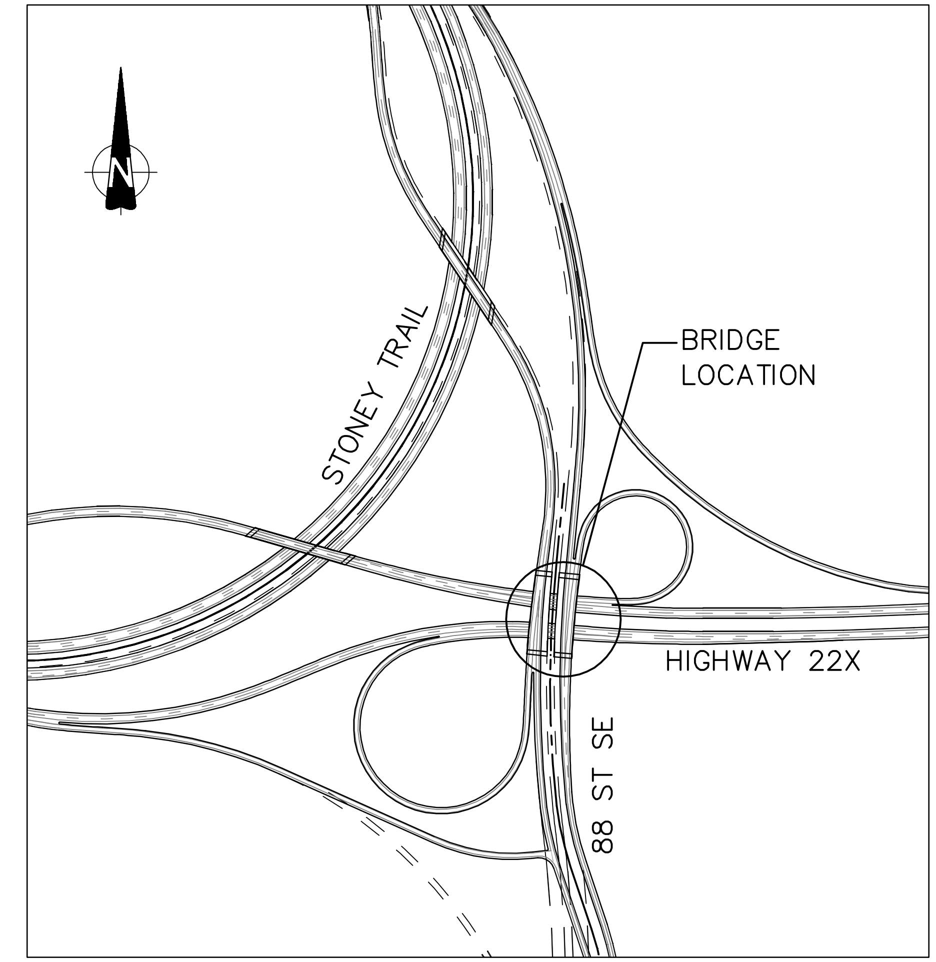
PLAN No. 18–A–35
CONTRACT No. 7875/09
PLAN LOCATION

BAR CODE

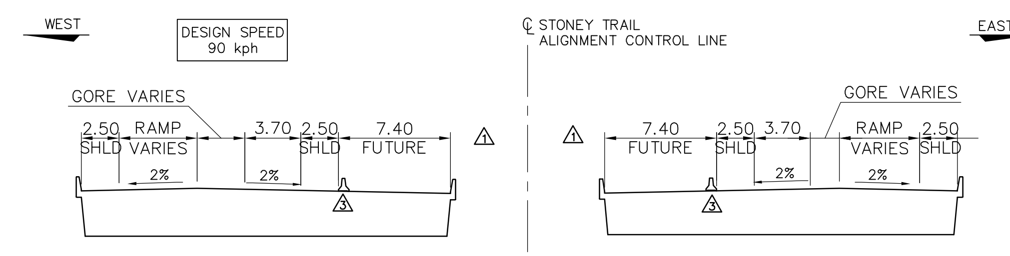
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
EB–WB 114TH AVE SE OVER STONEY TRAIL



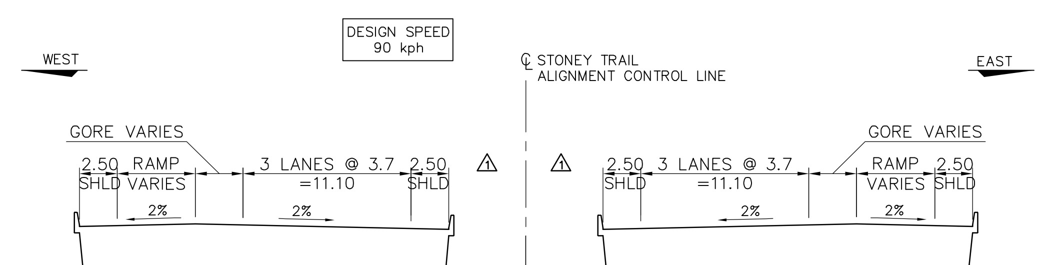
PLAN
NTS



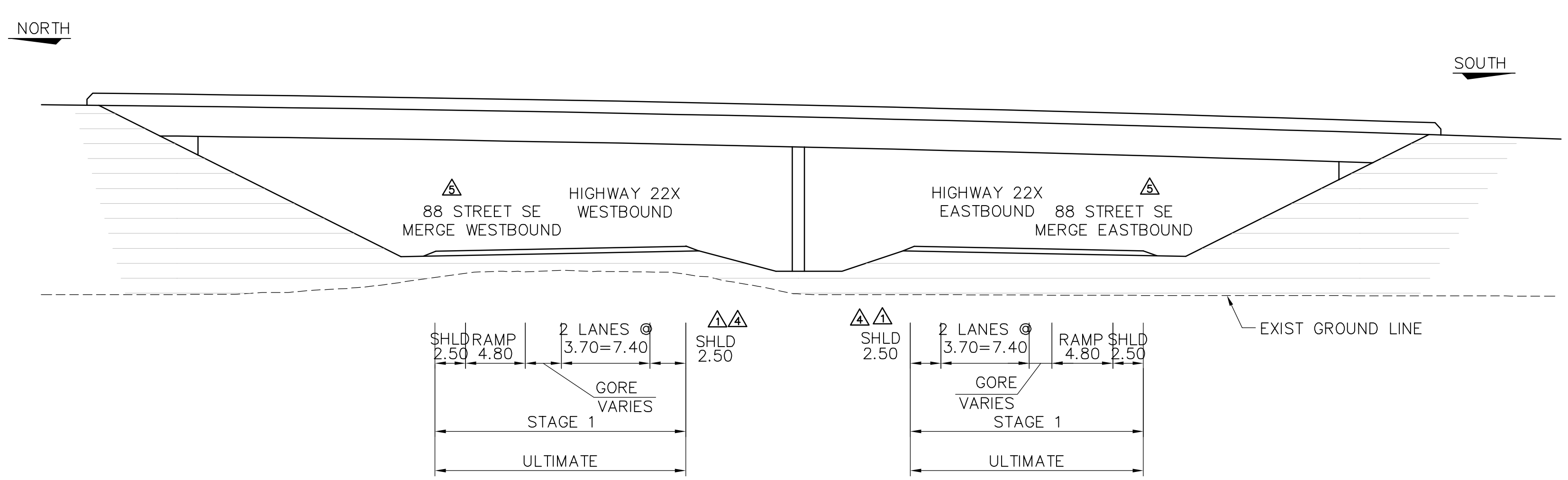
KEY PLAN
1:5000



BRIDGE SECTION – STAGE 1
NTS



BRIDGE SECTION – ULTIMATE
NTS

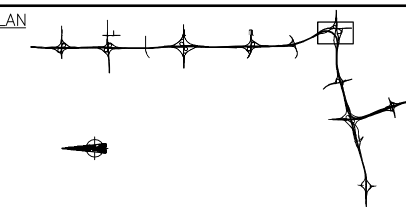


BRIDGE ELEVATION
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO. 82449

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB STONEY TRAIL TO 88 STREET SE
OVER HIGHWAY 22X

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–37

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 4, 7 & 9	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

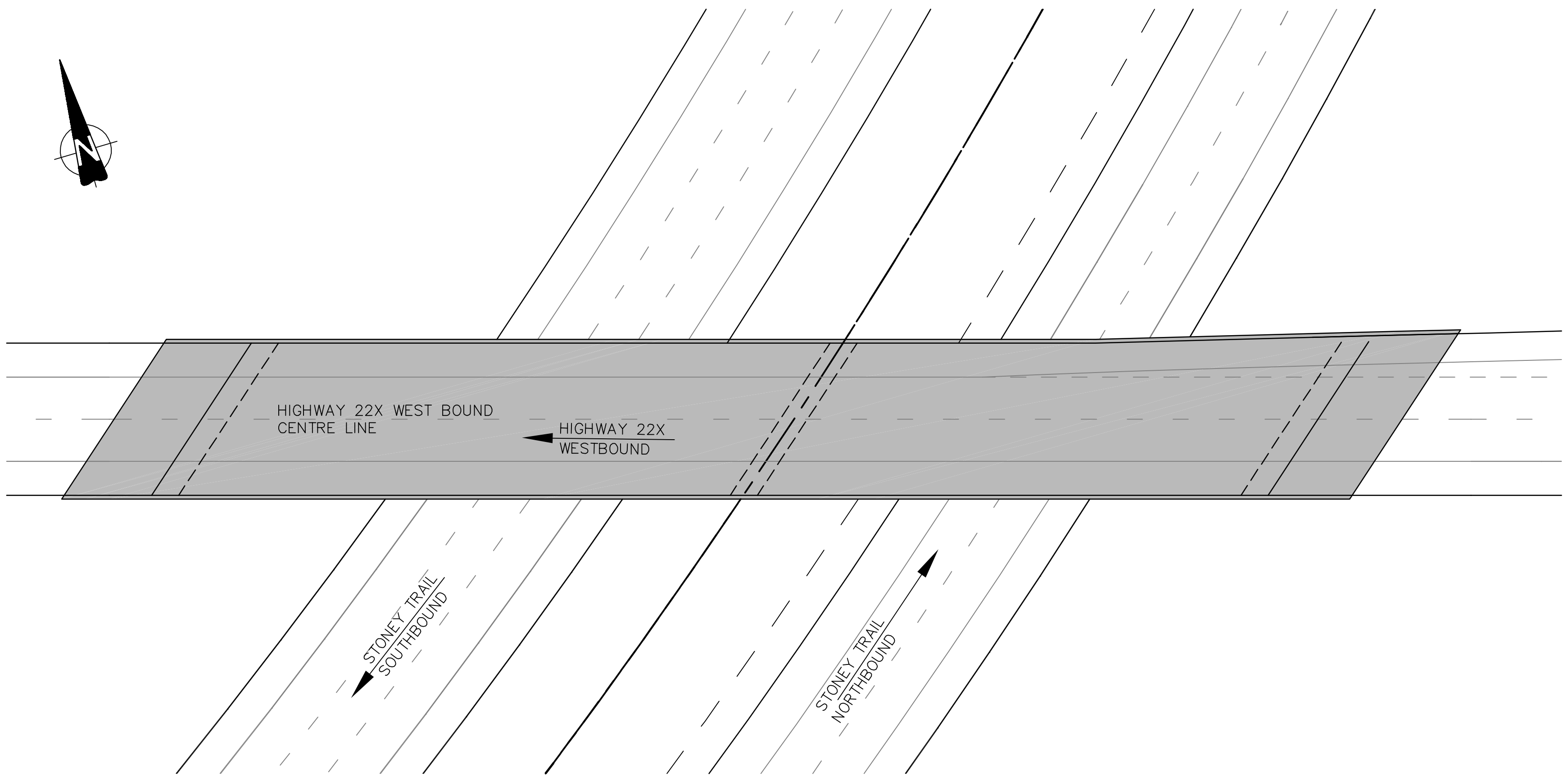
SURVEYED / DESIGNED / CHECKED / DRAWN

PHOTO No. / TITLE SEARCH DATE / GRAPHICS FILE

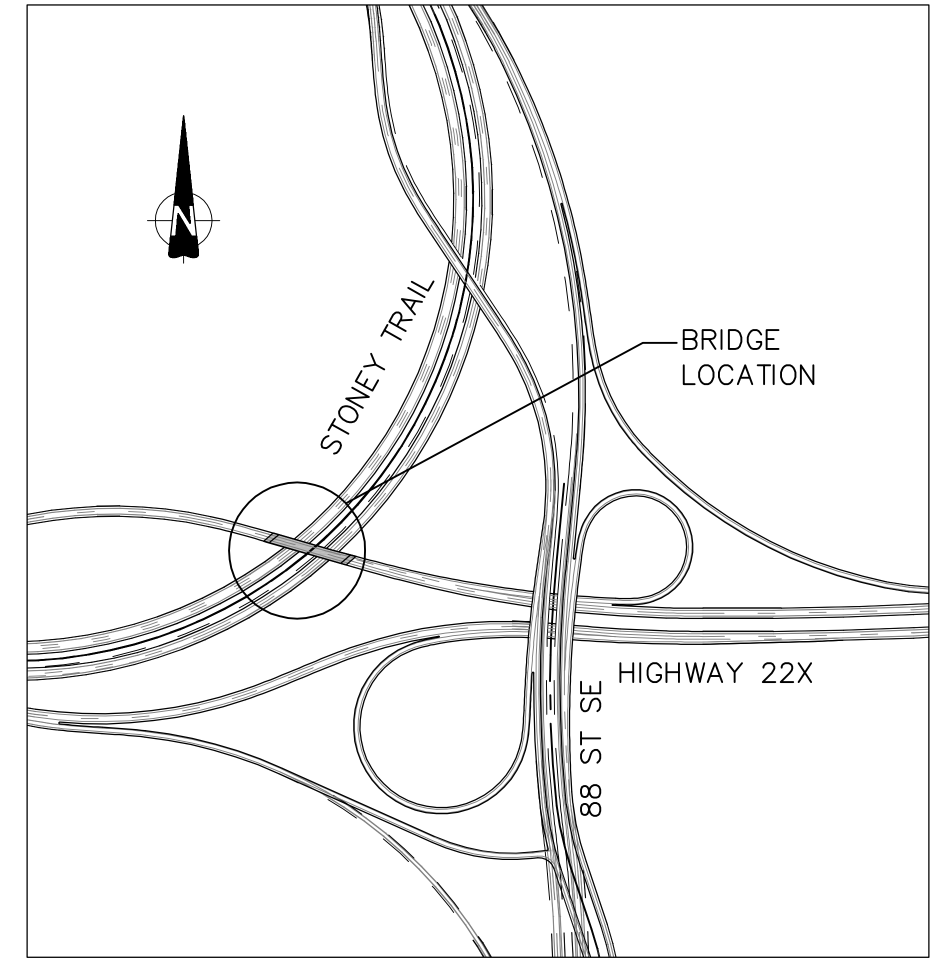
PLAN No. 18–A–37
CONTRACT No. 7875/09
PLAN LOCATION

BAR CODE

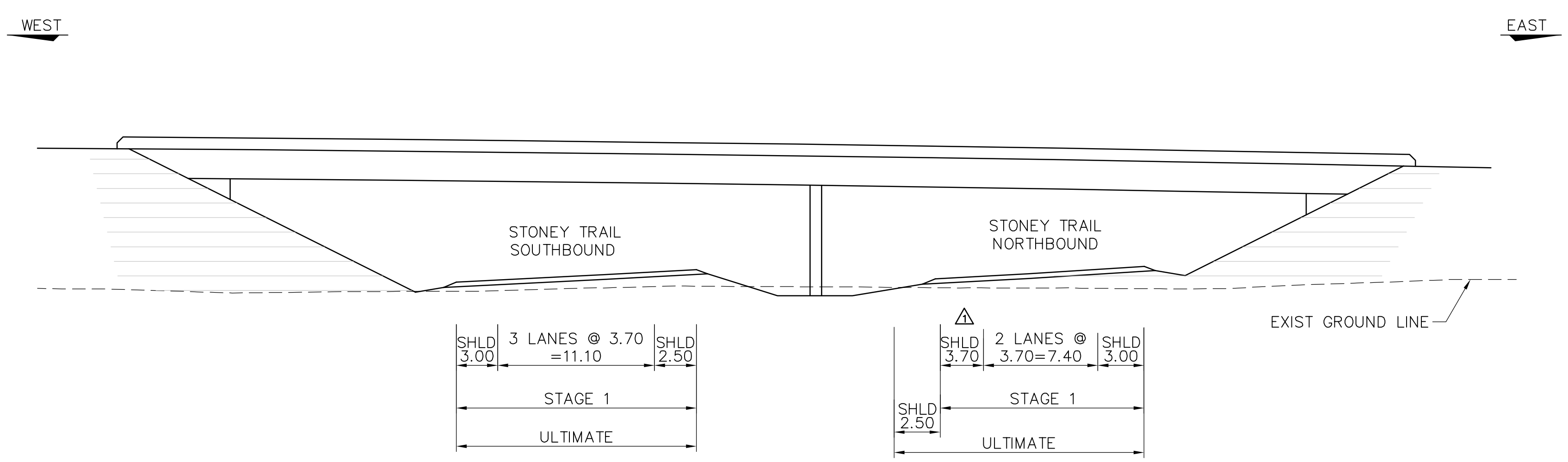
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB STONEY TRAIL TO 88 STREET SE
OVER HIGHWAY 22X



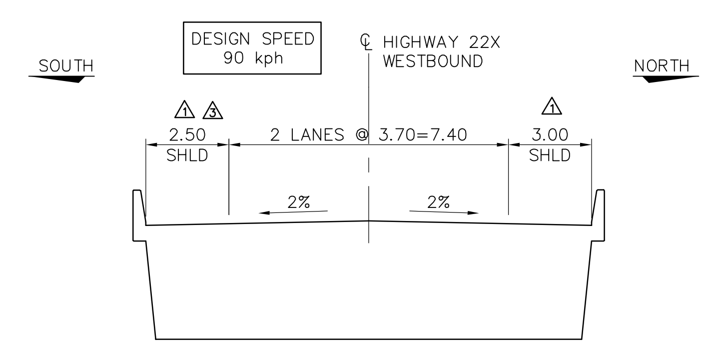
PLAN
NTS



KEY PLAN
1:5000



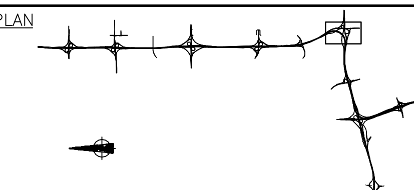
BRIDGE ELEVATION
NTS



BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES:
1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82449

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
WB HIGHWAY 22X TO STONEY TRAIL
OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–38

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
WB HIGHWAY 22X TO STONEY TRAIL
OVER STONEY TRAIL

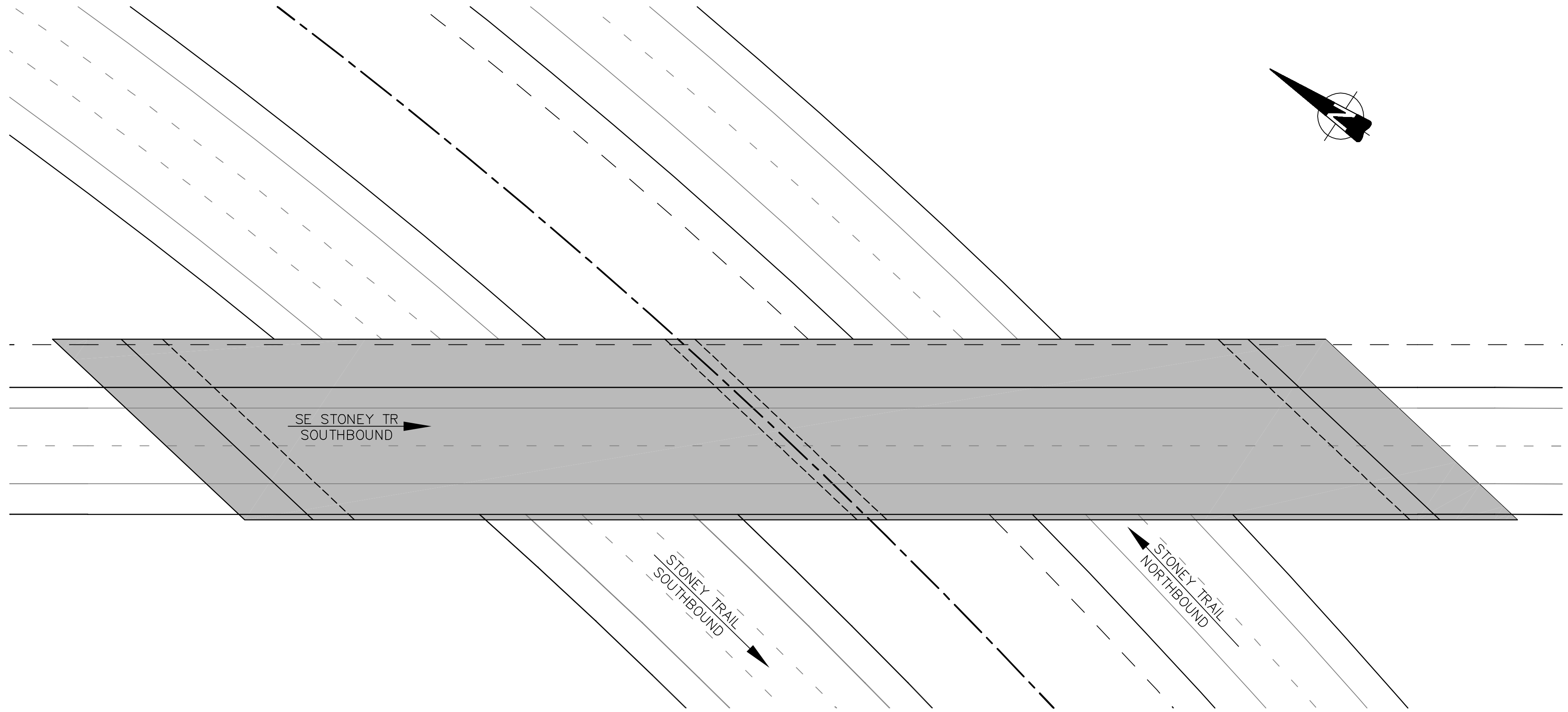
BAR CODE

PLAN No. 18–A–38
CONTRACT No. 7875/09
PLAN LOCATION

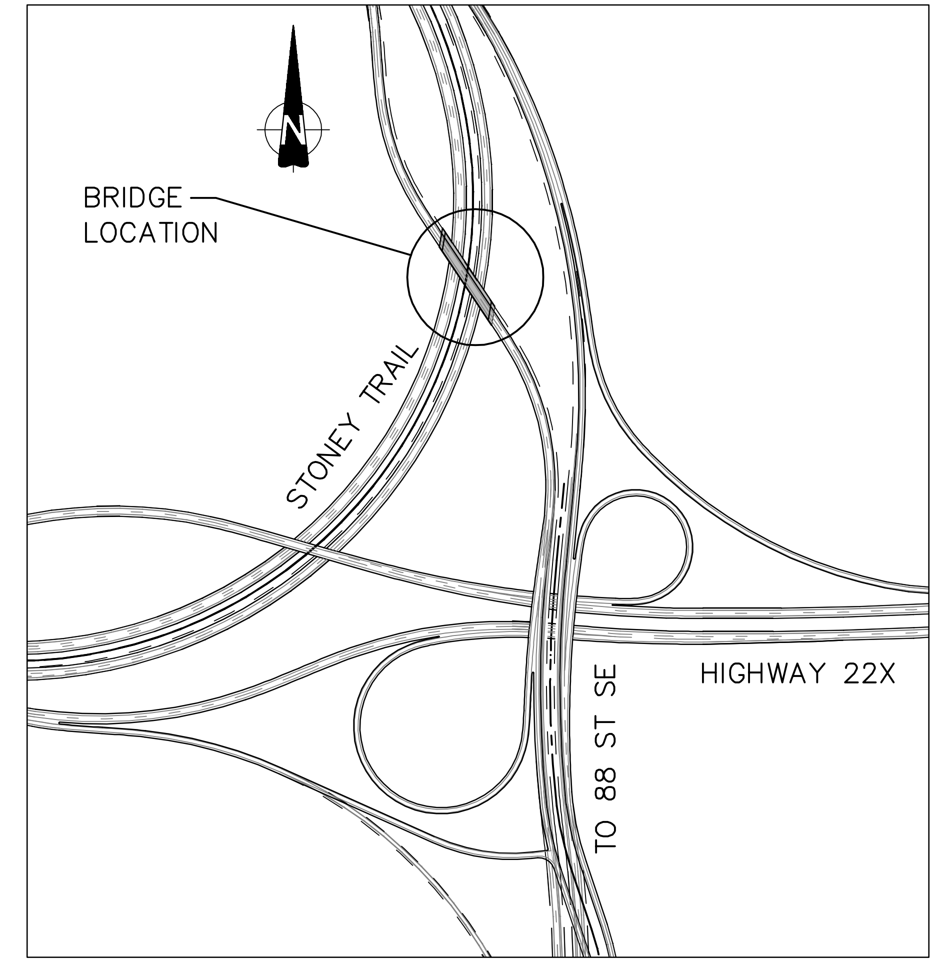
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

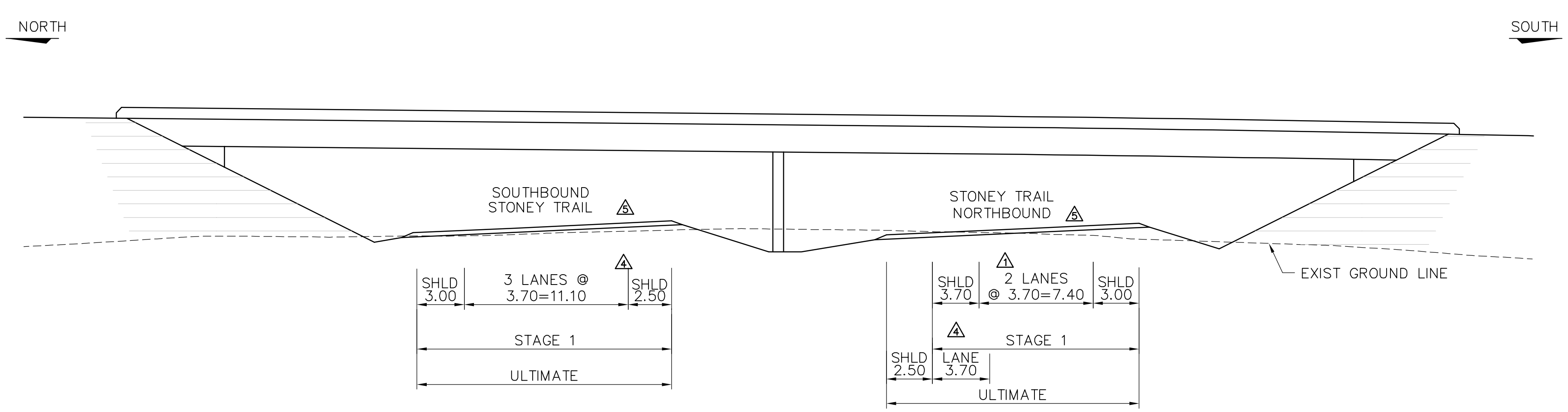
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



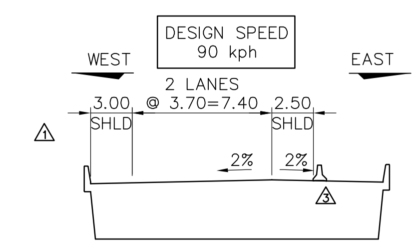
PLAN
NTS



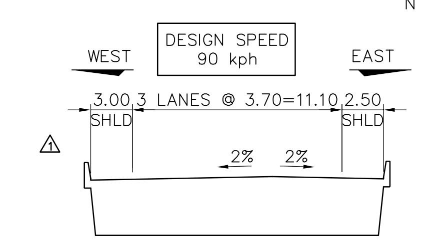
KEY PLAN
1:5000



BRIDGE ELEVATION
NTS



BRIDGE SECTION – STAGE 1
NTS

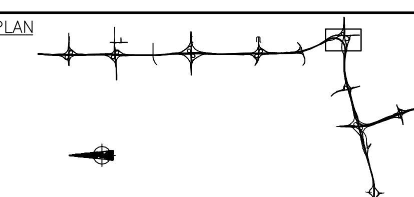


BRIDGE SECTION – ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82449

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
SB STONEY TRAIL TO 88 STREET SE
OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-39

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

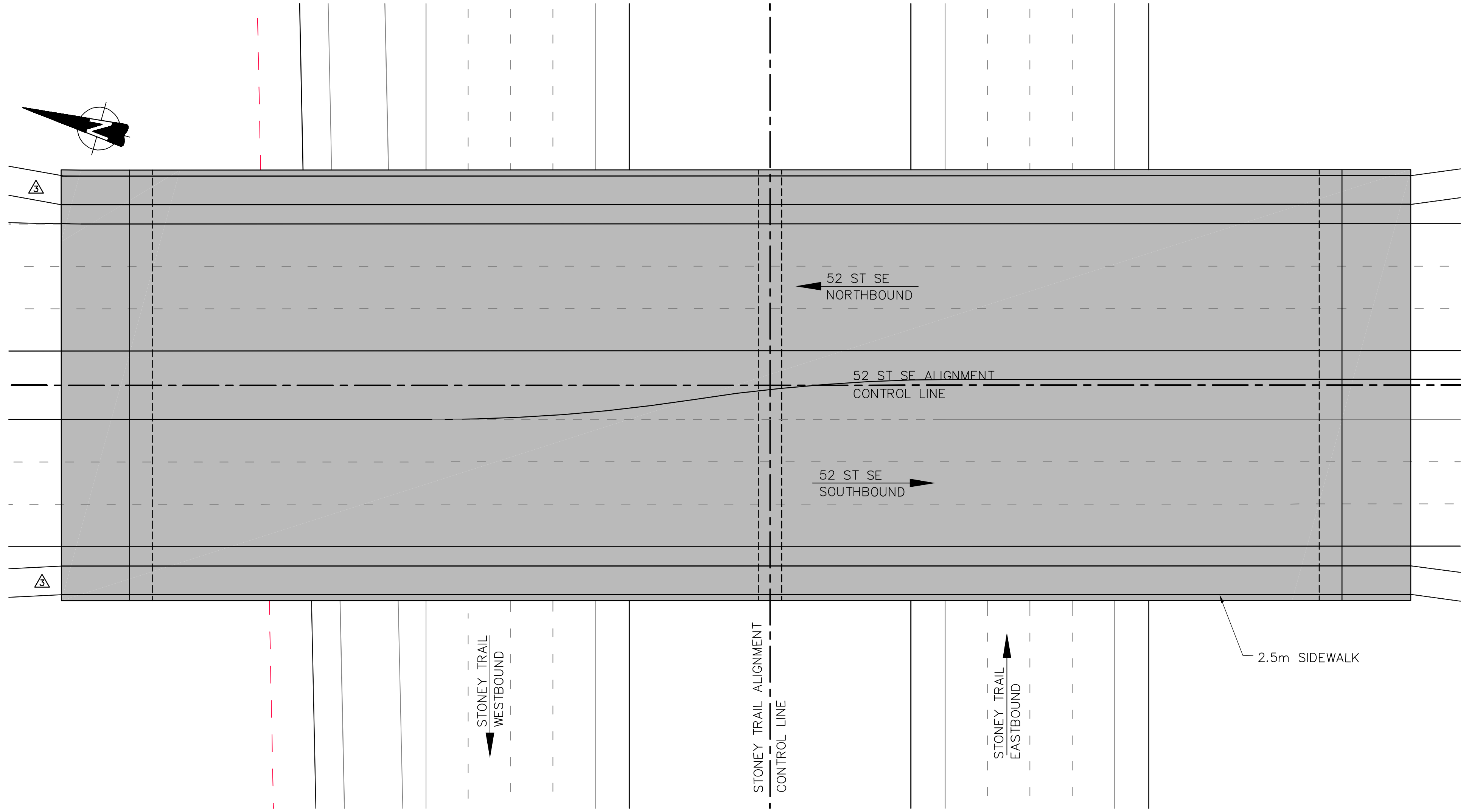
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
SB STONEY TRAIL TO 88 STREET SE
OVER STONEY TRAIL

BAR CODE

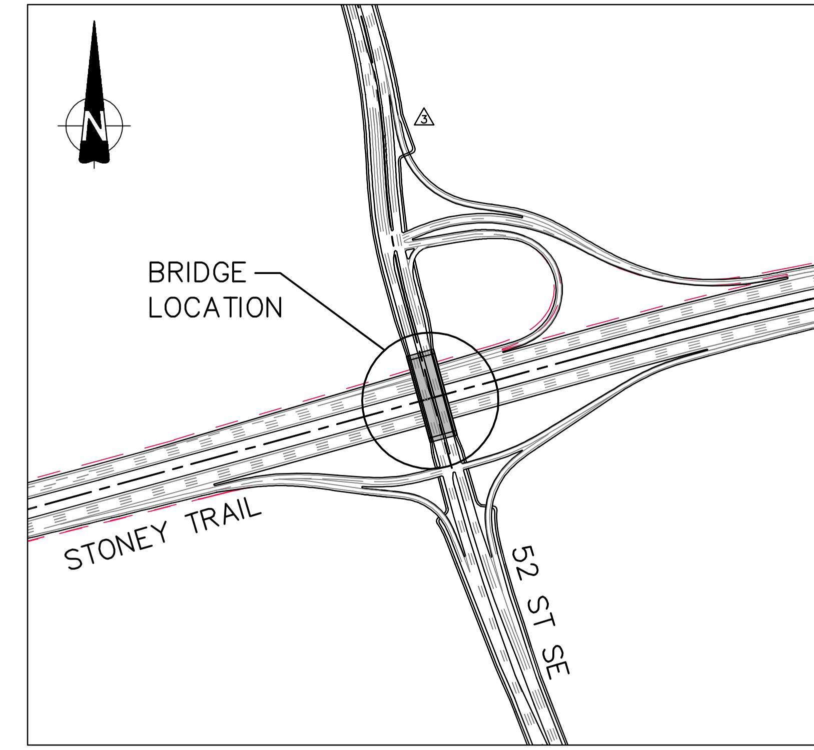
PLAN No.	18-A-39
CONTRACT No.	7875/09
PLAN LOCATION	

		BY	DD.MM.YY
PHOTO No.		-	-
TITLE SEARCH DATE		-	-
GRAPHICS FILE		-	-
SURVEYED		-	-
DESIGNED		-	-
CHECKED		-	-
DRAWN		-	-

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 4, 7 & 9	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	

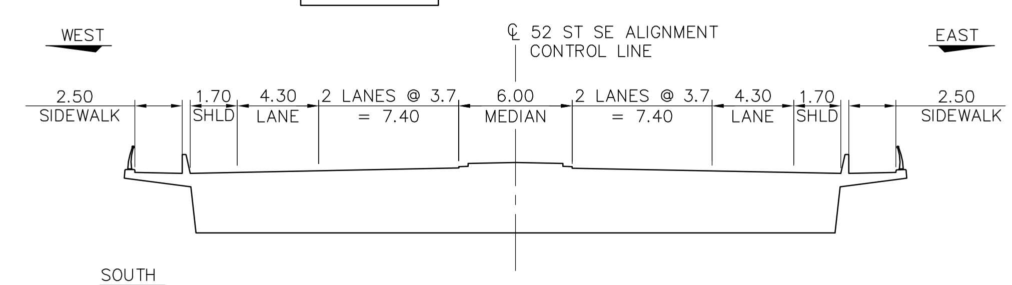


PLAN
NTS

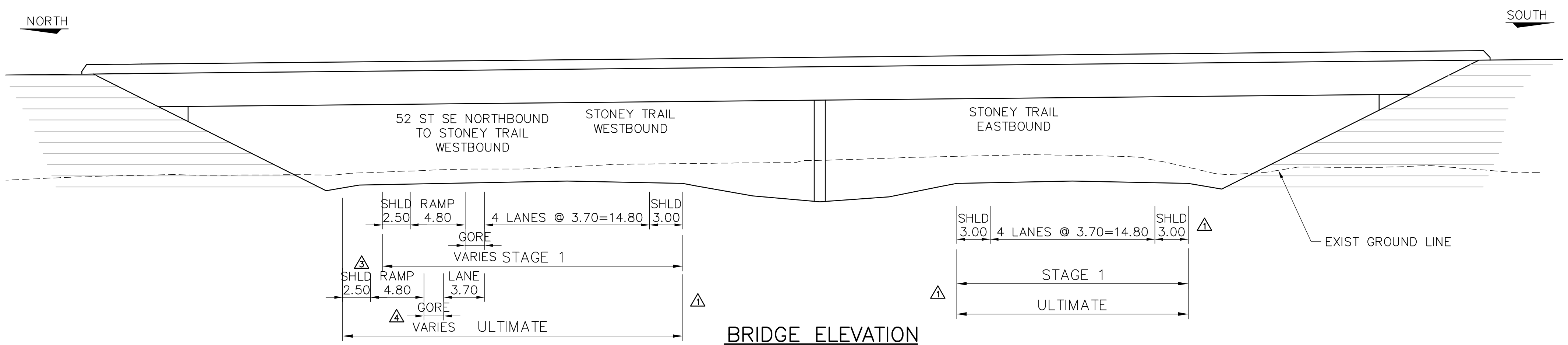


KEY PLAN
1:5000

DESIGN SPEED
70 kph



BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

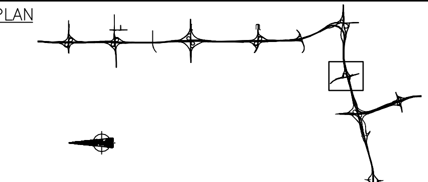


BRIDGE ELEVATION
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82450

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB 52 STREET SE OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–40

Alberta
TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB 52 STREET SE OVER STONEY TRAIL

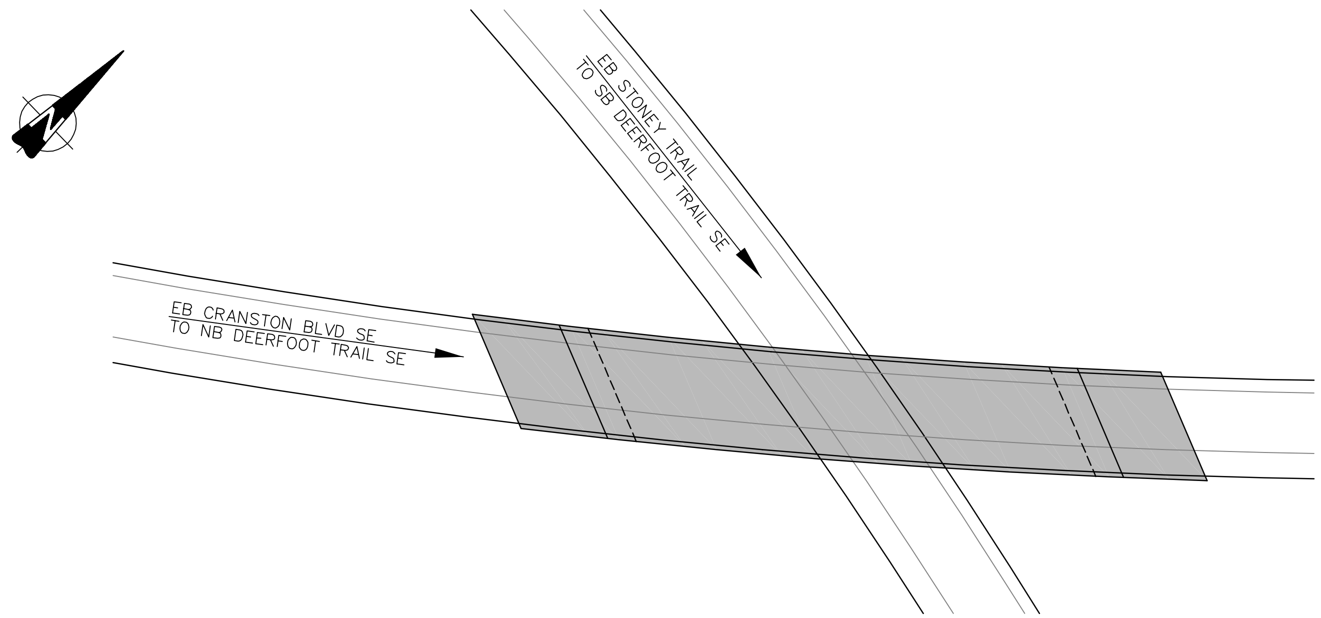
BAR CODE

PLAN No.	18–A–40
CONTRACT No.	7875/09
PLAN LOCATION	

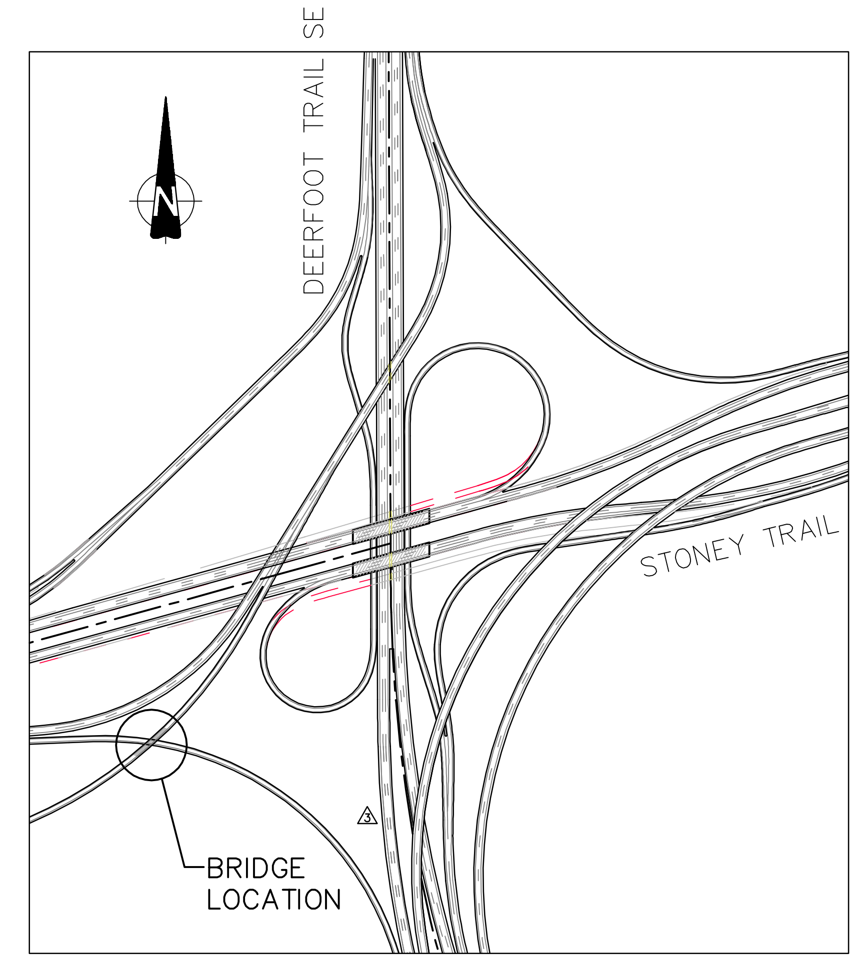
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 4, 7 & 11	JB	
4	ISSUED FOR ADDENDUM 17	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

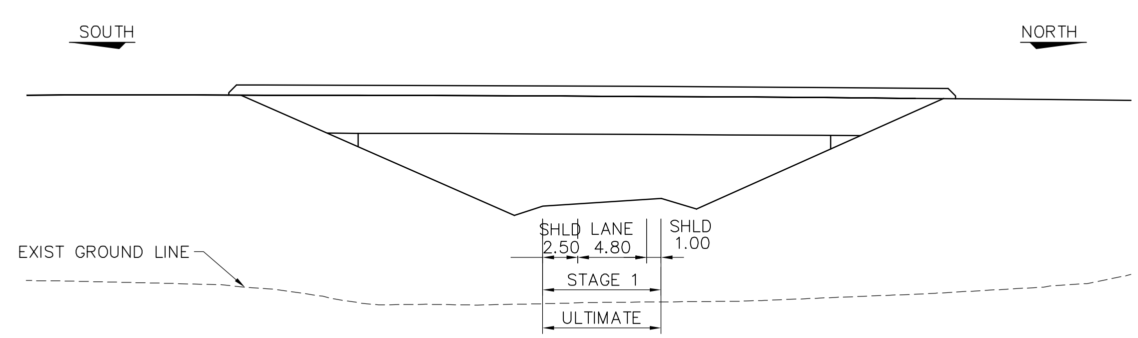
	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–



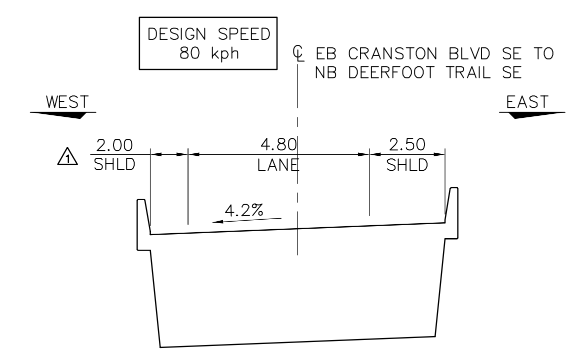
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

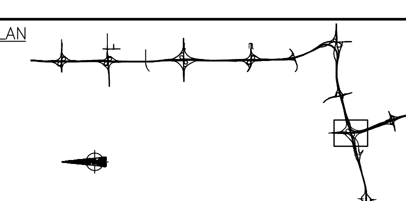


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: ⚠

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82010

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB CRANSTON BLVD SE TO NB DEERFOOT TRAIL SE
OVER EB STONEY TRAIL TO SB DEERFOOT TRAIL SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–41

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
EB CRANSTON BLVD SE TO NB DEERFOOT TRAIL SE
OVER EB STONEY TRAIL TO SB DEERFOOT TRAIL SE

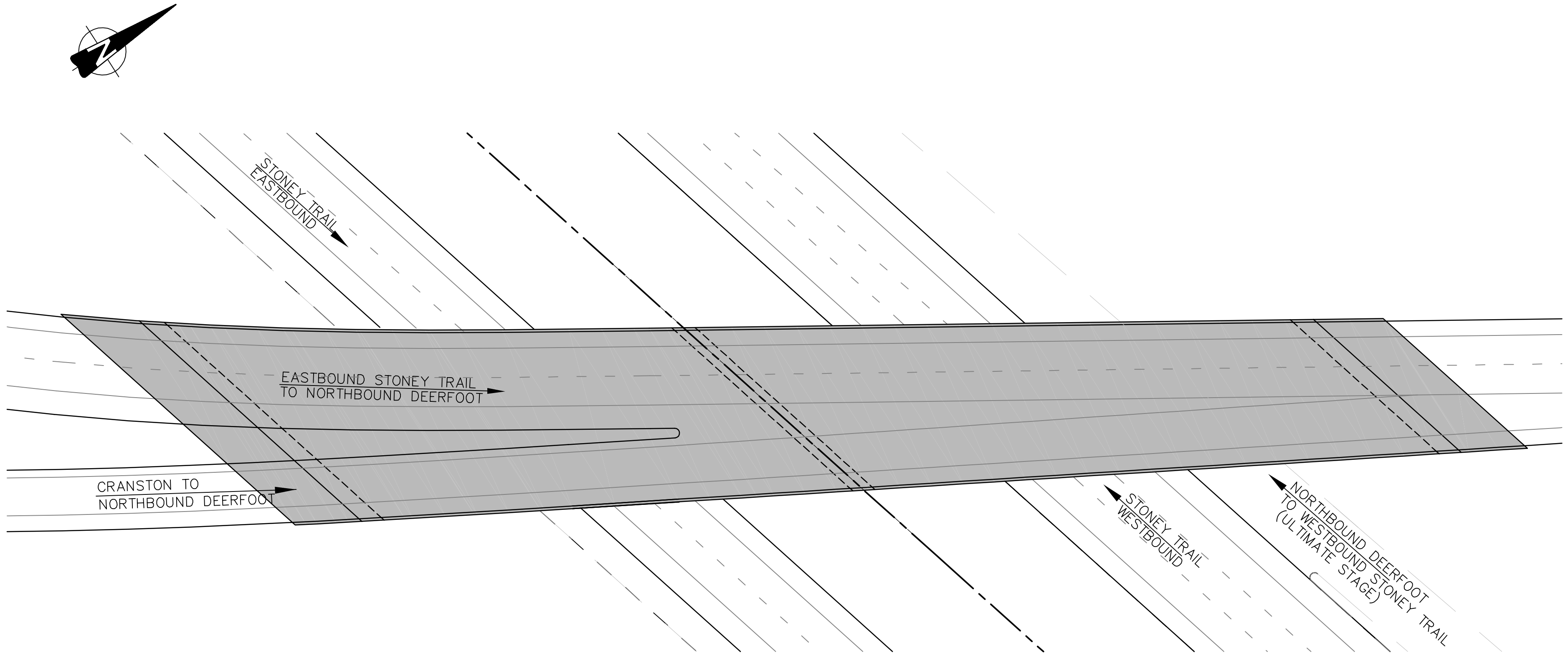
BAR CODE

PLAN No. 18–A–41
CONTRACT No. 7875/09
PLAN LOCATION

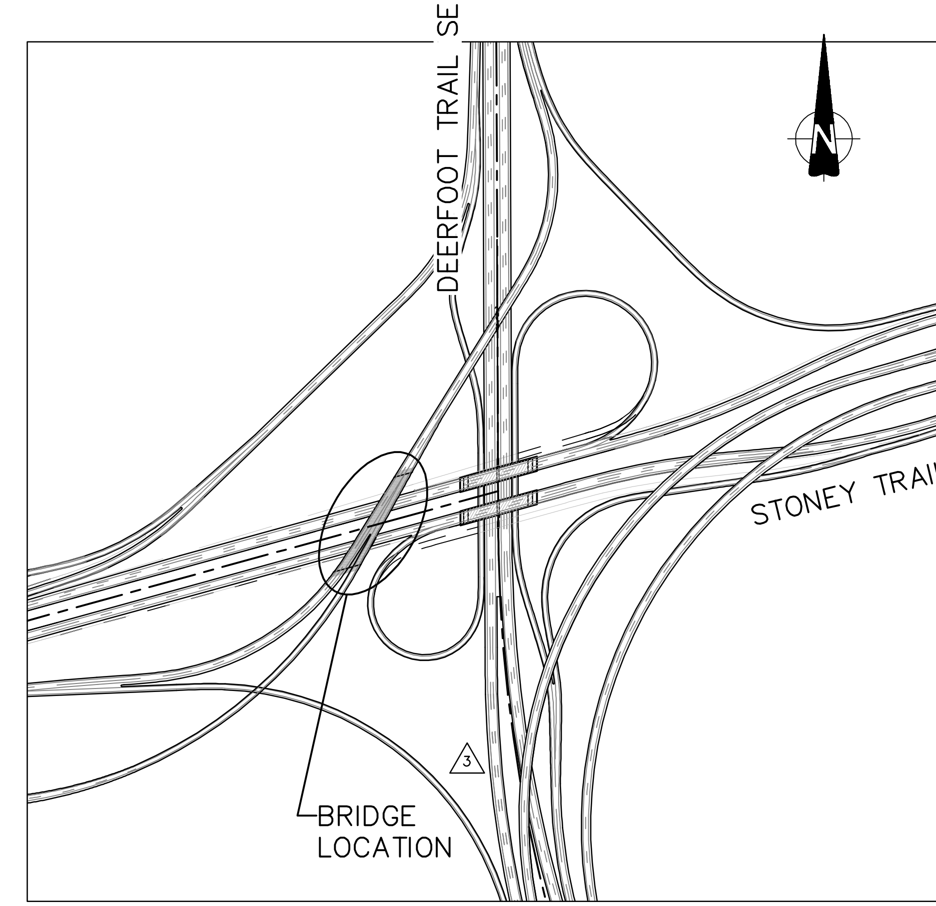
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

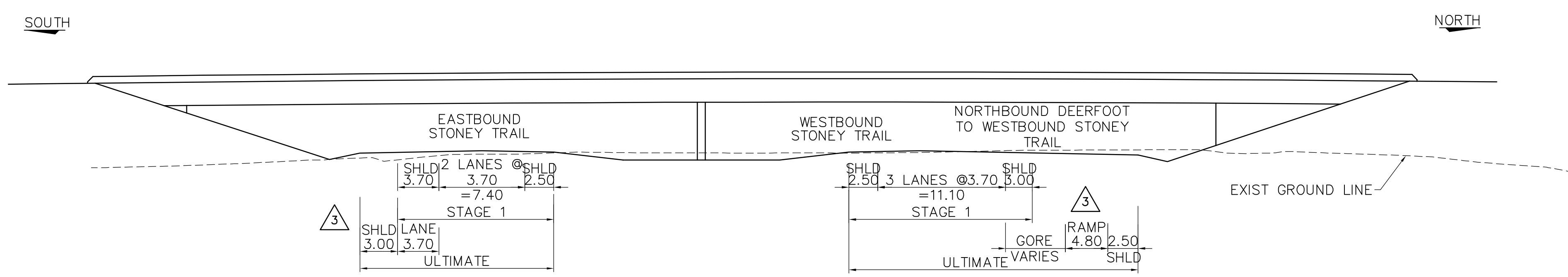
	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–



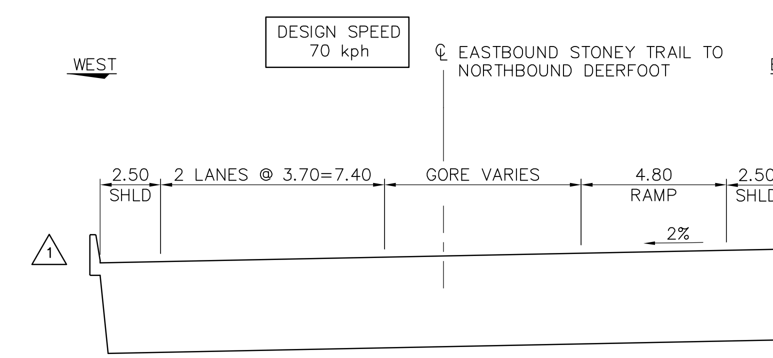
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

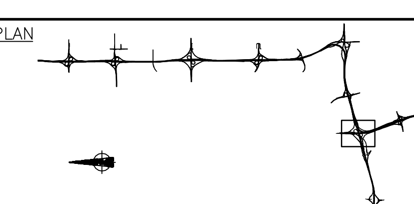


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO. 82010

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
EB STONEY TRAIL TO NB DEERFOOT TRAIL SE DIRECTIONAL RAMP OVER EB–WB STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–42

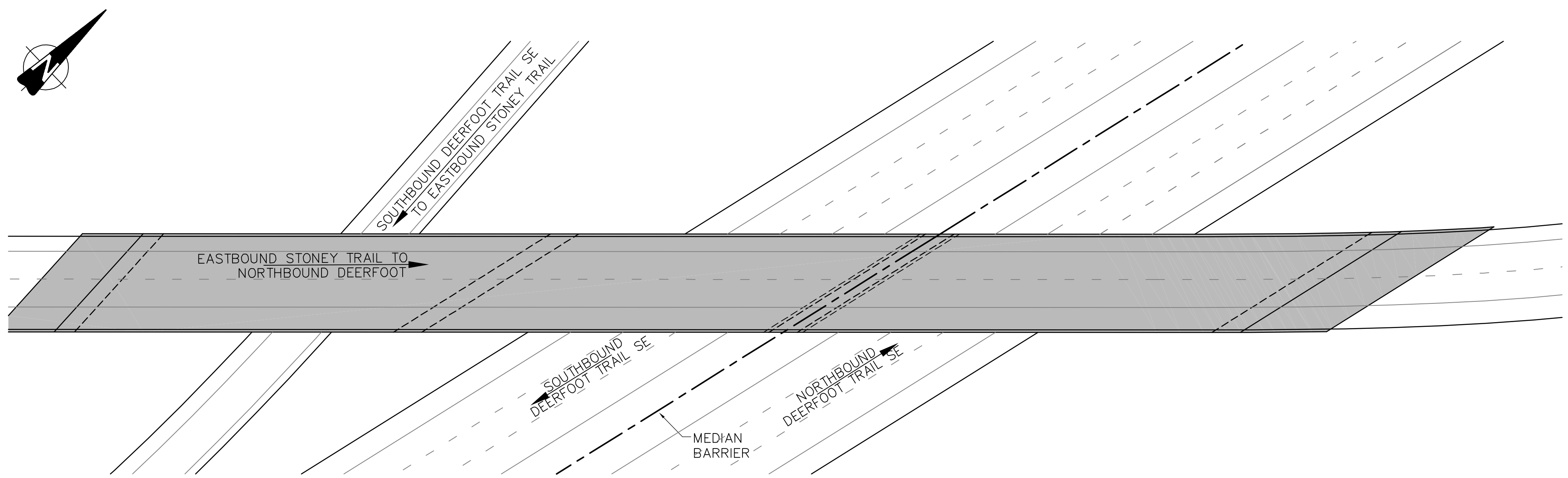
Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

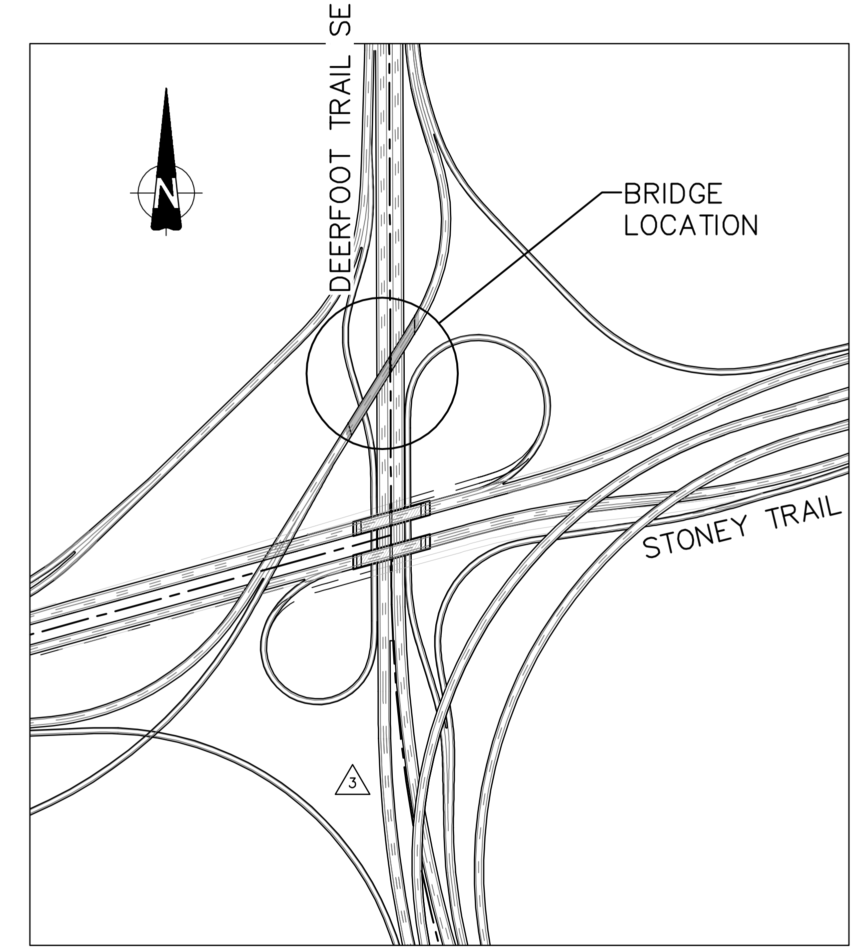
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 BRIDGE INFORMATION DRAWINGS EB STONEY TRAIL TO NB DEERFOOT TRAIL SE DIRECTIONAL RAMP OVER EB–WB STONEY TRAIL

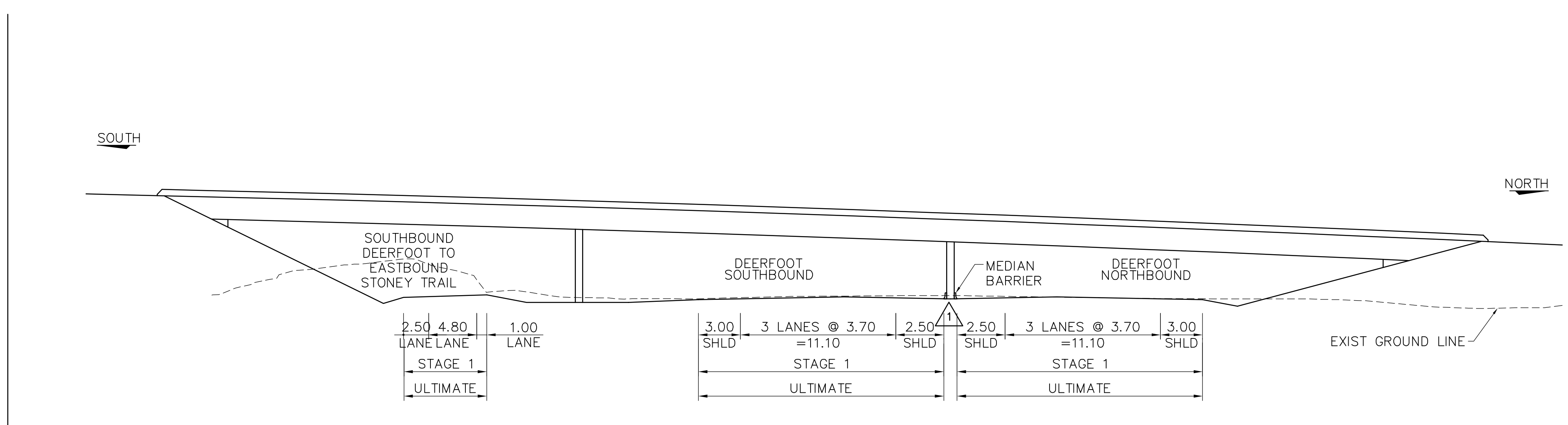
PLAN No. 18–A–42
CONTRACT No. 7875/09
PLAN LOCATION



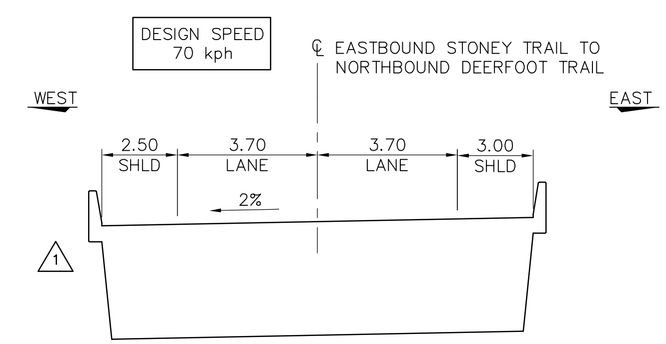
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

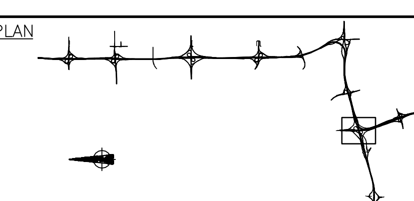


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82010

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
EB STONEY TRAIL TO NB DEERFOOT TRAIL SE
OVER NB-SB DEERFOOT TRAIL SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-43

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
EB STONEY TRAIL TO NB DEERFOOT TRAIL SE
OVER NB-SB DEERFOOT TRAIL SE

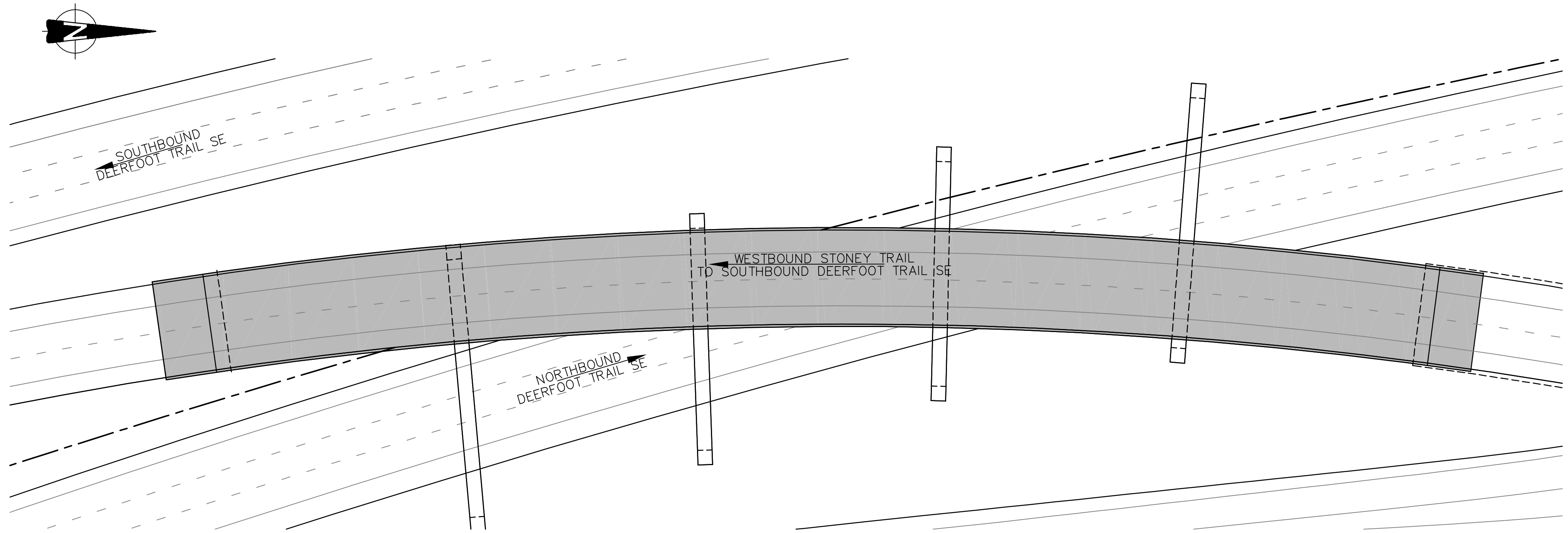
BAR CODE

PLAN No.	18-A-43
CONTRACT No.	7875/09
PLAN LOCATION	

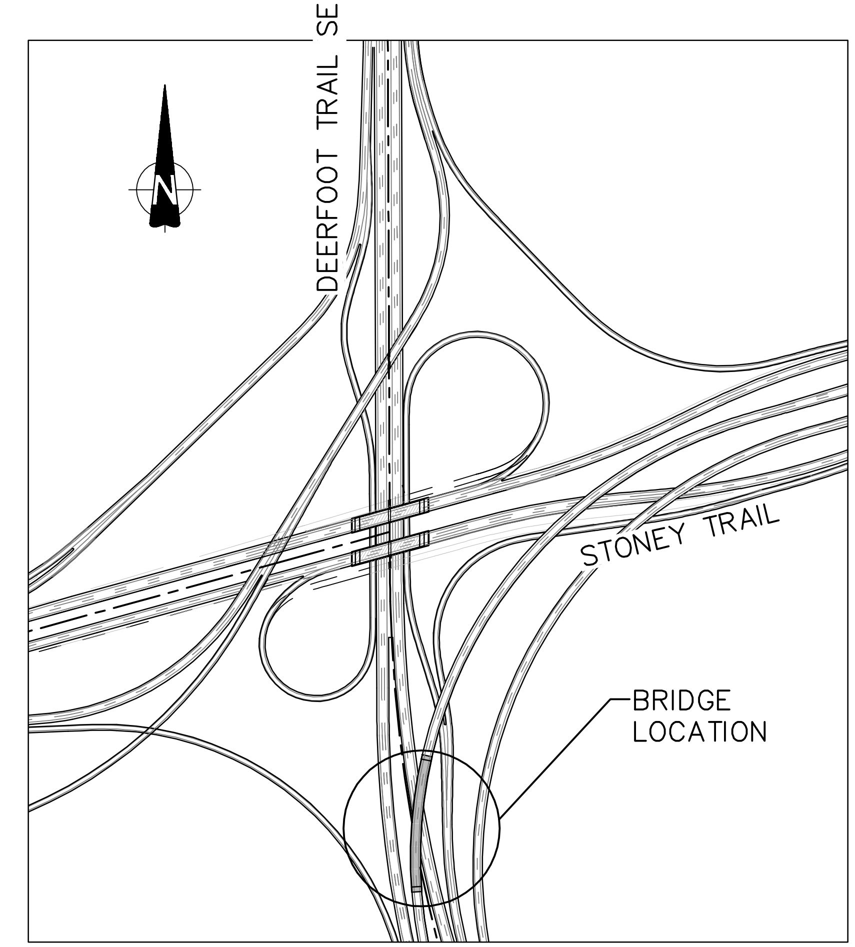
No.	REVISION	BY	DD.MM.YY
1-2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

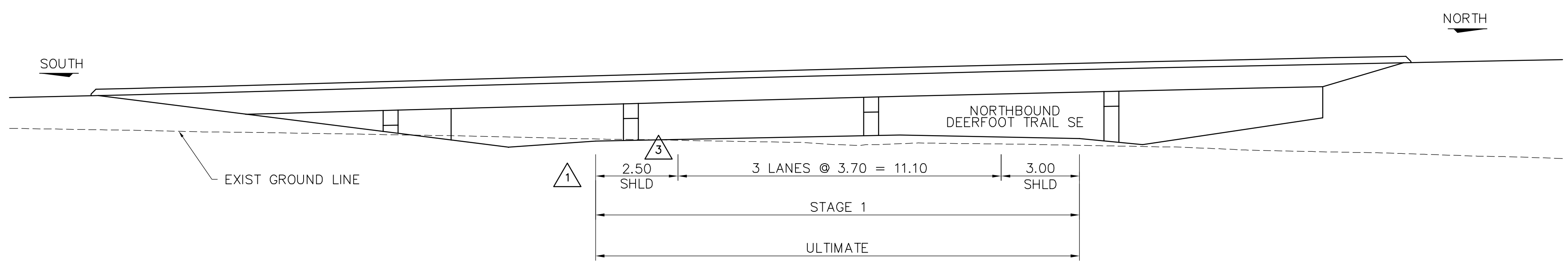
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



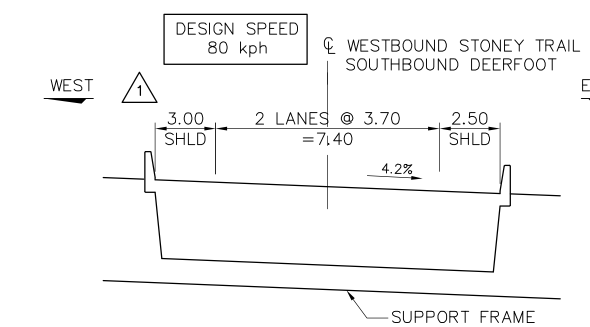
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

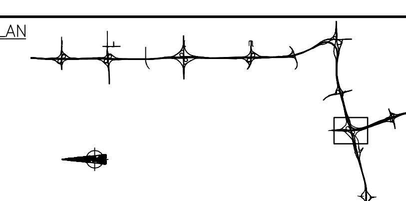


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82010

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
WB STONEY TRAIL TO SB DEERFOOT TRAIL SE
OVER NB DEERFOOT TRAIL SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–44

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
WB STONEY TRAIL TO SB DEERFOOT TRAIL SE
OVER NB DEERFOOT TRAIL SE

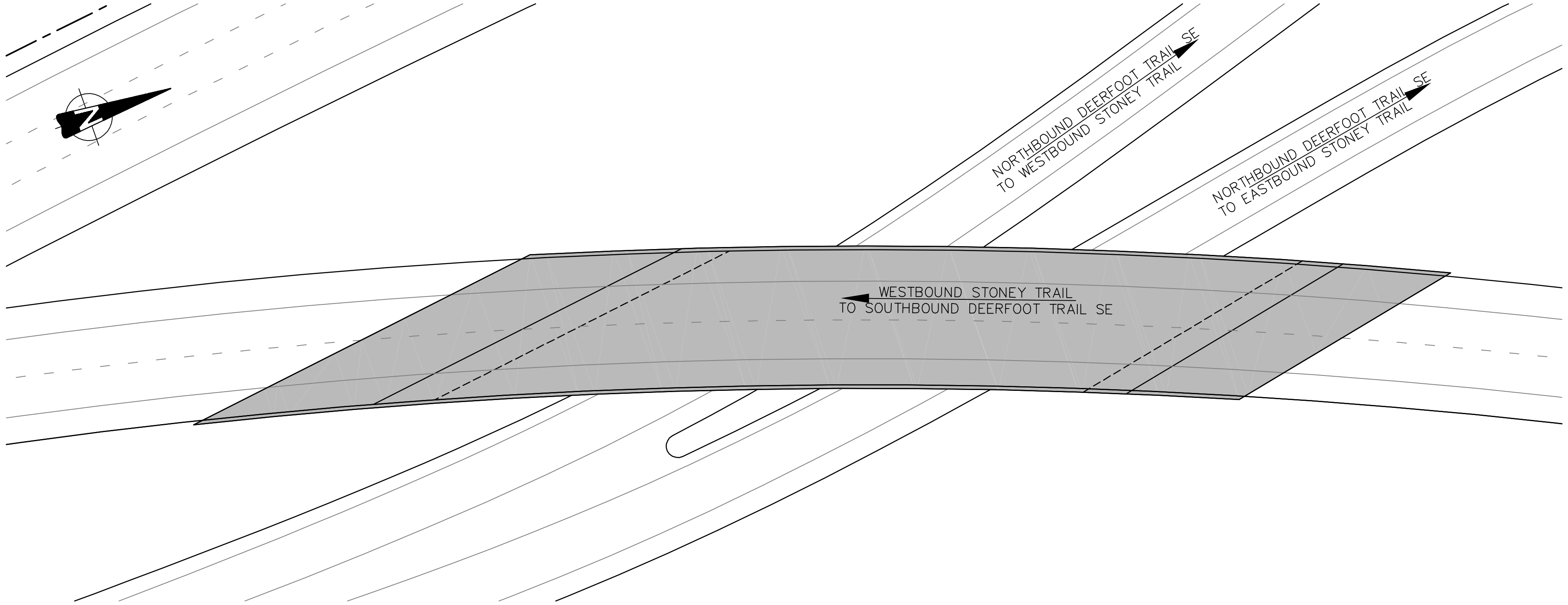
BAR CODE

PLAN No.	18–A–44
CONTRACT No.	7875/09
PLAN LOCATION	

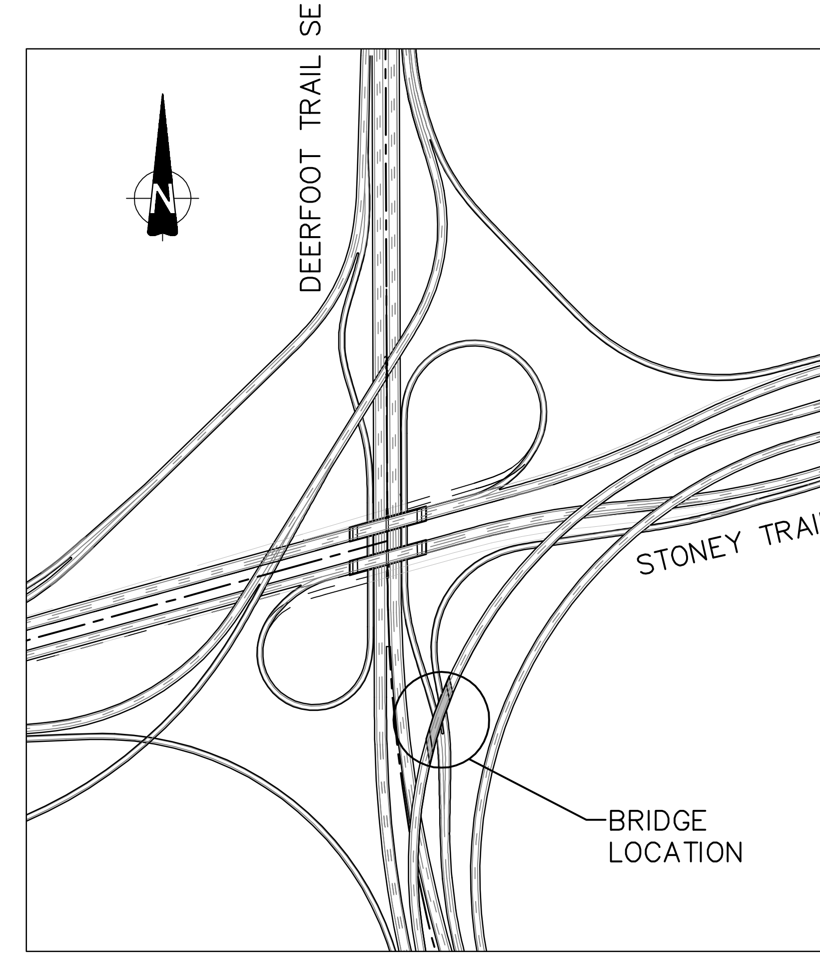
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

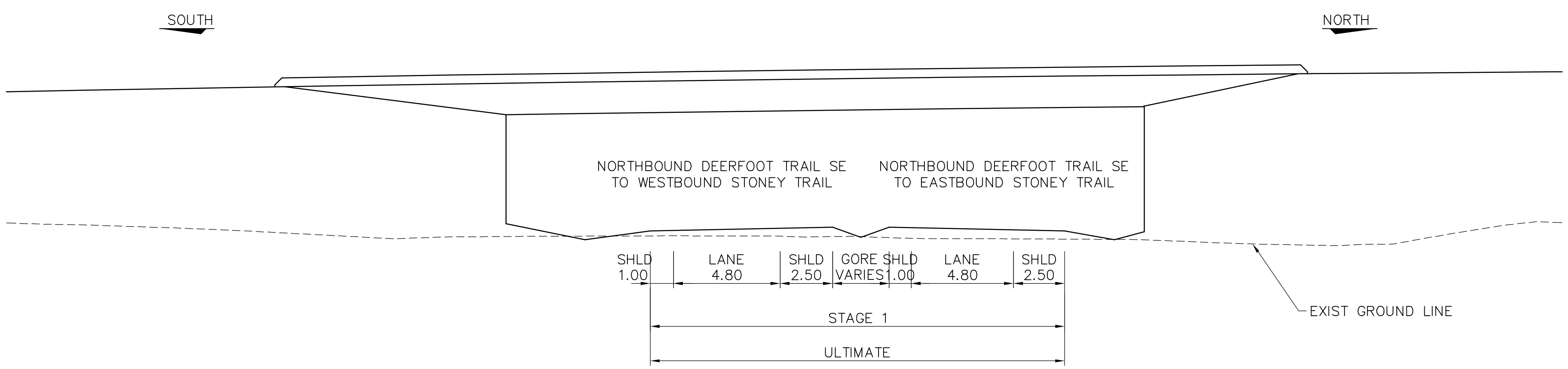
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



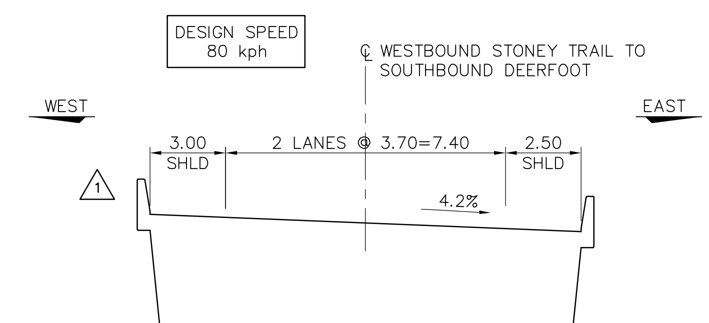
PLAN
NTS



KEY PLAN
1:5000



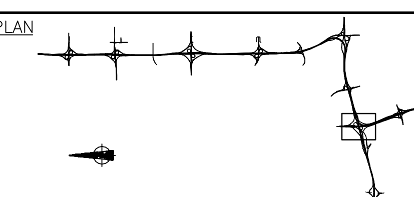
BRIDGE ELEVATION
NTS



BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3
1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO. 82010

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
WB STONEY TRAIL TO SB DEERFOOT TRAIL SE OVER NB DEERFOOT TRAIL SE TO EB-WB STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-45

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

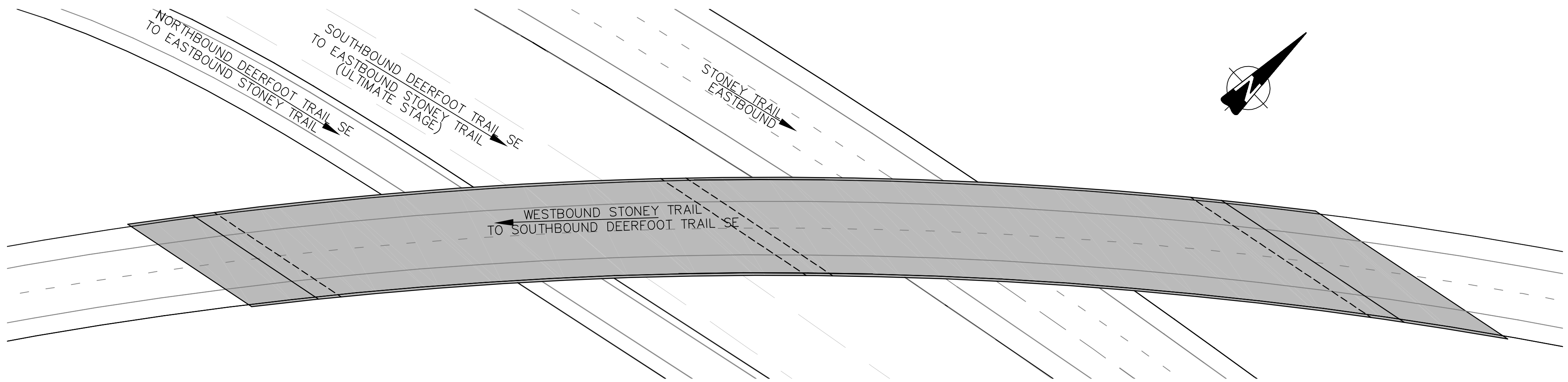
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
WB STONEY TRAIL TO SB DEERFOOT TRAIL SE OVER NB DEERFOOT TRAIL SE TO EB-WB STONEY TRAIL

BAR CODE

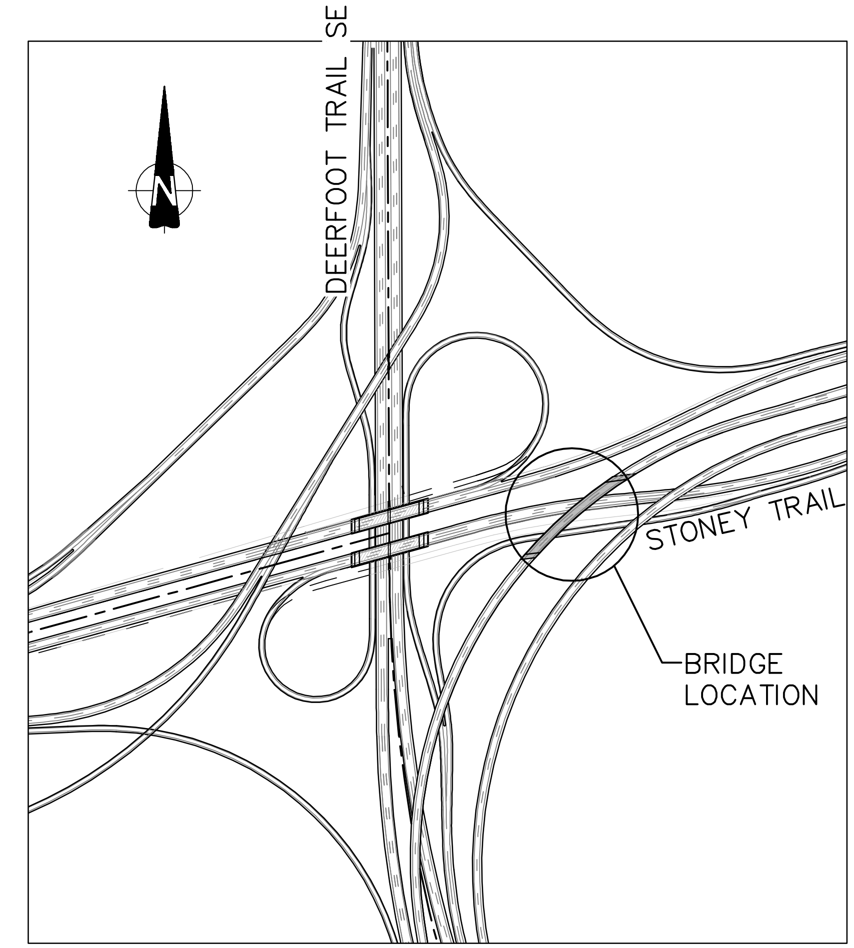
PLAN No.	18-A-45
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

No.	REVISION	BY	DD.MM.YY
1-2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

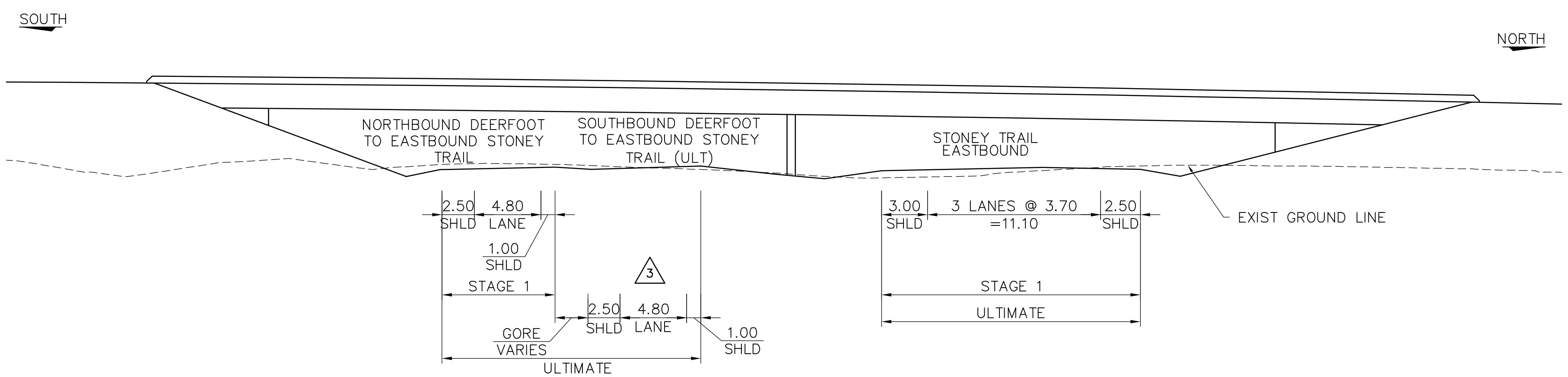
	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-



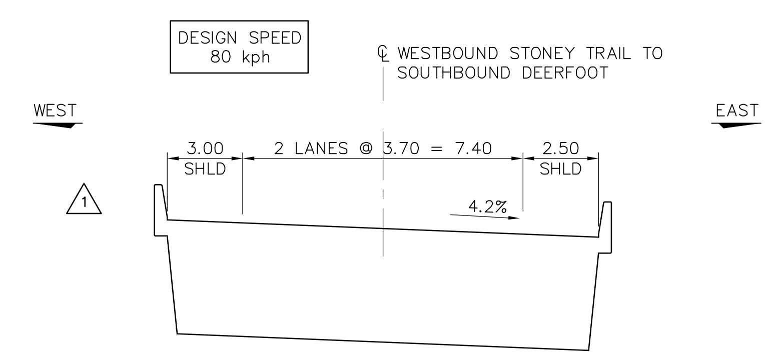
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

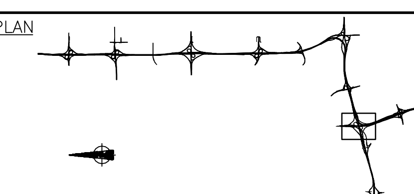


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82010

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
WB STONEY TRAIL TO SB DEERFOOT TRAIL SE
OVER EB STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–46

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
WB STONEY TRAIL TO SB DEERFOOT TRAIL SE
OVER EB STONEY TRAIL

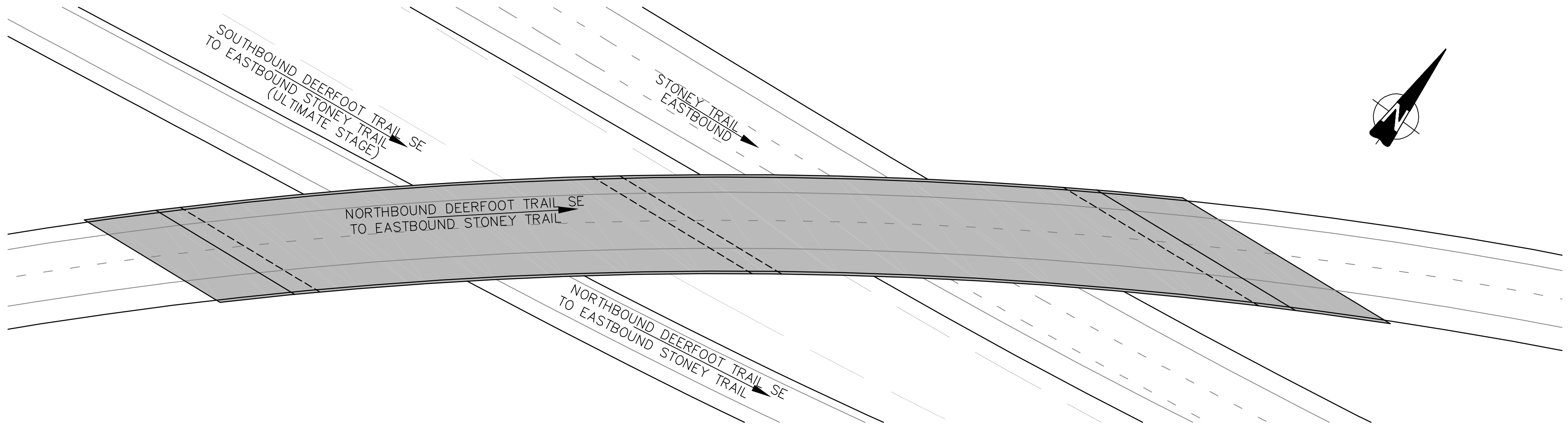
BAR CODE

PLAN No.	18–A–46
CONTRACT No.	7875/09
PLAN LOCATION	

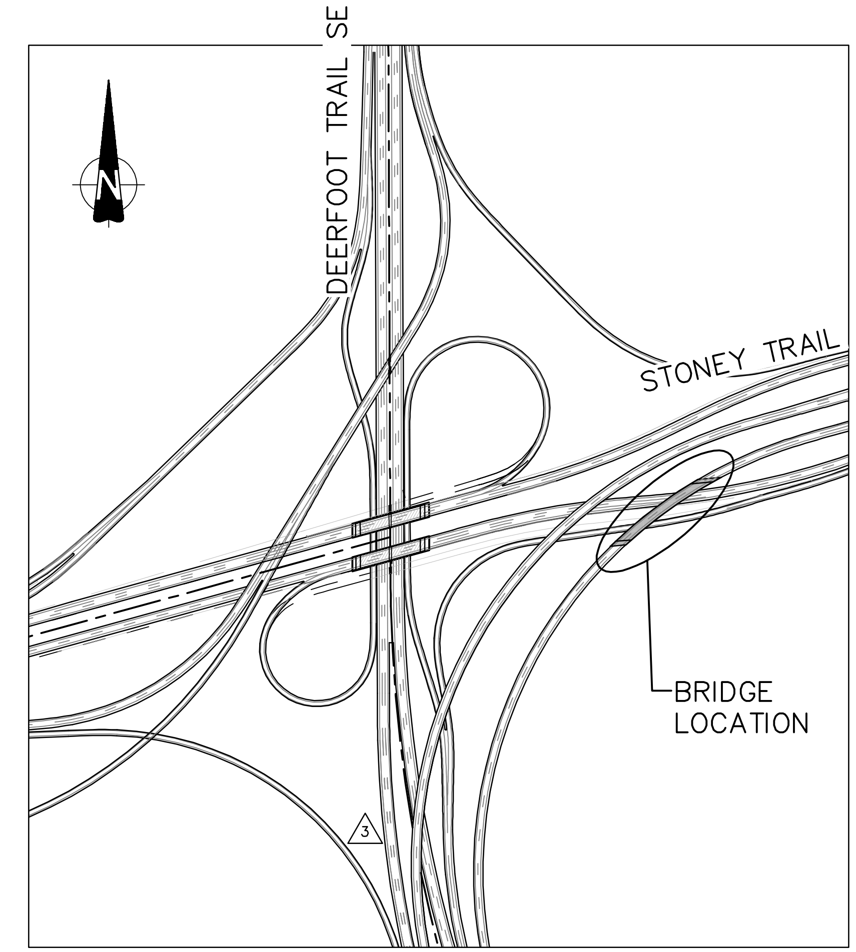
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

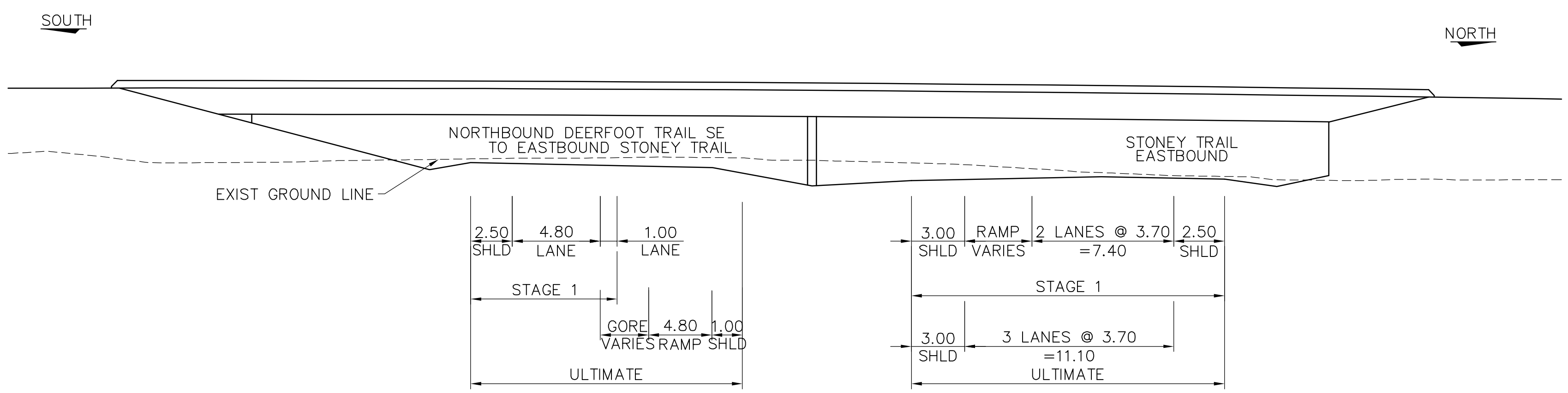
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



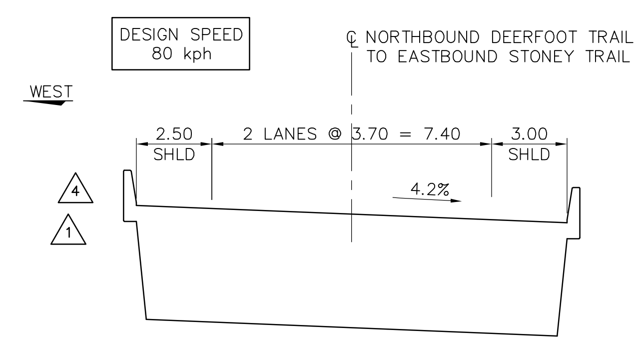
PLAN
NTS



KEY PLAN
1:5000



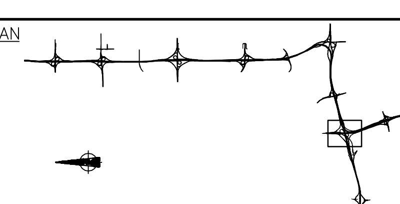
BRIDGE ELEVATION 3
NTS



BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3
1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82010

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
NB DEERFOOT TRAIL SE TO EB STONEY TRAIL OVER EB STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–47

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
NB DEERFOOT TRAIL SE TO EB STONEY TRAIL OVER EB STONEY TRAIL

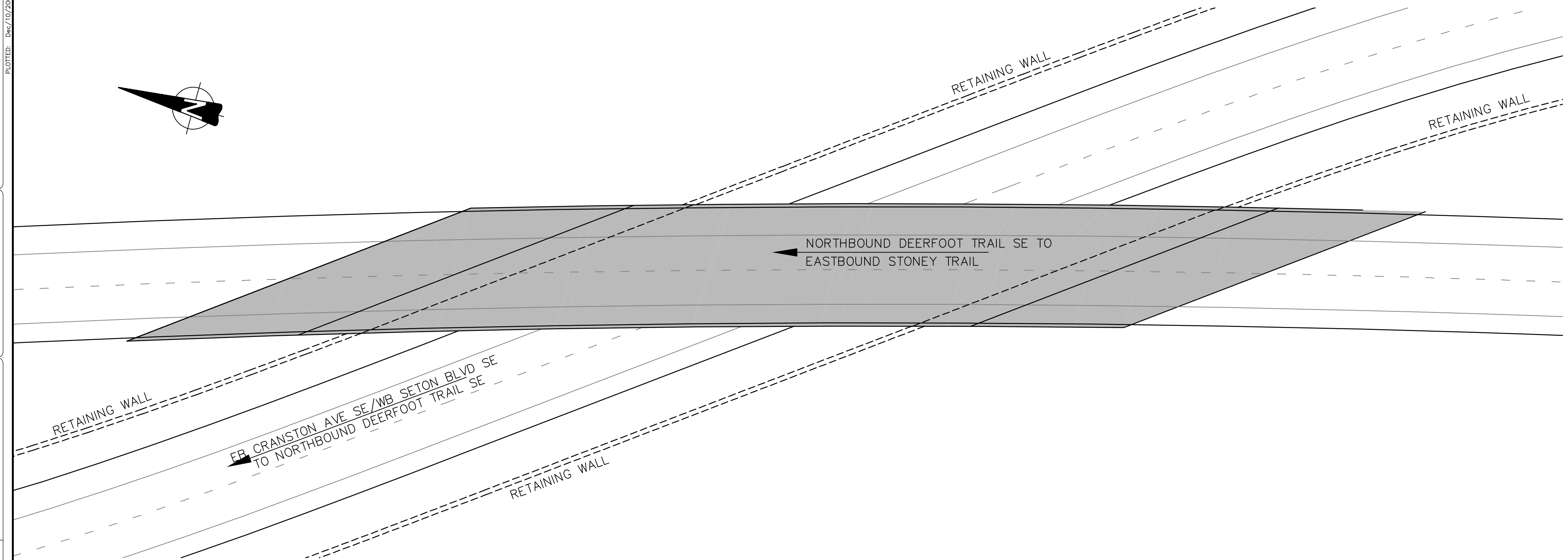
BAR CODE

PLAN No.	18–A–47
CONTRACT No.	7875/09
PLAN LOCATION	

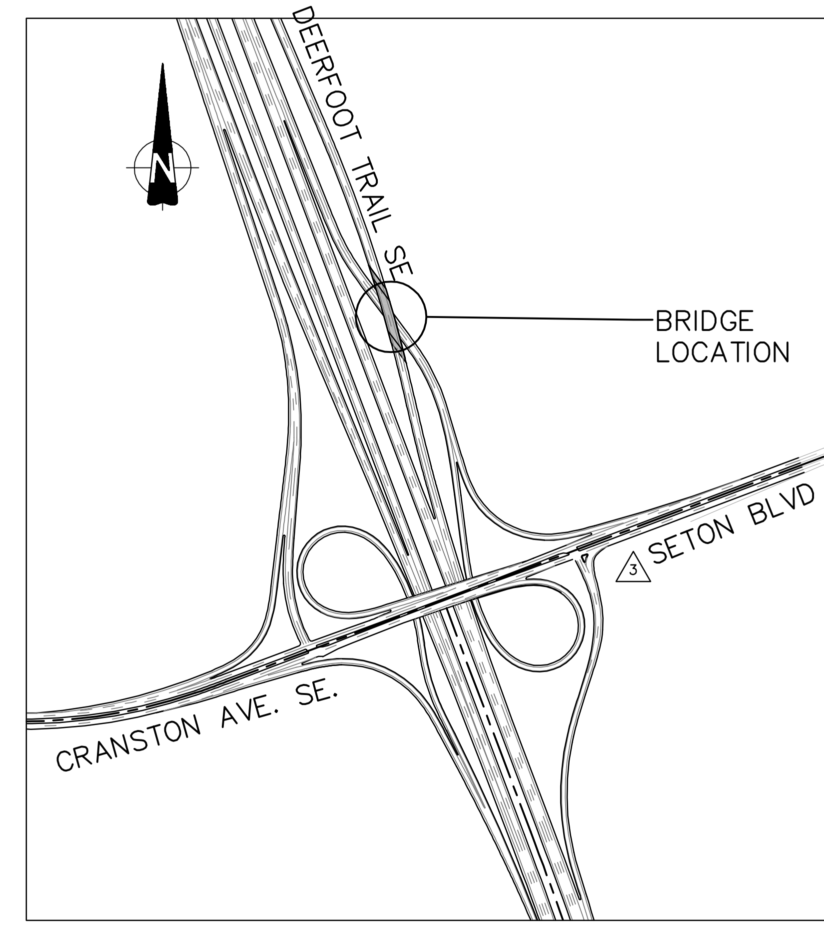
No.	REVISION	BY	DD.MM.YY
1–3	ISSUED FOR ADDENDUM 4, 7 & 11	JB	
4	ISSUED FOR ADDENDUM 16	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
6	ISSUED FOR ADDENDUM 25	JB	10.12.09

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

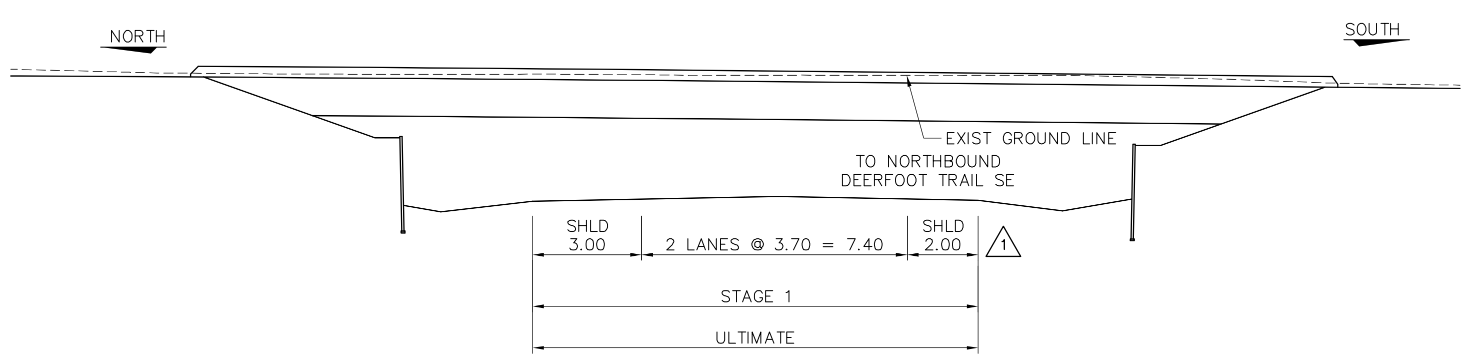
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



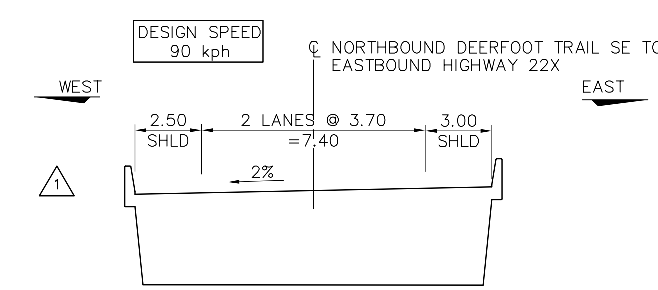
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

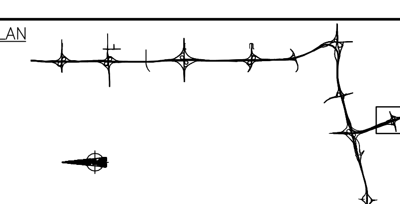


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82011

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB DEERFOOT TR TO EB STONEY TR OVER CRANSTON AVE SE/WB SETON BLVD SE TO NB DEERFOOT TR

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-48

Alberta
TRANSPORTATION

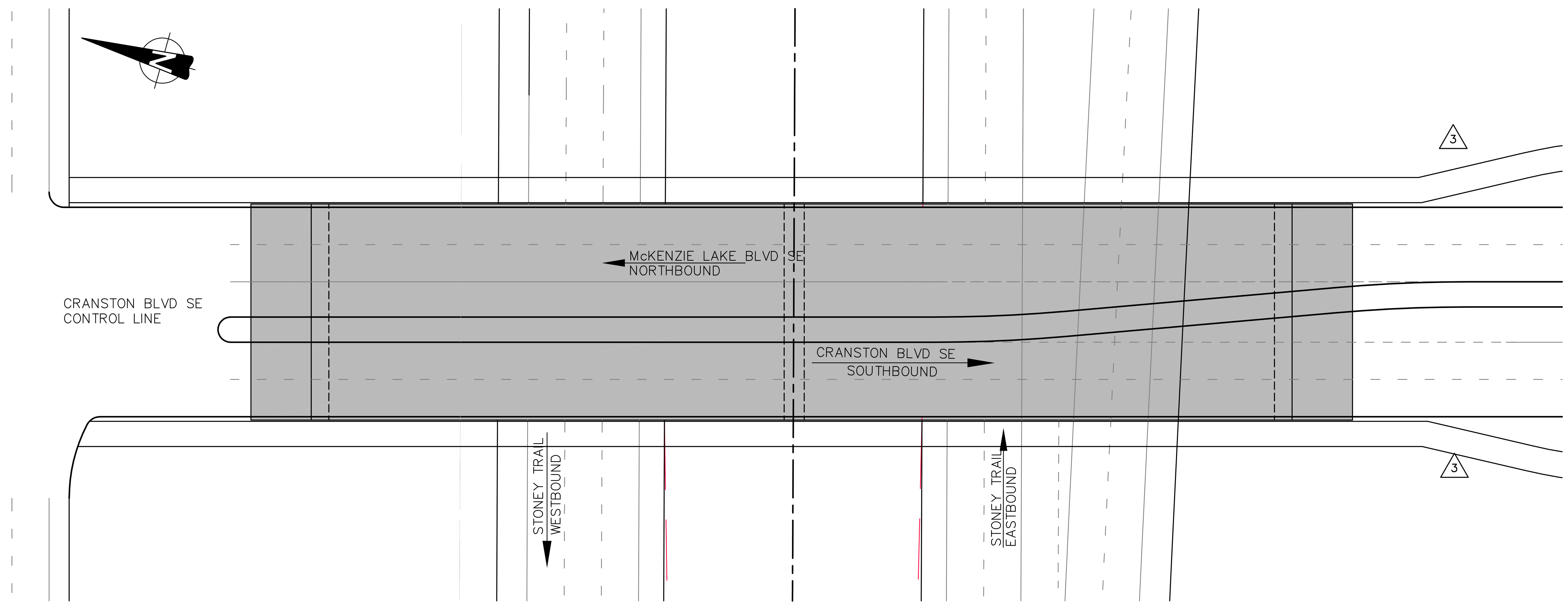
N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
NB DEERFOOT SE TR TO EB STONEY TR OVER CRANSTON AVE SE/WB SETON BLVD SE TO NB DEERFOOT TR SE

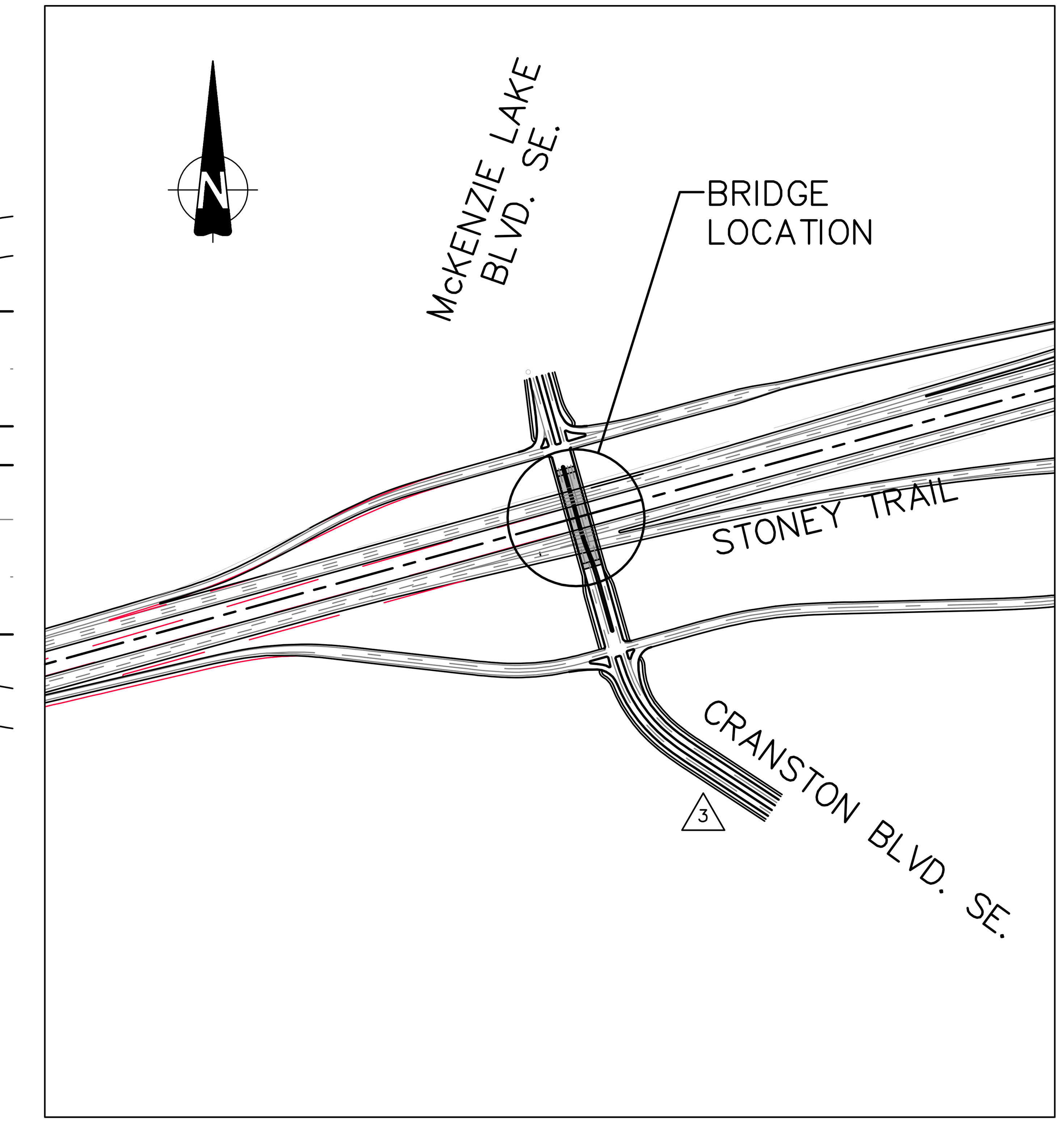
PLAN No. 18-A-48
CONTRACT No. 7875/09
PLAN LOCATION

No.	REVISION	BY	DD.MM.YY
1-2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

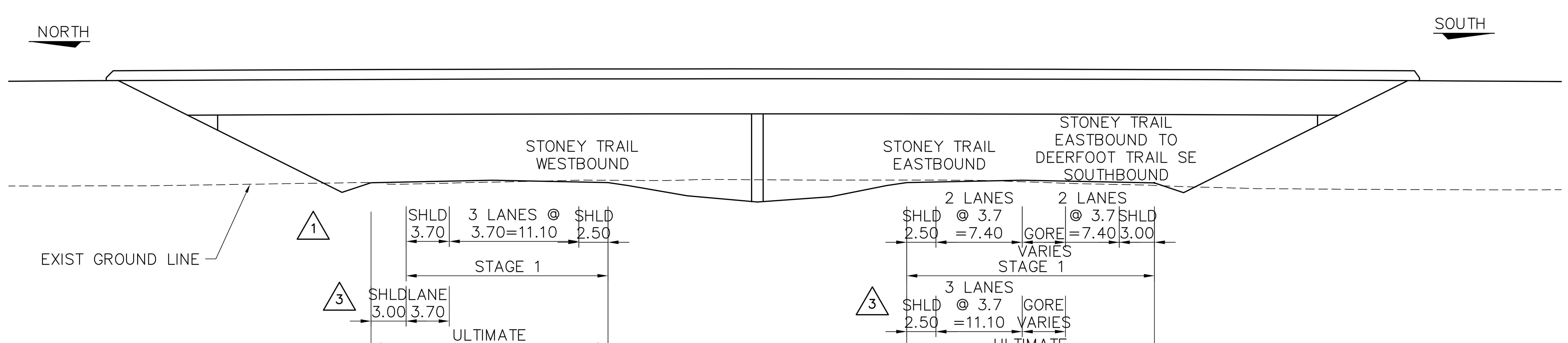
SURVEYED / DESIGNED / CHECKED / DRAWN



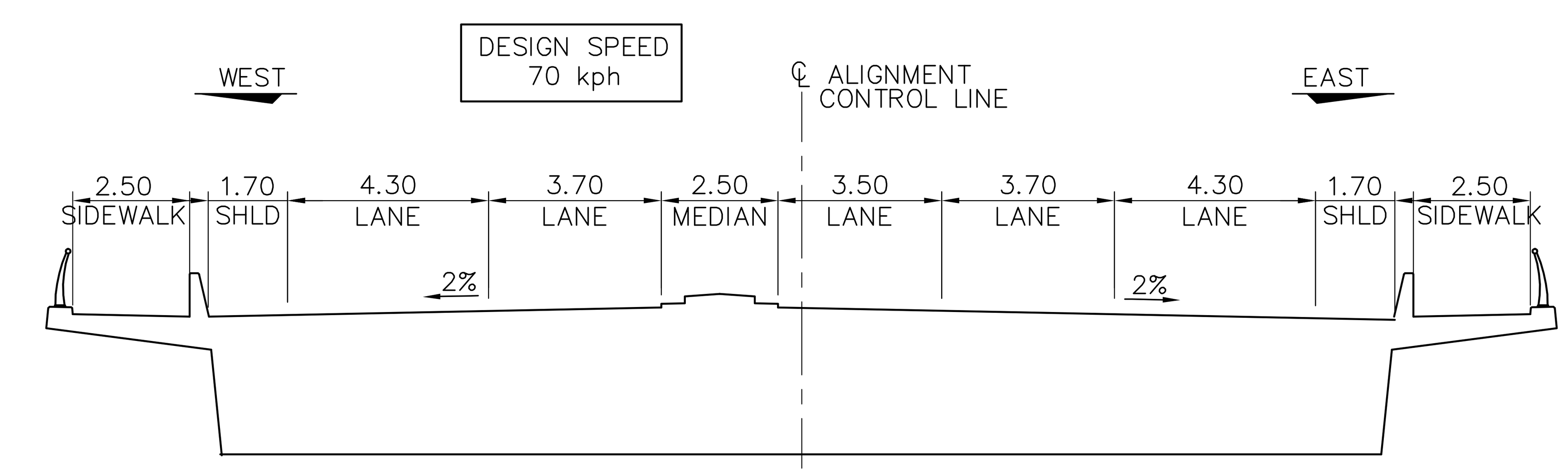
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

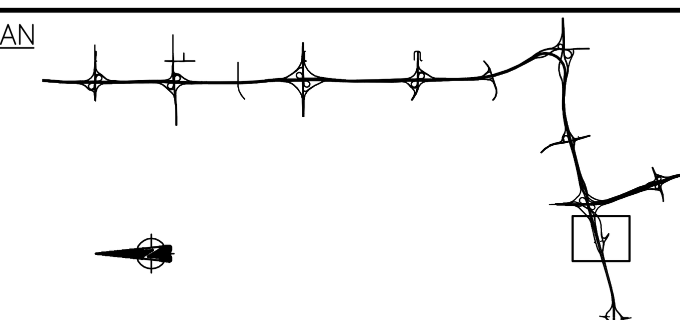


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES: 3

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO.
82451

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION
DRAWINGS
NB–SB MCKENZIE BLVD SE/CRANSTON BLVD SE
OVER EB–WB STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–49

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

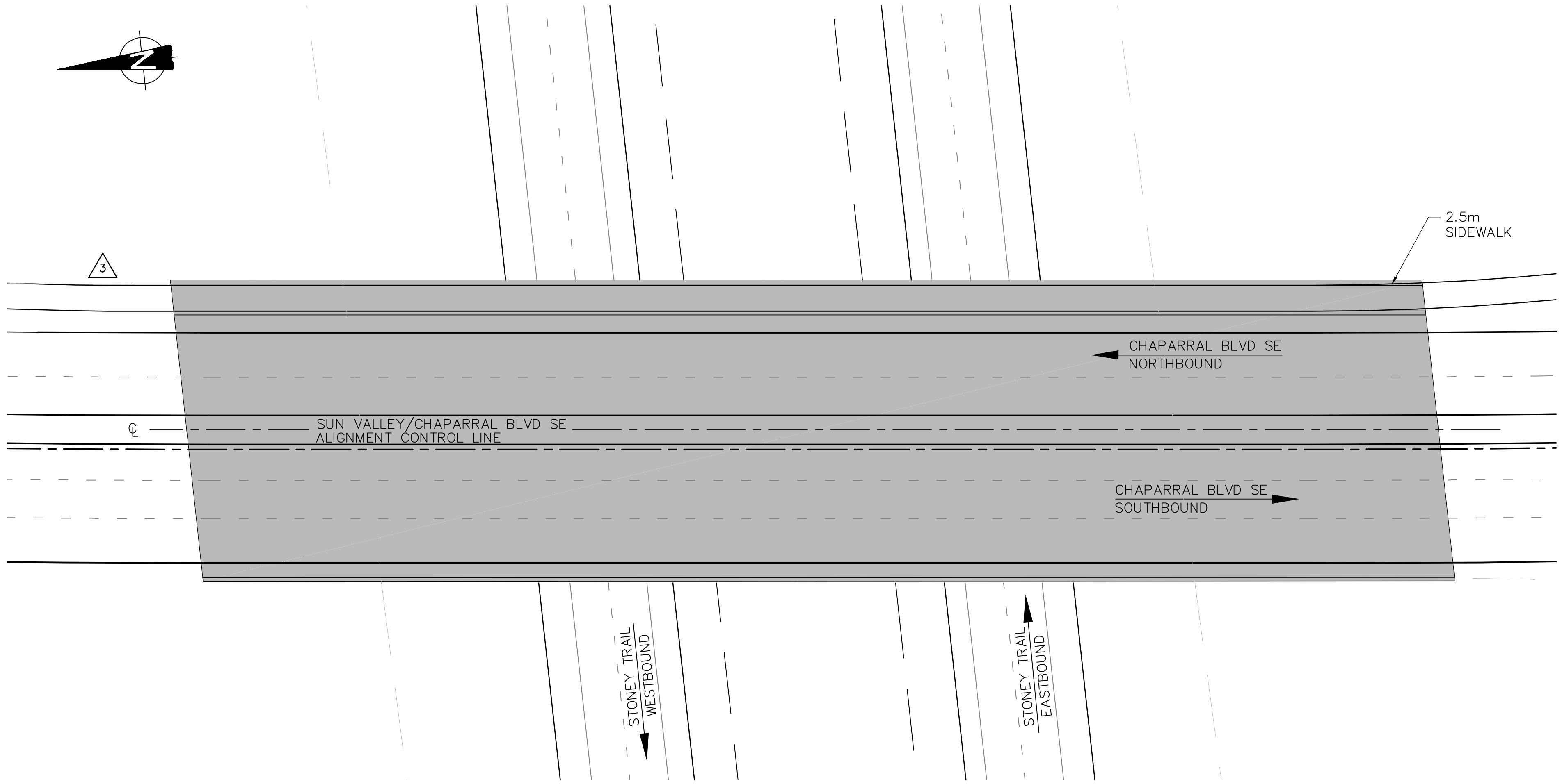
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
NB–SB MCKENZIE BLVD SE/CRANSTON BLVD SE
OVER EB–WB STONEY TRAIL

BAR CODE

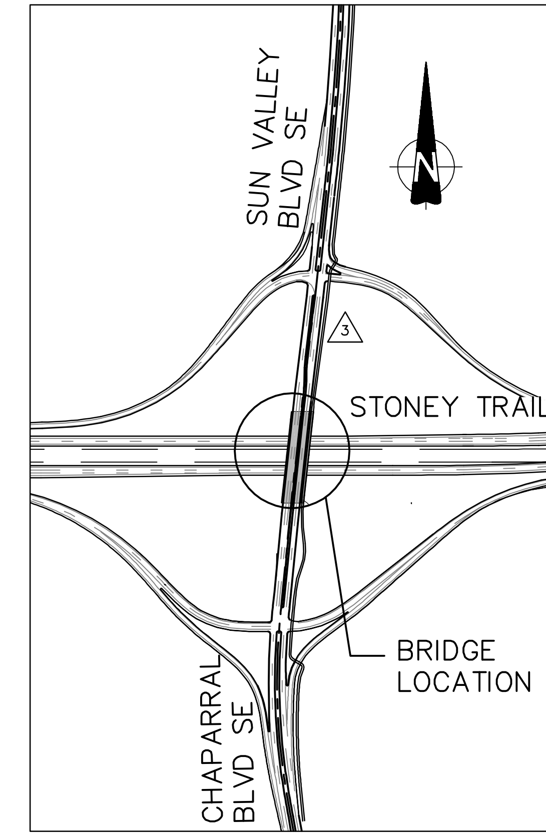
PLAN No.	18–A–49
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

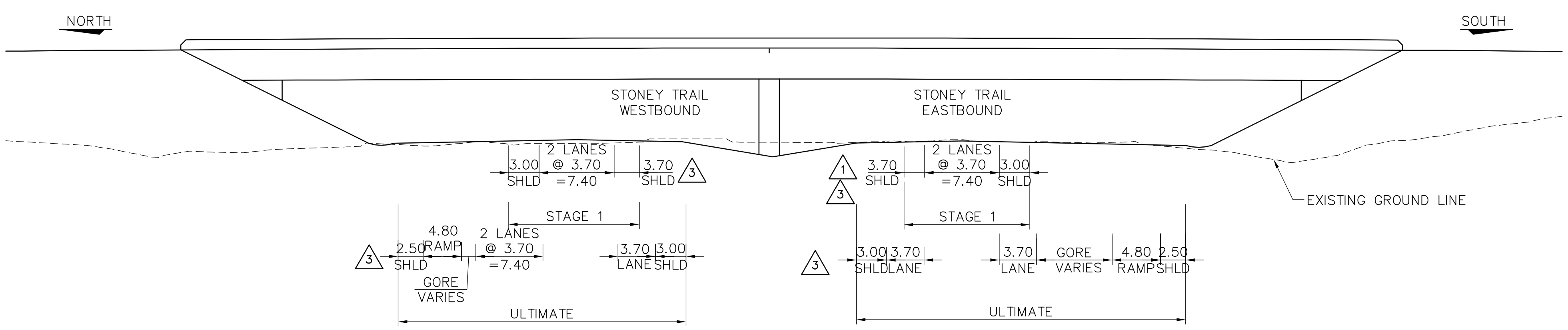
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09



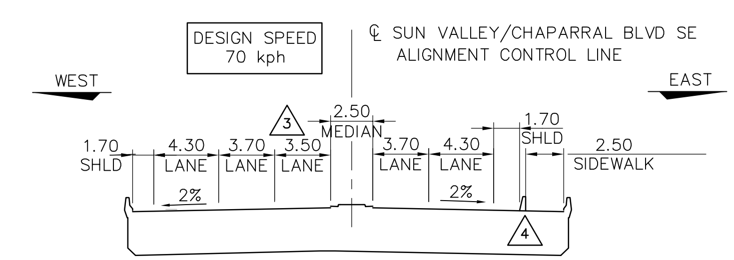
PLAN
NTS



KEY PLAN
1:5000



BRIDGE ELEVATION
NTS

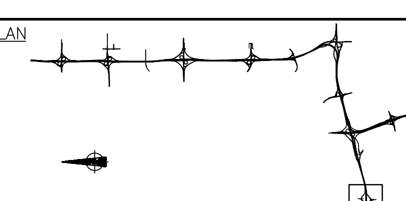


BRIDGE SECTION – STAGE 1 AND ULTIMATE
NTS

NOTES:

1. ALL DIMENSIONS SHOWN ON THE ELEVATION VIEW ARE ON SQUARE AND DO NOT ACCOUNT FOR THE SKEW OF THE STRUCTURE.
2. REFER TO SCHEDULE 18, TECHNICAL REQUIREMENTS FOR DESIGN CRITERIA.
3. ALL DIMENSIONS SHOWN IN METRES.

KEY PLAN



BRIDGE FILE NO. 82452

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
BRIDGE INFORMATION DRAWINGS
SUN VALLEY BLVD SE/CHAPARRAL BLVD SE OVER STONEY TRAIL

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-A-50

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
BRIDGE INFORMATION
SUN VALLEY BLVD SE/CHAPARRAL BLVD SE OVER STONEY TRAIL

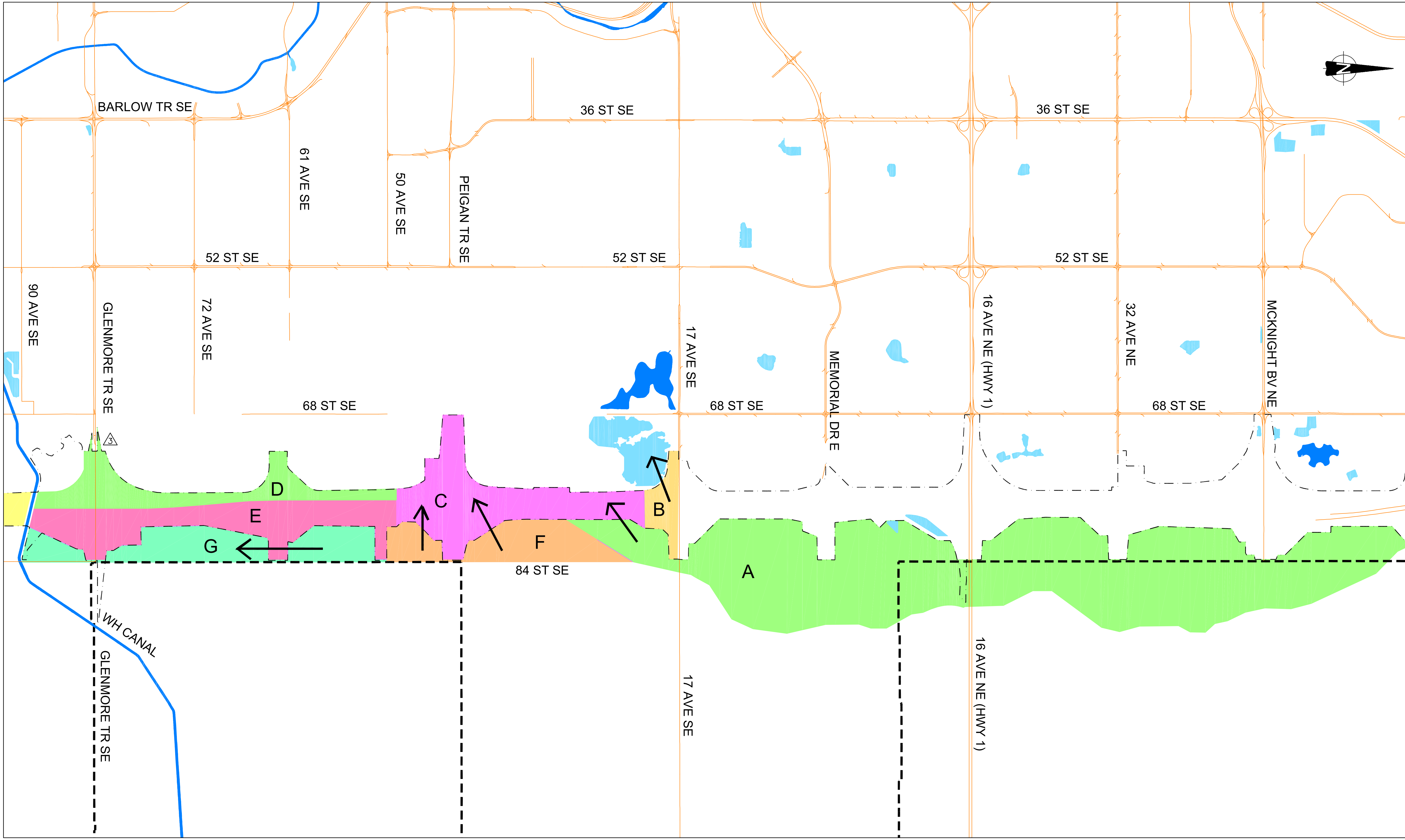
BAR CODE

PLAN No. 18-A-50
CONTRACT No. 7875/09
PLAN LOCATION

No.	REVISION	BY	DD.MM.YY
1-2	ISSUED FOR ADDENDUM 4 & 7	JB	
3	ISSUED FOR ADDENDUM 11	JB	
4	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
5	ISSUED FOR ADDENDUM 25	JB	10.12.09

SURVEYED / DESIGNED / CHECKED / DRAWN

PHOTO No. / TITLE SEARCH DATE / GRAPHICS FILE



NOTES:

LEGEND

- TRANSPORTATION UTILITY CORRIDOR BOUNDARY (3)
- CATCHMENT (VARIOUS COLOURS)
- EXISTING STORM POND
- HYDROLOGY
- ROADS
- MUNICIPAL BOUNDARY (3)
- DRAINAGE DIRECTION

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
DRAINAGE
SE RING ROAD DRAINAGE – PART 1

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

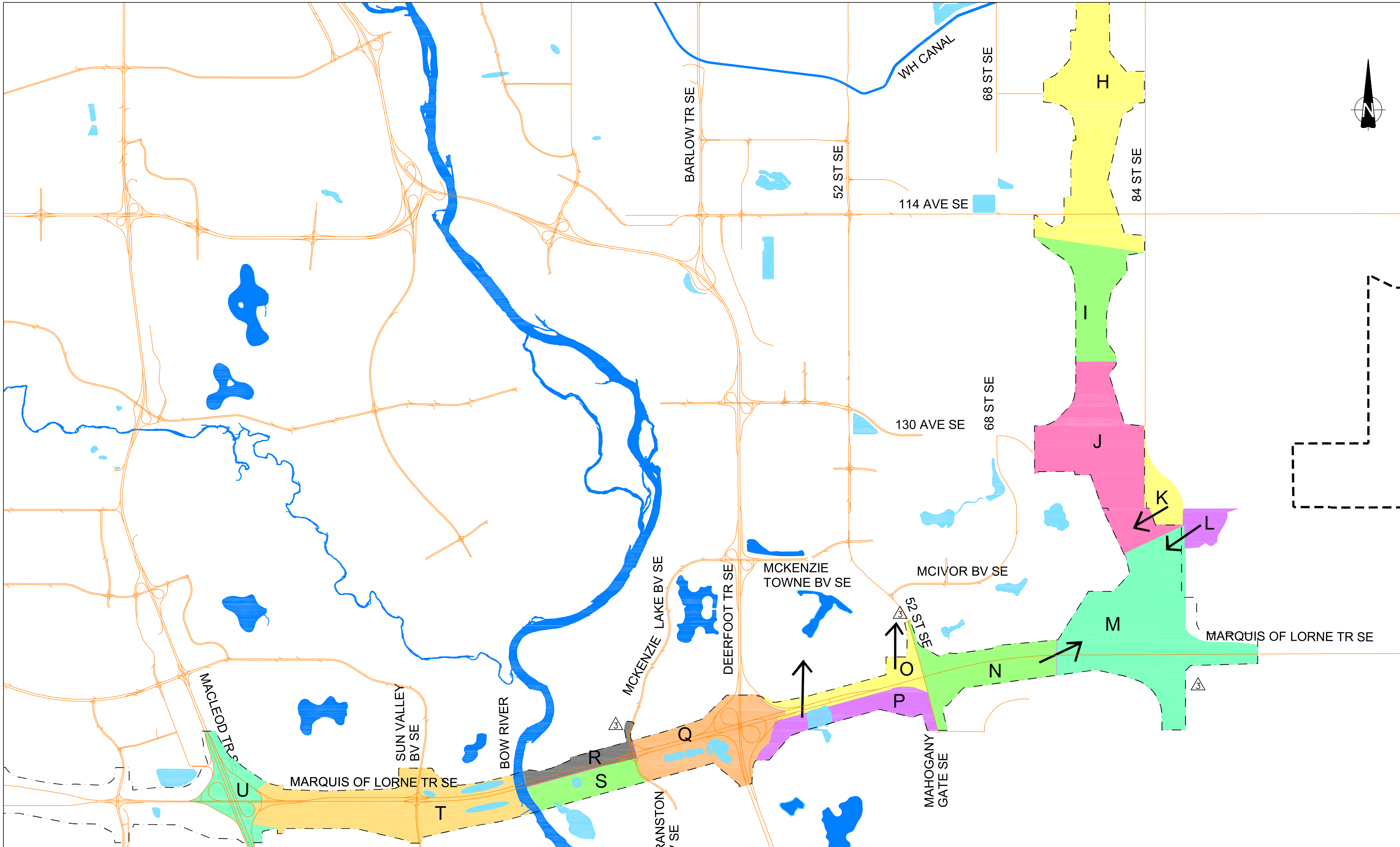
REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–51

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE18 DRAWINGS
DRAINAGE

BAR CODE

PLAN No. 18–A–52
CONTRACT No. 7875/09
PLAN LOCATION

No.	REVISION	BY	DD.MM.YY
1	ISSUED FOR ADDENDUM 7	JB	
2	ISSUED FOR ADDENDUM 11	JB	
3	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
4	ISSUED FOR ADDENDUM 25	JB	10.12.09



NOTES:

LEGEND

- TRANSPORTATION UTILITY CORRIDOR BOUNDARY
- CATCHMENT (VARIOUS COLOURS)
- EXISTING STORM POND
- HYDROLOGY
- ROADS
- MUNICIPAL BOUNDARY
- DRAINAGE DIRECTION

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18 DRAWINGS
DRAINAGE
SE RING ROAD DRAINAGE – PART 2 & 3

Alberta TRANSPORTATION

N.T.S.
DRAWING NOT TO SCALE UNLESS OTHERWISE SPECIFIED

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–A–52

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE18 DRAWINGS
DRAINAGE

BAR CODE

PLAN No. 18–A–52
CONTRACT No. 7875/09
PLAN LOCATION

No.	REVISION	BY	DD.MM.YY
1	ISSUED FOR ADDENDUM 7	JB	
2	ISSUED FOR ADDENDUM 11	JB	
3	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	
4	ISSUED FOR ADDENDUM 25	JB	10.12.09

SURVEYED
DESIGNED
CHECKED
DRAWN

APPENDIX B - SELECT DEPARTMENT STANDARD DRAWINGS AND REFERENCE TABLES

Standard Concrete Joints - S-1411-87

Standard Construction Joints - S-1412-99

Type 1c Sealer for Precast Girders - S-1637-97

Installation of Large Steel Pipes - S-1418-93

Details of Standard 2:1 Sloped End Sections For CSP Round Culverts - Table A

Details of Standard 2:1 Sloped End Sections For CSP Arch Culverts - Table B

Details of Standard 2:1 Sloped End Sections For SPCSP Round Culverts - Table C

Sign Structure Steel Identification Plaque - S-1682-02

Standard Pipe Pile Splice - S-1414-87

Standard H-Pile Splice - S-1415-87

Standard Close Pipe Pile End Plate - S-1479

Sketch SK-1 (Finishes and Sealing for Exterior Concrete Girders)

Deck Waterproofing System - S-1443-98 (rev 7)

Sketch SK-2 (Vehicle 1 – 32 Wheel Trailer)

Sketch SK-3 (Vehicle 2 – 48 Wheel Trailer)

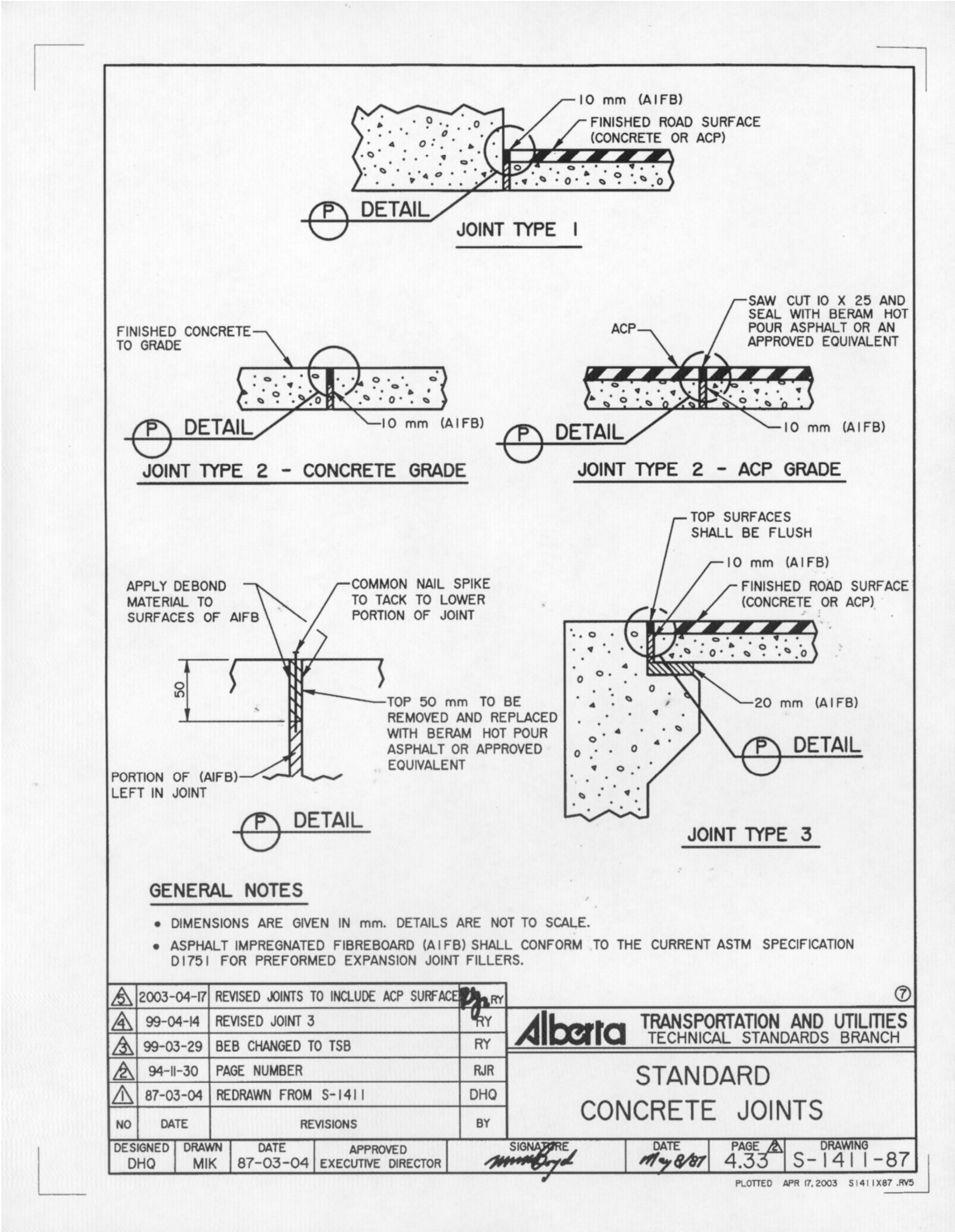
Sketch SK-4 (Vehicle 3 – 64 Wheel Trailer)

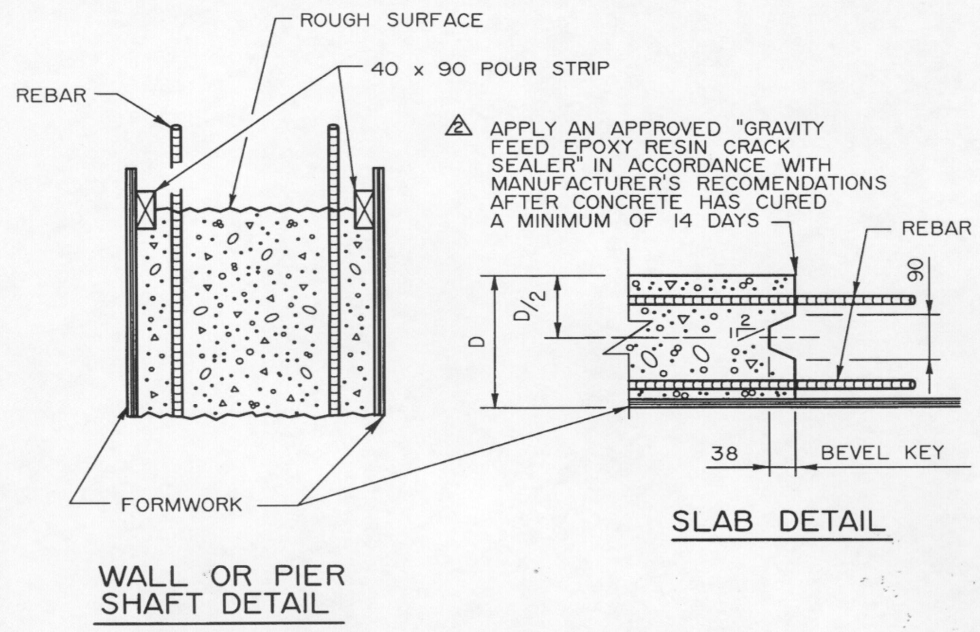
Sketch SK-5 (Vehicle 4 – 10 Line 2 File Road Style Scheurle Trailer)

Sketch SK-6 (Vehicle 5 - 12 Line 2 File Road Style Scheurle Trailer)

Sketch SK-7 (Vehicle 6 - Mobile Crane)

Sketch SK-8 (Different Axle Type and Tire Spacing)


10 mm (AIFB)
FINISHED ROAD SURFACE (CONCRETE OR ACP)
P DETAIL
JOINT TYPE 1
FINISHED CONCRETE TO GRADE
10 mm (AIFB)
P DETAIL
JOINT TYPE 2 - CONCRETE GRADE
ACP
SAW CUT 10 X 25 AND SEAL WITH BERAM HOT POUR ASPHALT OR AN APPROVED EQUIVALENT
10 mm (AIFB)
P DETAIL
JOINT TYPE 2 - ACP GRADE
APPLY DEBOND MATERIAL TO SURFACES OF AIFB
COMMON NAIL SPIKE TO TACK TO LOWER PORTION OF JOINT
50
TOP 50 mm TO BE REMOVED AND REPLACED WITH BERAM HOT POUR ASPHALT OR APPROVED EQUIVALENT
PORTION OF (AIFB) LEFT IN JOINT
P DETAIL
TOP SURFACES SHALL BE FLUSH
10 mm (AIFB)
FINISHED ROAD SURFACE (CONCRETE OR ACP)
20 mm (AIFB)
P DETAIL
JOINT TYPE 3
GENERAL NOTES
• DIMENSIONS ARE GIVEN IN mm. DETAILS ARE NOT TO SCALE.
• ASPHALT IMPREGNATED FIBREBOARD (AIFB) SHALL CONFORM TO THE CURRENT ASTM SPECIFICATION D1751 FOR PREFORMED EXPANSION JOINT FILLERS.
5 2003-04-17 REVISED JOINTS TO INCLUDE ACP SURFACE RY
4 99-04-14 REVISED JOINT 3 RY
3 99-03-29 BEB CHANGED TO TSB RY
2 94-11-30 PAGE NUMBER RJR
1 87-03-04 REDRAWN FROM S-1411 DHQ
NO DATE REVISIONS BY
7
Alberta TRANSPORTATION AND UTILITIES
TECHNICAL STANDARDS BRANCH
STANDARD CONCRETE JOINTS
DESIGNED DHQ
DRAWN MIK
DATE 87-03-04
APPROVED EXECUTIVE DIRECTOR
SIGNATURE
DATE May 8/87
PAGE 4.33
DRAWING S-1411-87
PLOTTED APR 17, 2003 S1411X87 .RV5



GENERAL NOTES

- DIMENSIONS ARE GIVEN IN mm. DETAILS ARE NOT TO SCALE.
- SURFACES OF HORIZONTAL JOINTS SHALL BE THOROUGHLY CONSOLIDATED AND INTENTIONALLY LEFT IN A ROUGHENED CONDITION.
- JOINTS SHALL BE CLEANED OF SURFACE LAITANCE AND OTHER FOREIGN MATERIALS PRIOR TO PLACING NEW CONCRETE.

(8)

DRAFTING STANDARDS PAGE: 6.3

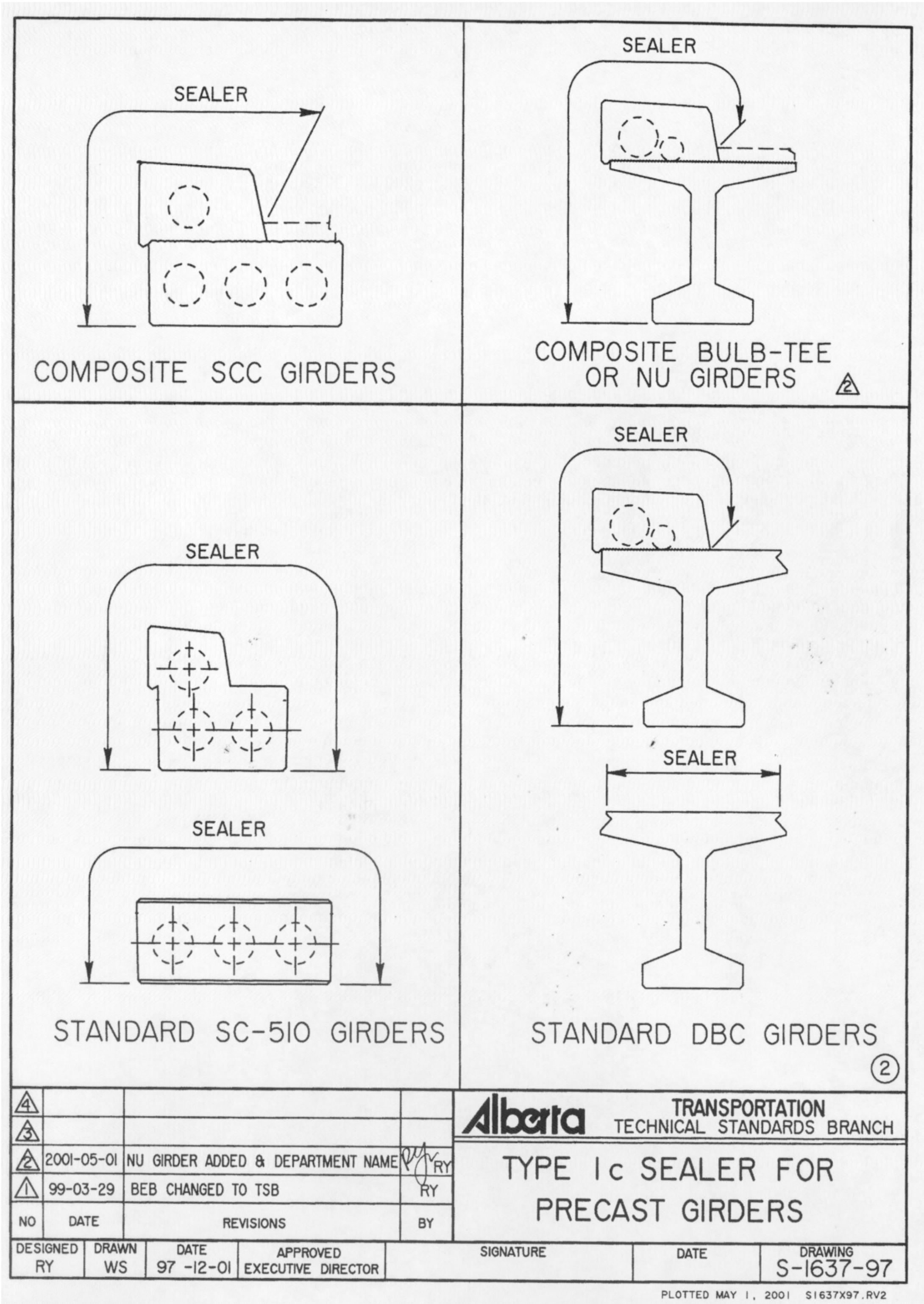
NO	DATE	REVISIONS	BY
4			
3			
2	01-06-06	SLAB DETAIL JOINT REVISED	RY
1	99-04-12	REDRAWN FROM S-1412-98 REV 1	RY

Alberta TRANSPORTATION AND UTILITIES
TECHNICAL STANDARDS BRANCH

STANDARD
CONSTRUCTION JOINTS

DESIGNED	DRAWN	DATE	APPROVED	SIGNATURE	DATE	PAGE	DRAWING
RY	WS	99-04-12	EXECUTIVE DIRECTOR		May 8/87	4.35	S-1412-99

PLOTTED JUNE 06, 2001 S1412X99.RVI


SEALER
COMPOSITE SCC GIRDERS
SEALER
COMPOSITE BULB-TEE
OR NU GIRDERS
SEALER
SEALER
STANDARD SC-510 GIRDERS
SEALER
SEALER
STANDARD DBC GIRDERS
2
4
3
2 2001-05-01 NU GIRDER ADDED & DEPARTMENT NAME RY
1 99-03-29 BEB CHANGED TO TSB RY
NO DATE REVISIONS BY
Alberta TRANSPORTATION
TECHNICAL STANDARDS BRANCH
TYPE Ic SEALER FOR
PRECAST GIRDERS
DESIGNED RY
DRAWN WS
DATE 97-12-01
APPROVED EXECUTIVE DIRECTOR
SIGNATURE
DATE
DRAWING S-1637-97
PLOTTED MAY 1, 2001 S1637X97.RV2

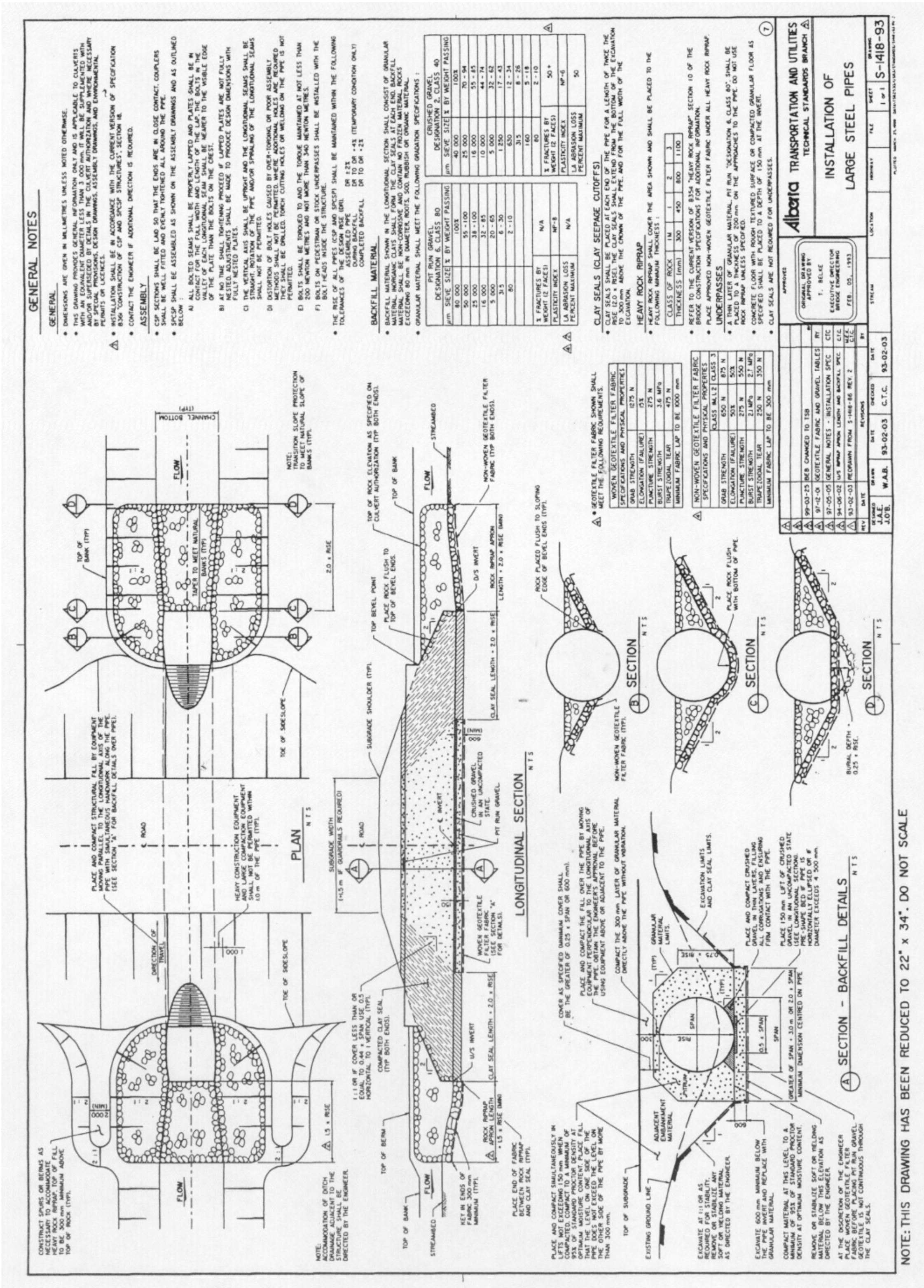
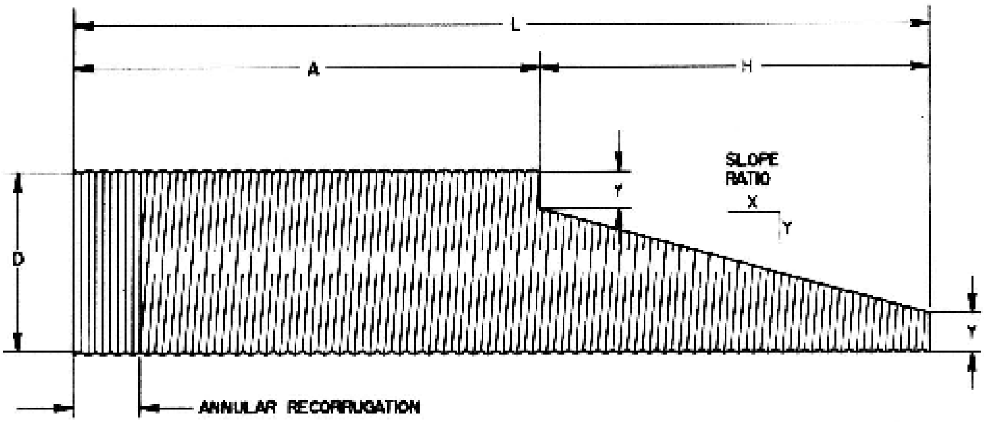
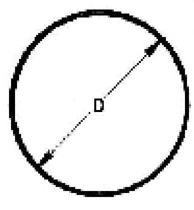

GENERAL NOTES
PLAN
LONGITUDINAL SECTION
SECTION - BACKFILL DETAILS
SECTION
Alberta TRANSPORTATION AND UTILITIES
TECHNICAL STANDARDS BRANCH
INSTALLATION OF LARGE STEEL PIPES
S-1418-93
NOTE: THIS DRAWING HAS BEEN REDUCED TO 22" x 34". DO NOT SCALE

TABLE A
DETAILS OF STANDARD 2:1 SLOPED END SECTIONS FOR CSP ROUND CULVERTS

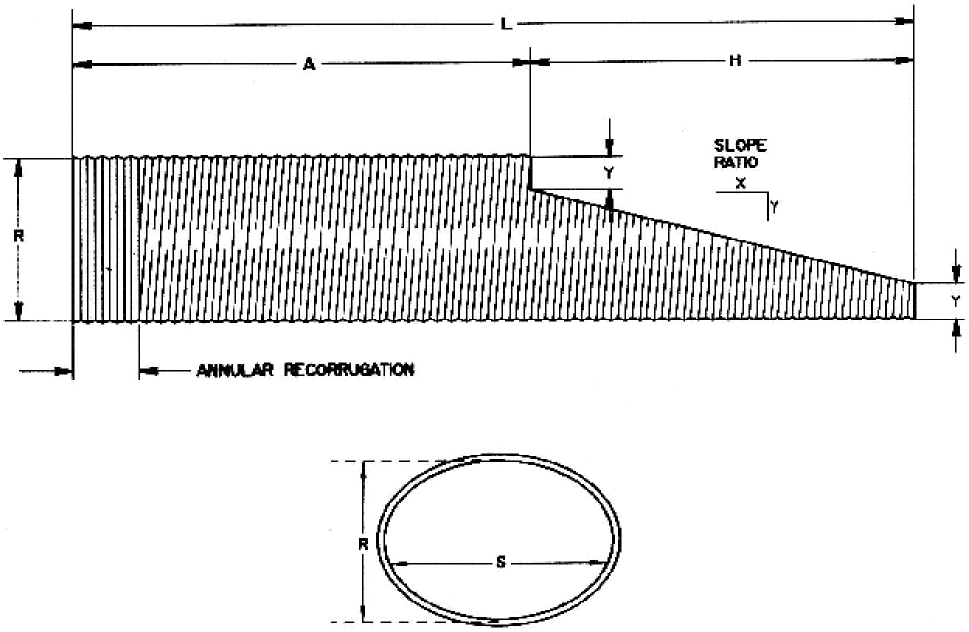


INSIDE DIAMETER "D" mm	SLOPE RATIO X:Y	"Y" mm	"A" m	"H" m	INVERT LENGTH OF SLOPED END SECTION "L" m
1200	2:1	150	4.2	1,800	6.0
1400	2:1	200	4.0	2.000	6.0
1600	2:1	200	3.6	2.400	6.0
1800	2:1	300	3.6	2.400	6.0
2000	2:1	300	5.2	2,800	8.0
2200	2:1	300	4.8	3,200	8.0
2400	2:1	400	4.8	3.200	8.0
2700	2:1	400	6.2	3.800	10.0
3000	2:1	500	6.0	4.000	10.0
3300	2:1	500	5.4	4.600	10.0
3600	2:1	600	5.2	4.800	10.0



SECTION

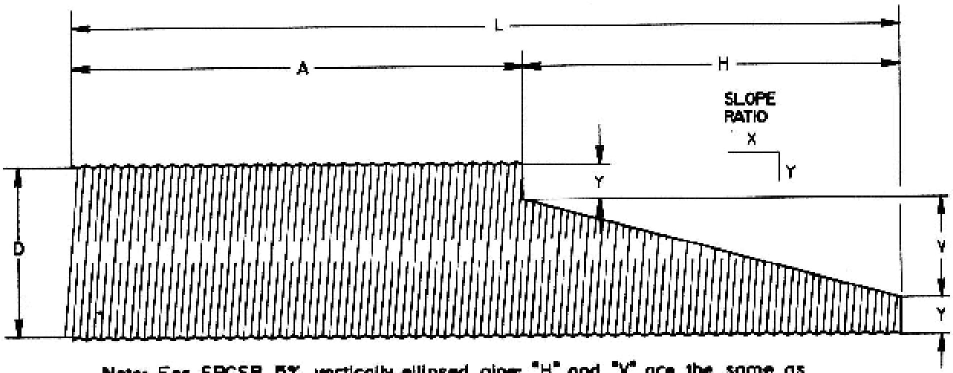
TABLE B
DETAILS OF STANDARD 2:1 SLOPED END SECTIONS FOR CSP ARCH CULVERTS



EQUIVALENT INSIDE DIAMETER "D" mm	SPAN "S" mm	RISE "R" mm	SLOPE RATIO X:Y	"Y" mm	"A" m	"H" m	INVERT LENGTH OF SLOPED END SECTION "L" m
1200	1390	970	2:1	150	4.660	1.340	6.0
1400	1630	1120	2:1	200	4.560	1.440	6.0
1600	1880	1260	2:1	250	4.480	1.520	6.0
1800	2130	1400	2:1	300	4.400	1.600	6.0

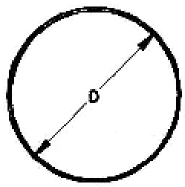
Graphics File: P:\web\manual\cb6\chapt-5\5\revisions\cb6515ml.man

TABLE C
DETAILS OF STANDARD 2:1 SLOPED END SECTIONS FOR SPCSP ROUND CULVERTS



Note: For SPCSP 5% vertically ellipsed pipe; "H" and "Y" are the same as for a round pipe of equivalent diameter; "Y" is variable with the increase in rise.

INSIDE DIAMETER "D" mm	SLOPE RATIO X:Y	"Y" mm	"H" m
1500	2:1	293	1.828
1660	2:1	373	1.828
1810	2:1	295	2.440
1970	2:1	375	2.440
2120	2:1	298	3.048
2280	2:1	378	3.048
2430	2:1	453	3.048
2590	2:1	533	3.048
2740	2:1	455	3.658
3050	2:1	610	3.658
3360	2:1	765	3.658
3670	2:1	920	3.658
3990	2:1	1080	3.658
4300	2:1	1235	3.658
4610	2:1	1390	3.658
4920	2:1	936	6.096
5230	2:1	1091	6.096
5540	2:1	1246	6.096
5850	2:1	1095	7.320
6160	2:1	1250	7.320
6470	2:1	1405	7.320
6780	2:1	1560	7.320
7090	2:1	1715	7.320
7400	2:1	1870	7.320
7710	2:1	2025	7.320
8020	2:1	2180	7.320



SECTION

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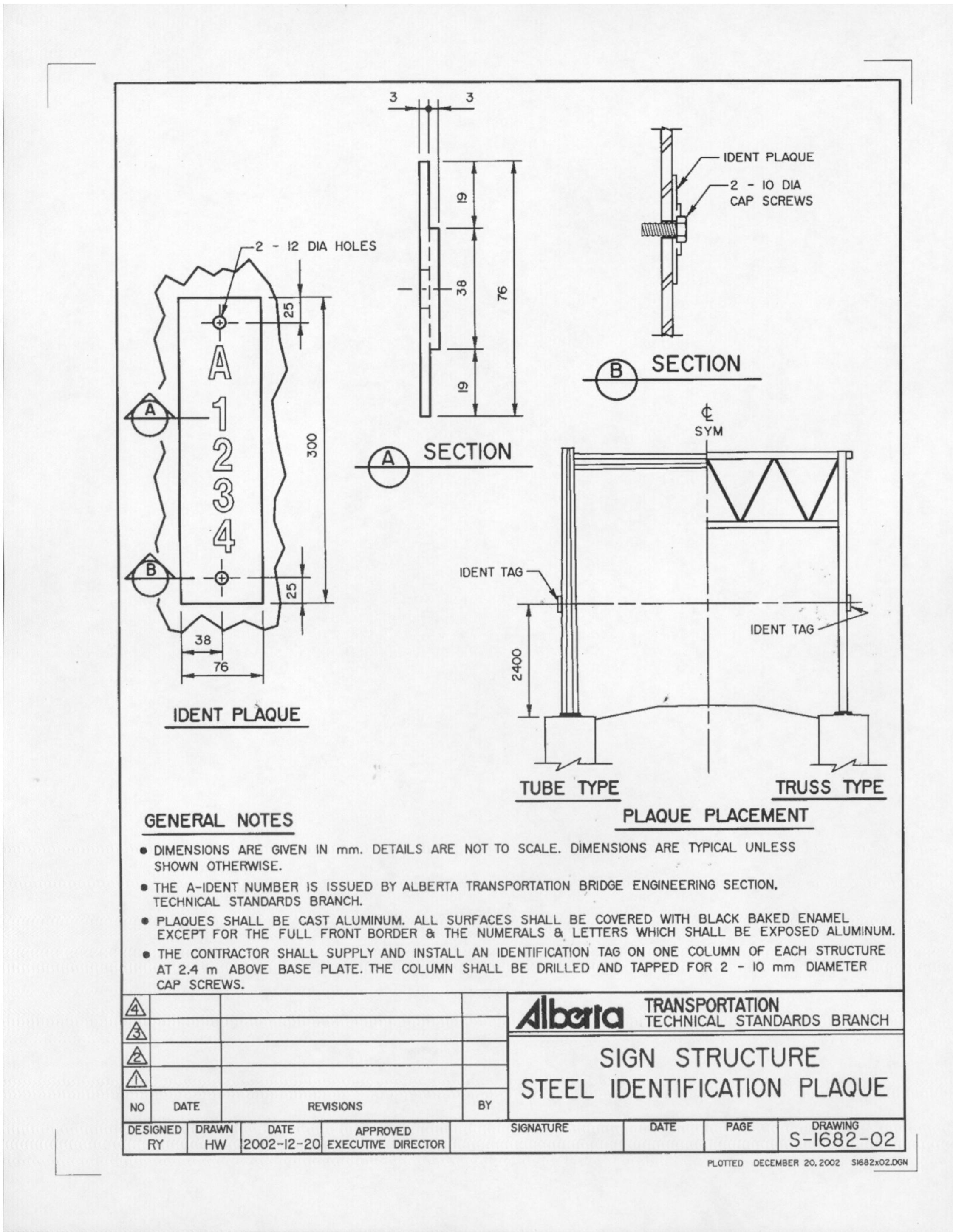
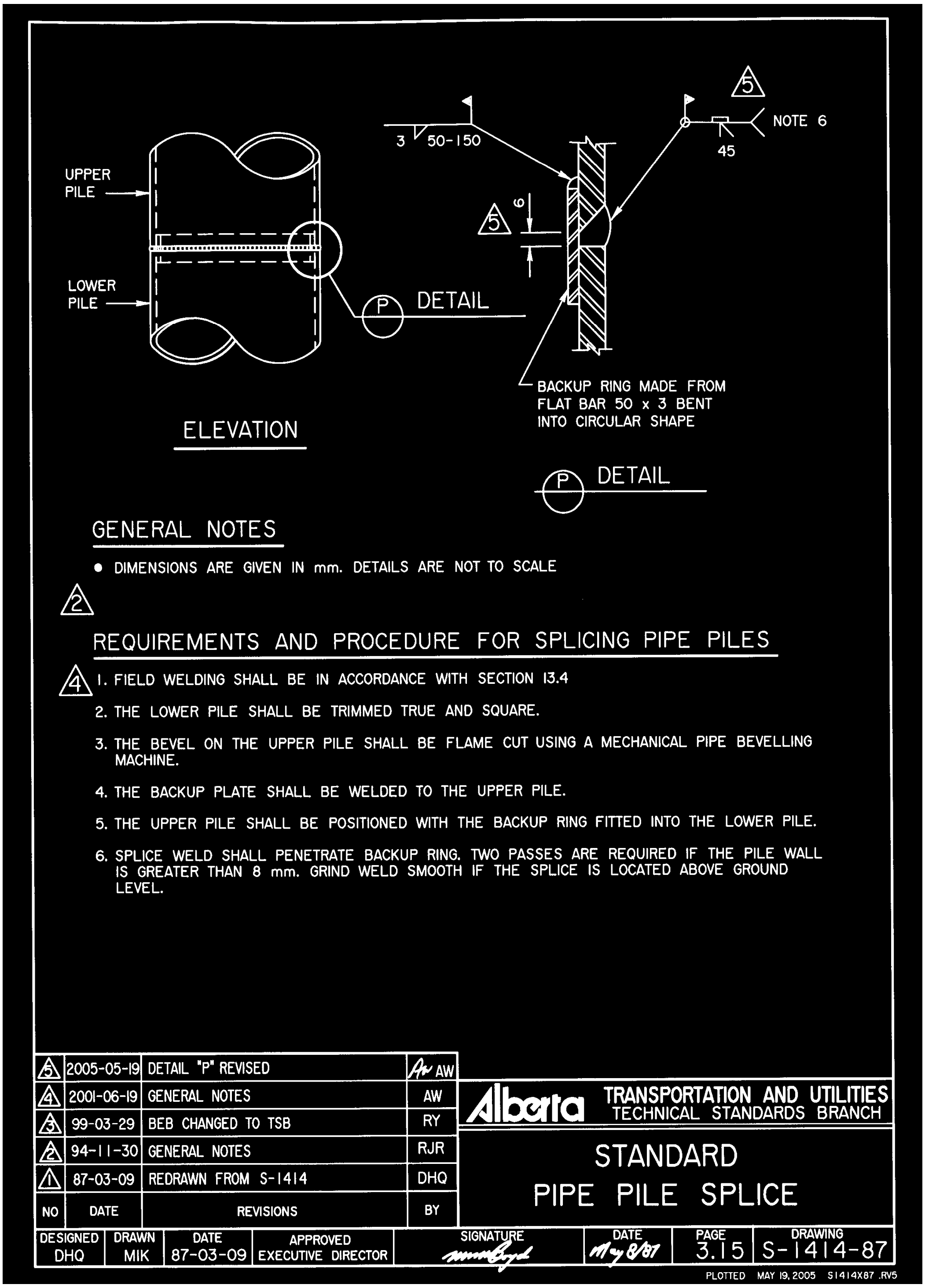
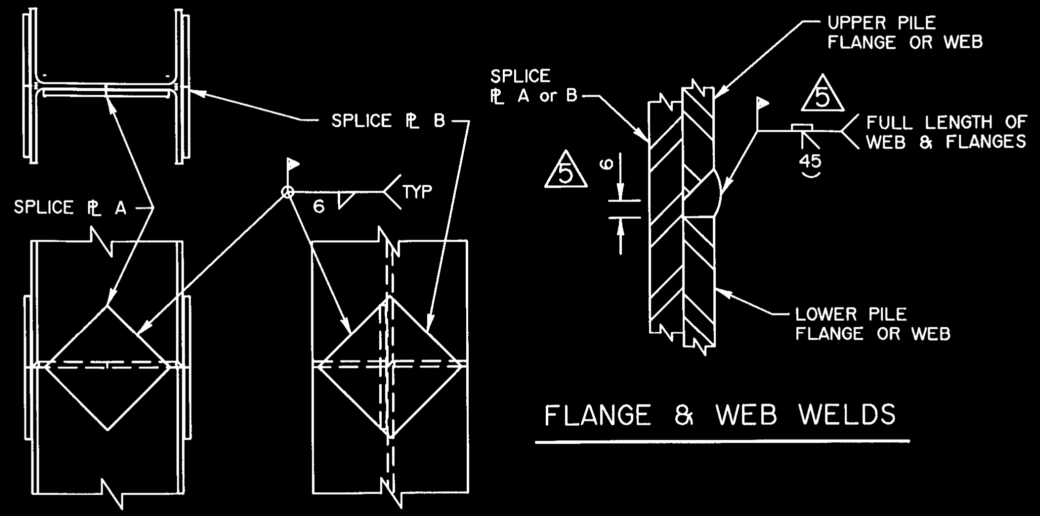

2 - 12 DIA HOLES
IDENT PLAQUE
2 - 10 DIA CAP SCREWS
A SECTION
B SECTION
IDENT TAG
SYM
2400
TUBE TYPE
TRUSS TYPE
PLAQUE PLACEMENT
IDENT PLAQUE
GENERAL NOTES
• DIMENSIONS ARE GIVEN IN mm. DETAILS ARE NOT TO SCALE. DIMENSIONS ARE TYPICAL UNLESS SHOWN OTHERWISE.
• THE A-IDENT NUMBER IS ISSUED BY ALBERTA TRANSPORTATION BRIDGE ENGINEERING SECTION, TECHNICAL STANDARDS BRANCH.
• PLAQUES SHALL BE CAST ALUMINUM. ALL SURFACES SHALL BE COVERED WITH BLACK BAKED ENAMEL EXCEPT FOR THE FULL FRONT BORDER & THE NUMERALS & LETTERS WHICH SHALL BE EXPOSED ALUMINUM.
• THE CONTRACTOR SHALL SUPPLY AND INSTALL AN IDENTIFICATION TAG ON ONE COLUMN OF EACH STRUCTURE AT 2.4 m ABOVE BASE PLATE. THE COLUMN SHALL BE DRILLED AND TAPPED FOR 2 - 10 mm DIAMETER CAP SCREWS.
Alberta TRANSPORTATION
TECHNICAL STANDARDS BRANCH
SIGN STRUCTURE
STEEL IDENTIFICATION PLAQUE
NO DATE REVISIONS BY
DESIGNED RY DRAWN HW DATE 2002-12-20 APPROVED EXECUTIVE DIRECTOR
SIGNATURE DATE PAGE DRAWING S-1682-02
PLOTTED DECEMBER 20, 2002 S1682x02.DGN


NOTE 6
45
3 50-150
6
UPPER PILE
LOWER PILE
P DETAIL
BACKUP RING MADE FROM FLAT BAR 50 x 3 BENT INTO CIRCULAR SHAPE
ELEVATION
P DETAIL
GENERAL NOTES
• DIMENSIONS ARE GIVEN IN mm. DETAILS ARE NOT TO SCALE
REQUIREMENTS AND PROCEDURE FOR SPLICING PIPE PILES
1. FIELD WELDING SHALL BE IN ACCORDANCE WITH SECTION 13.4
2. THE LOWER PILE SHALL BE TRIMMED TRUE AND SQUARE.
3. THE BEVEL ON THE UPPER PILE SHALL BE FLAME CUT USING A MECHANICAL PIPE BEVELLING MACHINE.
4. THE BACKUP PLATE SHALL BE WELDED TO THE UPPER PILE.
5. THE UPPER PILE SHALL BE POSITIONED WITH THE BACKUP RING FITTED INTO THE LOWER PILE.
6. SPLICE WELD SHALL PENETRATE BACKUP RING. TWO PASSES ARE REQUIRED IF THE PILE WALL IS GREATER THAN 8 mm. GRIND WELD SMOOTH IF THE SPLICE IS LOCATED ABOVE GROUND LEVEL.
5 2005-05-19 DETAIL "P" REVISED AW
4 2001-06-19 GENERAL NOTES AW
3 99-03-29 BEB CHANGED TO TSB RY
2 94-11-30 GENERAL NOTES RJR
1 87-03-09 REDRAWN FROM S-1414 DHQ
NO DATE REVISIONS BY
Alberta
TRANSPORTATION AND UTILITIES
TECHNICAL STANDARDS BRANCH
STANDARD
PIPE PILE SPLICE
DESIGNED DHQ
DRAWN MIK
DATE 87-03-09
APPROVED EXECUTIVE DIRECTOR
SIGNATURE
DATE
PAGE 3.15
DRAWING S-1414-87
PLOTTED MAY 19, 2005 S1414X87 .RV5



FLANGE & WEB WELDS

SPLICE DETAILS

PILE DESIGNATION	SPLICE PLATE DIMENSIONS	
	PLATE A (WEB)	PLATE B (FLANGE)
HP 250 x 62	140 x 10 x 140	170 x 10 x 170
HP 310 x 94	175 x 12 x 175	200 x 12 x 200
HP 360 x 132	200 x 16 x 200	250 x 16 x 250

GENERAL NOTES

- DIMENSIONS ARE GIVEN IN mm. DETAILS ARE NOT TO SCALE.
- 2 STEEL SHALL CONFORM TO ASTM A36 OR CSA G40.21M 300W.

REQUIREMENTS AND PROCEDURE FOR SPLICING H-PILES

4 1. FIELD WELDING SHALL BE IN ACCORDANCE WITH SECTION 13.4

2. PILE ENDS TO BE SPLICED SHALL BE FLAME CUT USING A STEEL GUIDE TO OBTAIN A SQUARE AND EVEN CUT. BEVEL CUTS SHALL BE MADE AT 45°.

3. SPLICE PLATES A & B SHALL BE WELDED TO THE UPPER PILE BEFORE POSITIONING IT.

4. THE UPPER PILE SHALL BE POSITIONED ON AND THE SPLICE PLATES WELDED TO THE LOWER PILE; BUTT WELDS SHALL THEN BE MADE.

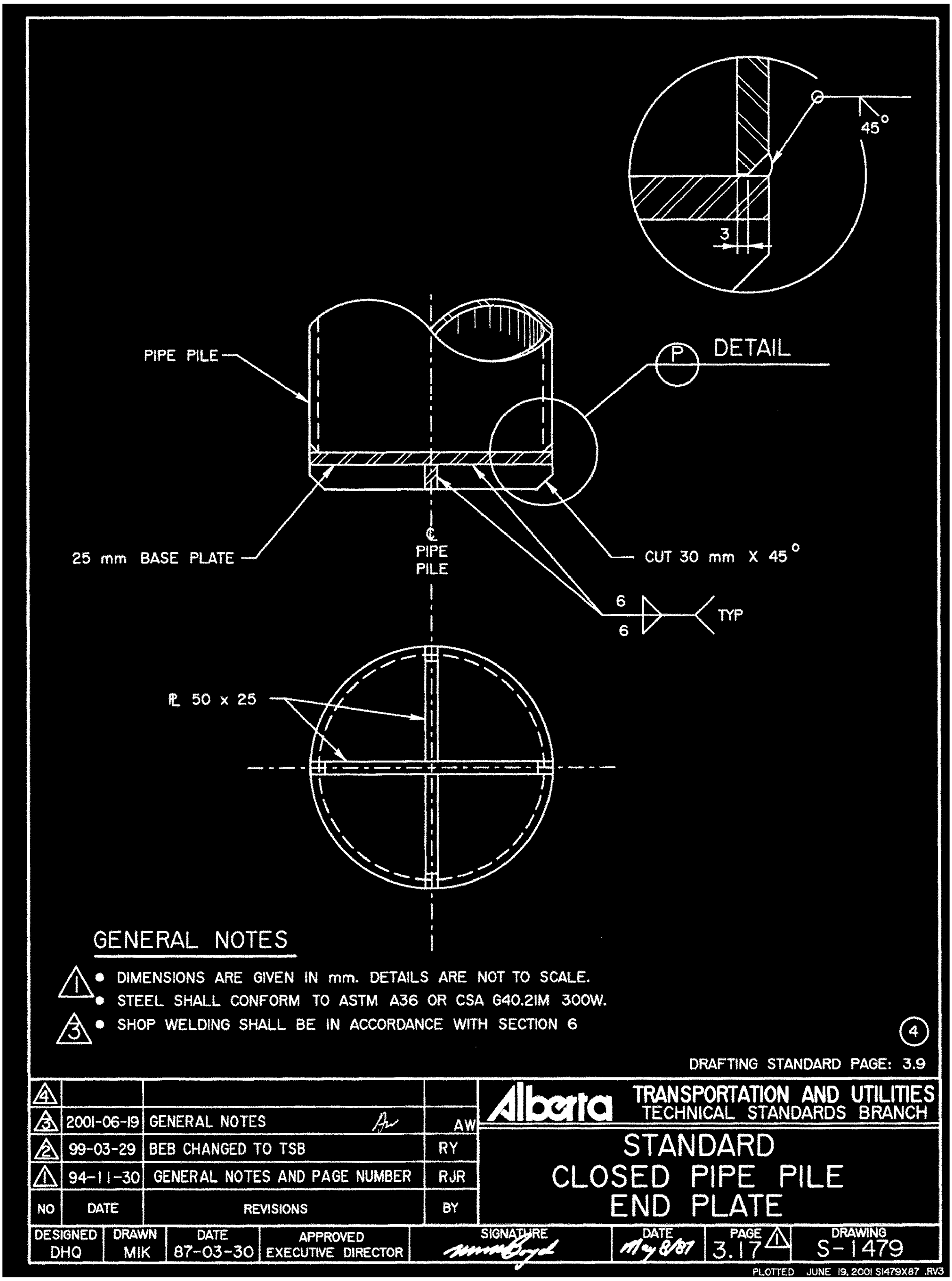
NO	DATE	REVISIONS	BY
5	2005-05-19	FLANGE & WEB WELDS REVISED	AW
4	2001-06-19	GENERAL NOTES	AW
3	99-03-29	BEB CHANGED TO TSB	RY
2	94-11-30	GENERAL NOTES	RJR
1	87-03-11	REDRAWN FROM S-1415	DHQ

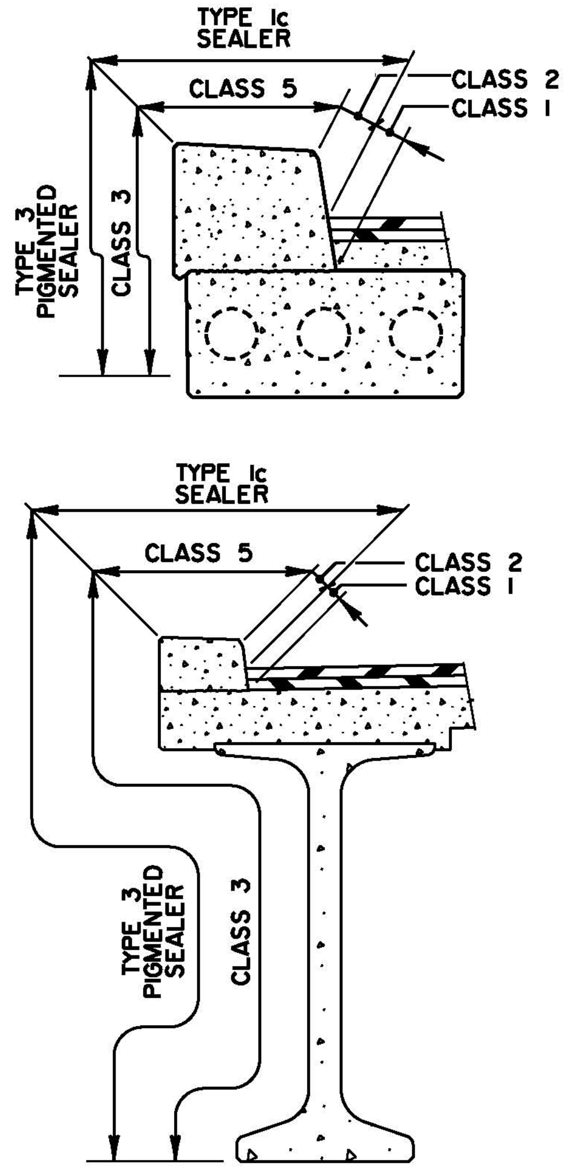
Alberta TRANSPORTATION AND UTILITIES
TECHNICAL STANDARDS BRANCH

STANDARD
H-PILE SPLICE

DESIGNED	DRAWN	DATE	APPROVED	SIGNATURE	DATE	PAGE	DRAWING
DHQ	MIK	87-03-11	EXECUTIVE DIRECTOR		May 8/87	3.13	S-1415-87

PLOTTED MAY 19, 2005 S1415X87 .RV4


45°
3
PIPE PILE
P DETAIL
25 mm BASE PLATE
℄ PIPE PILE
CUT 30 mm X 45°
6
6
TYP
℄ 50 x 25
GENERAL NOTES
1 • DIMENSIONS ARE GIVEN IN mm. DETAILS ARE NOT TO SCALE.
• STEEL SHALL CONFORM TO ASTM A36 OR CSA G40.21M 300W.
3 • SHOP WELDING SHALL BE IN ACCORDANCE WITH SECTION 6
4
DRAFTING STANDARD PAGE: 3.9
3 2001-06-19 GENERAL NOTES AW
2 99-03-29 BEB CHANGED TO TSB RY
1 94-11-30 GENERAL NOTES AND PAGE NUMBER RJR
NO DATE REVISIONS BY
Alberta
TRANSPORTATION AND UTILITIES
TECHNICAL STANDARDS BRANCH
STANDARD
CLOSED PIPE PILE
END PLATE
DESIGNED DHQ
DRAWN MIK
DATE 87-03-30
APPROVED EXECUTIVE DIRECTOR
SIGNATURE
DATE May 8/87
PAGE 3.17
DRAWING S-1479
PLOTTED JUNE 19, 2001 S1479X87 .RV3



Alberta TRANSPORTATION

FINISHES AND SEALING FOR EXTERIOR CONCRETE GIRDERS

	DATE	DRAWING
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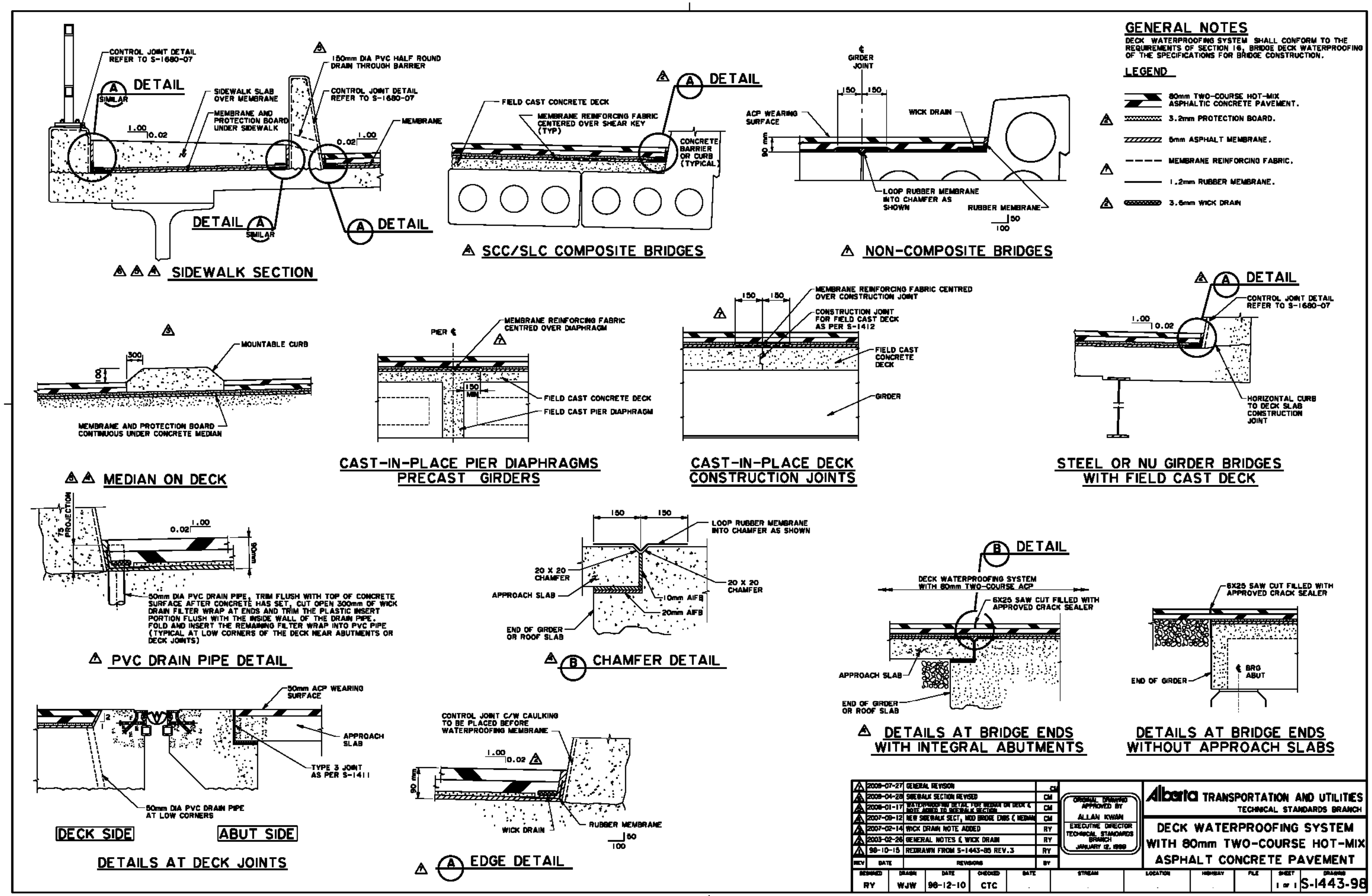
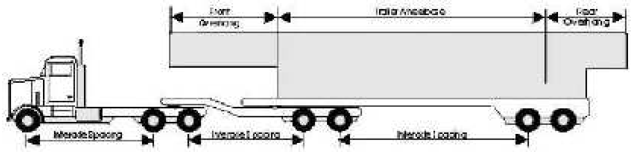


s1443x98.rv7.dgn 8/10/2009 3:33:21 PM

PLOTTED: Oct/01/2009 4:32 pm BY: sru

CH2MHILL

Vehicle 1: 32 wheel Trailer (Tractor, 16 wheel Jeep, 16 wheel trailer)



Axle No	1	2	3	4	5	6	7
Wheel per axle	2	4	4	8	8	8	8
Axle Type	1	2	2	3	3	3	3
Axle load (kN)	71.6	122.6	122.6	181.5	181.5	181.5	181.5

Axle spacing(m): 5.0 | 1.4 | 3.65 | 1.4 | 11.0 | 1.4

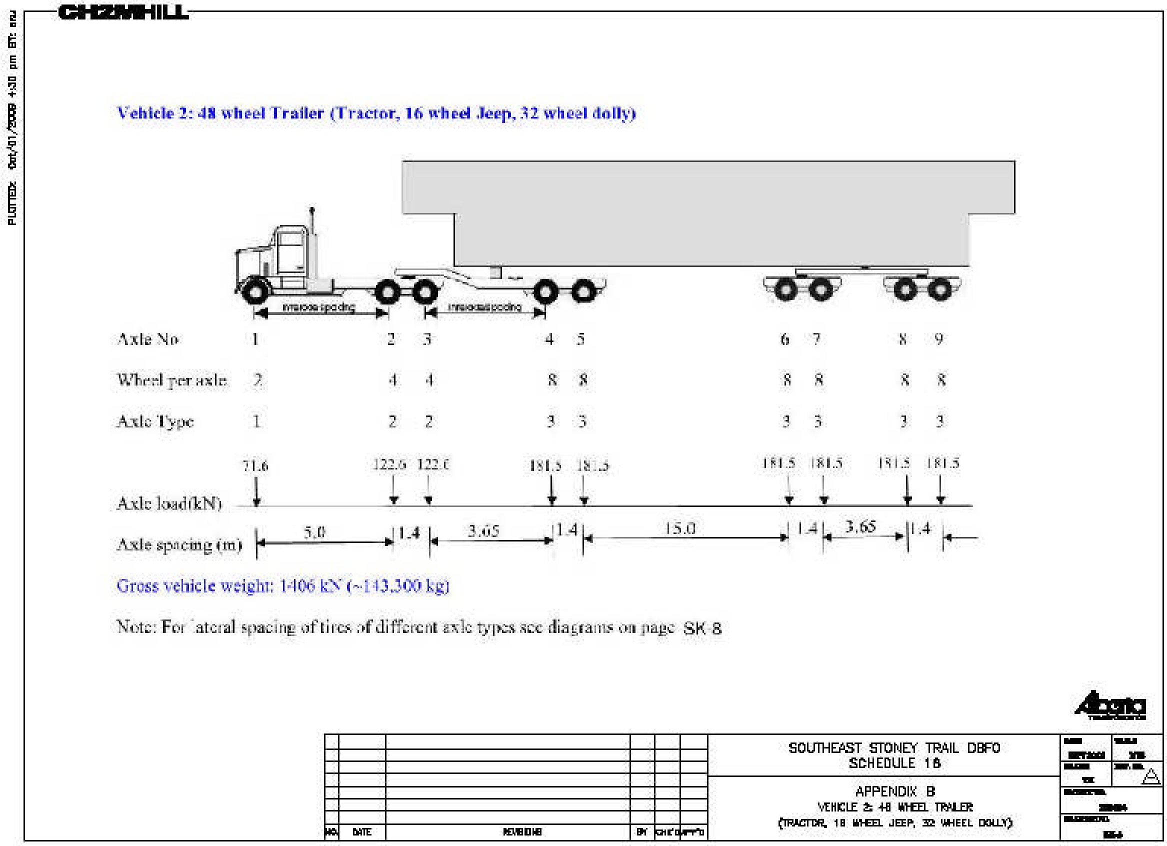
Gross vehicle weight: 1043 kN (~106,300 kg)

Note: For lateral spacing of tires of different axle types see diagrams on page SK-8

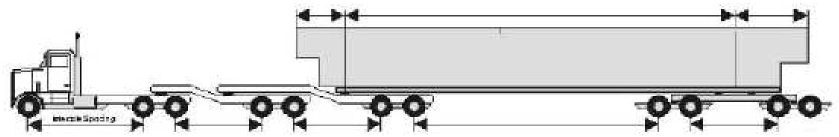
NO.	DATE	REVISIONS	BY	CHK'D	APP'D

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18

APPENDIX B
VEHICLE 1: 32 WHEEL TRAILER
(TRACTOR, 16 WHEEL JEEP, 16 WHEEL TRAILER)


CH2MHILL
Vehicle 2: 48 wheel Trailer (Tractor, 16 wheel Jeep, 32 wheel dolly)
Axle No 1 2 3 4 5 6 7 8 9
Wheel per axle 2 4 4 8 8 8 8 8 8
Axle Type 1 2 2 3 3 3 3 3 3
Axle load(kN) 71.6 122.6 122.0 181.5 181.5 181.5 181.5 181.5 181.5
Axle spacing (m) 5.0 1.4 3.65 1.4 15.0 1.4 3.65 1.4
Gross vehicle weight: 1406 kN (~143,300 kg)
Note: For lateral spacing of tires of different axle types see diagrams on page SK-8
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX B
VEHICLE 2: 48 WHEEL TRAILER
(TRACTOR, 16 WHEEL JEEP, 32 WHEEL DOLLY)
NO. DATE REVISIONS BY CHK'D APP'D

Vehicle 3: 64 wheel Trailer (Tractor, 16 wheel Jeep, 16 wheel jeep 32 wheel dolly)



Axle No	1	2	3	4	5	6	7	8	9	10	11
Wheel per axle	2	4	4	8	8	8	8	8	8	8	8
Axle Type	1	2	2	3	3	3	3	3	3	3	3
Axle load (kN)	71.6	122.6	122.6	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5

Axle spacing(m): 5.0 | 1.4 | 3.65 | 1.4 | 3.65 | 1.4 | 17.3 | 1.4 | 3.65 | 1.4

Gross vehicle weight: 1767 kN (~180,300 kg)

Note: For lateral spacing of tires of different axle types see diagrams on page SK-8

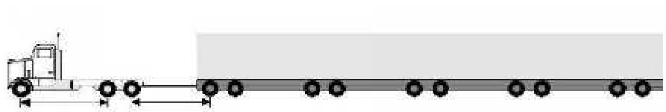
NO.	DATE	REVISIONS	BY	CHK'D	APP'D

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18

APPENDIX B
VEHICLE 3: 64 WHEEL TRAILER
(TRACTOR, 16 WHEEL JEEP, 16 WHEEL TRAILER, 32 WHEEL DOLLY)

CH2MHILL

Vehicle 4: 10 Line 2 File Road Style Scheurle Trailer (Tractor, 5 sets of 16 wheel)



Axle No	1	2	3	4	5	6	7	8	9	10	11	12	13
Wheel per axle	2	4	4	8	8	8	8	8	8	8	8	8	8
Axle Type	1	2	2	3	3	3	3	3	3	3	3	3	3
Axle load (kN)	71.6	122.6	122.6	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5

Axle spacing(m): 5.0, 1.5, 5.0, 1.5, 4.5, 1.5, 4.5, 1.5, 4.5, 1.5, 4.5, 1.5

Gross vehicle weight: 2132 kN (~217,300 kg)

Note: For lateral spacing of tires of different axle types see diagrams on page SK-8

NO.	DATE	REVISIONS	BY	CHK'D	APP'D

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18

APPENDIX B
VEHICLE 4: 10 LINE 2 FILE ROAD STYLE SCHEURLE TRAILER
(TRACTOR, 5 SETS OF 16 WHEEL)

CH2MHILL

Vehicle 5: 12 Line 2 File Road Style Scheurle Trailer (Tractor, 6 sets of 16 wheel)

Axle No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Wheel per axle	2	4	4	8	8	8	8	8	8	8	8	8	8	8	8
Axle Type	1	2	2	3	3	3	3	3	3	3	3	3	3	3	3
Axle load(kN)	71.6	122.6	122.6	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5	181.5

Axle spacing(m): 5.0 | 1.5 | 5.0 | 1.5 | 4.5 | 1.5 | 4.5 | 1.5 | 4.5 | 1.5 | 4.5 | 1.5 | 4.5 | 1.5

Gross vehicle weight: 2495 kN (~254,300 kg)

Note: For lateral spacing of tires of different axle types see diagrams on page SK-8

NO.	DATE	REVISIONS	BY	CHK'D	APP'D

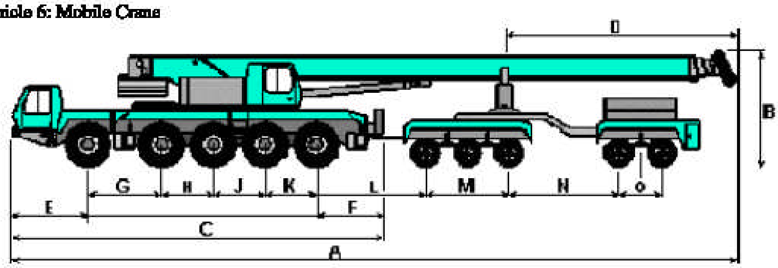
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18

APPENDIX B
VEHICLE 5: 12 LINE 2 FILE ROAD STYLE SCHEURLE TRAILER
(TRACTOR, 6 SETS OF 16 WHEEL)

PLOTTED: Oct/01/2009 4:28 pm

CH2MHILL

Vehicle 6: Mobile Crane



Axle No	1	2	3	4	5	6	7	8	9	10
Wheel per axle	2	2	2	2	2	4	4	4	4	4
Axle Type Case 1	1	1	1	1	1	2	2	2	2	2
Axle Type Case 2	2	2	2	2	2	2	2	2	2	2
Axle Load (kN)	98.1	98.1	98.1	98.1	98.1	88.3	88.3	88.3	112.8	112.8

Axle Spacing (m): 2.0 | 1.6 | 1.6 | 1.8 | 4.2 | 3.0 | 4.2 | 1.2

Gross vehicle weight: 981 kN (~100,000 kg)

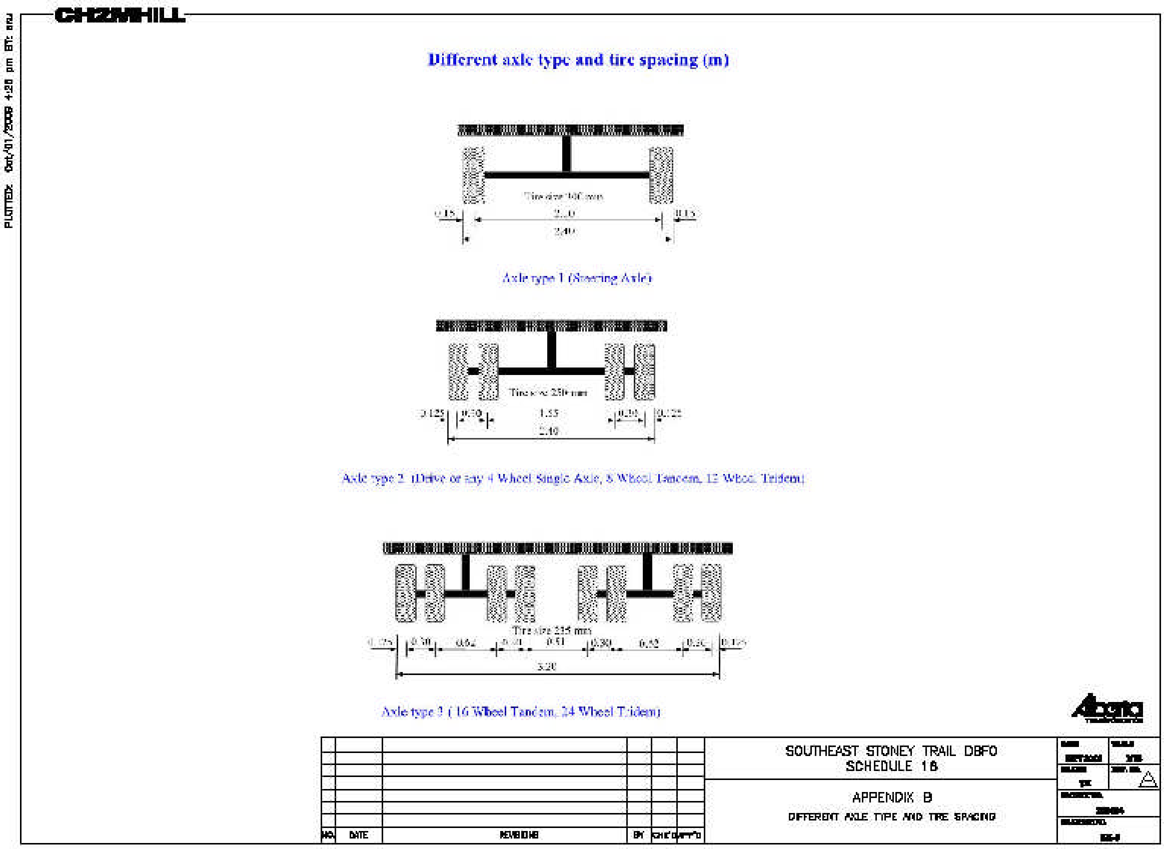
Note: For lateral spacing of tires of different axle types see diagrams on SK-8

Alberta

NO.	DATE	REVISIONS	BY	CHK'D	APP'D

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18

APPENDIX B
VEHICLE 6: Mobile Crane


CH2MHILL
Different axle type and tire spacing (m)
2.40
Axle type 1 (Steering Axle)
1.55
2.40
Axle type 2 (Drive or any 4 Wheel Single Axle, 8 Wheel Tandem, 12 Wheel Trident)
Tire size 235 mm
0.51
3.20
Axle type 3 (16 Wheel Tandem, 24 Wheel Tridem)
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX B
DIFFERENT AXLE TYPE AND TIRE SPACING
NO.
DATE
REVISIONS
BY

APPENDIX C -
REPORTING SUMMARY

1. GENERAL

1.1 Section References

References to section numbers in this Appendix C are to section numbers of the Technical Requirements.

1.2 Priority

In the event of any inconsistency between the listing of, criteria for and the descriptions of the reporting obligations set out in the body of Schedule 18 and the listing of such criteria included in this Appendix C, the more detailed provisions of the body of Schedule 18 shall govern.

2. REPORTING

Included in the reporting requirements set out in the Technical Requirement are the following:

Quality Management System (Section 100.2.1)

QMS - External Audit Results and Deficiencies List Correction Results (Section 100.2.1.4.2)

Environmental Management System (Section 100.2.2)

Environmental Construction Operations (ECO) Plan including Spill Management Plan (Section 100.2.2)

Road Salt Management Plan (Section 100.2.2)

EMS - External Audit Results and Deficiencies List Correction Results (Section 100.2.2.3)

Handling of QMS/EMS Non-Conformance (Section 100.2.3)

Project Schedule (Section 100.2.4)

Traffic Management Plan (Section 100.2.5)

Safety Plan (Section 100.2.6)

Public Communications Strategies (Section 100.2.7)

Construction Management Plan (Section 100.2.8)

Operations and Maintenance Plan (Section 100.2.9)

Infrastructure Wholelife Management Plan (Section 100.2.10)

Guide Signing (Section 200.2.7)

Environmental (Section 200.2.13)

Survey (Section 200.4.10)

General Design Documentation (Section 300.2.3)

Roadway Safety Audits (Section 300.2.6)

Reclamation Certificates (Section 300.3.1)

As-Built Information (Section 300.3.3)

Geotechnical Reports (Section 300.4.1.3)

Pavement Design Report (Section 300.4.1.8.1)

Traffic Control Devices - Warrant Calculations (Section 300.4.1.9.2)

Bridge Structures Design Report Requirements (Section 300.5.3)

Bridge Structures Final Design Report Requirements (Section 300.5.4)

Cast-In-Place Concrete – Submissions (Section 300.5.7.2)
Class HPC and Class HPC with Steel Fibres (Section 300.5.7.5.2)

Structural Steel – Submissions (Section 300.5.8.2)

Engineering Data (Section 300.5.8.3.3)

Fabrication (Section 300.5.8.4.2)

Bridge Girders (Section 300.5.8.5.2)

Precast Concrete Units – Submissions (Section 300.5.9.2)

Post-Tensioning – Submissions (Section 300.5.9.10.12.2)

Construction (Section 300.5.9.10.12.7)

Construction of CSP and SPCSP Structures – Submissions (Section 300.5.10.2)

Mechanically Stabilized Earth Walls - Submissions (Section 300.5.11.2.2)

Construction - Conformance Criteria (Section 300.5.11.4.1)

Sign Structures – Submissions (Section 300.5.12.2)

Piling Submittals (Section 300.5.13.2)

Piling Capacity Testing (Section 300.5.13.8)

Waterproofing Protection Board (Section 300.5.15.7.3)

Rehabilitation As-Built Construction Reports (Section 400.1.2)

Daily Road Reports (Section 400.2.1.2)

Maintenance Reporting Procedures (Section 400.2.6)

Snow Clearing and Ice Control Operations Plan (Section 400.3.1)

Winter Maintenance Operations Requirements Reporting (Section 400.3.3.1)

Preferential Bridge Deck Icing Plan (Section 400.3.4)

Preferential Bridge Deck Icing Reporting (Section 400.3.4.1)

Pavement Geometric Requirements (New Infrastructure Only) (Section 400.4.2)

Smoothness Requirements (New Infrastructure Only) (Section 400.4.3)

Rutting Performance Requirements (New Infrastructure Only) (Section 400.4.4)

General Pavement Maintenance Requirements (Section 400.4.6)

Miscellaneous - Operation and Performance Requirements (Section 400.4.7)

Traffic Control Devices - Operation and Performance Requirements (Section 400.4.8)

Road Traffic Noise Mitigation (New Infrastructure Only) (Section 400.4.9)

Testing Conducted with an Inertial Profiler (Existing Infrastructure Only) (Section 400.4.10)

Skid Resistance Requirements (New Infrastructure Only) (Section 400.5.1)

Bridges Structures Inspection/Testing Notification and Inspection Reporting (Sections 400.5.1.3.4 and 400.5.1.3.5)

Bridge Structure Maintenance and Rehabilitation Requirements Notification and Reporting (Sections 400.5.2.6 and 400.5.2.7)

Performance Requirements (New Infrastructure Only) (Section 400.5.3)

APPENDIX D - *HISTORICAL RESOURCES ACT* (ALBERTA) CLEARANCE LETTERS

Alberta Community Development
Cultural Facilities and Historical Resources

RECEIVED
MAR 0 9 2006

Old St. Stephen's College
8820 - 112 Street
Edmonton, Alberta, Canada T6G 2P8
Telephone 780/431-2300 Fax 780/427-5598
www.cd.gov.ab.ca

March 2, 2006 Our File(s): 4715-04-001, 2005-522

Mr. Aziz Merali
Earth Tech Canada Inc.
300 Atrium VII
340 Midpark Way SE
Calgary, Alberta
T2X 1P1

Dear Mr. Merali:

SUBJECT: ALBERTA INFRASTRUCTURE AND TRANSPORTATION
CALGARY EAST RING ROAD FUNCTIONAL PLANNING STUDY
HISTORICAL RESOURCES IMPACT ASSESSMENT
FINAL REPORT, ARCHAEOLOGICAL RESEARCH PERMIT 2005-522

The Cultural Facilities and Historical Resources Division (CFHRD) of Alberta Community Development have recently reviewed a copy of a Final Report from FMA Heritage Resource Consultants Inc. regarding the results of the Historical Resources Impact Assessment (HRIA) that they conducted for the captioned project. The results of the HRIA and CFHRD's requirements are summarized in Table 1.0.

HISTORICAL RESOURCES IMPACT ASSESSMENT

Terms of Reference (Archaeological Research Permit 2005-522)

Under Mitigative Research Permit 2005-522, FMA Heritage Resource Consultants Inc. conducted an Historical Resources Impact Assessment for archaeological resources on the proposed Calgary East Ring Road project along the east side of Calgary. The consultant used foot traverses, visual inspection and 25 backhoe tests to assess the area.

Results

No new sites were recorded during the course of this assessment. Based on these results staff of CFHRD have recommended that Alberta Infrastructure and Transportation be granted Historical Resources Act clearance for this project. I agree with this recommendation.

...cont.

HISTORICAL RESOURCES ACT **REQUIREMENTS/CLEARANCE**

Alberta Infrastructure and Transportation has *Historical Resources Act* clearance to proceed with this project. However, Pursuant to Section 31 of the *Historical Resources Act*, should any historical resources be encountered during construction activities staff of the Heritage Resource Management Branch are to be contacted immediately. It may then be necessary for the CFHRD to issue further instructions regarding the documentation of these resources.

Should you require additional information or have any questions regarding our Department's review of this project, please contact either Barry Newton of the Heritage Resource Management Branch, (780-431-2330), or Dan Spivak of the Royal Tyrrell Museum of Palaeontology (403-823-7707).

On behalf of Alberta Community Development, I would like to thank you for your cooperation in our endeavour to conserve Alberta's past.

Sincerely,

Mark Rasmussen
Assistant Deputy Minister
Cultural Facilities and Historical Resources Division

cc: Jeremy Leyden, FMA Heritage Resources Consultants Inc.

DEPARTMENTAL CONTACTS

Dan Spivak
Resource Management Program
Royal Tyrrell Museum of Palaeontology
Box 7500
Drumheller, Alberta
T0J 0Y0

Tel. 403-823-7707
Fax. 403-823-7131

Trevor Peck
Staff Archaeologist
Heritage Resource Management Branch
Cultural Facilities and Historical Resources Division
Alberta Community Development
8820 - 112 Street
Edmonton, Alberta
T6G 2P8

Tel. 780-431-2348
Fax. 780-427-3956

Barry Newton
Resource Management Planner
Heritage Resource Management Branch
Cultural Facilities and Historical Resources Division
Alberta Community Development
8820 - 112 Street
Edmonton, Alberta
T6G 2P8

Tel. 780-431-2330
Fax. 780-427-3956

Alberta Culture and Community Spirit
Historic Resources Management

Old St. Stephen's College
8820 – 112 Street
Edmonton, Alberta, Canada T6G 2P8
Telephone (780) 431-2300 Fax (780) 422-3106
www.culture.gov.ab.ca

January 7, 2009

Our File(s): 4953-08-044

Ms. Sandra Menzies
CH2M HILL Canada Ltd.
Suite 1500, 800 - 6th Avenue SW
Calgary, Alberta
T2P 3G3

Dear Ms. Menzies:

SUBJECT: ALBERTA TRANSPORTATION
HIGHWAY 201, 17th AVENUE SE TO HIGHWAY 22X
ACCESS MANAGEMENT STUDY
HISTORIC RESOURCES OVERVIEW REPORT

The Archaeology Group has provided the Historic Resources Management Branch (HRMB) of Alberta Culture and Community Spirit with an Historic Resources Overview package for the captioned project. Ministry staff have reviewed the potential for the proposed project to impact significant historic resources and have concluded that an Historic Resources Impact Assessment is not required. Therefore, Alberta Transportation has *Historical Resources Act* clearance to proceed with the development of this project.

Reporting the discovery of historic resources

However, pursuant to Section 31 of the *Historical Resources Act*, should any historic resources be encountered during development activities, please contact me at (780) 431-2330, (Land Use Planning Section, Historic Resources Management Branch, 8820 - 112 Street, Edmonton, Alberta, T6G 2P8), fax (780) 422-3106 or e-mail barry.newton@gov.ab.ca . It will then be necessary for the HRMB to issue further instructions regarding the documentation of these resources.

On behalf of the HRMB, I would like to thank you and officials of Alberta Transportation for your cooperation in our endeavour to conserve Alberta's past.

Sincerely,

Barry Newton
West Region, Land Use Planner
Land Use Planning Section

cc: Walt Kowal, The Archaeology Group
Don Snider, Alberta Transportation

Government of Alberta
Culture and Community Spirit

Historic Resources Management
Old St. Stephen's College
8820 – 112 Street
Edmonton, Alberta T6G 2P8
Canada
Telephone: 780-431-2300
www.culture.alberta.ca/hrm

Memorandum

From: David Link
Executive Director
Historic Resources Management Branch

Our File Reference: 4715-09-019, 4715-09-012; 2007-458

Your File Reference:

To: Darren Carter, Manager,
Environmental Management Services
Alberta Transportation

Date: August 25, 2009

Phone: 780-431-2313

Subject: ALBERTA TRANSPORTATION
SOUTH CALGARY RING ROAD - PART SECTIONS 29 & 20-22-29-W4M; PART SECTIONS 19 TO 30-22-1-W5M; PART SECTIONS 21 TO 28-22-2-W5M
WEST CALGARY RING ROAD – PART SECTIONS 8, 9, 16, 17, 20, 21, 28, 29, 32 & 33-24-2-W5M
HISTORIC RESOURCES IMPACT ASSESSMENT
FINAL REPORT, ARCHAEOLOGICAL RESEARCH PERMIT 2007-458

Staff of the Historic Resources Management Branch (HRMB) of Alberta Culture and Community Spirit have reviewed a final report prepared by Lifeways of Canada Ltd. discussing the results of the Historic Resources Impact Assessment that they completed for the captioned projects.

Nine new archaeological sites (EgPn-733, EgPn-734, EgPn-735, EgPn-736, EgPn-737, EgPn-738 EgPn-739, EgPn-740 and EgPn-741) were recorded in the course of this assessment and fourteen previously recorded sites (EfPl-93, EfPl-189, EfPm-66, EfPm-67, EfPm-68, EfPm-69 and EfPm-70, EgPn-25, EgPn-407, Egpn-613, EgPn-614, EgPn-653, EgPn-682 and EgPn-683) were revisited. There are no further requirements for archaeological sites EfPl-93, EfPm-66, EfPm-67, EfPm-68, EfPm-69, EfPm-70, EgPn-25, EgPn-613, EgPn-653, EgPn-733, EgPn-734, EgPn-736, EgPn-738 and EgPn-739. However, either complete avoidance or additional studies will be required for archaeological sites EfPl-189, EgPn-407, EgPn-614, EgPn-682, EgPn-683, Egpn-735, EgPn-737, EgPn-740 and EgPn-741.

HISTORICAL RESOURCES ACT REQUIREMENTS/CLEARANCE

Alberta Transportation is granted *Historical Resources Act* clearance to proceed with development in the area of archaeological sites EfPl-93, EfPm-66, EfPm-67, EfPm-68, EfPm-69, EfPm-70, EgPn-25, EgPn-613, EgPn-653, EgPn-733, EgPn-734, EgPn-736, EgPn-738 and EgPn-739.

...cont.

Darren Carter
August 25, 2009
Page 2

However, pursuant to Section 37(2) of the *Historical Resources Act*, Alberta Transportation is required to either avoid, or conduct additional studies at archaeological sites EfPl-189, EgPn-407, EgPn-614, EgPn-682, EgPn-683, Egpn-735, EgPn-737, EgPn-740 and EgPn-741 as outlined in the attached Schedule "C".

Should you have any questions regarding the above, please contact Barry Newton at (780) 431-2330, (Historic Resources Management Branch, 8820 - 112 Street, Edmonton, Alberta, T6G 2P8), fax (780) 422-3106 or by e-mail at barry.newton@gov.ab.ca.

On behalf of Alberta Culture and Community Spirit, I would like to thank you and officials of Alberta Transportation for your cooperation in our endeavour to conserve Alberta's past.

David Link

Attachment

cc: Don Hanna, Lifeways of Canada Ltd.
Don Snider, Alberta Transportation

SCHEDULE "C"
***HISTORICAL RESOURCES ACT* REQUIREMENTS**
ALBERTA TRANSPORTATION
SOUTH CALGARY RING ROAD – PT. SECS. 29 & 20-22-29-W4M; PART SECTIONS 19 TO 30-22-1-W5M; PT. SECS. 21 TO 28-22-2-W5M
WEST CALGARY RING ROAD – PT. SECS. 8, 9, 16, 17, 20, 21, 28, 29, 32 & 33-24-2-W5M
(PROJECT FILE 4715-09-019)

Pursuant to Section 37(2) of the *Historical Resources Act* Alberta Transportation is required to either avoid or conduct additional Stage 1 studies at the following archaeological sites as outlined below.

Timing: The Historic Resources Stage 1 studies are to be carried out prior to the initiation of any land surface disturbance activities under snow-free, unfrozen ground conditions.

1. EfPl-189 (LSD 16-19-22-29-W4M)

(1) Undertake up to 20 square metres of hand excavation in the site area.

(2) If at any time the material being recovered is substantially below expectations, excavations are to be halted and staff of the Historic Resources Management Branch contacted for further direction.

(3) Radiocarbon dates are to be obtained if suitable organic material is recovered in association with diagnostic artifacts in a sound context.

(4) The necessity for Stage 2 studies is dependant on the results of the Stage 1 studies.

2. EgPn-407 (LSD 3-16-24-2-W5M)

The site will not be impacted by the current project. However, should this site be threatened by any kind of future development, additional studies will be required prior to development proceeding.

3. EgPn-614 (LSD 5-28-24-2-W5M)

The site will not be impacted by the current project. However, should this site be threatened by any kind of future development, additional studies will be required prior to development proceeding.

4. EgPn-682 (LSD 3 & 4-33-24-2-W5M)

(1) Undertake up to 15 square metres of hand excavation in the site area.

(2) If at any time the material being recovered is substantially below expectations, excavations are to be halted and staff of the Historic Resources Management Branch contacted for further direction.

...cont.

SCHEDULE "C" PAGE 2

(3) Radiocarbon dates are to be obtained if suitable organic material is recovered in association with diagnostic artifacts in a sound context.

(4) The necessity for Stage 2 studies is dependant on the results of the Stage 1 studies.

5. EgPn-683 (LSD 14-28-24-2-W5M)

(1) Undertake up to 10 square metres of hand excavation in the site area.

(2) If at any time the material being recovered is substantially below expectations, excavations are to be halted and staff of the Historic Resources Management Branch contacted for further direction.

(3) Radiocarbon dates are to be obtained if suitable organic material is recovered in association with diagnostic artifacts in a sound context.

(4) The necessity for Stage 2 studies is dependant on the results of the Stage 1 studies.

6. EgPn-735 (LSD 4-21-24-2-W5M)

(1) Undertake up to 24 square metres of hand excavation in the site area.

(2) If at any time the material being recovered is substantially below expectations, excavations are to be halted and staff of the Historic Resources Management Branch contacted for further direction.

(3) Radiocarbon dates are to be obtained if suitable organic material is recovered in association with diagnostic artifacts in a sound context.

(4) Deep testing is to be conducted to determine if there are deeper cultural deposits at the site.

(5) The necessity for Stage 2 studies is dependant on the results of the Stage 1 studies.

7. EgPn-737 (LSD 14-28-24-2-W5M)

(1) Undertake up to 12 square metres of hand excavation in the site area.

(2) If at any time the material being recovered is substantially below expectations, excavations are to be halted and staff of the Historic Resources Management Branch contacted for further direction.

(3) Radiocarbon dates are to be obtained if suitable organic material is recovered in association with diagnostic artifacts in a sound context.

(4) The necessity for Stage 2 studies is dependant on the results of the Stage 1 studies.

...cont.

SCHEDULE "C" PAGE 3

8. EgPn-740 (LSD 14-16-24-2-W5M)

(1) Undertake up to 20 square metres of hand excavation in the site area.

(2) If at any time the material being recovered is substantially below expectations, excavations are to be halted and staff of the Historic Resources Management Branch contacted for further direction.

(3) Radiocarbon dates are to be obtained if suitable organic material is recovered in association with diagnostic artifacts in a sound context.

(4) Deep testing is to be conducted to determine if there are deeper cultural deposits at the site.

(5) The necessity for Stage 2 studies is dependant on the results of the Stage 1 studies.

9. EgPn-741 (LSD 14-16-24-2-W5M)

(1) Complete detailed plans of both stone features.

(2) Undertake the hand excavation of a one by one metre square unit in the cairn feature and a one by two metre unit in the stone arc.

(3) The necessity for Stage 2 studies is dependant on the results of the Stage 1 studies.

10. FINAL REPORT

A copy of the Historic Resources Stage 1 Studies final report for archaeological resources and any Interim reports are to be sent to the Historic Resources Management Branch, 8820 - 112 Street, Edmonton, Alberta, T6G 2P8.

Government of Alberta

Historic Resources Management
Old St Stephen's College
8820 – 112 Street
Edmonton, Alberta T6G 2P8
Canada
Telephone: 780-431-2300
www.culture.alberta.ca

FACSIMILE TRANSMITTAL

Historic Resources Management Branch
Land Use Planning
Old St. Stephen's College
8820 – 112 Street
Edmonton, AB T6G 2P8

Phone: (780) 431-2373
Fax: (780) 422-3106

FROM: Barry Newton

TO: Name: Don Hanna

Address: Lifeways of Canada Ltd.

Fax No.:

We are sending you page(s), including this one.

Date: FAXED SEP 03 2009

MESSAGE:

Government of Alberta
Culture and Community Spirit

Historic Resources Management
Old St. Stephen's College
8820 – 112 Street
Edmonton, Alberta T6G 2P8
Canada
Telephone: 780-431-2300
www.culture.alberta.ca/hrm

Memorandum

From: David Link
Executive Director
Historic Resources Management Branch

Our File Reference: 4715-09-019: 2009-150

Your File Reference:

To: Darren Carter, Manager,
Environmental Management Services
Alberta Transportation

Date: September 2, 2009

Phone: 780-431-2313

Subject: ALBERTA TRANSPORTATION
SOUTH CALGARY RING ROAD
PART SECTIONS 29, 30-22-29-W4M; PART SECTIONS 19 TO 30-22-1-W5M; PART SECTIONS 21 TO 28-22-2-W5M
HISTORIC RESOURCES STAGE 1 STUDIES – EfPl-189
INTERIM REPORT, ARCHAEOLOGICAL RESEARCH PERMIT 2009-150

Staff of the Historic Resources Management Branch (HRMB) of Alberta Culture and Community Spirit have reviewed an interim report prepared by Lifeways of Canada Ltd. discussing the results of the Historic Resources Stage 1 studies that they have completed at archaeological site EfPl-189 for the captioned project. Based on the results of these studies staff of the HRMB have indicated that there are no further requirements for archaeological site EfPl-189.

***HISTORICAL RESOURCES ACT* REQUIREMENTS/CLEARANCE**

Alberta Transportation is granted *Historical Resources Act* clearance to proceed with development in the area of archaeological site EfPl-189 (LSD 16-19-22-29-W4M).

Should you have any questions regarding the above, please contact Barry Newton at (780) 431-2330, (Historic Resources Management Branch, 8820 - 112 Street, Edmonton, Alberta, T6G 2P8), fax (780) 422-3106 or by e-mail at barry.newton@gov.ab.ca.

On behalf of Alberta Culture and Community Spirit, I would like to thank you and officials of Alberta Transportation for your cooperation in our endeavour to conserve Alberta's past.

David Link

cc: Don Hanna, Lifeways of Canada Ltd.
Don Snider, Alberta Transportation
Darryl Cariou, Senior Heritage Planner, City of Calgary

Alberta

Freedom To Create. Spirit To Achieve.

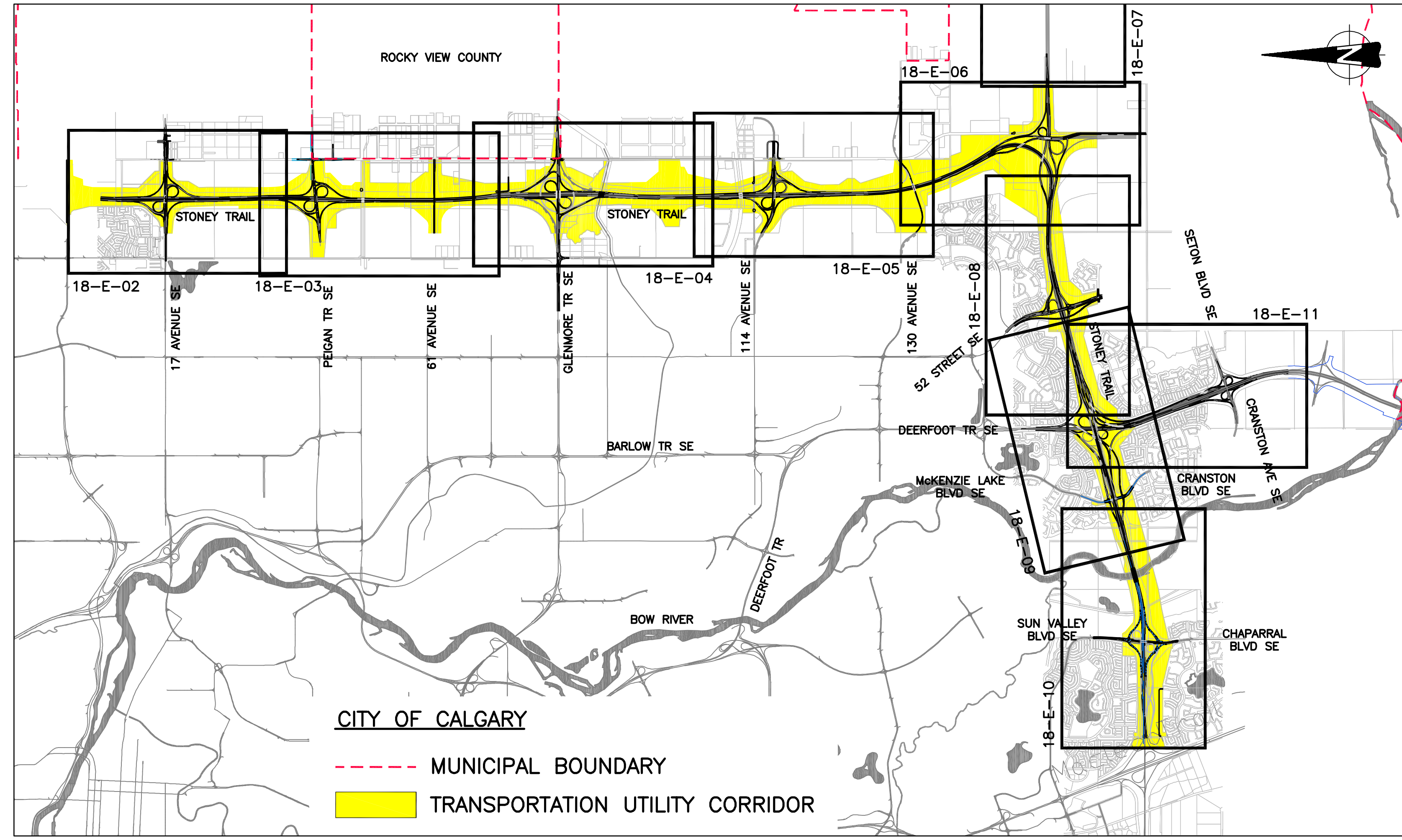
APPENDIX E - GUIDE SIGNING FOR NEW INFRASTRUCTURE

Drawings:

18-E-01 - COVER
18-E-02 - NORTH OF 17 AVENUE SE TO SOUTH OF 17 AVENUE SE
18-E-03 - NORTH OF PEIGAN TRAIL SE TO SOUTH OF 61 AVENUE SE
18-E-04 - NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE
18-E-05 - NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE
18-E-06 - SOUTH OF 130 AVENUE SE TO WEST OF 88 STREET SE
18-E-07 - WEST OF 88 STREET SE TO WEST OF 52 STREET SE
18-E-08 - EAST OF DEERFOOT TRAIL TO WEST OF MCKENZIE LAKE BLVD SE
18-E-09 - EAST OF SUN VALLEY BLVD SE TO WEST OF SUN VALLEY BLVD SE
18-E-10 - STONEY TRAIL TO CRANSTON BLVD SE/SECTION BLVD SE
18-E-11 - NEW INFRASTRUCTURE EAST OF 88 STREET SE

DRAWING LIST

18-E-01	1 OF 11	COVER SHEET
		GUIDE SIGNING FOR NEW INFRASTRUCTURE
18-E-02	2 OF 11	NORTH OF 17 AVENUE SE TO SOUTH OF 17 AVENUE SE
18-E-03	3 OF 11	NORTH OF PEIGAN TRAIL SE TO SOUTH OF 61 AVENUE SE
18-E-04	4 OF 11	NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE
18-E-05	5 OF 11	NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE
18-E-06	6 OF 11	SOUTH OF 130 AVENUE SE TO WEST OF 88 STREET SE
18-E-07	7 OF 11	EAST OF 88 STREET SE
18-E-08	8 OF 11	WEST OF 88 STREET SE TO WEST OF 52 STREET SE
18-E-09	9 OF 11	EAST OF DEERFOOT TRAIL TO WEST OF McKENZIE LAKE BLVD SE
18-E-10	10 OF 11	EAST OF SUN VALLEY BLVD SE TO WEST OF SUN VALLEY BLVD SE
18-E-11	11 OF 11	STONEY TRAIL TO CRANSTON AVENUE SE/SETON BLVD SE



SOUTHEAST STONEY TRAIL
DESIGN, BUILD, FINANCE AND OPERATE
CALGARY, ALBERTA, CANADA

SCHEDULE 18
APPENDIX E - DRAWINGS
ISSUED FOR NOVEMBER 6, 2009
DRAFT

CH2MHILL

Alberta TRANSPORTATION

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL
SCHEDULE 18 APPENDIX E DRAWINGS
COVER SHEET

BAR CODE

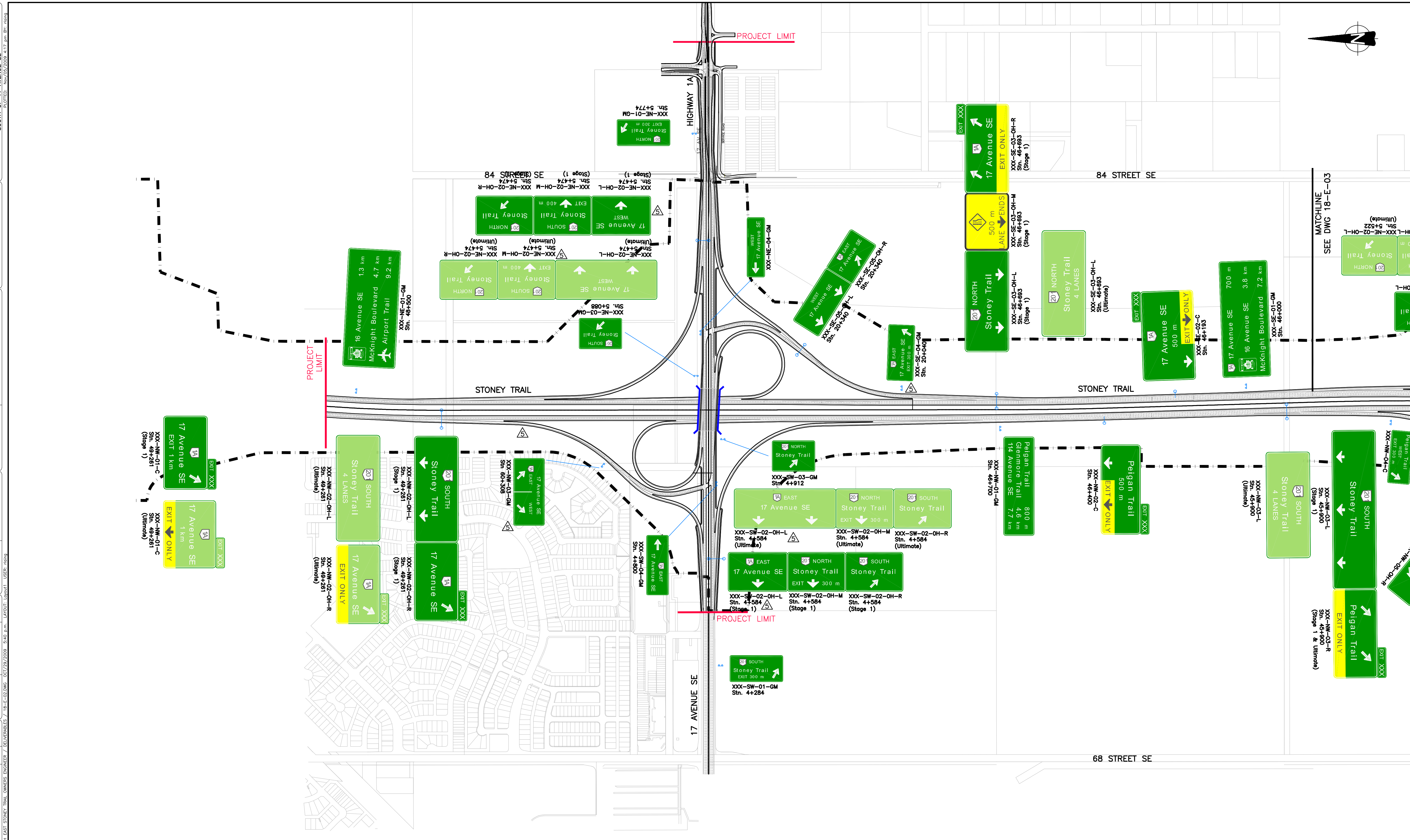
PLAN No.	18-E-01
CONTRACT No.	XXXX/XX
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DATE
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

No.	REVISION	BY	DATE
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

PLOTTED: Nov/05/2009 4:36 pm BY: rlaing

NDM PROJECT: CGY / SESTOE-388694 / SOUTH EAST STONEY TRAIL OWNERS ENGINEER / DELIVERABLES / 18-E-01.DWG OCT/29/2009 7:58 p.m. LAYOUT: Layout1 USER: rlaing



NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18-A-21, 18-A-22 AND 18-A-23.
2. SIGN STRUCTURES (OVERHEAD) TO BE DESIGNED FOR LOADING OF SIGN PANELS OVER FUTURE LANES.
3. EXIT NUMBERS INDICATED AS 'XXX' ARE SHOWN FOR INFORMATION ONLY AND WILL BE CONFIRMED PRIOR TO DETAIL DESIGN OF SIGN PANEL.

FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN

LEGEND

T.U.C. BOUNDARY
OVERHEAD BRIDGE
CANTILEVER
GROUND MOUNT
SIGN POST
STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-02

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
NORTH OF 17 AVENUE SE TO
SOUTH OF 17 AVENUE SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-02

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

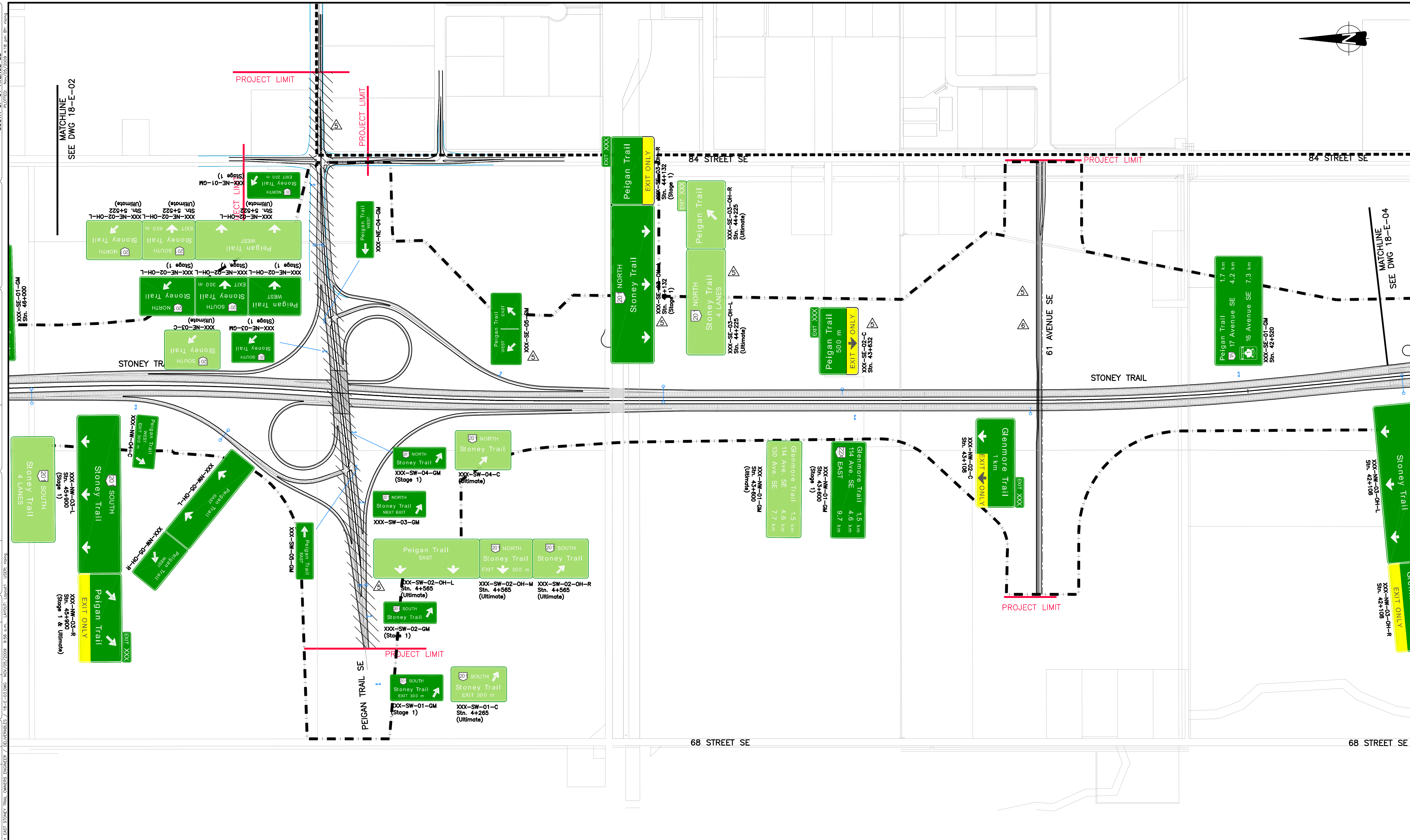
PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 GUIDE SIGNING FOR NEW INFRASTRUCTURE NORTH OF 17 AVENUE SE TO SOUTH OF 17 AVENUE SE

BAR CODE

PLAN No. 18-E-02

CONTRACT No. 7875/09

No.	REVISION	BY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB
4	ISSUED FOR ADDENDUM 11	JB
5	ISSUED FOR ADDENDUM 17	JB
6	ISSUED FOR NOVEMBER 6, 2009	JB



NOTES:

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FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC. 5

KEY PLAN

LEGEND

- T.U.C. BOUNDARY
- OVERHEAD BRIDGE
- CANTILEVER
- GROUND MOUNT SIGN POST
- STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-03

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
NORTH OF PEIGAN TRAIL SE TO
SOUTH OF 61 AVENUE SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-03

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
NORTH OF PEIGAN TRAIL SE TO
SOUTH OF 61 AVENUE SE

BAR CODE

PLAN No.	18-E-03
CONTRACT No.	7875/09
PLAN LOCATION	

No.	REVISION	BY	DD.MM.YY
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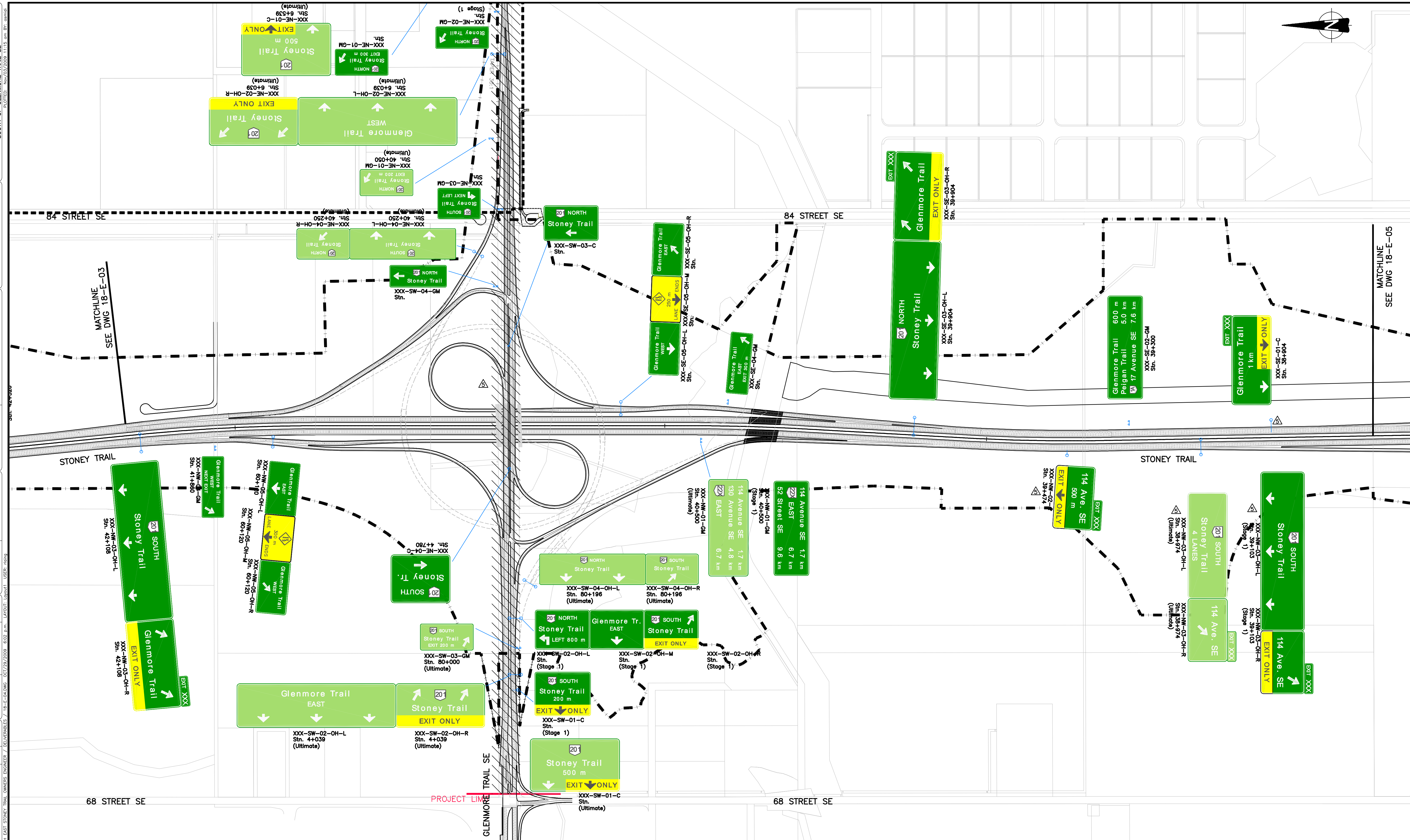
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-
PHOTO No.		
TITLE SEARCH DATE		
GRAPHICS FILE		



NOTES:

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2. SIGN STRUCTURES (OVERHEAD) TO BE DESIGNED FOR LOADING OF SIGN PANELS OVER FUTURE LANES.
3. EXIT NUMBERS INDICATED AS 'XXX' ARE SHOWN FOR INFORMATION ONLY AND WILL BE CONFIRMED PRIOR TO DETAIL DESIGN OF SIGN PANEL.

FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN

LEGEND

- T.U.C. BOUNDARY
- OVERHEAD BRIDGE
- CANTILEVER
- GROUND MOUNT SIGN POST
- STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-04

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18

GUIDE SIGNING FOR NEW INFRASTRUCTURE NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-04

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 GUIDE SIGNING FOR NEW INFRASTRUCTURE NORTH OF GLENMORE TRAIL SE TO SOUTH OF GLENMORE TRAIL SE

BAR CODE

PLAN No. 18-E-04

CONTRACT No. 7875/09

PLAN LOCATION

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

SURVEYED / DESIGNED / CHECKED / DRAWN

PHOTO No. / TITLE SEARCH DATE / GRAPHICS FILE

NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18-A-21, 18-A-22 AND 18-A-23.
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FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN

LEGEND

- T.U.C. BOUNDARY
- OVERHEAD BRIDGE
- CANTILEVER
- GROUND MOUNT
- SIGN POST
- STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-05

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
NORTH OF 114 AVENUE SE TO
SOUTH OF 130 AVENUE SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-05

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 GUIDE SIGNING FOR NEW INFRASTRUCTURE NORTH OF 114 AVENUE SE TO SOUTH OF 130 AVENUE SE

BAR CODE

PLAN No.	CONTRACT No.	PLAN LOCATION
18-E-05	7875/09	

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

SURVEYED · DESIGNED · CHECKED · DRAWN

PHOTO No. · TITLE SEARCH DATE · GRAPHICS FILE

NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18-A-21, 18-A-22 AND 18-A-23.
2. SIGN STRUCTURES (OVERHEAD) TO BE DESIGNED FOR LOADING OF SIGN PANELS OVER FUTURE LANES.
3. EXIT NUMBERS INDICATED AS 'XXX' ARE SHOWN FOR INFORMATION ONLY AND WILL BE CONFIRMED PRIOR TO DETAIL DESIGN OF SIGN PANEL.

FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN

LEGEND

T.U.C. BOUNDARY
OVERHEAD BRIDGE
CANTILEVER
GROUND MOUNT
SIGN POST
STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-06

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
SOUTH OF 130 AVENUE SE TO
WEST OF 88 STREET SE

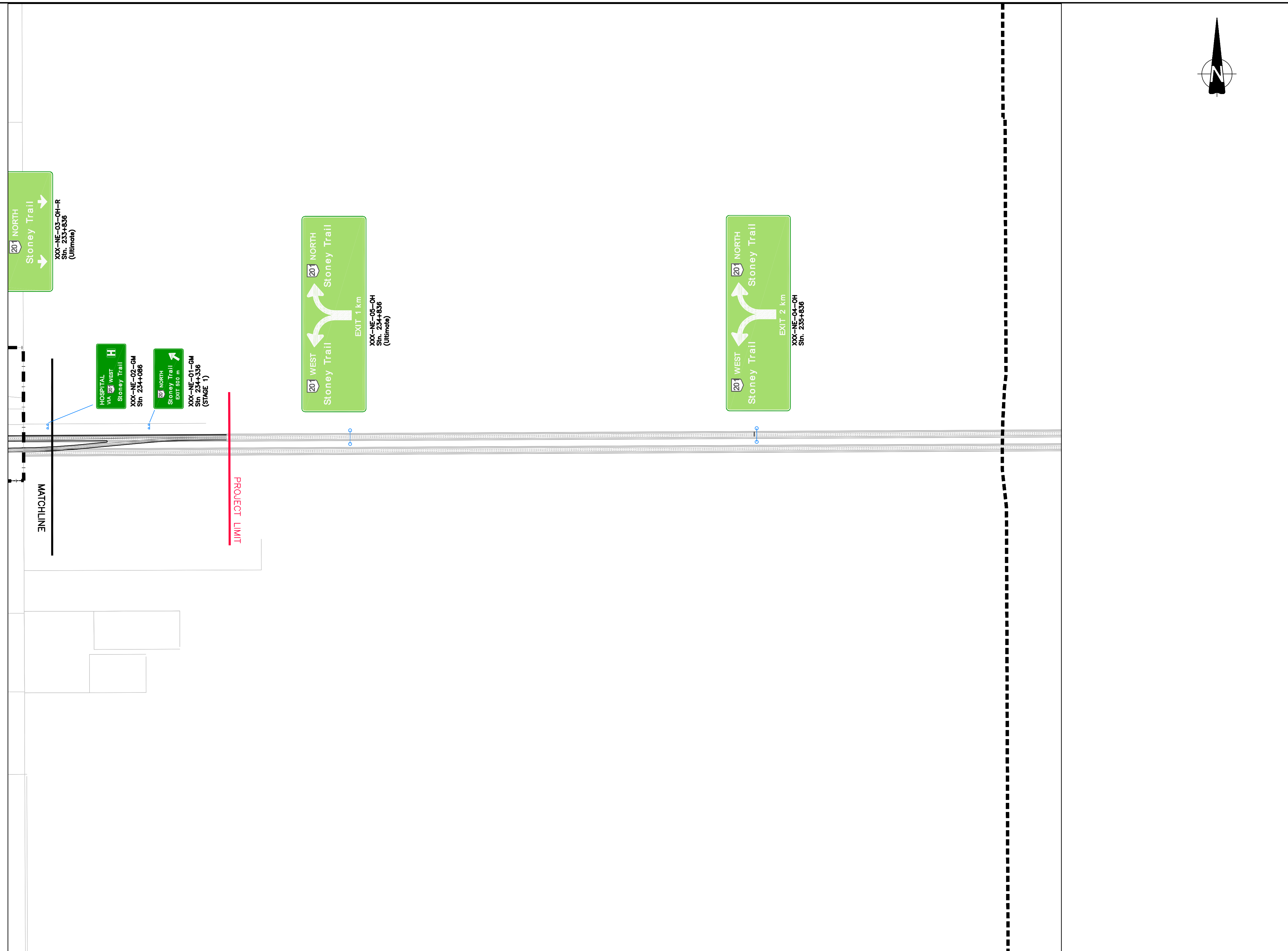
REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-06

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	



NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18-A-21, 18-A-22 AND 18-A-23.
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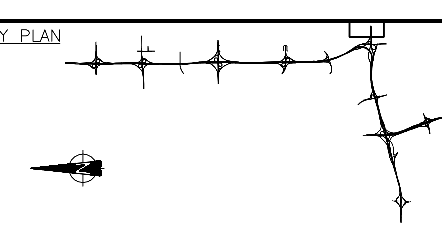
FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN



LEGEND

- T.U.C. BOUNDARY
- OVERHEAD BRIDGE
- CANTILEVER
- GROUND MOUNT
- SIGN POST
- STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-07

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
EAST OF 88 STREET SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-07

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
EAST OF 88 STREET SE

BAR CODE

PLAN No.	18-E-07
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

PLOTTED: Nov/03/2009 11:18 am

NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18-A-21, 18-A-22 AND 18-A-23.
2. SIGN STRUCTURES (OVERHEAD) TO BE DESIGNED FOR LOADING OF SIGN PANELS OVER FUTURE LANES.
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FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN

LEGEND

T.U.C. BOUNDARY
OVERHEAD BRIDGE
CANTILEVER
GROUND MOUNT
SIGN POST
STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-08

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
WEST OF 88 STREET SE
TO WEST OF 52 STREET SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-08

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION: SOUTHEAST STONEY TRAIL DBFO SCHEDULE 18 GUIDE SIGNING FOR NEW INFRASTRUCTURE WEST OF 88 STREET SE TO WEST OF 52 STREET SE

PLAN No. 18-E-08

CONTRACT No. 7875/09

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18-A-21, 18-A-22 AND 18-A-23.
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FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN

LEGEND

- T.U.C. BOUNDARY
- OVERHEAD BRIDGE
- CANTILEVER
- GROUND MOUNT
- SIGN POST
- STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-09

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO

11

GUIDE SIGNING
FOR NEW INFRASTRUCTURE
EAST OF DEERFOOT TRAIL SE TO
WEST OF McKENZIE LAKE BLVD SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-09

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
EAST OF DEERFOOT TRAIL SE TO
WEST OF McKENZIE LAKE BLVD SE

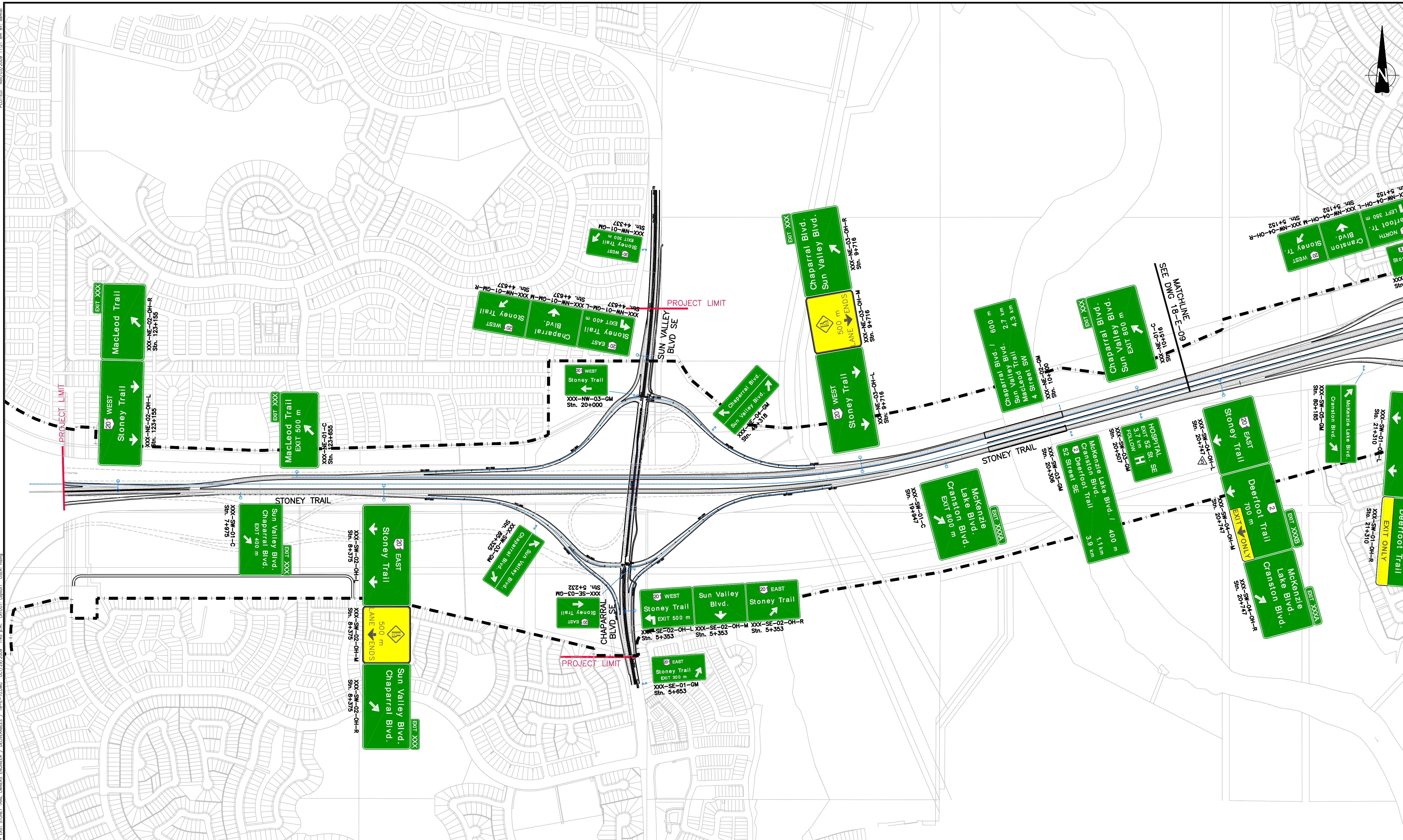
BAR CODE

PLAN No.	CONTRACT No.	PLAN LOCATION
18-E-09	7875/09	

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 1, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

SURVEYED
DESIGNED
CHECKED
DRAWN

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE



NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18-A-21, 18-A-22 AND 18-A-23.
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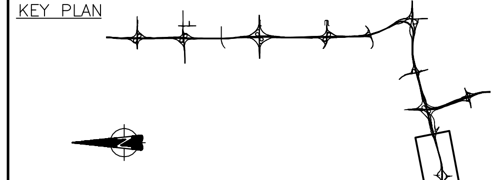
FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN



LEGEND

- T.U.C. BOUNDARY
- OVERHEAD BRIDGE
- CANTILEVER
- GROUND MOUNT
- SIGN POST
- STAGE 1 BRIDGES

Consultant Job No. 388694

18-E-10

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
EAST OF SUN VALLEY BLVD SE TO
WEST OF SUN VALLEY BLVD SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-E-10

Alberta TRANSPORTATION

0 100m
SCALE 1:5000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

No.	REVISION	BY	DD.MM.YY
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4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
EAST OF SUN VALLEY BLVD SE TO
WEST OF SUN VALLEY BLVD SE

PLAN No. 18-E-10
CONTRACT No. 7875/09

NOTES:

1. FUTURE MAINLINE GRADING REQUIRED AS SHOWN ON CROSS SECTIONS. REFER TO DRAWINGS 18–A–21, 18–A–22 AND 18–A–23.
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FUTURE GRADE SIGNING

GRADE SIGNING

HIGH LOAD CORRIDOR. ALL SIGN STRUCTURES TO BE PROTECTED TO ACCOMMODATE HIGH LOAD TRAFFIC.

KEY PLAN

LEGEND

T.U.C. BOUNDARY
OVERHEAD BRIDGE
CANTILEVER
GROUND MOUNT SIGN POST
STAGE 1 BRIDGES

Consultant Job No. 388694

18–E–11

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
STONEY TRAIL TO
SOUTH OF SETON BLVD SE

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	– –	Hwy 201:XX	7875/09	18–E–11

Alberta TRANSPORTATION

SCALE 1:5000

SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
GUIDE SIGNING
FOR NEW INFRASTRUCTURE
STONEY TRAIL TO
SOUTH OF SETON BLVD SE

BAR CODE

PLAN No. 18–E–11
CONTRACT No. 7875/09
PLAN LOCATION

PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
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4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

SURVEYED
DESIGNED
CHECKED
DRAWN

APPENDIX F - LIST OF ACRONYMS

AAR:	Alkali-Aggregate Reactivity
AADT:	Average Annual Daily Traffic
AASHTO:	American Association of State Highway and Transportation Officials
ACI:	American Concrete Institute
ACP:	Asphalt Concrete Pavement
AGC:	Associated General Contractors
AHDGA:	American Hot Dip Galvanizers Association
AISI:	American Iron and Steel Institute
AMA:	Alberta Motor Association
ANSI:	American National Standards Institute
APEGGA:	Association of Professional Engineers, Geologists and Geophysicist of Alberta
ARTBA:	American Road and Transportation Builders Association
ASCII:	American Standard Code for Information Interchange
AWS:	American Welding Society
ASTM:	American Society for Testing and Materials
BIM:	Bridge Inspection and Maintenance
CAP:	Corrugated Aluminum Pipe
CEAA:	Canadian Environmental Assessment Act
CECAB:	Canadian Environmental Certification Appeals Board
CGSB:	Canadian General Standards Board
CN:	Canadian National Railway Company
CP:	Canadian Pacific Railway Limited
CSA:	Canadian Standards Association
CSE:	Copper Sulphate Electrode
CSP:	Corrugated Steel Pipe
CSV:	Comma Separated Value
CTA:	Canada Transportation Act
CWB:	Canadian Welding Bureau
DCMS:	Dynamic Changeable Message Signs
DD:	Design Data

DFO:	Department of Fisheries and Oceans
DFT:	Dry Film Thickness
ESAL:	Equivalent Single Axle Load
EEMAC:	Electrical and Electronic Manufacturer's Association of Canada
EMS:	Environmental Management System
HERP:	Herbicide Exemption Request Program
ICP:	Inductively Coupled Plasma Spectrometry
IFI:	International Friction Index
IMU:	Inertial Measurement Unit
IRCA:	International Register for Certificated Auditors
IRI:	International Roughness Index
ISL:	Infrastructure Systems Limited
ISO:	International Standards Organization
Leq_{24}:	Weighted 24 hour equivalent sound level
LRFD:	Load and Resistance Factor Design
MAPP:	Medical Alert Pesticide Program
MSE:	Mechanically Stabilized Earth
MTO:	Ministry of Transportation Ontario
NCHRP:	National Cooperative Highway Research Program
NEMA:	National Electrical Manufactures Association
NQI:	National Quality Institute
NWPA:	Navigable Waters Protection Act
OSCAM:	On-Street Construction and Maintenance
PDF:	Portable Document Format
PG:	Performance Grade
PTFE:	Polytetrafluoroethylene
PTI:	Post Tensioning Institute
PVC:	Polyvinyl Chloride
QMS:	Quality Management System
RAP:	Reclaimed Asphalt Pavement
RAB:	Registrar Accreditation Board
RWIS:	Road Weather Information System
SHRP:	Strategic Highway Research Program
SPCSP:	Structural Plate Corrugated Steel Pipe
SSPC:	Society for Protective Coating Standards
TAC:	Transportation Association of Canada

APPENDIX G -
ALBERTA INFRASTRUCTURE LAND LEASE SUMMARY AND DRAWINGS

- **Table - pages 1 and 2**
- **Drawings**
  - 18-G-01 – COVER SHEET;
  - 18-G-02 - NORTH OF 17 AVE SE TO SOUTH OF 61 AVE SE;
  - 18-G-03 – NORTH OF GLENMORE TR SE TO SOUTH OF 130 AVE SE;
  - 18-G-04 – EAST OF HIGHWAY 22X JUNCTION TO WEST OF McKENZIE LAKE BLVD SE; and
  - 18-G-05 – EAST OF DEERFOOT TRAIL SE TO WEST OF SUN VALLEY BLVD SE

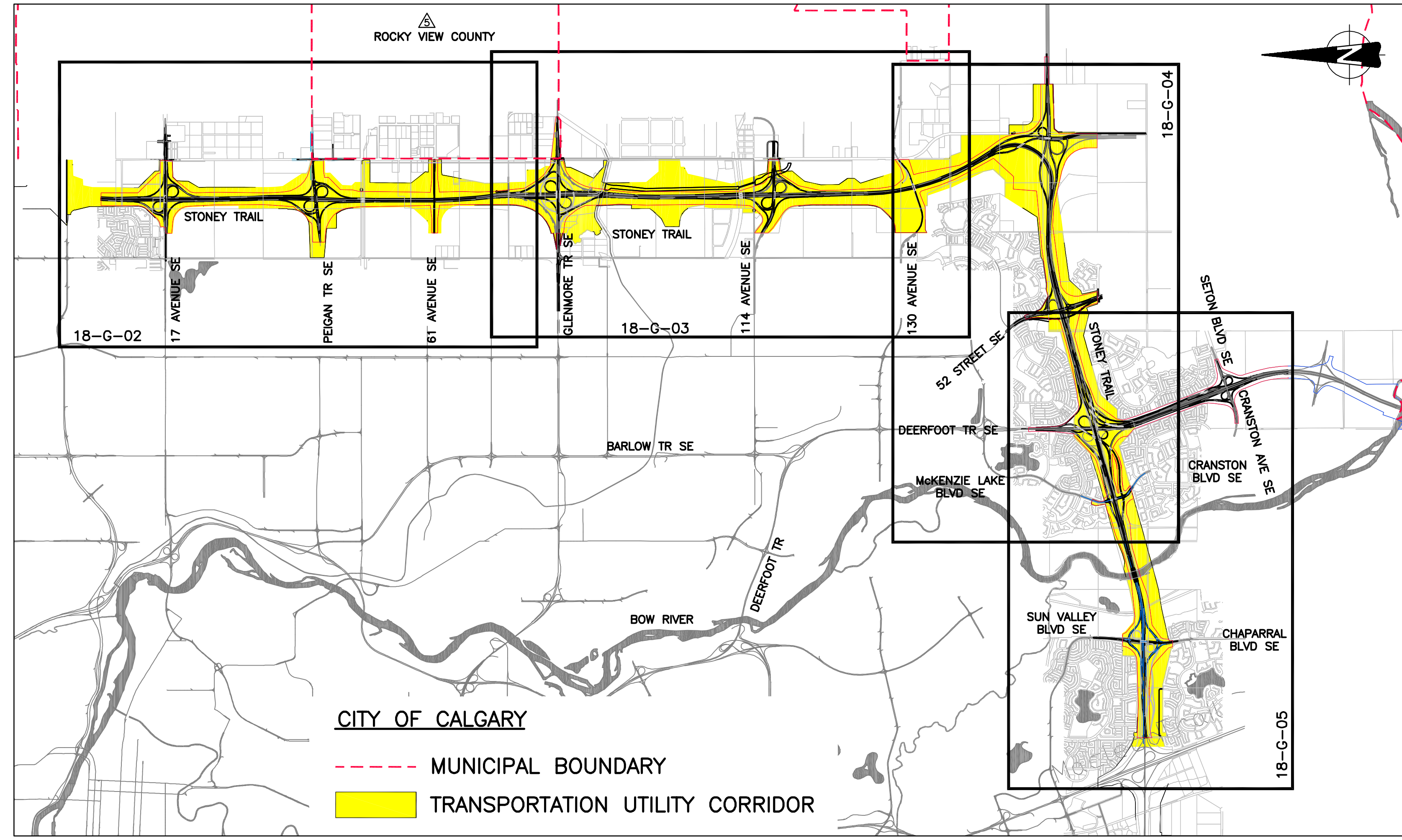
Appendix G
Alberta Infrastructure Land Lease Summary Table (2 pages)

Lease	Type of Agreement / Description	Legal	Lease Status	Lease Termination Date	Total Acres	Affected Areas (as defined in section 200.2.3.24 (Demolition) of Schedule 18 (Technical Requirements))
902C	AGRICULTURAL	5;1;22;22;NE 5;1;22;23;N 5;1;22;22;NE 5;1;22;23;N 5;1;22;23;NW 5;1;22;23;NE 5;1;22;23;NE 5;1;22;24;NW	To be Cancelled	31-Dec-2009	135.600	Not one of the Affected Areas
909S	AGRICULTURAL	4;29;23;1;NE 4;29;23;1;SE 4;29;23;25 SE	To be Cancelled	31-Dec-2009	254.480 48.630	Not one of the Affected Areas
910U	AGRICULTURAL	4;29;23;25;S2 4;29;23;24;NE	To be Cancelled	31-Dec-2009	144.370	Not one of the Affected Areas
911L	RESIDENTIAL / AGRICULTURAL / COMMERCIAL	4;29;24;13;NE 4;29;24;13;SE	To Remain	n/a	7.070	Not one of the Affected Areas
917C	AGRICULTURAL	4;29;22;35;SW 4;29;22;35;SE	To be Cancelled	31-Dec-2009	213.000	Not one of the Affected Areas
918H	SURFACE; well site and access road	4;29;23;25;NE	To Remain	n/a	3.480	Not one of the Affected Areas
922R	AGRICULTURAL	4;29;24;1; 4;29;23;36;NE 4;29;23;24;S 4;29;23;13;N 4;29;23;12;N 4;29;23;12;SE 4;29;23;24;N 4;29;24;12;NE 4;29;24;12;SE 4;29;24;12;NE 4;29;24;12;NW 4;29;24;12;SE	To be Cancelled	31-Dec-2009	991.460	One of the Affected Areas
926T	COMMERCIAL - tracking storage yard	4;29;23;13;SE	To be cancelled	31-Dec-2009	4.750	One of the Affected Areas
927M	AGRICULTURAL	4;29;23;36;NE	To be Cancelled	31-Dec-2009	11.930	Not one of the Affected Areas
929Q	LAND - access road	5;1;22;25;SE 4;29;22;30;SE 4;29;22;29;SW 4;29;22;29;SW 5;1;22;25;SE 5;1;22;24;NE	To Remain	n/a	25.180	Not one of the Affected Areas
930V	AGRICULTURAL	4;29;23;13;SE	To be Cancelled	31-Dec-2009	39.720	Not one of the Affected Areas
940B	AGRICULTURAL	4;29;23;36;SE 4;29;23;36;SW 4;29;23;25;NE	To be Cancelled	31-Dec-2009	293.380	Not one of the Affected Areas

Lease	Type of Agreement / Description	Legal	Lease Status	Lease Termination Date	Total Acres	Affected Areas (as defined in section 200.2.3.24 (Demolition) of Schedule 18 (Technical Requirements))
942G	AGRICULTURAL	4;29;22;26;N2 4;29;22;26;NE	To be Cancelled	31-Dec-2009	109.550	Not one of the Affected Areas
942H	SURFACE; regulators/valves and access road	5;1;22;23;NW 5;1;22;26;SE	To Remain	n/a	3.310	Not one of the Affected Areas
945F	AGRICULTURAL	4;29;23;13;SW 4;29;23;13;SE	To be Cancelled	31-Dec-2009	4.740	Not one of the Affected Areas
946A	LOW SERVICES COMM; Cell Tower - prime	W 1/2 28-22-29-W4	To Remain	n/a	0.720	Not one of the Affected Areas
946B	LOW SERVICES COMM; Cell Tower co-locate on 946A	W 1/2 28-22-29-W4	To Remain	n/a	0.720	Not one of the Affected Areas
946C	LOW SERVICES COMM; Cell Tower co-locate on 946A	W 1/2 28-22-29-W4	To Remain	n/a	0.720	Not one of the Affected Areas
946J	LOW SERVICES COMM; Cell Tower - prime/owner	E 1/2 35-22-29-4	To Remain	n/a	1.000	Not one of the Affected Areas
946W	LOW SERVICES COMM; Cell Tower co-locate on 946J	E 1/2 35-22-29-4	To Remain	n/a	1.000	Not one of the Affected Areas
947B	AGRICULTURAL	S 1/2 13-23-29-W4	To be Cancelled	31-Dec-2009	13.99	Not one of the Affected Areas
947H	LICENSE -Signage	NW 27-22-29-W4	To be Cancelled	31-Dec-2009		Not one of the Affected Areas
947J	LICENSE -Signage	NW 27-22-29-W4 NE 26-22-29-W4	To be Cancelled	31-Dec-2009		Not one of the Affected Areas
947R	LICENSE -Signage	NW 27-22-29-4	To be Cancelled	31-Dec-2009		Not one of the Affected Areas
944X	STOCKPILE	SE 13-23-29-4	To be Cancelled	31-Dec-2009	4.940	Not one of the Affected Areas
946E	LICENSE; Off Leash Dog Run	NW 27-22-29-4	To Remain	n/a	24.600	Not one of the Affected Areas
947T	AGRICULTURAL AND RESIDENTIAL	SE 25-23-29-W4	To be Cancelled	31-Aug-2009	34.97	One of the Affected Areas

DRAWING LIST

18–G–01	1 OF 5	COVER SHEET
		LEASE AREAS
18–G–02	2 OF 5	NORTH OF 17 AVE SE TO SOUTH OF 61 AVE SE
18–G–03	3 OF 5	NORTH OF GLENMORE TR SE TO SOUTH OF 130 AVE SE
18–G–04	4 OF 5	EAST OF HIGHWAY 22X JUNCTION TO WEST OF McKENZIE LAKE BLVD SE
18–G–05	5 OF 5	EAST OF DEERFOOT TRAIL SE TO WEST OF SUN VALLEY BLVD SE



SOUTHEAST STONEY TRAIL
DESIGN, BUILD, FINANCE AND OPERATE
CALGARY, ALBERTA, CANADA

SCHEDULE 18
APPENDIX G - DRAWINGS
ISSUED FOR NOVEMBER 6, 2009
DRAFT

CH2MHILL

Alberta TRANSPORTATION

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL
SCHEDULE 18 APPENDIX G DRAWINGS
COVER SHEET

BAR CODE

PLAN No. 18–G–01
CONTRACT No. 7875/09
PLAN LOCATION
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

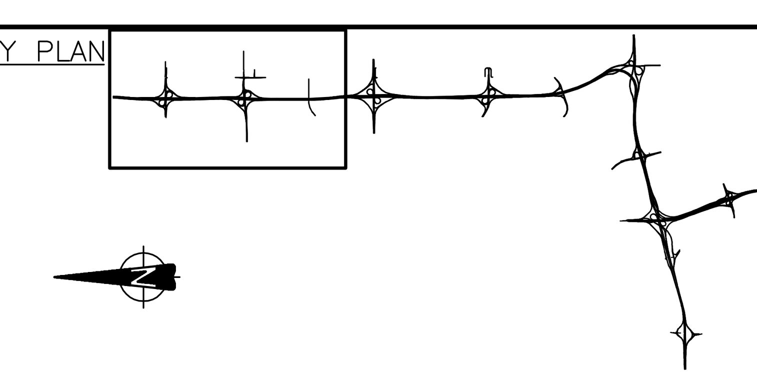
No.	REVISION	BY	DD.MM.YY
1–2	ISSUED FOR ADDENDUM 2 & 4	JB	
3	ISSUED FOR ADDENDUM 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	

	BY	DD.MM.YY
SURVEYED	–	–
DESIGNED	–	–
CHECKED	–	–
DRAWN	–	–

LEGEND:

- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- LEASE BOUNDARY w/ FILE NUMBER
- LEASE TO REMAIN
- GRADING ONLY (STAGE 1)

KEY PLAN



Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-G-02

Alberta TRANSPORTATION

0 250m
SCALE 1:10,000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

BAR CODE

PLAN No. 18-G-02
CONTRACT No. 7875/09
PLAN LOCATION
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

No.	REVISION	BY	DD.MM.YY
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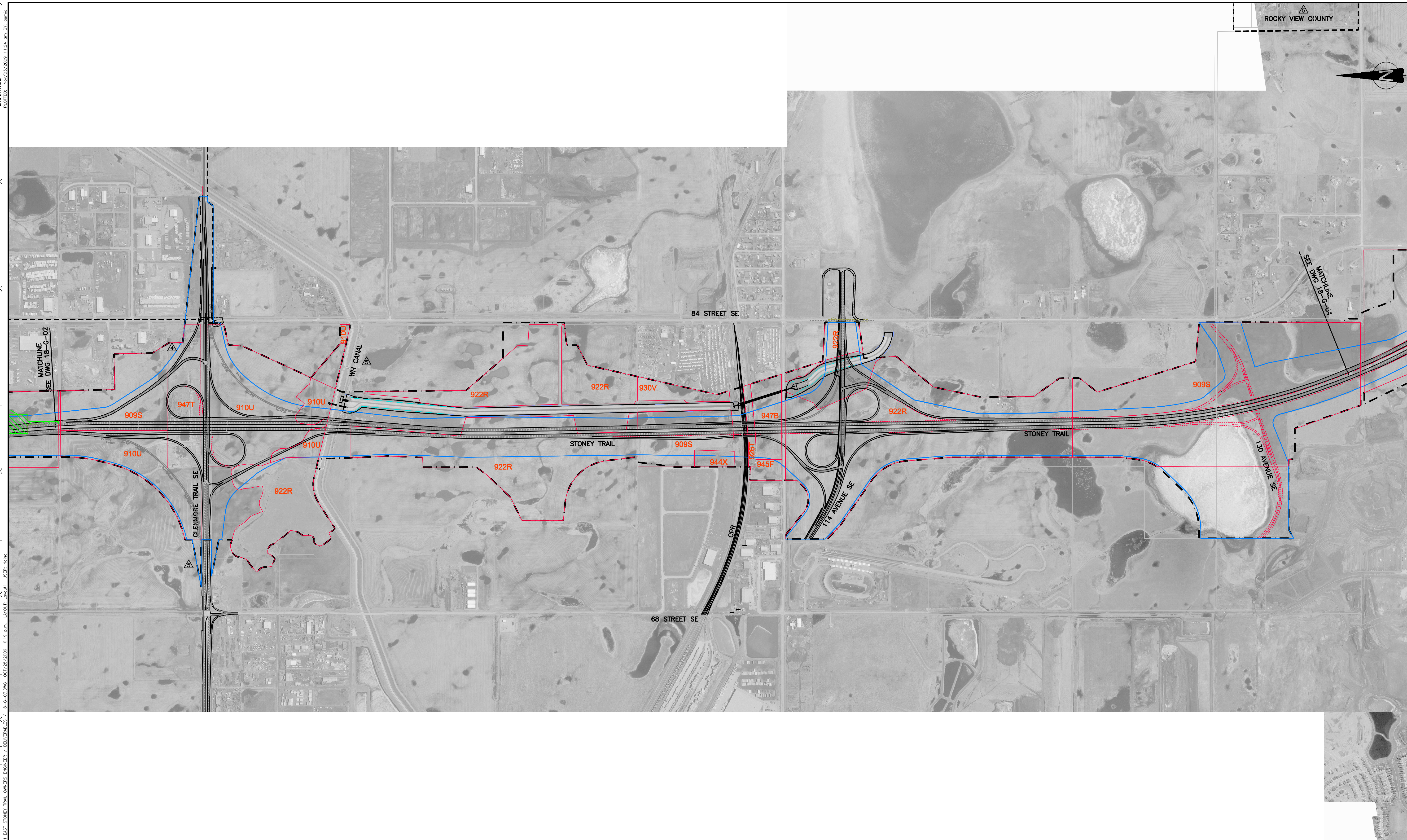


LEGEND:
- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- LEASE BOUNDARY w/ FILE NUMBER
- LEASE TO REMAIN
- GRADING ONLY (STAGE 1)

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-G-03

Alberta TRANSPORTATION

0 250m
SCALE 1:10,000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

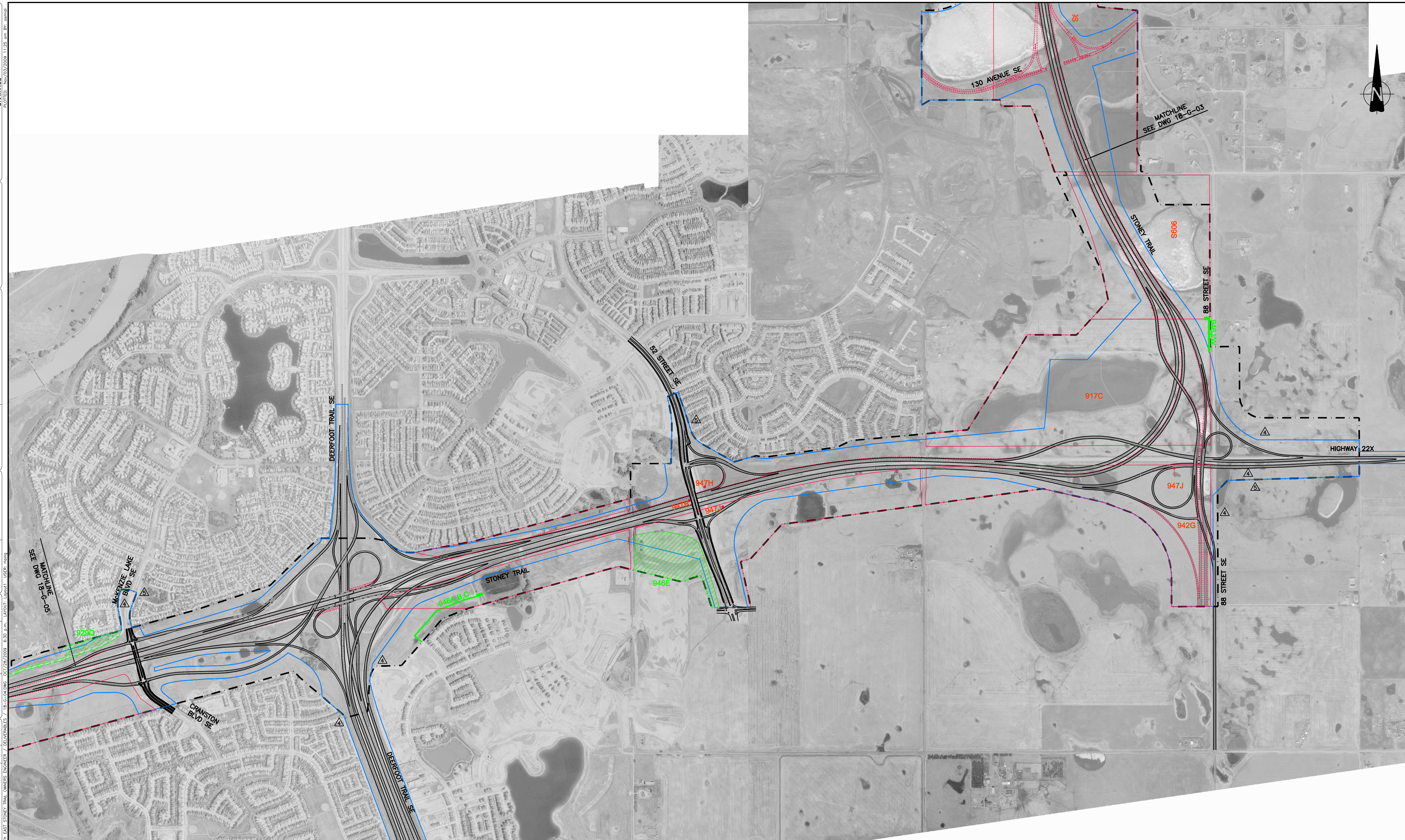
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

BAR CODE

PLAN No.	18-G-03
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

No.	REVISION	BY	DD.MM.YY
1-2	ISSUED FOR ADDENDUM 2 & 4	JB	
3	ISSUED FOR ADDENDUM 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR NOVEMBER 6, 2009 DRAFT	JB	



LEGEND:

- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- LEASE BOUNDARY w/ FILE NUMBER
- LEASE TO REMAIN
- GRADING ONLY (STAGE 1)

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-G-04

Alberta TRANSPORTATION

0 250m
SCALE 1:10,000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

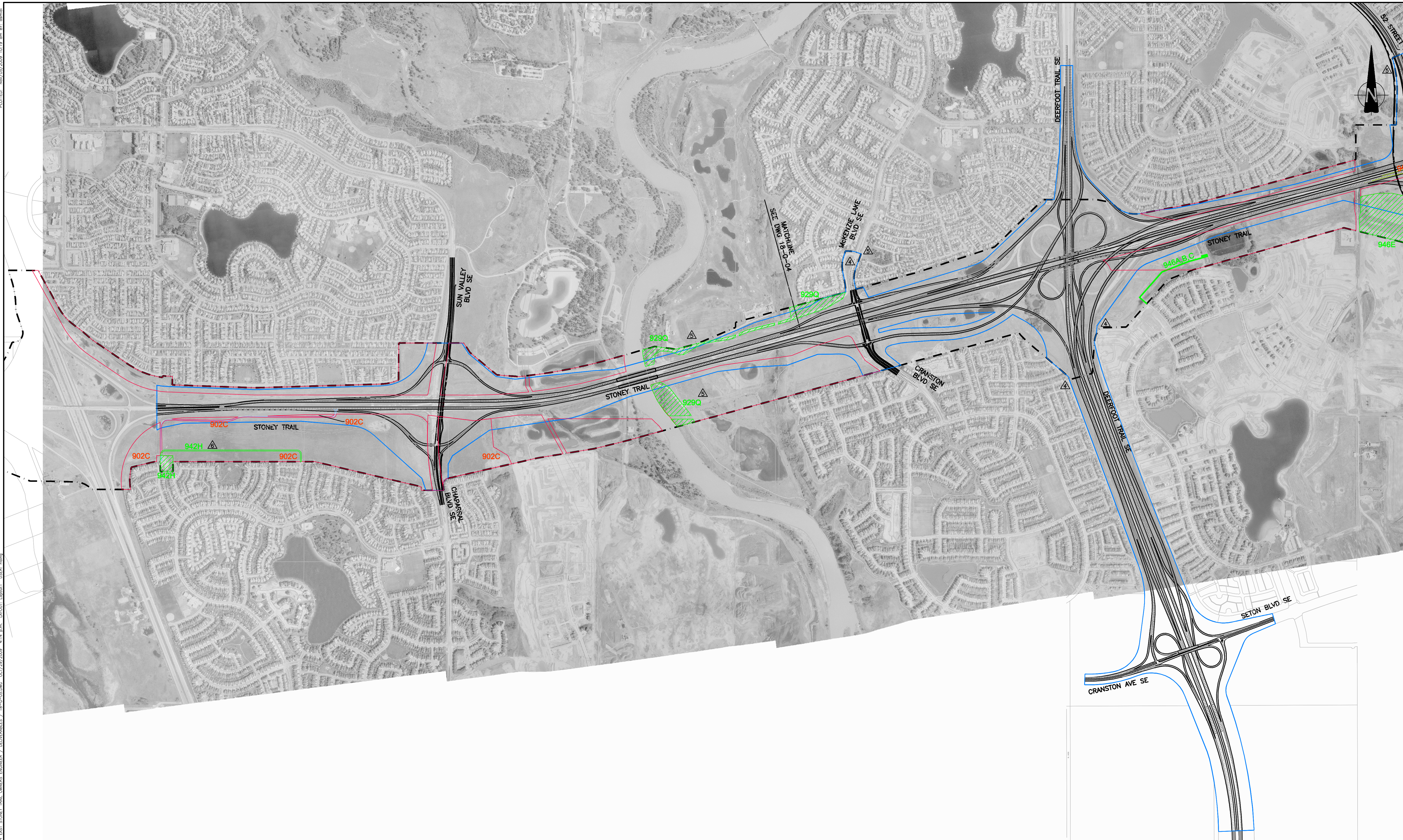
PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

BAR CODE

PLAN No.	18-G-04
CONTRACT No.	7875/09
PLAN LOCATION	
PHOTO No.	
TITLE SEARCH DATE	
GRAPHICS FILE	

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 2, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	



LEGEND:

- T.U.C. BOUNDARY
- MUNICIPAL BOUNDARY
- ROAD RIGHT OF WAY
- NEW INFRASTRUCTURE (STAGE 1)
- LEASE BOUNDARY w/ FILE NUMBER
- LEASE TO REMAIN
- GRADING ONLY (STAGE 1)

KEY PLAN

Consultant Job No. 388694

CH2MHILL

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

REGION	SHEET	PROJECT	CONTRACT No.	PLAN No.
SOUTHERN	- -	Hwy 201:XX	7875/09	18-G-05

Alberta TRANSPORTATION

0 250m
SCALE 1:10,000
SCALES SHOWN ARE CORRECT FOR 22" BY 34" SHEET SIZE

PLAN DESCRIPTION
SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18
APPENDIX G
ALBERTA INFRASTRUCTURE
LEASE AREAS
DRAWINGS

BAR CODE

PLAN No. 18-G-05
CONTRACT No. 7875/09
PLAN LOCATION
PHOTO No.
TITLE SEARCH DATE
GRAPHICS FILE

No.	REVISION	BY	DD.MM.YY
1-3	ISSUED FOR ADDENDUM 2, 4 & 7	JB	
4	ISSUED FOR ADDENDUM 11	JB	
5	ISSUED FOR ADDENDUM 17	JB	
6	ISSUED FOR NOVEMBER 6, 2009	JB	

	BY	DD.MM.YY
SURVEYED	-	-
DESIGNED	-	-
CHECKED	-	-
DRAWN	-	-

APPENDIX H - AUTOMATIC TRAFFIC RECORDER (ATR) SPECIFICATIONS

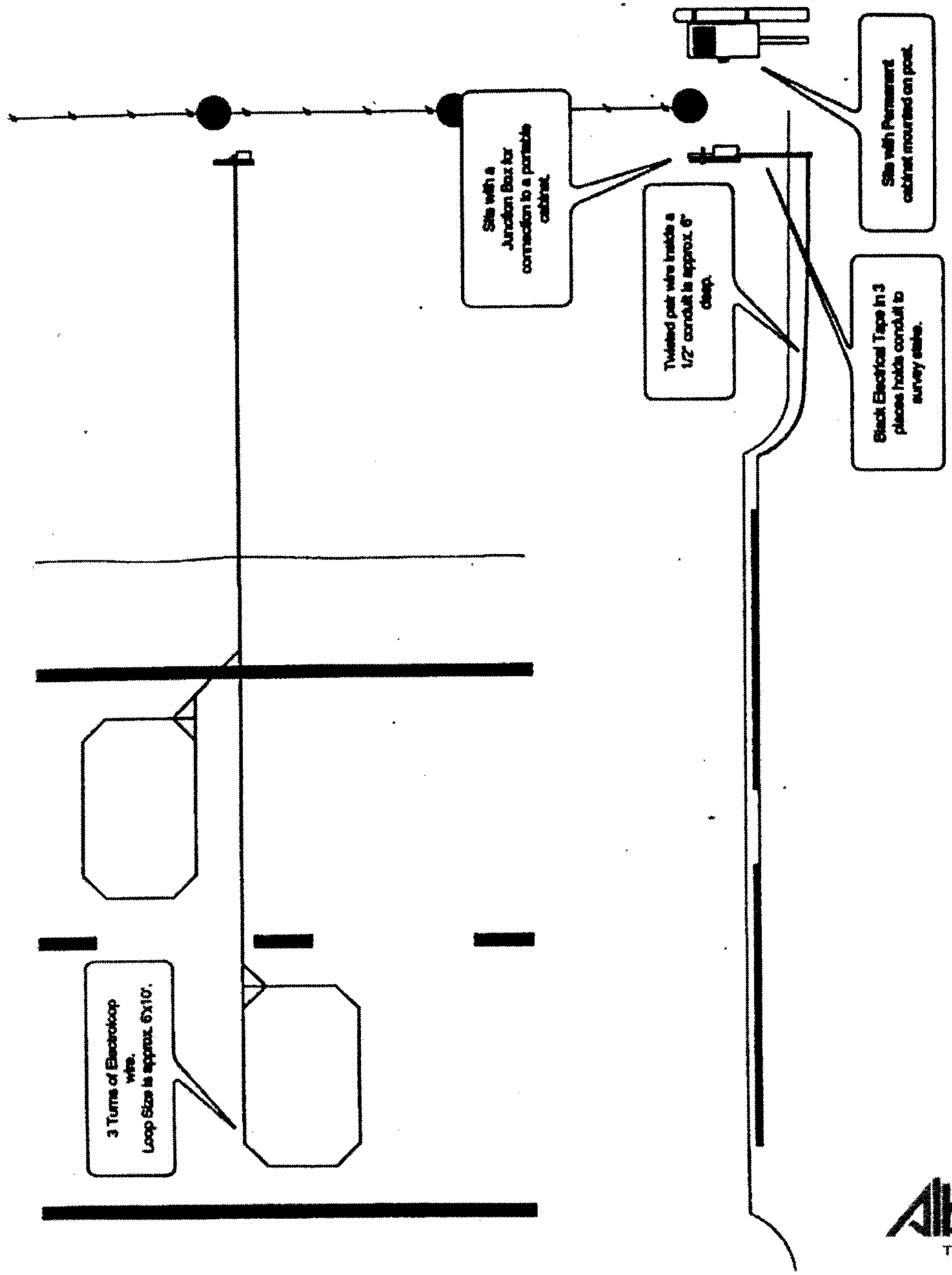
APPENDIX H

DRAWING NUMBER	TITLE
1 LOOP2001 - 1.0	LOOP INSTALLATION SPECIFICATIONS
2 LOOP2001 - 2.0	GENERIC LOOP INSTALLATION
3 LOOP2001 - 2.1	LOOP LAYOUT 2-LANE
4 LOOP2001 - 2.2	LOOP LAYOUT 4-LANE DIVIDED
5 LOOP2001 - 2.3	LOOP LAYOUT 6-LANE DIVIDED
6 LOOP2001 - 3.0	LOOP DETAIL
7 LOOP2001 - 4.0	ATR CABINET
8 LOOP2001 - 4.1	ATR CABINET
9 LOOP2001 - 4.2	ATR CABINET
10 LOOP2001 - 4.3	ATR CABINET
11 LOOP2001 - 4.4	ATR CABINET
12 LOOP2001 - 5.0	ATR BOX
13 LOOP2001 - 5.1	ATR BOX (INSIDE)
14 LOOP2001 - 6.0	BURIED CABLE SIGN
15 LOOP2001 - 6.1	SIGN MOUNTING POST
16 LOOP2001 - 6.2	JUNCTION BOX
17 LOOP2001 - 7.0	LOOP CABLE WIRING
18 LOOP2001 - 7.1	TERMINAL STRIP PIN OUT IN ATR BOX
19 LOOP2001 - 8.0	MODEM CABLE WIRING
20 LOOP2001 - 9.0	VOLTAGE REGULATOR
21 LOOP2001 - 9.1	VOLTAGE REGULATOR
22 LOOP2001 - 9.2	VOLTAGE REGULATOR CONNECTION

The specifications listed are guidelines only
Alberta Transportation assumes no responsibility for the completeness or the accuracy of the specifications contained in this document

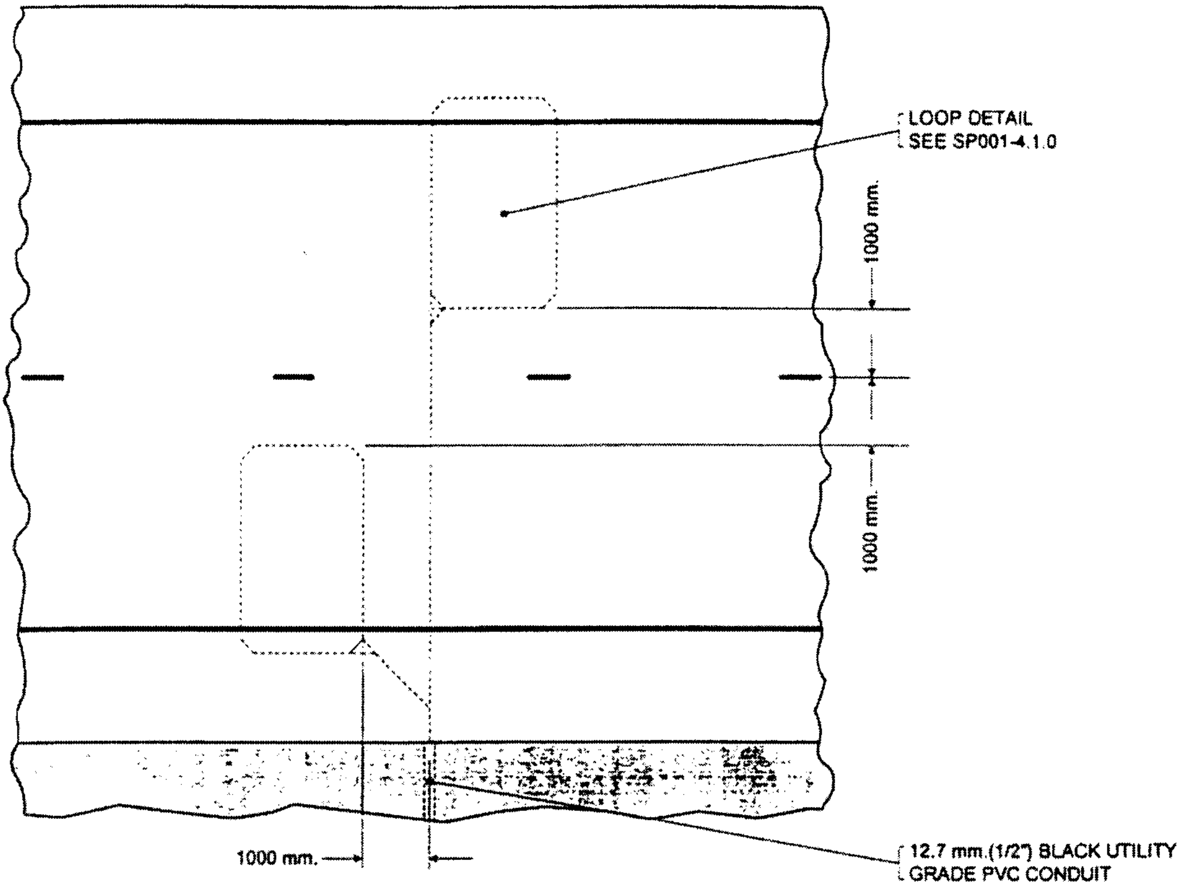
Alberta
TRANSPORTATION

LOOP INSTALLATION SPECIFICATIONS		No.	Revision	Date
		1		
		2		
Date: 2001 08 28 / Approved By	Drawing Number: LOOP2001 - 1.0	3		
		4		



Alberta TRANSPORTATION

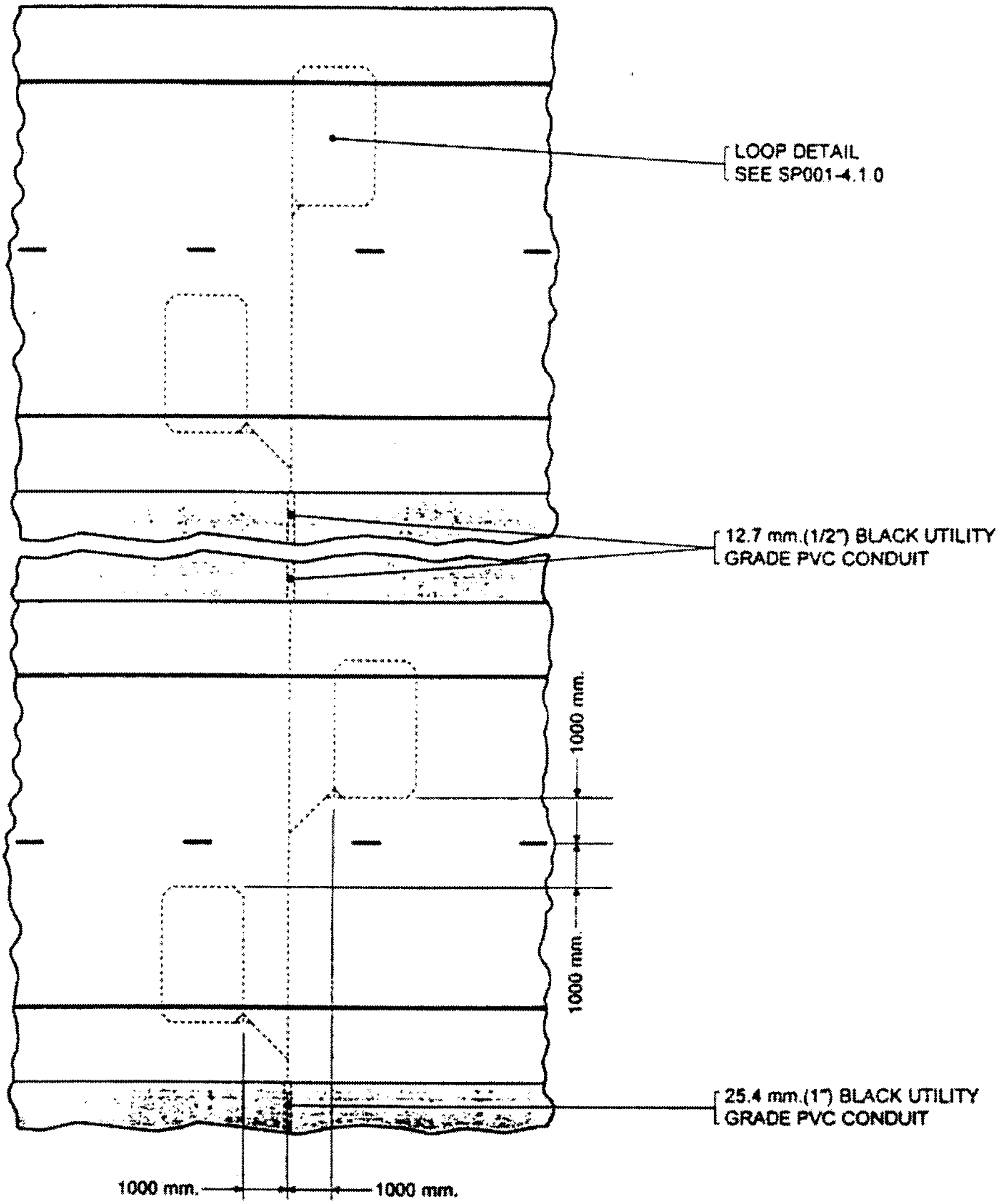
		No.	Revision	Date
GENERIC LOOP INSTALLATION		1		
		2		
Date / Approved By	Drawing Number	3		
2001.08.27 [signature]	LOOP2001 - 2.0	4		



Alberta
TRANSPORTATION

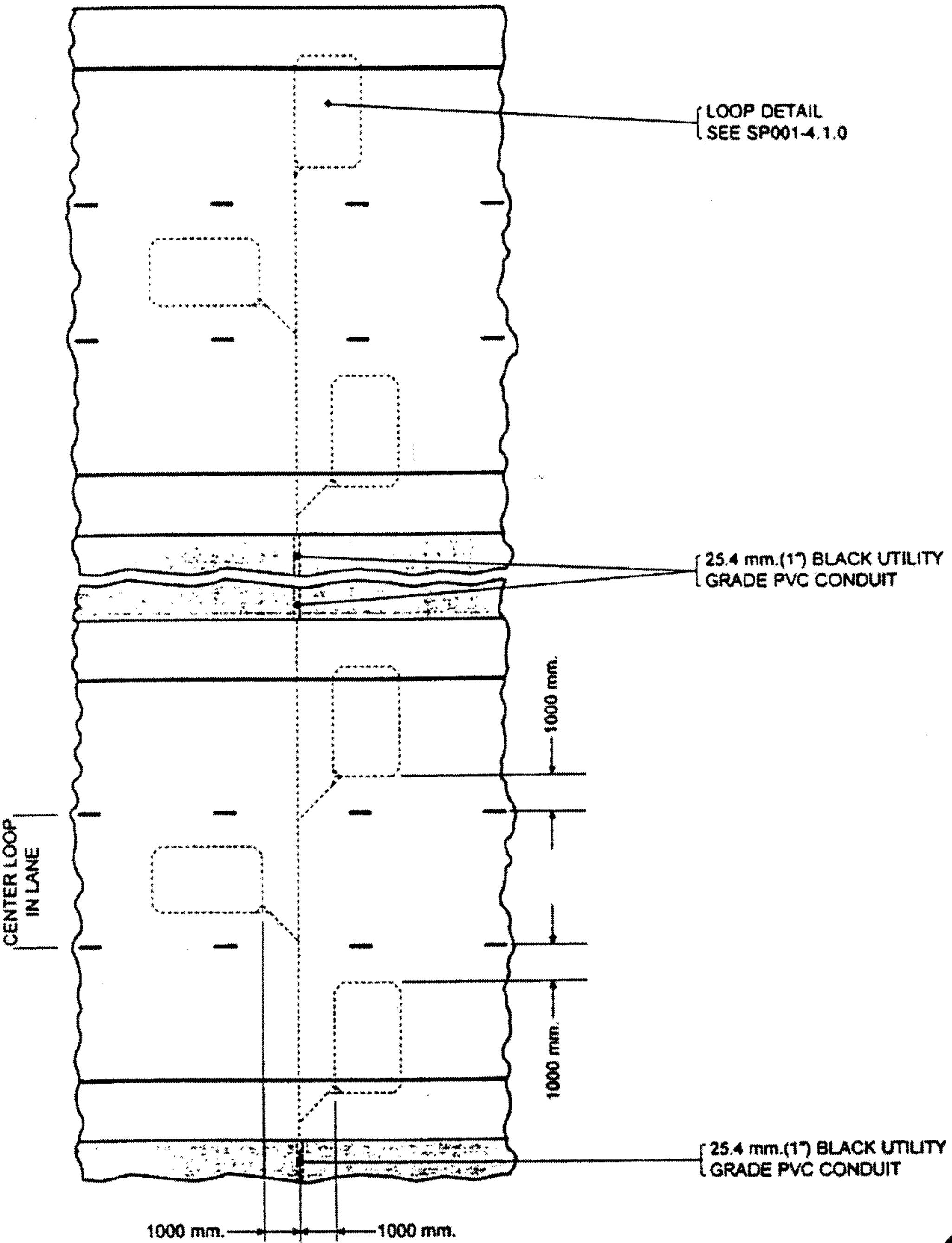
LOOP LAYOUT 2-LANE		No.	Revision	Date
		1		
		2		
Date	Approved By	3		
2001.08.27		4		

Drawing Number
LOOP2001 - 2.1



Alberta
TRANSPORTATION

LOOP LAYOUT 4 - LANE DIVIDED		No.	Revision	Date
		1		
		2		
Date / Approved By	Drawing Number	3		
2001 0827 [signature]	LOOP2001 - 2.2	4		

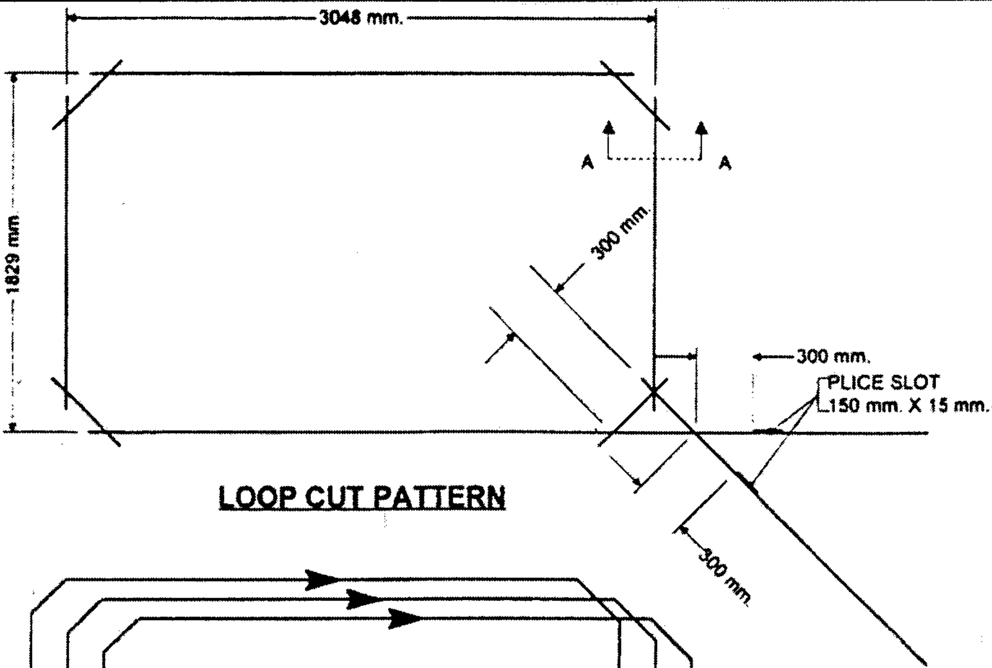


Alberta
TRANSPORTATION

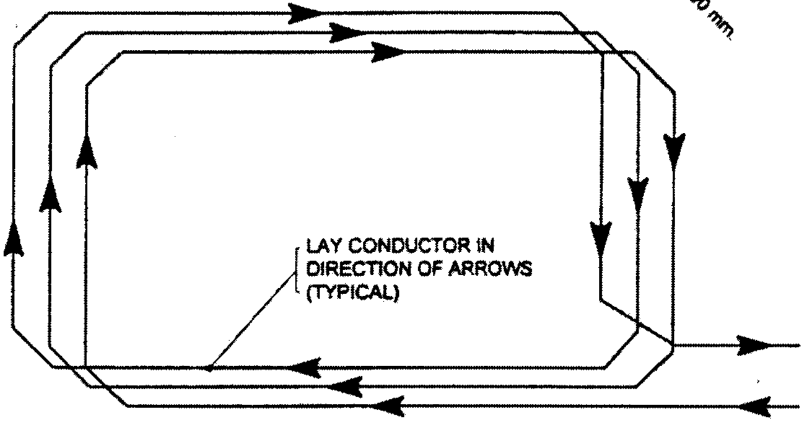
LOOP LAYOUT 6 - LANE DIVIDED

No.	Revision	Date
1		
2		
3		
4		

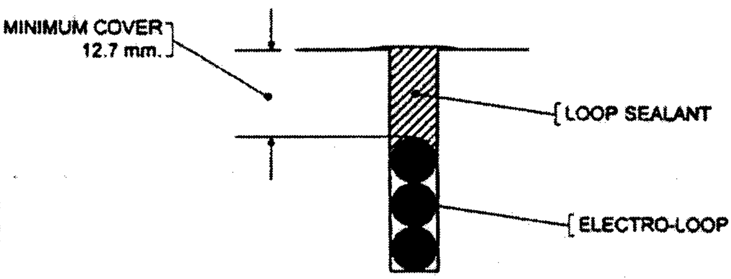
Date	Approved By	Drawing Number
2001 08 27		LOOP2001 - 2.3



LOOP CUT PATTERN



ELECTRO-LOOP LAYOUT

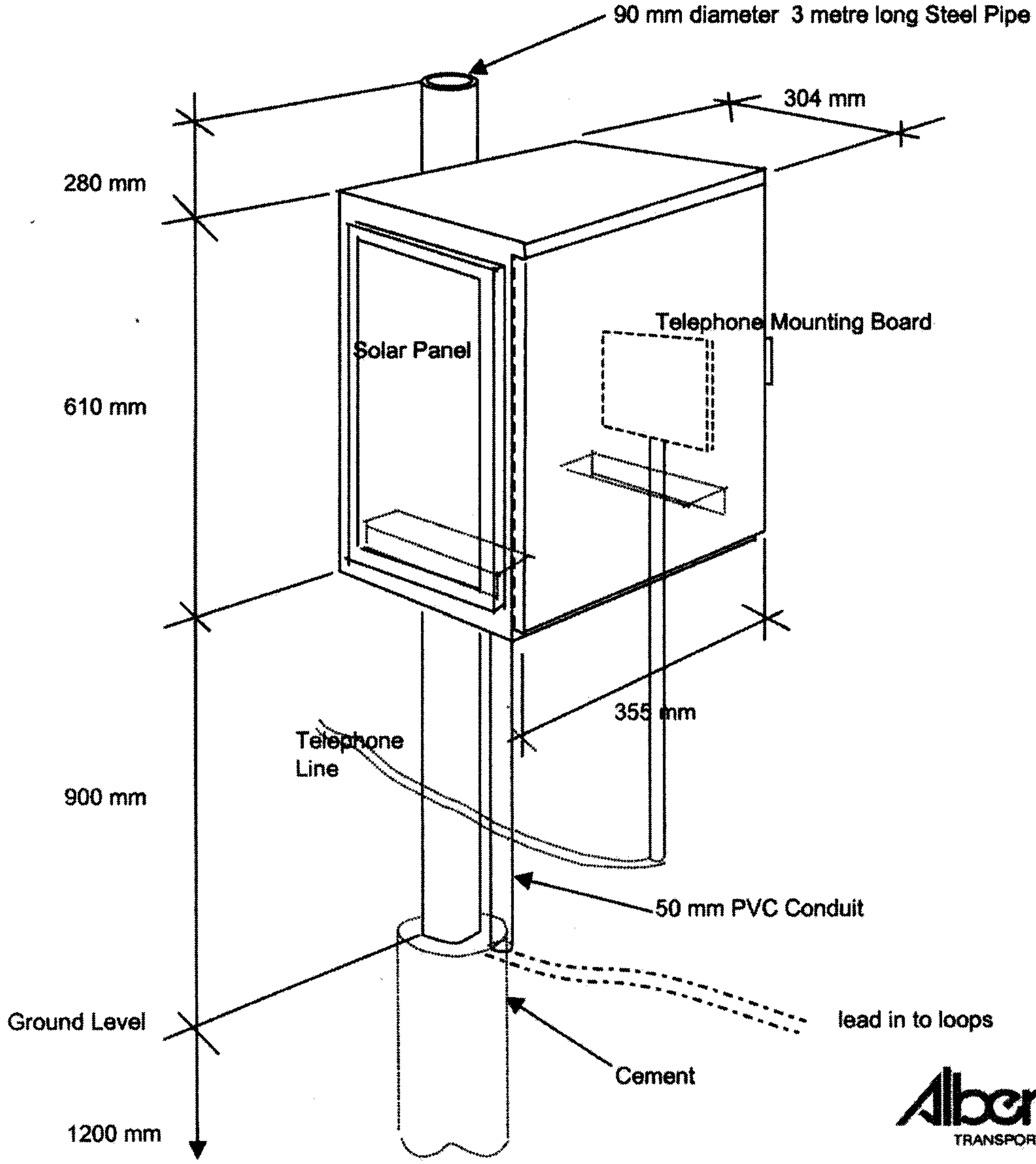


SECTION A-A

Alberta
TRANSPORTATION

LOOP DETAIL		No.	Revision	Date
		1		
		2		
Date: 20010827 Approved By: [signature]	Drawing Number: LOOP2001 - 3.0	3		
		4		

CABINET DIMENSIONS



Alberta
TRANSPORTATION

ATR CABINET		No.	Revision	Date
		1		
		2		
Date / Approved By	Drawing Number	3		
2001 08 28 [signature]	LOOP2001 - 4.0	4		

CABINET DIMENSIONS

BOX	OUTSIDE	360 mm	Wide (Cabinet Opening on this side)
		283 mm	Deep
		616 mm	High
		2 mm	Thick Steel Sheet
BOX	INSIDE	538 mm	High
		300 mm	Wide
		22 mm	Rain Lip
LID		333 mm	Deep
		362 mm	Wide
		25 mm	Rain Lip
DOOR		559 mm	High
		352 mm	Wide
		24 mm	Rain Lip
HINGE PINS		546 mm	Long
		16 mm	Wide Each 1/2 Hinge
			Located on Left Side of Cabinet Opening
LATCH	is located on the right side of the opening		
		279 mm	hole location up from bottom on the rain lip
		10 mm	lock hole diameter (inside)
		305 mm	latch distance from cabinet bottom
BOLTS (2)		152 mm	Distance from top of Cabinet
		152 mm	apart centered on left wall of cabinet
		29 mm	x 6 mm bolts
SHELF SUPPORTS (2)		25 mm	Wide
		25 mm	High
		273 mm	Long
		102 mm	distnce from botttom of cabinet
WEATHER STRIP		19 mm	Wide
		5 mm	Deep

Weather Strip on the door (inside) lines up with the rainlip or opening of cabinet.
All four edges of the door are to be weatherstripped with black foam rubber

Alberta
TRANSPORTATION

ATR CABINET		No.	Revision	Date
		1		
		2		
Date: 20010828 — Approved By: [signature]	Drawing Number: LOOP2001 - 4.1	3		
		4		

CABINET DIMENSIONS

SHELF
346 mm Wide
257 mm Deep
13 mm Thick Plywood

MOUNTING BOARD
254 mm Long
254 mm Wide
13 mm Thick Plywood
Centered holes 38 mm from top of board for two bolts,flat washer and nut

TERMINAL STRIP 16 postion or a 12 + 4 postion
152 mm location from bottom of board
two 229 mm x 19 mm diameter bolts (Robertson Head) per strip

TELEPHONE JACK BOX 51 mm x 57 mm
center mounted 51 mm from bottom of board with adhesive backing or
two 229 mm x 13 mm diameter bolts (Robertson Head)

TELUS MOUNTING BOARD located on bottom right outside of cabinet
254 mm High
203 mm Wide
19 mm Thick Plywood
two 25 mm x 5 mm diameter bolts located 25 mm from each side centered

HOLE FOR LOOP WIRES
64 mm dia. in center of cabinet bottom

TELUS WIRE HOLE 19 mm diameter
Located 64 mm from the back and 127 mm from the right side
13 mm diameter flex coil sheild is used through opening
The flex coil is fastened to the cabinet with a threaded connector
A locking ring is threaded on the inside of the cabinet

SOLAR PANEL MX5 - 6 VOLT located on door or left side 25 mm from top
two 8 mm diameter bolt holes located 235 mm apart and 152 mm from top of cabinet centered
two 25 mm x 8 mm diameter bolt, lock washer, washer, and nut
the bolt heads are located in the channels of the solar panel
6 mm diameter hole for solar panel wire is located 51 mm off centre of bolt holes

Alberta
TRANSPORTATION

		No.	Revision	Date
ATR CABINET		1		
		2		
Date: 2001 08 28 Approved By: [signature]	Drawing Number: LOOP2001 - 4.2	3		
		4		

CABINET DIMENSIONS

STEEL PIPE	3000 mm	High
	90 mm	Diameter
	5 mm	Thick Steel
MOUNTING	1200 mm	In Ground (Cemented in Place)
	1800 mm	Above Ground
CABINET LOCATION	900 mm	Between Ground and Cabinet
CABINET MOUNTS	64 mm	from bottom of cabinet
	152 mm	from top of cabinet

two 10 mm diameter "U" bolts, with 4 washers, 4 lock washers and 4 nuts

LOOP WIRES

come up through a 51 mm diameter, 991 mm long rigid PVC conduit
The conduit is fastened to the cabinet with a threaded sleave
which is glued to the end of the PVC conduit and screwed in place
with a locking ring on the inside of the cabinet

WIRING

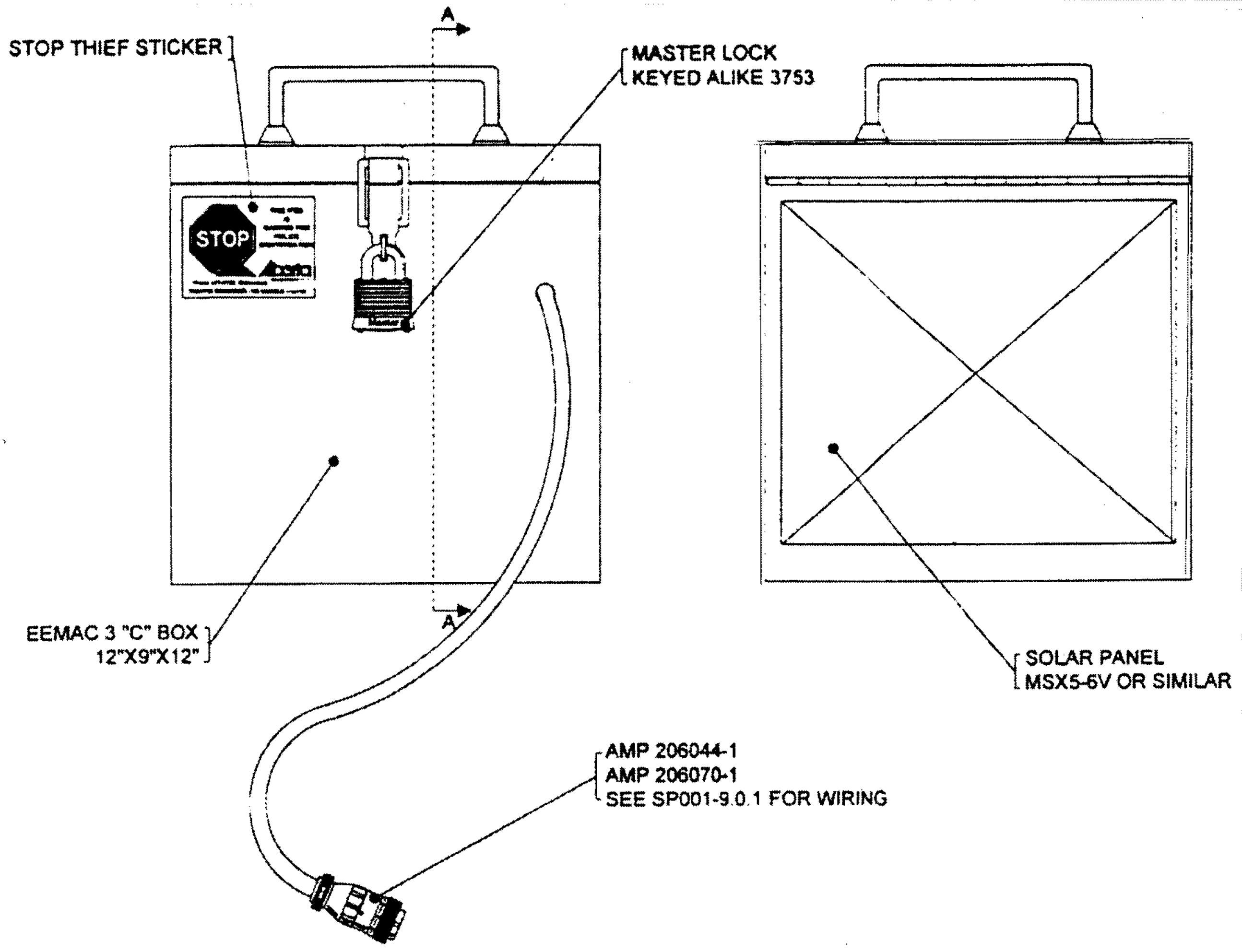
All wires running from the bottom of the cabinet to the mounting board are to be tie wrapped to a tie block in one group of wires to the back of the cabinet behind the shelf.
Tie blocks should be located every 150 mm to 200 mm
This also applies to the solar panel wire.
Excess wire should be kept to a minimum
The exception is loop wire where 900 mm to 1200 mm should be coiled below the shelf.
The wire running from the telephone jack should be 100 mm long and be 4 condutor telephone wire. The excess should be left outside the cabinet
The excess should be left outside the cabinet fro TELUS to connect to.
All wires that mount to the terminal strip will have
8 mm terminal ends which are crimped and soldered

Alberta
TRANSPORTATION

ATR CABINET			No.	Revision	Date
			1		
			2		
Date	Approved By	Drawing Number	3		
20010828	[signature]	LOOP2001 - 4.3	4		

Alberta
TRANSPORTATION

ATR CABINET		No.	Revision	Date
		1		2001.10.19
		2		
Date 2001 0828 Approved By	Drawing Number LOOP2001 -4.4	3		
		4		



BACK VIEW

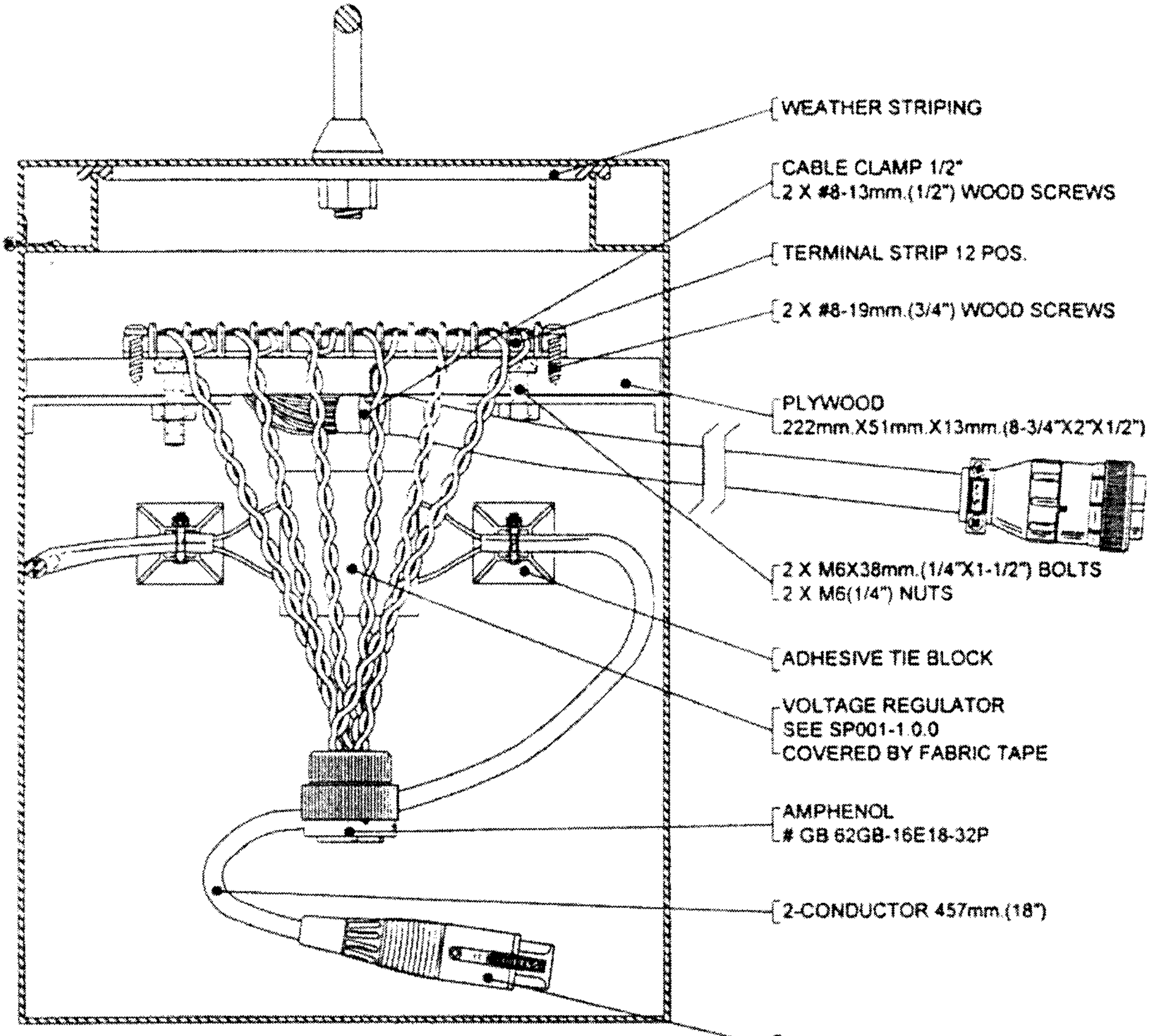
FRONT VIEW

Notes:

1. SECTION A-A, SEE SP001-6.0.1

Alberta
TRANSPORTATION

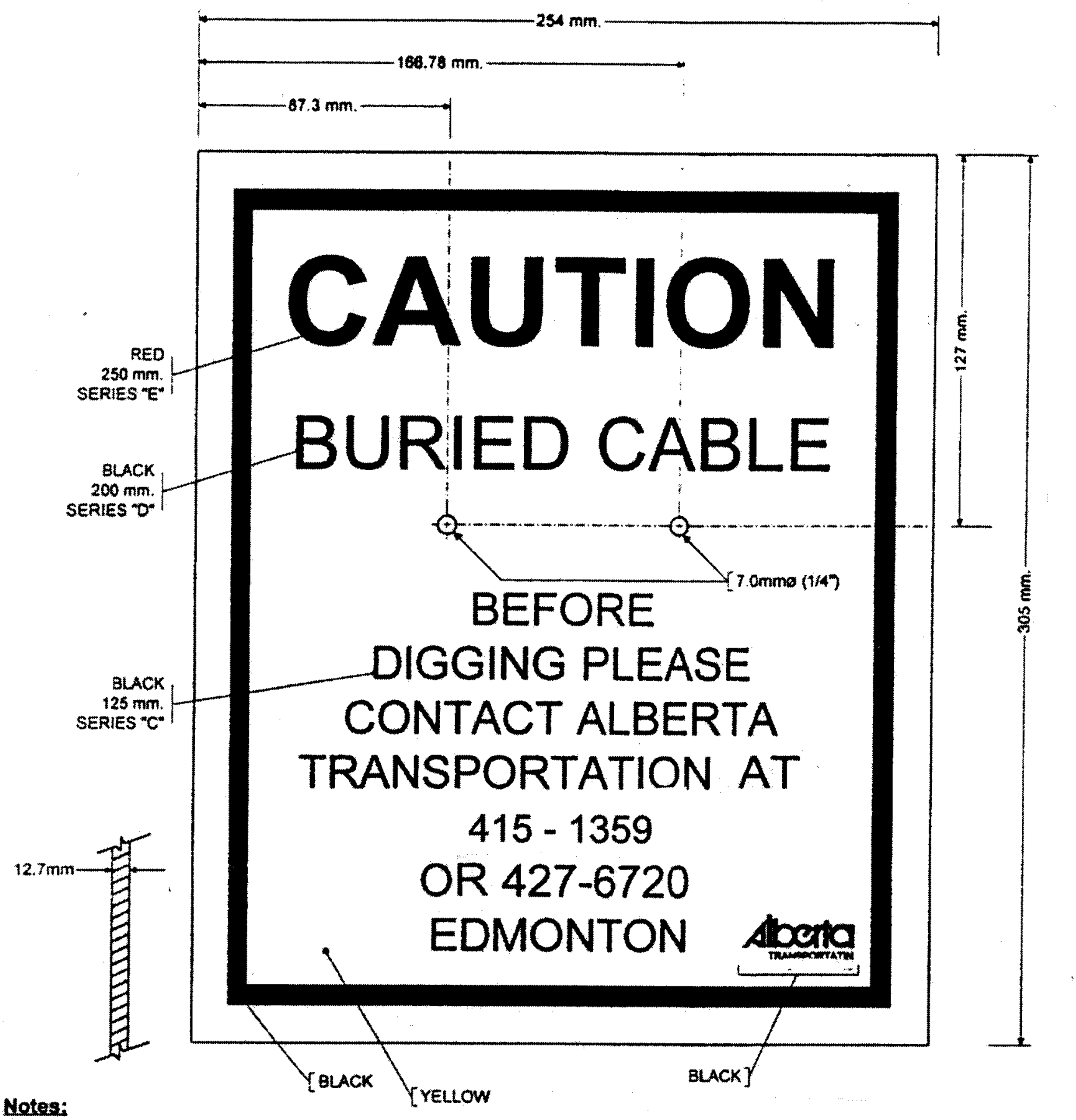
ATR BOX		No.	Revision	Date
		1		
		2		
Date 20010827	Approved By [signature]	3		
Drawing Number LOOP2001 - 5.0		4		



SECTION A-A

Alberta
TRANSPORTATION

ATR BOX (INSIDE)		No.	Revision	Date
		1		
		2		
Date: 2001.08.27 Approved By: [signature]	Drawing Number: LOOP2001 - 5.1	3		
		4		

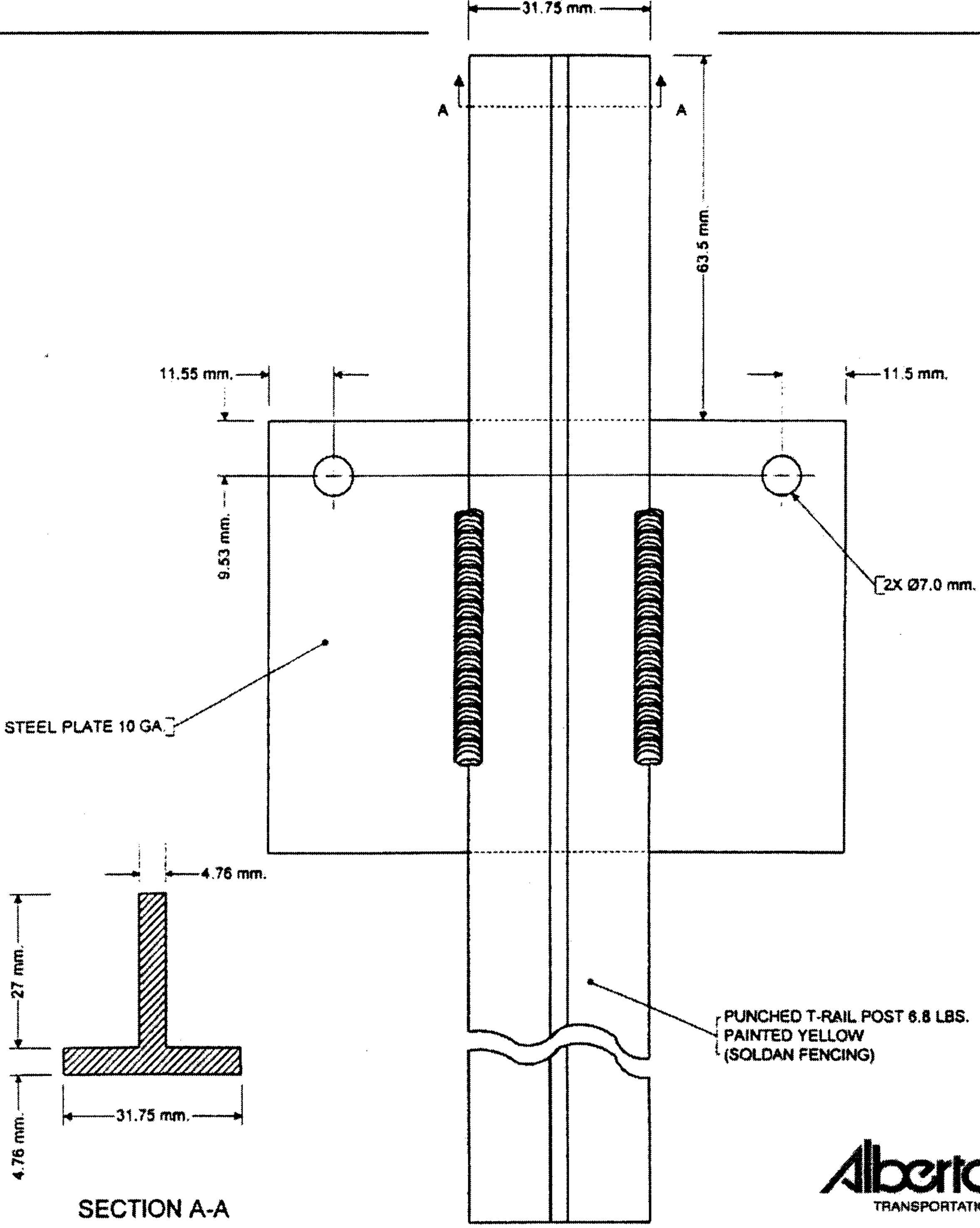


Notes:

1. ALL WRITING IN BLACK UNLESS OTHERWISE NOTED.

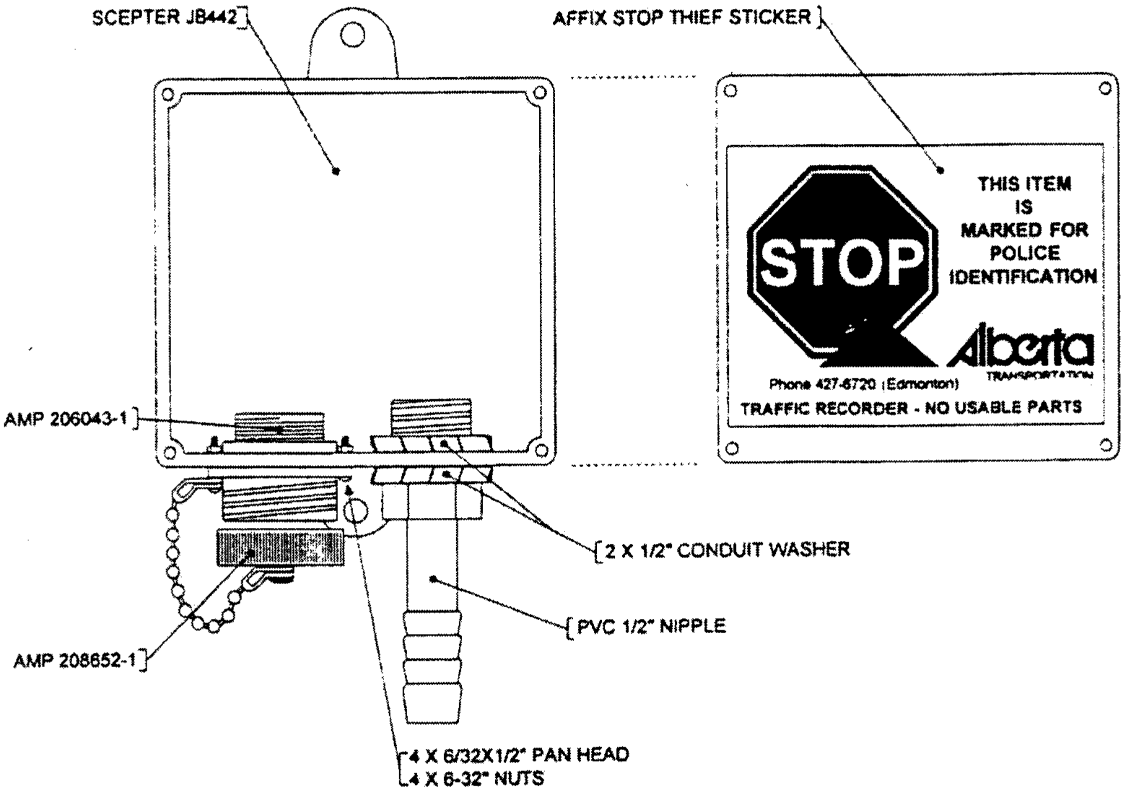
Alberta
TRANSPORTATION

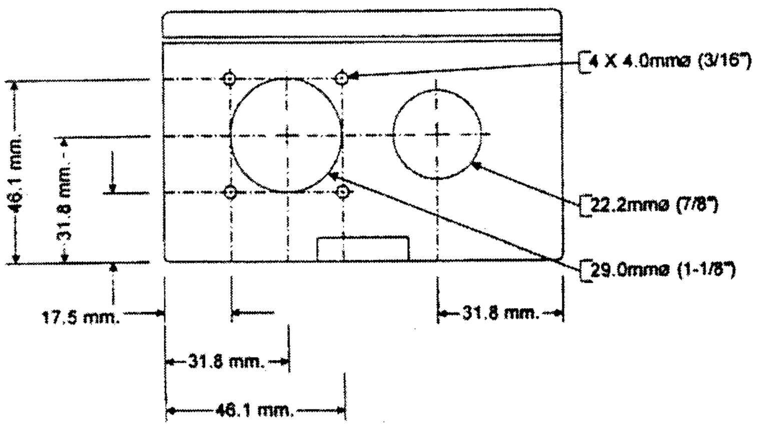
BURIED CABLE SIGN		No.	Revision	Date
		1		
		2		
Date: 2001.08.27	Approved By	3		
	Drawing Number: LOOP2001 - 6.0	4		



Alberta
TRANSPORTATION

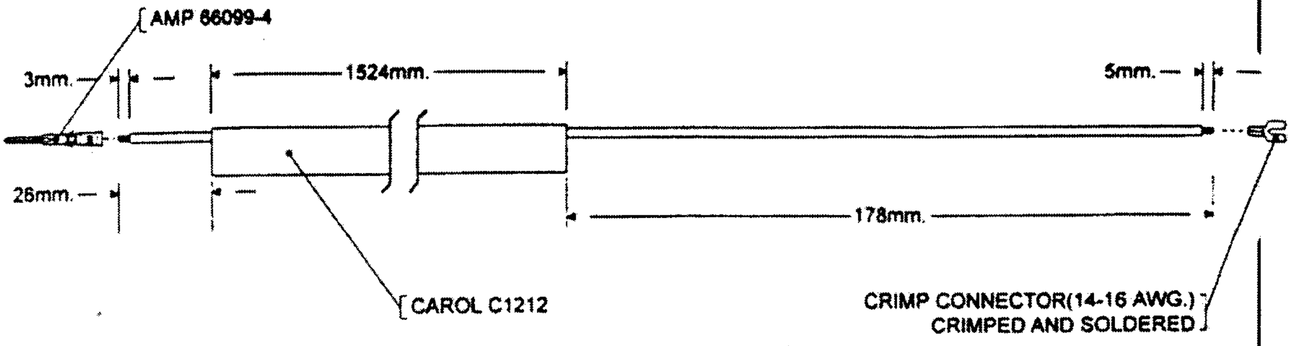
SIGN MOUNTING POST		No.	Revision	Date
		1		
		2		
Date: 2001,08,27 — Approved By: [signature]	Drawing Number: LOOP2001 - 6.1	3		
		4		



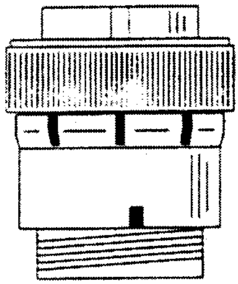


Alberta
TRANSPORTATION

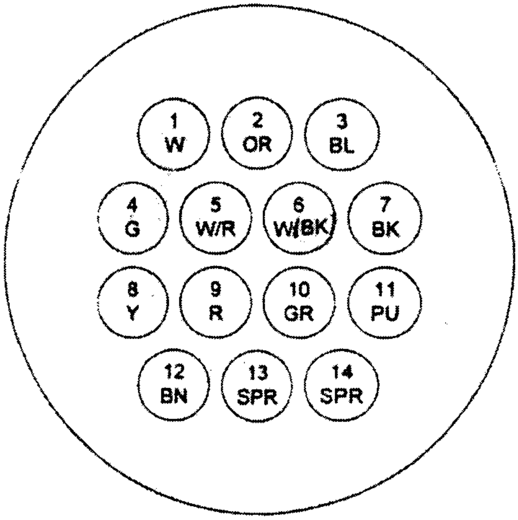
		No.	Revision	Date
JUNCTION BOX (4x4x2)		1		
		2		
Date / Approved By	Drawing Number	3		
2001.08.27	LOOP2001 - 6.2	4		



AMP 206044-1



AMP 206044-1
REAR VIEW



Color Table	
G	- Green
R	- Red
W	- White
Y	- Yellow
BK	- Black
BL	- Blue
BN	- Brown
GR	- Grey
PU	- Purple
OR	- Orange

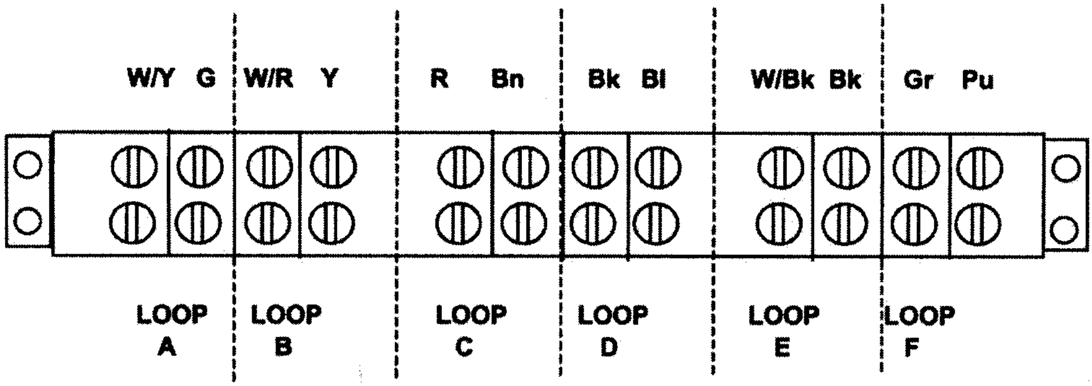
INPUT	PIN #
A	1,4
B	5,8
C	9,12
D	2,3
E	6,7
F	10,11

Alberta
TRANSPORTATION

LOOP CABLE WIRING

Date	Approved By	Drawing Number
2001.08.27	[signature]	LOOP2001 - 7.0

No.	Revision	Date
1		
2		
3		
4		

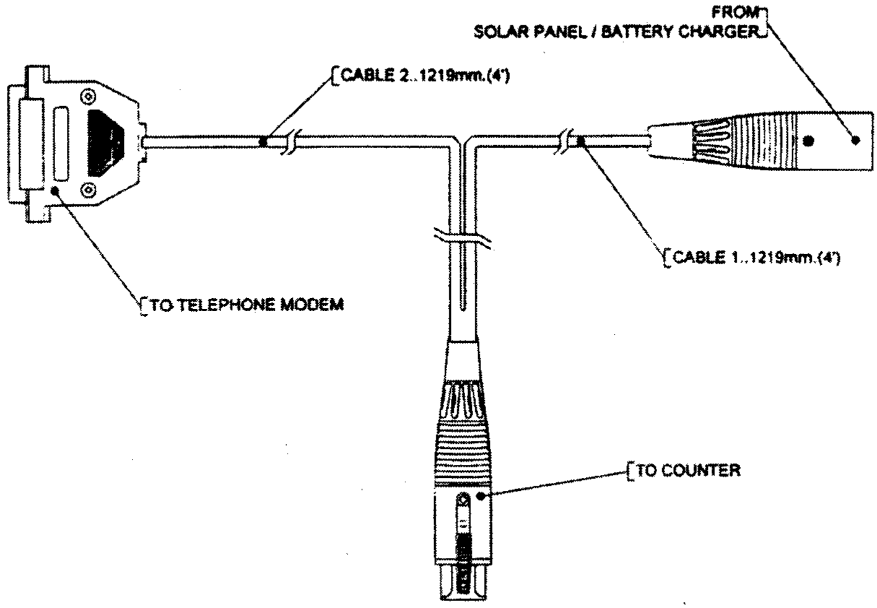


COLOUR TABLE	
G	Green
R	Red
W	White
Y	Yellow
Bk	Black
Bl	Blue
Bn	Brown
Gr	Grey
Pu	Purple
Or	Orange

The wires that go to the Golden River ATR need to be on the side of the terminal strip closest to the ATR. The pin out stays the same.

Alberta
TRANSPORTATION

TERMINAL STRIP PINOUT IN ATR BOX		No.	Revision	Date
		1		
		2		
Date / Approved By: 2001 0827	Drawing Number: LOOP2001 - 7.1	3		
		4		



CABLE 2 — MODEM / COUNTER; CABLE 1 — COUNTER / CHARGER

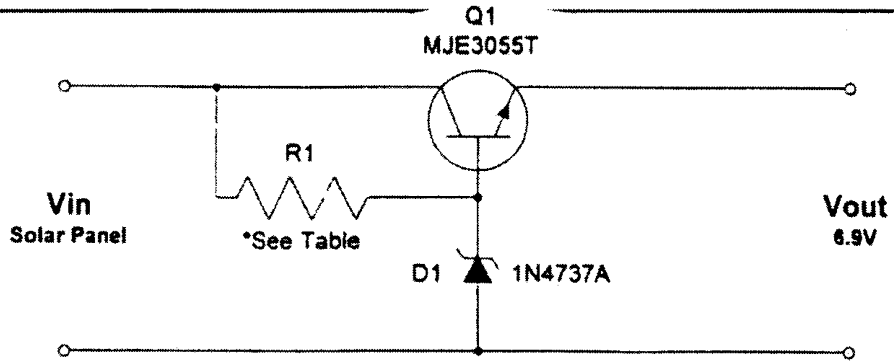
MODEM 25-Pin (Female)	COUNTER 5-Pin XLR (Female)	CHARGER (6-Volt) 5-Pin XLR (Male)
1,7 - Green 2 - Black 3 - White 4,20 - Red	1 - Red② 2 - White② 3 - White①/Green② 4 - Black② 5 - Black①/Red②	1,2,4 - N.C. 3 - White ⊖ 4 - Black ⊕
1,7 - Green 2 - Blue 3 - Yellow 4,20 - Red	1 - Red② 2 - Yellow② 3 - White①/Green② 4 - Blue② 5 - Black /Red②	1,2,4 - N.C. 3 - White ⊖ 5 - Black ⊕

Notes:

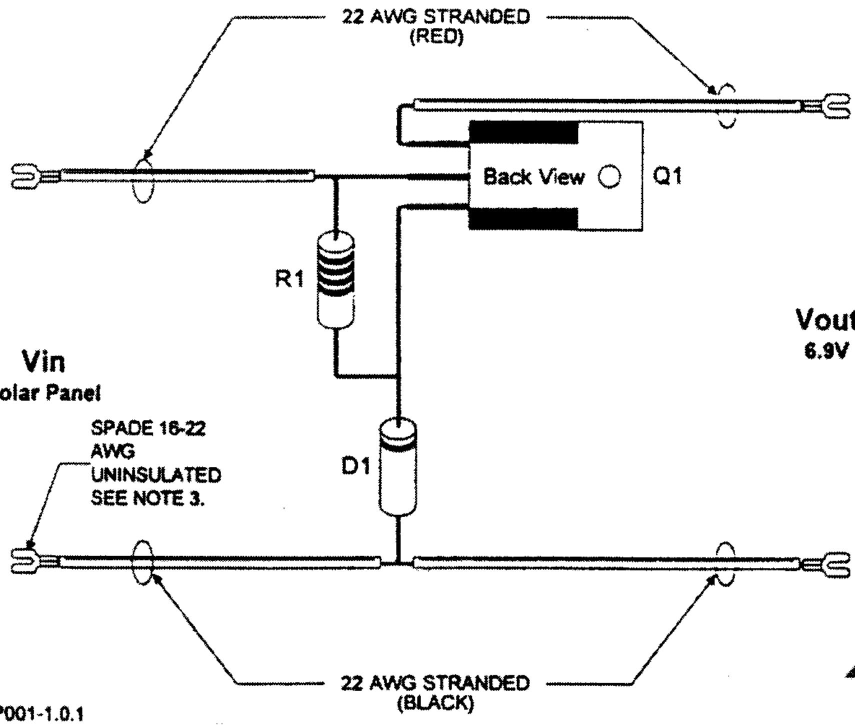
1. ① - INDICATES FROM CABLE 1.
2. ② - INDICATES FROM CABLE 2.

Alberta TRANSPORTATION

MODEM CABLE WIRING		No.	Revision	Date
		1		
		2		
Date: 2001 08 27 Approved By: [signature]	Drawing Number: LOOP2001 - 8.0	3		
		4		



*Resistor(R1) Selection	
Panel Voltage	**R1**
6V	120 Ohm,1/2W
12V	560 Ohm, 1/2W



Alberta
TRANSPORTATION

Notes:

REFER TO SP001-1.0.1

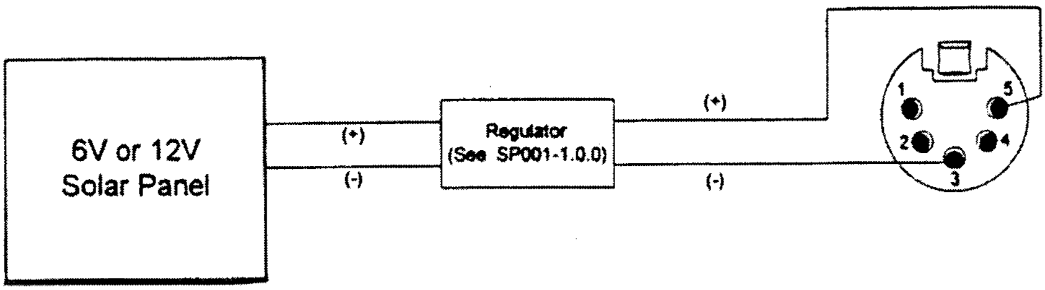
VOLTAGE REGULATOR		No.	Revision	Date
		1		
		2		
Date Approved By	Drawing Number	3		
2001 0827 [signature]	LOOP2001 - 9.0	4		

Notes:

1. ALL CONNECTIONS TO BE SOLDERED.
2. REGULATOR SHALL BE SPRAYED WITH LACQUER TO PREVENT SHORTING AND CORROSION.
3. SPADES TO BE CRIMPED AND SOLDERED WHERE CALLED FOR IN APPLICATION, OTHERWISE CONNECTIONS TO BE SOLDERED AND PROTECTED WITH SHRINK TUBING.
4. RED AND BLACK WIRES TO BE CUT TO SUITABLE LENGTH.

Alberta
TRANSPORTATION

VOLTAGE REGULATOR			No.	Revision	Date
			1		
			2		
Date	Approved By	Drawing Number	3		
2001_08.27	RK/GL	LOOP2001 - 9.1	4		

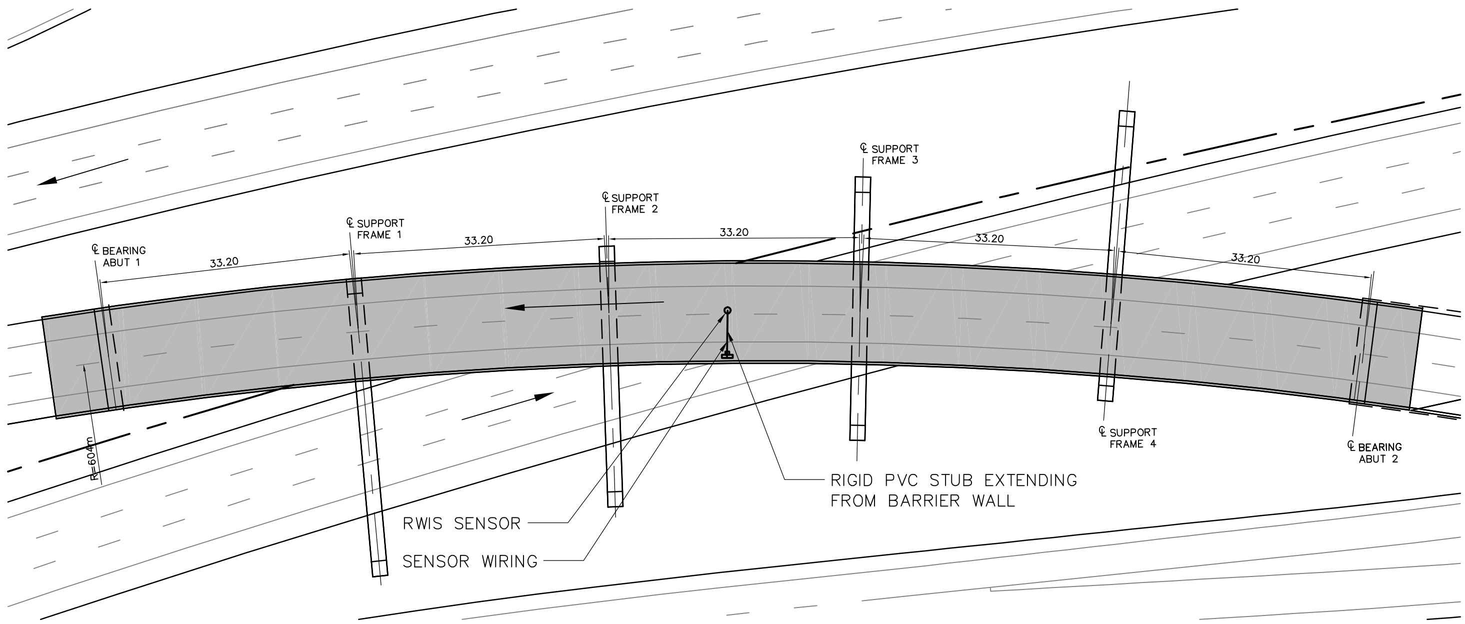


Alberta
TRANSPORTATION

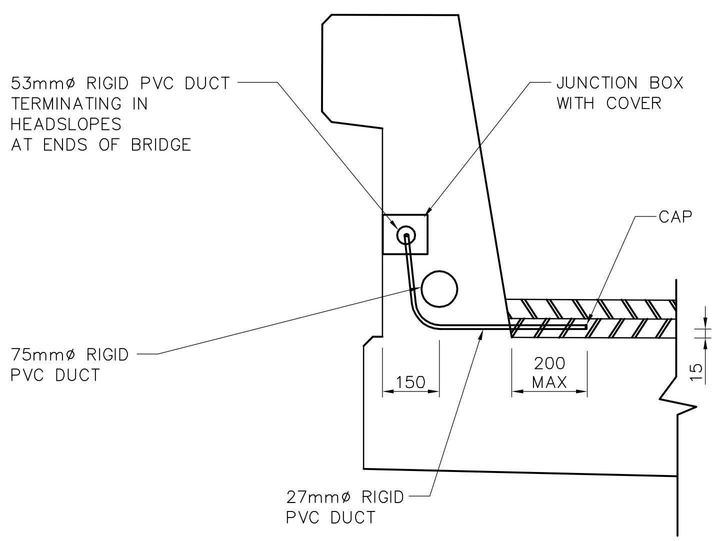
	No.	Revision	Date
VOLTAGE REGULATOR CONNECTION	1		
	2		
Date: 2001.08.27 — Approved By: [signature] — Drawing Number: LOOP2001 - 9.2	3		
	4		

APPENDIX I -
ROAD WEATHER INFORMATION SYSTEM - Drawing 18-I-01

CH2MHILL



PLAN
1:1000



SECTION
NTS

NOTES:
- FISH WIRE TO BE INSTALLED IN EACH DUCT FOR PURPOSE OF PULLING RWIS ELECTRONIC CABLE
- CONTRACTOR SHALL COMPLETE GRADING AND LANDSCAPING TO ENABLE THE INSTALLATION OF THE RWIS TOWER STRUCTURE.
- CONTRACTOR SHALL PERMIT ISNTALLER TO OBTAIN POWER FROM THE POWER SOURCE USED FOR THE INTERCHANGE LIGHTING. INSTALLER TO PROVIDE A SEPERATE FEED AND METER FOR RWIS OPERATIONS.
- CONTRACTOR SHALL COORDINATE INSTALLATION OF RWIS SENSORS WITH TELVENT PRIOR TO TRAFFIC AVAILABILITY.

NO.	DATE	REVISIONS	BY	CHK'D	APP'D
1		ISSUED FOR ADDENDUM 7	JB		

SOUTHEAST STONEY TRAIL DBFO
SCHEDULE 18

APPENDIX I
TYPICAL INSTALLATION FOR
RWIS DUCTING FOR BRIDGES

DATE MAY 9/09	SCALE NTS
DRAWN DT	REV. NO.
PROJECT NO. 388694	
DRAWING NO. 18-I-01	

APPENDIX J -
ACCESS TO AGGREGATE AT THE STAR

ACCESS TO AGGREGATE AT THE STAR

1. DEFINITIONS

In Section 200.3.14 of Schedule 18 to the DFBO Agreement and in this Appendix, the following expressions have the following meanings (and where applicable their plurals have corresponding meanings):

"**Aggregate**" means all material as excavated from the gravel deposit at the STAR by the Contractor or the Contractor's Personnel;

"**Cancellation**" means the cancellation and extinguishing pursuant to this Appendix of all of the Contractor's rights relating to accessing Aggregate from the STAR, including but not limited to excavating, mining, stockpiling, and hauling Aggregate from the STAR pursuant to this Appendix J;

"**Contractor's Personnel**" means the Contractor's employees, agents, and subcontractors (including subcontractors' employees and agents) performing work within the STAR;

"**Contractor's STAR Representative**" means the person appointed by the Contractor, and notified to the Department and the STAR Supervisor, as the Contractor's representative in respect of the ECO Plan;

"**Contractor's Election Notice**" means the Contractor's notice in writing which confirms the Contractor's irrevocable election to excavate, mine, stockpile, and haul Aggregate from the STAR for use solely in respect of the Project, with the total amount of Aggregate to be excavated, stockpiled and hauled not to exceed a maximum of 5.0 million tonnes of Aggregate;

"**Initial Aggregate Request**" means the Contractor's notice in writing which (i) outlines the Contractor's intended annual quantity of Aggregate to be excavated, stockpiled and hauled from the STAR for each calendar year starting from January 15, 2011 and until Traffic Availability, with such Aggregate to be excavated, stockpiled and hauled in any one calendar year not to exceed 2.0 million tonnes, and with the amount of Aggregate to be stockpiled at the STAR not to exceed 100,000 cubic metre at any point in time, and which also (ii) outlines the Contractor's total estimated quantities of Aggregate to be excavated, stockpiled and hauled from the STAR for the period from January 15, 2011 until Traffic Availability, which total shall not exceed a maximum of 5.0 million tonnes of Aggregate;

"**Pit Operating Plan**" means the final detailed plan specifying and delineating the operating limits for the Contractor, including operating locations, access points, staging areas, scale area, internal haul roads, stockpile locations for Aggregate and other operating conditions which require coordination among the STAR users, together with an outline of the health and safety system currently in use at the STAR and a safety orientation for the Contractor's Personnel, which plan may be amended from time to time;

"**STAR**" or "**Stoney Trail Aggregate Resource**" means the Department's aggregate pit situated at N ½ 28 and 33-25-2-5 in the City of Calgary;

"**STAR Completion**" means the date at which the Contractor's operations at the STAR, including excavating, stockpiling and hauling Aggregate, are completed;

"**STAR Supervisor**" means the individual designated by the STAR Operator to supervise the operation of the STAR;

"**STAR Operator**" means the BLV Group, a joint venture of BURNCO Rock Products Ltd, Lafarge Canada Inc. and Volker Stevin Contracting Ltd.;

"**Updated Aggregate Request**" means the Contractor's Initial Aggregate Request as updated on an annual basis and delivered to the STAR Supervisor and the Department on or before the 15th day of December of 2011 and each year thereafter to and including the year of Traffic Availability.

2. CONTRACTOR'S AGGREGATE REQUESTS

2.1 The Contractor has the option of excavating Aggregate from the STAR for use solely in respect of the Project, with such excavation to commence no earlier than January 15, 2011.

2.2 Subject to Section 2.3, the Contractor is limited to excavating, stockpiling and hauling a maximum of 2.0 million tonnes of Aggregate from the STAR per year, from January 15, 2011 to and until the date of STAR Completion, Traffic Availability, the date of Cancellation, or the date of termination of the DBFO Agreement, whichever occurs earliest.

2.3 The Contractor is limited to excavating, stockpiling and hauling a maximum of 5.0 million tonnes of Aggregate from the STAR.

2.4 In the event that the Contractor intends to utilize Aggregate from the STAR for the Project, the Contractor shall deliver the Contractor's Election Notice to the Department within 60 days of the Execution of the DBFO Agreement. Following the delivery of the Contractor's Election Notice, the Contractor shall thereafter be permitted to access Aggregate from the STAR for the Project. Failure of the Contractor to deliver the Contractor's Election Notice to Department by the above-mentioned deadline will result in the Contractor not having any rights to excavate, mine, stockpile, haul or otherwise access any Aggregate from the STAR from the Department.

2.5 On or before December 15, 2010, the Contractor shall deliver to the Department its Initial Aggregate Request.

2.6 Taking into consideration the Contractor's Initial Aggregate Request which the Department will provide to the STAR Operator, the STAR Operator will prepare a draft pit operating plan for review by the Department and the Contractor.

2.7 By January 15, 2011, the STAR Operator will review the Contractor's Initial Aggregate Request and will prepare the Pit Operating Plan.

2.8 The Contractor agrees to pay to the Department $1.50 (CDN) plus GST for each tonne of Aggregate specified in the Initial Aggregate Request which the Contractor intends to excavate and haul from the STAR in 2011 ("Initial Aggregate Request Payment"), and the Contractor acknowledges that the Initial Aggregate Request Payment is a debt due and owing to the Department.

2.9 Payment of the Initial Aggregate Request Payment to the Department shall be made by cheques to the Department and paid as follows:

(a) 25% within 30 days of the Contractor's delivery of its Initial Aggregate Request;
(b) another 25% within 60 days of the Contractor's delivery of its Initial Aggregate Request;
(c) another 25% within 90 days of the Contractor's delivery of its Initial Aggregate Request; and
(d) the remaining 25% within 120 days of the Contractor's delivery of its Initial Aggregate Request.

2.10 In the event that the Department has not received the Initial Aggregate Request Payment specified in Section 2.9 in full by the dates specified in Sections 2.9(i) to (iv) above, the Contractor acknowledges and agrees that the Department may set off such sums against any Payment or Progress Payments to be made to the Contractor in accordance with section 9.8 of the DBFO Agreement.

2.11 The Contractor shall deliver to the Department and to the STAR Operator its Updated Aggregate Request on an annual basis to be submitted no later than December 15, 2011, and by December 15th of each year thereafter including the year in which Traffic Availability occurs. The Department and the STAR Operator shall use the Updated Aggregate Request to evaluate the sufficiency of the Pit Operating Plan. All Updated Aggregate Requests will be subject to written approval from the Department prior to the commencement, continuation or resumption of Aggregate activities at the STAR by the Contractor, including but not limited to, excavating, stockpiling or hauling activities by the Contractor at the STAR for the calendar year referred to in the Updated Aggregate Request.

2.12 The Contractor agrees to pay to the Department $1.50 (CDN) plus GST for each tonne of Aggregate specified in such Updated Aggregate Request which it intends to excavate, stockpile and haul from the STAR for the calendar year following the year within which such Updated Annual Request was delivered to the Department and the STAR Operator ("Updated Aggregate Request Payment"), and the Contractor acknowledges that the Updated Aggregate Request Payment is a debt due and owing to the Department.

2.13 Payment of the Updated Aggregate Request Payment to the Department shall be made by cheques to the Department and paid as follows:

(a) 25% within 30 days of the Contractor's delivery of its Updated Aggregate Request;
(b) another 25% within 60 days of the Contractor's delivery of its Updated Aggregate Request;
(c) another 25% within 90 days of the Contractor's delivery of its Updated Aggregate Request; and
(d) the remaining 25% within 120 days of the Contractor's delivery of its Updated Aggregate Request.

2.14 In the event that the Department has not received the Updated Aggregate Request Payment referred to in Section 2.13 in full by the dates specified in Sections 2.13(i) to (iv) above, the Contractor acknowledges and agrees that the Department may set off such sums against any Payments or Progress Payments to be made to the Contractor in accordance with section 9.8 of the DBFO Agreement.

3. PROHIBITED USE OF STAR AGGREGATE

3.1 The Contractor shall not use any Aggregate hauled from the STAR on any work other than base and paving work for the Project, regardless of when the Aggregate is hauled from the STAR. Waste material resulting from the processing of the Aggregate may be used for work on the Project (except for base and paving work), provided such use is in accordance with all other requirements in the Technical Requirements.

3.2 Notwithstanding Section 3.1, at the option of the Contractor, all Aggregate hauled from the STAR and not used by the Contractor for the Project on or before the date of STAR Completion, Traffic Availability, the date of Cancellation, or the date of termination of the DBFO, whichever occurs earliest ("Remaining Aggregate"), shall either be returned to the STAR at the Contractor's sole expense or shall be purchased by the Contractor at a rate of $6.14/ cubic metre plus GST over and above that rate initially paid by the Contractor therefor. This clause applies whether or not the Contractor has subsequently processed the Aggregate by crushing or screening or any other process.

3.3 Within 90 days of the earliest of the date of STAR Completion, Traffic Availability, the date of Cancellation, or the date of termination of the DBFO Agreement, the Contractor shall either return Remaining Aggregate to the STAR, or pay the Department for such quantity of Remaining Aggregate as measured and determined by the Department.

4. CONTRACTOR'S ACTIVITIES WITHIN THE STAR

4.1 The Contractor's Use of STAR

The Contractor shall ensure that all of its activities on or in relation to the STAR are at all times performed:

(a) in an efficient, effective and safe manner;
(b) in a manner that is not likely to be injurious to health or to cause damage to property; and
(c) in compliance with all applicable legal requirements.

The Contractor acknowledges that it does not have an exclusive rights to the STAR and that other contractors working for the Department, including the STAR Operator, may use the STAR concurrently. The timing and extent of the Contractor's permitted access to Aggregate in the STAR will be addressed in the Pit Operating Plan.

Specifically, the Contractor's Aggregate mining sequence will involve mining the Aggregate to the bottom of the STAR deposit, ceasing all mining activity in the depleted pit until the STAR Operator strips sufficient additional overburden material, which will be used to reclaim and reslope portions of the depleted pit area. The Contractor's mining activities will recommence once this overburden removal is completed for the adjacent phase of active mining. This process of stripping may occur more than once during the duration of mining for the Project's Aggregate needs. The Department estimates that such stripping operations to open an active pit adjacent to a depleted pit will result in approximately a 1 month shut down for each such occasion.

The Contractor acknowledges that it must schedule its operations at the STAR to facilitate site modifications at the STAR.

The Contractor shall work with the STAR Supervisor and all other STAR users to coordinate its activities.

The Contractor shall comply with the provisions of the Pit Operating Plan.

The Contractor's operations at the STAR are limited to hours allowable under The City of Calgary's bylaws unless the Contractor can obtain authorization from the City otherwise.

The Contractor will not move or remove any fencing or signage at the STAR without the prior written permission of the STAR Supervisor.

The Contractor and the Contractor's Personnel will have no claim against the Department, including its employees and agents, the STAR Supervisor, and the STAR Operator for any inconvenience, delay, or loss arising from the Contractor's operations at the STAR, including, but not limited to, the presence and operations of others in the STAR, the time required for the STAR Operator to open an active pit adjacent to a depleted pit as described in the second and third paragraphs of this Section 4.1, the requirement to reschedule operations to facilitate STAR site modifications, hours of operation at the STAR being limited, or otherwise.

4.2. Mining

At least five Business Days prior to the Contractor commencing operations in relation to Aggregate mining or other activities at the STAR, the Contractor shall attend a pre-construction meeting with the STAR Supervisor and the Department, at which time pre-construction and construction issues shall also be addressed and coordinated. The Contractor shall schedule the pre-construction meeting in consultation with the STAR Operator and the Department. The Contractor shall contact the STAR Supervisor at the following address:

BLV Group
c/o 10511 – 15th Street SE
Calgary, Alberta
T2J 7H7

Attention: Travis Coates or Bruce Whale
Telephone: (403) 724-2445
Cell: (403) 371-1841

The STAR Supervisor, in consultation with the Department, shall designate mining areas to the Contractor in the Pit Operating Plan. Prior to commencing each mining phase, the Contractor shall contact the STAR Supervisor to confirm the specific area to be mined by the Contractor.

The Contractor shall attend ongoing meetings at the request of the STAR Supervisor and will cooperate with the STAR Supervisor to facilitate the STAR pit coordination among all users of the STAR. The Contractor shall record the minutes of all meetings and provide them to the Department and the STAR Supervisor as soon as is reasonably practicable.

The Contractor acknowledges that mining and excavating may require specialized equipment and methods to extract the Aggregate which may be over 20 m deep.

The Contractor shall determine the nature of the equipment and activities necessary to access the Aggregate material from a tightly compacted deposit and layers of conglomerated pit run throughout the mining face at STAR. It is the Contractor's sole responsibility to supply whatever equipment it determines necessary for mining, ripping, stockpiling, measuring and hauling activities so as to most efficiently access and process its needed Aggregate.

When oversize pieces of conglomerate are exposed by the Contractor, the Contractor shall break and process or dispose of such oversize pieces of conglomerate in a location determined by the STAR Supervisor.

In addition to the Contractor's requirements for breaking up and utilizing any cemented conglomerate aggregates, all Aggregate up to and including 600 mm diameter shall be utilized.

The Contractor's excavation of Aggregate shall advance uniformly to obtain maximum yield from the STAR.

When the Contractor is accessing Aggregate from a source that has partially been excavated previously, the Contractor's new excavation shall proceed as an extension of the previous excavation. The STAR Operator will remove and deposit overburden or reject materials from the previous excavation in accordance with the Pit Operating Plan.

The Contractor should expect to encounter a tightly compacted deposit and layers of conglomerated pitrun throughout the mining face. Oversize pieces of conglomerate are to be broken with a breaker and processed by the crusher. Disposal of these pieces will not be allowed.

Blasting of materials will only be undertaken in the event that the Contractor is unable to loosen the conglomerate type materials using the Group 12 dozer equipped with a ripper, as defined in the *"Alberta Roadbuilders and Heavy Construction Association Equipment Rental Rate Guidelines"*.

Blasting, if required, will be undertaken by the STAR Operator at no cost to the Contractor. Due to safety considerations, the Contractor may have to remove all equipment and personnel from the site during the period required to prepare and conduct blasting.

The Contractor shall control all its equipment and work operations so that its operations do not extend beyond the designated operating limits as set out in the Pit Operating Plan.

The Contractor will be allowed only to mine and stockpile Aggregate within the STAR. No crushing, screening or processing of Aggregate, and no production of asphalt concrete or Portland cement concrete by the Contractor shall be allowed within the limits of the STAR.

The Contractor shall not bring onto the STAR any equipment or materials other than those required for mining, ripping, stockpiling, scale measurement and hauling activities.

The Contractor's mining and off-site processing/crushing operations may be subject to inspection by the Department or a representative of the Department. The Department hereby reserves to itself unrestricted access at all times to the Contractor's designated areas at the STAR including but not limited to the mining and scale areas for purposes of inspection.

4.3 Trucking

The Contractor will gain access to STAR via 85 Street NW.

The Contractor shall consult with The City of Calgary and local appropriate municipal authorities to determine current approved truck routes, restricted truck routes, bridge maximum weights, load securing requirements and road bans and the Contractor will comply with these same requirements.

The Contractor shall not permit truck traffic, either empty or loaded, on Rocky Ridge Road under any circumstances.

The use of engine retarding brakes is prohibited within the STAR, on adjacent public roads, and within The City of Calgary's municipal limits. The Contractor shall abide by this prohibition when hauling Aggregate and equipment to and from the STAR.

4.4 Internal Haul Roads

Throughout the STAR the Contractor shall adhere to a speed limit of 30 km/h.

The Contractor is responsible for building and maintaining, at its sole expense, those internal haul roads principally used by the Contractor to a smooth, dust free and safe condition all to the satisfaction of the STAR Supervisor.

The Contractor acknowledges that all of its vehicles located in the STAR and proceeding to and from the STAR shall meet legal load (gross vehicle weight) requirements. Overloaded vehicles will be required to return to the STAR and unload such excess overload Aggregate in its designated stockpile area.

4.5 Use of Staging Areas

The Contractor's trucks shall use the area designated for its staging in the STAR as indicated in the Pit Operating Plan while awaiting loading or unloading. The Contractor's trucks shall not park or idle on 85 Street NW. The Contractor's trucks waiting in the specified staging area shall have their engines shut off.

4.6 Stockpile Locations

The Contractor may only stockpile quantities of Aggregate necessary to facilitate the hauling of such material off-site, in those STAR areas designated for its stockpiling in the Pit Operating Plan.

The maximum quantity of all Aggregate that the Contractor may stockpile on the STAR site at any one time shall not exceed 100,000 cubic metres.

All Aggregate stockpiled by the Contractor at the STAR as of the date of STAR Completion, Traffic Availability, the date of Cancellation, or the date of termination of the DBFO Agreement, whichever is earliest, shall be the property of the Department without compensation to the Contractor.

All Remaining Aggregate returned to the STAR shall be the property of the Department without compensation to the Contractor, and shall be stockpiled by the Contractor at the STAR in such location as specified by the STAR Supervisor.

4.7 Scale Areas and Scaling

The Contractor shall provide a platform scale, scale house and scale person for the measuring of all Aggregate removed from the STAR.

Platform scales shall be of sufficient length and capacity to accommodate in a single loading any truck, including pups or trailers that are used. The scale house shall be weatherproof, heated and large enough to provide reasonable working accommodations for the scale person and the Department's supplied scale person or representative, if any, and required furnishings.

The Department reserves the right to audit the scaling operations or to perform some other audit activities on the removal, weighing and quantity reporting of Aggregate removed from the STAR.

Prior to accessing any Aggregate from the STAR, the Contractor shall provide the Department with a copy of the certificate indicating that the platform scales have been certified on-site by Measurement Canada, an agency of Industry Canada. The most recent certificate shall be displayed at all times within the scale house.

In the event a certified scale is modified in any way, including being moved and set up in a new location, it must be re-certified by Measurement Canada and such re-certification must be provided to the Department prior to the platform scale being used to measure Aggregate being hauled from the STAR.

4.8 Quantities Measurement and Payment

The Contractor shall scale and ticket all Aggregate prior to it being hauled off the STAR.

The Contractor shall maintain records itemizing the dates, and quantities of all Aggregate excavated and hauled from the STAR in a form acceptable to the Department.

On or before the 15th day of each month after the Contractor commences in mining, ripping, stockpiling, scale measurement or hauling activities in the STAR, the Contractor shall provide the Department with a summary itemizing the quantity of Aggregate that was removed from the STAR by the Contractor in the preceding month.

On or before January 15, 2012, and each year thereafter, the Contractor shall provide the Department with a written summary of the amount of Aggregate hauled from the STAR in the preceding year, which amount shall not exceed 2 million tonnes. In the event that the actual amount hauled from the STAR exceeds the amount specified by the Contractor in the Initial Aggregate Request or any and all subsequent Updated Aggregate Requests ("Excess Aggregate"), then the Contractor shall immediately owe and pay to the Department $1.50 (CDN) plus GST for each excess tonne of Excess Aggregate hauled from the STAR in the previous year. Any such sum owing to the Department by the Contractor is a debt due to the Department and may be set off by the Department against any Payments or Progress Payments to the Contractor in accordance with section 9.8 of the DBFO Agreement.

The Department reserves the right to audit all activities associated with the removing, weighing and quantity reporting of Aggregate removed from the STAR by the Contractor and the Contractor shall keep accurate records of all operations relating to the STAR and shall retain them for until 2 years after Traffic Availability or the termination of the DBFO Agreement whichever is earlier. The Department also reserves the right to modify the quantity of Aggregate removed by the Contractor, and the total amount to be paid to the Contractor, based upon the findings of these audit activities.

5. SAFETY

5.1 General

The STAR Operator has agreed to assume all of the responsibilities of the "**prime contractor**", as defined in the *Occupational Heath and Safety Act* (Alberta) ("**OH&S Act**"), of the STAR.

At least five Business Days prior to the Contractor commencing operations in relation to Aggregate operations and mining at the STAR, the Contractor shall provide a site safety plan to the satisfaction of the Department.

The Contractor shall post its site safety plan, the STAR Operator's safety plan, its STAR emergency response and contingency plan, and any other safety material required by the STAR Supervisor or the Department to be posted, at all worksites within the Contractor's operating limits within the STAR as specified in the Pit Operating Plan.

5.2 Safety Legislation and Safety Plans

The Contractor and its employees shall follow, and the Contractor shall ensure that its subcontractors are required to follow, all applicable federal and provincial safety legislation, the Contractor's site safety plan, the STAR Operator's safety plan, the STAR Operator's contingency and emergency response plan, and the "BLV Group Safety and Loss Prevention Manual for the Spy Hill project".

5.3 Personal Protection Equipment

The minimum requirements for personal protection equipment ("**PPE**") to be used by the Contractor's Personnel while at the STAR are as follows: CSA approved safety headgear, CSA approved safety eyewear, CSA approved high visibility clothing and CSA approved safety footwear.

In addition to the above stated minimum PPE requirements, hearing protection and dust masks are also required to be used when the Contractor's Personnel are working near any crushing or processing equipment that may be operated at the STAR.

The Contractor's Personnel shall not wear vests or loose fitting clothing near equipment that has a potential for snagging such loose fitting clothing.

Operators of mobile equipment and vehicles equipped with a full cab are not required to wear PPE while they are inside the cab of such vehicles. Operators of mobile equipment that is only equipped with canopies are required to wear PPE at all times, whether on or off the equipment. Operators of mobile equipment are required to wear seat belts at all times when the vehicle is moving and truck drivers must wear all PPE when they are out of their trucks.

Daily pre-job safety inspections shall be conducted by the Contractor and shall be submitted to the STAR Supervisor in order to identify any new hazards as they arise.

The STAR Supervisor may suspend the Contractor’s operations at the STAR in cases of recognized imminent danger or when the Contractor fails to comply with safety orders issued or fails to rectify previously identified operation worksite hazards. The Department’s interpretation of a worksite hazard will be considered final in all cases.

5.4 Incident Investigation

The Contractor shall investigate safety incidents and near misses and reports of such safety incidents and near misses shall be communicated to the occupational health and safety officials for the Province, the Department and the STAR Supervisor as soon after the safety incident and near miss as is practicable and in any event within 72 hours of the occurrence. Direct and indirect underlying causes are to be determined and provided to the Department and to the STAR Supervisor along with measures to be taken by the Contractor in an effort to prevent future incidents.

5.5 Meetings

Safety meetings shall be held at least on a monthly basis and a copy of the minutes and attendance of the meeting shall be forwarded to the Department and the STAR Supervisor. Advance notification of selected meeting days and times are to be provided to the Department and the STAR Supervisor so that the STAR Supervisor and a representative of the Department may attend meetings.

6. ENVIRONMENTAL MATTERS, DUST AND NOISE

6.1 Environmental Construction and Operations Plan Management Plan

The Contractor shall prepare and implement an Environmental Construction and Operations Plan in accordance with the Province’s manual entitled "Environmental Construction Operations Plan (the “**ECO Plan**”) Framework," 2009 version. The completed ECO Plan shall consist of written procedures and drawings that address the environmental issues relevant to Aggregate mining, ripping, stockpiling, measuring and hauling at the STAR, and shall detail temporary environmental control measures that the Contractor shall undertake to comply with all applicable legislation, regulations and approvals during such activities.

The Contractor shall ensure effective implementation of the ECO Plan by assigning responsibility for the implementation, and maintenance of temporary erosion control measures to the Contractor's STAR Representative. The individual responsible shall be identified at the pre-construction meeting with the STAR Supervisor and the Department, and all appropriate contact details, including email and cell phone, provided.

The Contractor shall submit its ECO Plan to the STAR Supervisor and the Department at least 14 calendar days prior to the pre-construction meeting. The STAR Supervisor and the Department will review the ECO Plan and communicate any concerns to the Contractor at least seven calendar days prior to the pre-construction meeting. The Contractor shall address any issues or concerns regarding the proposed ECO Plan to the satisfaction of the STAR Supervisor and the Department prior to the commencement of its operations in the STAR.

Finalized ECO Plans shall be agreed to by the Department and the Contractor's STAR Representative and shall be signed by the Contractor's STAR Representative before the Contractor commences any operations at the STAR. When the Contractor's STAR Representative changes, the new Contractor's STAR Representative shall provide a letter of acknowledgment to the STAR Supervisor indicating that he/she has reviewed the ECO Plan and the Contractor will comply with its requirements.

The finalization of the ECO Plan to the mutual satisfaction of the Contractor and the Department does not constitute an approval or assurance from the Department that the "temporary environmental control measures" detailed in the ECO Plan are sufficient to ensure compliance with all applicable legislation, regulations or conditions of approval. The Contractor is ultimately responsible to ensure all measures used on the STAR are sufficient to ensure compliance with all applicable authorities. This may mean increasing the number of installations, providing alternate devices or modifying procedures for Aggregate mining, ripping, stockpiling, measuring and hauling at the STAR.

If at any time it is determined that the devices or procedures detailed in the ECO Plan (including any specific measures, locations or quantities proposed) are inappropriate or insufficient, the Department will notify the Contractor in writing and Contractor shall modify the ECO Plan accordingly.

The Department may suspend work of the Contractor and the Contractor's Personnel (if any) in the STAR in any case where in the Department's opinion the Contractor has failed to adhere to the finalized ECO Plan. The Department may continue such suspension and prohibit the Contractor's further access to Aggregate in the STAR until such time as the Contractor provides the Department with documentation that demonstrates to the satisfaction of the Department how the Contractor will address such past failures and minimize the likelihood of recurrence.

No suspension shall void any security under the DBFO Agreement or relieve the Contractor of any other responsibility under or in respect of the DBFO Agreement. During any period of suspension, the Contractor shall not haul or otherwise remove, without the prior written consent of the Department, any part of the Aggregate or equipment at the STAR. The Contractor and the

Contractor's Personnel acknowledge that they have no claim for compensation or damages against the Department, its employees or agents or against the STAR Operator and its employees or personnel including the STAR Supervisor for any suspension, stoppage, hindrance or delay arising out of or in connection with the STAR from any cause whatsoever.

The costs of preparing the ECO Plan and the performance of all work necessary to ensure compliance with applicable legislation, regulations or conditions of approval shall be that of the Contractor's.

Notwithstanding the previous paragraph, the ECO plan shall include but not be limited to the following items:

6.1.1. Proximity to Residential Development

(a) The Contractor acknowledges that the STAR is in close proximity to several residential developments and that all activities at the STAR will be closely monitored to ensure compliance to existing bylaws, codes of practice, regulations, acts and approvals regarding all forms of emissions or releases including but not limited to dust, particulate matter, noise, odours, chemicals, lubricants, and light.

(b) The Department and the STAR Operator have committed to conducting operations at the STAR such that the local communities perceive it as meeting "Good Neighbour" standards. In support of that commitment the Contractor shall conduct all of its activities towards minimizing any negative impact its operations may have on the neighbouring communities.

(c) The Contractor acknowledges that it will conduct all of its operations in the STAR in compliance with all current and future, provincial, federal, and City of Calgary applicable environmental laws, regulations, standards, codes, and bylaws.

6.1.2. Noise

(a) All of the Contractor's operations at the STAR shall be conducted in accordance with all applicable statutes, regulations, or other subordinate legislation (whether federal, provincial, municipal, or common law). Applicable legislation includes, but is not limited to:

   (i) Alberta *Occupational Health and Safety Act*, RSA 2000 c. O- 2, Noise Regulation Alberta Regulation 314/81 and Amendment 439/81. This regulation provides exposure limits and guidance on hearing protection.

   (ii) The City of Calgary – Community Standards Bylaw #5M2004.

(b) The Contractor's loader back-up alarms will be set at the minimum dBA levels allowable under Alberta Occupational Health and Safety guidelines. During hours of darkness, the back-up alarm shall utilize a strobe light warning system in-place of the beeping alarm.

(c) If through the monitoring program in place at the STAR, noise mitigation is identified as being required, the Contractor, at its own expense, shall implement such procedures as may be necessary. These mitigation measures may include, but are not limited to:

(i) Enclosing any separate component of any conveyor systems by a sound and dust retarding blanket system.

(ii) Any electrical generating sets will have sound absorbing baffles installed.

(iii) Rubber liners will be located at all transfer points to reduce the impact noise.

(iv) The equipment will follow a regular maintenance program where all noise from bearings and rollers will be repaired.

(d) The Contractor may also be required to limit operating hours or cease operations if noise mitigation techniques are unsuccessful.

6.1.3. Dust

(a) An air-monitoring program is in place at the site. Stations have been setup to monitor operational impacts on the neighbouring community. The Contractor is required to control dust to the satisfaction of the STAR Supervisor by employing dust abatement measures, at the sole cost of the Contractor, including but not limited to:

(i) Notwithstanding municipal bylaw requirements, all loads leaving the STAR must be tarped and box ledges swept of loose material.

(ii) Areas around loading operations are to be cleared of settled dust on a daily basis. No fan systems (or any other processing) to remove the fines aggregate component will be permitted.

(iii) Temperature permitting, the Contractor shall use water as a dust suppressant in the active pit and on haul road areas primarily used by the Contractor. Under freezing conditions other dust abatement products or methods as approved by the Department shall be used. Paved surfaces are to be regularly swept.

(b) If through the monitoring program, further mitigation is identified as being required, the Contractor, at its own expense, shall implement the following program that will further reduce the dust emissions produced by the Contractor's mining, loading and/or hauling operations:

(i) Each separate component of any conveyor systems employed by the Contractor shall be enclosed by a sound and dust retarding blanket system. This system is to confine all dust to the enclosure where it will settle out at the base of each component;

(ii) Water sprays shall be installed at various transfer points to control dust generated during operation of any conveyor systems; and

(iii) any other methods as may be required.

6.1.4. Waste Management

(a) The Contractor shall report discharges or spills of oil, diesel fuel or any other regulated substance to the appropriate authorities in a timely manner. The Contractor shall be solely responsible for the cost of any clean up required as a result of the Contractor's operations at the STAR.

(b) The Contractor shall properly dispose of all construction materials, refuse and all other waste materials in the nearest approved landfill site. No materials of any kind are to be buried or burned on site by the Contractor.

(c) The Contractor shall provide suitable temporary sanitary facilities for the Contractor's Personnel and shall enforce their use.

7. PUBLIC RELATIONS

7.1 The Contractor shall cooperate with the STAR Operator and the Department to develop and implement procedures and methodology for handling public relation issues including fugitive emissions, odours, noise and trucking related complaints.

8. COMPLETION OF OPERATIONS

8.1 The Contractor shall notify the Department and the STAR Supervisor in writing not less than 60 days before the date of STAR Completion.

8.2 At the date of STAR Completion or Traffic Availability, whichever occurs earlier, the Contractor shall clean up the operating areas of the STAR affected by the Contractor's operations in accordance with the following:

A. The site from which Aggregate has been removed shall be left in a neat and presentable condition, and all debris, including waste materials not suitable for use in reclamation, resulting from the Contractor's operations, shall be removed and disposed of in the nearest approved land fill site. All temporary structures shall also be removed.

B. The Contractor shall notify the STAR Supervisor and the Department when its operations at the STAR have finished to arrange for an inspection to determine what remediation or clean-up measures, if any, are required. All deficiencies identified by the STAR Supervisor and the Department shall be remedied to the satisfaction of the Department, acting reasonably.

8.3 Without limiting the generality of the preceding paragraph, the Contractor shall, at minimum, perform the following remediation activities:

A. The Contractor shall leave the Contractor's area of the STAR as designated in the Pit Operating Plan in a neat and presentable condition and any fencing or other infrastructure that the Contractor moved to access the Aggregate shall be replaced in the condition equal to or better than they were before being moved or removed, and all debris resulting from the Contractor's operations shall be removed and disposed of, at the Contractor's sole expense, as required by the STAR Supervisor.

8.4 Following remediation and clean-up by the Contractor, the Department shall inspect the Contractor's area to determine if such remediation and clean-up is satisfactory. In the event that the Department determines that such remediation or clean-up is not satisfactory, the Department shall notify the Contractor of such deficiencies ("**STAR Deficiency Notice**"). If the Contractor has failed to rectify the deficiencies outlined in the STAR Deficiency Notice to the satisfaction of the Department within 30 days of the date of delivery of the STAR Deficiency Notice to the Contractor, at the Contractor's sole cost, the Department may complete any and all remediation or clean-up measures or part thereof, or may contract with any other contractor to complete the necessary remediation or clean-up measures all at the expense of the Contractor. All costs and expenses incurred by the Department in respect of rectifying such deficiencies shall be set off by the Department against any Payments or Progress Payments to the Contractor in accordance with section 9.8 of the DBFO Agreement.

9. CANCELLATION

9.1 If the Contractor, upon receiving a Notice of Default from the Department relating to any default or breach by the Contractor or the Contractor's Personnel with respect to any of the terms and conditions contained in section 200.4.13 of Schedule 18 to the DBFO or in this Appendix J, fails to

(a) cure the Default within 21 days; or

(b) where the Default cannot by reasonable commercial efforts be cured within 21 days, communicate to the Department and initiate within that 21 days a commercially reasonable course of action designed to cure the Default, and thereafter diligently pursue that course of action until the Default is cured; or

(c) where the Default is an Incurable Default, within 21 days communicate to the Department and initiate a commercially reasonable course of action designed to mitigate the consequences of the Incurable Default to the maximum extent practicable, and thereafter diligently pursue that course of action until the consequences of the Incurable Default have been so mitigated,

the Department may, at its sole option, cancel and extinguish the rights of the Contractor relating to the STAR including but not limited to the Contractor's rights to excavate, mine, stockpile, and haul Aggregate.

9.2 Cancellation shall not release the Contractor from any of its obligations or liabilities in relation to the STAR, and shall not affect the rights and authorities conferred on the Department in relation to the STAR.

9.3 At the date of Cancellation or the date of termination of the DBFO Agreement, whichever occurs earlier, in the event that any remediation or clean-up is required at the STAR in respect of the Contractor's operating areas, at the Contractor's sole cost, the Department may complete any and all remediation or clean-up measures or part thereof, or may contract with any other contractor to complete the necessary remediation or clean-up measures all at the expense of the Contractor. All costs and expenses incurred by the Department in respect of rectifying such deficiencies shall be set off by the Department against any Payments or Progress Payments to the Contractor in accordance with section 9.8 of the DBFO Agreement.

9.4 As at the date of STAR Completion, Traffic Availability, the date of Cancellation, or the date of termination of the DBFO Agreement, whichever is earliest, the Contractor shall immediately remove all its excavating, mining, hauling and all other equipment from the STAR

9.5 Notwithstanding anything contained in this Appendix J, all costs and expenses incurred by the Department as a result of any default or breach by the Contractor of any of the terms and conditions of section 200.4.13 of Schedule 18 to the DBFO Agreement or of this Appendix J, including any costs of remediation or clean-up, will be a debt owing to the Department.

9.6 The Contractor and the Contractor's Personnel shall not have any claim for compensation or damages against the Department, its employees or agents, the STAR Supervisor, the STAR Operator or any of its employees or agents for any stoppage or delay or other loss caused by or resulting from any suspension or cancellation of any and all rights of the

Contractor relating to the STAR or costs, damages, expenses or consequences arising therefrom.

10. SUBCONTRACTING BY CONTRACTOR

10.1 The Contractor may not, without the prior consent of the Department, which consent shall not be unreasonably withheld, subcontract any of its obligations, rights, activities or operations relating to the STAR.

10.2 The Contractor may replace a subcontractor or engage additional subcontractors only with the prior consent of the Department, such consent not to be unreasonably withheld (having regard to the reputation of and the technical, commercial and financial resources available to the proposed replacement subcontractor as well as the aggregate capacity of the STAR).